Annotated Bibliography

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Dr. Sergio Nicasio-Arzeta

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Source #1

Keeley, A. T. H., Beier, P., & Jenness, J. S. (2021). Connectivity metrics for conservation planning and monitoring. Biological Conservation, 225. https://doi.org/10.1016/j.biocon.2021.109008

Summary

Keeley et al. describes a number of different connectivity metrics used in conservation research, policy, and beyond in order to assess their use and the best practices in regards to such metrics. This article identifies categories of areas which may be assessed in conservation efforts, critically analyzes current work in these areas in order to prioritize metrics which should be used, in what fashion these metrics should be applied, as well as further looks at these different ecoscapes in order to analyze which may be best used due to their differences which exist even within these categories. Finally, Keeley et al. emphasizes that the prioritization of goals must also be taken into consideration in decision making for what metrics should be used, as well as they speak to the current broad lack of information which still exists in regards to proper connectivity metrics in conservation.

Relevance

Connectivity metrics are essential in understanding, measuring, and analyzing any data in regards to habitat connectivity, as they are what allows such data to exist at all. In order to begin any work in this realm, how these metrics are used, assessed, and issues which currently exist must be understood. Not one singular metric can nor should be used when assessing connectivity, but it is very important to understand the differing roles which exist for different types of metrics in different areas which exist globally. This article serves to aid in both the theoretical framing in understanding habitat connectivity and how it's studied, as well as it provides methods which should be used in collecting and understanding the validity of certain metrics in connectivity as a whole.

Source #2

Van Dyke, F., & Lamb, R. L. (2020). *Conservation biology: Foundations, concepts, applications* (Third edition). Springer. PP. 261- 302

Summary

In Chapter 7 of Conservation biology: Foundations, concepts, applications, Van Dyke, F., & Lamb, R. L. goes through the basics of conservation biology, defining important foundational terms and describing the conservation, preservation, and management of habitat, the goal being the preservation of biodiversity. Van Dyke, F., & Lamb, R. L. seems to use language and management strategies that lean more towards a geographic-based approach to biodiversity conservation as opposed to a population approach. However, he makes it clear that different species have different habitat needs, thereby responding differently to conservation efforts. He

then describes habitat loss, fragmentation, isolation and degradation. Lastly, this chapter goes through several case studies.

Relevance

As Dr. Nicasio-Arzeta pointed out, this is an essential reading. No matter what approach we take when interpreting our data, the basic information we learned from this chapter will be relevant to our research. The approach we take, i.e., geographic-based or population based, will depend on our own individual interests and, in large part, the data that we receive. Dr. Nicasio-Arzeta pointed out that we will be using maps a lot, so the visual interpretations of habitat loss represented through maps that this chapter provided, as well as all the basic definitions, will be a huge help in interpreting our data at the basic level.

Source #3

Vergnes, A., Kerbiriou, C., & Clergeau, P. (2013). Ecological corridors also operate in an urban matrix: A test case with garden shrews. Urban Ecosystems, 16(3), 511–525. https://doi.org/10.1007/s11252-013-0289-0

Summary

Vergnes et al.'s experiment with garden shrews in urban ecosystems highlights the positive role of corridors in the occurrence of shrews in domestic gardens. Although the three species of shrews studied, crocidura russula, sorex coronatus, and sorex minutus, behaved differently, showing a varied distribution of shrews in the landscape, the distribution of shrews in disconnected gardens was significantly less than found in the other, connected, sample sites. Additionally, Vergnes et al.'s results showed that though the three shrew species showed sensitivity to the local habitat scale, their response to garden characteristics were similar across the board. These findings support the idea that spatial configuration of gardens is a key factor in shrew dispersal.

Relevance

The findings in this experiment support the ideas proposed by authors in previous readings. For instance, the different species of shrew did not have exactly the same response to habitat fragmentation, choosing different areas to dispers to depending on their individual needs. This backs up Van Dyke, F., & Lamb, R. L.'s argument that different species have different responses to habitat fragmentation. Additionally shows the implication of the species-based approach to biodiversity conservation and gives us a real world example of how to interpret data that we may receive from Dr. Nicasio-Arzeta. Most importantly, it shows the importance of connectivity in a specific, tangible environment.

Source #4

Hilty, J., Worboys, G. L., Keeley, A., Woodley, S., Lausche, B. J., Locke, H., Carr, M., Pulsford, I., Pittock, J., White, J. W., Theobald, D. M., Levine, J., Reuling, M., Watson, J. E. M., Ament, R., & Tabor, G. M. (2020). Guidelines for Conserving Connectivity through Ecological Networks and Corridors, 1–17. https://doi.org/10.2305/iucn.ch.2020.pag.30.en

Summary

The first three chapters of Hilty et al., describe the necessity for connectivity, scientific understanding of such, and language commonly used when discussing connectivity. The first of these chapters emphasizes why connectivity is especially important in our world today, considering the increasing impact of both humans on earth and anthropogenic climate change. It shows how wide and severe the impacts of humans are, and highlights how ecological networks for conservation can allow critical species to exist at all on this planet. The second chapter speaks to how scientific consensus agrees on the need for connectivity, and any harm which it may cause is an individual case which does not diminish the importance of connectivity. This chapter also introduces terms such as structural and functional components of connectivity, and begins to discuss how connectivity is modeled and understood within science. The third chapter defines commonly used terms in conservation in regards to connectivity in order to ensure that scientists, policy makers, and the general public can speak to connectivity using the same understood words, as well as how to differentiate between these words.

Relevance

This reading is very relevant as it ensures we all have the same foundation when discussing connectivity. It is very important to know that when individuals are beginning to work with each other on similar projects, and discussing such, that everyone agrees on at least some sort of rudimentary understanding. Through showing the need for connectivity, we know we all care and understand the importance of doing this work. The scientific consensus is also important and not disputable, thus it is also relevant to be commonly understood. Finally, a common language regarding connectivity is of the utmost importance, as even though we all speak the same language, it is not uncommon to believe the definition behind words to be differently understood, especially in words which are closely related such as protected areas and ecological corridors.

Source #5

Fischer, J., & Lindenmayer, D. B. (2007). Landscape modification and habitat fragmentation: A synthesis. Global Ecology and Biogeography, 16(3), 265–280. https://doi.org/10.1111/j.1466-8238.2007.00287.x

Summary

Joern Fischer and David B. Lindenmayer wrote this paper to “provide a holistic view of the ecology of modified landscapes by synthesizing recent developments across a range of

different research themes" (Fischer & Lindenmayer, 2007), focusing on landscape modification that has occurred in the last few decades and resulted in loss of native species diversity. This loss can be understood through individual processes affecting native species and human-perceived landscape patterns and their correlation with species and assemblages, such as extinction cascades. They make the argument that the species based approach and pattern oriented approach to understanding the ecology of modified landscapes is complimentary.

Relevance

This paper clarifies more specific terms that are often misunderstood or seen synonymous with other terms when they are not, so I think it will help us in our research when we get into the nitty-gritty of things. The different approaches to biodiversity conservation seems to be a repeating theme, and this paper does a good job at clarifying the distinctions between the two while keeping them complimentary. And if me and my partner choose different approaches, it might be interesting to see what we come up with and how we may be able to bounce ideas off each other. Finally, this paper does a good job at identifying anthropomorphic threats to habitat connectivity, which I feel will help us when we receive our data. We may be able to look at the specific area that habitat loss is happening and identify some of those threats to help us understand how animals might respond.

Source #6

Hashemi, R., & Darabi, H. (2022). The Review of Ecological Network Indicators in Graph Theory Context: 2014–2021. International Journal of Environmental Research, 16(2). https://doi.org/10.1007/s41742-022-00404-x

Summary

Hashemi & Darabi discuss the importance and applications of graph theory in order to better understand and analyze ecosystems. In the past ten years, graph theory has become especially prevalent in regards to research on ecological networks, and using this theory as a tool to understand connectivity is especially prevalent. This article provides insight to prior research, where this research occurs spatially, as well as its necessity for conservation insight, which is required to be done for a broader global scale than what currently occurs. Hashemi & Darabi also emphasize the importance of ecological network resilience, the current lack of such, and the importance of graph theory in understanding this as well.

Relevance

This paper is particularly relevant as it brings to light a more recent technique in research regarding connectivity in ecosystems. The authors emphasize its broad applications in the use of indicators in order to better assess the connectivity of not just one species, but a number of species at once, as well as its future potential applications in the assessment of resilience. Graph theory as a whole is likely to be used in our work this upcoming year due to its current increasing

relevance, as well more generally its applications are likely to be expected to continue to grow in the future. The advantageous nature of using graph theory makes it more likely for us to come across it in future literature review searching, as well as it is important to understand for both future papers we may read along with understanding our data regarding connectivity currently.

Source #7

Beazley, K. F., Oppler, G., Heffner, L. R., Levine, J., Poe, A., & Tabor, G. (2021). Emerging policy opportunities for United States–Canada transboundary connectivity conservation. Parks Stewardship Forum, 37(3). https://doi.org/10.5070/p537354732

Summary

Beazley et al. describes a number of currently existing opportunities for connectivity conservation, specifically regarding an intergovernmental approach between the United States and Canada to ensure connectivity across their border. As the border spans thousands of miles, and has remained peaceful, the authors describe recent conversations which have occurred in regards to next steps to ensure ecological connectivity across these nations. A number of specific opportunities were identified by those who attended the beginnings of conversations regarding this subject, including prioritizing Indigenous communities and strengthening relationships between those groups and non-Indigenous groups, inclusion of local stakeholders, and promoting private landowners across this border. More concrete actions were also stated, such as creating funding commitments from the two nations, increasing initiatives in the United States to match those in Canada, identifying gaps, and to conduct transboundary environmental assessments. Finally, it was noted that connectivity must be integrated further into society, initiatives which currently coexist between the nations must be strengthened, increasing funding rapidly, and beginning systematic changes in both nations.

Relevance

This paper is particularly important to our research as our area of study exists on the border of the United States and Canada. Beazley et al. describes the importance of connectivity across this border, as species do not see it in the way we as humans do. In regards to connectivity, the projects we are doing now are beginning on one of the opportunities of transboundary connectivity work, and thus this article provides further justification in doing this. As we continue our work overall in this realm, continuing across the border between the United States and Canada, why exactly and how this should be done may be questioned, and this paper begins to provide further justification of the importance of this, and what following continuing steps for connectivity in this space may be.

Source #8

Belote, R. T., Dietz, M. S., McRae, B. H., Theobald, D. M., McClure, M. L., Irwin, G. H., ... & Aplet, G. H. (2016). Identifying Corridors among Large Protected Areas in the United States. PLOS ONE, 11(4), e0154223

Summary

Belote et al. largely describes processes used in order to identify corridors which can be later used in identifying key areas for conservation and connectivity. These units of land, corridors, were specifically located in order to ensure that connectivity was prioritized to look at areas outside of currently designated large protected areas as well as areas specifically currently designated as either inventoried roadless areas, or wilderness study areas. What is ultimately produced by the authors is a baseline ranking of potential corridors for connectivity, which then can be adapted in order to ensure the needs of a specific species are prioritized while also ensuring cost to existing development as a whole is minimized.

Relevance

This paper provides some critical insights into how the area we will be assessing is even identified in the first place. Our study area is a corridor in the northern Montana and Saskatchewan border which was likely informed using similar methods to that of the authors of this paper. Information provided by Belote et al. was then adapted to specifically pertain to the Greater Sage-Grouse in order to ensure connectivity would be prioritized for that species, and thus the corridor was identified. Through the understanding and methods provided by this paper, we can then continue to further understand the why behind our research projects in the first place.

Source #9

Buchholtz, E. K., O'Donnell, M. S., Heinrichs, J. A., & Aldridge, C. L. (2023). Temporal Patterns of Structural Sagebrush Connectivity from 1985 to 2020. Land, 12(6), 1–13. https://doi.org/10.3390/land12061176

Summary

In this study, Buchholtz et al. examines how the structural connectivity in the sagebrush biome of the Western United States changes over time. The researchers used a time series of sagebrush land cover data from 1985 to 2020 to assess how the density of connections among areas with abundant sagebrush changed overtime. Their results showed that most of the biome experienced moderate change in connectivity, but the amount and type of change varied and showed more of a shift in range than a significant loss of or gain. They found that two different PACs and SEI classes had the highest and most stable proportions of connectivity. PAC stands for Protected Areas of Conservation and SEI stands for Sagebrush Ecological Integrity. This is expected given that these areas are specifically designed to protect sagebrush obligate species (PACs) and cover intact sagebrush areas (SEIs). This provided insight into the effectiveness of

how conservationists focus management today and how conservationists could focus management in the future.

Relevance

This paper offers insight into how connectivity might change in our study area with the type of designated area of conservation and management interests, focusing on sagebrush. The species that we will be researching rely on sagebrush, and our data tracks connectivity gain or loss based on the amount of intact sage brush. So if I know how the sage brush is moving, I can use this information to help me hypothesize how the greater sage grouse will move in response. This is the backbone of my research, and the maps and figures resemble what my data might look like, giving me an idea of how to structure my own research and what to look for when I'm identifying which areas will be most crucial for maintaining connectivity for the greater sage grouse. Additionally, it represents, at least in some ways, the concept that connectivity in some regions is not lost all together with disturbance, it shifts, increasing in some areas and decreasing in others. This concept is something that I see in my own data set.

Source #10

McGuire, J. L., Lawler, J. J., McRae, B. H., Nuñez, T. A., & Theobald, D. M. (2016). Achieving climate connectivity in a fragmented landscape. Proceedings of the National Academy of Sciences, 113(26), 7195-7200

Summary

In this paper, McGuire et al. look at fragmentation patterns across the contiguous United States. The author's findings demonstrate that increasing climate connectivity is critical for allowing species to track rapidly changing climates, as there seems to be a poleward shift in species ranges as they move to habitats with more suitable climates. The authors point out that many plants and mammals will need to move large distances to track preferred climates, but Their movement is limited by both anthropogenic barriers such as infrastructure and natural barriers . A current limitation is the lack of natural land in the midwestern United States, which prevents movement from the East to cooler natural land patches in the West. Their results show that low-elevation regions could benefit the most from corridors, while certain regions show very little benefit from corridors. The author concludes by pointing out that climate connectivity does not guarantee species survival in the face of climate change, and that many species have broad range tolerances and may survive a warmer climate. However, corridors will greatly improve the chances of climate sensitive species being able to track suitable climates.

Relevance

A big part of my research project, and hypothesis, relies on this idea that species are shifting their distributions in response to climate change, moving poleward and up in elevation, which this paper touches on. While this idea cannot apply to all species, as different species have different responses to climate change, this is an integral part of my hypothesis and research, as I

will be looking at different climate change scenarios and how connectivity is expected to increase or decrease. As this paper points out, fragmentation affects a species ability to track suitable climates, but how a species is affected depends on their mode of dispersal. My land use data will help me isolate the different barriers that the greater sage grouse may run into as they shift their distributions, especially their winter migratory patterns.

Source #11

Nuñez, T. A., Lawler, J. J., McRae, B. H., & Pierce, D. J. (2013). Connectivity planning to address climate change. Conservation Biology, 27(2), 407-416

Summary

Nuñez et al. describes a method in order to specifically identify corridors for conservation of connectivity in climatic warming scenarios. In doing this, the methods proposed and used for the case of the Pacific Northwest can be applied to other areas to identify such areas. A cost-distance modeling approach was used to specifically identify these areas for potential conservation, and different models of warming were also further used to understand how species may potentially move within an area as their habitat shifts and may no longer be as suitable as the area increases in temperature. Although what was created is ultimately a very simplified approach in order to be broadly applied to a large number of species, their assumptions and use of modeling still provides a first step in approaching where conservation for connectivity should occur.

Relevance

This paper is very relevant to our research as it pertains to connectivity in warming scenarios, which our project addresses in some fashion. It also displays how connectivity in light of climate change is distinctively different from connectivity in the present day. Thus, when approaching what areas exactly should be highlighted and promoted in their importance for connectivity in the future, methods proposed by Nuñez et al. must be highly considered in doing so. Along with this, the paper also discusses how they took a distinctly different approach to connectivity in increasing climatic scenarios, which emphasizes its individual purpose as a paper to us.

Source #12

Tack, J. D., Jakes, A. F., Jones, P. F., Smith, J. T., Newton, R. E., Martin, B. H., Hebblewhite, M., & Naugle, D. E. (2019). Beyond protected areas: Private lands and public policy anchor intact pathways for multi-species wildlife migration. *Biological Conservation*, *234*, 18–27. https://doi.org/10.1016/j.biocon.2019.03.017

Summary

In this paper, Tack et al. examines the migratory patterns of sage-grouse and pronghorn in the Northern Great Plains, emphasizing the importance of private lands and public policy to

conservation efforts. Using Brownian Bridge Movement Models (BBMMs), the researchers concluded that the sage-grouse and pronghorn share overlapping pathways and show similar migratory behaviors, suggesting that both species rely on similar habitat and environmental cues for successful migration. Their research shows the majority of combined migratory pathways for both species traversed a combination of public and private lands, with protected lands encompassing 5% of pathways for both species. However, land tenure of the study area comprised only 5%, so that statistic, though small numerically, is not insignificant. Intact grasslands and sagebrush steppe, which is vital to both species, was found predominantly in private lands, though the cultivation of these lands pose a significant threat to both species. Finally, sage-grouse core areas make up a large portion of migratory pathways for the pronghorn species and the majority of migratory pathways for the sage brush. Overall, the author stresses an all-lands and multi-species approach to conservation .

Relevance

The study area for our research project is the same area that this paper focuses on, just different corridors, as far as I can tell from the data that I've gathered so far. Though our research will focus on the sage-grouse, and this paper includes data on pronghorn as well, this paper provides a great overview of the migratory behaviors of the greater sage grouse in the area that we will be studying, which is something that I was missing but is vital to my research. Additionally, it provides context of the importance of land allocation and management in conservation. Previously, I thought that protected land would be most essential for protection of the greater sage grouse, since more protection leads to less disturbance. But now I know that it is not that simple, and that land use will be an important factor in my research. From looking at the data that I have for my own research project, the land that the corridor I will be studying overlaps includes both private, public, and protected land, which I will need to categorize to answer my research questions. This paper does a great job of that, which I will be using as a reference for my own research project.

Source #13

Thornton, D. H., Wirsing, A. J., Lopez-Gonzalez, C., Squires, J. R., Fisher, S., Larsen, K. W., Peatt, A., Scrafford, M. A., Moen, R. A., Scully, A. E., King, T. W., & Murray, D. L. (2018). Asymmetric cross-border protection of peripheral transboundary species. In Conservation Letters (Vol. 11, Issue 3). Wiley-Blackwell. https://doi.org/10.1111/conl.12430

Summary

In this study, Thornton et al. presents results of an analysis focused peripheral transboundary species (PTS) whose pathways cross a range of ecosystems and cross international borders with different levels of protection.. Their results showed lack of symmetry within such protected areas. For example, along the United States-Canada border the population of the

Canada Lynx is smaller and more fragmented in the southern range segment, with the core range segment residing in Canada. Subsequently, the Canada Lynx are listed as threatened in the United States but legally harvested in Canada, with restrictions. This mismatch threatens the persistence of populations in one of the paired countries due to disrupted connectivity, and is made worse by factors like climate change and border infrastructure. The study advocates for increased international collaboration in research and management to mitigate these risks, highlighting the importance of considering transboundary contexts in conservation planning.

Relevance

Our study area spans both the United States and Canada, with most of the identified transboundary corridors being in the United States. Though it does not sound like this is a major barrier in the conservation of the greater sage grouse, in relation to our research project, this is something to keep in mind. And in conducting further research, I did find out that the greater sage grouse does have different protection statuses in the United States and Canada. Though they are only threatened in the United States, they are endangered in Canada. This will likely result in different protection statuses and management practices, though further research will need to be conducted to make any conclusions. Nevertheless, the management practices used on a parcel land may have an impact on the ability of the greater sage grouse to disperse, and the peripheral range of the corridor I will be studying, the northern range, may be a greater area of importance than I originally thought, challenging my hypotheses.

Source #14

Chen, I.-C., Hill, J. K., Ohlemüller, R., Roy, D. B., & Thomas, C. D. (2011). Rapid Range Shifts of Species Associated with High Levels of Climate Warming. Science (American Association for the Advancement of Science), 333(6045), 1024–1026. https://doi.org/10.1126/science.1206432

Summary

In this paper, *Rapid Range Shifts of Species Associated with High Levels of Climate Warming,* Chen et al. examines poleward and higher elevation range shifts of many terrestrial organisms as a behavioral response to climate change. Though species respond differently to climate change, and more research to assess an individual's response to climate change, Chen et al. found that the majority of species studies are participating in this trend, especially where the climate has warmed the most. A quarter of the species studied moved in the opposite direction, showing a high diversity of range shifts in recent decades. Chen et al. proposed three processes that could be responsible for this, stating them as time delays in species' response, individualistic physiological constraints, and alternative and interacting drivers of change.

Relevance

This change in range shift is a concept that has been brought up in a lot of papers, and in some cases used to defend the protection and good management of certain parcels of land in and around nature corridors. While this paper cannot be applied to the movement of sage grouse

specifically, and more research is needed to determine if global warming is causing the sage grouse to move poleward, it can be used to help defend the use of good management practices in certain areas to maintain connectivity, if the sage grouse is hypothesized to move in the direction of those parcels of land.

Source #15

Row, J. R., Doherty, K. E., Cross, T. B., Schwartz, M. K., Oyler‐McCance, S. J., Naugle, D. E., Knick, S. T., & Fedy, B. C. (2018). Quantifying functional connectivity: The role of breeding habitat, abundance, and landscape features on range‐wide gene flow in sage‐Grouse. Evolutionary Applications, 11(8), 1305–1321. https://doi.org/10.1111/eva.12627

Summary

Row et al. uses landscape genetics in order to specifically look at functional connectivity for sage-grouse throughout their habitat in the United States. They do so using a large number of genetic samples, historical data, cross-comparing data in order to ensure accuracy, as well as utilizing a variety of other existing models to verify further. Looking at functional connectivity specifically as well, this paper considers a variety of factors which are usually not considered when looking at structural connectivity, and thus provides an important and different approach to assessing important areas for sage grouse connectivity overall. Overall insights provided in this research show sage grouse show specific levels of habitat degradation which they can remain connectivity through, as well as emphasize the impact of terrain, human activity, and sagebrush on the species.

Relevance

This paper directly influences our research projects as it serves to inform conservation practices for sage grouse in the future, which our upcoming work is concerned with. Along with this, through its approach using comprehensive gene flow of sage grouse populations in order to assess functional connectivity, it provides a different method which other papers do not usually use to evaluate. Specifically as well, the quantified metrics of what level of habitat degradation sage grouse appear to tolerate in terms of connectivity will likely provide broad applications to our work in evaluating the potential influence of habitat for sage grouse connectivity. Finally, the functional connectivity approach of this paper provides new insights compared to the typical structural connectivity approach we have more often seen.

Source #16

Tack, J. D., Naugle, D. E., Carlson, J. C., & Fargey, P. J. (2011). Greater sage-grouse centrocercus urophasianus migration links the USA and Canada: A biological basis for international prairie conservation. Oryx, 46(1), 64–68. https://doi.org/10.1017/s003060531000147x

Summary

Tack et al. provides a significant argument for the importance of conservation of migration areas for sage grouse in order to ensure proper connectivity of the species. In the research which paved the way for this paper and understanding of the length of sage grouse migration, the longest recorded migratory event for the species was also recorded in the process, that being greater than 120 kilometers in just one direction. Recording their migratory patterns as well, this paper also emphasizes the great distance sage grouse travel in order to ensure a proper winter food source, which is significantly decreasing in amount and connectivity over time. Along with this, the authors also provide further understanding of the importance of conservation of the species in both the United States and Canada, as one country has the ability to create a significant influence on the other in terms of sage grouse populations.

Relevance

This paper is especially relevant as it provides a broader perspective to our research area and species of interest. As this paper specifically focuses on the same area we will be looking at, yet slightly broader, it provides an important insight on where exactly the same sage grouse we are concerned with migrate for the winter. Considering this is important in order to have a broader understanding of sage grouse and their habits, as well as how the area we are looking at is an important stepping stone for the species. Along with this, it also provides further justification of our study area in the first place. Concluding remarks of this paper emphasize the importance of conservation initiatives to occur through the border of the United States and Canada in order to ensure proper migration as well as connectivity.

Additional Resources

Cross, T. B., Schwartz, M. K., Naugle, D. E., Fedy, B. C., Row, J. R., & Oyler‐McCance, S. J. (2018). The genetic network of greater sage‐grouse: Range‐wide identification of keystone hubs of connectivity. *Ecology and Evolution*, *8*(11), 5394–5412. https://doi.org/10.1002/ece3.4056

Cross, T. B., Tack, J. D., Naugle, D. E., Schwartz, M. K., Doherty, K. E., Oyler-McCance, S. J., Pritchert, R. D., & Fedy, B. C. (2023). The ties that bind the sagebrush biome: Integrating genetic connectivity into range-wide conservation of greater sage-grouse. Royal Society Open Science, 10(2), 220437. https://doi.org/10.1098/rsos.220437

DOHERTY, K.E., NAUGLE, D.E., COPELAND, H., POCEWICZ, A. & K I E S E C K E R , J. (2011) Energy development and conservation trade- offs: systematic planning for greater sage-grouse in their eastern range. In Greater Sage-Grouse: Ecology and Conservation of a Landscape Species and its Habitats (eds S.T. Knick & J.W. Connelly), pp. 505–516. Studies in Avian Biology (vol. 38), University of California Press, Berkeley, USA.

KNICK, S.T., DOBKIN, D.S., ROTENBERRY, J.T., SCHROEDER, M.A., VANDER HAEGEN, W.M. & VAN RIPER, III, C. (2003) Teetering on the edge or too late? Conservation and research issues for avifauna of sagebrush habitats. The Condor, 105, 611–634.

Leu, M., & Hanser, S. E. (2011). Influences of the human footprint on Sagebrush Landscape Patterns: Implications for sage-grouse conservation. Greater Sage-GrouseEcology and Conservation of a Landscape Species and Its Habitats, 252–271. https://doi.org/10.1525/california/9780520267114.003.0014

Pascual-Hortal, L., & Saura, S. (2006). Comparison and development of new graph-based landscape connectivity indices: Towards the prioritization of habitat patches and corridors for conservation. Landscape Ecology, 21(7), 959-967

Saura, S., & Rubio, L. (2010). A common currency for the different ways in which patches and links can contribute to habitat availability and connectivity in the landscape. Ecography, 33(3), 523-537

Saura, S., & Torné, J. (2009). Conefor Sensinode 2.2: A software package for quantifying the importance of habitat patches for landscape connectivity. Environmental Modelling & Software, 24(1), 135-139

Tack, J. D., Naugle, D. E., Carlson, J. C., & Fargey, P. J. (2012). Greater sage-grouse Centrocercus urophasianus migration links the USA and Canada: a biological basis for international prairie conservation. *Oryx*, *46*(1), 64–68. doi:10.1017/S003060531000147X

Tack, Jason Duane, "SAGE-GROUSE AND THE HUMAN FOOTPRINT: IMPLICATIONS FOR CONSERVATION OF SMALL AND DECLINING POPULATIONS" (2009). Graduate Student Theses, Dissertations, & Professional Papers. 856. https://scholarworks.umt.edu/etd/856