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Northwest Forest Plan—The First 25 Years (1994–2018): Socioeconomic Monitoring Results

Technical Coordinator

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Cover photo: View of forested landscape and a log truck in Santiam Canyon, Oregon, 2018 Photo by Gabriel Kohler.

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Abstract

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The Northwest Forest Plan (NWFP) record of decision directs federal agencies to monitor the social and economic impacts of the NWFP in two ways: determine whether the supply of timber and nontimber resources is predictable and sustainable; and evaluate changes in local communities associated with federal forest management. The methodology for this 25-year NWFP report combines established practices for measuring timber and other forest resource supply trends with the application of novel social science research approaches.

County-scale quantitative analysis of social and economic change since 1980 shows no clear correlation between federal forest management and social and economic change during the 1994–2017 "NWFP era." In the 1980s counties where both federal forest lands and forest industry employment were highly important experienced negative socioeconomic change; the same counties changed little during the NWFP era itself. Counties minimally reliant on federal forest lands, but highly reliant on forest industry just before 1990, experienced negative socioeconomic change primarily during the 1990s and 2000s. Counties with high social vulnerability in 2017 generally had unusually high dependence on household income from private sector forest industry employment in 1978.

Qualitative case studies revealed that 9 of 10 rural communities experienced negative social and economic change during the NWFP era; the degree of change was related to geographic isolation. Two communities lost essentially all forest management infrastructure, but seven retained some industry employers, an agency duty station, or both. Community interviewees cited declines in services and civic engagement as problems much more frequently than lack of timber industry jobs. Multiple industry employers reported difficulty locating and retaining employees. Interviewees lamented the loss of community social capital traditionally contributed by federal agency staff as an example of how their community had been harmed by implementation of the NWFP, rather than reduced timber harvest volumes or forest industry jobs. These findings suggest that many rural communities in the NWFP area have experienced socioeconomic decline since 1994 and that changes to forest management and industry are important factors in the decline. However, the types of social and economic changes are contingent on local history and geography, and thus vary widely across the region.

Keywords: Northwest Forest Plan, socioeconomic monitoring, timber and nontimber resources, rural communities and economies, collaboration, social values and forest management.

Preface

The Northwest Forest Plan (NWFP) 10-year report aimed to demonstrate whether the plan met its socioeconomic goals by focusing on goods and services produced from federal land management. The analytical framework used for the 10-year report uncovers linkages between the socioeconomic data and federal land management under the plan.

The primary purpose of the 15-year report was to update data and trends displayed in the 10-year report. The 15-year report drew heavily on the 10-year report. The 15-year report is similar to the 10-year report in displaying data related to socioeconomic well-being in the NWFP area. While the 10-year report provided data from the years 1994 to 2003, the 15-year report generally focused on the next 5-year period, from 2004 to 2008.

The analytical frameworks for the 10- and 15-year reports also differ. Unlike the 10-year report, the analytical framework used for the 15-year report, which was also used for the 20-year report, was not designed to uncover linkages between socioeconomic data and federal land management actions under the plan. The 15-year and the 20-year reports track demographic data as well as data on agency expenditures and several forest-related resources to display potential trends related to socioeconomic well-being. The differences between the 10- and the next two five-year reports are primarily a result of new priorities and methodologies for NWFP monitoring agreed upon by the Regional Interagency Executive Team in March 2006.

This 25-year monitoring report differs from the 10- and 20-year reports in that it restores community case studies to the assessment of social and economic change trends, and it creates a rigorous analytical framework for tracking demographic and employment trends for the 72 counties of the NWFP area.

For chapters 4 and 5 of this report, researchers sampled 10 communities located throughout the NWFP area in 2018—four in Washington, four in Oregon, and two in California. Narrative profiles of each community in chapter 4 are followed by community member interviewee responses to questions about community change and the NWFP. Chapter 5 discusses themes common to communities that were studied, and groups the communities by socioeconomic-change trajectory.

Executive Summary

Mark D. O. Adams and Elisabeth Grinspoon[1]

The 1994 record of decision (ROD) for the Northwest Forest Plan (NWFP) created three types of monitoring: implementation, validation, and effectiveness. Social and economic monitoring is part of effectiveness monitoring. The ROD defines effectiveness monitoring as "evaluating if the application of the management plan achieved the desired goals." The social and economic monitoring reports produced roughly every 5 years since 2006 address two aspects of effectiveness monitoring: (1) use levels of natural resources and (2) rural economies and communities. For natural resources, the reports measure the output of timber harvest, special forest products, grazing, mineral extraction, and recreation. The ROD directs monitoring of rural economies and communities to address the following question: **"Are local communities and economies experiencing positive or negative changes that may be associated with federal forest management?"**

This 25-year report differs from its predecessors in two important respects. First, it restores community case studies to the assessment of social and economic change trends, as directed in the ROD. Communities have not been assessed since the first report (the 10-year report) in 2003–2005. Nearly all community case-study field work for this 25-year report was performed through a partnership with the Ecosystem Workforce Program at the University of Oregon. In this report, program staff are the lead authors of chapter 4 and the sole authors of chapter 5, which collectively present and interpret the case study findings.

Second, this 25-year report creates a rigorous analytical framework for tracking demographic and employment trends for the 72 counties of the NWFP area. This new element of the monitoring protocol responds to two factors. Agency executives sought restoration of a limited version of the community-scale quantitative analysis of well-being that was a foundational element of the 10-year report. However, the U.S. Census Bureau made major changes to the process of collecting detailed population and housing estimates in 2003. These changes rendered it impossible to replicate the approach taken in the 10-year report, and there are no suitable substitute data. The executives also requested a framework suitable to linking the description of social and economic trends in counties to the community case

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studies, as it was not possible to conduct field work in a sufficient number of communities to make robust inferences about change in all communities in the region. The resulting framework is a **typology of counties**. It links descriptions of social and economic trends in counties to the community case studies and facilitates identification of multiple trajectories of social and economic change at the **county scale** within the region. The typology is introduced, and trends in its constituent variables analyzed, in chapter 2.

The features of the typology make it possible to directly address the hypothesis raised by the ROD direction—that social and economic change could be associated with federal forest management changes. The typology is deployed in an analysis of changing social vulnerability for counties in the NWFP monitoring region. The key question for quantitative monitoring is whether a county's social vulnerability has improved, stayed about the same, or deteriorated, in comparison to overall change in social vulnerability characteristics for the entire NWFP monitoring region. If relative social vulnerability deteriorated—worsened, i.e., negative social and economic change—between 1990 and 2017 only in counties where federal forest management was historically a critical economic activity, this relationship would imply that implementation of the NWFP correlates with negative social and economic change. The typology framework is essential to distinguishing whether variability in change trends correlates to the variability in the baseline relationship between federal forest lands, forest industry employment, and county characteristics. To avoid the logical fallacy that social and economic conditions in 1990 represent a constant state, social vulnerability is examined in multiple periods, using data sources that correspond to the historical eras in table E.1. This quasi-hypothesis-testing approach to the ROD direction is a first in the NWFP social and economic monitoring reports; it reflects best available social science practices. Chapter 3 presents analysis of demographic and economic change since 1980 and the social vulnerability change assessment.

Table E.1—Historical eras for interpreting long-term social and economic change trends

Era	Approximate duration
	Years
Multiple use, sustained yield[a]	1960–1988
Litigation	1989–1993
Early Northwest Forest Plan	1994–2000
Later Northwest Forest Plan	2001–2017

[a] Also referred to as "peak harvest" because that event occurred near the end of this era.

Chapters 4 and 5 restore the community case study to the monitoring protocol. Researchers visited a representative sample of 10 communities located throughout the NWFP area—four in Washington, four in Oregon, and two in California—in the summer and fall of 2018. They interviewed local civic leaders and agency staff about changes their communities had experienced, both in recent years and the years immediately before the NWFP. Narrative profiles of each community in chapter 4 are followed by a cross-case comparative section that summarizes responses to questions about community change and the NWFP stratified by type of interviewee (e.g., agency personnel, local government official). Chapter 5 discusses themes common to the studied communities and groups the communities by socioeconomic-change trajectory.

Typology of Counties

The 72 counties in three states that have always been part of the NWFP monitoring protocol are organized into a typology by performing a statistical cluster analysis of six variables that describe aspects of federal forest lands management and forest products employment that can be comparably quantified at the county scale. Four variables describe aspects of the significance of federal forest lands management to the counties' levels of resiliency, or social vulnerability, and two additional variables measure the significance of forest products industry employment to that vulnerability. The variables describe relationships that existed **at the start of the 1989–1993 "litigation era"** in the Pacific Northwest timber region. This era reflects a baseline at the end of the 1960–1988 "peak-harvest era" and prior to implementation of the NWFP beginning in 1994 (see table E.1); hence, it is possible to measure the entire span of social and economic change in the NWFP era at once. Data for the four federal forest lands variables are from a variety of state and federal agency sources. Data for the employment variables are from the 1990 Census of Population and Housing.

The typology yields six groups of counties, organized according to the **relative** importance of the four federal forest lands management indicators ca. 1988 and two employment indicators in 1990. "Relative" means that each county is compared to the aggregate region (all 72 counties combined). The disparity between how important these indicators were in each county and how important they were in the region as a whole defines the groups as follows: "none," "low," "moderate," "high," "very high," and "extremely high." The groups are depicted in figure E.1. The key characteristics of the groups are as follows:

- **None** (18 counties): Both federal forest lands management and forest products employment were either totally absent or of negligible importance. These 18 counties were not further monitored for this 25-year report.

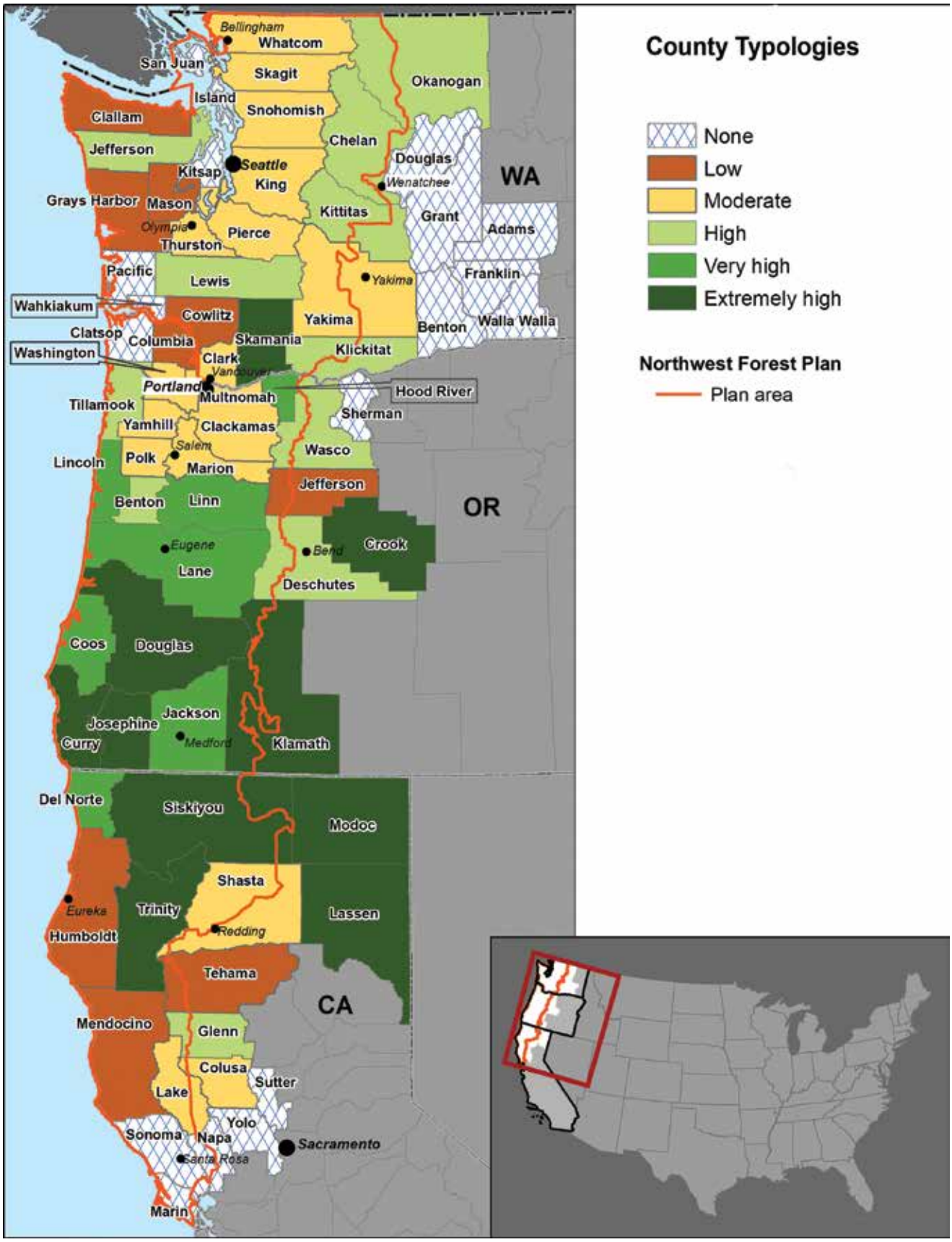

Figure E.1—Counties grouped by six typologies based on relative importance of federal forest lands management and forest industry employment to their social and economic characteristics, circa 1990.

Monitoring in this report was limited to the remaining 54 counties, categorized into five significance-level groups:

- **Low** (9 counties): Federal forest lands management factors were relatively unimportant, though not negligible; forest products industry employment was extremely important. These counties are predominantly rural in character; the largest population center is Eureka-Arcata, California; population was about 50,000 in 2017.
- **Moderate** (17 counties): Both federal forest lands and forest products industry were of low to moderate importance. Most of these counties are in the Portland-Salem, Oregon, and Seattle-Tacoma, Washington, metropolitan regions.
- **High** (11 counties): A diverse group of counties that are mostly on the edges of the NWFP area boundary. Both federal forests and industry employment were of variable importance, but never less than moderate and sometimes very high. It includes the small (in 1990) cities of Bend and Corvallis, Oregon, and Wenatchee, Washington, but is otherwise mostly rural.
- **Very high** (7 counties): Consistently very high importance for both federal forest lands and forest products industry employment. Includes the medium-size urban areas (in 1990) of Eugene-Springfield and Medford-Ashland, Oregon, but is otherwise fairly rural.
- **Extremely high** (10 counties): Consistently extremely high importance for both federal forest lands and industry employment. All 10 counties are non-metropolitan; most are rural. The largest population center is Roseburg, Oregon, which had a population of about 21,000 in 2017.

This typology framework facilitates insight into how the effects of changing federal forest management varied in strength across the counties of the NWFP area by comparing trends to the baseline relationship of counties to federal forests and forest industry employment. We analyzed long-term change trends for three of the six typology indicators for which annual data series were available: federal employees and payments to counties, aspects of federal forest land management change, and private sector employment in wood products manufacturing. Change trends for federal and nonfederal timber harvest since 1978 were also assessed within the typology framework. Key findings from these indicator change-trend assessments follow.

Timber Harvest

- In 1984–1988, federal timber harvest volume in the region briefly reached high levels that were last seen in 1973, but in the context of the 1978 to 2017 trend, mid-1980s harvest volume levels are anomalously high.

- Federal timber harvests collapsed after 1988, declining 75 percent between 1988 and 1994, and an additional 75 percent between 1994 and 2000.
- In 2001, total federal harvest volume reached its low for the 1978–2017 period: 5 percent of total federal harvest in 1988.
- Nonfederal harvest volume declined by about 20 percent between 1987 and 1994, remained relatively stable through 2007, then fell significantly.
- Federal timber harvest volume increased after 2010, though it remained a minimal proportion of total timber harvest volume in the region.
- Harvest from nonfederal lands has accounted for the vast majority of total harvest volume in the region since 1990 although it declined during the past decade.

Potentially commercially productive forest land is not uniformly distributed throughout the NWFP area; it is to be expected that the cutbacks in harvest volume also are not uniform among the five county groups. Measured by rate of change, the steep decline in federal timber harvest volume during the litigation era was broadly similar among all county groups. However, in absolute terms, federal timber harvest reductions were primarily concentrated in roughly 15 of the 54 counties.

- In 1988, 2.6 billion board feet (BBF) was harvested from federal lands in counties in the "extremely high" group; in 1994, that figure was 0.4 BBF.
- The corresponding amounts for counties in the "very high" group were 2.1 BBF (1988) and 0.2 BBF (1994).

For nonfederal harvest, there is more variation across the county groups. Harvest volume in the "low"-group counties fell fastest from its 1987 peak, and it continued to fall faster than that of the other groups throughout the NWFP era.

The 2009 harvest from state and private lands in counties in the "low" group was 29 percent of the 1987 volume, by far the lowest proportion of peak-harvest era volume for any county group.

County Payments and Total Revenue

Proceeds from the sale of timber on national forest lands have long been a key driver of local economic conditions in the NWFP area. The payments data timeline covers the 32 years from 1986 through 2017, but for most of this timeline, revenue-sharing payments to counties were partially or entirely unrelated to the actual timber sale revenues. Congress passed the Secure Rural Schools and Community Self-Determination Act of 2000 (SRS), which tied the payment amounts to a percentage of payments made between 1986 and 1989, not current harvest receipts. Given the major importance historically of these timber payments for many counties in the NWFP area, especially in southern Oregon, the payments trend is still highly relevant to ongoing NWFP monitoring.

- Timber revenue-sharing payments to counties peaked in 1989, at $646 million (2017 dollars) for the 54 counties of the NWFP monitoring region analyzed in this report.
- Payments to counties fell by 60 percent over the course of the litigation and early NWFP eras (1989–1993 and 1994–2000, respectively), even after factoring in supplemental payments to 48 of the 72 NWFP counties authorized by Congress from 1992 to 2000 (sometimes referred to as "owl payments"). The 54 analyzed counties collectively received $249 million (2017 dollars) in 2000.
- In 2001, the SRS reset payments to 85 percent of averaged payments from the late 1980s, which dramatically boosted revenue to counties compared to the 1990s.
- Ad-hoc congressional reauthorizations of the original SRS resulted in payments to counties plummeting after 2007. The total payment received by the 54 counties in 2017 was $107 million (2017 dollars).

Payments to counties were made by the states using an unchanging allocation formula, and consequently, the proportional declines in revenue are nearly uniform across all county groups:

- "Extremely high" group: 1988 payment = $253 million; 1994 = $158 million; 2000 = $97 million; 2017 = $48 million (81 percent less than 1988) (all in constant 2017 dollars)
- "Moderate" group: 1988 = $85 million; 1994 = $51 million; 2000 = $34 million; 2017 = $12 million (85 percent less than 1988) (all 2017 dollars)
- "Low" group: 1988 = $25 million; 1994 = $19 million; 2000 = $9 million; 2017 = $5 million (80 percent less than 1988)

The **effect** of the declines, however, differs starkly among the county groups according to the prevailing trend for total revenue collection from all sources by counties in each group:

- "Extremely high" group: 1987 total revenue = $471 million; 1997 = $611 million; 2017 = $538 million (14 percent more than in 1987, but 12 percent less than in 1997)
- "Moderate" group: 1987 = $3.2 billion; 1997 = $6.4 billion; 2017 = $9.4 billion (294 percent more than in 1987)
- "Low" group: 1987 = $648 million; 1997 = $837 million; 2017 = $1.2 billion (85 percent more than in 1987)

For the 10 counties where federal forest lands management had "extremely high" importance in about 1990, the shrinking payments have had a major impact on county finances. For the 17 counties in the "moderate" group, that impact has been negligible.

Federal agency employees—

Community field work in the 10-year monitoring report documented the extent to which local permanent full-time and seasonal U.S. Department of Agriculture, Forest Service and U.S. Department of the Interior, Bureau of Land Management (BLM) employees were vital contributors to community social fabric across the NWFP area, and the negative effects to communities of staff cutbacks and management unit closures or consolidations in the first years of the NWFP. Following this lead, this report analyzes county-scale trends in Forest Service and BLM staffing from 1973 to 2017, based on data from the U.S. Office of Personnel Management.

- For the 54 counties analyzed, the total number of Forest Service and BLM permanent positions (year-round and seasonal) peaked in 1982 at 14,200.
- A second peak occurred in 1992, at 13,200.
- The number of employees between the late 1970s and 1994 appears to have moved in parallel with the size of federal timber harvests, lagging by about 2 to 4 years—hence, employment peaked in 1992 after federal harvest volume peaked in 1988.
- After 1992, employment declined for 21 out of 25 years.
- The permanent agency staff in the 54 counties in 2017 was 7,790, the least since 1973 and 41 percent less than in 1992.

There was relatively little variation in the rate at which the Forest Service and BLM workforce contracted across the county groups. However, because of the underlying size of the total workforce across these county groups, similar rates of Forest Service/BLM employment contraction had very different degrees of social and economic effect.

- Total Forest Service and BLM agency staff with duty stations in the extremely "high" group: 1982 = 4,400; 1992 = 4,300; 2001 = 2,900; 2017 = 2,560 (40 percent less than in 1992)
- Total agency staff in the "moderate" group: 1982 = 3,900; 1992 = 3,600; 2001 = 2,500; 2017 = 2,150 (40 percent less than in 1992)
- Total agency staff in the "low" group: 1982 = 850; 1992 = 720; 2001 = 460; 2017 = 340 (50 percent less than in 1992)

Between 1992 and 2017, these three groups of counties lost permanent Forest Service and BLM staff at roughly comparable rates—40 to 50 percent. But in the "low" group, the loss was 380 jobs; in the "moderate" and "extremely high" groups, it was roughly four times that. As with county payments, the effect of these reductions in the county groups was radically different:

- Adults age 16 and older employed in the “extremely high” group of counties: 1982 = 90,000; 1992 = 111,000; 2001 = 127,500; 2017 = 132,000 (19 percent more than in 1992)
- Employed adults age 16 and older in the “moderate” group: 1982 = 1.7 million; 1992 = 2.4 million; 2001 = 3.1 million; and 2017 = 3.7 million (118 percent more than in 1992)
- Forest Service/BLM-employed adults in the “low” group: 1982 = 151,000; 1992 = 184,000; 2001 = 210,000; 2017 = 216,000 (18 percent more than in 1992)

In the “extremely high” group, the loss of 1,700 permanent federal forest agency staff between 1992 and 2017 was paralleled by an increase of only 21,000 in the number of all employed adults, including those who were working less than full time. The ratio of agency jobs lost to all jobs gained was (-)0.08—nearly (negative) 10 percent, a very impactful result. In the “low” group, total employed adults increased by 32,000, a similar percentage to employment growth in the “extremely high” group, but fewer than 400 agency jobs were lost in “low” group counties after 1992. Considered against the addition of 1.3 million adults to the workforce since 1992 in the “moderate” group, the loss of 1,450 federal forest employees was not consequential, except that it may have disproportionately affected isolated rural communities within that group of counties.

Wood Products Manufacturing Employment

In the NWFP area, a few isolated locales remain where wood products manufacturing is an essential economic activity. Broadly speaking, the industry has ceased to be the pillar of the regional economy and of household incomes that it was for much of the 20th century.

- Between 1975 and 2017, 1978 was the peak year for wood products manufacturing employment in the 72 NWFP-area counties. At that high point there were 151,625 jobs; just over 144,000 (95 percent) were located in the 54 counties analyzed in the typology.
- By 1982, wood products manufacturing jobs had fallen by 31 percent to just more than 100,000, largely due to a nationwide recession and its severe regional effect on the forest products industry.
- In 1988, only about 18,000 of the nearly 50,000 jobs lost across the region during the recession had been regained.
- Between 1988 and 2000, the number of wood products manufacturing jobs declined to 89,000—40 percent fewer than in 1978.
- The trend is similar from 2001 to 2017, but counts are not strictly comparable to the 1988–2000 period due to changes in data classification. Jobs declined from 54,000 in 2001 to 34,000 in 2017.

- 1978 was the peak year in the NWFP area for inflation-adjusted annual average wages in wood products manufacturing: slightly more than $63,000 in 2017 dollars.
- The average wage for wood products manufacturing employment in the NWFP area overall in 2017 was about four-fifths of what it was in 1978.

The effect of this severe contraction of the wood products industry has varied considerably by county type. The percentage of jobs and wages represented by wood products manufacturing in three of the county groups is shown in table E.2.

While the proportional dominance by wood products manufacturing of all jobs and wages in the “low” and “extremely high” groups before 1989 is striking, equally important is the **convergence** of the proportion of jobs and wages in these groups. It indicates that average wood products manufacturing wages in these county groups steadily declined from the 1978 peak. In the “moderate” county group, which is primarily comprised of metropolitan-area counties, total wages paid in the industry remained largely steady from 1980 to 2000. Though both federal and nonfederal timber harvest volumes rebounded during the 1980s following the recession in all county groups, industry jobs did not rebound in groups comprised mostly of counties farther from urban centers—especially in the "low" and “extremely high” county groups. These two trends imply that a greater proportion of timber harvested in more remote counties of the NWFP area was traveling farther, possibly to metropolitan areas, for processing, in comparison to the pre-1980 recession norm. If this is the case, then mill furloughs or closures during the 1980s must have occurred at a higher rate in county groups other than the “moderate” group.

Table E.2—Change in the proportion of total jobs and total wages from wood products manufacturing 1978–2017

	1978		1988		2000		2017*	
County group	**Jobs**	**Wages**	**Jobs**	**Wages**	**Jobs**	**Wages**	**Jobs**	**Wages**
	Percent							
Extremely high	19	27	13	17	8	10	2	2
Moderate	3	3	2	2	1	1	0	0
Low	24	35	20	28	11	15	4	6

* 2017 data is not directly comparable to earlier years due to classification changes after 2000.

Monitoring Implications of Analyzing Federal Forest and Industry Employment Indicators Within the County Typology

The NWFP ROD monitoring direction posits social and economic trends associated with federal forest lands management during the NWFP era that were distinct from any pre-NWFP trend. This implication illustrates a common logical fallacy in monitoring: the presumption that a baseline monitoring year represents circumstances that were constant (i.e., a "steady state") before that point. As applied to NWFP monitoring, the fallacy would be to assume that forest-related employment and its associated social and economic implications, as recorded just before adoption of the NWFP, were essentially static—stretching far into the past before about 1990. Yet, as the trend analysis of the typology's constituent variables indicates, forest industry employment and timber harvest trends before the NWFP era were negative in both the "low" and "extremely high" county groups for which the importance of federal forest lands was very different **before, as well as during,** the NWFP era. It is therefore important to establish the prevailing social and economic change trend occurring at the time of the baseline monitoring year, because changes during the monitoring era could simply reflect a continuation of already established trends, in which case it is not plausible that the major shift in forest management represented by the litigation and NWFP eras played a significant role. We thus modify the simple ROD-derived hypothesis to reflect this finding. If social and economic change trends exist that are plausibly associated with federal forest lands management during the NWFP era, social and economic indicator trends should meet three expectations:

- County groups defined by low, very high, or extremely high importance of federal forest lands ca. 1990 and very high importance of forest industry employment had similar social and economic profiles in 1980.
- These groups had similar socioeconomic change trajectories from 1980 to 1990.
- These groups had divergent change trajectories after 1990: groups with "very high" or "extremely high" federal forest lands importance will exhibit one trend, and the "low"-importance group will exhibit a clearly distinct trend.

If all three of these conditions are met, there is support for the hypothesis that distinct social and economic changes were plausibly linked to forest management changes resulting from implementation of the NWFP.

To account for this possibility, this report introduces a two-step **social vulnerability** analysis process within the context of the typology, using data from 1980 as the starting point. The first step is an examination of change trends in individual measures of demographic and employment trends from which a singular measure of social vulnerability is induced. From this analysis, six demographic,

income, and employment status variables are selected to create a singular metric of social vulnerability, which is measured at key transition points between the peak harvest, litigation, early NWFP, and later NWFP eras: 1980, 1990, 2000, and 2017 (refer to table E.1).

Change in Social Vulnerability

Social vulnerability refers to the collective inability of a social group to withstand a variety of stressors and shocks, and subsequently recover to previous levels of organizational functionality. Disaster events such as hurricanes, floods, and wildfires are the most common topics for social vulnerability analysis. However, the concept is useful for interpreting a population's capacity to respond to economic shocks, such as the abrupt closure of a town's principal employer, as well as slow, persistent structural shifts in a region's economic and social organization, including farm consolidations and declining populations. A version of vulnerability analysis has been used previously in economic assessments for natural resource management planning in the Pacific Northwest, including the Interior Columbia Basin Ecosystem Management Project (Horne and Haynes 1999).

This report follows two precedents in constructing a singular social vulnerability measure and observing how it changes over time in each of the 54 counties monitored in this report. One precedent is the foundational research literature on social vulnerability (Cutter et al. 2003, 2008; Cutter and Finch 2008); the other is the quantitative analysis of community-scale change in the first NWFP monitoring report (Donoghue and Sutton 2006). Six of the demographic change variables analyzed in the preceding two sections were selected for constructing an aggregate measure based on these two models: adults age 65 and older; high school or lower education level; total earned wages from all job sectors; individuals in poverty; unemployed adults age 16 and older; and not participating in the workforce. Each variable is transformed to express a relative degree of difference between each county observation and the overall region; these measures are averaged to indicate how different the vulnerability characteristics of the county are from the region's total population.

Describing change in social vulnerability over time requires careful attention to language. If characteristics associated with vulnerability—poverty, underemployment, high proportions of people over 65—intensify within a data unit, such as a county, with the passage of time, and this trend is not countered by change in the opposite direction for other vulnerability-associated characteristics, then social vulnerability in the reporting unit has **deteriorated**: on balance, the population of the county is poorer, older, and less fully employed at the end of the era compared to the start, and therefore social vulnerability worsened over the measured time period. Conversely, if these characteristics become less prominent during the era measured, and other related factors do not trend in the opposite

direction, then a smaller proportion of people are in poverty, over 65 years old, or underemployed. The population is less vulnerable at the end of the era measured than it was at the beginning: social vulnerability has **improved**. The ROD directs agencies to determine whether positive or negative social and economic change trends have occurred during the NWFP era that might be linked to management. **Improving social vulnerability is positive change. Deteriorating social vulnerability is negative change.** The executive summary and chapter 3 use this terminology consistently: whenever deterioration is observed, the analysis is showing negative socioeconomic change within the limited interaction of age, employment and income variables included in the social vulnerability metric; when improvement—a lessening of vulnerability—is observed, the change is positive.

Results of social vulnerability change between 1990 and 2017 are presented in figure E.2. There is a striking geographic pattern in locations within the NWFP area that experienced negative and positive changes in social vulnerability. A cluster of counties along the eastern slopes of the Cascade Range in northern Oregon and Washington all experienced improved social vulnerability: positive change. Social vulnerability varied in these counties in 1990, but all moved

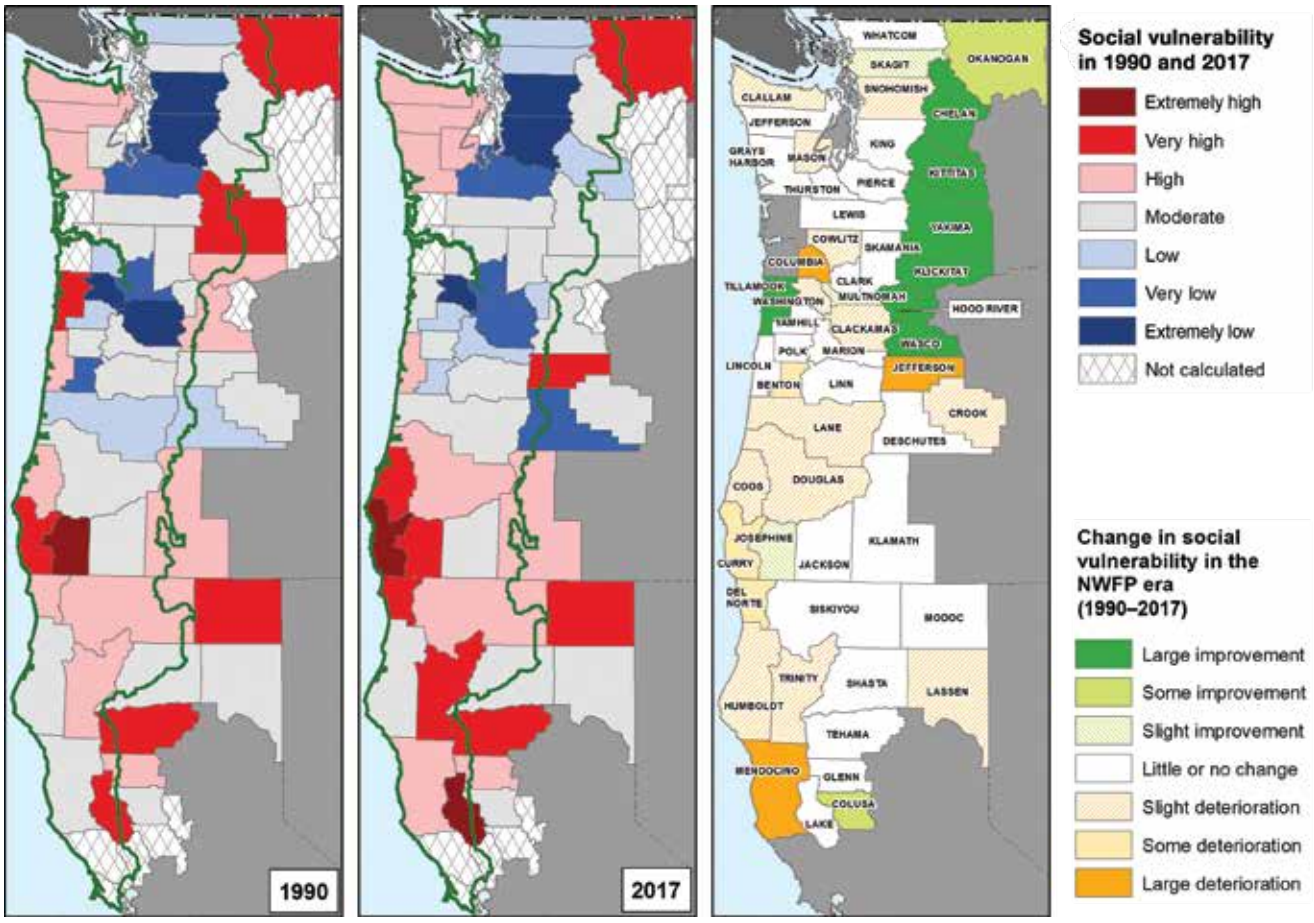

Figure E.2—Change in relative social vulnerability in NWFP counties between 1990 and 2017.

from moderate or high vulnerability in 1990 to low or moderate vulnerability in 2017. Most of these positive change counties belong to the "high" group, but the "moderate" (Yakima, Washington) and "very high" (Hood River, Oregon) groups are also represented. By contrast, deteriorating vulnerability—negative social and economic change—was characteristic of a broad swath of southwestern Oregon and northwestern California, as well as parts of Washington's Olympic Peninsula. In general, these are locations where social vulnerability was moderate to very high in 1990, and high to extremely high in 2017. All these counties except one (Benton, Oregon) belong to the "low," "very high," or "extremely high" groups that share high importance of forest industry employment at the end of the peak-harvest era (1988) but had very different economic connections to federal forest lands.

The social vulnerability change analysis does not yield clear and consistent evidence supporting the simple linear association hypothesis implied by the ROD: that federal forest lands importance in the late 1980s could be clearly associated with either positive or negative social change in the NWFP era. The "high"-importance group appears to be linked to improving social vulnerability, but both "low" and "extremely high" importance are associated with deteriorating vulnerability. Counties in the "very high" group do not exhibit a clear group trend: some exhibit negative change, some no substantive change, and one (Hood River County, Oregon) has the largest increment of positive social change since 1980 of any county in the NWFP monitoring region. This complex relationship strongly suggests other factors, such as degree of isolation from major metropolitan areas, or regional biophysical differences (nearly all counties with improved vulnerability in fig. E.2 are in one NWFP biophysical province—the East Cascades) are more important than a close economic connection to federal forest lands in the late 1980s in determining the nature of social and economic change since 1990.

Based on the observed social vulnerability changes for county groups in the NWFP region, if county-scale social and economic change trends were plausibly associated with the shift in federal forest lands management introduced by the NWFP and the lawsuits that triggered it, social and economic indicator trends would exhibit these three characteristics:

1. Groups defined by "low," "very high," or "extremely high" importance of federal forest lands ca. 1990 and very high importance of forest industry employment would have similar social and economic profiles in 1980.
2. These groups would have similar socioeconomic change trajectories from 1980 to 1990.
3. Socioeconomic change trajectories in these groups would diverge after 1990: groups with very high or extremely high federal forest lands importance exhibit one trend, and those with low importance a clearly distinct trend.

There is some support for the first point. However, the social vulnerability of the "low" group was generally not as high as the "extremely high" group in 1980, mostly reflecting higher proportions of adults in the workforce and employed, as well as higher average wages in the "low" group. The "low" group's vulnerability measure for 1980 is closer to the metropolitan-dominated "moderate" group than to the "extremely high" group. Social vulnerability change trajectories for the low and extremely "high" groups (point 2) were similar during the 1980s, though negative trajectories were not unique to these two groups. The "high" and "very high" groups experienced similar deterioration in social vulnerability during the 1980s. There is no evidence supporting point 3 in either the trend analysis of individual variables, or in the summary social vulnerability trends detailed in chapter 3. The "low" and "extremely high" groups share almost identically deteriorating social vulnerability from 1990 onward. They have remarkably parallel trends in a wide range of individual measures monitored, including lagging job and wage growth, lower average wages in most employment sectors, higher poverty, lower workforce participation, and declining non-Hispanic White population (after 2010) and total population age 25–44 (after 1990). All these post-1990 trends are also clearly related to social and economic change trends occurring in both groups in the 1980s.

During the entire 1980–2017 period assessed in this report, the strong similarity in deteriorating vulnerability shared by the "low" and "extremely high" groups is one of only two clearly indicated associations between social vulnerability change and county groups; the other is low and slightly improving social vulnerability in the "moderate" group. These two associations have obvious geographic dissimilarity. The "extremely high" and "low" group counties are generally remote from major urban centers, lack even a moderate-size city (the largest, greater Eureka-Arcata, California, had a population of roughly 50,000 in 2017), and were historically dependent on the wood products industry for household incomes and secondary economic activity. The "moderate" group includes nearly all the major urban centers in the region; though it had substantial absolute levels of employment and wages earned in the wood products industry, there was nothing like dependence on the sector for local economic vitality given the vital and diversified economies within which those jobs were embedded. The strikingly parallel negative social and economic change trends in the low and "extremely high" groups since 1980 would appear from this evidence to have much more to do with geographic location and the changing nature of the forest products industry than with forest landowner type.

In summary, there is no linear association between higher importance of federal forest lands management factors within a county in the late 1980s and improving or deteriorating social vulnerability before or after 1990. Instead, a combination of three factors was most likely driving negative change trends: (1) extremely high proportions of employment and earnings in a county supplied by wood products

manufacturing **before the 1980 recession**, e.g., in 1978, or earlier*;* (2) distance from major metropolitan centers and, to a lesser extent, major transportation corridors such as Interstate 5; and (3) small and dispersed county populations.

Nothing in the lack of support for the ROD hypothesis of a relationship between forest management changes and social and economic changes **as measured at the county scale** confirms or denies whether those federal forest management changes had **local** effects. This is the reason why stakeholders strongly requested restoration of community case studies to the monitoring report after a 10-year absence. The final two chapters of this report present 10 community change case studies, focusing equally on the past 10 years, and the entirety of the litigation, early, and later NWFP eras spanning the period 1989–2017.

Socioeconomic Monitoring of Communities in the NWFP Area

The objective of the case study monitoring was to obtain local perspectives on community well-being, social and economic changes since the implementation of the NWFP 25 years ago, and how these changes relate to federal agency management actions. Case study monitoring was guided by two overarching research questions:

- What is the status and trend of social and economic well-being of selected case study communities?
- How have relationships changed between communities and federal forest management, including the forests, forest management actions, and federal forest agency personnel?

To answer these questions, we monitored multiple indicators using a mixed-methods case study approach consisting of three components: (1) perceptions of community change in the past 25 years, (2) historical background and current state of the economy, and (3) community location and sociodemographic trajectory. The individual indicators of community characteristics, the case study component they relate to, and the data collection method used to estimate them, are shown in table E.3.

Case study research was conducted in 10 nonmetropolitan communities distributed across the NWFP area to represent the major ecoregions: two in California, four in Oregon, and four in Washington. Case study locations are described in table E.4 and mapped in figure E.3.

Table E.3—Components and indicators of community-scale monitoring in the Northwest Forest Plan (NWFP) 25-year socioeconomic monitoring report

Case study component	Indicators monitored	Methods
Component 1: attitudes and perceptions of community change	Thoughts on the NWFP: employment; housing; goods, services, and commuting; community social life; education; demography; relationship between community and federal agencies; land use and management; future directions	Semi-structured key informant interviews
Component 2: historical background and current economy	Geography, history and notable events, land ownership and management, industry and employment, housing and infrastructure, tourism-oriented amenities	Systematic review of academic, non-academic, and online publications and information sources
Component 3: community location and socio-demographic trajectory	Geographic isolation, school enrollment (total students, ethnic composition, free and reduced lunch eligibility)	Spatial analysis, data visualization

Table E.4—Case study communities in the Northwest Forest Plan (NWFP) 25-year socioeconomic monitoring report

Case study	County, state	NWFP ecoregion	County group[a]
Darrington	Snohomish, WA	West Cascades	Moderate
Leavenworth	Chelan, WA	East Cascades	High
Lake Quinault	Grays Harbor, WA	Olympic Peninsula	Low
Stevenson	Skamania, WA	West Cascades	Extremely high
Santiam Canyon	Linn/Marion, OR	West Cascades	Very high
Gilchrist	Klamath, OR	East Cascades	Extremely high
Myrtle Point	Coos, OR	Coast Range	Very high
Riddle	Douglas, OR	West Cascades/Klamath Mountains	Extremely high
Happy Camp	Siskiyou, CA	Klamath Mountains	Extremely high
Weaverville	Trinity, CA	Klamath Mountains	Extremely high

[a] Counties grouped by relative importance of federal forest lands management and forest industry employment to their social and economic characteristics, circa 1990.

Change in Communities Over the Past 25 Years

Case study communities have changed considerably over the past 25 years, as has the relationship between community well-being and federal agency management actions. Findings from these 10 case studies agree with the NWFP 10-year socioeconomic monitoring report conclusion that case study communities in the plan area experienced social and economic change differently. These differences partly relate to the fact that each community has its own unique geographic and historical context that determined the starting point of their sociodemographic change trajectories after implementation of the NWFP. However, commonalities among the communities include shared experiences within thematic areas; similar factors that historically tied them to federal forests; and related trajectories in

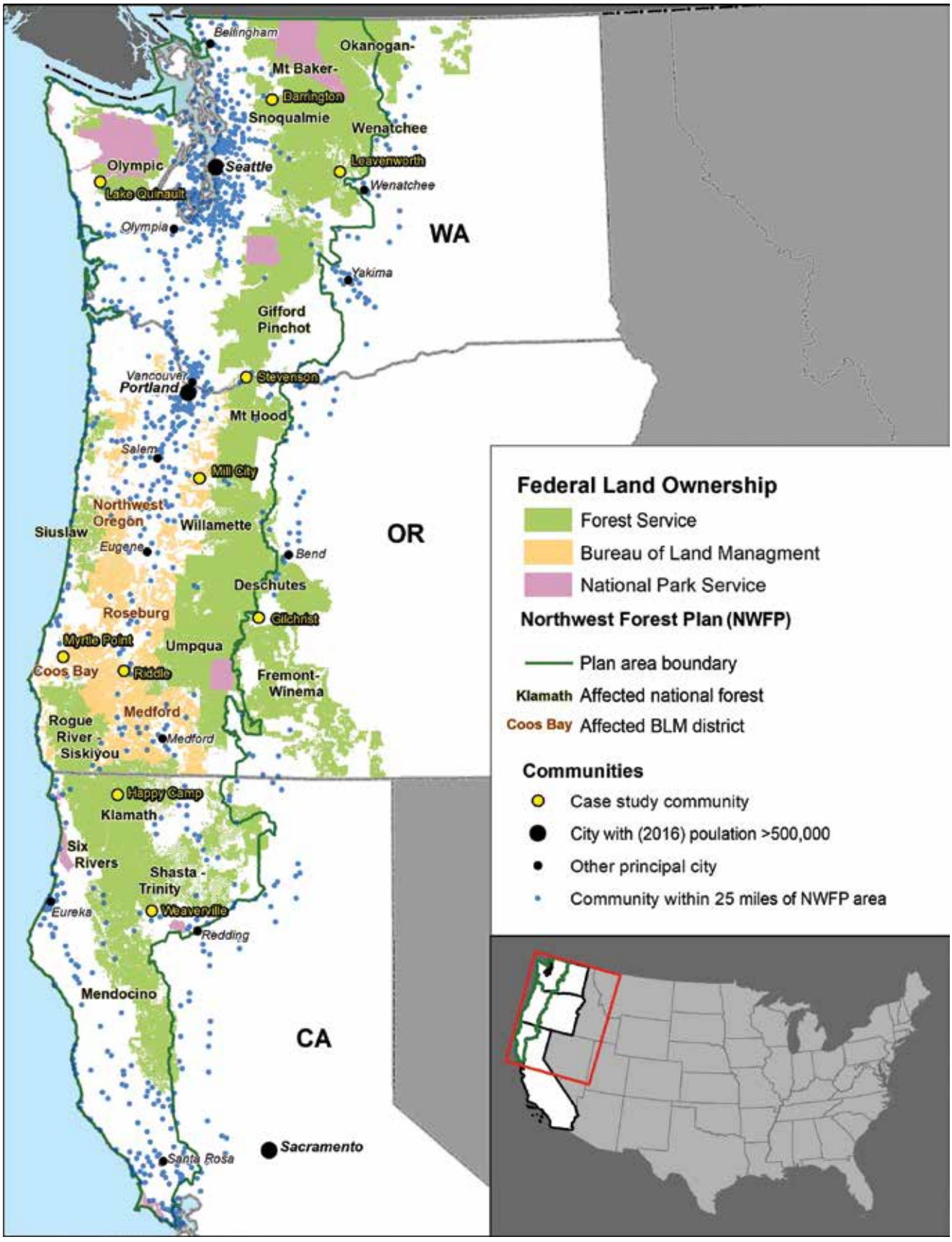

Figure E.3—Locations of case study communities in the Northwest Forest Plan 25-year socioeconomic monitoring report.

industry, employment opportunities, school enrollment, housing, services, and community social life. Our findings show that community-level outcomes are not always captured by county-level analyses.

It is difficult to tie the NWFP directly to the various changes experienced by communities since its adoption. Over the past 25 years, the timber industry has undergone numerous technological and market-induced changes that have resulted in plant shutdowns and employee reductions, regardless of the forest policies in force. Sawmills and other wood products manufacturing facilities have been consolidated by international financial entities. Automation in logging and processing has reduced both skilled and unskilled manual labor positions, with only a slight increase in technical and managerial employment opportunities. Although timber industry representatives included in our case studies were actively seeking employees, most reported that they were often unable to attract a competent and dedicated workforce. However, it is also clear in our case studies that federal forest management since NWFP implementation has done little to buffer changes to employment opportunities and community characteristics that many participants perceived as negative, or to enhance changes that participants saw as positive.

Emergent Themes of Socioeconomic Well-Being

Case study participants in every community discussed several common themes related to community well-being. These include commuting for work; the availability of goods and services; the nature of community-federal agency relationships; vulnerable populations; workforce and employment opportunities; and housing issues, including ownership, quality, availability, and affordability trends.

Community isolation: commuting and goods and services availability—In every case study except Happy Camp, California, which is the most remote of the 10 communities, participants reported an increase in the number of community members commuting for work. Because commuting distances vary between case studies, the effects of this shift have been dissimilar among the communities. The practical effect of relative distance (i.e., the degree of isolation perceived by community members) is a function of the employment opportunities, goods, and services available locally, and the capacity of individual households to commute to make up any deficits. In every case study except Leavenworth, Washington, participants reported a decline in the number and type of goods and services available locally. Lake Quinault, Washington, and Santiam Canyon, Gilchrist, and Riddle, Oregon, currently meet the U.S. Department of Agriculture classification of “food desert.” Because public transportation in most of our case studies is limited or unavailable, declining availability of local services is a serious hardship for economically disadvantaged households that have more difficulty reaching those services.

Vulnerable populations—
Since 1999, school enrollment records in nearly every case study show an increase in the percentage of schoolchildren who qualify for federal free and reduced lunch assistance; this is a reliable indicator of households with insufficient incomes to meet their needs, not just those with incomes below the national poverty threshold. As communities lost access to local services, vulnerable populations most affected by the lack of services were increasing. Case study participants typically explained the increase in vulnerable populations as a function of an overall decline in local living wage employment opportunities.

Community-federal agency relationships—
Case study participants reported a trend of agency disengagement with their respective community and its well-being. Disengagement has been amplified, if not caused, by federal agency workforce reductions, duty station closures, high staff turnover, and an increased number of employees commuting daily to rural agency offices from nearby metropolitan and micropolitan communities. This issue was also reflected in interviews of agency personnel who were more frequently uncertain of the answers to questions about social and economic change in the local area, or whose answers were out of sync with community leaders and other stakeholders. Few of the current agency personnel among the interviewees had been stationed at their respective community location for more than a few years.

Workforce and employment change—
In every community, case study participants suggested that since the implementation of the NWFP, many of the hardest working community members had moved away in search of opportunities elsewhere. Aside from a net decrease in employment opportunities, case study participants also suggested that higher paying family wage jobs were at best difficult to find, and at worst effectively nonexistent. Another frequent theme involved automation in logging and milling occupations. Many participants suggested that automation was responsible for a significant reduction in job opportunities and an overall shift in the type of skills that employers seek.

Timber-dependence change factors—
Our analysis of case study communities identified five major timber-dependence-related change factors affecting social and economic trajectories over the past 25 years (table E.5): (1) reduced public sector funding owing to loss of federal timber receipts, (2) reduction in federal agency employees, (3) loss of owner-operator enterprises such as logging companies and small mills, (4) mill and logging automation, and (5) mill closures. Only two out of the ten case study communities experienced all five of these factors (Stevenson and Santiam Canyon); five

Table E.5—Presence or absence of timber-dependence change factors in case study communities for the Northwest Forest Plan 25-year socioeconomic monitoring report

	Reduced public funding	Federal agency reduction	Loss of owner operator	Mill and logging automation	Mill closure
Darrington	✓	✓	✓	✓	—
Leavenworth	—	✓	—	—	—
Lake Quinault	✓	✓	✓	—	—
Stevenson	✓	✓	✓	✓	✓
Santiam Canyon	✓	✓	✓	✓	✓
Gilchrist	✓	✓	—	✓	✓
Myrtle Point	✓	—	✓	—	—
Riddle	✓	—	—	✓	—
Happy Camp	✓	✓	✓	—	✓
Weaverville	✓	✓	✓	✓	—

communities experienced different combinations of four of the factors (Darrington, Weaverville, Lake Quinault, Gilchrist, and Happy Camp), two communities experienced two factors (Myrtle Point and Riddle), and one community experienced only one (Leavenworth).

Community socioeconomic trajectories—
Community socioeconomic trajectories ranged from persistent economic and demographic decline to increasing prosperity and gentrification. However, these did not follow a clear continuum from "good" to "bad" outcomes. In accounting for tourist amenities, services, timber-dependence change factors, and "commutability," the 10 case study communities fit into five different types of socioeconomic trajectories: (1) high-amenity tourism; (2) diversified timber and county seat; (3) diversified timber and recreation; (4) exclusive natural resources; and (5) low-amenity, isolated. These trajectories are elaborated in table E.6. In all 10 communities, simple geographic location may play the decisive role in structuring the trajectories. For example, towns that followed a trajectory in which the timber industry still plays a role (trajectories 2–4 above), have an alternate economic function (e.g., county seat), are within commuting range of a larger community, or have achieved some measure of social and economic stability, despite agency cutbacks and a contracting timber industry. Communities lacking these characteristics have experienced continuing social and economic decline.

Overall, according to interviewees, 9 of the 10 communities in this round of monitoring have experienced more negative than positive social and economic changes during the NWFP era. The 10th, Leavenworth, has a recent history of economic change that suggests gentrification, which may also be experienced negatively by many residents. Perceptions of the degree to which social and

Table E.6—Socioeconomic trajectories of case study communities in the Northwest Forest Plan 25-year socioeconomic monitoring report

Trajectory	Community	Explanation
High amenity and tourism	Leavenworth	Successfully developed a tourism and recreational amenity economy: the community itself is a tourist attraction.
Diversified timber/ County seat	Stevenson Weaverville	Some timber industry remains. Status as a county seat has helped retain services and provided an economic buffer.
Diversified timber/ Recreation amenity	Darrington Santiam Canyon Gilchrist	Continued demographic shift (fewer families, more retirees). May have reached a point of economic stability with a combination of surviving timber operations and recreation/tourist businesses. Commuting is feasible if arduous for residents traveling to a larger community for work and for agency employees who live elsewhere.
Natural resources	Myrtle Point Riddle	Continued natural resources focus without accompanying tourism/amenity development. Commuting options are limited. Continued social and economic decline.
Low amenity/ isolated	Lake Quinault Happy Camp	Economy and population severely affected by changes in timber industry. Commuting is infeasible due to extreme distances. Despite natural beauty of its setting, the community has been unable to recover because of isolation and lack of tourist infrastructure and amenities.

economic changes were severe only approximately correlate with the five trajectories of change in figure E.4 in which communities to the right of the chart tended to have more limited current community capacity and infrastructure. Many interviewees pointed to the 1980s or earlier as a time when they felt their community was thriving and tended **not** to characterize the negative trends they observed as having started after the NWFP was implemented in 1994. Many interviewees expressed dissatisfaction with the direction of federal forest management under the NWFP, but only some said that they thought a renewed emphasis on federal timber harvesting would be beneficial to their community. Most interviewees, regardless of their role in community life, noted how the complexity of social and economic change factors and their interaction with changes in federal forest management made it nearly impossible to attribute changes specifically to the NWFP instead of to larger state, regional, and national trends.

Conclusion: The Future of NWFP Monitoring

This 25-year NWFP social and economic monitoring report is a thorough overhaul of recent monitoring practices. It was undertaken to restore two elements that have been lacking in recent reports: first, this report systematically focuses on the core monitoring direction of the NWFP ROD. This focus is achieved via a county

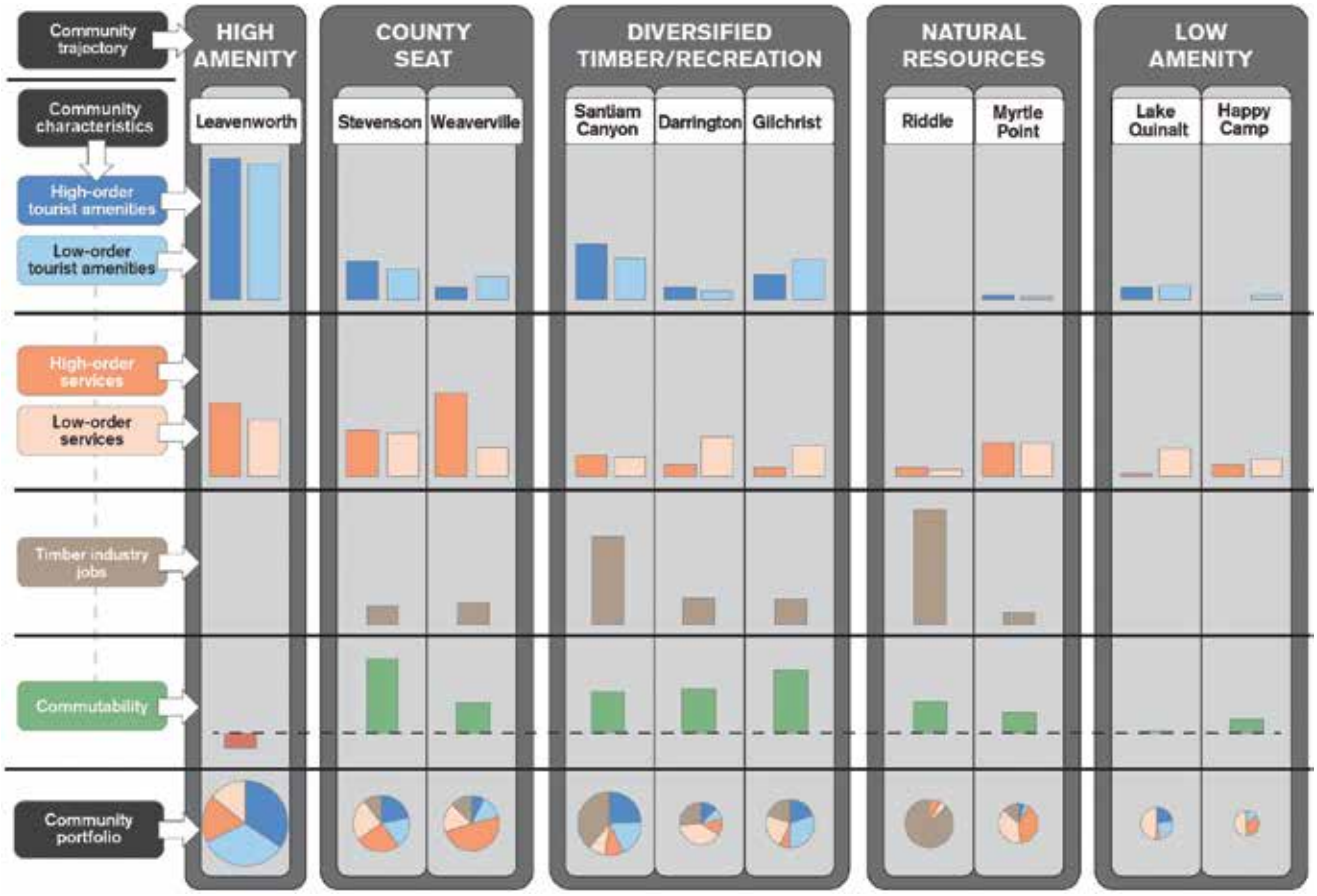

Figure E.4—Trajectories, characteristics, and portfolios of 10 case study communities in the Northwest Forest Plan 25-year socioeconomic monitoring report.

typology, which describes the interrelated importance to county social and economic characteristics of federal forest management and forest products industry employment at the end of the peak-harvest era of federal forest management. The typology makes it possible to quantitatively assess the proposition implied by the ROD monitoring direction that community social and economic change trends might be related to changes in federal forest management. Through the typology, we compare accounts of community scale change to parallel changes in groups of counties that the community is either (a) located in and similar to or; (b) has an affinity with in spite of being located in a different type of county. Second, in response to stakeholders, and because large-scale quantitative analysis is ill-suited to determining the likelihood of association between federal forest management and community social and economic change, the report restores community case study field research to the monitoring protocol.

The comprehensive county-scale quantitative analysis of changes to federal forest management metrics since the 1970s, and social vulnerability since 1980, fails to find compelling evidence that a particular social and economic change trend, either positive or negative, is clearly associated with federal forest land management

changes brought on in the litigation era (1989–1993) and codified in the NWFP era since the plan's adoption in 1994. Instead, the analysis finds strong negative change trends—**deteriorating social vulnerability, which is associated with increases in human suffering and economic loss**—in three types of counties that shared extremely high forest products industry employment significance in the late 1980s, but divergent significance values for federal forest lands—one extremely high, one very high, and one low. Two of these types of counties, with "low" and "extremely high" federal forest lands importance, tend to share (1) "extremely high" percentages of total earned wages before 1980 from private sector wood products employment; (2) relative geographic isolation from major metropolitan areas and, to a lesser extent, major transportation corridors such as interstate highways; and (3) small and dispersed population centers. The third type of county, with "very high" importance for federal forest lands management in the late 1980s, is broadly similar, but with a less pronounced deterioration in social vulnerability, likely resulting from the moderating influence of larger principal cities like Eugene and Medford.

The ROD hypothesis that changes to federal forest management could be associated with the federal forest management changes represented by the NWFP also lacks support in that substantial negative change trends in these three county groups were well-established in the 1980s, before the management changes occurred, and continued more or less unchanged to the present. The lack of a detectable break in the trend after 1990 strongly suggests that federal forest management changes had little effect when counties are the analytical unit. Deteriorating social vulnerability here appears to be mostly a function of the abstract but powerful general restructuring of the goods-producing American economy that commenced in the 1980s, to the considerable disadvantage of most rural communities.

The community case study findings are consistent with the large-scale quantitative analysis. Community residents tended to have limited familiarity with the NWFP, but broadly agreed that their communities had not been vital since the mid-1980s or earlier. Many pointed to a lack of capacity in their communities to benefit if federal forest managers were to prioritize timber harvesting once more. They ascribed limited current capacity to a host of industry changes, only some of which were related to federal lands management. Several industry representatives among the interviewees lamented their inability to secure productive and reliable workers for their current operations.

These communities and their remaining timber processors are both experiencing the tail end of a vicious circle that appears to have been set in motion in approximately 1980, which also is evident in the county-scale analysis. That circle functions as a series of cascading effects: first, timber employment and wages failed to return to levels typical of the 1960s and 1970s after a major industry

downturn in 1980–1982. Next, in communities, and even entire counties, where a large proportion of jobs and wages came from the industry, many young people may have decided to seek better employment opportunities elsewhere, either in the region's larger cities and major metropolitan areas, or outside of the region entirely. This may include some adults' efforts to remain employed in the industry by relocating to metropolitan areas where the region's processing infrastructure was already increasingly concentrating in the 1980s. By the mid-1990s, some communities and a few entire counties had populations that were top-heavy with older adults who were largely not working. At the same time, the federal forest agency workforce was starting to shrink, as were transfer payments that supported public services, primarily schools and roads. Only those communities with favorable locations could partially counteract this general decline by establishing tourism-related businesses. However, in many of these communities, this relative geographic advantage also facilitated commuting, which undermined community capacity by facilitating out-of-community employment for local residents and encouraging locally stationed federal employees to commute into the community rather than being more integral members of its social networks.

Much of this transition cycle had already occurred by the time the NWFP standards and guides were complete in the late 1990s, and agency staff could devote their attention entirely to implementing management policy. At this point, another vicious circle was beginning. Most of the 10 communities struggled to serve increasingly vulnerable populations with diminished resources, while the remaining timber processors had a difficult time finding appropriately skilled and motivated workers from within the local community when seeking to expand. The agencies continued to downsize as payments to counties that were briefly restored in the early 2000s shrank dramatically. Communities that already had limited younger populations saw school enrollment decline further, the vulnerability of the population increase (as indicated by most or all students receiving free or reduced-price lunches), and the average age of residents increase significantly. Population decline—which was stark in Happy Camp, notable in several other communities, and is now detectable in entire groups of counties—closes the second circle.

Future social and economic monitoring of the NWFP would benefit from new direction that builds on the approach taken in this report. The existing county-scale framework is designed to be robust over a long period of time because essentially all relevant secondary social and economic data available for future quantitative monitoring is county based and budgets will likely not allow for systematic collection of primary data on a sufficient scale to monitor the entire region. Yet, in having established a lack of clear association between the NWFP and county-scale social vulnerability trends using a 40-year data record, updating this analysis every 5 years will probably not yield important new insights into the NWFP-social change

association and should be a secondary concern. A more pressing issue is the future of communities and rural counties in the low- and extremely high-county types that enjoyed an age of prosperity through timber processing more than 40 years ago, but now abut swaths of forest land offering few obvious alternatives for economic development. These communities and counties appear to lack of the capacity needed to make these federal forest lands the mainstay to their local economies as they once were. These communities and counties are perhaps entering a third cycle of decline, and a key question for social and economic monitoring is how the NWFP might be adapted to help break that cycle.

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Contents

PNW GTR 1019

Chapter 1: Federal Forest Resource and Recreation Outputs in the Northwest Forest Plan Region

Allison Borchers, Elisabeth Grinspoon, and Delilah Jaworski[1]

Introduction

People living in the Northwest Forest Plan (NWFP) region have close social and economic ties to U.S. Department of Agriculture (USDA) Forest Service and U.S. Department of the Interior Bureau of Land Management (BLM) lands, which cover nearly 40 percent of land in the socioeconomic study area. The NWFP, along with 19 Forest Service land management plans and 7 BLM resource management plans, create the framework for the management of public land uses, products, and services, which contribute to the well-being of nearby counties, communities, tribes, and families. Forest products and services also support the maintenance of local business infrastructure. The infrastructure, in turn, plays a critical role supporting and enhancing Forest Service and BLM capacity to conduct management activities.

This chapter provides basic information to answer the NWFP monitoring question: what are the status of and trend in socioeconomic well-being? It focuses on data about Forest Service and BLM resource management activities that contribute to socioeconomic well-being in the NWFP area. These activities include special forest products, grazing, minerals, recreation, and timber production. In addition to showing trends in uses, products, and services, this chapter evaluates agency expenditures and several forest- and district-related resources using the same measures as previous reports. Finally, economic input-output modeling shows contributions of jobs and income associated with management activities on Forest Service- and BLM-managed lands.

In this chapter, most of the data are displayed graphically to show trends in resource management activities. The analysis does not evaluate the effects of Forest Service and BLM management activities on social and economic well-being. Chapters 4 and 5 analyze the nature and the extent of effects based on data collected directly from community members and local federal land managers.

The data sources, analytical framework, and format for this chapter are nearly identical to those used in the 15- and 20-year reports to bring the trends from previous reports as up to date as possible. However, unlike previous reports, this chapter only covers 1994–2016; data from 2017 and 2018 are not included because complete sets were not available.

Key Findings

The average timber harvest from Forest Service and BLM lands has consistently been a small fraction of the total timber harvested on all lands since the adoption of the NWFP in 1994. Since 1994, harvest on Forest Service and BLM lands has made up, on average, approximately 7 percent of total timber harvest on all lands in the NWFP area. In 2016, 6.4 billion board feet (BBF) was harvested from all other ownerships, which include state and private lands in the NWFP area. That same year, 649 million board feet (MMBF) (10 percent) were harvested from Forest Service and BLM lands in the NWFP area.

Timber harvest on Forest Service and BLM lands in the NWFP area decreased 1 percent between 2012 and 2016. During the same 4 years, timber harvest on all other ownerships in the NWFP area decreased by 4 percent. Even with these recent declines, 2016 timber harvest levels in the NWFP area remain well above the harvest level lows experienced following the Great Recession (2007–2009).

Total employment in forest products industries, including logging, primary and secondary wood manufacturing, and primary and secondary pulp and paper manufacturing, has increased by 7 percent between 2012 and 2016. This modest increase does not bring employment levels back to those experienced before the Great Recession.

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Timber offered for sale on Forest Service and BLM lands remained relatively stable between 2012 and 2016. The volume of timber offered for sale is an indicator of intended accomplishment by the agencies and measures all timber volume made available for sale by the Forest Service and BLM. In 2016, timber offered for sale was approximately 80 percent of probable sale quantity (PSQ), which is the average annual estimate of the amount of timber that can be produced in the current decade and in every succeeding decade into perpetuity.

The effects of changes in timber harvest and related employment on well-being are likely more pronounced in nonmetropolitan counties. Nonmetropolitan counties are generally more rural and more strongly tied to the wood products industry. Most of the timber harvested in the NWFP area comes from nonmetropolitan counties. In both urban and rural areas of the NWFP area, the role of timber harvesting and processing has been declining as a share of total employment. In 2001, more than 12 percent of jobs in nonmetropolitan counties were in the timber sector. By 2012, it had declined to 3 percent and remained at 3 percent in 2016.

Overall total agency employment has been declining since 1993. Because of a jump in 2013, however, total agency employment was 18 percent higher in 2016 compared to 2012. The overall decline in total agency employment was driven by larger decreases in employment on national forests in Oregon and Washington. The declines affected local NWFP-area communities because agency employment provides important contributions to socioeconomic well-being in rural areas. In addition to the economic benefits of direct agency employment, other jobs in the local economy are supported by agency timber harvest and recreational activities on federal lands.

Recreation visitor spending is one of the largest sources of economic activity associated with federal land management in the NWFP area. Millions of visitors recreate on federally managed lands in the NWFP area. In 2016, the estimated number of visits was approximately 20 million—with 6 million visits to BLM-managed lands and 14 million to Forest Service lands in the NWFP area. Visitors to federal lands in the NWFP area spend money on lodging, restaurants, souvenirs, and other trip-related expenses. This spending contributes to economic activity in the NWFP area. In 2016, recreation visitors to Forest Service and BLM lands supported approximately 5,400 direct jobs and 2,400 indirect and induced jobs in the NWFP area.

Study Area and Data Sources

The 72-county study area for socioeconomic monitoring is the same as for previous NWFP social and economic monitoring reports, but the boundaries are not the same as those for the NWFP area. More explanation of the history behind the inclusion of these 72 counties is provided in chapter 2. Here, we track data on quantifiable resource management activities on federal forest lands that contribute to social and economic well-being. These include timber, special forest products, grazing, minerals, and recreation. We also analyze agency budgets, employment levels, and revenue contributions to local governments. The analysis describes changes in federal timber harvest that are related to changes in employment in the wood products manufacturing industry.

Both spatial and temporal scales presented in this report vary because of data limitations. Unlike the demographic data presented in chapter 2, agency resource data are not available at the county level. Agency resource data are available at the unit level (i.e., forest or BLM district). Agency units may cross portions of multiple counties. While agency recreation data are collected at regular intervals, changes in sampling methodologies limit the ability to compare data across years to identify trends.

The last part of this chapter presents data on the economic contributions from federal land management agencies to counties in the NWFP area. These data are used to estimate how various resource outputs, uses, and recreation opportunities affect jobs and income. They are closely related to other social data and the status of trends in socioeconomic well-being in the NWFP area. The data for these indicators, and many of the other indicators discussed in the following sections, come from Forest Service regional and BLM state resource specialists, state and federal social and economic databases, and IMPLAN economic modeling data. Most of the agency data represent complete counts of the identified indicators, such as timber harvest, agency employment, and budgets. Other data are based on surveys such as recreation use. We describe the survey data used as indicators in more detail in the relevant sections.

Timber

The NWFP was implemented in part to stabilize local economies by supplying a steady federal timber supply in the area (USDA and USDI 1994b: 26). The connection between timber harvest on federal lands, rural economies, and the well-being of local communities is central to the NWFP (Power 2006). Planners recognized that timber harvested from federal lands provides important contributions to rural community well-being by supporting employment opportunities in harvesting and forest-product mills and providing income earned from timber-related jobs which stimulates the area's economy as it circulates through local businesses. Because the NWFP was designed to support community well-being through steady flows of timber, an important part of the monitoring program tracks changes in volume of timber flowing from federal lands.

According to agency data, Forest Service and BLM contribution was about 36 percent of total timber harvest in the NWFP area until 1990. Since the adoption of the NWFP, harvest on Forest Service and BLM lands has made up, on average, approximately 7 percent of total timber harvest on all lands in the NWFP area. The percentage of timber that comes from Forest Service and BLM land in the NWFP area has declined by 25 percent since 1990. Note, however, that most timber came from private land in the area even before implementation of the NWFP.

One of the methods that the Forest Service and BLM use for calculating timber production is allowable sale quantity (ASQ), which is the quantity of timber that may be sold from lands identified as suitable for timber production. The Forest Service Manual (FSM) 1900 and Forest Service Handbook 2409 define ASQ as the "average annual allowable sale quantity." During the 1980s, the ASQ from national forests and BLM districts in the NWFP area averaged 4.5 BBF annually (USDA and USDI 1994a).

Owing to uncertainty in timber calculations for the various alternatives in the NWFP, the term "allowable" in ASQ was changed to "probable" to express probable sale quantity (PSQ). Harvest levels associated with the NWFP are described using PSQ rather than ASQ. PSQ describes harvest levels that can be maintained without a decline over the long term and include scheduled or regulated yields from the NWFP matrix or adaptive management areas. PSQ represents the anticipated annual flow of timber during a 10-year period. PSQ from national forests and BLM districts under the NWFP is 805 MMBF. PSQ does not include harvests from reserves or administratively withdrawn areas, which only produce volume in the short term, not the long term (USDA and USDI 1994a).

Similarly, timber harvested from late-successional and riparian reserves does not contribute to PSQ volume because timber produced through treatments in the reserves is not considered a sustainable supply of timber (USDA and USDI 1994a). Although timber harvested from late-successional and riparian reserves does not contribute to PSQ, timber from the reserves does contribute to the total volume offered for sale by the agencies and to local socioeconomic well-being.

Data Analysis

This section examines data on the total volume of timber offered for sale by the Forest Service and BLM, in addition to volume sold and volume harvested (USDA FS 2019a, 2019b; USDI BLM 2019). We compare these data to the PSQ to determine if the NWFP is fulfilling its promise of providing a steady supply of timber in the NWFP area. The Forest Service and BLM maintain corporate timber-volume reports on volume of timber offered for sale, volume of timber sold, and volume of timber harvested. Volume offered is the amount of timber that the federal agencies make available for sale in a given fiscal year (October 1–September 30). Not all timber sales that agencies offer are purchased; therefore, volume of timber sold is the timber that receives a bid from a qualified purchaser and is awarded. Once sold, purchasers generally take 2 to 3 years to harvest. Consequently, the volumes sold and harvested in a given year are rarely the same. Volume harvested is the timber-related value that enters the economy in a given year as well as the measure of the timber from Forest Service and BLM lands that contributes to employment in that year. The economic impact analysis that covers timber-related employment in the "Jobs and Income Associated With Resources and Recreation" section below also uses these data on volume harvested.

Changes in volume of timber offered for sale are indicators of intended accomplishment by the Forest Service and BLM. Volume offered for sale measures all volume made available for sale by the Forest Service and BLM, including volume offered from late-successional and riparian reserves, and volume not meeting forest utilization standards. The Forest Service data on the volume of timber offered for sale, sold, and harvested are expressed

in terms of long logs. BLM timber data are expressed as short logs. Long logs are scaled to 32 ft for timber volume measurement, and short logs are scaled to 16 ft. BLM short log volume is converted to long log volume using a conversion factor equal to 0.825 times the short log volume. In addition to Forest Service and BLM timber data, data on timber harvested on all land ownerships in the NWFP area are presented to show the relative contributions of Forest Service and BLM harvests (CDTFA 2019, Oregon Department of Forestry 2019, Washington State Department of Revenue 2019).

Results

Timber harvest on Forest Service and BLM lands in the NWFP area decreased by 1 percent between 2012 and 2016. In the same timeframe, timber harvest on all other ownerships in the NWFP area decreased by 2 percent. Even with these recent declines, 2016 timber harvest levels in the NWFP area remain well above the low harvest levels following the Great Recession of 2008 (fig. 1.1). Although 2016 harvest levels were above the 2008 levels, the 649 MMBF harvested from Forest Service and BLM lands in the NWFP area in 2016 is a small fraction of the annual timber harvest from Forest Service and BLM lands in the area before the NWFP. The area that is now known as the NWFP averaged about 4.7 BBF from 1965 through 1989, excluding harvests in California. Harvests on nonfederal ownerships averaged about 8.5 BBF. The total across all ownerships was about 13.2 BBF.

Discussion

The average timber harvest from Forest Service and BLM lands has consistently been a small fraction of the total timber harvested on all lands since the adoption of the NWFP in 1994. Since then, harvest on Forest Service and BLM lands has averaged approximately 7 percent of total timber harvest on all lands in the NWFP area (fig. 1.1). Prior to the NWFP, from 1965 to 1989, large variations were found in harvest rates. The slumps are typical of national economic downturns, such as the large recession of the early 1980s. Excluding the 1980s recession, Forest Service and BLM harvests in the NWFP areas of Oregon and Washington ranged between 4 and 6 BBF until 1990. More recently, between 2012 and 2016, timber offered for sale on Forest Service and BLM lands has remained relatively stable. In 2016, timber offered for sale was approximately 80 percent of PSQ (fig. 1.2).

Following a steep decline in federal timber harvests in the late 1990s and early 2000s, harvest volumes increased through 2005. However, the housing market crash of 2008 decreased demand for wood products in the construction industry. Between 2004 and 2009, timber harvesting declined on all ownerships by 3.5 BBF (fig. 1.1). Forest Service and BLM harvests declined by 200 MMBF over this period. As the housing market recovered, timber harvests on federal lands in the NWFP area increased between 2008 and 2016 (fig. 1.3). These ups and downs in timber harvest on federal lands are significant because timber harvest is especially important to nearby communities although

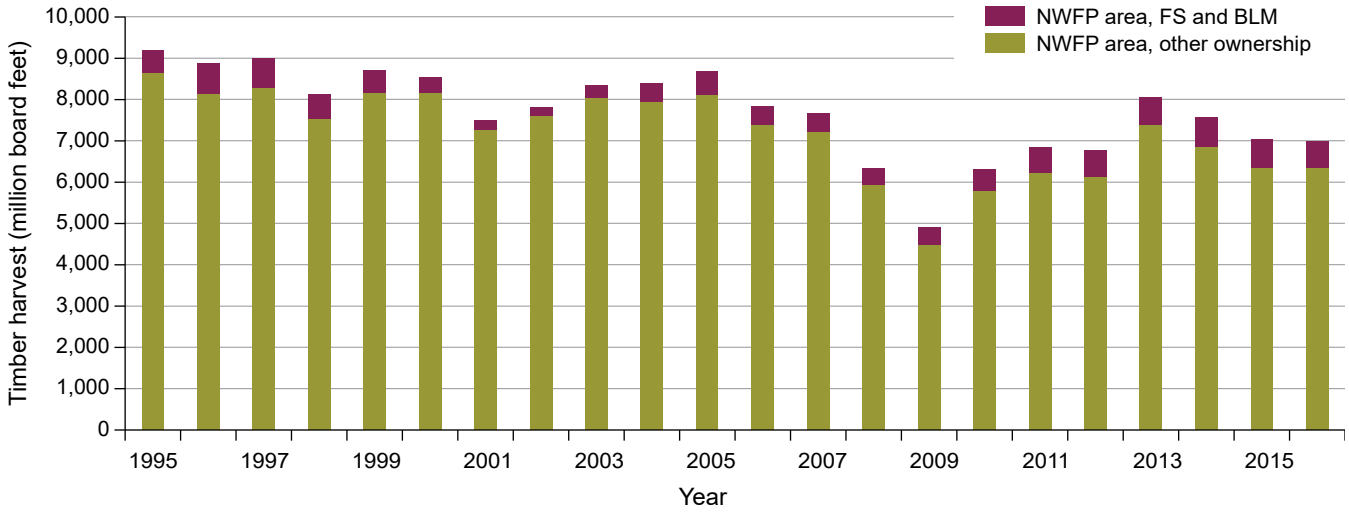

Figure 1.1—Timber harvest in the Northwest Forest Plan (NWFP) area by the Forest Service (FS), Bureau of Land Management (BLM), and other "ownerships," 1995–2016.

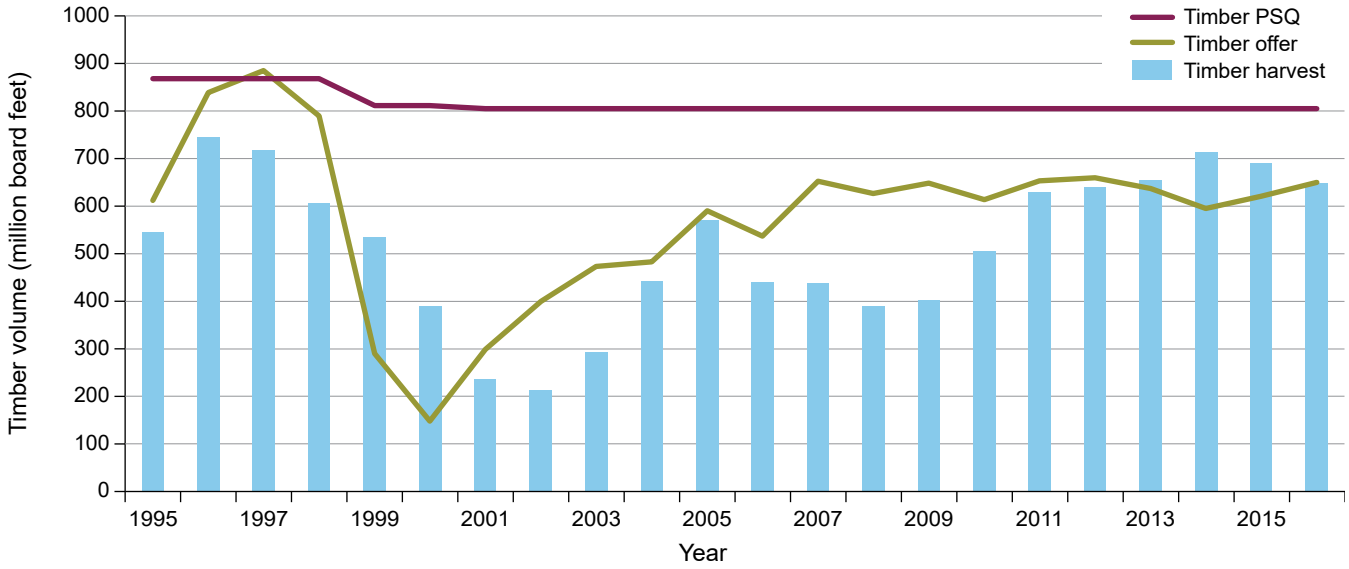

Figure 1.2—Timber harvest, on offer for sale, and as estimated probable sale quantity (PSQ) on Forest Service and Bureau of Land Management lands in the Northwest Forest Plan area, 1995–2016.

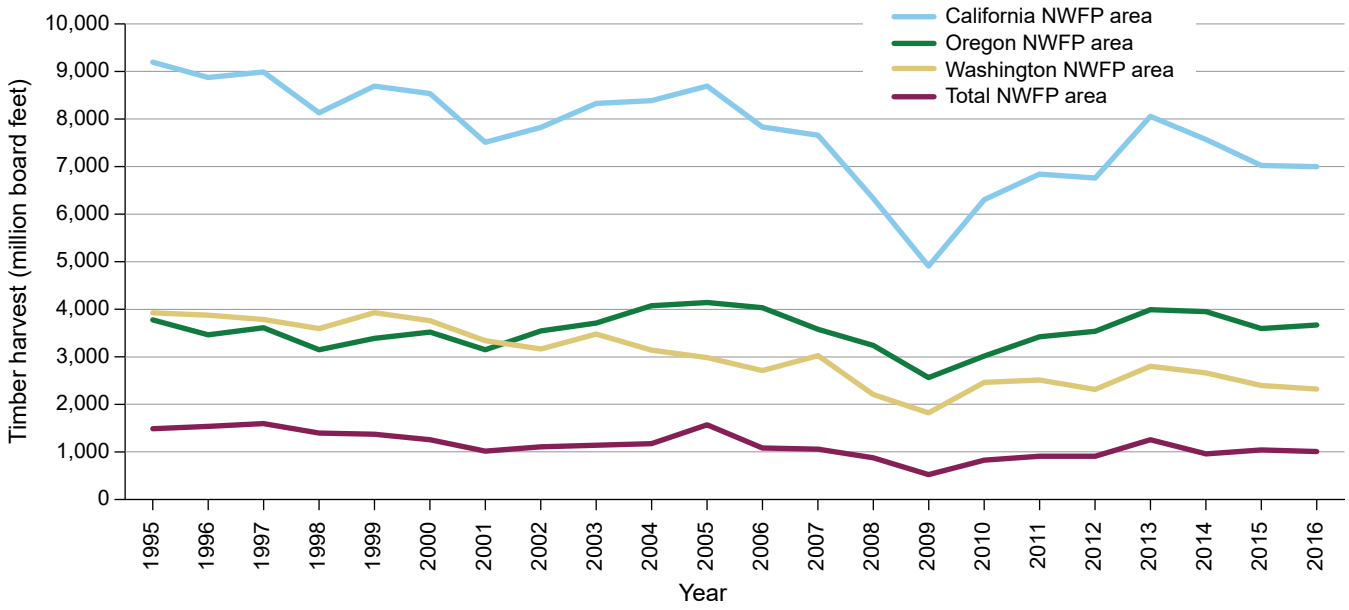

Figure 1.3—Timber harvest on all private and public lands in the Northwest Forest Plan (NWFP) area by state and in total, 1995–2016.

federal timber harvests account for only about 7 percent of total harvest in the NWFP area (fig. 1.1).

Changes in timber harvested from all lands—public and private—have not been uniform across states. NWFP counties in Oregon have seen a modest decrease in total timber harvest volume from 1995 to 2016. In 1995, 3.8 BBF were removed from NWFP counties in Oregon across all ownerships. In 2016, 3.6 BBF were removed, a 3-percent decrease between 1995 and 2016. In contrast, both Washington and California saw larger declines in timber harvests on all ownerships in the NWFP area—41- and 32-percent, respectively, from 1995 to 2016 (fig. 1.3).

In addition to changes in flows of timber from private lands, globalization also affects timber harvesting in the NWFP area. Imports of foreign timber increased from 12 MMBF in 1995 to a high of 465 MMBF in 2005 (fig. 1.4). Imports have since declined to 71 MMBF in 2016. In contrast, exports of timber harvested in the NWFP area have followed an inverse trend: timber exports have declined from 1.4 BBF in 1995 to 481 MMBF in 2006. Export levels returned to 1995

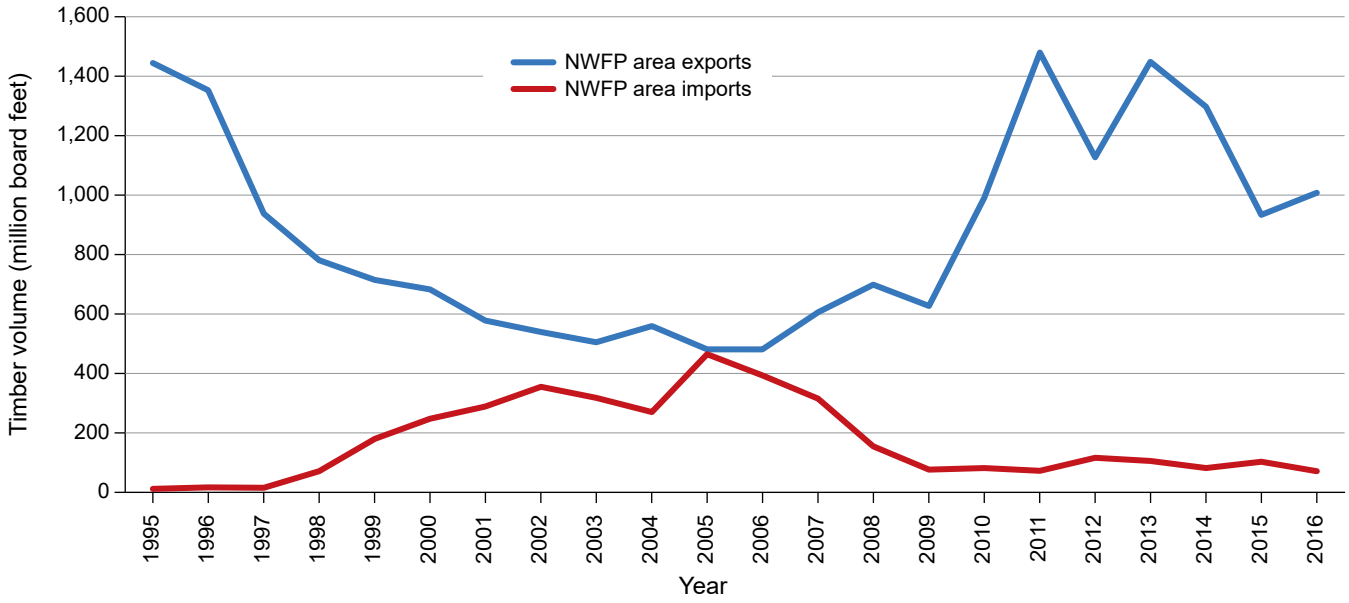

Figure 1.4—Exports of timber from and imports of timber to the Northwest Forest Plan (NWFP) area, 1995–2016.

levels in 2011 and 2013. In 2016, 1 BBF were exported from the NWFP area (fig. 1.4). While global competition generally benefits consumers through lower prices and a wider variety of goods, some local firms become less profitable. Changes in the global marketplace may also negatively affect timber harvesting and local economies in the NWFP area.

Special Forest Products

Special forest products are harvested from BLM and Forest Service lands in the NWFP area for commercial and personal consumption. In the Pacific Northwest, more than 200 species of special forest products are harvested on private and public lands (Alexander and Fight 2003). The products include food, such as mushrooms and berries, medicinal plants and fungi, floral greenery, wildflowers, Christmas trees, and fuelwood. Local community members and migrants earn income through harvesting and selling special forest products. Some also harvest special forest products for subsistence, cultural heritage, family traditions, recreation, or spiritual fulfillment. Since the late 1980s, interest in special forest products has grown considerably. Demand has increased as a result of consumer interest in wild-harvested and organically produced foods and medicines (Charnley et al. 2018)

Greater consumer demand for and interest in the cultural and ecological significance of special forest products along with the decline in timber harvesting (Lynch and McLain 2003) has increased interest in the role special forest products play in local communities and economies, as well as the potential future role these products could contribute to community well-being. Huckleberries and mushrooms are among the most valued species in the Pacific Northwest. Valued mushrooms include morels (*Morchella* Dill ex Pers.: Fr.), chanterelles (*Cantharellus* Adans. ex Fr.), boletes (*Boletus* L.), and western matsutake (*Tricholoma murrillinum* Singer). Floral greens are also of major economic significance. These include salal (*Gaultheria shallon* Pursh), evergreen huckleberry (*Vaccinium ovatum* Pursh), Oregon grape (*Mahonia nervosa* (Pursh) Nutt.), western redcedar (*Thuja plicata* Donn ex D. Don), western swordfern (*Polystichum munitum* (Kaulf.) C. Presl), beargrass (*Xerophyllum tenax (Pursh)* Nutt), pinecones, mosses, and coniferous boughs such as noble fir (*Abies procera* Rehder) (Alexander and McLain 2001, Weigand 2002).

Data Analysis

Because the range of products harvested is so diverse, estimating the economic contribution of special forest products from Forest Service and BLM land is difficult. The Forest Service and the BLM collect data on the permit price of collection not the market value of the product. The following sections present data on the permit price of nonmarket products, which are the best available approximation of the value of special forest products. Because the unit and categories that the Forest Service and BLM use to measure special forest products are different, we present the data separately for the two agencies.

The geographic scale is also different for the Forest Service and the BLM. The Forest Service data include all the land on Deschutes and Okanogan-Wenatchee National Forests, although parts of these forests are outside of the NWFP area. The 10-year report and all subsequent reports use state-level BLM data from Oregon and Washington. These data include special forest product harvests primarily from the five western Oregon BLM districts in the NWFP area and the Prineville District (Roche 2004). Little harvesting of special forest product occurs on BLM districts east of the Cascades (as modified from Charnley et al. 2006). The BLM tracks special forest products in the Timber Sale Information System and summarizes the data annually in a publication called BLM Facts. Because of apparent data irregularities in the BLM Facts, data for this 25-year monitoring report come from personal communication with BLM personnel who obtained the data directly from its Timber Sale Information System.

Forest Service Results and Discussion

In 2016, 99 percent of the value of special forest product harvest permits from Forest Service lands in the NWFP area came from seven categories: foliage, fruits and berries, fuelwood, grass, limbs/boughs, mushrooms, and Christmas trees (fig. 1.5: A). The remaining 9 special forest product categories (dry cones, other plants, transplants, nonconvertible products, green cones, posts/poles, bark, seeds, herbs) contributed a small share of total value of permits (fig. 1.5: B). While this distribution was roughly similar in 2012 and 2002, the value of fruits and berries permits sold increased dramatically. In 2002, about $4,000 worth of permits were issued. By 2012, this figure had grown to $76,000, then dropped slightly to $67,000 in 2016 (a 13-percent decrease since 2012). The total annual values of special forest products removed from Forest Service lands in the NWFP area have fluctuated based on demand (fig. 1.6).

Data suggest that the harvest of special forest products on Forest Service lands in the NWFP area has been variable

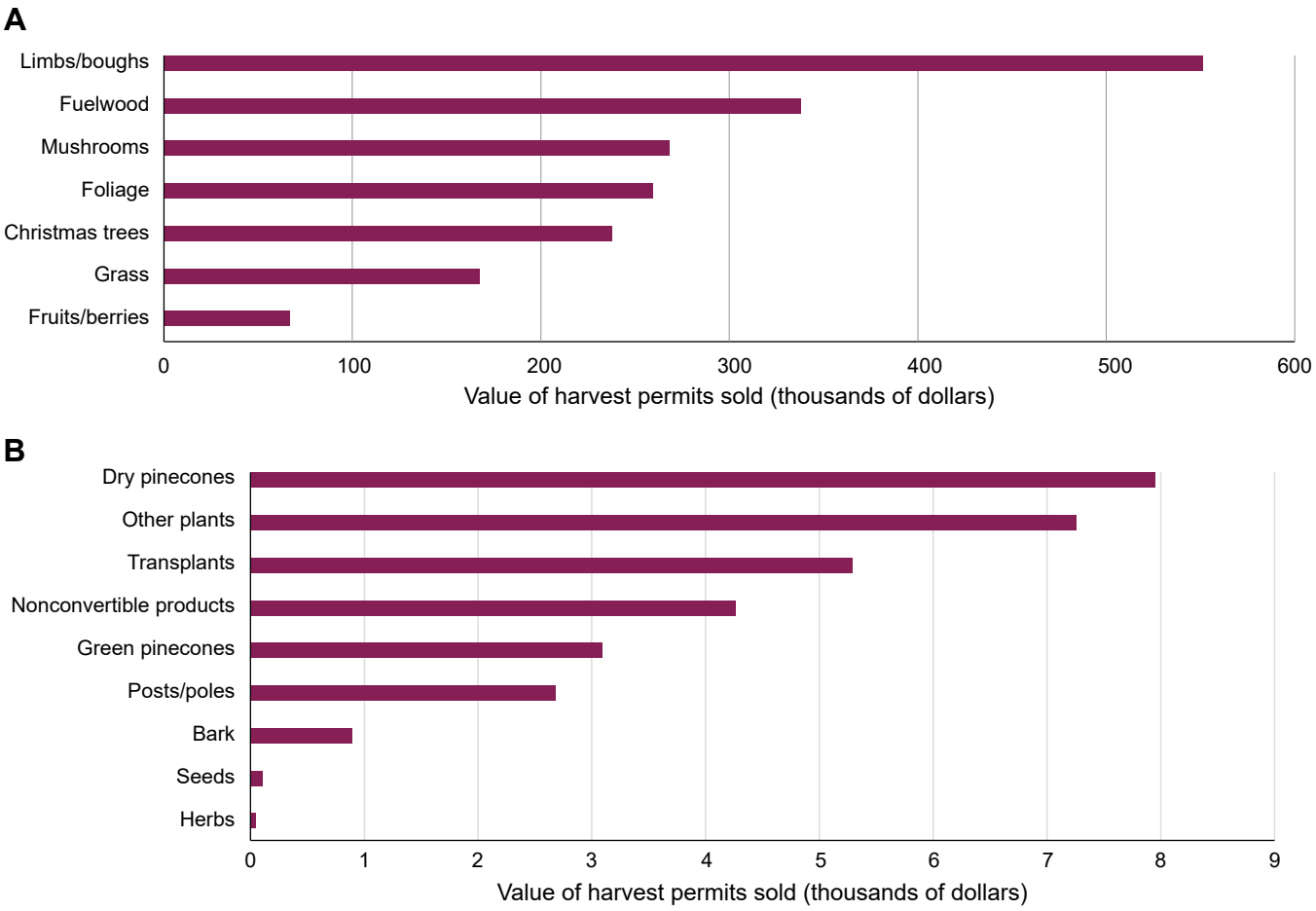

Figure 1.5—Value of special forest product harvest permits sold for Forest Service-managed lands in the Northwest Forest Plan area, 2016. Note: Nonconvertible products are timber products that do not have a common standard conversion to cubic or board feet of solid wood. There is no definitive description of what products are included in this category, which can include a wide variety of forest products requested for harvest.

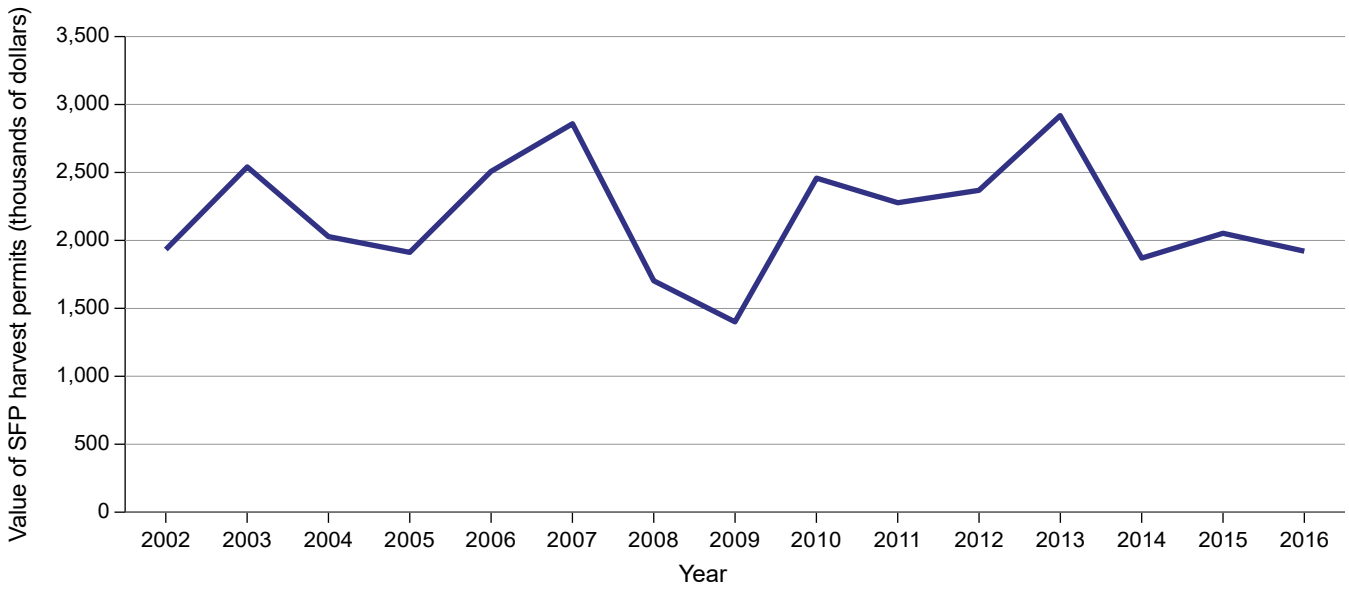

Figure 1.6—Value of special forest product (SFP) harvest permits sold for Forest Service lands in the Northwest Forest Plan area, 2002–2016.

over the past 5 years. Trends are hard to discern. Harvesting of some socially and economically meaningful special forest products, such as limbs, boughs, and foliage, increased between 2012 and 2016, while harvesting of mushrooms, fruits, and berries fell during that period. The number of Christmas trees cut on national forests in the NWFP area remained relatively steady over the 5-year period (table 1.1).

Bureau of Land Management Results and Discussion

Fewer special forest products are harvested on BLM lands than Forest Service lands in the NWFP area. Mushroom collection increased from 265,000 pounds in 2004 to 402,000 pounds in 2012. Mushroom harvest has been declining since 2012 to 232,000 pounds in 2016 (table 1.2). Floral and greenery harvesting shows more variable trends from year to year—from more than 1.4 million pounds in 2008 to 766,000 million pounds in 2016. The harvest of coniferous boughs is also significant but has seen a generally declining trend since 2008 (table 1.2).

On BLM lands in the NWFP area, 94 percent of the value of special forest product permits results from the harvesting of boughs, floral and greenery, fuelwood, and mushrooms. These have been the top-four permitted products every year since 2000. The total value of special forest products harvested from BLM lands in the NWFP area is significantly lower than the value of special forest products harvested from Forest Service lands in the NWFP area.

The market value of special forest products may be much higher than the numbers reported in this section, which uses permit prices as a proxy for value. In addition, the value of special forest products that are collected for personal consumption is not captured in market transactions. One estimate suggests that special forest products account for $1.4 billion of economic activity in the United States (Charnley et al. 2018). The income from special forest products is important to commercial harvesters in the Pacific Northwest. Although many do not rely on special forest products as a sole source of income, they do provide supplemental sources of income that contribute to household economies. They also provide economic opportunities for Southeast Asian and Latino immigrants in the Pacific Northwest (Charnley et al. 2019).

Grazing

Relatively little grazing occurs on Forest Service and BLM lands within the NWFP region, compared with grazing on public lands in eastern Oregon and Washington and northeastern California. Grazing on public lands in the West has declined as the cattle industry has moved to the Midwest (Mitchell 2000). Most of the grazing in the NWFP area is on the Okanogan-Wenatchee, Klamath, Rogue-Siskiyou, and Deschutes National Forests. There is also grazing on the Medford and Lakeview BLM Districts. Little or no grazing occurs on the other BLM districts in the NWFP area (as modified from Charnley et al. 2006).

Table 1.1—Amounts of special forest products harvested from Forest Service lands (national forests) in the Northwest Forest Plan area by sold permit allotment, 2002–2016

Special forest product (allotment units)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Limb/bough (tons)	295,156	365,285	428,835	504,277	207,501	280,266	202,580	7,238,968	11,924,923	2,959	3,036	148,859	157,048	268,586	405,837
Mushrooms (lbs)	380,613	344,309	679,426	315,030	430,713	630,313	223,931	60,130	168,303	634,135	460,810	237,766	158,247	219,207	193,708
Fruits/berries (lbs)	43,450	76,400	136,750	99,650	143,700	201,206	35,721	103,602	41,225	119,230	94,645	100,658	94,155	48,391	84,491
Nonconvertible	354,124	416,466	360,889	550,039	1,018,132	770,205	340,260	106,233	13,185	38,699	40,676	65,658	29,920	62,207	84,322
Other plants (lbs)	8,450	18,500	6,434	4,236	5,750	18,831	8,501	7,600	16,741	29,777	28,674	15,665	63,844	11,025	76,700
Christmas trees (each)	51,380	65,723	53,809	61,979	84,488	44,436	46,674	31,557	64,443	53,884	54,488	46,505	49,131	52,604	48,434
Fuelwood (mbf)	22,472	22,569	23,195	19,340	19,512	23,960	36,745	42,523	45,037	43,935	42,730	44,052	36,808	36,236	31,630
Dry pinecones (bushels)	55,595	98,442	64,511	71,694	67,259	67,386	63,317	16,900	48,659	32,517	49,199	52,105	84,392	37,164	29,992
Transplants (each)	31,473	24,828	28,277	24,762	23,293	26,676	17,898	6,928	10,284	6,503	6,513	8,521	6,313	6,537	7,507
Green pinecones (bushels)	720	3,315	2,700	400	365	1,600	140	3,240	44	40	580	2,046	1,741	120	6,033
Bark (lbs)	101,350	63,260	8,000	55,980	50,340	57,200	6,000	6,000	0	6,500	6,400	6,500	500	4,850	3,755
Foliage (tons)	615	848	783	893	1,186	1,565	1,355	464	1,609	947	862	1,590	1,202	1,644	1,412
Grass (tons)	4,832	1,860	17,923	2,101	2,114	2,214	1,554	612	1,868	1,716	1,851	2,065	841	1,932	1,404
Seeds (lbs)	10	490	128	120	20	40	120	0	21	420	22	41	40	721	920
Herbs (lbs)	40,500	500	700	1,000	1,900	140	1,240	2,130	17,320	4,740	1,570	1,410	2,550	700	520
Posts/poles (MBF)	1,108	1,208	1,773	1,700	896	1,269	688	443	682	927	449	458	378	408	325
Fungi (lbs)	5,424	3,485	5,460	12,205	38,840	42,525	8,875	0	0	0	0	0	0	0	0
Mosses (lbs)	125,619	129,098	129,000	123,900	500	0	0	0	0	0	0	0	0	0	0
Wildflowers (lbs)	0	0	0	7	210	20	10	0	1	0	0	0	0	0	0

[a] Nonconvertible refers to a variety of timber products that do not have a standard conversion to cubic or board feet of solid wood, nor a definitive product category.

Table 1.2— Amounts of special forest products harvested from Bureau of Land Management lands in Oregon and Washington by sold permit allotment, 2004–2016

Special forest product (allotment units)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Boughs, coniferous (lbs)	257,811	217,190	525,248	498,061	708,255	356,242	396,790	242,600	155,160	288,525	143,400	158,823	71,150
Burls and miscellaneous (lbs)	83,270	20,810	63,550	4,840	2,230	2,000	6,700	500	3,900	2,135	6,200	17,850	2,100
Christmas trees (number)	307	256	336	543	551	755	598	558	570	581	624	465	380
Edibles and medicinals (lbs)	4,086	7,640	19,801	5,170	6,600	13,890	4,650	13,510	16,600	14,300	15,950	18,900	13,900
Floral and greenery (lbs)	784,292	437,209	660,613	1,106,343	1,497,243	823,642	874,780	1,016,780	1,146,825	1,391,450	792,640	781,908	765,653
Fuel wood, green (tons)	4,358	2,902	3,125	3,661	3,867	5,975	5,659	5,692	6,427	5,226	6,047	5,855	4,453
Mosses, bryophytes (lbs)	8,665	600	5,408	500	6,100	35	1,400	—	5	1,000	—	—	540
Mushrooms, fungi (lbs)	264,809	334,927	364,029	237,341	490,570	398,539	397,545	318,717	401,972	388,159	309,183	261,249	232,262
Seed and seed cones (bushel)	366	24	342	1,780	60	2,065	100	272	1,001	417	852	2,900	75
Transplants (number)	5,191	8,508	1,718	10,434	4,542	3,985	2,883	5,300	311	782	2,066	5,995	3,350

Data Analysis

Indicators of livestock grazing on federal lands include the number of grazing allotments or leases, allotment acres, grazing permittees, and animal unit months (AUMs). The Forest Service and the BLM track the number and acreage of active and vacant grazing allotments. The Oregon BLM also tracks the number of grazing leases but does not report the number of acres leased. Previous NWFP monitoring reports include Forest Service data on the number of active allotments and number of active allotment acres. Vacant allotments were not included. The reports also include Forest Service data on the number of grazing permittees. A grazing permittee, or lessee, is any entity that has a grazing permit or lease for one or more allotments, such as an individual or cooperative with several members (FSM 2230.5). The reports include BLM data on the number of grazing leases as an indicator of changes to livestock grazing in the NWFP area.

The use of the allotment and lease data in the 10-year report is somewhat problematic in that it is unclear whether the analysis uses the same definition for active, inactive and closed allotments, and leases for different years. This 25-year report, like the 20-year report, avoids this problem by using the permitted and authorized AUMs as indicators of range use. One AUM is the amount of forage a 1,000-pound mature cow and calf consume in a 30-day period, which is about 780 pounds of dry weight. Permitted AUMs are measures of planned capacity; they are the number of AUMs that are specified on the grazing permit for the duration of the permit (FSM 2230.5). The permit is usually valid for 10 years (FSM 2231.03). Permitted AUMs provide a comparable indicator for Forest Service and BLM grazing capacity. Comparing Forest Service and BLM permitted AUMs is more clear-cut than comparing the number of Forest Service active allotments and BLM active leases. Authorized AUMs are the amounts of forage permittees pay for and are authorized to use in a given year. Authorized AUMs indicate how much of the planned capacity is used annually. It is this amount that contributes to jobs and income.

The Forest Service AUM data used in this 25-year report are comparable to those used in the 20-year report, but they are not completely comparable to those used in the 10-year report. The 10-year report used district-level data and excluded districts outside of the NWFP area. For the 20-year report, district-level data were unavailable. The 20- and 25-year reports used forest-level data. The data for the entire Okanogan and Wenatchee, and Deschutes National Forests were used although these forests are partially outside of the NWFP area. Data from the Winema National Forest are excluded because this forest was combined with the Fremont National Forest, which is completely outside of the NWFP area. It is noteworthy that the use of forest-level data creates an upward bias of approximately 30 percent overall. Most of the bias is associated with the inclusion of the entire joint Okanogan and Wenatchee National Forests. One half of these national forests' AUMs are outside of the NWFP area. Moreover, these two forests contribute about 50 percent of the total authorized AUMs across all the national forests in the NWFP area.

Results

In northwest Oregon,[2] there is an average of 3,446 heads of beef cattle in each county. In northeastern[3] Oregon counties, the average is 26,969 (NASS 2017). Federal forage constitutes a small share of this sector. In 2016, approximately 100,000 AUMs were authorized on Forest Service lands in the NWFP area, similar to the 2012 authorized level (fig. 1.7). This represents a small increase in authorized AUMs since 2006. However, authorized use has fluctuated considerably since 2006, suggesting that the increase does not reflect a trend.

Authorized AUMs on BLM-managed lands also experienced small increases over the 2006 authorized level from about 15,000 to 17,000 AUMs (fig. 1.8). Again, authorized use has fluctuated from year to year. Changes in authorized use may reflect both economic and ecological conditions, which influence both the demand for and availability of forage.

Discussion

A reduction in grazing activity on NWFP-area federal lands was expected based on the NWFP ROD standards and guidelines. The reduction in timber program activity under the NWFP was expected to contribute to reduced forage availability on some federal lands. As a result of reduced timber activity, a decrease in transitory range was

[2] As defined by the National Agricultural Statistics Service, includes Benton, Clackamas, Clatsop, Columbia, Lane, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill Counties.

[3] As defined by the National Agricultural Statistics Service, includes Baker, Umatilla, Union, and Wallowa Counties.

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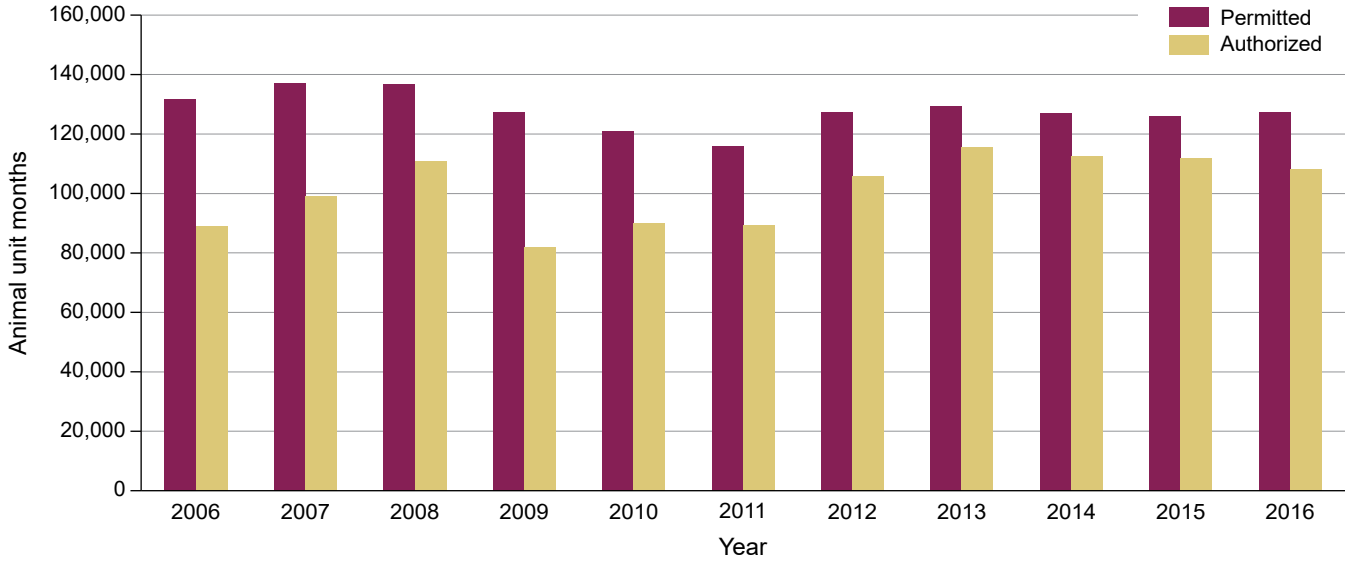

Figure 1.7—Permitted (for permit duration) and authorized (forage use per year) grazing on Forest Service-managed units in the Northwest Forest Plan area, 2006–2016. Note: One animal unit month is the amount of forage consumed by a 1,000-lb. cow in 30 days.

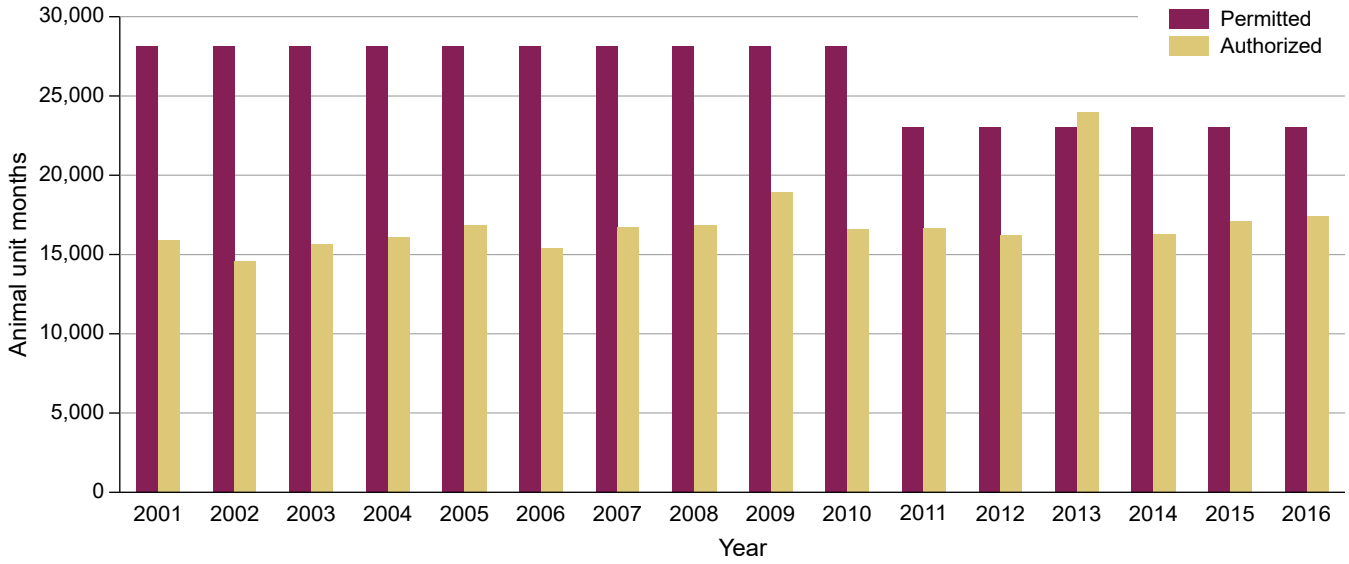

Figure 1.8—Permitted (for permit duration) and authorized (forage use per year) grazing on Bureau of Land Management-managed units in the Northwest Forest Plan area, 2001–2016. Note: One animal unit month is the amount of forage consumed by a 1,000-lb. cow in 30 days.

also expected. While Forest Service and BLM data do indicate that livestock grazing on National Forest System and BLM lands in the NWFP area decreased after 1994, Forest Service grazing specialists report that the NWFP had less of an effect on grazing opportunity than expected (Mackinnon 2005, Phelps 2003). The NWFP was one of several factors responsible for the decline in grazing in the area. Prolonged drought and Endangered Species Act (1973) requirements related to anadromous fish also limited grazing.

In 2016, the AUMs authorized on Forest Service lands in the NWFP area were similar to the 2012 authorized level. The increase in authorized AUMs since 2006 was small. However, authorized use fluctuates annually, suggesting that the increase does not reflect a trend. Likewise, for the BLM, authorized AUMs increased slightly from the 2006 authorized level. Like the Forest Service, BLM-authorized use fluctuated from year to year. Changes in authorized use may reflect both economic and ecological conditions, which influence both the demand for and availability of forage.

Minerals

Mining on federal forests in the NWFP area is a minor land use. For "leasable minerals"—oil, gas, and geothermal energy—the Cascade Range in Oregon and Washington and parts of the northern California forests may contain valuable geothermal resources (USDA and USDI 1994a). While there was little geothermal exploration or development in the NWFP area in earlier monitoring reports, this update presents new data on recent geothermal exploration in the area.

The four California NWFP forests have no oil or gas. Some federal forest lands in Oregon and Washington may contain oil and gas resources, but there has been little exploration for development. The NWFP ROD contains guidelines for minerals management in riparian reserves as well as standards and guidelines for plans of operation, reclamation plans and bonds, inspection, and monitoring (USDA and USDI 1994b: C-34–C-35). These standards and guidelines increase the cost of extracting minerals in the NWFP area.

Data Analysis

Developing good indicators for mining is challenging. Not only do existing indicators differ by mineral class, the years for which data are available are not consistent. Potentially useful data for NWFP monitoring are mineral production data. However, the agency formerly known as the Minerals Management Service, which used to track the production of leasable minerals, showed no record that leasable minerals were produced in the NWFP area just before the NWFP was implemented. Information related to locatable minerals is proprietary; the government does not charge users any royalties or payments for locatable minerals. The Forest Service does track the removal of salable minerals.

The 10-year report identifies leases and mining claims as indicators, but not enough data was available to identify trends. Assessing trends in mining claim data was also difficult because agency databases do not distinguish between abandoned and active sites. The 20-year report examines data on mineral production on Forest Service lands for salable minerals; these data are readily available. This 25-year report repeats the approach used in the 20-year report.

Salable Minerals

Volume and value of salable minerals removed are the indicators used for salable minerals production. The Forest Service tracks three categories of use: Forest Service use, free use, and contract use. The Forest Service removes salable minerals mainly for road construction and reconstruction. The agency issues free-use permits to members of the public and government agencies. Contracts of sale are required for commercial removal of salable minerals (as modified from Charnley et al. 2006).

No data are available for the Forest Service's Pacific Northwest Region before 2000 for free-use permits or contracts of sale. The Forest Service salable minerals data are available annually beginning in 2000. For this report, data are assessed between 2000 and 2016 for even-numbered fiscal years to simplify the presentation.

Results

Salable minerals are available for agency use, free-use permits, or sale to commercial entities or individuals. The production of salable minerals on Forest Service lands in the NWFP area has fluctuated considerably since 2000. In 2000, more than 600,000 tons of mineral materials were removed from Forest Service lands in the NWFP area. In 2016, less than 80,000 tons were removed (fig. 1.9). The type of use also varied over the same period. In both 2000 and 2016, most mineral materials removed were sold to private entities. However, in the intervening years, free-use permits or agency use most often constituted the majority of salable mineral production (fig. 1.9). Salable mineral production on Forest Service lands in the NWFP area does not appear to be linked to broader economic conditions and trends. Salable mineral production was low during much of the construction boom (2002–2006) and grew to the highest level since 2000 in the midst of the recession and housing bust (2008) (fig. 1.9). Salable mineral production shows considerable fluctuation between years, suggesting that the changes do not reflect a trend.

While the Cascade Range in Oregon and Washington and parts of northern California forests contain potentially valuable geothermal resources, previous NWFP monitoring reported little geothermal exploration or development in the NWFP area. Since 2012, the Mount Baker-Snoqualmie National Forest has completed two geothermal environmental assessments. An environmental assessment was completed within the Skykomish Ranger District in 2012 and the Mount Baker Ranger District in 2015. The Skykomish project received no bids at auction. A public auction for the Mount Baker project is planned.

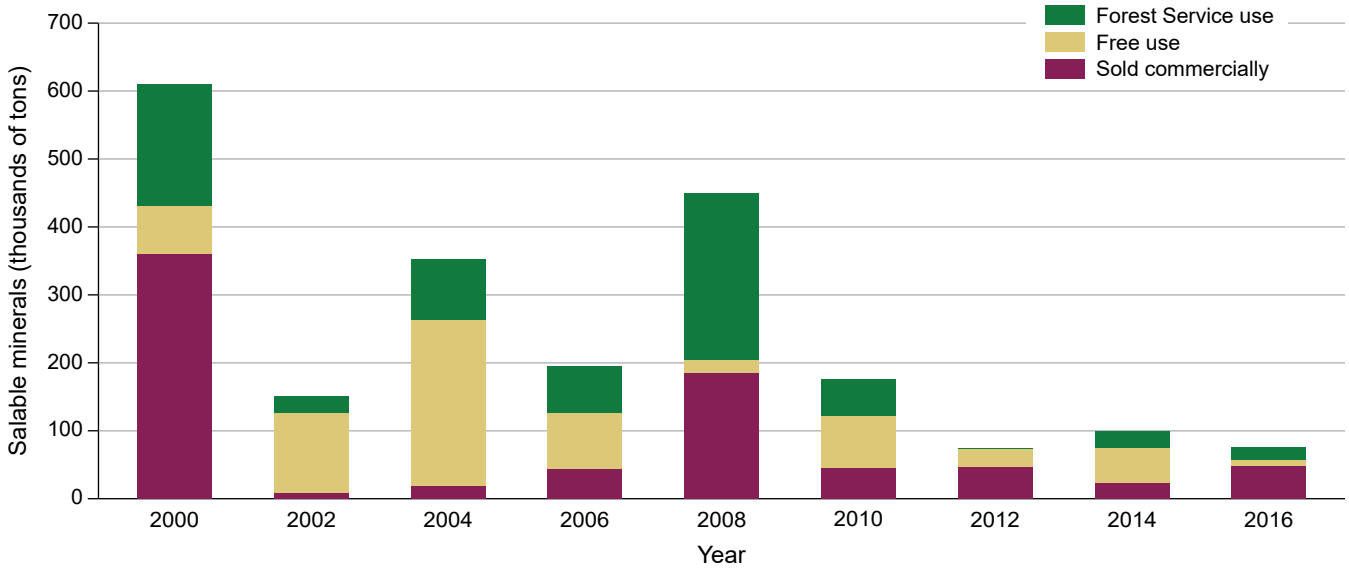

Figure 1.9—Salable mineral production on USDA Forest Service-managed lands in the Northwest Forest Plan area, 2000–2016.

In addition, the Skykomish County Public Utility District conducted geothermal exploratory drilling within the district and within a private land holding on the district with inconclusive results.

Discussion

Little mining occurs on Forest Service- and BLM-managed lands in the NWFP area. No leasable mineral production (e.g., oil and gas) occurs in the area. Data on locatable minerals production is proprietary and not collected. Salable minerals, or mineral materials, (e.g., sand and gravel) are removed throughout the NWFP area. Salable minerals are used primarily for construction and road building. Mineral activities in the NWFP area support regional infrastructure (e.g., aggregate replacement for roads, rip rap, and other materials for flood repairs) and for local or regional economic development (e.g., aggregate and construction materials for residential, commercial, and public works projects). The mineral program on federal lands in the NWFP area supports jobs, income, and raw materials to local and national economies; however, this minor contribution is not measured in this analysis. There are 5,300 jobs in mining stone, sand, gravel, and clay in the NWFP area, which is less than 0.1 percent of total employment in the NWFP area (IMPLAN 2016).

The permit value of salable mineral production on Forest Service lands in the NWFP area is low. The value, according to the displayed data, was above $2 million in 2000, but declined to about $100,000 in 2016 (fig. 1.10). From 2000 to 2016, the economic contribution to the local economy of mineral production on Forest Service lands in the NWFP area has been minor.

Recreation

The vast majority of surveyed Oregon and Washington residents report participating in outdoor recreation (Oregon 2013, Washington 2013). Forest Service- and BLM-managed lands provide a wide variety of motorized and nonmotorized recreation opportunities in the NWFP area. Demographic trends, including population growth, an aging population, growing minority populations, and increasing levels of physical inactivity may affect public demand for the quantity and type of outdoor recreation on public lands in the NWFP area (Oregon 2013).

Data Analysis

Agency recreation data provide information related to the supply of and the demand for recreation opportunities on federal forest lands (USDA FS 2019d; USDI BLM 2019). The 10-year report focuses on recreation supply to assess whether predictable levels of recreation opportunities were produced under the NWFP using the following indicators: acres of wilderness, road miles, number of recreation residences, ski-area visitation, number of outfitter guide permits, the number and capacity of developed sites, as well as recreation visitation. Recreation data before 1999 were unavailable for most of these indicators (Charnley et al. 2006).

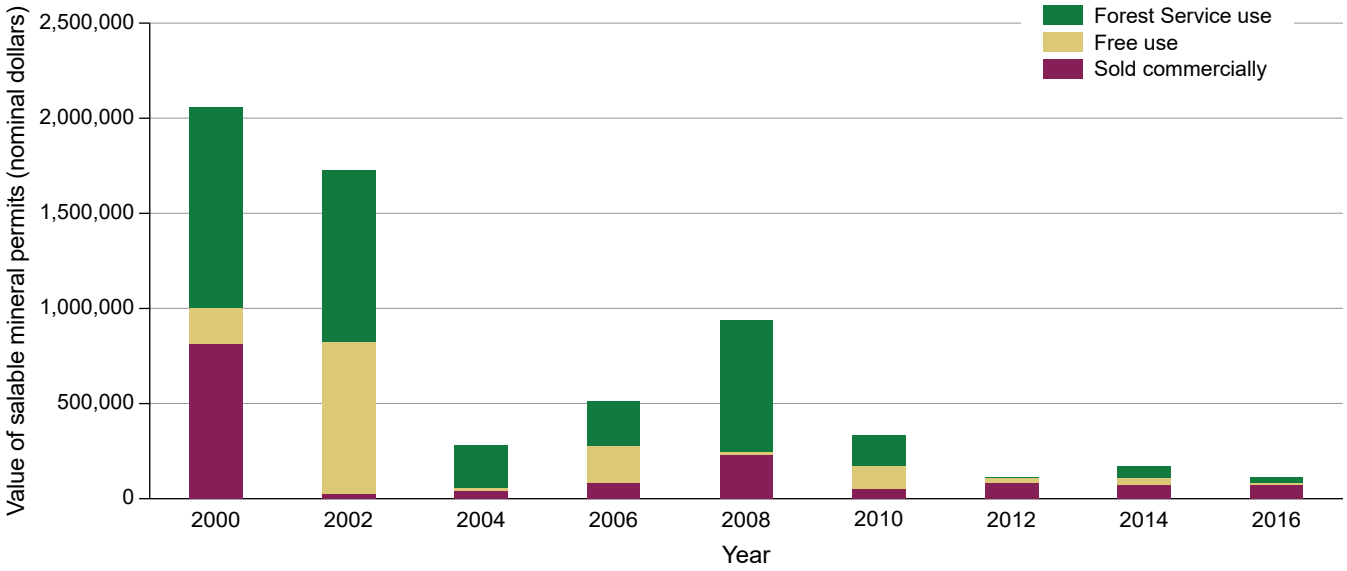

Figure 1.10—Permit value of salable minerals produced on USDA Forest Service-managed lands in the Northwest Forest Plan area, 2000–2016.

Recreation data

Like the previous reports, the 25-year report tracks data on road miles to indicate recreation opportunities as measures of supply and visitation as an estimate of demand. The number of trail miles is not used as an indicator because of the Forest Service's Travel Management Rule, which is a major policy shift in the management of off-highway vehicles and other recreation opportunities. Travel management planning on Forest Service lands masks the potential effects of the NWFP on recreation supply and demand. Other indicators were not used because of the general lack of available and consistent data.

Most of the data are presented and discussed separately for the Forest Service and BLM because the two agencies track recreation differently, and each agency has different data available for different years. The Forest Service develops estimates of the volume of recreation use on national forests through the National Visitor Use Monitoring (NVUM) program. The current methodology has been consistent since 2005. The BLM has maintained recreation data in the Recreation Management Information System in electronic form since 1999. Paper data files for earlier years were not retained by the Oregon State Office. The following sections address data sources and limitations in more detail.

Results

Recreation supply—

The agencies' road systems support numerous recreation opportunities. Road mileage can be used as an indicator of recreation opportunities, including driving for pleasure, which is one of the most popular outdoor recreation activities in the United States (USDA FS 2003). Roads provide access to dispersed recreational opportunities, such as hiking, camping, hunting, and fishing. Roads also serve as recreation sites for individuals who use off-highway vehicles and bikes on Forest Service road systems. The Forest Service and BLM maintain five levels of roads. Level 1 includes roads closed to traffic year-round. Level 2 roads are maintained for high clearance vehicles. Level 3, 4, and 5 roads are maintained for passenger cars, although levels of convenience and comfort vary. Agencies include system road miles in their inventories and are responsible for maintaining these roads. National forests also have "unclassified" roads, which are not managed as part of the forest transportation system. These include abandoned travel ways, roads proposed for decommissioning, and off-road vehicle tracks that are not designated and managed as trails by the agencies. Unclassified roads are not evaluated because the Forest Service does not consistently manage data on them, and they are not intended for public use.

The 15- and 20-year reports included only road mileage for the Forest Service's Pacific Northwest Region. This 25-year report has expanded the results to include the

agency's Pacific Southwest Region and six national forests in the NWFP area. National forests make up slightly more than 89 percent of all Forest Service and BLM lands in the NWFP area. Data for system roads are reported for fiscal years 2003 through 2016. Between those years, the miles of roads classified as level 1—closed to traffic year-round—increased. The mileage in all other maintenance levels decreased (fig. 1.11; table 1.3). The total number of miles of roads open to passenger cars (levels 3–5) decreased by about 3,900 miles between 2003 and 2016. Over the same period, the miles of roads in level 1 increased by approximately 5,000 miles (table 1.3). The reduction in the miles of roads open to passenger vehicles coincided with staffing and budget reductions in the Pacific Northwest Region (see

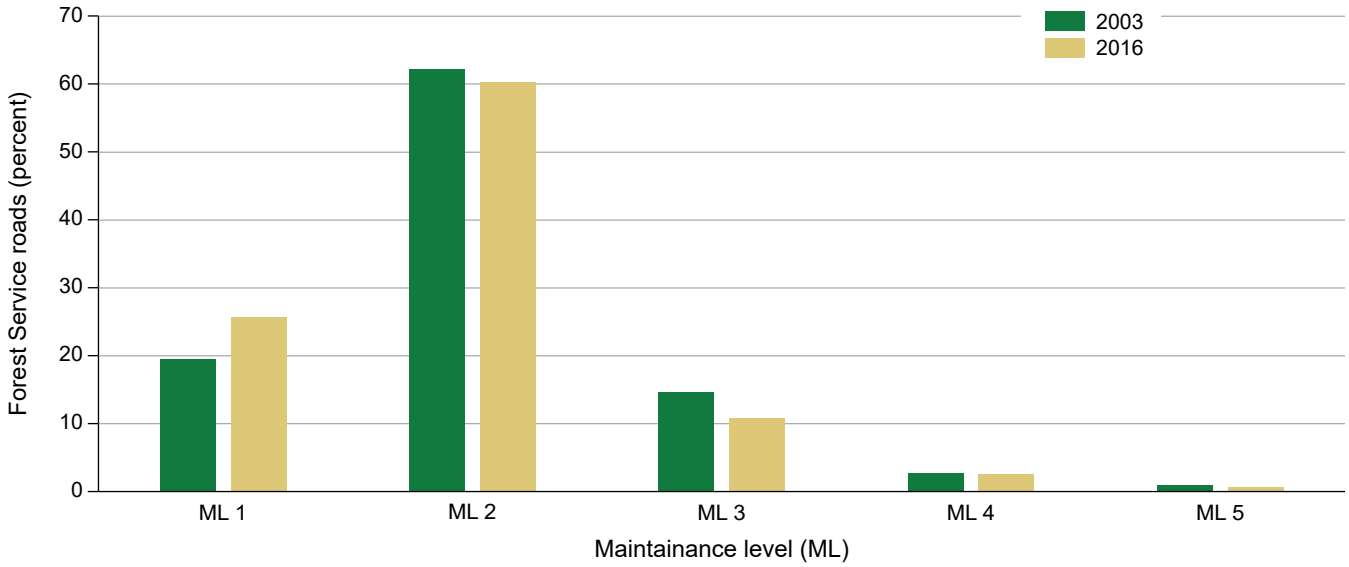

Figure 1.11—Percentage of USDA Forest Service Pacific Northwest and Pacific Southwest Region roads by operational maintenance level (ML) in the Northwest Forest Plan area, 2003 and 2016.

Table 1.3—USDA Forest Service Pacific Northwest and Pacific Southwest Region national forest road miles in the Northwest Forest Plan area by operational maintenance level (ML), 2003–2016

Year	ML 1	ML 2	ML 3	ML 4	ML 5	MLs 3–5	Total
	Miles						
2003	17,119	54,545	12,803	2,367	854	16,024	87,689
2004	18,223	53,126	12,375	2,295	830	15,500	86,849
2005	18,353	54,554	11,179	2,202	753	14,133	87,040
2006	18,638	55,333	10,488	2,041	646	13,175	87,145
2007	18,807	56,712	10,158	2,211	641	13,010	88,529
2008	19,257	56,668	9,577	2,153	625	12,356	88,280
2009	21,678	53,876	9,279	2,139	628	12,046	87,600
2010	22,301	52,743	9,221	2,131	657	12,010	87,055
2011	22,299	52,545	9,177	2,120	657	11,954	86,798
2012	22,294	51,976	9,291	2,116	657	12,064	86,335
2013	22,431	51,930	9,201	2,128	648	11,977	86,337
2014	22,426	51,828	9,200	2,128	648	11,976	86,229
2015	22,070	51,987	9,314	2,172	591	12,077	86,134
2016	22,149	51,875	9,284	2,172	592	12,048	86,072
Change from 2003 to 2016	5,030	-2,670	-3,519	-195	-262	-3,976	-1,616
	Percent					*Percent*	
	29	-5	-27	-8	-31	-25	-2

"Agency Jobs, Unit Reorganizations, and Budgets" below). While some closed roads are redundant and therefore do not impede access, in general, a reduction in road miles indicates a decrease in access and recreation opportunities.

Recreation demand—

Data are available on changing trends in outdoor recreation from the Oregon Parks and Recreation Department (Oregon 2013) and the Conservation Office (Washington 2013). Population growth in Oregon and Washington is increasing demand for outdoor recreation on public land. This trend may be tempered by changes in the social and demographic composition of the population. Changing age structure and income levels of the population correspond to different participation rates in recreational activities. Although participation rates for older Americans are increasing, they are still participating at rates lower than people in other age groups. As the population ages, demand for passive activities may increase. Higher income people participate in outdoor recreation at higher rates than do lower income people.

The growing disparity between wealthy and poor people in the NWFP area, which mirrors that in the nation, may lead to further inequities in opportunities for participation. State recreation planning documents for Oregon and Washington identified this issue as a significant concern for recreation providers (Oregon 2013, Washington 2013). Ethnicity is another important factor in recreation activities in the region. Different ethnic groups participate in outdoor recreation at different rates, exhibit different preferences for specific activities, and use recreation sites in different ways.

Forest Service—

The NVUM program surveys visitors on each national forest in 5-year intervals. In this 25-year monitoring report, the most recent two intervals, or rounds, are presented. Both rounds reflect application of stricter protocols and are therefore comparable. Table 1.4 displays the NVUM results for each NWFP-area national forest. The Wenatchee, Mount Baker-Snoqualmie, Mount Hood, Deschutes, Gifford Pinchot, Siuslaw and Shasta-Trinity National Forests report

Table 1.4—Annual national forests visitations in the Northwest Forest Plan area according to National Visitor Use Monitoring (NVUM) survey rounds 2 and 3

State	National forest	Surveyed	NVUM round 2	Confidence interval[a]	Surveyed	NVUM round 3	Confidence interval[a]
		Fiscal year	*1,000s of visitors*	*Percent*	*Fiscal year*	*1,000s of visitors*	*Percent*
Washington	Okanogan NF	2005	347	74.5	2010	272	32.3
	Wenatchee NF	2005	1405	31.1	2010	1,096	16.9
	Mt. Baker - Snoqualmie NF	2010	1995	20.9	2015	2,185	19.6
	Gifford Pinchot NF	2011	588	29.6	2016	1,169	13.6
	Olympic NF	2010	562	20.2	2015	626	16.5
Oregon	Mt. Hood NF	2011	1947	12.5	2016	2,306	9.4
	Willamette NF	2007	970	16.1	2012	938	16.6
	Siuslaw NF	2011	946	20.8	2016	1,017	13.2
	Deschutes NF	2008	1895	12.3	2013	1,376	11.3
	Umpqua NF	2007	300	25.4	2012	506	25.6
	Winema NF	2008	296	13.9	NA	NA	NA
	Rogue River NF	2007	306	18.1	2012	597	15.9
	Siskiyou NF	2007	514	27.8			
California	Klamath NF	2008	303	35.9	2013	145	22.6
	Six Rivers NF	2008	224	23.4	2013	185	33.7
	Shasta-Trinity NRA	2008	1287	21.8	2013	688	23.9
	Shasta-Trinity Non-NRA	2008	625	24.8	2013	351	27.8
	Mendocino	2008	347	16.6	2013	254	19.4

[a] Confidence interval is 90 percent.

NF = national forest, NRA = national recreation area.

the highest levels of use, with more than 1 million annual visits in each surveyed period. Most of these forests are near urban centers in the NWFP area.

Bureau of Land Management—The Recreation Management Information System data are gathered using a combination of census, sampling, and estimation methods. Figure 1.12 displays the number of recreation visits on BLM districts in the NWFP area. Although visitation declined following a peak between 2007 and 2009, total visitation has been increasing again since 2014. Total visits remain above 1999 levels (fig. 1.12). There is larger variation in visitation trends within districts. Over a 15-year period, the BLM Coos Bay District saw a 21-percent decline, while the agency's Medford District saw a 55-percent increase (table 1.5). These differences are less drastic over the last 5-year period (table 1.5). Across BLM-managed lands in the NWFP area, annual recreation visits grew by 12 percent between 2001 and 2016.

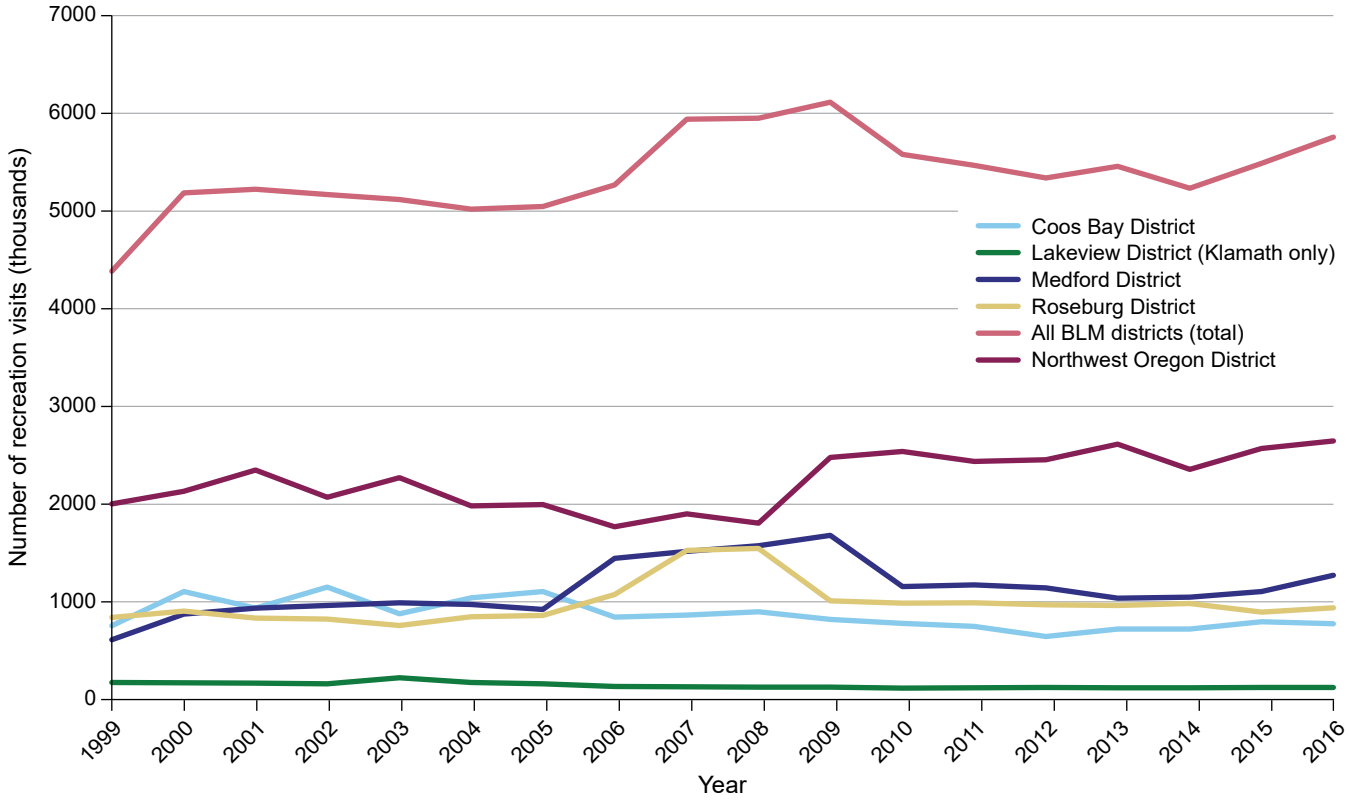

Figure 1.12—Estimated recreation visitation for Bureau of Land Management (BLM) units in the Northwest Forest Plan area by unit and in total, 1999–2016. Note: Salem and Eugene Districts were merged into the Northwest Oregon District in 2016. For comparison reasons, they are shown as merged in this table prior to 2016.

Table 1.5—Change in number of recreation visits to Bureau of Land Management (BLM) districts within the Northwest Forest Plan area over 15-, 10-, and 5-year periods, 2001–2016

	2001–2016 Change	2006–2016 Change	2011–2016 Change
BLM district	*Percent*	*Percent*	*Percent*
Coos Bay	-21	-8	3
Lakeview (Klamath only)	-26	-8	3
Medford	55	-11	6
Roseburg	12	-9	-5
Northwest Oregon	15	46	8
Total	12	8	5

Discussion

The 10-year report concludes that the demand for recreation and tourism grew in the Pacific Northwest during the first decade of NWFP monitoring (Charnley et al. 2006). However, the conclusions were limited because of the agencies' capacity to determine specific trends in recreation opportunities and by the lack of agency regional-scale recreation data for the years before 1999. The indicators for which reliable data were available from 1994 onward were number of designated wilderness acres, number of Forest Service recreation residences, and number of skier days. These indicators represent a minor component of the overall recreation program on agency lands, and they are not closely tied to changes expected under NWFP direction.

For the 25-year report, the quality and quantity of available recreation-related data improved slightly. The study protocol of Forest Service NVUM surveys, however, still presents challenges to tracking trends on National Forest System lands. NVUM is intended to provide a snapshot of the volume of recreation visitation to national forests and grasslands, not trends in recreation visitation use patterns (USDA FS 2019d).

The overall decrease in road mileage also potentially affects the quantity of recreation opportunities associated with driving for pleasure. The miles of roads in levels 3, 4, and 5 show declines leading to fewer opportunities and decreases in quality related to reduced access to dispersed sites and, in combination with increased demand, more crowding at accessible sites. While this reduction is likely to negatively affect those in passenger cars, the increase in the number of level 2 miles may positively affect those using high-clearance vehicles. The effects of these changes in terms of magnitude and quality are unknown.

The "Jobs and Income Associated With Resources and Recreation" section presents the estimates of the economic contribution, in terms of jobs and income, resulting from recreation visitors—both local and nonlocal visitors—to federal lands within the NWFP area.

Jobs and Income Associated With Resources and Recreation

The Pacific Northwest is endowed with natural resources. Federal lands are an important part of the forest resource base, which contribute to socioeconomic well-being by providing a variety of commodities, uses, and services. Forest Service management activities and the production of goods and services contribute to businesses within several sectors. Recreation expenditures contribute directly to lodging and restaurants in the accommodation and food services as well as retail trade sectors; timber production contributes directly to logging in the agriculture and forestry as well as manufacturing sectors; forage production contributes directly to ranching in the agriculture sector; and agency budgets contribute directly to a number of businesses in addition to directly providing public sector employment opportunities. These businesses help the Forest Service and BLM to sustain and restore the ecological integrity of federal lands as well as provide the public with opportunities to use and enjoy forest resources.

This section of the monitoring report presents an assessment of the role that forest resources from Forest Service and BLM lands play in the economy of the NWFP area. The job and income information presented here is from IMPLAN model data primarily based on the U.S. Census County Business Patterns, U.S. Bureau of Labor Statistics Covered Employment and Wages Program, and U.S. Bureau of Economic Analysis Regional Economic Information System. The data are organized by industry or industry group using the North American Industrial Classification System (NAICS). The employment data includes both full- and part-time jobs, and the income data includes wages and proprietor income. Estimates for the self-employed are included, which is important in the logging industry. Income data is reported in 2016 dollars using gross domestic product price deflators.

Factors affecting the NWFP area's industrial composition and associated rates of employment and income over time include changes in technology, industrial diversification and growth, regional competitiveness, product demand, and supply of raw materials. The Forest Service and the BLM directly influence the supply of raw materials, including timber, recreation opportunities, forage, minerals, wildlife, fish, water, and other nontimber forest products. The supply and use of these resources have direct effects on the industries involved in the primary production and conversion of the resources as well as indirect effects on the businesses and workers supporting these industries.

Expectations

The NWFP was designed to support predictable levels of resource outputs and uses within the NWFP area. The emphasis on predictable levels was meant to provide workers and industry with greater certainty about future

investments necessary to maintain and expand their businesses. Prior to the NWFP, many federal policies associated with sustaining rural communities emphasized the connection between resource flows and uses from federal lands and employment.

Data Analysis

An economic contribution analysis estimates the role of federal lands, uses, and management activities on employment and income in the communities that surround Forest Service- and BLM-managed lands for this monitoring report. These estimates come from IMPLAN Professional Version 3.0 with 2016 data. The IMPLAN modeling system allows the user to build regional economic models of one or more counties for a particular year and estimates the economic consequences of activities, projects, and policies on a region. In this case, the 72 counties constitute the area of analysis for the discussions in this section. More explanation of the history behind the inclusion of these 72 counties is provided in chapter 2.

Using IMPLAN, the analysis captures direct, indirect, and induced economic activity in the NWFP area. Direct effects occur in the immediately affected industry. For example, a logging company experiences direct effects from a federal timber sale. Indirect effects occur in industries that supply the directly affected firm. When the logging company buys equipment (e.g., trucks and tools), economic activity increases in other firms in the local area. Induced effects occur when employees of the directly and indirectly affected firms spend their earnings in the local area. Employees purchase housing, food, fuel, and other goods and services. All of these transactions influence local economic activity. In this way, the economic effects of a federal timber sale affect many firms in an economy, not just those in the forestry sector.

The 10-year monitoring report covers 1990 through 2000 and is organized by industry or industry group using the Standard Industrial Classification (SIC) system. The more recent IMPLAN data, 2001 and later, are organized by industry or industry group using the NAICS. The IMPLAN datasets are selected because they interpret data from a variety of published government sources to fully disclose disaggregated employment and income for individual counties. This disclosure provides the ability to identify individual industries, such as the primary and secondary wood products processing sectors, in the NWFP monitoring area.

The IMPLAN data also include estimates for the self-employed, which are especially important in the logging industry. IMPLAN data are used in this section to provide specific timber industry-level detail not available in Bureau of Labor Statistics and other readily available datasets. The 10-year report uses data from Christensen et al. (2000) to identify whether the counties were metropolitan or nonmetropolitan. The 20- and 25-year report use updated 2011 metropolitan and nonmetropolitan data obtained from the Bureau of Labor Statistics website. The quantity of resource outputs and uses for estimating employment and income associated with Forest Service- and BLM-managed lands in this section is taken from previous sections of this report.

A change in timber industry output generates changes in purchases from supporting industries and expenditures by employees, known as indirect and induced effects. To estimate timber-related indirect and induced employment and income, IMPLAN impact models were built for the region to produce employment and income multipliers based on the effects of a final demand change in the timber industry. Recreation-related employment and income cannot be defined using a single tourism industry. Recreation dollars are spent on a variety of goods and services. Associated employment and income were generated by building IMPLAN impact models to identify the direct, indirect, and induced employment and income associated with the total expenditures by the recreation users. The expenditure patterns are based on data identified in the NVUM program. The methods to derive these data are presented in "Spending Patterns of Outdoor Recreation Visitors to National Forests" (White 2017).

The following sections discuss results for timber, other forest products, and recreation. The data identifying the trends in timber flows are readily available, and the relationships between timber flows and employment are generally known, so the analysis of timber's contributions to employment and income are the most extensive. Little or no comparable data are available for nontimber forest products.

Results

Timber-related jobs and income—

Sector totals—The timber industry became a major economic force in the NWFP area in the mid-19th century. The industry had a dominant role in the region's economy until the 1960s. During the past half century, the timber

industry's significance declined relative to the region's economy. An examination of the past decade reveals continued shifts in timber sector employment. In 2001, there were more than 100,000 jobs in the NWFP area in timber-related sectors, including logging and primary and secondary processing. By 2016, however, the number of jobs in those sectors dropped by nearly 30 percent to 70,000 jobs (table 1.6). This was not a continuous decline, between 2012 and 2016, there was a modest increase from 65,000 to 70,000 jobs across all timber-related sectors.

Timber-related jobs and income are in logging, solid wood product manufacturing, and pulp and paper processing. Solid wood manufacturing and pulp and paper processing can be further subdivided into primary and secondary manufacturing industries. Primary processing in solid wood manufacturing includes sawmills, wood preservation, and veneer and plywood mills. Secondary manufacturing in solid wood products includes industries, such as mill work, reconstituted wood products, and cabinetry. Primary processing in pulp and paper includes pulp, paper, and paperboard mills. Secondary manufacturing in pulp and paper includes paperboard containers, paper bags, and stationery.

Employment in all timber-related industries increased between 2012 and 2016 in the NWFP area but remains below 2008 levels (fig. 1.13). Logging, primary solid wood manufacturing, and secondary wood manufacturing all saw sharp declines in employment between 2008 and 2009. This decline in timber-related industries coincided with the recession. Since then, employment in these industries has experienced increases, but has not returned to 2008 levels. Likewise, income in timber-related industries declined after 2008 (fig. 1.14). However, the decline in income was less stark than the decline in employment. Both metropolitan and nonmetropolitan areas in the NWFP area saw employment decline in all timber-related sectors between 2001 and 2016 (table 1.6). Timber-related industries account for a larger share of employment and income in nonmetropolitan counties in the NWFP area. Therefore, the decline of timber-related industries may be experienced more acutely in rural areas.

In both urban and rural areas of the NWFP area, however, timber harvesting and processing is declining as a share of total employment. In 2001, more than 12 percent of jobs in nonmetropolitan counties were in the timber sector. In 2016, it had declined to 3 percent. During the same period, however, total nonmetropolitan employment in the NWFP area increased more dramatically than metropolitan employment. Declines in the timber industry were more than offset by growth in other sectors. Although overall employment increased, changes in the relative significance of various sectors changed. If new jobs do not match existing worker skills, then the changes may increase unemployment. The mismatch between skills and job requirements may be

Table 1.6—Change in number of metropolitan and nonmetropolitan jobs in the Northwest Forest Plan area, 2001 and 2016

	2001	2016	Change (2001–2016)	Change (2001–2016)
Metropolitan jobs	*No. of jobs*	*No. of jobs*	*No. of jobs*	*Percent*
Logging	9,914	8,542	-1,372	-13.8
Primary solid wood mfg	13,001	10,565	-2,436	-18.7
Secondary wood mfg	19,763	12,663	-7,100	-35.9
Primary pulp and paper	5,567	3,944	-1,623	-29.2
Secondary paper	7,259	5,079	-2,180	-30.0
All wood related	55,503	40,791	-14,712	-26.5
All industries	5,387,931	6,480,766	1,092,835	20.3
Nonmetropolitan jobs				
Logging	10,498	7,921	-2,577	-24.5
Primary solid wood mfg	19,244	11,804	-7,440	-38.7
Secondary wood mfg	10,210	7,244	-2,966	-29.1
Primary pulp and paper	7,589	2,309	-5,280	-69.6
Secondary paper	1,428	382	-1,046	-73.3
All wood related	48,970	29,660	-19,310	-39.4
All industries	410,577	919,447	508,870	123.9

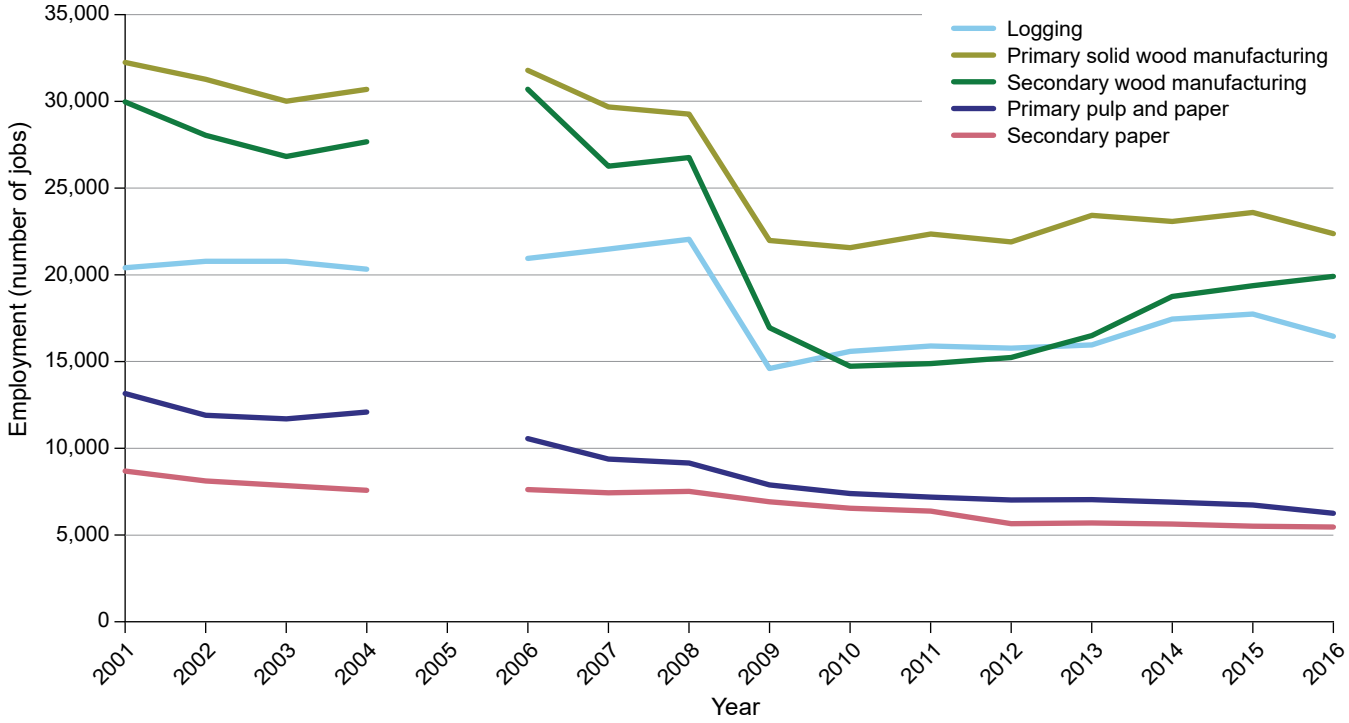

Figure 1.13—Timber-related industry employment in the Northwest Forest Plan area, 2001–2016. Note: The 2004–2006 gap in data is carried over from the Northwest Forest Plan 15- and 20-year reports.

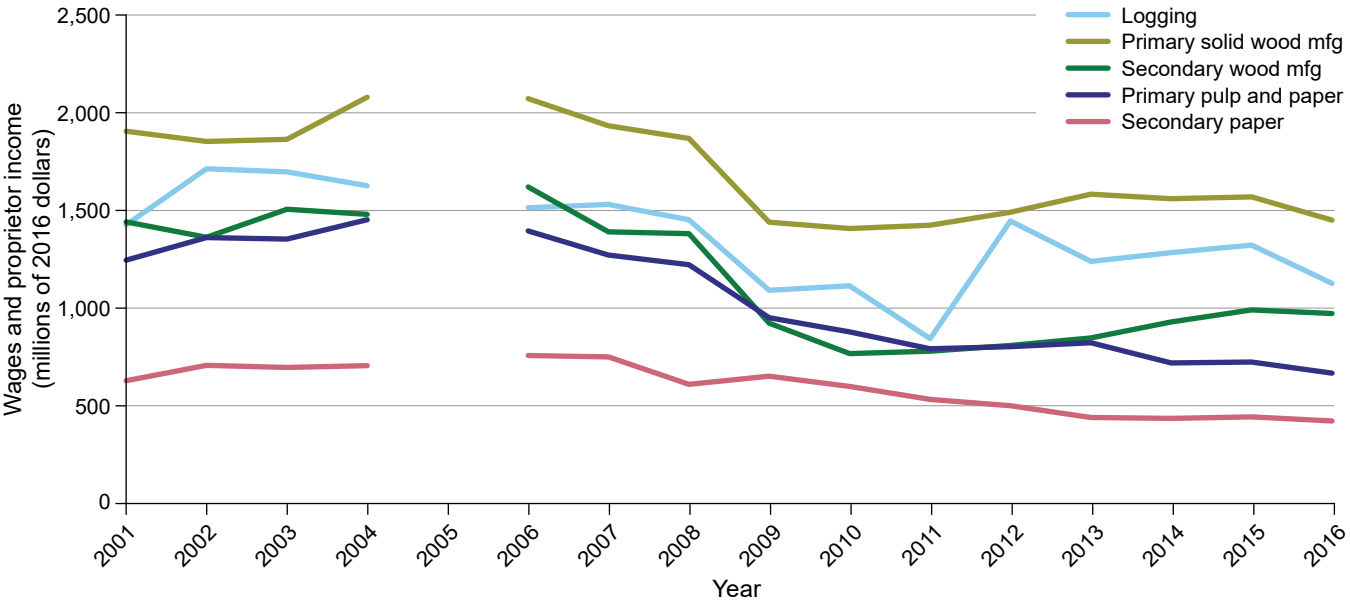

Figure 1.14—Timber industry wages and proprietor income, Northwest Forest Plan area, 2001–2016. Note: the 2004–2006 gap in data is carried over from the Northwest Forest Plan 15- and 20-year reports.

exacerbating unemployment in nonmetropolitan counties, where the unemployment rate exceeds the metropolitan unemployment rate in all three NWFP area states.

Timber harvest rates varied since 1994. The slumps are typical of national economic downturns, such as the large recession of the mid-2000s. Forest Service and BLM harvests in the NWFP area ranged between 2 and 6 BBF (fig. 1.1). The other ownership harvests ranged between 4.4 and 8 BBF. Because economic recessions and recoveries affect all owners, the peaks and valleys in harvest levels generally coincided across all ownerships. The result was that total harvest levels varied between 4.9 and 8.6 BBF in the NWFP area.

Although there is a strong, direct cause-and-effect relationship between timber harvest levels and the number of timber industry jobs and income, this relationship was affected by industry restructuring that included adjusting the amounts of logs exported and imported, the closure of less efficient mills that were unable to compete under new log supply market conditions, and technological change (FEMAT 1993).

Pressure from international competition may induce efficiencies in the timber sector. Fewer logging and primary wood manufacturing employees are needed for each million board feet of timber (fig. 1.15). This suggests employees are becoming more productive and the timber sector is becoming less labor-intensive. Despite increased labor productivity, average annual real incomes in timber-related sectors are similar in 2001 and 2016 (fig. 1.16). Therefore, individuals in that sector are comparably compensated as they were 15 years ago.

Imports steadily increased as exports decreased until 2005 when they offset each other. The import and export trends reversed beginning in 2006, lowering the number of logs available for timber processing industries in the NWFP

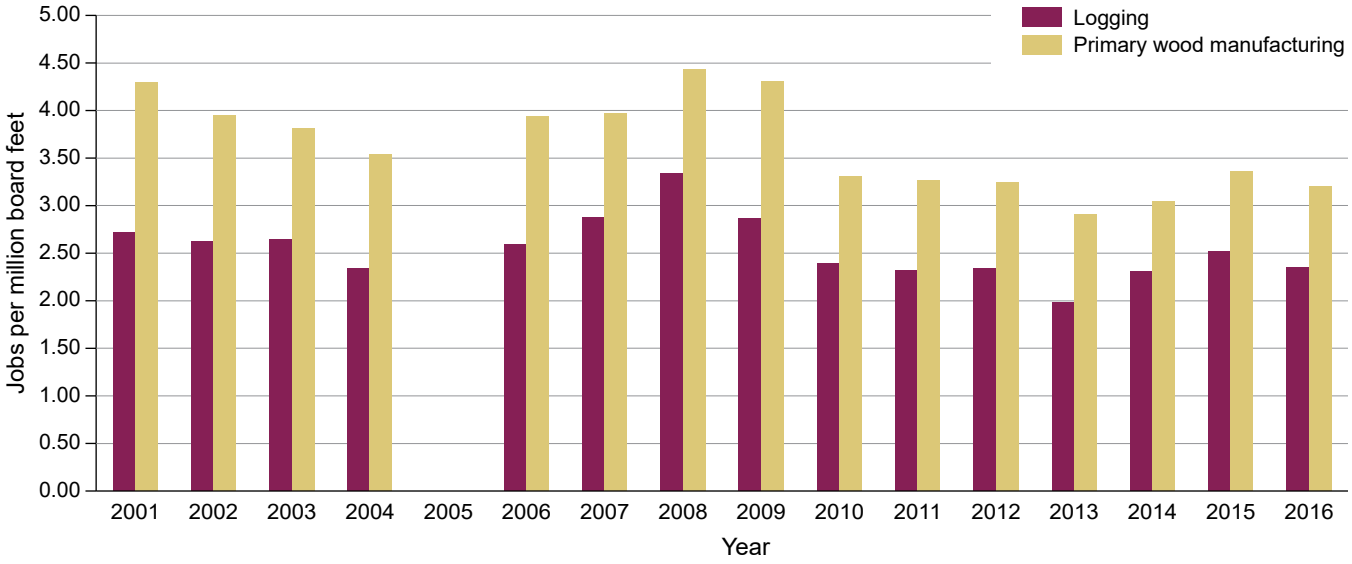

Figure 1.15—Logging and primary wood manufacturing jobs per million board feet of timber harvested from all ownerships in the Northwest Forest Plan area, 2001–2016.

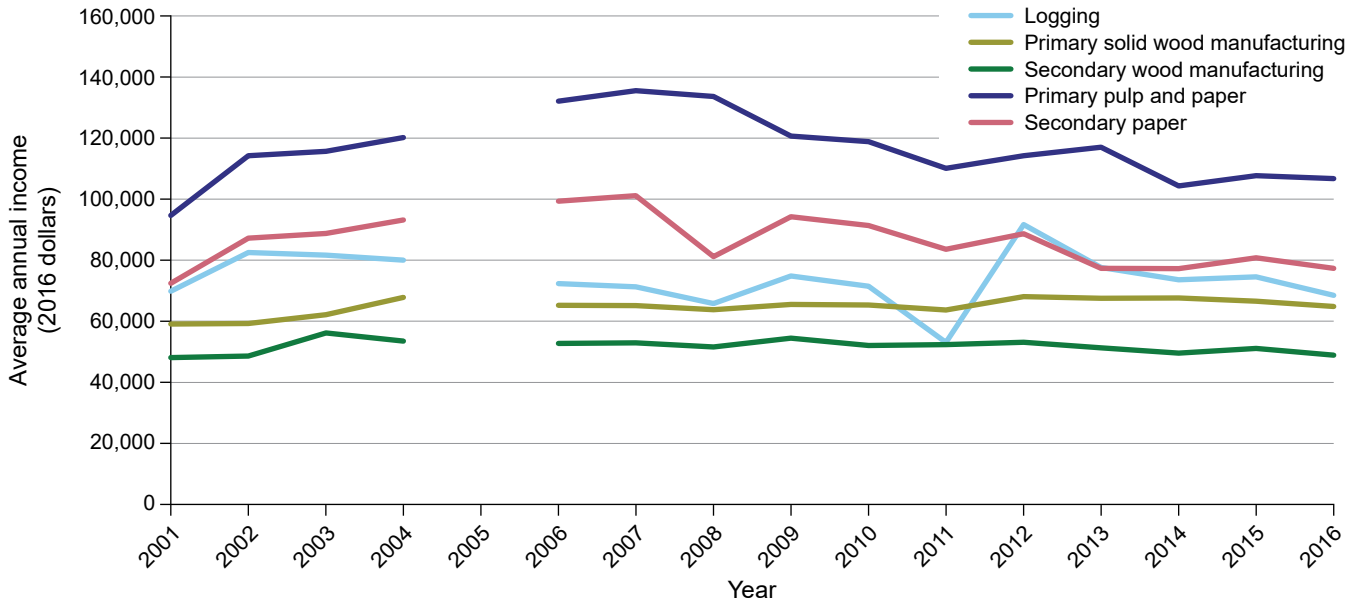

Figure 1.16—Timber-related industry average annual real income in the Northwest Forest Plan area, 2001–2016.

area. Because timber industry employment and income are based on the quantity of logs processed, the net exports are subtracted from the timber harvest amounts to approximate the volume of logs available for processing by local primary wood products industries in the NWFP area (fig. 1.17). Decreasing exports have mitigated some of the effects of the federal harvest reductions.

The 10-year report showed that about two-thirds of the primary wood products employment was lost in the first half of the 1990s and that the rate of decline was much slower at the end of the decade. Although most of the job losses were associated with the decline in volume harvested, some of the losses were also due to technological changes in the primary wood manufacturing industries. To identify potential changes in employment opportunities related to technological advancements, employment in the primary wood products manufacturing and in logging is compared to the volume available to these industries each year from 2001 through 2012. The logging industry is identified separately because this work is done whether the logs are processed locally or exported out of the NWFP area. To identify direct jobs per million board feet of timber harvest, employment in the remaining primary wood products industries is compared to the volume available to these industries. These data are presented in table 1.7.

The jobs per million board feet have fluctuated in both the logging industry and primary wood manufacturing over the years 2001 through 2016. Both the manufacturing and logging sectors saw a 13-percent decline in jobs per million board feet between 2001 and 2016 (table 1.7).

Forest Service and Bureau of Land Management contributions—

IMPLAN was used to estimate the economic contribution in terms of jobs and income related to the harvest on federal lands within the NWFP area. In 2016, timber harvested from Forest Service- and BLM-managed lands in the NWFP area and processed in the region supported approximately 3,500 direct jobs and an additional 5,300 indirect and induced jobs throughout the 72 counties (fig. 1.18). These jobs occur both within timber sectors, but also in other supporting sectors.

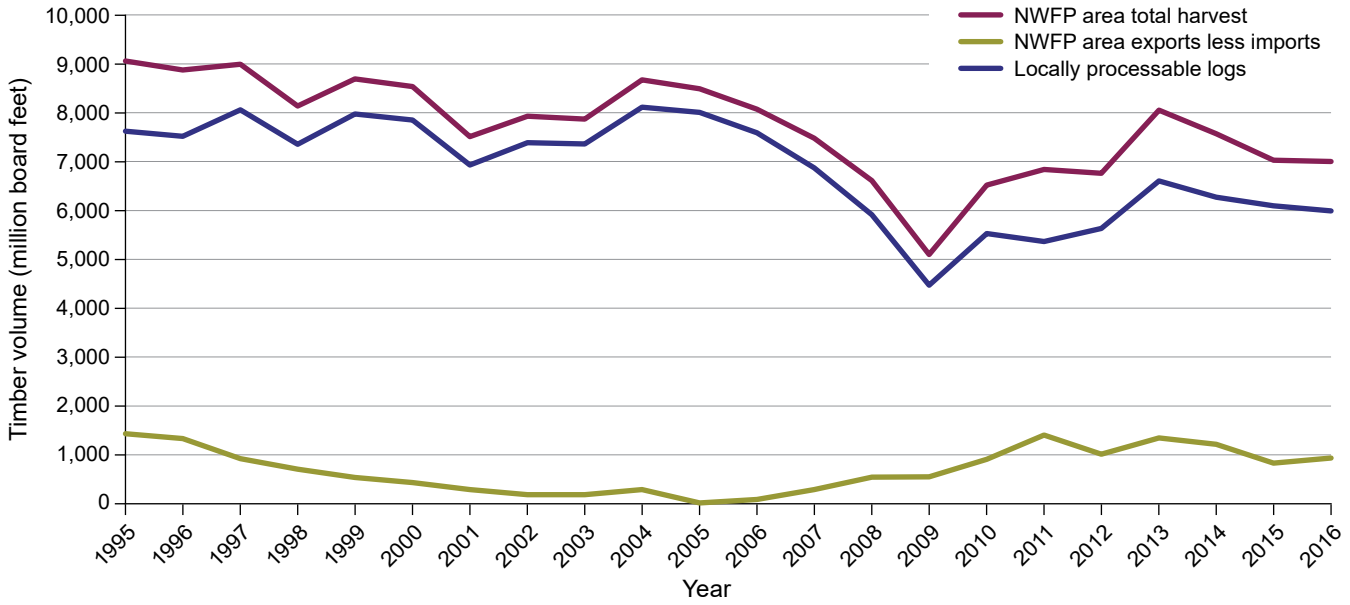

Figure 1.17—Timber harvest (all ownerships), net exports (exports less imports), and volume available for local processing in the Northwest Forest Plan (NWFP) area, 1995–2016.

Nontimber forest industries—

Several nontimber forest-based industries are significant to employment in the Pacific Northwest. The 10-year report discusses these industries and their associated employment to identify potential trends that may be associated with NWFP implementation. As with the 15- and 20-year

Table 1.7—Employment for logging and primary wood manufacturing in the Northwest Forest Plan area, 2001–2016

Year	Logging	Primary wood manufacturing	Total employment	Total harvest	Harvest not exported	Logging jobs per million board feet of harvest	Primary wood manufacturing jobs per million board feet of harvest
	Number of jobs			*Million board feet*		*Number of jobs*	
2001	20,412	32,245	52,657	7,508	6,930	2.7	4.3
2002	20,777	31,273	52,050	7,927	7,388	2.6	3.9
2003	20,777	30,019	50,795	7,866	7,360	2.6	3.8
2004	20,322	30,686	51,007	8,672	8,112	2.3	3.5
2005	NA	NA	NA	8,490	8,008	NA	NA
2006	20,930	31,790	52,720	8,072	7,591	2.6	3.9
2007	21,480	29,685	51,165	7,474	6,869	2.9	4.0
2008	22,048	29,269	51,317	6,613	5,914	3.3	4.4
2009	14,598	21,978	36,576	5,099	4,471	2.9	4.3
2010	15,585	21,565	37,150	6,519	5,528	2.4	3.3
2011	15,900	22,375	38,275	6,841	5,362	2.1	3.3
2012	15,768	21,891	37,659	6,758	5,631	2.3	3.9
2013	15,969	23,429	39,398	8,055	6,606	2.0	3.5
2014	17,442	23,069	40,512	7,571	6,274	2.3	3.7
2015	17,735	23,594	41,329	7,027	6,094	2.5	3.9
2016	16,463	22,369	38,831	6,999	5,991	2.4	3.7

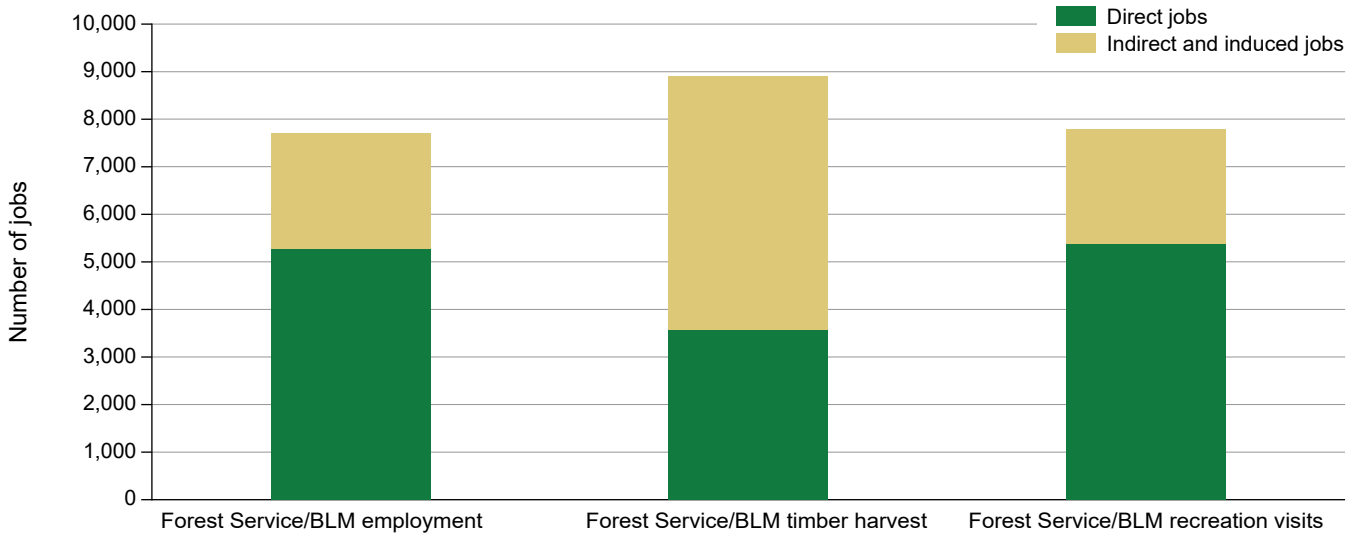

Figure 1.18—Employment supported by Forest Service and Bureau of Land Management (BLM) in the Northwest Forest Plan area, 2016.

reports, this 25-year report does not carry forward the analysis completed for the 10-year report. The switch from the SIC system to the NAICS system made comparisons of industry data before 2001 to data for 2001 and later not possible; Forest Service- and BLM-related employment in these industries was a small contribution, and there was relative employment stability within these industries.

Recreation—

Forest-based recreation associated with the national forest and BLM lands under the NWFP included activities such as off-road vehicle use, sightseeing, hiking, camping, hunting, fishing, boating, rafting, bicycling, and winter sports. Measuring the number of people employed in association with these activities is not easy. Millions of visitors recreate

on Forest Service- and BLM-managed lands in the NWFP area. The annual number of visits was estimated at 19.5 million, with 5.8 million to BLM-managed lands and 13.7 million to Forest Service-managed lands in the NWFP area (see the "Recreation" section above). Visitors to Forest Service- and BLM-managed lands in the NWFP area spend money on lodging, restaurants, souvenirs, and other trip-related expenses. In 2016, recreational visitors to Forest Service and BLM lands supported approximately 5,400 direct jobs and 2,400 indirect and induced jobs in the NWFP area (fig. 1.18). Recreational visitor spending, therefore, is an important source of economic activity associated with Forest Service and BLM management in the NWFP area.

Grazing—

There were approximately 11,000 jobs in the cattle ranching and farming sector across the NWFP area, which is approximately 0.2 percent of overall employment in the area (IMPLAN 2016). The contribution of the cattle ranching and farming sector to income is even smaller—0.05 percent—which indicates that livestock grazing jobs pay much less than other jobs in the NWFP area (IMPLAN 2016).

In 2016, about half of employment in cattle ranching and farming jobs was in nonmetropolitan NWFP-area counties (5,900) (IMPLAN 2016). The relative contribution of the cattle ranching and farming sector to total employment is much higher in nonmetropolitan counties owing to the smaller labor market. About 0.6 percent of employment in nonmetropolitan NWFP-area counties was in cattle ranching and farming compared to less than 0.01 percent in metropolitan counties (IMPLAN 2016). The 20-year report found about 0.8 percent of employment in nonmetropolitan NWFP-area counties was in cattle ranching and farming (IMPLAN 2012). The overall contribution of grazing to economic activity remains minor across the NWFP area. The "Jobs and Income Associated With Resources and Recreation" section presents more information on the economic contribution, in terms of jobs and income, resulting from federal grazing management.

The employment and income data include all types of cattle ranching and farming, including feedlots. Federal forage constitutes a small share of this sector. In 2016, about 100,000 AUMs were authorized on Forest Service lands in the NWFP area, similar to the 2012 authorized level (fig. 1.7). This represents a small increase in authorized AUMs since 2006. However, authorized use has fluctuated considerably since 2006, suggesting that the increase does not reflect a trend.

Agency Jobs, Unit Reorganizations, and Budgets

The Forest Service and BLM employ thousands of individuals throughout the NWFP area. The agencies provide quality jobs in rural communities by offering permanent full-time and seasonal or part-time jobs. Part-time jobs can be a component of a broader livelihood strategy for people engaged in several pursuits. Seasonal jobs are especially important for young people looking for summer work. Table 1.8 identifies the NWFP-area units included in this analysis.

Table 1.8—Northwest Forest Plan (NWFP) units included in the analysis of employment and income contributions of Forest Service and Bureau of Land Management (BLM) lands to surrounding communities

Agency and state	National forest/BLM district
Forest Service:	
Washington	Gifford Pinchot National Forest
	Mount Baker-Snoqualmie National Forest
	Okanogan National Forest
	Olympic National Forest
	Wenatchee National Forest
Oregon	Deschutes National Forest
	Mount Hood National Forest
	Rogue River National Forest
	Siskiyou National Forest
	Siuslaw National Forest
	Umpqua National Forest
	Willamette National Forest
California	Klamath National Forest
	Mendocino National Forest
	Shasta-Trinity National Forest
	Six Rivers National Forest
Bureau of Land Management:	
Oregon	Coos Bay District
	Eugene District
	Medford District
	Roseburg District
	Salem District

Note: the Winema National Forest is within the NWFP area, but it was administratively combined with the Fremont National Forest in 2002. The Winema National Forest was dropped from this analysis because data specific to the forest are no longer readily available.

Agency Jobs

It was estimated that rural communities in the NWFP area would lose fewer than 2,000 Forest Service jobs. Potential staffing changes were not estimated for the BLM (as modified from Charnley et al. 2006).

Data analysis—

This report uses similar data to previous reports and extends the time series through 2016. The data are reported by BLM state and national forest region. The Winema National Forest is excluded from this dataset as it was administratively combined with the Fremont National Forest. There are no trends at the unit level that provide a distinctly different picture than the one provided at the agency scale. The unit data are not included in this report.

Results and discussion—

Forest Service data show that employment on NWFP-area forests in Oregon and Washington (the agency's Pacific Northwest Region) has been declining since 1993. However, because of a jump in reported agency employment in 2013, total agency employment appears to be 18 percent higher in 2016 compared to 2012 (fig. 1.19). In 2016, NWFP-area forests in the Pacific Northwest Region had 3,100 employees, while in 1993, they had 5,700 employees (fig. 1.19). The decline in employment on NWFP-area forests in California has been less steep than the decline in the NWFP area overall. Over the 25-year period, agency employment fell 27 percent. However, Forest Service data show that between 2012 and 2016, employment on NWFP-area forests in California increased 19 percent (fig. 1.19). The BLM units in the NWFP area employ far fewer people than the Forest Service. Between 2012 and 2016, the number of BLM employees in the NWFP area fell from about 1,000 to 830. This remains above the 25-year employment lows experienced in the mid-2000s (fig. 1.19). These data differ from the results presented in chapter 2, which uses U.S. Office of Personnel Management data.

Unit Reorganizations

Although staffing losses were projected for the Forest Service, a change in the distribution of agency offices was not expected. The distribution of offices housing field-unit line officers is used as an indicator to measure the presence of empowered agency officials in NWFP-area communities (Charnley et al. 2006). The data analyzed in the 10-year report compares 1990 and 2004. The year 2010 was added to the dataset for the 15-year report. The 2010 data were gathered from agency websites and agency contact lists. Data were updated for 2016.

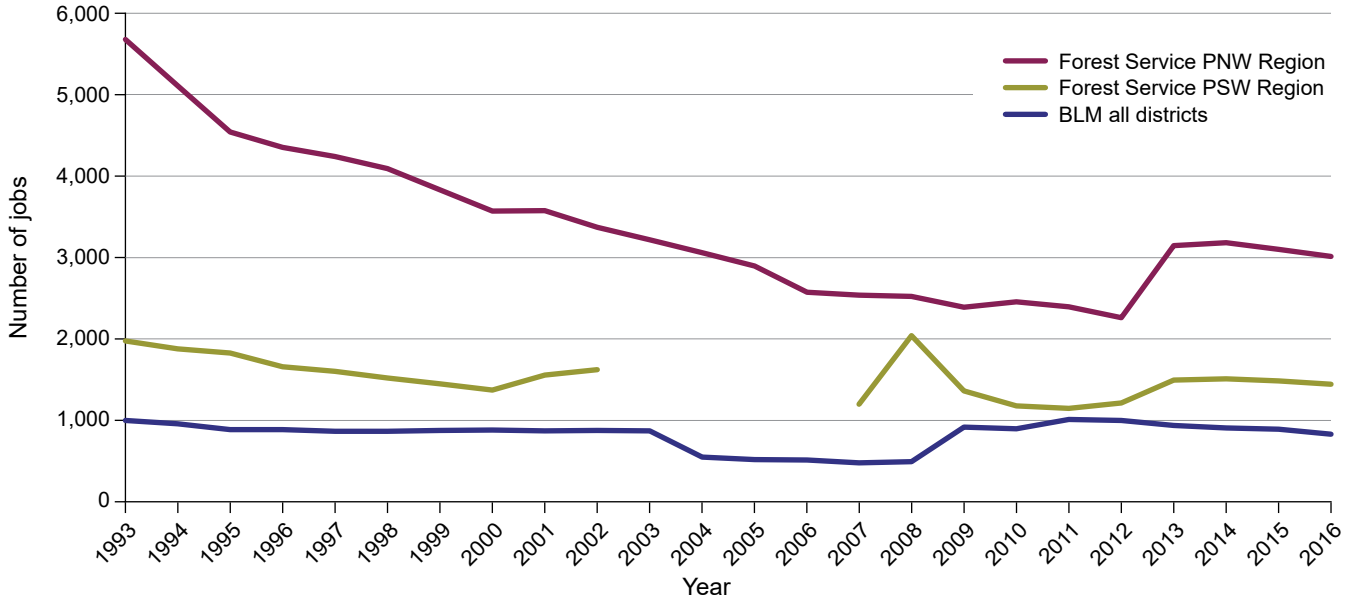

Figure 1.19—USDA Forest Service Pacific Northwest (PNW) and Pacific Southwest (PSW) Regions, and all Bureau of Land Management (BLM) employment in the Northwest Forest Plan area, 1993–2016. Note: the 2003–2006 gap in data is carried over from the Northwest Forest Plan 15- and 20-year reports.

Table 1.9—Forest Service and Bureau of Land Management offices with line officers in the Northwest Forest Plan area, select years

1990	2004	2010 and 2016
Forest Service offices in Washington		
Vancouver (Gifford Pinchot SO)	**Vancouver (Gifford Pinchot SO)**	**Vancouver (Gifford Pinchot SO)**
Randle RD	Randle (Cowlitz Valley RD)	Randle (Cowlitz Valley RD)
Trout Lake (Mount Adams RD)	Trout Lake (Mount Adams RD)	Trout Lake (Mount Adams RD)
Amboy (Mount St. Helens NM)	Amboy (Mount St. Helens NM)	Amboy (Mount St. Helens NM)
Packwood RD		
Carson (Wind River RD)		
Mountlake Terrace (Mount Baker-Snoqualmie SO)	**Mountlake Terrace (Mount Baker-Snoqualmie SO)**	**Mountlake Terrace (Mount Baker-Snoqualmie SO)**
Sedro Woolley (Mount Baker RD)	Sedro-Woolley (Mount Baker RD)	Sedro-Woolley (Mount Baker RD)
Darrington RD	Darrington RD	Darrington RD
Skykomish RD	Skykomish RD	Skykomish RD
North Bend RD	North Bend (Snoqualmie RD)	North Bend (Snoqualmie RD)
Enumclaw (White River RD)		
Wenatchee (Wenatchee SO)	**Wenatchee (Okanogan and Wenatchee SO)**	**Wenatchee (Okanogan and Wenatchee SO)**
Chelan RD	Chelan RD	Chelan RD
Cle Elum RD	Cle Elum RD	Cle Elum RD
Entiat RD	Entiat RD	Entiat RD
Lake Wenatchee RD		
Leavenworth RD	Leavenworth (Lake Wenatchee/ Leavenworth RD)	Leavenworth (Wenatchee River RD)
Naches RD	Naches RD	Naches RD
Okanogan (Okanogan SO)		
Winthrop RD	Winthrop (Methow Valley RD)	Winthrop (Methow Valley RD)
Twisp RD		
Tonasket RD	Tonasket RD	Tonasket RD
Olympia (Olympic SO)	**Olympia (Olympic SO)**	**Olympia (Olympic SO)**
Hoodsport (Hood Canal RD)	Hoodsport (Hood Canal RD)	Hoodsport (Hood Canal RD)
Quilcene RD		
Quinault RD		
Forks (Soleduck RD)	Forks (Soleduck RD)	Forks (Pacific RD)
Forest Service offices in Oregon		
Bend (Deschutes SO)	**Bend (Deschutes SO)**	**Bend (Deschutes SO)**
Bend RD	Bend RD	Bend (Bend-Fort Rock RD)
Crescent RD	Crescent RD	Crescent RD
Sisters RD	Sisters RD	Sisters RD

Table 1.9—Forest Service and Bureau of Land Management offices with line officers in the Northwest Forest Plan area, select years (continued)

1990	2004	2010 and 2016
Medford (Rogue River SO)	**Medford (Rogue River and Siskiyou SO)**	**Medford (Rogue River and Siskiyou SO)**
Jacksonville (Applegate RD)	Jacksonville (Applegate RD)	
Ashland RD	Ashland RD	Ashland (Siskiyou Mountains, RD)
Butte Falls RD	Butte Falls RD	
Prospect RD	Prospect RD	Prospect (High Cascades RD)
Grants Pass (Siskiyou SO)		
Brookings (Chetco RD)	Brookings (Chetco RD)	
Grants Pass (Galice RD)	Grants Pass (Galice RD)	Grants Pass (Wild Rivers RD)
Gold Beach RD	Gold Beach RD	Gold Beach RD
Cave Junction (Illinois Valley RD)	Cave Junction (Illinois Valley RD)	
Powers RD	Powers RD	Powers RD
Corvallis (Siuslaw SO)	**Corvallis (Siuslaw SO)**	**Corvallis (Siuslaw SO)**
Alsea RD		
Waldport (Alsea/Waldport RD)		Waldport (Central Coast RD)
Hebo RD	Hebo RD	Hebo RD
Mapleton RD	Florence (South Zone RD)	
Reedsport (Oregon Dunes NRA)	Reedsport (Oregon Dunes NRA)	
Roseburg (Umpqua SO)	**Roseburg (Umpqua SO)**	**Roseburg (Umpqua SO)**
Cottage Grove RD	Cottage Grove RD	Cottage Grove RD
Tiller RD	Tiller RD	Tiller RD
Toketee (Diamond Lake RD)	Toketee (Diamond Lake RD)	Toketee (Diamond Lake RD)
Glide (North Umpqua RD)	Glide (North Umpqua RD)	Glide (North Umpqua RD)
Eugene (Willamette SO)	**Eugene (Willamette SO)**	**Eugene (Willamette SO)**
Westfir (Oak Ridge RD)	Westfir (Middle Fork RD)	Westfir (Middle Fork RD)
Oakridge (Rigdon RD)		
Lowell RD		
Blue River RD		
McKenzie Bridge (McKenzie RD)	McKenzie Bridge (McKenzie River RD)	McKenzie Bridge (McKenzie River RD)
Sweet Home RD	Sweet Home RD	Sweet Home RD
Mill City/Detroit (Detroit RD)	Mill City/Detroit (Detroit RD)	Mill City/Detroit (Detroit RD)
Sandy (Mount Hood SO)	**Sandy (Mount Hood SO)**	**Sandy (Mount Hood SO)**
Dufur (Barlow RD)	Dufur (Barlow RD)	Dufur (Barlow RD)
Maupin (Bear Springs RD)		
Estacada (Clackamas RD)	Estacada (Clackamas RD)	Estacada (Clackamas RD)
Troutdale (Columbia Gorge RD)		
Mount Hood-Parkdale (Hood River RD)	Mount Hood-Parkdale (Hood River RD)	Mount Hood-Parkdale (Hood River RD)
Zigzag RD	Zigzag RD	Zigzag RD

Table 1.9—Forest Service and Bureau of Land Management offices with line officers in the Northwest Forest Plan area, select years (continued)

1990	2004	2010 and 2016
Klamath Falls (Winema SO)	**Klamath Falls (Winema SO)**	
Chemult RD	Chemult RD	Chemult RD
Chiloquin RD	Chiloquin RD	Chiloquin RD
Klamath Falls (Klamath RD)	Klamath Falls (Klamath RD)	Klamath Falls (Klamath RD)
Forest Service offices in California		
Yreka (Klamath SO)	**Yreka (Klamath SO)**	
Klamath River (Oak Knoll RD)		
Happy Camp RD	Happy Camp RD	Happy Camp (Happy Camp/Oak Knoll RD)
Etna (Salmon River RD)		
Mount Hebron (Goosenest RD)	Mount Hebron (Goosenest RD)	Mount Hebron (Goosenest RD)
Orleans (Ukonom RD)		
Fort Jones (Scott River RD)	Fort Jones (Salmon River and Scott River RDs)	Fort Jones (Salmon River and Scott River RDs)
Willows (Mendocino SO)	**Willows (Mendocino SO)**	**Willows (Mendocino SO)**
Covelo RD		Covelo (Covelo RD)
Upper Lake RD	Upper Lake (Covelo and Upper Lake RDs)	Upper Lake (Upper Lake RD)
Stonyford RD	Willows (Grindstone RD)	Willows (Grindstone RD)
Corning RD		
Redding (Shasta-Trinity SO)	**Redding (Shasta-Trinity SO)**	**Redding (Shasta-Trinity SO)**
Big Bar RD		
Hayfork (Yolla Bolla and Hayfork RDs)	Hayfork (Hayfork and Yolla Bolly RDs)	Hayfork (Hayfork and Yolla Bolly RDs)
Weaverville (Weaverville and Redding RDs)	Weaverville (Big Bar and Weaverville RDs)	Weaverville (Big Bar and Weaverville RDs)
Mountain Gate/Redding (Shasta Lake RD)	Mountain Gate/Redding (Shasta Lake RD)	Mountain Gate/Redding (Shasta Lake RD)
Mount Shasta (Mount Shasta and McCloud RDs)	McCloud (Mount Shasta and McCloud RDs)	McCloud (Mount Shasta and McCloud RDs)
Eureka (Six Rivers SO)	**Eureka (Six Rivers SO)**	**Eureka (Six Rivers SO)**
Orleans (Orleans RD)	Orleans (Orleans RD)	Orleans (Orleans RD)
Willow Creek (Lower Trinity RD)	Willow Creek (Lower Trinity RD)	Willow Creek (Lower Trinity RD)
Bridgeville (Mad River RD)	Bridgeville (Mad River RD)	Bridgeville (Mad River RD)
Gasquet (Smith River NRA)	Gasquet (Smith River NRA)	Gasquet (Gasquet RD and Smith River NRA)

Table 1.9—Forest Service and Bureau of Land Management offices with line officers in the Northwest Forest Plan area, select years (continued)

1990	2004	2010 and 2016
Bureau of Land Management offices in Oregon		
North Bend (Coos Bay district manager and 3 resource area managers)	**North Bend (Coos Bay district manager** and 2 field managers)	**North Bend (Coos Bay district manager** and 1 field manager)
Eugene (district manager and 3 resource area managers)	**Eugene (district manager** and 2 field managers)	
Salem (district manager and 4 resource area managers)	**Salem (district manager** and 1 field manager)	**Salem (Northwest Oregon district manager** and 2 field managers)
Tillamook (resource area manager)	Tillamook (field manager)	Tillamook (field manager)
Medford (district manager and 4 resource area managers)	**Medford (district manager** and 4 field managers)	**Medford (district manager** and 4 field managers)
Roseburg (district manager and 4 field managers)	**Roseburg (district manager** and 2 field managers)	**Roseburg (district manager** and 2 field managers)

Locations of Forest Service supervisors' offices are distinguished by boldface (agency data omit deputy forest supervisors and assistant district rangers). Where place name and ranger district name differ, both are provided. Administration of the Ukonom Ranger District moved from the Klamath to the Six Rivers National Forest in 1999. The Spokane District, in western Washington, is not included in this analysis as the district and reporting covers an area much larger than the Northwest Forest Plan area. SO = supervisor's office, RD = ranger district office, NM = national monument office, NRA = national recreation area office.

The Forest Service in the NWFP area had 17 supervisor offices and 79 district ranger offices in 1990 (table 1.9). In 2004, these numbers had decreased to 15 forest supervisor offices and 59 district ranger offices, and by 2010, there was a further net reduction of four district ranger offices. The reduction included six closures and two openings. This reduction in offices represents a 27-percent decrease by 2010 in the number of Pacific Northwest Region communities with Forest Service line officers. No Forest Service offices closed between 2010 and 2016 in the area.

In 1990, 24 line officers, excluding associate district managers, were employed at local BLM NWFP-area units. The total includes five district managers and 19 field managers. By 2004, seven line officer positions (almost 30 percent) were lost (table 1.9). All these positions were field managers. The number of district managers and the locations of offices housing line officers remained unchanged. There were no differences in the total number of line officers and office locations in 2010. However, the number of field managers in offices has changed. More data on staffing is presented in the following section on staffing and budgets.

Budgets

Budget allocations determine the funding levels for the staff and offices on units in the NWFP area.

In the 15-, 20-, and 25-year reports, budget evaluations were done at the Forest Service regional and BLM state offices, and agency units scale. This reduces the complexity of the analysis relative to that undertaken in the 10-year report. The focus in the latter reports is on the important social and economic consequences related to changing budgets. Agency national perspectives were not addressed because they do little to identify social and economic trends in the NWFP area. A program-level analysis was also not undertaken because the trends in total budget provide a reliable indicator of how dollar spending affects staffing and office management. Program expenditures tend to vary based on management emphasis during a particular year, and it does not matter which program pays for staffing and facilities. The sources of data for the 15-, 20-, and 25-year reports budget analyses are the total annual allocations to NWFP-area units from agency regional and state offices.

The 2003–2005 annual Forest Service budgets for its Pacific Northwest Region increased by 20 percent.

During those years, cost pools to pay for items such as overhead were managed off the top, so the dollars were not included as part of the individual unit budgets. Without this adjustment, the Forest Service budgets during those 3 years would not be comparable to the other years. The 20-percent factor is based on an average cost pool amount identified in the 2006–2008 budgets.

All budget data presented here were adjusted to constant dollars using 2016 as the base year. Gross domestic product price deflators from the U.S. Bureau of Economic Analysis were used to convert annual budget amounts to real 2016 dollars. The 2004–2016 data were added to similar 10-year report data. However, the data presented here will not be directly comparable to the earlier report for two reasons: the base year for the budget data was 2003 in the 10-year report; and the Winema National Forest data were removed. The Winema has been administratively combined with the Fremont National Forest (currently the Fremont-Winema National Forest), so budget data for the Winema National Forest after 2001 are no longer available.

Results—

Budget reductions may be one explanation for lower agency employment. Figures 1.20 and 1.21 show that NWFP-area forests budgets and employment steadily declined from 1993 through approximately 2012. Budgets saw an increase, then a similar size decrease between 2008 and 2013. Budgets have been relatively stable from 2013 through 2016. Overall, BLM budgets have been relatively stable compared to the Forest Service budgets in the NWFP area (fig. 1.22).

Discussion—

Agency staffing and budgets determine how effectively forests are managed and policies are implemented. Staffing reductions affect the amount of resource management work that can be accomplished, and the amount and quality of services provided, such as recreation opportunities on federal lands. Meaningful collaboration between federal agencies and local communities also requires that community members have ongoing access to federal decision makers, such as BLM district managers and Forest Service supervisors. Interactions between local people and agency employees also help build trust. Potential effect of reductions in agency staffing levels and office closures include the level and type of agency presence in local communities. This topic is examined in more detail in the community case studies.

Figure 1.20—Budget for all Forest Service Pacific Northwest (PNW) Region forests in the Northwest Forest Plan area, 1993–2016.

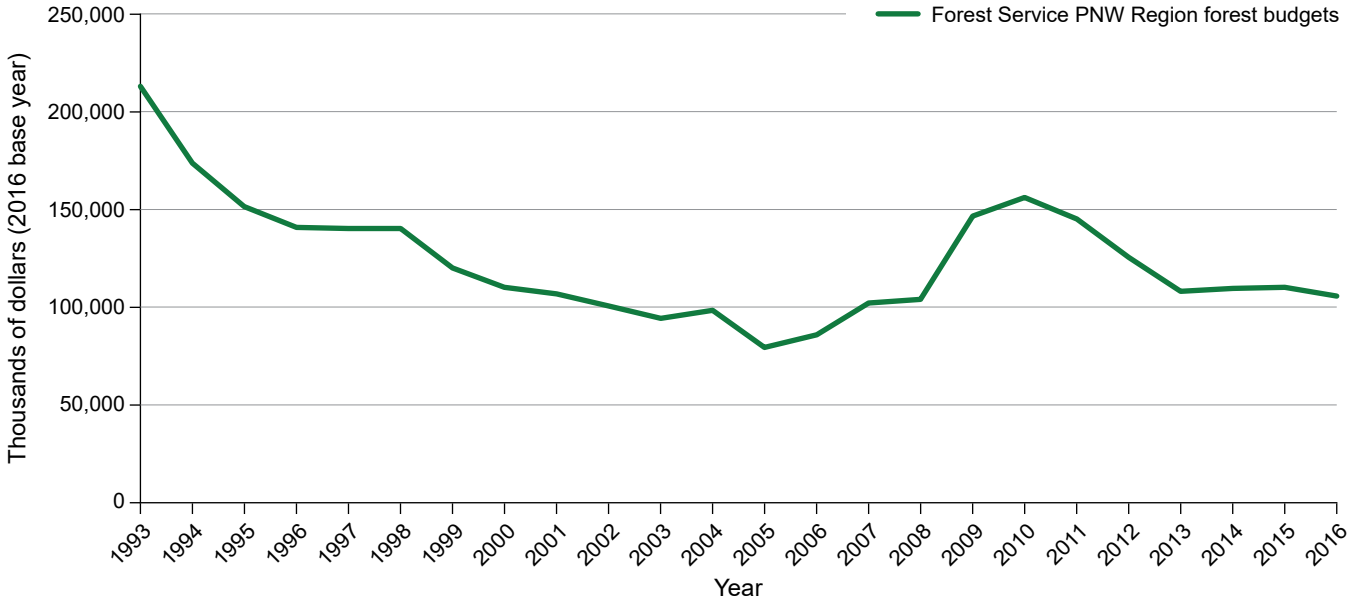

Figure 1.21—Budget for all Forest Service Pacific Southwest (PSW) Region forests in the Northwest Forest Plan area, 1993–2016.

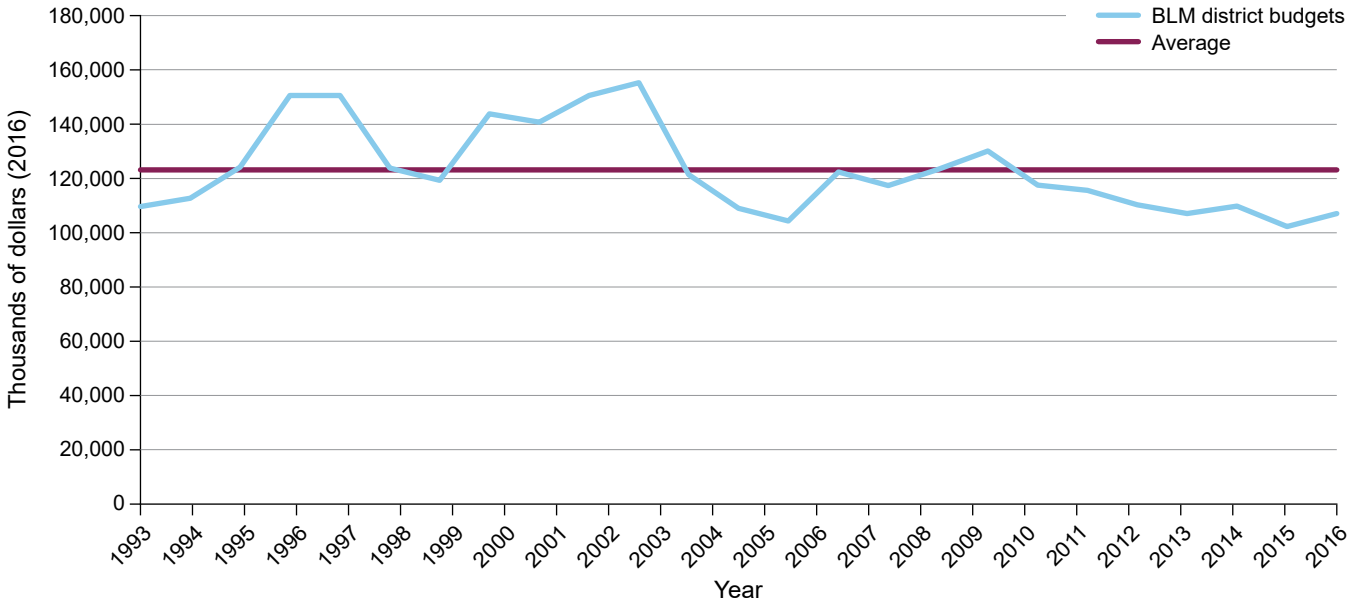

Figure 1.22—Budget for all Bureau of Land Management (BLM) districts in the Northwest Forest Plan area, 1993–2016.

Payments to County Governments

The federal lands managed by the Forest Service and BLM total approximately 22.1 million acres in the NWFP area. Congress has long recognized the loss of tax revenue as compared to what would be received by local governments if the land were retained in private ownership. As compensation, Congress initiated the Twenty-five Percent Fund Act in 1908. The act allocates 25 percent of revenue generated from timber sales or use of National Forest System land to the states for distribution to the counties. In 1937, Congress passed the Oregon and California Revested Railroad Lands Act (O&C Act). The O&C Act placed management jurisdiction of revested Oregon and California Railroad lands and Coos Bay Wagon Road (Wagon Road) lands under the Department of the Interior. The O&C Act allocated 50 percent of timber receipts generated from revested lands to the counties.

The revenue sharing between federal and local governments based on the Twenty-five Percent Fund Act and the O&C Act resulted primarily from the sale of

timber from public lands. Up to 1991, because the amount of payment is based on timber markets, and these markets rose and fell, federal revenue sharing was not a dependable source of funds for local governments. In the early 1990s, payments from the Twenty-five Percent Fund began a sharp decline as timber receipts from Forest Service timber sales fell dramatically. The decline in payments affected rural communities in the West, particularly in the range of the northern spotted owl (*Strix occidentalis caurina*) in Washington, Oregon, and northern California.

Recognizing the loss of timber revenue and the necessity to support county schools and infrastructure, Congress began making payments as stop-gap measures to mitigate the reduction in revenue to 48 counties in western Oregon, Washington, and northern California in 1991. In 1993, Congress passed the Omnibus Budget Reconciliation Act of 1993 to provide more long-term alternative payments. The payments, known as the Spotted Owl Safety Net payments, began in 1994 at 85 percent of the average of payments made based on timber receipts from fiscal years 1986–1990, and then declined annually by 3 percent.

In 2000, to increase support to timber-dependent counties as well as to other counties containing public land, Congress enacted the Secure Rural Schools and Community Self-Determination Act (SRS). The SRS provided payments, which replaced Spotted Owl Safety Net payments. The size of the payment was set equal to the average three highest receipt years, by county, under the Twenty-five Percent Fund Act from 1986 to 1999. The SRS payments to counties associated with National Forest System lands allocated funds to benefit public education and county road systems.

The SRS payments are also part of BLM revenue sharing associated with O&C and Wagon Road lands. Eighteen counties in western Oregon receive these payments. The funds are allocated to county general purposes. With the Forest Service portion of the SRS payments, counties can set aside up to 15 to 20 percent of the full payment amount for use on projects, such as resource improvement projects on or near federal lands. The counties can also use the 15 to 20 percent of funds to support services that include search, rescue, and emergency services on federal lands; community service work camps; easements for conservation or recreational purposes; forestry-related education activities; fire prevention; and county planning.

The last payment under the original SRS was planned for fiscal year 2006. Continual reauthorizations of the SRS payments have been signed by Congress, with the exception of 2016 when authorization lapsed. SRS is currently authorized through fiscal year 2023.

Another federal program designed to compensate local governments for the presence of tax-exempt federal lands within their jurisdictions is Payments in Lieu of Taxes (PILT). PILT legislation was passed in 1976. Seventy-one of the 72 NWFP counties receive PILT payments. Payments are tied to other federal revenue-sharing programs, including the Twenty-five Percent Fund, the O&C Act, and Wagon Road. The size of PILT-based payments to local governments depends on the number of acres of federal land in the county, the amount of non-PILT revenue-sharing payments received the previous year, and a payment formula involving population levels (USDI 2010).

Expectations

Payments-to-states mitigation measures, especially the SRS payments, were expected to offset the effects of reduced federal timber harvest receipts on county governments. The mitigation measures, however, require reauthorization from Congress for payments to continue.

Data Analysis

The primary sources of Forest Service SRS payment data are the annual Forest Service All Service Receipts reports (USDA FS 2019c). Forest Service data before 2004 are from the 10-year report (Charnley et al. 2006). The BLM SRS payment data are from the BLM Oregon state website, which provides official payments made to counties data (USDI BLM 2019). The PILT data source is the U.S. Department of the Interior payments in lieu of taxes website (USDI 2019).

Results

The 15-year report indicated the SRS payments were declining. The latest data show that SRS payments have continued to decline from their peak in 2006. By 2017, SRS payments were a third of the 2008 amount (fig. 1.23). Funding lapsed for SRS payments in 2016 but have since been reauthorized. Without congressional reauthorization, county payments would revert to the Twenty-five Percent Fund, which gives counties a share of federal timber receipts. As the 15-year report noted, the SRS adjustment resulted in payments to counties that were more than 20 times higher than what they would have received under Twenty-five Percent Fund revenue sharing.

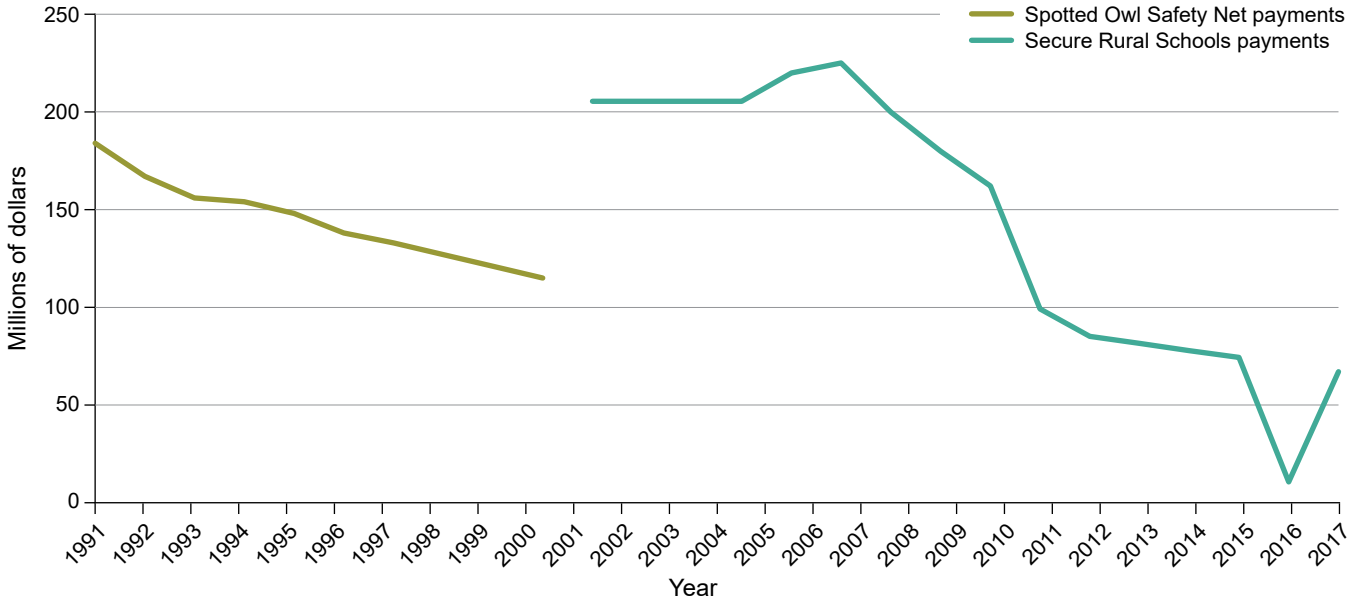

Figure 1.23—Federal Spotted Owl Safety Net and Secure Rural Schools national forest-related payments to counties in the Northwest Forest Plan area, 1991–2017.

Figure 1.24 shows the data for BLM O&C Act and Wagon Road payments, which are also called Secure Rural Schools payments. O&C and Wagon Road payments have also sharply declined since their peak in 2006. By 2016, these payments were 16 percent of the 2006 payments. Figure 1.25 shows the data for PILT-based payments from 1996 to 2016. PILT increased by more than 50 percent in the NWFP area between 2012 and 2016. However, the increase in PILT is not enough to offset declines in SRS, O&C, and Wagon Road payments.

Discussion

The 48 counties in the NWFP area that qualify for SRS payments received more than $205 million annually from 2001 to 2004. In 2005, payments rose to $219 million. The next year, the payments peaked at $225 million. By 2017, payments had declined to less than $70 million. Figure 1.23 shows the transition path of declining Spotted Owl Safety Net payments, which was replaced by a higher rate of revenue support by the Secure Rural Schools Act.

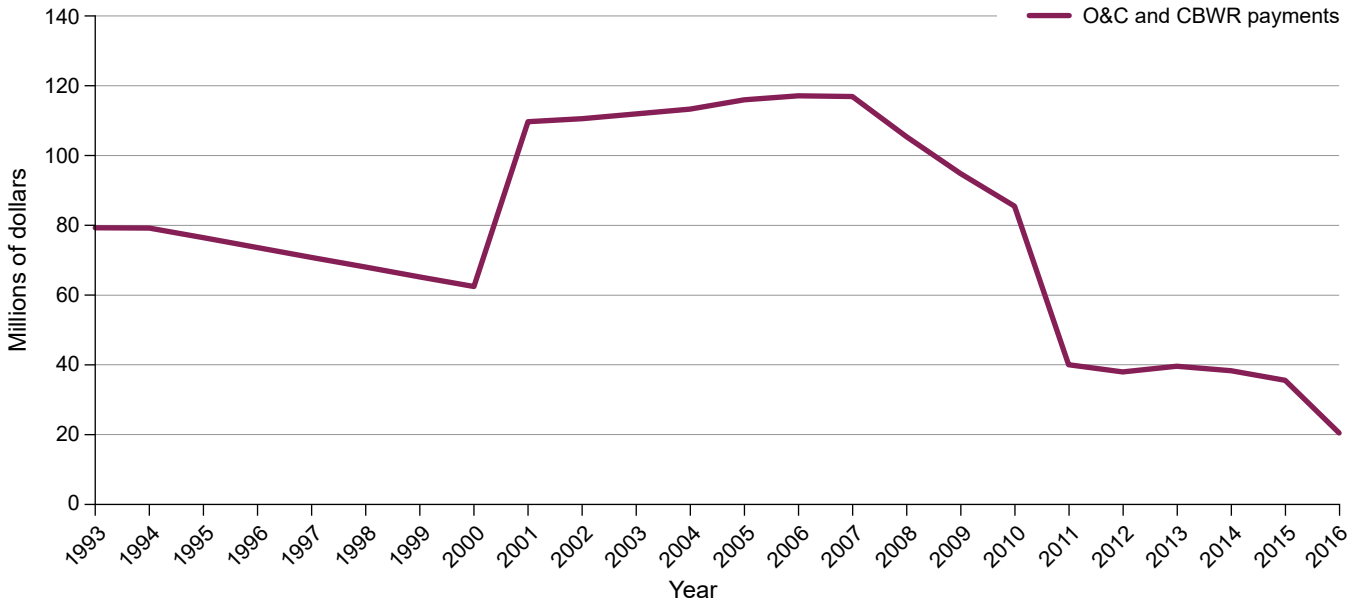

Figure 1.24—Oregon and California Railroad (O&C) and Coos Bay Wagon Road (CBWR) national forest-related payments to counties in the Northwest Forest Plan area, 1993–2016.

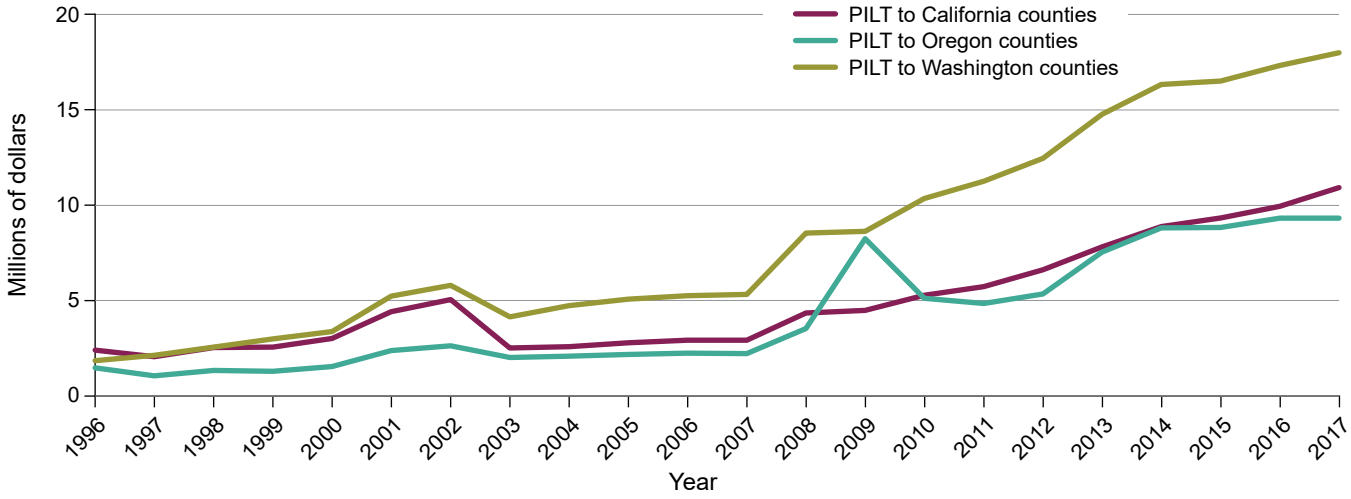

Figure 1.25—Federal, national forest-related "payments in lieu of taxes" (PILT) to counties in the Northwest Forest Plan area, 1996–2017.

Continual reauthorizations of the SRS payments have been signed by Congress, with the exception of 2016 when authorization lapsed. SRS is currently authorized through fiscal year 2023. If the program is not reauthorized, the counties will receive payments under the Twenty-five Percent Fund. Twenty-five Percent Fund payments will be a small fraction of the money that was paid under the Secure Rural Schools Act.

The Omnibus Budget Reconciliation Act of 1993 and the Secure Rural Schools Act met their goals of replacing past dependence on timber harvest revenues and mitigated the loss of revenues associated with the declines in federal timber harvest in the region. It is still not known how these payments affected overall county financing. As stated in the 10-year report, a guaranteed amount would likely have a stabilizing effect. Although the SRS legislation has been reauthorized, the long-term stability of the payments is uncertain. Without continued congressional action, counties in the NWFP area will need to address a short fall of several hundred million dollars.

Conclusion

Social and economic issues are part of the controversy that led to development of the NWFP ROD. This controversy emerged in the late 1950s and included three related social and economic issues: (1) the role and quantity of federal timber in the market; (2) federal agency obligations to communities near or among federal timberlands; and (3) the role forests play, especially federal forests, in local and regional economies.

This chapter uses social, economic, and federal agency data to show the potential social and economic relationships that NWFP-area communities have with the federally managed land and how trends in this data may address changes in socioeconomic well-being. The report provides data and analysis in response to the monitoring question: what are the status of and trends in socioeconomic well-being?

Since the 20-year monitoring report, total employment in forest products industries, including logging, primary and secondary wood manufacturing, and primary and secondary pulp and paper manufacturing, has increased by 7 percent between 2012 and 2016. This modest increase does not bring employment levels back to the levels recorded before the Great Recession of 2008.

The effects of changes in timber harvest and related employment on well-being are likely more pronounced in nonmetropolitan counties. Historically, nonmetropolitan counties are less diverse economically and more strongly tied to the wood products industry. Most of the timber harvested in the NWFP area comes from nonmetropolitan counties. In both urban and rural areas of the NWFP area, the role of timber harvesting and processing is declining as a share of total employment. In 2001, more than 12 percent of jobs in nonmetropolitan counties were in the timber sector. By 2012, it had declined to 3 percent and remained at 3 percent in 2016. Declines in timber industry employment were more than offset by growth in other sectors from 2001 to 2016.

Forest Service and BLM employment has been declining since 1993. However, because of a jump in 2013, total

agency employment is 18 percent higher in 2016 compared to 2012. Forest Service and BLM employment within the NWFP area remains one of the largest sources of economic contributions to the local economy associated with agency management. Employment is a foundation of socioeconomic well-being. In addition to direct agency employment, jobs in the local economy are supported by agency timber harvest and recreational activities.

Recreational visitor spending is one of the largest sources of economic contributions associated with Forest Service and BLM management in the NWFP area. Managing sustainable outdoor recreation opportunities with decreasing budgets and increasing population is a challenge. This collaboration with communities, tourism providers, recreation enthusiasts, and other stakeholders is intended to maintain recreation experiences that are economically beneficial—as well as socially and ecologically sustainable in the long term.

The chapter tracks data on agency expenditures and forest-related resources to display potential trends. The data are not suitable for a statistically valid cause-and-effect analysis linking trends in socioeconomic well-being to natural resource management activities on federal lands. The following chapters in this report show how this monitoring is significantly enhanced by using a combination of existing data and new research, as was the protocol for the 10-year report. Data collected for chapter 3 of this report indicate possible relationships between socioeconomic trends with natural resource uses and management activities on federal lands.

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Chapter 2: Typology of Northwest Forest Plan Counties, circa 1990

Mark D. O. Adams[1]

This 25-year Northwest Forest Plan (NWFP) socioeconomic monitoring report introduces a new protocol for tracking social and economic change at the scale of counties within the NWFP monitoring region. The new protocol is a major change from prior NWFP socioeconomic reports. The 1994 NWFP record of decision (ROD) states that the federal forest management agencies should assess whether there could be a relationship between social and economic changes in communities, and implementation of the NWFP. In chapters 2 and 3 of this report, we adapt that direction so that the unit of analysis is counties, not communities. This adaptation reflects changed circumstances for monitoring since the ROD and the 10-year monitoring report were issued in 1994 and 2006, respectively. Budgets for social and economic monitoring have been much smaller since the initial 10-year report; and community-scale quantitative data from the U.S. Census Bureau are no longer as reliable as they were in the 20th century. This chapter introduces the new, adapted protocol based on a typology of counties in the NWFP monitoring region. Chapter 3 deploys the typology to analyze intraregional spatial patterns of social and economic change during, as well as preceding, the 1994–2017 "NWFP era." Chapter 5 links observed community-scale changes to the typology and the framework it provides for social and economic change trend analysis in counties.

Chapters 2 and 3 together address the second of the two principal goals of this 25-year NWFP socioeconomic monitoring report:

1. Restore community-scale perspectives on social and economic change to the monitoring protocol so that the input of people who reside in communities with historic ties to federal forest management are part of the analysis of change.
2. Describe the geographic variability of social and economic changes during the entire NWFP era (since about 1990), as well as in the preceding decade, at a scale that is larger than the community, but smaller than the region as a whole.

Both of these goals are designed to address the effectiveness monitoring question for social and economic conditions established by the NWFP ROD in 1994: "Are local communities and economies experiencing positive or negative changes over time that may be associated with federal forest management?"

Chapter 2 introduces pre-1990 data to enhance analysis of changes related to shifting priorities for federal forest management. Chapter 3 also uses data from before the NWFP era to understand how social and economic circumstances of counties in the region were changing as they entered into the NWFP era. The need for this long-term historical record is explained in chapter 2 "Conclusion" as well as in the discussion of individual datasets.

The social and economic change monitoring approach has not been consistent through the three previous report cycles. The 10-year report combined in-depth qualitative research conducted in 17 communities associated with five federal forest management units with quantitative analysis of social change in more than 1,300 community equivalents. While the quantitative analysis sought a general answer to the ROD monitoring question by measuring change and classifying it as positive or negative in **all** communities within the NWFP area, the qualitative analysis sought to illustrate the nature of change through first-person accounts of community leaders experiencing it. In the quantitative analysis, communities were defined as aggregations of U.S. Census block groups; counties were not a unit of analysis. Owing to changes in available data as well as funding for the report, the subsequent 15- and 20-year monitoring reports switched to counties as the unit of analysis for measuring social change and did not attempt to address the hypothetical relationship between observed social and economic changes and continued implementation of the NWFP that is found in the ROD monitoring directive. Qualitative field work was eliminated from the 15- and 20-year updates.

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A future return to the exemplary paired quantitative and qualitative analysis of the social and economic characteristics of NWFP communities of the 10-year report is unlikely. Changes to the U.S. Census made in the early 2000s that significantly degraded the quality of estimates for small communities are likely permanent. There are far more quantitative datasets available for counties than there are for communities, and they are uniformly of higher quality and consistency. A qualitative research protocol for primary data collection in communities capable of producing generalizable findings across the region would be prohibitively expensive and time consuming. In this report, we address these realities by introducing a robust methodology for analyzing social and economic change trends in NWFP counties that accomplishes two objectives: (1) it returns the focus of social and economic change monitoring to the specific direction found in the NWFP ROD, but adapts the ROD's direction to apply to counties rather than communities; and (2) it serves as an easily updated foundation for subsequent county-scale monitoring related to the NWFP or other monitoring initiatives by the federal forest management agencies. The county typology thus represents a **major change** to the monitoring protocol, which is necessary as a response both to report stakeholders and changes to available data.

The county typology links the narrative analysis of community-scale change found in chapter 4 to quantitative assessment of change measured at the county scale; these linkages are fully explored in chapter 5. The typology also facilitates assessment of a hypothesis directly following from the ROD effectiveness monitoring direction: that communities or counties that had the strongest social and economic links to federal forest lands management before the NWFP era are more likely to have experienced distinct and negative social and economic transitions during the NWFP era than other communities or counties lacking similarly strong links. The previous 15- and 20-year social and economic monitoring reports have not provided insight into the "…may be associated with federal forest management" portion of the ROD direction.

Because none of the previous iterations of this NWFP socioeconomic monitoring report have directly addressed this hypothesis at the county scale, tracking social and economic change in counties in relation to the typology is most revealing if the period of change evaluated is the entire span of the NWFP era. The start of the NWFP era can be defined as the year the plan was formally adopted—1994. An equally reasonable definition would include the 5-year period preceding formal adoption of the plan when the legal challenges that precipitated the plan were being heard, and the U.S. Department of Agriculture (USDA) Forest Service and U.S. Department of the Interior Bureau of Land Management (BLM) were significantly constrained in their ability to offer timber for sale (the first legal challenge to timber sales that ultimately led to adoption of the NWFP was filed in 1989). Much of the demographic data relevant to social and economic change monitoring are collected on the 10-year census cycle; hence, 1990 is the census year that is closest in time to the start of the NWFP era. The 10-year monitoring report used 1990 as a baseline year for evaluating social and economic change during the 1990s. For all these reasons, the typology is based on data culled from the late 1980s to 1990. **The typology thus groups the 72 counties of the NWFP monitoring region according to the strength of economic links between federal forest lands and counties as they existed before the NWFP era. It does not describe current relationships between federal forest management and county economic and workforce conditions.**

Chapter 2 covers development of the typology and descriptions of differences among the types of counties. It is divided into five sections:

- "Background": review of quantitative analyses of social and economic change in the 10-, 15-, and 20-year reports; identification of the 72 counties in the NWFP social and economic monitoring protocol; alternative grouping of counties by metropolitan status.
- "County Typology": construction and interpretation of the county typology.
- "Trends In Federal Forest Land Management and Timber Industry Employment, Circa. 1990–2017": analysis and interpretation of change, in the NWFP era and immediately prior, in the six metrics that contribute to the typology.
- "Discussion."
- "Implications for Monitoring Social and Economic Change Trends Before and During the NWFP Era."

Chapter 3 analyzes social and economic change trends in five relevant county types during the NWFP era as well as during the decade that preceded the NWFP era.

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Background

In the spring of 1993, President Bill Clinton directed his administration to convene a conference of industry and federal forest management agency officials with the goal of resolving ongoing legal disputes over the sale and harvest of timber from federal forest lands within the ranges of the threatened northern spotted owl and marbled murrelet. A team of internal agency and external forest scientists, dubbed the Forest Ecosystem Management Assessment Team (FEMAT), compiled a report analyzing the projected economic and ecological consequences of multiple timber harvest scenarios for federal lands affected by the legal quagmire. The FEMAT report, issued in late 1993, formed the basis of the subsequent NWFP.

The FEMAT report established a boundary within which management of federal forest lands needed to be modified to respond to the ongoing legal disputes focused primarily on whether Forest Service and BLM forest management adequately considered the needs of threatened and endangered species and their habitats. Multiple considerations contributed to the delineation of the NWFP boundary, but essentially all are biophysical in nature. The boundary encompasses 90,987 square miles (58,231,400 acres) in parts of three states, and includes landscapes understood using the best available science in 1993 as **potentially** supporting one or more endangered or threatened species identified in the FEMAT report as requiring management changes on federal forest lands. The region's delineation does not strictly follow federal forest property boundaries; instead, it encompasses a mix of federal and nonfederal lands. At least seven-eighths of the total land area managed by 11 national forest units and four BLM districts in western Oregon, western Washington, and northwestern California are entirely within the NWFP boundary. An additional three national forest units on the east side of the Cascade Range in Oregon and Washington, and one BLM district on the east side of the Cascades in Oregon, are partially within the boundary. The alignment of the NWFP boundary and federal forest land management units is shown in figure 2.1 and enumerated in table 2.1.

Figure 2.1—Federal forest land administrative units affected by the Northwest Forest Plan. BLM = Bureau of Land Management.

Table 2.1—Federal forest land administrative units within the Northwest Forest Plan (NWFP) boundary

National Forest Unit	U.S. Forest Service region	Total area	Area within NWFP boundary	
		Square miles		*Percent*
Olympic NF	6	991.7	991.7	100.0
Mt. Baker-Snoqualmie NF	6	2,764.1	2,764.1	100.0
Okanogan-Wenatchee NF	6	6,277.2	5,159.1	82.2
Gifford Pinchot NF	6	2,122.6	2,122.3	100.0
Columbia River Gorge NSA	6	130.1	122.5	94.2
Mt. Hood NF	6	1,587.0	1,586.1	99.9
Siuslaw NF	6	983.9	983.9	100.0
Willamette NF	6	2,639.8	2,639.8	100.0
Deschutes NF	6	2,518.1	1,215.9	48.3
Fremont-Winema NF	6	3,522.6	528.6	15.0
Umpqua NF	6	1,541.6	1,541.6	100.0
Rogue River-Siskiyou NF	6	2,687.1	2,687.1	100.0
Six Rivers NF	5	1,828.9	1,828.9	100.0
Klamath NF	5	2,354.2	2,176.2	92.4
Shasta-Trinity NF	5	3,335.4	3,253.5	97.5
Mendocino NF	5	1,437.6	1,266.0	88.1
BLM district	**BLM office**			
Northwest Oregon	OR/WA	1,123.1	1,123.1	100.0
Roseburg	OR/WA	665.6	665.6	100.0
Coos Bay	OR/WA	509.4	509.3	100.0
Medford	OR/WA	1,362.8	1,362.8	100.0
Lakeview	OR/WA	338.3	81.0	24.0

BLM = Bureau of Land Management, NSA = national scenic area, NF = national forest, PNW = Pacific Northwest, PSW = Pacific Southwest.

Previous Social and Economic Monitoring Reports

The first effort to formally monitor social and economic conditions in the NWFP era began in 2003. It culminated in publication of a six-volume main report in 2006, and five separate reports of community case studies between 2006 and 2008 (Buttolph et al. 2006, Charnley 2006, Charnley et al. 2008, Dillingham et al. 2008, Kay et al. 2007, McClain et al. 2006). The 10-year report devoted significant effort to documenting social and economic changes in communities. The large research team conducted 303 interviews in 17 communities that were associated with five federal forest management units: Olympic National Forest, Okanogan-Wenatchee National Forest, Mount Hood National Forest, Klamath National Forest, and the BLM Coos Bay District. In addition, the U.S. Forest Service Pacific Northwest Research Station invested heavily in a quantitative analysis that measured changes in community-scale well-being status between 1990 and 2000 for several hundred community-equivalent units in the monitoring region.

Following the 10-year report, the committee of federal agency executives that oversees monitoring for the NWFP decided to significantly scale back the scope of social and economic monitoring. The 15- and 20-year reports reflect this reduced scope. A small team updated data describing forest management metrics—timber harvested, recreation visits, nontimber forest products collected, and the value of leases for grazing and mineral exploration, among others. These reports included tracking of some basic demographic trends using county-scale data and assessed geographic variability by grouping the counties by their designation (as of 2003) as either a metropolitan or nonmetropolitan county.

After release of the 20-year monitoring report in 2016, some federal forest management stakeholders emphatically requested that future social and economic monitoring efforts under the NWFP restore community-scale analysis and feature the input of community members.

New Social and Economic Monitoring Protocol

This 25-year socioeconomic report is designed to respond to this feedback, while preserving continuity with previous versions in reporting federal agency management data. In 2017, the federal agency executives that oversee all aspects of NWFP monitoring approved limited restoration of community case study analysis to the 25-year report. Ten community case studies would be conducted and linked to a new quantitative analytical framework. The analytical framework would facilitate generalization about communities in the NWFP area based on the 10 communities studied and allow for a far more nuanced assessment of variable social and economic change trajectories in the region. Unlike the 10-year report, the quantitative analysis is conducted at the county, rather than community, scale. This change was necessitated by fundamental structural changes to U.S. Census data made in 2003, which rendered small-scale population estimates so uncertain that long-term trend analysis is no longer feasible for small areas (Adams and Charnley 2018, Spielman et al. 2014).

Though we lose the ability to show quantitatively how demographic and employment changes affect individual communities in the NWFP area, we retain consistency with past precedent for economic modeling and monitoring. The new framework combines demographic data from the U.S. Census Bureau; employment data from the U.S. Department of Labor, Bureau of Labor Statistics and the U.S. Office of Personnel Management; and a selection of forest management data from the Forest Service, BLM, and state agencies. All of these are reported for counties, rather than for management units as is customary for internal data management by the Forest Service and BLM. The use of counties as the data unit for analyzing social and economic change is consistent with the 15- and 20-year monitoring reports, as well as with routine economic modeling and statistical description by allied government agencies, such as the USDA Economic Research Service (e.g., Pender et al. 2019). The economic element of the FEMAT report, which established probable timber sale quantities that were later written into the NWFP, was also based on county-scale analysis.

Counties in the NWFP Monitoring Protocol

There have been 72 counties in the NWFP monitoring protocol since the first monitoring report was researched and written in the early 2000s. The reasons why some of the counties were included were not documented and remain unclear. Two factors, existing (1980s) trade flows in the wood products industry and potential habitat for the threatened northern spotted owl and marbled murrelet, were likely important. To ensure consistency, this group of 72 counties has been observed in every subsequent monitoring report despite the unclear reasons for including some with little or no federal land or saleable timber. The counties in the monitoring protocol are compared to the NWFP area delineated in the FEMAT report in figure 2.2.

The 72 counties are a diverse mix. They include major urban centers, primarily agricultural landscapes, and remote, heavily forested rural places. The diverse character of these counties means that treating the region as a unit for the purpose of evaluating social and economic change trends would yield meaningless results: the entire population of metropolitan Seattle, about 3.5 million people, and the roughly 4,000 people of Forks, Washington—more than 150 miles from the nearest interstate highway—would be combined in a single metric describing the region's social and economic change.

The degree to which a county is physically within the NWFP boundary gives some indication of the likelihood that it was strongly linked to federal forest lands historically. Figure 2.3 and table 2.2 depict the proportion of a county's total land area comprising federal forest lands administered by the Forest Service and BLM and subject to management under the NWFP. Twenty-four of the 72 counties have negligible or no federal forest lands managed under the NWFP framework. NWFP-managed lands comprise more than 40 percent of the land base in 13 counties. Eight of these—Lane, Douglas, Jackson, Josephine, Curry, Del Norte, Siskiyou, and Trinity Counties—form a contiguous block in northern California and southwestern Oregon.

Figure 2.2—The 72 counties included in the Northwest Forest Plan monitoring protocol.

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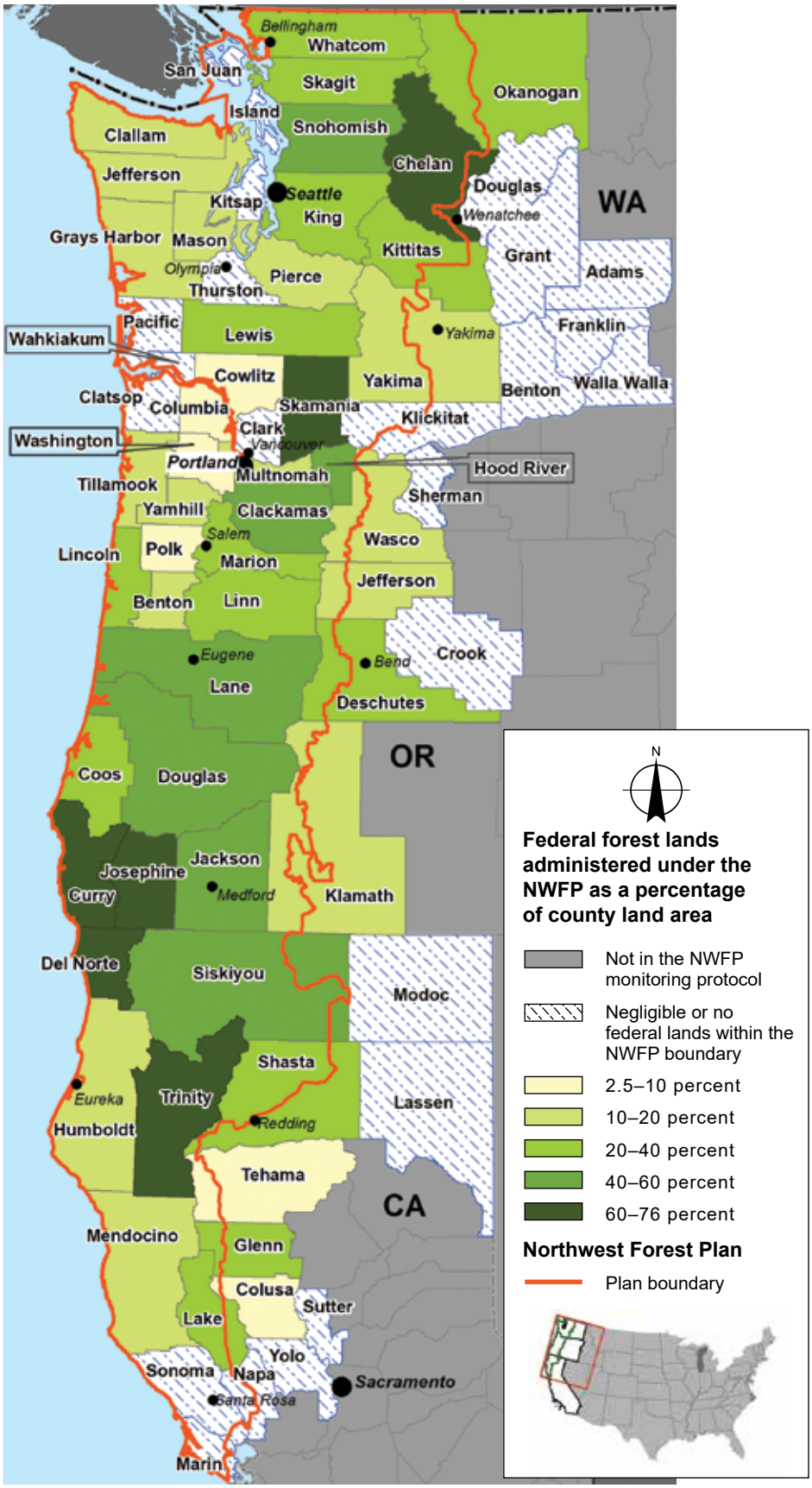

Figure 2.3—Proportion of county land area in the Northwest Forest Plan (NWFP) monitoring protocol managed by the Forest Service or Bureau of Land Management (BLM) within the NWFP area.

Table 2.2—Proportion of county land area within the Northwest Forest Plan (NWFP) boundary managed by the Forest Service (FS) or Bureau of Land Management (BLM)

County	Area in NWFP boundary	FS lands in NWFP boundary	BLM lands in NWFP boundary	FS/BLM lands in NWFP boundary
	Acres			*Percent of county*
California				
Colusa	29,767	27,448	—	4
Del Norte	649,661	439,495	—	68
Glenn	175,821	171,276	—	20
Humboldt	2,319,877	339,167	96,836	19
Lake	656,057	246,899	44,853	34
Lassen	—	—	—	—
Marin	277,572	—	—	—
Mendocino	2,263,913	177,854	121,976	13
Modoc	781	—	—	0
Napa	163,008	—	*	0
Shasta	1,144,788	433,452	66,774	20
Siskiyou	3,402,371	2,006,825	40,152	50
Sonoma	967,413	—	6,899	1
Sutter	—	—	—	—
Tehama	258,392	181,868	2,835	10
Trinity	2,058,352	1,487,577	71,013	76
Yolo	—	—	—	—
Oregon				
Benton	433,511	17,885	57,640	17
Clackamas	1,205,448	540,496	76,336	51
Clatsop	545,976	—	*	0
Columbia	427,560	—	10,870	2
Coos	1,040,541	79,777	162,749	23
Crook	—	—	—	—
Curry	1,046,164	619,840	68,022	66
Deschutes	465,604	447,116	—	23
Douglas	3,245,993	1,007,846	654,640	51
Hood River	341,015	190,202	*	56
Jackson	1,791,660	451,708	459,127	51
Jefferson	270,348	147,593	—	13
Josephine	1,051,663	402,079	299,975	67
Klamath	1,094,540	592,224	51,958	16
Lane	2,954,900	1,421,876	288,228	58
Lincoln	635,697	173,880	20,148	31
Linn	1,475,638	464,551	87,092	37
Marion	761,682	201,852	21,066	29
Multnomah	296,758	54,873	4,120	20
Polk	477,225	1,451	40,080	9
Sherman	—	—	—	—

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Table 2.2—Proportion of county land area within the Northwest Forest Plan (NWFP) boundary managed by the Forest Service (FS) or Bureau of Land Management (BLM) (continued)

County	Area in NWFP boundary	FS lands in NWFP boundary	BLM lands in NWFP boundary	FS/BLM lands in NWFP boundary
	Acres			*Percent of county*
Tillamook	718,726	89,051	48,305	19
Wasco	370,256	170,823	1,810	11
Washington	465,091	—	11,560	2
Yamhill	459,782	24,816	32,726	13
Washington				
Adams	—	—	—	—
Benton	—	—	—	—
Chelan	1,687,712	1,346,687	5,166	70
Clallam	1,130,050	199,641	*	18
Clark	414,752	1,398	*	0
Cowlitz	738,643	35,548	*	5
Douglas	—	—	—	—
Franklin	—	—	—	—
Grant	—	—	—	—
Grays Harbor	1,235,562	139,428	*	11
Island	136,727	—	—	—
Jefferson	1,174,299	167,796	*	14
King	1,407,706	366,921	*	26
Kitsap	282,548	—	—	—
Kittitas	928,252	482,740	*	32
Klickitat	500,457	7,423	2,597	1
Lewis	1,563,605	446,438	*	29
Mason	642,328	127,801	*	20
Okanogan	877,582	813,983	1,224	24
Pacific	585,540	—	*	0
Pierce	1,103,337	131,011	*	12
San Juan	170,167	—	—	—
Skagit	1,132,904	372,791	*	33
Skamania	1,076,976	816,609	*	76
Snohomish	1,358,686	639,987	*	47
Thurston	488,206	*	*	0
Wahkiakum	162,044	—	*	0
Walla Walla	—	—	—	—
Whatcom	1,379,263	460,635	*	33
Yakima	1,390,338	506,043	*	18

* Negligible: less than 1,000 acres. Green = Forest Service-managed lands only; orange = Bureau of Land Management-managed lands only.

However, area within the NWFP boundary is not always a good indicator of the historic importance of federal forest management for social and economic well-being in a county; whether the county is rural, suburban, or urban has a very large effect. This recognition led to the classification of counties into either metropolitan or nonmetropolitan groups in the 15- and 20-year reports for assessing the differences in demographic change.

Metropolitan Designation

In the 15- and 20-year NWFP social and economic monitoring reports, county-scale demographic and employment data were grouped into two categories of counties—metropolitan and nonmetropolitan. In both reports, the grouping was based on the 2003 U.S. Office of Management and Budget (OMB) circular which designated metropolitan and nonmetropolitan counties for the American Community Survey (ACS) and the 2010 U.S. Census. The OMB designations are based on 2000 U.S. Census data. A county is designated metropolitan if it either (1) has at least one population center with more than 50,000 people, or (2) lacks such a population center, but is adjacent to a county that has one, and at least 25 percent of employed people commute to the neighboring county for work. In the NWFP area, Lane County (which includes Eugene city), Oregon, is an example of the first condition and Skamania County, Washington, about 40 miles northeast of Portland, Oregon, is an example of the second condition. The 2003 circular also created a new classification of "micropolitan" county—a county that was not part of a standard metropolitan statistical area and had a single principal city with a population between 10,000 and 50,000, such as Albany (2000 population ~30,000) in Linn County. Micropolitan counties such as Linn County were classified as nonmetropolitan in the 15- and 20-year reports. The remaining counties are defined as lacking both a population center of more than 10,000 people and commuting ties to another county that is either micropolitan or metropolitan. These counties are truly rural. The 2003 metropolitan designations used in the 15- and 20-year monitoring reports are shown in figure 2.4 and table 2.3. In both reports, 32 of the 72 counties were identified as metropolitan; of the 40 that were nonmetropolitan, 26 were actually micropolitan and 14 were rural. Metropolitan designations are updated every 10 years by the OMB; however, the 2013 circular, which changed the designation of some NWFP-area counties, was not used in the 20-year monitoring report although it was available at the time. Table 2.3 shows which counties' designations were changed.

The metropolitan/nonmetropolitan scheme is limited in two important ways. First, these designations change over time as population grows in some areas but not others: Linn County was classified as nonmetropolitan in 1990 and 2000, micropolitan in 2003, and metropolitan in 2013. This raises the question: to which of these groups should Linn County be assigned for tracking changes in population and economic data from 1994 to 2017? Second, there are major differences in demographic and economic conditions within both the metropolitan and micropolitan categories.

Some metropolitan counties have only a single medium-size city (e.g., with 50,000 to 100,000 residents) and are otherwise remote from other large urban centers—e.g., Shasta County, California; Deschutes County, Oregon; and Yakima County, Washington, and their respective cities of Redding, Bend, and Yakima. Others, such as King County, Washington (Seattle city location), form the core of major metropolitan regions. There are also very different relationships to federal forest lands among metropolitan counties of the NWFP area. Both Clackamas County, Oregon (Gresham city location), and Sonoma County, California (Santa Rosa city location), are suburban counties in major metropolitan regions with 2010 populations greater than 350,000. There are nearly 500,000 acres of national forest lands in Clackamas County, as well as several small towns far from the metropolitan area that historically relied heavily on local timber processing for employment. There are neither federal forest lands nor former timber towns in Sonoma County. Some counties are metropolitan only because 25 percent or more of workers residing in that county commute to a metropolitan county that does have one or more large cities. Skagit and Skamania Counties in Washington are examples; the latter had a total population in 2010 of just more than 11,000, and its largest population center, Stevenson, consisted of about 2,500 people.

There are also significant differences among micropolitan counties. Some, such as Linn County (in 2003) have a substantial city (e.g., Albany) that is just smaller than the metropolitan threshold, and are connected to nearby larger cities, such as Eugene and Salem. At the opposite end of the spectrum is Adams County, Washington, which had less than 20,000 residents in 2010, but more than 25 percent of those employed commuted to

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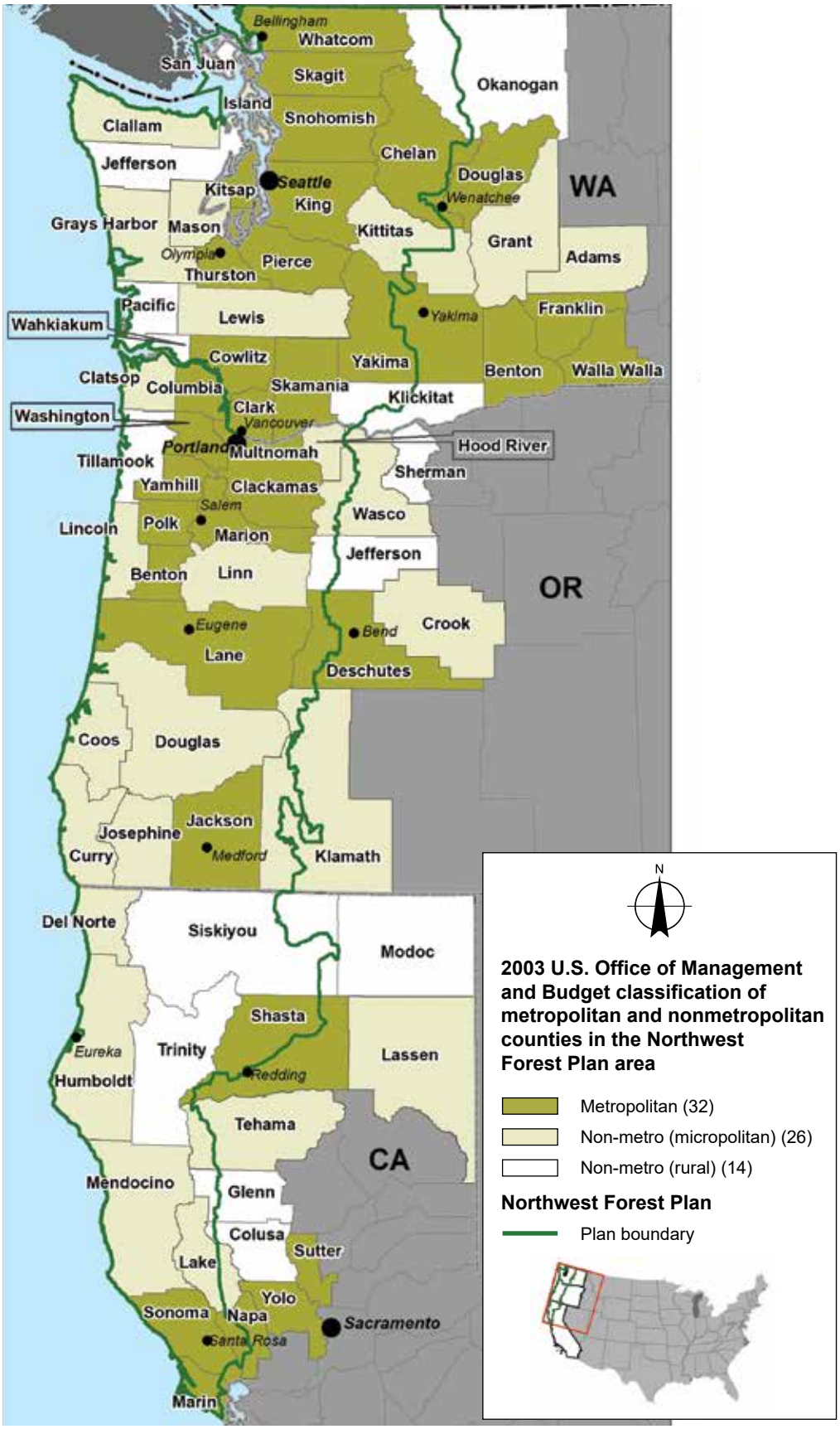

Figure 2.4—The distribution of metropolitan and non-metropolitan designations among the 72 counties in the NWFP monitoring protocol, as used in the 15- and 20-year reports.

Table 2.3—Metropolitan designations for counties in the Northwest Forest Plan monitoring protocol

County	1990 census designation	1997 OMB designation (2000 census)	2003 OMB designation	2013 OMB designation
California				
Colusa	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan
Del Norte	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Glenn	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan
Humboldt	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Lake	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Lassen	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Marin	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Mendocino	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Modoc	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan
Napa	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Shasta	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Siskiyou	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan
Sonoma	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Sutter	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Tehama	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Trinity	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan
Yolo	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Oregon				
Benton	Nonmetropolitan	Metropolitan	Metropolitan	Metropolitan
Clackamas	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Clatsop	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Columbia	Nonmetropolitan	Metropolitan	Metropolitan	Metropolitan
Coos	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Crook	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Curry	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Deschutes	Nonmetropolitan	Metropolitan	Metropolitan	Metropolitan
Douglas	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Hood River	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Jackson	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Jefferson	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan
Josephine	Nonmetropolitan	Nonmetropolitan	Micropolitan	Metropolitan
Klamath	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Lane	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Lincoln	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Linn	Nonmetropolitan	Nonmetropolitan	Micropolitan	Metropolitan
Marion	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Multnomah	Metropolitan	Metropolitan	Metropolitan	Metropolitan

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Table 2.3—Metropolitan designations and typology code for counties in the NWFP monitoring protocol (continued)

County	1990 census designation	1997 OMB designation (2000 census)	2003 OMB designation	2013 OMB designation
Polk	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Sherman	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan
Tillamook	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan
Wasco	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Washington	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Yamhill	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Washington				
Adams	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Micropolitan
Benton	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Chelan	Nonmetropolitan	Metropolitan	Metropolitan	Metropolitan
Clallam	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Clark	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Cowlitz	Nonmetropolitan	Metropolitan	Metropolitan	Metropolitan
Douglas	Nonmetropolitan	Metropolitan	Metropolitan	Metropolitan
Franklin	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Grant	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Grays Harbor	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Island	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Jefferson	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan
King	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Kitsap	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Kittitas	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Klickitat	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan
Lewis	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Mason	Nonmetropolitan	Nonmetropolitan	Micropolitan	Micropolitan
Okanogan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan
Pacific	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan
Pierce	Metropolitan	Metropolitan	Metropolitan	Metropolitan
San Juan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan
Skagit	Nonmetropolitan	Metropolitan	Metropolitan	Metropolitan
Skamania	Nonmetropolitan	Metropolitan	Metropolitan	Metropolitan
Snohomish	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Thurston	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Wahkiakum	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan	Nonmetropolitan
Walla Walla	Nonmetropolitan	Nonmetropolitan	Micropolitan	Metropolitan
Whatcom	Metropolitan	Metropolitan	Metropolitan	Metropolitan
Yakima	Metropolitan	Metropolitan	Metropolitan	Metropolitan

Green shading = Forest Service but no BLM lands, orange shading = BLM but no Forest Service lands, OMB = U.S. Office of Management and Budget.

neighboring Grant County, which includes the small city of Moses Lake. Further complicating the comparison of these two groups is the geography of forests and federal lands: half of Linn County is covered by federal, state, and private timberlands; Adams County is almost entirely irrigated high desert, and nearly all of its land is privately owned. Table 2.3 lists the 72 NWFP-area counties by historical metropolitan classification and the six county types analyzed for this report ("County Typology"). The 2003 metropolitan designation was used to track social and economic change between 2000 and 2010 in the 15- and 20-year reports.

County Typology

The monitoring objectives in the NWFP ROD acknowledge that the relationship between social and economic conditions and federal lands management are too complex and intertwined with other factors to establish cause-and-effect social and economic change outcomes resulting from implementing the NWFP. However, the effectiveness monitoring section asks, "are local communities and economies experiencing positive or negative changes that **may be** associated with forest management?" (ROD 1994: E-9). Suggested metrics to use in such assessments include employment, demographic, government revenue, and social service burden data. Because of the aforementioned changes to demographic data from the Census Bureau, it is now only possible to quantitatively assess whether changes to the economies and social characteristics of counties are positive or negative.

At the outset of any such monitoring, it is important to define what "positive" or "negative" change for a county looks like. An increase in a county's unemployment rate of 1 percent between monitoring periods is moving in a negative direction, but the magnitude of the increase may prove practically insignificant after examining other contextual factors. For example, the 1-percent increase could be a negative development if the region to which the county belongs experiences a simultaneous 5-percent decrease in the unemployment rate. Most often, social science analysis simply compares a county's measure of a variable to the comparable measure for the state in which it is located, or to the national measure. This approach is easy to communicate but fails to acknowledge that the measured element of the county—in this case, its labor market—may have so little in common with a state or the nation that the comparison is meaningless. A single unemployment rate for the NWFP area, for example, is overwhelmingly influenced by labor-market and workforce conditions in metropolitan Seattle-Tacoma, Portland-Salem, and the northern San Francisco Bay area, where the vast majority of these regions' workers reside. A 1-percent increase in isolated, rural Okanogan County, Washington, over the same period where unemployment decreased 5 percent in Seattle and Portland might not seem like bad news to locals there. Hence, a more productive approach to evaluating social and economic change trends is comparing a county to a group of its peers—other counties that are already known to have similar traits—and then comparing trends in a peer group (multiple similar counties) to trends for the entire region. One common way of doing this is to divide counties according to whether they are officially metropolitan or not. This approach is still too limiting, however; as discussed in the preceding "Background" section, there are many kinds of metropolitan areas and nonmetropolitan contexts. The typology effectively establishes these peer groups for making meaningful interpretations of whether change is truly positive or negative.

Typology

To address the limitations of the binary metropolitan/nonmetropolitan designation classification, we created a classification scheme with multiple types of counties. Each type is defined by shared characteristics, and those common characteristics are distinct from the shared characteristics of other types of counties. We used a statistical technique called "cluster analysis" to sort counties into types. We created six distinct county types from among the 72 counties in the NWFP monitoring region. Assessing the significance of the hypothetical 1-percent change in unemployment relative to eight other counties that are known to have been quite similar at a particular point in time yields much stronger insights into whether the change is practically important for people living there. Such comparisons are in chapter 3. Chapter 2 establishes the typology, compares changes in the metrics used to compute it, and establishes the implications of those changes for social and economic trends.

Because effectiveness monitoring in the ROD directs evaluation of whether "local communities and economies [are] experiencing positive or negative changes that may be associated with forest management," we generated a

typology of counties that is based on shared relationships to federal forest lands management prior to the NWFP. This design directly addresses the problem of including counties in the monitoring protocol that are truly remote from federal forest lands, such as Adams County, Washington. In theory, changes that may be associated with federal forest management would be most apparent in a type that was strongly linked to federal forest management before the NWFP was implemented. Conversely, such trends should be muted or imperceptible in county types with weak or no links to federal forest lands.

To differentiate counties along these lines more precisely, we characterize not only measures directly related to federal forest lands, but also employment in the timber industry, which may or may not be a function of federal forest lands management activity. Some counties may have large extents of federal forest lands, but no locally based timber industry to speak of—e.g., a county in which much of the federal forest land was congressionally designated wilderness. Other counties have robust timber industries, but little or no federal forest lands, timber stocks, or associated management employees; nonfederal forests are key here. Counties where the two factors are tightly intertwined—a robust local timber industry in a county dominated by federal forest lands—are the most important for the monitoring question. Hence, the data used to create the typology reflect these separate but potentially interacting domains: (1) factors directly related to the presence of federal forest lands, and (2) private sector timber industry employment.

Data

We collected data from multiple sources that describe potential economic links between counties, the forest products industry, and federal forest management.

Factors directly related to the presence of federal forest lands—

Counties with very high proportions of federal lands may have fewer options for economies that are uncoupled from federal lands management. One direct consequence is that such counties have limited revenue from property taxes because federal lands cannot be taxed by states. Historically, the U.S. Congress has created multiple means of compensating counties for this lack of potential property-based revenue. Sharing revenues generated by selling timber on federal lands with such counties is the most relevant example for this report. However, rural forest-based counties with large extents of federal lands historically also benefitted from the local assignment of federal government workers. Forest Service and BLM employees have historically been distributed to duty stations in many of the 72 counties. This federal government workforce is more highly educated and typically receives a higher combined salary and benefits package than most private sector workforces in rural areas of the nation. Hence, federal employees have historically been a kind of ballast that steadies the social fabric of rural communities, even entire counties. Their influence in urban areas is muted.

Private sector forest products employment and secondary economic activity—

Extraction and processing of timber from federal lands historically generated jobs not only in manufacturing and logging, but also truck driving, road building and maintenance, and equipment servicing, which paid good wages and required only modest formal schooling. In counties with large extents of forest lands, the workforce created by companies and independent operators carrying out the various stages of timber harvesting and processing historically formed a core of middle class households that had sufficient disposable income to create demand for retail and professional services in their communities. Loss of such jobs frequently triggers a domino effect: declining disposable income reduces demand for services, and a secondary economy linked to the spending by workers in the extraction economy is also impaired or lost. It is difficult to parse out the secondary employment and economic benefits—jobs driving trucks or working in retail—from primary employment in the wood products industry, so we focus on that primary driver of economic activity.

We selected variables representing the two domains based on reliable data for 1980 to 1990 that could either be tracked directly or by robust proxy forward from 1990 through the NWFP era. We ultimately used six county-level measures to create the typology, three for factors directly related to the presence of federal forest lands, and two direct measures of private sector timber industry employment. Variable 4, federal timber processed in mills, bridges the two groups. Table 2.4 presents an overview of these county typology variables.

Table 2.4—Variables used to create county typologies for this Northwest Forest Plan (NWFP) 25-year socioeconomic monitoring report

Variables	Data source	Data date
1) Area of potentially commercial nonwilderness federal forest lands within the NWFP boundary	a) BLM and Forest Service surface ownership data b) Congressionally designated wilderness c) Forest Service conterminous USA forest group	a) as of 1990 b) as of 1990 c) 2013
2) Payments to states from federal timber sale contract receipts	a) Forest Service Secure Rural Schools archived payment reports b) U.S. Census of Governments, local government finance section	a) 1986–1989 b) 1987
3) USDA Forest Service and Bureau of Land (BLM) Management employees	a) U.S. Office of Personnel Management b) U.S. Bureau of Labor Statistics	a) 1988–1990 b) 1988–1990
4) Federal timber processed in mills	a) Forest Service Pacific Northwest Mill Survey (OR and CA) b) WA Department of Natural Resources Mill Survey	a) 1988 b) 1988
5) Workers employed in logging and forestry	a) U.S. Census of Population and Housing, SF-3 ("long form")	a) 1990
6) Workers employed in wood products manufacturing	a) U.S. Census of Population and Housing, SF-3 ("long form")	a) 1990

The variables forming our county typology are heavily skewed toward a single extractive use of federal forest lands—timber harvesting. This is not to say that timber-related economic benefits to counties or communities are the only ones that matter. Other uses of federal forest lands also generate economic activity; recreation is the most prominent example. In addition, ecosystem services that originate from federal lands such as clean water, though not always easy to quantify, are important to the health of local communities and economies. However, we encounter two limiting factors in trying to build a typology from a more holistic view that encompasses traditional economic and ecosystem services benefits of federal forest lands. Economic and labor force data directly measure employment in primary sectors related to timber extraction but not recreation. Some proportion of employment in retail (e.g., ski rentals), hospitality (e.g., lodging), and professional services (e.g., urgent care medical clinics) may be driven by recreational use of forest lands; but it typically must be estimated through complicated modeled relationships that are beyond the scope of this research. Also, the agencies do not collect recreation and nontimber forest products data in a manner that can be tracked longitudinally or integrated with a county-based typology. We are not aware of any comprehensive county-based dataset describing quantifiable ecosystem services delivered by federal lands.

The emphasis on timber extraction in about 1990 in our typology is also consistent with the historical evolution of resource-management philosophy. The National Forest Management Act (NFMA) and The Federal Lands Planning and Management Act (FLPMA), both passed in 1976, laid the foundation for a shift in management philosophy toward what was known by the 1990s as "ecosystem management." The NWFP is considered a major milestone in the transition of federal land management agencies to an ecosystem management paradigm. Our typology variables reflect the era just prior to this major management paradigm shift becoming operational. The 1980s represent the tail end of the "multiple use" era of federal lands management (Hays 2006). The multiple use paradigm was premised on using professional judgement to balance valuable but potentially conflicting management objectives. However, often implicit in the implementation of multiple use management—particularly of national forests in the Pacific Northwest from the 1960s through the 1980s—was an older notion that timber extraction was the highest and best use; multiple use in practice often meant balancing nonextractive management priorities after timber extraction had been maximized (see Hirt 1994 for a rigorously argued example of this interpretation). Although discretion of individual managers clearly attenuated this practice in some places more than others, at the general

scale of a region, our typology variables accurately reflect the general prevailing pre-ecosystem management view that timber was the most economically important of the multiple uses of federal forest lands and should therefore be prioritized.

Statistical methods—

The typology is created by first transforming the six variables shown in table 2.4 into a location quotient. In brief, location quotients describe a relative degree of difference between a single observation of a variable (e.g., for one county) and all the observations combined (the sum of all 72 observations). A value of 1 indicates no difference: for that variable, the individual county is identical to the region. Higher values indicate that the variable is overrepresented in the individual county compared to the region. Values approaching zero indicate the opposite.

This feature makes it possible to group location quotient values so that they describe a continuum of relative degrees of difference between individual counties and a regional benchmark. In most cases (depending on what the variable measures), the value can be interpreted in readily understood terms: a value of 0.85 indicates that the county's value is 85 percent of the same value when measured for all 72 counties combined: i.e., it is similar, or nearly equivalent. A location quotient of 2 for a single county indicates a value twice as large as the comparable value for the 72 counties combined.

The maps in figures 2.5 through 2.10 illustrate how location quotient values for the six variables in table 2.4 are distributed throughout the NWFP monitoring region, using descriptive classes ranging from very low to extremely high. Table 2.5 identifies the approximate range of location quotient values for each class used to sort counties in figures 2.5 through 2.10.

Cluster analysis measures the degree to which individual data observations—in this case, for the 72 counties—have similar values for multiple variables. In essence, counties that have similar location quotients for more than one of the six variables are grouped together. The best match for each individual county is obtained by determining the degree to which its similarity to one group outweighs any possible similarities to other individual counties or groups. Each location quotient describes the degree to which a county has disproportionately larger or smaller quantities of the six variables than would be the case if it were identical to the region. The process groups counties according to a similarly large disproportionate presence or absence of measures of the importance of federal forest lands to local employment and government revenue—and by extension, community vitality.

Table 2.5—Location quotient values for mapping variablesa used to create county typologies for this Northwest Forest Plan (NWFP) 25-year socioeconomic monitoring report

Class and approximate range of location quotient values		Hypothetical interpretation of the location quotient classification for the variable "people in poverty"
None	0.00	No one is in poverty
Very low	0.01–0.25	The number of people in poverty is one quarter, or less, what it would be if the county's population was just like the NWFP region as a whole
Low	0.26–0.75	The number of people in poverty is between one quarter and three quarters of what it would be if the county was just like the NWFP region as a whole
Equivalent	0.76–1.25	The number of people in poverty is roughly equivalent to what it would be if the county was just like the NWFP region as a whole
High	1.26–2.00	The number of people in poverty is between one and one quarter and two times what it would be if the county was just like the NWFP region as a whole
Very high	2.01–3.00	The number of people in poverty is two to three times what it would be if the county was just like the NWFP region as a whole
Extremely high	>3.00	The number of people in poverty is more than three times what it would be if the county was just like the NWFP region as a whole

Extremely high outlier values ≤33.4 occur in variables 2, 3, 5, and 6. These outliers are mapped in figures 2.5–2.10 with an "exceptional" coding scheme capturing all values >6. See table 2.4 for a list of the six variables used to create county typologies.

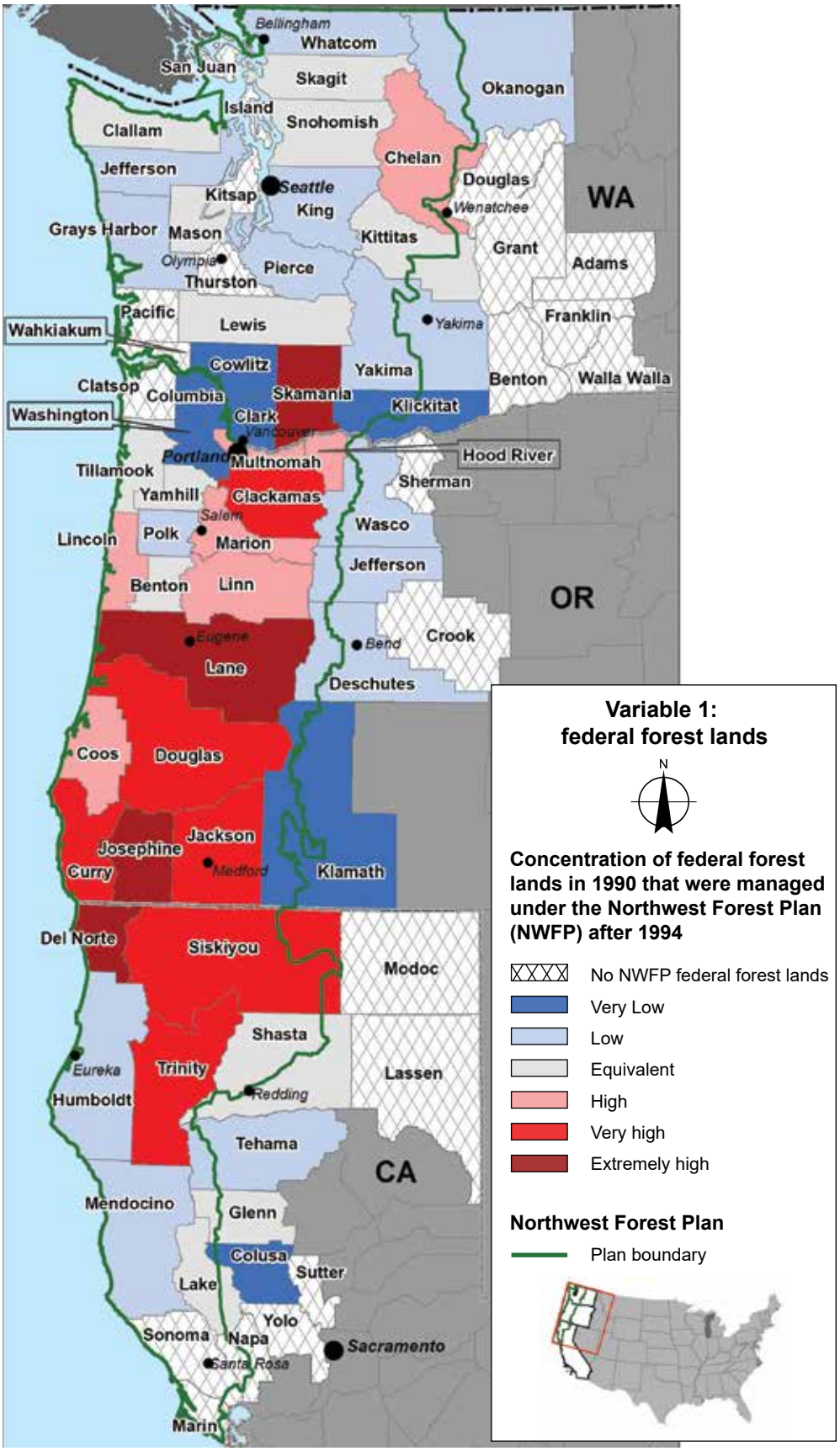

Figure 2.5—Distribution of location quotient value for variable 1 (area of federal forest lands).

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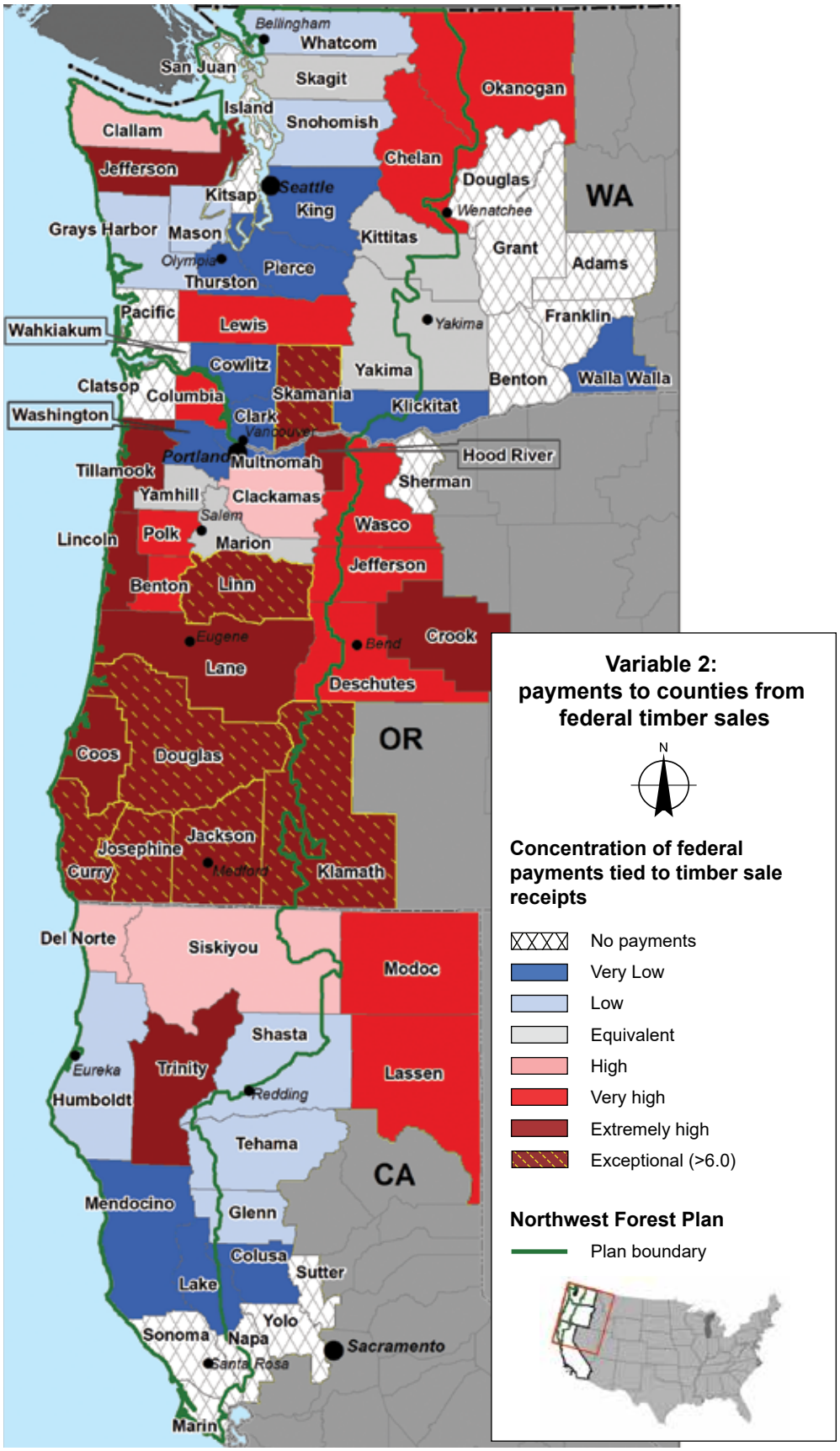

Figure 2.6—Distribution of location quotient for variable 2 (U.S. Department of Treasury payments to counties). Payments were based on Forest Service and Bureau of Land Management timber harvest receipt average of the 3 highest years (1986–1989) relative to 1987.

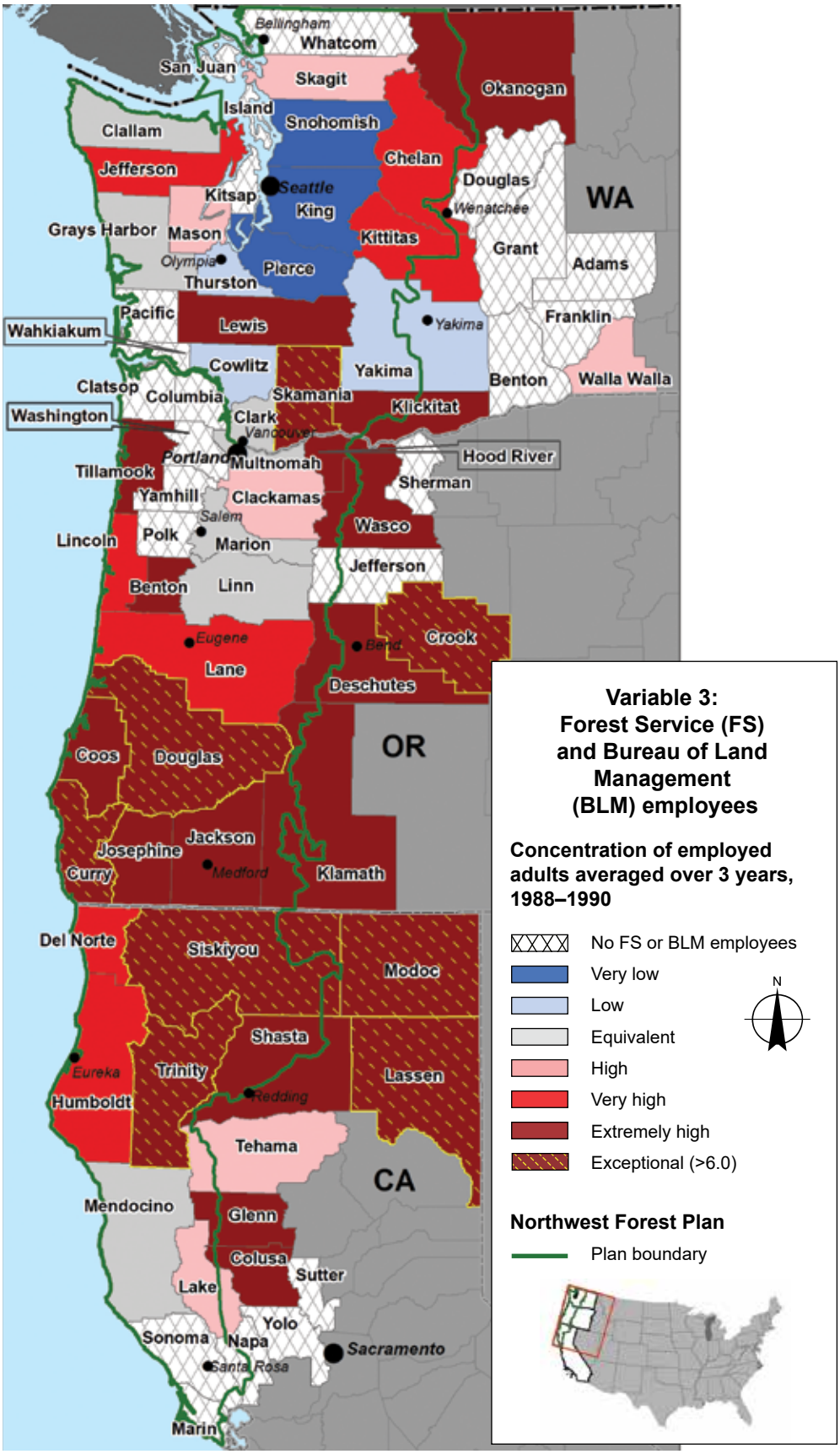

Figure 2.7—Distribution of location quotient for variable 3 (number of permanent Forest Service and Bureau of Land Management employees). Number of employees based on a 3-year average relative to total number of employees age ≥16, 1988–1990.

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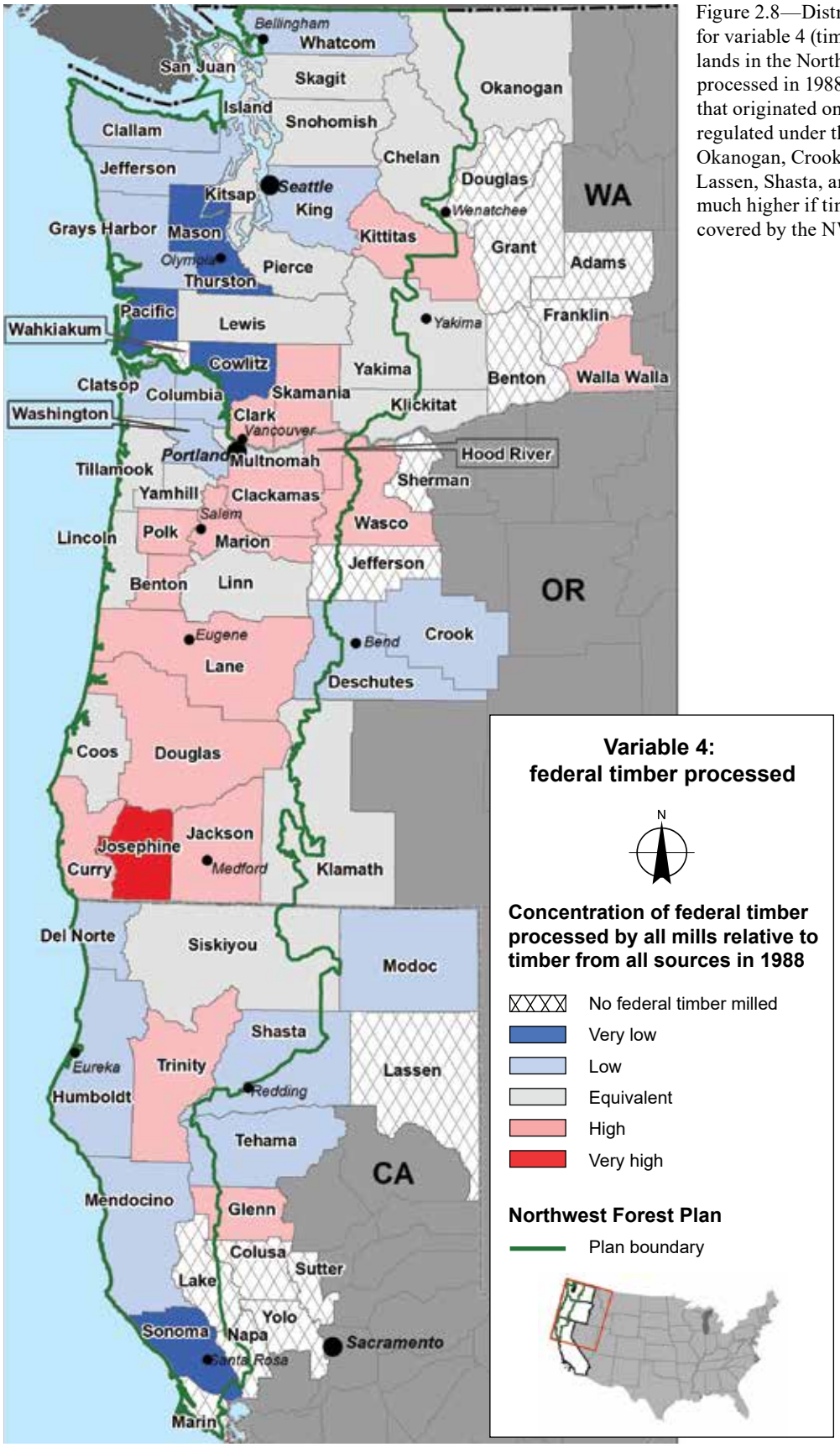

Figure 2.8—Distribution of location quotient value for variable 4 (timber originating on federal forest lands in the Northwest Forest Plan [NWFP] area and processed in 1988). Note: federal timber is timber that originated on a federal forest management unit regulated under the NWFP after 1994. Values for Okanogan, Crook, Deschutes, Klamath, Modoc, Lassen, Shasta, and Tehama Counties would be much higher if timber from federal forest units not covered by the NWFP after 1994 were included.

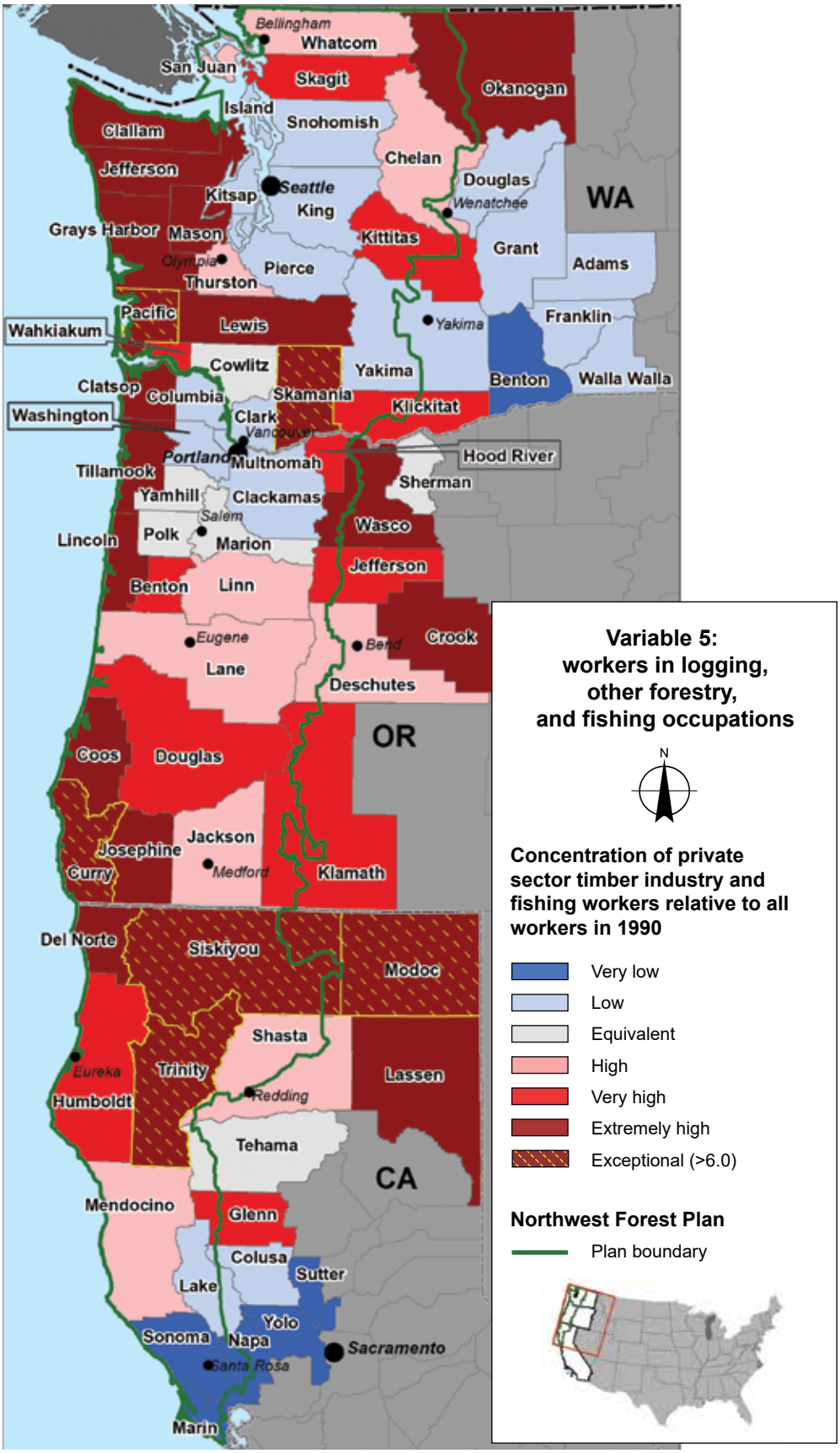

Figure 2.9—Distribution of location quotient value for variable 5 (number of employees in the forestry and fishery sectors in 1990).

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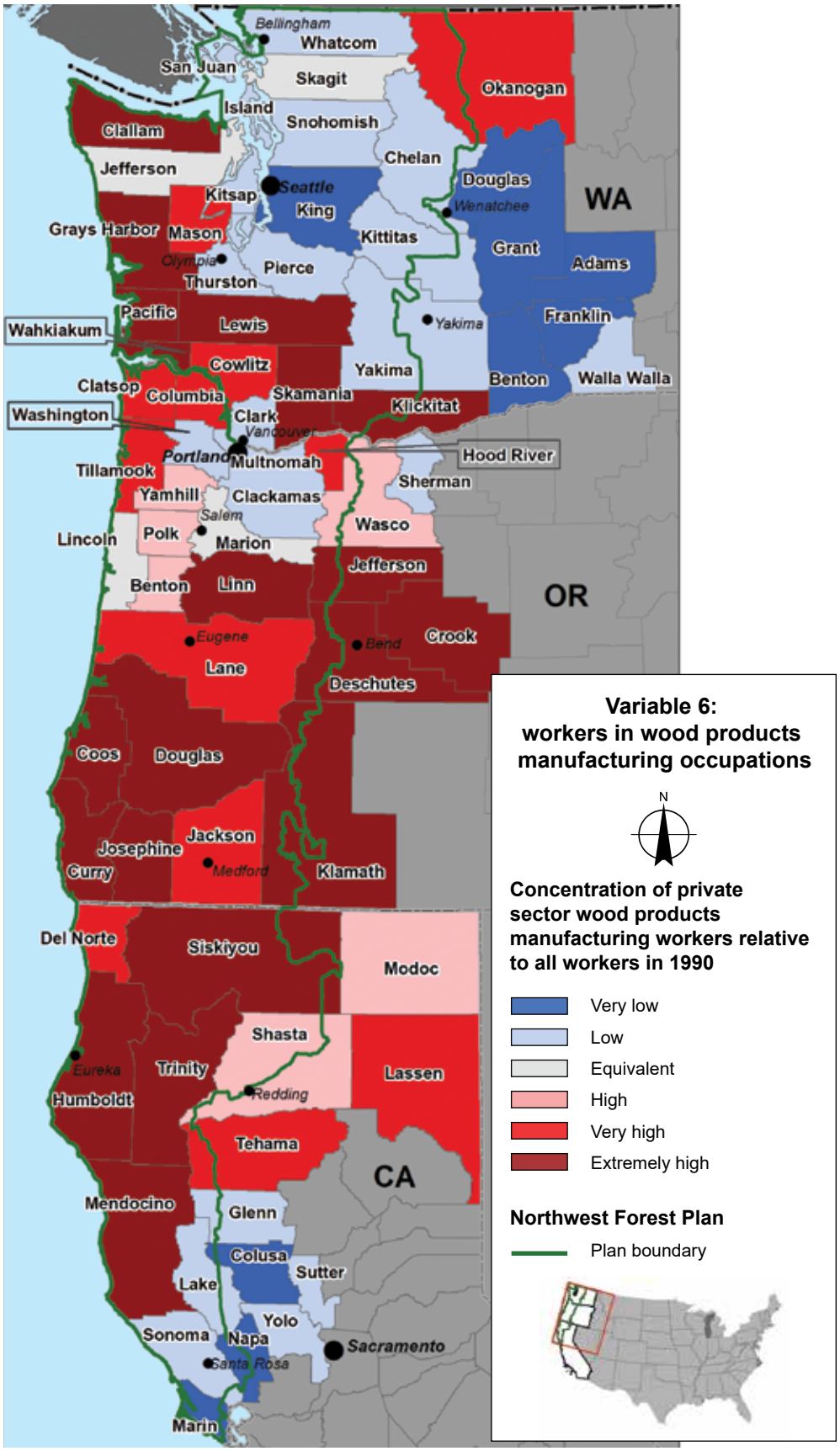

Figure 2.10—Distribution of location quotient value for variable 6 (number of employees in the wood products manufacturing sector).

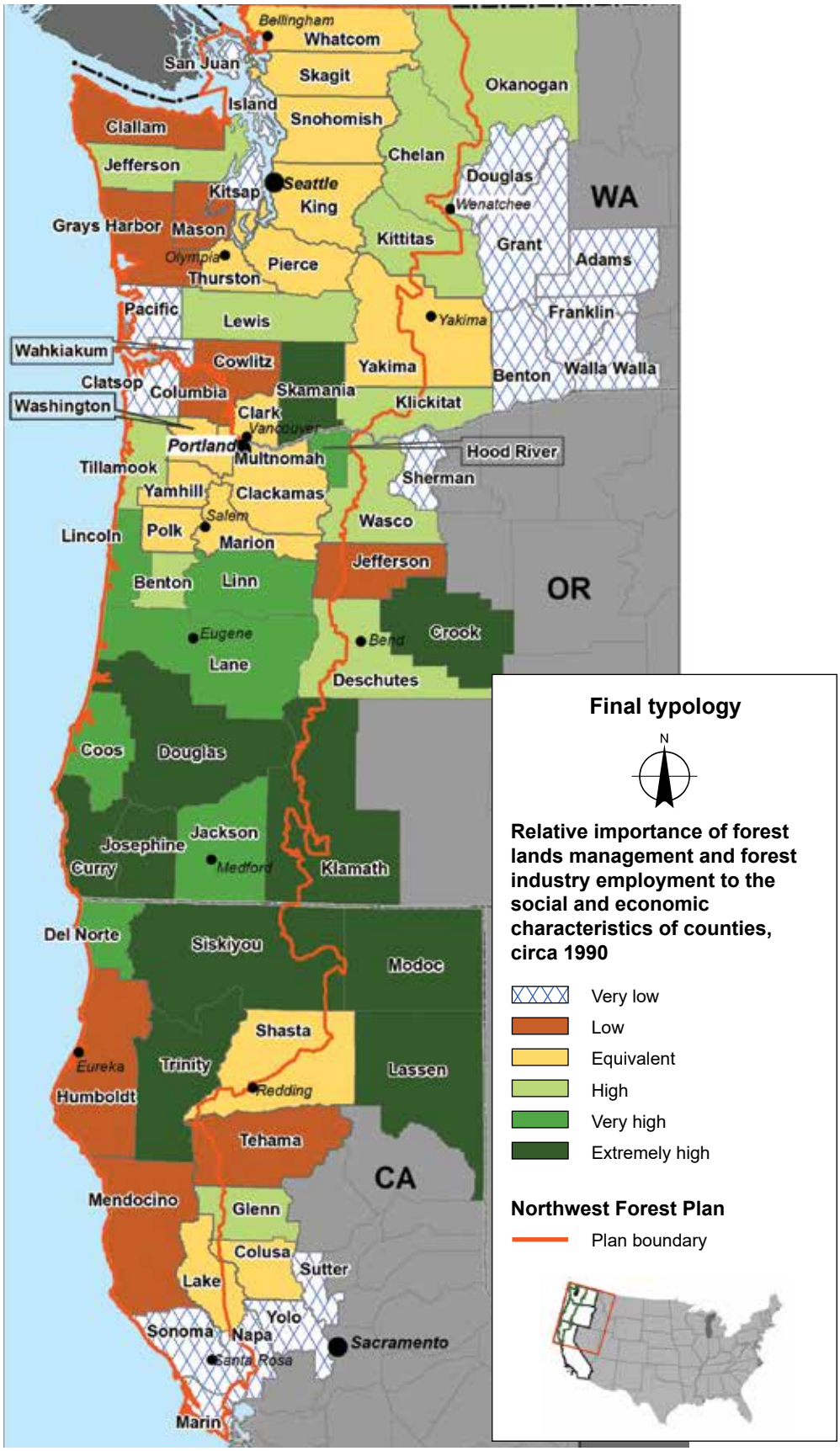

Figure 2.11—Final typology of Northwest Forest Plan counties. The legend shows only the names of the county groups; names are used exclusively in the remainder of the document text. None = group 0; Low = group 1; moderate = group 2; high = group 3; very high = group 4; extremely high = group 5.

Table 2.6—Summary statistics for the six typology variables aggregated to the six groups of the typology used in this Northwest Forest Plan (NWFP) 25-year socioeconomic monitoring report

County group number and name	Land area		1986–1989 revenue		Timber processing log volume		
	Total	NWFP federal forest land	Total county revenue[a] (all sources)	Federal payments tied to timber sales[b]	Number of processing facilities except export terminals	Total processed in all facilities except export	Total volume, from NWFP federal forest units
	- - - - - - Acres - - - - - -		*- - - - Millions 2017 dollars - - - -*		*- - - Count - - -*	*- - - - - - - - - MMBF - - - - - - - - -*	
0 None	11,540,833	176	1,892	0	26	362	85
1 Low	11,851,276	971,132	648	24	152	3,147	479
2 Moderate	17,811,979	2,022,529	3,203	80	151	3,187	1,431
3 High	16,290,127	2,027,464	316	57	68	1,250	643
4 Very high	8,889,112	3,106,516	424	198	136	3,103	1,887
5 Extremely high	24,118,146	5,141,979	471	248	84	2,683	1,686
Sum	90,501,473	13,269,795	6,955	608	617	13,731	6,212

County group number and name	1986–1989 employment[c]		1990 employment[d]				
	Total reported by employers	Full-time Forest Service and BLM[e]	Total reported by individuals	Total in forestry and fishing occupations		Total in wood products manufacturing occupations	
	- - - - - - - Number employed - - - - - - -		*- - - - - - - Number employed - - - - - - -*		*Percent*	*Number employed*	*Percent*
0 - None	521,442	0	700,759	2,286	0.3	7,168	1.0%
1 - Low	170,982	708	219,473	3,828	1.7	21,915	10.0%
2 - Moderate	2,121,075	3,445	2,497,042	12,132	0.5	41,652	1.7%
3 - High	146,954	1,864	181,941	3,673	2.0	11,229	6.2%
4- Very high	230,377	2,256	287,118	4,899	1.7	24,456	8.5%
5 - Extremely high	106,816	3,583	134,394	4,301	3.2	19,553	14.5%
Sum	3,297,647	11,856	4,020,727	31,119		125,973	

[a] Total county revenue is for 1987.

[b] Federal payments are an average of the three largest payments in 1986–1989.

[c] Data reported by employers are from Quarterly Census of Employment and Wages (QCEW) surveys of state labor agencies, which do not include self-employed workers.

[d] 1990 employment is from the decennial U.S. Census of Population and Housing; because data are from a survey of households, all employed individuals are estimated, including the self-employed. Total employed by industrial category of occupation is a directly related subset of total employed, so calculating percentages here is appropriate.

[e] Forest Service and Bureau of Land Management (BLM) employment data are from an unrelated source; percentage calculations are not appropriate because no crosswalk for the QCEW and U.S. Office of Personnel Management data on federal employees exists.

County groups—
The cluster analysis differentiates the 72 counties into six groups, as shown in figure 2.11. Summaries of the raw data comprising the six typology variables are reported in table 2.6. Two groups, 0 (none) and 2 (moderate), stand out for having much larger total amounts of county government revenue and employed persons than the other four. This is because 23 of the region's 32 counties that were classified as metropolitan in the two prior monitoring reports (see figure 2.4 and table 2.3) are sorted by the cluster analysis into one of these groups. The other four groups are broadly similar in terms of general revenue and employment characteristics, though with much smaller totals. As table 2.6 indicates, however, workforce size and revenue amounts—very general indicators of the size of an associated economy—are not necessarily correlated with federal forest management and timber industry employment significance within groups. For example, group 2 (moderate) has 10 times the total employment of groups 1 and 4, and about twice the employment in wood products manufacturing; but an equal amount of timber volume was processed in these three groups in 1988. Group 0 (none) is notable for near-total absence of federal forest lands; consequently, this group also lacks revenue-sharing payments from federal timber sales and federal forest management employees.

Group 0 (18 counties): none—
Eighteen counties in the NWFP monitoring protocol have no significant relationship to the federal forest lands variables in the typology. For three of the federal forest variables—NWFP federal forest area, timber sale revenue sharing payments, and Forest Service or BLM employees—the sum of observed values for all 18 counties is essentially zero. The

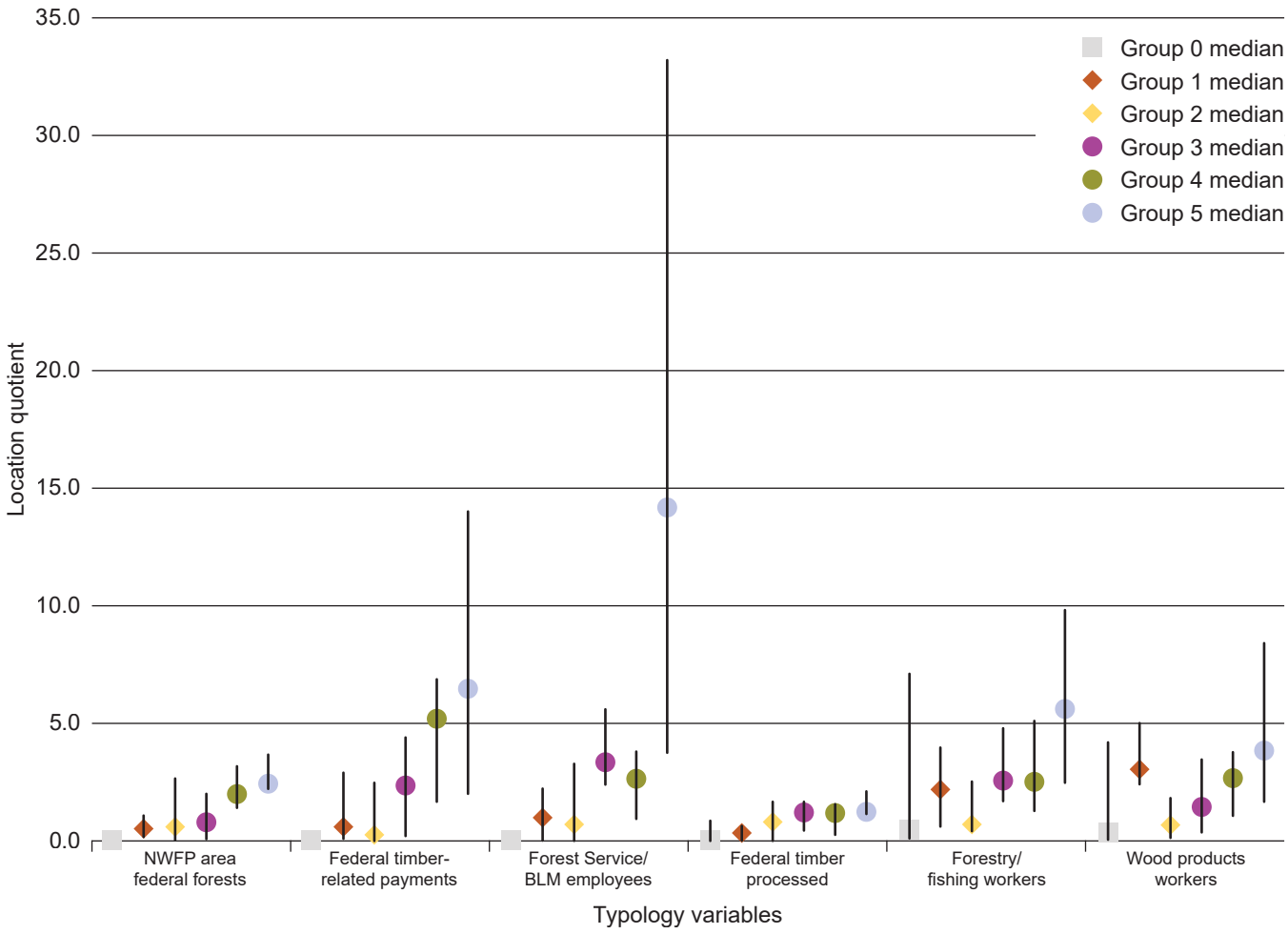

Figure 2.12—Range and median value of location quotients for typology variables 1–6 by county group. Median location quotient values for the six variables (table 2.4) in each group are shown as geometric shapes. Circles represent groups with generally high to extremely high importance values for federal lands and timber industry employment metrics circa 1990; quadrilaterals represent groups with generally low importance for these metrics. The complete range of values observed among the counties in each group is indicated by the vertical bar. BLM = Bureau of Land Management, NWFP = Northwest Forest Plan.

26 wood processing facilities in the 18 counties processed about 2.5 percent of all timber in 1988 and about 1.3 percent of federal timber—minimal amounts. In nearly all of them, timber industry employment was also minimally important. Three of the 18 counties are exceptions (their very high outlier values are shown in fig. 2.12): Clatsop, Oregon, and Pacific and Wahkiakum, Washington, neighboring counties on either side of the Columbia River estuary. Historically, all three counties have depended on employment in natural resources, both timber production and commercial fishing (the height of the bar for group five in fig. 2.12 is attributable to an indeterminate but likely large fisheries employment figure for these counties). Yet they share zero importance values for federal forest lands with the rest of the group, and zero values do not occur in any of the other groups, so this group is their best fit.

Group 1 (nine counties): low—
Counties in this group share two common features: timber industry employment was very to extremely important for total household earnings; and the importance of federal forest land management was generally low. Median values for the four federal forest management variables (fig. 2.12) fall within the low importance, or equivalent importance group, as do the group location quotients in table 2.7. Medians for the timber industry employment variables are in the very high range, in common with groups 3, 4, and 5; the group location quotient (table 2.7) for wood products manufacturing employment is in the extremely high range. Raw data values in table 2.6 underscore the importance of timber production: these nine counties had as many operating wood processing facilities, and processed as much log volume, as the 17 mostly urban counties of group 2 (moderate). A map of land ownership patterns in the "low" group of counties would reveal that potentially commercial forest lands principally belong to private industry firms, the Washington Department of Natural Resources, private nonindustrial landowners, or American Indian nations.

Group 2 (17 counties): moderate—
All of the counties that were designated as part of the Bellingham, Seattle-Tacoma, and Olympia, Washington; Portland-Vancouver (Oregon and Washington, respectively); Salem, Oregon; and Redding, California, metropolitan areas belong to this group. Only three of its member counties—Colusa and Lake, California, and Skagit, Washington—were not already part of a

Table 2.7—Importance of summed observation variables (1–6) to county groups relative to the entire Northwest Forest Plan (NWFP) region based on location quotient

Group	Number of counties	(1) NWFP area federal forests	(2) Payments from timber sales	(3) Forest Service/ BLM employees	(4) Federal timber milled	(5) Forestry/fishing workers	(6) Wood products manufacturing workers
(0) None	18	None (0.0)	None (0.0)	None (0.0)	Low (0.5)	Low (0.4)	Low (0.3)
(1) Low	9	Low (0.6)	Low (0.4)	Equivalent (1.0)	Low (0.3)	Very high (2.3)	Extremely high (3.2)
(2) Moderate	17	Equivalent (0.8)	Low (0.3)	Low (0.5)	Equivalent (1.0)	Low (0.6)	Low (0.5)
(3) High	11	Equivalent (0.9)	Very high (2.1)	Extremely high (3.5)	Equivalent (1.1)	Very high (2.6)	Very high (2.0)
(4) Very high	7	Very high (2.4)	Extremely high (5.4)	Very high (2.7)	High (1.3)	Very high (2.2)	Very high (2.7)
(5) Extremely high	10	Very high (2.4)	Extremely high (6.0)	Extremely high (9.3)	High (1.4)	Extremely high (4.1)	Extremely high (4.6)

Location quotient values were calculated on summed observations of the six variables for counties in each group (see table 2.6).

metropolitan area in 1990, and Skagit was so designated before the 2000 census. Colusa, still rural in 2017, and Lake, a micropolitan county, are not well matched to any of the groups; this group was the best fit for these counties. A feature of Pacific Northwest geography is that county boundaries in Oregon and Washington were drawn in the mid-19th century to extend from the primary lowland cities on Pacific coast water transportation routes eastward to the crest of the Cascade Range. Because timber resources in the upper elevations of the west side of the Cascades had not been developed by the turn of the 20th century, counties that were principally drawn to manage what developed into large urban populations also ended up including large extents of federal forest reserves—later, national forests such as Mount Hood, Gifford Pinchot, and Snoqualmie. The group had more than 2 million acres of nonwilderness federal forest land, more than 3,000 Forest Service and BLM employees, and mills that processed more than 1.4 billion board feet (BBF) of federal timber in addition to about 1.7 BBF of nonfederal timber. One-third of the region's wood processing industry workforce was employed in a county in this group. Unlike group 1 (low), where absolute measures of these federal forest management variables are truly low, in group 2, absolute values of these measures are high but rendered **relatively** insignificant by the sheer size of the population, workforce, and economic activities they are embedded within. Compare aggregate county data for the two groups in table 2.6. The term "moderate" captures this group's place between group 1, where the federal lands measures are minimally important in absolute terms, and groups 3–5, where they are highly important in both absolute and relative terms.

Group 3 (11 counties): high—
This group is composed of a diverse mix of counties from the western and eastern fringes of the NWFP-area boundary. Just two member counties, Lewis, Washington, and Benton, Oregon, are neither located on the Pacific coast nor bisected by the eastern NWFP boundary line. In 1990, the only city in the group with more than 25,000 people was Corvallis, Oregon (in Benton County). Other significant population centers were Wenatchee, Washington (Chelan County), and Bend, Oregon (Deschutes County), with about 20,000 people each. No counties in this group were metropolitan in 1990, but populations grew rapidly in these three places during the 1990s, and their counties were designated metropolitan by 2000. The remainder of the group's counties were largely rural in character. Timber industry employment was still very important but lacked the outsized importance found in groups 1, 4, and 5. The location quotient for the group in aggregate for wood products manufacturing is barely in the very high range (table 2.7), though the median for the 11 individual observations is higher (figs. 2.12, 2.13). Forestry and fishing employment importance was more clearly in the very high range. Among the four groups in which timber industry employment was at least very high, this is the only one in which the importance value for variable 5, forestry and fishing, was higher than for the manufacturing variable (variable 6). The forestry and fisheries variable captures labor in most other steps of the timber processing supply chain, so it is plausible that forest management created more of the small-business or independent-operator mode of timber work—loggers, drivers, equipment mechanics—in these counties as compared to mill jobs. Because 7 of the 11 counties are only partly within the NWFP-area boundary, federal forest lands administered under the NWFP are represented in the group in roughly the equivalent proportion as in all 72 counties in aggregate. Lacking large population centers, however, makes the smaller Forest Service and BLM employee presence still one of extreme importance: the group's total workforce had 100,000 fewer participants than the otherwise mostly comparable group 4. Only 2 of the 11 counties received a share of BLM Oregon and California Revested Railroad Lands Act (O&C Act) payments (Benton and Tillamook, Oregon), and their share was small; hence, unlike groups 4 and 5, the payments variable is almost entirely based on the 25-percent rule payments made by the Forest Service, explaining their somewhat lesser importance than in groups 4 and 5.

Group 4 (seven counties): very high—
All but one of the members of this group are in Oregon, five in the southwestern quadrant of the state. The primary unifying factor for these counties is the extremely high importance of revenue-sharing payments derived from federal timber sales (variable 2). The five counties in southern Oregon—Coos, Jackson, Lane, Lincoln, and Linn—received 40 percent of the annual O&C Act payments made by the BLM to the state of Oregon. The other two counties of the group (Del Norte, California; Hood River, Oregon) also had disproportionately high

importance values for payments, a result of very small total government revenues and very large proportions of county area covered by national forest lands. Forest Service and BLM employees also have very high importance. The group includes the only two large stand-alone metropolitan areas, Eugene-Springfield and Medford-Ashland, Oregon, that are not classified in either group 0 or group 2. Both counties had a large central administrative office for both agencies in 1990 as well as multiple district offices—roughly 15 percent of the entire region's Forest Service and BLM workforce in the late 1980s was based in these counties. Both timber industry employment variables also have medians that fall in the "very high" range (fig. 2.13). The group had the highest number of wood processing facilities per county (19.5) in 1988 as well as the highest rate of timber processed per facility (22.8 million board feet [MMBF]); this is one of only two groups where the aggregate group location quotient for federal timber processed is above the "equivalent" range.

Group 5 (10 counties): extremely high— The relative importance of two federal forest management variables, payments and agency employees, is literally off the charts in these 10 counties, as indicated in figure 2.12. The highest outlier value among all 432 (72 × 6) location quotient values that contributed to the calculation of the typology is the extremely disproportionate presence of Forest Service employees in Trinity County, California,

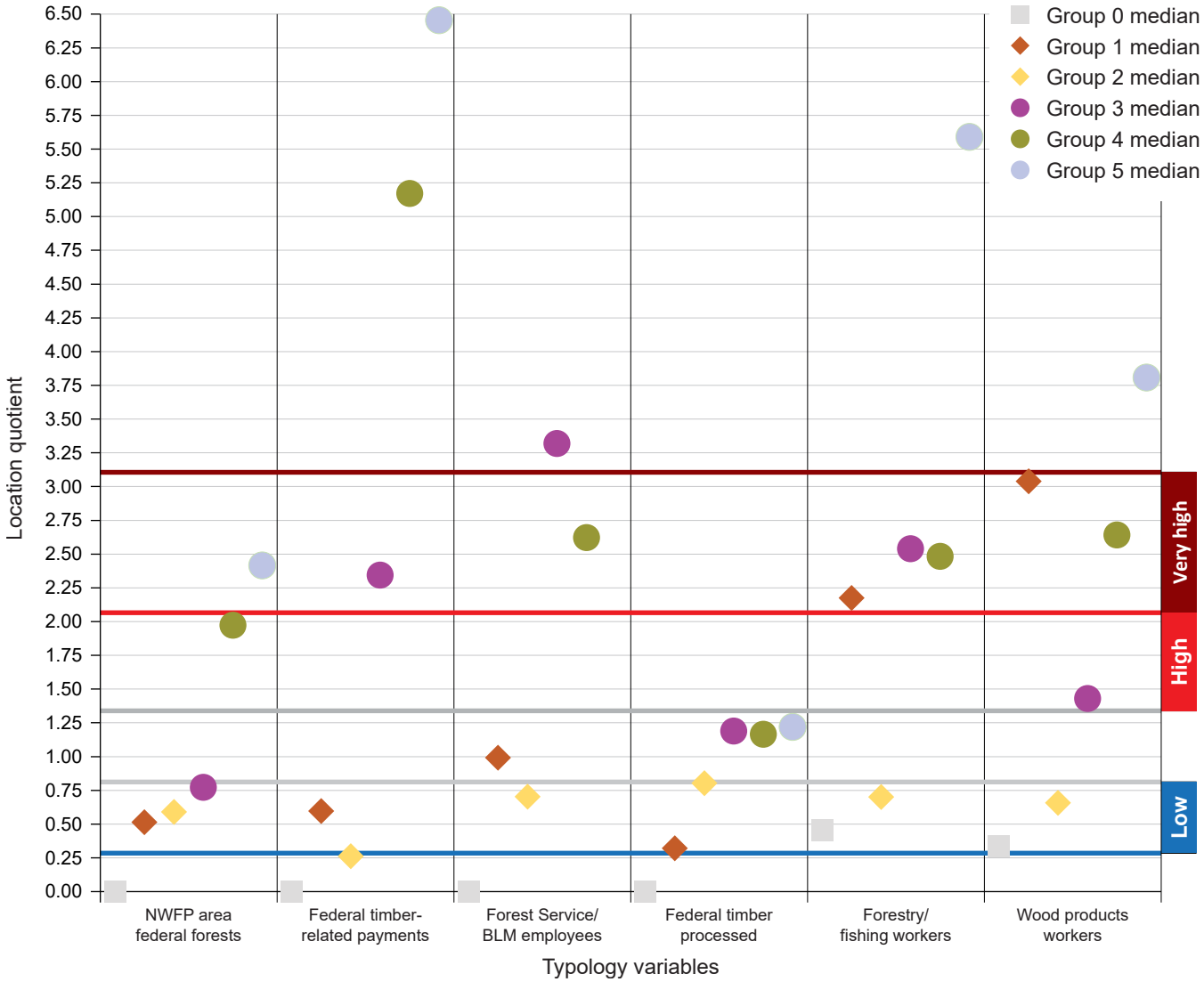

Figure 2.13—Location quotient median value by degree of importance for typology variables 1–6 by county group. The text boxes on the right axis correspond to the range of importance values for each variable from table 2.5. The median for all location quotient observations in a group is a better indicator of the relative degree of shared importance for the variable within the group, although individual observations may deviate from the indicated collective group importance (e.g., the very long bars for some variables in figure 2.12). BLM = Bureau of Land Management, NWFP = Northwest Forest Plan.

in the late 1980s. For every one such employee that would have been based in the county if its total workforce and federal forest agency workforce were proportionally equivalent to the region, thirty-three were observed. Similarly, Skamania County, Washington, received 14 times the revenue from federal timber sale payments than it would have had it been equivalent to the region. These extreme outliers, and others that would be equally remarkable in the absence of these leading examples, indicate not only that the 10 counties in the group had very large shares of the region's total payments and full-time agency employees in an absolute sense, but also that they had very small shares of the region's total workforce and county revenue (see table 2.6). For example, these 10 counties had slightly more than 10,000 workers per county, according to 1980s data in the Quarterly Census of Employment and Wages (QCEW) published by the Bureau of Labor Statistics; the nearest comparable group, group 3 (high), had about 3,500 more workers per county, but half as many Forest Service and BLM employees. The converse example is group 2 (moderate), which had roughly the same number of Forest Service and BLM employees as group 5, many in the agencies' regional offices in Portland, Oregon, but roughly 20 times as many people in the total workforce. In group 5, the importance of these workers was potentially large enough that an entire county, not just a community, could have plausibly felt negative consequences from severe reductions in the agencies' workforces. The same extremes apply to the timber industry workforce variables. The median for forestry and fisheries employees is by far the highest of all groups. The individual observations median for wood products (manufacturing) workers (fig. 2.12) is similar only to group 1, the "low" group; the aggregate group location quotient similarly is only in the extreme range for groups 1 and 5, though the disparity between the two is larger (table 2.7).

County Groups and the Monitoring Question

The divergent relationships of these six county groups to measures of federal forest management and timber industry employment, circa 1990, create a framework in which multiple distinct social and economic change trends can be detected. Group 2, for example, includes all Seattle- and Portland-area counties. It undoubtedly experienced social and economic changes during the NWFP era far differently than groups 1, 3, 4, and 5. As of 1990, these four groups included only two places with more than 50,000 people. While the relationship between groups 0 and 2 on the one hand, and 1, 3, 4, and 5 on the other, is reminiscent of the metropolitan/nonmetropolitan scheme used in previous reports, the typology transcends this dichotomy. It detects important distinctions among the nonmetropolitan and rural counties in the relative importance of the timber industry and federal forest lands that could have plausibly resulted in multiple, distinct, nonmetropolitan social and economic changes: groups 1 and 5, for example, are dissimilar in the importance of federal forest lands, but quite similar in the importance of private sector industry employment (refer to tables 2.6 and 2.7). The typology thus sets up a quasi-experimental control for evaluating the hypothesis that there might be social and economic change trends that occurred only because of implementing the NWFP; if so, evident trends in group 5 should not be similar to trends in group 1.

Because counties in group 0, the "none" group, lack connections to federal forest lands in circa 1990, group 0 trends are not analyzed in the charts, graphs, and interpretation found in the remainder of this report. When the term "all NWFP region" appears in figures showing the analyses of these data, unless otherwise noted, it refers only to the 54 counties in groups 1–5, which had some connection to federal forest lands, circa 1990. Lacking any evident connection to federal forests, group 0 observations would contribute only noise to a data trend, making interpretation difficult. Eliminating that noise to better detect trends that could be related to implementing the NWFP is the major purpose of the typology. In a few instances it may be more appropriate to report the sum of observations for all 72 counties, such as in the initial analysis of social vulnerability in chapter 3. We identify which dataset is being depicted in the footnotes of each chart as well as in the interpretive text as required.

In the remaining section of chapter 2, we begin to describe how social and economic change could have been related to the typology by first understanding how the variables used to build the typology have themselves changed during the 25-year NWFP monitoring era. We assess social and economic change trajectories in chapter 3.

Trends in Federal Forest Land Management and Timber Industry Employment, Circa 1980–2017

Historical Eras in Time-Series Analysis of Typology Variables

The core monitoring question addressed in this chapter is whether implementation of the NWFP might be associated with distinct positive or negative social and economic changes measured at the scale of counties. The first task in assessing this question is to quantify observed trends in the measurement of federal forest land management indicators: if no new trends develop during the litigation and implementation eras, then there is little reason to pursue the question further, because lack of identifiable change trends would suggest that the plan itself did not have the effects ascribed to it. Any identified trends may or may not be caused by implementing the NWFP, but if they occur on a parallel timeline with the litigation and subsequent implementation of the plan, they are at least correlated with the forest management changes the plan instituted. An example of a correlated, noncausal trend would be the contraction of private forest industry employment resulting from a corporate restructuring or new overseas competition unrelated to the supply of timber from federal forests. Describing trends in forest management indicators provides essential context for forming more nuanced hypotheses about the possible links between plan implementation and social and economic change.

Although earlier rounds of NWFP socioeconomic monitoring used 1990 as the baseline year for describing management and socioeconomic change, trends in forest management indicators during the NWFP era may have been continuations of existing trends; if so, the interpretation of the observed trends would have to be revised to account for a constant trend occurring under two very different management regimes. A constant trend with origins well before the NWFP litigation and adoption eras would most likely be associated with underlying factors other than the prescriptions of the plan. To address this possibility, we obtained data that were consistently recorded since at least 1980 to establish a prevailing trend at the time of NWFP adoption. We identify three key reasons for considering the preexisting trend in the 1980s:

- The 1980s were a period of dramatic upheaval, restructuring, and reorganization in the Pacific Northwest timber industry.
- The events that precipitated the NWFP, including the implementation of the first federal agency land management plans required by NFMA, and subsequent lawsuits asserting the agencies violated NFMA requirements, occurred almost entirely within that decade.
- The 1980s are the decade in which the American economy began its present course of segmentation into high-growth, information- and professional services-dominated, large metropolitan-area economies, and economically marginal communities in the rust belt and rural areas throughout the nation.

All of these factors are potential drivers of social and economic conditions at the outset of and during the NWFP era, and ignoring them could lead to spurious conclusions about a hypothetical relationship between implementing the NWFP and county-scale social and economic change.

These large-scale potential drivers of change suggest a refinement of the standard, binary comparison of "before" and "during" eras for NWFP monitoring. From an initial exploration of time-series data describing timber harvest, payments to counties, and both federal agency and private industry employment levels, we induce the following eras for interpreting social and economic change:

- Intensive harvest era: 1978–1988
    - Harvest data for all 72 counties are available from 1978 to the present, and the interpretation of trends in other federal forest management variables is aided by reference to harvest levels.
    - This era actually consists of two sub-eras:
        - 1978–1982, when both harvest volume and timber industry employment were contracting in response to primarily U.S. market dynamics that culminated in periods of national recession from 1980 through 1982.
        - 1983–1988, when harvest volume rebounded to levels that were typical of the 1960s and early 1970s, and] total timber industry employment also rebounded, though average annual wages did not.
- Litigation era: 1989–1993
    - The first federal lawsuit seeking to block timber sales by the Forest Service and BLM in the Pacific Northwest was filed in 1989, and over this 5-year period, the agencies were either partially or wholly enjoined from entering into new timber sale contracts while federal

district court Judge William Dwyer considered whether the agencies' response provided adequate remedy.
    - Federal timber sales and harvest volume plummeted during this era, but state and private harvest volume also declined, though by lesser amounts.
- Early NWFP era: 1994–2000 (this 7-year period corresponds well with three important benchmarks):
    - The standards and guides phase of implementing the NWFP began in 1994–1995 and was largely complete by 2000. By 2000, the background surveys of sensitive species and prescriptions for ensuring that management actions did not jeopardize them were in place, and the work of agency staff could again focus principally on active management.
    - Passage of the Secure Rural Schools Act in 2000 replaced the older systems of sharing revenue from federal timber sales with county governments using a new system that was based on a formula tied to historical payments instead of current timber receipts. 2001 was the first year of payments using the new formula.
    - 2000 was the last year in which labor force data collected by state and federal agencies were classified according to the SIC system, which was used only in the United States during the latter 20th century. Data collected starting in 2001 were classified using the North American Industry Classification System (NAICS). A significant change in this shift was the classification of jobs in logging and related activities, which moved from the manufacturing series (as part of wood products manufacturing) to the natural resources series. Consequently, charts and graphs describing longitudinal change in employment data have a break between 2000 and 2001; trends are reported separately for the two classifications.
- Post-2000 era: 2001–2017
    - Like the intensive harvest era, this 17-year period includes a recession (the Great Recession of December 2007–June 2009, the longest recessionary period since World War II) as well as two periods of strong national economic growth (2003–2007 and 2012–2017). Because workforce data are the only variables that indicate a strong argument for breaking this era into multiple pieces, trends are summarized for the entire period with reference to expected trend lines during the Great Recession.

Federal Forest Lands (Typology Variable 1)

This variable is essentially static over time. We only intended for it to describe 1990 conditions as a contributor to the cluster analysis. The area of federal forest lands does not change appreciably during the NWFP era (e.g., through land swaps, sales, or the designation of new wilderness areas by Congress), so it is not analyzed longitudinally.

Timber Harvest (Not a Typology Variable)

Quality timber harvest data for the late 1980s and early 1990s exist, but harvest volume was not a contributor to the typology because the assumption that timber harvested in a particular county generated employment or secondary economic benefits within the same county is often untenable. Federal (or nonfederal) timber harvested from stands located in one county may well have been marked by foresters with an employment duty station in a different county, logged by a contract crew based in a third county, and hauled to a mill in a fourth county. Fine-scale timber flow data that would show the economic linkages originating with harvests are beyond the scope of this analysis.

Still, understanding general trends in timber harvest levels within the region is a prerequisite for interpreting change in other federal forest management indicators. It is widely known that timber harvests from federal lands during the NWFP era were dramatically lower than before NWFP implementation—this is the most widely circulating narrative about implementation of the NWFP. Less well known, but documented in this section, are the relationships between declining federal timber harvest, **nonfederal** timber harvest volume, and federal forest management factors that were historically tied to the volume of federal timber harvested—such as federal agency employment levels, payments to counties, and employment in private sector timber industry jobs.

Readily available timber harvest data for all counties in the monitoring region exist from 1978 to the present. California data between 1978 and 1984 report only total harvest, not harvest by land ownership, so figure 2.14 shows only total harvest between those dates for all three states. Harvest totals from counties in the "none" group are not included in the figure.

Timber harvest volume in the 54 counties that we analyzed for this report in NWFP monitoring region peaked in 1978 and again in the mid-1980s. This latter peak followed a dip associated with the nationwide recession of 1980–1982, which significantly curtailed demand for

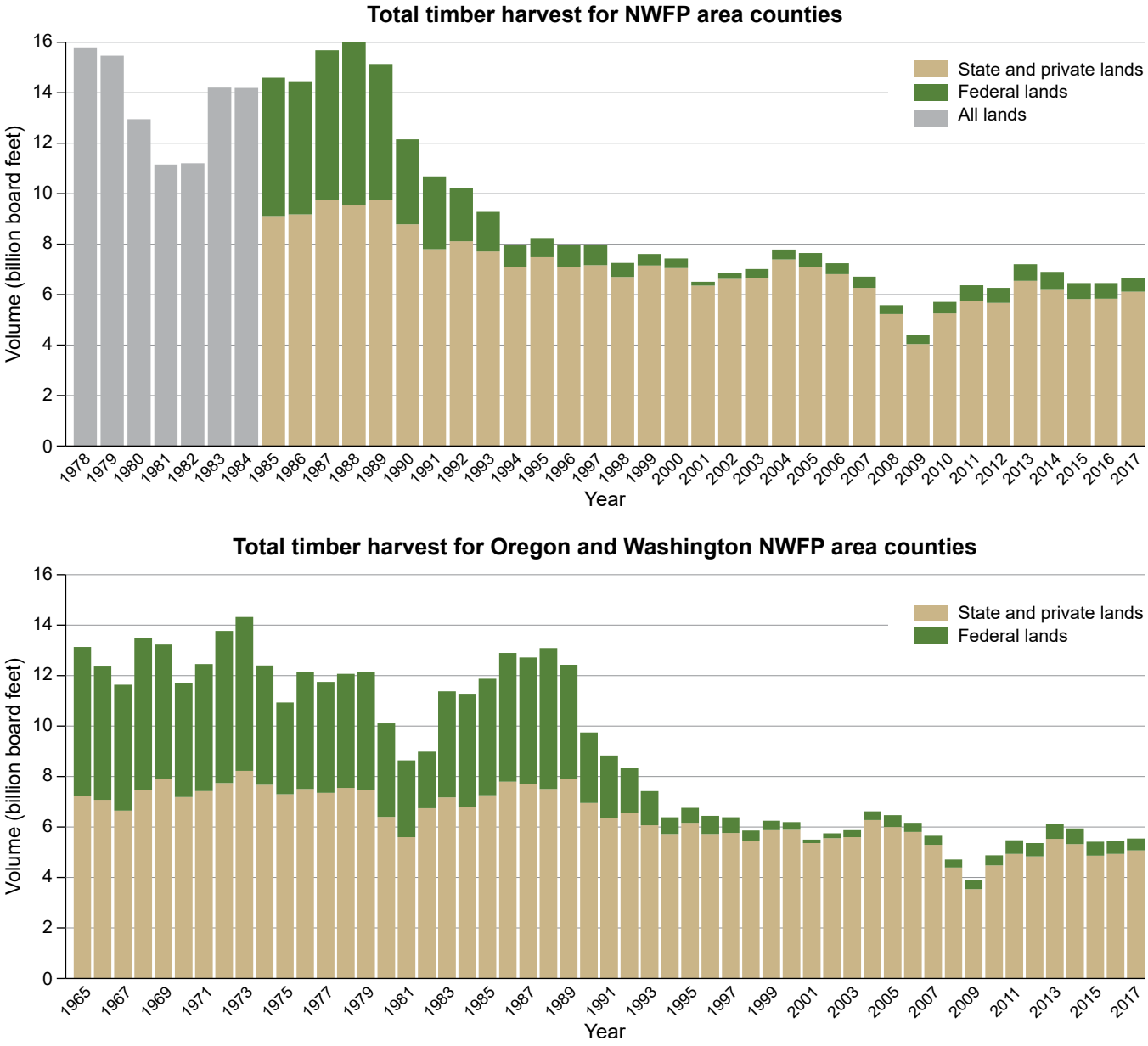

Figure 2.14—Timber harvest volume for the 54 analyzed counties in Northwest Forest Plan (NWFP) region since 1978 (top) and for 41 Oregon and Washington counties in the region since 1965. California data for 1978 through 1984 exclude landownership sources of harvested timber, so only total harvest volume from all ownerships is shown for that period.
Data source: California Board of Equalization, Oregon Department of Forestry, and Washington Department of Natural Resources.

wood products nationwide. State and private lands in the NWFP region yielded 9.3 BBF annually in 1986, 1987, and 1989. Federal harvest volume peaked in 1988 at 6.6 BBF. The effect of legal injunctions on federal timber sales in the "litigation era" (1989–1993) are obvious: from 6.6 BBF in 1988, federal harvest volume was cut roughly in half in just 2 years, and declined by 80 percent to 1.6 BBF by 1993. During the litigation era, total harvest from state and private forest lands also declined, but much less severely. The 10-year average harvest between 1985 and 1994 from state and private lands—8.7 BBF—is 89 percent of peak harvest during that decade in 1987; it was 122 percent of the corresponding minimum harvest volume in 1994. For federal lands, the corresponding 10-year annual average is 4 BBF, representing 60 percent of the peak annual volume during that decade from 1988, but **466 percent** of the minimum harvest (847 MMBF) in 1994. The most important message from this analysis is that after the early 1990s, nearly the entire supply of timber to the forest products industry in these 54 counties in NWFP area that

are shown in figure 2.14 originated on nonfederal lands, in contrast with at least three prior decades.

How do the high annual harvest volumes of the 1980s compare to prior decades? We cannot answer the question with data from the entire region because California data are missing. For Oregon and Washington, however, harvest data go back to 1965. Figure 2.14 shows that mid-1980s federal harvest volumes in the 41 Oregon and Washington counties (not including 13 counties in the "none" group) of the NWFP monitoring region reflect levels that were typical of, or slightly less than, those of the mid-1960s. Federal timber volume harvested in the NWFP monitoring region within these two states was greater than 5 BBF in 1965–1969, 1971–1973, and 1986–1988; the 5.59 BBF of federal timber harvested in 1988 in these 41 counties was the fifth-largest annual volume in the 1965–2017 time span. Similarly, state and private harvest volume in the 41 counties was greater than 7 BBF in 1965–1966, 1968–1979, 1983, and 1985–1989. The generally parallel movement of timber volumes from the two ownership types before 1989, followed by sharply divergent amounts of harvest after 1988, strongly indicate the decisive effect of forces other than markets—specifically, legal proceedings—shaping total timber harvest-volume quantity in the late 1980s and early 1990s.

The dramatic change in timber harvest activity around 1990 was not experienced uniformly across the NWFP monitoring region, however, as indicated in figure 2.15. In particular, the regional surge in total harvest during the mid-1980s was strongly associated with just three of the five county groups: The "low" group, for which state and private harvest volume increased by 20 percent from 1985 to 1987, and remained at the elevated level for 3 more years (fig. 2.15); and the "very high" and "extremely high" groups, for which federal harvest volume increased by 17 and 37 percent, respectively, from 1985 to 1988 before beginning to collapse 1 year later (fig. 2.15). Variation among the groups of counties after the NWFP was adopted in 1994 was limited. For federal timber harvest, counties in all but the "extremely high" group were already reduced to not more than 200 MMBF annually by 1994, and they generally remained below that amount for the duration of the era until 2017. In the 10 "extremely high" group counties, harvest volume held steady at about 400 MMBF through 1996, then fell slowly to a low point of near 0 in 2001. During the NWFP era, nonfederal timber harvest declined by a much larger percentage in the "low" group, particularly in 1994–2000. Nonfederal harvest volume fluctuated within a generally similar range in the other county groups for the entirety of the NWFP era, except during the recession of 2007–2009. There is a clear signal of that recession in the data for nonfederal lands harvest, but not for federal lands—another indicator that harvests on federal lands during the NWFP era were somewhat disengaged from macroscale market dynamics.

Timber harvest was not included as a typology variable because it is not possible to verify that the economic effects of harvesting timber in a particular county remain in that county. However, if even a majority of the economic and workforce benefits of timber harvests do occur in the county in which the timber is located, figure 2.15 clearly indicates that negative effects of declining harvests would not be felt equally across the region. Three groups that include just 26 counties are associated with the largest timber harvest declines from late-1980s levels to the NWFP era: the "low" group, for which nonfederal timber harvest volume declined by 60 percent from 1990 to 1995; the "very high" group, for which federal harvest declined by 93 percent and nonfederal harvest declined by 33 percent from 1987 to 1994; and the "extremely high" group, for which federal harvest declined by 85 percent from 1987 to 1994.

The effects of this shock to the forest products-oriented economies of **communities** in the NWFP area were documented in multiple case studies in the first of these NWFP social and economic monitoring reports (Charnley 2006). This analysis adds additional insight to those findings. While communities that were affected by local changes—e.g., an individual mill that sourced its timber solely from a nearby federal forest land unit—could be found throughout the region in the 1990s, figure 2.15 suggests that such communities were most likely to have been found in counties of the "very high" and "extremely high" groups. Not addressed in earlier versions of this report, is the fact that similarly affected communities may have been just as likely in counties of the "low" group at the start of the NWFP era, for which processing facilities would have been mainly linked to nonfederal sources of timber.

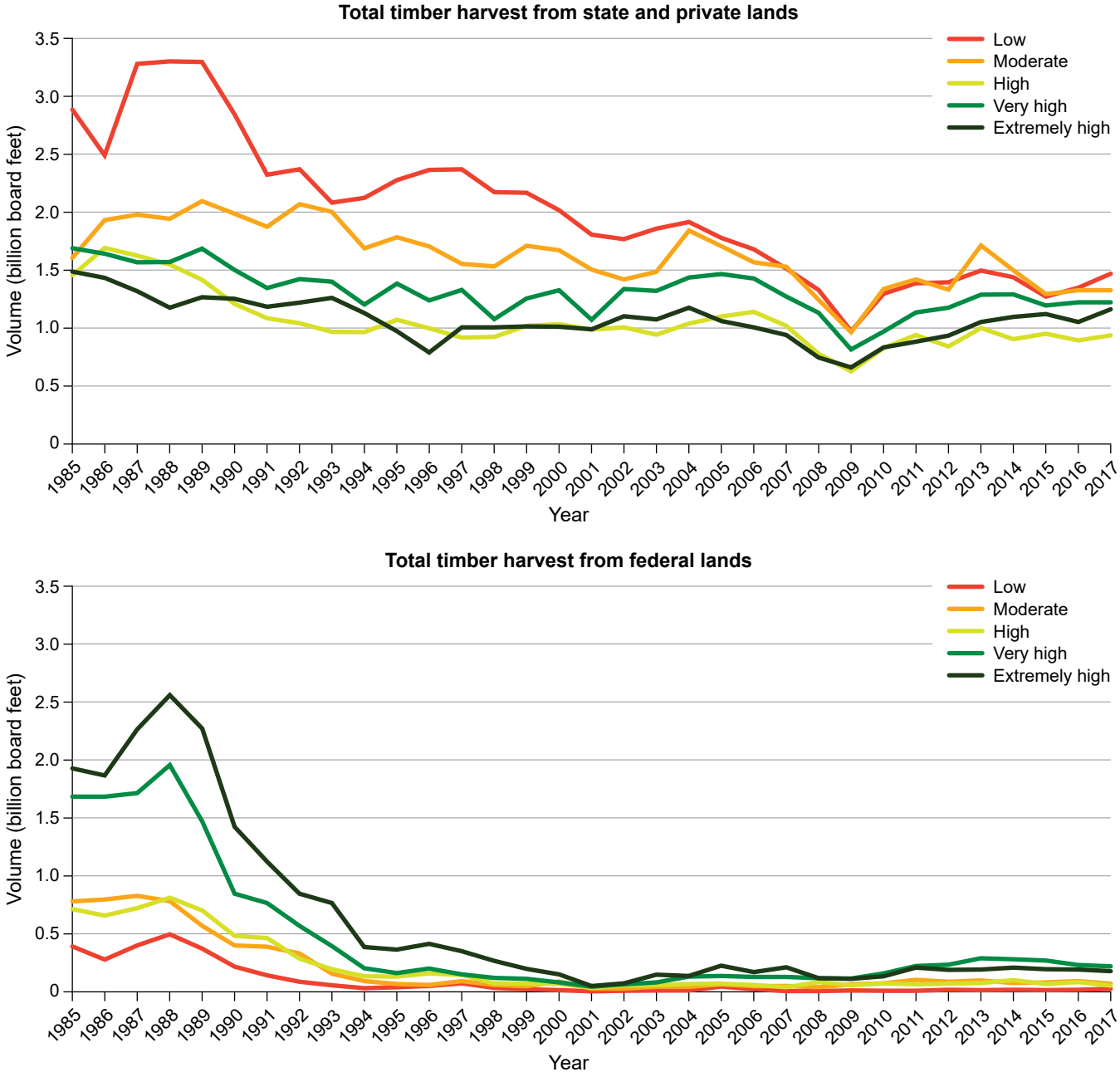

Figure 2.15—Timber harvest trends in Northwest Forest Plan area counties since 1985 by county group (low, moderate, high, very high, extremely high). Data sources: California Board of Equalization, Oregon Department of Forestry, Washington Department of Natural Resources.

Payments to Counties from Federal Timber Harvests (Typology Variable 2)

Timber sale payments to counties were transferred from the U.S. Treasury to state governments, which in turn disbursed them to counties based on a formula that tied each county's proportion of the annual payment to its proportion of federal lands managed by the agency that made the payment. For most of the counties in the NWFP monitoring area, the payer was the Forest Service, but in 15 western Oregon counties, both the Forest Service and the BLM made payments to states that were derived from their timber sale programs. Payments to states tied to the value of Forest Service timber sale contracts were mandated by a 1908 federal appropriations bill (35 Stat. 260, codified in 16 U.S.C. 500). The law requires the Treasury to make payments that are equal to 25 percent of the total value of Forest Service timber receipts from within that state each year (the law is still in effect but has been superseded).

States apportion the payment to counties based on each county's share of the total national forest land area in the state. Counties receiving these funds may only spend them on public schools or road infrastructure. Payments from the BLM to the state of Oregon were authorized by the Oregon and California Revested Lands Sustained Yield Act of 1937 (50 Stat. 874, codified in 43 U.S.C. 2601). The terms of payments were more generous than the 1908 federal appropriations bill. Fifty percent of receipts were to be returned to the state for distribution only among the 18 counties with BLM O&C program lands—counties with non-O&C BLM lands do not receive a share (three of these 18 counties do not have national Forest Service lands and did not receive payments from the Forest Service). Unlike payments from the Forest Service, no conditions were attached to expenditure of the O&C funds by the counties. Because the payments were tied to the dollar value of federal timber sale contracts, they historically closely tracked the volume of federal timber harvested, though there was frequently a lag effect as the timber was not always harvested in the year the contract was executed.

This close-tracking relationship with harvest volume changed at the inception of the NWFP era. First, recognizing that the radical decline in federal timber sale activity during the early 1990s was seriously jeopardizing local government revenues, Congress enacted a measure in 1993 to supplement the sale contract payments for 48 counties within the range of the northern spotted owl. Colloquially known as "owl payments," these supplemental funds lasted until 2000 and raised the amount that counties were receiving significantly. Nearly all county payments from 1993 to 2000 in the charts in figure 2.17 reflect these owl payments; the decrease in timber payment revenues would have been much steeper after 1992 otherwise. Second, in 2000, Congress passed the Secure Rural Schools Act (SRS), which overhauled the process of sharing revenue generated by federal lands management with county governments. The SRS established payments for 2001 that were 85 percent of the average of the three highest timber sale-generated payments between 1986 and 1989, then applied a formula that would cause them to progressively shrink each year thereafter. The SRS was slated to expire in 2006 but was reauthorized on an ad-hoc basis every year from 2007 to 2017, except 2016—always with a smaller percentage of the original amount than the prior year. The SRS did not rescind the original payments-to-counties authorizations: instead, it gave counties the option to choose either the original statutory payment from timber sale proceeds or the SRS formula amount each year.

For many rural and micropolitan counties in the NWFP area, timber payments were historically an essential source of revenue supporting public services. In southwestern Oregon in particular, the size of payments generated by federal timber sale revenue between the 1950s and late 1970s was so large that property taxes were almost an afterthought. Several counties kept mill rates on private property at extremely low levels compared to the rest of the state. In the aftermath of the 2007–2009 Great Recession, with SRS payments that were far smaller than in the mid-2000s, several southwestern Oregon counties were on the brink of insolvency as a result (e.g., Zheng 2013).

Payments are incorporated into the typology to capture this relationship. The location quotients are calculated by comparing each county's share of the average of the 3-highest years of total payment revenue in 1986–1989 for all 72 counties, to its share of the total general revenue for all 72 counties recorded in the federal 1987 Census of Governments (U.S. Department of Commerce, Census Bureau 2018). Location quotient values significantly greater than 1 indicate that the county was unusually reliant on these revenues in comparison to all counties in the region combined. A crosswalk between the Census of Governments data on total county revenues and the payments tied to federal timber harvests is not feasible. Thus, we do not report payments from timber harvests as a percentage of total county revenue; the location quotient is designed to keep the two measures distinct while comparing local (county) shares of each measure.

Figure 2.16 shows the background trajectory of total revenue for each county group reported in the Census of Governments against which the trend in payments tied to federal timber harvests can be assessed (U.S. Department of Commerce, Census Bureau 2018). There was immense variation in total county revenue amounts across the five groups in 1987—the data year that is the foundation of this location quotient in the typology. The median county in the "moderate" group, Clark County (including Vancouver city), Washington, collected slightly more than $109 million in total revenue (2017 dollars) in 1987. The median total revenue amounts in the "low," "high," "very high," and "extremely high" groups were $51 million, $22 million, $39 million, and $42 million (2017 dollars), respectively.

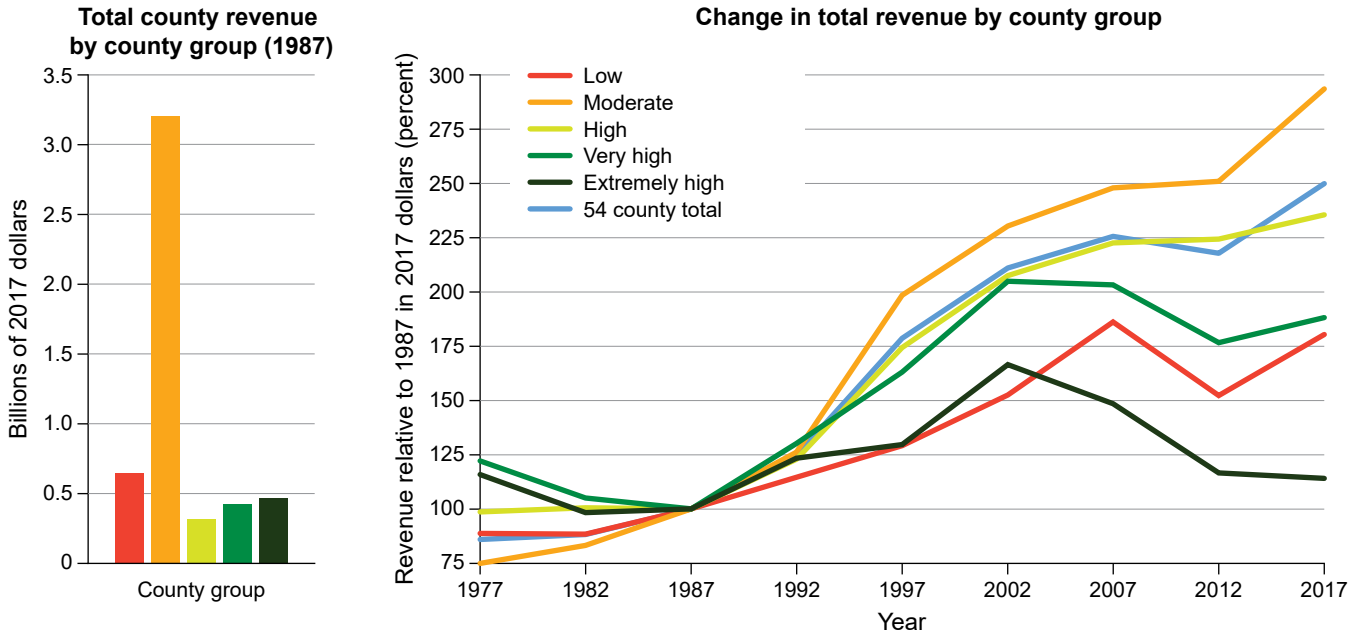

Figure 2.16—Total county government revenues by county group (low, moderate, high, very high, extremely high) from all sources in 1987 (left); and change in total county revenues from 1977 through 2017, relative to 1987 (right), for 54 counties analyzed in the Northwest Forest Plan region.
Data sources: U.S. Census of Governments local finance section.

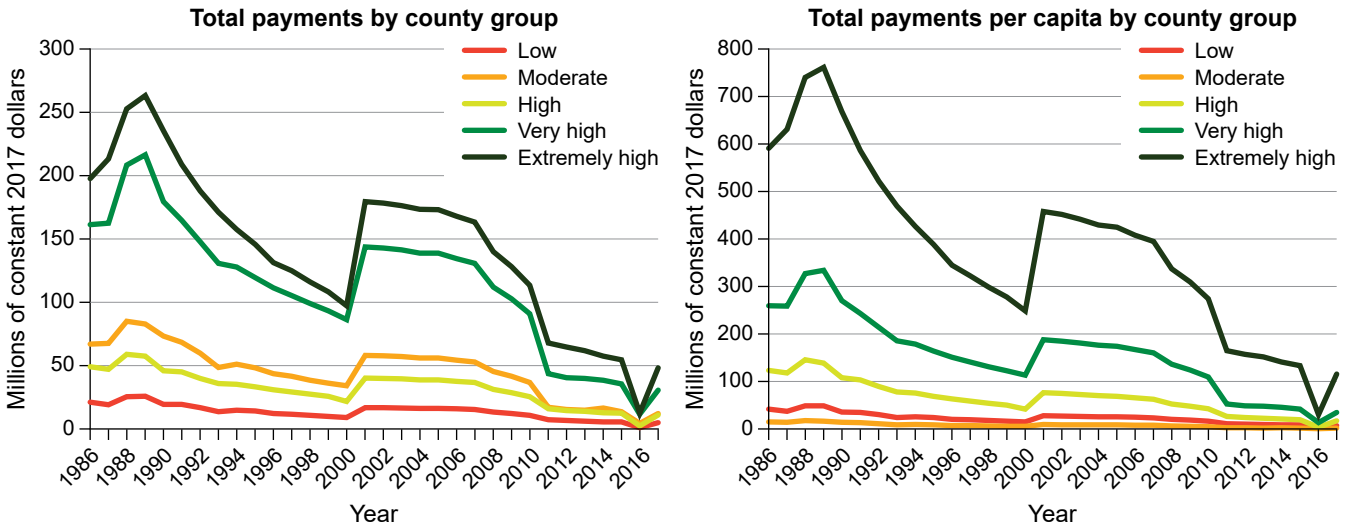

Figure 2.17—Federal timber harvest payments to counties, 1986–2017, by county group (low, moderate, high, very high, extremely high).
Data sources: USDA Forest Service Secure Rural Schools Program archived payment reports, Bureau of Land Management Oregon/Washington State Office.

The diverging growth curves in total county revenue after 1992 reflect increasing economic segmentation in the region. Revenues in the "moderate" group nearly tripled from 1987 to 2017, while revenues in the "extremely high" and "low" groups did not even double in that time. Adjusted for inflation, the "extremely high" group was unique in having failed to recover to pre-2007–2009 recession revenue levels as of 2017. The 2017 county revenues in the "extremely high" group were barely greater than those collected in 1987, with clearly negative implications for funding public services. The trend line of the "high" group closely tracks the 54 counties analyzed in the NWFP area through 2007, and this group appears to have fared better than the region in the aftermath of the recession, with a higher ratio of 2012 to 1987 revenue. This is likely due to extremely rapid growth in revenue

in Deschutes County, Oregon, home to Bend—one of the nation's fastest growing small cities between 1990 and 2010—and to a lesser extent, Chelan County, Washington, which experienced similar though less dramatic post-1990 rates of population and economic growth.

The county groups at opposite ends of the spectrum of importance of federal forest lands management—"low" and "extremely high"—both had rates of growth in total revenues for the region that seriously lagged the region from 1992 onward. Because it cannot be determined whether the payments tied to federal timber harvests are captured in the Census of Governments data, we cannot assume that the low rates of growth in the chart are directly related to falling timber payment amounts, though that is a plausible hypothesis. The low growth in total revenue during the 1990s must also reflect limited growth in taxable property values and business revenues, fees, and intergovernmental revenue sharing, such as state and federal grant program funds.

Figure 2.17 demonstrates the disproportionately large support received from federal timber sales by a fraction of NWFP-area counties. Owing to the formulas used by the states to distribute these payments to counties, 70 percent of the combined 1986–1989 average payment to counties, about $400 million in 2017 dollars, went to the 17 counties in the "very high" and "extremely high" groups. All but one of these 17 counties (Skamania, Washington) are in southwestern Oregon or far northern California. Even with the support of the supplemental owl payments, these 17 counties received just more than half that amount in 2000—$221 million (2017 dollars). The first years of the SRS provided a major revenue infusion to these counties, whereas the change to the SRS caused more modest adjustments to the total payment amounts in the rest of the region; this is depicted by the height of the peak in the trend lines between 2001 and 2006 in figure 2.17. Once the initial SRS law expired in 2006 and was ad hoc reauthorized over the ensuing decade, revenues from the program plummeted in 2017 dollars by $146 million in the 17 counties in the "very high" and "extremely high" groups, and by $63 million in the 37 counties of the other three groups combined (fig. 2.17).

Among counties in the "very high" and "extremely high" groups, the potential for shrinking revenues to cause large disruptions in public finances was much greater in the latter. The two groups received total payments that were very roughly similar in size, as shown in figure 2.17. But the per capita impact of those payments was twice as great in the "extremely high" group counties that had some of the region's smallest populations before and throughout the NWFP era. Additionally, county revenue tied to business taxes or fees would have been much smaller in these counties owing to their much smaller populations. Except when they occur in high-amenity communities, small populations would also tend to predict lower per capita revenues from property taxes than counties with larger populations, such as those in the "very high" group, because small populations are associated with less economic activity and hence lesser property values per measurement unit.

Payments tied to timber harvests (until 2000) and the SRS (after 2000) became increasingly important in the "extremely high" group counties during the NWFP era in comparison to the pre-NWFP era, when much more timber was harvested. Table 2.8 shows a location quotient value calculated for the sum of timber payments and total county revenue at four time points (the 1987 value is part of the typology). The relative importance of combined timber, owl, and SRS payments to the first four groups changes little over the 30-year period; but in the "extremely high" group, the relative importance of the small residual payment in 2017 is more than twice that of the large payment in 1987. Lack of growth in general county revenue (fig. 2.16), including negative growth in the "extremely

Table 2.8—Change in location quotient value for timber sales and Secure Rural Schools Act-related payments, 1987–2017

County group/ example	1987	1997	2007	2017
Low	0.4	0.5	0.5	0.7
Moderate	0.3	0.2	0.3	0.2
High	2.0	2.0	2.0	2.4
Very high	5.2	5.6	5.8	6.1
Extremely high	6.2	7.5	9.0	14.4
Deschutes (OR)	2.9	1.9	1.4	1.3
Douglas (OR)	10.1	15.7	17.0	39.3

Location quotients for "low" through "extremely high" county groups are calculated on the sums of timber payments and total county revenues for all counties within each group; Deschutes and Douglas County examples are based solely on values for those counties. Data sources: U.S. Census of Governments local finance section, USDA Forest Service Secure Rural Schools Program archived payment reports, and Bureau of Land Management Oregon/Washington State Office.

high" group since 2002 after adjusting for inflation, is the cause of this heightened importance factor. Douglas County, Oregon, is an extreme example of the trend. In 1987, it had $10 of timber payment revenue for every $1 that it would have had if timber revenues were distributed to every county in the NWFP region in uniform proportion to each county's share of total revenues (location quotient 10.1). In 2017, the county's relatively meager SRS payment represented roughly four times greater importance than its 1987 payment (nearly 39.3 versus 10.1). Deschutes County, Oregon, part of the "high" group, is a counterexample: it had strong initial ties to federal forest management, but experienced robust economic growth and diversification during the NWFP era. General revenue growth in this county significantly outpaced revenue growth for the region, resulting in a shrinking location quotient over time even as timber and SRS payments dried up.

Decreasing payments to counties have clearly been most problematic for the group of counties with the strongest ties to pre-NWFP federal forest lands management. However, this trend is **not** a plausible result of NWFP implementation. Pre-1986 data on payments tied to timber sales were not available for this report. However, the strong uptick in federal timber harvest volumes from 1986 to 1989 (fig. 2.15), and the known federal timber harvest trends in the decade before 1986 (fig 2.14), suggest that the peak values for payments in 1987–1989 were anomalous even within the "peak harvest" era. Only in 1990, 1991, and 1992 did the decline in payments entirely reflect the slowdown or stoppage of new federal timber contracts caused by litigation. After 2000, no county in the NWFP area, and relatively few nationwide, were still receiving payments tied to federal timber sale contract values rather than payments calculated by the SRS formula. The size of the post-2000 annual payment had nothing to do with current or prior year sale contract values within the state to which the payment was made. It can be argued that SRS payments did not even reflect "normal" pre-NWFP harvest conditions as the SRS payment calculation was based on federal harvest volumes from the peak anomaly years, 1986–1988, in the Pacific Northwest. The continued outsized importance of the payments in places such as Douglas County, Oregon, is partly a function of the SRS formula being based on a period of anomalous federal harvest revenue; but more so because counties in the "extremely high" group were unable to participate in the regionwide increase of total county revenues.

Employees of the Forest Service and Bureau of Land Management (Typology Variable 3)

This analysis of the two federal forest management agencies' workforces in the NWFP monitoring region is new to the monitoring reports. It uses data obtained from the U.S. Office of Personnel Management (OPM) that show full-time permanent and full-time seasonal (e.g., a recurring part-year appointment at the same location) Forest Service and BLM employees by the county of their official duty station. This is a different dataset than appears in chapter 1 of this report, which uses self-reported Forest Service and BLM data organized by management unit, not county, and which includes temporary seasonal employees.

The community case studies conducted in 2003–2004 for the 10-year monitoring report frequently found that cutbacks in the federal forest management workforce had especially negative consequences for community well-being during the mid-1990s. This finding reappears in the 2018 community case studies reported in chapter 4 of this report. We could not obtain data for state or national trends in the BLM and Forest Service workforces from OPM to better contextualize the trend, but even without context the shrinking of the professional forest management agency workforce in the NWFP area since the late 1980s is striking.

Since 1973, the first year in which personnel data are available from OPM's database, there have been two peaks in the total number of permanent Forest Service and BLM employees in the NWFP monitoring region: 14,300 employees in 1982, and 13,300 employees in 1992 (fig. 2.18). The sharp spike recorded in 1982 may have resulted from a data anomaly and could not be verified by another means, but the general upward trend from the mid-1970s is surely valid. After passage of FLPMA and NFMA in 1976, agencies added substantial numbers of permanent employees, especially to perform roles other than harvesting timber or building roads that had not been previously prioritized. The need to meet management and planning requirements articulated in NFMA, combined with the traditional practice of funding staff positions administering timber programs from timber sale receipts, are likely the principal drivers of the overall growth in

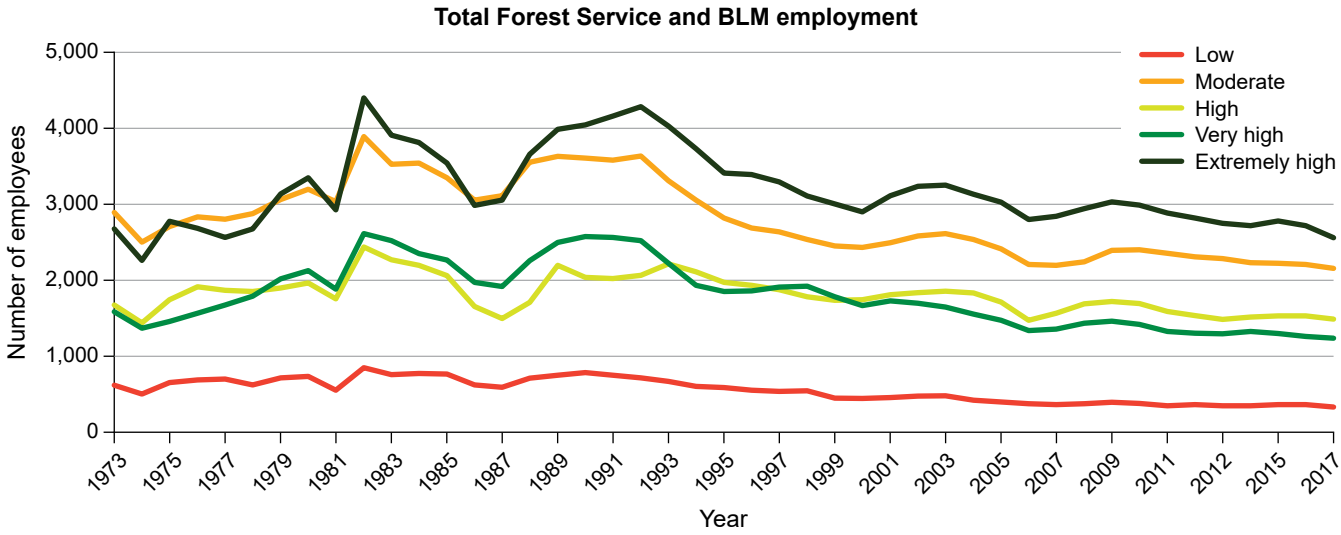

Figure 2.18—Total number of permanent full-time and seasonal Forest Service and Bureau of Land Management (BLM) employees in the Northwest Forest Plan region by county group (low, moderate, high, very high, extremely high), 1973–2017. Data source: U.S. Office of Personnel Management.

employment from 1973 to 1992. Staffing levels mirror the 1980–1982 recession-generated dip in total timber harvest (see fig. 2.14), with a lag of about 2 years that could plausibly be related to lower sale volumes and receipts during the early 1980s recession. Staffing levels may also have responded to the mid-1980s surge in federal timber harvests (see the Oregon and Washington data trend in fig. 2.14), lagging roughly 3 years behind the last year of large federal timber harvest volume in 1988, and reaching the second staffing peak in 1992. As documented in the 10-year report, during the initial implementation period of the NWFP, a significant proportion of federal agency staff responsible for administering timber programs were eliminated through duty or location reassignments, early retirement, or termination, while staffing devoted to developing and implementing NWFP standards and guidelines modestly increased—in a few cases, by repurposing former timber program administrators (e.g., McClain et al. 2006: 40).

Permanent Forest Service and BLM workforces steadily declined after 1992 roughly proportionally in all five county groups (fig. 2.19). However, the effect of that decline on communities and economies was surely not equivalent. In the "extremely high" group, 1,720 (41 percent) permanent Forest Service and BLM positions were eliminated between 1992 and 2017 (about 1.65 percent annually), while total employment rose 19 percent—less than 1 percent annually—from about 111,000 to 132,000. In the "moderate" group, Forest Service and BLM permanent employment declined similarly—also by roughly 40 percent, about 1,400 employees—but total employment grew 54 percent, about 2.16 percent annually; more than a million jobs were added. In the "moderate" group, as well as the "very high" group, a large majority of eliminated federal forest management agency positions were in metropolitan counties. Though some small communities on the rural fringe of these counties experienced significant contraction in agency employment (e.g., Mill City in Linn and Marion Counties, Oregon, and Darrington in Snohomish County, Washington; see chapter 4), most of the losses in these county groups were in cities where the effects would not have been significant beyond the household scale—e.g., staff reductions in the Forest Service Pacific Northwest Region office in Portland, Oregon, or the Mount Baker-Snoqualmie National Forest supervisor's office in Everett, Washington. In this sense, the "extremely high" group stands out. In only one case did employment reductions occur in a metropolitan county—Skamania County, Washington (see the Stevenson case study in chapter 4)—and it is only designated metropolitan by its commuting links; Skamania is otherwise rural with a very small population. Eliminated positions in the other nine counties occurred almost exclusively in rural towns or the small, isolated cities, such as Klamath Falls, Oregon, that

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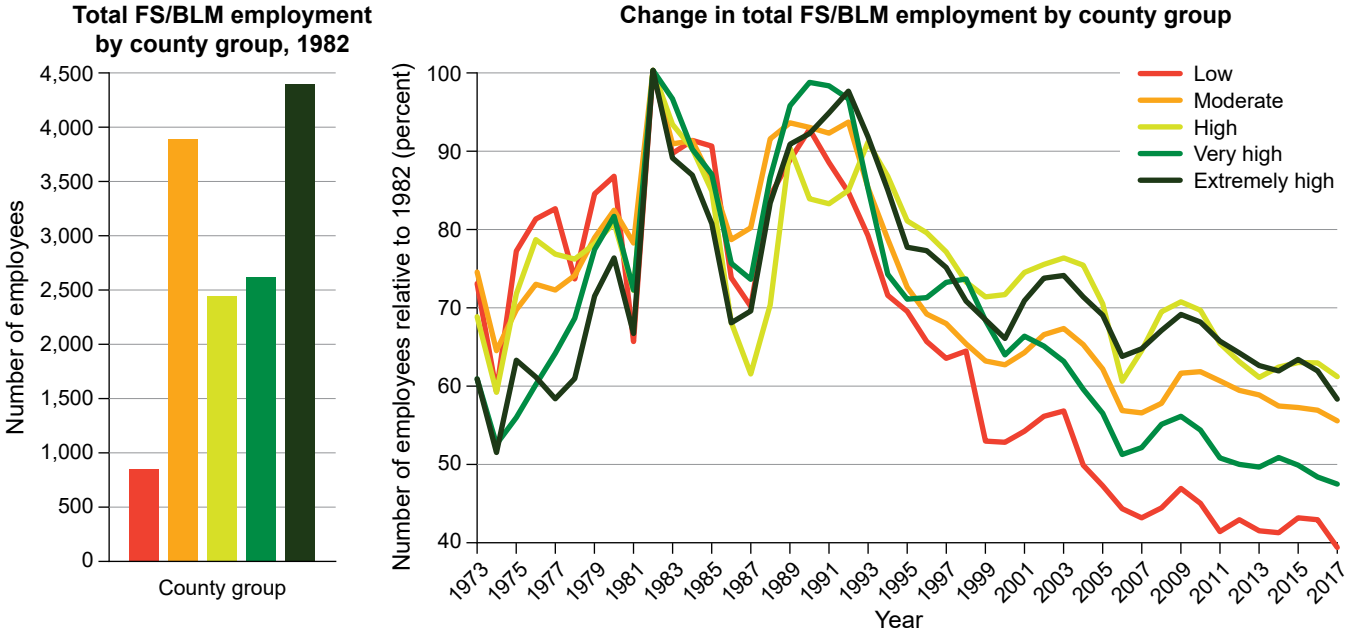

Figure 2.19—Total Forest Service (FS) and Bureau of Land Management (BLM) employment by county group (low, moderate, high, very high, extremely high) in 1982 (left); and change in total employment from 1973 through 2017, relative to 1982 (right), for counties analyzed in the Northwest Forest Plan region.
Data source: U.S. Office of Personnel Management.

serve as regional services hubs for vast rural hinterlands. The federal employee pool likely had a very significant role in supporting community businesses and social institutions in these smaller population centers.

It is sometimes possible to use the county-scale data to isolate changes in employee counts to a single management unit or its subdivisions, which gives additional insight into potential community-scale effects. For example, Lewis County, Washington, (in the "high" group) had 245 Forest Service employees in 1983, and between 245 and about 210 through 1992; it had 55 in 2017. All these employees would have been assigned to the administrative units on the northern half of the Gifford Pinchot National Forest, presumably residing in small and somewhat isolated rural towns such as Morton, Randle, and Packwood, Washington.

Federal Timber Processed in Mills in 1988 (Typology Variable 4)

The data for this variable come from periodic reports issued by the Forest Service, Pacific Northwest Research Station and the Washington Department of Natural Resources. Comparable reports were compiled from the mid-1960s until 1994. The reports collect and analyze data obtained from surveys sent to the owners and operators of wood products mills throughout Oregon and California (for reporting by the Forest Service) and Washington (for reporting by the Washington Department of Natural Resources). Because of confidentiality protections built into the survey participation agreement, and changes in the way the data were reported after 1994, it is impossible to track the federal timber in the mill stream analysis through the NWFP era. There is considerable anecdotal evidence of the role cutbacks in federal timber harvesting played in the closure of individual mills that were unable to source similar raw material from other landowners in the early years of the NWFP era. Even if the mill survey data could facilitate longitudinal analysis, however, its county-level data would at best suggest which counties may have experienced more such federal timber-supply-related closures. Effects to communities can only be adequately detected and analyzed with case study approaches. Notable examples among the chapter 4 case studies of communities that exemplified the narrative of mill closure or severe cutback during the NWFP era include Darrington and Stevenson, Washington; Mill City and Riddle, Oregon; and Happy Camp, California.

Private Sector Employment and Wages Earned in Wood Products Manufacturing (Typology Variables 5 and 6)

The data used to build variables 5 and 6 in the typology are from the long-form (SF-3) release of 1990 decennial U.S. Census data. These are estimates of the number of adults age 16 and older that worked in the forestry/fishing (variable 5) and wood products manufacturing (variable 6) sectors, based on the SIC system. The data are derived from individuals responding to the census survey. These data can only be used on a once-per-decade cycle from 1960 to 2000. After 2000, estimate error is too high for accurate reporting in many smaller population counties owing to replacement of SF-3 by the ACS, which is also not designed to facilitate time-series analysis.

In this section, we instead present a proxy analysis of longitudinal change for typology variable 6, jobs and wages in the wood products manufacturing sector, obtained from the QCEW (U.S. Department of Labor, Bureau of Labor Statistics 2018). Unlike the decennial U.S. census and the ACS, which censuses people, the QCEW is a census of registered companies; thus, self-employed and contract workers are not counted. This poses a greater problem as a proxy for variable 5, because a significant proportion of workers in logging and fisheries operate as sole proprietors or family partnerships that do not pay into state unemployment insurance pools. Hence, we focus on manufacturing where self-employment is rare. The accuracy of this data is considerably higher than for ACS data and is also directly comparable year to year, whereas ACS data is not. However, data for counties that have few companies responding to the QCEW is suppressed, which typically occurs when only a few companies within a classification in a county exist or respond. This problem became acute for many smaller counties within the region after the early NWFP era. The trends depicted in the following figures must be understood as increasingly approximate as they approach the present. The analysis that follows is lengthy because it uncovers some important insights into the core monitoring question hypothesis regarding social and economic change that might be related to federal forest lands management.

Robust county-level data from the QCEW are available dating back to 1975. Users of these and related economic and employment data in a time series must contend with the change from the SIC system to the NAICS, which occurred in 2001. This change significantly altered the categories in which many types of jobs were counted. For example, logging was included in the wood products manufacturing sector in the SIC, but was moved to a separate series, natural resources, in the NAICS. Rather than attempt an imperfect crosswalk between the two systems, charts displaying QCEW data in this report, including figure 2.24 in this chapter as well as several in chapter 3 have a break between the years 2000 and 2001 to indicate the shift.

After adjusting for inflation, the peak year in the NWFP area for jobs in the private sector wood products manufacturing industry in our time series was 1978. This was also the year in which annual average wages for jobs in wood products manufacturing peaked, at slightly more than $53,000 in 2017 dollars (fig. 2.20).

The inflation-adjusted annual wages paid for wood products manufacturing work declined steadily from 1978 to 1991, reaching a low for the 1975–2000 period of $48,000 (in 2017 dollars); it then rose slightly to $52,000 (2017 dollars) in 1999. For the indirectly comparable 2001–2017 period, average annual wages reached their highest level in 2017 at slightly more than $51,000. Average wages moved parallel to total employment leading into the 1980 recession. After 1982, the two data series frequently trended in contrary directions: average wages declining steadily as total employment recovered somewhat in the mid-1980s; employment and average wages both declining steeply between 1987 and 1991; then wages increasing slightly as employment levels continued to shrink in the litigation and early NWFP eras (1989–1993 and 1994–2000). Except for a brief period in 2004–2006, average wages and total employment have mostly moved in opposite directions since 2001.

As figure 2.21 indicates, annual change in total timber harvest volume in the 54 counties analyzed in the NWFP region has not closely mirrored the trend in total earnings from wood products manufacturing since the 1980–1982 recession. The most notable decoupling of wages and timber volume occurs in roughly 1983–1986, following the end of the major national recession in 1982. The sharp increase in harvested timber volume was not accompanied by a correspondingly sized increase in total wages. Inferring from the trend lines in figure 2.20, declining average annual wages is a more important source of this decoupling than outright job loss. Total wages rose only minimally from 1982 to 1984, stayed relatively

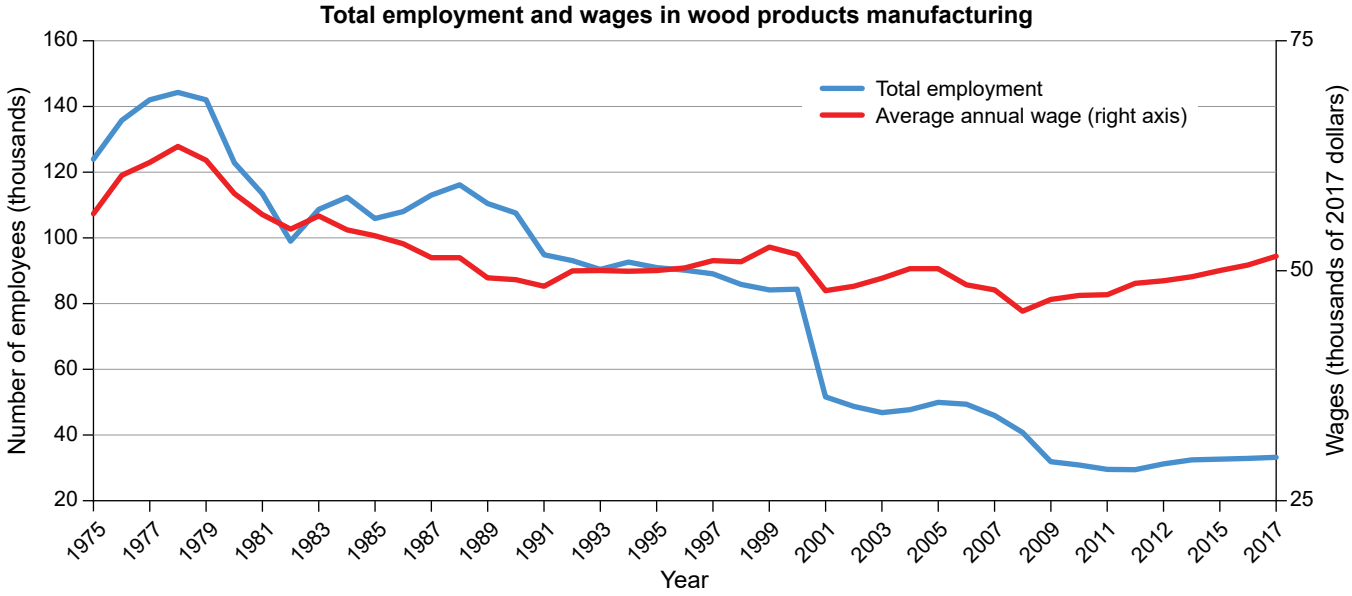

Figure 2.20—Change in wood products manufacturing employment and average annual earnings for the 54 counties analyzed in the Northwest Forest Plan monitoring region, 1975–2017. Data source: U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages area files.

Figure 2.21—Change in total wood products manufacturing wages and timber harvest volumes for the 54 counties analyzed in the Northwest Forest Plan monitoring region, 1975–2017. California data for 1978 through 1984 exclude landownership sources of harvested timber, so only total harvest volume from all ownerships is shown for that period. The 18 counties assigned to the "none" group in the typology are excluded from totals. Data sources: Oregon Department of Forestry, Washington Department of Natural Resources, California Board of Equalization (harvest volume), U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (wages).

constant though 1988—the last peak years of harvesting activity—then began declining significantly after 1988. The decline in wages starts the same year, 1989, as the decline in harvest volume. Total wages were nearly flat during the early implementation of the NWFP from 1994 to 2000. From 2001 to 2017, there was parallel downward movement of wages and harvest volume leading into the Great Recession of 2007–2009, but during periods of modest annual increases in harvest volume (2001–2005; 2009–2014), total wages paid remained nearly flat.

Figures 2.20 and 2.21 reveal an interesting intermittent relationship between timber harvest and wood products

manufacturing wages that has operated at the scale of all 54 counties analyzed in region since the late 1970s. After 1978, associations between the slope of the lines for timber volume and total wages in the NWFP region have been reasonably close during periods of harvest contraction, **but not harvest expansion**. Total wages have moved almost entirely downward since the early 1980s after adjusting for inflation, except for two incremental increases that are nearly imperceptible in the scale of the chart in figure 2.21, by about 10 percent in the years 2004–2006 and by 16 percent in 2010–2017, albeit to a level that was still one-third less than it had been in 2001. As indicated in figure 2.20, these slight post-2001 increases in total wages are primarily associated with increasing average annual wages rather than numbers of people employed.

Figure 2.21 depicts the region-wide association between harvest and wood manufacturing wages, but there is considerable intraregional variation, as illustrated in figures 2.22 and 2.23. Although we do not have data describing timber flows from harvest to processor within the region, interpreting the position of the "wage" line relative to the harvest volume bars in each chart offers general

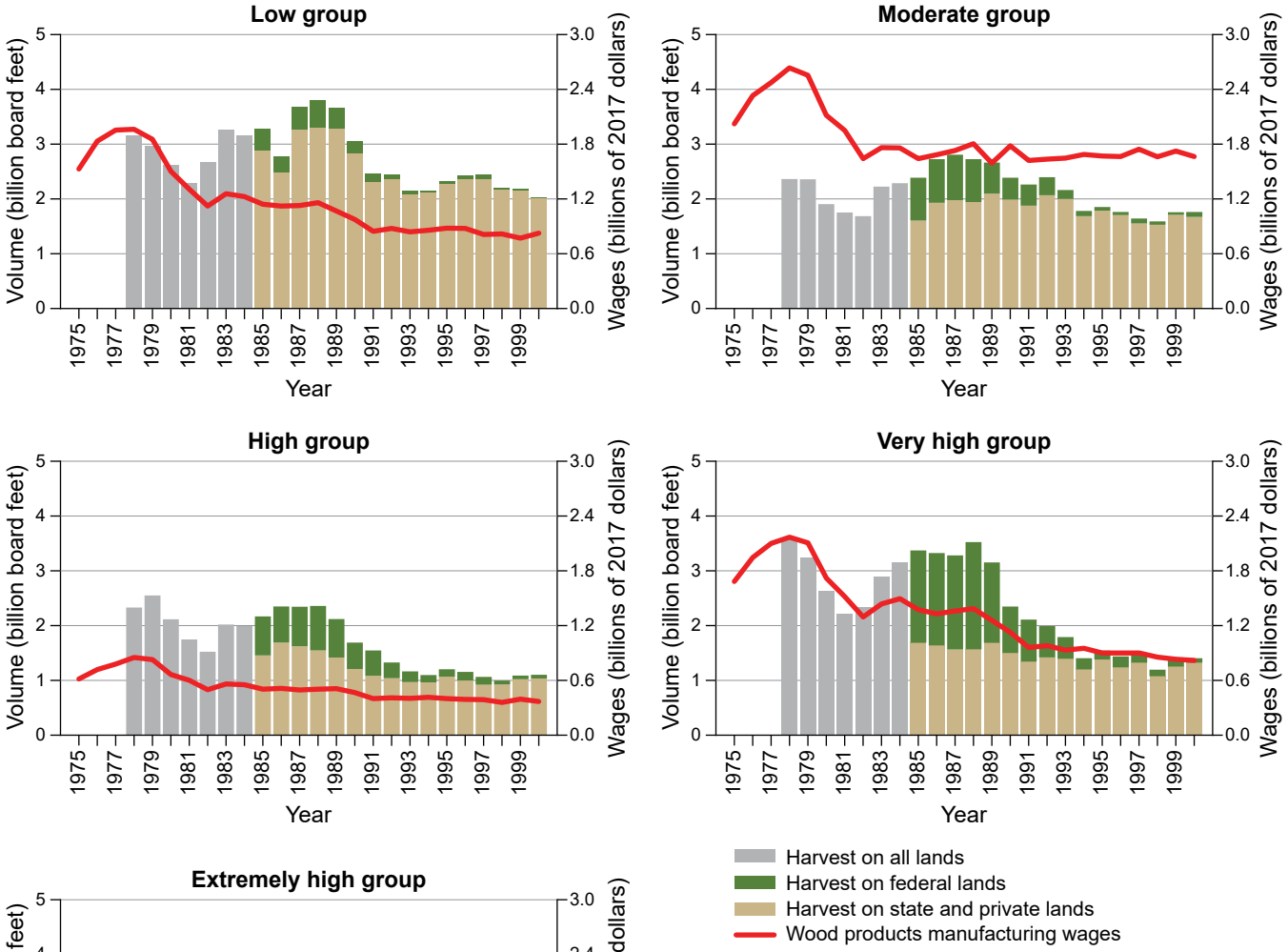

Figure 2.22—Change in total wood products manufacturing wages and timber harvest volumes by county group for the 54 counties analyzed in the Northwest Forest Plan monitoring region, 1975–2000. California data for 1978 through 1984 exclude landownership sources of harvested timber, so only total harvest volume from all ownerships is shown for that period. The 18 counties assigned to the "none" group in the typology are excluded from totals. Data sources: Oregon Department of Forestry, Washington Department of Natural Resources, California Board of Equalization (harvest volume), U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (wages).

insights into the relationship between harvest volume and employment within the group. For example, the "moderate" group has the largest share of wages from wood products manufacturing throughout the period 1978–2000, but only the fourth-largest share of harvest volume during the same period (fig. 2.22). The "low" and "extremely high" groups share the opposite relationship between wages and harvest volume: both have much smaller total wages than the magnitude of harvest volume suggests. The implication is that during the peak-harvest era, considerable timber volume harvested in "extremely high" or "low" group locations was processed in a "moderate group" county. The relatively flat trend for wages in the "moderate" group during the litigation and early NWFP eras may also support this interpretation: processors in "moderate"-group counties, which are primarily metropolitan, may have had a competitive advantage over processors in the more remotely located "low"- and "extremely high"-group counties, remaining open as regional timber volume shrank and facilities in "low"- or "extremely high"-group counties were forced to close.

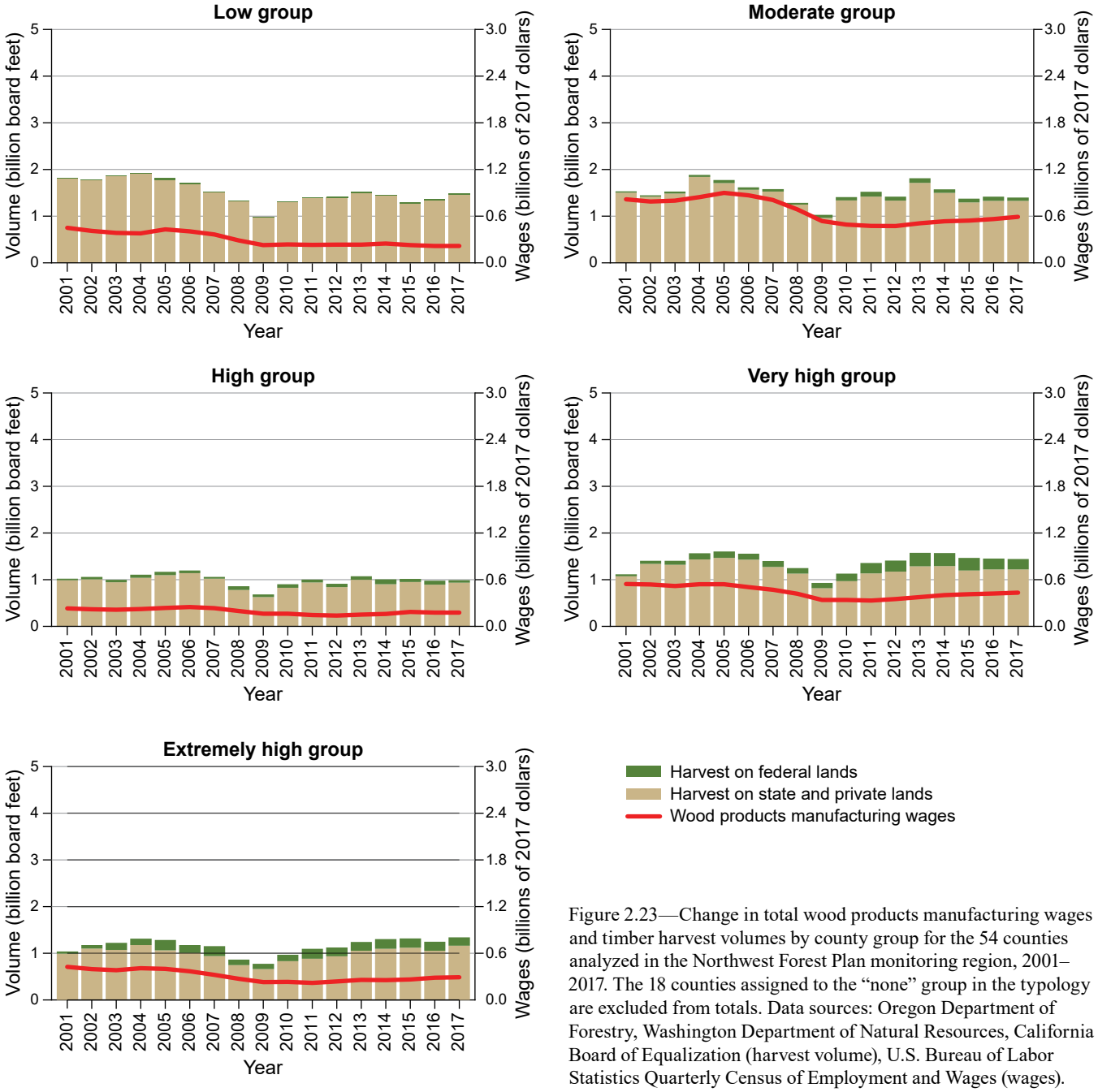

Figure 2.23—Change in total wood products manufacturing wages and timber harvest volumes by county group for the 54 counties analyzed in the Northwest Forest Plan monitoring region, 2001–2017. The 18 counties assigned to the "none" group in the typology are excluded from totals. Data sources: Oregon Department of Forestry, Washington Department of Natural Resources, California Board of Equalization (harvest volume), U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (wages).

In the later NWFP era, 2001–2017, there is much less regional variation in harvest volume and wage trends (fig. 2.23). Wages declined from a high point in 2001 (2005 for the "moderate" group) by 40–50 percent in 2010 across all five groups. (This similar trend across all groups is hard to perceive because the y-axis scales are held constant to facilitate interpreting the relative magnitude of wages and harvests in the 1975–2000 [fig. 2.22] and 2001–2017 period charts). The same was true for total harvest volume from state and private lands, which was at its high point in 2004 or 2005 in all five groups and had declined by 40–50 percent in in 2009, presumably in response to the Great Recession. Federal timber harvest volume was larger in all five groups in 2009 and 2010 than in any prior year since 2000. After 2010, state and private harvest volume recovered slowly, to 70–80 percent of 2004–2005 peak volume as of 2017 in all groups. Federal harvest volume in each group reached a peak, or at least 90 percent of peak, for the 2001–2017 timespan in 2013 or 2014. Wages recovered to around 70 percent of their 2004–2005 peak in each group, except the "low" group. In the "low" group, wages continued declining, reaching an all-time low in 2017 of less than half of their 2005 peak. There is very little indication in the trend lines that federal harvest volumes were related to wages paid in wood products manufacturing in any of the groups during the later NWFP era.

How impactful to local economies was the decline in wood products manufacturing for each group of counties, regardless of the relationship between timber harvest volume and wood products manufacturing employment? This is the relevant formulation for the monitoring question. If, for example, counties in a particular group successfully replaced lost earnings from mill employment with equivalent earnings from other industries, then the loss of mill jobs might have negative connotations for the cultural identity of counties and communities, but not for economic aspects of well-being. This question is explored in more detail in chapter 3, but we establish some preliminary conclusions here.

Table 2.9 compares the change in wood products manufacturing earnings through four discrete periods: (1) peak harvest, up to 1988; (2) litigation phase, 1989–1993; (3) NWFP early implementation era, 1994–2000; and (4) 2001–present. The largest absolute decline in wages for each county group occurred during the 1978—1988 portion of the peak-harvest era. In all but the "extremely high" group, the decline in absolute dollars during the peak-harvest era was by far the largest of all the eras. In the "extremely high" group, it was of almost identical magnitude to the earnings loss that occurred in 1989–1993, the 5 years of pre-NWFP litigation of federal timber harvests (table 2.9, yellow cells). During this pre-NWFP litigation era, a similar-size decline in wages occurred in the "very high" group, but it was much smaller than the decline in wages in the "very high" group in the preceding peak harvest era. These two groups have the two highest location quotients for federal timber processed in 1988; they also have the largest location quotients by far for federal lands regulated by the NWFP (table 2.7). Although it is tempting to posit causation for this pattern of wage loss during the 1988–1993 period to enjoined federal timber sales, the "low" group offers some counter evidence. "Low"-group counties experienced a decline in total wages

Table 2.9—Change in personal earnings from wood products manufacturing by county group over four periods before, during, and after Northwest Forest Plan (NWFP) implementation, and percentage of change since previous period

County group	Peak harvest era (1978–1988)		Litigation era (1989–1993)		Early NWFP era (1994–2000)		Current era (2001–2017)	
	Million dollars	*Percent*	*Million dollars*	*Percent*	*Million dollars*	*Percent*	*Million dollars*	*Percent*
Low	-804	-39	-319	-28	15	-2	-233	-52
Moderate	-831	-32	-156	-9	16	1	-226	-28
High	-346	-41	-101	-20	36	-9	-53	-23
Very high	-782	-36	-455	-33	112	-12	-111	-20
Extremely high	-429	-28	-418	-37	8	-1	-133	-31

Data for 1978–2000 were measured using SIC code 24 for wood products manufacturing, which includes logging. Data for 2001–2017 were measured using NAICS code 321 for wood products manufacturing, which excludes logging. Data source: U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages. Earnings are shown in 2017 dollars.

during the 1988–1993 period that was roughly 75 percent as large as the "extremely high" group ($319 million vs $429 million); as a percentage of wages in 1988, the loss was nearly comparable to wage loss in the "very high" group (28 versus 33 percent). Importantly, state and private timber harvest volume did not significantly decline until 1990–1991. Assuming a modest lag effect between harvest and processing of perhaps 1 to 2 years, job and wage cuts due to reduced supply to mills would be expected in 1992–1993, at the end of the litigation era. Figure 2.21 indicates otherwise—wages began a fairly steep decline after 1988, in common with the "very high" and "extremely high" groups. There must be more to the story than timber harvest volume.

These data strongly imply that large losses in earnings during the 1978–1988 portion of the peak-harvest era are related to factors shared across at least these three groups of counties, and federal forest lands are not so shared. Leading candidates include at least four aspects of the timber industry that were either not yet on the scene or were rare in the 1970s: increased mechanization in logging, automation in mills that were early adapters to shorter rotations and smaller diameter timber, imports of softwood lumber, and exports of raw logs from nonfederal lands (Power 2006). In "moderate"-group counties, total wages from wood products manufacturing fluctuated between $1.6 and $1.8 billion (in 2017 dollars) throughout most of the 1980s and 1990s and did not decline steadily as in the "low," "very high" and "extremely high" groups. This trend suggests either that wood processors in these counties had a unique competitive advantage that compensated for these novel disruptors of timber markets, or that these factors were much less prominent as drivers of wage loss compared to counties in other parts of the NWFP region. In fact, wood processing employers in the "moderate"-group counties paid $16 million (in 2017 dollars) more in wages in 2000 than in 1994 (table 2.9: green cell), the only positive change in wages paid in any of the four eras among the five county groups. Reductions in federal timber harvest were surely a cause of lost earnings before the NWFP era, but these data imply that this was far from the only cause (disentangling the causes is not within the scope of this report). Most significantly for addressing the ROD monitoring direction, it does not appear that there is any association between harvest levels and wood products manufacturing wages during the NWFP era, especially not after 2001. During the latter NWFP era (2001–2017), wood products manufacturing wages declined in all county groups by roughly equal measure, and the trend was not correlated with harvest volume trends.

The absolute dollar and percentage declines in earnings shown in figure 2.22 and table 2.9 do not give a full picture of how a declining timber industry may have affected household incomes and, in turn, secondary economic activity, county revenue, and the reservoirs of social capital in communities. The dollar amounts and percentage changes in earnings lost from wood products manufacturing in table 2.9 indicate a broadly similar trend spanning all five groups, but the background employment conditions against which that trend played out were quite different.

Figure 2.24 helps fill in this picture by comparing change in the proportion of all wage earnings from wood products manufacturing to growth in total employment. As is the case in the analysis of changes to total government revenue (fig. 2.16), the impacts of lost wages in wood products manufacturing were most acute in "extremely high" group counties, followed by the "low" group. Roughly one-quarter of all wages paid in these counties before the 1980–1982 recession was from logging and mill employment; in the early 1970s (not shown in fig. 2.24), it was more than 30 percent for both groups. Though the dollar amount of the mid-1980s rebound in wages in the "extremely high" group was similar to what occurred in the "very high" and "low" groups (figure 2.22), only the "extremely high" group experienced a sudden rise in the proportion of wages from the wood products industry (by 4 percent in 1983). Not more than 12–13 percent of wages in the "low" and "very high" groups was derived from the wood products industry during the mid-1980s, while in the "extremely high" group, the percentage remained above 20. During the litigation era, the decline in actual dollar amounts of wages paid was similar in the three groups (figure 2.22, table 2.9)—and wages derived from wood products manufacturing in the "extremely high" group remained about 7 percent more than in the other two groups. The principal cause of that anomaly is anemic growth in total jobs during both the intensive harvest and litigation phases before the NWFP, as indicated in the yellow highlighted cells in table 2.10. Wood products manufacturing earnings suffered their largest decline by magnitude in the "extremely high" group during the litigation era (1989–1993), during which time total jobs grew by only 3 percent, less than half that of the next-lowest group. Significantly, after 1993, job growth was essentially equivalent in the "low" and "extremely high" groups (table 2.10).

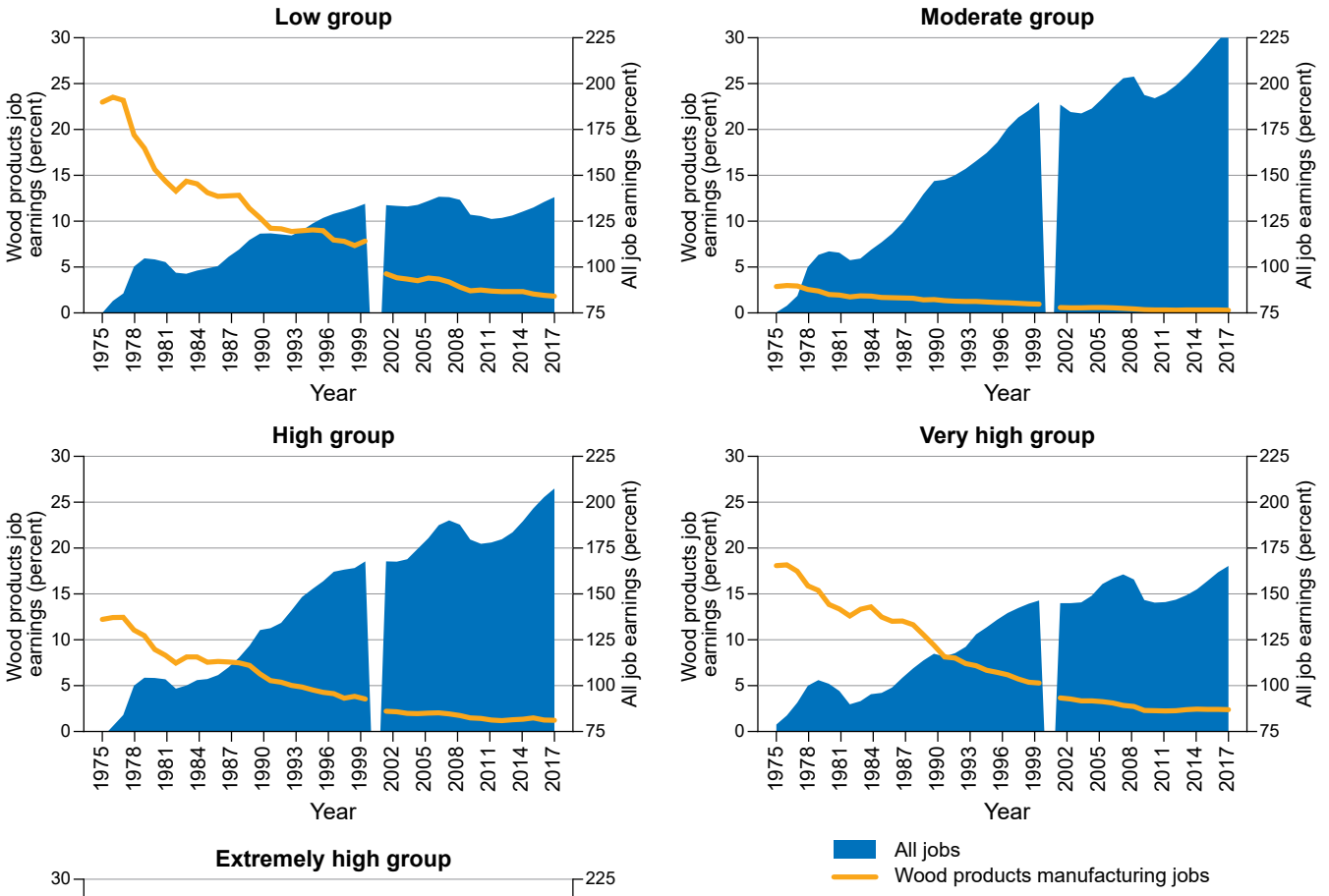

Figure 2.24—Change in total personal earnings from wood products manufacturing relative to all jobs since 1978 ("Wood products job earnings"), and from total employment in a given year relative to total employment in 1978 ("All job earnings"). Data source: U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages. Blue shading shows growth in total jobs as a percentage of total jobs in 1978—the year that wages from wood products manufacturing in the Northwest Forest Plan region peaked in the 1975–2017 dataset. Orange lines show change in the percentage of all (including public sector) wood products manufacturing jobs. All five charts have a value of 100 percent for 1978. The break between 1999 and 2002 indicates a change in industrial classification schemes.

Two key points regarding wood products manufacturing earnings in the era preceding the NWFP bear repeating. First, the bump in the percentage of earnings from wood products manufacturing during the intensive harvest era in the "extremely high" group (fig. 2.19), is very likely to have been a function of the sharp increase in federal forest lands harvest activity that occurred in 1983–1988 (see fig. 2.14: 1979–1983 and 1984–1988 federal harvest quantities for Oregon and Washington). During the 10 years of the peak harvest period, from 1978 to 1988, total employment in the "extremely high" group grew considerably less than 1 percent annually (7.7 percent over 10 years), and there were 2,855 fewer jobs in wood products manufacturing in 1988 compared to 1978. However, a closer look at the decade reveals some notable inter-decadal trend variability (see table 2.11). All the groups shed around 30 percent of their wood products manufacturing jobs during the 1980–1982 recession. Some of these manufacturing jobs were recovered in all groups during the mid-1980s after the recession concluded. However, a much higher percentage of jobs was restored in the "extremely high" group than in any of the others. Though this group is composed of 10 small-population counties, the absolute number of jobs added was greater than in the "moderate" group, with 17 counties principally in major metropolitan areas (table 2.11). Harvest levels on state and private lands changed relatively

Table 2.10—Change in total employment by county group over four periods before, during, and after Northwest Forest Plan (NWFP) implementation

County group	Peak harvest era (1978–1988)	Litigation era (1989–1993)	Early NWFP era (1994–2000)	Current era (2001–2017)
		Percent		
Low	9.4	7.0	14.7	3.2
Moderate	31.7	16.6	23.6	21.4
High	15.2	22.4	19.0	23.7
Very high	9.4	10.8	20.8	14.0
Extremely high	7.7	3.1	16.3	3.5

Yellow highlighting represents particularly weak growth in total employment. Note that during the Northwest Forest Plan era, "low" and "extremely high" county groups had nearly identical growth trends despite major differences in forest resource ownerships.

Table 2.11—Change in wood products manufacturing employment by county group over four periods before, during, and after Northwest Forest Plan (NWFP) implementation, and percentage of change since previous period

County group	Peak harvest era (1978–1988)		Litigation era (1989–1993)		Early NWFP era (1994–2000)		Current era (2001–2017)	
	No. of jobs	*Percent*	*No. of jobs*	*Percent*	*No. of jobs*	*Percent*	*No. of jobs*	*Percent*
Low	-10,328	-33.9	1,852	9.2	-5,715	-26.0	199	1.2
Moderate	-11,995	-28.7	4,936	16.6	-3,250	-9.4	-1,663	-5.3
High	-4,758	-33.6	1,654	17.6	-2,016	-18.2	-1,433	-15.8
Very high	-9,737	-28.9	3,061	12.8	-8,049	-29.8	-2,566	-13.5
Extremely high	-8,500	-35.2	5,645	36.0	-6,702	-31.4	-561	-3.8

Highlighting represents particularly strong growth in wood products manufacturing jobs.

little during this era within the "extremely high" group; but federal harvests grew dramatically post-recession, albeit for a brief, nearly 5-year period. These trends may indicate a short-term employment restoration directly associated with the significant increase in federal timber harvesting that was focused in counties belonging to the extremely high group.

The second key point to stand out is that the group most similar to the "extremely high" group in timber industry employment is not the "very high" group, which had the greatest commonalities with respect to federal forest lands variables; it is the "low" group, which was defined by minimal connections to federal forest lands during this era. Compared to the "extremely high" group, counties in this group experienced somewhat less fluctuation in total harvest volume during the peak-harvest era, and smaller declines during the litigation era (figure 2.22). Yet the magnitude of lost earnings from wood products manufacturing in constant dollars between 1978 and 1993 (about $1.125 billion) was considerably larger than in the "extremely high" group (about $850 million) (table 2.9); the drop in the percentage of all earnings from wood products manufacturing was just as steep and essentially uninterrupted (figure 2.24); the underlying foundation of growth in all jobs was nearly as weak (table 2.10); and the magnitude of total jobs lost in wood products manufacturing was greater. More than 14,000 wood products manufacturing jobs were lost compared with 10,000 in the "extremely high" group; and there was only a 9-percent growth in wood products jobs in the 1983–1988 rebound, compared with 36 percent in the "extremely high" group (table 2.11).

Both the "low" and "extremely high" county groups lack a major urban center (see figs. 2.4 and 2.11), and most locations within these 19 counties are more than an hour's drive to the nearest urban centers. The "low" group also includes the ports of Aberdeen/Hoquiam and Port Angeles, Washington, and Eureka, California, from which logs harvested from nonfederal lands were increasingly exported in the 1980s—possibly introducing an additional market disincentive for maintaining labor-intensive mills nearby. Disadvantaged by geographic location and the preponderance of federal, state, and industrial forest lands relative to developable private property and convenient

location to urban services, counties in both groups likely had far fewer opportunities for economic diversification that could drive jobs and public revenue growth alike. Consequently, these counties stood to be harmed the most from general wood products industry trends that were suppressing wages, diminishing labor requirements, or both, throughout the region. The data suggest that industry workers fared better in the "extremely high" group during the 1980s, and a likely explanation is increased harvesting and local processing of federal timber.

Pre-NWFP employment and wage trends influence on the interpretation of NWFP-era social and economic change

We focus in this section on the pre-NWFP background in private sector timber industry employment to give context to the core monitoring question we address: "could negative social and economic change trends in some counties of the NWFP area be related to implementation of the NWFP after 1994?" This analysis emphasizes that these changes are also very likely related to **what came before the NWFP**. The wood products industry contracted dramatically across the entire NWFP area from the late 1970s to early 1990s, negatively effecting individual workers in the industry to some degree everywhere in the region. Broad structural effects of this change to local economies were not distributed uniformly across the region: counties, or communities, within the "low" and "extremely high" groups, and to a lesser extent the "very high" group, received much more severe consequences because they appear to have lacked other stable or growing employment sectors; or, these counties received much larger amounts of revenue from payments tied to federal timber, raising only small total revenues through other mechanisms. Both "low" and "extremely high" groups generated little employment growth during the litigation phase. In theory, litigation principally or entirely affected production of federal timber, and could reasonably be hypothesized to have generated a uniquely negative impact on "extremely high" or "very high" group counties—not "low" group counties. In fact, the trends examined in this section suggest two variations on the same theme of major contraction in principal industry jobs: constant wage loss in the "low" group, and a temporary reversal of what would have otherwise been a similar constant wage loss (mid-1980s) in the "extremely high" group—both against a background of anemic job growth overall.

The takeaway message is that conditions in timber industry employment at the onset of the NWFP era already offer evidence contrary to the hypothesis that social and economic change trends might be identified that are plausibly related to the implementation of the NWFP, because they are unique to a group of counties where federal forest lands had "extremely high" importance just before the start of the NWFP era, and because those trends were not simply a continuation of existing trends that were identifiable in the peak-harvest and litigation eras. Instead, two county groups, one strongly tied to federal forest lands and one not, had already experienced negative social and economic changes in the 1980s, likely as a result of broad structural changes in the timber industry; and they appeared equally poised for continued economic weakness in the ensuing NWFP era. It is highly likely that the brief restoration of timber industry jobs in the mid-1980s in the "extremely high" group of counties is a temporary reversal of that underlying trend, not a stable baseline condition.

Change by county group in total and wood products manufacturing jobs since 2001 (table 2.12) supports this interpretation. Percentage loss in wood products manufacturing jobs was comparably large in four of the groups, and was exceptionally large—57 percent—in the "low" group during the later NWFP era. Total job growth in all other sectors (table 2.12) was minimal in the "low" and "extremely high" groups during the later NWFP era, such that the large losses in wood products jobs counteracted 40 percent of the gains in jobs after 2000 in all other sectors. The similarity of these two groups in employment characteristics throughout the 1980s primed them for similarity in the NWFP era as well. This finding forces a reevaluation of the hypothesis that negative social and economic changes might occur that could be related to implementation of the NWFP because they appear to be related to a county's strength of ties to federal forest lands before the era began. A more appropriate hypothesis may be that high economic importance of **productive forest lands regardless of ownership** during the 1970s and early 1980s and simple geographic location far from metropolitan economic centers are the key driving factors in negative social and economic changes within the NWFP region. We examine this revised hypothesis in chapter 3.

Table 2.12—Relationship between change in total employment and wood products manufacturing employment by county group in the Northwest Forest Plan region, 2001–2017

County group	Change in total employment		Change in wood products manufacturing employment		Employment change not including wood products	Employment loss in wood products (3rd column) as a percentage of total job growth in all other sectors (5th column)
	No. of jobs	*Percent*	*No. of jobs*	*Percent*	*No. of jobs*	*Percent*
Low	+ 6,667	3.2	-5,015	-56.6	+ 11,682	-42.9
Moderate	+ 656,644	21.4	-6,000	-33.5	+ 662,644	-0.9
High	+ 50,876	23.7	-1,500	-31.8	+ 52,376	-2.9
Very high	+ 43,205	14.0	-2,905	-25.8	+ 46,110	-6.3
Extremely high	+ 4,430	3.5	-2,961	-33.6	+ 7,391	-40.6

Conclusion

Typology of Counties

Past NWFP social and economic monitoring reports have addressed the principal monitoring direction of the ROD either by attempting to quantify the social and economic characteristics of all communities throughout the monitoring region, as in the 10-year report, or by reporting trends for a few basic population variables for counties, broken into metropolitan and nonmetropolitan groups, as in the 15- and 20- year reports. The former approach is no longer possible owing to changes in the available data and monitoring budget constraints. The latter approach yields insufficient insight into the principal monitoring direction from the NWFP ROD to answer the question: "Are local communities and economies experiencing positive or negative changes over time that may be associated with federal forest management?"

This report strikes a compromise between the past two approaches by relying on county- rather than community-scale data and organizing the 72 counties of the monitoring region into a typology of six groups. The typology is constructed via a cluster analysis of six variables that describe relative degrees of importance for four measures of federal forest lands management and two measures of private sector timber industry employment for each county during the period immediately before the 1994 adoption of the NWFP. The four federal forest management indicators are (1) area of actively managed federal forest lands with a potential commercial forest group as the dominant cover class, relative to total county area; (2) total revenue-sharing transfer payments from federal timber sales, relative to all county revenue; (3) total Forest Service and BLM permanent employees, relative to all employed adults; and (4) total log volume from federal forest lands later subject to the NWFP, relative to total log volume from all sources processed. All four variables are assembled from data for the late 1980s. The two employment variables are jobs in forestry/fishing and wood products manufacturing, relative to all jobs, both from the 1990 census. Collectively, the counties in each group share similar traits as measured on more than one variable. The six groups of counties are named according to the relative degree of importance of the four federal forest lands management variables within each county in comparison to a fixed reference value, the sum of all 72 observations—i.e., the entire region's aggregate characteristics.

The essential characteristics of the six groups are compared in table 2.13, which is a reformatted version of table 2.7 (table 2.13 also appears in the executive summary). The groups are mapped in figure 2.11.

In theory, social and economic changes since circa 1990 that could possibly be related to implementation of the NWFP would have a functional relationship with the four federal lands management variables—the greater the importance of these variables before the era began, the more pronounced the social and economic changes associated with implementing the plan. Any such changes would register far more strongly, possibly uniquely, in the "extremely high" or "very high" groups of counties.

Table 2.13—Summary of linkage strengths between county types and federal forest management and timber industry employment variables just prior to Northwest Forest Plan implementation, circa 1990

		Typology variables					
		Federal forest lands management[b]				Timber industry employment	
County group[a]	Number of counties	Forests	Payments	Employees	Mills	Logging	Processing
None	18	---	---	---	-	-	--
Low	9	-	-	0	--	++	+++
Moderate	17	0	--	-	0	-	-
High	11	0	++	+++	0	++	++
Very high	7	++	++++	++	+	++	++
Extremely high	10	++	++++	++++	+	++++	++++

Zeroes represent relative equivalence between the county group and all 72 counties in the Northwest Forest Plan monitoring region as a unit in terms of the importance of the measure. Plus (+) symbols signify importance—the more pluses, the greater the importance; conversely, the number of minus (-) symbols indicates progressively less importance for that county group.

[a] County groups are based on importance of first four variables circa 1990.

[b] Federal forest management typologies include federal forest presence ("Forests"), timber-related payments to counties ("Payments"), related federal employment ("Employees"), and federal timber processed by local mills ("Mills").

Federal Forest Management and Timber Industry Employment Trends, 1980s–2017

To establish what changes in federal forest lands management and timber industry employment variables might mean for social and economic change, we performed time-series analysis on annually reported datasets for the following typology variables: total revenue-sharing payments to counties associated with federal timber sale receipts and from the SRS program, relative to total county revenue reported in the semi-decadal Census of Governments (U.S. Department of Commerce, Census Bureau 2018) (variable 2); full-time Forest Service and BLM employees (permanent and seasonal), relative to total annual employment levels in the QCEW (U.S. Department of Labor, Bureau of Labor Statistics 2018) (variable 3); and total employment and wages in wood products manufacturing (U.S. Department of Commerce, Census Bureau 1992), relative to total employment and wages from all employers, also from the QCEW (variable 6). In addition, we compared change trends in these variables over time with a time series of timber harvest by federal and nonfederal landowner by county group. Though timber harvest is not one of the typology variables, it is essential context for interpreting change in revenue payments, agency employees, and the timber industry workforce.

Key points—

Timber harvest—

Timber harvest volume was not used in the typology because of the uncertainty surrounding whether the economic impacts associated with harvest occur in the county in which the timber was located. However, timber harvest was historically either the main or an important driver of three factors used to determine typology and tracked in this chapter: private forest products employment, revenue-sharing payments to counties, and budget and staffing for units of the federal forest management agencies. Understanding trends in timber harvest is key to interpreting trends in these economic aspects of forest management—in turn, facilitating the assessment of the core monitoring question.

- Federal timber harvest volume declined by 75 percent overall between 1988 and 1993, from 5.6 to 1.3 BBF. During the 1994–2000 era, it declined an additional 75 percent to 130 MMBF. Since 2001, federal timber harvest volume has slowly but steadily climbed; 2014 was the peak year since 1988.
- State and private lands timber harvest volume declined by 20 percent between 1988 and 1993, from roughly 7 to 5.7 BBF; it remained constant at just under 6 BBF until 2006 and has generally declined since, in contrast with the federal harvest trend (though the state and private amounts are still far greater).

- Annual federal harvest volumes in the mid- to late 1980s were anomalous when considered in the context of a timeframe extending back to the 1960s. In 1984–1988, federal timber harvest volume briefly reached levels last seen in 1973. The decline during the 1989–1993 litigation era still reached about 40 percent below the lowest point of the 1965–1982 timespan: in other words, an unprecedented decline.
- During the early phase of NWFP implementation (1994–2000), federal timber harvest volume shrank most rapidly in counties within the "moderate" and "very high" groups, and most slowly in the "high" and "extremely high" groups; the inverse occurred after 2001, with more rapid growth in harvest amounts in the "moderate" and "very high" groups.
- For state and private harvest, there is more variation across the county groups. Harvest volume in the "low"-group counties fell fastest from its 1987 peak and continued to fall faster than in the other groups throughout the NWFP era. The 2009 harvest from state and private lands in the "low" group was 29 percent of the 1987 volume, the lowest by far of any group in any year after the peak. This trend may have had important implications for timber industry employment in the low group.

County payments and total revenue—

Historically, payments to counties sharing a portion of the proceeds of federal timber sale contracts have been a vital source of local government revenue for counties in the "extremely high," "very high," and "high" groups. The nine Oregon counties that received the vast majority of annual BLM O&C payments belong to one of these three groups. These payments were partially decoupled from actual timber sales beginning in 1993, and completely decoupled after passage of the Secure Rural Schools Act (114 Stat 1607, 16 U.S.C. 90, § 7101) in 2000. Hence, these payments were only partially affected by actual management of federal forest lands for the first 6 years of the NWFP era and were unrelated to current forest management thereafter.

- For data from 1986 to 2017, revenue payments to counties sharing a portion of federal timber receipts peaked in 1988, at $617 million (2017 dollars) for the 72-county monitoring region and fell by about 60 percent over the course of the litigation and early NWFP eras. This decline occurred even though Congress authorized supplemental payments to 48 of the 72 NWFP counties from 1993 to 2000.
- During this same time span, total county government revenues in the NWFP region increased by 224 percent to just under $14 billion (2017 dollars).
- Although a direct comparison of corresponding year values in the two data series is not appropriate, the significance of the timber payments to the region's revenues probably declined by roughly an order of magnitude during the litigation and early NWFP eras.
- Owing to the structure of payments in reauthorizations of the SRS, an additional order-of-magnitude decline in significance has occurred since 2007 because the first SRS payment in 2001 was reset to 85 percent of the 1986–1989 average, but this formula was only used through 2006.
- Because the revenue sharing payments are made to states, which distribute them to counties according to a formula that has remained constant, the rate of decline in transfer payments is uniform across the county groups.
- Though the rate of decline in federal revenue sharing payments is uniform, there is extreme variation according to county group in absolute dollar amounts of county revenues collected since 1987. Two groups, "low" and "extremely high," had especially weak growth in county revenue after the late 1980s, but only the "extremely high" group also received significant timber revenue-sharing payments.
- Counties in the "extremely high" group where most severely affected by shrinking payments over time. The payments had the largest per capita effect by far of any group, and this group had the least total revenue growth overall. After adjusting for inflation, total revenue collected has been on a negative trajectory from 2002 to 2017, the year for which the most recent data were available.

Forest Service and BLM employees—

The 10-year monitoring report documented the extent to which permanent full-time and seasonal Forest Service and BLM employees were vital contributors to community social fabric across the NWFP area, and the negative effects of staff cutbacks and accompanying management unit closures and consolidations in the first years of the NWFP. Following this lead, the current report analyzes county-scale trends in Forest Service and BLM staffing from 1973 to 2017.

- The number of Forest Service and BLM permanent employees in the NWFP area peaked in 1982 at more than 14,000, and again in 1992 at more than 13,000.
- Between roughly 1980 and 1994, the total employee count appears to contract in parallel with shrinking timber harvests, with a lag of about 2 to 4 years—hence, employment peaked in 1992 after federal harvest volume peaked in 1988.
- Employment levels declined in 21 of the ensuing 25 years after 1992; in the other 4 years, fewer than 100 employees more than in the previous year were recorded.
- Agency employment in 2017 was 41 percent lower than in 1992; the lowest number of full-time employees of any year on record dating to 1973 was recorded in 2017.
- The majority of employees through the entire data series were stationed in one of two county groups—"moderate" and "extremely high."
- There was relatively little variation in the rate at which the Forest Service and BLM workforce contracted across the county groups, but because of the underlying size of the total workforce in the different county groups, similar rates of contraction had very different degrees of social and economic impact. By far, counties in the "extremely high" group were most affected by reductions in the Forest Service and BLM workforces as a result of the very small total workforces in which these employees were embedded.

Wood products manufacturing employment—
This chapter analyzes the trend since the 1970s in three dimensions of annual employment by private wood products manufacturing companies: total employees, total wages paid, and average annual wages paid (wage data is in constant 2017 dollars). Data are from the Bureau of Labor Statistics QCEW (U.S. Department of Labor, Bureau of Labor Statistics 2018). They do not include self-employed and contract workers but are otherwise statistically robust and have been consistently reported annually since 1975. The typology is based on similar measures of employment in the timber industry from the 1990 Census of Population and Housing (U.S. Department of Commerce, Census Bureau 1992), which include contract and self-employed workers but cannot be tracked in a time series. Trend analysis is only possible with QCEW data.

- Earnings from wood products manufacturing in the NWFP area in the 1975–2017 reporting period peaked in 1978, just short of $10 billion (in 2017 dollars).
- Earnings and total employment contracted rapidly between 1978 and 1983 in association with a period of national recession (1980–1982), then rose slightly to new peaks in 1984 and 1988.
- Total employment rose in all five groups during the 1983–1988 recovery from the recession, but the rise in total employment was much more significant in the "extremely high" group than in any of the others.
- Total wages paid in wood products manufacturing also recovered in 1983–1988, but less so than employment, resulting in a steady decline in average annual wages paid from their peak in 1978. This decline in the average inflation-adjusted wage lasted continuously until 1991.
- Total wages paid fell by 25 percent during the 1989–1993 litigation era, less than the 45-percent decline in total timber harvest.
- During the early NWFP era, change in total wages was relatively small for the region as a whole; but there was internal variation in the rate of change among the groups, including a slight increase in total wages paid in the "moderate" group, mainly composed of urban counties, and a decline in wages paid in the "low" group.
- During the later NWFP era, wages remained relatively stable in the 54 counties analyzed in the monitoring region from 2001 to 2006, fell by 42 percent in response to the Great Recession (2007–2009), to a low of $1.4 billion (2017 dollars), and have since rebounded slightly to $1.8 billion—still one-third less than in 2005. As was the case in the latter half of the peak-harvest era (1983–1988), wages did not recover from the recession in the "low" group and were lower in 2017 than at their peak for this era in 2004.

Implications for Monitoring Social and Economic Change Trends Before and During the NWFP Era

The ROD monitoring direction specifies that agencies should identify social and economic changes that **may be related to changes in the management of federal forest lands**. The following trends in this time series analysis are candidates for identifying associated social and economic changes.

Revenue sharing (timber payments)—
Although for most of the era analyzed here, revenue sharing payments were not directly associated with federal lands management decision making, healthy public finances in

more than a dozen counties of the NWFP monitoring region were historically contingent on consistently substantial timber revenue-sharing payments. The most significant decline in payments has occurred since 2006. Most of the lost revenue occurred in 17 counties in the "extremely high" and "very high" groups. Of these, the effect was potentially very serious in the "extremely high" group owing to a concurrent trend of **shrinking** total county revenue after 2002. Most counties in the "very high" group, such as Lane County, Oregon, were also heavily affected because payments historically were very large (Lane County received the largest timber payment of the era in absolute dollars when payments were directly tied to sale contract receipts), although declines in counties of this group typically occurred against a backdrop of healthier growth in total revenue, compared to those in the "extremely high" group.

The direct implication of loss of revenue paid through the Forest Service is shortfalls in local school district budgets and public road maintenance. For BLM O&C payments, declining revenue potentially affected all aspects of county governance, including priority programs such as public safety and public health infrastructure. The principal direct effects on social and economic conditions would be cutbacks in public sector employment or wages paid. Secondary effects could include declining primary and secondary instructional quality and outcomes; disincentives to business formation and growth, such as poorly maintained public infrastructure; and a lack of available health care. All these factors could contribute significantly to low or even negative population growth as younger residents of such counties perceive a lack of future career opportunities, as well as higher rates of unemployment or poverty. If such a trend is unique to the "extremely high" group, it could be associated with declining revenue-sharing payments during the NWFP era.

Forest Service and BLM employees— Very large declines in the number of full-time employees between 1992 and 2017 occurred in the "extremely high," "very high," and "moderate" groups. As with revenue sharing payments, the underlying trend in total employment is very different in these groups. Since 1992, total employment grew 54 percent in the "moderate" group, 41 percent in the "very high" group, and 19 percent—about 0.77 percent annually—in the "extremely high" group. The number of federal forest agency jobs eliminated in the "extremely high" group since 1992 (1,720) is not likely large enough to be the sole cause of unique increases in unemployment, higher rates of poverty, or other macroscale measures of social well-being at the county scale. However, as documented in chapter 4, these effects were frequently very significant at the community level. While communities within any of the county groups could have suffered a blow from the elimination of employees of a ranger district or resource area office, the probability of such a community being in the "very high" or "extremely high" group of counties is greater. This is a function of these county groups' stronger connections to federal forest land area.

Employment in the private sector timber industry— Timber employment was historically important in most parts of the NWFP area, but it was exceptionally important in both the "low" and "extremely high" groups. At least one-third of all wages paid by employers in the early 1970s in these two groups came from private sector wood products manufacturing operators. Total jobs and wages paid, as well as average wages paid, fell consistently throughout the region from 1975, the first year for which data are available, to 1993, but the rate and effect of this decline varied across the groups. The largest losses in the late 1970s and 1980s occurred in the "low" and "moderate" groups; losses were greatest in the "very high" and "extremely high" groups after 1988. There is some indication in the pattern of employment during the 1980s that in these latter two groups, a major increase in timber harvest from federal lands may have contributed to a short-lived rebound in jobs and wages from private wood products manufacturers in the mid-1980s. During this same period, jobs and wages steadily declined in the "low" group whose counties harvested very little federal timber and had processing facilities that were not likely located where they could economically bid on federal timber harvested in counties of other groups.

Processing timber harvested in counties of another group does appear to have occurred during the 1980s or the early phase of the NWFP in the "moderate" group: wages paid in wood products manufacturing remained largely steady from the late 1980s to 2000. It is the only group in which this is the case. The "moderate" group primarily consists of counties that have large cities or are part of major metropolitan areas and are almost entirely located along the Interstate 5 corridor. An opposing trend of stable

wages paid during the litigation and early NWFP eras in the most centrally located and urban group of counties implies that processors in these counties had a locational advantage during the period of declining total harvest.

After 2000, total employment and wages paid in the timber industry were not closely related to timber volume harvested. Both employment and wages were highest in 2001–2004 for all groups, a period in which virtually no federal timber was harvested. However, employment and wages declined steadily in the "low" group until 2017, whereas in the other groups they rebounded slightly after the 2007–2009 Great Recession.

Wood products employment trends within the NWFP area transcend county groups, which has important implications for the principal monitoring question. During both the pre-NWFP era from 1975 to 1993, and the NWFP era after 1993, the most significant and consistent decline in total employment and wages in wood products employment occurs in the "low" group, which had only minimal connections to federal forest lands, circa 1990. The group with the most similar initial condition and trend is the "extremely high" group. Both groups were extremely reliant on wood products manufacturing for earned wages during the 1970s, and remained so even as jobs and wages in the industry declined. Continued reliance on timber processing jobs during industry contraction reflected the lack of growth in total employment in both groups after the late 1970s. There is some indication that federal forest management—increased timber harvest—generated a temporary rebound of jobs and wages in the "extremely high" group just before the litigation era that immediately preceded the NWFP, but there is no corresponding rebound in the "low" group. Because both groups were heavily reliant on this sector and experienced broadly similar job and wage losses in the absence of alternative sources of jobs and wages, trends in indicators such as unemployment, reliance on public assistance income, and poverty should be similar during the entire NWFP era for counties in both groups.

This expectation contradicts the simple hypothesis with which this chapter opens—that it might be possible to perceive a uniquely negative social and economic change trend during the NWFP era within only those counties with the strongest connections to federal forest lands management. Instead, we have two interacting hypotheses:

- Negative social and economic change trends may have occurred **before and during** the NWFP era in counties with unusually high reliance on private sector employment in the timber industry, especially in wood products manufacturing.
- These trends may have been uniquely exacerbated by federal forest management shifts during the NWFP era only in counties that exhibited the above trend and were also strongly tied to federal forest lands management, circa 1990.

Thus, to observe preliminary support for the overall hypothesis that uniquely negative social and economic change may have occurred in association with implementation of the NWFP, social and economic indicator trends should show the following:

- Counties in the "low" and "extremely high" groups had similar social and economic profiles, circa 1980.
- Counties in these groups follow similar change trajectories from roughly 1980 to 1990.
- **Counties in these groups follow divergent change trajectories after 1990, with the "extremely high" group exhibiting a heightened negative social and economic change trend as compared to the low group**.

If all three conditions are observed, then social and economic change might be plausibly linked to implementation of the NWFP—otherwise, it is likely that other drivers were much more important than the NWFP in directing social and economic change.

Chapter 3 investigates these hypotheses by examining trends in major demographic and economic indicators dating to 1980 (where data are available) and compiling an aggregate summary statistic of relative social vulnerability that can be tracked through the era from 1980 to 2017.

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Chapter 3: Social and Economic Changes in Similar NWFP Counties Since 1980

Mark D. O. Adams[1]

This 25-year Northwest Forest Plan (NWFP) socioeconomic monitoring report strives to (1) restore community-scale perspectives on social and economic change to the periodic monitoring report by including voices of residents from communities with historic ties to federal forest management in the change analysis, and (2) describe the geographic variability of social and economic changes during the NWFP era at a scale that is larger than the community, but smaller than the region as a whole.

Both goals are aimed at answering the effectiveness monitoring question for social and economic conditions established by the NWFP record of decision (ROD) in 1994: "Are local communities and economies experiencing positive or negative changes over time that may be associated with federal forest management?"

The creation of a new framework for analyzing social and economic change during the NWFP era—a county typology—facilitates linking the narrative analysis of community-scale change in chapter 4 of this report to quantitative change assessment measured at the county scale, for which quantifiable data are far more readily available and of higher quality. County-scale change assessment, within the context of the county typology, is the subject of this chapter.

The typology enables direct assessment of a hypothesis implied in the ROD effectiveness monitoring question:

- Distinct trends of social and economic change exist in communities (counties) that are associated with implementation of the NWFP from 1994 to 2017; the stronger the pre-NWFP social and economic links of communities or counties to federal forest lands in the NWFP region, the more distinct the associated trend.

Previous social and economic monitoring reports have not directly linked quantitative analysis of social and economic change to measures of federal forest management, and so have provided relatively little insight into the "*…may be associated with federal forest management*" portion of the ROD direction. The analysis in this chapter assesses the extent of county-scale evidence that appears to support this hypothesis.

Time series analysis of three datasets that contributed to the definition of the county typology in chapter 2 uncovered evidence complicating the simple hypothesis that counties with the strongest connections to federal forest lands management at the start of the NWFP era would exhibit social and economic change trends that were unique within the monitoring region, and the nature of the trends would imply that implementation of the NWFP played a major causal role in the trajectory of change. Distinctly negative trends in total employment, timber industry employment, and growth in total revenue collected by counties are shared by two groups in the typology: the "low" and "extremely high" groups, named according to the relative importance of federal forest lands ca. 1990. Instead, the results in chapter 2 suggest that there are in fact two interacting hypotheses to explore:

- Negative social and economic change trends may have occurred both before and during the NWFP era in counties with unusually high reliance on private sector employment in the timber industry, particularly manufacturing, in the decade before NWFP adoption—regardless of their connection to federal forest lands.
- These trends may have been exacerbated by federal forest management changes introduced by the NWFP **only in those counties exhibiting the first condition that were also strongly tied to federal forest lands management ca. 1990**.

Evidence supporting this two-part hypothesis would include the following:

- Similar social and economic profiles, circa 1980, among counties with very high reliance on timber industry employment, circa 1990.
- Similar social and economic change trajectories between 1980 and 1990, a period of significant change in the

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Pacific Northwest timber industry that also coincided with the end of the era of major timber harvests on federal lands.

- Divergent social and economic change trajectories after 1990 for counties that shared these pre-1990 characteristics, in which counties strongly tied to federal forest lands at the end of the 1980s experienced social and economic changes after 1990 that were distinct from those observed after 1990 in counties that were not strongly linked to federal forests.

This chapter employs the typology of NWFP counties described in chapter 2 to determine if evidence of social and economic change trends provides support for these nested hypotheses, ultimately addressing the core monitoring question of the ROD at the county scale. The central element of the analysis of social and economic change is a measure of county-scale **social vulnerability**, which is analogous to the community-scale calculation of social well-being published in the 10-year NWFP socioeconomic monitoring report. Vulnerability refers to the capacity of a population to prepare for, and respond to, a catastrophic event (Cutter et. al. 2003). The event may take the form of destruction from a wildfire, closure of a major employer, or significant changes to government policies affecting social safety net programs. Vulnerability means that the population cannot recover its previous levels of economic activity, prior social networks, or other defining community characteristics after the event has occurred. In the research literature, characteristics that increase vulnerability include high rates of poverty or low-income households; high proportions of racial and ethnic minorities, particularly when they represent immigrant communities with limited English proficiency; unusually high proportions of people age 65 and older, or of children 17 and younger; low levels of educational attainment; low levels of participation in the workforce; and heavy reliance on nonwage income from support programs such as supplemental nutrition assistance (SNAP, or "food stamps") (Cutter et. al. 2003).

Social vulnerability analysis is most frequently employed to understand the condition of a population at a specific point in time. Sometimes this is retrospective—e.g., examining the spatial pattern of population characteristics associated with social vulnerability along the U.S. Gulf Coast prior to Hurricane Katrina to better understand how efficiently emergency response aid and longer term economic recovery supports post-Katrina were allocated (Burton 2015). More often, an index of vulnerability is generated at a point in time for risk assessment purposes with an eye to advance preparations for a hazard event (e.g., Davies et al. 2018, Oulahen et al. 2015). Tracking changes in social vulnerability over time is uncommon in this research literature, though it raises clearly important management and policy questions: Did an economic intervention in the form of a public subsidy have the desired social outcome (e.g., farm price supports)? Does disaster assistance appear to have accelerated the social and economic recovery of a community that suffers loss from a wildfire or hurricane?

This chapter thus introduces a form of social vulnerability analysis that is novel in at least two ways:

- It uses a metric based on data inputs that both describe a specific social and economic relationship—forest land management and its primary local economic effects—and are stable over long time periods.
- It describes vulnerability **relatively**, rather than in absolute terms as is more typical in published research literature.

"Relative" means that the social vulnerability tendency of each county in the NWFP monitoring region is defined only in comparison to the other counties in the monitoring region—not to the United States, or to the three Pacific coast states. This feature is important because the NWFP obviously does not apply to all three states, much less the nation. Instead, the ROD socioeconomic monitoring directive implies an interest in intraregional variability in social and economic change—e.g., some communities or counties are suffering because of federal forest management changes but others are not. Describing vulnerability in relative terms within the spatial footprint of the potential causal mechanism (the NWFP) is the most sensitive approach for detecting these nuances.

Describing change in social vulnerability over time requires careful attention to language. If characteristics associated with vulnerability—poverty, underemployment, a high proportion of people age 65 and older—intensify within a data unit, such as a county, over time, and this trend is not countered by change in the opposite direction for other vulnerability-associated characteristics, then

social vulnerability in the reporting unit has **deteriorated**: on balance, the people in the county are poorer, older, and less fully employed at the end of the era compared to the start, and therefore social vulnerability worsened over the measured time period. Conversely, if these characteristics lessen during the era measured and other related factors do not trend in the opposite direction, then fewer people are in poverty or underemployed, and social vulnerability has **improved**: the population is less vulnerable at the end of the era measured than it was at the beginning. The ROD directs agencies to determine whether positive or negative social and economic change trends have occurred during the NWFP era (1994–2017) that might be linked to management. **Improved social vulnerability is positive change. Deteriorated social vulnerability is negative change.** This chapter uses this terminology consistently: whenever deterioration is observed, the analysis is showing negative socioeconomic change within the limited interaction of age, employment, and income variables included in the vulnerability metric; when improvement or a lessening of vulnerability is observed, the change is positive.

This chapter is divided into four sections, three addressing the hypotheses regarding a relationship between social and economic change and federal forest management changes wrought by the NWFP, and the first providing historical context. The second and third sections identify and evaluate trends in individual measures of population and workforce characteristics, with distinct trends established for each group in the county typology from chapter 2. These sections also serve as continuations of the sections of the 15- and 20-year NWFP socioeconomic monitoring reports that updated population and employment trends for counties in the region. The last and longest section of this chapter develops and applies the social vulnerability measure to provide a comprehensive assessment of the ROD-derived hypotheses. These sections appear in this chapter as follows:

- "Historical Perspective on Social and Economic Changes in the NWFP Era"
- "Demographic Change"—analysis of NWFP county types
- "Employment and Income Change"—analysis of household income and labor force trends in NWFP county types
- "Changing Social Vulnerability in the NWFP Monitoring Region Since 1980"—construction of the social vulnerability metric, and evaluation of changes in the metric within individual counties, and the five county groups with at least minimal links to federal forest lands at the end of the 1980s

Historical Perspective on Social and Economic Changes in the NWFP Era

This chapter analyzes data time series that generally begin in 1980, and earlier in a few cases. Most demographic data, such as the age, race, and ethnic composition of county populations, were updated once every 10 years in the decennial U.S. Census of Population and Housing until the 2000 Census was completed. In 2003, the American Community Survey replaced most of the data collection and estimation that had historically been part of the decennial census program. Since 2009, demographic data comparable to the pre-2003 decennial census have been released every 5 years in the ACS. Workforce and earnings from employment data are obtained from the Quarterly Census of Employment and Wages, which is published annually and includes data for counties from 1975 forward. Because it includes population characteristics that are only available once per decade from U.S. Census Bureau data, the social vulnerability metric is constructed using data from three decennial census years—1980, 1990, and 2000—combined with 2006–2010 and 2013–2017 ACS data; the latter was the most current available when this analysis was conducted.

This extended historical perspective on the NWFP era, including socioeconomic condition and trend assessment for the 14-year period (1980–1993) that preceded it, represents another major change from past social and economic monitoring. The 10-year report used 1990 data as a baseline for assessing social well-being in communities within the plan era. The two subsequent reports used current population estimates from 2002 as the baseline condition. Neither approach acknowledges that some trends in forest management indicators during the NWFP era may have been continuations of existing trends and could therefore be associated with underlying factors that are more relevant than the NWFP itself to the trend.

The Pivotal Decade: The 1980s

The 1980s are the pivotal decade in which the American economy began its present course of segmentation into information- and professional services-dominated, large coastal metropolitan economies (Sassen 1990),

as well as economically peripheral communities in the rust belt (Horbor 2013) and rural areas throughout the nation (Barkley 1995, Goetz and Debertin 1996). The Pacific Northwest timber economy historically spanned both urban and rural areas of the region (Cook 1995, FEMAT 1993). From the late 1950s, when federal forest resources were fully integrated into the regional timber economy, through the late 1970s, the economic and social conditions associated with the wood products economy in the Northwest—in both rural and urban contexts—were relatively stable and generally prosperous, though there were periodic market fluctuations that caused more localized negative economic and social impacts. Regionally, it was a "golden age" for communities and counties in which employment in wood products or forest management was highly important (Hirt 1994, Robbins 2004). This changed in the 1980s. The wood products industry was profoundly affected by a nationwide recession that began in late 1980 and lasted intermittently into 1982 (FEMAT 1993). A very large proportion of workers in all aspects of the production chain were furloughed or lost their jobs entirely. The paradigm for managing forests—federal, state, most private industry lands—remained largely unchanged during the recession and its aftermath, but the production side of the industry emerged in a state of significant transition: new international markets opened up, new processing machinery increased efficiency and lowered labor requirements, and international competition for supplying domestic demand was on the near-future horizon (Cook 1995, FEMAT 1993, Hays 2006, Power 2006). In some parts of the Northwest where timber production was central to identity and livelihoods, the 1980s were bleak as a result of these changes (see Robbins 1989 for a vivid local oral history account of these effects).

Understanding pre-existing social and economic change trends in the NWFP region is a crucial element of this monitoring effort. A major industry restructuring is typically accompanied by significant displacement of workers and the life patterns and community networks they create. Even in the absence of industrial restructuring, natural resources extraction economies have well-documented boom-and-bust cycles in which market downturns also yield displacement effects (Humphrey 1995). The coexistence of persistent rural poverty and local economic dependence on natural resource extraction—in forestry as well as other sectors—has been well-documented not only in the "global south" (e.g., Peluso 1995), but within the United States, particularly since the mid-1970s (Humphrey 1995). Given the chronic association of elevated poverty in communities where natural resource extraction dominates the employment profile, and the dynamic transformation of the forest products industry during the 1980s, it is unreasonable to expect that social and economic conditions measured in the year 1990 in much of the NWFP region reflect continuity with a recent past that was socially and economically stable and healthy. This is especially true for parts of the region where the timber industry was extremely important to household earnings and community social organization. The year 1971 might be described as a proxy for prior long-term stability, but not 1989.

To account for the effect of these dynamic events on social and economic change entering into the NWFP era, we initiate our time-series analysis of social vulnerability at a point—spring 1980, when decennial census data was gathered—when the economic and social structures of rural and urban parts of the NWFP area were not yet radically different, and when insufficient time had passed for the disrupting effects of the 1980–1982 recession to appear in demographic and economic profiles. Datasets for the independent assessment of employment and earnings change in this chapter begin in 1975, which further clarifies the transformative nature of the 1980s. In many popular narratives, the spotted owl litigation and adoption of the NWFP brought the era of small-town prosperity resulting from the post-World War II era of forest industry in the Northwest to an abrupt and harsh end. The reality is more complex: a period of transition lasting roughly a decade preceded these seminal events. Our longer historical perspective makes it possible to assess the potential role that economic marginalization of rural places may have played in social and economic changes, apart from specific changes to federal forest land management, thus further clarifying whether observed changes could provide support for the hypothesis implied in the ROD monitoring question.

This chapter follows the same organization of historical periods found in chapter 2 of this report in analyzing social vulnerability, its contributing individual metrics, and their change over time:

- Intensive harvest era: 1978–1988 (1980 data points for demographic change and social vulnerability)
- Litigation era: 1989–1993 (1990 data points)

- Early NWFP era: 1994–2000 (2000 data points)
- Later NWFP era: 2001–2017 (2010 and 2017 data points)

Demographic Change

Demographic change can have major implications for the endurance of a community's identity as well as the livelihoods of its residents. Community institutions, cultural norms, and social networks are all formed in the context of a community's demographic character—the mix of ages, genders, and ethnic/racial identities that comprise its population. Demographic changes have important consequences not only for the persistence of valued, intangible community institutions and networks, but also for practical considerations, such as the continuing existence of a workforce with particular skills. This reality does not mean that avoiding demographic change is a desirable or realistic community goal. It means that the specific **nature** of demographic change has consequences for community viability.

Total Population

Change in total population has varied considerably across the groups of counties since 1980. Table 3.1 reports change in total population for each county group by decade. These changes are graphically illustrated in figure 3.1, which depicts change in total population as a function of population in 1990 during the pre-NWFP litigation era. The 15- and 20-year NWFP monitoring reports tracked population change according to whether counties were classified as metropolitan or nonmetropolitan by the U.S. Office of Management and Budget in 2003. Table 3.1 and figure 3.1 depict total population change for the portion of the NWFP monitoring region that excludes the "none" group of counties (see chapter 2) from the analysis; they are based on the 54 counties that belong to the five remaining groups, where the importance of federal forest lands in the late 1980s was at least "low." All subsequent data reporting in this chapter follows this practice: "All NWFP region" refers to the 54-county subset, and data for the extraneous "none" group of counties are not reported.

Since 1990, the dominant population growth trend in the 54 counties analyzed in the NWFP monitoring region has occurred in the "moderate" group, which is largely metropolitan in character (see figs. 2.4 and 2.11 in chapter 2). As indicated in figure 3.1, the "low," "very high," and "extremely high" groups lost share of the total 54-county

Table 3.1—Change in total population for county groups by decade, 1980–2017

County group[a]	1980 population	1990 population	1980–1990 change	2000 population	1990–2000 change	2010 population	2000–2010 change	2013–2017 population[b]	2013–2017 change[b]
	- - - No. of people - - -		*Percent*	*No. of people*	*Percent*	*No. of people*	*Percent*	*No. of people*	*Percent*
Low	490,079	541,420	10.5	605,463	11.8	664,308	9.7	669,200	0.7
Moderate	4,273,414	5,086,421	19.0	6,205,639	22.0	7,072,982	14.0	7,582,787	7.2
High	382,988	422,265	10.3	521,282	23.4	602,030	15.5	630,981	4.8
Very high	630,540	660,053	4.7	762,473	15.5	831,626	9.1	857,223	3.1
Extremely high	331,583	350,597	5.7	390,691	11.4	414,435	6.1	410,754	**-0.9**
Total	6,108,604	7,060,756	15.6	8,485,548	20.2	9,585,381	13.0	10,150,945	5.9

Bold indicates negative change.

[a] County typology groups 1–5 from chapter 2 of this report, based on 54 of the 72 counties in the Northwest Forest Plan monitoring region.

[b] Data estimated from a rolling sample collected over 5 years, so published estimates are not exact population counts, or precise points in time.

Data sources: 1980–2010, U.S. Census of Population and Housing SF-1; 2013–2017 American Community Survey 5-year estimates.

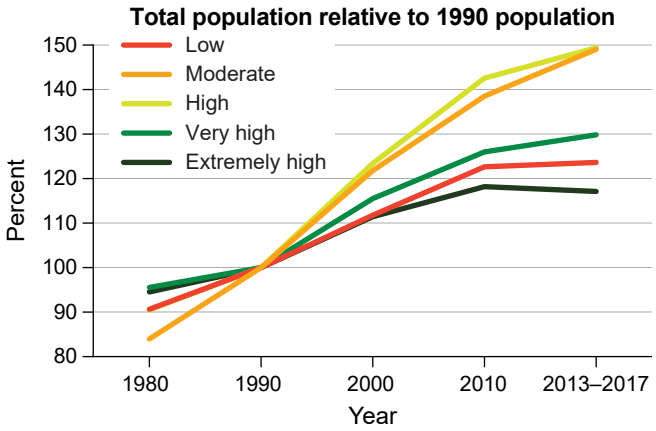

Figure 3.1—Change in total population for county typology groups (low, moderate, high, very high, extremely high [see chapter 2 of this report]) by decade, 1980–2017, as a percentage of 1990 population. Data for 2013–2017 are estimated over 5 years. Data sources: 1980–2010, U.S. Census of Population and Housing SF-1; 2013–2017 American Community Survey.

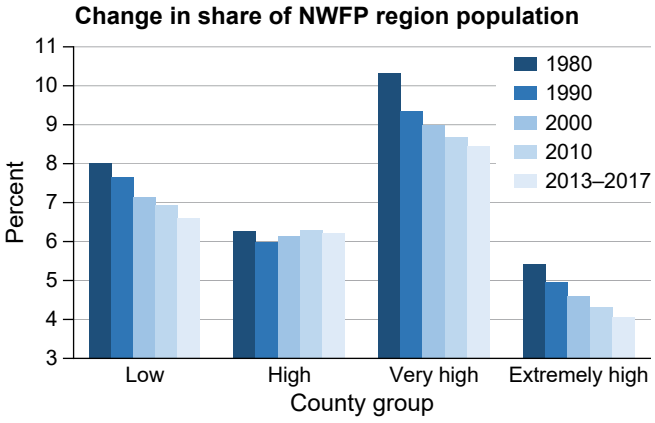

Figure 3.2—Change in non-"moderate" county group (low, high, very high, extremely high [see chapter 2 of this report]) share of the total population for 54 counties in the Northwest Forest Plan (NWFP) monitoring region, 1980–2017. Data for 2013–2017 are estimated over 5 years. Data sources: 1980–2010, U.S. Census of Population and Housing SF-1; 2013–2017 American Community Survey.

population in every successive census after 1980. Population growth rates in these groups significantly lagged that of the region overall in every decade. The "high" group is unusual in that its population change trend was similar to these other three groups during the 1980s, but was similar to the "moderate" group between 1990 and 2010. During these two decades, the "high" group grew faster than the "moderate" group and regained some of its 1980 share of the region's total population. This trend may be waning, as indicated by change since 2010, which is again dissimilar to the "moderate" group. Only the "moderate" group among the five gained share of the total regional population in every decade after 1980 (fig. 3.2). The first and most recent periods of population change are of particular interest.

The population change trend in the 1980s for the four groups that are mostly or entirely nonmetropolitan reflects a national pattern at that time. During the 1970s, long-standing migration trends from rural to urban areas were briefly reversed, leading to a nonmetropolitan turnaround in migration patterns (Fuguitt 1985). This turnaround migration was notable for the high median age of urban-to-rural migrants, indicating that the phenomenon was largely driven by retirees. Meanwhile, rural young people were still migrating to urban areas in the 1970s as in previous decades, but the magnitude was smaller (Knapp 1995, Richter 1985). In the NWFP area, signs of the nonmetropolitan turnaround are especially evident in the large proportion of adults age 65 and older in 1980 that were found in many coastal counties, such as Curry, Lincoln, and Tillamook Counties in Oregon and Clallam and Jefferson Counties in Washington. In the 1980s, this brief turnaround reversed. The 1980s was the first decade in which rural population losses resulting from migration were not offset by natural increase (births more numerous than deaths) in much of rural America (Johnson 2006), which caused zero or negative population growth to become common across a broad swath of rural counties, particularly in Appalachia, the Upper Midwest, and the Great Plains, but also in the interior West (Hobor 2013). In the NWFP area, this effect seems to have been especially strong in the "extremely high" and "very high" county groups—implying that negligible population gains or even losses could be associated with "very" or "extremely high" importance for federal forest lands.

In the 1990s, demographers debated whether a second turnaround migration was underway, this time characterized mainly by migration to "exurbs"—new, extremely low-density housing developments on the outskirts of major cities, or in the vicinity of recreational amenities such as lakes, mountain scenery, and public lands in mostly "nonmetropolitan" counties (Fuguitt and Beale 1996). There is evidence of this effect within the NWFP area in the dramatically different population growth rates

in the "high" group in the 1990s and 2000s, as compared to the 1980s. The "high" group includes two counties—Deschutes, Oregon, and Chelan, Washington—that were nonmetropolitan in 1980. They are centered on the moderate-size cities of Bend and Wenatchee, respectively. Bend was among the nation's 10-fastest growing cities with more than 10,000 residents for much of the 1990s and 2000s, and the Wenatchee and Lake Chelan areas in Chelan County also experienced rapid growth resulting from in-migration (though in Chelan County, it is because of growth in both migrant farmworker communities and more affluent "amenity" migrants). There is some evidence that even counties in the "low," "very high," and "extremely high" groups experienced at least some in-migration in the 1990s; their growth rates were double those observed in the 1980s, though only 50 to 60 percent of the corresponding population growth rate in the "moderate" group.

Although ACS population estimates include some error (Bazuin and Fraser 2013) that requires interpreting emergent trends with substantial caution, the most recent estimates from 2013–2017 suggest that population loss of the sort that began in many U.S. rural counties in the 1980s was occurring in some parts of the NWFP area after 2010. The "low" group's total population count was essentially unchanged after 2010, and the total population of the "extremely high" group was **smaller** in 2013–2017 than in 2010 (table 3.1). By the end of the 37-year reporting period, the aggregate population of these two groups had grown by 24 and 17 percent, respectively—less than 0.5 percent annually in the latter case—and appeared poised at the start of a trend of continuing population decline. Growth in the "moderate" and "high" groups in the 2010s was much slower than in previous decades, yet the relative gap between these and the "low" and "extremely high" groups was wider. Total population trends for the five county groups show that the full range of national experiences with population change since 1980 have also been distributed within the NWFP area: rapid growth of major metropolitan areas ("moderate" group); isolated instances of rapid growth after 1990 in then-nonmetropolitan areas ("high" group); and slow growth, stasis, and even some decline ("low," "very high," "extremely high" groups). Higher population growth rates by themselves do not indicate that a county, or community, is better or worse off. However, strong local economies in places with low, or negative, population growth are quite rare.

Population by Age-Class Distribution

The age of a population has major implications for a wide range of factors that affect community well-being, including workforce potential, tax collection, and demand for social services. The standard demographic age-classes that are used in the U.S. Census as well as much demographic research are as follows:

- Under age 25 (sometimes subdivided into ages 18–24 and children under age 18)
- Ages 25 to 44
- Ages 45 to 64
- Age 65 and older

Figures 3.3 and 3.4 show growth in the size of each group's four age-class populations (fig. 3.3) and how changing growth rates affected the distribution of each group's total population into the four age-classes (fig. 3.4).

Growth in the four main age classes of population by decade in each group varied considerably after 1990, and to a lesser degree during the 1980s. Collectively, this variability appears to strongly reflect national rural-urban demographic shifts since 1980. Figure 3.3 is arranged to emphasize one principal distinction among the NWFP county groups in growth by population age class: between 1980 and 2000, there was very little differentiation in the growth of population in the 46 to 64 and 65 and older age classes among the five county groups relative to their own 1990 populations. The combined effect of existing residents growing older, and in-migration and deaths of adults older than 45, during the most important 20-year period of economic transition in the region, was quite similar. (Although the relative balance of these three factors is probably different, data describing them were not available to this report.) In contrast, the five county groups have had very different growth trajectories for the two younger population cohorts relative to their 1990 populations in every decade since 1980. Only the moderate group, comprised largely of major metropolitan-area counties (fig. 2.11), has consistently seen population increases in the two younger cohorts in every decade, though the magnitude of growth is not as large as in the older cohorts (e.g., 2010 population ages 45 to 64 is twice that of 1990, but 2010 population ages 25 to 44 is only 25 percent larger than in 1990).

The most significant social and economic change trend revealed in figure 3.4 is the **decline** in the size of the ages

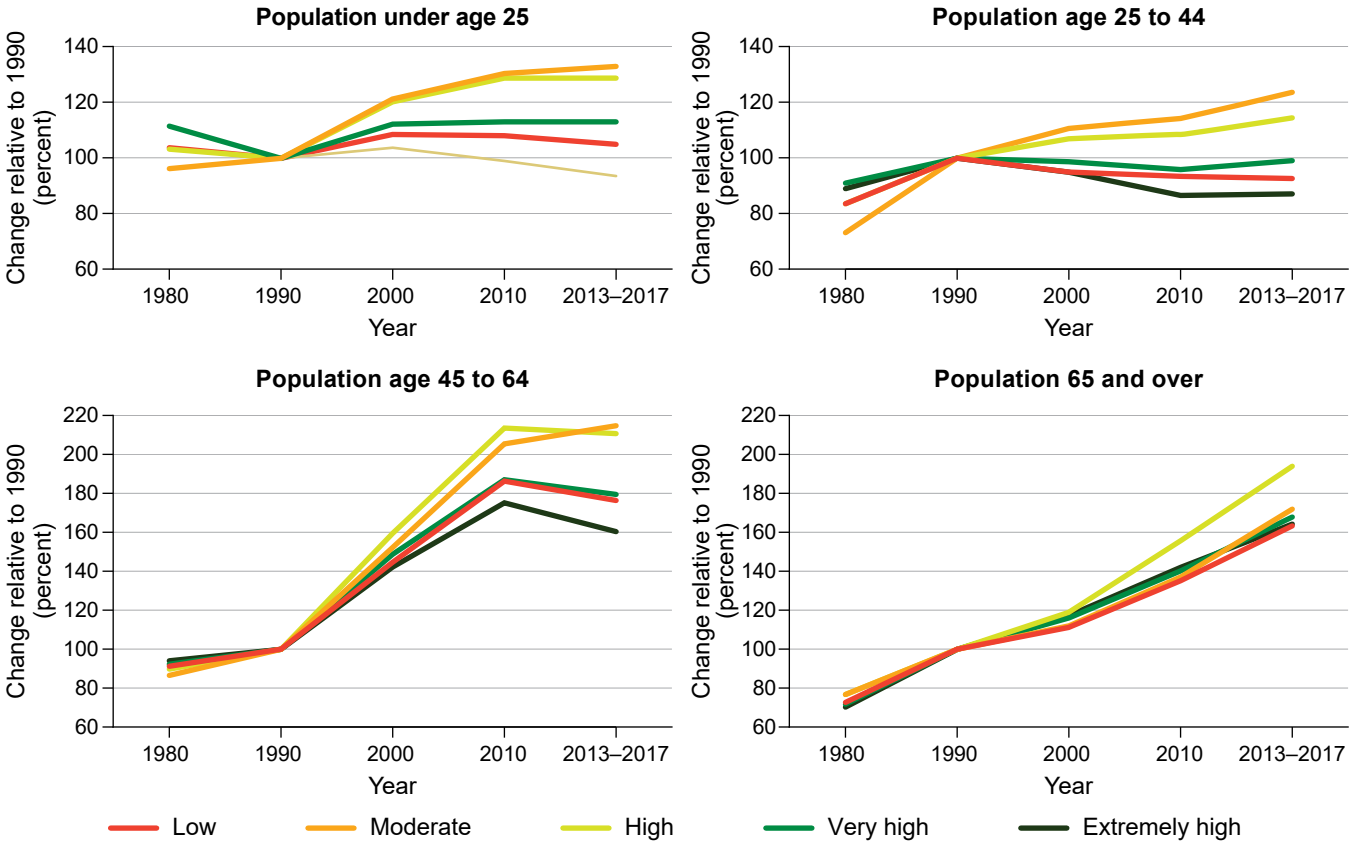

Figure 3.3—Change in population age-class cohort size in county groups (low, moderate, high, very high, extremely high [see chapter 2 of this report]) relative to 1990 cohort size. Data for 2013–2017 are estimated over 5 years. Data sources: 1980–2010, U.S. Census Bureau Decennial Census of Population and Housing; 2013–2017, American Community Survey.

25 to 44 cohort in three county groups: "low," "very high," and "extremely high." In all three, the 1990 population is the largest between 1980 and 2017. This age cohort is highly significant for a community's social and economic future: it is the class of adults on the verge of forming households or already raising young children, starting careers, and, as they approach their mid-40s, typically reaching a high point in their work productivity and often also their earnings, particularly so in skilled labor occupations. Shrinkage of this cohort presents serious challenges to long-term viability of a community or county; in all three county groups, shrinkage occurred during the 1990s, and these populations had not recovered to 1990 levels by 2017.

These variable growth trends result in the changing distribution of each group's total population into the four cohorts in each decade as shown in figure 3.4. In 1980, the five groups had similar age-cohort distributions: about 40 percent of the population was under age 25, and roughly 30 percent was ages 25 to 44. Slight differences emerge among the remaining 30 percent of the population, with the "low," "high," and "extremely high" groups having higher percentages of people in the 65 and older cohort than the "moderate" and "very high" groups. Tracking the height of the cohort bars through the five data periods reveals some key differences. The share of population 65 and older grows rapidly in all but the "moderate" group, and especially so in the "extremely high" group in which nearly one-quarter of the populace was over age 65 in 2013–2017. An increased share of adults ages 45 to 64 in the total population is generally similar across the groups, but the "extremely high" group is remarkable: owing to a higher share of adults 65 and older and lower shares of adults under age 45 compared to the other groups, its ages 45 to 64 cohort was its largest in both 2010 and 2013–2017, a pattern that only the "low" group comes close to approximating. The largest difference among the groups is the changing height of the ages 25 to 44 cohort (figure 3.4). It is the second-largest cohort in the "low," "high," and "very high" groups in 1980, 1990, and 2000, and in the "extremely high" group in 1980 and 1990. By 2013–2017,

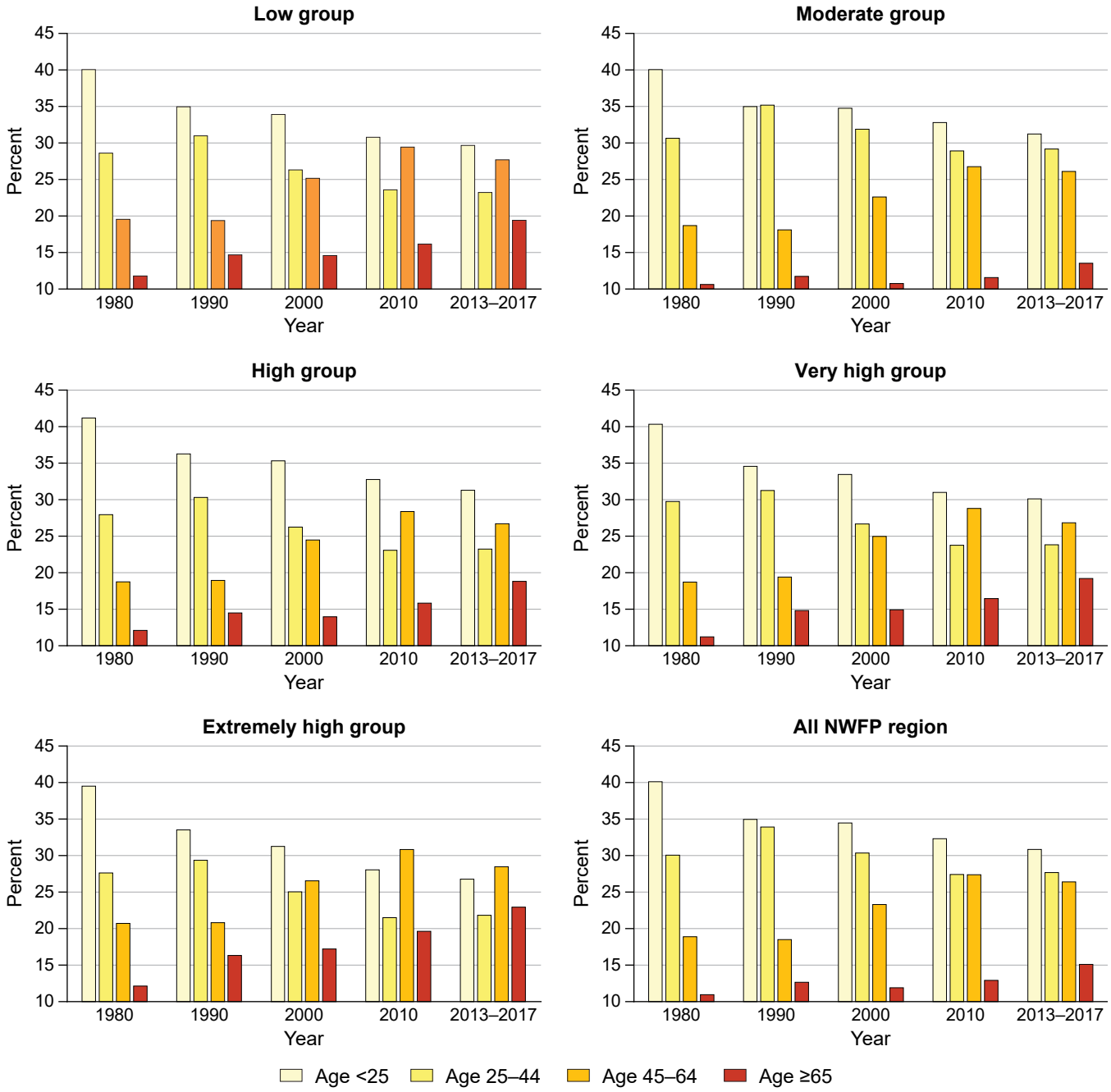

Figure 3.4—Change in age-class cohort share of county group (low, moderate, high, very high, extremely high [see chapter 2 of this report]) total populations and relative to the Northwest Forest Plan (NWFP) monitoring region as a whole, 1980–2017. Data for 2013–2017 are estimated over 5 years. Data sources: 1980–2010, U.S. Census Bureau Decennial Census of Population and Housing; 2013–2017, American Community Survey.

it is the smallest cohort in the "extremely high" group, and second smallest in the "low" group. When total population is growing in the present and likely to continue growing in the future, this cohort is usually the largest or second largest: the "low," "very high," and "extremely high" groups all appear to be in various stages of population stasis or decline because of the shrinking share of their populations that belong to this cohort.

Changing distributions of population among the four age-class cohorts is important in the context of federal forest lands management and county economies because it strongly influences the kinds of economic adaptation strategies that might replace a dominant economic and community role for forest products and federal forests. Population growth usually results in economic growth simply because a larger population means increased

demand for goods and services (though there is much debate about how and to whom the benefits of that economic growth might accrue). Two forces interact to produce population growth: migration (both immigration and emigration) and natural increase (the difference between births and deaths). Populations with large proportions in the youngest age cohorts are predisposed to **demographic momentum**, which means that if net migration is not strongly negative (more emigrants than immigrants), even when natural increase declines, the future population will continue growing as the young people form family households and reproduce (Newbold 2014). The classic cases of demographic momentum are usually found in the societies of developing nations, but the post-World War II era in the United States is also an example. In the NWFP area, still in 1980, all five county groups were roughly equivalent in being poised for some momentum—because the youngest cohort in each was the largest, represented about the same proportion of the population, and was significantly larger than the next-largest cohort. This probably reflects the last offspring of the baby boom era still being in their late teens. Following 1980, however, no group exhibits classic momentum in which the proportions of population in each cohort would remain roughly the same over a period of several decades. Only the "moderate" group comes close to this description.

Differences in net migration almost surely explain why the "moderate" group exhibits signs of sustained population growth that resembles true demographic momentum, while the other four do not. The key to this difference is illustrated in figure 3.3. In 1980, the ages 25 to 44 cohort population was much smaller compared to the same population in 1990 in the "moderate" group (71 percent) than in any of the others—indicating rapid growth occurred in this cohort during the 1980s only in the "moderate" group counties. In the "very high" and "extremely high" groups, growth of the ages 25 to 44 cohort was far slower, effectively equal to the rate of shrinkage in the under age 25 cohort during that era. The "high" and "low" groups fall in between. All groups except the moderate group probably experienced significant emigration of youth and young adults either in the 1970s or 1980s, and most intensely so in the "very high" and "extremely high" groups. This is consistent with national research findings on nonmetropolitan turnaround—specifically, that younger people resumed migrating from nonmetropolitan to metropolitan counties at the end of the 1970s, even as older people were still going in reverse (Sears et al. 1992). For the "very high" and "extremely high" groups, changes in the population size of the two youngest age cohorts can be mostly explained by the transition of people ages 15 to 240 in 1980 into the 25 to 44 cohort in 1990. Only large net positive migration (immigration greater than emigration) can explain the large difference between the under age 25 and ages 25 to 44 cohort sizes in the moderate group.

If significant numbers of people under age 25 or ages 25 to 44 left counties with the strongest ties to federal forest lands in the 1970s or 1980s before forming families, or after family formation but with young children, future population growth prospects in the counties they left were significantly curtailed. In this scenario, a lag effect should occur in which populations in the ages 25 to 44 cohort shrink first, followed one or two decades later by shrinking populations in the under age 25 cohort, as fewer adults of typical family-formation age remain in the population in successive decades. This is exactly the trajectory of the "extremely high" group starting in 1980, and of the "very high" and "low groups" starting in 1990. As a result, these three groups have increasingly high proportions of their populations in the oldest age class, which predicts depopulation in the future in the absence of changed circumstances (the "high" group exhibits similar trends, but as figure 3.2 shows, it is not mainly because of shrinkage in younger cohort sizes, but because of the most rapid growth among all groups in the older cohorts, likely owing to immigration). In fact, depopulation arrived in the "extremely high" group after 2010, as shown in table 3.1, and the "low" group appears poised on the cusp of population decline. The case of the "low," "very high," and "extremely high" groups is not an isolated phenomenon: 24 percent of U.S. counties have been in a primarily depopulating phase since 1920, including 46 percent of those in remote rural locations (Johnson and Lichter 2019). Eighty percent of U.S. counties, nearly all of them rural, have experienced a shrinking workforce over the past 10 years (Ozimek et al. 2019).

Population decline and a shrinking workforce are vexing problems for economic development: once the trend begins, it is difficult to reverse. In 2019, the governor of Vermont was reported to have said that an aging population was the number one political issue faced by his state (Ozimek et al. 2019). Reversing the negative effect on economic

activity caused by depopulation almost always requires large, immediate increases in immigration to yield a larger and more productive workforce within a time frame substantially shorter than a generation. Ironically, the places that struggle to hold onto their own younger and potentially more productive adult workers, and their children, must find ways to entice the same kind of people to migrate to their community.

Race and Hispanic Ethnicity

The racial and ethnic diversity of populations can have a major influence on the shared social values, networks, and cultural institutions of a community, possibly even the shared identity of a county. Racial and ethnic composition may or may not be related to the economic and workforce characteristics of a place. Race or ethnicity should not be presumed to be related to workforce or employment. However, there may be circumstances where the employed members of an ethnic group in a county or community tend to occupy a narrow range of occupations. For example, members of an immigrant community with few proficient English speakers will generally be limited to low-skill service sector or manual labor employment of various kinds, even if group members possess more advanced job skills, because of the communication barrier. Gateway towns to destination ski resorts and rural agricultural communities are two examples where large proportions of Hispanic residents are often employed in service and labor occupations.

In 1997, the Council on Environmental Quality (CEQ) issued guidelines to federal agencies for how to identify whether communities met the definition of a "minority population," to comply with requirements that agencies avoid imposing disproportionate environmental health impacts on low-income or monitoring communities (CEQ 1997). The CEQ guidelines define a minority population as follows:

- A readily identifiable group of people living in geographic proximity with a population that is 50 percent minority or greater. The population may be made up of one minority or a number of different minority groups; together the sum is 50 percent or more.
- [Or] A minority population may be an identifiable group that has a "meaningfully greater" minority population than the adjacent geographic areas, or may also be a geographically dispersed/transient set of individuals such as migrant workers or Native Americans (CEQ 1997).

The Pacific Northwest region of the United States is not known for a large degree of overall racial or ethnic diversity. Racially diverse communities exist but tend to be geographically limited to a few localized areas. It is likely that the first of the two CEQ definitions of minority population can only be met by counting populations within American Indian reservations, or by limiting the scope of population enumeration to the neighborhood scale within major metropolitan areas. With the limited exception of American Indian reservations, and a few off-reservation American Indian communities, non-White racial populations are overwhelmingly found in neighborhoods within the larger cities of the Northwest. By contrast, the geographic distribution of the Hispanic population is much broader, and includes both urban and rural locales.

It is important to recognize that Hispanic identity is an ethnicity, not a racial category. People who identify as ethnically or culturally Hispanic may belong to any of the standard racial categories used by the U.S. Census Bureau—these are shown in figure 3.5. Census data on Hispanic ethnicity by race makes it possible to create the two groups in figure 3.6 for comparison: the category "non-Hispanic White" alone reflects what most White Americans think of as "White," even though many Hispanic people also identify as White. The converse of non-Hispanic White is an aggregate of all Hispanics, including Hispanic Whites, with all people who do not identify as racially White alone. Hence, it is everyone who is "non-White." Figure 3.6 provides the broadest possible overview of change among the county groups in the size of their White, non-Hispanic and non-White populations, and figure 3.5 illustrates the changing share of each group's population by racial category.

Racial diversity of the NWFP-area population has changed relatively little since the intensive harvest era of the 1980s, as shown in figure 3.5. Whites comprised between 92 and 96 percent of the total population in all five groups (comprised of 54 of the NWFP monitoring region's 72 counties) in 1980. This figure may be somewhat inflated as the census questionnaire of that era did not allow people to select more than one race; there was only an "other" category. The White share of the population trended downward in every group in each successive

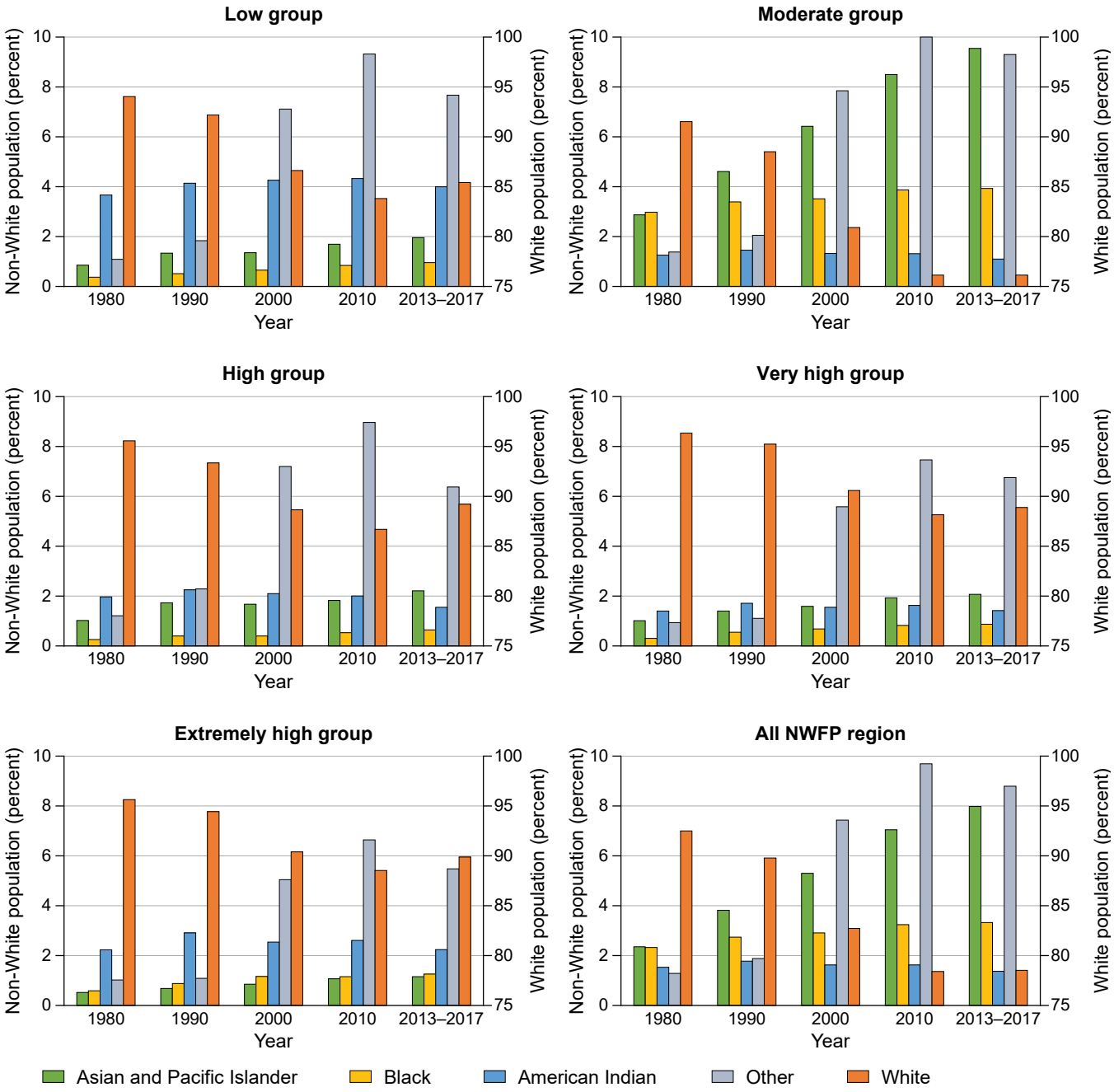

Figure 3.5—Change in racial category share of county group (low, moderate, high, very high, extremely high [see chapter 2 of this report]) total populations and relative to the Northwest Forest Plan (NWFP) monitoring region as a whole, 1980–2017. Data for 2013–2017 are estimated over 5 years. The "other" category is not directly comparable between censuses except for 1980 and 1990; changes to 2000 and 2010 census surveys expanded racial categories with numerous alternatives such as "two or more races," which have been incorporated into this category. Data sources: 1980–2010, U.S. Census of Population and Housing SF-1; 2013–2017, American Community Survey.

census, but only very slightly in the "high," "very high", and "extremely high" groups: from 94–96 percent to about 88–91 percent over a period of 37 years. A similar drop in the share of the population that is White occurs in the "low" group, which was slightly less White than these other three in 1980 and still comparably less—85 percent—in the most recent data (2013–2017). The share of Whites in the total population of the moderate group declined about twice as much, from 92 to 77 percent. The share of Black and American Indian population in the NWFP monitoring region has changed very little in 37 years. Some of the declining White share in the "moderate" group is

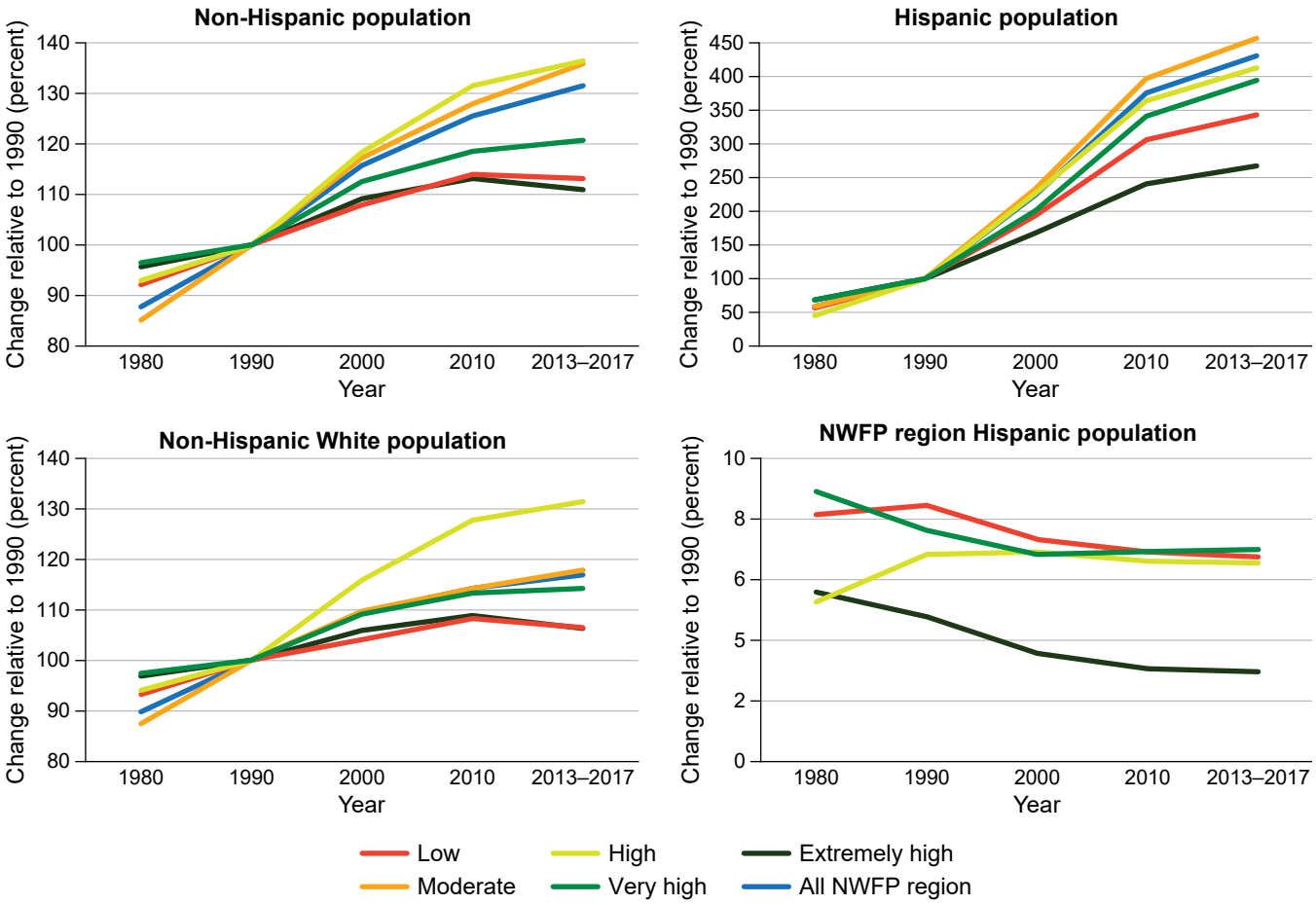

Figure 3.6—Change in Hispanic and non-Hispanic populations in county groups (low, moderate, high, very high, extremely high [see chapter 2 of this report]) as a percentage of 1990 cohort size and relative to the region as a whole in the Northwest Forest Plan (NWFP) monitoring region, 1980–2017. See "Race and Hispanic Ethnicity" section text for explanations of how these terms are used in this report. Data for 2013–2017 are estimated over 5 years. Data sources: 1980–2010, U.S. Census of Population and Housing SF-1; 2013–2017, American Community Survey.

due to more rapid growth among people identifying as Asian, which does not occur in any other county group. The remainder is attributable to the significant growth in the "other" category shown in figure 3.5, which includes the multiple racial identities categories that appeared in the census questionnaire for the first time in 2000. In all but the "moderate" groups, growth in "other" is the only significant source of the decline in the White share of the population. Possible explanations for the growing share of "other" are that some American Indians of mixed ancestry may have chosen to identify as "two or more races," rather than "Native American" alone; or members of the growing Hispanic communities in these groups may have selected the "other race" category because none of the "alone" categories—"White," "Black," "Native American," "Asian," and "Pacific Islander"—accurately captured their own sense of identity. The census data in figure 3.5 cannot account for how people of Hispanic ethnicity identified their racial identity.

Figure 3.6 illustrates how the size of the Hispanic population in each group has changed since 1980 relative to its size in 1990, as well as the proportion of the region's total Hispanic population that resided in each of the groups other than the "moderate" group. The charts in the left column track change in the size of the non-Hispanic population relative to 1990: above, all non-Hispanics regardless of race, and below, the population that selected the category "non-Hispanic, White alone" to identify their racial and ethnic identity. Change in the Hispanic population regardless of racial identity, and Hispanic population share of four of the county groups, is tracked in the charts in the right column. There are intriguing differences among the groups.

Perhaps most significantly, the charts identify two county groups, "low" and "extremely high,' where the non-Hispanic White population declined after the 2010 census (fig. 3.6, table 3.2). This is a partial explanation for the decreasing share of White population in these groups relative to "other" in figure 3.5: so long as the size of the population identifying as other remained constant, a declining non-Hispanic White population will cause the other category's share of the population to increase. Figure 3.6 indeed indicates a growing Hispanic population in these groups, more than doubling between 1990 and 2010, though growing more slowly after 2010 (see also table 3.3). Hence, population growth overall was static or slightly negative in the "low" and "extremely high" groups from 2010, despite growth in the Hispanic population. Since 2010, people of "other" race or Hispanic ethnicity are the only source of population growth in these two groups, and the non-Hispanic population has been shrinking more substantially than the total population that figures indicate.

The rate of population increase has been similar in the "high" and "moderate" groups since the 1990s, but the ethnic and racial dimensions of that growth have been dissimilar in ways that offer additional insight into population changes in the faster growing counties of the NWFP area. Non-Hispanic population increases were similar over the 1990–2017 period in both groups, with somewhat faster growth in the "high" group in the 2010s, but slower growth afterward. **Non-Hispanic White** growth rates were not similar: the trajectory of change in the "high" group looks almost identical to that in the upper chart of figure 3.6, which depicts change in all non-Hispanic population. The "moderate" group has much slower non-Hispanic white growth (figure 3.6); it is comparable to the "very high" group, where overall population growth was slow. The 2013–2017 non-Hispanic White population in the "moderate" group is less than 20 percent larger than it was in 1990: annual growth of about 0.63 percent. The non-Hispanic White population in the "high" group was 31 percent larger than in 1990, or annualized growth of 1.15 percent—nearly twice as rapid. In part, this faster growth reflects the much smaller size of the base population in the "high" group. These data show that nearly all additional non-Hispanics in the "high" group counties since 1980 have been White, but that is not the case in the "moderate" group.

Figure 3.6 reinforces an important point: population growth in the "high" group of counties has been robust since 1990 in contrast with the "very high," "extremely high," and "low" groups; and although Hispanic populations have grown rapidly in the "high" group—the

Table 3.2—Non-Hispanic white population by county group, 1980–2017

County group	1980 population	1990 population	2000 population	2010 population	2013–2017 population
	Number of people				
Low	452,629	485,448	505,426	525,658	**516,948**
Moderate	3,850,864	4,405,600	4,833,724	5,033,297	5,194,025
High	361,556	384,426	445,502	491,289	505,354
Very high	598,520	614,410	670,478	696,320	702,392
Extremely high	311,430	321,584	340,591	350,087	**341,930**

Bold highlights population loss since previous census. Data for 2013–2017 are estimated over 5 years. Data sources: 1980–2010, U.S. Census of Population and Housing SF-1; 2013–2017, American Community Survey.

Table 3.3—Hispanic population by county group, 1980–2017

County group	1980	1990	2000	2010	2013–2017
Low	13,919	24,669	47,812	75,522	84,660
Moderate	123,076	210,371	491,907	834,954	960,763
High	9,001	19,901	45,149	72,358	82,085
Very high	15,228	22,237	44,702	75,767	87,623
Extremely high	9,549	13,912	23,354	33,471	37,198

Data for 2013–2017 are estimated over 5 years. Data sources: 1980–2010, U.S. Census of Population and Housing SF-1; 2013–2017, American Community Survey.

Hispanic population was four times as large in 2013–2017 as in 1990—the absolute number of Hispanic people those figures represent is quite small. Hence, rapid population growth in the "high" group has been principally of non-Hispanic Whites. Because non-Hispanic Whites have much lower fertility rates than Hispanics, the implication is that rapid population growth in the "high" group results primarily from immigration by non-Hispanic Whites, not births to the population already residing in these counties. Figures 3.3 and 3.4 shed additional light on this finding: the size of the **older** population cohorts grew exceptionally rapidly in the "high" group after 1990, more so than the population overall; in the "moderate" group, rapid population growth overall was not associated with a rapidly increasing share of older age cohorts. In short, population growth in the "high" group counties was likely to have been driven mostly by immigration of middle-age or retirement-age non-Hispanic Whites.

Educational Attainment

Prior to the 1990s, the highest educational attainment level of the population was not a primary consideration for the sustainability of community social fabric, institutions, and economic life. Multiple interviewees for the community case studies in chapter 4 of this report recalled the 1970s and 1980s as a time when it was possible to find steady, good-paying work in a mill or with a logging outfit regardless of whether a worker had earned their high school diploma. Interviewees described how what they perceived as steady, family-wage work supported volunteerism and other ways of engaging in community institutions outside the workplace. The national transition to an information- and services-oriented economy that began in the 1980s has left very few employment options for people without a high school diploma, and only modestly more opportunities for those with a high school diploma but no college experience or higher degree.

Traditionally, social science examining social vulnerability, poverty, or barriers to economic development has focused on the proportion of a county or community's population that lacks a high school diploma. However, increasingly, U.S. adults with a high school diploma but without higher education face limited job prospects; most opportunities for such workers are in the low-wage service sector. The more relevant metric for social vulnerability may now be proportion of the population that lacks a higher education degree.

The best available data for describing educational attainment comes from the decennial census and the ACS. In both, the data classes include four general categories, with additional subdivisions. The four primary classes are "no high school diploma," "high school diploma (only)," "some college," and "higher education degree." The "some college" class has multiple subdivisions, one of which is associate degree. Associate degrees conferred by community colleges may not reflect the diverse education typically offered by a bachelor of arts degree, but they often represent valuable technical training in a specialty field, such as health care, that may be sufficient to earn a living wage. This is probably especially true in nonurban locations. To better understand how the transition in educational attainment has unfolded in the county types, and by extension in communities, we examined both the proportion of the population that has either a high school diploma or no diploma, but no experience in college; and the proportion that has a bachelor's degree or higher. Change in the share of the adult population (by U.S. Census Bureau reporting convention, adults age 25 and older) that fall within each of these four main classes is depicted in figure 3.7. Change in the size of the four educational attainment cohorts relative to 1990 is shown in figure 3.8.

Change in the proportion of the NWFP-area population that is older than 25 whose highest educational attainment is a high school diploma or less was significant after 1980. This change is consistent with national trends. In 1980, around 60 percent of adults over age 25 in the 54 counties analyzed in the NWFP area had attainted not more than a high school diploma, and the proportion was nearly 70 percent in the "extremely high" and "low" groups (add the two respective columns in the charts in figure 3.7 to arrive at this total percentage). In 2013–2017, the proportion of adults in the region over age 25 with no more than a high school diploma had fallen by nearly half, to 31 percent, including fewer than 10 percent that had failed to earn a high school diploma (fig. 3.7). This trend is shared broadly among all groups in the region. As with other demographic characteristics, however, the change is more pronounced in the "moderate" group. In the "extremely high" and "low" groups, the proportion of adults over age 25 in 2013–2017 with no more than a high school diploma remained at 40 to 42 percent; hence, what had been a gap of 6 percentage points between these groups and the moderate group in 1980 was now a gap of roughly 10 points.

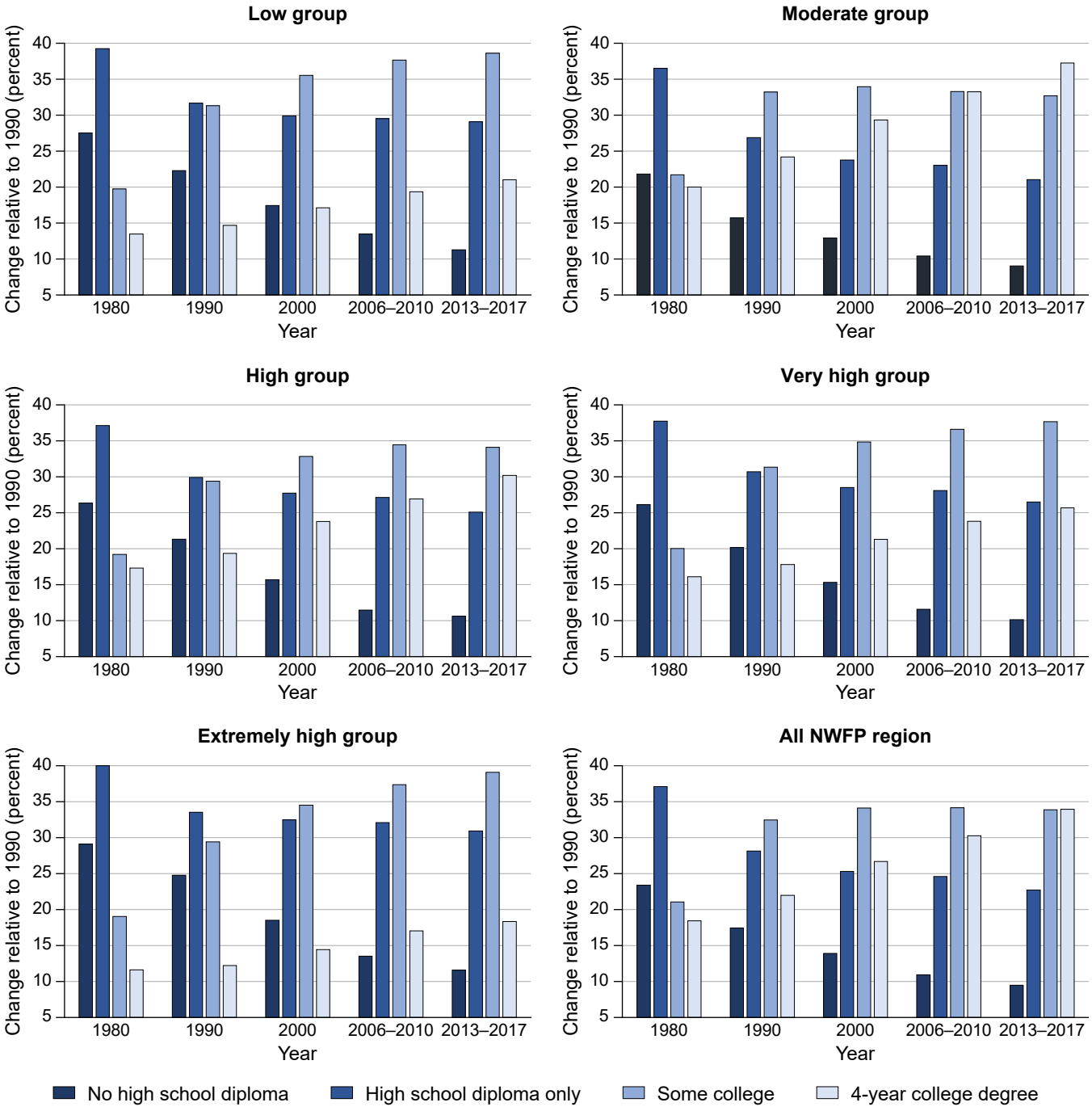

Figure 3.7—Change in educational attainment cohort share of county group (low, moderate, high, very high, extremely high [see chapter 2 of this report]) and relative to the Northwest Forest Plan (NWFP) monitoring region as a whole, 1980–2017. Data for 2006–2010 and 2013–2017 are estimated over 5 years. Data sources: 1980–2000, U.S. Census of Population and Housing SF-3; 2006–2017, American Community Survey.

This decreasing proportion of adults over age 25 lacking any post-secondary educational experience is mirrored by a steady increase in the proportion of adults over age 25 whose highest educational attainment is a 4-year bachelor's degree or higher. The share of the over age 25 population holding a bachelor's or higher degree increased from 19 to 34 percent in the 54 counties analyzed in the NWFP area (fig. 3.7). In the "moderate" group, the share of adults with a bachelor's degree or higher increased steadily in every decade, from 20 percent in 1980 to 37 percent in in 2013–2017. This is reflected in the almost perfectly linear growth in the size of the college degree-holding cohort (fig. 3.8), a trend also observed in the "high" group. Growth in college degree holders in the other three groups lagged, particularly after 2000 (fig 3.8). The share of college degree holders in the adult populations of these groups

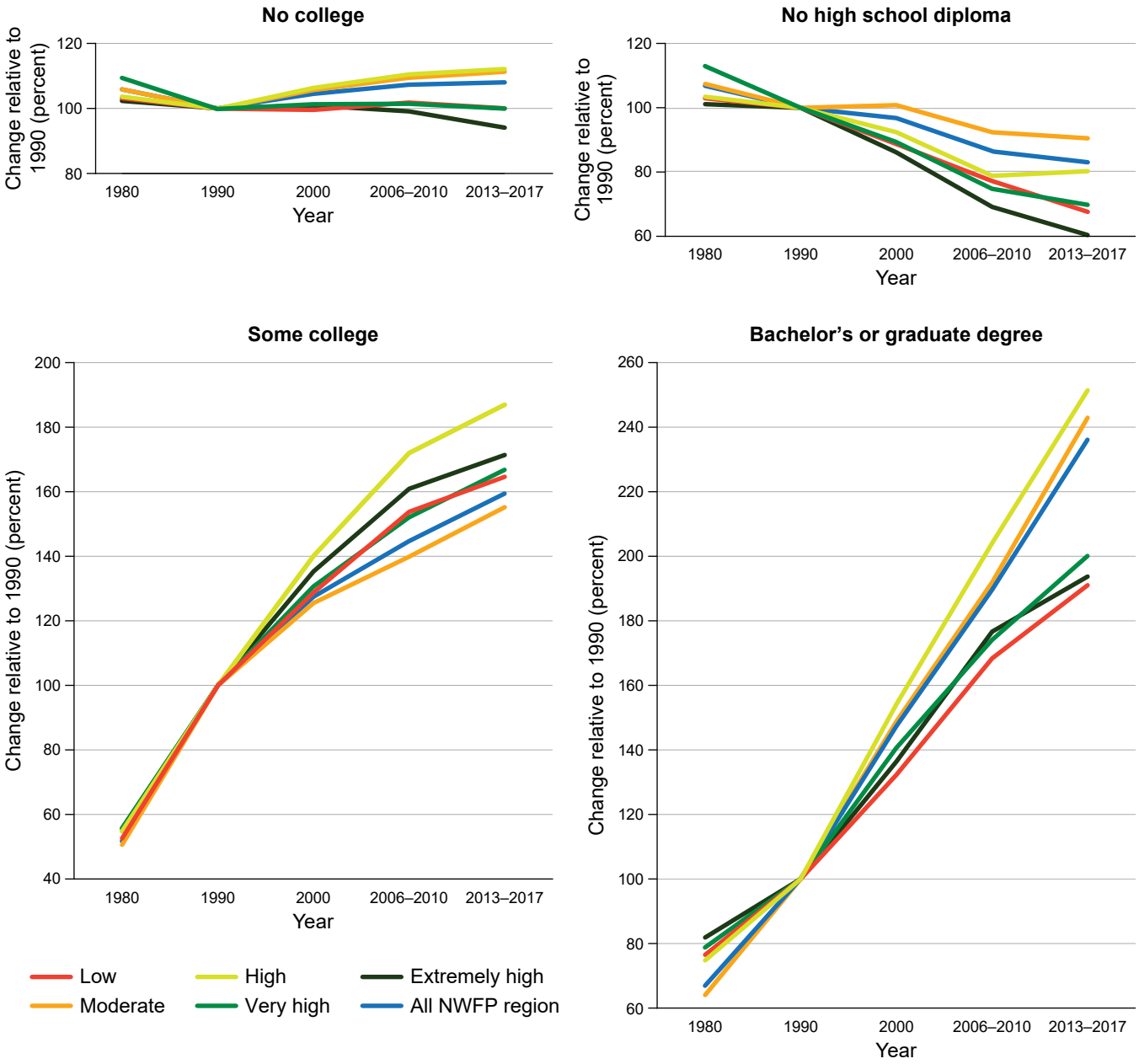

Figure 3.8—Change in educational attainment cohort share of county group (low, moderate, high, very high, extremely high [see chapter 2 of this report]) relative to 1990 in the Northwest Forest Plan (NWFP) monitoring region,, 1980–2017. Data for 2006–2010 and 2013–2017 are estimated over 5 years. Data sources: 1980–2000, U.S. Census of Population and Housing SF-3; 2006–2017, American Community Survey.

did continue to increase, but at a slower rate than the "high" and "moderate" groups, and it reached a smaller share by 2013–2017, e.g., growing from 13.5 to 20 percent of all adults age 25 and older in the "low" group. Part of the explanation for the share of degree holders increasing even as growth in their numbers slackened is that in these groups the no college and no diploma cohorts shrank by the largest amount. No-college cohorts of the "high" and "moderate" groups were about 12 percent larger in 2013–2017 than in 1990.

Possibly the most significant distinction in educational attainment among the groups is the difference between the slow increase in the share of adults with a bachelor's degree or higher in the "low," "high," "very high" and "extremely high" groups, and the rapid increase in the share of adults in these groups that have some college, but no 4-year degree. A proportion of adults counted in this category do hold a 2-year associate degree or professional certificate from a community college, though these data do not distinguish adults that enrolled at a 4-year college but did not complete a degree from those that never sought a 4-year

degree but did pursue a community college degree. The trend line for the share of "some college" adults in figure 3.8 is consistently upward in this category in every decade for these groups; a plurality of adults age 25 and older fall into this category by 2000. The "high" group trend then deviates from the other three because of continued steady growth in the size of the 4-year degree cohort after 2000, which the others lack (fig. 3.8).

There are clear regional trends in highest educational attainment. First, increasing high school graduation rates resulting in shrinking proportions of adults lacking a diploma is universal. Post-high school diploma attainment is bifurcated along the same distinctions among groups found in changing age-class proportions and the size of the non-Hispanic White population. Growth in the size of the 4-year degree cohort was consistent in every decade after 1980 in the "moderate" group, and after 1990 in the "high" group. In the other groups, growth in this cohort was initially slower (1980–2000) and then lagged farther behind after 2000. In the "moderate" group, the 4-year degree-holding cohort's share of the 2013–2017 adult population is significantly larger than the no-college cohort share (37 and 26 percent, respectively). In the "low" group, the reverse is true: 21 to 40 percent, respectively. The gap between the "moderate" and "extremely high" groups in the share of adults that have attained no more than a high school diploma grew only slightly from 1980 to 2013–2017—by an additional 4 percentage points—but the gap in proportion of college degree holders between the two expanded by 9 percentage points.

The adult populations of the "low," "very high," and "extremely high" groups generally did not translate increasing success in completing high school into earning 4-year college degrees over the 1990–2017 period. Given the necessity of earning a 4-year college degree to compete for a wider range of jobs that generally are higher paying, these populations would be expected to increasingly fall behind in the search for higher wages and a wider range of career pathways. This trend, however, may also be related to differences in the highest degree required to hold the typical job in the more isolated nonmetropolitan and rural counties. It is entirely possible that the dominant educational cohort in the "low," "very high," and "extremely high" groups—those with college experience but without a 4-year degree—reflects the highest attainment necessary to compete for the range of jobs actually available in these counties, and hence would potentially reflect a practical decision made by people intending to stay put and choose an occupation from the limited palette of available careers. In short: an associates degree may offer access to most of the highest-paying and most stable jobs available in more rural counties of the "low" and "extremely high" groups.

Even if such a practical choice to earn no more than an associates degree is being made by many high school graduates in more rural areas of the region, it remains the case that young people desiring a 4-year degree would be strongly pulled away from home in such counties by better opportunities elsewhere to put such a degree to professional use. This "brain drain," phenomenon, which occurs throughout rural U.S. communities, has implications not just for families and cultural traditions, but for the economic future of a community: it can create a feedback loop in which future would-be employers, particularly those in higher paying occupations requiring some specialization, may perceive the lack of local college-educated young adults as a strong disincentive to create new jobs in a location that needs them. It may be the case that a 2-year degree from a regional community college represents sufficient technical expertise for accessing the available higher paying jobs in counties of the "low" or "extremely high" groups. However, the simultaneous brain drain can reinforce an existing job market that is increasingly uncompetitive when weighed against national economic trends.

Summary of Demographic Change Since 1980 by County Group

Two demographic changes since 1980 are common to all five county groups: (1) consistent decline in the percentage of adults aged 25 and older whose highest educational attainment is a high school diploma, (2) and steady growth in the proportion of population that identifies as Hispanic. Both changes reflect trends that exist broadly throughout the United States. Other than these shared trends, the five groups of counties are generally divided into two types of post-1980 change.

Generally, the "low," "very high," and "extremely high" groups share similar trends with important implications for the future of community- as well as county-scale social and economic characteristics:

- Populations are aging in place: sustained cohort growth is occurring only in the proportion of the population age 65 and older. Populations aged 25 to 44 are smaller in 2013–2017 than in 1980 in the "extremely high," "very high," and "low" groups; in the "extremely high" group the population under age 25 was also smaller in 2013–2017 than in 1980.
- Very little change in the racial character of these counties has occurred that is not likely related to a change in the way racial identity data has been collected by the U.S. Census Bureau. The population of the "extremely high" group, 96 percent White in 1980, was still 92 percent White in 2013–2017.
- Hispanic population growth in these groups was steady in 1980–2000 but slowed somewhat after 2000. The largest amount of Hispanic population growth occurred during the 1990s. For the "extremely high" and "low" groups, growth in the Hispanic population since 2010 has been a counterweight to contraction of the non-Hispanic population.
- Non-Hispanic White population was smaller in 2013–2017 than in 2010 in the "low" and "extremely high" groups, and in both groups it was less than 10 percent larger than 37 years prior in 1980.
- Attainment of a 4-year college degree has increased much more slowly than in counties of the moderate and high groups. This probably reflects a combination of choice on the part of some young adults to earn associate degrees that are a fit for the labor markets in their home counties, and a brain drain of young adults not returning to their place of upbringing after earning college degrees elsewhere.

Demographic change in the "moderate" and "high" groups was generally unlike change in the "very high," "extremely high," and "low" groups, though individual counties within the moderate and high groups may diverge from the overall trend described here.

- Population is generally growing in all age-classes in every decadal interval. The lone exception is a decline in population under age 25 in the "high" group during the 1980s, only—before the rapid growth of places like Bend, Corvallis, and Wenatchee began in earnest in the 1990s.
- Population growth in the older age cohorts was especially strong in the "high" group in the 1990s and 2000s; the deviance from prior decade rates of growth for younger cohorts strongly suggests a primary role for immigration of older adults to several counties in this group—e.g., Deschutes County, Oregon, and Chelan County, Washington.
- One significant change to the racial composition of the population has occurred, largely within the "moderate" group, that is likely a phenomenon restricted to major metropolitan areas: the share of the population that is of Asian origin has steadily increased, from 2.5 to nearly 10 percent.
- Hispanic population growth has been somewhat stronger than in the "low," "very high," and "high" groups, with the share of the population identifying as Hispanic increasing from 2.5 to 14 percent in the "moderate" group.
- Non-Hispanic population growth was especially rapid in the "high" group and is almost entirely accounted for by non-Hispanic White population growth, whereas growth in the non-Hispanic White population has been slower in the "moderate" group. Coupled with the age-class change findings, a plausible distinction between these groups is that relatively stronger population growth compared to the other groups is a function of in-migration; in the "high" group, largely of older non-Hispanic Whites, and in the moderate group, by a younger and more ethnically/racially diverse population. Older age and non-Hispanic White characteristics of migrants would tend to be associated with greater household wealth and higher educational attainment.
- Attainment of a college degree by adults age 25 and older has grown significantly more rapidly than for the other three county groups. The share increased from 20 to 37 percent in the "moderate" group and from 17 to 31 percent in the "high" group. The two groups have a similar steady share of adults with some college but no degree from 1990 to 2013–2017. Nearly 70 percent of the population in the moderate group has attained either some college or a college degree—almost exactly the inverse of 1980 when just under 60 percent of the population had attained not more than a high school diploma.

The "low," "very high," and "extremely high" groups do not share importance of **federal** forest lands in the late 1980s in common, but they do share high importance of forest lands and forest products industry. The most significant population trend that all three groups broadly

share, aging in place, was set in motion during the 1980s, possibly even in the previous decade. Changes to educational attainment and racial and ethnic composition of their populations since 1980 have been relatively modest. Slow change in these demographic characteristics, proceeding on a generational time scale rather than a decadal one, is predictive of a population that experiences very low levels of in-migration. It is typical of counties in these groups that the current population is on average much older, just as White, and somewhat better educated, though not to the degree typically found in the most economically productive locations, in comparison to the population in 1980. None of these demographic trends have an obvious change of trajectory after 1990, or after 2000, that suggests changes in federal forest management played a role in directing a new trend trajectory. In the next section, we examine another potential opportunity to detect such trend-changing effects: trends in labor force characteristics and earnings since 1980.

Employment and Income Change

Employment opportunities and personal earnings are central to evaluating the social and economic well-being of communities and counties. In interviews conducted both for the 10-year report and for chapter 4 of this report, community leaders frequently described declining well-being in their community, attributing the trend primarily to a loss of family-wage blue collar jobs such as those that amply sustained the local population from the 1950s through the 1970s. This section presents a suite of quantitative employment and income trends addressing the frequent narrative "good jobs disappeared." Employment measures include total employment by industry "supersector," unemployment, and nonparticipation in the labor force by the adult population. Wage and income metrics are per capita income, total and average wages from employment by industry supersector—adjusted to 2017 dollars—as well as nonwage income from public assistance programs, and people in poverty.

Per Capita Income

Figure 3.9 displays trends in per capita income by county group and for all 54 counties analyzed in the NWFP monitoring region in aggregate since 1969. There is a stark divide among the region's counties—those in the "moderate" group in which the major urban centers of the region are mostly located, and the rest. The trend line for the region in aggregate closely tracks the "moderate" group trend line, an indication of the degree to which the most populous counties dominate total personal income in the region. The gap between the "moderate" group and the

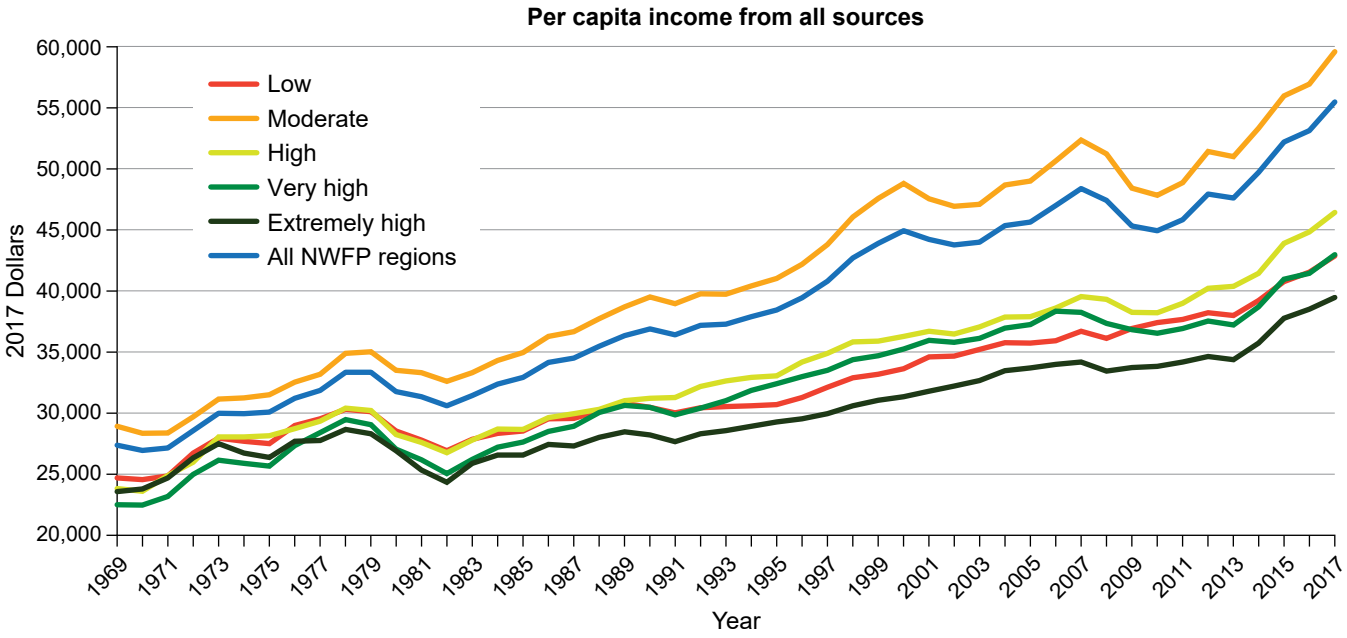

Figure 3.9—Change in county group (low, moderate, high, very high, extremely high [see chapter 2 of this report]) per capita income from all sources since 1969 in the Northwest Forest Plan (NWFP) monitoring region. Data source: U.S. Bureau of Economic Analysis local income and gross domestic product series CA-30.

other four groups has existed since 1969. However, it was about $4,000 in 1973, and held steady at less than $7,000 from 1969 until 1979 (in inflation-adjusted 2017 dollars).

The significant divide in per capita income within the NWFP monitoring region has its origins in the early 1980s. Between 1979 and 1982, the tail end of the major nationwide recession, per capita income had declined by 7 percent in the "moderate" group, but by 13 to 16 percent in the other groups. In the moderate group, it had recovered to its prerecession level by 1984, a process that took an additional decade in the "extremely high" group, which emerged as the lowest per capita income group during the 1980s. By the mid-1990s, per capita income had grown 25 percent in the "moderate" group, and the gap between the "moderate" and "extremely high" groups was $11,500. During the period of robust national economic growth in the 1990s, the gap widened to more than $17,000. The 2008–2010 recession briefly shrank the gap between the "moderate" and other groups, but it rapidly attained its former size. The gap between the two groups was more than $20,000 in 2017.

Per capita income is a useful shorthand metric for comparing earnings-related aspects of social vulnerability, but it masks one important variable that determines the rate: population growth. As the analysis in the above "Demographic Change" section demonstrates, population growth has been weak in county groups other than the "moderate" group. In the "low" and "extremely high" groups, population growth was effectively stalled after 2010. If wages are growing slowly, but population is growing more slowly still, then per capita income will continue to increase at a moderate pace. Conversely, population growth was strong in the counties of the "moderate" group after 1980. This can cause negative growth in per capita income if income growth does not keep pace with population growth. Clearly that has not happened in these counties in the past 35 years—despite strong population growth, income has grown faster, except during the brief recession in 2001 and the Great Recession in 2007–2009. The disparity in income growth between the "moderate" and other county groups is therefore likely much larger than change in per capita income indicates. To understand this disparity, we analyze trends in earnings from employment—by far the largest source of household income in all counties—during the same era.

Employment and Earned Wages

Data describing employment and wages earned by the industrial "supersector" in this section are obtained from the U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages dataset, which has consistently recorded data reported by employers dating to 1975. Because it is a census of employers that pay into state unemployment insurance compensation pools, income from self employment or family partnership companies is not included. The industry sector of employers is classified according to the Standard Industrial Classification system (1975–2000) and North American Industry Classification System (NAICS 2001) rubrics. Employment and wage trends for all 54 counties analyzed in the NWFP monitoring region are shown in figure 3.10. The charts include a break at the year 2000, since the two classification schemes are not cross-walked. There are several important trends in employment and wages in the NWFP region since 1975.

Employment

- Trade, transportation, and utilities (TTU) was the main sector for employment from 1980 to 2000, after which it shared equal importance with the services sectors (supersector includes retail and wholesale trade are services).
- Employment in manufacturing grew more slowly during the 1980s and 1990s than in all categories other than natural resources. Total employment in manufacturing peaked in 1998 and declined by 200,000 jobs in the next two decades.
- The main sources of job growth are services (professional services and other services) followed by the public sector.

Wages

- Professional services was the fifth-most important source of wages until 1987; it was the most important source of wages 12 years later. During the late 1990s, average annual professional services wages increased by 67 percent to nearly $80,000 in 2017 dollars. In 2017, total earnings in professional services were nearly twice the nearest supersectors—TTU and government.
- During the 1980s, average annual manufacturing wages held steady while average annual TTU wages declined. Consequently, total earnings from the two categories

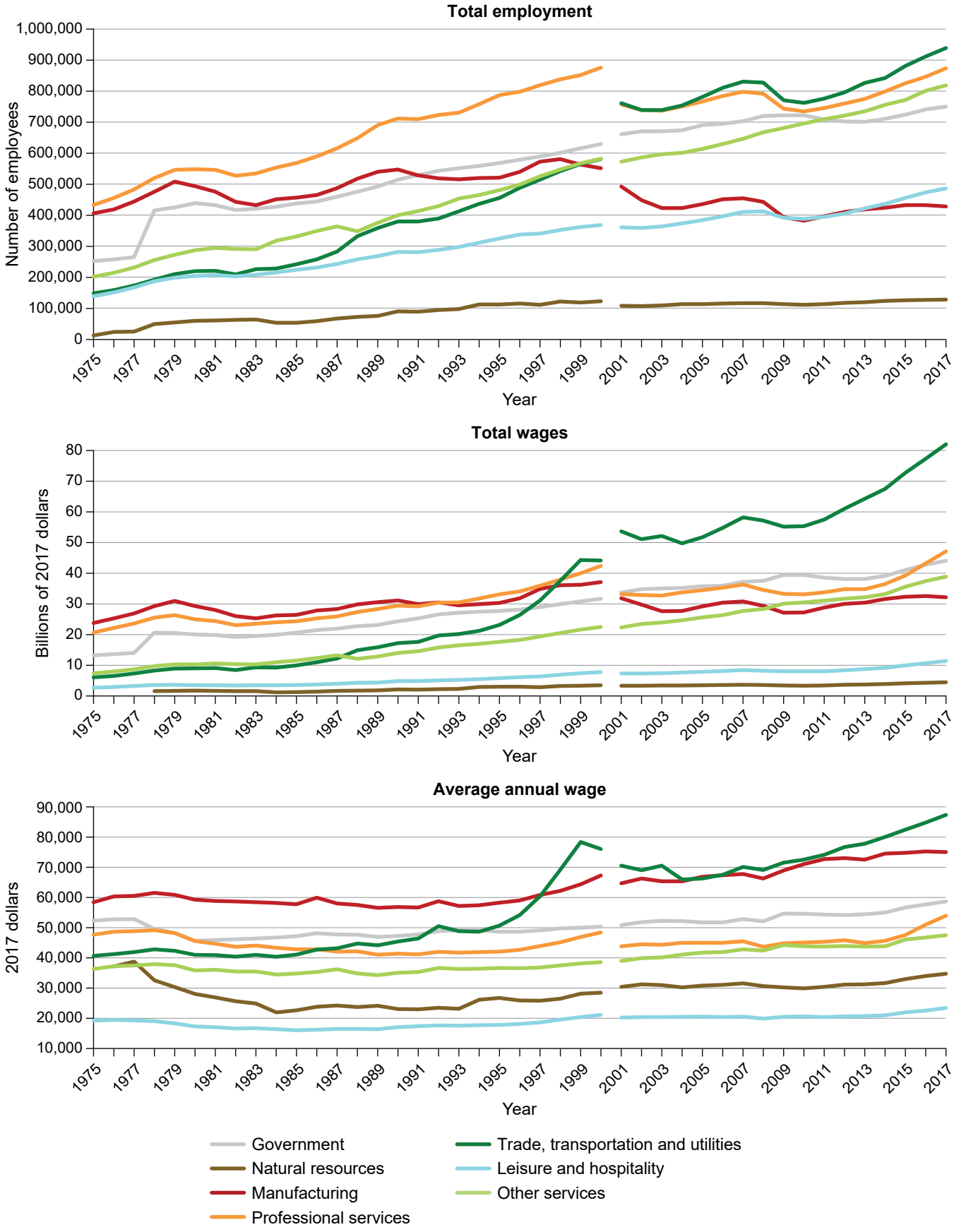

Figure 3.10—Change in total employment and total and average wages by industry supersector for 54 counties in the Northwest Forest Plan monitoring region, 1975–2017. Breaks between 2000 and 2001 represent use of two classification schemes that were not cross-walked. Data source: U.S. Department of Labor Bureau of Labor Statistics Quarterly Census of Employment and Wages.

paralleled each other even though jobs in TTU were growing much faster.

- TTU remains the second-most important source of employment and earnings, but average annual wages in 2017 were comparable to 1990; they have never been higher than they were in 1978 after adjusting for inflation.
- Average annual manufacturing wages rose in the late 1990s and have continued to climb moderately since. Owing to the decline in total manufacturing jobs, manufacturing is now the fifth-largest source of total earnings.
- The "other services" category has had the most consistent growth over three decades, including no declines during the two main periods of recession. However, "other services" average wages have been lower than all other supersectors except natural resources for the entire data record. Most "other services" employment is in private sector health, education, and social services. Private health care is likely to be the largest driver of growth in total jobs and wages in this category; a large proportion of health care jobs—e.g., home health aides, nurse assistants—are relatively low paying.

Figure 3.10 presents a microcosm of the transformation of the U.S. economy since 1980. Professional services jobs supplanted manufacturing jobs as the highest paying job sector in the mid-1990s. Goods-producing job categories such as manufacturing and natural resources not only failed to produce many new jobs, but shed jobs. Employment growth has been almost entirely confined to services sectors. All the services sectors save professional services either have a consistent history of low pay ("other services") or have seen a steady decline in average wages since the 1980s (TTU). Public sector employment has occupied a middle ground between private sector services and goods production for the duration of the study period, with steady but not remarkable job growth, and consistent but modest increases in average wages. At the broad scale of the entire region, from about 1975 to 1985, a typical worker laid off from a job in the manufacturing sector could still hope to transition to a job in the TTU sector at roughly comparable pay: TTU jobs were increasing, and the average pay gap was not large. From the mid-1980s onward, however, that laid-off worker faced an increasingly large wage gap between the former employment and the available replacements, unless they had skills or education allowing them to access a range of government or professional services positions. In the NWFP monitoring region, there is not one specific tipping point for this transition: it occurred gradually during the 1980s in the aftermath of the recession, as average TTU wages steadily declined, and manufacturing employment fluctuated up and down.

Figure 3.10 describes trends in the NWFP monitoring region when all 54 counties are combined into a single reporting unit; the trends shown at this scale are broadly similar to those occurring at the national scale over the same 1975–2017 timespan. However, there are major regional disparities within the NWFP monitoring region. The principal dichotomy is between trends in the "moderate" group, where most of the region's urban population lives, and the other four county groups. Within this broad dichotomy there is further variability, however. For example, the "high" and "very high" groups have much stronger employment growth than the largely rural "low" and "extremely high" county groups. These latter groups show further subtle but informative differences in the evolution of employment and wages across the NWFP area since the peak timber harvest era began to wane in the late 1970s. The following subsections explore these distinctions and their implications for the ROD monitoring question.

Total employment by industry supersector

The principal opposing trends in total employment for the region—growth in professional services and decline in manufacturing—are not similarly evident in all five groups (fig. 3.11). Manufacturing employment grew slightly in the "moderate" group between 1975 and 2000 and dipped only slightly in the early 1980s. Manufacturing employment in the "high" group fluctuated within a narrow range in the same time span, but like the moderate group, peaked in the late 1990s. In each of the "low," "very high," and "extremely high" groups, manufacturing employment peaked in 1978; these are also the three groups in which it was the largest employment category at the time. A brief rebound occurred in the "very high" and "extremely high" groups in the mid-1980s to about 1990, followed by another sharp decline. The second decline is reversed in the 1990s in the "very high" group but not in the "extremely high" group. In these two groups, this pattern is almost surely reflecting what was occurring in the forest products industry. The largest decline in manufacturing, however, occurred in the "low" group, where jobs never really

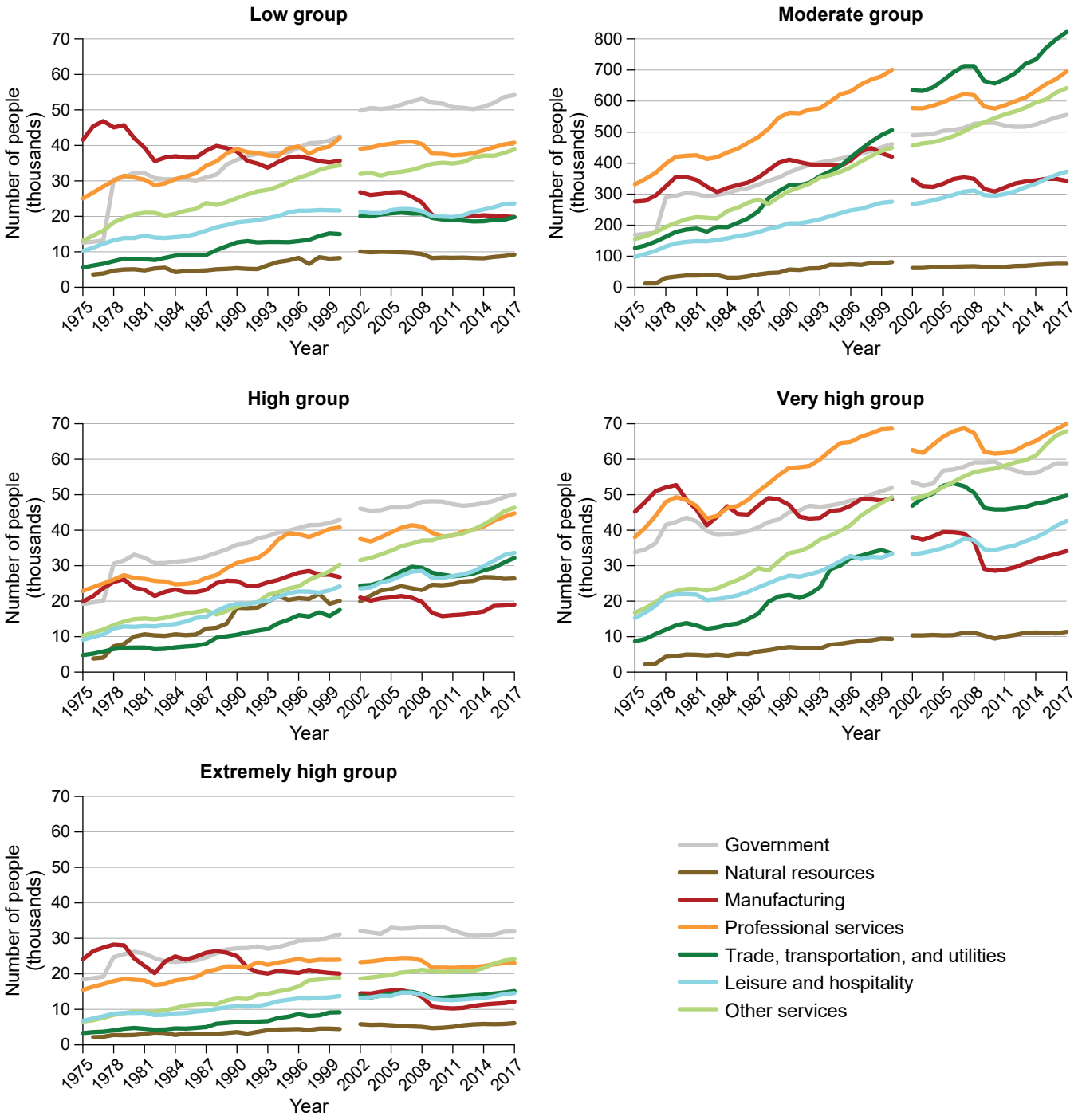

Figure 3.11—Change in total employment and total and average wages by industry supersector for county groups (low, moderate, high, very high, extremely high) in the Northwest Forest Plan monitoring region, 1975–2017. Breaks between 2000 and 2001 represent use of two classification schemes that were not cross-walked. Data source: U.S. Department of Labor Bureau of Labor Statistics Quarterly Census of Employment and Wages area files.

recovered from the sharp decline associated with the 1980–1982 recession. After 2000, each group's manufacturing jobs followed roughly similar trajectories, losing about one-quarter of their manufacturing jobs over the next 17 years; the largest percentage decline again occurred in the "low" group.

Figure 3.10 indicates that for the NWFP monitoring region as a unit, as manufacturing jobs fluctuated during the pre- and early-NWFP eras, then declined during the remaining NWFP era (2001–2017), the surging growth in both professional and other services filled the void—which is consistent with national employment trends.

The extent to which this dynamic occurred within each county group, however, depended largely on whether the group includes a principal isolated urban center or metropolitan region. The "extremely high" and "low" groups lack a population center that is larger than that of greater Eureka-Arcata, California: about 50,000 people in 2017. In these two groups, the number of professional services jobs grew anemically between 1975 and 2000 and barely changed between 2001 and 2017. Although manufacturing jobs were steadily declining in the later NWFP era, professional services jobs still did not outnumber them in the "low" group, and only barely did (after 2010) in the "extremely high" group. This contrasts sharply with the "very high" and "moderate" groups, where jobs in both the professional and other services sectors increased by nearly 400 percent between 1980 and 2017, and significantly outnumbered manufacturing jobs in the later NWFP era. In the "moderate" group in 2017, there were half a million more jobs in professional services than manufacturing, whereas the two sectors had been equal only 20 years prior. The "high" group is anomalous: until 2000, professional services jobs did grow steadily, twice as fast as the "extremely high" group, but not nearly as rapidly as the "moderate" and "very high" groups; they continued moderately upward thereafter, exceeding jobs in manufacturing by 50 percent in 2017. While the "moderate" group includes all the major Seattle and Portland metropolitan area counties, the "very high" group includes what were until 2010 the two largest isolated urban centers in the region—Eugene-Springfield and Medford-Ashland, Oregon. The "high" group has one comparable city: Bend, Oregon. Professional services occupations are overwhelmingly a "city" phenomenon in recent U.S. economic history, and the size of city populations included within each group is likely the most important driver of these differences.

Two other differences among the groups are possibly significant for understanding how the economic and social circumstances of counties in each group may have changed. During the 1989–1993 litigation era, public sector employment became the largest source of jobs in both the "low" and "extremely high" groups, though its absolute numbers increased only moderately in the latter during the preceding 15 years. Somewhat surprisingly, it always has been the leading job sector in the "high" group. Although the number of these jobs has grown relatively little since 2000 in all three, no other sector has overtaken it. In the "low" and "extremely high" groups, current trends since 2000 suggest that the "other services" category might eventually supersede it, but it could take another two decades. Since the litigation era began in 1989, the number of TTU jobs has accelerated dramatically in the "moderate" and "very high" groups but remained essentially flat in the "low" and "extremely high" groups (fig. 3.11). TTU and leisure and hospitality are the categories that are most responsive to so-called secondary economic benefits—e.g., mill workers spending their paychecks at restaurants, bars, and movie theatres—as well as to the economic impacts of tourism. Only one trend is common to all five groups: consistent job growth in the other services category.

Total wages and share of total wages by industry supersector

The disparate change trends for total jobs among the county groups in figure 3.11 are magnified by wage trends depicted in figures 3.12 and 3.13. Manufacturing had the largest share of total jobs in the "very high" and "extremely high" groups until 1981 and in the "low" group until 1989. Average annual wages paid in manufacturing in these two groups between 1975 and 1980 were equal to or higher than manufacturing wages in the "moderate" group. These average wages, adjusted to 2017 dollars, have not since been equaled in any industry category with two exceptions in the "moderate" group: average annual wages in professional services eclipsed the manufacturing wages of the late 1970s in the mid-1990s; and average annual public sector wages reached the late 1970s manufacturing average in about 2015. TTU average wages in the "moderate" group are on track to match that amount within the next 5 years. In the "high," "very high," and "extremely high" groups, average wages paid in the public sector have nearly drawn level with average manufacturing wages. Unlike the "moderate" group, average manufacturing wages have declined significantly from their height in the late 1970s—by as much as 25 percent in the "extremely high" group. A manufacturing job in a "low" county group location in the late 1970s thus equates to a very generous standard of living both at that time (wages equal to those paid in metropolitan counties with higher living costs) and historically (higher than any other kind of job in a "low" group county over the ensuing 38 years).

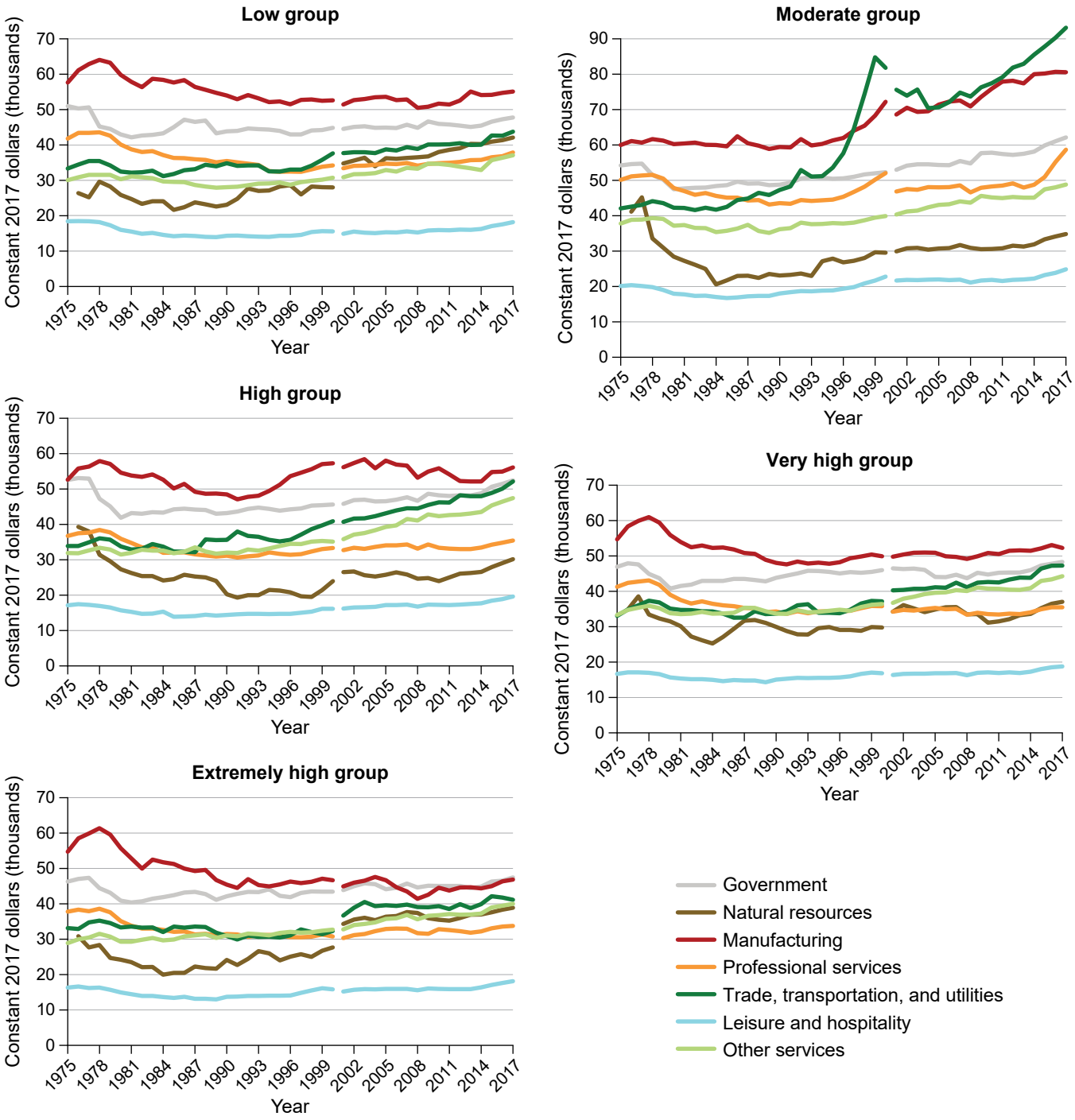

Figure 3.12—Change in average annual wages by industry supersector for county groups (low, moderate, high, very high, extremely high) in the Northwest Forest Plan monitoring region, 1975–2017. Breaks between 2000 and 2001 represent use of two classification schemes that were not cross-walked. Data source: U.S. Department of Labor Bureau of Labor Statistics Quarterly Census of Employment and Wages area files.

The very high proportion of jobs coupled with the high average wages paid in manufacturing created huge disparities in the sector source of job earnings in the "low," "very high," and "extremely high" groups. In 1978, 46, 36, and 41 percent of all employment earnings in these three county groups, respectively, came from manufacturing jobs. Twenty years later, the respective percentages in these three groups were 27, 21, and 22—by which time public sector employment was the leading source of wages by far in the "extremely high" group, and the coequal main source of wages in the other two groups. Notably, the TTU sector is a source of job growth in 1980–2000 in all five

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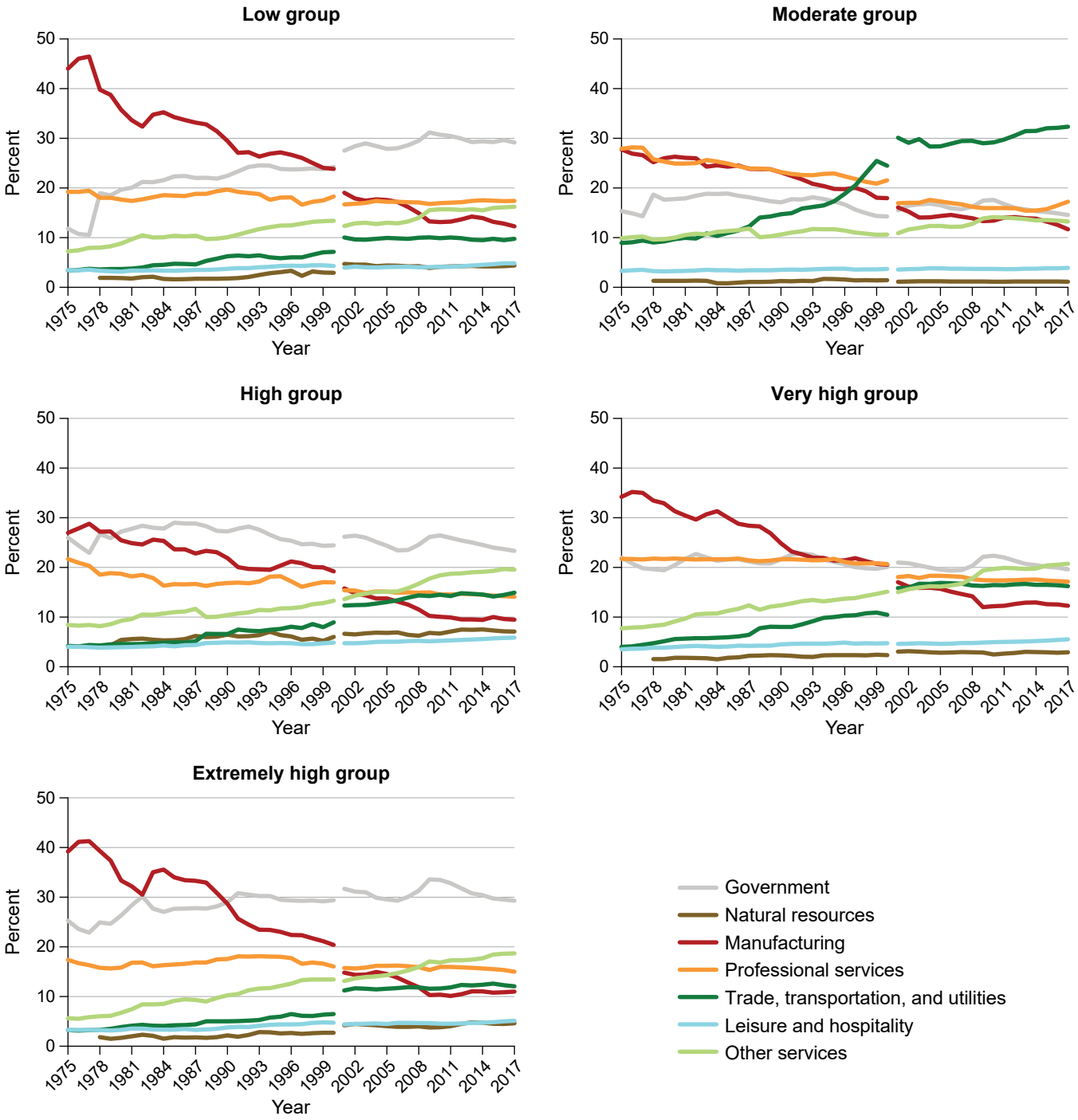

Figure 3.13—Change in total wages by industry supersector for county groups (low, moderate, high, very high, extremely high) in the Northwest Forest Plan monitoring region, 1975–2017. Breaks between 2000 and 2001 represent use of two classification schemes that were not cross-walked. Data source: U.S. Department of Labor Bureau of Labor Statistics Quarterly Census of Employment and Wages area files.

county groups, and in all but the "low" and "extremely high" groups after 2001 as well, but because of falling wages, its share of wages remains steady or declines in every group. The other widely shared sector of job growth, "other services," has a steadily increasing share of wages in four county groups, but not in the "moderate" group—a reflection of the disproportionately high wages paid in professional services there. Despite persisting low average wages, the "other services" sector was the second-largest source of wages in the "extremely high" and "high" groups during and after the 2007–2009 Great Recession and was the largest source of wages in the "very high"

group. Many common jobs in this sector—such as various medical technicians and aides—require some specialized instruction and skill, but typically not a 4-year college degree. There may be some interaction between the very high rates of "some college, no degree" attainment (figs. 3.7 and 3.8) in county groups that have mostly nonmetropolitan and rural counties, and the "other services" sector's high share of all wages paid in those same groups after 2001.

In short, the common narrative of community decline shared by interviewees in chapter 4—that the loss of family wage jobs is the central problem—also appears to apply to entire groups of counties within the region. In every county group except the "moderate" group, inflation-adjusted average annual wages declined in every industry sector from 1978 to 1983. A recovery of average annual wages within a 10-year period is common to all four of these groups in only one category: the public sector. For the service sectors that are the main source of job growth in the region overall since the 1990s, professional services and other services, average annual wages recovered to their circa 1980 levels in the late 1990s in the "very high," "extremely high," and "low" groups, but this level was only about 60 percent of average manufacturing wages in 1980. Average annual wages in TTU, a main source of job growth in all county groups from 1980 to 2000, have **never** recovered to their 1980 levels in these four county groups. The history of changing average wages in the "very high," "extremely high," and "low" groups is defined mainly by convergence of the different sectors into a narrow range of variability after 2001, with manufacturing wages much lower and all other sectors only slightly higher than in the 1980s. In a county that was not part of the "moderate" group, a hypothetical manufacturing worker that was laid off in the mid-1980s faced the prospect of a replacement job in another sector that paid substantially less. The same laid off worker in the mid-2000s would not have experienced that same gap, but only because their manufacturing job paid much less than a comparable job had paid decades earlier. In the "low," "very high," and "extremely high" groups since the pre-NWFP litigation era, the most promising paths to steady employment, if not necessarily strong earnings, have been pursuit of public sector employment, followed by private sector health and social services employment. While manufacturing has remained a preferred occupation in these groups based on its continued higher average wage, it has been an industry in decline, measured both in terms of total jobs and average wages, since 1978.

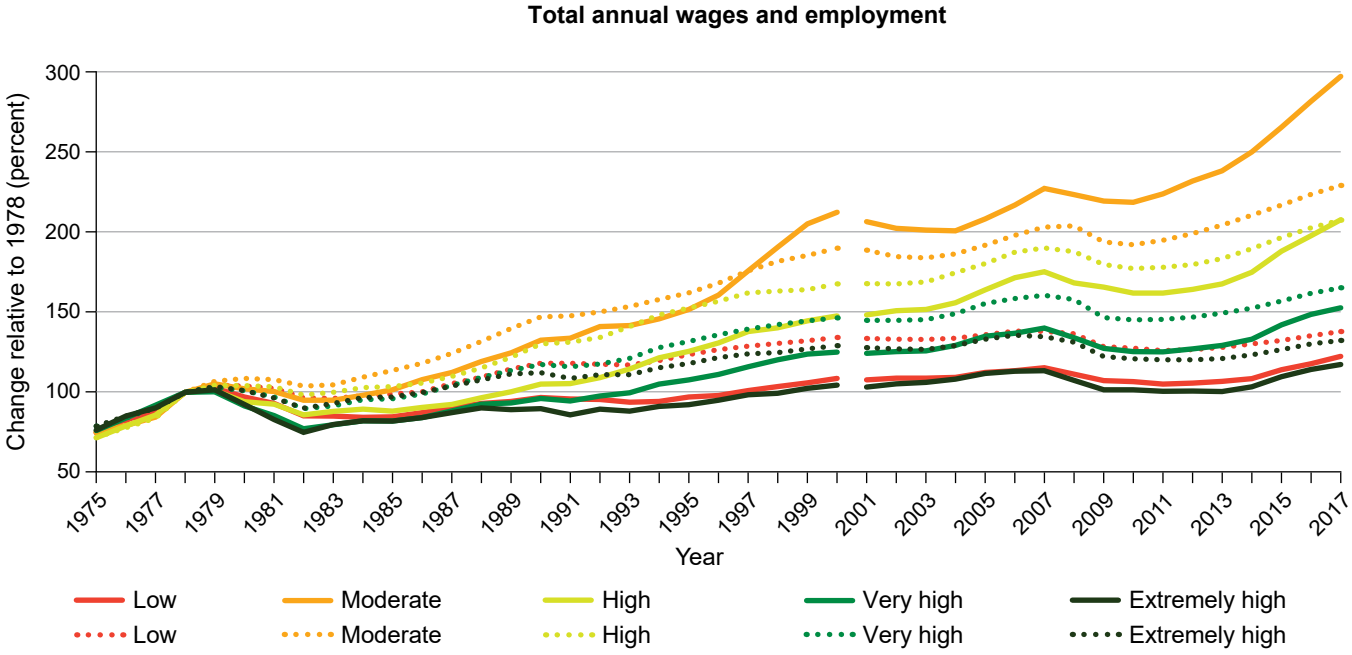

Figure 3.14—Change in total employment (dotted line) and total wages (solid line) for county groups (low, moderate, high, very high, extremely high [see chapter 2 of this report]) relative to 1978 total employment and wages (in constant 2017 dollars) in the Northwest Forest Plan region, 1975–2017. Break between 2000 and 2001 represents use of two classification schemes that were not cross-walked. Data source: U.S. Department of Labor Bureau of Labor Statistics Quarterly Census of Employment and Wages area files.

The impact of these general trends in each county group is summarized in figure 3.14. Although a 5-year period is insufficient to claim a long-term relationship, it is striking that both jobs and wages in all five county groups are tightly clustered on the same sloping line between 1976 and 1980, at least implying that broad similarity in wage and job trends may have been the norm in earlier years as well (1975 is the earliest date these data are available). In all five county groups, wages declined during the early 1980s recession, but total jobs declined in only three groups—"low," "very high," and "extremely high." Total **job** recovery in these latter three groups tracked each other almost exactly in the ensuing decade, returning to 1978 levels in 1986 (1978 is the baseline year for the chart in fig. 3.14 because it was the peak year for employment in wood products manufacturing in all five groups). In both the "extremely high" and "low" groups, however, total earned **wages** did not return to their 1978 level until 1998. Total earned wages recovered from the early 1980s recession in the "moderate" and "high" groups in 1985 and 1988, respectively. Rapid growth in the TTU and public services sectors in these latter two groups, and a smaller and partially reversed decline in manufacturing employment, explain the difference.

The 1980s were thus the crucial decade for the bifurcation of the NWFP area into economic "haves"—the counties of the moderate group, specifically those in the major metropolitan areas—and "have nots"—those groups for which wood products manufacturing had been far and away the dominant source of wage earnings before the 1980s recession (fig. 3.13): "low," "very high," and "extremely high." The "high" group is in the middle, comprising the most economically diverse group of counties of all the groups. Some counties—Deschutes, Oregon, and Chelan, Washington—evolved more in line with the larger metropolitan areas, while others—like Lewis, Washington—were more like the "low" or "extremely high" groups. The most notable regional economic shift after the mid-1980s is the overtaking of job growth by wage growth in the mid-1990s in the "moderate" group—directly related to the surge in the average annual wage paid in the professional services sector (fig. 3.12). Wage growth has outpaced job growth only in the "moderate" group, though the "high" group reached equivalence between the two as of 2017.

Since 2001, the divergence of the group trajectories has continued. The "moderate" and "high" groups—the latter primarily reflecting trends in the three largest counties, Benton, Chelan and Deschutes—saw robust job and wage growth and rebounded strongly from the 2007–2009 recession. In the "low," "very high," and "extremely high" groups, wage growth remained very weak after wages returned to 1978 levels in the late 1990s; and job growth also slowed. In 2010, both the "low" and "extremely high" groups had total wages again equivalent to 1978 levels and essentially the same number of total jobs as in 1996. What job growth did occur was heavily concentrated in the "other services" and public services sectors, both of which have had flat average annual wages since 2001 (figs. 3.11, 3.12). "Other services" is also one of the lowest paying sectors. Throughout the 1980s and the NWFP era that followed, counties belonging to the "low," "very high," and "extremely high" groups lost high-paying manufacturing jobs; only some of these jobs were replaced, and those by much lower paying jobs.

Labor Force Participation and Employment

The total number of people age 16 and older that are either working or seeking work are counted as the labor force; subtracting members of the armed forces yields the "civilian" labor force. Full-time students (e.g., those ages 16 to 18 still in high school) do not contribute to the labor force unless they are also working. The labor force subset that is seeking work but has none is the unemployed. A common misunderstanding of the unemployment rate—perhaps the single-most cited statistic in evaluating economic health—is that it is calculated by dividing the number of people not working by the total number of people. In fact, it is the number of people actively seeking work and failing to find it divided by the number of people in the labor force—those who are working, plus those not working but actively seeking work. Adults aged 16 and older that are neither working nor seeking to work do not factor into the calculation because they are not part of the workforce. This is particularly important to grasp for places where a chronic shortage of jobs causes working-age adults to give up seeking work: though they may wish to work, if they are not actively seeking employment when an employment survey is conducted, they are not counted as unemployed. This cohort is sometimes referred to as "discouraged workers."

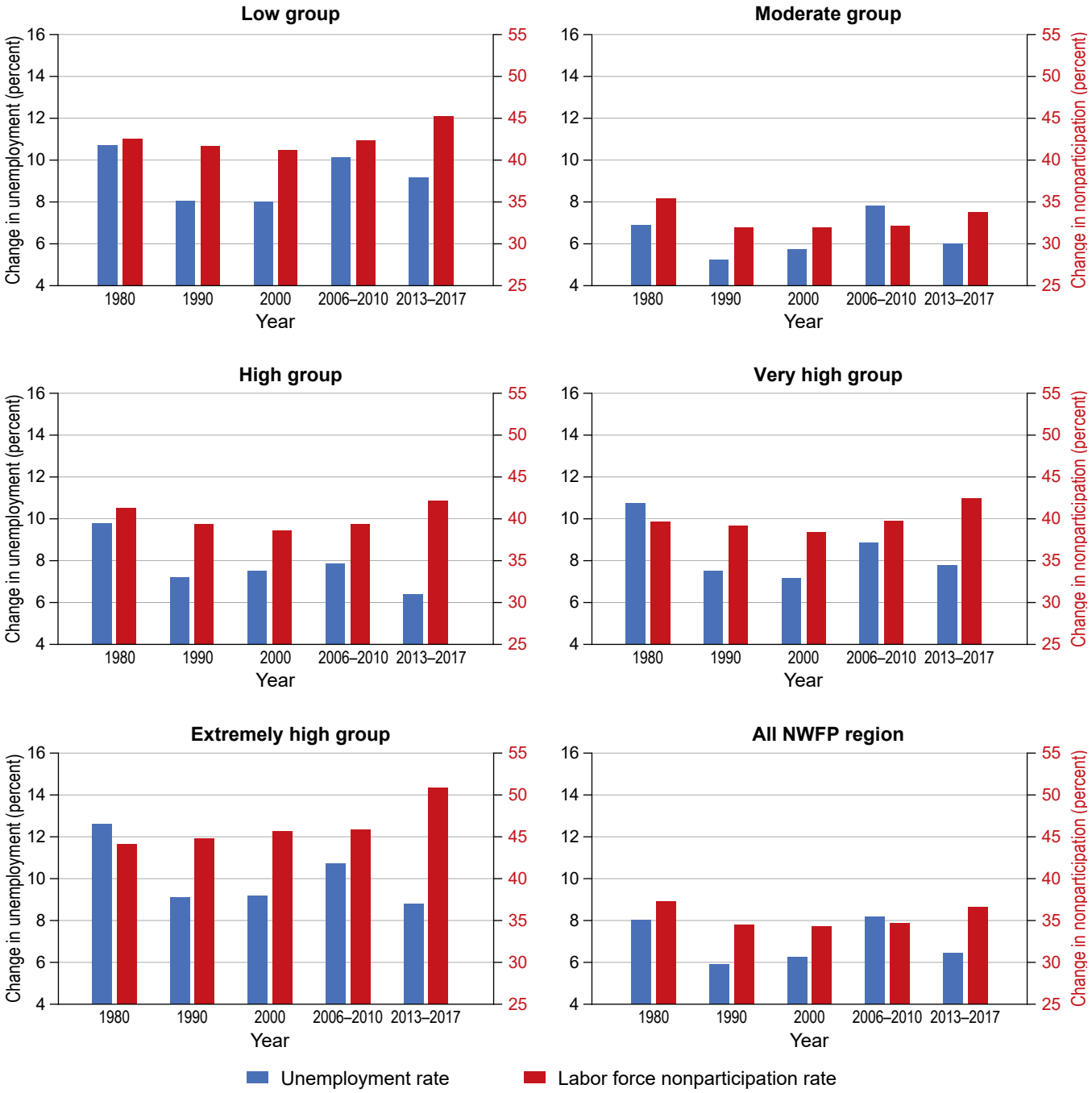

Figure 3.15—Change in rates of civilian population age 16 and older unemployed and not participating in the labor force for county groups (low, moderate, high, very high, extremely high [see chapter 2 of this report]) in the Northwest Forest Plan (NWFP) monitoring region, 1980–2017. Data for 2006–2010 and 2013–2017 are estimated over 5 years. Data sources: 1980–2000, U.S. Census of Population and Housing SF-3; 2006–2017, American Community Survey.

The intraregional disparity in jobs and wages is also present in nearly identical form in the changing size of the civilian labor force and the subset that is unemployed (figure 3.15). All five county groups had relatively similar growth in jobs and wages during the latter 1970s as shown in figures 3.11 and 3.13. In 1980, widespread high unemployment occurred as the nation entered a series of brief, interconnected recessions. The differences in the 1980 unemployment rate among the groups offer one of the first indications of the coming shift in the region's economy that heavily favored its metropolitan areas (fig. 3.15). All but the "moderate" group recorded an unemployment rate higher than 10 percent; the highest rate was nearly 13 percent in the "extremely high" group. Unemployment in

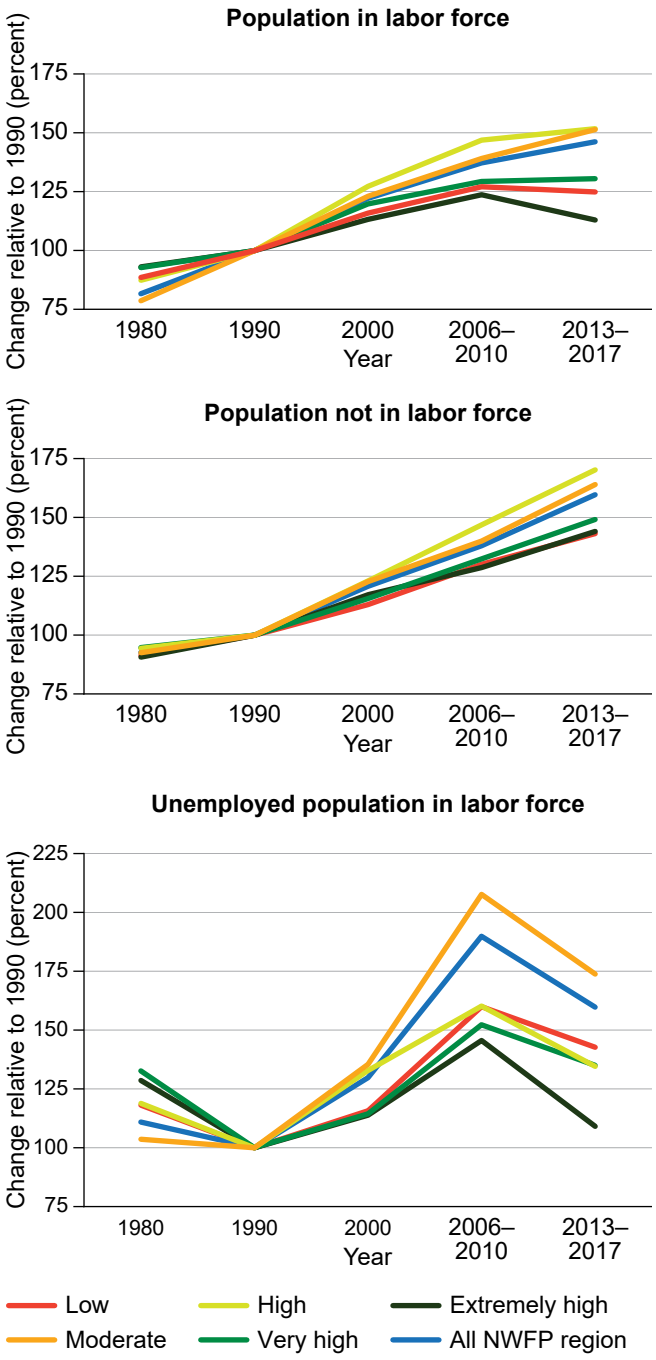

Figure 3.16—Change in total civilian labor force age 16 and older, and unemployed and not participating, for county groups (low, moderate, high, very high, extremely high [see chapter 2 of this report]) and the region as a whole in the Northwest Forest Plan (NWFP) monitoring region, 1980–2017. Data for 2006–2010 and 2013–2017 are estimated over 5 years. Data sources: 1980–2000, U.S. Census of Population and Housing SF-3; 2006–2017, American Community Survey.

the "moderate" group was 7 percent. Slightly more than 35 percent of adults in the "moderate" group were not in the workforce in 1980, whereas workforce nonparticipation rates in the other groups ranged from a low of 40 percent ("very high") to 44 percent ("extremely high") (fig. 3.16). The likely explanation for this disparity is the extremely high concentration of employment and wages in the manufacturing sector in the 1970s: the U.S. manufacturing sector, including the forest products industry, was seriously affected by the early 1980s recessions, and county groups such as the "low" and "extremely high" groups had much greater exposure to those negative impacts.

Since 1980, the five county groups have shared some superficially similar unemployment and workforce participation trends, but there are important distinctions. Generally, unemployment declined from a high in 1980 to a low in 2000, rose in 2006–2010—capturing the effects of the 2007–2009 Great Recession—and declined in 2013–2017. In the "high" and "extremely high" groups, the 2013–2017 unemployment rate is the lowest of any decade. However, in the "low" and "extremely high" groups, unemployment has not been below 8 percent since 1980, whereas nationally it has been at 5 percent or less for much of that time. It was never as high as 8 percent in the "moderate" group in any of the five data points. Generally, county group nonparticipation rates follow a concave arc—dipping from 1980 to a low in 2000, then rising again. Only in the "moderate" group is the 2013–2017 rate lower than the 1980 rate. The "extremely high" group deviates from this trend with steadily increasing nonparticipation rates. As with unemployment, there is a large gap between lower nonparticipation in the "moderate" group (varying between 35 and 38 percent) and the other groups (varying between 40 and 51 percent) (fig. 3.16).

Unemployment must be interpreted in the context of the nonparticipation rate to evaluate its significance. For example, the declining unemployment rate in all but the moderate groups between 2006–2010 and 2013–2017 appears to suggest that labor force circumstances have improved since the Great Recession. However, in all four cases, there is a roughly comparable increase in the nonparticipation rate. The rate at which adults were not working—including both the unemployed and those who had exited the workforce—typically **increased:** for example, from 52 percent (10 + 42) in 2006–2010 to 54 percent (9 + 45) in 2013–2017 in the "low" group. Again, the "moderate" group is distinct. There is neither a clear trend of an increasing share of adults in this group not working, nor a steady increase in the relative proportion of the nonworking population that has left the workforce (though the last data point is an increase in

nonparticipation percentage and decrease in unemployment). The other groups are typically opposite. There is a steady increase in the proportion that has exited the workforce since 2000 in the "low" group, and since 1980 in the "extremely high" group—where **60 percent** of the adult population was not working in 2013–2017.

Accelerating the negative effect of an increasing share of adults not working in groups other than the "moderate" group is slow, flat, or negative growth in the size of the workforce (fig. 3.16). During the 1980s, the size of the nonparticipating cohort grew at essentially the same rate in all five groups, but there were significant differences in the growth of the actual workforce: quite rapid in the "moderate" group, slow in the "low," "very high," and "extremely high" groups. After 1990, the groups deviated both with respect to growth in the nonparticipant cohort, and the actual labor force, which flattened after 2006–2010 in the "low" and "very high" groups and turned negative in the "extremely high" group. Although growth in the nonparticipant cohort slowed, it remained much stronger than growth in the labor force—hence a sharp uptick in the proportion of nonparticipants. These trends directly reflect those in the age-class distributions of each group's population discussed in the "Demographic Change" section above. Low natural increase coupled with net outmigration of younger people has characterized the "low" and "extremely high" groups since 1980. In this situation, the main factor contributing to labor force growth would be young people in a county or community that were less than 16 years old when the previous census was taken turning 16 and actively working during the following census period. As older adults retire, or become discouraged workers, more people exit the labor force than enter it, causing both the unemployment rate and the size of the labor force to decline, while the nonparticipation rate increases. The same force that would mitigate accelerating growth in older age-classes would also mitigate this trend: in-migration of younger adults seeking work. A lack of opportunities, as suggested in figures 3.11, 3.12, and 3.13, likely prevents this from happening.

Poverty and Public Assistance Income

Lack of sufficient household income to meet basic expenses, let alone maintain a reserve of funds for managing a shock—such as job loss—is one of the foremost elements of a vulnerable society. Individuals residing in households with household income below an annually defined "poverty rate" for their household size is the standard measure of people with insufficient income (USDC CB 2020). Many social scientists argue that the standard is too restrictive: it misses many people who have incomes that are low enough to cause them to struggle to meet basic needs, but not low enough to be considered in poverty (e.g., Blank 2008); it fails to account for the distinction between income and assets (e.g., Ruggles and Williams 1989); and it does not acknowledge how poverty is experienced differently by households headed by women and people of color (e.g., Christopher 2005). Other standards for defining low income exist—such as twice the poverty level, or half of a regional median household income—but American Community Survey data on income are reported in a way that makes consistent comparisons to these standards in multiple decades extremely difficult. The estimated number of people with income below poverty is a consistent measure over time so it is a preferable measure to these alternatives for temporal change analysis even if it inadequately captures the extent of insufficient income. There is also a robust social science literature describing the economic challenges experienced by rural populations in the U.S.; most of this research employs the poverty standard (Tickamyer et al. 2017). These factors on balance argue for the use of the poverty rate as an indicator of household-level economic stress in longitudinal analyses like this one.

However, it can be helpful to supplement poverty data with other data describing income received from public assistance programs. Public assistance income refers to money from various public programs intended to supplement very low incomes. It includes recognizable federal programs such as Temporary Assistance to Needy Families (TANF) and the Supplemental Nutrition Assistance Program (SNAP, colloquially known as food stamps). The largest proportion of this income comes from state unemployment compensation. Other state and local programs are also included but vary from state to state and so are not catalogued by the Census Bureau. Many public assistance programs have eligibility thresholds for household income that exceed the official federal poverty rate. This allows some additional insight to the distribution of household economic stress beyond what the poverty rate alone can capture. The most prominent and consistently available example of this form of assistance with more generous eligibility is the USDA subsidized free and reduced-price school lunch program; data from

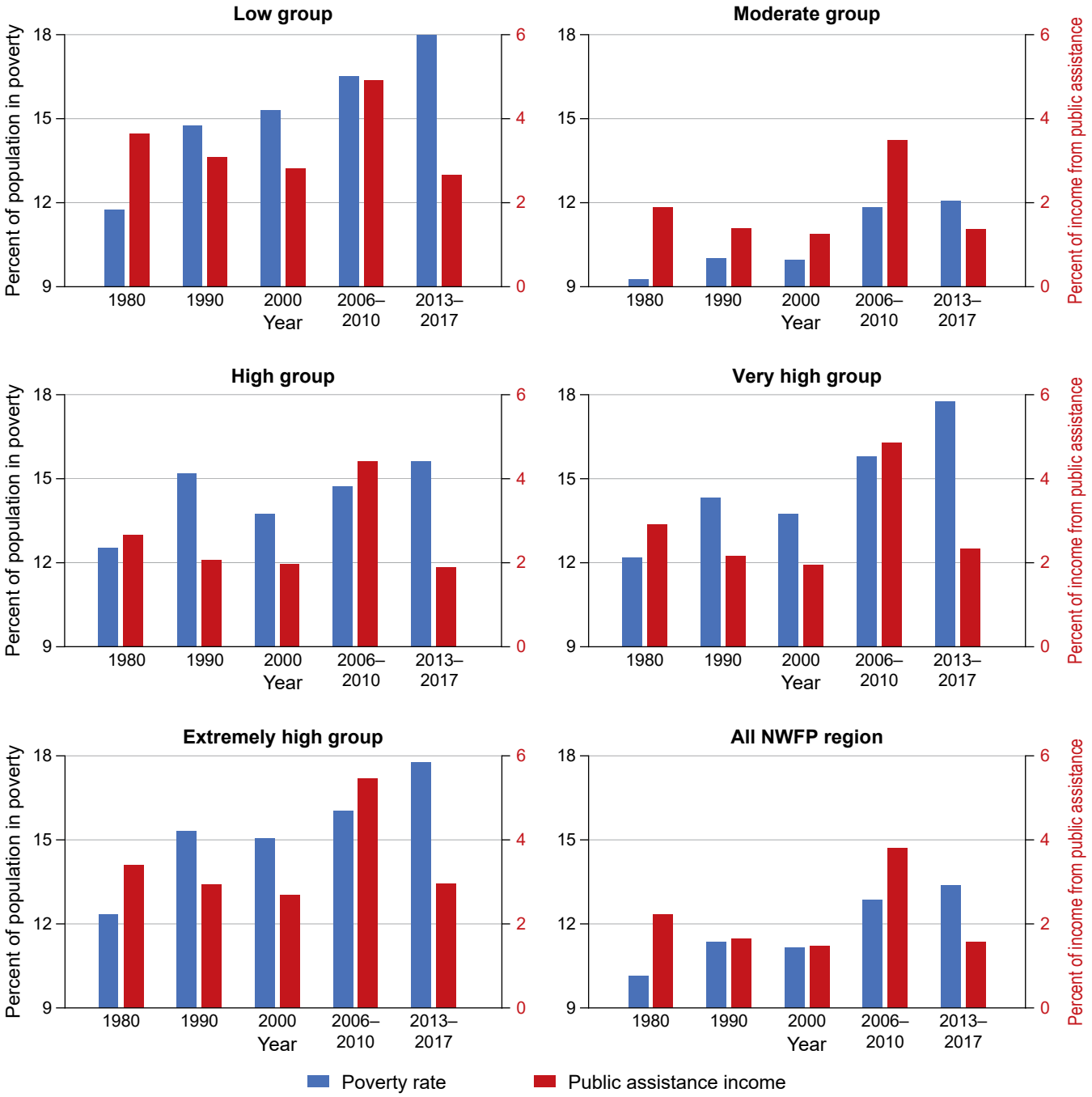

Figure 3.17—Change in population living in poverty and household income from public assistance programs for county groups (low, moderate, high, very high, extremely high [see chapter 2 of this report]) in the Northwest Forest Plan (NWFP) monitoring region, 1980–2017. Data for 2006–2010 and 2013–2017 are estimated over 5 years. Data sources: 1980–2000, U.S. Census of Population and Housing SF-3; 2006–2017, American Community Survey (poverty); U.S. Department of Commerce Bureau of Economic Analysis local gross domestic product and income series, table CAINC35 (public assistance).

this program are used in chapter 5 of this report to draw conclusions about economic stress in the community case studies reported in chapter 4.

The five county groups share two principal poverty characteristics in common: poverty was lowest in 1980, and highest in 2013–2017. Although discussions of poverty may invoke images of city slums for some people, figure 3.17 shows clearly that poverty in the NWFP area is much lower where counties are largely metropolitan. This is consistent with the distribution of poverty nationwide when measured at the county scale: rural, agricultural and natural resource-based counties have much higher poverty

rates than metropolitan counties across the country. The poverty rate of the "moderate" group is consistently 3 to 6 percentage points lower than the other groups; it barely reached 12 percent as its highest rate in 2013–2017, whereas in the other four groups, poverty fractionally below 12 percent ("low" group in 1980) is the **lowest** rate. The five groups also share somewhat similar steps in the generally increasing poverty rate: a large jump of 2 to 3 percent in the 1980s, and a similar jump in the 2000s, which ended in a recession. Broadly, dissimilarities in the prevalence of poverty in 1980 are more important than subtle distinctions among the groups in increasing or decreasing poverty trends since. With some exceptions, poverty has generally trended upward consistently throughout the region since 1980.

The exceptions are still important, however. One key exception is the increase in poverty in the 1980s: by less than 1 percent in the "moderate" group, but by 2.5 to 3.5 percent in the other groups. This disparity matches the differential response of wages among the groups in the aftermath of the early 1980s recession (fig. 3.12): rebounding to prerecession levels in the "moderate" group in a few years, but in more

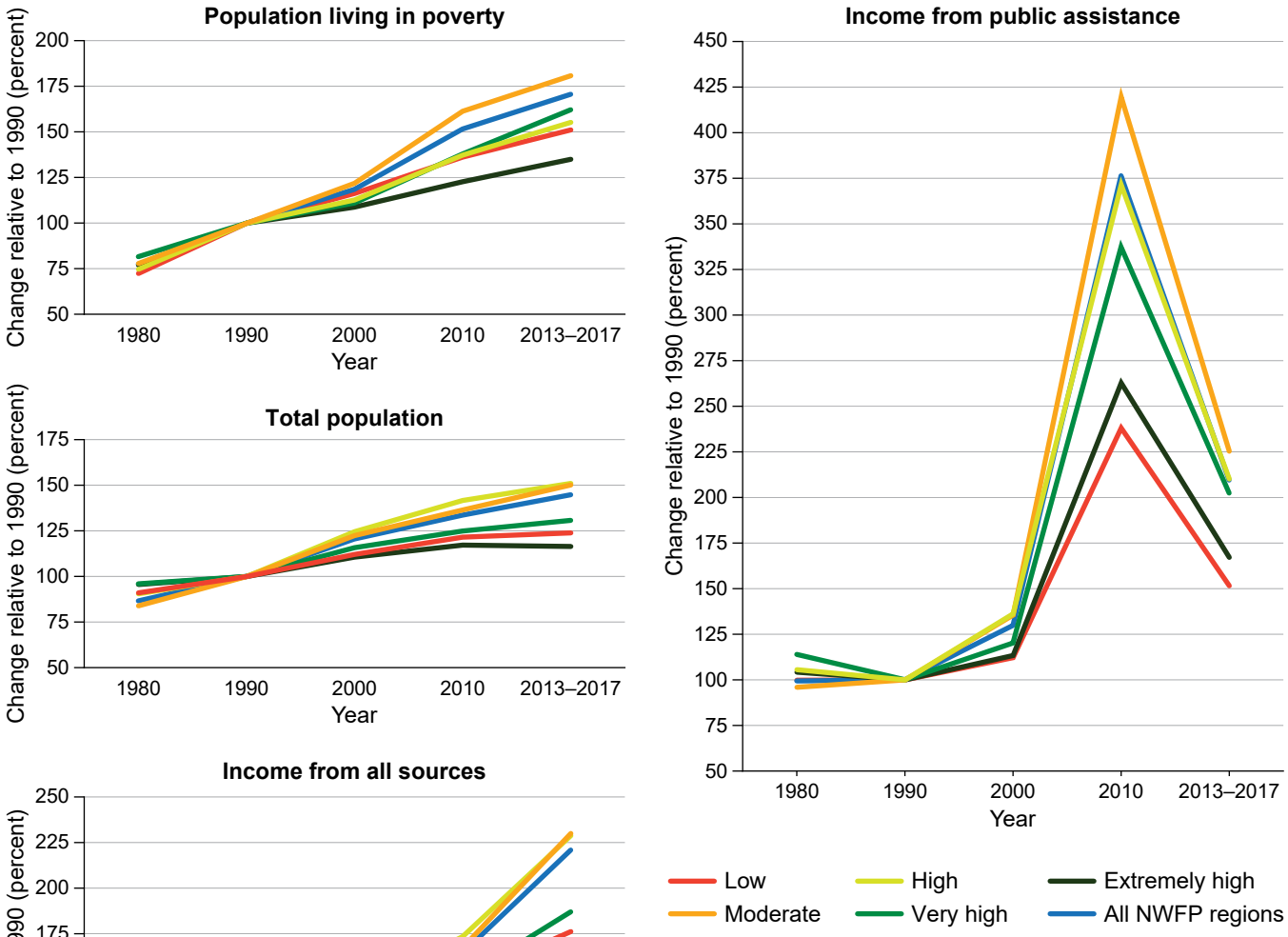

Figure 3.18—Change in total population, population living in poverty, household income from public assistance programs, and total income for county groups (low, moderate, high, very high, extremely high [see chapter 2 of this report]) in the Northwest Forest Plan (NWFP) monitoring region, 1980–2017. Total population for which income is calculated differs from total population. Data for 2006–2010 and 2013–2017 are estimated over 5 years. Data sources: 1980–2000, U.S. Census of Population and Housing SF-3; 2006–2017, American Community Survey (poverty); U.S. Department of Commerce Bureau of Economic Analysis local gross domestic product and income series, table CAINC35 (public assistance).

than a decade in the others. Another exception occurred in the 1990s, when the poverty rate stayed about the same in the "extremely high" group and increased in the "low" group, while it decreased in the "high" and "very high" groups. This discrepancy may be accounted for by several factors, including stronger overall job growth, somewhat faster recovery (albeit still slow) of pre-1980 recession wages, and a larger increase in professional service jobs, all in the "moderate" and "very high" groups (figs. 3.11, 3.12). There is almost no change in unemployment or labor force participation during the 1990s in these groups that would potentially affect incomes at a large scale (fig. 3.16).

During the later NWFP era—after 2000—poverty and public assistance income trends mirror the intraregional differences among the groups in population growth, changing age-class distribution, educational attainment, job growth, and average wages: generally, the "low," "very high" and "extremely high" groups are similar and contrast with the "high" and "moderate" groups. During the 2000s, both poverty and the share of income from public assistance increased similarly in all groups , a sign that the nationwide recession of 2007–2009 had a uniform effect across the region. Nearly all the spike in public assistance income across all five groups is likely attributable to unemployment compensation. It reflects the much larger rise in unemployment, hence also compensation, in the "moderate" group compared to the others (fig. 3.18). The large gap between the "low" and "extremely high" groups and the other three implies that job loss directly tied to the recession was much less pronounced in these two groups. In the last data interval, poverty rises less than 1 percent in the "high" group, and less than 0.50 percent in the "moderate" group, while increasing about 1.75 to 2 percent in the other three groups (fig. 3.17). These differences appear to owe less to growth in the population living in poverty—which grew at similar rates in all five groups after 2006–2010—than to the combination of steady growth in the population in poverty coupled with slower (or negative) growth in the base population upon which the poverty rate is calculated (fig. 3.9). Intraregional changes to poverty during the NWFP era, since roughly 1990, thus reflect changes to total population, age-class distribution, educational attainment, job growth, and average wages.

Changing Social Vulnerability in the NWFP Monitoring Region Since 1980

The main purpose of creating the county typology was to examine whether groups of counties organized by the relative importance of federal forest lands to county social and economic attributes around 1990 experienced distinct trajectories of social and economic change. If distinct trends existed, and unique positive or negative changes were found only in groups in which federal forest lands were highly, very highly, or extremely important, that finding would support the hypothesis that implementation of the NWFP has been associated with positive or negative social and economic changes. Evaluating the hypothesis one variable at a time—as in the preceding sections—complicates efforts to establish support for the hypothesis, because a negative trend in one measure may contradict a positive trend in another. Instead, this section evaluates the hypothesis through the lens of **Social Vulnerability**, an aggregate measure of social and economic vitality that is based on synthesizing key metrics from this section into a single value.

Social vulnerability has become an increasingly prominent concept in research on socioecological systems since the early 2000s. It refers to the collective inability of a social group to withstand shocks or stressor events or to recover their previous levels of organizational function after such an event. Shocks or stressors are typically understood to be negative: they cause disruption and harm. Preparedness for and recovery from natural disasters—such as hurricanes, floods, and wildfires—are the most common topics for social vulnerability analysis. However, the concept has also proven useful for interpreting a population's capacity to respond to economic shocks (e.g., abrupt closing of a town's principal employer), or its ability to adapt to slow, persistent structural shifts in a region's economic and social organization (e.g., farm consolidation and population loss in rural regions). A version of vulnerability (or resilience) analysis has been used previously in large-scale economic assessments for natural resource management planning in the Pacific Northwest, including the Interior Columbia Basin Ecosystem Management Project (Horne and Haynes 1999). A significant section of Volume III of the 10-year NWFP social and economic monitoring report was devoted to a quantitative community-scale analysis of social well-being, which as defined in that report was effectively an inverse

expression of social vulnerability. For reasons discussed in chapter 2 of this report, replicating this community-scale quantitative analysis of change is no longer possible owing to changes in the available data.

Tracking change over time in a single aggregate measure of social vulnerability for each county within the context of the county typology is the most direct approach available to addressing the core monitoring question presented by the NWFP ROD: "Are local communities [counties] and economies experiencing positive or negative changes over time that may be associated with federal forest management?" When social vulnerability is defined by demographic and economic characteristics, **negative change** in social and economic systems, as posited by the ROD monitoring direction, occurs when social vulnerability **deteriorates**. Conversely, **positive change** in social and economic systems occurs when social vulnerability **improves**. If there is a plausible connection between positive or negative social and economic change trends at the county scale and implementation of the NWFP, then county groups with the strongest connections to federal forest lands during the late 1980s—the "extremely high," "very high," and "high" groups, respectively, should experience alternately **improved** or **deteriorated** social vulnerability after 1990 to a greater degree than groups where the importance of federal forest lands was moderate or low. Any changes strongly associated with the NWFP would be most pronounced in the "extremely high" group, which had the strongest circa 1990 connections to federal forest lands.

Defining Social Vulnerability

Cutter et al. (2003), citing Blaikie et al. (1994), define vulnerability as "a measure of societal resistance or resilience to hazards." Hence, vulnerability is often used interchangeably with "resilience" or "well-being." These authors note that while social vulnerability is "partially the product of social inequalities," e.g., having little wealth or being a member of a racial or ethnic minority group—it also includes "place inequalities," the characteristics of places such as level of urbanization, economic vitality, and population growth rate (Cutter et al. 2003: 45). The latter characteristics obviously influence employment opportunities, and in turn, household income and wealth. Hence, social and place factors are in a continually reciprocating relationship. Steady **deterioration** in place-based aspects of vulnerability, such as population loss and decreasing job opportunities, produces a feedback effect for at least some social inequality factors, such as low income. This reciprocation may generate another kind of negative feedback: lack of quality jobs and lower ceilings on earned income that spur simultaneous out-migration of residents seeking better employment opportunities; in turn, out-migration deflates housing values, potentially leading to in-migration of populations with already high social vulnerability characteristics, such as little or no personal wealth, income, or employment prospects. Multiple interviewees for the case studies in chapter 4 reported observing this latter reciprocal phenomenon in their communities.

The feedback effect caused by diminished employment in both the forest products industry and the federal forest management agencies is the principal focus of this analysis. We thus employ a subset of the variables in common use for quantitative metrics of social vulnerability, focusing specifically on factors related to or directly describing employment and income: age, educational attainment, income from wages, poverty, and employment status. Notably missing from this list are measures of racial minority status, ethnicity, and limited English-language proficiency, which are mainstays of the quantitative social vulnerability literature. Reasons for omitting these characteristics are discussed in the next subsection. Also absent are commonly employed measures related to a population's total size and degree of urbanization. Larger and denser populations are less vulnerable. However, many aspects of the variables that are used in this analysis are correlated with urban or rural location and are thus also proxies for population size and urban location.

Ultimately, six variables contribute to the social vulnerability metric. They capture the age, education, workforce participation, and employment status of the adult population, as well as earned wages and poverty. Table 3.4 compares the variables comprising the social vulnerability metric in this analysis to its two principal models: (1) the 10-year social and economic report, volume III social resilience analysis (Charnley et al. 2006, Donoghue et al. 2006) the work of Susan Cutter and colleagues, (Cutter et al. 2003, Cutter and Finch 2008), (2) and experimental specifications of social vulnerability analyses (Burton 2015, Tate 2013). Change trends for all variables except wages have been presented individually in the above sections on demographic and employment and income change.

Table 3.4—Social vulnerability metric variables used in this Northwest Forest Plan (NWFP) 25-year socioeconomic report compared to principle study models referenced

NWFP 25-Year report	Donoghue and Sutton 2006 (NWFP 10-year report)	Cutter et al. 2003, 2008
Demographics		
Population age ≥65	—	Percentage of population age ≥65
Population age ≥25 with high school diploma or less education	(Percentage of population age ≥25 with Bachelor's degree)	(Percentage of population age ≥25 without high school diploma)
Income		
Annual wages paid by employers[a]	—	[Per capita income]
Individuals in poverty	Percentage of population living in poverty	Percentage of population living in poverty
Labor force		
Population age ≥16 in the civilian labor force and unemployed	Percentage of population unemployed	Percentage of civilian labor force unemployed
Population age ≥16 not in the civilian labor force	—	Labor force participation rate

Parentheses indicate similarly calculated but not identical measure to this 25-year report; brackets indicate a distantly related measure to this 25-year report. Reference studies use simple percentages as variables instead of location quotients.

[a] Because employment and wages census data are reported by employers, self-employment and other labor income such as tips are not included.

The vulnerability analysis employs an aggregate measure of wages paid by all employers regardless of industry sector, rather than a sector-by-sector assessment as in the "Employment and Income Change" section (e.g., figs. 3.12 and 3.13). Each of the six variables is transformed into a location quotient, as in the typology calculation. Location quotients standardize the observations so that they are less susceptible to extremes of variance introduced by the vast differences in population size among the counties of the NWFP monitoring region.

Demographic measures—

Older population is among the most frequently included measures in vulnerability analyses. It represents the population most likely to not be working and, consequently, be living on a fixed income. Older populations experience compromised health at higher rates than younger people and have much more limited mobility, both of which increase overall vulnerability to a stressor event. Lack of a high school diploma is also a common metric in the literature, but its usage (e.g., by Cutter et al. 2003) (table 3.4) is arguably a vestige of an earlier era when an earned diploma was a sufficient credential for entry to a range of low-skill professions that offered some potential for skill development and upward mobility (e.g., in many kinds of manufacturing). Increasingly, adults with a high school diploma but no advanced education have limited employment options beyond low or minimum wage employment that offers few prospects for skill development or career advancement (e.g., in services such as retail sales). The converse measure, adults lacking a bachelor's degree, is also frequently used in vulnerability analysis (e.g., Donoghue and Sutton 2006) (table 3.4). However, in much of the NWFP area, attainment of 4-year degrees increased only slowly since 1980 (fig. 3.8), but the proportion of adults with "some college," including an associate degree, increased much more rapidly. In nonurban areas, an associate degree may represent more sufficient higher education for entry into a wider range of stable and higher paying jobs than in urban areas; so in most of the region, adults with "some college" should be thought of as decreasing the aggregate vulnerability characteristics of their communities, not increasing it (as would be the case if the metric were based on a 4-year degree). We thus aggregate adults lacking a diploma and those who possess one, but have no additional education, into a single category.

Income measures—

By combining all industry sectors from the analysis shown in the "Employment and Income" section (figs. 3.11–3.13), the wages measure captures the overall tendency for jobs

in a county to pay low wages. This minimizes the skewing effect that could be caused by a small county having an unusual concentration of high-paying jobs in a single industry (e.g., manufacturing). Three common measures of vulnerability that capture **all** income, as opposed to only wage income, are per capita income, individuals in poverty, and median household income. Individuals in poverty is not an ideal measure of the prevalence of low-income households, though it is the best available option for assessing the degree to which low incomes from all sources, not just wages, are common. Median household income is not conducive to the calculation of location quotients, so it would be difficult to compare to the other five measures that are in that form. Per capita income trends are difficult to interpret when some populations shrink—as has occurred since 2010 in some NWFP-area counties. This is because per capita income appears to increase, implying lessening vulnerability, when population declines, while that decline is also an indicator of **increasing** vulnerability. Caveats for poverty and other measures of income are discussed in the "Employment and Income Change" section. Because of these qualifying features of poverty, low-income status, per capita income, and median income, aggregate earnings from wages is the preferred measure.

Workforce measures—
Unemployment frequently features in vulnerability analysis, but workforce participation rarely does, although when combined they accurately reflect the condition of the labor market more than unemployment alone. That is because unemployment declines when working-age people give up seeking work. We include both measures, though there is significant correlation between adults aged 65 and older and workforce nonparticipation. The rationale for doing so despite this correlation is that some locations in the region may have large numbers of discouraged workers (who no longer seek work) that are not yet 65 years old. Because people exiting the workforce depresses the unemployment rate, relying solely on unemployment and age indicators would cause populations in places with large numbers of discouraged workers under 65 to appear less vulnerable than they actually are.

Excluded race and ethnicity measures—
We exclude race, ethnicity, and national origin variables for two reasons: first, as documented in the "Demographic Change" section, the overwhelming majority of the NWFP monitoring region's non-White population is concentrated in a few metropolitan counties. According to the classic formulation in which racial minority status is associated with higher vulnerability, all nonurban counties in the region would logically be considered **less** vulnerable because roughly 9 out of every 10 people are White, non-Hispanic. This directly contradicts the probability that rural populations are more economically vulnerable as a function of structural shifts in the U.S. economy since the 1980s (Mills 1995), exacerbated after the 2007–2009 recession (Farrigan et al. 2014). (However, there are differences of opinion on whether there is a systematic tendency for rural counties to be poorer than urban ones [e.g., Fisher and Weber 2004]). Second, larger shares of Hispanic population should **not** be presumed to increase vulnerability in the context of employment and income, especially employment in the forest products industry. In the Pacific Northwest, Hispanic workers are often essential to an integrated forest products business operation (Moseley 2006, Moseley and Reyes 2008). Additionally, there are multiple locations in the NWFP monitoring region that have recently experienced non-Hispanic White population loss (table 3.2; fig. 3.3), which is a common trend across the rural United States (Johnson et al. 2015). In some of these NWFP region locations, White non-Hispanic population loss is somewhat mitigated by Hispanic population growth (table 3.3; fig. 3.3a). Because population loss is a strong contributor to high social vulnerability, the mitigating effect of Hispanic immigration somewhat reduces social vulnerability. In this report, race and ethnicity are not associated with the aspects of social vulnerability that we seek to describe.

Interpreting a Social Vulnerability Metric

Although the concept of a single numeric value describing the vulnerability of a population is appealing, interpreting its practical meaning is a challenge. How can a single measure adequately differentiate a vulnerable population from one that is not, or is less vulnerable? One approach is a binary scheme based on threshold values: e.g., if 20 percent of a population is in poverty, it is socially vulnerable, but less than 20-percent in poverty means it is not. This is obviously problematic for describing the vulnerability of a population that experiences 19 percent poverty. Also, thresholds that may have had some significance for a particular point in time may no longer be relevant after time passes (e.g., 5-percent Hispanic

was a large proportion in the NWFP area in 1980, but not in 2010). Threshold approaches to characterizing social and economic conditions are still used—e.g., by the U.S. Department of Agriculture Economic Research Service to determine a "retirement county" or "persistent poverty county" (USDA ERS 2019). But these individual characteristics, and their contribution to social vulnerability overall, exist on a continuum, not in binary mode. Approaches that better describe the range of vulnerability conditions that may exist in multiple subregions are preferable.

One straightforward alternative is to compute **relative** social vulnerability in which each observation is compared to a reference population. The degree to which each observation's population is vulnerable is described by the size of the difference between it and the reference population. This approach creates a continuum of vulnerability that more accurately reflects reality, but introduces a new difficulty: what makes an appropriate reference population? States, regions, or the nation are the most frequently chosen reference populations in studies using this relative approach (e.g., an unemployment rate that is 1.2 percent lower than the national rate). Unless social vulnerability is being analyzed in the context of phenomena that match these geographies, however, the reference is unrelated to the observation and the comparison is meaningless. In 2013–2017, 37 percent of California's population claimed non-Hispanic White identity. If a rural county in northern California was "only" 80 percent non-Hispanic white, it would be a high outlier in that part of the state, where many counties have populations that are 90 percent or more non-Hispanic White, and therefore of special significance; but studies using the state as the reference would classify the county as "very white" because 80 percent is far more than 37 percent. Comparing the same county to the state of Oregon, which was 77 percent non-Hispanic white in 2013–2017, yields a totally different interpretation.

The location quotient approach solves this reference dilemma by defining the reference population as the sum of individual observations in each of the 54 counties analyzed in the NWFP monitoring region for which federal forest lands were at least minimally important in the late 1980s (see fig. 2.11). Each county is compared to the aggregate region to which it is directly related by the design of the monitoring protocol. The degree to which a county is differentiated from the reference population in the various contributing factors to social vulnerability thus defines its relative vulnerability. A definition of "very high vulnerability" resulting from this reference comparison is specific to the region that is explicitly connected to the research question: could there be a relationship between changes in federal forest management introduced by the NWFP and decreasing levels of social vulnerability? The same value that resulted in "very high vulnerability" compared to this 54-county reference has some other meaning in comparison to state or national populations.

Calculating the Social Vulnerability Metric and Describing its Practical Importance

The social vulnerability metric is the average of the six location quotients for the variables in table 3.4 for a given data publication year. The z-scores (a measure of how much each observation deviates from the mean of all 54 observations) for each individual location quotient are also averaged. For example, in table 3.5, averaging the six location quotients calculated for Colusa County, California, in 1990 yields a metric of 1.233, and z-score of 0.174; for Tillamook County, Oregon, the comparable values are 1.378 and 0.858, respectively. The metric scores by themselves are difficult to interpret: what is the practical importance of the difference between 1.233 and 1.378? Unlike the location quotients in chapter 2, the difference between these two values does not represent an additional 14 people "more than expected"

Table 3.5—Examples of social vulnerability (SV) metric calculations for 1990 data with averaged z-scores

County	Age ≥65	No college	Wages	Poverty	Unemployment	Nonparticipation	SV metric
Colusa, CA	0.998	1.389	1.277	1.186	1.429	1.117	1.233
z-score	-0.627	1.079	0.686	-0.189	0.383	-0.290	0.174
Tillamook, OR	1.652	1.330	1.378	1.343	1.202	1.366	1.378
z-score	1.849	0.753	1.384	0.343	-0.291	1.110	0.858

Table 3.6—Classifying social vulnerability metric values for 1990 data with "moderate" as the central value

Social vulnerability class	Descriptive statistic	Average of six location quotients	Average of six z-scores	Number of counties	Percent of all counties
Extremely high	Maximum	1.504	1.193	1	1.9
Very high	+1.5 SD	1.472	1.131	7	13.0
High	+1.0 SD	1.384	0.754	12	22.2
Moderate	+0.5 SD	1.296	0.377	20	37.0
	Median	1.242	0.224		
	Mean	1.208	0.000		
	-0.5 SD	1.119	-0.377		
Low	-1.0 SD	1.031	-0.754	5	9.3
Very low	-1.5 SD	0.943	-1.131	5	9.3
Extremely low	Minimum	0.762	-1.933	4	7.4
	SD	0.176	0.754		

SD = standard deviation

if Tillamook County were identical to Colusa County in degree of difference from the region. That is because the vulnerability metric is an average of six values that are based on different measurement units: people and dollars. Also, unlike the case of the location quotients in chapter 2, a vulnerability metric value of 1 is not "equivalent to region." This is because counties with very large populations are predisposed to have lower social vulnerability, but county population size is not normally distributed among the counties in the NWFP monitoring region. Only a handful of counties—like Pierce County, Washington, location of Tacoma—contribute a majority of the summed population and universal variables for each individual location quotient.

To counteract this skewing effect in the reference population, a county's measure is assigned a social vulnerability label based on the position of its average of six z-scores within the distribution of all 54 averaged z-scores. Observations close to the mean for all 54 averaged z-scores are described not as "equivalent to the region," but as "moderately vulnerable"—e.g., midway between very low and very high vulnerability. Using "moderate" as the central value gives practical meaning to the terms high and low and invokes the idea of a continuum of differing social vulnerability among the 54 counties analyzed. This scheme is depicted in table 3.6, for the data year 1990.

In 1990, the distribution of vulnerability scores was close to normal, but slightly skewed toward high vulnerability. There are a nearly equal number of counties in the "tails" of the distribution, more than or less than one standard deviation from the mean: nine in the very or extremely low vulnerability range, and eight in the very or extremely high vulnerability range. Sixty-eight percent of counties are within the first standard deviation, as occurs in a normal distribution. Instead of counties being equally distributed above and below the mean, a disproportionate number are above it. This distribution makes intuitive sense: there are just a few counties in the region with extremely large populations and robust economic activity, which tend to promote low social vulnerability within the definition established here. A much larger proportion of counties are nonmetropolitan or rural, with a variety of small to medium population sizes and economic bases. Most of these should be similar, with somewhat to considerably higher vulnerability than the few low vulnerability counties. There is a clear indication within this snapshot of 1990 conditions of a continuum of vulnerability conditions in existence across the NWFP monitoring region—likely much closer to reality than an either-or condition based on thresholds.

Use of the averaged z-score to establish a practical description of relative social vulnerability offers an

additional aid to describing relative social vulnerability: minimizing the skew imposed on the average of the six location quotients by one or two outlying values. For example, in Colusa County (see table 3.5), two of the six measures—unemployment (1.429) and no collage (1.389)—have moderately high values. However, although the "unemployment" and "no college" quotients are similar, they are not equally unusual values. The **z-score** for unemployment (0.383) shows that it is well within the first half of the first standard deviation, e.g., one of the 20 observations (38 percent of n = 54) closest to the mean—it was roughly average among the 54 counties in 1990. By contrast, the z-score for "no college" (1.079) is unusually high—it is among the 17 values farthest from the mean, in the second standard deviation (z > 1.0). Hence, "no college" should be treated as more influential in establishing relative social vulnerability in Colusa County than unemployment, although the "no college" location quotient is a slightly smaller value. The average z-score accomplishes this.

In Tillamook County (table 3.5), there is less variability in the tendency of the six location quotients to be low or high in comparison to the region. The average of the six observations is very close to the values of four of the six, and the other two roughly cancel each other out. Again, however, the four measures with values between 1.3 and 1.4 are not similarly typical, ranging from about average (poverty, 1.343, z = 0.343) to extremely unusual (wages, 1.378, z = 1.384, the fourth-highest [i.e., fourth-lowest wages] among 54 counties.) The metric value—1.378—falls within the upper half of the first standard deviation for all metric values. However, the average z-value—0.858—is well within the **second** standard deviation above the mean, and the high z-score for wages is influential in determining this position. This distinction may seem academic, but it is significant for describing Tillamook County's relative social vulnerability in 1990 in practical terms. Because the averaged z-score, in referencing a mean and standard deviation of a data distribution, is closer to the concept of relative vulnerability, it should take precedence in assigning a vulnerability class to Tillamook County—which, by virtue of falling in the second standard deviation, is very high instead of high. Colusa County, with an averaged z-score that is clearly very close to average, and a metric value that is essentially the median for 1990 (1.242), is clearly in the middle of all 54 counties in terms of social vulnerability; hence it is classified as moderate.

Assessing Social Vulnerability Change

The NWFP ROD specifically directs the monitoring effort to examine **trends** in social and economic change—hence, changes in relative social vulnerability. Interpreting the significance of social vulnerability change is as challenging as defining differing states of vulnerability. The reference population to which each county is compared is a moving target, its characteristics changing simultaneously with those of each individual county being analyzed, but likely at different rates. Depending on the background change in the reference population, change in a county over time may have multiple, divergent meanings. To compare just two of the many permutations: (1) county and reference population were similar at the start of the trend period, but social vulnerability of the reference population improves while social vulnerability of the county's population deteriorates; (2) county population was much more vulnerable than the reference population at the start, and vulnerability deteriorated in both. Although the county's population is more socially vulnerable at the end of the trend period in both instances, the **relative change** is negligible in the second, but large in the first. The first case is a clear instance of the kind of change that the ROD directs agencies to look for: a community—or county—that is becoming more vulnerable while the region it belongs to grows less vulnerable. In the second instance, the trend for the county is not distinct from the trend for the region, which argues against an interpretation that management of federal forest lands could be an important driver of the county trend. Location quotients with the total regional population as the reference are ideal for assessing the significance of social vulnerability change trends.

Insights gleaned from understanding how a county's vulnerability status changes over time relative to other counties and its reference region are illustrated in figure 3.19. Assume that a hypothetical county has an unchanging metric value of 1.3 in every measurement year. In 1980, it falls in the very high vulnerability range: most counties are closer to the average, which is 1.14. The range (lowest to highest value) of the vulnerability metric for 1990 does not change very much from 1980, but the mean climbs to 1.2, indicating greater separation between low and high values, with more large values in the high range. More counties are also above the mean in 1990 than in 1980. Because of these shifts during the 1980s, in 1990 the hypothetical county is in the high rather than very high range, though its averaged

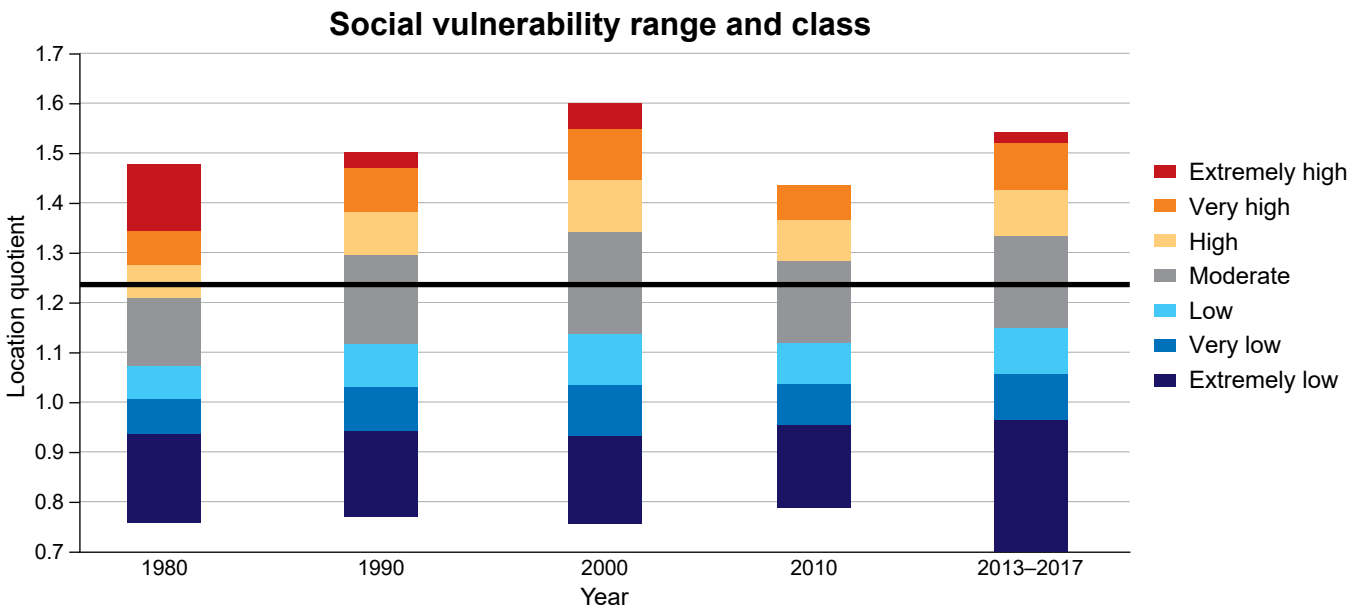

Figure 3.19—Range of values for assessing relative social vulnerability and subdivision into classifications (extremely high through extremely low). Location quotient 1.0 means that social vulnerability in the observed data unit (e.g., county group) is identical to that of the entire Northwest Forest Plan (NWFP) region. Because the range of values is not identical in every census year, a constant value of 1.3 (i.e., local social vulnerability 30 percent greater than it is for the NWFP region) does not have the same interpretive classification. In years with the highest or lowest outlier values, 2000 and 2013–2017, a value of 1.3 falls into the moderate category and is roughly comparable to the NWFP region; but it is high or very high in other data years

demographic, income, and employment characteristics are unchanged. Between 1990 and 2000, the range of vulnerability metric values expands further. Outliers are now much farther from the mean; the mean climbs to its highest value in any of the 5 years observed, 1.27; and the range of each classification is expanded, reflecting the greater deviation among values. The hypothetical county is in the moderate range in 2000, close to the mean. Nothing has changed in the county itself, but because of changes occurring in other counties and in the region overall, it is no longer unusual in 2000, whereas it was in 1980. In 2010, the range of values has shrunk and the hypothetical county returns to the high range. There is less variation across the 54 counties than in any of the prior three data points, and outliers—particularly high outliers—are much closer to the mean. The extremely high range does not even exist owing to the narrower span of values. The hypothetical county, moderate by 2000 standards, is somewhat more like the upper outliers in 2010 than it is in 2000. As the economic recovery from the Great Recession commenced after 2009, it primarily benefitted the few large metropolitan counties. This caused the reverse of the change from 2000 to 2010: the range widened to a similar extent as in 2000, but with lower extremely low outliers and consequently a slightly lower mean. The hypothetical county returned to the center of the moderate range, about where it was in 2000.

Figure 3.19 illustrates an important consideration for trend analysis with implications for longitudinal analyses of long-term vulnerability change. The full range of vulnerability metric values in 2010 is unusually small compared to the other four data years. That shrinking range is almost entirely driven by the effects of an economic anomaly: the Great Recession. Because nonmetropolitan and rural counties in the NWFP monitoring region were already generally more vulnerable in 2000 than urban counties, mostly in the "moderate" group, their vulnerability characteristics were less effected by the recession; the comparably well-off populations of the "moderate" group counties in the early 2000s suffered a much more significant blow from unemployment and falling wages, which is what causes the range compression effect. Because the Great Recession cannot be considered a normal event, and because its timing is such that it has a huge skewing effect on data recorded in 2010, we interpret social vulnerability change and its association with types of counties over the entire span of the NWFP, from 1990 to 2017, rather than on a decade-by-decade scale. This smooths the skew imposed by the Great Recession and makes the long-term trend much clearer.

Social Vulnerability Among NWFP Counties in 1990

The obvious initial choice for a baseline from which to observe changing social vulnerability is 1990, roughly the same time point in which the typology captures the importance of federal forest lands and forest products industry employment to the counties. The litigation that closed the intensive harvest era and ushered in the NWFP era is like a hinge in the history of the social and economic consequences of federal forest management in the Pacific Northwest. The litigation era (1989–1993) begins just prior to 1990, meaning that its effects were not fully captured by data collected in 1990; these same data describe populations well before the NWFP was adopted and implemented. Hence, 1990 is the critical reference year. However, as discussed in the introduction, a baseline year does not exist in a vacuum. Understanding preceding trends is key to interpreting the trend from the 1990 baseline year forward. The following results thus establish change trends for (1) 1980–1990, to establish the existing trajectory of social vulnerability change when the litigation era commenced and profoundly altered federal forest management, particularly important since the 1980s were a pivotal decade for social and economic change; (2) 1990–2017, to understand how relative social vulnerability changed during the NWFP era itself. Figure 3.20 shows the distribution of relative social vulnerability across the 54 counties analyzed in the NWFP monitoring region for 1990.

The most obvious overall pattern in figure 3.20 is that low social vulnerability was related to the size of population centers. Very and extremely low vulnerability is confined to counties comprising the core of the Portland and Seattle metropolitan areas, as well as the small city of Corvallis (Benton County), Oregon. Low vulnerability occurs only in counties that were also officially metropolitan areas in 1990, either owing to the presence of mid-size cities (e.g., Bellingham, Washington, and Eugene and Bend, Oregon), or because they are located on a metropolitan periphery (Yamhill and Columbia Counties, Oregon). Among the remaining counties, which are defined by only small principal cities or by entirely rural populations, social vulnerability ranged from moderate—e.g., roughly average for the region—to extremely high. Coastal counties generally had high social vulnerability, except Mendocino and Humboldt Counties, California. Other regions with high social vulnerability include interior northern California, except Shasta and Lassen Counties; southern Oregon, except for Douglas and Jackson Counties, and several among the tier of counties east of the Cascade Mountains in Washington and northcentral Oregon. There are few places where high and low social vulnerability counties are directly contiguous. This relationship underscores an important shared characteristic of high vulnerability counties in 1990 that is not otherwise directly measured: greater distance from major metropolitan areas is generally associated with higher vulnerability.

In figure 3.21, the central monitoring question is directly addressed by charting the prevalence of high, moderate, and low social vulnerability counties within each county group. The three groups where federal forest lands were important in the late 1980s ("high," "very high," "extremely high") were composed almost entirely of counties with above-average vulnerability scores in 1990: the area of the bars to the left of the central y-axis. Six of ten counties in the "extremely high" group registered high, very high, or extremely high social vulnerability; the same is true for six of eleven in the "high" group and three of seven in the "very high" group. By contrast, the two counties among the seventeen of the moderate group with very high vulnerability were clearly unusual outliers, not typical of the group overall. High, moderate, and low social vulnerability were most evenly distributed within the "low" group. As figure 3.12 shows, a key finding is that a majority of counties in which federal forest lands were highly important in 1990 were already experiencing high or higher social vulnerability.

Social Vulnerability Trajectory Prior to 1990

The analyses in the "Typology Discussion" in chapter 2 of this report and the "Demographic Change" and "Employment and Income Change" sections in this chapter demonstrate that intraregional variability in demographic, economic, and employment characteristics of counties across the NWFP area was much smaller in 1980 than it was afterward. Age-class distribution of population, educational attainment, and wages were all very similar across the entire range of county groups outside major metropolitan areas in 1980. The gap between major metropolitan area counties and the rest of the region was much smaller than it was in later decades. Occasionally in 1980, average wages were even **higher** outside metropolitan areas, reflecting an era when manufacturing was a

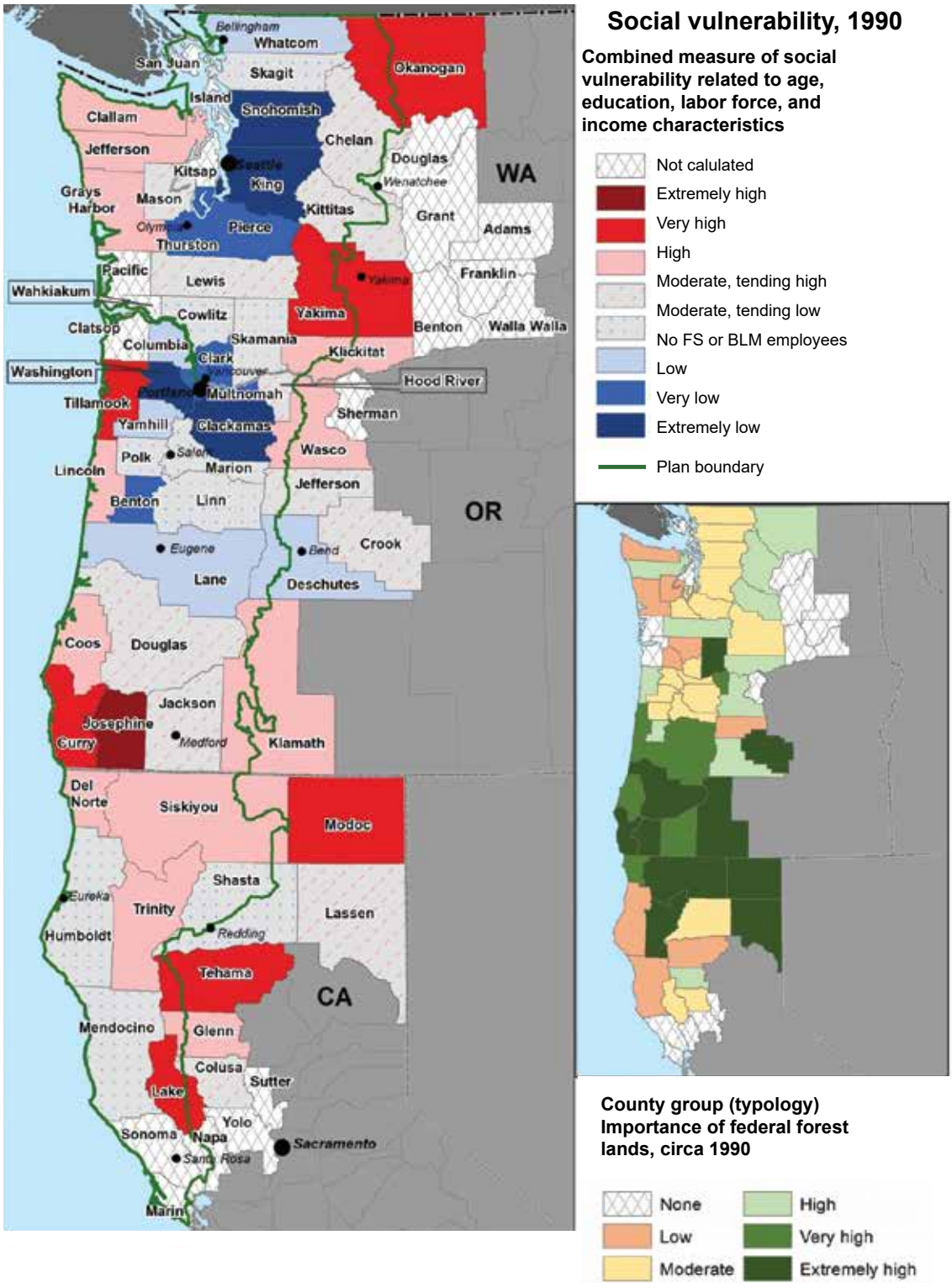

Figure 3.20—Relative social vulnerability for Northwest Forest Plan (NWFP) area counties in 1990. BLM = Bureau of Land Management, FS = Forest Service.

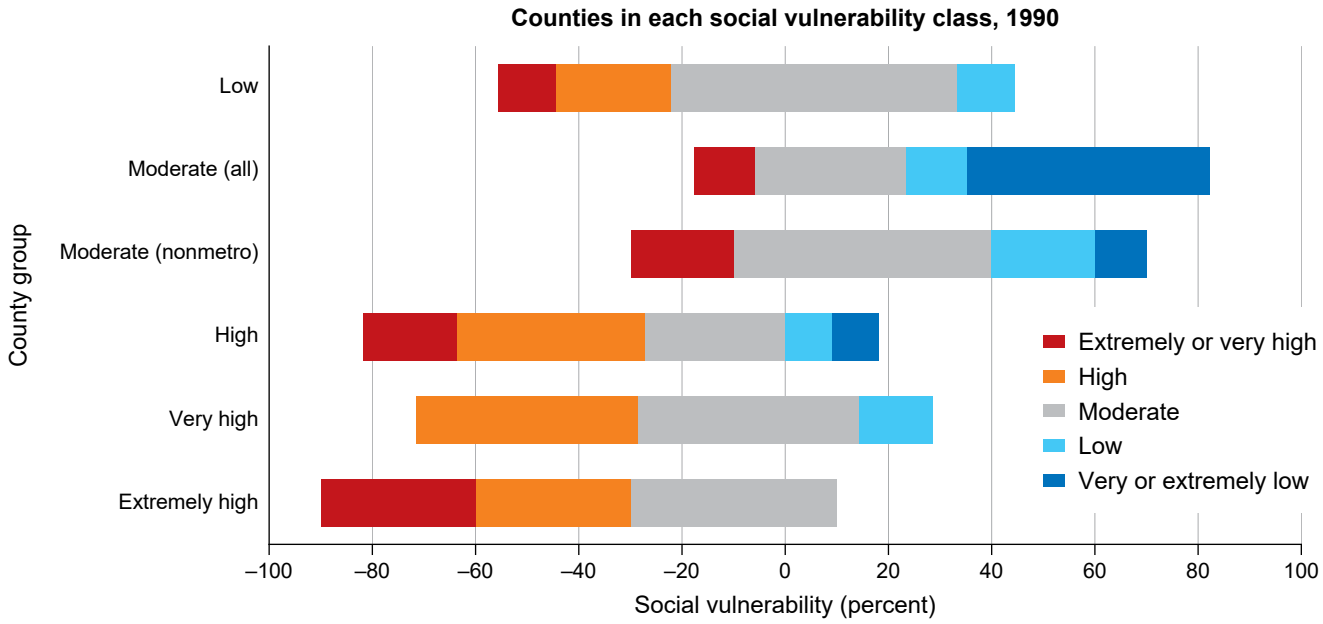

Figure 3.21—Share of counties by county group within relative social vulnerability classes (extremely high through extremely low) in 1990. The central y-axis (at 0 percent of the x-axis) corresponds to the average of 54 individual vulnerability scores for counties in the Northwest Forest Plan monitoring region in 1990 (see fig. 3.19). Moderate vulnerability counties (gray) are assigned to the right or left of the central y-axis based on whether they are above (positive) or below (negative) the 1990 average. Moderate (all) includes all metropolitan counties in Seattle-Tacoma, Washington (Clark, King, Pierce, and Snohomish), and Portland-Vancouver, Oregon (Clackamas, Multnomah, and Washington). Note that these seven counties dominate the very or extremely low end of the social vulnerability spectrum. Moderate (nonmetro) excludes the above-mentioned metropolitan counties.

regionally dominant job sector, and provided typically high-paying jobs even outside of metropolitan centers.

Understanding the recent trend leading up to 1990 is key to interpreting post-1990 trends corresponding to the NWFP era. Available data allow only for measuring change between 1980 and 1990. Social vulnerability in 1980 is mapped in figure 3.22, and the frequency of social vulnerability classes among the five county groups in 1980 is charted in figure 3.23.

The broad geographic pattern of social vulnerability in 1980 (fig. 3.22) is very similar to 1990 (fig. 3.20). Counties comprising the core of the two major metropolitan areas (Seattle and Portland) showed very or extremely low vulnerability. Very low or low vulnerability was generally found in the same areas in 1980 as in 1990—peripheral to core metropolitan areas (e.g., Cowlitz and Skamania Counties, Washington), and Benton, Lane, and Deschutes Counties, Oregon. Among the remaining small-city, nonmetropolitan, and rural counties, differences between 1980 and 1990 are subtle. There were fewer incidences of high vulnerability in coastal counties in 1980, particularly on Washington's Olympic Peninsula. Change of vulnerability class occurs only in isolated instances.

In 1980, social vulnerability classifications were distributed within the five county groups (fig. 3.23) in about the same manner as at the end of the decade, in 1990 (fig. 3.21). High or higher social vulnerability was rare in the "low" and "moderate" groups: of the 26 counties in these two groups, just three—Lake and Tehama Counties, California, ("moderate" and "low" groups, respectively) and Yakima County, Washington, ("moderate" group)—registered high or very high. A clear majority of counties in these groups had average or below average (moderate to very low) social vulnerability. Conversely, a majority of counties in the "high," "very high," and "extremely high" groups had above-average social vulnerability in 1980—six of eleven in the high group, two of seven in the very high group, and five of ten in the extremely high group. Low vulnerability was found in just four of the twenty-eight counties in these three groups: in Benton, Deschutes, and Lane Counties, Oregon, and Skamania County, Washington. All four were classified metropolitan in 1990, either because of the location of a mid-size city (Benton, Deschutes, Lane Counties) or because of commuting links to a major metropolitan area (Skamania County, to greater Portland, Oregon).

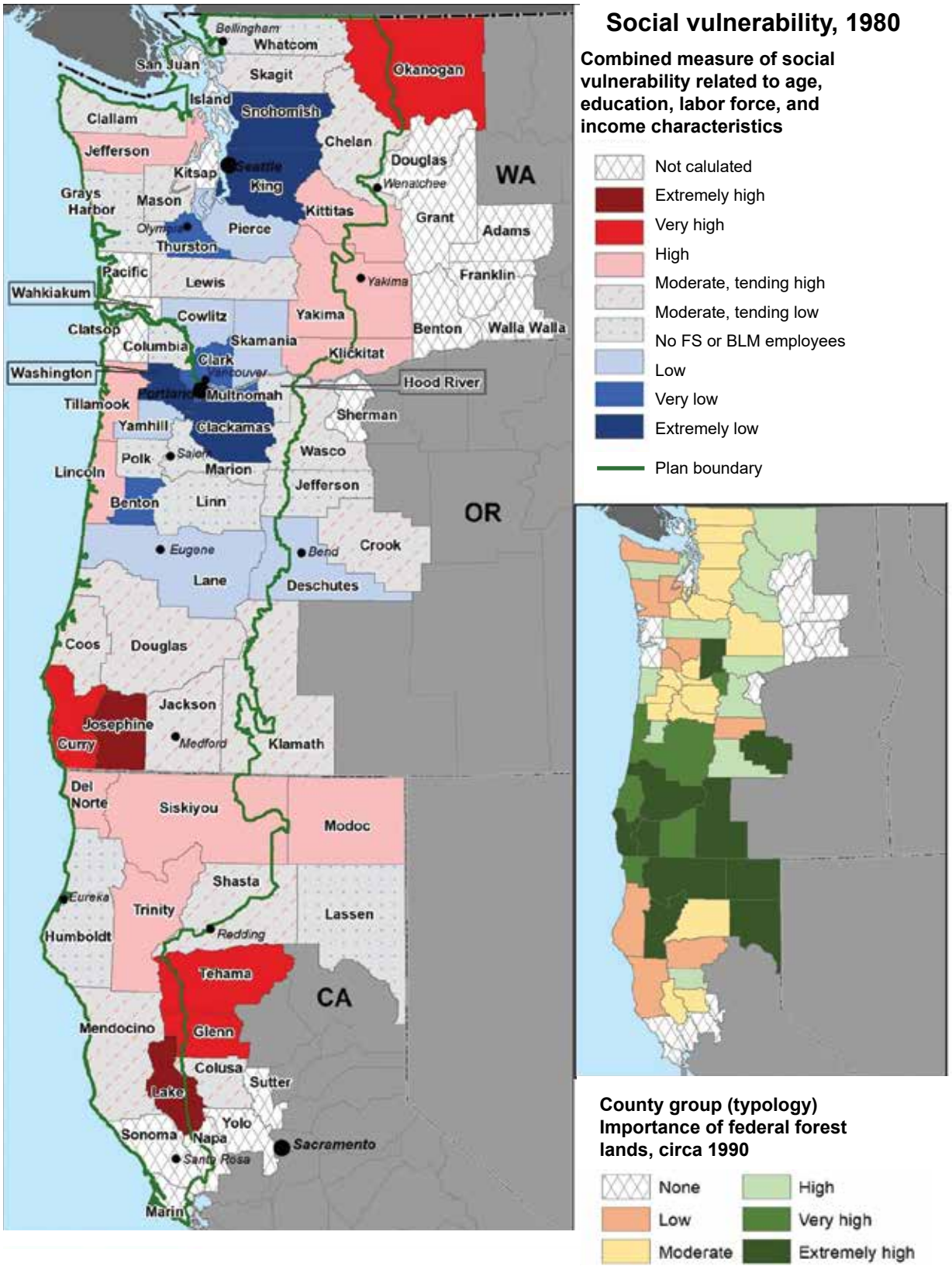

Figure 3.22—Relative social vulnerability for Northwest Forest Plan (NWFP) area counties in 1980.

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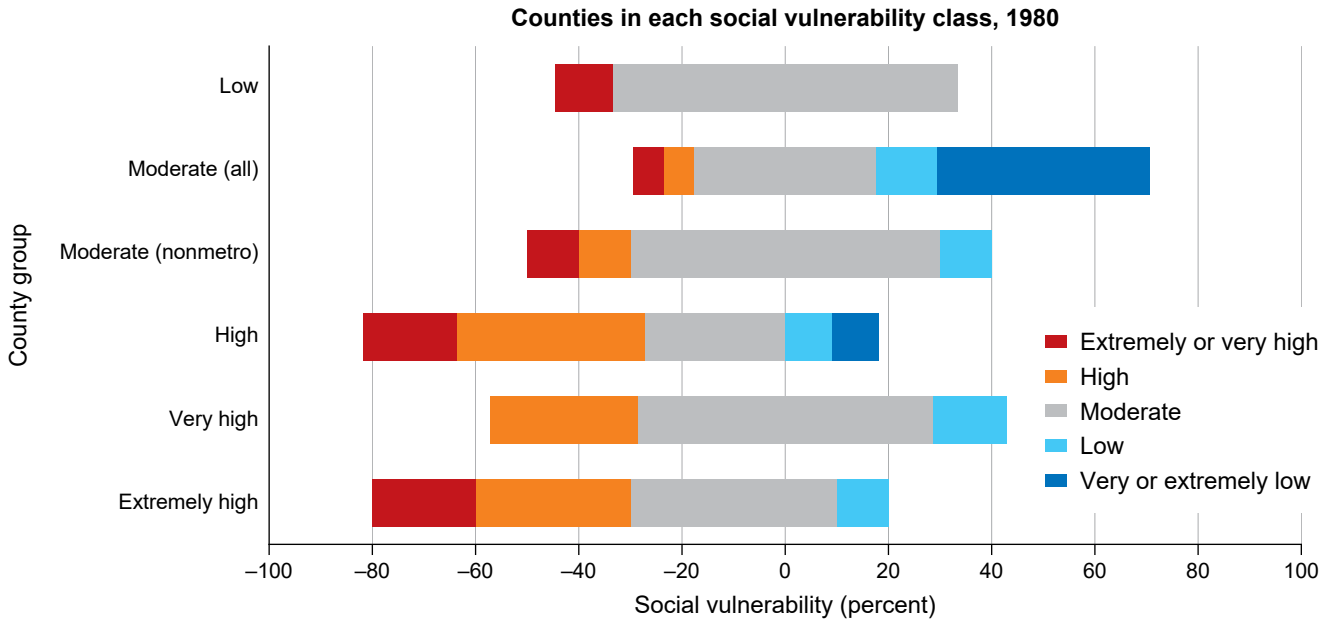

Figure 3.23—Share of counties by county group within relative social vulnerability classes (extremely high through extremely low) in 1980. The central y-axis (at 0 percent of the x-axis) corresponds to the average of 54 individual vulnerability scores for counties in the Northwest Forest Plan monitoring region in 1990 (see fig. 3.19). Moderate vulnerability counties (gray) are assigned to the right or left of the central y-axis based on whether they are above (positive) or below (negative) the 1980 average. Moderate (all) includes all metropolitan counties in Seattle-Tacoma, Washington (Clark, King, Pierce, and Snohomish), and Portland-Vancouver, Oregon (Clackamas, Multnomah, and Washington). Note that these seven counties dominate the very or extremely low end of the social vulnerability spectrum. Moderate (nonmetro) excludes the above-mentioned metropolitan counties.

Only changes that are large enough to cause social vulnerability in a county to be reclassified within the scheme shown in table 3.6 register in the preceding comparison of 1980 and 1990 maps (figs. 3.21 and 3.23). However, changes in relative social vulnerability too small to result in reclassification may still be important. They may signal a direction of change that continues in a subsequent measurement era, for example. In figure 3.24, the maps from figures 3.20 and 3.22 are placed side-by-side with a third map indicating where change in social vulnerability was detectable between 1980 and 1990, even if those changes did not result in reclassification. The third map aids in identifying subregions where a similar direction of relative vulnerability change occurred in multiple neighboring counties. There are four examples of NWFP subregions where relative vulnerability deteriorated (worsened) between 1980 and 1990: the eastern tier of NWFP-area counties in Washington and northcentral Oregon; Coos and Douglas Counties, Oregon; Washington's Olympic Peninsula (Clallam, Grays Harbor, and Mason Counties); and the east-side Cascades of southern Oregon and northeastern California (Klamath, Modoc, and Lassen Counties). Conversely, there are four clear regions in which social vulnerability improved: the eastern Puget Sound region of Washington; Portland and its northern suburbs (Clark, Columbia and Multnomah Counties); the southernmost NWFP-area counties in California; and east-central Oregon (e.g., Crook County).

The map in figure 3.24 indicates subregional change tendencies in levels of social vulnerability but does not clearly show the association between deteriorating or improving social vulnerability and the county typology. The chart in figure 3.25 accomplishes this by classifying the percentage of each group's counties according to whether they experienced deteriorating, improving, or no change in social vulnerability during the 1980s. Negligible or no change was the most common trend: 24 of 54 counties. Of these 24 counties, 13 are in the "moderate" group, and all of them remained at moderate or low vulnerability. Eight negligible or no change counties remained at high or very high vulnerability, and seven of these were in the "high," "very high," or "extremely high" groups, with the eighth

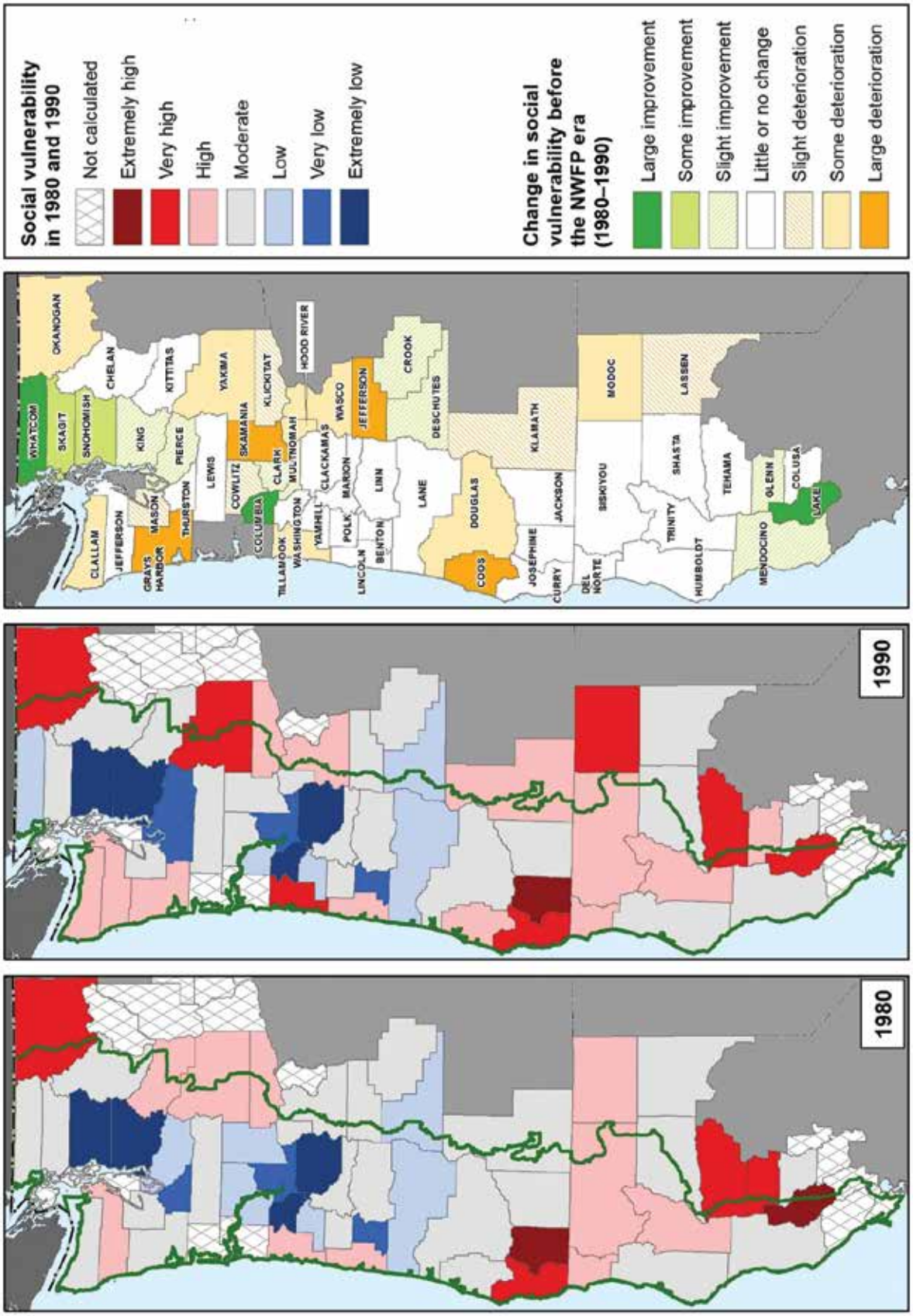

Figure 3.24—Change in relative social vulnerability in Northwest Forest Plan (NWFP) region counties between 1980 and 1990.

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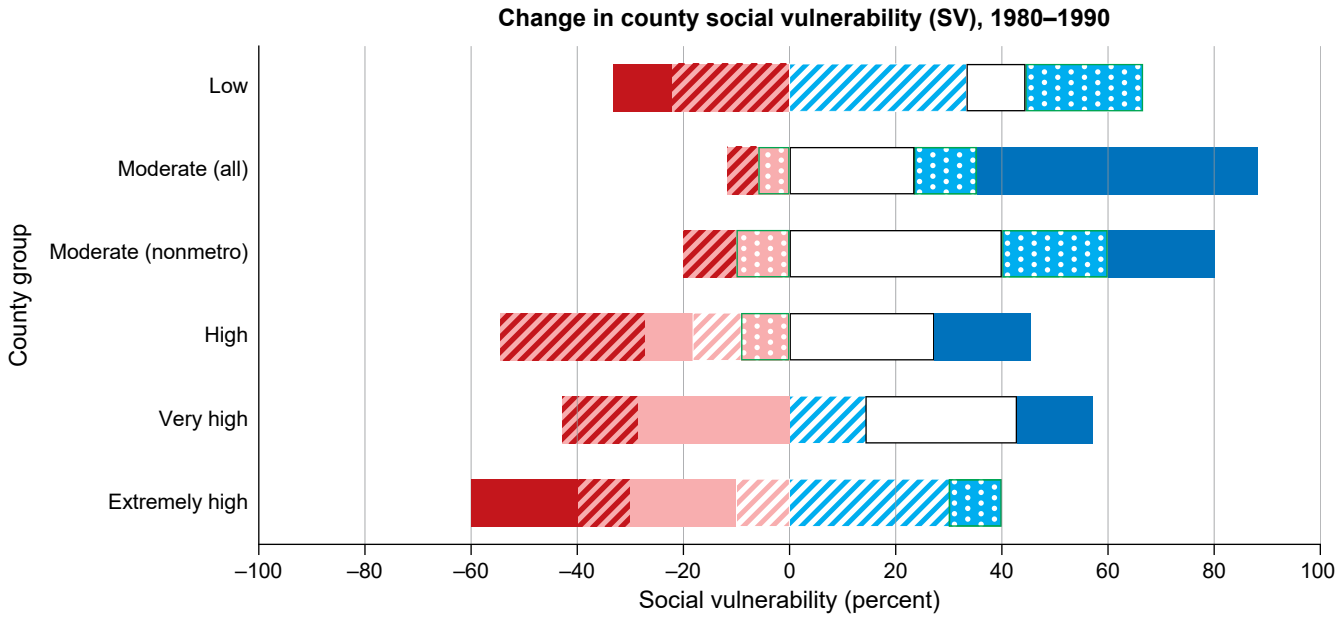

Legend	1980 SV	1980–1990 SV change	No. of counties
Very high, very high	Very or extremely high	None	3
High, –	High or very high	Deteriorated	8
High, high	High	None	5
–, high	Moderate or high	Deteriorated	2
High, +	High	Improved	2
–, Moderate	Low or moderate	Deteriorated	7
Moderate, moderate	Moderate	None	10
Moderate, +	Moderate	Improved	5
Low, low	Low or very low	None / improved	12

Figure 3.25—Change in individual county social vulnerability (SV) (see fig. 3.19) as a percent of counties within each county group, 1980–1990. Bar graph patterns indicate social vulnerability levels: forward slash hatching = deteriorating, stippling = improving, solid color = minimal or no change. For example, two of the ten counties (20 percent), Curry and Josephine, Oregon (see fig. 3.24), in the extremely high group had very high social vulnerability in 1980 and 1990, with minimal change during the intervening decade. These are represented in the solid red section of the bar spanning −40 to −60 percent. One county in this group, Modoc, California (fig. 3.24), had social vulnerability that was high in 1980 but very high in 1990; hence, its social vulnerability deteriorated, as indicated by the dark red forward slash hatching over a pink solid section of the bar spanning −30 to −40 percent. In contrast, 53 percent of moderate group counties sustained very low or extremely low social vulnerability from 1980 to 1990, hence just more than half the length of the bar is shown as solid blue to the right of the 0-percent axis, making it better than average. Moderate (all) includes all metropolitan counties in Seattle-Tacoma, Washington (Clark, King, Pierce, and Snohomish), and Portland-Vancouver, Oregon (Clackamas, Multnomah, and Washington). Note that these seven counties dominate the very low or extremely low end of the social vulnerability spectrum. Moderate (nonmetro) excludes the above-mentioned metropolitan counties. – = deterioration; improvement; + = improvement.

in the "low" group. Deterioration in vulnerability was the next-most common trend: 17 of 54 counties. Only one of these seventeen (Yakima County, Washington) was in the "moderate" group. Half of counties in the "extremely high" and "low" groups had a deteriorating trend, as did 36 percent in the "high" group and 28 percent in the "very high" group. There were 13 counties in which social vulnerability **improved** (lessened). These are shown in green fill or hatching on figure 3.24 and as sections of bars outlined in green in figure 3.25. Eight of these belong to the "moderate" group, two to the "low" group, and three to the "high" and "very high" groups—no "extremely high" group counties experienced improving vulnerability during the 1980s. All three counties where federal lands importance in the late 1980s was at least high and social vulnerability improved—Crook and Deschutes, Oregon, and Glenn, California—are on the periphery of the NWFP area.

Summary of social vulnerability change, 1980–1990—

The trajectories of social vulnerability change shown in figures 3.24 and 3.25 point to two broad social and economic change trends in the 54 counties analyzed in the NWFP monitoring region for the 1980s:

Origins of the urban-rural divide

1. Of the 54 NWFP counties, 13 saw improvements in relative social vulnerability between 1980 and 1990, 17 experienced deterioration, and the remaining 24 had negligible or no change. These numbers superficially suggest a nearly normal distribution of positive and negative social and economic change trends, but there is a clear geographic divide between where improvement and deterioration occurred.

Of the 13 improving counties, 8 are in the east Puget Sound urban complex of Washington, or the Portland-Vancouver metropolitan area. In seven of these eight counties, vulnerability was already low or very low in 1980, and improved further. Three of the remaining five, nonmetropolitan or rural counties in the southern end of the monitoring region in California, had some relative vulnerability improvement, but were still classified as moderate-high to very high vulnerability in 1990. Only two of the improving counties, Deschutes and Crook, Oregon, belong to a county group where both forest industry employment and federal forest lands management were highly important in the late 1980s, and only Crook County could be described as nonmetropolitan/rural. Improving social vulnerability in the 1980s, with limited exceptions, was confined to the NWFP monitoring region's major metropolitan centers.

Conversely, only 1 of the 17 instances of deteriorating (worsening) social vulnerability occurred in a "moderate" group county: Yakima, Washington. The other 16 are in one of three sub-regions where the deterioration trend is associated with already moderate to very high vulnerability in 1980. Each of these three regions is typified by counties belonging to the "low" group (Olympic Peninsula, Washington); "high" group (east Cascades of Washington and north-central Oregon); and "very high" or "extremely high" group (southwest Oregon). Although these subregions do not share importance of federal forest lands in the late 1980s in common, they do share two other traits: very high importance of forest products industry employment, and long travel times to major metropolitan areas, from 1 to 5 hours or more.

In short, counties typified by three factors—relatively remote location, lack of large population centers, and high dependence on forest products industry employment—were generally in a moderate to high social vulnerability state in 1980 and were generally worse off in 1990. Counties close to major metropolitan areas tended to be both in a lower vulnerability state in 1980 and either about the same, or better off, in 1990, regardless of the importance factor of either forest products employment or federal forest lands before the NWFP.

Socioeconomic convergence of the "low," "high," "very high," and "extremely high" groups

2. Only one of the nine counties (11 percent) of the "low" group was in the high or very high range of social vulnerability in 1980. The corresponding percentage in the "high," "very high," and "extremely high" groups was 54, 29, and 50 percent, respectively. Moderate social vulnerability in "low" group counties where forest products employment was highly important was the norm in 1980; this was unlike "high," "very high," or "extremely high" group counties where the same high importance of forest products employment was associated with high or very high social vulnerability.

During the 1980s, a majority of "low" group counties experienced deteriorating (worsening) social vulnerability, the highest rate of any county group, though similar to the "extremely high" group (50 percent). In both "low" and "extremely high" groups, roughly 30 percent of counties were moderately vulnerable in 1980 and more vulnerable in 1990. The trend of "low" group counties assuming social vulnerability characteristics more like those of the "very high" and "extremely high" groups during the 1980s implies **that counties in the "low" group were the most negatively affected by social and economic changes during the 1980s**. The importance of federal forest lands at the end of the 1980s is correlated with higher vulnerability on average in 1980, and with a moderate deterioration during the decade. However, where **neither** federal forest land management nor large urban area influences were present—typical of the "low" group—deteriorating social vulnerability was more pronounced. For nonurban counties where forest products employment was highly important, high importance of federal forest lands circa 1990 is associated with less widespread deterioration in social vulnerability during the 1980s. Note that this discussion is about association, not causation.

Change in Social Vulnerability During the NWFP Era (1990–2017)

Entering the 1990s, social vulnerability in metropolitan counties had generally improved over the preceding decade, while social vulnerability in nonmetropolitan and rural counties had generally deteriorated in the preceding decade. Deterioration in social vulnerability during the 1980s in rural or nonmetropolitan counties was typically greater in counties that were more remote from metropolitan centers, highly dependent on forest products employment, or both. In large part, these changes reflect the postindustrial national and international economic restructuring that began in the 1980s.

Against this backdrop, the ROD monitoring direction asks agencies to determine whether there are positive or negative social and economic change trends since 1990 that might be uniquely associated with implementation of the NWFP. Given existing trends that defined the 1980s, identification of such an association, requires determination that (1) there is a shift to a more rapid rate of social vulnerability deterioration after 1990 that is distinguishable from the rate or extent of deterioration between 1980 and 1990 (the "background change rate") in counties with very strong circa 1990 connections to federal forest lands; (2) social vulnerability improves in these counties, since it had generally been about the same or slightly deteriorating during the 1980s; (3) any shift in social vulnerability in these counties does not also occur in the counties where federal forest lands were moderately or minimally important circa 1990.

This section presents the 1990–2017 vulnerability change trend in the NWFP county groups. This era of vulnerability change is the nearest equivalent to the NWFP era (1994–2017), and the year 1990, as discussed earlier, is a kind of "hinge" year for social and economic links to forest management in the NWFP monitoring region. Because decade-by-decade change trends are strongly skewed by the 2007–2009 global Great Recession, there is an anomaly in reporting 2000–2010 social vulnerability change, which over-emphasizes the temporarily deteriorating social vulnerability in the "moderate" group (refer to fig. 3.19). Because this trend could cause confusion in interpreting the results, we focus on the long span of change during the entire NWFP era equivalent data period, 1990–2017. This has the benefit of smoothing variations in the degree of interdecadal change, thus establishing the main trajectory lasting roughly two-thirds longer than the average adult's working years.

Counties showing significant improvement on the east side of the Cascades in Washington and northcentral Oregon (fig. 3.26) are practically identical to counties in the same region that almost uniformly experienced deteriorating social vulnerability in the 1980s (fig. 3.24). Aside from these seven contiguous east-side Cascades counties, only five others in the entire NWFP monitoring region had improved social vulnerability in 2017 compared to 1990; each is isolated from the others. In only three of these (Tillamook and Josephine Counties, Oregon, and Skagit County, Washington) was social vulnerability in 2017 notably different than in 1990 (Tillamook, very high to moderate; Skagit, moderate to low; Josephine, extremely high to very high). These results emphasize two main themes regarding social vulnerability change in the NWFP area as defined in this analysis: (1) even modestly improved social vulnerability after 1990 is rare; and (2) because a swath of counties on the east side of the Cascades belong to three different groups from the typology ("moderate," "high," and "very high," although the majority are in the "high" group), locational factors not captured in the typology must have a role in social vulnerability improvement.

Deteriorating social vulnerability between 1990 and 2017 clusters in particular subregions of the NWFP monitoring region (fig. 3.26). One subregion dominates a large part of the map: a contiguous span of nine counties from Benton and Lane Counties in west-central Oregon through coastal northern California. Other, more isolated instances of deterioration are found in western Washington, east of the Cascades in central Oregon and northeastern California, and suburban counties of Portland and Seattle (Snohomish, Washington, and Clackamas, Oregon). The last of these subregions is of little interest because the counties in question are still among the half-dozen that were least socially vulnerable in the entire NWFP monitoring region in 2017. Removing these from consideration results in 15 counties where social vulnerability deteriorated between 1990 and 2017, none of which belong to the "moderate" county group. Seven are part of the "low" group, and the remaining eight belong to either the "high" (one) "very high" (three) or "extremely high" (five) groups. This element of the map in figure 3.26 reinforces the impression gained from several of the trend analyses in the above sections on demographic,

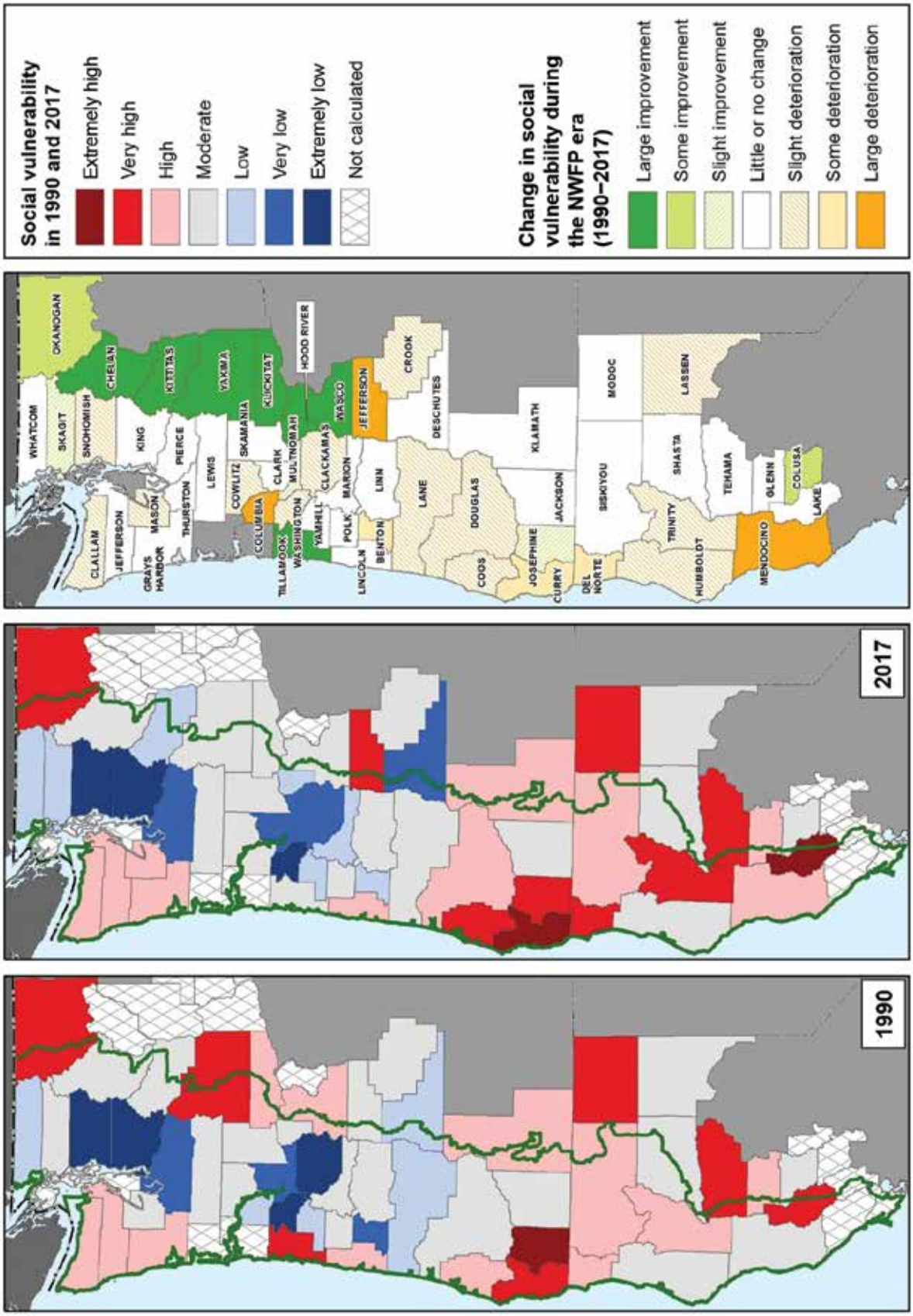

Figure 3.26—Change in relative social vulnerability in NWFP counties between 1990 and 2017.

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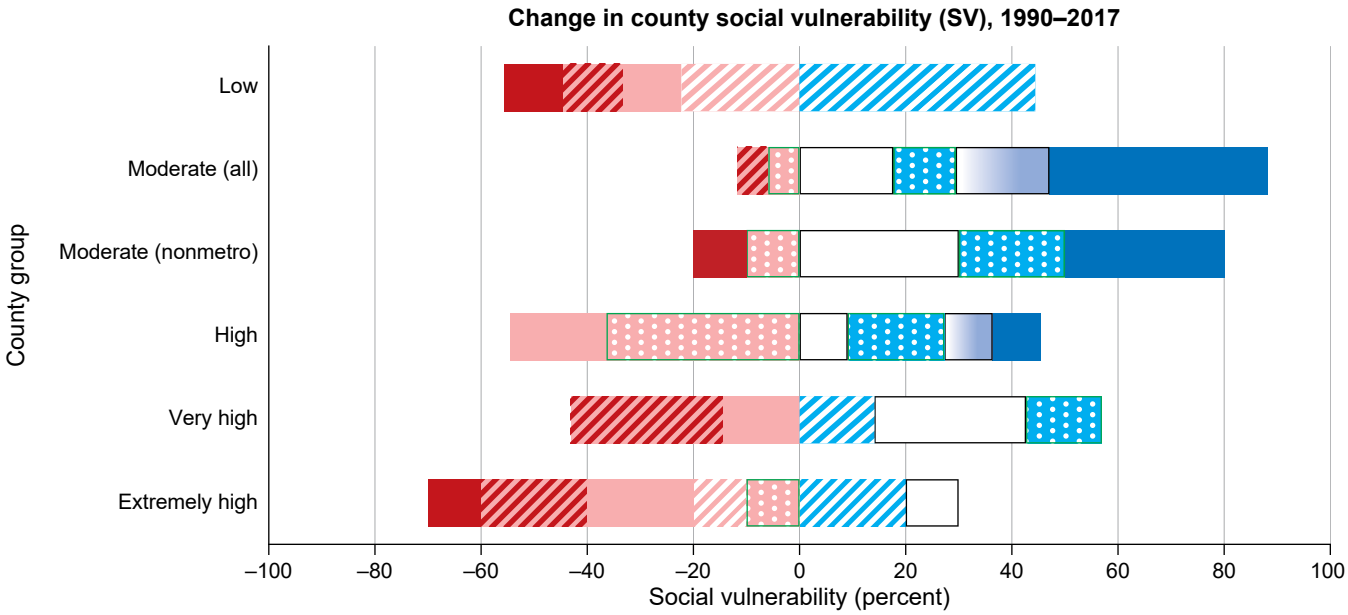
employment, and income changes in which trends for the "low," "very high," and "extremely high" groups were frequently similar for such measures as changes in dominant industry sector for wages (fig. 3.12), per capita income (fig. 3.9), unemployment (fig. 3.16), and poverty (fig. 3.18). Recalling the analysis in the "Typology Discussion" section in chapter 2, these three groups were similar, and distinct from the "moderate" and "high" groups, in the percentage of wages earned from the forest products industry, particularly in wood products manufacturing.

Figure 3.27 provides a systematic appraisal of the relationship between change in social vulnerability during the NWFP era and county type. More than half of counties in the "high" group had improved vulnerability. Roughly a third of these showed improved vulnerability in counties where it was high in 1990. Most in this subgroup are



Legend	1980 SV	1980–1990 SV change	No. of counties
Very high, very high	Very or extremely high	None	3
High, –	High or very high	Deteriorated	8
High, high	High	None	5
–, high	Moderate or high	Deteriorated	2
High, +	High	Improved	2
–, Moderate	Low or moderate	Deteriorated	7
Moderate, Moderate	Moderate	None	10
Moderate, +	Moderate	Improved	5
Low, low	Low or very low	None / improved	12

Figure 3.27—Change in individual county social vulnerability (see fig. 3.19) as a percent of counties within each county group, 1990–2017. Bar graph patterns indicate social vulnerability levels: forward slash hatching = deteriorating, stippling = improving, solid color = minimal or no change. For example, 30 percent of the extremely high bar in the graph is to the right of the 0-percent y-axis, while 70 percent is to the left. This indicates that social vulnerability for three of ten counties in this group was below average for the region in 1990 and above average for the remaining seven. One of these three counties (10 percent of the group), Skamania, Washington, had moderate social vulnerability in both 1990 and 2017, with minimal change in the intervening years. The solid white portion of the bar spanning 20 to 30 percent represents unchanged social vulnerability for Skamania during the Northwest Forest Plan era (1990–2017). Two other moderate counties in this group, Crook, Oregon, and Lassen, California (see fig. 3.26), had some deterioration in social vulnerability during the era but were still classified as "moderate" in 2017, as shown by the blue forward slash hashing in this bar to the right of of the 0-percent axis. Moderate (all) includes all metropolitan counties in Seattle-Tacoma, Washington (Clark, King, Pierce, and Snohomish), and Portland-Vancouver, Oregon (Clackamas, Multnomah, and Washington). Note that these seven counties dominate the very low or extremely low end of the social vulnerability spectrum. Moderate (nonmetro) excludes the above-mentioned metropolitan counties. - = deterioration; improvement; + = improvement.

counties east of the Cascades (see fig. 3.26). Improved vulnerability in counties where it was high in 1990 is very limited: one county in the "moderate" group (Yakima, Washington), and in the "extremely high" group (Josephine, Oregon, where social vulnerability remained among the highest of all 54 counties in 2017, even after improving since 1990). Hood River County, Oregon, on the east side of the Cascades, had the largest social vulnerability improvement of all the 54 counties from 1990 to 2017, after vulnerability had deteriorated there between 1980 and 1990. Hood River is the only county among the "low," "very high," and "extremely high" groups that began the NWFP era in the moderate to high vulnerability range and ended in the low range. Its exceptional status is indicative that the norm for counties in these groups was that social and economic conditions were no better, usually worse, in 2017 than in 1990.

Deteriorating social vulnerability was the dominant trend in the "low" and "extremely high" groups during the NWFP era and occurred in about half of the "very high" group counties (fig 3.27). Eighteen of nineteen counties in the combined "low" and "extremely high" groups were either in a high social vulnerability state in 2017, experienced deteriorating vulnerability during the NWFP era, or both. In contrast, social vulnerability deteriorated in just 4 of the 28 counties in the "moderate" and "high" groups; three of these were low vulnerability counties in suburban Seattle and Portland, and the fourth, Benton County, Oregon is something of a special case owing to the unusual dominance of its employment base by Oregon State University.

The ROD directs agencies to evaluate the hypothesis that implementation of the NWFP could be associated with positive or negative social and economic change. The evidence in figures 3.26 and 3.27 does not offer straightforward support for that hypothesis. Rather, the evidence suggests a complicated situation in which there is no simple linear association between the combined importance value of federal forest lands and forest industry employment in the late 1980s, and positive or negative social and economic change defined as improving or deteriorating social vulnerability, respectively. Among groups of counties where the importance of federal forest lands was highest, vulnerability deteriorated in about half; improvement was very rare, and where it occurred, the county remained in a high vulnerability condition in 2017. For these counties, the social vulnerability trend after 1990 was very similar to the 1980–1990 trend in most cases.

There is only one example of a clear "break" in a trend, occurring in 1990, leading toward either improved or deteriorated social vulnerability in 2017 contrasting with the established trend for the 1980s that would suggest a role for the implementation of the NWFP in social and economic change—as outlined at the start of this section. This occurred in most of the counties in the east-side Cascades region (fig. 3.26) where vulnerability was improved in 2017 compared to 1990; reference to figure 3.24 shows that five of these seven counties—Okanogan, Yakima, Klickitat, Hood River, and Wasco—experienced deteriorating vulnerability in the 1980s, followed by improvement between 1990 and 2017. There is only one other example of such a break, which occurred for Tillamook County. Two counties in the "low" group (but with dissimilar geographic contexts)—Columbia and Mendocino—exhibited the opposite trend, with improvement during the 1980s followed by deterioration during the plan era. These results do not provide support for the hypothesis posed by the ROD that changes in federal forest management could be associated with unique negative social and economic changes. A break in pre-existing social vulnerability change trends that even implies a possible role for the NWFP based on chronology alone is not sufficiently associated with any of the county groups to warrant further exploration at this scale of analysis.

Instead the map in figure 3.26 strongly implies that geographic location in combination with very high importance of private employment in forest industry circa 1990 is an important predictor of **negative** social and economic change during the NWFP era, and location in a metropolitan area alone is a predictor of **positive** social and economic change. The strongest evidence for this alternative interpretation of social and economic change during the NWFP era is provided by the "low" group counties. In these counties, federal forest lands were minimally important circa 1990, but forest products industry employment was extremely important. Almost all the "low" group counties are located at a considerable distance from major metropolitan centers. Seven of the nine counties are not located on an interstate highway, and only one of the nine is part of a major metropolitan area (Columbia County, Oregon).

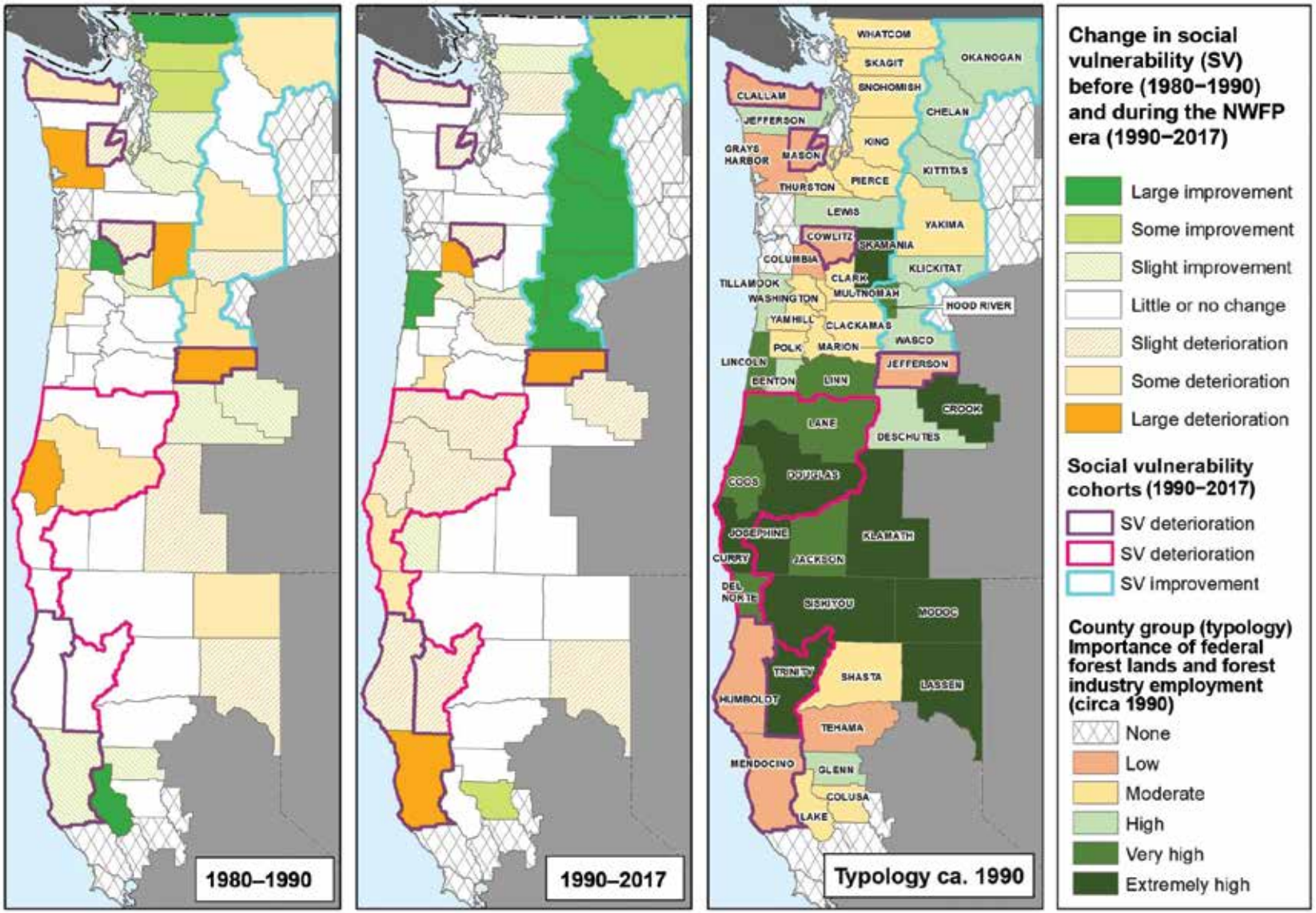


Figure 3.28—Counties with shared social vulnerability improvement or deterioration trends in the Northwest Forest Plan (NWFP) monitoring region, 1990–2017. Note that two of the three county cohorts experienced social vulnerability deterioration.

Elements of Positive and Negative Social Vulnerability Trends in the NWFP Area Since 1980

An explanation for positive or negative social change trends in the NWFP monitoring region since 1990 must lie in location factors that are, at best, indirectly related to the county typology (figs. 2.11, 3.26). This section explores what these factors could be by evaluating changes in the six factors that comprise the typology independently, focusing on the three cohorts of counties outlined in figure 3.28: the "improved" group of contiguous counties on the east side of the Cascades; and two "deteriorated" cohorts, one comprised of geographically discontinuous members of the "low" group (Clallam, Mason, Cowlitz, Jefferson, [Oregon], Humboldt, and Mendocino; and contiguous members of the "very high" and "high groups" in southwestern Oregon and northern California (Lane, Douglas, Coos, Curry, Josephine, Del Norte, and Trinity).

Figure 3.29 compares the six location quotients within these three cohorts to the 54 counties as a whole for each of the years, 1980, 1990, 2000, 2010, and 2017. The gray vertical bar at left for each data year defines the minimum and maximum value for all 54 location quotients of each variable, and the small horizontal bar identifies the mean for all 54 counties. The green bars identify the same values for the "improved" cohort, and the orange and yellow bars correspond to the two "deteriorated" cohorts—yellow for the cohort belonging to the "low" group, orange for the other. Some combination of two trends should be identifiable if the variable is contributing substantially to the overall change in social vulnerability: the relationship of the range of values in the green, yellow, or orange vertical bars to the gray bar should be increasingly different moving forward in time; and the position of the horizontal bar, indicating the mean value for each cohort, should increasingly be differentiated from both the gray horizontal bar and from those of the other change cohorts.

Adults aged 65 and older—

The overall trend established by the gray bar for the 54 counties is a slight increase in the minimum value in each decade, a large increase in the maximum value between 1990 and 2000 after which it shrinks slightly; and a steady increase in the value of the mean—indicating, the population of the "average" NWFP monitoring region county has been proportionally older in each successive census since 1980. The green bar contrasts with this trend: the maximum value remains nearly constant through the decades, the minimum value is progressively smaller, and the position of the mean is slightly lower in each successive decade. Hence, population in the "improvement" cohort of counties became, on average, proportionally somewhat **younger** in each decade after 1980. Differences between the "improved" cohort and the NWFP region are not large, but they are distinct. In the "deteriorated" cohorts, significant negative change—increasing concentration of adults age 65 and older—occurred in the 1980s and 1990s in the southwestern Oregon cohort (yellow bar) (fig. 3.29). The mean is above 1.5—half again the population of adults over age 65 expected—in 2000 and afterward. The minimum value is greater than 1 for every decade after 1980 and is typically not much less than the mean value for the green cohort in those years. In the "low" group (yellow bar), the trend is essentially the same, with values not quite as high. **Intensifying concentration** of adults age 65 and older in the population is an important driver of **deteriorating** social vulnerability in both cohorts, more dramatically so in the yellow cohort; **lessening concentration** of adults age 65 and older in the population is an important component of **improving** social vulnerability in the mean cohort.

Adults aged 25 and older, no college—

An increase in the concentration of adults lacking any post-high school education among the general adult population is assumed to drive deteriorating social vulnerability: members of this cohort are presumably less competitive for jobs in emerging industries or professional specializations that pay higher wages. Following a large jump in the 1980s, driven by very rapid growth in adults with college experience in a few urban counties, the mean for the region remained constant from 1990 onward. Surprisingly, it is the "improved" cohort (green) where the concentration of adults with not more than a high school diploma has increased the most relative to the region (fig. 3.29). One of the improving cohort counties, Yakima, Washington, has the maximum location quotient value for all 54 counties analyzed in the region in both 2010 and 2017. The two deterioration cohorts share very similar change

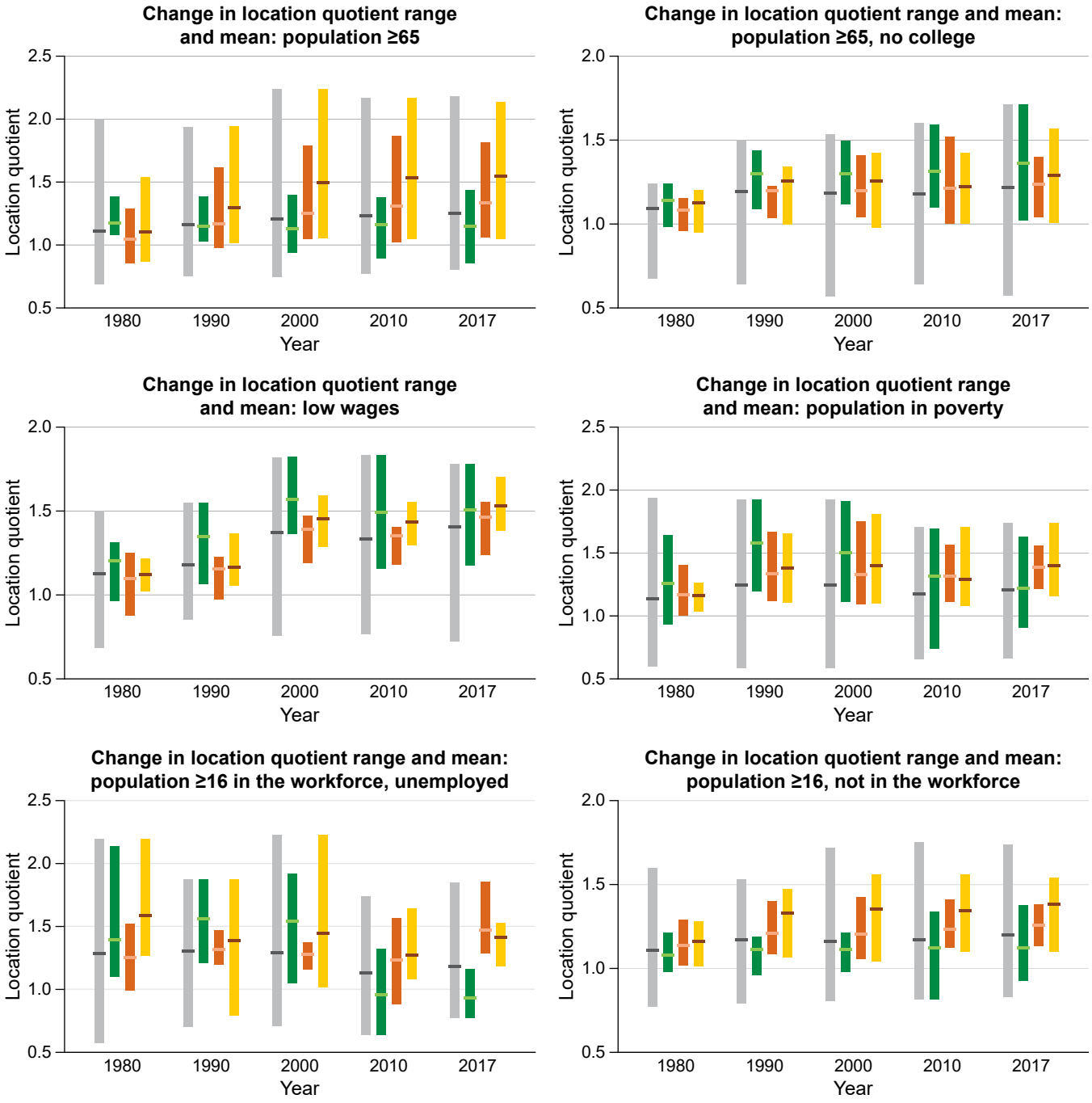


Figure 3.29—Key factors in changing social vulnerability between 1980 and 2017 for three county cohorts (see fig. 3.28). Relative social vulnerability range and mean is shown for county cohorts with improved (green) and deteriorated (yellow and orange) social vulnerability (fig 3.28), and for all 54 counties analyzed in the Northwest Forest Plan Monitoring region (gray). Horizontal lines in bars indicate the 54-county mean.

trajectories: the largest change was increased concentration of no-college adults between 1980 and 1990. After 1990, the mean and minimum values are essentially unchanged in each decade, with some fluctuation in maximum values. Mean values are roughly comparable to the NWFP region and, surprisingly, are substantially less than the "improved" cohort in 2000 and afterward. The concentration of adults lacking post-high school education appears average in the deteriorated cohorts and atypically high in the "improved" cohorts: a surprising result. A concentration of less-educated adults in the population thus contributed slightly to social vulnerability deterioration in the yellow and orange cohorts; it **counteracted** the improvement trend in the green cohort. Improvement in this cohort would have been even stronger had concentrations of these adults been similar to the "deteriorated" cohorts.

Total wages—

The location quotient for total wages is calculated **inversely**; higher values indicate a concentration of lower wage jobs. The range of values in the gray bar expands dramatically between 1990 and 2000, mostly in an expanded minimum range less than 1; this reflects rapid growth in high-wage jobs in a few counties of the "moderate" group (figs. 3.12, 3.13), which increased disparities between the majority of counties in the region and these few. As the range expands, the mean jumps higher: most counties do not participate in this rapid growth in high-wage jobs, resulting in more income concentrating in fewer counties at the bottom end of the range.

In all five observations, the "improved" cohort has a higher range and mean for the wage location quotient than both the region and the "deteriorated" cohorts; in all but 1980, one of the "improved" cohort counties—Okanogan, Washington—has the highest value (lowest concentration of wages) in the NWFP monitoring region. Other counties in that cohort, including Kittitas, Washington, and Hood River, Oregon, also appear in the half-dozen highest values (concentration of low-wage jobs) in 1990 and 2000. The mean lowers after 2000, along with the minimum value, suggesting that the wage trajectories of these counties diversified after values rose in concert between 1980 and 2000.

In both "deteriorated" cohorts, but particularly the one associated with the "low" county group, the changing value of the mean tracks the changing value of the mean for the region. The relatively narrow range of values indicates strong similarity in the concentration of wage income among the counties of each cohort—the opposite of the entire region (fig. 3.29: gray bar). There is more upward movement between 1980 and 2017 in the mean and range of the deteriorated cohorts than the improved cohorts, and that upward movement is expected to lead to deteriorated vulnerability. In this case, the explanation would be the erosion of wages relative to the region as higher-paying jobs disappear over time. Figures 3.12 and 3.13 reinforce this finding for the "low," "very high," and "extremely high" groups—from which these two deteriorated cohorts exclusively draw.

This chart may seem counter-intuitive: the "improved" cohort has the highest concentration of low wage employment. The key is that improved and deteriorated are descriptions of change, and the "improved" cohort actually does improve on this measure **in a relative sense**. There is a much greater difference between the means of the improved cohort, and the region and deteriorated cohorts, in the 1980, 1990, and 2000 observations. This difference lessens after 2000: in effect, more counties in the region, including those in the deteriorated cohort "catch up" to where these improved cohort counties were in 1980, 1990, and 2000—high concentrations of low-wage work—while some of the improved cohort counties (e.g., Hood River) experience improvement via the lessening concentration of low-wage employment. This variable nicely illustrates the complex tradeoff between describing vulnerability at a point in time, and describing vulnerability change over time: if the monitoring direction was interpreted simply as "where are their socially vulnerable counties in 2017?" several members of the "improved" cohort would likely be counted among the high-vulnerability counties given their high concentration of low-wage employment. But when concentrations of low-wage employment were **relatively** higher in 1990 than in 2017, the result is a contribution to social vulnerability improvement.

Poverty—

The poverty chart in figure 3.29 establishes the clearest pattern of change that explains why one cohort has "improved" while the others "deteriorated" after 1990. Mean values for poverty concentration in the region change relatively little over the five reporting dates, though the range shrinks after 2000—this is probably caused by a lessening of concentration regionally—poverty becoming more evenly distributed among counties in contrast to 1980

and 1990. In 1980 and 1990, the "improved" cohort has the highest range and mean for poverty concentration; the "deteriorated" cohorts are also higher than the region, but not as high. Poverty concentration increased substantially during the 1980s in the region, somewhat more so in the deteriorated cohorts—and most of all in the "improved cohort," such that the mean concentration of poverty among improved cohort counties in 1990 was 1.57, one of the highest mean values in any year for any of the six variables shown in figure 3.29.

1990 is the hinge for social vulnerability change in the NWFP region, and in 1990 poverty in the counties of the improved cohort was already relatively more concentrated than anywhere else in the region. From this point it would take a remarkable turn of events for poverty to further concentrate in the improved cohort counties—either no change or lessening was much more likely. The latter clearly occurred: by 2017, the mean poverty concentration in the improved cohort was the same as for the entire region and was lower than either deteriorated cohort—a reversal from 1980 and 1990. Poverty clearly worsened in a relative sense in the deteriorated cohorts, while lessening in the improved cohort—a straightforward interpretation.

Unemployment and workforce nonparticipation— As discussed in the "Employment and Income Change" section, unemployment and workforce nonparticipation are best understood in tandem. In 1980, unemployment concentration was much more significant in the "improved" and southwest Oregon deteriorated cohorts compared to the region, but not so in the "low" group deteriorated cohort. All three cohorts had nonparticipation characteristics that were similar to the region, but much smaller value ranges – less diversity in the tendency for nonparticipation to be concentrated among each cohort's counties. Concentrated unemployment appears to decline in the southwest Oregon cohort between 1980 and 1990, returning to levels closer to the region overall—**but this is countered by a sharp increase in concentration of workforce nonparticipants**. Lack of participation is often a principal cause of declining unemployment. Compared to the region, unemployment concentration increased and nonparticipation concentration decreased in the improved cohort between 1980 and 1990. Changes in the "low" group deteriorated cohort are modest, and differences between it and the region for both measures in 1990 are only slightly greater than in 1980—this cohort was still following unemployment and nonparticipation averages for the region closely in 1990 (fig. 3.29).

Dramatic differences emerge after 1990. In the improved cohort, nonparticipation is slightly less concentrated than for the region overall in every decade, and the cohort includes the lowest concentration level of nonparticipants recorded for any county in 2010, in Hood River County, Oregon. Concentrated unemployment, still on average much higher than the region in 2000, dropped to levels far lower than the region in 2010 and 2017. The combination of consistently slightly below-average concentration in workforce nonparticipation, and dramatically lessening concentration of unemployment after 2000 is the most impactful of any of the six variables contributing to improving social vulnerability for this cohort. In the "improved" cohort, most adults over age 16 were actively looking for work and finding work in these two reporting periods, which contrasts sharply with the situations in 2000, 1990, and 1980.

Exactly the opposite occurs in the "deteriorated" cohorts. The mean and range of the southwestern Oregon cohort remain at similar levels for nonparticipation annually from 1990 through 2017, while unemployment concentration grows significantly higher compared to all counties in 2000 and 2017. In the "low" group improved cohort counties, the mean for concentrated unemployment was consistently on par with all counties in 1990 and 2000, but somewhat higher in 2010 and much higher in 2017. Concentrated nonparticipation also increased incrementally relative to all counties in 2010 and 2017. Here too, workforce and employment status are the most significant factors driving deteriorating social vulnerability for both cohorts. Especially after 2000, there were very high concentrations in these counties both of adults over age 16 who were not seeking to work and of those actively seeking work but not finding it. In the southwestern Oregon (orange) cohort, an unusually high concentration of the unemployed was also present in 1980, and the apparent lessening of unemployment between 1980 and 1990 is mitigated by the rise in nonparticipation; unlike the "low" group "deteriorated" cohort, this cohort of counties appears to have uniquely struggled with lack of adequate employment opportunities since before the NWFP era.

Summary of factors contributing to changed social vulnerability in selected county cohorts—

Relative to all counties, **improved** social vulnerability counties (fig. 3.29: green) saw the following:

- Dramatically improved workforce conditions—active participation and low unemployment—particularly after 2000.
- Concentrations of low wages on average relatively much higher in 1990, but not as relatively high after 2000.
- Lessening concentration of poverty—from higher than average in 1990 to below average in 2017.
- Typical concentration of adults age 65 and older in 1990, but progressively lower concentrations on average than the region in each successive data year.

Relative to all counties, **deteriorated** social vulnerability counties (fig. 3.29: yellow and orange) saw the following:

- Concentrations of adults over age 65 and workforce nonparticipants (these are correlated) that grew much more rapidly than for counties overall, especially in the southwestern Oregon cohort with counties drawn from the "very high" and "extremely high" groups.
- Average concentration of unemployed adults after 1990, (after 2000 for counties in the "low" group cohort) increasing faster than for the region or the "improved cohort." Coupled with increasing average concentrations of nonparticipants (especially for the southwestern Oregon cohort), relatively much higher proportions of adults were not working in 2000, 2010, and 2017 in these cohorts.
- Increasing average concentrations of low-wage employment—from comparable to the region in 1980 and 1990, to much above the region in 2010 and 2017 (especially for the southwestern Oregon cohort).
- Stable high concentrations of poverty contrasting with a slight decline in the average poverty concentrations for the region.

The essential factor in improved social vulnerability east of the Cascades in Washington and northcentral Oregon appears to be maintaining a younger and more actively employed population in comparison to all counties, especially compared to those with deteriorated social vulnerability. Persistently high average concentrations of low wages and adults with no education beyond high school suggest that much of this available employment was relatively low wage and had lower skill requirements; otherwise, the improvement trajectory would have been even more pronounced. Likewise, the essential factors in deteriorated social vulnerability, both for neighboring counties belonging to the "very high" and "extremely high" groups (southwestern Oregon cohort) (fig. 3.29: orange), and for dispersed counties all belonging to the "low" group (fig. 3.29: yellow), are high concentrations of older population and employment inactivity. Differences among the cohorts in the average concentration of poverty are variable for 1990–2017. Low wages and lack of education beyond high school are shared traits of the improved and deteriorated cohorts after 1990 and are especially concentrated in the improved cohort for most of 1990–2017.

Figure 3.29 reveals a key finding. Interviewees in the 10 case study communities (chapter 4) frequently emphasized that lack of "family-wage" jobs was an essential contributor to community decline. Recalling the caveats that this analysis is at the county, not community, scale, and that all modes of calculating a social vulnerability metric are inherently subjective, here **low wages are not necessarily linked to deteriorating social vulnerability during the NWFP era**. Social vulnerability improved in the counties spanning the east-side Cascades of Washington and north-central Oregon despite a persistent high concentration of low-wage employment.

Much more prominent in the social vulnerability improvement and deterioration change trends for these cohorts of counties are relative concentrations of older, nonworking, and unemployed adults. However, it is important to emphasize that these traits are not **causes** of social vulnerability; they are manifestations of it. Concentrated older adult population is a phenomenon that takes more than one decade to develop. Rapidly aging populations occur when natural increase (the ratio of births to deaths in a county or community) is low, and in-migration is limited or nonexistent (see "Demographic Change" above). The "very high," "extremely high," and "low" groups experienced much more rapid aging than the NWFP monitoring region as a whole during both the NWFP era and the 1980s. Additional age-related traits common to these groups are very low or negative growth in adults in the age 25 to 44 cohort, especially between 1980 and 1990, and total population stasis or decline since 2010.

Deteriorating social vulnerability in the two cohorts recorded here (fig. 3.29) is ultimately very likely related disproportionate outmigration of young adults in the 1980s,

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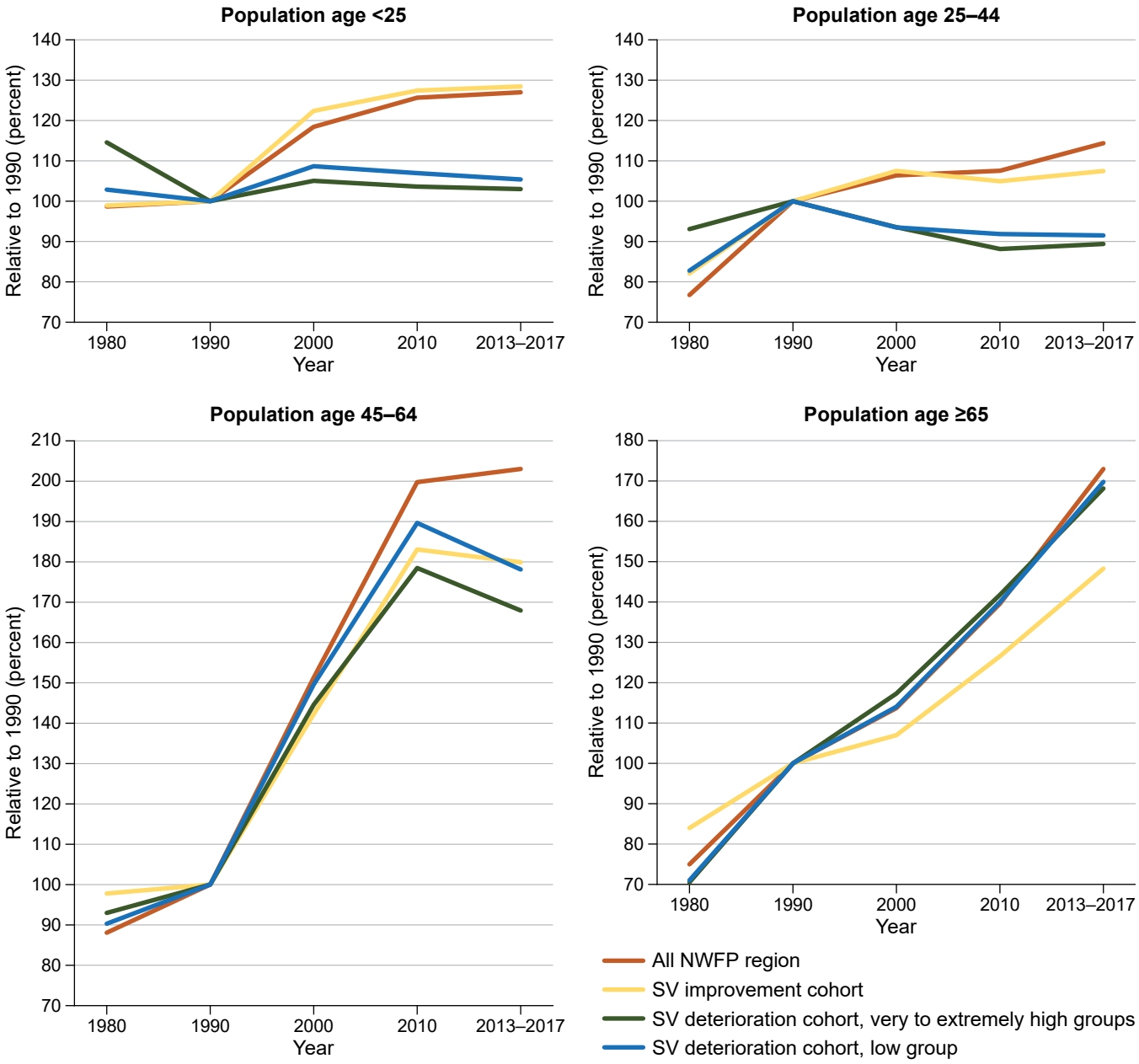

Figure 3.30—Change in age class population size relative to population size in 1990 for three social vulnerability (SV) change cohorts and all analyzed counties in the Northwest Forest Plan (NWFP) region as a whole, 1980–2017. See figure 3.28 for counties in each cohort.

with little or no in-migration in subsequent decades to replace them and the households they otherwise might have formed in their counties of birth. Pursuit of more and better job opportunities is the most plausible explanation for the out-migration: a lack of these jobs in the cohorts where vulnerability deteriorated is implied by the high minimum values for the wages location quotient in 1980 and 1990 compared to all counties (fig 3.29). However, this same observation applies to the improved cohort. The difference must be either there was less outmigration of young adults before the NWFP era in these counties, or that out-migrants were replaced in subsequent decades by young in-migrants or higher rates of natural increase. To examine these possibilities, figure 3.3 (age-class change as a function of 1990 population by age-class) and figures 3.11 and 3.12 (total jobs and average wages) are reproduced here with only the counties in the deteriorated and improved cohorts represented.

Figure 3.30 shows the essential differences among the cohorts in their changing population age-class distributions. In the 45–64 age range, all three cohorts closely track the region. There are substantial differences in the younger age ranges. In the improved cohort, growth in both the

under 25 and 25 to 44 age classes also closely track the growth rate for the region as a whole—i.e., including the region's large metropolitan counties; the growth rate for under 25 population even slightly exceeds the rate in the region. From 1990 to 2017, both deteriorated cohorts have either no net change (population under 25 years) or a **decrease** (population 25 to 44 years) in the size of these population classes. Additionally, between 1980 and 1990, the southwestern Oregon deteriorated cohort (refer to fig. 3.28) had significant negative growth in population under age 25, and almost no growth in population ages 25 to 44—contrasting strongly with the other cohorts and the region overall. The patterns exhibited by the southwestern Oregon counties cohort are virtually the opposite of demographic momentum; two decades of the growth patterns in figure 3.30 would be enough to predict future population loss—as actually occurred (table 3.1). In populations over age 65, the deteriorated cohorts track the region, while the improved cohort has slower growth in the population age 65 and older in every decade after 1990.

While the 65 and older age class contributes to the vulnerability metric, measuring concentration of older adults implicitly also measures younger cohorts: by definition, if people over age 65 are concentrated in a county—disproportionately represented in comparison to the reference population—then people under 65 are disproportionately **underrepresented**. This chart shows that focusing on change in younger cohorts, with little, no, or negative change indicating high social vulnerability, would have highlighted deteriorated social vulnerability in those cohorts just as dramatically. Figure 3.30 clearly reiterates one of the main messages regarding changing social vulnerability in the NWFP monitoring region. In the 1980s, some counties were already experiencing deteriorating social vulnerability, particularly those in the "extremely high" and "low" groups, and one of the principal drivers was low or negative growth in populations under age 44. Growth rates for populations over ages 45 and 65 in these counties were largely similar to the growth rates for the region, indicating that middle-aged people residing in them in 1980 and 1990 remained as they aged. But the younger adults that left such counties in the 1980s were not subsequently replaced—hence the heavy concentration of population over age 65 in the 2000, 2010, and 2017 bars for the two deteriorated cohorts in figure 3.29.

Figure 3.31 compares the change in jobs, and figure 3.32 compares the change in average wages (in constant 2017 dollars) by industry supersector for the three social vulnerability change cohorts in aggregate and the NWFP monitoring region (it repeats the data display design from figs. 3.11 and 3.12 in the "Employment and Income Change" section above). These comparisons reveal some striking similarities and differences.

- Natural Resources. In the improved cohort, there was strong growth in jobs in the natural resources supersector (fig. 3.31), which sharply contrasts with the deteriorated cohorts in which there was practically no growth. This supersector includes all forestry occupations other than manufacturing, but also fishing and agriculture. Average wages in this supersector, however, were very low in the improved cohort, and considerably higher in the deteriorated cohort (fig. 3.32). The most likely explanation for these paired distinctions is that nearly all growth in this supersector recorded in the improved cohort occurred in agriculture, which is mostly low-wage, low-skill work, hence driving down average wages in the improved cohort. In the deteriorated cohorts, most of the jobs in this supersector are probably in forestry and fishing, higher paying sectors where there has been little job growth.
- Manufacturing. Manufacturing jobs were the highest paying in all three cohorts in the 1970s and 1980s (fig. 3.32). After 1990, manufacturing and public sector jobs paid the same on average in the improving cohort, but manufacturing jobs still paid the most in the deteriorated cohorts. Manufacturing was far from the most important source of jobs in the improved cohort in the late 1970s and early 1980s but was in the deteriorated cohorts. This was especially true of the wood products manufacturing subsector where there were fewer than about 5,000 jobs overall in the improved cohort in 1975, and never more than that afterward. In the late 1970s, there were six times as many wood products jobs in the deteriorated "low" group cohort, and eight times as many in the deteriorated southwestern Oregon cohort (fig. 3.31). Changes in the number of manufacturing jobs since 2001 are also significantly different. In the improving cohort, there was relatively little change averaged over the 16-year period since 2001. In the other cohorts, manufacturing jobs fell by at least one-third from 2001 to 2017. This loss of manufacturing jobs is similar to

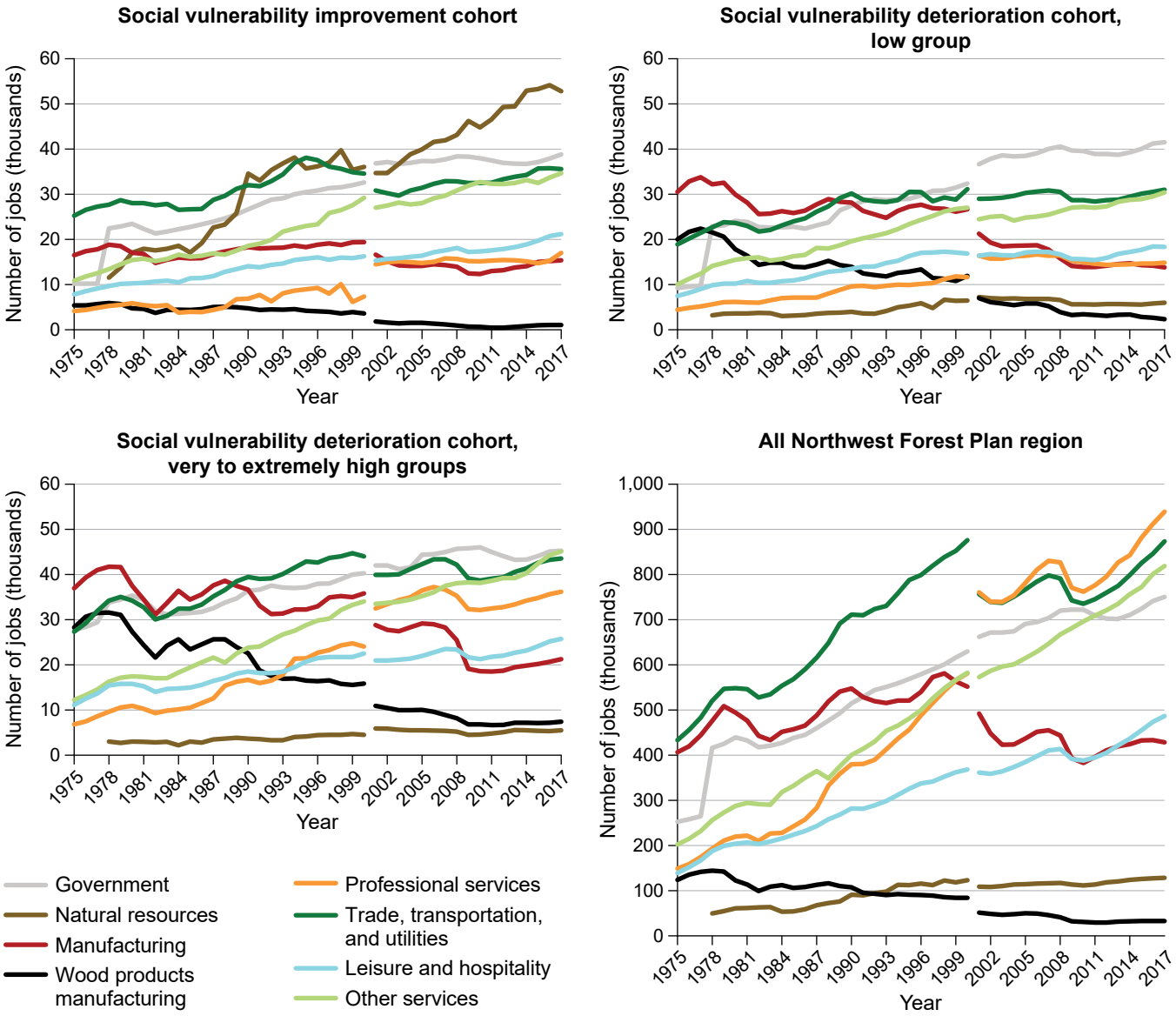

Figure 3.31—Change in average annual wages by industry supersector in three social vulnerability change cohorts and for all analyzed counties in the Northwest Forest Plan region, 1975–2017. Break between 2000 and 2001 represents use of two classification schemes that were not cross-walked. See figure 3.28 for counties in each cohort.

what has occurred in the region overall—indicating that the improved cohort has been unlike the region with respect to manufacturing employment for most of the period since at least 1990.

- Services. Average wages in the other service (e.g., private health care) and professional service (e.g., law, finance) sectors were in roughly similar ranges, and changed at about the same rates, in all three cohorts in the entire 1975–2017 data record (fig 3.32). In the deteriorated "low" group and improved cohorts, there was very little growth in professional services jobs—which is by far the most important source of high-paying jobs in the region after 1990 (fig. 3.31; see also fig. 3.11). The deteriorated-southwest Oregon cohort includes the Eugene-Springfield metropolitan area (Lane County, Oregon), and consequently shows much stronger growth in this sector. Other services, which are generally lower paying, were the most rapidly growing source of jobs in both of the deteriorated cohorts as well as second-most rapidly (after natural resources) in the improved cohort. "Other services" is the primary source of job growth in the region (fig. 3.31), but only natural resources and leisure and hospitality pay lower average annual wages (fig. 3.32).

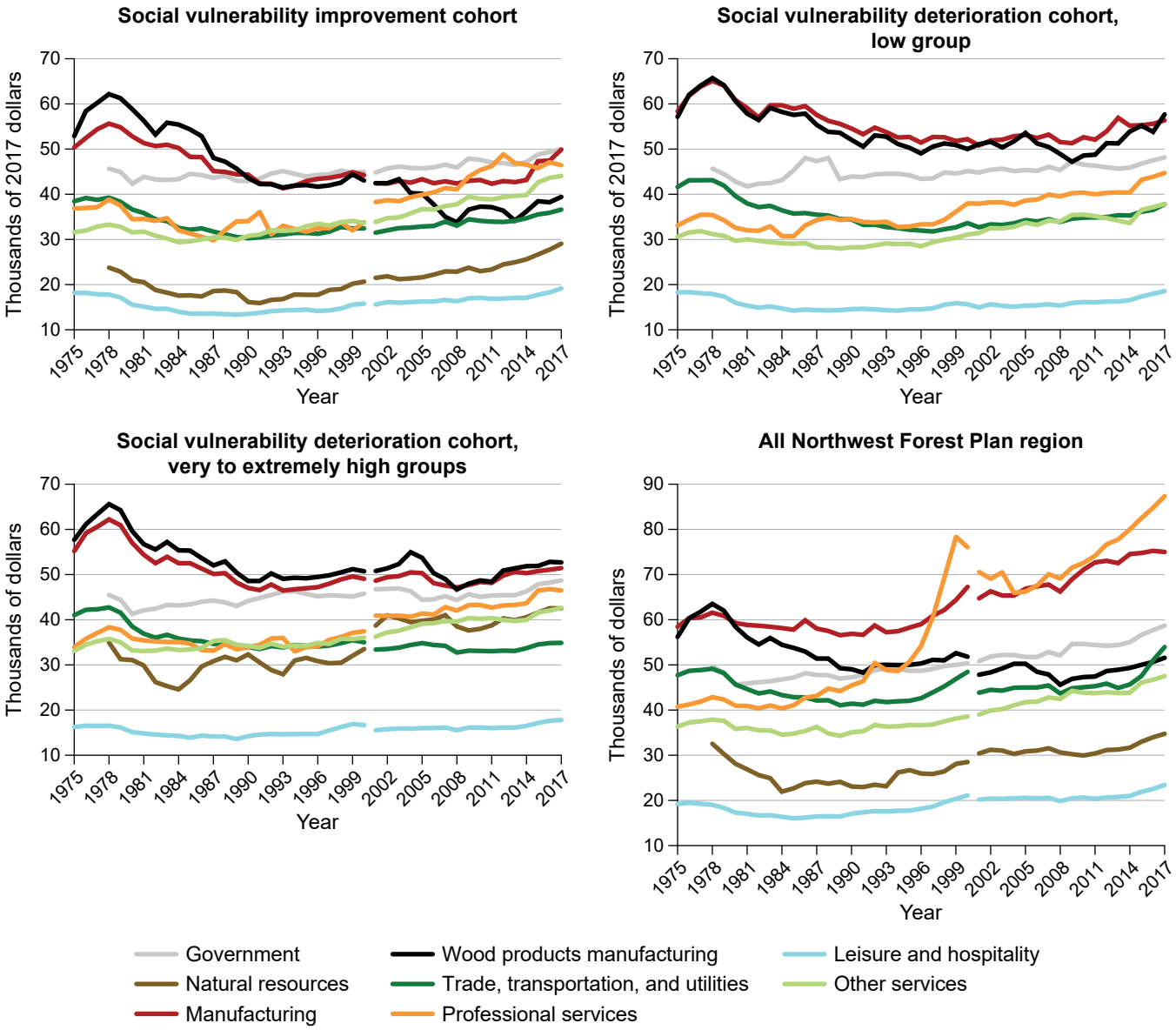

Figure 3.32—Change in average annual wages by industry supersector in three social vulnerability change cohorts and the entire NWFP region, 1975–2017 (refer to fig. 3.28 for counties in each cohort).

None of the three cohorts experienced strong job growth in multiple supersectors during or before the NWFP era. Jobs in supersectors with large proportions of total jobs in the 1970s, such as government and trade/transportation, generally followed similar upward trajectories with fluctuations, and average wages were similar in all three. There is a slight anomaly in a greater increase in professional services jobs in the cohort that includes greater Eugene-Springfield (Lane County, Oregon) (fig. 3.26) as would be expected in a large urban center. But the two most important differences in employment change among these three cohorts are the very sharp upward trend of natural resources jobs in the improved cohort, which may account for its consistently lower unemployment from 2000 onward (fig. 3.29); and that the improved cohort lacks a key source of **job loss**: the manufacturing supersector (fig 3.31).

Collectively, figures 3.30, 3.31, and 3.32 emphasize two major distinctions between the improved and deteriorating social vulnerability cohorts, which do not share county type but do have generally long distances from major metropolitan areas in common. The first is the loss of young adult population in the deteriorated cohorts between 1980 and 1990. The second is the proportion of all jobs in the manufacturing supersector, and wood products manufacturing subsector, in the later 1970s. To what extent might these factors have driven social vulnerability change from 1990 to 2017?

Possible drivers of deteriorating social vulnerability during the NWFP era—

The ROD direction establishes the expectation that social and economic changes that occurred within the NWFP monitoring region after adoption of the plan in 1994 could be associated with its subsequent implementation. This expectation is inherently spatial because federal forest lands are neither uniformly present throughout the NWFP monitoring region, nor of equal importance to all local or county economies. Changes that are associated with new federal forest lands management approaches under the NWFP should be distinct in those places where federal forest lands are highly important, and different from changes observed elsewhere in the region. If, for example, deteriorating social vulnerability between 1990 and 2017 was associated with federal forest lands management changes, county groups where these lands were historically relatively **unimportant** should have experienced a demonstrably different change trend from those where federal forest lands were highly important. The analysis of changing social vulnerability, both during the 1980s and between 1990 and 2017, finds that negative change—**deteriorating** social vulnerability—is typical of multiple county groups that share a very high importance of private sector forest products employment in the late 1980s, but for which the late 1980s importance of federal forest lands differed considerably. The expectation does not materialize in the county typology analysis.

However, the county typology may mask differences among counties that are assigned by a statistical procedure to each group, so the findings in the preceding sections of this chapter still constitute preliminary evidence. The strength of the evidence either supporting or not supporting the ROD expectation is evaluated here by testing for correlation between each of the six distinct measures that created the typology, two additional characteristics of employment in the 1980s, and social vulnerability for each individual county. Correlation could manifest in two

Table 3.7—Correlation between key forest management and employment indicators and relative social vulnerability, 1980–2017

	Relative social vulnerability: year measured			
	1980	1990	2000	2017
	ρ	ρ	ρ	ρ
Wood products manufacturing wages, 1978	*0.26	***0.39	***0.41	****0.54
Public sector jobs, 1982	0.21	*0.25	**0.31	**0.31
Potential commercial federal forest (typology 1)	0.01	0.12	0.09	*0.24
Average payments to counties, 1986–1989 (typology 2)	0.20	**0.30	*0.25	**0.34
Average number of federal forest employees, 1987–1990 (typology 3)	0.22	**0.30	***0.40	**0.32
NWFP federal timber processed, 1988 (typology 4)	0.05	0.07	0.00	-0.04
Forestry/fishing jobs, 1990 (typology 5)	***0.39	****0.51	****0.58	****0.58
Wood products jobs, 1990 (typology 6)	****0.42	**0.28	0.13	***0.41
	Social vulnerability change: decade/era			
	1980–1990	1990–2000	1990–2017	1980–2017
Wood products manufacturing wages, 1978	***0.41	0.11	**0.31	****0.57
Public sector jobs, 1982	0.17	*0.25	0.12	*0.23
Potential commercial federal forest (typology 1)	**0.32	-0.11	*0.25	****0.44
Average payments to counties, 1986–1989 (typology 2)	**0.33	-0.15	0.06	**0.29
Average number of federal forest employees, 1987–1990 (typology 3)	*0.25	***0.40	0.04	0.21
NWFP federal timber processed, 1988 (typology 4)	0.08	*-0.23	*-0.24	-0.15
Forestry/fishing jobs, 1990 (typology 5)	0.21	**0.34	***0.35	****0.50
Wood products jobs, 1990 (typology 6)	***0.41	0.06	**0.33	****0.59

Bold text indicates high statistical significance and moderate to strong correlation. Statistical significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.001$.

relationships. First, employment or federal forest land measures describing the end of the peak-harvest era might be correlated with the actual social vulnerability in any of the decades for which the metric is calculated—1980, 1990, 2000, or 2017 (2010 is excluded because interpretation is skewed by the Great Recession). Second, those measures could be correlated with changes during a specified time period: 1980–1990, 1990–2000, 1990–2017, or 1980–2017. For example: if counties in which federal forest management was very important in the late 1980s had a wide range of social vulnerability metrics in every decade, but in each of them the vulnerability metric improved by a similar amount, then federal forest importance in the late 1980s would be correlated with change in social vulnerability, but not with actual vulnerability in a particular decade.

Table 3.7 presents results of a two-tailed Pearson test of correlation between the z-scores for each of the six typology variables, two additional measures of employment sector dependence in the peak-harvest era, social vulnerability in each decade and social vulnerability change over four timespans. The two additional measures reflect especially significant metrics describing the importance of forest products employment during what was apparently the most significant period of transition for the industry in the dataset: dependence on wages earned from wood products manufacturing in that sector's peak year, 1978; and dependence on the public sector for employment in 1982, at the nadir of the 1980–1982 recession's effect on job losses in the forest products industry—and also a peak year for total employees of the federal forest management agencies (see fig. 2.18). Very high importance for both indicates that there was a lack of alternative sources of private sector employment that unemployed forest products workers could readily turn to during the most consequential period of transition in the industry's recent history.

The top half of table 3.7 measures correlation between the social vulnerability metric score recorded in each decade and the eight forest management and employment variables measured in the year indicated in the row label. Variables in the rows capture a single point in time—1978, 1982, or the typology inputs recorded between 1986 and 1990. The four columns in the top half of the table are four separate dates of measure for the same social vulnerability metric. Correlation is calculated on the z-score of all variables, not the actual value, which normalizes the span of values and improves the validity of the Pearson correlation coefficient. In the social vulnerability calculation, larger numbers equate to higher vulnerability, so positive correlation indicates association between high vulnerability and high importance for the test factors, and between low vulnerability and low importance.

Two forest products industry employment factors, wages earned from wood products manufacturing in 1978 and employment in forestry and fisheries in 1990 (typology variable 5), are moderately to strongly and significantly correlated with high social vulnerability in every decade from 1990 to 2017; the latter is also strongly correlated with high vulnerability in 1980. The strength and statistical significance of correlation between these factors and high social vulnerability increases in each successive decade. Counties characterized by very high proportions of wages from the forest products industry in 1978, and of jobs in forestry and fishing in 1990, already had high social vulnerability characteristics in 1980, after which social vulnerability appears to have further deteriorated. High importance of wood products manufacturing **jobs** (as opposed to wages) in 1990 (typology variable 6) is significantly and strongly correlated with high social vulnerability in 1980 and 2017, albeit weakly correlated in 1990 and not in 2000. **The very strong, increasing association of wages from wood products manufacturing in 1978 and social vulnerability 40 years later is an exceptionally important result: it strongly suggests that NWFP monitoring region counties with extreme dependence on private sector wood products earnings in the peak harvest era—regardless of the predominant class of forest land ownership— have experienced declining resilience and well-being ever since that era was interrupted by the 1980 recession**.

None of the four typology measures of federal forest lands importance are correlated with social vulnerability in 1980. In 1990 and 2017, two are payments to counties, and U.S. Department of Agriculture, Forest Service/U.S. Department of the Interior, Bureau of Land Management (BLM) employees. Forest Service/BLM employees also correlate with high vulnerability in 2000. Correlation in these variables is neither as statistically significant nor as strong as for the employment measures. It also does not increase over time. This correlation pattern suggests a scenario in which counties where these indicators were highly important in 1990 tended to have higher

vulnerability populations in 1990, but did not in 1980; after 1990, their levels of social vulnerability changed relatively little. A plausible explanation of social vulnerability change in counties where these federal forest factors were highly important—principally, those in the "very high" and "extremely high" groups—is social vulnerability deteriorating from moderate or high in 1980 to high-very high in 1990 and remaining in this range afterward. The maps of social vulnerability change (figs. 3.24 and 3.26) generally agree with this interpretation. Notably, the proportion of federal timber processed within a county in 1988 (typology 4) has no association with social vulnerability in any decade; this is probably because the range of importance values for this variable is much narrower than the range of social vulnerability metric values (see fig. 2.8).

The bottom half of table 3.7 evaluates the correlation between social vulnerability **change** and the various importance measures. The results broadly follow the outline of correlations in the top half of the table, but there are some important distinctions. First, forestry and fishing occupations are not correlated with negative social vulnerability change during the 1980s, while wood products manufacturing jobs (in 1990) and wages (in 1978) are. Payments to counties and potentially commercial federal forest areas in the late 1980s are also correlated with negative social vulnerability change between 1980 and 1990, though less strongly than the employment measures. Forest Service/BLM employees is weakly correlated with negative change 1980–1990, and very strongly correlated with negative change in 1990–2000—the only variable strongly associated with vulnerability change in this decade. Four variables—all three forest products employment measures (wages in 1978, employment in forestry/fisheries, employment in wood products manufacturing; table 3.7), plus federal forest land area—highly, significantly, and strongly correlate with change measured between 1980 and 2017; a fifth variable, payments to counties, is weakly correlated with 1980–2017 change. Only the three employment variables, however, are correlated with both negative change between 1980 and 2017 and between 1990 and 2017.

There are two key findings in the correlation analysis: (1) The importance of federal forest lands at the end of the peak harvest era, captured by the forest land area, payments, and employees variables (typologies 1–3), is **not** associated with high social vulnerability in 1980. However, it **is** associated with negative social vulnerability change during the 1980s, and with high social vulnerability in 1990. It is generally not associated with negative social vulnerability change beginning in 1990, except possibly in cases where agency employees were highly important, but payments and land area less so (e.g., Modoc County, California, and Klickitat County, Washington). Only federal forest land area correlates with negative social vulnerability change over the entire 1980–2017 era.

(2) The importance of forest products employment in 1978 and 1990—i.e., throughout the 1980s—is generally correlated both with high social vulnerability in all decades and periods of negative social vulnerability change beginning in 1980. These are the only variables from this set that are also correlated with negative social vulnerability change over the full span of the NWFP era. Very high importance of these factors in 1978 and 1990 is ideal for predicting which counties have high social vulnerability in 2017, and which experienced negative social and economic change trends between 1980 and 2017.

It is significant that the two key findings are sharply contrasted in their correlation with social vulnerability change during the NWFP era itself, because the eight "factor" variables tend to be correlated with each other. Yet industry employment variables are correlated with negative social change during the NWFP era independently of federal forest variables. Both are moderately to strongly correlated with high social vulnerability in 1980 and with negative social changes that are measured with 1980 as the baseline year.

If the correlation analysis supported the ROD expectation that distinct social change occurred in association with federal forest land variables during the NWFP era, the two key findings would be reversed—federal forest lands importance correlated with negative social change during the NWFP era, but not forest products employment importance (because the latter is highly important to the "low" group counties but the former is not). **This analysis thus confirms that deteriorating social vulnerability during the NWFP era is not associated with high importance of federal forest lands at the end of the peak harvest era of federal forest lands management**. However, deteriorating social vulnerability from roughly 1978 to 1988 is somewhat associated with the high importance of federal forest lands at the end of the era. This finding further confirms suggestive preliminary

evidence earlier in this chapter that counties in the "very high" and "extremely high" groups experienced their most significant negative social and economic changes, such as negative growth in population under age 25, between 1980 and 1990. By the time the NWFP had been adopted and implementation began, many of these counties were already in a very high social vulnerability state that changed little during the era, which explains lack of association with change in social vulnerability between 1990 and 2017. Yet federal timber harvest and employee trends in the mid-1980s in these counties appear to have been an effort to bring back the forest production economy of the 1970s, perhaps in response to the negative impact of the 1980–1982 recession (e.g., fig. 2.14, tables 2.11 and 2.12). Ironically, the period of greatest negative social and economic change since 1980 for counties where federal forest lands were historically most important—the decade **ending** with the start of the litigation era—is thus **the same period in which federal forest management appears to have been focused on maintaining continuity with the earlier multiple-use management era in which timber production was prioritized**.

The drivers of negative social and economic change in counties of the NWFP monitoring region are very likely mainly related to the structural changes that occurred in the region's forest products industry following the 1980–1982 recession. A consistently strong correlation between earnings from the forest industry in 1978 and employment in natural resources in 1990 with high social vulnerability in all decades after 1980 strongly supports this interpretation. Counties belonging to the "low" group were generally less socially vulnerable in 1980 than comparable counties in the "very high" and "extremely high" groups where federal forests were very important in the latter 1980s; this was still true though not to the same degree in 1990. After 1990, social vulnerability deterioration was typical in "low" group counties and the vulnerability status of "low," "very high" and "extremely high" group counties was increasingly alike from 2000 onward. The modest difference between "low," and very high and extremely high group levels of vulnerability in 1990 may explain why the 1978 earnings indicator in table 3.7 is correlated with social vulnerability change (high-earnings reliance, large deterioration) between 1990 and 2017, but the federal forest management factors in table 3.7 are not. In simplest terms, a county with a high degree of historic dependence on the forest products industry for employment is likely to have experienced negative social change in the last four decades regardless of whether federal forests were an important part of industry operations.

Conclusion

This report applies the county typology to evaluate the monitoring question, "Are local communities [counties] and economies experiencing positive or negative changes that may be associated with federal forest management?" This approach has made possible the following response: there is no association—statistical or even simply observational—between the degree of importance of federal forest lands to counties in the years just before the NWFP era, and positive or negative social changes from 1990 to 2017, as described by changing levels of social vulnerability. Instead, high dependence on forest products industry employment during the late 1970s and 1980s is statistically strongly correlated with negative social change from 1980 to 2017, and moderately associated with negative social change from 1990 to 2017. Most counties that fit this scenario already had above-average social vulnerability among the NWFP monitoring region's counties in 1980; of these, counties where federal forest lands management indicators were also highly or extremely important were very likely to have had high or very high social vulnerability in 1980.

The 1980–1990 period, corresponding to the last decade of the peak-harvest orientation of federal forest lands management, is by far the most consequential era for negative social change for counties in the NWFP monitoring region outside major metropolitan areas: it is the pivotal decade. Many counties outside major metropolitan areas and lacking moderate to large population centers experienced deteriorating social vulnerability during the 1980s. Among the most notable negative social changes were increasing concentrations of the NWFP region's people in poverty and adults not participating in the workforce, limited growth or **decreases** in the population under age 45, and very low growth in earned wages (after adjusting for inflation). Forest products employment was moderately to highly important in most of these extra-metropolitan counties, but federal forest lands were highly important only in some.

Thus, forest products industry employment was the common factor uniting most nonmetropolitan counties with unusually large declines in young adult populations

and wages and increases in poverty and workforce nonparticipation during the 1980s. Severe job losses caused by the 1980–1982 national recession and likely migration of younger adults from rural to metropolitan NWFP area counties, or to locations outside the region, were probably the most consequential negative social and economic changes for forest products-dependent counties. The geographic distribution of these two key negative change trends during the 1980s are consistent with a large body of research demonstrating strong links between natural resources extraction dependency, poverty, cyclic underemployment, and outmigration in rural counties of the United States and Canada (Crandall and Weber 2004, Fisher 2005, Irwin et al. 2009, Lichter and Brown 2011, Slack and Jensen 2004, Stedman et al. 2004, Tickamyer and Duncan 1990).

By 1990, NWFP monitoring region counties had largely sorted into the relative states of social vulnerability (e.g., low, moderate, very high) that they recorded in each ensuing decade. Only in a select group of primarily nonmetropolitan counties, mostly east of the Cascade Range in Washington and northern Oregon, did social vulnerability improve from where it had been in 1990. That improvement was generated primarily by the population of the counties becoming younger, workforce participation remaining strong, and unemployment decreasing. Persistent low total wages and lower educational attainment otherwise suggested high social vulnerability between 1990 and 2017. Though federal forest lands were highly important in most of these counties in the late 1980s, forest products employment in the late 1970s and 1980s was much less important in comparison to other nonmetropolitan, forest-dominated counties at the same time. Job growth after 1990 was concentrated in the natural resources sector; that growth was likely in agricultural rather than forestry jobs. The improved social vulnerability of these outlier counties appears to be largely unrelated to changes in federal forest management, though anecdotally, many locales in these counties (e.g., Hood River, White Salmon, Leavenworth, Lake Chelan, Twisp) are attractive amenity destinations where federal forest recreation is an essential contributor to the amenities.

Among counties where social vulnerability did not improve during the NWFP era—the majority of the region's counties—there are basically two types: (1) those in major metropolitan areas in which federal forest lands were moderately important in the late 1980s, and in which baseline social vulnerability in 1980 or 1990 was already moderate to low; (2) those remote from major metropolitan areas in which forest industry dominated employment in the 1980s, including both counties for which federal forest lands were very or extremely important and counties for which federal forest lands were negligibly important, but industry employment was highly important. For those in the second group where federal lands were very or extremely important, the main era of negative change had already occurred prior to 1990; in some cases, social vulnerability was already high to very high in 1980. After 1990, social vulnerability either continued to slowly deteriorate following the 1980–1990 trend or stayed about the same. Federal forest land importance is associated with negative change during the 1980s, but not with negative change after 1990. For counties where federal forest lands were of limited importance, negative social change occurred both before and after 1990; in 1980, these counties were, as a rule, better off from a vulnerability standpoint than counties with high federal forest importance circa 1990.

There is no evidence in county-scale data trends supporting the expectation established in the ROD that federal forest lands would be associated with a unique social vulnerability change trend during the NWFP era. This finding does **not** establish that changes to federal forest lands management in the litigation and NWFP eras failed to have a negative effect on the social and economic character of counties in which federal lands management was highly or extremely important in the late 1980s. As documented in chapter 2, the loss of hundreds of Forest Service and BLM employees between 1992 and 2017, and the severe cutback in county revenues associated with federal forest lands management after 2006, had outsized impacts on small, rural counties where federal forest lands were historically extremely important. The takeaway message is that these factors alone are not uniquely associated with broader negative social and economic change. They should be understood as **exacerbating existing trends**, which are shared with counties where federal forests are largely a nonfactor. Those trends were set in motion at least by the early 1980s when counties dependent on forest products earnings lost younger populations during the 1980s and were unable to develop

comparable alternative sources of earnings to replace rapidly disappearing wages from wood processing. The key driving factor appears to have been the negative effect of forest products industry restructuring during the early 1980s on jobs and wages, and the effect was especially significant for counties with a limited economic base beyond the industry, regardless of whether the forest lands supplying it were federally managed or not.

Given that these existing trends were already underway during the mid-1980s, when federal forest agencies dramatically increased timber harvest to restore volume more typical of the early 1970s, it is likely that negative social and economic change in counties where federal forest lands were highly or extremely important would have looked about the same regardless of whether the NWFP was implemented, or some other management direction was chosen that prioritized timber production over other uses. The apparent effort to restore federal timber harvest volume to 1970s levels in the mid-1980s appears to have had no effect on the slow but steady decline in social vulnerability resulting primarily from an aging, nonworking population, the disappearance of many manufacturing jobs, and the erosion of wages paid for those manufacturing jobs that remained. Though there is no support for the expectation that management changes introduced by the NWFP are identifiably associated with social change trends after 1990 when measured at the scale of counties—this statement **emphatically does not** apply to measurement of social change at the **community** scale. The question of how a sample of communities, chosen to represent each county type, changed during the NWFP era is addressed in chapters 4 and 5.

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PNW GTR 1019

Chapter 4: Comparative Case Study of 10 Nonmetropolitan, Forest-Based Communities in the Northwest Forest Plan Area

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Introduction and Methods

In this chapter, we present descriptive results of qualitative case study-based social and economic monitoring work conducted between August and November 2018 in 10 rural communities across the Northwest Forest Plan (NWFP) area. We provide (1) geographic and historical sketches of each community, (2) community member and federal agency perceptions of social and economic changes over the past 25 years, and (3) community member and federal agency perceptions of the relationships between communities and federal forest management. Our results point to the diversity of experience and response to the NWFP both within and across our case study communities. To reflect the diversity of perspectives on each of the topical areas, we present a range of verbatim interview responses organized by community case study. In the concluding section, we compare and contrast these results across the case study communities, focusing on specific topical areas. In chapter 5, we present additional analyses and a more synthetic discussion of our findings by supplementing our qualitative investigation with secondary data and spatial analysis.

Main Takeaways

- All but one case study community (Leavenworth, Washington) reported a general decline in socioeconomic well-being. This was true even for communities that retained considerable timber industry capacity.
- The type and character of social and economic changes varied considerably across case study communities. However, in terms of negatively perceived changes that were common across the case study communities, interviewees attributed many of these to changes in American society and economy more broadly. For example, interviewees reported a decline in participation in civic organizations and a decline in jobs resulting from significant automation in the timber industry.
- At 25 years since NWFP implementation, many interviewees expressed more disappointment over changes in the relationships between federal forest management agencies (most specifically the U.S. Department of Agriculture Forest Service) than they did in the limitations that the plan imposed on timber resources. In every case study community that had federal agency presence, staff reductions and the propensity for agency staff to commute to their rural duty stations has resulted in a tangible loss of human capital.
- **Implications for federal land managers:** This information is a resource for referencing perceptions about socioeconomic well-being and potentials of communities in which the agencies live and work. Although these perceptions will vary by individual community, the trends reported here can provide land managers insight into the types of perceptions community members have about living in rural forest-dependent communities. These perceptions influence how individuals engage with their local forest land and the management of these lands.

25-Year Monitoring Objectives and Questions

The NWFP initiated conservation measures to meet species- to ecosystem-level management goals. The NWFP also attempted to account for and mitigate social

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and economic impacts the plan might cause. Because conservation efforts were expected to cause adverse economic effects to the wood products industry due to changes in timber supply, a key goal of the NWFP was to support the social and economic stability of local communities as they adjusted to new conditions. The plan included financial assistance to counties to compensate for lost "timber dollars" and aimed to provide a predictable supply of timber and nontimber forest products to relevant markets. Monitoring of NWFP goals and effects were also extended to the socioeconomic realm with an evaluation question from the NWFP record of decision (ROD): **"Are local communities and economies experiencing positive or negative changes that may be associated with federal forest management?"** (Charnley 2006).

The monitoring questions addressed in this chapter are as follows:

- What is the status and trend of social and economic well-being of selected case study communities?
- How have relationships changed between communities and federal forest management (including the forests, management actions, and federal agency personnel)?

Just as for the NWFP 10-year socioeconomic monitoring report (Charnley 2006), the purpose of our case study-based monitoring work was to link federal agency management actions with community well-being and to provide local perspectives on changes that have occurred since NWFP implementation 25 years ago. We provide critical insights into the socioeconomic trajectories of rural NWFP-area communities that we hope will contribute to future research directions, policy efforts, and resource management strategies. In the NWFP 15- and 20-year monitoring reports, the focus on local communities and economies was limited to reporting on the "status and trend of social and economic well-being in the Northwest Forest Plan area" at the county level (Grinspoon and Phillips 2011, Grinspoon et al. 2015). In this 25-year monitoring report, those same data are reported (see chapter 2), but additional, in-depth research is also presented to illustrate the diversity of people's experiences across NWFP communities. This additional monitoring research was conducted in response to a request NWFP-area, national forest land managers made to address a concern heard from stakeholders about past NWFP monitoring reports not adequately representing their respective communities. Specifically, chapter 2 contains a county-level typology of all counties within the NWFP area, and this chapter contains case study research that focuses on local perceptions of social and economic well-being in rural, forest-dependent communities. Thus, in addition to meeting the monitoring requirements of the NWFP and contributing to future research, policy, and management strategies, an explicit goal of this chapter is to provide NWFP stakeholders with a resource for referencing perceptions about socioeconomic well-being and potentials of their communities.

Case Study Community Monitoring Approach

To assess the status and trend of social and economic well-being for each case study, we asked interviewees questions about changes at the community level in employment, housing, services, social life, and demography and well-being. To assess changes in the relationships between the community and federally managed forests, we asked questions about land use and management as well as the relationships between the community and the federal agency. We additionally conducted background research on the history and current demographic and economic status of each case study.

Our interpretation of monitoring results follows that of the NWFP 10-year socioeconomic monitoring efforts, which notes the following (Charnley et al. 2006: 5):

> [T]he complexity of relations and the number of factors involved in socioeconomic monitoring mean that setting specific or definite thresholds or values, which would cause a reevaluation of [NWFP] goals, strategies, standards, and guides is impossible (USDA and USDI [1994]: E-9). Neither the ROD, the FSEIS [Final Supplemental Environmental Impact Statement], nor the FEMAT [Forest Ecosystem Management Assessment Team] report provide any measures against which to judge "success" or lack thereof in achieving Plan socioeconomic goals. Alternatively, success may be measured against the standard of a desired condition (USDA and USDI [1994]: E-6). The desired condition in the ROD is the same as the Plan goals: to maintain the stability of local and regional economies (USDA and USDI [1994]: 26) and to assist with long-term economic development and diversification by offering new

> economic opportunities for year-round, high-wage, high-skill jobs (USDA and USDI [1994]: 3).

In other words, we did not judge whether NWFP goals had been achieved in our results for this report. Rather, we use the data we collected to respond to the ROD evaluation question to the best of our ability, within the parameters of our scope of work. We focus our questions on changes in communities in the past 25 years, and report perceptions of these trends, as well as other available data to help detail some of the perspectives on community change.

Similar to the qualitative interview portion of the NWFP 10-year monitoring report, our results from interview data are not generalizable to the NWFP area overall. As Charnley et al. (2006: 5) noted about their own work, our results are instructive:

> … for the way in which they illustrate how the Plan [NWFP] affected some rural communities around federal forest lands, and the ways in which agency efforts to mitigate Plan effects did or did not help communities adapt to change ... qualitative data provide a more detailed understanding of the social and economic conditions and trends described by the quantitative data, the meanings people associate with the trends in the quantitative data, and insights into what caused them.

Our objective was to present our findings in a format that readers could easily relate to the NWFP communities with which they are most familiar. Although our findings ultimately show how each community presents its own unique combination of issues, experiences, and perceptions, many of the themes and trends that emerged in our research were shared across multiple communities. In this sense, readers familiar with communities in the NWFP area will be able to relate their own viewpoint with at least some, if not most, of the perceptions and experiences we present below.

Defining Community

Our definition of community defines each case in our study as a group of people variously connected to each other by their residence or employment in a specific geographic place, i.e., each case study represents a "community of place" (Charnley et al. 2006, 2018; Machlis and Force 1988). We spatially defined our case studies in terms of the boundaries of an elementary school district or a unified school district (combined elementary and secondary). The NWFP 10-year report used consolidated census blocks to spatially define case study areas, while the 15- and 20-year reports did not include case study communities. We chose school districts firstly because the error margins for the most recent census-block-level American Community Survey data were too wide to offer reliable insights (MacDonald 2006, Spielman et al. 2014). Secondly, school districts are of interest because they provide reliable, annual-level demographic information in the form of enrollment as a proxy for the number, ethnic ancestry (percentage of minority students), and income level for households with school age children (percentage of students eligible for free and reduced-price meals) (Harwell and LeBeau 2010). Thirdly, rural school districts help to operationalize the concept of community of place as a meaningful unit of social organization because schools represent an institutional focal point where children develop local social and human capital as well as a sense of place (Bauch 2001). These factors later play an indispensable role in the long-term stability and reproduction of the local socioeconomic system because they provide social context for local civic engagement (Harmon and Schafft 2009).

Community Sampling Rationale

Potential case study communities were drawn from a sample of nonmetropolitan settlements that are within the boundaries of the NWFP area and include significant amounts of federal forest land within the boundaries set by the school district (e.g., they are forest based). Although some of the case studies included some dispersed rural residences (e.g., farms) and small unincorporated hamlets, most residences were clustered around one or more commercial and administrative centers identified by the U.S. Census in their list of census designated places (fig. 4.1, table 4.1). One exception to this rule, the Gilchrist School attendance area—which is only one part of the Klamath County School District—draws its student base solely from small, unincorporated settlements in northern Klamath County, Oregon (see below).

Our case study sampling strategy was multifaceted, taking several parameters into account:

- We sought to balance the geographic distribution of the communities within the NWFP boundary while sampling from a diversity of county types (table 4.1).

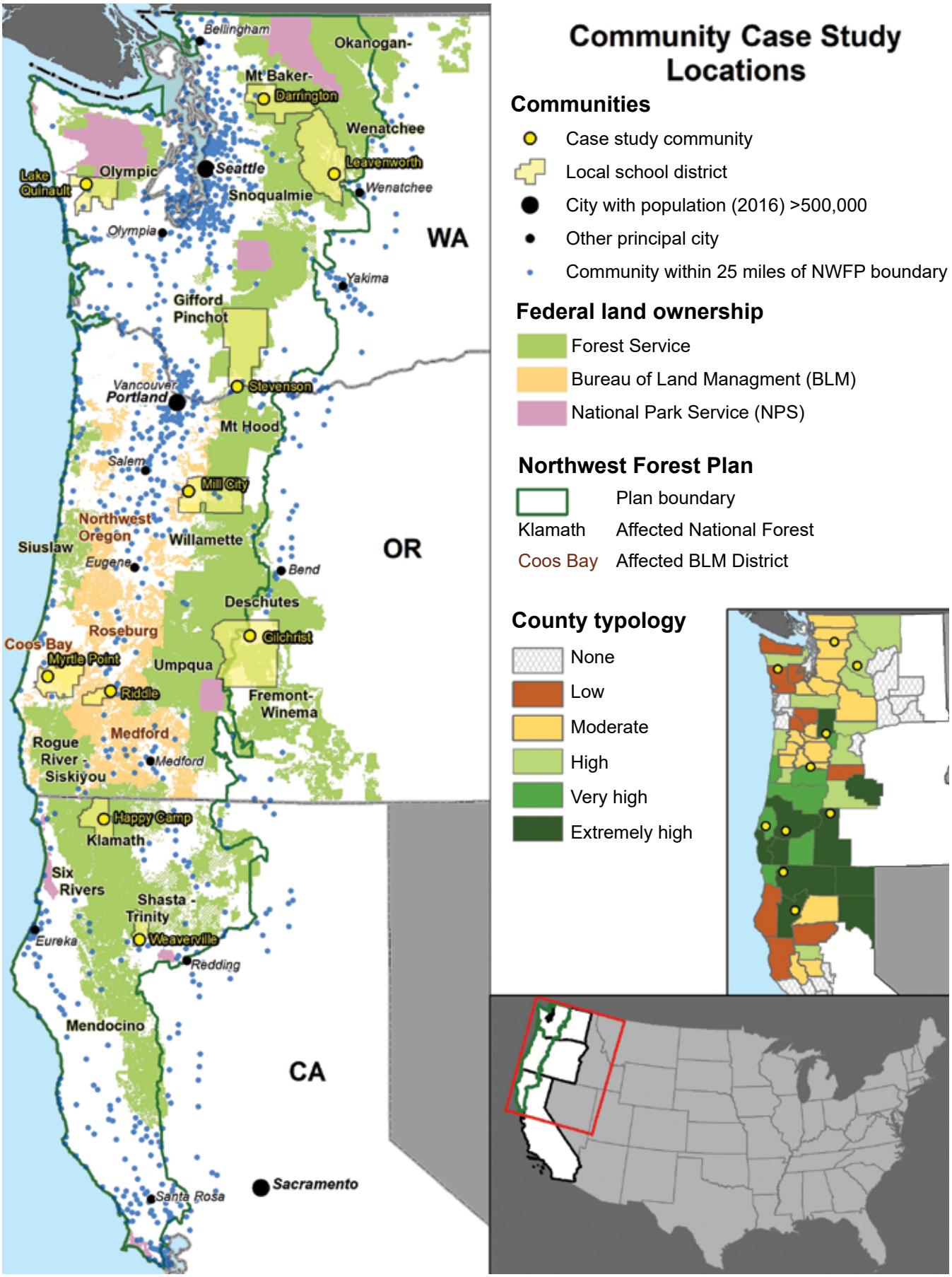


Figure 4.1—Case study communities and federal forest lands within the Northwest Forest Plan (NWFP) boundary. Map credit: Mark D. O. Adams.

Table 4.1—Census designated places or other unincorporated commercial centers within each case study

Case study name	Significant populated places	County and state	Biophysical province	Previous case study	BLM lands	Native American lands
Darrington	Darrington	Snohomish County, WA	Western Cascades	No	No	Yes
Leavenworth	Leavenworth, Chumstick, Peshastin	Chelan County, WA	Eastern Cascades	No	No	No
Lake Quinault	Lake Quinault, Amanda Park, Neilton, Humptulips	Grays Harbor County, WA	Olympic Peninsula	Yes	No	Yes
Stevenson	Stevenson, North Bonneville, Carson	Skamania County, WA	Western Cascades	No	No	No
Santiam Canyon	Mill City, Gates, Niagara, Detroit, Idanha	Linn & Marion Counties, OR	Western Cascades	No	Yes	No
Gilchrist-Crescent	Gilchrist, Crescent, Crescent Lake, Chemult	Klamath County, OR	Eastern Cascades	No	No	No
Myrtle Point	Myrtle Point, Bridge	Coos County, OR	Coastal Range	Yes	Yes	Yes
Riddle	Riddle	Douglas County, OR	Klamath Mountain	No	Yes	Yes
Happy Camp	Happy Camp	Siskiyou County, CA	Klamath Mountain	Yes	No	Yes
Weaverville	Weaverville	Trinity County, CA	Klamath Mountain	No	No	No

- We sampled with relatively even numbers across each state, given the proportion of the state within the NWFP area. This resulted in four case studies from Washington, four from Oregon, and two from northern California.
- We ensured that we did not have more than one case study per county, although on two occasions, we did include case studies from adjacent counties. Nevertheless, these adjacent case studies differ in both physiographic and socioeconomic characteristics.
- We maximized our sampling of communities from each of the major forest types (biophysical provinces) within the NWFP boundaries in each state. This resulted in two forest types from California Klamath Mountain, one from Oregon Klamath Mountain/Oregon Western Cascades, one from the Oregon Coastal Range, one from the Oregon Western Cascades, one in the Oregon Eastern Cascades, one from the Washington Olympic Peninsula, two from the Washington Western Cascades, and one from the Washington Eastern Cascades.
- We wanted our sample to include at least two communities that were previously studied in the NWFP 10-year socioeconomic report (see Charnley 2006), at least two communities associated with U.S. Department of the Interior (USDI) Bureau of Land Management (BLM) lands, and at least two communities with a significant American Indian presence.

Data Types, Collection, and Analyses

Our case study analysis consisted of two separate components:

Historical Background and Current Economy

We conducted library- and internet-based research on the current and historical conditions of community infrastructure, services, tourist amenities, important events, and other relevant newsworthy material for each case study. We relied on published histories, government and nonprofit sector industry sources, as well as news stories from reputable news outlets posted on websites maintained by professional journalists, and community websites. Our goal was to provide an overview of the settlement and socioeconomic history of each community as well as detail the key conditions, events, and important changes in each community over the past few decades. We supplemented field observations (photographs and field

notes) with Internet research to summarize community infrastructure, current availability of goods and services, and potential for recreation and tourist economy. We used publicly available geographic information system (GIS) data to characterize the spatial attributes of the community in relation to its surroundings, including administrative boundaries and recreational amenities. We also relied on secondary data to summarize recent quantitative trends in the community demography and real estate markets. For additional methods, data sources, and supplementary results on the case study background, see supplemental materials available online (https://doi.org/10.7264/rz2j-dc54).

Perceptions of Community Change

As our main data collection effort, we conducted semi-structured interviews with members of each community who fell broadly into three groups: community leaders, representatives of stakeholder groups, and federal agency personnel. We used a snowball sampling strategy that relied on long-time residents and key informants to provide additional contacts. We also specifically selected some contacts over others as an effort to obtain equal representation in terms of gender and stakeholder types. Community membership was defined as persons whose primary residence or workplace was within the geographic case study boundary (e.g., the school district). We made some exceptions to this rule when federal agency personnel or representatives of stakeholder groups did not live or work within the community, but were nevertheless responsible for administration or management of social, economic, or forest-based services and resources inherent to the community's well-being.

We conducted 11 to 17 interviews with individuals who reside, work, or somehow represent socioeconomic interests within each case study (table 4.2). These interviews were conducted in some cases with multiple individuals at once, meaning that we conducted 137 interviews with 158 people (an average of 14 interviews and 16 interviewees per case) (table 4.2).

We used a semi-structured interview protocol with close- and open-ended questions in 10 key areas of interest (table 4.3) (see app. A in "Supplemental Materials" for full interview protocol: https://doi.org/10.7264/rz2j-dc54). We used a systematic coding structure to tabulate results and to identify emergent themes.

Considerations and Limitations

Given these methods, chapters 4 and 5 should not be taken as an exhaustive or even comprehensive analysis of the socioeconomic well-being of rural, forest-based communities in the NWFP area. First, our community sample was limited to 10 localities, and there is much diversity across these communities. We do not maintain

Table 4.2—Interviews and interviewees by case study

Case studies	Interviews	Interviewees	Agency personnel	Community leaders	Stakeholder group representatives
Santiam Canyon	16	19	4	9	3
Darrington	11	14	4	4	3
Stevenson	12	13	2	6	3
Myrtle Point	17	21	7	5	5
Leavenworth	15	18	3	6	6
Gilchrist	14	15	4	9	1
Riddle	14	18	5	4	5
Lake Quinault	14	14	6	6	2
Happy Camp	11	12	4	5	3
Weaverville	13	14	4	6	3
Total	137	158	43	60	34

Table 4.3—Key areas of interest for the case study interview protocol

Topic of interest	Number of subquestions
Employment	3
Housing	2
Goods, services, and commuting	4
Community social life	3
Education	2
Demography	8
Relationship with forests and federal agency	7
Land use and management	16
Future directions	3

that our community sample is representative of the complete diversity of rural communities across the NWFP area. Second, our assessment of each community was limited to a very small subsection of willing interviewees. For each community, we attempted to represent a diversity of viewpoints and perspectives, but we know these viewpoints are likely not a complete representation of the diversity of perspectives in each sampled community. For example, our target groups were limited to federal forest personnel, timber industry representatives, and community leaders. Although minority groups have increased in numbers in our case study communities in recent years, their numbers are still small and are undoubtedly underrepresented in our target sample groups. Third, to present as much context as possible, we researched the history, geography, and infrastructure for each community, to add additional information and insights to the work. However, as our research capacity was limited by time, the scope of our task, and budgets, our methods represent rapid appraisals and are not meant to be definitive or complete. In addition, our focus was on federal forest land- and timber-dependent communities, so our work was specific to a subset of those most aligned with the research purpose and intent. We attempted, to the best of our ability, to make a full and accurate representation of our observations and data sources. We take full responsibility for any errors contained in the community case study portion of the report (chapters 4 and 5).

Proximity to American Indian lands is a critical and sensitive issue, as at one time all of the lands in this region were American Indian lands, and public lands throughout the region are important to many tribes. We acknowledge indigenous occupants of each community in the history sections included in this chapter. Although investigating community well-being and the NWFP from an indigenous perspective was beyond the scope of our task, we refer readers to the report on the effectiveness of the federal-tribal relationship (Case-Scott et al. 2021).

More broadly, it is important to note that major trends related to forest management at the national, regional, state, and municipal levels have affected community-forest relationships over the past 25 years, as noted in chapters 2 and 3 of this report. An increase in collaborative governance around forestry issues, including forest restoration, changes in demographics and populations of rural schools, and federal agency transitions have all affected rural communities in the NWFP area. To varying degrees, other broader trends such as climate change, population growth, urbanization and migration, housing development pressures, market forces, and changes in demand for labor-intensive natural resources jobs as well as ecological changes, such as invasive species and fire behavior have also affected populations within the NWFP area. All of these changes mean that these communities are no longer as they were 25 years ago not only because of the NWFP. It is important to keep these considerations in mind when reading these chapters on community changes, as these forces can often be hard to disentangle from each other.

Community Case Studies

Below we summarize the results of our data collection by case study location, organized into the following sections:

- Geography
- Brief history and notable events
- Economic and social context for the past 25 years
    - Land ownership and management
    - Industry and employment
    - Housing and infrastructure
    - Tourism-oriented amenities

- Perceptions of social and economic changes
  - Employment
  - Housing
  - Services
  - Social life
  - Demography and well-being
  - Relationships with federal forests and agencies
  - Land use and management
  - Future directions

Darrington

Geography

The Darrington case study community is defined by the boundaries of the Darrington School District in the western Cascade Range in eastern Snohomish County of Washington (figs. 4.2 and 4.3) and a small portion of southern Skagit County. The mountainous portions of these counties are linked by history and through the timber economy. Darrington is an incorporated town in the Swede Haven U.S. census-designated place with a 2010 population of 1,347. The school district boundaries encompass rural settlements and agricultural lands along the Stillaguamish River and the Sauk River, including Sauk Prairie, the Sauk-Suiattle Reservation, and Mansford (in southern Skagit County). The townsite of Darrington has a roughly rectangular 170-ha footprint of residential and business-related structures laid out on a cardinally oriented road grid. State Highway 530 connects Darrington to the metropolitan and industrial areas of the Washington coast to the west (about 25 miles) and the town of Concrete and North Cascades National Park to the north (about 25 miles).

The Darrington townsite is situated on the banks of the Sauk River at the top of the Stillaguamish Valley, but settlements in the area follow the Sauk River north to its confluence with the Suiattle River and westward along the headwaters of the North Fork of the Stillaguamish River. Elevations range from 278 to 7,723 ft above sea level, with Whitehorse Mountain looming 6,840 ft above sea level over the townsite. The geology is dominated by Pre-Upper Jurassic gneiss and granitic outcrops with valley bottom sediments of glacial drift consisting of silt, clay, and sand. Clay sediments along the Stillaguamish are quite active, commonly causing landslides. The climate is temperate with an annual precipitation of 81.25 inches, and temperatures range from 61.7 °F average high in the summer to 40.5 °F average low in the winter. The forest is dominated by mesic conifers, namely Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco), western redcedar (*Thuja plicata* Donn ex D. Don), and western hemlock (*Tsuga heterophylla* (Raf.) Sarg.) typical to the western Cascades.

Brief History and Notable Events

The Darrington area was an important resource area for American Indians as the Stillaguamish, Sauk, and Suiattle Rivers and floodplains provided productive gathering, hunting, and fishing grounds. At the time of nonindigenous settlement of the Pacific Northwest, peoples now known as the Sauk-Suiattle Indian Tribe occupied the area with an 1855 population of around 4,000. By the 1880s, early settlers and mineral prospectors were scoping out Darrington for settlement, and in 1884, homesteaders burned down the American Indian village at Sauk Prairie after claiming the land for themselves under federal law. In 1889, prospectors discovered gold about 30 mi southwest of Darrington at Monte Cristo. Darrington soon developed as a stopover point along the wagon road from Sauk City to Monte Cristo (Poehlman 1973). Mining claims and several small mines followed suit and settlement progressed throughout the 1890s. In 1897, the General Land Office established Washington Forest Reserve, which was designated as a national forest in 1907; it would eventually become Mount Baker-Snoqualmie National Forest.

The Northern Pacific Railroad between Arlington and Darrington was completed in June 1901 and immediately began transporting machinery for the construction of the town's first sawmill, the United States Mill. By 1902, the United States Mill employed around 100 workers and was producing 23,000 board feet per day (Poehlman 1973). Population growth was slow; the resident population was still only 100 people by 1906. In 1908, a cedar shingle mill was being operated on the Sauk River and, in 1909, the mill purchased a large timber sale from the newly formed Mount Baker National Forest. By this time, a handful of sawmills were working intermittently and the stage was set for timber to outpace mining as Darrington's main industry.

In the early 1920s, an automobile road connected Darrington to lower Snohomish County and development progressed through private and collective action initiatives. Potable water and sewage were centralized, bridges were

Darrington at a Glance

> "This used to be a thriving community. Proud. Like I say, mostly Southern heritage. People working, kids behaving themselves… Boy, there was parades and floats. We used to have a Timberbowl parade every year. They'd parade logs… They don't do that anymore. But everybody had a lot of pride."

Cities, towns, and census-designated places (CDPs): Darrington (town), Swede Heaven (CDP)
Other populated places (unincorporated): Sauk Prairie, Sauk-Suiattle Reservation, Mansford
School district: Darrington School District
Population (2010): 1,347
State: Washington
Federal forest lands: Mt. Baker-Snoqualmie National Forest, Darrington Ranger District
County: Snohomish (with very small portion of Skagit)

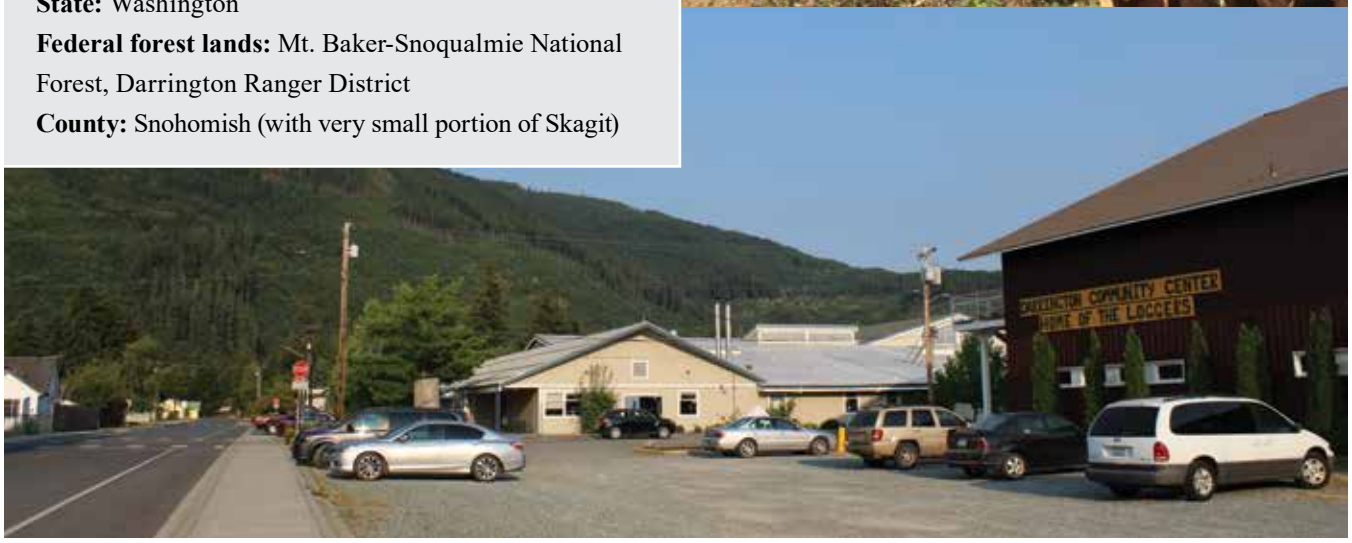
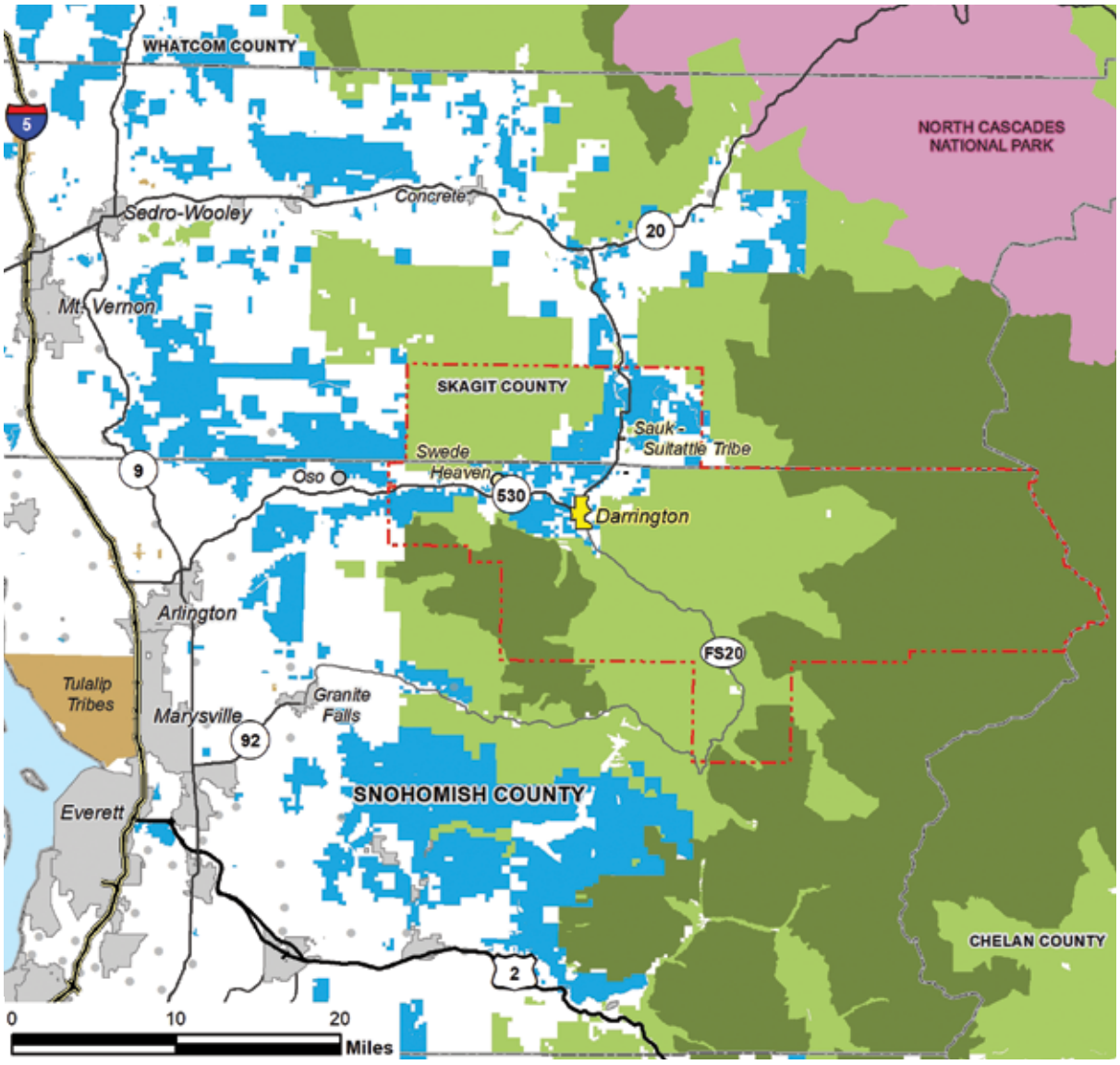


Figure 4.2—Darrington Case Study (top) Seeman Ave (WA SR 530) commercial district, view toward Whitehorse Mtn., Darrington (middle) Hampton Lumber log yard, Darrington, (bottom) Darrington Community Center, view east toward Gold Mountain. Photos by Gabriel Kohler.



Darington Community Case Study

Land ownership

- Forest Service wilderness
- Forest Service
- Washington DNR
- National Park Service
- Tribal lands
- Private lands

Communities

- Other case study settlements
- Darrington School District
- Darrington
- Other settlements
- Incorporated city or town

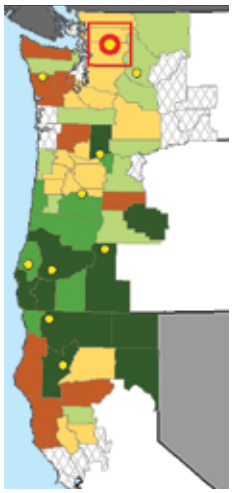


Figure 4.3—Location of Darrington Case Study. Map credit: Mark D. O. Adams. Note: private lands include the forest industry. DNR = Department of Natural Resources.

built over the rivers, and, in 1926, electricity reached the town (Poehlman 1973). During this same era, the Forest Service began to release timber sales of at least 40 to 50 million board feet (MMBF) per year, which were significantly larger than earlier sales. This attracted the Sauk River Lumber Company, which became one of the town's largest employers. With burgeoning employment opportunities, a new group of forest workers and their families from Southern Appalachia arrived in Darrington. By 1947, the "Tarheels," as they became known (most of them coming from Sylva, North Carolina), numbered around 500 out of a total town population of 850 (Poehlman 1973). Cultural legacies of the Tarheels remain strong in Darrington.

Logging and milling operations essentially shut down during the early part of the Great Depression. At that point, many Darrington residents relied on federal programs, such as the Works Progress Administration for work. In 1933, the Civilian Conservation Corps (CCC) set up a camp in Darrington to fill the employment gap. The CCC constructed many of the Forest Service roads and lookout towers and built the Mountain Loop Highway. This period also saw a slow shift toward the use of trucks in logging. Prior to the 1930s, logging was organized around moveable timber camps linked to mills by railroad. Between 1922 and the 1950s, the Sauk River Lumber Company moved its camp six times. Truck logging changed the socioeconomic dynamics of logging because owner-operator outfits were able to enter the market to go after smaller timber sales than those that made railroad logging camps profitable (Poehlman 1973). These outfits significantly reduced overhead for the mills who purchased their timber. Between the late 1950s and early 1970s, Darrington area sawmills were almost entirely dependent on owner-operator loggers. Summit Timber Company in Darrington relied heavily on these loggers to supply its mill with about 1 billion board feet of timber between 1964 and 1974 (Poehlman 1973). In 1974, the Summit Timber Mill employed 300 workers.

Beginning in the 1960s, designated wilderness areas and the new North Cascades National Park (designated in 1968) restricted nearby timber availability to Darrington's mills. Together, Glacier Peak Wilderness (1960), Henry M. Jackson Wilderness (1984), and the Boulder River Wilderness (1984) comprised 38 percent of Darrington School District's land base and 45 percent of the school district's national forest area.

In 2014, the Oso landslide 15 mi downriver from Darrington was a major disaster that killed 43 people and cut off the main route from Darrington to commercial and social service centers on the Washington coast for 6 months. The landslide attracted national attention and spurred local collective action in Darrington, not only in the rescue and cleanup efforts immediately after the disaster, but in response to hardships caused by the isolation and loss.

Economic and Social Context for the Past 25 Years

Land ownership and management—
Land ownership and management in Darrington is divided into three sectors: the Forest Service manages 84 percent of the land, Washington state manages 8 percent of the land, and the remaining 8 percent (slightly less than 30,000 acres) is divided among private individuals and corporations. Thirty-eight percent of the Darrington case study land base is classified as designated wilderness.

Industry and employment—
Industry in Darrington is currently limited to Hampton Lumber, which produces kiln-dried framing lumber. Hampton Lumber purchased the Summit Timber Mill in 2002, installing machinery upgrades and a cogeneration biomass electricity generation plant. The Summit Timber Mill employs approximately 170 workers, most of whom are full-time residents in Darrington. In addition to the sawmill, there is a cannabis processing plant, operated by Green Haven, LLC, in Darrington and, in 2018, it was within the top 10 percent of marijuana products producers in Washington state.

Housing and infrastructure—
The median home price in Darrington in October 2018 was $241,500, significantly lower than the median price for homes in Washington state, which was $377,100. Figure 4.4 shows the existing infrastructure and cultural amenities in Darrington. The community actively maintains a large community center, a relatively new library, and recreational park infrastructure such as a skate park. Darrington has a medium-sized supermarket, the Darrington IGA, which is open daily with regular business hours. Community

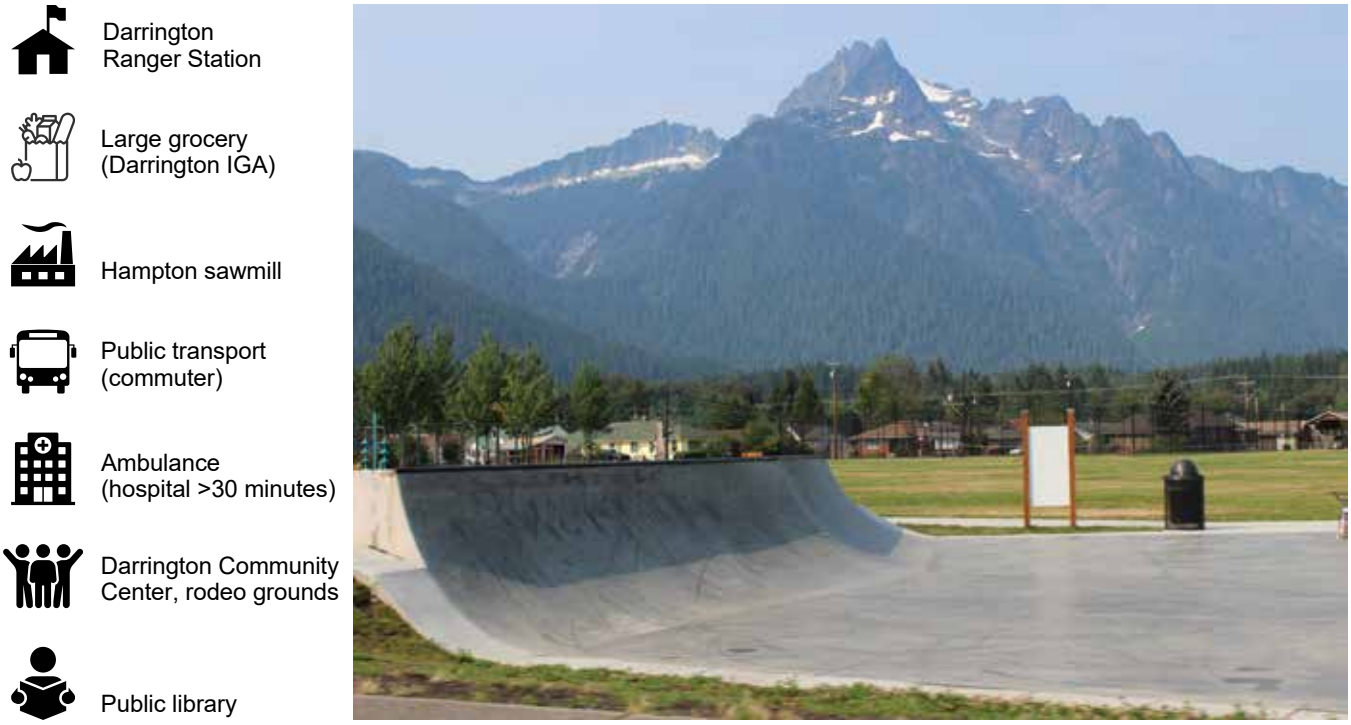


Figure 4.4—Graphic summary of community infrastructure in Darrington. The Darrington skate park and Whitehorse Mountain. Photo by Gabriel Kohler.

Transit offers daily public transportation from Darrington to Arlington and beyond. There are two ambulances with one full-time paid staff and 12 full-time professional fire and emergency responders. The nearest hospital is 28 miles away in Arlington. However, Skagit Regional Health operates a family medicine clinic that is open weekdays, 9 am to 5 pm. The town also has dental services through Darrington Family Dental clinic.

Tourism-oriented amenities—
Darrington's mountain valley location in the North Cascade Mountains provides for striking scenic views and outdoor recreation opportunities that are tourism attractions. Popular tourist activities include hiking and climbing around Whitehorse Mountain, whitewater rafting on the Sauk and Stillaguamish Rivers, and driving the scenic Mountain Loop Highway. Two annual events, the Darrington Bluegrass Festival and the Timberbowl Rodeo, capitalize on the valley's natural beauty and draw tourists during the summer months. The Darrington Rodeo Grounds host additional cultural events and festivals throughout the year. Darrington has three restaurants, a coffee shop, a bar, and a brewery that is only open on weekends. The town has eight vacation rental homes, one 20-room motel, and 136 campsites (including Forest Service, state-operated, and private campgrounds).

Perceptions of Social and Economic Changes

Employment—
Most interviewees in Darrington (n = 9/11) believed that employment opportunities have decreased over the past 25 years. Many interviewees emphasized the interdependencies between the timber industry and other employment sectors. For example, one interviewee said that employment opportunities had "diminished greatly. … I mean it's a ripple effect in a small, remote community."

Although the industry in Darrington was already reduced to one sawmill before the NWFP, it was still a major employer. One interviewee reported that Darrington's sawmill "used to have 500 employees. [It's] 170 now. … Five hundred people before, and they were a multiplier of three [more jobs in town per sawmill worker], well that just brought in other businesses and lots of other people."

Many interviewees lamented the loss of smaller independent logging companies. These small-scale, owner-operator loggers represented a cultural and economic backbone of the community that functioned to expand employment opportunities in both quantity and quality.

For example, one interviewee reported that "When I first started in the woods, there were probably, I can't say for sure … 15 to 18 logging companies. If you didn't like working for one, you could quit and go to work tomorrow morning for another one. And if you were a good worker, you didn't have any problem [finding work]. … [Now,] if you want to be a logger, there's not many opportunities."

One interviewee pointed out that a few decades ago there were other timber-related opportunities for making money as well:

> [T]here was a lot of little shake mills, that cut shakes. Everybody had a shake saw in their backyard. They could buy a few shake blocks, and everybody'd sell cedar. Cut and making roofing, cedar shakes or shingles. My family was involved in the shingle business for many years. But there used to be a lot of those mills around. There was probably half a dozen of those when I was a kid, besides the big mills. There were three or four big sawmills. Then two or three five-man sawmills, and little ones besides.

Some interviewees suggested that the downward trend in work opportunities and worker outmigration began before the NWFP. For example, one interviewee reported "Even before the [NWFP] came into being, the best and the brightest of our community were looking for jobs elsewhere. You could see the writing on the walls." Another interviewee said that wilderness areas had constrained economic opportunities in the area, "I've seen definitely a decline in timber-oriented jobs, basically because we have, like I said, three wilderness areas."

And apart from restrictions in timber supply resulting from the NWFP, the timber industry itself has changed. As one of two interviewees pointed out, "automation in the timber industry has definitely affected the jobs." Another suggested that the industry has not been forthcoming about that fact:

"… whether the timber industry wants to admit it or not, … they've looked for ways to reduce their labor force and so they've been going towards a lot of mechanization, and one of the things I was surprised to hear [is that] they can use a feller buncher [mechanized harvester used in logging] now on some of the steep terrain … and the mill went through the same thing." This was not just limited to mill work, but also extended to logging technologies such as feller-bunchers, which reduce the number of workers needed in a logging crew. One interviewee referred to this new style of logging as "Nintendo logging," noting its similarity to a video game.

Housing—

According to most interviewees (n = 9/11), the costs of housing in Darrington had increased over the past 25 years: "A lot of the local folks can't afford housing now. I never thought we would ever have an affordable housing crisis."

However, in addition to increasing costs, the biggest housing issue reported in Darrington was the shortage of residential rentals. One interviewee explained, "Well, I'm trying to help [some people] find rental places. There are hardly any. One person did find one, I believe. The other gal is like, 'Well, I can't really afford what's available.' There's nothing to rent. I mean very few rentals." Many interviewees felt that housing was still more affordable in Darrington than other places such as Arlington, Everett, or Seattle. According to some interviewees, this cheaper housing was attracting new residents to Darrington. As one interviewee stated, housing prices are, "basically pushing people out of King County. They are moving out here. [One person] just sold their house within a year and it's 1 square ac and they sold it within six days for half a million."

Indeed, "cheap housing" had also changed some of the community dynamics, as two interviewees during an interview explained:

> Interviewee 1: A bunch of people came in during the big crash of 2008 and they bought up a lot of these houses [in Darrington]. Now they're kind of slumlords…
>
> Interviewee 2: … Snohomish County has a set rate for housing for low income. And that rate goes up here [Darrington], and those people are down in Seattle and Everett [where prices are higher]. They just fill them [rentals] full of low-income people. Which is great, you know, I think there needs to be that. But that's how a lot of [crystal methamphetamine addicts] got into those places, and then they ruined the houses. Then you have a lot of those [houses] still on the market that are meth houses [used to manufacture methamphetamines] and the wells were contaminated, etc...

Another interviewee explained the following:

> People had to leave the community because they couldn't afford the mortgage in the [2008 economic] downturn. Consequently, what happened with those places, a lot of them went up for auction. People in our community didn't know how to deal with an auction plus they were probably working when the auctions were happening. So, we had a lot of out-of-area people pick up the homes for little or nothing. 20,000 dollars. They would find out that there wasn't any property management up here and they lived too far away to manage it themselves so they would turn them over to DSHS [Washington State Department of Social and Health Services] and you would have impacts from DSHS, not that that's a bad thing, but you had out of area people coming here ….

Services—

The majority of interviewees (n = 7/11) reported that the number of services in Darrington had declined over the past 25 years. According to one, "Last 25 years? They've all declined…. Having more full-time wages and jobs in town and the community kept the money in the community…. So we used to have two grocery stores, now we only have one grocery store. …[W]e finally have restaurants again; we didn't have any restaurants for a while."

Interviewees also noted losing a clothing store and a bowling alley. In spite of these losses, some interviewees thought that things had not changed much since at least the 1980s. For example, one interviewee reported that Darrington had always had, "one bank, one hardware store, one tavern, one mini-mart … restaurants always about the same." However, there were some contradictions between interviewee's recollections. One resident could recall a time when there were three or four gas stations and a couple of motels in comparison to one of each now. Another lamented that, "There used to be a bar and two taverns, but the loggers went away. It's sad. It's just sad."

Interviewees pointed out that social services had decreased at the same time that the need for services had increased. Some reported that the availability of low-priced housing in the past 25 years had attracted a number of new, lower income families. As one interviewee explained, the needs of some of these newer families had put a strain on the community: "It overruns [social services]…. There's not the [social] services available. There's not the [job] opportunities, and it's concentrating [social] services on one little area that the rest of the county isn't even funding services for."

Social life—

When asked about changes in recreational, leisure, or socializing opportunities over the past 25 years, Darrington interviewees had mixed responses. Nearly half (n = 5) thought that opportunities had improved, at least in terms of recreational opportunities that are actively promoted by regional and local organizations. One interviewee explained that "especially since the [2014 Oso landslide], we really have promoted [recreation], … and Glacier Peak Institute has done [a] really great job of promoting with our youth all the great things you can do here in our community. The hiking, the canoeing, the bike riding." Recent improvements for opportunities for the community's children also included a skate park.

However, others (n = 4) suggested that opportunities for socializing had declined over the past 25 years:

> Well, we had a Lions Club, we had the [owner-operator] loggers, which was not an association, but there were 20 or 30 of them before, and they were very, very active in the community as far as donating time and money and machinery.... I mean everything from athletic fields to the community center to the bluegrass grounds, that was pretty much done by a logger in town that paid his crew to go down there and do it and get the cement poured and everything else. The rodeo grounds moved. We used to have a timberbowl [a large rodeo event] a long time ago, it was one of the biggest ones on the west coast. So all of this was being supported by the vitality of all the small timber logging companies.

As one interviewee explained, the decline in community social life was directly linked with the decline in local job opportunities, even when families didn't relocate:

> What happens when you start to lose that core of your community, [when] the working folks in your community [are] starting to 'eave, even if they're commuting, they don't [participate],

> because they spend so much time away from their community, they don't become engaged. When you're a community of 2,000 people, you rely on each individual to contribute different aspects of well-being throughout the community, whether it's serving on the [parent, teacher, student association] or school board or coaching or having a Cub Scout troop; all these things make for a healthy thriving community. When people are commuting, especially when they commute at least 45 minutes one way—so an hour and a half out of your day—and it's a nine-to-fiver, you're getting [back to Darrington] too late to do anything and be engaged. Now, those commutes are, some of them are … 2 hours [away]. So the impacts are rippled through the entire community.

Indeed, one interviewee who commutes to work in Darrington explained that the town's lack of social life was one reason they continued to commute:

> … I mean that's kind of why I decided not to move here.… You know, I think of like, well, what am I gonna wanna do on the weekends, all my friends are, they'd be like an hour and a half away then. I mean, as it is, I still drive down from where I live to be able to socialize. A brewery opened up in town [Darrington]. That's something. It's like, yeah, I don't wanna drink. So, you know. That takes out the bar and the' brewery, and that's 75 percent of what's available in town.

Demography and well-being—

When asked if young people remained in the community, one long-time resident of Darrington explained, "High school graduation is a love-hate day. You love it to see these young people, bright, great people moving on to fantastic things and fantastic opportunities. [But] they're not here. They leave. They don't come back." However, as noted above, another interviewee pointed out that this trend was already well on its way by the time the NWFP arrived.

When presented with school enrollment data showing a 35 percent decline since 1999, most interviewees in Darrington (n = 7) saw a link to the implementation of the NWFP. Others suggested that family sizes across the United States had declined or that more people were choosing not to have children.

While most interviewees agreed (n = 7) that the number of families with school-age children in Darrington had decreased, others suggested that newcomers were responsible for shifts in the school demographics. Referring to the influx of families with low incomes after the 2008 recession, one interviewee suggested the following:

> Once they're here, they become part of the community; but they bring their families and their other extended families …. [This] was a poor school district, but less than 50 percent … [of students were in the free and reduced-price meals program]…. [M]ore importantly, special needs were pretty close to being in check with state standards. Now, [the number of] our special needs students far, far exceed[s] the state standard, and school districts are only paid to the standard. We have had to reduce education opportunities for the majority of the students to service the special needs portion of our student body. It's a taking away or lessening of education opportunities for a lot of folks.

One interviewee reported knowing several graduates of Darrington High School that returned to raise families, but added that, "Most people who are moving here are moving here because they're retired … moving to our community because they're selling their homes in Seattle or wherever … and coming up here because it's cheaper." Others, the interviewee explained, have moved into a development on the outskirts of Darrington (with a Darrington address), but their daily routines consist of a "drive from Arlington to that housing development; but never come into the community. Even though they live in Darrington, or maybe their kids come to Darrington [schools], they never really come into the community because they're working down below [anywhere west of Darrington].

When asked about the types of people that are moving to Darrington, one interviewee responded, "Quite frankly? … Drug addicts." The respondent said the reason why is because the area is "rural. No police…. That's the first thing they look for. You can't get caught. [There's] nobody out there."

Relationships with federal forests and agencies— Some Darrington interviewees thought that the community had a generally positive view of the Forest Service (in particular, the Darrington Ranger District of the Mount Baker-Snoqualmie National Forest) as an agency and in terms of district personnel, but other interviewees disagreed. One interviewee said, "Everybody hates the Forest Service. They used to love it. They hate it now." Indeed, several interviewees, as one explained, expressed nostalgia for a time when they perceived Forest Service personnel as an integral component of the community:

> Most of my schoolteachers in elementary school were Forest Service wives or husbands 'cause they move and that was one job that they could do where they could get work wherever they were going. And so they were completely engaged in part of the community …. Now, Forest Service employees, a few of them live here. Most of them don't. You have people that work out at this Forest Service office that live in Bellingham. Live in Sedro-Woolley. Live in Everett. That would never happen 35 years ago. I find it very ironic that in our world we have so many people that are so conscientious about their carbon foot-printing [who] don't adhere to their [own] philosophy.

Another recalled the following:

> … [S]o you had mill workers, you had loggers, you had Forest Service employees and they all played together, worked together, and if you did something—if you were a logger and you got out of line—you were brought back into line …. You owned it. If the Forest Service was out of line, you went upstairs and you found resolution and everybody was good with it. It was just one of the things that I think that made community colorful and wonderful and a complete society.

Several interviewees mentioned that one of the most significant reasons for the changing relationship between the community and the Forest Service was a significant reduction in seasonal and year-round workforces:

> The Forest Service has gone from 80 full-time employees here, down to 8 or so. And those people give time and a half of themselves to the community. They give more than everybody else. [They have] great, educated jobs. And they give so much... you see the skate park you passed coming in. That was put in by Forest Service employees really working hard in the community to see something happen. A lot of the dances that happen in town, that's Forest Service employees. A lot of volunteers on the community boards, that's Forest Service employees. They give a ton.

For several of the interviewees, the loss of these types of community members was very apparent. One interviewee linked this decline directly to the NWFP:

> The other impact [of the NWFP] is that in the '80s and even … into the early '90s, summertime employment at the Forest Service was 130 to 230 to almost 300 employees, over 100 year-round employees. They're down to 16 year-round employees. They have probably under 50 summertime employees. And if you look at those figures, well you look at the socioeconomic impacts of that kind of population reduction, but it's not only the population reduction that bothers you. It becomes a fabric of diversity. You [no longer] have that Forest Service with the education and the commitment to the woods.

One interviewee suggested that rather than the NWFP itself, internal changes in Forest Service agency culture had changed its relationship with the community. For example, when asked "Do you think federal agency people are engaging the community?" the interviewee said, "Hell no! They're here for their retirement. That's all they care about. They're just here putting their time in. So, they got that rule that so many years they're going to get their retirement. And if they don't do anything, they don't make a mistake. Sure way not to make a mistake is not to do anything. You can't be held accountable for your mistakes if you don't do anything...."

Land use and management— Darrington case study interviewees unanimously agreed that the national forest lands are an integral component of the community. Interviewees saw the national forest as an important place for natural resources and for recreational activities. Local special timber products mentioned by interviewees include flowers, firewood, cedar, berries, and mushrooms. Forest-related activities that were considered important include snowmobiling, river rafting, hunting,

and fishing. However, the popularity and feasibility of some of these activities had changed over the past 25 years, as reported by one interviewee:

> Everybody used to talk about fishing all the time. I used to fish all the time myself for trout. And, of course, then they started restricting the number of trout you could keep, and the size they have to be. Most of our water is so cold that the fish don't grow very fast, not like in eastern Washington where the lakes are warm and the fish grow fast. These glacier-fed streams are so cold, the fish grow very slowly. So, they never get as big. But there was a lot of opportunities for fishing, hunting, hound hunting, hound hunters.

A common complaint concerned changes in forest access that most associated either directly or indirectly with the NWFP. For example, one interviewee said, "Infrastructure is falling apart, doesn't matter whether you're talking about roads, trails, the places that people like to go. Everybody likes to drive around here and the roads are just terrible." Another said, "When there was a lot of logging activity around here, the roads were kept open, which made access for hunting and also for fishing." Many interviewees continued to attribute many negative changes to the community to the NWFP, as described here by one interviewee:

> In my mind, the [NWFP] was nothing more than trying to lock up all federal timber and make it all old-growth timber for the spotted owl. Now, it says in there there's going to be logging practices and rural communities [will be] looked at and helped. To me, that was just a ruse to lock up all federal timber—period. The Mt. Baker-Snoqualmie [National Forest] have done a really good job of that.

The general perception was that the national forest was no longer in the business of selling timber: "They don't even have a timber program in this town. You may as well say there's none. They can't even keep the blowdown [windthrown trees] cleaned up."

Another interviewee voiced a more nuanced opinion:

> When the [NWFP] came out, I was fairly excited because I thought it was going to give us the tools to look at our future and be able to plan. It didn't work out that way. I thought it was a good plan because it pissed off the environmentalists and it pissed off the industry. So I thought, "that's gotta be great." We're someplace in the middle of the road. What it did in the Forest Service world, it created … 5 years of the stagnation because you had to inventory what you had. Owl habitat. All this stuff and so nothing really ... and this was really too bad because at that time in '96, '98, you still had a workforce at the Forest Service that all of them were working to do the analysis so that they could stay within the perimeters of the [NWFP]. So basically, everything halted and they were still selling a few timber sales that were on the books pre-'94, then as those waned, they left. Impacts were felt .... [T]he process that you had to go through to fix a road was so onerous that it was easier to do nothing than it was to do something. Since then, it has loosened a little bit. Not by a lot.

Most interviewees in Darrington (n = 9) thought that wildfire was a growing concern. Only three interviewees thought that the Forest Service was doing its best to manage wildfire hazard. Several interviewees thought the forests had been better managed in the past. For example, one interviewee recalled:

> When I was growing up, you would log, you would dig your fire trails, you would get the slash piles in place, you'd burn all the dead stuff, then you'd go back and replant. Bam! It's changed. I'm sure there's science to all of that but some of the fuel on the ground does worry me because I'm surrounded by trees.

One interviewee cited the lack of road access as the cause of increasing wildfire hazard as the lack of road access inhibited fire suppression efforts. However, another interviewee suggested that wildfires were still rare in the western Cascades and, as a result, it was less of a forest management concern than on the eastern slope:

> Forest health is more the issue than fire or hazardous fuels. So, again, just looking at commercial thinning to maintain forest health. There may be a fuels component to the project just because when you harvest, you create fuels, so there's an acknowledgement there; but it's not treated, we're not doing treatments for fire.

Future directions—
When asked about future directions that Darrington could take, interviewees were of mixed opinions. Some were optimistic; for example, one said that if timber harvests were to increase on the national forest, "There would be more jobs. … loggers make good money. They could support a family. … I think a couple of [lumber mill] companies that are around would then be able to work closer to home and not have to travel so far [to source logs]. Not work on private land, because that's what they're doing. They're logging private lands right now." Another predicted that "People would gradually migrate back if there's opportunities. Like I told you, opportunity invites venture capitalists. And they bring jobs."

In terms of alternatives to logging and timber industry, several interviewees mentioned the opportunities surrounding the legalization of marijuana. However, Darrington's climate presents considerable constraints for agricultural development. Indeed, because of its winter climate, one interviewee voiced skepticism about Darrington's prospects for growth in general:

> It's just because in the wintertime it's rain. Seattle gets 30 inches of rain. We get 80 some inches of rain, and it's wet and it's 33 degrees, slushing down. It's miserable to be outside unless you've got moss growing on your back and feathers…. You have to have some grit. People move up here like, "Oh, I love it!" Summertime's warm and great, and then it hits you, and you can't make it through the winter because it's dark and cloudy and its pouring on you the whole time.

Another interviewee was fairly pessimistic in explaining that isolation from the nearest interstate highway precluded economic development in Darrington:

> [F]rom the Canadian border all the way down to the Californian border, … I haven't seen one west-slope Cascade community that's [become successful] through recreation, and pulled themselves out of this. Not one [such as Darrington] that's more than 30 miles away from the freeway. All the populations [are] decreasing. All their school enrollments are all decreasing. Poverty rates [are] going up. Special needs rates [are] going up. Pretty much all across, low test scores. … I read the past research on these small towns and they've done these case studies: it's like, "oh it's their lack of ability in these rural communities to innovate." And you see anybody whose made it out of it [socioeconomic decline]. They're not innovating, they're just near the freeway. There's just sprawl happening, and that's how they pull themselves out.

Another interviewee explained that the future of the community was tied to the creation of jobs elsewhere:

> I mean, bedroom communities is what we're becoming. There's [a] complete disconnect with the landscape. You just come here, commute elsewhere, come back. That's gonna be our future. It's pretty much the model that's given to us and provides us but a lot of this, as near as I can tell, it's gentrification. It forces the poor people out. We're not actually investing in them, trying to innovate. The model is gentrification. They're not coming in and investing in the workforce skills to innovate and have this new community they talk about. We'll force them out of here and we'll have these rich people there.

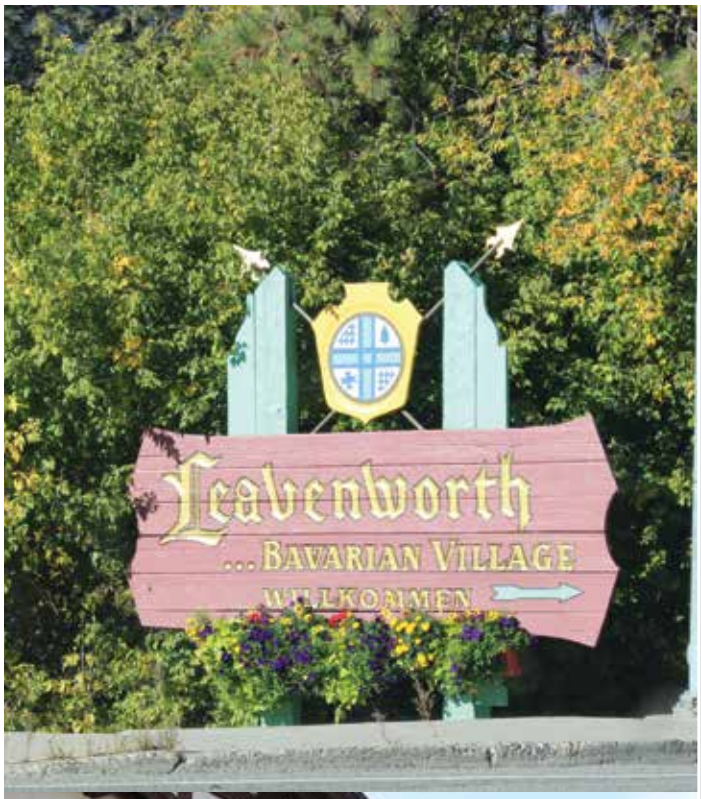
Infrastructure is also a constraint for development. As one interviewee pointed out, "Until we get a sewer treatment plant, I think it's going to be very difficult for [new] businesses."

Leavenworth

Geography

The Leavenworth case study is defined by the Cascade School District in Chelan County, in Washington's eastern Cascades (figs. 4.5 and 4.6). The case study boundary includes the city of Leavenworth (Washington's "Bavarian Village"), Peshastin, Chumstick, and a number of other unincorporated, populated places. Leavenworth is the most significant of the populated places within the case study boundaries and is located at the confluence of the Wenatchee and Icicle Rivers. In 2010, the population of Leavenworth was 1,965.

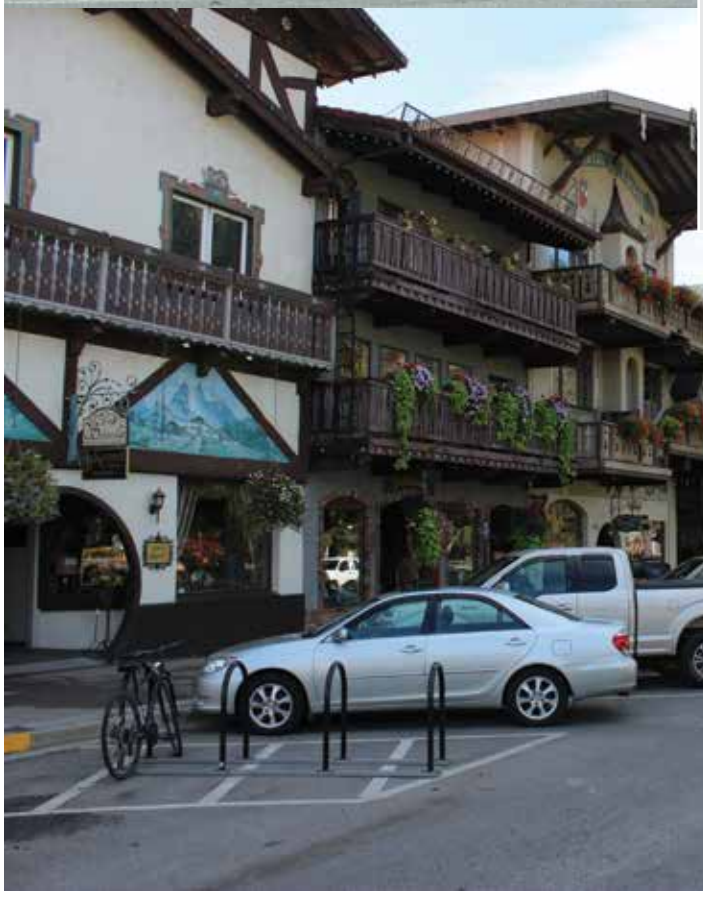
Elevations range from about 900 to more than 8,000 ft above sea level. Average temperatures range from a mean low of about 20 °F in the winter to a mean high of about 87 °F in the summer. Annual rainfall is about 25 inches, with 79 inches of snowfall. Leavenworth is in the eastern Cascades, characterized by steep mountainous terrain and

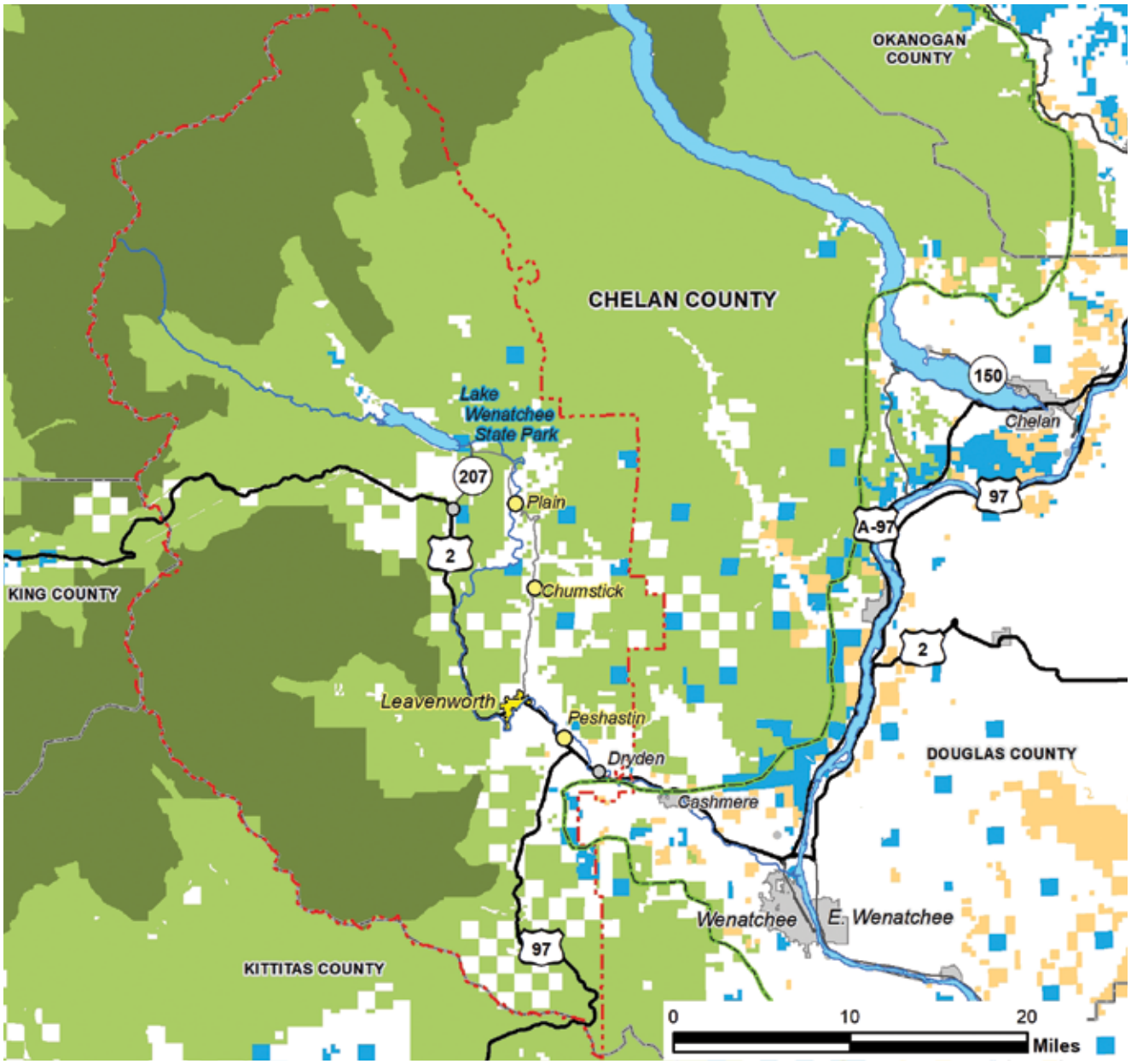


Leavenworth at a Glance

> "This town has grown substantially. It's almost exponential. This year was just unbelievable for home building…. Early on, the focus was the town—'come in and visit the shops,' etc. It slowly nibbled away, started with rafting, a little bit of back country, hiking and hunting and stuff, but it wasn't focused on the rock climbing and the bouldering, and the other mountain biking. Those are all new."

Cities, towns, and census-designated places: Leavenworth (city)
Other populated places (unincorporated): Peshastin, Dryden, Chumstick, Plain, Berne, Merritt, Nason Creek, Coles Corner, Winton, Lake Wenatchee, Telma
School district: Cascade School District
Population (2010): 1,965
State: Washington
Federal forest lands: Mt. Baker-Snoqualmie National Forest, Wenatchee River Ranger District
County: Chelan





Leavenworth Community Case Study

Land ownership

- NWFP boundary
- Forest Service wilderness
- Forest Service
- Bureau of Land Managment
- Washington DNR
- Private lands

Communities

- Other case study settlements
- Cascade School District
- Leavenworth
- Other settlements
- Incorporated city or town

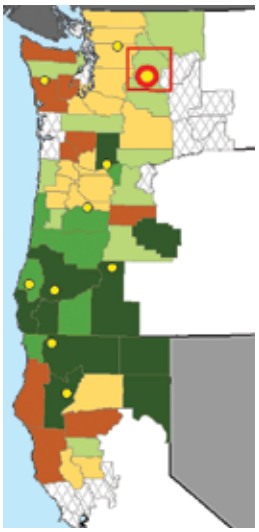


Figure 4.6—Location of Leavenworth Case Study. NWFP = Northwest Forest Plan. Map credit: Mark D. O. Adams. Note: private lands include the forest industry. DNR = Department of Natural Resources, NWFP = Northwest Forest Plan.

fast-running streams. The geomorphology of the area was largely shaped by glacial activity during the Pleistocene, and the Leavenworth townsite sits on the terminal moraine of the last glacial retreat. Forests comprise subalpine mixed conifer at higher elevations, transitioning to cold-dry ponderosa pine (*Pinus ponderosa* Lawson & C. Lawson) forests and sagebrush steppe.

Brief History and Notable Events

The Leavenworth area was an important seasonal foraging area for the Yakama, Chinook, and Wenatchi American Indian tribes. By the late 19th century, nonindigenous settlers began to arrive in search of gold and other minerals. Following the establishment of a trading post in 1885, Leavenworth's current townsite emerged on an area known as Icicle Flats. By the early 1890s, Leavenworth began to develop in earnest as the division headquarters and switch yard for the Great Northern Railway, which ran through the town and up over nearby Stevens Pass to Seattle. The railway facilitated industrial timber development with the founding of the Lamb-Davis Sawmill. In 1904, dam construction along the Wenatchee facilitated the construction of one of the largest and most modern steam-powered sawmills of its time. Leavenworth was incorporated in 1906 and the town entered an economic boom built on the export of timber and produce from orchards. By the 1920s, Leavenworth boasted 6,000 inhabitants.

However, the boom did not last. A major problem was that the railroad route over the steep Stevens Pass posed numerous technical challenges for the rail company. In 1900, the construction of Cascade Tunnel allowed the railroad to bypass a 12-mile stretch of steep and dangerous switchbacks, but the tunnel brought new hazards. Increasingly powerful steam locomotives created life-threatening heat and smoke conditions within the 2.63-mile-long tunnel. In 1903, the air quality problem nearly turned deadly when a 100-passenger train stalled in the tunnel, rendering many passengers unconscious. Although tragedy was averted by the actions of a quick-thinking, off-duty rail worker, in 1910, an avalanche on the downhill side of the tunnel struck an Amtrak train and killed 96 passengers, making it the deadliest train accident in Washington history. The Cascade Tunnel continued to operate with the 1909 introduction of electric-powered engines that towed trains and their locomotives through the tunnel. However, by the 1920s, the Great Northern Railway was looking for a new route.

The inevitable economic bust arrived in Leavenworth in the late 1920s as the Great Northern Railway relocated its headquarters to Wenatchee and rerouted the rail line to a less dangerous route that bypassed Leavenworth, instead heading northwest from Peshastin through the Chumstick Valley. The railroad reroute prompted the sawmill to close in 1926, and repeated late frosts dampened the agricultural potential of the area. Within a few years, the Great Depression compounded these issues and Leavenworth descended into a four-decade economic and population decline. In the midst of this decline, the town was split over how to fund the schools (Frenkel and Walton 2000: 563).

By the early 1960s, it was evident that Leavenworth would become a ghost town if economic prospects did not change. Public discussion centered on transforming Leavenworth into a tourism-oriented "theme" town (Frenkel and Walton 2000). Local business leaders consulted the University of Washington's Bureau of Community Development, which started forming citizen committees in 1963 to build consensus and solidarity among community members surrounding the community's potential development. This process led to the selection of a Bavarian alpine-theme backed by two Seattle-based entrepreneurs. By the end of the 1960s, the building facades along Leavenworth's main thoroughfare had been "Bavarianized" and the economy began to rebound as tourism took off. Indeed, the scheme enjoyed so much success that other communities have attempted to emulate the strategy (Frenkel and Walton 2000).

Although the timber industry was no longer an important player in Leavenworth's economy, it was still active in the case study area and surrounding region through the mid-2000s. A large sawmill in Cashmere (just outside the case study boundaries) shut down in 1977, but the Peshastin Lumber and Box Mill operated until 1998. In the early 1990s, Longview Fibre opened a small-diameter wood mill in Winton, about 13 miles from Leavenworth and well within the case study boundaries. In 2004, Longview Fibre was the only remaining mill along the Wenatchee River corridor and provided about 100 jobs to residents in the greater Wenatchee River valley. The mill closed in late 2006.

Economic and Social Context of the Past 25 Years

Land ownership and management—
Land ownership in Leavenworth is dominated by the Forest Service, which manages 86 percent of the land base. Forty-two percent of the case study area is classified as designated wilderness. Private lands compose 12 percent of the land base (nearly 92,000 acres). Washington state controls about 1 percent of the land in the case study area.

Industry and employment—
Currently, manufacturing in Leavenworth is nonexistent and tourism forms the mainstay of the economy (see below). However, one notable development over the past few years is the emergence of digital cryptocurrency miners in northcentral Washington. They are taking advantage of low-cost hydroelectric power produced by the region for their energy-intensive work that uses powerful specialized computers to generate new units of cryptocurrencies. In 2018, Leavenworth City Council passed a zoning ordinance to regulate the growing industry, citing concerns over fire hazards associated with large electrical loads, noise pollution from heat-dispersal fans cooling computer servers, aesthetic concerns over the look of computer-filled cargo containers, and the potential effects of the industry on electricity prices.

Housing and infrastructure—
Our research found that in October 2018, the median home price in Leavenworth was $405,600, which is 108 percent of the median price for homes in Washington state. Figure 4.7 catalogues the existing infrastructure and cultural amenities in Leavenworth. There are several public transportation options for commuting to or from Leavenworth, including a bus route to and from Wenatchee. Cascade Medical Hospital in Leavenworth offers a family practice clinic; physical, speech, and occupational therapy; diagnostic imaging; and an urgent care unit. A professional ambulance service and 14 paid fire and emergency responders operate in the case study area.

Tourism-oriented amenities—
Leavenworth is the most established tourist destination of the case study areas, and the magnitude of tourism amenities reflect this. The community has 70 restaurants; 567 vacation rentals; about 889 hotel rooms; 1,107 campsites; and 10 recreation outfitters. The town—complete with Bavarian-themed architecture, community events, souvenirs, restaurants, and more—draws more than a million tourists each year. Beyond the scenic appeal, the mountainous area surrounding Leavenworth also offers opportunities for hiking, rock climbing, skiing, and more. In addition to the town of Leavenworth, the case study area includes Lake Wenatchee, a more rustic but still popular tourist destination with more than 150 campsites in Lake Wenatchee State Park, in addition to other tourist amenities. The lake offers opportunities for boaters, windsurfers, and other water sports, as well as hiking, cross-country skiing, and mountain biking.

Perceptions of Social and Economic Changes

Employment—
Leavenworth interviewees were nearly evenly split over the question of whether employment opportunities had increased or decreased overall during the past 25 years (increased, n = 4; decreased, n = 4; fluctuated, n = 6; total, n = 14). Those who described an overall decline in the number of opportunities attributed it to changes in the timber industry and to the NWFP. For example, one interviewee explained, "What we saw with the big downturn with the passage of the [NWFP], and this was true across the Northwest, is closure of many, many mills. So, I would say the infrastructure is still somewhat depressed, and many of the mills that were in existence 25 years ago aren't anymore."

However, this same interviewee also expressed the following:

> [Employment] opportunities were significantly limited once the plan was passed, and I think that may be in large part [due to] some of the work by the environmental community.… They seemed to have kind of turned the corner on that in the last probably 5 to 8 years. And now, what we see is a lot of environmental organizations leading these collaborative groups that are trying to get forest management and forest restoration type projects done. So, I think overall, that's starting to change here in the pretty recent past.

Other interviewees also noted a recent increase in wildfire-related forest management jobs, but added that the

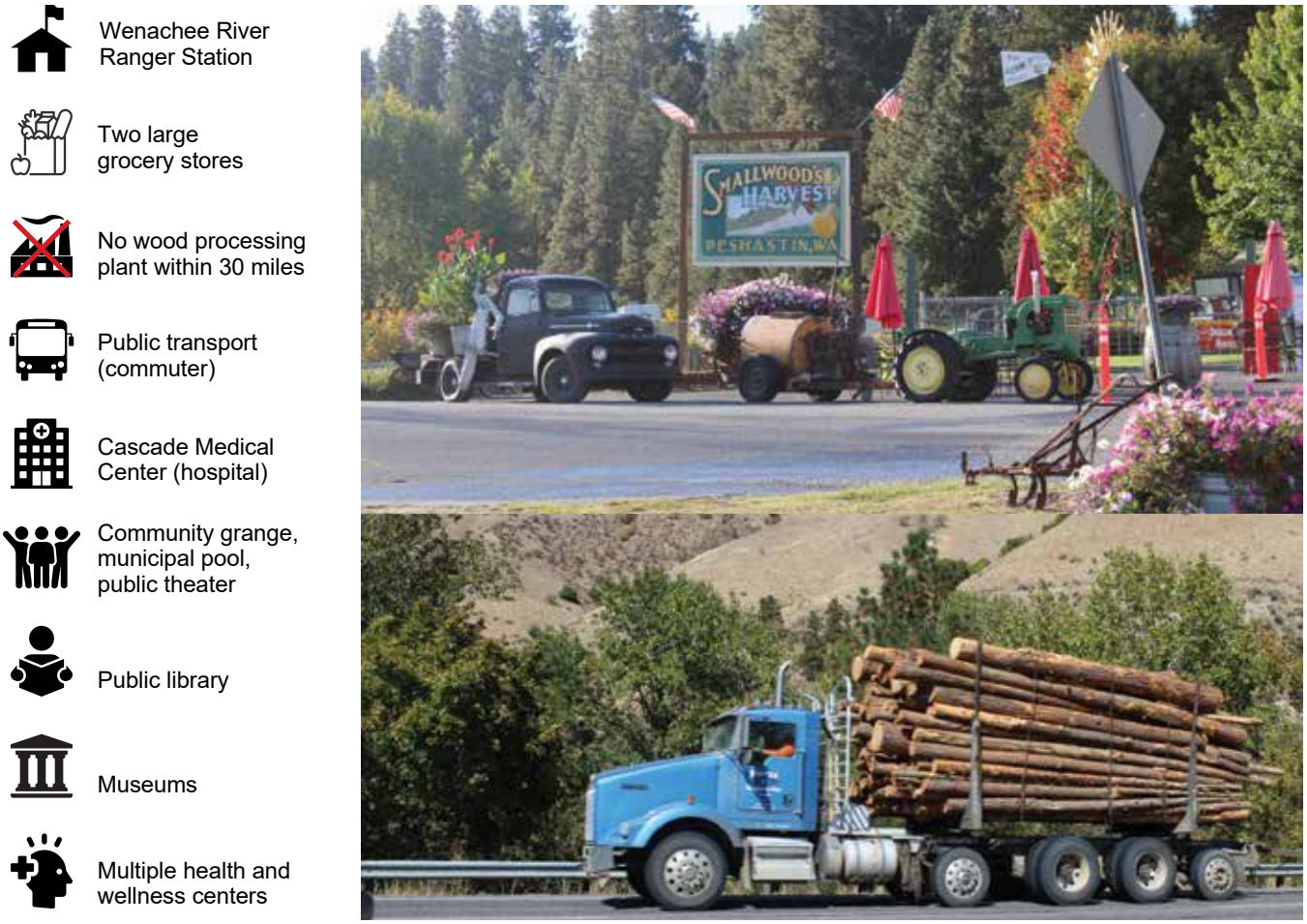


Figure 4.7—Graphic summary of community infrastructure in Leavenworth, (top) orchard retail outlet and (bottom) log truck on U.S. Highway 2, both near Peshastin. Photos by Gabriel Kohler.

increase was small in relation to the increase in jobs related to tourism:

> Yeah, I think there has been some uptick in the industry around fuels reduction—wildfire preparedness, in terms of jobs in the woods. But that's pretty minimal, really, in the grand scheme of things.… Other ways that employment has changed: I mean, there's just been a huge shift in terms of, from my perspective, in terms of people moving towards the tourism industry. And the focus in Leavenworth is certainly on tourism.

Indeed, most interviewees explained that whereas jobs in the timber industry declined in the past 25 years, they had expanded in the tourism service industry. Yet, several of Leavenworth's interviewees noted that the increase in tourism jobs did not completely replace jobs lost to the timber industry. In fact, two interviewees independently stated that timber jobs that were lost paid "$20.00, $30.00 an hour," whereas tourism and recreation-related jobs paid half of that. One interviewee observed that in making the shift from timber to tourism, "We've eliminated kind of a working-class segment of our population- manufacturing. Our mill closed. Logging is down. As a result, people have had to either relocate to find work. … or some have settled for taking a lower paying job in the area. A few like me actually got a little higher-paying jobs, [and] had to redefine themselves." Similarly, two interviewees noted that many of the jobs in the area were not just lower wage, but also seasonal. And as one put it, along with cost of living increases, this had caused many people to commute from Leavenworth to Wenatchee for work since "there's more living wage jobs down there than there are here."

Housing—

Leavenworth interviewees were unanimous in their assessment that housing costs had increased in the past 25 years. Indeed, many interviewees stressed the extreme

nature of this increase. As one interviewee described it, "You know, a home that… just before we moved home 10 years ago, would have gone for less than $200,000 is probably now a $550,000 home. It's bananas."

Among the several causes cited for increasing the cost of housing were second-home ownership and the ability for high wage earners to telecommute, which one interviewee explained as follows:

> The increase in secondary home ownership in our area creates a housing dilemma. I think more and more often we have a lot of employees in Leavenworth per se, [that] don't live in Leavenworth. And I'd say it's not just the secondary home ownership. It's people's increasing ability to work remotely, and Leavenworth's a desirable place to live. It's got great recreation opportunities and access to amazing public lands, and rivers, and mountains. It's a small town, and so, there's also things like that that go along with it. I think there's a lot of reasons that the cost of living has come up. It's also just so close to Seattle. Just two and a half hours. There's a lot of people that live in Leavenworth and commute to Seattle for a couple of days a week.

One interviewee said that Leavenworth, like other case study communities, is also experiencing a crisis in the availability of rental housing: "There's a pinch on rental stock. Leavenworth is a hard case study because there are multiple causal factors at work here, you know? And so it's ... Little Bavaria [Leavenworth] is different from a lot of other places, but rental stock is at a premium. There's not enough of it. Prices are increasing, housing prices are dramatically increasing. In 25 years it's [been] insane."

Another interviewee added the following:

> Almost every house that you come across anymore is being used for rentals. People aren't raising families there. One of the reasons is they can't afford it, because property values have gone up dramatically—because it's the "in" place to be. Now this isn't the same in Peshastin, though. If you get down into Peshastin you've still got older, lower income people. A lot of the Hispanics have moved out there because it's cheaper; they can get a cheaper house in [the] Dryden-Peshastin area.

Another interviewee suggested that "most of the property in Leavenworth is owned by west-siders that are coming over [from urban areas west of the Cascades], and when they're not using it, they're renting it out as weekend rentals."

Services—

Most interviewees in Leavenworth (n = 11) thought that services in the community had increased, or at least stayed the same (n = 1) over the past 25 years. One interviewee explained it as follows:

> We do have good healthcare here. We have a nice hospital, and that's been taken care of so that's good. I think the school district struggles because a lot of the people, they come here to retire, so they [don't] want to pass the levies, the property tax levies, and they're retired. They don't have kids. They're not involved so they don't want to pass that through. I think the school district suffers some from that, though they got a brand-new school. I don't know how much that is, but I know that; I've just heard that they struggle. Now, as far as restaurants, there's tons of restaurants. There's tons of drinking establishments, beer halls, and wine tasting.

Another interviewee said that in the past 25 years services had "probably actually improved—you can't buy underwear here, but the world has changed, too: so if you don't want to go down-valley, you just go online and you order it …. What services are we missing up here? We've got plumbers, and accountants, and lawyers …."

Social life—

The majority of interviewees in Leavenworth thought that the community's social life had either improved (n = 4) or stayed about the same (n = 4). One way that it had improved concerned the opportunities surrounding cultural events: We have pretty good access to that kind of stuff, I would say. Like, Icicle Creek Center for the Arts, which is out at Sleeping Lady…. It's like a performing arts center, so they show ski movies and different arts, events, and stuff like that. We have some businesses like a local workspace has opened up the coworking idea, and then [there is] Wenatchee River Institute downstairs, they put on lectures at the barn." Volunteerism was cited as another factor holding up the community social life: "There is definitely a

strong sense of volunteerism, I would say, here. People are committed to having a strong community, I think."

Although the town of Leavenworth dominates the area, the unincorporated village of Peshastin is part of the case study area as well. One interviewee reported similar improvements in community cohesion and volunteerism in Peshastin:

> Forming the community council here in Peshastin was a good thing. … We're part of a county so we have no [official] city power, but at least we have a voice. If somebody has a problem, they can come to [the community council] and then they can go to the county and say, "this is a problem in Peshastin," and you get more notice because it's from the community council rather than just some individual. … The library has, every year we do a fundraiser, ice cream social, and everybody loves that because, again, they say it's the one thing you can come to that's just a local thing. It's not tourists. … [A]s far as in the Cascade School District, I would say Peshastin's the only place that really has opportunities for local people to get together.

Some interviewees did report changes in the general social life of Leavenworth. One interviewee gave this example:

> I think things have changed quite a bit with the increase in tourism in Leavenworth. I think even just being there for 8 or 9 years, when I got there, rent was pretty cheap. And you could be a ski bum and live there and work at Stevens Pass, and for the Forest Service in the summer. And people would meet up in town at the local watering hole or whatever. And I think more and more with the town being busier and busier, it used to be the case where people would say, "how is it with all the tourists?" And you'd say, "It's not bad. You learn how to avoid them pretty easily." And then, I think more and more it's become a pretty major barrier to getting people together in town anyway. I think most people get together at folks' houses or whatever. It's more of a potluck-type of scenario where people get together.

Yet another interviewee stated, "I think we get together entirely too often and talk entirely too much—and we have too many opportunities for that"; while still another reported: "It is hard to get people together."

One change residents expressed concern over was the schooling situation in Leavenworth. For example, one described a perceived increase in homeschooling: "30 years ago, there were a couple of families in our area that would do homeschooling; now, … [it] almost seems like it's half the community."

Demography and well-being—

Although most interviewees agreed that well-being in the Leavenworth area had generally improved, Leavenworth's Cascade School District has lost about 18 percent of its 1999 enrollment. This shift in demographics may be turning around. For example, one interviewee reported, "We are seeing a lot more influx of young adults that are starting families here. That should reflect here in the next 5 years in increased school population, but those folks aren't folks I would say are going to probably be on free and reduced lunches."

This recent shift to more affluent young families was attributed to "amenity migrants from Seattle" and the proliferation of telecommuters in the community, according to one interviewee:

> What I've seen is that there are a lot of people that bring their work with them. They are telecommuting. They work on computers in Seattle from here. I talked to [someone] the other day, (s) he works for [a company based in Florida]. (S) he was over here, they have a house here and in Seattle, but (s)he does computer work, statistical analysis for them …. We see that. A lot of people bring their work with them. If you're an architect or engineer or something.

Another reported that, "… there is a trend of people moving here from out of the area and using this as their home base that are in the young-family age group, and I hear that from other folks in the community, too, because with Seattle getting so crazy, I think people move here because it's nearby. A lot of people can work remotely or semi-remotely and still go to the west side [of the Cascades] when they need to."

The situation in Peshastin was slightly different, as one interviewee reported:

> I just don't think we have as many children living here. It just doesn't seem like in the neighborhood there's the kids. When I grew up, there was; geez, we were down in Peshastin and we had a neighborhood. There was probably 20 kids running around outside. We just don't have that anymore. I think the people that are still here are my age. They're retired. Their kids have grown up. They've moved away and we've got a few people. I think the only people [that have children] that are really living here anymore are the Hispanics.

According to interviewees, a significant portion of newcomers in Leavenworth are retirees. As one interviewee put it, "People come here and retire." Another explained that "Leavenworth is a retirement community. It's become that. It's a shift in the population from young people with kids to a retirement community and the programs that support people who have a lot of time on their hands."

It was a widely expressed perception that these new residents are shifting the demographics of the community. As one interviewee noted, "Yeah, just people moving over here from the other side [west side of Washington state] that are retiring. Okay. Yeah, there's a lot of people that are in this area that do not have kids, or they probably have grandkids and obviously **they** don't live here."

Relationships with federal forests and agencies— Interviewees were ambivalent about the relationship between Forest Service employees on the Okanogan-Wenatchee National Forest and the community. In part, this ambivalence came from the perception that Forest Service staff and budgets had decreased. For example, one resident noted, "There's been a solid decrease in the number of staff in our local federal agencies. They don't have as much time to be in the community as they used to be, and then morale is terrible…. The 'do more with less' [approach] has crushed their spirits."

The shift in how the Forest Service staffs its local offices was also perceived as having significance for changes in community-agency relations. One interviewee explained it as follows:

> The folks that have been on the [national] forest for 20, 30 years are super engaged in local clubs and the community. And then there's a lot of ... I think it's certainly a major challenge to have the constant rotation of new employees coming in, to have people that aren't really connected to the community.… I don't put it necessarily on the Forest Service employees. It's not their fault that they're only there for a year or two oftentimes…. Those higher level positions often just get a new person every couple of years. And it's hard for those people to engage in the community.

At the same time, another interviewee pointed to an increase in public engagement with management issues:

> I think there's outside pressures and partnerships that are pushing the [Okanogan-Wenatchee National] Forest to have more public involvement and collaboration. And there's certainly policy direction on that, too. But there's also pieces of what they have to do that they feel strongly that they can't involve the public for legal reasons or whatever. It kind of feels like they're always walking the line.

When asked about how the Forest Service communicates with the local community, one interviewee said, "I think they communicate a lot. [but] I do not believe it's effective."

Land use and management— When asked whether or not interviewees in Leavenworth felt like the Okanogan-Wenatchee National Forest was an integral component of the community, most (n = 12) answered affirmatively. For example, one interviewee replied, "That's why I think most people live there, is the access to public lands. … recreation, hunting, fishing, mountain biking, the hiking and climbing. Yeah. The ability to just be in wild places pretty quickly."

Another interviewee echoed this sentiment about Leavenworth, stating, "It's a mountain town. It's always been a mountain town. I mean, we... maybe we're not a timber town anymore, but we've never not been a mountain town. Recreation, mountain biking, hiking, all the things that those people move here for."

But interviewees such as this one also suggested that a diversity of forest uses exists in Leavenworth: "I think it's different demographics, but, so you could start with Evergreen Mountain Bike Alliance and the trail use. It's partnering with the Forest Service to work on those. I think there's still a lot of the old-school driving around on Forest Service roads, shooting guns … hunting, not just shooting

guns. I mean that's great. That is the town. That is what the social use is and the value."

Interviewees mentioned the importance of several nontimber forest products including mushrooms, seedlings, pinecones, huckleberries, firewood, herbs, and Christmas trees. They also spoke of other nontimber values, such as leases for the ski resorts and landscaping for cross-country skiing, rock climbing, mountain biking, hiking, and hunting.

In terms of land management, interviewees had mixed views about Forest Service activities. For example, one interviewee explained, "I think there's a general feeling that the Forest Service isn't getting anything done. In the Lake Wenatchee-Plain area, I think it's more where people are more affected by the lack of timber industry. And that there's more angst about that, and people actively being upset with the Forest Service."

This was especially true concerning wildfire management, according to one interviewee: "I think [community members] are really aware of their wildfire risk and the fact that the drainage hasn't burned in over 100 years. All the regional wildfire risk analysis shows this area is the bright red hotspot. And that community feels like they're starting to do a lot of work on their lands, and they'd like the Forest Service to begin doing work on their land to make it more resilient to wildfire." As another interviewee put it, the forest is, "sitting there … waiting to burn."

Future directions—
When asked about a future with an increase in timber sales on the national forest, interviewees had diverse responses. Several suggested that it could be positive for the environment; as one put it, "It would increase the management activities to improve forest health and reduce wildfire risk because it protects communities, and watersheds, and fish; they're all tied together."

Another respondent suggested that a "more sustainable supply" of timber could "incentivize us having infrastructure to do more forest restoration, thinning, and work in the area."

One interviewee pointed out that although timber workers have long ago left the area, it remains an attractive place to live. Consequently, workers would return, "The direct impacts from jobs in the woods and a working wage to bring their families to live there and take advantage of those opportunities. I know a lot of loggers that have left, and they would prefer to be [back] here and work and raise their families here."

On the other hand, one interviewee told us that because Leavenworth is primarily a tourist destination now, "People would speak up if it [logging activity] were visible and would object." Another interviewee echoed this statement, saying, "If anywhere around town got clearcut, it would be a problem."

In terms of future directions other than the timber industry, as interviewees such as this one unanimously pointed out, Leavenworth is already well on its way down the tourism and recreation path: "The path of the town… will continue to grow. You're not going to see this town fail because they made that switch and fortunately they're close enough to Seattle and these places that it worked… Amtrak runs a train.… They run a specific train for festivals over here—and tour buses. Oh my God, it's just incredible. In the dead of winter, freaking tour bus after tour bus filled full of people."

Not all interviewees shared an optimism about the continued growth in the tourism and recreation sector, as expressed by this one: "The tourism piece is gonna keep going till, it's like a boomtown, right? A boomtown is gonna bust sometime, maybe…. Maybe not."

As another interviewee suggested, it will be important to find "that balance between tourism and the people that live here …[this] is the big push and pull right now. Housing is a huge push and pull." The challenge will be "trying to manage the success, I guess, of this community and make it sustainable."

Lake Quinault

Geography

The Lake Quinault community case study area is defined by the boundary of the Lake Quinault Unified School District, which encompasses 448 square miles of northern Grays Harbor County, Washington, including a portion of the Quinault Indian Reservation (figs. 4.8 and 4.9). Lake Quinault is in a remote area along U.S. Highway 101 on Washington's Olympic Peninsula, which is known locally as the "west end." Lake Quinault is approximately 90 miles west of Olympia and Interstate 5, and 40 miles north of Aberdeen-Hoquiam, which is the nearest full-service community. The school district serves three main community centers: residents living along the north and south shores of Lake Quinault, including Amanda Park and

Lake Quinault at a Glance

> "Back in the day, we used to have community events. But so many of the people that want to get together have left that, it's kind of a ghost town, as far as that goes."

Cities, towns, and census-designated places (CDPs): Amanda Park (CDP), Neilton (CDP), and Humptulips (CDP)
Populated place names (unincorporated): Lake Quinault
School district: Lake Quinault Unified School District
Population (2010): about 1,187
State: Washington
Federal forest lands: Olympic National Forest, Pacific Ranger District
County: Grays Harbor (also a sliver of Jefferson County in the upper Quinault Valley)

Figure 4.8—Lake Quinault Case Study, (top) protest sign, South Shore Road, upper Quinault Valley, (middle) view from Lake Quinault North Shore (in Olympic National Park) towards the south shore and the Colonel Bob Wilderness, Olympic National Forest, (bottom left) Upper Quinault Valley, (bottom right) Quinault Rainforest, south shore Lake Quinault, Olympic NF. Photos by Mark D. O. Adams.

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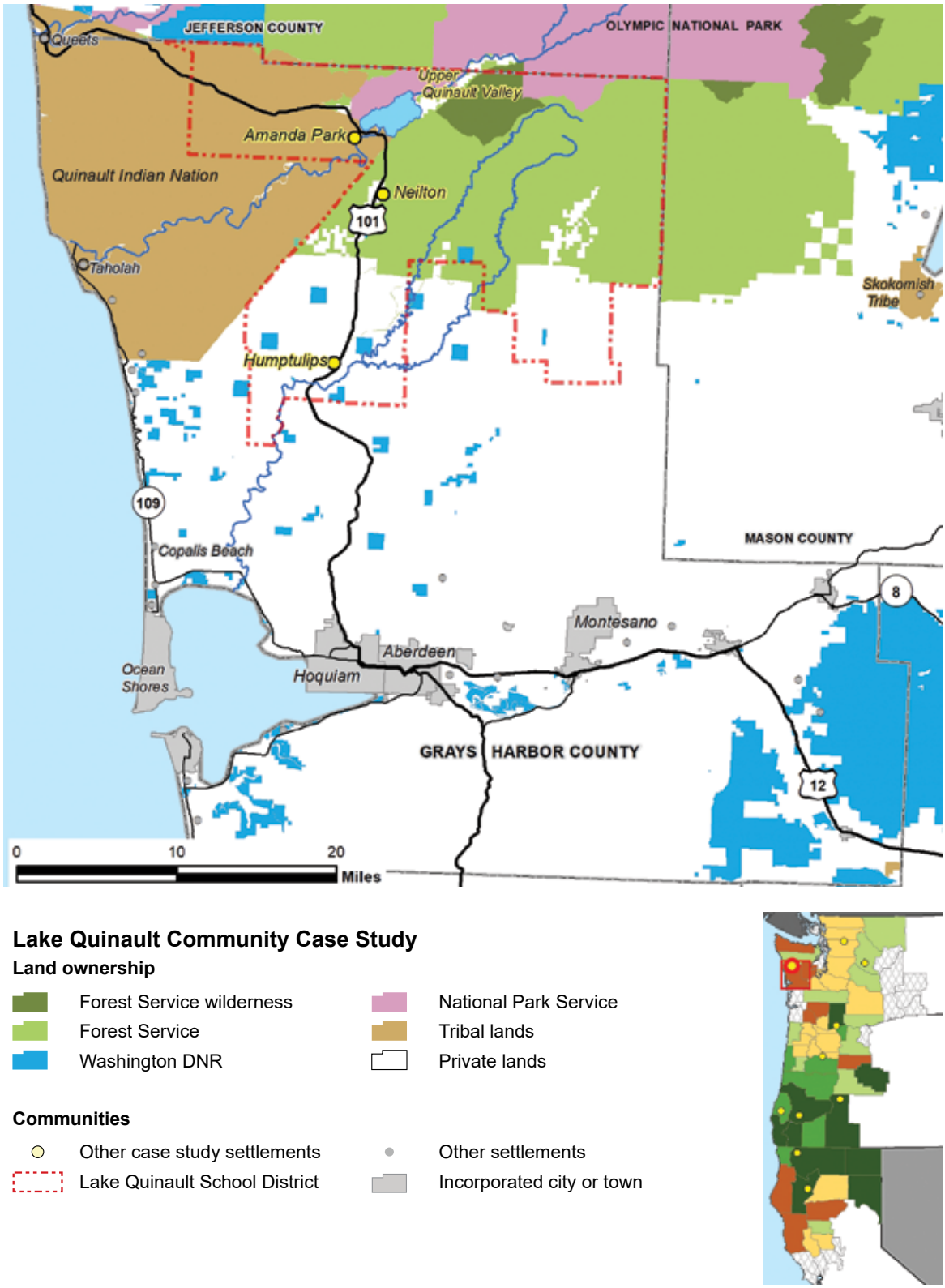


Figure 4.9—Location of Lake Quinault Case Study. Map credit: Mark D. O. Adams. Note: private lands include the forest industry. DNR = Department of Natural Resources.

areas along the upper Quinault River to the northeast of the lake, including some in neighboring Jefferson County; Neilton; and Humptulips. In addition, the district is the high school servicing district for the largely American Indian community of Queets, which was not included in the case study as the effects of the NWFP on American Indian tribes is monitored separately.

Locals tend to refer to the community as "Quinault," and describe its extent as encompassing residents of both shores of Lake Quinault, residents of the upper Quinault Valley above the lake, and residents and businesses in Amanda Park. Neilton and Humptulips are most often thought of as separate communities with their own identity, though Neilton is sometimes described as being part of the greater Quinault community because of its proximity to the lake. Most commercial buildings and businesses in the community are located along a strip of U.S. Highway 101 in Amanda Park, as is the consolidated K–12 school. A store and gas station are located on leased Forest Service land on the south shore of the lake. Also on the south shore is the historic Lake Quinault Lodge, which was built in 1926 on the model of the more famous national park lodges of the early 20th century. The lodge is operated by a concessionaire under lease with the Olympic National Forest. Neither Neilton nor Humptulips has any significant services, though small cedar shake mills are located in both. The 2010 population of the entire Lake Quinault School District was 1,187 residents, with 252 in Amanda Park, 315 in Neilton, 255 in Humptulips, and the remainder outside these designated places, mostly in the upper Quinault valley. The greater Aberdeen-Hoquiam area had a 2010 population of slightly less than 30,000.

Land tenure arrangements in the greater Lake Quinault community are unusual. The community is surrounded by a variety of public or quasi-public lands: Olympic National Park, Olympic National Forest, State of Washington trust lands, and the Quinault Indian Reservation. The Quinault Indian Nation holds title to the lake bottom and regulates use of the shore below the mean water line. Residences along the north shore of the lake are located on private parcels within the boundary of Olympic National Park. Most homes along the south shore are on Forest Service land, and homeowners are allowed to occupy the structures according to a lease agreement with the Forest Service. Originally, lease holders were allowed to reside year-round, but now all leases dictate that the homes be used only seasonally. Most of the private lands along both sides of U.S. Highway 101 between Neilton and Aberdeen are owned by private industrial timber companies, particularly Rayonier. Some residents of Amanda Park live on private property within the Rayonier boundaries on the Quinault Reservation.

The west end of the Olympic Peninsula has a distinctive physical geography. Topographic relief is high, ranging from sea level to a high of nearly 8,000 ft over a span of approximately 45 miles. Locally, the mean surface elevation of Lake Quinault is 190 ft above sea level, while the summit of Colonel Bob Mountain, the highest point in the range on the south side of the lake, is 4,500 ft above sea level. The strong elevation gradient, combined with consistent onshore winds during the fall, winter, and spring, create a temperate rain forest climate on the west end. Several coniferous tree specimens in the valley are record-size by wood volume, including the largest Sitka spruce (*Picea sitchensis* (Bong.) Carrière) and western redcedar in North America, and the co-largest Douglas-fir in the United States. Other common tree species at lower elevations include western hemlock, and bigleaf maple (*Acer macrophyllum* Pursh). Temperatures are mild and exhibit small annual variation, from average wintertime low at 35 °F to average summertime highs of around 73 °F. Freezing temperatures are rare. The area gets about 131 inches of precipitation per year, most of it falling between October and June.

Brief History and Notable Events

The Quinault River valley is within the ancestral home of the Quinault and Queets Tribes, southern coastal Salish peoples. The Quinault and Queets Tribes now share a reservation along the lower Quinault River below the lake's outlet with descendants of five other western Washington tribes: Chehalis, Chinook, Cowlitz, Hoh, and Quileute. Collectively, these groups comprise the Quinault Indian Nation. Like most northwest Pacific coast peoples, the Quinault and their neighbors maintained permanent homesites and developed a complex culture largely because of an abundance of foods and materials for clothing, structures, and transportation from the ocean and rainforest.

The Lake Quinault area was among the very last areas of Washington to be visited and settled by nonindigenous people. The first recorded visit of a White American to the Quinault Valley was by the trapper Alfred Noyes in 1888, although a previous pioneer homestead had been occupied

in the Neilton area earlier. Following a U.S. Army survey expedition through the southern Peninsula in early 1890, White settlers platted a Quinault townsite on the south shore of the lake later in 1890, opened a lodge in 1891, and founded a school in 1892. The Olympic Forest Reserve was created by President Grover Cleveland in 1897. It included unpatented lands along the south and north shores of the lake. The reserve was transferred to the Agriculture Department and renamed Olympic National Forest in 1907. Two years later, President Theodore Roosevelt declared the heart of the forest as the Mount Olympus National Monument. The monument was redesignated the Olympic National Park in 1938, and more national forest lands were added, including the north side of the upper Quinault Valley and the north shore of the lake.

The Olympic National Forest's first ranger for the Quinault area established the Neilton townsite in 1910. In 1909, the newly created Forest Service took over the Quinault townsite on the south shore of the lake, temporarily using the Quinault Lodge as a ranger station. A permanent ranger station for the Quinault District was established on the south shore of Lake Quinault in 1916. During the first half of the 1910s, the district platted the recreational summer home lots on the south shore, which continues to hold a substantial fraction of the total housing units in the Quinault community today.

The earliest nonindigenous settlers of the Quinault Valley engaged in subsistence farming and ranching or supply, but local settlers began arriving in the 1910s specifically to make timber claims on lands outside the Olympic Forest Reserve. Small mills existed in the area by 1914. However, because of its relative remoteness from markets, the west end of the Olympic Peninsula saw little economic development activity until the end of World War II. Industrial scale logging on private industry lands in the southern part of Grays Harbor County was largely complete before the war, but during the 1940s, the community still contained similar proportions of loggers and mill workers as it contained self-sufficient farmers, ranchers, and business owners catering to a few tourists.

The Olympic National Forest began to initiate large-scale logging efforts in the 1950s as part of a general push to accelerate harvest on national forests to compensate for the lack of remaining timber on private industry land. Railroads that had been laid out around the west end of the lake in the early decades of the 20th century were upgraded to facilitate more efficient transportation of logs to the large mills in Hoquiam-Aberdeen. The forest significantly expanded the staff of the Quinault Ranger Station, and by the mid-1970s, it had more than 100 employees. Large-scale industrial logging on the forest required significant labor, owing to the difficulty of constructing roads and accessing timber on very steep slopes in frequently poor weather. The community of Lake Quinault boomed during this era. Residents born between the late 1950s and early 1980s could readily find permanent work as timber fallers or mill workers even before completing high school; and with a high school degree, they could often find work with the Forest Service on timber sale or road engineering crews. The community had multiple logging and road building contractors. Although a large industrial sawmill never opened in the community, many small-scale mills developed in the valley and nearby Neilton and Humptulips during this era. A large proportion of these were family-operated shake and shingle mills. Most of these new small mills were supported by the Grays Harbor Sustained Yield Unit, which stipulated that 50 percent of national forest harvest in the county was required to be milled within the county; as a result, they were dependent on national forest timber. The community did not diversify economically during the timber boom era; it was always heavily reliant on logging on national forest land and, to a lesser extent, tourism in the valley.

Economic and Social Context for the Past 25 Years

Land ownership and management—
National forest land comprises 47 percent of the land base, or 134,000 acres, of the Lake Quinault case study area, 40 percent of which is designated wilderness. The Forest Service maintains a small staff at its Lake Quinault office, which is part of the Olympic National Forest, Pacific Ranger District. Four percent of the case study area is national park, 15 percent is controlled by the USDI Bureau of Indian Affairs (BIA), and 1 percent is owned by the State of Washington. This leaves 31 percent of the case study area (about 90,000 acres) in private ownership.

Industry and employment—
Employment opportunities in Lake Quinault are few. A small number of cedar shake mills continue to operate in the Lake Quinault case study area. One of the largest employers in the area is the Lake Quinault Lodge, which

Figure 4.10—Graphic summary of community infrastructure in the Lake Quinault community, Lake Quinault Lodge, and Amanda Park commercial strip on U.S. Highway 101. Photos by USDA Forest Service (top) and Mark D. O. Adams (bottom).

employs about 80 workers. The Pacific Ranger District, Quinault office is staffed by about only a dozen individuals.

Housing and infrastructure—

We could not obtain a median housing price for Lake Quinault, but less isolated Aberdeen, Washington, (43 miles to the south) had a median home price of $147,400, which is 38 percent of the median price for homes statewide. The Lake Quinault case study area has very little infrastructure (fig. 4.10). The community is more than 75 miles from the nearest interstate and about 30 miles from the nearest moderately sized commercial center. Grays Harbor Transit operates a daily public transportation route between the Lake Quinault case study area and Aberdeen. There are several small convenience-type grocery and general stores within the case study area, but the nearest supermarket is in Aberdeen. There are no ambulances within the case study area, but Lake Quinault Volunteer Fire Department has three locations and 15 part-time, paid firefighters. The nearest hospital is in Aberdeen; however, the Quinault Medical Clinic in Neilton provides family health care and is open four days per week.

Tourism-oriented amenities—

Lake Quinault's tourist draw comes from its proximity to the rainforests and coast of Olympic National Park and Olympic National Forest on the Olympic Peninsula. The lake is surrounded by temperate rainforest, which can be explored either on foot, via a well-developed network of hiking trails, or by car via a scenic loop drive. Lake Quinault Lodge, located within the national forest at the edge of the lake, comprises the majority of lodging options in the area, with about 92 rooms out of the area's total 134 rooms, as well as a restaurant, boat rentals, tours, special events, and other amenities. Lake Quinault has six restaurants, six vacation rental homes, and 126 campsites.

Perceptions of Social and Economic Changes

Employment—

When asked about trends in employment over the past 25 years, no clear consensus emerged from interviewees in Lake Quinault (n = 14). Some interviewees noted a decline in forest-sector jobs, but others saw growth in the tourism sector. Indeed, one employer said, "I'd say 50 percent of our staff comes out of Hoquiam and Aberdeen. They ride the bus or drive.… There's not a big enough population of able-bodied workers, so we have to look outside the area. Tourism is definitely growing."

However, interviewees more commonly described general instability in the Lake Quinault area's employment sector. One interviewee linked this instability to a decline in the middle class:

> Most of our middle-class families left because there were no family-type jobs out here, … what we saw was a move or slow growth to more [of] a poverty-level [school] district. We are now one of the highest poverty-level districts in the state—99 percent of our children fully qualify for free and reduced [school meals].… One company up here, Cane Creek (now known as Alta), at one time had three full-time shifts. It went down to one shift, went back up to two shifts, and they do shingles and fencing.

Another interviewee explained that "Being able to support a household has dropped [a lot]. Everybody who wants to make any money has had to leave here."

At the same time, interviewees also reported that local businesses are having a hard time finding workers. In part, transportation was an issue. For example, one interviewee said the following:

> They're [a local business] trying to find employees. It's not an easy thing to do. …. The community, we have had some people that take the bus out from Aberdeen to fill some jobs. But most of the jobs we have, first of all, the bus doesn't come down. They probably would, but if you're working the restaurant business, they don't pick you up at 10 at night—or … get you out here at 6 in the morning.

Housing—

There was little agreement in Quinault about changes in housing costs over the past 25 years. However, a common theme was the shortage of residential rentals. For example, one interviewee said "There is a dearth of rentals. There are heartbroken people who've grown up in this community that aren't economically advantaged in order to buy a home who hate the idea of having to move, but literally cannot find places to live. The rental market is—it's almost nonexistent out here."

One interviewee described a recent direct experience with the residential rental market, blaming the shortage on an increase in short-term vacation rentals:

> I think finding a place to live is very challenging. I think over the last few years you're seeing a lot of the house rentals and apartments more, a lot of them have gone to nightly and weekly rentals. So, that's definitely impacted the availability of housing. So, it's a struggle for people moving into the area here. I don't know of anything for rent around Lake Quinault, and I'm actually looking for a new prospective employee and haven't got much luck.

Another pointed out that although rentals were scarce, they were relatively affordable as they are generally in rough condition: "I don't think there's very many places to rent, but the rent isn't very high. People don't maintain their homes, like they used to. So, they can't get a high number for rent, and people can't afford to pay for a high-rent house."

The quality of the housing has been an increasing problem, according to one interviewee:

> A lot of the houses around here are old. And then also, the economy around here has been up and down. Some of the ones that are on the edge, they don't get maintained. They're just easier to tear down. But the county did change the zoning around here, which is two/one. Two acres and then you can have a mother-in-law [live next door] probably if you have three acres. There's been a couple people taking advantage of that.

In part, interviewees blamed housing issues on government policies. As one interviewee explained, "We're losing housing stock, and the [national] park contributes to that obviously.

They give you a very good deal to sell your house. Their policy right now on the north shore is to buy these homes, and for the most part, demolish them and return those lands to a more-wild state." Another interviewee echoed this perception: "And there's very little new homes that are being built, but that's due to some of the land limitations: where there's not that much land available to build on. Because the federal and the national park, is a big problem for the community. Because they have been consistently, buying all the nice houses, along the north shore, and demolishing them."

Services—
Quinault's long-time resident interviewees (n = 7) felt that services had declined within the case study area over the past 25 years. Citing the local restaurant scene, one interviewee explained it as follows:

> We used to have a clinic in Neilton, and it went bankrupt, and we lost our medical facilities. The restaurants, other than the lodge in the rainforest who primarily cater to out-of-town tourists, [there are] two: one's open in the morning, and one's open in the afternoon, in order to stay in business. So, there's not enough tourists, it rains 150 inches a year in the winter. So, they have this little window in the summer where they can make money, but they lose money all winter and nobody's been able to make a profit for the last 20 years, with the communities supporting the restaurants, because of the downfall in the economics. So, winters are tough for the restaurants.

Another pointed out that emergency and policing services were also in decline:

> There used to be a cop around the area, lived in the community. Now, if there's any, the tribe has tribal cops, and the Forest Service and the park have their own. But the police services are spotty at best. If something happens, expect somebody—if it's an emergency—it might be hour and a half, two hours. If it's something that's less [of an] emergency, it might be two days, might be three days, might not ever happen. So, that seems like it's getting worse.

Although interviewees reported that things had declined in the past 25 years, Quinault's heyday was decades ago. As one interviewee described, "The whole area was booming in the '50s and '60s. It was logging, the logging not only was an export, it brought in people. We had businesses that were flourishing. We had more restaurants. We had taverns that were open until 1, 2 o'clock in the morning because there were younger guys [here]."

Lastly, one interviewee pointed out that in the past few decades electrical power services had been improved: "The one thing I think we've improved on in this whole area is our reliability on electric power. When I first moved here, the power would be out, it seemed like every week at some point. Now, they're rare. They've rerouted the power grid so it's much, much more reliable."

Social life—
Quinault's long-time resident interviewees (n = 7) perceived a less vibrant social life in the community. As one interviewee explained:

> You might just see some of your friends at the restaurant from time to time, but we don't really have a lot of things going on with the community. … Back in the day, we used to have community events. But so many of the people that want to get together have left that, it's kind of a ghost town, as far as that goes. And sometimes you see friends like once a year, but we don't have a lot of community gatherings, and that's something that would be beneficial… it's just kind of disheartening. So, we all kind of hunker down and hide in the trees.

A conversation with two interviewees detailed this perception even further:

> Interviewee 1: "We have some of the socializing things here, you know, they come to the bingo and stuff like that. There was a Lions Club in Queets Clearwater, I'm not sure if it's…"
>
> Interviewee 2: "It's gone."
>
> Interviewee 1: "It's gone. I mean, they're trying to bring back the community, the Lake Quinault Community Circle which is a group of community members who try to do some fundraising and … support activities for Lake Quinault, whether it's the school or other activities there.… [T]here's still a lot of fishing and hunting here. Of course,

> people go hiking and stuff like that. In terms of outside the churches, I don't know of a lot of other community activities."
>
> Interviewee 2: "There's not, and I would say with that Lake Quinault Community Circle, that it's kind of come back, it has morphed into something different. It used to be a fundraiser that concentrated on giving kids scholarships, they sold brooms, they did all this fundraising and then gave a lot of scholarships. Now the same group is going around feeding people because the elderly don't have enough food. So, they're kind of focusing on now, helping people survive."

Demography and well-being—
Interviewees reported a decline in the local population and a general decline in the population of Lake Quinault. As one interviewee explained, "I've seen our population go down. And I've seen the population mix change. I don't know. It is what it is. I'm not going to say it's a good thing or a bad thing."

Interviewees were mostly uncertain about whether or not new people were coming to the Lake Quinault community. However, more than one interviewee brought up a shift in the ethnic composition of the community: "I think the last 15, 10, 15 years … our Hispanic population has grown. We don't seem to have a lot of millennial types living out here, I think it's a little too remote. That'd be the biggest change…. Most of the people that I know that are Hispanic are working two and three jobs. They're really hard-working, good people to have in your community, I think."

When presented with the changing statistics on school enrollment (a 42 percent decline since 1999) and free and reduced-price meals (an increase from 52 to 99.4 percent of total enrollment since 1999), one interviewee had the following to say:

> Obviously, the population of students are directly related to job availability. So, if you have an area where jobs are going down, then the student population will obviously go down. I just read in the paper, too, that Gray's Harbor County, I think, was fifth or fourth on the highest unemployment rate in Washington state, which is probably about average; but for how it's been for the last several years: ... I'm just speculating. We have a lot of Hispanic communities that have migrated into the area, that have taken advantage of some of the jobs around here as far as working in the woods, brush removal, berry picking. Those types of jobs that don't make as much, so therefore, they are qualifying for the free and reduced lunch. Not specifically just the Hispanic folks, but there has been a large influx of Hispanics in this area. That is reflected in the student population information too that I have seen.

In terms of community well-being, one interviewee suggested a significant decline:

> What I see here, I stay involved in the food bank here. I donate a lot and I help and a friend of mine is the manager of the food bank. I know [the number of] families that utilize those services has like quadrupled in the last 10 years. I think there's a lot more drug use. I think there's a lot less employment or less desire for employment. Without these backpack programs and things, I don't think these kids would eat, honestly. So, I think this community out here does a really good job feeding kids and backpack programs and daycare and I think there's a huge need for it.

Relationships with federal forests and agencies—
A majority of interviewees (n = 8) had a negative view of the relationship between the community and the Forest Service. As one interviewee put it, "They're one of the major landowners up here. And you have to, you have to get along with them. If you don't, well, you're out of luck."

Another interviewee expressed the opposite: In the time I've been here, I have never heard any disparaging words about the Forest Service. I think the staff here works really well with the public. I can't speak for all of the Forest Service but these guys are very good partners, they're very motivated. They like taking the time [to] spend with people. I think they have a really good image.

According to another, the agency's relationship with community has changed with its level of presence:

> It's not like when I grew up. There were several [Forest Service] families, and probably eight or nine families that lived right within a couple of blocks of the lodge. They were all part of the community. Most of the professional people that

> worked there were involved in the Lions Club they had up there. The ladies were involved in the ladies' deals. It was a different ... a lot different. There are still some Forest Service people that are fairly involved with the community, but not like it was back then. It's a lot different. A lot of the professionals don't live in the community anymore.

Interviewees, such as this one, were mostly ambivalent (n = 10 "unsure") about whether the Forest Service engaged with the community:

> I'd say that they don't [engage]. I'd say that there's a disconnect from the community members. Yeah, because of the lack of support that the Forest Service has had in the last 20 years.… [A] lot of it has to do with the reduction in the people who they hire [and the number] that are out of this forest has gone down towards only about five people. … And so, a lot of the permanent residents here that used to work for the Forest Service, that were community members, aren't there anymore. And so, nobody's tooting the horn, you know, and it's an empty office. But the Forest Service [is] without any community members, or even a law enforcement officer that's from this area. So, there's just a void.

One interviewee related this move toward less engagement and investment in the community to the housing crisis:

> I think the limited Forest Service staff are as involved, or community oriented, as you might expect. The person I referred to earlier who thought about maybe making this kind of the place (s)he was gonna live permanently and so bought a house out here, (s)he was very involved in the community. The lack of places to live mean that one of the more recent Forest Service employees ended up buying [a home] … way north of here. I don't think (s)he ever really got a chance to feel invested in this place.

Another factor that interviewees such as this one brought up was the small size of the local Forest Service staff: "You can't get much smaller than the Forest Service office right here. Size wise. Population wise. Not that many people work there…. [F]or the Forest Service, *it can't get much worse. It comes down to it. Most of the people that work there are either really young or about ready to retire*."

Land use and management—

In terms of land use, interviewees were nearly evenly split on whether the national forest was an integral component of the community (yes, n = 7; no, n = 5; unsure/yes and no, n = 2). In terms of nontimber forest products use, Quinault interviewees listed firewood, cedar blocks and slabs, Christmas trees, evergreens, mushrooms, and salal. In the formal economy, "most of the [cedar] shingle mills that are left are owned by Hispanics that came in the 2000s," said one interviewee. Another reported that firewood was a "big deal" for "everybody," whereas salal was also a "big one" mostly on the "east side." Quinault also has an annual mushroom festival and they added that "folks come in from out of town for that."

Interviewees reported that many locals talk about the spotted owl injunction as, "the day the woods shut down." In general, nonagency interviewee views varied on how the Forest Service manages the forest: One said, "It doesn't seem like they do managing anymore—just ripping out roads." Another explained it as follows:

> There's places up there [where] there's a lot of old growth left. Pockets that some of them are fairly large sized that will provide murrelet habitat and should provide owl habitat. We don't need to log anymore old growth. But if we could keep that stuff that's been harvested and keep harvesting that on a continuing basis, that's kind of what I would like to see happen.

A third interviewee reported as follows:

> When you have tree blowdowns, [talk in the community] goes back to the old timber industry: "Why don't they just let us go cut those trees up and sell the lumber rather than sit out there and cause a forest fire?" I don't think that caused any forest fires yet, but you hear that. So, you've got that back-and-forth. But on the other aspect, they know they live in a beautiful part of the country and they appreciate it and they take care of it as well as they can, I feel.

On the other hand, another interviewee reported the contrary:

> I think the Forest Service is an excellent steward of our resources here. We draw a lot of people from all over the world… a lot of them are here to hike and climb and camp. I think the Forest Service provides just a wonderful resource for those people. It seems like lately they're doing, the Forest Service is doing more on trail repairs, bridge repairs, things that maybe in the early 2000s, because of budgets, maybe they weren't doing, but now it seems like they're back on track and replacing some of their infrastructure in the forest.

Future directions—

When asked if the timber industry could play a role in the future of the Quinault community, most interviewees responded negatively. For example, one said "It would be jobs for the short term, but no sustaining benefits—all of the good ground is long-since cut, and what's growing there now is not the sort of material that is being milled around here much anymore. Pretty soon, all our logs will probably be too large for the existing infrastructure."

Another said the following:

> I certainly wouldn't encourage the Forest Service to return to [being] a source of large-scale timber production or any large-scale natural resource extraction. I think it's already an area that is desirable as a place of recreation, and the Forest Service already has the pieces that are right next to the park that are dedicated to recreation. And, even some farther afield, though they're sort of not maintaining access to those more remote places, but the Forest Service has always kind of had a shared goal of recreation, supporting recreation. I think that if they were to return to resource extraction at a big scale of big trees, that would negatively impact the beauty of this area and it would negatively affect the one viable business that is only of limited viability already. I don't think it would be good.

Instead, interviewees saw tourism and recreation as their mainstay for the future even if it didn't bring high-wage employment opportunities. This was described by one interviewee this way: "It used to be that 300 visitor contacts was a really busy day downstairs, but now we are getting 800, commonly—something is definitely changing about people coming so far off the beaten path to see this place—I think there will be an increase in jobs, but recreation [and] service jobs, so that family-wage thing is still going to be missing."

That said, another local resident noted the following:

> I think the community as a whole is desperate for something at this point. And they would be very appreciative of some sort of a, maybe a community rebuild.… [W]e'd all kind of given up on forestry and economics there but, we'd all be up for recreation, and the campgrounds are packed. … People come to this area, tourists that just love the area and there's an opportunity there to do more with recreation, if that was available I'd like to see some of the moneys that are being made from many timber harvests, to be put into some recreation opportunities for people. But, you know, they tend to bill out the campground contracts to big companies, and local people really don't have a chance of being a part of that.

Stevenson

Geography

The Stevenson case study community was spatially defined using the boundaries of the Stevenson-Carson School District, Washington state (figs. 4.11 and 4.12). Stevenson is the seat of Skamania County and is located on the north bank of the Columbia River about 40 minutes east of Vancouver, Washington. The Stevenson-Carson School District includes nearly all residents of Skamania County, with the exception of 24 students that attend the Mill A Elementary School in the southeastern part of the county.

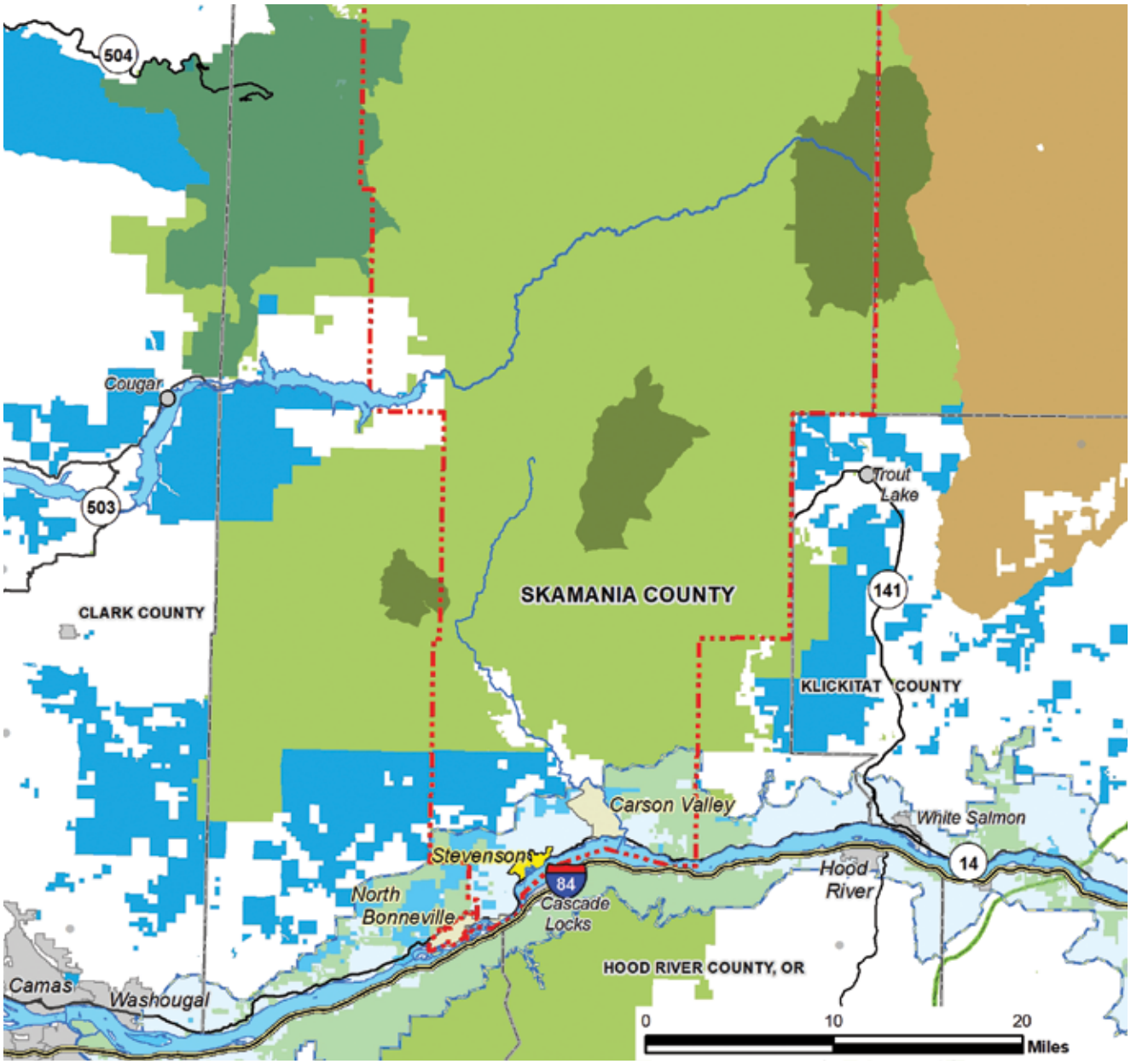
There are two incorporated cities and one census-designated place in the Stevenson-Carson School District. North Bonneville and Stevenson are incorporated, and Carson is a census-designated place. Carson, which is about 5 miles northeast of Stevenson on the west bank of the Wind River, is the largest community in Skamania County. The Stevenson area can be accessed via Highway 14, which runs east and west on the northern side of the Columbia River or via U.S. Interstate 84, which provides access from the Oregon side by way of the historic Bridge of the Gods in Cascade Locks, Oregon. In Skamania County, where Stevenson is located, 90 percent of the land is forested, and 80 percent of that forested land is part of the

Stevenson at a Glance

> "Eighty-six percent of our county is national forest, yet [the Forest Service has] shut down all of their offices [here]."

Cities, towns, and census-designated places (CDPs): Stevenson (city), North Bonneville (city), and Carson (CDP)
Populated Place Names (Unincorporated): Stabler, Tire Junction, Northwoods
School District: Stevenson-Carson School District
Population (2017): 6,528 +/- 300 (School District); 1,445 +/- 150 (Stevenson)
State: Washington
Federal Forest Lands: Gifford Pinchot National Forest
County: Skamania

Figure 4.11—Stevenson Case Study, (above) Hot Springs Ave, Carson Valley, WA, (middle) finished lumber, High Cascades / WKO Mill, Carson Valley, WA, (below) Lewis & Clark Highway (WA SR 14) Business District, Stevenson, WA. Photos by Gabriel Kohler.



Stevenson Community Case Study

Forest Service managment status

- NWFP boundary
- Forest Service wilderness
- Forest Service
- Mount St. Helens NM
- Columbia River Gorge NSA

Other land ownership

- Yakima Indian Reservation
- Washington DNR
- Private lands

Communities

- Stevenson-Carson School District
- Stevenson
- Other case study settlements
- Incorporated city or town

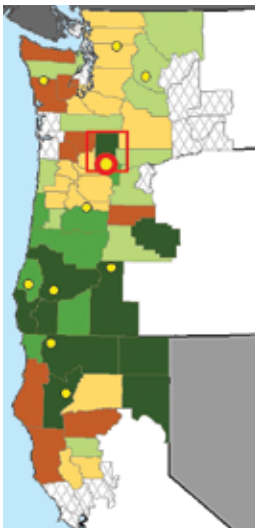


Figure 4.12—Location of Stevenson case study. Note: private lands include the forest industry. DNR = Department of Natural Resources, NM = national monument, NSA = national scenic area, NWFP = Northwest Forest Plan. Map credit: Mark D. O. Adams.

Gifford-Pinchot National Forest. Within the Gifford-Pinchot National Forest, a portion of land along the bank of the Columbia River was designated a national scenic area in 1986, when President Ronald Reagan signed the Columbia River Gorge National Scenic Area Act.

According to the 2010 U.S. Census, the population of Stevenson includes 1,465 people, 640 households, and 390 families. The city of Stevenson has a total area of 1.79 miles^2, 1.65 miles^2 of which is land and 0.14 miles^2 is water. The Carson area has a larger population, with 2,279 people living in 1,006 households. Carson census-designated place has an area of 4.82 miles^2. As of the 2010 census, North Bonneville had a population of 956 people, 420 households, and 262 families. The city of North Bonneville has a total land area of 2.41 miles^2.

The Stevenson-Carson School District is about 40 miles wide from east to west and extends north from the northern bank of the Columbia River into the Cascade mountains about 50 miles. Elevation gradually increases from the southern edge of the county, which is 20 ft above sea level, to the northern edge, at 8,888 ft above sea level in the Cascade Mountains. The climate of the area is temperate, but is strongly dependent on topography, with precipitation ranging from 35 to 90 inches annually, falling mostly in winter. Temperatures in Carson range from an average minimum of 27 °F in winter to an average maximum of 80 °F in summer. Vegetation is primarily coniferous forest and ranges from mesic in the west to xeric in the east. Douglas-fir, western hemlock, and western redcedar are common in the western mesic areas. Douglas-fir (*Pseudotsuga menziesii* var. *glauca*), grand fir (*Abies grandis*), Oregon white oak (*Quercus garryana*), and ponderosa pine are common in the eastern xeric areas. Strong winds are a feature of the area, especially near the southern edge along the Columbia River. Other notable features of the county include Mount St. Helens and Bonneville Dam.

Brief History and Notable Events

The Columbia River Gorge has long served as a major transportation corridor with many locations along the river significant for hunting, gathering, fishing, and trade. Given its significant function for trade and transport, indigenous peoples along the Columbia River were decimated early on by smallpox and other Old World diseases. Nonetheless, at the time of contact by Euro-American explorers, a diverse number of indigenous peoples considered the Stevenson-Carson area part of their home territory. The county name, "Skamania" derives from a Chinook term for swift waters.

Early Euro-American settlers following the Oregon Trail arrived in the Stevenson area around 1854. In 1851, Francis Chenoweth built a railroad that consisted of one wagon and a mule on wooden rails. The Oregon Steam Navigation company, which brought steamboats up the Columbia, was founded in 1860. This company later became the Oregon Railroad and Navigation Company, which at the time carried massive amounts of grain from eastern Washington to Portland. In 1908, the Spokane, Portland and Seattle Railway arrived and moved the town away from the river. In 1933, the Bonneville lock, dam, and powerhouse project began and the town of North Bonneville developed alongside the project. Early entrepreneurs developed the Shipherd and St. Martin hot springs, which brought people seeking health and pleasure to the area. The combination of the logging camps and the hot springs created a demand for hotels and other services in Stevenson.

Mills and logging camps were widespread in the area with the river playing a crucial role in log transportation. The Forest Service's Wind River Nursery, 15 miles north of Stevenson, struggled to keep up with the demand for seedlings needed to replant after logging and wildfire. The Wind River Nursery's first sowing of more than 1 million seedlings was completed in 1910. With the establishment of the Civilian Conservation Corps in the 1930s, the nursery grew to an annual production of 5 million trees. This production level was held for several years until World War II dampened it. At the same time, logging increased, creating a gap between harvesting and replanting. This period was characterized by an emphasis on sustained yield timber management.

In the 1950s, there were more than 50 sawmills in the area. The Broughton log flume brought rough-hewn logs from as far away as 9 miles to the Broughton Lumber Mill where they were processed. The Broughton mill and flume were in operation until 1986 when the mill closed because of the high costs of modernization and market conditions. Wilkins, Kaiser & Olsen, Inc., a logging company based in Carson, built a veneer mill in 1966 and a sawmill in 1972. The Walkins, Kaiser & Olsen sawmill is still in operation under High Cascade International Corporation.

One of the most significant recent events in the history of the Stevenson community was the passage of the Columbia

River Gorge National Scenic Area Act in 1986. The act drew attention to scenic and recreational opportunities in the area surrounding Stevenson and today underpins one of the most viable economic assets that the community can develop. This act also allowed the Forest Service to acquire additional lands within the Columbia Gorge area and, in collaboration with county governments in both Oregon and Washington, to oversee managing the area.

In 1992, the curtailing of logging on national forest land and the closing of Stevenson Co-Ply (a plywood and plywood byproducts plant), the county's largest employer, led to a hard transition in the community. Shortly after this closure, the Skamania Lodge opened, and the primary economy of the Stevenson-Carson School District quickly shifted from timber to tourism. According to regional labor economist Scott Bailey, timber harvests fell from around 400 MMBF per year in 1980 to about 24 MMBF in 2009.

In 1997, the Wind River Nursery and associated Forest Service Wind River Ranger Station closed. At its peak, this nursery produced as many as 36 million seedlings a year and was a major source of employment in the area. Ownership of the nursery property was transferred to Skamania County for redevelopment. The closing of the Wind River Ranger Station also removed Forest Service representation from Skamania County.

In 2017, the Eagle Creek Fire affected the community of Stevenson and surrounding areas. Originally igniting on the Oregon side of the Columbia River, the fire moved into the Stevenson area near Archer Mountain, requiring more than 40 homes to be evacuated. During the fire, 153 hikers were trapped overnight by the flames and had to be evacuated by search and rescue. The total burn area of the fire was 48,861 acres, but only a small amount of those were in the Stevenson area. Even so, the fire damaged many of the recreational opportunities that are important to Stevenson's tourist economy. The Eagle Creek Fire has provoked discussion about the need for wildfire risk reduction treatments in the forests surrounding Stevenson.

Economic and Social Context for the Past 25 Years

Land ownership and management—
The Forest Service manages 91 percent of the land base (608,692 acres) in the Stevenson case study area. Seven percent of the area is classified as designated wilderness. The nearest Forest Service district office is in Trout Lake, 41 miles from Stevenson. Three percent of the case study land base is in state ownership, leaving only 6 percent (40,944 acres) in private ownership.

Industry and employment—
In 2001, the High Cascade International Corporation purchased and continues to operate the Wilkins, Kaiser & Olsen sawmill in Carson. According to its website, the mill distributes more than 230 MMBF of Pacific Northwest Douglas-fir and white fir dimensional lumber annually. However, tourism currently forms the majority of Stevenson's economy. Transitioning from timber to tourism involved a shift in local employment opportunities to lower wage jobs. Consequently, the proportion of community members employed outside of the county increased and the number of commuters to Vancouver, Washington, and Portland, Oregon, grew by more than 50 percent.

The amount of protected land in the Stevenson area challenges the community's ability to bring in new industry because the amount of developable land is limited. However, this is not a barrier for some industries. Recently a drone tech company called Insitu, which is owned by Boeing, developed a campus in nearby Klickitat County, bringing new workers with higher wages to the area. In 2009, Insitu opened a manufacturing facility in Stevenson, transferring 100 jobs there, but these jobs were transferred back to Klickitat County in 2014. Median incomes in nearby Klickitat County soared 21 percent between 2010 and 2013, mirroring income increases that are typical in oil regions. Insitu employs 800 people in 12 offices around the Gorge; its headquarters is in Hood River, just 20 miles from the city of Stevenson.

Housing and infrastructure—
In May 2019, the median home price in Skamania County was $222,000, 3 percent higher than the median home price for Washington state. Community members in the Stevenson, Carson, and North Bonneville areas share services (fig. 4.13). For example, the Carson area does not have a full-service grocery store, and community members typically commute 10 minutes to Stevenson or elsewhere to obtain groceries. Skamania County Transit offers daily public transportation routes around Skamania County and to/from Vancouver, Washington.

The Stevenson area does not have a hospital but does have a clinic operated by the Northshore Medical Group that is open four days per week. This clinic offers a variety of

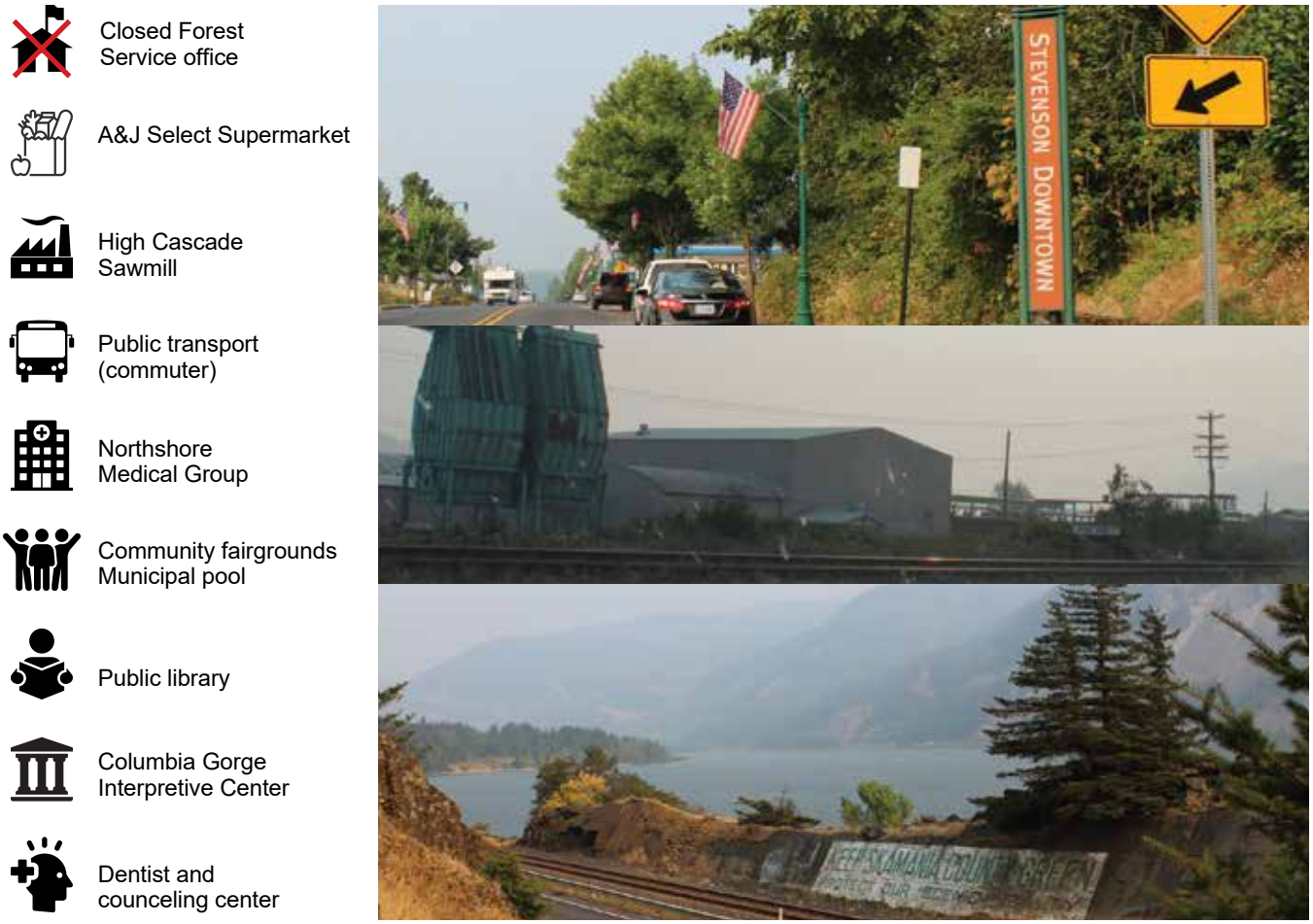


Figure 4.13—Graphic summary of community infrastructure in Stevenson. Photos: (top) WA SR 14 entering Stevenson; (middle) High Cascades Mill, Carson Valley; (bottom) Columbia Gorge near Stevenson. Photos by Gabriel Kohler.

family-oriented healthcare services. Located in Stevenson, Skamania EMS and Rescue is a professional ambulance service staffed by both full-time paid and volunteer responders. Stevenson also has one dentist office open four days per week. Stevenson has retained its supermarket (open seven days per week, from 7 am to 10 pm) and a number of other small shops and convenience stores.

Tourism-oriented amenities—
Tourism activity in the Stevenson case study area is largely concentrated in the southern portion at the Columbia Gorge, especially in the towns of Stevenson and Carson. Although most of the tourism amenities in this section of the Gorge are located across the river in Oregon, the Washington side around Stevenson does have two large full-service resorts, Skamania Lodge and Carson Hot Springs Resort, each of which has a golf course, spa, a restaurant, and additional amenities. The area also hosts a third golf course, Beacon Rock Golf Course, as well as the Columbia Gorge Interpretive Center, a museum that covers the natural and cultural history of the Columbia River Gorge. Hiking, windsurfing, and other outdoor recreation, as well as scenic viewpoints, dining, and breweries and wineries, bring visitors to the area. The Stevenson area has 29 restaurants, 44 vacation rentals, approximately 389 hotel rooms, and 151 campsites.

Perceptions of Social and Economic Changes

Employment—
Interviewees in Stevenson showed somewhat less consensus on the direction of change in employment opportunities over the past 25 years. Six interviewees reported that the number of opportunities had decreased because of timber industry losses. An interviewee explained that, "At one point the county I think had six mills going. Again, as time progressed, more and more of those closed up. With our situation today, … we've got WKO [Wilkins, Kaiser and Olson, Inc. mill], but there are no logging companies."

Only one interviewee thought that employment opportunities had increased on the whole, while two interviewees claimed they had both increased and decreased over time. Most interviewees agreed that wages had dropped, even if new jobs had been created: "Well, certainly I've heard that in terms of logging jobs, those have tanked. And in terms of other types of employment, I know the county's been working hard at creating those other types of employment, and I think they've done a relatively good job compared to other areas. But I think they're pretty low-wage jobs as…."

The perception was that jobs had shifted from an emphasis on timber to recreation, which does not pay as well. For example, one interviewee stated that jobs have "decreased in the way of family-wage jobs, living-wage jobs. In the late '90s, they built Skamania Lodge [a destination hotel and resort], early '90s I guess, which we saw employment go up a little bit, but as far as employment for a family, living wage, they've declined."

Three Stevenson case study interviewees attributed workforce changes to the NWFP by virtue of decreasing county revenue coming from timber sales on the national forest. For example, one interviewee put it this way:

> I would say definitely decrease [in job opportunities]. Mainly because of lack of funding for public agencies such as the county … with the loss of the timber revenues and then the subsequent Skamania school-funding issues. I think they're down 40 percent. And government's the largest employer in our county. Or was.

Another interviewee pointed to an increase in recreation-based tourism as the source of changes in economic opportunities: "Everybody recognizes there's been an increase in recreation use and services that provide for those people: breweries, restaurants, whatever else. There are generally service industry jobs that are pretty—they're not family-waged jobs.... The recreation use is increasing, there are these opportunities, and it's not necessarily the kinds of opportunities that Skamania County would really prefer."

Housing—

Interviewees in Stevenson were unanimous in their assessment that housing costs had increased over the past 25 years. Interviewees suggested that the price of housing had doubled in recent decades. One interviewee explained that the "cost of rentals, if you can find a rental, is very high. Over a thousand a month in most places for just a two bedroom." Indeed, several interviewees (n = 7) noted a shortage of rental homes. As one interviewee stated, you "can't rent a house … If there's a rental, somebody else already knows about it. [Buying a home] is your only option."

However, buying a home is also increasingly difficult. One interviewee explained, "There's a very limited land base where anybody can build a house. So, anything that comes on the market is sold almost instantly. And most of the buyers we have coming in now are from out of county."

Another interviewee suggested that "it's very hard for people starting out here to buy a decent house in Skamania County. They just, you know, they're not making enough money to warrant the prices that the homes cost." Part of the problem, one interviewee suggested, is the proximity of Stevenson to Portland: "Houses are officially being driven up by second-home [buyers], or people just commuting to Portland." Another interviewee noted that the housing market was tight, "partly because 80 percent of our county is federal forest land, and the Gorge Act also restricted development so that puts more of a premium on the housing market."

Services—

Stevenson interviewees disagreed about the status of various services in their community. While four interviewees reported some loss of services over the past 25 years, three reported a gain, and four reported that they were unsure; there was no perceived change, or there had been perceived losses and gains depending on the type of service. Interviewees who reported a decline in services suggested that health services had remained the same, but retail stores had declined. As one interviewee explained:

> The [health] clinics kind of stay the same. The stores have decreased. We used to have a general mercantile, sold shoes and clothing, toys, and things like that. That's no longer around. We used to have a couple of grocery stores and a bakery. That's gone down, but I don't know if that's a function of being closer to Portland and modern technology and Amazon and all that.

Indeed, some interviewees reported driving out of town to access a wider variety of retail goods. one said, "In

Washougal or just Camas, there's a new Costco. I mean, I'm speaking from personal experience. We go there, there's lots of services there. That's about 35 minutes away, max. Hood River's got Safeway and a Walgreens and all those kinds of facilities. A Walmart. And so, people will go there as well."

For the most part, interviewees reported relative stability of services, but some fluctuation in tourism-related businesses. One interviewee explained it as follows:

> From a service standpoint, we have services here, mainly in one town—in Stevenson—things like the banks and a pharmacy and a medical clinic .... It's the only town in the county that has those offerings. That hasn't changed. It's pretty much been the case since, in the time I've lived here. … With the transition to tourism, I've seen a big increase in tourism-related services, especially restaurants. And then the adult beverage side of things, so we have a lot more brew pubs and tasting rooms and that kind of thing that serve not only the local residents but also the visitors.

Yet other interviewees continually pointed out that with the decrease in federal timber dollars, the county is no longer able to offer as many services as in the past. For example, as one interviewee reported, "You know we don't even have sheriff's office after hours. It's like they have a dispatch there but no deputy's working after certain hours of the evening."

Social life—

About half (n = 5) of Stevenson interviewees reported a decline in the community's social life over the past 25 years. For example, one interviewee explained the following:

> As far as socializing goes, probably the Community Council but they only meet like quarterly. The fire district meets every week ... you have the VFW. There's not a lot of social stuff anymore. It used to be a big deal. People are not involved in that type of stuff anymore in the county, [not] getting together doing things.

Although this decline in social life was not attributed to the NWFP, this same interviewee suggested that the plan was responsible for a decrease in local recreational opportunities: "Far as recreation goes? The [NWFP] had a major impact on that, and it's been negative as far as the [national] forest is not getting the money to provide recreation." Another interviewee pointed out that the decline in federal timber dollars flowing to the county had also affected recreational and socializing opportunities that the county used to provide:

> [One example is the] deterioration of the [county] fairgrounds. The county completely chopped their public recreational programs. They used to teach kids how to snowboard and wind surf. All that's gone. The county, zero percent funds the 4H program, which is the only county in the entire state that has no funding for extension services. So, they've just slashed a lot of those types of recreation. … The Grange Hall. I mean that's on county property. I think it's county owned. It's a historic building that's just dilapidated and they don't have funding to restore it or actually put it anywhere and maintain it. Grangers are struggling as an organization anyways because they were brought together by farming in the past. It's a cool building, but they just don't have any ability to maintain it.

Another interviewee recalled the following:

> When I was growing up, we used to have ... Maybe I'll just take baseball for example. We used to have two baseball teams in Stevenson, two baseball teams in Carson, a baseball team in North Bonneville, one in Skamania, and one in Cascade Locks. Here a couple years ago, they didn't have enough to field one team. The whole league is smaller. Things have cost more.… Our soccer program here is pretty healthy for the kids. Our county used to do a few more things when I was growing up, dances and activities for the kids. They used to have dances and they offered ski lessons where they're take you to the mountain and go skiing. I don't see any of that anymore. They offered programs like that, which I don't see anymore. Everything is very, very heavily volunteer-based. Back in the day ... the county used to handle all those recreational programs like baseball and soccer. Now it's all a group of volunteers, and they're having trouble finding volunteers to coach and volunteers to do

> things, where the county used to take care of all of that, the logistics of it, and then the people would volunteer to coach. Now we have to have volunteers to arrange everything.

However, the other half of interviewees in Stevenson were unsure or saw some increases in opportunities to socialize or recreate over the past 25 years. For example, one interviewee said that the increase in tourism had also increased opportunities for locals:

> I'd say [social life has] definitely increased, especially from a recreation side of things. I mean, we've seen more users on our trails, more people interested in water sports on the Columbia River, or going into the forest. So, there's more interest in our area and part of that is, honestly, with the county being promoted as a recreational destination, more people are coming to learn about that. And I think the social [opportunities] goes along with that.

Demography and well-being—
Stevenson interviewees discussed a wide range of changes that occurred over the past 25 years in the demographic makeup and economic well-being of families within the community. For example, in the Stevenson school district, school enrollment has dropped 19 percent since the late 1990s. Most interviewees thought the NWFP was directly responsible for this trend. One interviewee explained this way:

> The thing about the declining student population is just the fact that there's no jobs here for people. The young families aren't here anymore. And the families that are here that have kids, most of them are working minimum-wage jobs, not living-[wage] jobs. Usually both parents have to work. That was another thing that ... with the [NWFP] there was a huge tree nursery up here and that was closed by the [NWFP]; that was closed because they had no need for the seedlings because they weren't doing any logging. And that employed, part-time work, that probably employed during the spring season and the fall season probably 500 people.

Another interviewee's explanation attributed declining quality of education in local schools to the loss of federal timber dollars:

> Another factor is we seem to have, and I don't have data on this, but just from a hearsay standpoint, we have a lot of people who send kids out of county to private schools. That questions obviously the strength of the local school. But again, they were heavily, they were just as dependent upon timber revenues as the county was. So, it was a decline in timber revenues, and the strain to be able to pass new levies for the school, as a contributing factor.

A third explanation for declining enrollment offered in two different interviews was that working families were being replaced by an influx of retirees, telecommuting professionals (without "families"), and second-home owners. This demographic shift, said one interviewee, also makes Stevenson a less desirable place to locate job-creating businesses:

> The retirees and the [other] people who are coming, I say, chasing the wind [to wind surf] or whatever, do tend to have money. So, they go to our restaurants. They spend their money locally. But they don't have children that are populating our schools and filling jobs at a certain level, so ... with declining enrollment at our schools, it makes it hard to entice new business if we don't have a really vital school system.

Interviewees were also asked about the increase in the percentage of students eligible for the free and reduced-price meals program in the school district. One interviewee explained, "Those who are still here are making less money than they did when they were working in timber-related jobs. So, I'm not surprised that the number of students [getting] free and reduced lunches have increased accordingly. So, people are making—they just have less money."

In terms of the retention of young adults, a number of interviewees reported that "kids that grow up here are leaving town." Another put it this way:

> Younger people graduate from high school and get the hell out of this county…. 'Cause there's no future. You're gonna work on minimum-wage jobs is what you're gonna have if you live in this area. Then what happens is all the really good young

> people that have ambition move out and what we have left are the ones who haven't got a prayer of making it outside the county.

A counterpoint to the apparent decline in the area's attractiveness to working families and entrepreneurs is evident with the number of recently opened, tourist-oriented businesses. One interviewee explained it as follows:

> There are people that are still of working age that are finding work. And, new people have come for businesses, like the brewery out there and some of those. I don't think those were people that were in the community. They're being drawn out there because of the setting, I think. And, then form a business, and start paying taxes, and becoming part of the community. So, that's what I see. Again, the Skamania Lodge too, is really worth looking ... I'm really curious what the [demographic and economic] impact of that has been over time.

Relationships with federal forests and agencies— Interviewees suggested that the relationship between the Stevenson community and the Forest Service on the Gifford Pinchot National Forest is somewhat strained. For example, several interviewees repeatedly pointed out that "85 percent" of the land in the entire county was national forest, leaving very little taxable land base. One interviewee suggested that since the NWFP, recreation-based tourism was the main factor driving the connection between the community and the national forest, but that relationship wasn't necessarily beneficial for Stevenson:

> [Tourism] doesn't bring a lot of money into the county. It does bring a lot of responsibility into the county—providing special services like search and rescue and police and all this other stuff that the local citizens are paying for. Ambulance service and everything else... without the [federal payments from timber sales], the county doesn't have a future.

Consequently, without the payments from federal timber sales, the national forest is increasingly seen by some Stevenson residents as a liability rather than an asset.

When asked if the Forest Service engaged with the community, most interviewees echoed this sentiment:

> They do [engage] through our collaborative group, and they do some things like a fishing derby, but I think actually the engagement in the community has decreased because Skamania County doesn't even have anymore any place you can go that the Forest Service operates like they used to that has permits that you can buy or information. They've closed those down, so all that stuff has gone for the local stores, and so I think their engagement in the public information department has decreased.

Other interviewees made similar points: "No, they [the Forest Service] pulled all their employees. Eighty-six percent of our county is national forest, yet they've shut down all of their [offices] .... Their offices are in Trout Lake, for crying out loud!" Another made the following point:

> People complain about how the Forest Service manages the forests, certainly. And then also the fact that they don't have, the Forest Service doesn't have a presence in the county and I say that meaning they used to have a ranger's station and a visitors' center here up until about 15 years ago when they closed it, so the fact that we're almost 90 percent federally owned and yet the Forest Service doesn't have an office here.

One interviewee reported the following:

> They [Forest Service employees] don't attend anything [i.e., community activities]. We rarely see them. I live above Carson, the major access onto the forest, and I spend a lot of time on the forest, I do a lot of hiking and fishing, hunting, picking berries, and stuff. So, I'm out in the forest two or three times a week, [and] I've seen three Forest Service vehicles [total] all summer.

Interviewees also explained that community perceptions of the Forest Service were "very negative. You don't hear many positive comments of what they're doing." This negativity again came back to the inability of the county to gain tax revenue from the national forest. As one noted, "The community fought the scenic area legislation to the bitter end and lost. And then the Forest Service started buying up all the private lands within the scenic area, which takes them off the tax rolls."

According to one interviewee, the relationship between the Forest Service and the rest of the community was

divisive even before the NWFP: "When I came here in '79, I was a Forest Service person, and I didn't feel a part of the community. It was the logging people and the Forest Service. So far, really, that's been that way for a long time."

Land use and management—
Interviewees in Stevenson unanimously agreed that the national forest was an integral part of the community, even within the context of change. Recreation on the national forest was mentioned frequently within the context of economic development and less so as something in which Stevenson residents were engaged. Interviewees reported that a number of special forest products were important for Stevenson, either directly or indirectly from outside users. These include boughs, huckleberries, beargrass, mushrooms, firewood, and Christmas trees.

Some interviewees reported changes in the relationship between the community and the forest. For example, when asked if the national forest was an integral part of the community, one interviewee said the following:

> Not nearly as much as it used to be, not even with recreation. We see kids in our community who don't know the difference between a Doug fir and a Ponderosa pine, and I'm sorry, that's significant. There are people who don't even know anything about the national forest. There are families that work here, but ... if you're in a logging community, that's all what you know. So, there's a huge change.

Interviewees were fairly negative when it came to how the Forest Service is managing the forest; as one put it: "what [the Forest Service is] doing right now is minimal. They're not really doing active management any longer."

Concerns about "mismanagement" were expressed around two themes. The first was access to recreational resources, as described by this interviewee:

> It's a thing where they gotta call it a national forest, but… give it 10 more years with the management they're doing now and the conditions they're allowing it to go into… I mean the public won't even have access. Because right now it's hard ... the condition of the roads especially for access is to the point where 80 percent of the roads are in a condition where they're not even safe to be driving on. And the other ones are abandoned.

The second area of concern interviewees expressed, as described here by another, was loss of economic resources: "With the fires that are going on around this country, I'm really concerned, and a majority of people in the county are concerned by the lack of management of the forest and, at some point, we're going to lose that resource and we're not gonna get any revenue from it."

Future directions—
When asked if increasing harvests from local forests would improve economic prospects for the Stevenson community, interviewees had a diversity of responses. Most thought the effects would be predominantly positive. Two interviewees discussed it as follows:

> Interviewee 1: "Well, I think you … would see an increase in county revenue. So hopefully what would happen; from there would be the trickle-down effect: … supplement their road funding, start maintaining their buildings better, see some improvements in infrastructure."
>
> Interviewee 2: "Also, we'd start seeing less and less need for subsidized school lunches."
>
> Interviewee 1: "Yep, and there would be more funding for the school. They'd probably be hiring more personnel, more staff, so then you would see some influx in population."

One interviewee suggested that the economic effects would be complicated:

> Well, I think it would help [local residents] out. … but I don't think it would help generate economics the way that people think it would. Because, you know, they lost a lot of their contracting capacity and stuff. You know, one of the biggest loggers for the local mill there …the person is from Idaho or eastern Washington and (s)he just brings in crews that live in trailers. They're very transient, nomadic. It's not like they're going there to buy houses and raise families. But with that, if there was a more certain level of timber harvest for long-term commitments, that would help those get settled down on one area, right? So, I do think it would benefit [the community] economically, but I don't think the magnitude would be nearly what ... it's never gonna be the glory days of the 1980s again there.

Two interviewees suggested that there would be costs and benefits to reviving the timber industry. For example, one of these interviewees said, "Well, I think it would be a positive in that it's a double-edged sword. …. I hate to see clearcuts on the forest, but I'm enough of a realist to know that we need that income in our communities, and we need the jobs." Only one interviewee was strongly negative about the prospects of increasing local timber harvests, saying, "Basically, it wouldn't help us. …. There's no infrastructure to take advantage of it."

When asked about other potential futures for the development of Stevenson, interviewees responded with ideas ranging from "light industry" involving "high tech" and fermentation science to health care and small businesses centered on recreation. As one interviewee put it:

> That's the million-dollar question that everyone is trying to answer. We're trying to bring industry in but between the federal forest lands and the Gorge Act, there's very limited ground to improve. It makes it difficult to do any of it. And with the roads, limited access to the community, it makes it nice to be here but not if you're trying to run a business and move your product.

Santiam Canyon

Geography

The Santiam Canyon case study was defined using the boundaries of the North Santiam Canyon Unified School District (figs. 4.14 and 4.15). The community straddles Linn and Marion Counties in the Oregon western Cascades. It is located between 30 and 50 miles southeast of U.S. Interstate 5 and the city of Salem and consists of about 815 square miles. The case study covers several small commercial-residential centers strung out along the Santiam River and State Highway 22, a moderately traveled, east-west route connecting the Salem area of the Willamette Valley with eastern Oregon. Place names associated with the Santiam Canyon case study include four incorporated cities—Mill City, Gates, Detroit, and Idanha—as well as two unincorporated, semi-abandoned hamlets, Niagara and Little Sweden, filling the gap between Gates and Detroit. In the 2010 U.S. Census, the population was about 2,681 for the entire case study area.

Mill City, the largest of the Santiam Canyon settlements, straddles Linn and Marion Counties. In 2010, the population was 1,855. Most of the nearly 618-acre residential and commercial footprint is situated in Linn County on the south side of the Santiam River. The Marion County side of Mill City consists predominantly of a commercial strip along State Highway 22. Despite this geographic situation, Mill City hosts the elementary and secondary schools for the district and is home to two of three remaining sawmills in the area, Freres Lumber Company and Frank Lumber Company.

Gates is about a 300-acre cluster of service-oriented businesses and houses along Highway 22, although a small neighborhood on the south side of the Santiam River is connected via bridge. In 2010, the population was 471.

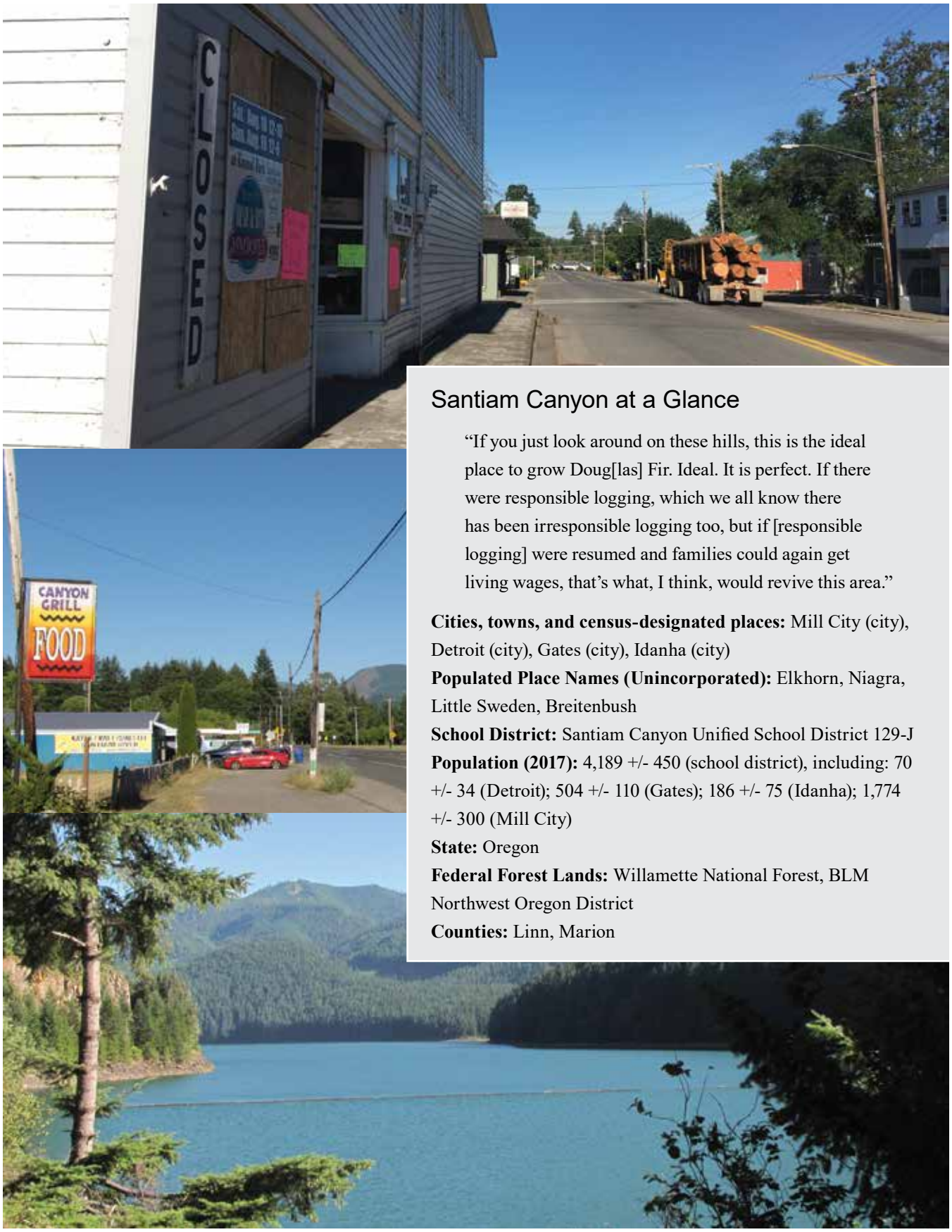
Detroit is farther east along Highway 22 at the upper end of the Detroit Reservoir. In 2010, the permanent resident population was 221. The settlement was relocated from the river floodplain in the early 1950s before the construction of the Detroit Dam and the filling of Detroit Reservoir. The main settlement footprint is approximately 185 acres and is about 1 mile from the Forest Service ranger station. This census-designated place hosts two marinas that cater to Detroit Reservoir's recreational boaters. Because the population began declining in the late 1980s, Detroit's schools have been closed and consolidated with Mill City schools.

Less than 5 miles up Highway 22 sits the small settlement of Idanha. In 2010, the population was 134. Once the site of three sawmills, Idanha is a small, mostly abandoned settlement of about 125 acres. Although the post office and its mailboxes remain, it is not staffed and functions as a self-service facility.

The terrain in Santiam Canyon is steep and mountainous, with rocky gorges, fast-running streams, and few opportunities for agriculture. Elevation ranges from 751 to 9,288 ft above sea level, and the geology is dominated by volcanic and pyroclastic rocks. The climate is temperate, with an annual precipitation of 76 inches and temperatures ranging from 75 °F average high in the summer to 31 °F average low in the winter. The forest is dominated by mesic conifers, namely Douglas-fir, cedar, and hemlock typical to the western Cascades.

Brief History and Notable Events

At the time of Euro-American contact, Santiam Canyon was inhabited by the Santiam band of the Kalapuya Indians and the northern Molala peoples. The canyon was an important east-west travel corridor that facilitated

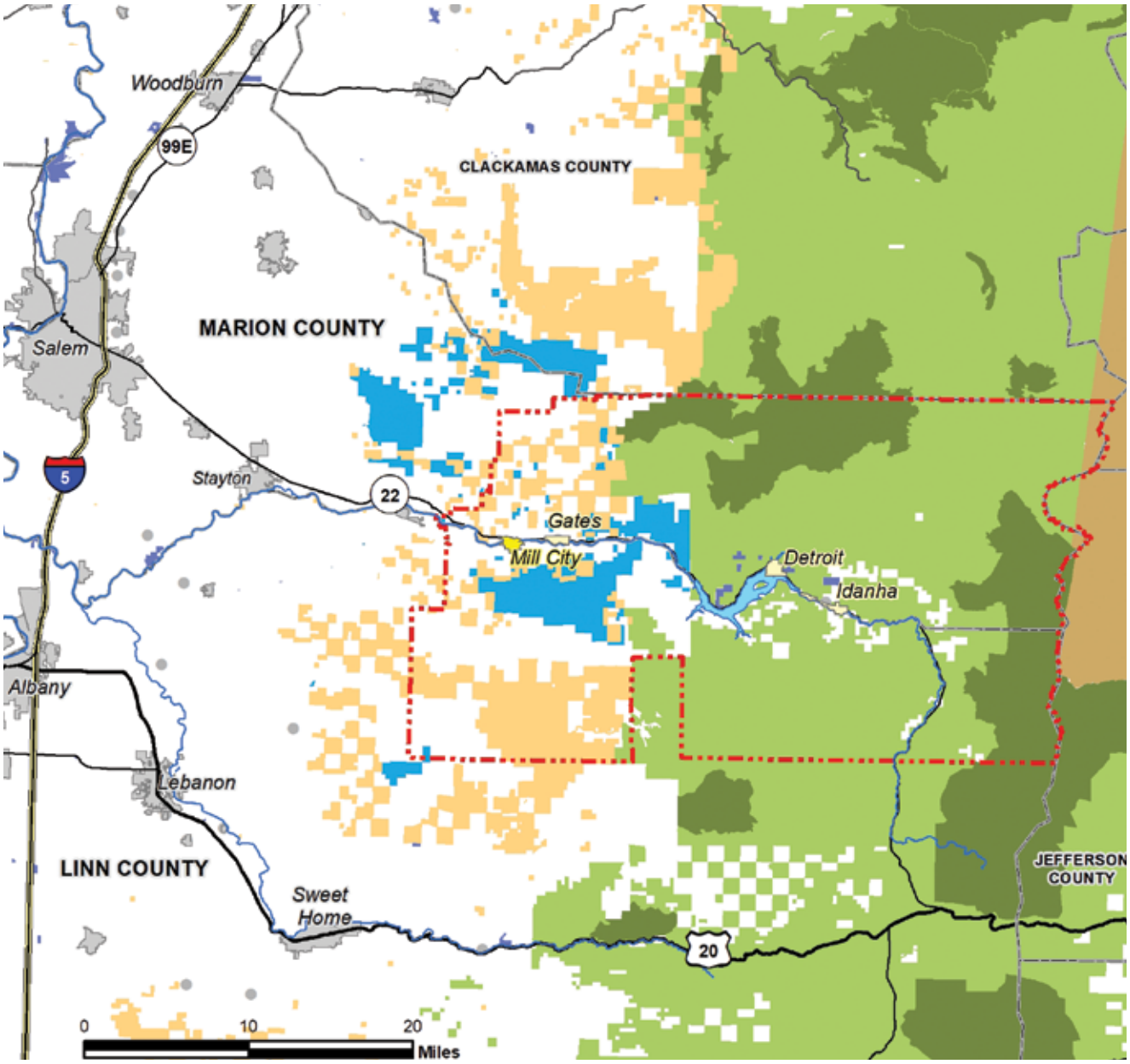


Santiam Canyon at a Glance

> "If you just look around on these hills, this is the ideal place to grow Doug[las] Fir. Ideal. It is perfect. If there were responsible logging, which we all know there has been irresponsible logging too, but if [responsible logging] were resumed and families could again get living wages, that's what, I think, would revive this area."

Cities, towns, and census-designated places: Mill City (city), Detroit (city), Gates (city), Idanha (city)
Populated Place Names (Unincorporated): Elkhorn, Niagra, Little Sweden, Breitenbush
School District: Santiam Canyon Unified School District 129-J
Population (2017): 4,189 +/- 450 (school district), including: 70 +/- 34 (Detroit); 504 +/- 110 (Gates); 186 +/- 75 (Idanha); 1,774 +/- 300 (Mill City)
State: Oregon
Federal Forest Lands: Willamette National Forest, BLM Northwest Oregon District
Counties: Linn, Marion

Figure 4.14—Santiam Canyon Case Study, (top) Broadway Street, Mill City, (middle) Santiam Canyon Highway (OR 22), Gates; view to Santiam State Forest lands, (bottom) Detroit Lake and Willamette NF at Detroit Dam. Photos by Michael R. Coughlan (top); Mark D. O. Adams (middle, bottom).



Santiam Canyon Community Case Study

Land ownership

- Forest Service wilderness
- Forest Service
- Bureau of Land Managment
- Warm Springs Reservation
- Santiam State Forest
- Other state lands
- Private lands

Communities

- Santiam Canyon School District
- Mill City
- Other case study settlements
- Incorporated city or town
- Other settlements

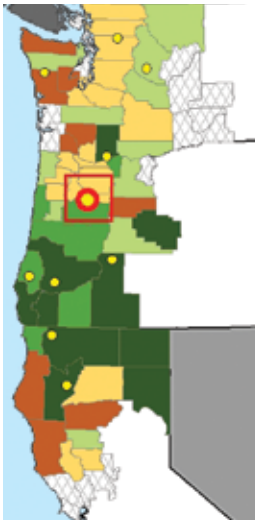


Figure 4.15—Location of Santiam Canyon Case Study. Note: private lands include the forest industry. Map credit: Mark D. O. Adams.

trade and access to resources from the Cascade Range and Willamette Valley. A north-south travel route called the Molala Trail also traversed the canyon. The Molala were known for trading locally obtained huckleberries as well as elk and deer hides. This fur trading intensified as Euro-American trade networks developed through the early 19th century. Like other places in the Pacific Northwest, the indigenous peoples of Santiam Canyon were decimated by diseases introduced by Euro-Americans and by the 1850s only a few hundred remained. In 1856, survivors of the epidemics were forcibly moved to reservations such as the Grande Ronde Indian Reservation.

Santiam Canyon, from the present site of Mill City and east, was first settled by nonindigenous homesteaders starting in the 1870s (St. Boniface, n.d.). By the 1880s, the Oregon Pacific Railroad brought more development to the canyon, from the Willamette Valley as far east as Idanha before going bankrupt in 1890. The rail line facilitated the first large-scale logging and milling activities in Santiam Canyon, enabling the export of timber from the Canyon to markets in Albany and Salem (Reinhardt 2011). In 1887, four entrepreneurs formed the Santiam Lumbering Company and constructed the first large-scale sawmill in what would soon be named Mill City (St. Boniface, n.d.). The Cascade Forest Reserve was created in 1893, and logging was restricted to private lands. A. B. Hammond purchased the railroad in 1895 and the sawmill in Mill City in 1900, forming the Hammond Lumber Company.

Over the next 36 years, the Hammond Lumber Company began cutting, milling, and exporting Santiam Canyon's large stock of massive old-growth Douglas-firs. The operation used shifting logging camps and rail lines to systematically extract the canyon's timber. Indeed, Santiam loggers harvested the majority of what would become the Santiam State Forest during this period. The Hammond Lumber Company came to an end in 1936 after the death of A. B. Hammond; the rail lines and sawmill were disassembled and sold off. Only smaller mills, such as Freres (established 1922) were left in the area.

The portion of the Cascade Forest Reserve surrounding Santiam Canyon became the Santiam National Forest in 1911, and in 1933, this forest merged with the Cascade National Forest to form the Willamette National Forest. The creation of the Willamette National Forest coincided with the Great Depression and the New Deal, a period when the Forest Service transitioned into an active agent of local economic development. A Civilian Conservation Corps camp built near Idanha also operated during the early 1930s (St. Boniface, n.d.).

Beginning with the war effort, the 1940s ushered in an era of intensive forestry and local economic development. The construction of Highway 22 and a multitude of Forest Service logging roads attracted a number of new lumber companies to the area. New sawmills were constructed in Idanha and Mill City. In 1949, with the impending construction of Detroit Dam, residents of "Old Detroit" petitioned the Army Corps of Engineers and the Forest Service to help them relocate the town to a site on the Willamette National Forest out of the area to be flooded. The Forest Service declined to cede the land and the residents settled on the site of an old logging camp, called Camp 17, that Hammond Lumber Company sold to them (Reinhardt 2011). By 1953, the dam was complete and Detroit had relocated to the site of the old Hammond logging camp. Detroit Lake is now a regionally important recreational amenity that is popular for boating, fishing, camping, and swimming.

In 1964, the passage of the Wilderness Act made it possible to protect public lands from timber harvests and by 1968, the highest elevation areas of Santiam Canyon were included in the Mount Jefferson Wilderness. Bull of the Woods Wilderness was designated in 1984, followed by Opal Creek Wilderness in 1996. In total, designated wilderness areas now make up about 12 percent, or around 83,000 acres, of the Santiam Canyon case study area.

Climate change is likely already affecting the Santiam Canyon environment. For example, in 2017, Santiam Canyon experienced its largest wildfire on record with the Whitewater Fire burning more than 14,000 acres. Toxic algae blooms have also been a problem for Detroit Lake, affecting water quality as far as 90 miles downstream in Salem, which uses the Santiam River for its drinking water source for 192,800 people. The state health authority issued toxic algae bloom advisories limiting water recreation in Detroit Lake in 2007, 2015, 2017, and 2018. In 2018, the advisories were extended to Salem's vulnerable populations, suggesting that people should not drink from municipal water sources.

Economic and Social Context for the Past 25 Years

Land ownership and management—
Land ownership and management within the Santiam Canyon case study is dominated by the Forest Service, which manages 322,000 acres (62 percent of the land base) from the Detroit Ranger Station on the outskirts of Detroit. Private industrial timberlands are second in area ownership with 80,000 acres (15 percent of the land base). Thirteen owners manage the private industrial timberlands, but four companies control about 90 percent of this land: several entities controlled by Weyerhaeuser Company, Longview Fibre Company, and entities associated with Freres Lumber and Frank Lumber, the two local sawmills. The BLM and Oregon Department of Forestry (ODF) also represent significant timber holdings at 10 and 6 percent, respectively. The BLM operates out of its office in Salem, and the ODF has its North Cascade District Office in Mehama, 7 miles down canyon from Mill City. Nonindustrial private lands make up only 5 percent of the land base.

Industry and employment—
Industry and employment in Santiam Canyon are limited compared to 25 years ago. However, two lumber companies remain in operation, Freres Lumber Company (founded in 1922) and Frank Lumber Company (founded in 1955); in 2016, they employed 480 (in Lyons and Mill City) and 120 (in Mill City) workers, respectively. Freres retooled its milling operations for smaller logs in 1993 and diversified by purchasing the Young and Morgan Mill City plywood plant in 1998. Frank Lumber installed a 45-inch-diameter band mill in 1992 and began making wood fuel pellets in 2008. Both companies have automated significant portions of their operations. Outside of the timber industry, local employment is largely limited to the Forest Service, the Santiam School District, and the handful of small businesses that cater to tourists, recreationists, and local residents (e.g., restaurants, motels, small markets, and gas stations). The area continues to be served by a railway that connects to the main Union Pacific line in the Willamette Valley. According to the North Santiam Canyon Economic Opportunity Study of 2014, employment in the entire North Santiam Canyon area declined from 1,505 jobs in 2006 to 1,248 in 2009, with some recovery (1,400) by 2012. However, during this same time period, total payroll increased by 14 percent.

Housing and infrastructure—
Housing prices in Santiam Canyon are relatively low in comparison to Oregon. Median home price in Mill City is $178,800, just over half of the median for the state of Oregon. However, dilapidated houses are common and new construction is constrained by state wastewater regulations (see app. B in the online supplemental materials: https://doi.org/10.7264/rz2j-dc54). Services have declined or stagnated over the past 25 years (fig. 4.16). Two smaller grocery stores in Mill City are closed, and according to current USDA standards, Santiam Canyon is a food desert. Although a Dollar General store was established in 2017, the nearest large grocery store is in Stayton, a 20-minute drive from Mill City. Public transportation between Gates (via Mill City) and Salem is available Monday through Friday.

In terms of cultural amenities, the Mill City townsite has a community center, library, and a small heritage museum that is open Saturdays from 1 to 3 pm. The Canyon Crisis and Resource Center provides social and mental health services involving domestic violence, family and teen pregnancy issues, homelessness, and general mental health. According to its website, the Canyon Crisis and Resource Center serves 35 crime victims, 50 families with "immediate needs," 120 persons for information and referrals, and provides 20 people with shelter each month. Gates, Idanha-Detroit, and Mill City each have their own small, mostly volunteer, fire departments, while the nearest ambulance service is down canyon in Lyons.

Tourism-oriented amenities—
Santiam Canyon is home to Detroit Lake Reservoir, a popular recreational destination with 32 miles of shoreline when the lake is full. The lake is served by two marinas, has one day-use swimming area, and is regularly stocked with trout and salmon to provide fishing opportunities. Other attractions in Santiam Canyon include[1] Breitenbush Hot Springs retreat, Elkhorn Valley Golf Course, and numerous recreational opportunities in the Willamette National Forest, including Opal Creek and Middle Santiam Wilderness areas. Highway 22 provides access to Hoodoo Ski Area a little more than 30 miles west of the

[1] The use of trade or firm names in this publication is for reader information and does not imply endorsement by the U.S. Department of Agriculture of any product or service.

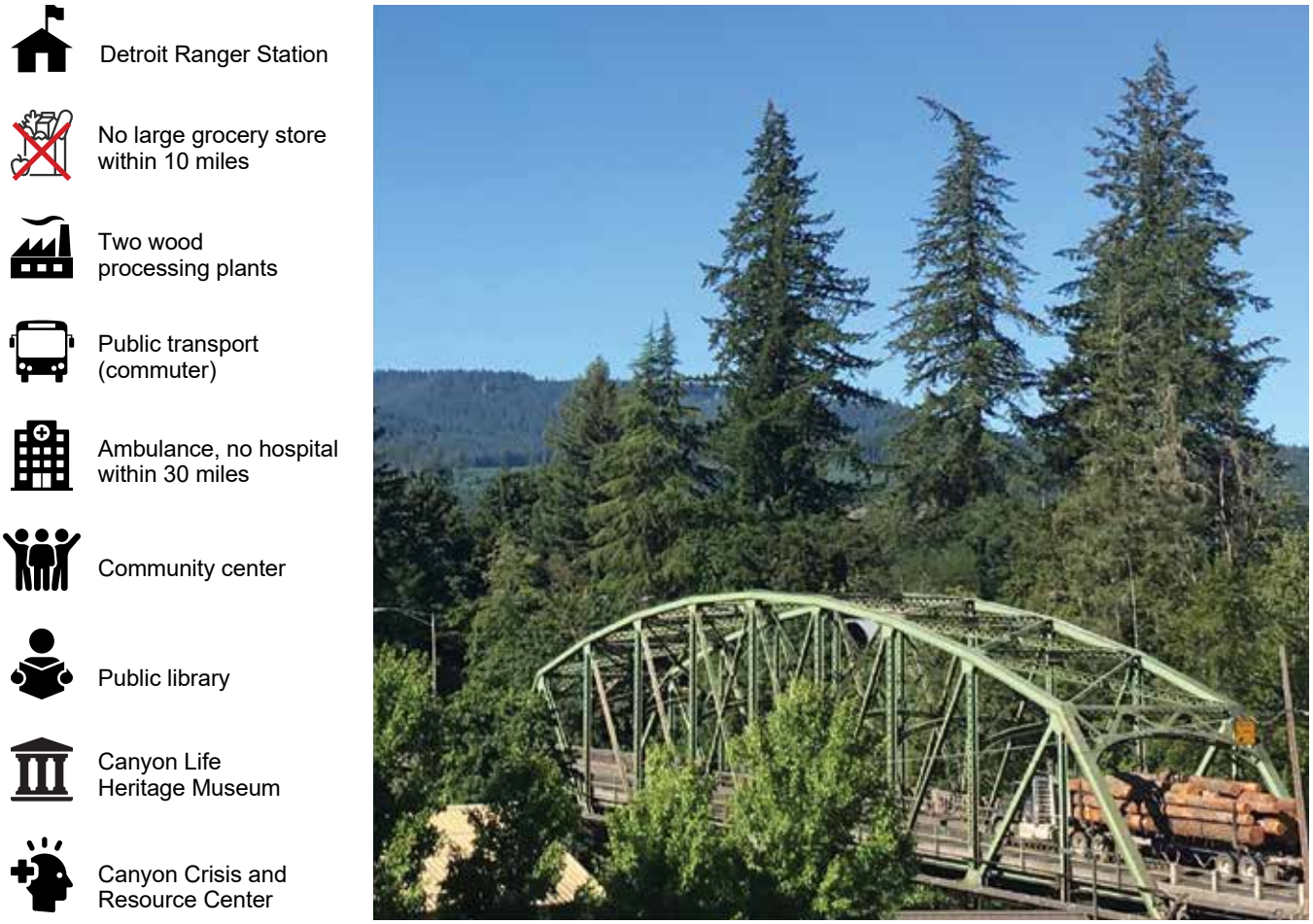


Figure 4.16—Graphic summary of community infrastructure in Santiam Canyon. First Avenue Bridge over the North Santiam River, Mill City. Photo by Gabriel Kohler.

canyon. The canyon has 12 restaurants, four recreational outfitters, 31 vacation rental homes, about 133 motel rooms, and 629 campsites.

Perceptions of Social and Economic Changes

Employment—

Most interviewees (n = 13/16) in Santiam Canyon thought that employment opportunities had declined over the past 25 years. Some tied this perceived decline directly to the effects of the NWFP. As one interviewee put it, "Of course we felt it when they [the Forest Service] quit their logging program. There were several mills in and around Mill City that closed. Almost all the people up here were tied to the timber industry … [the NWFP] just totally destroyed the occupations up here."

Another interviewee suggested that even if the NWFP was to blame for immediate job losses, the old timber economy wasn't sustainable: "I'm sure that there are people in the community that will tell you that if we could still clearcut up here … that they'd be fine [with employment opportunities]. At the same time, if we could still manage [the national forest] like that, there wouldn't be anything left to manage by now."

However, another interviewee was less certain about the link to federal forest policy: "I think if you asked me that question [see Interview guide question 107: are these changes in your community due to the NWFP?] 20–25 years ago, I would have definitely said it was because of the [NWFP]. … But the communities have had time to reconfigure and readjust. So, I think it might just be the nature of communities now."

Along this vein, some interviewees offered other explanations for the decline in jobs, such as mechanization and automation of logging and mill jobs. Other observers emphasized that the decline in jobs was not steady or ongoing. They suggested that employment opportunities had increased in recent years for those willing to commute to cities along the Interstate 5 corridor (e.g., Salem, Albany,

and Portland). Some thought that employment opportunities had increased in the service sector, even if wages were lower than past timber industry jobs.

Many interviewees connected the changes in employment to other problems now facing Santiam Canyon. For example, some observed that while there are not as many jobs as there were 25 years ago, the rate of unemployment is not entirely linked to lack of opportunities. As one interviewee put it, "There's employment opportunities, but so many of these people absolutely do not want to work. Those that do want to work, they probably have lost their drivers' licenses and … they don't have the money to pay whatever fines."

Many interviewees stressed complex and dynamic relationships between changes in employment in the timber industry; decline in family-owned, service-oriented businesses; and reduction of high-wage jobs in sectors that require college degrees (e.g., the Forest Service and school district). These observations related to other subject areas included in our interviews, such as costs and quality of housing, diversity of locally available services, and the number of families with school-aged children.

Housing—

The majority of interviewees (n = 14/16) reported that housing costs have increased since the NWFP. Interviewees noted that housing prices had fluctuated, specifically with reference to the 2008 recession, which caused many foreclosures in the canyon. Several interviewees noted that while home prices and rents might be lower in Santiam Canyon than along the Interstate 5 corridor, housing costs were an increasing burden on the canyon's working families. Many linked decreasing affordability to feedbacks between the lack of "living-wage" jobs in the canyon and an influx of higher income commuters and second-home owners. As one noted, "There's a lot of second homes in the canyon, which drives the price up for people that work at lower wage jobs and need housing [in the area]. You get this bigger divide."

In addition to increases in housing costs, interviewees perceived a relatively recent decline in housing availability. As one said, "Recently, very recently, … rentals are hard to find. That drives up rental prices even amongst the people that can't afford regular rent. The rental prices are going up, not as obviously keeping pace with Portland or anything. … [and] availability is low."

Several interviewees (n = 5) also reported that housing was limited in part because new construction had been constrained by the lack of a modern sewer system. For example, another noted that "Trying to get the wastewater sewer in areas where we don't have it now … cities like Idanha and Gates and Detroit … [do] not have a sewer system. We have locations where homes can't be built because there's not septic room and the septic has failed and so forth."

The lack of modern sewer systems, according to an interviewee, has also affected short-term housing for tourists:

> There's a thing called the three-basin rule which prevents any new discharges into the water here, and so people can't build.… [People] have trouble with septic systems or sewer systems.… Detroit has, when you drive down the street, they have porta potties and stuff like that for the guests to go use. It's hard to develop when you're locked in by a lot of things.

An unexpected theme that repeatedly emerged (n = 6) during conversations about housing was the Section 8 Housing Choice Voucher Program that is federally subsidized and state administered to provide rental assistance to low-income families. An increase in Section 8 housing was described as being indirectly related to timber job loss and subsequent need for rent assistance. One interviewee explained it this way:

> There was a lot of homes left open [after timber industry-dependent residents] just moved away. If they couldn't sell [their homes] right away then they decided they would rent the houses. So, Section 8 discovered them and started putting people that were chronically mentally ill from Linn and Marion County [in the houses]. They moved them out of Salem, out of Albany, out of different areas [to] up here.

Another explained the change as follows:

> In the '70s and '80s, I would say that the majority of people owned their own home, [had] pride in ownership, things like that. A lot of them moved out, and the housing market was cheap. A lot of investors bought homes and turned it into a rental market. … [T]he houses were not well-maintained,

> … rent prices were low, and the housing was not particularly desirable.… A lot of the people without jobs and stuff were snapping them up—Section 8 kind of housing.

Interviewees also cited external factors for the increase in Section 8 housing. One articulated the perception that county government services were actively encouraging low-income people to move to Mill City: "There was a lot of push for the counties to push lower income folks towards Mill City as a place to live because it was cheaper. You could rent cheaper.… A lot of places where Section 8 people would move to."

Some interviewees (n = 3) said that this influx of lower income and disabled people had changed the character of the community and put a strain on already-stressed social services. One interviewee further attributed an increase in homelessness to lower income people who had relocated to Mill City because of rental assistance but were evicted because they could not maintain employment or lacked access to mental health services.

One interviewee explained that these changes have had a negative impact on the overall quality of housing in Mill City:

> Bit by bit now these Section 8 houses have pretty much gone away. There's only a few left because so many of the people that were landlords, their houses have gotten completely torn apart. Drugs have been cooked in them, or if you were the person that signed the lease then the next thing you know you've got 12 other people living there. Then if you evict anybody then maybe six of you might leave, but the other six are going to stay; and you have to go to court to get them out, and they trash the place.

Services—

In general, interviewees (n = 10/16) thought that there were fewer services in Santiam Canyon than there were 25 years ago. This was particularly true for services provided by private businesses, such as restaurants, stores, and gas stations. One interviewee explained it this way: "Since the logging industry dropped, the people left, which meant a lot of these businesses left with them."

Another lamented the loss of available business services:

> We used to have a Sears catalog order store and there used to be a True Value Hardware store and the hardware store is now a church because the [store owners] retired. … There were a couple of banks and now there's just one. There were two grocery stores. … This old grocery store… that was the coolest store. It had a wooden floor, it was this old store, they sold everything. You could buy logging boots there, meat, carpentry tools, groceries, sewing supplies, anything you wanted. It was an awesome store, but that one closed.… There was an auto parts store.… There were probably five gas stations when we moved here; now there's one.

The lack of a stronger consensus on this trend does not likely relate to differences in perceptions of services in the past, but rather the fact that a Dollar General and a Subway were recently installed and, according to interviewees, this improved service options and outlook for the community. An interviewee explained that although the area was in general decline, "at the same time, there is some growth. There's been some stores like Subway and Dollar General coming into the Mill City area."

One interviewee jokingly expressed awe at this shared perception, saying, "It was looking pretty bad, and now there's a Subway there. It's like, 'Whoa, Subway!'"

Social life—

Interviewees had mixed responses when asked about their perceptions of changes in organized recreational, leisure, or other community-level social activities in the Santiam Canyon area. Some (n = 6) thought there were fewer opportunities than there were 25 years ago, but most (n = 9) were uncertain if there was a definite pattern. In terms of formal community organizations, interviewees noted that church attendance is "fairly stable" but several (n = 4) noted that fraternal organizations were all experiencing a demographic shift. As one interviewee said, "The animal clubs aren't doing as well as they used to. Moose, Eagles, Lions, etc., they tend to be an older population and they don't have a lot of younger people coming up behind them."

Another interviewee thought this might be a larger social trend:

> There's still a strong Lions Club in the community. There's some Elks and Daughters of …. Anyway, some fraternal organization, I can't remember the name it, that are still going. But they're looking for younger people, they're aging right now. So, I really don't know if it's really a community change

> as much as it's just a typical demographic change that everybody's experiencing in some of these fraternal organizations.

In spite of the apparent generational decline in participation in fraternal organizations, community members have found other ways to address problems requiring collective action. As one interviewee explained: "There was a group that came together 2 years ago.... Some friends started it, the Save our Bridge [group], which is the river bridge there in Mill City. And they just acquired an eight-million-dollar grant to do some rehab on the bridge and do some beautification things around Mill City … so there's these small groups that get together and continue to work."

Another interviewee pointed out that recent social and demographic changes were not necessarily all negative in terms of community social interactions: "This new influx of people who come in, even one or two new people can make a huge difference.... We see it in organizations everywhere; you have new people coming into the area; they have fresh ideas and insights; they've got energy; they are bringing a perspective from outside the community; they see opportunity."

Even amidst this uncertainty, interviewees mostly agreed that there were fewer opportunities for children. For example, one interviewee said the following:

> Detroit and Idanha have a whole lot less opportunities for kids [compared to 25 years ago].… We [in Mill City] had, at one point … a summer- and after-school program and stuff like that for kids … we had the gym open until midnight on the weekends so the kids could come and hang out together.… There are some churches that are trying to take up the slack in some kinds of things, but it just varies depending on how much energy people have to do things. But our schools are only open four days a week, so I think that there's more kids out on the streets now and more vandalism kind of stuff because they have less to do.

Demography and well-being—
Most interviewees (n = 13/16) agreed that the number of families with school-aged children had declined in the canyon. Indeed, Santiam Canyon school district report cards show that enrollment declined by 27 percent between 1999 and 2017 (741 to 540 students). The majority of interviewees (n = 10/16) also felt these trends of declining numbers of families with school-aged children were related to changes in how the Forest Service and BLM managed their lands in the past 25 years; as one said, it was "because of the shutdown of logging on federal property."

Many interviewees tied declining school enrollment to factors beyond declining job opportunities. One interviewee explained it this way:

> Twenty-five plus years ago, from the mid '90s beyond, it was a very stable community, … yes, people would move in and out, but you also had a lot of long-time residents.… It's really changed from that now to a much more transient population. I mean, families that just come and go, because there's a lot more rentals. There isn't much work opportunity, and housing is cheap up here, so we see a lot of turnover with the students.

Interviewees unanimously agreed that retirees stayed in the community. However, interviewees (n = 13/16) did report that new people were moving to the community, although there was little agreement as to what sorts of people were making the canyon their home. One persistent theme was the influx of low-income people. As one interviewee reported, "We get a lot of Section 8 people up in here.… The people that are moving in aren't the most productive type [of] people. A lot of homeless." This perceived influx of lower income people was noted by interviewees as having put a social and economic strain on the community that is not easily solved. One interviewee explained how they believed it related to the NWFP:

> We've got this influx of people that we don't know what to do with. Because we don't have the services for them, they don't have jobs, they're not going to have jobs. Many of them come up here in the beginning with disability money and that's the ones that are chronically mentally ill…. So, just like I said, in the beginning of this [25] years ago when the boulder hit the water [the NWFP] it had all of these rings coming out from it and the biggest impact was the working families that traditionally had been in the timber industry all their lives.… That [working families moving away] was the huge impact in the beginning. Then it goes out to the businesses, then it goes out to the schools, then it goes out to the community

> at large because then you have all of these other people that have moved in and replaced what the working community was [with] a very needy group of people. From those houses being kind of left from working families moving out because of the [loss of] jobs, that brought in the Section 8 and it brought in kind of this disadvantaged, at-risk population, moving from Salem and Albany.

Relationships with federal forests and agencies— When interviewees were asked if federal agency employees (Willamette National Forest, Detroit Ranger District) were engaged in the community, many (n = 8) had positive perceptions of federal employees as community members. One interviewee reported that, "They [Forest Service employees] are excellent. They do a beautiful job of integrating the community." Forest Service employees were noted as being part of the volunteer fire departments, school boards, active in church, community organizations, and local government. Some community members recalled a time just before the NWFP when relationships between the Forest Service and the community were strained over northern spotted owl conservation. However, most felt that that antagonism had passed.

Only three interviewees felt negatively or very negatively about current employee engagement. One suggested that 25 years ago, the relationship was a good one, but had since changed: "Used to be, you'd see foresters around all the time. They would be interconnected into the schools, into our stuff, into community organizations. You would see them being a part of everything. I don't even know who any [of the] foresters are anymore."

On the other hand, only five interviewees felt that official federal agency communications and interactions with the community were effective.

Land use and management— Santiam Canyon interviewees mostly felt that the national forest and BLM lands were an integral component of the community (n = 10/16). One interviewee said, "Well, the local mills need the federal land. They are the main purchaser of the timber. The recreation opportunities, a lot of us just recreate in our own backyard. It's just kind of fun. My drinking water comes from the North Santiam River. It's kind of an important thing."

However, one interviewee suggested that the relationship was changing due to changes in land management:

> Most people wouldn't know federal from state and state from even some of the private, as far as timberland. It doesn't have as much access as it used to. When I was young and we would go drive around in the mountains for entertainment, it was rare you'd run across gates, but everything is gated now.… Most people don't look at it that way. They just see what they see from the highway or from the main roads, and that's it.

Another interviewee suggested that the reduction in timber sales had made the national forest less important to the community: "[The national forest] was [a key part] at one point. I don't think it is now… it just goes back to the volume that they used to sell. I don't really see where its much of a factor anymore. … I guess I can't see where it's [the national forest] really doing much for the community."

Nearly all of Santiam Canyon case study interviewees cited the importance of outdoor recreation and use of special forest products to the community's social and economic well-being. Interviewees in Santiam Canyon reported harvesting (or knowledge of others' harvesting) of a number of important special forest products, including pinecones, ferns, beargrass, fir boughs, moss, firewood, mushrooms, and berries. Many of the locals continue to hunt deer and elk and to fish for steelhead in the national forest and on BLM lands. River rafting and kayaking were also cited as up and coming activities, but much of the recreation discussion revolved around use and management of the national forest's wilderness areas. One interviewee recounted this way:

> The Forest Service is having problems with their enforcement of the wilderness in those highly used areas, such as Marion Lakes for instance, you can't go in through that area and try to find a spot behind a log that there isn't an array of toilet paper sticking up and at one time they had a ranger up here that didn't mind going against the wilderness. (S)he had, I think, three different outhouses that were used up there and maintained each year. (S) he kept things much cleaner.

In general, the two most common complaints about forest management involved the lack of timber harvests

and wildfire. As one interviewee explained, "I think most people wish there was more timber harvest … I think people are frustrated with the way forest fires are managed. … there is frustration with bureaucracy, but the biggest frustration in our area is, we don't have the jobs we used to have here because we can't harvest trees."

All 16 interviewees reported that fire management was a major and growing community concern. Some interviewees expressed dismay toward what they viewed as deficient fire management policies. As one said, "It's an issue, just letting it burn, and the smoke." One interviewee expressed a strongly negative view of the relationship between wildfire and forest management:

> The nonmanagement of our lands threatens all the private lands that are close by. It's tragic. If you believe in climate change, do you think that climate change is everywhere or just on public lands? Ninety-six percent of the acres burned last year were on public lands, not on private lands. Ninety-six percent! You can't blame it on climate change, you've got to blame it on nonmanagement or mismanagement by the Forest Service.

Related to this view, another interviewee suggested the following:

> These fires that we are experiencing are unnatural and it's because there's so much fuel in the forest that wasn't there historically, and we really need to remove that fuel to protect these rural communities. And it can provide such an economic boost to our economy and our state, and the livability of our state. … We used to have a logger around every hillside. When the lightning struck, we ran over and put it out, and now they're not there anymore and the fires get big before they can do anything about it.

Future directions—

When asked about the future directions of their community, most thought that increased timber harvesting on federal lands would have positive impacts on the community. Some interviewees thought that the lack of timber sales on federal lands was the key barrier for economic development of the community. One interviewee surmised, "There are billions of dollars of new investment in mills in the Southeastern United States because it's privately owned land and the same renaissance could happen here if the Forest Service would return to managing the land." Another suggested that reviving a significant logging program was the only viable economic pathway, explaining, "There'll be tourism somewhat, but I don't see that as the answer to stabilize communities like this."

Some interviewees thought that the opportunity for economic development based on logging and milling was no longer viable. For example, one interviewee explained it as follows:

> We lost so many of our mills. I'm afraid that they would just haul the logs out [of the forest] and [the logs] would go somewhere else. For a number of years, they were still putting them on barges and shipping them overseas. Where we would possibly gain a little bit in timber tax dollars … there would still be some industry that would revive a little bit of the logging, the transportation, and stuff like that …. Loggers are hard to find. It's harder to find choker setters, and it's hard to find people that have those skills anymore.

In lieu of increased timber harvests, most interviewees cited the potential for developing recreation and tourism sectors. However, many cited the canyon's sewer system problems as the most significant barrier to developing this potential. Another drawback of the recreation path was the observation that, "none of those [recreation jobs] provide jobs that are living-wage jobs, unless you happen to be the manager. But for most people those are not living-wage jobs."

Gilchrist

Geography

The Gilchrist case study area is defined by the Gilchrist School attendance area, which encompasses the unincorporated settlements of Gilchrist, Crescent, Crescent Lake, and Chemult on the north side of Klamath County, Oregon (figs. 4.17 and 4.18). Settlements are strung out along State Highway 97, which runs north-south locally, connecting Klamath Falls with Bend, and State Highway 58, which links the Eugene-Springfield area (via Oakridge) with Highway 97. Gilchrist was founded in the late 1930s as a company town associated with the logging and milling operations of the Gilchrist Timber Company. The townsite footprint, including mill and log pond, occupies less than 350 acres. Crescent Lake was founded as a

Gilchrist at a Glance

> "Gilchrist is not a logging town anymore. I don't know what we are…. Just a place where people live."

Cities, towns, and census-designated places: None
Populated place names (unincorporated): Gilchrist, Crescent, Crescent Lake, Odell Lake, Chemult
School district: Gilchrist School attendance area (Klamath County School District)
Population (2017): 1,425 +/- 362 (zip codes 97731, 97733, 97737; includes all populated place names)
State: Oregon
Federal forest lands: Fremont-Winema National Forest, Chemult Ranger District and Deschutes National Forest, Crescent Ranger District.
County: Klamath

Figure 4.17—Gilchrist case study at a glance, (middle right): U.S. Highway 97 commercial strip, Crescent, (left): world's largest documented ponderosa pine by volume, Crescent, (lower right): Interfor sawmill driveway entrance, Gilchrist. Photos by Michael R. Coughlan.

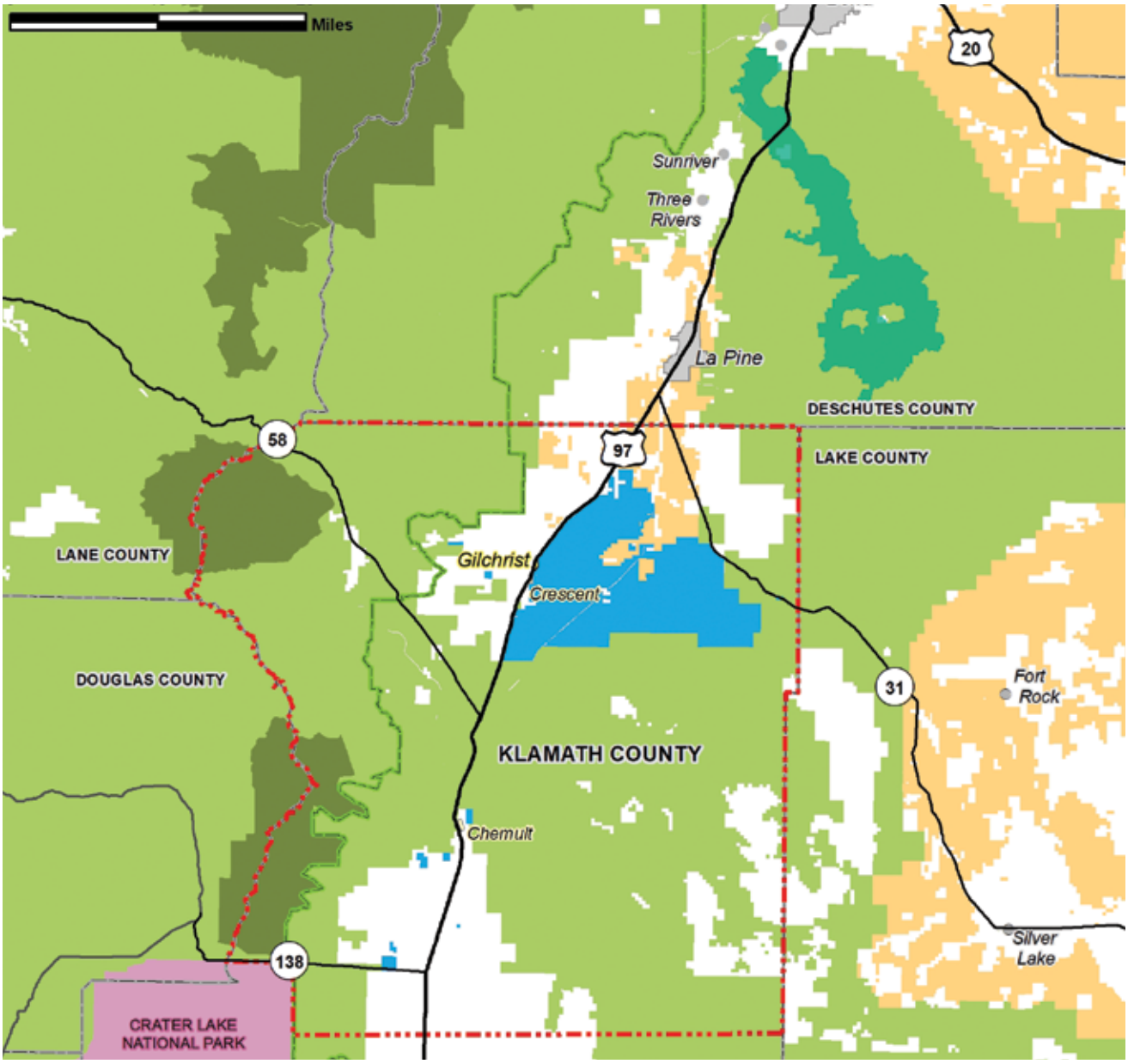


Figure 4.18—Location of Gilchrist Case Study. Note: private lands include the forest industry. NVM = national volcanic monument, NWFP = Northwest Forest Plan. Map credit: Mark D. O. Adams.

railway service area and developed into a second-home and recreational tourism destination. This settlement consists of approximately 700 acres of dispersed housing in two locations along Highway 58, including some limited services, such as a sportsman center and the Central Cascades Fire and EMS Station. Chemult and Crescent are predominantly oriented toward highway tourism services. Crescent is home of the Crescent Ranger District office for the Deschutes National Forest as well as the Walker Range Fire Patrol Association (see below). It is directly south of Gilchrist and occupies about 1,000 acres, including about a 1-mile-long commercial strip along Highway 97. Chemult is home of the Chemult Ranger District office for the Fremont-Winema National Forest. Similar to Crescent, Chemult is smaller, composed of trailer parks and older, dilapidated businesses. It is stretched along about a half mile of Highway 97.

Elevations in the Gilchrist case study range from 4,260 to 7,900 ft above sea level. The geology is volcanic in origin and characterized by numerous and large pyroclastic flow deposits. Gilchrist's climate is classified as dry-summer subtropical with average high temperature of 76 °F in summer, average low of 20 °F in winter and about 34.46 inches of precipitation annually. Land cover in the Gilchrist area is dominated by ponderosa pine and lodgepole pine (*Pinus contorta* Douglas ex Loudon) forests. Higher elevations are populated by mixed subalpine conifers and the western edge of the case study area contains more mesic coniferous trees typical of the western Cascades.

Brief History and Notable Events

Prior to the 1860s, the Klamath peoples were the main occupants of the Gilchrest area. Klamath lifeways were heavily transformed by their adoption of horses in the 18th century which provided them with increased mobility and allowed them to intensify trading activities. Klamath peoples were eager trading partners with Euro-Americans, exchanging slaves for horses, but as Euro-American gold prospectors began encroaching on Klamath lands relationships became adversarial. Following a series of sporadic, region-wide conflicts with Euro-Americans, the Klamath were forced to cede millions of acres to the United States and were confined to the Klamath Reservation in 1864.

In contrast to farming and mining interests that sparked settlement in most of the NWFP area, development of the Gilchrist case study area hinged almost entirely on the alignment of railroad and timber interests in the early 20th century, with a legacy of mid-19th century public domain land grants. By 1865, in exchange for their road constructing services, the Oregon Central Company obtained the odd-numbered township sections, three sections deep along the Oregon Central Military Wagon Road from Eugene over Willamette Pass to the Klamath Reservation. The Oregon Central Company soon sold their lands and through various efforts managed to consolidate portions of these checkerboarded timberlands. However, access to these timberlands had yet to be solved.

Around the turn of the 20th century, the Weed Lumber Company joined forces with the California Northern Railroad (a subsidiary of Southern Pacific Railroad) to penetrate the central Oregon timberlands. By 1912, they had reached the Klamath Reservation with the intention of continuing northward. At the same time, Southern Pacific Railroad was working to extend and connect their lines between Eugene and Ontario. This development provided opportunity to connect the Weed-Klamath line with the Eugene-Ontario route. Although neither of these efforts were completed as planned, by 1926, they had resulted in what became known as the Natron Cutoff, a shorter and less-steep route between Weed and Eugene that bypassed the Siskiyou Mountains. At this time, small settlements sprung up at Crescent Lake Junction and Chemult to service steam engines along this route. Significantly, however, the route also came within striking distance of the lodgepole and ponderosa pine forest that would become Gilchrist timberlands and later, Gilchrist State Forest.

Meanwhile, in 1902, a timber magnate by the name of Frank W. Gilchrist began purchasing the forest land in central Oregon (Driscoll 2012). Around this same time, Gilchrist's (and his heirs') main business venture, the Gilchrist-Fordney Company, began logging and milling operations in Laurel, Mississippi. Gilchrist-Fordney's Mississippi logging camps were family-friendly, temporary towns that attracted "married men, who were typically more stable and sober than were their single counterparts. The presence of their families reduced turnover among the woods crews" (Driscoll 2012: 18). The strategy was successful and provided a model for the company town that the Gilchrists would soon create in central Oregon. By the 1920s, the Gilchrists owned 60,000 acres of timberland in Oregon, and in 1925, when it was finally apparent that the timberlands could be accessed by

railroad, the Gilchrist Timber Company formed to manage these lands, further their consolidation, and prepare to log them (Driscoll 2012). Around this time, one of the major institutions of the Gilchrist case study area, the Walker Range Fire Patrol Association (Walker Range), was founded by the Gilchrist Timber Company and other timber interests to protect their investments.

By the mid-1930s, Gilchrist-Fordney had exhausted its timber resources in Mississippi and the Gilchrist Timber Company began work on the Klamath Northern Railroad, a short line railroad that would connect a sawmill with the Southern Pacific Railroad. With the new rail connection in place, the Gilchrist Timber Company transferred its focus and some of its infrastructure from Mississippi to Oregon. It offered employment and housing to workers who would make the same move. The company developed housing; a sewer system; a school; and a large, multiuse commercial and community space known as the Gilchrist Mall. The mall housed a bowling alley and bar, a restaurant, a supermarket, a library, and, directly adjacent to the mall, a small movie theater. The town and milling operation were designed with a "New Deal" type of philosophy that considered sustainable yield and community stability as the long-term strategy for success (Driscoll 2012). By the early 1940s, Gilchrist was a bustling company town and its small community prospered for the next five decades.

In 1991, with the death of Frank Gilchrist, the Gilchrist family heirs sold the Gilchrist Mill and timberlands. Crown Pacific Partners purchased the property and liquidated the remaining old-growth and other merchantable timber on the forest. In 1997, the company dismantled the mill and sold the company housing. The company filed for bankruptcy in 2003 and creditors formed the Cascade Timberlands, LLC, in turn selling to Fidelity National Financial ("Whitefish") in 2006. Interfor, a large international timberlands and milling company, purchased the remains of the Gilchrist Mill and retooled it for smaller diameter lumber. Fidelity National planned a housing and golf course development called Crescent Creek Resort that would have built nearly 2,000 houses, 800 overnight rental units, and two golf courses along the west side of Highway 97 in Gilchrist. However, the 2008 recession put the development on hold.

In 2010, the State of Oregon obtained control over lands on the east side of Highway 97. The new Gilchrist State Forest includes 43,000 acres of the forest acquired through direct purchase and 25,000 acres obtained through purchase by the nonprofit The Conservation Fund. The remainder of the former Gilchrist Timberlands are now owned by Shanda Asset Management Holdings, an international property and equity management corporation.

Economic and Social Context for the Past 25 Years

Land ownership and management—
Federal forests comprise 70 percent of the Gilchrist case study area's land base with 2 percent under BLM management and 68 percent under Forest Service management. Seven percent of the area is in federally designated wilderness. Twenty-eight percent (274,092 acres) of Gilchrist's lands are owned by private individuals and corporations, with the majority of that being industrial timberlands formerly owned and logged by the Gilchrist Timber Company.

Industry and employment—
After the school district and the Forest Service, the Interfor Gilchrist mill is the case study's largest employer. The mill employs about 165 workers. There are several small businesses, such as restaurants, motels, and gas stations scattered throughout the case study area. These provide a number of lower wage jobs to the community and rely mainly on tourists passing through the area on their way to Crater Lake, Bend, and other camping, hiking, and boating destinations in the Cascades (see the "Tourism-oriented amenities" section).

Housing and infrastructure—
We could not find any data on home prices for the Gilchrist case study area, but the median home price in nearby La Pine is $251,800. This price is slightly less than 75 percent of the median home price in Oregon. New housing in Crescent where developable private lands exist has been limited by the lack of a sewer system. However, the Crescent Sanitary District is working to construct a wastewater treatment facility and collection system to address this issue.

Gilchrist lost its small supermarket some years ago and technically meets the USDA definition of a food desert. Further, there is no daily public transportation into or out of the case study area. Consequently, low-income residents

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Figure 4.19—Graphic summary of community infrastructure in the Gilchrist community. Photos by Michael R. Coughlan.

may have difficulty obtaining fresh foods if they do not own a vehicle or cannot drive. However, a small convenience-style grocery store operates out of the Gilchrist Mall and, in 2018, a Dollar General was established in Crescent at the junction of Highway 97 and the Crescent cut-off road that cuts over to Highway 58 just east of Crescent Lake. See figure 4.19 for a graphic summary of services and amenities in Gilchrist.

For most of its history, the Gilchrist community lacked even a basic health clinic. Recently, La Pine Community Health Center has been running a part-time clinic out of the Gilchrist School. The clinic offers walk-in services two days per week. However, the nearest dentist office is in La Pine to the north, or in Chiloquin to the south. Crescent Fire District provides emergency services with two fire engines and two ambulances with four paid personnel supplemented by volunteers. Chemult Rural Fire District provides additional volunteer emergency services with two ambulances. Lastly, Walker Range Fire Patrol provides wildland firefighting services to state and private timberlands within the case study area.

Tourism-oriented amenities—
The Gilchrist case study area is situated at the confluence of Highway 58 from the northwest, Highway 97 from the northeast and south, and Highway 138 from the southwest. Visitors traveling to or from the tourist destinations of Oakridge, Mount Thielsen, Crater Lake, Bend, and La Pine pass through this area. Tourism attractions include Odell Lake and Crescent Lake, as well as the towns of Crescent, Gilchrist, and Chemult along Highway 97. Odell Lake has two marinas, one on each end of the lake, each of which also features lodging, camping, and other amenities. The Crescent Lake Resort at Crescent Lake also offers a marina, lodging, and further amenities. Two nearby ski areas, Willamette Pass and Mount Bachelor (one of the largest ski resorts in the nation), are within 45 miles of the Gilchrist area. Camping, hiking, and other outdoor recreation on national forest lands are popular tourist activities in the case study area. The Gilchrist area has 14 restaurants, 35 vacation rentals, about 197 motel rooms, and 533 campsites. However, most of the restaurant and motel infrastructure needs renovation; abandoned businesses next to those still in operation detract from the overall aesthetic appeal of the area. This is particularly true for the commercial strips in Chemult and Crescent, but also the Gilchrist Mall.

Perceptions of Social and Economic Changes

Employment—
Gilchrist interviewees were nearly unanimous in their assessment that employment opportunities had decreased over the past 25 years (n = 12/14). Two interviewees suggested that job opportunities decreased and then fluctuated. However, most suggested that shifts in employment opportunities were unrelated to the NWFP. Instead, these shifts related to the sawmill changing hands and opening and closing intermittently in the late 1990s and early 2000s before Interfor retooled and opened its current operation. For example, one interviewee said, “I would say they [job opportunities] have decreased. But having said that, I don’t believe it has anything to do with

the [NWFP]. I just believe that when the mill sold from the Gilchrist family in 1991, it changed the dynamics of this community."

One business owner said this change in mill ownership had ripple effects through the community:

> The employment opportunities, I'd say decreased, because [of] what we were just talking about [sawmill closure]. All these little businesses shut down. And not only businesses. I mean, let's go back and talk about the mill, how there was a lot of men working at the mill. So, their spouses would need some part-time work here.

Most interviewees (n = 9/14) pointed toward the changes in Gilchrist Sawmill ownership and management as the main cause of shifts in employment opportunities. One put it this way:

> Just a year and a half, 2 years ago, the mill changed hands. And so, there was a lot of layoffs. A company from Canada came in from my understanding, and now it's a completely different leadership and management team that they have. They've changed the shifts for the mill workers, so they're not doing the same, I guess nightly shift if that's what they were used to.

Interviewees noted that the first change in ownership in the early 1990s resulted in a decline in employment opportunities because of an initial period of layoffs followed by modernization of the sawmill that decreased the number of workers required to operate it. Community-employment dynamics were also complicated in Gilchrist because it was a company town where the Gilchrist lumber company owned the housing as well as the sawmill and the timberlands that supplied it. One interviewee explained that following the sale of the Gilchrist's 28,000-acre forest in 1991, unsustainable logging had caused, "more economic impact regarding jobs and stability of the community," than any federal forest policies.

At the same time, interviewees recognized the role of national forest lands in maintaining the few sawmill jobs that remained in Gilchrist. One interviewee explained this way:

> Okay, people talk about tourism, which you are never going to get [the] multiplier effect off tourism that you get off a mill. Remember when you have a mill ... there's not only the guys working the mill but there's all those other businesses that are supported by the mill. They need log trucks, the log trucks need fuel, the log trucks need to be maintained. The mill needs materials to keep it operational. Mills pay much higher wages than what a seasonal tourism job will.

However, overall, the problem with employment was not necessarily job opportunities, but low wages. One interviewee described it as follows:

> Living-wage jobs is very few here in this immediate community, and the cost to raise a family is far more than what an employee's gonna find [in wages] at the local Shell station or the local grocery store. The mill, from what I remember from when my husband worked there, they pay a really good wage, but in today's economics, it sometimes takes two family members for working, just to survive, and I still think, with being an employee maybe at the mill, they're still just barely surviving, because the second member of that family, if there is [one], doesn't have a living-wage job in the community.

Another problem brought up by some interviewees related to drug addiction and the fact that employers require workers to be drug free. For example, as one interviewee put it, "There's a drug problem and it's everywhere, we just see it more here because we're local, we're smaller … some of that has bearing on that people don't have an opportunity for a job. But why? Because they can't pass a drug test. The mill drug tests, [other local businesses] drug tests, and that's a big problem."

Housing—

Interviewees in Gilchrist (n = 9) mostly agreed that housing costs had increased. For example, one interviewee explained, "A lot of people live in trailer parks now. Rent is so high, and it's really hard to find a place to rent, and you get that all over the place. Deschutes County is ridiculous, and if you do find a place, it's like $1,400, $1,500 a month. People can't afford to live."

The housing situation in Gilchrist is complex. Until 1997, the Gilchrist townsite and the houses within were owned by the Gilchrist timber company and were rented only to employees. After 1997, home sites were individually platted and sold. One interviewee explained it as follows:

> When Gilchrist went out of business and Crown Pacific took over, that's when the changes started. I think when the Gilchrist Town sold the houses individually, it kind of took away the whole [heart of the community] .... When private people could come in and buy the houses, it just seems to me like there was an increase of rent for the houses that really didn't need to be..... People are retirees buying the houses.

Outside of Gilchrist and Crescent, many homes are vacation homes only. As one interviewee related, "When you talk to people up there, especially out in the Crescent Lake area, there's people, they have like a second home and stuff like that. A lot of those people have summer homes, I guess." Another factor complicating the housing situation in the Gilchrist area is housing in neighboring La Pine and Bend. For example, one interviewee explained, "You know, in Bend, you actually have a housing shortage, and what it does is it boils over into this area. So, things become more expensive. It's harder for people to afford houses."

Another interviewee confirmed this housing shortage:

> Right now, there's not a lot [of houses available]. I think in Gilchrist itself, I think there's one house for sale. They sell quickly because it's still fairly affordable. Klamath County taxes are very affordable, and it's cheaper to live in Klamath County. It is a cheap county so they can buy a house, and work in La Pine…. It's amazing how many people make the whole 40–45-mile jump from down here to then work every day.

Indeed, interviewees explained that beyond the issue of housing availability, other social changes are shifting relationships between employment and housing within the region. For example, interviewees explained that workers in the Gilchrist case study area mostly commute from elsewhere: "The opportunity to buy [a house] is still, I believe there, there's still places, but the workforce, I believe the majority of the workforce doesn't live in the communities anymore. They commute from Bend or La Pine."

Another stated that although La Pine is outside the case study area, "A lot of us live and work there." A third interviewee stated, "I know the majority of the folks who work here at the Forest Service live in La Pine or Bend, and they commute one way or the other to work." This same interviewee also explained that not only do people commute in to work, but many residents of Gilchrist work outside the case study area: "I think the majority of the folks who live here in Crescent don't work in Crescent or Gilchrist. I think they work in the La Pine or Bend area." Lastly, one explanation for the housing shortage and the need to commute related to the lack of infrastructure and state environmental regulations:

> Well what people are doing right now is they're commuting from La Pine, down to Gilchrist. [This is because] a number of years ago the DEQ [Oregon Department of Environmental Quality] imposed a ... In effect, it was a de facto building moratorium. Now that'll change with the coming of the sewer, which will take place .... They're supposed to break ground next month for the settling pond and then complete the sewer. See, right now, you can build a house in Crescent, but you have to spend $125,000 for a sand [wastewater treatment] filtration system, so no one's building. And what that's done is ... It's not a moratorium per se, it's a de facto moratorium. Because you can theoretically build. It's just you're going to have to pay out an additional [$]125,000; so no one's building.

Services—

Most interviewees in Gilchrist (n = 10) reported fewer services than 25 years ago. One interviewee pointed out the following:

> Look around, we don't have much. … A lot less [services] than there used to be. Because it all has to do with the mill [being] the main pull for here. Okay? The mill now has changed, they're not locals, a lot of them aren't [living] right here in this area, they're coming from someplace else. So, you know, [now] we have one restaurant. We had [more] restaurants. Gilchrist Mall is almost a ghost town up there, and that's not a good thing.

One interviewee was more optimistic about the situation of services in Gilchrist:

> Locally, they've been pretty steady. There's been a few stores that came in and tried and left and didn't last very long. There was a hardware store next door that didn't make it. There was one little restaurant just next to it that's an empty lot now,

> that was here for years and years and years. She just retired. It was a real estate [business] for a little while, and that just closed down. They tried to make a go at a grocery store, but it didn't make it. Mohawk's been here forever. The tavern's been owned by various people and it's still going. Gilchrist Mall. There's different things that have come and gone in there. One of the restaurants did close. There's been a bunch of little businesses that have come in and out of that area.

However, as noted by one interviewee, the recent addition of Dollar General appears to have some symbolic weight, indicating a revival of services:

> Stores have come up, as you can see the Dollar General has moved in. We've had a lot of cafés; we only have one café [now]. Gas stations, we've had three, three gas stations that I know of; of course, now we only have one. People are trying to do things in the community by bringing the Dollar General in. We had a grocery store in Crescent here, it closed down, but we still got the one up in Gilchrist. It's kinda evened out, like bringing that Dollar General, has really helped the community.

Dollar General was not the only perceived improvement in Gilchrist's services that interviewees reported. For example, one interviewee explained the following:

> Okay, let's go over the health first. That actually has improved because … in town we have the school-based health center and that's open to the community. It's not every day, but there, so the community can go there too, and I've heard nothing but good reports about walk-ins and getting the services there. You don't have to go to La Pine or Bend for immediate minor things, not major. But they can be checked and then sent [to a hospital if needed] …. So that's an improvement—a big improvement.

Social life—

Interviewees were more or less split over whether or not there were significant changes in the community's social life. Six interviewees reported a decline in opportunities to socialize or recreate, four reported no change, and three reported an increase or both an increase and decrease. One interviewee who suggested that very little had changed in the way of opportunities for socializing told us, "The high school still has a football team, but... most [opportunities for kids to socialize] around here are just high school sports." At the same time, others such as this interviewee cited the football team as a sign of decline:

> Sports have always been here in Gilchrist …. [but] you know, there's less people in the school because they're not living here in the local area. So, they're down to a six-man football team this year. And they have seven people on the football team. Okay? And you know, social activities, it's very limited. You make your own activities is what it comes down to more than anything else.

Another suggested that these changes had more to do with cultural changes than demographic decline:

> We go to football games and volleyball games and stuff. And it just doesn't seem like parents are as involved with their kids. And I want to say it has to do with the computers and the phones. They sit at home. They don't get out. And this is an area where people say, "Oh, there's nothing to do." There's so much you can do if you aren't sitting in front of your couch or your TV.

An increase in socializing opportunities was supported by interviewees citing both the "community club" and the Little League, "The community club has gotten stronger. There's more people involved with the community club. There's Little League that is larger now. [Before] our kids had to go to La Pine to get into the Little League." But these assertions were contradicted by another who said, "There used to be five little kid baseball camps. I'm including Chemult, Crescent Lake Junction, two in Gilchrist. You don't see that anymore."

Decreases observed by some were explained in relation to a declining population and the lack of capacity of people to maintain diverse social club opportunities. For example, one interviewee stated, "I think maybe on the club side, that they may have sort of decreased a little, but that's because of the population [decline]." Another explained, "The Lions Club had a chapter here but they folded. It got so the same people in the community club were doing the Lions Club, and it got to be too much!"

Demography and well-being—
The majority of interviewees in Gilchrist (n = 11) said that families with school-aged children had decreased in the past 25 years. Since the late 1990s, enrollment in the Gilchrist School attendance area declined by a notable 66 percent. This demographic shift was, in part, attributed to the loss of working families after the sale of the mill in the 1990s, but also to the lack of incentives for younger people to stay in Gilchrist. For example, one interviewee stated, "I don't see a lot of kids going, 'Oh, I want to come back here.' What is there to do? Work in a sawmill, or Forest Service?" In relation to this problem, several people, as another interviewee described, observed that Gilchrist is an aging community: "I would say that… most of the community right now is people that are retired."

Interviewees (n = 10) also said that new people were moving into the Gilchrist case study area. However, these were mainly retirees as well. As one interviewee explained, "The new people that are moving right now are most likely retired folks. It's cheaper to live here than elsewhere." Other newcomers were described as "antigovernment." One interviewee said, "Some of the other new people I would say are people that maybe are antigovernment, that want to disassociate, that feel like they're kind of off the grid [here]." Or, according to another interviewee, "homeless" people were moving in: "We have a homeless problem here. I would never have thought that this would have been an area that we would have a homeless [problem] and such a high drug [use] area. Who wants to be homeless in minus 40 degrees in the winter?"

Not all interviewees agreed with the above sentiments. For example, one interviewee suggested that these demographic trends were starting to rebound:

> If you look at the kindergarten and you look at the junior high school in Gilchrist, there's a lot more young kids. The high school has not seen the influx because a lot of people left for other jobs to get out of the community that were living here; and it's kind of like every place else, they kind of float back once in a while. And we're seeing a lot more float back.

Relationships with federal forests and agencies—
Interviewees in Gilchrist generally agreed that the relationship between the Forest Service employees and the community could be described as positive (n = 9) to very positive (n = 2). Several interviewees differentiated their opinions of the local Forest Service employees from the policies of the agency itself.

One interviewee, for example, said the following:

> The problems we do have, once again, stem from things like the [NWFP]; and the community understands that this is something that's forced on them [Forest Service employees], not necessarily something they endorse. So yeah, [the relationship is] generally positive. I mean that's where you go get your firewood tags and your maps and everything else you need.

As another interviewee pointed out, some of the positivity felt about the Forest Service comes down to the efforts and actions of specific individuals, rather than the agency as a whole:

> Oh my goodness. There is just this one lady at the Forest Service that is just awesome with the community. She gives all back. She's just awesome.… But like I said, the people have changed over the years, and they're different people, and people come and go.... Most of the people now from the Forest Service do not live in this area. They live in Deschutes County and commute.

As this interviewee implies, staff turnover at the Forest Service as well as changes in the residential preferences of employees have affected the nature of the connections with the community. Several interviewees point out that the shift in residence preferences for Forest Service employees was an issue. For example, according to one interviewee, "There's probably fewer Forest Service people that actually live in Gilchrist and Crescent than maybe 10 years ago or 15 years ago. … [Now] there may be less of that kind of involvement and more of a formal Forest Service providing the education and the field trips and the tree planting days."

Another interviewee said that the Forest Service continued to engage the community, "But it [the engagement] is probably not as strong as it used to be." When prompted for their perception of the Forest Service, two other interviewees launched into a satirical exchange about how luxurious the new local Forest Service building was with its "elevator" and "heated sidewalks". According

to these interviewees, "a lot of people thought" the building and its modern amenities were unnecessarily costly and out of place given the condition of the building stock in the rest of the community.

Land use and management—
Gilchrist interviewees (n = 11) mostly agreed that the national forest is an integral part of their community. According to interviewees, special forest products are important to the community, both culturally and economically. Interviewees named matsutake mushrooms, pinecones, firewood, poles, Christmas trees, berries, moss, and botanicals such as yarrow as some of the major local special forest products.

Interviewees, as echoed by this one, reported that Gilchrist community members were active users of the national forest:

> Well, people recreate on it. They go out to drive off-road. You're either going on industrial timberland or you're going off to Forest Service, so the Gilchrist State Forest. They're going to go out and get their firewood on the Forest Service. They're going to get their Christmas tree on a Forest Service. There's a strong ownership that it's their forest here. There's been groups over here that have gone out, cleaned up tires and garbage and things like that.

Another interviewee said, "People go in there [the national forest], they go back in there… They fish, they hunt, they hike, they ride their bicycles, they recreate on the national forest and in a lot of cases make their living off of it. People still work in the forest and as more biomass is removed, more jobs will be created in that forest."

One interviewee noted that although people continue to use the national forest, things have changed:

"Some people go to Waldo Lake and hike and stuff, but a lot of people go to Crescent Lake and Odell Lake campgrounds, and fish, and do all that kind of stuff. But I wouldn't say ... And the hunting is just awful anymore. People just don't hunt like they used to because there's no deer."

Several interviewees expressed negative opinions of current forest management. For example, one interviewee explained, "There's so much more they [the Forest Service] could be doing. So much more. It's just asinine the little amount of work that they put out."

Another said, "I would have to say that even though that they over-burned, the Forest Service, and let their prescribed burns kind of get out the way, it does look nice in the end. Two or three years down the road."

A third complained that, "Between them [the Forest Service] and the [state] Fish and Game [agency], and how they've worked together to shut it all down pretty much and make it difficult, it seems like it's not our land anymore at all."

Future directions—
Gilchrist interviewees had mixed responses when asked about the community's future. When asked about the potential impacts of increasing timber harvests on the national forest, some interviewees were skeptical. One cited the fact that the local sawmill is not set up to process the type of timber that the national forest offers:

> Most of the [NWFP], not all of it but most of it on Crescent is in the mixed conifer end of things. The local mill, because of a whole variety of different reasons, has shifted to working exclusively with pine and most of it is medium-sized pine, medium to smaller sized pine so .... You're looking at species that our local mill would not take, or if they would take the species, we may be logging something that is too big for them to take anymore.

According to another interviewee, "The mill can't handle the large trees. I don't know where they would take them now. I know that during the Davis Fire they took that salvage up to Warm Springs. Warm Springs is closed, so it'd probably go west side."

Other interviewees cited the fact that most of the area had been logged over already. One put it this way:

> I mean, you're looking at a community that has logged, since the '50s, over and over and over, and that's why you just can't keep doing that. You have to give the ground a little bit of rest and to grow … It's pretty good ground, it's easy ground, it's cheap to log. But what I have seen is it takes more bigger and bigger areas, to get the board feet out of it. In the past, we were in small areas now we have to go bigger.

On the other side of the continuum, some interviewees thought that the easing of logging restrictions would benefit the community by increasing the funding going to the

public schools, for example. One interviewee, noting the electoral politics of the time, expressed guarded optimism that the community would benefit, "because of the change in the [federal] administration":

> Yeah, it's just a matter of opening all the timberland back up, you know. I mean if I had my druthers, we'd have every acre of the national forest managed for timber production. So, no more wilderness areas. And then what I'd like to see is a cost-benefit analysis. Like once again we have to revisit things like the Endangered Species Act. Is it really economically worth it? Because what drives the Endangered Species Act is aesthetic sensibilities. So, what we should do before we do anything ... You know like a monument, or a wilderness area is do a cost-benefit analysis. What would actually produce more revenue?

This interviewee also pointed to potential congruencies between timber management and recreation:

> And if you manage this timberland, you can still have recreation there, plus you'll actually be managing the resource so it's put to the greatest economic purpose, as opposed to just being out there so some person from Seattle or Portland can come over and go walk out look at the trees and then go back. …But as far as recreational opportunities, I think Crescent's being discovered, or the Crescent Ranger District is being discovered, because the Bend areas and the Sisters areas are becoming overpopulated or overused, so that use is coming our way.

Aside from timber, the other major asset cited by interviewees was in the outdoor tourism and recreation. For example, one interviewee said the following:

> It [Gilchrist] has the potential for more outdoor recreation, specifically mountain biking, I think in the general area. Part of that would be related to the Gilchrist State Forest which is directly adjacent to the community. I think if a group wanted to come in and develop that, you could kinda have to some extent maybe a little bit of an east-side Oakridge, which is a [small rural] mountain biking [town in Oregon] ... Oakridge is on the west side and then it shifted. Because of the [NWFP], it shifted a lot towards mountain biking and I think you could have that same type of experience here except for without the rain.

On the other hand, one interviewee thought the potential for developing recreation was limited: "So, you know, recreation, we're kind of limited on our recreation besides hunting and fishing." This same interviewee continued, "The only thing that we have that we can be going with is a damn retirement community, okay? It's kind of headed down that road anyway because it's the [housing] slop-over from Bend, La Pine, it's coming south, okay?"

The idea of a retirement community was also presented as a positive development solution. Another interviewee said, "I don't know what the future will hold for this community.... Maybe retirement people can come and maybe that's the answer. There was a resort planned at one time just outside of town on Pressing Creek, but it never came to fruition so I don't [know]… where that's at. That would help the economy as far as providing jobs."

In spite of this potential, interviewees cited a number of factors restricting economic development in the Gilchrist case study area. One said, "As far as Gilchrist is concerned, it can only grow so much 'cause it's surrounded by others—by state forest now …. So, growth, unless it's interior, is not gonna happen anymore; [that is] not necessarily bad. Crescent on the other hand, when the sewer comes in, they have a possibility for growth."

Quite a few interviewees were excited for the future prospects that a new sewage system was projected to bring. One interviewee cited increased business potential:

> If the septic system comes in like they say it's going to, I'm hoping to see that a few of the smaller businesses are able to open back up. We have one place to eat in Crescent for crying out loud, and we used to have four or five; so even if [a] small burger joint got to open up, that's a step in the right direction …. And I've heard there's people that invested money in land….

Another interviewee was optimistic about potential for the new sewer to help ameliorate the housing crisis:

> I mean, with the sewer coming in, we're going to get more people … actual people living here. I think we'll see more people with families coming down here because the houses will be more

> affordable. It's like what happened in Redmond. I mean people that can't afford [to live in Bend] ... I had a place east of Bend and one of my neighbors, his daughter wound up buying a house in Redmond, because she and her husband couldn't afford it in Bend. So, you'll see the same thing happen here. People will move here because ... I think people that live in La Pine that are working for the mill will get houses down here. And then some people will buy here and commute. There are people [that] live in La Pine that commute to Bend.

Another interviewee made a counter point to this assertion:

> If people are counting on the sewer, and they think that the sewers are going to bring more people, and more businesses, and it's just .... We have so many houses, so many people here already that don't even work in this area. What makes you think that they're going to want to move here and get a job here when there's really no jobs to get?

Only one interviewee articulated an "ultimate dream" solution:

> Well, you know, the ultimate dream for all of these rural towns that I've lived in has been that, especially with the technological advances we've made in the past decade, would be that you get a clean industry that comes in and brings skilled job potential that wouldn't pollute or wouldn't denigrate, and would respect the community's integrity, and provide jobs, and provide a tax base. To me, that's the ultimate dream for any rural community: is that they are respected for their tradition, and where they came from, but with a beneficial industry that can provide the jobs and can add to the community in a lot of ways. And I really think that the Forest Service and the public land management agencies can be pivotal to that.

Myrtle Point

Geography

The Myrtle Point case study community is defined by the Myrtle Point School District in Coos County at the confluences of the North Fork, East Fork, and South Fork of the Coquille River (figs. 4.20 and 4.21). Its name derives from the myrtle trees that grow along the banks of the Coquille River.

The city of Myrtle Point is located along Oregon Route 42, which connects Coos Bay with Roseburg. The school district also includes the small, unincorporated rural settlements of Bridge and Remote along OR 42 to the southeast of Myrtle Point, Gaylord and Broadbent along the Powers Highway (OR 542), and Norway and Arago northwest of the city. Dora and Sitkum, historic stagecoach stops on the Coos Bay Wagon Road (see below), as well as Gravelford, are other historic place name settlements included in the case study boundaries.

In 2010, there were 2,514 people and 1,027 households in the city of Myrtle Point, a slight increase from the 2000 census. However, the 1990s saw an 8.5-percent decline in population attributed to the exodus of timber workers and their families (Charnley et al. 2006). Each of the nine unincorporated hamlets historically had post offices that have since closed. Today, their combined populations are unlikely to exceed 100.

Topographically, this case study area is located in the Oregon Coastal Range and elevations range from about 10 to 3,524 ft above sea level. The unincorporated community of Norway, on the western edge of the case study area, marks the highest tide point in the Coquille River. The confluence of the Middle and North Forks of the Coquille River, just below Myrtle Point city limits, marks the end of the river's navigability. Settlements and agricultural fields cover the relatively wide floodplains of the Coquille River forks and tributaries, while timberlands cover the hillsides. Temperatures range from an average high of 68 °F in summer to an average low of 55 °F in winter. Myrtle Point averages approximately 57 inches of rain and 1 inch of snow per year. Forests are typical of the Coastal Range, with western redcedar, Douglas-fir, and Port Orford cedar (*Chamaecyparis lawsoniana* (A. Murray bis) Parl.) dominating the overstory.

Brief History and Notable Events

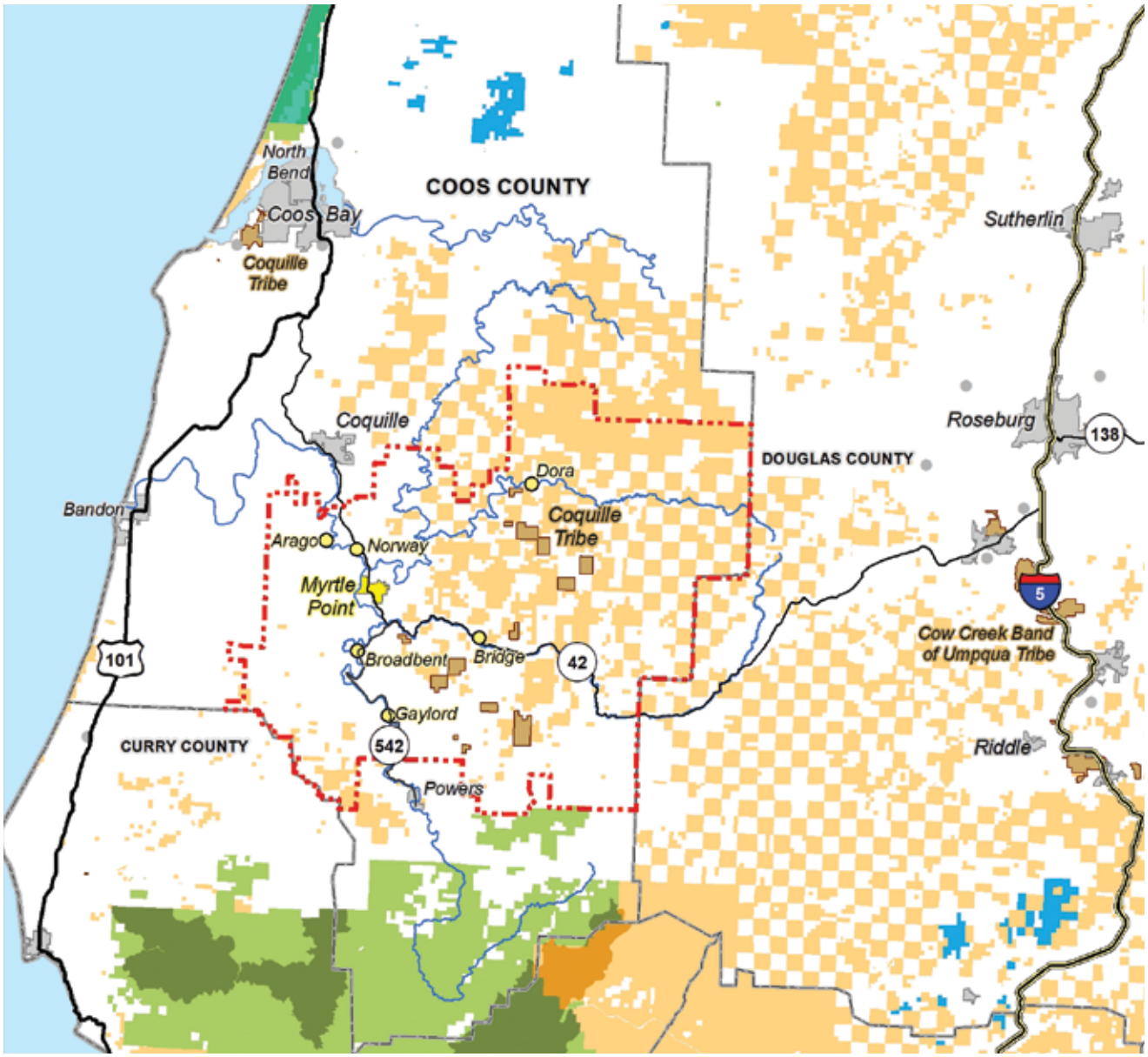
Until the early 1850s, the Myrtle Point area was chiefly inhabited by the ancestors of the Coquille Indian Tribe. The Coquille were sedentary fishers, hunters, and coastal foragers who lived in permanent villages along the forks of the Coquille River. The Coquille also inhabited seasonal camps in the uplands, particularly in spring and fall, where important resources were gathered. After discovery of gold in the region, American Indians throughout Oregon were

Myrtle Point at a Glance

> "There's less economic activity in the Myrtle Point area. The downtown area in Myrtle Point is not anywhere near as resilient as it was in the '80s."

Cities, towns, and census-designated places: Myrtle Point (city)
Populated place names (unincorporated): Bridge, Remote, Broadbent, Gaylord Norway, Argo, Dora, Sitkum, Gravelford
School district: Myrtle Point School District
Population (2017): About 2,517 +/- 40 (city); 4,957 +/- 520 (school district)
State: Oregon
Federal forest lands: Bureau of Land Management Coos Bay District**,** Rogue River-Siskiyou National Forest, Powers Ranger District (just outside the school district boundaries).
County: Coos

Figure 4.20—Myrtle Point Case Study, (top): Spruce Street business district, Myrtle Point, (bottom): Mixed BLM, private forest industry, and private farmland near Dora, on the historic Coos Bay Wagon Road. The forest landownership boundary is marked by the distinct forest stand ages. Photos by Mark D. O. Adams (top); Gabriel Kohler (bottom).



Myrtle Point Community Case Study

Land ownership

- Forest Service wilderness
- Forest Service
- Oregon Dunes NRA
- Oregon Board of State Forestry
- Tribal lands
- BLM wilderness
- Bureau of Land Managment
- Private lands

Communities

- Myrtle Point School District
- Myrtle Point
- Other case study settlements
- Incorporated city or town
- Other settlements

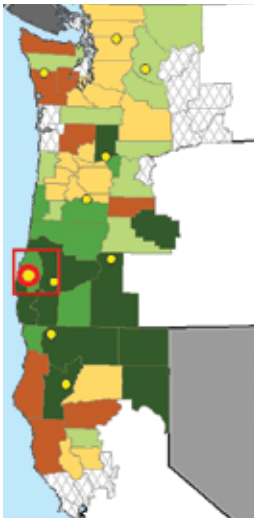


Figure 4.21—Location of Myrtle Point Case Study. Note: private lands include the forest industry. BLM = Bureau of Land Management, NRA = national recreation area. Map credit: Mark D. O. Adams.

drawn into treaty arrangements, the terms of which were often not honored by nonindigenous settlers. Consequently, the Coquille lost rights and access to lands in the Myrtle Point case study area until the 1996 Coquille Forest Act allowed the tribe to regain ownership and stewardship responsibilities for 14 tracts comprising 5,410 acres of forest land in eastern Coos County.

By 1853, gold miners were actively prospecting the banks of the Coquille River, and settlers were carving out homesteads along suitable areas of its floodplain. Early settlement was enabled through the Donation Land Claim Act of 1850. Ultimately, as gold did not pan out, miners and other entrepreneurs of the frontier turned their focus toward the area's coal and timber (Lansing 2005). Sawmills were being constructed as early as 1856.

The Homestead Act of 1862 spurred further settlement of the area, and by the 1880 census, the community boasted 52 permanent residents. By 1890, the population had grown to 354. Myrtle Point's location at the terminus of a navigable river meant that its agricultural lands were situated just outside the flood danger zone but well within reach of efficient access to markets via river barge and maritime transport offered by the Port of Coos Bay. The area proved fruitful for dairy farming, and products were soon being shipped to cities along the west coast. Creameries were in operation in Myrtle Point, Gravelford, Broadbent, and Bridge.

The city of Myrtle Point was founded in 1879, and by 1893 a railroad connected Myrtle Point with Coos Bay. By the early 1900s, logging and small milling operations were also profiting from this fortuitous geography. Agricultural settlement came relatively early to Myrtle Point, but the ownership and management of the forested landscape is more a legacy of the Coos Bay Military Wagon Road (CBWR) 1869 land grants that followed on the Civil War. As an extension of the Oregon and California Railroad (O&C) grants of 1866, the CBWR of 1869 granted every odd numbered section (640 acres each) within 3 miles of the proposed road corridor to the company that would construct road. The CBWR was completed in 1873, and although it did not pass through Myrtle Point proper, its legacy was significant to the case study area's timber industry history. Early on, for example, the CBWR may have "primed the pump" by developing infrastructure in Coos Bay that created a market for Myrtle Point timber. Later, with the NWFP, the checkerboard pattern of O&C and private timberlands may have helped to buffer the timber industry in and around Myrtle Point from complete economic collapse as private lands could still be logged.

Throughout the 20th century, timber gained importance in Myrtle Point's economy. The population peaked between the 1960s and 1980s, and its decline beginning in the 1980s was tied to the decline in the timber industry (Charnley 2006). During the past 30 years, timber-related jobs have declined by more than half, and the smaller mills operating in the area have gone out of business. The population in 2010 declined by 15 percent since its 1980 peak. However, the dairy industry and agriculture more generally have remained strong, with one creamery, Valley Crest Foods of Myrtle Point, continuing to operate.

Economic and Social Context for the Past 25 Years

Land ownership and management—
About 30 percent of the land base (96,175 acres) in the Myrtle Point case study area are part of the CBWR and O&C lands administered by the BLM. These acres fall under the NWFP. The nearest BLM office is in Coos Bay. Private timberlands and other private holdings comprise the majority of the case study area's land base (68 percent, or 223,772 acres). Two percent of the case study area (about 5,410 acres) comprises the Coquille Tribal Forest, land officially administered by the BIA. The Coquille Tribal Forest was being actively logged in September 2018 when we conducted Myrtle Point interviews. Although the Forest Service does not manage land within the case study area's boundaries, the Powers Ranger District (Rogue River-Siskiyou National Forest) is immediately south of Myrtle Point. According to interviewees, several Forest Service staff live in Myrtle Point and commute to the Powers Ranger Station.

Industry and employment—
The timber industry is no longer a significant employer in Myrtle Point; however, several smaller operations continue to survive. East Fork Lumber operates a small sawmill specializing in Port Orford cedar, western redcedar, and Douglas-fir. W&L Lumber, LLC, mills small-diameter timber (3 to 30 inch) with an annual production of 4,000 MMBF. Rose City Archery Inc. manufactures wood arrows. Burg Bandsaw Mills manufactures portable sawmills.

Dairy farms and a notable number of other local commercial businesses also provide employment

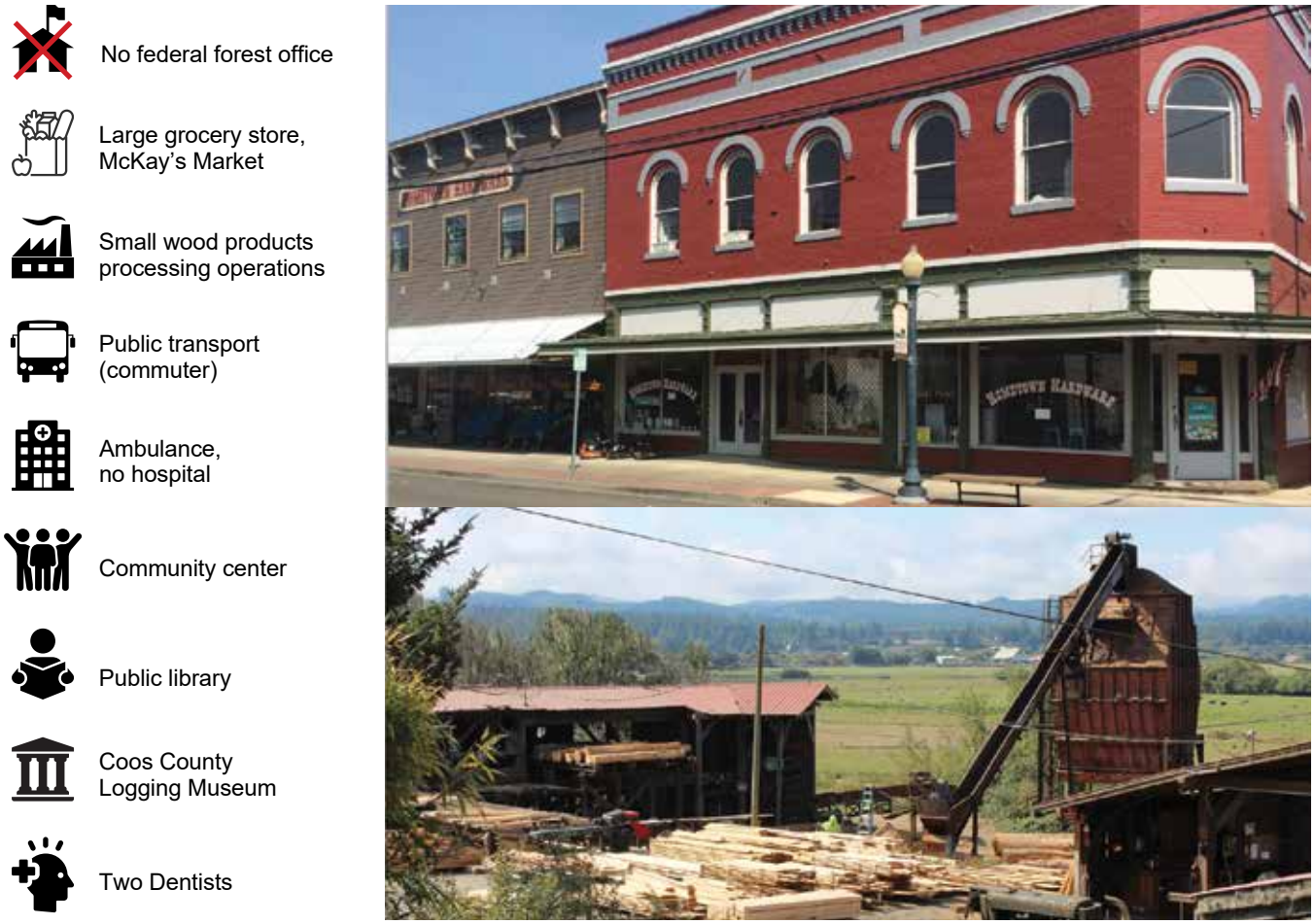


Figure 4.22—Graphic summary of community infrastructure in the Myrtle Point community, the 333 Spruce Street historic building, Myrtle Point business district (bottom) East Fork Lumber Mill, Norway. Photos by Michael R. Coughlan (top) and Gabriel Kohler (bottom).

opportunities. The school district is also a significant employer. Neither the Forest Service nor the BLM operates an office out of Myrtle Point. Many people commute to work elsewhere in the greater Coos County area.

Housing and infrastructure—
Median home price in Myrtle Point in December 2018 was $159,300, just less than half of the median for the state. Myrtle Point has a supermarket as well as several other stores variously specializing in hardware, auto parts, and farm and logging equipment. Coos County Area Transit operates daily transportation between Myrtle Point and Coos Bay. Myrtle Point Ambulance Department operates four ambulances on an as-needed basis. North Bend Medical Center operates a primary care clinic in Myrtle Point with three providers. Two dentists also provide services within the case study area. Figure 4.22 provides a graphic summary of Myrtle Point's infrastructure.

Tourism-oriented amenities—
Located 30 minutes inland from the coast, Myrtle Point and its surrounding area have limited tourism-oriented amenities in comparison to nearby alternatives, such as Bandon and Coos Bay. The main tourist attractions in this case study area are the Coos County Logging Museum, the Amaze Zing miniature golf course, and the waterfalls and hiking trails of Coquille Myrtle Grove State Park. There is also a nine-hole, private golf course. Myrtle Point and the surrounding area has seven restaurants, two vacation rentals, about 28 hotel rooms, and 28 campsites.

Perceptions of Social and Economic Changes

Employment—
A majority of Myrtle Point interviewees (n = 13/17) thought that employment opportunities had mostly decreased over the past 25 years. One said, "I would say, in my opinion, I think they've decreased. I mean, we hear stories, again,

I didn't move here till '86, but we hear stories of [how] people [could] quit a job and walk down the street, Main Street, and get a [new] job."

One interviewee suggested that employment opportunities were not a constraint in Myrtle Point, but rather, "people don't want to work":

> People can get jobs. Every one of the businesses downtown is needing help, and they have trouble finding people that want to work. … Some big businessmen there that had a lot of trucks and trucking things … said [that lack of jobs], "That's kind of a fallacy. We always need workers, but we want them to come sober. We want them to show up for work, and they've got to be able to pass the drug test."

Another interviewee offered a more nuanced view of this theme:

> I have lots of friends that own logging companies, or dairies, and they just hire local people. They say that they have the hardest time hiring people that, they don't have to be experienced, but people that show up on time, work hard, and have just a good work ethic. But then I also hear other people saying that there's no jobs, and they're the ones that are getting laid off from the mill, and things along those lines.

A more common theme was that the main problem facing the community wasn't the number of job opportunities, but the wage level. According to one interviewee, "Family wage jobs are harder to get. There's a lot of service industry if you want to do in-home care. If you want to do food service there's some of those, but family-wage [jobs] are harder to get."

One interviewee linked demographic decline to wage depression rather than job availability:

> There's always been employment opportunities here. The main thing is, most people, a lot of people left. Most younger people leave here because of the [lack of] employment opportunity. You can go get a manual labor job here in Coos County, but it's not really a family wage, so most people that have an opportunity after high school, tend to leave.

This same interviewee suggested a link between these workforce changes and the NWFP: "As labor force goes down, the changing of employment has been more mechanical of ways of logging compared to what it was before [NWFP], just because timber size changes."

Another interviewee suggested that the idea that the NWFP negatively affected employment opportunities was no longer valid: "I'm kind of curious if this premise is aging out after 25 years. Because so many other aspects of timber have changed in terms of where things are being produced, the workforce changes. I mean there is just dramatic shifts in all this."

Housing—

Most interviewees (n = 13) perceived that housing costs had increased over the past 25 years. Interviewees also mentioned fluctuations in housing costs related with the 2008 recession. The recession brought its share of foreclosures and "house flippers." As one interviewee reported, "Many of these old houses, keeping in mind houses in our town go back to the 1800s ... Some of them are tired old houses, no foundation, but now we have young guys, and there's one particular family around industries, young guys, and they're purchasing the houses, fixing them up, and reselling them."

Those interviewees who mentioned rentals (n = 6) also reported that rentals were expensive and increasingly difficult to find. Two interviewees attributed the decline in rental availability to increased risks associated with "social issues" among the pool of potential renters: "There are less rentals available. But I'm not sure what that means. And it could just be that less people are willing to rent things they have on their property that they own. Just because of the ... so many social issues and it's so difficult to manage."

Services—

A majority of interviewees (n = 9) in Myrtle Point suggested that there were fewer services than 25 years ago. Three interviewees suggested that while some services had declined, others had remained or even increased. One interviewee explained the following:

> Healthcare, I think, is pretty steady, although the local clinic now instead of having doctors on staff [they have] a physician assistant, that sort of thing. It's declined slightly. In terms of shopping, we used to have two grocery stores in town, so

> with just one, now there's a slight decline in terms of .... Well, I guess not so much availability, but selection, and so maybe the ability to get a good sale, one or the other. There's not the competition now. But most of the other services ... I mean the number of restaurants in town has probably declined since I've been here. But hardware, that sort of thing, are still readily available. Auto parts, stores, those types of things are ... those have been steady in the time period I've been here. I mean, there's been ups and downs, but they've returned to the levels I think that they were at.

Another interviewee reported the following:

> We have one less grocery store. We used to have a Safeway in town. They closed down, and there's I think maybe one more restaurant since I've been here. Then, everything else has pretty much stayed the same. Changed owner, things have changed ownership. We had a dentist in town that was a local dentist. His/her dad was the dentist at the same office, and (s)he retired when(s)he I think was 65 and ended up selling it to a chain dentist.

Interviewees reported that many Myrtle Point residents travel to Coos Bay to do their shopping or access other services. However, it was unclear whether this travel had increased or been steady over the past 25 years.

Social life—

The most frequent response to our inquiry about the status of Myrtle Point social life was that it had generally declined (n = 7) over the past 25 years. In general, the decline was associated with shifts in timber-based livelihoods and the economy overall. One interviewee asserted that, "A lot of families have been pinched financially and any time you're pinched financially, you have your focus on just surviving, and because of that, you're focused less on family and friends and socializing, to a certain extent."

Another interviewee explained it this way:

> I don't feel like we have as much leisure time. I feel like everybody's working a lot. And most people I know are working long hours. There's not very many 40-hour job weeks. I mean, we have the guys at the mill. They have a rotating schedule so you can't count on them to do anything because you never know what they're doing. Those of us who are self-employed work nonstop. The guys in the woods who work long hours have no energy by the time they're done. People who don't have the good jobs are working two little jobs. So, I don't feel like there's a lot of leisure time available.

However, there was no strong consensus. Three interviewees reported an increase in socializing opportunities, and one reported no change at all. As one interviewee explained, "People attend the events, but getting people together for something always seems to be.... You pretty much know who you're going to see.… There's a certain number of people that get out and do. There is great enthusiasm. Oh, the school stuff. My goodness. They get packed houses for the school plays, sports things, and this sort of thing."

One interviewee reported that changes were less related to declining opportunities, but more related to shifts in activity preferences, citing a decline in church attendance and fishing and noting that there "used to be a drive-in theater and bowling alley."

Another interviewee made the following observation:

> I think they have gotten a little better actually. I mean, it kinda depends on what you like to do, but kind of the recreational activity is like movies. We still have a really nice movie theater that they've made improvements to. It seems like there's been a lot more advertising and push to let people know about like hiking trails and all of the things that there are to do around here.… It sure seems like there's a lot more like festivals and things going on every weekend around here, especially tied to the Dunes being here and just attracting the tourists and with the casino and stuff. There's barbecue competitions, there's music. It seems like in the time that I've been here, that's gotten to be more prevalent. I mean, I definitely think the social organizations, like service kind of organizations … those sorts of things, those are definitely decreasing. I was a part of one of those, then it just ... was just a different generation I guess, and it seems like that is going down.

Demography and well-being—

In terms of the demographics of Myrtle Point, interviewees' shared perspectives often disagreed with each other.

Despite the decline evident in school enrollment, only seven of the interviewees reported a decline in the number of families with school-aged children. Other people were uncertain. One interviewee added, "I do see an awful lot of grandparents bringing up children. That, again, comes with the drug problems. There is a lot of that."

When asked about young people, many interviewees reported that they mostly leave the community after high school. For example, one interviewee reported, "I would say that probably most that leave to find work, don't come back, or leave to go possibly [do] schooling, [and then] don't come back."

However, an interviewee who had not grown up in the community stated, "I am impressed by how many people [who] grow up in Myrtle Point are back in Myrtle Point after going to college, getting degrees." Indeed, another interviewee suggested that staying in the community after graduating from high school is "becoming more common. It used to be, 'Get the heck out and be gone,' you know? Now they seem to be coming back. Everyone has talked about that and staying around and starting their own business and this sort of thing." A fourth perspective suggested, "There's a lot of them [Myrtle Point natives] that left right after high school and are coming back as retirees."

The majority of interviewees (n = 13) reported that new people were moving to Myrtle Point. Newcomers were mostly described as "retirees, second-homeowners, rich Californians." One interviewee noted, "We've got people moving in. This is a desirable area so we have folks still moving in. It's not like we have vacant houses everywhere."

In spite of the influx of retirees, interviewees also suggested that resident retirees were leaving the community. One interviewee offered this explanation:

> We have a lot of our retirees that move to go [be] with their families now that most of their families, most of their children, moved away, went to college, moved away, got a job someplace else. So, we're starting to see waves of retirees, which I would have said in the '90s and even the early 2000s, most of our community is now retirees, we're starting to see that we're losing those families as well.

Another provided an example: "I'm aware of several now-retired couples that have moved away to be near their children, their grandchildren. It's just depending on where their children are.… But there are some older ones that are retired and have remained here because either family ties or whatever has allowed them to stay."

Relationships with federal forests and agencies—
Because neither BLM (Coos Bay District) or Forest Service (Powers Ranger District, Rogue River-Siskiyou National Forest) have historically had an office presence in the community, the relationships with the agencies were not strong. As one interviewee explained, most people "don't really know" any agency personnel and that locally they are basically "nonexistent." Another interviewee added, "I wouldn't know who Forest Service is." Along this same line, one interviewee stated, "We all know [BLM] people. But are they present [in the community]? Not really."

Another interviewee summed up the relationship between the BLM and the community, "Well, I mean what would they have to say to us? … It's like they're irrelevant in our lives."

Another interviewee said the following:

> First thing I ask anybody when I meet someone from the Forest Service, I ask them, "Did you buy a house?" Just in passing, I try to get to know people. I go, "Did you buy a house?" And if they say, "No, I'm just gonna rent." It tells you in two years, they're gonna be gone. And that's came true, I'd say, 100 percent of the time. So, that makes it hard to build relationships. And there's a prime example, there's a [Forest Service employee who grew up] here … still lives here and (s)he's great, (s)he's a young kid, … But (s)he wants to move up in the Forest Service, but the way the Forest Service has it structured, (s)he can't stay in the same area to be promoted.

Land use and management—
The majority of interviewees (n = 14) agreed that the BLM O&C forest lands are an integral part of the Myrtle Point community. Many interviewees suggested that the relationship has changed over time. As one person described the relationship to federal forest land was multifaceted but is now reduced to recreational activities: "Part of it was the income from the people who worked on [the federal lands]. The other thing was the money that the BLM and the Forest Service got from the harvest, the timber. And then, there's people who want to go out and

go deer hunting out there in the woods, go driving in the woods. I still do that. I enjoy that."

Interviewees in Myrtle Point reported a wide range of recreational and commercial forest uses. Nontimber forest products used for commercial and noncommercial activity included firewood, ferns, mushrooms, evergreen boughs, flowers, cedar, huckleberries, and salal. One interviewee explained this way:

> There are people that go out and do the boughs and whatever…. In fact, there is a company here in town that collects those. You see that quite a bit in the fall that there's pickup truck loads of the boughs off the trees. I guess cedar boughs. I'm not sure exactly what they collect. There are definitely people in our community that rely on that as a kind of a seasonal income.

Another pointed to a local company that uses cedar branches to make arrow shafts. Interviewees also listed hunting, fishing, mountain biking, and recreating more generally in the federal forest.

In terms of fire management, several people suggested that it wasn't an issue on the minds of Myrtle Point community members. However, it may become a concern moving into the future, as one interviewee explained:

> [Fire is] not here in Coos County as much, because we get moisture. So, our forests don't usually catch on fire because we are very close to the ocean, and so we do receive the coastal moisture in the air, which helps a lot. But the last couple years, we've been getting fires like in Camas Valley area, we've been getting all of them down in the Medford, which is getting close to home. It is definitely something that I will say is becoming way more of a concern and even so because of that. It's becoming ... just because we've had more and more in the last couple years, it's definitely become more of a hot-topic conversation lately.

Another interviewee explained it as follows:

> Well, this is the year that people are talking about fire, just because all of western Oregon is on fire, but being on the coast we have the .... It's the low-frequency, high-intensity fire type. People aren't talking about fuels reduction and fire breaks and things like that …. I think there's going to be more heightened awareness of what we need to do with fuels reduction, especially as we get into, the way we interface with the residential areas.

Although fire wasn't a specific concern, several interviewees tied fire management to forest management more generally. For example, as one interviewee explained, "If you manage your forest actively, you'd be [doing] fire hazard management at the same time."

Future directions—

Myrtle Point interviewees saw a diversity of futures for the community. In response to our question about the future potential for a timber-focused economy, one interviewee explained it may take some time to rebuild the community's capacity:

> If you went back to the timber harvest levels that we knew in the '80s, it'd take a little while. Training people would be the biggie, because we just don't have the source of loggers that we used to have. But eventually, you would have a source of contractors who would build up their equipment, buy more equipment, hire people. And then, yeah, that would add a lot of activity to our areas.

Others listed a host of benefits that might come from increased harvests on federal lands. For example, one said: "More jobs, more employment. A little more industry. Fewer businesses turning over because they couldn't make it. A little more community stability. Probably increased funds for their school districts."

Several other visions for Myrtle Point were also put forward by interviewees. For example, one interviewee cited the potential for Myrtle Point as a mountain bike destination: "One of the things that's developing is on the Coos County Forest, they have developed mountain bike trails. And they are very popular. They're trying to develop more of them."

Some interviewees were optimistic about a future outside of timber dependency. For example, one person explained the following:

> I think that the majority of folks here are trying to move on and find other ways [to make a living than in the timber industry], creative solutions for funding and revenue and jobs. I think there's some people here who just have philosophies that

> prevent that from happening. They don't want to pay more taxes; they don't want to do those sorts of things. But I see that there is just a recognition that we won't be back where we were.

On the other hand, many interviewees were fairly pessimistic about Myrtle Point's future. As one noted: "It's just really one of these areas where the best thing we have is our natural resource. So, recreation dollars are great, but they're inconsistent and change with the time. I've lived here my entire life, and I can't tell you a good answer of what would be an alternative besides [logging and timber milling]."

Another interviewee surmised that transforming to a retirement community is the only realistic future for Myrtle Point:

> I can't imagine any kind of catalyst that would really help development, in developing the economy that much. Not a lot, in my opinion. To me, the thing that's probably happening more in this area is because of the affordability of it, and the mildness of weather, you do have people getting out of California and retiring in Myrtle Point or Coos Bay, North Bend, wherever. To the degree that California becomes too expensive and it's more economical to live in Myrtle Point, you might have some migration into the community.

One interviewee cited the proposed Jordan Cove Energy Project, a liquefied natural gas pipeline through Coos County, asserting, "I don't think the Jordan Cove thing is going to be the answer to everything. I think it would be the problem. I don't like it, and you can quote me on that one."

Riddle

Geography

The Riddle case study area is defined spatially by the Riddle School District in southern Douglas County (figs. 4.23 and 4.24). The Riddle townsite is situated at the confluence of Cow Creek and the South Umpqua River, which placed the town in an ideal location for capturing saw logs from the Coastal Ranges and the Cascades. Its location adjacent to Interstate 5 has also positioned the town well for processing and distributing timber.

The case study area covers a large portion of the lower Cow Creek watershed and includes the sparsely settled Cow Creek and the city of Riddle. Cow Creek runs eastward out of the Siskiyou Mountains until it meets the South Umpqua River as it flows north and west out of the Cascades and heads toward the sea. The area ranges in elevation from 640 to 3,733 ft above sea level. Riddle receives about 31.05 inches of precipitation annually (mostly between October and May) and temperatures range from an average minimum of 36 °F in winter and an average maximum of 85 °F in summer. Riddle sits in the Klamath Mountain ecoregion at a point within 15 miles of the Coastal Range ecoregion, 60 miles of the Western Cascades ecoregion, and 70 miles of the Southern Cascades ecoregion, thus providing access to a diverse cross-section of forest resources.

Brief History and Notable Events

Cow Creek Valley, part of which would later become the community of Riddle, was settled in 1851 by William H. Riddle and family under the Donation Land Claim Act. Settlers predominantly found their livelihood in stock-raising and farming: "At that time, Cow Creek valley looked like a great wheat field. The Indians according to their custom, had burned the grass during the summer, and early rains had caused a luxuriant crop of grass on which our immigrant cattle were fat by Christmastime" (Riddle 1920: 37).

At the time of nonindigenous settlement, the area was occupied by the Cow Creek Tribe, a band of what is now recognized as the Cow Creek Band of the Umpqua Tribe of Indians. However, the Cow Creek Band likely consisted of at least three distinct linguistic groups, including Upper Umpqua, Targunsan, and Milwaletas. The Cow Creek were hunter-gatherers who relied heavily on semicultivated camas root, silver salmon, lamprey eels, deer, and other game. During the first year of the Riddle settlement, the nearest nonindigenous neighbors were 8 miles away and there were only four other nonindigenous homesteads within a 25-mile range. Early settlers developed interdependent social and economic relationships with the Milwaletas, while other bands were hostile to the settlers (Riddle 1920). However, by 1852, more settlers began to arrive in the Cow Creek area, including a John Smith from Indiana who filed a land claim on the present townsite of Riddle. By the end of the year, "nearly all the tillable lands were claimed" (Flora, n.d.). Gold discoveries in the nearby Cascades soon influenced the local economy in terms of trade and resource extraction. Local pines were the first to be logged, providing timber for house construction. The

Riddle at a Glance

Older Resident: We used to be a thriving community. We used to have stores open on Main Street. We're never going to get that back again. Things will never, ever be the same again.

Younger Resident: You have some people that have a love for [Riddle] and know that there's great things here and then you have other people that are like, 'There's nothing here. There's no jobs. There's no stores.... There's nothing to do here,'… so you either enjoy it or you don't.

Cities, towns, and census-designated places: Riddle (city)
Populated place names (unincorporated): Cow Creek
School district: Riddle School District
Population (2010): 1,185
State: Oregon
Federal forest lands: Bureau of Land Management Roseburg District, Umpqua National Forest, Tiller Ranger District (20 miles to the east)
County: Douglas

Figure 4.23—Riddle case study, (top): saw shop and Douglas-fir interpretive highway sign, Riddle, (middle): Pruner Road and Riddle By-Pass, C&D finished lumber staging yard, Riddle, (bottom): recent burn on forest industry land near Riddle. Photos by Michael R. Coughlan.

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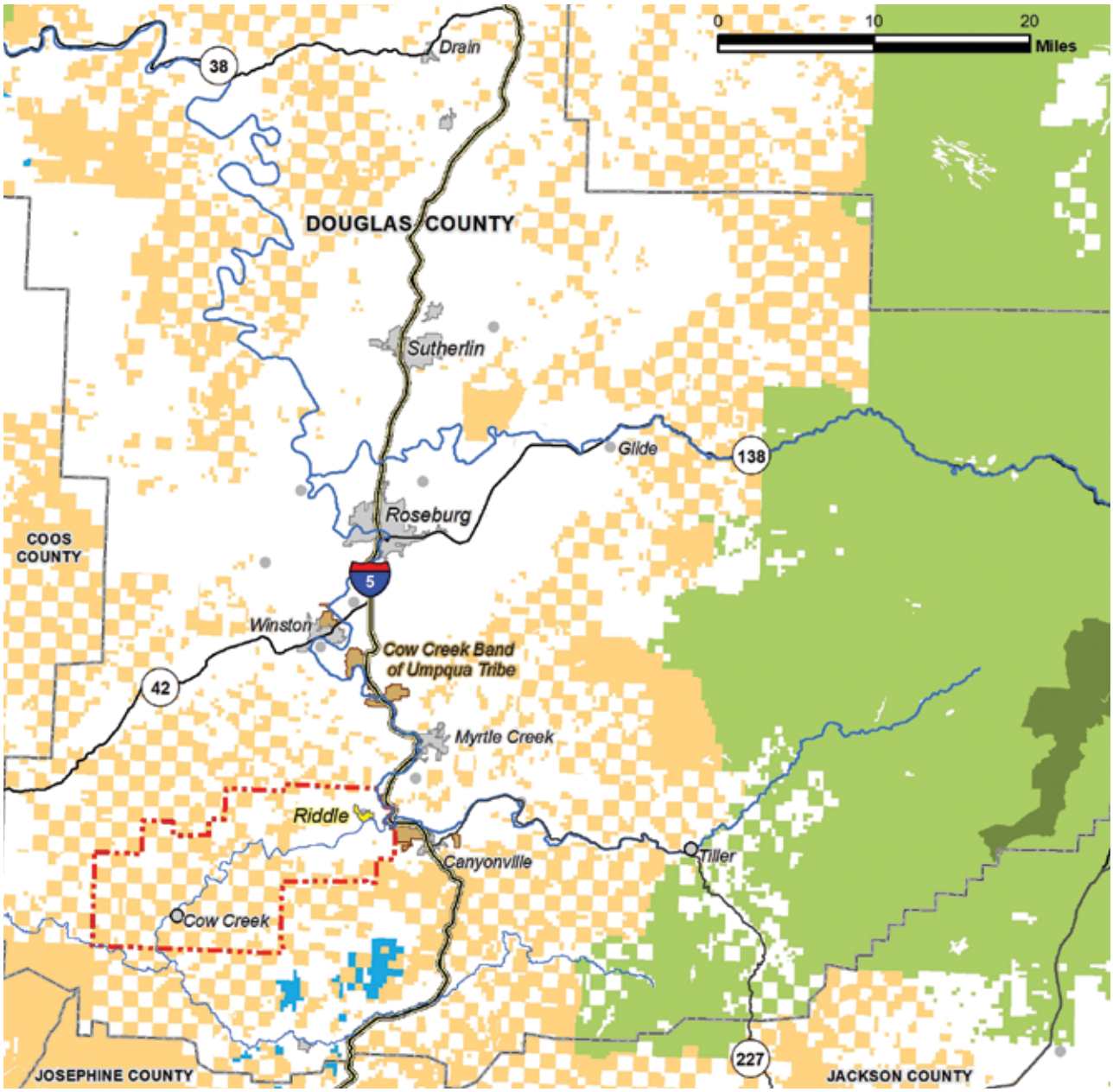


Figure 4.24—Location of Riddle Case Study. Note: private lands include the forest industry. Map credit: Mark D. O. Adams.

area's first sawmills were constructed in the early 1850s in nearby Myrtle Creek and Canyonville (Riddle 1920).

As settlements grew, relationships with indigenous groups became strained and some settlers began to attack these American Indians to claim land. By 1855, open conflict broke out between the U.S. Army (and local volunteers) and the American Indians throughout southern Oregon in what is known as the Rogue River Indian War. As a direct result of this war, the Cow Creek Band was forced onto the Grand Ronde Reservation. However, some of the Cow Creek band remained hidden in the hilly country surrounding the Riddle area and over the next 25 years, this group was known for periodically rustling the cattle of early settlers. By 1910, the band initiated legal claims to their ancestral homeland. After 70 years of litigation, these efforts resulted in formal tribal recognition by the federal and state governments and the tribe now operates the Seven Feathers Hotel and Casino Resort in Canyonville, Oregon, a major employer for the Riddle community.

In 1866, the Smith land claim to the future town of Riddle was sold to William Riddle's sons, Abner, and J.B. Riddle. Meanwhile, the O&C land grants of 1866 provided 3,700,00 acres of land as an incentive toward the development of a railway connecting Portland with San Francisco. The grant allowed the railroad construction company to select every odd section (640 acres each) for 20 miles on either side of the rail corridor (within 30 miles if the designated section was already claimed). This resulted in a checkerboard pattern of land ownership across Oregon, but particularly in the area of the Riddle case study. Following multiple counts of land fraud, these lands reverted to government ownership in 1916 eventually becoming the BLM-managed O&C timberlands.

The O&C Railroad reached the Riddle townsite in 1882 and the settlement began to develop around a train depot consisting of "two hotels, a store, a warehouse, a sawmill, and a schoolhouse" (SDGMI 1953). The town received a bit of a boost because for the first eight months, it served as the southern terminus of the railroad. Gold, nickel, and other mineral prospects were soon developed, and by 1891, the International Nickel Mining Company of Chicago purchased the nickel mine and developed a hotel, worker housing, and a sawmill. The town of Riddle was incorporated in 1893. However, the nickel mining operation stalled as the company's stockholders got into legal disputes, and in 1908, the components of the company's planned 150-ton capacity smelter still sat in storage at the Riddle railyard. The Silver Peak copper mine (later named the Formosa Mine) began operation in 1910, although it is difficult to know how much the mine contributed to the town's development as it sits 7 miles to the south of the townsite.

Early exports for the town were prunes and walnuts. According to the town's website, the Rosenburg Brothers' prune packing plant provided the town's only employment during the Great Depression. However, 735,600 pounds of copper; 2,198 ounces of silver; and 240 ounces of gold were extracted from Riddle's Silver Peak mine from 1926 to 1937. The mine was Douglas County's most productive, producing 95 percent of the county's copper during that period. Logging and timber milling began to boom during WWII, and a number of lumber mills were constructed. One of these mills, DR Johnson Lumber Company, opened in 1951 and is still in operation. Nickel mining began in earnest in the early 1950s with a contract from the federal government. The town went from 214 people in 1940 to 992 in 1960. Demographic and economic growth continued with the completion of Interstate 5 in 1966.

Riddle's population began to decline in the 1980s with market-induced job loss in the timber industry. As timber-related jobs continued to decline in the 1990s, the closure of the Glenbrook (formerly Hanna Smelting Company) nickel mine in 1993 and its smelter in 1998 left another 300 workers without jobs.

Economic and Social Context for the Past 25 Years

Land ownership and management—
Land ownership in the 89,026-acre Riddle case study area is predominantly privately owned forest, industrial, and residential lands that comprise 62 percent of the land base. The BLM manages 34,194 acres of O&C timberlands, with 38 percent of the land base. Until 2018, these lands fell under the NWFP. Riddle has never hosted a BLM office. The BLM district office is in Roseburg. The Cow Creek Band of Umpqua Tribe of Indians owns a small amount of land (about 6 acres), officially managed by the BIA within the Riddle case study area.

Industry and employment—
In 2018, there were five sawmills operating in the Riddle case study area: Herbert Lumber Company, D.R. Johnson Lumber, C&D Lumber Company, Billboard Lumber Products, and Roseburg Forest Products. Herbert Lumber specializes in high-quality products, such as custom windows and doors. D.R. Johnson Lumber specializes in 3- and 6-inch Douglas-fir structural joists and planks. It also operates a laminate plant that manufactures structural glue-laminated beams using Douglas-fir and Alaska yellow cedar (*Callitropsis nootkatensis* (D. Don) Oerst.). C&D Lumber uses Douglas-fir, Incense cedar (*Calocedrus decurrens* (Torr.) Florin), and Port Orford cedar to produce 2-inch lumber, timbers, and decking. Billboard Lumber specializes in custom milled wood products for use in surveying, construction, and agricultural applications. Roseburg Forest Products operates its "Plant 4" in Riddle, specializing in laminated veneer lumber I-beams and plywood. In addition to the timber industry, Green Diamond Performance Materials operates a sand "mine" (nickel ore byproduct) and processing plant used to produce abrasive blast media, foundry products, roofing materials, and specialty aggregates.

However, in spite of all of this industry, it remains unclear how many of Riddle's residents are employed by these operations. Interview data (see below) suggest that many mill workers commute from elsewhere. Riddle's main employer may be the Seven Feathers Casino in Canyon City. The casino is operated by the Cow Creek Band of the Umpqua Tribe of Indians; it opened in 1994 and has been steadily expanding ever since.

Housing and infrastructure—
In stark contrast to all of this industrial activity, Riddle continues to suffer economically, having failed to recover from the 1980s decline in the timber industry tipping point. The median home price is $163,300, just under half of the median for the state, and much of the housing is small and appears quite dilapidated on the exterior. The abandoned Formosa Mine, which reopened for a short time in the early 1990s, is now a superfund site that leaches heavy metals and acid mine drainage into the headwaters of Middle Creek, which potentially threatens Riddle's ground water.

Figure 4.25 summarizes the case study infrastructure. Riddle is technically a food desert as it does not have a grocery store within 10 miles of the town center. Umpqua Public Transportation District operates a public commuter bus three times daily to Roseburg, so residents without their own means of transportation can access services and commodities there. Riddle has a locally funded public library and a community center, and much of the public park and recreation infrastructure has been updated in the past 25 years. Although the town has a volunteer fire department, the nearest ambulance service is several miles away in Myrtle Creek. The town does have a dentist office, but other health care services are not available locally.

Figure 4.25—Graphic summary of community infrastructure in Riddle, the Riddle branch of the Douglas County Library, and Roseburg Forest Industries Plant #4. Photos by Michael R. Coughlan.

Tourism-oriented amenities—
The Riddle case study area's tourism amenities are few. The case study area's potential to capture tourist dollars is severely overshadowed by Roseburg, 30 minutes to

the north along Interstate-5, as well as the nearby cities of Myrtle Creek, Tri-City, and Canyonville—all within a 15-minute drive. Riddle has two restaurants and three vacation rentals. The case study area does not have any hotel rooms or campsites. Downtown Riddle does have some historic character, but the buildings are rundown and neglected. Riddle's industrial feel also hinders its potential as a tourist destination.

Perceptions of Social and Economic Changes

Employment—

Nearly all Riddle interviewees (n = 13; one interviewee did not answer this question, n = 14 total) perceived a decline in employment opportunities over the past 25 years. One interviewee put it this way:

> [When] Hanna nickel [mine] was open, it was thriving. Mills were producing more lumber and plywood. Houses were being built. People were moving in [to Riddle] to get their jobs. Once [the NWFP] came into effect and they realized what it was going to be, what it was going to cost, the jobs were gone. People were moving out in droves because there weren't any jobs.

One interviewee suggested that the NWFP had also precipitated a change in workforce demographics:

> What you saw was a graying of our industry once the [NWFP] became fully implemented and some of the lawsuits that followed that drove down even further some of the management practices.… Forestry became a relatively unattractive industry for young people to get into. Consequently, we saw a graying of our industry; and I would say since about 2010, there's actually been pretty good demand, and forestry has regained some of its, shall we say, sex appeal, or there's renewed interest in it.

Several interviewees thought that following an initial decrease in the number of jobs, there had been some recovery, but that changes in the workforce demographics had permanently shifted community-employment dynamics. One interviewee offered the following example:

> [Riddle] went through a real decrease, but it's coming back. We have the mine out here for years, but that's been replaced by Green Diamond [mine], which is a family-wage job, just not as many. The mills are working steady, but the people that live within the town have changed because when the timber industry went down, people moved away. The people that moved in were [of a] different economic status, so people that work here take their money and run. They don't live in Riddle.

Another interviewee suggested that although employment opportunities had declined in Riddle, it was not the only cause of its relatively high rate of unemployment: "I'd say they [jobs] decreased, but on the other hand, everybody is trying to hire, they can't find anybody. My opinion is, they can't pass the drug test."

Outside of the timber industry, interviewees suggested that Seven Feathers Casino (in nearby Canyonville) had created a large number of local jobs in recent years. Several interviewees pointed to new construction along Interstate 5 that is expected to bring a Grocery Outlet, Dollar Tree, and Starbucks to the area. And, according to one interviewee, "there will be three other stores on the other side"—all of which would create service jobs.

Housing—

Most interviewees (n = 8) reported that since the mid-1990s, housing costs had increased in Riddle. But housing was still affordable in comparison to Douglas County. As one interviewee explained, much of the housing context in Riddle comes from its legacy as a mining town:

> The cost of housing here has increased, but we are probably the cheapest housing. I can't imagine us not being one of the cheapest housing areas in the state. Housing is pretty inexpensive here compared to other places, but it's also substandard, most of it. Well, the mining housing, a lot of it [is] the kind of housing that they slapped up for the single miners who moved away from their families to work at Hanna nickel mine at one time. So they built tons of little apartments or little single-dwelling houses that are still here and still functional.

At the same time, because of the lack of higher wage jobs, affordability of home ownership and availability of rentals are real issues in Riddle. For example, one interviewee explained, "Renting or buying a house in

Riddle right now is very slim." Another reported that, "Property prices have expanded exponentially over time. I think it's pretty much out of reach of young people, same with regard to renting. There's nothing available. What is available is all market driven, so it's pretty expensive."

One interviewee suggested the housing crisis is partly due to "zoning issues." Other interviewees also said that newer housing construction is limited by urban growth boundaries as well as infrastructure.

Another suggested, "It's [housing availability], kind of followed the market … going up and down. Right now, it's on the up because it was so affordable that people were coming in and using it as investment in a rental." Five interviewees were unsure of a definitive trend in housing costs or reported that they had not seen any change.

Services—

Interviewees (n = 10) agreed that there are fewer services in Riddle now than there were 25 years ago. As one said, "In Riddle, one store after the next went down. It used to be a thriving little downtown there, and … [now,] one store left?" Another interviewee said, "We used to have a grocery store. We used to have a doctor. We used to have gas stations. We have done with that now. As far as mental health, there's nothing in Douglas County really, to speak of…. For anything as basic as milk, you have to go out of town."

One interviewee chronicled the decline of Riddle's services: "It was first the grocery store [that closed]. Then the gas station. Then the pharmacy. And it was probably within a 10-year period. I'm not sure exactly.… [And] we lost the hardware store, too." However, historically services in Riddle were always few in number. When asked about changes in services over the past 25 years, one interviewee said, "Oh, we never had any [services] here."

Social life—

No clear consensus emerged about the changes in social life in Riddle over the past 25 years. Four interviewees reported no change at all, and three were uncertain about any changes. Two interviewees suggested either an increase or both increases and decreases in opportunities for socializing. However, within these mixed responses, one interviewee reported, "We have a strong central group of volunteers that are involved in almost everything. We still have two major events here in town. We have our Sawdust Jubilee, which we have our fireworks. It's our big summer festival."

Another interviewee explained the following:

> Our main thing we have is our Sawdust Jubilee in the summer. It's our kind of 4th of July. We have a big adult softball tournament and our fireworks shows and leading up to that, we have our, like our dinner auctions which have brought a lot of people. Not a whole lot unfortunately. There used to be more, but you know a lot of the older people carried all that stuff for so long and there's not younger people stepping up to do things and make them happen. Everybody likes to get really upset when things don't happen but they don't want to be a part of making it happen.

Interviewees also mentioned continued community interest in school sports activities, but dwindling interest in civic organizations:

> A lot of the community members really go and support the kids in the schools, the sports activities there, so I don't think that's changed. There's still strong support there. … [Civic organizations] have a hard time getting members. We have a hard time in the American Legion, getting members. [For the] Small Woodlands [Association] and Historical Society, getting someone [to join their] … board is hard; and all the organizations are having that problem here.

In terms of opportunities for children, one interviewee told us, "There isn't anything. There's nothing except the library and school dances." For recreational opportunities, one interviewee stated, "It's about the same [as 25 years ago]. There's nothing. I mean, if you're a hunter or fisherman, or hiker, or biker, it's fine, but we don't have a community pool. We don't have a community place for young people or, well, we have a community center that the seniors use..."

Demography and well-being—

Interviewees in Riddle reported that the community demographics had shifted in the past 25 years. One interviewee described the community as follows:

> It's changed. I don't know that it's decreased, I think what's happened is the demographic has changed. We have fewer professional people and more ... less-educated; lower socioeconomic people

> will flock here because of the cheap housing. We have seen—how do I say this politely—we've seen the demographics shift in such a way that the kids who come here have more socioeconomic issues, more mental health issues, more general health issues than what we were seeing, 10, 15 years ago. We have kids who don't see a dentist. We have kids who don't see a doctor. We have families who don't have medical care. We have families who [have] mental health issues. We have a bigger drug issue than we've ever had. Probably more people are into the growing and distribution of marijuana here now then were 10 years ago. It's become a bigger issue. People can grow it in their back yard [and] sell it someplace.

One source of change in demographics is the continued loss of younger people who leave for college. As one interviewee explained, this phenomenon extended beyond the Riddle community to the entire county: "The demographics are very interesting, in the sense that most of the people that do well in high school are out of here. There's a huge brain drain in Douglas County, and I think that's reflected in Roseburg Forest Products moving their headquarters from Roseburg to Eugene."

Although many interviewees explained the decline in school enrollment (25 percent since 1999) as a function of the loss of working families (with school-aged children), one interviewee reported, "A lot of the older folks stay here. They have their homes bought and stay here. I know I just moved back here a couple of years ago and bought a house because I feel like it's a great place to raise my kids. It's a very tight community. They can go for a walk and it's okay, you know?"

In spite of some younger families returning, interviewees also pointed out that the population is aging. One interviewee said, "I think that we do have a lot of older population. I think some of it is moving up from California, you're able to come up here and retire … at a little better rate just because of the cost of living in the area."

Relationships with federal forests and agencies— BLM forest lands (Roseburg District) meet Riddle on its western side, and the Umpqua National Forest historically supplied logs to Riddle's sawmills. Yet neither agency has had much of a presence in the town as their district offices are located elsewhere. When asked whether or not federal land managers engaged with the community of Riddle, one interviewee summarized it this way:

> There's not [any engagement]. I'm sure there's a little bit with some of the sawmills and stuff, but as far as the community is concerned: none. [In] Roseburg, which is the larger community that's just north of us, I go to different functions and stuff that the Forest Service is at. I've never heard or never been in a meeting at Riddle that's had Forest Service people at it. … The interaction is basically nothing. … They have just written it [the federal agencies] off. It is what it is. As a community, we're just going to go on regardless.

Other interviewees described the community's relationships with federal agencies as mostly negative, in part because of the apparent political leanings of community members. According to one, "This community is much more Republican, much more than it is Democrat; so this community really believes that... the government should be supplying the timber and we should log it."

Another interviewee said, "Well, yeah, it's all fairly negative because … the Forest Service used to be huge around here and now there might be four or five people that work there and there are no logs coming off of the Forest Service [land], so it's just kind of left to fend for itself. I'm not sure [land] management is exactly what you can call it!"

One interviewee articulated a commonly expressed community perspective:

> Some of them [community members] are very upset. Even now, after all these years of living with the [NWFP] and the spotted owl, there are folks that are, they don't like the government because of it.… I don't really know, but I know that it runs deep. Again, I know people who are okay with what's going on. Myself personally, I don't like what the plan has done to my community and other communities.

Some interviewees said the negative community sentiment was more about land management policy than individuals themselves or the forests they're tasked to manage. One explained the following:

> You can really commonly find individuals that absolutely despise the Forest Service but love their next-door neighbor who works for the Forest

> Service because "that's not the Forest Service, that's my neighbor, and we go hunting together on Forest Service land." And those kinds of things make that part of that community…. I think if you went to people and said we're going to sell off the BLM land in this area and let them turn it into housing tracts they would hate that idea because that would change the character of that community.

Another suggested that the negativity was partly the fault of the agency's failure to engage with community members:

> I would say right now, if you talked to 100 private landowners you would probably find 99 of them say that the agencies don't do enough. That's my guess in my interaction with people that's pretty uniform. Part of that is likely a misunderstanding of the complexities of fire management and a misunderstanding of what the Forest Service is trying to accomplish when it lets an area burn for longer than would [happen] on private land. So there's that misunderstanding. Part of it, too, is I don't know if the Forest Service has done a convincing and compelling job of explaining to people, of educating people, [about] all of those policies.

Land use and management—

The majority (n = 12) of interviewees in Riddle agreed that the federal timberlands were an integral part of the community. As one interviewee put it, "For me, I like to look up in the glades, the mountains, see the timber, see a creek running through. It's the visuals that are important, I think, to a lot of people."

Another interviewee suggested that federal management policies were changing the way people interact with the forest:

> In years past way back, the people used the forest to hunt and fish and to do all those kinds of things. Through time since, the [NWFP] then shut roads down because it's hard to maintain them. They shut roads down…. The access to the whole forest is even less, and when we were out logging and managing [the lands] that took care of [road maintenance].… People don't hunt as much as they used to, which there's not as many critters as there used to be, the hunting type critters, because we don't have the openings [in the forest] that the harvesting created.

One interviewee said the relationship between the community and forest was driven by,

> The supply of timber, recreation, and just the mass ownership, just the pure size of the ownership. It's hard … just hard to avoid it when 40 to 50 percent of the land is owned by the federal government. It's gonna have an impact on how you move around in the community.

In terms of nontimber forest products, interviewees said people used the nearby forests for mushrooms, berries, firewood, Christmas trees, beargrass, cedar boughs, mosses, posts and poles, and ferns. One interviewee also mentioned that birding was an important activity.

Interviewees also agreed (n = 13) that wildfire is a major and growing concern for the community. One interviewee put it this way:

> This summer was horrible for us, and the summer before. We lived with days almost all summer long … [that were smoky]. That's all we had was smoke. Being an exfirefighter, … I fought fire for 15 years, and I know what it can do, and we need to practice better, not control, but better practices on the land. We've got some really, really good opportunities to do some thinning, do some brush clearing.

However, interviewees also recognized that wildfire has some local economic benefits as well as costs. One said the following:

> Actually, to be honest, the fires help the economy in the short term because they set up their fire camps and that's always lucrative for whoever's land [they are on] and a couple years ago, it was the Riddle School District [land]. Firefighters make a lot of money, really good money, but that's the short term. The long term is the forest just burned. That doesn't recover overnight.

In another example, an interviewee explained the following firefighting benefits to the community:

> The more fires there are, the more jobs there could be for firefighters, contracted firefighters. People who work in the fire camps. People in fire buy from local economies. Buy water, buy food, whatever. That increases the economy. More people save money, they put money in the bank, they can buy a new car next year because they worked on a fire all summer. It's not good, it's not sustainable, that kind of work, but it is a [economic] jolt.

Some interviewees complained that because of restrictions on logging and management policies, federal agencies were not doing enough to manage wildfire: "It used to be that if a fire started in the forest, the loggers were out there and they took care of it, but now, they're not only not out there, if they are out there, they're not allowed to do anything about it."

Future directions—
Visions for Riddle's future were varied. One interviewee pointed to Riddle's strategic location adjacent to Interstate 5:

> You know, the Internet has just exploded so what I see is use of the freeway. … I had a talk with the owner of the company who was selling some property along the freeway and I told him, "you know what, they're not making any more freeway property." … Distribution being the way that it is now, you can have Amazon distribution centers. You could have all these different things [by the freeway]. So, there's room for that type of growth and well, you see it in the freeway now. How many trucks do you see out there? We're moving stuff every day, all day.

One interviewee highlighted a diversity of options for Riddle's future:

> Well, you know, it's rural, so it's still agricultural-driven, we've had the marijuana industry, we've had the grape industry. It is a beautiful place, so there still is the businesses that get associated with retirement and tourism… You know, if one of these mills in Riddle would go down, then I think people would go away, I don't think they would find something else to do. I think they would just leave. I don't know what would replace it…. They could go as close as Roseburg or Medford or Eugene [to find a job], and they could actually commute there from here. So, they may stick around, but I don't think [so]…. I think this WinCo warehouse over here is, you know, there's a little bit opportunity up and down Interstate 5 for warehousing and distribution. I suppose that would be one thing you could see as increasing.

Another interviewee highlighted a role for the nearby casino in Canyonville:

> I think what's most likely to improve this in Riddle is eventually Seven Feathers Casino will come along and start buying up land here. Rip down some of this substandard housing, put up better housing. Demand a higher price for it and those people will have to leave. You improve the housing in this area, you'll improve the economics in this area. But, there also, somebody's going to have to come in with family-wage jobs. That's just not happening right now, even for the well-educated.

Several interviewees saw a continued future for the timber industry that was more adapted toward restoration forestry. One interviewee explained the following:

> The county commissioners, the sociopolitical constructs in concert with the industry want the good old days to come back. Period. I think the mechanisms are in place, if they would just let us do it, we could treat this entire [forest]. We could have wood coming out of here, we can have anywhere from 15 to 25 million board feet coming out of here, annually, just as a byproduct of restoration work, and a maintenance of fire resilience. I think that you could extend that forward probably, based on my experience with this project, at least 25 or 30 years into the future.

Happy Camp

Geography

The Happy Camp study case area is defined by the boundary of the Happy Camp Elementary School District, which encompasses 363 miles^2 of far northwestern Siskiyou County, California (figs. 4.26 and 4.27). Siskiyou County is the fifth-largest county by land area in California and has one of the lowest population densities of all California counties—seven people per square mile in 2010. There are only nine incorporated communities in the county. The Happy Camp case study is part of a largely remote

Happy Camp at a Glance

> "We were going through timber faster than we had land to support it. I never will think that was sustainable even though I made my own bread and butter in the timber industry. So we definitely went too far, too fast, and it would've caught up with us eventually.…"

Cities, towns, and census-designated places (CDPs): Happy Camp (CDP)
Populated place names (unincorporated): none
School district: Happy Camp Union Elementary School District
Population (2010): 1,190
State: California
Federal forest lands: Klamath National Forest, Happy Camp Ranger District
County: Siskiyou

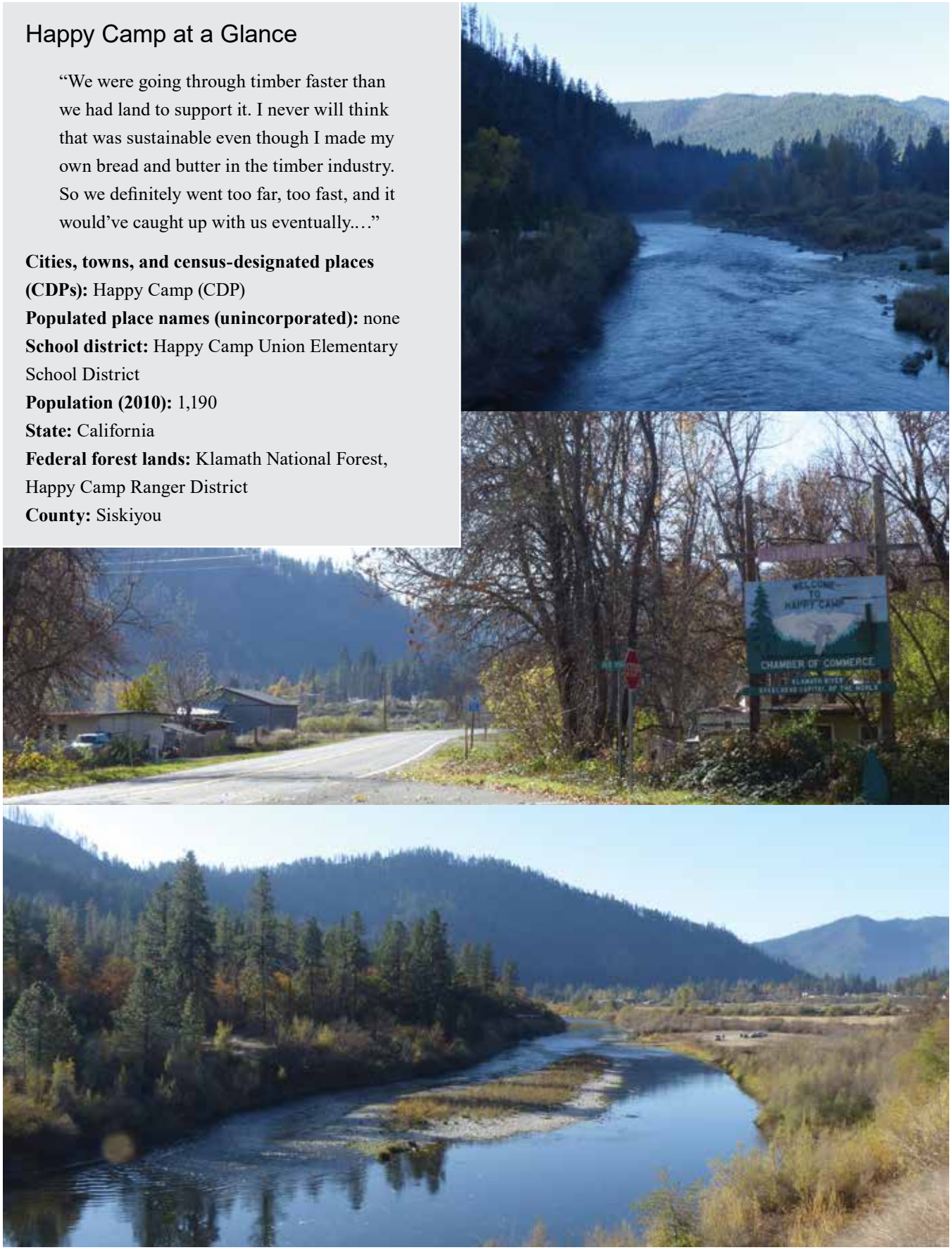
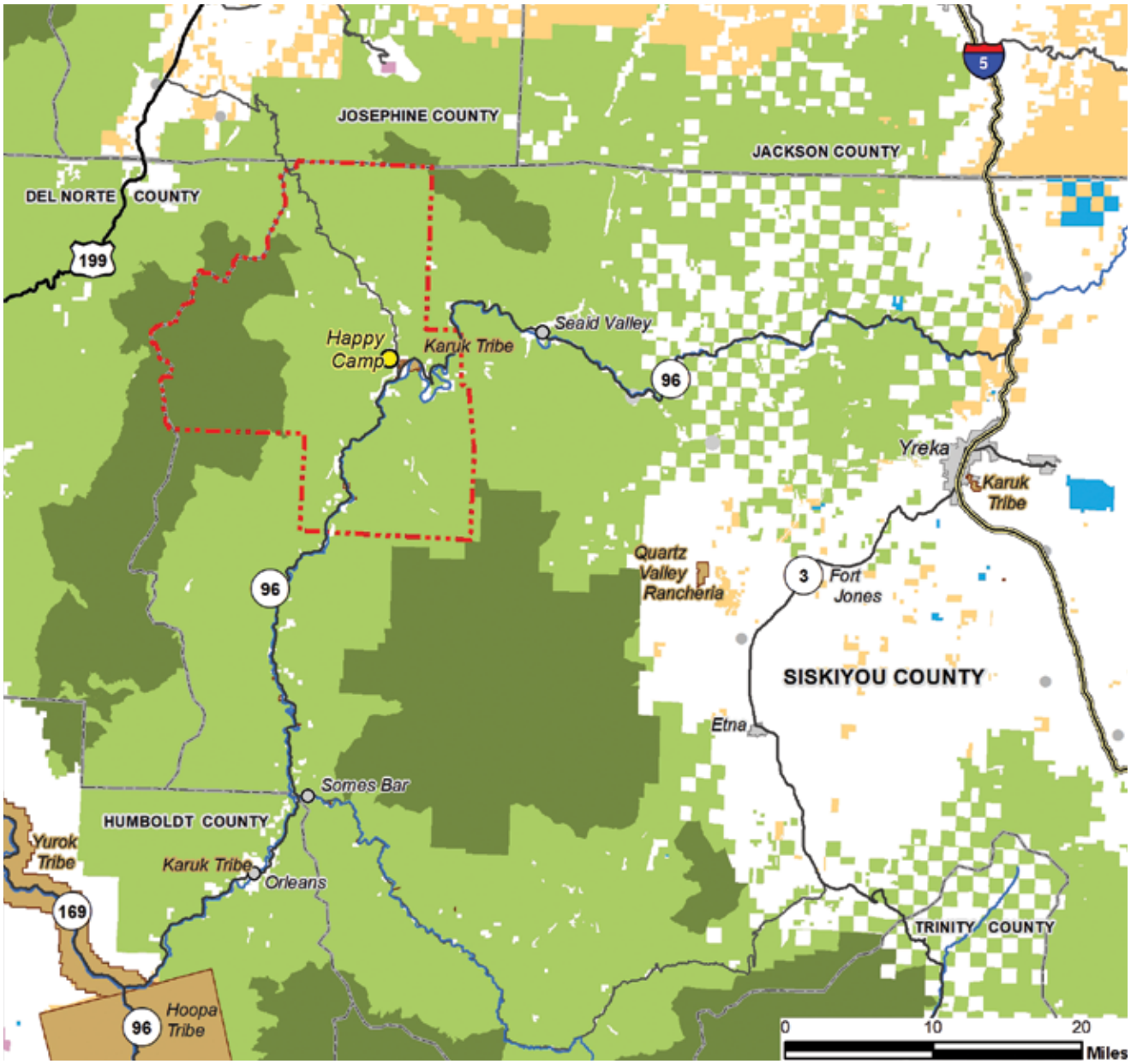


Figure 4.26—Happy Camp Case Study, (top): Happy Camp boat launch on the Klamath River, (middle): entering Happy Camp from the east on CA SR 96, (bottom): Klamath River, east side of Happy Camp; former mill site in background at right. Photos by Mark D. O. Adams.



Happy Camp Community Case Study

Land ownership

- Forest Service wilderness
- Forest Service
- California State Lands Commission
- Tribal lands
- Bureau of Land Managment
- National Park Service
- Private lands

Communities

- Happy Camp Union Elementary School District
- Happy Camp
- Incorporated city or town
- Other settlements

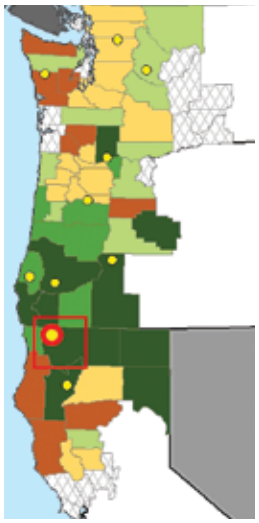


Figure 4.27—Location of Happy Camp Case Study. Note: private lands include the forest industry. Map credit: Mark D. O. Adams.

200-mile long corridor known as the Mid-Klamath region, which stretches from the Iron Springs Dam on the Klamath River, 30 miles northeast of Yreka, California, downstream to the river's junction with the Trinity River in Humboldt County at the community of Weitchpec. Happy Camp is at the approximate mid-point of this corridor. It is 75 miles west of Yreka—the nearest full-service community—and Interstate 5, and 40 miles southeast of Cave Junction, Oregon, via a bistate county and national forest road route over Greyback Pass that experiences intermittent seasonal closure in the wintertime.

In 2010, the population of Happy Camp was 1,190, about 24 percent of which identified as Native American. The Karuk Tribe has a small amount of trust land in Happy Camp that was acquired on their behalf by the BIA over the latter half of the 20th century. Some tribal offices, services, and housing, including a health clinic that is available to both tribal and nontribal residents, are in Happy Camp. The tribe's council chambers, natural resources department, and some other services are in Orleans, 50 miles downriver from Happy Camp.

Happy Camp is in the heart of the Klamath Mountains physiographic province, which extends from the Lower Umpqua River in southwestern Oregon into northwestern California as far as the headwaters of the Sacramento and Eel Rivers. Elevations range from about 1,090 to 6,435 ft above sea level. The Klamath River Canyon in the vicinity of Happy Camp separates two subprovinces, the Siskiyou Mountains to the north and west, and the Marble Mountains to the south. Owing to its geologic origin processes, the Klamath province is characterized by rugged mountain topography: steep slopes and large elevation gradients, especially in the Marble Mountains. The Klamath-Siskiyou ecoregion has one of the most diverse flora in all of North America, which has evolved as a function of several factors: steep elevation gradients; Mediterranean climate with hot dry summers and a highly variable range of winter precipitation, mostly rain, depending upon location; a history of frequent fire; and serving as a junction between several highly differentiated ecoregions. Forests in the Siskiyou and Marble Mountains include a wide range of species. Forests of tanoak (*Notholithocarpus densiflorus* (Hook. & Arn.) Manos, Cannon & S.H. Oh) and Pacific madrone (*Arbutus menziesii* Pursh), interspersed with sugar pine (*Pinus lambertiana* Douglas) and Douglas-fir were historically dominant on lower and mid-elevation slopes. At higher elevations, tanoak, madrone and sugar pine give way to increasingly large proportions of Douglas-fir, white fir (*Abies concolor* (Gord. & Glend.) Lindl. ex Hildebr.), and Shasta fir (*Abies magnifica* A. Murray bis var. *shastensis* Lemmon).

Brief History and Notable Events

Happy Camp's location at the junction of Indian Creek and the Klamath River is near the northeastern extent of the ancestral territory of the Karuk Tribe. The Karuk have resided along the stretch of the Klamath River roughly from Seiad Creek about 15 miles east of Happy Camp to Weitchpec at the confluence with the Trinity River, and along the lower Salmon River since time immemorial. The traditional "Center of the Earth" for the Karuk people is located near the junction of the Salmon and Klamath Rivers, about 40 miles downriver from Happy Camp. As with nearly all native peoples in California, the Karuk were never offered treaties with the United States comparable to those signed by tribes of Oregon and Washington. The Karuk were not formally recognized by the United States government until 1986. They attained self-governing status in 1994, an event that positioned the tribe to exercise control over federal funds allocated to them, rather than ceding control to the BIA. The Karuk are among the largest tribes by enrolled population size in California; however, unlike their downstream neighbors the Hoopa and Yurok Tribes, they have no formal reservation. Virtually all of their ancestral lands are now managed by either the Klamath or Six Rivers National Forests.

White miners pursuing the California Gold Rush arrived in Happy Camp in the summer of 1851 after travelling upriver from the coast. One unverified account of the origin of the town's name is that a miner by the last name of Camp was in such a good mood while prospecting in the valley that his partner named the site "Happy Camp." Small-scale gold mining, primarily panning and dredging of the river bottom, was the principal economic activity along this stretch of the river until about 1900. Flat and easily cleared land for agriculture was scarce. The community briefly had a significant population of Chinese immigrant miners in the 1880s. By 1920, mining had diminished to the point where it was an inconsequential contributor to the local economy.

President Theodore Roosevelt designated the Klamath Forest Reserve in 1905. A ranger station was established at Happy Camp the same year. When the reserves were

transferred to the Agriculture Department in 1907, the reserve was renamed Klamath National Forest. Commercial forest harvests on the Happy Camp Ranger District of the Klamath National Forest did not begin until the 1950s. Most of the secondary road network in the area was constructed in the 1950s and 1960s to support transportation of logs harvested on the national forest.

Happy Camp was a classic resource extraction boomtown between the late 1950s and mid-1980s. Residents who came of age during some part of this era described the town with terms such as "vibrant" and "busy." Karuk members and White residents alike worked on falling crews, for trucking operations, or in one of three mills that operated on the river's floodplain east of the community specifically to process national forest timber. No other land ownership provided significant amounts of timber to local mills—the nearest large private industrial forest landholdings were established on railroad grant lands between Hamburg, a village about 35 miles upriver of Happy Camp, and Yreka; and most timber harvested there was historically processed at mills in Yreka. The community's population is currently estimated at about 1,100. Residents believe that it was roughly three times as large in the 1970s, though data confirming this are unavailable because the unincorporated community did not become an official census-designated place until 2006.

In its long history, Happy Camp has had only two drivers of economic activity: mining, until the early 20th century; then timber. It is a classic case of an isolated boom-and-bust, resource-extraction economy that is highly susceptible to shocks when one or more legs of the economic base are removed. The Klamath National Forest's timber output was slightly more than 200 MMBF in the 1980s, a level that was reached with steady growth in output over a period of 25 years. The NWFP established an annual average sale quantity of 51 MMBF for the forest, a target that has been met only twice in 24 years, in 1996 and 1997. The Happy Camp and Oak Knoll districts, which were combined in the 1990s, accounted for roughly one third of the 1980s harvests, and the great majority of that timber was milled in Happy Camp. All three mills that had operated in the community were closed by the mid-1990s. Residents generally perceive that these mills were likely to have closed sooner than later even without the NWFP, as a result of economic shifts within the industry and a decline in the supply of large-diameter trees for which they were designed. All agreed that the community suffered a shock caused by closure of the Stone Forest Products mill in 1995 and a concurrent decline in the staffing level of the Happy Camp Ranger District. Prior to the 1990s, the main sources of employment in town were the Forest Service; Happy Camp schools; and a host of locally based, independent forestry contractors.

Economic and Social Context for the Past 25 Years

Land ownership and management—
The Forest Service manages about 97 percent of the Happy Camp case study area's land base. This proportion has significant implications for Happy Camp's economic prospects in terms of its potential development as well as its property tax-based income stream. National forest lands are managed by the Happy Camp Ranger Station in the case study area. Just 3 percent of case study area lands (about 7,686 acres) is in private hands; about 347 acres are managed by the Karuk Tribe (officially under the BIA).

Two large, designated wilderness areas—the Marble Mountain Wilderness (240,000 acres) on the Klamath National Forest, and the Siskiyou Wilderness (182,000 acres) shared by the Klamath, Six Rivers, and Rogue River-Siskiyou National Forests—are administered by the Forest Service in this part of the county. The Marble Mountain Wilderness area is among the Forest Service's four oldest designated areas for wild lands management, receiving the primitive area designation in 1931 when it was first introduced by the agency, and being upgraded to designated wilderness by the 1964 Wilderness Act. The Siskiyou Wilderness was designated by Congress in 1984. Much of the lower elevation national forest lands between these wilderness areas and the Klamath River were managed for industrial timber production between the late 1950s and 1980s.

Industry and employment—
The Forest Service and the Karuk Tribe are Happy Camp's largest employers. The case study area's four sawmills have been closed since 1994. Some were hopeful that river dredging by some enthusiastic gold miners might revive the economy, but a 2009 moratorium put an end to that practice because of its environmental effects. Cannabis farming presented a second economic prospect for Happy Camp's sinking economy. However, because most of this

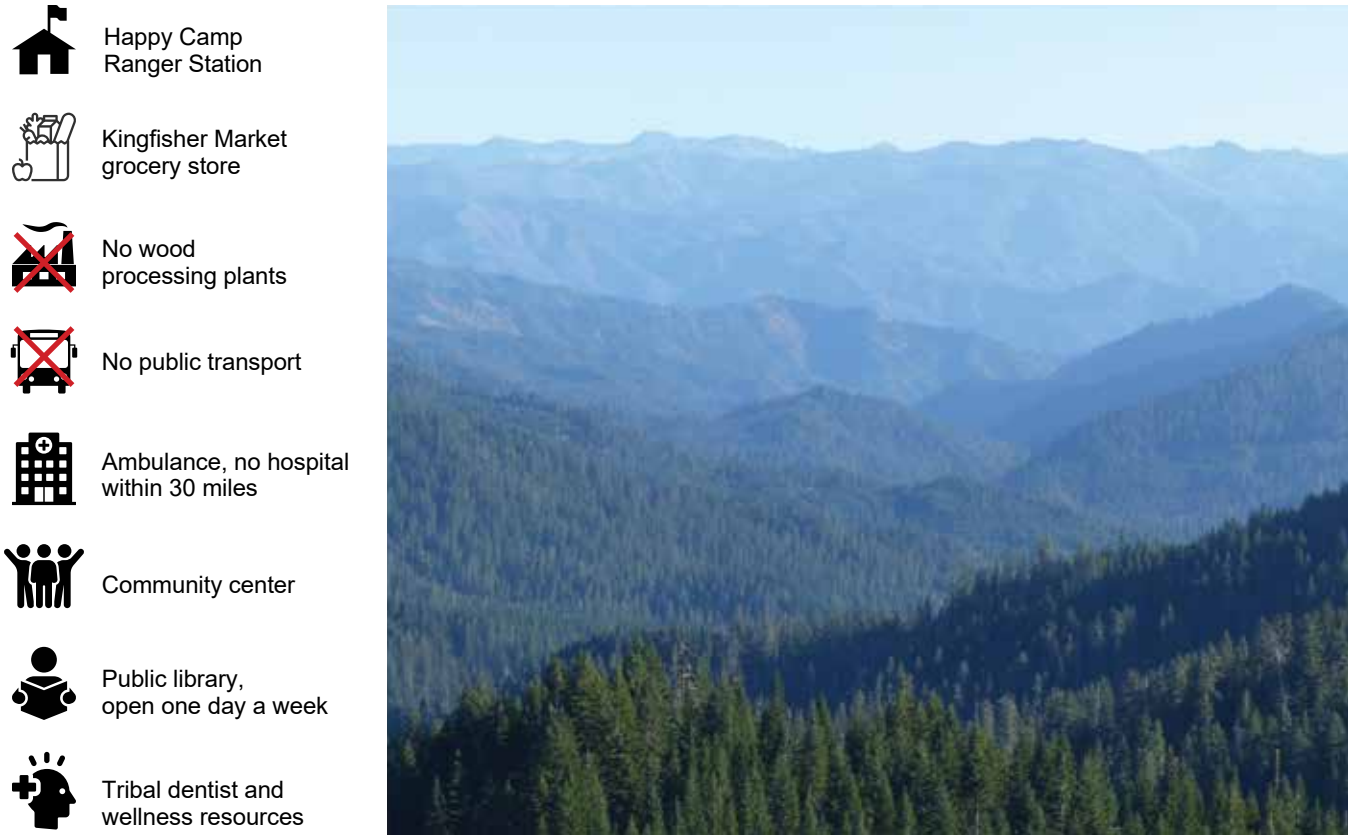


Figure 4.28—Graphic summary of community infrastructure in Happy Camp. Indian Creek Valley and the Marble Mountains beyond, from Grayback Pass between Happy Camp and Cave Junction, Oregon, Klamath National Forest. Photo by Mark D. O. Adams.

activity may remain illegal, it is difficult to quantify the impacts of cannabis on the case study area. Consequently, recreational tourism may be the case study area's largest industry (see below).

Housing and infrastructure—
Although we could not obtain a median home price for Happy Camp, online listings via Zillow Group, Inc., for single family homes in the area as of April 2019 ranged from $70,000 to $239,000. This pricing is far below the state of California's median home price of $548,000. Happy Camp retains a small independent grocer, a card-lock gasoline filling station, a pizza parlor, a coffee house, and an auto parts store (fig. 4.28). Residents described the availability of tire and auto repair service as "intermittent" despite the community's high dependence on long-distance driving for all but the most basic services. The tribal government provides medical and dental offices that are open on weekdays. The nearest hospital and medical specialists, large chain store retailers, and full-service restaurants are all in Yreka, which is a 90-minute drive along winding California Highway 96. Daily public transportation is not available. Happy Camp Volunteer Ambulance Service operates three ambulances but does not have paid employees. Happy Camp has a public library branch, but it is currently open only one day per week.

Tourism-oriented amenities—
Located in northernmost California in the southern Klamath Mountains, Happy Camp is a historic mining town that is more remote than Weaverville (see below). Visitors enjoy three nearby wilderness areas—Marble Mountain, Siskiyou, and Red Buttes—by hiking, fishing, swimming, and participating in recreational gold mining. The Klamath River is a popular destination for whitewater rafting. The Happy Camp area has four restaurants, one vacation rental, about 29 hotel rooms, and 63 campsites.

Perceptions of Social and Economic Changes

Employment—
Half of the interviewees in the Happy Camp case study (n = 6/12) reported a decline in job opportunities over the past 25 years associated with the closure of a lumber mill.

Others reported a more complex situation. One interviewee described the changes this way:

> When the mill was there, there was a lot of work associated with the timber industry…. I mean, I know people commuted [into Happy Camp] from Seiad..… There is a few loggers down there [in Happy Camp], but not nothing compared to what it was. The employment now is either the tribe, or the Forest Service firefighting, and more government-type jobs, not industry of what would you call it, production-type work.

One interviewee said that apart from the Karuk Tribal Government, the Forest Service, the school district, and a couple of stores, "there is basically no other employment." The interviewee added that unemployment was high and "welfare rates are probably around 60 percent."

Another interviewee pointed out that a new source of income arrived in Happy Camp in 2003—marijuana cultivation:

> I think what you really saw between 2003 and present, was the rise of the pot economy. Previous to 2003, it was not legal to grow on your land, so people were growing illegally on national forest lands. With the passage of [Proposition] 215, you had all of a sudden, tons of people growing tons of weed in their front yards, all over town. And so, the people who were somewhat skillful at that, made a lot of money, and that affected the economy and kind of filled some of the gap that was left when the mill closed and all that happened.

Housing—

Most interviewees in Happy Camp (n = 7) were uncertain about any change in the cost of housing, but they mostly described it in negative terms. For example, several interviewees said housing was in rough condition. One said, "There's housing right within town, locally, that's mostly ramshackle and old." Another characterized housing as limited and overpriced:

> It's not that you can't get something, it's just that you don't have a lot of choice. So, there's not a lot of options. So, the market isn't that great. You tend to pay more, especially if it's ... so if it's right in town like in that little block of town here those aren't that expensive, they're pretty reasonable. But they're definitely not that great of quality, the houses are close, and they're small, and they're pretty old, and not really in that good of shape. Soon as you get into an area that you have a little more property, the house may not be that great, but if you have a decent-size plot and you have a house there then… people are asking [$]200,000, [$]300,000, which I feel is overpriced.

Another interviewee described it similarly:

> We had more [housing] choices when we first moved here, but recently, if it wasn't for the tribe building that big housing development, we'd really have problems; and most other homes are substandard. A lot of the people that own them are now [in their] 80s and 90s; and a lot of times they're not able to make the repairs or keep it up or make it really livable. Sometimes it's scary because things aren't safe because of that. It's really hard for people moving to the community to find places that are appropriate and they don't want a log cabin in the woods. They'd like to have electricity.

Services—

The majority of Happy Camp interviewees (n = 10) agreed that the number of services in the case study area had declined. One interviewee explained the following:

> We could talk about restaurants. Probably in 2005, I'm guessing you probably had three or four restaurants maybe, and I'm thinking now that the pizza parlor is the only thing that's open. So yeah, the decline has continued for sure when you look at that. I can't remember when the service stations started going out of business, but we have one reliable place to get fuel right now and that hasn't changed for a long time, so that's been pretty steady. But it was after the [NWFP] when one by one the fueling stations went out of existence.

Another suggested that the number of businesses had been fluctuating:

> I think Happy Camp, in particular, the grocery store has just gone through a recent facelift, they're still there and they're still strong. There's

> starting to be some more downtown revitalization. It's happening. Some of the store fronts are starting to open up again. But its order is a magnitude less than it was 25 years ago. Probably, I would say between... it's kind of a flat line from 10 years ago.

According to one interviewee, social services had always been limited:

> We've always had a challenge with getting county services to Happy Camp and that's where the tribe has stepped up and began providing those services that the county has really, never really, provided because Happy Camp is too far away from Yreka, which is only an hour-and-a-half [away]. So, the county still does not provide a lot of services in Happy Camp.

Social life—

Interviewees (n = 7) said they thought that social life in Happy Camp was less vibrant than 25 years ago. Only one interviewee suggested that things had improved, while two were uncertain and one reported that things had stayed the same. One interviewee described a fairly dire situation:

> It's really, really, really changed because of the amount of drugs and alcohol—mostly drugs—that are in the area now. People get off work they go home, they stay home. They may socialize at sports, you know high school event or an elementary school event and then they go home, but there's no ... before you used to be able to just go meet somebody and go for dinner. Well, there's no restaurants to meet somebody and go for dinner, there's no bar to go have a drink with somebody when they come from out of town or whatever. So, a lot has changed. There's really not a lot of venues for … [socializing].

In terms of community service organizations, the decline has been severe in Happy Camp. One interviewee said, "We have far fewer active clubs than we used to." Another offered more detail:

> We have no more Lions; we have no Lionesses. The Grange has maybe three people left in it, and so they get a few volunteers when they have a special thing, but they don't have regular meetings or do anything like that. American Legion and Veterans of Foreign Wars, and both of those had women's auxiliaries and stuff. There are just lots and lots of organizations where people volunteered for and did a lot of things, but not—we don't have any of them anymore.

Another interviewee echoed this statement: "We no longer have Lions, Lionesses, VFW… and there is no place to gather. High school booster club is pretty much it—or hang out at the Pizza House."

Reflecting on the situation, one interviewee made the following assessment:

> It's the number of people and maybe our culture has changed a little bit, people don't give as much of themselves as they used to, perhaps. Because even though those clubs were active when I grew up and they made things like Bigfoot Days work, and they just did really great things for the community. They gave scholarships for kids going to school, a lot of scholarships. They had numbers that they don't have back then, but they also had a sense of community that kept them going. And so, they felt an obligation, and they liked doing it, and they liked the people they socialized with, and it did create a stronger community—a more cohesive community. So, people are a little bit more tucked away in their houses and stuff than they used to be.

Demography and well-being—

Interviewees generally thought (n = 7) that the number of families with children had decreased in the past 25 years. Indeed, school enrollment dropped nearly 40 percent since 1999. Interviewees were split (50/50) on whether or not there were any new people moving to Happy Camp. One type of newcomer mentioned by interviewees was the marijuana farmer. One interviewee said the following:

> Basically, people come in, buy private property, kind of take over. They're insular. They grow weed, they make money, and they build their empire. Which is really damaging to our local communities because they're not giving back. They're not investing in communities. They're basically here to make money. With housing so scarce for the people who do wanna live here

> and do have kids in the school, participating in building up the community, it's really hard to see.

One interviewee reported that the area had attracted retirees: "There is people that move here to retire. They like the peace, and the rural mountains, the rivers, that type of thing."

Another reported that demographics were mostly steady after the initial downturn in timber production during the 1990s:

> This downturn happened a couple, two or three decades ago, or began then. There hasn't been any change [since that time]. There's the large number of the tribe. The tribe is about 40 percent of the town, maybe 60 percent of the school, but you've got retirees, both who retired from the logging industry, and you have retirees that move here because of recreation, hunting and fishing, and so forth. Other than that, the turnover is with the USDA Forest Service, primarily, and the school, but the school is so small in terms of numbers, it's less.

Interviewees had mixed views about whether young people were staying in Happy Camp after high school. One interviewee said that Karuk American Indians were beginning to return after obtaining a college education:

> We've got enough of those great tribal kids that went to college and got a degree, and are choosing to come back and reinvest those skills into … [such as] fishery work, whether they're working for the Forest Service or the tribe, … they're coming back to put those skills back in the community.

One interviewee described a perceived drop in the town's diversity as follows:

> When I grew up, we had more Hispanics, I think because ... Especially the ones that were more migrant types. And we've always had one or two solid Hispanic families that were just long-time residents in Happy Camp. But when logging was going on, a lot of Hispanic crews would do the brushing or the choker setting, I worked with a lot of Hispanics, you know, in the job, but I don't see that type. The type that move in and out, I don't see that anymore. We still have our long-term residents and stuff, thank goodness, but we don't have the people that move in and out as much as we used to.

Relationships with federal forests and agencies—
When asked about the relationship between the community and the Forest Service, half of the interviewees (n = 6) reported that relations were mostly negative, four interviewees were uncertain, and two reported that it was mostly positive. One interviewee explained the following:

> I definitely think that everybody acknowledges that the Forest Service is an integral part of the community. Some people have a very negative feeling about that, and I don't know. It's hard for me to sense what proportion of the population. Some have a really negative feeling because they grew up there and saw maybe some things that they didn't like, and that's been reinforced over time. Some people feel really negatively about it. I think the employees obviously feel positive or neutral about it, but I think everyone agrees that it's definitely a strong presence.

Another reported, "Several of them [Forest Service staff] are really integral members of the community…. They're doing the community events. They're volunteering. I think that there's several Forest Service employees that are really important members of the community down there. I think they have a big influence on what's going on."

On the other hand, one interviewee complained that personal interactions were few and far between: "I don't see where anyone wants to interact—we've had several rangers come in, but they chose to live in Seiad [Valley]; at the lower station, you've got 25 to 30 people in fire, but you don't really see them much in the community."

Land use and management—
Happy Camp interviewees were in unanimous agreement that the national forest is an integral part of the community. One interviewee put it this way:

> Happy Camp hasn't lost that connection. That's for sure… 90 percent of it is public lands, and if anything, the people do feel a strong ownership of those lands and want access to those lands. I think that's the main thing with the travel plan that came out recently. That was a big issue with a lot of people. Some people wanted roads closed and stuff, but a lot of folks also wanted to continue to have access to their forest through those roads and stuff—being able to go out there and go hunting, and go fishing, and go just collecting plants or whatever in the forest.

Interviewees listed special forest products that were important to their community, such as firewood, mushrooms, boughs, and a "wide range of foods and artisan resources," that are "too many to name," but could include "traditional plants for medicines, basketry, construction, nets, and foodstuffs."

Most interviewees (n = 10) reported that wildfires are a significant concern in Happy Camp and that the Forest Service was not doing enough to protect the forest or the community. As one interviewee explained, "When it comes to fires, they [community members] blame the Forest Service. They say it's their problem."

Future directions—

When asked if increased timber harvests would help the Happy Camp economy, interviewees were generally positive, but added some caveats. For example, one interviewee suggested the following:

> Well, I don't even think it has to be that intensive. I mean, I think even if it's select cut, just go into an area and get the underbrush out of there, take out the dead and dying trees, and I know you can't harvest them, they're not worth much, but if we have a biomass plant, then those could come to the biomass plant. Thin some of it out so they have room to grow, so the animals can get through there. We don't have porcupines around here anymore because they can't get through the brush, whereas before when there was no brush they were everywhere and now there's none. I haven't seen a porcupine around here since I was a kid because there's too much brush…. Do what the tribes do with burning the underbrush and cleaning it out is the way it should be and there are a lot of stands that there's a lot of bigger trees that are just close to dying. Take those out before they die so that you can use the lumber, so that you can sell the lumber and make a profit on it or whatever. Don't leave them there till they die and they're good for nothing. I don't know, that's just how I feel. That's what you do in your garden, that's what you should do with our forest, since fire has been suppressed for so long.

Several interviewees talked about "thinning" rather than logging. For example, on said: "I'm a believer in thinning stands; failure to salvage just extends the recovery process to where it will take hundreds, thousands of years'; remove the dead stuff, replant." Another interviewee qualified this sentiment:

> It's not so simple as more or less logging—it's a question of what does it take to restore the forest to where it yields the resources it has always yielded, to help us make our livelihood here. If it's logging, then we are for it; but it's going to be rare that it's old-school logging that works.

Another added to this idea for a forest restoration economy:

> Pretty much anybody over 50 that remembers the good old days wants those good old days back. I think the reality is that we can get back to those good old days, but hopefully it's not a single species management, it's holistic management. It's us managing for production, ecosystem production that's been maximized. What I've learned from tribal elders and what I've seen in my own life is [that] fire, [when] properly managed on this landscape, can create more than 10 times the abundance that we currently have. Salmon, deer, elk, mushrooms, timber, all of it. If you use fire correctly on this landscape and garden the fire, you can create an incredible amount of harvestable surplus, which is the rich life that the early settlers to this landscape enjoyed.… So, I see 200 to 400 new jobs that could be created through creating locally based, manual, mechanical fuel reduction crews and locally based fire management crews.

Because the social and economic situation in Happy Camp is so challenging, one interviewee said the following:

> Because, think about it, in a community this small, if two people get a job that haven't had a job before—and even if it's at $20 an hour that they're working and that $20 bucks is circulated in this community from two people—it makes a huge difference. And if they're supporting their family and not on aid or if they're working and they're not doing drugs and getting drunk, it makes a huge difference in this community. So, if you multiply that two times 10, then this community is healing and on the way back to what it should have been. People need things to do or they're just gonna be idle and they're gonna drink and they'll be

> depressed and they're gonna do this and they'll rob or whatever, but people need things to do.

Interviewees mostly did not have responses when asked about alternative futures for Happy Camp that did not center on timber management. However, one interviewee did suggest there was at least some potential for recreation-based business opportunities:

> You don't come by Happy Camp just by mistake. You come here, you plan to come from one direction or the other, and stuff. It would be nice to get some rafters…. [S]ome of the guys that were working on those rivers, fishing and stuff … said they think there was some regulation, [that] they had to get more insurance or something, and they said they figured out … [the cost vs potential revenue] was just about even, so it cost them everything they made doing the fishing guiding to pay the insurance. There's a cooperative, several different guys that drive it, for some reason. If we could get more of those kind of things and bring more people in.

Weaverville

Geography

We defined the Weaverville case study area using the boundaries of the Trinity Alps Unified School District (figs. 4.29 and 4.30). Weaverville is the county seat of Trinity County in northern California, 1 hour west of Redding and the Interstate 5 corridor. The community of Weaverville is the only populated place name associated with the Weaverville case study. Weaverville is a census-designated place in Trinity County, with a population of 3,600 during the 2010 census. Weaverville has a total area of 6,720 acres, all of it on dry land. Weaverville is accessible from the east and west via Highway 299, and from the north and south via Highway 3. The community hosts the elementary and secondary schools for the district, the Forest Service Trinity River Ranger Station, and the only remaining sawmill in the area.

The area within the case study boundaries consists of primarily a mosaic of mixed-conifer, chaparral, and hardwood forests. Topography ranges from moderate to steep mountain slopes with an elevation that ranges from about 1,930 to 8,275 ft above sea level. The Mediterranean climate of the area is characterized by hot, dry summers and wet winters. Most of the 35 inches of annual precipitation falls between October and May, and temperature ranges from an average high of 94.1 °F in summer to an average low of 27.4 °F in winter. Notable features in the Weaverville area include the Trinity Alps Wilderness, Trinity River, and Trinity Lake.

Brief History and Notable Events

The town of Weaverville was founded in 1850 during the California Gold Rush. At the time of Euro-American colonization, the Weaverville area was inhabited by a number of different indigenous groups, most prominently the Wintu, a Penutian language speaking people. Beginning in the 1820s, Euro-American settlers usurped Wintu lands while settler livestock devastated their food resources. Miners exploited the Wintu as forced laborers and, between 1846 and 1852, murdered them in a series of tragic massacres. One of the more notorious events known as the Bridge Gulch Massacre occurred in April of 1852 when approximately 70 Euro-Americans from the new community of Weaverville attacked a nearby Wintu community murdering more than 150 people. Allegedly, only a few children survived the massacre.

The settlement history of Weaverville is also notable because as early as the 1850s, gold mining opportunities attracted a large number of Chinese miners and laborers. Activities began with placer mining along the upper Trinity River and quickly began moving up Oregon Gulch just west of Weaverville and then into placer deposits in the creeks surrounding Weaverville. Simple sluice boxes soon evolved into operations using large industrial dredging equipment and high-pressure hydraulic jets (MacDonald 1910). In 1872, Weaverville Ditch and Hydraulic Mining Company began operating a small hydraulic plant in Oregon Gulch. By 1875, the company employed 250 Chinese laborers (Rohe 1994). By the 1870s, Weaverville hosted one of the largest Chinatowns in California, housing between 1,000 to 2,000 Chinese gold miners and their families.

In 1892, the Oregon Gulch mining operations were purchased by the La Grange Company. At the time, the mine was the largest hydraulic mining operation in California (Clark 1970). La Grange employed additional Chinese laborers to expand the water supply for the hydraulic operations. As labor and material costs increased during WWI, the mining industry declined. The La Grange mine closed in 1918. The Chinese population also declined

Weaverville at a Glance

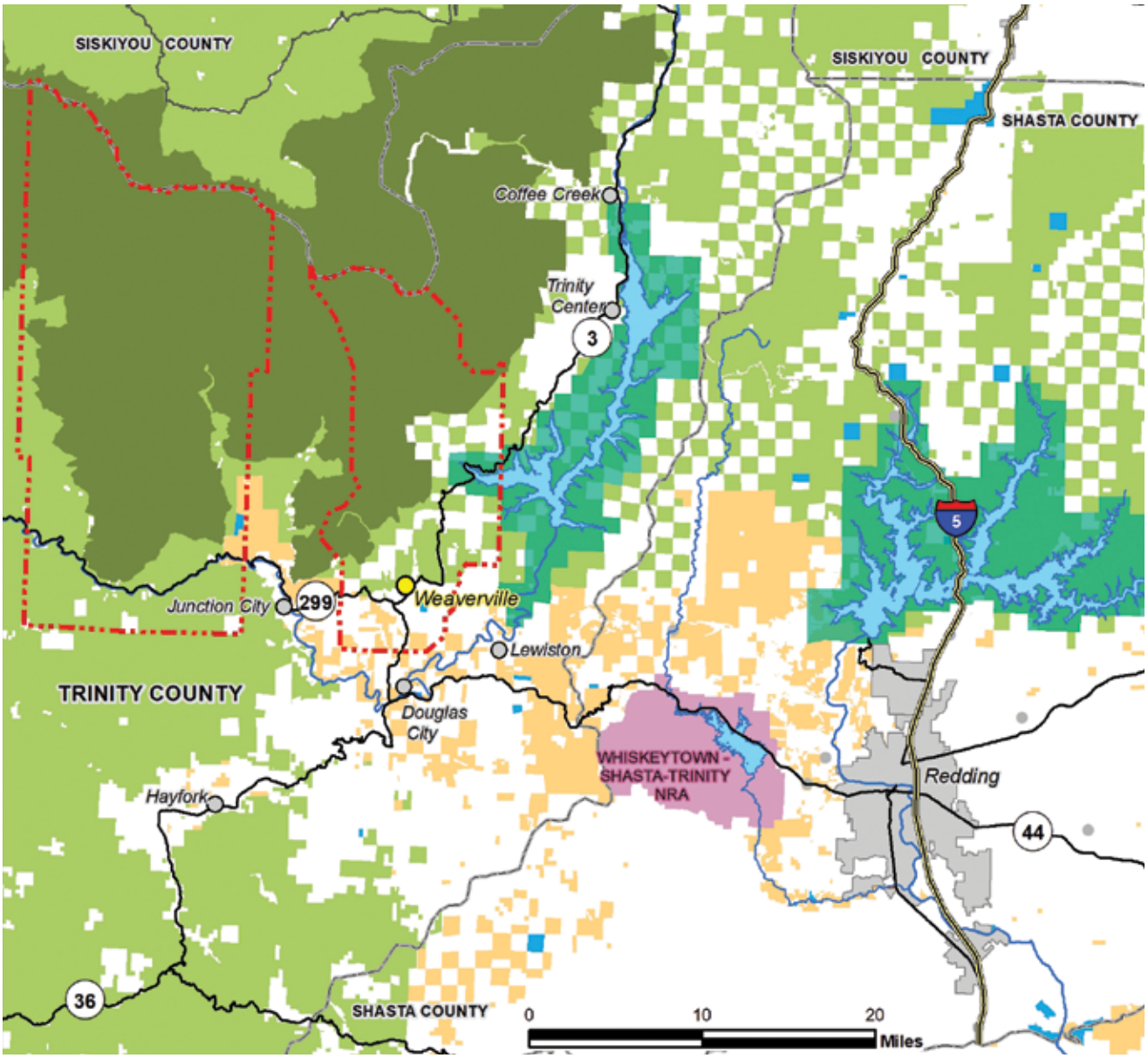
> "We are the poorest county in the state, and it's absolutely illogical that we should be living in a county that's blessed with these natural resources and be this poor."

Cities, towns, and census-designated places (CDPs): Weaverville (CDP)
Populated place names (unincorporated): none
School district: Trinity Alps Unified School District
Population (2010): 3,600
State: California
Federal forest lands: Shasta-Trinity National Forest, Weaverville Ranger District
County: Trinity

Figure 4.29—Weaverville Case Study. Main Street business district, Weaverville. Photo by Gabriel Kohler.

around this time. The Joss House, a historic Daoist temple (now a California State Park), was originally built in 1853. It burned and was rebuilt in 1874 and is one of the few structural remnants of Weaverville's Chinese history. The hydraulic mining operations around Weaverville were so extensive that they irreversibly changed the landscape surrounding Weaverville. The La Grange mine is now a California historic landmark.

During the gold mining period (1850 to 1950), lumber production in Trinity County was primarily oriented toward local consumption. As a boomtown, a number of disastrous conflagrations quickly consumed its haphazardly constructed wood structures. Eventually, residents adopted more fire-resistant construction, developing its distinctive red-brick architecture. Timber was also an important resource for the mine and the mining industry more generally. Timber was used for fuel, but also to build flumes, shoring, housing, and other mining infrastructure. For example, the La Grange mine had its own sawmill. In the 1880s, a steam-powered sawmill (the "Jumper Sawmill") was constructed just east of Weaverville. Logs were skidded directly to the Jumper mill by oxen and the mill shut down after the immediate area had been logged.



Weaverville Community Case Study

Land ownership

- Forest Service wilderness
- Forest Service
- Whiskeytown-Shasta-Trinity NRA
- California State Lands Commission
- Tribal lands
- Bureau of Land Managment
- National Park Service
- Private lands

Communities

- Trinity Alps Unifies School District
- Weaverville
- Incorporated city or town
- Other settlements

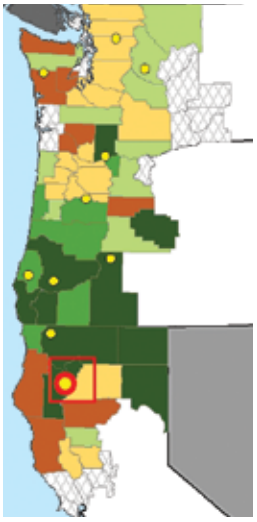


Figure 4.30—Location of Weaverville Case Study. Note: private lands include the forest industry. NRA = National Recreation Area. Map credit: Mark D. O. Adams.

Around the 1930s, gold mining briefly picked up again with new dredging technologies. However, by the late 1940s, the mining industry declined and never fully recovered. In 1947, The Vanzee family built the Weaverville Sawmill. Perhaps because the railroad never arrived in Weaverville, the timber industry did not gain any economic traction until the 1950s with the development of road and trucking infrastructure. The Weaverville Sawmill burned in 1952 and was reconstructed in 1954. The sawmill shut down in 1981, underwent remodeling and the Trinity River Lumber Company reopened the mill in 1983. In 2009, the mill again burned. Owner Frank Schmidbauer rebuilt and retooled the sawmill once again, reopening it in 2011. Today, in addition to a small wood products industry, Weaverville's economy is oriented toward recreation and tourism.

Recent wildfires in and around Weaverville have been significant both for forest and fire management and for the community more generally. The Helena Fire (August and November 2017) burned more than 21,000 acres and destroyed 72 homes and 61 outbuildings. Unhealthy air quality caused by smoke from the fire forced public school closures in Weaverville for several days in September. Like other recent fires in northern California, the fire was started by a downed electrical power line. The fire resulted in continuing closure of portions of the national forest.

Economic and Social Context for the Past 25 Years

Land ownership and management—
The federal government manages 75 percent of the land base in the Weaverville case study area, with the Shasta-Trinity National Forest comprising 77,207 acres and the BLM managing 3,116 acres. Fifty-one percent of the case study area is designated wilderness area. The Forest Service manages its lands from the Weaverville Ranger Station in Weaverville. The closest BLM field office is in Redding. Private interests claim 15 percent of the case study area (16,357 acres), while the state of California owns 295 acres and the Bureau of Reclamation holds 43 acres.

Figure 4.31—Graphic summary of community infrastructure in Weaverville, the Weaverville Ranger District offices, and log staging yard of Trinity Valley Lumber. Photos by Gabriel Kohler.

Industry and employment—
Weaverville has no railway service. California Highway 299 and Highway 3 are two-lane freeways that provide access to Weaverville from the west, north, and south. Trinity River Lumber Company is Weaverville's only remaining sawmill. The plant specializes in 2- by 4-inch and 4- by 4-inch Douglas-fir and white fir lumber products.

Cannabis cultivation, both legal and illegal, makes up one of the most profitable industries in Trinity County. Although much of this industry is a cash economy, some cannabis-related income makes it into the county budget through application and licensing fees. This industry hit a peak while marijuana was still illegal in the state of California around 2008 but remains an economic giant in the Weaverville area. This industry has brought in new groups of people from all around the world to grow; it has been called the Green Rush because of its similarities to the get-rich-quick spirit of the California Gold Rush.

Housing and infrastructure—
Median home price in Weaverville was $210,200 in April 2019, less than half the median home price for the state of California at $548,000. Despite some economic decline over the past 25 years, the community retains a large portion of its commercial services (fig. 4.31). Trinity Transit operates a daily public transportation route between Weaverville and Redding. There are four dentists in Weaverville, and Trinity County Life Support operates three ambulances. In addition, Mountain Communities Healthcare District operates Trinity Hospital and Trinity Community Health Clinic. The former has a 24-hour emergency room and in-patient hospital care. The Weaverville Fire Protection District employs a full-time fire chief to organize a 25-member volunteer fire department.

Tourism-oriented amenities—
The Weaverville case study area borders the three major outdoor recreation destinations for Trinity County—Trinity Lake, Trinity River, and Trinity Alps Wilderness—where visitors enjoy hiking, backpacking, mountain biking, fishing, and more. The case study area does contain a golf course, as well as a marina within Trinity Lake Resort, a lakeside resort with full amenities. Beyond the outdoor attractions, the town of Weaverville's historic background as a California Gold Rush town provides additional tourist draw, including the Joss House State Historic Park and the Jake Jackson Museum. The area has 18 restaurants, six vacation rentals, about 161 hotel rooms, 265 campsites, and one recreation outfitter.

Perceptions of Social and Economic Changes

Employment—
Interviewees in the Weaverville case study nearly all (n = 13) perceived that job opportunities, especially in the forest sector, had declined over the past 25 years. As one interviewee reported, "Everybody's saying the unemployment rate's so great in the state of California. You saw our data. It's not great here. I mean, ours is one of the highest unemployment [rates] in the state."

Another interviewee explained the following:

> There used to be a lumber mill in Hayfork, but not only from that mill but also Trinity River Lumber Mill here in Weaverville used to employ many more people, timber fallers, truck drivers, because when we were harvesting trees for both of those large mills off our local forests.… Now that activity has moved to other areas because of the minuscule, or really insignificant, timber sales on the Trinity side of the forest. As a timber faller, you can't stay in business here, you've got to work somewhere else.

Interviewees described a systemic effect resulting from job losses that most associated with forest policy changes brought in by the [NWFP]. For example, one interviewee described a "direct correlation on the number of jobs and the families that left town." This correlation was explained as a loss of "solid family-supportive-type jobs." Another drew a link between forest jobs and the failure of some local businesses, stating, "Some places that have gone out of business over the years, they were hanging on by a thread anyway; and then when you drop 9 percent [of the] population, there goes your margin of error."

Other interviewees painted a more nuanced picture of changes in job-related economics. One noted: "It would depend on the definition of employment. We've gone from having a lot of people employed in natural resources to … a lot of people involved in marijuana production and processing." Another interviewee stated: "When the mills went down, marijuana went up."

One interviewee made a connection between the increase in "employment" related to marijuana and changes associated with the NWFP:

> When [timber] extraction was viewed as a dirty work, the bottom fell out of our economy, and what happened? We lost jobs, we lost an economic base, and that created a vacuum. What has sealed that vacuum, the marijuana growers have flooded in here with their ability to hide because we don't have a county government that has the adequate funding to field an enforcement of activity.

The lack of county government funding was further linked to the NWFP because of the decline in payments to local governments from national forest timber sales.

Housing—
Eight interviewees in Weaverville thought that housing costs had increased, while three reported no change and one thought there had been a decrease. The topic may be difficult to assess because, as one interviewee reported, "We didn't have a real estate crash. Even during the big real estate crash that happened in 2008." This interviewee explained it as follows:

> We have a disproportionately high or elevated real estate market here because of the fact that there is such a limit on the number of units that there are .... [W]here you would think that something like the loss of workforce and stuff would have changed that, it hasn't.… [R]ental prices here are really elevated. ... [B]ecause then you start getting into these things like where nice houses are [becoming] even more and more desirable; that just sort of puts them out of reach for a lot of people in the community.

An interviewee attributed Weaverville's housing market in part to the prevalence of public land ownership in the case study area: "You get to that 77 percent federal ownership again, there's not much private land available to build on, to develop. And when you couple that with steep terrain, you know, what's left: only a small fraction of that is actually developable. And so, we have a housing crisis in terms of just an absolute shortage."

Marijuana production was reported as another cause of the housing crisis. As one interviewee said, "The housing market has been greatly affected by marijuana because they have money and they can pay for it. So, our houses are almost overpriced here."

Services—
In Weaverville, a strong majority of interviewees (n = 11) perceived a decrease in services compared to 25 years ago. Only one interviewee thought there were more services. One interviewee explained the changes in this way:

> I'd say everything has become more consolidated. We've got one major grocery-like supermarket, and then there's a couple of little sort of quickie mart-type places here and there that offer a few things, but they tend to be very specialized things that people go specifically to those locations for. I mean, yeah, the grocery, there used to be two major supermarkets that got consolidated down... one closed and the other one sort of expanded.

However, another interviewee explained that these changes were not related to the socioeconomic impacts of the NWFP:

> And a lot of that isn't just what's happened because of the [NWFP], the big box stores that got put in Redding basically sucked most of the .... We used to be able to buy furniture here, buy clothes here, high-end hardware. I mean, you could buy TVs, you could buy all that kind of stuff here and … the big box stores formed and got into business in Redding …. [T]hat's not the [NWFP], that's just the impacts of the environment of those kind of facilities, … causing a shut-down of those functions here…. And what happens to us is … now if I want to buy a piece of furniture, I've got to go to Redding and buy it. The sales tax on that furniture is going to Chester County and not Trinity County; and so the sales tax revenue that would come to the county to fund the sheriff or whatever it gets lost to Chester County.

Interviewees also recognized that residents were partly to blame for the competition from Redding stores. One said the following:

> My wife and I, we go to Redding to do a lot of our grocery shopping because the price of fuel and driving to Redding is cheaper than buying and we still buy groceries locally. It might be $1.50 difference and a gallon of milk and commodities with having young kids growing up here,

> providing stuff for them. It's really cheaper to go to Redding and buy the large-quantity items.

Interviewees reported that restaurants had also declined: "Recently we have lost, I think, four restaurants in the last year." Another reported that "the number of restaurants is almost in free fall here."

One interviewee suggested that the marijuana industry made a significant impact on services and the community at large, despite any appearances to the contrary:

> We have to be entirely honest with you. A lot of that is fronts. So, there's people that are at this business... and that business... they've got to funnel their money, so we have this and that. The services absolutely suck. Try to actually hire a contractor in Trinity County … to actually lay concrete for you, there's very few that actually work. They have to have a front. So, they've got to be able to put enough money through to pay enough taxes that they made $42,000 this year so Uncle Sam leaves them alone. So, see, we're not able to ... There's estimates that a billion dollars of marijuana money leaves Trinity County every year. You know timber's nowhere near that. We don't get any taxes. The schools get nothing for it. A lot of times, their kids are messed up and we're spending extra mental health and counseling, but the effect of marijuana on our community is unbelievable with our students because it's so available. So, we have extra mental health costs and everything else for the kids.

For health care services, Weaverville has a small hospital, but this is a recent development. As one interviewee explained, "Rural health care is a huge, huge problem." The interviewee reported that to solve this problem it took, "A couple of ballot measures to create a health care district and create a parcel tax to try and get the hospital back on its feet. The public utility district stepped in and loaned money to the hospital, and actually ran it for a couple years. And now, the hospital's back on about as good as financial footing as small rural hospitals get."

Social life—

Weaverville interviewees were split over whether the past 25 years had seen at least some increase (n = 3), a decrease (n = 6), or stagnation (n = 3) of the amount of opportunities for socialization in the community.

According to interviewees, one type of opportunity that is still strong is fraternal orders and service clubs, including Rotary Club, Lions Club, Moose Lodge, International Order of Odd Fellows, and Clampers. In line with this perception, one interviewee reported, "Our churches are very busy and active." However, one interviewee reported that these groups have had "trouble staying relevant." In addition, as another pointed out, that type of activity may not appeal to the younger generation: "I never got into it [a fraternal organization] because it just seemed weird to me. It seems like a lot of those groups like the Lions Club and some of these other ones are aging out."

One interviewee suggested that changes in social activities were partly due to "social media" and partly "natural":

> Social media has played a big role, and everyone is kind of communicating with each other. Other than that, I don't really see a huge change. People come; people go. What we're seeing with a lot of community groups and the clubs and the organizations is, a lot of those people are starting to age out. They either haven't done a good job of recruiting younger people into the fold, or those types of clubs and organizations aren't attractive to younger people anymore. It's probably a combination of both. We've had a couple younger people create new organizations, and that's been good. I think it's probably the natural evolution of communities and clubs and that type of thing…. I think it falls to the natural population decrease for us, unfortunately. There just aren't the jobs up here that can support a family of four, five, or whatever the family is.

Another interviewee more involved with community organizations reported that "we are struggling with membership at all these institutions." The interviewee explained the following:

> Every one of these community groups is struggling, and it's all attributed back to that economic activity. You know, if we had more restaurants, because we had more timber, and people had more money to spend locally, you know, we'd have restaurant owners who wanted to be in Rotary, who wanted to be in Lions, and it's

> just this domino effect in the right direction that we've lost.

Team sports activities such as Little League baseball and soccer still exist, but they have diminished in the past 25 years. One interviewee explained that this was partly due to a shift in socioeconomic demographics:

> I think what's happened with regard to that [social activity] was that a lot of the ... I'll just say "blue collar folks," the families that were involved with that either left or they became dependent on governmental assistance in general. There certainly has been in my estimation a shift with regard to the professional class of folks that have come in… They tend to have less kids, tend to be somewhat less religious, they tend to be more professional, even if they do have kids they usually have one or two. The days of the religious family with the logger dad that had seven or eight kids is just long gone.

Another interviewee reported the following:

> When I was a kid here, there was multiple, as an example, multiple softball leagues, there was an A league and a B league, and there was 10 teams per league. Now they struggle to get four teams out there. So, some of it I think like the opportunity is still there to have softball programs … but people just don't go out and play. There was a Forest Service bowling league. I don't know if we have enough people here on the staff locally that we could put together a Forest Service bowling league. … So, after my dad passed away, I actually took his spot in the bowling league because there was no room … Somebody had to be like, 'hey, here's your opportunity.' Somebody had to leave. So that has changed significantly. And there was another league that there was a huge waiting list to get into it. Every team had five guys and… [now] that same league is a three-person league and we can't fill all the teams. A lot of those same folks are still around that were filling those—just as they're getting older; like I said, it's more of a retirement type community now.

At the same time, one interviewee expressed optimism about the enduring social fabric of Weaverville:

> Weaverville totally has some cool community things. There's an arts council, Trinity County Arts Council, but it's centered in Weaverville and around Weaverville. There's little art ... Just galleries everywhere and there's the Clampers, which is a civic group and is totally a thing here. They organize lots of fundraisers and civic things. There's the fourth of July celebration, which is the most fantastic little slice of America that you'll ever see. All the people who graduated from high school here, whose families grew up here and have roots here, all come back. Fourth of July is a big ... It's cool too…. There's definitely a community affinity and affinity to place that's really powerful here.

Demography and well-being—

Since 1999, Weaverville has seen a 15-percent drop in school enrollment. The majority of interviewees in Weaverville (n = 10) reported that the number of families with school-aged children had declined. Interviewees (n = 7) also reported that young people tended to leave town after high school. About the same number of interviewees (n = 8) suggested that retirees stayed in the community. One interviewee explained it this way:

> Then there's the broader shifting demographics. Over that same timeframe, the average age of the population has increased. The number of working families and school children, and therefore school enrollment, has decreased. All of the calculations for how much money flows into the school system is related to numbers of students served. Basic payments from state and federal programs to the schools has gone down, unrelated to timber, but all of those demographic changes were related to the changes in the timber economy.

One interviewee expressed the idea that Weaverville would soon stop attracting retirees because it was vulnerable because of its long distance from more metropolitan areas with services. This vulnerability is further exacerbated by its exposure to wildfire hazards, according to one interviewee:

> They move here in their 60s, and they love it. They love the outdoor stuff, and they love it for a while… [depending] on their health. So, as they get older, they start needing more health services,

> but because of all those other factors, our local health services aren't fantastic. We do have a local hospital we've managed to keep, and I'll say the guy now is doing a whale of a job keeping it open. But because of all those economic factors, we don't have a great medical services base here, so they start driving to Redding. Well, if you drive occasionally to Redding, it's no big deal. I go to my doctor's appointment once a month in Redding, and the older you get, the more you're going to Redding. Then the fire happens, and you can't get there. Eventually you say you know I loved it up here, but the convenience factor has deteriorated to the point where I may as well move to Redding, or somewhere else where I can be close to my doctor.

Another interviewee suggested that retirees didn't stick around because "there aren't the amenities here that an older retirement community would need: pretty much, hospitals and stores."

Another interviewee reported demographic shifts of a different type:

> There seems to be, we seem to have attracted to some extent some folks who don't have that work ethic of work hard and provide for your family and contribute to community. It's more like what can we take advantage of. And with … inadequate law enforcement, Trinity County has become known as a place where you can come and do your own thing with very little chance of being affected by law enforcement.

When asked if the interviewee thought those changes related to how the Forest Service manages the forest, the interviewee responded, "Absolutely!", drawing a connection to the decline in federal timber dollars flowing to the county.

One interviewee directly attributed these demographic changes to the NWFP and to forest management problems, more generally:

> So, I think the biggest [reason] is the [NWFP]. I hate to sound so negative about it, but once you took away that local timber activity and all the revenue it generated, that had all these spillover effects, you know, from more restaurants, more businesses. More people lived in the community than had gainful employment and money to spend, and you just get that multiplier effect. We've lost every bit of that, and on top of it, now we get really big fires every year that also add to the problem.

Others shared this more negative view of demographic change. For example, one interviewee said the following:

> We're a rural community and I don't see the changes as being positive. You know, the people that are in the new industry, like the marijuana cultivation industry, don't seem to be taking a real role in the community as far as community betterment. They seem to be more isolated within their own groups and just pretty much doing their own thing.

One interviewee suggested that this demographic change was making Weaverville less attractive to amenity migrants:

> A lot of landowners here that were absentee landowners that vacationed here but had [vacation] houses here. A lot of them are getting rid of that stuff because they don't wanna come back to see the way Trinity County's went downhill with the marijuana environment. And they just don't wanna deal with it. … It's not the same place it used to be 20 years ago.

However, not everyone interviewed felt that way. For example, one interviewee explained that the NWFP was merely one part of broader, more complex changes: "I think there's been a general flight to cities anyway. Natural resource and agricultural jobs have gone down over the same time period as the [NWFP] because of automation and globalization. The [NWFP] is not the factor, unto itself. It's this convergence of factors."

Relationships with federal forests and agencies— The majority of Weaverville interviewees (n = 10) reported that the community had an overall negative view of the Forest Service. Only one interviewee, a local business owner, suggested that the relationship was mostly positive. One complaint from community members was the lack of Forest Service presence from the Shasta Trinity-National Forest in the community. One interviewee explained it this way:

> I hate to sound harsh, but I guess it's back to candor again. They don't engage locally. It's almost like one of their job requirements is not to engage locally, and maybe they don't want to be accused of being too cozy with local folks, local businesses. I'm not sure what the answer is, but you know, I ought to be bumping into Forest Service personnel when I'm in the grocery store. I don't. I don't know where they buy their groceries. Are they ordering them on Amazon? So, they ought to have more of those folks living here locally, and maybe they all commute from Redding. I don't know. I know they all don't, but a good number of them may. And if they were integral to the community, if we had somebody from the Forest Service as a member of Rotary, they'd be more in touch with the ramifications of their decisions, and we would get, I don't want to say local preference, but for lack of a better term.

Another interviewee reported the following:

> When they combined the Shasta-Trinity National Forest and move essentially all the management to Shasta County, what we don't have now is, I'll say the high-level managers of the Forest Service living in town, being in Rotary Club, being involved with the historical society, doing all of those things because they're all in Shasta County…. By pulling that [the Forest Service] administration out, what they've done is basically taken the connectivity between the community and the management away. So, when we had a forest manager here you might be able to have lunch with him every week at Rotary for instance and talk to him, and you don't anymore, and so you can't get that level of communication. They don't get the feedback from the community and so it's a double dealer because we don't have them in town and of course, again, there's a number of [Forest Service] management jobs that are gone because when they combined [ranger districts] and they moved to Shasta County, so now here we are again, lost another batch of what are probably better paid jobs than any of the jobs in the county.

One interviewee pointed out that Forest Service staff were still engaged in the community, but that there were simply fewer of them:

> I have a lot of friends who [work] for the Forest Service or otherwise work in fire, in natural resources, or in management positions. They remain integral people in the community. Most of them are young, working age. They're working age. A lot of them have families. They participate in the school system. They participate in community events. I would consider them still part of the heart of these communities. I think the criticism, or the reality is that that's just ... they're diminished. There are less of them—period.

One interviewee articulated a more long-term perspective on interactions between the community and Forest Service:

> Well, my perception is the Forest Service was a well-respected part of the community, and most of the people that were working for the Forest Service took that pride and respect from the community and was actively involved in the communities. But, after the [NWFP] happened, ending a lot of our timber management, which was the job support and 10-percent receipts and all that things happened, my friends that are not Forest Service friends pretty much lost respect for the national Forest Service itself, as far as being an upstanding and a respected agency. They looked at the Forest Service as more of just another government agency that just spends money and doesn't do anything…. After that self-sustaining component of the agency itself left, the respect of the community towards the agency left.

In terms of general sentiment toward actual Forest Service staff, one interviewee explained it this way:

> My impression is local agency staff are doing the best they can with limited resources, and very poor overall leadership with reference to the Shasta-Trinity. Now, Shasta-Trinity has a new supervisor, and it would be unfair to judge what her/his long-term effect is going to be on the situation at this point. But I'm talking about where we've been in the last 20 years or more.

Another interviewee noted the following:

> [I have a] high level of confidence that people would perceive it [the Forest Service] as less than custodial. This forest deserves better and people have different ideas about what that means, but if you polled Trinity County people about active management in a general sense, everybody would expect and desire more than what we're getting, like I said, wide-ranging perceptions of what's right and what the forest needs and what ought to be.

Eight interviewees also suggested that the Forest Service did not communicate effectively with the community. As one interviewee explained, "I think the general community, other than using the hiking trails and all that, I don't think has a general interaction with the Forest Service."

Another reported that "Engagement has decreased dramatically. I tie that all back to the lack of management. When they're doing nothing, they don't engage in the community very well because they don't feel good about what they're doing. And the community doesn't feel good about what they're doing."

Land use and management—
The majority of interviewees in Weaverville (n = 10) said that the federal forest lands were an integral component of the community, while only two interviewees replied to the contrary. Interviewees described the Forest Service and the Shasta-Trinity National Forest as "a big player." One said, "I mean, they're the 800-pound gorilla in the room. You really almost can't do anything in Trinity County without stumbling across some Forest Service land at some point. They play a big role in what happens here. I think sometimes they lose sight of that."

Another pointed to the historical ties between the community and the national forest:

> Certainly, the history of the coupled economy too, and not just the history, the ongoing coupling of our economy to federal lands. The lake is entirely on National Forest System land. The Trinity Alps are entirely National Forest System land. Most everywhere everybody hunts is entirely National Forest System land. It's all access. It's all about the road system. BLM is primarily on the river, so all of the river access points are on BLM land. It's so integral. This is a public lands community in the truest sense.

However, only a few Weaverville interviewees reported use of nontimber forest products. These included firewood, Christmas trees, minerals, and herbs. The sentiment that the forest was an integral component of the community was often qualified. For example, one interviewee complained that the national forest "ought to be [part of the community]. It definitely dramatically influences the community, but the national forest is not operated as an integral part of the community, especially this national forest." Another echoed this statement, saying that the national forest is an integral component of the community, but not without caveats:

> Not to the level that it ought to be. Some of the kinds of things that happen are, and I don't have any idea if this has anything to do with the [NWFP], but it might. Basically, what we see is the closing down of a lot of the wilderness access systems. The road systems. There's a lot of roadless areas and that kind of stuff being implemented… And so, the lack of access, what we've got now today, is significantly less access to the forest than we had when I moved here. And I don't have any idea whether that has anything to do with the [NWFP] or not, but from the standpoint of the way the forest is being managed by the Forest Service, they are clearly managing the forest in a way that says we want to make roadless areas.

Most interviewees (n = 9) also suggested the community had a negative view of the Forest Service management policies. As one interviewee put it, "If possible, I would say they view the management even more negatively than the agency itself." Another interviewee explained it this way:

> A lot of folks here will get very upset … when they get talking about the timber production we used to get, and how the community used to benefit, and some folks will point out well just because you live here, doesn't mean this federal land is yours. It belongs just as much to a guy in Texas as it does to you. I don't agree with that. While you know, strictly speaking, sure all federal land belongs to all federal taxpayers I guess, or

> U.S. citizens, but I think if you live locally, I certainly wouldn't want to impose my view of how a forest in Texas should be managed over the interests of the folks that actually live with the ramifications of that. I think we've lost that here locally, and I think that's where it ought to be integral to our community. When you look at these decisions, if they're going to revise the [NWFP], what impact does it have locally? And that's got to take precedence over what impact does it have in Florida, or Delaware. You know, folks out there can come visit if they want, but you're not living with it day in and day out.

The majority of Weaverville interviewees (n = 10) said that wildfire management was a growing community concern. Interviews for the Weaverville case study were conducted in the first few days of the 2018 Camp Fire in nearby Paradise, which would soon grow to be the largest wildfire in California's recorded history. One interviewee voiced the perception that "the community is very upset about the way the Forest Service deals with fire." They went on to explain, "The community wants the Forest Service to get on with managing the land in a way that'll help make the forest healthier and reduce the threat of wildfire. But the Forest Service just can't get its act together in that regard."

One interviewee reported, "We had 200,000 ac burn in Trinity County in 2015, 200,000 acres burn in 2008, and every year between now and then, we have a major fire season. The smoke socks us in, which prevents the tourism, which is kind of the last remaining economic piece." Others also voiced a concern not only about immediate safety from fire, but the impacts that smoke can cause. An interviewee said: "The secondary impact of smoke is a real consequence of fire activity here." Another explained: "What I've noticed the last 5 years or so, my wife and I have always slept outside in the summertime, we can't do that any longer. The smoke is so intense in the fire [season]. The last 3 or 4 years we've lost part of July and much of August to the impact of smoke on health issues in the community."

Another interviewee said, "Like, recreation: let's say you're already struggling with a low lake, and you're trying to attract people—and then you get socked in with smoke for six-weeks straight—nobody's coming up [here] for that."

Future directions—

When asked about a potential future involving increased timber harvests from the national forest, interviewees were cautiously optimistic. For example, one interviewee explained the following:

> I'd say it [increased timber harvest] would bring back more jobs. You know there'd be a need for [production] capacity, so more people … would need to come in from outside the area. It's a matter of sustainability, you know. That's the huge thing. Like, people that come and set a way here need to have some degree of job security.

This idea was extended by another interviewee who suggested the following:

> You've got to put some guardrails on this. It has to be durable. So, if they revise the [NWFP] such as you could have a sustainable harvest, and people who live here don't want to go back to clearcutting days. I know environmentalists here, and they think, "Uh-oh, we're going to clearcut everything." Nobody here wants that. I don't want to look at a clearcut either. But if we could have sustainable thinning management, I mean the forest is producing way more trees than we can take off with the one mill we have left anyway. If we got everything locally. But if it were sustainable, you'd have people moving back here. You'd have those timber logging, filling, hauling operations come back here. And the spillover that would create everywhere; we'd have more stores open up because there'd be more demand. We'd have more restaurants open up because there'd be more demand. We'd have more kids in the school because families would move back for all those other things. But the key is it would have to be sustainable.

Another interviewee suggested that increasing timber harvests might not be the best economic development pathway, but perhaps the best alternative:

> If you look at the potential, when 77 percent [of the land] is owned by the federal government, and it's in giant Doug fir, and white fir. If you write that off, there's nothing left. There's nothing else. If it's not that, there's nothing, not of significance. I mean, could we bump up tourism some? Yes. Could it

> take the place of a robust forest products industry? Not even close. You know, because the other thing is if we start sustaining that kind of harvest, then do you have another mill open? Does this mill expand? Do they go to three shifts, instead of two? There's just so much potential there, and that natural resource is so abundant, it's not just going to waste, it's burning up now. That's worse than going to waste. I mean we're putting carbon in the atmosphere, instead of in people's homes.

In line with this view, one interviewee hypothesized that increased timber harvests could have multiple benefits:

> [Commercial timber harvesting has] the potential to reduce the threat of fire over more area than we're able to do at present. It would enhance access to federal lands, which would help the tourism industry. If that work is done under stewardship contracting, that money comes back here instead of going to the federal treasury, so it can be reinvested in service work that needs to be done on those lands. It's kind of a virtuous circle.

When asked what futures they could envision in absence of increasing timber harvests on federal forest lands, one interviewee replied the following:

> I mean, my anticipation [is that it] would be a continued, steady decline. We'll see our population skew older. We'll see fewer young people here, and we'll see fewer people here, period, if we don't do something to reverse this trend that we're on. And again, I think without some [sustainable] forest products industry…. I don't think there's any way to reverse it. I mean, you can nibble around the edges here and there like with tourism, but without forest products, I don't know how you get there.

Several interviewees cited the potential to develop hiking and wilderness-based recreation but complained that access was difficult. One said, "I think we could better utilize our wilderness. Provide more opportunity to get into the wilderness, not less opportunity. I think basically .... In order to really utilize the wilderness now, you've got to be a backpacker."

One interviewee suggested that improvements in infrastructure could realign Weaverville's current trajectory:

> Well, we need high-speed Internet. I think there's a consensus that that's holding us back. There's some things on the horizon that might pan out, but we need high-speed Internet. That would help attract those young, educated people here, and maybe some entrepreneurs. That would be huge. If we had an electric cogeneration plant here that could operate profitably, which that's never been possible so far, so that we could bring in forest fuels for that plant, not just mill byproduct.

Conclusions

The results presented highlight the diverse attitudes and perceptions about local social and economic changes during the past 25 years among and between our case study communities. In this section, we summarize interviewee perspectives by key areas of interest.

Employment

Across all of our case study communities, nearly 65 percent of interviewees perceived an overall decline in local employment opportunities. The cause of this decline was attributed to changes in the timber industry, including closure or automation of sawmills, loss of independent contractors (mainly loggers), and loss of local businesses owing to general demographic and economic decline associated with the former two factors. About 10 percent of interviewees suggested an increase in employment opportunities. Interviewees attributed increases in employment opportunities to the service sector, specifically tourism and recreation, and to a lesser degree, jobs in forest restoration and wildland fire management. Nearly all of these more optimistic responses were qualified with the suggestion that the newly created jobs did not pay as well as jobs lost in the timber industry. A major theme that emerged across communities concerned the lack of "family-wage" jobs within the local area. In nearly every community, there was a perception that before the NWFP, higher wage jobs were much more prevalent than they are today. However, only a few of the interviewees directly attributed this decline in wages and opportunities to the NWFP. Many interviewees suggested that the decline in wages was more directly tied to changes in the timber industry, such as automation.

Housing

Across all of our case study communities, nearly 65 percent of interviewees thought that the costs of housing had increased. In Darrington, Santiam Canyon, and Riddle, interviewees reported a decline in the quality of housing caused by a combination of factors they described, including outmigration, absentee landlordism, and inconsiderate or drug-addicted renters. At least some interviewees pointed out that new housing developments were limited because of the proportion of the communities' lands under federal ownership. Interviewees in Gilchrest, Santiam Canyon, Riddle, and Darrington suggested urban growth boundaries, environmental regulations, or aging and inadequate sewage or water infrastructure had hampered efforts to build new housing. Although housing issues were only indirectly perceived to be related to the NWFP through its effects on the local availability of family-wage jobs, interviewees saw these housing problems as a general symptom of decline in social and economic well-being.

Services

Nearly 57 percent of interviewees from across the case study communities, and a majority in every community except Leavenworth, reported a decline in the variety and number of entities providing goods and services locally. About 7 percent suggested no significant changes and 7 percent likewise suggested that there had been change, but overall parity in the number and type of services. Fourteen percent thought that local services had generally increased, but half of the interviewees who reported an increase were from Leavenworth, where no interviewees reported a decline. Many of the communities have lost grocery and hardware stores, dental and medical services, restaurants, bowling alleys, and movie theaters.

Social Life

The majority of interviewees in each case study community reported a decline in social life and opportunities to socialize. Overall, only 15 percent reported improvements in their communities' social life, and about 14 percent reported that things had not really changed. Across communities, those who discussed declining social life most often referred to declining interest and membership in civic organizations, such as Lions or Elks Clubs. Along with the demise of those institutions, interviewees reported a decline in traditional "small-town America," community-cohesion type activities (such as parades and youth dances) that civic organizations often supported or sponsored. Interviewees who reported improved social life cited an increase in learning and recreational opportunities for children. While interviewees in some of the communities tied changes in social life to the NWFP, most thought that the trends they observed related to changes in American culture more broadly. A common sentiment was that people had less time to participate in community-centered activities because many people needed to commute for work.

Demography and Well-Being

A strong majority of interviewees in all communities reported that there were fewer families with school-aged children and that most young people did not stay within the community after graduating from high school. Although some interviewees linked this demographic shift to the NWFP because of reduced employment opportunities, most thought it was a broader trend in rural America. A majority of interviewees also reported that retirees generally stayed in the community. Interviewees in Gilchrist, Myrtle Point, Riddle, and Stevenson reported an influx of retirees moving into their communities. Interviewees thought that retirees were moving to their communities because living costs were more affordable. However, only in Riddle did a majority report that retirees were the most significant newcomers. Interviewees in Darrington and Santiam Canyon suggested that the most significant newcomers in their community were lower income and disabled or otherwise disadvantaged people who depended on federal housing and other government assistance programs.

Relationships With Federal Forests and Agencies

In communities with Forest Service ranger stations (all except Myrtle Point and Riddle), interviewees generally reported that the relationship between the agency and the community had deteriorated with the implementation of the NWFP. On the contrary, in Santiam Canyon, some interviewees suggested that the relationship had improved with the passage of the NWFP, which resolved or at least ended political tensions related to the northern spotted owl. In these same communities, interviewees nearly universally noted that federal agency presence in community affairs

was not what it used to be (see Santo et al. 2021). There were several reasons that were cited for this perception, but the most salient centered on the fact that many of the Forest Service ranger district employees used to live and raise families in the communities, but this was no longer the case. Interviewees (community members and agency personnel alike) cited three main reasons for this change: (1) federal workforce reduction had resulted in fewer Forest Service and BLM employees, (2) Forest Service policies encouraged employee turnover through promotion incentives, and (3) many agency personnel chose to commute from larger towns and cities where there are better schools and more services.

Land Use and Management

While interviewees in every case study community agreed that federal forest lands are an integral part of the community, interviewees were divided as to whether they saw the forest primarily as an economic resource, a cultural resource, or a combination of the two. Many people recounted local land uses in terms of fishing, hunting, hiking, driving, and the collection of special forest products. Many lamented the closure of forest roads. On national forest lands, where roads have been decommissioned in the name of forest restoration, several interviewees discussed how they saw road closure as poor land management, forest neglect, and as a threat to forest resilience in the face of increasing fire hazard. For the BLM forests, interviewees discussed access issues relating to checkerboard ownership, stating that private landowners were closing access to their lands which then blocked access to public forest lands.

Fire management is increasingly becoming a concern for all but the coastal range communities (Myrtle Point and Lake Quinault). While wildfire has been a management issue for some time in northern California, it is only now becoming a more pressing issue in the Cascades.

Future Directions

Interviewees across the case study communities provided mixed responses about each community's future prospects. Some were pessimistic, suggesting that the communities would continue to decline demographically and economically. Others were hopeful that recreation and tourism might eventually breathe new life into the former timber towns. In chapter 5, we discuss the social and economic trajectories of each community in greater depth. We suggest that these 10 communities fit into five distinct socioeconomic trajectories, each with their own set of possible futures (see Coughlan et al. 2021). While this classification of socioeconomic trajectories is not meant to be exhaustive for nonmetropolitan, forest-based communities in the Pacific Northwest, we are fairly confident that most communities in the NWFP area can be classified using the same criteria.

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Chapter 5: Socioeconomic Trajectories of Nonmetropolitan, Forest-Based Communities in the Northwest Forest Plan Area

Michael R. Coughlan and Heidi Huber-Stearns[2]

Chapter 5 provides further analysis and discussion of findings from case study interviews presented in chapter 4. We synthesize and provide additional context for interpreting interviewee perceptions and experiences by presenting (1) emergent themes of socioeconomic well-being—an in-depth discussion of specific social and economic change-related themes that emerged across multiple communities; (2) timber-dependence change factors—an analysis of geographic and historical contingencies, largely independent from the Northwest Forest Plan (NWFP), that aims to explain why communities share some experiences in common and others diverge significantly; and (3) community socioeconomic trajectories—an analysis that shows how geographic and historical traits interacted synergistically with the NWFP in ways that allow us to classify each of the case study communities into five types of socioeconomic trajectories.

The purpose of our case study-based monitoring work was to link federal agency management actions with community well-being and to provide local perspectives on changes that have occurred since the initiation of the NWFP 25 years ago. This work was completed in response to the NWFP record of decision evaluation question, "Are local communities and economies experiencing positive or negative changes that may be associated with federal forest management?" (Charnley 2006). In this chapter, we link key themes and patterns that crosscut case studies to implications for federal forest management and socioeconomic community well-being. We focus on discussions of community "potentials" and trajectories, based on our findings, to help relate the case study areas to other similar communities and provide some synthesized findings from our 10 case studies. Although we could not study all the census-designated places in the NWFP area, our discussion of factors driving change, shared themes, and socioeconomic trajectories shows how our case studies are similar to other nonmetropolitan, forest-based communities in the NWFP area. (Coughlan et al. 2021)

Our social and economic monitoring approach focused on two overarching monitoring questions:

What is the status and trend of social and economic well-being in select case study communities?

How have relationships changed between communities and federal forest management (including the forests, management actions, and federal agency personnel)?

To address these questions, chapter 5 presents an analysis and discussion of socioeconomic status, trends, and relationships between communities and federal forest management. The chapter is divided into three topical areas:

1. Emergent themes of socioeconomic well-being, in which we describe themes that emerged from interviews across communities and discuss these in relation to our analysis of supplemental geographic and demographic data.
2. Timber-dependence change factors, in which we outline major factors variously implicated in driving changes in each of the case study communities.
3. Community trajectories, in which we describe points of divergence and convergence in the socioeconomic trajectories followed by our case studies and the potential pathways they convey for each community's future.

Main Takeaways for Chapter 5

- Historical and geographic factors interacted synergistically with the NWFP in ways that differentially affected the socioeconomic trajectories of local communities.
- The degree of geographic isolation from goods, services, and employment is a major factor influencing

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socioeconomic well-being of nonmetropolitan, forest-based communities.
- The effects of isolation on socioeconomic well-being are magnified for vulnerable populations living in nonmetropolitan, forest-based communities.

Implications for Federal Land Management

Communities have experienced and are continuing to experience a variety of transitions that affects what their interests are and how they are connected to federal land management. Communities that are the most isolated from goods and services may be most dependent on nearby federal lands, and changes to land management more strongly experienced in these places.

Our findings show that different communities have different needs and potentials. Federal forest managers should not take a one-size-fits-all approach to community engagement. For example, county seat communities may have entirely different needs and expectations than communities following the low-amenity, mountain-forest trajectory. Finding the right kind and intensity of community engagement may require federal agencies to invest more human capital in local communities.

Local community members welcome and appreciate the professional and personal investments and contributions of federal forest employees in their communities. Federal agencies may want to incentivize employees to live and invest in the communities where they work. Cultivating interpersonal relationships improves social capital and cohesion between federal agencies and local communities and has great potential to improve overall community well-being.

Resilience to wildfire and other forest disturbances are extremely important to local communities. It is important that federal agencies do their very best to communicate the rationale for management actions and to highlight investments that promote socioecological resilience.

Methods

Because the results and discussion in this chapter present a further analysis and interpretation of case study results presented in chapter 4, we frequently reference interview results and rely heavily on historical and economic information presented in chapter 4. Below, we present theory and method for additional analyses on community isolation, vulnerability, and demographic change that do not appear in chapter 4. For detailed methods for the interview—and noninterview-related data collection and analysis, see the "Methods" section of chapter 4 and the online supplemental materials at https://doi.org/10.7264/rz2j-dc54. The "Methods" section of chapter 4 also explains limitations and considerations of our approach, including that our methods represent rapid appraisals and are not meant to be definitive or complete for all cases. The scope and scale of our work means that it is not a comprehensive analysis of all the socioeconomic well-being factors of all rural, forest-based communities in the NWFP area. In addition, it is important to note that major trends related to forest management at the national, regional, state, and local levels have affected community-forest relationships over the past 25 years, as noted in earlier portions of this volume.

Community Location and Sociodemographic Trajectory

Spatial analyses and geographic isolation— Scholars have hypothesized that geographic isolation is a factor that locks in community-level socioeconomic pathways for various reasons related to the lack of efficient transport or informational connections to markets, goods, services, appropriate workforce, or employment opportunities (Fischer 2018, Kelly et al. 2015, Rasker et al. 2009, Wilson 2014). This work is based on central place theory (Christaller 1966, Von Thünen 1966, Weber 1929), which posits that economic activity is governed by a law of diminishing returns related to the cost-distance of transporting commodities (or individuals) between its place of production to an urban center where commodities are marketed, consumed, and services are centralized. Consequently, we expected that the degree of geographic isolation of our case study communities would have implications on relative socioeconomic well-being. For example, because we drew our sample from nonmetropolitan communities, we assumed that none of them would have access to the full suite of goods and services readily available in metropolitan areas. We therefore expected that changes in access to goods and services would be a major socioeconomic concern and that isolation from these services (as measured by drive time to the next nearest large commercial center) would be viewed negatively. We further expected that areas with higher proportions of low-income, minority, and retired populations would be more vulnerable to geographic isolation.

Consequently, the effects of isolation should be magnified in communities with more vulnerable populations.

To assess isolation as a factor in community well-being, we designed a spatial analysis to provide context for community perceptions of access to goods and services that we solicited in our interviews. We conducted spatial analyses in ArcGIS 10.5. We geolocated our case studies' spatial footprints using shapefiles representing the selected school districts. To calculate a community's relative "isolation" we measured travel time along existing road networks through a "cost distance" geographic information system (GIS) analysis. Cost-distance analyses measure the "cost" (in our case, calculated as automobile travel time) of movement from one point to another along user-specified paths across a cost surface (in our case, the highway road network). Road network data were converted to a 100- by 100-m-cell raster with each cell value converted to its value in miles (length of 1 cell = 0.062 mile). We also obtained shapefile point data on hospitals and Walmart stores (see app. A.3 in the online supplemental materials: https://doi.org/10.7264/rz2j-dc54). We snapped all data points to the nearest node along the road network. We additionally created a separate road network layer for interstates and created points for entry/exit points. We created cost-distance maps for representing cumulative travel time along the road network from the nearest point for each data type (e.g., interstate exits, hospitals, and Walmarts). We then calculated the zonal mean cost distance for each data type using case study school districts as our reference zones.

We analyzed proximity to interstate highways (entry/exit ramps) as a general indicator of isolation from markets, workforce, as well as high-order "business services" and high-order goods. In this case, high-order business services involve high-tech, financial, insurance, and real estate services (Coffey 2000, Coffey et al. 1996) and high-order goods are high-tech equipment or appliances that individuals and households access only occasionally as a result of expense and need. These services and goods are "high-order" because they are costlier to deliver in terms of the level of technical skills, education, special training, or equipment needed to deliver them. We also analyzed distance from hospitals as a proxy for isolation as most of our case study communities also lacked high-order services that are nonbusiness services, such as hospitals, mental health clinics, and dentists. We used the distance from Walmart stores (which bundles many goods and services) as a proxy for isolation from "low-order" goods and services that people access frequently such as supermarkets, pharmacies, clothing stores, gas stations, hardware stores, and beauty salons. We found that across our small case study sample, proximity to Walmarts and hospitals presented the most relevant results because both types of goods and services are of more direct interest to individuals and households. In addition, isolation from these types of goods and services was most frequently mentioned by interviewees (see chapter 4).

A second factor of community isolation concerns the opportunity cost of the distance an individual has to travel to obtain desirable employment. We refer to this community attribute as "commutability." Places with high commutability will have high potential to act as a bedroom community for industrial and business centers outside of its boundaries. We created an index to assess the commutability of case study communities (see app. A.3.3 in the online supplemental materials: https://doi.org/10.7264/rz2j-dc54). The commutability index divides the cost-savings of home ownership in the case study community versus home ownership in the "modeled" place of work by the drive time between home community and place of work (where place of work was the nearest micro- or metropolitan community to each case study). High commutability indicates high cost-savings on housing per minute of drive to and from work. To assess the bedroom community potential for each case study, we compared the case study commutability index with the case study's median home price, as a proxy for relative housing affordability. Thus, bedroom community potential is a function of the community's commutability and its affordability.

Demographic trajectory—
To provide context for our qualitative investigation of community demographic change, we pulled data from a variety of non]census data sources. State education departments provide a number of annually collected, local-level metrics that are relevant to a community's socioeconomic well-being. We used school enrollment, percentage of enrolled minority ethnicities, and percentage of free and reduced-price meal eligibility to provide a quantitative assessment of changes in community population, social vulnerability, and well-being between fall 1999 and fall 2016 (years for which data were

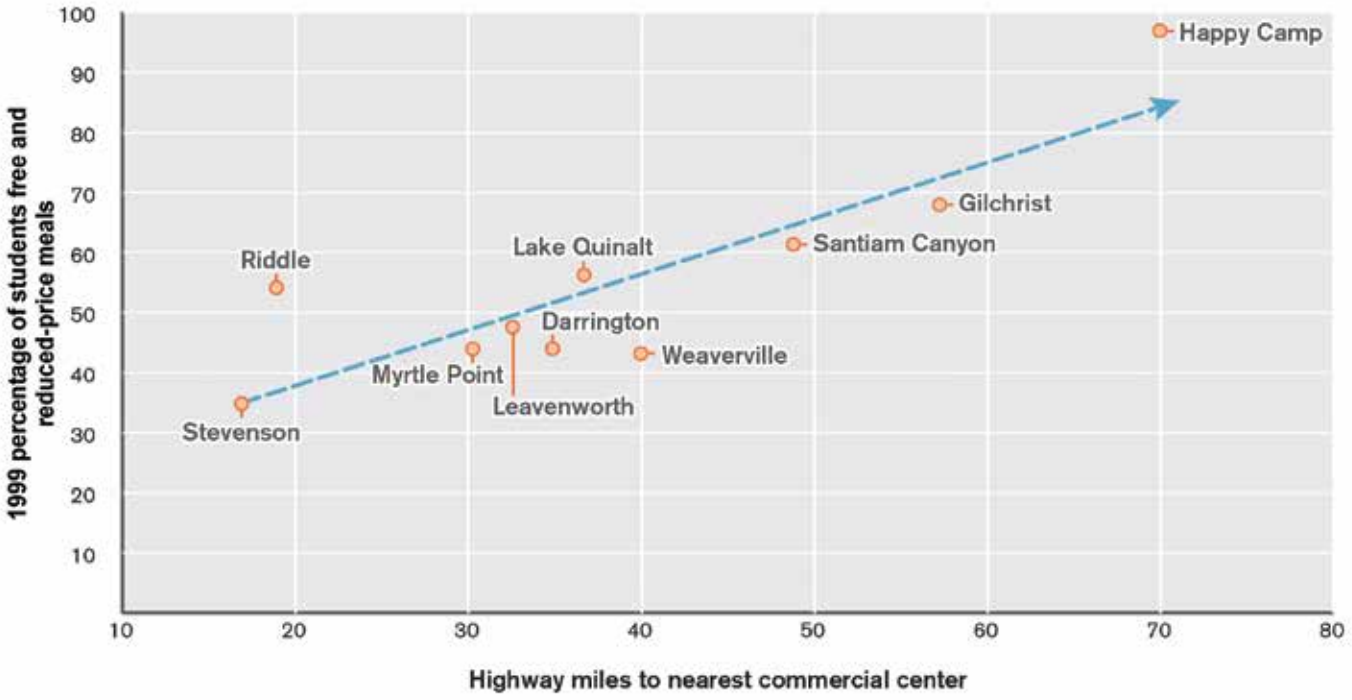

Figure 5.1—Percentage of enrolled school-age children eligible for free and reduced-price meal (as a proxy for poverty) and highway miles to nearest large commercial center, by case study, 1999.

consistently available across all three states within the NWFP area). We downloaded school report card data (annual profiles) from state-maintained department of education websites for our case studies in all three states (see app. A for details and app. D for website addresses in the online supplemental materials: https://doi.org/10.7264/rz2j-dc54). School enrollment serves as a proxy for demographic changes (specifically the number of households with school-aged children), while percentage of ethnic minority and percentage of students qualifying for free and reduced-price meals were used as indicators of social vulnerability (Harwell and LeBeau 2010).

Analysis and Discussion

Emergent Themes of Socioeconomic Well-Being

Our interview findings (chapter 4) clearly show that people in our 10 case study communities have experienced significant social and economic change over the past 25 years. Many participants linked these changes either directly or indirectly to changes in the timber industry and forest management. There is considerably less consensus on the causes of those changes as participants variously listed timber markets, industrial policies and practices, automation of the milling and logging industries, changes in forestry practices and resources management, and federal policies such as the NWFP. Although not all communities experienced these changes in the same way, several themes were consistent across all communities. Below we present some of the most salient themes that emerged from our interviews within the context of socioeconomic trends and factors using secondary, data such as school enrollment, GIS analyses, county-level census data, and historical research.

Isolation, well-being, and commuting for work, goods, and services—

> There was a time here where we had a fully operating grocery store, a pharmacy, a doctors' office, a dentist's office, a hardware store—you name it, you could get what you needed. Now, most of those services are gone. You can't see a doctor [here], you have to go somewhere else to see a doctor.
>
> *—Case study interviewee*

In comparison to urban areas, small, rural, forest-based communities have always had some degree of isolation from goods, services, and employment opportunities.

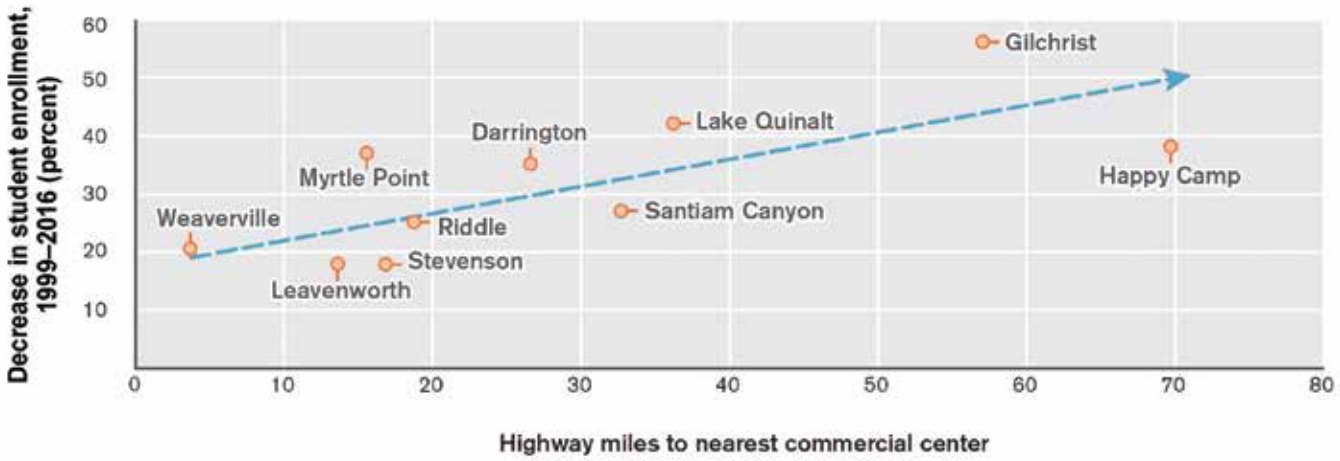

Figure 5.2—Community distance to nearest hospital (x-axis, a proxy for geographic "isolation" from high order services) and percentage of decrease in public school enrollment 1999–2016 (y-axis, proxy for demographic "decline"). Blue trend line shows that demographic decline worsens as isolation increases.

This is especially true for what geographers refer to as high-order goods and services, which are relatively expensive items or services acquired infrequently (e.g., large appliances, vehicles, real estate, finance, hospital services), which are conventionally only available in urban and suburban settings. However, over the course of the 20th century, these communities, along with North America more generally, became less isolated with improved access to low-order goods and services such as postal services, groceries, hardware, car repair, and haircutting. Given the ongoing economic development seen in many areas of the country over the past 25 years, it might seem counterintuitive that the geographic isolation of these forest-based communities should have increased with regards to either high- or low-order goods and services. However, with the exception of Leavenworth, participants across the case studies reported a decline in the type and number of local businesses that provide goods and services to their respective communities. This decline in local business translates to increased driving time to access goods and services that are not available locally. While populations may still have access to a dentist, for example, by driving 20 miles to the next community, the loss of such services locally increases the overall costs of going to the dentist in terms of both amount of time and resources expended. Lower income families may have a hard time finding time, money, or means of transportation to access these services.

Communities that were farthest from the nearest large commercial center are the most disadvantaged when specific services are lost locally. For our case studies, there appears to have been a pre-existing relationship between the percentage of households in poverty and a community's relative isolation from goods and services. For example, figure 5.1 shows the 1999 percentage of school-age children eligible for the free and reduced-price meal programs (our proxy for percentage of population in poverty) and the distance to the nearest large commercial center by highway miles. This figure shows that in our cases, a community's 1999 school-age poverty rate increased as distance from a commercial center increased. In other words, the more isolated a community, the higher its percentage of families in poverty.

Participants perceived that increased cost distance of goods and services has contributed to a decline in the overall well-being of their respective communities. Santiam Canyon, Gilchrist, Quinault, Happy Camp, and Riddle have lost their grocery stores and, because of the distances residents must travel to reach supermarkets, these communities easily meet the U.S. Department of Agriculture's definition of a "food desert." Nonmarket or informal market availability of foods may substitute for grocery stores in rural areas, for example, from farmers' produce stands or from higher percentages of households who hunt, fish, or garden (Bitler and Haider 2011). However, many formerly timber-dependent communities in the Pacific Northwest are in agriculturally limited environments. Additionally, participants from several communities complained about loss of access to hunting and fishing areas as a result of federal agency road closures

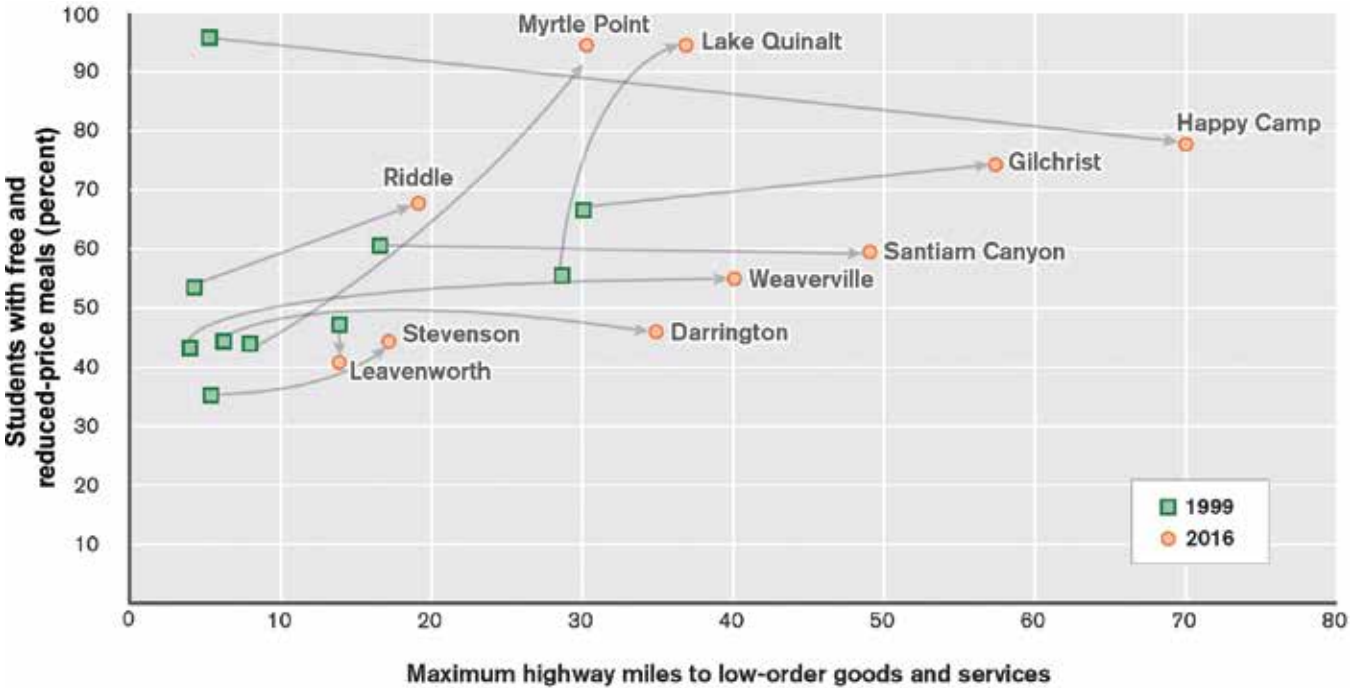

Figure 5.3—Scatter plot showing isolation from low-order goods and services and relative proportion of low-income families in the community. Arrows connect 1999 data point with 2016 data point. Change in isolation is modeled as shift from maximum highway mile distance to within-community commercial center (1999) and nearest large commercial center with a Walmart (2016). Proportion of low-income families is modeled using percentage of enrolled public school students that are eligible for free and reduced-price meals in 1999 and 2016.

and management decisions as well as an overall decline in fish and game availability.

In addition to the loss of grocery stores, our participants listed a number of different (and nonsubstitutable) types of goods and services that their communities had lost over the past 25 years, including access to medical services, pharmaceuticals, fuel, hardware, and banking. Participants explained this increasing isolation as a "trickle down" effect of the initial loss and continued decline of timber-related jobs that began in the 1990s. Based on interviews, we identified three implications of the loss of local employment opportunities:

- As workers emigrate to find new jobs elsewhere, there are fewer local consumers. For example, the decline in families with school-age children was generally perceived by case study participants as reflective of the loss of working-age adults who relocated to find employment. With fewer consumers, participants explained, small businesses that were already operating on small profit margins went out of business. This exodus by working families (as proxied by decline in public school enrollment) appears generally to have been more severe in the communities most isolated from high-order services (e.g., Gilchrist, Happy Camp, and Lake Quinault) (see fig. 5.2). Thus, isolation may increase the incentive for households to relocate to larger, less isolated communities, creating a positive feedback loop. It also decreases incentives for high school graduates to stay in the community or return after attending college.
- Loss of income means populations have less money to spend on goods and services. Again, with fewer consumers, businesses suffered. As businesses closed, more jobs were lost. This process doubly affected community well-being because as incomes declined, availability of local goods and services also declined, thus increasing community isolation. In most communities, the percentage of children eligible for free and reduced-price meals increased since 1999. This increase in children eligible for free and reduced-price meals is a proxy for the percentage of the community that is economically vulnerable and shows a clear pattern of economic decline at the household level. At the same time, the distances community members had to travel to buy groceries or hardware, or to see a doctor or dentist increased as businesses closed or moved

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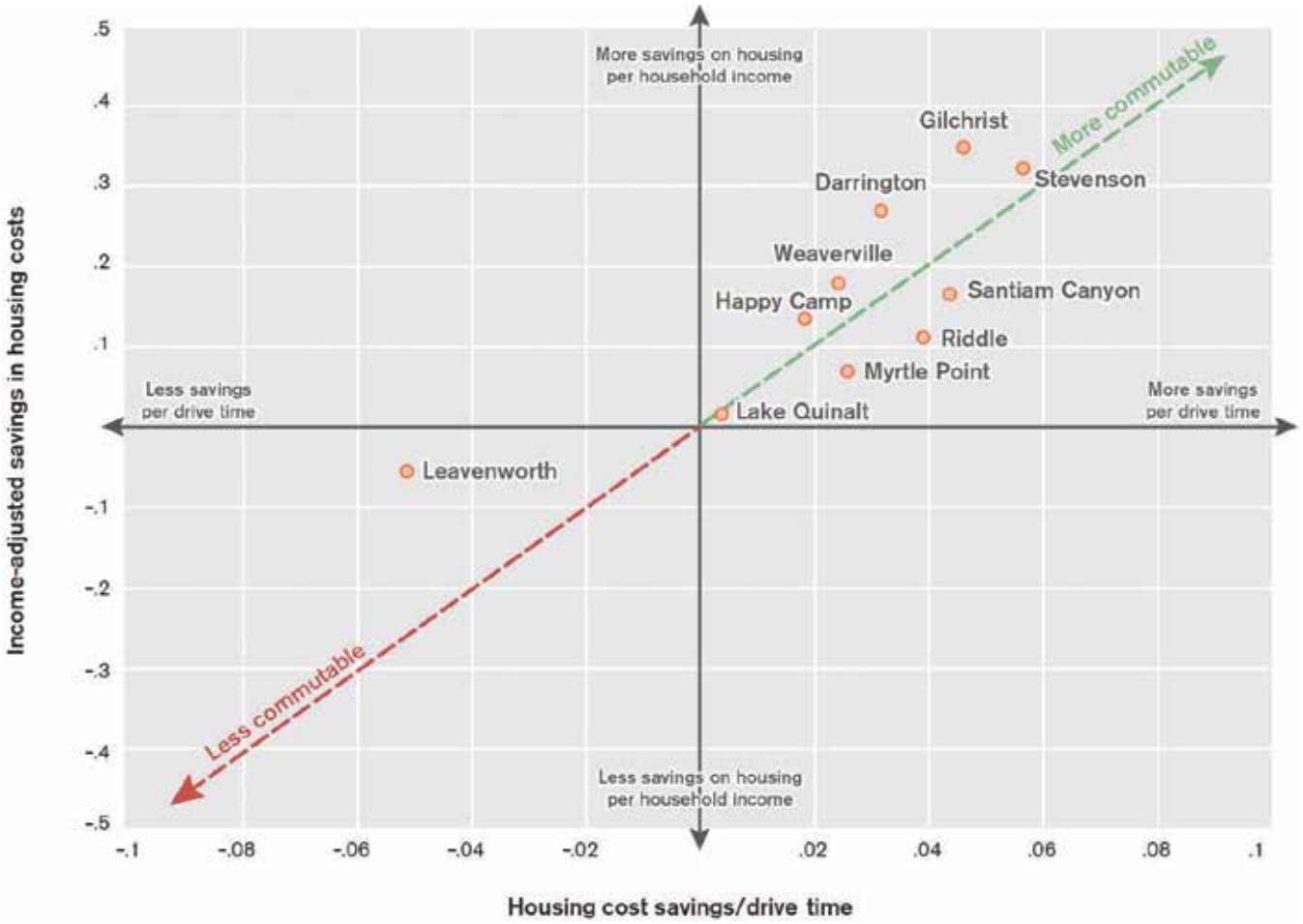

Figure 5.4— Case study commutability. The x-axis shows the cost-savings in housing by commute drive time and the y-axis shows the difference in housing costs between bedroom and work communities adjusted by the median income for the work community. Communities in the upper right quadrant are better suited as bedroom communities and communities in the lower left quadrant (only one in our sample) are better suited as work communities. Commute drive times ranged from 33 to 90 minutes. For communities that were more suited to commuting (upper right quadrant), communities with lower housing costs were generally places that had further commute distances translating to low cost savings per drive time.

elsewhere (fig. 5.3). Thus, as communities lost vendors of goods and services, their most vulnerable populations' ability to access the more distant commercial centers in which those goods and services were then located also decreased. In the past, although the percentage of low-income families appears to have been positively related to the distance from large commercial centers (fig. 5.1), low-order (daily) goods and services would have been accessible for these families because many things were still available locally. By 2016, with the exception of Leavenworth, community well-being had declined as indicated by the loss of many local businesses and public services as well as an increase in the percentage of low-income families. Communities such as Myrtle Point, Weaverville, Stevenson, and Darrington (to some degree) still had many low-order services available locally. However, as services and jobs slowly continued to shift to more distant commercial centers, consumers were taking advantage of more attractive services in those areas (e.g., lower prices and larger selections provided by box stores, such as Walmart and Lowes). This put additional strain on the remaining local businesses, as did more recent competition from internet-based consumer services, such as Amazon.com. While the internet may increase access to goods for some living in rural communities, low-income families may not benefit. The trend seemed to point toward increasing isolation even for communities that have held onto their grocery and hardware stores. The one exception to this rule may be Riddle, which is currently developing services just outside of the case study area's limits along the Interstate 5 corridor.

- An increase in the number of people commuting for work. This is the third response to the decline of local employment opportunities. Based on our interviews, on average, people who lived in our case study areas and commuted to work were traveling about 28 to 53 miles daily. Clearly, some of these communities are better suited to commuting for work than others (fig. 5.4). One participant in Leavenworth reported that some people commute to Seattle (134 miles, or about 2 hours and 18 minutes of drive time) once weekly where they own or rent another home. However, commuting was more commonly reported between Leavenworth and Wenatchee (23 miles, or about 33 minutes of drive time) with people variously living or working in either community. In Santiam Canyon, participants reported that it was common for people to commute to Stayton (17 miles), Salem (32 miles), and even Portland (76 miles). In Happy Camp, where most participants reported no change in commuting, three participants did independently note that people had tried commuting in the late 1990s after the initial decline in timber industry jobs, but that they found the distances to be too great. In terms of access to nearby commercial and metropolitan centers, Happy Camp is the most isolated of our case studies as it is situated about 70 miles away from the town of Yreka. Further, the commute between Happy Camp and Yreka involves a two-lane, mountain road. In places such as Lake Quinault and Myrtle Point, there was less consensus on whether there had been changes in the number of people commuting over the past 25 years. One explanation for this lack of consensus might be that some people were already commuting relatively long distances to work by the 1990s.

Figure 5.4 shows the "commutability" index, which calculates the relative potential for each case study community to serve as a "bedroom" community for a larger, industrial, or business center—a community where residents commute to another, distant place for work (a "work community"). The index combines the relative difference in the cost of housing between the bedroom community and the work community as a percentage of the median wage in the work community divided by the round-trip drive time between the two places. The graph helps convey the suitability of each case study as a bedroom community with no major industries that residents must commute from to an outside work community, but also takes into consideration the wage a person would need to earn to make home ownership a reasonable goal.

Note the location of Leavenworth in the lower left quadrant, indicating a net cost rather than savings in terms of both housing and drive time. Unless wages are extremely high, Leavenworth is likely better as a work community than a home community. Stevenson (upper right quadrant) has a high commutability owing to moderate housing costs in comparison to potential wages gained by commuting to the Portland area, making it a good choice for commuting if one can get a median or higher wage job. Lake Quinault (upper right quadrant, nearest to the x- and y-axes intersection) has relatively low commutability because of low housing costs in the work community and the relative lack of savings considering the costs of drive time.

As some interviewees suggested, when a large percentage of the workforce is commuting, this can take a toll on a small rural community. For example, several participants in Darrington observed that the types of people who would normally participate in community social and civic activities were also the type of people who were willing to drive farther for a higher status, higher paying, or more intellectually rewarding job. Consequently, participants explained, much of the time that those people once voluntarily devoted to the community or to local activities with their families was spent commuting to work.

Shifts in Community-Federal Agency Relationships

Many of the communities reported that 25 years ago, Forest Service employees used to be an important part of community civic life, but that this is no longer the case (see Santo et al. 2021). Decreases in the number of district staff have accompanied shifts in the residency choices of Forest Service employees. For example, more Forest Service employees prefer to live in larger communities and commute into work. In the Gilchrist case study community, so many employees commute from Bend to the Crescent Ranger Station (a distance of 48 miles) that the Forest Service provides a commuter shuttle bus. This shift has been especially difficult in many communities because, aside from the school district, the Forest Service is one of the few employers that can attract and retain a college-educated workforce. Many participants noted that the presence of positions requiring college degrees had a

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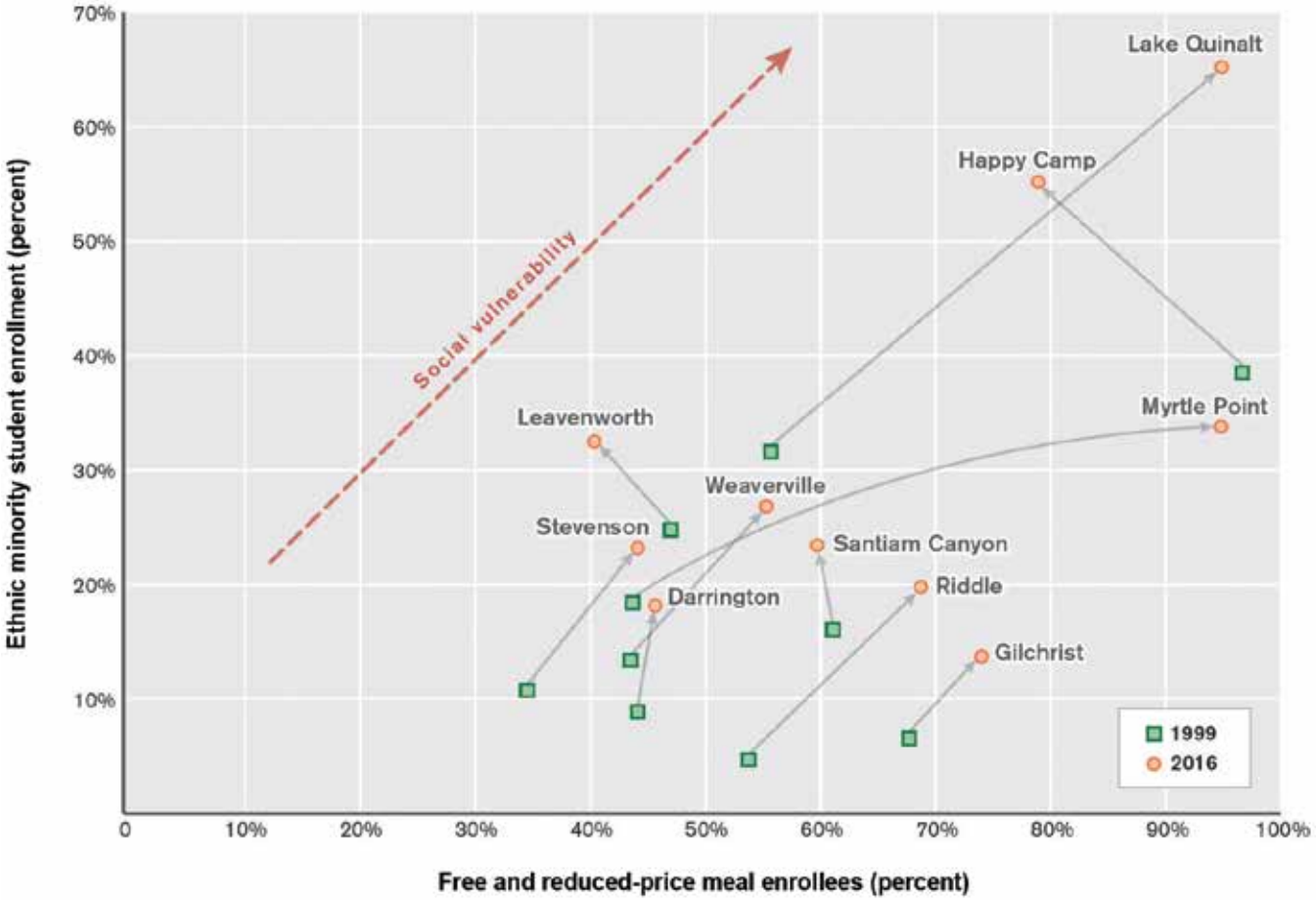

Figure 5.5—Percentage of enrollment of ethnic minority (y-axis) and low-income students eligible for free and reduced-price meals (x-axis) in public schools. Directional arrows depict changes from 1999 to 2016, orange dashed arrow shows direction of increasing social vulnerability. Note that when both minority and low-income students are considered, vulnerable populations have increased in all communities.

multiplying effect as workers often brought their educated spouses who took jobs in the school district, started businesses, and volunteered in the community.

Several participants speculated that Forest Service employees no longer preferred to live and raise families in the local community because of the decline in the quality of public school education as well as increasing isolation from goods and services. Many participants linked declining school quality directly to the decrease of federal timber dollars associated with the implementation of the NWFP. The Secure Rural Schools funding program was supposed to have served as a stop-gap measure for these schools, but participants reported that much of the funding had been appropriated by county governments to prop up other failing services.

Vulnerable Populations

> [We] are underrepresented in some ways on a state and federal level, because we tend to be a poor white community … people talk about poverty like they understand it and they know it, but they don't. Because their view of poverty is minorities—these people are impoverished and they're not minorities.
>
> *—Case study interviewee*

> We have a huge diversity now … Minority diversity, yeah, has gone up since then [the 1990s], other than just the Native [American] population in the schools. Which is great to see."
>
> *—Case study interviewee*

Vulnerable populations are groups of people that are socially or economically disadvantaged in ways that increase their susceptibility to harm from health crises,

natural disasters, and other sorts of socioeconomic perturbations. Vulnerable populations include people living in poverty, racial and ethnic minorities, elderly and disabled people, and the unhoused. The relative percentage of vulnerable populations in a given community is one factor contributing to a community's well-being. Although we could not estimate the exact percentage of vulnerable populations within our case study communities, we were able to estimate the percentage of children from socially and economically disadvantaged families enrolled in public schools using the number of children who identify as a racial or ethnic minority and the number of children who qualify for the free and reduced-price meal programs.

According to public school data, vulnerable populations have increased in all the case study areas (fig. 5.5). However, the nature of the vulnerability and the degree of change was variable. For example, change in Myrtle Point was mostly related to an increase in the percentage of children from low-income families. Happy Camp saw an increase in percentage of children who identify as ethnic minorities, but a decrease in the percentage of children in poverty. One factor potentially causing these changes is the growth of the marijuana industry in northern California, which has attracted ethnic minority growers and may have helped alleviate some of the poverty facing the region. Leavenworth saw changes that were similar in direction to Happy Camp but were likely for different reasons. The tourism and recreational amenity sectors of the economy grew in Leavenworth, which attracted minorities who were seeking work in those areas. However, the decline in low-income families may have been more a function of gentrification than a reflection of poverty alleviation. Interviewees discussed how housing in the Leavenworth case study area school district was cost prohibitive, and how many lower wage workers in the service industry commuted from Wenatchee.

Myrtle Point and Lake Quinault saw the most drastic changes since 1999, with increases in the percentages of both minority and low-income students. It is unclear if there was a link between those two categories. In Myrtle Point, one participant suggested a connection between an influx in the Hispanic population and the dairy industry. In Lake Quinault, there was growth in the number of Hispanics in the area who were successful in utilizing forest products. Participants specifically cited Hispanic ownership and operation of cedar shingle mills. Santiam Canyon, Darrington, Gilchrist, and Leavenworth each showed only small changes. The exact nature and reasons for these shifts would require further inquiry.

Shifts in Workforce and Employment

Participants reported conflicting opinions about workforce and employment changes within the case studies, but mostly agreed that employment opportunities had declined. For example, 79 percent of participants suggested that their community experienced a decline in employment opportunities over the past 25 years, and many linked this decline to demographic changes, loss of services, and other socioeconomic plights facing their communities. Participants in nearly every community suggested that many of the hardest working individuals had left the community to pursue better employment opportunities elsewhere. Yet, many participants with knowledge about the timber industry or other businesses reported that larger employers were having difficulty finding reliable or skilled employees. Sawmills visited within the case study areas were all advertising employment opportunities.

The two most common factors cited by participants that may help to explain this contradiction involve a shift toward automation and a shift in cultural attitudes about labor. In terms of the former factor, nearly every sawmill in our case study areas had retrofitted or completely rebuilt their operations to accommodate smaller diameter logs and to increase efficiency (e.g., reduce number of workers and time involved in processing). Similarly, loggers and participants with knowledge about logging practices reported an increased reliance on heavy machinery (such as feller bunchers) to accommodate smaller diameter trees and to increase labor and time efficiencies.

However, automation of these industries produces opposite demands on the workforce. In the case of sawmills and lumber processing plants, automation has increased the need for skilled technical workers such as electricians. These positions require post-high school education. But interviewees reported that fewer young adults were returning to the case study communities after pursuing a college education compared to 25 years ago. Lumber companies must therefore compete with other industries in urban areas to attract appropriately skilled workers.

In the case of logging, participants suggested that there had been a decrease in demand for highly skilled laborers. They explained that the skill and knowledge

required to fall large, old-growth trees took more training and experience than the operation of the newer heavy equipment (described as "Nintendo logging" by one participant). While some highly skilled loggers may have moved into positions at sawmills, many left the timber industry altogether to pursue jobs in other sectors. Both the skillset and relative socioeconomic autonomy of the independent operator type of logger provided them with a degree of transferability across employment sectors. This means that when local, timber-specific jobs were lost, many loggers found work both outside of their communities and outside of the timber industry.

The other factor brought up by participants across the case studies involved cultural attitudes toward labor. For example, many participants reported their perceptions that people, in general, just do not want to work anymore:

> I have lots of friends that own logging companies, or dairies, and they just hire local people. They say that they have the hardest time hiring people that, they don't have to be experienced, but [that they just need] people that show up on time, work hard, and have just a good work ethic.
>
> *—Myrtle Point case study interviewee*

> Their [small business's] biggest struggle is getting qualified help..… When you talk to the restaurant people, basically, they have an awful time getting qualified employees..… If you try to find somebody with a work ethic who is not on drugs, it's tough.
>
> *—Weaverville case study interviewee*

> A good friend of ours for a long time was a mill manager…. They just wanted able-bodied, willing workers. The drug analysis was something, but often, that wasn't the only thing. It was, [just needing] people [who are] willing to work. I guess, if you're willing to work, you're willing to go clean for a while. It's hard to tease those things apart.
>
> *—Riddle case study interviewee*

> We've got people that don't have a decent work ethic. I mean, if you noticed there's a hiring sign out in front of the mill, and the reason for that is twofold: one, people that don't pass drug tests, and two, people that don't understand when they hire you to show up every day at 7 o'clock you've got to be there every day at 7 o'clock, whether you want to or not.
>
> *—Gilchrist case study interviewee*

> Yeah, there's employment opportunities, but so many of these people absolutely do not want to work.
>
> *—Santiam Canyon case study interviewee*

> We get about 10 or 12 applicants every Monday. And only half of them can pass a drug test. And by qualified [applicants] I mean ... being able to show up and pass a drug test.
>
> *—Sevenson case study interviewee*

Multiple interviewees suggested that drug use and addiction prevented a segment of the labor pool from keeping a steady job. The importance of these perceptions about the labor pool did not rest on whether they are accurate, but rather that they pointed to a general shift in socioeconomic dynamics between the types of jobs being created and the available labor pool in each community. Jobs were in fact available in these communities, but they may not have paid well enough to attract or retain motivated and skilled labor. Participants complained about the lack of "family-wage" or "living-wage" jobs in every community except Leavenworth. In Leavenworth, participants mentioned that there had been a recent increase in jobs, but that they were mostly lower wage jobs.

Home Ownership and Housing

The trajectory of community housing and its relationship with demographic shifts was another common theme that emerged across the various case studies. There was a common perception that 25 years ago the majority of houses were owned and occupied by local, working families and were affordable, modest, and well-maintained. Beliefs had shifted in two directions: (1) housing was now less affordable and less available, and (2) many houses were in poor condition.

Interviewees often began this narrative with mid-1990s mill closures and job losses attributed in part to the NWFP. Following this decline, they explained that many people left the case study communities in search of better economic opportunities. This initial exodus flooded the real estate market with available housing, thus depressing the housing market during the late 1990s and early 2000s. In some communities, such as Riddle and Darrington, entrepreneurs

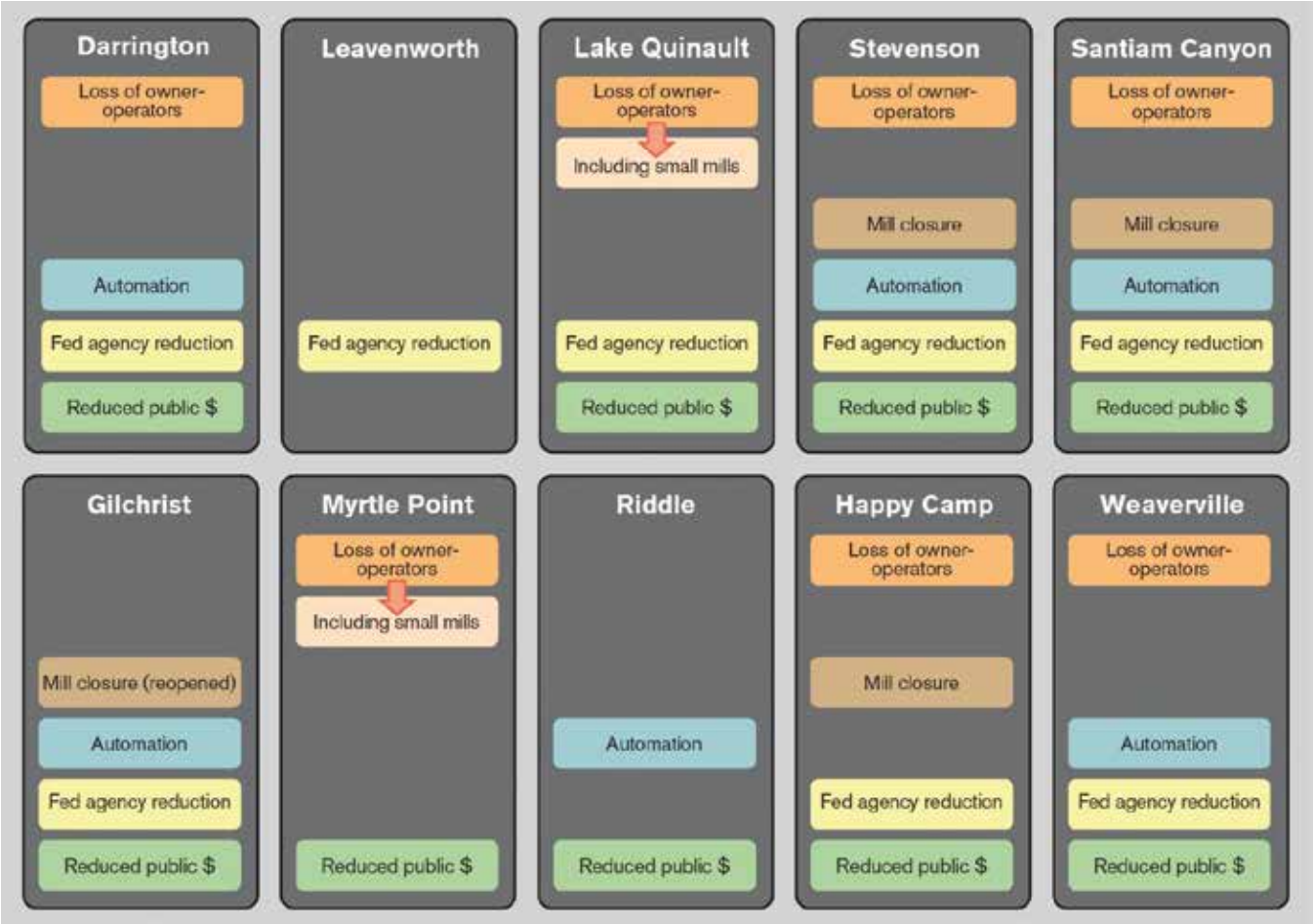

Figure 5.6—Timber-dependence change factors most significant to each case study community.

were said to have snapped up houses for rentals. These relatively cheap and available rentals then came into disrepair as landlords and tenants neglected them. As a result of this problem, houses on the market in Santiam Canyon were described by one interviewee as, "either places that need an awful lot of fixing up and are really low priced, or they're quarter- to a half- a million-dollar homes on the river."

In some communities, such as Santiam Canyon, participants associated some of the housing neglect with the prevalence of drug addiction. In Happy Camp, disrepair was associated with elderly owners who lacked either the physical or financial ability to maintain them. Consequently, the availability of standard quality homes was reported as limited. Conversely, in many communities, such as Weaverville, Myrtle Point, and Gilchrist, there was a perception that home ownership was now out of reach for young working families, primarily owing to an inflation of prices by retirees characterized as amenity migrants. One interviewee in Weaverville described these amenity migrants as "equity refugees," saying the following:

> It's very difficult to find affordable housing here…. Most of the new housing that was built … an awful lot of it was built by what I would call "equity refugees" out of other parts of California who came here with the proceeds from a house sale and set up a nice place here with those proceeds. And [they] are in that retirement demographic.

With the exception of Leavenworth, housing in the case study communities was reported as generally more affordable than housing in more urban areas. A Gilchrist interviewee said, "I think there's one house for sale. They sell quickly because it's still fairly affordable. Klamath County taxes are very affordable, and it's cheaper to live in Klamath County. It is a cheap county so they can buy a house, and work in La Pine next 20 miles."

According to participants in nearly every case study, this relative "affordability" had attracted retirees who sold their homes in higher priced areas (California noted most often) and bought a retirement home in the case study community. In addition to the various consequences that this shift in demographics entailed, retiree in-migration inflated the housing market and pushed prices beyond the reach of average- to low-income working families.

Another common housing theme related to the overall shortage of rentals. Participants in every case study mentioned the lack of rental housing. They also suggested that this was a relatively new phenomenon. To try to explain the shortage in rentals, we looked at the number of web-based, short-term rentals in each case study area. However, aside from Leavenworth and Stevenson, the number of short-term rentals did not seem overinflated for any of the case studies. Instead, this shortage may perhaps be indicative of a decline in home ownership, a trend toward smaller families, or the attrition of older homes in disrepair coupled with a lack of new construction.

Timber-Dependence Change Factors

Our analysis of interview transcripts identified five main factors driving the character and variability of perceived socioeconomic changes experienced by case study communities over the past 25 years: (1) loss of owner/operator enterprises, (2) mill closure, (3) mill and logging automation, (4) reduction in the number of local federal agency employees, and (5) reduced public sector funding (e.g., loss of federal timber receipts). These factors differentially affected the case study communities (fig. 5.6) and their relative influence on human and financial capital, infrastructure, and access to forest resources continues to shape the socioeconomic trajectory of the communities. With the exception of Leavenworth, the effects of these change factors have led to a decline in overall community well-being. All of these factors have significantly contributed to some communities' socioeconomic trajectories. In others, only one or two factors have played a significant role in directing the community's overall demographic and economic pathway. Consequently, the different socioeconomic trajectories are contingent both on this history and the broader scaled geographic contexts within which they are situated.

Loss of owner-operator, timber-related enterprises— Case study participants in several communities reported the loss of owner-operator, timber-related enterprises such as logging and trucking operations because reduced work opportunities had led these types of people to divest or outmigrate. Participants suggested that this loss had several immediate effects on communities: (1) It represented a direct loss of local infrastructure since contractors would likely sell or take their heavy equipment with them. (2) The loss of these contractors locally meant that contracts for logging or related work opportunities had to be outsourced and financial gains were not retained locally. (3) Timber-related contractors represented a skilled labor force with a multitude of practical, readily transferable technical skills. (4) Owner-operators had business and leadership skills that often transferred to organizations that undertook community service-oriented projects. Sociological literature supports the notion that rural communities benefit more from a relatively large number of locally owned, small-scale enterprises than a few large-scale "absentee-owned" industries (Lyson and Tolbert 1996). Consequently, we suggest that the loss of owner-operator enterprises represents a significant factor driving socioeconomic decline in the case study communities.

Mill closures—
The Pacific Northwest lost several sawmills during the restructuring of the timber industry in the 1990s. The causes of sawmill closures were often complex and may have had nothing to do with the NWFP. Worker layoffs associated with mill closures resulted in severely reduced household incomes that likely affected overall financial capital of mill worker households. Human capital associated with the mill worker skillset was essentially devalued if and where workers were unable to find new jobs in the timber products industry. Effects to financial capital and associated devaluation of human capital had a variety of long-term, multidimensional effects on communities, ranging from increased drug abuse and poverty to home abandonment and outmigration.

Automation—
***Milling*—**Nearly all of the mills that remained in business in our case study communities had retooled to adapt to changes in market supply and demand, or had diversified their business. Most often, retooling involved installing equipment designed to mill smaller diameter trees and

to manufacture specialty products. However, much of the retooling involved equipment designed to automate production and increase manufacturing efficiencies. One result of this retooling was that sawmills did not need as many workers to operate as they once did, which may have contributed to unemployment and outmigration. Additionally, automation in mills created a greater need for skilled technicians who could operate and maintain high-tech machines. Filling these jobs was problematic for mills operating in smaller communities that had a skilled-labor (human-capital) deficit.

Logging—As the emphasis in logging shifted away from late-successional, large-diameter trees, timber extraction also automated its operations. Logging now involves harvesting machinery. For example, feller bunchers greatly increase logging efficiencies by gripping, cutting, and skidding, multiple, smaller diameter trees at once. Some feller bunchers additionally delimb and buck logs. One worker operating a feller buncher replaced what formerly would have involved a whole crew of loggers. This had both reduced the number of workers required to cut timber and shifted the skillset that logging requires. The effects on community capacity were likely similar to those created by mill automation.

Reduction in federal employees—In every community with a Forest Service ranger station, interviewees noted the reduced capacity of the Forest Service to conduct forest management. However, they also complained that reduction of Forest Service employees had resulted in community brain drain as Forest Service employees and their spouses tended to be college educated and were often oriented toward community leadership and service. Thus, not only was the reduction in ranger district employees a significant loss of higher wage jobs for the community, but also a loss of human capital. Many

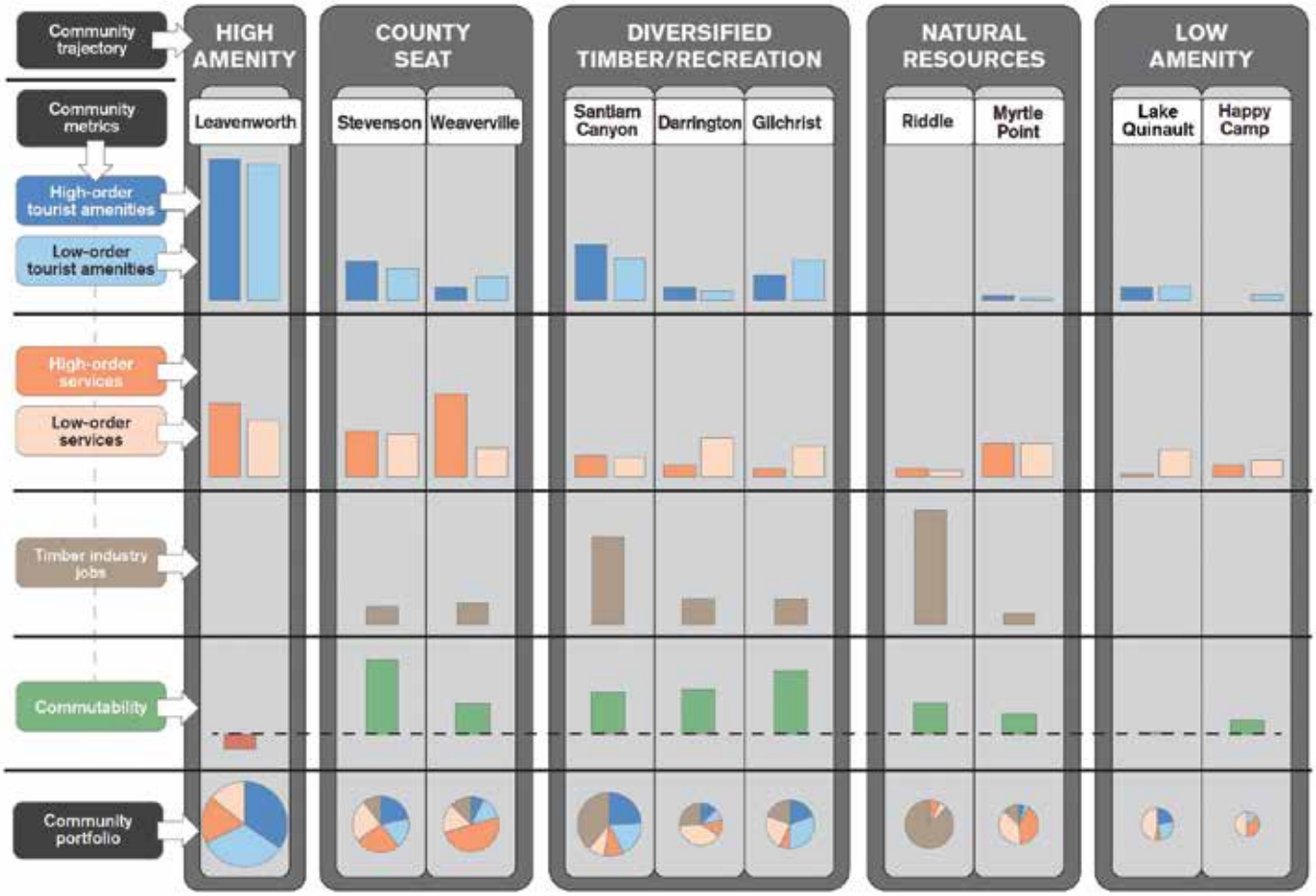

Figure 5.7—Correspondence between normalized socioeconomic metrics and community trajectories. Bars depict normalized distribution of metrics across case studies whereas pie graphs (bottom row) depict metrics as a function of within-community distribution. See app. A in the online supplemental materials for detailed methods and results: https://doi.org/10.7264/rz2j-dc54.

Table 5.1—Community socioeconomic trajectory and related county typology

		Circa 1990 county typology (see Chapter 2)			
				Relative importance during the late 1980s of:	
Community	Change trajectory	County	County group	Federal forest management	Forest industry employment
Darrington	Diversified	Snohomish	(2) Moderate	Moderate	Low
Leavenworth	High amenity	Chelan	(3) High	High	Moderate
Lake Quinault	Low amenity	Grays Harbor	(1) Low	Low	Extr. high
Stevenson	County seat/diversified	Skamania	(5) Extr. high	Extr. high	Extr. high
Santiam Canyon	Diversified	Linn	(4) Very high	Very high	Very high
		Marion	(2) Moderate	Moderate	Low
Gilchrist	Diversified	Klamath	(5) Extr. high	Extr. high	Extr. high
Riddle	Natural resources	Douglas	(5) Extr. high	Extr. high	Extr. high
Myrtle Point	Natural resources	Coos	(4) Very high	Very high	Very high
Happy Camp	Low amenity	Siskiyou	(5) Extr. high	Extr. high	Extr. high
Weaverville	County seat/diversified	Trinity	(5) Extr. high	Extr. high	Extr. high

participants noted that Forest Service spouses often served the community in other crucial capacities as employees or volunteers at the school district, local government, or service-oriented civic organizations.

Reduced public sector funding—
All of our case study communities experienced some degree of reduced public sector funding with effects that included declines in public school budgets, road and transportation infrastructure, and funds for parks and recreation infrastructure and services. Many participants directly attributed this decline to the loss of access to natural resources (timber harvesting) resulting from the NWFP. Loss of access to federal timber not only reduced the tax base by eliminating jobs and revenue associated with the wood products industry, but also reduced county revenue through the reduction in shared federal timber receipts. For example, 25 percent of national forest and 50 percent of BLM Oregon and California Revested Railroad Lands Act timber-receipt payments were previously allocated to counties. Reduced federal and county government budgets then led to what interviewees described as a degradation of physical and human capital publicly available to community members.

Many case study participants were strongly negative about the loss of payments flowing from timber sales on federal forests to county governments. Several mentioned the inability of the county to maintain roads, sheriff's offices, and other public services. Participants across a number of case studies also lamented the loss of forest access. Participants attributed reduced access to the decline in the timber program. Participants suggested that the number and quality of national forest roads had declined, limiting community members' abilities to recreate in forests they considered an integral part of their community. They commonly attributed the decline in roads to the loss of personnel, equipment, or funding for the local ranger district to maintain the road network. Many recognized that roads were no longer needed for logging activities that paid for their construction, but some interviewees expressed frustration that federal managers would not allow locals to maintain the roads themselves. Beyond the ability to access timber on the forest, participants viewed this loss of access as "forest closure." In some cases, participants noted road closures on lands near their community that we found were actually private industrial lands intermixed with publicly owned lands, meaning that in some cases, issues of access were actually about private land gate closures affecting access to public lands.

Community Socioeconomic Trajectories

As outlined in the previous section, case study communities have followed divergent socioeconomic pathways over the past 25 years. While each community has aspects that are unique and particular to their local contexts, they also share significant points of commonality that lend to classification.

Classification of community socioeconomic trajectories involved a mixed-methods approach employing interview results (including the timber-dependence change factors discussed above), and the quantification of services, amenities, employment in the timber industry, an index of commutability, and median home prices (fig. 5.7). While our typology is loosely based on that outlined by Charnley et al. (2018) (e.g., high-amenity, diversified natural resources, and declining communities), our empirical analysis provides a more nuanced version of this schema. Given the different factors we observed influencing socioeconomic outcomes, there are likely multiple different types of forest-based, nonmetropolitan communities within the NWFP area, beyond the ones we identified from the communities we studied. As noted previously, our focus was on federal timber-dependent communities, so our typology was specific to a subset of communities most aligned with the research purpose and intent. We identified five socioeconomic trajectories for the communities we studied:

- High-amenity, mountain-forest trajectory (high amenity)
- Diversified timber-county seat trajectory (county seat)
- Diversified timber-recreation amenity trajectory (diversified timber-recreation)
- Diversified natural resources trajectory (natural resources)
- Low-amenity, mountain-forest trajectory (low amenity)

The importance of examining community-level perceptions of change became especially apparent when socioeconomic trajectories were cross-referenced with the county typology presented in chapter 2 of this report (table 5.1).

High-amenity, mountain-forest trajectory— High-amenity, mountain-forest trajectory communities have successfully developed a "high-order" tourism and recreational amenity economy (Charnley et al. 2018, Morzillo et al. 2015). High-order tourist amenities include attractions such as high-end hotels, lodges, and resorts (focused on golfing, skiing, etc.) situated in areas that offer exceptional scenery and a multitude of relatively expensive services, activities, restaurants, and accommodations. Communities on a high-amenity trajectory have been developed and marketed as tourist attractions and destinations in and of themselves. They are likely to attract international and wealthy clientele. They have a high number of short-term visitors, a large, small-business sector, a large number of vacation homes, and may be gentrifying as a result of the significant presence of telecommuting professionals. They may also offer lower order amenities such as campgrounds, picnic areas, hiking and biking trails, boat and bike rentals, and stores that provide camping accessories, convenience foods, and hunting and fishing gear. Communities on a high-amenity trajectory were likely already in the process of moving away from timber extraction and wood products manufacturing by the time of the NWFP.

***Leavenworth*—**In 2018, Leavenworth was a gentrifying mountain-forest community with a seemingly resilient economic trajectory. We suggest that Leavenworth has followed this trajectory by developing and marketing itself as a high-amenity community (Charnley et al. 2018, Paveglio et al. 2014). This case study provides the one exception to the overall trend of social and economic decline seen in our nine other NWFP area communities. However, interviewees here did still report issues related to housing costs and low-wage jobs. In considering the relationship of the Leavenworth case study to the NWFP, we should highlight that this community has not been economically dependent on timber since the 1950s. With tourism as its main industry, the town of Leavenworth is itself the amenity that tourists come to visit. Federal forest lands provide the scenic backdrop to Leavenworth and the NWFP likely safeguards the landscape against unaesthetic logging operations. With respect to the NWFP, the largest effect of the plan and related policy shifts in the past 25 years on Leavenworth was noted by interviewees as the downsizing of the Wenatchee River Ranger Station. This contrasts with other communities who noted larger effects on the timber industry and related workforce in the community.

Since the late 1960s, Leavenworth's trajectory has been toward the development and marketing of its tourism and recreational amenities. Social and economic well-being in the community is strong, but wealth disparities may grow as the community continues to gentrify and outsource lower wage service jobs. Another challenge that Leavenworth might face relates to the limited capacity of the Okanogan-Wenatchee National Forest to accommodate the increasing number of visitors attracted to Leavenworth and its recreational activities on national forest land.

Diversified timber-county seat trajectory— Diversified timber-county seat communities may have retained some capacity in the wood products industry, but their status as the county seat provided an economic buffer to the timber industry and forest policy shifts of the past 25 years. Because they hosted county government jobs and services, these communities also retained several commercial services that they would not otherwise have been able to retain. These communities retained timber industry-related infrastructures such as sawmills or plywood plants. They also provide travel-related services for highways as well as a variety of high- and low-order amenities supporting nature-based tourism. They may also have been in proximity to larger metropolitan areas, enabling a large segment of the population to commute for work, but still enjoy the benefits of living in a smaller city, such as affordable housing. Their trajectory was continued, albeit slow, economic growth through diversification.

***Stevenson*—**Stevenson represented a diversified county seat community with mountain-forest amenities and a small wood-products manufacturing segment. The community's 25-year socioeconomic decline was slower than that of similarly sized forest-dependent towns within the NWFP area, likely buffered by its county government functions. Stevenson also benefited from its location on the Columbia River Gorge and its proximity to the metropolitan areas of Portland, Oregon, and Vancouver, Washington. These factors likely explain why Stevenson's economy appeared to be moving on from timber-dependence toward a more diversified economy.

However, Stevenson suffered from the loss of timber-industry related jobs that had yet to be replaced with jobs of similar wage levels. According to participants, the case study area went from supporting six sawmills to one. Stevenson also lost all of its logging contractors. The loss of the Forest Service Wind River Ranger District and Nursery was a large shock to Stevenson, leaving the case study area without a Forest Service presence. In 1997, the nursery closure alone resulted in the loss of 300 jobs. A majority of Stevenson participants pointed out that the community was severely limited in its physical growth potential owing to the high percentage of national forest in the area (89 percent of the case study area is in the Gifford Pinchot National Forest). This was also a factor that participants highlighted with respect to the limited-potential tax base and the loss of federal timber receipts to the county.

In spite of these losses, Stevenson's population mostly remained stable. Free and reduced-price meal-eligible students as a percentage of school enrollment had increased (from 35 to 44 percent) but remained near the average for the entire state of Washington (45 percent). The community had been developing its tourist-oriented infrastructure with the Skamania Lodge and the Columbia River Gorge Interpretive Center, both high-order amenities. However, participants noted that growth in this sector had not replaced the losses from the timber industry since service-oriented wages were much lower than timber industry wages. Stevenson had also developed its potential as a bedroom community for Portland and Vancouver. The town additionally supplies travel-related services along Highway 14 and the Wind River Highway. Along with the sawmill in Carson and the benefits of being the county seat, the Stevenson case study community had more or less adjusted to post-timber boom economic realities.

***Weaverville*—**Weaverville represented another diversified county seat community. This community undoubtedly felt social and economic effects of the declining timber industry during the 1990s. However, changes in school enrollment were negligible from 1999 to 2007, which suggested that prolonged NWFP-related outmigration was either not an issue in this case study, or demographic decline stabilized rather quickly. School enrollment began to drop in concert with the 2007–2009 recession but had since recovered. The school district showed low attrition (retaining 85 percent) of 1999 enrollment. The percentage of students eligible for free and reduced-price meals (68 percent) was also slightly below average for the state of California (76 percent), which suggested that poverty rates were not exceptionally different from the region. Nevertheless, participants did report demographic shifts associated with the loss of sawmill and timber faller jobs that represented family-wage jobs. Participants also reported the perception that the Forest Service was less involved in the community than in former times, mostly as a result of the Forest Service having fewer employees overall. In terms of loss of public sector funds, participants in Weaverville noted a loss of funds for education from state and federal sources. They also complained about the road closures on federal forest lands, some of which may be related to lack of funding to maintain the road network.

Paveglio et al.'s (2014) Wildland Urban Interface archetype schema places Weaverville as somewhere

between a "rural lifestyle community" and a "working landscape/resource dependent community." Rural lifestyle communities are those that have a diversity of resident types, such as amenity migrants; commuters; and people working in diverse industries, including the service industry, forestry, and manufacturing. Resource-dependent communities generally focus on the extraction and manufacturing of one type of resource (e.g., timber). Timber dependence continued to play a role in Weaverville, but its importance had diminished over the past 25 years, with the increase of commuting and the influx of amenity migrants.

Diversified timber-recreation amenity trajectory— Diversified timber-recreation amenity communities have continued to shift demographically but may have reached a point of economic stability. Demographically, they were aging. There were fewer and fewer families with school-aged children, and the majority of residents raised in the community out-migrated after high school graduation. However, the population deficit was superficially maintained by an influx of older, often retired amenity migrants. From an economic perspective, they typically retained at least one sawmill or wood products manufacturing facility. They were situated in highly aesthetic settings, which gave them considerable potential to develop tourist amenities. These communities had lakes, rivers, and mountains that they used to develop low-order recreational amenities to support hiking, climbing, mountain biking, fishing, or river running opportunities. They may also have had some potential to develop high-order amenities such as ski areas, music venues, lodges, and hot spring or golf resorts. They usually provided services to highway traffic passing through on the way to other tourist destinations. They were typically located close enough to metropolitan centers to serve as bedroom communities, and this proximity may have attracted some vacation homeownership. Vacation homeownership may have bolstered local economic activity in the form of service demand, but it also drove up home prices, making the communities less attractive as bedroom communities. Lastly, these communities were often attractive to professionals who could telecommute and to retirees looking for relatively affordable housing, rural lifestyles, and mountain-forest settings. These communities struggled to develop each of these economic opportunities and often faced additional challenges related to constraints on new construction, limitation of aging houses and infrastructure, and absolute limits on private property suitable for housing development.

***Darrington*—**Darrington remained on a trajectory of socioeconomic decline but showed promise for leveraging its mountain-forest surroundings toward a more diversified, nature-based amenity economy, while retaining its timber industry. According to participants, Darrington was hard-hit by the NWFP. Independent owner-operator logging companies were a cultural and economic backbone of the community. Outmigration of this class of people severely reduced the community's capacity to collectively solve problems and many community members continued to have negative attitudes toward the Forest Service and subsequently about the community's future. Mill closures and automation had also affected the community. The reduction in Forest Service employees notably affected the community's proportion of educated professionals. Reduced public sector budgets adversely affected the schools and limited the Forest Service's ability to maintain its aging road network.

Darrington's growth as a place for extractive natural resource use was partially limited by the lack of private lands and wilderness designation on the majority of adjacent national forest land. Another constraint was the short seasonality of its tourist attractions that are limited to only the drier summer months. Darrington had little potential for developing winter sports since the town itself receives very little snow and higher elevation areas nearby are predominantly undevelopable wilderness areas.

Nonetheless, Darrington's scenic setting, its rivers, and its location at the trailhead of premier wilderness in the North Cascades have provided several potential avenues for the community's economic development. Several of Darrington's community efforts have focused on leveraging these nature-based amenities. For example, the Glacier Peak Institute was an effort to build community capacity by empowering and developing local and regional youth through "action-based education," such as whitewater rafting trips. Building on its annual bluegrass festival, Darrington also began to develop and promote itself as a venue for summer music festivals. The Summer Meltdown music festival has been held at the Whitehorse Mountain Amphitheatre for the past 12 years, the same venue as the Darrington Bluegrass Festival. It was slated to return

summer 2019. Timber continued to play a role with an operating sawmill in Darrington.

Santiam Canyon—Santiam Canyon remained on a trajectory of marginal socioeconomic decline but showed some promise for developing recreation amenities, while maintaining a small to moderate timber- and restoration-based wood products industry. Participants in Santiam Canyon reported significant effects to the community from all five factors tied to timber dependence (fig. 5.6). This case study area experienced a significant demographic decline associated with the loss of owner-operators as well as mill-related jobs that were drastically reduced in number because of mill closure and automation. On their own, the upper canyon settlements of Idanha and Detroit would probably have fit more closely with the "low-amenity, mountain-forest trajectory" as the sawmills were closed and commuting distances and employment opportunities for attracting or retaining residents were limited. This loss of human capital was exacerbated by the reduction in Forest Service employees who represented a large segment of the college-educated, professional population. Schools in Idanha, Detroit, and Gates were closed and consolidated with Mill City. Businesses in every settlement were shuttered. Public services and utilities declined because of lack of funding and limited community capacity.

In addition to these problems, the quality of housing had failed to keep pace with that of the rest of the country. Development in the canyon was constrained by the lack of proper sewer and wastewater treatment plants. Aside from Mill City, the canyon's settlements used aging septic systems and future developments for tourist infrastructure, industry, and housing would require updated infrastructure. Climate change has shortened and warmed the winter season, exposing the area to increased risk for wildfires, something noted by many interviewees. The 2017 fire season was the worst one in the canyon's history. Warmer temperatures in summer 2018 caused a toxic algae bloom and forced the closure of the lake to recreation and also endangered downstream drinking water in the city of Salem.

Santiam Canyon had several low-order recreational amenities from which it could develop its potential as a service center for nature-based recreation as well as a bedroom and telework community for professionals with the desire to live close to mountains, forests, lakes, and rivers. Detroit Lake was an attraction for tourists and second homeowners, and Highway 22 (which runs through the canyon) was a well-traveled route between the Willamette Valley and the Bend area, including nearby ski areas. River rafting was another area attraction with at least one outfitter operating on the Santiam River. With two sawmills in Mill City and one plant in nearby Lyons, the timber industry continued to play a role in Santiam Canyon's economy. The "Save Our Bridge" initiative represented a recently successful collective action initiative to save an historic railroad bridge in Mill City. None of these social and economic prospects seemed likely to fully support Santiam Canyon nor restore it to its former condition. However, taken together, they may eventually curb the community's apparent economic and demographic decline. Nonetheless, because of the community's heritage, perceptions that the timber industry is Santiam Canyon's most viable economic trajectory will likely remain strong among some community members.

Gilchrist—The Gilchrist case study was only marginally on the trajectory of potential diversified mountain-forest community. Its marginality was, in part, related to the community's past as a company town and the fact that its socioeconomic decline was also only indirectly related to the NWFP. Because the timber industry in the Gilchrist case study community was historically tied to the Gilchrist Timber Company and its company-owned town, the community did not have a significant percentage of independent contractors. The dissolution of the Gilchrist Timber Company in 1991 and subsequent liquidation of remaining private timber holdings and sawmill represented a significant blow to the community. Jobs were lost, and many people chose to leave the community. Because of the autocratic nature of a company town, the company stood in for local government and collective action institutions—at least for the Gilchrist hamlet. In the 1990s, the timber company was the main employer and the company town was the center of gravity for the majority of social and economic activity within the case study area. Thus, the dissolution of the Gilchrist Timber Company left the entire case study area largely without substantial institutional support to guide and direct social and economic deployment.

The refurbishment of the sawmill in 1999 and 2000 provided a potential asset to the community, but job opportunities had yet to make a visible impact on the

case study area's economy. Instead, many mill workers commuted from other locations outside Gilchrist. Special forest products represented another significant economic activity in the Gilchrist case study. Recent years had seen a decline in permits issued for mushrooms and other special forest products, but these activities remained commercially significant.

Gilchrist's location along Highways 97, 58, and the Crescent Cutoff road, made it well-positioned to provide services to tourists on the way to Sunriver, Bend, Crater Lake National Park, and Eugene. As a testament to this, a Dollar General store recently opened in Crescent at the intersection of Highway 97 and the Crescent Cutoff road. Crescent and Crescent Lake were also logistically positioned to service tourists and outdoor recreationalists visiting the region's many lakes, hiking and ski trails, and the Willamette Pass Ski Area.

A large amenity-based development plan created by Fidelity National Timber Resources was put on hold following the 2007–2009 recession. The status of this resort (or any others) remained unknown, but the potential for this type of development existed. Development constraints in Crescent related to lack of infrastructure were recently resolved by the planned construction of a centralized sewage system and water treatment plant. Consequently, the case study area may soon welcome an influx of amenity migrants in the form of retirees and second homeowners. The community was also an affordable housing alternative to Bend and the surrounding area. The Gilchrist case study appeared to be following a trajectory similar to Santiam Canyon and Darrington in which timber industry, tourism, commuting, and amenity migrants will each play a role.

Natural resources trajectory—
Natural resources trajectory communities were in continued demographic and economic decline that may be tied to the decline of small-scale industry and agriculture in rural America, rather than to changes in federal forest policy or the timber industry more broadly. For example, they may have had high amounts of private industrial timberlands that buffered them from changes in federal forest policy, yet they were still experiencing socioeconomic decline. The wood-products manufacturing segment of their economy may still have been relatively active, but other shifts in the timber industry (such as automation) had led to outmigration and general economic decline. These communities may have had a relatively significant agricultural sector or may have had mining or other manufacturing industries that helped diversify the economy. A large segment of the population may have already been commuting for work and to access goods and services. Because these communities were positioned along well-traveled transportation routes (i.e., they were on the way to somewhere else), they had also managed to hold on to travel-related small businesses such as gas stations, convenience stores, restaurants, and motels, at least on their highway-facing roads. In these communities, tourism, second-home ownership, and retirement represented smaller potentials for growth.

***Riddle*—**The Riddle case study followed a diversified natural resources-dependent trajectory, but inarguably remained in significant socioeconomic decline. It was difficult to parse out the various causes of Riddle's socioeconomic decline, especially given that this small community retained five operating wood products manufacturing plants as well as a mining operation utilizing ore byproduct from the nickel mine. A major factor contributing to Riddle's decline was the closure of the Glenbrook Nickel Mine in 1993, a year before the NWFP, and then its smelter in 1998. In 1990, the company employed 230 workers.

Plant closure and layoffs (both temporary and permanent) associated with NWFP-related timber supply constraints as well as automation updates also heavily affected Riddle in the mid to late 1990s. Much of the housing and infrastructure in Riddle was aging and outdated, and interviewees reported that the quality of schools and other public services had declined because of federal timber dollars. The local tax base was limited as four of the five sawmills as well as the Green Diamond Products (mining operation) were located outside of the city boundaries. Study participants explained that few people who work at the mills actually live in town as better housing, services, and schools were found elsewhere. Participants suggested that Riddle's population had high unemployment and drug use, and that most residents who worked outside of town were employed at the Seven Feathers Casino in nearby Canyonville. However, several participants were optimistic about the potential for a renewal of storefronts and businesses in Riddle's small downtown.

Sawmills and wood products plants in Riddle had either updated their technologies or innovated to find a market niche. One mill continued to source large-diameter trees from as far away as Canada and northern California, allowing it to specialize in the milling of these types of trees. Riddle could potentially provide a home to mill workers in the future, especially with an update to housing and an increase in local services. The Green Diamond Sand Products mining operation had been extracting sand from Riddle's 15-million-ton ore byproduct reserves since 2002 and expanded and updated its operation in 2005. Another aspect that held promise for Riddle was the development of its Interstate 5 highway frontage, which was outside of the city limits, but inside the school district. Actual and potential developments included travel services as well as light industry that required access to the highway for the distribution of its products. Some of this development was already underway, with a Dollar General and other highway food and beverage services under construction in 2019.

***Myrtle Point*—**Myrtle Point was another example of a community following a diversified natural resources trajectory, but it has diversified in a different way than Riddle. It was primarily diversified through its agricultural sector, a constant presence since the town's settlement. The 10-year NWFP monitoring report described a situation where the wood products industry and the demographics of Myrtle Point were in tandem decline. For example, the report highlighted that school enrollment declined by 7 percent between 1990 and 2000. This demographic decline continued and even accelerated over the past 20 years. Since 2000, school enrollment in Myrtle Point has declined by 3 percent annually on average. By spring 2017, enrollment was 62 percent of its 2000 total. However, participants also reported an influx of retirees taking advantage of affordable housing opportunities. This in-migration may have helped to stabilize the overall population and its demand for goods and services, but the working-age segment of the population was narrowing.

It remained unclear whether the timber industry in Myrtle Point continued to decline since the 10-year report in 2004. The East Fork Lumber Company continued to operate its mill in Myrtle Point, creating a steady parade of logging trucks headed toward Coos Bay or Roseburg. Many timber-related services, such as JD Myrtle Saw Shop, were still in business. The prevalence of private timberlands in Myrtle Point may have contributed to some stability in timber supply over the past 15 years. Several Myrtle Point participants pointed out that timber supply might have been less of a limitation on the local wood-products industry than labor and milling infrastructure.

Although there were several shuttered restaurants and storefronts in Myrtle Point's downtown, major services such as the supermarket, hardware stores, banks, and auto parts stores remained open. According to our participants, nontimber forest products, such as salal and wild berries also continued to attract commercial attention. However, efforts to develop a nature-based tourist economy did not seem to have made much headway, and participants who mentioned it were not optimistic about the prospects of it growing the local economy.

Nonetheless, the community had several assets that it had continued to leverage. Timber from private lands had retained a small timber economy. For example, a small milling operation (Rose City Archery, Inc.) manufactured wooden arrows. Although dairying was not as large of an economic contribution as it once was, one dairy plant and several dairy farms remained in operation in Myrtle Point. Significantly, Myrtle Point served as a bedroom community for enterprises in Coos Bay. Myrtle Point's fate as a community seemed to be heavily tied to the Coos County economy generally, but more specifically to the socioeconomic trajectory of Coos Bay.

Low-amenity mountain-forest trajectory—Low-amenity, mountain-forest communities had not recovered from changes in the wood products industry that significantly affected their community. They no longer had any capacity for economic growth involving manufacturing because the infrastructure no longer existed and the workforce had moved on. These communities were often located in highly aesthetic settings, but they were in areas too far from larger metropolitan areas to support a large proportion of commuters or short-term visitors. They may also have lacked the infrastructure and amenities that retirees and professional telecommuters seek. As isolated, out-of-the-way communities, they were also not positioned along transportation corridors that demand travel-related services. Consequently, nature-based tourism in the form of resorts and recreation-support services was the only viable economic pathway for these communities.

***Lake Quinault*—**Because of its inherent geographic isolation, the Lake Quinault case study community had

followed the low-amenity, mountain-forest trajectory. The Lake Quinault community's narrow economic base positioned it for serious effects from NWFP implementation in 1994. The Olympic National Forest's annual timber output dropped from around 250 MMBF in the early 1980s to 10 MMBF in the late 1990s, a drop of 96 percent. The Quinault Ranger District had a staff of more than 100 people around 1980, but recent numbers showed a more than 90-percent reduction. The Quinault District merged with the Forks District to the north, and most of the remaining district employees, including the district ranger, were assigned to the Forks duty station. Many Quinault District employees and their families left the area in the mid to late 1990s, a loss that was keenly felt by the remaining community members.

Logging contractors based in the area needed to travel farther to find work, and competition for contracts increased with the loss of nearly all harvesting opportunities on the Olympic National Forest. Some operators were able to find work as subcontractors for logging operations on the nearby Quinault Reservation, which had adopted a commercial forest management plan around this same time. However, Lake Quinault was relatively isolated in comparison to other timber-based communities in Grays Harbor County, and its contractors were outcompeted by larger, more centrally located operators. A few Quinault owner-operators transitioned into road maintenance; others shut down altogether. There was never a large industrial sawmill in Lake Quinault, but there were many small-scale shake and shingle mills that sourced timber locally. However, changes introduced with the NWFP limited opportunities both for cutting green cedar and salvaging down cedar on the national forest. The decline in available material combined with market shifts forced most of these small mills to close.

Visitation to the area increased notably after about 2010, and Lake Quinault and the Lake Quinault Lodge represent significant high-order tourist amenities that keep the tourist economy alive. Lake Quinault is also in proximity to Olympic National Park and local businesses likely benefitted from national park visitors exploring the area. Beyond further development and promotion of these tourist attractions, prospects for socioeconomic development of the Lake Quinault case study area remained limited.

Happy Camp—The Happy Camp case study represented another community that, because of its geographical constraints, had followed a low-amenity, mountain-forest trajectory. Happy Camp experienced a significant timber industry-related demographic decline in the mid-1990s. Mill closures significantly affected this small forest-based community, and Happy Camp had not found alternative solutions for economic development. For a few years after the implementation of the NWFP and closure of the last remaining mill, local timber operators attempted to stay in business by traveling longer distances for harvests. Residents reported that this quickly proved to be unsustainable for operators, both because of the higher business costs and stress on their families. Interviewees expressed doubt that the community currently had much capacity to provide qualified workers if new timber-related businesses were to locate in town.

Multiple interviewees believe that a major cause of the community's continued struggle is the opioid epidemic that had hit local families hard in the past decade. They said that this issue was also exacerbated by an influx in the early 2000s of welfare recipients who were referred to the area because of its unusually low housing prices, although jobs were scarce. Wildfire activity increased exponentially in the past decade, with almost entirely negative health and economic effects on the community. The high percentage of socially vulnerable populations have made the threats from wildfire an even greater concern in Happy Camp.

The Karuk Tribe was in many ways an exception to the community's socioeconomic decline. The tribe has funded the expansion of tribal social services through grants, and some services were also available to nontribal members. For example, the tribe took over the faltering community clinic, the community's only basic health services. Interviewees generally agreed that the situation in Happy Camp would be worse without the tribe's presence. Although tribal government was primarily centered in Orleans, 50 miles to the southwest, it provided many social services in Happy Camp. This may have been because Happy Camp is centrally located between Orleans and tribal land in Yreka, where some tribal members reside, and where the tribe invested in a casino.

Two former mainstays of limited summertime economic activity, rafting and recreational dredge mining in the river, had disappeared. Fewer fishermen traveled to the area to fish the summer and fall steelhead runs than in previous

decades. Given the community's isolation and the dramatic shifts in the economics of the wood products industry in recent decades, it is difficult to envision a future that at all resembles the past. Community leaders were hopeful that new opportunities related to forest restoration, such as a biomass plant, would lead to a turnaround. However, they expressed doubt that the Forest Service will be able to consistently supply the material that such a plant would require to maintain operations.

Conclusion

In line with many rural communities across the United States, and in the Pacific Northwest more specifically (Isserman et al. 2009, Johnson 2006, Ulrich-Schad et al. 2013), 9 out of 10 case study communities in the NWFP area showed continued decline in socioeconomic well-being over the past 25 years. While this reflects national trends in rural, natural resource-dependent communities, our results show that community-level socioeconomic changes have not been uniform across the NWFP area. As we outline in this general technical report, the diversity in socioeconomic trajectories is evident across case study communities and the counties in which they are located. A significant portion of diversity in trajectories of change can be explained by the type and character of former timber dependence and relationships between each community and federal forest management agencies.

Even where commonalities exist between communities, changes have been differentially felt because of geographic and infrastructure contexts. These contexts determine each community's relative level of isolation from goods and services and the availability of natural and cultural tourist amenities. High-order tourist amenities that serve as visitor attractants are unequally distributed across the NWFP area. While natural amenities are fixed in place, they are also differentially supported by cultural amenities and services. In some cases, visitor infrastructure is badly in need of updates, but new development faces considerable regulatory or property-related barriers. Further, while some communities have retained wood-products manufacturing capacities, these communities have not necessarily escaped socioeconomic decline. Office consolidation and workforce reduction in federal forest management agencies have had negative effects on human capital and community capacity. The proliferation of low-wage jobs replacing higher wage and higher skilled employment opportunities has exacerbated the decline in community well-being.

Many of these findings for our 25-year monitoring align with findings from the 10-year monitoring effort (Charnley 2006) and the 2018 *Synthesis of Science to Inform Land Management Within the Northwest Forest Plan Area* (Charnley et al. 2018). In particular, our findings support the following for the NWFP area:

- Communities still feel negative impacts from changes in timber availability and harvesting on federal lands, and the loss of associated jobs, including federal land management agency jobs.
- Communities are still experiencing the loss of local family-wage forestry jobs.
- Communities are still facing challenges related to "sustaining themselves in a manner that links their local economy and culture to the natural resources that surround them, and to federal forest lands in particular." (Charnley et al. 2006).
- Overall, federal timber now plays a moderate to minor role in case study communities, as compared to 25 years ago.
- Relations between local community residents and Forest Service and BLM personnel are increasingly distant.
- Recreation and related amenity assets of national forest lands have influenced some changes in communities moving toward natural resources sectors other than timber.

Our findings in this report represent a complex situation, where—aside from the reduction in personnel at local forest management stations—we cannot completely untangle the effects of the broader social and economic forces on communities from any of the potential NWFP-specific effects. In the 25-year timeframe for our monitoring, the NWFP area, and rural communities in North America as a whole, experienced a variety of changes, such as the recession of 2008, increases in automation reducing manual labor jobs, decrease in federal agency employment and services, reduction in available social and mental health services, and rural populations moving to urban areas. Most of our interviewees recognized the complexity of the social and economic factors affecting their communities, and many noted that the changes they were describing (many of which were negative), were not necessarily directly attributable to the NWFP, but rather were a product

of these larger state, regional and national trends. In this sense, most of those we interviewed would not likely agree that it is the role of the federal forest managers to promote community stability. However, the community-scale and county-typology analyses we have conducted help to distinguish not just effects that can be attributed to the NWFP (in combination with other sources of change), but where and how they are most likely to occur in forest-based communities in the NWFP area (Coughlan et al. 2021). For example, communities with less diversified economies, or in more remote (fewer main roads or nearby amenities) areas, might be more susceptible to community changes, such as reduction of federal staffing or reduced school enrollment. Other key takeaways from our study that we feel can help inform forest policy, planning, and federal forest management include the following:

- Our findings show that different communities have different needs and potentials. Federal forest managers should not take a one-size-fits-all approach to community engagement. For example, county seat communities may have entirely different needs and expectations than communities following the low-amenity, mountain-forest trajectory. Finding the right kind and intensity of community engagement may require federal agencies to invest more human capital into local communities.
- Local community members welcome and appreciate the professional and personal investments and contributions of federal forest employees in their communities. Federal agencies may want to incentivize employees to live and invest in the communities where they work. Cultivating interpersonal relationships improves social capital and cohesion between federal agencies and local communities and has great potential to improve overall community well-being.
- Resilience to wildfire and other forest disturbances are extremely important to local communities. It is important that federal agencies do their very best to communicate the rationale for management actions and to highlight investments that they are making toward the promotion of socioecological resilience.

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Metric Equivalents

When you know:	Multiply by:	To find:
Miles	1.609	Kilometers
Acres	0.405	Hectares
Feet	0.305	Meters
Cubic feet	0.0283	Cubic meters
Inches	2.54	Centimeters
Tons	907	Kilograms
Pounds	0.454	Kilograms
Ounces	29.6	Milliliters
Degrees Fahrenheit	0.56 °F – 32	Degrees Celsius

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