Project Title: ***Validating Connectivity Models and Informing Conservation Decisions in the Columbia Plateau Ecoregion***

Project Coordinator: Joanne Schuett-Hames, Co-lead of Washington Wildlife Habitat Connectivity Working Group; WDFW; (360)902-2695; Joanne.Schuett-Hames@dfw.wa.gov.

Project PI(s): WDFW—Michael Atamian (Michael.Atamian@dfw.wa.gov), Brian Cosentino (Brian.Cosentino@dfw.wa.gov), Howard Ferguson (Howard.Ferguson@dfw.wa.gov), Woodrow Myers (Woodrow.Myers@dfw.wa.gov), Michael A. Schroeder (Michael.Schroeder@dfw.wa.gov); DNR—John Fleckenstein (JOHN.FLECKENSTEIN@dnr.wa.gov); NAU—Andrew Gregory (Andrew.Gregory@nau.edu); TNC—Sonia A. Hall (shall@tnc.org); The Orianne Society—Stephen Spear (sfspear2@yahoo.com); and Leslie Robb (Independent researcher, robblar@homenetnw.net).

Partners: The Washington Wildlife Habitat Connectivity Working Group (WHCWG) is a science-based collaboration of land and resource management agencies, NGOs, universities, and Washington Treaty Tribes (See Appendix A for full list of partners). The group is co-led by Washington State Departments of Fish and Wildlife (WDFW) and Transportation (WSDOT).

Project Summary: We are requesting funding to support implementation of a connected sage-steppe ecotype for the Columbia Plateau Ecoregion (See Appendix B). We will share results from our ecoregional connectivity analysis (WHCWG 2012) and prepare additional analyses and products directly applicable to those implementing connectivity conservation. We emphasize conservation needs for Greater Sage-Grouse and will: (1) test model assumptions using telemetry and genetic data, and (2) develop an occupancy model for Washington. In addition, we will engage in a rigorous effort to validate shrubsteppe connectivity models, evaluate efficacy of existing linkages, and set a baseline for future monitoring of conservation action impacts on connectivity. This proposal builds on work funded previously by the GNLCC; see Appendix C for examples of how products are being used.

Need: The Columbia Plateau Ecoregion is a 20 million acre region of sage-steppe dominated systems within the Great Northern landscape. Fragmentation due to agriculture and infrastructure dominate the human footprint (Leu et al. 2008) of this ecoregion. Persistence of sage-steppe species depend upon connected habitats. One species that illustrates this is the Greater Sage-Grouse (*Centrocercus urophasianus;* hearafter sage-grouse): in the Columbia Plateau there are two populations that, though only 50 km apart, are genetically distinct (Oyler-McCance et al. 2005). Retaining and restoring connectivity of sage-steppe habitats in this ecoregion is a critical need under current conditions (WHCWG 2012), as well as under a changing climate (WHCWG 2011). The Washington State Wildlife Strategic Plan (WDFW 2005) identified habitat conversion, fragmentation, and degradation as the most serious threats to wildlife. Other documents and plans that identify this need include recovery documents for sage-grouse (Stinson et al. 2004) and Washington ground squirrel (USFWS 2009).

The connectivity analysis of the Columbia Plateau Ecoregion (WHCWG 2012) modeled habitat connectivity for landscape integrity and eleven focal species, and articulated a vision for a connected landscape (Appendix B). This vision reflects the current land use and the patterns of infrastructure and development across the ecoregion, supporting the conclusion that it reliably represents connectivity at this scale. These results provide a solid foundation from which entities can design conservation strategies to achieve this vision. One such entity is the Arid Lands Initiative (ALI), a public-private partnership working to develop and cooperatively implement a coordinated strategy to conserve and restore a well-connected system of eastern Washington's arid lands. We propose to share the connectivity analysis results, and to work with the ALI to tailor our communications and products to their needs as they incorporate connectivity into the selection of priority areas for conservation action.

Adaptive management is a fundamental way that new knowledge is incorporated into decision-making processes. For expert-opinion based modeling efforts such as the connectivity analysis of the Columbia Plateau, validation with empirical data constitutes the first adaptive management loop. We propose to collect data to initiate a rigorous effort to validate connectivity models, evaluate the efficacy of existing linkages, and set a baseline for future monitoring necessary to close the adaptive management loop.

Objectives: In the connectivity analysis of the Columbia Plateau Ecoregion (WHCWG 2012) focal species were selected to represent the main vegetation types across the Columbia Plateau, and emphasized wildlife sensitive to stressors including development and climate change. The proposed science delivery and model validation work directly supports two LCC objectives and functions: (1) *decision support tools/systems and science applications for focused resource conservation* (Objectives 1–2), and (2) *testing assumptions of model predictions* (Objectives 3–8).

Part 1: Science Applications for Focused Resource Conservation—The ALI is an entity focused on implementing conservation actions. The WHCWG can complement their expertise by providing technical support and interpretation of connectivity modeling products. We will:

Objective 1: Share results of the Columbia Plateau connectivity analysis broadly and freely. We will make the Columbia Plateau connectivity products freely available on the web.

Objective 2: Deliver tailored connectivity products to the Arid Lands Initiative. With the support of the North Pacific LCC, the WHCWG is developing additional tools to create products tailored to the needs of the ALI.

Part 2: Testing Assumptions of Model Predictions—Adaptive management will depend on understanding (1) whether we have accurately modeled habitat and habitat concentration areas[1] (HCAs), and (2) how landscape characteristics influence the linkages between them. We will:

Objective 3: Develop and evaluate a habitat model for sage-grouse. Previous research has shown that range-wide habitat models perform poorly in Washington at predicting presence and absence (Aldridge et al. 2008; Wisdom et al. 2011). We propose to develop a Washington-specific habitat model for sage-grouse and to evaluate this model using historical occurrences.

Objective 4: Validate habitat models of focal species tied to sage-steppe ecotypes. In the connectivity analysis, habitat models were used to delineate HCAs. There are some species which depend on persistence within corridors to achieve multi-generational movement between HCAs. We propose to validate the HCAs of four focal species characteristic of the dominant sage-steppe ecosystems, and to develop a study design to guide validation projects for corridor-dwelling species.

Objective 5: Validate the sage-grouse ecoregional connectivity model. The WHCWG is currently validating a statewide-scale connectivity model (WHCWG 2010). Initial results suggest that this model does not accurately capture the connectivity value of agricultural lands. At the ecoregional scale, agriculture was parsed into multiple categories, including one designed to capture Conservation Reserve Program lands. Wind turbines and powerlines layers were also included at this finer scale. We propose to evaluate the ecoregional model developed using greater spatial and thematic resolution.

Objective 6: Validate the mule deer ecoregional connectivity model. We will evaluate connectivity model assumptions and predictions using (1) movement data from a 5-year radio-telemetry study (2002–2006) in north-central Washington, and (2) landscape genetic techniques using available and new data obtained from other Columbia Plateau populations.

Objective 7: Determine the value of a focal species approach relative to a landscape integrity approach. Focal species analyses are more time- and data-intensive than landscape integrity analyses,

[1] Habitat areas that are expected or known to be important for focal species.

and such resources are not always available. We propose to use movement and gene flow data for sage-grouse to compare the focal species and landscape integrity models.

Objective 8: Test a framework for evaluating corridor efficacy and establish a baseline. As part of a global effort to study corridor efficacy, we propose to evaluate a critical linkage within the Columbia Plateau's Connected Backbone (Appendix B) and the ALI's priority area. We will assess genetic structure for white-tailed jackrabbits, and study the role of landscape characteristics in spatially structuring populations. As the ALI partners work to improve connectivity, this analysis will become the baseline condition against which the impact of their conservation actions can be measured.

Methods: The requested funding plus the leveraged funds detailed in the attached budget will allow us to complete the tasks listed in this section, and thereby fulfill the above objectives.

Part 1: Science Applications for Focused Resource Conservation

Objective 1: Share results of the Columbia Plateau connectivity analysis broadly and freely.

Task 1.1. *Package and post online the GIS products developed during the Connectivity Analysis of the Columbia Plateau Ecoregion (WHCWG 2012).* Key cooperators: WDFW.

Objective 2: Deliver tailored connectivity products to the Arid Lands Initiative.

Task 2.1. *Host two workshops with the ALI to communicate results of the Columbia Plateau connectivity analysis and the potential new products, and to review draft tailored products.* Key cooperators: WHCWG partners, ALI.

Task 2.2. *Develop new products tailored to the needs of the ALI using the connectivity analysis's base data layers and the enhanced connectivity tools currently being developed.* Key cooperators: WDFW, TNC, ALI.

Part 2: Testing Assumptions of Model Predictions

Objective 3: Develop and evaluate a habitat model for sage-grouse.

Task 3.1. *Develop a habitat model using a logistic regression approach to examine occupied and unoccupied habitat within the historical sage-grouse range in relation to available spatial layers for the Columbia Plateau.* Key cooperators: WDFW, USFS.

Task 3.2. *Use the habitat model to produce a species distribution map and evaluate it relative to the HCAs used in the Columbia Plateau connectivity analysis and historical observations of sage-grouse.* Key cooperators: WDFW, USFS.

Objective 4: Validate habitat models of focal species tied to sage-steppe ecotypes.

Task 4.1. *Collect fecal pellets in primary modeled HCAs to determine presence/absence of black-tailed and white-tailed jackrabbits.* Genetic analysis of fecal pellets is needed to identify the species of jackrabbit and to model genetic structure. Key cooperators: WDFW.

Task 4.2. *Determine presence/absence of least chipmunk within modeled HCAs and linkages.* We will use standard small mammal trap lines and grids to survey for least chipmunks, stratified by HCAs and habitat. Key cooperators: WDNR.

Task 4.3. *Develop a detailed sampling design plan for four corridor-dwelling focal species to lay the foundation for a future genetic analysis to validate the Columbia Plateau connectivity analysis.* Western rattlesnake, tiger salamander, and Washington and Townsend's ground squirrels are focal species that rely on residence in linkage corridors between HCAs for functional landscape connectivity. Once the sampling design is complete, as a test case we will confirm the presence of rattlesnakes at selected corridor sampling sites. Key cooperators: The Orianne Society.

Objective 5: Validate the sage-grouse ecoregional connectivity model.

Task 5.1. *Compare movement data for radio-marked sage-grouse in north-central Washington to connectivity model predictions.* Key cooperators: WDFW, USFS.

Task 5.2*. Conduct a landscape genetic analysis of sage-grouse for the Columbia Plateau Ecoregion.* We will use a causal modeling framework (Shirk et al. 2010; Cushman et al. 2006) to infer the relative role of distance, barriers, and landscape resistance to gene flow on genetic isolation of sage-grouse in this ecoregion. The resistance surface created by WHCWG (2012) will be used to examine connectivity based on microsatellite variation in sage-grouse. Key cooperators: WDFW, USFS, Dept. of Defense.

Task 5.3. *Examine patterns of lek persistence in relation to the habitat (Tasks 3.1 and 3.2) and connectivity models (WHCWG 2012).* We will use model results to predict lek persistence, and compare predictions to lek data collected from 1960 through 2012. Key cooperators: WDFW, USFS.

Objective 6: Validate the mule deer ecoregional connectivity model.

Task 6.1: *Compare movement data (2002–2006) for radio-marked mule deer in north-central Washington to connectivity model predictions.* Key cooperator: WDFW, USFS.

Task 6.2. *Collect additional tissue samples for mule deer, and analyze genetic samples collected between 2002 and 2005 on 5 mule deer HCAs.* We will build on existing genetic data to validate the connectivity model. Key cooperators: WDFW.

Task 6.3. *Conduct a landscape genetic analysis of mule deer for the Columbia Plateau Ecoregion.* We will analyze available tissue samples collected from five populations (2002–2006) and collect additional samples from populations occupying 9 HCAs in four counties. We will apply landscape genetic analysis techniques to relate patterns of connectivity between populations to patterns of landscape resistance. Key cooperators: WDFW, North Central High School of Spokane, USFS.

Objective 7: Determine the value of a focal species approach relative to a landscape integrity approach.

Task 7.1. *Compare predictions of the sage-grouse connectivity and landscape integrity models (WHCWG 2012).* The analysis will focus on the difference in value associated with examination of focal species versus intact ecosystems. We will focus on sage-grouse, where sufficient data exists to determine the absolute rather than relative value of the models. Key cooperators: WDFW, USFS.

Objective 8: Test a framework for evaluating corridor efficacy and establish a baseline.

Task 8.1. *Assess the extent to which an identified critical linkage of the Columbia Plateau Ecoregion has provided for long-term connectivity.* We will collect genetic samples from white-tailed jackrabbit fecal pellets, and analyze samples for pairwise relatedness. Average pairwise relatedness between samples collected from corridor-connected patches will be compared to the relatedness between samples obtained in intact habitat, and samples from isolated patches to determine whether the corridor is effective or not (Beier and Gregory 2012). Key cooperators: Northern Arizona University, WDFW.

Task 8.2. *Perform landscape genetic analyses to assess the degree to which habitat resistance contributed to the observed level of gene flow among connected, isolated, and intact habitat patches.* In instances where the corridor is not effective, we will conduct a landscape permeability analysis along the corridor route to determine what attributes of the corridor are driving the impermeability (Gregory 2011). Key cooperators: Northern Arizona University.

Deliverables:

Description	Due Date
Objective 1: Share results of the Columbia Plateau connectivity analysis broadly and freely.	
Columbia Plateau connectivity analysis products available online.	JAN 2013
Objective 2: Deliver tailored connectivity products to the Arid Lands Initiative.	
High quality map products tailored to their needs available to the Arid Lands Initiative, and support in interpreting and using these products.	JAN 2013
Objective 3: Develop and evaluate a habitat model for sage-grouse.	
Summary report titled "A Habitat Model for Greater Sage-Grouse in the Columbia Plateau Ecoregion" to be submitted for consideration for publication.	MAR 2014
Objective 4: Validate habitat models of focal species tied to sage-steppe ecotypes.	
Summary report/s detailing: • current range for each jackrabbit species and verification of jackrabbit HCAs • current range, range contraction, and verification of the least chipmunk HCAs. Complete, spatially-explicit sampling design for future genetic validation studies of connectivity of four corridor-dwelling species.	JUL 2013
Objective 5: Validate the sage-grouse ecoregional connectivity model.	
Summary report titled "Landscape Resistance and Patterns of Movement, Lek Persistence, and Gene Flow for Greater Sage-Grouse in the Columbia Plateau Ecoregion" to be submitted for consideration for publication.	MAR 2013
Objective 6: Validate the mule deer ecoregional connectivity model.	
Summary reports entitled "Movement of mule deer in the Columbia Basin in relation to landscape resistance" and "Effects of landscape connectivity on genetic relatedness of mule deer in the Columbia Basin" to be submitted for publication.	JUN 2013
Objective 7: Determine the value of a focal species approach relative to a landscape integrity approach.	
Summary report titled "Comparison of Focal Species and Landscape Integrity Models using Greater Sage-Grouse" to be submitted for consideration for publication.	MAR 2013
Objective 8: Test a framework for evaluating corridor efficacy and establish a baseline.	
Manuscript in preparation for publication, assessing: • the effectiveness of the corridor for maintaining genetic connectivity • results of landscape genetic or permeability analyses linking gene flow to landscape attributes. These data will likely be used in a National Science Foundation proposal to help leverage funding for a larger global analysis of corridor efficacy.	JUN 2013

Statement of Compliance:

The Project Coordinator and Principal Investigators have read Great Northern Landscape Conservation Cooperative Information Management, Delivery, and Sharing Standards and agree to comply with those standards if the proposal is selected. We cannot release to the Public Domain data for Species deemed Sensitive by WDFW, *Policy-5210 Releasing Sensitive Fish and Wildlife Information* and data under contract such as proprietary energy or defense data.

Schedule:

Validating Connectivity Models and Informing Conservation Decisions in the Columbia Plateau Ecoregion		FY2013 (Federal)				FY2014 (Federal)		
	2012		2013				2014	
	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun
Part 1: Science Applications for Focused Resource Conservation								
Objective 1: Share results of the Columbia Plateau connectivity analysis broadly and freely.								
Task 1.1. *Package and post online the GIS products*								
Objective 2: Deliver tailored connectivity products to the Arid Lands Initiative.								
Task 2.1. *Host two workshops with the ALI*								
Task 2.2. *Develop new products tailored to the needs of the ALI*								
Part 2: Testing Assumptions of Model Predictions								
Objective 3: Develop and evaluate a habitat model for sage-grouse.								
Task 3.1. *Develop a habitat model*								
Task 3.2. *Use the habitat model to produce a species distribution map and evaluate it*								
Objective 4: Validate habitat models of focal species tied to sage-steppe ecotypes.								
Task 4.1. *Collect fecal pellets in primary modeled HCAs to determine presence/absence of black-tailed and white-tailed jackrabbits*								
Task 4.2. *Determine presence/absence of least chipmunk within modeled HCAs and linkages*								
Task 4.3. *Develop a detailed sampling design plan for four corridor-dwelling focal species*								
Objective 5: Validate the sage-grouse ecoregional connectivity model.								
Task 5.1. *Compare movement data for radio-marked sage-grouse to connectivity model predictions*								
Task 5.2 . *Conduct a landscape genetic analysis of sage-grouse*								
Task 5.3. *Examine patterns of lek persistence in relation to the habitat and connectivity models*								
Objective 6: Validate the mule deer ecoregional connectivity model.								
Task 6.1: *Compare movement data for radio-marked mule deer to connectivity model predictions*								
Task 6.2. *Collect and analyze mule deer genetic samples*								
Task 6.3. *Conduct a landscape genetic analysis of mule deer for the Columbia Plateau Ecoreigon*								
Objective 7: Determine the value of a focal species approach relative to a landscape integrity approach at two scales.								
Task 7.1. *Compare predictions of the sage-grouse connectivity and landscape integrity models*								
Objective 8: Test a framework for evaluating corridor efficacy and establish a baseline.								
Task 8.1. *Assess the extent to which an identified critical linkage of the Columbia Plateau Ecoregion has provided for long-term connectivity*								
Task 8.2. *Perform landscape genetic analyses to assess the degree to which habitat resistance contributed to the observed level of gene flow*								

Appendix A: Washington Wildlife Habitat Connectivity Working Group (WHCWG) Partners

Member organizations of the WHCWG include: The Nature Conservancy (TNC), Conservation Northwest (CNW), Washington Department of Natural Resources (DNR), US Forest Service (USFS), US Fish and Wildlife Service (USFWS), Western Transportation Institute (WTI), Bureau of Land Management (BLM), Washington Conservation Science Institute (WCSI), and University of Washington (UW). Additional partners include The Orianne Society, Department of Defense (DoD), and Northern Arizona University (NAU).

Appendix A.1: Citations

Aldridge, C. L., S. E. Nielsen, H. L. Beyer, M. S. Boyce, J. W. Connelly, S. T. Knick, and M. A. Schroeder. 2008. Range-wide patterns of Greater Sage-Grouse persistence. Diversity and Distributions 14:983–994.

Beier, P., and A. J. Gregory. 2012. Desperately seeking stable 50-year-old landscapes with patches and long, wide corridors. PLoS Biology 10(1): e1001253. doi:10.1371/journal.pbio.1001253.

Cushman, S. A., K. S. McKelvey, J. Hayden, M. K. Schwartz. 2006. Gene flow in complex landscapes: testing multiple hypotheses with causal modeling. American Naturalist 168:486–499.

Gregory, A. J. 2011. Landscape genetics and behavioral ecology of Greater Prairie-Chickens (*Tympanuchus cupido*). PhD dissertaiton. Kansas State University, Manhattan, Kansas.

Leu, M., S. E. Hanser, and S. T., Knick 2008. The human footprint in the West: A large-scale analysis of anthropogenic impacts. Ecological Applications 18:1119–1139.

Oyler-McCance, S. J., S. E. Taylor, and T. W. Quinn. 2005. A multilocus population genetic survey of the Greater Sage-Grouse across their range. Molecular Ecology 14:1293–1310.

Shirk, A. J., D. O. Wallin, S. A. Cushman, C. R. Rice, and K. I. Warheit. 2010. Inferring landscape effects on gene flow: a new model selection framework. Molecular Ecology 19:3603–3619.

Stinson, D. W., D. W. Hays, and M. A. Schroeder. 2004. Washington State recovery plan for the greater sage-grouse. Washington Department of Fish and Wildlife, Olympia, Washington.

WHCWG (Washington Wildlife Habitat Connectivity Working Group). 2011. Washington Connected Landscapes Project: Climate-Gradient Corridors Report. Washington Departments of Fish and Wildlife, and Transportation, Olympia, Washington. Available from http://waconnected.org/climate-change-analysis/.

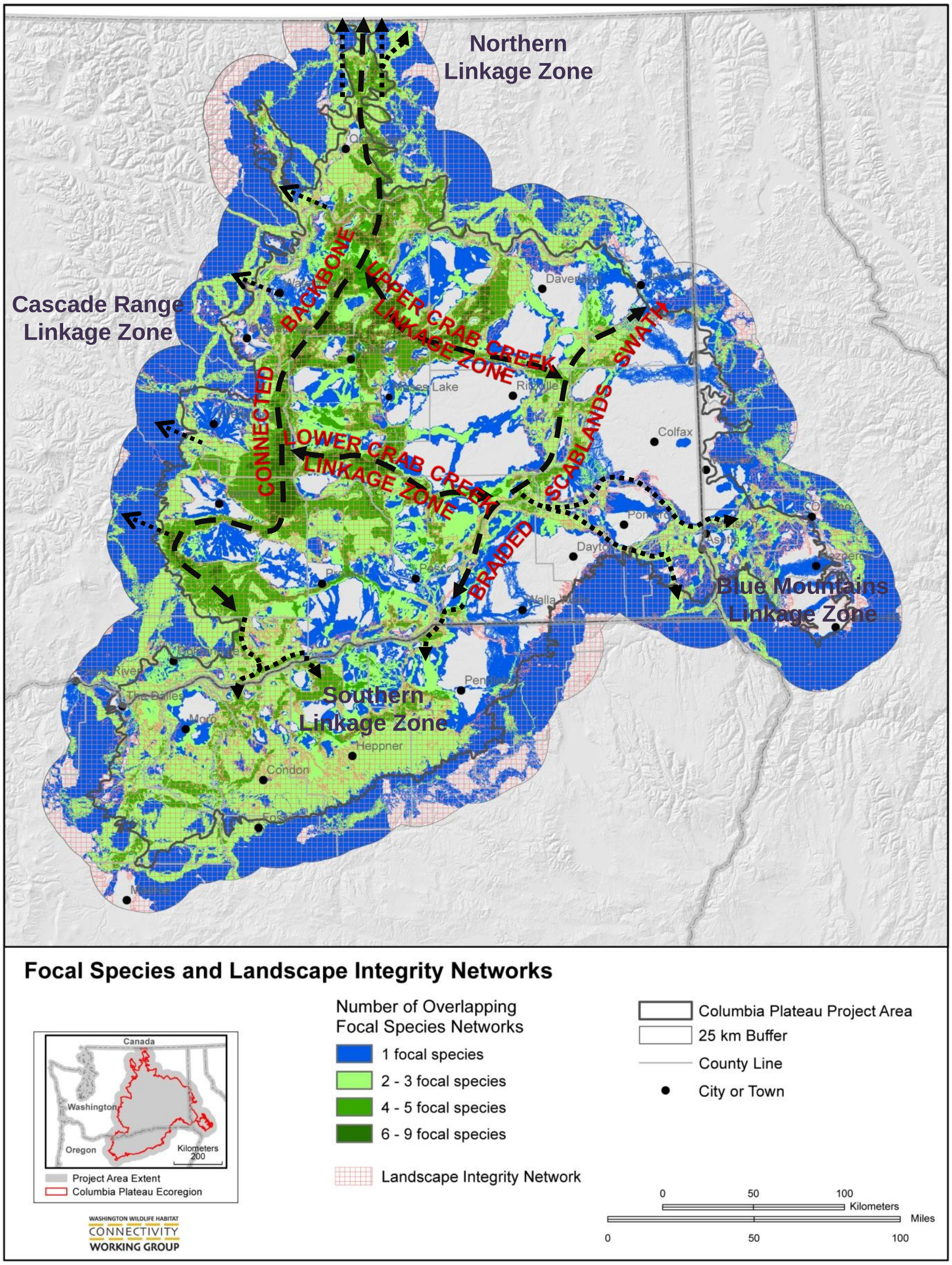
WHCWG (Washington Wildlife Habitat Connectivity Working Group). 2012. Washington Connected Landscapes Project: Analysis of the Columbia Plateau Ecoregion. Washington Departments of Fish and Wildlife, and Transportation, Olympia, Washington. Available from http://waconnected.org/columbia-plateau-ecoregion/.

WDFW (Washington Department of Fish and Wildlife). 2005. Washington's Comprehensive Wildlife Conservation Strategy. Wildlife Diversity Division. Olympia, Washington.

Wisdom, M. J., C. W. Meinke, S. T. Knick, and M. A. Schroeder. 2011. Factors associated with extirpation of Sage-Grouse. Pages 451–472 in S. T. Knick and J. W. Connelly, editors. Greater Sage-Grouse: ecology and conservation of a landscape Species and its habitats. Studies in Avian Biology Series (vol. 38), University of California Press, Berkeley, California.

U.S. Fish and Wildlife Service. 2009. US Fish and Wildlife Service Species Assessment and Listing Priority Assignment Form: Washington ground squirrel. Recommended conservation measures.

Appendix B: Vision for a Connected Columbia Plateau Ecoregion



Vision for a connected Columbia Plateau Ecoregion in Washington (WHCWG 2012). Solid colors reflect the number of focal species' networks particular areas belong to. The hatching represents the landscape integrity composite network. Dashed arrows highlight important areas for connectivity in Washington, and dotted arrows highlight important linkage zones to neighboring ecoregions and states.

Appendix C: Example uses of WHCWG products supported with funding from the GNLCC.

Statewide Analysis Products

Bureau of Land Management. WDFW provided least-cost corridors and HCAs layers for BLM planning. (*Brian Cosentino, 2012Mar*)

U.S. Fish and Wildlife Service. The Washington Statewide Analysis is being used in several programs to inform decisions. Programs include Habitat Conservation Plan development, Section 6 Coordination with states, including land acquisition to promote conservation objectives, Recovery initiative grant reviews, and in our participation in the Arid Lands Initiative. Applications occur throughout Washington State. (*Karl Halupka, 2012Mar*).

U.S. Forest Service. Results and products from the statewide analyses are being used to address ecological connectivity in land management planning. The Okanogan-Wenatchee National Forest and the Colville National Forest are in the process of revising their land management plans and are addressing ecological connectivity as one of several significant issues. Information from the statewide analysis on Habitat Concentration Areas and key linkage areas has been very useful. In addition, the final report provides a tremendous resource that summarizes information about connectivity planning and is being referenced in the environmental analyses that will accompany the revised land management plans. (*Bill Gaines, 2012Mar*)

Washington Department of Fish and Wildlife. Statewide Analysis. Model validation analysis for Greater Sage-Grouse. Genetic analysis of Greater Sage-Grouse in the Moses Coulee population indicates that this population is genetically distinct from the population on the Yakima Training Center as there is little genetic exchange between the two populations. This finding emphasizes the importance of augmentation efforts for the YTC population. (*Michael A. Schroeder, 2012Mar*)

Washington Department of Fish and Wildlife. Statewide Analysis. Connectivity modeling products for Greater Sage-Grouse. The connectivity analysis was used to argue against placement of a new powerline on the north side of the YTC rather than the south side (the north side would add additional resistance to the connection between the Moses Coulee and YTC populations. (*Michael A. Schroeder, 2012Mar*)

Washington Department of Fish and Wildlife. WDFW will use WHCWG state and Columbia Plateau product information in the near future to inform decision making for land acquisitions and prioritizing restoration projects on WDFW lands. (*Lauri Vigue, 2012Mar*)

Western Transportation Institute. Provided Statewide “Plus” GIS base layers to the North Cascades carnivore landscape genetic analysis project. (*Brian Cosentino, 2012Mar*)

Climate Connectivity Products

Environment Canada. Statewide Climate Gradient Corridors analysis use: to be included as part of a project looking at climate impacts on ecosystems, species, and parks in the Okanagan Valley, British Columbia (and possibly also the Thompson River drainage). (*Meade Krosby, 201*2Mar)

Environmental Protection Agency. Statewide Climate Gradient Corridors analysis use: (1) as an additional data layer to identify “green infrastructure,” i.e., areas of high ecological importance that need to be avoided as part of the PSRC Transportation 2040 Prioritization Tool for the environmental criteria, and (2) pointing to the analysis when reviewing and commenting on Federal projects pursuant to NEPA/CAA S. 309 for EPA, particularly transportation projects that may negatively affect these habitat corridors critical to species movement under current and potential future climate change scenarios. (*Meade Krosby, 2012Mar*)

Hells Canyon Preservation Council. Statewide Climate Gradient Corridors analysis use: to inform their work regarding a) a large windfarm proposal in an area that acts as a wildlife corridor between the Wallowas and Blue Mountains, and b) the integration of wildlife connectivity into the Blue Mountains Forest Plan Revisions. (*Meade Krosby, 2012Mar*)

Sierra Club. Statewide Climate Gradient Corridors analysis use: included as part of their "Climate-Informed Conservation Blueprints for Washington" analysis (completed by EcoAdapt), aimed at highlighting and prioritizing areas and actions likely to increase the success of their regional conservation efforts. (*Meade Krosby, 2012Mar*)

Columbia Plateau Analysis Products

Arid Lands Initiative. Multiple ALI partners used connectivity maps and other data layers to select three potential priority geographic areas to implement ALI conservation strategies, and to guide discussions that led to the selection of one priority area, considered a Proof of Concept area. The ALI's goal for this Proof of Concept is to "*Demonstrate that working together collaboratively, the public and private partners of the Arid Lands Initiative can measurably increase conservation outcomes, reduce regulatory uncertainty to the land manager, and maintain or improve economic viability*." (*Sonia A. Hall, 2012Mar*)

Andrew Gregory and Paul Beier, Northern Arizona University. Evaluating current connectivity for wildlife in Douglas County. These researchers have identified nearly 100 landscapes globally that contain de facto conservation corridors (landscape configurations that resemble conservation corridors in size and context, but which exist as a quirk of the way the landscape was developed) and plan to test conservation corridor efficacy. One of these study landscapes is the Moses Coulee–Mansfield Plateau area. They are using the connectivity products to inform the species they select to focus on in this landscape. As this is within the ALI's Proof of Concept area, this study will provide useful baseline information on the effectiveness of arid lands linkages in Douglas County. This is a key portion of proving the ALI concept: after multiple years of ALI conservation action, monitoring of relatedness between populations can be compared to this baseline evaluation to determine impact of those actions on connectivity. (*Sonia A. Hall, 2012Mar*)

Washington Department of Fish and Wildlife. Columbia Plateau analysis and HCA Map layer: (1) Washington ground squirrel population health is likely ultimately tied to habitat connectivity. In 2012 WDFW is initiating Washington ground squirrel occupancy modeling and population trends and the foundation for much of the sampling is the HCA map layer. (2) WDFW is working with USFWS to develop methods to reintroduce Washington ground squirrels. Within the next few years, the HCA map layer will be used in conjunction with historic presence data to determine strategic reintroduction sites which we hope will serve as stepping stones to link populations that lack genetic exchange. (*Rich Finger, Jim Watson, 2012Mar*)

Washington Department of Fish and Wildlife. Columbia Plateau Analysis - including HCA and Linkage Map layers. There have been no formal surveys for either of the two jackrabbit species in WA. So partially as a result of the findings of the Statewide and Columbia Plateau Analyses, WDFW in 2012 is initiating a Presence/Absence Survey for both the white-tailed and black-tailed jackrabbits in areas based on the modeling results from these two Connectivity studies. Searches will be made in the HCA and linkage areas identified in the analyses. (*Howard Ferguson, 2012Mar*)

Washington Department of Fish and Wildlife. Columbia Plateau Analysis. Connectivity products for Greater Sage-Grouse. Each spring district biologists conduct intensive surveys to search for "new" leks. The modeled resistance surface is being used to guide these efforts. We are also using this product to consider potential translocation sites. The connectivity models are also being used to support the establishment of “core areas” needed to influence management decisions. (*Michael A Schroeder, 2012Mar*)

Washington Department of Fish and Wildlife. Columbia Plateau Analysis. Linkage network for Sharp-tailed Grouse. The linkage network for Sharp-tailed Grouse has one habitat concentration area that is “centrally’ located with linkage pathways connecting to seven other habitat concentration areas. The Washington Sharp-tailed Grouse Working Group has targeted this habitat concentration area for future translocation. (*Michael A Schroeder, 2012Mar*)