[MUSIC PLAYING]

BONNIE: I'm Bonnie.

SYDNEY: And I'm Sydney. And this is Introduced from Wisconsin Sea Grant.

[MUSIC PLAYING]

BONNIE: This story starts in the summer of 2009, in Germantown, Wisconsin. Which is this little community, 25 miles Northwest of Milwaukee. And residents of the Esquire Estate Subdivision became concerned when they noticed what they described as small lobsters, crawling through their lawns at dusk. [MUSIC PLAYING] The more I learned about this story, the more I realized that it was actually very serious, and there was a large scale investigation, a million were spent, trying to contain these crayfish. And yeah, people devote their entire careers, trying to make sure things like this do not happen.

SYDNEY: Another thing that's interesting about this is that, I feel like you hardly ever hear about the first time an invasive species gets established here. Like we've done a lot of reporting on invasive species, but a lot of times it's species that have been here for a while, or weren't introduced in my lifetime. And by the time that we discover that they're even there, there's kind of no chance or hope to get them out. But in this case, it was the first time that red swamp crayfish were discovered in Wisconsin. And so you do have a fighting chance against them. And another thing is that, people still reference this today.

BONNIE: So I was surprised to learn about all of this, because I have unknowingly driven past this development, a lot of times growing up. But after hearing the story, I kind of wanted to go back and see it again. Germantown is kind of a funny community, just in that it's really, really into its German heritage.

SYDNEY: What do you mean?

BONNIE: I guess picture just a town that was built between 1950, and 1970, but like everything is stucco. The McDonald's, but make it German and stucco. Some of the street signs are in German, it's really funny. I was also hopeful when I went, that I could meet someone who was there in 2009, and could tell me a little bit more about what had happened in that place. So Esquire Estate is right off the main highway, I parked my car in a cul-de-sac and just started walking. So most of the houses in this development, I don't know they just look like classic, subdivision homes. This could be literally anywhere in Wisconsin, all of the backyards. They're all situated in a ring around, like this kidney bean shaped pond. And then all the backyards slope down into the pond, and then the water was this really striking shade of turquoise blue. Which I feel like can't be natural. [LAUGHTER]

Yeah, so the pond was a lot bigger than I had anticipated. And there's actually this island in the middle of it, with a community swimming pool on it. And you can walk to the island across this little bridge. And I could see people sitting out there, and chaise lounges around the swimming pool, and there were all these kids laughing, and splashing in the water. I really, really, really wanted to see the pond, but I felt like I was going to have to trespass across someone's lawn to do that. There's a sign that was a really clearly stating that you couldn't go back, unless you were a resident, or guest of a resident. So I just kept walking.

And the first person I met was the woman named Mary. She was in her front lawn, and she told me that she'd lived in this neighborhood for 27 years. Do you fish back there?

MARY: We don't. But a lot of people do. Yeah. The kids do a lot. But the water is clean, did you want to go look back there?

BONNIE: Can I?

MARY: Sure.

BONNIE: As we walked around her property, Mary told me more about the crayfish problem. She said that the first time she saw a crayfish, was actually two years before the 2009 incident.

MARY: I know I saw it, it was kind of near the COVID area that we have in the back, where the water drains out. And I had seen it way before it was a problem, but I didn't think much about it. I just kind of thought somebody used it as bait, and it'll die out kind of thing, but it didn't so. [LAUGHS]

SYDNEY: Oh my gosh, she saw it a few years before.

BONNIE: Yeah, there is something really, really eerie about that to me. I don't know, it feels like on this moments where two alternative realities just kind of diverge.

SYDNEY: Yeah. So if the crayfish were around for a while, but no one did anything, what changed?

BONNIE: Mary said that the winter before, all of the fish in the pond had died. Like at what point did people decide, this is a problem? And we should--

MARY: Because they were crawling all over the lawns and stuff. Somebody on the other side actually call the DNR, gave them a picture of it, and asked them what this species was or anything, because it was multiplying quite a bit. And I think that's when they kind of got involved, when they realized what was actually and stuff, and how invasive it was becoming.

SYDNEY: The first thing that the Department of Natural Resources did, was send someone out to collect a few samples, which they took to this crayfish expert, who worked for the Milwaukee Public Museum. And right away, they were able to confirm that this was a red swamp crayfish. Two days later, Heidi Bunk remembers getting an email confirming that there were red swamp crayfish in the pond. Heidi is a lakes biologist for the DNR, who does everything from coordinating community science programs, to issuing building permits, to answering phone calls from concerned residents. Heidi has a huge hand in everything that comes next.

HEIDI BUNK: So August 25th, 2009, [MUSIC PLAYING] is when we got that phone call. [MUSIC PLAYING] There were giant lobsters wandering all over Germantown. That's the call we got.

SYDNEY: Oh my gosh. [LAUGHTER] So the DNR Springs into action, Scott Van Egeren was a Natural Resources Scientist at the DNR, back in 2009. Now, he's a regional lakes biologist in Rhinelander. But back then, he was just finishing up grad school. Scott had some previous experience researching crayfish, and so when he got the email about the red swamp crayfish in Germantown, he knew it was something that he wanted to be involved in.

Along with Heidi, Scott would become one of the main handful of people who focused on Germantown. So the DNR staff went down to the pond, and saw what they were dealing with. [MUSIC PLAYING]

SCOTT VAN EGEREN: Fisheries staff, right away started to walk around the pond, and pull out crayfish. I think at first we were thinking, well, these crayfish are sold for crayfish boils. That could be it, somebody just dumped their live crayfish that they didn't completely use all of them, and maybe there's not that many. So they would catch like 10, as they walked around.

SYDNEY: We asked basically everyone we talked to, what their first impression of the crayfish was that day. And everyone said, they were huge. Like the biggest ones were eight inches long. And they were more aggressive than anyone expected. [LAUGHTER] A lot of people that research crayfish, are used to the Wisconsin native crayfish, or even the rest of crayfish, which is invasive, which apparently are a little bit more calm, and like skittish. They run away from you, but red swamp crayfish will charge you, is what I understood.

BONNIE: They're fearless. [LAUGHS] Yeah.

SYDNEY: The red swamp invasion in Germantown was a particularly big deal, because this was the first red swamp crayfish introduction in Wisconsin. Red swamp crayfish had never been recorded in Wisconsin before, but they're kind of notorious throughout the world. They've become invasive in a lot of different places. They become really abundant, and they spread fast, and they're really hardy. We talked to Stephanie Peay, she's a British ecologist, and independent crayfish researcher. Because the species of crayfish that are invasive in Europe, are the ones that we have native here in North America. Seeing as Europe in total has only a handful of native crayfish species, Stephanie is really impressed with the ones in the US.

STEPHANIE PEAY: The United States and in particularly the Southeast, is a global hot spot for crayfish biodiversity. In terms of the number of species that are present, and a lot of them unique to specific areas in some cases, specific river systems, or cave systems. You've got cave dwelling crayfish, in some parts of the United States. I went to a crayfish conference down in Missouri, some years ago. And there's over 80 species in that state alone. So you have the most amazing wealth, of these weird and wonderful animals.

SYDNEY: Because of global trade, people have been moving crayfish around. And some species of crayfish including red swamp crayfish, are common in aquaculture. Like people farm them because they're good to eat, and they taste like lobsters. The fact that they can be so large, is what makes them popular for boils.

STEPHANIE PEAY: Red swamp are amazing burrowers, they really are. And they're also really quite terrestrial. They live down naturally in southeastern United States. So places like Florida, and that area. And they live in seasonal ponds. So they're used to things drying up. So they have two survival strategies. One is head out, and the other is hunker down. So head out, they will go and walk over land, until they try and find somewhere that's a wet pond they can move into.

Hunker down is where they pull up the drawbridge literally, they're in their burrows, it's drying out outside, so they stop up their burrows with a mixture of mud, and spit. And try and stay in damp conditions in this deep underground burrow, and wait it out until it gets wet again.

SYDNEY: We mentioned it in the last episode, that red swamp crayfish, their burrows can destabilize dams, and other earthen structures.

STEPHANIE PEAY: So you can see they're pretty tough to control.

HEIDI BUNK: What we had learned about these crayfish was that, they might be able to walk a couple of miles across land, and there are lots of little storm water ponds, drainage ditches, the Menominee River was within a mile or two of this. And if they got in a river system, the genie's out of the bottle, right? You can't put them back in then, we're not going to get them all if they make it to a river or a stream.

BONNIE: So this was basically a ticking time bomb.

SYDNEY: Yeah, the Menominee River leads to Lake Michigan, and Germantown itself is only a 20 minute drive from the Great Lakes. So yeah. For the DNR the first step was to secure the perimeter, which is blocking culverts, and exits, and kind of stretching a fabric fence around the whole lake to make sure that no crayfish got out. But that didn't really work.

STEPHANIE PEAY: The crayfish were not very impressed with this set up. Just burrowed right under it.

BONNIE: So now the crayfish are clearly out, and they're on the move. So the question is where did they go, and where are the crayfish now? Because the surrounding area is full of woods, and farmland, and wetland. And you can just picture like on a bone dry day, all of this would just look like grass. Like these culverts and ditches, but l add a little bit of water, and all of a sudden you have this network of channels, ushering the crayfish out into the great wide world. [LAUGHS] So it was really important to figure out where they had gone. So at this point the DNR calls in the Water Guard.

The Water Guard was this group of conservation wardens, who in the summer focused exclusively on protecting Wisconsin's lakes, rivers, and waterways. Chris Hamerla was part of the original response team. He remembers scouting ditches, turning over rocks along highways from the early, early morning, until nightfall. The other thing the Water Guard was trying to do was figure out, how the crayfish got there. So they would go around to local schools, and ask them if they had been distributing crayfish to students. And he would walk around the subdivision, and knock on people's doors, and ask them if they had seen the crayfish. Or if they knew anything about where the crayfish might have come from. And honestly I can't imagine, outing myself at this point, that would be so embarrassing if it was you. [LAUGHS] Yeah. Here's what that conversation would have sounded like.

CHRIS HAMERLA: Hey, good afternoon. My name is Chris Hamerla, I'm a deputy conservation warden. You've probably noticed the DNR staff working on your pond, we're looking for these crayfish. Perhaps you've seen them crawling across your yard, and that's how you'd open up the conversation.

BONNIE: They were going all over the place asking people for information.

CHRIS HAMERLA: Few people were like, well, yeah. We saw some in our yard. Or we saw some crawling across our driveway. So at that point it led us to, well when did you see that? We've been seeing it for the last month. We're OK, well this is a bigger issue maybe than we think. This isn't a new population. And potentially these things have spread.

BONNIE: So the Water Guard expanded its search radius. Now they were looking in places roughly a mile or a mile and a half away from the pond. Trying to gauge just how far the crayfish could have walked. And that led them to a storm water retention pond, at the police department roughly a quarter mile away from the pond, and across a busy road.

CHRIS HAMERLA: So what we actually ended up finding first was, just some pieces of red swamp crayfish on a rock. Like a raccoon or something had eaten it. It was like, OK, obviously we need to check this pond out better. So then you kind of look around the pond, while here's an area with some rocks. You start pulling up the rocks, here's a red swamp crayfish.

BONNIE: As they're evaluating how far the crayfish have made it away from the pond, they also need to evaluate how many crayfish are in the pond, and where in the pond are they.

JAKE VANDER ZANDEN: Very distinctly we remember going down to the pond, it was late morning. They were just clearly everywhere in the ponds. So they were abundant in full force.

BONNIE: That was Jake Vander Zanden, the director of the Center for Limnology at UW Madison. And someone who spent a career researching aquatic invasive species. He came down to help the DNR learn about the crayfish, where they came from, kind of what their life histories looked like. And where they were in the pond, so that when they started trying to remove the crayfish, they would be as effective as possible.

JAKE VANDER ZANDEN: I remember like the first time I went inside, I was in my swimming suit and going, and just poking around and picking up red swamp crayfish. And getting bit occasionally. I was in the middle of the pond. It was fairly deep, but around the edges, there was sort of a nice shallowy area where you could wade, and find crayfish. And these crayfish were pretty happy, sitting in these shallow nearshore areas just hanging out. I remember finding it really not that humorous to be in this, I mean--

I just sort of felt that this pond was nasty. I don't even know why I felt that, but it was the blue dye, and then it was also just envisioning all of the oils from the road, running off into this little pond and everything. [LAUGHS] The storm water pond. And then there's the element of, OK, I need to get in there, and I need to be snorkeling around, because I'm the biologist who's supposed to be the one who really comes in with these insights about the location of the burrows, and that sort of thing. But this is the kind of thing that biologists do. You end up in golf course ponds, and it's just the way it is so.

BONNIE: Most of the work Jake does, is really academic. He observes invasions that have already happened. For example, the rescue crayfish invasion that has been going on, for the last like 60 years in Wisconsin. And how they impact lakes. But this time felt different.

JAKE VANDER ZANDEN: We're dealing with a real world situation, that we don't have any control over. This is not an experiment, this is a crisis, right? So Jake sent some of his students out to help.

SYDNEY: Here's what Scott remembers.

[MUSIC PLAYING]

SCOTT VAN EGEREN: So within two weeks, we had students out there catching crayfish, with many traps. I think they were like 100 some. And then the catch went up to like 60 to 100 crayfish a day.

SYDNEY: If these crayfish were from a recent crayfish dump, they would have all been about the same size, and the same age. But from the trapping that students did, they were seeing crayfish of all different sizes, and sexes, and life stages. Clearly they'd been established longer than a few months. Once it was clear that there were thousands in the pond, the DNR started thinking about doing a chemical treatment. And by chemical treatment I mean, using chemicals to kill all the crayfish in the pond. [LAUGHS] Just want to acknowledge that there's a lot of euphemisms being used in this episode. [LAUGHS]

Naturally the DNR looked for other people or organizations, that had used chemicals before to control crayfish, because Wisconsin hadn't done this before at all. And it turned out not many other places in the US have really done this.

SCOTT VAN EGEREN: There really wasn't much out there in the scientific literature about chemically controlling crayfish. Our staff were really kind of trying to break new ground here.

SYDNEY: So there were a few chemical options to think about. Like you don't want a chemical that's going to stay in the pond for a long time. And so there was this insecticide that they had thought about using, which to me I wouldn't have gone to insecticide, because crayfish aren't insects. But apparently they're close enough to insects, that we can use an insecticide. So there is this chemical called perinile that they could use, but the challenge to using any of these chemicals is that, there are regulations that prevent you from using them to protect people I guess.

And so you can't use them on waterways in the US, unless you have the right permits. And getting those permits takes like a year. So they wouldn't be able to use this insecticide right now, but they still needed a short term solution. So they decided to use bleach.

[MUSIC PLAYING]

HEIDI BUNK: So imagine a 4,000 gallon tanker truck showing up in your neighborhood, on a Tuesday morning or whatever. And pumping bleach into your local pond.

SYDNEY: Yeah when I imagine that, I don't think I would be pleased necessarily. I guess I would want to get the crayfish out.

BONNIE: I think I would have a lot of questions.

SYDNEY: Scott and Heidi said that the residents are really understanding, with the gravity of the situation. And also yeah, the bleach did kill everything else that was in the pond, but they also said there wasn't much else in the pond, because of that fish kill had happened in the year before.

BONNIE: So they treated the pond with bleach, and they also had someone go around to each individual burrow, and apply bleach into the burrow, to make sure that they were getting the crayfish, and that crayfish couldn't hide. And the burrows are pretty easy to spot, they're just little holes in the ground, and sometimes there's like a little column of dirt, where you can tell like the crayfish has burrowed out. And they were using roughly the concentration of bleach that you would want to use, if you were going to clean out your shower. And after this treatment it appeared that there were no crayfish left in the pond.

SYDNEY: Heidi showed us a graph of how many crayfish are caught throughout the few months, and after the bleach treatment, the number goes directly down to zero flat line.

BONNIE: But when the DNR came back the next spring, the crayfish were back too.

[MUSIC PLAYING]

SYDNEY: So it's the spring of 2011, and the crayfish were back in Germantown. The numbers of crayfish climbed even higher, than what they initially were. Once the DNR does get funding again, they start looking for expert advice. They decide to invite none other than UK crayfish expert, Stephanie Peay.

STEPHANIE PEAY: They kindly invited me out to come and have a look at the site in 2012.

SYDNEY: Stephanie was really interested to see the site, she had been actually advising them for a little bit on this. So Stephanie gets on a plane on her way to Wisconsin. Stephanie has experience using pesticides to control crayfish. Her main thought had to do with the fact that the burrows were above the water level.

STEPHANIE PEAY: I said you got to deal with the ones that are in the banks. Otherwise, it for sure will not work. So that was why I recommended doing a measure which would dig out the banks, and put down an impermeable surface. These are techniques that I'm familiar with, from big construction.

SYDNEY: So the question with that was, what can and can't read swamp crayfish burrow into, if they were going to put a new bank on? So they designed what they call this crayfish condo study. Where they take plastic bins, and different sizes of rocks and gravel, and then put crayfish in there to see what they can burrow into, and what they can't.

STEPHANIE PEAY: It was amazingly hot when I was there in Germantown. I think there was a heat wave going on. So the temperature was up over 40 degrees centigrade, so up over 100 Fahrenheit. I'm not used to working in heat like that. But amazingly, despite the fact that red swamp crayfish they're an aquatic animal, I think they coped with the heat better than I did. You think, wow, that is an impressive animal.

BONNIE: They also learned that raccoons love crayfish.

SYDNEY: How did they learn that?

[LAUGHTER]

BONNIE: So one thing that Stephanie wanted to do while she was there was, run these experiments on the island during the night. Stephanie just left some buckets. There were 10 buckets, and each bucket had 30 crayfish. So 300 crayfish, and they were testing out like these different concentrations of chemical, to see how the crayfish would respond. But she was doing this on the island, and the residents didn't want anyone to stay on the island overnight. So Stephanie leaves, and when she's gone, the raccoons come. Here's Heidi.

HEIDI BUNK: The raccoons essentially had a frat party there. And all that was missing was the crushed beer cans.

SYDNEY: What did it look like?

HEIDI BUNK: A disaster zone. There were torn crayfish, everywhere crayfish parts up in trees, on shrubs, stomped on all the containers were turned over. So there was quite a party raccoons had a pretty good time.

SYDNEY: So the next order of business was to do the bank treatment. The bank treatment was this idea that Stephanie recommended. It was a way of completely altering the shore around the pond, to make it inhabitable to red swamp crayfish. So they removed all of the brush, and plants, and trees, along the shore of the pond. They brought in giant diggers, and scraped away all of the soil, and any remaining crayfish burrows 15 feet around the shore of the pond. They lined that with impermeable fabric, brought in truckloads of gravel and rocks, and put that on the shore. And the neighborhood had their new shoreline. After that they were able to use the insecticide.

BONNIE: So meanwhile there are still all of these crayfish across the street at the police retention pond. Which this pond is completely man-made. It's smaller, and nothing else really lives in it. So if they can't eradicate the crayfish in the pond, they decide that they'll just eradicate the pond and completely fill it in.

SYDNEY: Wow. That seems like a very big decision.

BONNIE: Right. Like just cancel the pond. [LAUGHS] The pond no longer exists. [LAUGHS] Yeah Heidi kind of spoke to that a little bit.

HEIDI BUNK: The decision came because we knew that both the bleach, and the perinile were not going to kill them if they were in the burrows. And we wanted to eliminate the habitat for these crayfish. So the idea was to fill in this pond for approximately five to seven years.

SYDNEY: So obviously the crayfish and the pond were eradicated at the police pond. But what about the Esquire Estate's pond? In 2015 the year after they did the bank treatment, and the insecticide, they only found two crayfish that year. In 2016, they didn't find any. In 2017, they found one crayfish. And in 2018, they didn't find any either.

BONNIE: How could they go from having zero to one? That makes me feel like there could be more than one, even if it looks like there aren't any.

HEIDI BUNK: So in this case, complete eradication wasn't achieved. [MUSIC PLAYING] And to me I'm somewhat surprised, because I'm pretty sure there were a few red swamps lurking around on the wrong side of the barrier.

SCOTT VAN EGEREN: When you're thinking about eradicating species, like I said, I never want to use that word. I kind of don't think we should. It's almost never possible. So I think the lesson learned for all of us is, if you really think you're going to eradicate something, that's a pretty tall order. And if it's not just something in a little pond, it's probably not possible.

BONNIE: Throughout this whole time there was this ongoing investigation, to see how these crayfish got in. No one really wanted to commit to a single theory. But I'm just curious from what you've heard, are there any that you think sound the most plausible?

SYDNEY: I don't know I think leaning towards the crayfish Boyle theory, maybe someone ordered a box of live crayfish, and then somehow they got in. Because I don't know, it just seems like they would take so many crayfish initially, to create an invasion this big. What do you think?

BONNIE: Yeah, I think the more people have been involved, the more likely it is that we would have an answer right now, and the fact that we don't, I think it was like a very small number of people, if not one person. [MUSIC PLAYING]

SYDNEY: There are still a lot of lessons that the scientists involved have learned from this. First of all they've learned, just how to contain and control red swamp crayfish, which there hasn't been much research on.

BONNIE: While they were conducting all of these surveys in ditches around the police department, they also made some other discoveries. For instance, they found a few rare species of frogs, and even rare native crayfish. And that was surprising to Scott, because he doesn't usually think to monitor environments like this.

[MUSIC PLAYING]

So I asked Mary the woman who lived at Esquire Estates, who I talked to at the very beginning. I asked Mary if she had any wisdom for people who might live in communities similar to hers. And she said, that the most critical thing someone can do is, do not stock crayfish or anything else in your pond, or your river. Situations like this are so preventable, just do not stock crayfish or anything else in your local pond, or wetland, or lake, river, just do not do it. [LAUGHS]

[MUSIC PLAYING]