EAST CASCADES OAK PARTNERSHIP

Strategic Action Plan 2020-2030

A summary of this strategic plan can be found at: www.columbialandtrust.org/ecop/

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The East Cascades Oak Partnership acknowledges the Wasco, Wishram, Klickitat, Kittitas, Tenino, and Yakama people as the original stewards of the land we discuss in this plan. ECOP respects the relationship between tribal peoples and land, and pledges to learn from and consider impacts to tribal values and needs in its work.

We want to share our special gratitude with Levina Wilkins, Yakama Nation elder of the Wiinatchapam, Pshwanapam, Tyttnapam, and X'washx'wypam bands for showing us the importance of cultural preservation and reciprocity through her stories. Her sharing compels respect & responsible conservation.

We would like to thank the Oregon Watershed Enhancement Board Focused Investment Partnership Program whose generous grant to the East Cascades Oak Partnership made this planning work and ECOP's growth possible. And Pacific Birds and Columbia Land Trust, whose support and leadership helped to imagine, launch, and sustain the East Cascades Oak Partnership.

We also want to thank the dozens of people who lent us their time, expertise, creativity, and patience through a long and thorough planning process: Stakeholders and community advisors who sat down for interviews with our partners, attended tours, and participated in forums; ECOP partners and committee members who put in long hours puzzling through logic models and tedious spreadsheets; and technical experts who prepared and presented technical information to roomfuls of eager oak enthusiasts.

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Thank you to Dr. Timothy Babalis whose work collating and presenting published historical knowledge sheds light on the current oak landscape.

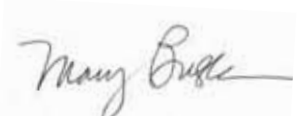
Thank you to the consultants who helped us research, contemplate, and present the detailed information in this plan.

And thank you to the volunteer photographers who lent us their photographs. Credits for their work can be found in Appendix B.

Please also see Appendix A - Acknowledgements for a list of names of the dozens of people who contributed to this plan and who give us faith the implementation of this plan will have a powerful impact on the oak landscape. Thank you, all!

Sincerely,

Lindsay Cornelius, ECOP Manager



Mary Bushman, ECOP Coordinator

EXECUTIVE SUMMARY

This strategic plan is the culmination of a three-year effort to create a shared vision for oak conservation among partners, to increase networking, to catalyze learning, to leverage resources, and to align partners around the most powerful conservation opportunities. To that end, the planning process was as important as this resulting document, which informs partners, funders, and the public about the ecological and social significance of the oak landscape, how we interact with it, and the actions we can take to improve outcomes for people and nature.

The first four sections: Acknowledgements, About the East Cascades Oak Partnership, The Case for Conservation, and Planning Process, help us understand why the partnership formed, who the partners are, the urgency and necessity of oak conservation, and why and how we embarked on this planning process.

The next three sections: Profile of the Focus Area, About Oregon White Oak Trees, and About Oregon White Oak Systems, familiarize us with the East Cascades oak landscape specifically, its human history, the biology and ecology of Oregon white oak systems east of the Cascades.

The last four sections: Ecological Priorities & Conservation Goals, Theory of Change, Progress Monitoring Framework & Adaptive Management, and Sustainability & Funding, deeply explore how people are interacting with the oak landscape, how those interactions impact oak systems, and outline what ECOP partners hope to accomplish by implementing priority strategies.

We've organized our planning work around the six primary ways people are interacting with the oak landscape: rural residential development, fire suppression & conifer encroachment, grazing, ecological stewardship (managing for specific ecological outcomes and First Foods), conversion to orchards & vineyards, and recreation. Our plan is organized around human behaviors because this helps us – stakeholders, partners, funders – see ourselves in the oak landscape, and as actors who can affect change.

We have summarized our Theory of Change in a graphic that appears in the Progress Monitoring Framework section near the end of this document, but we feel that graphic does a good job condensing the complexity of our thinking into a single page, so it is presented on the following page as well, along with a graphic that illustrates the actions any of us can take to affect change in the oak landscape right now.

This full plan document is intended for an audience that wants to understand more deeply the business of oak conservation. For a summary of this plan, please visit the East Cascades Oak Partnership webpage at: www.columbialandtrust.org/ecop. Though this plan is detailed, it is not prescriptive: it relies on on-going partner engagement, collaboration, and learning to hone and adapt the strategies, and to build the necessary relationships to successfully implement them. To that end, subsequent efforts like grant applications, deeper spatial analysis, data gathering, fundraising, relationship and trust-building, and research and monitoring will provide important detail moving forward.

Human beings have coexisted with Oregon white oak systems since time immemorial. With some rather simple adjustments to our behaviors, with the cultivation of effort and resources, with the revival of connection and awareness, we can continue to thrive in the oak landscape for millennia to come, and allow our family of plants and animals we so appreciate and depend on to share in the privilege.

COMMUNITY OUTCOMES

Crops, forests, and homes are protected from wildfire	Local communities are fluent in oak system ecology	Health & economic impacts from smoke are reduced	Forage for domestic livestock is improved	Eco-recreational tourism economy is supported	Safe access to first foods is widely available	Natural resource jobs are core to local economy	Agricultural crops are pollinated and resist pests	Conservation advances needs of diverse communities

GOALS

THE OAK LANDSCAPE IS INTACT AND CONNECTED	THE OAK LANDSCAPE IS RESILIENT TO CLIMATE CHANGE AND DISTURBANCE	BIODIVERSITY PERSISTS	RECIPROCITY IS CENTRAL TO HUMAN BEHAVIOR IN THE OAK LANDSCAPE	NEEDS OF HISTORICALLY MARGINALIED COMMUNITIES ARE RESPONDED TO

ECOLOGICAL OUTCOMES

Oak system diversity persists, climate buffers are protected	Connectivity is preserved for species migration and adaptation	Species composition and stand structure indicate resilience to disturbance	Oaks are released from conifer encroachment	Mature oak habitat features are retained and recruited	Diverse native oak associated species & pollinators persist	Human interactions within the oak landscape are reciprocal

IMPLEMENTATION RESULTS

Ecological stewardship is underway on priority sites High priority sites are protected from conversion Intact, functional oak systems are identified, conservation and restoration tools selected, prioritized & implemented	BMP delivery mechanisms in place. Landowners have access to BMPs Stewardship guidance is available & considers multi-faceted outcomes/needs Learning pathways are inclusive and responsive to stakeholder needs	Rx fire & fuels reduction is implemented in priority geographies Policies are in place to allow for fire, reduce liability risk Rx Fire personnel, resources are locally available Sites identified, prioritized for application of prescribed fire and oak release	Oak systems in priority geographies are restored according to BMPs Available funding for stewardship is increased and spatially prioritized for use Native seed and plants are locally available Oak-aware, trained work force is locally available	ECOPs strategic plan is adapted based on learning Strategies and outcomes encompass the needs of historically marginalized communities ECOP partners are engaged in adaptive management (culture of learning)	Partners responsible for policy and regulation have technical support and expanded capacity Funding for oak projects has increased Planning outcomes, permitting, and policy advancements reflect value of oak systems	Important connecting lands are protected by easement Landowners have succession plans, tools to assist with estate planning Emergency grazing resources and reciprocal grazing practices in place

STRATEGIES

Identify, protect and restore priority oak systems and bring into ecological stewardship	Develop adaptive BMPs, informed by TEK, monitoring, peer-to-peer learning pathways, and research.	Improve fire resilience of the oak landscape	Increase capacity and efficiency of oak system stewardship	Build and maintain a culture of learning, reciprocity, and adaptation among partners and the public.	Conduct outreach to planners, agencies, and the public to focus resources and shape policy in the oak landscape	Prevent fragmentation and conversion of large working lands to development or higher intensity agriculture
RR 1,ES 1, FF 4, GR 1, OV 1, REC 1	ES 2, RR 2, FF 1, GR 2, OV 2, OV 5,	FF2, FF 3, RR 4	ES 3, RR 3, OV 3, REC 5	ES 4	FF 2, GR 3, RR 4, OV 3, REC 2, REC 3,	GR 4, OV 4, REC 4

East Cascades Oak Partnership Theory of Change

EAST CASCADES OAK PARTNERSHIP

Columbia Land Trust

EAST CASCADES OAK PARTNERSHIP

DO YOU LIVE, WORK, OR PLAY IN OAK COUNTRY?

HOW YOU CAN HELP

	IF YOU... RECREATE, HUNT, BIRD, or BOTANIZE in OAK COUNTRY	HAVE OAKS ON LAND YOU ARE RESPONSIBLE FOR	RAISE LIVESTOCK	WORK IN FOREST PRODUCTS	WORK IN REAL ESTATE	ARE A FUNDER	ARE AN EDUCATOR	ARE A PLANNER OR POLICY MAKER	ARE A VINTNER OR AN ORCHARDIST	ARE IMPACTED BY WILDFIRE OR SMOKE
FIRST THINGS FIRST:										
Get outside! Learn about the plants and animals who share oak country with you	x	x	x	x	x	x	x	x	x	x
Learn about land use history in our region and cultural resources	x	x	x	x	x	x	x	x	x	x
Read ECOP's strategic plan and help implement our strategies	x	x	x	x	x	x	x	x	x	x
Attend ECOP events, access tools and resources to help protect oak	x	x	x	x	x	x	x	x	x	x
Learn about management before protesting temporary loss of recreational access	x									x
WHILE YOU'RE OUT AND ABOUT:										
Honor closures to protect sensitive resources	x	x	x	x	x	x	x	x	x	x
Clean the weed seeds off your boots and clothing between visits	x	x	x	x					x	
Learn about and adopt best management practices	x	x	x	x					x	
SPREAD THE WORD:										
Connect friends and neighbors in oak country with ECOP	x	x	x	x	x	x	x	x	x	x
Share your own stories about oak country on social media and in outreach materials	x	x	x	x	x	x	x	x	x	x
Participate in planning and public comment on issues that affect oak	x	x	x	x	x	x	x	x	x	x
PRACTICE GIVING:										
Challenge someone to match or beat your contribution to ECOP's work	x	x	x	x	x	x	x	x	x	x
Consider impacts of required land use practices before enrolling in tax programs		x	x	x						
Take advantage of incentive programs for oak stewardship		x	x	x					x	
Consider reducing match or fee requirements in high priority program areas						x		x		
INNOVATE, LEARN, and COLLABORATE:										
Evaluate the impacts of your behaviors on the ecology of your oak system	x	x	x	x	x			x	x	
Prioritize curriculum that centers local tribes, rural living, and local ecology							x			
Learn about and prepare for wildfire, engage in prescribed fire programs	x	x	x	x	x		x	x	x	x
Partner on collaborative learning projects to help shape best management practices	x	x	x	x	x		x	x	x	x
Participate in ECOP certification programs	x	x	x	x	x				x	
Help innovate forest product markets & product pathways for slash & charred wood				x		x				x
LEND A HELPING HAND:										
Participate in volunteer events with ECOP partners	x	x	x	x	x	x	x	x	x	x
Connect landowners with incentive programs and information about tax programs				x						
Provide landowners with information about living in the oak/fire landscape		x			x			x		x
Connect with advisors before developing site design and building plans		x			x			x		
Streamline permit & incentive program application processes				x	x	x		x		

ABOUT THE EAST CASCADES OAK PARTNERSHIP

The East Cascades Oak Partnership is comprised of people who know and love the Columbia River Gorge and the East Cascades as a place with thriving wildlife, a vibrant natural resource economy, and incredible beauty. We've recognized the importance of Oregon white oak systems to our quality of life and to the well-being of hundreds of species of plants and wildlife we share our home with. We are collaborating to leverage resources, share knowledge, and implement conservation strategies that will help protect vulnerable oak habitats, encouraging more reciprocal human interactions with these important resources and improving outcomes for people, oaks, and wildlife.

Geographic Scope

ECOP serves nearly the full geography of Oregon white oak distribution in the East Cascades ecoregion, an area roughly bounded by the Yakama Nation Indian Reservation to the north, the Warm Springs Indian Reservation to the south, the Cascade Mountains to the west, and the shrub steppe of the Columbia Plateau to the east. This geography is anchored by partners operating primarily within communities of the Columbia River gorge in both Oregon and Washington.

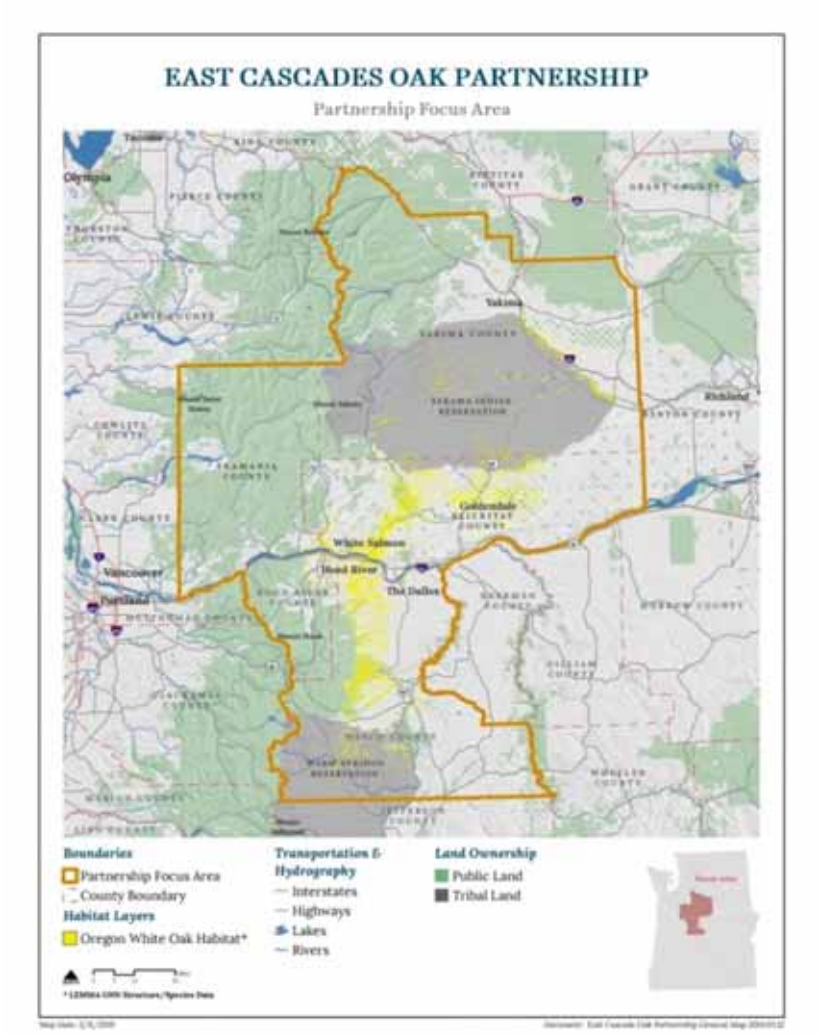


Figure 1: Partnership Focus Area Map

ECOP MEMBER INSIGHTS:

"The East Cascades Oak Partnership sits in the center of this magical Venn diagram of science, community, passion, and drive. I'm amazed at how much effort has gone into understanding so many perspectives on the issues, and the care that's being taken to account for the broad swath of needs and goals."

Michelle Sager - Conservation + Volunteer Coordinator, Ekone Ranch & Sacred Earth Foundation

THE CASE FOR CONSERVATION

"The persistent, the common, the various, the adaptable has value in itself. The oak's distinction is its insistence and its flexibility. The tree helps and is helped in turn. It specializes in not specializing."

- *William Bryant Logan, Oak: The Frame of Civilization*

Oregon white oak occupies diverse niches in the East Cascades. A lone oak might be massive and spreading in a native bunchgrass savanna or one among thousands huddled together on an exposed slope, dwarfed by the wind. They persist in shallow soils, in fertile soils, among pine and fir, in meadows or talus. They stand alone, in clumps, on mounds or like shrubs. They support hundreds of species of wildlife with their acorn crops, fungal and plant associations, and their abundant cavities. They withstand fire, re-sprout following disturbance, and, by virtue of their hollow cores and gaping cavities, provide the resources of both a living and a dead tree.

Oaks provide shade in harsh environments for people and livestock, exhibit hardiness in response to fire and grazing, support First Foods important to indigenous peoples throughout the region, and abundant game species like deer, elk and turkey. Their trunks are energy-rich, dense wood that make excellent firewood, whiskey barrels, and strong boards, their fire-resistant crowns grow acorns that feed people and wildlife, house an abundance of birds that fill our skies with song, shade wildflowers that feed important pollinators, and sequester carbon less vulnerable to release during wildfires. They provide a beautiful backdrop for popular mountain biking and hiking trails that are at the heart of our tourism economy, are inspiration for artists and philosophers, and provide a fascinating landscape for curious minds to explore. Their natural fire resistance can be a buffer against catastrophic wildfire.

There is some mystery and much debate surrounding historic condition of oak systems in the East Cascades, what condition they are in now, and what to do about it. While the genetics of the trees are nearly identical to those in the Willamette Valley, the systems of which they are an integral part are very different, as are the ways people interacted with these systems throughout human history. Research efforts have been robust in west side oaks over the last two decades, but very little research has focused on the east side systems[1].

Climate resilience models completed by The Nature Conservancy in 2015 predict the East Cascades will have higher resilience to climate change than many ecoregions of the Pacific Northwest. In a study area that included 11 ecoregions, the East Cascades demonstrated the second highest level of ecosystem diversity next to its neighbor, the Columbia Plateau[2]. In this same assessment, the oak component of the East Cascades ecoregion had the second lowest level of protected lands (8.9%). The majority of Oregon white oak woodlands, savanna, and mixed oak-pine forests in the East Cascades are located on private lands in the wildland urban interface.

In Washington, East Cascades Oak-Ponderosa Pine Forest and Woodland are critically impaired (S1S2).[3] In Oregon, Oregon white oak woodlands are identified as one of 11 strategy habitats of conservation concern in Oregon[4]. Robust regulatory frameworks and incentive programs exist to support fish recovery, but outside of the Columbia River Gorge National Scenic Area and within mule deer winter range in Wasco County, human behavior in oak habitats in the East Cascades is not regulated – oaks are largely unprotected from development,

[1] Devine, W.; Bower, A.; Miller, J,; Aubry, C. 2013. Oregon white oak restoration strategy for National Forest System lands east of the Cascade Range. Olympia, WA: U.S. Department of Agriculture, Forest Service, PNW Region.

[2] Buttrick, S., K. Popper, M. Schindel, B. McRae, B. Unnasch, A. Jones, and J. Platt. 2015. Conserving Nature's Stage: Identifying Resilient Terrestrial Landscapes in the Pacific Northwest. The Nature Conservancy, Portland Oregon. 104 pp. Available online at: http://nature.ly/resilienceNW March 3, 2015

[3] Rocchio, Joe & Crawford, Rex. 2015. Ecological Systems of Washington State. A Guide to Identification. pp37.

[4] Oregon Conservation Strategy. 2016. Oregon Department of Fish and Wildlife, Salem, Oregon.

overgrazing, and from conversion to fir and pine. Many people recognize the importance of conserving and stewarding oak systems, but until now we've lacked the strategy and resources to implement landscape scale conservation. This plan aims to change that. We believe future generations of people, plants and animals will value these places as we do and, by acting as a partnership, we seek to convey to those future generations a healthy and thriving landscape.

Conservation Plans Supporting Oak Conservation In the East Cascades of Oregon and Washington	
State of Washington Priority Habitats and Species List	2019
Prairie, Oaks, and People: A Conservation Business Plan to Revitalize prairie-oak habitats of the PNW	2018
Oregon Department of Fish and Wildlife Oregon Conservation Strategy	2016
Partners in Flight Landbird Conservation Plan	2016
Columbia Land Trust's Conservation Agenda	2016
Oregon White Oak Restoration Strategy for National Forest System Lands East of the Cascades	2013
Conservation Strategy for LandBirds of the East-Slope of the Cascade Mountains in OR and WA	2000
A Landowner's Guide to Restoring and Managing Oregon White Oak Habitats	2004

Table 1: Conservation Plans Supporting Oak Conservation in the E. Cascades of Oregon and Washington

Urgency

- The Pacific Northwest is a climate refuge for people fleeing catastrophic weather events. Oak occurs at low elevation in the wildland urban interface. As population growth accelerates, the wildland urban interface expands, putting stress on oak systems and putting people in the path of wildfire.
- A massive transfer of land between generations is occurring, priming the potential for large scale changes in land ownership and management during this plan period.
- Industrial timber companies structured as timber investment management organizations subdivide and sell land to the highest bidder, and entrepreneurs purchase land for vineyard development and second homes.
- Increasing numbers of homes are dedicated to temporary housing to accommodate tourists, necessitating an expansion of housing options for permanent residents into undeveloped, more affordable areas in wildlands.
- Grazing practices appropriate for European grasses are still practiced 170 years post-European settlement, stressing native perennial grasses and flowering forbs and causing dramatic shifts in plant populations toward non-native, invasive annual grasses and weeds, dramatically reducing pollinator habitat and contributing to altered fire behavior and intensity.

- Travel Oregon promotes the Columbia River Gorge, bringing unprecedented numbers of tourists to the region, overwhelming the carrying capacity of recreational infrastructure at a time when funding for public agencies managing recreation and the plant and wildlife species impacted by it is limited.
- Fire suppression contributes to elevated fuel levels and altered fire behavior. Fuels reduction treatments are applied uniformly or without regard to the consequences of stump-sprout or habitat features.

- Increased drought and soaring temperatures combine with fierce winds to drive catastrophic wildfires, threatening communities and forests across a region that is now grossly underprepared for fire.
- Wildfire smoke threatens human health and businesses across an increasingly long fire season.
- Oak tree crowns die back and re-sprout in catastrophic fire conditions, reducing the number of larger, mature, single-stemmed oaks providing cavities, sloughing bark, and other habitat features for wildlife.

In the midst of these daunting challenges, oak systems and the people who live in and interact with them are a potential source of stability and hope for our region. Much of the landscape has yet to be fragmented by development, with great potential over the next decade for landscape scale conservation and management across public and private lands. This plan details the many ways people in the East Cascades can adapt their behaviors to mitigate the stressors on oak systems and ensure our natural and built communities thrive in the future.

Planning Horizon

This plan addresses actions partners will take over the next decade (2020-2030) to improve outcomes for Oregon white oak systems in the East Cascades. Some of those outcomes will be immediately measureable and others may only be measureable over the next several decades.

Vision

Oak systems are abundant, diverse, and healthy, supporting rich biodiversity and human uses for generations to come.

Mission

We empower people to make decisions and take actions that improve outcomes for Oregon white oak systems.

Guiding Principles and Agreements

We believe our own well-being is intimately tied to the health of the landscape we live in.

We believe we can accomplish long-term, higher-impact conservation through collaboration.

Culture and identity shapes our individual interactions with nature and with each other. While ECOP partners share a common interest in oak, it is our different cultural and lived experiences in the oak landscape that deepen our collective understanding of this place and the people who live in it. We value learning from and understanding each other's perspectives, and we will actively seek the perspectives of those whose voices are not represented by the partners.

Relationships between land and people are complex and diverse. Our goal is to understand how people interact with oak systems and find conservation solutions that help people meet their goals while improving ecological outcomes for oak.

We believe everyone from an enormous federal agency to a single individual has a role to play in landscape-scale change. Our plan is intended to demonstrate how each of us can nurture a more reciprocal relationship with oak systems, and how the organizations we are a part of can leverage resources to create social and ecological change.

Best management practices (BMPs) help people make decisions that improve outcomes for oak systems. BMPs should be informed by sound science, stakeholder experience, and traditional ecological knowledge, considering East Cascade site diversity and a wide range of management goals important to our economy, diverse cultures, and our quality of life.

There are *very few* places remaining in East Cascades oak systems with intact understory plant communities. We believe these special places need to be protected from potentially destructive management practices, including intensive grazing and fire suppression.

We need answers to important questions. Peer-reviewed research by academic institutions can be deployed alongside monitoring, community science, and traditional ecological knowledge to better understand the response of oak systems to management practices and climate change.

Partnership Structure

The East Cascades Oak Partnership is open to any interested individual, organization, business, agency, or nation that embraces the ECOP Declaration of Cooperation (Appendix C), which outlines the purpose the partnership serves, expectations of partner participation, and operating principles. ECOP also has a guidance document that details decision-making processes, fiscal, and administrative sponsorship.

See Figure 2, ECOP Structure and Authorities, on the following page for a list of participating partners, committees, and authorities.

PLANNING PROCESS

"This partnership has over the past four years dramatically increased our collective understanding of the state of Oregon white oak habitats east of the Cascades. While we've known for years that these habitats are among the most diverse and important pieces of our landscape, we haven't until now had a sufficient understanding of how to protect and steward them as a regional resource."

- Brad Nye, Conservation Director, Deschutes Land Trust

As an emerging partnership, we have been focused on building a shared base of understanding about the oak landscape, learning about how people historically interacted with and are currently interacting with oak systems in our region and about the ecological impacts of climate change and human behaviors on oak systems. That learning is reflected in this plan.

Partners volunteered more than 3,500 hours, heard from over 50 speakers, and interviewed more than 30 stakeholders to better understand the contributing factors that shape people's behaviors in the East Cascade oak landscape. We used this information to build strategies that would address those factors and then tested those strategies using a logic tool called results chains. Figure 3 on page 17 shows the ECOP planning process and map products.

Figure 2: **East Cascade Oak Partnership Organizational Structure and Authorities**

			Attend ECOP meetings and events
			Working group participation Vote in administrative decisions Receive funding and working group support Project implementation of actions in SAP
			Working group leadership DOC enforcement and administration Brand development (with administrative sponsor)
			Coordination of ECOP meetings and events Supervision of ECOP-dedicated staff Development and deployment of ECOP brand Sponsor for ECOP admin funding proposals Leads prioritization of ECOP-admin funding proposals Permanent position on Steering Committee
Members	**Core Partners**	**Steering Committee**	**Administrative Sponsor**
Initiated by an individual's participation in meetings or events. Participants are expected to read and adhere to the operating principles in the DOC.	*Initiated by an organization or entity's formal adoption of the DOC and acceptance by the ECOP Steering Committee. Are held accountable to the terms in the DOC.*	*Serves 2 year renewable term. Self or peer-nominated at annual meetings and selected by acting Steering Committee members and ECOP-dedicated staff.*	*Serves 5 year renewable term. Self-nominated for core partner vote at annual meeting on 5-year basis.*
Dozens of private landowners Graduate students - PSU, WSU, UW **And individuals from the following:** Greenlight LTD Hood River Soil and Water Conservation District Humbleroots Nursery Klickitat County Natural Resources Department Mosier Watershed Council Mount Adams Resource Stewards Natural Resource Conservation Service (NRCS) OSU Extension - Master Naturalists Skookum Resource Management, INC USFS - Gifford Pinchot National Forest USFS - Mt. Hood National Forest Vinitas Consulting, LLC Wasco County Planning Department Wasco Forest Collaborative Washington Conservation Commission	Columbia Land Trust Columbia River Gorge Commission Confederated Tribes of the Warm Springs* Deschutes Land Trust Ekone Ranch/Sacred Earth Foundation Friends of the Gorge Land Trust Oregon Department of Fish and Wildlife (ODFW) Oregon Department of Forestry (ODF) Oregon State Parks Pacific Birds The Dalles Watershed Council Underwood Conservation District USFS - Columbia River Gorge Nat. Scenic Area WA Department of Fish and Wildlife (WDFW) WA Department of Natural Resources Wasco Soil and Water Conservation District Yakama Nation*	Amber Johnson - WDFW Bill Weiler - Sandy River Watershed Council Bruce Taylor - Pacific Birds Dan Bell - Friends of the Gorge Land Trust Jake Anderson - Klickitat County BOCC Jeremy Thompson - ODFW Lindsay Cornelius - Columbia Land Trust Michelle Sager - Sacred Earth Foundation Robin Dobson - Ecologist/Retired USFS Sara Evans-Peters - Pacific Birds	Columbia Land Trust Lindsay Cornelius, Natural Area Manager and ECOP Manager Mary Bushman, ECOP Coordinator

**Indicates partners not required to sign the Declaration of Cooperation. Our most recent Declaration of Cooperation was just completed and is out for signature by agencies and partners. We expect more to formally sign on.*

Advisory Members (Technical Committee and Working Group Members):

Amber Johnson	*Washington Department of Fish and Wildlife*	Katie Pierson	*Oregon Department of Fish and Wildlife/NRCS*
Andrew Owen	*NRCS State Forester*	Keyna Bugner	*WA DNR Natural Areas Program*
Ayn Shlisky	*Retired USFS and The Nature Conservancy*	Lindsay Cornelius	*Columbia Land Trust*
Ben Hartmann	*WDFW*	Lisa Naas-Cook	*Columbia River Gorge Commission*
Cathy Flick	*Retired USFS*	Mary Bushman	*ECOP Coordinator*
Christina Mead	*USFS - Botanist*	Mitch Attig	*Columbia Land Trust GIS Manager*
David Wilderman	*WA DNR Natural Areas Program*	Molly Jennings	*WA DNR Natural Areas Program*
David Anderson	*Retired WDFW*	Rick Lancaster	*USFS: Mt. Hood National Forest*
Doug Glavitch	*USFS: Mt. Hood National Forest*	Robin Dobson	*Retired USFS, Klickitat Canyon Winery*
Jessica Hudec	*USFS: Gifford Pinchot National Forest*	Sarah Callaghan	*USFS: Columbia River Gorge National Scenic Area*
Joe Rocchio	*WA Department of Natural Resources Natural Herit*	Susan VanLeuven	*WDFW Klickitat Wildlife Area*
Karen Lamsen	*Wasco Soil and Water Conservation District*	Tynan Ramm-Granberg	*WA DNR Natural Heritage Program*
Kate Williams	*WA DNR - Forest Health Division*	Whitney Olsker	*USFS: Eastside Silviculturalist*

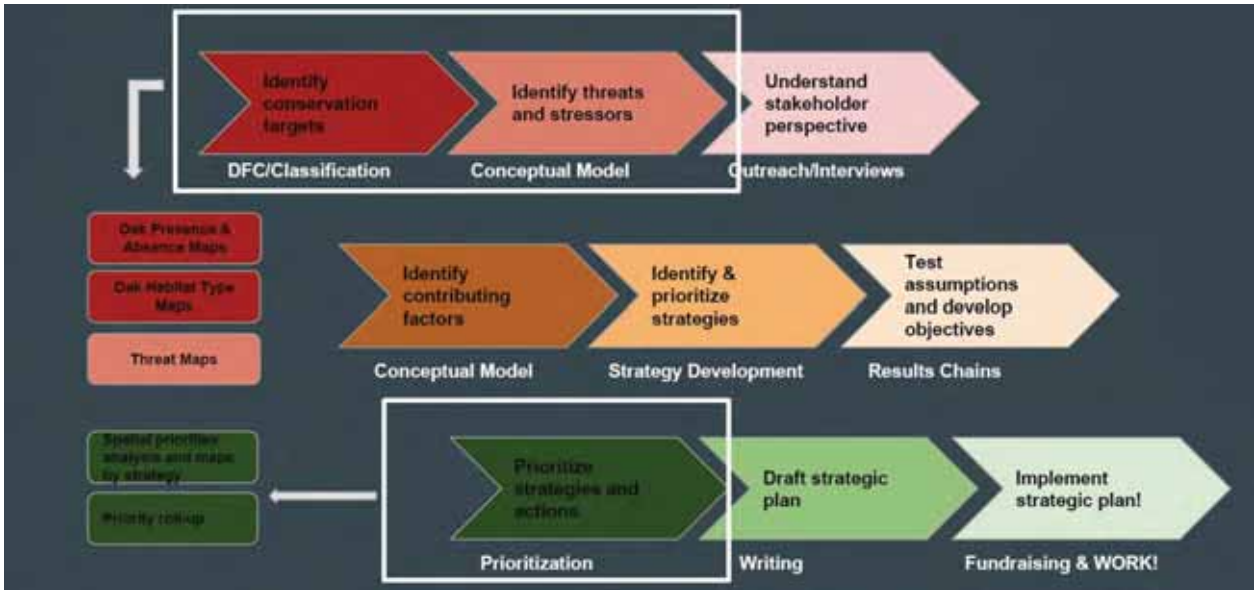


Figure 3: Planning Process and Map Products

ECOP Planning Timeline & Learning Themes		
Meeting Date	Learning Theme	Planning Element
April 2017	ECOP Launch	Partnership purpose and structure
June 2017	Oak Ecology	ECOP goals and objectives
November 2017	Flora and fauna of oak systems	Building a conceptual model
March 2018	Fire in oak systems	Threats discussion. Interviews.
June 2018	Grazing in oak systems	Field trip to Klickitat Wildlife Area
September 2018	Cultural resources and human interactior	Mapping and spatial priorities
December 2018	Regulations and incentives in oak system	Strategy development
February 2019	Planning in oak systems	Strategies and results chains
May 2019	Restoration & management in oak syste	Results chains review & discussion
August 2019	Climate change	Map review: ecological prioritization
November 2019	Strategic planning review	Prioritization of strategies

Table 2: ECOP Planning Timeline and Learning Themes

The Landscape

Over the last 15 million years, major geologic phenomena including emerging volcanoes, cataclysmic basalt flows, ice dam failures, massive floods, and erosion carved a landscape with exciting topography, diverse soils, and steep climate and elevation gradients. The East Cascades is a transition zone from the forested slopes of the Cascade Mountains (Mt. Adams and Mt. Hood near 12,000 feet elevation and 120" annual precipitation) to the arid shrub-steppe of the Columbia Plateau (Columbia River floodplain elevation 100 feet, less than 15" annual precipitation). These transitions can occur over a very short linear distance. Behind every fold in this landscape is a unique microclimate, and the result is an incredible array of species, many of them endemic, that together comprise two of the most important characteristics of the East Cascades: its biodiversity and its climate resilience.

And Its' People

People have been interacting with the oak systems of the East Cascades since time immemorial. Prior to European arrival, indigenous peoples throughout the region were accustomed to traveling from place to place to gather resources as they became seasonally available. Generally, the Sahaptin-speaking Yakama people lived north of the Columbia River along with closely-related Kittitas (or upper Yakama) and Klickitat peoples. Upper Chinookan- or Kiksht-speaking Wasco and Wishram people lived along the shorelines of the Columbia River - the Wasco primarily along the southern shore of the river in the vicinity of The Dalles, and the Wishram along the northern shore. Closely related Kiksht speakers lived along the Columbia River west of the Wasco and Wishram around Hood River, White Salmon River and the Cascades. Just east of the Wasco were other Sahaptin speaking peoples, often collectively called the Tenino.[5] Today the descendants of these people are present across our region, continuing important traditions and cultural practices despite social and ecological hardship initiated by the arrival of European-American settlers and the United States military in the middle 1800's, as well as contemporary challenges to sovereignty and treaty terms.

[5] Babalis, Timothy. Landscape History of Oregon White Oak Woodland East of the Cascades. 2019. Page 6.

The Treaty of 1855, negotiated between Washington Governor Isaac Stevens and Yakama Chief Kamiakun, and between Oregon Governor Joel Palmer, with representatives of the Upper Chinookan and Sahaptin bands, established the boundaries of the Yakama Nation Indian Reservation and the Warm Springs Reservation, and provided these tribes legal standing and jurisdiction over the condition and abundance of culturally important foods, particularly salmon. Subsequent policy development and legal interactions between the Unites States, the states of Oregon and Washington, local governments and the tribes have at turns imperiled and elevated the rights of tribes to protect, steward, and own important land and resources.

The oak landscape is a source of many foods and medicines important to tribal well-being. Though acorns may not have constituted a *primary* food source for the indigenous peoples of the western Columbia Plateau as was the case for those west of the Cascades, oak associated roots, berries, and wildlife were of critical dietary importance (Levina Wilkins, personal communication, 2019).

Yakama elder, Levina Wilkins, reports her people once used oak wood to make grinding bowls for milling acorns and other seeds. She described how children would find flexible young saplings in oak woodlands to tie into knots. These trees would grow for a hundred years when the next generation would come back and harvest the now very dense knotted portion of wood. This knot would be hollowed out using hot stones and then scraped to remove charred wood. The resulting bowl was hard as rock and could be used for many generations, often lasting until the next generation of oak knots was harvested. To our knowledge, these bowls are no longer made, but one artifact is preserved in the Heritage Museum on the Yakama Reservation. When asked if her band ever burned oak woodland to promote particular conditions, Mrs. Wilkins said no, they just relied on nature to take care of itself (Babalis, 2019). The fire history and climate of the East Cascades didn't necessitate anthropogenic burning to prevent conifer encroachment into oak systems, as was the case in oak systems of the Willamette Valley and Puget Trough.

Following the Treaty of 1855, the Oregon Donation Act and the Homestead Act were passed into law, promoting an upward trend in migration eastward by Euro-Americans, which spiked when gold was discovered in Idaho and eastern Oregon. A prosperous and thriving year-round village and trading ground for American Indians, Celilo Falls was situated at a critical crossroads on the river and along interior trade routes, quickly becoming a center of commerce-supporting mining camps for migrants. The demand for meat and overland transportation gave rise to a thriving stock industry – the first major non-tribal industry to emerge in Wasco County. Ranchers began taking up rangeland east and south of the The Dalles, grazing large herds of stock on the native bunchgrass of the western plateau. These ranchers brought spring grazing practices with them learned from their European ancestors. The native bunch grasses and associated forbs weren't adapted for spring grazing and were depleted and outcompeted by annual grasses and hardy weed species across much of the American west. By the late 1870's much of what had been fertile grasslands in the region were converted to dryland wheat farming and other forms of more intensive agriculture, driving grazing into more marginally productive areas of oak and pine woodlands. In the understory of heavily grazed oak woodlands, perennial grasses and native flowering forbs were also eventually depleted, largely displaced by annual grasses.

Beginning in the 1850's and continuing through the 1880's, steamships (pictured right[6]) and portage railways on the Columbia and its tributaries were the primary means of transportation, with three steamships making multiple trips per

[6] 1867 photograph by Carleton E. Watkins. Steamship at Upper Cascades Landing on the Columbia River

day and requiring up to 40 cords of wood for fuel on each leg of the journey. Ponderosa pine, Douglas-fir, and Oregon white oak were the primary fuels utilized, harvested along the Columbia and its tributaries and transported over land by portage railway to boat landings. The logging industry in Klickitat County originated first in response to the demand for steamship fuel, and oaks on both sides of the river were likely cut to satisfy the demand.

Since that time, the timber and grazing industries have endured and are now accompanied by tourism, fishing, and orchard and vineyard operation as the dominant natural resource based industries in the region. Across the five counties in our service area, a much higher percentage of workers are employed in the agriculture, forestry, fishing, and hunting industries than expected based on population according to Data USA (Hood River County – 18 times higher than expected, Wasco County – 10 times higher than expected, Klickitat County – 7 times higher than expected, Skamania County – 2 times higher than expected; and Yakima County – 20 times higher than expected)[7]. These figures demonstrate the prevalence of people employed in natural resource industries in the ecoregion, and the importance of natural resources to the ecoregion's economy and way of life.

People have been interacting with this landscape for millennia, but since the mid 1800's, these interactions have accelerated significant changes in how oak systems function. The current population of our core service area (Klickitat, Skamania, Hood River, and Wasco Counties) is approximately 84,250 people and growing. Climate change is likely to upset or accelerate human interactions with oak systems in unpredictable ways. The people who live in the region hold a wide variety of perspectives on what land and water can support, how each should be managed, and who should benefit. As baby boomers age and our region grows more ethnically diverse, much of the resource land in our region will change hands, setting up the potential for dramatic changes in ownership, management, and culture.

This strategic plan outlines the primary ways people are interacting with oak systems today and the ways we can change our behaviors to improve outcomes for oaks and all who rely on them.



[7] Data USA website. https://datausa.io/. Accessed April 2020.

ABOUT OREGON WHITE OAK TREES

It starts with a nut…

In the late summer and early fall, incredibly large and nutrient-rich seeds emerge on the branches of Oregon white oak. These seeds, or acorns, have high rates of germination and, due to their size and weight, rely on predators like squirrels and birds to assist with dispersal. Acorns have high water content compared to other seeds, which means they are easily killed by desiccation and heat. They germinate very quickly, making them difficult to store. Though there is some variation among individual oak trees, oak woodlands and forests across the region tend to produce acorn crops with a high degree of synchrony, suggesting large scale weather phenomena, specifically dry springs and cold falls, entrain acorn production on a regional basis[8]. Because the acorn crop varies from year to year, predators cannot adapt to any consistent availability of forage. During years with large acorn crops, oak establishment may be more successful as predators simply can't keep up.

…and the nut becomes a seedling

From the meat of the acorn, emerges a taproot that may grow twice as much as the shoot in the first season of growth. The prioritization of root development over shoot development may help oaks survive in increasingly dry climates and is good for surviving fires. In some studies, seedling crowns died back repeatedly due to drought for 5-21 years before successfully establishing. Seedlings can have roots that are three times older than their stems as a result. After the root secures dependable water, rapid single-stemmed growth begins in the crown[9].

…and the tree endures disturbance for the rest of its life.

Oregon white oak trees are exposed to browsing by wildlife and domestic livestock, damage from windstorms and falling timber, insects and disease, cutting by people, and fires of varying severity, as well as competition resulting from lack of fire. Despite the leaves of oaks being waxy and relatively fire resistant, the leaf is the plant tissue most commonly and most readily damaged by fire. Leaves are easily replaced. Oregon white oaks produce leaves and branches from epicormic buds. These epicormic branches can provide additional resources to the tree following disturbance. Oregon white oak buds are hardier than leaves, but they are irreplaceable, and intense fire can result in bud damage or loss. Oaks frequently sprout from the root crown following top-kill by fire or cutting, leading to shrubbier or clumpy growth forms.

[8] Peter, David H.; Harrington, Constance A. 2009. Synchronicity and geographic variation in Oregon white oak acorn production in the Pacific Northwest. Northwest Science. 83(2):117-130.

[9] Peter, David. "Oregon White Oak Biology and Fire Ecology." East Cascades Oak Partnership Meeting. June 27, 2017. Hood River, Oregon.

Oregon White Oak in the East Cascades Context

Oregon white oak occurs from northern California to southern British Columbia on the west side of the Cascades, and extends east through the Columbia River Gorge into the East Cascades ecoregion. Genetically, Oregon white oaks west of the Cascades and east of the Cascades are nearly identical, but their structure, function, and species associations are quite different.

Figure 4: Native range of Oregon white oak[10]

Figure 5: Oak partnerships in the state of Oregon[11]

[10] https://www.srs.fs.usda.gov/pubs/misc/ag_654/volume_2/quercus/garryana.htm

[11] Map created by Jeff Kreuger for Pacific Birds, 2019

In the East Cascades, oaks are pioneer, mid-seral, as well as climax species, depending on site conditions, particularly soil type, aspect, and available moisture[12]. The primary disturbance mechanism in oak systems is wildfire, though human behaviors like timber harvest and grazing also substantially disturb oak systems, and fire suppression over the last 170 years may have altered how oak systems experience and respond to fire.

As fires are suppressed, vegetation communities change. Oak tree density increases as seedlings and saplings survive to maturity in the absence of fire. In more mesic stands, less fire tolerant vegetation like shrubs and conifers begin to grow more prolifically. Oaks may be shaded out and fuels can accumulate. When these forests do burn, they can burn much hotter than historically, causing damage to oaks and associated species. If a tree is top-killed by fire, buds in the root crown at the base of the trunk might initiate. This is called stump sprouting, and oaks also do this when dominant stems are cut or broken off, as often happens as a result of fuel reduction efforts. In the case of stump sprouting, a single stemmed tree temporarily becomes a shrub and that shrub may remain shrubby due to herbivory and fire, or leaders may emerge to form a cluster of trees that share a root mass. The stems of these many sprouts may eventually grow together to form what appears to be a single-stemmed tree, or they may persist as a cluster or ring of trees – a common growth form currently on the landscape. Large diameter, single-stemmed trees provide large cavities the Washington-state threatened western gray squirrel and other wildlife utilize for nesting.

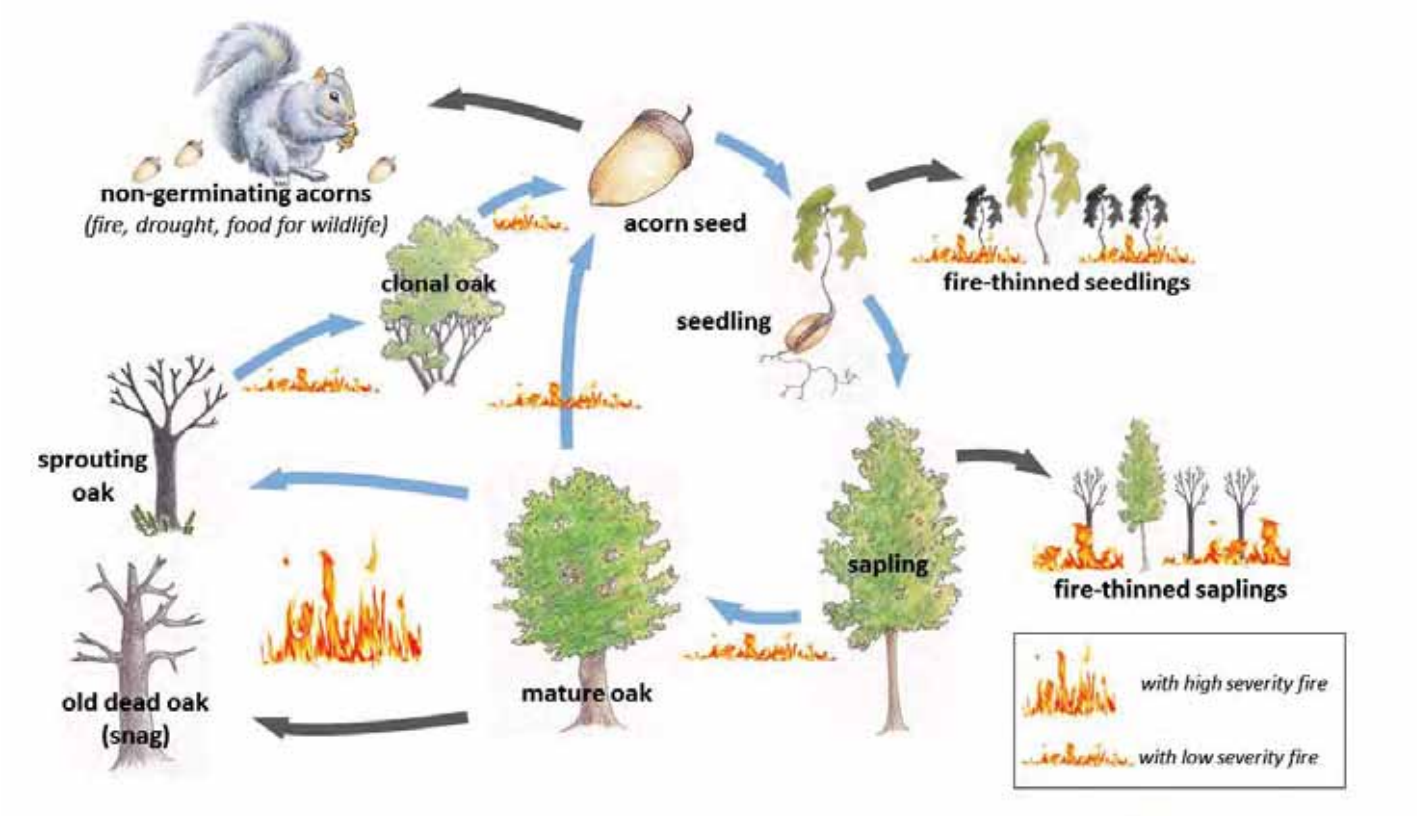


Figure 6: Fire in East Cascade Oak Climax Systems. Art by Ayn Shlisky.

[12] Devine, et al. Oregon White Oak Restoration Strategy for National Forest System Lands East of the Cascade Range. March 2013. pp8-10.

The climax state in East Cascade oak systems varies by oak system type. The climax state can be described both in terms of tree and stand structure, as well as by associated plant species composition and habitat features. Oregon white oak is the climax dominant tree species in the drier woodland types and ponderosa pine or Douglas-fir is the climax dominant tree species in the more mesic (wetter) types. Structure of these climax systems can vary due to soil type, exposure, and precipitation, but is most dramatically impacted by the intensity and duration of disturbances like fire and fire suppression, and grazing.

The trees first grab our attention, but there is so much more to a system. There are hundreds if not thousands of other species that occupy and influence oak forests and woodlands, each of them playing important roles in ecosystem function, and each sensitive to changes in myriad complex ways. In a region as ecotonal as the East Cascades, landscape-scale conservation is a critical approach to maintaining biodiversity.

> "Oak habitats are a diverse and important feature on the landscape...By being involved in this partnership, we have the opportunity to share and learn with other individuals or agencies as we attempt to better manage these habitats for their long-term persistence."
>
> - *Christina Mead, botanist for the USFS*

Photo Gallery

The photo galleries on the following pages provide a glimpse of the diverse ways oaks present in the region.







Photo 1: Oaks overtopped by fir drop their limbs

Photo 2: Oak seedlings encroaching on mature oak

Photo 3: Conifer encroachment on oak

Photo 4: Some fire effects can be mimicked mechanically

Photo 5: Understory controlled burns can reduce seedling density and understory fuel loads

Photo 6: Oaks may respond to release with epicormic branches to capture suddenly available light

Photo 7: Ground disturbance can occur during mechanical thinning, leading to increased invasives

Photo 8: Thinning oaks without applying herbicide to cut stump can increase stem density

Photo9: Oaks are resilient and can sprout following intense fires that kill the crowns

Photo 10: Sprouts that mature can grow together over time into what appears to be a single stem.

Photo 11: Annual grasses, in this case medusahead , can completely alter oak systems

Photo 12: Oak woodlands with native understories support a broad diversity of flora & fauna

Photo 13: Wind exposed oak can display Krumholtz and can be sensitive to sudden exposure from thinning.

Photo 14: Cavities in boles of oaks support wildlife

Photo 15: Western gray squirrel kits in tree cavity

Photo 16: Furroughed and sloughing bark provides important habitat for lichens, bats, & insects

Photo 17: Seedling from acorn beneath weed mat. Weed mats reduce competition & retain moisture.

Photo 18: Acorns store a great deal of energy, which provides nutrition for seedlings & for wildlife.

Photo 19: Mites and wasps can cause leaf galls

Photo 20: Crown gall caused by an Agrobacterium

Photo 21: Galls caused by wasp, *Andricus californicus*

Photo22: Galls caused by the wasp, *Besbicus mirabilis*

Photo 23: Oak pit scale followed by anthracnose (fungal infection, can weaken and kill oak, especially during drought

Photo 24: Oak succumbing to infection

ABOUT OREGON WHITE OAK SYSTEMS

Oak system diversity is critical to the biodiversity and climate resilience of the Pacific Northwest. These diverse systems occur in relatively small patch sizes across a largely connected landscape, providing opportunity for species to adapt to changing climates across steep precipitation and elevation gradients. The ecotonal nature of the region coupled with complex human interactions that alter systems in a variety of ways makes describing or classifying the different types of oak systems present in the region a challenge. Classification of oak systems helps us adopt a common language to talk about our interactions with oaks and the management options available to us.

Oregon White Oak System Classification

There are two primary classification systems currently in use by public agencies that describe oak systems in the East Cascades:

1. USNVC – Unites States National Vegetation Classification[13]
2. National Vegetation Classification for Existing and Potential Natural Vegetation (PNV)

ECOP felt the USNVC would allow us to describe the oak *system* diversity in the region at the level of detail we desired. We are currently developing a crosswalk tool that will allow those who utilize PNV to translate our classification work from USNVC. The USNVC classifies oak as follows, from very coarse to very fine:

Formation Class:	Forest and Woodland
Formation Subclass:	Temperate and Boreal Forest and Woodland
Formation:	Cool Temperate Forest and Woodland
Division:	Vancouverian Forest and Woodland
Macrogroup:	Southern Vancouverian Dry Foothill Forest
Group:	Cascadian Oregon White Oak-Conifer Forest
Alliance:	E. Cascadian Oregon White Oak-Pine Woodland
Subgroups:	See the following table for draft proposed subgroups
Plant Associations:	See Table 6 on page 36.

We may propose to the USNVC the addition of subgroups within the E.Cascadian Oregon White Oak-Pine Woodland alliance that differentiate between key structural and compositional differences among East Cascade oak systems.

American Bird Conservancy and Klamath Bird Observatory developed an informal classification[14] of bird habitats based on oak system structure and species composition that helps to describe the diversity of oak systems present in the East Cascades. We adapted that classification for our planning purposes, and nested it as subgroups within the USNVC. Table 3, ECOP Oak System Classification, on the following page shows the six primary oak systems ECOP adopted for planning purposes.

[13] http://usnvc.org/

[14] Altman, B. and J. L. Stephens. 2012. *Land Managers Guide to Bird Habitat and Populations in Oak Ecosystems of the Pacific Northwest*. American Bird Conservancy and Klamath Bird Observatory. 82 pp.

Oak System Types and Descriptions				Mapping Thresholds and Status			
	Conservation Targets	Visual of System Characteristics	Oak System Characteristics	Canopy Type	Oak Cover	Conifer Cover	Understory (Shrub Cover)
				Mapped	Mapped	Mapped	Not mapped
Oak-Dominant Habitat Types (Xeric)	*Open Oak Woodland & Savanna*		Open oak woodland and savanna varies from grasslands with scattered oak trees to more woodland like stands. At low elevations, occurs on modal sites while typically restricted to only xeric sites at mid- and higher-elevations (balds, steep slopes, shallow soils)	Open Canopy (10-50% Cover)	(0-50%)	<10%	Grass dominated understory with <30% shrub cover (<10% for savanna)
	Closed Oak Woodland		Oak Woodland is characterized by a relatively closed canopy. At low elevations, occurs on mesic sites (north aspects; toe slopes) and typically restricted to only xeric to very xeric sites at mid and higher elevations (balds, steep and/or shallow soils, etc.)	Closed Canopy (50-75% Cover)	(25-50%)	<10%	Herbacious ground cover with <30% shrub cover
	Oak Forest		Oak Forest is characterized by nearly closed canopy. High levels of competition lead to columnar shaped tree crowns with limited branching and foliar volume. Subcanopy on drier sites is devoid woody vegetation, and on mesic sites can be very densely vegetated with shrubs.	Closed Canopy (>75%)	>75%	<10%	
Oak-Co-dominant Habitat Types (Mesic)	*Mixed Oak-Conifer Forest & Woodland*		On xeric sites, more open woodland savannah with pine, and on mesic sites more closed woodlands with fir and pine, though both are often present on xeric sites as well. Both habitats occurs in transitions zones or on north-facing slopes and terraces. At low elevations found in mesic sites (i.e., north aspects) and typically restricted to only xeric to very xeric sites at mid and higher elevations (balds, steep and/or shallow soils, etc.).	Varies from Open (0-50%) to Closed (>50%)	Open Stands >25% Closed Stands - No threshold	Open Stands >10% Closed Stands 10-35%	Varies widely
	Riparian Oak		Mixed stands of oak and various hardwoods located in ravines and creeks at lower elevations. Oaks in riparian stands often grow straight and tall with larger diameters than in stands of similar density on more xeric soils.	Codominance and shrub cover varies by stream type, aspect, and available moisture. For mapping purposes, we classified as riparian all oak systems that occur within 100' of perennial stream center and added floodplain areas that extend beyond 100' from (as mapped by FEMA).			
Other	*Forests With Oak*		Mixed conifer stands with oak components in the understory or on balds and shallow soils.	Varies From Mod (50-75%) to Closed Canopy >75%	NA	Open Stands > 35% Closed Stands - >10%	Varies widely

Table 3: East Cascade Oak Partnership Oak System Classification

None of the systems in Table 3 is comprehensively mapped in the East Cascades. There have been disparate mapping efforts by different agencies and organizations over the last several decades, each using different classification systems, in different geographies, and at different scales. Because there is no reliable, comprehensive dataset at the scale at which we want to work, we worked with OSU's Landscape Ecology, Modeling, Mapping, and Analysis (LEMMA) Lab to analyze plot data from GNN to generate oak current extent, and assigned a subgroup classification based on 2018 stand metrics.

GNN stands for "Gradient Nearest Neighbor" and uses multivariate gradient modeling to integrate data from field plots with satellite imagery and mapped environmental data[15]. A suite of fine-scale plot variables is used to construct regional vegetation attribute maps. Areas of non-forest were masked out using ancillary data, but for ECOP's purposes an alternative mask was developed to ensure we didn't lose important savanna and open oak woodland systems. All GNN map products are grid-based at 30-m spatial resolution.

GNN uses plot data from ongoing regional forest inventories conducted by the Forest Inventory and Analysis program (FIA) at the Pacific Northwest Research Station, Current Vegetation Survey (CVS) of Region 6, USDA Forest Service, and the Bureau of Land Management in western Oregon; as well as the Ecology Program of Region 6. Figure 7 below shows the modeled distribution of oak system types.

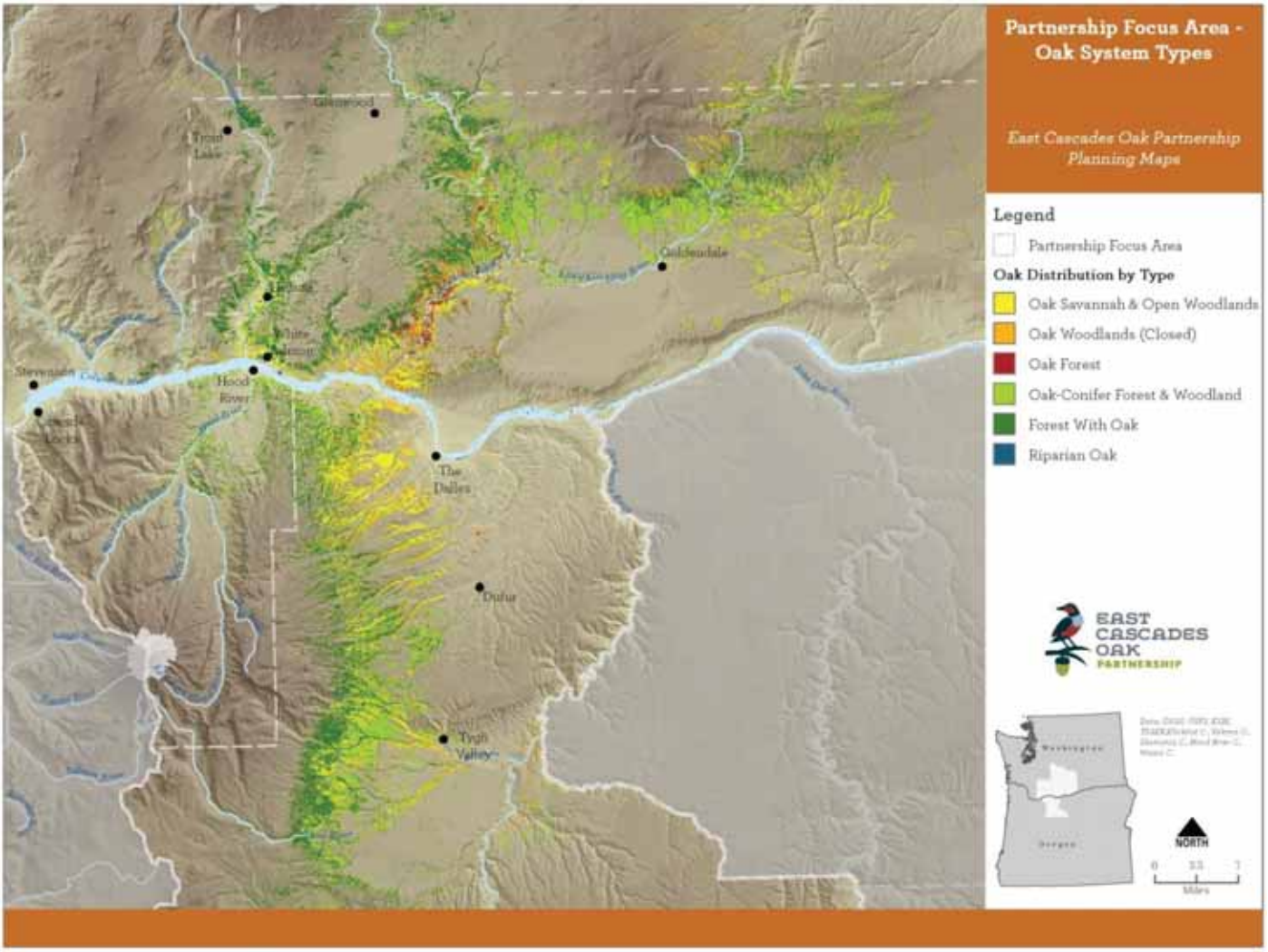


Figure 7: Modeled Extent of Oak System Types

[15] *https://lemma.forestry.oregonstate.edu/projects/imap*

Modeled Oak System Types by the Acre							
Oak System Type	REGION	OREGON			WASHINGTON		
	# ACRES	TOTAL	PRIVATE	PUBLIC	TOTAL	PRIVATE	PUBLIC
Open oak woodland and savanna	**61,880**	**33,560**	21,290	12,270	**28,320**	**20,380**	**7,940**
Closed oak woodland	**39,070**	**15,620**	11,460	4,160	**23,450**	**14,260**	**9,200**
Oak forest	**6,820**	**770**	610	160	**6,050**	**3,960**	**2,090**
Mixed oak-conifer forest and woodland	**97,330**	**38,580**	17,300	21,280	**58,750**	**36,650**	**22,110**
Riparian oak	**49,870**	**14,050**	8,090	5,960	**35,820**	**17,240**	**18,590**
Forest with oak	**138,380**	**61,050**	22,160	38,890	**77,330**	**44,460**	**32,860**
TOTAL	**393,350**	**163,630**	80,910	82,720	**229,720**	**136,950**	**92,790**

Table 4: Oak System Types by the Acre

Spatial Prioritization of Oak Systems for Conservation

Following the creation of the system map, we developed a prioritization model to predict where the largest contiguous, most climate-resilient patches of oak with high levels of predicted oak system diversity and high levels of predicted occurrence of sensitive oak-associated species might occur.

The model identified "patches" of unfragmented oak cover and assigned a score for:

1) patch size (bigger was better)
2) oak system diversity (patches with a greater diversity of oak system types scored higher)
3) understory condition (high probability of having been grazed scored lower)
4) predicted terrestrial resilience and permeability (higher predicted resilience score was better)
5) predicted presence of rare, threatened, or endangered species (the more species predicted the better)
6) actual occurrence of priority plant species (GS ranked – the more the better)

The model parameters are described in Table 5 on page 33. The result, Figure 8 on page 34, is intended to inform the partnership where the most intact, functional oak systems are predicted to occur, warranting deeper on-the-ground investigation.

Oak Patch Scoring Matrix for the ECOP Prioritization Model

Category	Ecological Indicator	Multiplier/Weight	Indicator	Worst (1)	2	3	4	Best (5)	Data Sources	Comments
Size	Total patch area	1	Total size of patch (Acres)	< 100 acres	100 - 1,000 acres	1,000 - 5,000 acres	5,000-10,000 acres	> 10,000 acres	GNN Structure and Species Maps	Patch Identification: Patches were identified using all oak occurrence detections in GNN 2012 data (QUGA4_BA>0). Patches delineated using 4 way region group analysis without grouping. All patches less than 10 acres were dropped from modeling efforts.
Oak Diversity	Oak community types	1	Count of oak system types present within a patch	1 oak type	2 oak types	3 oak types	4 oak types	5 oak types	GNN Structure and Species Maps	To be considered present, oak type must be at least 1% of total patch area. Forests with oak class combined with Oak & Conifer Forest & Woodland
Understory Condition	Understory condition (grazing potential)	1	Total acres of marginal grazing lands within patch (acres)	>80% suitable grazing habitat	60-80% suitable grazing habitat	40-60% suitable grazing habitat	20-40% suitable grazing habitat	<20% suitable grazing habitat	USGS 30M DEM, NLCD 2016, USDA Crop Data, Grazing Allotments	
Terrestrial Resilience	Resilience to climate change	1	% of oak patch identified as having above average resilience	< 20% of patch	20-40% of patch	40-60% of patch	60-80% of patch	> 80% of patch	TNC Conserving Natures Stage	Terrestrial resilience data was resampled to 30m for analysis - all areas identified as "above" average resilience were used to determine % of patch.
RTE Species (Animals)	Rare, threated, and endangered (RTE) species presence	1	Predicted occurrence count of RTE species	No RTE Species	1 - 5 RTE Species	5 - 10 RTE Species	10 - 15 RTE species	15 or more RTE species	USGS Species Modeling	The extent of each species predicted range was summarized by area for each oak patch. To be present a species range must cover 10% of the total patch size. Predicted occurrence totals for all species within a given patch were then scaled to a 1-5 score.
RTE Species (Plants)	Rare, threated, and endangered (RTE) species presence	1	Predicted occurrence count of Priority Plant Species	No RTE Species	1 - 5 RTE Species	5 - 10 RTE Speices	10 - 15 RTE Species	15 or more RTE species	Expert Opinion & Oak Type Associations	
Partner Input Areas	High value oak habitats (professional input)	1	Occurrence of partner input areas	No partner input areas within patch	At least one partner input area within patch	At least two partner input areas within patch	At least three partner input areas within patch	More than four partner input areas within patch	Partner Input	All intersections between partner input areas considered present.
Rare Plants	Occurrence of Priority Plant Species (GS Ranks)	1	Observed rare and sensitive plants	No species present	At least one Priority 3 Species	At least one Priority 2 Species	At least one Priority 1 Species	More than one Priority 1 Species Occurrence	DNR Natural Heritage, INR ORBIC Occurrence Data	

Table 5: ECOP Scoring Matrix for the Prioritization Model

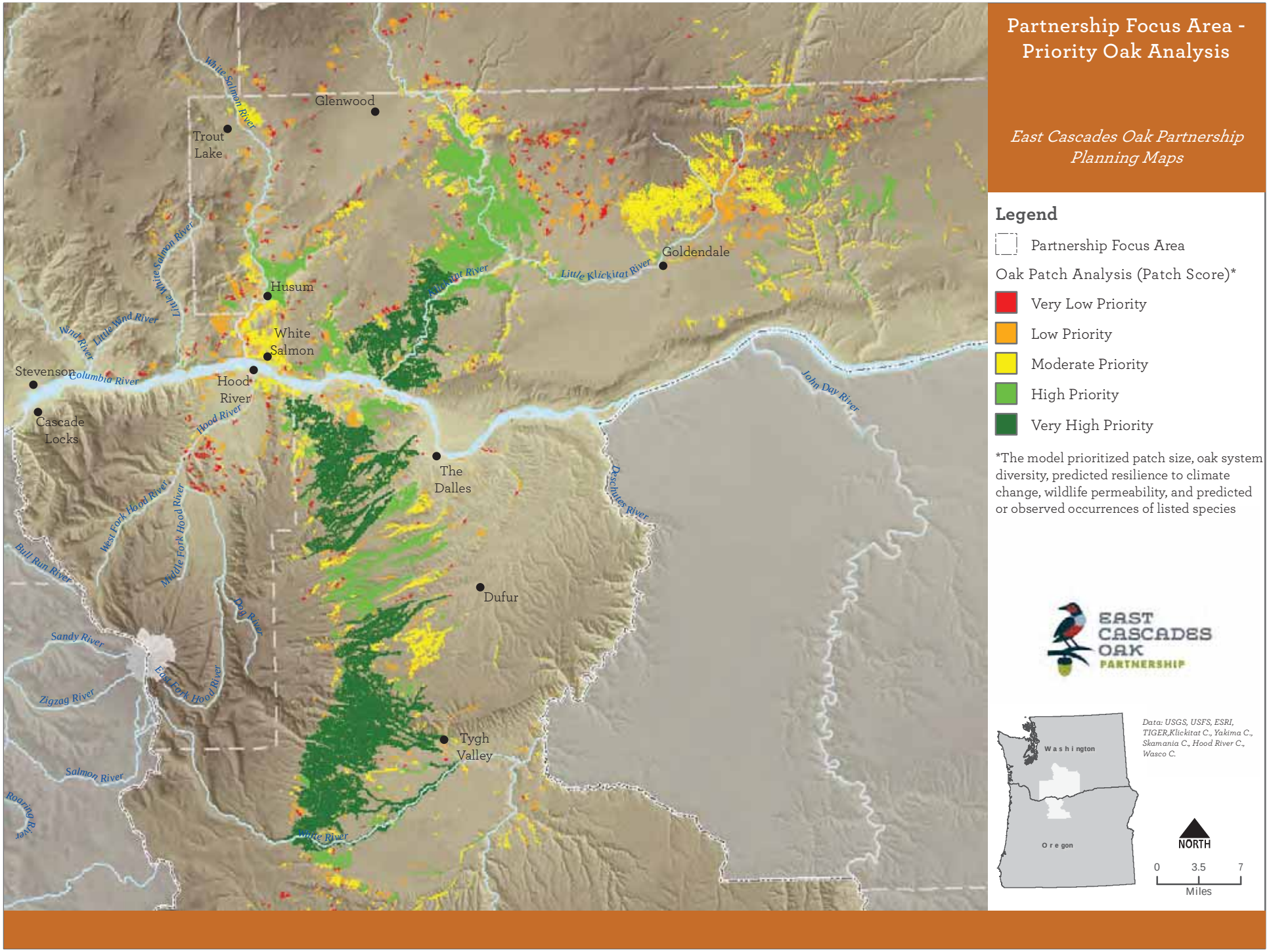


Figure 8: ECOP Prioritization Model Results

In addition to running the model, we asked partners to tell us where they've personally seen intact, functional oak systems, or places with most or all of the following attributes:

- Includes a **diversity of native plant and animal species** (likely no intensive spring grazing)
- May have **unique features** like seeps, springs, creeks and river, talus, cliffs
- Is **resilient to wildfire**, meaning not overly fuel loaded, especially with young conifer
- Includes **mature habitat characteristics** such as large cavities on primary stems, snags, bark sloughing, and mature oaks of any size or structure.

We incorporated this information into our planning maps that were used in our spatial planning exercises.

Priority Habitat and Species

Lewis's woodpecker

Striped whipsnake

Suksdorf's lomatium

Oregon white oak systems east of the Cascades support incredible biodiversity, including many endemic, rare, threatened, and sensitive species.

The 2016 Oregon Conservation Strategy[16] identifies Oregon white oak woodlands as one of eleven priority habitat conservation targets in the state of Oregon. Similarly, Washington State Department of Fish and Wildlife identified oak woodlands as one of eleven priority terrestrial habitats in its 2020 Washington State Priority Habitat and Species List[17]. The Washington Department of Natural Resources Natural Heritage Program[18] assigned a conservation status risk of "S1S2", or critically imperiled, and NatureServe assigned global conservation status ranks for USNVC plant associations linked to East Cascades Oak-Pine Forest and Woodland ecological system as "critically imperiled" to "vulnerable" globally.

[16] *Oregon Conservation Strategy. 2016. Oregon Department of Fish and Wildlife, Salem, Oregon.*
[17] *State of Washington Priority Habitat and Species List. 2020. Washington Dept. of Fish and Wildlife. Olympia, WA.*
[18] *Rocchio, Joe & Crawford, Rex. 2015. Ecological Systems of Washington State. A Guide to Identification.*

NatureServe Global & State Conservation Status for Oregon White Oak		
Group Associations	Global/State Rank	NatureServe Code
Pinus ponderosa -Quercus garryana / Balsamorhiza sagittata	G2/S2/SNR	CEGL000881
Pinus ponderosa – Quercus garryana/ Carex geyeri	G2G3/S2S3	CEGL000882
Pinus ponderosa – Quercus garryana/Purshia tridentata	G3/S2	CEGL000883
Pinus ponderosa – Quercus garryana / Symphoricarpos albus	G2G3/S2S3	CEGL000084
Quercus garryana / Carex geyeri	G1G2/S1S2	CELG000549
Quercus garryana / Festuca idahoensis	G1?/S1	CEGL0000551
Quercus garryana / Pseudoroegneria spicata	G1G2/S1S2	CEGL000552
Quercus garryana/Symphoricarpos albus	G2G3/S2S3	CEGL000553
Quercus garryana/Toxicodendron diversilobum/Elymus glaucus	G2/S1	CEGL000932
Quercus garryana/Corylus cornuta-Symphoriocarpos albus	GNR/SNR	CWWA000932
Pseudotsuga menziesii – Quercus garryana/Toxicodendron diversilobum	G3/S2?	CEGL000928
Pseudotsuga menziesii – Quercus garryana/Symphoricarpos albus	G2G3/S2S3	CEGL000929

Table 6: USNVC Plant Association Conservation Status assigned by NatureServe for East Cascade Oak-Pine Forests

Within each of the six oak system types, or subgroups, a variety of plant associations and stand characteristics are possible. The understory plant community may include a diversity of fire regime-adapted native plants including perennial grasses, forbs, and shrubs. The composition of these understory plant communities depends on abiotic factors like precipitation, aspect, canopy closure, fire return interval, and soil type, and on human interactions that change species utilization and composition, like grazing, forestry, and fire suppression. Table 7 details the rare, threatened and endangered species known or predicted to occur in East Cascade oak systems. Table 8 details culturally important First Foods. There are a great many more species not listed here that occur in or interact with oak systems.

Climate change is expected to disrupt historic flora and fauna species assemblages and interactions across the region. ECOP has not set specific species conservation targets, but is rather focused on protecting a diversity of ecological systems and habitat features connected across a diversity of ecofacets to preserve biodiversity and the opportunity for species adaption to climate change. Some ECOP partners manage for or work to protect habitat for oak-associated at-risk or culturally-important species, and ECOP supports those efforts, but our planning priorities were focused on system diversity and connectivity.

East Cascades Oregon White Oak Associated Rare, Threatened, and Endangered Species (Predicted and Observed)

Group	Common Name	Scientific Name	Federal							Oregon				Washington			
			Endangered	Threatened	Proposed threatened	Candidate	Species of Concern	Under Review	Recovery	Endangered	Threatened	Sensitive	Species of Concern	Endangered	Threatened	Sensitive	Candidate
MAMMALS																	
	Gray wolf	*Canis lupus*	E											E			
	Canada Lynx	*Lynx canadensis*		T										E			
	American pica	*Ochotona princeps*										S					
	North American wolverine	*Gulo gulo luscus*			PT						T						C
	Fisher	*Pekania pennanti*			PT								SC	E			
	Western gray squirrel	*Sciurus griseus*										S			T		
	Townsend's big-eared bat	*Corynorhinus townsendii*					SOC					S					C
	Pallid bat	*Antrozous pallidus*					SOC					S					
	Fringed myotis	*Myotis thysanodes*					SOC					S					
	Pacific Marten (interior)	*Martes caurina*										S					
	Long-legged myotis	*Myotis volans*										S					
	Sierra Nevada red fox	*Vulpes vulpes necator*										S					
	California myotis	*Myotis californicus*										S					
	Silver-haired bat	*Lasionycteris noctivagans*										S					
REPTILES																	
	Western pond turtle	*Actinemys marmorata*										SC		E			
	Western painted turtle	*Chrysemys picta bellii*										SC					
	Sharp-tailed snake	*Contia tenuis*															C
	California mountain kingsnake	*Lampropeltis zonata*					SOC					S					C
AMPHIBIANS																	
	Larch Mountain salamander	*Plethodon larselli*					SOC					SC				S	
	Oregon spotted frog	*Rana pretiosa*		T								SC		E			
	Western toad	*Anaxyrus boreas*										S					C
	Cascades frog	*Rana cascadae*					SOC					S					
	Columbia spotted frog	*Rana luteiventris*															C
	Northern red-legged frog	*Rana aurora*										S					
FISHES																	
	Oregon chub	*Oregonichthys crameri*							R								
	Columbia River Chinook Salmon	*Oncorhynchus tshawytscha*		T								S					C
	Lower and Mid Columbia Steelhead	*Oncorhynchus mykiss*		T								SC					C
	Pacific lamprey	*Entosphenus tridentatus*					SOC					S					
	Bull Trout	*Salvelinus confluentus*		T								SC					C
AVIANS																	
	Yellow-billed Cuckoo	*Coccyzus americanus*		T							T			E			
	Northern Spotted Owl	*Strix occidentalis caurina*		T							T			E			
	Chipping Sparrow	*Spizella passerina*										S					
	White-breasted Nuthatch	*Sitta carolinensis aculeata*										S					C
	Lewis' Woodpecker	*Melanerpes lewis*					SOC					S					C
	Black-backed Woodpecker	*Picoides arcticus*										S					C
	Pileated Woodpecker	*Dryocopus pileatus*										S					C
	Oregon Vesper Sparrow	*Pooecetes gramineus affinis*						UR					SOC				C
	Three-toed woodpecker	*Picoides dorsalis*										S					C
	White-headed Woodpecker	*Dryobates albolarvatus*										SC					C
	Vaux's Swift	*Chaetura vauxi*															C
	Olive-sided Flycatcher	*Contopus cooperi*					SOC					SC					
	Loggerhead Shrike	*Lanius ludovicianus*										S					C
	Northern Goshawk	*Accipiter gentilis*					SOC					S					C
	American Peregrine Falcon	*Falco peregrinus anatum*							R			S					
	Flammulated Owl	*Psiloscops flammeolus*										S					C
	Bald Eagle	*Haliaeetus leucocephalus*														S	
	Tri-colored blackbird	*Agelaius tricolor*					SOC										
	Purple martin	*Progne subis*										SC					
	Swainson's hawk	*Buteo swaninsoni*										S					
	Ferruginous hawk	*Buteo regalis*										S			T		
	Golden Eagle	*Aquila chrysaetos*															C

East Cascades Oregon White Oak Associated Rare, Threatened, and Endangered Species (Predicted and Observed)

Group	Common Name	Scientific Name	Federal							Oregon				Washington			
			Endangered	Threatened	Proposed threatened	Candidate	Species of Concern	Under Review	Recovery	Endangered	Threatened	Sensitive	Species of Concern	Endangered	Threatened	Sensitive	Candidate
MOLLUSKS																	
	Puget oregonian	*Cryptomastix devia*						UR									
	Burrington jumping-slug	*Hemphillia burringtoni*						UR									
	Dalles Sideband	*Monadenia fidelis minor*															C
	Columbia pebblesnail	*Fluminicola fuscus*					SOC										
	Columbia Oregonian	*Cryptomastix hendersoni*						UR									C
VASCULAR PLANTS																	
	Umtanum Desert buckwheat	*Eriogonum codium*		T													
	Obscure buttercup	*Ranunculus reconditus (triternatus)*					SOC							E			
	Suksdorf's biscuitroot	*Lomatium suksdorfii*											C			S	
	Sierra onion	*Allium campanulatum*													T		
	Common blue-cap	*Githopsis specularioides*														S	
	Barrett's penstemon	*Penstemon barrettiae*											C		T		
	Northern wormwood	*Artemesia campestric var. wormskioldii*								E				E			
	Tygh Valley milk-vetch	*Astragalus tyghensis*									T						
	Oregon daisy	*Erigeron oreganus*										C					
	Dissapearing monkeyflower	*Erythanthe inflatula*										C					
	Diffuse stickseed	*Hackelia diffusa var diffusa*									T						
	Bolander's linanthus	*Leptosiphon bolanderi or L. bakeri*														S	
	White meconella	*Meconella oregana*					SOC						C	E			
	Parry's knotweed	*Polygonum parryi*													T		
	Howell's bentgrass	*Agrostis howellii*											C				
INSECTS																	
	Western bumblebee	*Bombus occidentalis*											SOC				
	Monarch butterfly	*Danaus plexippus*											SOC				
	Oregon silverspot butterfly	*Speyeria zerene hippolyta*		T													
OTHER																	
	Vernal Pool Fairy Shrimp	*Branchinecta lynchi*		T													

Key:

Not indicated	
T	Threatened
E	Endangered
C	Critical
SOC	Species of concern
SC	Sensitive critical
UR	Under Review

The lists on this page were verified against state and federal lists of RTE species on 12/7/2020. Lists were accessed using Oregon and Washington Heritage program lists for plants and wildlife.

East Cascades Oregon White Oak-Associated Culturally Important Plants and Animals**

Common Name	Sahaptin Language Name*	*Scientific Name*
grass	wap'áy	*generic*
fish	waykáanash	*generic*
Chinook salmon	núsux	*Oncorhynchus tshawytscha (chinook)*
currant	xnínaash	*Ribes sp*
chokecherry	tmíshaash	*Prunus virginiana*
service berries	chcháya	*Amelanchier alnifolia*
cottonwood	xźpxap	*Populus trichocarpa*
balsamroot	xnít (root/food)	*Balsamorhiza sp.*
bare-stem desert parsley	xnít (root/food)	*Lomatium nudicaule*
desert parsley	xnít (root/food)	*Lomatium grayi*
cow parsnip	xnít (root/food)	*Heracleum lanatum*
biscuitroot	sápk'tit	*Lomatium macrocarpum*
bitterroot	pyaxí	*Lewisia rediviva*
Piper's desert parsely	xnít (root/food)	*Lomatium piperi*
cous	xnít (root/food)	*Lomatium cous*
onion	stúpsa	*Allium acuminatum*
Canby's desert parsley	xnít (root/food)	*Lomatium canbyi*
camas	xmáash	*Camassia quamash*
huckleberries	wíwnu	*Vaccinium sp.*
tule	tk'ú	*Scirpus validus*
spring beauty	unknown to us	*Claytonia lanceolata*
wild strawberries	suspánaash	*Fragaria vesca*
wild celery	xásya	*Lomatium sp.*
wild carrot	sawítk	*Perideridia gairdneri*
avalanche lily	xnít (root/food)	*Erythronium grandiflorum*
yellow bell	xnít (root/food)	*Fritillaria pudica*
cranberry	xísya	*Vaccinium oxycoccus*
beaked hazelnut	unknown to us	*Corylus cornuta*
Oregon white oak	ts'uníps	*Quercus garryana*
acorn	wawachí	*Quercus garryana*
elderberry	mit'ípaash	*Sambucus caerulea*
kinnickinick	sapátwa	*Arctostaphylus uva-ursi*
oregon grape	lk'áwk'awaash	*Mahonia aquifolium*
pine tree	táp'ash	*Pinus sp.*
Indian potato	anipásh	*not sure*
rabbit brush	tawshá	*Chrysothamnus sp.*
wapato	wáptu	*Sagittaria latifolia*
blackberry	wisíkaash	*Rubus armenicus*
Deer	tl'álk	*Odocoileus virginianus*
Elk	k'ayík	*Cervus canadensisi*

East Cascades Oregon White Oak-Associated Culturally Important Plants and Animals**

Common Name	**Sahaptin Language Name***	*Scientific Name*
beaver	yíxa or wíshpush	*Castor canadensis*
Bear	anahuy	*Ursus americanus*
Wolf	lalawísh	*Canis lupus*
Bats	lach'at lách'at	*various*
Coyote	spílya	*Canis latrans*
Mink	ptyáw	*Neovison vison*
Otter	nuksháy	*Lutra canadensis*
Antelope	chatwílll	*Antilocapra americana*
quail	pátashi	*Callipepla californica*
pheasant	unknown to us	*Phasianus colchicas*
bald eagle	k'ámamul	*Haliaeetus leucocephalus*
golden eagle	xwayamá	*Aquila chrysaetos*
hawks	unknown to us	*various*
sage sparrow	unknown to us	*Artemisiospiza nevadensis*
sage thrasher	unknown to us	*Oreoscoptes montanus*
white headed woodpecker	ch'íya (woodpecker)	*Dryobates albolarvatus*
rabbit	wilalík	*Lepus sp.(Jack rabbit)*
raven	xúxux	*Corvus corax*
Lewis' woodpecker	síwsiw	*Melanerpes lewis*
cougar	xwayawi	*Felis concolor*
skunk	tiskáy	*Mephitis mephitis (Stripped)*
turkey	táki	*Meleagris gallopavo*
bull frog	alukw'át (frog)	*Lithobates catesbeianus*
tail Frog	alukw'át (frog)	*Ascaphus montanus*

* http://www.native-languages.org/sahaptin.htm

**This list of culturally important foods was gleaned from the Climate Plan for the Territories of the Yakama Nation(2016) and a presentation to ECOP (2018) by Cheryl Mack, retired USFS Archeologist

ECOLOGICAL PRIORITIES & CONSERVATION GOALS

ECOP identified critical ecological processes and functions at the landscape scale:

1. Functional ecological processes
    i. Fire
    ii. Pollination
    iii. Soil formation
    iv. Hydrology
2. Native biodiversity
3. Oak system diversity
4. Climate resilience
    i. Connectivity across elevation, temperature, and precipitation gradients for species adaptation
    ii. Fire readiness
5. Connectivity for species migration, climate adaptation, and dispersal

And critical ecological processes, functions, and characteristics at the site scale:

1. Ecological stewardship and reciprocal human interactions
2. Absence of invasive species
3. Safe access to healthy First Foods and game species
4. Fire readiness
5. Soil health
6. Oak recruitment (oaks in site appropriate successional states)
7. Species occurrence (rare, threatened, endemic, and endangered species)
8. Presence of mature habitat features, including:
    i. Cavities
    ii. Snags and coarse wood with decay class diversity
    iii. Acorn production
    iv. Bark sloughing
    v. Understory plant structure and composition

Our spatial priorities are displayed in Figure 9 on the following page. Anchor habitats show where partners have existing opportunity for ecological stewardship; priority areas show where we will first focus our proactive efforts to evaluate and apply strategies; and opportunity areas show where we will be more opportunistic in our efforts. The arrow show corridors connecting them.

ECOP'S Conservation Goals:

1. The oak landscape is intact and connected
2. The oak landscape is resilient to climate change and disturbance
3. Biodiversity persists
4. We empower people to behave reciprocally with oak systems
5. We respond to the needs of historically marginalized communities

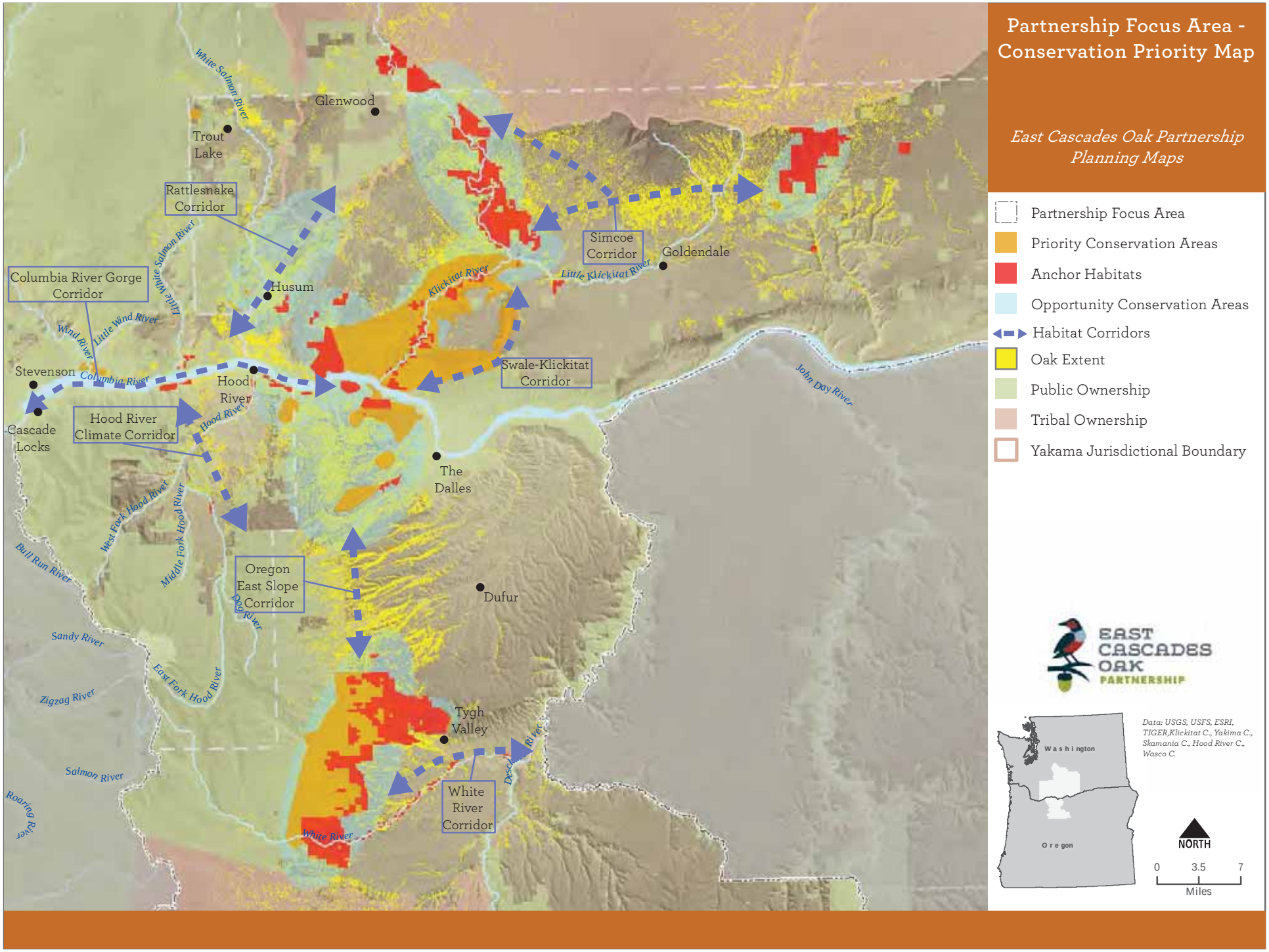


Figure 9: ECOP's Conservation Priorities

Ecological Outcomes

When we successfully implement the strategies described in this plan, we believe the following ecological outcomes will be expressed in the landscape:

1. Oak system diversity persists, climate buffers are protected
2. Connectivity is preserved for species migration and adaptation
3. Species composition and stand structure indicate resilience to disturbance
4. Oaks are released from conifer encroachment
5. Mature oak habitat features are retained and recruited
6. Diverse native oak associated species and pollinators persist
7. Human interactions within the oak landscape are reciprocal

Community Outcomes

When we successfully implement our strategies in cooperation with stakeholders, we believe the following outcomes will be expressed in our communities:

1. Crops, forests, and homes are further protected from wildfire
2. Local communities are fluent in oak system ecology
3. Health and economic impacts from wildfire smoke are reduced
4. Forage for domestic livestock is improved
5. Eco-recreational tourism economy is supported
6. Safe access to First Foods is widely available
7. Natural resource jobs remain core to the local economy
8. Agricultural crops are pollinated and resist pests
9. Conservation responds to the needs of diverse communities

Our lives are bound up in and reliant on the function and condition of the oak landscape. The Oregon Conservation Strategy and the Washington Natural Heritage Program's Guide to Ecological Systems of Washington State identify several limiting factors in oak woodlands, as well as more broadly across the East Cascades landscape. These include altered fire regimes (fire suppression), land use conversion, habitat fragmentation, invasive species, recreational activity, loss of habitat structure, and climate change. ECOP identified six primary ways people interact in oak systems that exacerbate these limiting factors.

Human Interactions in the Oak Landscape

1. Rural residential development: building infrastructure and living our lives in the oak landscape
2. Fire suppression and conifer encroachment: extinguishing ecologically important fire and active conversion of oak systems to commercially valuable species
3. Grazing: raising cattle, sheep, and other domestic livestock, commercially or recreationally on forage from the oak understory
4. Orchards and vineyards: installing and tending row crops in place of oak
5. Recreation: enjoying the oak landscape on foot, horse, or motor vehicle
6. Ecological Stewardship & First Foods: managing land for species, for ecological outcomes, or for First Foods

Each of these interactions is characterized by a variety of behaviors that impact oaks. Figure 10 on page 45 shows how some of these interactions affect oak systems.

Threats & Impacts

The "Theory of Change" section that follows outlines how ECOP will improve ecological outcomes for oak by adjusting human behavior. We intentionally framed "threats" in our planning process as "impacts" to make our planning work less confrontational with stakeholders. We described the impact of each of these behaviors and then asked partners to rank the impacts of each one according to three criteria: scope, severity, and irreversibility.

<u>Scope:</u> Portion of the target that can reasonably be expected to be affected by the threat within 10 years. Very High = Pervasive, affecting target across all or most (71-100%) of its occurrence. High = Widespread, affecting the target across much (31-70%) of its occurrence. Medium = Restricted, affecting target across some (31-70%) of its occurrence. Low = Very narrow, affecting the target across much (1-10%) of its occurrence.

<u>Severity:</u> Within the scope, level of damage to the target from the threat that can reasonably be expected given the continuation of current circumstances. The degree of destruction or degradation. Very High = Likely to destroy or eliminate the target. High = Seriously degrade the target. Medium = Moderately degrade the target. Low = Only slightly degrade the target. Note: destruction or degradation is defined in reference to one or more key attributes of the target.

<u>Irreversibility:</u> The degree to which the effects of threat can be reversed and the target affected by the threat restored. Very High = The effects of the threat cannot be reversed and it is very unlikely the target can be restored, and/or it would take more than 100 years to achieve this. High = The effects of the threat can technically be reversed and the target restored, but it is not practically affordable or it would take 21-100 years to achieve this. Medium = The effects of the threat can be reversed and the target restored with a reasonable commitment of resource and/or within 6-20 years. Low = The effects of the threat are easily reversible and the target can be easily restored at relatively low cost and/or within

Using Miradi software, we analyzed the responses of partners and summarized threat rankings. Upon review, partners felt the threats might play out differently between the xeric (dry) extent of our region and the more mesic western extent, so our technical committee further refined the threats analysis by extent.

Impact Ranking for Human Interactions by Extent		
Specific Human Behavior	Xeric Rank	Mesic Rank
Rural residential development	**High**	**High**
Fire suppression and fir encroachment	**High**	**High**
Grazing	**High**	**Medium**
Conversion to conifer plantations	**Medium**	**High**
Conversion to orchards and vineyards	**Medium-high**	**Medium-High**
Recreational use and infrastructure	**Low**	**Medium**
Energy development	**Low**	**Low**

Table 9: Impact ranking for each interaction is based on scope, severity, and irreversibility

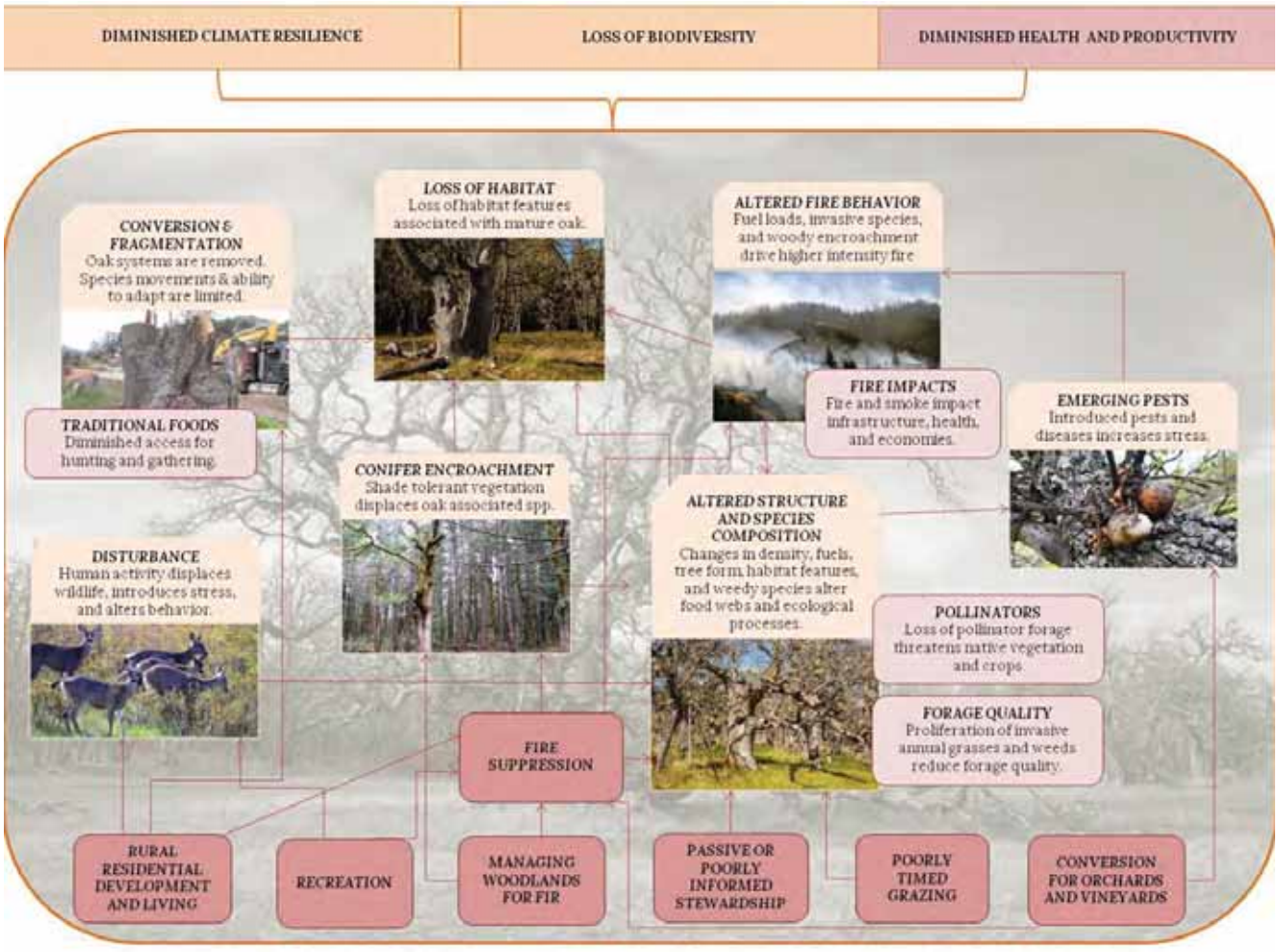


Figure 10: Impacts of Human Behaviors on East Cascade Oak Systems

To facilitate a conversation about impact and opportunity at a finer scale, we broke into two working groups – Washington and Oregon, and discussed smaller geographies within each state. The planning geographies were based loosely on watershed boundaries and landforms (see Figure 11, ECOP Planning Subgeographies on the following page). For each of these planning geographies, we developed a suite of 13 maps (see a sample of a map atlas in Appendix D) to help us understand the spatial expression of threats and opportunities across the region. Appendix F, GIS Mapping Approach & Metadata, details how each of these maps was made. The map atlas for each geography included the following:

- Aerial Map
- Protected Lands Map
- Conservation Partner Jurisdiction Map
- Oak System Type Map
- Oak Prioritization Map
- Potential Fir Encroachment Map
- Forest Conversion Map
- Wildfire Hazard Potential Map
- Opportunity for Prescribed Fire Map
- Grazing Potential Map
- Residential Density Map
- Number of Existing Structures Map
- Potential New Structures Map

We used the maps and the strategies we developed from extensive stakeholder interviews to develop a theory of change with geographic priorities for implementation. Some maps were produced at the region extent to see region-wide trends.

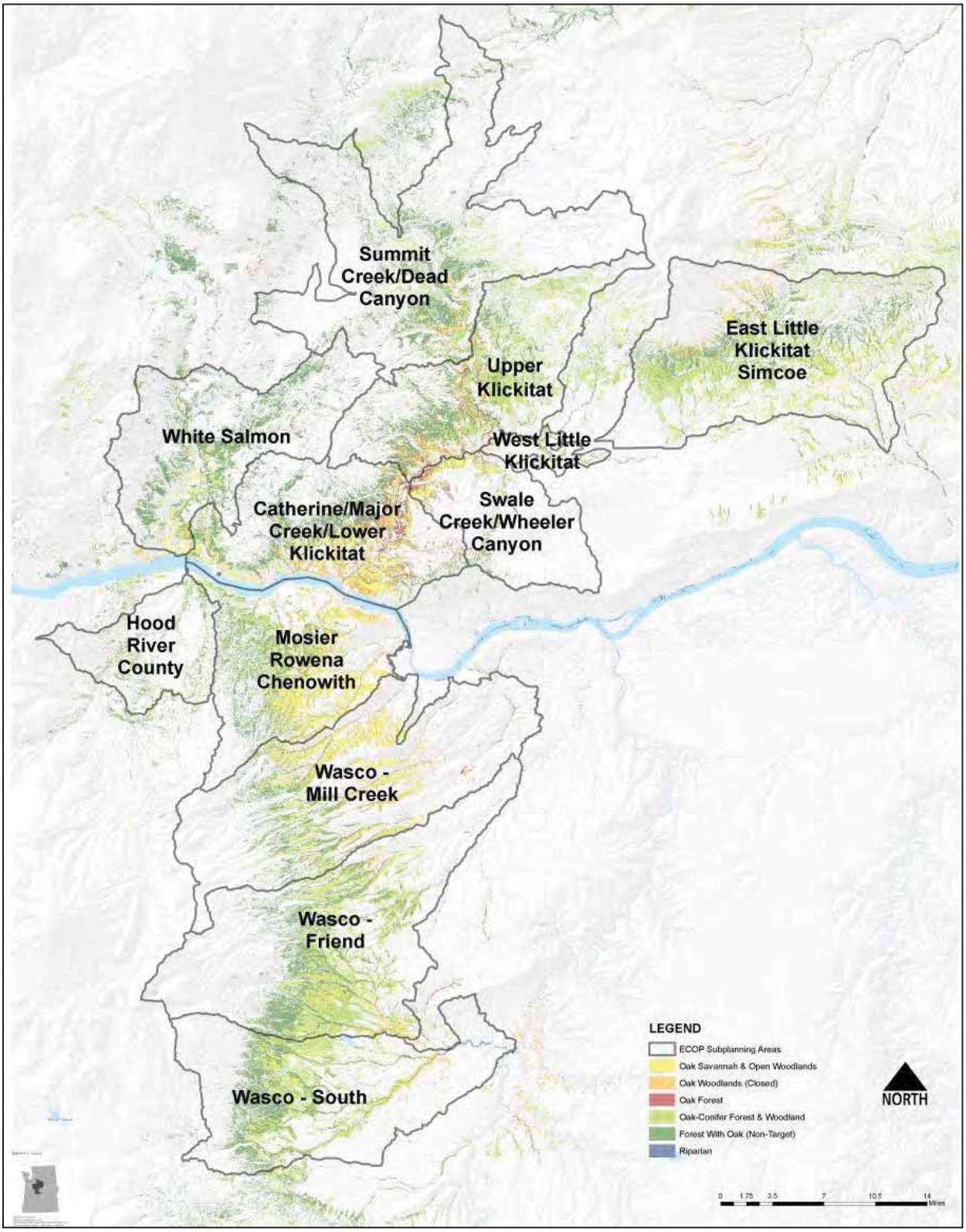


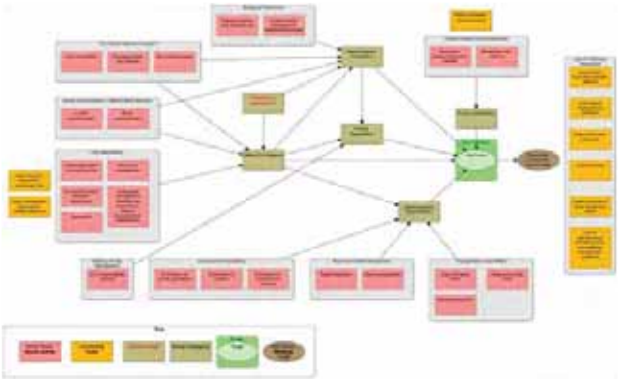
Figure 11: ECOP Planning Subgeographies

Theory of Change

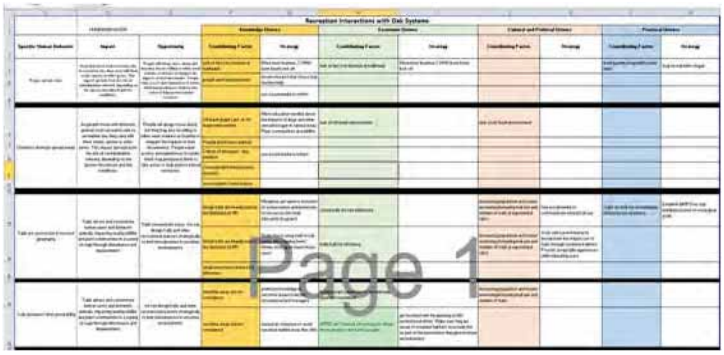
People's behaviors are influenced by a number of factors including:

- Individual beliefs, knowledge, and skills
- Social interactions with other people – friends, family, neighbors, community
- Environmental influences - economy, regulations, climate, logistics, etc

Through stakeholder interviews, ECOP partners identified the contributing factors that drive behavior in the oak landscape (see Appendix E: ECOP Conceptual Model). For each human interaction – rural residential development, fire suppression and fir encroachment, grazing, ecological stewardship, recreation, and orchards and vineyard development - we brainstormed strategies to address those contributing factors (see Appendix G, Human Behaviors and Strategies Tables for an example of the tables we developed).



Conceptual Model in Appendix E



Human Behaviors and Strategies Table, App. G

We then tested those ideas using results chains for weak assumptions and missing linkages, and carried forward the most promising strategies.

Results chains are in each section below

In addition to evaluating the strategies for ecological effectiveness, we also evaluated strategies for their potential to address human needs in the landscape.

We asked ourselves the following questions:

- Does the strategy address important human needs?
- Does the strategy support economic development?
- Does the strategy promote community?
- Is the strategy responsive to the needs of underrepresented groups?
- Does the strategy promote reciprocity between people and nature?

The following sections outline the theory of change for each of the primary human interactions in the East Cascade oak landscape. We dropped energy development, which does not have significant or widespread impacts on oaks in our region at this time.

RURAL RESIDENTIAL DEVELOPMENT

According to our oak system model there are about 390,000 oak acres in our core service area. With 33,000 private landowners controlling approximately half of the oak landscape, we believe there are powerful opportunities to impact outcomes by addressing the impacts of rural residential living.

OVERALL IMPACT RANKING: *HIGH*

IMPACTS OF RURAL RESIDENTIAL DEVELOPMENT

Construction of homes and associated infrastructure requires removal or displacement of plants and wildlife. Residential use is concentrated at lower elevations in the East Cascades where oak systems occur. The cumulative impacts can be devastating. The impact of residential activity extends beyond the footprint of infrastructure:

Invasive species. Humans and domestic animals are the primary vectors for invasive species, providing a seed source and the disturbance necessary to establish them. Native species are not adapted to the pace and scale of these introductions, which could be exacerbated by climate change. Increasers, or plants that respond well to grazing disturbance, include a host of non-native invasive species, including grasses that alter fire behavior and stand structure, and weeds that outcompete native flowering forbs, which support pollinators and insects that in turn provide food for birds, mammals and other wildlife. People transport animals and materials (like firewood, ornamental plants, pets, and food) to and from their residences, increasing the possibility of introducing insect pests and plant diseases.

Firewood cutting and domestic use of wood**.** Firewood cutting on residential properties often results in the removal of healthy trees, dying or dead trees and snags. Snags are important habitat features, providing food sources, nesting, and shelter structures for birds, insects, mammals and reptiles. Increasingly, people concerned about wildfire remove snags and vegetation to create defensible space, sometimes extending those practices far beyond the perimeter needed to protect structures. Because of their often small diameters and hardiness, people perceive oaks to be weedy, "not valuable for anything but firewood".

Fire suppression and fuel reduction. Climate change is exacerbating risk of catastrophic fire and the impacts are being felt across the American west. The presence of residences necessitates fire suppression, which can result in conifer and shrub encroachment, changes in oak stand structure, and vegetation composition. Fuels accumulate and plant community composition shifts away from fire-adapted species, setting the stage for catastrophic loss of habitat and infrastructure when fire does occur. Bird, insect and animal species relying on those plant communities are also compromised. Public agencies are offering fuel reduction programs to create defensible space around structures and improve forest health. When fuel reduction practices are applied homogenously and expansively, regardless of site diversity or habitat needs, oak systems are degraded. In many cases, landowners are cutting oaks to reduce fuels without treating stumps with herbicides, only to have them sprout back shrubbier than before, potentially contributing to elevated fuels and fuel ladders.

Wildlife displacement and disturbance. Wildlife habitat extent and connectivity in rural areas is significantly impacted by increased residential density. Roads, utilities, buildings, landscaping, and human presence can all function as barriers to wildlife, impacting behaviors like foraging and reproduction. Additional displacement and fitness-reducing stress can result from noise, grazing, expansion of weed populations, loss of important habitat features, and introduction of toxins or disease. As climate impacts are expressed on the landscape, connected corridors are critical for climate adaptation across temperature, precipitation, and elevational gradients.

Alteration of soils and water regimes. Residential development can change soil fertility and water regimes particularly where residents plant, water, and fertilize crops, gardens, and ornamental plants. Soil fertility and water regimes are also altered by waste from the domestic animals that are often associated with residential development. These changes affect oak and associated plant communities that are adapted to dry and low fertility growing conditions.

Rural Residential Development Impact Analysis	
Specific Human Behavior	Ranking
Removal of oaks and conversion of habitat to homesites, roads, and utilities	**High**
Fire suppression, aggressive fuels reduction, and lack of prescribed fire to protect infrastructure and safety	**High**
Passive or misguided management, including tree removal due to perceptions of fire risk	**High**
Roads and built infrastructure fragmenting habitat and inviting noise and other disturbances	**High**
Hobby farming or raising livestock introduces weeds and causes significant shifts in plant communities	**High**
Passive management results in proliferation of weeds, fir encroachment, and fuels	**Medium**
Uncontrolled pets kill, stress, or displace wildlife	**Medium**
Fences impact animal behavior, which impacts food webs and landscape processes	**Medium**
Landscaping preferences and perception of “weedy” oaks lead to removal and displacement of native vegetation	**Low**
Mammals, insects, and other organisms seen as nuisances are removed, including apex predators	**Low**
Hunting/shooting noise and wildlife displacement	**Low**

Table 10: Rural Residential Impact Analysis by Specific Human Behavior

Rural Residential Development **Avoided**

Figure 12

ECOP works on advocacy to increase habitat protection in state, county and city planning:

- Develop business case for planned developments in oak systems (RW)
- Create disclosure requirement in sale process
- Prevent building in water limited areas
- Absentee homeowner tax to pay for affordable housing
- Incentivize redevelopment (dilapidated home sites) to reduce instances of new development in oak systems
- ECOP and members participate in comprehensive plan updates (clarify oak policies)
- Develop oak mitigation requirements for development impacts
- Increase the flow of data to planners
- Advocate/information to local leadership for oak overlay protections at the county or state level
- Develop regulations as a means to protection
- Support enforcement of existing regulations with increased financial and staffing resources
- Increase coordination between National Scenic Area and county planners; realtors; OR and WA DFW (Look at USFWS Collaborators as a model)
- Consider impacts of urban sprawl / protection of urban oak systems (individual trees too)

Increase capacity for incentive programs. RR-2

. Increase funding to:

- Assist Hood River County adoption of Incentive Program
- Develop Business Case(s) for:
  - Opposing variances in high priority areas
  - Planned communities in oak systems
  - True cost of rural development in fire prone areas, roads, utilities, etc…
- Discount fees for permit applications with voluntary consultation (OR and WA DFW)
- Support Conservation Districts to provide habitat assessments prior to development
- Offer cash to support redevelopment

Work on advocacy to increase habitat protections in state, county and city planning RR-3

Expand outreach to leaders, landowners, builders and developers RR-3

- Develop Landowner Guide to Living Lightly in Oak Systems
- Develop a strong (info rich, user friendly) web presence about oak conservation (See UC Extension program https://ucanr.edu/sites/oak_range/).
- Promote oak focused CC&R's in planned communities (conservation fees, limit land uses, guide building, fencing, and fire prep, etc…
- Offer trainings to realtors on oak conservation.
  - Require for licensing?
  - Develop a green marketing certification program
- Host home/land tours focused on oak systems in rural residential settings. Community organizations
- Handbook, videos, apps on how to do due diligence during bare land purchase
  - Interactive tool for interpreting environmental overlays /user friendly interface
  - BMP's for site plans and road building

High priority areas for protection and conservation are understood

Data is shared

Local leaders, landowners, planners understand the value of oak systems

Land owners and local leadership support the protection of oak systems

Realtors are motivated to inform due diligence processes related to oak systems

Planners have tools to recommend protection of oak systems

Landowners want to steward oak systems on their properties

Planners recommend protections that support oak system conservation

Developers Landowners Builders understand protection requirements

Developers Landowners Builders submit oak friendly site plans

Rural Residential developments avoid impacts to oak systems

Large parcels/working lands are protected from fragmentation and development

Conversion of oak systems AVOIDED

Target: ECOP OAK

Conservation partners know and can respond to emerging threats

Go to page 1

Support research to improve effectiveness of rural residential programs. ES-1

- Increase relationships with academia to develop priorities for research capacity
- How effective are landowner guides? Which format is more likely to reach the intended audience (landowners, realtors, builders, developers)
- Paper , Website, Online videos, Seminars, workshops, Required trainings
- What data do planners need to avoid impacts to oak systems
  - geographic, Wildlife, connectivity, high value habitat areas, science/research based data on impacts to oaks?

- ID geographic priorities for landscape scale conservation approach
- Establish long term funding to support Conservation and Easements (example: lottery in CO a model)
- Protect high priority habitats and connecting lands
- Acquisition of inholdings within existing public lands
- Build relationships and create programming to prevent working lands failure (and subdivision of large land parcels)

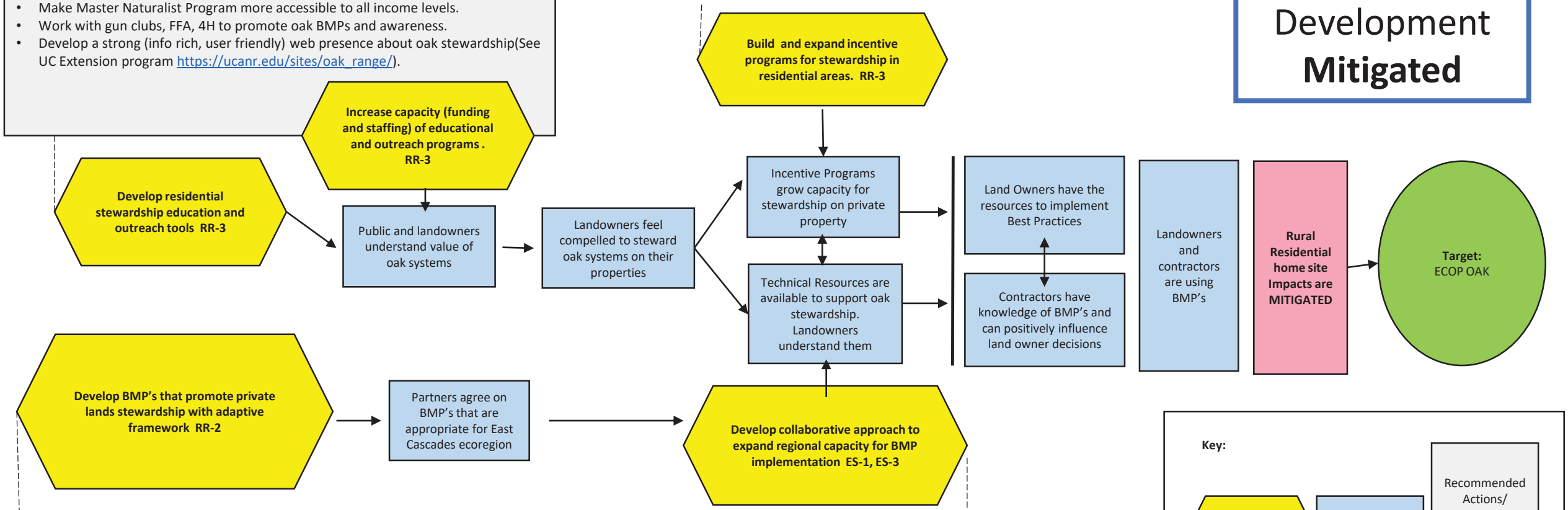
Increase capacity for conservation RR -1

Key: Strategies | Outcomes | Recommended Actions

Rural Residential Development **Mitigated**

Develop Education and Outreach Tools:
- Develop locally focused oak curriculum for schools (K-Community College) – coordinated to support teachers meeting state standards
- Develop Landowner Guide to Oak Systems
- Develop a diversity of delivery methods for landowner guide, including website, You-tube and social media tools
- Implement BMP demonstration sites and mentor programs with peer leaders in priority geographies
- Make Master Naturalist Program more accessible to all income levels.
- Work with gun clubs, FFA, 4H to promote oak BMPs and awareness.
- Develop a strong (info rich, user friendly) web presence about oak stewardship(See UC Extension program https://ucanr.edu/sites/oak_range/).

Build and expand incentive programs:
- Increase capacity for administration and expansion of Oregon Wildlife Habitat Program
- Implement new incentives for implementing BMPs, including new or existing tax breaks for habitat protection and climate resilience and discounts for fire preparedness/oak awareness
- Provide funding for oak education programs
- Expand landowner applications to USFWS – Partners for Wildlife (focus on high priority private lands)
- Increase funding for NRCS Oak CIS program (habitat and fuel reduction program)
- Assist counties with adoption of incentive programs



Develop adaptive BMPs for landowners and managers:
- Develop East Cascades oak systems best management practices specific to rural residential land uses including IPM, fuels reduction, wildlife habitat features, native understory vegetation, fencing, road building & maintenance

Develop collaborative approach to expand BMP implementation:
- ID seed bank priorities for a community seed bank.
- Grow more oak seedlings, promote nursery stock for oak system understory vegetation
- Train & certify contractors in oak stewardship BMP's
- Ensure established stewardship programs have access to BMPs
- Implement standardized monitoring and adaptive management
- Work with USFS collaboratives to incorporate oak
- Identify knowledge gaps and key management questions and prioritize for research
- Explore outreach opportunities with landscape contractors and nurseries
- Develop business case for oak-aware planned developments

Key:

Strategies | Outcomes | Recommended Actions/ Messaging

Go to page 2

SPATIAL INDICATORS OF VULNERABILITY TO RURAL RESIDENTIAL DEVELOPMENT

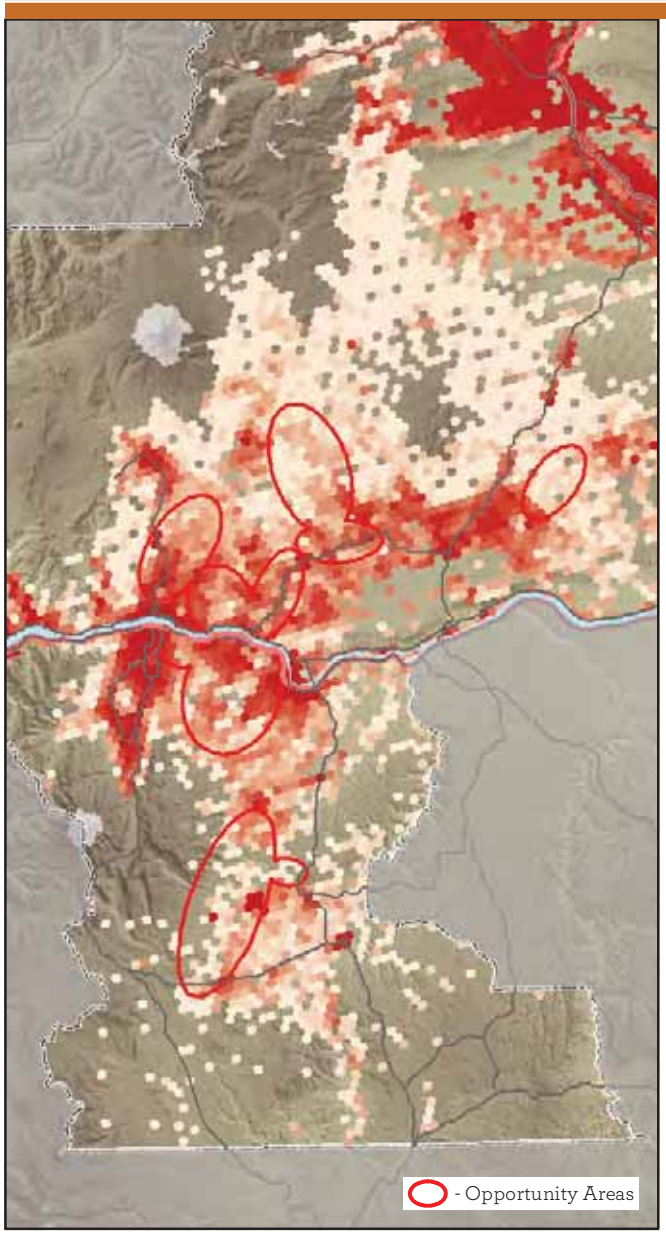
Figure 13 on the following page shows the spatial indicators of the region's vulnerability to rural residential development. These indicator maps were built off current parcel size, buildout status, and zoning allowance data. The potential new structures map shows the disparity in Oregon and Washington's zoning approaches. Though the existing density of structures does not widely differ between states, the threat of increased fragmentation and conversion of oak due to residential development is much greater in Washington. Many of the neotropical migratory songbirds that utilize oak woodlands, including species of concern like Lewis' woodpecker, rely on oak systems on both sides of the Columbia River, and priority species in Oregon may well depend on oak habitats situated to the north as they adapt to climate stress.

Table 11 below details the stakeholders engaged during the planning process to help us understand the challenges and opportunities around rural residential development in the region.

STAKEHOLDER ENGAGEMENT - Rural Residential Development			
ECOP's Rural Residential Working Group Members:			
Name	***Position***	***Entity***	***Nature of Engagement with ECOP***
Bell, Dan	Executive Director	Friends of the Gorge Land Trust	Rural residential working group
Bushman, Mary	ECOP Coordinator	Columbia Land Trust	Rural residential working group
Cornelius, Lindsay	Natural Area Manager	Columbia Land Trust	
Johnson, Amber	Habitat Biologist	WDFW	Rural residential working group
Olson, Jessica	Planner	Columbia River Gorge Commission	Rural residential working group
Thompson, Jeremy	District Wildlife Biologist	ODFW	Rural residential working group
Stakeholders Interviewed:			
Name	***Position***	***Entity***	***Nature of Engagement with ECOP***
Dancer, Dan	Developer	Rowena Wilds Council	Rural residential interview
Linblad, Mo-chi	Planning Dept. Director	Klickitat County	Rural residential interview
Meyer, Maui	Owner and Operator	Copperwest Realty, Hood River Growers and Shippers, Nisei Construction, and Celilo Restaurant and Bar	Rural residential interview
Olson, Jessica	Planner	Columbia River Gorge Commission	Rural residential interview
Reif, Sara	Energy Coordinator	ODFW	Rural residential interview
Thompson, Jeremy	District Wildlife Biologist	ODFW	Rural residential working group
Results Chains Workshop Participants and Advisors (in addition to the ECOP working group listed above):			
Name	***Position***	***Entity***	***Nature of Engagement with ECOP***
Bryce Guske	Land Use Planner – Klickitat County	Columbia River Gorge Commission	Rural residential results chain
Flick, Cathy	Retired biologist	USFS	Rural residential results chain
Joanna Kaiserman	Land Use Planner	Columbia River Gorge Commission	Rural residential results chain
Weiler, Bill	Education Coordinator	Sandy River Basin Watershed Council	Rural residential results chain
Presentations to the East Cascades Oak Partnership Formal Meetings:			
Name	***Position***	***Entity***	***Nature of Engagement with ECOP***
Anderson, Jacob	Program Coordinator	Klickitat County Natural Resources Department	Planning challenges and opportunities panel
Brewer, Angie	Planning Director	Wasco County	Planning challenges and opportunities panel
Guske, Bryce	Land Use Planner – Klickitat County	Columbia River Gorge Commission	Planning challenges and opportunities panel
Howsley-Glover, Kelly	Long Range Planner	Wasco County	Planning challenges and opportunities panel
Johnson, Amber	Habitat Biologist	WDFW	Regulatory Protections
Nick Kraemer	Senior Planner	Hood River County, City of White Salmon, City of Mosier	Planning challenges and opportunities panel
Olson, Jessica	Planner	Columbia River Gorge Commission	Regulatory Protections
Thompson, Jeremy	District Wildlife Biologist	ODFW	Regulatory Protections

Table 11: Stakeholder Engagement for Rural Residential Development

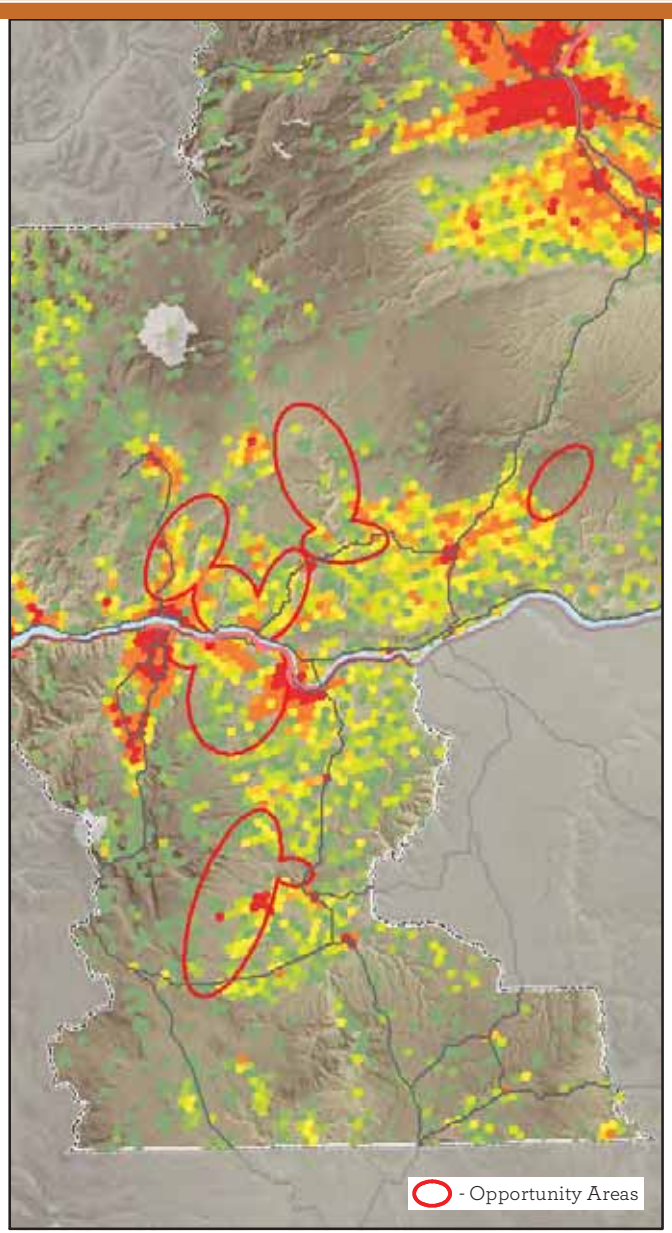
Partnership Focus Area - Rural Residential Development



Existing Parcel Density

Number of parcels within 640 acre hexagon.

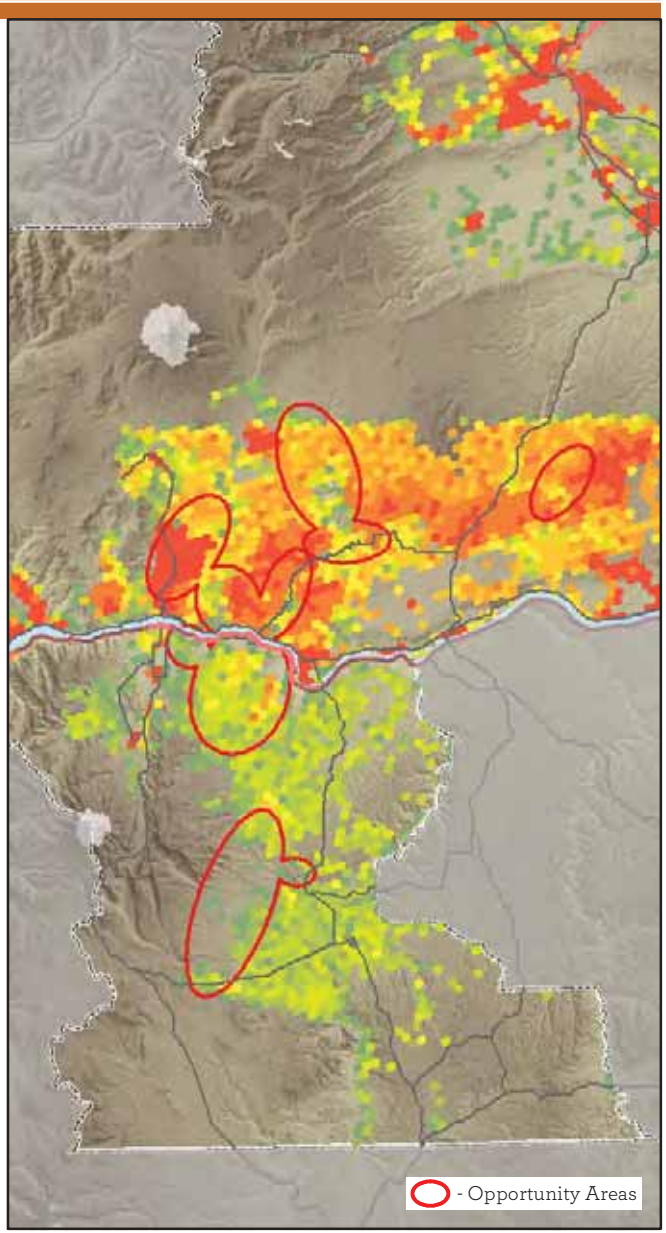
- 1
- 2
- 3
- 4 - 5
- 6 - 8
- 9 - 13
- 14 - 22
- 23 - 40
- 41 - 87
- 88 - 2336



Number of Existing Structures

Number of existing structures within 640 acre hexagon.

- 1 - 2
- 3 - 4
- 5 - 6
- 7 - 8
- 9 - 12
- 13 - 21
- 22 - 29
- 30 - 36
- 37 - 110
- More than 110



Potential New Structures

Number of potential new structures within a 640 acre hexagon, based on zoning.

- 1 - 2
- 3 - 4
- 5 - 6
- 7 - 8
- 9 - 12
- 13 - 21
- 22 - 29
- 30 - 36
- 37 - 110
- More than 110

Miles
0 5 10

NORTH

OPPORTUNITY FOR CHANGE – RURAL RESIDENTIAL DEVELOPMENT

"ECOP is exactly what many landowners need in the oak habitats of the Columbia Gorge, whether they come to the conversation from a love of the land generally, or have specific concerns about wildfire, healthy forests, climate change, or biodiversity."

- Tova Tillinghast, Underwood Conservation District

Land use planning processes are in place in Oregon to advocate for and protect important resources, but are lacking in Washington. Opportunity to prevent fragmentation and sprawl using a variety of conservation and planning tools may be increasingly supported in both Oregon and Washington as hotter, drier summers drive fire behavior that threatens infrastructure and suppression costs escalate. Oaks in the East Cascades occur at lower elevations where people are concentrated, often in what is called the wildland urban interface. Implementing fuels reduction and prescribed fire, limiting landowner liability in the application of prescribed fire, expanding capacity and availability of skilled workers in fire-related occupations, and reducing the cost and complexity of fighting wildfire by limiting expansion of homes into the wildland urban interface is an ecological health, human health, and equity issue that funders and community leaders are likely to coalesce around.

People who live, work, and play in the East Cascades have strong relationships with nature. According to regulatory authorities in our region, most landowners show willingness to change course to benefit natural resources if they are made aware of those values before they've invested significant resources in a particular development plan or layout, and if they have support in the implementation of mitigation measures. The public is likely to support land protection strategies like planning processes, pre-building or harvest consultations with resource experts, and incentive programs to limit the extent of habitat loss and degradation, to protect infrastructure, improve oak system condition, and prevent long periods of smoke-filled air that damage local economies and public health, and limit recreational access to favorite places.

Preserving connectivity between conservation areas and across ecofacets is critical to maintaining climate resilience and biodiversity. Deploying resources strategically to protect existing connectivity corridors and climate buffers, and restoring degraded resources within those geographies are key elements of our strategy.

RURAL RESIDENTIAL DEVELOPMENT STRATEGIES

Associated Maps:

Rural Residential Development Impact Score: **HIGH**

Wide spread conversion to rural residential uses is irreversible, decimating habitat and landscape processes like connectivity and fire.

Rural Residential Development Conservation Emphasis: Expansion of development into sensitive or uniquely intact oak systems and connectivity corridors is avoided. Landowners are supported in implementing oak-friendly practices that improve outcomes for oak systems.

STRATEGY DETAIL

	Timeframe	Actions	Lead Partners
RR 1.	**Protect sensitive and uniquely intact oak systems from development. Maintain connectivity using a variety of incentive and land protection tools.**		
PRIORITY 1	2020	Identity sensitive and uniquely intact oak systems using peer networks and standardized diagnostic protocols. Expand network of partners and volunteers implementing detection program	ECOP
PRIORITY 1	2020-2031	Increase capacity for conservation: establish long-term funding sources for protection strategies.	ECOP
PRIORITY 1	2021-2031	Implement land protection strategies (acquistion, conservation easements, tax incentives, conservation incentives such as CIS...) on priority lands and corridors identified by ECOP	CLT, FOGLT, DLT, WDFW, DNR NAP, others
RR 2.	**Establish and distribute best management practices to support positive outcomes for private landowner management goals and oak systems.**		
PRIORITY 3	2021-2025	Develop East Cascades oak systems best management practices specific to rural residential land uses	ECOP
PRIORITY 3		Determine most efficient and effective mechanisms for delivery through permitting process, planning departments, builders, etc.	CRGC, County Planners, ODFW, WDFW, DNR, ODF
PRIORITY 3		Develop landowner resource tool and distribute to high priority landowners in oak systems in connectivity corridors and climate buffers	ECOP, Conservation Districts, NRCS, DNR, ODF
RR 3.	**Build and expand outreach and incentive programs to rural residential landowners in core conservation areas, connectivity corridors, and buffers.**		
PRIORITY 5	2020-2030	Expand programs such as, but not limited to, the Oregon Wildlife Habitat Conservation and Management Program (WHCMP), NRCS CIS program in Wasco County, and the USFWS Partners program to deliver best management practices.	NRCS, ODFW, WDFW, SWCD's, USFWS, Watershed Councils, others?
PRIORITY 5	2020-2030	Develop a networking, informational, and / or certification program for rural residential landowners that provides incentives and guidance for oak-friendly residential living.	SWCD's
RR 4.	**Advocate for inclusion of oak protection and stewardship in federal, tribal, state, county, and city planning, policy, and permitting processes.**		
PRIORITY 6	ONGOING	Develop residentially focused BMP's, including mitigation targets where regulatory frameworks (primarily in the scenic area) are in place.	ECOP, County governments, WDFW, ODFW, Columbia Gorge Commision,
PRIORITY 6	ONGOING	Incorporate mandatory consultations with ODFW and WDFW early in existing regulatory frameworks to communicate voluntary oak protections landowners can take as they develop site plans	County governments, ECOP, WDFW, ODFW, CGC, others?
PRIORITY 6	ONGOING	Develop incentives for voluntary consultations with ODFW / WDFW and for landowner inclusion of BMPs in site development plans.	ECOP
PRIORITY 6	ONGOING	Share information with decision-makers about value of oak systems and the response of oak systems to development and human interactions typical of rural-residential life.	ECOP
PRIORITY 6	2021-2030	Develop a focused outreach approach to engage consultants, developers, builders, and county planning officials in conversations about how to avoid / mitigate impacts to oak systems.	ECOP, County governments, WDFW, ODFW, CGC, others?

Table 12: Strategies to address impacts of rural residential development

FIRE SUPPRESSION AND CONIFER ENCROACHMENT

"ECOP inspires me because we're advancing conservation while addressing key human needs in the landscape. We can improve condition and access to first foods, and we can improve grazing forage for livestock, all while increasing native biodiversity in the oak woodland understory, and we can restore oak systems damaged by fire suppression while reducing risk of catastrophic wildfire in the wildland urban interface."

- Lindsay Cornelius, Natural Area Manager, Columbia Land Trust

Fire suppression has been practiced since European settlement in the mid 1850's. Prior to European settlement, fires played a central role in shaping oak habitat, particularly in more mesic oak systems where conifers were able to establish in the absence of fire.

OVERALL IMPACT RANKING: HIGH

RANKING OF SPECIFIC HUMAN BEHAVIORS:

Fire Suppression & Conifer Encroachment Impact Analysis	
Specific Human Behavior	Ranking
Fire suppression and lack of prescribed fire	**High**
Inadequate management response following fire	**High**
Inadequate fuels reduction practices outside defensible space areas	**High**
Conversion to conifer – passive	**HIgh**
Conversion to conifer – active (plantation management)	**Medium**
Collateral damage from timber harvest activities	**Medium**
Domestic wood cutting	**Low**

Table 13: Fire Suppression and Conifer Encroachment Impact Analysis by Specific Human Behavior

IMPACTS OF FIRE SUPPRESSION AND FIR ENCROACHMENT

In the Willamette Valley and Puget Trough oak is a seral species. Historically, fires were intentionally lit by indigenous peoples to prevent conifer encroachment and promote oak-associated food crops. The East Cascades climate is dry, windy, and hot in the summer with frequent wildfire ignitions by lightning. Oak in the East Cascades can be successional or climax, depending on the site - indigenous peoples had little need to light fire in the oak landscape, and reportedly rarely extinguished them.

Fire suppression in the East Cascades has been practiced over the last 170 years to protect infrastructure and commercial investments characteristic of European immigrants and their descendants. Suppression behaviors are reinforced by loss of marketable wood due to charring, safety concerns, liability concerns, risk aversion, and by a complex, top-down first-responder command system with deeply entrenched practices and beliefs. Suppression efforts contribute to changes in fuel loads, species composition and stand structure, soil conditions, and future fire behavior, all of which have repercussive impacts through food webs, on species distribution, utilization, and behavior. Over time, suppression can have the perverse effect of contributing to elevated risk of catastrophic fire.

Climate change may exacerbate the size and intensity of wildfire in the future, possibly locking many oak into a structural growth form characteristic of catastrophic disturbance - tree crowns are killed and then sprouts emerge from the root crown, creating many-stemmed oaks that may eventually grow into tight clusters, rings of trees, or a fused, single tree. Larger diameter, single-stemmed trees may become less abundant on the landscape, limiting availability of important habitat features like large cavities in primary stems and the deeply furroughed, sloughing bark characteristic of very old bark. In limited geographies, this shrubbier growth form may pre-date fire suppression due to high levels of wind exposure, or higher intensity fire behavior.

Fuels reduction is a commonly practiced fire risk reduction strategy in the wildland urban interface. Historically it was applied to regenerating stands with high levels of conifer encroachment and understory shrubs. Fuels reduction addresses vegetation immediately around structures and sometimes is applied in more remote contexts to promote forest health. Fuels reduction prescriptions can vary dramatically and when applied in a heavy handed, uniform manner can oversimplify habitat in the understory, remove snags important for wildlife, and lead to changes in density or species composition that favor generalists. People may cut mature oaks, believing it will reduce fuel loading or improve the health of remaining mature oaks, only to have the cut oaks sprout back at the root crown, contributing to shrubbier growth forms that may act as fuel ladders.

Without fire, species composition in more mesic environments shifts toward Douglas-fir and other conifer species. Absent mechanical intervention, this can lead to oak mortality when conifers are tall enough to shade out the oak. Because this process takes decades to play out, many landowners don't realize it is happening. Passive management is a significant threat to oaks in this case. On floodplains, north and west-facing slopes, and toward the western extent of the ecoregion where precipitation levels are greater, many oak stands have been actively planted to conifer. Oak systems on industrial forest land that prove difficult to convert may be at risk of residential development as a strategy for maximizing profits on marginally productive forest lands.

Conifers are sometimes contorted when growing in oak stands as they grow around squirrelly oak limbs, creating defects in otherwise marketable wood. Shade from oak crowns can slow growth of conifers, and the strong branches of oaks often hang up falling conifers creating dangerous conditions for loggers and

equipment wear and tear. All of these factors contribute to removal of oak in favor of conifer where land is being managed for financial outcomes. In addition to intentional removal of oak, incidental damage to or removal of oaks can occur in association with timber harvest activities, usually due to proximity of oak to commercially valuable species or haul routes and yarding trails. Foresters have a rule of thumb in the East Cascades: if the oaks are tall and straight, the site can be converted to fir.

Table 14 below details the stakeholders engaged during the planning process to help us understand the challenges and opportunities around ecological stewardship in the region.

STAKEHOLDER ENGAGEMENT – Fire Suppression and Fir Encroachment			
ECOP's Fire and Firs Working Group Members:			
Name	*Position*	*Entity*	*Engagement*
Anderson, David	Retired Biologist	WDFW	Fire and firs working group
Cornelius, Lindsay	Natural Area Manager	Columbia Land Trust	Fire and firs working group
Dobson, Robin	Retired Botanist	USFS	Fire and firs working group
Hudec, Jessica	Fire Ecologist	USFS Ecology Group (GPNF)	Fire and firs working group
Sager, Michelle	Forestry Education Program Coordinator	OSU Extension	Fire and firs working group
VanLeuven, Susan	Wildlife Area Manager	WDFW Klickitat Wildlife Area	Fire and firs working group
Stakeholders Interviewed:			
Name	*Position*	*Entity*	*Engagement*
Ahrens, Glenn	Forester	OSU Extension	Fire and firs interview
Currin, Kristin	Owner and Operator	Humbleroots Nursery	Fire and firs interview
Gilmer, Tony	Training Captain	Fire District 3	Fire and firs interview
Grose, Jeremy	Procurement Forester	SDS Lumber Company	Fire and firs interview
Jones, Paul	Owner and Operator	WyEast Timber Services, LLC	Fire and firs interview
Kozma, Jeff	Biologist	Yakama Nation	Fire and firs interview
McLaughlin, Jay	Executive Director/Forester	Mount Adams Resource Stewards	Fire and firs interview
Morrison, Dan	Retired Manager	WDFW Klickitat Wildlife Area	Fire and firs interview
Richardson, Dan	Firewise Coordinator	Underwood Conservation District	Fire and firs interview
Rose, Roland	Fire Fuels Planner	USFS CRGNSA	Fire and firs interview
Schults, Patrick	Forester	WSU Extension	Fire and firs interview
White, Jim	Forester	Private Consultant	Fire and firs interview
Results Chains Workshop Participants and Advisors (in addition to the ECOP working group listed above):			
Name	*Position*	*Entity*	*Engagement*
Bugner, Keyna	Natural Areas Manager	WA DNR	Fire and firs results chain
Dodd, Kristin	Forester	ODF	Fire and firs results chain
Gard, Mel	Forester	ODF	Fire and firs results chain
Hummel, Rainer	Forest Practices Forester	WA DNR	Fire and firs results chain
Lawson, Alan	Fire Investigator and IC	WA DNR	Fire and firs results chain
Presentations to East Cascades Formal Partnership Meetings:			
Name	*Position*	*Entity*	*Engagement*
Hummel, Rainer	Forest Practices Forester	WA DNR	Forest Practices in Washington
Lennon, Dan	Small Landowner Forester	WA DNR	Firewise Program and Oak Habitats
McLaughlin, Jay	Executive Director	Mount Adams Resource Stewards	Prescribed Fire – Implementation Challenges
Reel, Brian	Forest Practices Forester	ODF	Forest Practices in Oregon
Rose, Roland	Fire Fuels Planner	USFS CRGNSA	Application of Prescribed Fire

Table 14: Stakeholders engaged on the topic of fire suppression and fire encroachment

Awareness Campaign Potential Focuses and Messages:

- Increase information via pamphlets, online info, etc
- Audience: small lot vs. large lot messaging
- Provide a visual tool for desired future condition by oak types.
- Provide photos of what an oak mosaic looks like
- Conifer density is higher in many woodlands due to fire suppression, contributing to higher fuel loads and altered stand structure, changing associated wildlife and plant species and killing oak. Thinning can reverse those trends.
- Thinning for habitat benefit is not always profitable, but timber sales and habitat grants can help offset costs.
- Management of oak habitats especially on the west side of the E. Cascades ecoregion must be an ongoing process (humans must continue to mow and thin to maintain habitat)
- Woody vegetation control can benefit native wildlife species (e.g., Western meadowlark, native butterflies, Western gray squirrel, etc.).
- Outreach to LO and managers

BMPs, research, and management tools:

- Create BMPs that outline impacts of mechanical manipulations on oak system integrity and function.
- Create BMPs to deal with stump spouts and maintenance, including integrating compatible grazing options.
- Create product or tool that differentiates between fire preparedness for homes and oak management for habitat.
- Integrate human consumptive uses (i.e. firewood cutting, commercial wood production, grazing) into BMPs.
- Research: gather information on how oaks respond to wildfire and contribute to intensive fire behavior.
- Incorporate Research: climate change and drought stress.
- Provide example plans and prescriptions

Increase Capacity, Oak-Specific Training, and Coordination:

- Increase funding for oak release programs and training
- Provide landowner support for forest management plans, and projects
- Provide landowner contracting support (i.e. pay contractor hourly or lump sum – decouple forester's revenue from amount of timber cut).
- Assist with business development of local crews.
- Create and distribute list of 'ECOP recommended contractors'.
- Build a collaborative with shared equipment and trucking (of material).
- Partner with ODF, DNR and existing fuel reduction crews to help treat fuels/woody biomass.
- Increase youth engagement/Youth Corps to build current and future workforce.
- Build a contractor workforce by subsidizing some costs.
- Build peer support and awareness for oak management using momentum of early adopters

Develop and disseminate BMPs and management decision support tools. FF-1

More information is available to implement stronger projects

Funding and Labor Capacity Available

Increase funding, capacity, oak-specific trainings, and coordination of workforce. FF-3

Implement an awareness campaign to improve public perception of oak and improve willingness to reduce woody encroachment and fuels in overtopped oak woodlands– remove or reduce density of conifer & retain oaks FF-2 and 3

People recognize fir encroachment and heavy fuels increase wildfire risk

People value ecological benefits of maintaining habitat variety (forest, woodland, savanna)

Landowners understand how the ecology of their property interacts with their management goals

Policy makers are motivated to include oak strategies in rule making and planning

Advocate and support oak-friendly fir encroachment policies and planning efforts FF-2

Policy makers and general population support concept of fir encroachment reduction

Increase incentives for implementing fir encroachment removal. FF-2

Lower Costs & Increase technical assistance implementing fir encroachment removal. FF-3

Landowners and managers have access to trained contractors and implementation is affordable

PM-FF2

Policies support fir encroachment removal

Landowners have access to support and funds for fir encroachment reduction

More acres are treated annually

PM-FF2

Decreased fir encroachment

Target: ECOP Oak Systems

Landowners and managers know their options for treatment

Landowners and managers see success and support from peers

Fir Encroachment Results Chain

Figure 14

Building policy to increase capacity for incentives:

- Advocate for Fire Wise (and other similar programs) to fund continued maintenance or decrease reapplication cycle.
- Expand Forest Practice rules to allow reforestation with oak in high value habitat zones.
- Advocate for mandatory oak consultations for FPAs that occur on oak systems.
- Advocate for paradigm shift in forest practices (fire, terrestrial habitat, mitigation for oak lass).
- Explore options for alternative funding sources (sales tax on forest products to support forest health or recreational use tax to support habitat protection).
- Engage with Oregon Forestland Urban Interface Fire Protection Act (Senate Bill 360) to provide aid for property owners in fuels reduction in WUIs.
- Develop county tax incentive for fuels reduction on private property.
- Participate in DNR 20 yr Strategic Plan
- NRCS EQUIP

Lower Cost of Implementation and Provide Technical Assistance include:

- Provide a visual tool for desired future condition by oak types.
- Use BMPs to inform incentive programs (educate educators i.e. Fire Wise).
- Build capacity, skill and availability of contractors using mechanized logging systems that reduce collateral damage to oak
- Reduce permit barriers and provide assistance to landowners in the scenic area.
- Increase access to oak seedlings and acorns.

Increase incentives to oak release:

- Bring mobile tech for slash
- Connect MARS, agencies, and non-profits with restoration projects to recover and disseminate oak restoration byproducts as affordable fuel.

Fire Exclusion Results Chain

Outreach, funding, policy, BMP's, technical assistance

Awareness campaign potential focuses and messages:

- Target Audience: Public (benefits and needs of fire before it happens)
- Target Audience: WUI and other Landowners (benefits, needs, and how-to)
- Incorporate smoke messaging (Oregon Smoke Management Plan).
- Difference between Rx (prescribed) fire vs. wild fire.
- Relationship of climate and wildfire risk (increased risk).
- Relationships between wildfire smoke, health, economic impacts (property loss, decreased tourism, agricultural production, increased costs for health care, etc.)
- Coordinated public message between fire departments and conservationists.
- Fire ambassadors: FFA, volunteer fire departments (trusted voices)
- Risk of doing nothing
- Cost benefit of Rx fire vs wildfire

Reduce landowner liability barriers

- Clarify landowner and burn boss responsibilities, hold over for escaped fires.
- Create fund or short term loan program for post-wildfire stewardship and remediation.
- Create insurance or pool of money for when permit-compliant fire escapes (pay for suppression and court costs).
- Develop (commercial) product path for burned material.
- Expand Fire Wise to make it more effective (maintenance funding, expand geography).
- Develop tax incentive for fuel reduction and prescribed fire opportunity areas

Increase technical assistance:

- Provide technical assistance to landowners on permitting and implementation.
- Provide training and template with HOAs and small communities for fire suppression response.
- Provide list of ECOP recommended & trained contractors.
- Provide BMP's and technical information to land owners and practitioners for oak systems including understory stewardship
- Develop a community seed bank.

Implement an awareness campaign centered around benefits of prescribed fire and fuels reduction. FF-3

Remove liability and cost barriers to landowners implementing fire. FF-3

Increase capacity and technical assistance to landowners FF-1

Concerns are mitigated, less red tape for landowners, less fear of litigation

Landowners have help understanding what to do

PM-FF1

Public understands the benefits of prescribed fire and fuels reduction

Public and landowners support prescribed fire as a restoration and prevention tool

Landowners implement prescribed fire and fuels reduction

Policy makers understand benefits of prescribed fire and fuels reduction

Policy makers see public support

Prescribed fire-friendly policies are enacted, funding is increased

PM-FF2 and 3

Advocate for policies and increased funding for prescribed fire and fuels reductions . FF-2 and 3

Rx fire friendly policies and funding mechanisms are developed and supported

More sites prepared for fire and acres burned annually at low and moderate intensity

Improved fire resiliency

Target: ECOP Oak Systems

There is enough internal capacity and trained practitioners to meet increased demand

Partnership building, training, coordination, and BMP strategies. FF-1

page 2

Funding, policies and regulations to increase capacity for prescribed fire:

- Explore creation of new levy or county level funding strategies.
- Work with economists to demonstrate cost benefits of investing in prescribed burning
- Advocate for funding a long term fuels plan (50 year plan).
- ECOP lobbying voice for agency and community vision (adjust political expectations and deliverables).
- Advocate for liability protections for prescribed fire personnel, landowners, and agencies.
- Public nuisance penalties for lack of action
- Build community vision
- Encourage insurance companies to adopt "good landowner discounts" around fire preparedness

Key: Strategies | Outcomes | Recommended Actions/ Messaging | Performance Measures | **Ecological Results**

Fire Exclusion Results Chain

Partnership building, training, coordination, and BMPs

Increase Training Opportunities:
- Provide training on oak specific knowledge to existing prescribed fire and fuels reduction programs.
- Provide training opportunities to increase number of trained practitioners.
- Provide training opportunities to existing fire program staff to increase number of available burn bosses.
- Provide training opportunities for contract crews and fire department to increase prescribed fire capacity and personnel.
- Increase # of prescribed fire volunteers.
- Include fire education in higher education to encourage future generations of fire responders

Increase Coordinated Planning :
- Understand ECOP role in planning and advocacy efforts
- Utilize tribal expertise/assistance in burning.
- Incorporate Rx fire into Community Wildfire Protection Plans.
- Coordinate with Fire Departments.
- Create and share fire response template with HOAs and small communities.
- Organize post-fire recovery resource teams.
- Address gaps in IMTs suppression-recovery transitions.
- Coordinate with planning and building departments.
- Develop a community seed bank.

Define Science based priorities:
- Map and prioritize existing efforts and opportunities to implemented Rx fire.
- Programmatic approaches, landscape scale application

Increase prescribed fire training programs and opportunities. FF-1

Organizations are collaborating - sharing resources, crews, and equipment

Increase coordinated planning efforts. FF-2 and 3

Organizations and agencies are working on shared priorities

PM-FF3BCG

Define, map, and advocate for science based geographically explicit prescribed fire priority areas. FF-3 and FF-4

Smoke impacts are predictable and of low intensity and duration

Increased number of trained contract and volunteer prescribed fire practitioners

PM-FF3D

More trained practitioners available to implement prescribed fire

More Rx Fire

EE-FF3

Fire is providing landscape scale benefits

Fuels are reduced, less crown damage, less competition, fire-adapted plant community improves

Target: ECOP Oak Systems

Infrastructure and human safety is improved in WUI

Increased capacity for implementing prescribed fire programs

PM-FF1

More partners are interested and available to implement burns

Research, create, adopt, and disseminate Best Management Practices . FF-1

Public, landowners, and policies are supportive of prescribed fire

Outreach, funding, policy technical assistance strategies

Page 1

Build Partnership:
- Engage partners to dedicate resources.
- Develop strong relationships with tribal partners.
- Increase fire department (increase volunteerism) prescribed fire capacity and personnel.
- Fund trainings on prescribed fires
- Engage with private landowner fire advocates – pyromaniac list serve…
- Increase accessibility to resources for burn bosses

Build partnerships, promote opportunity for contract prescribed fire crews, get more people involved. FF-3

Prescribed Fire and Fuels Reduction Best Management Practices:
- Engage with academia to improve fire science
- Research impacts of fire on oak systems (trees and understory) and component response
- Develop monitoring program RE: prescribed fire effectiveness.
- Develop BMP's to bring ecological goals in line with prescribed fires and mechanical treatments.
- Refine existing fuels reduction practices to improve outcomes for oak systems.
- Convey BMPs and ecological information to response personnel and land owners.
- Refine existing fuels reduction practices to improve outcomes for oak systems.
- Convey BMPs and ecological information to land owners
- Revisit best management practices for smoke related health issues
- Identify data gaps and build shared monitoring approach to build improved data sets – wildfire and Rx

SPATIAL INDICATORS OF VULNERABILITY:

The following panel of maps in Figure 15 on page 64 shows the historic mean fire return interval (MFRI), the number of years departed from MFRI (since robust records were available in the mid 1990's), and the probability any given area will burn based on fuel loads. Figure 16 on page 65 shows areas prone to conifer encroachment in the absence of fire.

OPPORTUNITY FOR CHANGE – FIRE SUPPRESSION AND FIR ENCROACHMENT

Approximately half of mesic oak systems in our region occur on private lands. We believe many landowners would take action to protect oaks from encroachment if they understood the problem, particularly because doing so can also provide income through the sale of removed conifers. Oregon forest practice rules may allow for exemptions from the requirement to replant with conifer upon landowner request and where ecologically justified. With support in making that justification, landowners may qualify for exemption. Acquisition of ecologically intact oak systems on marginally profitable forest lands may be a natural partnership opportunity between conservation organizations and forest landowners. Oak systems previously converted to fir may be easy targets for restoration through oak planting and fir removal.

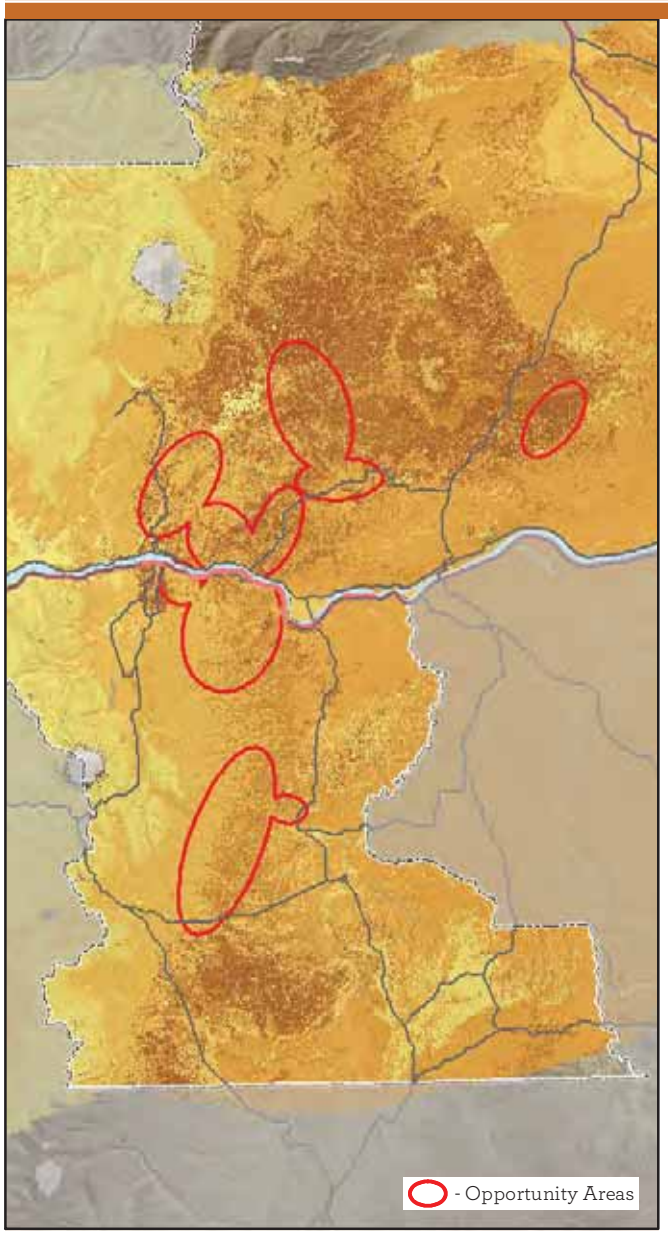
People are highly motivated to promote defensible space around structures in fire-prone areas. Oregon white oak is the most fire-adapted and fire-resistant tree in the East Cascades, contributing to catastrophic fire behavior in only the worst of conditions. Fuels reduction practices can be compatible with oak system management, especially where decision-makers are willing to compromise in the appropriate setting (i.e. away from structures) to protect habitat features. Fuels reduction can play an important role in preparing for prescribed fire where fuels have accumulated. Changes can be made to the way local mills process charred wood to increase utilization of wood from forests experiencing low intensity fire severity.

Fire is increasingly in the national spotlight and public attitudes about fire readiness, prescribed fire, and fuels reduction are changing. Funding sources are increasingly available to implement prescribed fire and fuels reduction in oak systems. Oregon's recent SB 1536 would dedicate 25 million dollars to wildfire mitigation in fire prone geographies. Washington's Forest Health program dedicates 58 million dollars to forest health and fire preparedness in high priority areas, 20% of which are located in ECOP's service area. Each of these initiatives substantially overlaps with our spatial and ecological priorities, particularly where fir encroachment occurs in the wildland urban interface. We will work to ensure these funds are applied to improve ecological outcomes in the oak landscape.

Many crews currently employed on fuels reduction and prescribed fire projects in the East Cascades travel from the west side, sometimes daily during project implementation – exacerbating carbon pollution the effects of which we are trying to address in our forests. An increase in forest health treatments in E. Cascade forests and woodlands could support development of locally-owned businesses and expertise, particularly for Latinx people already working in fuels reduction or forestry. The expanding fire season may increase general public and especially first responder exposure to carcinogens and particulates from wildfire smoke that can damage health, potentially disproportionately impacting the Latinx community, which make up the majority of Oregon's contract wildland firefighting crews. Implementing fuels reduction and prescribed fire, expanding capacity and skilled workers in fire-related occupations, and reducing the cost and complexity of fighting wildfire by limiting expansion of homes into the wildland urban interface is an ecological health, human health, and equity issue that funders can coalesce around.

Partnership Focus Area - Fire History Status

Figure 15: East Cascades Oak Partnership Planning Maps



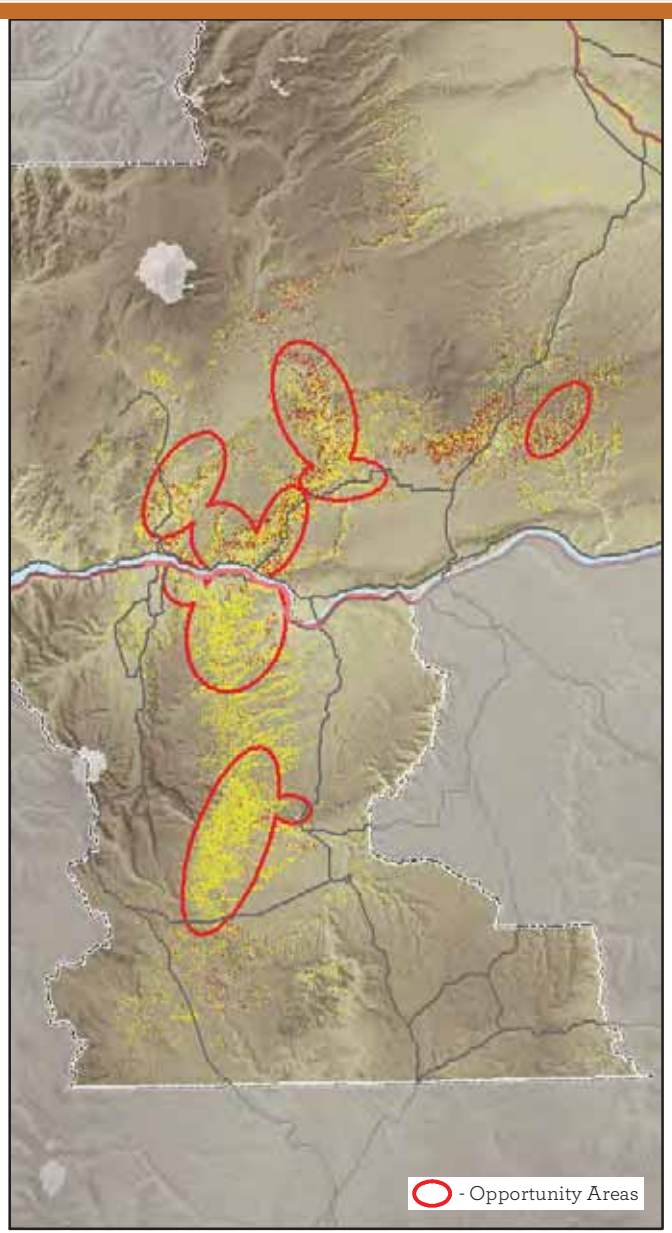
Fire - Mean Fire Return Interval

Mean Fire Return Interval (LANDFIRE 2014)

0-5 Years

51-60 Years

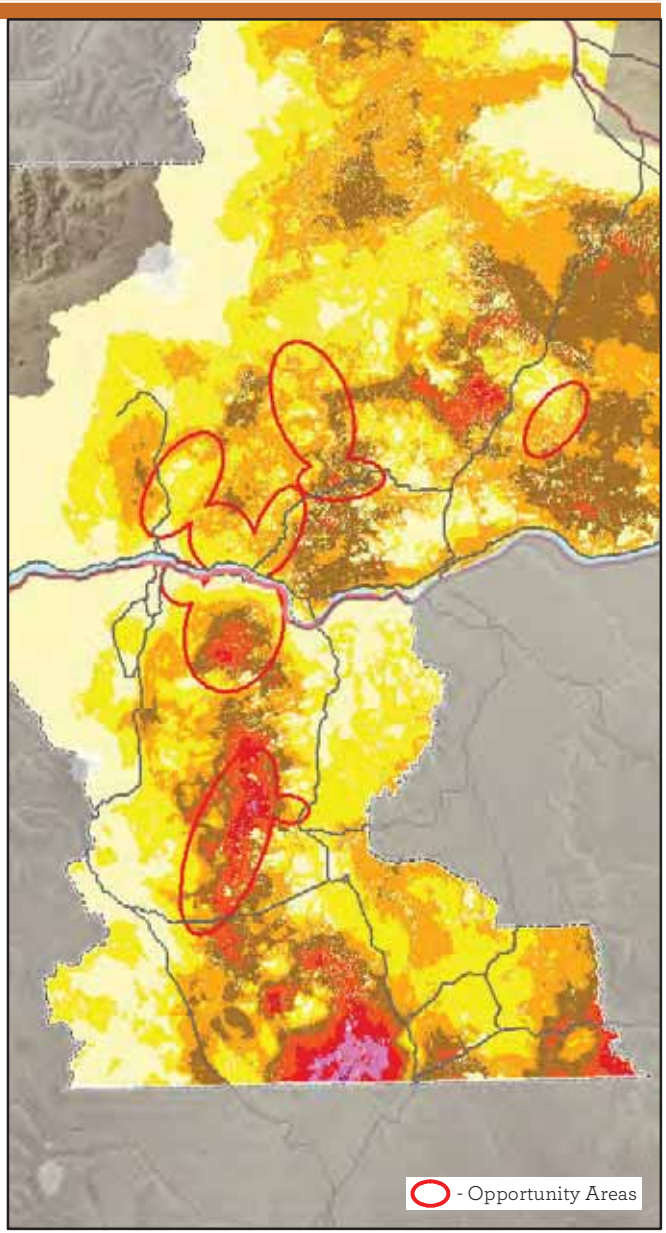
501-1000 Years



Fire - Oak Habitat - Years Until MFRI

Years Until Mean Fire Return Interval For Oak Habitat Areas

- -10 Years
- -9.9 - -5 Years
- -4.9 - -2.5 Years
- -2.4 - 0 Years
- 0.1 - 2.5 Years
- 2.6 - 5 Years
- 5.1 - 7.5 Years
- 7.6 - 10 Years
- 10.1 - 12.5 Years
- 12.6 - 15 Years



Fire - Burn Probability

Annual probability of a > 250 acre wildfire occuring with 30m cell.

- 0 - 0.5%
- 0.5 - 1%
- 1 - 1.5%
- 1.5 - 2%
- 2 - 2.5%
- 2.5 - 3%
- 3 - 3.5%
- 3.5 - 4%
- 4 - 4.7%

0 5 10 Miles

NORTH

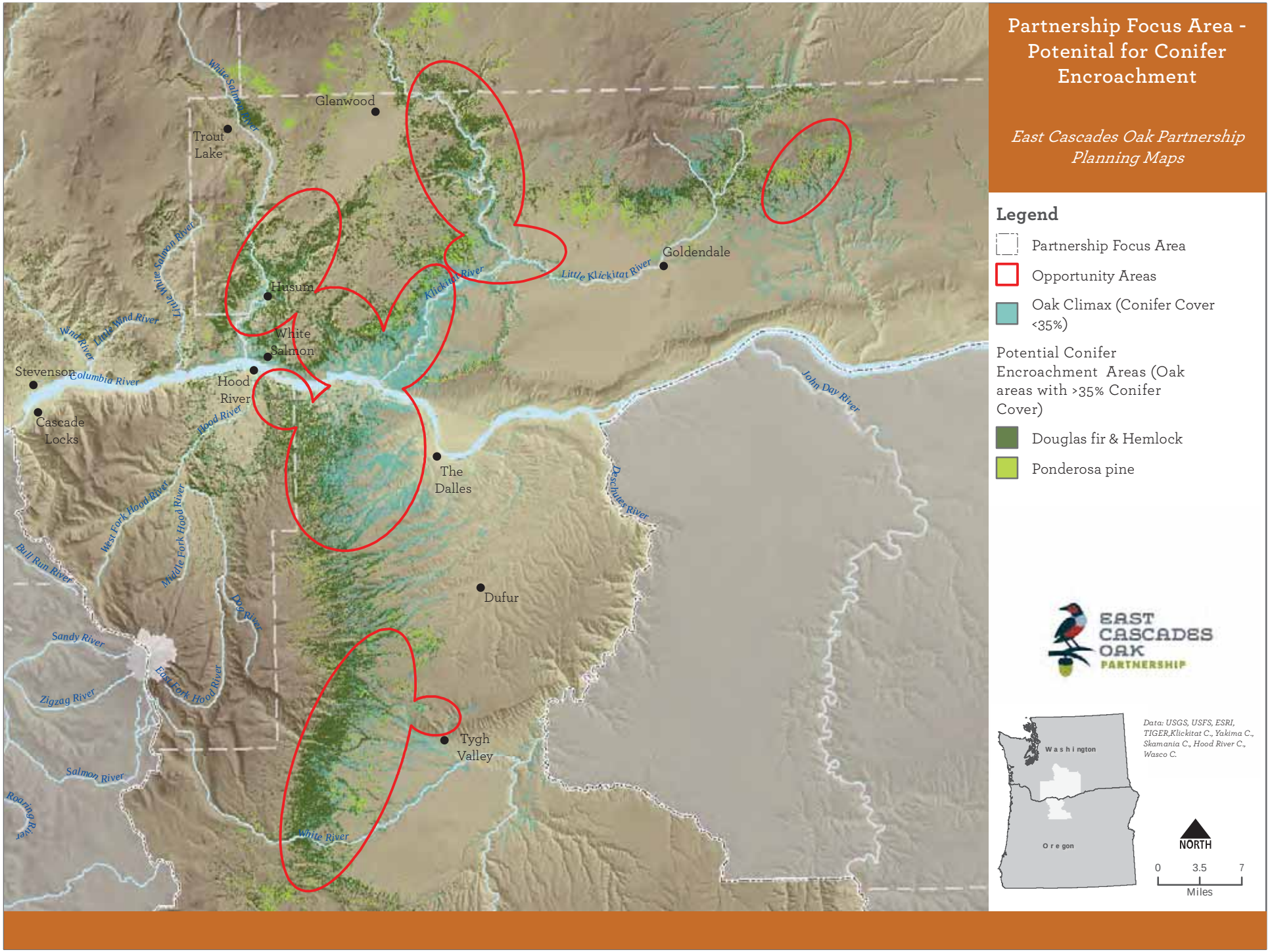


Figure 16: Potential for Conifer Enroachment in the East Cascades

FIRE SUPPRESSION AND CONIFER ENCROACHMENT STRATEGIES

Associated Maps:

Fire Suppression and Conifer Encroachment Impact Score: HIGH (mesic) and MEDIUM (xeric)

Fire suppression leads to conifer encroachment and fuel loading / higher intensity fire. Severe damage and permanent loss of oak systems can occur.

Fire Suppression and Conifer Encroachment Conservation Emphasis: Oak systems and the people living in them are fire resilient. Oak systems are prepared for wildfire and prescribed fire is deployed responsibly to improve conditions in priority areas. People understand and embrace the role of fire in ecological health and community safety.

STRATEGY DETAIL

	Timeframe	Actions	Lead Partners
FF 1.		**Establish and distribute best management practices and fill key knowledge gaps to improve oak release and prescribed fire management outcomes.**	
PRIORITY 3	2020	Prioritize research questions to inform best management practices	ECOP, DNR, USFS, ODF, Contractors, Industrial forest Co.'s.
PRIORITY 3	2020-2021	Design and initiate research and standardized monitoring protocols using peer reviewed science and traditional ecological knowledge	ECOP, DNR, ODF, USFS, NRCS, Klamath Bird Observatory, Warm Springs Tribe,
PRIORITY 3	2020 - 2021	Determine decision making process between partners; implement adaptive practices to modify BMPs as learning occurs	ECOP
PRIORITY 3	2020-2022	Share BMPs with fuels reduction funders and practitioners. Offer training to contractors on oak-friendly practices and build list of recommended contractors.	ECOP, NRCS, Conservation Districts, ODF, DNR, ODFW, USFS, WST
PRIORITY 3	2021-2025	Develop landowner resource tool and distribute to high priority landowners in oak systems with high levels of predicted encroachment	ECOP, Conservation Districts, NRCS, DNR, ODF
FF2.		**Advocate for oak systems experiencing fir encroachment in existing fuels reduction program funding allocations, expand funding and partner capacity to implement release activities.**	
PRIORITY 4	2020-2027	Advocate for increased funding to reduce fir encroachment in priority oak systems, particularly where prescribed fire can be applied. Work with DNR and ODF forest practices divisions and statewide planning processes; encourage outreach and engagement to landowners in priority geographies.	ECOP, ODF, DNR, USFS, ODFW, WDFW, NRCS, SWCD's
FF 3.		**Design and implement a prescribed fire program that builds regional capacity and competency for prescribed fire and removes barriers to implementation.**	
PRIORITY 9	2022	Discern partnership potential with state, federal, local and tribal Rx and wildland fire resources and discern appropriate role for ECOP	ECOP
PRIORITY 9	2022	Identify spatial priorities for Rx fire that consider intended ecological outcomes, social outcomes, logistical simplicity, risk mitigation, partner capacity / engagement, and adjacency to tribal, conserved, and public lands	USFS, DNR, Yakama Nation, Confederated Tribes of Warm Springs,
PRIORITY 9	2021 - 2025	Advocate for policy that limits landowner liability for Rx fire and / or establish insurance pool	ECOP, State FIPs
PRIORITY 9	2022-2025	Develop training opportunities and funding to grow local Rx resources.	DNR, ODF, USFS, MARS
PRIORITY 9	2022-2025	Explore potential planning and funding mechanisms and incentives with counties and fire districts to support Rx fire implementation in priority geographies	DNR, ODF, , OSU Ext, NRCS
PRIORITY 9	2024	Develop youth engagement opportunities to build interest in Rx and cultivate future work force.	All Partners
PRIORITY 9	2021-2025	Develop advocacy pathway to enact or support a paradigm shift in state policy and forest practices to protect terrestrial resources as well as aquatic resources.	ECOP, State FIPs
PRIORITY 9	2020-2026	Increase access to oak seedlings and acorns. Work with local nurseries and suppliers to increase availability of locally collected E. Cascade oak associated plant materials. Work with partners to identify what their seed production resources are and if they can be	Humbleroots, ECOP, SWCD nursery sources.
PRIORITY 9	2022-2025	Explore technological solutions to slash disposal to reduce carbon footprint, and / or develop a product path to recover oak slash as affordable fuel for at-risk families	OSU Extension, DNR, ODF, USFS
FF 4.		**Protect high priority oak systems experiencing encroachment to facilitate release and ensure conservation management.**	
PRIORITY 8	2020-2021	Identity sensitive and uniquely intact oak systems threatened by fir encroachment or fire suppression using peer networks and standardized diagnostic protocols. Expand network of partners and volunteers implementing detection program.	ECOP
PRIORITY 8	2021-2027	Implement land protection strategies on priority lands identified by ECOP	CLT, FOGLT, Deschutes Land Trust, YN, CTWS, USFS, DNR NAP, State

Table 15: Strategies to address impacts of fire suppression and fir encroachment

GRAZING

Domestic livestock grazing began in the mid 1800's on the fertile grasslands of the Columbia Plateau. As the more fertile soils of grasslands were developed for agriculture in the early 1900's, grazing was pushed to the understory of oak woodlands. Sheep and cattle are the most commonly raised commercial livestock in the region. Grazing of horses and other domestic livestock on small acreages is also commonly practiced in rural residential areas.

Grazing in oak understories requires investment in large acreages, potentially stabilizing a landscape that could otherwise be fragmented and developed. Washington landowners are motivated to graze by special use tax programs. This practice generally occurs where state-supported, county-implemented tax deferrals have encouraged the continuation of agricultural land uses and where no habitat incentives exist.

OVERALL IMPACT RANKING: Dry: HIGH; Mesic: MEDIUM

RANKING OF SPECIFIC HUMAN BEHAVIORS ASSOCIATED WITH GRAZING:

Grazing Impact Analysis	
Specific Human Behavior	Ranking
Over-grazing and seasonally inappropriate grazing	**High**
Grazing sensitive habitats	**High**
Ranch failure – conversion to development	**High**
Elective grazing in rural residential areas	**Medium**
Livestock utilization facilitates the spread of weeds	**Medium**
Ranch infrastructure to support grazing	**Low**

Table 16: Grazing Impact Analysis by Specific Human Behavior

IMPACTS OF GRAZING

Grazing practices in play today were introduced by European immigrants and were adapted for European grasses, which were stimulated by spring cropping. Native perennial bunchgrasses, which reproduce in the late spring and early summer, were not adapted to this disturbance. The inability of native grasses and forbs to produce seed combined with soil compaction and nutrient loading led to gradual but expansive displacement of native grasses and forbs (see photo bottom right) by less protein-rich invasive annual grasses (see photo top right) such as cheatgrass, dogtail, and ripgut, perennial non-natives such as bulbous bluegrass, as well as non-native noxious weeds like knapweeds, skeletonweed, houndstongue, and starthistle. The seeds of some of these plants hitch rides on the fur of livestock, rapidly spreading into previously intact plant communities.

Some grazing approaches compact soils or cause erosion, alter fire behavior, and impact oak regeneration and stand structure, resulting in disruptions to wildlife species utilization, habitat simplification, and loss of biodiversity. Additionally, grazing can compact soils, break up fragile, long-forming cryptobiotic crusts, and affect oak regeneration, persistence, and stand structure. Other habitat features important in oak systems such as streams, lakes, wetlands, and vernal pools are sensitive to erosion, denuding, and nutrient loading that can occur with grazing.

Grazing practices can be linked to changes in fire behavior. Grazing changes the structure of the grasses and forbs which in turn affects fire behavior. In undisturbed woodlands, native perennial bunchgrasses grow in clumps with bare dirt and forbs surrounding them. In disturbed woodlands, non-native annual grasses though typically shorter in stature grow in dense mono-cultural mats with thick thatches that die back earlier in the year than native perennial grasses do. These factors increase the risk of uniformly carrying higher intensity fires. Wood fences historically used to confine livestock are vulnerable to fire, necessitating fire suppression (see Fire and Fir section) and making prescribed fire difficult to implement.

Bunchgrasses grow deeper and bulkier roots with each growing season, storing carbon underground and safeguarding that carbon against the wildland fires that burn these systems regularly. The best way to maximize the amount of carbon trapped underground is to maximize perennial, native grass growth. Overgrazing and drought are the biggest challenges to carbon sequestration because they prevent plants from putting down healthy roots. Native perennial bunchgrasses provide better nutrition to livestock than invasive annual grasses, but waiting until early summer to graze the lower elevations where oak occurs is impractical when cattle are confined, have been fed all winter on expensive feed, and higher elevation grazing allotments on public lands are still under snow.

Figure 17: **Grazing Results Chain**

Key: Strategies | Outcomes | Recommended Actions

Create, promote and deliver incentive programs to increase success of grazing in oak systems on working lands:
Work with agencies on programs specific to grazing in oak systems (NRCS, ODFW, WDFW…)
- funding program for feeding during prolonged drought/wet
- Assist with fencing to protect sensitive oak systems and water resources
- Expand Farm Bill definition of disaster qualifications and program deliverables
- Develop grazing deferment program in areas of high value habitat which pays for fencing annual lease payments, and other expenses (crews, technology, etc)

Increase Technical Assistance:
- Work alongside ranchers to research and develop BMP's to improve understory habitats and regeneration of oak systems
- Define BMP's for disturbance response groups (see research bullet) for implementation in ranching operations and to assist the use of grazing in restoration efforts (replacing fire disturbance)
- Create a tool to support development of site specific goals and guidance for attaining those goals
- Develop a community seed bank. ECOP recommendations for native seed supply and species selection
- Provide guidance and or technical review for sustainable grazing management plans in oak systems

Create incentives to improve outcomes of grazing in oak systems. GR_2

Increase technical assistance and resources to land managers. GR-2

Ranchers have the information and resources to implement BMP's

Ranchers adapt best practices based on outcomes

Ecological condition of oak systems is improved on grazed lands

Awareness Campaign Potential Focuses and Messages:
- Target Audience: Ranchers (benefits and needs)
- Target Audience: Partners (benefits, needs, and how-to)
- Hire ranchers to do pilot projects on public lands (start with ranchers who have leases on public lands) to test BMPs
- Create demonstration project areas
- Combat the "removing the undesired" land policy pre-1960 that targeted oaks
- Support emerging interest in collaboration and business networking
- Hold one-on-one workshops. Focus on developing relationships
- Develop a program to help ranchers ID unique plant communities
- Establish relationships with peer leaders in the ranching community
- Build curriculum for 4H and FFA mentor programs
- Consistently deploy people to build trust and strong relationships
- Examples of coalitions between ranchers and conservationists

Build a business case for sustainable grazing in oak systems
- Forage value, what are the trade offs for native vs non-native forage – weight on cows
- Cost/benefits
- Branding (Oak Accord type program) and supply chain for working lands products

Implement information campaign on ranching economics and ecological benefits of oak systems on working lands. GR-2

Ranchers understand the value of oak systems and native understory for wildlife and forage

Ranchers and partners understand ecological outcomes of grazing regimes

ECOP Partners and ranchers achieve mutually beneficial ecological and financial goals

Target: East Cascade Oak Systems

Coordinated Research and Partnership Development

Partners understand ranching logistics, needs, and values

Grazing lands provide connectivity with conserved lands

Working lands are not developed

Ranchers and partners have knowledge of areas to avoid grazing (key or unique oak systems)

Research and disseminate information to support positive outcomes for both. ranching and oak systems GR-2

Develop landscape scale approaches to support oak friendly grazing and prevent or reverse damage GR-1

Protect large working lands from development. GR-3

Research Targets:
- Define "sustainable" grazing
- Define and map sensitive oak system areas
- Build data analysis capacity and capability
- Define disturbance response groups – look at NRCS state and transition models (UNLV USFS doing some of this research in shrub steppe communities)
- Test logistical challenges and timing for ecological optimization of grazing
- Standardize simple L.O. and volunteer monitoring protocols and share results (USFS, FFA, Citizen Science ?)

Coordinated Landscape Scale Approaches:
- Limit or prohibit grazing in sensitive areas
- Designate reserve acres for emergency grazing during drought, fire, excessively wet situations
- Landscape scale plan for climate resilient, fire adapted grazing through leases or conservation easements

- Intergenerational transfer assistance, easements and mentoring
- Capital for emerging ranchers
- Estate Planning
- Lobby for gradual payment estate taxes

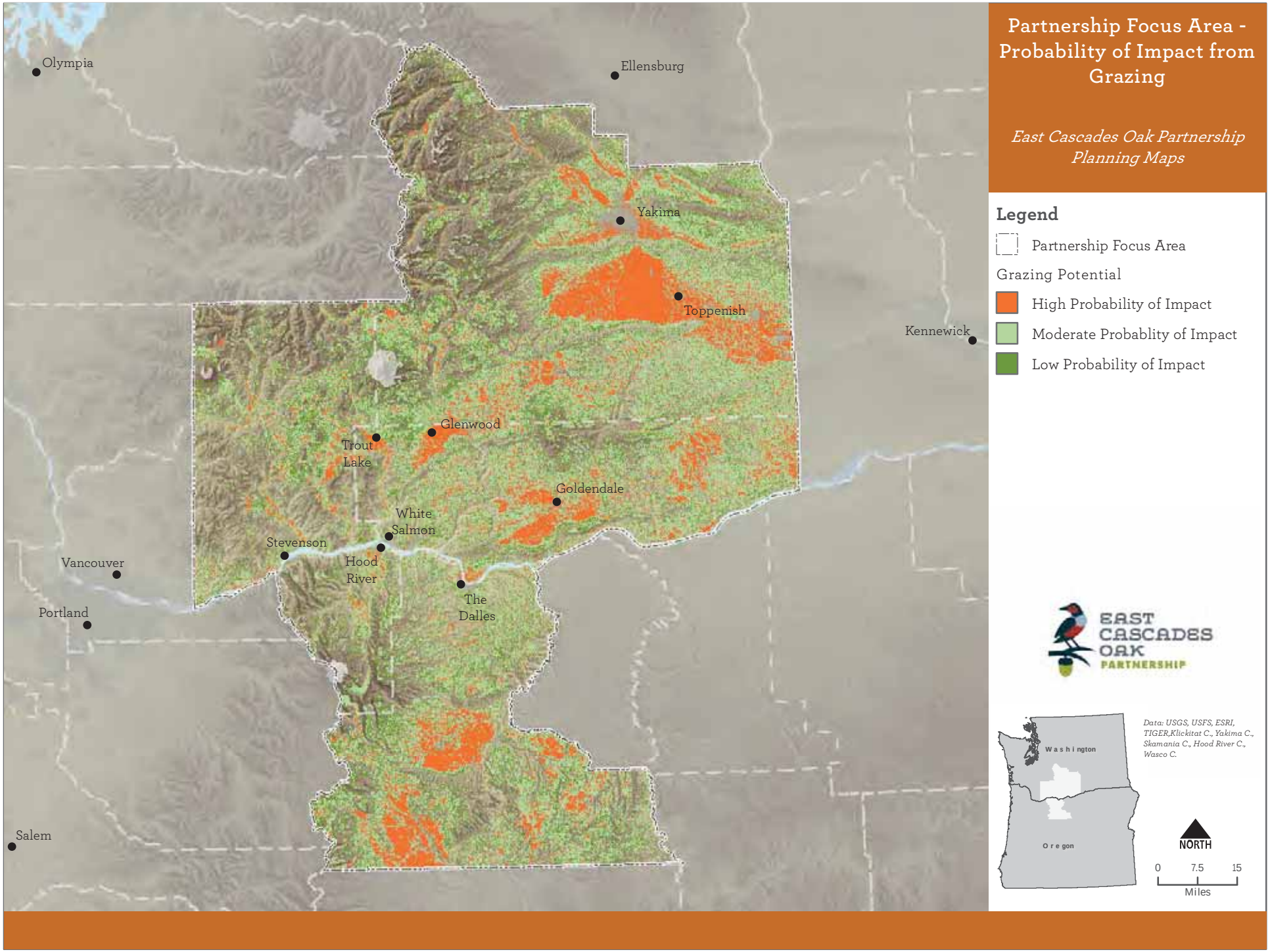


Figure 18: Potential Impacts from Grazing in E. Cascade Oak Systems

STAKEHOLDER ENGAGEMENT - Grazing			
ECOP's Grazing Working Group Members:			
Name	**Position**	**Entity**	**Nature of Engagement with ECOP**
Bushman, Mary	ECOP Coordinator	Columbia Land Trust	Grazing working group
Cornelius, Lindsay	Natural Area Manager	Columbia Land Trust	Grazing working group
Johnson, Amber	Habitat Biologist	WDFW	Grazing working group
Pierson, Katie	Farm Bill Biologist	NRCS and ODFW	Grazing working group
Thompson, Jeremy	District Wildlife Biologist	ODFW	Grazing working group
Weiler, Bill	Education Coordinator	Sandy River Basin Watershed Council	Grazing working group
Stakeholders Interviewed:			
Name	**Position**	**Entity**	**Nature of Engagement with ECOP**
Anderson, Jake	Owner and Operator	Private Ranch	Grazing interview
Blaine, Jason	Owner and Operator	Private Ranch	Grazing interview
Chiles, Matt	Owner and Operator	Private Ranch	Grazing interview
Kreps, Kelly	Owner and Operator	Private Ranch	Grazing interview
Sizemore, Jim	Owner and Operator	Private Ranch	Grazing interview
Results Chains Workshop Participants and Advisors (in addition to the ECOP working group listed above):			
Name	**Position**	**Entity**	**Nature of Engagement with ECOP**
Callaghan, Sara	Botanist	USFS CRGNSA	Grazing results chains
Davis, Pat	Owner and Operator	Private Ranch	Grazing results chains
Presentations to the East Cascades Oak Partnership Formal Meetings:			
Name	**Position**	**Entity**	**Nature of Engagement with ECOP**
Chaney, Marty		NRCS	Grazing Tools for Restoration (TOUR)
Hansen, Bob	Board of Directors	Institute for Applied Ecology	Grazing Tools at Columbia Hills
Kaiser, Nate	Klickitat Wildlife Area Leasor	Private Rancher	Grazing 101 (TOUR)
Sizemore, Jim	Commissioner (& rancher)	Klickitat County	Grazing 101 (TOUR)
VanLeuven, Susan	Wildlife Area Manager	WDFW	Grazing Tools on the Klickitat Wildlife Area

Table 17: Stakeholders engaged on the topic of grazing

OPPORTUNITY FOR CHANGE – GRAZING:

> "There is very little information available to landowners regarding oak habitats on the east side of the Cascades. Information I have learned working with ECOP has been a big help with the oak restoration on my property."
>
> - Pat Davis, Rancher in Wamic, OR

Oak systems with native, undisturbed understory plant communities are extremely limited on the landscape and should be prioritized for protection from overgrazing. Identifying and deploying land protection mechanisms in these places is a critical element of our strategy, particularly within the priority geographies identified for connectivity and climate resilience buffers of protected areas. Where working lands occur within these priority geographies, grazing practices can be adapted to improve outcomes for both livestock and oak systems.

Oaks provide shade and forage for livestock in areas that may have otherwise been developed or used for less compatible economic activities. The employment of grazers as a restoration or maintenance mechanism for oak systems may provide some benefits; however, there are many factors to consider. Grazing can be used to maintain native understory vegetation that thrives under annual or semi-annual disturbance cycles. This practice is successful when grazing intensity and timing are carefully managed to meet specific goals.

- Grazing can reduce fuel loads and alleviate detrimental fire behavior by decreasing the density and height of understory shrubs and grasses.
- Grazing can also be used to maintain or increase target understory plant species that respond to specific grazing regimes. Some ranchers and land managers report grazing can keep re-sprouted oak from growing into larger shrubs or trees.
- Adjusting the timing and intensity of grazing in sensitive habitats can dramatically alter outcomes for native plants and wildlife, improving biodiversity and repairing aspects of damaged food webs. It can also help with recovery of more protein rich native grasses that better support livestock. Seasonal prescriptive grazing in areas that have thick thatches of annual grasses can help create opportunities for forbs and alter structural and compositional habitat attributes. Perennial bunchgrasses fix and store more carbon below ground that is not consumed by fire.
- Ranching can keep land in open space uses more consistent with conservation than rural residential development, energy development and other more intensive uses.
- Restoration grazing in oak systems can be difficult to implement due to logistical challenges and a higher level of required investment on the rancher's behalf.
- Wildfire-appropriate and wildlife-friendly infrastructure can be utilized to prepare the landscape for prescribed fire. Fire resistant materials such as metal fencing can be used for infrastructure in areas where prescribed fire is a goal.
- As an alternative to pasture creation, grazing in understory of oaks provides shade for livestock and can be compatible with native plants when undertaken with prescriptive grazing. Native perennial grasses provide more nutritious forage that is fire adapted than do annual grasses, which often colonize un-maintained pastures over time.
- There is no one size fits all prescription for employing grazing as a maintenance tool in oak systems. Every site and every situation will have complex factors to consider. Development of goals and measures of success are critical to understanding the effectiveness of these strategies.

GRAZING STRATEGIES	Associated Maps:
Grazing Impact Score: HIGH (xeric) and MEDIUM (mesic) *Grazing can alter stand structure and species composition, damage associated understory species, alter soil properties, and introduce/increase noxious weeds. With care, grazing can serve as a restoration tool to accomplish specific management goals.* **Grazing Conservation Emphasis:** Sensitive or uniquely intact oak systems are protected from high impact domestic grazing. Large scale working lands are not converted to higher intensity uses. Oak systems utilized for grazing provide high quality forage for livestock and are managed toward improved ecological integrity and climate resilience.	

STRATEGY DETAIL

	Timeframe	Actions	Lead Partners
GR 1.	**Prevent expansion of grazing into sensitive or uniquely intact native oak systems using land protection tools.**		
PRIORITY 1	2020	Identity sensitive and uniquely intact oak systems using peer networks and standardized diagnostic protocols. Expand network of partners and volunteers implementing detection program	ECOP
	2020	Implement land protection strategies on priority lands identified by ECOP	CLT, FOGLT, WDFW, USFS, DNR NAP, State Parks
GR 2.	**Establish, disseminate, and incentivize BMP's to support positive outcomes for both ranching and oak systems**		
PRIORITY 3	2020-2030	Prioritize research questions to inform best management practices	ECOP, NRCS, BLM, USFWS, ODFW, USFS, SWCD's, Extension Services,
	2020-2030	Work with ranchers and partners to develop oak informed BMP's that support oak systems including associated flora and fauna.	NRCS, Ranching partners, BLM, USFS
	On-going	Design and initiate learning pathways to build more robust knowledge on oak system response to grazing regimes and grazing productivity outcomes	ECOP, Research institutions
	On-going	Determine decision making process between partners; implement adaptive practices to modify BMPs as learning occurs	ECOP, NRCS, BLM, USFS
	2021-2025	Develop landowner resource tool and distribute to high priority landowners in oak systems with high levels of predicted grazing.	NRCS, Ranching partners, BLM, USFS
	2025-2030	Develop and deliver information, incentive programs, and resource tools to ranching community to support implementation of BMPs.	NRCS, Ranching partners, BLM, USFS
GR 3.	**Advocate for oak-friendly, socially-responsible grazing practices on public land allotments.**		
PRIORITY 15	2021-2023	Allotment system is refined or deployed to improve public land allotment access by historically marginalized communities	USFS, ECOP
	2021-2030	Distribute BMPs to public land managers, participate in planning processes.	ECOP, NRCS, USFS, BLM
GR 4.	**Protect large working lands from subdivision and development in priority areas, buffers and connectivity corridors.**		
PRIORITY 16		Develop emergency grazing resources for producers experiencing prolonged drought or wildfire	ECOP
		Explore feasibility of creating community grazing plans that help producers rest ground on a three year rotation	ECOP
	2021-2030	Develop programs to protect large acreages from conversion to intensive agriculture or development	NRCS, Ranching partners

Table 18: Strategies to address impacts of grazing

ECOLOGICAL STEWARDSHIP




OVERALL IMPACT RANKING: Not initially ranked – added after initial ranking.

RANKING OF SPECIFIC HUMAN BEHAVIORS WITHIN ECOLOGICAL STEWARDSHIP:

Ecological Stewardship Impact Analysis	
Specific Human Behavior	Ranking
Poorly informed management choices and management paralysis	**High**
Management does not consider diverse values and perspectives	**Medium**
Peer reviewed science is lacking in the region	**Medium**
Oak systems are not well described and mapped in the region	**Low**

Table 19: Ecological Stewardship Impact Analysis

IMPACTS OF ECOLOGICAL STEWARDSHIP

Ecological stewardship is practiced by natural resource managers whose primary management goal usually includes improving ecological outcomes in priority habitats or for target species, including for First Foods and game species. Partners manage resources for a variety of outcomes and not all perspectives are considered when decision-makers create policy or define best management practices. The voices of people underrepresented among decision-makers often go unheard. Sometimes our management lens is focused on a particular habitat or feature and sometimes on ecosystem function and integrity. Often these lenses disregard the role of people in oak systems, and sometimes management that seeks to improve outcomes for one system or species can compromise conditions for another. For example, controlling weeds with herbicides can compromise the fitness of First Foods for safe consumption.

Funding for large scale restoration is limited. Decisions by managers and limitations on their capacity to implement restoration practices impact the integrity of some of the most intact oak systems remaining in the landscape. These places may be important references of historic condition and may represent some of the last of particular plant assemblages or habitat features for at risk and culturally-important species.

Natural resource managers often make decisions without adequate information about site history, climate impacts, or how decisions impact resources and relationships. Funding and capacity for research and effectiveness monitoring and development of best management practices is extremely limited and so then is objective learning and adaptive management.

Natural resource managers make choices that impact ecological integrity and human uses, including herbicide application, vegetation removal, infrastructure installation (such as trails), public access policy, risk abatement (removal of snags or diseased trees), burning and fire suppression, fuels reduction, game species harvest limits, and a host of other activities. Every management action imparts a cascade of impacts on system function and integrity.

Figure 20 on page 77 displays the anchor habitats where there is high existing potential for ecological stewardship. About 45% of the oak landscape is publically owned, providing ample opportunity to incorporate best management practices through partner stewardship. ECOP will work to build this potential in additional priority areas and connectivity corridors, through acquisition and stewardship, or by deploying incentive programs and best management practices in partnership with private landowners.

Table 20 on page 78 details the stakeholders engaged during the planning process to help us understand the challenges and opportunities around ecological stewardship in the region.

"Oak habitats are diverse and important features on the landscape around the Mt. Hood National Forest. We have limited amounts of these communities on our eastern zone, and they are vital for sensitive wildlife species and overwintering habitat. We feel connected to the mission of the East Cascades Oak Partnership in our desire to maintain and improve these special habitats. By being involved in this partnership, we have the opportunity to share and learn with other individuals or agencies as we attempt to better manage these habitats for their long-term persistence on the landscape."

- Christina Mead, botanist for the USFS

Figure 19

Ecological Stewardship Results Chain

Stewardship = Restoration, Enhancement and Management

Expand community knowledge about and appreciation for oak systems and human interactions:

- Increase capacity of and develop programs educating the public about oak systems and providing stewards with technical assistance
- Develop mentor program for landowners implementing BMP's
- Develop a strong (info rich, user friendly) web presence about oak stewardship (See UC Extension program https://ucanr.edu/sites/oak_range/).
- Develop technical resources for stewards including sample logging contract language, management plan templates, tools, thought-provoking checklists & guides, DIY Stewardship You-tube videos, etc.

Develop stewardship education and outreach tools. ES-1

Stewards understand the need for active management to promote oak system integrity

Stewards understand and appreciate the value of oak systems & oak system diversity

Advocate to improve outcomes for stewardship programs:

- Promote forest practices that improve oak systems (address conifer centric FPA in OR and WA)
- Reduce barriers to funding state and federal land stewardship - BiOps when chemicals are used, impacts of burning on species, cultural resources.
- Increase knowledge and visibility of FPA exceptions that allow the planting of oak during forest management activities
- Expand existing and develop new Oak System Stewardship incentive programs
- Require stewardship funds when budgeting for new lands purchased

Remove policy barriers to oak friendly stewardship. See other chains.

Policy promotes oak-friendly management choices

Stewards choose to manage oak systems for ecological lift using BMPs

Restoration and management results in ecological lift or does no harm

- Create landscape-level conservation plan to improve connectivity, resilience to climate change, and system integrity
- Work with partners to develop BMP's that support restoration and enhancement of oak systems based on practices that consider East Cascades ecological parameters

Partners understand ecological outcomes of human interactions with oak systems

Build science- and TEK-based East-Cascade BMP's and landscape scale priorities ES-1 and 2

Stewards understand how to implement BMP's

Stewards have resources to implement BMPs

Increase efficiency and capacity for stewardship activities. ES-3

Oak systems are intact and functional

Target: ECOP OAK

- Build funding for oak stewardship activities in high priority areas
- Develop community seed bank
- Co-implement and share resources across property boundaries
- Expand restoration capacity by increasing oak trained contractors.
- Train crews on oak specific techniques and BMP's
- Develop a list and help market "ECOP certified" contractors.
- Create a business case for crews to guide their progress towards ECOP certification

Partners agree on and regularly update BMPs

Research, Monitoring, and Adaptive Management:

- Develop classification and ecological integrity assessment with historic and DFCs
- Identify knowledge and data gaps.
- Develop research partnerships with educational and research institutions
- Develop knowledge of R, T, E and culturally important species.
- Monitor lesser studied species, provide rapid response support for species in decline
- Develop standardized monitoring protocols to measure effectiveness of BMPs
- Ensure proposed projects incorporate funding for monitoring in project budgets
- Develop process for evaluating strategy impacts on under-represented communities
- Ensure stewardship projects are based on clear objectives (SMART)
- Develop and share management plan templates
- Advocate to funders for inclusion of monitoring funds in grant awards
- Identify opportunities to integrate new BMPs into existing programs and technical resources
- Develop an adaptive management feedback loop to inform BMP's
- Analyze existing climate models to understand and respond to impacts on species distribution, species interactions, and ecological processes
- Create a hotlist of management questions managers can ask themselves prior to management activities, feed into application of BMP's
- Develop comprehensive classification system and ecological integrity assessments
- Implement effectiveness monitoring and standardize data collection
- Develop research program to answer key management questions

Stewards understand how management is advancing toward DFC / Targets

Develop projects on a strong planning foundation ES-2

Stewards diagnose existing condition and have DFC/targets to manage toward

Diversity of oak systems persist across the region

Key:

- Outcomes
- **Strategies**
- Recommended Actions/ Messaging

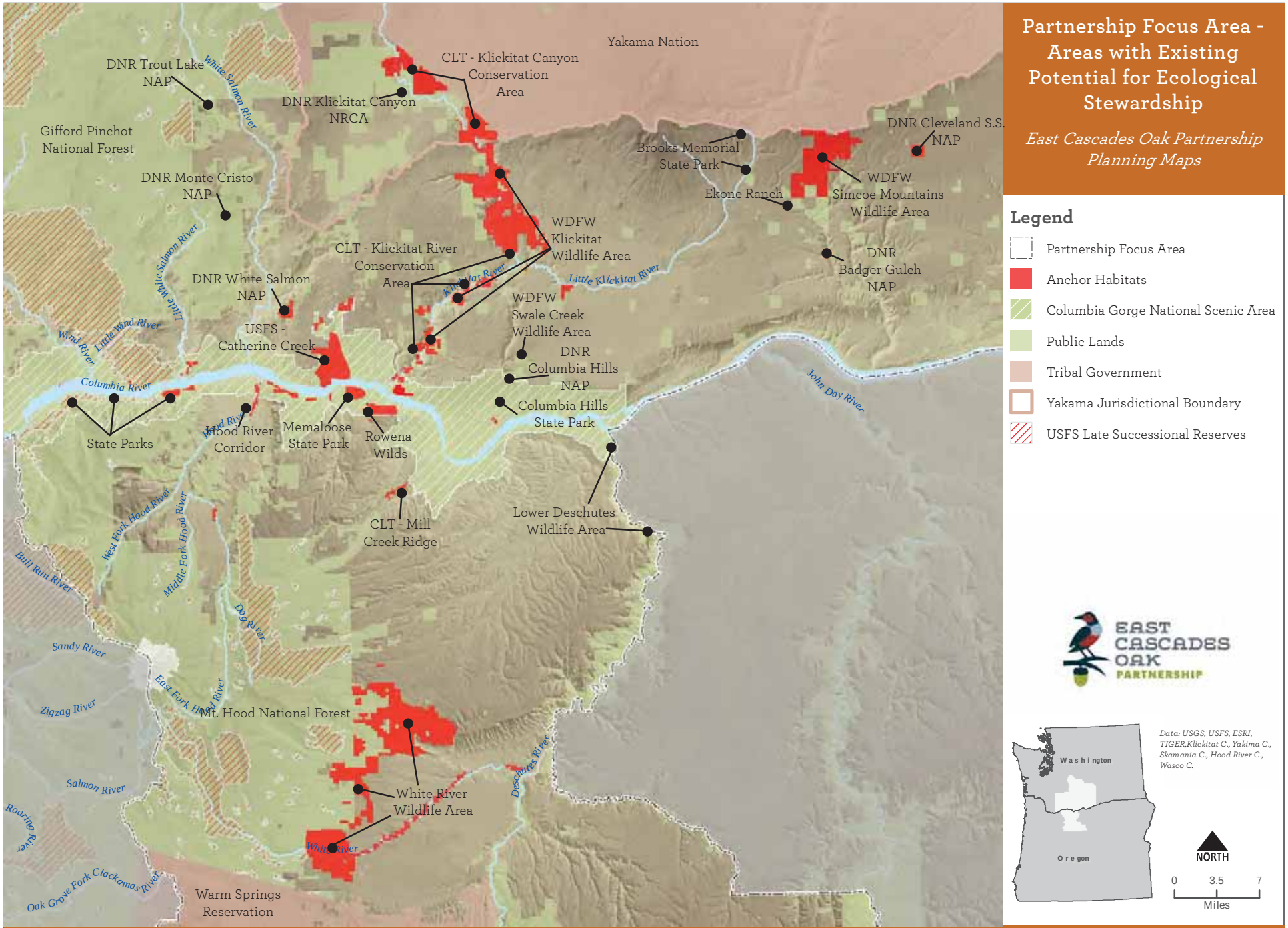


Figure 20: Opportunities for Ecological Stewardship on Tribal, Public, and Conserved Lands

STAKEHOLDER ENGAGEMENT – Ecological Stewardship			
ECOP's Ecological Stewardship Working Group Members:			
Name	**Position**	**Entity**	**Engagement**
Bushman, Mary	ECOP Coordinator	Columbia Land Trust	Ecological stew working group
Cornelius, Lindsay	Natural Area Manager	Columbia Land Trust	Ecological stew working group
Stakeholders Interviewed:			
All ECOP participants provided feedback during partnership meetings			
Results Chains Workshop Participants and Advisors (in addition to the ECOP working group listed above):			
Name	**Position**	**Entity**	**Engagement**
Dodd, Kristin	Forester	ODF	Ecological steward results chain
Esposito, Dan	District Conservationist	NRCS	Ecological steward results chain
Pierson, Katie	Farm Bill Biologist	ODFW and NRCS	Ecological steward results chain
Robinson, Barbara	Botanist/Klickitat Trail Cons.	Retired	Ecological steward results chain
Van Leuven, Susan	Wildlife Area Manager	WDFW	Ecological steward results chain
Presentations to the East Cascades Oak Partnership Formal Meetings:			
Name	**Position**	**Entity**	**Engagement**
Altman, Bob	Retired	American Bird Conservancy	Birds in E. Cascade Oak Systems
Christy, John	Herbarium Manager	Portland State University	Mapping Historic Extent of Oak using GLO
Cornelius, Lindsay	Natural Area Manager	Columbia Land Trust	Oak Restoration Lessons learned
Dodd, John	Retired Biologist	USFS	Soils in Oak Systems
Gilligan, Laurie	Ecologist	City of Portland	Oak Stand Structure, Regeneration, and Fire
Jacobson, Todd	Habitat and Access Bio	WDFW	Landowner Incentives Panel
Johnson, Bart	Professor	U of Oregon Department of Landscape	Climate Policy and Management
Kaye, Tom	Executive Director	Institute for Applied Ecology	Climate Change Impacts and Strategies
Mack, Cheryl	Retired Archaeologist	USFS	Cultural Resources in the Oak Landscape
Michalak, Julia	PhD Candidate	UW Landscape Ecology and Conservation	Climate Vulnerability and Adaptation for OWO
Paredes, Sergio	Resource Conservationist	NRCS	Landowner Incentives Panel
Pelton, Emma	Endangered Species Conservation Biologist	Xerces Society	Pollinators in E.Cascade Oak Systems
Peter, David	Ecologist	USFS PNWRS – Olympia	Oak Ecology
Pierson, Katie	Farm Bill Biologist	ODFW and NRCS	Landowner Incentives Panel
Reilly, Matthew	Post Doctoral Scientist	Humboldt State University	Broad Scale Perspectives on Climate Change
Rombough, Chris	Owner and Operator	Rombough Herpetological	Herpetofauna in Oak Systems
Stone, Daphne	President	Northwest Lichenologists	Lichens in Oak Woodlands
Taylor, Bruce	Regional Partnership Coordinator	Pacific Birds	Open Standards for the Practice of
VanderHaegen, Matt	Research Scientist	WDFW	Western Gray Squirrel in Oak
Warren, Robert and Ryan	Model Watershed Program Director	Bonneville Environmental Foundation	Introduction to Results Chains
Wilkins, Lavina	Program Manager	Yakama Nation Language Department	A Yakama Perspective on Oregon White Oak

Table 20: Stakeholders engaged on the topic of ecological stewardship

OPPORTUNITY FOR CHANGE – ECOLOGICAL STEWARDSHIP

Management decisions matter and practitioners want to do right by the systems and resources they manage. Our decisions are shaped by our cultural values and knowledge. Managers throughout the East Cascades can learn from anecdotal observation, community science, and elders in tribal and non-tribal communities. We can build a learning framework that capitalizes on our wealth of local knowledge and motivation to learn, and that builds capacity and interest among academic partners to help us address key uncertainties and improve management outcomes and resources.

ECOLOGICAL STEWARDSHP STRATEGIES

Associated Maps:

Ecological Stewardship Impact Score: Not Scored.

ECOP partners collectively are responsible for some of the most intact, functional oak systems across a broad geography. Poorly informed management, lack of capacity, and management paralysis can all contribute to degradation or loss of important resources.

Ecological Stewardship Conservation Emphasis: Natural resource managers and landowners learn and adapt their practices to improve outcomes for oak systems and the people who rely on them. Stewards have technical and financial support to take necessary actions to support resilient oak systems.

STRATEGY DETAIL

	Timeframe	*Actions*	*Lead Partners*
ES 1.	**Protect the most intact, functional oak systems, connectivity and climate adaptation corridors on the landscape, and manage for ecological stewardship.**		
PRIORITY 1	2020-2030	Implement land protection strategies on the highest priority properties identified by ECOP	Land Trusts, public agencies, conservation buyers
		Advocate for application of Good Neighbor Authority resources on lands adjacent to Forest Service lands for conservation management by ECOP partners	ECOP, USFS, ODF
ES 2.	**Develop projects on a strong research, monitoring, and adaptive management framework.**		
PRIORITY 2	2020	Develop classification and ecological integrity assessment with historic and desired future conditions for diversity of oak systems	DNR Natural Heritage, ECOP
	2020	Identify and prioritize knowledge gaps for research and evaluation. Include traditional ecological knowledge (TEK)	ECOP, WDFW
	2022-2025	Address key questions through research and learning by developing partnerships with academic institutions and with sources of traditional ecological knowledge	ECOP, Tribes, USFS (ecology groups and research stations), OSU, PSU, local
	2021-2022	Determine best management practices for ecological stewardship: enhancement, restoration, and first foods.	ECOP
	2022-2025	Develop standardized monitoring protocols to inform best management practices and rapid response tools by system type to threat type	ECOP, PSU, DNR, NHP, ODF, USFS
	2022-2025	Develop feedback loop for effectiveness monitoring and research conclusions into best management practices	ECOP
ES 3.	**Increase capacity and efficiency for stewardship activities**		
ADMINISTRATIVE PRIORITY 1	2021-2030	Implement cooperative funding strategy (SAP) to reduce competition among partners and target funding applications to highest priority projects	ECOP
	2020-2030	Co-implement projects across jurisdictional boundaries.	All partners
	2020-2030	Build and train oak-aware restoration workforce	Extension, DNR, SWCD's, CGComm Coll,
	2021-2031	Establish access to quality local seed and plant materials for oak associated floral species	ECOP, BFI, USFS, Clark College, other potential seed producers
	2025	Build resource library and partner guide to facilitate sharing of information and resources including tools, equipment, plans, documents, and personnel	ECOP
ES 4.	**Build and maintain a culture of learning and responsiveness among partners in ECOP.**		
ADMINISTRATIVE PRIORITY	ONGOING	Facilitate learning opportunities that lift the shared knowledge of ECOP partners	ECOP
		Build relationships with underrepresented communities impacted by ECOPs work	All partners, ECOP
		Develop process for evaluating and responding to impacts of ECOP strategies on underrepresented communities	ECOP
		Build relationships with ECOP stakeholders	All partners, ECOP

Table 21: Strategies to address impacts of ecological stewardship

RECREATION



OVERALL IMPACT RANKING: Low

RANKING OF SPECIFIC HUMAN BEHAVIORS WITHIN RECREATION:

Recreation Impact Analysis	
Specific Human Behavior	Ranking
Fire suppression to protect recreational infrastructure or use	**High**
People oppose active management due to limited access or aesthetic preferences	**High**
Increase of recreation density or more intensive uses	**High**
Permeability of the landscape to recreational uses is increased by infrastructure and technology	**High**
Risk of unintentional ignition in a landscape unprepared for fire	**High**
Trails are vectors (but within a contained geography)	**Low**
People and domestic animals spread seeds	**Low**
Trails and associated noise/disturbance of users fragment landscape and alter animal behavior	**Low**

Table 22: Recreation Impact Analysis

IMPACTS OF RECREATION:

People love to play. Play is how we learn and relate, and is an important part of culture, health, and identity. In the East Cascades, playing in the outdoors is commonplace, with entire industries and economies built around unique outdoor experiences. Wind and snow sports, boating, biking, hiking, hunting, fishing, off-roading, horseback riding, botanizing, and birding are all popular in the East Cascades, and there seems to be no satiating the appetites of the recreation community for new and different trails or experiences.

Roads and trails attract, concentrate, and disseminate human users and domestic animals, impacting nearby wildlife and plant communities through disturbance and displacement. Recreational use can interrupt reproduction, foraging, rearing, and migratory behaviors, the impacts of which can cascade through food webs. Abiotic factors like soils and fire regimes can also be affected.

As people and their pets move between recreation sites, they carry with them seeds, spores or other pests, disseminating invasive species. Trail crossings can contribute to erosion and sedimentation into streams. Recreational users may protest active management, temporary or seasonal closures, and fire even if these disturbances are natural processes that revive the forest and associated plant and wildlife species. Their opposition can delay or prevent ecologically-supported management, particularly on public lands.

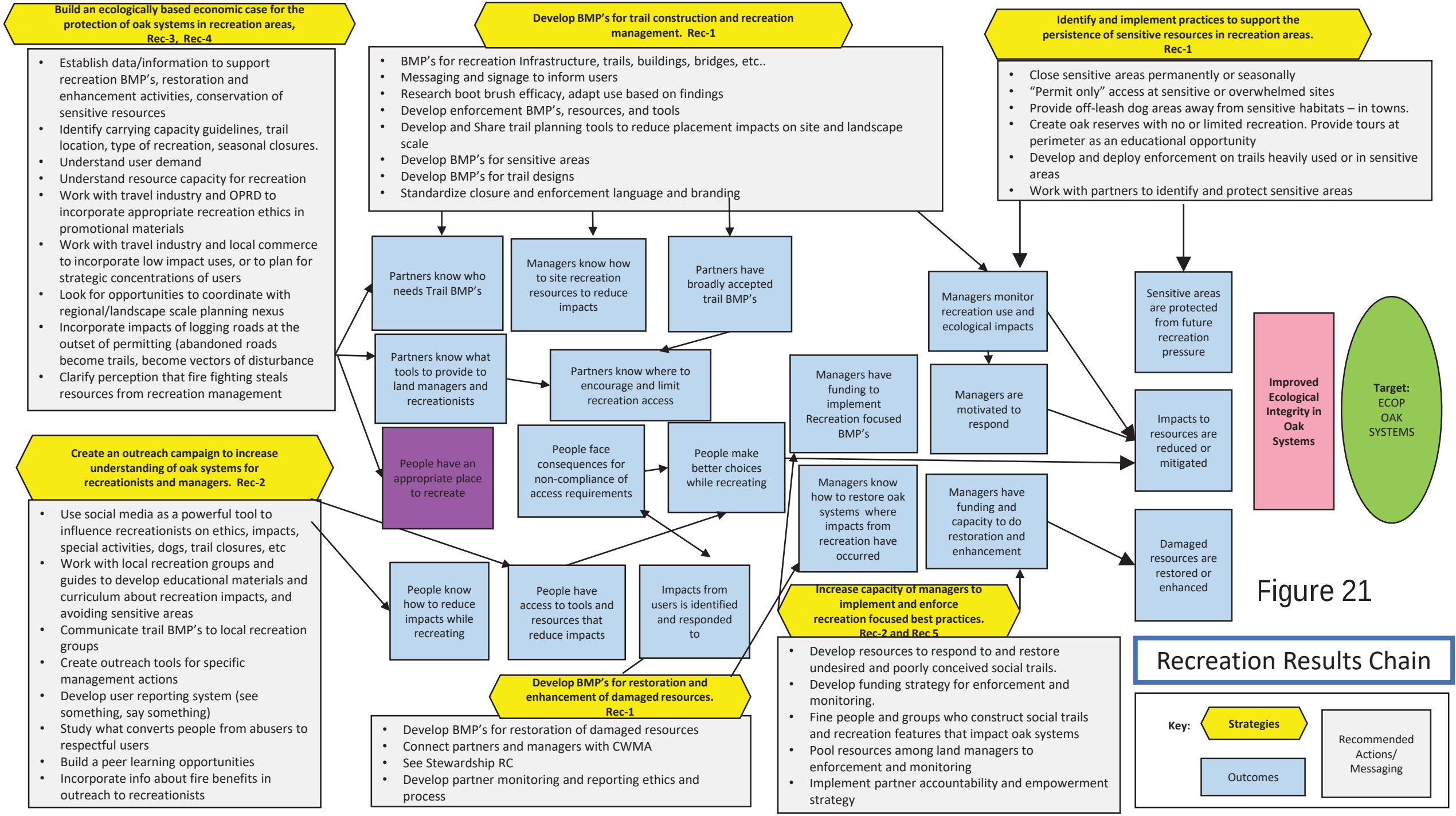

Build an ecologically based economic case for the protection of oak systems in recreation areas, Rec-3, Rec-4
Establish data/information to support recreation BMP's, restoration and enhancement activities, conservation of sensitive resources
Identify carrying capacity guidelines, trail location, type of recreation, seasonal closures.
Understand user demand
Understand resource capacity for recreation
Work with travel industry and OPRD to incorporate appropriate recreation ethics in promotional materials
Work with travel industry and local commerce to incorporate low impact uses, or to plan for strategic concentrations of users
Look for opportunities to coordinate with regional/landscape scale planning nexus
Incorporate impacts of logging roads at the outset of permitting (abandoned roads become trails, become vectors of disturbance
Clarify perception that fire fighting steals resources from recreation management
Develop BMP's for trail construction and recreation management. Rec-1
BMP's for recreation Infrastructure, trails, buildings, bridges, etc..
Messaging and signage to inform users
Research boot brush efficacy, adapt use based on findings
Develop enforcement BMP's, resources, and tools
Develop and Share trail planning tools to reduce placement impacts on site and landscape scale
Develop BMP's for sensitive areas
Develop BMP's for trail designs
Standardize closure and enforcement language and branding
Identify and implement practices to support the persistence of sensitive resources in recreation areas. Rec-1
Close sensitive areas permanently or seasonally
"Permit only" access at sensitive or overwhelmed sites
Provide off-leash dog areas away from sensitive habitats – in towns.
Create oak reserves with no or limited recreation. Provide tours at perimeter as an educational opportunity
Develop and deploy enforcement on trails heavily used or in sensitive areas
Work with partners to identify and protect sensitive areas
Partners know who needs Trail BMP's
Managers know how to site recreation resources to reduce impacts
Partners have broadly accepted trail BMP's
Partners know what tools to provide to land managers and recreationists
Partners know where to encourage and limit recreation access
People have an appropriate place to recreate
People face consequences for non-compliance of access requirements
People make better choices while recreating
Managers monitor recreation use and ecological impacts
Managers have funding to implement Recreation focused BMP's
Managers are motivated to respond
Sensitive areas are protected from future recreation pressure
Impacts to resources are reduced or mitigated
Improved Ecological Integrity in Oak Systems
Target: ECOP OAK SYSTEMS
Create an outreach campaign to increase understanding of oak systems for recreationists and managers. Rec-2
Use social media as a powerful tool to influence recreationists on ethics, impacts, special activities, dogs, trail closures, etc
Work with local recreation groups and guides to develop educational materials and curriculum about recreation impacts, and avoiding sensitive areas
Communicate trail BMP's to local recreation groups
Create outreach tools for specific management actions
Develop user reporting system (see something, say something)
Study what converts people from abusers to respectful users
Build a peer learning opportunities
Incorporate info about fire benefits in outreach to recreationists
People know how to reduce impacts while recreating
People have access to tools and resources that reduce impacts
Impacts from users is identified and responded to
Managers know how to restore oak systems where impacts from recreation have occurred
Managers have funding and capacity to do restoration and enhancement
Damaged resources are restored or enhanced
Develop BMP's for restoration and enhancement of damaged resources. Rec-1
Develop BMP's for restoration of damaged resources
Connect partners and managers with CWMA
See Stewardship RC
Develop partner monitoring and reporting ethics and process
Increase capacity of managers to implement and enforce recreation focused best practices. Rec-2 and Rec 5
Develop resources to respond to and restore undesired and poorly conceived social trails.
Develop funding strategy for enforcement and monitoring.
Fine people and groups who construct social trails and recreation features that impact oak systems
Pool resources among land managers to enforcement and monitoring
Implement partner accountability and empowerment strategy
Recreation Results Chain
Key:
Strategies
Outcomes
Recommended Actions/ Messaging

Figure 21

Table 23 below details the stakeholders engaged during the planning process to help us understand the challenges and opportunities around recreation in the region.

STAKEHOLDER ENGAGEMENT - Recreation			
ECOP's Recreation Working Group Members:			
Name	**Position**	**Entity**	**Nature of Engagement with ECOP**
Berkley, Andrea	Natural Resource Specialist	Oregon State Parks	Recreation working group
Bushman, Mary	ECOP Coordinator	Columbia Land Trust	Recreation working group
Cornelius, Lindsay	Natural Area Manager	Columbia Land Trust	Recreation working group
Olson, Jessica	Planner	Columbia River Gorge Commission	Recreation working group
Weiler, Bill	Education Coordinator	Sandy River Basin Watershed Council	Recreation working group
Stakeholders Interviewed:			
Name	**Position**	**Entity**	**Nature of Engagement with ECOP**
Dunn, Steve	Trail Steward	Hood Rats	Recreation interview
Keyna Bugner	Natural Area Manager	WA DNR Natural Areas	Recreation interview
Kolojejchick-Kotch, Lauren	Network Manager	Columbia Gorge Tourism Alliance	Recreation interview
Kreps,Kelly	Owner and Operator	Private Ranch	Recreation interview
Rotherham, Justin	Instructor	Mazamas	Recreation interview
Spangler, David	Park Manager East Gorge	Oregon State Parks	Recreation interview
Wallis, Kelly	Tom McCall Preserve Manager	The Nature Conservancy	Recreation interview
Results Chains Workshop Participants and Advisors (in addition to the ECOP working group listed above):			
Name	**Position**	**Entity**	**Nature of Engagement with ECOP**
Berkeley, Andrea	Natural Resource Specialist	Oregon State Parks	Recreation results chain
Presentations to the East Cascades Oak Partnership Formal Meetings:			
Name	**Position**	**Entity**	**Nature of Engagement with ECOP**
Haukness, Lorelei	Recreation Program Manager	USFS – CRGNSA	Recreation Trends on National Forest System

Table 23: Stakeholders engaged on the topic of recreation

OPPORTUNITY FOR CHANGE – RECREATION:

As is often the case with birders, hunters, and fishers, people's interest in outdoor recreation can translate to caring about the ecology of the places they recreate. Users are in some ways a captive audience, highly invested in a place and experience that can be leveraged to share information about ecological integrity and management, to find volunteer labor and support for conservation. People value access and experiences in nature, which may predispose them to take action to help protect natural resources.

People will always move about, but they may also be willing to utilize wash stations or brushes to mitigate the impacts of their movements. Trails concentrate users. We can design trails and other recreational features strategically to limit impacts in sensitive environments. Dog owners need off-leash areas to sufficiently exercise pets, but also appreciate having access to a wider variety of trails and natural areas. They may be willing to observe leash rules to maintain access.

Hunting is enjoyed by a vast many people, particularly in rural and indigenous communities who utilize oak-associated species as a food source and enjoy the connection hunting provides with nature. Hunting requires an intimate knowledge of animal behavior that can help increase awareness of and appreciation for wildlife and habitat. Hunting license fees provide a high percentage of public agency operational and conservation

program grant funds. With the decline in hunting, funding for state agencies managing wildlife is becoming more limited. Advocating for new funding sources, including the possibility of a dedicated sales tax on outdoor gear for conservation funding would help agencies struggling to manage resources impacted by recreation.

RECREATION STRATEGIES			
			Associated Maps:
Recreation Impact Score: LOW *Both mesic and xeric oak sytsems can be damaged by trail building, noxious weed introduction and expansion due to disturbance, and altered landscape processes through fire suppression and fragmentation by human and domestic animal presence.* **Recreation Conservation Emphasis:** Recreational access is strategically implemented at the landscape scale to limit impacts to intact and functional oak systems and to facilitate a direct, meaningful connection between people and nature			
STRATEGY DETAIL			
	Timeframe	***Actions***	***Lead Partners***
REC 1. Identify and implement practices to support the persistence of highly sensitive resources in established recreation areas & prevent expanded recreation into the same			
PRIORITY 7	2020-2025	Develop BMPs to help managers identify & protect the most sensitive resources from the most impactful types of recreation.	ECOP
		Work with partners to identify and promote suitable off-leash dog areas away from sensitive habitats and near population centers.	ECOP
		Ensure the highest quality habitats are protected with conservation programs designed to limit mixed use and prioritize protection from disturbance.	WA DNR NAP, CLT, DLT
REC 2. Create an outreach and education campaign to increase understanding of oak systems for recreationists and land managers			
PRIORITY 13	TBD	Work with local recreation groups and guides to develop educational materials and curriculum about recreation impacts and avoiding sensitive areas	Parks, Mazamas, Native Plant Society, Bike Clubs
		Explore potential of implementing a shared branding / marketing strategy across ownerships to improve user expectations, improve enforcement, facilitate permitting programs, streamline volunteer engagements, and support user-reporting systems.	ECOP, All partner landowners
		Communicate trail BMP's to local recreation groups	Parks, Mazamas, Native Plant Society, Bike Clubs
REC 3. Ensure planning and recreation industry entities have access to information about the impacts of recreation on oak systems			
PRIORTY 17	TBD	Work with travel industry and parks departments to incorporate recreation ethics in promotional materials	OPRD, FOG, WA State Parks
		Work with travel industry and local commerce to incorporate low impact uses and to plan for strategic concentrations of users away from sensitive resources	ECOP, OPRD, FOG, WA State Parks
		Participate in regional and local planning efforts around recreational resources	ECOP
		Incorporate potential recreational impacts of logging roads at the outset of permitting (abandoned roads become trails, become vectors of disturbance)	DNR, ODF
		Build an economic case for protecting sensitive resources and actively managing public access to recreation areas	ECOP
REC 4. Explore opportunities to partner with local governments on special use tax classifications for open space, as landowner incentives to keep land in natural resource classification.			
PRIORITY 18	TBD	Reduce burden on small landowners where public use is required to qualify by pooling enforcement, creating permits and user-training programs, and leveraging volunteer labor or resource planning support.	TBD
REC 5. Develop a shared enforcement and restoration strategy with landowners struggling with overwhelmed recreation sites			
PRIORTY 19	TBD	Develop funding strategy for enforcement, remediation of damage due to unauthorized uses, and monitoring / issue detection.	ECOP
		Fine people and groups who construct or use unauthorized recreational infrastructure	TBD
		Pool resources among land managers to aid in enforcement and monitoring	ECOP Partners, Large Landowners

Table 24: Strategies to address impacts of recreation

ORCHARDS AND VINEYARDS

OVERALL IMPACT RANKING: LOW

RANKING OF SPECIFIC HUMAN BEHAVIORS WITHIN ORCHARDS AND VINEYARDS:

Orchard and Vineyard Development Impact Analysis	
Specific Human Behavior	Ranking
Oaks are removed and/or monocultural crops are installed	**High**
Infrastructure is installed to support orchards, displacing oaks and fragmenting habitat	**High**
Pests and diseases and invasive species may be inadvertently introduced	**High**
Crop management may involve spraying herbicides or pesticides that damage oak systems	**Medium**
Crop management may require water withdrawals or application that change oak system hydro.	**Medium**
Traditional row crop maintenance suppresses or destroys native oak associated species	**Medium**
Infrastructure and crop presences necessitates fire suppression	**Medium**

Table 25: Orchard and Vineyard Impact Analysis

IMPACTS OF ORCHARDS AND VINEYARDS:

As in areas of California, southern Oregon, and the Willamette Valley, wine grapes and fruit orchards thrive in the same soil types and on the same landforms as Oregon white oak systems. Vineyards and orchards are profitable and are popular for hobbyists, and there seems to be no satiating the market. Conversion to agriculture has significant impacts on wildlife and oak system function and connectivity.

Beyond the displacement that occurs to make room for infrastructure and row crops, displacement of and stress to native species also occurs on the margins of orchards and vineyards through spread of invasive species, pesticide drift, noise disturbance, and changes to air and water quality or quantity. Changes to soil and water quality commonly occur as the result of agricultural production practices. Exhausted land often requires the use of herbicides, pesticides, and fertilizers to maximize production of agricultural products, further exacerbating ecological stressors and ensuring the need for further intervention. Wildlife suffer from acute or chronic direct exposure to pesticides, but also from habitat or food supply modification resulting from pesticide use. Herbicides may reduce food, cover, and nesting sites needed by insect, bird, and mammal populations; insecticides may

diminish insect populations utilized by bird or fish species; insect pollinators may be reduced, thereby affecting plant pollination.

The transportation of animals and materials (like firewood, ornamental plants and food) increases the possibility of transporting emerging insect pests and plant diseases. Emerging pathogens and fungi may damage or kill oaks or associated species. Native species response to these emerging threats may be hampered by the pace and scale at which they occur, which is also exacerbated by climate change.

Table 26 below details the stakeholders engaged during the planning process to help us understand the challenges and opportunities around orchard and vineyard development and operations in the region.

STAKEHOLDER ENGAGEMENT – Orchards and Vineyards			
ECOP's Orchards and Vineyards Working Group Members:			
Name	**Position**	**Entity**	**Nature of Engagement with ECOP**
Johnson, Amber	Habitat Biologist	WDFW	O&V working group
Bushman, Mary	ECOP Coordinator	Columbia Land Trust	O&V working group
Cornelius, Lindsay	Natural Area Manager	Columbia Land Trust	O&V working group
Thompson, Jeremy	District Wildlife Biologist	ODFW	O&V working group
Olson, Jessica	Planner	Columbia River Gorge Commission	O&V working group
Stakeholders Interviewed:			
Name	**Position**	**Entity**	**Nature of Engagement with ECOP**
Joannadies, Darryl	Owner and Operator	Viola Wine Cellars	O&V Stakeholder Interview
Casteel, Mimi	Owner and Operator	Hope Well Vineyards	O&V Stakeholder Interview
Maness, Nicole		Willamette Partnership	O&V Stakeholder Interview
Dudley, Pat	Owner and Operator	Bethel Heights Vineyards	O&V Stakeholder Interview
Pouillon, Alexis	Owner and Operator	Domaine Pouillon Winery	O&V Stakeholder Interview
Results Chains Workshop Participants and Advisors (in addition to the ECOP working group listed above):			
Name	**Position**	**Entity**	**Nature of Engagement with ECOP**
Dobson, Robin	Owner and Operator	Klickitat Canyon Winery	O&V Results Chains
Busacca, Alan	Owner and Operator	Vinitas Consultant, LLC and Volcano	O&V Results Chains
Flick, Cathy	Retired Biologist	USFS	O&V Results Chains
Presentations to the East Cascades Oak Partnership Formal Meetings:			
Name	**Position**	**Entity**	**Nature of Engagement with ECOP**
Busacca, Alan	Owner and Operator	Vinitas Consultant, LLC and Volcano	Vineyard Development Presentation
Casteel, Mimi	Owner and Operator	Hope Well Vineyards	Oak Accords Presentation

Table 26: Stakeholders engaged on the topic of orchards and vineyards

OPPORTUNITY FOR CHANGE –ORCHARDS AND VINEYARDS:

Row crops such as grapes and fruit trees can accommodate native oak-associated plant species in the understory and between rows. Production of food is not mutually exclusive with habitat and many consumers would desire wine and food products produced from sustainable farms. Programs to motivate growers to adopt growing practices are already in place and are growing across the state. The Oak Accord is an incentive program working to protect oak in the Willamette Valley. The program offers a business case for ranchers, vintners, and orchardists that demonstrates how stewardship of habitat will leverage better long term results from their farming operation. The program has developed and promotes BMP's for protecting and restoring oak habitats in agricultural settings. This program can be replicated or expanded to meet the goals for protecting, and restoring oak systems east of the Cascades.

Farmers are particularly observant of plants and their responses to farming practices, and they may be motivated to learn approaches that prove to be fruitful – for profits and ecological outcomes. These businesses all rely on ecological services like pollination and groundwater recharge. Landowners are motivated to protect crops from new disease and pests and may be open to reducing mono-cultural growing practices.

Table 27 on page 88 lists strategies ECOP partners have developed to address the impacts of orchard and vineyard development and operations on Oregon white oak systems in the East Cascades:

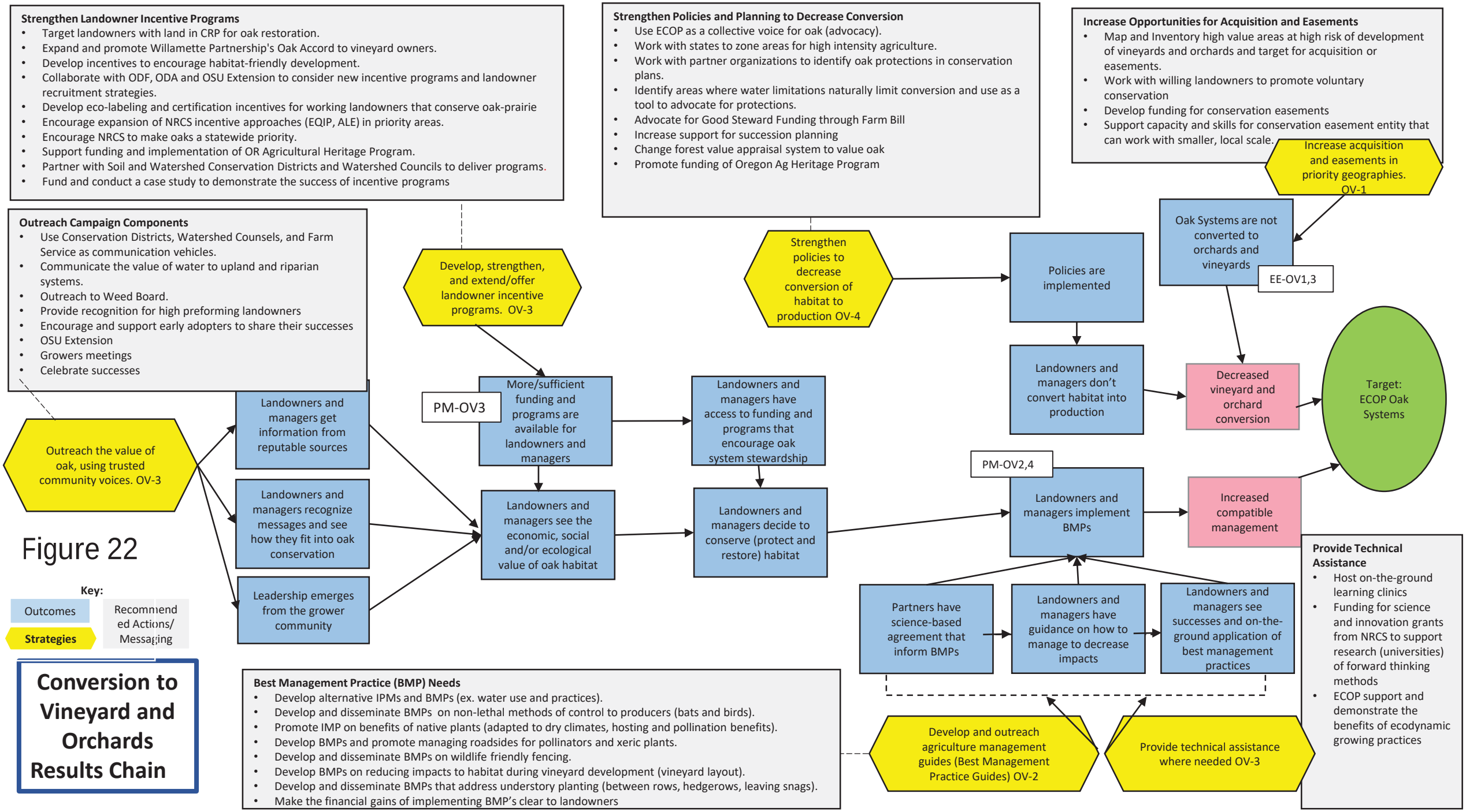

Strengthen Landowner Incentive Programs
Target landowners with land in CRP for oak restoration.
Expand and promote Willamette Partnership's Oak Accord to vineyard owners.
Develop incentives to encourage habitat-friendly development.
Collaborate with ODF, ODA and OSU Extension to consider new incentive programs and landowner recruitment strategies.
Develop eco-labeling and certification incentives for working landowners that conserve oak-prairie
Encourage expansion of NRCS incentive approaches (EQIP, ALE) in priority areas.
Encourage NRCS to make oaks a statewide priority.
Support funding and implementation of OR Agricultural Heritage Program.
Partner with Soil and Watershed Conservation Districts and Watershed Councils to deliver programs.
Fund and conduct a case study to demonstrate the success of incentive programs
Strengthen Policies and Planning to Decrease Conversion
Use ECOP as a collective voice for oak (advocacy).
Work with states to zone areas for high intensity agriculture.
Work with partner organizations to identify oak protections in conservation plans.
Identify areas where water limitations naturally limit conversion and use as a tool to advocate for protections.
Advocate for Good Steward Funding through Farm Bill
Increase support for succession planning
Change forest value appraisal system to value oak
Promote funding of Oregon Ag Heritage Program
Increase Opportunities for Acquisition and Easements
Map and Inventory high value areas at high risk of development of vineyards and orchards and target for acquisition or easements.
Work with willing landowners to promote voluntary conservation
Develop funding for conservation easements
Support capacity and skills for conservation easement entity that can work with smaller, local scale.
Increase acquisition and easements in priority geographies. OV-1
Outreach Campaign Components
Use Conservation Districts, Watershed Counsels, and Farm Service as communication vehicles.
Communicate the value of water to upland and riparian systems.
Outreach to Weed Board.
Provide recognition for high preforming landowners
Encourage and support early adopters to share their successes
OSU Extension
Growers meetings
Celebrate successes
Develop, strengthen, and extend/offer landowner incentive programs. OV-3
Strengthen policies to decrease conversion of habitat to production OV-4
Policies are implemented
Oak Systems are not converted to orchards and vineyards
EE-OV1,3
Outreach the value of oak, using trusted community voices. OV-3
Landowners and managers get information from reputable sources
Landowners and managers recognize messages and see how they fit into oak conservation
Leadership emerges from the grower community
PM-OV3
More/sufficient funding and programs are available for landowners and managers
Landowners and managers have access to funding and programs that encourage oak system stewardship
Landowners and managers see the economic, social and/or ecological value of oak habitat
Landowners and managers decide to conserve (protect and restore) habitat
Landowners and managers don't convert habitat into production
Decreased vineyard and orchard conversion
Target: ECOP Oak Systems
PM-OV2,4
Landowners and managers implement BMPs
Increased compatible management
Partners have science-based agreement that inform BMPs
Landowners and managers have guidance on how to manage to decrease impacts
Landowners and managers see successes and on-the-ground application of best management practices
Provide Technical Assistance
Host on-the-ground learning clinics
Funding for science and innovation grants from NRCS to support research (universities) of forward thinking methods
ECOP support and demonstrate the benefits of ecodynamic growing practices
Best Management Practice (BMP) Needs
Develop alternative IPMs and BMPs (ex. water use and practices).
Develop and disseminate BMPs on non-lethal methods of control to producers (bats and birds).
Promote IMP on benefits of native plants (adapted to dry climates, hosting and pollination benefits).
Develop BMPs and promote managing roadsides for pollinators and xeric plants.
Develop and disseminate BMPs on wildlife friendly fencing.
Develop BMPs on reducing impacts to habitat during vineyard development (vineyard layout).
Develop and disseminate BMPs that address understory planting (between rows, hedgerows, leaving snags).
Make the financial gains of implementing BMP's clear to landowners
Develop and outreach agriculture management guides (Best Management Practice Guides) OV-2
Provide technical assistance where needed OV-3
Key:
Outcomes
Recommended Actions/ Messaging
Strategies
Conversion to Vineyard and Orchards Results Chain

Figure 22

ORCHARDS AND VINEYARDS STRATEGIES

Associated Maps:

Orchards and Vineyards Impact Score: MEDIUM

Potential conversion of oak systems to vineyards and orchards is irreversible and devastating to habitat, though currently this land use is mostly limited to existing agricultural lands and grasslands. Adjacent habitat can be impacted by orchard and vineyard management from herbicide drift, hazing, and fragmentation.

Orchards and Vineyards

Conservation Emphasis: Orchard and vineyard development does not displace oak systems. Native plants are integrated into existing orchards and vineyards to support pollinators and other native organisms, and management practices minimize impacts on adjacent oak systems.

STRATEGY DETAIL

	Timeframe	*Actions*	*Lead Partners*
OV 1. Prevent expansion of orchards and vineyards into sensitive and uniquely intact oak systems using land protection tools.			
PRIORITY 1	2021	Map and Inventory high value areas at high risk of development of vineyards and orchards and target for acquisition or easements.	ECOP
	2021-2023	Identify and / or develop funding for conservation easements and acquisitions.	ODF, ODA, OSU, NRSC, SWCD's, Land Trusts
	On-going	Work with willing landowners to promote voluntary conservation through easements and acquisitions	ODF, ODA, OSU, NRSC, SWCD's, Land Trusts
OV 2. Develop and distribute agriculture management guides (Best Management Practice)			
PRIORITY 9	TBD	Develop oak system focused IPMs and BMPs (ex. water use and practices).	ODF, ODA, OSU, NRCS, SWCD's
	TBD	Make the financial gains of implementing BMP's clear to landowners through financial analysis and messaging	ODF, ODA, OSU, NRCS, SWCD's
OV 3. Develop and implement incentive programs that support the protection and stewardship of oak systems in and around vineyards and orchards.			
PRIORITY 10	TBD	Fund and conduct a case study to demonstrate the success of incentive programs	ECOP
	2021	Develop messaging and communications strategy to promote programs using trusted community voices	ECOP
	2021-2025	Expand and promote Willamette Partnership's Oak Accord (or similar) to vineyard owners and other landowners in ECOP service area.	ECOP, Willamette Partnership, ODF, ODA, OSU, NRSC, SWCD's
	2020-2025	Collaborate with ODF, ODA and OSU Extension to consider new incentive programs and landowner recruitment strategies.	ECOP
	2020-2030	Encourage expansion of NRCS incentive approaches (EQIP, ALE, CRP) in priority areas.	ECOP, ODF, ODA, OSU, NRSC, SWCD's
	TBD	Support Soil and Watershed Conservation Districts and Watershed Councils in delivering incentive programs.	ECOP, SWCDs, WCs
OV 4. Strengthen policies and planning to decrease conversion and protect large working lands			
PRIORITY 11	Ongoing	Support partner participation in county planning processes and zoning designations with messaging, relationship building, and reminders	ECOP
	2020-2025	Work with partner organizations to identify oak protections in conservation plans and priorities.	ODFW, WDFW, land trusts
	Ongoing	Advocate for oak stewardship funding through Farm Bill	ECOP
	2021-2022	Increase support for succession planning to encourage ag producers to keep large parcels intact.	ECOP
OV 5. Support research and provide technical assistance based on research			
PRIORITY 12	TBD	Secure funding for science and innovation grants from NRCS to support research (universities) on forward thinking methods.	ECOP,NRCS
	TBD	Host on-the-ground learning clinics	NRCS, SWCDs, other
	TBD	Support and demonstrate the benefits of ecodynamic growing practices	ECOP, Klickitat Canyon Winery

Table 27: Strategies to address impacts of vineyard and orchard development and operation

Progress Monitoring Framework and Adaptive Management

The East Cascades Oak Partnership emerged in a spirit of learning. During strategic planning we committed to building a shared base of understanding about oak systems and the people interacting with them. It is our intent to translate this practice into an adaptive management process that will make our conservation efforts more effective.

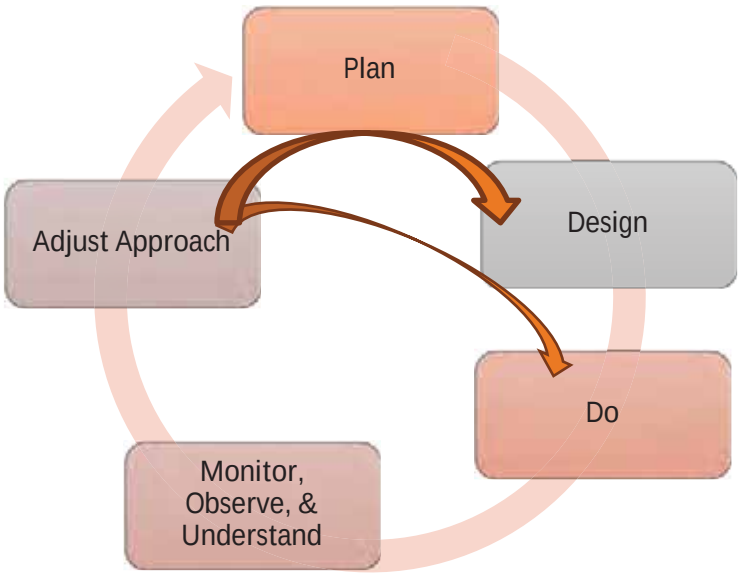


Figure 23: Adaptive Planning & Management

Plan:
Identify conservation values and targets
Research and understand contributing factors
Develop strategies and test using results chain

Design:
Select actions, scale, and spatial focus
Develop performance measures

Do:
Implement actions

Monitor, Observe, & Understand:
Implement monitoring plan
Interview stakeholders and partners
Engage in community learning

Adjust Approach:
Analyze, synthesize and evaluate
Communicate and adjust

Monitoring Approach

Strategies will be implemented over the next decade. We will use the implementation monitoring metrics outlined in Figure 25 on page 91 to determine if we are successfully implementing the strategies as described in the plan. The timeline for measuring progress against each metric is outlined in Table 28 on page 93.

We will use the ecological outcome metrics outlined in Figure 26 on page 92 to determine if our strategies are effectively moving the dial toward our desired ecological outcomes and conservation goals. The timeline for measuring ecological outcomes is in Table 29 on page 94. Quantified targets and timelines for each metric are still being developed, as we move closer to adopting a shared understanding of historic condition and desired future condition. In 2020, the partnership will begin work on an adaptive best management practice framework, and will outline draft best management practices. During this process, we will also set specific targets for each of our ecological outcomes.

COMMUNITY OUTCOMES

Crops, forests, and homes are protected from wildfire	Local communities are fluent in oak system ecology	Health & economic impacts from smoke are reduced	Forage for domestic livestock is improved	Eco-recreational tourism economy is supported	Safe access to first foods is widely available	Natural resource jobs are core to local economy	Agricultural crops are pollinated and resist pests	Conservation advances needs of diverse communities

GOALS	THE OAK LANDSCAPE IS INTACT AND CONNECTED	THE OAK LANDSCAPE IS RESILIENT TO CLIMATE CHANGE AND DISTURBANCE	BIODIVERSITY PERSISTS	RECIPROCITY IS CENTRAL TO HUMAN BEHAVIOR IN THE OAK LANDSCAPE	NEEDS OF HISTORICALLY MARGINALIED COMMUNITIES ARE RESPONDED TO

ECOLOGICAL OUTCOMES

Oak system diversity persists, climate buffers are protected	Connectivity is preserved for species migration and adaptation	Species composition and stand structure indicate resilience to disturbance	Oaks are released from conifer encroachment	Mature oak habitat features are retained and recruited	Diverse native oak associated species & pollinators persist	Human interactions within the oak landscape are reciprocal

IMPLEMENTATION RESULTS

Ecological stewardship is underway on priority sites High priority sites are protected from conversion Intact, functional oak systems are identified, conservation and restoration tools selected, prioritized & implemented	BMP delivery mechanisms in place. Landowners have access to BMPs Stewardship guidance is available & considers multi-faceted outcomes/needs Learning pathways are inclusive and responsive to stakeholder needs	Rx fire & fuels reduction is implemented in priority geographies Policies are in place to allow for fire, reduce liability risk Rx Fire personnel, resources are locally available Sites identified, prioritized for application of prescribed fire and oak release	Oak systems in priority geographies are restored according to BMPs Available funding for stewardship is increased and spatially prioritized for use Native seed and plants are locally available Oak-aware, trained work force is locally available	ECOPs strategic plan is adapted based on learning Strategies and outcomes encompass the needs of historically marginalized communities ECOP partners are engaged in adaptive management (culture of learning)	Partners responsible for policy and regulation have technical support and expanded capacity Funding for oak projects has increased Planning outcomes, permitting, and policy advancements reflect value of oak systems	Important connecting lands are protected by easement Landowners have succession plans, tools to assist with estate planning Emergency grazing resources and reciprocal grazing practices in place
STRATEGIES						
Identify, protect and restore priority oak systems and bring into ecological stewardship	Develop adaptive BMPs, informed by TEK, monitoring, peer-to-peer learning pathways, and research.	Improve fire resilience of the oak landscape	Increase capacity and efficiency of oak system stewardship	Build and maintain a culture of learning, reciprocity, and adaptation among partners and the public.	Conduct outreach to planners, agencies, and the public to focus resources and shape policy in the oak landscape	Prevent fragmentation and conversion of large working lands to development or higher intensity agriculture
RR 1,ES 1, FF 4, GR 1, OV 1, REC 1	ES 2, RR 2, FF 1, GR 2, OV 2, OV 5,	FF2, FF 3, RR 4	ES 3, RR 3, OV 3, REC 5	ES 4	FF 2, GR 3, RR 4, OV 3, REC 2, REC 3,	GR 4, OV 4, REC 4

EAST CASCADES OAK PARTNERSHIP

Figure 24: East Cascades Oak Partnership Theory of Change

Columbia Land Trust

Figure 25: ECOP Implementation Results Metrics 2020-2030

PROTECT

Identify, protect and restore priority oak systems and bring into ecological stewardship

RR 1,ES 1, FF 4, GR 1, OV 1, REC 1 , GR 4, OV 4, REC 4

Intact, functional oak systems are identified, conservation and restoration tools selected, prioritized & implemented	High priority sites are protected from conversion	Ecological stewardship is underway on priority sites	Conversion of large working lands to higher intensity uses is prevented
•Ecological integrity assessment tool deployed in X% of priority areas accessible to the partnership. • Conservation strategies identified, underway, or complete for priority projects	Land protection strategies implemented on priority acres.	•BMPs shared out to landowners in priority areas and implemented on priority acres.	•Emergency grazing resources and reciprocal grazing practices are in place •Succession strategies shared out to landowners in priority areas
P1	P2	P3	P4

LEARN

Develop adaptive BMPs, informed by TEK, monitoring, peer-to-peer learning pathways, and research.

ES 2, RR 2, FF 1, GR 2, OV 2, OV 5,

Key questions are identified and prioritized. Learning pathways are inclusive, responsive to stakeholder needs	Stewardship guidance is available and considers diverse stakeholder/LO goals and values	BMP delivery mechanisms are in place. Landowners in priority geographies have access to BMPs
•Community learning projects are underway •Research and monitoring projects are underway on priority management questions	•Classification system is adopted by partners •Community learning project results are integrated into BMP tool design	•BMP tool is accessible to landowners and managers across priority areas •All ECOP partners are using adaptive BMP tool
L1	L2	L3

RESTORE

Improve fire resilience of the oak landscape

FF2, FF 3, RR 4

Sites are identified and prioritized for application of prescribed fire and oak release	Rx Fire personnel, resources are locally available	Policies are in place to allow for fire, reduce liability risk	Rx fire & fuels reduction is implemented in priority geographies
•EIA tool includes fire readiness assessment •Priority areas that are accessible by partners for assessment are assigned readiness score	•Local crew developed •Burn boss or certified burner certs earned by ECOP partners •First responder training offered	•Certified burner program active •Strict negligence policy replaced by gross negligence policy •Insurance options accessible	•Prescribed fire projects implemented successfully in priority areas. •Local crew and certified burner resources active; burn area increasing yearly
R1	R2	R3	R4

CATALYZE

Increase capacity and efficiency of oak system stewardship

ES 3, RR 3, OV 3, REC 5

Oak-aware, trained stewardship work force is locally available	Native seed and plants are locally available	Available funding for stewardship is increased and spatially prioritized for use	Oak systems in priority areas are restored according to BMPs
•Locally supported, ECOP "certified" crews available •Work force training/certification available to forestry crews working on oak projects	•Seed collection and grow-out capacity expanded at local nurseries •Plant materials center and BFI native seeds are using E.Cascades seed sources	•Existing funding for fuels reduction is focused in priority areas •Available funding for understory restoration and fuels reduction doubled	•BMPs implemented on priority acres •Disturbance monitoring across management footprint
C1	C2	C3	C4

ADAPT

Build and maintain a culture of learning, reciprocity, and adaptation among partners and the public.

ES 4

ECOP partners are engaged in adaptive management (culture of learning)	Strategies and outcomes respond to the needs of historically marginalized communities	ECOPs strategic plan is regularly adapted based on learning
•ECOP members have attended at least one meeting/year or one focused training opportunity •Core partners are engaged in monitoring implementation and/or community learning project	•Learning pathways include voices and values of tribes, LatinX, and other POC •Tribal, POC values and needs are reflected in ECOP strategies and resource distribution	•Core partners are participating in adaptive elements of strategic plan (reporting/adapting) •ECOP goals are clear and provide a long term vision, even as strategies and objectives shift
A1	A2	A3

INFLUENCE

Conduct outreach to planners, agencies, and the public to focus resources and shape policy in the oak landscape

FF 2, GR 3, RR 4, OV 3, REC 2, REC 3,

Planning outcomes, permitting, and policy advancements reflect value of oak systems	Funding for oak projects has increased	Partners responsible for policy and regulation have technical support and expanded capacity
•ECOP is participating in state wide oak FIP efforts •Outreach, messaging, and educational tools are in place to reach realtors, developers, ag producers , landowners, and other stakeholders	•Funding dedicated to forest health, climate resilience, and oak conservation is doubled in the oak geography	•Messaging developed for specific audiences •Funding capacity for ODFW and ODF expanded for consultations •Mitigation targets reflect TEK and best available science •Mandatory early consultation policies in place in all counties
I1	I2	I3

Figure 26: ECOP Desired Ecological Outcomes* 2020-2030

EAST CASCADES OAK PARTNERSHIP

Oak system diversity and extent persists

- Priority parcels are permanently protected from conversion E1
- Priority parcels are actively managed for ecological stewardship E2
- Function and condition of priority oak systems are stable or improving E3
- Mesic oak systems are released from conifer encroachment E4

The oak landscape is resilient to climate change

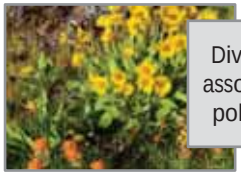
- Anchor habitats are connected by undeveloped land; BMPs are in place in corridors and buffers E5
- Anchor habitats are buffered along elevation & precipitation gradients to facilitate climate adaptation E6
- Emerging pests and novel plant communities are detected and considered in BMPs E7
- Research is underway to understand and respond to climate impacts in oak systems E8

Oak systems are resilient to disturbance events

- Increase in fire-adapted flora & fauna, stand structure & fuel loads E9
- Oak recruitment, snags & CWD are characteristic of successional state & historic fire return interval E10
- No substantial increase of invasive species following disturbance events E11
- Gaps and fire breaks in fuel loads and tree canopy are maintained as appropriate E12

Mature oak habitat features are retained & recruited

- Legacy oaks are identified and released from competition and fuel loading E13
- Limited mortality of mature oak during disturbance events/limited crown fire behavior E14
- Acorn production patterns do not change substantially – acorn production is stable or increasing E15
- Larger snags and trees with bole cavities and dead limbs persist through fire activity E16



Diverse native oak associated species & pollinators persist

- Intact understory plant communities are protected from disturbance and displacement E17
- Disturbed plant communities are stable or improving under ecological stewardship E18
- Native pollinator diversity is stable or improving E19
- Monitoring efforts for species diversity, or R,T and E species show favorable trends E20

Human interactions in the oak landscape are reciprocal

- Diversity of people (race, occupation, values) are engaged in ECOP strategy development & implementation. E21
- ECOP foundationally considers many ways of knowing land E22
- People in the oak landscape understand the value of oak systems & role of fire E23
- Stakeholders can identify and name oak-associated species E24
- BMPs are widely embraced and applied; concept of reciprocity is central to behavior E25
- Natural climate solutions implemented regionally include the oak landscape E26
- First foods and culturally important species persist E27
- Learning pathways have increased partner understanding of the oak landscape and associated species, as well as response to management E28

*Quantifiable objectives and metrics will be refined as we learn more through assessment, monitoring and research.

Additionally, we will develop community outcome metrics to measure important impacts on human use of and experience in the oak landscape. All of our metrics will be a combination of quantitative and qualitative, reflecting the importance of strategies that accomplish measurable results on the ground and that change hearts and minds.

Qualitative evaluation: The evaluation of some metrics will occur during ongoing community learning projects, through relationship building, during periodic formal stakeholder interviews, and with partner input.

Quantitative evaluation: We anticipate being able to detect measureable change for some metrics immediately, and others over decades. We will be working in complex ecological systems that are highly responsive to variables outside of our control; establishing causal relationships between our strategies and some desired outcomes may be prohibitively expensive. In these cases, the partnership will be looking to use landscape trends as indicators, to encourage academia to engage in research and monitoring in our region, and to improve efficiencies using existing monitoring or research efforts. We will also work to understand the land through lenses that measure outcomes differently than does the dominant culture (science-based conservation) most ECOP partners are part of. As we learn more, we will likely adapt or broaden our metrics to reflect this understanding.

Monitoring and Plan Adaptation Timeline

Informal plan adaptation: Every year, the steering committee will lead partners through an informal evaluation process at the ECOP annual meeting, reviewing the metrics planned for that particular year and evaluating progress against our broader goals. We'll invite feedback on what is and isn't working, make adjustments to implementation timelines or metric performance goals for possible revision.

Formal Plan Adaptation: At year four, ECOP partners will review results chains for any necessary revisions based on performance against metrics and make necessary adjustments to goals, strategies, and metrics. The process will be repeated at year 8.

Implementation Monitoring Timeline	
Timeframe	Implementation Metric
Annually	A1, A2, A3
Year 2	P1, L1, L2, L3, C3, C4, A1, I1, I3
Year 4	P2, P3, R1, R2, C1, C2, I2, I3
Year 8	P4, R3, R4, I3
Year 10	I3

Table 28: Timeline for implementation of metrics – Implementation Outcomes

Ecological Outcome Monitoring Timeline		
Timeframe	Quantitative Metric	Qualitative Metric
One time fixed	E8	
Annually	E15, E17, E21	E22
Biannually	E1, E2, E5, E6, E26	E28
5 year cycle	E7, E9, E10, E12, E19, E20, E27	E23, E24, E25
10 year cycle	E3, E4, E13, E17, E18, E25	
Following disturbance events	E3, E4, E11, E14,E16, E17	

Table 29: Timeline for implementation of metrics – Ecological Outcomes

Key Questions and Uncertainties

In 2013, the USFS published the "Oregon White Oak Restoration Strategy for National Forest System Lands East of the Cascade Range" (Devine, et al, 2013). The strategy provided an important first look at available literature in oak systems east of the Cascades, restoration opportunities, priorities, and approaches, as well as research and planning needs. The management decision-making tool included in the strategy suggested a 30 TPA (trees per acre) target for restoration in climax oak systems, generating significant concern among partners that this single target oversimplified desired future condition in the oak climax system types.

The 2013 strategy made recommendations for landscape scale planning, specifically stating comprehensive system maps were needed, a protocol for restoration prioritization, and connectivity between anchor habitats. It also recognized the need for site-scale restoration targets, the need for public outreach around specific restoration efforts, and a monitoring component to measure effectiveness of treatments. Key areas of research the strategy identified include genetic structure of E. Cascade oak populations, understory management and use of prescribed fire, density management in oak/pine stands, oak regeneration, and historical and potential extent of oak.

During strategic planning from 2017-2020, ECOP partners identified a slew of key management uncertainties and mapping needs that build off the USFS identified needs cited above. We prioritized these for monitoring and research and generated the following top priorities:

- What was the historic extent of oak systems across the ecoregion? Potential extent?
- What was the historic condition and fire frequency in different oak systems pre-European contact?

- What are the primary indicators of functional, intact oak systems?
- How will climate change impact ecological processes and species assemblages in the oak landscape?
- What stand conditions in oak systems promote fire resilience and lower risk of catastrophic fire?
- How does prescribed fire/climate change impact wildfire behavior/smoke and carbon budgets?
- How does management impact oak successional processes, stand structure, and habitat features?
- How does management impact listed, priority, & culturally important oak-associated species?
- What role does fire behavior and intensity play in habitat feature development?
- Where did fire refugia historically occur in the landscape?
- Are oak trees more susceptible to disease or insects following disturbance/management?
- Has fire suppression led to higher density oaks of common age?
- What role does stump sprouting play in oak succession? Habitat development?
- How does grazing intensity/duration/timing impact condition of oak systems?
- What effect does removal of grazing have on understory plant communities and fuel loads?
- What are the carbon budgets of annual grass dominated vs native bunch grass dominated stands?

Existing Monitoring and Research Efforts

ECOP is currently contracting with Institute for Applied Ecology in partnership with Oregon Department of Forestry and the USFS to develop a monitoring tool specific to East Cascade Oak Systems that will help us understand oak system response to disturbance events, including wildfire, prescribed fire, thinning, release, and fuels reduction. This tool will allow partners to measure response to management and adapt our approach accordingly.

The Washington Department of Natural Resources Natural Heritage Program is also contracted with ECOP to develop a classification and rapid assessment tool that will help ECOP partners assess current condition of oak systems and prioritize projects within ECOP's priority geographies at the parcel and stand scales for land protection and stewardship strategies.

Table 30 on page 96 outlines monitoring & research efforts currently underway in E. Cascades oak systems.

Communicating Progress

Informal adaptations to the plan and progress against metrics will be reported to ECOP partners through our formal meetings annually. These informal evaluations will also be useful in reporting back to key stakeholders and funders, though the more intensive formal plan adaptation at years 4 and 8 will provide the most robust evaluation of how ECOP is performing against its conservation goals. Partners understand their role in monitoring and reporting, as outlined in the declaration of cooperation, and their participation will be coordinated by ECOP-dedicated staff at Columbia Land Trust, ECOP's fiscal and administrative sponsor.

	ECOP DEVELOPED TOOLS	GIS oak system model	Oak prioritization model	Disturbance monitoring protocols	ECOP Rapid Assessment Tool	ECOP Site Level Assessment Tool	BMP Development Tool	ECOP PARTNER TOOLS	STATE	DNR Natural Heritage EIA	DNR Forest Health Rx Fire Monitoring Protocol	Oak Mitigation Assessment Tool (WDFW)	Western gray squirrel nest surveys (WDFW protocol)	PRIVATE/ACADEMIA	Proposed NEON Observatory Network (NSF)	Stump Sprout Monitoring (Columbia Land Trust	Grazing impacts on seedling establishment (Columbia Land Trust)	Oak Mitigation Assessment Tool (Oak Accords)	University of Washington Rare Care	Audubon Christmas bird count	FEDERAL	RAVG (USFS)	First Order Fire Effects Monitoring (FOFEM - USFS)	USFS Acorn Monitoring Protocol	US National Vegetation Classification (USNVC)	Potential Natural Vegetation (PNV)
CLASSIFICATION, MAPPING, MODELING, & PRIORITIZATION																										
Classification of oak systems		X		X	X	X	X			X															X	
Ground-truthing oak system model/map				X	X					X																
Ground-truthing oak prioritization model				X	X	X				X																
Modeling effects of disturbance events, climate, or management																							X			
Prioritizing geographies for landscape scale processes		X	X																							
Prioritizing parcels for strategy implementation			X		X																					
Prioritizing stands for strategy implementation					X	X				X																
Identifying appropriate mitigation sites, planning & policy boundaries			X		X	X						X						X	X	X						
ASSESSMENT OF CONDITION																										
Assessment of current condition				X	X	X	X			X																
Assessment of current condition against historic condition						X				X																
Assessment of current condition against desired future condition				X			X			X						X										
Assessment of readiness for prescribed fire																										
EFFECTIVENESS AND CHANGE DETECTION ANALYSIS																										
Measuring system response to management or wildfire				X							X				X			X				X				
Measuring system response to climate change				?											X											
Evaluating effectiveness of treatment against management goals				X			X				X					X										
LANDSCAPE ASSESSMENT and DISTURBANCE EVENTS																										
Fire history and dendrochronology																										
Assessment of fire severity and/or extent				X							X											X				
Assessment of impacts due to climate change @ system level										X																
Assessment of climate budgets, abiotic factors															X											
SPECIES OR HABITAT FEATURE MONITORING																										
Presence/Absence Surveys										X			X		X					X						
Species response to management or disturbance events													X				X									
Population or production surveys or counts										X										X				X		

Table 30: Existing Oak Monitoring and Research Efforts

Sustainability and Funding

We believe sustainability is about being relevant, efficient, effective, and staying true to our values.

East Cascades Oak Partnership cares about people and oaks, and we see the relationships between them as integral to conservation success. Implementing conservation strategies that are responsive to the needs and interests of the people who interact with them ensures we remain relevant. This is why we built our plan around human interactions in the oak landscape. Strong alignment around our mission and vision ensure that while we are adaptive within shifting ecological and social contexts, we are also strategic and efficient in the implementation of strategies we feel will be most effective in accomplishing our shared goals.

Columbia Land Trust and Pacific Birds joined forces in 2017 to explore the feasibility of a partnership after hearing a desire for collaboration and leadership from partners during a community event. Partners responded with enthusiasm and sustained that enthusiasm over the subsequent three year planning period. While COVID-19 introduced logistical and economic challenges that threatened to curtail our progress in 2020, we've continued to have the same engagement by partners remotely. Columbia Land Trust has demonstrated considerable support for the partnership in its on-going financial and administrative support of ECOP-dedicated staff, and has included ECOP in its 2020 Conservation Agenda as an example of how it hopes to implement conservation across Columbia Land Trust's service area over the next four years. Pacific Birds has provided contributions to Columbia Land Trust annually for operational funding and as match against implementation grants, formally recognized the importance of partnerships in "Prairie, Oaks and People – a Conservation Business Plan", and has indicated a strong commitment to the success of ECOP. Strong support from other partnering land trusts and agencies has engendered repeated support from foundations and organizations dedicated to conservation, including most importantly the Oregon Watershed Enhancement Board, who's Focused Investment Partnership Program catalyzed the growth of ECOP in 2017.

Columbia Land Trust and Pacific Birds are just two organizations in a landscape of committed and capable oak conservation partners. While ECOP started as an initiative of Columbia Land Trust with support from Pacific Birds, we are actively working to vest ownership of ECOP with the steering committee. The Steering Committee recently developed ECOP's logo and a guidance document that outlines the decision-making process and authorities for people and organizations participating in ECOP, and gives the partners the authority over fiscal and administrative sponsorship. These tools help provide clarity and guidance to the steering committee and ensure the partnership can survive partner transitions or sudden changes in capacity or funding.

As the partnership grows more practiced in the implementation of partner-driven priority strategies, we believe ECOP will become and remain indispensable to partners.

Funding

Our opportunity to engage in innovative or ambitious new strategies hinges on our ability to secure funding. We have compelling stories to tell about how our work can improve ecological outcomes while addressing important community needs. This strategic plan, paired with the 2020 ECOP Financial Plan, are powerful tools to help drive necessary fundraising.

In 2019, the ECOP steering committee enlisted local consultant Sandi Scheinberg to identify potential funding mechanisms for priority strategies in our strategic plan. Scheinberg's report was completed in March of 2020. On a similar timeframe, ECOP worked collaboratively with other OWEB-supported oak partnerships

across the state of Oregon to complete a statewide funding strategy for strategies identified as "cross cutting," or those shared statewide. The results of that effort were made available in April 2020.

Both of the financial planning efforts were completed prior to the very significant economic impacts from Covid-19. The ECOP Financial Plan[19] combines relevant portions of both into one document and considers the changes that are likely to slow or shift the funding environment in response to our current economic crisis, forecasted to endure for at least several more years. We also reflect on our recent success during this crisis to secure small grants that continue moving the partnership's priority actions forward.

ECOP also produced a large and sprawling spreadsheet that outlines the many grant opportunities that could potentially fund different strategies in our plan. The spreadsheet details the source, program description or funder focus, how to apply, when to apply, funding range, relevant links or contacts for each source, the geography in which the program operates, and the ECOP strategies that may be eligible for funding. It is an unwieldy trove of information, so we are including here a summary list of the sources we identified and the strategies that might relate:

Funder	Related Strategy or Interaction
OWEB Oregon Ag Heritage Program	Ecological stewardship fire suppression & conifer encroachment
OR -ODFW / Access & Habitat Grant	Ecological stewardship
Oregon Wildlife Foundation	Monitoring, ecological stewardship
OWEB / State and Regional FIP Implementation Grants	Partnership operations and all strategy implementation in Oregon
OWEB / Technical Assistance / Capacity Grants	Partnership operations in Oregon, not restricted to FIP
National Fish and Wildlife Foundation	Fire suppression and conifer encroachment, wildfire, climate resilience
99 Girlfriends	Local conservation for species
Brainerd	Unknown
Burning Foundation	Biodiversity and quiet remote recreation
Center for National Lands Management	Best management practices
Conservation Alliance	Land protection campaigns
Conservation Finance Alliance - Natural Climate Solutions	Natural climate solutions accelerator
Cornell Land Trust Bird Conservation Initiative	Bird conservation on private lands

[19] ECOP Financial Plan (2020) is available upon request to Columbia Land Trust

Fund for Wild Nature	Citizen science, litigation, advocacy
Giles Mead Foundation	Environment w/unknown emphasis
Harder Foundation	Environment w/variable emphasis
Hewlett Foundation	TBD
Jubitz Foundation	Grassroots habitat restoration
Land Trust Alliance Advance Conservation Excellence (ACE)	Priority support for land trusts
Lazar Foundation	TBD
Meyer Memorial Trust	Equitable conservation
National Forest Foundation	Holistic forest management
Network for Landscape Conservation / Funded by Hewlett and Doris Duke	Landscape scale conservation and indigenous-led conservation
Northwest Ecological Research Institute (NERI) / McGowan Grant	Neglected corners and niches of ecology
Oregon Community Foundation / PNW Resilient Landscapes Initiative / Community Grant Program	Columbia River Gorge conservation
Oregon Zoo	Species recovery, biodiversity
Pacific Birds	Coalition building, partnerships
Packard Foundation	Sustainable grazing/agriculture research, conservation
Patagonia	Action-oriented grassroots efforts off the beaten track
Temper of the Times Foundation	Advertising and outreach
Western Forestry Leadership Coalition	Landscape-scale restoration on private lands, collaboration with agencies/tribes
Wilburforce	Protect & connect wildlife habitat
Wildlife Conservation Society / Climate Adaptation Fund	Science-driven restoration to improve climate resilience
USDA/Dept of Int (BLM)	Federal funds to state agencies for priority work
USDA/NRCS / RCPP & EQIP	Advance NRCS priorities – oak and fire
USDA/NRCS/ Cost Share and Technical Assistance Grants	Rural residential, fire suppression and fir encroachment in the WUI
USDA/NRCS/ Joint Chiefs Landscape Restoration Partnership	Fire suppression and conifer encroachment

USDA/Retained Receipts Monies from Stewardship Contracting	Fire suppression and conifer encroachment
USFS / Collaborative Forest Landscape Restoration Program (CFLRP)	Fire suppression and conifer encroachment
USFWS - Partners for Fish & Wildlife Program (Partners Program)	Ecological stewardship
WA - DNR / All Lands Forest Restoration Grant Program	Fire suppression and conifer encroachment
WA - DNR / Cost Share Program	Fire suppression and conifer encroachment; Ecological Stewardship
WA - DNR / Forest Stewardship Program	Fire suppression and conifer encroachment
WA - DNR / Natural Areas Program	Ecological stewardship
WA Recreation & Conservation Office (RCO)	Ecological stewardship, fire suppression and conifer encroachment
WDFW - Aquatic Lands Enhancement Account	Ecological stewardship
WDFW - Habitat and Access Program	Ecological stewardship
WDFW - Lands 2020 Grants	Ecological stewardship
Western Forestry Leadership Coalition / 2020 Landscape Scale Restoration Competitive Grant Program	Rural residential, fire suppression and conifer encroachment

Table 31: Potential sources of funding for ECOP

The success of ECOP will depend on sustained partner interest, allocation of time and resources, and our ability to understand and respond to the ecological and social challenges in our region. Partners continue to creatively collaborate, generate and debate ideas, and make forward progress on strategy implementation. If the seeds of our success are anything like acorns, we are poised to grow into one impressive oak partnership.

Certifications

The following organizations have signed on to the ECOP Declaration of Cooperation, which reads:

"As East Cascades Oak Partnership Core Partners, we commit to on-going investment in the mission and values of ECOP and implementation of this Strategic Action Plan, including regular attendance at partnership meetings or events, and participation in joint ECOP projects as applicable by contributing time, expertise, and/or financial resources."

Columbia Land Trust
Columbia River Gorge Commission
Confederated Tribes of the Warm Springs*
Deschutes Land Trust
Ekone Ranch/Sacred Earth Foundation
Friends of the Gorge Land Trust
Oregon Department of Fish and Wildlife
Oregon Department of Forestry
Oregon Parks & Recreation Department
Pacific Birds
The Dalles Watershed Council
Underwood Conservation District
USFS - Columbia River Gorge Nat. Scenic Area
WA Department of Fish and Wildlife
WA Department of Natural Resources
Wasco Soil and Water Conservation District
Yakama Nation*

* According to the terms of our Declaration of Cooperation, tribes are not required to sign a formal partnership agreement to participate, but may do so. The Yakama Nation signed the ECOP Declaration of Cooperation in 2017, and the Confederated Tribes of the Warm Springs staff participated In ECOP until staffing challenges in 2018. Covid-19 related challenges delayed the re-engagement of CTWS, and a re-orientation meeting is planned for spring 2021, should the COVID situation allow.

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APPENDIX A: ACKNOWLEDGEMENTS

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The **Oregon Watershed Enhancement Board** provided Focused Investment Partnership funding that propelled the East Cascades Oak Partnership from concept to functional partnership. We are grateful for their investment!

Columbia Land Trust convened partners in 2015 to explore conservation priorities in the East Cascades. Following that event, **Pacific Birds** provided seed money to Columbia Land Trust to explore the feasibility of a partnership. Columbia Land Trust and Pacific Bird's leadership and continued investment has transformed ECOP from idea to reality.

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Central and Eastern Klickitat Conservation Districts
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Columbia River Gorge Commission
Confederated Tribes of Warm Springs
Deschutes Land Trust
Ekone White Eagle Preserve
Friends of the Columbia Gorge Land Trust
Hood River Soil and Water Conservation District
Hood River Watershed Group
Humbleroots Nursery
Institute for Applied Ecology
Klickitat County
Mosier Watershed Council
Mount Adams Resource Stewards
Natural Resources Conservation Service
Oaks and Eagle Foundation
Oregon Department of Fish and Wildlife
Oregon Department of Forestry
Oregon State Parks
Oregon State University
Oregon State University Extension
Oregon Wildlife Foundation
Pacific Birds Habitat Joint Venture
Sandy River Basin Watershed Council
The Nature Conservancy
Underwood Conservation District
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Bob Altman	American Bird Conservancy
Bob Hansen	Institute for Applied Ecology
Brian Reel	Oregon Department of Forestry
Bruce Taylor	Pacific Birds
Bryce Guske	Columbia River Gorge Commission
Cheryl Mack	Retired USFS Archeologist
Chris Rombough	Rombough Herpetological
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Daphne Stone	Northwest Lichenologists
David Peter	Retired - USFS PNW Research Station
Emma Pelton	Xerces Society
Jacob Anderson	Klickitat County Natural Resources
Jay McLaughlin	Mt Adams Resource Stewards
Jeremy Thompson	OR Department of Fish and Wildlife
Jessica Olson	Columbia River Gorge Commission
Jim Sizemore	Klickitat Co. Commissioner / Sizemore Ranch
John Christy	Oregon Natural Heritage Program
John Dodd	USFS retired soil scientist
Julia Micalak	PhD candidate University of Washington

Stakeholders Interviewed by ECOP:

Alan Busacca	Vintner / Geologsit
Alexis Poullon	Vintner
Andrea Berkley	Oregon State Parks and Recreation
Blain Johnson	Rancher
Dan Morrison	Retired Klickitat Wildlife Area Manager
Dan Richardson	Underwood Conservation District
Daniel Dancer	Land Developer / Artist
Darryl Joannadies	Vintner
David Spangler	Oregon State Parks and Recreation
Glen Ahrens	Oregon State University Extension Forester
Jay McLaughlin	Mount Adams Resource Stewards
Jason Blain	Rancher
Jeff Kozma	Yakama Nation TFW
Jeremy Grose	SDS Lumber Company
Jeremy Thompson	Oregon Department of Fish and Wildlife
Jessica Olson	Columbia River Gorge Commission
Jim Sizemore	Owner / Operator Sizemore Ranch
Jim White	Mount Adams Resource Stewards
Justin Rotherham	Mazamas
Kelly Kreps	Owner / Operator Kreps Ranch (hay boss)
Kelly Wallis	TNC Tom McCall Preserve
Keyner Bugner	Washington DNR Natural Areas Program
Kristin Curren and Drew Merritt	Humble Roots Nursery

APPENDIX A: ACKNOWLEDGEMENTS

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Matt VanderHaegen	WA Dept. of Fish and Wildlife
Matthew Reilly	Post Doc Humbolt State University
Mel Gard	Oregon Department of Forestry
Nate Keyser	Owner / Operator Keyser Ranch
Nick Kraemer	Planner / Consultant to local municipalities
Rainer Hummel	WA Dept. of Natural Resources
Robert Warren	Bonneville Environmental Foundation
Roland Rose	USFS Columbia River Gorge Scenic Area
Sergio Peredes	NRCS
Susan Van Leuven	WA Dept. of Fish and Wildlife
Todd Jacobson	WA Dept. of Fish and Wildlife
Tom Kaye	Institute for Applied Ecology

Stakeholders Interviewed (continued):

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Lauren Kolojejckick-Kotch	Columbia Gorge Tourism Alliance
Lorelei Haukenss	USFS Columbia Gorge
Matt Chiles	Owner / Operator Horseshoe Bend Ranch
Maui Meyer	Urban Realtor / Broker and Developer
Mimi Casteel	Vintner
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Neil Keyser	Rancher
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Pat Davis	Rancher, Watershed Council Chairman
Pat Dudley	Vintner
Patrick Schultz	WSU Extension
Paul Jones	Wyeast Timber Services, LLC
Roland Rose	USFS Fire Fuels Planner and Batallion Chief
Sarah Reif	ODFW Energy Coordinator
Steve Dunn	Hood River Area Trail Stewards (HRATS)
Tony Gilmer	Klickitat Fire District 3
Angie Brewer	Director - Wasco County Planning

Other Contributors:

Dr. Timothy Babalis	Landscape History of Oregon White Oak Woodlands East of the Cascades
Dr. Ayn Shlisky	Illustrations for strategic plan
Becky Brun and Sandi Scheinberg	ECOP Communications Assessment
Sandi Scheinberg	ECOP Financial Analysis
Melissa Delzio and Mandi Middlestetter	ECOP logo and strategic plan summary design
Tanner Scrivens and Mitch Attig	GIS mapping and analysis
Jimmy Kagan	GIS mapping technical support and data access
Matt Stevens - CoreGIS	GIS mapping technical support and data access
Mary Bushman	ECOP Coordinator
Lindsay Cornelius	ECOP Manager

APPENDIX B: Photo Credits

THANK YOU, CONTRIBUTORS!

Photo Log

Photos that appear in our strategic plan that are not attributed here were taken by Columbia Land Trust staff.

Photo #	Page #	Brief Description	Photographer
N/A	4	Oak woodland in fall sun	Doug Gorsline
N/A	10	Acorn and oak leaf close-up	Paloma Ayala
N/A	13	Hex graphic: wildland firefighter	Doug Gorsline?
N/A	13	Hex graphic: oaks with balsamroot	Doug Gorsline?
N/A	13	Hex graphic: western gray squirrel kits	Theo Anderson
N/A	13	Hex graphic: fall oaks	Lynn Weissenfels
N/A	13	Hex graphic: balsmaroot and car	Doug Gorsline
N/A	13	Hex graphic: grass widows	Doug Gorsline
N/A	13	Hex graphic: fence lizard	Doug Gorsline
N/A	18	Landscape photo of Klickitat River	Doug Gorsline
N/A	19	Steamship on the Columbia	Carleton Watkins Collection
N/A	24	gnarly oak (bottom, center right)	Doug Gorsline
5	25	Prescribed fire in mixed oak conifer understory	Roland Rose
10	26	Oak cut down at USFS trailhead at Lyle, WA	Barbara Robinson
11	26	Medusahead grass infestation USFS Mt. Hood	Christina Mead
13	27	Krumholtz oak	Barbara Robinson
14	27	Oak cavity	Lynn Weissenfels
15	27	Western gray squirrel kits	Theo Anderson
16	27	Furroughed oak bark	Daphne Stone
22	28	Gall wasp - Besbicus mirabilis	Doug Gorsline
N/A	27	open grown oak with dropped limb, top photo	Lynn Weissenfels
N/A	35	Priority habitats and species - Lewis' woodpecker	John Davis
N/A	35	Priority habitats and species - Striped whipsnake	Chris Rombough
N/A	35	Priority habitats and species - Suksforf's lomatium	Kathryn Beck
N/A	43	Ecological outcomes - Deer	Brian Chambers
N/A	43	Ecological outcomes - thicket hairstreak on buckwheat flower	Doug Gorsline
N/A	43	Ecological Outcomes - fence lizard	Doug Gorsline
N/A	44	Human Interactions - woodland firefighter	Doug Gorsline
N/A	44	Human Interactions - vineyard	Robin Dobson
N/A	49	Rural Residential Development - deer and house	Brian Chambers
N/A	49	Rural Residential Development - woodland firefighters	Doug Gorsline
N/A	58	Fire - prescribed fire in mixed conifer/oak woodland	Roland Rose
N/A	58	Fire - fire with oak leaves	Rollin Bannow
N/A	63	Opportunity for Change - woman with fir log	Paloma Ayala
N/A	72	Rancher herding cattle in Simcoe Mountains	Gabriel Olson
N/A	74	Ecological Stewardship - woman planting oak	Doug Gorsline
N/A	80	Recreation - woman biking	Sandi Scheinberg

APPENDIX B: Photo Credits

N/A	88	Orchard and Vineyard strategy table - photo of vines	Robin Dobson
N/A	86	Theory of Change - prescribed fire	Roland Rose
N/A	86	Theory of Change - Rancher	Gabriel Olson
N/A	86	Theory of Change - oak and balsamroot	Brian Chambers
N/A	86	Theory of Change - western gray squirrel kits	Theo Anderson

EAST CASCADES OAK PARTNERSHIP

May 2020 – December 2030

PURPOSE

Oak systems in the East Cascade ecoregion represent some of the most important and beloved habitats in the Pacific Northwest with high levels of biodiversity and predicted climate resilience. Participating partners of the East Cascades Oak Partnership[1] (ECOP) believe we can accomplish long-term, higher-impact conservation through collaboration. ECOP serves as a vehicle for collective action and coordination among participating partners working to advance shared priorities.

PARTIES AND MUTUAL BENEFIT

Each partner to this Declaration assumes a role in helping to ensure functional oak systems persist across the East Cascades ecoregion. Partners assist with the implementation and adaptation of the ECOP Strategic Action Plan to improve the efficiency and effectiveness of conservation investments. Partners acknowledge this work may include traditional conservation strategies like land protection and habitat enhancement, as well as outreach, education, policy, cultivation of new funding sources, research and monitoring. Partners agree to support each other in implementing and adapting the ECOP Strategic Plan to improve the efficiency and effectiveness of conservation investments.

ECOP VISION

Oak systems are abundant, diverse, and healthy, supporting rich biodiversity and human uses for generations to come.

ECOP MISSION

We empower people to make decisions and take actions that improve outcomes for Oregon white oak systems.

SCOPE

ECOP's service area is defined by the extent of Oregon white oak in the East Cascades ecoregion from the Yakama Nation Indian Reservation to the north and the Warm Springs Indian Reservation to the south, the Cascade Mountains to the west, and the shrub steppe of the Columbia Plateau to the east.

SERVICES

ECOP can provide participants with a host of benefits, including the following:

[1] The East Cascades Oak Partnership ("ECOP") does not use the terms "partnership" and "partner" in the legal sense. ECOP is not a partnership under either Oregon or Washington law. Instead, it is a cooperative arrangement among separate legal entities.

- Well-vetted, highly strategic priorities supported by a broad alliance of partners and stakeholders
- Networking, partnership, and collaboration opportunities
- Improved access to expertise, data, resources, and learning opportunities
- Technical resources, expert and peer review and input, and outreach
- Leveraged funding
- Credibility and visibility, expanded reach and impact
- Improved understanding of diverse values and people's relationships with land

EXPECTATIONS FOR PARTNER ENGAGEMENT

Members are individuals, businesses, organizations, or entities who participate in ECOP meetings and events. Members make important contributions to the planning process and may participate in working groups to advance ECOP goals.

Core Partners are businesses, organizations, or entities who formally adopt the Declaration of Cooperation, who participate in ECOP decision-making, and who are organizationally invested in the implementation of strategies. With the exception of sovereign tribal governments, core partners must formally sign on to this agreement. Tribes may participate as core partners in the spirit of this agreement. All partner involvement is voluntary, and participation is contingent on compliance with operating principles outlined in ECOP's governance document. This declaration in no way restricts any member from participating in similar activities with other public and private agencies, organizations or individuals, nor does it bind partners to any financial arrangement or funding obligation. Core partners may commit to providing match for specific grants or financial support for ECOP. Commitments are obligatory in good faith, or as indicated by any grant-related project commitments or contracts made by the core partner during project implementation. Core partners understand that any projects described as part of an OWEB FIP Implementation Grant Initiative will not be candidates for other OWEB funding categories for the duration of the FIP Implementation Grant.

The ***administrative sponsor*** is the core partner responsible for ECOP's administrative business and coordination and serves for a 5 year, renewable term. The current administrative sponsor serving from 2020-2025 is Columbia Land Trust.

The ***steering committee*** is responsible for governance of the partnership, as described in ECOP's governance document, including allocation and use of implementation funding secured by ECOP's fiscal or administrative sponsor on behalf of the partnership. The fiscal sponsor has discretion over funding requests and expenditures directly related to ECOP administration, including indirect costs, basic operating costs, and reimbursement rates of ECOP-dedicated staff.

Working groups are tools we use to advance ECOP priorities, particularly where a lead partner needs substantial input and support from other core partners. Any core partner may make a request to the steering committee for the formation of a working group. Working groups may have the support of paid ECOP-dedicated staff for coordination and facilitation. Determination of such support will be made by the administrative sponsor.

Partners agree to clearly communicate about the work each of us is doing in oak systems, and we intend to leverage the work each of us does in the oak landscape to accomplish more together. For more detail about the decision-making processes and governance mechanisms, please see the attached 1) ECOP Governance Document, and 2) ECOP Organizational Structure and Authorities chart.

Decision-Making

Decisions will be made by consensus ideally and by consent when necessary. Consensus focuses on personal preferences of partners and looks for 100% agreement, while consent focuses on what partners can live with and looks for no substantial objection.

If consent cannot be achieved, the steering committee will make a decision by supermajority vote (60%). In these instances, the steering committee must have a quorum to hold the vote.

DECLARATION

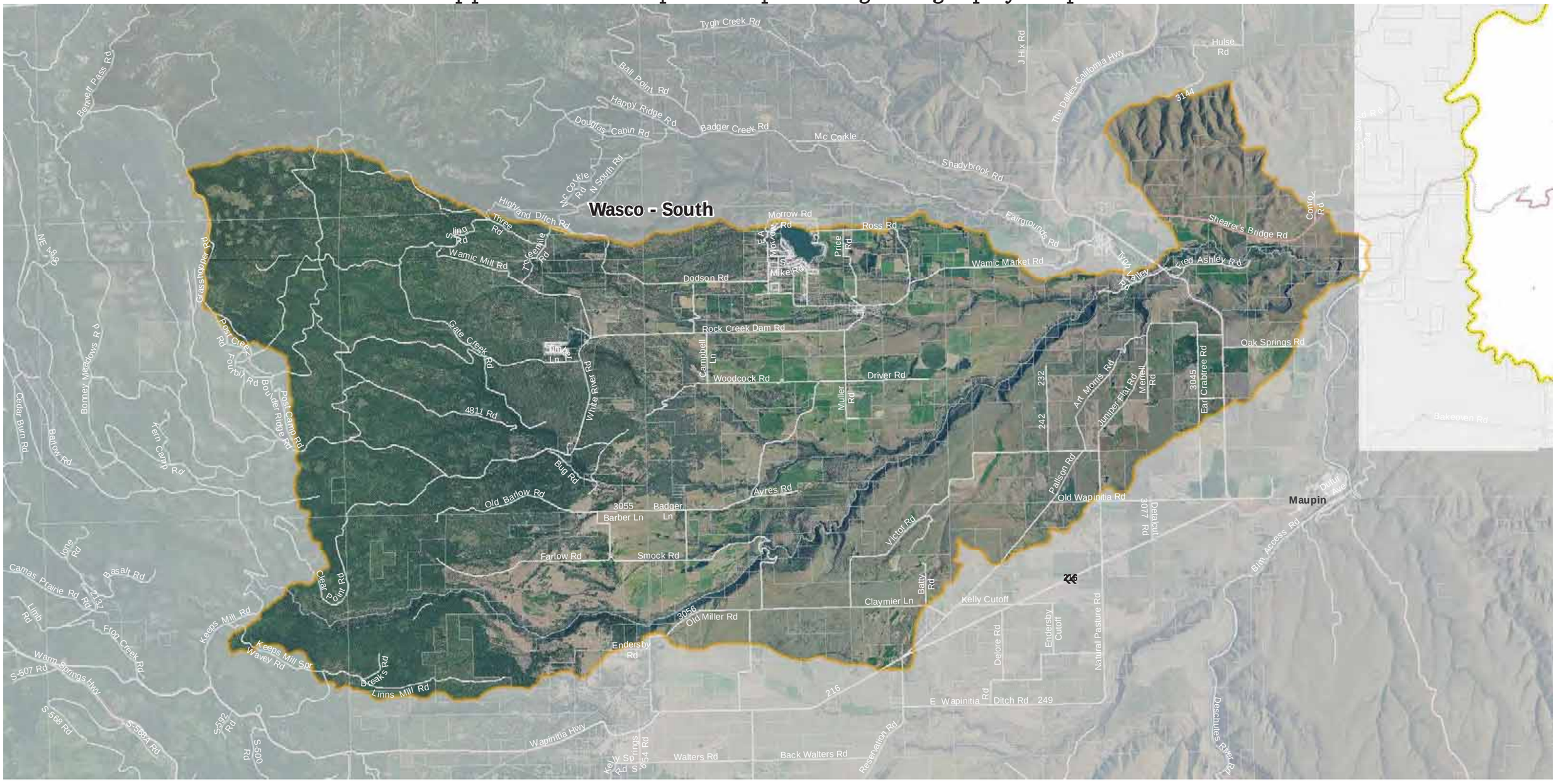
As East Cascades Oak Partnership Core Partners, we commit to on-going investment in the mission and values of ECOP and implementation of its Strategic Action Plan, including regular attendance at partnership meetings or events, and participation in joint ECOP projects as applicable by contributing time, expertise, and/or financial resources.

_____ _____
Signature Date

Print Name and Title: _____ Organization:_____

ORGANIZATION POINT OF CONTACT FOR ECOP BUSINESS: _____
Name, Position

_____
Email Phone #



Aerial Map

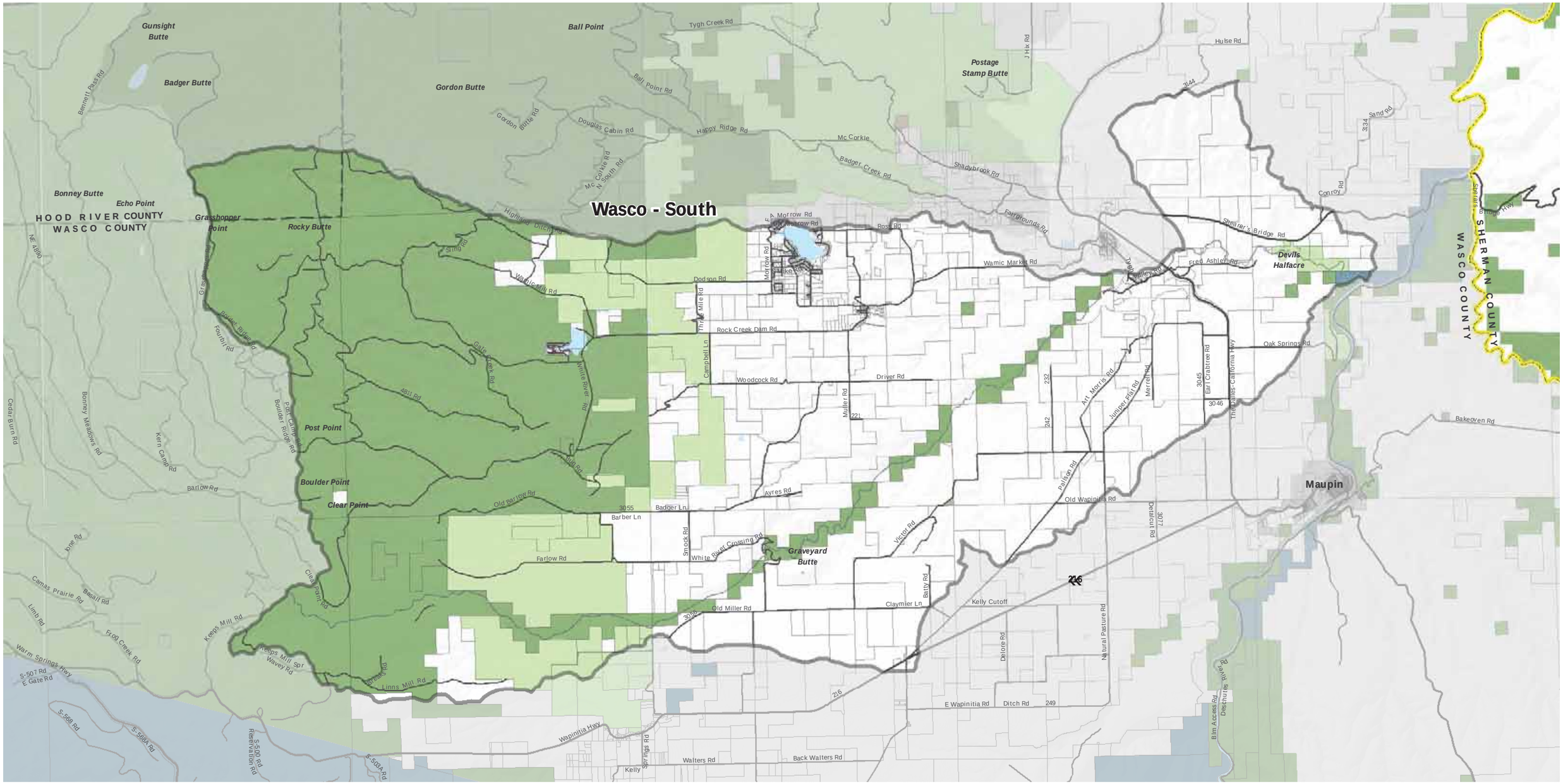
Wasco - South

- East Cascade Oak Partnership Focus Area
- Sub Planning Areas v1 (DRAFT)
- Taxlots
- Local Roads
- Interstates
- Highways

N

0 0.375 0.75 1.5 Miles

Map Date: 10 / 7 / 2019
Maps By Columbia Land Trust
Data Sources: USGS, TIGER, ESRI, NAIP
Document Name: basemap - aerial



Protected Lands

East Cascade Oak Partnership Focus Area

Sub Planning Areas v1 (DRAFT)

Land Ownership

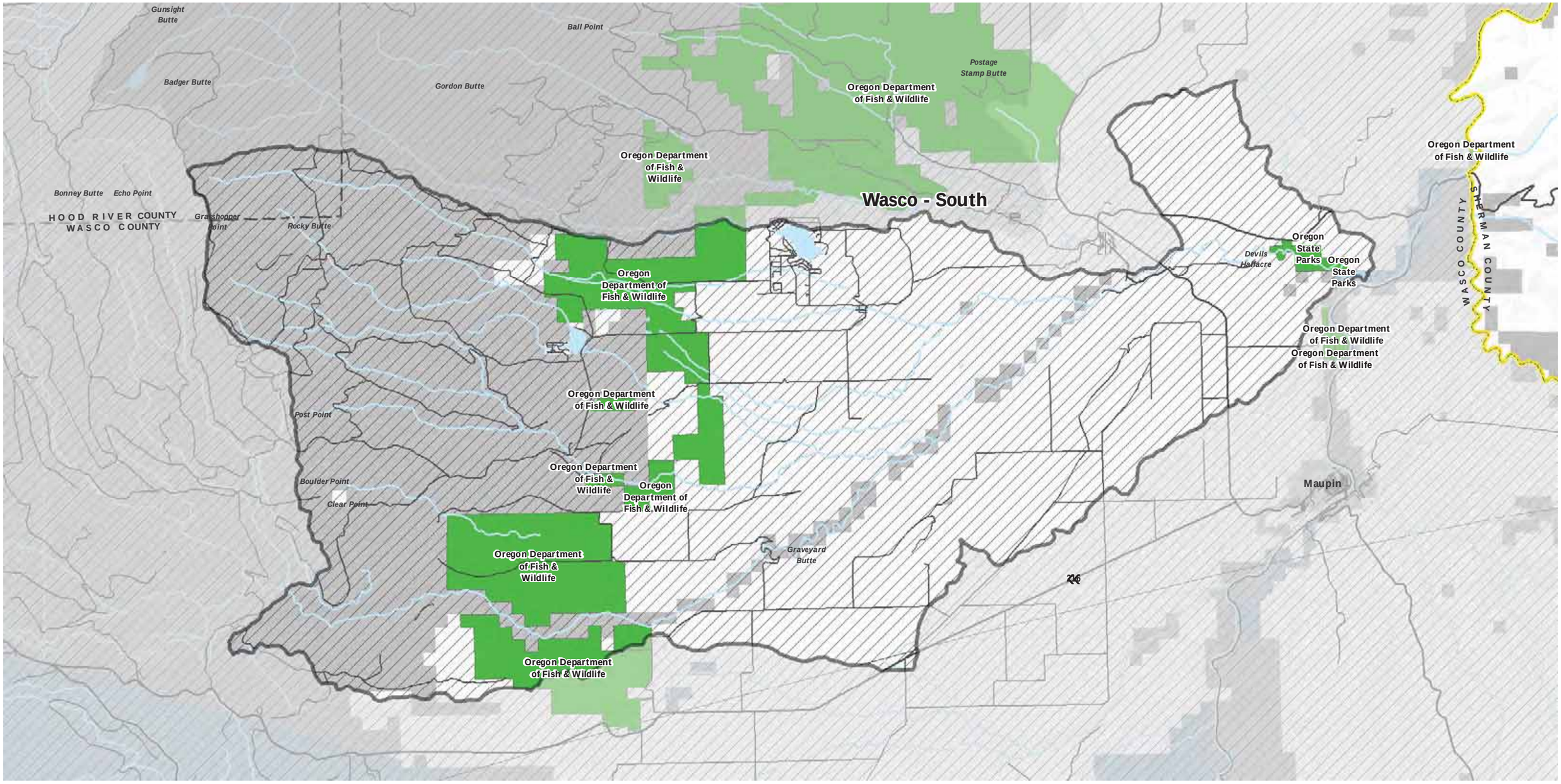
- Federal Government
- State Government
- Tribal Government
- Local Government
- Private

Wasco - South

N

0 0.375 0.75 1.5 Miles

Map Date: 10/7/2019
Maps By Columbia Land Trust
Data Sources: USGS, TIGER, ESRI, GNN, ODF, DNR, TNC
Document Name: basemap - public lands



Conservation Partners

Wasco - South

- East Cascade Oak Partnership Focus Area
- Sub Planning Areas v1 (DRAFT)
- Protected Lands (Public & Private)
- Tribal Lands

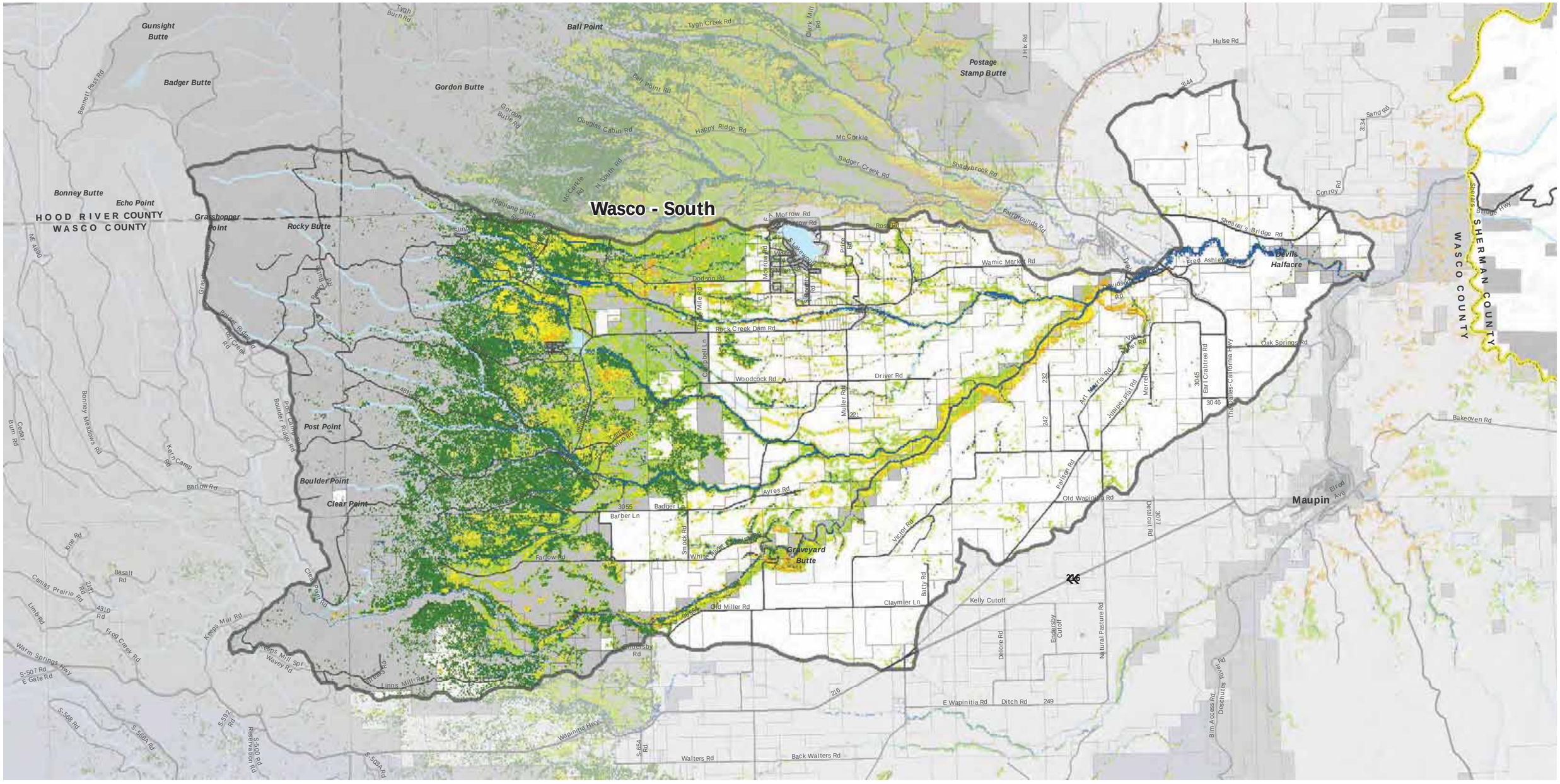
ECOP Conservation Partners

- Service Areas
- Managed Lands

N

0 0.375 0.75 1.5 Miles

Map Date: 10/7/2019
Maps By Columbia Land Trust
Data Sources: USGS, TIGER, ESRI, GNN, ODF, DNR, TNC
Document Name: basemap - partner areas



Oak Types

Wasco - South

- East Cascade Oak Partnership Focus Area
- Sub Planning Areas v1 (DRAFT)

Land Ownership

- Protected Lands (Public & Private)
- Tribal Lands

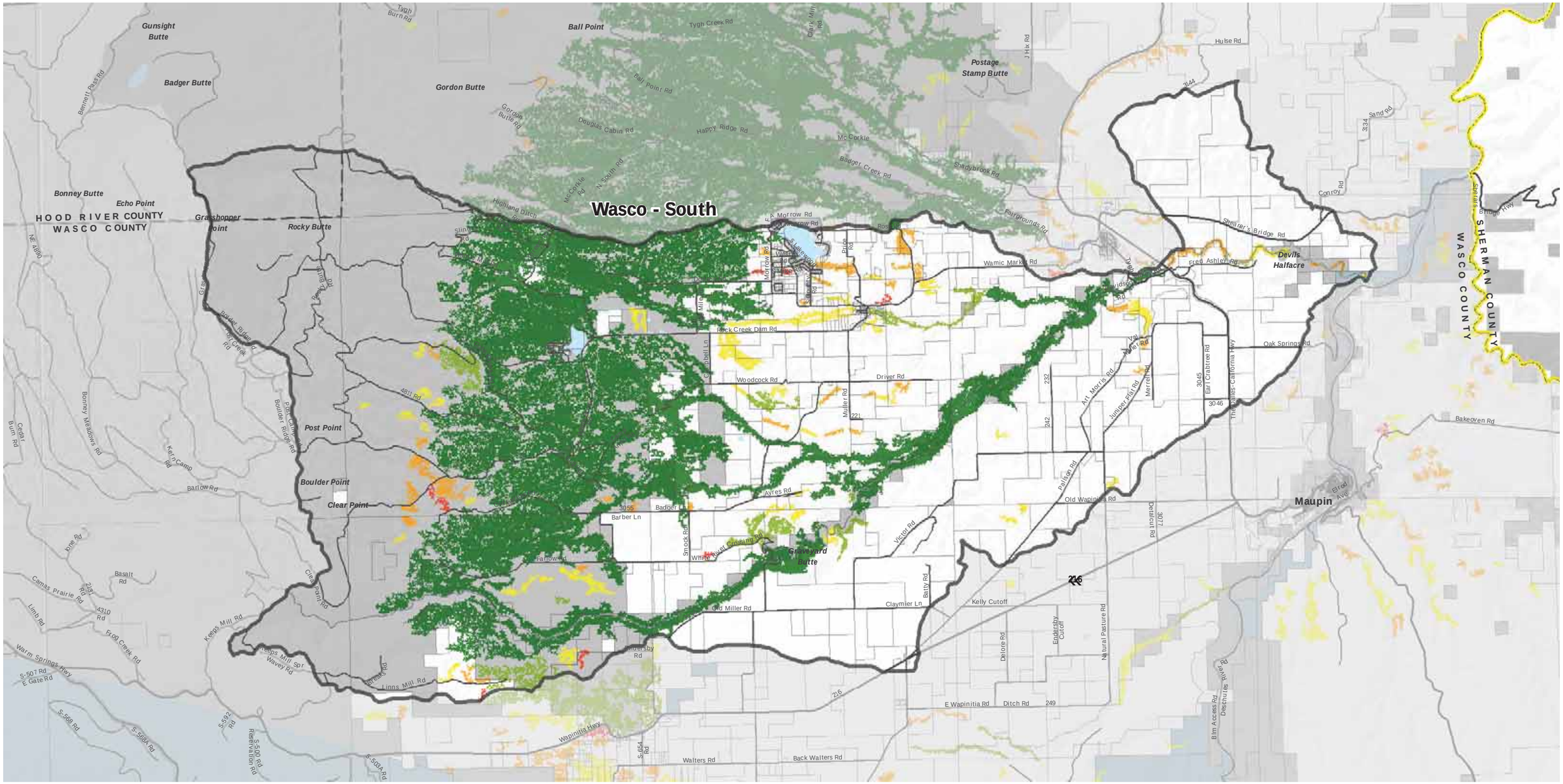
East Cascade Oak Partnership - Oak Types

- Oak Savannah & Open Woodlands
- Oak Woodlands (Closed)
- Oak Forest
- Oak-Conifer Forest & Woodlands
- Forests With Oak (Non Target)
- Riparian

N

0 0.375 0.75 1.5 Miles

Map Date: 10 / 7 / 2019
Maps By Columbia Land Trust
Data Sources: USGS, TIGER, ESRI, GNN, ODF, DNR, TNC
Document Name: basemap - oak type



Oak Prioritization Model v4

Wasco - South

- East Cascade Oak Partnership Focus Area
- Sub Planning Areas v1 (DRAFT)
- Protected Lands (Public & Private)
- Tribal Lands

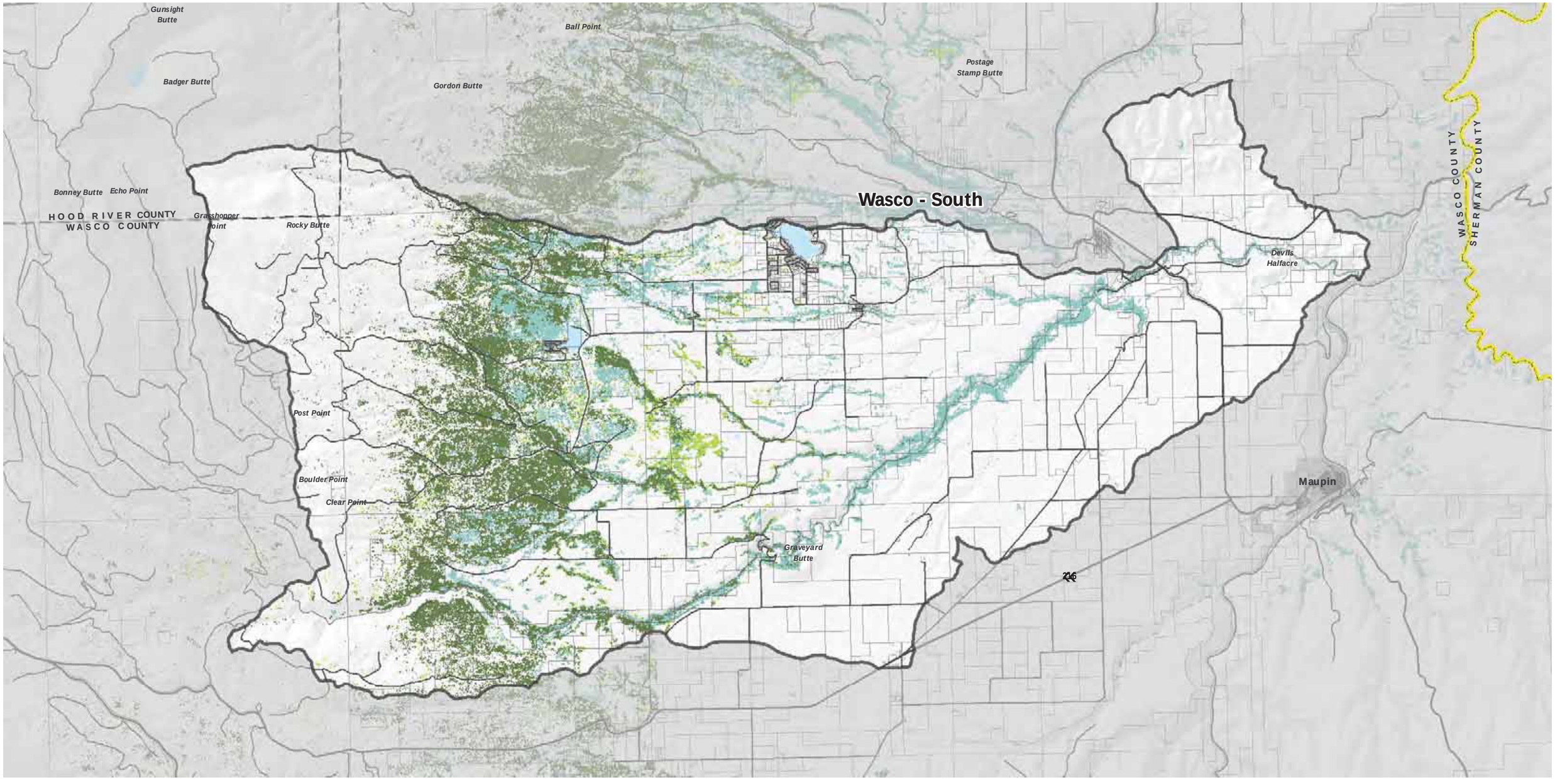
Oak Prioritization Model v4 - Patch Scores

- Very Low
- Low
- Moderate
- High
- Very High

N

0 0.375 0.75 1.5 Miles

Map Date: 10 / 7 / 2019
Maps By Columbia Land Trust
Data Sources: USGS, TIGER, ESRI, GNN, ODF, DNR, TNC
Document Name: basemap - oak patch model v4



Forests - Potential Fir Encroachment

Wasco - South

- East Cascade Oak Partnership Focus Area
- Sub Planning Areas v1 (DRAFT)
- Oak Habitat (Conifer Cover <35%)

Potential Conifer Encroachment Areas (Oak areas with >35% Conifer Cover)

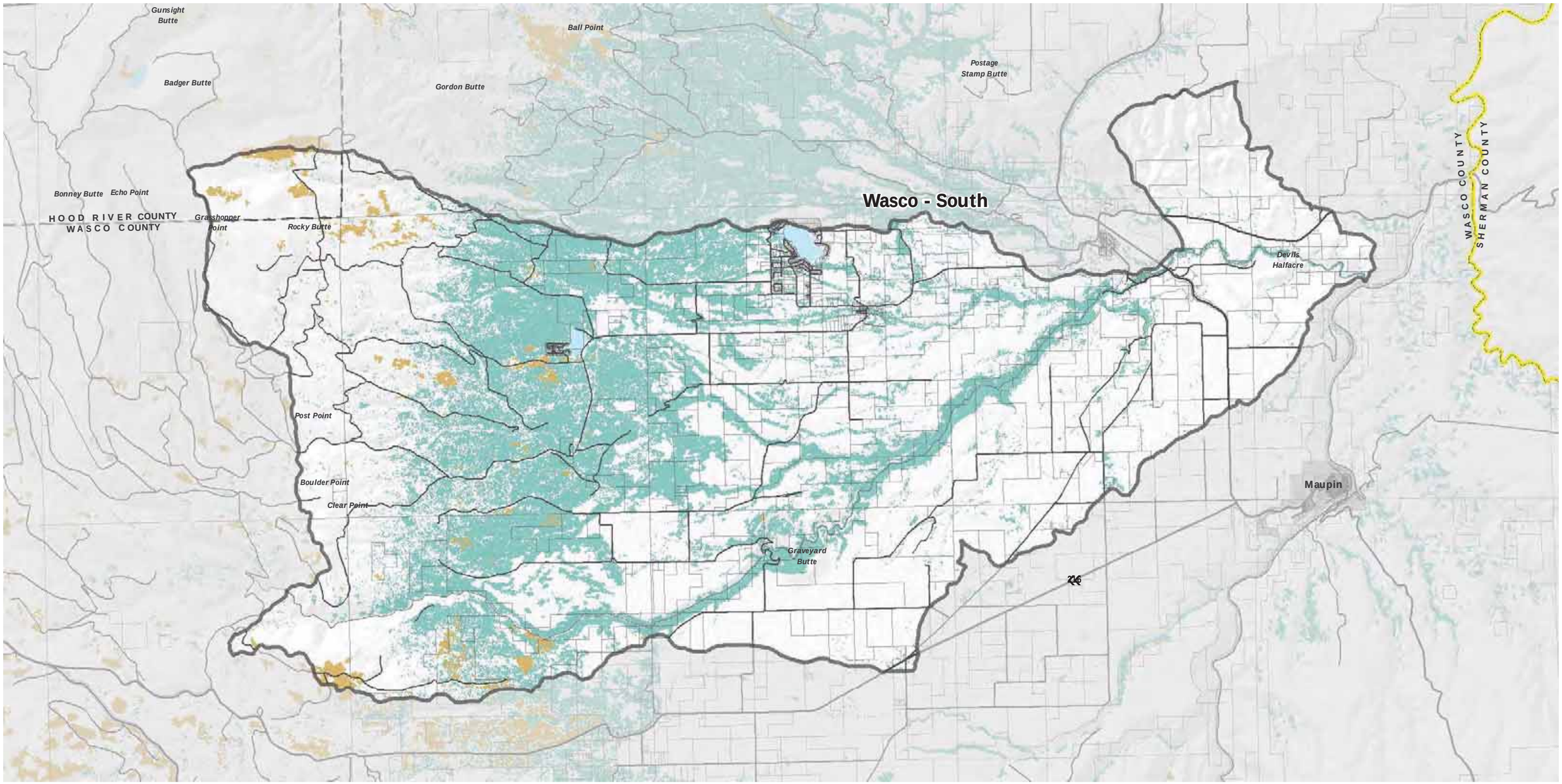
- Douglas fir & Hemlock
- Ponderosa pine

Encroachment areas were determined by querying GNN species and structure data for forests types with Oregon White Oak occurences and conifer cover greater than 35%. All occurences were then classified by basal area estimates for fir and pine species.

N

0 0.375 0.75 1.5 Miles

Map Date: 10/7/2019
Maps By Columbia Land Trust
Data Sources: USGS, TIGER, ESRI, CoreGIS, GNN
Document Name: threat map - fir - encroachment



Forests - Forest Conversion (2001-2016)

Wasco - South

East Cascade Oak Partnership Focus Area

Sub Planning Areas v1 (DRAFT)

Oak Habitat (GNN)

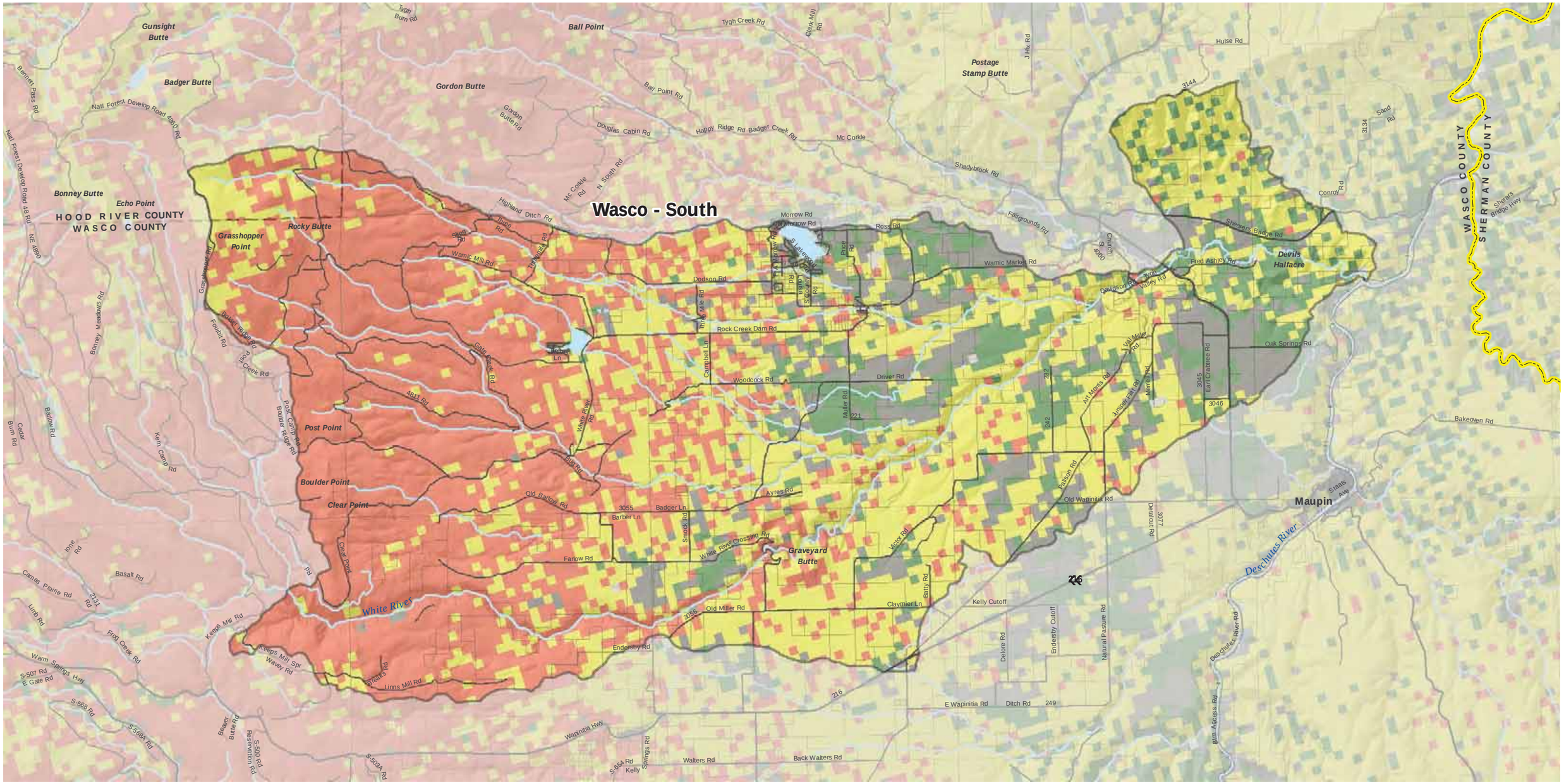
National Land Cover Change Index

Change In Forest Cover Between 2001-2016

N

0 0.375 0.75 1.5 Miles

Map Date: 10 / 7 / 2019
Maps By Columbia Land Trust
Data Sources: USGS, TIGER, ESRI, CoreGIS, GNN, NLCD
Document Name: threat map - fir - forest management



Fire - Wildfire Hazard Potential

Wasco - South

- East Cascade Oak Partnership Focus Area
- Sub Planning Areas v1 (DRAFT)

Wildlfire Hazard Potential

- Very Low to Low
- Moderate to High
- Very High
- Non-burnable

Wildfire hazard potential is a strategic wildland fuel and land management planning tool developed to help identify where wildfires are likely to occur and how intense they may be at a landscape scale.

N

0 0.375 0.75 1.5 Miles

Map Date: 10 / 7 / 2019
Map Created By Columbia Land Trust
Data Sources: USGS, TIGER, ESRI, USDA Fire Modeling Institute
Document Name: threat map - fire - wildland fire potential

Gunsight Butte
Ball Point
Badger Butte
Gordon Butte
Postage Stamp Butte
Bonney Butte
Echo Point
HOOD RIVER COUNTY
WASCO COUNTY
Grasshopper Point
Rocky Butte
Wasco - South
WASCO COUNTY
SHERMAN COUNTY
Devils Halfacre
Post Point
Boulder Point
Clear Point
Maupin
Deschutes River
Graveyard Butte
White River
216

Fire - Opportunities for Prescribed Fire

Wasco - South

East Cascade Oak Partnership Focus Area
Sub Planning Areas v1 (DRAFT)
Oak Habitat (GNN)

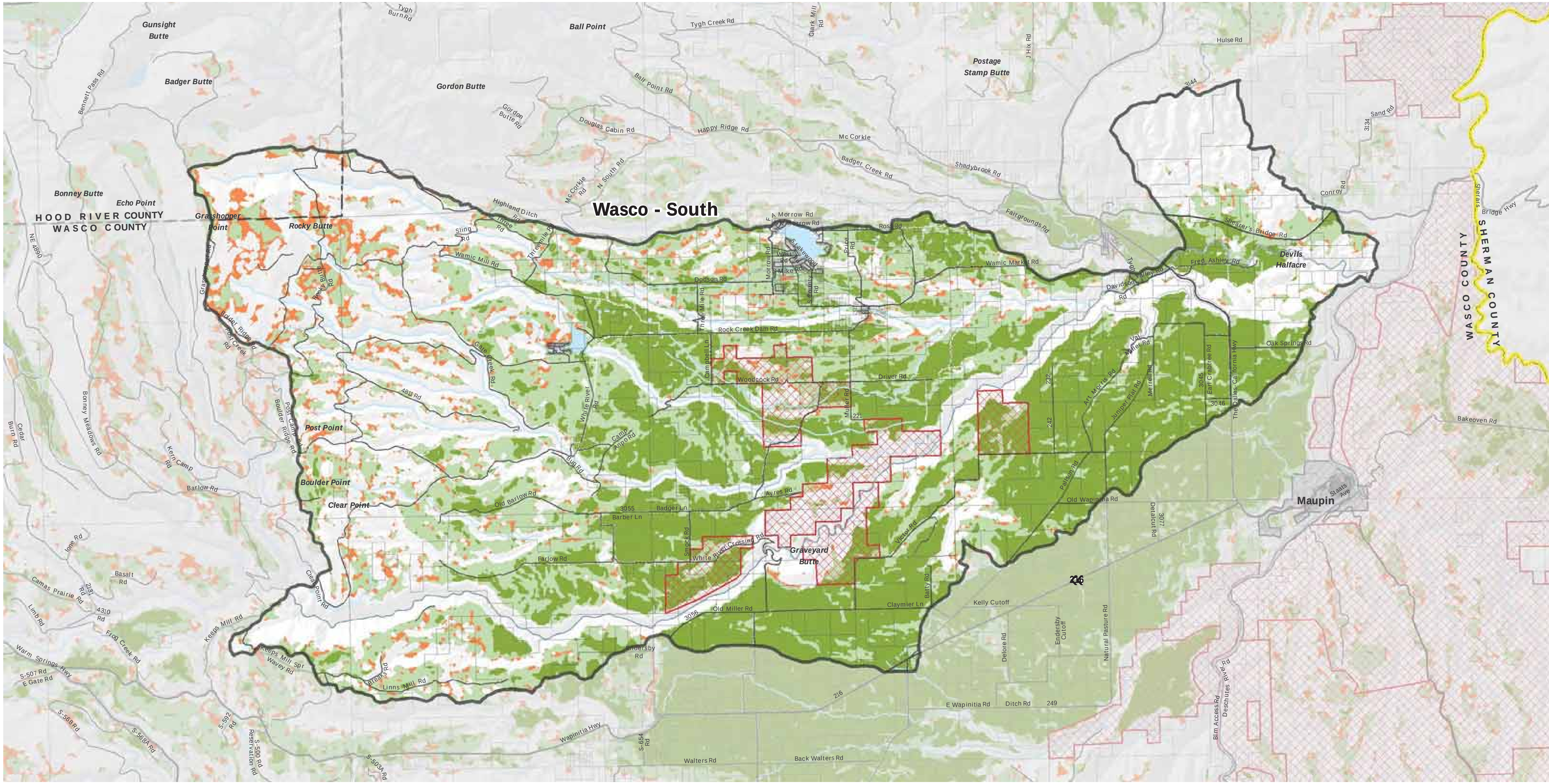
Opportunity Areas for Prescribed Fire in Oak

Potentially Suitable (>20 acres or more per structure & within 10 years

Opportunities for prescribed fire in oak were determined based on estimates of structure density (>20 acres or more per structure) and where the forest conditions are 10 or more years past the Mean Fire Return Interval.

N
0 0.375 0.75 1.5 Miles

Map Date: 10/7/2019
Maps Created By Columbia Land Trust
Data Sources: USGS, TIGER, ESRI, CoreGIS, LANDFIRE
Document Name: threat map - fire - prescribed fire opportunities map



Grazing - Grazing Potential

Wasco - South

East Cascade Oak Partnership Focus Area

Sub Planning Areas v1 (DRAFT)

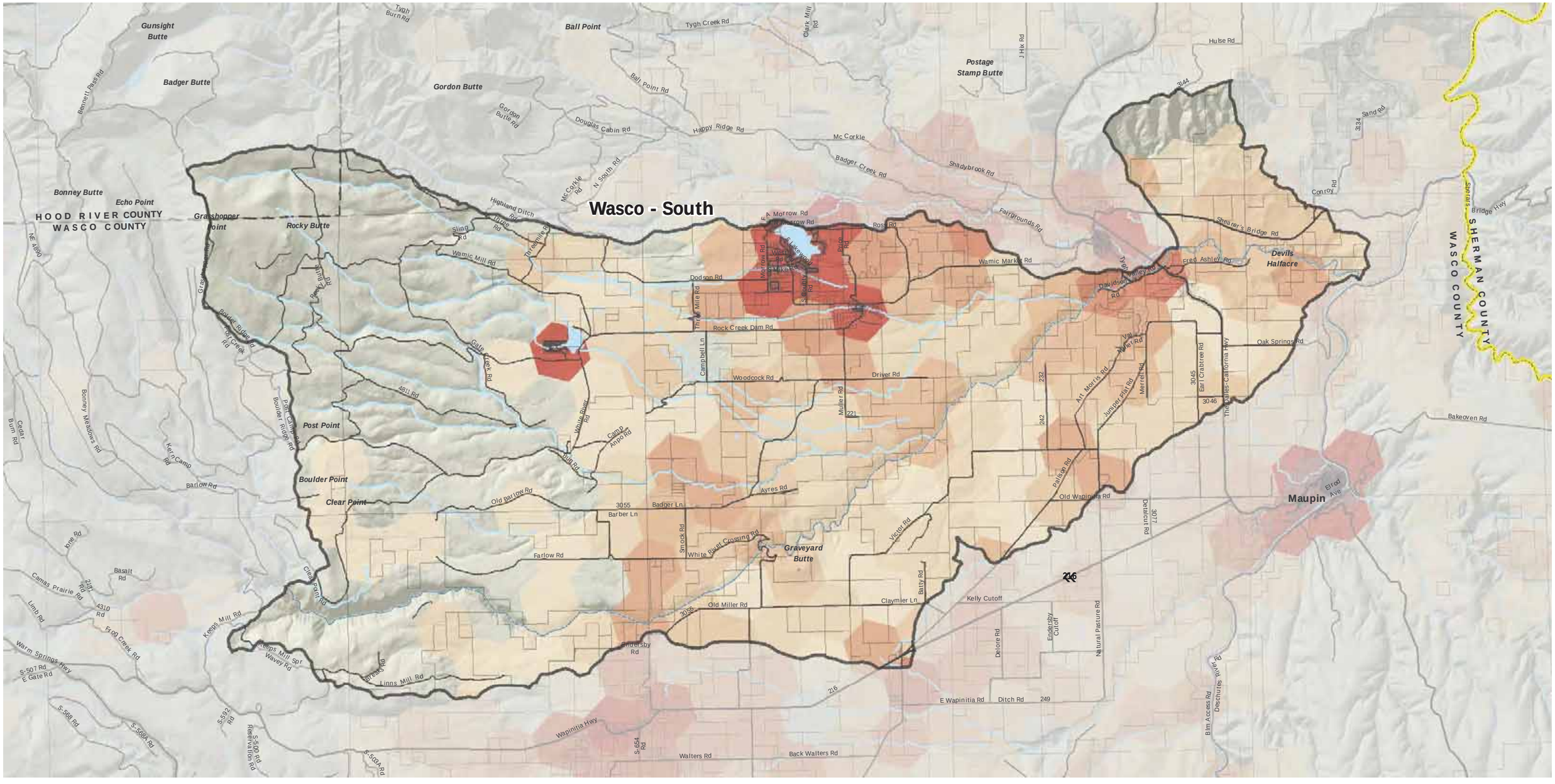
Grazing Potential

- Highly Suitable
- Suitable
- Marginal
- Grazing Allotments (Federal Lands)
- Closed Range Areags

Potential grazing areas are based on a combination of BLM allotments, WSDA 2017 field level data for hay/pasture, landcover classes from the NLCD (hay/pasture, herbaceous, and scrub/shrub), and are stratified by slope to indicate grazing potential.

N 0 0.375 0.75 1.5 Miles

Map Date: 10/7/2019
Maps By Columbia Land Trust
Data Sources: USGS, TIGER, ESRI, CoreGIS, GNN, NLCD
Document Name: threat map - grazing potential



Residential - Parcel Count By Hex With Oak Habitat

Wasco - South

East Cascade Oak Partnership Focus Area

Sub Planning Areas v1 (DRAFT)

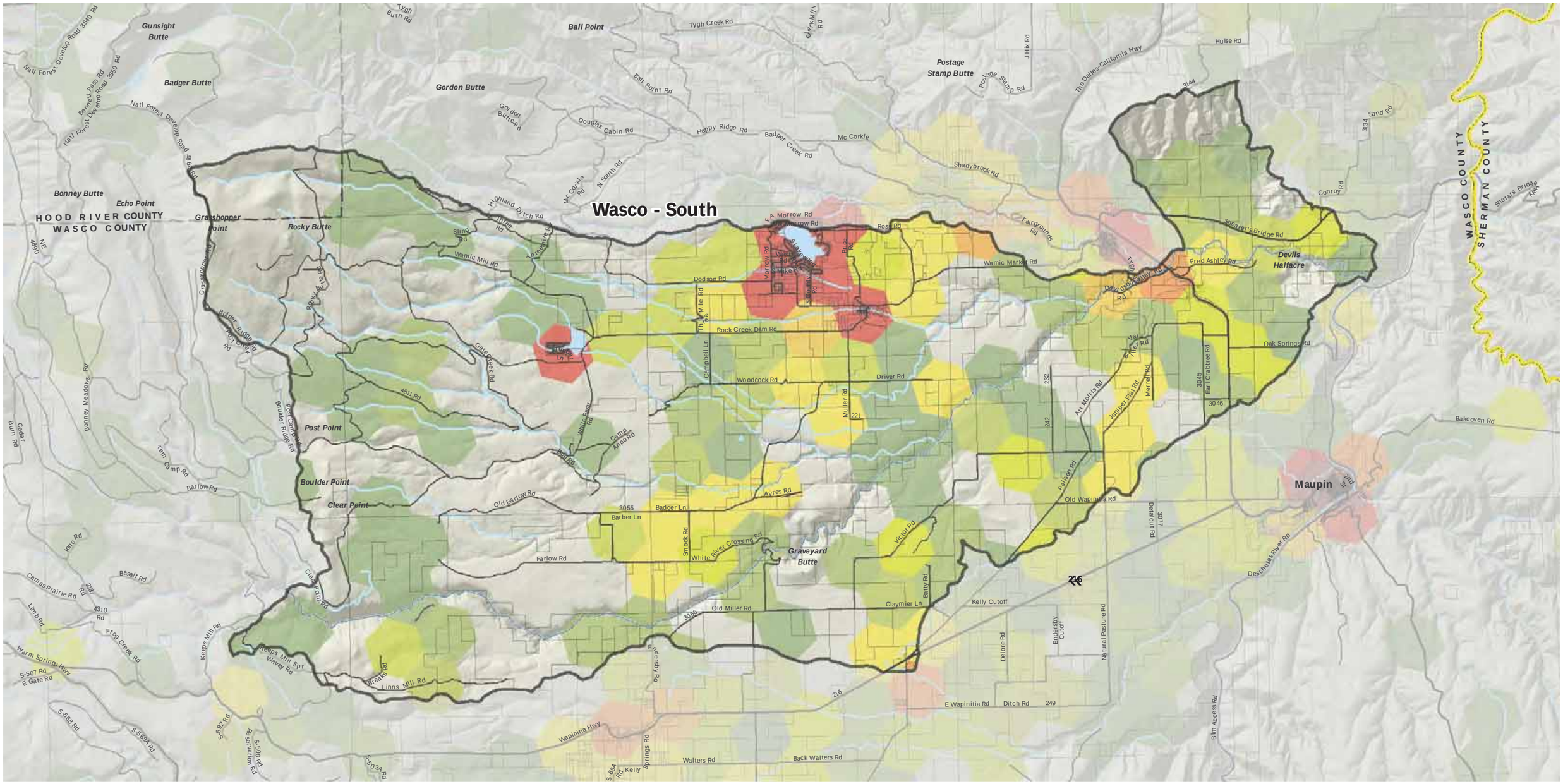
Number of Parcels Within Hexagons

1
2
3
4 - 5
6 - 8
9 - 13
14 - 22
23 - 40
41 - 87
88 - 2336

N

0 0.375 0.75 1.5 Miles

Map Date: 10 / 7 / 2019
Maps By Columbia Land Trust
Data Sources: USGS, TIGER, ESRI, CoreGIS, GNN
Document Name: threat map - rural residential - parcels within oak zones



Residential - Number of Existing Structures By Hex With Oak

Wasco - South

East Cascade Oak Partnership Focus Area

Sub Planning Areas v1 (DRAFT)

Number of Existing Structures Within Hexagons Containing Oak

- 1 - 2
- 3 - 4
- 5 - 6
- 7 - 8
- 9 - 12
- 13 - 21
- 22 - 29
- 30 - 36
- 37 - 110
- More than 110

N

0 0.375 0.75 1.5 Miles

Map Date: 10 / 7 / 2019
Maps By Columbia Land Trust
Data Sources: USGS, TIGER, ESRI, CoreGIS, GNN, Microsoft
Document Name: threat map - rural residential - existing structures

Gunsight Butte
Ball Point
Postage Stamp Butte
Badger Butte
Gordon Butte
Bonney Butte
Echo Point
HOOD RIVER COUNTY
WASCO COUNTY
Grasshopper Point
Rocky Butte
Wasco - South
WASCO COUNTY
SHERMAN COUNTY
Devils Halfacre
Post Point
Boulder Point
Clear Point
Maupin
Graveyard Butte
216

Residential - Potential New Structures By Hex With Oak

Wasco - South

East Cascade Oak Partnership Focus Area

Sub Planning Areas v1 (DRAFT)

Potential New Structures Within Hexagons Containing Oak

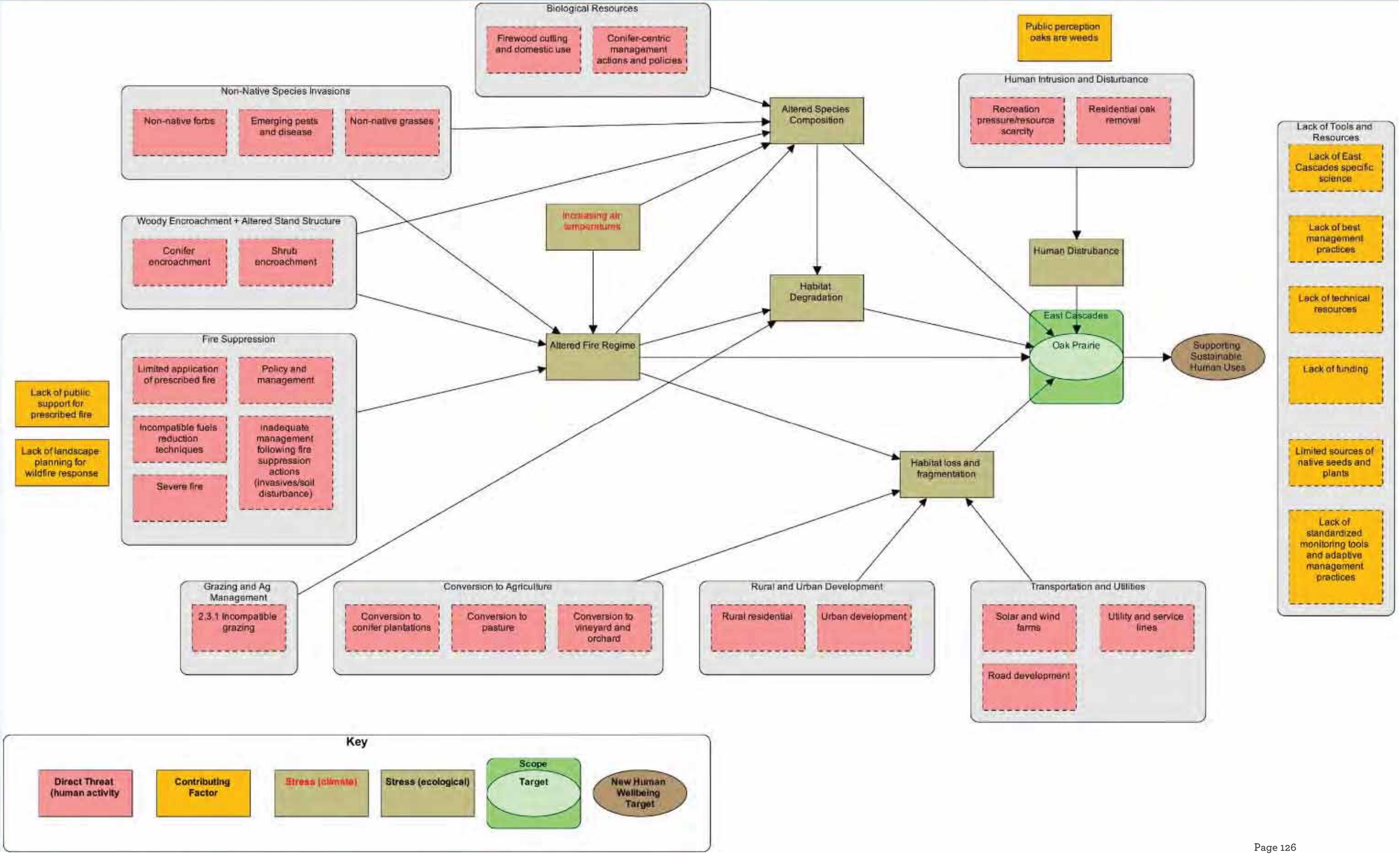
- 1 - 2
- 3 - 4
- 5 - 6
- 7 - 8
- 9 - 12
- 13 - 21
- 22 - 29
- 30 - 36
- 37 - 110
- More than 110

N

0 0.375 0.75 1.5 Miles

Map Date: 10/7/2019
Maps By Columbia Land Trust
Data Sources: USGS, TIGER, ESRI, CoreGIS, GNN
Document Name: threat map - rural residential - potential parcels

APPENDIX E: ECOP CONCEPTUAL MODEL



APPENDIX F: GIS Mapping Approach and Metadata

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Prepared by Mitch Attig and Lindsay Cornelius, Columbia Land Trust

12/27/2020

Introduction:

When the East Cascades Oak Partnership began strategic planning in 2017, there were no comprehensive data sets or map products describing the diversity and extent of East Cascade oak systems across Oregon and Washington. Existing mapping efforts were confined to single states, counties, or watersheds, and parameters varied based on mapping purpose. During initial meetings when ECOP partners were exploring the purpose of the partnership, a host of conservation planning questions with spatial components was identified.

In addition to conservation planning, partners identified key management uncertainties that could be informed by spatial information. Columbia Land Trust's GIS Coordinators, Tanner Scrivens and Mitch Attig, and consultant, Matt Stevens of CoreGIS, assisted the ECOP Technical Committee through a series of mapping conversations and exercises to understand the limitations and opportunities associated with existing data, and to identify which data we needed to build to answer key questions.

A list of key management uncertainties is included in the Monitoring Approach section of the strategic plan narrative. This appendix will focus on the spatial needs related to the planning process.

We identified a host of mapping products that would assist us in our planning effort, from understanding the extent, current condition, and historic condition of oak systems across the region, to the spatial attributes of threats affecting the ecological integrity of oak systems. Our partners were broadly concerned about landowner perceptions and concerns about having their properties show up on a strategic planning map. The following is a formal position statement ECOP adopted that is intended to help partners participate in mapping effort without compromising the privacy and trust of landowners they work with.

ECOP's Position on Mapping:

ECOP understands and respects the private nature of land ownership in our region. Being strategic means understanding not only how we should work, but where we should work. These decisions are based on where oaks are located and, within that landscape, where we hope our voluntary

conservation strategies can best protect and enhance woodlands in a meaningful way. Private landowners may feel uncomfortable seeing their names or the parcel they own identified on a map. They may feel they are being targeted or that having oaks may somehow impose on them undesired attention, regulation or affiliation. Out of respect for such landowners, ECOP will approach mapping in the following manner:

- All maps produced with identifying information such as parcel boundaries and landowner names will be utilized *internally* by partners to help the partnership discern where we should work. This information will not be shared publically and will only be utilized to advance voluntary conservation with willing landowners. If ECOP receives a request to leave a parcel off a map, it will honor that request.

- All maps produced for distribution to the general public will identify priority geographies with loosely-defined (fuzzy or blurry boundary) circles or polygons absent parcel lines (publically owned lands and conserved lands may be displayed), and will only include parcel boundaries or landowner names if the landowner has provided consent to do so. ECOP may include parcel boundaries for other purposes, such as demonstrating threat or in grant applications that describe our priorities to potential funders.

Individual partners will also abide by these rules when using ECOP's electronic data or mapping tools. Individual partners will use their own data and mapping tools according to their own established practices, which may include naming landowners or displaying parcel boundaries. In any case, they shall make an effort to distinguish between business conducted as a partner of ECOP and business conducted as an individual entity.

To help communicate consistently to the public about when a partner is advancing ECOP priorities, programs, or positions, the partner shall disclose early in the communication its role in the partnership.

Examples:

"In collaboration with the East Cascades Oak Partnership, we are implementing best management practices to…"

"To advance the goals of ECOP, ____ is submitting a grant to…"

And, if producing a map, making sure the ECOP logo or attribution is prominently displayed if the map represents ECOP projects or priorities.

We also developed some basic talking points about mapping that could help partners navigate spatial data conversations with landowners:

We need to decide where we will focus our work, which means we need to look at information on maps.

All information we share on maps is already available to the public on county websites and in public records.

We respect your privacy, and won't share identifying information about you unless you give us permission to do so.

Being on the map doesn't commit you to anything or impose anything on you. The strategies we are working on are voluntary.

Spatial data products that support strategic planning:

The following mapping efforts were identified and responded to during our planning process:

Spatial Need or Map Description:	Product	Priority
GENERAL MAPPING NEEDS		
Where should each strategy be deployed to conserve/restore a resilient oak landscape?	Analysis	H
Where are the most intact, functional habitats? How can they be protected, connected, and buffered?	Analysis	H
Where are oaks protected by existing regulation?	Data layer	L
Where are funding programs available to landowners? What level of funding? Purpose?	Data layer	H
Partner jurisdiction map and existing programs/services.	Data layer	H
Maps of R,T, E species extent or potential habitat, key species, culturally important species	Data layer	H
Map private inholdings and adjacency to public lands	Data layer	M
Large landowner map - thresholds by size. Can we map age of landowner? Or by LLC, etc?	Data layer	H
Create a general human interaction map showing broadly how land is being used	Analysis	L
Climate model impacts map	Data layer	H

Spatial Need or Map Description:	Product	Priority
FIRE		
How do we define WUI in our region?	Information	H
Map WUI	Data layer	H
What geographies are at highest risk of catastrophic wildfire?	Data layer	H
What is the expected fire return interval by geography?	Data layer	H
What partners are working on fire and where? Jurisdictional maps.	Data layer	H
What has burned, when, and how far back does recorded history go? Does TEK offer spatial information?	Data layer	H
Where is firewise/national fire plan funding being implemented?	Data layer	H
Where are "shovel ready" prescribed fire opportunity areas in terms of stand condition? Priority needs?	Analysis	M
Identify planned communities and HOAs	Data layer	L
Map of permitting jurisdictions	Data layer	H
Map geography of community wildfire protection plans	Data layer	M
Where are native seeds collected and available for purchase?	Data layer	L

Spatial Need or Map Description:	Product	Priority
What are appropriate seed zones for collection by species?	Data layer	L
FIR ENCROACHMENT		
Where has encroachment occurred? Probability of encroachment? Impacts from climate change?	Analysis	H
Map potential impacts of encroachment on R, T, and E, key, and culturally important species	Data layer	M
Map wood product outlets/opportunities	Data layer	L
Identify "high value oak zones" for advocating for forest practice rule changes	Analysis	H
Map landowner incentive programs	Data layer	H
ORCHARDS AND VINEYARDS		
Where do landowners have land enrolled in CRP?	Data layer	L
What geographies are appropriate for high-intensity agriculture? At risk for conversion?	Analysis	M
Where does water availability naturally limit conversion?	Data layer	M
What geographies are most at risk for development that are also high functioning habitat?	Analysis/map	H
Jurisdictional map for road maintenance	Data layer	L

Spatial Need or Map Description:	Product	Priority
RURAL RESIDENTIAL		
Partner jurisdictions and program availability	Data layers	H
Identify peer leaders/influencers in each geography for demonstration sites/projects?	Data layer	H
Where are gun clubs, FFA, 4H programs, etc?	Data layer	L
Geographies of high hunting pressure?	Data layer	L
Potential partner nursery areas	Data layer	L
Map water limited areas	Data layer	M
Map absentee landowner ownership	Data layer	M
Can we map redevelopment potential?	Analysis	M
Which geographies have comprehensive growth plans? Age of comprehensive plan?	Data layer	L
Where are the highest priority areas to protect from development?	Analysis	H
Map urban sprawl/rate of change in urban areas	Analysis	H
Map individual oak trees in urban area	Data layer	L
Jurisdictions of realtors? Does this exist?	Data layer	L
Anticipate where working lands are at risk of	Analysis	H

Spatial Need or Map Description:	Product	Priority
conversion?		
GRAZING		
What lands are being grazed? What scale of grazing - hobby vs commercial, public vs private?	Data layer	H
How are lands being grazed (intensity)?	Data layer	H
How has ecological integrity been impacted by grazing practices?	Analysis	H
Where are grazing incentive programs being implemented?	Data layer	H
Map areas of drought risk for emergency grazing – impact of climate change	Data layer	M
Map areas that can support emergency grazing for displaced animals during drought/fire	Analysis	
Map known habitat features sensitive to grazing (water, rare plant communities & intact, etc)	Analysis	H
Map disturbance response groups - NRCS	Analysis	?
RECREATION		
Recreation hotspots and trails	Data layer	L
ECOLOGICAL STEWARDSHIP		

Spatial Need or Map Description:	Product	Priority
Map CWMA jurisdictions	Data layer	H
Map weed control partner jurisdictions	Data layer	H
What practices are being implemented where?	Data layer	M
Where is monitoring and research happening and for what interactions?	Data layer	M

To start, we focused on building the most accurate model predicting distribution and extent of oak systems across the region. To do that, we needed to describe, or classify, oak systems, but those descriptions had to work within the constraints of available data sets. The GNN, or Greatest Nearest Neighbor, data set was the only suitable option, so our classification needed to rely heavily on oak system tree species composition and structure as opposed to vegetation associations or other attributes.

Gradient Nearest Neighbor (GNN) - Nearest Neighbor (NN) imputation methods have proven to be an effective tool for characterizing vegetation structure and tree species composition in forested landscapes across large regions. NN models are particularly well-suited for creating detailed vegetation maps for a variety of reasons: they produce spatially-explicit maps over large areas spanning all ownerships and land uses, they describe multiple attributes of composition and structure, and they maintain covariance among vegetation components (when k=1), and the maps retain the range of variability present in the reference data used to develop the map.

All NN predictions are based on relations between ground (response) data and mapped (explanatory) data. Many variations of NN imputation are possible by varying the distance metric (which quantifies the relations between response and explanatory data), the type of environmental variables used as predictors (e.g. climate, topography) and the number of neighbors (k) imputed to each cell.

GNN is just one variation of NN that the LEMMA[1] group has implemented at broad (regional) spatial extents using regional inventory plots and Landsat imagery, based on k=1 and direct gradient analysis as the 'distance' metric.

[1] **LEMMA Group** - LEMMA (Landscape Ecology, Modeling, Mapping, and Analysis) is an informal team comprised of employees of the USDA Forest Service, Pacific Northwest Research Station, and the Department of Forest Ecosystems and Society, Oregon State University (OSU), based at the Forestry Sciences Lab on the OSU campus. They work together and with collaborators on a variety of research projects, supported primarily through grants and interagency agreements.

The detail-rich nature of GNN models allows users to map the distribution of a wide variety of vegetative characteristics across the landscape. The GNN models are also used as input for several other types of models, including habitat suitability, fuels and fire risk, biomass and carbon, and landscape scenario models for evaluating alternative futures.

Due to its extreme topography and steep precipitation gradients, the East Cascades landscape is highly ecotonal. Aspect, slope, soil type, exposure to sun and wind, and proximity to water tables have dramatic and immediate impacts on stand structure and veg composition. We explored using ecofacet and abiotic factors to predict oak system occurrence, but were limited by soil data resolution, accuracy, and capacity for field verification during the planning period. GNN models rely on data collected on 5 mile grids. This plot density prevents our accurately representing the highly ecotonal nature of the ecoregion at the site scale. The model would be most useful to us in understanding landscape scale processes and patterns. We would also use model results to indicate where we would focus our proactive efforts to evaluate conditions on the ground, and then ground truth and modify our model accordingly.

In addition to the prioritization model, we integrated partner input. We asked partners to tell us where we should be working based on qualitative descriptions of intact and functional oak systems. This information was also incorporated into our conservation priority maps as hand digitized polygons in a single partner input layer.

The following sections describe how each high priority map product was created. We were unable to create some high priority map products due to data limitations or resource availability, and we chose not to produce some of the lower priority map products due to time and resource constraints.

Modeled Oak System Types

The system type model was developed to assist with classification and to inform the prioritization model described in the next section.

Columbia Land Trust staff worked with ECOP's Technical Committee and the Klamath Bird Observatory to develop system definitions that would 1) best fit the ability of available data to model the range of system types in the ECOP region, and 2) most accurately represent the existing range of systems in the region. The American Bird Conservancy[2] (ABC) definitions closely resemble the final classification of modeled oak systems for that planning process. There are some modifications that do not neatly fit ABC and those are explained in the metadata format. The association of bird habitats to ECOP system types has not been verified but some information and references are provided in the ABC Guide to Bird Habitat and Populations in Oak Ecosystems of the Pacific Northwest.

[2] Altman, B. and J. L. Stephens. "Land Managers Guide to Bird Habitat and Populations in Oak Ecosystems of the Pacific Northwest". *American Bird Conservancy and Klamath Bird Observatory websites*, 2015, www.abcbirds.org/wp-content/up-loads/2015/05/QuercusGuidePart1.pdf

Model Description Rule Set for Classifying GNN data based on the following definitions:

1. **Oak Savannah**

    a. First, isolated areas that the four digit code of the dominant tree species based on basal area contains "QU." The % is basically a wildcard saying that anything can come before or after the "QU". This is selecting for any type of *Quercus* within the GNN dataset. Additionally select anything that has overall canopy cover under 10 and a basal area of *Quercus garryana* that is more than 0. (No results returned)

    b. Select cells with dominant species code including "QU" like above, canopy cover less than 25 AND hardwood canopy cover less than 25 and conifer canopy cover less than 10.

    c. Select cells where FORTYPBA is Remnant (total canopy cover is less than 10%) AND where basal area of *Quercus garryana* is more than 0.

2. **Oak Woodland (Open)**

    a. Select cells with dominant species code including "QU" like above AND canopy cover above 25 but less than 50 AND hardwood canopy cover less than 50 AND conifer cover less than 10.

3. **Oak Woodland (Closed)**

    a. Select cells with dominant species code including "QU" like above AND canopy cover greater than 50 AND canopy cover above 50 but less than 75 AND hardwood canopy cover more than 25 and conifer canopy cover less than 10.

4. **Oak Forest**

    a. Select cells with dominant species code including "QU" like above AND canopy cover greater than 75 AND hardwood canopy cover more than 25 AND conifer canopy cover less than 10.

5. **Oak-Conifer Forest and Woodland**

    a. Open Systems

        i. Select cells with dominant species code including "QU" like above AND canopy cover less than 50 AND conifer canopy cover more than 10.

    b. Closed Systems

        i. Select cells with dominant species code including "QU" like above AND canopy cover more than 50 AND conifer canopy more than 10 AND conifer canopy less than 35.

        ii. Select cells that don't fall into any previous oak classes AND basal area of *Quercus garryanna* is more than 0 AND canopy cover is less than 5 AND conifer canopy is more than 10 AND the dominant hardwood tree species includes QU in name.

6. **Forest with Oak**

a. Open Systems

i. Select cells with dominant species code including "QU" like above AND canopy cover more than 40 AND canopy cover less than 75 AND conifer canopy cover more than 35.

b. Closed Systems

i. Select cells with dominant species code including "QU" like above AND canopy cover more than 75 AND conifer canopy cover more than 10.

ii. Select cells that have not been selected by any previous classes above AND Basal area of *Quercus garryanna* is more than 0 AND canopy cover is more than 50 AND conifer canopy cover is more than 35 AND HDWPLBA (hardwood tree species with plurality of basal area) including QU in name.

iii. Select cells that have not been selected by any previous classes above AND basal area of *Quercus garryanna* is more than 0. This is a catch all to pick up all remnant oak occurrences that haven't been picked up yet.

7. Riparian

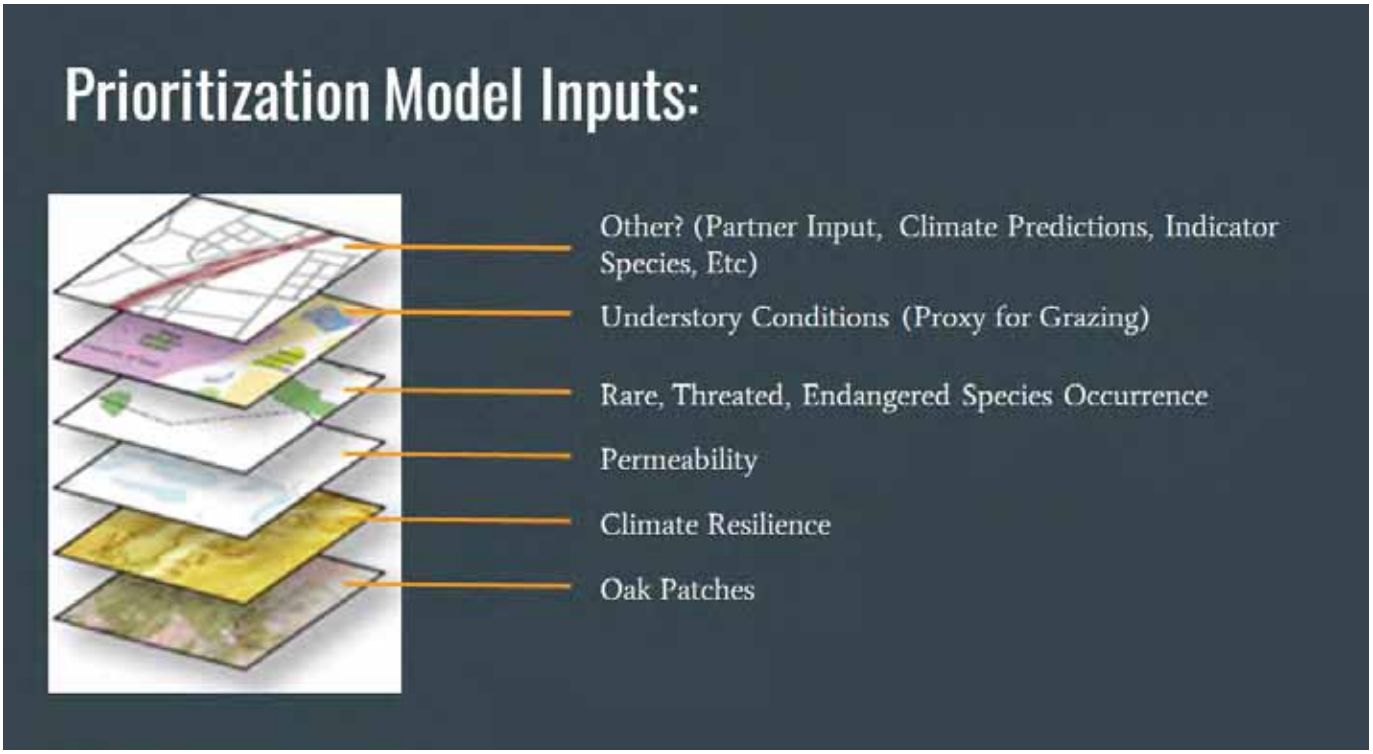
i. Buffered all stream centerlines from NHD 24k Stream Layer by 100 ft for both Oregon and Washington. Merged this with floodplain footprints from FEMA FIRM Maps. Once combined, created a binary mask to select on oaks that fall within the floodplain footprints OR 100 ft within the 24k stream layer.

Conservation Prioritization Model

Spatial Prioritization of the Oak Landscape for Conservation

- Identify anchor habitat (partner authority over management decisions)
- Identify connectivity corridors and climate buffers between anchor sites
- Identify priority areas where partners will focus proactive efforts for strategy implementation and opportunity areas where partners will respond opportunistically with strategy implementation

We applied the parameters described in the table on the following page, "Oak Patch Scoring Matrix for the ECOP Prioritization Model" to develop model inputs, applied a 30-m cell grid to each layer, and then totaled the cumulative score for each cell.



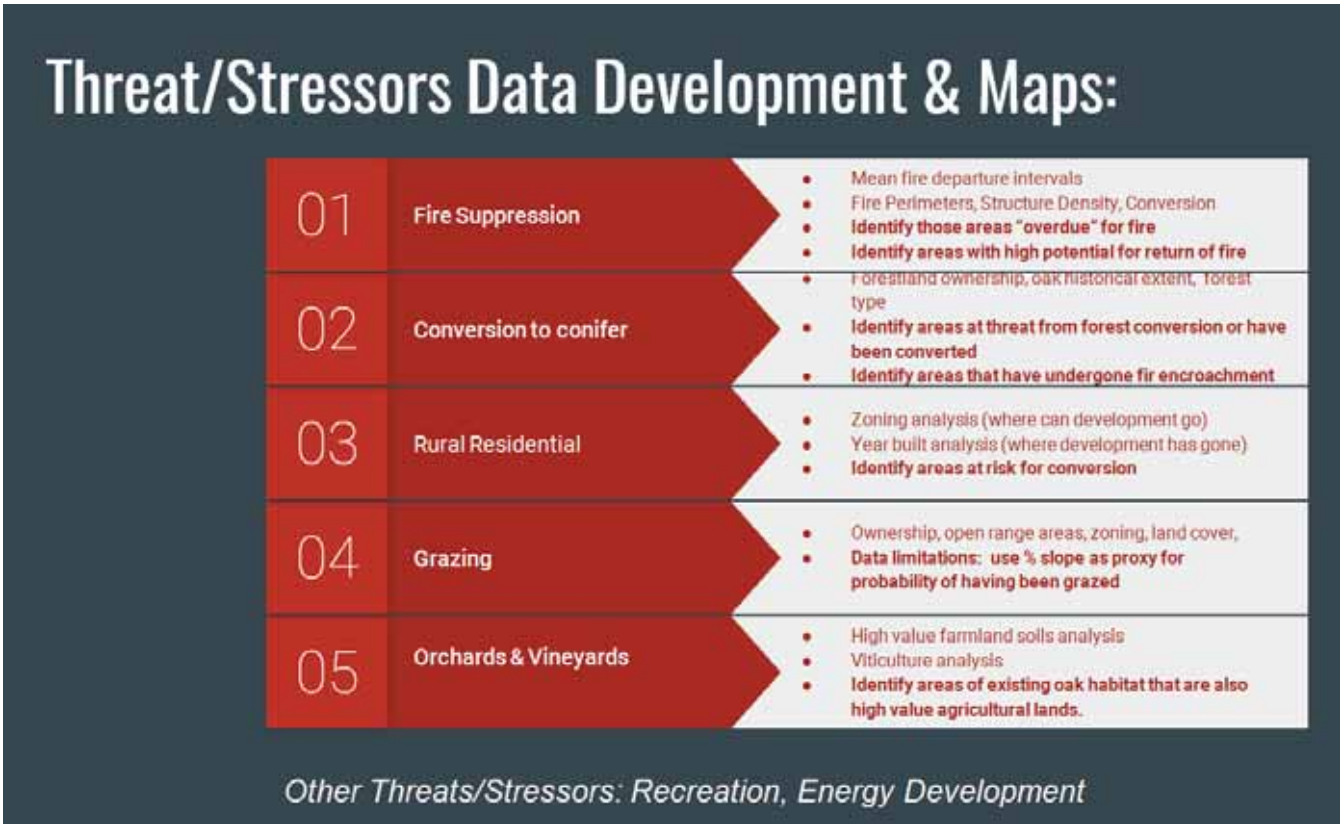
The resulting map highlighted areas we should look proactively for intact, functional oak systems.

EAST CASCADES OAK PARTNERSHIP

Oak Patch Scoring Matrix for the ECOP Prioritization Model

Category	Ecological Indicator	Multiplier/Weight	Indicator	Worst (1)	2	3	4	Best (5)	Data Sources	Comments
Size	Total patch area	1	Total size of patch (Acres)	< 100 acres	100 - 1,000 acres	1,000 - 5,000 acres	5,000-10,000 acres	> 10,000 acres	GNN Structure and Species Maps	Patch Identification: Patches were identified using all oak occurrence detections in GNN 2012 data (QUGA4_BA>0). Patches delineated using 4 way region group analysis without grouping. All patches less than 10 acres were dropped from modeling efforts.
Oak Diversity	Oak community types	1	Count of oak system types present within a patch	1 oak type	2 oak types	3 oak types	4 oak types	5 oak types	GNN Structure and Species Maps	To be considered present, oak type must be at least 1% of total patch area. Forests with oak class combined with Oak & Conifer Forest & Woodland
Understory Condition	Understory condition (grazing potential)	1	Total acres of marginal grazing lands within patch (acres)	>80% suitable grazing habitat	60-80% suitable grazing habitat	40-60% suitable grazing habitat	20-40% suitable grazing habitat	<20% suitable grazing habitat	USGS 30M DEM, NLCD 2016, USDA Crop Data, Grazing Allotments	
Terrestrial Resilience	Resilience to climate change	1	% of oak patch identified as having above average resilience	< 20% of patch	20-40% of patch	40-60% of patch	60-80% of patch	> 80% of patch	TNC Conserving Natures Stage	Terrestrial resilience data was resampled to 30m for analysis - all areas identified as "above" average resilience were used to determine % of patch.
RTE Species (Animals)	Rare, threated, and endangered (RTE) species presence	1	Predicted occurrence count of RTE species	No RTE Species	1 - 5 RTE Species	5 - 10 RTE Species	10 - 15 RTE species	15 or more RTE species	USGS Species Modeling	The extent of each species predicted range was summarized by area for each oak patch. To be present a species range must cover 10% of the total patch size. Predicted occurrence totals for all species within a given patch were then scaled to a 1-5 score.
RTE Species (Plants)	Rare, threated, and endangered (RTE) species presence	1	Predicted occurrence count of Priority Plant Species	No RTE Species	1 - 5 RTE Species	5 - 10 RTE Speices	10 - 15 RTE Species	15 or more RTE species	Expert Opinion & Oak Type Associations	
Partner Input Areas	High value oak habitats (professional input)	1	Occurrence of partner input areas	No partner input areas within patch	At least one partner input area within patch	At least two partner input areas within patch	At least three partner input areas within patch	More than four partner input areas within patch	Partner Input	All intersections between partner input areas considered present.
Rare Plants	Occurrence of Priority Plant Species (GS Ranks)	1	Observed rare and sensitive plants	No species present	At least one Priority 3 Species	At least one Priority 2 Species	At least one Priority 1 Species	More than one Priority 1 Species Occurrence	DNR Natural Heritage, INR ORBIC Occurrence Data	

Threat Maps



01: Fire Suppression

The goal was to understand the historic fire return interval as the basis for evaluating impact of fire suppression (departure from mean historic fire return interval) and predicting areas of potential conifer encroachment, fuel loading, and fire intolerant plant community development. We also wanted to understand where we might implement prescribed fire without significant site preparation, and how fire risk interacts with the wildland urban interface.

Mean Fire Return Interval and Fire Regime Group

Utilized LANDFIRE Fire Return Interval that "quantifies the average period between fires under the presumed historical fire regime." These data were intended for use at the landscape scale and have limited utility and the stand level.

Utilized LANDFIRE Fire Regime Groups data that "were intended to characterize the presumed historical fire regimes within landscapes based on interactions between vegetation dynamics, fire spread, fire effects, and spatial context."

Distance (Time) From Mean Fire Return Interval

Acquired a dataset for each year of disturbances from LANDFIRE and selected out the areas that were burned within that year where disturbance type was “Wildfire” or “Prescribed Fire” AND where the severity attribute was either “Low”, “Medium”, “High” or “Increased Green”. Created a raster layer for each year that only included these data. (Essentially burns from this year only). After creating a raster layer for each years of disturbance (1999-2014) a raster calculation was used with creates a raster showing the age of each burn (compared to 2019). Ex: A burn with a value of 5 burned in 2015, a burn with a value of 20 burned in 1999.

Took LANDFIRE MFRI dataset and reclassified so that each cell has the value that is the UPPER limit of the return interval from the range in the source data. Essentially if the MFRI was 0-5 years, those cells were classified to a 5, saying that the MFRI was 5 years. Restricted MFRI to areas where the MFRI is less than or equal to 20 years because this is all we had data for disturbances. Ended up with a raster showing where the MFRI was either 10 years, 15 years, 20 years or no data (mfri_LTEQ_20). Utilized the raster calculator to multiply the burns by age mask (0’s signify areas that burned in the last 20 years, 1 is no burns) (removes areas that have burned between 1999 and 2000) and the raster mfri_LTEQ_20. Then utilized a mask to remove any areas that didn’t have a MFRI of 10,15 or 20 years. Then inverted this time scale to show how many years these areas were *past* their interval. Reclassified 20 --> 0, 15 --> -5, 10 --> -10. This shows that an unburned area that had a fire return interval of 20 is zero years past MFRI, an unburned area of a mean fire return interval of 15 is 5 years past MFRI and an unburned area that had a mean fire return interval of 10 is 10 years past MFRI. Lastly, masked out areas that were rivers, ice/snow, etc.

Next, followed a similar procedure for the areas that have burned. Created a MFRI raster just signifying the areas that have burned, subtracted from this the age of the burns, and masked it to just show areas where the MFRI is less than 20.

Prescribed Fire Opportunities

Joined the structure density feature class created by utilizing county building data with the feature class that was created to show the time until the mean fire return interval (above). Multiplied this against the binary oak definition (1’s for containing oak, 0’s for no oak) which creates a raster that only includes areas that contain oak according to our analysis. Utilized data created previously from LANDFIRE which included disturbances for each year.

Merged the burned and unburned raster layers showing the time to MFRI (above) and extracted the areas where the time to MFRI is -10 years (10 years overdue for burning). Then, using the structure density data, extracted areas where the structure density is 50 or 20 acres per structure. Then, multiplied the areas where structure density is 50 or 20 acres per structure by the areas where time to MFRI is -10. Converted all areas of nodata to 0 and ran a focal median statistics tool with a 4x4 moving window to remove much of the speckling that was occurring and to create areas that would be large enough to actually conduct prescribed fire activity.

Wildland Urban Interface

We adopted the WUI[3] identified by the USFS in 2017.

02: CONVERSION TO CONIFER

The goal of this analysis was to understand where oaks are at risk of encroachment by conifer species. All structural and compositional changes resulting from fire suppression and active conversion to conifer species impact the ecological integrity of oak systems, but our analysis focused on fir species encroachment, which is more frequently fatal to oaks than is pine encroachment and changes in oak density and plant associations.

Risk of Conifer Encroachment by Fir Species

Used the Landfire Biophysical setting data to extract five classes of oaks for the study area:

("us_140bps_ecop" == 735) | ("us_140bps_ecop" == 820) | ("us_140bps_ecop" == 800) | ("us_140bps_ecop" == 720) | ("us_140bps_ecop" == 790)

Output is called: oak_classes_BPS

Then used GNN data to select all conifer forests where the FORTYBA equaled one of the following:

ABAM,Pacific Silver Fir,1 | ABGR,Grand Fir,1 | ABLA,Subalpine Fir,1 | PSME,Douglas Fir,1

Ran LOOKUP on the GNN data to create a raster layer based on FORTYPBA to extract the fir classes.

Output is: gnn_FORTYPBA_v1

Extracted oak types from GNN data. Extracted oak layer output is:
gnn_standard_mask_quga_extract_reclass_UTM10

Created a binary oak distribution layer:
Con(IsNull("gnn_standard_mask_quga_extract_reclass_UTM10"),0,"gnn_standard_mask_quga_extract_reclass_UTM10")

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[3] Radeloff, Volker C.; Helmers, David P.; Kramer, H. Anu; Mockrin, Miranda H.; Alexandre, Patricia M.; Bar Massada, Avi; Butsic, Van; Hawbaker, Todd J.; Martinuzzi, Sebastian; Syphard, Alexandra D.; Stewart, Susan I. 2017. The 1990-2010 wildland-urban interface of the conterminous United States - geospatial data. 2nd Edition. Fort Collins, CO: Forest Service Research Data Archive. https://doi.org/10.2737/RDS-2015-0012-2.

Output is: current_oak_GNN

Created inverse current oak mask by switching 0/1 values

Output is: current_oak_GNN_inverse

Multiplied inverse mask against the FORTYPBA to remove fir from current oak distribution

"current_oak_GNN_inverse" * "gnn_FORTYPBA_v1"

Output is: gnn_FORTYPBA_v2

Created inverse mask of oak_classes_BPS to create

Output is: oak_classes_BPS

Multiplied *original* oak_classes_BPS by the gnn_FORTYPBA_v2 layer to limit Fir spp to the BPS extent of potential oak

"oak_classes_BPS" * "gnn_FORTYPBA_v2"

Output is: gnn_FORTYPBA_v3

Converted the 0 values in gnn_FORTYPBA_v3 to NODATA

SetNull("gnn_FORTYPBA_v3"==0,"gnn_FORTYPBA_v3")

Output is: fir_encroachment_v1

03: RURAL RESIDENTIAL DEVELOPMENT

This analysis identified where on the landscape parcels can be divided and developed, further fragmenting the landscape and diminishing the extent and quality of oak systems.

Existing Structures Within Hexagons Containing Oak

Tabular building data from counties merged with spatial taxlot data showing taxlots. Ran density analysis tool to derive the number of structures per acre.

Land Ownership By Size

Utilized county parcel data and symbolized based on the size of the parcel in acres.

Percent Land Cover Change within Hexagons Containing Oak

Used the NLCD 2016 Land Cover Change Index (https://www.mrlc.gov/data) to measure changes within the entire ECOP study area, then summarized the area of change pixels within WGA CHAT hexagons.

Number of Parcels Within Oak Zones

Utilized county parcel data and summed up the number of parcels within each hexagon that contained oak.

Potential of New Structures Within Oak Areas

Created a consolidated zoning layer. All unique zoning categories were included in a single field consisting of county name prepended to original description. Removed all public lands using PADUS, but kept tribal lands, Wild and Scenic River corridors and Columbia River Gorge National Scenic Area. Established an attribute field for the amount of possible lots (utilizing minimum lot size established by county zoning) and whether or not the lot was already developed (utilizing the assessed value of improvement from each county). Established four categories that each parcel will fall into:

Fully Developed: the parcel has an improvement on it assessed at >= $10k, and the parcel is smaller than 2x the minimum lot size (query Dev = 1 AND possible_lots < 2)

Developable: the parcel has an improvement on it assessed at < $10k, and the parcel is smaller than 2x the minimum lot size (query Dev =0 AND possible_lots <2)

> *NOTE: if the lot is smaller than the minimum lot size, I am giving it a '1' for new lots, assuming that the lot can be developed, even if it cannot be subdivided.*

Divisible: the parcel has an improvement on it assessed at >= $10k, and the parcel is larger than 2x the minimum lot size; (query Dev = 1 AND possible_lots >=2)

Undeveloped: the parcel has an improvement on it assessed at < $10k, and the parcel is smaller than 2x the minimum lot size (query Dev =0 AND possible_lots >=2)

Utilized Python floor function to round down fractional lots to the nearest whole number. For lots that were deemed divisible, subtracted one lot to account for existing development.

04: GRAZING

The goal of this analysis was to identify areas where understory plant communities, which are one of the highest priorities for land protection due to the difficulty of restoration, might still be intact. For the sake of this analysis, we assume everything that can be grazed has been grazed. We don't consider grazing intensity because we don't have the data required to model it. Landowners enrolled in agricultural tax designations are required to submit information about production to the counties and to the USDA, but this information is not publically available. Since no data was available, we worked with stakeholders to develop a proxy for grazing probability using slope, which naturally controls where domestic animals can go.

Probability of Grazing Impacts

Utilized the data from BLM Grazing Allotments, WSDA 2017 Crop Distribution and NLCD 2016.

Created a 30m DEM that was reclassified as follows:

0 - 10% slope = 1 Good for all grazing animals

10 - 30% slope = 2 Marginal for cows, good for goats

30 - 45% slope = 3 No go for cows, marginal for goats

More than 45% slope = 4 No grazing

Considering the amount of noise present, utilized focal median over the raster using a circular window 3x3 without ignoring NoData to smooth out noise. Created a mask by reclassifying landcover classes where no grazing is likely to occur (0) and all other classes (1). Multiplied by smoothed raster created from DEM to remove areas where no grazing would occur.

No Grazing Classes: Open Water, Perennial Snow/Ice, Developed classes (all 4).

05: Orchards and Vineyards

We did not complete this analysis due to limited time and resources.

06: Recreation

We did not complete this analysis due to limited time and resources.

"Fire and Fir" Human Interactions with Oak Systems

HUMAN BEHAVIOR			Knowledge Drivers		Economic Drivers		Cultural and Political Drivers		Practical Drivers	
Specific Human Behavior	**Impacts**	**Opportunity**	Contributing Factor	Strategy	Contributing Factor	Strategy	Contributing Factor	Strategy	Contributing Factor	Strategy
Fire Suppression/lack of prescribed fire (see also fire suppression on rural residential tab)	Fire is a natural and frequent process that plays an important role in shaping East Cascade oak systems. Fire suppression is necessary to protect infrastructure and natural resources being managed for industrial, commercial or residenial use. Fires are typically extinguished regardless where they occur as soon as they are detected and resources can be mobilized. Suppression efforts contribute to changes in fuel loads, species compostion and structure, soil conditions, and future fire behavior, all of which have repercusive impacts through food web, species utilization and behavior. Climate change may exacerbate the size and intensity of wildlfire in the future.	Fire is increasingly in the national spotlight and public attitudes about fire readiness, prescribed fire, and fuels reduction are changing. Funding sources may increasingly become available to implement strategies that are consistent with best management practices for prescribed fire and fuels reduction in oak systems.	Limited application of precribed fire due to public perception of risk/fear of out of control fire.	Educate people about impacts of prescribed fire vs wildfire	Opportunity cost is high for planning and implementing prescribed fire due to flexibility required for mobilization, unpredictability of weather during a burn, and planning required.	Build organizational capacity of partners or invest in centralized resource for planning and implementing prescribed fire across ownerships on both public and private lands	Public land policy and process - need more detail on this one		With a lack of coordinated burn plans, fires must be put out where it is safest for firefighters to extinguish the fire as soon as possible	Work with local fire suppression agencies to create model wildfire plan for high priority "let it burn" areas.
			Disagreement among practitioners about the actual fire frequency, impact of fire on oak regeneration, growth form and density.	Develop standardized monitoring form, long-term monitoring approach, and volunteer team (including partners) to deploy following fires in the region to monitor and build data source re: impact of fire on oaks.	prescribed fire can result in fire scars on conifers, making them less marketable at the mill. Stands age 12-20 are very vulnerable to fire. Any burned material at the mill makes residual chip recovery difficult (there can be no char for papermaking material)	burn before conifers are 12 years old, then wait until commercial harvest to begin burn regime again. OR, explore prescribed fire impacts on commerical attributes of wood - temperature and flame height control near conifers? Consider experimenting with paper products that incorporate charred wood... what is the real limitation? Is it purely aesthetic and can be overcome, or is it chemical? Charred chips could be used for home char fuel. Paul Jones is working on biomass and hog fuel options using burned logs.	Protection of infrastructure, livestock and human life is priority. No one wants to assume the liability of "let it burn" policies.	Build a culture around fire that accepts fire as natural and expected; plan communities for fire resilience (i.e. identify fire risk zones); incentivize fuels reduction and defensible space through insurance discounts and audits by local fire department	Fire crew personel and fire bosses are limited in the region and are in high demand during summer and fall	Increase the number of people that are trained to do prescribed burns
				Influence legislation that regulates burn prescriptions (air quality regs, etc)				Develop programs that encourage or require people to use fire-resistant building materials (to reduce burden on fuels reduction funding programs and allow for greater habitat consideration when creating defensible space)		
			Limited application of precribed fire - limited technical resources and fire experts available to private landowners interested in ecological burn programs	Talk to fire personnel at agencies about precribed fire practices on large properties; work with USFS to develop prescribed fire training opportunities (there are currently limited # contractors who can put on trainings.		Work with SDS to modify chip handling flow at mill to allow for sorting and sale of burned chip material.		Advocate for liability protections for prescribed fire burn personnel	Limited application of precribed fire due to air quality controls and impacts to at-risk population (health related sensitivity to smoke)	AQ - Soften state/fed regulations for short term peaks exceedances to allow for prescribed fire and/or create a burn trailer program (possibly utilizing Fruit Grower's Association burn trailer)
				Prioritize private land burn programs 1) where ecological value would be greatest and 2) adjacent to federal lands where federal funding may be available	Limited application of precribed fire / liability, permits, technical resources, air quality, public perception.	Prioritize prescribed fire partnership programs on private lands adjacent to federal lands: USFS has authority to burn under State Partners in the Good Neighbor Authority and another act that helps on private lands.		Encourage landowners to utilize non-combustible materials when constructing infrastructure (like metal t-posts, etc)		
					Cost of implementing prescribed fire is high due to liability (risk), required mobilization flexibility, onerous permit requirements (minimum equipment required, etc) and safety precautions	Develop funding support for prescribed fire program	Tribes may have deep level of understanding and experience with putting fire on the ground. Not currently utilitzed in fire programs	Include Tribes and TEK in fire prescriptions		
				Make permitting process easier so that when a fire happens we can react		Prioritize private land burn programs on lands adjacent to USFS or other federal lands to take advantage of Good Neighbor funding and implementation support				
				Streamline permitting process and implement coordinated burn program		Work with DNR to develop professional locally available prescribed fire burn team or unit. Build trust with the agency.	suppression efforts			
Inadequate management following fire	Suppression efforts can lead to soil disturbance and change in plant species composition and density, often trending toward noxious weeds or invasive species.	Fires are detectable disturbances managers can respond to using best management practices.	lack of long term monitoring and response capacity	Educate land owners on continuing need for maintenance. Initiate programs for monitoring and maintenance. (Smiley face NRCS fund this)	Funding to pay for seed, labor and soil stabliization or other remediation following fire is not widely or readily avialble.	Create a fund or develop short term loan program for response to wildfire.			It is difficult to mobilize resources and respond in the immediate aftermath of a fire, dependent on scale and timing of fire	streamline permit process for work on the ground
			lack of available BMPS	Landowner outreach	limited immediately available local seed sources	Develop community seed bank. Http://www.greatbasinnpp.org/webinars				Develop checklist for post-fire management response for landowner and partner use