

An aerial photograph of a rugged, mountainous landscape. The terrain is a mix of green vegetation and brown, rocky slopes. Several small lakes and rivers are visible. White lines are overlaid on the image to delineate the boundaries of Wallowa County, OR, and Valley County, ID. The sky is a clear, bright blue.

*Wallowa County, OR*

*Valley County, ID*

# Rural Divides

*An examination of landscape integrity  
across political and ecological systems*

By Willow Vero, MLA 2026



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# Acknowledgements



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# 1.1 Introduction

## Project Concept

Over the past seventy years, human migration patterns have impacted many rural landscapes in the American West; those with outstanding natural systems and world class recreation opportunities have experienced significant change. These movements and migration patterns have created a ‘rural restructuring process’ (Abrams, 2016). During rural restructuring, “traditional” land uses such as logging, ranching, and agriculture transition to post productive or multi-functional landscapes where the new extractive practices include the consumption of natural, recreational, and scenic resources by absentee landowners, new migrants, and tourists. This restructuring process has led many interdisciplinary researchers including sociologists, economists, geographers, and planners to introduce the concept of the “New West”, where shifts in socioenvironmental characteristics occur following the decline of traditional extractive industries (Robbins et al., 2009, Hjerpe et al., 2021). These changes impact many systems including ecology, social arrangements, and economic activities (Gosnell and Abrams, 2011). This project uses a comparative case study and landscape integrity model to examine differences in Oregon and Idaho’s ecological structure, wildlife habitat, and land use planning systems.

### Rural Restructuring: Cause and Effect

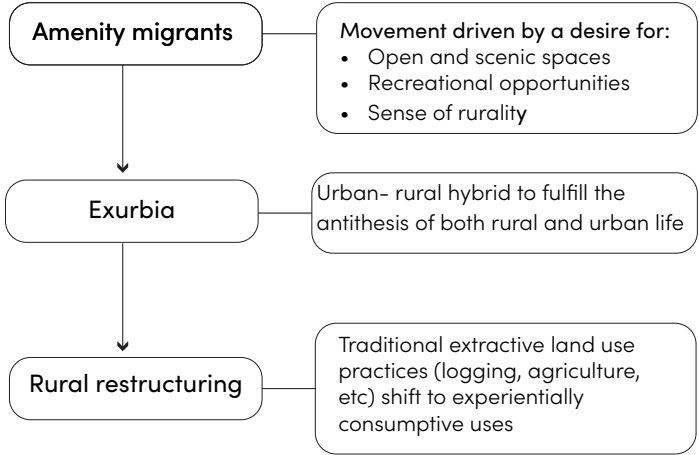
Two processes known as amenity migration and exurbanization cause rural restructuring. Amenity migration involves the movement of generally affluent urban people who desire landscapes with scenic beauty, open space, recreational opportunities and a sense of rurality (Abrams, et al. 2012, McKinnon, 2016). Exurbanization is characterized by the popularity of residential development past the urban fringe (DeStefano, 2009). Exurbanization is separate from urban sprawl in the sense that it embodies the desire for rural rather than urban living. Taylor and Hurley describe exurbia as “a landscape created by the fusion of rural and urban ideas” and as a purposefully created rural-urban hybrid that is maintained as an antithesis of rural urban living (Taylor and Hurley, 2016). The arrival of amenity migrants from urban spaces creates an exurban landscape which experiences rural restructuring (Figure 1). Amenity migration and exurbanization create an influx of urban people, who in turn bring the accompanying need for low density residential and service developments and urban necessities. These developments mainly occur in the form of residential subdivisions, hotels, retail, restaurants, and expanded road networks (Abrams, 2016, Frodeman, 2024). These developments often result in fragmented landscapes,

as historically open spaces or agricultural lands are developed and subdivided to serve the new residents. Within ecological systems, wildlife habitats are often impacted as residential, commercial and industrial development patterns result in shrinking patches and corridors. These changes can prevent migration and breeding, thereby decreasing genetic diversity and the wellbeing of animal and plant species (The Environmental Law Institute, 2003). As fragmentation occurs, these newly arriving urban folk generally bring new influences in rural politics and economics with their affluence (McKinnon, 2016). This affluence can create opportunities for conflicts, but also unique coalitions which, when leveraged, can protect habitats and migration corridors (Taylor and Hurley, 2016).

### Application of a Landscape Architecture Lens

Landscape architecture education and practice have historically overlooked rural landscapes across the American West, despite their unique social and natural ecologies. As restructuring progresses, many of these socio-cultural and ecological qualities face increasing risk of loss. Much of the work centered around amenity migration and rural restructuring transpires through geography, economics, or sociology lenses. An application of a multi-pronged landscape architecture lens would add complexity to the field. To serve this need, this research project aims to merge two fields of study; landscape ecology, which emphasizes the interactions between spatial patterns and ecological process, and land use planning and policy, interpreted in this project as the management and regulation of land to guide development (Figure 2).

Figure 1 Guiding Concepts



### Project Overview

Within the planning context of the United States, each state creates their own land use policy or program. Many states, including Idaho, delegate land use decisions to local jurisdictions at the county or city level, allowing for local interpretation and regulation of development patterns. Conversely, some states such as Oregon, Washington, and Hawaii operate under statewide top-down land use policies. To understand the ecological implications of a top-down vs local planning system on local ecology, a comparative case study will be conducted to examine the differences between Oregon and Idaho’s landscape ecology and land use planning systems. This study focuses on changes to wetland and riparian areas, using Great Blue Heron nesting habitat as an ecological indicator. Additionally, this comparative study opens the door to a discussion on whether the original goals centered around wildlife and open spaces of the respective land use planning systems are achieved.

Within the practice of landscape ecology, many methods exist to study ecosystem and landscape health. Landscape integrity is a branch of ecology that offers an opportunity to study the impacts of human modification at large scales and across time periods. Using guidance and existing studies from the field of landscape ecology, a landscape integrity model (LIM) was developed to analyze human influences in comparable watersheds in Wallowa County, Oregon and Valley County, Idaho (Walson and Hartmann, 2018 and Theobald, 2010). LIMs are useful tools to study ecological and landscape scale changes since they can be easily replicated across different locations and can accommodate new variables and inputs. These qualities allow for standardized comparison of seemingly different landscapes.

The LIM examines the degree of modification using a human influence index and a timescale of 30 years (Figure 3). The elements of the LIM focus on human influences such as vegetation transition, building and road densities, and disturbances associated with recreation. Total acres of change and disturbance are used to produce a landscape integrity score for each watershed. Findings from the model provide opportunities for further study, as LIMs can be easily modified to accommodate new variables or geographies.

Figure 2 Project Study Areas

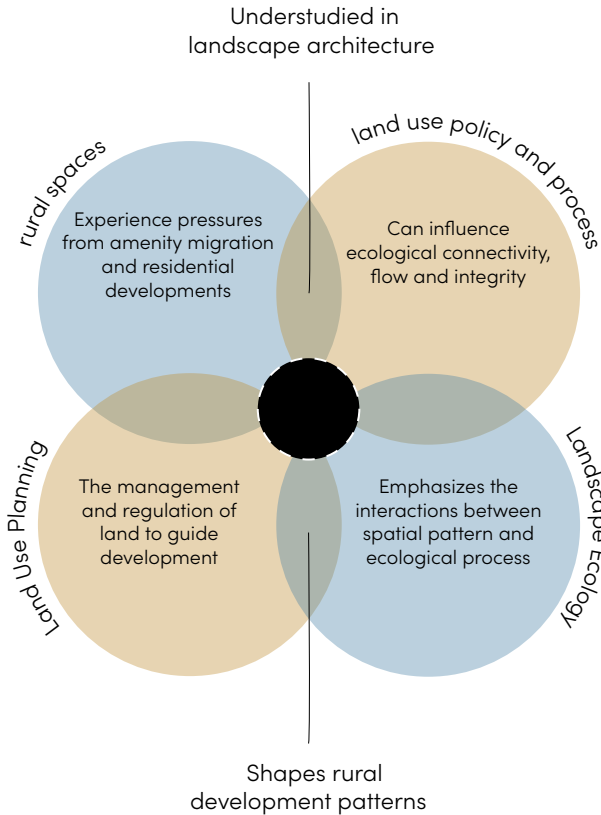
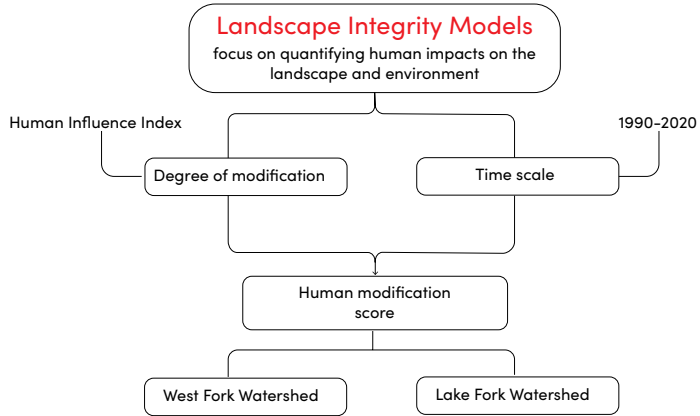


Figure 3 LIMs





# 1.1 Introduction

## What is Landscape Integrity?

To understand landscape integrity, and the condition of the landscape overall, it is critical to understand what is being studied. Landscape integrity focuses on the condition of the overall landscape, particularly looking at how human activities and influences shape ecological patterns and processes. Lotonenko, from LASD Studio defines landscape ecosystem integrity as “the degree to which ecological relationships are sufficiently complete, connected, and functionally organized to support self-regulation under variable conditions or disturbances, while retaining the capacity for improvement or degradation over time” (Lotonenko, 2026). Landscapes with high integrity are able to maintain ecological stability, resist undesirable transitions, and support recovery after a shock or stressor, but when integrity is low, chemical, mechanical, financial, or institutional inputs are required to maintain ecological performance and flows (Lotonenko, 2026) (Figure 4). Looking towards a future with climatic uncertainty, studying and understanding landscape integrity offers a well-positioned framework for designers, planners, and policy makers to prepare for changes and increase resilience across natural and constructed systems (Wurtzebach & Schultz, 2016).

Landscape integrity frames attributes from landscape ecology in a way that offers planners, policy makers, and researchers an opportunity to normatively and usefully study social and natural ecosystems. Additionally, landscape integrity includes tools to measure and visualize changes. These qualities make landscape integrity an applicable field of study for landscape architects, planners, and concerned citizens.

To understand the concept of landscape integrity and rural landscapes, one first must understand what constitutes a ‘landscape’ within the field of landscape ecology. Forman and Godron, early practitioners in the field define a landscape as “a heterogenous land area composed of a cluster of interacting ecosystems that is repeated in similar form throughout” (Forman and Godron, 1986). They also argue that geomorphological processes, colonization patterns, and local disturbances create landscapes (Forman and Godron, 1986). Within the concept of the landscape there are three main characteristics: structure, function, and change (Botequilha Leitao et al., 2006). Structure includes the spatial relationships among different ecosystems present, function examines the interactions or flows among the

ecosystems and change studies the alteration of the structure and function over time.

This project examines the three characteristics of a landscape within two **rural watersheds with high amenity wealth**. The three characteristics can be illustrated as follows:

Structure within rural landscapes often manifests a variety of ecosystems. Ecosystems or “elements” include:

- Patches of small cities, residential areas or subdivisions, industrial areas, recreation areas, forested areas, contiguous wetlands, or cultivated lands all of which vary in distribution, shape, and size
- Corridors of riparian areas, roads and ditches, trail systems, maintained powerlines, irrigation ditches, and established wildlife migration routes. Corridors can encourage OR hinder movements and system flows
- Matrixes are mixture of all the in between heterogenous areas or elements

Function focuses on the interaction of elements and ‘services’ of the landscape including:

- Flows, filtration, and recharge in riparian areas and the systems they support
- Absorption of CO2 and production of oxygen through trees and soil
- Movement of chemicals and pollutants by wind, agricultural processes, and vehicles
- Seasonal and daily habitats and migration of animals, (some historic movements may be altered by introduced elements)
- Introduction of household predators (cats, dogs, exotics, etc) or imbalance of species hierarchy that threaten native wildlife structures
- Movement of people though the landscape

Change examines the alteration of structure and function over time, including:

- Loss of vegetated patches to housing, recreation, or industrial areas
- Increase in road corridors which fragment

contiguous riparian, shrub, or wooded patches

- Conversion of agricultural lands and pasture to residential, or industrial areas
- Changes in species distribution and abundance caused by introduced predators or human influence
- Transformations of developed patches to ‘natural’ vegetation structure through processes of restoration, reforestation, or naturalization

**Elements of Landscape Integrity**  
Critical elements of landscape integrity include connectivity, trophic completeness, vegetation structure, and disturbance (Figure 4).

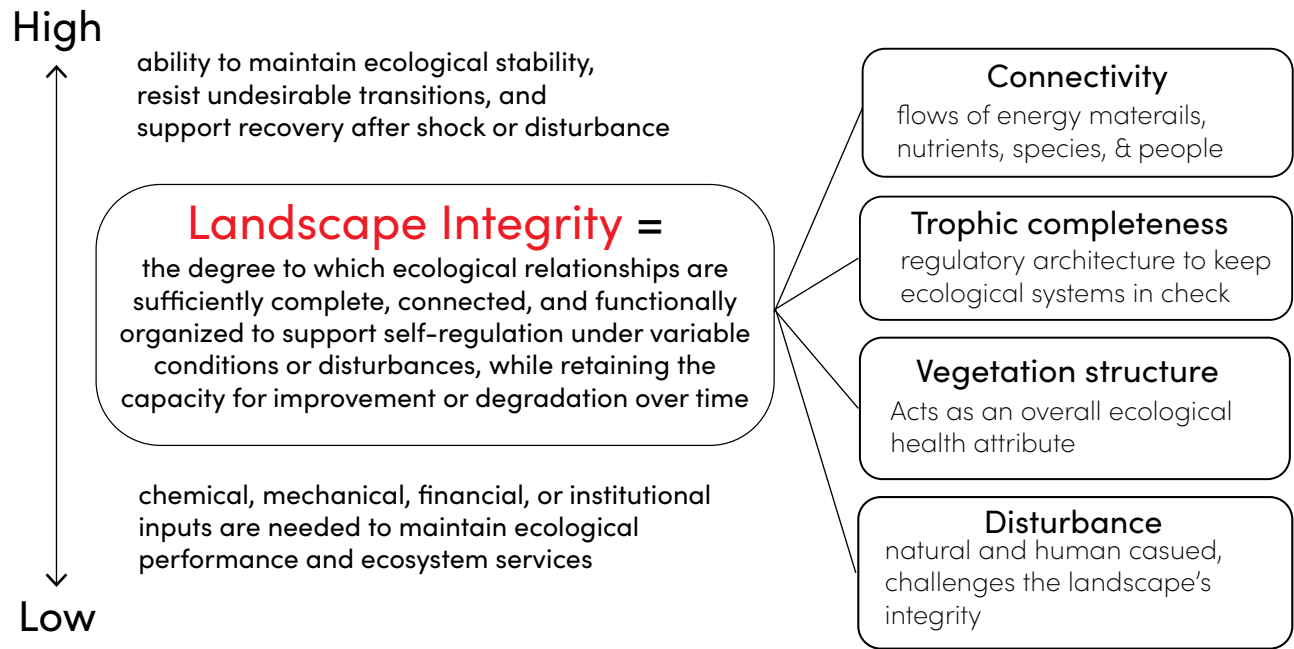
Connectivity is the degree to which the landscape allows or impedes the flow of energy, materials, nutrients, species and people (Botequilha Leitao et al., 2006). As human influences unfold across the landscape, new roads, housing developments, fencing, or industrial practices can hinder flows of plants, animals, or nutrients between patches, thereby decreasing the integrity of the landscape. These changes can manifest as problems with species movements, genetic diversity, and nutrient cycling

(Lotonenko, 2026).  
Trophic completeness illustrates the pathways that energy and matter move within the landscape. Lotonenko suggests that trophic completeness can be thought of as the regulatory architecture needed to keep systems in check (Lotonenko, 2026). For instance, landscapes that do not include balanced predator-prey relationships may have lower landscape integrity and may experience cascading changes. As people move into and develop rural landscapes, they alter predator-prey relationships by introducing new predator species and removing of apex species. These seemingly small changes have potential to impact vegetation, habitat structures, and disturbance regimes.

Vegetation structure supports both connectivity and trophic completeness. The loss or conversion of vegetative areas impacts habitats, hydrological systems, nutrient cycling, and functions as an overall ecological integrity attribute (Walston & Hartmann, 2018).

Disturbance can be natural or human influenced. Landscape level disturbances may include, fire and flood regimes, population changes, pressures from predators or invasives, agricultural practices, road networks, climatic changes, and increases in impervious surfaces.

Figure 4 Elements of Landscape Integrity





## 1.2 Introduction

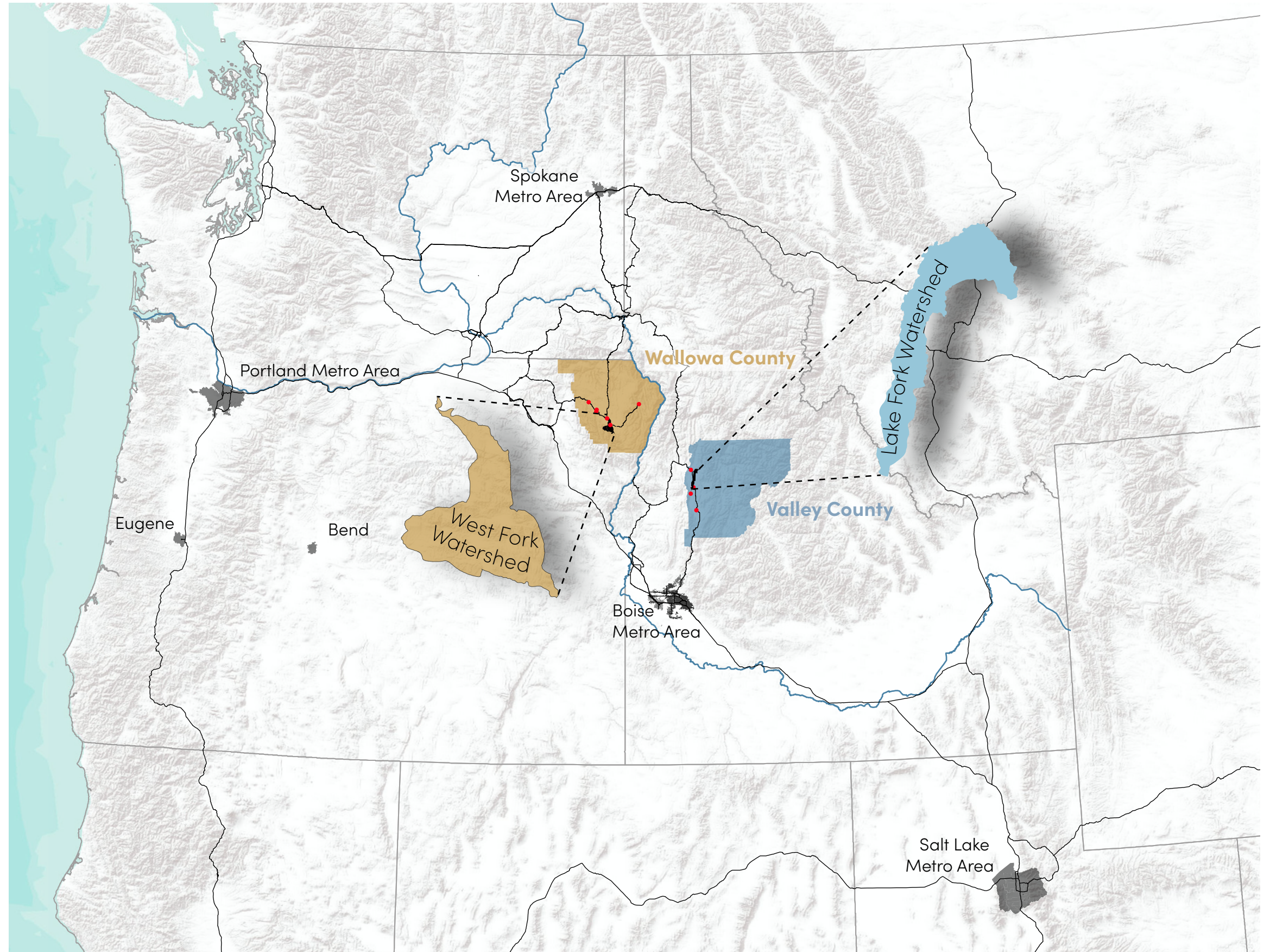
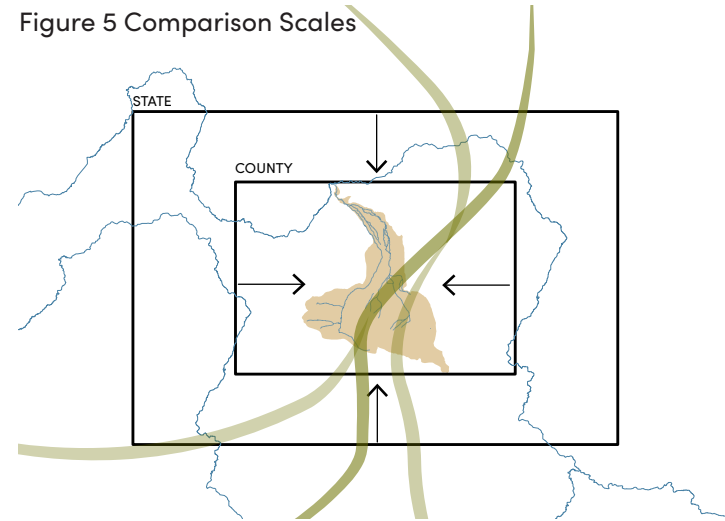
### Location

Since political and ecological systems operate at fundamentally different scales, this project's comparative study includes multiple geographic layers. Policy comparisons occur at the state and county levels, while the landscape integrity study and model are conducted at a watershed level. Policy is administered through rigid jurisdictional boundaries, while ecological systems, such as watersheds and migration corridors cross and ignore these imposed lines. As a result, planning interventions will be analyzed at large county and state scales, but ecological patterns themselves will be examined at more localized resolutions (Figure 5).

Wallowa County, Oregon and Valley County, Idaho have been chosen for comparative study. Their geographic proximity, speculative parallel amenity wealth and contrasting land use policy make for an interesting comparison. Wallowa County is located in Northeastern Oregon, south of the Spokane metro area and east of Portland. Valley County is located in central Idaho, north of the Boise metro area. Hells Canyon, the Snake River, and Adams County, Idaho separate these two counties. Both counties are attractive to amenity migrants due to parallel natural resource amenities including scenic views, open spaces, and pastoral qualities. Wallowa and Valley Counties are home to world class recreation opportunities centered around lakes, wild and scenic rivers, wilderness areas, and large amounts of national forest lands. The two counties offer an escape from urban and suburban centers. In 2024 the total county population in Wallowa County was 7,522 and Valley County had a population of 12,777.

Wallowa County's West Fork Watershed and Valley County's Lake Fork Watershed were selected based on similar ecological and amenity qualities.

Figure 5 Comparison Scales





# 1.3 Introduction Local Amenity Wealth

## Natural Amenities

### Wallowa County:

- Wilderness areas
- Scenic lakes and rivers
- Scenic gondola and hiking trails
- Known as “Little Switzerland”

### Valley County:

- Wilderness areas
- Scenic rivers and lakes
- Ski areas and hiking trails
- Golf courses

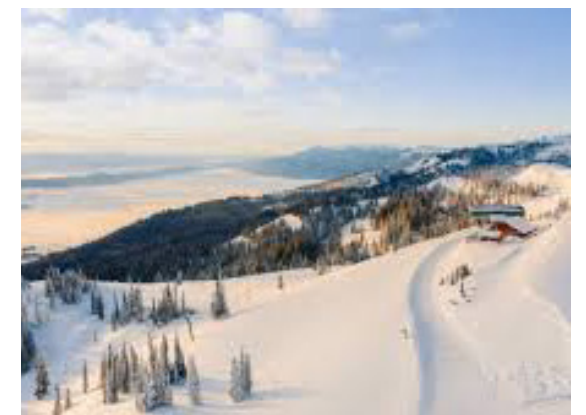
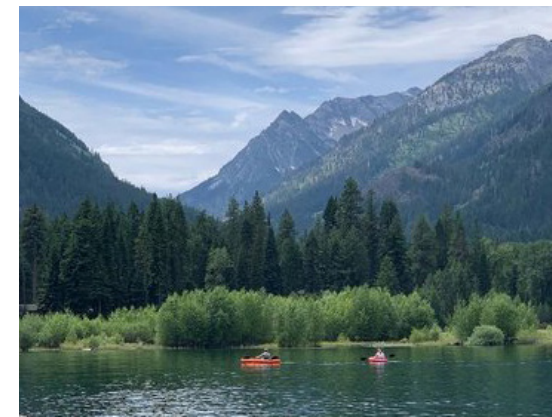
## Rural Restructuring

“Wallowa County is a beautiful place to live and recreate, and because of this our property values have skyrocketed. Vacation rentals and second homes make up a fair amount of our current housing stock”

– Wallowa County  
Commissioner John Hillock

“Land-use patterns in Valley County have been radically altered during the past decades away from the traditional agricultural-use pattern to one of recreation home and subdivision development.”

– 2025 Valley Co. Comp Plan

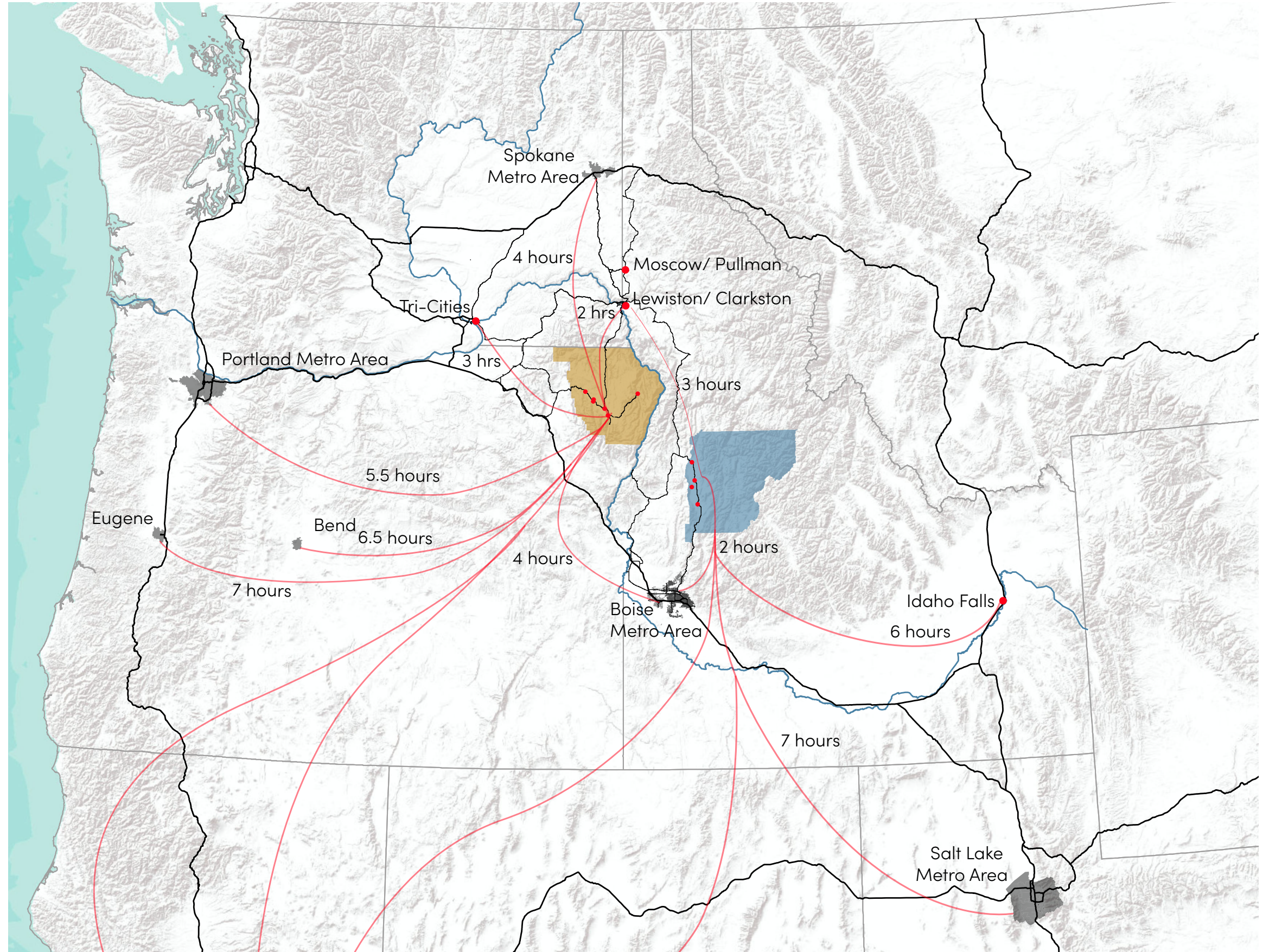




## 1.4 Introduction

# Regional In-Migration

Wallowa and Valley Counties straddle the Pacific Northwest and Rocky Mountain regions making relocating and vacationing accessible for many people. By surveying and studying property ownership information held in local tax lot databases patterns of amenity migration begin emerging. Many amenity migrants relocating to Wallowa County arrive from the Portland, Eugene, Bend, and Spokane metro areas. Due to proximity, Valley County experiences a significant influx from the Boise area. However, new arrivals also migrate from Salt Lake City, Idaho Falls, and the Spokane metro areas. Both counties are experiencing an influx from various cities in California.





# Wallowa and Valley Counties:

Social and ecological profiles, watershed selection criteria, and development timelines



Valley County neighborhood  
Image credit: Build Idaho

Wallowa and Valley counties share many ecological and socio-economic qualities but diverge in some areas. Similarities include a comparable total area (roughly 2 million acres), a large amount of public lands in the form of mostly national forests and wilderness areas, agricultural valleys where most private lands are located, small cities within the valleys, and a variety of landowners including federal, state, conservation, and private entities. In both counties, about half of dwellings are located outside of city limits (51% in Wallowa County, 57% in Valley County). Additionally, both counties are home to an abundance of riparian systems and a vast amount of transcontinental, regional, and local migration routes for a variety of species.

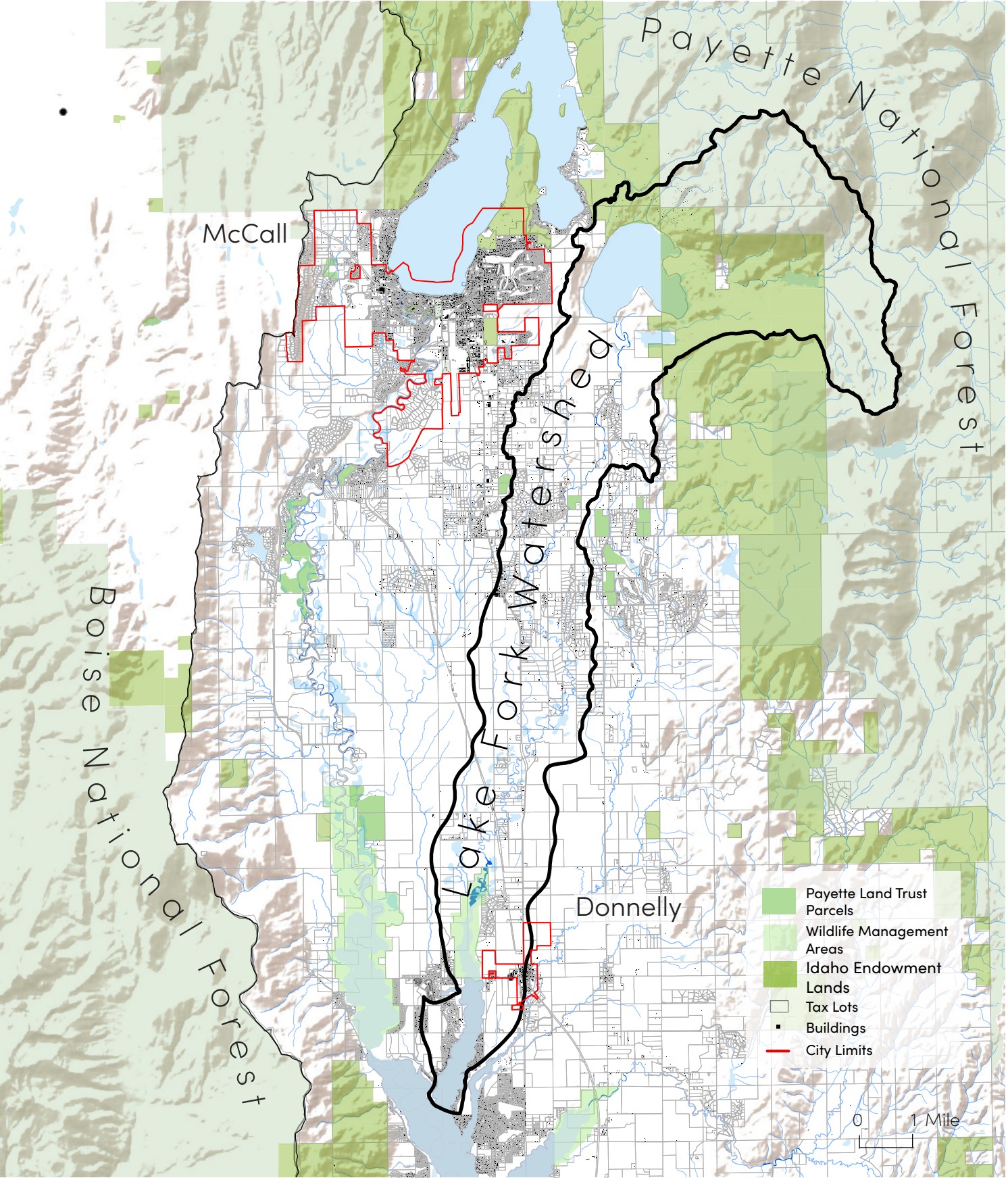
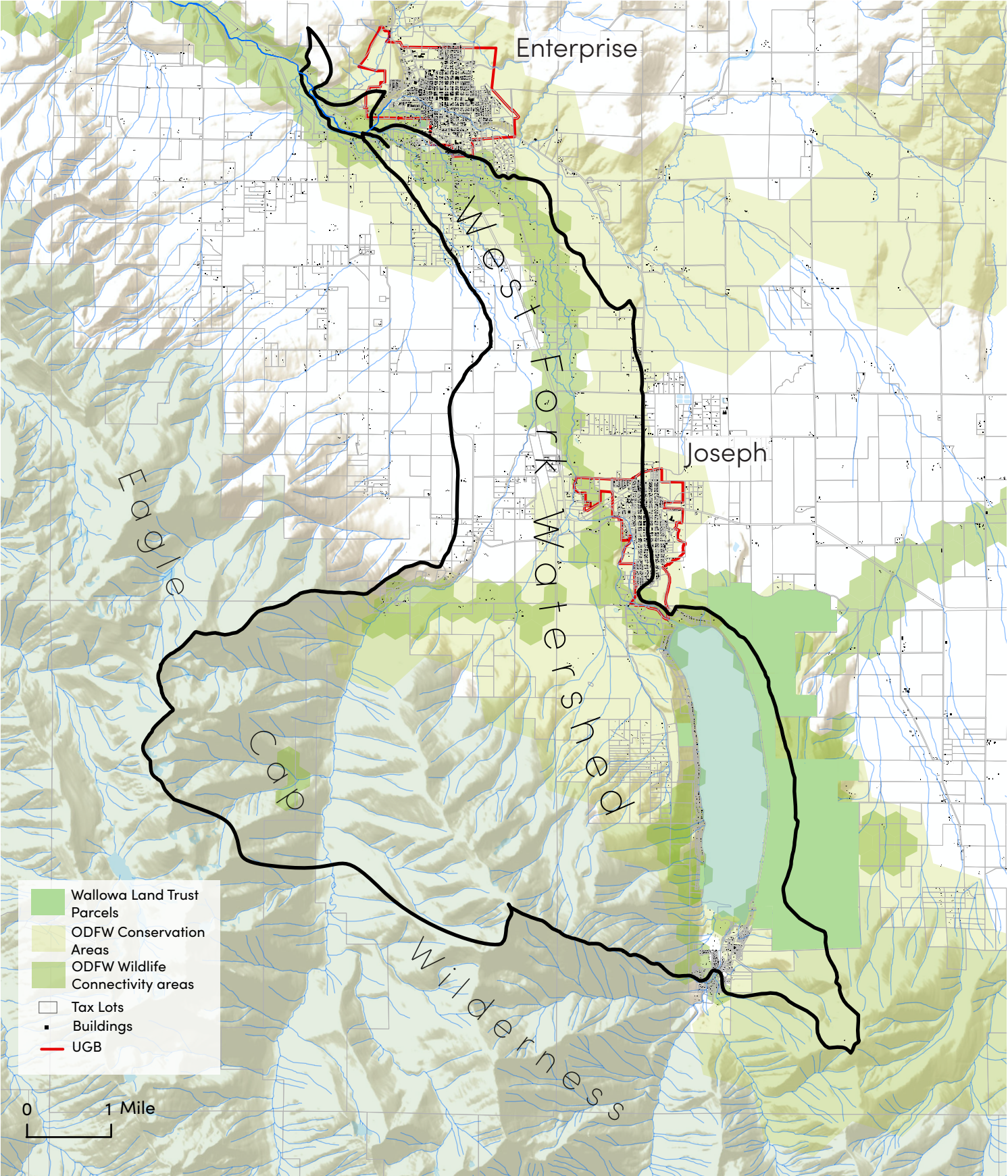
Because the counties are vast, this project limited the application of a LIM to a watershed in each county. The West Fork Watershed in Wallowa County and the Lake Fork Watershed in Valley County were selected due to their similar qualities. West Fork Watershed, located in Wallowa County has an area of 24,920 acres, Valley County's Lake Fork comprises 28,569 acres. Starting at a large scale, both watersheds act as cross valley corridors between 'protected' areas such as national forests and wilderness areas, wildlife management areas, endowment lands, conservation opportunity areas, and land trust parcels. Both watersheds' headwaters stem from natural lakes and include

riparian corridors with multiple stream classes. The Lake Fork Watershed (Valley Co.) terminates in Lake Cascade, a human made reservoir. West Fork Watershed (Wallowa Co.) joins the larger Wallowa River, later joining the Columbia River downstream. Both watersheds include a small number of urban lots. The city of Joseph with a population of 1,154 in 2020 is partially located in the West Fork watershed. Donnelly, Idaho is partially located in the Lake Fork Watershed with a population of 249 in 2020. Rural developments in the form of subdivisions, farms, ranches, and ranchettes are sprinkled throughout both watersheds.

Finally, due to their many natural amenities there are numerous recreation opportunities in both watersheds. Many are centered around the lakeshores in each watershed in the form of motorized boat ramps, campgrounds, and parks. The West Fork has the iconic Wallowa Lake Tramway which takes visitors to the mountain top, and the East Moraine Community Forest which offers hiking, biking, and horseback trails. The southern end of Wallowa Lake, known as "Little Switzerland," is the gateway to the Eagle Cap Wilderness and features many tourist amenities (Figure 6).



2.1 Study Areas  
Watersheds





2.2 Study Areas

# Rationale for watershed study selections

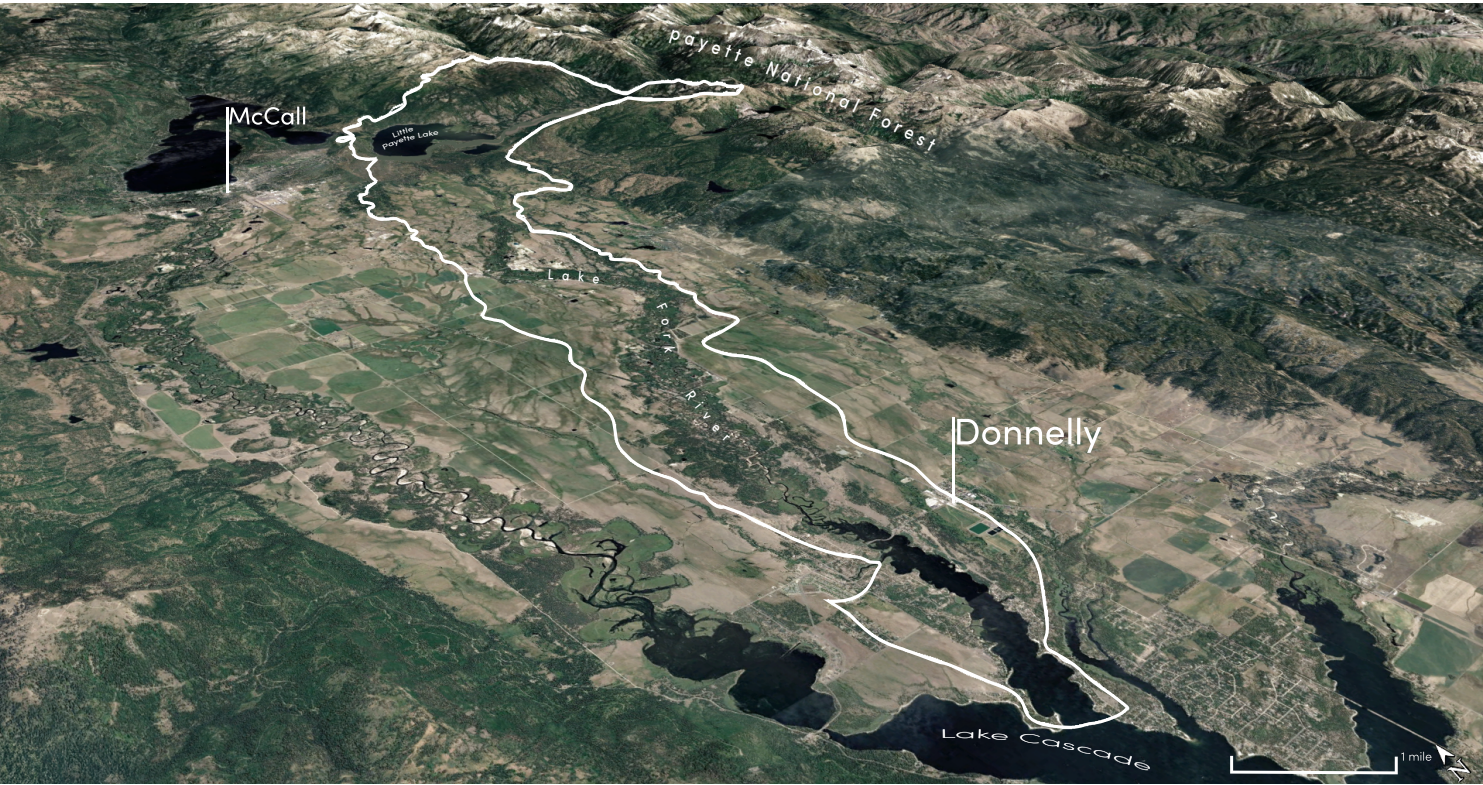
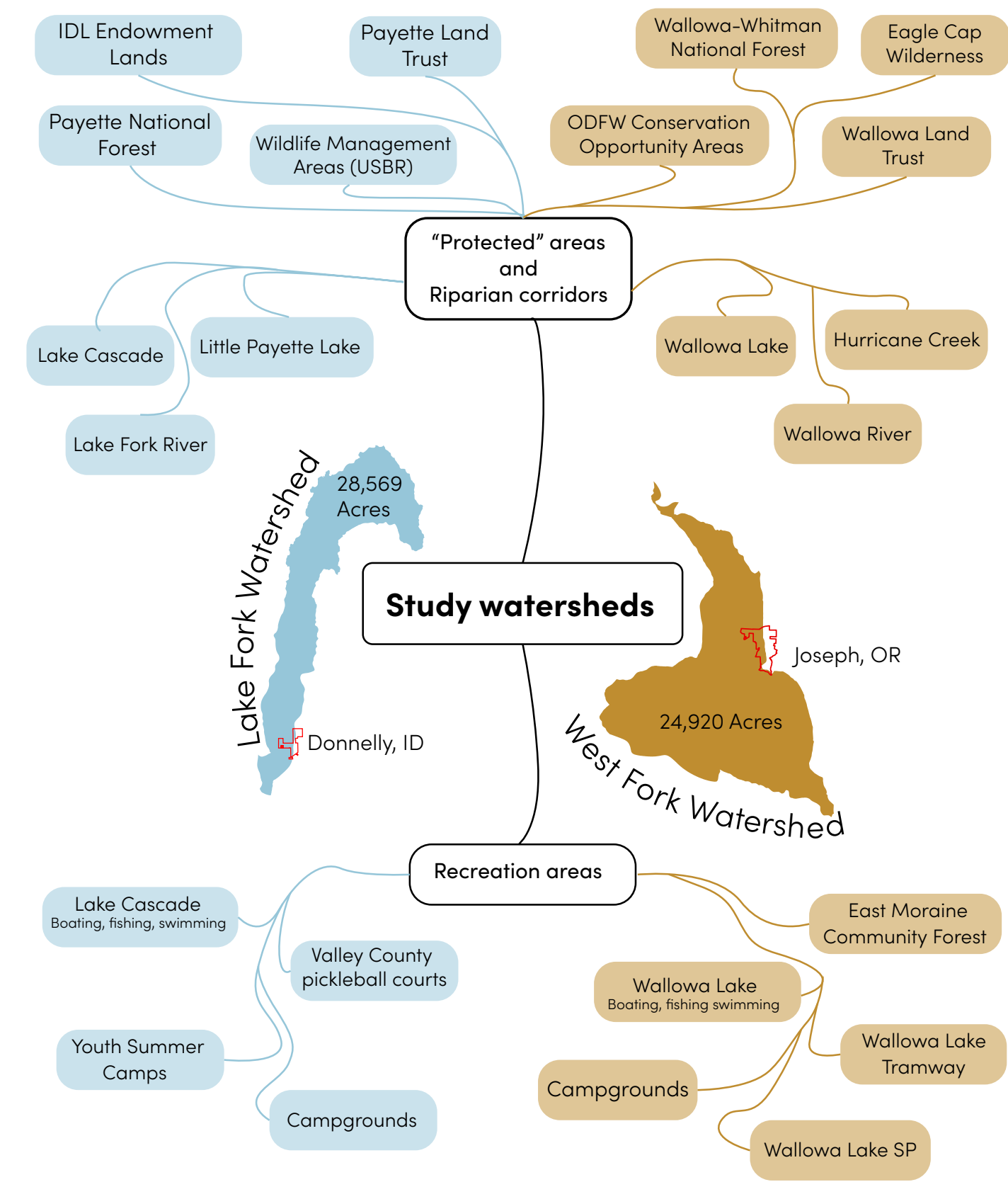


Figure 6 Watershed Attributes





## 2.3 Study Areas

# Wallowa County: Land Use History and Development Patterns

For countless generations the Wallowa Valley was home to the Nimi'ipuu (known today as the Nez Perce), the group traveled throughout the valley on a seasonal round (Chieftain, 2007). In the aftermath of the Nez Perce War of 1877, Wallowa County's settlement history mirrors many communities in the American West. Small groups of settlers arrived in the late 1800s, traditional extractive processes began including logging, mining, and grazing. In 1915 the Eastern Oregon Lumber Mill opened in Enterprise, jumpstarting logging production and in-migration to the county. By 1916 the estimated county population was 12,000 (Chieftain, 2007). The shuttering of the mill in 1926 wreaked economic havoc on the isolated community, and the rural restructuring process began. Before the mill closed, the recreation and development of an amenity industry was already underway with the construction of the Wallowa Lake Lodge and the development of the south lake shore.

Wallowa County's population steadily declined until the 1970s. In 1973 Tom McCall and the Oregon Legislature passed SB 100, Wallowa County's Comprehensive Land Use Plan was acknowledged by the State in 1986. Combined, these actions started the era of land use planning in Wallowa County. In response to state and local level environmental policies and rulings, Wallowa County was a hot bed of indigenous, environmental, and extractive industry conflicts between 1970 and into the 2000s. The 1993 Salmon Habitat Recovery Plan was adopted into the Comprehensive Plan, impacting logging and grazing practices, a win for the Nez Perce Tribe, salmon, and other species but a loss for the logging industry. In response to federal, state, and local environmental policies, in 1994 two tar and feathered effigies of well-known environmentalists were hung in Joseph (Durbin, 1994). As clashes raged on, the County Court established the Wallowa County Natural Resources Advisory Council (NRAC) to review the implementation of Comprehensive Plan Goal 3, Goal 4, and Goal 5. Planning efforts to protect environmental assets are still underway; in 2024 NRAC published the Wallowa County Natural Resources Plan, which functions as an update to the Salmon Habitat Recovery Plan but includes a wider scope of species and landscapes.

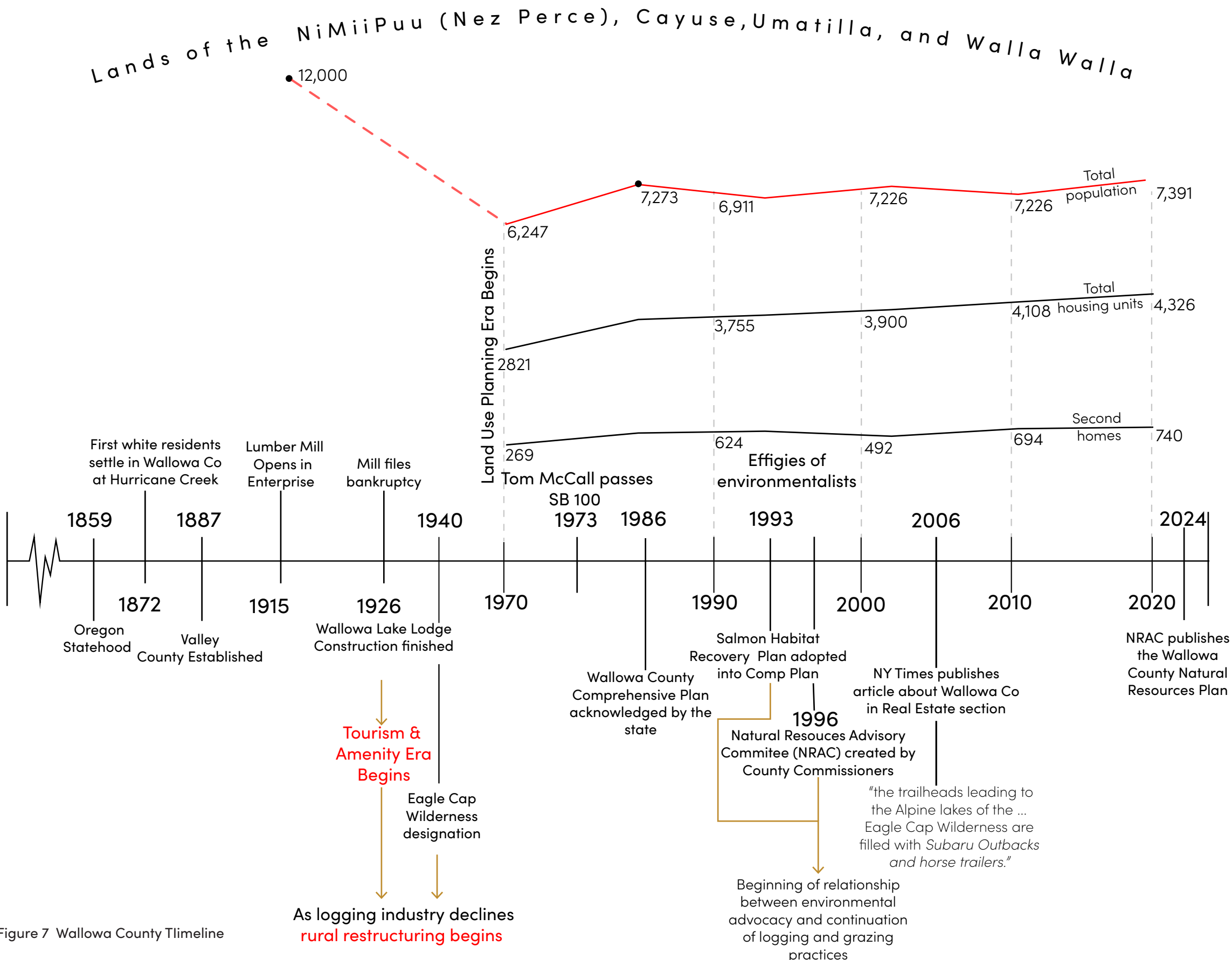


Figure 7 Wallowa County Timeline



# 2.3 Study Areas

## Valley County: Land Use History and Development Patterns

Much like Eastern Oregon, Central Idaho has a significant indigenous history; multiple tribes occupied what is today, Valley County. The Shoshone Bannock and Shoshone Paiute occupied the southeast part of the county, while NiMiiPuu (Nez Perce) occupied the northern area. By 1863, the Tribes collective territory was reduced by 90% largely due to gold mining and prospectors (Woods, 2002). In 1902 the McCall Mill was established, and logging became the region's main industry. The damming of Lake Cascade in 1948 kickstarted the tourism and recreation economy, the newly constructed lake offered plentiful recreation opportunities and an opportunity for lake front living. At this time logging was still a booming industry and rural restructuring did not begin until the 1978 closure of the Boise Cascade Mill.

Following Oregon and other states, Idaho passed the Local Land Use Planning Act in 1975, and Valley County adopted their first Comprehensive Plan in 1978. The Plan attempted to regulate development pressures the entire state of Idaho was feeling response the exurbanization movement. Up until the 1990s Wallowa and Valley County shared similar total populations, but from the 1990s and on, Valley County gained population and housing units grew at a quicker rate. Much of this growth could be attributed to Idaho having a weaker land use planning program which leads to less regulation on rural development making it easier to build homes outside of city limits. Rural restructuring and amenity migration progressed into the 21st century, with a boom in resort communities and second homes. The dependence on the natural amenity economy can be seen in the housing slump caused by the 2008 financial crisis and recession, and the updated Comprehensive Plan which focuses on shoreline protections, regulating short term rentals, and zoning

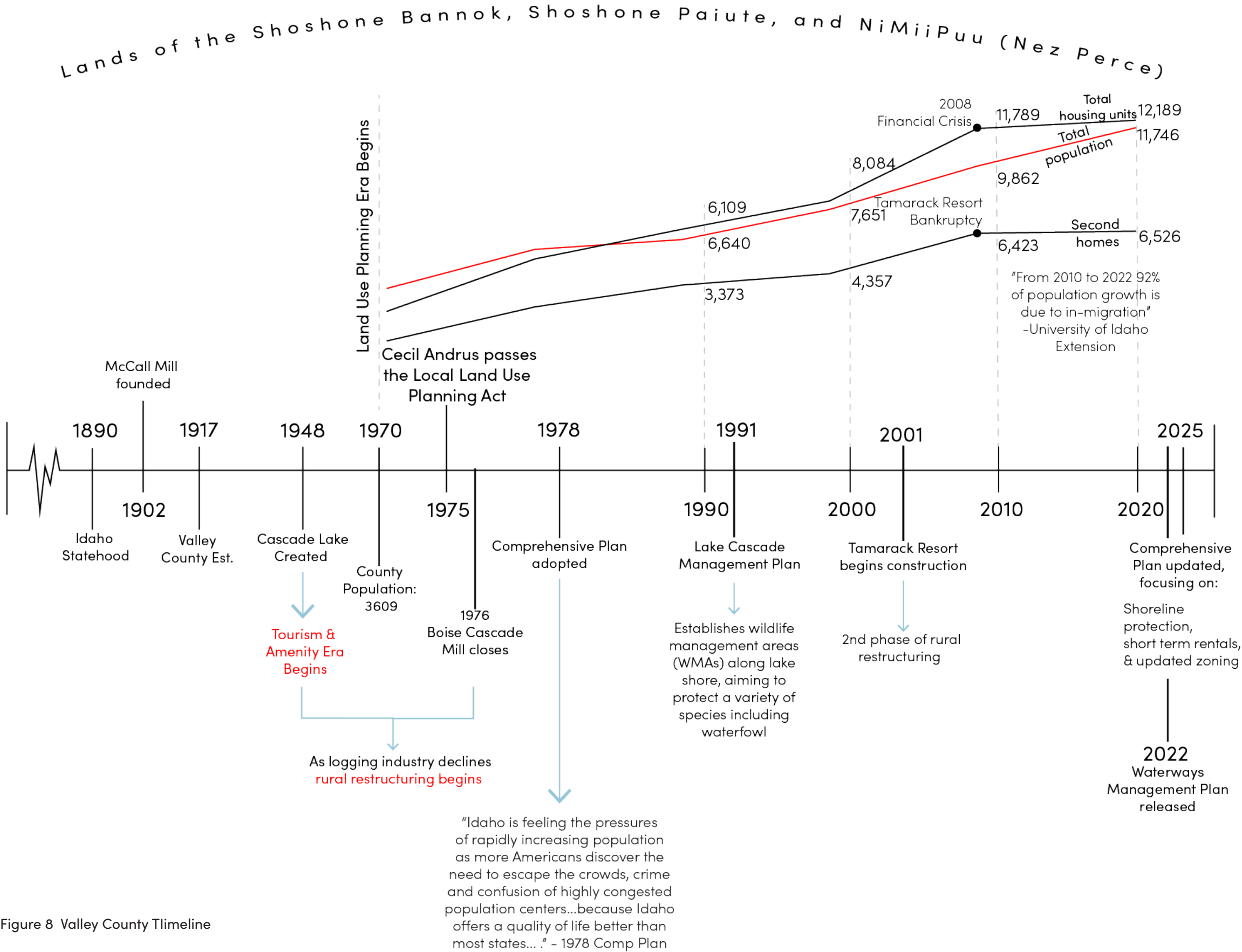


Figure 8 Valley County Timeline



### The Landscape Integrity Study

Problem statement, research questions, hypothesis, methodology, and findings



Houses on the shore of Wallowa Lake  
Image Credit: VRBO

### Problem Statement:

As rural counties and communities experience amenity migration and undergo rural restructuring, many landscape processes are altered. Alterations to rural landscape processes include decreases in habitat connectivity and size, disturbance of riparian systems, and introduced chemical and noise pollutants. Because rural restructuring frequently stems from land use planning decisions, and because each state operates under a different planning framework, the resulting ecological changes and development patterns may vary widely across the U.S.

### Research Questions: Hypothesis:

1. Does a state with a land use policy that reduces rural sprawl have a greater landscape integrity score?
2. Will Great Blue Heron habitat remain more intact in a state with strong conservation goals and programs?

The West Fork Watershed in Wallowa County, Oregon will experience less overall human influence impacts due to strong land use planning which attempts to limit residential, industrial, and commercial growth outside designated Urban Growth Boundaries.



# 3.1 Landscape Integrity Study Methods

To understand patterns of human influenced changes in the study watersheds, a landscape integrity model was developed to track and visualize patterns of human influenced disturbance and change over time. To apply rigor to the study, the Great Blue Heron is used as a landscape integrity indicator species, and a spatial study of habitat disturbance patterns was conducted. As apex predators, herons function as keystone species whose presence contributes to the trophic completeness of the landscape.

To conduct spatial analysis, landscape attributes of each watershed were mapped in ArcGIS Pro; these attributes included administrative boundaries, waterbodies, road networks, buildings, recreation sites, USFWS defined wetlands, and National Land Cover Data (NLCD) from 1990, 2000, 2010, and 2020. Four disturbance indicators (landcover, roads, recreation and building density) were used to calculate and compare each watershed’s landscape integrity score.

## Landscape Integrity Model (LIM) and Human Influence Index

After conducting a literature review of existing models, a modified multi step methodology and index was adopted by bridging Walston and Hartmann’s Landscape Integrity Index (Walston & Hartmann, 2018), Theobald’s Human Modification Framework (Theobald et al., 2010), and a USFWS habitat suitability model (Short & Cooper, 1985).

To quantify human impacts on the landscape, this project used index-based measures of disturbance. Indexes assign severity scores to the presence of specific human influences associated with development patterns such as changes in impervious surfaces, the loss of agricultural areas, road networks, and recreation site within the study area. Disturbances and land cover transitions with the greatest potential to disrupt landscape structure and connectivity, such as expanding impervious surfaces, heavily traveled roads, or chemical and mechanical pollutants, are assigned the lowest index values.

For vegetation and land-cover transitions, the project adopted Walston and Hartmann’s 0–1 scale, where values closer to 0 indicate greater human influence and ecological departure. To capture additional stressors, specifically roads and recreation, the analysis incorporated Theobald’s Human Modification framework. Because Theobald’s index defines higher integrity with values near 0, scores were inverted to align with the Walston and

Hartmann scale. Together the index values create the Human Modification Index which rates the severity of disturbance on a scale of 0 (high human modification) to 1 (low human modification) (Figure 10 & 11). After mapping all attributes in GIS and calculating acreages, the data was exported to Microsoft Excel for summary statistics and final calculations.

## Vegetation Structure

To study changes in vegetation structure during the study period of 1990–2020 a from- to analysis was conducted. The From-To analysis process was completed by merging sequential (1990 and 2000, 2000 and 2010, 2010 and 2020) landcover raster layers using the raster calculator and creating a new column in the attribute table to characterize when a pixel transitioned from one NLCD pre-defined category to another. Transitions associated with human influenced development were then isolated and extracted for each decade. These transitions include changes from any vegetation class to developed, high intensity; developed medium intensity; developed, low intensity; developed, open space; cultivated crops; or pasture/ hay. To illustrate logging patterns, transitions from any forest class to shrub/ scrub were isolated (Figure 9).

Figure 9 From-To Analysis



## Disturbance Indicators

The remaining three disturbance indicators include road networks, recreation opportunities, and building densities. Road networks contribute to the overall score and influence a landscape’s integrity. As road networks increase, the landscape’s connectivity lessens as many species’ habitats may become fragmented as various noise, chemical, and climatic disturbances are introduced. Recreation sites bring disturbance in the form of noise, chemicals, changes in vegetation structure, and often limit connectivity. Buildings increase the human footprint on the landscape, and similar to roads and recreation sites create disturbance in the form of noise, light, and chemical pollution, fences, household predators, changes in hydrology, and possible introduction of invasive species.

To analyze the influence of roads and recreation opportunities Theobald’s Human Modification Framework was used (Theobald, et al., 2010). To calculate total acreage of roads, buffers were applied to road lines in ArcGIS. Roads designated as highways received a 30-meter buffer to account for both the road width and the associated disturbances such as noise, light, and chemical pollutants (Theobald, et al., 2010). All other roads were buffered to their approximate natural width, a buffer of 4 meters was applied to roads designated as secondary or collectors, and a 3-meter buffer was applied to local roads (private roads or neighborhood streets).

Building distance followed the guidance of the 1985 Blue Heron Habitat Suitability Model, which identified herons’ sensitivity to human influence, and applied a 250-meter distance of impact to buildings. Analysis and indexing of building densities was twofold, using Walton and Hartman’s index scores to calculate footprint intensity and a buffer distance of 250m adopted from the USFWS Great Blue Heron Habitat Suitability Model (Short & Cooper, 1985). It is important to note that this buffer distance is specific to herons and is not a buffer that would apply to all species or ecological processes. A source could not be found which linked road or recreation site distance of impact, so this project only analyzed building related disturbances.



A view of rural developments from a multi story building in Enterprise, OR. Image credit: Timmanblog.com

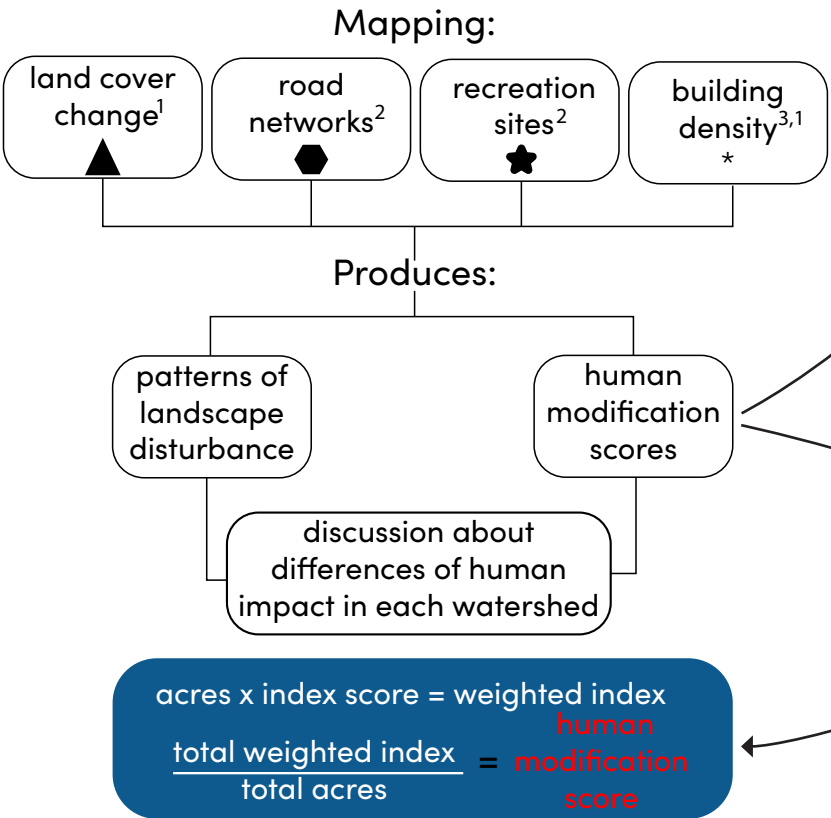


# 3.1 Landscape Integrity Study Methods

## Calculation and Scoring

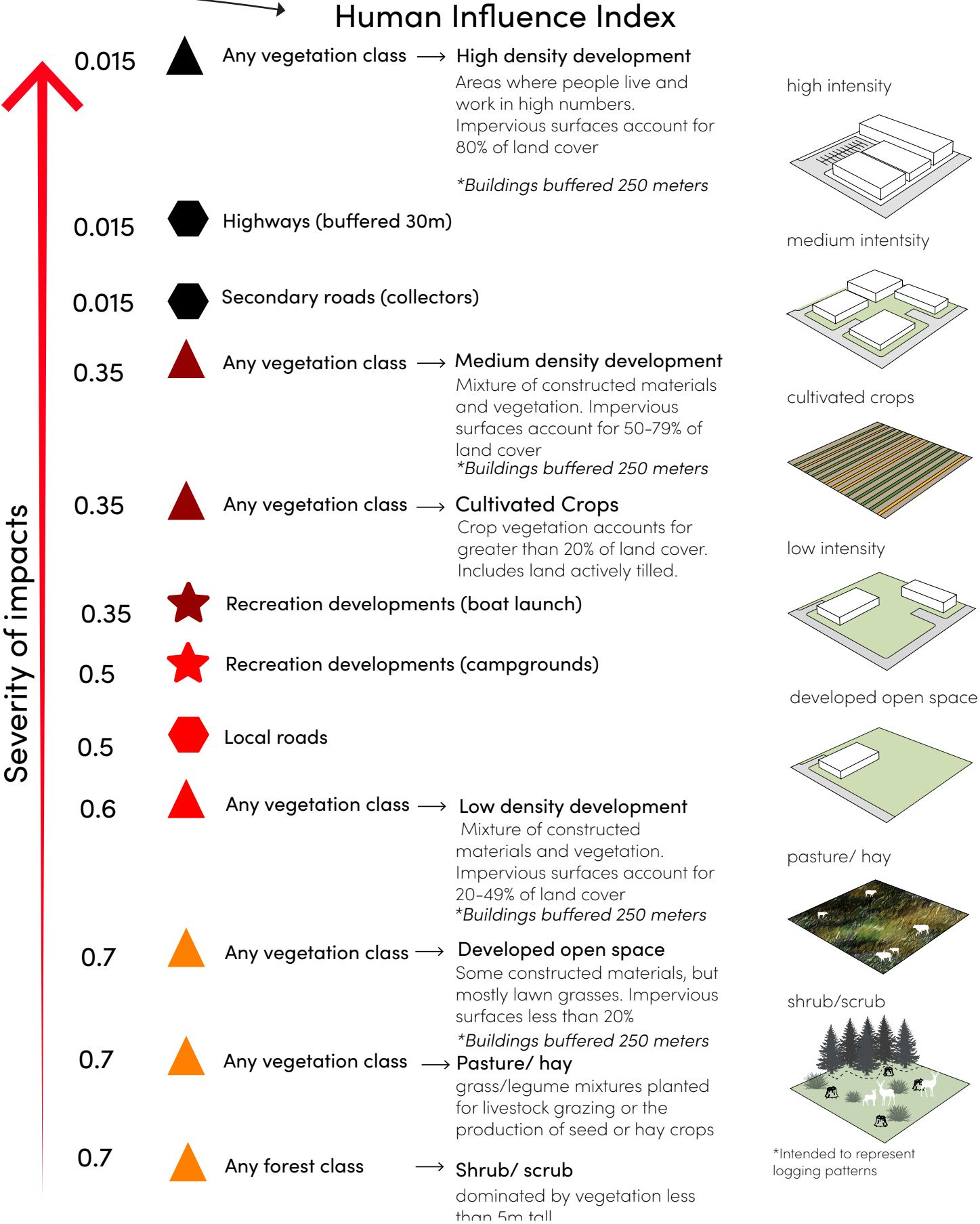
Human modification scores for each watershed were calculated from mapped landscape disturbances and changes in vegetation structure. A formula was created by multiplying acres of vegetation transitions or total disturbance area by the associated index score, resulting in a weighted index score. A weighted index score was assigned to each vegetation transition and road class, recreation sites, and building density. The four indicators were then totaled and divided by total acres to find a final human modification score.

Figure 10 Methods Diagram



1. Walston & Hartmann, 2018 2. Theobald et al., 2010 3. Short & Cooper, 1985

Figure 11 Human Modification Index





# 3.1 Landscape Integrity Study

## Methods- Limitations

### Methodology Limitations

Before discussing the project findings, it is important to understand limitations within the project methodology and data. One limitation is the differences in the riparian structures of the two watersheds. Wallowa County's West Fork Watershed includes a series of small creek and river channels with a large natural (but now dammed) lake at the headwaters. The watershed includes many irrigation channels and ditches, and the Wallowa River has been straightened in many places. Valley County's Lake Fork Watershed features a natural lake (but now damned) as its headwater, then progresses into a larger river with oxbows and a winding channel and ends in a reservoir. If there was more time at the beginning of the project, a more structured site selection methodology could have been implemented allowing for more consistent study areas.

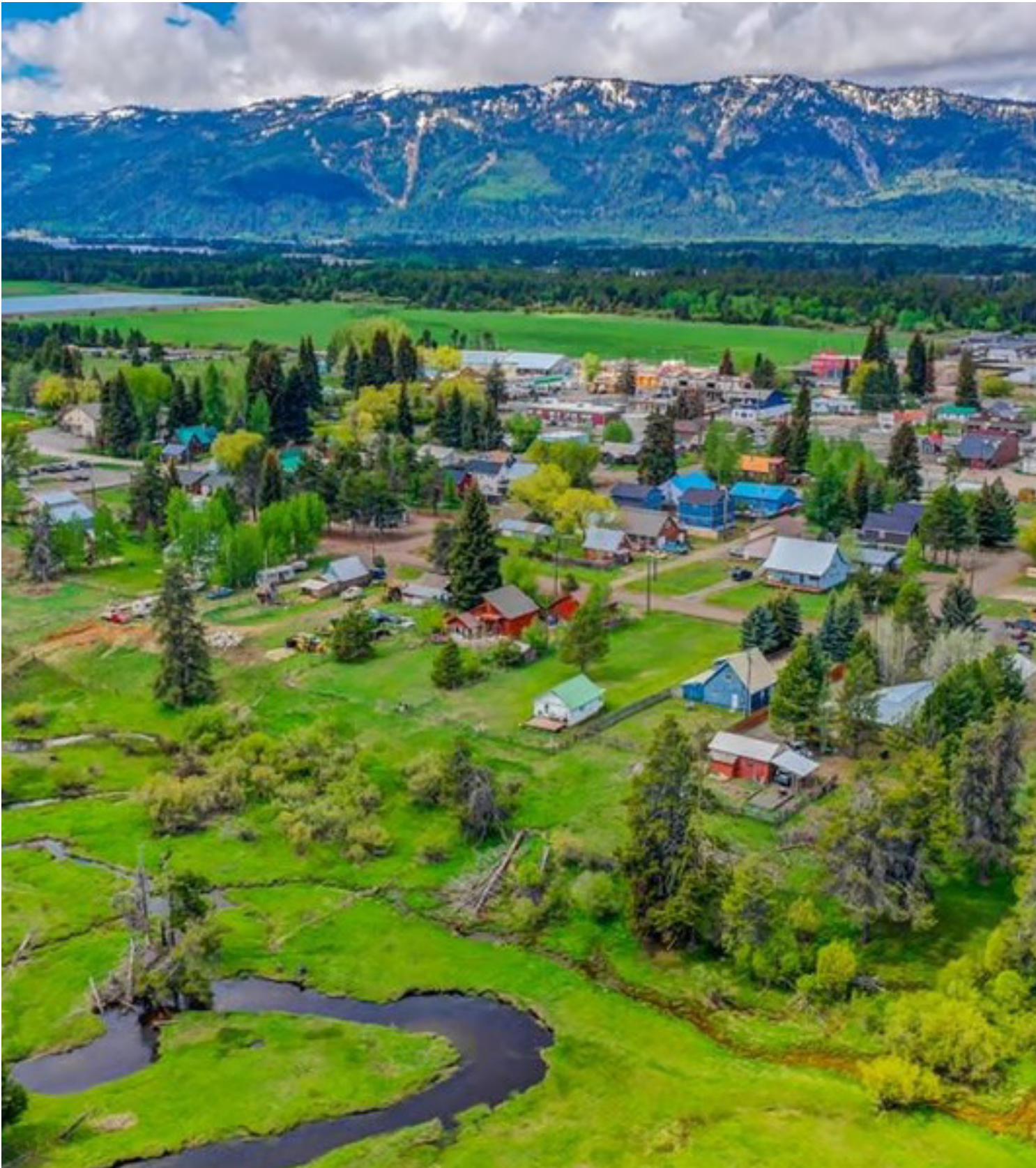
### Data Limitations

There are multiple limitations to the data used within this project. One geospatial data limitation was that the GIS data from Wallowa and Valley Counties had to be sourced differently and therefore may have been of different qualities. Using datasets from different state, county, and private sources also introduces potential discrepancies because each provider may use different data-collection methods. Valley County Idaho has an open-source GIS data portal; much of the data related to Valley County specifically (roads, tax lots, administrative boundaries, etc) came from this portal. Wallowa County does not have an open-source GIS platform, so much of the data relating to Wallowa County and the West Fork Watershed came from Oregon GEOHUB, a state-run GIS data portal. Roads, tax lots, buildings, zoning, and administrative boundaries were downloaded from GEOHUB and clipped to the county and watershed. Because this is a state platform, there is less local knowledge or ground truthing of datasets. Land cover, waterbodies, stream classes, and wetlands came from federal sources (USGS, and USFWS) and are consistent across both watersheds/ counties. Building footprints for Valley County were not available through the open-source GIS portal or the Idaho GIS Hub, so this project obtained a dataset from the open-source GitHub repository. Microsoft Maps produced this dataset using 2019–2020 satellite imagery. In contrast, building footprints for Wallowa County were downloaded from Oregon GEOHub and published in January 2023. This three-year difference

introduces a minor comparison bias and may affect the total building counts in each watershed. Another limitation of this project is that it relies on the USGS Annual NLCD Collection 1.0 to analyze vegetation-structure change. The land cover classes are quite broad and only offer very limited specificity. Although the Multi-Resolution Land Characteristics Consortium provides a legend for each land-cover class, the categories are broad and do not identify species composition. This lack of detail created challenges when isolating heron nesting habitat. For example, the “woody wetlands” class is described as *“areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.”* but it does not specify tree height or species. As a result, including woody wetlands in the heron habitat methodology remains somewhat speculative. The project also used NLCD data to distinguish medium- and low-intensity development when calculating building-density scores. Because the NLCD's data-collection methods are not fully documented, these classifications may not align with existing conditions, or data that is collected in person.

### Timescale Limitations

Most LIMs examine how landscapes change over time. In this project, land-cover data was the only dataset available across multiple time points, so vegetation structure was the only indicator measured between 1990 and 2020. Road networks, recreation, and buildings were assessed only for the 2020 time point. A more robust LIM would include temporal data for all disturbance indicators, but acquiring those datasets would have required more time than this project allowed.



Birds Eye View of Donnelly, Idaho  
Image credit: Zillow



# 3.2 Landscape Integrity Study Methods - Great Blue Heron

## Methods

To compare the extent of high integrity heron nesting habitat between the two watersheds, maps were created using the USFWS National Wetlands Inventory and the 2020 land-cover dataset. From these layers, land-cover types associated with suitable nesting conditions, specifically Woody Wetlands and Deciduous Forest were isolated. These combined land cover types characterize nesting habitat, and the remaining wetland areas are used to visualize foraging habitats (Figure 12).

The USFWS has been mapping and inventorying wetlands since the passage of the 1986 Emergency Wetlands Resources Act. To identify areas that may maintain high integrity nesting habitat, the study adopted and applied Short and Cooper’s 250-meter disturbance zone to each building in the watersheds from the 1985 Great Blue Heron Habitat Suitability Model. These layers were then overlayed to indicate what wetland areas may retain high integrity for heron nesting (Figure 12).

To better compare between watersheds, two calculations were performed. First, the acres of impacted nesting habitat were divided by the number of buildings in the watershed. Since the counties do not have the same acreage, building density per acre offered a clearer comparison than the total number of buildings. Additionally, building densities provide an overall spatial understanding of human footprints. High building densities generally equal less landscape integrity. The second calculation divided acres of impacted habitat by acres of developable land. Developable land includes all lands in private, city, or county ownership. This calculation showed the overall amount of habitat that has been impacted based on the total availability of land that could be developed. To focus the comparison on the effects of Oregon and Idaho land use policies, federal lands are removed from the acreage of the watershed.

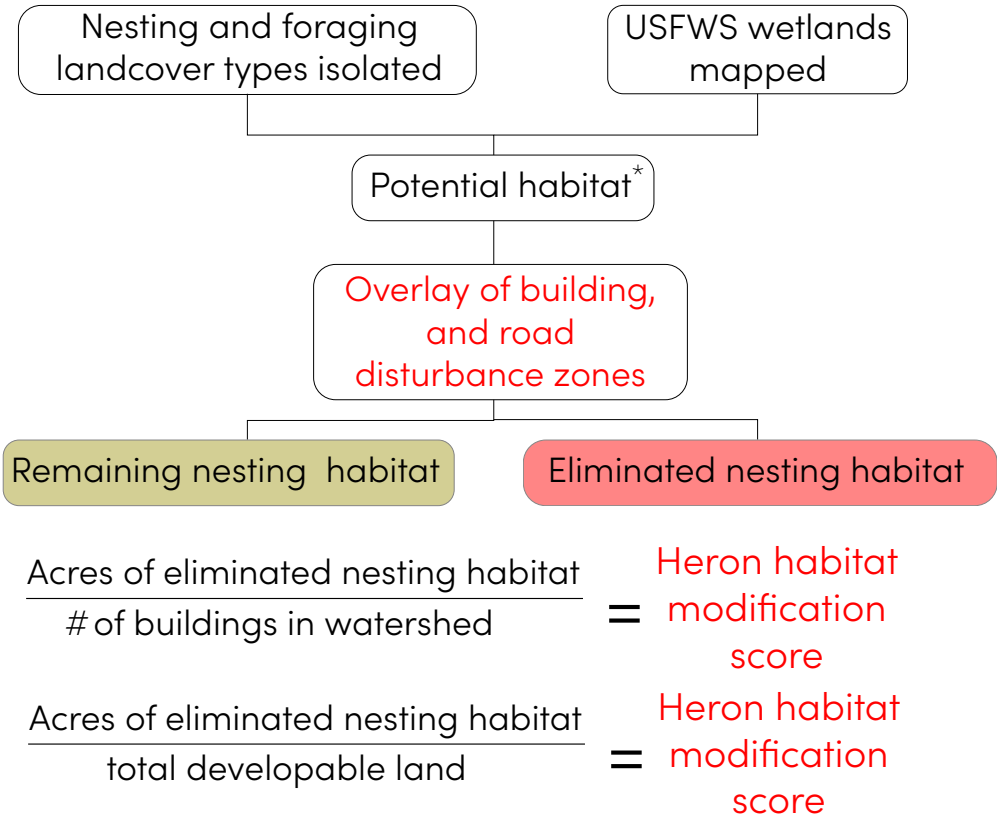
**Wetlands and Herons: Key Ecological Indicators**

Wetlands and riparian systems are critical components of the landscape, cycling nutrients, providing habitats, and absorbing floodwaters. Disruption of wetlands and riparian areas lessens a landscape’s overall integrity. In dry climates, studies suggest that upwards of 80% of wildlife species rely on wetland and riparian corridors for survival (Short & Cooper, 1985).

Great Blue Herons act as an indicator species for ecosystem health. Loss of habitat and disturbance can cause Great Blue Heron to decline, when keystone species decline, the trophic completeness of the landscape is compromised. Herons have broad habitat needs, they nest in tall, dead trees, 5-15 meters above the ground and often in colonies (Short and Cooper, 1985). They tend to hunt in open shallow areas including stream and pond edges, wet meadows, and flooded fields (Sibley, 2003). Fish are preferred, but herons’ diets can include small amphibians, insects, and small rodents. Literature suggests that herons, on average, will forage up to 5km (3.1 miles) from their rookery (Short and Cooper, 1985).

Comparing the integrity of heron habitats between watersheds offers an additional variable to test the hypothesis. **Herons were selected in part since they are included in the Wallowa County Comprehensive Plan under Goal 5 (wildlife resources) and the Lake Cascade Management Plan.** These planning documents report rookeries along the Wallowa River and within the Lake Cascade Wildlife Management areas.

Figure 12 Heron Methodolgy

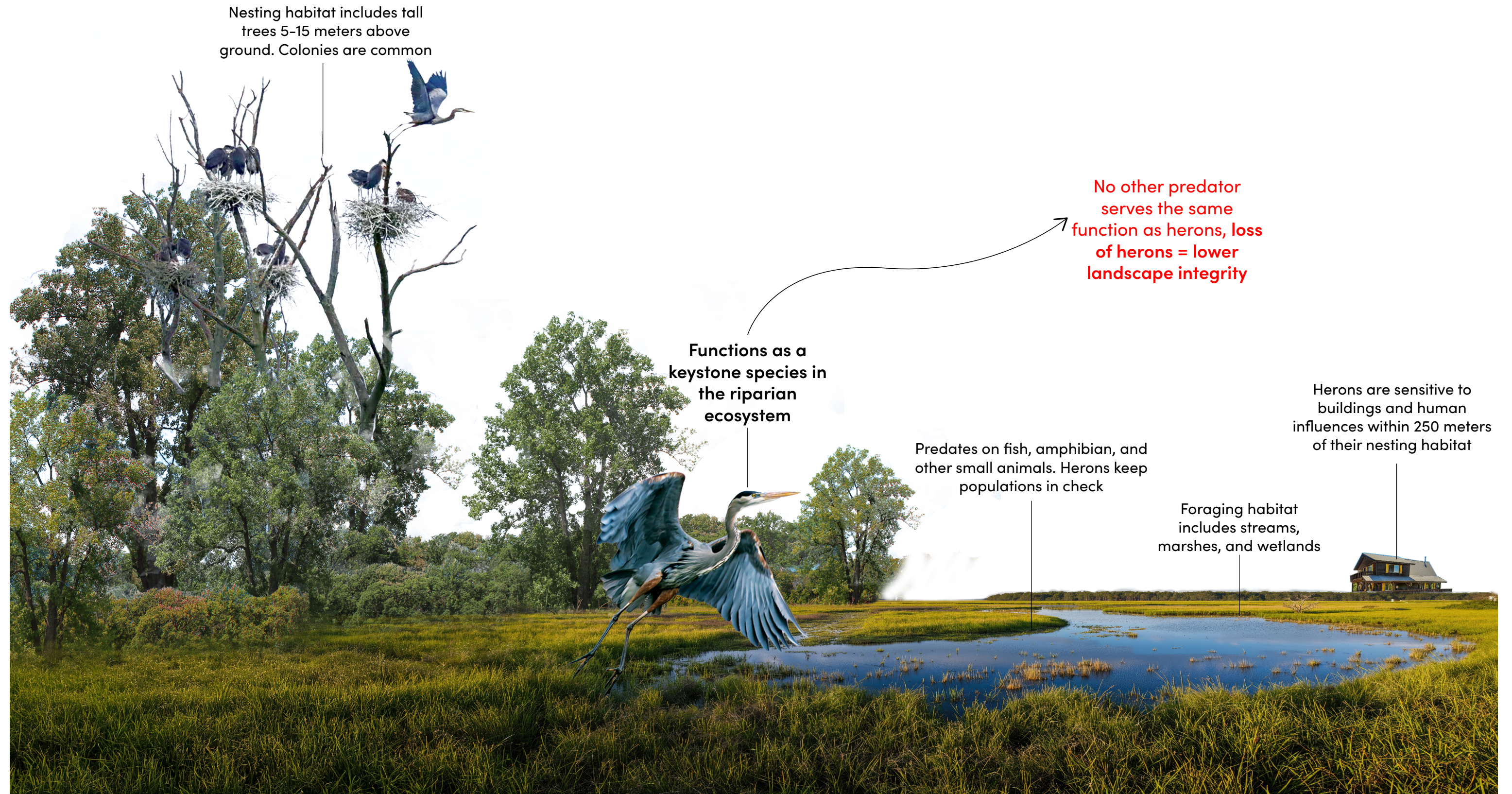


\* federal lands (NF) are removed from the total acreage of the watersheds

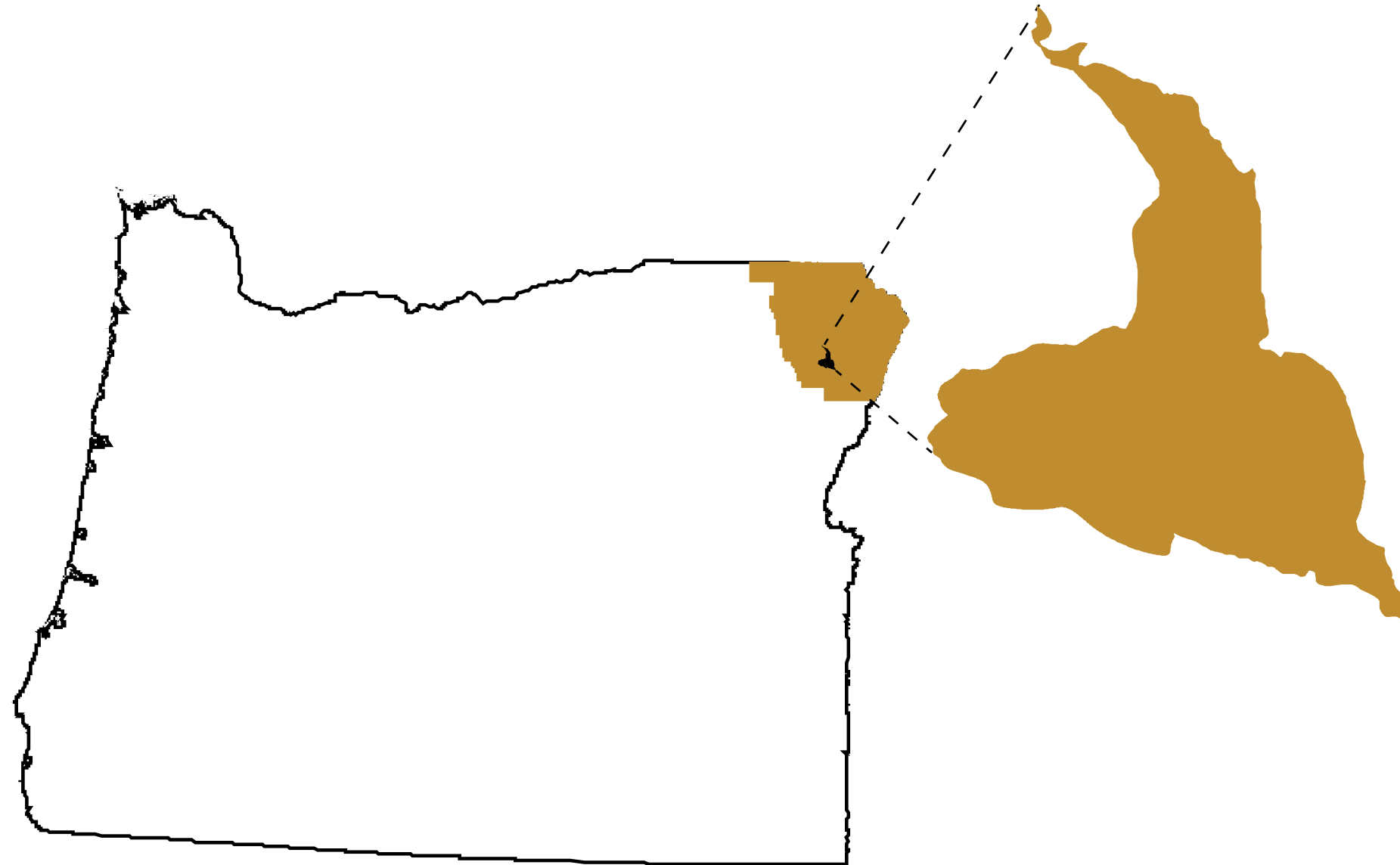


## 3.2 Landscape Integrity Study

### Great Blue Heron- an ecological indicator





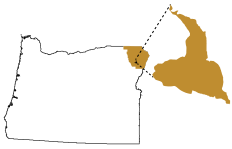


## Findings: West Fork Watershed



### 3.3 Landscape Integrity Study

## Findings: West Fork Watershed



After all indicators (land cover change, recreation opportunities, road networks, and building density) were analyzed and calculated using the Human Modification Score Calculation as seen in Figure 23, Wallowa County’s West Fork Watershed received a human modification score of 0.43. This score indicates that there have been significant changes in the landscape and local ecology during the study period of 1990-2020.

#### Vegetation Structure

The from-to land cover change analysis resulted in a total of 1,116 acres transitioning between 1990 and 2020, which represents a 4% (0.0447) total landcover change, across all decades. Across all four decades, the average human modification score for vegetation structure was 0.57. Total acres transitioned each decade were rather consistent but did trend downwards each decade with the largest transition between 1990 and 2000 when 404 acres transitioned. Between 2000 and 2010, 387 acres transitioned and between 2010 and 2020 there were 325 acres of transition (Figure 14).

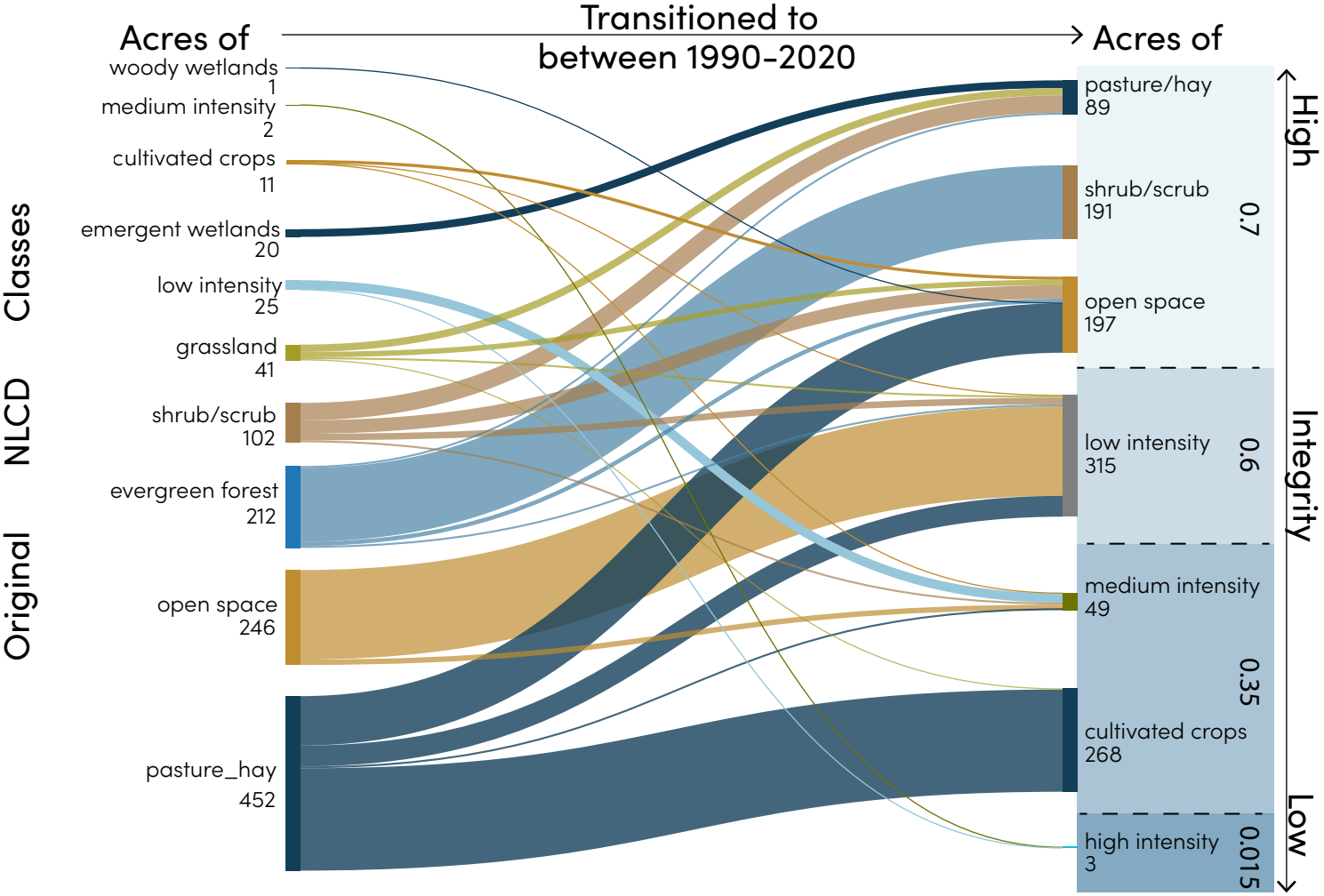
Once all transitions were aggregated, pasture/ hay landcover type experienced the most change with a total of 452 acres transitioned to a land cover type associated with human development and decreasing the overall amount of pasture/hay (Figure 13). Within this transition group, transitions from pasture/ hay to cultivated crops was the largest with a total change of 265 acres. A transition from pasture to cultivated crops potentially introduces disturbances in the form of new chemical pollutants, noise from machinery, fences, and altered hydrological systems. Many species are sensitive to these changes, and the landscape experiences changes in connectivity, trophic completeness, and vegetation structure. These combined impacts explain why the transition to cultivated crops receives such a low index score of 0.35. Surprisingly, between 1990 and 2020, 187 acres of pasture/ hay transitioned to developed, open space; developed low intensity; or developed, medium intensity. **As one of the main goals of the Oregon land use system is to protect and conserve agricultural land a lower transition was expected.**

Transitions within the developed, open space group were the second most common. This may be attributed to the study area including 387 acres of the Joseph UGB and 34 acres of the Enterprise UGB. The inclusion of these city parcels may have skewed the results, as many of the low intensity transitions also occurred within the UGBs.

Additionally, many of the transitions that fall into the change to developed open space change include areas that are included in the road network calculation. Within this landcover transition many of the pixels are occurring in areas that are established roads. This data issue appears in both watersheds between 2000 and 2010. It is possible that the Annual NLCD data picked up a change in paving materials, or a different constraint. As discussed in the limitations section, the lack of specificity in the NLCD descriptions is problematic for troubleshooting results.

Evergreen forest land cover types experienced the third largest decrease in total area with a total of 212 acres transitioning to a land cover type associated with human development. The largest transition was to shrub/scrub which signals the continuation of logging practices within National Forest or private timber areas. The breakdown of decade transitions is interesting and might signal a pause in local operations. Between 1990 and 2000, 84 acres transitioned to shrub/scrub, but between 2000 and 2010 there was a steep decline, only 3 acres transitioned to shrub/scrub. Between 2010 and 2020 there was a jump, where 104 acres transitioned.

Figure 13 Land Cover Transitions





3.3 Comparative Study

Findings: West Fork Watershed



Figure 14 West Fork Watershed Human Modification Score and Land cover transitions

Land cover changes (index adopted from Walston & Hartmann 2018)

| 1990-2000                | Acres        | Score       |
|--------------------------|--------------|-------------|
| Total acres transitioned | 404          | 0.56        |
| 2000-2010                |              |             |
| Total acres transitioned | 387          | 0.54        |
| 2010-2020                |              |             |
| Total acres transitioned | 325          | 0.61        |
| <b>Total</b>             |              |             |
| Total acres transitioned | <b>1,116</b> | <b>0.57</b> |

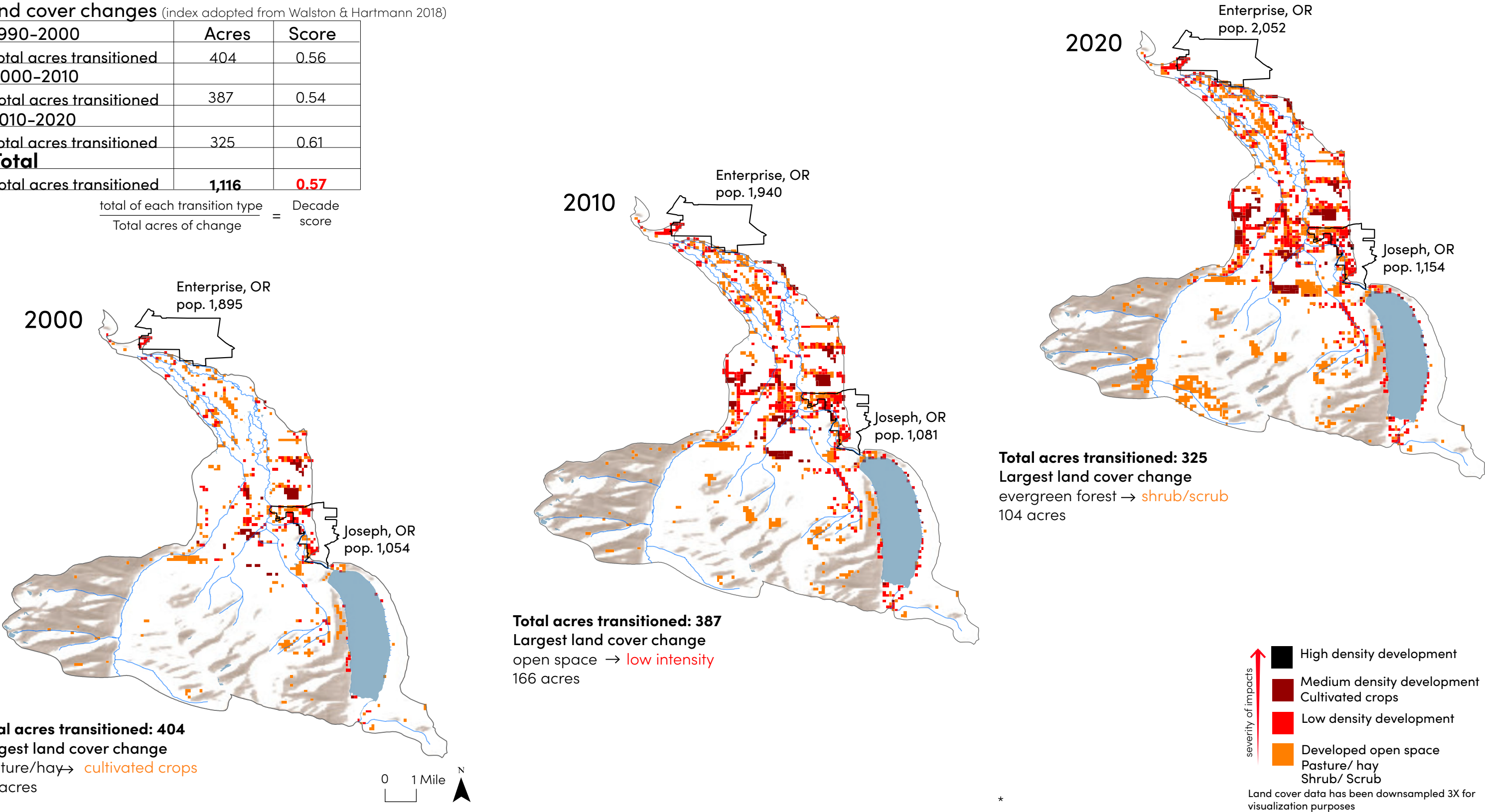
total of each transition type

Total acres of change

=

Decade score

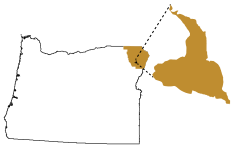
Compounding Land Cover Transitions 1990-2020





3.3 Landscape Integrity Study

Findings: West Fork Watershed



Road networks

Across the watershed there are approximately 354 acres of road networks. This value includes the buffered distance of highways (including 30m distance of impact) and other roads natural width. Highways and secondary roads account for 247 acres and are associated with a low index score of 0.015 (Figure 15). Road networks in the West Fork watershed received a human modification score of 0.16.

Recreation sites

Within the watershed, there are four campgrounds and two boat launches with a combined footprint of 700 acres (Figure 15). Campgrounds and boat launches both lessen a landscape’s integrity by introducing disturbance in the form of noise, chemicals, changes in vegetation structure, and often limit connectivity. The human modification score for recreation impacts in the watershed is 0.44.

Building Disturbance

By overlaying building footprints on the 2020 Annual NLCD raster, buildings within the watershed were filtered into two groups, low intensity and medium intensity. For the 2020 time point, across both low and medium intensity categories there were 1,860 buildings, 1,193 in low intensity settings and 668 in medium intensity settings (Figure 15). Applying distance of impact of 250 meters for Great Blue Heron nesting habitat around each building the watershed has 11,904 acres of building disturbances and a human modification score of 0.56.

Road Networks (index adopted from Walston & Hartmann 2018)

|                 | Acres | Index | Score |
|-----------------|-------|-------|-------|
| Highways        | 221   | 0.015 | 3.31  |
| Secondary Roads | 26    | 0.015 | 0.39  |
| Local Roads     | 107   | 0.5   | 57.2  |
| Total           | 354   |       | 0.16  |

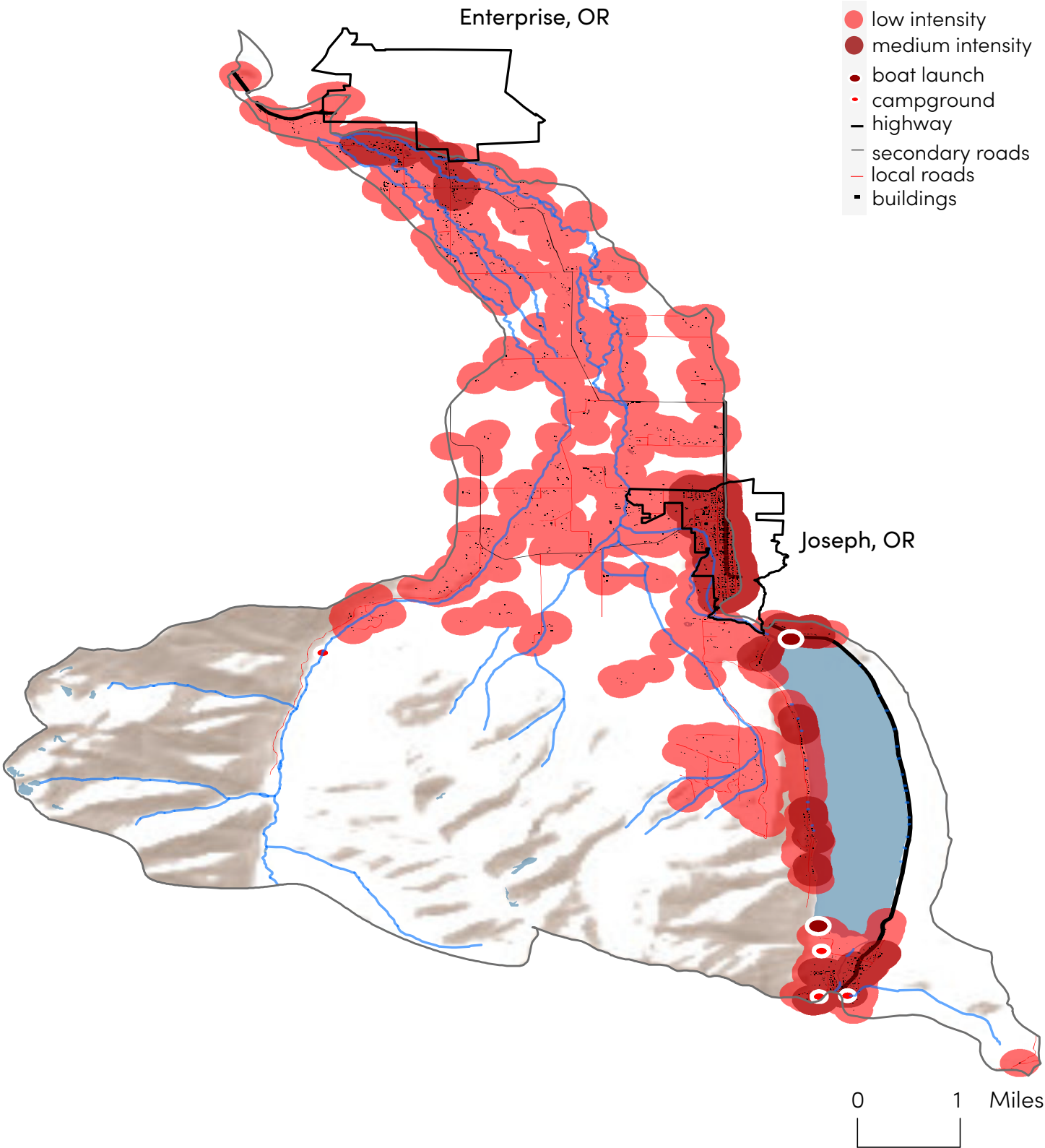
Recreation Impacts (index adopted from Theobald 2010)

|               | Acres | Index | Score |
|---------------|-------|-------|-------|
| Campgrounds   | 400   | 0.5   | 200   |
| Boat Launches | 300   | 0.35  | 105   |
| Total         | 700   |       | 0.44  |

Building Density (distance of impact adopted USFWS)  
(index adopted from Walston & Hartmann 2018)

|                | Acres  | Index | Score |
|----------------|--------|-------|-------|
| Low Density    | 9,421  | 0.6   | 586   |
| Medium Density | 1,673  | 0.35  | 5653  |
| Total          | 11,904 |       | 0.56  |

Figure 15 Human Development Impacts in the West Fork Watershed



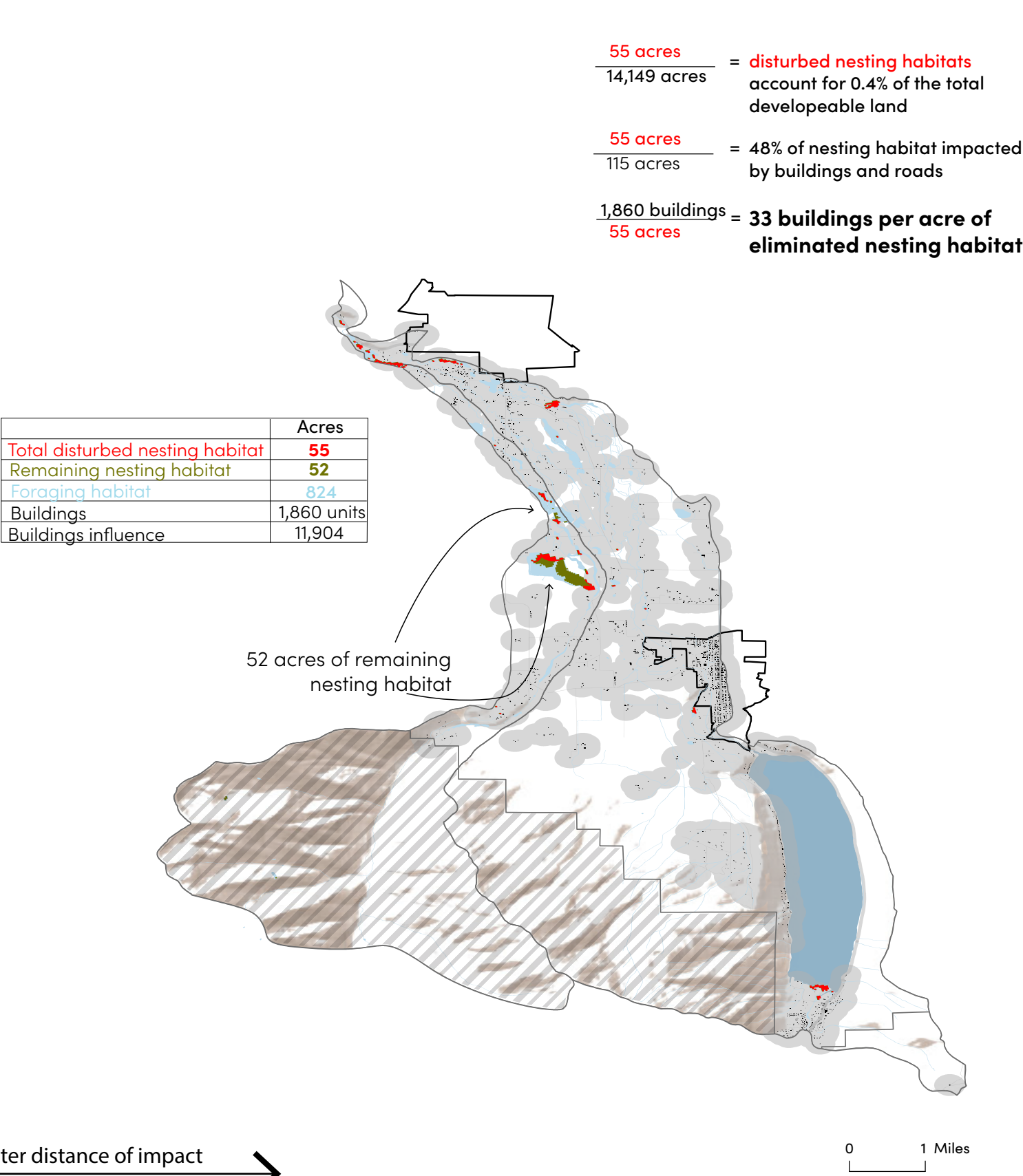
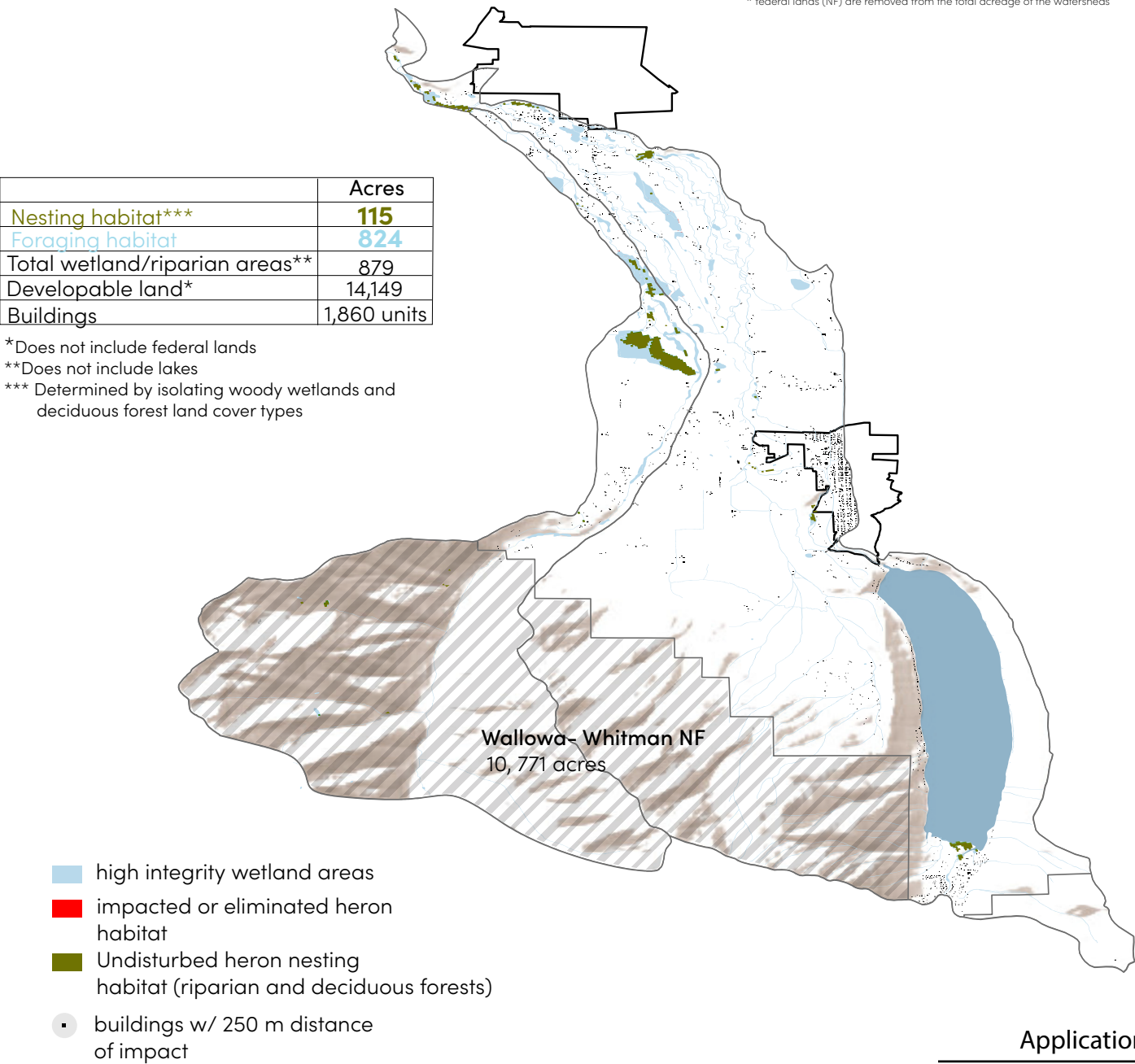


# 3.3 Landscape Integrity Study

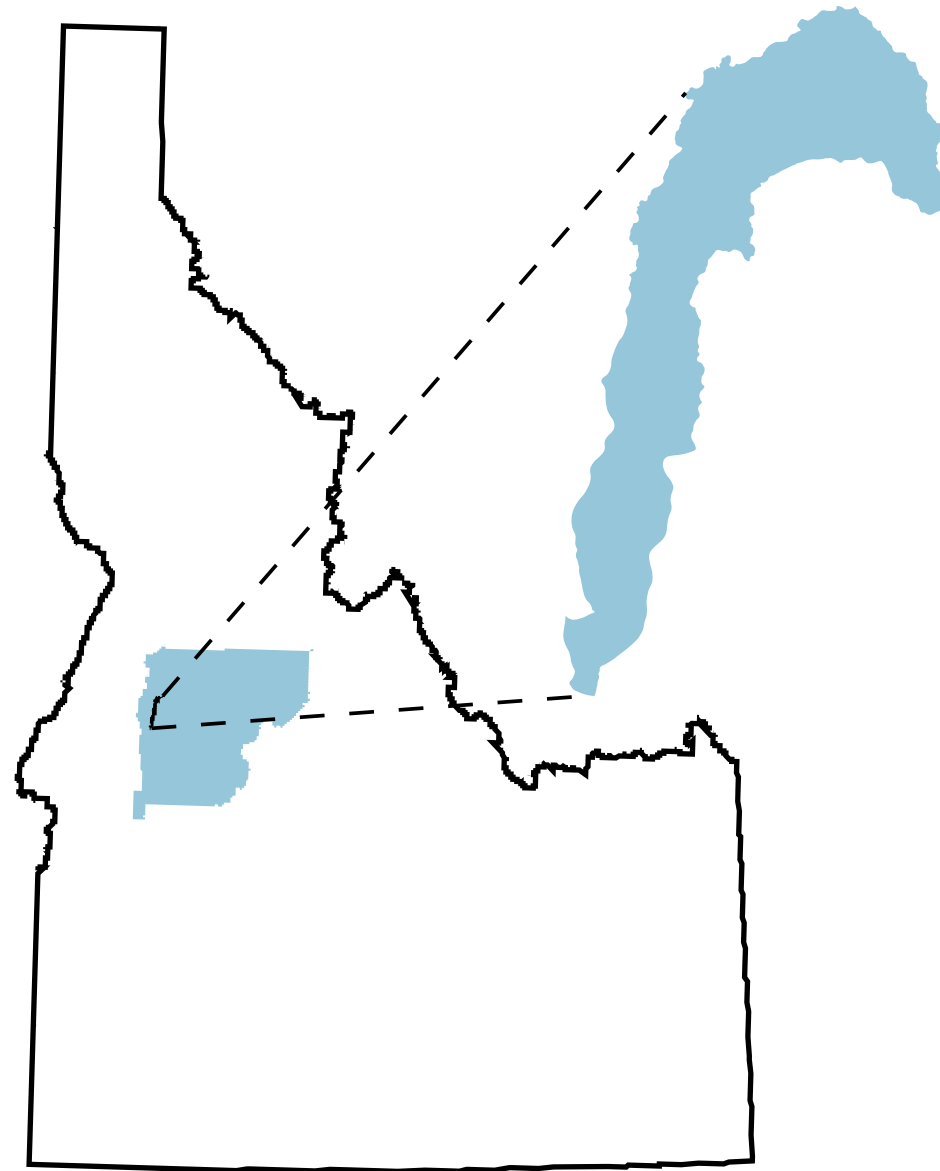
## Findings: West Fork Watershed

**Wallowa County's West Fork Watershed**  
In the West Fork, approximately 48% of nesting areas (deciduous forest and woody wetland land cover types) have been disturbed when the 250 meter distance of impact is applied to buildings (Figure 16). There are 33 buildings per acre of eliminated nesting habitat in the watershed. When examining the relationship to speculative nesting habitat and developable land disturbed nesting habitat accounts for only 0.4% of total developable land. The high number of buildings outside of the Enterprise and Joseph UGBs are likely responsible for the high building density.

Figure 16 Impacts to Heron Nesting Habitat







## Findings: Lake Fork Watershed



# 3.4 Landscape Integrity Study Findings: Lake Fork Watershed



After all indicators (land cover change, recreation opportunities, road networks, and building density) were analyzed and calculated using the Human Modification Score Calculation as seen in Figure 24, the Lake Fork Watershed received a score of 0.45. This score illustrates slightly higher integrity overall compared to Wallowa County’s West Fork Watershed.

## Vegetation Structure

The From-To land cover change analysis resulted in a total of 1,128 acres transitioning between 1990 and 2020 and an average human modification score of 0.63 across all four decades. (Figure 18) Overall, 4% (0.0429) of the watershed experienced a land cover transition. Transitions were not consistent throughout the decades. Between 1990 and 2000, 298 acres transitioned. Between 2000 and 2010 the watershed experienced a large spike, where 606 acres transitioned to a different land cover type. Between 2010 and 2020 only 324 acres transitioned to a different land cover type. This is consistent with the county wide trend of housing units and population growing rapidly between 2000 and 2010 as seen in the timeline.

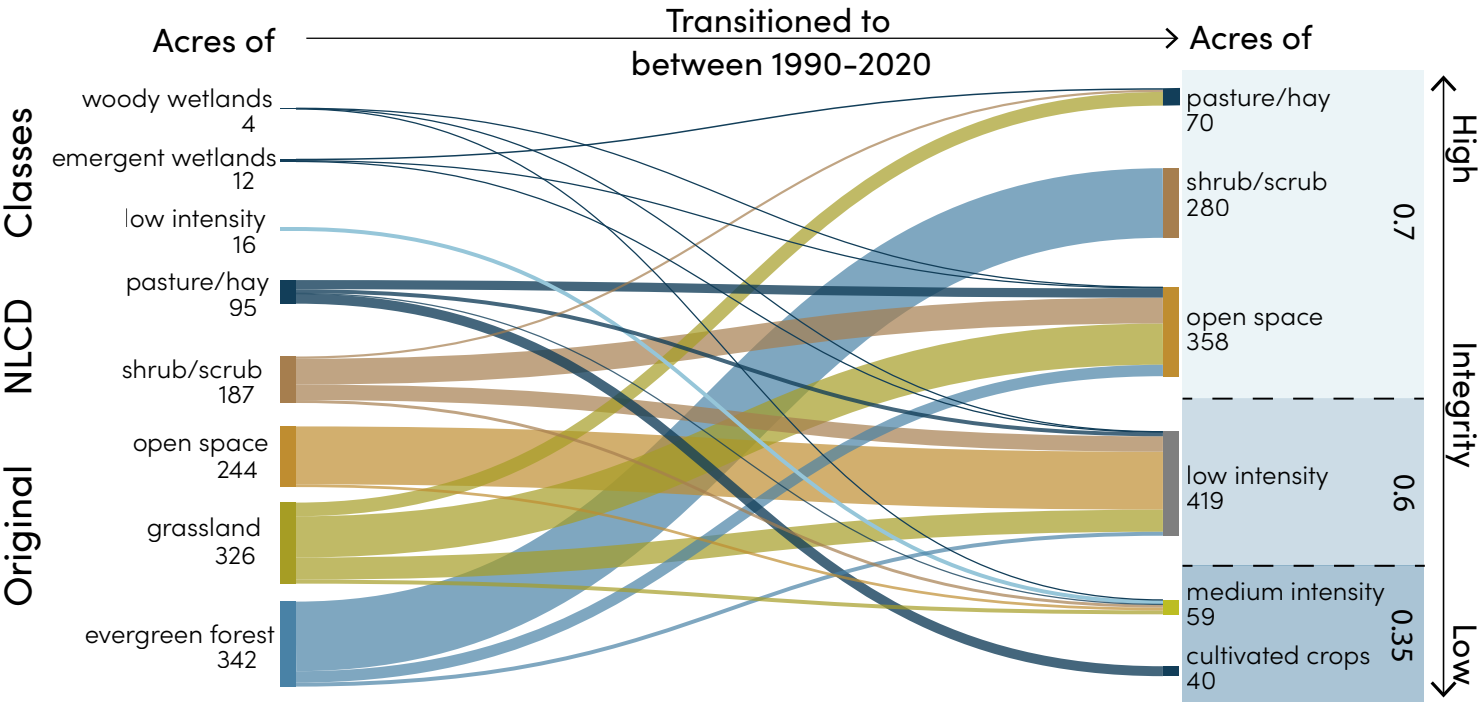
Once the transitions were aggregated, the evergreen forest land cover class experienced the most

transition, with a total of 342 acres transitioned. The majority (280 acres) transitioned to a shrub/ scrub class (Figure 17). Within this transition there was a downward trend, 103 acres transitioned to shrub/ scrub between 1990 and 2000, 96 acres between 2000 and 2010, and 81 acres between 2010 and 2020. This trend aligns with the rural restructuring process and the decline of the timber industry. The remaining 62 acres transitioned to developed, open space or developed, low intensity. These transitions likely signal the removal of evergreen trees in forested areas to build houses and create yards or the management of defensible space around homes.

The second largest transition was within the grassland land cover class. In total 326 acres of grassland transitioned between 1990 and 2020. Grassland transitions occurred across multiple developed classes and to pasture/hay. Transitions to developed, open space; developed, low intensity; and developed, medium intensity account for 271 acres of change.

There were 244 acres of change from developed, open space to a more severe developed intensity. As previously noted in the West Fork findings, this change includes the development or improvement of road networks.

Figure 17 Lake Fork Land Cover Transitions



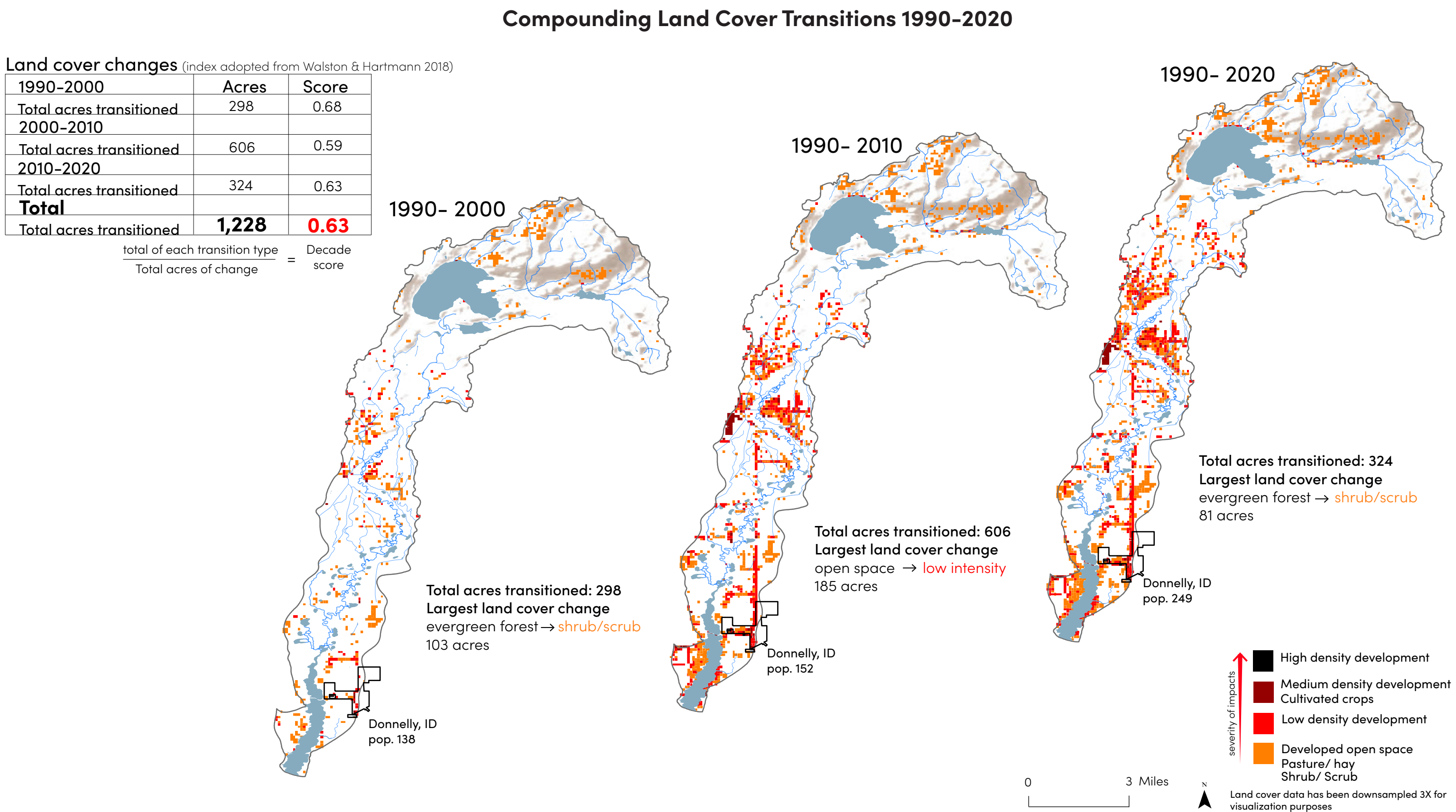


3.4 Landscape Integrity Study

Findings: Lake Fork Watershed



Figure 18 Lake Fork Watershed Human Modification Score and Land cover transitions





# 3.4 Landscape Integrity Study

## Findings: Lake Fork Watershed



### Road networks

Across the watershed, there are 363 acres of roads (Figure 19). Highway 55, a state highway that runs through the middle of the watershed brings significant disturbance to the watershed as it is the main transportation corridor between Boise and northern Idaho. The total human modification score in the Lake Fork watershed was 0.14.

### Recreation sites

There are multiple small campgrounds located on the shores of Lake Cascade, the total acreage of the campgrounds was 300 (Figure 19). Boat launches resulted in an acreage of 150. Together recreation opportunities totaled 450 acres with a score of 0.45.

### Building density

Of 1,993 buildings spread across the watershed, only 79 are considered medium intensity. The remaining 1,914 are considered low intensity and are on a variety of parcel sizes. Applying a 250 meter distance of impact to all buildings to account for the Great Blue Heron nesting buffer, there are 12,525 acres of building related disturbance, with a human modification score of 0.59 (Figure 19).

### Road Networks (index adopted from Walston & Hartmann 2018)

|                 | Acres | Index | Score |
|-----------------|-------|-------|-------|
| Highways        | 229   | 0.015 | 3.43  |
| Secondary Roads | 35    | 0.015 | 0.53  |
| Local Roads     | 99    | 0.5   | 49.5  |
| Total           | 363   |       | 0.15  |

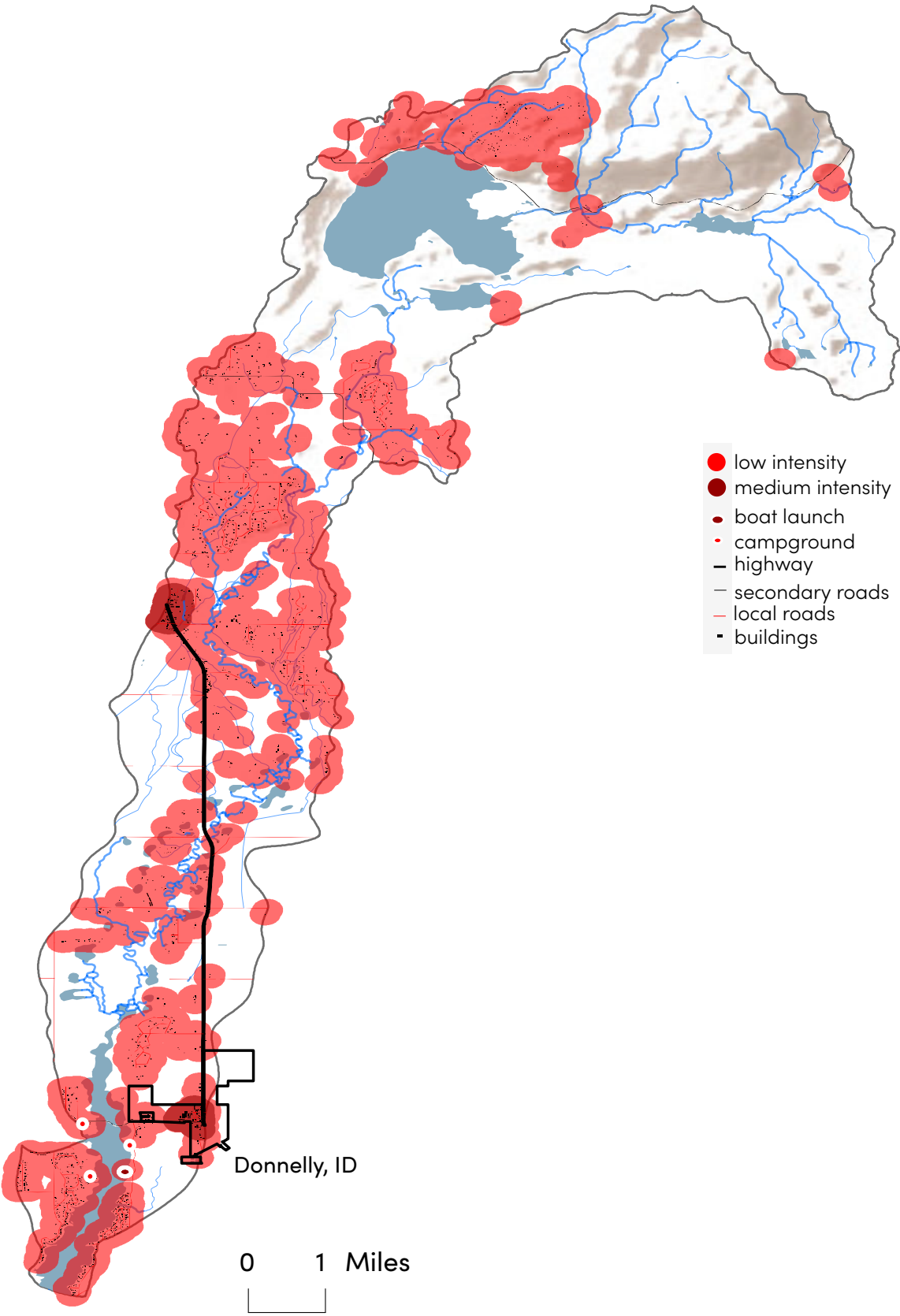
### Recreation Impacts (index adopted from Theobald 2010)

|               | Acres | Index | Score |
|---------------|-------|-------|-------|
| Campgrounds   | 300   | 0.5   | 150   |
| Boat Launches | 150   | 0.35  | 52.5  |
| Total         | 450   |       | 0.45  |

### Building Density (distance of impact adopted USFWS) (index adopted from Walston & Hartmann 2018)

|                | Acres  | Index | Score  |
|----------------|--------|-------|--------|
| Low Density    | 12,188 | 0.6   | 7313   |
| Medium Density | 337    | 0.35  | 117.95 |
| Total          | 12,525 |       | 0.59   |

Figure 19 Human Development Impacts in the Lake Fork Watershed



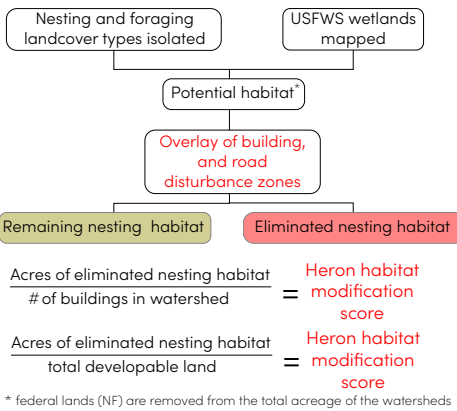
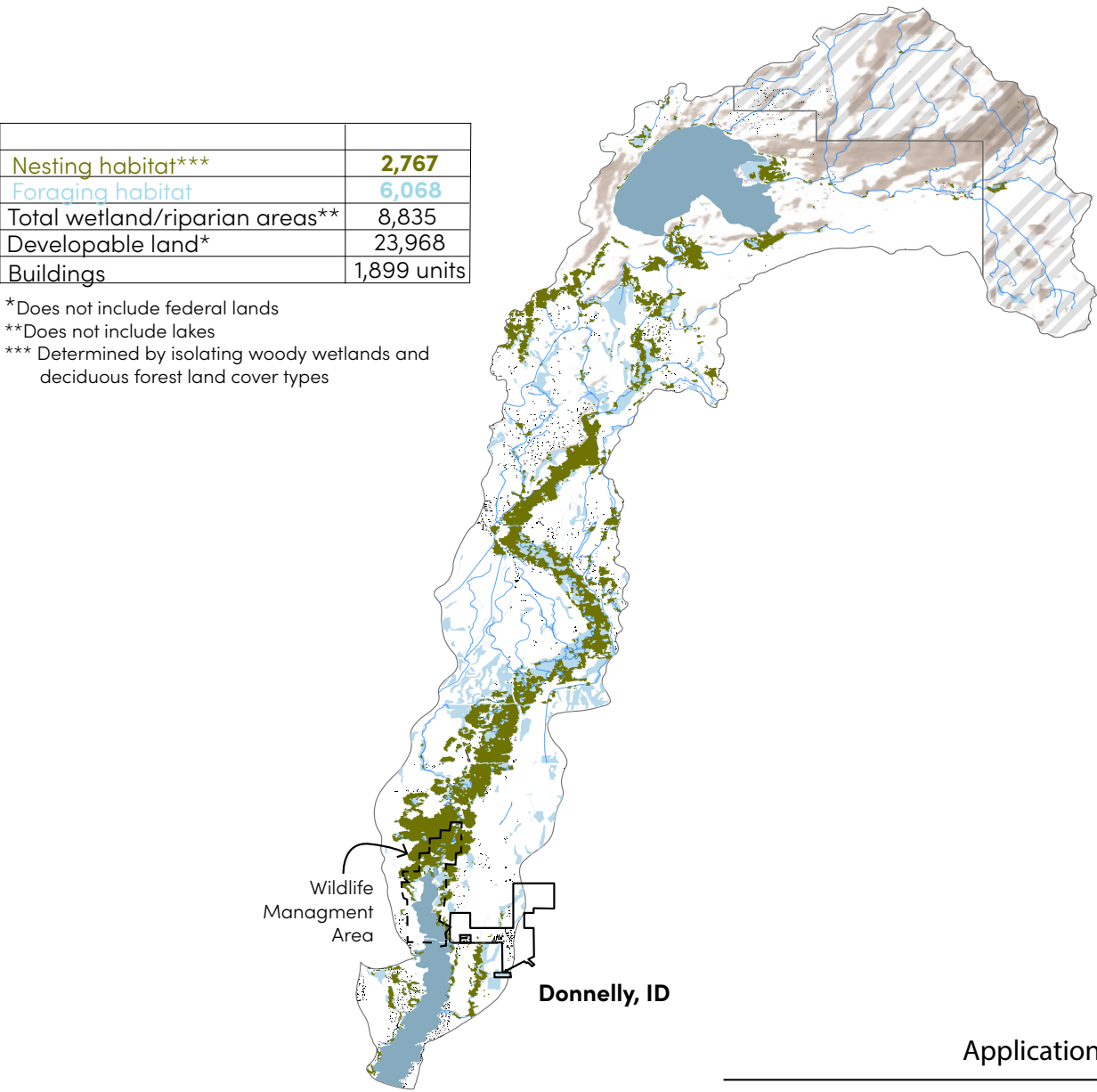


# 3.4 Landscape Integrity Study

## Findings: Lake Fork Watershed

**Valley County's Lake Fork Watershed**  
Valley County's Lake Fork Watershed has lost approximately 57% of nesting habitat to building related disturbances. It is important to note here that the Valley riparian system is more robust overall and includes a much higher acreage. **The building density score in the Lake Fork Watershed was 1.2 buildings per acre of lost nesting habitat.** Impacted nesting habitat accounts for 7% of the total developable land in the watershed (Figure 20).

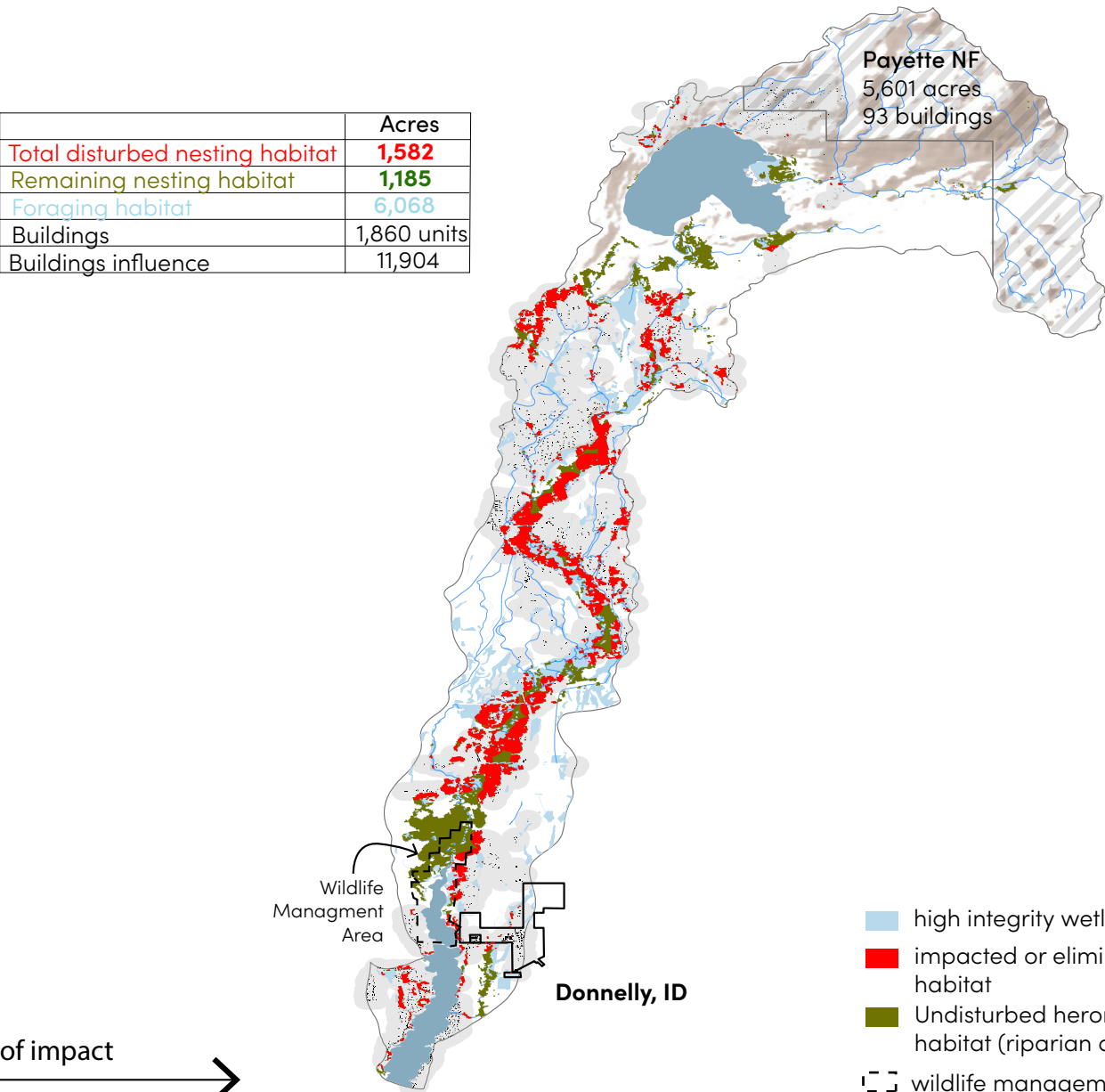
Figure 20 Impacts to Heron Nesting Habitat



$\frac{1,582 \text{ acres}}{23,968 \text{ acres}} = \text{disturbed nesting habitat accounts for 7\% of the total developable land}$

$\frac{1,582 \text{ acres}}{2,767 \text{ acres}} = 57\% \text{ of nesting areas impacted by buildings and roads}$

$\frac{1,899 \text{ buildings}}{1,582 \text{ acres}} = 1.2 \text{ buildings per acre of eliminated nesting habitat}$



0 1 Miles

- high integrity wetland areas
- impacted or eliminated heron nesting habitat
- Undisturbed heron nesting habitat (riparian and deciduous forests)
- wildlife management area
- buildings w/ 250 m distance of impact



# 3.5 Landscape Integrity Study

## Findings: Watershed Comparison

The overall human modification scores for the two watersheds are similar: the same percentage of land cover transitioned (4%) and many of the individual indicators had nearly identical scores. Once all indicators were totaled, Wallowa County's West Fork received a score of 0.43 and Valley's West Fork resulted in a score of 0.45. Per the adopted index, values closer to 1 signal higher landscape integrity. The hypothesis of the West Fork Watershed having a higher integrity score proves false. A few details about these findings are worth discussing.

### Vegetation Structure

Total acres of land cover changes in the two watersheds were similar, but the overall scores favored the Lake Fork Watershed, signaling slightly higher landscape integrity. The Lake Fork Watershed experienced an additional 112 acres of change, but many of the transitions were at the higher end of the index, resulting in a higher integrity score. In the West Fork Watershed, the 265 acres of pasture to cultivated crops is largely responsible for Wallowa County's West Fork Watershed receiving a slightly lower score since the transition to cultivated crops is associated with a low index score. The transition to cultivated crops also occurred in the Lake Fork, but only 40 acres of pasture/hay land cover transitioned.

### Possible Indicator of Rural Residential Developments

The transition of land cover types into the developed, low-intensity class is an important transition to compare across the study areas. This class is defined as areas with 20–49% impervious surface, typically associated with single-family housing. Transitions into this category therefore represent a shift from vegetated land cover to structures, driveways, or other forms of human influence, likely rural residential development in both watersheds. Both watersheds show substantial transitions from developed, open space to developed, low intensity. As noted in the West Fork findings, this pattern likely reflects road networks rather than new housing. Removing this transition reveals a more meaningful comparison: the Lake Fork Watershed experienced over 100 additional acres of vegetated land converting to developed, low intensity between 1990 and 2020. (Figure 21) This suggests a higher rate of rural residential development in Lake Fork during the study period of 1990-2020.

Because the building-footprint dataset is only available for 2020, building density cannot be analyzed across decades. As a result, land-cover transitions provide one of the only ways to infer changes in building density over time. Although the total number of buildings is similar in the watersheds

(1,861 in West Fork and 1,993 in Lake Fork), the land-cover transitions suggest that many West Fork structures pre-date 1990, while many Lake Fork structures were built between 1990 and 2020. This pattern is reinforced when overlaying the Valley County subdivision and plat data and filtering by year. (Figure 22)

### Road networks

Much like the vegetation structure scores, the road network scores are rather close. The Lake Fork received a slightly lower score due to a larger total footprint at 363 acres and slightly more acreage of highways and secondary roads which carry an impact score of 0.015. Recreation Sites Both Wallowa Lake and Lake Cascade support motorized recreation and include lakeshore campgrounds. However, the recreation index score was higher in the West Fork Watershed, due to the large campground at Wallowa Lake State Park, multiple boat launches on the lake, and an RV Park. The campground, RV park, and one of the boat launches are in the densely developed southern lake area. The campgrounds at Lake Cascade are much smaller and less dense.

### Building Disturbance

Building density values between watersheds makes for an interesting comparison. The Lake Fork watershed contains 132 more buildings and a larger overall impact footprint. However, because the West Fork Watershed partially includes the cities of Joseph and Enterprise, it has a higher concentration of medium-intensity development which, when applying the human influence index, lowers its landscape integrity score. In many respects, this result should increase the landscape's integrity since denser development within UGBs limits dispersed rural impacts across the broader watershed. When calculating for buildings per acre in relation to developable land (federal lands omitted) in each watershed, Wallowa's West Fork Watershed has 0.13 buildings per acre, and Valley's Lake Fork has 0.08 buildings per acre of developable land. This density calculation reinforces the findings of the model, specifically that buildings and the associated impacts are more severe in the West Fork Watershed. However, based on the Valley County development and land use timeline and the substantial increase in housing units from 1990 to 2010, it would have been reasonable to expect more buildings in the Lake Fork Watershed.

### Heron Nesting Habitats

Aligning with the findings of the human modification index and the building density calculation, Wallowa

County's West Fork Watershed has experienced more building related disturbance of nesting habitat than Valley County's Lake Fork Watershed. Although the Lake Fork Watershed contains more total acres of disturbed nesting habitat, the West Fork exhibits a higher building density relative to the amount of disturbed habitat, indicating a more concentrated pattern of development pressure. However, the relationship between impacted habitat and developable land was much higher in the Lake Fork Watershed indicating more lower density sprawl like development patterns impacting nesting habitat. Because the Oregon Land Use Program attempts to restrict dispersed rural development, the project hypothesis assumed that the West Fork Watershed would contain fewer buildings and therefore exhibit lower building-related disturbance. Instead, the results show the opposite: building density is higher in the West Fork, indicating that by yet another metric Valley County's Lake Fork Watershed has higher landscape integrity (Figures 23 and 24).

Figure 22 Landcover Transitions to Low Intensity and Subdivisions 1990-2020

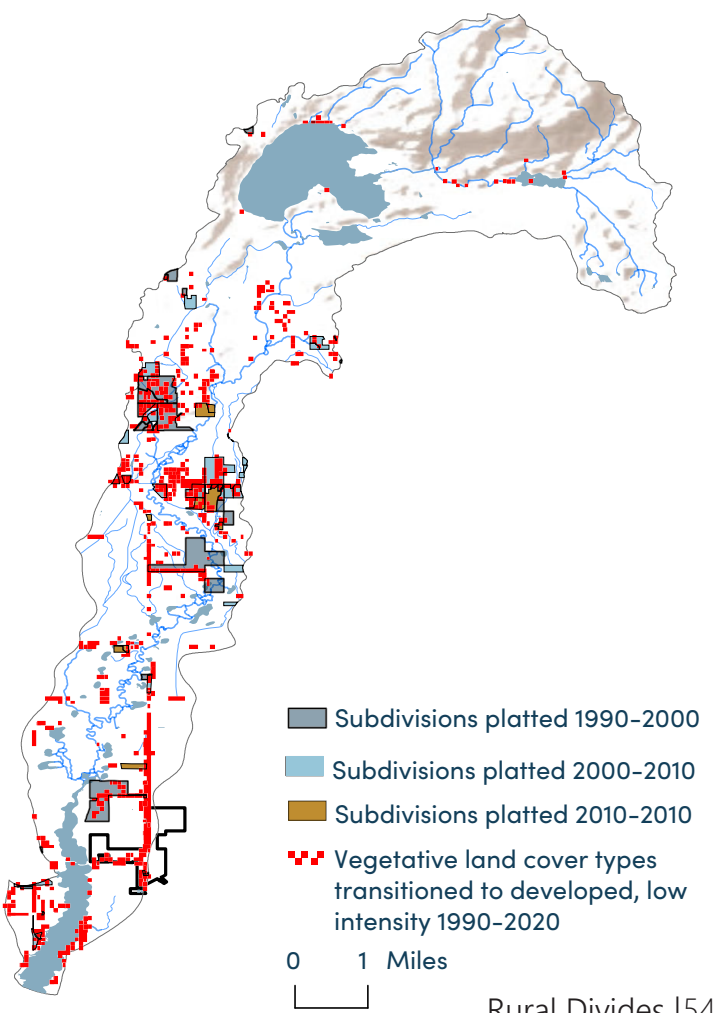
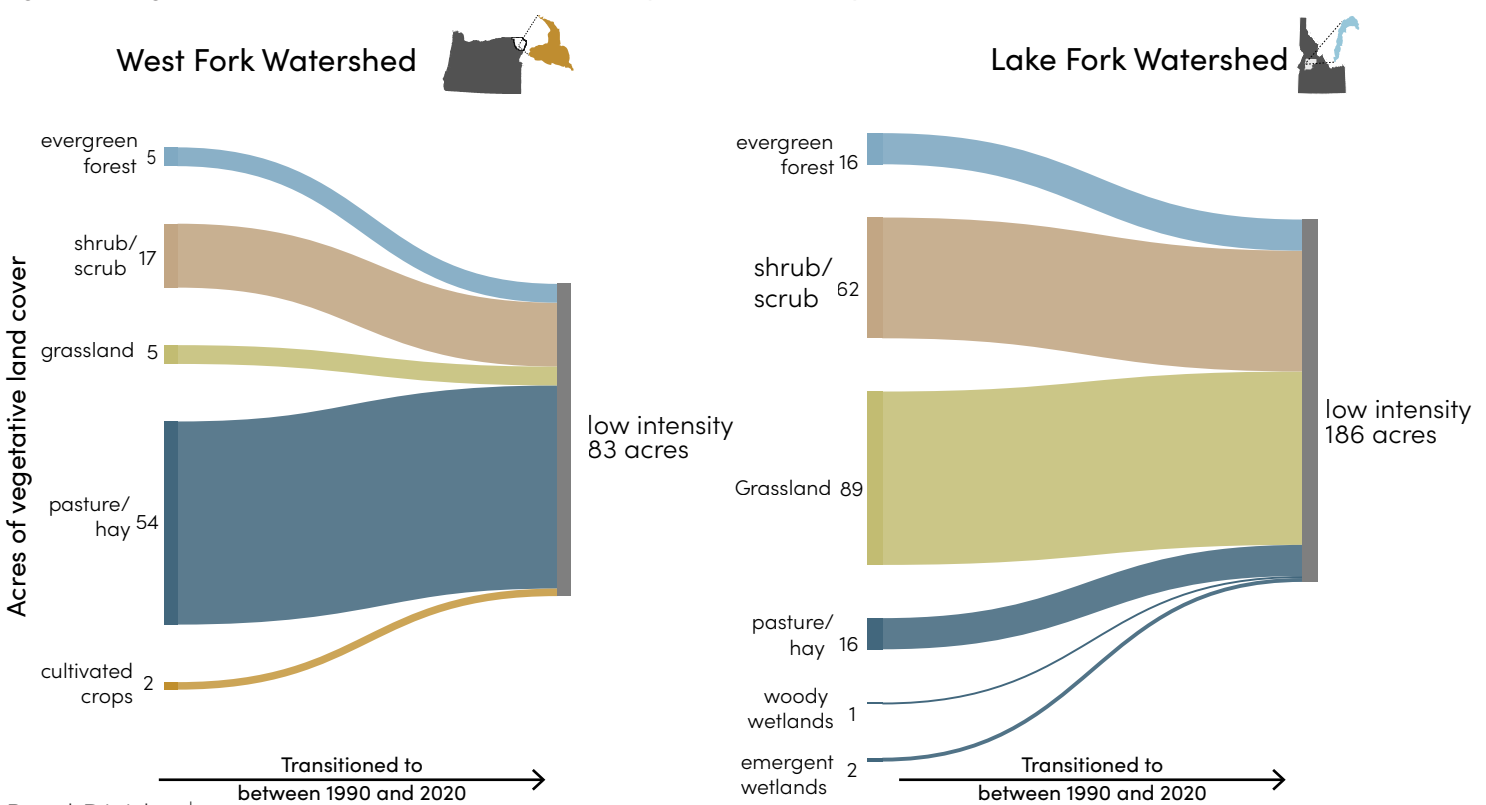


Figure 21 Vegetative Land Cover Transitions to Developed, Low Intensity

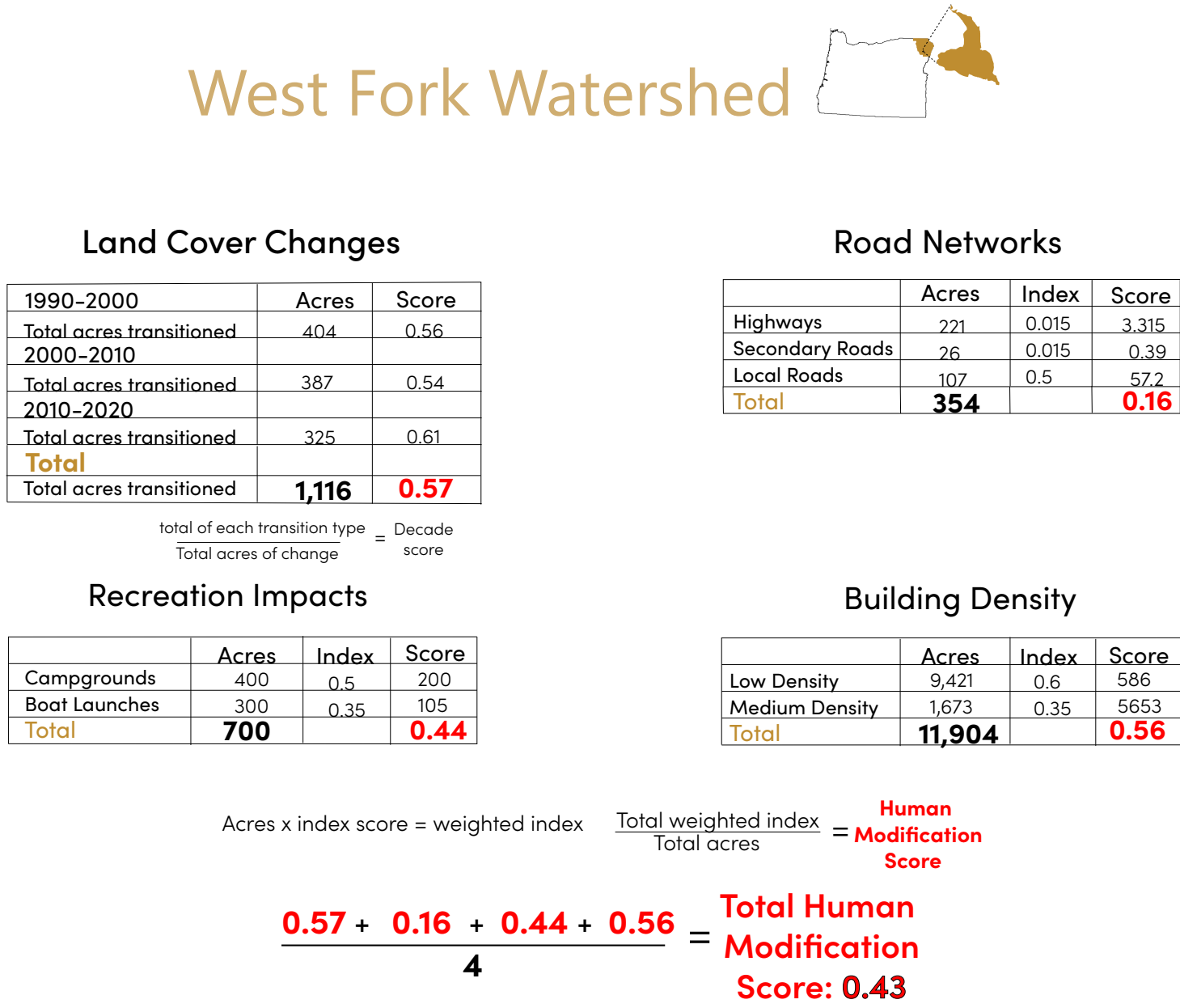




# 3.5 Landscape Integrity Study

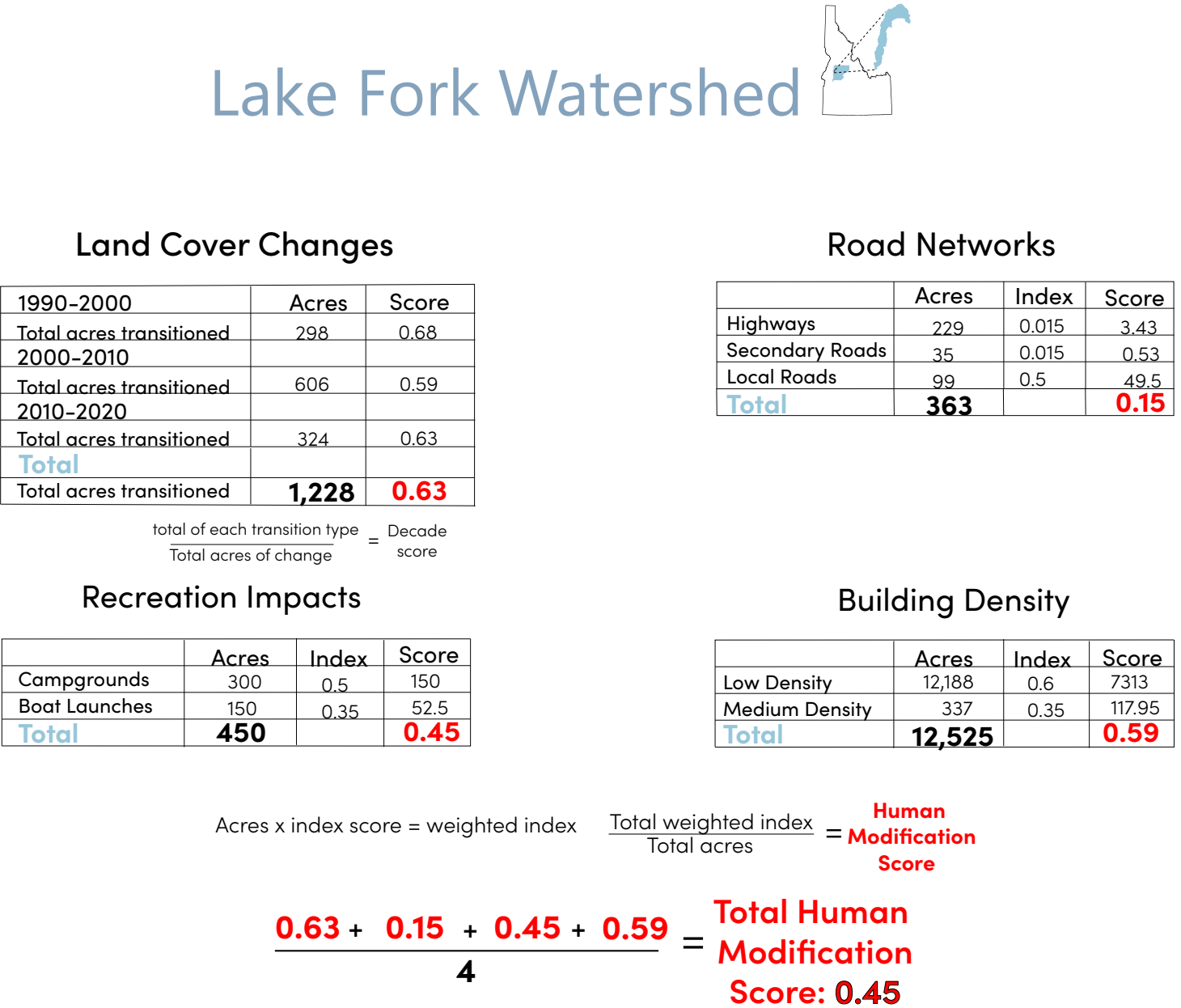
## Findings: Watershed Comparison

Figure 23 West Fork Watershed Total Score



Slightly Lower Landscape Integrity

Figure 24 Lake Fork Watershed Total Score



Slightly Higher Landscape Integrity



# 3.5 Landscape Integrity Study

## Findings: Watershed Comparison

Overall, the hypothesis has proven false, as Valley County’s Lake Fork Watershed has received a human modification score closer to 1, and has a lower building density when examining impacts on heron nesting habitat. The project findings suggest that a state land use policy that strives to control development past UGBs does not necessarily result in higher landscape integrity (research question #1), nor do wildlife habitats remain more intact in a state with strong conservation goals and programs (research question #2). However, since these findings are specific to the selected watersheds and counties, they do not mean that the Oregon land use program has failed. As discussed in the limitations section there were multiple constraints that could have yielded different results if more robust and reliable data were available.

It is worth noting that these findings are specific to the two watersheds, different watersheds in the same county could have yielded a different outcome based on characteristics and presence of disturbance indicators. To ensure comparability, efforts were made to select watersheds with similar characteristics such as a small inclusion of city parcels, federal lands that featured cross valley connections, riparian corridors, and a variety of recreation opportunities. Because the analysis assumed that relatively few buildings would exist outside UGBs, building count

was not included in the original screening. As a result, the similar building counts were unexpected, unintended and ultimately lessened the integrity of Oregon’s West Fork Watershed. Possible reasons for the presence of so many buildings outside of the UGB will be discussed in the following chapter. Overall, Oregon’s unique land use policy is intended to protect farm and forests lands, not habitat, but one might assume that habitats would be inadvertently protected as well. Wildlife habitat is intended to be protected under Oregon’s Goal 5, but many efforts are voluntary and unadopted by conservative leaning counties, such as Wallowa. These considerations and a deeper review of policy in each county will be discussed in the following chapter.

### Future Research Needs

Trophic completeness was a main element missing from this study of landscape integrity. To include trophic completeness analysis, future studies of landscape integrity could include a biodiversity study (of waterfowl or other species) which could be done by analyzing the presence of different species over time in relation to land cover transitions. EBird and the Global Biodiversity Information Facility provide species datasets from the 20th century to 2025. These datasets could be overlayed with the land cover transitions to track changes in trophic completeness.



Family of nesting Great Blue Herons  
Image credit: Southern Wisconsin Bird Alliance



# Policy Investigation

## Comprehensive plan comparison



Valley County neighborhood on the shore of Lake Cascade  
Image credit: Build Idaho

Land use and development patterns are guided and regulated by a variety of local and state policies and plans. Many of the results from the comparative study and the concluding findings can be traced back to the different county and state processes at play. Wallowa County functions under the top-down state-controlled Oregon Land Use Planning Program, while Valley County operates under the much more flexible Local Land Use Planning Act (LLUPA). Both state policies

require comprehensive plans at the county level. Comprehensive plans are intended to guide long-range development and the wellbeing of the county but are implemented very differently in Wallowa County and Valley County. This chapter contains a brief overview of the respective state policies, how land use policy can be leveraged to protect habitats, and an analysis of both county comprehensive plans in relation to the findings of the landscape integrity study



# 4.1 Policy Investigation

## Land Use Planning Overview

Land use planning across the United States varies from state to state, allowing each state to make decisions regarding development patterns, private property rights, natural resource and habitat conservation, and what activities or industries can take place in certain areas. Oregon's land use planning and policy goals are known as a champion of protecting open spaces, the environment, and limiting sprawl. Idaho has a weaker system and virtually no statewide planning goals with no centralized agency or funding mechanisms (Figure 25 and 26). **Across both plans, two main land use policies arise, zoning conditions and riparian setback requirements.**

### Oregon's Land Use Planning History

In response to development pressures on agricultural and open spaces in the 1970s, Oregon Governor Tom McCall passed legislation protecting these cherished lands. Tom McCall proclaimed: "Sagebrush subdivisions, coastal 'condomania,' and the ravenous rampage of suburbia in the Willamette Valley all

threaten to mock Oregon's status as the environmental model for the nation" (Oregon DLCD, 1998). Adopted in 1973, Senate Bill 100 (SB 100) outlines land use planning in Oregon. The statewide system is controlled by a top-down framework with a central agency, the Land Conservation and Development Commission (LCDC). SB 100 created a multi-scale approach that functions within state, county, and city jurisdictions (Abrams, 2016).

### Idaho's Land Use Planning History

In 1975 Idaho Governor Cecil Andrus passed the Local Land Use Planning Act (LLUPA), which created a land use system that allows for flexibility at the local level with no state agency overview. Localities interpret the LLUPA as they see fit, additionally LLUPA places importance on private property rights (Section 67-6502 – Idaho State Legislature, n.d.). Since LLUPA does not feature a central planning agency like Oregon, there is no funding or technical support, making it difficult to institute certain planning goals or objectives within a county.

### Wildlife Protections

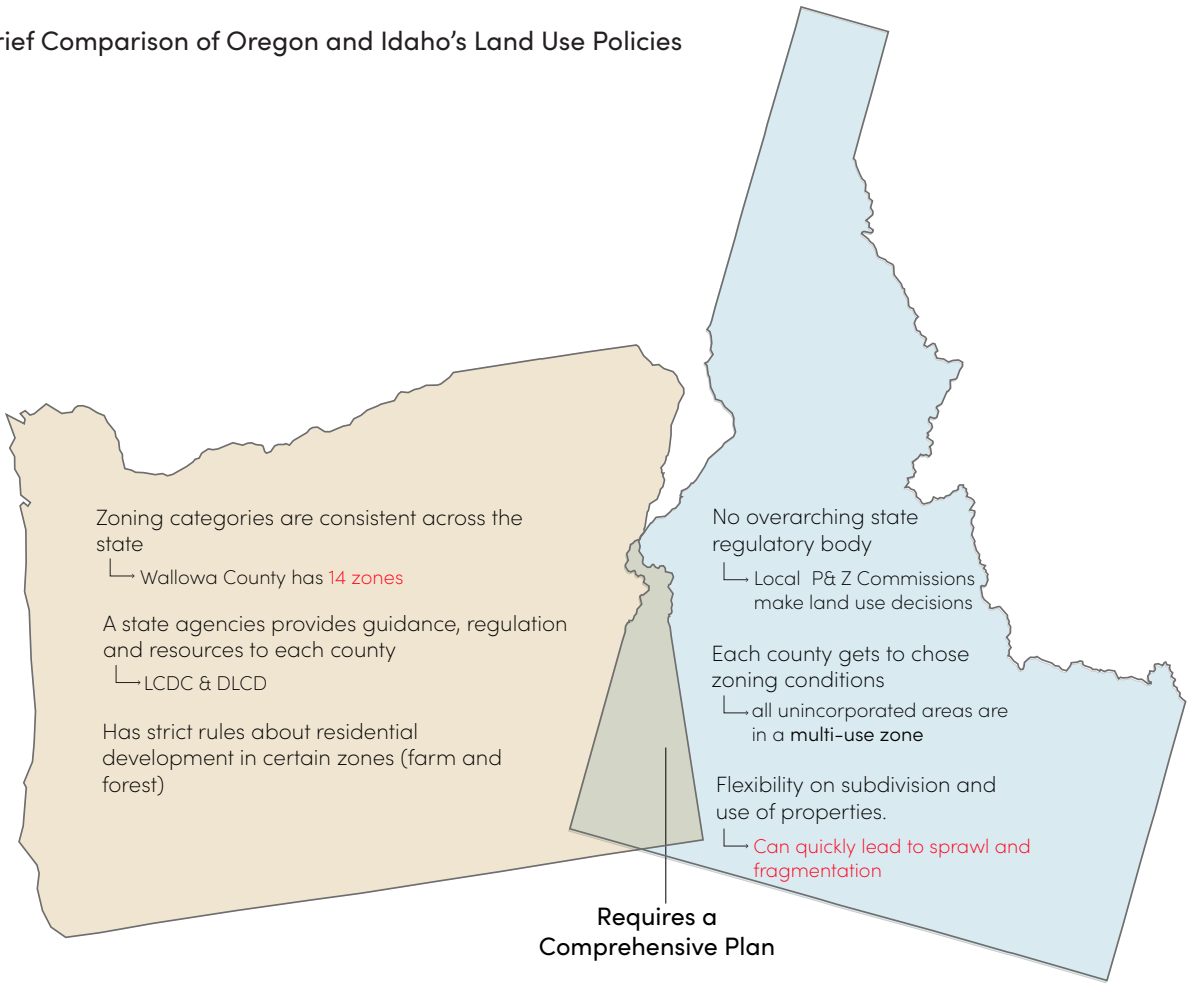
A variety of land use planning tools can protect critical habitats. Within Oregon's top-down system, Goal 3 protects agricultural land from both industrial and residential development and Goal 5 requires an inventory of wildlife habitat and sensitive areas. Literature suggests that planning measures aimed at conserving agricultural and productive lands often inadvertently lead to increased wildlife conservation (Abrams, 2016). Many species rely on these agriculturally productive lands for a variety of habitat needs such as migration stopover, breeding, forage, and cover.

States without top-down regulatory measures, and ones that promote private property rights (like Idaho) often allow for parcels over a certain acreage to be waived from the formal review processes. Waiving these review processes may allow development nuisances that hinder wildlife to occur. Nuisances include fences that prevent passage, soil disturbances, domestic animals (dogs, cats, livestock) who may harass or threaten wildlife, and the alternation or elimination of food and water sources (Maestas, 2003; Esparaza, 2009, Haggarty, et al., 2017). However, literature suggests that states without top-down measures may often have increased localized informal planning processes that can decrease habitat

fragmentation. Such controls may include, fees for development of lands in or near critical habitat which are then invested into conservation efforts nearby, such as wildlife safe fences, lighting requirements to protect dark skies, and noxious weed control (Robbins, et al., 2012). However, researchers suggest that many of these informal processes are often wrapped up in complex relationships with developers, rural planning boards/ commissions, and are often unfortunately driven by capital gains over landscape preservation. In many areas experiencing amenity migration and exurbanization, new residents are passionate about promoting the landscape resources they were initially drawn to, this can often lead to the strengthening of these informal processes and diverse stakeholder engagement.

Although many planning applications are regulatory, such as zoning, there are also a large amount of incentive-based planning measures that can increase habitat conservation, such as the use of conservation easements and land trusts, transferable development rights, and cluster developments (Theobald, et al., 2005). Overall, even if there is not a robust top-down approach to control and regulate land use decisions, there are many avenues that communities and planners can take to promote habitat conservation.

Figure 25 Brief Comparison of Oregon and Idaho's Land Use Policies





# 4.1 Policy Investigation

## Land Use Planning Overview

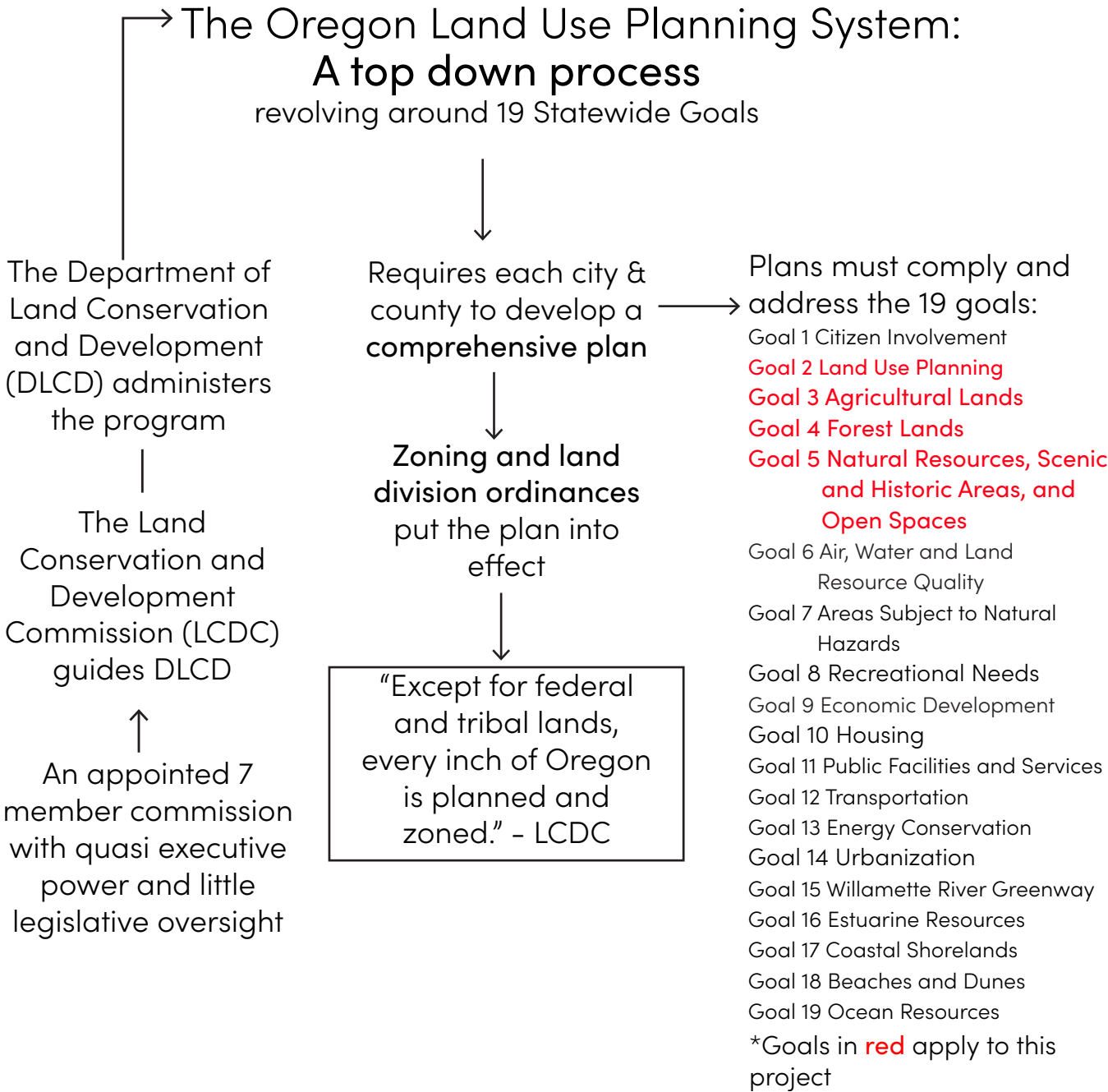
Figure 26 In Depth Comparison of Oregon and Idaho's Land Use Policies

### OREGON'S LAND USE PLANNING

"Sagebrush subdivisions, coastal 'condomania,' and the ravenous rampage of suburbia in the Willamette Valley all threaten to mock Oregon's status as the environmental model for the nation" -Tom McCall

1973 Passage of **Senate Bill (SB) 100** by Tom McCall

Created

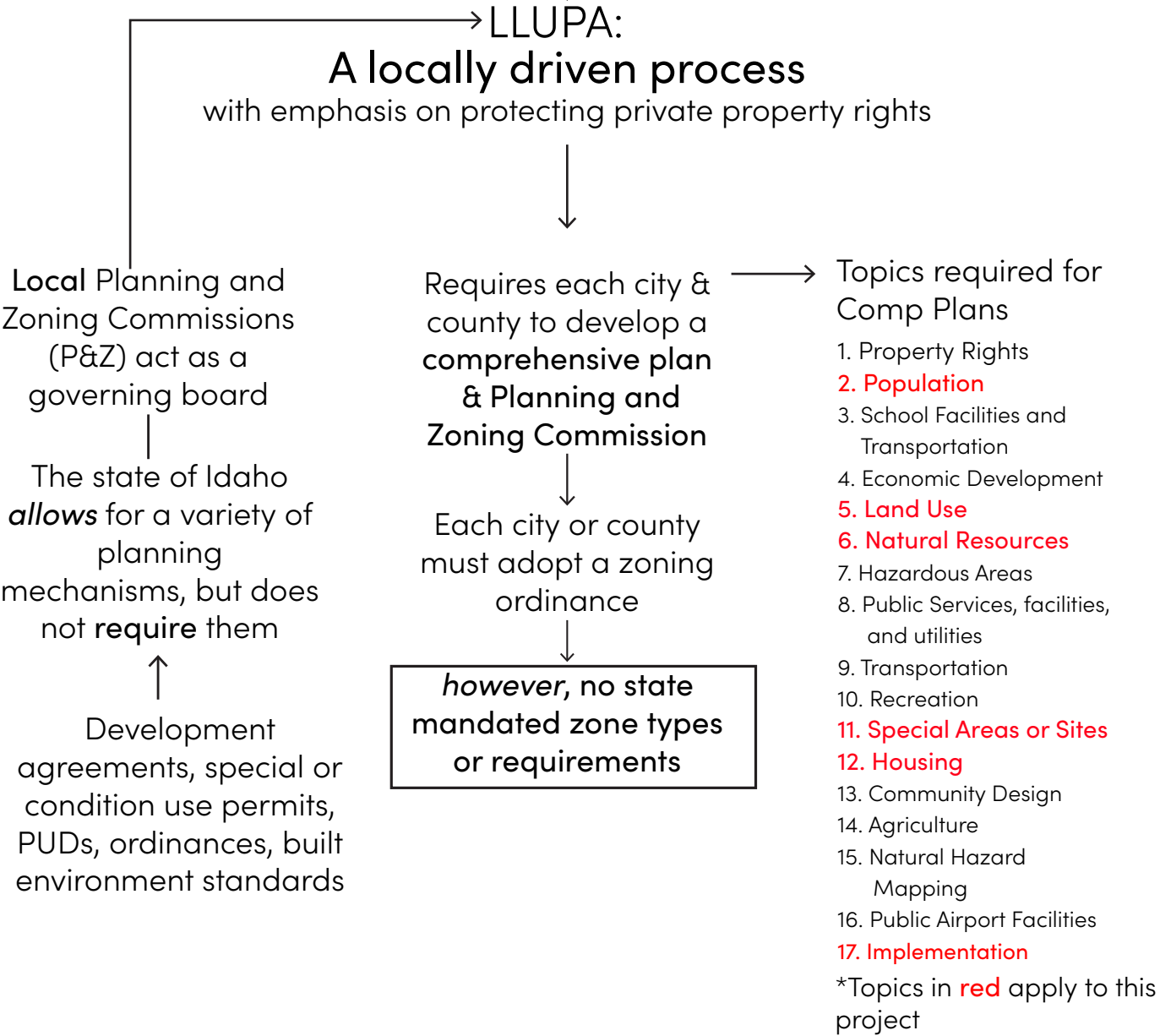


### IDAHO'S LAND USE PLANNING

"Idahoans get their second paycheck each day when they walk out their front doors."  
- Cecil Andrus (the final democratic governor of ID)

1975 Passage of the Local Land Use Planning Act by Cecil Andrus

Created:





# 4.2 Policy Investigation

## Wallowa County- Zoning Mechanisms

### Overview

As outlined by Goal 2 of Oregon’s statewide planning program, each city and county are required to produce a comprehensive plan. Comprehensive plans function as long range plans that guide development and land use decisions in the county. The comprehensives plans are ultimately implemented through zoning rules and ordinances. Additionally, these plans function as a way for the 19 Statewide Goals to be implemented. Statewide goals that apply to this project include Goal 3, Goal 4, Goal 5, Goal 6 and Goal 8 (Figure 27). In addition, Articles 15-19, 28, 42, 44, and 54-56 from the Wallowa County Comprehensive Plan relate to the project findings (Figure 28). Any text that is in *“italics”* is a direct quote from the plan, unless a different citation is used, all factual statements are sourced from the Wallowa County Comprehensive Plan (the Plan).

The purpose of the Wallowa County Comprehensive Plan is to

1. *“Protect the custom, culture, and community stability of the county,*
2. *Maintain the agricultural and time basis of the county,*
3. *To accommodate anticipated development, and*
4. *To make provisions for those uses which may be needed by the county, but which may have such undesirable characteristics as noise, smoke, and odor” (p. 3).*

The Plan also suggests that the lifestyle and customs culture of Wallowa County shall be protected, including timber/ grazing interests, agriculture, local businesses, tourism, recreation, and retirement and the arts. To achieve the above purpose and protect the lifestyles and customs culture Wallowa County has instituted 13 different zones, however only 8 will be discussed in relation to this project; Non- Resource/ Existing Lot (EL-2), Exclusive Farm Use (EFU), Timber-grazing (T/U), Rural Residential (R-1), Recreation Residential (R-2), Resort Residential (R-3), Resort Commercial (RCR), and Resort Park (RP) (Figure 26). The following sections discuss the policies that led to a higher-than-expected building count and policies that contributed to heron nesting disturbances.

### Existing Lot (EL-2) and Exception Areas

The Existing Lot Zone and exception areas are largely responsible for the high building counts outside of the Enterprise and Joseph UGBs.

Per Article 42, the purpose of the Existing Lot zone is to allow for *“non farm, non- forest residential use I areas predominately comprised of lots or parcels of insufficient size required for farm or forest uses”*. (Art. 42, p. 1). To be accepted in the Existing Lot zone, parcels had to be recorded or platted before July 1988.

Additionally, there are many areas that the county has accepted qualified as exclusionary areas (known as exception areas at the state level). These areas have qualified for exclusion from Goal 3 or Goal 4

Figure 28 Wallowa County Ordinance Articles

| Wallowa County Articles                                   | Purpose                                                                                                                                                                     |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Article 15: Exclusive Farm Zone (EFU)                     | Protect and maintain agricultural lands for farm use, consistent with existing and future needs for agricultural products                                                   |
| Article 16: Timber-grazing (T/U)                          | Protect and maintain forest lands for grazing, and rangeland use and forest use, consistent with existing and future needs for agricultural and forest products             |
| Article 17: Rural Residential (R-1)                       | Provide areas suitable for small acreage parcels and to maintain a buffer between urban and farm or forest uses                                                             |
| Article 18: Recreation Residential (R-2)                  | Provide minimum standards for residential development and recreational uses in areas of the County that visitors are attracted to for natural and man-made amenities        |
| Article 19: Commercial Recreation (CR-2)                  | Provide minimum standards for commercial development and uses in areas of Wallowa County that are used primarily by visitors from outside the County.                       |
| Article 28: Goal 5 and 6 Resource Overlay                 | Protection of identified Goal V and VI Resources.                                                                                                                           |
| Article 42: Existing Lot (EL-2)                           | Allow the establishment of non-farm, non-forest residential use in areas predominantly comprised of lots or parcels of insufficient size required for farm or forest use    |
| Article 44: Wallowa Lake Moraines Goal 5 Resource Overlay | In the Overlay Zone, conflicting uses may be prohibited, limited, or allowed, depending upon the impact on the resource                                                     |
| Article 54: Resort Residential (R-3)                      | Provide minimum standards for residential development and recreational uses in the unincorporated Resort community of South Wallowa Lake                                    |
| Article 55: Resort Commercial (RCR)                       | Provide minimum standards for commercial development and uses in areas of Wallowa County that are used primarily by visitors from outside the County                        |
| Article 56: Resort Park (RP)                              | Provide minimum standards for park, camp, retreat and conference grounds, and open space recreation activities in the unincorporated Resort Community of South Wallowa Lake |

Figure 27 Oregon’s Statewide Land Use Planning Goals

| Statewide Goals                                                             | Purpose                                                                                                           |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Goal 2: Land Use Planning                                                   | Requires each local government to have and follow a comprehensive land use plan and implementation regulations    |
| Goal 3: Agricultural Land                                                   | Requires counties to identify farmland and zone as EFU                                                            |
| Goal 4: Forest Land                                                         | Requires counties to identify forest, and places development restrictions                                         |
| Goal 5: Natural Resources, Scenic Areas and Historic Areas, and Open Spaces | Requires counties to inventory resources and develop codes to protect resources. Levels of protection varies.     |
| Goal 6: Air, Water, and Land Resources Quality                              | Instructs local governments to consider protection of air, water and land resources from pollution and pollutants |
| Goal 8: Recreational Needs                                                  | Includes information on small and large destination resorts.                                                      |



# 4.2 Policy Investigation

## Wallowa County- Zoning Mechanisms

protections “due to existing levels of non-resource use or the need to accommodate future non-resource uses.” (p. 3). Both the Existing Lot areas, and the descriptions of the exception areas include many parcels under 5 acres and include high building densities compared to EFU and Timber-grazing zones. Although a map of the exclusion areas could not be obtained, but the Plan includes descriptions of locations. Many of the described areas are within the periphery of Enterprise, Joseph, and west of Wallowa Lake, therefore making up large swaths of the watershed. This spatial pattern helps explain the unexpectedly high building counts outside of UGBs.

### Exclusive Farm Use (EFU) and Agricultural Protections

Goal 3 and Article 15 aim to preserve and maintain agricultural lands in Wallowa County by providing areas for continuation of agricultural activities and permitting new uses which are compatible with agricultural activities. Within the West Fork Watershed 6,123 acres are zoned as Exclusive Farm Use (EFU). The number of dwellings on land zoned EFU is limited to a farm related single-family dwelling on a 160-acre parcel.

However, Article 15 provisions include additional dwellings for family members experiencing hardship or dwellings for relatives assisting with agricultural operations. Additionally, the adoption of House Bill (HB) 3326 in 2002 expanded the allowed number of buildings on a parcel zoned EFU. HB 3326 allowed for splitting of EFU parcels and additional dwellings to be built in areas that are “generally unsuitable land for the production of farm crops or livestock” and in areas that did not increase the cost of, or interfere with nearby operations, (Art. 15, p. 9, and Abrams,

Figure 26 Wallowa County Minimum Lot Size by Zone

| Zone                               | Minimum Lot Size |
|------------------------------------|------------------|
| Exclusive Farm Use (EFU)           | 160 acres        |
| Timber- grazing (T/U)              | 240 acres*       |
| Rural Residential (R-1)            | 5 acres          |
| Recreation Residential (R-2)       | 0.17 acres       |
| Resort Residential (R-3)           | 0.17 acres       |
| Resort Commercial Recreation (RCR) | 0.17 acres       |
| Resort Park (RP)                   | N/A              |
| Existing Lot/ Non Resource (EL-2)  | Varies           |

\*Land divisions of less than 240 acres in size may be allowed for uses listed in OAR 660-06-025(3)

2011). Between 2002 and 2008, 23 petitions to split EFU parcels were filed in the county, representing a total of 43 proposed parcels. Of the 23 petitions, only 7 were denied by the Planning Department or Board of Commissioners.

Within the context of this project, a map of approved parcel splits could not be found but is possible that some of the splits occurred within the study area as much of the watershed is comprised of EFU. As seen in Figure 27, the majority of nest area disturbances are within areas zoned EFU. This also may explain the high amount of transition seen within the pasture/ hay landcover type.

In many ways, as Abrams suggests, HB 3326 sped up the rural restructuring process and may be partially responsible for the higher-than-expected building count in the watershed.

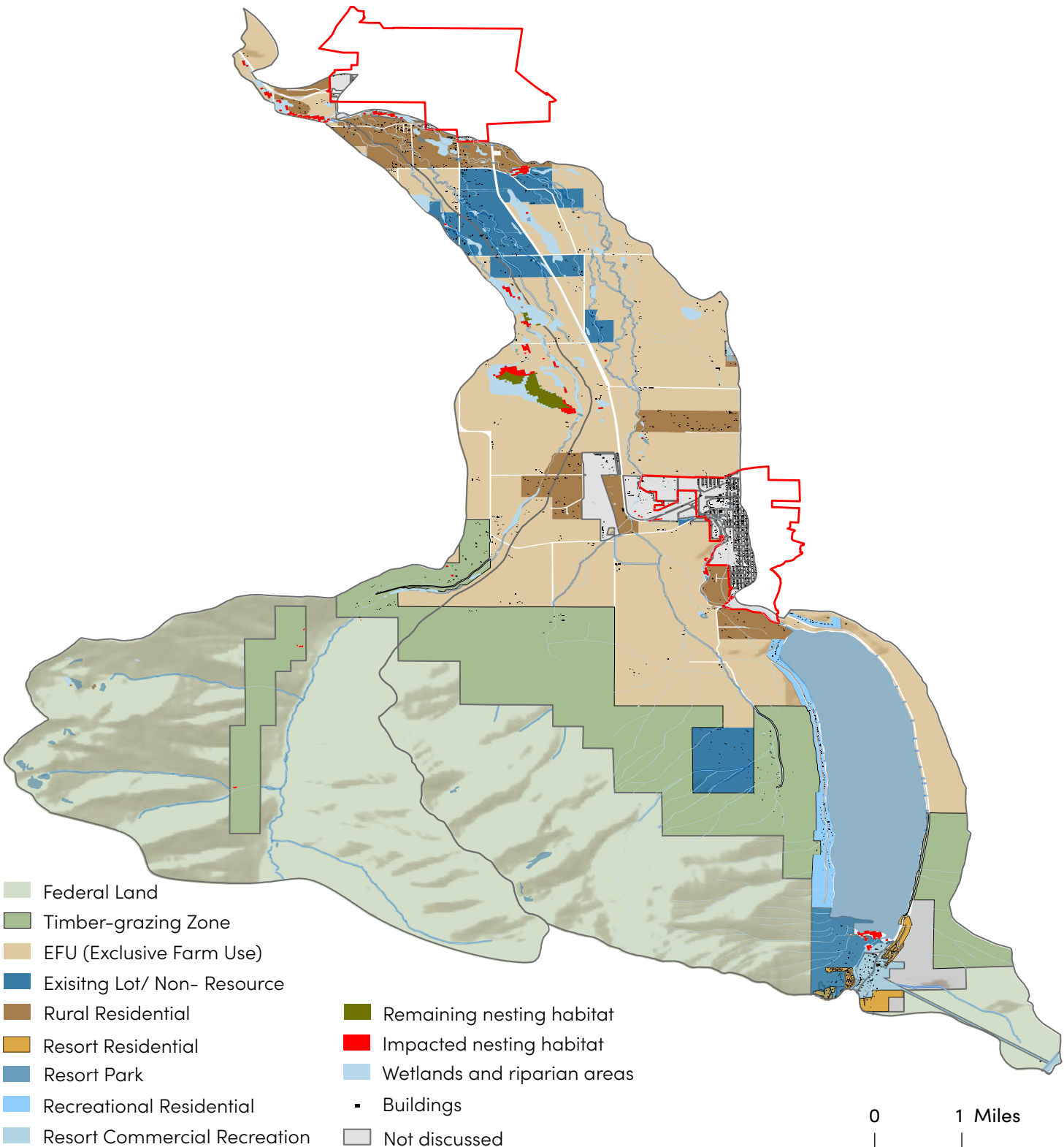
### Timber – grazing (T/U) and Forest Protections

Goal 4 and Article 16 aim to provide areas for commercial forest operations while protecting forest areas from conflicting uses. Wallowa County granted private lands in predominately in forest use on January 1, 1993 into the Timber-grazing zone. There are 3,606 acres zoned timber-grazing in the watershed. Similar to EFU, the Timber-grazing Zone allows one single- family dwelling and associated nonresidential buildings. Under Article 16, allows for additional dwellings for a family member experiencing hardship, and buildings associated with hunting or fishing accommodations. Many of the buildings at the southern end of the watershed are in the Timber- grazing zone. Since Wallowa County’s economy and customs culture is partially based on recreation and the proximity to National Forest lands, it is possible there are many additional hunting and fishing dwellings within the Timber-grazing zone. Much like HB 3326, the possible occurrence of hunting accommodations in the T/U zone could have increased the overall building count in the study area.

### Rural Residential (R-1)

The Rural Residential zone accounts for 1,195 acres of the watershed and the zone is intended to provide areas for small acre parcels while acting as a buffer between urban areas and farm or forest areas. The minimum lot size of 5 acres is much smaller than EFU or Timber-grazing. This smaller lot size equates to a higher building density. As seen in Figure 27, much of the Rural Residential zone is in the center of the watershed and in the area south of Enterprise, where many nesting areas experience building related impacts.

Figure 27 Wallowa County Zoning Map including Impacts to Heron Nesting Habitat





## 4.2 Policy Investigation

# Wallowa County- Zoning Mechanisms

### South Wallowa Lake Area (R-2), (R-3), (RCR), and (RP)

The South Wallowa Lake area includes multiple high-density zones that greatly increase the watershed’s building density.

The western shore Wallowa Lake is in the Recreation Residential Zone (R-2). In this zone, minimum lot sizes are only 7,500 sq feet (0.17 acres) and the zone permits up to two single family dwellings are allowed when setbacks are met. The southern shore is comprised of the Resort Residential Zone (R-3) and the Resort Commercial Recreation Zone (RCR). In the Resort Residential Zone, the minimum lot size is 7,500 square feet and the zone permits up to two single family dwellings. The Resort Commercial Zone allows for retail zones, single family dwellings, condos, hotels, RV parks, and public/private campgrounds, with a

minimum parcel size is 7,500 square ft. The Resort Park Zone provides areas for camping, park, and retreat activities. No new lots or division of parcels are allowed in this zone. The large Wallowa Lake State Park campground is located within the Resort Park Zone. All zones in the South Wallowa Lake area require a 25ft setback from water bodies.

Goal 8 of the Statewide Land Use Planning Goals regulate resort development. By allowing for higher densities outside of UGBs, resort zones function similarly to exception areas. The small parcels and high building density along the shore of Wallowa Lake and the within the Resort Zones greatly contribute to the higher-than-expected building density in the watershed.



Wallowa County Landscape  
Image credit: Leon Werdinger



## 4.3 Policy Investigation

# Wallowa County- Wildlife Protections

### Natural Resource and Water Protections

Article 28 outlines the protections for Goal 5 (Open Spaces, Scenic and Historic Areas, and Natural Resources) and Goal 6 (Air, Water, and Land Resource Quality) resources within the county. The discussion of riparian areas within Article 28 is relevant to this project. The article defines a riparian area as “the area adjacent to a river, lake, or stream consisting of the area of transition from aquatic ecosystem to a terrestrial ecosystem” and within the county riparian corridors include:

“2. Along all lakes, fish bearing streams with an average annual flow less than 1,000 cfs (all other streams within Wallowa County), the riparian management corridor boundary shall be 50 feet from the top of each bank.

3. Where the riparian management corridor includes all or a portion of an identified significant wetland and is determined during the County assessment process, the distance to the riparian management corridor boundary shall include the wetland.” (Art. 28 p. 1-2).

In EFU and Timber- grazing zones there is a 100 ft set back from any riparian corridor to protect fish and wildlife habitat and water quality. However, in the Rural Residential Zone (R-1) and Recreation Residential Zone (R-2) the setback is only 25 feet (Figure 28).

**This small setback distance potentially increases disturbance to heron and other species whose habitat includes riparian corridors.** It is important to note; these riparian corridor setback distances are local discretionary choices and are not representative of a state policy. Under state and federal laws, there are more protections for **designated wetlands compared to riparian corridors, therefore nesting habitat within wetlands might be better protected.** Altering wetlands require permits from the Department of State Lands, County and inspection from the Wallowa County

Natural Resources Technical Advisory Committee (WCNRTAC).

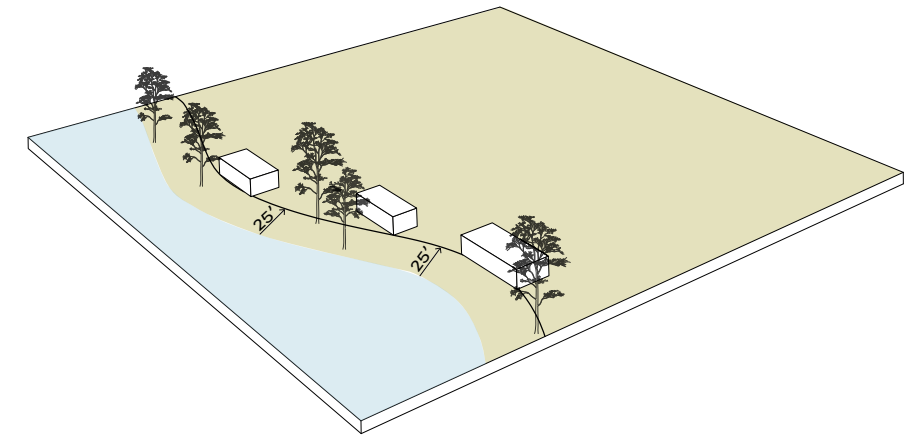
Article 28 includes protections for birds, particularly the heron. Section 3 of Article 28 states:

“if a structure is proposed to be sited... within 500 feet of a rookery or nesting site... the applicant must supply a plan, acceptable to the review of authority, for the mitigation of adverse effect on the corridor or habitat” (Art. 28, p.7) however, the plan continues to state that “said mitigation plans shall include the setbacks as follows: in resource zones (EFU, Timber-grazing, etc) there shall be a 100 foot minimum setback from.. rookeries, nesting sites.. for the purpose of preserving habitats... in non resource zones there shall be a 25 foot minimum setback for structures from rookeries, nesting sites for the purpose of preserving habitat..” (Figure 28)

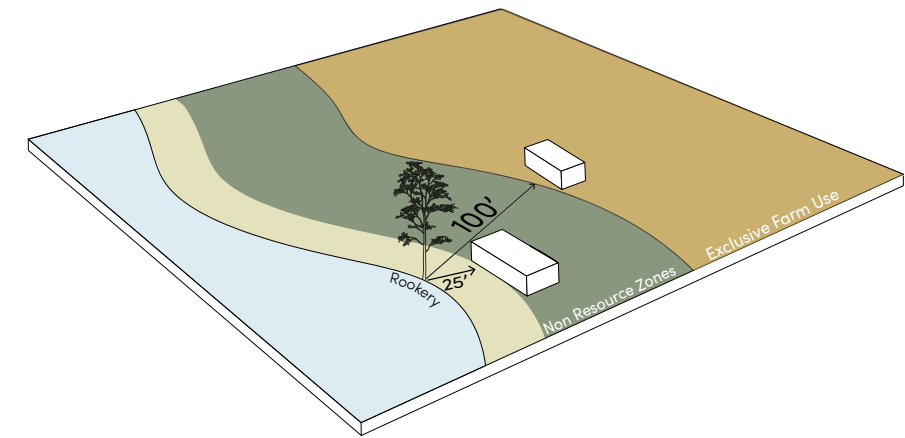
As the heron profile in the previous section described, a 25ft set back from rookeries is not a far enough distance for ideal heron habitat, as they are sensitives to buildings within 250 meters of nests (Figure 28). Since large portions of the watershed and riparian areas are in non-resource zones and exception areas, **county representatives have done little to protect heron habitats under Article 28 and Goal 5.** Setback distances can become political decisions, especially in this case where amenity migrants may value a home with creek or river views and ambiance. Since the Great Blue Heron is not an endangered species it holds very little political or ecological power in Wallowa County.

**Overall, due to the small 25ft setbacks in the existing lot, rural residential, and South Wallowa Lake zone areas, heron nesting habitats have virtually no protection in the West Fork Watershed.** As Figure 27 shows, the presence of these zones in the watershed has contributed to the high building count and density and the overall disturbance of heron nesting sites.

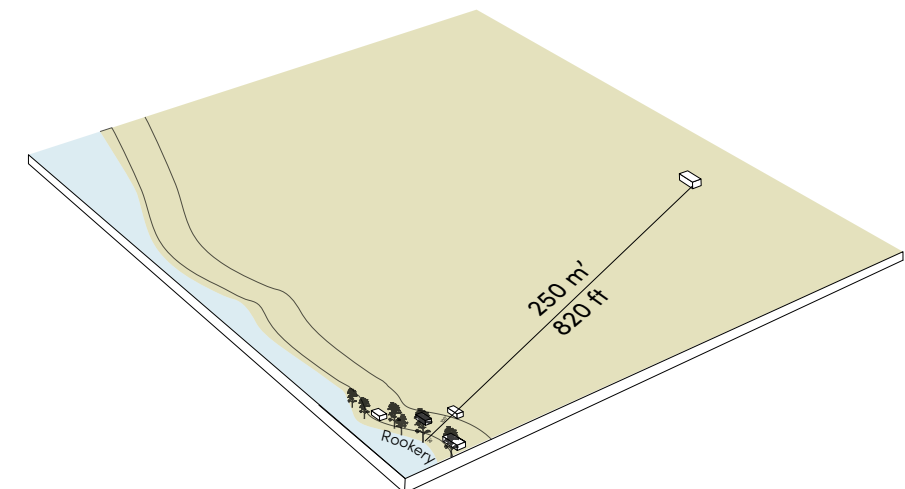
Figure 28 Wallowa County Setback Distances



25' Riparian Setback Distance



Rookery Setback Distances



Distance of Impact from Short and Cooper's Habitat Suitability Model



# 4.4 Policy Investigation

## Valley County Zoning Mechanisms

Much like Oregon, under the state of Idaho’s Local Land Use Planning Act (LLUPA), each county is required to adopt a comprehensive plan. Under LLUPA comprehensive plans must outline goals and strategies in accordance with 13 objectives under Idaho Code Section 67-6502. Objectives that directly relate to this project include:

- Objective G: (g) to avoid undue concentration of population and overcrowding of land
- Objective (J) to protect fish, wildlife, and recreation resources

Within the comprehensive plan, Chapters 2, 4, 6, 8, and 13 support the project findings (Figure 29). The chapters presented and discussed in an order that narratively makes sense, not chronologically. Any text in *“italic”* is a direct quote from the plan, unless a different citation is used, all information is sourced from the 2025 Valley County Comprehensive Plan (the Plan).

The purpose of the Valley County Comprehensive Plan is “not to control land, but to prevent uses of land that are *harmful to the community in general. The natural beauty and open characteristics of the county can, without reservation, be described as a major reason why land development is rapidly increasing in the county*” (p. 4) The plan goes on to say that human interest shall be considered in balance of ecosystem decisions.

### Land Use

Chapter 13 includes descriptions of existing land use and development patterns in the county. Much like Wallowa County, Valley County is home to large

swaths of federal lands, forested areas, agricultural areas, rural residential areas, and small cities. **Unlike Wallowa County, there is no categorical zoning,** rather five land use designations exist, and one catch all Multi Use Zone (Figure 30). The purpose of the multiple use classification is to grant landowners maximum flexibility when using and developing their properties. The Lake Fork Watershed includes 3 of the 5 designations; rural, cities and areas of impact, and villages. Most of the watershed is made up of the rural designation.

Rural designations apply to all unincorporated properties within the county. Commercial, industrial, and residential uses are allowed.

The Donnelly area is designated as Cities and City Areas of Impact. The City of Donnelly Impact Area is governed by the County.

The community of Lake Fork, partially located in the watershed, is designated as a village. Commercial and industrial uses are allowed, as long as they are compatible with nearby uses and with the existing character. Villages are under the jurisdiction of the county.

Land use decisions in Valley County are implemented through Valley County Code Title 9 and Tile 10. Title 9, know as the Valley County Land and Development Ordinance is intended to fulfill the goals and objectives of the Plan.

Chapter 9.4 outlines Valley County’s ordinances for permitted uses, minimum lot sizes, and setbacks (Valley County Code 9.4, 2025) (Figure 31). Agricultural

Figure 30 Valley County Zoning Map

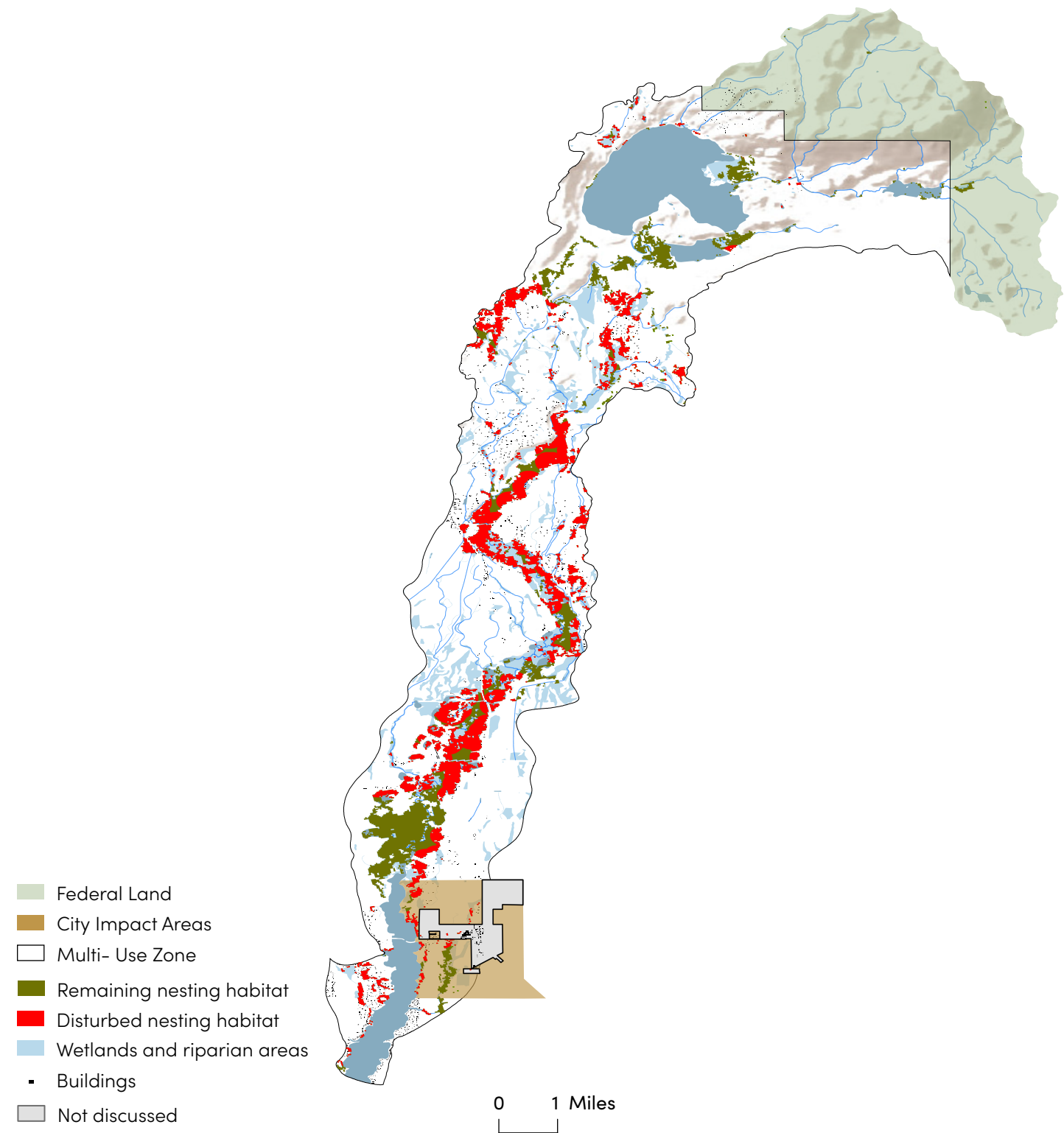


Figure 29 Relevant Valley County Comprehensive Plan Chapters

| Chapter                                 | Purpose                                                                                                  |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------|
| Chapter 2: Population                   | Describes population trends and managing projected population growth                                     |
| Chapter 4: Natural Resources            | Identifies natural resources in the county and provides management goals and objectives                  |
| Chapter 6: Special Areas and Sites      | Outlines cultural and natural landscapes within the county, provides management goals and objectives     |
| Chapter 8: Housing and Community Design | Describes housing availability in the county and goal and objectives to manage projected growth patterns |
| Chapter 13: Land Use                    | Provides an analysis of existing land use in the county and introduces Multi Use Zoning and designations |



# 4.4 Policy Investigation

## Valley County- Zoning Mechanisms

uses require a minimum lot size of five acres. For single-family residences, minimum lot size depends on the availability of sewer and water services: parcels with both services must be at least 20,000 square feet (0.46 acres), while parcels without services must be at least one acre. For all other uses, the code does not specify a minimum lot size, but parcels must be configured to accommodate sewer and water systems, streets, driveways, and required setbacks. The county permits planned unit developments through conditional use review and requires a minimum lot size of two acres.

Figure 31 Valley County Minimum Lot Sizes

| Use                            | Minimum Lot Size |
|--------------------------------|------------------|
| Agriculture Use                | 5 acres          |
| Single family w/ sewer &water  | 0.66 acres       |
| Single family w/o sewer &water | 1 acres          |
| Planned Unit Development       | 2 acres          |

Collectively, these standards encourage dispersed, low-density development patterns characteristic of rural sprawl. Sewer and water requirements also shift the financial burden of infrastructure expansion onto developers or the county, further extending development into previously undeveloped areas which could have been historically habitat for a variety of species. Both the resulting sprawl and the infrastructure needed to support it reduce overall landscape integrity.

### Population and Housing

Since the 1970s *“Land-use patterns in Valley County have been radically altered during the past decades away from the traditional agricultural-use pattern to one of recreation home and subdivision development. This rapidly evolving pattern, which places more demands on the environment and community than the former one, creates the need for a thoughtful response from the community to prevent future damages to the environment and community which attracted development here in the beginning”* (p. 90)

Chapter 2 centers around population demographics and changes in the county. Idaho was the fastest growing state in 2016, and Valley County’s population is expected to double in the next 20 to 30 years. Aligning with this trend is the occurrence and consistent increase in second homes; in 2025 between 78%-83% of housing units were second homes. *“Based*

*on the County’s current growth patterns and land-use entitlement process, the County is forecasted to grow primarily in the area northwest of Donnelly, the Donnelly city limits, and the area south of Cascade.”*  
**The Lake Fork Watershed study area is directly included in this forecast.**

Goals under Chapter 2 include managing growth and development while protecting quality of life, under this goal is an objective to consider impacts to water quality. However no direct actions or tactics are listed to achieve these goals or objectives.

Chapter 8 examines the housing challenges in Valley County. The rapid growth of second-home development has *“changed the county’s land-use pattern from agricultural to rural residential. The effects are both positive and negative.”* (p. 49) The combination of a large second-home market and a recreation-dependent economy have created a wicked problem: the tourism industry relies on a stable workforce, yet much of the housing stock is occupied by second homes and vacation rentals, leaving few options for local workers. This shortage increases pressure to build additional housing, which in turn converts more vegetative land and habitat into low- or medium-density development. Goal 1 of Chapter 8 responds to this issue by encouraging an adequate supply and variety of affordable housing types for local residents. Under goal one, objective 5 states:

*“Consider higher densities and multi-family units where services are available. Encourage clustering of houses and higher density with areas of contiguous open space to reduce habitat fragmentation which, in turn, benefits fish and wildlife, reduces the potential for human-wildlife conflicts, and is aesthetically pleasing to members of the community.”* (p.59)

Goal 3 aims to protect the rural flavor of the region and protection of special areas. Within this goal Objective 13 encourages housing developments to adopt wildlife best management practices such as: controlling pets, avoiding wildlife depredation, retaining native vegetation to support birds, small mammals, and pollinators, retaining buffers of riparian vegetation around wetlands, and wildlife friendly fencing (p. 61)

Goals 1 and 3 and objectives 5 and 13 include wildlife interests in the planning process, **but without requirements rather than encouragement there are, in fact, very few protections.** In Chapter 15, encourage is defined as *“to foster, sustain and promote”* (p. 109), this definition holds no mandates or requirements.



Jughandle Mountain, Valley County  
Image credit: Davefaitlemonde.com



# 4.5 Policy Investigation

## Valley County- Wildlife and Water

Chapter 4 focuses on the county's natural resources. The Plan defines natural resources as water, wildlife, geothermal waters, timber forests, and minerals and expresses the importance of natural resources to the economy and recreation system. The Plan states that *“Overall water quality in Valley County, Lake Cascade, and Payette Lake has been found to be declining. Lake Cascade is of particular concern.”* (p.17), when water quality declines, all habitats suffer. Notable actions and practices to improve water quality include the Idaho DEQ’s Cascade Reservoir Watershed Management Plan to reduce phosphorus and chlorophyll in the reservoir, and the Valley County Waterways Management Plan. Communities across the county developed and adopted the Waterways Management Plan which provides a coordinated framework to guide management and improvements of all waterways in the county.

Within Chapter 4, wildlife resources are addressed through Goal 3, which states: *to protect fish and wildlife as the natural resources of critical importance in Valley County.* Objectives under this goal include;

- “b. preservation of vegetative buffers adjacent to rivers and creeks for wildlife and fish habitat,*
- d. Encourage clustering of houses with areas of contiguous open space to reduce habitat fragmentation which, in turn, benefits fish and wildlife and reduces the potential for human-wildlife conflicts, and*
- e. Encourage housing developments to incorporate wildlife-friendly best management practices”* (p. 22).

Chapter 6 identifies waterways and wildlife habitat as valuable in Valley County. Goal 2 works to recognize waterways and waterbodies as special areas. Objectives within this goal include

- “3. Encourage retention and maintenance of vegetation along all water bodies.*
- 4. Implement goals established in the Valley County Waterways Management Plan that are in alignment with the Valley County Comprehensive Plan*
- 5. Encourage open space buffers adjacent to rivers, creeks, and other water bodies in order to preserve and protect riparian areas by adopting setbacks, leaving as natural vegetation, and/or using BMPs.”* (p. 35)

Goal 3 recognizes important wildlife habitats, objectives within this goal include:

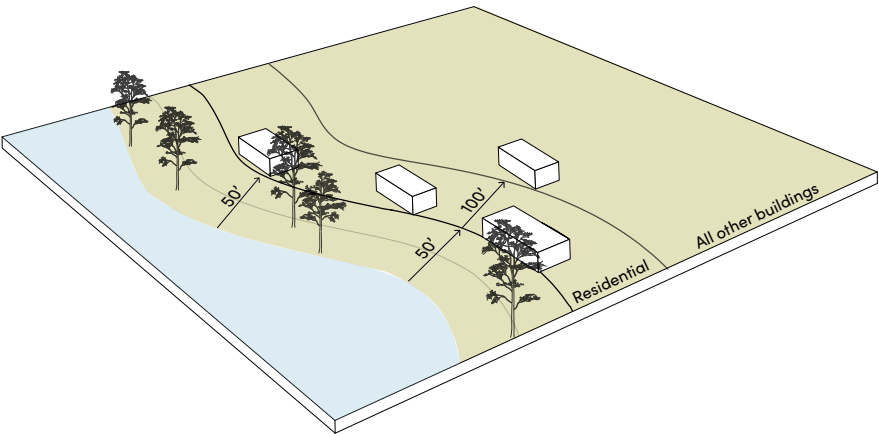
- “1. Consider the needs of fish and wildlife in policies and regulations for the preservation of water quality.*
- 2. Include consideration of the needs of the fisheries and wildlife resources of the areas in specific plans for the North Fork of the Payette River, and other watercourses or waterbodies.*
- 3. Consider the effects on wildlife ecosystems in development and special area protection decisions, and*
- 4. Preserve important fish and wildlife habitat by working with agencies and conservation groups including the Idaho Fish and Game Department and Payette Land Trust.”* (p. 35)

The use of interpretive language such as “thoughtful” “encourage” and “consider” though out the Plan’s goals and objectives does not mandate protections for the heron or ecological systems. Rather these phrases open the door for discretionary decisions by county commissioners with political motives.

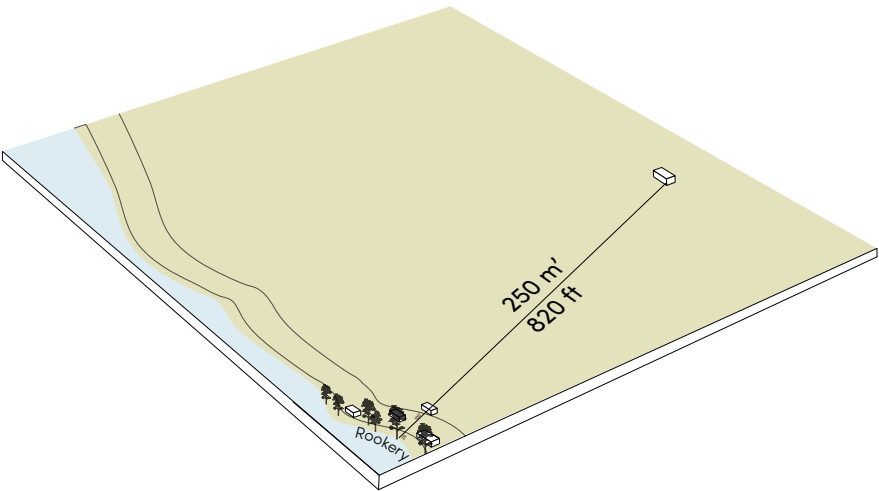
In accordance with In 9.4.3.2 setback distances include 50 ft for residential and 100ft all other buildings, plus a 25 ft enhancement buffer zone along banks (Figure 32). **Within the lens of landscape integrity, 25 ft does not provide much room for ecological processes to occur.** Additionally, 9.6.6 implements a riparian area overlay. The special overlay applies to areas 150 ft from any lake, pond, river, or year round flowing creek or stream. The overlay mainly regulates stormwater basins and dredging, rather than habitat protections, but does re-enforce the building setbacks.

The Valley County Comprehensive Plan advocates for the protection of species, but without significant setback or buffer distances there are few protections. **It seems there is an effort to balance human interests and ecosystem needs, but overall, the balance is only aspirational with no measurable zoning mandates or statutory rules.**

Figure 32 Valley County Setback Distances



Building Setback Distances



Distance of Impact from Short and Cooper’s Habitat Suitability Model



# 4.6 Policy Investigation

## Key Takeaways- implications for the future

Overall, neither Wallowa County nor Valley County has meaningfully protected habitats and it seems human interest has taken precedence. A review of the comprehensive plans showed that the amenity economy is alive in both counties.

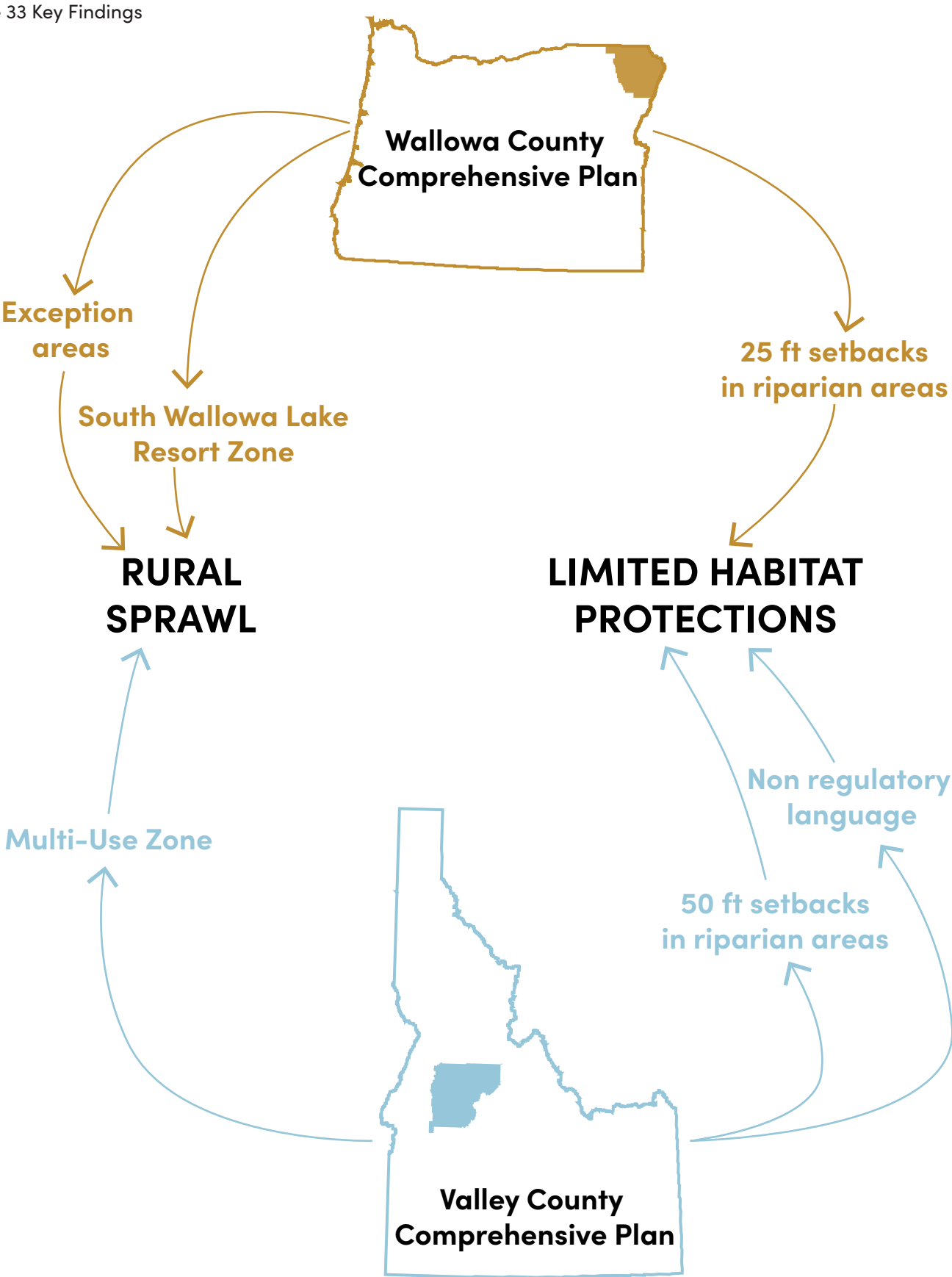
The most significant finding from the policy review is the lack of substantial setback distances along riparian corridors (Figure 33). Both counties' comprehensive plans include very small setbacks from riparian corridors, and these small setbacks negatively impact heron habitat. Wallowa County directly addresses heron rookeries in the Plan under natural resources yet only ascribes a small 25ft setback from nests. Valley County's required 50 ft setback and 25ft enhancement buffer is an improvement from Wallowa County's 25 ft setback **but is still not enough to promote high landscape integrity.** Additionally, since much of the language is non regulatory and does not include measurable outcomes there are very few protections for herons and the overall ecology in Valley County.

The human modification index showed that both counties have experienced rural sprawl patterns that lessen the overall integrity and connectivity of the landscape. Wallowa County's allowance of many exception areas and resort zones has done little to protect the landscape from rural sprawl. Wallowa

County's Resort and Recreation Residential Zones along the shores of Wallowa Lake have significantly eliminated or fragmented significant amounts of habitat and decreased landscape connectivity. Since Wallowa Lake is natural lake, this was likely a very significant habitat area for a variety of species before the extractive and amenity industries took hold. Now heron and other species have either been extirpated from the waterbody or must navigate human created disturbances. The presence of the Recreation Residential Zone and Resort Zone in Wallowa County provides clear evidence that rural restructuring is taking place. As the introduction timeline illustrated, the county relied heavily on the logging industry; however after the mills closed the recreation industry took hold. Wallowa County seems to be a perfect example of the "New West".

Looking to Idaho, Valley County's relaxed Multiple Use Zone within the rural designation and minimum lot size of 0.46-5acres is likely responsible for the hundreds of acres of vegetative land cover transitioned between 1990 and 2020. If lot sizes were larger, as in Wallowa County, perhaps less vegetation would have transitioned. As the second home market drives a housing boom, a variety of species habitats will continue to be fragmented by low density planned unit developments or subdivision of existing parcels.

Figure 33 Key Findings





# 5.0 Conclusion

## Final Conclusions

This master’s project demonstrates and validates that the intersection of landscape integrity and land use planning offers a lens to study the reshaping of rural landscapes in the American West. The findings indicate that rural restructuring and amenity migration are not abstract sociological trends but are active drivers of land use change, exurban development patterns, and alter habitat structures. Without intentional planning interventions, natural amenity dependent communities will begin to lose the natural characteristics and qualities that currently define them.

The result of a false hypothesis, and the finding that Oregon’s more stringent land use policies did not translate to measurable habitat protections does not diminish the project’s contribution. Rather the findings underscore the complexity of rural **landscapes and local politics and highlights the under studied relationship between politics and natural ecologies.** Additionally, the false hypothesis

opens the door for future studies. Future studies could continue comparing different counties or watersheds in Oregon, for instance left-leaning Willamette Valley counties could be compared to right-leaning eastern or southern counties, or new state comparisons could be considered. Another line of inquiry would be to study postindustrial rural communities experiencing population decline rather than growth. Understanding how landscape integrity responds in context of negative population change could reveal whether certain rural landscapes are entering early stages of 21st century rewilding and could offer an opportunity for targeted conservation interventions.

Taken together, this work positions landscape integrity models and studies as a valuable tool for understanding social phenomena like rural restructuring and offers a foundation for planners, ecological designers, and policymakers looking to balance community vitality and ecological resilience.



Residences in Valley County  
Image credit: Intermountain MLS



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