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Developing Measures of Socioeconomic Resiliency in the Interior Columbia Basin

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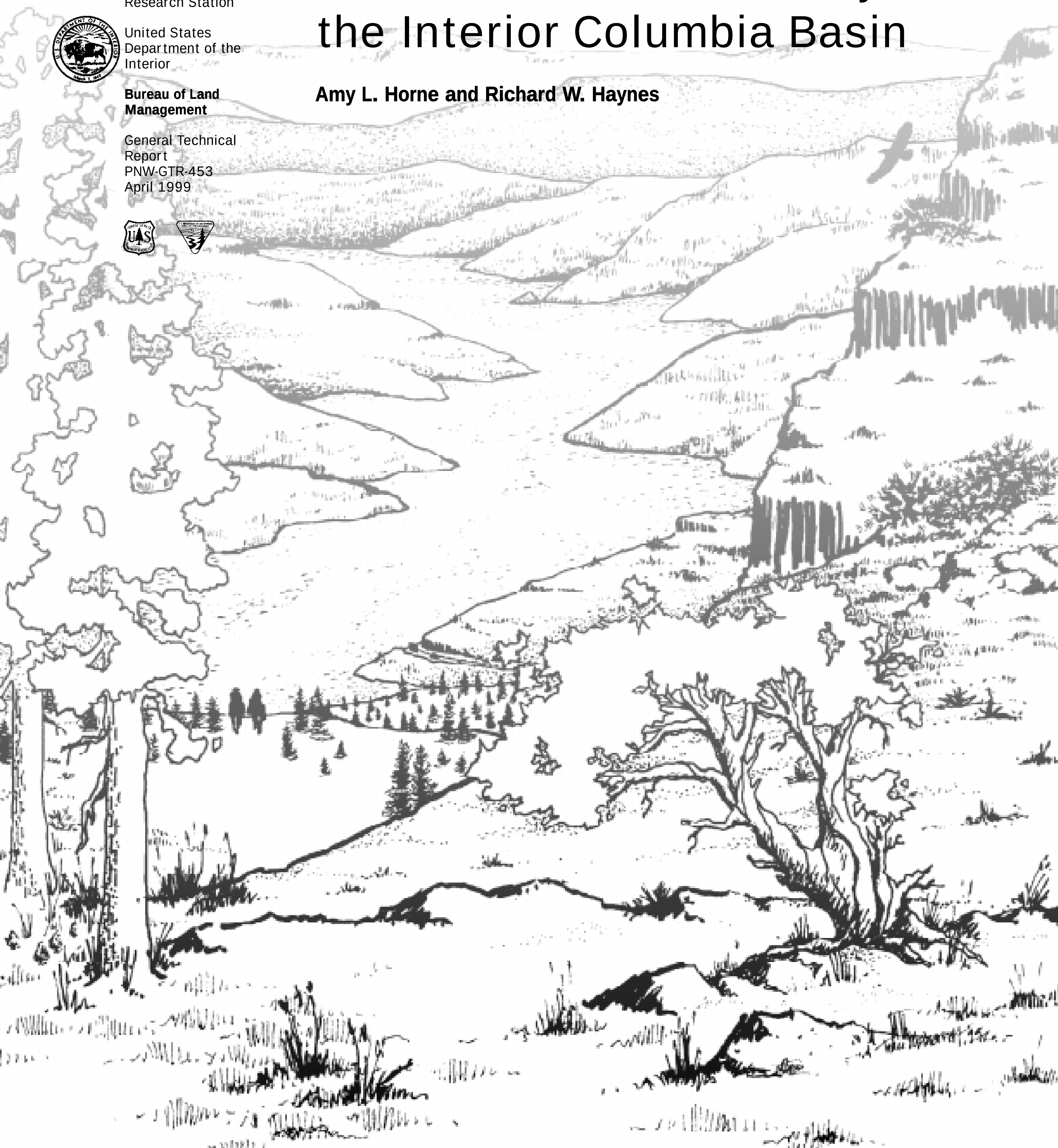

Authors

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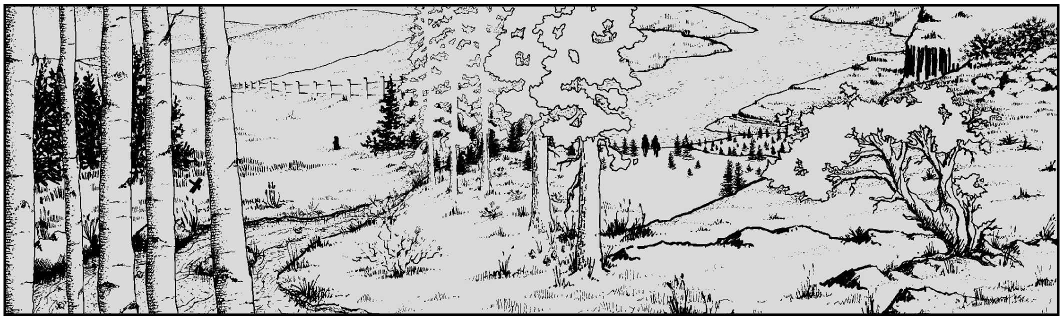

Developing Measures of Socioeconomic Resiliency in the Interior Columbia Basin

Amy L. Horne and Richard W. Haynes

Interior Columbia Basin Ecosystem Management Project: Scientific Assessment

Thomas M. Quigley, Editor

U.S. Department of Agriculture
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Abstract

Horne, Amy L.; Haynes, Richard W. 1999. Developing measures of socioeconomic resiliency in the interior Columbia basin. Gen. Tech. Rep. PNW-GTR-453. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 41 p. (Quigley, Thomas M., ed.; Interior Columbia Basin Ecosystem Management Project: scientific assessment).

Measures of socioeconomic resiliency were developed for the 100 counties studied in the Interior Columbia Basin Ecosystem Management Project. These measures can be used for understanding the extent to which changes in policies for management of Federal lands may affect socioeconomic systems coincident with those lands. We found that most of the basin's residents (67 percent) live in counties with a high degree of socioeconomic resiliency; however, these counties represent only 20 percent of the land base. Whereas 68 percent of the basin is categorized as having low socioeconomic resiliency, only 18 percent of the people live in these areas. These findings allow land managers to better gauge the impacts of land management actions and to focus social and economic mitigation strategies on places of greatest need.

Keywords: Well-being, Federal land management, ecosystem management.

Preface

The Interior Columbia Basin Ecosystem Management Project was initiated by the Forest Service and the Bureau of Land Management to respond to several critical issues including, but not limited to, forest and rangeland health, anadromous fish concerns, terrestrial species viability concerns, and the recent decline in traditional commodity flows. The charter given to the project was to develop a scientifically sound, ecosystem-based strategy for managing the lands of the interior Columbia River basin administered by the Forest Service and the Bureau of Land Management. The Science Integration Team was organized to develop a framework for ecosystem management, an assessment of the socioeconomic and biophysical systems in the basin, and an evaluation of alternative management strategies. This paper is one in a series of papers developed as background material for the framework, assessment, or evaluation of alternatives. It provides more detail than was possible to disclose directly in the primary documents.

The Science Integration Team, although organized functionally, worked hard at integrating the approaches, analyses, and conclusions. It is the collective effort of team members that provides depth and understanding to the work of the project. The Science Integration Team leadership included deputy team leaders Russel Graham and Sylvia Arbelbide; landscape ecology–Wendel Hann, Paul Hessburg, and Mark Jensen; aquatic–Jim Sedell, Kris Lee, Danny Lee, Jack Williams, and Lynn Decker; economic–Richard Haynes, Amy Horne, and Nick Reyna; social science–Jim Burchfield, Steve McCool, and Jon Bumstead; terrestrial–Bruce Marcot, Kurt Nelson, John Lehmkuhl, Richard Holthausen, and Randy Hickenbottom; spatial analysis–Becky Gravenmier, John Steffenson, and Andy Wilson.

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Interior Columbia Basin Ecosystem Management Project

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Introduction

One of the goals for ecosystem management proposed in the Interior Columbia Basin Ecosystem Management Project (ICBEMP) was to encourage social and economic resiliency (hereafter called socioeconomic resiliency), defined as the ability of human institutions to adapt to change (Haynes and others 1996). These institutions include both communities and economies. A community is defined as a sense of place, organization, or structure (for example see Galston and Baehler 1995). An economy is defined by transactions among people that allocate scarce resources among alternative uses, and may exhibit different spatial configurations than communities.

With the concept of socioeconomic resiliency, we recognize that change is inherent in human systems. Further we assert that concerns such as sustainability have to be viewed against that backdrop of change. Social and economic factors are continually in flux--population grows, people migrate, social values evolve, and new technologies and knowledge are created. These factors exhibit both short-term cycles and long-term trends. The social and economic approach to ecosystem management, echoing biological and physical approaches, adopt the philosophy that it is important to understand the dynamic nature of social and economic systems and their underlying processes. Management objectives and actions that are fully cognizant of these systems and work with, not against, their dynamics can then be designed.

The challenge is how to develop a measure of socioeconomic resiliency that is useful for understanding the extent to which changes in policies for Federal land management may affect socioeconomic systems coincident with those lands (see Quigley and others 1996). Our interest stems from a long-held concern of professional foresters about the relation between forest management practices and the economic well-being of nearby residents (see for example Society of American Foresters 1989).[1] Complicating the search for a measure of socioeconomic resiliency are two factors. First, because social indicators are often just proxies for some unmeasurable concept, findings derived from proxies should be related back to that concept. Second, the use of social indicators assumes that, for some measures at least, it is appropriate to express them on some ordered scale (Carley 1981).[2]

We assume in this paper that the relation between diversity and resiliency in social and economic systems is similar to that in the ecological literature (for example see Moffat 1996); that is, a system with higher diversity is less affected by change than a system with lower diversity and the former therefore has higher resiliency. Socioeconomic systems with high resiliency are defined as those that adapt quickly as indicated by rebounding measures of socioeconomic well-being. People living in areas of high resiliency have a wide range of skills and access to diverse employment opportunities. Thus if specific firms or business sectors experience downturns, unemployment rates rise only briefly until displaced people find other employment. Systems with low resiliency have more lingering negative impacts, such as unemployment or out-migration rates

[1] Many people believe that the Forest Service has implicitly adopted an objective of maintaining small communities scattered throughout the West that are perceived to be dependent on public timber harvests and public rangeland, a policy consistent with aggregate public policies to minimize the social costs of a cyclic economy (Boyd and Hyde 1989).

[2] Other studies, such as Ross and others (1979), have attempted to define social well-being at the country level. They advised that these indicators are designed to monitor well-being and to reveal geographical variation. They cautioned against broader applications.

that remain high for several years. The long-term declines in some agricultural communities are examples of socioeconomic systems with low resiliency. The terms "high" and "low" should not be thought of as "good" or "bad," but simply as a reflection of the ability of a socioeconomic system to respond to changes in social or economic factors.

Note that having greater diversity (and higher resiliency) does not eliminate the possibility of wide fluctuations for single economic entities or sectors. This concept differs from many discussions of ecosystem management where the focus is on the goals of economic sustainability and community stability (Richardson [1996] provides a good review of this literature). The danger with such goals is that they may mislead people into thinking that ecosystem management can protect their community from forces of change, whether good or bad.

Measures of socioeconomic resiliency can be used to examine various propositions about the role of Federal land management actions on the social and economic systems in the interior Columbia basin (the basin). What, for example, is the relation between the percentage of land in Federal ownership and socioeconomic resiliency? Do "frontier" counties[3] (counties with fewer than six people per square mile) with a high percentage of their land under Federal ownership have significantly lower than average socioeconomic resiliency and so merit special Federal policy?

In this paper, we describe how we developed measures for socioeconomic resiliency. These measures were derived from various discussions in the "Economics and Social Assessments" for the ICBEMP (Haynes and Horne 1997, McCool and others 1997). Here we define our composite measure and describe how we measured each of its components and combined them into an overall scale. We also use the various data sets and concepts to illustrate spatial differences in the importance to different counties of mining, lumber and woods products industry, and ranching.

[3] This term applies to counties with less than six people per square mile and was developed by researchers concerned with the depopulation of rural areas (Lang and others 1995).

Methods

Spatial Scales of Analysis

The first challenge faced in measuring socioeconomic resiliency is to define spatial areas that reflect patterns of human activity. Areas defined according to ecological criteria (such as hydrologic subbasins) do not effectively capture these patterns. Any spatial definition of socioeconomic systems is to some degree arbitrary; these are open systems in which people, money, goods, and services continually cross any boundary adopted. Further, if socioeconomic systems are defined in a spatial hierarchy (international, national, regional, and local), interactions occur continually among all levels (Horne and others, in press). To conduct our research for the ICBEMP, we examined socioeconomic systems at three scales: the basin, Bureau of Economic Analysis (BEA) areas, and counties (Haynes and Horne 1997). When possible, these were related to national and international systems to set context and provide perspective.

The basin was defined for the purposes of the ICBEMP as the U.S. portion of the Columbia basin east of the crest of the Cascade Range, and those portions of the Klamath and Great Basins lying within Oregon. As such, it stretches from the Continental Divide in western Montana and northwestern Wyoming west through most of Idaho, small portions of Nevada and Utah, and eastern Oregon and Washington (fig. 1).

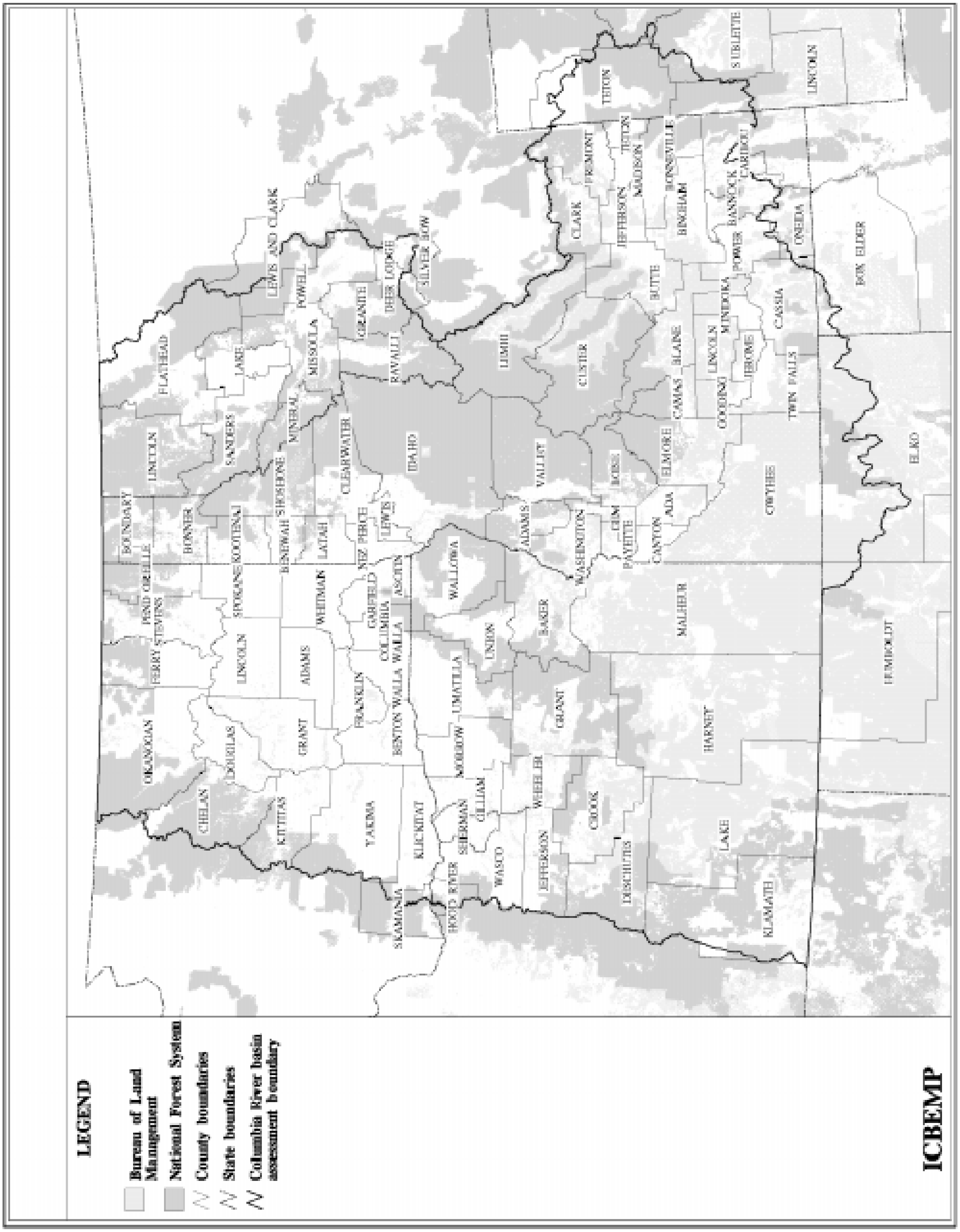

Figure 1—Counties in the interior Columbia basin.

We wanted the next smaller size of socioeconomic systems to be regions that captured a high proportion of ordinary economic links. To represent these areas, we adapted nine economic regions (shown in fig. 2) from the BEA (1995). The BEA defined functional economic units by identifying economic nodes and the surrounding counties economically related to them. Labor force commuting patterns were the primary factor used to determine these regions, the goal being to include both place of work and place of residence. We modified the BEA areas to include only those counties in which some of the basin lies. Our Bend-Redmond area is the part of the BEA-defined Portland economic area that lies east of the Cascade crest. Our Butte area contains only half of the economic unit defined by BEA. A few counties in Nevada, Utah, and Wyoming were connected to BEA areas that lie primarily outside the basin, so these were not included in any analyses at this scale. This affected only a small percentage of the land base and residents of the basin.

The next smaller units used for examining socioeconomic systems were counties. Counties are good subjects for socioeconomic research because they are long-lasting administrative features. They are the smallest unit for which consistent, long-term economic and demographic data are available across the basin. County governments also have considerable influence in Federal land management policies. There are 100 counties that have some portion of the basin lying within their boundaries (see fig. 1).

Data

The basic data sets (see tables 2-6 in the appendix) were constructed at the county level from various sources. Generally, the data came from published sources, although some supporting data were collected for the ICBEMP.

Measuring Socioeconomic Resiliency

The theoretical basis for socioeconomic resiliency rests on the concept of social well-being, which was defined in the ICBEMP as a composite of four factors: economic resiliency, social and cultural diversity (population size, mix of skills), civic infrastructure (leadership, preparedness for change), and amenity infrastructure (attractiveness of the area) (McCool and others 1997). In this section, we discuss the development of an operational definition at the county level.

Our approach follows the spirit of the definition of social well-being. An index of economic resiliency can be developed directly from measures of diversity in employment or income among economic sectors. Social and cultural diversity can be measured by using data on lifestyle diversity. Because there was no direct way to measure civic infrastructure, we used population density as a proxy, following the work of Barkley and others (1996). There was no easy way to index amenity infrastructure. The socioeconomic resiliency index we developed was thus a composite of three factors: economic resiliency, population density, and lifestyle diversity.

The measures for both economic resiliency and lifestyle diversity were calculated by using a diversity index (Shannon and Weaver 1949):

$$D = -1 * SUM_{i=1 \text{ to } n} (E_i * \log E_i) , \qquad (1)$$

where

D = the diversity index of an area,

SUM = summation,

i = the i^{th} industry,

n = the number of industries (two-digit Standard Industrial Classification [SIC] codes),

E_i = the proportion of total employment in the area located in the i^{th} industry, and

$\log E_i$ = the logarithm (base 10) of E_i.

The indices were then normalized so that all numbers ranged between 0 (no diversity) and 1.0 (perfect diversity).

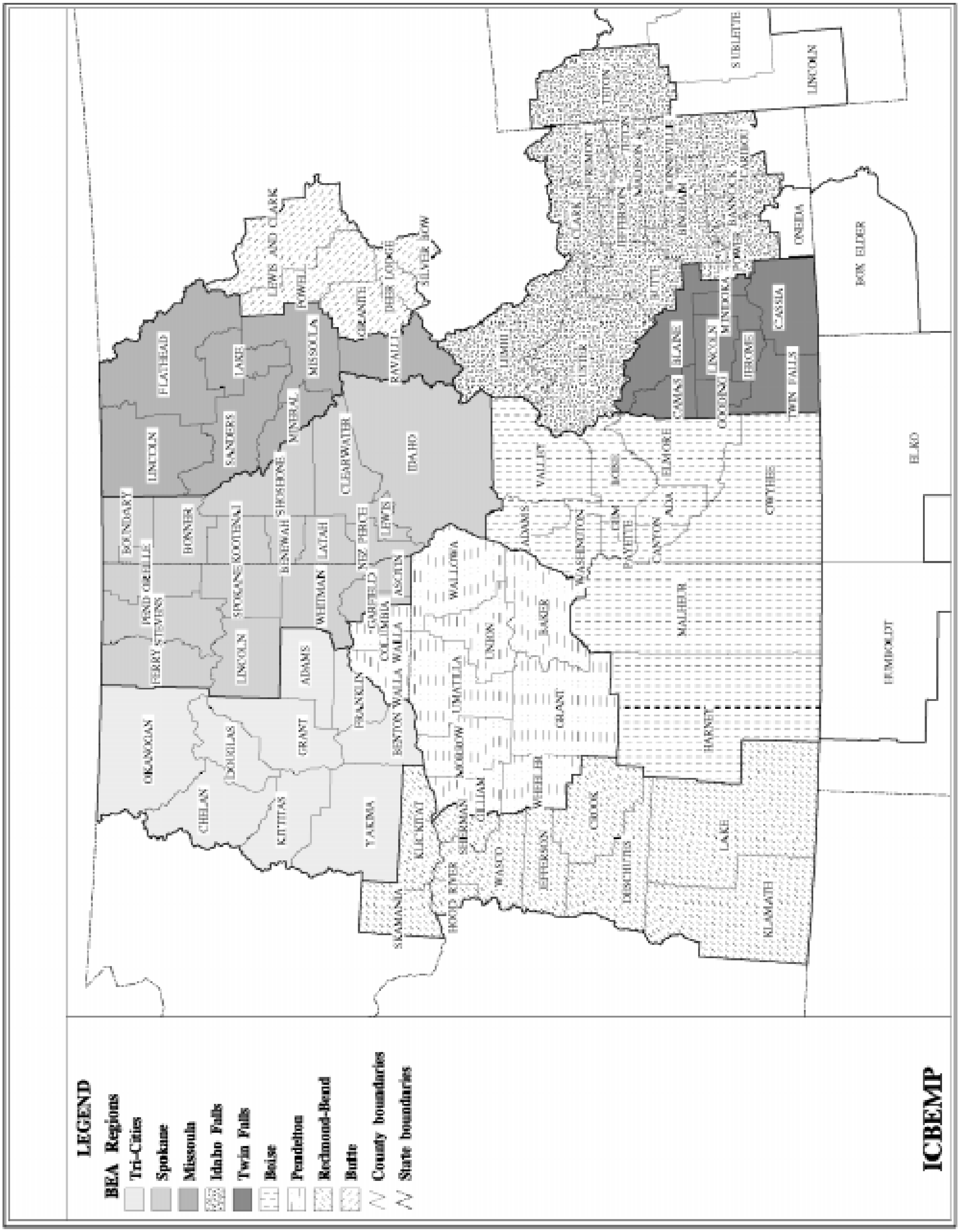

Figure 2—Economic subregions of the interior Columbia basin.

Economic resiliency—We defined economic resiliency as diversity of employment. The calculations of employment diversity were done for another study of the economic diversity of all counties, labor market areas, and states in the United States.[4] We used numbers calculated from 1991 employment data in the IMPLAN database, classified according to two-digit SIC codes. The economic resiliency indices for each county are shown in table 2 and figure 3.

We assigned ratings to basin counties that reflect how their economic resiliency compares relative to all U.S. counties. We divided the employment diversity indices for 3,106 U.S. counties into thirds. The top third had a diversity index of 0.7652 or higher; thus, we rated any basin county with a diversity index in this range as having "high" economic resiliency. Basin counties with employment diversity indices ranging between 0.7059 and 0.7651 were assigned an economic resiliency rating of "medium." Counties with an employment diversity index less than 0.7059 received an economic resiliency rating of "low" (table 3).

Figure 4 shows the range in the assignment of ratings to low, medium, and high economic resiliency. Mirroring the skewed distribution among all U.S. counties, the range in the lowest category is the greatest, whereas the range around the other two ratings is relatively narrow. The implications of the greater range in the low category are worth remembering; for example, the economic diversity of an average low county (with a value of 0.65) is closer to a medium rating than to those counties in the bottom quarter of the low ratings.

Population density—Population density of each county was calculated by dividing the total population by the number of square miles in the county (table 2). Population numbers for each county were obtained from the U.S. Department of Commerce, Bureau of the Census (1995). The number of square miles in each county was determined from data collected as part of the ICBEMP and did not distinguish between public and private ownership.

We developed a four-step system for population density that ranged from 0 to 3 (table 3). A rating of 3 was assigned to counties with population densities equal to or greater than 33 people per square mile. A rating of 2 was given to counties having population densities between the basin average (11 people per square mile) and 33 people per square mile. A rating of 1 was given to counties having population densities less than the basin average (11 people per square mile) but not less than six people per square mile. The rating of 0 was given to the "new frontier" counties, those having population densities of less than six people per square mile. A map of population densities of the basin counties is shown in figure 5.

Lifestyle diversity—Lifestyle diversity was computed by using the PRIZM database (Claritas Corporation 1994). This database identified 62 lifestyle groups in the United States through cluster analysis on census block demographic data pertaining to education, affluence, family life cycle, mobility, race, ethnicity, and degree of urbanization. These factors explained 89 percent of the statistical difference among American neighborhoods. By considering the proportion of households in each lifestyle group for each county, we calculated lifestyle diversity by using the Shannon-Weaver diversity index described above for economic resiliency (table 2). The results were normalized so that the highest possible rating was 1.0. The counties in the top third received a lifestyle diversity rating of 3; the middle third received a rating of 2; and the lowest third received a rating of 1 (table 3). A map of the lifestyle diversity ratings of the counties is shown in figure 6.

[4] Schuster, Ervin; Alward, Greg; Niccolucci, Mike. Unpublished report. On file with: USDA Forest Service, Rocky Mountain Research Station, 240 W. Prospect Rd., Fort Collins, CO 80526-2098.

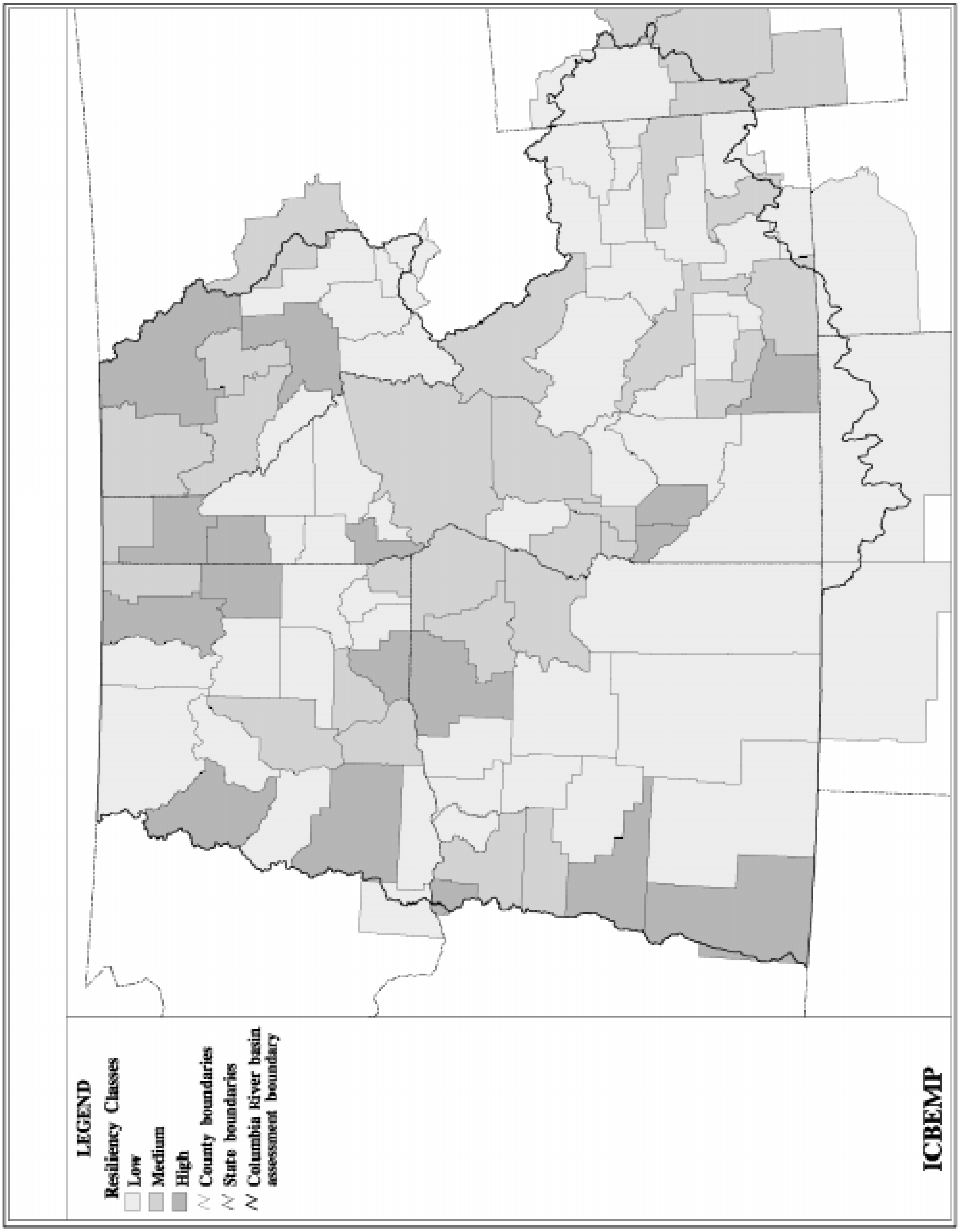

Figure 3—Economic resiliency of counties in the interior Columbia basin.

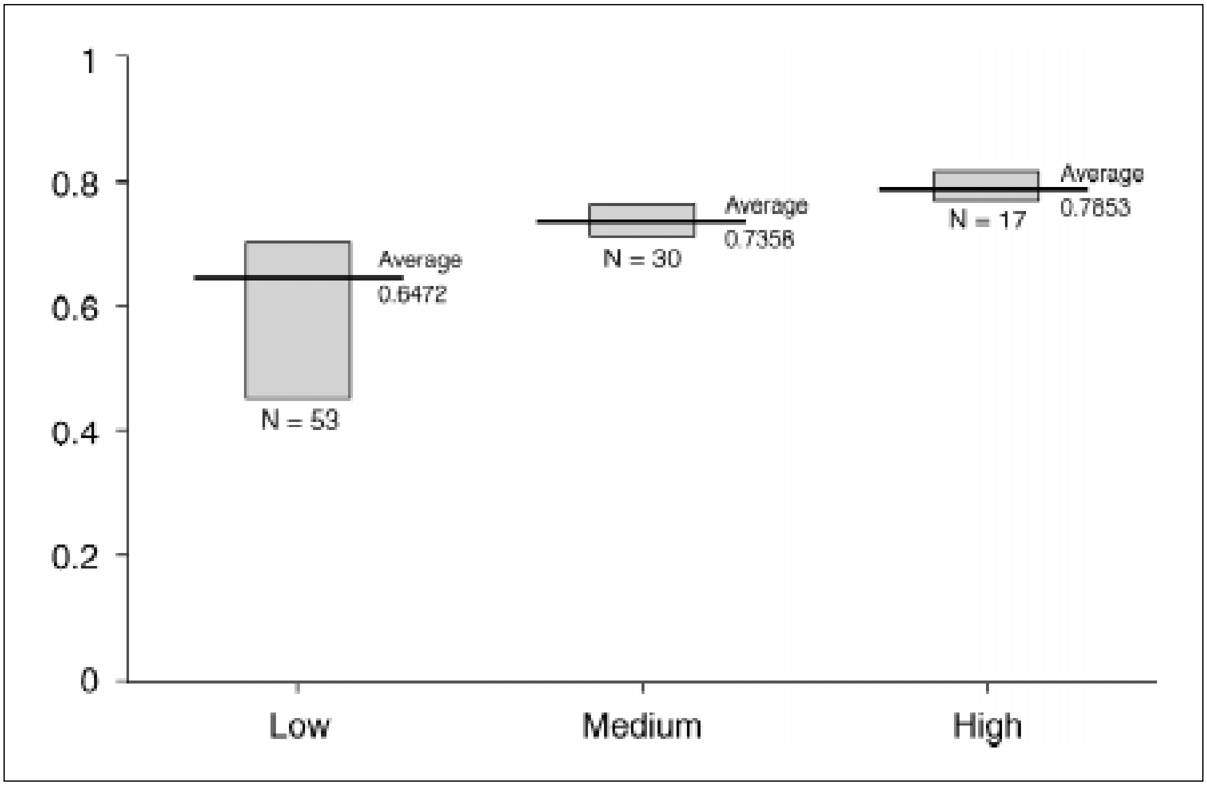

Figure 4—The range in estimates of economic resiliency of counties in the interior Columbia basin. N = the number of counties in each class.

Socioeconomic resiliency—The composite rating of socioeconomic resiliency was determined by combining the results of economic resiliency, population density, and lifestyle diversity (table 3). We assigned the socioeconomic resiliency rating based on the sum of the ratings for the three factors; that is, the three factors were equally weighted, and the highest possible score was nine. Counties receiving a composite score greater than six were rated as having high socioeconomic resiliency. Counties with a score of five or six were given a rating of medium socioeconomic resiliency. Counties with a rating of four or less were rated as having low socioeconomic resiliency. Figure 7 shows a map of the socioeconomic ratings for the counties in the basin.

Developing Measures of Reliance on Federal Forage and Timber

In discussions about changes in Federal land management, concern is often expressed about communities or economies that might be disproportionally affected. This raises the question about how to identify such counties. In this section, we propose two approaches that would be suitable for use in the types of analysis done as part of an environmental impact statement (EIS). The first approach is based on use or outputs, whereas the second is based on employment derived, in this case, from natural resources. The maps of these ratings provide one tool for managers to display the spatial perspective on alternative Federal land management strategies. This approach also affirms the public's perception of where Federal lands play a traditional commodity role.

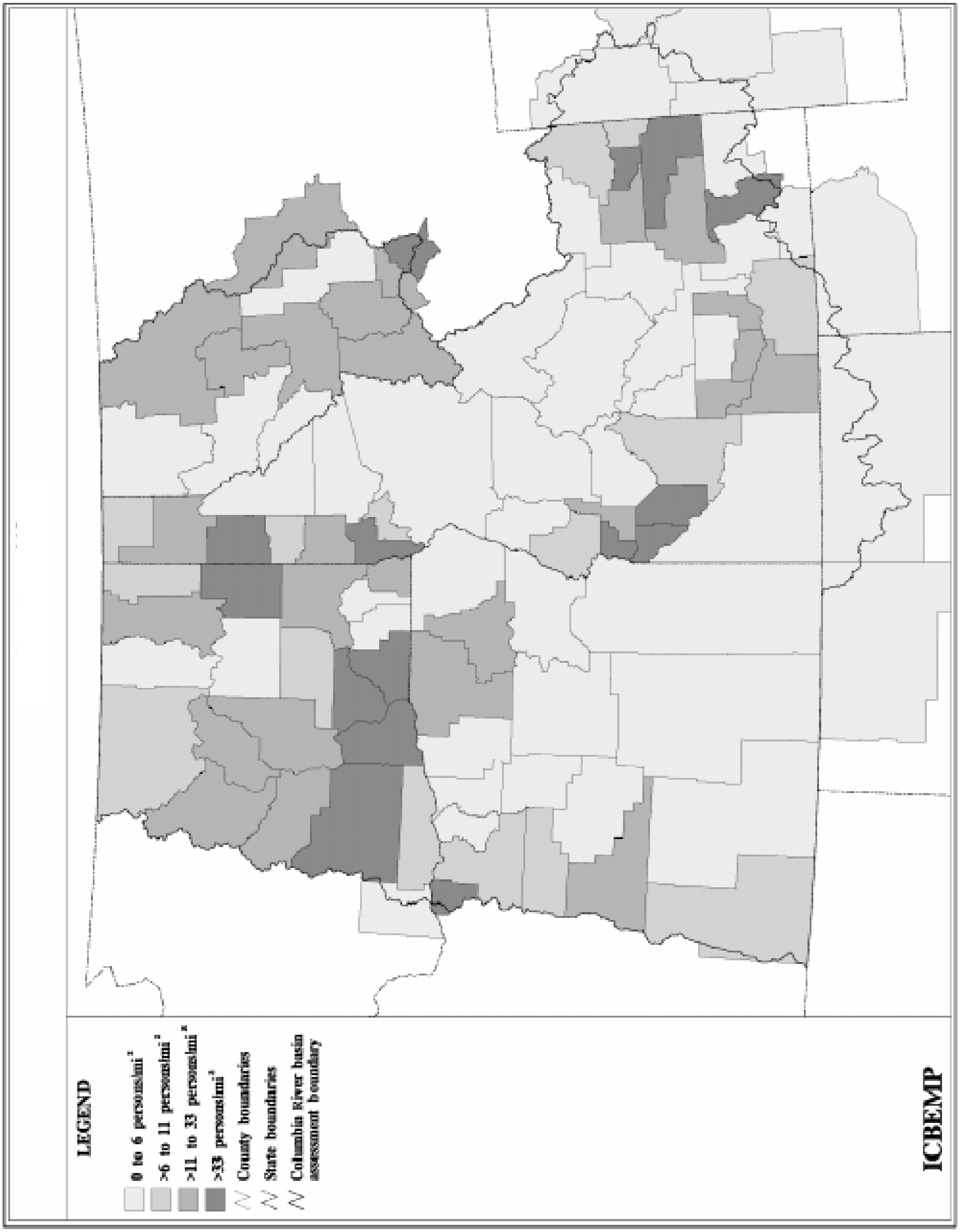

Figure 5—Population density ratings of the counties in the interior Columbia basin.

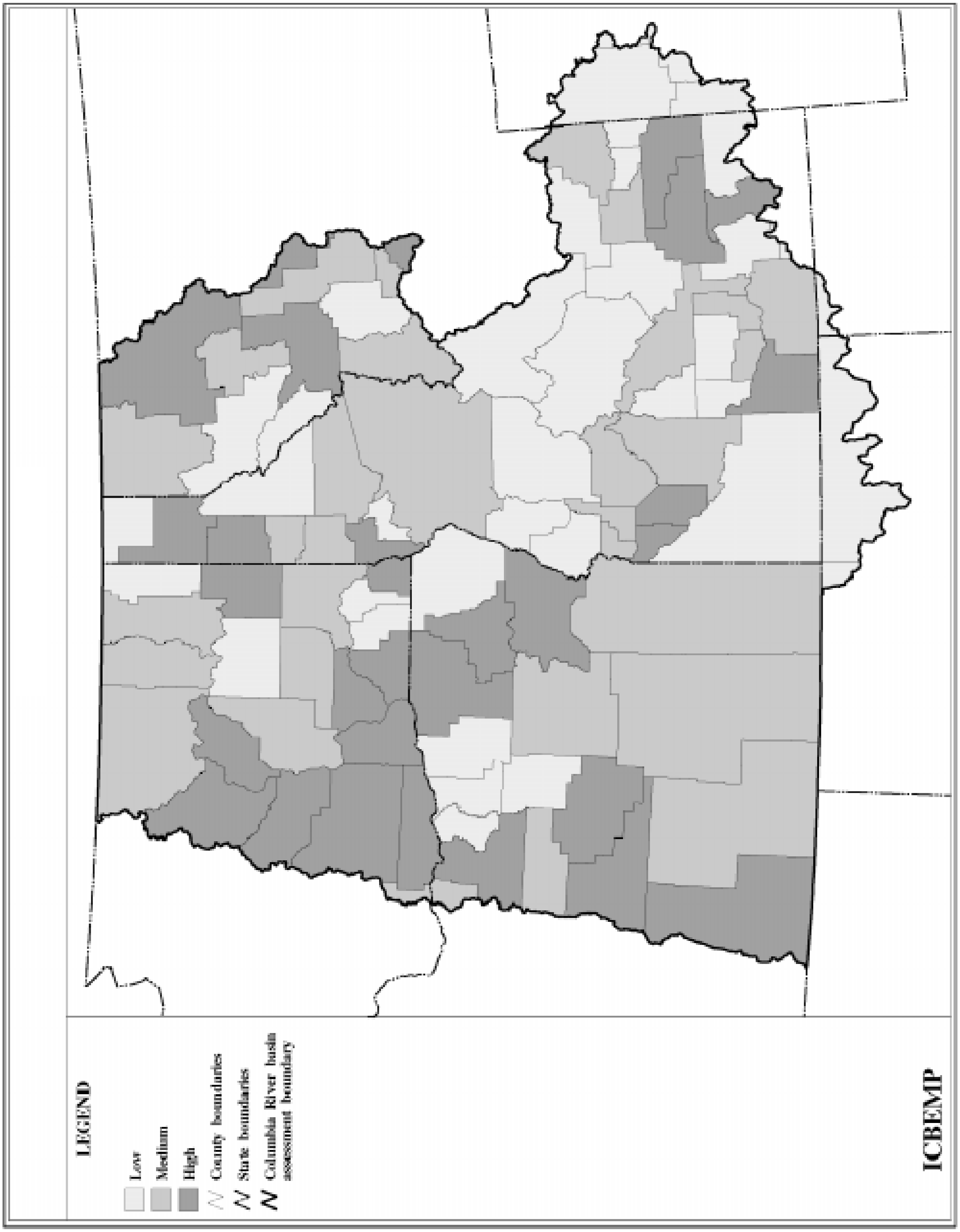

Figure 6—Lifestyle diversity ratings of the counties in the interior Columbia basin.

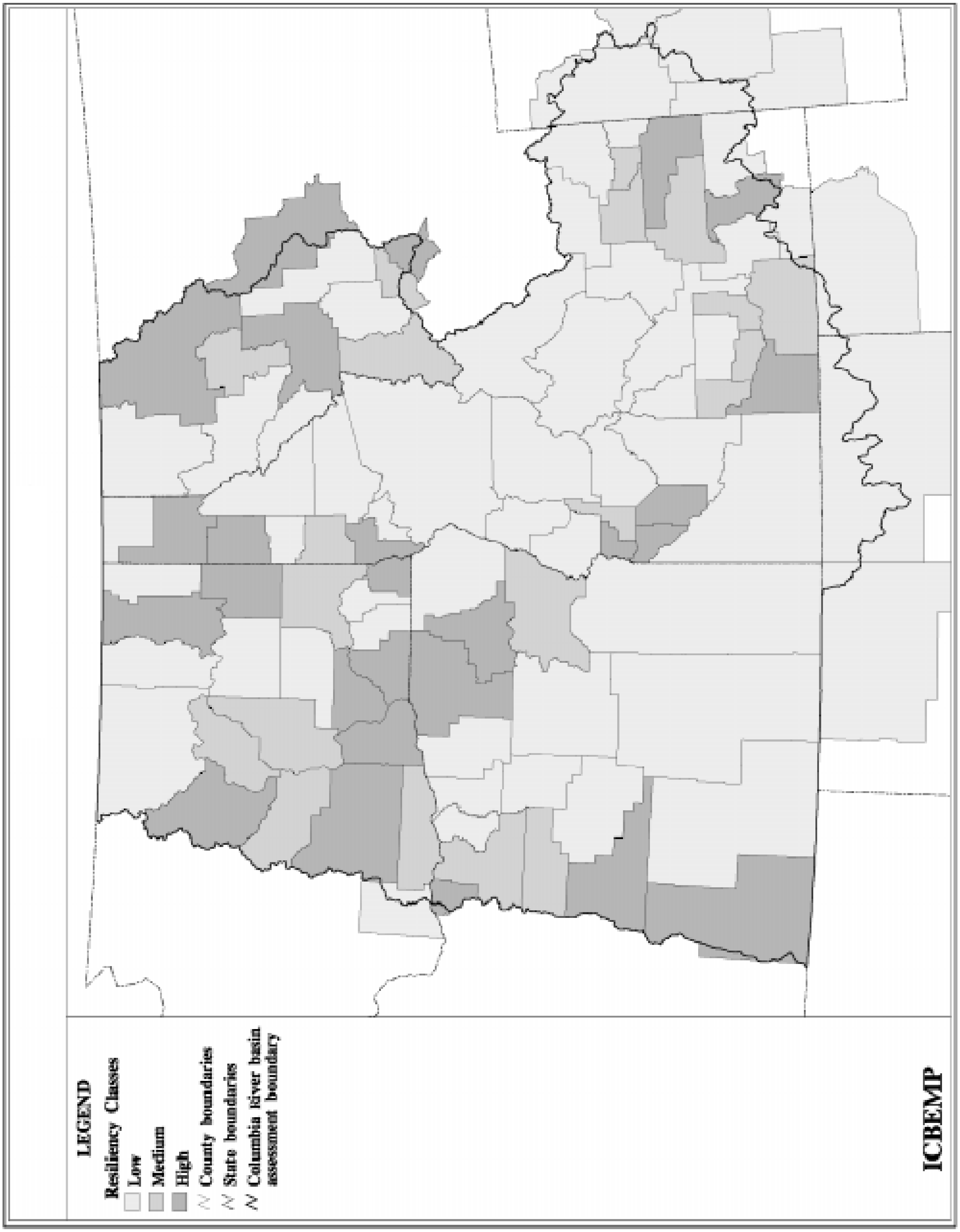

Figure 7—Socioeconomic resiliency ratings of the counties in the interior Columbia basin.

Forage reliance—To evaluate the EIS alternatives (Haynes and others 1997), we needed to identify how varying the allocation of Federal forage to cattle would affect the cattle industry in different parts of the basin. To address this question, for each county we calculated the percentage of agricultural sales represented by cattle, and the portion of cattle produced from Federal forage (Haynes and Horne 1997). This approach is similar to that used by Eckert and others (1995) except that our index focuses on identifying those counties in which Federal ownership in particular is significant, not all rangeland. We assigned a high rating of 3 to counties in which the value of cattle reared on Federal forage represented 10 percent or more of agricultural sales. A medium rating of 2 was assigned to counties in which the percentage of agricultural sales represented by cattle was between 10 percent and the basin average of 3.57 percent. Counties in which the percentage of agricultural sales represented by cattle grazed on Federal lands was less than the basin average received a low rating of 1 (table 4). A map of the forage reliance ratings of the counties is shown in figure 8.

Reliance on Federal timber—We faced a similar task of evaluating the effect of EIS alternatives on the timber industry in various parts of the basin. We collected timber harvest data for each county by type of ownership.[5] We calculated the percentage of the total basin timber harvest derived from each county and the percentage of each county's share that came from Forest Service (FS) lands (we did not include U.S. Department of the Interior, Bureau of Land Management (BLM) harvest data because it accounts for only 0.6 percent of the timber harvest in the basin). If FS timber harvest were perfectly distributed among the basin's 100 counties, each would contribute 1.0 percent to the FS total. Counties without any reported timber harvest were assigned a rating of zero. A rating of 1 was assigned to counties in which the FS timber harvest was less than the average of 0.34 percent. A rating of 2 was assigned to those in which the FS timber harvest was between the average and 1.0 percent. A rating of 3 was assigned to those counties in which the FS timber harvest was higher than 1.0 (table 4). Because these ratings are based on harvests, the analysis focuses on the location of timber resources rather than processing. Using timber harvest data has the pragmatic advantage of displaying data by four broad categories of land owners (FS, other public, forest industry, and nonindustrial private). Timber processing data have limited information about the origin of log inputs, which makes them inadequate for assessing effects of changes in management for one type of land owner. Figure 9 shows a map of the timber reliance ratings for the basin counties.

Resource-dependent employment—The second approach uses the sum of employment from ranching, lumber and wood products, and mining as a proxy for the employment from commodity-based industries. There are many who believe these jobs are better than those in the service sector. We do not argue this point but instead provide a measure for identifying those countries that might be disproportionally affected by Federal land management actions. A low rating of 1 was assigned to counties in which resource-based employment was less than the regional average of 4 percent. A medium rating of 2 was assigned to those counties in which resource employment was greater than 4 percent but less than 10 percent. A high rating of 3 was assigned to those counties in which resource-based employment was equal to or greater than 10 percent. The resultant ratings are shown in table 5 and figure 10.

[5] Kegan, Chuck. 1993. University of Montana. Data for Montana, Oregon, and Washington collected from state forestry agencies. On file with: Pacific Northwest Research Station, 1221 S.W. Yamhill Street, Suite 200, P.O. Box 3890, Portland, OR 97208-3890.

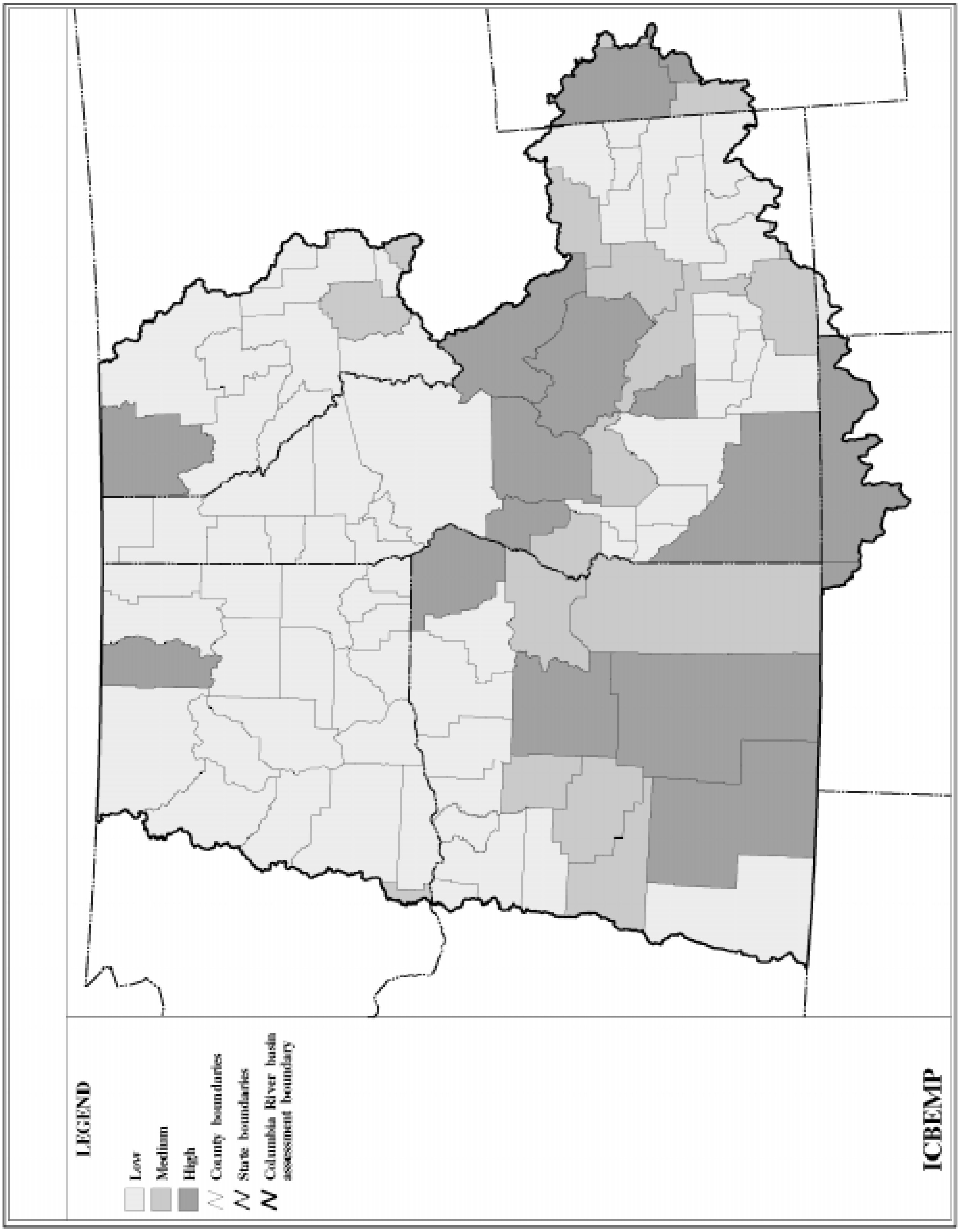

Figure 8—Range-reliant counties in the interior Columbia basin.

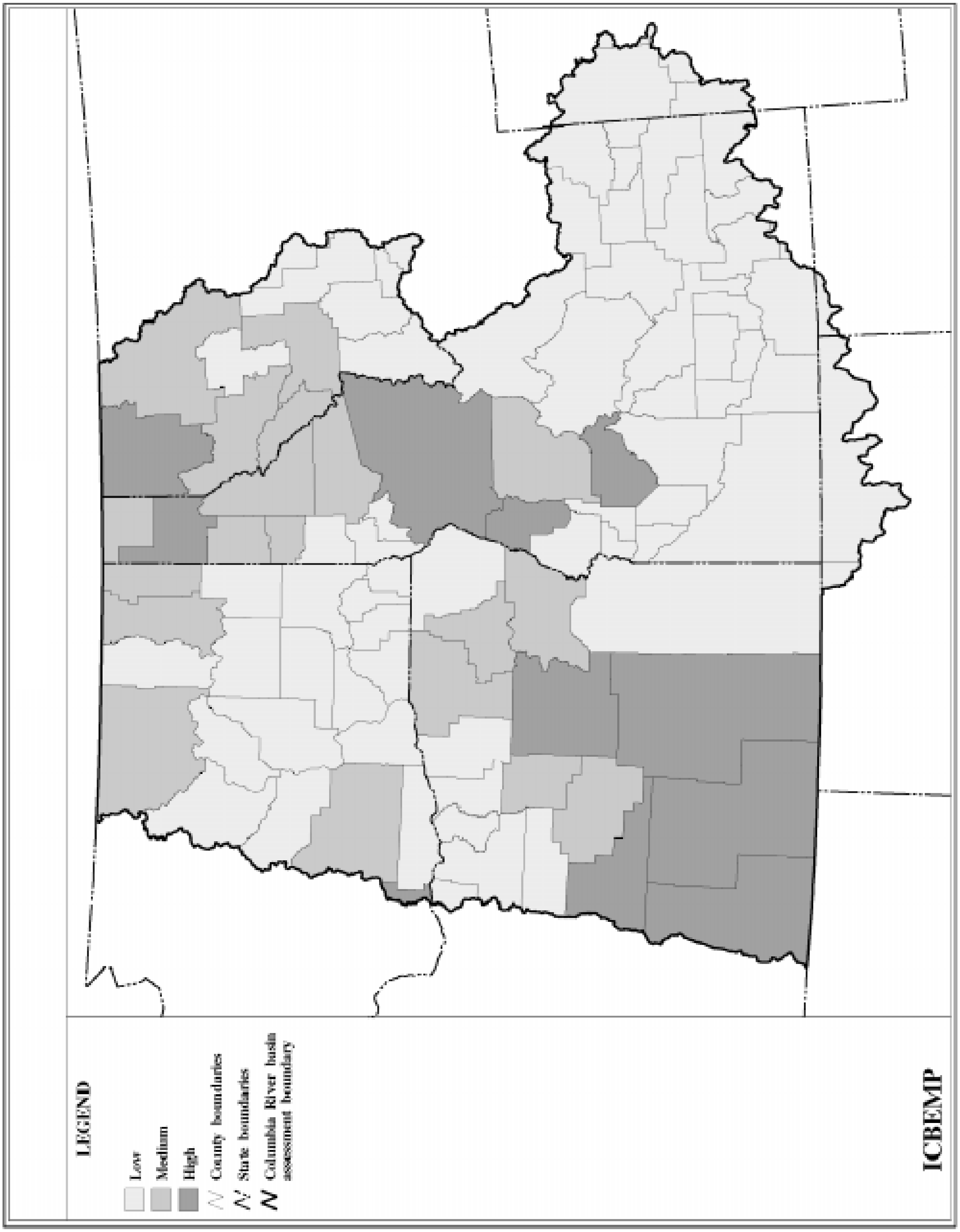

Figure 9—Timber-reliant counties in the interior Columbia basin.

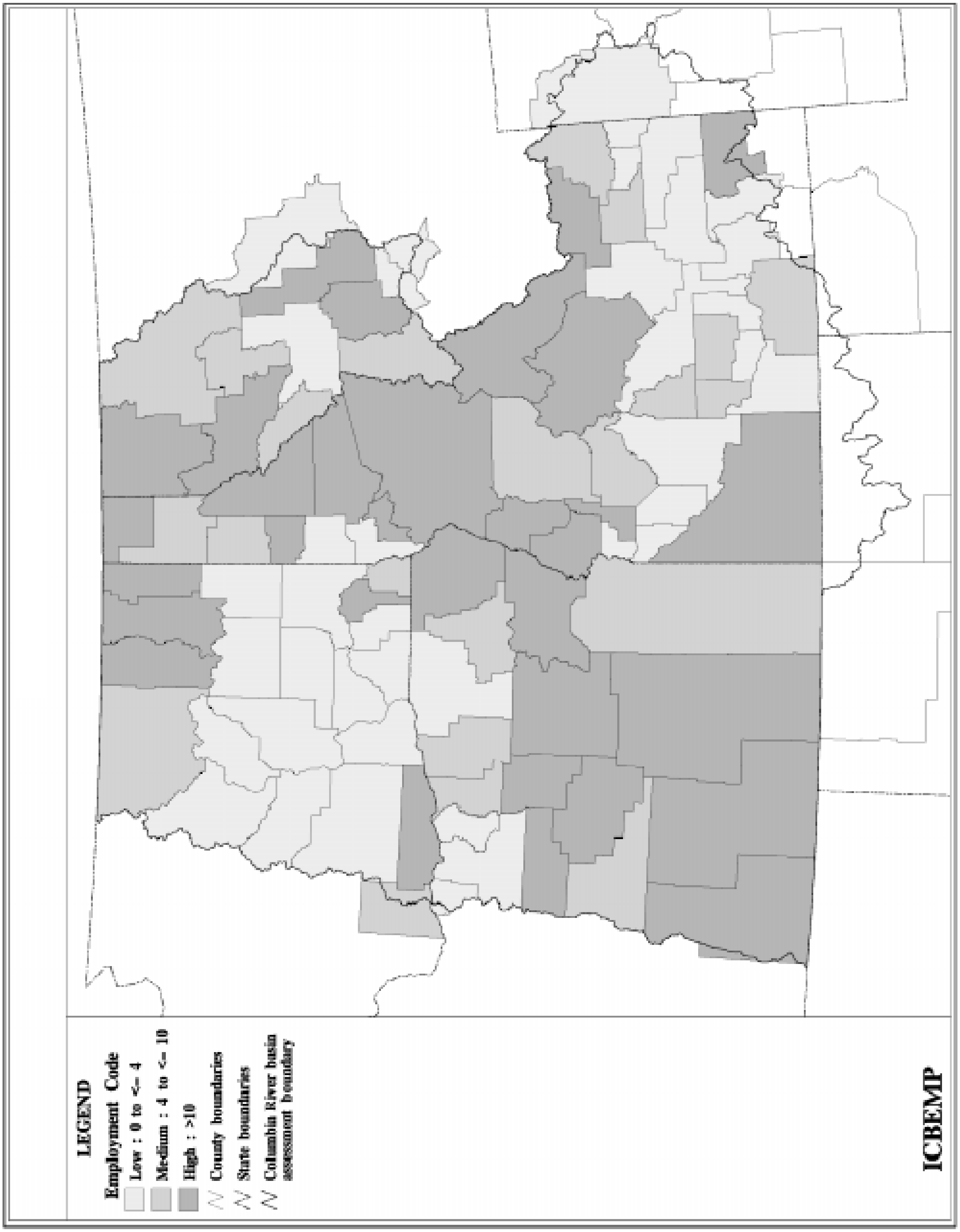

Figure 10—Resource employment by counties in the interior Columbia basin.

Population Growth Rate

Johnson and Beale (1995) found three patterns of growth among U.S. counties during the 1980s. The highest growth rates were due to higher rates of immigration in counties offering significant recreation opportunities. Some social scientists suggest that these counties attract people who seek cleaner environments and less stressful lifestyles. Immigrants may bring capital (retirees and entrepreneurs) or advanced skills (educated labor) that benefit economic development. The middle rate of population growth occurred in urban counties. All other counties experienced slower growth rates. According to Johnson and Beale, there are 19 recreation counties in the basin, 6 urban counties, and 75 "other" counties (fig. 11). During the 1990-94 period of rapid population growth in the basin, the fastest growth rates occurred in recreation or urban counties. We gave recreation counties a rating of 1, urban counties a rating of 2, and other counties a rating of 3 (table 2). By assuming basin counties will continue to exhibit differences in population growth rates based on this typology, we could project future populations.

Findings

Socioeconomic Resiliency

We found that 26 counties have high, 20 have medium, and 54 have low socioeconomic resiliency. The basin counties with high socioeconomic resiliency are typically those with high population densities, high to medium economic resiliency, and high to medium lifestyle diversities (table 2). Klamath County, Oregon, is rated high even though it has low population density because it has high economic resiliency and high lifestyle diversity. Our thinking was that its diversity in skills and economic sectors would override low population density and enable it to adapt quickly to change. Another unusual county receiving a high rating was Silver Bow, Montana, which had low economic resiliency but high lifestyle diversity and high population density. Here the numbers and skills of people were thought to compensate for low economic resiliency.

The 20 counties with medium socioeconomic resiliency ratings generally had medium economic resiliency and either medium or high ratings for lifestyle diversity and population density. Three unusual counties received a medium rating because the mix of human and economic resources suggested moderate abilities to adapt to change. Klickitat County, Washington, had low economic resiliency but high lifestyle diversity; Cassia County, Idaho, had low population density but medium ratings for economic resiliency and lifestyle diversity; and Baker County, Oregon, had low population density but medium economic resiliency and high lifestyle diversity.

The 54 counties given a low rating of socioeconomic resiliency had low population density and low or medium ratings for economic resiliency and lifestyle diversity. The economies of many of these counties are dominated by agriculture.

The patterns that emerge when county socioeconomic resiliency ratings are mapped (fig. 7) largely agree with the findings of McCool and others (1997) in their study of communities. High-resiliency counties tend to lie along transportation corridors (Interstates 82, 84, 86, and 90; the Columbia-Snake River waterway to Lewiston, Idaho). A second group of counties with high resiliency is associated with areas having high scenic amenities and quality of life along the east slope of the Cascade Range and the northern Rocky Mountains. The metropolitan areas are really multicounty complexes linked by trading and commuting patterns. Large expanses of areas with low socioeconomic resiliency are found in the arid parts of the basin: eastern Oregon and southern Idaho. Other low socioeconomic resiliency areas are associated with rugged and isolated portions of central Idaho, western Montana, and eastern Washington. They include both Federal wilderness and private agriculture.

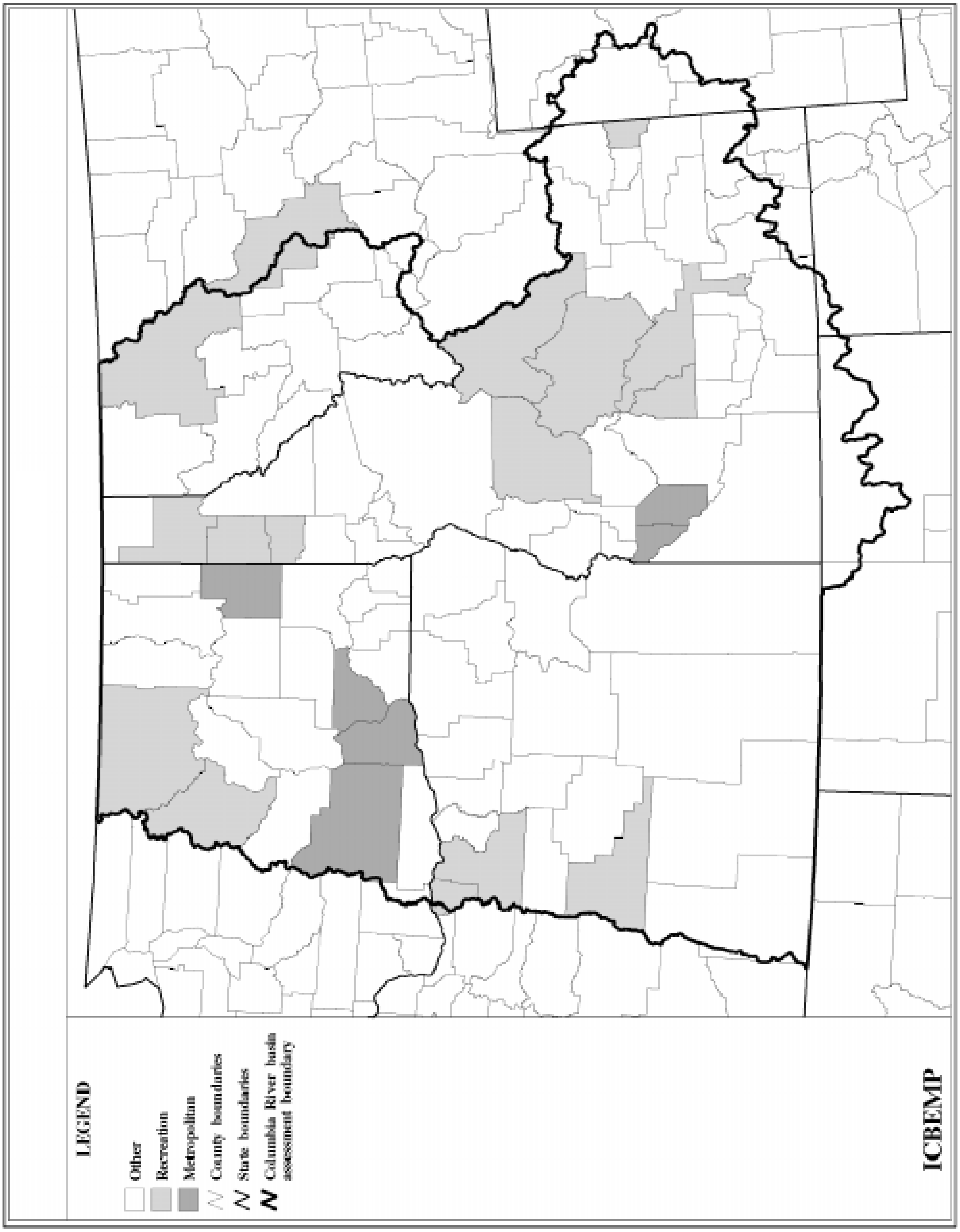

Figure 11—Recreation and metropolitan counties in the interior Columbia basin. Source: Johnson and Beale 1995.

The three components of socioeconomic resiliency (lifestyle diversity, economic resiliency, and population density) are highly correlated. Economic resiliency and lifestyle diversity are the most highly correlated of the three pairs (0.61); followed by population density and lifestyle diversity (0.53), and economic resiliency and population density (0.46). This suggests that the mixture of people may be more important to providing human systems with resiliency than the sheer numbers of people. Important characteristics of diversity for socioeconomic resiliency may include education, wealth, stage of family life cycle, mobility, ethnicity, and urbanization.

Using counties or land area as the unit for socioeconomic resiliency provides a distorted view of the status of people living in the basin. This difference is shown in fig. 12. Two-thirds of the people live in counties with a high degree of socioeconomic resiliency; however, these counties represent only 20 percent of the land base. Although 68 percent of the basin is categorized as having low socioeconomic resiliency, only 18 percent of the people live in these areas (table 1). The individual BEA areas generally exhibit the same distribution of socioeconomic resiliency expressed by both population and land area, with the notable exception of those in southern Idaho. The Boise and Idaho Falls BEA areas are distinguished by having highly concentrated areas with high socioeconomic resiliency and a high percentage of the land base with low socioeconomic resiliency. The Twin Falls BEA area is distinguished by having a high proportion of both population and land area in medium socioeconomic resiliency.

The ability of an area to adapt to change does not necessarily indicate its present state of economic well-being. Using per capita income as a measure of economic well-being, we found little correlation between socioeconomic resiliency and economic well-being (fig. 13). The relation of socioeconomic resiliency to per capita income does differ around the basin, thereby reflecting different characteristics of economic activity. For example, in the Missoula and Butte BEA areas, counties with higher adaptability tend to be those with higher incomes. But in the Idaho Falls, Twin Falls, and Pendleton BEA areas, counties with lower socioeconomic resiliency tend to have higher per capita incomes, thereby reflecting the importance of agriculture in those regional economies.

Sixty-three counties in the basin are Federal land counties.[6] Overall, they do not have different levels of socioeconomic resiliency than other counties, thereby indicating that Federal ownership per se does not affect the ability of a county to adapt to change.[7] The Boise BEA area is an exception with significantly higher socioeconomic resiliency in non-Federal counties. In the Spokane, Missoula, Idaho Falls, Bend-Redmond, and Butte BEA areas, most people living in Federal land counties live in areas of high socioeconomic resiliency.

In the basin, 44 of the 100 counties are classified as frontier counties with less than six people per square mile. Thirty-three of these counties are Federal land counties, 11 are not. These frontier counties have significantly lower socioeconomic resiliency than other counties, which is not surprising because population density is one of the factors in the composite measure of resiliency. Federal-land frontier counties do not exhibit any more differences in socioeconomic resiliency than non-Federal land frontier counties. Although 62 percent of the basin's land area is in frontier counties with low socioeconomic resiliency, only 13 percent of the basin's population lives in them. Concern for frontier counties arises because they may have difficulty developing and sustaining social services, medical clinics, and physical infrastructure. On the other hand, these very qualities may make frontier counties attractive to some people. The low socioeconomic resiliency of frontier counties does not mean the people living

[6] Defined as having at least 33 percent of the land area in Federal ownership.

[7] Using a simple t-test, we rejected the hypothesis that Federal counties had different levels of socioeconomic resiliency than other counties.

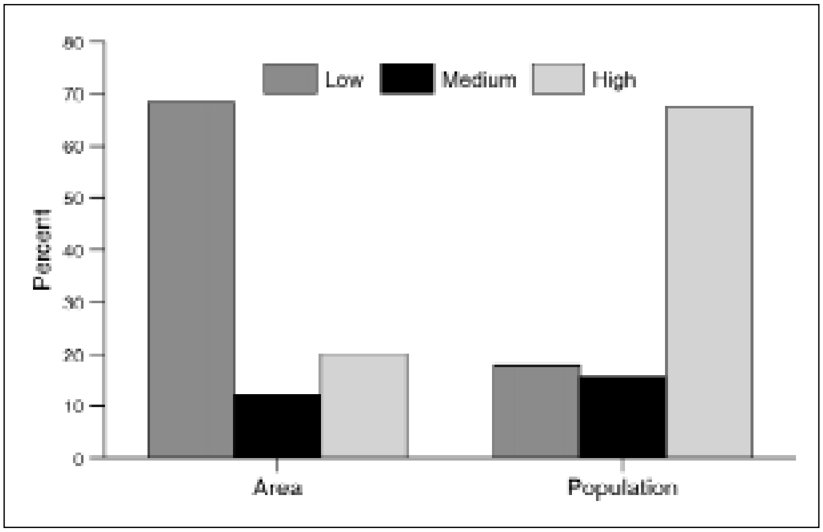

Figure 12—Socioeconomic resiliency based on area and population in the interior Columbia basin.

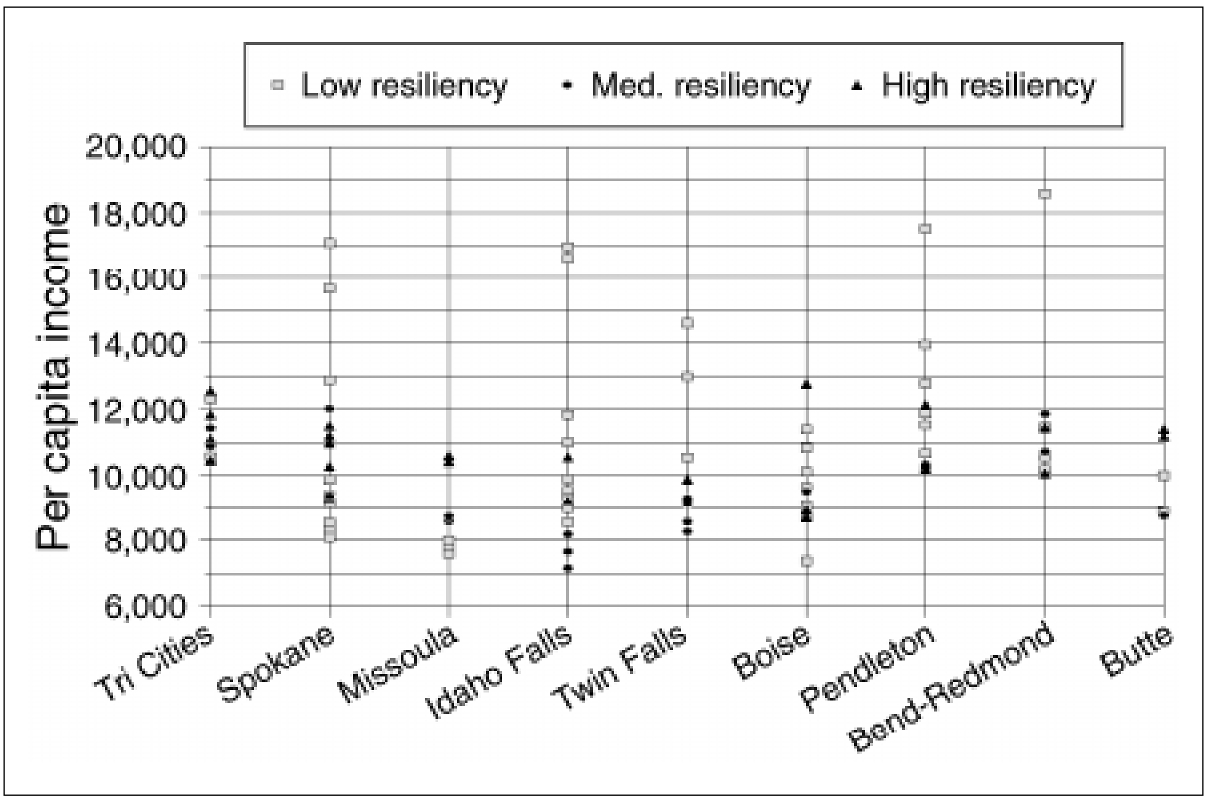

Figure 13—Socioeconomic resiliency and per capita income by economic subregion in the interior Columbia basin.

Table 1—Socioeconomic resiliency ratings summarized for both population and land area by basin, BEA areas, frontier counties and Federal land areas

Area	Economic resiliency	Population			Land area		
		High	Medium	Low	High	Medium	Low
		Percent					
Basin		67.06	15.39	17.55	19.83	11.99	68.19
Boise	0.81	71.56	10.63	17.81	4.69	6.08	89.23
Butte	.78	74.37	8.91	16.72	41.13	7.23	51.64
Idaho Falls	.81	59.68	16.76	23.56	10.91	5.65	83.44
Missoula	.81	66.69	23.70	9.61	46.80	24.09	29.11
Pendleton	.79	75.36	8.75	15.89	28.32	13.31	58.37
Redmond-Bend	.80	65.42	21.42	13.61	32.77	20.52	46.71
Spokane	.81	79.23	9.28	11.50	25.71	9.24	65.05
Tri-Cities	.79	71.55	20.11	8.35	42.09	28.40	29.51
Twin Falls	.78	39.08	47.32	13.61	16.69	40.50	42.81
Frontier counties	--	0	.50	13.44	0	1.12	67.57
Federal land counties	--	23.06	5.36	13.90	12.27	5.18	59.59

-- = No data.

in them are poor: frontier counties average significantly higher per capita incomes than other counties in the basin, except in the Missoula BEA area (table 6). In fact, 15 of these counties (including all 11 of the non-Federal frontier counties) have among the highest per capita incomes in the basin, a reflection of the role that wheat and other agricultural products play in them.

Recreation is another category providing mixed results. In general, socioeconomic resiliency is not correlated (less than 10 percent) to whether a county is recreation, urban, or other. This overall finding masks offsetting relations in different parts of the basin. In the Bend-Redmond, Butte, Missoula, and Spokane BEA areas, socioeconomic resiliency of recreation counties tends to be high. But in the Idaho Falls and Twin Falls BEA areas, recreation counties tend to have low socioeconomic resiliency.

Effect of Scale on Analysis

These measures of socioeconomic systems are affected by the size of the area measured; larger units generally display greater resiliency than smaller areas. This can be demonstrated by comparing the calculations of economic resiliency for counties with those for the BEA areas. The economic resiliency ratings for the BEA areas are shown in table 1. They indicate that the economies within the basin are diverse (the highest possible score is 1.0), and by assumption have high economic resiliency. Little variation is found among the BEA areas across the basin. These findings make sense because per capita income is rising rapidly in the basin, and there are few pockets of poverty (Haynes and Horne 1997). The economy of the basin has been resistant to national recessions in the past two decades, except when the agricultural sector has been significantly affected. The highest economic resiliency ratings are for BEA areas containing metropolitan counties (Boise, Spokane, and Tri-Cities). The BEA areas with a substantial percentage of employment resulting from recreation (Idaho Falls, Missoula, and Bend-Redmond) also have high economic diversity, thereby suggesting they have high potential resilience to fluctuations in recreation or other activities. The two BEA areas in which timber manufacturing plays a major role (Pendleton and Bend-Redmond) also have fairly diverse economies, thereby suggesting resistance to fluctuations in that industry. The lowest diversity number is for Butte, but it is misleading because diversity is calculated for only the basin half of the area defined by BEA.

A different picture emerges when one examines the numbers calculated for each county (see table 2). The average economic diversity index for the 100 counties in the basin is 0.7, much lower than the statistics calculated for the BEA areas. Of the 100 counties associated with the basin, 17 received a rating of "high" economic resiliency, 30 were rated "medium," and 53 were rated as "low." These data indicate locational differences within the basin, a BEA area, and among counties in adaptability to change.

These lower numbers are in part simply a reflection of analyzing areas of smaller size. The difference indicates that employment options are less within a county than in a BEA area. For this reason, people often extend job searches beyond the county in which they live. In 1990, one in six workers in the average basin county worked outside the county in which they lived (table 6). Commuting was up over 1980 when the ratio was one in eight. This supports our view that counties are too small to represent economies; the well-being of people is connected with larger areas than the county in which they live.

Future Trends in Socioeconomic Resiliency

Population projections for each county in the basin were developed by assuming different migration patterns for each type of county identified by Johnson and Beale (1995). Using these assumptions, McCool and Haynes (1996) projected that the population of the basin will increase from 3.1 million in 1995 to 6.0 million by 2040. From these projections, we calculated the population density in 2040 of each county in the basin. We found that the percentage of the land base in frontier counties will decline from 68 percent to 45 percent, and the percentage of the population living in such counties will decline from 6 percent to 3 percent (see fig. 14). Seventy-nine percent of the population will live in the most densely populated areas (up from 61 percent of the population today), and the percentage of the land base in high-density use will increase by 8 percent.

Because population density is one of the composite factors in socioeconomic resiliency and is highly correlated with the other two factors of economic resiliency and lifestyle diversity, we can use these population projections to make inferences about the trend in socioeconomic resiliency

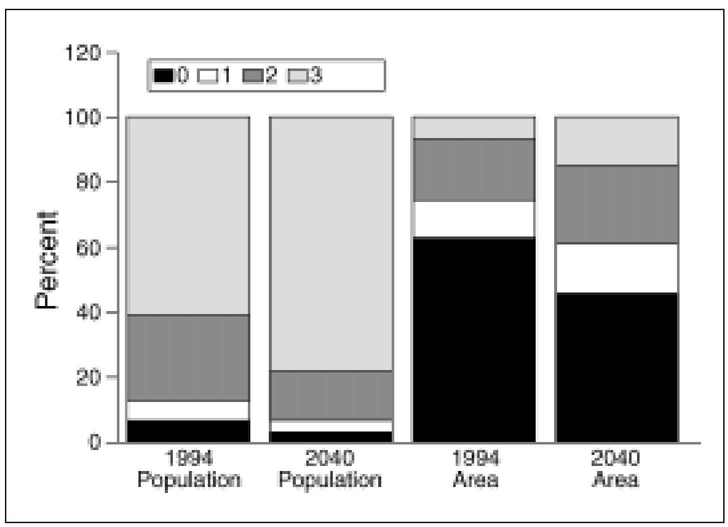

Figure 14—Interior Columbia basin area and population by population density class, for 1994 and 2040.

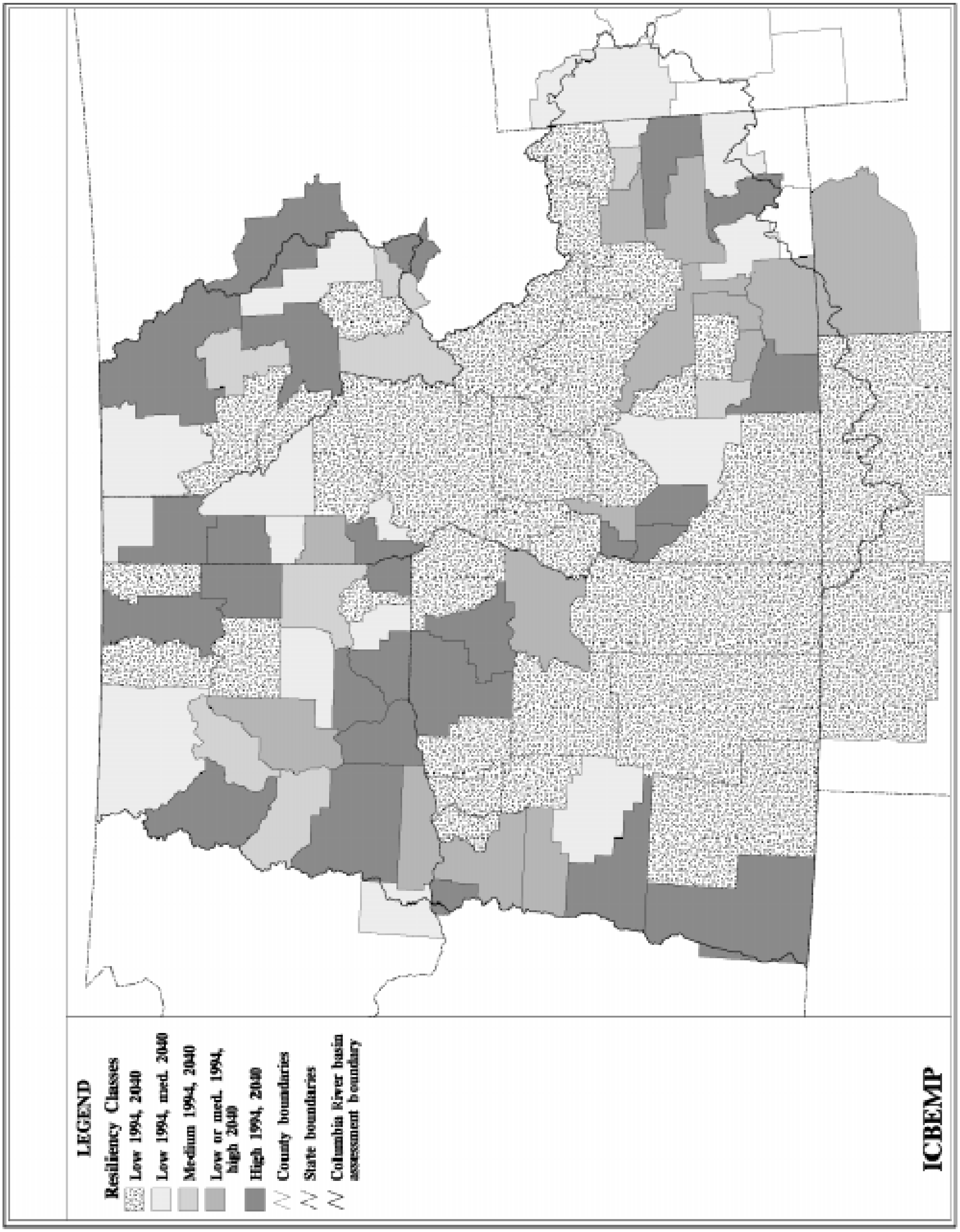

Figure 15—Socioeconomic resiliency of counties in the interior Columbia basin, projected for 2040.

for the basin. The socioeconomic resiliency of the basin generally will increase, but unevenly across the basin. Our projections indicate that in 2040, 34 counties will have low socioeconomic resiliency, down from 54. The number of counties with high socioeconomic resiliency will be 40, up from 26.

A band of areas with high socioeconomic resiliency may stretch along the east slope of the Cascade Range from Klamath County, Oregon, through Chelan County, Washington (fig. 15). Another band of counties may follow the paths of Interstate 86 and Interstate 84 from Yakima County, Washington, through northeastern Oregon and southern Idaho to Idaho Falls. A third area with high socioeconomic resiliency may lie along the Idaho-Washington border from Lewiston through Spokane, Coeur d'Alene, and Sand Point. A fourth area with high socioeconomic resiliency may be along the northern Rocky Mountains associated with existing population centers of Kalispell, Missoula, Butte, and Helena. Areas of low socioeconomic resiliency will probably continue to exist in the drier parts of eastern Oregon into Owyhee County, Idaho, and in much of central Idaho. There also may be scattered pockets of low socioeconomic resiliency in a few isolated counties of eastern Washington and western Montana.

Conclusion

All socioeconomic systems face risks, whether they have a high or low socioeconomic rating. Human populations are both important drivers and responders to change. The recent (1990-94) period of rapid economic growth in the basin was fueled in part by immigration. Some social scientists argue that quality of life is driving social and economic change in the basin (Power 1995, Rudzitis and others 1995), but this has not always been the case. In the 1980s, population left the basin during a nationwide recession that was particularly hard on natural resource sectors (mining, timber, and especially agriculture). Broad structural changes in the U.S. economy, ordinary business cycles, changes in technology, and population growth will continue to affect social and economic systems in the basin.

Two trends are likely to have significant effects on regional and local socioeconomic systems. One is the continued growth in the trade and service sectors. Another is the application and dissemination of telecommunications and information technologies that will give people greater choice about where and how to live. Migration patterns, inventions, and changes in lifestyle remind us that humans are among the most adaptable creatures in the basin. In spite of change, they will continue to adapt and to interact with its ecosystems.

This approach of trying to gauge the propensity of economic and social systems to adapt to externally introduced changes is a significant departure from judging these changes in only terms of short-term impacts on social and economic systems. It is not our intention that this approach replaces the more traditional impact analysis. In the case of Federal land management, it expands the tools available to gauge the longer term effects of changes in land management. It also will help land managers and the public understand the spatial patterns of different responses economic and social systems exhibit when faced with significant challenges.

Acknowledgments

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Appendix—Data and Ratings by County

Table 2—Basic data by county

State	County	Area	1994 population	Population density	Typology[a]	Economic resiliency	Lifestyle diversity
		Square miles	*Persons*	*Persons/ square mile*			
ID	Ada	1,060	243,337	229.5	2	0.8106	0.7573
ID	Adams	1,370	3,850	2.8	3	.6577	.2186
ID	Bannock	1,148	70,932	61.8	3	.7606	.6589
ID	Benewah	784	8,539	10.9	1	.6256	.3697
ID	Bingham	2,120	40,990	19.3	3	.7008	.5284
ID	Blaine	2,661	15,990	6.0	1	.7161	.4186
ID	Boise	1,907	4,498	2.4	3	.6560	.3632
ID	Bonner	1,919	31,890	16.6	1	.7730	.4738
ID	Bonneville	1,901	79,213	41.7	3	.7466	.6644
ID	Boundary	1,278	9,189	7.2	3	.7096	.1682
ID	Butte	2,234	3,044	1.4	3	.4546	.1258
ID	Camas	1,079	793	.7	1	.6311	.1303
ID	Canyon	604	104,431	172.9	2	.7977	.6303
ID	Caribou	1,798	7,182	4.0	3	.6290	.3454
ID	Cassia	2,580	20,811	8.1	3	.7389	.3583
ID	Clark	1,765	814	.5	3	.5637	.0904
ID	Clearwater	2,488	9,061	3.6	3	.6361	.4328
ID	Custer	4,937	3,984	.8	1	.6627	.3079
ID	Elmore	3,101	22,589	7.3	3	.6005	.4255
ID	Fremont	1,895	11,525	6.1	3	.6835	.3551
ID	Gem	566	13,467	23.8	3	.7119	.4536
ID	Gooding	734	12,678	17.3	3	.7128	.2031
ID	Idaho	8,503	14,588	1.7	3	.7210	.3512
ID	Jefferson	1,105	18,427	16.7	3	.6923	.3861
ID	Jerome	602	16,597	27.6	3	.7414	.3949
ID	Kootenai	1,316	87,277	66.3	1	.7844	.6228
ID	Latah	1,077	32,276	30.0	3	.6738	.4526
ID	Lemhi	4,570	7,425	1.6	1	.7506	.2822
ID	Lewis	480	3,838	8.0	3	.6750	.3369
ID	Lincoln	1,206	3,570	3.0	3	.6142	.2472
ID	Madison	473	23,743	50.2	3	.6932	.3396
ID	Minidoka	763	20,699	27.1	3	.7021	.4290
ID	Nez Perce	856	36,348	42.5	3	.7908	.6006

Table 2—Basic data by county (continued)

State	County	Area	1994 population	Population density	Typology[a]	Economic resiliency	Lifestyle diversity
		Square miles	*Persons*	*Persons/ square mile*			
ID	Oneida	1,202	3,657	3.0	3	.6519	--
ID	Owyhee	7,696	9,052	1.2	3	.6142	.1226
ID	Payette	410	18,956	46.2	3	.7581	.4363
ID	Power	1,442	7,891	5.5	3	.6488	.2535
ID	Shoshone	2,635	13,871	5.3	3	.6873	.2959
ID	Teton	451	4,269	9.5	1	.6662	.1695
ID	Twin Falls	1,928	58,462	30.3	3	.7900	.5653
ID	Valley	3,734	7,636	2.0	1	.7232	.2736
ID	Washington	1,473	9,149	6.2	3	.7207	.1978
MT	Deer Lodge	741	10,229	13.8	3	.6866	.4051
MT	Flathead	5,256	67,285	12.8	1	.8014	.5818
MT	Granite	171	2,655	15.6	3	.6876	.1578
MT	Lake	1,654	23,653	14.3	3	.7575	.4124
MT	Lewis and Clark	3,498	51,523	14.7	1	.7554	.5667
MT	Lincoln	3,675	18,409	5.0	3	.7288	.4087
MT	Mineral	1,223	3,633	3.0	3	.6621	.0941
MT	Missoula	2,618	85,669	32.7	3	.7890	.6380
MT	Powell	2,333	6,792	2.9	3	.6229	.3771
MT	Ravalli	2,400	30,700	12.8	3	.6400	.4252
MT	Sanders	2,790	9,733	3.5	3	.7225	.2910
MT	Silver Bow	719	33,814	47.0	3	.6530	.5398
NV	Elko	17,203	40,399	2.3	1	.6959	--
NV	Humboldt	9,658	15,261	1.6	1	.6852	--
OR	Baker	3,088	16,274	5.3	3	.7550	.4743
OR	Crook	2,988	15,895	5.3	3	.6699	.5249
OR	Deschutes	3,055	90,923	29.8	1	.7952	.6397
OR	Gilliam	1,223	1,851	1.5	3	.6217	.1467
OR	Grant	4,529	7,929	1.8	3	.7006	.3584
OR	Harney	10,227	7,067	.7	3	.6694	.4190
OR	Hood River	534	17,989	33.7	1	.7674	.3620
OR	Jefferson	1,791	15,564	8.7	3	.7331	.4177
OR	Klamath	6,136	60,484	9.9	3	.7681	.6156
OR	Lake	8,359	7,330	.9	3	.6436	.4196
OR	Malheur	9,930	27,421	2.8	3	.7035	.4190

Table 2—Basic data by county (continued)

State	County	Area	1994 population	Population density	Typology[a]	Economic resiliency	Lifestyle diversity
		Square miles	*Persons*	*Persons/ square mile*			
OR	Morrow	2,048	6,647	3.2	3	.5869	.2588
OR	Sherman	831	1,901	2.3	3	.5543	.1725
OR	Umatilla	3,231	63,068	19.5	3	.7717	.5660
OR	Union	2,039	24,590	12.1	3	.7441	.5058
OR	Wallowa	3,152	7,466	2.4	3	.7195	.3310
OR	Wasco	2,395	22,607	9.4	1	.7616	.5699
OR	Wheeler	1,716	1,578	.9	3	.5554	.0073
UT	Box Elder	6,729	38,750	5.8	3	.6531	--
WA	Adams	1,930	15,046	7.8	3	.6469	.3576
WA	Asotin	641	19,788	30.9	3	.7444	.5549
WA	Benton	1,760	129,295	73.5	2	.7233	.6937
WA	Chelan	2,994	55,915	18.7	1	.7718	.6094
WA	Columbia	873	4,102	4.7	3	.5975	.2565
WA	Douglas	1,848	30,372	16.4	3	.6810	.5243
WA	Ferry	2,257	7,033	3.1	3	.6687	.3868
WA	Franklin	1,266	42,711	33.7	2	.7453	.5163
WA	Garfield	718	2,305	3.2	3	.6097	.2473
WA	Grant	2,791	62,310	22.3	3	.7218	.4388
WA	Kittitas	2,333	29,726	12.7	3	.7054	.5013
WA	Klickitat	1,904	17,281	9.1	3	.6839	.4749
WA	Lincoln	2,340	9,428	4.0	3	.5716	.2859
WA	Okanogan	5,315	35,781	6.7	1	.7023	.3523
WA	Pend Oreille	1,425	10,317	7.2	3	.7172	.3315
WA	Skamania	1,684	8,958	5.3	3	.6419	.4356
WA	Spokane	1,780	395,874	222.4	2	.8124	.7744
WA	Stevens	2,541	36,388	14.3	3	.7723	.4625
WA	Walla Walla	1,299	52,582	40.5	3	.7686	.6631
WA	Whitman	2,177	38,865	17.8	3	.5854	.4157
WA	Yakima	4,312	207,683	48.2	2	.7858	.6320
WY	Fremont	9,266	35,128	3.8	1	.7506	--
WY	Lincoln	4,089	13,665	3.3	3	.7602	--
WY	Sublette	4,936	5,375	1.1	1	.7220	--
WY	Teton	4,222	13,152	3.1	1	.6971	.2756

-- = no data.

[a] Johnson and Beale (1995) typology codes 1 = recreation county, 2 = metro county, 3 = all other counties.

Table 3—Component ratings and resiliency codes by county

State	County	Population density[a]	Economic resiliency[b]	Lifestyle diversity[c]	Socioeconomic resiliency[d]
ID	Ada	3	3	3	3
ID	Adams	0	1	1	1
ID	Bannock	3	2	3	3
ID	Benewah	1	1	2	1
ID	Bingham	2	1	3	2
ID	Blaine	0	2	2	1
ID	Boise	0	1	2	1
ID	Bonner	2	3	3	3
ID	Bonneville	3	2	3	3
ID	Boundary	1	2	1	1
ID	Butte	0	1	1	1
ID	Camas	0	1	1	1
ID	Canyon	3	3	3	3
ID	Caribou	0	1	1	1
ID	Cassia	1	2	2	2
ID	Clark	0	1	1	1
ID	Clearwater	0	1	2	1
ID	Custer	0	1	1	1
ID	Elmore	1	1	2	1
ID	Fremont	1	1	2	1
ID	Gem	2	2	2	2
ID	Gooding	2	2	1	2
ID	Idaho	0	2	2	1
ID	Jefferson	2	1	2	2
ID	Jerome	2	2	2	2
ID	Kootenai	3	3	3	3
ID	Latah	2	1	2	2
ID	Lemhi	0	2	1	1
ID	Lewis	1	1	1	1
ID	Lincoln	0	1	1	1
ID	Madison	3	1	1	2
ID	Minidoka	2	1	2	2
ID	Nez Perce	3	3	3	3
ID	Oneida	0	1	1	1
ID	Owyhee	0	1	1	1
ID	Payette	3	2	2	3

Table 3—Component ratings and resiliency codes by county (continued)

State	County	Population density[a]	Economic resiliency[b]	Lifestyle diversity[c]	Socioeconomic resiliency[d]
ID	Power	0	1	1	1
ID	Shoshone	0	1	1	1
ID	Teton	1	1	1	1
ID	Twin Falls	2	3	3	3
ID	Valley	0	2	1	1
ID	Washington	1	2	1	1
MT	Deer Lodge	2	1	2	2
MT	Flathead	2	3	3	3
MT	Granite	2	1	1	1
MT	Lake	2	2	2	2
MT	Lewis and Clark	2	2	3	3
MT	Lincoln	0	2	2	1
MT	Mineral	0	1	1	1
MT	Missoula	2	3	3	3
MT	Powell	0	1	2	1
MT	Ravalli	2	1	2	2
MT	Sanders	0	2	1	1
MT	Silver Bow	3	1	3	3
NV	Elko	0	1	1	1
NV	Humboldt	0	1	1	1
OR	Baker	0	2	3	2
OR	Crook	0	1	3	1
OR	Deschutes	2	3	3	3
OR	Gilliam	0	1	1	1
OR	Grant	0	1	2	1
OR	Harney	0	1	2	1
OR	Hood River	3	3	2	3
OR	Jefferson	1	2	2	2
OR	Klamath	1	3	3	3
OR	Lake	0	1	2	1
OR	Malheur	0	1	2	1
OR	Morrow	0	1	1	1
OR	Sherman	0	1	1	1
OR	Umatilla	2	3	3	3
OR	Union	2	2	3	3

Table 3—Component ratings and resiliency codes by county (continued)

State	County	Population density[a]	Economic resiliency[b]	Lifestyle diversity[c]	Socioeconomic resiliency[d]
OR	Wallowa	0	2	1	1
OR	Wasco	1	2	3	2
OR	Wheeler	0	1	1	1
UT	Box Elder	0	1	1	1
WA	Adams	1	1	2	1
WA	Asotin	2	2	3	3
WA	Benton	3	2	3	3
WA	Chelan	2	3	3	3
WA	Columbia	0	1	1	1
WA	Douglas	2	1	3	2
WA	Ferry	0	1	2	1
WA	Franklin	3	2	3	3
WA	Garfield	0	1	1	1
WA	Grant	2	2	2	2
WA	Kittitas	2	1	3	2
WA	Klickitat	1	1	3	2
WA	Lincoln	0	1	1	1
WA	Okanogan	1	1	2	1
WA	Pend Oreille	1	2	1	1
WA	Skamania	0	1	2	1
WA	Spokane	3	3	3	3
WA	Stevens	2	3	2	3
WA	Walla Walla	3	3	3	3
WA	Whitman	2	1	2	2
WA	Yakima	3	3	3	3
WY	Fremont	0	2	1	1
WY	Lincoln	0	2	1	1
WY	Sublette	0	2	1	1
WY	Teton	0	1	1	1

[a] Population denstiy 0 = <6.0, 1 = >6.0<11, 2 = >11<33.3, 3 = >33, persons per square mile.

[b] Economic resiliency 1 = <0.7058, 2 = >0.7059<0.7651, 3 = >0.7652, based on Shannon Weaver index using 1991 employment data.

[c] Lifestyle diversity 1 = <0.3455, 2 = 0.3512<0.4626, 3 = >0.4626, based on Shannon Weaver index.

[d] Socioeconomic resiliency 1 = 1-4, 2 = 5-6, 3 = 7-9, based on population density+economic resiliency+lifestyle diversity.

Table 4—Reliance of basin counties on Federal forage and timber

		Forage reliance				Timber reliance			
State	County	Calculated dependency on Federal forage	Cattle and calf sales as a percentage of total agric. sales	FS/BLM range reliance	Forage codes	Total	FS	BLM	Timber codes[a]
						------- *Thousand board feet* -------			
ID	Ada	0.0050	0.5221	0.26	1	53	0	0	1
ID	Adams	.2384	.8877	21.16	3	75,133	56,260	0	3
ID	Bannock	.0625	.2223	1.39	1	2,517	0	0	1
ID	Benewah	.0053	.0853	.05	1	134,107	29,801	0	2
ID	Bingham	.0330	.2140	.71	1	3,209	0	0	1
ID	Blaine	.1410	.4100	5.78	2	759	272	0	1
ID	Boise	.1714	.5609	9.61	2	113,527	75,443	1,285	3
ID	Bonner	.0099	.5135	.51	1	189,683	60,786	847	3
ID	Bonneville	.0848	.2252	1.91	1	5,317	4,354	0	1
ID	Boundary	.0097	.1395	.14	1	67,972	31,137	127	2
ID	Butte	.2047	.2925	5.99	2	0	0	0	0
ID	Camas	.3934	.3337	13.13	3	1,748	0	0	1
ID	Canyon	.0001	.4172	.01	1	0	0	0	0
ID	Caribou	.1500	.2283	3.42	1	4,573	2,037	0	1
ID	Cassia	.0938	.3858	3.62	2	384	384	0	1
ID	Clark	.3360	.2519	8.46	2	12,153	11,317	86	1
ID	Clearwater	.0359	.2635	.95	1	235,898	34,684	0	2
ID	Custer	.3562	.7934	28.26	3	470	470	0	1
ID	Elmore	.0904	.3879	3.51	1	16,325	4,034	0	1
ID	Fremont	.1120	.2407	2.70	1	15,643	14,460	0	1
ID	Gem	.0277	.3315	.92	1	4,296	3,575	0	1
ID	Gooding	.0070	.3494	.25	1	0	0	0	0
ID	Idaho	.0583	.4085	2.38	1	134,146	73,586	1,851	3
ID	Jefferson	.0093	.3255	.30	1	0	0	0	0
ID	Jerome	.0140	.2897	.41	1	0	0	0	0
ID	Kootenai	.0055	.1217	.07	1	158,023	36,077	0	2

Table 4—Reliance of basin counties on Federal forage and timber (continued)

		Forage reliance				Timber reliance			
State	County	Calculated dependency on Federal forage	Cattle and calf sales as a percentage of total agric. sales	FS/BLM range reliance	Forage codes	Total	FS	BLM	Timber codes[a]
						------- *Thousand board feet* -------			
ID	Latah	.0800	.0686	.55	1	94,051	16,832	0	1
ID	Lemhi	.1726	.8333	14.38	3	13,607	10,522	0	1
ID	Lewis	.0031	.0809	.02	1	16,210	0	0	1
ID	Lincoln	.0367	.3931	1.44	1	0	0	0	0
ID	Madison	.0185	.0852	.16	1	1,106	0	0	1
ID	Minidoka	.0065	.1078	.07	1	0	0	0	0
ID	Nez Perce	.0007	.1488	.01	1	19,299	0	0	1
ID	Oneida	.1583	.3234	5.12	2	0	0	0	0
ID	Owyhee	.2293	.5547	12.72	3	1,981	0	0	0
ID	Payette	.0111	.3126	.35	1	0	0	0	0
ID	Power	.0373	.2296	.86	1	390	0	185	1
ID	Shoshone	.1225	.2862	3.50	1	174,722	47,228	0	2
ID	Teton	.0386	.1952	.75	1	1,797	1,501	0	1
ID	Twin Falls	.0809	.2452	1.98	1	0	0	0	0
ID	Valley	.1666	.8660	14.43	3	56,628	20,116	0	2
ID	Washington	.0695	.5487	3.82	2	4,667	1,762	0	1
MT	Deer Lodge	.0237	.7365	1.74	1	11,117	6,459	0	1
MT	Flathead	.0097	.3025	.29	1	150,332	32,957	0	2
MT	Granite	.0414	.9164	3.80	2	20,599	3,664	90	1
MT	Lake	.0002	.4684	.01	1	53,444	2,466	0	1
MT	Lewis and Clark	.0106	.6265	.67	1	12,741	1,418	15	1
MT	Lincoln	.1675	.6632	11.11	3	207,796	110,697	0	3
MT	Mineral	.0291	.3532	1.03	1	32,412	22,114	0	2
MT	Missoula	.0143	.6294	.90	1	135,699	23,063	607	2
MT	Powell	.0120	.8215	.98	1	43,266	2,843	2,115	1
MT	Ravalli	.0112	.5356	.60	1	40,008	9,397	0	1

Table 4—Reliance of basin counties on Federal forage and timber (continued)

		Forage reliance				Timber reliance			
State	County	Calculated dependency on Federal forage	Cattle and calf sales as a percentage of total agric. sales	FS/BLM range reliance	Forage codes	Total	FS	BLM	Timber codes[a]
						------- *Thousand board feet* -------			
MT	Sanders	.0027	.6780	.18	1	106,997	48,284	0	2
MT	Silver Bow	.1046	.8629	9.02	2	5,471	9	0	1
NV	Elko	.3828	.9127	34.94	3	0	0	0	0
NV	Humboldt	.3836	.3631	13.93	3	0	0	0	0
OR	Baker	.0782	.7758	6.07	2	52,511	18,561	0	2
OR	Crook	.0961	.6568	6.31	2	83,486	43,025	0	2
OR	Deschutes	.1736	.3106	5.39	2	82,597	52,274	11,449	3
OR	Gilliam	.0119	.2756	.33	1	145	145	0	1
OR	Grant	.1486	.8790	13.06	3	178,169	126,802	68	3
OR	Harney	.2016	.8458	17.05	3	45,750	42,073	0	3
OR	Hood River	.0154	.0125	.02	1	17,939	1,345	0	1
OR	Jefferson	.1706	.2045	3.49	1	36,169	3,535	0	1
OR	Klamath	.0424	.3882	1.65	1	483,880	215,733	11,040	3
OR	Lake	.1512	.6995	10.58	3	116,666	71,185	0	3
OR	Malheur	.1833	.4008	7.35	2	6,307	0	0	1
OR	Morrow	.0325	.3859	1.25	1	27,168	7,067	0	1
OR	Sherman	.0126	.0698	.09	1	0	0	0	0
OR	Umatilla	.0153	.2494	.38	1	101,719	21,678	0	2
OR	Union	.0457	.4912	2.25	1	143,211	40,703	0	2
OR	Wallowa	.1745	.6681	11.66	3	58,214	13,223	0	1
OR	Wasco	.0205	.1565	.32	1	70,189	11,330	0	1
OR	Wheeler	.0458	.7982	3.66	2	56,626	18,641	0	2
UT	Box Elder	.0382	.3468	1.33	1	0	0	0	0
WA	Adams	0	.4099	0	1	0	0	0	0

Table 4—Reliance of basin counties on Federal forage and timber (continued)

		Forage reliance				Timber reliance			
State	County	Calculated dependency on Federal forage	Cattle and calf sales as a percentage of total agric. sales	FS/BLM range reliance	Forage codes	Total	FS	BLM	Timber codes[a]
						------- *Thousand board feet* -------			
WA	Asotin	.0140	.3755	.53	1	8,578	2,932	0	1
WA	Benton	.0015	.0889	.01	1	0	0	0	0
WA	Chelan	.3266	.0065	.21	1	32,694	13,567	0	1
WA	Columbia	.0222	.0692	.15	1	26,599	11,684	0	1
WA	Douglas	.0188	.0683	.13	1	1,320	0	0	1
WA	Ferry	.1396	.8239	11.50	3	69,009	13,811	0	1
WA	Franklin	.0017	.1109	.02	1	0	0	0	0
WA	Garfield	.0273	.1213	.33	1	7,143	5,788	0	1
WA	Grant	.0024	.2724	.06	1	0	0	0	0
WA	Kittitas	.0075	.6231	.47	1	91,519	11,956	0	1
WA	Klickitat	.0040	.2525	.10	1	105,049	0	0	1
WA	Lincoln	.0030	.1166	.04	1	7,917	0	0	1
WA	Okanogan	.1008	.1323	1.33	1	106,860	27,500	0	2
WA	Pend Oreille	.0391	.5023	1.96	1	142,723	31,121	0	2
WA	Skamania	.4784	.1378	6.59	2	110,878	85,717	0	3
WA	Spokane	0	.1061	0	1	68,697	0	0	1
WA	Stevens	.0124	.3731	.46	1	211,229	22,036	0	2
WA	Walla Walla	.0001	.0688	0	1	5,189	0	0	1
WA	Whitman	0	.0640	0	1	1,427	0	0	1
WA	Yakima	.0032	.2463	.08	1	136,688	20,580	0	2
WY	Fremont	.1598	.6217	9.93	2	0	0	0	0
WY	Lincoln	.1593	.5157	8.22	2	0	0	0	0
WY	Sublette	.2957	.9256	27.37	3	0	0	0	0
WY	Teton	.2386	.8513	20.31	3	0	0	0	0

[a] Counties may be coded 1 even though they show 0 Forest Service timber harvest. In these cases the Forest Service harvest is less than 1,000 board feet.
Range data was collected by Leslie Frewing-Runyon and are on file at the Pacific Northwest Research Station, Portland, Oregon.

Table 5—Employment for various occupations in the natual resource field, by county, for 1994

County	State	Total	Ranching	Lumber and wood products manufacturing	Mining	Total natural resource
		Number of jobs				
Ada	ID	174,958	298	2,235	293	2,826
Adams	ID	1,738	90	298	(D)[a]	388
Bannock	ID	35,702	98	29	54	181
Benewah	ID	4,631	18	926	(D)	944
Bingham	ID	18,533	359	22	51	432
Blaine	ID	13,832	129	45	87	261
Boise	ID	2,056	23	139	(L)[b]	162
Bonner	ID	15,971	57	1,314	85	1,456
Bonneville	ID	44,886	183	116	34	333
Boundary	ID	4,590	28	470	(L)	498
Butte	ID	7,465	92	0	(D)	92
Camas	ID	579	35	0	(L)	35
Canyon	ID	51,241	481	1,068	90	1,639
Caribou	ID	4,462	122	0	521	643
Cassia	ID	11,465	413	0	89	502
Clark	ID	788	87	0	(D)	87
Clearwater	ID	4,661	21	757	15	793
Custer	ID	2,685	154	0	274	428
Elmore	ID	11,331	303	0	(L)	303
Fremont	ID	4,451	139	129	(L)	268
Gem	ID	4,983	137	605	(D)	742
Gooding	ID	6,076	362	0	(D)	362
Idaho	ID	6,978	192	675	130	997
Jefferson	ID	6,841	292	106	17	415
Jerome	ID	7,494	293	0	(L)	293
Kootenai	ID	48,567	35	1,932	172	2,139
Latah	ID	18,737	48	492	18	558
Lemhi	ID	4,030	207	177	83	467
Lewis	ID	2,243	27	282	(L)	309
Lincoln	ID	1,903	133	0	(D)	133
Madison	ID	11,794	86	156	(D)	242
Minidoka	ID	10,434	151	0	(L)	151
Nez Perce	ID	24,549	65	655	(D)	720

Table 5—Employment for various occupations in the natual resource field, by county, for 1994 (continued)

County	State	Total	Ranching	Lumber and wood products manufacturing	Mining	Total natural resource
		Number of jobs				
Owyhee	ID	3,510	412	0	122	534
Payette	ID	7,880	121	0	15	136
Power	ID	5,042	105	0	(L)	105
Shoshone	ID	5,804	3	136	473	612
Teton	ID	1,941	61	0	0	61
Twin Falls	ID	35,160	418	218	84	720
Valley	ID	5,054	44	137	52	233
Washington	ID	4,593	179	329	(L)	508
Deer Lodge	MT	3,764	33	0	50	83
Flathead	MT	39,832	97	1,903	143	2,143
Granite	MT	1,470	114	288	57	459
Lake	MT	10,799	228	316	20	564
Lewis and Clark	MT	33,733	164	101	165	430
Mineral	MT	1,447	5	69	0	74
Missoula	MT	55,053	63	894	64	1,021
Powell	MT	3,000	184	196	18	398
Ravalli	MT	13,271	174	649	116	939
Sanders	MT	3,775	153	284	23	460
Silver Bow	MT	17,483	33	6	604	643
Baker	OR	8,296	377	422	88	887
Crook	OR	8,391	198	1,986	24	2,208
Deschutes	OR	53,258	80	2,756	120	2,956
Gilliam	OR	1,312	74	0	0	74
Grant	OR	4,717	207	523	0	730
Harney	OR	4,249	408	445	(L)	853
Hood River	OR	12,312	9	479	(D)	488
Jefferson	OR	7,817	88	1,245	0	1,333
Klamath	OR	29,715	370	2,814	30	3,214
Lake	OR	4,544	373	600	22	995
Malheur	OR	17,439	654	0	63	717
Morrow	OR	4,945	219	164	(L)	383
Sherman	OR	1,137	31	0	0	31
Umatilla	OR	33,272	329	975	(L)	1,304

Table 5—Employment for various occupations in the natual resource field, by county, for 1994 (continued)

County	State	Total	Ranching	Lumber and wood products manufacturing	Mining	Total natural resource
		Number of jobs				
Union	OR	13,328	179	1,071	19	1,269
Wallowa	OR	4,180	225	275	(L)	500
Wasco	OR	11,300	108	225	11	344
Wheeler	OR	662	82	6	0	88
Adams	WA	8,926	0	0	(D)	0
Asotin	WA	6,467	271	141	(D)	412
Benton	WA	76,129	38	0	79	117
Chelan	WA	43,790	107	208	198	513
Columbia	WA	2,212	10	0	(D)	10
Douglas	WA	10,668	28	0	(L)	28
Ferry	WA	2,765	58	207	262	527
Franklin	WA	23,828	54	32	14	100
Garfield	WA	1,172	176	0	0	176
Grant	WA	33,156	42	0	(D)	42
Kittitas	WA	15,119	410	145	16	571
Klickitat	WA	7,918	217	596	24	837
Lincoln	WA	4,704	118	0	(L)	118
Okanogan	WA	22,745	138	1,046	69	1,253
Pend Oreille	WA	3,716	198	154	27	379
Skamania	WA	2,631	28	172	(D)	200
Spokane	WA	224,287	3	1,541	360	1,904
Stevens	WA	14,582	123	1,231	108	1,462
Walla Walla	WA	28,244	142	0	20	162
Whitman	WA	19,626	170	217	(L)	387
Yakima	WA	110,762	113	1,884	33	2,030
Teton	WY	17,637	0	--	57	57

-- = no data.
[a] (L) = less than 10 people employed.
[b] (D) = data not available due to disclosure.

Table 6—Per capita income and percentage of people commuting out of county to place of employment for each county in the basin

State	County	Per capita income, 1988	Percent commuting 1980	Percent commuting 1990
		Dollars		
ID	Ada	12,780	5.34	5.34
ID	Adams	10,858	11.01	17.61
ID	Bannock	9,220	7.08	13.27
ID	Benewah	9,910	7.11	10.71
ID	Bingham	8,191	25.66	26.87
ID	Blaine	13,017	3.73	2.06
ID	Boise	9,053	40.97	41.44
ID	Bonner	9,311	12.57	12.96
ID	Bonneville	10,572	12.24	12.06
ID	Boundary	8,314	4.73	7.36
ID	Butte	9,320	9.36	21.37
ID	Camas	14,608	.71	23.82
ID	Canyon	8,923	14.74	22.59
ID	Caribou	11,034	11.12	6.31
ID	Cassia	9,101	19.94	21.73
ID	Clark	16,991	4.79	14.90
ID	Clearwater	9,359	4.84	9.39
ID	Custer	9,921	7.06	15.12
ID	Elmore	8,767	6.06	10.71
ID	Fremont	8,988	22.46	35.39
ID	Gem	9,525	20.88	37.49
ID	Gooding	9,307	18.53	23.63
ID	Idaho	9,425	10.32	12.75
ID	Jefferson	7,652	41.05	42.40
ID	Jerome	8,543	28.58	37.80
ID	Kootenai	10,306	18.61	19.55
ID	Latah	9,406	12.39	16.10
ID	Lemhi	9,564	8.25	3.35
ID	Lewis	12,923	17.48	26.50
ID	Lincoln	10,574	13.36	26.61
ID	Madison	7,148	19.69	15.82
ID	Minidoka	8,250	27.57	27.45
ID	Nez Perce	11,237	9.83	12.11
ID	Oneida	--	13.82	28.44

Table 6—Per capita income and percentage of people commuting out of county to place of employment for each county in the basin (continued)

State	County	Per capita income, 1988	Percent commuting 1980	Percent commuting 1990
		Dollars		
ID	Owyhee	7,379	19.00	36.08
ID	Payette	8,682	38.88	39.59
ID	Power	11,881	23.78	27.49
ID	Shoshone	9,173	2.19	10.25
ID	Teton	8,566	17.10	28.12
ID	Twin Falls	9,901	6.01	8.50
ID	Valley	10,165	4.93	8.65
ID	Washington	9,039	12.52	18.03
MT	Deer Lodge	8,731	10.94	20.86
MT	Flathead	10,623	2.77	2.98
MT	Granite	10,020	8.98	12.35
MT	Lake	8,738	12.12	15.97
MT	Lewis and Clark	11,402	3.75	4.16
MT	Lincoln	8,012	4.63	3.28
MT	Mineral	7,910	10.16	15.73
MT	Missoula	10,450	3.40	3.71
MT	Powell	8,838	11.85	14.93
MT	Ravalli	8,591	18.77	19.16
MT	Sanders	7,622	7.72	11.42
MT	Silver Bow	11,197	4.07	6.38
NV	Elko	--	3.50	10.55
NV	Humboldt	--	4.90	5.04
OR	Baker	10,344	4.86	6.52
OR	Crook	10,575	9.72	14.02
OR	Deschutes	11,461	4.09	5.89
OR	Gilliam	17,547	8.54	8.39
OR	Grant	10,696	2.20	4.21
OR	Harney	11,417	1.49	2.59
OR	Hood River	11,427	11.59	12.10
OR	Jefferson	10,707	8.74	15.66
OR	Klamath	10,078	3.79	4.73
OR	Lake	11,495	1.86	4.50
OR	Malheur	9,665	10.05	12.19
OR	Morrow	11,887	14.52	19.55

Table 6—Per capita income and percentage of people commuting out of county to place of employment for each county in the basin (continued)

State	County	Per capita income, 1988	Percent commuting 1980	Percent commuting 1990
		Dollars		
OR	Sherman	18,563	15.89	18.17
OR	Umatilla	10,222	11.56	12.17
OR	Union	10,349	2.86	4.76
OR	Wallowa	11,544	2.09	3.57
OR	Wasco	11,878	12.43	15.45
OR	Wheeler	13,958	8.66	15.73
UT	Box Elder	--	15.73	17.52
WA	Adams	12,380	9.95	16.65
WA	Asotin	11,030	60.20	52.89
WA	Benton	11,896	13.95	17.69
WA	Chelan	12,594	9.36	11.80
WA	Columbia	12,793	6.13	15.84
WA	Douglas	11,477	58.09	57.03
WA	Ferry	8,126	12.56	15.78
WA	Franklin	11,165	34.00	38.53
WA	Garfield	15,707	6.41	12.03
WA	Grant	10,935	7.52	6.73
WA	Kittitas	10,448	6.57	10.82
WA	Klickitat	10,757	15.79	20.45
WA	Lincoln	17,127	10.96	17.93
WA	Okanogan	10,634	6.44	7.04
WA	Pend Oreille	8,559	28,10	31.48
WA	Skamania	10,191	27.72	46.26
WA	Spokane	11,544	2.67	3.31
WA	Stevens	9,296	18.59	22.68
WA	Walla Walla	12,135	11.14	12.23
WA	Whitman	12,070	9.14	8.72
WA	Yakima	10,493	6.52	4.86
WY	Fremont	--	2.07	4.26
WY	Lincoln	--	8.01	11.27
WY	Sublette	--	7.21	11.99
WY	Teton	16,655	4.05	3.39

-- = no data.

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Horne, Amy L.; Haynes, Richard W. 1999. Developing measures of socioeconomic resiliency in the interior Columbia basin. Gen. Tech. Rep. PNW-GTR-453. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 41 p. (Quigley, Thomas M., ed.; Interior Columbia Basin Ecosystem Management Project: scientific assessment).

Measures of socioeconomic resiliency were developed for the 100 counties studied in the Interior Columbia River Basin Ecosystem Management Project. These measures can be used for understanding the extent to which changes in policies for management of Federal lands may affect socioeconomic systems coincident with those lands. We found that most of the basin's residents (67 percent) live in counties with a high degree of socioeconomic resiliency; however, these counties represent only 20 percent of the land base. Whereas 68 percent of the basin is categorized as having low socioeconomic resiliency, only 18 percent of the people live in these areas. These findings allow land managers to better gauge the impacts of land management actions and to focus social and economic mitigation strategies on places of greatest need.

Keywords: Well-being, Federal land management, ecosystem management.

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