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National Zoning Atlas: A New Public Tool & Database

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UC GIS Week
Tuesday, November 19, 2024
10am-11am

National Zoning Atlas: A New Public Tool & Database

Sessions:

- Digitize, Demystify, Democratize: Exploring the National Zoning Atlas Map Viewer | Speaker(s): Tara Safavian, Anthony La, Dr. Clancy McConnell, and Dr. Catherine Brinkley - UC Davis | Pg. 2 | Video Timestamp: 2:04
- Test-driving the first-of-its-kind California Zoning Atlas: Using zoning patterns in rural and agricultural counties to inform regional land-use policy | Speaker(s): Anthony La, Tara Safavian, Dr. Clancy McConnell, and Dr. Catherine Brinkley – UC Davis | Pg. 12 | Video Timestamp: 42:18

As you just received a notification, we are recording these and they will be available on YouTube after the end of the week.

But this is our fifth annual UC GIS Week. We have a wonderful first session to kick us off titled the National Zoning Atlas, a new public tool and database. And in this we have a workshop that will start us off and then a presentation to talk a little bit more about this. So for this we have, I'll be the moderator for the session. My name is Amy Work.

We also have Janet Reyes who is a helper. So if you have technical questions about the session, we were available in chat.

And you'll see that we'll take questions. If you have questions during the workshop, you can chat them in the chat box. But we'll take all questions for both the workshop and the presentation at the end. But any technical questions, go ahead and put those in. You'll also see some other links coming through in the chat.

You'll have more information on the website, but our sessions are 10, 1, and 3 o'clock. So you can find more about that. But I'm really excited for this workshop. So the National Zoning Atlas, a new public tool and database. And at first we have Tara Safavian who was talking about digitize, demystify, democratize, exploring the National Zoning Atlas map viewer. So Tara, I'll go ahead and turn it over to you. And you can take us away.

Okay, sounds good. Do we want to start now or at 10.05?

I think we can probably go ahead and start now. I think we gave people a few minutes to sort of get in.

But I think we can go ahead and get started.

Sounds good. All right. Can everybody see that?

Yes.

Okay.

Anthony, why don't you go ahead and get started?

Digitize, Demystify, Democratize: Exploring the National Zoning Atlas Map Viewer

Speaker(s): Tara Safavian, Anthony La, Dr. Clancy McConnell, and Dr. Catherine Brinkley - UC Davis

Abstract:

The National Zoning Atlas (NZA) is a publicly-available database that aims to collect and standardize all zoning codes across the U.S. into a single, easy-to-read format. It allows the public to assess zoning in their area, advocate for policy reform, and keep politicians and public administrators accountable. It can also be a powerful tool for researchers.

In this workshop, we will begin by reviewing the GIS and attribute data collection methods used by the UC Davis Center for Regional Change to build the California Zoning Atlas, the largest component of the NZA. Then, we will walk through how to use the NZA map viewer and compare jurisdictions within California and between states. We will conclude with an open discussion of policy implications, advocacy outcomes, ongoing challenges, and possible research questions. Attendees only need to use the NZA Map Viewer; there are no software or hardware requirements to participate.

Transcript: Video Timestamp: 2:04

All right. Okay. Hello, everyone. Welcome to our workshop on the National Zoning Atlas.

My name is Anthony La. Today I am presenting with Tara Safavian. And we are both geospatial and zoning analysts for the National Zoning Atlas, otherwise known as the NZA. For some background on us, we both learned to analyze zoning codes at UC Davis as GIS interns for the California Zoning Atlas, where we eventually began to teach other students how to do the same before it finally became our full-time job. So it really is a pleasure to be able to present for the NZA and all they have accomplished so far.

So, but jumping right in, what exactly is the NZA? And why do we need one?

The National Zoning Atlas is a collaborative research project working to digitize, demystify, and democratize U.S. zoning codes.

Our product is a first of its kind database and interactive map that displays the regulations that govern what and where people can build across the country.

We're trying to unlock a better understanding about zoning, which we already know affects not only our built environment, but also our economy, our national environment, our health, and of course our housing.

So this is what the atlas currently looks like with over 5,000 plus jurisdictions completed and over half a million pages of zoning code analyzed,

resulting in the atlas covering land that is home to over 118 plus million Americans.

We'll provide an in-depth tutorial later in this workshop, but for now, I want to very briefly explain what exactly makes zoning so complicated in the first place.

Beginning with the State Zoning Enabling Act of 1922 pictured here, this was the model legislation for states authorizing local governments to zone. As a result, around 30,000 individual jurisdictions have highly decentralized zoning, making it difficult to understand them at scale.

Another factor that complicates zoning is that features within the codes are inconsistent. A low-density single-family district may be called R1, R40, or something else entirely.

Code accessibility is also inconsistent, meaning it's sometimes hard to even locate a code online or in person.

This is especially true in small and rural towns with limited planning staff, and if you do manage to find a code and read it, you would agree the text is too long, convoluted, and full of legalese. Now, the NZA responds to zoning's challenges by first creating a one-stop shop for zoning codes, meaning we collect and collate thousands of unique codes and store information about them in a single database.

Second, our methodology produces a standardization of key code data points that enable apples-to-apples comparisons across jurisdictions. It allows us to present zoning districts cohesively on a single national map.

Lastly, the NZA is able to cut through the noise and make the codes accessible to non-experts, are easy to use online map, also promotes public access and visibility, and can be used as a tool for public education. It provides a powerful but simple but powerful visual component that instantly reveals zoning's more inequitable trends. Right.

Now, I'll cover how the zoning atlas is built.

First, the data inputted into the atlas has to be accurate enough to make sure it's usable by policymakers and clear enough for non-experts to understand. We do this through following a methodology enshrined in our "How to Make a Zoning Atlas Guide" seen on the right here. This document contains instructions for the atlases to work streams.

There are analysts who work with zoning code text and analysts who work with the corresponding GIS data.

The guide also provides instruction for how to input information into our back-end online data entry tool and database, the NZA Editor. The NZA leadership team regularly evaluates and updates the methodology to adopt more uniform and consistent conventions that are adapted from our ever-growing collection of zoning codes.

Here's a view from inside the NZA Editor.

In every jurisdiction with zoning, analysts work together to establish the list of zoning districts present between the zoning code and the map.

Here you can see the zoning districts listed for Ithaca, New York. At this stage, we also identify what type of district it is, residential, mixed-up residential, or non-residential, and whether or not it is an overlay.

Analysts then analyze over 100 different data points within each district beginning with treatment type, meaning whether the residential district allows one family, two family, three family, or four or more family housing units. Here are some of the field analysts filled out in the editor. You can see we track minimum lot size setbacks, height caps, and parking requirements among various other use, law, and structural characteristics.

But for that, for now, I'll pass it on to Tara to discuss the geospatial side of the analysis.

All righty, so moving on to the geospatial side, we kind of have three main steps that we take for our GIS. The first one is, of course, to obtain zoning data. Now, if we're lucky enough, we will get shapefiles directly from the jurisdictions, which is the most optimal solution, but oftentimes we have to georeference and create these layers manually from a PDF map, regardless of what that quality may be like.

Next, we have a series of punch-outs. So, basically,

we have to erase several different kinds of lands in our analysis. The first one is tribal lands. The next is protected area database of the US or PADIS. Next is water. And then finally, we erase right of ways. And this is for standardization and comparison of jurisdiction and jurisdiction, because these are all areas that you cannot develop on. Finally,

the last thing we do, of course, is cleanup. As I'm sure you guys are all familiar with, slivers, any bridges connecting polygons that shouldn't be connected. And we also fill in all unzoned areas.

Okay, next, how is the atlas being applied? If you'd like, you can visit this website right here to see more details. But first, as a title, we have a list of the atlas and the atlas. And first, as a testament to our claims, here are a few examples of how some of our partners have activated their atlases to help influence policy, inform analysis, and drive research in the field. Our more famous advocacy use case comes out of Montana, where the Think Tank Frontier Institute used their Montana atlas to convince lawmakers that the state's spike in home

is overly restrictive zoning. The group succeeded in their campaign. This picture shows Montana governor Gian Forte speaking after the adoption of a package of sweeping zoning reforms that included easing restrictions on ADUs, as well as duplexes and triplexes. In another example, our partner Housing Works Rhode Island publishes an annual housing fact book. After releasing the in the fall, they incorporated zoning data into their analysis and enhanced the quality of their regional investigations.

And finally, atlas data is being used in scholarly research, among which includes a collaboration with Cornell Tech to investigate methods to accelerate zoning data collection and standardization using natural language processing.

Here are a few more examples of the atlas being applied to academic research. You can learn more at our website at either of these two links listed above.

And so now I'm going to do a brief demo of our public facing interactive map. I really encourage you all to visit the website above and follow along with me, [zoningatlas.org slash atlas](http://zoningatlas.org/atlas).

And Anthony, if you wouldn't mind pasting this link in the chat,

I'm going to switch over to the map. Can everybody see that?

Okay, awesome. Sounds good. I'm going to give it a few seconds to allow everybody to pop on if they wish you can do this on your laptop or your phone, but I would I'd recommend using your laptop.

Okay, I'm going to get started. The first thing that I'd like to bring your attention to is the legend and layer options here on the left. You can see that we have tribal lands and protected lands here listed as toggleable layers in the map. Water and wetlands are not toggleable.

And also everywhere that is labeled purple here on the map has zoning. And you can see also we have Hawaii and Alaska.

Next, if you're using the map, you would want to zoom into a jurisdiction. So what I'm going to do is I'm going to use this zoom to filter to go into Colorado, because that is where I have done most of my work for the atlas.

I am going to zoom to the jurisdiction of Boulder within Boulder County.

And you can see that pops up and you get a nice indication of where exactly the boundary of Boulder is in relation to the rest of the county.

I'd also like to draw your attention to this little note card that pops up in the corner. It tells us exactly how many zoned acres we have in this jurisdiction, as well as how many zoning districts there are in this jurisdiction.

Okay, next, I'm going to go back to the filter options. And I would like to show where people can build, let's say single family homes in Boulder. So once I turn that on, the map automatically updates. And you can see only where you can build a single family home in Boulder.

Next, I'm going to do, let's say I want to find something a little bit more specific, I can move on to the advanced filters right here. And let's say I want to look at one family

homes allowed only by right, so not subject to any kind of public hearing. And I want to see where they have no minimum lot size. And so now the map updates again, and I can see areas in Boulder where I could build a one family housing by right with no minimum lot size. Also, if you've noticed this note card on the right has updated as well. And it's telling me that 42% of Boulder follows these specifications, as well as 25 of its 48 zoning districts.

Finally, last thing I want to talk about is you can actually scroll down here and look at all of these zoning districts that are following these specifications. If I reset the filters, then I will get all 48 of these zoning districts. And you can also click on any of these one districts to see more details about their requirements and allowances.

Finally, this is something new that we've added to the Atlas, is we actually have this option for a jurisdiction county or metro and micropolitan area snapshot. And basically what this shows you is a brief statistic page of different things that are allowed and not allowed in any given jurisdiction county or metro or micropolitan area.

Thank you for going along with me for that. I'm actually going to hop back to the presentation. Has that switched over for everyone?

Okay, awesome. Sounds good.

Okay. I really encourage you to compare any jurisdiction that you explore with other jurisdictions or counties that are close by. The point of this tool is to standardize a very non-standardized dataset so that any user can compare and contrast zoning regulations across the country. All right, so we're moving on to the more interactive portion of this workshop now. I'd like everybody, if you can, to open up a computer or phone to the Atlas map. Again, look at that link, the same one that we were just at.

Okay, so the first thing I'd like you guys to do is to zoom to any mapped or purple labeled city on the Atlas and see on what percent of land can you build apartments or four plus family housing. And does this surprise you?

I'm going to leave a minute or so for you guys to go in and do that and then we'll discuss.

Also, Anthony and Clancy too, I cannot see the chat right now. So if anything comes through there, just let me know.

Yeah, I'm trying to answer a few things in there now.

Okay, would anybody like to unmute and talk about this?

Or Amy, would it make more sense to do? I think you can raise your hand and zoom.

I think either. I think it looks like John has a question.

John? Oh, if I'm interpreting my... John, can you speak up a little bit louder? It sounds like you're in the distance.

Oh, sure. Yeah, that was my microphone.

Yeah, I zoomed into New Orleans and it looks like the...

Well, many of the places where you can build apartment buildings are in very, very hazardous flood zones.

Does this surprise you?

No.

No, because renters tend to live in places that are a little bit more dangerous.

Yeah, so I just wanted to make that observation. I did not quite get to figure out where the percent of land would be. But this was just a visual inspection.

Yeah,

it should show up in the little note card on the bottom right once you have that filter set up in the map.

Oh, sure. Yeah, okay.

Okay, yeah, sorry if that wasn't very clear.

Yeah. Yeah, yeah.

So yeah, 27% of the acres,
27% of zoned acres, 47% of zoning districts.

Yeah, and it's really interesting. And one other observation is this would make no sense at all if you hadn't cut out the water because it's the very watery place.

Would anybody else like to share?

Oh, somebody said in the chat they're not seeing any interaction at all. Make sure that the area that you're looking at has already had their zoning uploaded to the Atlas.

So when you're zoomed out, it should look purple.

Oh, another little thing I noticed was if you're using the place name search, it won't show up if it ain't in there. Yes. So Eugene Oregon ain't in there, so it did not autocomplete.

Yes, you need to have for your little note card to show up, you have to have put...

You should be able to see this.

You have to have put your jurisdiction in this select bar. Sorry, I should have mentioned that. Otherwise, you won't get your statistics here in the corner.

I'll wait for someone else to chime in, but I looked at Columbus, Ohio, and it showed... It falls along what would be some of the main roads, not highways, but your major roads that go down. So looking at some of that and then just scattered across. But I think it was 16% of zoned acres for four plus family, and then 30% of the zoning districts. Which is interesting to see.

Alec, would you like to say something?

Yeah, I was just wondering if it's possible on the Atlas, could you give an example of downloading some data?

We do not have data download available as of yet.

Is that interesting?

If you have?

Or is it somehow restricted by the providers? Are there hassles like that?

I'm sorry, could you repeat that? I missed the first half.

Is it in the plans or are there restrictions from the providers that make that difficult?

To be honest, I'm not quite sure.

I can help answer this if you want.

And I'll just disclose, I'm not an employee of the National Zoning Atlas. While Tara and Anthony are, and they have their own policies. But part of the concern, from my understanding about the National Zoning Atlas not yet providing download of the data, is that it would be used in the wrong hands by corporate developers.

Instead of for advocacy or housing promoters, that kind of thing, that it would be just snatched up by developers and used to slice up the country a little bit finer for themselves. That's part of the justification I got when I first started on the California Zoning Atlas a couple years ago. I do think though that eventually, and I was trying to get to some of this in the chat, but it's hard to explain it, is I think eventually it could turn into a feature service layer or perhaps even downloadable.

It's not a problem with zoning data. The data

the GIS data for 99.999% of the country is public data. It is owned by the public and the cities and counties are not allowed to do, they're not even allowed to charge money to give you the data. But in some cases it is owned by a private company that does the GIS work and then they write into the contract, which is kind of wrong, but they write in the contract that they then own the data. So besides those few cases, it's public data, it's more a policy of the National Zoning Atlas and also just issues with versions of the data.

Anyway, I hope that helps answer some of it.

Yeah, thanks. As long as we're not pushed back to geo-referencing PDFs to recover the geo-referenced information for our local analyses.

Right, yes, and that's what we're having to do in a lot of cases with the National Zoning Atlas. We had to do that a few times with the California Zoning Atlas, not too many. It wasn't too bad, but there's actually a few counties in California where there's like Lassen County doesn't even have any GIS data at all. They don't even have, they have a paper map that's not even scanned.

Oh my.

So it's a pretty sour situation in a few places.

In Colorado, I've had to geo-reference hand-drawn maps. I was once given the only copy they had of their zoning map was a laminated copy on the wall of their office and so they took a picture of it and they sent it to me and that's what I had to work with. So it's not optimal everywhere.

Yeah, I'm in Berkeley so I'm waiting for Alameda County to come online. Anyway, thanks for your work.

Elise?

I just wanted to,

Liz in the chat asked if academics can request access to the data for a particular project.

Is that something that the National Zoning Atlas would be open to?

It is, sorry I'll speak up for some of this too.

It is possible,

depending on what area of the country you're studying, the National Zoning Atlas is doing a large amount of the work now because they've got this amazing team, but especially early on almost all the work was done by state teams like the California Zoning Atlas.

So there in some cases those state teams own the data and so it's possible to reach out to individual state teams and request data in that way, especially if you're working in a local area and not in an entire state. It could be a lot more possible. It is always worth reaching out to the team and I'll put the link in the chat here again and you could just ask because they do really want to support research and the more publications that come out with National Zoning Atlas data the better for them so that there could be a partnership in there. You'll just expect to have to sign some kind of NDA.

All righty, I think I'm going to move on to our next question.

Okay, so stay in your current location on the map wherever you just zoomed to for the previous question. Use the advanced filters to see what percent of land allows apartments with no minimum parking restrictions.

And then if you'd like you can talk about what are pros and cons of minimum parking requirements and how do you think they affect urban development.

And feel free to raise your hand or say something in the chat.

Yes, you can select no minimum parking requirement.

You should be able to.

Oh yeah, on dress of course. Um, so oftentimes when you are you have any kind of residential building in the zoning code, it will require you to have x amount of parking spaces available that you are including on your lot.

So let's say that you have you want to build an apartment in the zoning code, it might say, Okay, so for every unit, or for every bedroom, you are required to have one parking space available for your residents.

Okay.

Okay.

So I'm going to ask you to comment on the pros and cons of these parking requirements.

Um,

well, I mean,

the, the, the issue with parking requirements, is it, it drives up the cost of the housing, and it also reduces the amount of housing you can actually build because of the increased cost, and also because of just space requirements. You know, in, in more suburban areas maybe that's not so much of an issue but in

what's it called,

and, you know, more urban infill areas like either you don't have parking, or you have to build like underground parking which is incredibly expensive.

Exactly. Yeah. So, I guess, pros, if you're living in a very car centric area, you need somewhere to park your car. Cons, it takes up a lot of space, it's really expensive that everybody has a car needs a car.

I would just like to say, say john's comment.

I also hope that one day we might have minimal bicycle parking requirements, I think that'd be great.

And as for Daniel's comment on more data for Los Angeles, we are currently working on that on Los Angeles County now.

So, as of yet, there is that data is not complete but we are currently doing it.

Alrighty. If nobody has anything else to say, I'm going to move on to the next slide.

So this doesn't have to do with the map specifically. But just what kinds of research questions can you explore using the National Zoning Atlas data.

Those are both really good. Yeah, it's a good answer.

April says food deserts and housing types that's a really good one.

Amy says pollution exposure and housing types. That's interesting.

Liz says media deserts and housing types. Amy says, at you policies, love the at you policies that's a good one.

Alrighty, thanks for responding to this one guys. I agree with everybody's answers. I think that there's a lot of stuff that has become open to being researched because of this data and because prior to the National Zoning Atlas there really wasn't any kind of standardization, and you would be looking at each district kind of, or, sorry, each jurisdiction on an individual basis which is very difficult to do and very time consuming.

And going through zoning code in general is, it's, it's a tough process. So,

Liz says housing rules and political outcomes for voting distributions, etc. That's really interesting. I would love to see something like that.

Alrighty, I'm going to move on to the next question but if anybody would like to continue to talk about this in the chat you're more than welcome to.

Alright, now we've got, what are the zoning issues most important to address using this data.

If you're not familiar with a lot of current zoning issues you could just start by talking about like the housing crisis or something that's a little bit more well known or general.

Daisy says depends on what the zonings were developed for but the best use case is where to invest and expand certain services. That's a really good idea.

And then, Aiden asks, is there a place where I can find research using the NZA. Yes, if you go on to our website.

We have a whole section dedicated to research collaborations.

I just put the link in the chat for you to

see. Aiden says populations with close access to public transportation. Oh, Anthony, do you want to Yeah,

that's a great topic to mention because I am currently working on a project that looks at Metro stations north of New York City and looking at a half mile buffer around each of these stations to see how much multifamily versus single family housing is allowed around there. Yeah, good idea. We're working on it.

We have zoning impact on housing insecurity. Yes, yes, yes, yes.

Okay, we're running low on time so I'm going to move on to the next one.

So, what are strategies that housing or land use advocacy groups could use to properly leverage the data in the California zoning Atlas, or just the all of it the National Zoning Atlas.

Okay.

This says increased zoning for multifamily homes.

Liz says I would imagine that land use advocacy groups could use the Atlas to see where the best use case would be to build more housing for low income people. Yes, absolutely.

Something that actually we've discussed a lot internally is about how affordable housing definitions and requirements, excuse me,

are very difficult to interpret interpret. And also, it's difficult to for us to find a way to standardize those.

So I think that that's a that's a really it's a really good important thing to look into.

Andy says I've heard some cities have amended their zoning rules to recognize tiny homes, which most places get classified as RVs, what category would that ball under. That's a good question, Andy, a lot of times, mobile home parks, end up classified as PRDs or plan residential development,

which is a little bit different than like traditional single family zoning because it's not exactly single family zoning.

So Tara, maybe we can come back to some more of those at the end and maybe we can do a transition over to Anthony for the presentation and keep the questions and comments coming in the chat and we'll be able to respond at the end if that sounds good.

Yeah, sounds great.

So, just wrapping up. We'd love your participation. Again, you can find the map at zoning atlas.org slash atlas. Once you start exploring share what you find and ping us with any zoning code updates, corrections or questions about the Atlas or methodology. If you do something there from your town that you don't think looks right, let us know.

You can follow us on Twitter and Instagram at zoning Atlas or find us on LinkedIn. And of course you can email us at zoning at sorry at info at zoning atlas.org and I'm pasting that into whoops.

Didn't mean to do that. I'm going to paste that into the chat. That's the email.

Okay, so we will be switching over now to our presentation. So I'm going to stop sharing for just a second, so I can switch over.

First up, Anthony La will be talking about test driving the first of its kind California zoning Atlas using zoning patterns and rural and agricultural counties to inform regional land use policy.

Yes, but to clarify, Tara will do a quick background on it first before I talk about the results of it.

Hello, everybody. Welcome to our presentation, not a workshop at this time of test driving the first of its kind California zoning Atlas using zoning patterns in rural and agricultural counties to inform regional land use policy.

Once again, I'm Tara Safavia and I'm here with Anthony La, we're both geospatial and zoning analysts at the NZA, as well as UC Davis alumni.

Test-driving the first-of-its-kind California Zoning Atlas: Using zoning patterns in rural and agricultural counties to inform regional land-use policy

Speaker(s): Anthony La, Tara Safavian, Dr. Clancy McConnell, and Dr. Catherine Brinkley – UC Davis

Abstract:

Land use laws influence quality of life; they directly impact access to housing, transportation, education, employment, and even food. Zoning, which dictates land use on a jurisdictional level, tells us what can be developed in any given area (and its permitted dimensions). Unfortunately, because every jurisdiction in the U.S. has its own zoning, there is little existing literature on how zoning affects land use patterns across regions and how these patterns change over time.

The National Zoning Atlas (NZA) is a publicly-available database that aims to collect and standardize all zoning codes across the U.S. into a single, easy-to-read format. It allows the public to assess zoning in their area, advocate for policy reform, and keep politicians and public administrators accountable. The UC Davis Center for Regional Change, in partnership with the Othering and Belonging Institute at UC Berkeley, led the California branch of this effort, collecting nearly twice the amount of data of any other state atlas and training a cohort of nine undergraduate GIS zoning analysts.

In this presentation, we will share preliminary findings from the first study to use data from the California Zoning Atlas, focusing on single-family zoning, the most restrictive form of land-use ordinance, at the parcel level. Our novel questions include: How do zoning patterns differ between urban and rural areas? How can zoning patterns inform conservation policies like California's 30x30 Initiative, which aims to conserve 30% of land in the state by 2030? How do single-family, multi-family, mixed-use, and non-residential zones vary between incorporated and unincorporated areas?

Transcript: Video Timestamp: 42:18

In this presentation we will share preliminary findings from our study that uses data from the California zoning Atlas in combination with the crop scape database from US National agricultural statistics service. Our focuses on single family zoning, the most restrictive form of land use ordinance at the parcel level.

First, here's a quick review of some key terms. If you don't remember zoning briefly is a tool that cities and counties use to designate and determine what and where developments can be built zoning codes are very highly individualized.

Next crop scape is an annual raster maintained by the George Mason, Mason University that identifies types of crop cover across the continental US on the right, we included an image of San Joaquin's 2023 crop scape raster. Each of these different colors here represents a different land cover type, which are mostly crop varieties, the except for the dark gray portions here which develop which represent developed area.

For those interested in the remote sensing side of things crop scape data currently uses Landsat eight and nine imagery, as well as Sentinel minus two a and two B satellite imagery. And also this data is collected during the growing season.

A few things that we're aiming to explore with this research are the following.

One, how do zoning patterns differ between urban and rural areas. So here we're mostly looking at differences between residential allowances and lot size.

Two, how does current land use effect. Oh, excuse me. How can zoning patterns inform conservation policies like California's 30 by 30 initiative, which aims to conserve 30% of land in the state by 2030. So here we're talking about how does land use affect how we enact conservation policies.

Third and finally, how do single family multifamily mixed use and non residential zones vary between incorporated and unincorporated areas. This question is pretty similar to number one but the distinction between them is important because incorporated jurisdictions aren't necessarily urban and unincorporated areas aren't necessarily rural.

Here is another look inside the National Zoning Atlas editor, which you may remember, remember we used to input zoning data for jurisdictions individual zoning districts. The top section is all data points collected and used by the NZA.

You can see here that for NZA purposes, we categorize districts as primarily residential mixed with residential and non residential.

However, for this project we included an additional categorization to the California jurisdictions in the editor, because we want to differentiate between single and multifamily residences. And it's important to note that per the NZA methodology we categorize one residence agricultural land as single family zoning.

Next, we joined our own categorized zone data to parcel data, such that we ended up with parcels assigned as single family multifamily mixed use and non residential.

And after some manual correction, we erased bodies of water as well as any unzoned parcels for standardization and comparison across jurisdictions.

Here on the right is an example of Fresno parcel data categorized by zone type.

You should notice that much of Eastern Fresno County is actually unzoned because of the Sierra Nevada mountains and some of Western Fresno is unzoned as well due to the coast range.

Now that we have our categorized parcel data here is where the crop scape data comes in.

First, we use the 2023 crop scape raster to create two new rasters, one with only agricultural land cover which we call our ag raster, and the other with only developed land cover which we call our urban raster.

Next, we use the 2007 and 2023 rasters to create a farmland change raster. To achieve this we reclassified all agricultural land cover as ones and all non ag land as zeros, and we then use the raster calculator tool in our Pro subtract the 2007 raster for the 2023 raster, such that the resultant raster consisted of three values, zero minus one and one, and the zero indicates no change in land use of either stayed ag or stayed non ag and that is indicated over on this map in yellow. The minus one indicates agricultural loss, which is indicated on the map in red, and a plus one value indicates agricultural gain which is indicated in green.

Finally, we clip the zone category layer by each of our new rasters, the 2023 ag land, the 2023 urban land farmland gain since 2007 and farmland loss since 2007. So the result is four different feature layers ag urban farmland gain farmland loss per county providing us with information about the zone category and area per parcel within each layer.

Okay, and I'm handing it off to Anthony now.

Awesome. Thank you. So, for analysis we looked at multiple counties but today we only have time to focus on two of them, San Joaquin County and Mendocino County.

So, because these results are pretty much brand new the formatting isn't quite so polished so I'm going to describe these graphs in detail. Since I know the text may be too small or the colors might be too similar for some viewers.

So each graph has the x axis showing parcel areas but between 11 different bins, and the y axis will show area per zone category all within the units of the US survey acres.

At the top the legend can be found matching the four zone categories to their corresponding color. So each set of four bars, like you can see on the bottom goes like this on the left is multifamily as the lightest green, then mixed use, then non residential and then single family as the darker screen.

So, kind of like the simplest way to interpret these results really quickly it would be to say something like for parcel sizes in agricultural areas between 40 and 100 acres single family zoning is the most prevalent. Right, that's just an example.

So with that established we can move on to actually interpreting these results.

So first starting with the top graph, showing the agricultural analysis, we see that a large percentage of land in agricultural areas is dedicated to single family zoning in parts of sizes of five acres and larger and particularly in the 100 plus acre bin.

In contrast, the results for the urban analysis below shows a different trend where there's an increase in acreage for all zoning categories, but single family zoning still has the largest overall size.

You can also see that urban areas have all urban areas have the largest acreages in smaller parcels, while the agricultural areas have the largest acreages in larger parcels. Some reasons for this may be due to some smaller parcel sizes being easier to convert to urban areas over time.

Because agriculture areas have been have an increased need for size to meet the demand of an increasing population.

Now moving on to farmland loss and gain for this county between the years of 2007 and 2023.

We can see that majority of farmland loss in the top graph occurred in single family zone areas of relatively smaller parcel sizes, with most of the loss occurring in parcels between half an acre and one acre.

This pattern connects with the large acreages for single family in the urban results, meaning that to some degree, the land that was lost there in farmland areas was turned into urban development.

Also notice in the farmland gain results below that the multifamily zone areas are low to none, showing that these areas are likely not preferable for farmland conversion as might be expected.

However, a majority of the gain is occurring in areas known for single family in parcels of greater acreage, especially in the 100 plus category reinforcing the agricultural preference for land of larger sizes in this county.

Right. So now moving on to Mendocino County.

The agricultural areas of this county favor larger parcel sizes with mixed use zoning being the most frequent differing from the single family majority that we saw earlier in San Joaquin.

This pattern occurs in the urban areas where mixed use zoning is more prevalent than single family non residential and multifamily categories in the 30 plus acreages.

An explanation for the for the large amount of mixed use zoning may be connected to the fact that Mendocino County zones much of the rural land as residential and commercial to efficiently use limited space.

But for farmland loss and gain.

We see that multifamily zone areas have little to no gain over the 16 year time period in Mendocino staying consistent with San Joaquin County. But between these two graphs, we see that farmland loss occurred mainly in single family zone areas and parcels of 40 plus acres and that farmland gain mainly occurred in mixed use zone areas of similar parcel sizes.

Together these results highlight a possible trend between the preference of mixed use areas for ag land and the large agricultural losses in single family zone areas.

Okay.

Now that concludes the day we have to show you for today. I know that was really quick but we were on the time crunch we only have five minutes left here so I didn't have to go a bit fast.

And as a reminder, these are preliminary results.

But please let us know if you have any more questions. Thank you.

Thank you all. I'm saying we can open it up to questions so I saw that there were questions coming in.

Q&A

I guess, I do have one and think, well I see one coming through. Okay. Well the organizers I will save chat and keep it along with video recording. Yes, I believe you also can save the chat as well.

Maybe in the upper portion there's three dots and you may be able to save it as well.

But what do you what are you all hoping, or what do you hope will come from this analysis like what is it policy change is it sort of out of curiosity.

That is a good question.

The, this study is just our original four counties, it would be, it would have been wonderful to do the whole state as Anthony and Tara can attest because they've done the vast majority of the GIS work on this project. So, is a pretty time intensive to study just what we did, there was a lot of issues with our spatial join joining the parcel data to the zoning data, as I'm sure everyone who's in GIS knows doing that kind of thing manually is a lot of work.

But little studies like this can inform regional policy or even statewide policy, just even going off of the few things that Anthony had time to present today, demonstrating that there are incredible differences between rural and developed areas, and that we have another study or another part of the study that shows the difference between incorporated and unincorporated areas, you know, cities versus county area that can really provide potentially a lot of effort or emphasis on channeling funding to certain types of jurisdictions, and a lot of the money currently goes to developed areas to cities, but we also need to change the way that zoning is developed in unincorporated areas there are a lot of urbanized county areas and if we could channel, perhaps multifamily housing money or policies that are in effect, county codes that that could make a big difference and then what we're more concerned about in this project or at least that I like to think of as a conservation scientist is that the project could inform how we're conducting conservation, like a 30 by 30 data set for what counts as conserved land and what counts as conservation easement, and almost all of that is happening in counties,

but counties are also underfunded they're poorer, they're more rural, so that tells us we should be channeling most of our funding to counties for conservation.

And that could happen in the form of zoning on large parcels but perhaps also small parcels, so it's helping kind of parse out all these little intricacies about where different types of land are and how those patterns are changing over time.

Thank you. And I see another question there and I can read it, and I guess the, and you can no one respond to it the map look like there was a really widespread expansion of Ag land from 2007 to 2023.

I'm not saying Andy but we, we haven't yet gotten, you know, this is so fresh I mean this is literally like last week, Anthony and Tara got these tables done. So we haven't totaled everything up yet but that's a good question.

The 2007 imagery are, you know, Atlanta has been around for a long time but it's pretty good the remote sensing I think is pretty good and we're, they are classifying it.

And they're taking it from 100 different attributes you know there, it goes down as fine as like this is a melon field this is a cucumber field this is alfalfa, all that just into Ag and developed and the remote sensing is pretty robust for what for differentiating between crops and urban. So, I'd say I'm reasonably confident on that.

Oh, could cross check yeah.

I'll just add, hi, Catherine, one of the faculty members who's been involved in it that the NASA census Ag census data is satellite imagery and so it'll change land and active farming to non active if fields are fallowed. That can also change what what is perceived to be ag land versus what is fallowed ag land.

Well, thank you all.

It's the top of the hour, so we will save the chat. The recording will be available after the end of this week will notify you. So thank you all if you are at Berkeley there is a mapathon happening in person on the campus of Berkeley. Otherwise you can join us again at one o'clock this afternoon for GIS and AI tree range maps drones and digitizing but

Anthony, Tara, Clancy, thank you so much for this wonderful session to kick us off for UC GIS week.

Thank you.

Thanks all.