# Transcript of ‘Where Eagles Died’

## Season 3, Episode 7, Transforming Tomorrow

[Theme music]

**Paul:** Hello and welcome to Transforming Tomorrow from the Pentland Centre for Sustainability in Business.

I'm Paul Turner.

**Jan:** And I'm Professor Jan Bebbington.

How can the number of eagles killed in Scotland tell us how many eagles existed in the past? And what does this have to do with my marriage? I'm slightly scared, but all will become clear very soon.

[Theme music]

**Paul:** I want to talk to you about birds, Jan.

**Jan:** What kind of birds?

**Paul:** Well, do you have any particular birds that you like?

**Jan:** I quite like eagles. Do you like eagles?

**Paul:** They're all right. It's… [trails off into confused sounds]

**Jan:** …what movie does a famous line come in, which is 'the eagles are coming'?

**Paul:** [confused sound] I, I, I don't know. It sounds like you've been watching some really bad French cinema that's been overly dubbed…

**Jan:** …mmm…Lord of The Rings. [laughs]

**Paul:** Lord of The Rings…?

**Jan:** …yeah…

**Paul:** …the eagles are coming… Oh, is that the one where people keep saying, well, why didn't they just ride the eagles in the first place…?

**Jan:** …exactly. Exactly. It would've solved the whole problem.

So when you say eagles, what do you mean by eagles? 'Cause there's lots of different types of eagles.

**Paul:** When I say eagle, I mean a particular kind of eagle depending on the context of the conversation I'm having. [Jan laughs]

Um, in this country you'd be talking, and by this country I'll restrict it to England for the minute. You'd be talking about not very many eagles at all. You might see the odd golden eagle that's just got lost on its, you know, its hunting from Scotland, I suppose.

**Jan:** But Scotland has two types of eagles, the golden eagle and the white-tailed eagle.

**Paul:** They do indeed. And if… I want to say, I'm not mistaken, there's plans, or maybe already afoot, or already taking place, for white tailed eagles and round the Isle of Wight or something as well?

**Jan:** Yes, you're right. You're right.

**Paul:** Yes. Yeah. So yeah, I do know some things about eagles.

I, I've seen the last golden eagle in England when it was, uh, here. It's not here anymore. At Haweswater...

**Jan:** …ooh…

**Paul:** …there was an RSPB reserve, there is still an RSPB reserve, at Haweswater, which is a reservoir in the Lake District. And in the late eighties, early nineties, there was a pair of golden eagles.

And went on through the nineties, there was a pair, they bred quite successfully. Then there was only one. Until you had a lonely golden eagle at Haweswater for a while…

**Jan:** …it makes me very sad to think of that.

**Paul:** Yes, it was. Yes. Yeah, yeah.

**Jan:** So why are we talking about eagles?

**Paul:** It's a good question, Jan. Why are we talking about eagles? [Jan laughs]

We're not just talking about it for, you know, turning this into an ornithological podcast, we are talking about it for a specific reason. And that's because,

whereas normally I bring notes from home, you've brought something from home a bit bigger than notes today. [Jan laughs]

You brought your husband, uh…

**Jan:** It's true.

**Paul:** Yeah. I'm assuming there's a good reason for this, and I believe it's something to do with eagles.

**Jan:** It is indeed.

So, um, our guest today is Jason Harrison who also, as noted, happens to be my husband. So he's a PhD researcher in the Department of English here at Lancaster University, and he is gonna talk us through a piece of work that he undertook for his degree in Sustainable Mountain Development. Um, looking at golden eagle populations in Scotland.

**Paul:** Ah, I'm assuming we can learn something from golden eagle populations in Scotland.

**Jan:** We can.

**Paul:** We can. Good…

**Jan:** …about sustainability…

**Paul:** …because if we can't, it would sense that he'd wasted his life studying all about golden eagle populations.

**Jan:** No study is wasted.

**Paul:** Wow. I, I beg to differ given that there are certain universities offering Taylor Swift studies, et cetera, et cetera, et cetera.

**Jan:** Don't be rude to Taylor. She's my friend.

**Paul:** Is she? Is she really?

**Jan:** No…

**Paul:** …no, I didn't think so…

**Jan:** …I wish… [laughs]

**Paul:** No.

**Jan:** So, enough of this. Enough of this. Should we?

**Paul:** Yeah. I, I'll welcome Jason. I'm assuming you've already seen him this morning…

**Jan:** [laughing] …yes, indeed…

**Paul:** Welcome Jason.

**Jason:** Hi. Nice to see you.

**Paul:** So Jason, tell us then a little bit about where you studied, the University of Highlands and Islands, 'cause that, that to me sounds like it's gonna be in an episode of Balamory. Um, I don't know if you know what Balamory is.

**Jan:** I do, yes…

**Paul:** …yeah, it sounds like it would come from the, the University of Balamory would be even better, uh, for yeah, it sounds like it comes from an episode of Balamory.

But yeah, tell us a little bit about what that is, and also what sustainable mountain development is, 'cause I'm interested in what that is too.

**Jason:** Thank you. Um, the University of Highlands and Islands, um, or UHI, is a university that has its headquarters in Inverness, but it's, it's what's called a dispersed campus.

And most of its, um, campus space is actually on, in further education colleges, the southernmost of which is, uh, Perth on the Scottish mainland. And the northernmost of which is, um, in Shetland. And it covers the, the big, what's known as the Highlands and Islands, the big sort of rural area to the north of Perth, not so much to the, the northeast 'cause you've got Dundee and, and Aberdeen there, which are quite big cities. Right up to the Northern Isles and right up to the, uh, Outer Hebrides.

And, um, sustainable mountain development is a, is a strange, um, term. It's actually, I'll, I'll say what it is first. It's really just sustainable development for mountain regions or areas.

Obviously ,the needs of particular types of areas be, be they sort of forests or mountains or deserts or whatever. They have particular needs for, for sustainable development and the term itself, uh, sustainable mountain development comes from the agenda, the UN Agenda 21, which was a, a document that came out of the 1992 Rio Earth Summit.

And there were various chapters that cover various needs. And chapter 13 is Managing Fragile Ecosystems: Sustainable Mountain Development.

Um, it's not so well known now because it was superseded by the Sustainable Development Goals, which came out in 2005, which is still current.

**Paul:** I don't believe they have a Sustainable Development Goal for mountains, do they? Maybe they missed out.

**Jan:** No, no, they don't. But it, but some of the needs, and listeners might be reading in the newspaper, you know, some, um, villages at the bottom of glaciers, um, in the Alps are under quite a bit of risk and threat. And indeed there was a, you know, a big, you know, landslide through one of them, unfortunately.

And so some of those challenges of remote areas, maybe quite fragile economies with different kind of environmental hazards, mean that all of the SDGs are relevant to mountains, but how they're, how they're manifest in a mountain environment can be quite different.

So it's a really cool subject area.

**Paul:** It makes me wonder, though, because there is an under the sea and oceans SDG.

If there's something that goes that far down, why shouldn't we have something that goes specifically far up as far as, uh…

**Jan:** …there's Life on the Land, which is everything above. [laughs]

**Paul:** Yeah. But then that's comparing the beach to the top of Mount Everest…

**Jan:** …it is. That's, that's hugely varied.

**Paul:** Yes. Hugely varied. So maybe it's, it's a missed opportunity…

**Jan:** …it is…

**Paul:** …to have an 18th SDG…

**Jan:** …okay…

**Paul:** …'cause you know, seventeen's never enough.

**Jan:** [laughing] Yes, it could be. It could be.

**Paul:** Jason, let's divert away from myself and Jan discussing what the UN got wrong when it came to classifying SDGs.

Talking about your work, then. You've looked at eagle populations in northwest Scotland in the early eighteen hundreds.

So let's look then at the early eighteen hundreds in the northwest Highlands in Scotland. What was going on there?

**Jason:** Ooh, quite a lot. Um, the, we need to go back really to, uh, maybe a hundred years earlier and before that, um, at that time the, um, the mountain landscapes of particularly northwest Scotland, um, to a lesser extent other, other mountainous landscapes were, um, fairly well populated.

Admittedly, it was a, a fairly, um, spread out population, but I've, I've referred to it in my writing as a, as a mosaic of small farming communities. You'd see a patchwork of, of clusters of buildings, um, plots, uh, where oats and barley, uh, were grown. Um, animals were, were kept.

The, most of the landscape was used, um, in a fairly non-intensive way so that these communities practiced, uh, transhumance. So they took their animals up onto the, the higher areas of the mountains. Um, so they, they, they grazed them up there in areas called shielings.

Um, and they used most of the land, apart from the really rocky steep bits, you know, particularly the, the rocky parts. Uh, that all changed. It started in the latter part of the, um, 18th century, um, through, into the, uh, the middle of the 19th century when the, um, landlords decided that they, they wanted to get rid of these, uh, these communities so that they could establish very large sheep farms.

Much, much far more sheep than you'd get today, in any, any farm, thousands, you know that a farm might be a 5,010, maybe 10,000 sheep on it and, and quite a large area. Um, and that, that's instigated, um, a whole a wave really, you, you'd think of it as, over quite a long time of, of evictions, uh, known as the Highland Clearances.

And communities were either made to move to much more marginal lands, around the edges of these mountain areas, uh, particularly the coastlines, or some of them, uh, emigrated. Uh, some of them moved to the Central Belt to, to work in factories and things like that. That's the Central Belt of Scotland.

**Paul:** I think there's a whole different podcast around the political…

**Jan:** …yes, indeed…

**Paul:** …consequences and motivations and everything of the Highland Clearances, which I think maybe we'll avoid today.

**Jan:** Yes, I think so. Because, because it's a consequence of the Highland Clearances on land use, which Jason's already alluded to about the sheep, but then what that meant for the, the eagles.

So, how are the Clearances, land use change, linked to the, the fortunes of the eagles, and which eagles are we talking about?

**Jason:** The, uh, the land use change, it wasn't just about moving people off the land, it was also about a, a much more intensive kind of ethos of completely controlling the local um, fauna.

Whereas before animals had been reasonably well left alone. You know, things like foxes and crows and ravens and eagles. Um, the, the landowners instigated, um, programmes of what they would refer to as vermin eradication. And vermin could be anything from a jackdaw, um, through things like wildcats and pine martens, uh, to foxes and, and golden eagles were particularly viewed as a, as vermin.

Uh, the other species, the white-tailed eagle had already, they don't tend to, to nest as much inland, there weren't as many of them and they'd already suffered a lot because they're, they're much easier to, um, to kill than golden eagles, 'cause they tend to nest in less access, in more accessible places. And, um, they're not as shy of people.

**Paul:** Is it also a case that when it comes to white-tailed eagles they fish? Therefore, are they not quite as much of a threat to…

**Jason:** …um…

**Paul:** …farm?

**Jason:** Possibly, although actually, um, the, at the moment because white-tailed eagles have been reintroduced into Scotland and, and as you mentioned before, they have actually been reintroduced in the Isle of Wight as well now. Um, they are blamed by farmers for taking lambs.

They eat, they're quite versatile. They do, they catch fish. They're, they're a fish eagle. Um, very closely related to the, the bald eagle that you see in the, the United States. Very similar bird.

And they, they can catch fish out of the water. They also, um, they're not very good at catching sort of agile things on land, but they will eat carrion, and they're not averse to eating lambs.

**Paul:** So, so they're still a threat to the, the…

**Jason:** …they can be…

**Paul:** …livestock of families…

**Jason:** …that, that's a subject of much discussion at the moment. Um, but the golden eagles were much more, that population then looking at other historical sources was much more, um, was reasonably healthy.

Um, it's reasonably healthy today with, with big caveats. And it was more like, like it is now. There was, there was a good number of them, uh, nesting, on, you know, and cliffs and rocky bluffs and things in the mountains.

**Paul:** Yeah. I suppose should have stressed they're perceived as a threat because…

**Jason:** …perceived…

**Paul:** …whether they are or not is a different matter, 'cause different people have different perceptions.

**Jan:** I think this is a podcast where we say, well, let's put that aside [everyone laughs] because that's another conversation altogether.

So, so how did, um, the estates and, and it's probably worth telling our listeners what a, an estate is in this context as well. But how did those estates deal with reducing eagle numbers? How did they do it?

**Jason:** Okay. Uh, well I'll start off by saying what an estate is. It's, it's a large, uh, rural land owning. We get them now, you know, they, they're often associated with the, with the landed gentry. In fact, I spent some of my childhoods living on the estate of Lord Allendale.

In, in the Highlands they, they're often, um, very often set aside for deer stalking or grouse, uh, shooting a bit like the Forest of Bowland, a mere few kilometres from where we are now.

The estate managers, uh, instigated a programme of eradication. They spent a reasonable amount, amount of money on it. Um, they employed people who would be known as fox and eagle hunters. So that's one job title.

Uh, because foxes and eagles were, were viewed as being the, the worst offenders as far as a threat to sheep is concerned. And, uh, those people are actually the predecessors to, to what are now called gamekeepers, whose job is often still to get rid of vermin, if you will, particularly, not so much on deer-stalking estates, but more on grouse estates.

And in addition to having paid, um, employees, who would get a cottage and, uh, a wage, they also had a programme of, um, bounties that they paid for all these different kinds of vermin. The top bounty being, top bounties being adult foxes and adult eagles. They'd pay slightly less for, for, for eagle chicks, and then a bit less, again, for, for eagle eggs.

And anybody could get that bounty. In theory. It was quite a lot of money. Um, I'd worked out that it was about two thirds of the standard monthly wage for one of these, uh, fox and eagle hunters, or about the same as the amongst wages for a, a manual labourer. So that's a not inconsiderable sum of money.

Um, they, they also, they would let freelancers, if you will, uh, get the rewards too. You had to demonstrate that you'd killed an eagle by keeping its head and its talons, obviously otherwise you could just say, oh, I've killed an eagle. You know, give me my bounty please. [laughs]

Uh, they were a little bit worried about the, the freelancers, um, doing a bit of surreptitious, uh, poaching on the side. I think they made them swear come some, some sort of oath that they wouldn't kill any of the, the deer or anything [laughing] on the land whilst they were, they were there, you know.

**Paul:** A lot of trusting going on there.

[Jason laughs]

**Jan:** Well, not that trusting because, uh, it's interesting and this is where, this is about accounting, Paul, you'll be happy to know. [Paul laughs]

There, there was also like an audit regime. So you had to, when you, um, would come onto, when you presented, um, well when you caught something, you go to the local magistrate, you go, look, I've caught this, and they would certify it. And so you'd need the certification, and the talon and the claws. Um, so there was sort of like an audit trail when you came to actually collect your cash.

**Paul:** How could you prove that an eagle had come from a specific place? What if one landowner's paying you five bob more than the landowner down the

road, you just go and get it off the landowner where wherever you want, and take it to the one who's paying most?

**Jason:** That's a good question actually, I hadn't thought about it like that.

Um, in the case of the area that I'm, that I've studied, which is, um, Sutherland, which is in the, the, the far north of Scotland. It's a very large, uh, one of the old counties. It goes right up to Cape Wrath. Um, the, the northeastern bit is, is, is Caithness, but the rest of very large chunk of northern Scotland up to Cape Wrath is Sutherland.

And in that case, the, um, there was a, um, an association called the Sutherlands Association for the Protection of Property, which was a, a committee made up of 11, um, farmers, I think, if I remember rightly. And, um, they had a standardised system and they paid out, they paid into this, this, this pot, and they, and they paid out.

So it wasn't, um, there was no point in trying to go to a different farm. There, there's a very large area anyway…

**Paul:** …mm-hmm…

**Jason:** …if, if you'd killed an eagle, then they'd give you the money for it.

**Paul:** How, so to speak then, successful was this? How many eagles were left at the end compared to how many there were when this all started?

**Jason:** Um, it was, uh, very successful. It's, it's quite difficult to estimate numbers, but, uh, work that's been done that covers the whole of the British Isles, which includes lreland, suggests that, uh, there was a population loss of between 35 and 80%.

And that's because the, both the loss and what the population was to start with are known within quite wide parameters, which gives you this fairly wide parameter of population drop. And the more importantly perhaps the range of the species contracted from, um, mountain landscapes across Scotland and Ireland, um, to, I think they'd already been eradicated from England and Wales by then, to just those in the Highlands and Islands.

**Jan:** So how do you know all of this? [Paul laughs]

I know that sounds like, that sounds like a very wifely question…

**Paul:** …it really does…

**Jan:** [laughing] …for which I apologise… [laughs]

**Paul:** …it really does. This, this does sound like the kind of conversation you should be having at home. [caricaturing Jan] How do you know? Yes, yeah.

**Jan:** So where do, where do you get the data, like the number of eagles killed and those sorts of things?

**Jason:** The, the data that I had as a, as a kind of starting point for my research, the, the, my research I was really, I was looking to kind of ratify, um, research that had already been done is from, um, sources that are, um, documentary evidence, so records of, of the killing of eagles and, uh, place names actually.

Um, there's a lot of places that we know that there were, that there's, there's, at, I think there's at least two Eagle Crags in the Lake District, for instance, which aren't anywhere near these, this old nesting pair that, uh, that, that Paul, uh, mentioned.

And we're pretty sure that from, from just from records that there were eagles. And um, also from, from place names.

**Jan:** So this is a historical piece of research, Paul, which will interest you as a historian. So we went to the National Library of Scotland where they have estates archives…

**Paul:** [appreciatively] …mm-hmm…

**Jan:** …and we, we, you know, ordered the boxes and, and I read the cashbook because that's the way I'm like, [Jan and Paul laugh] that's what I enjoy doing, 'cause…

**Paul:** …I don't think the accounts can still be put in from 1823, Jan, [Jan laughs] I think that the, the, you know, the Inland Revenue are gonna say it's a little bit past…

**Jan:** …little bit past. But I was, whereas Jason has said how much it was worth to the workers, I was trying to find out how much did it cost to the estate in general…

**Paul:** …mm-hmm…

**Jan:** …and so what they were paying in those bounties were like pennies compared to the other kind of things going through.

So, so that was kind of interesting to realise that there was an uh, asymmetrical value, um, in terms of cost and the, the benefit, which would of course, you know, prioritise, um, people killing eagles.

But we found something in the archives, which was super exciting. So, what, I know the answer to this, but for the purposes of our…

**Paul:** …yeah, this isn't your podcast, this is Jason's podcast…

**Jan:** …exactly…

**Paul:** …let Jason speak for himself.

**Jan:** What, what did you find, Jason?

**Jason:** Well. We found, um, first of all, um, I'll mention that when you, when you look at archives, it can be quite difficult to know what you're gonna find.

It's not like a, it's not like a library and some things that, they have a, a catalogue and they have items in the catalogue, and some of them are, um, quite well described and you, you hope at least are, you get an, you get an idea of what you're gonna get from reading the description.

I, uh, pulled an item, uh, out from the archive called 'game bundle'. And it's literally a little, um, parcelled up bunch of, I dunno, say 10 pieces, quite small pieces of paper wrapped up in string.

It's quite exciting 'cause I, I wouldn't be surprised if it hadn't been opened since it was archived, or even before. And within that, I found, we found a piece of paper which had a, a table on it, which listed all of these vermin species that had been killed over the period between 1819 and 1826. And I correlated this with the Sutherland Association for the Protection of Property.

So I knew how many adult eagles, um, they also killed chicks and they, they took eggs and killed things like foxes and crows and stuff. Uh, I knew how many adult eagles were killed per year, over a seven-year period.

**Paul:** When you say a game bundle, I'm imagining you found out Monopoly, Cluedo. [Jan laughs]

But no, it, it, it turns out not being the case. So what do you do with that data then? When, when you've got it, how do you use it and what kind of conclusions can you draw from it?

**Jason:** Well, a little bit like the other historical research. It's, it's firstly, um, good to think that you, you're not gonna be able to draw any really accurate conclusions, but nevertheless, they can tell you things.

There's a, there's, there are methods that, uh, use, um, the numbers of animals that are killed. To estimate how many the total population is, which, which you can imagine.

Um, the, the classic method is, is known as the Leslie-DeLury method, which is actually named after two, uh, researchers that worked with other people who, um, researched the, an effort to eradicate rats in, I think Calcutta in India. And also the catching of, um, of lobsters and other seafoods, uh, in Canada, round an island.

Um, the principle being, the easiest way to, um, work out a population of creatures is to kill them all. [Paul laughs] If you literally eradicate them, then you know that the, the population that year was, you kill a thousand and there's none left, then the, the population was a thousand.

**Jan:** This has taken a very dark turn all of a sudden…

**Paul:** …obviously, I'm gonna guess this wouldn't get past many ethical committees nowadays.

**Jason:** This not, yeah. But, but also the, uh, if you're catching, um, the, the easiest, the easiest, uh, way to understand it is that you're catching fish. Um, there's a, there's a season for, for fishing a particular species. And at the beginning of, of that year, the, um, the, there'll be a probably a few hundred thousand or tens of thousands of cod or something, and you'll fish them. And it, and it makes sense that over the period of the, of the season, you'll catch fewer as, as the numbers are depleted.

And in principle, if you, if you forward cast that in a, in a mathematical sense, it's very, fairly simple and you keep thinking, well, what, what's the rate of, of depletion, of catch? At what point in the future will we not catch any? In a sense, in principle and, and hypothetically then you would've fished all the fish.

But you, you don't, you obviously don't do that. Uh, we're talking about, um, in this case, fisheries, which you, you want to preserve, but it gives you an idea of what, what the overall population is based on what you're catching.

**Paul:** Obviously this is a long time before the Royal Society for the Protection of Birds came along and said, oi, stop killing all the birds. But were there

people such as ornithologists back then who may be able to give an idea of how many birds they were still seeing were there, was there anyone who was just watching birds and keeping an eye on birds for the sake of nature or not?

**Jason:** Mmm. That's a, yeah, again, it's gonna get a bit dark. Um, ornithologists back in the, um, the, we're talking about slightly pre-Victorian, um, the period that I'm looking at. But, uh, ornithologists in the 19th century, in the Victorian age particularly had a different attitude.

So if you, uh, were interested in, in a particular species, you'd go out and you'd shoot some of them, and then you'd look at the stuff you'd shot, uh, quite often and you'd maybe get it, uh, get it stuffed.

So there were, um, there were a couple of accounts, one by a man called Osgood Mackenzie, who was a big landowner who would shoot anything that moved and then speak in a fairly, um, elegaic sense about, alas, these creatures are not with us anymore, you know, as if he'd hadn't had quite a decent part in that, including things like, well, there's no ospreys on, uh, on the loch anymore, on the islands. You know, I used to collect their eggs as a boy, ah alas, there are no ospreys.

And there was another chap who used to, um, an English man that used to go up to Scotland to shoot things and stuff things, and he's almost certainly responsible for, for the loss of particular species in a particular area.

So [laughs] they, they had an idea of what was there, and then they had an idea of, um it not being there anymore, 'cause they more or less owned up to having killed them. [laughs]

**Paul:** Yeah, it makes a lot of sense. You've brought your husband along today. I'll bring up my partner who works in museums, and she used to run, uh, a district museum. And their collection of stuffed birds, stuffed animals, and not just from within the district where the museum operated from all around the world, from New Zealand, from Australia, from Scotland, from all the places that we might talk about. They have them just so that the people living in Barrow in Furness can see what these animals and birds look like and get to learn more about them.

That was like you say, the, the, the way they did it. Let's shoot one, look at it, study it, stuff it, put it in a case and uh, have it on display.

**Jan:** Yeah. Wow. Can we, can we try to lighten this podcast? 'Cause currently it's a bit death and mayhem, I have to say. [laughs] So…

**Paul:** …I don't know that there's much mayhem. It was very well organised how they got them all into the museums…

**Jan:** …ah, I suppose that's true… [laughs]

**Paul:** …curators would be very upset if you said they oversaw a world of mayhem.

**Jan:** Yeah. Organised death.

**Paul:** Organised death. I'll accept that. Yeah, yeah, yeah.

**Jan:** That's okay then. So, so let's take all these pieces together, Jason. So we've got, um, some data with this run of what's been killed. Um, and it was recorded because they paid money to, to people who had killed these creatures.

Um, we have some sense of then, um, something about historical numbers from place names, but it's a bit hazy. You, you told us a wee bit about methods that existed that allow you to figure out how much population is from how much you've killed.

So maybe if we start with that method, tell us more about the method and then tell us what you found out from its application.

**Jason:** The method that I used is, it's actually a very new, uh, method and it works on the same principle as, uh, as Leslie-DeLury. We don't need to to know much about those methods as such, but, um, the, there are, there's at least one reason why Leslie-DeLury is not suitable for this particular data set.

Um, I was very lucky. I was writing, um, this dissertation and doing the, the research for this dissertation a little bit pre-Covid, a couple of years before Covid, and somebody, uh, Japanese researcher called Agetsuma published a paper whilst I was doing the research and I think without Agetsuma, I probably couldn't have done the, the research. I'd, I'd thought that there'd be something out there that I could use. And actually [laughs] it came about whilst I was looking, which is a, a very, very lucky.

The Agetsuma method, um, works on in an area where the, they are trying to eradicate creatures such as vermin. And, um, in principle, if you know, if a population died in a particular year, and you know how many were killed in

that year, then you know, um, what the population from the year before would've been based on growth rates of populations, and the number of, um, creatures that were killed, killed the year before.

So, it makes an assumption that you're looking at the final, last group. And, um, you work backwards from there. You need to work backwards for a few years because the, the more you work backwards, the, the better the figures get. But in, in principle, it gives you the preceding populations for the year, which as you would imagine, you would expect to, to be declining.

In my case, I had a set of data that finished in 1826. Um, there were certainly much fewer of them then. Um, a caveat with the Agetsuma method is that you make this assumption that, that they've all gone. But obviously there might be some left, in which case you're really estimating a minimum for the population rather than a, a median or, or some other term that you'd want to use.

So I worked back from 1826. I had enough years to, to backcast to 1819, which is when this, this eradication program began. And it gives me an idea of how many eagles there were flying about the, uh, above the skies of Sutherland at that time.

**Paul:** I've just got a quick question here, because you've mentioned eagles fly, therefore they're not restricted to, there's a big wall there, I can't get past it. They could fly away as far as they want. They could come from as far as they want.

Does that make it harder to measure populations of avian creatures than it does land-based mammals?

**Jason:** It does. Um, we do have the advantage with eagles that they, um, the nest in the same place every year, and the breeding ones tend to, um, stick with the same site year on year for decades. Um, in, in principle indefinitely.

The, the previous, um, methods of have looked at, they don't really count the number of eagles so much as the number of nests, and whether they're occupied. It's quite easy to see if the, your pair of binoculars or whatever, it's quite easy to see if a nest is in use or not.

And you know where the nests are. That they're, they're all in well-known spots and they have been for years. And that, that's kind of how the previous method works. So they were interested in, they tend to working nesting pairs.

Now I had to think about how many nesting birds there were as opposed to immature and juvenile birds, which are two different categories.

You get juveniles that are like a year out of hatching. And then for sort of three, four years after that, they're, they're immature adults. And, um, again, it, it does, it does create problems 'cause they do range quite, uh, quite widely. Um, so there, there might well have been, uh, birds, flying birds from much further afield.

And even the ones that, uh, that when chicks fly the nest, they will, uh, they'll, they'll range all over the place. And when they're trying to breed, they'll, they'll, research has shown that they try and come back to where they came from, which inevitably means that they're waiting for some, a nest to, one of the birds to die. Or they might fight one of the birds to, to create a new pair or, or something like that.

So that poor eagle in the Lake District, nothing, uh. There were two, uh, up until 2004 and then there was a, a lone male, which was displaying for a mate up until 2016. And then the poor thing didn't have any, any adults around to kind of come and start a new nest with it. And then, and then it died.

Sorry, I got a little bit off track there, but I thought that was nice…

**Jan:** Yes, it died.

**Paul:** It died. I did tell you it had been there by itself for a while. I hadn't realised it was 12 years. That's quite a long, long time…

**Jason:** …I just looked that up last night. So I did a little bit of…

**Jan:** [softly] …yeah. 12 years, waiting.

[normal volume] So from all of that quite, quite simple, but also quite complex, uh, calculations. What did you learn about the historical eagle population versus the current eagle population?

**Jason:** Yeah, the historical population, I would say was both similar to the population that we've got now and different. It was similar in the fact that the, the, the nest occupation was either the same or, um, even higher than it is, uh, currently.

The last survey, we're actually about 10 years off the last big survey, they, they come once a decade and the last one was in 2015. Um, the last survey showed 508 nesting pairs, uh, with 70% of nest sites being occupied. So in principle,

there could be around seven 50, um, nests. Back in 1819, there would've been a similar number of nesting birds, um, possibly more.

But what I would say from that was that there were more birds flying about, not nesting, much more. And that's interesting in itself because, um, the, the problem that we have at the moment is that there are issues with various bits of Scotland, but where the birds are nesting successfully there aren't many, um, mature adults to take the place of, um, of the, of the nesting birds as they die or, or whatever.

And, um, the immature ones can nest, but they're not as good at it. So the nests are more likely to fail. So the population is actually, has a level of instability in it, which you, you wouldn't have got in, you don't get in in other, um, parts of the world.

It's noting, it's worth noting that the golden eagles, um, breeds right across the northern hemisphere and other, um, populations are, are more successful because they have far more what are called floaters. Which are mature adults that are, that could build a nest compared to now.

The, um, the proportion of, uh, of nesting birds to non-nesting birds now. There, there's, there's a very large proportion of, uh, mature adults, about 85%, 80 to 85% are, are on nests, whereas in, in other areas it might only be 30%. So there's a lot of birds ready to take over out there.

So it, it looks like it was a more, uh, um, more eagles flying about. And that, that, that kind of speaks to the whole of Scotland really, because as, as Paul noted, the, um, the, they range far and wide. So there, there would've been, there's no reason to assume that there weren't many, um, non-nesting eagles flying about in other parts of Scotland as well.

**Paul:** Do they suffer a toll from the problems that led to their decline in population? Are there still people who are killing them, hunting them? I know here in England there's a particular issue around hen harriers and what happens with hen harriers and how they mysteriously get poisoned and disappear in certain parts of the country at certain times of year.

Do golden eagles in Scotland suffer from that at all now?

**Jason:** They do indeed. Um, so in the east of Scotland, where there are many grouse moors, um, which are the same kinds of areas where hen harriers mysteriously disappear, golden eagles mysteriously disappear.

That's interesting because the best part of Scotland for being, living as a golden eagle, apart from the persecution, is the east of Scotland. They've got a very good, um, a lot of hares, particularly, a really good supply, and grouse, indeed, they've got a very good, uh, supply of prey.

Where they do nest, the nests tend to be more productive, so there's a more, higher average number of chicks per, per nesting year. But unfortunately, in some areas there are only 30% of the nests that are occupied.

Whereas in the west of Scotland, the prey isn't as plentiful. They don't breed quite as successfully, but most of the nests are, are occupied and used for breeding.

**Paul:** We've mentioned that white-tailed eagles are back in Scotland, does the presence of white-tailed eagles have any effect on the population of golden eagles?

Are they hunting the same prey at any time? 'Cause as you mentioned before, it's not just fish, but the white-tailed eagles are going after, they can go after other things.

**Jason:** Um, surprisingly, or perhaps not surprisingly actually, um, not really. They occupy very different ecological niches. So the, um, well, white-tailed eagles and golden eagles eat carrion, which is about the only food source that they share.

Uh, golden eagles are quite agile. They're more finely built than, than white-tailed eagles. White-tailed eagles are a big, bulky bird. Golden eagle has a similar wingspan, I think, possibly slightly wider, but they're, they're slimmer. They've got sharper beaks and a smaller body and things like that.

And so there, there's an interesting, um, account of the, they will, they will, I say fight over carrion. There's an interesting account from an area in Norway, uh, where the both species, um, live and one immature golden eagle, it might have even been a juvenile, actually, managed to fight off seven white-tailed eagles in a period of about 10 minutes over a sheep carcass. 'Cause they're [laughs] much more aggressive and fighty.

That's a good word. That's the proper ornithologist word, that they're much more fighty than white-tailed eagles. But apart from that, um, they tend to have their own, uh, ecological niche.

The, the, the Englishman that was killing, whose name I, I couldn't recall off the top of my head. The Englishman that was going up to Scotland to slaughter wildlife, made observations of two nests of the two species on a loch side, uh, up in Scotland.

And it was quite interesting 'cause you could almost form a picture of both the golden eagles and the um, the white-tailed eagles kind of heading off in different directions. Like, you know, almost go, like going on your daily commute. So the golden eagle would fly into the interior and the white-tailed eagle would head off towards the coast.

So they were nesting quite close, but they didn't bother each other.

**Jan:** So to draw all of that together, what wider conclusions could be drawn from this work?

**Jason:** A tentative conclusion that you can make from, from my research is that the lands at the time that they were living on, um, quite sort of relatively infertile mountain land, you know, grass and heather, the kind of, uh, thing that you picture when you think of the Scottish mountains, was, may well have been ecologically richer than it is now.

So there, there, there may well have been more small animals like hares, particularly. Um, you also get rabbits on places like the Isle of Mull, although interestingly, interestingly enough, there are still more rabbits and things like that over in the, the Hebrides, and that's where the, the most robust eagle populations are. Both species actually, which is why Mull's a bit of a, a tourist hotspot for eagle spotting.

So the land was quite possibly ecologically richer. Which is interesting because that, that was at a time when a large portion of this land had people living on it and farming it, albeit in a, in a very non-intensive way.

So that tells us that that land does not have to be, um, pristine, if you will, to save species. That humans and, um, animals and the, the non-human, if you like, can, can co-exist very happily. Obviously, assuming that the humans, um, behave in a way that's sympathetic to the animals.

Uh, human presence isn't in itself a detriment to, to healthy and robust animal populations. There are, um, people at the moment, um, that have, uh, that are descended from the, the, the people that were cleared from, from the, from the, the mountain interior, if you will, couple of, of centuries ago who would

like to reestablish, I suppose there'd be small holdings or crofts in some of the areas where there were people before as, as a cultural endeavour. And there, there's no contradiction there between that and, and making sure that the wildlife thrives.

**Paul:** So, what are you doing now then, Jason? And I'm sure, being married to Jan, it has to tie in somewhere to sustainability, otherwise you'd get kicked out of the house!

Um, how does it tie into sustainability?

**Jason:** Yeah, I'm, I'm hanging on there by the skin of my teeth, if I'm honest with you. Um, so obviously I did, I did a master's degree in Sustainable Mountain Development. I actually did, uh, another master's degree after that in human geography, in which I looked at the, um, the portrayal, in academic terms, uh, you would say discursive construction, but that's a little bit, uh, jargony. The, the way that the landscapes of the Scottish Mountains and the western sort of Highlands, really the northwestern Highlands has been, uh, has been portrayed or, or viewed and, and what are the kind of dominant views of, of those lands.

And, um, from that, I'm now, um, working under two different, uh, supervisors. One is a, um, a professor of literature called Simon Bainbridge, who, um, specialises in romantic literature and indeed literature around mountains. So the Wordsworth, Wordsworth is the obvious connection there with the Lake District…

**Paul:** …mm-hmm…

**Jason:** …they spend a lot of time in the mountains. And another historian called Christopher Donaldson. Who's, who's very interested in, uh, things relating to that.

And, I'm looking at the, the culture and history of Scottish mountaineering, really. Particularly elite Scottish mountaineers and how they've kind of, how they see, how they view the landscape, how they see it.

And that has a, that has a big effect on the, the kind of dominant view of, of the Scottish Highlands now as a kind of big old empty mountain area with, you know, unspoiled lands and, and largely unpopulated, you know, away from the villages and the, the, on the roads and the coast is very much in keeping with their idealised kind of view of the landscape.

And my hypothesis is that they've actually had quite a big influence on that, but it's not been researched. And it links through to sustainability because, um, current populations of communities really, particularly the crofting communities, they're very marginal and out, like you get in many scenic parts of the country, apart from tourism, the, the people there are quite limited as to how they can live and what they can do.

And if, if the landscape was viewed in a more nuanced way, so that it wasn't seen as being that it has to be, everything has to be kind of empty that's empty at the moment, then that in itself will allow for sustainability.

The, the obvious thing is obviously wind, uh, wind power. There's no reason why, nobody wants to put a wind turbine on top of Ben Nevis or, or whatever. But at the same time, um, at the moment people get upset that if, if they climb a mountain, they, they can see a wind farm, which, it's kind of ridiculous.

They, they don't seem to be that bothered about, um, the, the big road that they, often an A road, that they drove in on with overcrowded car parks and motorbike engines kind of echoing up through the glen in places like Glencoe.

But they get very bothered at the idea of looking out over this kind of vast white horizons, landscaping, and seeing wind, wind turbines and I, I don't see why they shouldn't be, and that that's very much a kind of mountaineer's view of how things should be.

**Jan:** [laughing] Another controversial area where we won't go to far into.

**Paul:** I have two questions before we draw to a close, both of which you could possibly answer quite quickly. Did Wordsworth ever write about eagles?

**Jason:** No, I don't believe he did. I, I might be wrong. Simon might, uh, my, my supervisor Simon might have words with me about that. [Jan laughs]

[joking] Words worth with me. Ha-ha. [laughs] But, ah…

**Jan:** …ooooh…

**Paul: …**his sense of humour... [inarticulate noises] …this, er…

**Jason:** …terrible isn't it…?

**Jan:** …tell me about it…

**Jason:** [laughing] Not, not that I know of. No, I don't think he did.

**Paul:** And have any mountaineers ever been attacked by golden eagles?

**Jason:** Uh, that, that's a good question. And the answer would be, no. And we're, we're into, we're back to, um, the, the reason that the golden eagle's been able to keep itself, stop itself from being, uh, extirpated, which is a kind of the proper term for local extinction in, in the Scottish Highlands, is because they, they just go away when people are near.

And if you were anywhere near the nest, even if you, uh, I've not heard of any nests actually being literally sort of, you know, you put your hand up on a ledge when you're climbing and there's an eagle nest, 'cause people tend to know where they are. But, um, they, they fly off.

And actually white tailed eagles will, will not actually attack, um, people who get near the nest, but they'll get agitated and stay nearby and, and sort of make a fuss, which makes them easier to kill...

**Paul:** …mm-hmm…

**Jason:** …'cause even in the days when rifles weren't very good, 'cause the modern breech-loading, um, shotgun didn't come about until the mid-19th century. Even if you had a pretty rubbish flintlock rifle, you could probably get one if it was 10 foot away, making a fuss and flapping about.

**Jan:** Yeah. Well there's a, there's points of continuation there, which I think is pretty interesting.

**Paul:** I reckon a golden eagle could take your little border terrier if you take it for a walk…

**Jan:** …please don't encourage this kind of belief. [laughs]

**Paul:** I mean, I personally, I'd be on the side of the golden eagle in this particular equation…

**Jan:** [laughing] …oooh…

**Paul:** …those border terriers yapping about in the fells when you're going for a walk, like off the leash, you know, and this lot, yeah.

**Jan:** But for our closing question, Jason, what's next for the eagles in Scotland and possibly eagles in the rest of the UK?

**Jason:** Again, it's all very tentative, but I think that there could be about 775. I've categorised it as breeders here, 'cause I, I get, I get a bit sick of everything

being sort of viewed as, as breeding pairs because they're, they're individual birds really, and they, they come and they go.

But the, at the moment, there are maybe a thousand, uh, breeding birds in, in Scotland. Uh, there could be 1,450, or thereabouts, with a lot more, uh, mature birds ready to, to hop in or fly in, uh, to, to take over when nests, you know, need a new adult bird to, to breed.

Obviously, that's all very dependent on the prevention of eagle persecution in the, in the eastern Highlands. It's all very, no, no organisation ever holds its hands up and says, well, it was people from our estate or, or whatever. It's always rogues and bad apples.

But I don't believe that, I don't think these people could do this without the, the tacit sort of knowledge of, um, of the people that own the land and the, the sort of gamekeepers association and, and things like that.

Uh, there could be eagles back. There are relatively new, um, pairs in southern Scotland, so there could be eagles back in parts of the Lake District. Obviously the Lake District isn't that different from now to what it was say 20 years ago when the pair were, were breeding, um, around Haweswater. And same with North Wales, obviously. Um, and yeah, it'd be nice to see more of them, and it'd be nice if it was a more, um, robust population.

**Paul:** That's a very positive note to end on. Thank you very much for joining us, Jason.

**Jason:** Thank you.

[Theme music]

**Paul:** I suspect Jan, that was more painless than you expected it to be. [Jan laughs]

The look on your face when you walked into the studio this morning, knowing who our guest was about to be, I think you expected the worst podcast, the one of your nightmares.

**Jan:** Well, I just knew that you might tease us a lot, so thank you for that, Paul, you did very well.

**Paul:** I've looked it up and just for future reference, there is a take your child to work day, [Jan laughs] which in America is April the 23rd. As far as I'm able to tell, there is no take your significant other to work day…

**Jan:** …okay…

**Pau:** …so, um, for future, please don't.

**Jan:** [laughs] We could find a day and we could all, we could all do it. Because our significant others often, you know, have interests, um, aligned, but not exactly the same as our own. And it's, yeah, it's always great learning from each other.

**Paul:** Yes. I, I talk far more about Lancashire Police and things such as this with my significant other than I would do otherwise, talking about the, the police around here. Yes.

**Jan:** But here's the thing. Did you spot it? It's all about the accounting. So…

**Paul:** …no, for you. [Jan laughs]. I want to stop you there. For you, it was all about the accounting. I, I noticed that Jason couldn't wait to move on very quickly from the discussion of accounting. It was if yes, Jan, you just go in that room, do your accounting, I'll do the real work out here.

**Jan:** Yeah. But um, and um, yeah, I think that's probably fair enough.

But what's quite interesting. And this has been shown time and time again in the accounting history literature, which, you know, appreciate that, you know, some of our, our listeners might be, uh, you know, accountants that might look at accounting historians. People can deny things happen. They can do, they can say, no, no, no, this never happened. Those people weren't ever there.

But the accounting records, particularly in this older period where accounting records were much more foundational, and people kept and then preserved these records. Records of, for example, um, parts of the Army being in a particular place and the amount of bullets that were used, for example, exist.

So if you say, oh no, there was no massacre here, then it's actually, you can put those two things together and go, oh hang about. So this is quite interesting in that we wouldn't have known about those eagle deaths unless there was a bounty system, an accounting system, et cetera…

**Paul:** …mm-hmm…

**Jan:** …so those historical accounting records sometimes give us a glimpse back into ecological and social conditions of the past, and I find that, you know, quite exciting.

**Paul:** And there's so much to learn there about what happened to the golden eagle population. What, when it dipped, why it dipped, how people were being rewarded for the fact that it was dipping, and then how it slowly recovered and compared to how it is now to then.

And, it tells a story not just about golden eagles, but about other species as well, because golden eagles are gonna be far from unique when it comes to being persecuted and hunted to that local level of extinction.

**Jan:** It's the same as the canary in in the coal mine, is that actually some of these apex predators tell you about the underlying health of what's going on in the landscape as well, so that's great.

So, but what are we going to talk about next? Where are we going…?

**Paul:** …I'm gonna talk about your husband's creation of the word 'fighty', which…

**Jan:** [laughing] …fighty…

**Paul:** …I, I found to be particularly brilliant. I, I'm gonna use that now. I'm not gonna say aggressive or anything like that. I'm gonna say fighty.

**Jan:** I wonder if it's a Scottish-ism.

**Paul:** I don't know. Maybe it is, I shall ask when I get home, yeah.

So I do have a, a Scot at home, a resident Scot, who can tell me, who uses sometimes words, which I've never heard before, and which might…

**Jan:** …oh, I think fighty is a good, good example.

**Paul:** Yeah. But having discussed that, next time we're going to be joined by someone from here at Lancaster University talking to us all about big projects and their relations to net zero, how you manage projects, and a particular project that's going on here at Lancaster University, which is changing the way we have energy here…

**Jan:** …brilliant…

**Paul:** …at the University. That's gonna be Anna Cockman, and she's gonna be joining us next week.

**Jan:** Brilliant. I look forward to it.

**Paul:** So do I. Until then, thank you very much for listening. I'm Paul Turner.

**Jan:** And I'm Professor Jan Bebbington.

[Theme music]