

# A Socioeconomic Atlas for



## John Day Fossil Beds National Monument and its Region *2004*





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**A Socioeconomic Atlas  
for  
John Day Fossil Beds National Monument  
and its Region**

*by*

*Jean E. McKendry*

*Cynthia A. Brewer*

*Joel M. Staub*

*2004*

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## **Acknowledgments**

We would like to express our appreciation to the staff of John Day Fossil Beds National Monument for their enthusiasm and interest throughout this project, especially Superintendent Jim Hammett and John Fiedor, Chief of Visitor Services. We are also grateful to Pacific West Regional Director Jonathan Jarvis and Keith Dunbar, Team Leader for Planning and Partnerships, for their commitment. Funding from the National Park Service (NPS) Social Science Program and the NPS Recreational Fee Demonstration Program supported this project. In addition, the Peter R. Gould Center for Geography Education and Outreach at the Pennsylvania State University generously supported this project with systems administration and facilities.

## **About this Atlas**

This atlas is one in a developing National Park Service atlas series. The purpose of the atlas series is to show socioeconomic trends for regions around individual national park units. Pilot atlases were completed for Harpers Ferry National Historical Park, Joshua Tree National Park, Mount Rainier National Park, and Wilson's Creek National Battlefield. The potential to link these atlases to park planning, e.g., updating the General Management Plan, is being explored with a second series of atlases that began with the Blue Ridge Parkway.

After NPS produced the Blue Ridge Parkway atlas, atlases in the second series have been created in collaboration with the Department of Geography at the Pennsylvania State University. John Day Fossil Beds National Monument is

one of the atlases in the second series. For more information about the atlas series, contact Jean McKendry, National Park Service, 1849 C Street NW (3130), Washington, DC 20240 (jean\_mckendry@partner.nps.gov).

## **About the Authors**

Jean McKendry is Principal Scientist with the University of Idaho, College of Natural Resources. She is assigned to work with the National Park Service under a cooperative agreement. She serves as Principal Investigator/Project Manager for this atlas series.

Cynthia Brewer is an Associate Professor of Geography at the Pennsylvania State University. Her specializations are cartographic design and visualization. She manages production of the atlas series at Penn State.

Joel Staub is a Masters student in the Department of Geography at the Pennsylvania State University. He specializes in cartography and historical geography. He prepares data, maps, and graphs, and he edits text for the atlas series.

Final Version Date: 1/2005

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## **Preface**

Protection of the National Park System requires active and scientifically informed management. If park resources – both natural and cultural – are to be protected for future generations, the NPS must develop efficient ways to monitor the condition and trends of natural and human systems. Such monitoring must provide usable knowledge that managers can apply to the preservation of resources. And the NPS must share this information with surrounding communities, stakeholders, and partners to help them make important choices about their future.

Because of these reasons and more, the NPS has embarked on a significant initiative – the Natural Resource Challenge, an action plan for preserving natural resources and our country’s natural heritage within the complexities of modern landscapes (<http://www1.nature.nps.gov/challenge/index.htm>).

This atlas is one component in that effort. It is a tool for park managers, planners, community leaders, and others to use in addressing the challenge of preserving the natural and cultural resources of John Day Fossil Beds National Monument. Part of that challenge involves understanding conditions outside park boundaries – conditions which can have significant impacts on park resources. Systematic study and monitoring of regional conditions involves, to a large degree, investigation of human activities. This atlas focuses on such human activities, characterizing them in terms of standardized measures known as socioeconomic indicators.

The atlas can currently serve as an aid to management and planning, as a training tool, and as a means to facilitate public participation. It can be of long-term benefit by establishing baseline data for monitoring changing conditions and trends in the region. Through these and other potential uses, the atlas supports the critical goal of improving park management through a greater reliance on usable scientific knowledge, and contributes to meeting the Natural Resource Challenge.

Gary E. Machlis  
Visiting Senior Scientist  
National Park Service

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# Introduction

The purpose of this atlas is to provide park managers, planners, community leaders, and others with a better understanding of changing human activities and socioeconomic conditions in the region surrounding John Day Fossil Beds National Monument. These changes outside a park's boundaries can create complex park management challenges. Information about regional trends and conditions is needed in order to manage and conserve park resources – both natural and cultural – more effectively. This atlas provides such information in a series of maps, complemented by tables, other graphics, and explanatory text.

Maps are effective ways of conveying information. A map can highlight geographical patterns in data by showing the relationship between what is happening and where it is happening. For example, a map that shows a park's road network and also shows the locations of traffic accidents may indicate that certain sections of park roadway are particularly hazardous. Or a map that plots where park visitors come from might show that the park is popular with residents from a particular part of the region or the nation.

The maps in this atlas combine *contextual* information (such as boundary lines, roads, and key towns) with *thematic* information (such as demographic or economic statistics). This combination of contextual and thematic information helps the reader observe general trends inherent in the distribution of data. For example, a map that shows the population growth rate for each county in the park region may reveal that all of the highest growth rates are concentrated in counties south of the park.

Each map is designed to allow for easy comparison, so readers can see how conditions and trends in their own counties compare with those in other counties and relate to larger regional patterns. The consistent map design allows readers to make useful comparisons among two or more maps. For example, comparing maps of federal expenditures per person and poverty rates might reveal that federal expenditures tend to be higher in a region's poorer counties.

There are many potential uses for this atlas. For example, park managers can share the atlas with new park staff, regional staff, the media, or policy makers as a way of orienting them to the basic facts about the region. Planners can use the atlas to examine emerging trends outside the park and to prioritize actions to mitigate any anticipated adverse impacts on park resources. Local and regional leaders can consult the atlas to develop environmental policies that support park management goals while remaining responsive to local needs. Researchers can use the atlas to design studies that have practical benefit to park and ecosystem management. Additional uses are discussed in the atlas' concluding section, pages 76 - 77. Regardless of how it is used, the atlas can serve as a useful reference tool that adds to the body of usable scientific knowledge about John Day Fossil Beds National Monument and its surrounding region.

# Socioeconomic Indicators: Valuable Management Tools

## The Relevance of Human Activities to Park Resource Management

The management of park resources always requires attention to human behavior and activities. Protection of a threatened archaeological site can mean educating visitors about the Antiquities Act. Controlling non-native plant species can require close collaboration with park neighbors and volunteers. Preservation of scenic values can depend upon the monitoring of emissions from electrical generation plants several states away.

While there is an on-going and healthy debate about how to address this “human factor” in park management, a consensus has emerged about three basic principles:

- people are part of park ecosystems, and their needs and activities must be considered in management plans;
- park managers should be concerned with short and long-term trends, as well as the local, regional, and national consequences of actions; and
- where appropriate, decisions about park resources should be made collaboratively, including federal agencies, local governments, and citizens in the process.

Managing parks in accordance with these principles requires careful planning, for people have many competing needs.

Careful planning requires an accurate and objective assessment of current conditions as well as on-going trends.

Hence, understanding the social, cultural, and economic characteristics of the park region is crucial for successful park management.

## The Value of Socioeconomic Indicators

One approach to understanding social, cultural, and economic conditions and trends is to use *socioeconomic indicators*. Socioeconomic indicators are regularly collected economic or social statistics that describe or predict changes and trends in the general state of society. For example, the consumer price index (CPI) keeps track of changes in the price of a typical group of consumer goods. The CPI is used to monitor inflation, to compare the cost-of-living in one region of the country to another, and to support economic policy-making. Socioeconomic indicators can address historical trends, present conditions, or future projections.

An integrated set of socioeconomic indicators can be effective in presenting the “basic facts” about the people of a region. Such basic facts are important to park management, and can be used in many ways: assessing the potential impact of government policies, developing sound resource management strategies, designing effective interpretive programs, increasing public involvement in the planning process, and so forth. Like measures of water quality or wildlife populations, socioeconomic indicators enable managers and citizens to make scientifically informed decisions concerning public resources.

## The Integrated Set of Indicators

The indicators in this atlas are not simply a collection of various statistics displayed in maps, but an integrated set of indicators organized around broad areas of human activity that are of particular relevance to park management. The selection of a broad range of relevant indicators is important because the dynamics of human interaction on a regional scale are complex. For example, the growth of a new industry can influence a rise in immigration, which in turn can influence other human activities such as housing development. While industry, immigration, and housing are categorically different indicators, each one could be important for a park manager trying to anticipate growth issues that might impact park visitation or ecological systems.

The integrated set of indicators displayed in this atlas encompasses six general categories:

- *General population* indicators measure how many people live in a given area, where those people are concentrated, their ages, patterns of migration, and so forth. General population indicators provide a profile of the people who are neighbors to the park and potential partners in park management.
- *Economy and commerce* indicators measure the flow and distribution of money, materials, and labor. Economy and commerce indicators provide an overview of the interdependent economic relationships among people, businesses, industries, and government within the park region.
- *Social and cultural* indicators measure aspects of personal and group identity such as cultural origin, political and religious beliefs, health, and language. Social and cultural indicators provide insights into the varying perceptions and expectations that people bring with them when they go to their place of work, participate in a public meeting, or visit a park interpretive site.
- *Recreation and tourism* indicators measure activities specifically related to the provision of accommodations, entertainment, and personal services. Recreation and tourism indicators provide a way to analyze the economic role that travelers, vacationers, and other recreationists play in the region surrounding the park, which is itself closely linked to the recreation/tourism sector.
- *Administration and government* indicators measure the structure, resources, and actions of government organizations. Administration and government indicators provide an orientation to the role of government – local, state, and federal – in the park region.
- *Land use* indicators measure the interactions between people and terrestrial resources such as land, water supply, and vegetation. Land use indicators provide a way to gauge the impact of human activities such as farming, forestry, and urban development upon ecosystems within the park region.

## Selecting Specific Indicators

Drawing from the six general categories of socioeconomic indicators described above, a menu of 67 socioeconomic indicators was developed. Each indicator was determined to be readily available and mappable at the county level. From this menu, 17 *core indicators* were selected that would be common to all atlases published in this series. The core indicators provide information useful to all park managers. Incorporating these core indicators throughout the series of atlases enables park managers to make comparisons among parks in different regions of the country. John Day Fossil Beds National Monument staff chose additional indicators from the menu described above. Park staff selected these indicators to customize the atlas so that it would target information relevant to their particular management needs. Figure 1 shows the six general categories and the specific indicators included in this atlas; for each category, indicators are listed in the order they appear in the atlas.

The maps in this atlas are based on county-level data wherever possible. County-level data have several advantages. Good quality data are available at this scale, consistently collected at regular intervals, and comparable across all U.S. counties. Also, counties are stable geographic units for monitoring trends, as little change in county boundaries occurs over time. Finally, as administrative and political units, counties significantly influence environmental change and can be important partners in park management.

## Technical Notes

Appendix 1 provides the data sources for the indicators presented in this atlas. Appendix 2 provides technical information on the design of the maps. Appendix 3 includes endnotes and text that provide additional information on the measurement of selected indicators.

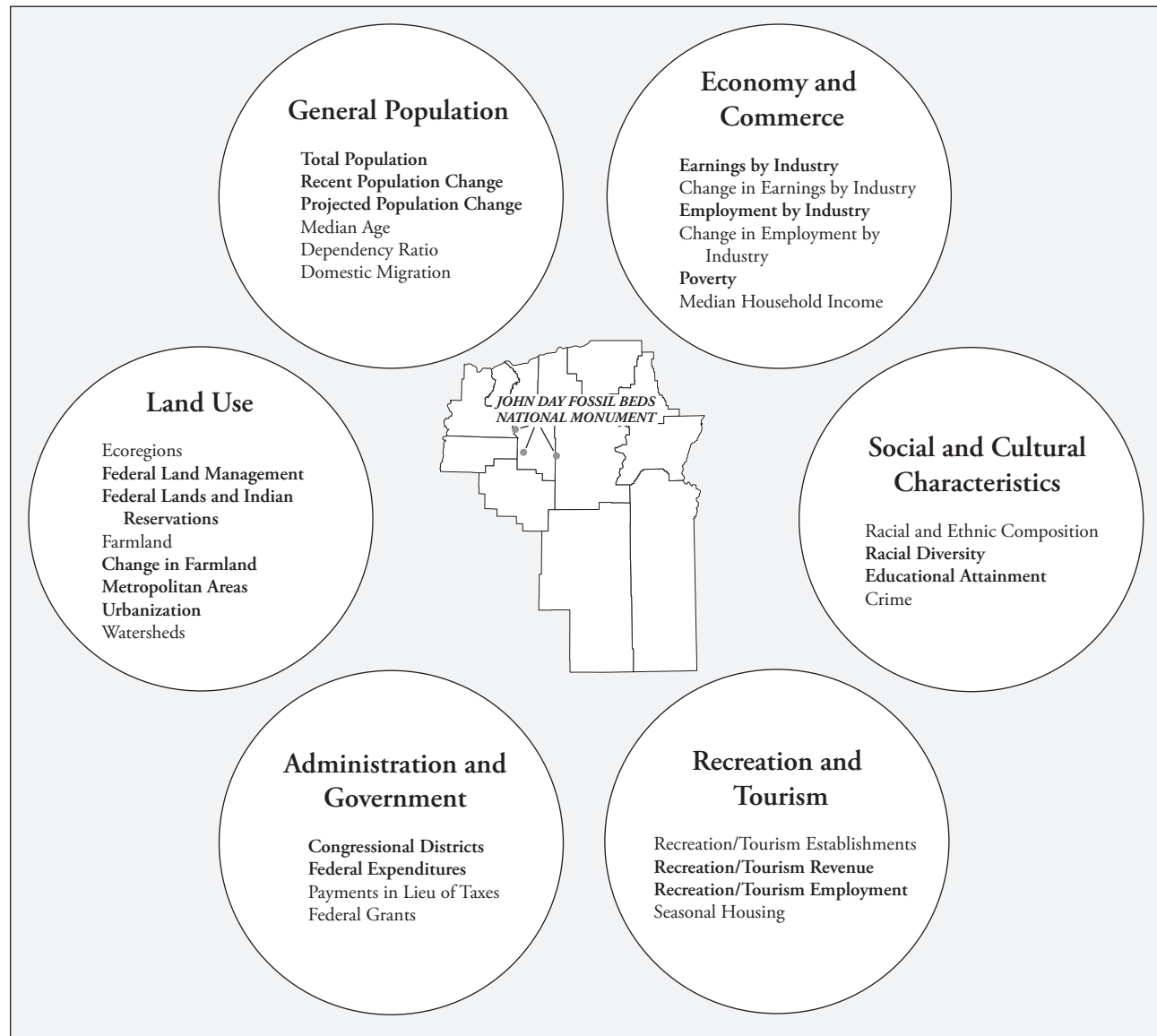


Figure 1. Indicators Included in this Atlas

core indicator    additional indicator

## The Region

In selecting the boundaries of the region of interest covered by this atlas, John Day Fossil Beds National Monument (NM) staff were asked to define the geographic area that has the most significant impact on the park's management. Because the atlas relies on county-level socioeconomic data, the region of interest was restricted to entire counties, rather than parts of counties. The region selected includes most of Oregon east of the Cascade Mountains, represented by a total of 13 counties. The map on the facing page depicts the region in its larger context.

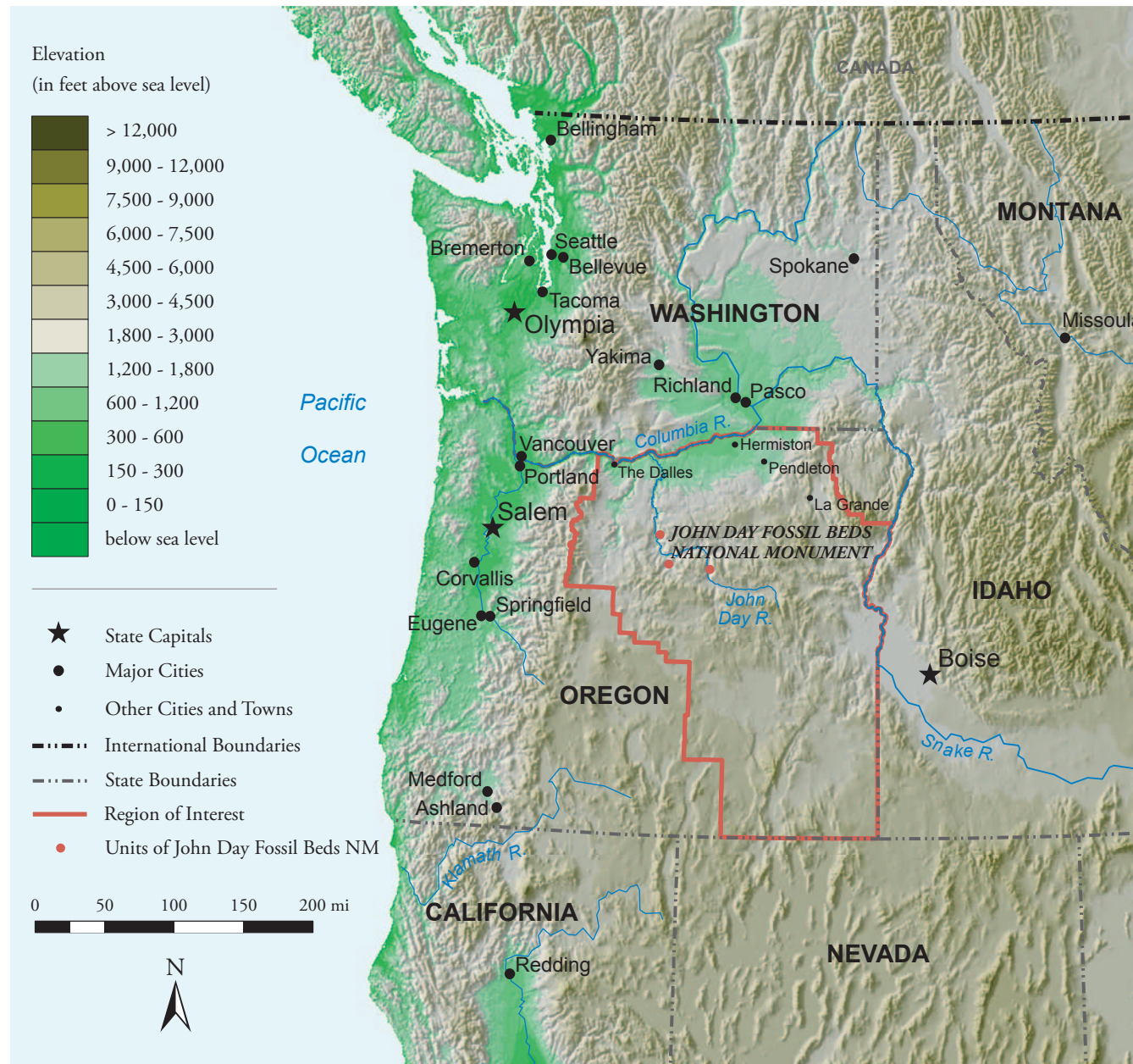
John Day Fossil Beds NM comprises three widely separated units – Sheep Rock Unit, Painted Hills Unit, and Clarno Unit – located in the central portion of eastern Oregon in the John Day River Basin. The John Day River is a major tributary of the Columbia River and the longest undammed river that flows into the Columbia. The National Monument is situated approximately 100 miles southwest of Pendleton and La Grande. The northern boundary of the John Day Fossil Beds NM region is the state border with Washington, with the Columbia River forming part of this border. Idaho borders the region to the east and Nevada to the south. The Columbia Plateau, a large, geologically interesting area formed by lava flowing out of fissures in the Earth's surface, extends into Washington and covers most of the northern portion of the region. The Plateau is dissected by river canyons, and crossed by the Blue Mountains in the northeastern portion of the region. The southern portion, called the Basin and Range Region, includes the northern reaches of the Great Basin and is composed of desert and semi-desert areas characterized by high basins and scattered steep mountains.

Covering almost half the area of the state of Oregon, the region contains just 5% of the state's population. The region is predominantly rural with a few towns and small cities. White people dominate the racial composition of the area; however, there are sizable populations of people whose ethnicity is Hispanic and Latino and other minority populations. The area was first used and settled by American Indians. Successive settlers included Basque sheepherders, Euro-Americans, and Japanese-American farmers. Settlers were attracted by potential economic gain from logging, farming, ranching, and mining. All but mining are still important resource activities in the region. Major agricultural products include onions, watermelon, potatoes, apples, pears, grains such as wheat, and beef. The area around Pendleton is renowned for its wool products.

Recreation-related tourism is becoming increasingly more important in the region. The John Day River has 147.5 miles designated as Wild and Scenic River. Hundreds of species of birds may be found in the region; migratory birds rely on its shallow lakes during their travels. Hunting, fishing, camping, and hiking are important activities throughout the region. The Umatilla and Malheur National Forests attract tourists, as does the Malheur National Wildlife Refuge.

In addition to John Day Fossil Beds NM, this region contains parts of other national park units including the Lewis and Clark National Historic Trail and the Oregon National Historic Trail.

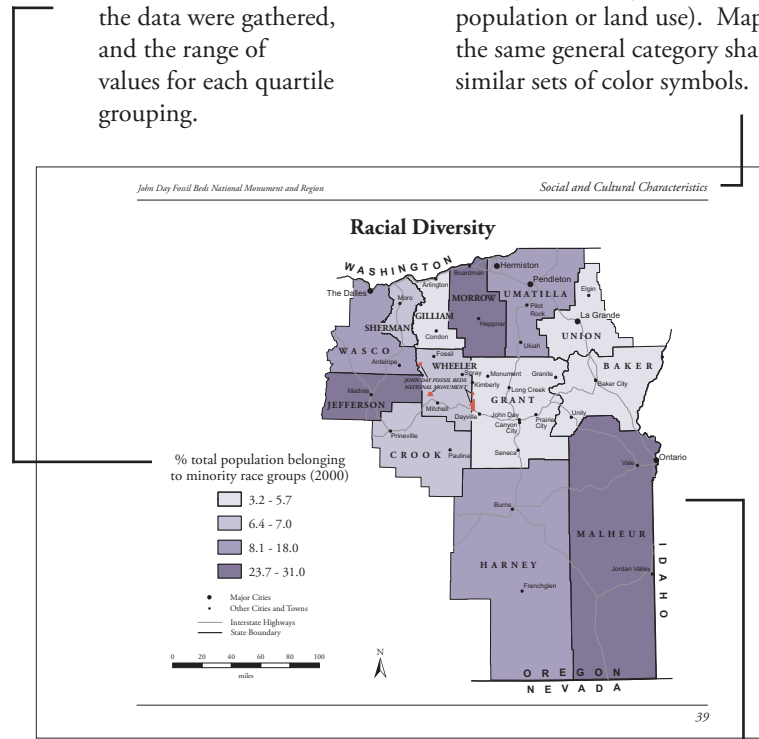
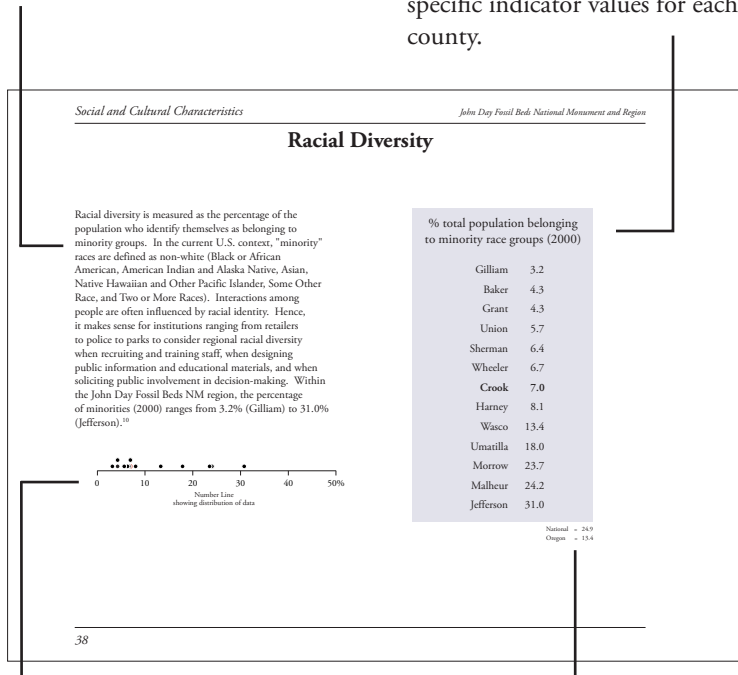
# John Day Fossil Beds National Monument and its Region



# Using the Socioeconomic Indicators and Maps

The socioeconomic indicators for the John Day Fossil Beds National Monument region of interest are presented in a series of maps. The best available county-level data are presented for each indicator. The following information is provided for each indicator:

- a brief description of the socioeconomic indicator and an observation about the spatial variation in the data as displayed on the map.
- a table that shows the data and relative rank for each county. The median value is highlighted in bold. The table allows the reader to look up and compare specific indicator values for each county.
- a map legend describing how the indicator is measured, the year that the data were gathered, and the range of values for each quartile grouping.
- the name of the general category to which this particular indicator belongs (such as general population or land use). Maps in the same general category share similar sets of color symbols.



- a number line that shows the distribution of values for the indicator, useful in understanding patterns in the data. The median value is represented by a red dot.
- a section displaying national and state data that can be compared with regional county data.
- a map that displays general patterns inherent in the data. For most indicators, counties are grouped into four classes that correspond to four sub-ranges of data values. These groups are called quartiles. The highest-ranked quartile receives the darkest shading. For more information on quartile classification, see Appendix 2, page 83.



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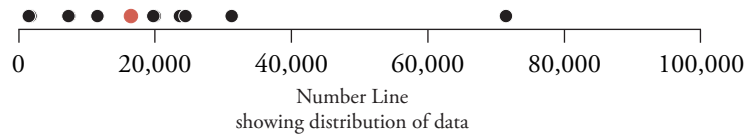
# The Socioeconomic Indicators



# Total Population

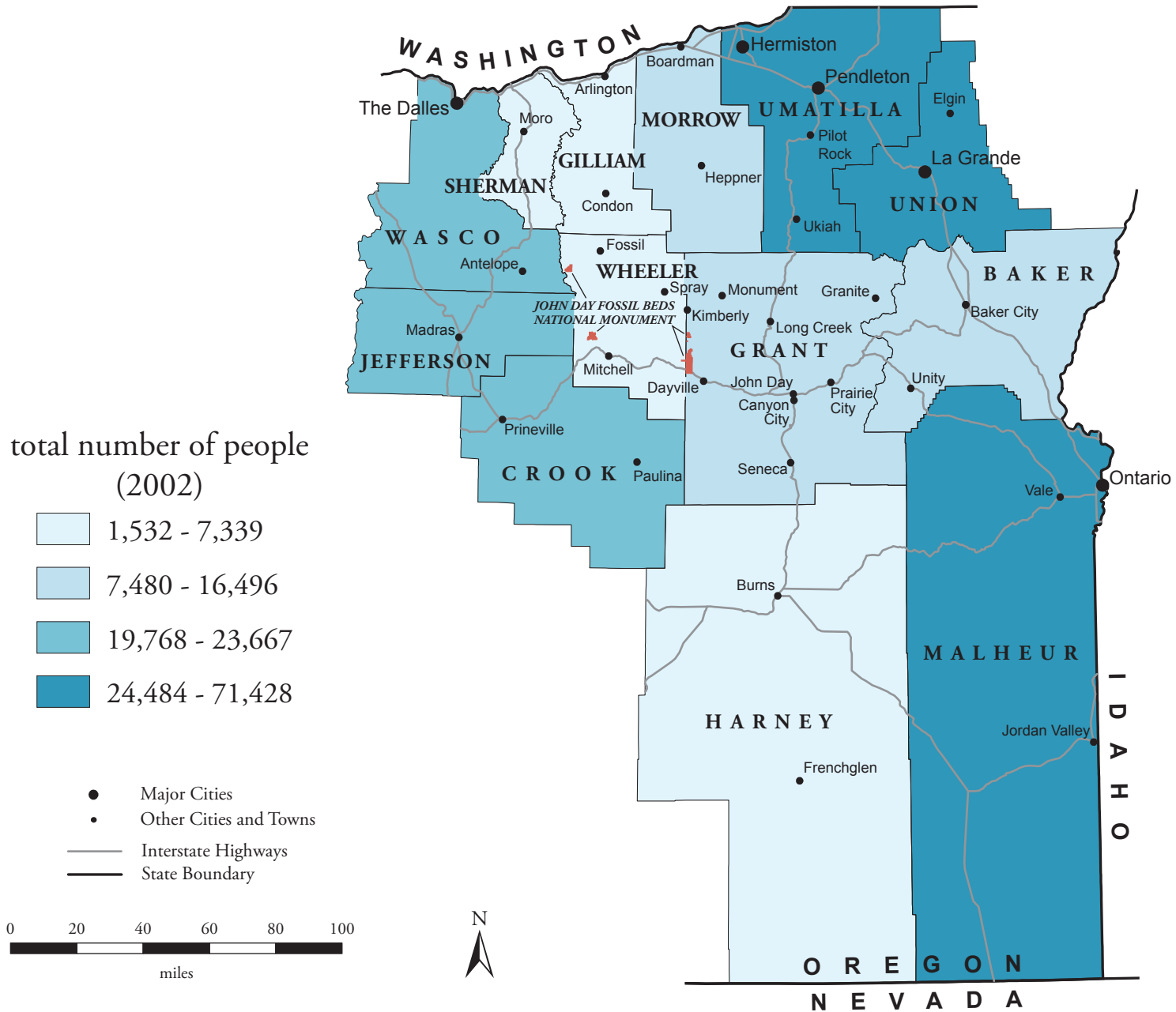
Population size is one of the most important influences on the character of human activities in a place and a key influence on resource use. People bring labor, knowledge, and economic activity to a place. At the same time, they generate demand for natural resources, goods, and services ranging from food to recreational opportunities. Within the John Day Fossil Beds NM region, county population (2002) ranges from 1,532 (Wheeler) to 71,428 (Umatilla).<sup>1</sup>

total number of people (2002)	
Wheeler	1,532
Sherman	1,784
Gilliam	1,842
Harney	7,339
Grant	7,480
Morrow	11,585
<b>Baker</b>	<b>16,496</b>
Jefferson	19,768
Crook	19,999
Wasco	23,667
Union	24,484
Malheur	31,248
Umatilla	71,428



National = 291,890,213  
Oregon = 3,521,515

# Total Population



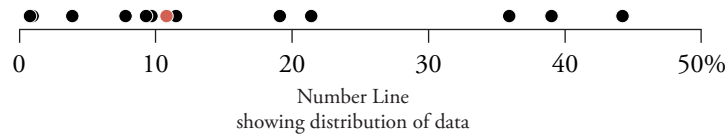
# Recent Population Change

Measuring recent population change provides an indication of the extent to which population change is influencing current local or regional priorities. For example, population growth changes the tax base, adds new voters, and can increase demand for services ranging from schools to transportation to outdoor recreation. Within the John Day Fossil Beds NM region, the recent increase in county population (1990 - 2000) ranges from 0.8% (Sherman) to 44.2% (Morrow).

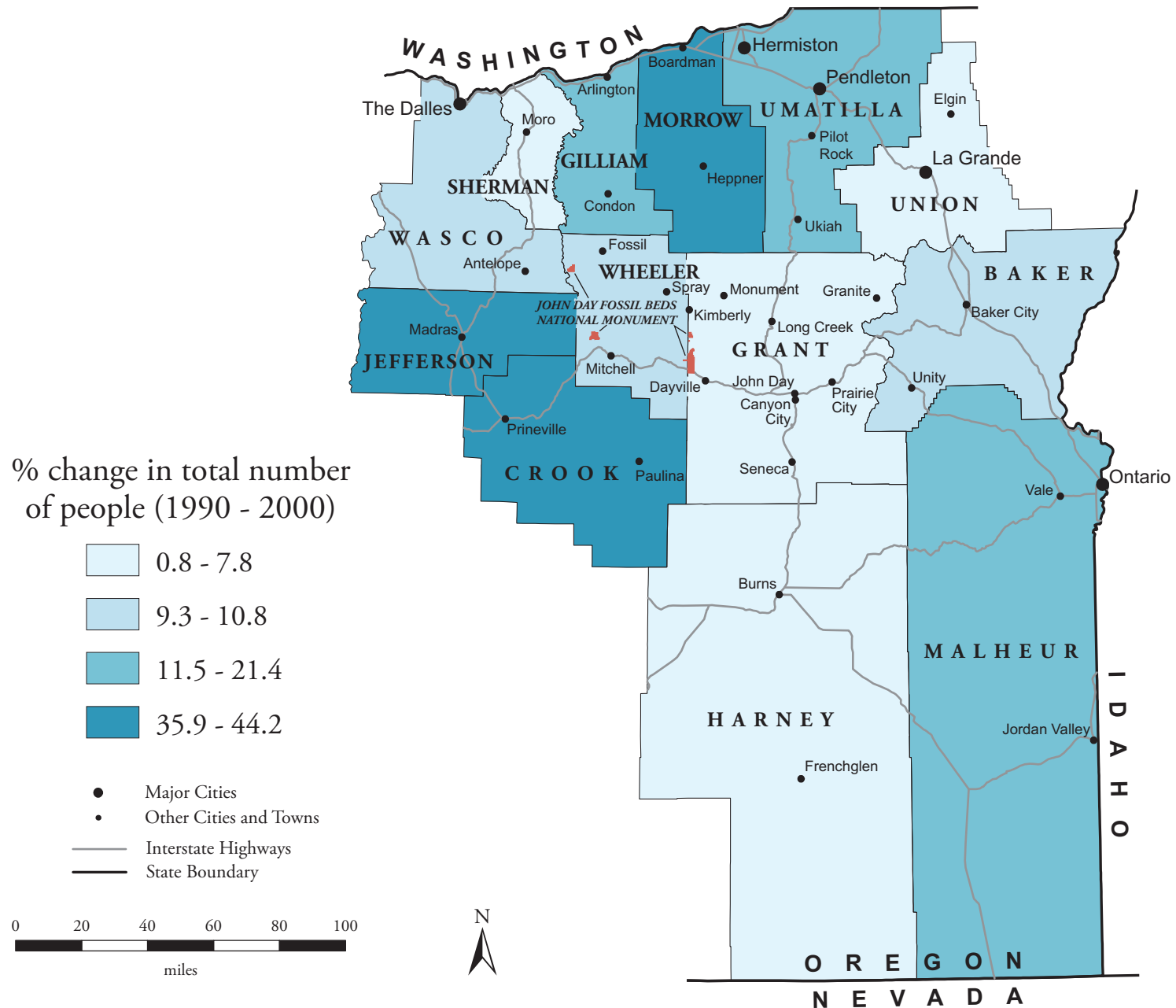
## % change in total number of people (1990 - 2000)

Sherman	0.8
Grant	1.0
Union	3.9
Harney	7.8
Baker	9.3
Wasco	9.7
<b>Wheeler</b>	<b>10.8</b>
Gilliam	11.5
Umatilla	19.1
Malheur	21.4
Crook	35.9
Jefferson	39.0
Morrow	44.2

National = 13.2  
Oregon = 20.4



# Recent Population Change



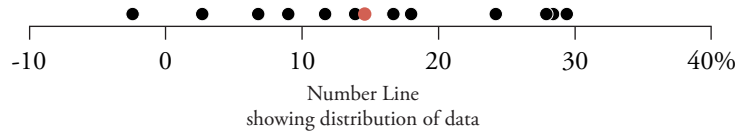
# Projected Population Change

Population projections can be made with some accuracy for short and mid-range time spans. Projections can help planners anticipate potential impacts on park resources. For example, population growth can generate changes in land use and transportation, growth of new and existing communities, and increases in the demand for park experiences. Within the John Day Fossil Beds NM region, the projected increase in county population by the year 2020 ranges from a decrease of 2.4% (Sherman) to an increase of 29.4% (Morrow).<sup>2</sup>

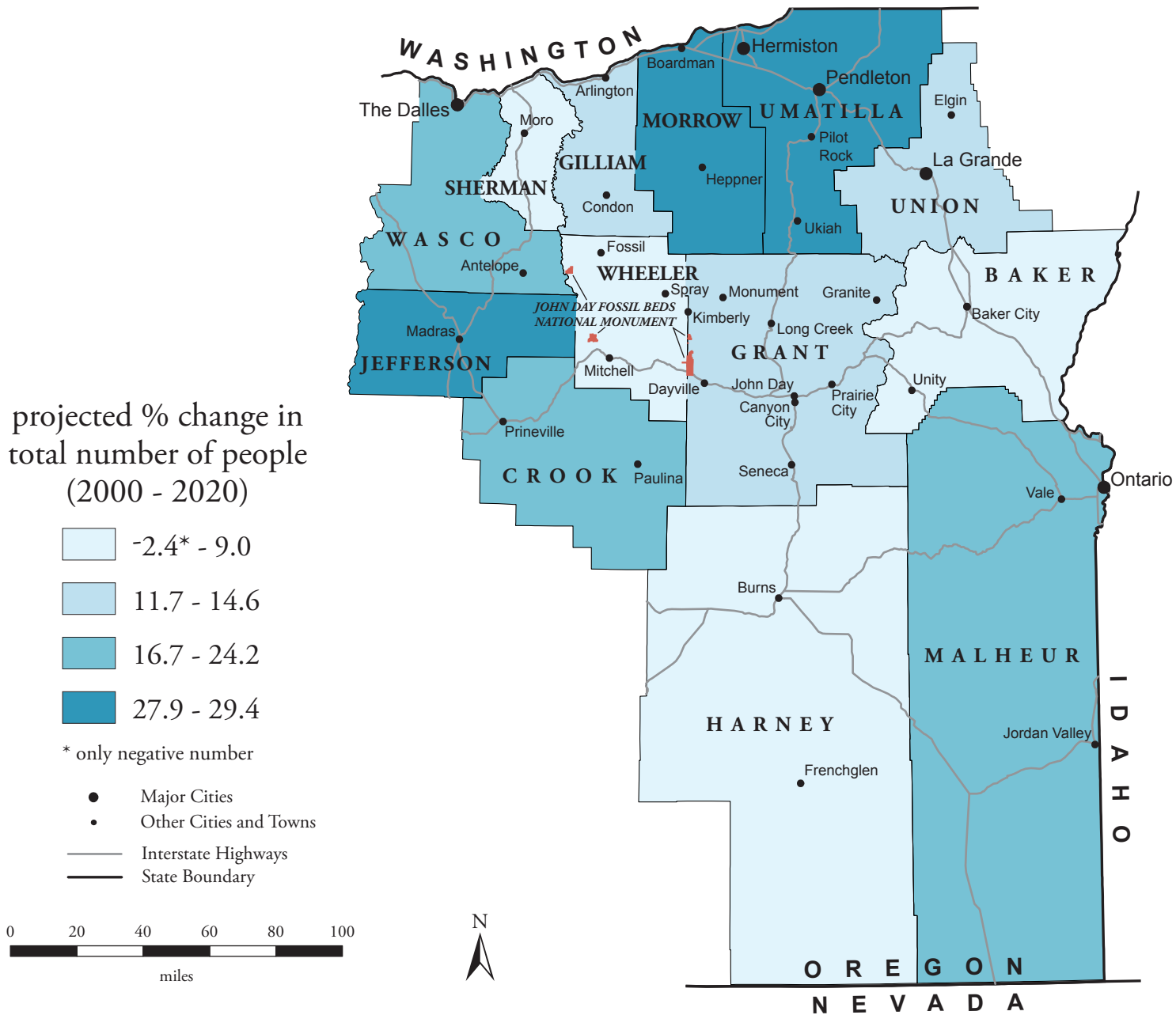
projected % change in total number of people (2000 - 2020)

Sherman	-2.4
Wheeler	2.7
Baker	6.8
Harney	9.0
Union	11.7
Grant	13.9
<b>Gilliam</b>	<b>14.6</b>
Wasco	16.7
Malheur	18.0
Crook	24.2
Jefferson	27.9
Umatilla	28.4
Morrow	29.4

National = 21.1  
Oregon = 30.0

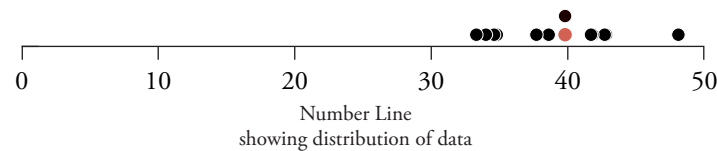


# Projected Population Change



# Median Age

Median age expresses the age of a “typical” county resident for whom half the population is older and half is younger. Just as age is an important influence on individual behavior, the median age of a county’s population can influence its character in many ways. For example, a relatively young county population might place a higher priority on schools, while a relatively old county population might place a higher priority on health care. Within the John Day Fossil Beds NM region, the median age of total population (2000) ranges from 33.3 (Morrow) to 48.1 (Wheeler).



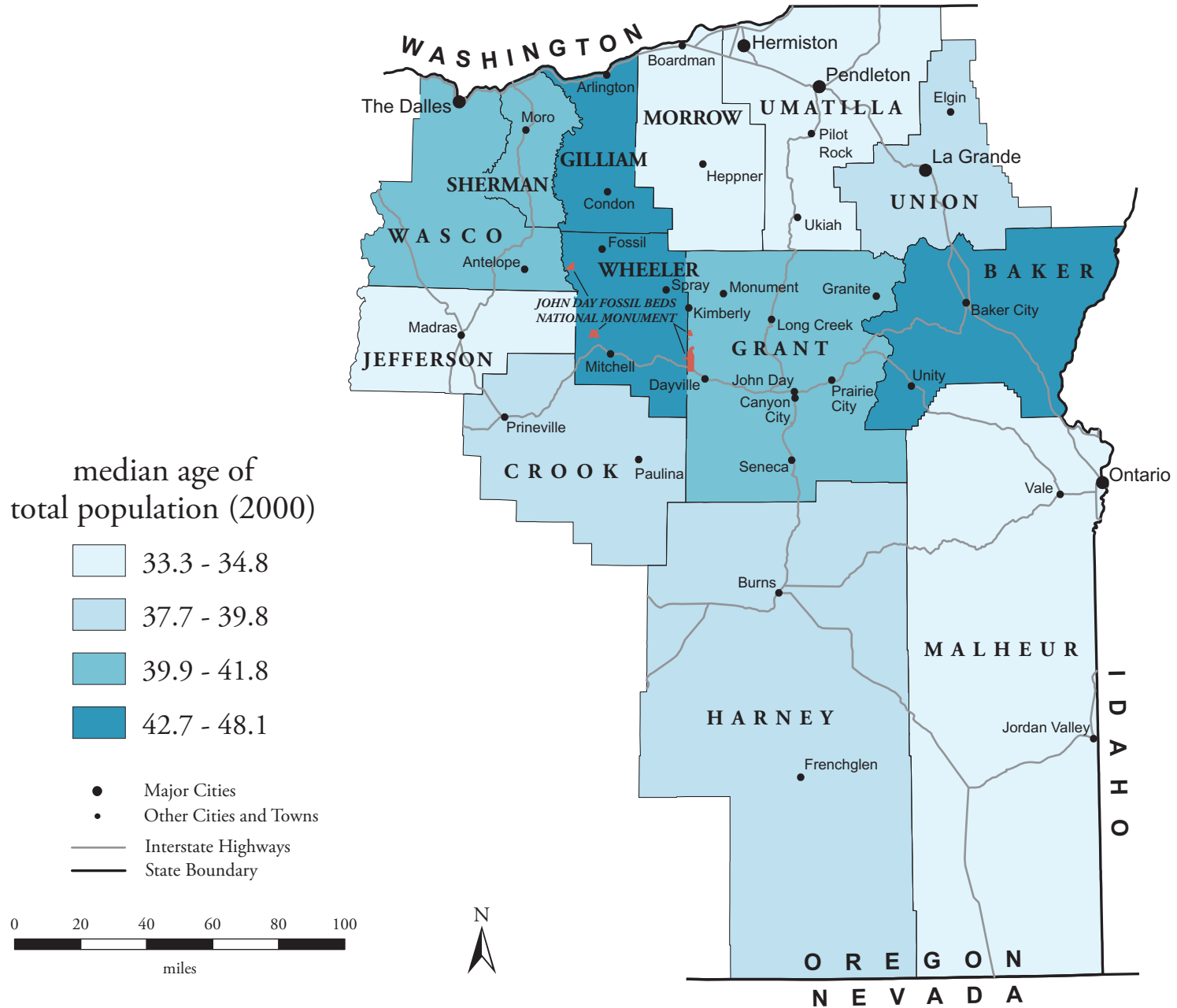
## median age of total population (2000)

Morrow	33.3
Malheur	34.0
Umatilla	34.6
Jefferson	34.8
Union	37.7
Crook	38.6
<b>Harney</b>	<b>39.8</b>
Wasco	39.9
Grant	41.7
Sherman	41.8
Baker	42.7
Gilliam	42.8
Wheeler	48.1

National = 35.3  
Oregon = 36.3

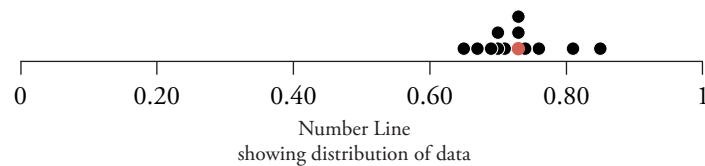


# Median Age



# Dependency Ratio

The dependency ratio generally compares the non-working age population (youths and elderly) to the working age population. A dependency ratio of 0.6, for example, means that there are 6 dependents for every 10 working-age people. A high dependency ratio may indicate the need for social infrastructure ranging from schools and teachers to health care facilities. At the same time, a high dependency ratio may point to an age structure that constrains a tax base needed to support such infrastructure. Interestingly, counties with a high dependency ratio may have populations on both ends of the age spectrum with significant time and flexibility to visit a park during off-peak periods, such as during the week and after school. Within the John Day Fossil Beds NM region, the dependency ratio (2000) ranges from 0.65 (Union) to 0.85 (Wheeler).

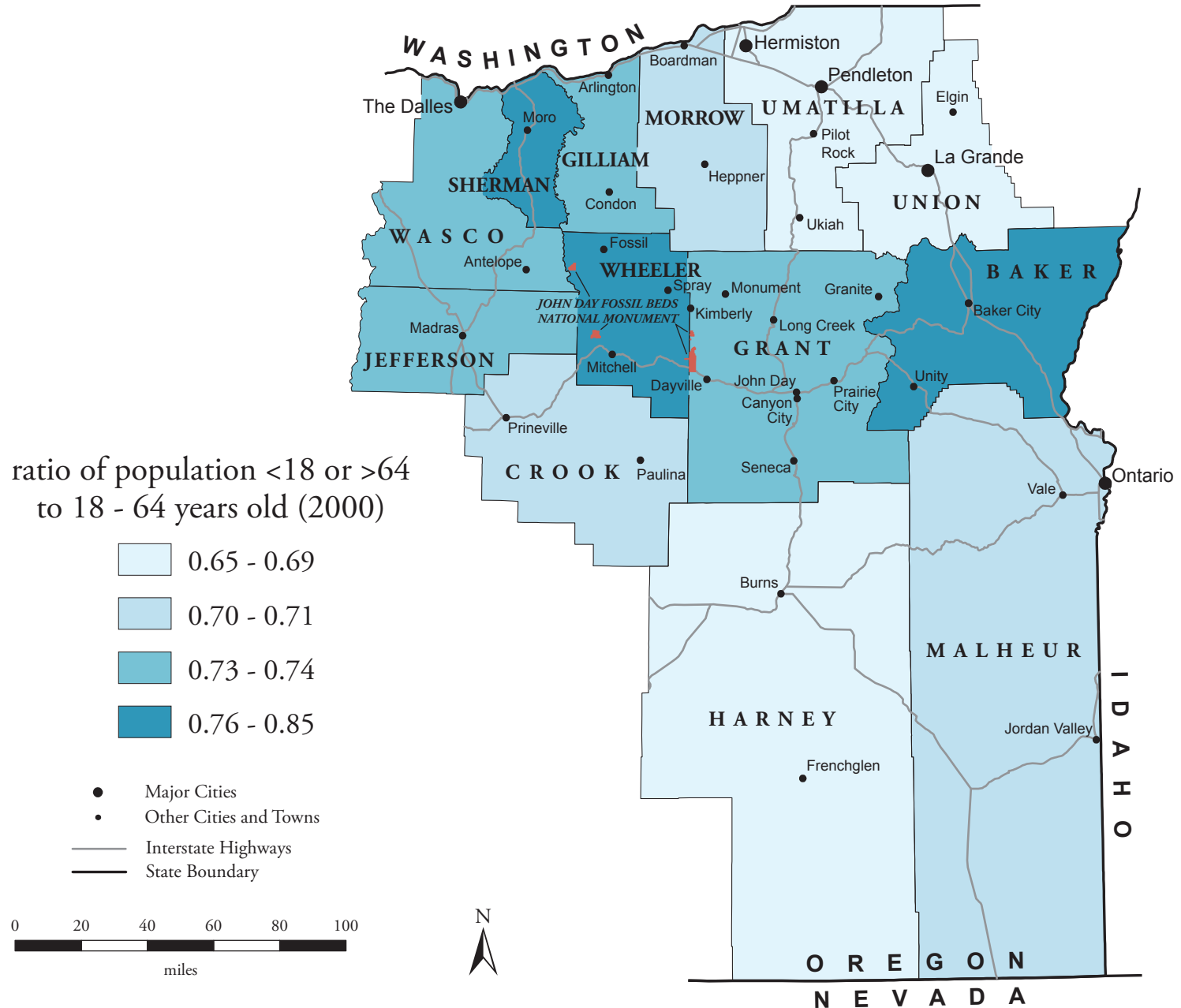


ratio of population <18 or >64  
to 18 - 64 years old (2000)

Union	0.65
Umatilla	0.67
Harney	0.69
Crook	0.70
Malheur	0.70
Morrow	0.71
<b>Gilliam</b>	<b>0.73</b>
<b>Jefferson</b>	<b>0.73</b>
<b>Wasco</b>	<b>0.73</b>
Grant	0.74
Baker	0.76
Sherman	0.81
Wheeler	0.85

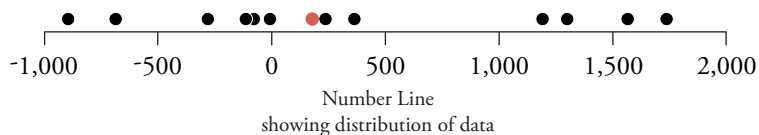
National = 0.62  
Oregon = 0.60

# Dependency Ratio



# Domestic Migration

Domestic migration measures the net movement of U.S. residents into or out of a county. These indicators provide a way of monitoring whether a county is attracting new residents or losing current residents. Factors that can encourage migration into a county include new industry, recreation or retirement offerings, and suburban development. Out-migration may occur when employment opportunities in an area are reduced or when opportunities elsewhere are more attractive. Domestic migration into the park region can have significant impacts for park management, such as increased visitor use, development pressure on adjacent lands, and new challenges for protecting thematically-related cultural landmarks or natural resources in the park region. Out-migration may reduce demands on park resources. Within the John Day Fossil Beds NM region (1995 - 2000), 6 counties experienced net out-migration, and 7 counties experienced net in-migration. These changes ranged from a loss of 894 people (Union) to a gain of 1,736 people (Jefferson).<sup>3</sup>

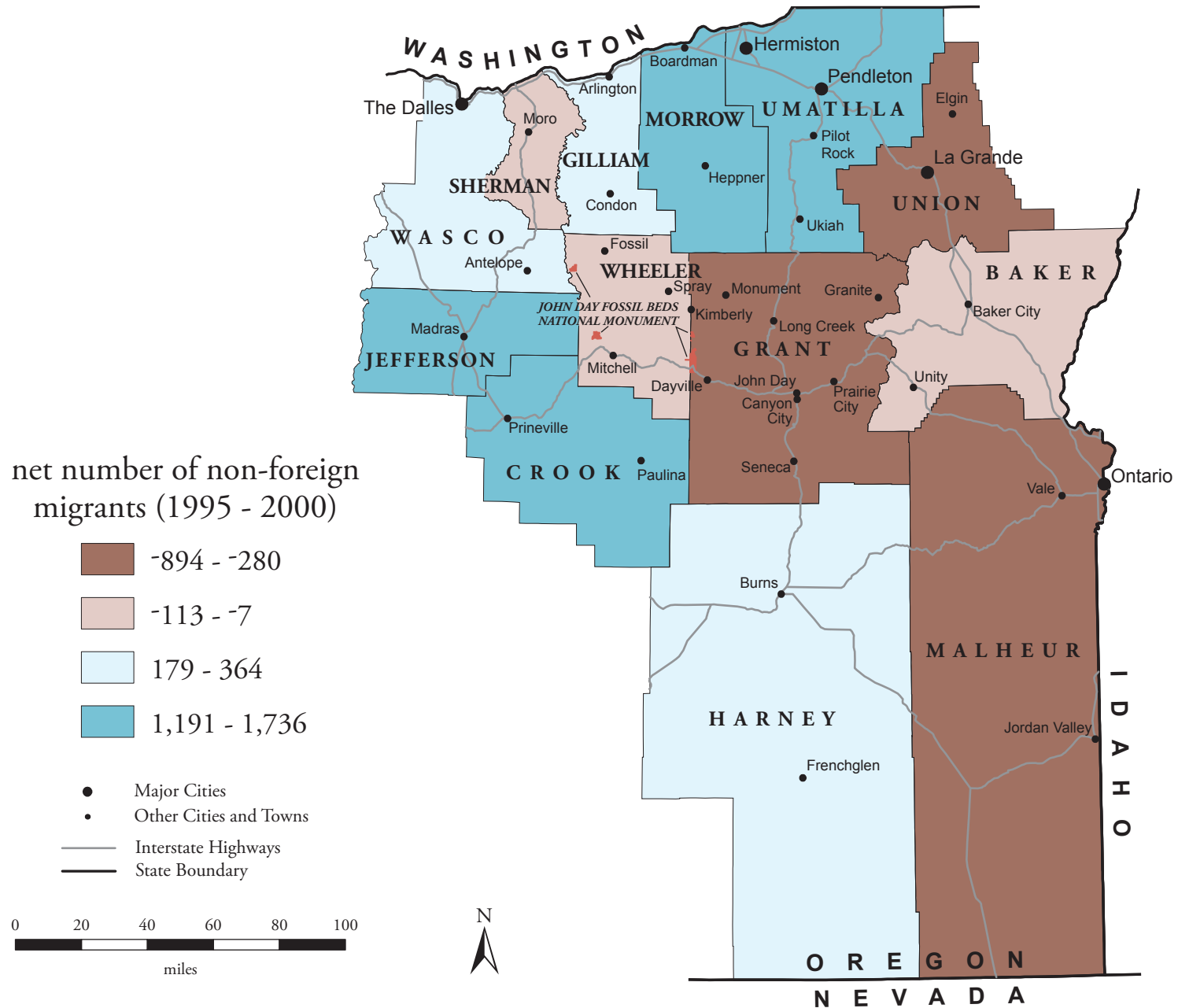


## net number of non-foreign migrants (1995 - 2000)

Union	-894
Grant	-685
Malheur	-280
Baker	-113
Sherman	-78
Wheeler	-7
<b>Gilliam</b>	<b>179</b>
Harney	237
Wasco	364
Morrow	1,191
Umatilla	1,299
Crook	1,565
Jefferson	1,736

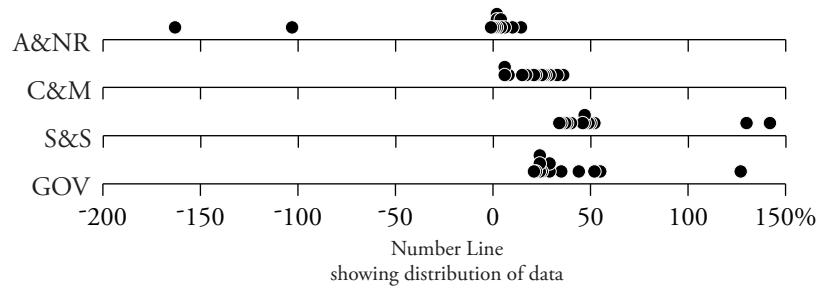
National = 0  
Oregon = 74,665

# Domestic Migration



# Earnings by Industry

Earnings by industry are indicative of the overall size of a local economy as well as the relative importance of each major industrial sector within that economy. The diversity of economic activities in the region presents an array of challenges to park management. For example, relatively mobile industries such as light manufacturing or financial services may be concerned with land costs and tax rates, whereas natural resource dependent industries such as farming or mining may be concerned with land use regulations and other environmental policies. In calculating the percentage of total earnings by industry, negative values reflect economic losses in sectors in 1999 that are offset by earnings in the other sectors during the same year. Within the John Day Fossil Beds NM region (1999), the leading sector of earnings in 10 of the 13 counties is sales and services. The second-ranking sector is the government.<sup>4</sup>

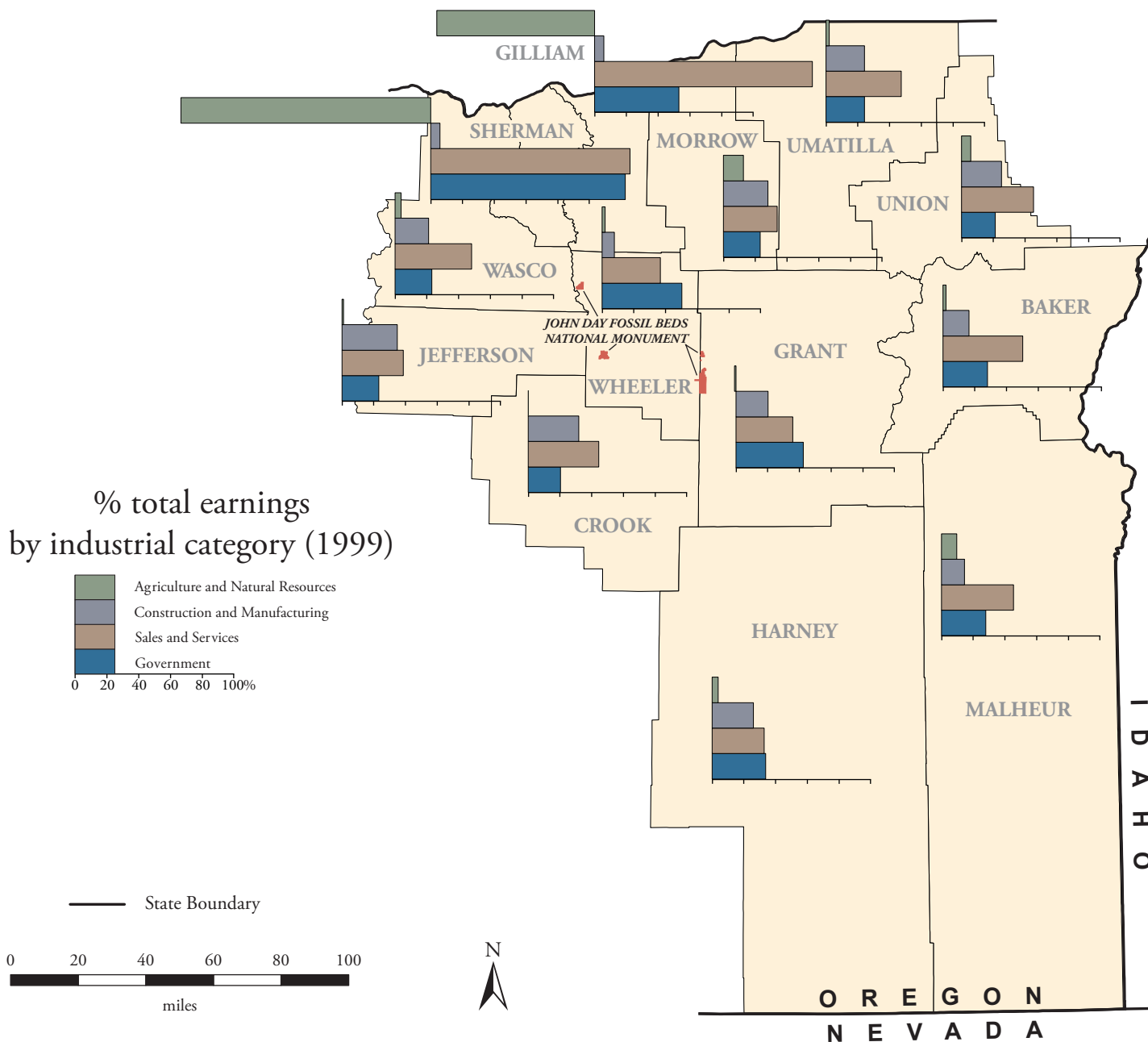


A&NR = Agriculture and Natural Resources  
 C&M = Construction and Manufacturing  
 S&S = Sales and Services  
 GOV = Government

Percentages may not add to one hundred due to rounding.

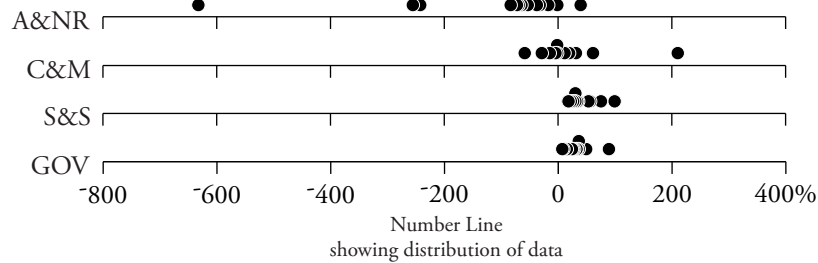
	% total earnings by industrial category (1999)			
	A&NR	C&M	S&S	GOV
Baker	2	17	52	29
Crook	0	33	46	21
Gilliam	-103	6	142	55
Grant	-1	21	37	44
Harney	4	27	34	35
Jefferson	1	36	40	24
Malheur	10	15	47	29
Morrow	13	29	35	24
Sherman	-163	6	130	127
Umatilla	6	26	47	22
Union	2	25	49	25
Wasco	4	22	50	24
Wheeler	2	8	38	52
National	2	22	60	16
Oregon	3	25	56	16

# Earnings by Industry



# Change in Earnings by Industry

Change in earnings by industry may be indicative of the overall growth, stability, or decline of a local economy. In addition, an industrial sector that shows significantly increased (or decreased) earnings relative to other sectors may reveal a local economy that is undergoing some restructuring. Changing economic activities within a region can have an impact on land use, migration of people in response to changes in jobs and services, and other livelihood concerns. Understanding trends in the economic activities can assist park managers in being responsive to change. Within the John Day Fossil Beds NM region (1990 - 1999), the agricultural and natural resources sector had the largest losses in 11 of the 13 counties.<sup>5</sup>



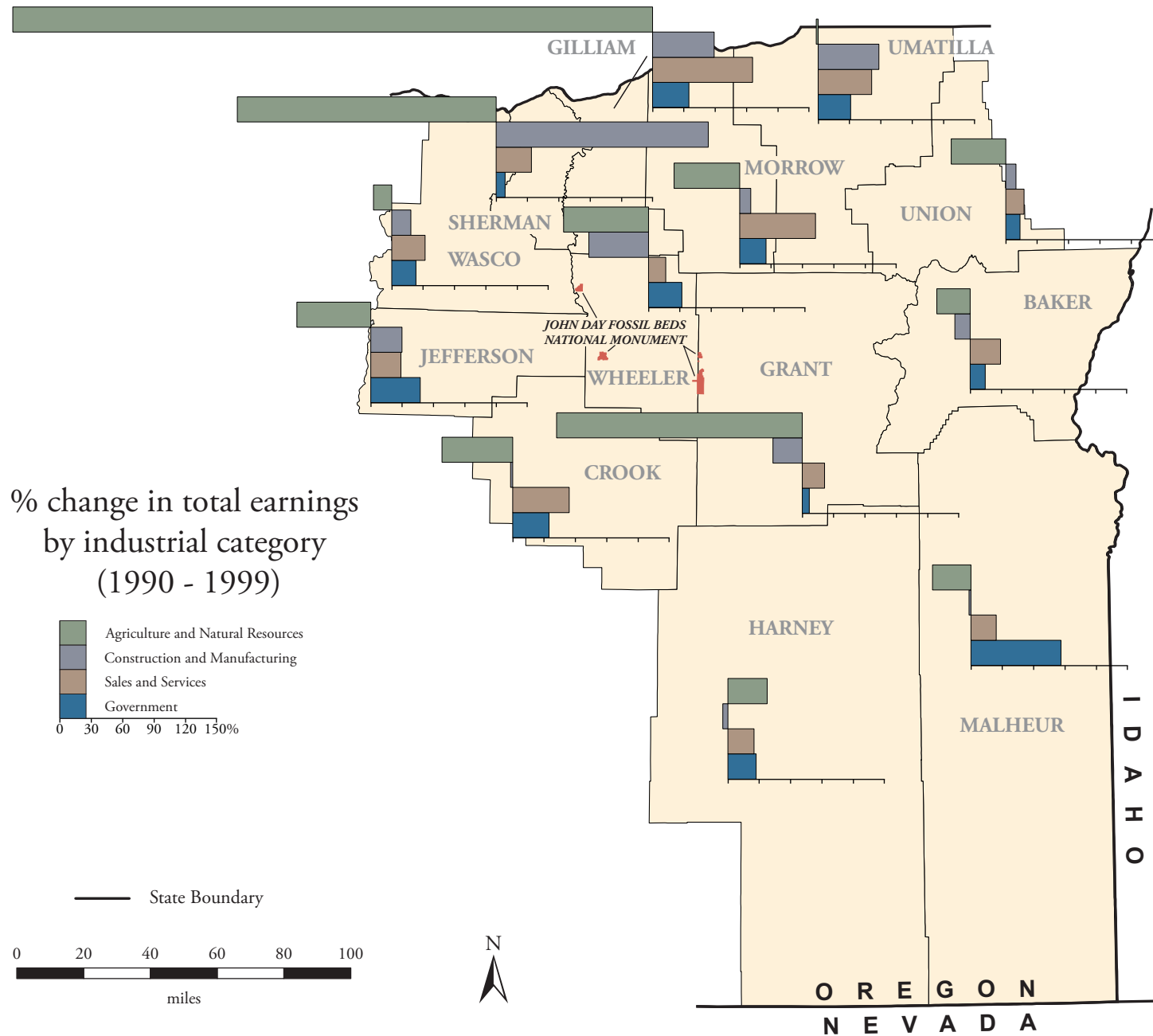
A&NR = Agriculture and Natural Resources  
 C&M = Construction and Manufacturing  
 S&S = Sales and Services  
 GOV = Government

% change in total earnings by industrial category (1990 - 1999)				
	A&NR	C&M	S&S	GOV
Baker	-33	-15	30	15
Crook	-70	-2	56	36
Gilliam	-633	61	99	36
Grant	-243	-29	22	7
Harney	39	-5	26	28
Jefferson	-73	31	30	49
Malheur	-38	-2	25	89
Morrow	-65	11	75	26
Sherman	-256	210	35	9
Umatilla	-2	60	53	32
Union	-54	10	18	14
Wasco	-18	19	33	24
Wheeler	-84	-59	17	33

National	4	16	45	16
Oregon	17	38	51	27

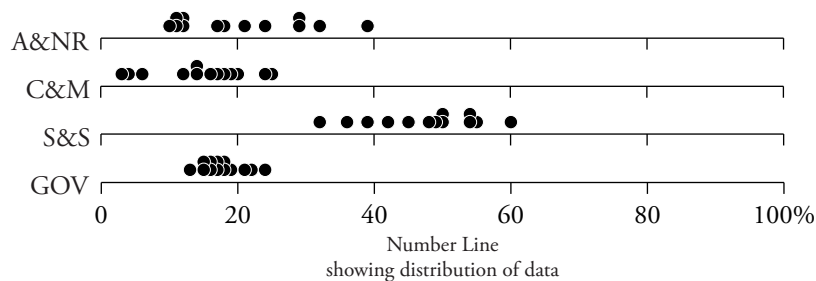


# Change in Earnings by Industry



# Employment by Industry

One indicator of the way a particular county's job market is structured is the percentage of workers employed in each of the four major industrial sectors. This employment distribution is indicative of the kinds of skills, knowledge, and concerns that are most prevalent among workers. Occupational patterns can influence people's priorities and actions with regard to parks and resource protection. For example, construction workers might welcome the prospect of rapid growth, whereas government workers such as teachers and police might worry that rapid growth would stress existing government resources. Within the John Day Fossil Beds NM region (1999), the leading sector of employment in 12 of the 13 counties is sales and services. The second-ranking sector is agriculture and natural resources.<sup>6</sup>

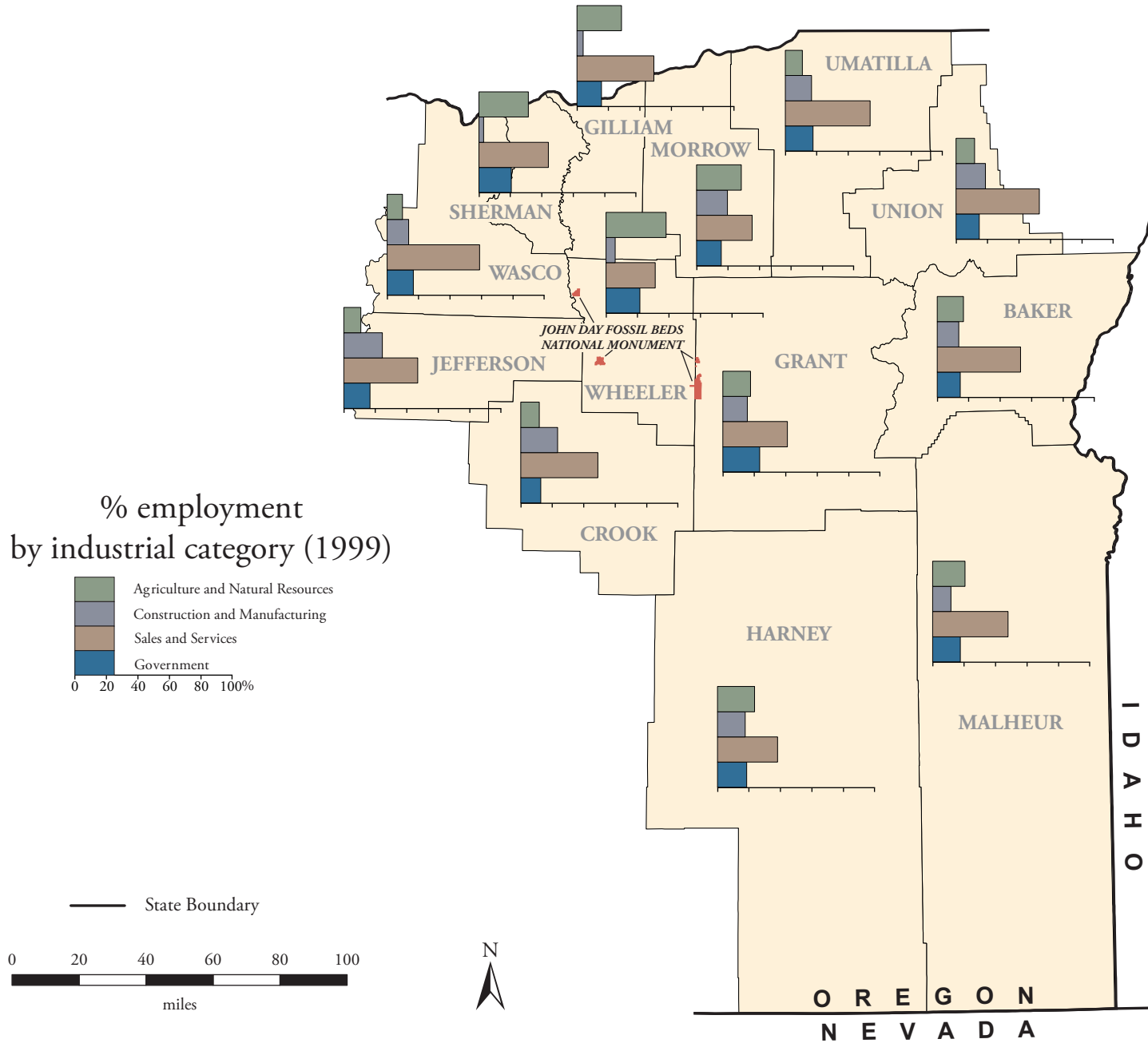


A&NR = Agriculture and Natural Resources  
 C&M = Construction and Manufacturing  
 S&S = Sales and Services  
 GOV = Government

Percentages may not add to one hundred due to rounding.

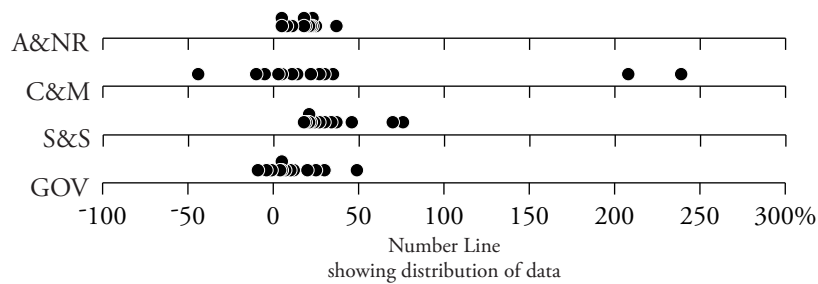
	% employment by industrial category (1999)			
	A&NR	C&M	S&S	GOV
Baker	17	14	54	15
Crook	12	24	50	13
Gilliam	29	4	50	16
Grant	18	16	42	24
Harney	24	18	39	19
Jefferson	11	25	48	17
Malheur	21	12	49	18
Morrow	29	20	36	16
Sherman	32	3	45	21
Umatilla	12	19	54	15
Union	11	17	55	18
Wasco	10	14	60	17
Wheeler	39	6	32	22
National	4	17	65	14
Oregon	5	18	64	13

# Employment by Industry



# Change in Employment by Industry

Jobs are of critical importance to individuals, families, and communities. Change in the proportion of people employed by various industries within an economy can create a cascading set of impacts. A declining industry's displacement of workers whose skills are in less demand can generate stress among households and communities. A growing industry's demand for new sets of skills can influence migration patterns and educational priorities. Local and regional political decisions, including those that impact park management goals, often place priority on protecting existing jobs or attracting new employment opportunities. Within the John Day Fossil Beds NM region (1990 - 1999), 7 of the 13 counties experienced high increases in employment in sales and services, and 5 had high increases in construction and manufacturing.<sup>7</sup>

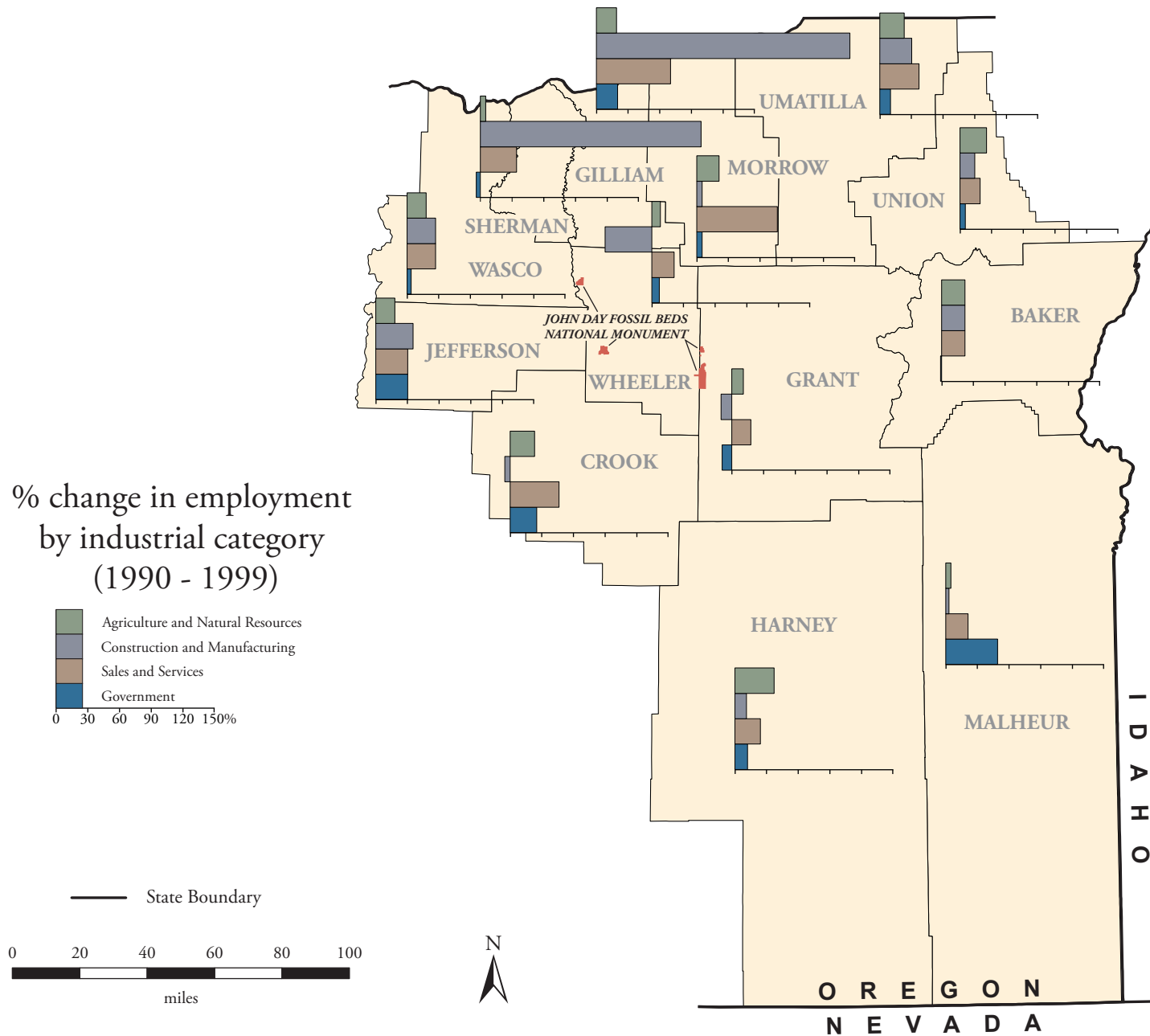


A&NR = Agriculture and Natural Resources  
 C&M = Construction and Manufacturing  
 S&S = Sales and Services  
 GOV = Government

	A&NR	C&M	S&S	GOV
Baker	22	22	22	-1
Crook	23	-5	46	25
Gilliam	19	239	70	20
Grant	11	-10	18	-9
Harney	37	11	24	12
Jefferson	18	35	30	30
Malheur	5	3	21	49
Morrow	21	5	76	5
Sherman	5	208	34	-4
Umatilla	23	30	37	10
Union	25	14	19	5
Wasco	18	27	27	4
Wheeler	8	-44	21	7

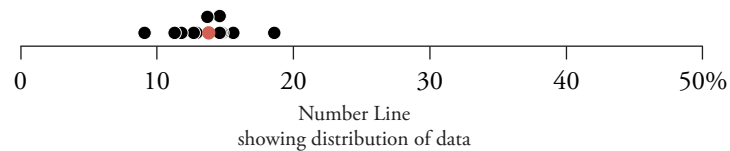
National	6	6	25	5
Oregon	18	21	33	11

# Change in Employment by Industry



# Poverty

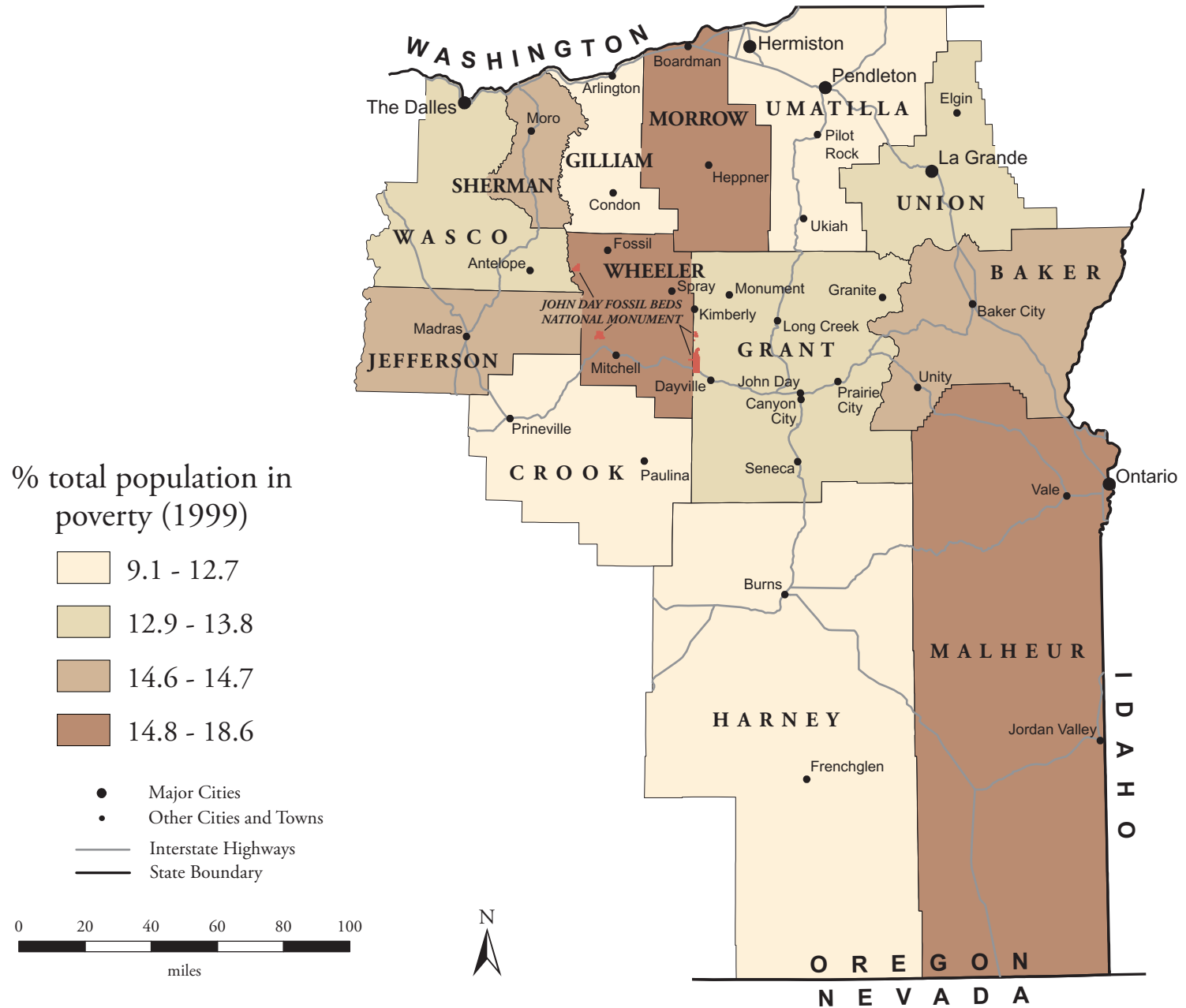
Poverty is officially defined as the condition of living in a household with income below the federally-determined poverty threshold (\$17,029 in 1999 for a family of four people). The extent of poverty can be measured as the percentage of the total population living below that threshold. Those living in poverty can face such difficulties as finding adequate housing and health care, getting enough food, and reaching job sites and government services, including parks. The level of poverty in the park region necessarily becomes significant to park management decisions and priorities. Within the John Day Fossil Beds NM region, the incidence of poverty (1999) ranges from 9.1% (Gilliam) to 18.6% (Malheur).<sup>8</sup>



% total population in poverty (1999)	
Gilliam	9.1
Crook	11.3
Harney	11.8
Umatilla	12.7
Wasco	12.9
Grant	13.7
<b>Union</b>	<b>13.8</b>
Sherman	14.6
Jefferson	14.6
Baker	14.7
Morrow	14.8
Wheeler	15.6
Malheur	18.6

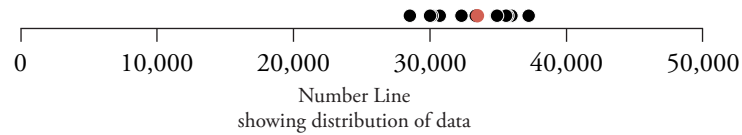
National = 12.4  
Oregon = 11.6

# Poverty



# Median Household Income

Median household income is indicative of the general level of income among households in a county. The median value is the central value in a ranked dataset, with an equal number of observations both above and below the median. General income measures can provide insights into the opportunities and time available for recreation in the park region. Within the John Day Fossil Beds NM region, median household income (1999) ranges from \$28,750 (Wheeler) to \$37,521 (Morrow).



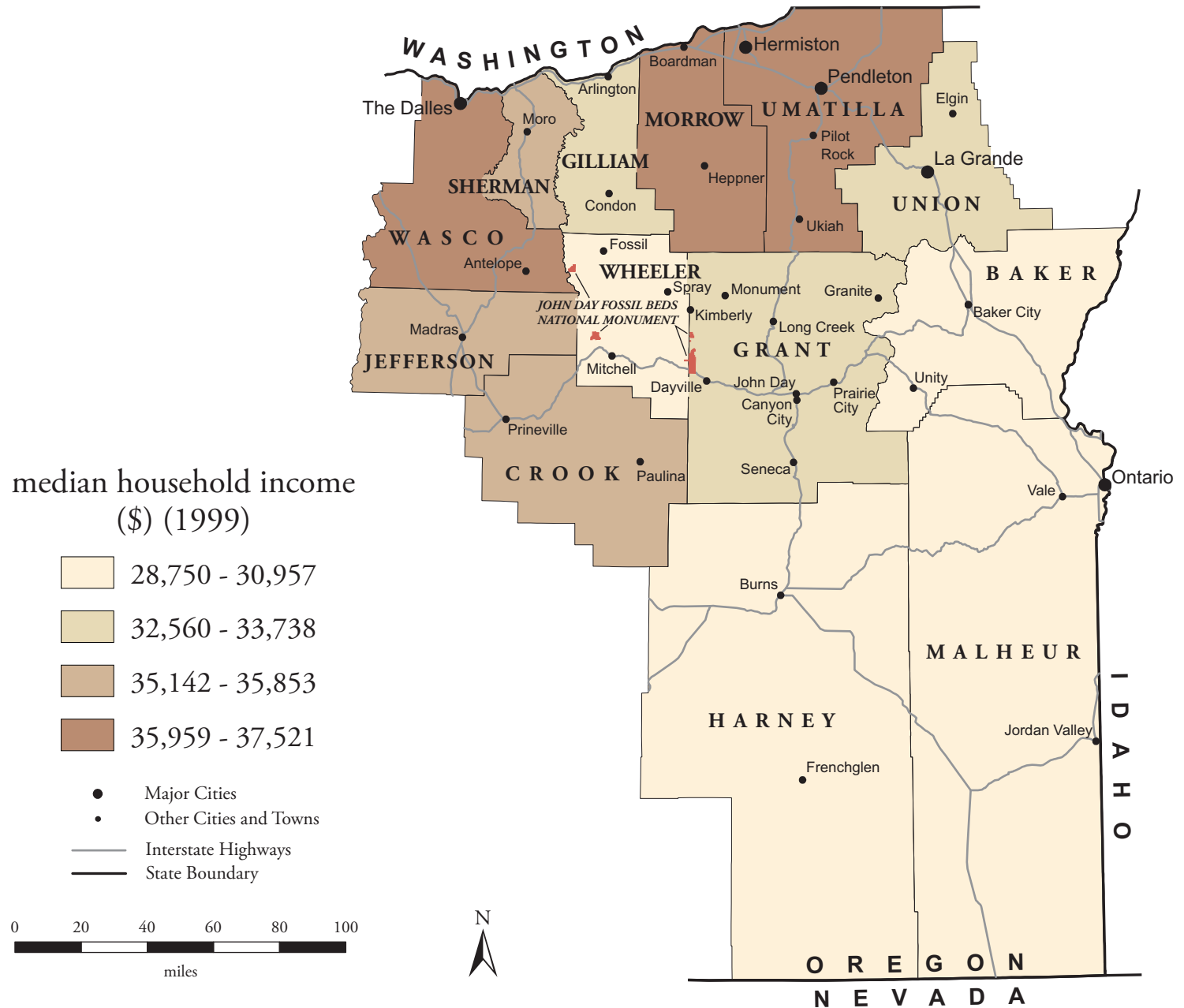
## median household income (\$ (1999)

Wheeler	28,750
Malheur	30,241
Baker	30,367
Harney	30,957
Grant	32,560
Gilliam	33,611
<b>Union</b>	<b>33,738</b>
Sherman	35,142
Crook	35,186
Jefferson	35,853
Wasco	35,959
Umatilla	36,249
Morrow	37,521

National = 41,994  
Oregon = 40,916

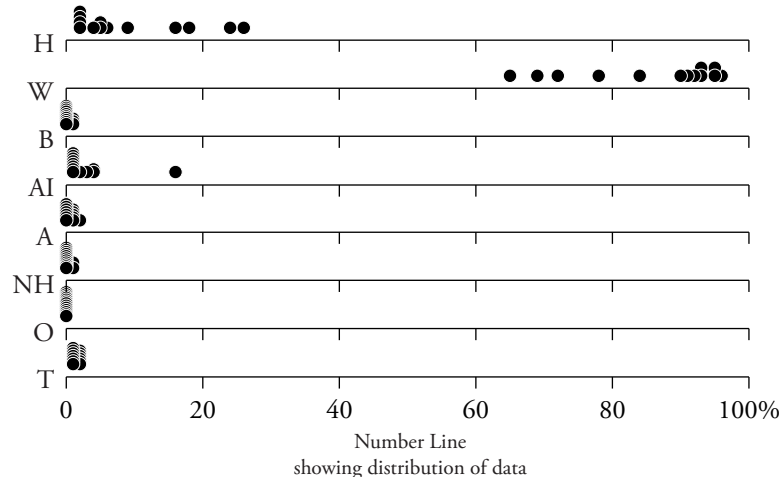


# Median Household Income



# Racial and Ethnic Composition

Racial and ethnic composition is indicated by the relative size of each of the major race groups and the separate Hispanic ethnic category as classified by the U.S. Census Bureau. These characteristics of the region’s population reveal its diversity, which informs park activities such as interpretation and outreach. Within the John Day Fossil Beds NM region (2000), non-Hispanic Whites constitute the largest racial group in all 13 counties. Malheur County has the largest percentage of persons of Hispanic or Latino origin.<sup>9</sup>



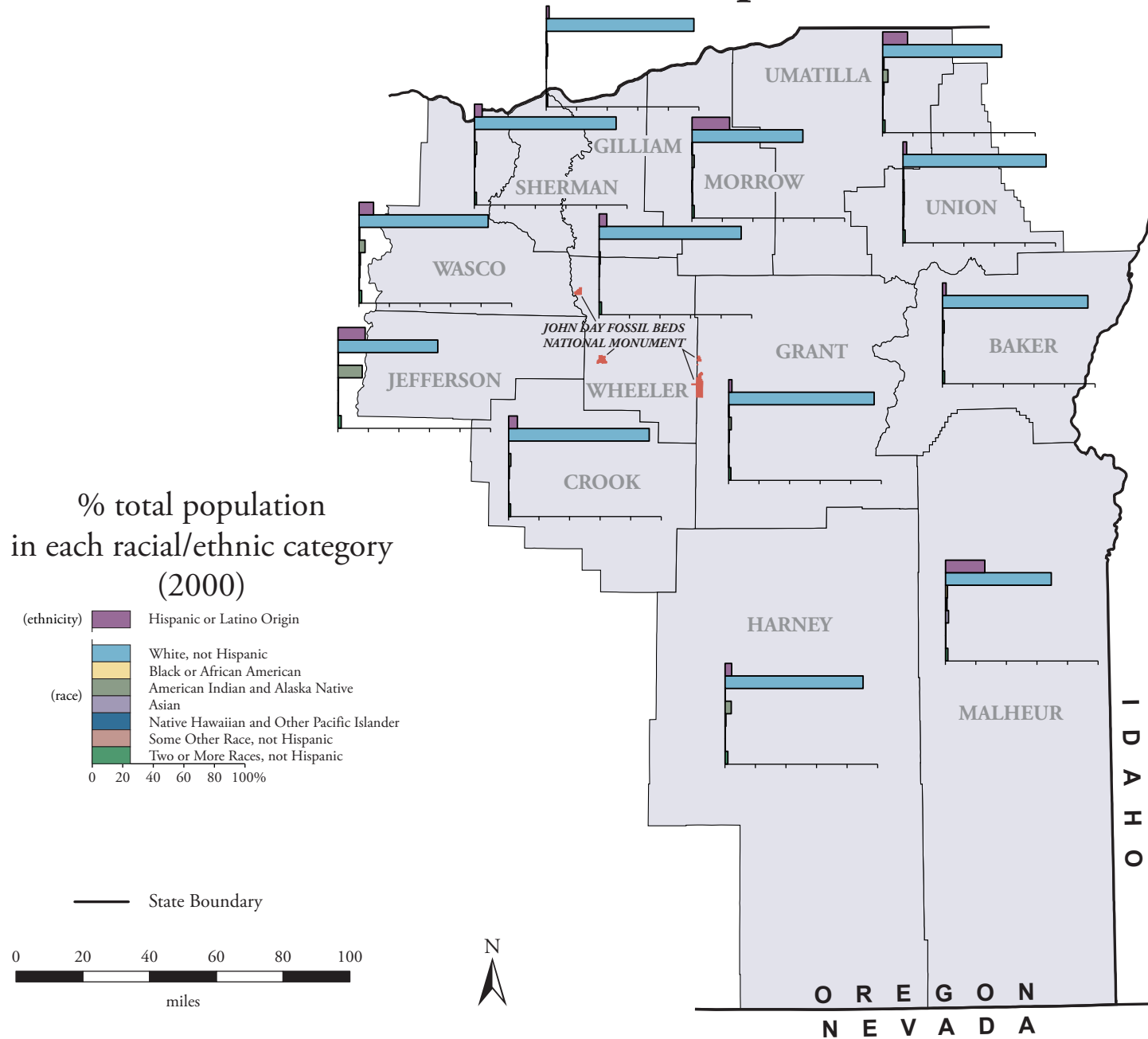
H = Hispanic or Latino Origin  
 W = White, not Hispanic  
 B = Black or African American  
 AI = American Indian and Alaska Native  
 A = Asian  
 NH = Native Hawaiian and Other Pacific Islander  
 O = Some Other Race, not Hispanic  
 T = Two or More Races, not Hispanic

Percentages for race may not add to one hundred due to rounding

	H	W	B	AI	A	NH	O	T
Baker	2	95	0	1	0	0	0	1
Crook	6	91	0	1	0	0	0	1
Gilliam	2	96	0	1	0	0	0	1
Grant	2	95	0	2	0	0	0	1
Harney	4	90	0	4	1	0	0	2
Jefferson	18	65	0	16	0	0	0	2
Malheur	26	69	1	1	2	0	0	2
Morrow	24	72	0	1	0	0	0	1
Sherman	5	92	0	1	1	0	0	1
Umatilla	16	78	1	3	1	0	0	2
Union	2	93	1	1	1	1	0	1
Wasco	9	84	0	4	1	1	0	2
Wheeler	5	93	0	1	0	0	0	2

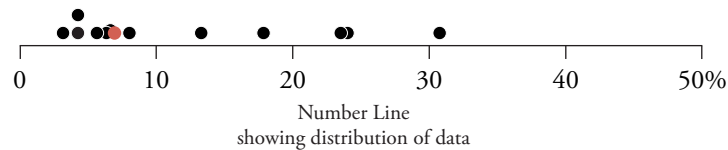
National	13	69	12	1	4	0	0	2
Oregon	8	84	2	1	3	0	0	2

# Racial and Ethnic Composition



# Racial Diversity

Racial diversity is measured as the percentage of the population belonging to minority groups. In the current U.S. context, “minority” races are defined as non-White (Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, Some Other Race, and Two or More Races). Interactions among people are often influenced by racial identity. Hence, it makes sense for institutions ranging from retailers to police to parks to consider regional racial diversity when recruiting and training staff, when designing public information and educational materials, and when soliciting public involvement in decision-making. Within the John Day Fossil Beds NM region, the percentage of minorities (2000) ranges from 3.2% (Gilliam) to 31.0% (Jefferson).<sup>10</sup>

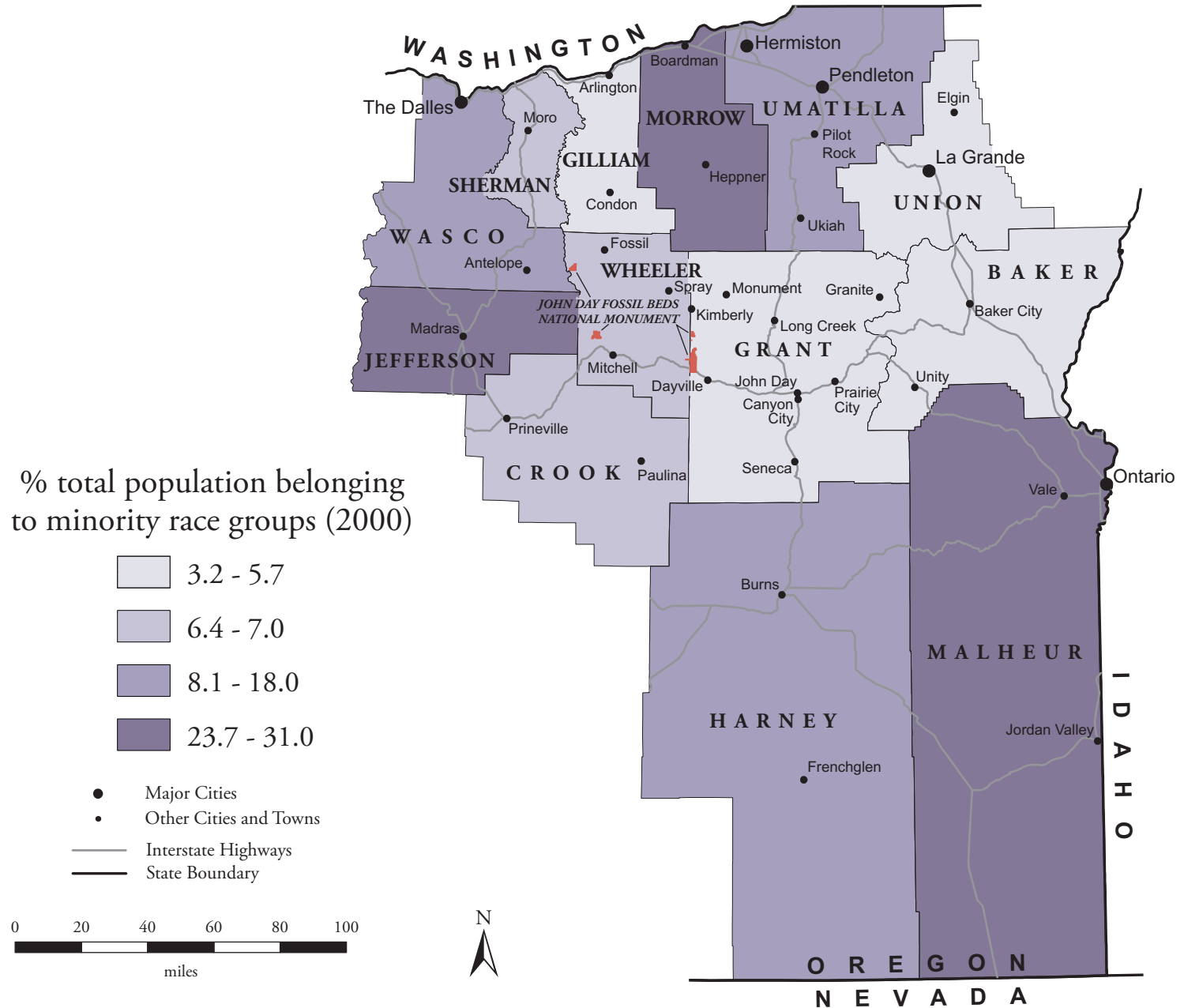


## % total population belonging to minority race groups (2000)

Gilliam	3.2
Baker	4.3
Grant	4.3
Union	5.7
Sherman	6.4
Wheeler	6.7
<b>Crook</b>	<b>7.0</b>
Harney	8.1
Wasco	13.4
Umatilla	18.0
Morrow	23.7
Malheur	24.2
Jefferson	31.0

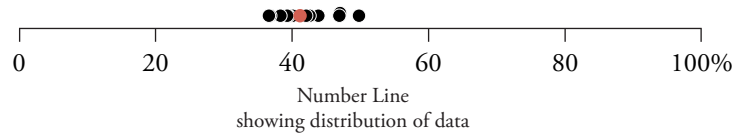
National = 24.9  
Oregon = 13.4

# Racial Diversity



# Educational Attainment

Educational attainment indicators measure the average amount of formal education that a county's residents have received. One indicator of educational attainment is the percentage of adults who have attended or graduated from college. Educational attainment influences many aspects of life, such as how much money people earn, what they do for recreation, where they get their information, and how they participate in civic life. With regard to park management, the educational attainment of the general public is an important consideration in activities, such as marketing, public participation processes, and the design of interpretive programs. Within the John Day Fossil Beds NM region, the percentage of adults with some college education (2000) ranges from 36.9% (Malheur) to 50.2% (Gilliam).<sup>11</sup>

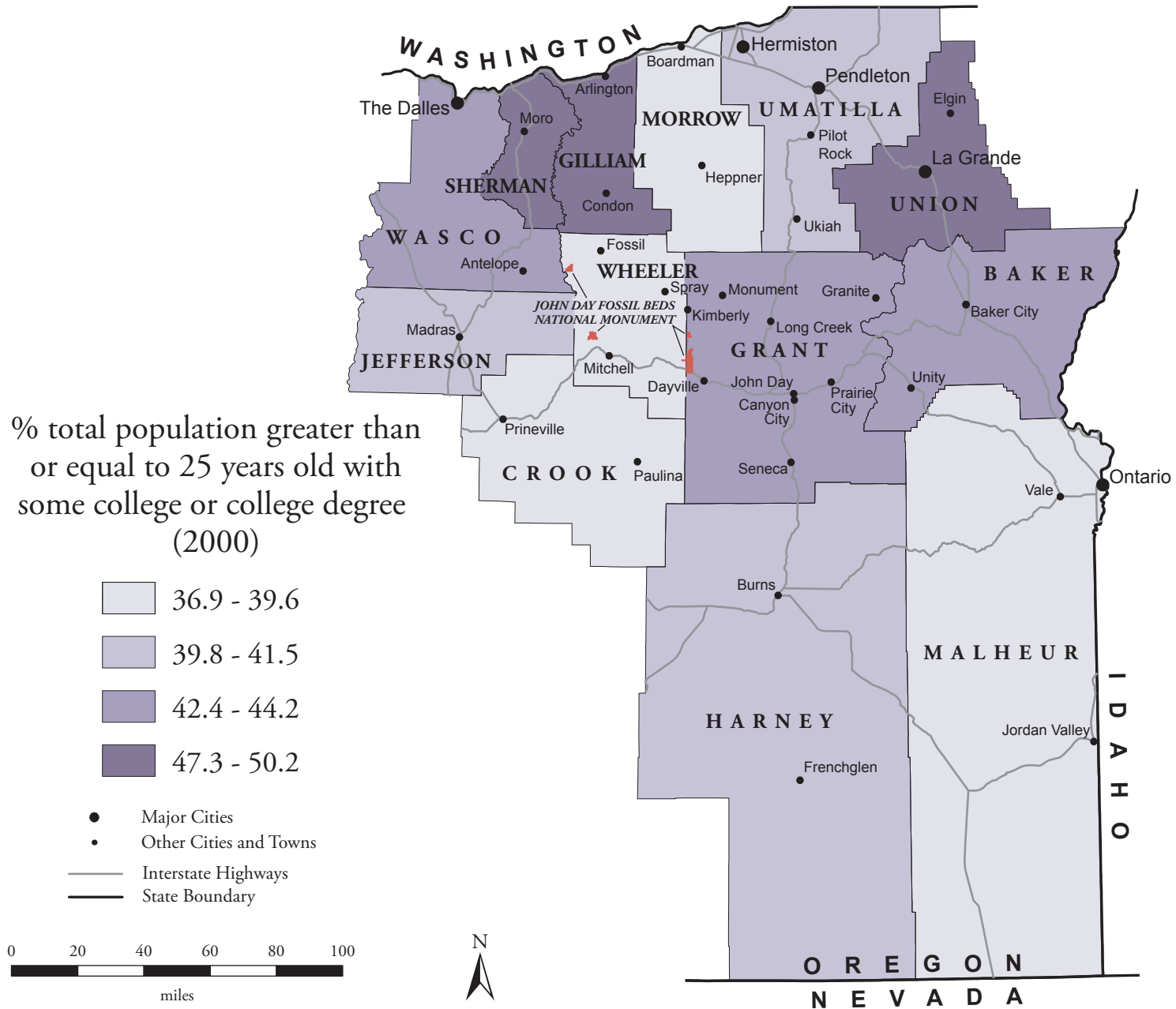


% total population greater than or equal to 25 years old with some college or college degree (2000)

Malheur	36.9
Crook	37.1
Wheeler	38.6
Morrow	39.6
Harney	39.8
Jefferson	40.4
<b>Umatilla</b>	<b>41.5</b>
Grant	42.4
Wasco	42.9
Baker	44.2
Sherman	47.3
Union	47.4
Gilliam	50.2

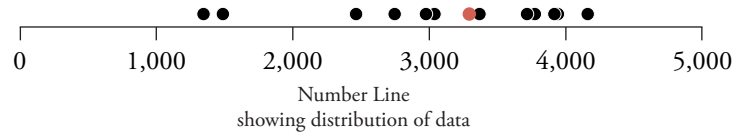
National = 42.9  
Oregon = 50.2

# Educational Attainment



# Crime

Crime indicators measure the frequency of various types of lawbreaking. One commonly used crime indicator is the number of serious crimes reported per 100,000 people. Serious crimes refer to murder and non-negligent manslaughter, forcible rape, robbery, aggravated assault, burglary, larceny-theft, arson, and motor vehicle theft. A high crime rate has many impacts on the general population, such as higher insurance rates and a reduced sense of security. Crime also affects government by increasing the demand for police, court services, and prisons. Crime presents direct challenges to park management, as the protection of visitors, park property, and resources becomes a greater priority. Within the John Day Fossil Beds NM region, the number of serious crimes reported per 100,000 people (2000) ranges from 1,357 (Wheeler) to 4,193 (Morrow).



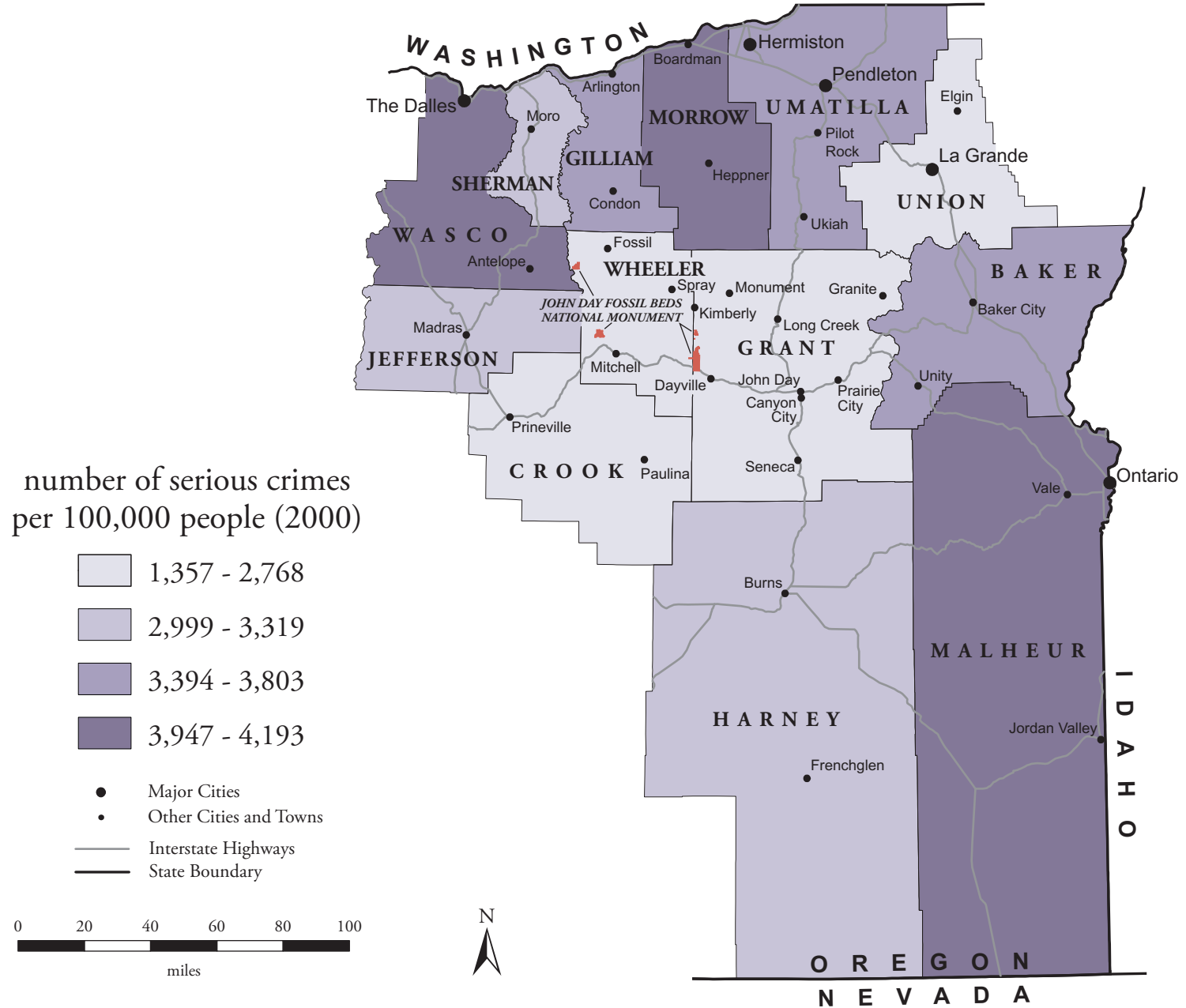
## number of serious crimes per 100,000 people (2000)

Wheeler	1,357
Grant	1,500
Union	2,483
Crook	2,768
Sherman	2,999
Harney	3,062
<b>Jefferson</b>	<b>3,319</b>
Gilliam	3,394
Baker	3,745
Umatilla	3,803
Wasco	3,947
Malheur	3,973
Morrow	4,193

National = N/A  
Oregon = 4,888

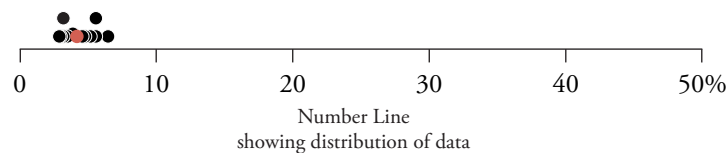


# Crime



# Recreation/Tourism Establishments

The recreation and tourism industry is measured using two categories: the arts, entertainment, and recreation sector (ranging from museums and concerts, to sporting events and amusement parks) and the accommodation subsector of the accommodation and food services sector (ranging from hotels to campsites). The size of these sectors is a broad indicator of a county's economic reliance on recreation and tourism relative to the other sectors of the economy. Recreation and tourism establishments can be proponents of actions that enhance their area's attractiveness as a visitor destination (such as transportation improvements, protection of scenic or cultural landmarks, or marketing campaigns). Recreation and tourism establishments also can be vulnerable to, and thus wary of, actions, policies, or chance events that could affect business, such as visitor use restrictions, fires, or economic downturns. Within the John Day Fossil Beds NM region, the percentage of total establishments in arts, entertainment, recreation, and accommodation (2001) ranges from 2.9% (Union) to 6.5% (Gilliam).<sup>12</sup>

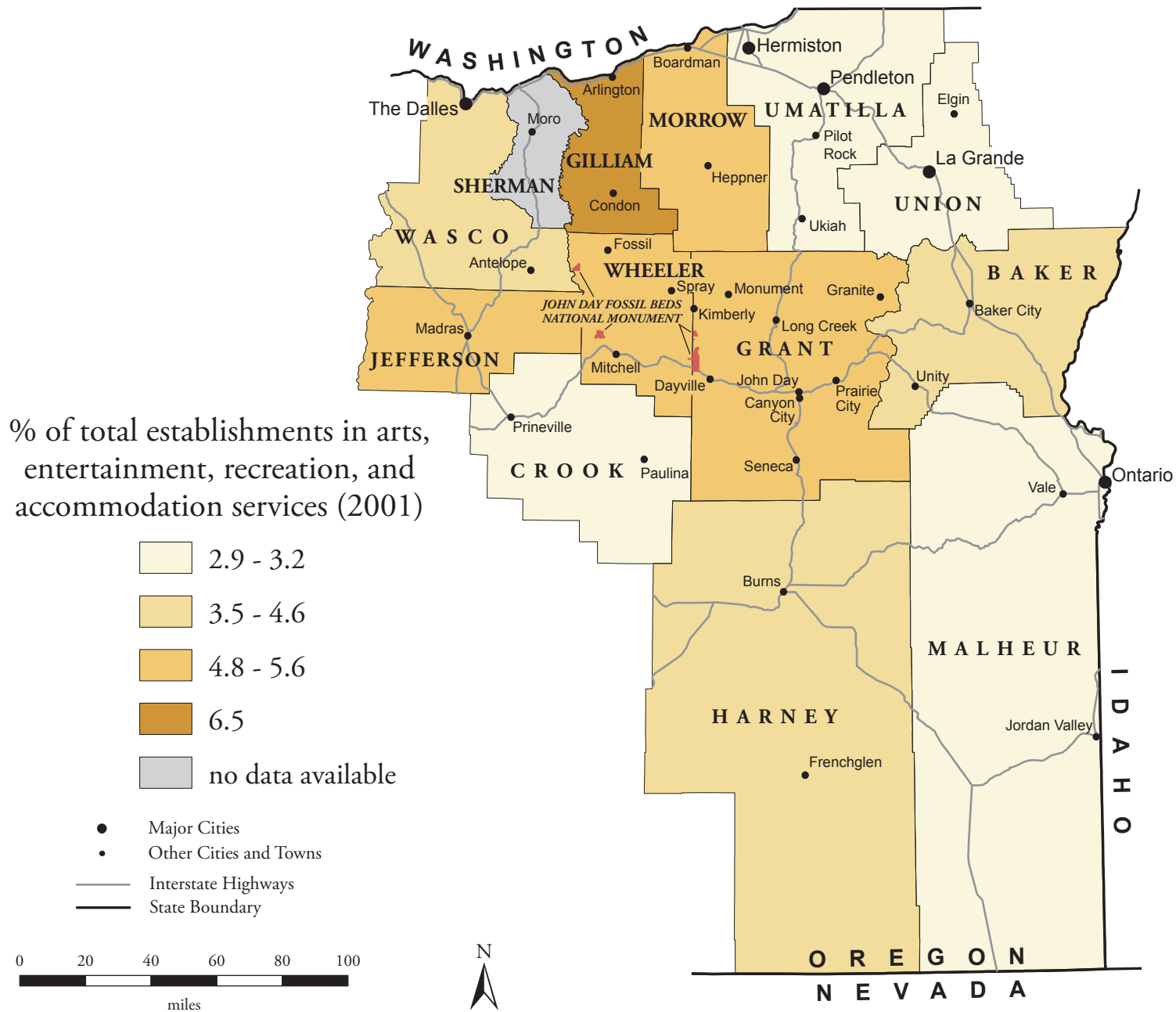


% of total establishments in arts, entertainment, recreation, and accommodation services (2001)

Union	2.9	
Umatilla	3.0	
Malheur	3.2	
Crook	3.2	
Wasco	3.5	
Baker	3.9	
Harney	4.6	← 4.2
Grant	4.8	
Morrow	5.2	
Wheeler	5.6	
Jefferson	5.6	
Gilliam	6.5	
Sherman	N/A	

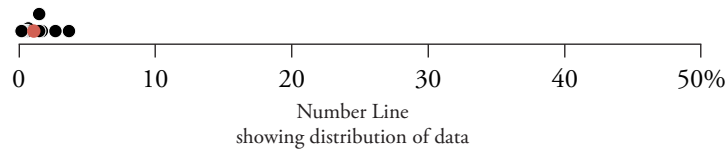
National = 2.3  
Oregon = 2.5

# Recreation/Tourism Establishments



# Recreation/Tourism Revenue

Recreation and tourism revenue is a key indicator of the economic importance of recreation and tourism to a county. Recreation and tourism revenue can be expressed as a percentage of total sales and service receipts. Recreation and tourism establishments can occupy an important position within a county economy because they attract visitor dollars from elsewhere. Secondary economic benefits are realized when these dollars are re-spent within the local economy or deposited in banks, where they provide capital to other businesses. Within the John Day Fossil Beds NM region, the percentage of total sales from arts, entertainment, recreation, and accommodation services (1997) ranges from 0.2% (Jefferson) to 3.7% (Grant).<sup>13</sup>

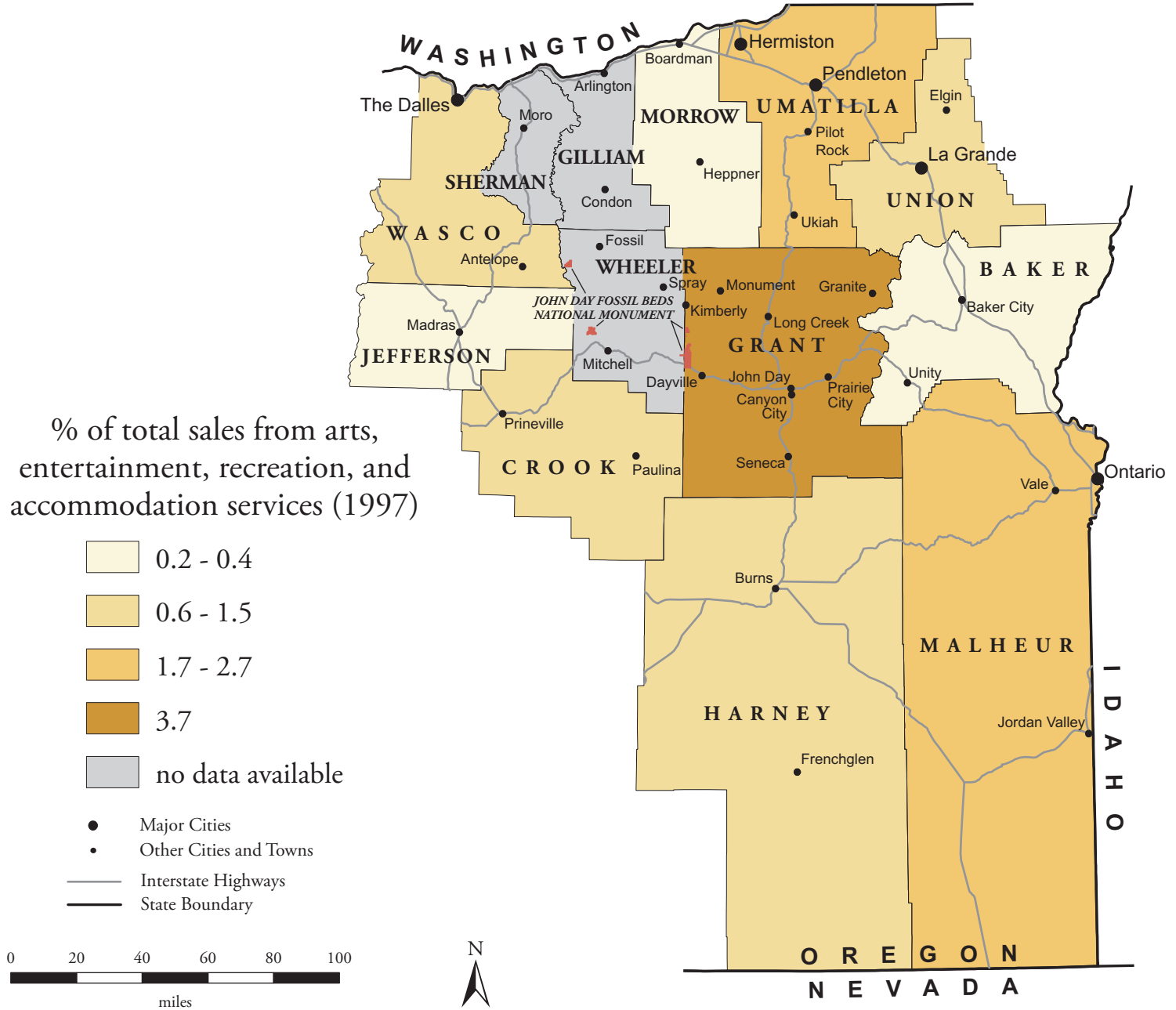


## % of total sales from arts, entertainment, recreation, and accommodation services (1997)

Jefferson	0.2
Baker	0.3
Morrow	0.4
Crook	0.6
Union	0.7
Harney	1.5
Wasco	1.5
Malheur	1.7
Umatilla	2.7
Grant	3.7
Gilliam	N/A
Sherman	N/A
Wheeler	N/A

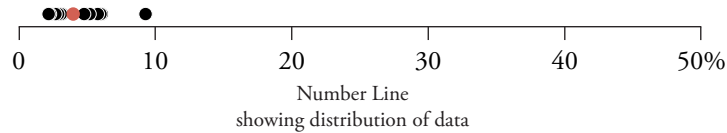
National = 1.1  
Oregon = 1.1

# Recreation/Tourism Revenue



# Recreation/Tourism Employment

The significance of the recreation/tourism industry to a county economy can be indicated by the percentage of county workers that it employs. Workers counted as recreation and tourism employees include country club managers, blackjack dealers, campground employees, fishing guides, motel attendants, and other providers of recreation services. A high level of recreation/tourism employment may mean that residents have more disposable income or that the area attracts visitors or vacationers. Within the John Day Fossil Beds NM region, the percentage of total paid employees in arts, entertainment, recreation, and accommodation services (2001) ranges from 2.2% (Crook) to 9.3% (Wheeler).<sup>14</sup>

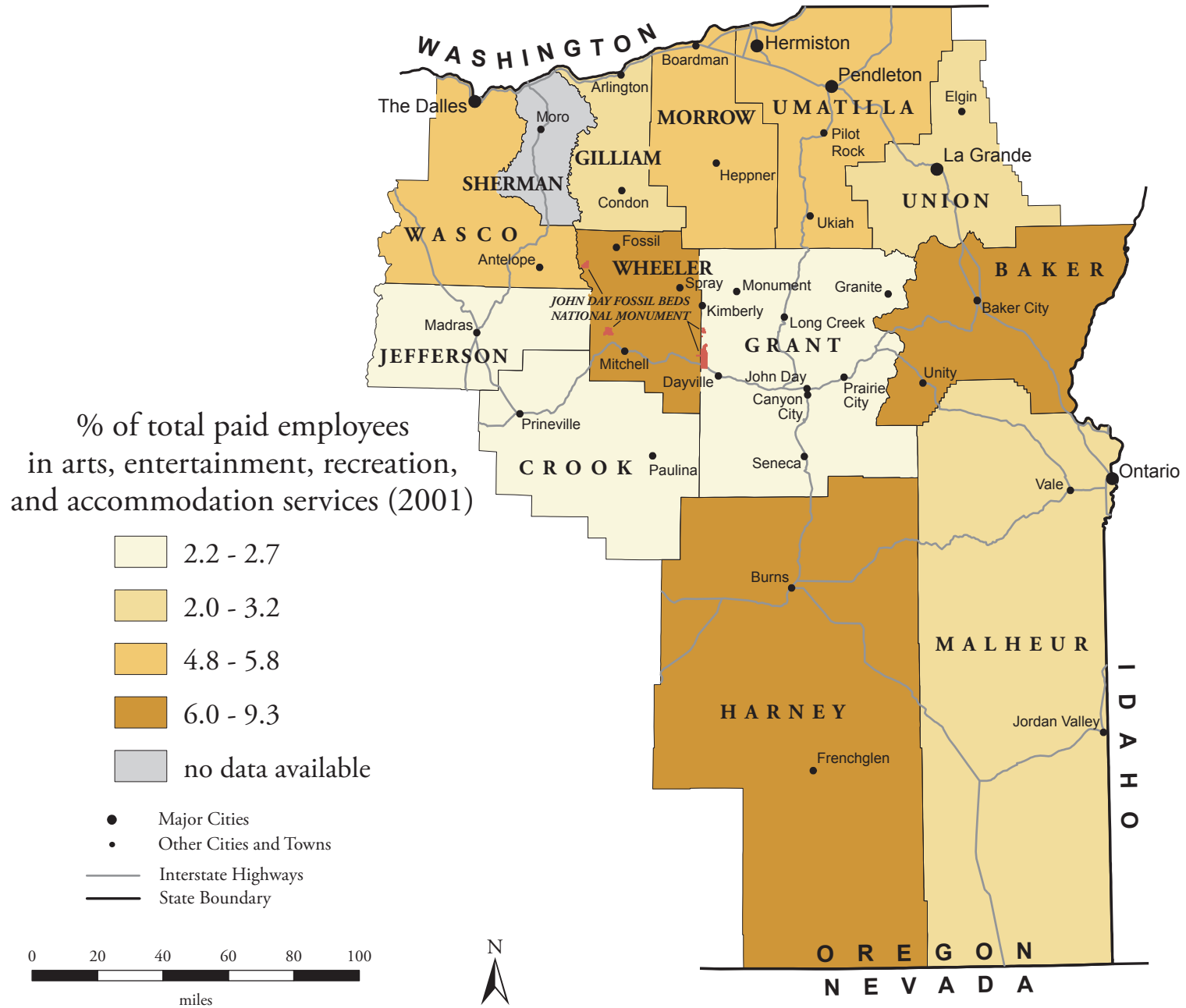


Crook	2.2
Grant	2.3
Jefferson	2.7
Union	2.9
Malheur	3.1
Gilliam	3.2
Umatilla	4.8
Wasco	5.2
Morrow	5.8
Harney	6.0
Baker	6.1
Wheeler	9.3
Sherman	N/A

4.0

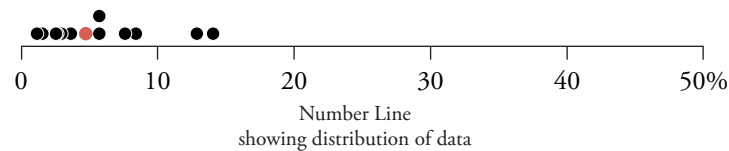
National = 3.1  
Oregon = 3.1

# Recreation/Tourism Employment



# Seasonal Housing

Seasonal, recreational, and occasional use housing units are those intended for occupancy only during certain seasons of the year and are found primarily in resort areas. A park with a large number of seasonal housing units located near its boundaries can be considered a “destination park.” Such parks attract people who can afford to travel a considerable distance and spend a few days in or near the park. Within the John Day Fossil Beds NM region the percentage of total housing units classified for seasonal, recreational, or occasional use (2000) ranges from 1.1% (Malheur) to 14.1% (Jefferson).<sup>15</sup>



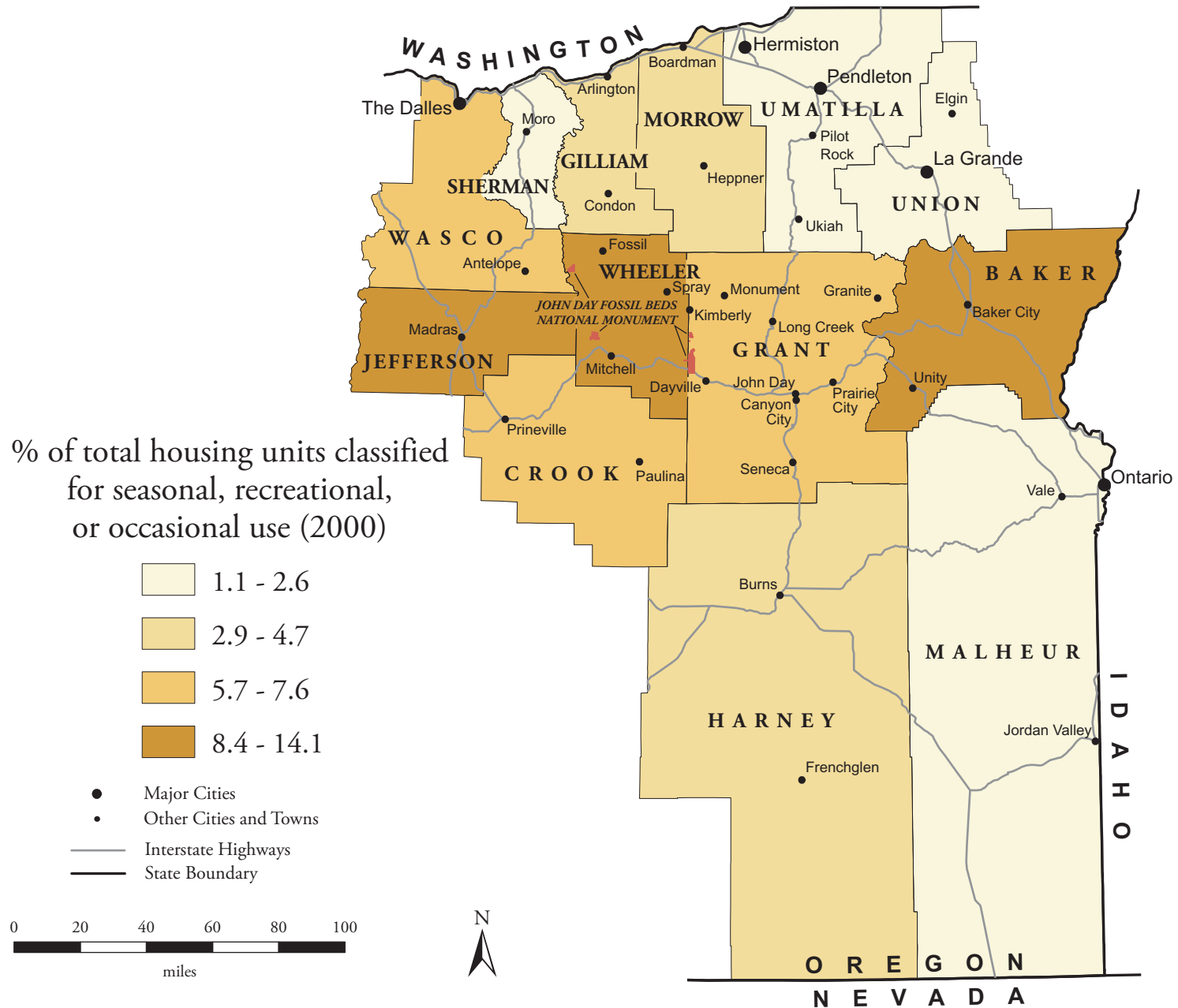
## % of total housing units classified for seasonal, recreational, or occasional use (2000)

Malheur	1.1
Union	1.5
Umatilla	2.5
Sherman	2.6
Gilliam	2.9
Harney	3.6
<b>Morrow</b>	<b>4.7</b>
Crook	5.7
Wasco	5.7
Grant	7.6
Baker	8.4
Wheeler	12.9
Jefferson	14.1

National = 3.1  
Oregon = 2.5



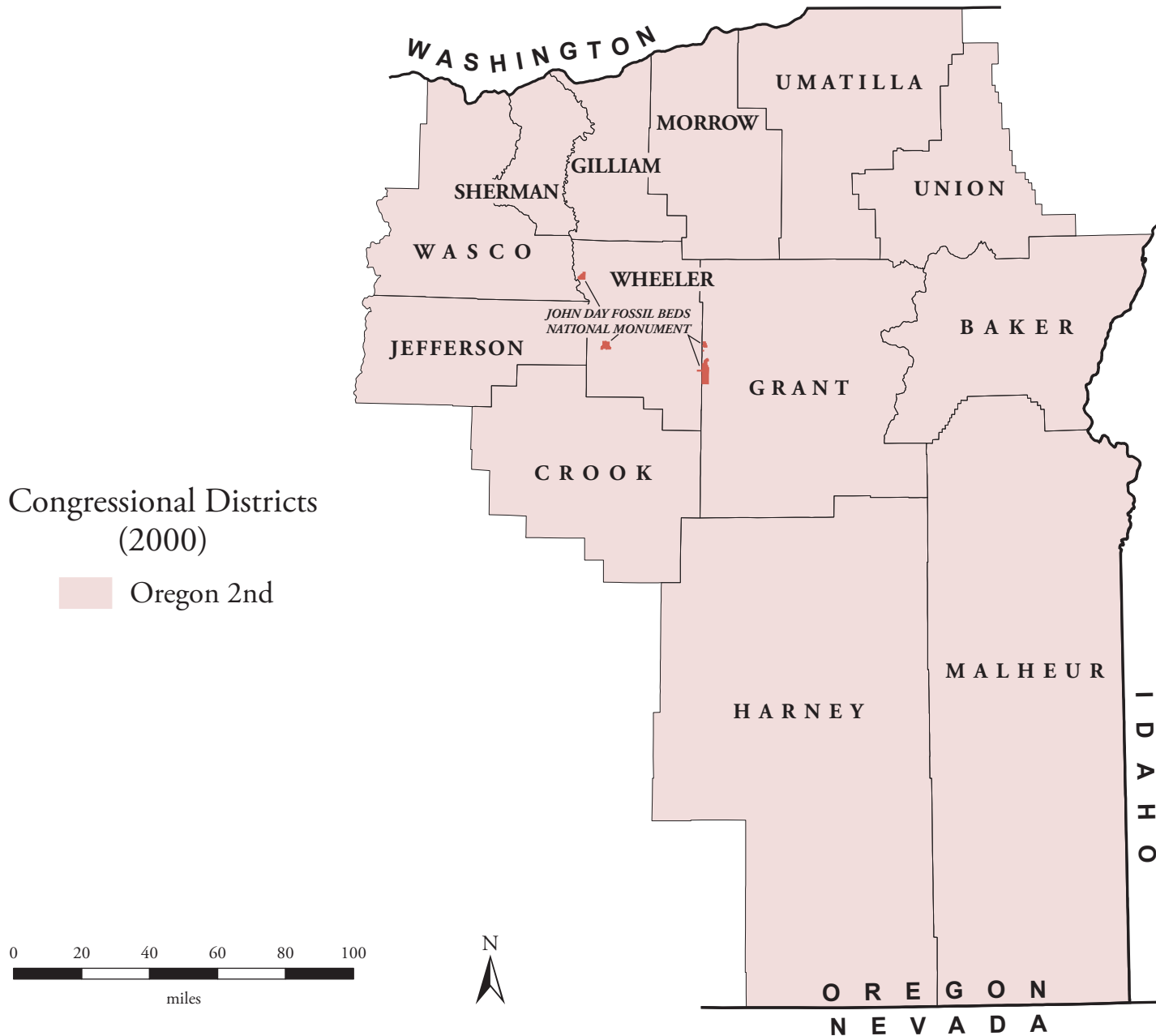
# Seasonal Housing



## **Congressional Districts**

Congressional districts form a key layer in the political structure of a region of interest for a park. These districts, roughly equivalent in population, are defined by state legislatures based on the national census and redrawn every ten years. Members of Congress are key points of access for citizens seeking to influence federal-level policies and programs, including those related to federal lands such as national parks and national forests. The John Day Fossil Beds NM region falls entirely within Oregon's 2nd Congressional District.

# Congressional Districts



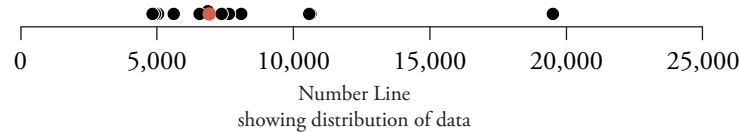
# Federal Expenditures

The importance of the federal government to a county economy can be indicated by the amount of federal expenditures per person. These expenditures can be a key source of dollars flowing into the county economy (in contrast, taxes and fees are an outflow of dollars). Federal spending can influence the park region through such wide-ranging initiatives as agricultural subsidies, social programs, military bases, and national parks. Within the John Day Fossil Beds NM region, federal expenditures per person (2002) range from \$4,881 (Jefferson) to \$19,655 (Sherman).<sup>16</sup>

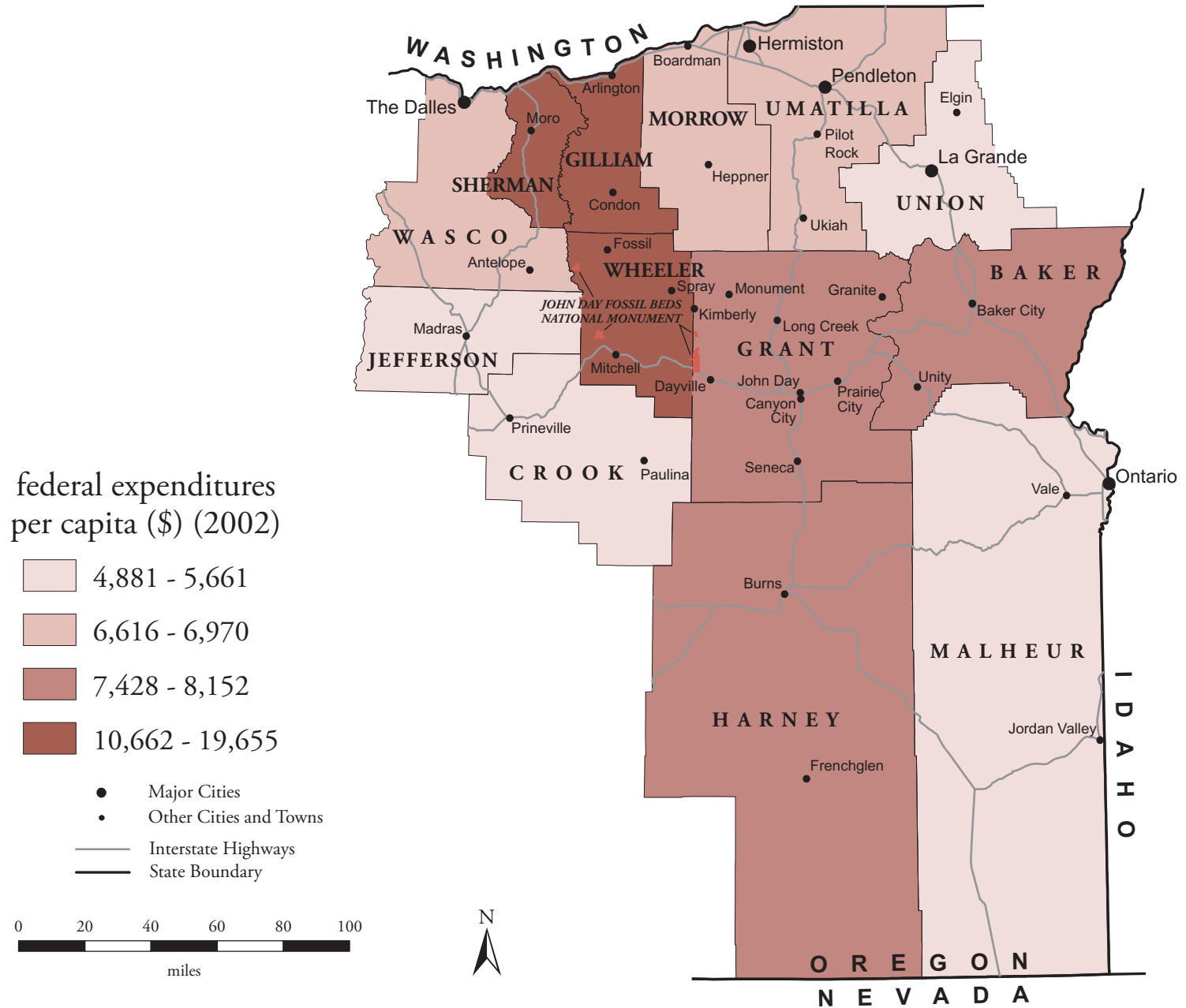
## federal expenditures per capita (\$) (2002)

Jefferson	4,881
Crook	4,972
Malheur	5,083
Union	5,661
Morrow	6,616
Wasco	6,917
<b>Umatilla</b>	<b>6,970</b>
Baker	7,428
Harney	7,699
Grant	8,152
Gilliam	10,662
Wheeler	10,713
Sherman	19,655

National = 6,650  
Oregon = 5,634

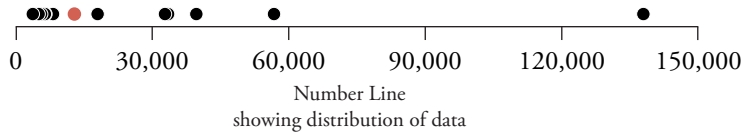


# Federal Expenditures



# Payments in Lieu of Taxes

Payments in lieu of taxes are measured as the total dollars transferred to counties by the federal government as part of the PILT Program (Payments-In-Lieu-of-Taxes) administered by the Bureau of Land Management. PILT payments are calculated according to a formula that includes population and the amount of federal land within an affected county. They have a direct impact on the park region as revenue for county governments. As counties use this revenue for capital projects or service provisions, the tax burden on local residents is effectively reduced. Indirectly, PILT payments are an indication of the federal government’s presence, visibility, and perhaps influence within counties in the park region. Within the John Day Fossil Beds NM region, payments in lieu of taxes (2003) range from \$27,268 (Morrow) to \$1,379,451 (Malheur).

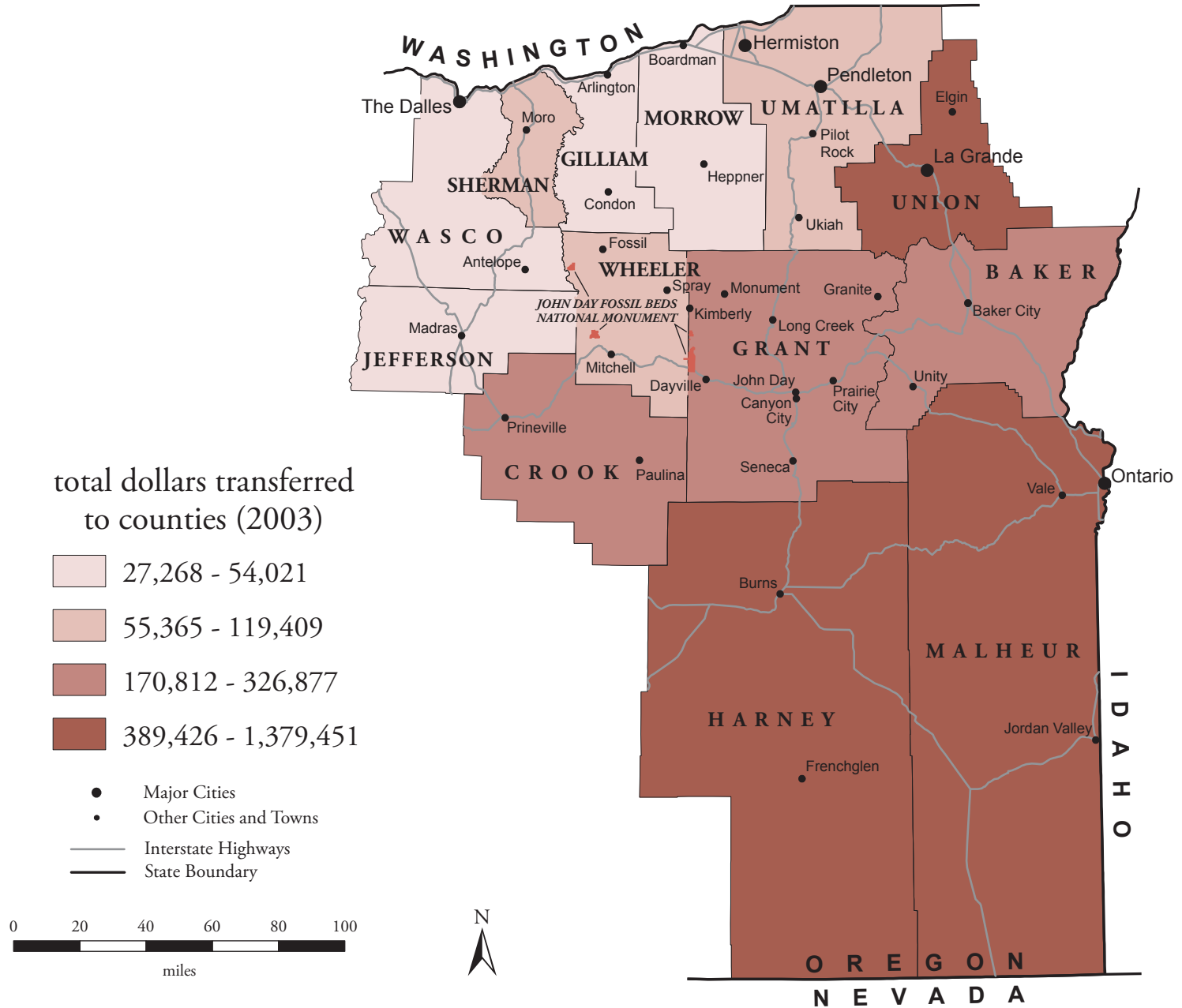


## total dollars transferred to counties (2003)

Morrow	27,268
Wasco	40,188
Gilliam	45,846
Jefferson	54,021
Wheeler	55,365
Sherman	72,071
<b>Umatilla</b>	<b>119,409</b>
Crook	170,812
Grant	319,996
Baker	326,877
Union	389,426
Harney	561,467
Malheur	1,379,451

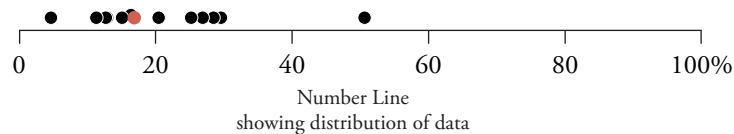
National = 218,172,589  
Oregon = 6,010,270

# Payments in Lieu of Taxes



## Federal Grants

Federal grants are a specific type of spending, generally intended to assist local governments in carrying out major capital projects or program enhancements. These grants differ from other federal expenditures in that they are centrally received and administered (as opposed to individual wages and loans), are short-term disbursements (as opposed to entitlement programs), and are not exchanged for any goods or services (as opposed to salaries and procurement). Federal grants represent an important short-term flow of dollars into a county. If a county receives a relatively high percentage of federal expenditures in the form of grants, this may indicate that other types of federal spending in the county are relatively limited. It also may indicate that the county has a relatively greater need for grant-funded projects and programs such as roads, sewage treatment, and school subsidies. Within the John Day Fossil Beds NM region, the percentage of federal expenditures received in the form of grant awards (2002) ranges from 4.7% (Gilliam) to 51.0% (Wheeler).<sup>17</sup>



### % total federal expenditures received as grant awards (2002)

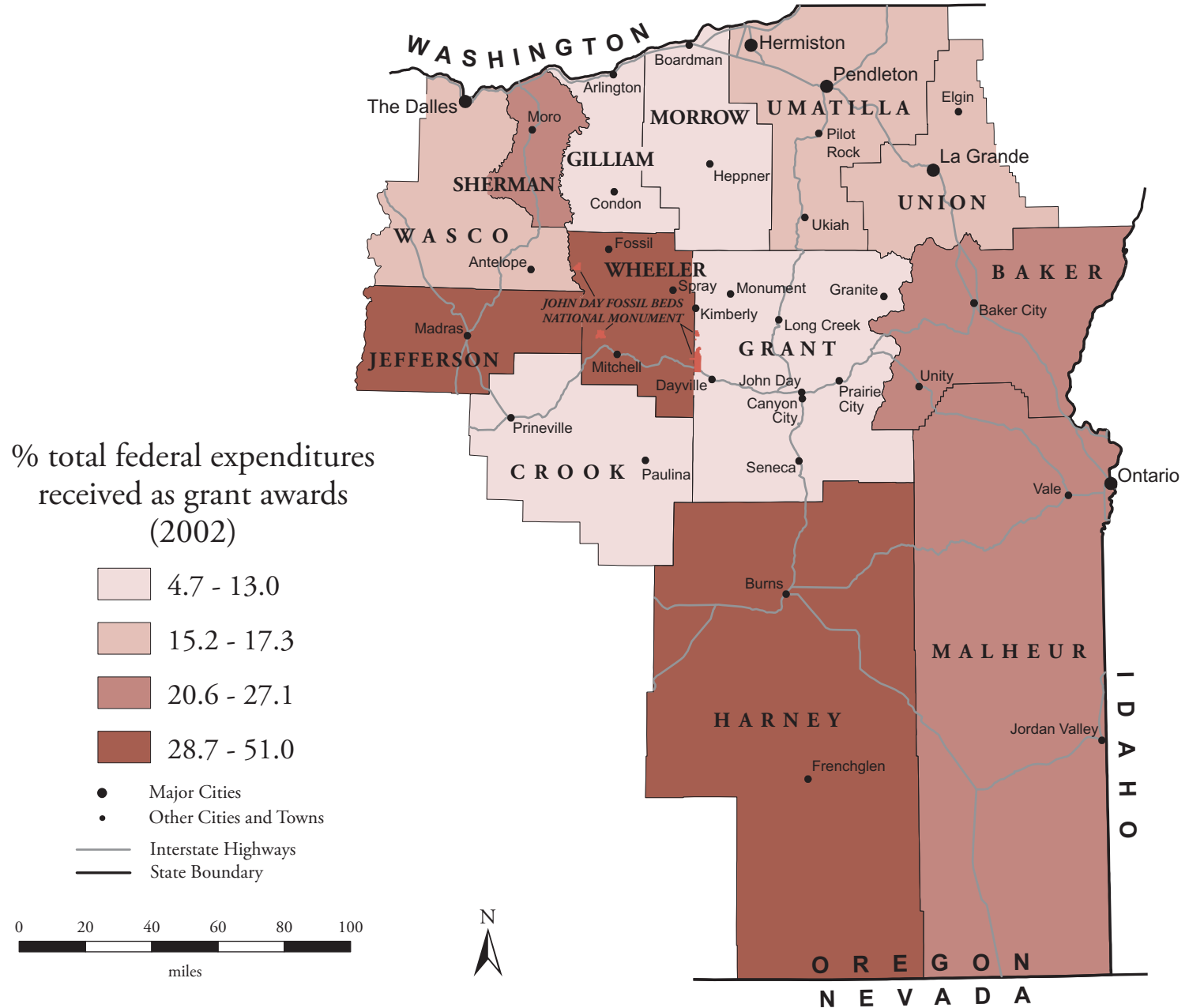
Gilliam	4.7
Morrow	11.4
Grant	12.8
Crook	13.0
Umatilla	15.2
Union	16.5
<b>Wasco</b>	<b>17.3</b>
Sherman	20.6
Baker	25.4
Malheur	27.1
Jefferson	28.7
Harney	29.8
Wheeler	51.0

National = 21.5

Oregon = 24.3



# Federal Grants



## Ecoregions

Ecoregions are areas in which similar climate, landforms, and soil exist and support similar communities of vegetation and animals. People affect natural systems within an ecoregion through such activities as agriculture, development, the creation of protected areas, hunting, and the introduction of non-native species. Natural resource protection efforts throughout an ecoregion may share many of the same approaches and techniques, since these efforts often focus on maintaining or restoring similar communities of indigenous animals and plants. Hence, many challenges of resource protection can be addressed effectively at the ecoregion level.

The John Day Fossil Beds NM region includes parts of three ecoregion divisions. The north-central part of the region is classified as Temperate Steppe Regime Mountains. This area is surrounded on all sides (like a horseshoe) by the Temperate Desert ecoregion division. In the far northwestern edge of the region, parts of two counties are classified as the Marine Regime Mountains, indicating their proximity to the Cascade Mountains.

### Bailey's Ecoregions

Ecoregions are ecosystems of regional extent, differentiated according to a hierarchical scheme that uses climate and vegetation as indicators of the extent of each unit. Robert Bailey of the U.S. Forest Service, U.S. Department of Agriculture, developed one system of ecoregional classifications (Bailey, R.G. 1995. *Description of the Ecoregions of the United States*, 2<sup>nd</sup> edition, Misc. Pub. No. 1391).

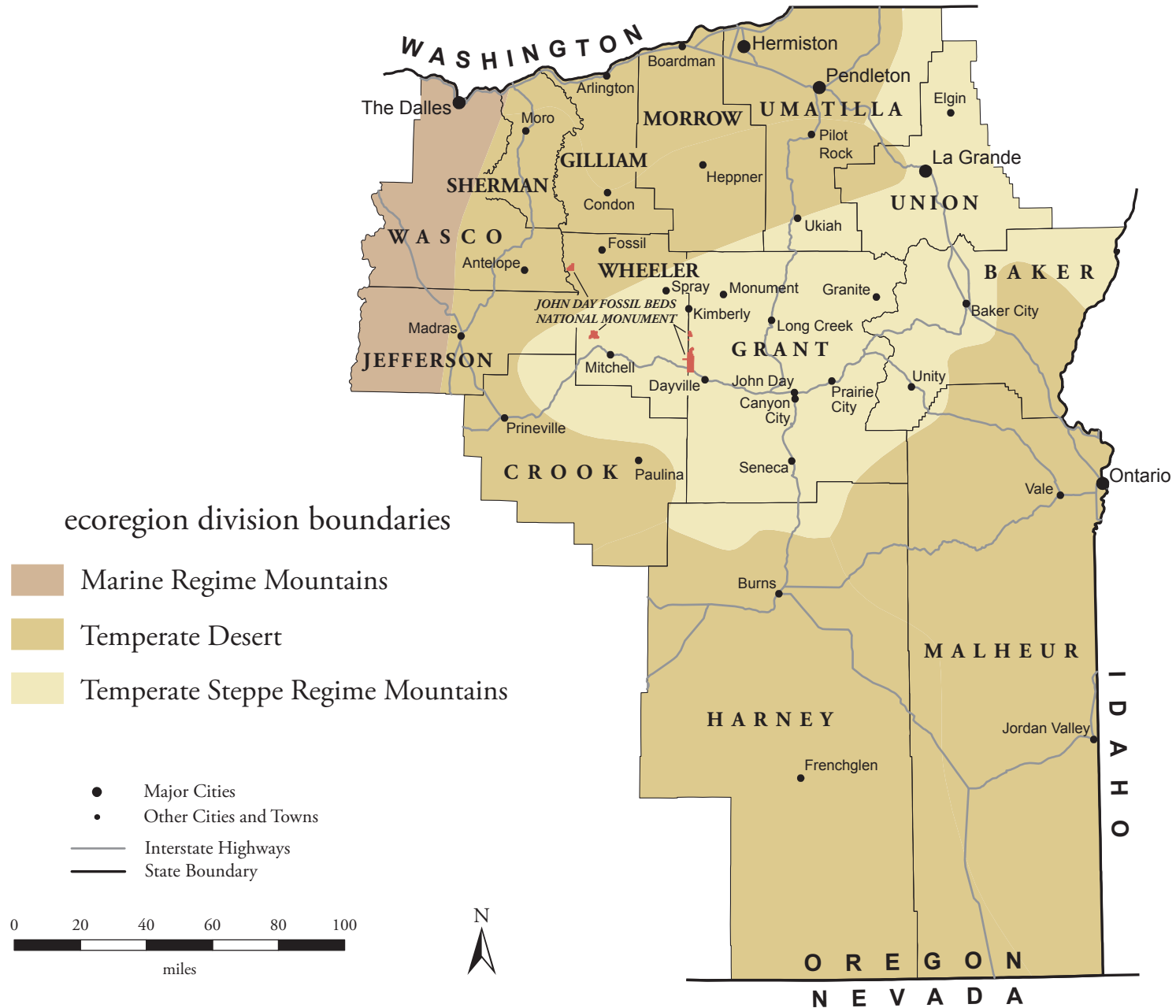
Descriptions of the three ecoregions that overlay the John Day Fossil Beds NM region are as follows:

Marine Regime Mountains – climate is marked by abundant rainfall from maritime polar air masses and a narrow range of temperatures because of proximity to the ocean. Cool air temperatures and high precipitation produce a damp, humid climate with much cloud cover. Mild winters and relatively cool summers are typical. Vegetation is characterized by needleleaf forest, such as Douglas-fir, red cedar, and spruce.

Temperate Desert – climate has significant contrasts in temperature between summer and winter with low rainfall amounts, and a greater annual temperature range and lower winter temperatures compared with deserts at lower latitudes. Vegetation is typically characterized as sagebrush semidesert, with a notable drought season and short humid season. Most precipitation falls in winter. This climate supports the sparse xerophytic shrub vegetation typical of semidesert, such as sagebrush.

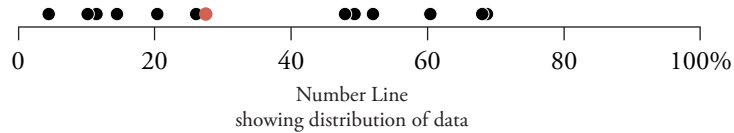
Temperate Steppe Regime Mountains – climate is semiarid, with cold and dry winters and warm to hot summers. Evaporation usually exceeds precipitation. Vegetation is typically characterized as semidesert. Numerous species of short grasses grow in widely distributed bunches that leave much soil exposed. Scattered shrubs and low trees are sometimes present. Buffalo grass, sunflower, and locoweed are typical plants.

# Ecoregions



# Federal Land Management

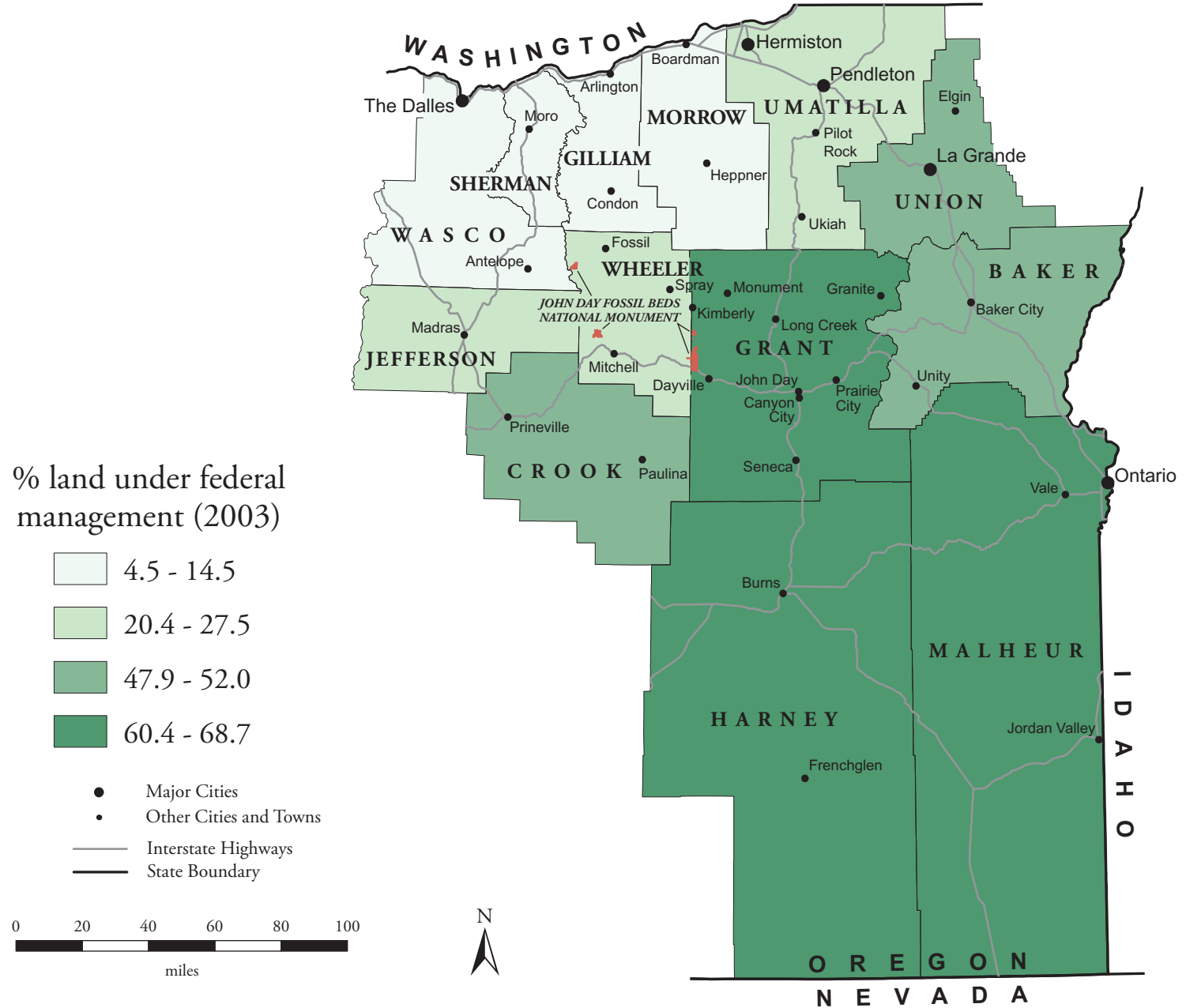
One indicator of the federal government’s role in regional resource management is the amount of land under federal management. This amount can be measured as a percentage of the total land area in each county. Stewardship of private land is carried out through a combination of regulation, market forces, and voluntary action. In contrast, stewardship of public land is carried out through direct implementation of agency policies. Thus the variation in public versus private land ownership across the park region can significantly influence the design and implementation of resource protection strategies. Within the John Day Fossil Beds NM region, land under federal management (2003) ranges from 4.5% (Gilliam) to 68.7% (Harney).<sup>18</sup>



% land under federal management (2003)	
Gilliam	4.5
Sherman	10.2
Morrow	11.5
Wasco	14.5
Umatilla	20.4
Jefferson	26.1
<b>Wheeler</b>	<b>27.5</b>
Union	47.9
Crook	49.3
Baker	52.0
Grant	60.4
Malheur	68.0
Harney	68.7

National = 27.2  
Oregon = 46.6

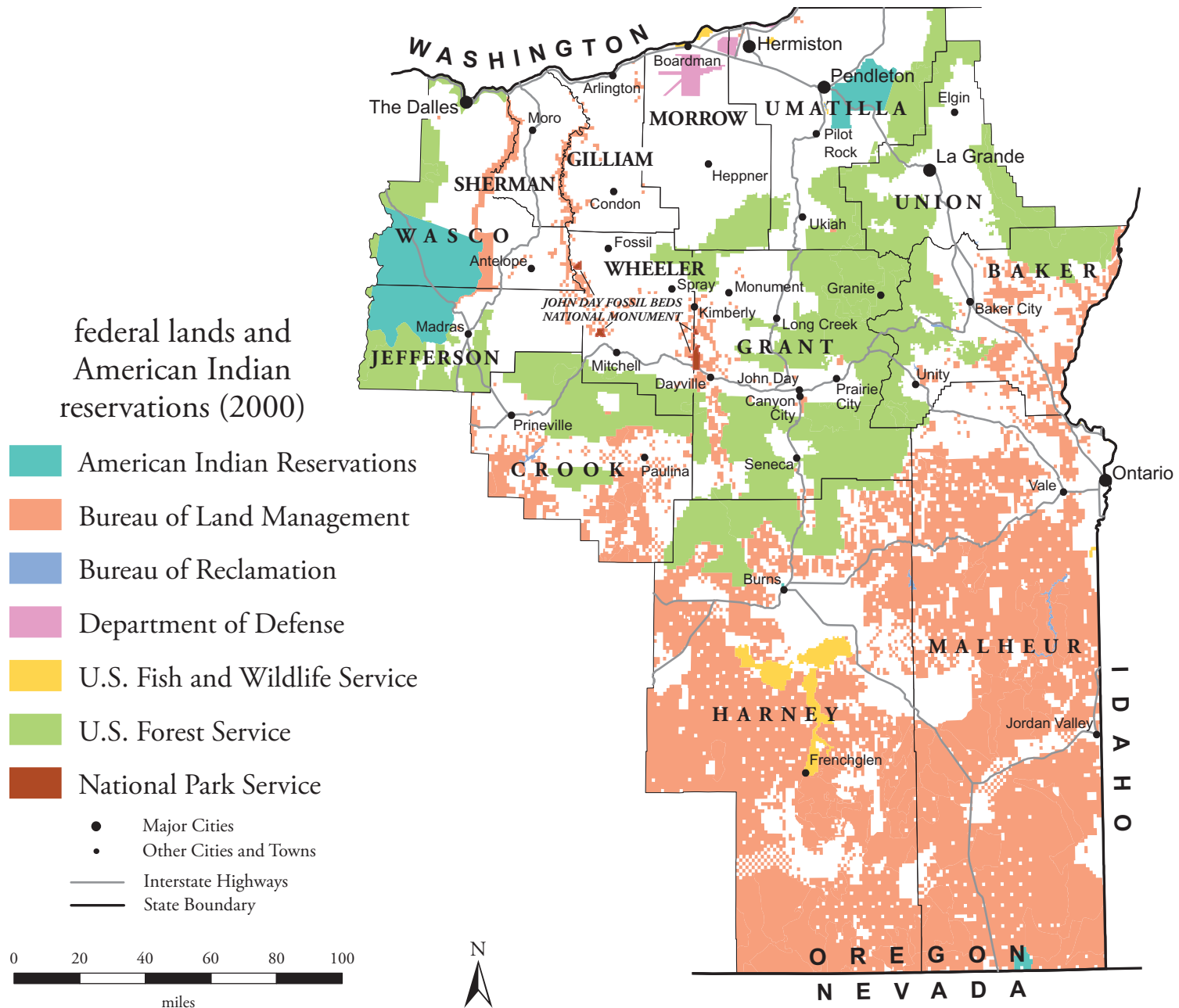
# Federal Land Management



## **Federal Lands and American Indian Reservations**

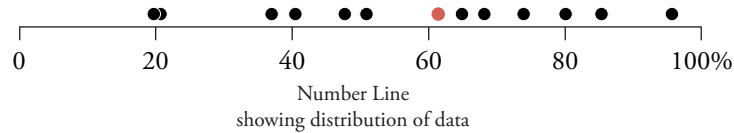
National park units, administered by the National Park Service, are part of a larger system of public lands. Other federal agencies that administer public lands include the Bureau of Land Management, Bureau of Reclamation, Department of Defense, U.S. Fish and Wildlife Service, and U.S. Forest Service. American Indian reservations are also an important part of the landscape. Public land managed by one federal agency may share boundaries with land managed by a different federal agency or with an American Indian reservation. Understanding the location and pattern of federal lands (by agency) and American Indian reservations can help park managers and others in the region cooperate on resource protection and planning issues.<sup>19</sup>

# Federal Lands and American Indian Reservations



# Farmland

The relative importance of farming within a county can be indicated by the percentage of the county's total land area that is classified as farmland. Farming includes crop cultivation as well as pasturing and grazing of livestock. Because damaged or degraded natural resources present a long-term threat to the health and profitability of farming, farm operators are potentially key partners in local and regional resource protection issues. Park management can require close coordination with area farmers on many issues, such as control of non-native species, species reintroduction, preservation of scenic values, allocation of scarce water supplies, or management of agricultural runoff. Within the John Day Fossil Beds NM region, the percentage of total county land area classified as farmland (1997) ranges from 19.9% (Malheur) to 96.4% (Gilliam).<sup>20</sup>

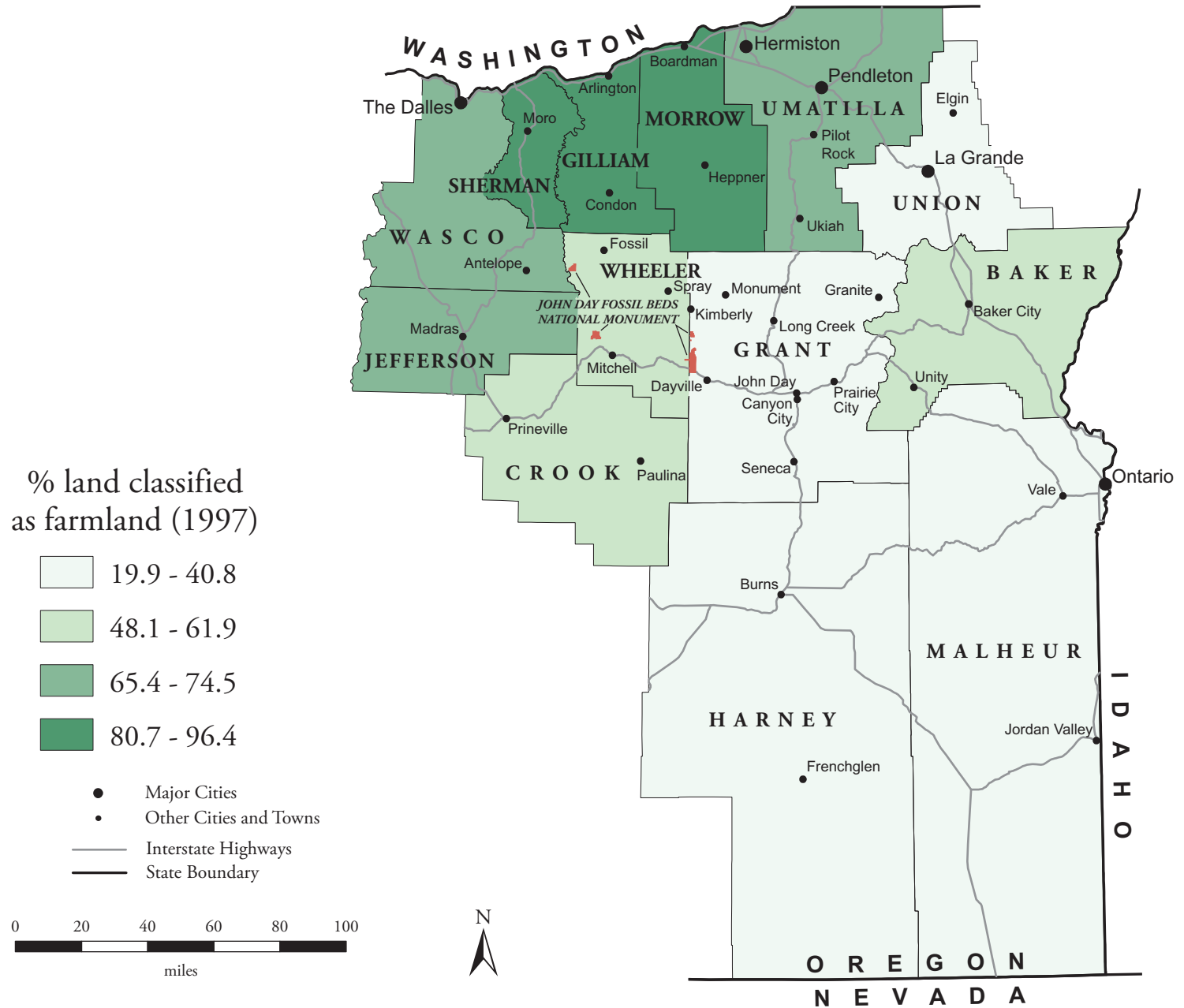


% land classified as farmland (1997)	
Malheur	19.9
Harney	20.9
Grant	37.3
Union	40.8
Crook	48.1
Baker	51.3
<b>Wheeler</b>	<b>61.9</b>
Umatilla	65.4
Jefferson	68.7
Wasco	74.5
Sherman	80.7
Morrow	86.0
Gilliam	96.4

National = 41.2  
Oregon = 28.4

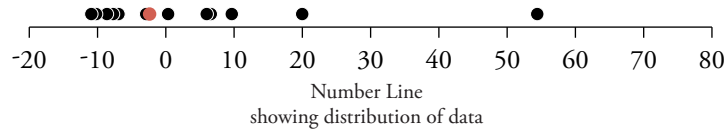


# Farmland



# Change in Farmland

Changes in the amount of farmland provide an indication of economic and land use trends among counties in the park region. Land can be converted to farming because of increased demand for agricultural products or because new technology, business practices, or government programs make farming profitable. Land can be taken out of farming due to soil depletion, competition from growers elsewhere, loss of labor, or conversion of land to other (often urban) uses. Within the John Day Fossil Beds NM region (1987 - 1997), the amount of farmland decreased in all counties except six. The change ranged from a decrease of 11.3% (Wheeler) to an increase of 54.7% (Jefferson).<sup>21</sup>

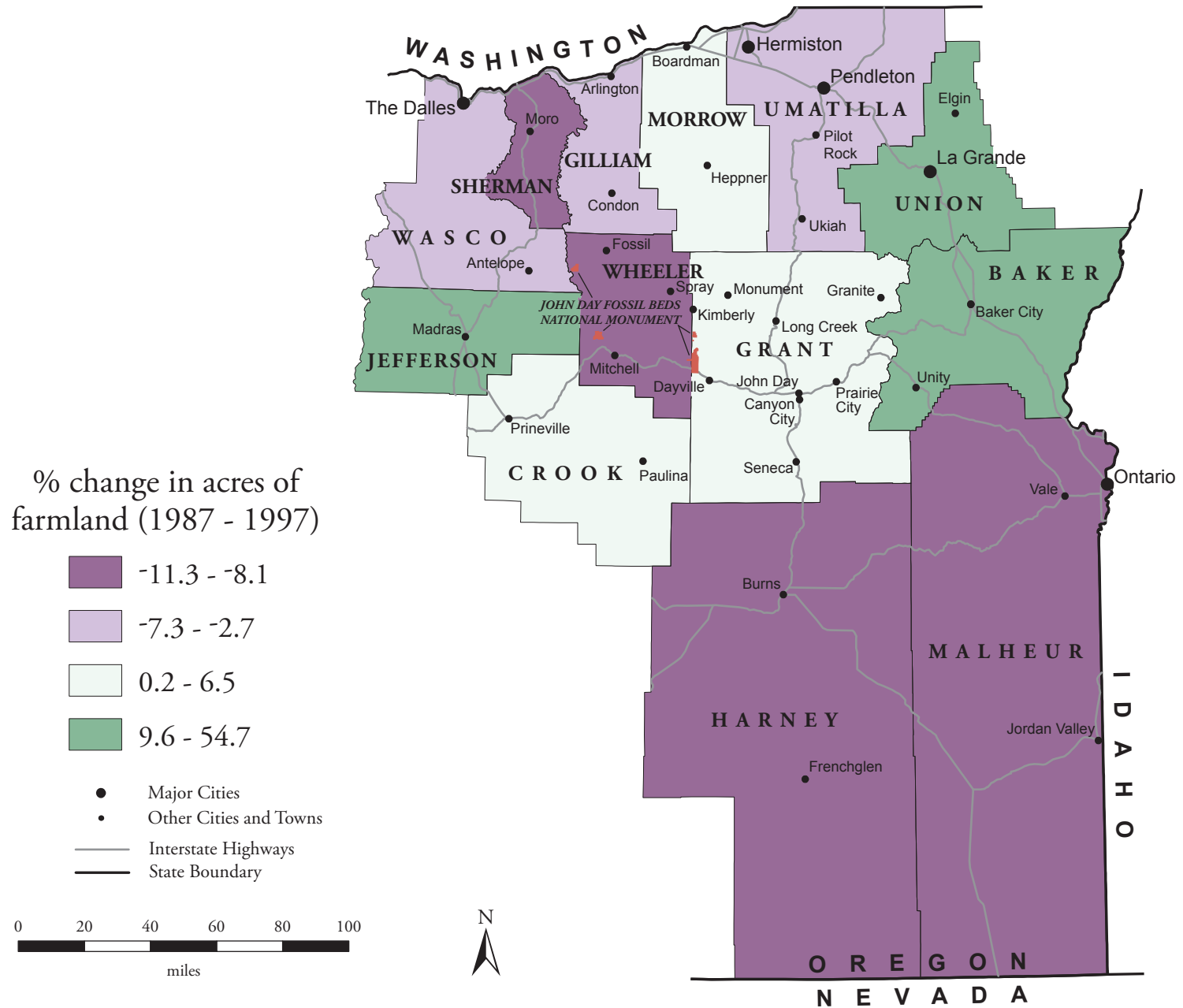


## % change in acres of farmland (1987 - 1997)

Wheeler	-11.3
Harney	-10.6
Malheur	-9.0
Sherman	-8.1
Umatilla	-7.3
Wasco	-3.2
<b>Gilliam</b>	<b>-2.7</b>
Morrow	0.2
Grant	5.9
Crook	6.5
Baker	9.6
Union	20.0
Jefferson	54.7

National = -3.4  
Oregon = -2.0

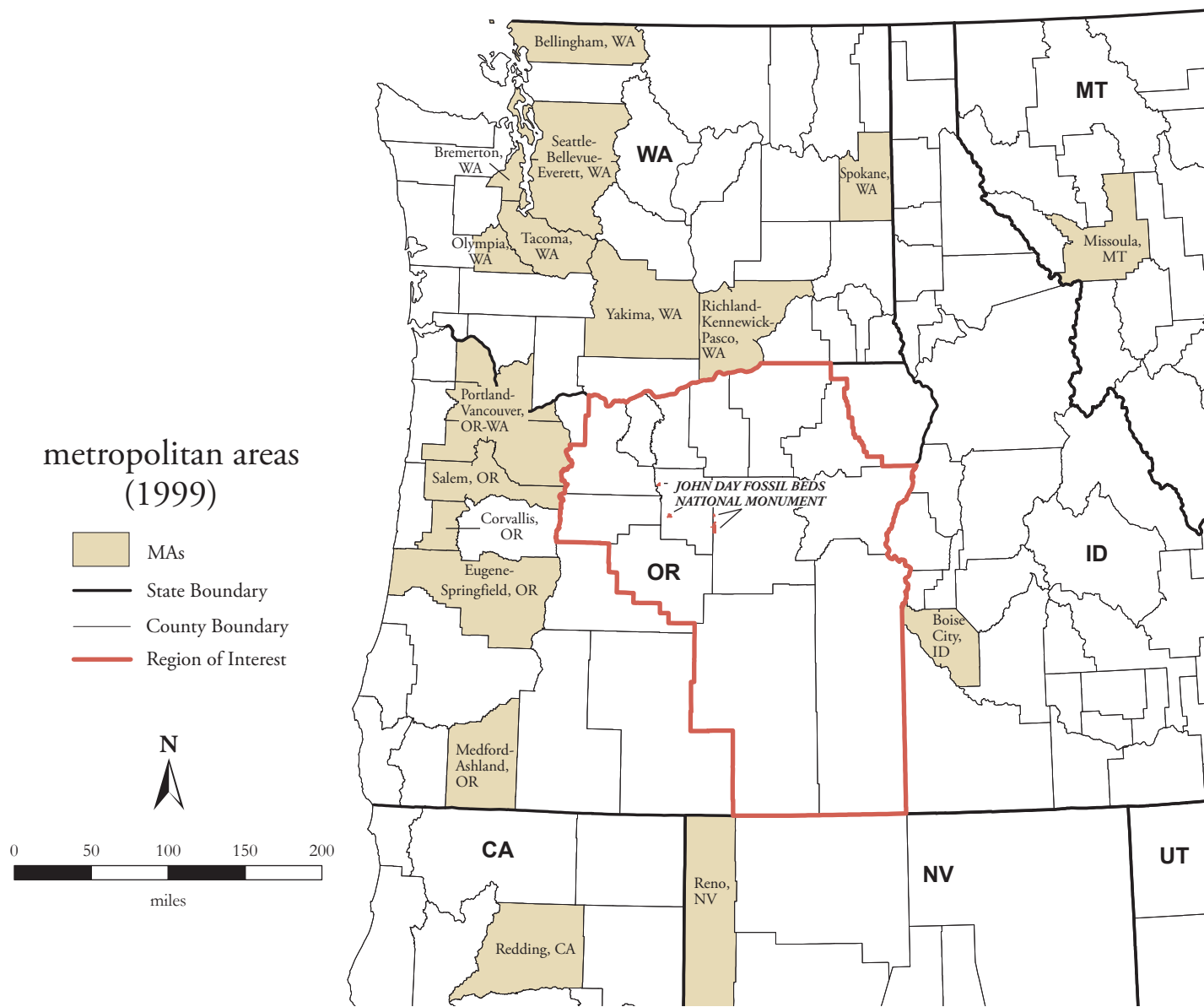
# Change in Farmland



## Metropolitan Areas

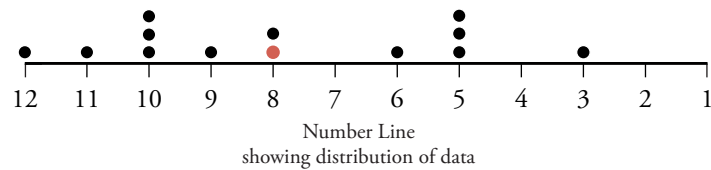
Maps of metropolitan areas show park managers densely populated urban areas that are near national park units. The Census Bureau defines a metropolitan area (MA) as having a large population nucleus, together with adjacent communities that have a high degree of economic and social integration with that nucleus. MAs are single counties or aggregations of counties. Most counties in MAs include both urban and rural land uses. For this map, a larger region around John Day Fossil Beds NM is provided to show the extent of nearby MAs, though there are no MAs in the park region.<sup>22</sup>

# Metropolitan Areas



# Urbanization

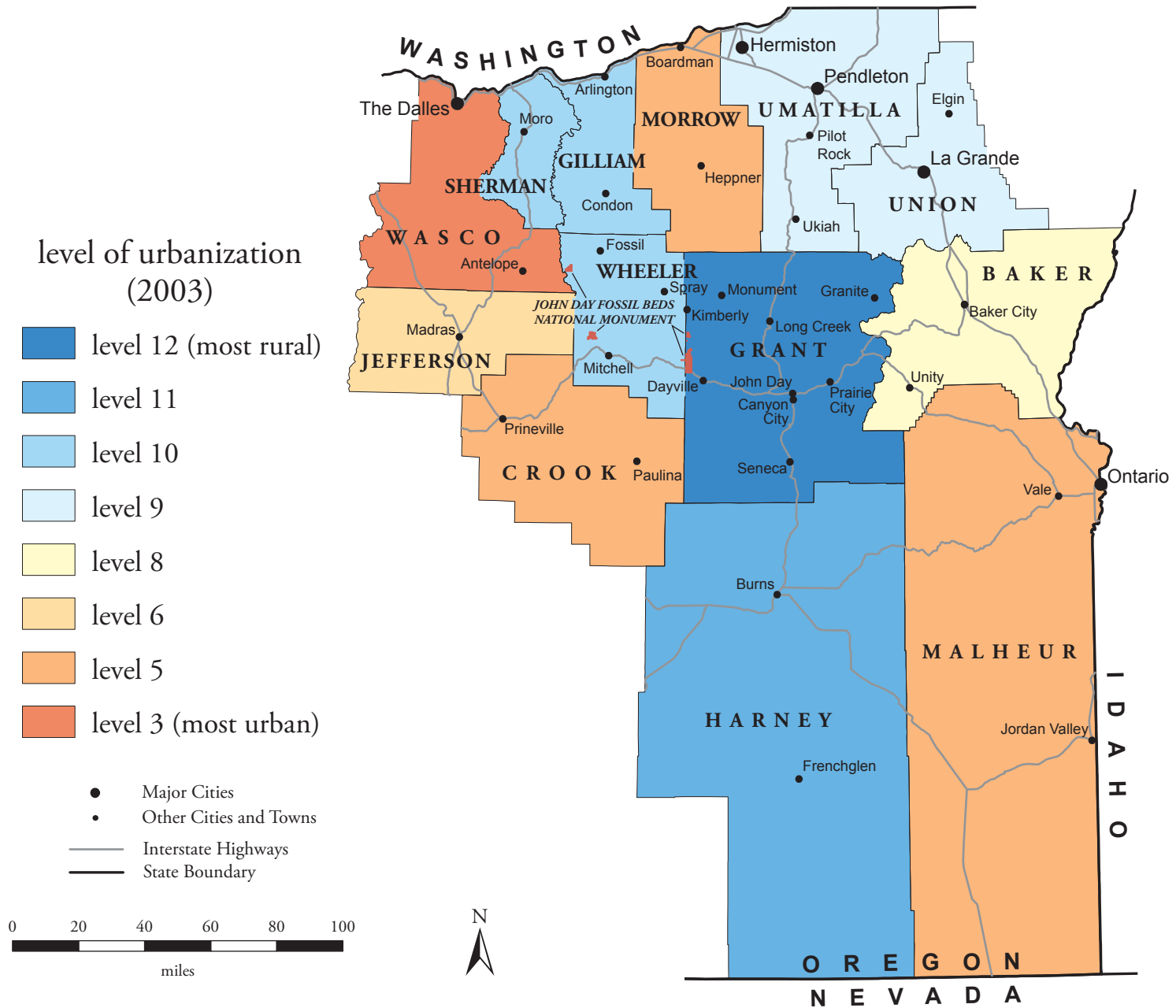
Urbanization is a measurement of the degree to which land has been developed as towns and cities. The political and economic priorities of more urbanized counties tend to differ from those of less urbanized counties. The concentration of people in towns, cities, and large metropolitan areas creates opportunities for cooperative efforts (such as municipal water systems, public transportation, and a host of non-governmental organizations) but also can increase the incidence of problems such as congestion, air pollution, and habitat fragmentation. The Economic Research Service classifies counties' degree of urbanization along a continuum ranging from completely rural (not near metro area and small population size) to large metropolitan. Within the John Day Fossil Beds NM region (2003), all 13 counties are classified as belonging to nonmetropolitan areas.<sup>23</sup>



## level of urbanization (2003)

Grant	12
Harney	11
Wheeler	10
Sherman	10
Gilliam	10
Baker	9
<b>Union</b>	<b>8</b>
<b>Umatilla</b>	<b>8</b>
Jefferson	6
Morrow	5
Malheur	5
Crook	5
Wasco	3

# Urbanization

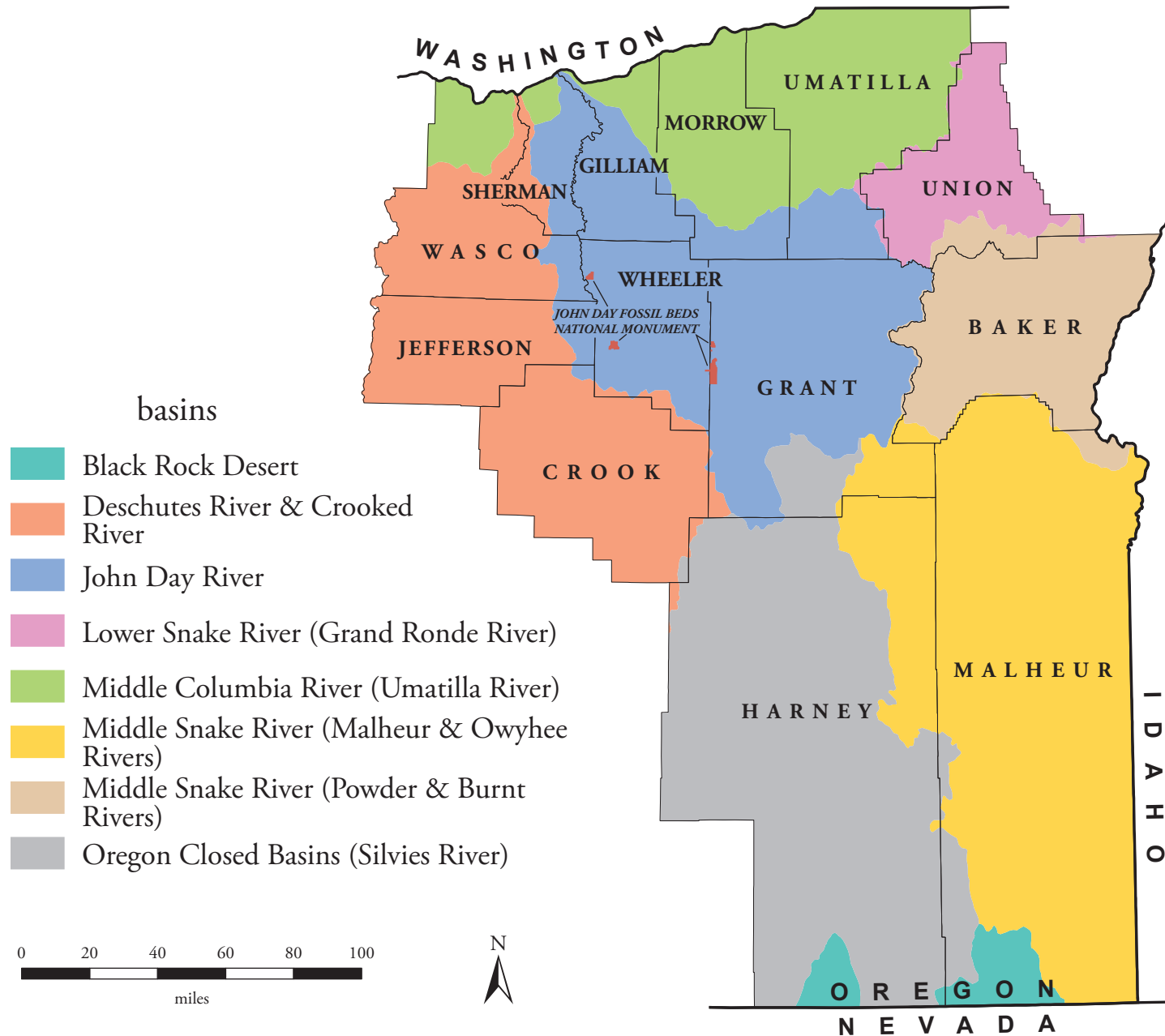


## Watersheds

Watersheds are delineated by the U.S. Geological Survey using a nationwide system based on surface hydrological features. Watersheds are increasingly serving as the geographical units within which governments, institutions, and citizens organize to carry out initiatives for environmental protection and restoration. Familiarity with watershed boundaries is fundamental in developing educational programs and in mobilizing constituencies to protect water quality throughout the park region. The John Day Fossil Beds NM region includes all or portions of eight basins.<sup>24</sup>



# Watersheds



## Conclusion: Using This Atlas for Park Management

A national park functions as part of a regional human ecosystem. A natural ecosystem can be understood in terms of factors such as flora, fauna, rainfall, temperature, elevation, and soil. Similarly, a human ecosystem can be understood in terms of factors such as population, commerce, social and cultural practices, politics, and land-use patterns.

The regional human ecosystem, like the natural ecosystem, strongly influences the long-term health of the park's natural and cultural resources. Just as a park may be concerned with upstream activities outside its boundaries yet inside its watershed, parks are also concerned with human activities taking place outside their boundaries yet inside their region. Thus, knowledge of natural and human conditions external to a park is as essential to park management as knowledge of internal natural and cultural conditions.

This atlas focuses on human activities and features in the region surrounding John Day Fossil Beds National Monument. Five primary applications for this atlas as a tool for park management are:

- monitoring activities and analyzing trends that could have short- or long-term impacts on the park;
- making comparative studies, both within the region and between regions;
- assessing potential social impacts of management decisions;
- supporting collaborative decision-making and public participation; and
- educating park staff and other stakeholders about regional socioeconomic trends.

**Monitoring activities and analyzing trends.** The standardized data sources and presentation format of this atlas allow it to serve as a baseline for long-term monitoring of human conditions and trends that impact the park, such as immigration or economic shifts. These human conditions and trends can have significant implications for park planning and management. For example, the atlas can be consulted to determine trends in educational attainment among regional residents. This information could be helpful in designing interpretive and public participation programs and materials that can increase access to and understanding of the role of the park in the region. The atlas can be used to gain knowledge about the overall structure of and local variations in the regional economy. This information could be important to developing a strong collaborative working relationship with regional business leaders. The atlas can be examined to recognize trends in land use. This information could support proactive planning to mitigate potential impacts of development such as habitat fragmentation, degradation of air or water quality, or intrusions upon historic settings and/or scenic values.

**Comparative studies.** This atlas can support comparative studies of two kinds. First, the atlas can be used to compare counties within the region. By displaying the range of values for a particular indicator or a set of indicators, the atlas can help identify specific counties where it may be desirable to take (or avoid taking) certain management actions because of the potential impact on the human ecosystem. Second, the atlas can be used to make comparisons with other park regions. Potential management actions can be evaluated in terms of how effective they have been for another park unit where similar regional socioeconomic factors are involved.

**Social impact assessment.** Federal law and NPS planning directives require that park managers evaluate the social impacts of potential management actions. The socioeconomic indicators displayed in this atlas can make an important contribution to such social impact assessments. For example, the maps displayed here could be used to help understand the impacts of various park management plans and provide context for assessments at smaller scales, such as local communities.

**Collaborative decision making.** In developing general management plans, park staff are directed to “consider the park holistically ... as part of the surrounding region” and to conduct planning “as part of cooperative regional planning whenever possible” (Director’s Order 1998-2, par. 3.3.1.2). Tools such as this atlas can support the goal of applying a regional perspective to park planning and management. Distribution of this atlas to citizens, elected officials, educators, business and service groups, resource managers, and others can strengthen their ability to effectively participate in park management activities and decision-making. Maps that present facts in a standardized format can be particularly helpful for establishing common ground on which to decide upon management priorities, especially for decisions that affect both the park and the adjacent region.

**Education and orientation.** The atlas can be used to orient new park staff, as well as central office staff, to some of the basic facts about human activities in the park’s region of interest. It can also serve as a tool for sharing information about socioeconomic trends with the public, gateway communities, media, and Congress.

In conclusion, effective park management requires a clear understanding of human activities in the surrounding region that can impact park resources and operations. By providing the “basic facts” about such activities, this atlas can help managers, citizens, and others better provide for the preservation and enjoyment of John Day Fossil Beds National Monument.

# Appendices

## Appendix 1: Data Sources for Indicators

The data sources used to obtain the measures for the socioeconomic indicators are listed below. The indicators listed on the left correspond to the titles of the maps in the atlas. The measure corresponds to captions for the legends used in the maps and the ranked data tables.

INDICATOR	MEASURE	DATA SOURCE
<b>General Population</b>		
*Total Population	total number of people (2002)	U.S. Department of Commerce, Census Bureau, <a href="http://eire.census.gov/popest/estimates_dataset.php">http://eire.census.gov/popest/estimates_dataset.php</a>
*Recent Population Change	% change in total number of people (1990 - 2000)	U.S. Department of Commerce, Census Bureau, <a href="http://www.census.gov/population/cen2000/atlas/all_00.xls">http://www.census.gov/population/cen2000/atlas/all_00.xls</a>
*Projected Population Change	projected % change in total number of people (2000 - 2020)	Woods & Poole Economics, Inc. 2002 Complete Economic and Demographic Data Source (CEDDS) on CD-ROM. Washington, DC. Woods & Poole Economics, Inc. provides long-term socioeconomic data projections at the state and local levels, in both hardcopy and electronic format. <a href="http://www.woodsandpoole.com">http://www.woodsandpoole.com</a>
Median Age	median age of total population (2000)	U.S. Department of Commerce, Census Bureau, <a href="http://factfinder.census.gov">http://factfinder.census.gov</a> – Census 2000 Summary File 1 (SF1) 100% Data, Table P13
Dependency Ratio	ratio of population <18 or >64 to 18 - 64 years old (2000)	U.S. Department of Commerce, Census Bureau, <a href="http://factfinder.census.gov">http://factfinder.census.gov</a> – Census 2000 Summary File 1 (SF1) 100% Data, Table P12
Domestic Migration	net number of non-foreign migrants (1995 - 2000)	U.S. Department of Commerce, Census Bureau, <a href="http://www.census.gov/population/www/cen2000/phc-t22.html">http://www.census.gov/population/www/cen2000/phc-t22.html</a> – Table 2
<b>Economy and Commerce</b>		
*Earnings by Industry	% total earnings by industrial category (1999)	Woods & Poole Economics, Inc. 2002 Complete Economic and Demographic Data Source (CEDDS) on CD-ROM. Washington, DC. Woods & Poole Economics, Inc. provides long-term socioeconomic data projections at the state and local levels, in both hardcopy and electronic format. <a href="http://www.woodsandpoole.com">http://www.woodsandpoole.com</a>

**Appendix 1: Data Sources for Indicators (continued)**

INDICATOR	MEASURE	DATA SOURCE
Change in Earnings by Industry	% change in total earnings by industrial category (1990 - 1999)	Woods & Poole Economics, Inc. 2002 Complete Economic and Demographic Data Source (CEDDS) on CD-ROM. Washington, DC. Woods & Poole Economics, Inc. provides long-term socioeconomic data projections at the state and local levels, in both hardcopy and electronic format. <a href="http://www.woodsandpoole.com">http://www.woodsandpoole.com</a>
*Employment by Industry	% employment by industrial category (1999)	Woods & Poole Economics, Inc. 2002 Complete Economic and Demographic Data Source (CEDDS) on CD-ROM. Washington, DC. Woods & Poole Economics, Inc. provides long-term socioeconomic data projections at the state and local levels, in both hardcopy and electronic format. <a href="http://www.woodsandpoole.com">http://www.woodsandpoole.com</a>
Change in Employment by Industry	% change in employment by industrial category (1990 - 1999)	Woods & Poole Economics, Inc. 2002 Complete Economic and Demographic Data Source (CEDDS) on CD-ROM. Washington, DC. Woods & Poole Economics, Inc. provides long-term socioeconomic data projections at the state and local levels, in both hardcopy and electronic format. <a href="http://www.woodsandpoole.com">http://www.woodsandpoole.com</a>
*Poverty	% total population in poverty (1999)	U.S. Department of Commerce, Census Bureau, <a href="http://www.census.gov/hhes/poverty/2000census/popvstat00.html">http://www.census.gov/hhes/poverty/2000census/popvstat00.html</a>
Median Household Income	median household income (\$) (1999)	U.S. Department of Commerce, Census Bureau, <a href="http://factfinder.census.gov">http://factfinder.census.gov</a> – Census 2000 Summary File 3 (SF3) Sample Data, Table P53
<b>Social and Cultural Characteristics</b>		
Racial and Ethnic Composition	% total population in each racial/ethnic category (2000)	U.S. Department of Commerce, Census Bureau, <a href="http://factfinder.census.gov">http://factfinder.census.gov</a> – Census 2000 Summary File 1 (SF1) 100% Data, Tables P7, P8

## Appendix 1: Data Sources for Indicators (continued)

INDICATOR	MEASURE	DATA SOURCE
*Racial Diversity	% total population belonging to minority race groups (2000)	U.S. Department of Commerce, Census Bureau, <a href="http://factfinder.census.gov">http://factfinder.census.gov</a> – Census 2000 Summary File 1 (SF1) 100% Data, Table P7
*Educational Attainment	% total population greater than or equal to 25 years old with some college or college degree (2000)	U.S. Department of Commerce, Census Bureau, <a href="http://factfinder.census.gov">http://factfinder.census.gov</a> – Census 2000 Summary File 3 (SF3) Sample Data, Table P37
Crime	number of serious crimes per 100,000 people (2000)	U.S. Department of the Interior, U.S. Geological Survey, <a href="http://nationalatlas.gov/crimesm.html">http://nationalatlas.gov/crimesm.html</a>
<b>Recreation and Tourism</b>		
Recreation/Tourism Establishments	% of total establishments in arts, entertainment, recreation, and accommodation services (2001)	U.S. Department of Commerce, Census Bureau, <a href="http://censtats.census.gov/cbpnaic/cbpnaic.shtml">http://censtats.census.gov/cbpnaic/cbpnaic.shtml</a>
*Recreation/Tourism Revenue	% of total sales from arts, entertainment, recreation, and accommodation services (1997)	U.S. Department of Commerce, Census Bureau, <a href="http://www.census.gov/epcd/www/econ97.html">http://www.census.gov/epcd/www/econ97.html</a>
*Recreation/Tourism Employment	% of total paid employees in arts, entertainment, recreation, and accommodation services (2001)	U.S. Department of Commerce, Census Bureau, <a href="http://censtats.census.gov/cbpnaic/cbpnaic.shtml">http://censtats.census.gov/cbpnaic/cbpnaic.shtml</a>
Seasonal Housing	% of total housing units classified for seasonal, recreational, or occasional use (2000)	U.S. Department of Commerce, Census Bureau, <a href="http://factfinder.census.gov">http://factfinder.census.gov</a> – Census 2000 Summary File 1 (SF1) 100% Data, Tables H3, H5
<b>Administration and Government</b>		
*Congressional Districts	Congressional Districts (2000)	U.S. Department of the Interior, U.S. Geological Survey, <a href="http://nationalatlas.gov/cgd108m.html">http://nationalatlas.gov/cgd108m.html</a>
*Federal Expenditures	federal expenditures per capita (\$) (2002)	U.S. Department of Commerce, Census Bureau, <a href="http://www.census.gov/prod/www/abs/cffr.html">http://www.census.gov/prod/www/abs/cffr.html</a>

## Appendix 1: Data Sources for Indicators (continued)

INDICATOR	MEASURE	DATA SOURCE
Payments in Lieu of Taxes	total dollars transferred to counties (2003)	U.S. Department of the Interior, Bureau of Land Management, <a href="http://www.blm.gov/pilt/search.html">http://www.blm.gov/pilt/search.html</a>
Federal Grants	% total federal expenditures received as grant awards (2002)	U.S. Department of Commerce, Census Bureau, <a href="http://www.census.gov/prod/2003pubs/cfr02.pdf">http://www.census.gov/prod/2003pubs/cfr02.pdf</a>
<b>Land Use</b>		
Ecoregions	ecoregion division boundaries	1) USDA Forest Service, Inventory and Monitoring Institute, <a href="http://www.fs.fed.us/institute/ecoregions/eco_download.html">http://www.fs.fed.us/institute/ecoregions/eco_download.html</a> 2) Bailey, Robert G. (1995). <i>Description of the Ecoregions of the United States</i> (2nd ed.). Misc. Pub. No. 1391, USDA Forest Service, 108 pp.
*Federal Land Management	% land under federal management (2003)	1) U.S. Department of the Interior, Bureau of Land Management. Payment in Lieu of Taxes, Fiscal Year 2003. Washington, DC. <a href="http://www.blm.gov/pilt/search.html">http://www.blm.gov/pilt/search.html</a> ( <i>federal land in acres</i> ) 2) U.S. Department of Commerce, Census Bureau <a href="http://www.census.gov/population/cen2000/atlas/all_00.xls">http://www.census.gov/population/cen2000/atlas/all_00.xls</a> ( <i>county square mile data to convert into acres</i> )
*Federal Lands and American Indian Reservations	federal lands and American Indian reservations (2000)	U.S. Department of the Interior, U.S. Geological Survey, <a href="http://nationalatlas.gov/atlasftp.html">http://nationalatlas.gov/atlasftp.html</a>
Farmland	% land classified as farmland (1997)	U.S. Department of Agriculture, National Agricultural Statistics Service, <a href="http://www.nass.usda.gov/census/">http://www.nass.usda.gov/census/</a>
*Change in Farmland	% change in acres of farmland (1987 - 1997)	U.S. Department of Agriculture, National Agricultural Statistics Service, <a href="http://www.nass.usda.gov/census/">http://www.nass.usda.gov/census/</a>
*Metropolitan Areas	metropolitan areas (1999)	U.S. Department of Commerce, Census Bureau, <a href="http://www.census.gov/geo/www/cob/ma1999.html#shp">http://www.census.gov/geo/www/cob/ma1999.html#shp</a>
*Urbanization	level of urbanization (2003)	U.S. Department of Agriculture, Economic Research Service, <a href="http://www.ers.usda.gov/Data/UrbanInfluenceCodes/">http://www.ers.usda.gov/Data/UrbanInfluenceCodes/</a>

**Appendix 1: Data Sources for Indicators (continued)**

INDICATOR	MEASURE	DATA SOURCE
Watersheds	basins	U.S. Department of the Interior, U.S. Geological Survey, <a href="http://www.nationalatlas.gov/hucsm.html">http://www.nationalatlas.gov/hucsm.html</a>

*\* Denotes a core indicator, common to all atlases in this series. Additional indicators were selected by park managers to include information specific to their particular management needs.*



## Appendix 2: Technical Notes on Map Design

**Selection of Base Map Data** – The regional base map used to map socioeconomic indicators in this atlas includes state and county boundaries, some of the major roads, major cities, and a few other selected cities and towns. The roads, cities, and towns are included to provide readers with a few familiar points of reference. It should be emphasized that this is not a general purpose atlas of the region, for it focuses only on socioeconomic indicators.

**Choropleth Mapping** – For most of the maps, data are grouped by quartiles which vary in shading from light to dark (for low to high values). This shading technique, known as choropleth mapping, is usually applied to ratio data; population density, infant deaths per 1,000 live births, and median income are examples. Maps that display total amounts (such as total population) often use other approaches, such as proportional symbols. For clarity, ease of use, and consistent design, choropleth mapping is used for most of the social indicator data.

**Quartile Classification** – The choice of a *quartile* classification of the data means that for most maps, counties were divided into four classes. Rather than focusing on the actual numerical value of the indicator for each county, the quartile approach emphasizes the rankings of data values among counties. The legend accompanying the map allows the reader to see the range of values among counties within a class. Quartiles make it easy for the reader to make intuitive comparisons among counties; the darkest shaded counties are in the “top quarter,” the lightest shaded counties are in

the “bottom quarter,” and so forth. Quartiles also facilitate comparisons between maps in the atlas (“this county ranks in the bottom quartile on all three of these indicators”).

Two notes: (1) Whenever the number of counties cannot be evenly divided by four, the convention for this atlas series is to reduce the size of the highest quartile first, then the next quartile if needed, then the third quartile if needed. Hence thirteen counties would be divided into groups of 4, 3, 3, and 3, with the last group of 3 having the highest data values/darkest shading. (2) Counties with identical data values are grouped in the same quartile, even if this results in quartiles of unequal size.

**Note on Political Boundaries** – The regional base map depicts the formally defined political boundaries of states and counties.

**Map Sources** – The regional map on the cover and at the beginning of the atlas was generated from the North American HYDRO1k dataset (<http://edcdaac.usgs.gov/topo30/hydro/>) developed at the U.S. Geological Survey’s EROS Data Center. The standard region of interest map used throughout the atlas was generated from U.S. Geological Survey shapefiles. Contextual information (roads and cities) was also obtained from the U.S. Geological Survey (<http://www.nationalatlas.gov>).

**Production** – Indicator data for the atlas were compiled in Microsoft Excel 2000. These were linked to U.S. Geological Survey shapefiles using ESRI ArcMap GIS 8.3. The GIS files were imported into Adobe Illustrator 10.0 for final map

design. Text was prepared in Microsoft Word 2000. The final atlas layout (text, maps, graphics) was completed using Adobe InDesign 2.0.

**Text Sources** – Additional web resources used to prepare park and regional descriptions are:

- John Day Fossil Beds National Monument; <http://www.nps.gov/joda/index.htm>
- U.S. Census Bureau; <http://www.census.gov>
- Eastern Oregon; <http://www.eova.com>
- Netstate.com; <http://www.netstate.com/states/index.html>
- Science Daily; <http://www.sciencedaily.com/encyclopedia>

### Appendix 3: Technical Notes on Measurement of Selected Indicators

<sup>1</sup> Persons enumerated in the census were counted as inhabitants of their usual place of residence, which generally means the place where a person lives and sleeps most of the time. This place is not necessarily the same as the legal residence, voting residence, or domicile. In the vast majority of cases, however, the use of these different bases of classification would produce substantially the same statistics, although appreciable differences may exist for a few areas.

<sup>2</sup> For an explanation of Woods & Poole's projection methods see page 11 in the Woods and Poole Technical Documentation manual.

<sup>3</sup> **Domestic migration** is measured as the movement of people within the United States between 1995 and 2000. Net migration is the difference between in-migration and out-migration to the area. A positive net migration indicates that more migrants entered the area than left it, while negative net migration indicates that more migrants left the area than entered it. Immigrants who moved to the U.S. from abroad between 1995 and 2000 are not included in these domestic migration figures.

<sup>4</sup> Economic activity is categorized as belonging to one of four **industry categories**: agriculture/natural resources, construction/manufacturing, sales/services, and government. Individual workers, regardless of their specific job responsibilities, are classified according to the category their overall company or organization belongs to. Thus, while

accounting is considered a “service” activity, an accountant for a mining company would be counted as working in “agriculture/natural resources.” “Government” includes all federal government workers and all state/local employees, such as teachers, police, firefighters, etc. Even though government jobs may involve construction, natural resource management, or provision of services, they are still counted as belonging to the “government” category.

<sup>5</sup> See note above on industry categories.

<sup>6</sup> See note above on industry categories.

<sup>7</sup> See note above on industry categories.

<sup>8</sup> **Poverty** is measured as the percentage of the total population living below the poverty level. The poverty level is defined as earnings of \$17,029 or less for a family of four persons (1999). Poverty thresholds are applied on a national basis and are not adjusted for regional, state, or local variations in the cost of living.

<sup>9</sup> **Racial composition** is based upon self-identification by people responding to the U.S. Census. Census respondents are asked to classify themselves according to the race with which they most closely identify. Specific responses such as “Polish,” “Haitian,” “Thai,” or “Lakota” were coded more generally as belonging to one of six general categories (White, Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, and Some Other Race). Respondents to Census 2000 could indicate more than one race, and these respondents are

grouped together in the category Two or More Races. Persons of Hispanic or Latino origin may be of any race. People of Hispanic origin who are not white were counted in the Hispanic group and were also counted in the Black, American Indian and Alaska Native, Asian, or Native Hawaiian or Other Pacific Islander group they indicated.

<sup>10</sup> **Racial diversity** is defined for this measure as the percentage of the population classified as being non-White. Diversity by this definition does not necessarily measure the degree of “variety” in the population. For example, a hypothetical county with a 90% Asian population would be considered more “diverse” than a county in which each of the six major race groups constituted 10% of the population (in the latter case, diversity would be measured as 60%). The Hispanic or Latino origin category was not included in this measure because persons of Hispanic or Latino origin may be of any race (including White). Data on the Hispanic population are included on pages 36 and 37.

<sup>11</sup> For the census, persons are classified according to the highest level of school completed or the highest degree received. The question included instructions to report the level of the previous grade attended or the highest degree received for persons currently enrolled in school.

<sup>12</sup> **Recreation and Tourism** is composed of the arts, entertainment, and recreation sector and the accommodation subsector, both a part of The North American Industry Classification System (NAICS). The arts, entertainment, and recreation sector includes museums, historical sites, gambling and recreation industries, golf courses and country

clubs, fitness and recreational sports centers, and all other amusement industries. The accommodation subsector is comprised of establishments including hotels, motels, bed and breakfasts, RV parks, recreational camps, and vacation camps. For a complete definition of these NAICS categories please consult <http://www.census.gov/epcd/www/naics.html>.

<sup>13</sup> See note above on recreation/tourism.

<sup>14</sup> See note above on recreation/tourism.

<sup>15</sup> Housing unit is a house, apartment, mobile home or trailer, group of rooms, or single room occupied or, if vacant, intended for occupancy as separate living quarters. Seasonal, recreational, or occasional use refers to vacant units used, or intended for use, only in certain seasons or for weekend or other occasional use throughout the year. A housing unit is vacant if no one is living in it at the time of enumeration, unless its occupants are only temporarily absent. Units temporarily occupied at the time of enumeration entirely by persons who have a usual residence elsewhere are also classified as vacant.

<sup>16</sup> **Federal expenditures** include expenditures, or obligation for, direct payments for individuals, procurement, grants, salaries and wages, direct loans, and guaranteed loans and insurance. Grant awards are reported by county of the initial recipient; thus if the initial recipient is the state government, the county in which the state capital is located is reported as having “received” that “pass-through” grant, even though the monies are subsequently distributed to other local governments.

<sup>17</sup> For **federal grants** administered through state governments, the recipient county is the county where the state capital is located.

<sup>18</sup> **Federal lands** include all tax-exempt federal lands administered by the Bureau of Land Management (BLM), the National Park Service, the U.S. Fish and Wildlife Service, the U.S. Forest Service, federal water projects, and some military installations (tribal lands are not included). The BLM calculates the amount of federal land within counties in order to administer the federal government’s payments-in-lieu-of-taxes (PILT) program.

<sup>19</sup> The U.S. Geological Survey produces the **federal lands and American Indian reservations** map layer. This map layer does not include any federally and American Indian held land that has an areal extent smaller than 640 acres. For more information and metadata, consult <http://www.nationalatlas.gov/fedlandsm.html>.

<sup>20</sup> **Farmland** consists primarily of agricultural land used for crops, pasture, or grazing. Also included is woodland and wasteland not actually under cultivation or used for pasture or grazing, provided it was part of the farm operator’s total operation. Farmland includes acres in the Conservation Reserve, Wetlands Reserve Programs, or other governmental programs. Farmland includes land owned and operated as well as land rented from others. Land used rent-free is included as land rented from others. All grazing land, except land used under government permits on a per-head basis, is included as farmland provided it was part of a farm or ranch. Land under the exclusive use of a grazing association is

reported by the grazing association and included as farmland. All land in American Indian reservations used for growing crops or grazing livestock is included as farmland. Land in reservations not reported by individuals is reported in the name of the cooperative group that used the land.

<sup>21</sup> See note above on farmland.

<sup>22</sup> Certain **Metropolitan Areas (MAs)** are defined around two or more nuclei. Each MA must contain either a place with a minimum population of 50,000 or a U.S. Census Bureau-defined urbanized area and a total MA population of at least 100,000. For a complete definition, consult [http://www.census.gov/geo/www/cob/ma\\_metadata.html](http://www.census.gov/geo/www/cob/ma_metadata.html).

<sup>23</sup> The Economic Research Service classifies counties according to their level of **urbanization**. The classification consists of twelve mutually-exclusive codes:

#### METROPOLITAN COUNTIES

- 1) In large metro area of greater than 1 million residents
- 2) In small metro area of less than 1 million residents

#### NONMETROPOLITAN COUNTIES

- 3) Micropolitan adjacent to large metro
- 4) Noncore adjacent to large metro
- 5) Micropolitan adjacent to small metro
- 6) Noncore adjacent to small metro with own town
- 7) Noncore adjacent to small metro no own town
- 8) Micropolitan not adjacent to a metro area
- 9) Noncore adjacent to micro with own town
- 10) Noncore adjacent to micro with no own town

- 11) Noncore not adjacent to metro or micro with own town
- 12) Noncore not adjacent to metro or micro with no own town

<sup>24</sup> **Watersheds** are delineated by the U.S. Geological Survey using a nationwide system based on surface hydrologic features and published in 1998. This system divides the country into 21 regions, 222 subregions, 352 accounting units, and 2,262 cataloging units. A hierarchical hydrologic code (HUC) consisting of 2 digits for each level in the hydrologic unit system is used to identify any hydrologic area. The 6-digit accounting units and 8-digit cataloging units are generally referred to as basins and sub-basin watersheds. This atlas maps the 6-digit cataloging units. (see <http://water.usgs.gov/GIS/huc.html>).



For more information, contact:

Dr. Jean E. McKendry  
National Park Service  
1849 C Street, NW (MIB 3130)  
Washington, D.C. 20240  
E-mail: [jean\\_mckendry@partner.nps.gov](mailto:jean_mckendry@partner.nps.gov)

Final Version Date: 1/2005

