

Ep12_PelletierDamRemoval

Wed, Sep 28, 2022 12:11AM 28:07

SUMMARY KEYWORDS

dam, floodplain, dam removal, project, removed, removal, upstream, vermont, sediment, fish, river, area, site, beaver dam, beaver, stream, pelletier, downstream, channel, trout

SPEAKERS

Karina Dailey, Shawn Good, Gabe Bolin, Alison Adams, Cate Kreider



Alison Adams 00:04

Welcome to restoration Roundup, a monthly podcast that explores recent research on new and emerging best practices for and stories about riparian forest restoration. I'm Alison Adams. I'm the watershed forestry coordinator with University of Vermont Extension and Lake Champlain Sea Grant and I run the watershed forestry partnership.



Cate Kreider 00:22

I'm Cate Kreider, and I'm a senior Environmental Studies student with a minor in reporting and documentary storytelling in the College of Arts and Sciences.



Alison Adams 00:29

In our last episode, we learned about process based restoration and what it means to restore a complete floodplain ecosystem. This month we're taking another angle on whole ecosystem restoration, this time through the lens of dam removal. We're excited to welcome Karina Dailey, Sean Good, and Gabe Bolin to the podcast. Karina is a restoration ecologist with the Vermont Natural Resources Council. Sean is a fisheries biologist with Vermont fish and wildlife. And Gabe is a water resource engineer with stone environmental. All three of our guests are currently working on a project to remove the Pelletier dam in Castleton, Vermont, and Cate and I are very excited to learn more about that project and dam removal in general. So welcome to the podcast to all three of you.



Shawn Good 01:21

Thanks.



 Karina Dailey 01:22

Good to be here.

 Gabe Bolin 01:22

Thank you, Alison.

 Alison Adams 01:23


Can each of you tell us a little bit more about the project and about your respective roles?

 Shawn Good 01:28

I'm Shawn good. I'm the fish biologist for Vermont fish and wildlife that's responsible for this area, the state and managing the fisheries resources there. And there's been an increasing call for dam assessments and identifying the need to remove dams that no longer serve a purpose. And when I got that request to review a list of dams a bunch of years ago, this was one that jumped to mind immediately because it's owned by the Department of Fish and Wildlife. It's on state land. And it does not serve a purpose anymore. And it's actually quite detrimental the fishery. So that's sort of what I saw, as you know, one of the high priority needs in my area. And I'm glad to see you know us at the point that we're at right now where it's actually happening.

 Karina Dailey 02:13


I'm Karina Dailey restoration ecologist with the NRC. I manage the dam removal program. And my role here has been to manage the project over the almost three years that the project has been in process. And I haven't even been in this position for three years. But I took it on from Brian Fitzgerald who was in the position before. Basically we're working with the engineer Gabe Bolin Sean good. The landowner being Vermont Fish and Wildlife Service and the contractor to manage the project. Prior to that we did the fundraising to get the funds to complete the posts the design of the project and now the implementation or removal phase which we're in currently.

 Gabe Bolin 02:54


I'm the design engineer for the project. So as design engineers, our job is to kind of characterize the site. So we went out and did topographic surveys, we took sediment samples of impounded sediment behind the dam to figure out what was behind the dam, we took measurements of the dam figured out what it was made of went through kind of hydraulic modeling to figure out okay, when we take out this dam and remove all the impounded sediment, what size channel and what size floodplain are we going to leave behind and and how does it perform over the long term?




 Gabe Bolin 02:57

 Cate Kreider 03:27

So what is the goal of dam removal? And what are the benefits? What is unique about this particular project?

 Karina Dailey 03:34

I think that the biggest goal to dam removal is restoring flow to a dynamic system. And when you have a dam, you basically have a barrier that creates a non flowing stagnant lake like system and removing that barrier reconnects the river and restores flow and natural sediment transport. And with that, there is a tremendous benefit both for public safety for fish and wildlife, water quality, and floodplain resilience.

 Gabe Bolin 04:01


Yeah, and I can speak to some of the uniqueness of the project. And I can start with maybe a goal of all dam removals as you obviously have the dam right, but also to remove the impounded sediment behind the dam and then create a new stream channel or what we call a pilot channel, and then figure out how much floodplain we want to include next to that channel or how much floodplain we can include thinking about site constraints. So some of the unique aspects of this project were just the sheer size, we were removing more than 16,000 cubic yards of impounded sediment behind the dam. For Vermont. That's a pretty big dam removal. So just to put it in perspective, 16,000 cubic yards of impounded sediment removal comes out to like almost 1400 Dump trucks. And we also have over 1000 foot road to travel through the site and remove the sediment and then haul it back out and get it off the site.

 Shawn Good 04:58

I didn't even realize that it was that many truckloads.

 Alison Adams 05:02

What's a more typical number for dams in Vermont?

 Gabe Bolin 05:05

I would say maybe half that size.

 Shawn Good 05:09

And this isn't a result necessarily the size of the dam being removed. But it's more having to do with where the dam is located in terms of the region of the state, right, the geology and the terrain. And the fact that these aren't rocky, steep gradient, high elevation mountain trout streams it's more on the, you know, outskirts of the Champlain Valley.

G

Gabe Bolin 05:31

Yeah, Shawn, that's a great point and you hit the nail on the head, this dam is located in the lower part of the watershed, where things they're not as steep, it's more flat. So when you have a dam constructed in the middle of a stream channel, the impounded sediment can reach back because it's so flat, the extent of impounded sediment can go pretty far upstream, you know, so we had to really kind of design a project that would remove sediment about 1500 feet upstream from the dam, which created a much bigger project relative to other dam removals in Vermont.

C

Cate Kreider 06:07

Given that the dam is located in a unique location. Are there any unusual or unique goals for this particular project?

K

Karina Dailey 06:14

I would say that every project is unique, and they're also different. So really, there is no apples to apples. They're all different. And that's the beauty of them and sort of the excitement in the design. What is unique to this one, I think and probably Gabe and Shawn have have different answers is that the Pelletier dam is on North Breton Brook which 0.5 miles downstream is the Castleton river. So pretty close to the confluence, but it opens up 37 Miles approximately upstream of habitat. So in removing this dam and reconnecting this portion of the river, you're opening a huge amount of stream with tremendous tributaries that come in all over feeder streams and headwaters that provide nutrients and sediment transport and habitat and basically improve biodiversity for the whole watershed.

A

Alison Adams 07:05

That's awesome. And maybe you've already answered this question. But is there anything that you want to add about how dam removal affects the health of surrounding forests and riparian areas and also the aquatic ecosystem?

S

Shawn Good 07:17

From a fisheries perspective? You know, the benefits of this particular dam removal is exactly what Karina just mentioned, it was something I had notes for. She's right, it's 37 miles of upstream habitat is now being open and will become accessible to trout populations, not just in North Breton brook in terms of upstream and downstream migration of resident trout populations and other fish species. But the Castleton itself Castleton river is sort of one of the premier wild trout fisheries in southwestern Vermont, it has brown and rainbow trout that are self sustaining and wild and naturally reproducing. And they need access to different types of habitat at different times of their life and dams can interrupt that access and interfere with it and because the dam on North Breton Brook is so close, like Karina said to the Castleton any fish moving up out of the Casselton in the heat of the summer looking for coldwater refuge, or

in the fall, looking for suitable substrates for spawning and laying their eggs get blocked by the Pelletier dam at a very low point in the river system. So taking this dam out is going to be a huge boon for the trout population in terms of both North Breton Brook and the Castleton because they they move freely back and forth, or they will be able to move freely back and forth and travel long distances now to access different habitat needs at different times of their life.

A

Alison Adams 08:52

Can one of you speak to what restoration efforts might be required following dam removal specifically in the areas surrounding the waterway itself, because I know it changes the levels of the water and the flow. And I imagine that does affect surrounding vegetation and things like that, is that a piece of this project as well.

G

Gabe Bolin 09:08

So as you would imagine, after we remove all this impounded sediment we have and we create this new channel and floodplain. The surfaces are really just bare soils. So the revegetation of these surfaces is huge. It's a big part of the project. So one of the things that we do immediately following excavation and grading is the current we have the contractor apply specific seed mixes that for this project, specifically on the floodplains. They're applying a wetland seed mix that has all different types of wetland, plant and native species. After that, we have kind of another team of the project that would come in and plant trees and bushes along the floodplain. And some of the vegetation will include plants like willows and dogwood specific plants that that really like water and that root pretty quickly so that we can establish vegetation quickly and mitigate any kind of erosion of those surfaces.

A

Alison Adams 10:07

Are there any risks or particular challenges when removing dams or in the this project specifically?

K

Karina Dailey 10:14

Um, certainly there are a number of hurdles and risks. So I would say just like a challenge is just coming up with the funding the stakeholder support. So it takes, you know, a village to remove one of these dams, that is a long process just to get to where we are, then actually, in the removal and implementation phase. Definitely a challenge is just trying to first see how this stream is going to react to this change, and recreate what is the pilot channel. So trying to recreate what was there hundreds of years ago is a challenge. And every every system reacts differently. And part of it is just letting nature take its course. But we want to control the release of sediment and, and make that a controlled effort. And not just a one time downstream slush of 16,000 cubic yards of sediment.

C

Cate Kreider 11:07

DATE RECORDED: 11/10/17

So I hear you speaking about hundreds of years ago, restoring it to that state, which is a great lead into the next question. This dam was built in the 1890s, to my knowledge to assist with running the mills in the area. So do you know anything about what the river liked before the installation of the dam? And does it inform what you hope to restore it to now, this dam has been there since 1890, you're right and prior to that there was another dam there since 1775. So there's been a tremendous history of dams in that location over time. But prior to that the river was connected. And indigenous populations relied on those systems for sustenance and trade routes. And it was an important part of the system. So we're trying to recreate that reconnection, and there's other dam blockages along the way, certainly in these systems, but every one that we can reopen, and now North Breton Brook is flowing freely, I believe, all the way to its headwaters. So that's really exciting.

A

Alison Adams 12:07

I'm curious, when you're thinking about removing a dam and restoring that river to its sort of original state? Do you tend to rely just sort of on an idea or knowledge about what the river and landscape in this region looked like in the past sort of in a general way? Or is there a process of looking at historical documents or surveys or whatever might exist related to that particular location? Like how do you determine what the goal is?

G

Gabe Bolin 12:33

As part of the design process, we typically look at historical aerial photography, or to get an idea of what was there prior to the dam. But the challenge for this project was that the dam is so old, we don't have information going back to that time period. So we kind of used a few different methods. One method is to try and look either upstream or downstream of the project area, and try to find what we call a reference reach. Basically a reach that we think has either minimal disturbance or no disturbance, you know, relative to man and manmade disturbances. So from that, if you can find a decent reference, and it's really hard to do, it's kind of a challenge for each project, you can get an idea of, you know, the sinuosity and the bedforms, and all these different types of features that we can kind of in a sense of mimic and recreate in the new channel that we're constructing behind the dam.

S

Shawn Good 13:31

I could give you a little bit more history perspective from a Department of Fish and Wildlife point of view two, which kind of indicates just how much we've come back and full circle with how we used to view these things. Like Karina said, this dam has been in place for industry for a long time. But those industries, whether it was stone Mills, or lumber mills, being powered by water, were mostly gone by the mid 1900s. And it was around that time when the Department of Fish and Wildlife, called the Department of Fish and Game at the time, started acquiring dams like this, or even building new dams themselves on stream systems to create what they called recreational fishing opportunities. And so it was around 1964 that the Department of fish and game acquired 19 acres around the Peltier dam and with the intention of improving the dam, doing more sealing on the upstream side and creating a second dam as well and then excavating behind those to create what we used to call pond sites. And we have these ponds, sites scattered all over the state where the state itself would dam rivers or repurpose existing

dams and then dig a big hole behind them on the upstream side to build upon and then we would stock that pond with fish, because that's what people wanted. They wanted to catch trout in a big deep pond. That was a long time before our current philosophy and management strategies which recognizes the fact that dams are actually a detriment to natural stream systems and aquatic organisms, including fish, Turtle salamanders and everything else that need unimpeded access and migration corridors up and down these river systems. So it was actually us that wanted to keep that dam in place 60 years ago.

C

Cate Kreider 15:21

So it sounds like there's a lot of back and forth on this dam, that in the 1700s, it was there, and then removed and then replaced in the 1800s. It was there as a means of energy production. And then it was there as a means of trout and recreational purposes in the area, porting those. So now we've decided that its removal will benefit many natural functions of the area, did the project receive any pushback from other areas that had an investment and in being there, such as historians?

K

Karina Dailey 15:54

I wouldn't say push back. But we're lucky in Vermont that there's tremendous support behind dam removal. And I think all of the regulators recognize the benefits of dam removal far outweigh that the costs of that documentation. But there certainly was due diligence related to the historic preservation piece. And that definitely can sometimes take longer to obtain those permits, and that clearance in advance. So we worked with historic preservation and UVM consulting, to create a historic reference documentation package. And that package will be on file with historic preservation to document the full history. And it's it's really interesting, in addition to the marble mill being there, it was also used to harvest ice. So it was an ice pond, which was common with a lot of the mills, they would combine like the ice factory and removal of ice, as well as the mill. And there was employee housing, there was a whole little facility at that site. So there's a lot to document and that has been documented in the package. And then there's a photo journal as the removal goes through that process. But then in the end, Vermont Fish and Wildlife has created a small parking lot just to allow fishermen to pull off safely on the road, or any recreationalists to move up and down the river. And there'll be a kiosk a historic kiosk signpost at the site that tells the story. So we have yet to create that. But that's part of our compliance package. And then the other piece is related to impact of the cellar holes and foundations that are around the site. So we are not allowed to excavate those and can only overlay fabric and materials on top of them. So the excavators can drive over those sites in some portion, some are no touch areas completely, but there is sort of a safe zone where they can drive over that area and not impact it.

A

Alison Adams 17:51

So when we were doing research for this interview, we saw that the dam was originally slated for removal last year. But as you said, it's actually currently underway being removed now. So what is the timeline moving forward?



K

Karina Dailey 18:02

Yes, the dam is being removed currently. And it's likely that it should be fully removed by the end of September, and then the Restoration tree planting process continues to be on that up until next spring.

G

Gabe Bolin 18:14

I'll just add it's a cool process where we're just kind of sharing ideas and kind of modifying our design to produce a really awesome product. And that did take some time. I think it's a process that is evolving. And as a group, I think we're coming up with methods for dam removals that are going to become efficient moving forward, but if you're going to result in pretty successful projects,

C

Cate Kreider 18:39

Could you tell us about the methods used to establish sediment movement and aquatic organism passage once the dam has been removed? This is a quote from an article I read about this project. "The removal plan includes removal of impounded sediment, pilot channel regrading, and inclusion of floodplain benches to recreate vertical and lateral connection to the adjacent floodplains." What are each of these tools and what benefits do they provide to the area?

G

Gabe Bolin 19:05

So floodplains offer numerous benefits to a river or stream system during a storm event when a channel floods to top of bank once that water can engage the floodplain, the area of flow, conveyance doubles, triples, or quadruples, and when that happens, everything kind of slows down. It allows for any suspended sediment to settle out and typically settle out on the floodplain. So there's all sorts of water quality and flood mitigation benefits that floodplains offer in systems where you have a channel that's what we call insized are really deep relative to a floodplain. It's hard for that water to engage the floodplain. There's a vertical separation there. And when that happens, all the force and all the power is concentrated in the channel. So it can result in even further down cutting and erosion on the banks. It's typically not a good situation. So when we talk about vertical connection that's what we're talking about. We want to create a channel that's in this case, maybe two feet from the floodplain surface elevation, and promote easy connection during storm events to that floodplain to realize those those velocity and and power reduction benefits and water quality benefits. So we created this channel and the floodplain. And we've really created about two and a half acres of connected floodplain, which is significant given this size of project.

A

Alison Adams 20:30

As I said before, we just did this episode about process based restoration. And a big focus of that type of restoration is to restore Beaver Dam type structures to help restore the natural flow of the river or help connect the river to its floodplain. Actually a lot of the same goals that you guys are describing here. And it strikes me that there's that contrast between putting in

beaver dams and taking out these manmade dams. Can you describe why you're removing one and why another might be added? And is there ever a time that a dam might be a structural tool for an ecosystem?

S

Shawn Good 21:02

There's a big difference between manmade dams and beaver dams. Whether they're naturally made by a beaver or the beaver analog dams that we're starting to investigate, to try to replicate that. In terms of aquatic organism passage, fish movement, turtles, salamanders, all that kind of stuff. beaver dams are not really a dam. They don't impede the movement or upstream migration to those aquatic organisms. They're temporary. They are full of holes, they trickle water through, turtles and frogs and salamanders and crayfish and fish find their way through. When water levels come up and Beaver Dam gets topped over a larger size strong trout can wiggle through that. So beaver dams, we look as something natural on the landscape that has always been there and that fish have evolved to adapt to and deal with. And they don't really impact or affect in a negative way. fish populations or aquatic organism populations, they can also benefit them as well. Unlike a manmade dam, where it's holding water back in large volumes. It's mostly impenetrable, often much higher vertically than any Beaver Dam you'll ever see. So they have a much more negative implication than a beaver dam does. And a Beaver Dam doesn't last forever, either, yeah. A big flood will wash it out and it's gone and then gets rebuilt again. Whereas a dam has been in place here on North Breton brook since the late 1700s. No Beaver Dam lasts that long.

G

Gabe Bolin 22:29

There are structures that that makes sense in some stream and river systems. And I'm thinking about this site versus a dam removal that might be in a more suburban or urbanized area, right? I think with Pelletier, we're, we're fortunate that first of all, this is you're not fishing wildlife land. And second of all, it's a pretty rural area. So we know there's going to be channel adjustment vertically and horizontally to some degree over time post construction, and we'll see how that goes. But in in suburban or urban environment, where you might have houses built on the sediment impoundment or adjacent to the impoundment, that's a different story. There's other elements that you can add to a stream or river restoration project to control the grade and not have it cut down vertically, as much so that you can protect that existing infrastructure. We call them grade controls. And there's ways that you can use them to ensure and maintain fish passage and aquatic organism passage over the long term, but still provide control of the channel bed so that you don't have impacts to adjacent or upstream infrastructure.

K

Karina Dailey 23:38

I think it's not uncommon for us to have active beaver dams above our smaller dam removal projects. Because often the dam is sited in an area where the topography slows down the gradient is less, it's not uncommon for beavers to be present upstream. And in the case of Pelletier, there's a lot of beaver activity upstream of this dam. And it's been really fun to watch

the beavers react to the downstream work. And they're building more dams upstream as we're removing the dam downstream and certainly diverting water for us as part of our flow plan. So they're a part of this system. And they're working in adapting as we work with them.

A

Alison Adams 24:16

And do you know how many dams there are in Vermont at this point? And do you have a sense of how many have been removed?

K

Karina Dailey 24:22

There are over 1000 dams in Vermont. And it's complicated when you ask the removal question because there's those that have been removed naturally from storm events where they've just broken down and those that have been physically removed and planned and designed for that, and of those that have been physically removed. I believe we're at 49 Dam removals and counting for this year. So that's really exciting.

A

Alison Adams 24:47

Karina emailed us right after the interview to tell us that actually the number is 55 and counting.

K

Karina Dailey 24:53

But when you think about those that have removed of natural causes, well that number doubles or triples. And of those 1000 I believe about 100 are hydro projects. So there are active hydro dams as well on the landscape.

C

Cate Kreider 25:07

As you know, most of our listeners are riparian forest restoration practitioners. What do you want those practitioners to know about dam removal?

S

Shawn Good 25:14

I think one of the biggest takeaways for me from a biological perspective is that opening up access and reconnecting upstream and downstream environments, benefits everything out there on our landscape for fish and wildlife resources. It's not just fish, although that's what I specifically work on is looking at what we benefit in terms of stronger and more resilient trout populations. But the minnows that live in the stream, the salamanders, the turtles, the crayfish that live in the stream, the mink and muskrats and beavers that are aquatic based mammals that move up and down. The dams impact and interfere with the movement and flow of

everything, wildlife, water fish, and taking them out and letting that stream with a little help from us revert back to what it used to be and you know, find its equilibrium. And its balance, again, just makes for a stronger, healthier environment in Vermont.

K

Karina Dailey 26:13

Yeah, I totally agree. It definitely reconnects the forest with its floodplain and the tributaries and the seeds and the leaf litter and the insects that are on those trees end up moving down that system towards Lake Champlain. So that connection is huge restoring flow to a system that should have flow.

S

Shawn Good 26:33

I'm just really excited to see this on the ground in action. The dam coming out is pretty exciting.

G

Gabe Bolin 26:40

Yeah, about 60% of the dam is out at this point. And we are literally turning the corner. We're turning the corner and a bend in the in the design, removing the haul road and loading out sediments. And it seems like for the last few dam removals that I've worked on, there's an effort to perform long term monitoring, which I think is a pretty strong component. As we said earlier, these channels post construction can really adjust laterally, vertically and just evolve over time as Mother Nature takes over. And if we have long term monitoring in place, we can kind of observe how these happen and maybe use that information to the future.

A

Alison Adams 27:28

Today's episode featured the call of the Louisiana waterthrush. It was recorded by Larry Klarsfeld in Beaver brook in Keene New Hampshire on April 20 2012. We downloaded the song from Xeno.canto.org. For more information about today's topic and other topics related to riparian forest restoration, visit the restoration roundup podcast tab of Lake Champlain sea grants watershed forestry Partnership website. This project has been funded wholly or in part by the United States Environmental Protection Agency under an assistance agreement to NEI WPCC in partnership with the Lake Champlain Basin program.