TWV Podcast #008:
Rehabbing Our Rivers! River Restoration or Reclamation? With Marty Melchior
Show Notes at http://thewatervalues.com/pod8

Intro: Welcome to The Water Values Podcast. This is the podcast dedicated to water utilities, resources, treatment, reuse, and all things water. Now here's your host, Dave McGimpsey.

Dave: Hello and welcome to another edition of The Water Values Podcast! I hope everyone had a great holiday weekend.

I'm recording this intro on Dyngus Day. What's Dyngus Day you ask? Well, it's a celebration of Easter Monday in Poland, and it is celebrated in Polish communities around the globe. Interestingly enough, one of the Dyngus Day traditions involves boys and girls drenching each other with water. Technically, boys were supposed to drench girls on Dyngus Day, and the girls were to drench the boys on Tuesday, but I understand that oftentimes the girls didn't bother waiting until the next day to get their revenge. Anyway, I first heard of Dyngus Day in college because I had 4 pledge brothers from South Bend, Indiana, and South Bend celebrates one of the larger Dyngus Day festivals in the U.S. By listening to The Water Values Podcast, you not only educate yourself about water issues, you also get your cultural horizons expanded, especially when they involve water like the Dyngus Day traditions do.

Okay – on with the show. Today is an interview with Marty Melchior of Inter-Fluve, Inc. Marty restores rivers and waterways for a living. Or does he reclaim them? I'll let you decide after listening to the interview. Marty gives us a lot to think about in terms of the way we think about water. He also builds on last week's talk with Ellen Wohl, although Marty discusses how we go about rehabilitating our rivers and streams and gives us a real hands-on look at how we rehabilitate our streams.

Well, if you're a regular listener, you know that before we get into the podcast, I need to make a few disclaimers. I'm a lawyer licensed in Colorado and Indiana. And nothing in this podcast should be taken as providing legal advice or as establishing an attorney-client relationship with you or anyone else. Additionally, nothing in this podcast should be considered a solicitation for professional employment. I'm just a lawyer that thinks water issues are interesting and that public education about water issues is needed. And that includes educating myself about water issues because no one knows everything about water.

With that said, let's get on with it. Open the valves, fasten your seatbelts and here we go.

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Dave: Marty, thanks very much for coming on to The Water Values Podcast. Greatly appreciate your time and could you please tell us a little bit about your background and how your interest in water began.

Marty: Sure. I have an undergraduate degree in molecular biology. I have a Master's Degree in fisheries. I didn't start out in rivers. I worked in the medical device industry, actually, for a little while before going back to grad school. I did grow up on a little ephemeral stream in Minnesota, and my family had a cabin on a lake so I was always around water, and I think that's where my interest started. I used to build little dams on the creek and pull them out repeatedly. So, I pretty much do the same thing now.

Dave: Got it. Now, could you tell us a little bit about what you do now.

Marty: Yeah, I'm a regional director for a company called Inter-Fluve. Inter-Fluve has been around for about thirty years. We are a river restoration design firm. And so we essentially assess rivers, look at the problems, and try and find solutions for those problems. And then we will design river restoration projects and do construction management until those projects are completed.

Dave: When you're looking around at these various projects, what typically causes the need for a river to be restored?

Marty: Well, if you look at the United States from a big picture perspective, we've done a lot of bad things to our rivers. We've straightened many of them. Many of them are contaminated, ditched, dammed, diverted. We've buried a lot of them in pipes. We have tiled a lot of our agricultural drainage. You know, the EPA, I think, estimates that roughly a third of the rivers in the U.S. are impaired, polluted or somehow endangered.

And if you look at it from a watershed perspective, we've logged off 95+ percent of our old growth forests. So every forest that you see now is either second growth or primary growth forest, a brand new forest. We've plowed up most of our prairies, paved over all of our urban watersheds. And the result of all that is that water, when it hits the ground, moves faster and hotter into our streams and that in turn causes a lot of erosion, a lot of sediment deposition, causes those streams to heat up and degrades the habitat.

And then if you want to talk about flooding, in floodplains, we've filled in a lot of our floodplains. We've dumped millions of yards of concrete and riprap into our stream banks to try and keep them from unraveling due to our long trail of misdeeds there. So they're in pretty urgent need of assistance and often overlooked.

Dave: Ok, now, back in Session 7 of The Water Values Podcast, Dr. Ellen Wohl from Colorado State University talked to us a little about rivers and how, I think her point was primarily that, look we've had the wrong perspective on rivers. We've treated them kind of like just conduits or gutters so to speak, rather than looking at them as an ecosystem. How does the restoration process, how do you kind of reverse that process? How do you turn it from just that conduit back into the ecosystem?

Marty: Yeah, well, it's really a matter of just, like you said, reversing what's been done. So, all of those things I talked about, like dams, for instance, a lot of times, all you have to do is take the dam out. If a stream has been straightened, we can put that sinuous planform back into it. And we can restore the habitat features that have been lost.

And so, it's really just a matter of trying to target some service, spatial target and the temporal target, as well. So we're trying to go back in space and time and figure out what the stream used to look like. Is there, there's usually no way that we can go actually back into some historical frame of reference and restore it to say what it was like in 1400 because the climate has changed, and land use has changed dramatically and so we have to do what is really called reclamation. It's not really restoration. Restoration implies, you know, setting it back to some target like that. But what we're doing is reclaiming portions of what was the undisturbed, if you want to call it that, stream.

Dave: Ok, so in this reclamation process, it sounded to me like, at first, you want to understand kind of the historical condition of the river, and then what comes next? Once you've figured out what the historical condition of that river is and you've obviously recognized the need for the reclamation, what's kind of the rest of the process?

Marty: Sure. Well, getting a handle on the constraints that you have is the first thing. So we need to do an assessments, a geomorphic assessment where we look at where the water's coming from, what does the stream look like, what's it current condition? And we can look at other streams that are perhaps not as impaired and compare the two, and see where we think that that stream should be going or what its state ought to be. And then we can start thinking about how to do that. And so the next step in that process then is trying to figure out how much water is coming down and when, so hydrologic investigation.

And so then we look at hydraulics, which is what's the water doing in the channel? What are the erosive forces that work there? And then we'll start to come up with design plans. Let's say that we are taking a channelized or ditched stream and making it into a sinuous stream again, we'll look at that what that sinuous planform should look like. How deep should the riffles be? How deep should the pools be? How high are the banks? Are we going to incorporate things like large wood, woody debris, riffles for spawning, and things like that, and then we'll develop plan sheets that actually show that on there. Just like you would if you were engineering a building or a

parking lot, we go through a similar process for designing streams. It's actually an engineering exercise.

Dave: Ok. You talk about the introduction of wood into the streams. I know Dr. Wohl talked a little about that. Could you expand, you haven't heard her interview yet, obviously. Could you talk about the importance of wood in a stream?

Marty: Yeah, sure. Ellen's great. She knows more about rivers than just about anybody in this country and she's absolutely right that wood played an incredible role in the stability of streams and formation of habitat historically. So, if anyone has a chance to go look at an old growth forested stream, what they'll see is, they may not even see the stream, because there is so much wood that has fallen into the river. It really occludes the channel in places, it blocks flow and a lot of times in those old growth forest streams, if it's a small stream, the water actually flows underneath all this wood, it's a matrix of logs.

And so, over the years, as trees get older, you know, the branches fall in, the trees blow over and they fall into the creek. Whenever that wood contacts the water, you'll get things like eddies forming and scour, and differential sediment depositions, so sediment depositing in different places. And what that does is create complexity. We know that fish and bugs in the stream thrive on complexity. They need complex visual environment so that they can hide from predators. And they need complex flow so they can, one instance maybe, rest in a pool or in another instance, look for bugs that are floating down so that they can eat them. In another instance, they may want a faster flowing riffle so they can spawn in there, and so wood provides complexity into what would be normally kind of a homogeneous landscape.

And you can see that if you look at streams where wood has been removed, the habitat is somewhat featureless. So what we try to do then to set the clock back and restore that complexity is to bring wood in. So we'll bring in logs, we call the root logs sometimes, logs with roots on them. We can put individual pieces in the stream or we can build log jams or complexes of wood as part of the bank's stabilization projects to help add complexity.

Dave: And all the, essentially, it sounds to me like the wood is the lynchpin or one of the key ingredients to this complexity and that complexity in turn improves water quality downstream, that many of our cities get their drinking water from. Is that fair?

Marty: That's right. Yeah, actually yeah, that's correct. What is one part of that process, you know, there are certainly many, many rivers and streams that don't have forested riparian zones, and so complexity comes in other ways too, but certainly wood has played big role in the history of our small streams and our big rivers, as well. If you know, well, if you look back at historical records of the Missouri River and the Mississippi River, big rivers in the Midwest, we know that the grade of those rivers is often controlled by massive log jams that were a hundred feet high

and miles across. We removed all of those log jams and so that has had a dramatic impact on the channel bed of those rivers. It's dropped many of those rivers and lowered the groundwater across vast areas of the Midwest.

Dave: Now, what are some of the ways that these Midwestern rivers that don't have the forest or riparian zones, what are some of the sources of complexity for those rivers?

Marty: Well, prairie streams, for instance, or streams that are, well, let's take one example at a time. So, a wetland stream, for instance, has higher groundwater. Those streams generally have fairly steep side slopes to the banks. There's often undercuts and places for fish to hide there, and wetland vegetation, shrubbery and things provide overhanging cover there. If you are in a prairie stream, you've got a similar situation there. You're typically in a riffle pool kind of stream type. So you'll have steeper riffles going into pools on the outside of the underbends where the water velocity is faster, and so you can undercut banks in those situations, and the prairie grasses can hold the bank in place so it doesn't necessarily collapse, and you'll get undercut bank cover there. You will find wood in those places as well. The odd tree is inputting wood into the stream here and there.

Dave: Ok, so back to the reclamation process. You've talked, I think, a lot about kind of the front end of the process. How do you develop, say, the goals for what the reclamation project is aimed to achieve? And how do you measure some of your objectives and do you have any hypotheses you test? Things like that?

Marty: Sure. A lot of times we're working with granted projects or projects with multiple funding partners and stakeholders. So they might be people like Fish and Wildlife Service, state Department of Natural Resources, local municipalities who maybe have a water quality or an aesthetic interest, as well, recreational users, and private landowners, too. So, the first thing that we do is sit down with those folks and talk about project performance criteria. So what do they want to see come out of that project? And what you'll find a lot of times is that when we solicit opinions from these folks, a lot of them have the same opinion, and it's usually an improvement in fish populations or improved water quality, improved riparian corridor function. Those are generally the top three.

Dave: So you establish those goals for the project, how do you, on the other side, once the project's done, how do you test whether or not the goals have been met? What kind of monitoring, is there a monitoring plan in place? What's kind of post-project, what does that look like?

Marty: Sure. A lot of times, monitoring is done by others. We don't like to monitor our own projects just from a conflict of interest standpoint. But a lot of our project partners will do that, so agency folks are project owners, and they're usually looking at biological response. So,

monitoring fish populations is popular, macroinvertebrates or aquatic insect populations, abundance in diversity, riparian wildlife, bugs, I'm sorry, birds for instance, amphibians. Water quality is often monitored, dissolved oxygen, for instance, or temperature. For instance, if you are taking a dam out, you want to assess whether or not removal is improving temperature, so you sample upstream, downstream.

Dave: Real quick, can I interrupt you, real quick? You said in terms of temperature. What are you looking for in terms of temperature? Do you want a lower temperature, higher temperature? If you could talk a little about that, I am sorry to interrupt you.

Marty: No. that's ok. So most of the time we're interested in reducing stream temperature. Trouts, for instance, trout streams are generally groundwater fed, and so they are often times they're very cold. And they have a low diversity of fish and bugs, but those, the fish and the bugs that are in cold water streams are generally intolerant of poor water quality and warm water conditions. And so, we would target cold water in that situation. Warm water streams have a higher diversity of organisms and the organisms, that live in those streams are more tolerant of poor water conditions and warmer water. But generally speaking, even in those systems, when we are doing a dam removal, for instance, we want to aim for slightly cooler temperatures, which generally correlates to better water quality.

Dave: Ok, great. I was sorry for interrupting you when you were talking about the monitoring and evaluation, so please continue on that track. I just wanted to get into the temperature issue real quick.

Marty: Yeah. So again, measuring the biological response is important. So fish and bug response in stream and also sometimes wildlife response in the riparian zone. What's also very important in terms of success of any kind of stream bank stabilization treatments or flood plain treatment is the response of the vegetation community. So, we need to monitor the success of that vegetation, whether or not it's growing, and then long term, looking at the diversity of the plantings, and we oftentimes, almost always, are targeting native species. So, along with that comes the removal of invasive plants or the control of aggressive, invasive, exotic plants.

Dave: Well, that's an interesting point there. Has the environment we've created, by, say, straightening the rivers, treating them more as a conduit than an ecosystem, has that, essentially allowed a lot of these invasive species to come in have their growth fostered? What's the role of how we've historically treated rivers and invasive species?

Marty: Sure. Well, if you look at a map of any invasive species in this country, they typically follow the transportation corridors. And those areas where we have a lot of human use and agriculture, so the absolute worst invasive species out there are things like reed canary grass. If you go to any stream in the Midwest, there are virtually no streams that don't have this in it. But

any kind of low gradient, former diverse wetland in the Midwest is usually a monoculture of reed canary grass.

The same can be said for coastal marsh areas out East, and the species there would be phragmites or giant reed grass. There are other plants that are just as heinous, like kudzu and knotweed. If you go to Chicago, for instance, and look at any of the urban riparian corridors there, you essentially have three species. You've got oak overstory of older trees, and then you have buckthorn in the middle, and garlic mustard underneath that. And so almost all of the native species have been completely replaced by just a few invasives. I don't know that it was an active, it certainly wasn't an active plan, but it's just a matter of people doing what they do and really not considering whether or not their actions are spreading invasive species or not. In a lot of cases, the damage has been done. It's certainly gotten worse over the last twenty years.

Dave: It's probably more of a transportation issue and human movement issue than it is treating the river as a conduit, as contrasted with as an ecosystem.

Marty: Yeah, it really doesn't matter in that case. Like in the case of reed canary grass, it's such a prolific seed producer and rhizome, that once it's in the system, anywhere in the system, as soon as you get a flood, it's going to blanket the downstream area and a new set of seeds. So, there's not a whole lot you can do, and it really doesn't matter how you manage the water in that situation.

Dave: Ok. Could you talk a little, now, about how different geography affects the reclamation projects, for example, mountainous geography versus plains geography?

Marty: Sure. Well, earlier I talked about constraints. And one of the first things we do is kinda look at river restoration from the bottom up. And so we look at the underlying bedrock, the surficial geology that controls how the water flows off the landscape. And so in mountain areas here, you know, a lot of hard rock there, it's much steeper and so streams are straighter, they have a different longitudinal profile so that they might waterfall over or cascade over boulder drops and things like that.

As you get down in the watershed lower, now you start to come out of say mountain foothills, the stream slope decreases and you get into more of a riffle and pool kind of environment. The soils are generally finer as you go downstream. And then once you get out into the plains or coastal plains, the Midwest is a great example, we have very low gradient streams and the soils are finer, so you are talking about maybe clay and silky loam and sand instead of gravel and boulders.

And so, there's a really complicated interaction between how rainfall reacts when it hits the landscape, how snow melts in those landscapes, where that water goes underground versus over

the surface, and how that water interacts with the soils. And so, all of that has to be taken into account when you are restoring a stream.

Dave: Fascinating how everything's interconnected. Let's talk about some of the projects you've been working on. I kinda got in touch with you via the Eel River Headwater Restoration in Plymouth, Massachusetts. Could you tell us a little bit about that project?

Marty: Sure. In Massachusetts and other places in the Northeast, there have been historically a lot of cranberry farms. A lot of those farms are getting old and it's more difficult now for cranberry owners to make a profit. There's more competition and the bogs themselves are reaching their designed life, if you want to call it that.

The Eel River site was a forty-acre cranberry bog that had at one time been a fen wetland with a small stream running through it. And the owners there decided to sell that land to the town of Plymouth. And the town of Plymouth has a very active ecological restoration program run by David Gould there. And David wanted to do something there. I went out and looked at the site with him probably in 2005 and we talked about wetland and stream restoration there. And it just kind of snowballed from there.

So, cranberry bogs are old wetlands. So they are old peat bogs that have been covered up with sand. A long time ago in the early 1800's, a landowner on the coast found that if you put sand on top of coastal native cranberry bogs, the cranberries would get stimulated to produce more berries. And so what cranberry bogs do now is put a layer of sand down every so often, and over a 150-year period, you've got, at Eel River, we've got about a foot-and-a-half of sand.

We looked at either taking that sand off or raising the groundwater up and restoring the wetland on top of the sand. It turned out to be much, much cheaper to raise the groundwater level up, so that's what we did. And we built about 8,000 feet of stream channel, took out a large, well, a fifteen-foot high dam and restored a lot of brook trout spawning and rearing habitat there.

Dave: Ok. And that project ended up in, or at least the actual reclamation construction work was done about when? And how's the monitoring going?

Marty: Sure. That project was completed in 2009, and the town has and the state Department of Ecological Restoration, they have also been just fantastic in getting these projects going. And they have been monitoring this project for vegetation. A few students at the University of Massachusetts have been monitoring fish and macroinvertebrate populations in the stream, too. And the long-term plan for that wetland is to be an Atlantic white cedar swamp. And so, in about 10 or 15 years, the place which is now sort of the emergent wetland forb and sedge meadow will be a forested wetland or a swamp.

Dave: What about some other projects that you've worked on in your time at Inter-Fluve? Can you talk a little bit about a couple of those projects?

Marty: Sure. We're working right now on removing one more dam out of two on the Patapsco River in Baltimore.

There is an exciting project in Taunton, Massachusetts. We have taken out, we've taken out two dams already on the Mill River in Taunton, and we are going to take out the third dam probably in the next year-and-a-half. And it's expected that the Mill River will have one of the largest, or the largest herring and alewife migrations on the East Coast once that project is completed.

The biggest problem with dams is that they block fish passage, and so the fish are literally coming right up to the dam and stopping, in this case. And so we've been monitoring fish populations there – our partners have been monitoring those I should say – and we're really looking forward to taking out that last dam and getting those fish upstream.

Dave: Terrific. You know, I'm looking at your website here as we're talking, and you've got some fantastic, some great pictures of some of the projects you've worked on. Take a historical project you've worked on and tell us just a little bit about one of these projects that's kind of featured on your website.

Marty: Yeah. There's a project, another Mill Creek project. There are so many Mill Rivers and Mill Creeks in the United States. I think Inter-Fluve's probably worked on twenty of them, but one of the first projects I did with Inter-Fluve was a project called Mill Creek in Plymouth, Wisconsin. And that was an old aquaculture facility. So they had taken a small headwater stream and really dug up the entire flood plain and put that stream into a series of ponds with dams on them to raise trout.

And back in about 2000, I started working on that project, and we ended up removing all of the dams and really just grading the flood plain flat again and building a new stream system on top of that. And that little stream, which is about 3,000 feet long total, has really provided the bulk of trout production for the Onion River system to which it feeds. And so it's been fun to watch that project evolve over fourteen years and see how the vegetation changes and how the stream has been producing fish.

Dave: Ok. Terrific. Well, you've really imparted some terrific information today. Where can people go to find out more about your work?

Marty: Sure. Our website is the best place for that, that's at www.interfluve.com. And there are numerous examples of river restoration on that site.

Dave: I really recommend that you check it out because the pictures on the website are just absolutely fascinating, and it's a really interesting site. It looks like you guys do absolutely fantastic work. So, Marty, thanks again for your time today. Really appreciate you coming on The Water Values Podcast, and we'll talk to you soon.

Marty: Happy to be here. Thank you.

Dave: You bet.

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Dave: That was my interview with Marty Melchior of Inter-Fluve – really interesting stuff. Stuff that I probably knew went on but not nearly in the detail that Marty explained. He also brought the river restoration process into much sharper focus when he talked about the process that goes into restoring or more accurately reclaiming rivers – from the historical research on the waterway to be reclaimed to the post-reclamation monitoring.

I thought the temperature issue – that reclamation typically aims at lowering waterway temperatures was interesting. Also, the discussion of invasive species in waterways and riparian zones interested me.

Marty also gave us some great examples of restoration projects around the country that he's worked on. Just very interesting what can be done to improve our waterways.

And the more I talk with these folks in the water industry, the more I'm learning. I conducted another interview today with someone who advises businesses on water risk and some of the same things Marty talked about in this session and Ellen Wohl talked about in Session 6, were things that my most recent interview subject discussed, albeit from different perspective. It's not really fair to you right now because I won't be releasing the episode recorded today for a few weeks, but I continue to find and learn about new interconnections amongst various issues in water. I hope you're learning those same interconnections, as well.

Please let me know what interested you about the interview by leaving a comment on http://thewatervalues.com or by emailing me at david@thewatervalues.com. You can also tweet at me @DTM1993. The Show Notes for this episode will be online at http://thewatervalues.com/pod8.

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Outro: You've been listening to The Water Values Podcast. Thank you for spending some of your day with us.