Webinar Brief for Resource Managers

Great Basin Fire Science Delivery | 1664 N. Virginia St./MS 0186, Reno, NV 89557 | 775-784-1107 | emb@cabnr.unr.edu

Conservation for Greater Sage-Grouse: Approaches for Prioritizing Management

Presented on March 21, 2011 by Steve Knick, Research Ecologist for USGS Forest and Rangeland Ecosystem Science Center

Project Summary: Steve Kick shares his research on conservation issues related to sage-grouse and other species of concern, and approaches for prioritizing management to address conservation issues. He presents approaches to manage for habitat from the local to landscape levels.

Management Implications

- Sage-grouse conservation requires a broad focus, from the individual level to the species distribution. Conservation efforts must take the appropriate information and use it to the maximum effect.
- The best way to increase sage-grouse is to increase sagebrush habitat.
- When trying to establish the best areas for conservation, use a model that looks at the life history of both the flora and the fauna, and prioritize management areas accordingly; don't conserve areas where sage-grouse were historically if sagebrush can't colonize.

Abstract:
Greater Sage-Grouse are some of the most charismatic fauna of the Great Basin region, and most widely distributed. Conservation of this highly mobile, widespread species is difficult for a number of reasons. The key difficulties to management are the diversity of sagebrush environments (not all sagebrush communities are the same or suitable), a broad distribution of the birds (their range covers 11 states), a wide range of system stressors (such as grazing activities, past and present), and the fact that lands are managed by different agencies (different lands are of different habitat quality, and lands may be managed for multiple different uses). Sagebrush communities are being impacted by anthropogenic activities that can directly and indirectly affect flora and fauna communities (e.g. coal-bed methane extraction results in loss of habitat, a direct impact, and the pools of extraction water elevate mosquito populations which spread West Nile virus, an indirect impact). Even small changes can have major impacts on sagebrush and sage-grouse communities. Across the range of the Greater Sage-Grouse, 70% of the land area is public land, with 50% managed by the BLM, alone. Of the 18,000,000 hectares of land managed by the BLM in the Great Basin, only 9,000 hectares are sagebrush habitat, able to be treated. With such limited areas to work with, managers need to be able to prioritize areas that will have the greatest effect on promoting

sage-grouse populations; for this, managers need conservation goals. Steve outlines three major, overall goals for sage-grouse: Delineating sage-grouse distributions (with an emphasis on metapopulation structure and connectivity), identifying optimal areas for sagebrush conservation and restoration, and increasing/maintaining connectivity of sage-grouse populations. Looking at the first goal, Steve and his team evaluated current sage-grouse populations and range compared to historical data. The current distribution of sage-grouse is about half of its historic range, with uneven shrinkage making for smaller, less well connected areas in some areas. Looking at the metapopulation structure, source and sink areas were identified, as well as areas of connectivity. While looking at the structure of the distribution, however, they found that large population dynamics were governed more heavily by individuals' behavior; connectivity of grouse depends on locations of leks, which is highly influenced by individual behavior. Modeling sagebrush distribution presents its own challenges; a broader perspective needs to be adopted when considering management. Steve and his team delineated areas with viable sagebrush populations, and then identified areas where, based on invasion/fire/climate/slope/etc., sagebrush restoration would be most effective. The approach suggested would be to start filling in areas within large patches of sagebrush that have a patchy local framework, near areas that can be used as seed sources. Overlaying optimal areas of sagebrush restoration with prime habitat areas for positively affecting sage grouse metapopulation dynamics, high priority areas are identified. These high priority areas can then be managed to make most effective uses of effort in conserving and restoring sagebrush and Greater Sage-Grouse populations.

Questions:

How would I cast the kind of recommendations made in the prioritization and the modeling in terms of one of the conservation reserve design series of having a single large area in which to focus efforts or having several smaller areas to interact with and the relative success it might be achieved from these different kind of strategies?

I guess in thinking of this, my original focus would be on some of these large areas initially because these are predicted in the long term both with the climate change effects and things other land development thing to have the most stability and we need to retain those over the long term. And then as a lower priority, try and include some of these smaller populations that are already are at risk but the reality is that some of the factors that are influencing these small populations are ones that we're not going to have much influence on whether it's a land used development, whether there's some kind of an isolation by distance already but that within some of these smaller areas, we may not be as successful as conserving some of this large areas. Having said that, there's an intermediate area as well that if we can get enough of these clusters within a fairly consolidated area that we could focus some of the effort and maximize a number of these groups and essentially create a large area. I think that would work as well but again conserving what we have is the main priority and that's going to be these larger areas.

What is the sage map website that you said we could get data from?"

It's a USGS sponsored website and it's on the Web and if I remember the Web address right, it's http://sagemap.wr.usgs.gov. You can also just do a Google search on sage map and we actually do sage map programs. One is for genetics and you know what that one but the other one is sagebrush in grassland ecosystem site. There are a lot of things on that site including many data layers that are free for download as well as the documents that you can download. The book that Jack Conway and I have an edition coming out as Studies in the Avian Biology until that book appears in print in the next couple of months, you can download free publication chapters of each of those for the book itself and get the data for many of those chapters as well. So it's a tremendous resource. It was originally sponsored by the Bureau of Land Management and now has maintained by the US Geological Survey.

When does a white horse become a black horse and how do you measure those grades of white and black in between and what level of fragmentation? Is it a mosaic and what level is it fragmented?

The answer to that is not a simple one because we used simply in measuring what we did as a measure of edge, of sagebrush versus non-sagebrush and all edges not created equally. You can have sagebrush that's next to your friends and it's a grassland that's not nearly as harsh in the edge as an area of sagebrush that might be next to riparian area or urban development or something like that. So there are different grades of edge, different species perceived that edge differently as well. And for instance sage-grouse probably perceived fragmentation much differently than does a Brewer's sparrow. A Brewer's sparrow may look at the collection of sagebrush itself and see fragmentation essentially as within the individual shrubs. Sage-grouse absorb that edge with the individual patches, within their annual range but if the distribution of sagebrush within their annual range is separated by 20 to 40 kilometers, they're not likely to cross it. So the way we treated sagebrush edge was that kind of that intermediate level for sage-grouse at the 18-kilometer resolution and looking at if you had patches within that but no sagebrush within that that would kind of define the level of sagebrush and the patches that were in there for fragmentation. What that level allowed us to do is look at, for instance we can have sagebrush fragmentation at a level, for instance in parts of Northeastern Nevada, parts of Southern Idaho, and Eastern Idaho as having a level of fragmentation that still sage-grouse but for instance that level of fragmentation is too great if you try and cross Snake River Plain. The sage in those populations are essentially isolated.

What are the methods you propose to conserve areas of optimal habitat especially from fire?

That's very difficult one because fire is a natural part of this system and always has been. The problem right now is that the incidence of fire is either too great in many areas that have been taken over by cheatgrass or the incidence of fire is too rare in some of the higher elevation areas currently experiencing woodland encroachment into these areas. So we have essentially two different situations, one in which there is too much fire, one in which there isn't enough fire. The conundrum is how do we conserve these areas still at fire be a part of this system but now one in which it's devastating itself? And in many cases, I have to admit I don't know the answer because cheatgrasses and filtered many of these areas and it's going to make it difficult to suppress fires once they get going in there. There's a push in many cases to kind of break up the larger patches of sagebrush and create fire breaks. I'm not really in favor of that because many times the disturbance, at least in the areas we've done that in the past, has not resulted in a very good set of needed plants that have come in to that area instead of taken over by cheatgrass or other exotics. And it hasn't had the kind of desired effect. Really the best thing we can try and do now is try and manage for systems that have a good overstory of sagebrush with an understory of native perennial grasses and forbs and try and use fire suppression as best we can within many of those areas and try and reduce the size of fire within those areas as best we can.

How you build flexibility into this kind of priority models that we have and what kind of factors do we need to include? How do we weight different factors in a new kind of evaluation of where we might prioritize areas?

That the models that we views are multi-variant models ultimately and even though the individual models have different inputs into them, they can be rearranged and new factors added ultimately into a new system. Ultimately, what you get in the output is some probability of success or probability of growing sagebrush or probability of maintaining the system itself. You can include new factors, where do we need the human footprint for instance as a disturbance? A development factor within that and the challenge for that is to give it some kind of a numerical value that tells you, is this a total effect? Is it a kind of an indirect effect? Is it a partial effect? And how does that factor weigh in among the other variables in your system. To give an example of that, if you have kind of a fragmented area that you're working on and you want to cite a power line to that. The effect to that area is probably not going to be as great then already fragmented areas. If you're putting it in a previously undisturbed sagebrush area, how do you weigh those different kinds of factors? And that's where a lot of the work we're doing right now is going at and trying to estimate the area

effect of the different kind of habitat relationships that are surrounding that effect and the time lags as well as spatial distribution of that decay function or effect away from that. So we've gone the first step of being able to look at different factors and knowing which ones we'd like to include whether it's development, whether it's climate change. The next step is to incorporate those ultimately into the model which we can do in the mathematical sense and regenerate the different priorities.

You said that Wyoming sage and basin big sage will be used for the distribution model, why not include Mountain Sage that is heavily used by grouse in Nevada sometimes more than Wyoming sage.
The final model actually did include Mountain Big Sagebrush as well. I showed the initial delineation for Wyoming big sagebrush and basin big sagebrush but in the paper that Cara Meinke wrote we did it both for Wyoming and basin and then for mountain big sage as well and then on the results I showed today with the blue squares that was combining results both for basin, mountain, and Wyoming big sage. So they all were included in the final model than it should.

How much area needs to be restored to meet population goals? How adequate are our current restoration techniques?
I don't know the answer to that because populations range over different sizes and can be up to 2,700 square kilometers. If you're doing a restoration or treatments in a critical area for instance in the wintering area, you can have a fairly big effect on that population itself as opposed to other areas within that and your range. The problem with sage-grouse is that they used different seasonal ranges that don't necessarily overlap. So the size of that can vary not only by the seasonal range but also the relative reports of that seasonal area as well. So I didn't answer that question. The next question was how adequate are our current restoration techniques? I would say that our current restoration techniques tend to be the most successful in those areas that haven't been heavily disturbed that have the native community. And in other words, we have the shortest distance to go, to get from the place that's disturbed to the place we want to get to. And so, the places for restoration has been successful have been in some of the areas with favorable precipitation, good soils, and a good community of native understory to begin with. The areas where restoration doesn't succeed very well are in these low precipitation areas where there's already exotic plants and cheatgrass. So we need to work on controlling them and have a much more massive investment in getting the site prepared to restore sagebrush.

You have delineated several areas e.g., Great Basin East and West, are you suggesting prioritization within each of these sub-areas or among all areas?
The sage-grouse range right now and management of sage-grouse within the entire range-wide distribution is really split into seven management zones that have been delineated by the Western Association of Fish and Wildlife Agencies. Those zones are based on similarities of environment as well as relative connectivity of sage-grouse populations within those zones. So not only east and west but there are also individual management zones. The way the prioritization cessation models are set up is you could prioritize across the entire species range. You could do an east and west. You could also develop a prioritization within individual management zones as well and ultimately you could also do it within BLM states or within field offices within states and things like that. And so essentially, if you look at a national prioritization and then you can break it down within that where you might want to focus efforts but you can do the prioritization at different levels.

We've seen how populations decline, how nesting success declines, and we lose individuals as a result of different activities where there's development or infrastructure things like that. Do we have any good information on how much we can gain by restoring or focusing on improving areas where there's already existing sage-grouse populations?

Unfortunately, I don't know that we have the answer to that and that's really critical answer and the reason being is that we look at, you know, right now there's a large push to mitigate conservation efforts particularly with regard to energy development. If we lose this much area due to energy development, are there places that we can improve or restore, expect to see a similar or offset kind of what we've lost in those development areas? I don't know that we have very good information on the increase in sage-grouse population as a result of this restoration. There's a couple of things that complicate it. First of all, lag periods can complicate population response. But on the one hand, sage-grouse kind of weird in that they almost respond immediately to disturbance at some lag period. Their ability to respond to restoration or to areas that we create is really slow and even areas that have come back in sagebrush in some places like in Oregon after 20 years now even though the characteristics are there, sage-grouse do not use those areas. So there's species that disturbance hits them hard. The response may not be as immediate and maybe more difficult to quantify, that's really something that's important. Again, as we look at some of the mitigation in the future, how we quantify what we lost and where we can regain it elsewhere? I can assure you those are not going to be a one-for-one. It's not that because things aren't created equally if we wipe out this area of good sagebrush habitat or sage-grouse population, we can't expect an equal response to someplace else.

Have the effects of climate change been considered in your modeling process? Can you comment on the effects of increased fire and drought on your priorities?

The effects of climate change have been quantified and I can tell you that none of the predictions under any of the climate change scenarios are going to be good for sagebrush or sage-grouse. The long-term effects of climate change if the full impact of I think six degrees centigrade by the end of this century are expressed, approximately 20 percent of the existing sagebrush distribution would remain and that's because we would have increased amount of fire. We would have facilitated cheatgrass expansion and we would also have encroachment or distribution of shrubs from the Mojave of Southern Regions coming in to area currently occupied by sagebrush. On the Northern extreme in the upper elevation, we aren't going to see a similar kind of expansion in sagebrush because that area already is taken over by agriculture or by different kind of woodland or something, so we aren't going to see this much expansion on the sagebrush end. So again, the effects of climate change if they are fully expressed are not going to be good particularly because of the increased fire, the facilitation of cheatgrass, and just a whole host of factors that contribute to nothing good for sagebrush.

How do we decide what to conserve and what to restore given that we might have unequal effects of restoration in response to the variables?

One of the ways that we could do that is if we can't do it on a one-for-one basis rather look at how we approve the stability of the long-term system both in terms of providing a larger area of sagebrush increasing the amount the number of leks within that sage-grouse population and increasing population size that ultimately contributes stability. So we may not be looking at necessarily the numbers of sage-grouse that we would increase but rather improving stability by having a larger area to restore. To do that, the kinds of places we might sweat would be again along the edges, the existing edges of the current areas where we have the larger population of sage-grouse and to connect some of the more isolating ones to that core area.

What should the priority be for states such as Utah which does not have much high priority areas identified?

There are populations of sage-grouse within Utah. Another priority that is not taken within these models are what you have the Gunnison sage-grouse in the eastern part of the state of Utah. And so, the priorities then would be to focus on the Gunnison sage-grouse as well as in some of those sage-grouse areas like at South Central Utah where you do have a fair number of sage-grouse remaining and to be able to improve conditions down that region.

Does your cheatgrass map include areas with less than 10 percent cover of cheatgrass next then with shrubs?" Landsat imagery does not pick up less than 10 percent without serious ground verification.
Yes, it does. And we developed these predictive maps separately. In other words, we developed the cheatgrass model based solely on environmental conditions. And so, it can be overlaid with the existing sage-grouse distribution. It's true that land side tour and of the other satellite formats doesn't readily allow you to pick out understories of sagebrush distribution. But again, our model of cheatgrass distribution I think would overlay quite well with the sagebrush in providing an estimate of what the understory might be within the existing sagebrush area.

If sage-grouse were listed how would that change the kind of model that we have or the depiction of the different areas for restoration?
Certainly, there are other areas that and other criteria that may factor into it and those would be either political or administrative decisions on where we might want to focus restoration. Our model at this point was based almost exclusively on environmental variables as well as the sage-grouse distribution. Having said that, I think that even if certain areas where politically mandated that these are places in which we need to conduct restoration. These are areas we need to focus our conservation. I think that within that, we could certainly adopt this kind of a modeling approach to look at the areas within that again as a large enough region in which we might do the actions either as conservation or restoration. So it could be readily adopted if sage-grouse were listed in areas where mandated that becomes a different variable and a different driving factor into where and why we do the treatments.

Is there a danger of setting up a tree house situation where those areas not in priority areas are allowed to further decline or wipe out by human impacts? If so, might lose some of the important genetic resources found near the fringes of the imperiled sage-grouse range might be shortchanging their chance for recovery by concentrating on the central core areas?
Yes, there is a danger of that and in a very large danger, one of the things we're looking at doing is trying to get an estimate for just how much genetic diversity is in these smaller isolated populations. Some of the earlier analysis by Sarah Lera-MacCant in the case that there is sufficient genetic diversity at the range-wide distribution with the exception of the Washington population and the Mono Lake population straddling Nevada and California. But the rest of these areas at the range-wide scale apparently contained relatively the same genetic information. We're looking at using a much finer level of genetic information to determine just how much diversity is contained within these isolated populations. If we can couple that with different dispersal models, we can ultimately come up with an estimate of what we lose by essentially writing off some of these more isolated smaller populations at the fringe. And that would provide us a good answer to your question about the danger of losing those populations and the reality is yes we would lose something by that.

Are the results of the model identifying priority restoration areas available as a sheet file?
Yes, they are and the various metadata were actually some of my list of things to do were it should be available and the approach itself is in the paper by Cara Meinke that appeared in Restoration Ecology in 2009 but the base layers as well as the restoration models themselves will be available on the sage map site.