Okay well, as Dr. Martinez said, very little research has been done on cooking features in Northern California, and they're always found on excavations but no one's really looked at them, so I looked at them for my thesis.
The purpose of my study was threefold, I was compiling ethnographic information from various ethnographies written by anthropologists and historians, dealing with cooking features in the Northern Sacramento Valley. I complied all the archeological data from excavations going back as far back as I could find excavations and then I applied a model that Alston Thoms had come up with called the Working Model For Land-Use Intensification.
A little bit of the theoretical stuff before we get into the fun data. Now, this talk is an abbreviated version of my thesis defense and in my thesis defense I also discussed many other theoretical paradigms that can be used to look at cooking features, but the main one which is Thoms' model is based on intensification, so I'm not going to talk about daily practice, household theories, and all of the other fun things.

I will talk a little bit about intensification. So, the premise of Thoms' model was that intensification of cook-stone technology which is using any rocks as a heating element basically, is a manifestation of land-use intensification triggered by population packing, I'll explain this. What this means is, if there's an increase or a change in cooking technology that requires more labor, more energy input, whether it would be fuel or human energy input, whatever, indicates an intensive use of marginal or lower ranked foods as a result of population increase on the landscape.
So this is his model, he came up with this model and says it's the, I quote, "Expected temporal patterns in the use of different kinds of hot rock cooking features with the technologically simplest features." Down here where you probably couldn't see the table where it's just the fire with cooking right over the coals, kind of like what we do with barbecue, and through time, you get more and more energy consumption, or energy input features where you start having rocks, being used, you also have to dig the hole, these take a long time to cook as we all found out at the pig roast a few years ago, 24 hours to cook a pig, that's a lot longer than say, half an hour to cook a big piece of meat over a fire, leading up to stone boiling in a non-ceramic container, in the ceramics, there's a jump to ceramics, at some point. In California, we don't really have a ceramic tradition like they do in the southwest so we've got stone boiling in non-ceramic containers or water tight baskets.

Okay, so according to his model stones becomes more used as heating elements in the cooking process as you have more land intensification so the more people you put on the landscape, and the more hemmed in they become, the harder it is for them to go out and get things that cook fast, so they have to start cooking them longer. And so you'll see more rocks used through time. Unfortunately there is one other thing, if you see this increase in rocks through time, so in a more recent archeological site you have 500 pounds of fire affected rock and then an archeological site from say 3,000 years ago, you only have 50 pounds, it could just be that the other site's older, there's a lot of problems with the archeological record.
Okay, so now I will explain intensification as I understand it. So with intensification, it's part of a productive theoretical paradigm which is heavily influenced by economic and biological approaches, human behavioral ecology. This paradigm looks at changes in human behavior through an evolutionary lens with the quote "Basic promise that organisms are defined by natural selection to optimize life time reproductive success and are capable of rapid adaptive shifts in behavior to contemporary environmental conditions." Which can be broadly defined as ecological, social, and political dimensions. So what that means, that's a quote from Karen Lupo. What that means is that individuals would change their behaviors including cooking techniques to ensure their continued survival in response to changes in the natural and the sociocultural environment around them. So, for example, a response to a reduction in animal protein resources, on the environment may come to change from cooking like I said over the open spits to stewing and breaking the bones to access the marrow, so you can extract more proteins and fats and all the good stuff out of them, but you'll still be using the same animal. So you might see a change in processing before you see a full change in subsistence strategy. So in intensification, resource, processing and land-use intensification, they're all intertwined, you can't really say one without the other but sometimes you can point one or the other out.
Okay, so that was the theory, we're done with that part. So, where my study took place was the Northern Sacramento Valley so here, a little bit south of here, up to Shasta Lake and you can see Shasta Lake right up there, we are right around here. And so I looked at these three counties, everything below 1000 foot elevation. It's the Great Valley Geologic Province so all of the, all of the resources available are pretty much the same from north to south, there is some change obviously, you'll get more oak trees and grasslands here whereas down here you have a thicker riparian belt along the river but it's not so ridiculously broad of a change.
So of course, as we all have been learning, context is the most important thing, so with that part, this part of the Sacramento Valley, the prehistoric setting has been figured out mostly from a the basic chronology is from artifact and culture chronology and from environmental change and this is not anyone in particular--any particular researcher's chronology, it's the one that I basically cobbled together from Elaine Sundahl, and from Basgall and Hildebrandt and multiple people who worked in different sections of the valley who've never complied it into one convenient, easy to understand chronology. So before 10,000 years present--10,000 years before present is the Pleistocene era, everything after that is the Holocene. Pleistocene era is when you see a lot of like what we would call Clovis, things like that. Early Holocene, is couple--2,000 years right around there, middle Holocene, which is the early archaic period usually, usually referred to as is from 8000 to 5000 years before present, and then the late Holocene, up which in Sacramento Valley we have a much better archeological record than we do anything before, is roughly 5000 years to present, now I want you to kind of remember we've got 5000 to 3000 years before present is the middle archaic, the late archaic is 3000 to 150 years before present which is contact, and then the historic period. My archeological sites all date to late archaic, I wanted you to note that because that's roughly, well that's roughly 3000 years but I don't have anything before that really.
And continuing over the context, in the Northern Sacramento Valley, we have ethnographically recorded many groups. There's the Konkow and the Mechoopda and Maidu, Nomlaki, Patwin, Wintu, and the Nisenan Maidu. The Nisenan Maidu are south by southern view in towards Sacramento, the Maidu were around here, Nomlaki on the other side of the river, the Patwin are south of the Nomlaki on the other side of the Sacramento river, and the Wintu are from roughly the hemi country border up to Redding and beyond.
Now every single one of these ethnographic accounts that I got my hands on, they all consume similar types of foods, that everyone always said oh they ate deer, they ate, these kind of animals went into great detail about the animals and of course they ate acorns. If I was lucky, some of the ethnographers went into some detail about how the acorns were processed aside from they pounded acorns, and turned them into mush. There were a couple accounts talking about bread ovens where they were actually measured and explained in dimensions in great detail.

Most of the food processing especially with plant matter was they said mortar and pestle, mortar and pestle, mortar and pestle. Very, very sparse details about a lot of the food eaten.
But the thing with the ethnographic account is I was able to figure out that there were three major ways of cooking. There is baking, there is boiling and steaming which involves water or liquids and then roasting and grilling. So baking was used by all the groups for, you know, with earth and rock ovens. And used for baking acorn bread, seed and fruit cakes, baking fish, insects and certain cuts of meat, like roasts. Boiling and steaming, that would be the hot rock used in baskets to boil water, acorn soup and mush, other kinds of soups. Rocks were also used heated up, water poured over them to create steam and then greens like clover and miner's lettuce were steamed. And there some meat cuts were steamed and then roasting and grilling nuts. The hot coals and direct heat used to cook most of the meats and just a few other foods.
So, based on the ethnographic and the archeological literature I was looking at the following features were what I expected to find in all the excavation reports. And the archeological literature I'm talking about is not the California literature but worldwide. So the cooking features I expect to find would be earth ovens, rock ovens, stone boiling, which would be just hot rocks that are in water, the cook stone grill, direct heat and fire effected rock. An earth oven is a small ash lens in a concave fire affected or oxidized earth layer with ash and charcoal deposited nearby from when the oven was opened up. A rock oven is very similar to an earth oven except there's a rock lining both top and bottom. Stone boiling like, I said rocks, heated up, thrown in so you'd have a fire pit and a pile of rocks. And then a pile of rocks that were the broken ones. Cook stone grill, large flat stones over a depression that would have a fire built underneath, sort of like a frying pan. Direct heat is just a fire pit. And in fire affected rock is the catch all term for any rock that's been thermally altered and broken and cast aside. So you would expect to see all of those in an archeological site.
So, using a grid for my data collection for Sacramento Valley itself, I used the North East Information Center. And I compiled all of the reports that were excavation reports or limited testing. The database that they have returned a list of 45 reports of excavations in the four counties that I was looking at. And going through all 45 of the reports all but 11 of the reports were eliminated because they didn't hit any cooking features, ash lenses, broken rock, they didn't go into any detail about anything like that. I also acquired excavation reports from other sources, and two MA thesis reports from the library here. And of course, I went to the field notes that we stored in the collection here in our archeology lab. So total I had 17 sites. It's not a lot of sites but it was better than nothing. Okay.
Now like with any archeological study, there is always a constraint to your study. One of the major constraints since this is a temporal model that I'm testing. We just don't really have Middle Holocene site information which is anything older than 5,000 years in large part because most of the Middle Holocene sites are very, very deeply or have been completely obliterated from the surface in large part because something happened environmentally over 5,000 years ago and before that buried everything. So when you are out in the Sacramento Valley, most of the sediments out there are much more recent than you would expect. The other problem would be old excavations versus new excavations. Old excavations are ones from the '60s and '70s were complete excavations or nearly complete where you would take out an area, you know, the size of that rogue chairs. New excavations, they're limited testing, it's a nearby meter hole, right there. If you're lucky, you hit a feature. Usually, it's just to find out how old the site is whether or not we need to avoid the site or can we remove it from management concerns and bulldoze through it. So you'll get a skewing of your data because the old sites have a wider area excavated where you will hit a feature and the new ones don't but then new excavation techniques are better than older excavation techniques 'cause we're not using, you know, shovels and, you know, inch foot, you know, inch screen or whatever. You know you're not losing a lot of data that way. There's always a time in context dependent bias. Older sites haven't had carbon 14 down on them, radio carbon dating. Of course, always researcher variation and then timing research questions, there's always time issues.
So here are the sites, as you can see, the ones with the red arrows are the ones that the features that are in that site actually had direct radio carbon dates so I have eight? Seven or eight direct radio carbon dates on features. That's it. Well, a couple of these have actually multiple features. The ones that have the broad bars like that, that's just showing this is a main period of occupation of the site. There's also a second component buried deeper in the site and there's like a gap, and then it kind of tapers off. This site, you see how it has just a very limited time between one 1000 and 500 BP, that is one of the more recently excavated sites where they were able to get a very tight dating. Where are we? This one, this is a butte one, which is the Patrick Ranch, no one's ever done any C14 dating on it so its dating somewhere between one 1500 years ago and contact, no one's really sure, it's just kind of based on projected point chronology. So that would be one of the issues like the site is probably a much more recent site like 500 years old but because we don't have good dates, we have this broad bar. Also, out of all these sites, I ended up with 103 features so that's a nice sample size.
What I ended up with was that all these reports had 22 different terms for features, tried to narrow it down to just seven terms for my thesis and like I said I had a 103 features, I had 10 earth ovens, 31 rock ovens, 7 direct heat was a rock heating element, it's like a fire pit so it had rocks around it to sort of retain heat. Direct heat for stone boiling and then this one uncertain feature which may have been an earth oven but it was kind of half-bulldozed. That's how they found it so then it wasn't really sure.
And 32 of the features were noted to have food remains in it. Now, since this is cooking, it's the food that's important. 11 of them had acorn, there were faunal remains in 15, and there were shell in 25 of them, the ones where you see it says grass seeds and other seeds, and the roots and bulbs. Those were all actually more recently excavated ones that had flotation. The preservation of the food items is biased towards the hard and durable items and the food that would be most likely recovered from cooking feature. So most of the features like I said though were not subject to flotation or fine mesh screening so only really large fragments were recovered, gives us a bias.
The rest of this is just me babbling on about the different kinds of features, this is the fun part though. This is the part that it was like, oh this is great I actually have data, I can figure stuff out. So this picture too, I want to point out, is this nice round little oven feature. This of course is not in California. I was in Nevada when I took that picture.

But in my 103 features, I had 10 earth ovens, there were food items recovered from 6 of them, and those 6 had C14 dates and you can see down here, here's the date of the features, they go from 2000 years old, right up 250 years old. So earth ovens were used pretty much throughout time. Well, throughout the last 3000 years.
Rock ovens, I had 31 rock ovens. That would be rocks on the bottom, pile of rocks next to it where they've been removed from the top. There were food items in 9 of them but only 5 of them had C14 dates. Once again, but--200 years to about 1000 years before present, so they're a little newer than the earth ovens but I only have 5 dates.

Let me show you earth ovens and rock ovens. This is a rock oven. You have rocks around the bottom. You would put your fueling here, light it on fire, wait for that to die down because it would heat up the rocks and then you would cover it and build another fire on top to have the radiant heat going down. Same thing with an earth oven, only you just dig a hole. You throw your fire, fuel in, light in on fire, wait for the ground to become hot, take out all the ash, throw your food in, put something on top and light a fire on top. So earth ovens never really have rock, I mean, there might be a piece of rock or two but its not intentional. This is obviously pretty intentional. And with an earth oven, it's also fairly intentional because what you end up with is an oxidized layer on the outside edge which would be kind of an orange or orange/red. You get the same thing with a rock oven you'll find an oxidized layer just radiating out from the rocks because they retain heat. Sorry, I didn't explain that very well to begin with.
So with the rock ovens, I had 31 of them, and some of them were actually described really, really well in the excavation reports. One of them was a perfect textbook example of what was in the Wintu Ethnography written by Cora Du Bois, it was very much an acorn bread oven. In Du Bois' ethnography, she discusses how you would have the main rock oven for the bread in the center and then you would have these smaller pits dug around it lined with rock and also lit, and then the bread would be cooked for 24 hours, and this is not a small loaf, this is, you know, a good meter across. So this site which no longer exists, sadly, they found this rock oven and as they were excavating this whole unit, they found this other little bit over here and then they opened a half unit, found another one and an area of red clay. So this particular site had the perfect example of one of these acorn ovens that Du Bois had talked about. And the red clay is something that would get mixed in with the bread to make the bread sweet because the clay leaches the tannins out of the acorn. So they also found at least two or three more at the same site and that site is only a couple hundred years old.
There's also another great example of cooking and repeated cooking which actually would feed well into the whole daily practice theoretical stuff which I didn't really discuss. It's the Richardson Spring site with the locus E. This is compiled from the excavation field notes because no reports have ever been written about this site. Locus E had these multiple ash lenses with rock concentrations around it. Unfortunately, I didn't have great data for a couple of this up here but I'm pretty sure there were rocks in there as well, until what you have is multiple uses of this area over and over and over and over again with these ovens constantly in use in this one area. Now locus E for this site is actually set apart from the area where house pits were found, set apart from an area that had a large lithic concentration and set apart from an area that was a rock shelter. You don't put your kitchen in the middle of your bedroom. You put it off on the side and use it a lot. Now, this site was also particularly interesting because there was a lot of fire-affected rock pulled from areas around this locus but not so much from other places.
So stone boiling is always written about in the ethnographies. Stone boiling involves putting hot rocks in the basket and stirring to heat your acorn mush. We found seven stone boiling features, now what those are would be rock and cobble concentrations near a concentration of ash, near ash lands or a fire pit. Then you'll get two kinds of rock concentrations, there's the brand new ones, nice perfect cobbles and then the fire-affected broken up, discarded ones. So seven of these features fit this description and unfortunately none of them had C14 dates. But of the sites themselves, they aged at least 3000 years ago.
Only one site had a cook stone grill. The site didn't have a C14 date either but the site was only 800 years old at the most and it was described exactly like Du Bois' description in the ethnography of two large flat slabs on top of an ash feature.
And then finally there are two other kinds. There's the direct heat, and the direct heat with a rock heating element. These are kind of more of the catch-all terms for features 'cause a lot of people didn't really pay attention to the morphology of the features. So you have things called fire pits and hearths that sometimes were said to be lined with rocks, sometimes just have rocks associated with them. Their feature size range from 50 centimeters to something very large. The descriptions weren't great so unfortunately this and the direct heat are not the best features to work with.
And none of them had C14 with nice fire pit.
Now, what does this all mean? Okay, I have 12 direct C14 dates. Only 12 out of 103 which is really a sad commentary on California archeology. We need more C14 dates, but what it does appear is that this trend if you flip it the other way, it follows Thoms' model. Here's 500 years BP, there's 4000 years BP and going through time, you should see an increase in the amount of cooking features that involved rock. Well, going through time here's 1500 years ago, there's a dramatic increase in the number of sites that have been excavated in the Sacramento Valley that have features with fire-affected rock and only a couple that are older. In fact Shasta-222 has two components, it has an old component and a newer component. So, yes, with the data that is out there so far, Thoms' model works for the Sacramento Valley. Through time you get more features with hot rocks.
And finally, a final word about fire-affected rock. Fire-affected rock is something that if it's ever excavated a site, it's kind of everywhere in a site. Nobody pays attention to it other than "oh, fire-affected rock, boom!" If you're lucky, somebody says, "Oh, you should weigh all the fire-affected rock that came out of that unit." And you eventually end up with bulk totals, but those don't always get put into the excavation report. I only found seven excavation reports that gave bulk totals of fire-affected rock, and in fact actually only six because this one right here only has a bulk total for one meter by meter, 10 centimeter deep unit, that's it. However, it is a rather impressive unit because it's a meter by meter by 10 centimeters deep so the total excavated volume is, you know, 0.01. The bulk weight in kilograms was 36.3 kilograms of rock. I actually helped excavate that unit, it was ridiculous. It was nothing but rock and it was either a dump part where all the fire-affected rocks was being thrown or we blew right through an oven.

But it was the first unit I ever excavated in my entire life. I didn't know what I was doing. But it's still an impressive amount considering like here's the total excavated volume of the site is 15.35 cubic meters, only 36 kilograms, 36 kilograms of rock. But the best part about this is here's the youngest site, here's the oldest site. The bulk total shows that through time, there's an increase in fire-affected rock. So anyway the purpose of this slide is to say if you're ever excavating a site, measure the fire-affected rock. It's useful.
Alright so, in conclusion, there's an increase in the bulk volume of fire-affected rock through time. There's an apparent increase through time in the features containing rock heating elements and although earth ovens, you would expect to see them fall out of use, they don't fall out of use, they keep going so, you know, instead of just switching wholly over to just rock ovens, people are still using earth ovens for something. Most of the earth ovens that had food remains recovered were either shellfish or small seeds. The rock ovens had more acorn and faunal remains so it might be a difference in what you cook.
And so yes, Thoms’ model does seem to work for the Northern Sacramento Valley. It would be great if we had sites that were older than 3000 years that had information regarding cooking features but we only have the last 3000 years and we need to do more and better work like C14 dates or reporting the features better or better yet instead of doing meter by meter unit spread randomly across the site and doing four. Maybe a whole chunk all at once, finding features that way. And it would be nice if we had better information from the Middle Holocene.
This is one of my favorite cooking features. It's a Basque bread oven, it was a reconstructed one but it works on the same principle as a rock oven

**Question:** Could you talk about the ethnographic significance of the bread oven? That's a pretty cool story, the acorn bread oven?

**Answer:** In the Maidu and the Wintu ethnographies, not in many of the other ethnographies but in the Maidu and the Wintu ones, I kept finding these little hints here and there regarding ritual and status. Since Cora Du Bois had access to women and didn't really talk to the men as much, she got all this great information about how bread was cooked and who cooked the bread and, you know, about what they put in the bread like red clay. She was able to get information regarding a specific kind of acorn bread which is a very large black bread loaf that was considered a specialty of a couple areas like the Stillwater Plains and Plateau northeast of Redding. And one woman who was considered the expert baker and usually an older woman, was the one who was always picked to prepare the bread for the special occasions because it was a special occasion bread, kind of like when Mom cooks the turkey. Dad takes all the kudos of cutting it up, but the mother prepares this giant thanksgiving feast or this particular matriarchal figure prepares this giant sweet bread loaf for the special occasions like dances. I didn't find that in any of the other ethnographies, just that particular one which I think in large part has to do with the fact that Cora Du Bois was the one who did the ethnography.
With the Maidu, there's a lot of stuff about ritual. The acorn bread being used by a Ritual Clown, it's this figure that, I can't even pronounce the word, is a very important person who is intricately involved at the rituals and accesses this figure of the opposite of how you should be. He's the jester or the clown, the one who points out when you're totally doing it wrong, you should do it like this and then proceeds to fall into a basket of acorn mush or just he acts as the counter, the example of what you should not be. He's lazy, he eats too much, he does stupid things, and he does it to point that that's not how you should be. So he, in all of the major rituals and dances and important occasions would be the first one to enter. He would enter backwards into the sweat lodge or the dance house and he would be eating the whole time and stealing people's food but this person of which there would be several in the village, also acted as the watchmen who would sit on top of the dance house and make sure that when everybody was, you know, kind of towing the line but at the same time was making sure nobody was sneaking up on them. There's so much that goes into that and there's actually been at least one article I can think of that goes into great detail but it's a very interesting figure so this acorn would've been very important just even daily. Also, acorn mush was used in the spring, what you would paint it on your house to ward off bad luck or to ward off the devil as one of the informants put it. So acorn mush, stone boiling, so cooking is actually very, very, very important, well actually in any culture, in any group, you are what you eat and you are what you are how you prepare it too.
Question: Now it’s the earth ovens you said that were pretty consistent through time. Is there any evidence that they changed in size?
Answer: No, the earth ovens were all pretty much close to a meter in size. Well, the one thing that I found that was different between features here and the features that Thoms' was working with in the Great Plains and the Northwestern Plateau is that our cooking features are smaller like their root ovens and the camas ovens were always about two meters in diameter. Ours are only over about a meter. A meter is a big feature in California.
Question: And were they ethnographically associated with feasting or anything like that?
Answer: I didn't find anything like that in the ethnography or in any of the worldwide ethnographic literature, I mean, there is examples of it being part of a feasting like doing a pig roast, I mean, that's a huge endeavor. But at the same time, you cook everyday so I think the really large ovens equate with feasting, but the smaller ones would just be like your Kenmore at home.
Question: Were the rock ovens bigger than the earth ovens?
Answer: No, they're about the same size.
Question: So the rock is sort of a proxy for effort expended production? The logic of the model is increasing amounts of rock per unit put in feature to increase the amount of cooked food?
Answer: Yes, and to increase the time that you cook your food. If you're just cooking a slab of meat above direct coals, it cooks pretty quickly but think of all the stuff you're losing from it even if it's on the bone, whereas if you throw that same chunk of meat into a container and stew it for a couple hours, then all the stuff even comes out of the bone--the marrow and grease and--grease extraction which has been tossed around lately in some of
the literature is also part of the stone boiling.
**Question:** Are the earth ovens and rock ovens the same sites or separate sites?

**Answer:** Same sites. In fact, there was one site that not only had the cooking features where you're just like "ah its direct heat" or "oh, it's, you know, kind of a fire pit sort of thing." But there were earth ovens, rock ovens and one of them they had the cook stone grill. I think a lot of it also had to deal with how it was excavated.

**Question:** How was the clay used in the bread? It isn’t harmful to humans?

**Answer:** It’s mixed in with the dough and this is actually not just done in California. On the island of Sardinia, there's a particular kind of acorn bread made there that clay gets used in. Clay or any sort of earth additive is very common in cooking throughout the world, it's just you don’t really hear about it but it’s used as a way of leaching out tannins or other things that would be harmful to humans.

**Question:** Is the clay actually ingested or is it discarded?

**Answer:** The clay is mixed in with the dough so you actually eat it.

**Question:** Do they mix a lot of clay in with their dough?

**Answer:** It would be like putting baking soda in your food. You're not going to put the whole thing of baking soda in there.
Question: What kind of ethnographic or even archeological evidence did you come across that indicated there was indeed population packing over this 3000 year period?

Answer: Well, did I mention that there are a bunch of ethnographically known groups in a tiny little area? So for the Great Plains, if you're standing in one state in the Great Plain, you're probably only dealing with one ethnographic group. In California, standing here in Chico, you know, in the ten mile direction, you've got at least four or five other groups you're dealing with. California prehistorically had a really large population and this population had very hemmed in boundaries in certain ways. So they weren't as mobile of hunter-gatherers which would mean that you would probably have to change some of your subsistence strategies to adjust to not being able to roam large distances.