

Transcript

00:00:06:17 - 00:00:07:20

James Shooter

You're going to let me sit in the hot sea?

00:00:07:23 - 00:00:18:01

Fredrik

Yeah. So, joysticks, both. Just be very careful. They're very, very sensitive.

00:00:18:03 - 00:00:19:22

James Shooter

I feel like you're putting a lot of trust in me here.

00:00:19:24 - 00:00:26:12

Fredrik

And this is the safety. So now the machine is active. That's active.

00:00:26:12 - 00:00:58:07

James Shooter

I've clambered into, the captain's chair of a 26 tonne excavator sat in the middle of the Abramson river in northern Sweden. Why, I hear you ask? Well, I'm obviously getting a crash course in river restoration from Fredrik, the operator on how to revitalize these historically engineered watercourses. I'm moving giant boulders around to mimic what these grand rivers would have once looked like.

00:00:58:09 - 00:01:06:09

James Shooter

Oop!

00:01:06:11 - 00:01:07:06

James Shooter

Was that all right.

00:01:07:08 - 00:01:08:17

Fredrik

It's okay. You're almost there.

00:01:08:21 - 00:01:39:06

James Shooter

Oh. So I'm a river restorer now? That's amazing. Whilst I give myself an all mighty pat on the back. Realistically, I've moved one rock in about 15 minutes and almost taken out two of the team standing on the riverbank. I'm pretty sure Frederick's job is safe, but I can't pretend I didn't enjoy having a go. And who's to say that my single rock won't make a difference?

00:01:39:08 - 00:02:02:02

James Shooter

Perhaps it will start to trap leaves and sticks. Providing a food source for invertebrates as the water is forced around it. It may well create a deeper pool and a new resting place for fish. Maybe a dipper or even an otter might perch on my rock, using it as a launchpad to hunt for food amongst the other rocks and logs that Fredrik has been busy moving about.

00:02:02:04 - 00:02:27:10

James Shooter

For those of you listening to the sound of a digger and thinking, wait a minute, that's not rewilding. I wholeheartedly disagree. And I promise I'm not just letting my childlike joy blind me to logic. The reality is this river and many others like it, has had huge changes brought upon it in the past, and now it needs something equally huge to restore it.

00:02:27:12 - 00:02:57:07

James Shooter

Something sitting at about 26 tonnes plus whatever Frederik weighs. Excavators in a river may not sound too nature friendly, but as the old saying goes, you can't make an omelette without breaking eggs. I'm James Shooter, host of The Rewild podcast, and this is Swedish Lapland.

00:02:57:09 - 00:03:20:01

James Shooter

It's late summer and I've been traveling across the north of Sweden, driving mile after mile of forest and lake, lake then forest. At this time of year, the days are long and the nights are short. The warm summer rays filter through woodland glades, lighting up the pink flowers of rosebay willowherb or fireweed, as it's also known.

00:03:20:03 - 00:03:41:00

James Shooter

The silence is only interrupted by the buzz of mosquitoes and the call of cranes. Blueberries, carpet the forest floor, and it's almost impossible to move a few meters without bending down for a juicy snack. As the haunting wails from pairs of red throated divers rise out of the water. And amazingly, we even come across a couple of elk.

00:03:41:02 - 00:04:02:14

James Shooter

We briefly lock eyes before their gangly legs take them across the forest track in front of us, and they're quickly swallowed up by the forest. It's quite amazing how such big creatures can disappear in the thicket of trees. What a privilege to share a moment with these secretive creatures. Moments later, another prize. This is amazing. They say one capercaillie in the middle.

00:04:02:14 - 00:04:10:04

James Shooter

And what was there? One, two. Three. Four. Five. Six. Young. And she's not bothered. Hey, she's just.

00:04:10:04 - 00:04:12:19

Isak Edstrom

Just waiting for chicks.

00:04:12:21 - 00:04:21:00

James Shooter

Because they've gone out the side of the road now. I've never seen so many capercaillie in one day I can say that. What do you call them?

00:04:21:02 - 00:04:22:07

Isak Edstrom

It's called tjader.

00:04:22:09 - 00:04:48:00

James Shooter

Tjader? Wow. Very pretty. I've seen these impressive turkey size birds a good number of times in Scotland, but we would classify them as a very secretive animal, only found right in the heart of the forest, tucked away from disturbance. But here we've seen several individuals just stood at the side of the road. They do like to chow down on gravel, as it helps them to grind up that pretty unpalatable diet of pine needles.

00:04:48:02 - 00:05:00:07

James Shooter

It's a spiky meal, but at least they'll always have pine fresh breath. In the car with me is Henrik Persson, team leader of Rewilding Sweden. He's taking me to a forest restoration site in the north west of the country.

00:05:00:09 - 00:05:21:09

Henrik Persson

Here, and most of the keystone species are existing in the nature, but they're restricted in carrying out the functions because of limited living space and degraded forest and so on. So we work a lot with creating living space for those organisms and such as reindeer, river pearl mussel and the beaver, trout, etc. but there's others as well.

00:05:21:09 - 00:05:40:16

Henrik Persson

Hanging lichens is a very important species to to or. Yeah. And various species that that we want to have back to, to facilitate reindeer grazing for example, that in turn have a very big impact on biodiversity in the mountain. It's kind of a young landscape. 10,000 years ago we had a lot of ice here. That's when the ice sheet melted.

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Henrik Persson

It sort of shaped the landscape that we see today. But considering we had a much, much higher coastline, then, than we have now, we also have, like a line along the coast, the highest coastline in where, where the sea is, has been since, decreasing level. So now we have a part of the landscape, that is shaped by the lowering of the sea, and the characteristics of the landscape is quite different.

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Henrik Persson

So if you look at the rivers, the glacial landscapes are much coarser. more morane and bigger stone squares, where the sea, where at that point and then decreased. we have more for sandy soils. We have, in the rivers there. We have more dynamic processes. that shapes, the courses. And of course, it's going to have an effect on, biota and, vegetation as well.

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James Shooter

If you were flying above the landscape around us, I wouldn't blame you for raising an eyebrow at the suggestion of the need for forest restoration here. One thing this place isn't lacking is forest. According to the UN, Sweden sits at about 68 to 69% forest cover. That's just a smidge over 28 million hectares. To put that into perspective, back in Scotland, we're at about 19% forest cover.

00:07:02:04 - 00:07:17:23

James Shooter

Go, Sweden. But and it is a big but there is an almighty difference between forest and forestry. It's estimated only 9% of that tree cover is primary forest. The rest is essentially one big tree farm.

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Henrik Persson

If you have the water draining the system quicker, you'd have better growth. So that's what they've been doing. They've been historically paying people in Sweden to go out and hand dig. I think we have 22 rounds around the globe of of hand dug ditches in entire of Sweden. So we we look at forest restoration and landscape restoration really out from a hydrological view.

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Henrik Persson

And that doesn't mean we always work with hydrology. It means that we restore forest bits to bed or vegetation. So other things to better hold, hold the hydrology. And that can be plugging ditches that could be restoring wetlands and so on. but looking from the water side of things, we call that we work with water scapes, not landscapes.

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Henrik Persson

You cannot replace a 700 year old forest with something that doesn't take 700 years to grow back. so you have the age different. You also have a species difference, of course, in

a planted forest and in a natural forest. The way it works now is that 80% of the, of the trees that are cropped down, it's going to be pulp for quick turnover, and end up as carbon dioxide in.

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James Shooter

Is that right? So what what kind of products are that?

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Henrik Persson

Yeah. I mean, the paper cups you buy at the coffee and wooden knives and forks and all kinds of stuff, you know, you get a cardboard package each time.

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James Shooter

We all need forestry. There's no getting away from that. But we can certainly put less pressure on the situation. I'm afraid I'm guilty in this. If I forget my reusable coffee cup in the car, I'll hold my hands up. I don't always let that get in the way of my need for a caffeine fix, and occasionally I'll still get a cappuccino in a disposable cardboard cup.

00:08:51:24 - 00:09:13:09

James Shooter

I'm complicit in the need for this intensive Swedish forestry, and that's not right. I need a reminder of my consumer choices every now and again. We probably all do. Being face to face with the impact really hits it home, but the positive in this is that we can actually all make a difference just by not buying something. It really is that easy.

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James Shooter

Whilst this expansive forestry might look like a wilderness from the air, get in and amongst the trees and it's anything but, the land is drained. The trees are planted in rows with little diversity in species or age, and they're packed in tight to force them into a vertical sprint for light, making their trunk straight and their growth fast.

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James Shooter

Sunlight to the forest floor is a rare sight, and then the trees are cut down, usually in one fell swoop at 50, 60, 70 years old. Some of these pines could naturally reach ten times that age. Imagine everything a 700 year old tree supports throughout its lifetime. After death, they can remain standing as Deadwood for another century or two.

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James Shooter

There's not a single geriatric pine around here. All have been removed in their youth. You can start to see how forestry disrupts the health, longevity and natural cycles of an ecosystem.

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Henrik Persson

Sami people are indigenous people that have been living in this region for thousands of years. and you know, in close connection to nature. And after the, changing seasons and what nature can give and provide. The ones we work with are mostly reindeer herders and, dependent on, really having that as a business.

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Henrik Persson

So the reindeers are semi wild in a way. but they do have a grazing function of a wild animal and do have a very big importance for the ecosystem. not only is, sort of ecological engineer itself, it means a lot for the forest ecosystem or the ecosystem is actually up, in the mountains.

00:10:51:13 - 00:11:00:22

Henrik Persson

But also there's the indicator species, because in, in many, in many places where, the reindeer will thrive and those kind of forest is the forest that we try to get back for all other species.

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James Shooter

The Saami people have utilized reindeer for thousands of years, their adaptations to survive a northern climate, made in the obvious choice for meat for transport and trade. Reindeer fur is made up of two parts, an ultra fine and dense under fur with hollow outer hairs that provide extra insulation. Their feet have two large toes and two rear dew claws, which spread out to ensure they don't sink in the snow with added fur underneath the grip.

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James Shooter

The red nosed reindeer may actually have some surprising truth, as their snouts are full of blood vessels which help to exchange heat, making cold air warm on the way into the lungs and warm air cool as it leaves the body. Perhaps the two coolest adaptations, though, excuse the pun, are special tendons in their feet which click as a reindeer walks, thus making it easier to stay together as a herd in snowstorms.

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James Shooter

And eyes that change colour across the seasons, golden in the bright summer months, and hues of blue in the winter. This is a part of the eye called the tapetum or cat's eye, the mirrored layer sat at the back of the eye, which helps animals to see in low light by reflecting rays back onto the retina for a second chance of being absorbed.

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James Shooter

When this turns colour in winter, researchers suggest this is to allow more blue lighting, and it dramatically increases the sensitivity across the long, dark months. A pretty nifty trick. So the importance of reindeer to the Saami people makes the forest through which they migrate important too. And thankfully, that's also good news for the rest of nature. So this has already been thinned out from what it what it was.

00:12:39:19 - 00:13:19:24

Henrik Persson

Yeah. Yeah. I mean, you seem to be taking away, quite a lot of wood where they've been taken away, taking out trees to, to get the bigger trees standing and grow and become old as well as creating conditions for the reindeer to graze. So very important thing when you thin out the forest in order for to get this back, this natural condition is to, is to actually remove the mulch of the, twigs and branches that you see have to at least collected it in piles, because that's normally when when forest companies thin out the leaves so much like a carpet of this on the ground, and that surrounds the sunlight from, from

00:13:19:24 - 00:13:22:05

Henrik Persson

reaching and quaking conditions on the ground floor.

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James Shooter

Yeah, that makes sense.

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Henrik Persson

and you will won't have any lichens come back. And also if you have lichens there already, they would die quickly. It's an effective way of killing them.

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James Shooter

Yeah. Suffocate them basically.

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Henrik Persson

Yeah basically. And Yeah. So there's so many things associated with thinning of, plantation forest at least.

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James Shooter

So this would have been a thickly densely planted spruce plantation. That's what this would have been, long ago.

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Henrik Persson

Yeah, yeah. and there's other areas as well where you have maybe pine, plantations in which had done the same thing.

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James Shooter

And I guess just looking around, I'm guessing that, I don't know, they've removed like 25% maybe, maybe a bit more of.

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Henrik Persson

Yeah, something like that. and that's why we hire the Sami people that we work with to do the job. okay. Because they know what's best for the reindeer and what's best for the reindeer in this kind of circumstances, that's best for their overall ecology. And,

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James Shooter

So it's it's basically good for the forest. It's good for the reindeer, and it's good for the Sami people.

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Henrik Persson

Yeah. So it's a win win in all cases.

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James Shooter

Whilst you've probably never given lichens much thought, they're actually quite important as well as being wonderfully weird, which is never a bad thing in itself. Just look at me, okay? Less of the wonderful and more of the weird, but still. Lichens are a symbiosis of an alga or cyanobacteria and a fungus. The fungi enjoy free access to the carbohydrates produced by the algae through photosynthesis, and the algae gets the protection and structure from the filaments of fungi.

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James Shooter

It's like one roommate being good at cooking and one at assembling flatpack furniture. Two essential skills brought together as one. Lichens are pioneers and are often amongst the first organisms to grow on areas of bare rock. They are survivors. They're poikilohydric, which means they have no control over their ability to regulate water content. But with that, they're designed to tolerate extreme and extended periods of desiccation.

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James Shooter

They actually shut off their biological functions when they get to a certain level of dehydration, and then essentially resurrect when conditions return to normal. The species within the Cladonia genus of lichens, which tend to grow on soil, decaying wood, and tree trunks, are favoured by the reindeer. They're an important food source,

especially in winter months when other forage is scarce, but you won't find them in densely planted forestry plantations.

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James Shooter

Not in any real numbers, anyway. So in certain cases they need to be brought back.

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Henrik Persson

We have projects and, and initiatives coming that would, helps the hanging lichens and other lichens to spread.

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James Shooter

What's the main process in that?

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Henrik Persson

Hanging lichens you can basically start, to find a mother tree that has, and you can start manually spreading. And you can if you happen to, you know.

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James Shooter

Literally taking fragments.

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James Shooter

Essentially planting it on the, on the branches of the trees.

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Henrik Persson

And it's experts doing that. We, we.

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James Shooter

A bit like, coral fragmentation, like.

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Henrik Persson

Maybe. Yeah. Yeah. Yeah. Exactly. But but generally that way it's good for lichens, you need the sunlight to come in and in a closely planted plantation forest. where the aim is to get as much, wood biomass as possible, as quick as possible. there is also standing so there is things that are close so that, the sunlight is not reaching the ground floor and therefore create little conditions for not only lichens, but much other, understory vegetation as well.

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James Shooter

Yes. You got patches of blueberries growing up. You've got the rosebay willowherb.

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Henrik Persson

Yeah. Yeah. Blueberry is a very important, species of much, much of the biology here as well. but it's generally letting the sun reach the understory vegetation on the ground, because you can go into some, like, contorta plantations we have everywhere, you know, it's just like a grey, dead forest floor and it's just dark.

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James Shooter

And gloomy. Yeah, you might die in there. Basically, the blueberries that cover the forest floor wherever the sunlight penetrates, not only make a tasty snack for Henrik and I, but a whole suite of species such as fox, black grouse and the roadside capercaillie. This purple stained pine marten scat on the ground around us. Two even brown bears won't miss a chance to go at these sweet treats.

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James Shooter

Frederick actually saw a bear here just a couple of weeks ago. It may have munched from the same bushes where plucking berries from now. Now that certainly makes it one of my more exciting snacks of the week.

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Henrik Persson

But you see here you have you have a lot of, trees that can be, if they're left, can grow old, left to grow. They can also work with better annotations. Correct. Create the sort of fake age difference. But by damaging trees so that you can get all those old forest characteristics in younger trees. So you can work a lot with improving it.

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Henrik Persson

but as you see already, it has a lot of, very nice characteristics, which can be compared to more natural forests.

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James Shooter

The reindeer in this landscape live a wild life for much of the year, carrying out annual migrations as their wild ancestors once did. Whilst lichens form an important winter forage, they also rely on shrubs, grasses, herbs, birch foliage and mushrooms. And with all this munching from lots of hungry mouths, the reindeer help to shape the forests and tundra on which they traverse.

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James Shooter

In some areas they can help promote tree seedlings getting into the soils as they open up gaps in the thick mats of lichen. In other ways, they can limit the survival rates of those seedlings, as they can cause indirect frost damage or open them up to fungal infections by breaking them whilst digging for lichens in the snow. They can even help change the species composition of the forest. In areas where they browse.

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James Shooter

Some studies have shown a 20% faster growth rate of Scots pine because they suppress the birch as a competitor. With reindeer present, you're more likely to end up with a conifer dominant woodland. With reindeer lacking, you're more likely to get deciduous, and this, of course, affects the wildlife that inhabits them, with lots of unappealing forestry in their path, their ecological effects are missing from large patches of land.

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Henrik Persson

So basically we have the reindeer species that we have in Sweden. it's coming from two strains. Maybe we have the mountain reindeers and they graze the forests most of the year or the year round. And then we have this migratory behavior where you actually need to, the forest grazed the mountains in the summer and a little less in the winter.

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Henrik Persson

So to have this migratory behavior and need and not all places are, food stops, so to say, some of this, they need to get from A to B in order to get to, you need somewhere. And, and we might have islands of, of a forest that have good conditions for lichens. But if you have, like, densely planted plantations and in between, they won't go in there.

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Henrik Persson

I mean, you wouldn't want to be near a human either.

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James Shooter

It's not just the standing plantations that disrupt the reindeers movement. It's also the large areas of clear fell that are left behind after the trees have been harvested. Brush and root plates are upturned, causing a minefield of woody debris better off avoided for fear of a broken leg. With the reindeer traveling 350 to 400km between summer mountain ground and coastal winters, there's lots of opportunity for poor quality habitat to block their passage.

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James Shooter

Thankfully, that also means a whole lot of opportunity for restoration to another upcoming threat for the reindeer to deal with is the changing climate. From reliable winters where the cold would stay all season with soft, powdery snow easily scraped to side with a hoof to find food to now facing winters of change, Henrik tells me the winter

of 2024 went from a balmy -41 centigrade one week to plus seven the next. In a good cold winter, the reindeer are easily able to find lichens through the lightness of candyfloss snow.

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James Shooter

In this changing climate, they've got a stodgy, uncooked lasagna to deal with instead, layers and layers of ice and snow impenetrable to reindeer feet and reindeer mouths.

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Henrik Persson

In order to get this whole thing working, you need to. Of course, everything starts with hydrology. We have a lot of ditches in Sweden, and the way we try to work with landscape is from a water perspective. It doesn't mean we work with waterways only, although we restore rivers and wetlands. But to get back the hydrology creates the right ground conditions for the right, natural.

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Henrik Persson

flora to grow fungi, etc. that create the conditions for what animals thrive. So it's, you know, the, the base for our life on Earth is water.

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James Shooter

Henrik takes me to the river banks of the Abramson, just south of the Arctic Circle. We drive along a maze of gravel roads before parking up and walking across an old section of clearfell. Young willow, aspen and birch are growing everywhere, all in a race to reach the sky and take advantage of the lengthy days of a Swedish summer.

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James Shooter

There's so many moose droppings on the floor, I'm surprised we don't come across more of these horse-sized deer. We come to a clearing and Frederik, the excavator driver, and Isaac, one of the field officers have got a small fire going. I think it's as much to keep the mosquitoes away as it is to brew their coffee. I'm thankful for both.

00:23:00:18 - 00:23:25:16

James Shooter

The team here is extremely committed to the river. They spend 11, 12, 13 hour days re-naturalizing the channel. They're all about four hours away from home, so they spend 4 or 5 days working as much as possible and then head home on weekends. They cook, eat and sleep together in a nearby bunkhouse. I'd wager a bet that they dream of the river and its boulders when they're asleep.

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James Shooter

There's a real sense of camaraderie, and they're all very enthusiastic about the work. Even with the long weeks in the field. Isak is a recent graduate, and this is his second year working on the river restoration project.

00:23:39:00 - 00:23:59:03

Isak Edstrom

So this is Abramson, which is part of the Rhone catchment. So this is Abramson where we're doing our main restoration project here, and this is like a bit upstream, but, yeah, it's like a normal forest. like a medium sized forest river, though what you will see here in the north of Sweden.

00:23:59:05 - 00:24:26:07

Isak Edstrom

Pretty like a couple of rapids, a couple of slow moving parts and a lot of rocks. Like a lot of boulders. People used to do timber floating here. So back in the day, when we had the huge forest industry in Sweden, we we moved all our timber from the north or like inland where the forest is down to the, to the coast where the sawmills were with the rivers, because they acted as natural roads.

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Isak Edstrom

You could, you could you didn't need roads, you didn't have any roads. So you just put the, timber into the rivers and then floated down to the coast.

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James Shooter

It sounds easy, right? Utilizing the power of nature to shift your heavy duty load on your behalf. The rivers, however, needed a helping hand. The boulders were removed from the riverbed and loaded up on either side of the channel to create a more canal like watercourse. How they did this work without the assistance of a 26 tonne excavator and a bloke called Frederick, I don't really know.

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James Shooter

Armies of men would have lined the river working in unison to do this labor intensive work. Woody debris would have been cleared to anything that might have snagged the logs on the way down. In some stretches, they even created a wooden floor to the riverbed by strapping huge planks together. All this engineering turned once wild rivers into industrial log flumes.

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James Shooter

and I've only just realized that that's what the amusement park rides are based on. if you have to. Don't worry. We're all learning together. Whilst most of this work was at first, by hand after the Second World War eventually came to an end, the Swedes brought back a number of abandoned Nazi tanks, adapted them with bulldozing equipment, and from there in became a lot more efficient at clearing watery roots.

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Isak Edstrom

In Sweden in general. It started like in the late 1800s with, like along with the industrialization of Sweden. And they were just like, okay, we have we need a lot of timber. And like it's also was an exploding market worldwide. So people saw an opportunity to start these sawmills and start this timber floating business.

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James Shooter

I can't really fathom, though, how they actually did it. Was it just sheer manpower, like, get him.

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Isak Edstrom

Yeah.

00:26:11:19 - 00:26:12:14

James Shooter

Hold it open.

00:26:12:14 - 00:26:25:14

Isak Edstrom

Yeah. It's crazy. Like, imagine them put in this hundreds and hundreds of meters of floor and walls and moving these rocks by hand. It's crazy actually. But yeah, they used some to to move the biggest boulders from the stream. They used like dynamite and stuff.

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James Shooter

So really just pulling it up.

00:26:27:03 - 00:26:31:21

Isak Edstrom

Yeah. But it's a crazy, crazy like you work how they managed to do all of this.

00:26:31:23 - 00:26:54:24

James Shooter

Explosives were used to blow up the largest of boulders and bedrock. Even when the biggest modern day excavator available or the largest tube of superglue. You're not going to get those big boys back. A piece of the river dynamic has been lost forever. Even the smallest creeks couldn't escape the process. Foresters put these to use too. By building dams upstream.

00:26:54:24 - 00:27:08:08

James Shooter

They could hold back water and snowmelt until the biggest volume was available, and then release it in one fell swoop to carry the buildup of logs at once. You wouldn't want to be fishing downstream at this point, that's for sure.

00:27:08:09 - 00:27:29:06

Isak Edstrom

Removing all these rocks, like, destroyed a lot of the habitats in the river, like a lot of these fish and a lot of insects and stuff. Live like between the rocks in these little crevices. Crevices on the on the river floor. So this is like the main habitats that would be destroyed, but also like the habitats along the river.

00:27:29:08 - 00:27:45:19

Isak Edstrom

The river sides were destroyed with, because when you make these walls, you make this, you move the river, you you move the boulders from the river to the sides. You not only destroy the river floor, you also destroy the sides where the water would,

00:27:45:21 - 00:27:46:17

James Shooter

Kind of flood forest.

00:27:46:17 - 00:28:00:03

Isak Edstrom

Yeah, it would flood the forest. Sometimes it would erode the forest. It would like some of the plants are used to being flooded, like two times a year or one time of year. And now they weren't flooded it all so dry. Just like this wall between the forest and the river.

00:28:00:09 - 00:28:22:17

James Shooter

The restoration work is now focused on reversing these past adaptations. The border walls are being torn down from the river flanks and plopped back into the channel itself, reconnecting the river to its forested floodplain and also bringing diversity back to the riverbed. This not only adds structure, but forces the river into a mosaic of different flows, currents and depths.

00:28:22:19 - 00:28:37:05

James Shooter

Diversity is the spice of life, after all. Deeper pools for resting, gravel, beds for spawning, rapids and riffles for oxygenation and insect life. The boulders raise the water table back up to natural levels too.

00:28:37:05 - 00:28:59:15

Isak Edstrom

Naturally you would have, a lot of trees standing next to the river, falling in with time and like beavers also felling trees. And I think, a lot of rivers would just be filled with trees. But, since, since we like doing this channelized river with a big wall on the sides, there's not a lot of trees like standing next to river anymore.

00:28:59:17 - 00:29:37:15

Isak Edstrom

And also, since we've been doing forest forestry here for hundreds of years, you don't have these 300 year old trees next to the river that would fell naturally of old age. So that's why we need to bring in more, more deadwood into the stream. It's important both for adding just like complexity into the system and adding habitats for insects and stuff, but also important too, because all, all of the twigs and stuff would, catch like leaves and stuff and just making more stuff to be able to get trapped in the system and therefore trapping more energy and carbon in the system, which it's like the the bottom of the food system in the,

00:29:37:15 - 00:29:55:08

Isak Edstrom

in the stream. So you want to catch all these leaves and stuff into the system and make them stay there. Frederick, our excavator guy has his great, excavator is like, so hard to do this. I've tried it myself, actually. It's so hard to move this excavator, but he sits in there driving this excavator and me together with him.

00:29:55:08 - 00:30:13:08

Isak Edstrom

We have we have this conversation and, like, discussion. Should we move this rock here? Should we move this rock here? And then we together try to create this sort of habitat that we think it should be good here. You can like never. You can never even imagine what it looks like before. It's like it's totally something totally different.

00:30:13:08 - 00:30:23:17

Isak Edstrom

So you can only, like, try to replicate some sort of what you would think is natural, but also just making sure to create these sort of, habitats. That is important for the river.

00:30:23:19 - 00:30:43:24

James Shooter

I don't know what Isaac's talking about here. Personally I found the excavator work incredibly easy. as long as nobody mines a maximum of three rocks a day being moved into position. Of course, this is a completely different realm for Frederick to be operating in. His usual habitat is a building site or road network. He was thrilled to find this kind of contract available.

00:30:44:01 - 00:31:05:17

James Shooter

I did talk to him in the cab, but as it was a little noisy, here's what he had to say in his own words. My perspective is that this work is so rewarding for the soul. I will leave something behind that will last a long time, maybe even to the next ice age. In the beginning, I did not understand the importance of boulders and rocks, deeper pools and fallen trees.

00:31:05:19 - 00:31:28:13

James Shooter

I mean, the fish just need water, right? But my interest has grown to the extreme. And my understanding for the biodiversity has gone from basically nothing to a lot broader now, if we can restore the homes of even the smallest of creatures in the water, we are also helping the big land living creatures, including us. I love the passion here that working in nature restoration has awoken.

00:31:28:15 - 00:31:42:08

James Shooter

And the good thing is, there's a lot more of this work to be had. Frederick's hoping to grow his business alongside the rewilding Sweden team, bringing in extra operators and excelling in this field. And who said there's no jobs in rewilding?

00:31:42:10 - 00:32:04:13

Isak Edstrom

There's a lot of pearl mussels here. So and these are and they did and they did species which is like a keystone species. If there's pearl mussels it's a high quality waterway. And we need to make sure we don't drive on on these with excavator and like dig next to them. So we had to snorkel this whole stream beforehand and look for them.

00:32:04:15 - 00:32:10:14

Isak Edstrom

And also the ones that were in stretches where we would be digging and where we would be moving with the excavator, we had to move them.

00:32:10:18 - 00:32:37:19

James Shooter

Freshwater pearl mussels are pretty fascinating creatures. They're one of the oldest living invertebrates in existence, easily reaching over 100 years old. But they start life in a tiny larval stage under a millimetre long, ejected into the water course alongside a few million others. These glochidia, as the larvae are known, float in the water course with their miniature shells wide open, ready to snap shot or an unsuspecting host.

00:32:37:21 - 00:33:03:03

James Shooter

For a lucky few, they'll be inhaled by a passing salmon or trout, where they latch onto their gills. They're hitchhikers and make good use of this oxygen rich environment. After almost a year of their fish ride, the juveniles will drop off and must find a clean, gravelly or sandy substrate. If they're to grow, they latch onto the ground with a muscular foot, and then that's pretty much them for the rest of their lives.

00:33:03:05 - 00:33:37:06

James Shooter

These mussels are described as a keystone species because they're integral to water quality in the river. Each one can filter up to 50l of water a day, improving the ecosystem for all of the riparian residents. This sounds like a pretty good service for us humans,

too, which makes us all the weirder because instead of allowing this incredible process to play out, we removed most of them historically to check for pearls, small balls of calcium carbonate which might look fancy around someone's neck but would be better off left within the living, breathing, filtering mollusc itself.

00:33:37:06 - 00:33:51:08

Isak Edstrom

But I think every summer, like every farmer would have to collect like 100, 100 of them or something to bring to the king. Because you wanted the pearls. Really? Yes. We just declared, like every pearl mussel in the country was his.

00:33:51:10 - 00:33:55:17

James Shooter

Oh, wow. That would seem. Yeah, decimate the. If everyone has to collect a hundred.

00:33:55:19 - 00:34:01:04

Isak Edstrom

Yeah. So I'd imagine, like, back in the day, that probably every, every waterway was probably just cluttered.

00:34:01:08 - 00:34:16:04

James Shooter

And imagine the amount of like structure that gives to a riverbed as well. It's just they're kind of forming almost many reefs. So and give me an idea of how, how long that process takes snorkeling up and down the river. is that quite a labour intensive?

00:34:16:05 - 00:34:29:13

Isak Edstrom

Yeah, yeah. For sure. Yeah. It takes a lot of time. And like, since it's a, some in some places the river is pretty wide. You have to snorkel, like up and down multiple times to look at all the between all the different rocks and stuff like zigzagging.

00:34:29:15 - 00:34:38:19

James Shooter

Yeah. Yeah. Yeah. Blimey. Wow. Okay. And so we're gonna, you're going to take me in now to, to have a look. Yeah. And see if we can find. Yeah.

00:34:38:19 - 00:34:39:16

Isak Edstrom

Let's go in okay.

00:34:39:19 - 00:34:41:03

James Shooter

Amazing.

00:34:41:05 - 00:34:43:21

Isak Edstrom

Because you put,

00:34:43:23 - 00:34:45:03

James Shooter

So boots off first.

00:34:45:03 - 00:34:47:05

Isak Edstrom

Yeah. Boots off.

00:34:47:07 - 00:34:50:20

James Shooter

I've been in a wetsuit before, but never a dry suit.

00:34:50:22 - 00:34:53:24

Isak Edstrom

It's pretty nice because you stay dry.

00:34:54:01 - 00:34:59:14

James Shooter

Stay nice and toasty. Yeah. Where an earth does that go?

00:34:59:15 - 00:35:04:07

Isak Edstrom

That's on your shoulders, right?

00:35:04:09 - 00:35:07:20

James Shooter

I mean, if I was doing this, it would be a much longer process.

00:35:07:22 - 00:35:15:21

Isak Edstrom

Yeah, it might be like you might get some water still, because your hands are outside and your face as well. All right.

00:35:15:23 - 00:35:18:04

James Shooter

So when they say dry suit, they mean....

00:35:18:05 - 00:35:19:06

Isak Edstrom

The mean moist.

00:35:19:08 - 00:35:20:08

James Shooter

Moist suit.

00:35:20:10 - 00:35:24:23

Isak Edstrom

Mostly dry suit. So nice. Oh my God. Yeah.

00:35:25:00 - 00:35:28:12

James Shooter

At least, the mosquitoes can't get into this.

00:35:28:12 - 00:35:29:00

Isak Edstrom

Yeah.

00:35:29:02 - 00:35:33:24

Unknown

Suit.

00:35:34:01 - 00:35:47:22

James Shooter

Yeah, that was the first step and I ended up on my arse. Oh, yeah. Oh, it's very wet. Yeah, I knew bringing the microphone was a bad idea. Yeah. Very silty.

00:35:47:24 - 00:35:56:07

Isak Edstrom

Yeah, it sinks in the bottom. It's not like a.

00:35:56:09 - 00:35:59:08

Isak Edstrom

I think it's quite deep here, but is it. You can know.

00:35:59:09 - 00:36:05:03

James Shooter

Well we'll see, we'll see. I can already feel the water trickling in.

00:36:05:09 - 00:36:09:18

Isak Edstrom

Yeah. Yeah.

00:36:09:20 - 00:36:12:05

Unknown

Also it's like.

00:36:12:07 - 00:36:16:13

Isak Edstrom

Bottom is so silty. So you have to make sure like to not move around too much.

00:36:16:13 - 00:36:19:00

James Shooter

Oh of course. Yeah, yeah, that makes sense. So you can actually see.

00:36:19:02 - 00:36:21:01

Isak Edstrom

Yeah. The water will get too murky. That.

00:36:21:03 - 00:36:41:16

James Shooter

There is fish here already. Oh. There is a little ones. Yeah. Minnow minnows. That's what they are.

00:36:41:18 - 00:37:01:05

Isak Edstrom

Now you have to watch your feet because we were starting to come into mussel territory. Oh, okay. Yep. Right here. It was such a cool species, the mussels. Because, can live until they're, like, 200, 200 years old. Or, like, the oldest ever is 280 years old.

00:37:01:05 - 00:37:02:19

James Shooter

280 years old.

00:37:02:19 - 00:37:05:03

Isak Edstrom

And that's actually just like 30km from this river.

00:37:05:04 - 00:37:06:02

James Shooter

Really?

00:37:06:04 - 00:37:08:22

Isak Edstrom

Wow. Maybe even older one here. Oh.

00:37:08:22 - 00:37:11:14

James Shooter

That's amazing. What kind of size do you get to in the not.

00:37:11:14 - 00:37:17:23

Isak Edstrom

They peak at their size at like 100 and 150 years old and that after that it's like, yeah, they don't get much bigger.

00:37:17:23 - 00:37:18:07

James Shooter

Okay.

00:37:18:12 - 00:37:21:10

Isak Edstrom

It's like 10 to 15cm.

00:37:21:15 - 00:37:27:10

James Shooter

That kind of big. Yeah, yeah. Did, Henrik say it's 1 in 1000 that has a pearl?

00:37:27:12 - 00:37:32:03

Isak Edstrom

Yeah. Like one I've heard like one 1 in 1000 in 2000.

00:37:32:05 - 00:37:33:03

James Shooter

And you haven't found any yet.

00:37:33:04 - 00:37:33:24

Isak Edstrom

No I haven't.

00:37:34:01 - 00:37:37:04

James Shooter

Not that I guess you look.

00:37:37:06 - 00:37:59:02

Isak Edstrom

And historically you would farm then or harvest them to get the pearls because of jewelry and stuff. So yeah, there was like this, king's robe that had, like 500 golden crowns with ten pearls each. And so that's 5000 pearls. Wow. And then if it was one pearl per, like 1000 or 2000, 5 million.

00:37:59:04 - 00:38:12:20

James Shooter

Jeez, that's insane.

00:38:12:22 - 00:38:19:17

James Shooter

I've seen one. Yeah. Amongst the rocks.

00:38:19:19 - 00:38:23:21

James Shooter

Like.

00:38:23:23 - 00:38:26:09

Isak Edstrom

Just.

00:38:26:11 - 00:38:37:06

James Shooter

Oh, yeah. Awesome. Good. Yeah. Yeah. So cool. Brilliant.

00:38:37:08 - 00:38:39:20

Isak Edstrom

Just chilling there.

00:38:39:22 - 00:38:49:10

James Shooter

And is that. What is that the kind of thing that it's where you find the most in between rocks. Or do they. Can they be anywhere on the river bed?

00:38:49:12 - 00:38:52:18

Isak Edstrom

Yeah. There are a lot of times like in between rocks like.

00:38:52:20 - 00:38:54:00

James Shooter

Because that's what they settle basically.

00:38:54:00 - 00:39:04:03

Isak Edstrom

Yeah. Yeah. And they can either move with their, they have like this muscle with which they can put out like a foot and they can move with it slightly moving around like short.

00:39:04:07 - 00:39:06:00

James Shooter

Oh really. So they can actually. Yeah.

00:39:06:00 - 00:39:17:13

Isak Edstrom

But like very very slow and very. But or they can just like go with the go with the flow, just like loosening their grip and just going with the stream.

00:39:17:15 - 00:39:20:15

James Shooter

Amazing. I and this is a good part of the job isn't it.

00:39:20:19 - 00:39:23:15

Isak Edstrom

Yeah. Yeah. This is this is the best.

00:39:23:17 - 00:39:54:08

James Shooter

I love a river. I jump at the chance to canoe or kayak. I find it an extremely peaceful experience, drifting slowly by with the current coming across wildlife that you wouldn't normally see, finding secluded bays on which to rest undisturbed by the worries of

everyday life. It's special, but almost all of our experiences with rivers are top side walks by the river, boating on the river, skimming stones, throwing sticks, taking a photograph, watching the birds.

00:39:54:10 - 00:40:15:23

James Shooter

But where a river's true value lies is beneath the thin blue line. Getting into a river is where the party's at. I was thrilled to find my own freshwater pearl mussel, half hidden amongst the mud and pushed into the side of a boulder. Get close and you can just about see its inhalant aperture sticking out between a slight opening between its two shells.

00:40:16:00 - 00:40:38:01

James Shooter

This is a siphon that pulls in water and the particles on which it feeds get too close and the shell snaps shut for protection. No one in, no one out. Once I get my eye in, I see two, three, four mussels. By the time I floated down this small stretch, I count more than 50. Isaac, who's previously surveyed it more meticulously than me

00:40:38:04 - 00:41:05:16

James Shooter

counted 500. Not bad for an endangered species. Rather thrillingly, a number of perch float by checking out my big googly eyes in my snorkelling mask. More minnows are seen in the side channels, using the vegetation as protection from anything that might snap them up. I'm even excited by seeing small piles of beaver poo on the riverbed. I've never thought about a beaver having a poo before, now I can't stop thinking about it.

00:41:05:18 - 00:41:26:21

James Shooter

Do they stop to squat? Do they swim and go? I need to know. This is the kind of magic and mystery a river provides. If only we had a better view of these underwater worlds. Perhaps we'd look after them a bit better. Maybe we wouldn't use them as dumping grounds outlets for sewage, or manipulate them to with an inch of their lives.

00:41:26:23 - 00:41:56:07

James Shooter

Give them the chance to run wild, and they'll perform the duties that life requires, that we require, fresh, clean water to drink. Flood protection, drought mitigation, nutrient cycling, a natural playground, home for fish, home for mussels, even places for beavers to do their number twos.

00:41:56:09 - 00:42:25:24

James Shooter

Well, friends. That's it. The last episode of the series. And what a ride it's been. 18 episodes, 16 countries, 48 contributors, three vans, several van related mental breakdowns, and a whopping great load of inspiration. We've had 125,000 downloads from 162 countries around the world. This goes to show the huge amount of interest in rewilding and the hope that it brings.

00:42:26:01 - 00:42:49:07

James Shooter

People are desperate for some good news for our planet. I'm desperate for some good news for our planet, and I truly believe that's what rewilding brings. I'm hugely grateful to the amazing people at Rewilding Europe for making that happen, and the teams on the ground getting stuck into the nitty gritty of nature restoration. Every single one of you are a driving force for good.

00:42:49:09 - 00:43:19:06

James Shooter

Also, hats off to all of my guests that spoke so eloquently and so passionately across the series, most of which were doing so in a second or third language. I find that incredible. I can only just about manage to put this together in my first language, so kudos to you. Thank you to Henrik, Fredrik and Isaac for this month's contribution to Andrew O'Donnell of Beluga Lagoon, for the rousing music, and to my wife Gemma for the brilliant episode artwork.

00:43:19:08 - 00:43:41:17

James Shooter

A huge thanks must also go to Laurien, Director of engagement and public relations and Frans, co-founder and executive director at Rewilding Europe for both putting their faith in me to deliver what has turned out to be a very enjoyable series. I've learned a lot. I've laughed a lot. I've had some once in a lifetime experiences that will live with me forever.

00:43:41:19 - 00:43:53:22

James Shooter

And I hope you've enjoyed coming along for the ride. Can I promise that I won't pop back up again with the odd special here and there? Well, we'll see. For now. Catch you next time.