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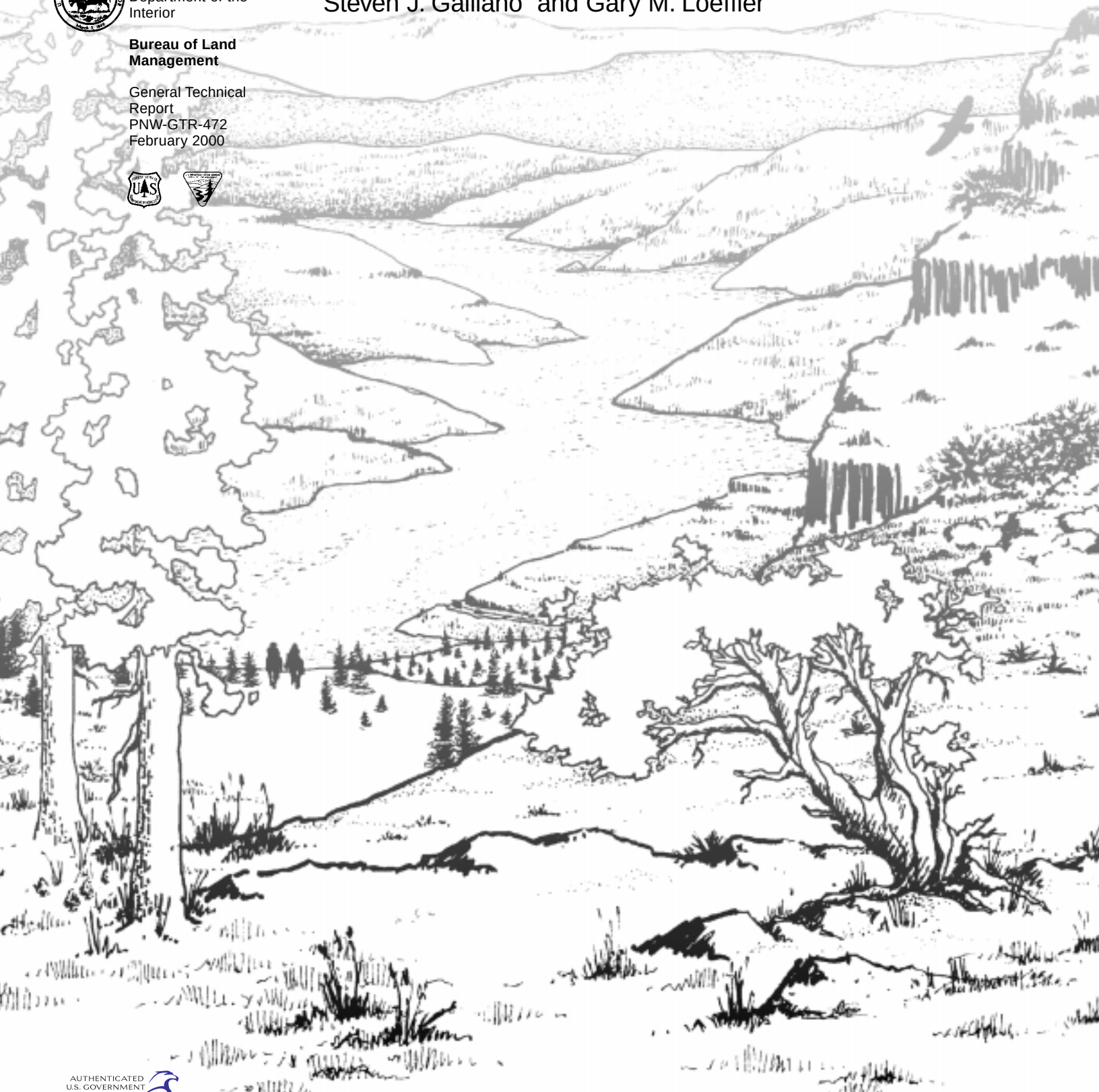
Scenery Assessment: Scenic Beauty at the Ecoregion Scale

Steven J. Galliano and Gary M. Loeffler



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Interior Columbia Basin Ecosystem Management Project: Scientific Assessment

Thomas M. Quigley, Editor

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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, Jon Bumstead, and Stewart Allen; terrestrial—Bruce Marcot, Kurt Nelson, John Lehmkuhl, Richard Holthausen, and Randy Hickenbottom; spatial analysis—Becky Gravenmier, John Steffenson, and Andy Wilson.

Thomas M. Quigley
Editor

United States Department of Agriculture

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Abstract

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Scenic quality is an important amenity on public lands in the interior Columbia basin (hereafter referred to as the basin). People's interests in and expectations about ecosystems can help establish desired aesthetic conditions for the varied landscapes found in the basin. This paper, a portion of the social science assessment for the Interior Columbia Basin Ecosystem Management Project, explains the procedures used to inventory scenic quality throughout the basin by using two primary indicators: landscape character and scenic condition. Landscape character is expressed as landscape themes, which portray the overall images of a large geographic area. Scenic condition is measured in degrees of scenic integrity, which express various levels of alteration to the landscape by humans to natural-appearing landscapes. Most landscapes in the basin are forests and shrub-grasslands having a predominantly natural appearance. Urban and rural developments visually dominate relatively few of the basin's landscapes although they are highly visible where they do occur. The overall scenic integrity of landscapes in the basin remains at a relatively high level with over 80 percent dominated by natural-appearing views.

Keywords: Scenery assessment, landscape character, scenic integrity, landscape themes, scenic beauty.

Contents

Introduction

Definition of Scenery

Scenery is defined as the general appearance of a place and the features of its views or landscapes—the arrangement of predominantly natural features of the landscapes we see. The adjective "scenic" has to do with natural scenery; affording beautiful views. Scenery assessment illustrates how the features of the basin's landscapes can be inventoried and analyzed so that managers can make decisions based on an understanding of how people value and attach meanings to their environment.

The physical setting of various places is the product of both natural processes and human culture, combined in varying proportions (Eckbo 1969). Scenery consists of both biophysical elements (landforms, water, and vegetation) and cultural elements (positive features resulting from human activities in the landscape). These might include structures: fences, rock walls, historic buildings; modified natural areas: fields, hedgerows, windbreaks, canals, or earth mounds; as well as farmsteads, military posts, and plantations (Magill 1992).

Natural processes such as fires, lava flows, stream erosion, and deposition, or the effects of insects on plants are dynamic, perpetual, and inevitable, causing scenery to be ever changing.

Cultural alterations often influence decisions made by people at various times and places and result in changes to the physical landscape. Human activities occurring in a landscape are generated by some type of objective or desire, such as harvesting timber or planting wheat.

Both biophysical and social functions should be considered in any land management decision. To achieve and maintain harmony among these functions, scenery management systems have been developed by resource agencies as inventory and predictive models. Although cultural attributes are often positive additions to many landscapes, the basic premise of these models is that on public lands, people expect natural-appearing scenery to visually dominate cultural or human alterations, especially in forested landscapes (Kaplan 1975, Smardon 1986).

The models these agencies produced have been developed, tested, adopted, and applied nationwide over the past 24 years or more. Presently, these models are being revised while retaining their original premises. The two primary scenic indicators used in this scenic assessment, landscape character and scenic integrity, have been developed from these models and are used to evaluate scenery.

Importance of Scenery Assessment

People are concerned about the quality of the scenery around them and have an impression of what they expect to see when they visit public lands (Newby 1971). Although our Nation's examples of exceptional natural beauty—Yellowstone National Park, Grand Tetons, the Grand Canyon, etc.—have long been recognized and protected for their uniqueness and scenic charisma, people also have acknowledged landscapes that may not be considered as striking: the rolling agricultural lands of Washington's Palouse country, the heavily dissected volcanic landscapes of Idaho's Snake River Plains, or the canyoned plateaus of the Blue Mountains.

Although the old adage "beauty is in the eye of the beholder" has truth for the individual, research has shown that high levels of agreement and predictability exist when a representative population is tested (Litton and Tetlow 1978). This research shows that landscape settings with high degrees of natural-appearing character are most desirable (Lee 1976, McGuire 1979, Newby 1971, Noe 1988). Similar studies also have shown that the public tends to have common perceptions of what constitutes natural scenic beauty (Zube 1976). One study, for example, measured how members of 26 different user, interest, and professional groups perceived six areas representing a cross section of forest management in northern Arizona (Daniel and Boster cited in Zube 1976). The most striking finding was the level of agreement in scenic preferences among these diverse groups.

The importance of scenery to humans is not an idea only recently developed by public resource managing agencies. For centuries people have been concerned about scenery and have recognized that it has many benefits to society. As early as 1757, documented philosophical studies of aesthetics were conducted by scientist Edmund Burke (Orians and Heerwagen 1992). In 1791, Gilpin published his "Remarks on Forest Scenery and Other Woodland Views" (Gilpin 1791) followed by Marsh in his 1864 book entitled "Man and Nature" in which the significance of nature's scenic beauty probably is described for the first time through an analytical approach.

Another indicator of the importance of the visual environment is the degree to which considerations for scenery are built into institutional policies at the local, regional, and national levels. Scenery and related aesthetic values have long been recognized in nearly all land use planning activities, perhaps beginning in the United States with the design of Central Park in 1858. The creation of Yosemite National Park and the national park system in 1872 are early examples of preserving our natural landscapes.

The National Environmental Policy Act (NEPA 1969) requires that all Federal agencies identify and develop procedures for ensuring that presently unquantified environmental amenities and values are considered on an equal basis with economic and technical aspects of major Federal actions affecting environmental quality.

Oregon's long-range transportation plan (1992) includes a goal called "livability" that contains eight policy statements. One of these specifically addresses aesthetic values: "It is the policy of the State of Oregon to protect and enhance the aesthetic value of transportation corridors in order to support economic development and preserve quality of life." Similarly, the "Shoreline Master Program Handbook" developed by the State of Washington Department of Ecology includes a policy recognizing that the "scenic, aesthetic, and ecological qualities of natural and developed shorelines should be recognized and preserved as valuable resources" (State of Washington 1978).

At the local level, almost all comprehensive land use plans use measures such as zoning, setbacks, and other ordinances to protect aesthetic, and other resources. One result of these policies has been many attempts to define and measure public perceptions of scenery and aesthetic values. These attempts began in the 1960s, gained momentum in the 1970s, and continue today (Elsner and Smardon 1979).

Contemporary research also indicates that there are measurable physical and psychological benefits to humans when they view natural-appearing, attractive scenery (Driver and others 1992, Ulrich 1984). For example, surgery patients who are provided windows with views of settings with trees recover faster and with fewer complaints than their counterparts with views of urban walls (Orians 1986). Thus, natural-appearing landscapes often serve as psychological escapes for a society where wildlands are becoming increasingly scarce while people's lives are becoming more complex. We suggest that natural-appearing, attractive scenery provides an essential contrast to urban settings where the stresses of traffic, crime, crowds, bright colors, and hard surfaces often create an unfriendly environment.

Current research (Ulrich 1984, Ulrich and others 1992) supports this position, indicating that society in general benefits from natural-appearing, attractive landscapes. When people feel better, they are more productive, interact better with their families, and tend to have increased involvement in community activities (Driver and others 1992).

The characteristics of high-quality scenery foster psychological and physiological benefits to individuals, communities, and society in general. Research indicates that people have both quantitative and qualitative expectations for scenery on publicly owned lands that transcend shallow cosmetic concerns (Kaplan and Kaplan 1988, Ulrich 1984). According to this research, natural-appearing landscape settings have inherent capacities to promote both physical and mental health. Researchers Magill (1992), Lee (1976), Litton (1984), and Daniel and Boster (1976) conclude

that public acceptance, desire, and preference for natural landscape features is not only identifiable but also measurable.

Just knowing that unaltered landscape settings exist provides psychological reassurance for some people, even though they may never experience those settings personally. The value to some people of knowing that desired environments, landscapes, services, or opportunities exist, although they personally might never use them, is what Randall and Stoll (1993) define as existence value.

In scenery assessment, existence value suggests that natural-appearing landscapes may not only be of importance for what they are, but for what they are not. To many people, it is the absence of concrete, asphalt, geometric forms, and urban infrastructure that give the forest and shrub-grassland landscapes existence value. Thus, naturally evolving scenery found on congressionally reserved public lands (like those of a designated wilderness area) serve as the antithesis of a heavily urbanized landscape (Randall and Stoll 1983). For people living in large cities lacking natural-appearing scenery who may never have an opportunity to view the diverse landscapes of the interior Columbia basin, simply knowing that naturally evolving and natural-appearing landscapes exist in this opposite corner of the continent gives those landscapes existence value.

Besides the physical and social benefits presented above, there are several indicators that support the expanding value of high-quality, natural-appearing scenery to our society:

- Increased appreciation for natural beauty when selecting parks, beaches, or other outdoor recreation areas (Alexander 1986).
- Increased importance of recreational settings and scenery because of decreases in leisure time.[1]
- Increased participation in scenery-oriented outdoor recreation activities, specifically sightseeing, picnicking, day hiking, nature study, visiting historic sites, backpacking, and canoeing and kayaking (Molitor 1995).
- Increased numbers of people who view themselves as environmentalists or at least sympathetic to environmental protection (Roper Starch, Inc. 1994).
- Increased actions by various levels of government to protect scenic quality in both built and natural landscape settings (Trent 1995).
- Increased public recognition that scenery is a limited resource (Litton 1984).
- Increasing market strength for real estate oriented toward natural-appearing scenery, even distant views thereof (Bennett 1995, Gobster and Shroeder 1988).

Based on the above discussion, this study contends that scenery assessment can be considered a rational and artistic process, rather than merely a romantic or emotional process.

Importance of Scenery in the Interior Columbia Basin

The significance of scenery as a resource and how it may be inventoried and sustained within the basin is a primary goal of this scenery assessment. The objectives of the assessment are to:

- Describe a rational approach to inventorying and classifying scenery within the basin.
- Identify landscape themes associated with various geographic portions of the basin as a way of providing an overview of images associated with broad landscape character.
- Inventory and classify the present level of scenic integrity (or condition) of scenic resources within the basin as a baseline on which potential changes can be measured.

The quality of the visual environment is important to people living within the basin (Trent 1995). Forest Service and Bureau of Land Management (BLM) lands often serve as important

[1] Recent studies indicate decreases in the amount of time Americans have available for leisure, primarily because of increases in the number of dual income households (Cordell and Siehl 1989, Hornback 1991), deferred child bearing (Szwak 1989), and an increase in the number of single-parent households (Luloff and Krannick 1990, McLellan and Siehl 1988, Szwak 1989).

backdrops for communities and residences in both rural and urban settings scattered throughout the basin, offering large areas of wildland viewing opportunities. These same lands also provide the settings for various occupational and recreational activities, serving a wide diversity of people living both inside and outside the basin.

People living within the basin consider the scenic quality of publicly owned lands important. Most people who value the basin's scenic resource realize that landscape settings are dynamic and may change over time, whether humans alter them or not. These stake-holders also indicate that they prefer not to see drastic changes in the character or condition of geographic areas of importance to them (Galliano and Loeffler, in press). Resource managers, therefore, also are concerned about the integrity of scenery, specifically visual changes resulting from human alterations to natural-appearing landscapes.

Air Quality and Scenery

Air quality is important to people who value the landscapes within the basin. Clean air and good visibility are important contributors to the quality of life for people who come to the basin to recreate or to earn a living.

Human perception of the scenic characteristics of a place depend on clean air. Air that is smoky, or full of dust or chemicals, often hampers visibility of scenic characteristics. This is especially true when viewing landscape characteristics in background distance zones, where important features often become indistinguishable. Additionally, human health and comfort also may be affected by poor air quality.

Throughout most of the year, most landscape settings within the basin have excellent air quality. The basin's relatively dry air, predominately sunny days, and frequent cleansing breezes provide long-range views uncommon in other parts of the country. Intentional burning of forest residues and agricultural fields, however, can be seasonally detrimental to air quality, especially when temperatures and wind conditions result in inversions that prevent air movement. In developed areas, air quality may be a significant problem year-round, especially where large industrial developments exist.

In accordance with the 1977 Clean Air Act, the Environmental Protection Agency established national ambient air quality standards for several types of air pollutants. These standards are primarily designed to protect public health and welfare but also include provisions to protect recreational, scenic, and historical values from air quality deterioration. The Clean Air Act divides clean air areas into three classes and specifies the increments of pollutants allowed in each area. Class I air-sheds include such areas as national parks, wilderness areas, and other congressionally designated areas established before August 7, 1977. Class II air-sheds include national parks, wilder-ness areas, national monuments, national sea-shores, and other areas of special natural, scenic, or historic value that were established after August 7, 1977 (CAA Part C, Sec. 160). Class III pertains to all other air-sheds outside of classes I and II.

Each state, working in concert with various Federal, state and local government agencies to prevent and control air pollution, is responsible for the administration of the Clean Air Act. On federally administered lands, Federal agencies have the direct responsibility to protect air quality related values, including visibility.

Inside class I areas, or within 125 miles of their boundaries, proposed management activities must be evaluated for potential impacts on air quality. Road building, timber harvests, and prescribed fires are three major activities that fall within this special review requirement. Outside of the class I areas, the act stipulates nationally uniform standards concerning maximum emission levels for stationary sources. For public lands within the basin, these stipulations are pertinent to proposed major developments like geothermal and mining complexes. Although the Environmental Protection Agency rarely exercises its authority to do so, it can essentially stop any proposed activity that does not meet established standards.

Although the scale of the scenery assessment for the basin does not permit the identification of air quality standards or mapping procedures, it does recognize the importance of maintaining clear views of public lands as a component in ecosystem management.

Conceptual Framework

Historical Overview

Early basin scenery—Until the beginning of the 19th century, the overall scenic character of the basin remained fairly constant. Human-induced landscape changes over extensive geographic areas have occurred exclusively during the past 200 years. Before the 1800s, the hunter-fisher-gatherer lifestyle prevailed, with few large-scale changes to the character of the basin until the newcomers imposed cultural alterations on its landscapes.

According to anthropologist Richard Hanes (1995), the entire basin was inhabited and used by highly mobile hunter-gatherers and semisedentary lakeside dwellers. These early inhabitants were linked to their environment by careful observation, economic calculation, ritual monitoring, and mythical explanation. To this day, their taking of plants is often accompanied by prayers and occasional offerings to the plant spirits as symbols of respect (Hanes 1995). With the exception of the eruption of Mount Mazama around 4000 B.C., environmental conditions remained relatively stable for at least 10,000 years after the retreat of the huge glaciers that once covered a large portion of this part of the continent. According to historical records, this relative stability was disrupted by the northern spread of Spanish horses in the early 18th century, the assault of fur traders 100 years later, and the introduction by Europeans of exotic diseases that devastated indigenous peoples (Robbins 1993).

This does not mean that the scenery of the basin was unaffected by humans. Archaeological and historical evidence suggests that many portions of the Pacific Northwest considered "natural" before Europeans arrived consisted of humanized landscapes. Native Americans inhabiting these landscapes purposely modified ecosystems to meet their subsistence needs (Hanes 1995). Widespread burning practices by Native Americans, along with lightning-caused fires, created forest environments that often were open and parklike in character. Many grassland portions of the basin were likewise the result of intentional and routine burning by these early inhabitants in an effort to improve their hunting and food gathering ventures (Robbins 1993).

The journals of 19th century explorers Lewis and Clark disclose the intricacies of Native American ecology, especially the significance of fire. On their return trip up the Columbia in spring 1806, Lewis reported that the plains of the Columbia were "covered with a rich virtue of grass and herbs from four to nine inches high." Farther upstream, Clark remarked that a great portion of these valley bottoms had been burned, destroying any timber that once grew there. Twenty years later, Peter Skene Ogden of Hudson's Bay Company[2] remarked as he led a trapping party through Oregon's upper Crooked River and into the Harney basin that the country was "overrun by fire," clearly placing the responsibility on native inhabitants of the area (Beckham 1995).

Other early travelers to the interior Columbia basin, including U.S. Army reconnaissance officer John C. Fremont, Oregon Trail pioneer John Kirk Townsend, Captain Benjamin Bonneville, missionary Jason Lee, and trapper James Clyman, also wrote of the important role Native American culture played in the ecology of the basin. Their early accounts of the "ravaging fires of the Indians" serve as testimony to the effect Native Americans had on the ecology of the basin.

As horses were acquired by Native Americans, especially as their herds grew in numbers, burning and grazing practices intensified. By the 19th century, the abundance of horses used by Native Americans had an important effect in shaping the landscapes of the basin (Robbins 1993).

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[2] The oldest continuing commercial venture in North America, Hudson's Bay Company, was chartered in 1670 to engage in fur trade and colonize North America.

The arrival of Euro-Americans in the early 19th century had a profound effect on the landscapes of the basin. The construction of military roads and railroads and newly introduced agriculture and livestock grazing all greatly accelerated biological and cultural modifications that resulted in large-scale visual changes. Worldwide market opportunities brought many fur trappers and farmers to the basin. These newcomers introduced exotic plants that inadvertently created artificial and heavily altered landscapes throughout the basin. They also brought contagious diseases that devastated Native American populations. Later came wagon loads of settlers with plants and animals indigenous to other ecosystems, further accelerating changes in the scenic character of the basin.

Beginning with the arrival of these early settlers, complex ecosystems have been progressively modified and simplified as single exotic species replaced diverse native species. According to Hann and others (1997), downy brome (*Bromus tectorum* L., cheat grass), as well as other brome grasses and exotic forbs like yellow star thistle (*Centaurea solstitialis* L.), continue to replace bluebunch wheatgrass (*Agropyron spicatum* Pursh) on those basin lands used exclusively for grazing. On the gentle slopes of the Palouse, monoculture crops of wheat eventually replaced virtually all other vegetation. In the Blue Mountains and elsewhere, logging activities and the suppression of fires resulted in the conversion of historic stands of open parklike stands of ponderosa pine (*Pinus ponderosa* Dougl. ex Laws) to true fir and Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco). Other similar scenic character changes can be detected throughout the basin.

The ensuing scenic changes since European settlement can be summed up as a steady shift in landscape character from **naturally evolving** toward **agricultural** and **developed**. This shift also is evidenced in broad-scale vegetative pattern analyses. According to Jones (1995), "The most dramatic changes in the availability of plant community groups across the landscape have been the increase in agricultural types, and the subsequent decrease in shrublands. Many types presently appear more fragmented relative to historic conditions."

Based on comparisons between historical and current vegetation layers, about 16 percent of the total landscape of the basin has changed from naturally evolving plants to exotic species during the past century. This equates to about 23 million acres of naturally evolving forest lands and shrub-grasslands converted to agricultural landscapes or urban developments. Furthermore, the current landscape appears to be substantially more fragmented than the historical landscape, with measurable decreases in patch size and increases in patch density and edge density.

Despite the fact that scenery in the basin has been influenced by humans for centuries, some contemporary resource planners refer to the region's pre-European settlement landscapes as "natural" or "unmanaged," as if the early manipulation of vegetation by native peoples was a natural occurrence. This view is probably attributed to the notion that the ecosystems of the basin were changing relatively slowly and appeared to be stable in human timeframes, in comparison to the rapid changes occurring since European settlement.

Vegetative diversity has increased since European settlement. Vegetative diversity, however, is not necessarily the same as high-quality scenery. Although people value all landscape settings to some degree, they generally regard those having the most positive combinations of variety, mystery, vividness, intactness, coherence, harmony, uniqueness, pattern, and balance as the most desirable (Daniel and Boster 1976). In many landscapes, positive cultural elements are also attributes that contribute significantly to scenic quality. Abrupt changes to either the natural or cultural elements of the landscape are offensive to many people (McCool and others 1986).

Scenery management: late 1800s to present— Conservation came about in America because of the waste, destruction, and uncontrolled exploitation of natural resources during the industrialization era. Long before legislation declared it a valued resource, America's high-quality scenery had been an important focus of the conservation movement. By the late 1800s, there was a strong movement toward protecting scenery on public

lands as the first Forest Reserves (forerunners to National Forests) were established. As early as 1908, special regulations were established for the Forest Service concerning the preservation of scenic values along road corridors, lake fronts, and river corridors. By the 1950s, following World War II, housing and construction demands to meet the needs of an expanding economy reached new heights, creating increased needs for timber. To meet these demands, an economical timber harvesting method was developed—clear-cutting. This method consisted of cutting all trees at one time, regardless of size or age, thus leaving large areas of unsightly bare ground.

This same period also saw a significant change in the leisure time of Americans, with paid vacations, more dependable automobiles, and the desire to visit public lands. During the 1960s, the Wilderness Act and the Multiple Use Act both emphasized the importance of protecting high-quality scenery on public lands. Public expectations for high-quality scenery soon conflicted with the increasing demand for timber products, leading managers of public lands along a collision course.

Brought about by these conflicting demands for commodity and amenity values, the 1969 NEPA significantly changed the way Federal agencies manage limited resources. This act requires the Federal Government to establish procedures that will ensure that all environmental amenities and values be given appropriate consideration in decisionmaking. Such analysis must include both amenity and aesthetic elements, such as recreation and scenery.

Protecting scenery and other important resources through prudent land use and management has been the essence of our national conservation approach. This approach to management was how society attempted to control profit-seeking, thereby preserving natural and historical resources and amenities (Nash 1975). Like the overall philosophy of ecosystem management, the objective was to maintain a sustainable landscape in which nature and people remain in equilibrium.

During the 1970s, visual resource management became the focus of public land managing agencies like the Forest Service, BLM, and Soil Conservation Service (SCS). Although their methods were somewhat dissimilar because of their agency missions, each developed a systematic approach to inventorying and evaluating scenic values. The Forest Service's visual management system (VMS), BLM's visual resource management (VRM) (USDI 1980), and SCS's landscape resource management (LRM) all responded to changing attitudes regarding our Nation's limited scenic resources. The latter two systems were modeled after the Forest Service approach but contained several variations. According to Smardon (1986), there are six coinciding objectives among the visual resource management systems developed by these agencies. All three systems were designed to:

- Inventory and evaluate scenic quality based on a consistent set of physical characteristics.
- Identify relative degrees of human interest and public attitudes toward the landscape.
- Map the distance zones and locations from which viewers observe public landscapes.
- Establish various visual management classes that guide appropriate resource management activities and assign appropriate levels of professional involvement to each class.
- Establish tolerance levels for the alteration of public landscapes and guidelines for rehabilitating scenery already modified beyond tolerable levels.
- Integrate all of the above into agency decisionmaking processes.

Further analysis indicates several additional commonalities among the scenery management systems developed by the three agencies. They all emphasize educating and encouraging support from decisionmakers. They use intensive training programs and publications as a way of encouraging support at all levels in their respective agencies. They use a broad foundation based on contributions from several experts in the field of

scenic resource management. Each agency continues to learn from their own experiences and from those of other agencies.

While these agencies were developing, adopting, and implementing their scenery resource management systems, controversies about scenery developed. Court cases like the Bitterroot (*Wyoming Council* v. *Butz* 1974) and Monongahela (*Izaak Walton League* v. *Butz* 1973) added visibility to the growing need for using sound methods to manage scenery on public lands. Prompted by these conflicts and the potential for many more like them, legislation like the Forest and Rangeland Renewable Resources Planning Act (1974), the Federal Land Policy and Management Act (1976), and the National Forest Management Act (1976), clearly recognize scenery as an identifiable and valued resource. These mandates place increased emphasis on environmental and scenic values and stipulate that scenery be inventoried and considered an integral component in resource management decisionmaking processes.

Starting as early as 1970, and continuing until the present, the Federal agencies discussed above were occupied with training employees and implementing their scenery management systems, with varying degrees of success. Several subsystems (e.g., visual absorption capability, existing visual condition) were developed by the Forest Service as creative methods for more thoroughly analyzing the scenic resource. Meanwhile, several comments and critiques from professionals within the agencies, academic institutions, private practitioners, and other agencies occurred. Since the publication of the Forest Service's VMS in 1974, SCS's LRM in 1978, and BLM's VRM in 1980, these systems have continued to evolve.

By the mid-1980s, agency administrators recognized that researchers and practitioners in scenery management, the social sciences, and ecology were providing additional knowledge of scenery management that was unavailable during the creation of these systems. Each agency, however, continued to operate within its own procedures, with the realization that updates would be necessary in the future (USDA Forest Service 1994).

In 1991, the Forest Service commissioned regional landscape architects to critique the scenery management systems in use by these agencies. They also were asked to solicit an independent firm to prepare an update incorporating recommendations and innovations that had occurred since the inception of the original VMS. This firm also was asked to make the necessary links to other agency programs. Based on the nature and extent of the modifications suggested, the Forest Service decided to change the title of its 20-year-old system to "Landscape Aesthetics: A Handbook for Scenery Management" (USDA Forest Service, in press). The reconstructed system is now known as the scenery management system (SMS).

The SMS provides an objective process for assessing constituents' preferences and expectations for the character of the landscape. It further presents a range of scenic integrity levels based on the condition or wholeness of landscape character and suggests a systematic approach for developing landscape character goals.

The Interior Columbia Basin Ecosystem Management Project believes that the Forest Service's SMS meets the needs of large-scale ecoregion assessments, and has used its procedures in the social assessment of the basin. In fact, the basin provided a large-scale testing laboratory for applying the new SMS. Several suggested changes resulting from its application have been incorporated into the evolving SMS, including the use of ecological subsections as suitably scaled landscape units for identifying large-scale landscape character attributes; revisions and simplification of the landscape themes; and simpler and more efficient approaches to inventorying scenic integrity.

The use of places as a key to link human identification, names, understanding, and meanings of landscapes to geographic areas is also an incorporated outgrowth of applying the SMS to the Interior Columbia Basin Ecosystem Management Project. The project has determined that places

are a way of combining many of the social and biophysical data being inventoried and analyzed in this project (Williams 1995). Additional information on sense of place can be found in Galliano and Loeffler (1999). In terms of the SMS, place attachment helps determine peoples' expectations and preferences for landscape character and desired scenic integrity of a given landscape.

The SMS works best when landscape character attributes are understood. For example, landscapes may be valued by constituents for their historical, spiritual, recreational, or other meanings. Thus, concepts of place attachment may be useful for determining the importance of scenery in various geographic areas.

Demand for Scenery

People who hunt, fish, and participate in "consumptive" recreation activities value scenery highly and choose where to recreate based not only on abundance of fish and game but also on scenic and aesthetic qualities (Allen 1988). In fact, the demand for natural-appearing landscapes is expected to outpace the demand for modified landscapes. The comprehensive outdoor recreation plans for the State of Washington and Oregon identified a need for nearly 19 million acres of natural-appearing landscapes to meet projected recreational demands by 2000, compared to about 5 million acres of heavily modified landscapes (FEMAT 1993). Taken as a whole, these and related findings suggest that scenery is not just a strong individual value but one held in common by a diversity of people.

Traditional approaches to scenery assessments have emphasized the supply of scenery because it is much more difficult to accurately quantify demand. Some progress in demand analysis, however, has been made. One technique considers three factors: population increases, recreation participation rates, and peoples' age. Projected change in human populations within the basin, together with established participation rates in recreation activities that normally require natural-appearing scenery, is perhaps the single most reliable basis for predicting demand for scenery. Researchers (Murdock and others 1990) agree, stating that change in population structure is a major driver of change in recreation participation based on the natural appearance of scenery.

Population increases—McCool and Haynes (1995) suggest that projecting human populations within a biologically meaningful timeframe is problematic. Based on data from the 1992 U.S. Bureau of the Census (U.S. Department of Commerce 1992), however, they investigated two separate population change scenarios based on several relevant factors. Both scenarios show increased populations in the basin ranging from a low projection of 0.3 percent to a high projection of 1.6 percent per year. From their analysis, it seems unlikely that a decrease in the population in the basin will occur within the next 50 years. This means that the number of basin residents potentially available to participate in recreation is most likely to increase. Likewise, the number of nonresident recreationists is similarly projected to rise (Molitor 1995).

Recreation participation rates—According to the 1990 Resources Planning Act (RPA) program update, scenery viewing has the highest participation rate of any activity among the most popular recreation activities in the United States, with about 20 percent of the Nation's population participating. The average for the basin is slightly higher than the national average (McCool and others 1997). Although these participation rates may change over time, scenery viewing likely will remain among the highest ranking recreational activities in the basin.

Population age—Age distribution as a social demographic trend seems to be a driver of change concerning scenery-oriented recreation activities. Like the rest of the country, the population in the basin is getting older as the baby boom generation pushes past midlife. Haynes and Horne (1997) indicate that the age structure of the basin changed markedly during the 1980s, with a more than 27-percent increase in the number of residents in the 65-and-older age group. Most of this increase is because of the aging of basin residents rather than to inmigration.

Evidence suggests that changes in peoples' physical abilities mean corresponding changes in the recreational activities they choose (Molitor 1995). With some exceptions, generally as people age, their available leisure time, amount of discretionary income, and attention to family commitments change. Their involvement generally shifts from the more active recreational activities (i.e., water skiing, running, and jogging) to the more passive (i.e., sightseeing and driving for pleasure).

Lifestyles—Another consideration influencing demand for scenery is lifestyles. Research indicates that adults living within the fastest growing counties in the basin have the highest rates of participation in sightseeing (Claritas, Inc. 1994). Conversely, those counties with declining populations generally indicate higher participation in hunting and freshwater angling. We speculate that those counties experiencing the greatest degrees of population growth are perhaps the areas where peoples' demand for natural-appearing scenery most likely will remain high in future years. This may be due, at least in part, to the fact that counties with growing populations are also the counties with the most recreational and scenic attractions.

Rasker (1993) and Rasker and Glick (1994) agree, suggesting that the fastest growing counties are those that remain attractive to growing numbers of retirees moving out of the cities and to owners of footloose industries (industries having no ties to specific geographic locations) with a preference for rural locations. High-quality scenery, according to Rasker, gives some basin communities a comparative advantage in attracting new residents and businesses. Rasker (1994) continues saying that "intact landscapes are recognized as the foundation on which sustainable, quality development depends."

The basin, therefore, will continue to have an increasing population, an overall aging population, and relatively constant recreation participation rates. The fastest growing areas likely will have the most people concerned about scenic quality. It also can be presumed that these trends suggest an increase in demand for high-quality, natural-appearing scenery within the basin.

Although some developed portions of the basin also may continue to offer pleasing scenery, the greatest opportunity for meeting this predicted increase in demand for scenery lies in the undeveloped and partially developed settings. These settings have a high degree of scenic integrity and offer landscape themes that are predominately naturally evolving or natural-appearing forests and shrub-grasslands, which are discussed in the following section.

Elements of Scenery Assessment

Two primary elements are used in broad-scale ecosystem scenery assessment and analysis: landscape character and scenic integrity. All public lands within the basin were inventoried and classified for these elements.

Landscape character is the overall impression created by scenery resulting from both natural processes and positive human influences. Landscape themes are one aspect of landscape character that applies to large-scale geographic areas. Landscape character also serves as a frame of reference for inventorying the scenic attractiveness of smaller geographic areas.

Scenic integrity is the present condition or level of visual wholeness or intactness of landscapes. Scenic integrity serves as a baseline measurement on which potential changes can be measured in relative terms.

Landscape character—Landscape character can be described spatially within an ecosystem assessment. For such broad-scale analysis, landscape character is most useful when considered at the ecological subsection scale. In this assessment, landscape character is described by using four primary attributes: landforms, vegetation, water forms, and cultural forms. These attributes serve later as a frame of reference for inventory-

ing scenic attractiveness,[3] which is a measure of inherent visual variety. Together, these attributes are used to describe the character of a large-scale landscape and also form a general description or overall impression that gives a landscape meaning and a "sense of place." These images are called landscape themes and are further described in the next section.

Following is an example of a landscape character description for one ecological subsection within the basin:

Subsection M242Co Upper Yakima basin

Landform—The landform of this subsection includes U-shaped and hanging valleys with alluvial fans, cirque basins, glacial moraines, and sharp rocky ridges at the higher elevations. Many rock outcroppings and avalanche chutes are common at the upper elevations, and provide increased variety through their prominently visible shapes. In contrast to the rockiness of the higher eleva-tions, southern portions of this subsection have rounded, dissected ridges.

Vegetation forms—Grand fir (*Abies grandis* (Dougl. ex D. Don) Lindl.), western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), Pacific silver fir (*Abies Amabilis* Dougl. ex Forbes) and mountain hemlock (*Tsuga mertensiana* (Bong.) Carr.) are found throughout this subsection. Grand fir and western hemlock occupy the drier, warmer portions of the subsection, with Douglas-fir on the driest of sites. Timber stands are predominantly scattered and diverse, offering substantial scenic variety in textures and colors, especially when combined with naturally occurring rock outcrops, avalanche chutes, and other openings.

Aquatic forms—There are few rivers and lakes in this subsection, although there are many springs found mostly in midslope glacial till deposits. Surface water tends to seep quickly into the coarse subsurface and is visible in drainage channels only during brief periods of runoff. Where springs are present, scenic variety tends to be greater because of increased vegetative diversity. Water features generally attract attention in the subsection because of their scarcity.

Cultural forms—Timber harvesting, wildfire suppression, and limited grazing have affected the scenic character of this subsection by increasing vegetative patterns.

Landscape character descriptions similar to the above example were completed for the 13 ecological subsections within the basin's two test basins (Yakima and Silvies) but were not completed for the remaining 381 subsections because of time and resource constraints. Instead, landscape themes were developed for each subsection.

Landscape themes—In large-scale ecological assessments like the Interior Columbia Basin Ecosystem Management Project, scenery is considered a primary resource that can be inventoried and analyzed. Although visual impacts associated with project level decisions normally will not be discernable at the scales used in this project, the cumulative effects of various broad alternatives or scenarios can be identified, mapped, and monitored.

Various large geographic areas have identifiable landscape themes (Ryden 1993). These themes are an indication of how people perceive these environments in a general sense. The approach of identifying themes for geographic areas was used in a scenery analysis prepared for the Columbia River Gorge National Scenic Area to capture the experiential essence of various places (Galliano and others 1990). Contained within the Columbia River Gorge are identifiable images or themes that change as people move from one portion of the area to another. Each discrete place has its own theme, even though that theme may not be unique; i.e., a given ecological subsection may contain several images or themes. It is also common for themes to repeat themselves from subsection to subsection.

Landscape themes are a way of identifying and describing visual and cultural impressions created by landscape settings and their existing land use

[3] Scenic attractiveness (previously called "variety class" in the Forest Service's VMS) is not appropriate to analyze at the basin scale but should be inventoried in subsequent levels of planning.

patterns. They describe the general impressions brought about by the biophysical appearance of a geographic area within a cultural context. For example, the Silvies Valley in southeast Oregon is largely a forest and shrub-grassland landscape. Developed areas, such as the small town of Seneca, exist within this landscape. People viewing the Silvies Valley might have a general impression of a forest-shrub-grassland landscape, based on its vegetation and landforms, yet the developed component is also part of this landscape's image.

In a broad sense, landscape themes serve as a baseline for assessing future changes in the scenic character of an area. Even at the large scales used in an ecosystem assessment, changes in one or more of the salient attributes composing the character of a given area can have a predictable effect on its scenery. In subsequent levels of planning, such as forest or unit planning, landscape themes are advantageous in identifying landscape character goals. In broad assessments, landscape themes are valuable in monitoring changes in the overall images of large-scale geographic areas.

Every geographic area within the basin has at least one identifiable landscape theme. Many areas have several themes. For the purpose of this assessment, however, only primary themes are discussed for each geographic area because of time and resource limitations.

Scenic integrity—As described previously, scenic integrity[4] can be used to describe various degrees of visual wholeness or completeness and is an indication of scenic condition. Scenic integrity can be used to describe scenery in the past, as it presently exists, and as predicted for the future. For this assessment, scenic integrity is used to measure the condition of scenery as it presently exists and to predict its potential condition under proposed alternatives.

Large-scale changes in landscape character are rare within human timeframes. The eruption of Mount St. Helens in 1980 changed the character of landscapes for miles around the volcano. Catastrophic fires, insect epidemics, as well as hurricanes and tornadoes in other parts of the country can alter the vegetation over vast areas. These events rarely change the character of those landscapes because the vegetation normally will return at some point in time, usually within human lifetimes. Such "temporary" changes that affect a single attribute like vegetation are considered changes in condition rather than character.

Scenic integrity is measured by using a continuous scale that ranges from very high to low. Landscapes with a high degree of scenic integrity have virtually no discordant elements and contain only positive human alterations. They are intact, unimpaired, and appear to be in good visual condition.

On the opposite end of the scale, landscapes with low scenic integrity usually have negative human alterations and are in poor visual condition. They often contain discordant and contrasting features such as geometric shapes resulting from vegetative treatment, structures that do not blend with their surroundings, or roads that create large cut and fill slopes across steep hillsides.

Providing a high degree of scenic integrity on natural-appearing landscapes usually requires a thorough understanding of how healthy ecosystems function. It also requires a knowledge of peoples' desires, preferences, and expectations based on constituent surveys, interviews, and observations. Scenic integrity may, in some situations, indicate the wholeness or condition of the ecosystem. Although high scenic integrity sometimes equates to high ecosystem integrity, one does not necessarily ensure the other.

The ecologically "intact" landscape may not always be the most visually pleasing, especially in foreground situations where a greater degree of detail is visible. These landscapes may seem "messy" and less orderly than people prefer. As Gobster (1995) explains it, "Although landscapes of high ecological integrity may not conform to traditional ideas of what is 'scenic,' they have an

[4] Scenic integrity originally was called existing visual condition in the Forest Service's VMS.

inner beauty that can be rewarding to discover." Educating the public about this "inner beauty" could be one solution to this apparent conflict.

Methods

The methods used in this scenery assessment involved two procedures:

1. Identify landscape themes, as a component of landscape character, at the ecological subsection scale.
2. Evaluate current levels of scenic integrity at the watershed scale.

This section describes these two procedures in detail and is followed by a section indicating consequences, limitations, and recommendations.

Landscape Theme Identification

The appropriate context must be considered when designating themes for the broad landscapes analyzed in the basin. Within the ecoregion context, it would be incorrect to assume that every acre or every landscape within a given ecological subsection will have a uniform landscape theme. These themes are only a broad description of landscape character that describe the overall images of the landscape contained within a subsection. Based on field interviews in the Yakima, Washington, and Burns, Oregon, test areas during 1994, constituents generally agree in describing all basin landscapes within a range of five themes:[5]

- Forest and shrub-grasslands (naturally evolving)[6] are those lands that have a vegetative cover of either forest species or shrub, forb, and grass species that are in a naturally evolving state or condition. This means that human intervention (manipulation or development) is minimum or nonexistent; natural processes dominate visually. Examples are wilderness areas or research natural areas.
- Forest lands (natural appearing) are those lands that have a vegetative cover of forest species (large trees creating the walls and ceilings of visual space) that are in a natural-appearing state or condition. Human intervention (manipulation or development) may be evident, but such intervention does not dominate the natural landscape. Examples are the scenic or recreational portions of wild and scenic rivers and scenic byways.
- Shrub-grasslands (natural appearing) are those lands that have a vegetative cover of shrub, forb, and grass species (small trees and plants that may create small walls of visual space, but an overhead plane or ceiling is absent) that are in a natural-appearing state or condition. Human intervention (manipulation or development) may be evident but does not dominate the landscape. Examples are national grasslands or open range lands where fencing does not create visually dominant geometric patterns.
- Agricultural lands are those "working landscapes" that have geometric patterns that visually dominate the landscape, usually because of fencing and monocrop planting and cultivation patterns. Examples are irrigated croplands and some dry land crops (if their field sizes are small enough to create discernible geometric patterns). At the ecoregion scale, the agricultural land theme also includes intensively managed timber lands that often have a cultivated, geometric appearance.
- Developed areas have gridded street patterns, commercial areas, and suburban residential areas. These can range from small developed areas with a gas station, a general store or restaurant, and surrounding homes (e.g., Cliffdell, Washington), to larger towns or cities with gridded street patterns, commercial hubs, and many residential developments (e.g., Ellensburg, Washington).

[5] This array of themes is similar to that found in the Forest Service's SMS.

[6] These are actually two themes, forest lands (naturally evolving [NE]) and shrub-grasslands (NE), combined because of relatively small amounts of shrub-grasslands (NE) areas in the basin.

Within these five themes, emphasis shifts from landscapes with natural disturbances and successional origins to human-dominated landscapes, or commercial, working landscapes. Although these developed areas may, in some cases, be attractive, they have little resemblance to the natural landscapes that once dominated the same geographic area. In the Forest Service's SMS, landscape themes also may contain variations on the broad themes that are an integral part of the desired future condition of the ecosystem. Theme variations, however, are normally applied to specific landscape units such as watersheds and are too detailed for application in this assessment.

As stated earlier, the theme of a large geographic area is an indication of the overall image of the landscapes within that area. It does not measure scenic condition, even in a broad sense. As a more precise measure of condition, the next section of this report, which deals with scenic integrity, will indicate the acres inventoried in various scenic integrity levels, and should be considered in conjunction with landscape themes.

Landscape themes were previously developed during an assessment of place (Galliano and Loeffler 1999) based on Bailey's (1980) national hierarchical framework, which stratifies the Earth into progressively smaller areas of increasingly uniform ecological potentials. In this framework, areas can be mapped according to associations of biotic and environmental factors including climate, physiography, water, soils, air, hydrology, and potential natural plant communities (ECOMAP 1993).

A team of physical scientists assigned physiographic names and biophysical descriptions were assigned to each ecological subsection. These became the foundation for developing place names and landscape themes for subsections.

Test area interviews revealed that people often describe places that are important to them through similar characteristics. People commonly referred to places with similar references to "agricultural lands," "forests," or "rangelands" when they were asked to describe what they felt was important about the places they identified or how they would like to see those places managed in the future. With these similarities in mind, we developed initial themes for all subsections based on biophysical narrative descriptions of attributes discussed previously. These landscape themes were sent to landscape architects at all National Forests within the basin for confirmation. Based on their concurrence or suggested changes, landscape themes were identified for use in both the place and scenery assessment.

Determining Scenic Integrity

Some National Forest lands within the basin had scenic integrity (originally called existing scenic condition in the old VMS) mapped for use in previous land management planning projects. These data were gathered in the early 1980s but are now outdated, as some landscapes have recovered and others have been further impacted. Only a few forests have been mapped more recently with current data. The BLM lands have not been mapped for scenic integrity at all. For BLM lands, desired scenery and recreation planning objectives that indicated the degree of naturalness were used as a proxy for existing scenic condition. Although these data were not ideal, they were the best available at the time.

Considering the range of variability and the age of many of the data described above, we consider the confidence level to be unacceptable. A computer-derived scenic integrity model was, therefore, developed to provide basin-wide consistency. This model was based on data layers available in CRBSUM,[7] which were combined to form a synthesis of vegetation, landform, and road density. Assigning scenic integrity levels to inventoried landscapes within the basin was a three-step process:

[7] The acronym CRBSUM stands for Columbia River basin successional model and is a simulation model used to project changes in landscape attributes.

Step 1: Categorize landform and vegetative stand types

Landforms were classified into (1) plains, (2) valleys, (3) foothills, and (4) mountains. Biophysical characteristics associated with each landform determine potential vegetation associations.

Four vegetation cover classes were developed from vegetative structural stages: (1) early-seral forest; (2) early-seral forest and shrub-grasslands; (3) multilayer young forests; and (4) old-growth, single or multilayer forests.

A set of 72 photographic slides depicting various combinations of vegetative stand structures, patch compositions, landforms, and management scenarios (consumptive, active, and passive) were selected. A team of landscape architects reviewed these slides and assigned scenic integrity levels to each based on their expert judgment. Some general assumptions made during this task included the following:

- Early-seral stage forests tend to be associated with recent disturbances.
- When associated with moist or wet foothill landforms, early-seral stage forests lack visual diversity that is expected of most natural landscape settings.
- Old-growth multilayer forests normally result in naturally evolving forest landscapes.
- Late-seral stage, open, parklike old-growth ponderosa pine or multilayered true fir-hemlock stands appear basically unaltered to most people.
- Road density is the primary factor used to classify degree of alteration in ecosystems dominated by shrubs and grasses, where vertical stand structure is limited.

Step 2: Rank road densities

Road densities within the basin were reviewed to further assess human alterations to landscape settings. This was most important where vegetative considerations were thought to be insufficient, as in some shrub-grassland ecosystems. Even though road density data are limited,[8] when used in combination with stand structure-landform categories, they provide an acceptable broad-scale depiction of existing human alteration in the project area.

Road densities are ranked on a scale of one to five, where five is the value assigned to a square-mile cell where no roads exist, and one represents more than 4.6 miles of road per square mile. Five road density classes, based on the preliminary road density analysis of January 1995, were used in this step (table 1).

Step 3: Develop rule set

To use the geographic information system (GIS) technologies available. A rule set was developed to provide inventory classifications relative to the many possible combinations of vegetation structure, landforms, and road alteration levels existing within the basin. A total of 20 different possible combinations of road density and stand structure-landform classes was divided into the spectrum of five scenic integrity levels corresponding to the Forest Service's SMS (USDA Forest Service, in press). The matrix shown in table 2 displays the scenic integrity levels derived from this process.

Field testing was then done by using a sampling approach throughout the basin that favored areas unfamiliar to the authors and that also offered a full range of scenic integrity levels. In the field, derived scenic integrity levels were compared to actual landscapes to verify their accuracy.

When applying this rule set to basin landscapes, it first appeared that agricultural lands and developed areas could be rated for scenic integrity along with other landscape themes. Problems were encountered, however, in attempting to rank scenic integrity for these lands because criteria

[8] Secondary travel routes, logging roads, and limited access roads or roads used primarily by offroad vehicles are not adequately inventoried in this analysis.

Table 1—Derived scenic integrity road alteration levels by road density class

Road density class	Road alteration level
NV = none to very low (0-0.1 mi/mi^2)	5 = unaltered
L = low (0.1-0.7 mi/mi^2)	4 = very slightly altered
M = moderate (0.7-1.7 mi/mi^2)	3 = slightly altered
H = high (1.7-4.7 mi/mi^2)	2 = moderately altered
E = extreme (>4.7 mi/mi^2)	1 = heavily altered

Table 2—Derived scenic integrity rule set[a]

Landform, vegetation, and structure by alteration level	Agricultural and urban structures	Forest and woodland structures—early seral	Shrubland structures	Forest and woodland structures—late multistory or single-story midseral
Level 1	Not assessed	Low	Low	Moderately low
Level 2	Not assessed	Moderately low	Moderately low	Moderately high
Level 3	Not assessed	Moderately high	Moderately high	High
Level 4	Not assessed	High	High	Very high
Level 5	Not assessed	High	Very high	Very high

[a] These are landscape ecology classifications and are not necessarily the same as landscape themes discussed in the text.

for determining their visual condition have not been established in the Forest Service's SMS. Although these criteria will eventually be formulated, there was not enough time to create and test them during the short duration of this project. Agricultural lands and urban developments were therefore classified as "not assessed" in this scenic integrity analysis.

Results, Limitations, and Recommendations

Landscape Character

Results—As stated earlier, people who visit public lands within the basin have an expected image concerning the landscapes they will see. This "mental picture" may have been created by previous visits to the area (or to similar areas); by videos, television, and photographs they have seen; or through stories they have heard from others who have seen the basin's landscapes. Whatever the origin, the images suggested represent the human knowledge, spirituality, anticipation, imagination, and emotions associated with the features of the area. Although several images for a particular landscape can exist at the same time, a particular geographic area tends to have an identifiable image.

Recall that landscape themes are a combination of natural attributes comprising the biophysical character and its human or cultural attributes. They are not goals for future management but merely show what currently exists within a broad spectrum of degrees of naturalness or degrees of development. Several themes may exist for each subsection, but as discussed earlier, only primary themes are listed. In this assessment, landscape themes have been identified for each of the 394 ecological subsections within the basin. Ecological subsections, generally ranging from 250,000 to 500,000 acres, seem to be an appropriate scale for determining landscape themes. The locations of inventoried subsection themes is shown in figure 1.

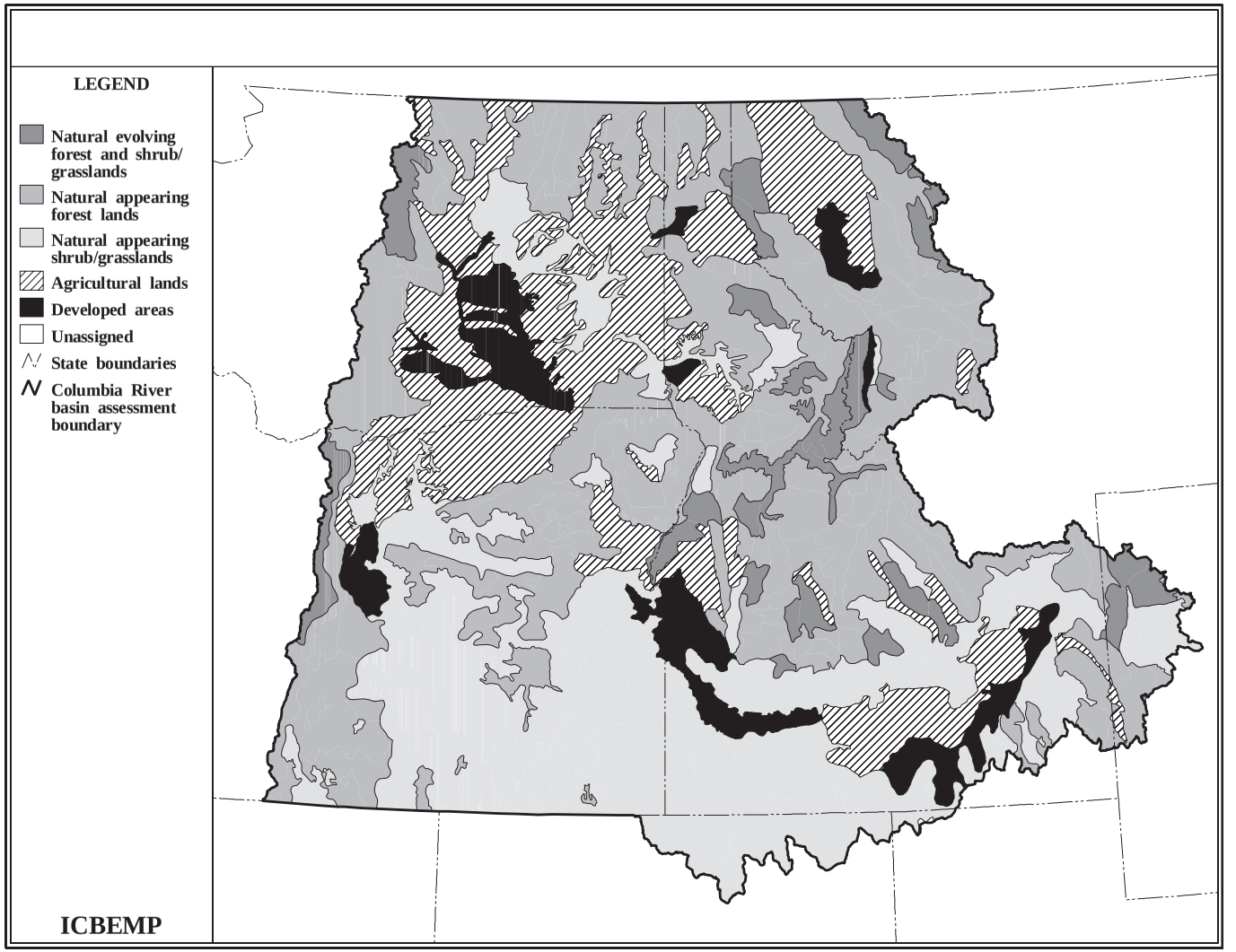

Figure 1—Interior Columbia River basin existing landscape themes by ecological subsections.

Table 3—Percentage of existing landscape themes on Forest Service (FS) and Bureau of Land Management (BLM) lands in the interior Columbia River basin

Landscape theme	Current situation		BLM and FS lands in the basin	Total basin
	Thousand hectares	*Thousand acres*	*– – – – – – – Percent – – – – – – –*	
Naturally evolving forest and shrub-grasslands	3913	9,666	10	7
Natural-appearing forest lands	21 561	53,256	46	37
Natural-appearing shrub-grasslands	17 826	44,030	34	30
Agricultural lands	11 540	28,503	8	20
Developed areas	3632	8,971	2	6
Not classified	19	47	<1	<1
Basin total[a]	58 491	144,473	100	100

[a] Total areas may be slightly different from other basin totals because vector data were used in this analysis.

Most BLM and Forest Service land within the basin currently has themes that are primarily nature dominated rather than human altered. As indicated in table 3, over 40 percent of these public lands have general landscape themes of natural-appearing forests, and over 30 percent are natural-appearing shrub-grasslands. Another 10 percent are naturally evolving forests and shrub-grasslands, occurring primarily in wilderness areas, wild and scenic river corridors, and other specially designated areas. In total, about 90 percent of the Forest Service- and BLM-administered lands within the basin currently have nature-dominated themes.

Limitations—The appropriate context must be taken into account when considering thematic assignments for such broad-scale landscapes. Readers might imagine that they are flying over these landscapes at a relatively low elevation, so that they can observe significant landscape features, yet are forced to see them in an oblique view within the context of surrounding landscapes. Within this context, it would be incorrect to assume that 90 percent of a given view or overlook would be essentially nature dominated. Rather, this figure suggests that within the entire basin, about 90 percent of all ecological subsections have primary landscape themes that are nature dominated.

Recommendations—Landscape themes provide a means of monitoring long-term changes in broad-scale landscape character. The cultural and visual impressions created by landscape settings and their accompanying land use patterns are contained within the themes identified for ecological subsections. Land use changes that occur gradually over several years may be difficult to track day by day. These changes can be identified, however, by reviewing thematic changes occurring over a period of 10 or 20 years. Inventory updates at such regular intervals can identify where changes in landscape themes occur and to what extent they affect scenic character. By using the GIS database developed for this project, comparisons between inventories can be electronically produced to indicate which subsections are relatively static in terms of their scenic character and which ones are changing. For those that are changing, this approach will indicate both the direction and degree of scenic character changes.

We do not recommend a finer spatial scale in mapping landscape themes for individual districts or forests but do recommend obtaining additional constituent involvement to ensure that the themes identified at the ecoregion scale are accurate and adequately detailed for sub-sequent planning projects.

We suggest that criteria be developed during subsequent adjustments to scenery management systems that clearly define positive cultural alterations as part of the definition of landscape character. This is especially important for agricultural lands and developed areas where human alterations tend to dominate these landscapes. It may be necessary for these criteria to be developed at the ecoregional scale so that different parts of the country may emphasize their own unique cultural landscape character.

Scenic Integrity

Results—Scenic integrity levels are how scenery on public lands is measured in terms of degrees of deviation from the attributes of the natural-appearing landscape. Scenic integrity levels are based on a standard set of criteria established in the Forest Service's SMS (USDA Forest Service, in press) and include the following five classes:

1. **Very high scenic integrity—**Settings where the landscape is visually intact with only minor positive human alterations. Visual harmony of the existing landscape character is expressed at the highest possible level.
2. **High scenic integrity—**Settings where the landscape appears intact. Scenic deviations resulting from human activities may be present but must repeat the attributes common to the natural-appearing character of the landscape so completely and at such a scale that they are not evident.
3. **Moderately high scenic integrity—**Settings where the landscape appears slightly fragmented. Discernible deviations remain visually subordinate to the natural-appearing landscape character viewed.
4. **Moderately low scenic integrity—**Settings where the landscape appears fragmented. Visual deviations resulting from human activities dominate the natural-appearing landscape character. Visual deviations are sometimes unlike natural occurrences within the landscape viewed.
5. **Low scenic integrity—**Settings where the landscape appears heavily fragmented. Deviations resulting from human activities strongly dominate the natural-appearing landscape character. Deviations must be blended with the natural landscape character to a minimal level.[9]

Figure 2 displays the scenic integrity levels for the entire basin.

Table 4 displays the acres and hectares of inventoried existing scenic integrity levels for the entire basin. It indicates that over 70 percent of Forest Service and BLM lands are within the high and very high range. This may indicate an overall condition for these public lands that is among the highest in the country.

Consistent with other basin assessment elements, scenery is displayed in tabular form by ecological reporting units (ERUs). The ERU boundaries were determined as an integrated exercise, with participation of all disciplines. They are a combination of ecoregions and hydrographic boundaries that are best suited to various scientific and resource interests. Their purpose is to facilitate the assessment process by reducing variations among social, biophysical, and economic conditions. Eventually, ERUs will be used in the implementation and monitoring of environmental impact statement decisions.

Thirteen ERUs have been determined for the basin (see fig. 3).

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[9] Drastically altered landscapes, where visual harmony is not expressed at all, are considered to be visually unacceptable. These landscapes often need rehabilitation. For the purpose of this assessment, unacceptably low scenic conditions were considered part of low scenic integrity because they have not been inventoried in the basin.

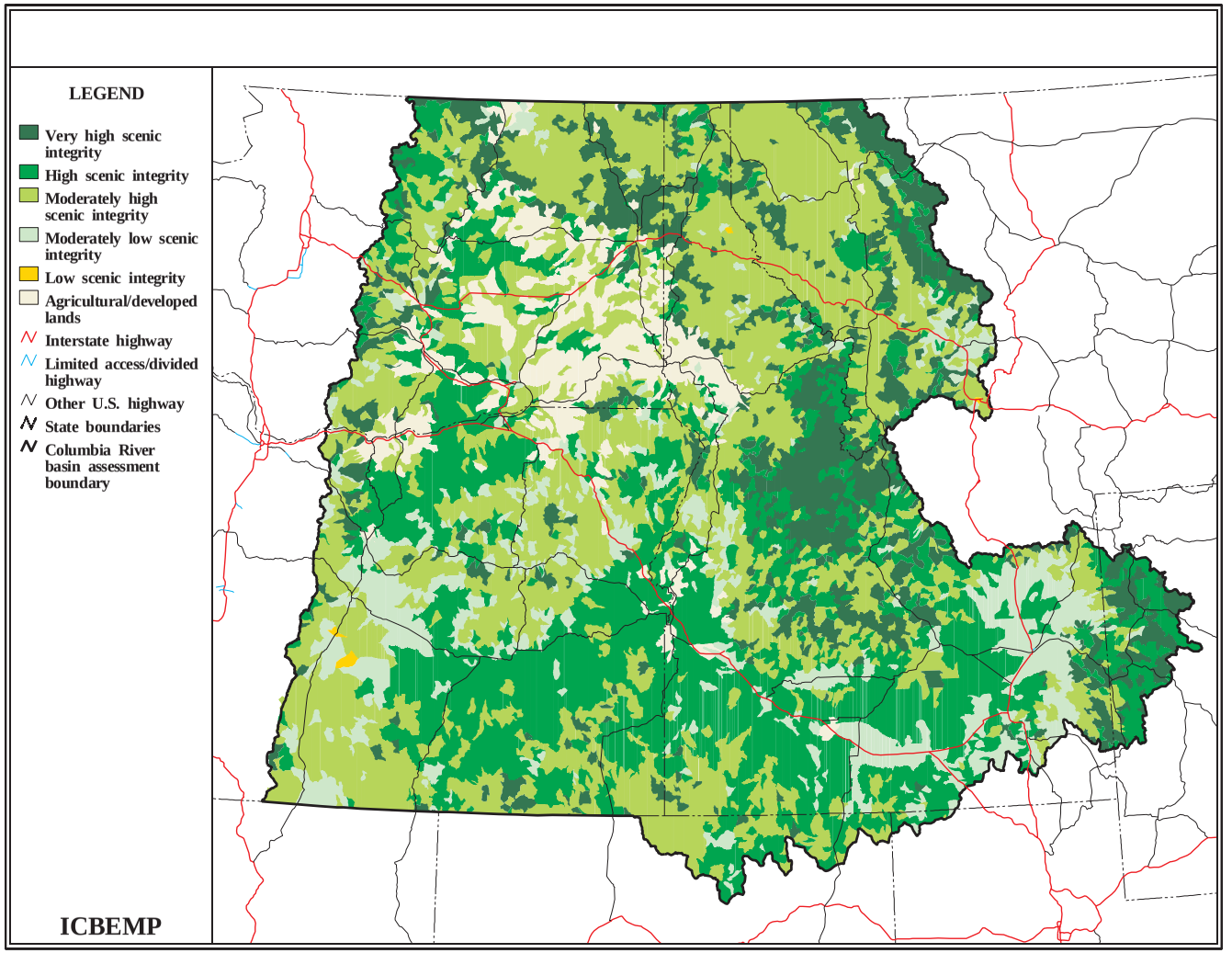

Figure 2—Existing scenic integrity in the interior Columbia River basin.

Table 4—Percentage of existing scenic integrity on Forest Service (FS) and Bureau of Land Management (BLM) lands in the interior Columbia River basin

Scenic integrity	Current situation		BLM and FS lands in the basin	Total basin
	Thousand hectares	*Thousand acres*	*– – – – – – Percent – – – – – –*	
Very high	8056	19,908	42	14
High	18 054	44,613	33	31
Moderately high	21 805	53,880	17	38
Moderately low	6356	15,705	7	11
Low	45	112	<1	<1
Not classified[a]	4045	9,996	<1	7
Basin total[b]	58 361	144,214	100	100

[a] No data are available currently for determining scenic integrity levels for lands with agricultural or developed themes. Lands with these themes were not classified in this scenic assessment.

[b] Total areas may be slightly different from other basin totals because vector data were used in this analysis. Variations in vector data sources account for slight variations in totals.

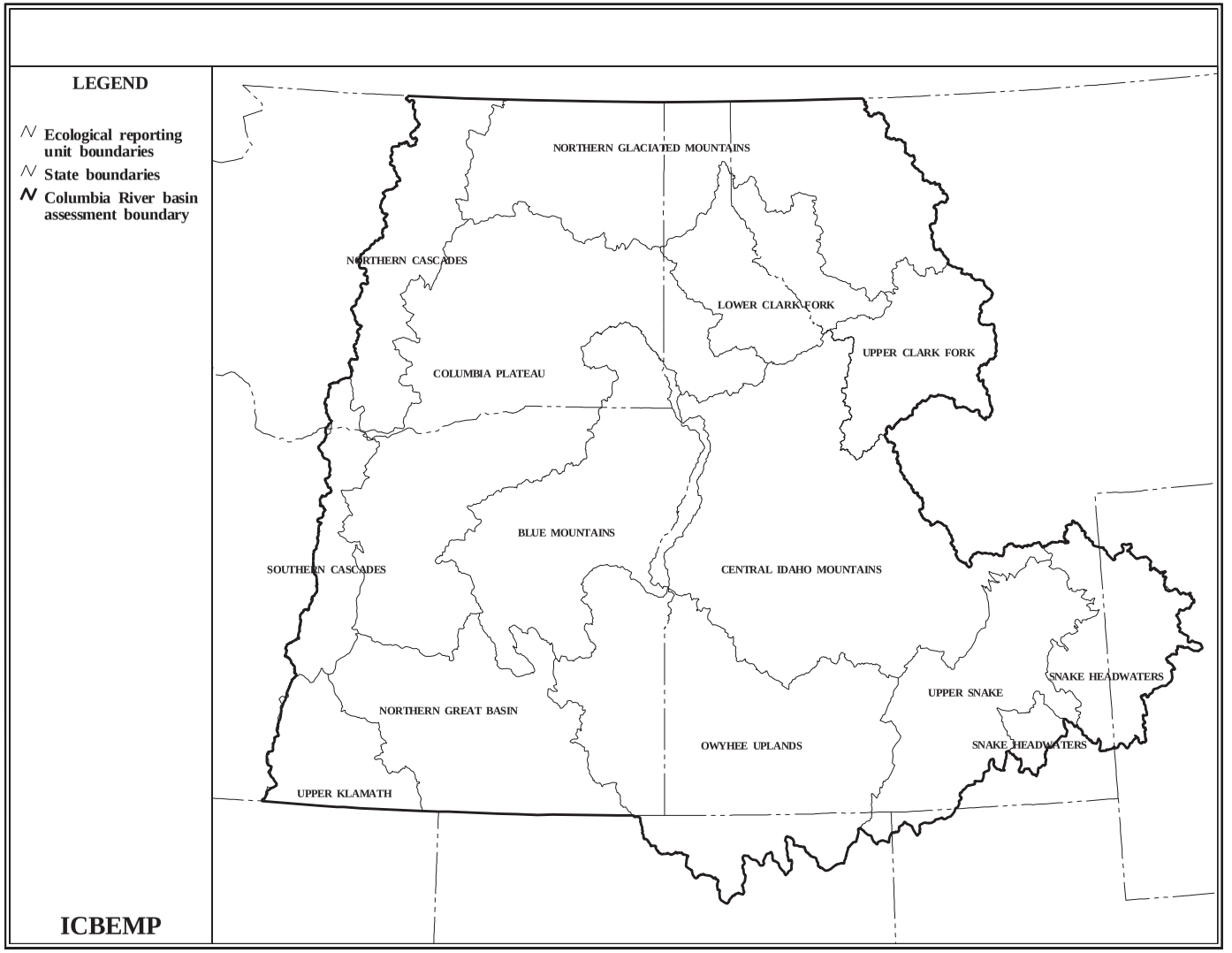

Figure 3—Interior Columbia River basin ecological reporting units.

Table 5—Interior Columbia River basin existing scenic integrity by ecological reporting unit (ERU) on Forest Service and Bureau of Land Management lands

Scenic integrity by ERU		Very high	High	Moderately high	Moderately low	Low	Not classified[a]
1	Northern Cascades	598	1,230	1,477	146	<1	5
2	Southern Cascades	166	101	1,193	422	12	5
3	Upper Klamath	99	62	1,487	178	<1	<1
4	N. Great Basin	450	3,962	2,850	484	59	<1
5	Columbia Plateau	59	482	1,084	951	<1	25
6	Blue Mountains	667	1,366	3,648	894	<1	15
7	N. Glaciated Mountains	1,702	576	4,224	222	<1	32
8	Lower Clark Fork	605	361	3,302	124	10	<1
9	Upper Clark Fork	1,233	524	1,186	116	<1	<1
10	Owyhee Uplands	375	7,659	6,721	630	<1	20
11	Upper Snake	101	2,253	600	573	<1	<1
12	Snake Headwaters	1,477	1,665	711	188	<1	<1
13	Central Idaho Mountains	5,718	5,244	5,135	694	<1	27
	Basin total[b]	13,250	25,485	33,618	5,622	91	128

[a] No data are available currently for determining scenic integrity levels for lands with agricultural or developed themes. Lands with these themes were not classified in this scenic assessment.

[b] Total areas may be slightly different from other basin totals because vector data were used in this analysis. Variations in vector data sources account for slight variations in totals.

The existing condition of lands in each ERU, shown in table 5, reveals interesting results. Disregarding ownership, there are five ERUs with more than half of their total lands within the very high and high scenic integrity levels, distinguishing these areas as some of the most scenic areas in the United States: Northern Great Basin, Snake Headwaters, Upper Snake, Central Idaho Mountains, and Owyhee Uplands.

Limitations—Based on field testing of the scenic integrity model, we estimate the derived scenic integrity model to be 70 to 80 percent accurate. This method, however, is not suitable for planning applications at smaller scales without adjustments and refinements, some of which are discussed in the following text.

The magnitude of visual disturbances may not be accurately reflected in the scenic integrity figures displayed in table 4. The scenic integrity model was based on a scale of watershed units averaging 20,000 acres. This relatively coarse resolution may have had the effect of elevating scenic integrity in the model from what actually may exist to an on-the-ground viewer. For example, although an area occupied by a large geometric clearcut is identified within a watershed as only a fraction of a percentage of the overall landscape surrounding it, that clearcut may be seen from miles around. It may have a dominating effect on a large portion of the scenery of the watershed unit as experienced by viewers moving through the landscape.

The derived scenic integrity model was based on available data that do not indicate location-specific alterations to scenery. In developing the derived scenic integrity model, two major scenic impacts were not analyzed: utility corridors, such as high voltage power lines or fossil fuel pipelines; and mining activities, both surface and underground. For this project, these inventories were not available in the proper GIS format.

The use of large-scale ERUs based on homogeneity of attributes is another limitation similar to that described above. Within each ERU, scientific information is usually aggregated within provincial boundaries. This aggregation results in compromises that necessitate the elimination of details concerning specific attributes (and anomalies) within each ERU.

Recommendations—Refined analysis techniques using the method suggested in this paper should be applied at smaller scales to specific watersheds, viewsheds, or other geographic areas within the basin. These techniques need to be refined for use at subsequent planning levels at BLM district, National Forest, or other administrative units.

It is suggested that the rule set developed for the derived scenic integrity model be amplified with additional data layers to indicate degrees of human alteration to otherwise natural-appearing landscapes. For example, during the field verification, mining activities and utility transmission corridors produced a significant degree of human alteration in some locations, yet these features were not available as data layers during the basin assessment. At smaller scale planning applications, with less time restrictions, however, such data should be applied, thereby providing an additional degree of accuracy.

Also, because of the magnitude of the basin-wide assessment, scenic integrity was "averaged" for relatively large watershed units of about 20,000 acres. We suggest that a 160- to 200-acre cell size be used as a more precise resolution for district or forest planning and monitoring projects.

The current state of the environment is important, but future states may be even more important. Monitoring of scenic resources in the basin is essential to know whether or not established resource goals are being met to see whether assumptions made in various analyses were accurate and to validate the concepts established in earlier planning processes. Scenery assessment provides an excellent medium for monitoring future changes in scenic integrity (condition). By using the same rule set displayed in table 2, the same GIS data layers may be combined in a similar manner to generate additional scenic integrity models at regular intervals, such as 5, 10, or 20 years. Comparing these newly created models with previously generated models will display broad-scale changes in scenic integrity throughout the basin.

We suggest that resource management agencies work in concert with educational institutions to develop a program that actively attempts to educate the public concerning all aspects of ecosystem management, especially the beauty of biologically healthy, sustainable landscapes. This is recognized as a tremendous challenge that may require major efforts by the agencies in order to change peoples' perceptions. Eventually, socially acceptable limits concerning the definitions of scenic beauty will be broadened to include healthy ecosystems.

General Limitations

Natural resource allocation limitations—For most public land management agencies, conflicts between the use of lands to provide amenities versus providing commodities have made them aware of several important messages. One of the most obvious of these messages is one of the most profound: the optimum use of the land and its resources must be achieved by keeping what people desire and what the environment can provide in equilibrium. Such a balance is not simple in the management of vast and diverse landscapes. There is a fundamental problem where planners are asked to satisfy all of society's desires, not only because human demands on the land seem boundless, but also because to satisfy some desires negates others.

Existence value—Using recreation participation as an indicator of recreation demand has inherent limitations. Presumably there are other scenery-dependent activities occurring on basin lands that are not taken into account in the participation rates cited. The omission of existence value is perhaps the most conspicuous deficiency in this approach. For example, people may value the existence of recreational lands for cultural, aesthetic, scientific, or spiritual reasons not expressed in recreation participation indicators.

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Preparing a scenic inventory and analysis for an area covering 144 million acres and occupying significant portions of 7 states and 100 counties is a challenge that required the contributions of many people. More than 30 professional landscape architects, planners, and social scientists throughout the BLM and the Forest Service met this challenge, each contributing significant data, insights, and recommendations that would ensure the success of the project. Their zeal and willingness to participate in such a far reaching endeavor made it possible to complete such an undertaking within the short timeframe provided.

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The planners and landscape architects at the Kisatchie National Forest in Louisiana were instrumental in initiating the process for inventorying existing scenic condition using GIS technologies. With the assistance of Mark Hotz, Dave Plume, Gini Stoddard, and Wendel Hann, the Kisatchie approach was further developed in this scenery assessment to become the derived scenic integrity model.

References

Alexander, L. 1986. Americans outdoors: the legacy, the challenge the report of the President's commission. Washington, DC: Island Press. 426 p.

Allen, S. 1988. Montana bio-economics study: results of the hunter preference study. Helena, MT: Montana Department of Fish, Wildlife and Parks. 241 p.

Bailey, R.G. 1980. Description of the ecoregions of the United States. Misc. Publ. 1391. Washington, DC: U.S. Department of Agriculture. 77 p.

Beckham, S.D. 1995. An interior empire: historical overview of the Columbia basin. Unpublished report. On file with: U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management, Interior Columbia Basin Ecosystem Management Project, 112 E. Poplar, Walla Walla, WA 99362.

Bennett, K. 1995. Human needs and dilemmas. Unpublished paper. On file with: U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management, Interior Columbia Basin Ecosystem Management Project, 112 E. Poplar, Walla Walla, WA 99362.

Claritas Corporation. 1994. PRIZM market segmentation cluster snapshots: target analysis profiles for Pacific Northwest recreationalists. Los Angeles, CA: Claritas Corporation. [Irregular pagination]. On CD-ROM. Available from: Claritas, Inc. 5055 Wilshire Boulevard, Los Angeles, CA 90036-4396.

Clean Air Act Amendments. Act of Aug 7, 1977. Public Law 95-95, 91 Stat. 685, as amended; 42 U.S.C. 7401, 7418, 7470, 7472, 7474, 7475, 7491, 7506, 7602.

Cordell, H.K.; Siehl, G. 1989. Wildland recreation use trends. Trends. 26(3): 4-8.

Daniel, T.; Boster, R. 1976. Measuring landscape esthetics: the scenic beauty estimation method. Res. Pap. RM-167. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 66 p.

Driver, B.L.; Brown, P.J.; Peterson, G. 1992. Benefits of leisure. State College, PA: Venture Publishing, Inc. 483 p.

Eckbo, G. 1969. The landscape we see. New York: McGraw-Hill. 223 p.

ECOMAP. 1993. National hierarchical framework of ecological units. Washington, DC: U.S. Department of Agriculture, Forest Service. 20 p.

Elsner, G.; Smardon, R.C., eds. 1979. Proceedings of our national landscape: a conference on applied techniques for analysis and management of the visual resource; [Dates of meeting unknown]; [Location of meeting unknown]. Gen. Tech. Rep. PSW-35. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station. 660 p.

Forest and Rangeland Renewable Resources Planning Act. Act of Aug. 17, 1974. Public Law 93-378. 88 Stat. 476, as amended; 16 U.S.C. 1600-1614.

Forest Ecosystem Management Assessment Team [FEMAT]. 1993. Forest ecosystem management: an ecological, economic, and social assessment. Portland, OR: U.S. Department of Agriculture; U.S. Department of the Interior [and others]. [Irregular pagination].

Galliano, S.J.; Loeffler, G.M. 1999. Place assessment: how people define ecosystems. Gen. Tech. Rep. PNW-GTR-462. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 31 p.

Galliano, S.J.; Michaliszyn, B.; Moran, P. 1990. Corridor visual inventory for the Columbia River Gorge National Scenic Area. Hood River, OR: Columbia River Gorge Commission. 124 p.

Gilpin, W. 1791. Remarks on forest scenery and other woodland views illustrated by the scenes of new-forest in Hampshire. [Reprinted 1973]. Surrey, England: Richmond Publishing Co. Ltd. (In three books).

Gobster, P.H. 1995. Aldo Leopold's "ecological esthetic": integrating esthetic and biodiversity values. Journal of Forestry. 93(2): 6-10.

Gobster, P.H.; Schroeder, H.W. 1988. Urbanites' perceptions and aesthetic expectations of forest environments. In: Johnson, J.E., ed. Managing north-central forests for nontimber values: Proceedings, 4th Region 5 technical conference of the Society of American Foresters; 1988 November 29-December 1; Duluth, MT. Publ. 88-04. [Place of publication unknown]: Society of American Foresters.

Hanes, Richard. 1995. Personal communication, cultural anthropologist, U.S. Department of the Interior, Bureau of Land Management, P.O. Box 10226, Eugene, OR 97440-2226.

Hann, Wendel J.; Jones, Jeffrey L.; Karl, Michael G. [and others]. 1997. Landscape dynamics of the basin. In: Quigley, Thomas M.; Arbelbide, Sylvia J., tech. eds. An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Chapter 3. Vol. 2. (Quigley, Thomas M., tech. ed.; Interior Columbia Basin Ecosystem Management Project: scientific assessment).

Haynes, R.W.; Horne, A.L. 1997. Economic assessment of the basin. In: Quigley, Thomas M.; Arbelbide, Sylvia J., tech. eds. An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Chapter 6. Vol. 4. (Quigley, Thomas M., tech. ed.; Interior Columbia Basin Ecosystem Management Project: scientific assessment).

Hornback, K.E. 1991. Socio-economic outlook: outdoor recreation 2000. Trends. 28(2): 14-19.

Jones, J.L. 1995. Broad-scale pattern assessment. Draft report describing the metrics used to assess broad-scale landscape structure. On file with: U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management, Interior Columbia Basin Ecosystem Management Project, 112 E. Poplar, Walla Walla, WA 99362.

Kaplan, R. 1975. Some methods and strategies in the prediction of preference. In: Zube, E.H. Landscape assessment—values, perceptions, and resources. Stroudsburg, PA: Dowden, Hutchinson and Ross, Inc.: 118-129.

Kaplan, S.; Kaplan, R. 1988. Cognition and the environment: functioning in an uncertain world. New York: Praeger. 132 p.

Lee, R.G. 1976. Assessing public concern for visual quality—landscape sensitivity research and administrative studies. PSW-19. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station. 76 p.

Litton, R.B., Jr. 1984. Visual vulnerability of the landscape: control of visual quality. Res. Pap. WO-39. Washington, DC: U.S. Department of Agriculture, Forest Service. 28 p.

Litton, R.B., Jr.; Tetlow, R.J. 1978. A landscape inventory framework: scenic analysis of the northern Great Plains. PSW-135. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station: 117-124.

Luloff, A.E.; Krannich, R.S. 1990. Demographic correlates of outdoor recreation: trends and implications. In: O'Leary, J.T. [and others], eds. Proceedings of the 3d outdoor recreation trends symposium; 1990 March 29-31; Indianapolis, IN. [Place of publication unknown]: [Publisher unknown]: 131-146.

Magill, A.W. 1992. Managed and natural landscapes: What do people like? Res. Pap. PSW-RP-213. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 28 p.

Marsh, G.P. 1864. Man and nature. [Reprinted 1965]. In: Lowenthal, D., ed. Cambridge, MA: Belknap Press of Harvard University Press.

McCool, S.; Haynes, R. 1995. Sustainability. 14 p. Unpublished report. On file with: U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management, Interior Columbia Basin Ecosystem Management Project, 112 E. Poplar, Walla Walla, WA 99362.

McCool, S.F.; Benson, R.E.; Ashor, J.L. 1986. How the public perceives the visual effects of timber harvesting: an evaluation of interest group preferences. Environmental Management. 22.

McCool, S.F.; Burchfield, J.A.; Allen, S.D. 1997. Social assessment of the basin. In: Quigley, Thomas M.; Arbelbide, Sylvia J., tech. eds. An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Chapter 7. Vol. 4. (Quigley, Thomas M., tech. ed.; Interior Columbia Basin Ecosystem Management Project: scientific assessment).

McGuire, J.R. 1979. Managing the forest landscape for public expectations. In: Proceedings of our national landscape; 1979; Lake Tahoe, CA. Gen. Tech. Rep. PSW-35. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station: 16-19.

McLellan, G.; Siehl, G.H. 1988. Trends in leisure and recreation: how we got to where we are. Trends. 25(4): 4-7.

Molitor, A. 1995. An assessment of natural resource-based recreation in the interior Columbia River basin. 41 p. Unpublished report. On file with: U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management, Interior Columbia Basin Ecosystem Management Project, 112 E. Poplar, Walla Walla, WA 99362.

Murdock, S.H.; Backman, K.; Hoque, M.N.; Ellis, D. 1990. The impacts of future change in population size and composition on recreational demand. In: O'Leary, J.T. [and others], eds. Proceedings of the 3d national recreation trends symposium; 1990 March 29-31; [Location of meeting unknown]. Bloomington, IN: Indiana University, Leisure Research Institute. 1: 147-195. Vol. 2. Sponsored by: Indiana University, Department of Recreation and Park Administration [and others].

Nash, R. 1975. Qualitative landscape values: the historical perspective. In: Zube, E.H., ed. Landscape assessment—values, perceptions, and resources. Stroudsburg, PA: Dowden, Hutchinson and Ross, Inc.: 117-125.

Newby, F.L. 1971. Perceptual assessment of forested roadside landscapes. Ann Arbor, MI: University of Michigan. 228 p. Ph.D. dissertation.

Noe, F.P. 1988. Effects of recreational and environmental values on tourist scenic preferences. In: Noe, F.P.; Hammit, W.E., eds. Visual preferences of travelers along the Blue Ridge Parkway. Scientific Monogr. Ser. No. 18. Washington, DC: U.S. Department of the Interior, National Park Service: 51-66.

Orians, G.H. 1986. Ecological and evolutionary approach to landscape aesthetics. In: Penning-Rousell; Lowenthal, D., eds. Landscape meanings and values. London, England: Allen and Unwin. 271 p.

Orians, G.H.; Heerwagen, J.H. 1992. Evolved responses to landscapes. In: Barkow, J.H.; Cosmides, L.; Tooby, J. eds. The adapted mind: evolutionary psychology and the generation of culture. New York: Oxford University Press. 196 p.

Randall, A.; Stoll, J.R. 1983. Existence value in a total value framework. In: Rowe, R.D.; Chestnut, L., eds. Managing air quality and scenic resources at national parks and wilderness areas. Boulder, CO: Westview Press: 265-274.

Rasker, R. 1993. Rural development, conservation and public policy in the Greater Yellowstone ecosystem. Society and Natural Resources. 6: 109-126.

Rasker, R. 1994. A new look at old vistas: the economic role of environmental quality in western public lands. University of Colorado Law Review. 65(2): 369-399.

Rasker, R.; Glick, D. 1994. Footloose entrepreneurs: Pioneers of the new West? Illahee. 10(1): 34-43.

Robbins, W.G. 1993. Landscape and environment—ecological change in the intermontane Northwest. Pacific Northwest Quarterly. 84(4): 140-149.

Roper Starch, Inc. 1994. From anxiety toward action a status report on conservation in 1994. The Times Mirror Magazine. [Not paged]. (National Environmental Forum Survey).

Ryden, K.C. 1993. Mapping the invisible landscape: folklore, writing, and the sense of place. Iowa City, IA: University of Iowa Press. 144 p.

Smardon, R.C. 1986. Historical evolution of visual resource management within three federal agencies. Journal of Environmental Management. 22(4): 301-317.

State of Oregon. 1992. Oregon State long range transportation plan. Unpublished report. On file with: Oregon Department of Transportation, 555 13th Street N.E., Salem, OR 97310.

State of Washington, Department of Ecology. 1978. Shoreline Master Program Handb. WAC 173-16. Report on file with: State of Washington, Department of Ecology, P.O. Box 47600, Olympia, WA 98504-7600.

Szwak, L.B. 1989. Social and demographic trends affecting outdoor recreation. In: Watson, A.E., comp. Outdoor recreation benchmark 1988: Proceedings of the national outdoor recreation forum; 1988 January 13-14; Tampa Bay, FL. Gen. Tech. Rep. SE-52. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 22-26.

Trent, J. 1995. Attitudes, beliefs and values for Interior Columbia Basin Ecosystem Management Project. 53 p. On file with: U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management, Interior Columbia Basin Ecosystem Management Project, 112 E. Poplar, Walla Walla, WA 99362.

Ulrich, R.S. 1984. View through a window may influence recovery from surgery. Science. [Vol. unknown]: [pages unknown].

Ulrich, R.S.; Dimberg, U.; Driver, B.L. 1992. Benefits of leisure. In: Driver, B.L.; Brown, P.J.; Peterson, G.L., eds. [Title unknown]. State College, PA: Venture Publishing, Inc.: 73-89.

U.S. Department of Agriculture, Forest Service. 1994. Reform of the Forest Service budget structure and budget process. Memorandum from Forest Service Chief Jack Ward Thomas, December 5, 1994. Washington, DC.

U.S. Department of Agriculture, Forest Service. [In press]. Landscape aesthetics, a handbook for scenery management. Agric. Handb. 701. Washington, DC: U.S. Government Printing Office. 314 p.

U.S. Department of Commerce, Bureau of the Census. 1992. USA counties. Washington, DC: CD-ROM (Machine readable data files).

U.S. Department of the Interior, Bureau of Land Management. 1980. Visual resource management program. U.S. Publ. Stock No. 024-011-0116-6. Washington, DC: Division of Recreation and Cultural Resources

U.S. Laws, Statutes, etc. Public Law 94-579. The Federal Land Policy and Management Act of 1976. Act of Oct. 21, 1976. 90 Stat. 2743, as amended; 43 U.S.C. 1701 (note), 1701-1702, 1711-1723, 1732-1737, 1740-1742, 1744, 1746-1748, 1751-1753, 1761-1771, 1781-1782.

U.S. Laws, Statutes, etc. Public Law 86-517. Multiple-Use Sustained-Yield Act of 1960. Act of June 12, 1960. 74 Stat. 215; 16 U.S.C. 528 (note), 528-531.

U.S. Laws, Statutes, etc. Public Law 91-190. National Environmental Policy Act of 1969. Act of Jan. 1, 1970. [An act to establish a national policy for the environment, to provide for the establishment of a Council of Environmental Quality, and for other purposes.] In its: United States statutes at large, 1969. 42 U.S.C. 4231, et. seq. (1970). Washington, DC: U.S. Government Printing Office: 852-856. Vol 83.

U.S. Laws, Statutes, etc. Public Law 94-588. National Forest Management Act of 1976. Act of October 22, 1976. 90 Stat. 2949, as amended; 16 U.S.C. 472a, 476, 500, 513-516, 518, 521b, 528 (note), 576b, 594-2 (note), 1600 (note), 1601 (note), 1600-1602, 1604, 1606, 1608-1614).

U.S. Laws, Statutes, etc. Public Law 88-577. Wilderness Act. Act of September 3, 1964. 78 Stat. 890; 16 U.S.C. 1121(note), 1131-1136.

Williams, D.R. 1995. Mapping place meanings for ecosystem management. Unpublished report. On file with: U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management, Interior Columbia Basin Ecosystem Management Project, 112 E. Poplar Street, Walla Walla, WA 99362.

Zube, E.H. 1976. Perception of landscape and land use. In: Altman, I.; Wohlwill, J.F., eds., Human behavior and environment. New York: Plenum: 62-80.

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