

Colorado State University Libraries
Center for Collaborative Conservation
Seminar and Discussion Series

Transcription of The tragedy of enclosure: climate change, fencing, and local environmental knowledge in Tibet, 3/12/2013

Collection: Spring 2013

Title: The tragedy of enclosure: climate change, fencing, and local environmental knowledge in Tibet

Date: 3/12/2013

File Name: CCC_2013_Spring_Hopping.mp4

Date Transcribed: November 2024

Transcription Platform: Konch AI

BEGIN TRANSCRIPTION

[00:04 - 01:08] Kelly Hopping: Okay. Thanks everyone for coming. Um, today I'm going to be talking about the things that I did as part of my CCC Fellowship. Uh, my Advisor, Julia Klein, and then Ciren Yangzom, who is an Instructor in the Geography Department at Tibet University. So, um, I'm going to be talking a bit about kind of applying on the tragedy of the commons that's why I am calling it, The Tragedy of Enclosure. So, um, this is one of my favorite images, is, it's the Tibetan Plateau. It's an image put together by NASA where you can see just how dramatic the plateau is. Um, so it thrusts up from this is India off to the west, China's to the east, and then Southeast Asia is down here. And so, um, I'm working right in Central Tibet, um, about where, uh, the pink circle is, in the Tibetan Autonomous Region at a place called Namtso [also known to as Nam Tso or Namucuo]. And so it's at 5000 meters or about 16,000 feet. So it's very cold, high, arid, and representative of really the central plateau in general.

[01:09 - 01:09] Background: Mm-hmm. [faintly]

[01:09 - 03:53] Kelly Hopping: So, um, in Tibet, in general, people have been, ah, practicing Pastoralism as their primary livelihood for estimated about 4000 years and then specifically where I'm working for about 3000. [background coughing] And so for a very long time, people have been depending on livestock for, um, so many aspects of their life. So here's a picture of, uh, people pulling the wool off of their yaks, which they then use to make, like even this rope that they have it cobbled with, um, for their slingshots, for their tents, for, um, all their textiles, they're using the wool from their livestock. There's the dairy and the meat as their main source of food. Uh, the dung is,

there's no trees here and so they use the dung as their only source of fuel for cooking and heat. And so everything about their lives and also other cultural dimensions are also really dependent on particularly the yaks and also the sheep, goats, and horses. And so, um, they've been living in this fairly harsh environment for all this time. And so, they do have coping strategies for dealing with, um, hardships on the plateau. And so, traditionally they have mainly been just maintaining large herd sizes, so that if they had something like a large snowstorm and a lot of animals died, they would still have some left, basically. This is kind of a buffering strategy. And then also mobility, where if the conditions are bad in one year, they could just move until they got to a good place. And so seasonally too, they're moving to follow as the vegetation greens up and so these are their sort of flexible strategies for dealing with hardship on the plateau. However, um, as we know, climate change is affecting the whole world and it's having really unprecedented effects in Tibet. Um, so this is a, um, figure from the Intergovernmental Panel on Climate Change showing predicted climate or temperature change. If we zoom in to this little area where Tibet is, we can see it gets the two red pluses rating, where it's predicted to have a much greater than average warming compared to similar latitudes, and also global temperature change. And so, this isn't something that is just going to be happening in the future. It's really already happening in Tibet. Um, so work has shown that temperatures are already increasing at about a third of a degree per decade, and that, um, the coldest temperatures or the minima, are rising faster than the maxima. So this is, um, a graph from a weather station close to my study area, showing minimum temperatures during the growing season since the 1950s. And so you can see with the minimum temperatures increasing, essentially what you're doing is you're increasing the average temperature by dropping the coldest temperatures out of the system.

[03:54 - 05:48] Kelly Hopping: So it's not just that the hot days get hotter, but you're losing cold days. And so in a very cold place like Tibet, this is going to have a lot of effects on things like glaciers and, um, permafrost melt, and a lot of these cryogenic ice processes, as well as the vegetation. So then, the other thing that's been happening that's really unprecedented in history of Tibet [chuckles very softly] is, um, the way that they're starting to change the way they manage their livestock. And this is because in 1959, China took over Tibet, but not actually that much changed for, um, the central plateau, central and west, where there wasn't as much Chinese control at that point, in terms of how people actually managed their day-to-day lives. So they, they did have them form collectives or communes, but in general, people were still kind of keeping their, um, same kinship group arrangements, and they were moving the way that they had always moved. But then in 2005 [background coughs] um, the household responsibility system kind of finally, uh, hit Tibet, or something that had been put in place around all of China for farmers and ran through pastoralists. But in 2005, that's when it really, uh, started to affect the area where I'm working. Where essentially

the Chinese said, you'll take better care of the rangeland if, if you take responsibility for it yourself at a household level. So we want you to start implementing fences for the first time. And so, the first wave of this in 2005, they just put fences around the wetlands, which are really key grazing areas that I'll talk about more later. Um, but in 2007, they ratcheted it down a little bit more and said, in addition to restricting the movement a little bit, you can have fewer livestock than you did before, and they've continued to, um, reduce the number of livestock that families are allowed to have without paying a fine.

[05:49 - 07:33] Kelly Hopping: And then in 2008, they said, okay, now you need even more fences. Instead of just the wetlands, you're going to basically fence your backyard. That's what we want you to do. Have fences at the household level, because then you'll take better care of it, if you feel more responsibility, which is essentially the idea. So, this is really following on the Garrett Hardin logic from the 1960s paper, where he wrote about the tragedy of the commons, using pastoralists as kind of an allegory for how, um, when people share a common resource, they'll just try to take advantage of it and use it as much as they can, because they can get benefit without feeling as much as the cost, and that leads to degradation. And so since then, some ecologists in this room, as well as, um, elsewhere around the world, have shown that this probably doesn't actually apply well at all to semi-arid areas, and also in the tundra places, exactly that's where I am working. So nonetheless, um, they've persisted with that logic and the Chinese has also started, um, giving, or the government started giving the herders these pamphlets. So, this is one from this summer that the herders had, where they're very simple captions and simple illustrations which are basically saying, if you have few livestock, the grass will be green, and if you have more and more, it leads to desertification, degradation and I think those might be skeletons in the last one in the desert. And so the herders are starting to get [background coughing] good information that seems like a knowledgeable source about how they should be managing their, their rangeland. [throat clearing in the background] So, if we kind of compare these two things, we know from Weather Station put up in the 50s that at about the same timeline we have unprecedented climate change, and unprecedented changes in how people are supposed to be managing their livestock.

[07:35 - 09:27] Kelly Hopping: So, my research in this super simple [soft chuckles] summary, [background laughter] has been looking at how climate is affecting the grassland, which in turn affects the livestock because their condition depends on the forage, and then the people in turn are completely dependent on the livestock. But also, I'm interested in how the decisions that people make about how they manage their livestock or feeding back to the grassland in this sort of loop. So, so most of my research is actually at this point. I consider myself a plant ecologist. But, with the CCC Fellowship, I'm starting to really be able to do more with the social component as well. So, it's a

really brief overview as well. For my ecological experiment, I'm manipulating two climate factors with snow, because Tibet's expected to get more snowstorms in the future, and then with warming chambers to simulate warmer temperatures. And then grazing, where we have Yaks and then remove yaks, um, and then Pikas, which are also their native species, but that are being implicated through degradation. And so, trying to understand how these interact and affect the grassland. But in the end, this is me, that's what I look like every day [soft chuckles] every summer where I'm on my hands and knees, counting things, measuring things, doing things in my experiment site, and I don't really actually [chuckles] like get out and about a lot. And so, I was increasingly knowing that I'm learning so much about what's going on through my experiment, that there's so much more to know, if I could branch out. So, um, the other thing is that I'm part of a larger project with my advisor. And so we're also working with social scientists down at, um, Boulder. And, uh, we have a project, where a Tibetan student on that project did interviews and hit the area, Tibet, that he's from about indigenous knowledge of environmental change.

[09:27 - 11:13] Kelly Hopping: And so, these are some pictures from where I'm working, but I really- I, I think that this is a really valuable angle to take as well, because particularly in a place like Tibet, where the terrain is really heterogeneous, there's not very many weather stations, or ways to monitor what's happening. Then people's observations, and especially these people who are paying close attention to the land, because they depend on it for their livestock and their livelihoods, and they're moving all across it. And they have, they're able, um, to think like a crew, this sort of fuzzy knowledge of a lot of variables, essentially, and then aggregate it into an overall assessment of how things are changing over their lifetimes or even compared to previous generations, from talking to older people. Whereas the weather station or the kinds of measurements that I do are essentially very precise for one variable or a couple variables. And so being able to talk to people, I think can lend a lot more insight into what's happening overall. And so, um, so this is just an example of the kind of work that I had done for that other project where I analyzed a lot of the data that a Tibetan student collected. I think this was one of our more exciting results, is that it's been really controversial in the literature right now, with essentially Western science debating whether, uh, Phenology or the green up of plants is getting later or earlier with climate change and that has a lot of impacts for pastoralists depending on it for forage. And so with our work, we found that people really strongly were saying that summer is starting later. So, there's a lot of analysis that follows from that. But, I thought this was really exciting and I essentially wanted to do it to answer some of my own questions in my study area, and be the ones that come up with the questions and go out and do the asking.

[11:13 - 13:03] Kelly Hopping: And so that's really what the CCC Fellowship allowed me to do. So, uh, my project was called something like, From Satellites to Thunder Dragons, the integrating diverse knowledge. Because, um, in Tibet, they still, the pastoralists especially still believe, for example, that thunder is made by a dragon in the sky. And so, I knew this is a really different view of how the world works, and so [background coughing] if we can bring together the different types of knowledge that we're working with, maybe we could come to a greater understanding of how their environment is changing and then that might allow us to be able to do something to help them adapt to better to it, or that was the hope. So, this is just a picture of a thunder dragon, that I sort of took shelter inside one of the little livestock sheds, and this was painted up under the eave of the dragon. Um, so, so the really primary goal of my, of my, um, project with the CCC was to bring together, um, my work with the local herders and, um, village leaders at the, at the local level in Tibet where I'm doing my experiment, but then also to work with, um, Ciren Yangzom, who's a Geography Instructor at Tibet University. So this gave her an opportunity to be able to do collaborative international research, which is not something that a lot of Tibetan scholars have an opportunity to do. And then, um, our main question was really to just examine this environmental knowledge or indigenous knowledge and then how it's being transmitted, with the hope that then we could, um, work together with people to understand what's happening better in the system. And I should also say that I think one thing that's important about working at the local level in Tibet is that because of the political structure, that's really the only level at which they have much autonomy to make decisions.

[13:03 - 14:59] Kelly Hopping: And so, um, I thought that working there and working with the village leaders would be about the, kind of best place where we could actually maybe hope for some, um, beneficial change or outcome. So, we came up with some hypotheses. We started out kind of basic. We thought that their traditional ecological knowledge would complement western scientific knowledge well. Um, we also thought that people with livelihoods who are most closely connected to the land, in this case it would be the herders, who were spending the most time herding, uh, would be the most knowledgeable about the changes. And then, uh, the people with the same livelihood practices would be sharing knowledge among themselves more. So herders basically, again, sharing more knowledge. And this is a picture I went out, I was herding one day, following along, um, with one herder, and then he encountered another herder, and they stopped to talk about the weather and the livestock. And so, this was the sort of interaction I was interested in how much are people sharing the knowledge that they're gaining about this in order to be able to, um, cope or adapt, eventually. So, um, so this is another map of my study area. The Tibetan Plateau is shown, the geographic physical plateau is shown in color, with, um, the bluer being wetter areas going to the red being more dry in the west. And then the black boundary here is the, um, Tibetan Autonomous Region, like the political boundary that's been established by China. And then I'm working where that

triangle is, to it's right and pretty close to the middle of it. And so, I'm in a village, um, with 36 households, and then we conducted interviews asking about environmental changes and then with whom people were sharing knowledge, and then also did a lot of GPS'ing and drawing maps and having village leaders look at, um, Google Earth actually to, um, see where people are moving seasonally and where the boundaries are between villages.

[15:00 - 16:29] Kelly Hopping: And then also this is a little more what it actually looked like. We got dropped off by a tourist car and then the Tibetans came to pick us up. This is in, um, back in January 2012 last year. So, we got dropped off and then they, um, they let us stay in this house. So, this was my house where I stayed for a few weeks while we did the interviews. And then it was really, really cold. We walked between houses, often just walking across ice, like in this picture. This is before I started wearing my Tibetan fur skirt for extra warmth. And then, sometimes we'll get a ride on the back of someone's motorcycle, and we just tried to go to every single household to talk to people about, um, about environmental change. And so, um, some of the strongest results that we got, I'm just going to go over here, um, in sort of a quick overview. So people strongly agreed that, um, in terms of livestock, their health was really decreasing and they cited that the size of their livestock was getting smaller, they're getting a lot more parasites, um, and they're producing less milk. And this is a picture of, um, women milking sheep. They tie the sheep and goats up in a kind of zipper and go down the line and milk all of them. Then, um, in terms of climate, they strongly agreed that temperatures were getting warmer and that there's less rain and snowfall. Um, but if you remember, the warming temperatures are something like 0.36 degrees per decade, but no one can sense like a 0.36 degree change in temperature.

[16:29 - 18:27] Kelly Hopping: So that's interesting that the way that they're perceiving it is not like, oh, it actually feels warmer, but through these sort of, uh, around the side ways of, uh, observing it, where one of the herders said, "Old people say that many years ago you still weren't warm enough wearing a lopa." Which is what this guy is wearing. It's a traditional robe made out of sheepskin where the fleece is still on the inside. And so, um, depending on how big you are, one lopa is made up of about 6 to 8 sheepskins. So it's just a giant, heavy garment. They're saying, they didn't use to be warm enough wearing a lopa. Now, you can be warm enough wearing Chinese clothes which are like ours, but really clumsy. So, it must be warmer now than a long time ago. So, they're using these other sort of ways of making these observations of what's happening with temperature. And but they're observing on the landscape because they say that there's less snow in the mountains. And I asked specifically about this mountain, which is, um, a holy mountain for all Tibetans, but really special for the people who live right here. And it's over 7000 meters which is, I think, about 24,000 feet. So it's just a giant mountain, and it's really rising above the rest of the range. So very, very, very

distinctive. So it's something that people notice if the snow on this one is changing. And they have a different term for it, where these down here are just mountains. But the ones that have snow year round are called snow mountains, and that's, they're a different class kind of. So I asked, if the snow on the snow mountain is changing? And people said there's less snow, but more often in the way that they talked about it was they said that they saw black lines on the mountain. And most people didn't know why, but because they had never really experienced it before. But recently, they're seeing black lines, which we know is essentially the rock showing through where the ice and snow is melted. So I noticed in my own pictures, I only take pictures [soft chuckles] of this mountain when it's looking super white and snowy. But here a little bit you can see those darker areas or what people are referring to as black lines on the mountain.

[18:27 - 20:03] Kelly Hopping: Um, they also talked about the growing season and the summer getting shorter and shorter, which goes along with what those herders in the other areas said when I showed that map earlier, where they said summer is starting later, summer is getting shorter, um, in terms of the green period. And then they had lots of different measures of how the rainstorm is getting degraded that they agreed upon. And then also they talked, like probably the thing everyone agreed on most strongly was that there's more water in the lake, and more water in the wetlands. So, this is something I'll come back to later again. [stammering] Yeah. Okay, so then my next hypothesis was that, um, herders would know more about what was changing than people who were spending less [background coughing] time on the land. And so used cultural consensus analysis to, um, try to answer this question. So essentially what this analysis is doing is it's comparing everybody's answers to every question. So everybody else's answers to every question. So you're not just saying one to one, if they're in agreement for a single question or between two people, but, um, across all the people, across all the questions. And then they're given a, it's called a competence score [as seen in the slide] because they're saying if there's this knowledge that's held culturally, how confident are you with that group knowledge for each person? And so a one would mean that you agree with everybody all the time, and a zero in this case means actually that they didn't answer enough questions to be included. But a lower score means that their answers are kind of all over the place relative to everyone else's. So my prediction, oh, so then again, on the x-axis, I have it just sort of categorized by time spent herding.

[20:03 - 21:41] Kelly Hopping: So not very many women answered the questions because I also learnt that this was more men's domain of knowledge, that I was interested in. So I didn't get as many women respondents, but they're mostly in the home. They're not going out and about, in doing the herding movement. Um, but they're doing all the milking and, uh, housework, basically. And then, there's some men who don't do any herding. And in this case, they're pretty much completely

engaged in business. Um, and then the village leaders are men who have herded in the past and who are in their term, as well as leaders that will herd again in the future. But, the current village leaders have been village leaders for quite a while, and they only have about one to two months of the year that they have time to herd because they're doing their village responsibilities the rest of the time. And then, some people are doing business seasonally, like in the summer and then herding in the winter, and then there's mostly herding and only herding. So anyway, I would have predicted that the people only herding would have the highest, um, scores because they would have known the most and been the most in agreement with everyone else. So the prediction was their points would have been up here and kind of aligned to the people doing the least herding would be would have the most random answers, essentially. But instead there's really no clear pattern. Like there's just as much spread for the people doing only herding as across really any of the other categories. And so, um, so I think that one thing that I learned from this too, though, is that, uh, just consensus isn't the only thing that's actually important and that there are some people who are going to know more than others. And so just trying to compare them to everyone else isn't maybe the best measure to understand it.

[21:41 - 23:27] Kelly Hopping: So that was one thing that I sort of took away from this, that, um, I'd ask a different question to follow up on it. Then the next thing was I wanted to know how people were sharing knowledge. So, I asked them, um, who would you, so if you had a question or an observation about, um, environmental changes, livestock changes, um, environmental being the ecological and climate changes, who would you talk to? And so then, um, from that, we're able to create a network to see the connections between people. [background throat clearing] And so this color scale is the same as the previous one. Here the lighter colors are women or men who are really doing very little herding, up to the black, is people who, um, are only doing herding as their livelihood. And so then the bigger the symbol, the further range movements they do, because some people are starting to just stay close to home and not do the traditional long range, um, daily movement into the mountains with their livestock. And then the village leaders are pulled out as triangles, um, because they're a little bit in a different role. And then the arrows point to, um, people who said so this person said that they talked to that person about environmental knowledge. Um, these people, the arrows go both ways, they said that they both talk to each other. So anyway conform a network, um, and pretty clearly see that the darkest colors and also the largest symbols, meaning the people who are herding the most and moving the most are in the center of the network and they're, um, essentially sharing the most knowledge with each other about the environment. But also the village leaders are really close to the center, considering that they don't do that much herding. And so, we can quantify this and do, look at a measure of the density of the ties, which are the social network term for the areas.

[23:27 - 25:05] Kelly Hopping: And so, people who are only herding, um, are using 18% of the possible connections to people who are herding part-time. So that's saying, you could be connected to absolutely everybody else in the network, but they're only connected to 18% of all those possible people they could be talking to. And the people who are only herding or only talking about 24% of the time to people, other people who are only herding. So, in other words, they're not using much of those connections to communicate but the herders are talking more with herders than they are with women and people who aren't herding that I didn't include here. But then what surprised me was that, um, their connection to the village leaders was almost 60%. So, they're talking to village leaders far more than they are to other herders. And I did some other analysis and what really shows in those, is that the village leaders are being disproportionately sought out. The people are coming to them to talk to them about these things. And they're not talking to people who are formerly village leaders, they're only talking to the current village leaders. And so to me, this really showed that, um, in the overall network, in the far side, you have about only 10% of the possible connections between people, but you have 60% when [background clearing of throat] it comes to the leaders. And so, there's also a power element here, where people are perceiving the leaders as somebody who can potentially do something about the problems or the changes they're observing. So there are there are a lot of people who also said, well, I just make these observations on my own. So, it's not that they're talking to each other in order to share the knowledge and learn from each other, I think, so much as to make their own observations and then go to the leader to figure out what can be done. That's the way a lot of people talked about it.

[25:07 - 26:47] Kelly Hopping: So to sort of, um, sum up, then going back to my original hypothesis, those changes that they reported about temperatures getting warmer, um, landscape degradation like these generally agree pretty well with, um, how Western science has been measuring these same types of things into that. Um, then my hypothesis about whether the herders would be the most knowledgeable about climate, climate and ecological change, I sort of think that one didn't quite come out so well. And I think I need to do some additional analysis to look at it. There could be real experts in there that are good, their knowledge is being diluted if I just look for consensus. But then, um, for the last one then herders were definitely sharing more knowledge among themselves. But, um, what I hadn't predicted was that village leaders would also play a very important role, um, in knowledge sharing. So that was sort of what I had set out to do. But, um, Robin really emphasized to us that we needed for this, the -- what would make this more exciting and better work, is to be truly collaborative, is to be open and flexible to other things coming along, and then sort of taking a different path if something came up. And so in the end, I think that the other stuff that I just presented is important and interesting, but it really took a turn when I started realizing that I wasn't asking people about fences, the wetlands and the lake, but that's what people wanted to talk about,

and people were bringing these things up much more. They were sort of going through my questions that I cared about, but they wanted to talk about this. So I thought I should pay attention. [chuckles softly] And so this is a picture of, um, a fence running down the lake. Um, just so you get an idea of what kind of fence they were working with.

[26:48 - 28:28] Kelly Hopping: So, uh, just to recap the fencing thing a little bit. In 2005, they put fences [background clearing of throat] around the wetlands for the first time. In 2008, they put fences between villages. But, um, what they didn't do was that the, at the local level, the herders and the village leaders resisted actually putting the fencing at the household level. They recognized that that wouldn't work in their system, it wasn't a good idea for their livestock and so they didn't do it. They just put the, the village boundaries. And then also, they didn't even bother to put the village boundaries once they got into the mountains, because they knew the Chinese would never go up there and check. And so this is when I was hiking, you just come across these big rolls of fencing that were dropped there by the government for them to put the fences up, and they never did. So those have been sitting there since 2008 and nobody wants them and nobody uses them. Um, [background coughing] and they all know that they're supposed to not cross a line right there. But if you're walking around in that area and talking to people, they're definitely going back and forth and, um, [background clearing of throat] trying to ignore this policy as best they can in the more remote area. So, um, I just wanted to show the map a little bit to give a better idea of where the fencing is happening. So there are actually six villages in this little area where I'm working, and, um, this is where they are in the winter and then in the, in the north side and also like then in the summer, they move to the south side of the lake, in the foothills of the Nyanchenthanglha Mountain [Alternate spelling is Nyenchen Tanglha]. And then in the spring and the fall, they kind of stop along the way. And so the way that the boundaries are put, the, this, um, running down to the lake on all sides.

[28:28 - 30:08] Kelly Hopping: And so that's kind of fine when you're in your little [background clearing of throat] segment in the winter or the summer, but then when you have to cross a-cross, you're cutting perpendicular to everybody's village land in the spring and the fall. And so, um, so [background clearing of throat] that was something people brought up a lot. And so, when they were talking about the fencing, um, I tried to pull up some quotes that kind of represented well what people said about it. So, when they talked about the effects of fencing on their livestock, um, one herder said, "Before the reform, livestock were like wildlife and could go everywhere and eat any land. But after the reform, they have fencing and they can't eat what they want." And another one says, "For the animals, fencing is bad. It's like they're in prison." [background laughter] And people also related this directly to after the fencing, there's a decline in their herd. [background coughing] And another thing that I was really struck by is how much people brought up the issue of conflict. So

I never said anything about conflict, and I didn't even think about it going in. But when I had my open ended question about, um, how do you feel about the overall grazing policies that are being put in place. One third of the people on their own mentioned [coughing] specifically conflict is an issue that had come with the reform. So some, one herder said, "Everybody says this is my land, his land, and that's not good." And then another one, "I don't think the government should be able to own the land and sky, and that the village leaders should be able to divide up the land with fences. So I have a lot of problems with the village leader." So this is one sort of internal conflict where this person didn't think the village leader should have been kind of putting through the will of the Chinese, um, government by implementing the fences.

[30:09 - 31:48] Kelly Hopping: Um, but most of the conflicts that people are referring to is not within their own village, but between villages when they were crossing across the others, um, land during their annual business. This guy on the other hand, he did bring up conflict, but he was basically saying, I'm the one who creates it. [laughter] And, um, and so in contrast to saying the village leader shouldn't be doing this, he was saying the village leaders aren't doing enough. So he lives right on the boundary. He's in Village 6. That's where I'm working at Village 6, and he's right on the boundary of Village 4. So he said, "Village 4 livestock sometimes get into the Village 6 fence by my house. The village leaders never care if Village 4 livestock get inside the fence, but my family cares. I like to go to the border to control Village 4 livestock from coming over the fence. Village 4 is always breaking the fence and letting their animals into Village 6's land. And since they come across the border right by my family, they eat my livestock's land. So even though Village 6 has a lot of land, this is bad for my family." So this is really a different view from thousands of years of sharing the land with everyone, moving where you need to go, is starting to be, for some of them, a shift to thinking this is my land, my territory and you keep your livestock out of it. Um, and so this is this is really stretching to make a connection but there is, um, these, um, petroglyph, uh, sites near where I'm working. And so this is a, um, from an archaeologist paper where he, um, did a bunch of drawings of them, and then he was sort of interpreting what they meant. And so this is, uh, from, from a cave near where I'm working and where the herders would go as well.

[31:48 - 33:47] Kelly Hopping: And this is a horned person figure sitting on a yak that they think is several thousand years old. And so, the archaeologists interpretation is that these paintings reflect a wholesome society. One, in fact, that is better balanced than contemporary society. And so, and in general too, there are parts of Tibet that are more known for, traditionally they do a lot of, um, livestock raids and stuff. But, this area where I'm working has been as far as the literature and from talking to people, relatively free of conflict. And so, um, for this, this new conflict that people are mentioning is really something that, um, is new [clearing of throat] that's being created by the fences

and that worries them for their society. On the other hand, there some people said, no, the fencing is good because you can take care of your own grassland yourself. And now the fences help us manage our land so the relationship between land and people is getting better. So this is essentially the Garrett Hardin version where, you know, now that we sort of, it's ours, we can take better responsibility for it and, and it's a good thing. So this made me wonder if, as an ecologist, if I could, um, use any of my skills or resources that I have access to, to help answer some of these questions; what effect is the fencing having on grass landscape and on this, um, on their livelihoods? So I did this. Whereas I use Landsat images, satellite images, um, from two different points in time. And so, uh, they have one from 1972, which was essentially in this period where livestock numbers weren't limited and there were no fences. Then in 2005, which is the first year they fenced the wetlands, and then in 2009, which was after they also put the fences between the village boundaries. And so, um, this is a transformation so that, um, wet things were blue, vegetated things were green and then ice and bare ground and clouds, you know, that actually made the clouds look quite good.

[33:47 - 35:28] Kelly Hopping: But this red is, um, ice and snow, bare ground. And so, this is the lake here, and then this is the land. And so this is again where they are in the winter and then in the summer. So, just to orient a bit, we're going to zoom in on this area which are where the winter villages are in the next images. So what it is, so this is again the peninsulas, this is the lake. So this is, um, subtracting the difference between 2009 and 2005 when the fences were first put around the wetland. And so, um, the colors are all a little off because I'm subtracting if it got -- so essentially if it got more wet, uh, the image will look more blue. I think that's why the land looks kind of blue as it may have just rained, which isn't very interesting for the analysis, but that's kind of why the colors are distorted. The land is wetter in 2009 than 2005. But the interesting thing is that, um, you can see the wetlands are these little, I hope you can see. They're like little indentation, kind of, because the wetlands are in the valleys, um, in the lowest lying areas. And so all these little kind of snaky shapes that are sort of purple are the wetlands. But then some of them are much more this red color, which is showing a decrease in the amount of vegetation in the wetlands since they fenced them. So eventually this will get quantified. But for right now, you can see that some of the wetlands in particular, and not just the, the meadow grassland in general, which is looking blue, um, it hasn't changed as much, but you see that the red color in the wetlands specifically. So, the next thing then is if you impose the village boundaries, um, the villages are all given numbers and there are two 6s because they didn't allocate enough land to Village 6 when they first did it.

[35:28 - 37:17] Kelly Hopping: So, they gave them another little chunk over here that they don't really use. So these are the different village boundaries now that were put in place in 2008. And so, what becomes suddenly clear is that most of those red wetlands or the degraded wetlands are only in

Village 6's land. And so, um, so it's not really distributed evenly across the landscape. And so, why this is really important is that the wetlands are a really key grazing resource in the winter in particular. Because with even a little bit of snow on the ground, like this is just a little, little bit of snow when I was there, it's already covering a really short stature of alpine vegetation. And so, the wetlands have these tussocks that stick up quite a bit more and so even when the water in the wetlands freezes, they still have vegetation accessible. Because they can't really make hay in this area, so the animals can only eat by standing there throughout the whole year. And so here you can see there's a fence, you can see there's a fence post there and there. So this is a fence around the wetland. There's a little bit of snow on the ground, but this is the brown is the wetland vegetation sticking out, and so they can put all their yaks in there and have forage. And so, in a particularly bad snowstorm year, then this is especially key because, um, it's really the only the only forage that they have access to. So they also talked about, um, how the, the water was getting higher in the wetland, in the winter. And so I didn't show that in that image but what they're reporting then is that the wetland water is also getting higher and it's physically covering more of the vegetation and then freezing and making it accessible. So if you have, in my satellite image analysis, you're having less production in the wetlands in the summer, and then more of it, according to the herders, is getting covered by water and freezing in the winter.

[37:17 - 39:05] Kelly Hopping: And overall you have less of this resource in the, um, during the winter. And then, furthermore, Village 6 where I'm working, it's really getting hit harder. So if you also remember the other things that people traditionally did to cope with something like a big snowstorm was to just start walking until they got to a snow free area. And so now they can only walk [chuckles] as far as their fence. And they all reported, I don't think people would let us in their land anymore because the last big snowstorm was before these fences were put up. And they said, we think people, their attitudes have changed too much. They wouldn't just say, yeah, sure, come on in and use our snow free land in the next county over. Instead, they would start to have that one guy's mentality. If this is mine, you can't come. And so, so you've got no more movement. You have lower herd sizes because of the Chinese policies reducing livestock numbers, which means they're less buffered and they do lose some livestock to snowstorms. And then the, what you just have is like a last ditch local resource in these wetlands is also degrading. So I think you can really start to see these interactions between policies and climate change and land change and the impact that this will have. Then the next one is now [clears throat] now, in subtracting the 1972 image to the 2009 image. And so, the main thing that you see here is that the snow in the mountains is melting and being replaced by vegetation, which is why it looks kind of green, because in this analysis, more green means more vegetation. So, you see more vegetation up in the mountains here, and then this

like dark blue perimeter in the lake means that the land that was in 1972, above lake level and this grazing land is being inundated by the lake.

[39:05 - 41:06] Kelly Hopping: And so, um, in this area here, that's about half a kilometer, that the water has come up on land, and most of it's happened in the last 10 years. There's over here kind of off the image where they are in the spring. It's a kilometer and a half that it's risen up on land. And the reason that it's going to different distances and different areas is because, um, this is a closed basin. So there are streams coming in that are fed from snowmelts and then rainfall. Um, but there are no streams leaving the basin. And so any water that comes in just causes the water level to rise, and rise, and rise. And so, um, this is a quote where, from one of the herders where some of them put this together, they said, "The snow melts- the snow mountains are melting and I see when I'm herding that the water is covering my grassland." And they would ask me if I thought those were connected and some of them would say they thought it was connected. Only I think two people made the connection that, that could be because warmer temperatures are melting snow in the mountains. But in general, they're making these connections that, um, the, the snow in the mountain that's being melted is creating, or flowing into the stream, causing the, the level of the water in the wetlands to rise and then ultimately causing the lake to rise to the point that some people have had to lose their homes because [coughing] they're covered by water now. And so once again, we see that poor Village 6 has most of the lake level rise. But, they said that, um, other people are concerned about it too, because in general, they're losing their land. So this is a really local example of what's happening at Namtso [also know as Nam Tso and Namucuo]. But these Chinese scientists in 2011 did an analysis of all the large lakes in China. So, this is a map of Tibet and then all the red spots are lakes that have had rising lake levels, and there are a few blue lakes that were actually there, lake levels were dropping. But they found that 84% of the large lakes in Tibet have been rising at an average rate of about a quarter of a meter per year, which is about 10 inches per year-

[41:07 - 41:07] Background: Mm-hmm. [faintly]

[41:07 - 42:41] Kelly Hopping: That the lakes are rising and which causes them to then move up onto land. So Namtso [also known as Nam Tso or Namucuo] is this one and it's rising at 0.25 meters per year. So right on average. So, we can assume that with fencing happening across Tibet, with livestock production happening across Tibet, that, um, that these policies and these same changes are actually much more, the dynamics are probably much more widespread and happening across Tibet more generally. And they found they agreed with the herders. They said, yes, because the glaciers are melting and feeding it. But also, interestingly, there's less wind. So the only way for water to leave basically is through evaporation off the surface, and even that is decreasing. So, so

that's why all these lakes are filling. So in conclusion through the research, um, I found that the pastoralists really are aware of the environmental changes that are taking place, and they're specifically seeking out the village leaders, um, to talk about these changes and share this knowledge. However, the top down policies of fencing and herd reductions are preventing people from taking the adaptive actions that they need to cope with the impacts of climate change. And so then, in addition, the burdens of climate change are shared inequitably and are really poised to worsen as temperatures continue to rise, that they're predicted to be more big snowstorms in the winters, um, which could in turn lead to more conflict. So those are some of the research conclusions but I thought that this herder summed it up really well when he said, "Without grassland, no livestock. And without livestock, no life."

[42:41 - 44:16] Kelly Hopping: And so I think this is really the essence of the problems that Tibetans are facing as a result of all those other things. So, I also had sort of my conclusion about collaboration, which is that, I was already friends with some people in this community from doing my ecological research there every summer. But, um, but then I didn't even anticipate how much my relationships had deepened with them, so that then this was in January when I did the interviews and then when I went back in the summer following that. So, everyone just wanted to welcome me into their homes, and they had gotten to know me as well as, um, me getting to know them and to learn from each other, during that, through collaborative process that we had embarked on in the winter. So, this is me dressed up in, um, my sweater and clothes, and this woman and her brother in the middle made this apron for me after the winter because I said I liked someone's apron. So, they spent the rest of the winter making one to have ready when I got there in the summer. And then my two American field assistants were also just really embraced as well. There's a couple other white people in there. But I think I learned so much about, um, not only that, it was a lot more unpredictable to try to be sort of flexible, to, um, an open collaboration so that what they were interested in, like the fences and the lake, then I could incorporate into my research, which I had anticipated going in. But then also, I think with a lot more meaningful, at least for me and hopefully for them. And the other thing that, um, it's nothing to do with the research directly, but I'm really excited about and I just wanted to share. Is that, um, this, this is a guy who we interviewed in the village in the winter, and his granddaughter is deaf.

[44:17 - 45:49] Kelly Hopping: And so, in fact, she can't go to school. She can't really, she has no prospects of doing anything other than just staying in the home and helping her family throughout her whole life. And so, out in the herding community anyway. And so Yangzom, my collaborator, knows someone who works at the school for Deaf Children in Lhasa. And so over the last, um, year, Yangzom and I, especially Yangzom who has been working to get this girl to be able to enroll in the

deaf school. And so, um, Yangzom just sent this email to me like two days ago that this girl is starting her first week of school today, and she's so excited to learn to write and she'll learn sign language and be with other, um, sorry, with deaf children. And her family is so happy that she has this opportunity that otherwise she wouldn't be able to. So I think that [clearing of throat] um, man, sorry. [burst into an emotional laughter] It makes me really happy. She's a really, she's such a wonderful kid. And I think that, um, going there in this like a collaborative spirit allowed this like, totally other unexpected things to happen. So with that, I want to really, really thank the Center for Collaborative Conservation and the National Science Foundation for supporting this work. And then so many Tibetan people just bent over backwards to help make this happen, because this is really difficult research to do in Tibet. And then, um, especially all those families for, for- I don't know, just being so wonderful and making us feel welcome and allowing us to do this work. So thank you all, thanks all for coming today. [Applause]

[45:57 - 45:59] Seminar Moderator: Thank you, Kelly. If you have some questions or comments. Yes.

[46:01 - 46:09] Seminar Attendee: Yeah. If, if there's less precipitation and it's getting warmer, why is the summer starting later or why do they perceive that?

[46:10 - 46:28] Kelly Hopping: So, um, one thing that's in the literature that they think might be going on is that the, there's a winter chilling requirement that's not being fulfilled when you don't have the cold temperatures. And so it takes longer for them to get, during that cold temperatures to get the queue that they need to germinate, and so that could be delayed.

[46:28 - 46:28] Seminar Attendee: Are there annual grasslands?

[46:30 - 46:31] Kelly Hopping: No, they're perennial.

[46:32 - 46:32] Seminar Attendee: Okay. [faintly]

[46:32 - 47:01] Kelly Hopping: Yeah. Um, another thing though [clearing of throat] that for me being there that I'm sort of observing is that I think that their grass, especially in my warming treatments, upper layers of soil are really drying out with the warmer temperatures and the dominant plant that like even just if you look like here or here, like anything that you see, it's just this turf of this very shallow rooted, um, grass species. And so I think that they're not able to access the water as well until the monsoon starts later. [overlapping] And this is kind of the interaction. Yeah.

[47:02 - 47:04] Seminar Attendee: Excuse me. What's the what is the rainfall pattern in a season? I mean what-

[47:04 - 47:09] Kelly Hopping: It's monsoonal, so it's 80% of the precipitation is usually in the summer.

[47:09 - 47:10] Seminar Attendee: Okay.

[47:10 - 47:10] Kelly Hopping: Yeah.

[47:10 - 47:12] Seminar Attendee: So they don't get a lot of moisture out of the winter snow?

[47:13 - 47:13] Kelly Hopping: No.

[47:19 - 47:19] Seminar Attendee: Okay.

[47:19 - 47:19] Kelly Hopping: Yeah.

[47:19 - 47:27] Seminar Attendee: I was wondering well if the Chinese occupation adopted certain methods of knowledge transmission within the community. So like how the kids are learning, that sort of thing. Presumably, do you think-

[47:29 - 47:29] Kelly Hopping: Yeah.

[47:30 - 47:32] Seminar Attendee: There's sort of Chinese formal schooling or anything like that?

[47:33 - 47:33] Kelly Hopping: Mm-hmm.

[47:33 - 47:34] Seminar Attendee: So that's sort of horizontal transmission-

[47:34 - 47:36] Kelly Hopping: Yeah.

[47:36 - 47:37] Seminar Attendee: Between [unintelligible].

[47:39 - 48:32] Kelly Hopping: Yeah. Yeah. So, I asked people how they got this knowledge, and there were a few people who said no one really taught me, but almost everyone said they learned from their own grandparents and parents and then also, um, from just other elder people, older people. [clearing of throat] And then also there's a big element of personal observation that they said they learned a lot just from spending time watching things. And, and then they also all said that their

children, who will have to go to school now, because a lot of the people that I interviewed had zero education, but now it's compulsory for six years for the children to go to a Chinese boarding school. And so they said, now the children are interested in learning. They don't listen even when we try to tell them. And then furthermore, they don't have that time anymore to make their own personal observations because they're away at school. So, so they all strongly felt that their children generation would not, with the kids today would not grow up knowing any of this stuff.

[48:34 - 48:39] Seminar Attendee: And presumably the fencing would breakup the horizontal transmission as well.

[48:40 - 48:40] Kelly Hopping: Yeah.

[48:40 - 48:41] Seminar Attendee: The people [inaudible].

[48:42 - 48:45] Kelly Hopping: Yeah. One thing I've thought about too, though, is they have cell phones now-

[48:45 - 48:45] Seminar Attendee: Right.

[48:45 - 48:47] Kelly Hopping: And they really do talk to each other.

[48:47 - 48:47] Seminar Attendee: Mm-hmm. [faintly]

[48:47 - 49:00] Kelly Hopping: And there's one woman who all of her answers where other people had said, oh, I don't know. We don't really have a lot of that vegetation around here because I was asking about specific types. And she said, oh, I talked to my sister on the phone and she said, over there they have it.

[49:01 - 49:01] Seminar Attendee: Mm-hmm. [faintly]

[49:01 - 49:01] Kelly Hopping: It's changing.

[49:01 - 49:01] Seminar Attendee: Mm-hmm. [faintly]

[49:01 - 49:11] Kelly Hopping: And so, so that could be one way where new technology is actually. But I don't think it makes up for the amount of, um, isolation that these are creating.

[49:12 - 49:14] Seminar Attendee: Is there any legacy of a Buddhist tradition that you saw?

[49:15 - 50:45] Kelly Hopping: Yeah. Very much. They're all very, very devout. But um, well, actually, that's kind of what this picture is. Um, where also the, the, um, the Bon religion before, um, Buddhism was more like indigenous to Tibet. Um, it's still somewhat alive. There are actually people who are just practicing Bon in this area, but these people are sort of, uh, an amalgam where they have, um, they're very, uh, devout with their shrines and their houses, and they, um, go to see the lamas for everything that they need, um, for Buddhism. But then they also, um, these prayer flags that she, they make these out of, um, sheep wool. So she had made a bunch of sheep wool, and she was going to take them up and then to straighten out all the store bought ones, uh, which are in color. And then I was really -- so there's kind of a, a peak off to the side of the image. And they normally fan out in all directions from the peak, but here they were like 70% of them were all going in one direction. And I asked why they did that, and they said that they were pointing towards the lake because they believed still very, um, animistic, so that they're deities in the lake and in that snow mountain and everywhere, um, that they have to kind of point the prayer flags towards them and do certain things towards them to have a good favor for their families and livestock. So it's very much a part of their daily life. And she set it down but she's always carrying a prayer wheel and they're always saying their mantras and as they're herding, spinning their prayer wheel and yeah. Yes.

[50:47 - 50:58] Seminar Attendee: If you run this talk ahead 30 or 40 years [clears throat] how much of the change that will happen in that period do you think will be because the children were off to school or some other social issue, versus how much the climate changed and the pastoral conditions changed?

[51:01 - 51:59] Kelly Hopping: I think it'll probably converge. I think that the children going off to school and aspiring to have non-range livelihood is a big part of it that will, um, that will happen more quickly. So we're just losing people who are interested in being herders is anymore. But, um, one thing that the older people also talked about is that in reality, their kids aren't really getting a good enough education to have a real job. Like they're not learning Chinese that well in there.

[background clearing of throat] They don't actually gain a lot of skills that they are going to end up in this kind of no man's land where they're not good herders and they're not well trained to do anything else either. And so in this area, because there is the sacred mountain and the sacred lake, um, and the place with the cave art and stuff, there's, um, it's kind of a big tourist economy where people come in these big buses and have lunch and walk around. So a lot of, just to see the lake, and then they go back to Lhasa. And so a lot of people in this area are starting to get swept up into that tourist economy, where they're just-

[51:59 - 51:59] Background: Mm-hmm. [faintly]

[51:59 - 52:29] Kelly Hopping: Selling trinkets or having people pay to take a picture with their yak. And that's something that concerns me because it seems like it's not very sustainable and that industry can't really grow indefinitely with, you know, things like the yaks that need their pictures taken with tourists. [laughs heartily] And so, um, so I'm not sure exactly what's going to happen, but I think it is going to be a lot of people who are, um, discouraged from [coughing in the background] being traditional livelihoods because they don't have the skills and the grassland is less able to support it because they don't have anything else to do better. So can I continue?

[52:40 - 52:41] Seminar Attendee: Like are there any, you know, charges like from trying to invade [unintelligible].

[52:43 - 54:09] Kelly Hopping: So I think they're supposed to be. And I talked with people about that and it sounds like it's really not well regulated. So there are a lot of areas where the fence is just permanently hiked up with barbed wire so that everything can just pass freely. And so I think that plus maybe maintaining it at this point is that there are some people who have bought in at the local level and want to maintain them. So there's social pressure to not totally do away with it and just break all the rules. But on the other hand, there's enough people who don't really respect the fences that they could also get away with, um, lifting them up. So because even though there's a road going to that tourist site, there's not a lot of oversight to where people are actually coming to check what they're doing. So a lot of it depends on the village leader level, like kind of what they report to the higher level. And they seem to be trying to be sort of flexible to do what they need to stay in favor with the Chinese, but then also like, maybe not put the fences up in the mountains or not put them at the household level, because that's what they understand that they're people need. So they're kind of doing this good, I think, to um, to yeah, the fences aren't too rigid, but I don't think they can totally do away with them. And there aren't fines at this point. There are fines if you have too many livestock above the limit and that's enforced just through turning the numbers, um, from your village to see how many livestock you have, and you'll pay a fine if you have too much, but they're not really checking the fences. At least here. Thank you.

[54:13 - 55:12] Seminar Attendee: I'm doing penance for being late of my compliments to you. [soft chuckles] Um, I want to thank Kelly for, for this great presentation. But also, I want to point out something that's really important about her work. And that is that I think she's, um, an example and there's others in this room that are what I would call, hmm, the, uh, new scientist or, uh, trans-disciplinary scientists. Someone that is really trying to bring people together with the environment. And, um, there's a lot of folks in this room that also are the advisors of these folks around here that are encouraging that kind of science. And I just want to, I want to say how important your work is,

how it's pathbreaking and I want thank you for, for supporting her. And just, you know, I just want to really compliment you on, on, on taking us to a new level. Not only high in, in the science issue here, but how you do it with people. And both of those things are super important than anything in life.

[laughter] So thank you very much, ma'am. [applause]

[55:17 - 55:24] Seminar Attendee: Can I ask another question or is that [overlapping] [chuckling] Um, the cultural competence thing.

[55:24 - 55:24] Kelly Hopping: Mm-hmm.

[55:25 - 55:29] Seminar Attendee: Were the questions just about climate, climate change or were they more general?

[55:30 - 55:48] Kelly Hopping: There were 50 questions and for that analysis they had to be very closed ended about, um, is something not changing? And then basically is it like increasing or decreasing, earlier or later? And so that sort of restricted it to they're fairly simple questions about all sorts of different environmental changes. So-

[55:49 - 55:49] Seminar Attendee: Okay. [faintly]

[55:49 - 56:03] Kelly Hopping: I asked about, um, things like temperature change and then it was that at a fine scale too. Like in the winter, in the summer and, um, and then a lot of questions about water, water quality, different types of vegetation and wildlife, livestock.

[56:03 - 56:08] Seminar Attendee: Cause the interesting thing, uh, can you, if you look at those people who were only herders, who got this-

[56:09 - 56:09] Kelly Hopping: Mm-hmm.

[56:09 - 56:10] Seminar Attendee: Enormous range.

[56:10 - 56:10] Kelly Hopping: Yeah.

[56:11 - 56:19] Seminar Attendee: Could could you relate, try to see if there's a relationship between where they fall in that continuum and how successful they are as herders?

[56:21 - 56:33] Kelly Hopping: That would be really interesting. And I think that traditionally, success would have been somewhat measured by how many livestock they had and that's not really possible anymore because of the limits that are placed on how many they're allowed to have.

[56:34 - 56:34] Seminar Attendee: Okay. [faintly]

[56:34 - 56:41] Kelly Hopping: But there's definitely a perception of, um, who's a better herder, and I even was starting to pick up on that.

[56:41 - 56:41] Seminar Attendee: Okay. [faintly]

[56:41 - 57:00] Kelly Hopping: And so, one thing that I'm wary of now with my own analysis is that I think that some of the people who are probably actually really smart about what's happening and are perceived as being the best herders, and actually, I asked a question about for everyone, who do you think in your household and in your village is the most knowledgeable?

[57:00 - 57:00] Seminar Attendee: Mm-hmm.

[57:00 - 57:30] Kelly Hopping: And that seemed to be a really uncomfortable question to ask. [background laughter] So people usually either said themselves or nobody [both burst out in laughter] and they, and they seemed uncomfortable. Like I could tell that they didn't want to pick out one person to, um, to have them for that. I was hoping I could do that way, and I don't think the data is that good, but I'm interested to pick out those people that people commented on, and that that guy is really smart, you should talk to him or he's a really good herder. And I think even the people who are doing the long range movement still, that's kind of a proxy for them being-

[57:31 - 57:31] Seminar Attendee: Mm-hmm.

[57:31 - 57:48] Kelly Hopping: Good herders because they're still bothering and most aren't to go to long distances. And so, I'm curious to select their answers out specifically and see like what they say. Because you could be, you know, really smart and not look competent because you're not saying average mediocre answers.

[57:48 - 57:48] Seminar Attendee: Right. [clears throat]

[57:48 - 57:48] Kelly Hopping: So-

[57:48 - 57:58] Seminar Attendee: Yeah. Yeah. It's the people at the bottom of that continuum are the really interesting group because I think you'd like to know, you know, are they right or are they wrong? [chuckling]

[57:58 - 58:04] Kelly Hopping: Yeah. And I think some of them you could tell they were. They kind of weren't that bright. Just like everybody, there's going to be a spectrum.

[58:05 - 58:05] Seminar Attendee: Right. Yeah.

[58:05 - 58:11] Kelly Hopping: And so I have sort of my own impressions about how well they were answering questions when they were elaborating. So I do want to go through more-

[58:11 - 58:11] Seminar Attendee: Okay.

[58:11 - 58:12] Kelly Hopping: Qualitatively to pull that out.

[58:13 - 58:15] Seminar Attendee: You did [unintelligible] in other domains but-

[58:16 - 58:17] Kelly Hopping: Mm-hmm.

[58:17 - 58:18] Seminar Attendee: The experts didn't have much knowledge [unintelligible].

[58:19 - 58:20] Kelly Hopping: Okay.

[58:21 - 58:25] Seminar Attendee: But they never [unintelligible].

[58:25 - 58:25] Kelly Hopping: Yeah.

[58:26 - 58:33] Seminar Attendee: [unintelligible]. Well, no. There's just, there's just kind of the experts have these kind of [unintelligible].

[58:34 - 58:45] Kelly Hopping: Well, yeah. One example is the shaman in this community who's responsible for collecting all the additional plants and for healing the animals, and he had terrible confidence compared to everybody else. So, yeah.

[58:45 - 58:48] Seminar Attendee: And like we we've been looking across domains and like it's entirely different like -

[58:49 - 58:50] Kelly Hopping: Yeah.

[58:50 - 58:54] Seminar Attendee: From [unintelligible].

[59:02 - 59:03] Kelly Hopping: Yeah. Yeah. Yeah. More work to be done. [laughter]

[59:05 - 59:07] Seminar Moderator: I think we're out of time. But, thanks once again. [applause]

END TRANSCRIPTION