Transcript of the June 23, 2022, *Science Informs Managing Working Lands for Lesser Prairie-Chickens Webinar*

Good afternoon, everyone. Thank you for joining us. We will begin our webinar shortly. Good afternoon, everyone.

Our conservation webinar is about to begin. To confirm audio is working properly please indicate in the chat window if you can hear me. Fantastic. Thank you. Today's webinar will be recorded. We will begin that recording now. Welcome to the June edition of the conservation outcomes webinar series. My name is Elizabeth Creech Natural Resources Communication Specialist with the USDA Natural Resources Conservation Service Resource Inventory and Assessment Division. It's great to be here with you today. We host this webinar series to highlight activities across the Natural Resources Conservation Service or NRCS related to efforts to assess and quantify the impacts associated with NRCS conservation programs. These one-hour live webinars occur on the fourth Thursday of even numbered months at 3 o'clock p.m. eastern time. We will get started with today's presentation in just a moment, but first a few logistics. If you would like to receive e-mail notifications with information on upcoming webinars, please subscribe to the NRCS conservation outcomes topic via GovDelivery. You may do so by following the instructions on the screen. A direct link titled subscribe for conservation outcomes webinar gov delivery e-mail updates is available under today’s links. You may access those at the bottom left of your screen. As mentioned earlier, today's webinar is being recorded. All participants joining the webinar are in listen-only mode and all audio is being broadcast through your device's speakers. If you are having problems with audio sometimes computer or mobile device headsets can help with the audio quality and volume. It may also be helpful to log out and back into this webinar session. Please note that there is a closed-captioning link provided in the today's link box. You may click this link to access live captioning. The captions will open in a new browser window where you can follow along with the presenter's comments. We will also provide a transcript after the live event along with the event recording. Please note that additional helpful links are available in the today's link box. The slides from today's presentation are available for download in PDF format under the today's handout section. If you would like to make the slide presentation pod larger you may use the icon with the four corner arrows that appears in the upper right of the presentation box to turn on and off the full

screen view. Finally, we encourage everyone to actively participate in today's webinar. Please type questions or comments into the Q and A box that you will shortly see appearing on your screen. You can submit your questions and comments throughout today's presentation. We will address as many of them as we can at the end of the event. With that, it's time to get started. I am pleased to turn the microphone over to Dan Mullarkey. Dan is our NRCS resource assessment branch leader. Thank you and over to you Dan.

>> Okay. Thank you. Welcome folks. Thanks for joining us today. Welcome to the latest installment of NRCS's conservation outcomes webinar series. NRCS has a long history of working with farmers and ranchers to help them conserve the natural heritage and sustainability of their operations. These recurring webinars give us a way to communicate to our stakeholders the importance of voluntary conservation programs, the funding provided through the Farm Bill and to highlight some of the documented outcomes in terms of natural resources and sometimes in terms of economic benefits. For nearly 20 years, our Conservation Effects Assessment Project or CEAP has been documenting outcomes for a variety of resource concerns. CEAP works closely with our science partners and other agencies and academia and outcomes generated help improve conservation delivery across the agency. Today's webinar is another great illustration of how science-based assessments not only quantify wildlife response-- in this case we're talking about lesser prairie-chickens-- but also generate important insights as to how planners and producers can improve the land for this species and for others that also rely on intact range lands of the Great Plains. In working with landowners and producers we rely on the best science coming from our university partners to provide the best assistance possible to our cooperators on the land. Today we're excited to share a compilation of findings from numerous studies led by our science partners at Kansas State University focused on improving our understanding of how lesser prairie-chickens respond to various land uses and management practices and how producers can help this at-risk species on productive working range lands. Thank you again for joining us today. With that I would like to turn it over to Charlie Rewa our CEAP wildlife component leader who will introduce today's presenter.

>> Thanks Dan. I'm Charlie Rewa, the NRCS wildlife component leader for the Conservation Effects Assessment Project. Thanks again for joining us this afternoon. We're excited to share some outcomes findings and science generated from many

years of studies supported by CEAP and others aimed at improving our understanding of habitat needs and management of the lesser-prairie chicken, an iconic prairie grouse of the southern high plains. We'll see how the science generated informs our work with ranchers and landowners managing grassland habitats that benefit chickens and producers alike. The agenda for today's webinar -- first, I will share a few words about CEAP wildlife component and the new Great Plains grasslands biome framework for conservation action. And then turn it over to Dr. David Haukos associate professor at Kansas State University and the Kansas cooperative fish and wildlife research unit. We should have time at the end to address questions that come up during the presentation portion of the webinar. The Conservation Effects Assessment Project wildlife component..well CEAP has several components. Today we're just focused on the wildlife piece. Our objective is to document Fish and Wildlife outcomes with NRCS conservation work and really to use those outcomes to inform a more effective conservation delivery. We work across the agency division in headquarters our state offices and others to identify priority assessments to work on. And as Dan mentioned we rely on cooperative partnerships with the wildlife science community including universities, NGOs and other state and other federal agencies. Since 2005, CEAP wildlife component has been supporting outcome based assessments throughout 80 cooperative agreements with science partners. Assessment findings reports and other documents can be found on the CEAP website included in today's link. The lesser prairie-chicken population occupied range significantly declined since the 80s. Greater than 99 percent of the current range occurs on private working land. So in the past decade NRCS has been working with land owners and producers to improve lesser prairie-chicken habitat on these private working lands. Science partnerships between NRCS and Kansas State University and others have been documenting outcomes of this work and developing the science needed to inform effective conservation delivery for the benefit of lesser prairie-chicken and the producers. Since 2016, CEAP wildlife has been working in partnership with Dr. Dave Haukos at Kansas State and other state and federal science partners to assess the habitat needs of this iconic species and help us understand how our work can benefit and. Much of the science generated by Dr. Haukos and others have been used to develop the recently released Working Lands for Wildlife Framework for Conservation Action in the Great Plains biome. With this framework while we recognize the conservation challenge presented by the historic decline of lesser prairie-chicken population, through the Great Plains framework NRCS and its partners have created a strategy for conserving species while maintaining

livelihood on productive range lands. A major scene of this strategy is wildlife conservation through sustainable ranching. The framework lays out specific recommendations for using Farm Bill conservation programs to strategically focus intact focal areas of working grasslands to address the major threats of the biome which are woodland expansion and land use conversion. By identifying core areas and taking action to defend, the framework provides hope and a pathway to effective conservation of prairie chickens and other species that rely on grasslands of the Great Plains. The science generated by Dr. Haukos and others informs the framework and our work with producers on sustainable grazing and other conservation practices. So now I would like to turn the floor over to Dr. David Haukos, for the main webinar presentation. I will be back at the end for the Q & A session. Dr. Haukos, the mic is yours.

>> Thank you, Charlie. I appreciate the opportunity today to spend a little time talking about some of our research that we have been doing through Kansas State University in conjunction with USDA and many other partners. First off, I would like to thank Charlie for helping to facilitate this research. I also would like to thank Christian Hagan who was a major factor in many of these projects associated with USDA and NRCS. Much of this work could not have been done without the extreme effort of about 15 graduate students and post docs along with 75 or so field technicians working on 40 different pieces of property with 40 different private landowners throughout the species lesser prairie-chicken range in Kansas and Colorado. What I would like to do today is spend a little time talking giving a little context and background relative to the ecology of lesser prairie-chicken and then go into some of these practices that can be used to manage lesser prairie-chicken habitats and some of the standards that should be goals in terms of developing conservation strategies for this important bird. The lesser prairie-chicken is one of the iconic species of the southwestern Great Plains even though they occupy a relatively small area of the Great Plains, their range does include areas that are dominated by mid grass prairie in the eastern part of the range short grass prairie in the northwestern part of the range and then in the southwestern part of the range sand sagebrush and sand shinnery oak prairie where associated with shrub land and grassland. Lesser prairie chickens need large prairie landscapes to persist. The area or the size for a sustainable population is somewhat uncertain, but you will see numbers anywhere from 20, 30 up to 50,000 acres to sustain the population. Their occupied range is characterized by extreme environments and climate. They are frequently experiencing or stressed by intensive drought, extreme weather events

and wide temperature ranges. They are really hearty unique species and yet they have a very wide range of tolerance for certain climatic and weather conditions. Throughout much of their occupied range grazing is the dominant land use. McDonald defined the current occupied lesser prairie-chicken as four different ecosystems. Two-thirds of the current occupied lesser prairie-chicken range occurs in Kansas and Kansas also supports about 90 percent or more of the current extant or current populations of lesser prairie-chickens. These four defined eco regions have very unique landscapes and a range of threats with differing relative priorities of impact to lesser prairie-chicken populations making conservation somewhat difficult to generalize across species range. These four ecosystems have been defined in the northern part of the range as short grass prairie Conservation Reserve Program or CRP mosaic where you have short grass prairies primarily dominated by Buffalo grass blue grass intermixed with CRP lands and some mid grass. Occasionally tall grass species. To the west and little bit south of the short grass prairie CRP mosaic ecosystem or region is sand sagebrush prairie in south eastern Colorado southwestern Kansas which up until the 80s had lesser abundance. Down in eastern New Mexico and western Texas in the sand shinnery oak prairie, you have a very isolated population of lesser prairie-chickens that are dependent upon a very unique landscape form that is very sandy, has dunes and really harsh environmental conditions at times. In the far eastern part the most area where has great amount of rainfall lesser prairie-chickens are found in the mixed grass prairie which is probably the largest eco region in terms of area, but its density has been going down for quite some time in terms of the number of birds. Contemporary populations of lesser prairie-chicken peaked in the 70s, 80s have been declining since then. This figure is based off of some estimated population values for the entire range of the lesser prairie-chicken. However, since 2012, there have been an annual aerial survey of lesser prairie-chickens in all of the eco regions and you can see here that there is some variation from year to year following the major drought in 2,011, 2012 throughout lesser prairie-chicken range the population did increase overall. The total population. However much of that increase was due to the short grass prairie CRP mosaic population whereas the other population in the other three eco regions remained basically either stable or declining based off of this survey. Some hypothesis for these populations decline. One interesting thing to note is populations of lesser prairie-chickens are well-known to go boom or bust or have large fluctuations in this area of high and extreme intense changes in weather and climate. However, during the last 3 or four decades these populations have not bounced back

during good environmental years and so some of the hypothesis for this is loss and fragmentation of lesser prairie-chicken grasslands that have been converted to other uses primarily crop land. Anthropomorphic structures things such as roads power lines wind turbines, things of that nature, lead to avoidance or increased mortality by lesser prairie-chicken, have steadily increased leading to functional habitat loss. The climate has started to change including more -- increased frequency and intensity of drought and increasing temperature, both of which do not allow these periods of good excellent environmental conditions allowing the species to regain populations and rebound in the previous occupied areas. Then other hypothesis include reduced food quality or nutrition issues, there is some speculation regarding disease, hybridization and predators. Probably of greatest note is hypothesis related to reduced habitat quality which relates to vegetation structure and composition which is a theme throughout much of our work. Then there is lots of heterogeneity in vegetation in terms of composition and structure at both the landscape and patch or other smaller scales. There is a loss of fire in the eastern portion of the range, which has led to trees being invaded and as you will see later trees create a tremendous response by lesser prairie-chickens. And then unmanaged grazing throughout the species range especially in the western semi arid area of this species has really impacted and changed the habitat and the landscape that are causing lesser prairie-chicken to avoid areas where they used to be quite abundant. In 2021, the aerial survey basically estimated 30,500 prairie chickens 90 percent of which are in the state of Kansas. 25,000 of the estimated number currently is estimated to occur in the short grass prairie CRP mosaic eco region. And then much smaller estimates population abundance in the other three eco regions. This relatively large portion of the population in the short grass prairie CRP mosaic is in my opinion somewhat a precarious situation. This eco region currently supports about 83 percent of the estimated lesser prairie-chicken population. This is a relatively recent population. Undocumented until the late 1990s. This lesser prairie-chickens in this eco region are highly dependent upon CRP to exist. And the landscape composition of this eco region is kind of sitting on a threshold of barely being viable to support lesser prairie-chicken populations in terms of the amount of grassland in this area. So this is something that we need to keep a close eye on. As Charlie mentioned lesser prairie-chicken populations primarily occur on private lands. There are some prairie chickens that occur on public lands on the U.S. Forest Service national command Comanche and Cimarron national grasslands. These areas are located in the sand sagebrush prairie of southeastern Colorado

southwestern Kansas. Back in the 80s there was a large number of lesser prairie-chickens in this area, but unfortunately the populations have declined to the point now where we consider lesser prairie-chickens to be essentially locally extirpated since 2016 throughout much of these public lands. The key to understanding lesser prairie-chicken demography and occupancy is they need a large variety of habitat types or habitat conditions for these populations to persist. They need different types of habitats for lekking where they gather and display for mating purposes in the spring, for nesting, for raising their broods and wintering. Vegetation structure and composition that is for each life history stage must be available in this relatively large area where these birds occupy. They have relatively large home ranges. In other words, we're looking for essentially landscape heterogeneity for these birds to persist.

There is a tremendous management dilemma associated with the birds that occupy large areas and need such different habitat types or patch type throughout their home ranges and their population areas. How do we create, restore and enhance these landscapes to provide these habitat types needed by lesser prairie-chickens on private working landscapes. We have to work in conjunction with producers in order to provide these important habitats for lesser prairie-chickens. How do we provide the necessary landscape heterogeneity or the different habit types stay scale large enough positive response for lesser prairie-chicken. Scale is a huge issue when it comes to managing lesser prairie-chicken. You need to manage at very large spatial scale. Finally, this is a subject some of our future research, how do we increase populations to objective levels and then facilitate colonization of either previously occupied habitat or enhanced restored habitat. How do we get prairie chickens to move into areas that we are applying conservation strategies. How do we get them to move or colonize or disperse to areas in order to increase the occupied range and the occupied area as well as increase overall population abundance. Lesser prairie-chickens occupy space based on a hierarchical decision process where the initial decision is based on the amount of grassland on the landscape. Not all the grassland needs to be useable by lesser prairie-chickens for example they essentially do not use or do not persist unless in short grass prairie, but grasslands of these type can need to be readily available and contribute to the overall availability of grasslands. And once they select an area based on the amount of grassland on the landscape, then they select individual patches or individual areas or home ranges based on vegetation composition and structure.

How much grassland is needed? Way back in 1970s Crawford and Bolen stated that lesser prairie-chickens disappear from landscape that have less than 63 percent prairie

or grassland. There has been no evidence to cast doubt in this since that point in time. In Sullin's work indicated that probability of use was maximized when you have 77 percent grassland on the landscape. However, this question is a lot more complicated because you have to take into account the interaction between land cover and climate where abundance of lesser prairie-chickens during years without extreme drought is relatively -- as your amount of grassland over that 60 to 65 percent is pretty much stable no matter how much crop land is available, but during years with extreme drought, abundance of lesser prairie-chickens declined rapidly in areas that have greater crop land. They do need more grassland in order to survive these years of extreme drought. As a matter of fact Beth Ross' work in 2016 indicated that the ability to persist through an extreme drought was maximized at about 90 percent grassland. As you increase the amount of cropland from 10 to 40 percent, then their ability to persist through a drought declines in the populations have a tendency to blink out during those conditions. Unfortunately here is a map of the Palmer drought severity index during just a few weeks ago. You can see throughout much of the current lesser prairie-chicken occupied rain where once again in a severe intensive drought. And these birds do not do well under these conditions as we would expect the population to decline again by next spring. In terms of the legal status I'm just going to go through this quickly to give a little context, but lesser prairie-chicken has been a subject of consideration for listing as a threatened or endangered species since 1996. In 2014 it was listed as threatened throughout its range. That decision was vacated by a court ruling and de-listed on the endangered species Act 2016. In May 2021 there is a new proposal listing the northern three eco regions as threatened in Kansas Colorado Oklahoma and part of Texas and then the sand shinnery oak prairie eco region in New Mexico and part of Texas is supposed to be listed as endangered. The final decision on this status has not been made. Lesser prairie-chickens are greatly constrained based off changes in the landscape. It probably will not be possible to achieve pre-European settlement conditions allowing for these abundant populations that perhaps occurred prior to settlement or at least in the late 1800s. We need to concentrate on removing the risk of local extinction which will require conservation of remaining large grassland areas, improving the habitat quality of these areas, and then using conservation approaches that are feasible on privately owned land and accepted by land owners and producers. Two of the primary management strategies include livestock grazing and fire to create vegetation heterogeneity. Most grazing practices are designed to have a uniformed grazing distribution using smaller pastures, increased

stocking rates and reduced grazing periods. In other words, you end up with a homogeneous pasture or unit relative to vegetation composition and structure. Patch burn grazing developed in Oklahoma expanding out through much of the southern Great Plains redistributes cattle on the landscape and creates heterogeneity in terms of using grazing differences in grazing pressure to create different vegetation structure and composition on a relatively smaller area of the landscape. Unfortunately prescribed fire is rarely used in semi arid portion of the lesser prairie-chicken range. We are limited then to use of grazing throughout much of the western portion of the range. So we evaluated heterogeneity based grazing management strategies on lesser prairie-chicken ecology. In the western portion of the species range where prescribed fire is not used or maybe not even an option, land owners do not have much in terms of practices that can be used to manage vegetation. And as a result, we evaluated different grazing features in terms of their effect on lesser prairie-chicken. Here are the ranges of our study sites or our study pastures where we radio tagged 116 female lesser prairie-chickens with GPS radio collars allowed us a large number of locations of these birds under these kind of grazing conditions including a range of 0 to 2.31 animal unit months from a low density to a high density stocking rate. Forage use from 0 to 77 percent of the forage. Pasture area. Under different levels of growing season deferment or periods when no grazing occurs. So our goal was to determine how prairie chickens respond under these wide variety of grazing practices as well as determine when we can maximize the amount of vegetation heterogeneity on the landscape. So the most influential factor in terms of vegetation heterogeneity was stocking density whereas when you have stocking density in semi arid landscape less than 2.6 animal units per ha you maximize the amount of heterogeneity or variation in vegetation structure, which is really really important when it comes to lesser prairie chicken use.

So one of the things that we were interested in is how non breeding lesser prairie-chickens respond to these grazing situations. Because we can use nesting information for a good index relative to used by breeding birds, non breeding incorporates both males and females. The relative probability of use by non breeding lesser prairie-chickens was greatest around 40 percent forage use. A little bit less than the standard that we commonly use. As stocking density increased from low to high, probability of use decreases. And probability of use is lowest at about 40 to 60 percent deferment. If you graze a little bit more than that or a little bit less than that, the birds tend to respond to it better. And then the most important factor is as

you increase pasture area, there was a linear increase in the probability of use. Graphically, this is what it looks like. Forage use in the upper left into the A figure indicates that probability of use or the likelihood that a prairie chicken will use that site is maximized right around 40 percent forage use during the non breeding season. And that relationship changes slightly depending upon whether you are in low density medium or high density grazing pressure. It still maximizes right around 35 to 40 percent forage use, but the probability of use declines dramatically as you go from low density grazing systems to high density grazing systems. Deferment you can see even though there is a relationship where deferment caused the lowest probability of use right around 40 to 60 percent, deferment that relationship is not that strong especially when you compare it to pasture area where there is a very tight and a very strong linear relationship in terms of increase probability of use as you increase pasture area. For the relative probability of nest placement to index kind of reproductive response to grazing pressure was maximized at right around one animal units months per HA. There were no nests when grazing pressure was greater than 1.2. There is a threshold here where once a certain grazing pressure is reached, lesser prairie-chicken don't nest there. Graphically, this is what it looks like. Probability of use by nesting lesser prairie-chickens was basically maximized again right around one animal unit per month and then once you get above 1.2, birds don't nest there. Prairie chickens have these very tight responses to some of these thresholds and this being one of them. So annual adult survival was what we sort of what we would expect and not influenced by grazing. Nest success is relatively high, but there was a negative relationship between grazing pressure and daily nest survival, which sort of looks like this where you get above one AUM per Ha nest survival drops off significantly in terms of daily nest survival rate. Lesser prairie-chickens respond positively to light to moderate grazing disturbances where greatest use was when forage use was less than 50 percent and stocking densities were less than 2.6 animal units per HA. Any pasture that had greater than 60 percent forage use did not support lesser prairie-chickens. Increasing pasture size develops a gradient grazing pressures within the pasture which develops a gradient of grazing structure enhance a probability of use. Nest site selection was more sensitive to grazing pressure. Increase probability of use for nesting birds forage use or decrease in probability of use in forage use increased beyond 20 percent because they need ticker taller vegetation during this period. Effect of deferment is kind of site specific, but it is possible to use grazing management to promote vegetation and patch heterogeneity in these western semi arid

areas of lesser prairie-chicken range where we do not have fire. But we did examine or test the effect of patch burn grazing on lesser prairie-chicken habitat in the eastern portion of their range. And we were trying to test or answer the question how does prescribed fire affect nest selection, habitat and space use. And given that lesser prairie-chickens have a tremendous response to encroaching trees we also wanted to determine if prescribed fire can benefit lesser prairie-chickens not only by providing changes in the vegetation structure, but also controlling tree encroachment. So we used a ranch down in the red hills of Kansas that had a wide variety of burning regime where there was basically patch burn grazing throughout much the entire ranch. And found that nesting lesser prairie-chickens only use areas that were greater than four years post fire. So the number of nests basically were dramatically larger in these areas of this patch burn grazing dynamic. However, lesser prairie-chickens selected one in two-year post fire patches during lekking. Like I mentioned greater than four-year post fire patches during nesting. And then year of fire and one year post fire patches during the post breeding and non breeding seasons. So essentially, all of the different patches were used by lesser prairie-chickens at certain points during their entire lifecycle. And because lesser prairie-chickens selected all available time since fire patches during their life history, patch burn grazing can be a viable management tool on these smaller areas to restore and maintain habitat on these landscapes in such a composition on the landscape or such a design on the landscape that allows lesser prairie-chickens to access all these different habitat types without expending much energy in terms of movement. In addition, these prescribed fires in these patch burn grazing mosaics can be used to prevent future eastern red cedar encroachment in the eastern part of the range. Why is this important? Well, the loss of fire has allowed these trees to establish these grasslands as that photo or image that Charlie showed early on the amount of increase of trees especially in the eastern part of the lesser prairie-chicken range, but also the eastern part of the Great Plains has dramatically increased over the last few decades. In the eastern part of lesser prairie-chicken range we're talking about eastern red cedars. And lesser prairie-chickens perceive structures including trees on the landscape as a potential predation risk and have a dramatic response to the presence of trees. We conducted some work again down in the red hills and you can see here on the right-hand side the blue dots are nest locations and the green dots are trees. And you can see that they basically don't mix. So lesser prairie-chickens -- when they nest in the eastern part of the range they avoid trees to the extent of about 300 meters from the nearest tree. However, this response

is much more dramatic when you look at tree density. So this is a figure of the proportion of lesser prairie-chicken nest in relation to the proportion of tree densities whereas you increase the density of trees on the landscape in other words, number of individual trees per HA once you get above two trees per HA prairie chickens don't use it. It is a very dramatic threshold. So the proportion of nests almost all of the nests are less than .75 trees per HA. Another graphically way of putting this is relative probability of use or resource selection curve where once you reach two trees per HA the probability of use is basically 0. They just don't -- they abandon that entire area once you get above a couple trees per HA. And when I talk about trees we're talking about anything that's basically three and a half to four feet tall or taller.

The relatively probability of use by lesser prairie-chickens doesn't include -- where locations don't include nests you will see that they have a very strong response out to about 600 to 800 meters from the nearest tree in terms of where they will go during the rest of their lifecycle throughout the rest of the year. Anything -- you are looking at anything -- 400 meters or above as a potential area useable by lesser prairie-chickens from trees. Anything less than 400 meters or so you have a probability of use of less than 50 percent and essentially birds are avoiding these areas. So one of the major components of the landscape in the western part of the lesser prairie-chicken range is conservation reserve program grasslands. And conservation reserve grasslands in the lesser prairie-chicken range basically greater than 700,000 HAs and provide a structural component that is no longer available in some of these areas or as a structural component never existed before especially up there in the CRP mosaic. But the value of CRPs value throughout the lesser prairie-chicken range following precipitation gradient. This one of the most surprising things that we found. First off lesser prairie-chickens have adapted to CRP throughout their range. And persistence of many populations especially in some of these high density prairie chicken areas is dependent upon CRP. Even when we release birds into a novel landscape they select for CRP. This is just a little short example of birds that were released or translocated lesser prairie-chickens from the short grass prairie mosaic down to the sand sage region and this is the selection ratio where anything above one indicates that that area or those landscapes are selected by those birds and you can see that the selection ratios for CRP both during the breeding season and non breeding season were much larger than any other major landscape feature in this area. So even when the birds are released, they are still selecting for CRP in these landscapes despite the fact that CRP only occurs in a very small proportion of these landscapes. So as you

move from east to west in the lesser prairie-chicken range you go from the mixed grass prairie to the short grass prairie. You start losing thicker grasses the farther west you go. There is also a precipitation gradient as you go from east to west as well. Relatively high precipitation down to landscapes that have limited amount of precipitation. Here is a map of the existing CRP as of 2014 throughout western Kansas eastern Colorado and occurring in the lesser prairie-chicken range. The probability of use of CRP changes dramatically as you go from west to east where you have a very high probability of use in the western part of the range and a relatively low probability range of use in the eastern part of the lesser prairie-chicken range. Lesser prairie-chickens select landscapes that had greater than 65 percent grass according to your Bohlen and Crawford, but most likely to use CRP grass lands when these local landscapes have about were about 5,000 acres of grasslands -- 5,000 acres of landscape where 70 percent was native prairie. As you increase the amount of native grassland in an occupied area by lesser prairie-chickens they are much more likely to use CRP. And this translates into a fitness benefit whereby lesser prairie-chickens that use CRP have a considerable higher land to value or contribution to the overall population as opposed to lesser prairie-chickens in native working grassland. When you put CRP on the landscape lesser prairie-chickens primarily use CRP for nesting. As the nest density in CRP is twice as high in native -- in CRP as native prairie. Even though lesser prairie chickens occupy a relatively small area they provide an important nesting component that is used by lesser prairie-chicken. So lesser prairie-chickens were seven times more likely to use CRP when the average annual precipitation was 55 centimeters compared to 70. You increased habitat availability primarily for nesting as survival is not really affected or changed by the presence of CRP. So we look at CRP as a habitat that provides refugia during periods of drought. Allows these birds to have an area that is somewhat reliable for nesting during these intense periods of drought. How do we take this information and move it into a conservation strategy. Dan Sullin's did this work whereby he examined this idea of tree removal and CRP placement as a potential conservation strategy for lesser prairie-chickens. So using these features in terms of relative probability of use you can see that as proportion of grassland increases probability of use by lesser prairie-chickens increase dramatically. You see that peak of about .77 or 77 percent grassland is where these probability of use is maximized, but then taking into account these other features of the landscape including roads vertical features oil wells and transmission lines where you see a really rapid response to the presence of these features on the landscape you can determine

how much land is available for lesser prairie-chickens. So in Kansas and Colorado when you stack all of these different features on the landscape you can see that these prairie chicken populations are subjected to or stressed by a large number of features in the landscape which eliminates much of these areas as available habitats. And as a result, we conducted a species distribution model to show where in these areas you have a high probability of occurrence based off of landscape features including these structures and the amount of grassland. You can see here that these areas the amount of available habitat is greatly reduced when you consider these conditions.
So it appears lesser prairie-chickens are constrained to areas that have greater than 70 percent grassland and less than ten vertical features in 12.6 square kilometers.
When you take all that information and apply it to the eco regions, currently we estimate available currently available habitat in the mixed grass prairie is about 16 percent of what is defined in the sand sagebrush about nine percent of that area is available habitat and about eight percent is available in the short grass prairie.
We can develop a strategy for strategic conservation including things like tree removal where we have an overlap of prairie chicken habitat and tree densities creating an area of high priority for tree removal along with strategic location of CRP most likely where there is greater than 60 percent native prairie in areas where there is less than 55 centimeters of rainfall. So when you strategically apply these two conditions, you can get a situation like this where in the upper slide you see strategic locations for tree removal in those orange and red areas and by removing trees in these areas you can restore 100,000 acres of in habitat. In the western part of the range to the west of the 55-centimeter belt of annual precipitation, you can restore 60,000 acres of habitat using strategic CRP enrollment. Conserving large grassland is necessary for persistence of lesser prairie-chickens. Larger areas are more resilient to drought. We need habitat in both eco regions to resist these negative events from weather and drought. By restoring trees and CRP as indicated we can probably increase populations by more than ten percent. Much of this work is available through these two publications that are down in the link box that were part of the NRCS lesser prairie-chicken initiative. And available. And also we do have the availability to get those publications through those scientific journals as well. In the future we're going to work primarily with movement models to evaluate how prairie chickens move within and among areas. And then determine thresholds for the persistence of lesser prairie-chickens. We want to determine additional thresholds both in terms of landscapes and population values that will allow for the persistence of lesser prairie-chickens in order to inform corridors,

colonization, dispersal things of that nature that continue to fine tune our strategies related to lesser prairie-chickens. With that, I would like to thank you for listening to this presentation and I would like to thank everybody that supported our research project.

>> Thanks Dave. That's a lot of information. I know we just about ran out of time here. There is a lot there. I hope folks get an understanding of sort of some of the information that you provided can really help us define kind of where those core areas are to avoid some of the anthropogenic stressors to really focus through the Great Plains framework strategy. There weren't any questions that came in during the presentation. But just the minute or two we have left, you were talking about the patch burn grazing mosaics. Did you find -- the patch burn grazing is basically done to sort of lead the cattle and to various places. Did you find stocking density pressure had any effect on chicken use as did in other areas like there is a sweet spot of grazing pressure or does that not matter.

>> Well yes. We did that. We connected that work. We haven't actually published it yet. The really interesting thing is we compared patch burn grazing interactions between cattle and lesser prairie-chickens to cattle and lesser prairie-chickens in rotational system. And in a rotational system there is significant overlap between locations of cows and prairie chickens. In the patch burn grazing system there is hardly any overlap. They are using totally different patches in those patch burn systems. In that regard, stocking density is probably not as important in those systems as it is farther west.

>> Okay. Interesting.

>> There was a question that came in about using drones to keep chickens away from wind turbines. I'm not sure that's really an issue. Because they avoid wind turbines anyway. Right? They do avoid wind turbines and fortunately there is not a major development of wind turbines associated with lessers at this point in time compared to some of the greater prairie chicken areas. Lessers have a much less tolerance for structures. As soon as that first wind your bin goes up they tend to avoid them or they switch their areas and they don't even really go close to them in any regard.

>> I don't see any other questions. It looks like we're about at the top of the hour. I want to thank Dave you for your time here today. There is a lot there. I encourage folks to download the great plain grassland biome that's in the web, today's web links as well as to review your slides later. I'm going to turn it back over to Creech to sort of wrap it up here this afternoon. So thanks.

>> Wonderful. Thank you Charlie. We do have a few reminders before we go. Before those I want to start with a big thank you to Dan, Charlie, to Dr. Haukos and to all of you who joined us for today's discussion on the conservation of this important bird. We'll post the recording of today's webinar along with the slides and transcript on our NRCS conservation outcomes web page. The link for that page is included under today's link. We also have recordings of past webinars on that page and details on how to sign up for the gov delivery e-mails we mentioned at the beginning of the session. With that, we hope to see you again for future webinars. Have a great afternoon, everyone. Thank you for joining us.