Hello and welcome. The title of my talk today is community archaeology and optimal foraging theory. I journey from Eagle Lake to Paris. So we're going to go from one of the most rural spots I know to probably one of the most urban spots I've ever been. And I know we got the turnout, because I put optimal foraging theory in the title. I know everyone has the romantic images of optimal foraging theory like I do. So what I'm going to talk about today is basically two presentations that I gave over the course of this last summer, one obviously at Eagle Lake and the other at Paris. Completely different topics. Completely different presentations. The only place where they share any common ground is that they're both zooarchaeological.
So here first my outline, just kind of talked a little bit what we're going to go over. I'm not sure if everybody knows what zooarchaeology is. So I'm going to talk a little bit about zooarchaeology. And then we're going to move into Eagle Lake and discuss not only what goes on at Eagle Lake, we have every year, we run an archaeological field school, zooarchaeological field school out of Eagle Lake. And then the capstone of that field school within the last few years has been the Stanley J. Olsen zooarchaeology conference where I gave my first presentation. And this first presentation is going to be on the Rancho de Taos community archaeology project. And that's an archaeology project that's happening in Talus, New Mexico. Then we're going to move across the Atlantic Ocean to Paris, France. And we're going to see some images of my trip to Paris, see kind of what a zooarchaeologist sees when they go to Paris as opposed to your normal tourist. And then we're going to talk about the 11th conference of the international council for archaeozoology. And at that conference I've got a couple of photographs. And then we'll talk a little bit about the presentation that I gave at that conference, which this time was entitled group size and hunting, technological influence on the distribution of hunting features in the prehistoric western great basin. This title has changed a number of times. Every time I give this talk, it gets a little bit shorter. The first time I talked on this subject, this talk was the influence of group size on the geographic placement of prehistoric hunting features in the western great basin. So it gets a little bit shorter. Frank and I were just talking about this yesterday. Next time it's just group size and hunting landscapes. So really short next time and right to the point. Okay. So that's kind of what we got planned for this talk.
So the first slide talking about zooarchaeology, zooarchaeology is basically the study of animal bones from archaeological sites. You actually probably caught in the title there's two terms for zoo-archaeologists or two terms that are used for this definition. The first is zooarchaeology. That's what we use mostly in the Americas. The second is what they use in Eurasia and Africa, and it's called archaeozoology. They mean basically the same thing. Some people say that zooarchaeology gives a little more influence on the anthropological side of faunal remains, bone analysis, while archaeozoology relies more on the biological side of this analysis. But either way the goals of both of these is to better understand the relationships between the humans and other animal populations. And zooarchaeology as a whole is an interdisciplinary field. It draws on anthropology. It draws on biology. Even more recently it's probably drawing heavily from some of the physical sciences.
So now we define zooarchaeology. What do we do every summer at Eagle Lake at the Eagle Lake zooarchaeological and field ecology field school? Well, we do a number of activities that get the students related to animals in the natural environment in their natural habitat. Because when you're looking at a bone from an archaeological site, you can't really make too many interpretations about that bone unless you know the context in which the animal lived. So here, just to go kind of clockwise in these photographs, we have Jay Bogiatto, it looks like he's leading a bird dissection up there in the top corner. Dr. Frank Bayham in this lower picture, it looks like he's checking out a sleeping deer there on the side of the road. And then this is one of the -- and this is one of the fun activities that we do at Eagle Lake. This is called seining. So we set up a net in the creek, and we chase all the fish down. And we catch the fish so that we can let the students see what type of fish live in the slower water, what type of fish live in the fast ripply water. And then we look at them and we release them.
So you're probably thinking, well, you know, what other types of animal interaction happen at the Eagle Lake field school? And these are a couple of pictures I think of some good animal interaction. Here we're actually doing some more specimen processing. That's a skunk that we came across that we wrapped in some chicken wire and buried. So that next year when we return, it will be a skeleton. Lots of -- when we catch rodents, there's lots of poking and prodding of the rodents. This is a big image of Jack Broughton that looks like it's maybe a pocket mouse that he's holding there. And it looks like they're measuring its tail. But one thing that we do quite a bit of is catch rodents and then measure their ears and tails and hold them and that kind of stuff. And then here it looks -- I wasn't there for this occasion, but it looks like this might be a couple of rabbits on the fire here, so what zoo-archaeologists do at Eagle Lake.
And, you know, there's risks and then there's always benefits. And one of the risks of doing a class like this is snake bites. So you can see up here in the upper corner this is Isaac. He was a student. And he's gotten bit by a little snake. Nothing big. We actually knew he was going to get bit when he picked it up, but it's not poisonous. It's not venomous. He just had a tough out a sting for a little bit. And then you get your rewards. Here's me and three of the students from the class, and we are studying fish bones. And then when you come across bones in the field, what we say at Eagle Lake is "it's all bones all the time." So there's quizzes everywhere. There's quizzes to be had in the field. There's quizzes to be had in the lab, life experiences to be learned in the field.
Here's a group shot of everybody who went to the zooarchaeology field school this past summer and also the Stanley J. Olsen conference. And this right here in the front is Karen Lupo. She was our guest speaker for -- like our calf stone speaker for the conference.
So this is a little bit of the presentation that I gave at the Eagle Lake zooarchaeology conference. It's entitled Ranchos de Taos, a community archaeology project. Really I'm just going to kind of introduce you to this project and give you the background on where this faunal collection is coming from, because we really haven't started doing much analysis on it, but it's a great project for anyone who is taking zooarchaeology next semester. Lots of potential there. And so any grad students who are in zooarchaeology, this is going to make a fantastic, fantastic student project and possibly a thesis. So this is kind of, you know, your traditional adobe house there in Talus, New Mexico.
So the Taos Collaborative Archaeological Program, I'll refer to it as the TCAP. It's run out of the Southern Methodist University out of Dallas, Texas. And it's Dr. Sunday Eiselt who is the director. She's a Chico State alumna. She got her masters degree here and is now teaching at Southern Methodist. It's also run in conjunction with Mercyhurst College. And in association with that, they, also, you know, as all field schools do, they want to provide their students with state of the art excavation documentation and analytical protocols.
So the theoretical framework behind community archaeology is really just to get the community involved. It's got these two main goals. The first one is the involvement of the community. You know, I've heard this referred to recently as section 106 archaeology. I think it's a little bit different, but still the same idea of consultation and getting out in the community and finding out what the community thinks before you dive into a big archaeological project or a big construction project is very important and is one of the underlying goals of community archaeology. So they want to get the involvement of a local community and the execution of their research projects. And they also want to participate in the community in some way to give back, making a humanitarian difference. And most of these pictures are a courtesy of Sunday Eiselt of the ICAZ Facebook page. So here's a picture of a student and probably a local person looking at a chart of pottery or a complete pot possibly.
And this is kind of summed up into three types of community archaeology. The first, research that collaborates with native Americans. The second, research that collaborates with other and local descendant communities. So that would be your stakeholders out in the public, and then outreach for public education.
Everybody knows where Taos, New Mexico is. I figured I would just kind of show you just real quick. Orange star up there on the map is where Taos, New Mexico is located.
Taos is at about 7,000 feet. So even in the summer months the high temperature during the day is maybe 60. Low temperature at night can be in the 20s. So even in August you can get snow. So this is some photographs from Sunday of the field school. This photograph actually right up here is Sunday. It looks like she's taking shelter from a rain storm. But you can see some students down here in this lower corner. It looks like they're working in some windy conditions there.
So the project itself, some background on the location and where this project's happening. The initial phase of this project happened in 2007 and it brought together not only the local community, but university students and faculty members along with private land owners, community leaders and then local and state agencies. This collaboration marked the first time that any archaeological research has been done in the Ranchos de Taos area and specifically in the Plaza at Ranchos de Taos. So this is a photograph just starting to look at the plaza. I got this from google earth, google street view. And you can see right here it says, historic Rancho Plaza. You guys might not be able to so that, but that's what that sign says right there. So this is -- being I've never even been to New Mexico, so I figure when I was doing this presentation, I should probably at least know what it looks like. So there's one picture.
Here's another picture that I got off google maps. And it kind of shows this is the plaza area. I keep wanting to point, but I can just use this thing. Right over in here, this is the big church. The church San Francisco de Asis is right there. It's a well-known landmark in the area. And that church itself -- let me see. Well, the surrounding area of Ranchos de Taos was settled in about 1716. And the whole plaza itself is a historic district. So it's on the national register of historic places. It was placed there in 1978.
And here's an up close photograph of the San Francisco de Asis. This building was erected in 1772. And it's part of the American historic building survey or also referred to as the historic American engineering record.
So all this stuff is online. And you can go look at photographs of this building from, you know, 80, 90 years ago online.
So the 2007 excavations focused on midden deposits in one of the houses off of this Rancho Plaza. And it focused mainly in this lady, La Puta De Fouets' adobe house. And this is the picture of the inside of her house with excavations happening in her floor. There was a total of 14 students from Southern Methodist University that participated in this project along with two recent high school graduates from the local communities. And here's a picture of two of these individual excavating the floor.
So the excavations focused on this midden deposit in her dining room and also in her front yard, which you see right here. And this area their excavating dates to about 1800. So this house has been in De Fouets' [assumed spelling] family for about eleven generations. So it's been in the same family for eleven generations. Where they were excavating they believe to be a kitchen area from the early 1800s. And, you know, one of the benefits, we talked about community archaeology needing some type of a humanitarian goal, some type of outreach for the community. Well, one of the things they did is create a kind of a step down living space for this individual so that, you know, she would have more head room and more living space in their house. So when they were done, the floor was level, but it was about 50 centimeters lower than it was previously.
And so here at Chico State what we've got going on is we've got faunal material. And when I say faunal material, I'm referring to animal bones. We have animal bones from the 2007 and 2008 excavations. Right now we have about a little over 3,500 of these. There's tons of potential projects. Nothing has been done on this work yet. You can address meat procurement like meat types. Were people eating domestic stock? Are they going out and getting wild stock? Butchery patterns is always a great one. Is the stuff hand cut? Is it saw cut? Economic status. You can look at some of -- if there is saw cut meat, you can look at some of the types of meat that are cut and talk a little bit about economic status of the individuals. Ethnicity is a good one. Style of meat utilization. Different cultures around the world process meat in different ways. Some make more soups and stews. Others eat meat more off the bone, that kind of stuff. And then culture contact. You can also maybe see the change to where they started using domestic animals. So those are some of the potential topics for this Ranchos de Taos project that I presented on at Eagle Lake.
So now we're going to move on to Paris and a couple of touristy pictures from Paris. What everyone's got to go see. The Moulin Rouge, you can't not see that. Notre Dame. The Louvre. And then this is up -- where's Georgia? This is up on a hill where all the artsy people hang out. This is actually my girlfriend in that photograph there. She couldn't make it because she's at work. So this is kind of my view of what the tourusty person sees, everyone sees on their average trip to Paris. But now, you know, what does a zooarchaeologist see?
Well, a zoo-archaeologists sees all this great history of animal human interactions. So you've got mummified cattle and a little mummified cat there, you know, big stone statues of cattle. It looks like that's maybe copper on a wall of a lion. And then obviously you got your nights in there. Poor horses that probably had to wear about 400 pounds of metal. And up here is a statue of a gentleman and his dog taking down some type of artiodactyl. But then that's what you see their prehistorically.
What do you see there in modern times? You see a lot of little dogs. Paris is full of little dogs. You see, you know, obviously a lot of great food. This restaurant we ate at is called The Kissing Pigs. And we had some great food there. This was our waiter with his pig snout on. And then in the background you can see some of the fish that they had. Their speciality was actually trotter. Their speciality was pig hoof, but I did not get it. I got seafood. And then, you know, this is my dinner one night. This was a salmon tartare. So just ground raw salmon with some french fries and a salad. So that's kind of more what I think the zooarchaeologist sees when they are in Paris.
But the real reason that I was in Paris, it wasn't for those touristy vacation photographs. It was for the ICAZ meetings. So, you know, again, we get that other use of zooarchaeology, the 11th international conference of archaeozoology. Here's our poster for this conference.
Here's just some photographs of the building, kind of the main greeting center of the building where it was held. You see the welcome sign. They had message boards all over so that, you know, people are coming internationally. And this conference happens once every four years. So you might make friends and not see them for eight years. So if you want to find out if your friend is at this conference, you can post them a little message and tie in with them. And then over here we have a couple of pictures of the poster areas of the conference, which I'm going to go through a couple posters here, because I'm pretty sure I will have time. But I do have a whole folder of handouts from posters that I brought back if anyone who go through the barrel, wants to kind of thumb through and see what people in zooarchaeology are doing internationally. I think there was definitely some great topics.
So these are some posters presented by some other researchers at the conference. I know you probably can't read these. It's not designed to be read on power point this small, but these were some that I thought were interesting. So I'm just going to run through them really quick. This one is about evidence of falconry, as you probably already read. It's in Madrid and Southeast Spain is where they're really working on this. And what they've discovered is they're using peregrine falcons. They're finding peregrine falcon remains archaeologically in an area where they don't occur modernly. So they're wondering why. And one of the things they're noticing is over here you can see these tarsometatarsus. And those are the lower leg bone of a bird. So the bone that goes to the bird's toes. And they're noticing they've got some buckling on the ends. And they're growing in a general bow shape, which they suggest is consistent with modern falcons that are bread and raised in cages. This is something you see in modern caged falcons. So they're saying that the bone remains from these falcons that they are finding probably indicate that these animals were raised in cages, suggesting that they were possibly used for falconry.
Another one, this one was great, because at the beginning of my trip, I spent three days with some family in London. So I really got a kick out of this one. The origin of the Tower of London Lions. And so recently they have done excavations in what was the moat of the tower of London. And they came up with these two lion skulls that they had radiocarbon dated to the 13th century AD. And then they did DNA analysis on them and got the haplotype of the animal and figured out it was from Northern Africa. And it's an extinct species, subspecies of lion. And they're saying with the radiocarbon dates, this is the evidence of the first lions in England. So that's kind of cool.
And then another one, lots of forensic posters being presented at these conferences. You know, lots on Teflon and burning and cut marks. I just found this one fascinating just because I never thought about this, but, you know, here in Northern California we frequently get deer bone that comes in fragmentary form that's confused with human bone. In Australia they get kangaroo bone. And they say kangaroos, there's a skeletal kangaroo right here, are very hard to determine if it's human or nonhuman. And so she's actually testing the thickness of the cortical bone in the shaft, because, you know, once you've been in archaeology and zooarchaeology and forensic for a while, people always say, oh, you can tell by the thickness of the bone if it's human or not. And so she's actually testing that to see if it holds true. And I don't know how many of you guys can see this, but the blue over on the very -- it will be your guys right-hand side of this is the human. And then all these other ones are all the other animals. And her results show that the only one that -- cortical bone thickness actually holds up, been telling human and nonhuman, is bovids, the cattle family. She said, other than that, there's too much variation if you just have a fragment. If you have a circular fragment -- I don't know how many people can see this -- like this one down at the bottom where you can take three points of measurement and actually get the circumference of the bone, your chances go way up. So that was another one.
And so now we're going to go on to what I presented on at the ICAZ meetings. And we've already gone over the title. And this is what it is. It's spacial chaos. And I just liked me out there with the question mark flying my kite and then all these other dots and everything, trying to make sense of it. But this actually has nothing to do with my project. This is actually something that I was playing around with from Bitten Ranch, the Bitner Ranch Project. This is the northern end of Bitner Valley. So it's a completely different project. These represent artifacts. All the points represent artifacts we found.
But, you know, before we can really get into hunting features, we got to talk a little bit about evolutionary ecology. And then we've got to move into optimal foraging theory so we can understand how to approach these. So the idea behind evolutionary ecology is it's the study of evolution and adaptive design in an archaeological context. So we're looking at the relationships of organisms within a given area. And evolutionary ecology is the hypothetico-deductive model basically formulating and testing hypotheses. And one thing that evolutionary ecologists are interested in is how natural selection shapes processes like predation, population dynamics, and mating strategies. I don't know if anyone can read this or not, but you get the nice comic here with the buck in the foreground and then the big elaborate buck with all the ornamental antlers and the girl in the background. The doe is telling her, it's not you; it's natural selection.
So then moving on to optimal foraging theory, optimal foraging theory suggests that individuals should strive or should strive to maximize their net intake of resources in relation to their energy expenditure during resource acquisition; so during foraging. So basically they're trying to get the most for their buck so that they don't have to spend all day foraging for lunch. They can spend the early morning foraging and hopefully get enough food to last them a few days. And then optimal foraging theory, so how this goes, think of evolutionary ecology as this kind of big umbrella. And then housed underneath this umbrella is optimal foraging theory. And then housed within optimal foraging theory are these models of optimality. And these argue that competition for resources should give advantages to organisms that have efficient techniques of acquiring energy and nutrients.

So it's going to talk about foraging people simulate themselves into groups so that they can most efficiently get the most efficient return for their input. And then, again, another comic. There's so many great comics out about evolution and optimal foraging theory. These are the two optimal coyotes or you might think of them as wolves foraging at the deer crossing. So I think they got it down pretty well there. Whether they catch a deer crossing or they catch a road kill, I bet they've got it made.
So I'll explain this optimal group model to you really quick. Let's see. On your Y axis here is the mean per capita return rate. So what that is measuring is the amount of caloric return that an individual gets when foraging. So how many calories per rate of energy they're getting is right here. And then down on the X axis right here is group size. So in is often designated for group size. And so right here you have your group size of one. So you're foraging individually. And then where this cross is right there, that's what the average forager can get by themselves is right there. And so as you go this way along the X axis, the group size gets bigger. And for a while there the foraging returns per individual within that group get bigger, too, until you hit this point labeled RO up here. That is what's considered the optimal maximum group size. And it varies depending upon what game someone is going after. So this would be different if you're hunting rabbit or it would be different if you were hunting waterfowl or it would be different if you were hunting large game. And so from this point up here you're getting, you know, better returns than you would get if you were foraging by yourself. But as the group size keeps getting bigger and bigger, your returns go down and down. But you'll tolerate these returns in here. You won't branch off and find another group or you won't forage by yourself. You'll continue to tolerate those, because you're still getting more than what you could get by yourself. Until the group size hits the group maximum right there and after which point your foraging returns are less than you would get by yourself, then you're going to break off from this group either form a smaller group or forage independently. And what we're studying here today is kind of a large game foraging. This model is built off of lots of ethnographic data, so research with modern hunter gatherer tribes. And what they found is average group size for individuals who are going to hunt large game such as elk, deer or pronghorn usually is about seven.
individuals per group. And that's per task group.
So you might be wondering, well, what are we looking at here in California? What type of interaction are we looking for here in California? I'm looking specifically at the interaction of humans with mainly these two species right here. This is pronghorn. Most people probably know them as Antelope. They're commonly referred to as Antelope, and then mule deer over here. Both plentiful in northeastern California and northern California. Pronghorn used to be in the Sacramento valley. Been reintroduced recently, but they're not anywhere in the numbers that they probably once were. And then, you know, the next step is, okay, we've got these large animals. How can we see a human interaction with these animals archaeologically other than the faunal remains at the common archaeological sites?
And one way that I think you can see that human animal interaction archaeologically is through these rock features. And there's been plenty of ethnographic evidence and archaeological documentation that associates these type of features with hunting activities. I feel like I'm safe to assume that features that are kind of in this horseshoe shape that are stacked maybe two to three courses high are what we call hunting blinds and are associated with the hunting of animals. And so you can kind of see, I've got a picture of three of them here. These photographs were actually taken from my study area. So you can look at them and you can get a little idea of what the environment looks like in that area. It's out in the great basin. It's a beautiful, wonderful place to work. But you can kind of see, you can see the shape of this one right there. This one the shape is not so much there, but you can kind of see it. And this is a nice good one here. So these are how I think you can archaeologically see this human animal interaction.
And here's one more photograph. I like this photograph, but it's blurry. But there's actually another hunting blind across the way right there.
And this just gives you an idea of where we are in North America just for those of you who may not know where Cow Head Slough is. That's where I'm doing my research. Chico is off the map down here. This is Eagle Lake. For anyone who is familiar with the Susanville area, that's right up in there. Cow Head Slough is right there, literally 200 meters from Oregon, 200 meters from Nevada, but in California.
And so in 2007 I did this survey when I was working for the Bureau of Land Management. The green areas shown here are the areas that I surveyed. And the survey documented 31 of those stone features that I just showed you guys. I already talked about how background research shows these type of features have a strong association with hunting activities. For today we are just going to quickly kind of go through some of the analysis I did for this southern portion of this survey.
So I'll go back one slide. So these features were mapped using tremble GPS. Then they were taken off the GPS and put into a graphic imaging system on a computer. And what I did in that graphic imaging system was I ran what's called a spider analysis. And what a spider analysis does is give you straight line distance. So all these red dots here are hunting blinds. If I scroll back and you look at this bottom one, you can kind of see the layout. All the red dots here are hunting blinds. And then you go forward. It's just a little bit bigger, but it is the same data set. So what a spider analysis does is it gives you straight line distance from one point in your analysis to every other point in the analysis. So I had to draw a box around it to give it an area. I define that as my survey boundaries. And then I ran a spider analysis. And it gave me, you know, like 880 distances and directions from all these points. And so then after that, after the spider analysis, I exported all of this data into SBSS, which is a statistical program.
And I ran a higher article cluster analysis on it, which statistically grouped these hunting blinds into clusters on the landscape. And so I know it's kind of hard to see, because there's no contour lines or anything, but I've given this presentation in a couple of different veins in some geography courses and that Kind of stuff. And I didn't want to give away the location of all these archaeological sites. So I kept the topography out on purpose. So what it did is it grouped this into five clusters. And then I took this and I threw it back into the GIS program. And I linked it up with all my original data, because, you know, because when I pulled this out to do the cluster analysis, it clustered the distances and stuff. And I had to reassociate it with the field data so that I could have all my field notes and stuff line up correctly. But the results were that it placed the 23 hunting features that were in this lower survey area into these five clusters. And that's -- you know, so that's one part of my thesis. Well, that's actually my thesis. The next part I'm going to show you is kind of not going to be in my thesis, but it's something that -- just a second, Gale. I'll grab you right at the end. So what I did, these clusters range in group size from three to up to seven, which seven is the magic number that would be expected through optimal foraging theory and optimal group size. So I think that, one, the background research has shown that these type of features are associated with hunting. Research and optimal foraging theory has shown that hunters and gatherers don't just randomly go out and willy-nilly look for resources. They have resource acquisition strategies. And I think that showing that these things cluster on a landscape supports the idea that these individuals in the Cow Head Slough area were hunting in groups.
The next thing I did, and this isn't part of my thesis, but is just part of something that I worked out for these few presentations. Okay. So now I know these things are clustered on the landscape. And I see kind of a, you know, kind of some similarity in some of the distances of these clusters. And so I thought, well, what could be shaping whether the distances between those hunting blinds. And one thing I thought of was hunting technology. And so I looked, you know, at both modern and ethnographic accounts pertaining to hunting with the bow and arrow. And even today with Olympic archery, the Olympic archers are most accurate with their bows and arrows of a distance of about 35 meters. Work with Ishi, who is a native American, who will definitely be learning a lot in the upcoming year about - - work with Ishi, ethnographic work with Ishi, who said he was most accurate at about 30 meters. And so you're looking at a range of between 30 and 35 meters that I hypothesize these hunting blinds may be placed. So that if you're in one hunting blind and you're in the next hunting blind, both individuals have the best chance of capturing anything that runs between them. And they won't -- something won't run between them that they won't capture.
And so I ran a nearest neighbor analysis on this data. This isn't part of the nearest neighbor analysis, but I thought this figure gives you an idea of what I'm looking at here. So this is one of the clusters that I'm talking about. And I'm just trying to look at the spacial distribution of these hunting blinds to see if hunting technology, the bow and arrow technology is shaping where these are placed. And it turns out that the average distance, the average distance to the nearest neighbor on the two clusters that I've done this on one cluster, it's 31.59 meters. And on the other cluster it's 37.39 meters. So kind of in the area where you would expect these to be placed based on the hunting characteristics of the bow and arrow.
That's it. This is the 2010 ICAZ photograph.
And in case you guys were wondering, there's where I am right there.