WASHINGTON CONNECTED LANDSCAPES PROJECT: ANALYSIS OF THE COLUMBIA PLATEAU ECOREGION

EXECUTIVE SUMMARY

WASHINGTON WILDLIFE HABITAT CONNECTIVITY WORKING GROUP

FEBRUARY 2012

Cover photo of landscape by Joe Rocchio. Black-tailed jackrabbit photo by Greg Lasley.

Washington Connected Landscapes Project: Analysis of the Columbia Plateau Ecoregion

Executive Summary

Washington Wildlife Habitat
Connectivity Working Group

February 2012

Mission Statement of the
Washington Wildlife Habitat Connectivity Working Group

Promoting the long-term viability of wildlife populations in Washington State through a science-based, collaborative approach that identifies opportunities and priorities to conserve and restore habitat connectivity

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(A listing of all WHCWG subgroups and members is provided in the full document)

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Executive Summary

Introduction

In the early 1800s, it took Lewis and Clark the better part of three years to travel from the Atlantic seaboard to the Pacific Ocean and back. Today, the same trip takes less than a day. People benefit in many ways from living in such a connected world. Being connected improves our lives by giving us access to new places, resources, partners, and ideas. However, the essential features of our modern and connected world—roads, railroads, transmission lines, irrigation canals, reservoirs, agricultural fields, mines, and houses—tend to fragment the natural world and affect animal movement. Like us, animals benefit from connectivity, and are harmed by isolation. When connected, even small patches of habitat function more like large patches, supporting more abundant, diverse, and resilient wildlife populations. For our world to continue enjoying healthy and diverse wildlife populations and the resources and values that wildlife represent, it is not only people who need to be connected; we also need to provide natural connections for animals.

The Washington Wildlife Habitat Connectivity Working Group (WHCWG) was formed to address issues of wildlife habitat connectivity within Washington and surrounding lands. Our mission is to "*promote the long-term viability of wildlife populations in Washington State through a science-based, collaborative approach that identifies opportunities to conserve and restore habitat connectivity*." The analysis described in this Executive Summary and the full report provides a vision for a connected landscape in the Columbia Plateau Ecoregion in Washington, and synthesizes the information that organizations need to incorporate connectivity into conservation efforts while meeting their own organizational goals and priorities.

Connectivity Analysis of the Columbia Plateau Ecoregion

The *Washington Connected Landscapes Project: Statewide Analysis* produced in 2010 (WHCWG 2010)[1] was an important first step for connectivity conservation. It described broad connectivity patterns for Washington State and neighboring areas in British Columbia, Idaho, and Oregon and highlighted the Columbia Plateau as an ecoregion where native vegetation communities are severely fragmented, limiting movement potential for animals. We then focused on this more detailed and comprehensive connectivity analysis of the Columbia Plateau Ecoregion in the United States[2] (Fig. ES.1), with the **goal of identifying the most important areas for maintaining and enhancing wildlife habitat connectivity across this ecoregion**. This analysis bridges the broad patterns of connectivity we observed in the statewide analysis to local scale and project-level conservation efforts.

[1] WHCWG (Washington Wildlife Habitat Connectivity Working Group). 2010. Washington Connected Landscapes Project: Statewide Analysis. Washington Departments of Fish and Wildlife, and Transportation. Olympia, WA.

[2] Our study area includes the Columbia Plateau Ecoregion and those lands within a 25 km buffer around the ecoregion boundary. Because of modeling constraints we do not include in our analysis the portion of the Columbia Plateau Ecoregion that extends into British Columbia, Canada.

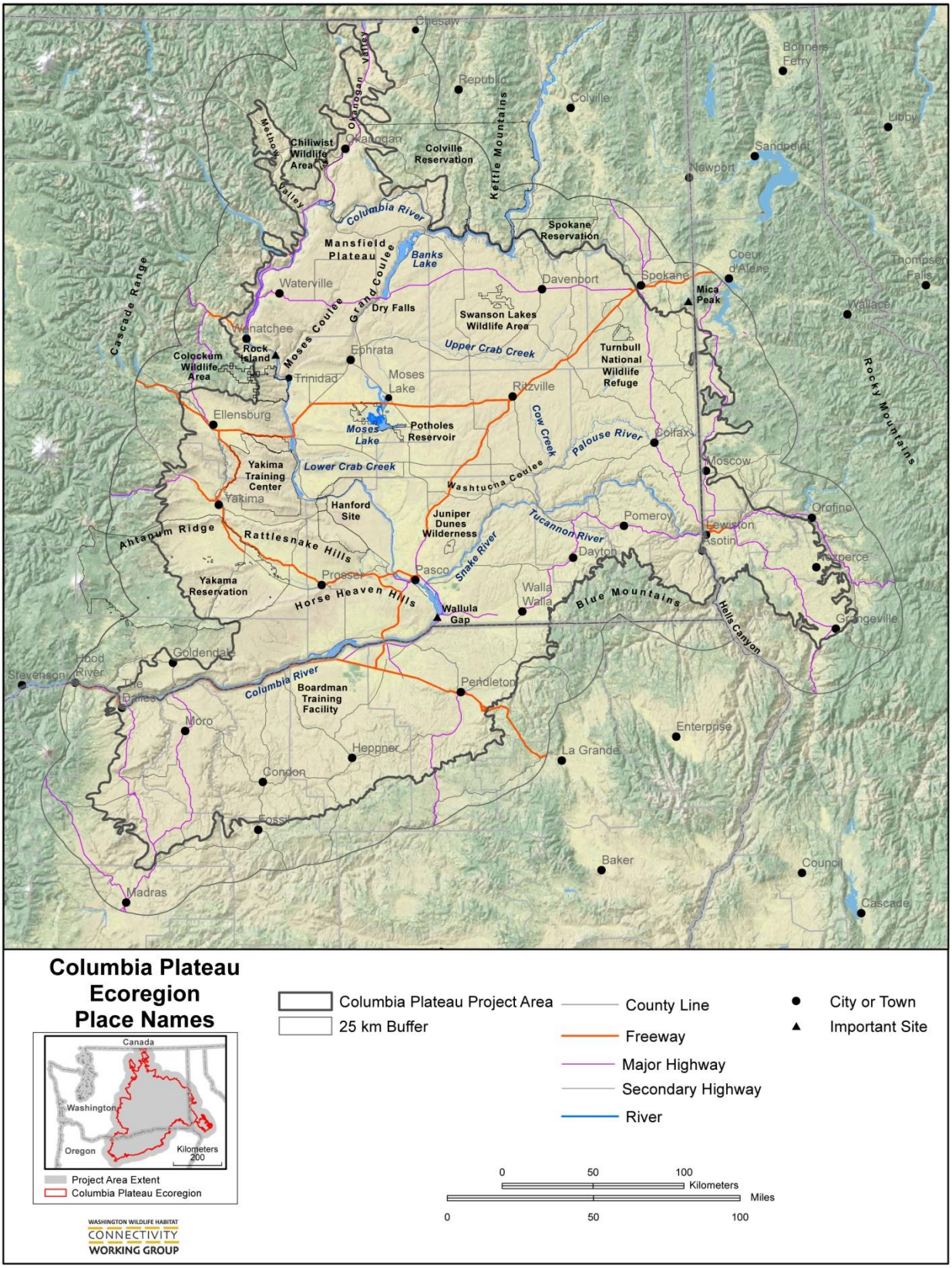

Figure ES.1. The Columbia Plateau Ecoregion showing common geographic features and place names.

The main products of our analysis are maps that depict linkage networks and the data and models used to create them. A linkage network includes areas of suitable habitat (called habitat concentration areas, or core areas) and the linkages connecting them. Sometimes the linkages include stepping stones of good habitat, though they are not contiguous enough to be characterized as habitat concentration or core areas. Other times the linkages follow the best, albeit marginal, movement routes through poor or degraded habitat, if there is nothing else available. The pathways that linkages take are influenced by both natural and man-made features across the landscape that may impede movement. For example, a linkage pathway may trace around cliffs, large lakes, or other natural impediments to animal movement, as well as developed areas, highways, or extensive agricultural areas.

The linkage network maps we present in this report are derived from two modeling approaches: focal species and landscape integrity. Our focal species approach produced linkage networks for 11 focal species selected to represent the connectivity needs of a broader assemblage of wildlife (See example in Fig. ES.2). Our landscape integrity approach identified cores of relatively intact natural areas with low levels of human modification, and linkages tracing the least-modified routes between them (Fig. ES.3). These two different approaches identified broadly similar patterns of habitat connectivity, giving us confidence that this modeling effort effectively represents the connectivity needs of our study area.

This Executive Summary describes the two main outcomes of the connectivity analysis of the Columbia Plateau Ecoregion: (1) a vision for a connected Columbia Plateau in Washington, and (2) recommendations for maintaining and restoring connectivity to achieve this vision.

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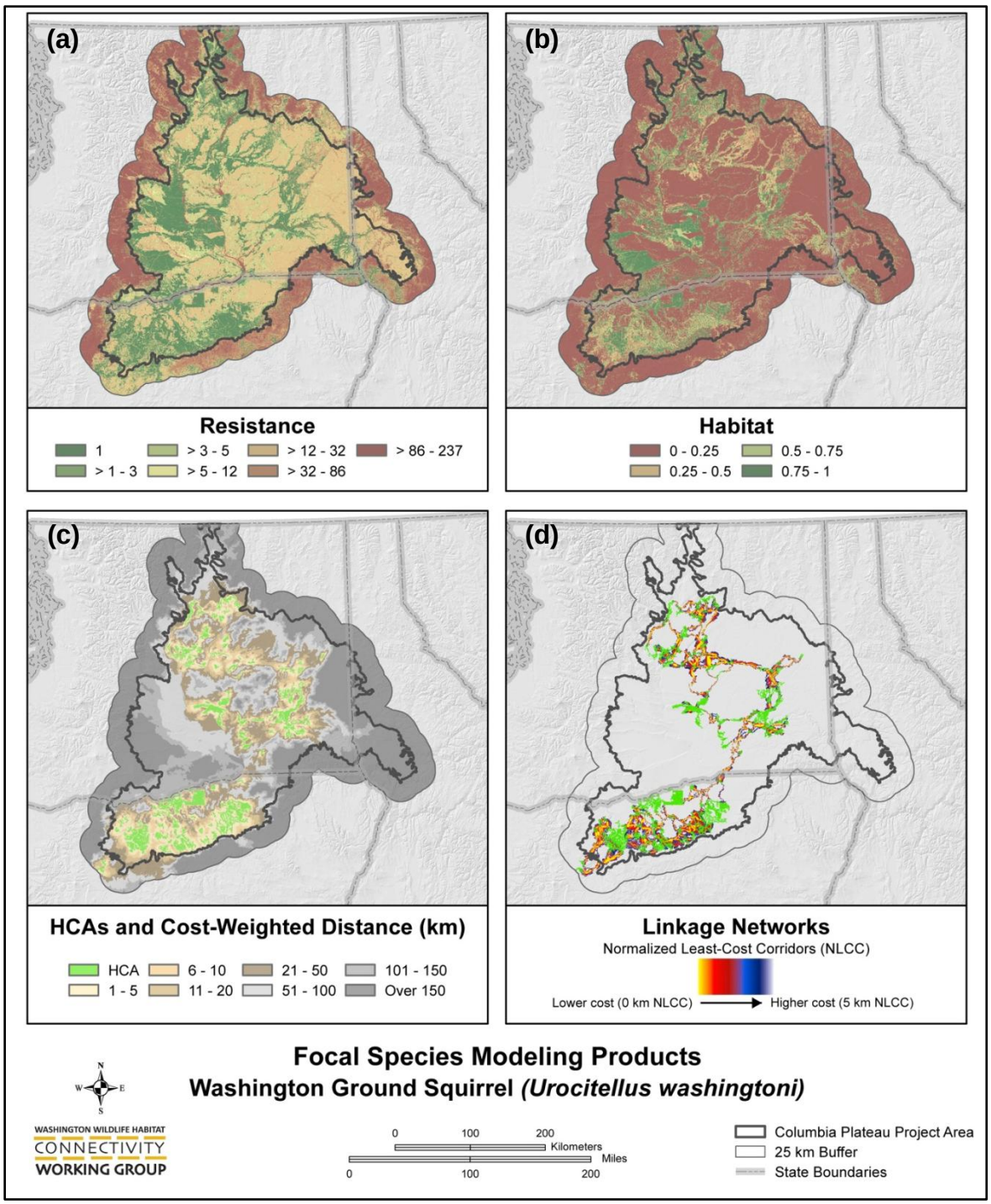

Figure ES.2. Main products of the focal species modeling approach. (a) Resistance, depicting how hard it is for the species to move across the landscape. (b) Habitat value, reflecting habitat suitability for the species across the landscape. (c) Habitat concentration areas (HCAs), where suitable habitat for the species is most dense; and cost-weighted distance, which provides a measure of the accumulated cost of movement as the species moves away from a HCA. This measure considers both the actual distance from the habitat area and the resistance to movement of the intervening landscape. (d) Linkage networks, which include the habitat concentration areas and the linkages connecting them, follow the path of least resistance for the species between neighboring habitat areas.

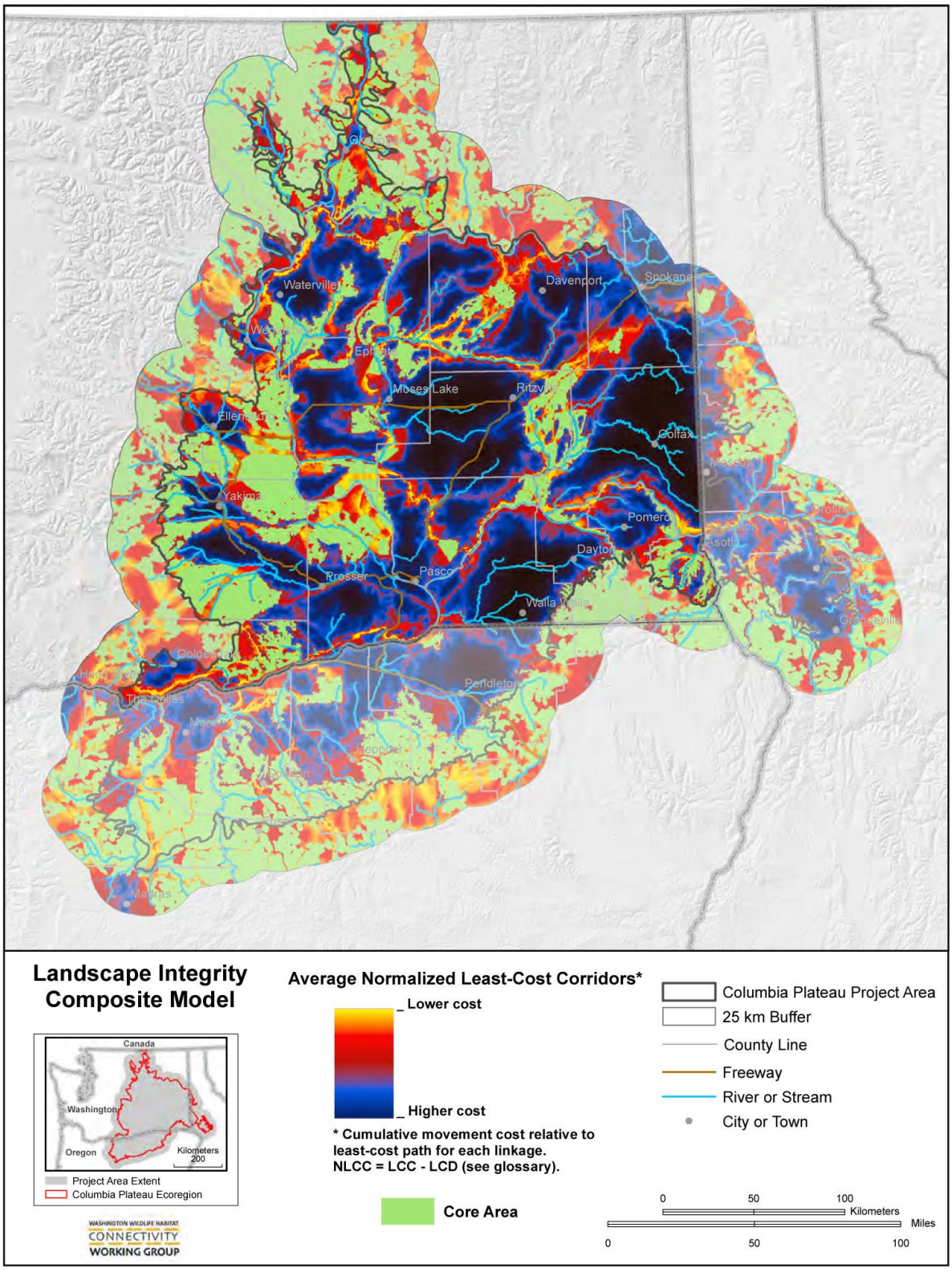

Figure ES.3. Landscape integrity composite model map. This map indicates the results from the combined linear, minimum, medium, and maximum linkage models (See full document for details of these models).

A Vision for a Connected Columbia Plateau Ecoregion in Washington

We have identified two broad regions and two critical sets of complex linkage zones—each containing multiple individual core areas and linkages—that together provide a vision for a connected Columbia Plateau landscape in Washington and beyond. These are:

- Central Washington's **Connected Backbone**, from the Horse Heaven Hills through to the Okanogan Valley (Fig. ES.4)—This series of loosely linked core areas has been identified as important in all the analyses carried out so far as part of the *Washington Connected Landscapes Project*. This result reinforces the conclusion of the statewide analysis that conversion and development in the Columbia Plateau has constrained potential movement routes for wildlife to fewer and fewer portions of the landscape (WHCWG 2010).
- The **Braided Scablands Swath**, from Spokane to the confluence of the Snake and Columbia rivers (Fig. ES.4)—In the eastern portion of the Columbia Plateau, movement routes are even more constrained, and generally follow lands still dominated by native habitat, mostly the lands scoured by the Missoula Floods, where soils are too shallow or rocky or the land too rugged to be used for agriculture. A well-connected system of Washington's arid lands will not be achieved with a sole focus on the north–south Connected Backbone in central Washington; it should also link to this Braided Scablands Swath and beyond.
- Complex east–west linkage zones between the Connected Backbone and the Braided Scablands Swath—The **Upper Crab Creek** and the **Lower Crab Creek Linkage Zones** encompass the main pathways that would allow for east–west movement (Fig. ES.4). These pathways are a critical component of a connected landscape. Like rungs of a ladder, these linkage zones connect two mostly parallel bands of habitat running approximately north to south, transforming them into a network of habitat that spans the majority of Washington's arid lands.
- Complex linkage zones beyond Washington, connecting the Washington network to surrounding areas (Fig. ES.4)—A connected landscape within Washington State that is isolated from the surrounding ecoregions and neighboring jurisdictions may not be sufficient to support species' long-term persistence under the continuing pressures of population growth, development, and the projected impacts of climate change. Complex linkage zones that can maintain connections to areas outside of Washington are therefore essential to the vision of a connected landscape we propose here. Our results highlight the most important areas as: (1) the **Northern Linkage Zone** along the Okanogan Valley, which contains potentially critical areas for the movement of shrubsteppe species to higher latitudes as temperatures increase in the region; (2) the **Southern Linkage Zone**, which includes the braided linkages south of the Horse Heaven Hills, providing a pathway to the Columbia River and across it to the uplands in north-central Oregon, and the tenuous linkage just east of Wallula Gap, establishing connectivity into north-central Oregon without needing to cross the Columbia River; (3) the broad and numerous linkages between the Connected Backbone and the forested areas in the **Cascade Range**; and (4) the diverging, narrow linkages that follow the Snake and Tucannon river valleys,

from the Braided Scablands Swath towards the **Blue Mountains** in northeastern Oregon and western Idaho.

The broad regions as well as the complex linkage zones arise from recurring patterns observed in the results obtained using the focal species and landscape integrity modeling approaches. These regions and linkage zones also reflect the current land use and the patterns of infrastructure and development across the ecoregion. This observed pattern supports the conclusion that our vision for the Columbia Plateau, though based on a landscape modeling project with intrinsic limitations, reliably represents connectivity at the ecoregional scale. Results of this connectivity analysis provide a solid foundation from which entities interested in connectivity conservation can design strategies to achieve their specific goals and priorities.

Achieving the Vision of a Connected Columbia Plateau

The vision for a connected Columbia Plateau we articulate here and in the full report has yet to be achieved. A guiding principle as our team was making the multiple decisions that went into the development of each model was to err on the side of including as many opportunities for connectivity conservation as was reasonable. For example, linkages for some species were allowed to be longer than the species' documented movement distances to help ensure that the best opportunities for linkages between important areas were identified, even if they might not currently function as connections (Appendix A). Additionally, this analysis did not include information on the condition of the vegetation: all areas where there is abundant shrubsteppe are treated equally, whether the vegetation is in excellent condition or highly degraded. Realistically, degraded lands provide lower habitat value and may well pose greater resistance to animal movement.

Even given this generous approach, many linkages in the region are tenuous and narrow, at best, suggesting that they may not persist under future environmental and land use changes. We raise these points to emphasize that connectivity in the future will depend not just on maintaining what is currently connected. It will also depend on restoration and enhancement efforts to increase the size and improve the condition of the broad connected regions and the complex linkage zones that comprise this vision for wildlife connectivity in the Columbia Plateau.

Grounded in this perspective, we provide some recommendations to those interested in conserving and restoring habitat connectivity in the Columbia Plateau and contributing to this vision. These recommendations are concrete examples of how to use the insights gained through this analysis—detailed below each recommendation—to inform decisions. They are not meant to be all-inclusive nor are they meant to be prescriptive. We recognize that each entity and organization has its own goals and priorities, and we consider that one of the greatest values of the Columbia Plateau connectivity analysis is the depth and breadth of results, which lend themselves to multiple uses and opportunities for informing decisions.

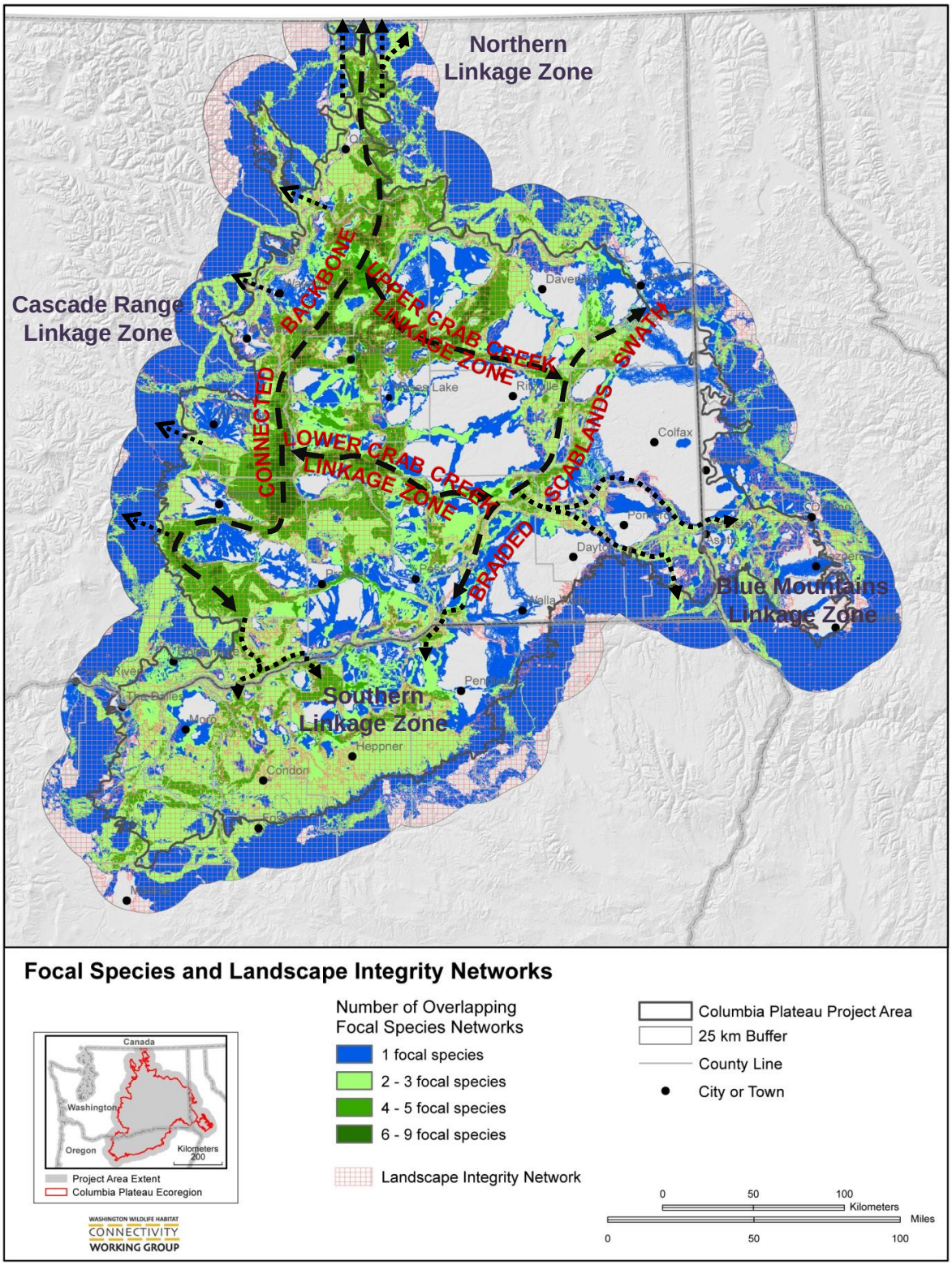

Figure ES.4. Vision for a connected Columbia Plateau Ecoregion in Washington. Solid colors reflect the number of focal species' networks particular areas belong to. The hatching represents the landscape integrity composite network. Dashed arrows highlight important areas for connectivity in Washington, and dotted arrows highlight important linkage zones to neighboring ecoregions and states.

Maintain and restore the integrity of the Connected Backbone. The larger blocks of remaining native habitat and the generally broad linkages between them along this Backbone are essential to connectivity conservation in the Columbia Plateau. Future land use changes and infrastructure development projects (wind farms for example) warrant appropriate consideration of connectivity effects in this area.

- The linkages along the Backbone in central Washington vary in their current capacity to function as true connections. Our ecoregional-scale results emphasize locations within the Backbone where particular attention is needed to either maintain or, most likely, restore linkages, such as the narrow or otherwise tenuous connections between the Horse Heaven Hills and the Hanford Site, across the Yakima Valley (Ahtanum Ridge to Rattlesnake Hills), and across the Columbia River between Rock Island and Trinidad.

Maintain and restore the integrity of the Braided Scablands Swath. A well-connected system of Washington's arid lands would be incomplete without the core areas and linkages in the eastern portion of the Columbia Plateau, contained in the Braided Scablands Swath. The emphasis in this portion of the ecoregion, where networks are less consistent and more tenuous, may need to be on restoration, particularly of deep-soiled plant communities around narrow linkages where the habitat characteristics differ from those of the scabland communities.

- Connectivity in the easternmost portion of Washington is less robust than further west (Figs. ES.3 and ES.4). This pattern is consistent with the level of agricultural conversion of the deep, tillable soils in the Palouse Prairie. Much of the remaining native habitat is associated with surface geology dominated by exposed volcanic rocks, either due to uplift of mountains or to the scouring of the Missoula Floods.

Restore and expand the complex linkage zones that transform bands of connected habitat into a comprehensive network spanning the Columbia Plateau in Washington and beyond. Apparently robust linkage zones extend from the Connected Backbone westward to the Cascade Range, and northward to British Columbia. Linkages are more tenuous, however, in the eastern and southern portions of the ecoregion. Linkages between the Connected Backbone and the Braided Scablands Swath, linkages that extend beyond the ecoregion in Washington, and linkages that provide opportunities to increase the number of linkage zones—thereby increasing the robustness of this habitat network—would benefit from particular attention to connectivity effects.

- The networks for the seven species most closely associated with upland systems in the Columbia Plateau tend to be contained within the ecoregional boundary (Fig. ES.5), indicating the likelihood of limited interaction with populations in adjoining ecoregions. However, there are prominent linkages with the potential for connecting the Backbone to the Cascade Range in the mule deer and landscape integrity networks (Fig. ES.6), as well as to British Columbia and north-central Oregon for these and the upland species (Figs. ES.5 and ES.6).
- Multiple narrower areas run approximately perpendicular to the Braided Scablands Swath, potentially linking it to the Connected Backbone. In addition to the Upper and Lower Crab Creek linkages, a less robust connector in the northern portion follows a

route along Lake Roosevelt, and another minor connector extends from Cow Creek across to the Potholes vicinity. Native habitats are confined to coulees and shallow rocky soils that have not been converted to agriculture.

- The species that represent drainages, aquatic, and canyon landscapes in the ecoregion—particularly Western rattlesnake and beaver—have networks that extend into the buffer, particularly along drainages and riverine corridors (Fig. ES.7).

Restore and expand key linkages that may be degraded or unlikely to be resilient to environmental change. It is important to recognize that this analysis is a reflection of the existing distribution of native habitat, which is not representative of the types of habitat that historically dominated the ecoregion. Areas with deep soils, particularly in areas with higher rainfall or with access to water, were selectively converted to other land uses, mainly agriculture. As a result, our vision for a connected landscape may fall short for species that are particularly dependent upon these under-represented systems, such as the endangered Columbia Basin pygmy rabbit (*Brachylagus idahoensis*). As a consequence, habitat restoration may be an important tool for connectivity conservation.

Test innovative approaches to simultaneously achieve production and conservation objectives. Better understanding the connectivity value of a matrix of native habitat and agricultural lands may provide a way to achieve agricultural production and connectivity conservation objectives that can be effectively replicated elsewhere.

- Multiple species' networks cross the Mansfield Plateau (Fig. ES.8, oval), in the northern part of the Connected Backbone, which has a mix of native remnant patches, active farm fields, and agricultural lands enrolled in the Conservation Reserve Program[3]. The landscape integrity network, however, traces the edge of the plateau (Fig. ES.8, dashed arrow), following a narrow strip of land dominated by cliffs along the western shore of Banks Lake that, although it is not as extensively modified by human activities, may pose a significant natural barrier to movement of many species.

Integrate conservation of connectivity for terrestrial vertebrates with conservation of aquatic systems. Water—the quantity, quality, and timing of its availability—is an important economic driver in the region, with agriculture being the dominant use of this resource. Linkages associated with the main rivers in the ecoregion provide an opportunity for investing in better ways to integrate conservation efforts focused on riverine systems (many associated with salmonid species recovery) with efforts focused on connectivity conservation.

- Key components of the networks of species that are associated with drainages, aquatic systems, and canyons follow the main river systems in an open ring around the Columbia Plateau in Washington (Fig. ES.7). This ring starts in the northeast, follows the Spokane River westward to its mouth, and from there follows the Columbia River west, south, and back east to the mouth of the Snake River, and further east following the Snake River upriver.

[3] The Conservation Reserve Program is a voluntary federal program through which landowners receive annual rental payments and cost-share assistance to establish long-term, resource-conserving vegetation cover on eligible farmland.

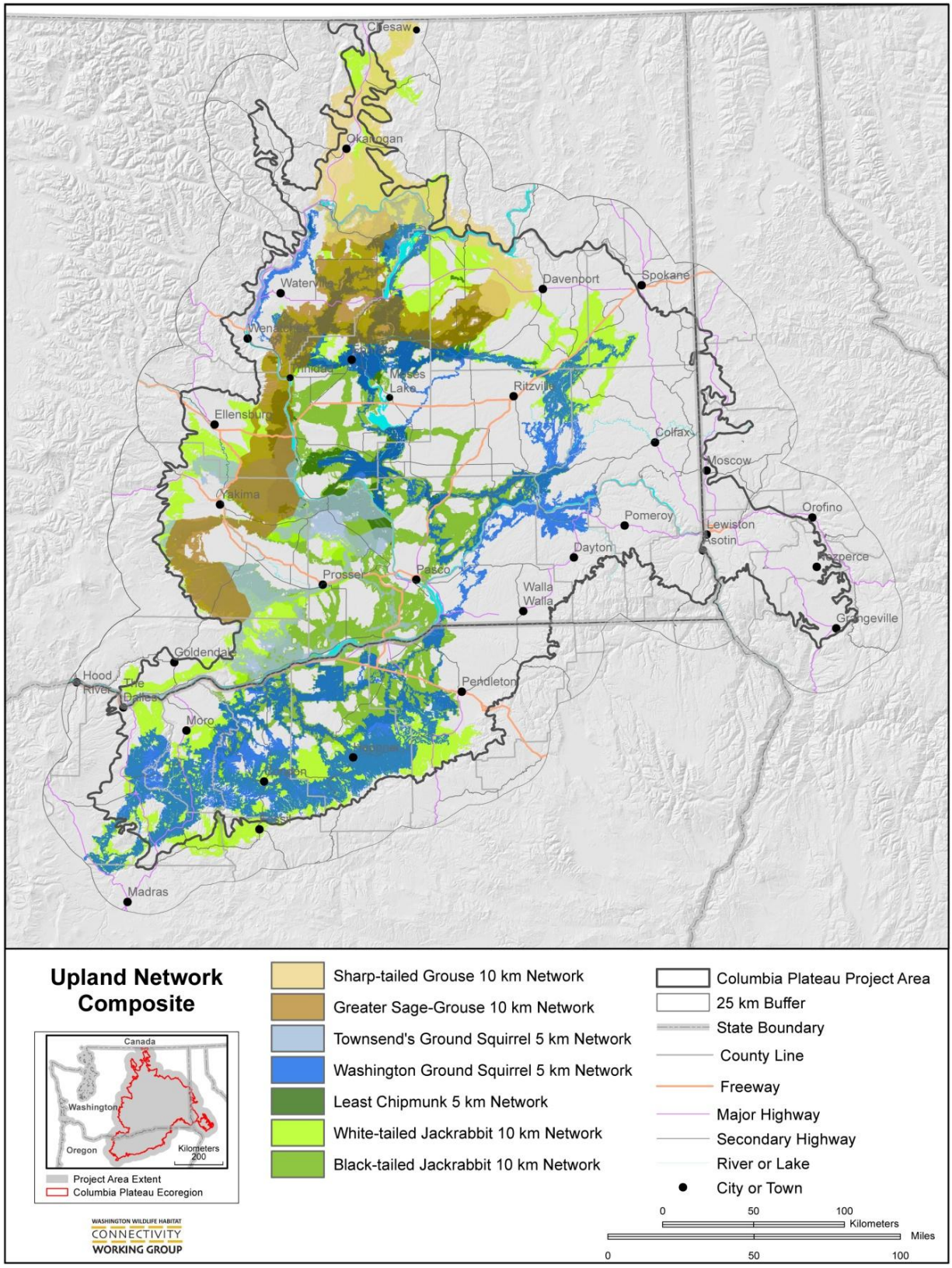

Figure ES.5. Upland Network composite map. This map is based on seven species closely associated with upland shrubsteppe habitat.

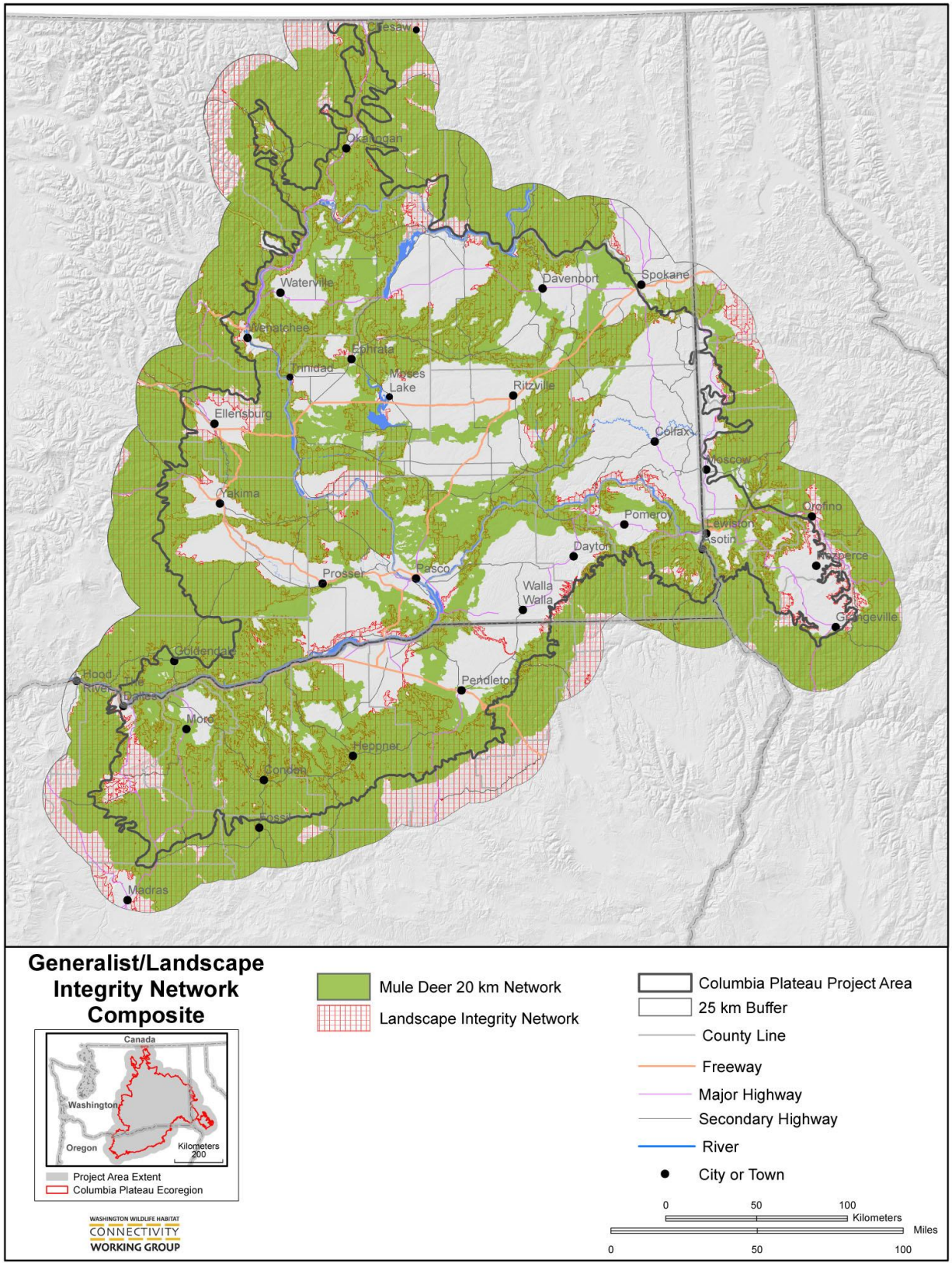

Figure ES.6. Generalist/Landscape Integrity Network composite map. Shown are mule deer and landscape integrity networks.

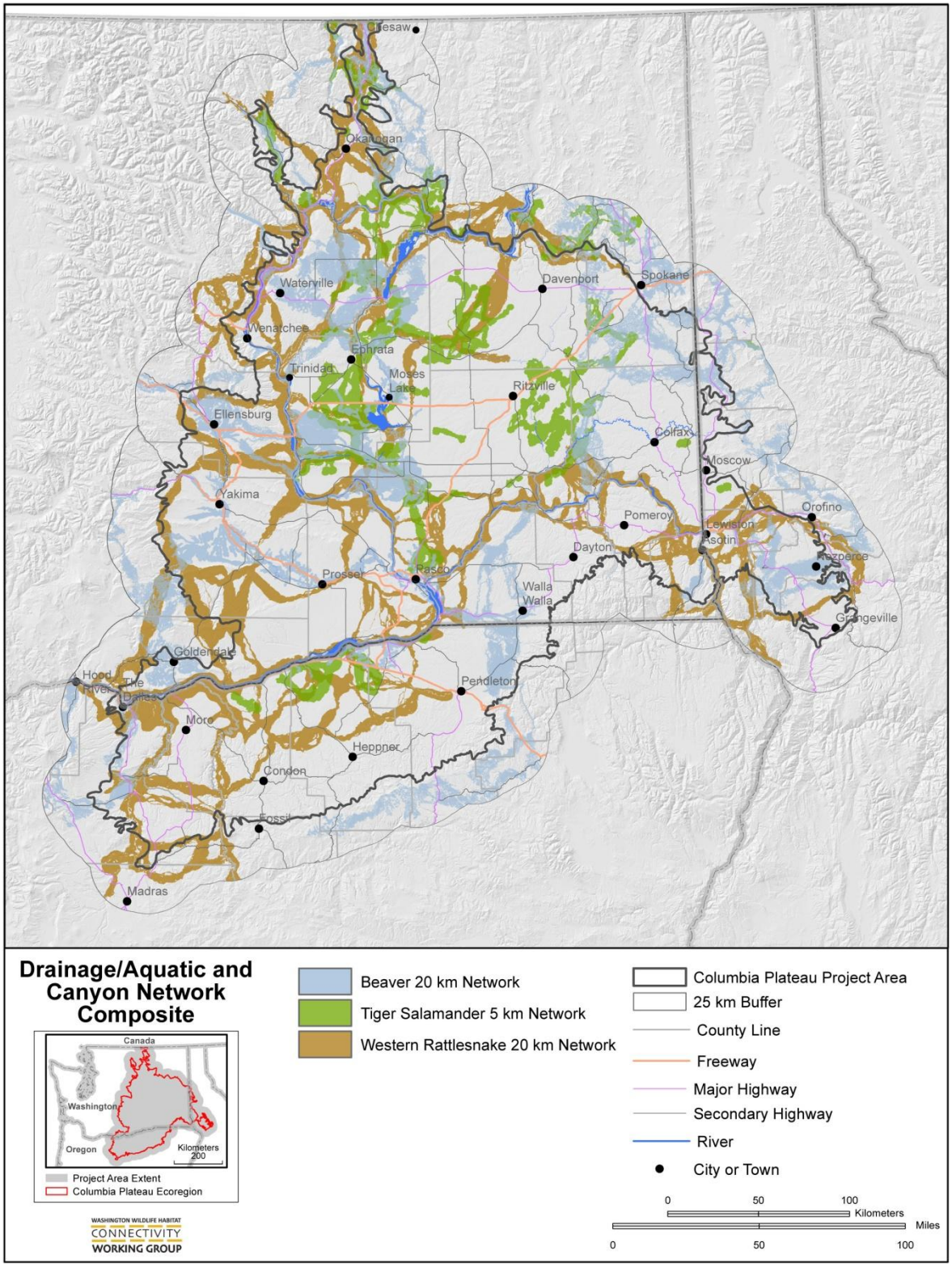

Figure ES.7. Drainage/Aquatic and Canyon Network composite map. This map includes beaver and tiger salamander, species selected to ensure inclusion of aquatic and riparian environments in the Columbia Plateau connectivity analysis; as well as Western rattlesnake, chosen to represent cliffs, canyons, and talus.

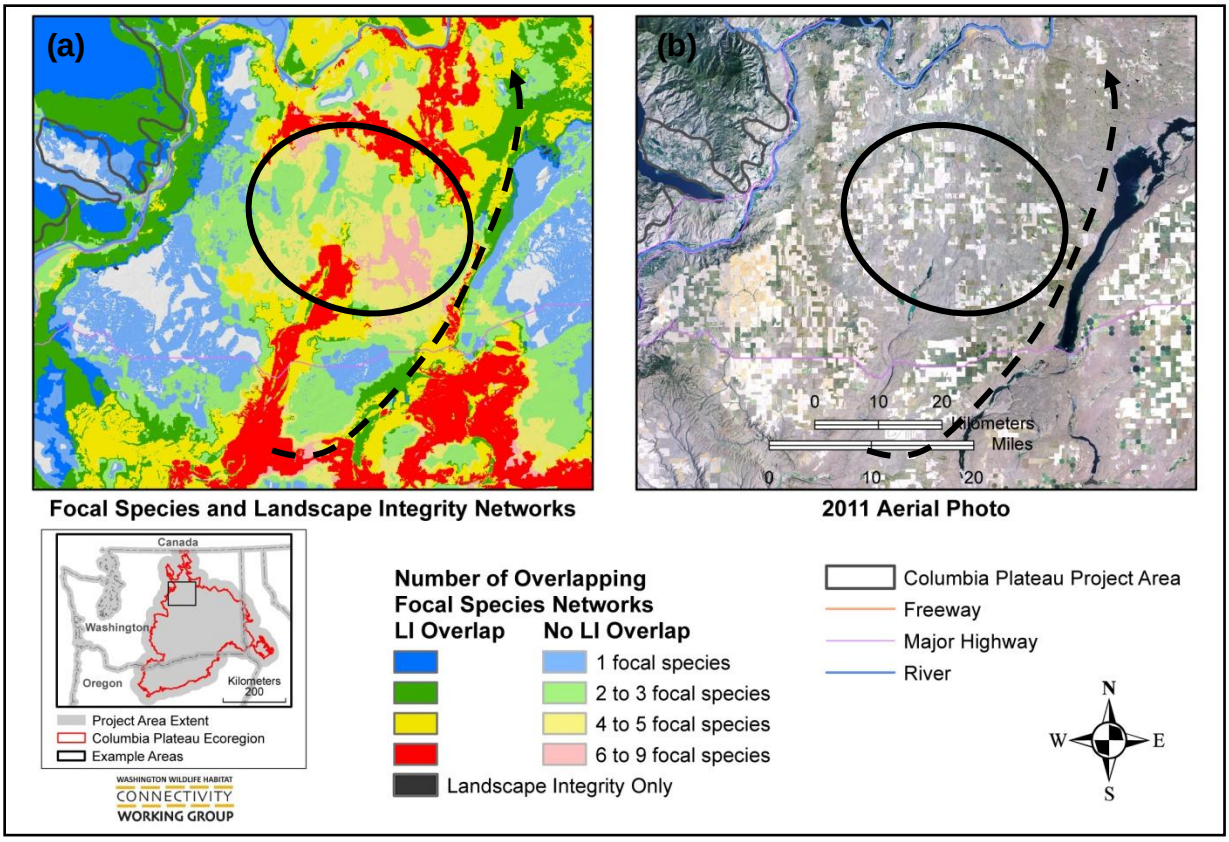

Figure ES.8. Mansfield Plateau, an area where the differences in results between the focal species and landscape integrity approaches are particularly noteworthy. (a) Overlap of focal species and landscape integrity networks. (b) 2011 aerial photo. Bold colors reflect the number of focal species' networks particular areas belong to, where they overlap with the landscape integrity network. Variants in soft colors occur where these focal species networks do not overlap with the landscape integrity network. Arrows and shapes highlight areas that exemplify how the networks for focal species (oval) and landscape integrity (dashed arrow) diverge.

Future Work and Conclusions

There are multiple opportunities for future work to test, validate, and apply the results from this analysis of the Columbia Plateau Ecoregion to individual species as well as a broader landscape perspective. With our partners, we are already planning or engaged in projects that will apply these results, including:

- ***Linkage Model Validation***—Two projects are underway, under the leadership of the Washington Department of Fish and Wildlife, to validate the Greater Sage-Grouse and mule deer connectivity models using radio-telemetry and genetic data collected from populations in the Columbia Plateau Ecoregion. An additional project led by Northern Arizona University will evaluate the effectiveness of linkages across the Mansfield Plateau as part of a worldwide study to test the efficacy of corridors.

- ***Future Analyses***—Led by The Nature Conservancy, we are developing tools that will identify: (1) critical barriers to wildlife movement that can inform restoration priorities, (2) core areas and linkages whose loss could disconnect large portions of the network, and (3) "pinch points" within individual linkages whose loss could sever an existing connection between core areas. The Washington Wildlife Habitat Connectivity Working Group (WHCWG) will use these tools to run analyses most useful to entities working on connectivity conservation in the Columbia Plateau. In addition, the WHCWG is working to identify linkages intended to facilitate species' adaptation to climate change (led by the University of Washington).
- ***Implementation***—The Arid Lands Initiative[4] will use our results to inform priority areas for implementing conservation strategies directed at "*conserving and restoring a viable, well-connected system of eastern Washington's arid lands and related freshwater habitats, sustaining native plant and animal communities, and supporting compatible local economies and communities*."

We are already moving forward with further work based on the results of the Columbia Plateau analysis to validate the models, and providing these results to inform the conservation decisions that different entities are making across this landscape. We also support and encourage current and future efforts to (1) improve our understanding of the value agricultural landscapes provide for connectivity and (2) develop linkage designs where needed to guide local collaborations and action. Our over-arching goal is to provide the information needed to effectively conserve habitat connectivity so that Washingtonians can continue enjoying healthy and diverse wildlife populations in this modern world and into an ever-changing future. We expect this analysis to support the development and implementation of innovative strategies and efficient and effective efforts to help fulfill the vision of a connected Columbia Plateau in Washington.

[4] The Arid Lands Initiative is a public-private partnership working to develop and cooperatively implement a coordinated strategy for the conservation of Washington's arid lands.

Focal species of the Columbia Plateau Ecoregion: LEFT COLUMN *black-tailed jackrabbit (Michael A. Schroeder), Western rattlesnake (James Rosindell), Townsend's ground squirrel (Ryan Shaw), white-tailed jackrabbit (Doug Backlund),* CENTER COLUMN *Sharp-Tailed Grouse (Gregg Thompson), tiger salamander (Gary M. Stolz), Washington ground squirrel (Rich Finger), least chipmunk (Kelly McAllister),* RIGHT COLUMN *beaver (Ginger Holser), Greater-Sage Grouse (R. E. Bennetts), mule deer (Woodrow Myers)*