From: Audrey Hatch and Julie Schneider, Independent consulting biologists; Kristeen Penrod, Science & Collaboration for a Connected Wildlands; and Sarah Reif, Oregon Department of Fish and Wildlife

To: OWEB Board

October 15, 2014

Subject: Fish and wildlife habitat connectivity as a priority for Focused Investment Partnerships

Dear OWEB Board,

Thank you for the opportunity to respond to your Priority Solicitation Questions. We respectfully request that your Focused Investment Partnership program consider Fish and Wildlife habitat connectivity as a top priority for conservation planning and implementation efforts in Oregon.

1. Proposed Priority Description

a) What is the native fish or wildlife habitat to be conserved or other natural resource issue to be addressed?

Maintaining and restoring habitat connectivity for native fish and wildlife throughout the state of Oregon is of paramount conservation importance. Barriers to fish and wildlife movement were identified as one of seven Key Conservation Issues facing the state in the 2005 Oregon Conservation Strategy. Given existing efforts to address fish passage through Oregon Statutes (ORS 509.580 through 509.910) and corresponding Administrative Rules (OAR 635-412-0005 through 0040), our priority highlights the need for efforts to address barriers to wildlife movement, including both terrestrial and aquatic species, throughout the state. Enhancing connectivity and linking natural landscapes has been identified as the single most important adaptation strategy (Heller and Zavaleta 2009) to conserve biodiversity during climate change.

b) What are the specific expected ecological outcome(s) to be achieved after this priority is addressed?

Disruption of landscape connections for species movements and range changes is one of the greatest stressors to ecosystems, especially under climate change. Movement is essential to wildlife survival. Whether it be the day-to-day movements of individuals seeking food, shelter, or mates; dispersal of offspring to new home areas; seasonal migration; recolonization of unoccupied habitat after a local population goes extinct; or for species to shift their range in response to global climate change (Forman et al. 2003, Crooks and Sanjayan 2006). Disruption of natural movement patterns by roads, development, land management practices or other impediments can alter these essential ecosystem functions. Without the ability to move among and within natural habitats, species become more susceptible to environmental disturbances and show greater rates of local extinction (Soulé and Terborgh 1999).

Conserving connectivity is essential to ensure natural ecological and evolutionary processes can continue operating over large spatial and temporal scales—such as top-down regulation by large predators, predator-prey relationships, gene flow, pollination and seed dispersal, competitive or mutualistic relationships among species, energy flow, and nutrient

cycling. Strategically conserving and restoring essential connections between wildland areas is essential to recover listed species; it can stabilize existing populations; it can help prevent additional species from becoming endangered or extinct, especially in light of climate change.

c) What is the defined geographic location within which this proposed priority can be successfully addressed?

Habitat connectivity must be addressed at multiple scales: regional, statewide and local. Wildlife does not heed state lines -- connectivity must be maintained across jurisdictional boundaries to encompass the distributional ranges of multiple species. Habitat connectivity is a conservation priority throughout the entire State of Oregon, but the local scale is "where the rubber meets the road". To succeed, we need a nested approach linking local actions to a statewide and regional framework.

Work is already underway at the regional level, such as the Western Governors Association's (WGA) Wildlife Corridors and Crucial Habitat Initiative, which includes 19 western states. Conservation organizations, such as The Nature Conservancy, are also tackling large-scale conservation planning efforts that span multiple states. These landscape-scale efforts are strategically focused on directing where the conservation need is greatest by developing coarse-scale regional analyses that inform connectivity. The authors of this proposed priority have all been involved with habitat connectivity planning at the regional level and would work at guiding state and local efforts to sync with these regional efforts. We see value in a collaborative model where state governments and the conservation community work closely together to address habitat connectivity.

In Oregon there has been some effort at the state level to actively address wildlife habitat connectivity. The Oregon Conservation Strategy is a guiding document for the state that prioritizes connectivity. Additionally, the Oregon Wildlife Movement Strategy (WMS) involved multiple government agencies, including Oregon Department of Transportation (ODOT), Oregon Department of Fish and Wildlife (ODFW), Oregon Department of Forestry (ODF), USFWS, USFS, BLM, and FHWA. The WMS focused primarily on wildlife passage of roadways, which can serve as a major barrier to wildlife, in addition to creating a human safety issue. However, except for fish passage and wildlife passage at roadways, the issue of wildlife connectivity in the State of Oregon has not been addressed yet in a meaningful and tangible way.

This is where the importance of the local level comes into play. It is at the grassroots level, through the efforts of Watershed Councils, Soil & Watershed Conservation Districts, and conservation organizations, such as land trusts and other interested parties that real progress is made on protecting habitat connectivity. These organizations are often in the best position to target, acquire, restore, manage, and maintain these critical wildlife habitat areas, but often need guidance and can lack strategic planning support.

Conserving connectivity across the Oregon landscape will require collaboration and coordination among numerous agencies and organizations – no single agency can do it alone. Specifically, efforts are underway to re-engage member organizations from the WMS Working Group, along with many other stakeholders. A series of habitat connectivity workshops will be held in each of Oregon's eight ecoregions to engage all potential stakeholders at the local level and promote the partnerships needed to successfully address connectivity at various scales.

Two of Oregon's neighboring states, California and Washington, have developed statewide and ecoregional connectivity analyses through highly collaborative efforts that involved not only government agencies, but also conservation organizations, academic institutions and other interested partners. These efforts can serve as a framework for a similar connectivity effort in Oregon that would help feed information to local conservation and restoration groups; share ideas and "lessons learned"; and ensure priority projects receive the guidance and coordination they need to be successful.

2. Significance to the State

a) Why is this proposed priority of ecological significance to the state, even though it may not be present everywhere in the state?

Congress mandated that each state develop a comprehensive wildlife conservation plan, also known as a State Wildlife Action Plan (SWAP). In 2005 Oregon presented its SWAP, known as the Oregon Conservation Strategy (OCS). Seven key conservation issues were identified by a diverse group of agencies and organizations that served on ODFW's Stakeholder Advisory Committee during the development of the OCS. As mentioned previously, one of the Key Conservation Issues identified was "barriers to fish and wildlife movement."

Maintaining and restoring habitat connectivity is vital to the ecological health of species and ecosystems across the state. Due to the ecological significance of this issue to the state, ODFW and ODOT initiated the Oregon WMS Working Group in 2006. This working group hosted a series of Wildlife Linkage Workshops across the state in 2007 to identify priority wildlife movement areas directly associated with the state highway system (Hatch et al. 2009), with the intent that future analyses would address connectivity at the landscape scale. The mission of the WMS, formalized in a 2008 Memorandum of Understanding, was to address wildlife passage and habitat permeability across the state via coordinated interagency partnerships. The proposed priority presented here is directly aligned with furthering and expanding that mission.

b) Are there any social and/or economic considerations that the Board should understand regarding this proposed priority?

Maintaining and restoring connected wildlands protects the health and diversity of our natural lands, which increases quality of life for all Oregon's residents, whether, human, plant or animal. Quality of life is a vital and necessary component of the social and economic health of Oregon. Conserving connectivity is critical to retain the abundant native wildlife important to sustaining a natural environment that attracts the tourist dollars our economy depends on. Our existing national forests, state parks and land preserves are a treasure all Oregonians depend on for the ecosystem services they provide, and residents and visitors alike depend on for recreation, education, tranquility, and inspiration. The economic value of these lands is in the billions, but the resource values they support could be irrevocably harmed by loss of connections between them. We need to protect our existing conservation investments by assuring the continued viability of key wildlife movement corridors.

Planning for wildlife habitat connectivity facilitates smart urban growth. As Oregon's human population continues to grow and the demand for residential infrastructure and development of energy resources increase, natural resource conflicts are likely to increase as well. Proactive identification of crucial corridors for fish and wildlife affords land use planners and developers the opportunity to plan their projects outside areas of potential

conflict. This has the effect of streamlining environmental review processes, reducing conflicts with the public, and lessening the potential costs of design and mitigation.

Oregon's statewide land use planning program originated in 1973 and requires each local government to adopt a comprehensive plan that is consistent with 19 statewide planning goals. The goal that most closely addresses fish and wildlife habitat, Goal 5, requires that cities and counties inventory their natural resources, determine their significance, identify conflicting uses, and determine whether to allow the conflicting use. State law requires local governments to review and update their comprehensive land use plans at specified intervals. Fish and wildlife habitat connectivity information would contribute significantly to comprehensive plan updates and Goal 5 inventories in ways that streamline land use review processes and potentially reduce conflicts.

c) In addition to its significance to the state, identify how the proposed priority fits within regional & local ecological priorities.

Identifying priority areas for conserving connectivity is essential for the conservation community to meet large-scale conservation challenges and is of immediate relevance to agencies and organizations engaged in landscape-level, ecosystem-driven conservation plans, such as the Oregon Conservation Strategy. To identify connectivity priority areas, both coarse and fine scale analyses are needed. As previously mentioned, much of the necessary coarse scale analyses have been conducted already through such regional efforts as the WGA and TNC, however, there is still much work to be done at the fine scale.

Fine-scale connectivity analyses using a bottom-up focal species based approach and is needed to guide on-the-ground conservation actions at both the regional and local level. For example, agencies and organizations that purchase land or conservation easements need fine-scale data and information to make strategic land acquisitions. Regulatory agencies need fine-scale data and information to help inform decisions regarding impacts on regional and local wildlife movement and habitat loss. Local jurisdictions need fine-scale data and information to help guide development projects away from critical linkages through General Plans, Specific Plans, and the development review process.

3. Limiting Factors

a) What ecological limiting factors exist that relate to the proposed priority identified? Limiting factors are the physical, biological, or chemical conditions and associated ecological processes and interactions (e.g., population size, habitat connectivity, water quality, water quantity, etc.) experienced by the habitat that may influence viable population parameters (i.e. abundance, productivity, spatial structure, and diversity).

The 2005 Oregon Conservation Strategy identified several limiting factors that directly or indirectly affect connectivity conservation, with 7 Key Conservation Issues identified:

ISSUE 1: Land Use Changes - Can impact fish and wildlife habitat, reduce habitat patch size, and decrease connectivity between habitat patches.

ISSUE 2: Invasive Species – Can alter habitat composition, increase wildfire risk, reduce productivity, or otherwise disrupt natural habitat functions.

ISSUE 3: Disruption of Disturbance Regimes - Fires have been suppressed, increasing forest tree density and fuel loads. As a result, wildfires have increased in intensity, placing both

human and wildlife habitat at risk. Flooding has been controlled to a great extent by dams, dikes and revetments (hardened banks), which has altered floodplain function.

ISSUE 4: Barriers to Fish and Wildlife Movement - Development, roads, dams and other structures act as barriers to the movement of fish and wildlife. These barriers reduce total habitat, create challenges to animal dispersal and reproduction and make wildlife more vulnerable to injury and death.

ISSUE 5: Water Quality and Quantity - Water quality and quantity problems can greatly impact aquatic species and are linked to increasing intensities of land use practices, changes in land use, and growing demand for water.

ISSUE 6: Institutional Barriers to Voluntary Conservation - In some cases, institutional barriers prevent landowners from implementing projects that will benefit fish and wildlife. These barriers include the difficulty of obtaining multiple permits, cumbersome requirements for financial assistance, lack of technical assistance, and rules originally passed for one purpose that block another one.

ISSUE 7: Global Climate Change - Climate change is one of the most serious long-term threats to healthy populations of fish and wildlife in Oregon and globally.

b) Reference any framework(s) that exist (Recovery Plans, Implementation plans, etc.).

- Executive Order Preparing the United States for the Impacts of Climate Change issued by President Obama on November 1, 2013.
- The President's Climate Action Plan. June 2013.
- Secretarial Order No. 3289, Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources. In 2009, the Secretary of the Interior launched a coordinated Department of the Interior strategy to address current and future impacts of climate change on America's natural and cultural resources. Part of this effort included the establishment of the Climate Science Centers and Landscape Conservation Cooperatives, which are working at landscape, regional, and national scales to support strategic adaptation and mitigation efforts on both public and private lands. Connectivity is an important focus of these efforts.
- Energy Independence and Security Act of 2007 (Public Law. 110-140). Under this law, the Department of the Interior must complete national assessments of the potential carbon sequestration (to include both geological and biological approaches) to mitigate greenhouse-gas emissions, which will then be used to develop strategies to enhance carbon storage. These best-management practices will have the goals of mitigating climate change, restoring and improving the health of ecosystems, facilitating adaptation to climate change, and providing green jobs.
- 2012 National Forest System Land Management Planning Rule under the National Forest Management Act of 1976. The National Forest System Land Management Planning Rule (Planning Rule) is a federal statutory requirement that outlines the procedure to amend, revise, and develop land management plans for our federal forests and grasslands. In 2012 the Planning Rule updates requires land management plans to include components that will maintain or restore the ecological integrity of ecosystems, and it specifies that those components are to include connectivity, among other things.
- Federal Land Policy and Management Act of 1976

- National Fish, Wildlife & Plants Climate Adaptation Strategy. www.wildlifeadaptionstrategy.gov
- USFWS recovery plans for federally listed species, including Northern Spotted Owl (2011), marbled murrelet (USFWS 1997), bull trout (2014), Fender's blue butterfly (USFWS 2010), and Oregon silverspot butterfly (USFWS 2001).
- 2005 Oregon Conservation Strategy, update pending for 2015.
- 2008 Oregon Wildlife Movement Strategy MOU.
- Preparing Oregon's fish, wildlife and habits for future climate change: A guide for state adaptation efforts. Prepared by ODFW and Defenders of Wildlife, 2008.
- Yale Framework for Integrating Climate Adaptation and Landscape Conservation Planning. www.yale.databasin.org
- FHWA's Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects
- FHWA's Critter Crossings

4. Threats and Benefits

a) What overall threats exist to the proposed priority identified? Threats are the human actions (e.g., fishing, development, road building, etc.) or natural (e.g., flood, drought, volcano, tsunami, etc.) events that cause or contribute-to limiting factors. Threats may be associated with one or more specific life cycle stages and may occur in the past, present, or future).

In addition to climate change, habitat loss and fragmentation are recognized as one of the greatest threats to biodiversity (Noss 1983, Harris 1984, Wilcox and Murphy 1985, Wilcove et al. 1986, Noss 1987, Reijnen et al. 1997, Trombulak and Frissell 2000, Forman and Deblinger 2000, Jones et al. 2000, Forman et al. 2003). Industrial, commercial and residential development removes and fragments habitat. The negative effects of urbanization were evident at housing densities as low as 1 dwelling unit per 40-50 acres (CBI 2005). Roads kill animals in vehicle collisions, create discontinuities in natural vegetation, alter animal behavior (due to noise, artificial light, human activity), promote invasion of exotic species, and pollute the environment (Lyon 1983, Noss and Cooperrider 1994, Forman and Alexander 1998). Direct effects include road mortality, habitat fragmentation and loss, and reduced connectivity. The severity of these effects depends on the ecological characteristics of a given species, context (vegetation and topography near the road), road type, and level of traffic (Clevenger et al. 2001). Urban and industrial development, unlike roads or aqueducts, creates barriers that cannot be corrected by building crossing structures. In addition, past and present timber harvest operations have also had an enormous impact on late-seral forest dependent species and their ability to persist in and move across the landscape.

b) What will happen if the threats aren't addressed?

Habitat loss and fragmentation decreases abundance and diversity of native species, and promotes displacement of natives by non-native species. These trends were evident for small mammals, birds, and butterflies in California (Blair 1996, Blair and Launer 1997, Sauvajot et al. 1998, Blair 1999, Rottenborn 1999, Strahlberg and Williams 2002); similar patterns were observed for birds and lizards in Arizona (Germaine et al. 1998, Germaine and Wakeling 2001), birds in Washington state (Donnelly and Marzluff 2004), mammals and forest birds in Colorado (Odell and Knight 2001), and migratory birds in Ontario (Friesen et al. 1995). If our existing conservation areas become islands with no connecting landscape to allow movement of species, they will not be able to continue to support animals and plants that currently reside within them or accommodate range shifts due to climate change.

c) Describe the economic, social, iconic and cultural benefits of addressing the outcome and impacts of not addressing it.

Benefits: Increased understanding about the value of native fish and wildlife habitat to sustainable Northwest communities. By protecting habitat connections we ensure the survival of our majestic wildlife and protect our own health. Addressing connectivity can also support comprehensive land use planning and minimize conflicts.

Impacts of not addressing connectivity include: decrease in abundance and diversity of native species; increased risk of extinction; costly ESA listings. Nature cannot survive or provide services to humans without adequate space -- without large connected areas of open space, fundamental needs such as clean air and clean water are compromised.

d) Briefly summarize how much has been done already, how much is remaining.

Existing projects that support the identification, conservation, or development of wildlife habitat connectivity:

- Western Governors Association's Crucial Habitat Assessment Tool www.westgovchat.org
    - Consists primarily of coarse scale analyses of connectivity and crucial habitats across the entire western United States presented through an online website supporting GIS based maps.
- Oregon Compass www.dfw.state.or.us/maps/compass/
    - An online data and planning tool that provides access to a variety of conservation related information, including connectivity related maps developed through the efforts of the WGA, WMS, and others.
- Oregon Wildlife Movement Strategy Wildlife Linkage workshops final report www.dfw.state.or.us/conservationstrategy/docs/Linkages_Report_Final_2009.pdf
    - These linkage maps across state highways were developed using vehicle-animal collision data available at the time. These maps may be updated as impacts from development, including increased traffic, affect wildlife movement in any given area.
- ODOT wildlife passage structures
    - U.S. Highway 97 Lava Butte Wildlife Passage Structures - First large scale wildlife passage structures built by ODOT and which were initiated as a result of findings from WMS wildlife linkage workshops which identified major hot spots for vehicle-deer collisions.
    - ODOT are developing plans for additional wildlife passage structures, but at this time they do not have the money to implement these projects.

Work that still needs to be done to support the identification, conservation, or development of wildlife habitat connectivity:

- Development of ecoregional partnerships focused on the conservation of habitat connectivity and that will develop projects to benefit connectivity in their local landscapes.
- Identification of funding sources for habitat connectivity related projects.
- Fine scale analyses that identify the most important linkages for a diverse suite of species (area-sensitive species, barrier-sensitive species, corridor-dwellers, habitat specialists, and ecological indicator species).

e) What is your best estimate of cost to address the priority, and as a result, how economically feasible do you believe it is to address this priority over time?
Society cannot afford to not address habitat connectivity, because the costs would be so high as to be unmeasureable. Any money spent addressing habitat connectivity would be an investment in a healthy future. The sooner we address habitat connectivity through medium – and long-term planning, the less it will cost us over the long term. The longer we wait to address this issue the more it will cost to acquire, restore, and mitigate. Ultimately the cost to build wildlife passage structures, acquire and either conserve or restore habitat for the purposes of connectivity, and to plan for its protection will cost millions, but to not do so may cost billions, if not trillions of dollars.

5. Opportunities

a) Ecological:

1. What are the measures of ecological success? What's the likelihood of ecological success in the short (6-year), medium and long-term (define the term lengths)?
Short- term measures of success are mostly organizational, and anticipated over the coming two to four years. These short-term measures include: Re-purposing habitat connectivity planning partnerships; engaging with grassroots and local efforts about habitat connectivity, including watershed councils and Soil and Watershed Conservation Districts; and increasing public awareness with a specific outreach campaign. Ecological measures of success include increased or maintained access for wildlife to essential high-quality habitat to maintain daily food and shelter needs, as well as seasonal dispersal needs.

Medium – term measures of success are anticipated over the next five – to ten years. Medium-term measures include improved ability to locate crossing structures for wildlife using habitat connectivity information; reduced mortality of wildlife in key priority areas; and increased or maintaining genetic diversity as wildlife are able to access key breeding sites and breeding partners.

Longer-term measures of success are anticipated in the ten – year timeframe. Longer-term measures of success include improved abilities for fish and wildlife to adapt to natural ecological and evolutionary processes; increased or maintained genetic diversity; and increased or maintaining the ability to respond to emerging conservation challenges such as climate change.

2. What types of voluntary conservation actions could be undertaken to address the proposed priority?
Maintaining working landscapes is integral to successful linkage implementation. For example, well-managed rangelands provide numerous benefits, such as watershed infiltration, groundwater recharge, and carbon sequestration, providing improved water and air quality; a local supply of food and fiber; and live-in and move-through habitat for numerous species. Several technical and financial natural resource management programs exist to encourage landowners to enhance or restore wildlife habitat on their lands. These types of voluntary conservation actions by ranchers can help sustain the economic viability of their operations so their lands continue to provide valuable live-in and move-through habitat and other ecosystem services.

Examples of voluntary conservation actions include: Managing agricultural practices to benefit wildlife (i.e., timing potential disturbances); water conservation; water quality trading; improvements of vegetation; invasive plant control; enhancing habitat complexity;

providing amphibian-friendly culverts; and providing guidance to urbanites and homeowners about responsible pesticide use and other practices.

3. Should the proposed priority be divided into geographic areas that are appropriate for partners to address?
We suggest dividing the effort into ecoregions following the Oregon Conservation Strategy: Coast Range, Willamette Valley, Klamath-Siskiyou, Cascades, Columbia Plateau, Blue Mountains, and Northern Great Basin. Some of these ecoregions, such as the Willamette Valley and Klamath-Siskiyou, and already have partnerships in place that would be tapped into for this effort.

b) Social:
1. Do partnerships exist to address the proposed priority? If so, briefly describe. If not, note why this proposed priority is important enough that partnerships may form to address it.
This priority fits well with the existing framework of Oregon's Watershed Councils and Soil and Water Conservation Districts, and with the conservation community in Oregon.

2. What social opportunities exist to address the proposed priority? Is there momentum built?
Momentum has built through the partners previously engaged in the Oregon Wildlife Movement Strategy and through the conservation community. Successful examples of partnerships from the Washington Connected Landscapes project, and the Washington Wildlife Habitat Connectivity Workgroup, demonstrate the value of working with key partners to develop ideas for a connected landscape together. Montana has a collaborative effort called "People's way" (peopleswaywildlifecrossings.org) that brings together tribes, agencies and conservation organizations to demonstrate the benefits of providing wildlife crossings on highways for people, wildlife and the conservation community.

3. Describe educational benefits, if any.
Other states addressing habitat connectivity have established public outreach and interpretation about wildlife habitat connectivity. For example: the state of Washington has hosted successful K-12 outreach efforts, including the "Building Bridges" art contest. Oregon's youth outdoor programs including 4H; the Oregon Master Naturalist program; and other educational programs offer opportunities to provide information towards the curriculum development process.

4. Summarize the social, community, political, regulatory or other factors that will help lead to the success of this proposed priority.
Partners with an interest in habitat connectivity are often motivated by the desire to demonstrate their environmental values, in keeping with Oregonians' values. Although non-regulatory, experience in other states demonstrates that land use planners, transportation planners, and others seek out the best available information and fish and wildlife habitat when that information is readily available.

5. What can be leveraged to address the proposed priority (funding, acreage impacts, other resources)?
Funding from State Wildlife Grants, Natural Resources Conservation Service, and other conservation programs may be leveraged to address habitat connectivity and to provide for a connected landscape for the states' fish and wildlife.

c)Economic Benefits

1. Describe the economic benefits of addressing the ecological proposed priority, including ecosystem services

A connected landscape for fish and wildlife will maintain existing ecological services and contribute to landscape resiliency under emerging conservation issues, such as climate change. Fish and wildlife provide recognized recreational and tourism benefits to communities throughout Oregon. Additionally, a connected landscape of fish and wildlife provide intangible benefits to urbanites and community residents even if they are not direct economic beneficiaries.

6. FOR ALL SUBMISSIONS: Assess the proposed priority by locating the proposed priority in one of the quadrants below (continuum from "well understood" to "not well understood" and from "easy" to "complex"). Describe why the proposed priority falls in this quadrant. There is no wrong answer to this question and there may be multiple answers.

Connectivity conservation is complex but reasonably well understood.

7. Is there other information the Board should know regarding this priority?

8. In lieu of attaching letters of support for this proposal, please submit a list of other supporting individuals or organizations.

As participants in the Oregon WMS MOU (2008), the following agencies support this proposed priority: FHWA, ODOT, USFS, BLM, USFWS, ODF, and ODFW. Other individuals or organizations that support this proposed priority include The Nature Conservancy, Kelly McAllister (WSDOT); Jen Watkins (Conservation Northwest); Patricia Cramer (Utah State University); Gregg Servheen (Idaho Department of Fish & Game); and Paul Beier (Northern Arizona University).

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