### **IV. Chapter One—The Context of the Dry Forest Zone**

The bry Forest Zone is important for understanding the challenges and opportunities that its communities face. This is a diverse and geographically large region. The fifteen counties of the zone have a total land area of 63,905 square miles or 40,899,201 acres, but much of this is sparsely populated. In 2008, population was 668,628 persons. In this chapter, we explore the biogeographical patterns and fire regimes that make this area a "dry forest zone," and discuss major trends in employment and well being.

#### BIOGEOGRAPHY

The Dry Forest Zone is a diverse area representing nearly all of the major dry forest and range ecotypes in the western U.S. The Cascade and Klamath mountain ranges bound the western edge of the zone, subjecting much of the region to continental rather than maritime climatic influences. Dry, cold winters and dry, hot summers characterize the continental climate. Annual precipitation in the zone ranges from less than 10 inches in the closed basins of southeastern Oregon to more than 120 inches along the crest of the Cascade and Klamath mountain ranges (Figure 1, page 9). Although precipitation values range greatly across the zone, 75 percent of the zone receives less than 30 inches of precipitation per year and nearly a third receives less than 15 inches, an amount that only boarders the ability to grow trees. Precipitation occurs during the winter and spring months. In much of the zone, only between 5 percent and 15 percent of all precipitation typically falls between July and September. The climate and precipitation patterns throughout the zone are representative of much of the interior northwestern U.S.<sup>1</sup>

A diversity of habitats, from open ponderosa pine forests and diverse mixed deciduous forests to alpine meadows and sage steppe deserts comprise the zone's landscapes. A combination of elevation, slope, aspect, precipitation, and disturbance regimes determine the specific composition of dominant vegetation types in any given site. Ecological regions are used to classify areas of common vegetation, climate, geology, and physiography.<sup>2</sup> Six major forested ecological regions comprise the zone: Blue Mountains, Eastern Cascade Mountains, Modoc Plateau, the Klamath, Southern Cascade, and Western Cascade Mountains (*Figure 2, page 10*). One major nonforested region occurs on the southeastern edge of the zone, covering most of Harney County, and portions of Deschutes, Crook, Klamath, Lake, and Modoc counties. Gently sloping closed basins dominated by lakes, sagebrush, and, to a lesser extent, juniper, characterize the Northwest Basin and Range.

#### **Blue Mountains and foothills**

The Blue Mountains and surrounding foothills are a complex of ancient geology forming plateaus, steeply cut river canyons, buttes, hills, low mountains, and, in the case of the Wallowas, steeply rising alpine peaks. The Blue Mountains cover the northeastern portion of the zone from Crook to Wallowa counties (seven of the fifteen counties of the zone). Vegetation in the Blue Mountains is widely varied from sagebrush and juniper in the lower-elevation foothills and canyons to mixed conifer, lodgepole pine, and alpine vegetation in the upper elevations. Meadows and forests form a mosaic of open and forested landscape across much of the Blue Mountains. The expansion of western juniper woodlands throughout the foothills is coming to dominate historic rangelands, alter hydrologic cycles, and reduce watershed health. Ponderosa pine is common in the middle elevations of the Blue Mountains and intense fuel buildups put fire resilient ponderosa pine ecosystems at risk of uncharacteristic high-severity fires. Mixed conifer, including grand fir, western larch, Douglasfir, and other tree species are also common in this region. The history of these mixed conifer forests reflects a complex of physiography, fires, forest pests, and historic selective logging over multiple entries, all of which challenge the healthy forest resources in the Blue Mountains region. Although forest ownership is largely federal, private nonindustrial forest ownership is also common in this region, making forest management responsive to the multiple values often associated with family forestry and ranching.

#### **Eastern Cascade Mountains**

Forming much of the western boundary of the zone, the Cascades are a glaciated high-mountain range that receives heavy precipitation to the west and leaves the eastern flanks and intermountain regions in a high gradient rain shadow. These volcanic

# **Average Annual Precipitation 1961–90**



## **Ecological Regions**



mountains are geologically recent additions to the landscape and their forests cover significant portions of Deschutes and Klamath counties. The ash-capped soils of the East Cascades are moderately productive, and forests below the alpine and subalpine zone quickly give way to ponderosa pine and dry Douglasfir. Although historically fire was a frequent low to moderate severity disturbance in these forests, fire suppression has allowed fuel loads to grow outside of their historic range of variability. Lodgepole pine occurs at higher elevations and is naturally subject to stand-replacing fires. Restoring fire-adapted ponderosa pine forests in this region has become an important goal for federal forest managers, while timber production remains a significant objective on several large tracts of industrial forestland, primarily in Klamath and Lake counties.

#### **Modoc Plateau**

The Modoc Plateau is a complex of fault-block mountains and volcanic ridges that straddle the Oregon-California border east of the Cascade Mountains in Klamath, Lake, and Modoc counties. Precipitation is less than 20 inches in much of the region. Ponderosa pine forests occur at higher elevations, while sage steppe and juniper woodlands occur at lower elevations. In Klamath and Lake counties, dense, second-growth ponderosa pine is found across the Fremont National Forest. Similar to the Blue Mountains foothills, western juniper has invaded historic rangelands. The federal government primarily manages forests in this region, although scattered tracts of industrial forestland occur throughout Klamath, Lake, and Modoc counties. Juniper woodlands occur on both publicly and privately owned land, and rangeland restoration for watershed health is an important priority for both federal land managers and local communities.

#### **Klamath Mountains**

The Klamath Mountains are a tangle of steeply dissected low- to moderate-elevation mountains that occur throughout Josephine, Jackson, Siskiyou, and Trinity counties. Due to intensive plate tectonics here, there is a diversity of soil types, which contributes to a vast range of vegetation. Although precipitation is generally higher than in the rest of the zone, most occurs during winter as snow. Forest types are diverse, reflecting patterns of elevation, aspect, soils, and disturbance. Forests range from Douglas fir and a mixed assortment of pine species to broadleaf woodland and chaparral shrublands. Like much of the zone, fire is the dominant disturbance regime and occurs with regularity. Fuel accumulations in these historically fire-adapted forests put forests at risk for high severity fires that alter forest structure, composition, and functions. Federal lands dominate this forested region and wilderness reserves are common. In Jackson and Josephine counties, nonindustrial private lands are checker-boarded with fragmented federal lands, while in Siskiyou County large tracts of private forest land flank federal land to the west; federally managed forest land dominates Trinity County more than any other county in the zone.

#### Western Cascade Mountains

The Western Cascade Mountains ecological region underlies much of Oregon and Washington's forest production and history, but constitutes only a small corner of the zone in Jackson County. Douglas-fir forests dominate this region of federal, industrial, and family forest land, most of which lies to the north and west of the zone flanking the Willamette Valley and Puget Trough. Precipitation in the Western Cascades is markedly higher than east of the Cascades, contributing to the region's ecological productivity. The southern tip of this ecological region extends into Jackson County, where federal wilderness areas dominate this ecoregion's landscape. Although fire is still an important ecological process in this ecoregion, disturbances in this portion of the zone are more likely to occur with mixed to high severity owing to forest types similar to the mesic forests of western Oregon.

#### Southern Cascade Mountains

Straddling the Cascade Mountains south of the California border (Siskiyou County), low to high mountains consisting of mixed forest types commingling multiple species of pine, fir, spruce, and hemlock form this ecological region. Like much of the zone, precipitation falls mostly during the winter, leaving hot and dry summers prone to fire. Pockets of forests dominated by stands of ponderosa pine, lodgepole pine, and western juniper occur in this region, but are less common than the mixed forest types that dominate the region. Lowlands typically transition from forest to sage steppe, grassland, and other open land covers. Forestland in this region is evenly mixed between private ownership and public management.

### A FIRE-ADAPTED DRY FOREST LANDSCAPE

Although forest types across the zone are diverse (Figure 3, page 13), the dominant ecological disturbance regime across the zone is not. Wildfire is a dynamic force across the zone. It shapes ecological structure, resets ecological functions, and contributes to the ecological composition of forest patches and landscape pattern. In forests characteristic of low-severity fire conditions, wildfire would typically creep across the forest floor consuming scattered grasses, occasional shrubs or other understory vegetation, but largely leave thick barked trees like ponderosa pine or western larch unharmed or with nonlethal scars along the base where needles and dead grasses had accumulated. Tree mortality under these conditions is relatively rare. This type of disturbance might occur half a dozen times or more over the course of a century, maintaining the opengrown parklike structure commonly associated with historical ponderosa pine forests. Mixed-severity fires occur in forests where fuels have accumulated

in various patterns across the landscape leading to fires that jump into the forest crown in some areas while in other areas only ground fires occur. The result of mixed-severity fires is one that creates a forested mosaic of age, structure, and tree composition across the landscape. High-severity fires create stand replacing events that are likely to lead to single age structure in recovering forest stands. Historically, high-severity fire were more common in wet forest types, higher elevation and sub-alpine forests, and in lodgepole pine stands adapted to the high-severity fire ecology. More recently, following nearly a century of fire suppression, high-severity fires have become more common across the landscape, occurring in a greater diversity of forest types as fuel loadings have increased and forest conditions have changed.<sup>3</sup>

Historically, wildfire was a regular occurrence across much of the zone (*Figure 4, page 14*). Fire regime is a concept that integrates fire frequency with its severity on any given landscape. The forests of the Klamath Mountains and Southern Cascades regions likely experienced mixed-severity fires on a regular cycle that served to maintain and diversify



## **Forest Type** Dry Forest Investment Zone



## **Fire Frequency** Dry Forest Investment Zone



forest structure and composition. Fire regimes in the East Cascades, Blue Mountains, and Modoc Plateau were historically more diverse, ranging from regular, low-severity fires to more mixed-frequency or mixed-severity fires largely dependent on forest types, fuel conditions, and other biophysical factors. In contrast, many of the nonforested portions of the Northwest Basin and Range and Blue Mountains foothills experienced mixed- to high-severity fires that occurred with moderate frequency creating a mosaic of rangeland conditions from grass dominated sites (high frequency fires) to shrub dominated sites (low to moderate frequency fires).

### CURRENT FIRE REGIMES AND CLIMATE CHANGE

Fire regime conditions today are quite different from what their historical frequency would suggest (Figure 5, page 16). Fire regime condition class (FRCC) measures the departure of current vegetation from historical conditions. The forests of the Southern Cascades, the Modoc Plateau, and the Blue Mountains ecological regions have changed dramatically from their historical regime. This departure is consistent with past harvests as well as impacts of fire suppression, which has allowed forest fuels to accumulate and resulted in greater fire hazards to the values of forest resources when wildfire does occur. Although high-severity fires were certainly an important historical dynamic in many forests across the zone, this type of stand- replacing fire was unlikely to be as extensive or frequent as it is under current management, fuels, and climatic conditions. Departures in fire regime to uncharacteristic states complicate forest management and the maintenance of forest resources. Global climate change, which may increase the length of the annual frostfree period across the zone, increasing fuel growth and reducing summertime water availability, further complicates these challenges to forest management.<sup>4</sup> Temperature measurements across the zone for the second half of the twentieth century indicate that climate has been warming in the zone for sixty years already (Figure 6, page 17).

#### HUMAN GEOGRAPHY OF THE ZONE

The zone is a rural region with low population densities and relative isolation from large economic markets. Although population densities vary, most of the zone contains fewer than seven persons per square mile (Figure 7, page 18). Less than one person per square mile populates eastern Oregon. Counties such as Harney and Wheeler are home to a small number of incorporated communities, and residents outside these communities are often far from their nearest neighbors. Residents outside of incorporated areas of the zone require long travel periods to services, goods, and medical facilities. The zone also holds relatively limited political influence. Western Oregon has four congressional representatives, whereas residents of all twelve Oregon zone counties have only one congressional representative. Northern California's zone counties have two representatives. We further discuss the political capacity of the zone in Chapter Five.

Low population density also contributes to a lifestyle that offers privacy and the many amenities that result from rural livelihoods. Families who have resided in the zone for generations as well as newcomers share a desire for this lifestyle. In-migration has taken place in central Oregon for the past decade. Deschutes and Crook counties have experienced rapid population growth, boom and bust in real estate markets, and social and cultural shifts in a number of communities. In migrants are attracted to the area by ample rural residential development, recreation opportunities, and a rural western resource-based culture. From 2000 to 2008, Deschutes County experienced nearly 40 percent population growth leading to a population density greater than fifty people per square mile. Only southern Oregon's density surpasses this at sixty-one people per square mile. While central Oregon has grown rapidly and recently, southern Oregon's population and density has been historically larger as a result of its smaller land area and several medium-sized communities including Medford, Grants Pass, Ashland, and others.

### **Fire Regime Condition Class**



## **Summer Temperature Change 1951–2006** Dry Forest Investment Zone



## **Population and Political Representation**



The majority of the communities in this region are small in size, and direct access to urban markets and market linkages are limited (Figure 8, page 20). The high costs of fuel and limited extent of viable railways challenge the ability of many businesses in the zone to harvest, process, and sell wood products at a profit. Transportation options in most of the zone are limited to state highways and railroad lines. A Burlington Northern and Santa Fe mainline connects the Oregon towns of Klamath Falls, Bend, and Redmond with California and oceanic shipping in the Columbia Gorge, and a Union Pacific line parallels Interstate 84 in eastern Oregon. Spurs also serve the Oregon towns of Gilchrist and Prineville, and Lake County owns a small line from Lakeview, Oregon, to Alturas, California. Elsewhere in the zone, Interstate 5 bifurcates Jackson County, providing direct connections to the major metropolitan areas of the San Francisco Bay Area, Portland, and Seattle. Proximity to an interstate highway is limited in most of the zone. Interstate 5 is two hours west of Deschutes County and also passes through Siskiyou County in northern California. Interstate 84 travels through Union and Baker counties connecting them

to Boise, Idaho, and Portland. Although there is potential to further develop the existing advantages of well-connected communities like Medford, Oregon, to take advantage of existing market connections, significant opportunities may exists to develop innovative ways to address the isolation challenges in communities like Enterprise, Oregon, or Hayfork, California.

### **BUSINESS PATTERNS IN THE ZONE**

County business patterns across the zone show that construction, retail trade, health care and social assistance, and accommodation and food service comprise the largest numbers of businesses. Businesses providing professional, scientific, or technical services are more common in southern Oregon and northern California, whereas Deschutes County is the only area in the zone with a large number of real estate-related businesses. The largest employers in the zone tend to be government, schools, and hospitals. Forest products companies such as Boise-Cascade, LLC, in Union County and JELD-WEN, LLC in Klamath County are also significant employers. Agriculture and ranching have been important to



## **Rural and Urban Linkages**

### Dry Forest Investment Zone



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many zone counties, but do not contribute extensively to employment. The housing market downturn has been particularly difficult for construction businesses and real estate; the recession has limited the amount of tourism and profitability of accommodation businesses; and even government, schools, and social services have experienced reduced budgets and cutbacks.

### FOREST-BASED EMPLOYMENT

The zone can be a challenging business and employment climate, particularly for the forest products economy. Shifts in public land management and economic conditions have occurred since the 1990s, but the recent recession has taken a further toll on wood products processing, forestry and logging, and contracting businesses. Although Union, Klamath, and Jackson counties still have several traditional industrial sawmills, employment in the forest products sector has shrunk significantly. We present a scan of the current primary processing capacity of the zone in Chapter Three. A number of community-scaled facilities either have emerged and remain active as small-diameter producers able to utilize restoration byproducts for post and poles, chipping, firewood, or other uses, but these businesses typically do not offer large numbers of jobs. As traditional sawmilling capacity has declined, so have the numbers of forestry and logging businesses in the zone. The number of forestry support businesses has typically been increasing, in part in response to increasing federal wildfire suppression contracting (Table 1,).<sup>5</sup> The North American Industry Classification System defines the forestry and logging industry as comprised of businesses that grow and harvest timber on long production cycles (ten years or more).6 Forestry support businesses are those that conduct activities supporting timber production, wood technology development, forestry economics and marketing, forest firefighting, pest control, timber estimates, and reforestation.<sup>7</sup>

#### TABLE 1

	Forest and Logging Businesses (NAICS 113)		Forestry Support Businesses (NAICS 11531)	
Subregions and counties	Number of Businesses, 2007	Change by number and percentage, 2000–7	Number of Businesses, 2007	Change by percentage, 2007
Northeastern Oregon				
Wallowa	8	3 (-14%)	21	16 (76%)
Union	22	4 (-15%)	26	24 (92%)
Baker	8	7 (47%)	3	2 (67%)
Eastern Oregon				
Grant	18	13 (42%)	5	2 (40%)
Wheeler	2	0 (0%)	0	0 (0%)
Harney	4	3 (-43%)	4	3 (75%)
Central Oregon				
Crook	15	5 (-25%)	1	1 (100%)
Deschutes	8	17 (-68%)	13	1 (8%)
South Central Oregon				
Lake	5	0 (0%)	2	2 (200%)
Klamath	20	11 (-35%)	10	3 (30%)
Southern Oregon				
Josephine	17	1 (-6%)	12	3 (50%)
Jackson	40	18 (-31%)	33	3 (12%)
Northern California				
Siskiyou	32	8 (-20%)	6	3 (-33%)
Modoc	2	3 (-60%)	0	0 (0%)
Trinity	7	13 (-65%)	0	0 (0%)

### Changes in Forestry Sector Businesses in the Dry Forest Zone by County, 2000-7

Changes in the number of forestry-based businesses have implications for the economy and identity of the zone. Since 2000, the number of traditional forestry and logging businesses declined in all but two counties of the zone. Wheeler County had two businesses in both 2000 and 2007 and Josephine County gained one business by 2007. Deschutes County suffered a 68 percent loss in forestry and logging businesses although central Oregon's population, urban area, and housing markets were growing. Jackson, Grant, Klamath, and Trinity counties all lost more than ten forestry and logging businesses, cutting the business pool by a third to a half in each county from 2000 to 2007. In contrast to the traditional forestry sector, forestry support businesses-those that do laborintensive hazardous fuels work, provide technical services and wildland firefighting, and others-grew in number across the zone, in some cases doubling. Northeastern Oregon added over forty businesses in this sector during this period. Northern California is the sole exception, experiencing near-equal losses of 37 percent and 33 percent in traditional forestry and forestry support businesses, respectively. Forestry support businesses increased by the least percentage in central Oregon, while northeastern and southern Oregon experienced the largest magnitude of gains.

These transitions in forest-based businesses in the zone suggest that significant changes in the nature of forestry and logging work have occurred. The number of businesses managing growth and harvest of timber on longer production scales has declined in favor of businesses that address hazardous fuels, forest health issues, or other technically related forestry work. This transition mirrors the shifts in the management objectives on public forestlands, the challenging economic climate for the forestry sector, and the changing ecological conditions of the zone's forests. As stand density, wildfire risk, and fuel loads have become a concern to forest managers and communities, firefighting, pest control, and thinning became important objectives alongside traditional timber production and multipleuse sustained yield practices. These data do not reveal whether workers adapted by moving from traditional logging businesses into forestry support businesses or by leaving forest-related work entirely.8

Employment in the milling and logging sector traditionally provided workers with relatively steady incomes and company health benefits, although mills would close in response to short-term market conditions, and logging operations were seasonal. Contracting businesses now conduct a majority of forestry support and harvesting activities. These businesses offer work that is largely seasonal, unstable, and often without health or other employment benefits. A 2007 study that compared logging to forestry support work in Oregon found that forestry support work provided smaller wages and sometimes only a few weeks of work per year.9 However, locally based contractors can return economic benefits to their communities. Local contracting capacity across the zone varies. Josephine, Jackson, and Lake counties have the largest contracting funding, but Lake has a much smaller number of contractors. Siskiyou and County has smaller total amounts of contract funding, but is home to sixteen contractors. Trends in the contracting workforce are discussed further in Chapter One.

### **EMPLOYMENT AND POVERTY**

In addition to changes in forest-based businesses, unemployment rates in the zone are also indicative of the challenges that many communities face. Unemployment rates in February 2009 in Harney, Crook, and Trinity counties exceeded 20 percent, and were above 18 percent in Grant and Siskiyou counties (Figure 9, page 23). These rates follow a regional pattern of high unemployment in the areas of eastern Oregon and northern California. Furthermore, underemployment is also a problem. Many employed workers across the zone are underutilized with only part-time, seasonal, or transitional employment. Statewide 2009 underemployment rates for Oregon and California are 20.1 percent and 21.1 percent, respectively.<sup>10</sup> The high levels of employment instability, the declining natural resource industries, and prevalence of seasonal and part-time work make it likely that underemployment in the zone is even more common than the statewide statistics suggest. Unemployment and underemployment often lead workers to relocate (especially younger workers) and cause a loss of forestry and business skills in rural areas. Other workers have extensive family and social ties that they are not likely to leave. Although the counties of the zone have lost skills and knowledge in recent years, a number of entrepreneurial business leaders have remained and adapted to the challenges in order to survive.

## **Unemployment Rate (January–September 2009)** Dry Forest Investment Zone



0% 6.9% 9.2% 13.8% 16.1%

A final socioeconomic indicator of well-being in the counties of the zone is the poverty rate (Figure 10, page 25). Trinity County has the highest poverty rate (19.9 percent), the highest unemployment rate (21.2 percent) and the greatest percentage of public land (89 percent) of any county in the zone. Lake County has the third-highest poverty rate and percentage of public land (80 percent). Although Deschutes County contains 82 percent public land and has lost 68 percent of its traditional forestry businesses since 2000, it has experienced substantial growth in recreation and tourism, with subsequent benefits to local service businesses that may help ameliorate the effects of unemployment and withstand growing poverty rates. Public lands such as the Deschutes National Forest are playing a new role in the economic development of their adjacent communities as recreation sites, but this type of development has not occurred to the same extent or at the same rate elsewhere in the zone. National forest and BLM lands in Trinity and Lake counties also no longer produce significant timber revenues, and but no new source has emerged to compensate for this decreased value stream, to support other community businesses, and to staunch the flow of job loss. A recreation-based economic strategy may work well in some places with the right combination of politics, economics, amenities, and access but it is not a viable or desired economic development strategy for most counties in the zone. Instead, the future of many communities may depend on economic development pathways that build from the connection between healthy forest resources and community well-being to develop integrated forest stewardship on working landscapes.

### **RESILIENCE IN THE ZONE'S COMMUNITIES**

Although much of the zone faces challenging socioeconomic and ecological conditions, communities and businesses in many parts of the zone have persevered and shown their resilience.<sup>11</sup> To thrive, communities

will have to develop solutions to current challenges and prepare themselves to adapt to future uncertainties. A 2002 USDA Forest Service report that assessed connectivity to service centers, socioeconomic wellbeing, and proximity to public lands among Oregon communities found fifty-four "communities of concern" that did not appear to be equipped for adaptation. Of these fifty-four, thirty-four communities were from the zone counties of Wallowa, Wheeler, Grant, Crook, Klamath, Lake, and Josephine.<sup>12</sup> In contrast, the Interior Columbia Basin Ecosystem Management Project (ICBEMP) revealed that resilience varies greatly across the west and was not determined by the role of the tradition timber economy. The zone communities of John Day, Prineville, and Lakeview were among the most highly dependent on wood products; however, they also ranked high, medium-high, and high, respectively, on the ICBEMP's community resiliency index.<sup>13</sup> This suggests that while communities may not have proximity to market corridors, other factors such as local leadership, entrepreneurship, or collaborative organization can contribute to their ability to face challenges. Although communities in the zone share similar challenges, communities range in their socio-economic vitality and capacity to adapt to change.

### **CONCLUSIONS**

The zone's forests are central to the economies and identities of its people. They provide resources and a way of life, and shape socioeconomic growth and development. Ecological conditions vary across the zone, but fire severity and forest health are uniformly important. New sectors such as service and recreation have grown, but forestry support and stewardship contracting work still contribute to the economies of public lands communities. The zone faces challenges, however, in responding to high poverty and unemployment rates, and in building markets across an isolated and dispersed geography.

### **Poverty Rate 2008**

### Dry Forest Investment Zone



0% 9.9% 13.2% 16.5% 19.8%