# Modoc Plateau Vegetation Mapping Project Rollout, October 2nd, 2020.

## Section 6: Using VegCAMP and BIOS data for Ecological Site Descriptions, State-and-Transition Models, and Rangeland Health data development

### Slide 1 (0:00): Introduction

Today I will be talking about ways NRCS has been attempting to use some of the great data that we've heard about today. We are all finding that budgets are shrinking, and time in the field is costly and labor intensive, and so although we all have varying goals and objectives, the core information we are all trying to collect to better inform decision-making and management across our natural landscapes is essentially the same. So pooling our data, in my opinion, will allow us to prioritize resources within our own organization by collaborating and using the data that's available like this data today.

### Slide 2 (1:08): Talk Overview and Speaker Introduction

I plan to briefly touch on the definition of ecological sites. I wanted to give you a sense of ecological sites and what ecological sites are; some of the value of the documents and the concepts, and then go over state and transition models. And then go over some quick examples and ways I see the crosswalk of their data with the data that we collect and use to develop our ecological sites.

I'm Kendra Mosely, I am the NRCS, Soil and Plant Science Division Regional Ecologist, responsible for Ecological Site Development, for Regions 2 and 8 which are becoming the SW Region, which encompasses California, Nevada Arizona, New Mexico, Utah, Hawaii and the Pacific Islands. I used to cover the northern part of the west coast which included Oregon, Washington, Idaho and Alaska; but we have reorganized boundaries, so I am going to be covering more of the desert region. I have been with NRCS going on 15 years and have been in California for most of them as either an Ecological Sites field specialist, a rangeland ecologist for the State NRCS, and for the past 10 – 12 years, I have been in this position that I currently hold.

### Slide 3 (3:17): Definition of Ecological Sites

An Ecological Site is described as a distinctive kind of land, with specific physical characteristics, that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation, and its ability to respond similarly to management actions and natural disturbances. So in other words an Ecological Site is a kind of land with similar characteristics and response to management. Our ESDs are reports that characterize and document the Ecological Sites, by synthesizing the existing knowledge, research and data of an Ecological Site, including climate, soils, hydrology, state and transition models; and the interpretations of that information and its characteristics in relation to land use planning and decision making. Ecological Site incorporate landscape characteristics like geomorphology, elevation, landform position, slope, aspect, and soil characteristics that strongly drive soil temperatures, soil moisture, and soil nutrient regimes. These, in turn, influence plant species responses including distribution, abundance, and productivity. Our natural systems seldom include distinct boundaries in space or time and Ecological Sites include a certain amount of variability and uncertainty, however the fundamental assumption for the Ecological Site

concept is that locations with common soils, climate and
geomorphology can be delineated into units that support similar plant species and respond similarly to management actions and natural disturbances.

### Slide 4 (5:07): Purpose and Function of Ecological Sites and ESDs

Land management and restoration are more effective when the landscape is subdivided into more manageable parts. When the unique processes and abiotic factors are identified and broken into these more manageable parts, it allows for more specific, manageable goals and objectives, monitoring plans, and assessments of successes and failures. The adoption of Ecological Site helps to identify the appropriate restoration targets, and when they are developed properly, Ecological Sites bring together several concepts including plant-soil interactions, succession and climax, non-equilibrium and community structure, and the ecological gradients along spatial heterogeneity.

### Slide 5 (5:51): Example from Pygmy Forest and the importance of the vegetation-soil relationship in ESDs

Similar to the slide Rachelle showed this morning, our Ecological Sites the delineate patterns and relationships on the landscape, recognizing different vegetation expressions. But we take it one step further by looking at more than the above-ground portions. Ecological Sites attempt to incorporate soils and below ground processes, that provide the foundational properties that result in those above ground vegetation patterns.

### Slide 6 (6:22)

6. We've been addressing these types of soil-vegetation relationships, it's been a core of the soil surveys of the NRCS and SCS before that; and since the inception of soil survey in the Dust Bowl Era. And I chose this as one shot from one of our old manuscripts from Mendocino County, that is a diagram of the area Rosie talked about earlier in the oligotrophic, wetland portions of Mendocino County and the Pygmy forest. You can see that even back then, we delineated out landscape and the relationships of the different patterns and soils

### Slide 7 (7:09)

We believe that recognizing the abiotic portion underlying the vegetation patterns is more static, changing at a slower rate than the above-ground biotic components that are rapidly changing as a result of numerous pressures and stressors that we are all extremely aware of these days in California, including massive fires, extensive droughts, etc. that can completely remove the vegetation and leave only a blank slate on the landscape. Connecting our vegetation to our soils and the relationships between them provides the key information for land management decision-making and monitoring; and highlights where the limited funds we all work with can be focused to see the best results possible.
Making it easier to highlight Ecological Sites that may be vulnerable, hard to restore, resistant to disturbances, or resilient and lower-risk to disturbances.

### Slide 8 (8:06): Ecological Sites are Correlated to Soil Components

As I previously mentioned our Ecological Sites are related to our soil descriptions, mapping processes and databases, and will be found linked at the component level. There will only ever be one Ecological Site related to one soil component. However, our mapunits that you find in our soil surveys may contain multiple components and these

components may have the same Ecological Site linked to them, or they may not. In these examples hear the Stellar mapunit has two components: the Stellar clay-loam and the Stellar clay-loam flooded, and therefore there are two different Ecological Sites one more of an upland site and one that is more generally driven by hydrologic processes and greater soil-water availability. Where in the other map unit mapunit the list of components are related to the same Ecological Site. And in this case, it's most likely due to different soil taxonomy differences that the vegetation doesn't care about at the scale of Ecological Site and soil mapping, but the soil taxonomy does.

### Slide 9 (9:15): Nesting Ecological Sites into Landscape Framework

So we also use a hierarchical organization to our mapping at different scales in order to successfully define and describe ecological processes, patterns, and anticipate ecological behaviors. Our Major Land Resource Areas (or MLRAs) and our Land Resource units, which are sub to the MLRA delineate the landscape to provide an initial set of boundaries across the country that will have the most impact on Ecological Sites within the MLRA or LRU. Each level of the hierarchy represents a unique set of attributes, scale, and products. Critical in the analyses and development of products at all scales is explicit definition of the concepts that distinguish individuals at each level. So for example to think about the Modoc Plateau, NRCS calls that area Major Land Resource Area 21: the Shasta and Klamath Buttes and Valleys which then encompasses a large area of buttes and valleys in southeastern Oregon and northeastern California. It's defined by externally drained basins which covers a diverse blend of volcanic uplands, reservoirs, lakes, narrow valleys, isolated volcanic peaks and valleys along the east side of the Klamath and Cascade mountain range, which are characterized by precipitation patterns that deliver most precipitation during the winter.

### Slide 10 (10:48): Differentiating Ecological Sites

Our Ecological Sites, as I've mentioned, are differentiated on their ability to produce the kinds, amounts and proportions of vegetation that respond similarly to disturbances. So therefore, our criteria for distinguishing between sites is evaluating the composition and structure of the vegetation, the proportion of species and how they pattern across the site, and their annual productivity which is viewed through net primary productivity. If you are familiar with Ecological Sites or out older Range Sites, many think of this productivity data with respect to foraging by grazing animals. The production information that is collected and used to define an Ecological Site is not and should not be forage values, and is not meant to reflect only grazing data. It's reflecting the full capacity of the site to produce growth in vegetation in a year and will depend on site and soil and climate characteristics. This production information serves as the baseline data that many calculations can be derived from, and those things would include calculating forage values, AUMs or stocking rates, for example.

### Slide 11 (12:02): State and transition models

So an accurate description of the temporal dynamics of an Ecological Site is essential for identifying management goals and objectives, selecting and implementing actions, monitoring progress, and assessing effects. A state-and-transition model is the preferred method for NRCS to describe these temporal dynamics of an Ecological Site. STM display and describe the range and of multiple stable states which include unique combinations of biotic and abiotic attributes and the transitions between these states,

which include driving forces, ecological processes.

### Slide 12 (12:43)

They reflect the potential for multiple stable plant communities that could be present in one Ecological Site. A state includes one or more vegetation communities including associated dynamic soil properties that occur in dynamic equilibrium with a particular Ecological Site and are functionally similar with respect to soil and site stability, hydrologic function, and biotic integrity. A state interacts with relatively static soil properties and topography that define an ecological site to produce persistent structural and functional attributes associated with a characteristic range of variability. A state may include a number of different plant communities known as community phases which are connected by community pathways. Community Pathways describe the causes of shifts between the community phases.

Community phases can include concepts of episodic community change, as well as succession and seral stages. Community pathways can represent both linear and non-linear plant community change.

Community pathways can be reversible in part by changes in natural disturbances, weather variations, or changes in management. Steps between states are called Transitions. Unlike community pathways, transitions are not reversible by altering the direction or intensity of factors that produce the change. Therefore, a transition from one state to another is often referred to as crossing a threshold. Transitions between states in an Ecological Site are often caused by a series of feedback mechanisms that alter soil and plant community dynamics and contribute directly to the loss of a state's resilience.

### Slide 13 (14:33)

So, the Ecological Site and State and Transition Model help to describe changes through data, photos, and discussions of literature. They describe and define recognizable plant communities or sets of communities that differ in ecological structures and functions other plant communities that may exist on the same site. Ecological function is described as the way in which a community processes energy, water, and nutrients. The existence of states on an Ecological Site information describing these processes and how one state differs from another on a site. Each state has unique attributes important to decision-making such as resilience, specific management actions or disturbance regimes that maintain that state or cross the site over a threshold to an alternative state

### Slide 14 (15:26): Ecological Site Vegetation information and transitions

These transitions between states should emphasize the hydrologic and vegetation indicators that signal an impending change and the dynamic processes that reduce the resilience of a state.

### Slide 15 (15:42)

Vegetation properties and soil processes are included in the description of a transition between states, and examples of dynamic soil properties that change on a recognizable timescale can include soil organic matter, bulk density, pH, salinity, soil erosion, and aggregate stability. These properties parallel changes in plant communities and transitions between states, and they can be used to understand the complexity and risk of transitions.

## Slide 16 (16:15): Data Collection and creation of Ecological Sites

The process and methods for differentiation and description of Ecological Sites involves several iterative steps that begin with the foundation of numerous data points that are rapid and assess the full range of characteristics and variation; moving to more detailed data collection that fine tunes the Ecological Site characteristics ending in focused data collection that gathers all the attributes needed to describe the reference characteristics of an Ecological Site. So here we have at the bottom numerous data points collected through low-intensity inventory techniques that are used to form rapid characterization of vegetation communities and associated environmental settings, which is then used to formulate the Ecological Site concept. Reconnaissance observations, traverses, and ocular estimates, and photos will assist in helping to become familiar with the general features such as vegetation patterns, landforms, plant species compositions, surficial geologies, and soils. The iterative stages include initial field sampling, analysis of data defining Ecological Site characteristics, field testing of differentiations, and modifications as needed. Differentiation of Ecological Sites and associated plant communities in reference or alternative states is essentially testing a working hypothesis. Our medium intensity sampling is intended to be a rapid process that focuses on environmental ranges associated with our general Ecological Site hypothesis. Relationships among disturbance processes, vegetation composition and structure, dynamic soil structure are all considered during that rapid phase. And then that high- intensity sampling provides that detailed information for the few sites that typify the Ecological Site concepts that are established. They should adequately represent our central concept of each of the Ecological Sites properties. So here I added just a couple points to show where I personally view the data that VegCAMP collects, and where it fits in our process, especially if we return to the locations of their releve plots and gather a bit more detailed soils information, and confirm the component the data is directly related to in our database. If we only need to return to these locations to confirm soils and relate to vegetation that was collected already, we significantly reduce the amount of time required to build these sites into Ecological Site. The Rapid Assessments would also assist us in confirmation and a better amount of data to test the extent of variation across each Ecological Site.

## Slide 17 (19:06): Data collection and how VegCAMP data can fit in/enhance ESDs

So our ESD or Ecological Site Descriptions include a lot of plant tables that describe site characteristics, ground cover, and canopy structure, percent cover, and height classes, plant species composition, and the annual production values, by species and by functional groups. When they are in the forested systems we also include site index and DBH.  I wanted to show that and then compare it to the sheets we saw earlier from Rachelle that gather all of that same information.

## Slide 18 (19:48)

Here is a map of the datapoints from our Ecological Site data. In the pink or purple dots, soils point data, where our soil scientists have gone out and collected a soils description or confirmation pit, the yellow is where our Ecological Site specialists have gone out to do vegetation data collection using our protocols, and the blue dots are from the VegCAMP data that I overlaid on top of our soils mapunits, so we could go in and actually look at some of the data all together. One of my goals is to see if you can use these already described soils and use the data to fill in some of our vegetation data

gaps, where we weren't able to visit and build concepts or fill in data or improve concepts we've already developed.
Opportunities like those shown within the yellow circle provide us with opportunities to improve our datasets without necessarily revisiting the location in person , reducing time and travel investments, while still providing us essential data.

### Slide 19 (21:04)

And so you can see here, when I overlap the layers and open up the attribute table, I can now see our mapunit called Loafercreek-Gopherridge has one of their datapoints that was associated with the Quercus douglasii – Bromus spp. – Daucus pusillis association, and if I go back to our Ecological Site, we have a Blue Oak Ecological Site concept that was developed for that with only two points, so now we have one more data point we can use to refine that concept and improve the dataset.

### Slide 20 (21:45): Databases and information compatibility between VegCAMP and Ecological Sites

And just like VegCAMP data, which goes into an Access database, our soils information and our vegetation information goes into our National Soils Information System Database. They are both Access database derived, ours is a bit bigger and more complicated, but provides us with an opportunity to crosswalk the data and share the data within our databases, and look at them spatially.

### Slide 21 (22:20)

The information that goes into our ESD, after it's all collected, and analyzed, and evaluated, and the concepts has been fully formulated; the ESD is written and the State and Transition Model is developed. So this is just and example of one of our ESDs…

### Slide 22 (22:36)

And here is the information that Rachelle mentioned earlier, that they put in their reports. It is a similar type of process, and would both provide us with vegetation patterns which support and complement and improve the information that we provide in our Ecological Sites.

### Slide 23 (22:55): alliances, associations, and State and Transition Models (STM)

Other easy ways to use the alliances and associations is to provide further confirmation of the various states and community phases in our State and Transition Models, augmenting the data that we collect to support the reference state community phases with data and information from the vegetation mapping data and reports assists in building better, more data-supported State and Transition Models. Rachelle mentioned earlier, the special project they did with juniper expansion, that would be really easy to pull out all of the data, based on the process Rosie showed us of identifying where the juniper expansion has been noted, and what the age classes are, and that could help us identify which data plots need to go with which community phases in our State and Transition Model.

### Slide 24 (23:50)

Other ways to use the alliances and associations is just to provide confirmation of the various states and phases…I already said that…with smaller budgets and limited time in the field, it is even more difficult to gather all the data for the alternative states and

community phases as well, and so many start as evidence and literature supported only. We generally don't have a lot of time or data collected yet for some of the alternative states. The problem with that is that many land managers and ecologists in California are operating in these alternative states and could really use this data to define these states and community phases as well. So of the associations in State 2 dropping those points to see where they fall on our soils maps and our soil data could rapidly improve the descriptions for those states in the model, providing better data and baseline management decisions.

## Slide 25 (25:03): Rangeland Health Reference Sheets

And lastly, our Ecological Site Descriptions also include rangeland health reference sheets that are described in the interpreting of rangeland health handbook. Rangeland health is intended to be used at the Ecological Site scale or equivalent landscape unit using the Ecological Site Descriptions and their site- specific State and Transition Models to inform and develop the reference sheet descriptions and ecological reference areas when available to conduct our assessments of rangeland health. This information includes descriptions of plant cover, production potentials, describes typical bare ground, structural and functional groups, litter and invasive plants, all information that can be gleaned from the vegetation mapping data that we've seen today. Many of California's ESDs still don't have their rangeland health reference sheets developed along with the Ecological Sites and ESDs, and so this could be another opportunity for us to improve our rangeland health reference sheets in California.

## Slide 26 (26:07) Questions and wrap up

26. So that is all that I have for you today. I hope you found it interesting and useful. If you would like
more information on Ecological Sites and ESDs, please don't hesitate to contact me.

Rachelle: That was great

Kendra. Betsy: I see a hand

raised by Diana.

Diana: Yeah, I have a question. If VegCAMP could collect soil data, what would that be? Soil data that would help you.

Kendra: Well, as I showed in the pyramid, the rapid assessments don't need a whole lot more than what you already collect. But at the releve level, usually what we do is dig enough of an auger hole that we can confirm the component as it's described in our database or the soil survey. And then we also note at what horizonation levels certain soil profiles have and rock fragment content and that kind of thing; as well as making sure we are capturing the things that matter most to how the soil and site functions ecologically. So, we generally need a deeper and more complete description, but it doesn't require a ton of data. We've talked about this some in our vegetation committee meetings about what would be required, I don't know that it would take a whole lot of time, it would just be a training aspect.

Rachelle: you have to dig a little pit, right? To measure the horizons and

whatnot. Kendra: yeah

Brian: How big is the auger that you carry?

Kendra: the augers go from about 4.5 ft to 5 ft.. The ones the soil scientists carry around can be extremely long and come in 3 different pieces. And some of the shovels that they need to get through those argillic clay soils are pretty ridiculous to carry around.

Brian: Not something we can easily carry in the field with us.

Julie: what we talked about in the veg committee is that we would need a soil scientist to come with the
crew, right. It's like the mid to upper level of your triangle that you showed us.

Kendra: or at least someone who has been trained well enough to know enough about the soil to get that information. We ask our range cons to do a lot of this work when they do our range inventories, so they've had to be trained, and there's actually a protocol in the NRI range inventory on how to do soil confirmations. So I think there's a process already in place that would be easy to use, but NRCS also has the Resource Scientists that could potentially offer assistance and stuff like that. And like I said, some of this can be done post-visit as well, if we are aware and can return to the same location, so we could do something like that as well.

Diana: And so how long does it take once you are at the site? I know it probably depends on soil type, but generally.

Kendra: It really depends on the type of soil, although if you have really shallow to hardpan, you can't get much further than that without needing a backhoe or something like that. But you know if you have information about the soils already, so if you know what soils to select from to confirm, it's pretty quick. If the information is harder to get and you are just out there trying to describe what you are looking at,
it can take longer. I'd ballpark 20 minutes of extra time in a data collection protocol to do the soils
confirmation
part.

Diana: Ok,
thanks!

Rosie: Any other questions?

Rachelle: Any questions specifically for

Kendra? Betsy: I see a question, Michael

Vasey.

Mike: I just wondered to what extent you investigate wetland soils? I'm really interested in tidal wetland
soils and diked wetlands.

Kendra: You know, it's really great that you ask that, because that has risen in our agency nationally that's something that needs to have more time spent on it. We have a special team in our unit called the coastal zone mapping team, and they've actually

started looking into this over on the eastern side of the country. So there is some work on that being done on how that protocol and process will work, to maybe even address sub-aqueous soils. Where we're right now struggling is that it is a fairly expensive process with needing a lot of specialized equipment, and so we've been working on building up that possibility of sharing responsibility with our partners that have some of that equipment in trying to get some of that accomplished, but it takes a little bit more in our agency, and the way we work—it takes a lot of outside pressure to move forward on the needs of outside individuals. Going to our California NRCS, and expressing interest in having that information would fast track that in California.

Mike: Thank you very much.

Kendra: You bet, and I would be happy to work on some of that. It's an area I find extremely interesting,
and would love to do more in.

Mike: Super!

32:55

Julie: …….so quiet

Rachelle: So different from doing an in person meeting,

right? Kendra: yes

Rosie: Well thanks Kendra, this has been great. I learned things. I enjoyed it a lot. I want to thank everyone who came. We mentioned a couple of times that there are going to be follow ups. So I am just going to reiterate what we've planned for the follow ups. Andrew Johnson is going to present on how to use the vegetation data in emergency stabilization work for BLM. We are planning on doing a more in- depth training on sensitive natural communities and we also want to put together a session that highlights the work that was done on bird distribution, but also other habitat-focused uses of vegetation data. So feel free to contact me if you might want to participate, like actually present on a habitat based one and we will see about getting one together soon. And finally, I want to ask Julie, I know there's something planned for CNPS, that could interest some people here, so if you want to mention what CNPS is going to do training-wise, that would be great.

Julie: Actually I think Betsy could speak to that, or Jennifer, since they are the ones

presenting that. 35:18

Betsy: Jennifer please jump in if I am misrepresenting something, but, we want to build off of what Rosie was doing in terms of demonstrating BIOS, and taking people through live exercises, and interacting with that data, as well as showcasing the Manual of California Vegetation and how to interact with that data as well, using real-world examples.

Rachelle: Is there a date for that one?

Betsy: That one is likely in November, correct Jennifer?

Julie: From what I believe, yes, but it hasn't been scheduled yet. I think CNPS is trying to

get some information from the general public about interest in a variety of workshops and this would be one of various workshops. I think they are trying to get some input right now to switch to a digital online workshop.

Betsy: Do we have time for one more question I have? I have one from Darin

about veg map. Rosie: Sure.

Betsy: Maybe clarify how the geology was used to inform the vegetation map, and whether you use a soils layer in vegetation mapping. I think there might be some confusion around the allocation vs. the vegetation map.

Rosie: For the Modoc, I didn't actually use a soils layer. When we did an allocation for the Great Valley, we did and when we mapped Mendocino Cypress: we used SSURGO data. But in terms of other uses for soil info., I'm actually going to defer to the mappers, to GIC and AIS, who've done some of the work, I'm curious: do you guys bring up a soils map and make use of them in creating your mental models for how you determine what vegetation types there are?

Brian: You know, I've tried bring the State Soil layer in, but it's just way too coarse most of the time. Not
very useful, it's just easier to use Google Earth and tilt it around and look around that way. Yeah, I wish it was finer and more current, and maybe that's happening, I don't know.

Julie: And I would just say, maybe in the broad view that there are certain geology layers, depending on the study area, that help inform broader sets of alliances that would be mapped in an area. It can be
useful, it's just a project-by-project basis.

Rachelle: Is John Menke on still? You could maybe speak to if you use soils or geology.

Rosie: I'm not sure he's still on.

Rachelle: I know geology can be used to stratify for sample allocation, and maybe that would help
inform those units Kendra was referring to, I think that might be what he's referring to. Specifically stratify on soils, so we know we are sampling in widely distributed—all the different soil types in the
study area. And I think we've done that before. You know, for soil types that drive vegetation.

Kendra: Yeah, I was just going to pipe in. When he said state soils map, did he mean NRCS map or some other kind of soils map?

Rosie: And SSURGO or

STATSGO? Brian: yeah, the

STATSGO.

Kendra: STATSGO? Well I could see how STATSGO wouldn't be very useful to you, but hopefully the SSURGO-level data is better for you. I also think NRCS has lacked some time and staff in helping people learn how to use our maps, which is what part of

the issue is. I don't know that it is always clear how to interpret the data that are within our map units. And maybe an opportunity to do some more trainings on how to use the maps that are currently available could be done.

John: Hi, this is John from AIS.

Rachelle: Hi John, do you want to say how you used soils maps in mapping.

John: Not specifically in Modoc, but we are using serpentine geology, even though it is a little more generalized for the Marin project; and we have used soil maps for predicting Arctostaphylos types in other coastal locations. So we do use those. A lot of times they're a little too generalized for mapping though.

Rachelle: yeah, kinda how Brian just said. Great, thanks John! 41:19

Betsy: And we do have one more question…is there a mailing list, Rosie? How can people stay in the
loop, like the Bureau of Land Management topic on post fire.

Rosie: so everyone that accepted the meeting, which included people we didn't have originally on our list, I put in a spreadsheet, so I have that and would use that for any of these future ones. But also, if you want to make sure you are on the list, put your information in the chat, and we will make sure we add you to the list. 42:21 Well if that was the last question, thanks so much to everyone who did the work to get this presentation ready, and thanks to everyone who showed up and showed interest in this new vegetation project, and hopefully this will help you make good use of the data. 42:48

Rachelle: Yeah, and we'd love your feedback! Maybe we can do a post-survey about all this data and if
there was something you thought maybe we skipped or what…

Diana: yes, that would be good. Let's send out a little survey, and get some information about how we can do better, what we missed.

Rachelle: Thank you Rosie for all you did.

Julie: yeah thanks for the coordination you did behind and in the scenes…