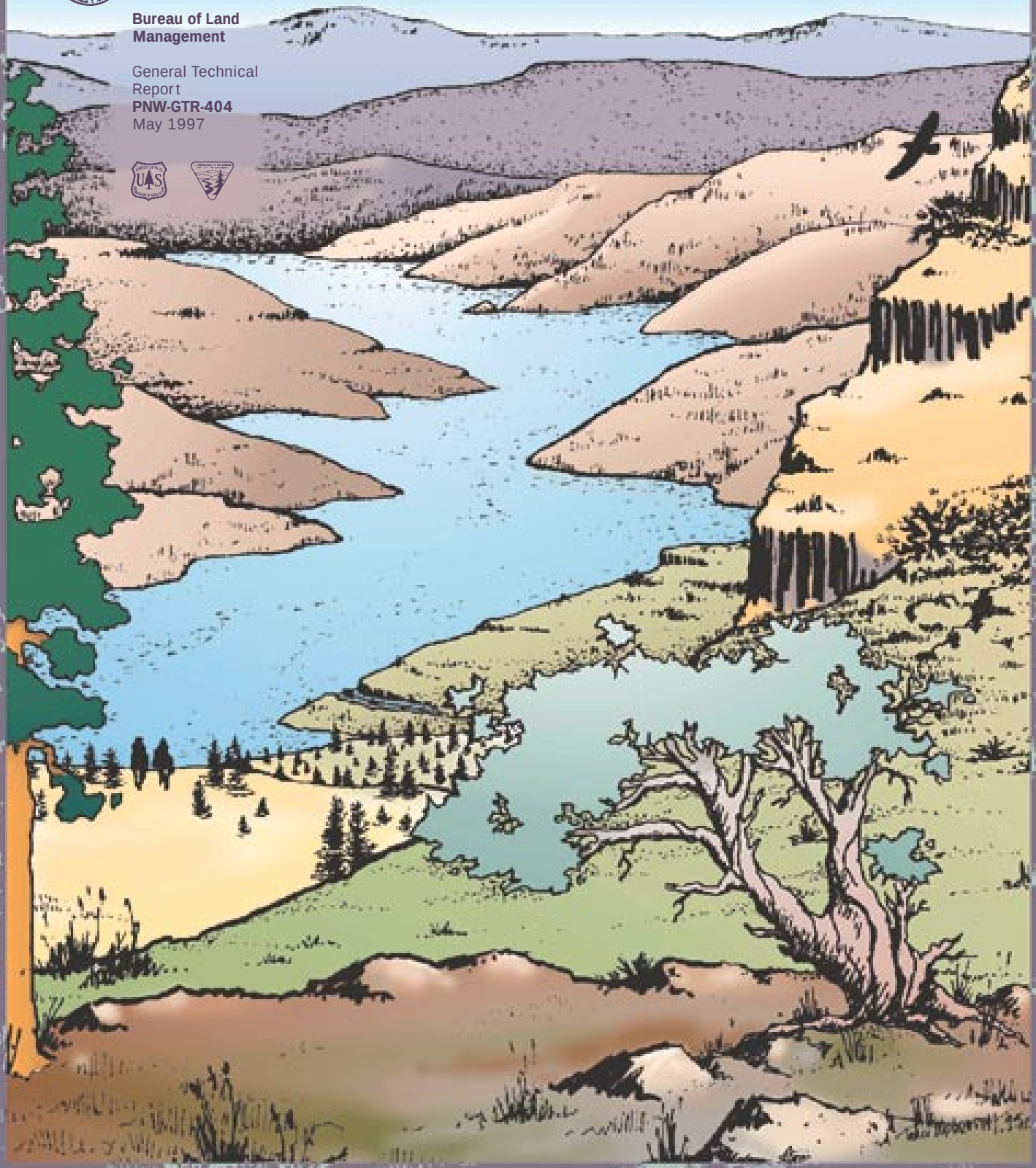
United States Department of Agriculture
Forest Service
Pacific Northwest Research Station

United States Department of the Interior
Bureau of Land Management

General Technical Report
PNW-GTR-404
May 1997

Highlighted Scientific Findings of the Interior Columbia Basin Ecosystem Management Project



The Authors

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Interior Columbia Basin Ecosystem Management Project

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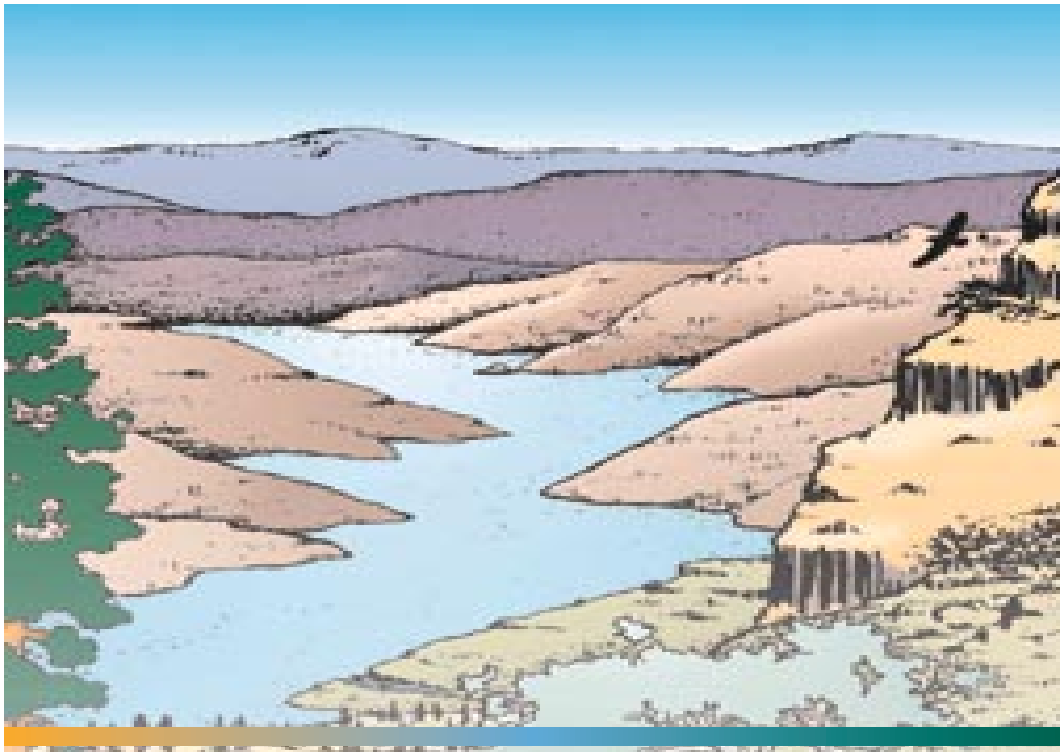

Highlighted Scientific Findings of the Interior Columbia Basin Ecosystem Management Project

Thomas M. Quigley and Heidi Bigler Cole

U.S. Department of Agriculture
Forest Service
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Portland, Oregon
May 1997
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Abstract

Quigley, Thomas M.; Bigler Cole, Heidi, 1997. Highlighted scientific findings of the Interior Columbia Basin Ecosystem Management Project. Gen. Tech. Rep. PNW-GTR-404. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; U.S. Department of the Interior, Bureau of Land Management. 34 p.

Decisions regarding 72 million acres of Forest Service- and Bureau of Land Management- administered lands will be based on scientific findings brought forth in the Interior Columbia Basin Ecosystem Management Project. Some highlights of the scientific findings are presented here. Project scientists drew three general conclusions: (1) Conditions and trends differ widely across the landscape; as a result, one-size-fits-all strategies will neither effectively restore nor maintain ecosystems. (2) Ecosystem elements are linked to one another; effective ecosystem management requires an understanding of these linkages. (3) The scientific assessment highlighted a wide variety of risks important to ecological and socioeconomic systems. It also brought forth numerous opportunities to restore ecological systems and provide goods and services. To realize the opportunities, managers must recognize and manage the risks. Three management options were analyzed: current direction, active restoration, and reserve system establishment. Analysis revealed that active restoration was effective in addressing basinwide risks and opportunities.

Keywords: Ecosystem management, ecosystem assessment, ecological integrity, socioeconomic resiliency, risk management.

Photo by John Hutmacher

Preface

This project was launched to accomplish two things:

- Restore and maintain long-term ecosystem health and integrity.
- Support, within the capacity of the land, the economic and social needs of people, cultures, and communities and provide sustainable levels of products and services from Forest Service- and Bureau of Land Management-administered land.

Problems cannot be resolved until they are understood. That was the science team's charge. The team set out to answer questions such as:

- Where are the problems?
- What caused them?
- Can they be fixed?
- What might be an effective strategy?

This document is designed to give you a quick look at the science findings. The findings show the intensity and magnitude of problems and will help managers develop more effective strategies. It is hoped that a clearer understanding of the problems will help you evaluate potential strategies.

This document features only a glimpse of the science findings. More information may be found in the following documents:

Overview and Executive Summary: Status of the Interior Columbia Basin: Summary of Scientific Findings. PNW-GTR-385

This 144-page document summarizes the science assessment's approach and findings.

A Framework for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins. Richard W. Haynes, Russell T. Graham, and Thomas M. Quigley, tech. eds. 1996. PNW-GTR-374

Principles and processes appropriate for ecosystem management at multiple levels are described in this document. It will be especially useful for people initiating ecosystem management across multiple jurisdictions.

An Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins. Thomas M. Quigley, Richard W. Haynes, and Russell T. Graham, tech. eds. 1996. PNW-GTR-382

This 304-page publication documents the integration process and highlights key scientific findings.

An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins. Thomas M. Quigley, S.J. Arbelbide, tech. eds. PNW-GTR-405

Detailed social, economic, terrestrial, aquatic, and landscape ecology reports are published in this document.

Evaluation of EIS Alternatives by the Science Integration Team. Thomas M. Quigley, Kristine M. Lee, S.J. Arbelbide, tech. eds. PNW-GTR-406

This document complements the draft environmental impact statements (DEIS). Outcomes and consequences associated with implementing the DEIS alternatives are projected.

These documents may be ordered by contacting:

Pacific Northwest Research Station
Publications
P.O. Box 3890
Portland, OR 97208-3890
(503) 808-2125

In addition to these documents, other scientific publications are in press, submitted to journals, or in preparation on all science topics addressed by the Science Integration Team.

Photo by John Hutmacher

Acknowledgments

Over 300 scientists and specialists worked on this science effort. At the same time, dozens of private citizens listened, learned, and asked compelling questions. Their varied backgrounds and insights are reflected in the detailed science documents, which are highlighted here.

This is a pioneering project in many ways. It required new technology, new levels of thinking, and persistence. The people who contributed to this project understand that solving broad scale problems requires broad scale thinking. We acknowledge these people and their contribution.

Science Integration Team Members

Science Integration Team Leaders	Thomas M. Quigley, Sylvia J. Arbelbide, Russell T. Graham
Document Production	Jodi Clifford, Karen Esterholdt, John Ivie, Traci Mc. Merritt, Cindy Miner, Liz Galli-Noble, Lynn Starr, Kelly Wenzlick, Kathy Campbell
Aquatics	James R. Sedell, Lynn M. Decker, Danny C. Lee, Kristine M. Lee, Bruce E. Reiman, Russell F. Thurow, Jack E. Williams
Economics	Richard W. Haynes, Amy L. Horne, Nicholas E. Reyna
Landscape Ecology	Wendel J. Hann, Carl L. Almquist, Mike Borman, Kenneth C. Brewer, Gary Ford, Thomas P. Frost, Iris Goodman, Paul F. Hessburg, Mark E. Jensen, J. L. Jones, M.G. “Sherm” Karl, Robert E. Keane, Bradley G. Smith
Social Science	James A. Burchfield, Steven F. McCool, Stewart D. Allen, John S. Bumstead, Steven J. Galliano, Richard C. Hanes, Dave Powell
Terrestrial Ecology	Bruce G. Marcot, Richard S. Holthausen, John F. Lehmkuhl, Kurt Nelson, Martin G. Raphael, Elaine J. Zieroth
Spatial Analysis	Rebecca A. Gravenmier, John R. Steffenson, Andrew E. Wilson

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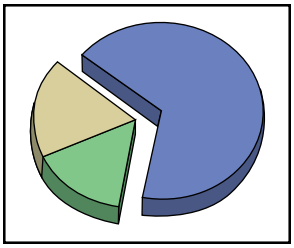

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Photo by John Hutmacher

Photo by John Hutmacher

Photo by John Hutmacher

THE CHALLENGE

Today's Forest Service (FS) and Bureau of Land Management (BLM) managers have challenges that their predecessors could not imagine:

- Wildfires of unprecedented intensity and size are sweeping through the country on a regular basis.
- Damaging noxious weeds are changing the rangelands, leaving less habitat for wildlife and forage for livestock.
- Rural communities can no longer depend on a predictable flow of natural resources from public lands.
- Natural resource issues are being debated nationally.
- American's expectations for natural resources have changed.
- Salmon populations are declining, and some species are nearing extinction.

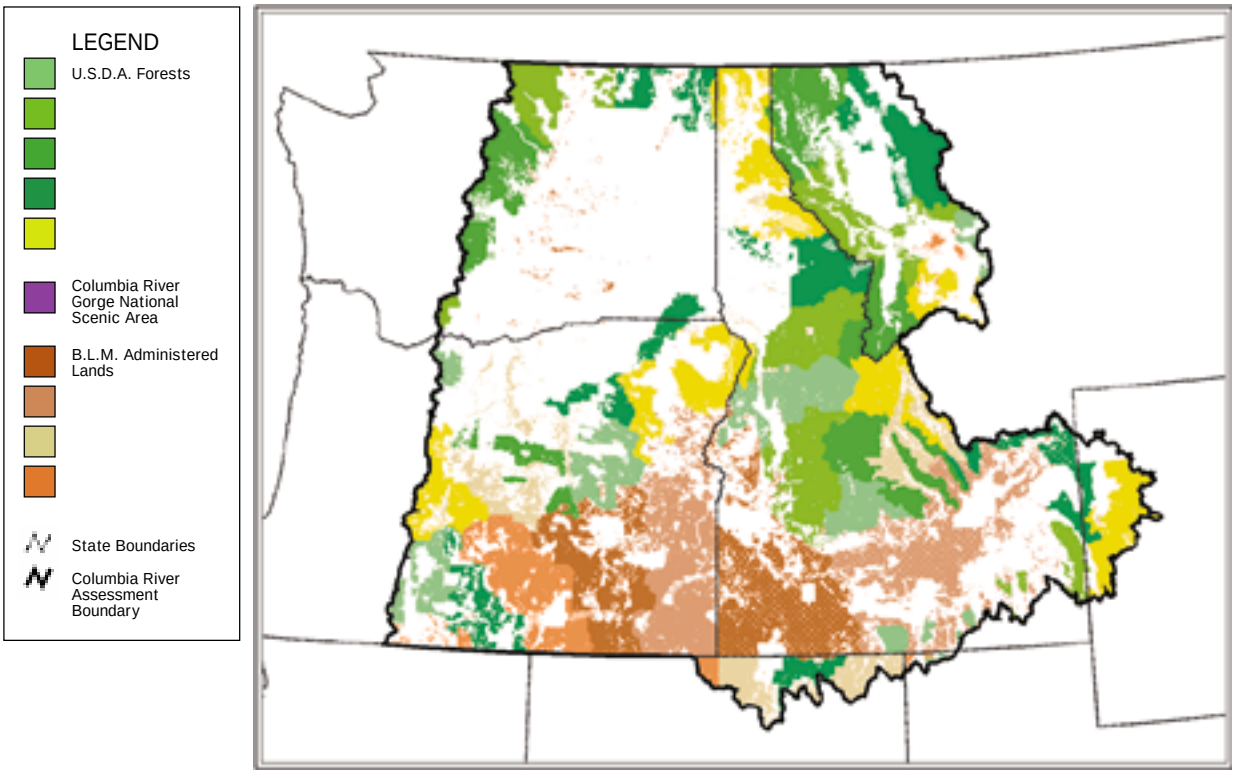
Land managers know the problems are too big to tackle unit by unit, however, they believe a coordinated strategy developed by local administrative units can have an impact.

THE CHARGE

A 1993 presidential directive launched the Interior Columbia Basin Ecosystem Management Project. Several Federal agencies teamed up to develop a scientifically sound, ecosystem-based strategy for 72 million acres of land administered by the BLM and Forest Service.

The project sought to answer two questions: (1) What are the ecological and socioeconomic trends and conditions in the basin? and (2) What land management strategy would most effectively improve them? A team of scientists tackled the first question, and a management team tackled the second.

ADMINISTRATIVE UNITS

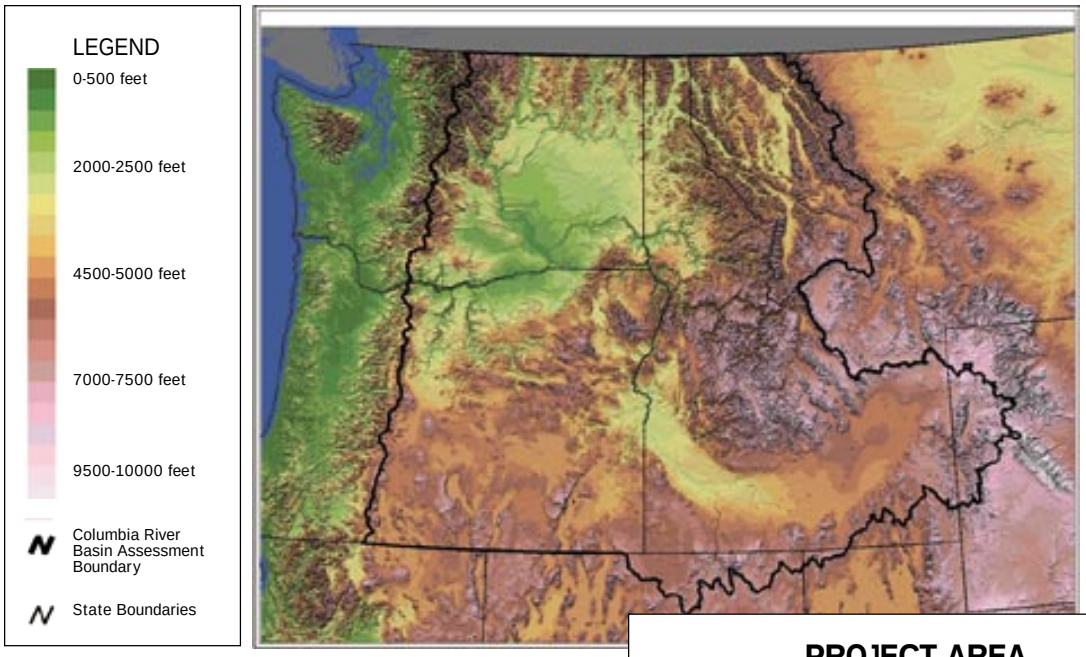


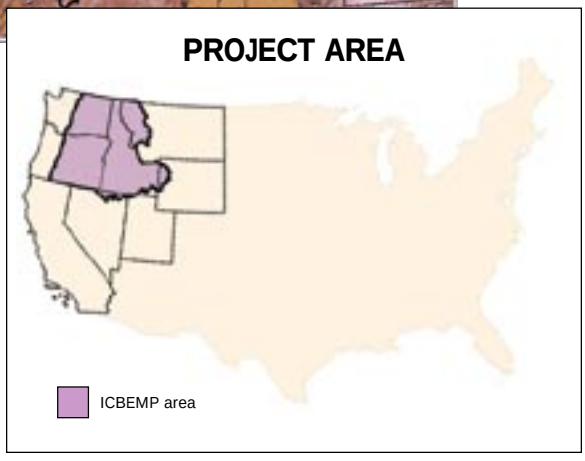
Science findings will help land managers chart the future course for these Forest Service- and BLM-administered lands.

Land managers are using the science information to develop management strategies and provide context for Forest Service and BLM management plans. The strategies are outlined and analyzed in two draft environmental impact statements (EIS), released to the public in spring 1997. These documents will be used to eventually amend 74 Forest Service and BLM land-use plans, enabling the local units to implement a comprehensive, collaborative strategy that will address broad scale issues.

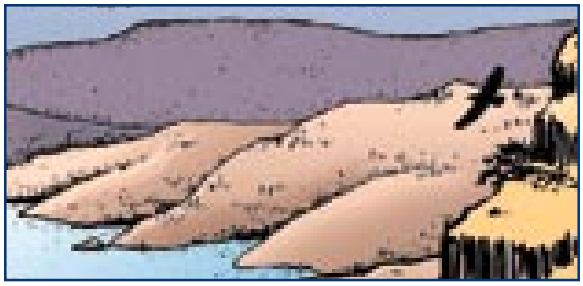
Scientists are providing credible information to managers on current conditions, risks, and opportunities as well as the consequences associated with several management options. Managers will use the science information to make decisions. Scientists will not make the decisions.

TOPOGRAPHY





The 145-million-acre project area, also called the basin, encompasses parts of seven states. The management strategy will affect 72 million acres managed by the Forest Service and BLM.

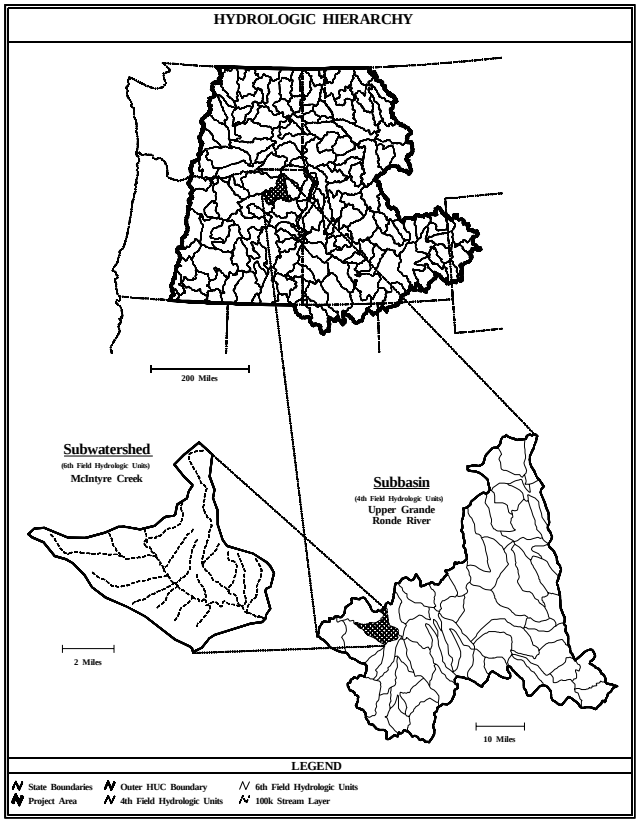


THE SCIENCE

A Science Integration Team was formed to tackle the question, What are the socioeconomic and ecological trends and conditions in the basin? The team included hundreds of scientists and technical specialists from Federal agencies and the larger science community. Their task was momentous: find a way to gauge the ecological and socioeconomic health for 145 million acres, an area the size of France. A comprehensive scientific assessment of this size had never before been done in the United States. At the time it was conducted, it was the largest assessment of its kind in the world.

Some data needed to conduct the assessment had already been gathered; however, it was scattered and inconsistent. After existing and new data were brought together, over 170 layers of information were analyzed by using Geographic Information Systems (GIS).

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT



Data were organized and analyzed in a watershed hierarchy, which allowed scientists to make consistent assessments at different scales. Analysis was conducted at the basin level (about 145 million acres), subbasin level (about 850,000 acres), watershed level (about 60,000 acres), and subwatershed level (about 20,000 acres).

This project examined relations at the broad scale as opposed to detailed examination of individual sites or specific locations. This is similar to flying at high altitude and characterizing conditions from that perspective.

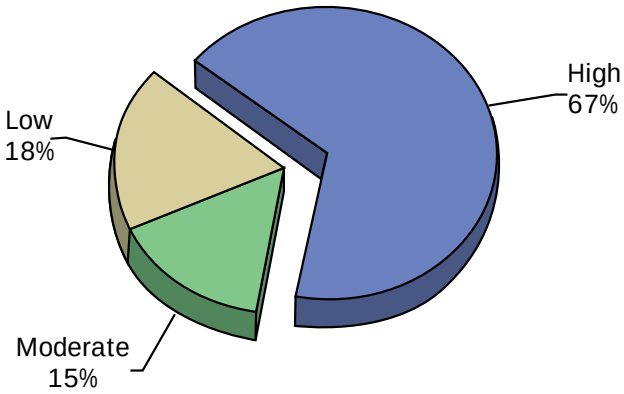
Photo by Tom Iraci

Developing a meaningful interpretation of the science information required scientists to develop integrated measures. These measures are especially useful to managers, because they allow conditions, risks, and opportunities to be characterized across the landscape. The integrated measures include socioeconomic resiliency and ecological integrity.

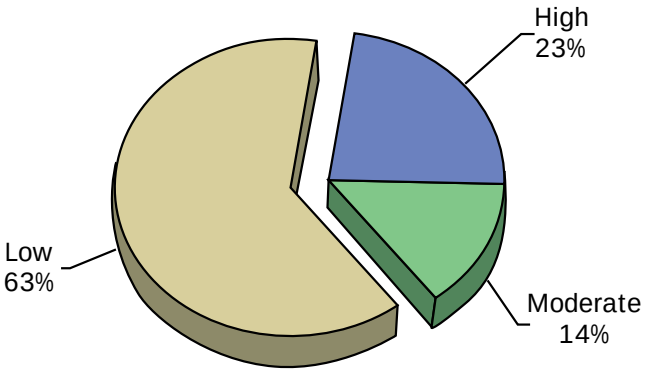
Socioeconomic resiliency estimates the social and economic sensitivity of a geographical area to outside economic influences. For example, a county with high socioeconomic resiliency is better equipped to handle new, nontraditional businesses or to cope when a major business experiences reversals.

We believe that high integrity can be maintained or achieved in concert with human activities, if management is based on ecological relations.

SOCIOECONOMIC RESILIENCY BY POPULATION

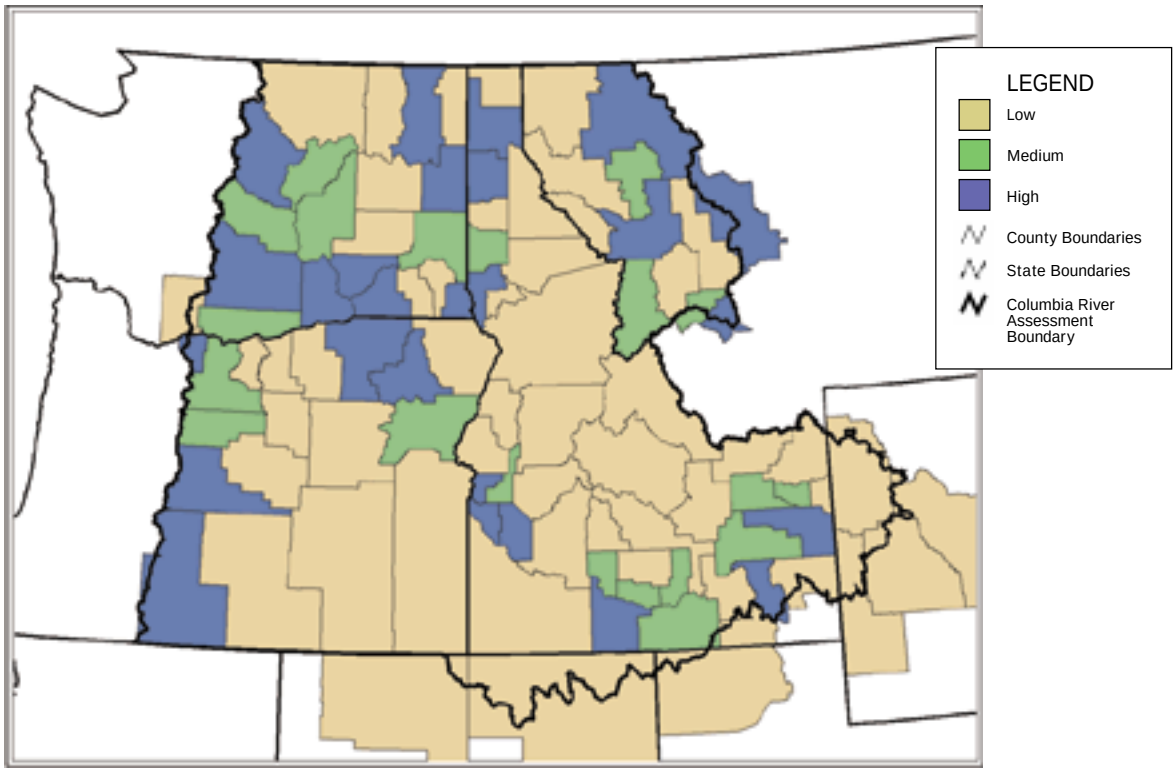


SOCIOECONOMIC RESILIENCY BY AREA



Most economic activity takes place in the population centers; therefore, most people live in highly resilient areas . Much of the basin consists of sparsely populated, rural communities. Some of these communities have few opportunities to diversify their economies. As a result, they have relatively lower socioeconomic resiliency.

SOCIOECONOMIC RESILIENCY RATINGS



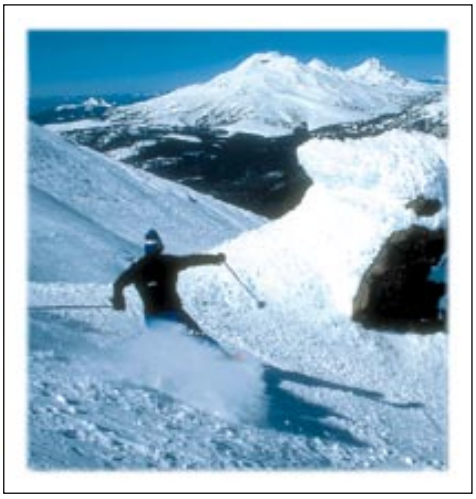
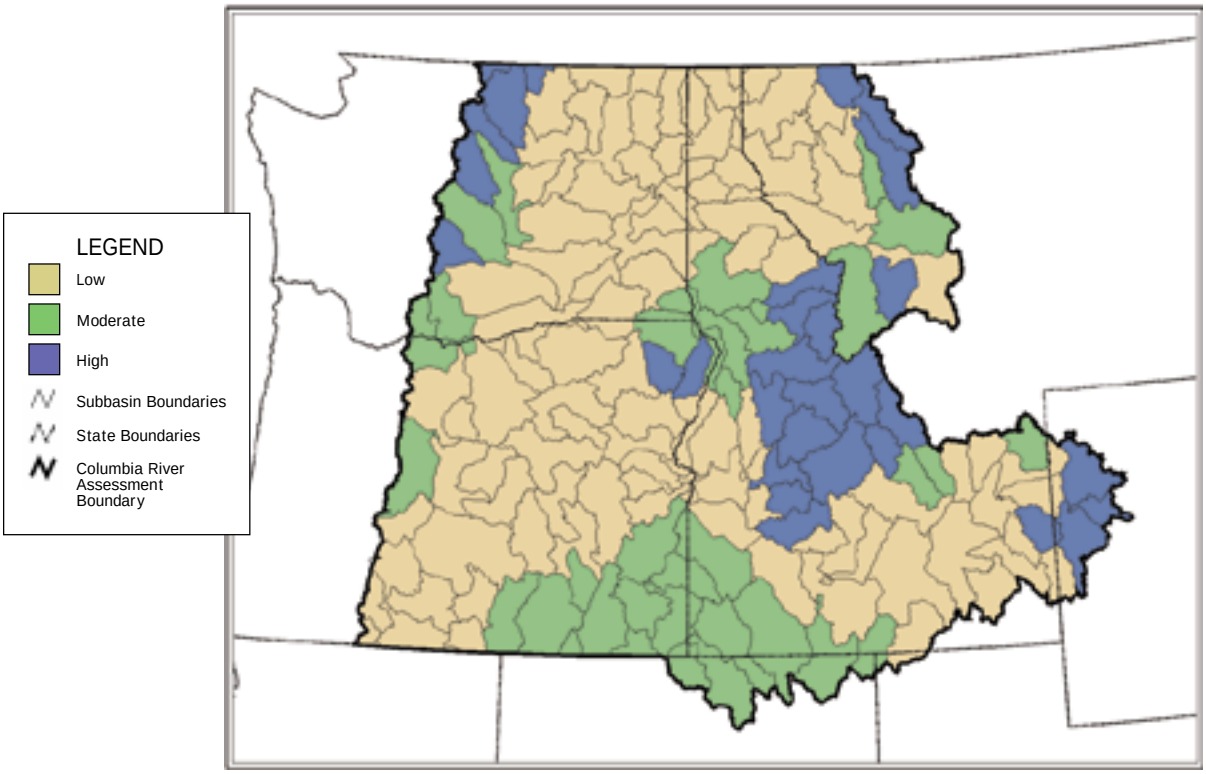


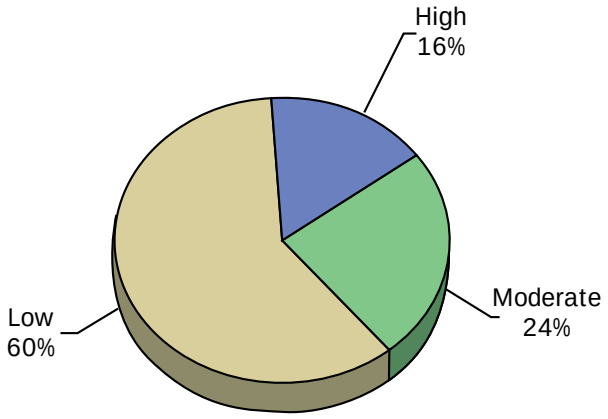
Photo by John Hutmacher

Counties with the highest resiliency ratings generally have large population centers or are located in areas with growing recreation demands.

COMPOSITE ECOLOGICAL INTEGRITY



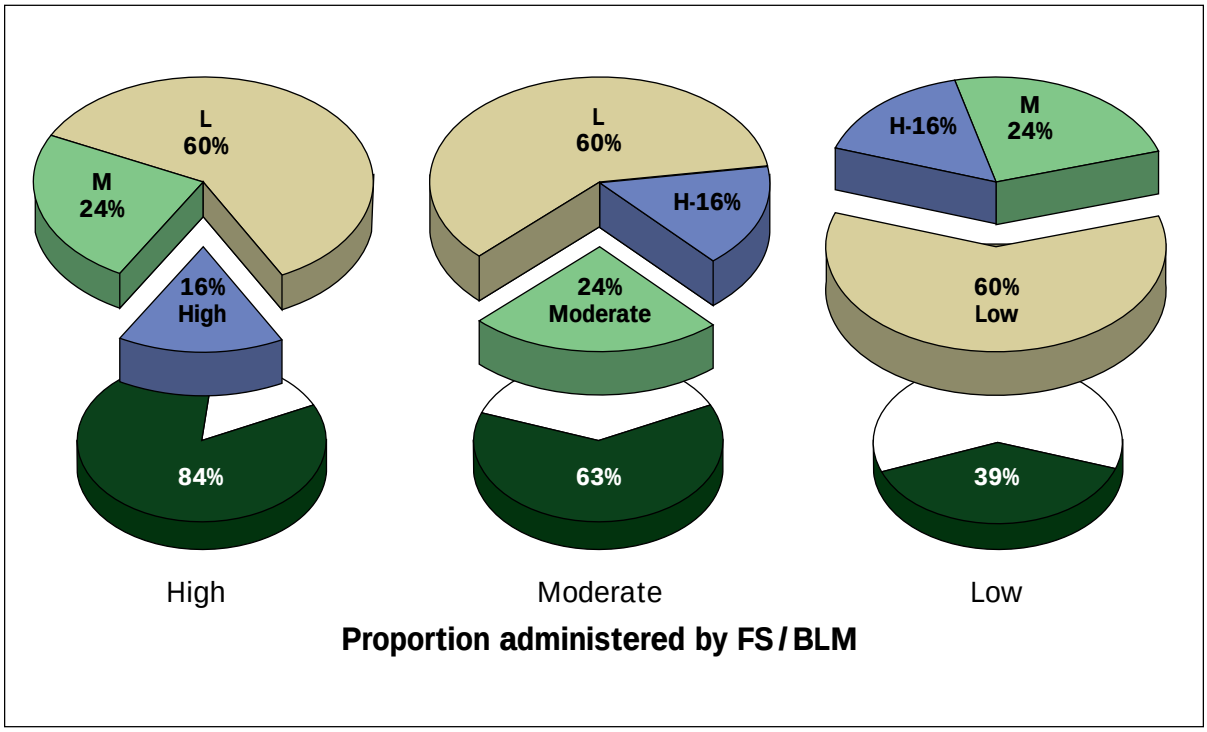
COMPOSITE ECOLOGICAL INTEGRITY



Ecological integrity describes the wholeness and resiliency of an ecological system. A system with high integrity functions properly because it has all its parts and processes intact. Such a system rebounds faster after wildfires, floods, road building, and other disturbances. The ratings of high, moderate, and low are relative ratings within the basin. No absolute measures exist.

Compared to many ecosystems in the world, BLM- and Forest Service-administered lands in the basin have much of their ecological integrity intact. Ecological integrity was rated as high, moderate, or low on a relative scale. In general, the more a system has been altered, the lower its integrity. A low-integrity area may not be highly degraded; its integrity is low compared to other lands in the project area. Low integrity should not necessarily be seen as "bad." Many low-integrity areas are filling societal needs; examples include agricultural lands and roads related to recreation access.

BASINWIDE ECOLOGICAL INTEGRITY PROPORTIONS ADMINISTERED BY FS / BLM



Management of Forest Service- and BLM-administered lands is important from the perspective of ecological integrity. Only 16 percent of the entire basin is rated as having high ecological integrity, and 84 percent of that high-rated area is managed by the Forest Service and BLM.

FOREST INTEGRITY

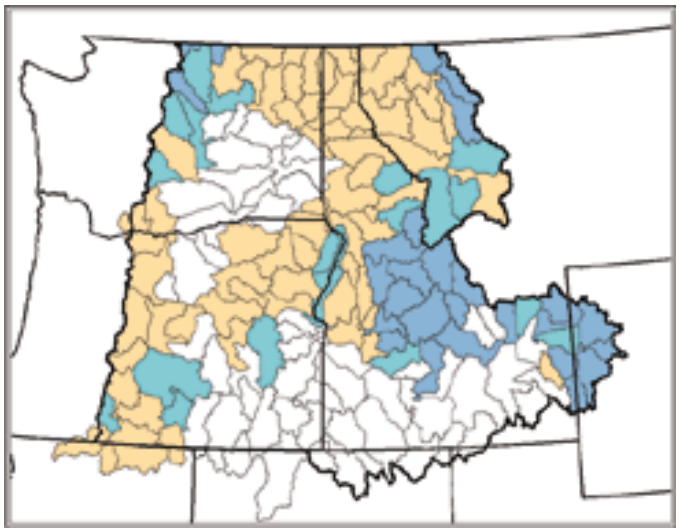


Photo by Tom Iraci

AQUATIC INTEGRITY

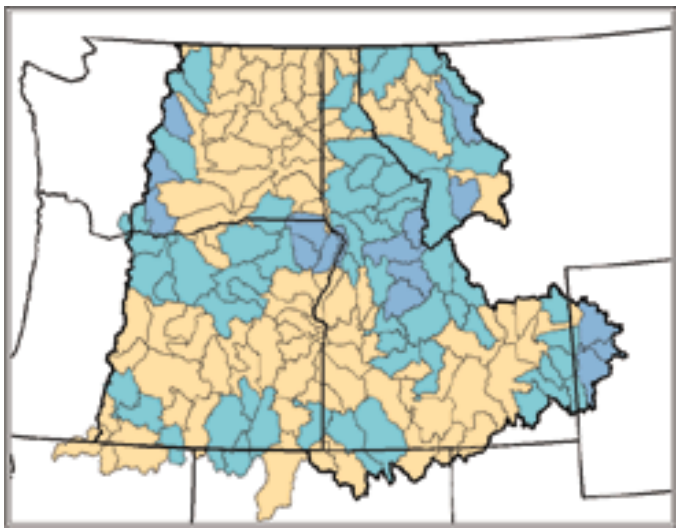


Photo by John Hutmacher

FOREST HYDROLOGIC INTEGRITY

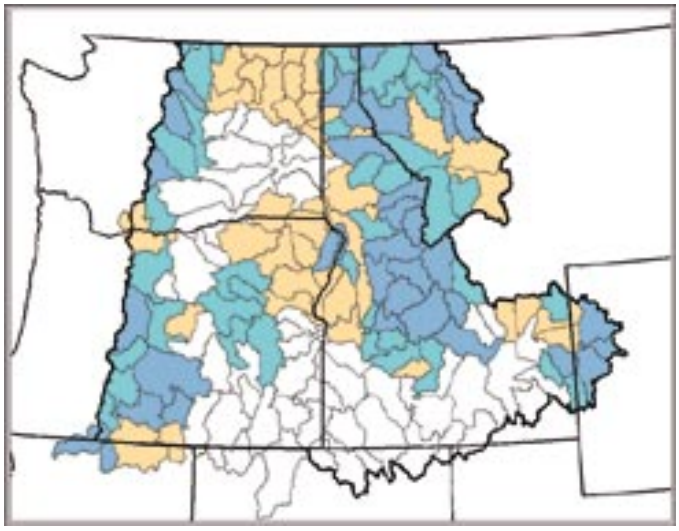


Photo by John Hutmacher

RANGELAND HYDROLOGIC INTEGRITY

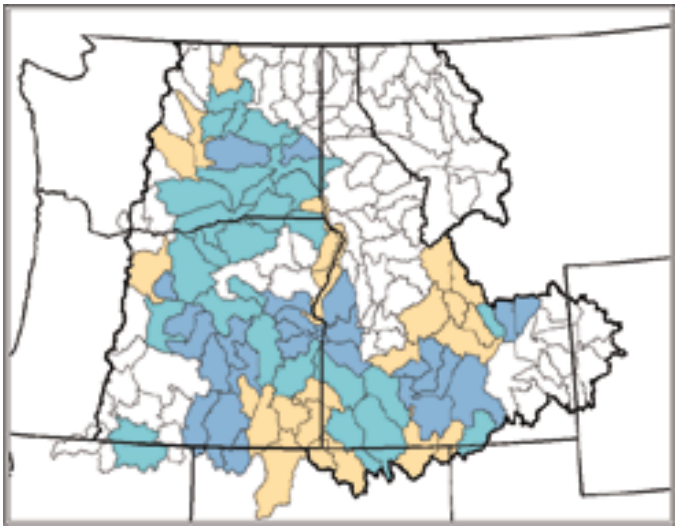
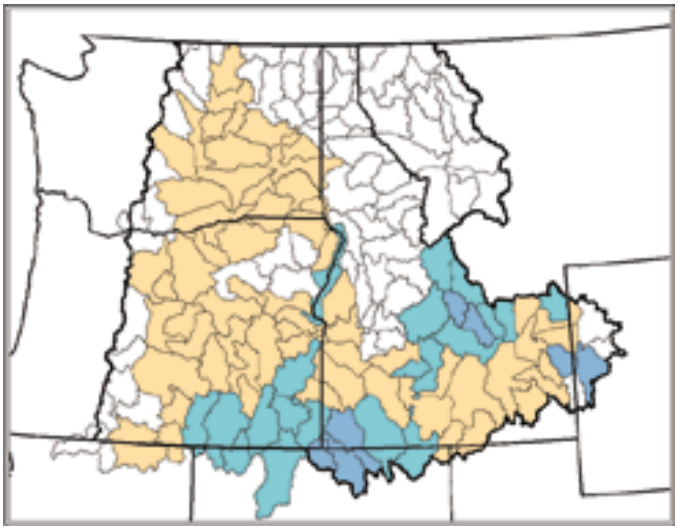
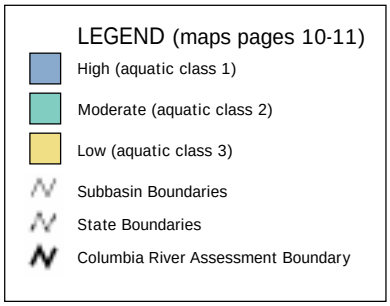


Photo by John Hutmacher

RANGELAND INTEGRITY





Composite integrity ratings considered the underlying components of forest, rangeland, aquatic, and hydrologic integrity. Integrity ratings provide valuable information to managers concerning conditions, risks, and opportunities on the landscape. The information will be used to help set management priorities.

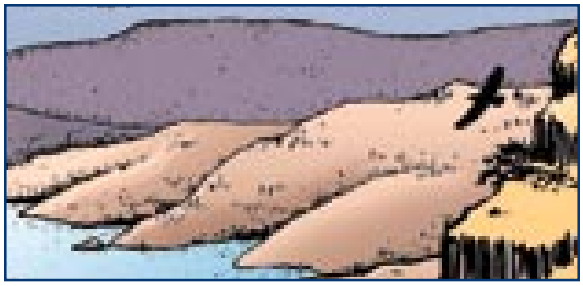
Forest high integrity: A mosaic of plant and animal communities; well-connected, high-quality habitat; diverse assemblages of native and desired nonnative species.

Aquatic high integrity: Possessing a full complement of native fishes and other aquatic species that are well distributed in high-quality, well-connected habitats.

Hydrologic high integrity: A network of streams where upland, flood-plain, and riparian areas have resilient vegetation; these networks support diverse and productive aquatic and terrestrial environments.

Rangeland high integrity: A mosaic of plant and animal communities; well-connected, high-quality habitat; diverse assemblages of native and desired nonnative species.

THE FINDINGS



Analyzing the data and GIS layers enabled scientists and managers to see the larger stories being played out across the landscape. They could assess the risks and opportunities associated with alternative management strategies. Ecological integrity and socioeconomic resiliency are but two measures that helped explain these larger stories. The information is valuable for future monitoring, research, and planning.

All science findings and the analyses behind them were reviewed by an anonymous, independently selected group of scientists, who double-checked the science findings and the underlying analyses.

Conclusions drawn from the scientific assessment both revealed surprises and confirmed hypotheses.

Ecosystem Management Strategies

Successful management strategies should share three common themes:

1. **Multiple risks to ecological integrity and economic well being must be recognized and managed.**

Risks range from naturally occurring wildfires and floods to human-caused events, including erosion from road building and disturbance from logging and domestic grazing. These different risks exist under any management strategy and they interact, one affecting the magnitude of the other. For example, targeted timber harvest and prescribed burns can reduce the risk of wildfire, but they pose their own direct risks to ecological integrity. Any strategy focusing on the management of only one risk while ignoring the others is certain to generate significant detrimental ecological and economic effects.

Ecosystem management must consider the specific actions being proposed and the ecological consequences and outcomes associated with inaction. Both action and inaction result in changed environments.

2. **Risks and opportunities differ significantly across the project area. Management plans must recognize this variation.**

The area's varied landscape has a multitude of conditions and capabilities. Any landscape strategy dictating a-one-size-fits-all prescription will not take advantage of this reality. A strategy that recognizes and takes advantage of the variability across the landscape will be more successful.

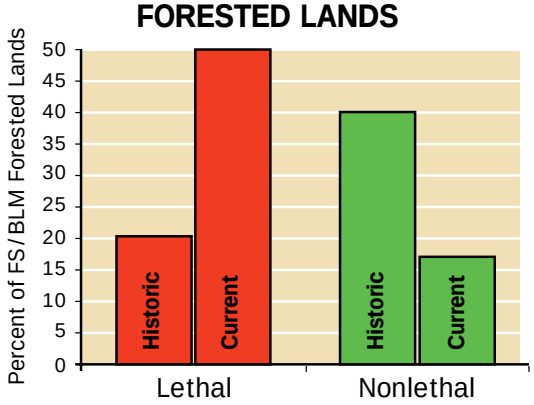
3. **Individual sites are linked to landscapes and landscapes are linked to ecological processes and human activities. These links must be understood and considered.**

Neither a landscape approach nor a site-specific approach alone can be successful. Ecosystem management must consider simultaneously the site, the landscape, and their interactions. In this multiple scale approach, cumulative effects will be managed by identifying and managing risks and opportunities at each scale.

Specific Findings

Landscape Ecology—Fire

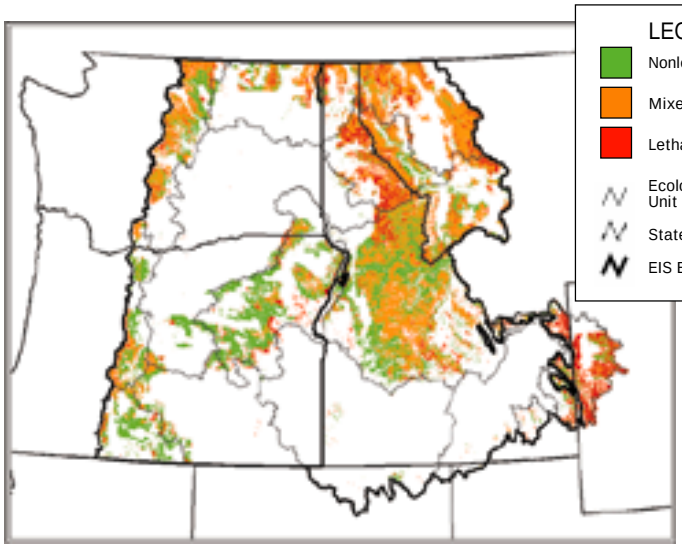
HISTORIC AND CURRENT FIRE SEVERITY ON FS / BLM-ADMINISTERED FORESTED LANDS



In recent times, the acreage with lethal fire regimes has more than doubled. This poses a significant threat to ecological integrity, water quality, species recovery, and homes in rural areas.

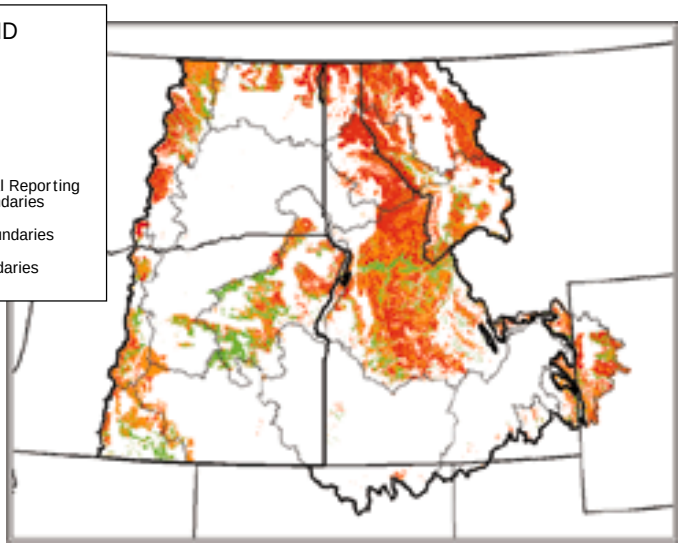
Photo by Tom Iraci

HISTORIC FIRE REGIMES FOR FORESTED POTENTIAL VEGETATION GROUPS

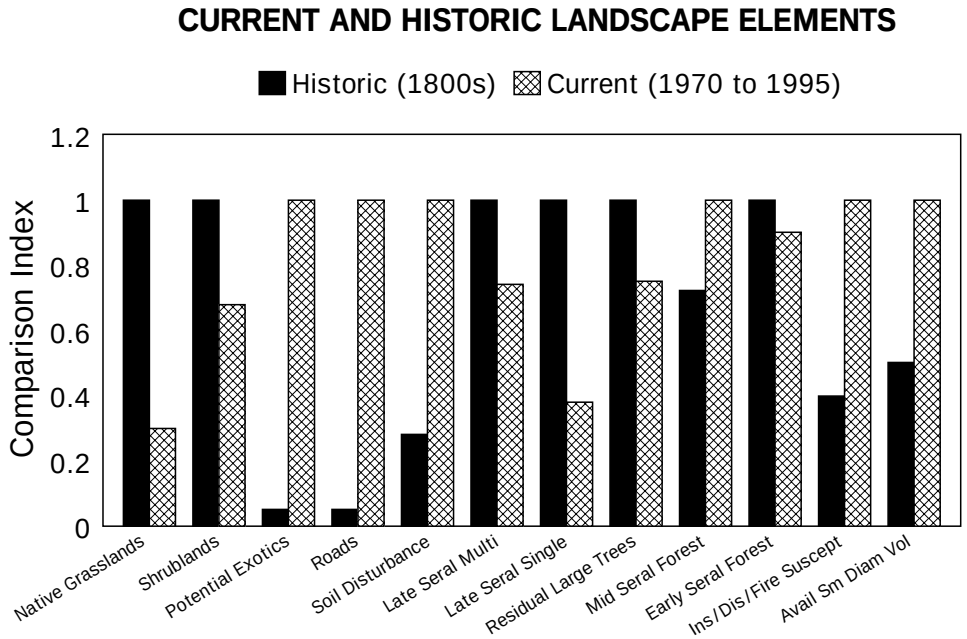


Fire severity and frequency have changed across the landscape. Before Euro-American settlement, most fires in low and mid elevation forests were nonlethal. Forests and rangelands benefited from these frequent, surface fires, which thinned vegetation and favored growth of fire-tolerant trees. Lethal, or stand-replacing fires, played a lesser role on the landscape.

CURRENT FIRE REGIMES FOR FORESTED POTENTIAL VEGETATION GROUPS



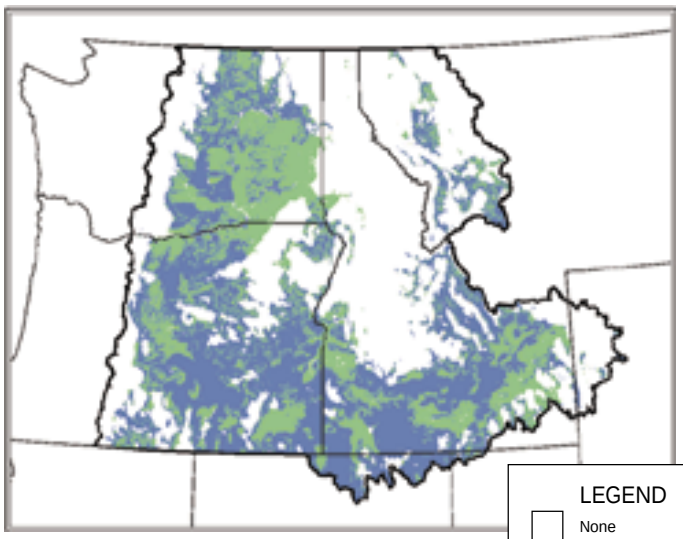
Lethal or stand-replacing fires currently predominate. Lethal fire regimes now exceed nonlethal fire regimes in forested areas. Fire exclusion, livestock grazing, timber harvest, and exotic plant introduction have contributed to these changes.



Several range and forest characteristics have changed dramatically. Highlights:

- *Drought, fire suppression, overgrazing, and logging have contributed to the changes.*
- *Native grasslands and shrublands have declined.*
- *Noxious (exotic) weed spread is expected to accelerate dramatically.*
- *Tree species mix and age classes have changed. Historically, there were more old and mixed age class stands. Now, uniform stands of middle-aged trees predominate.*
- *Much of the timber volume consists of small-diameter trees.*

SUSCEPTIBILITY TO CHEATGRASS INVASION



SUSCEPTIBILITY TO SPOTTED KNAPWEED INVASION

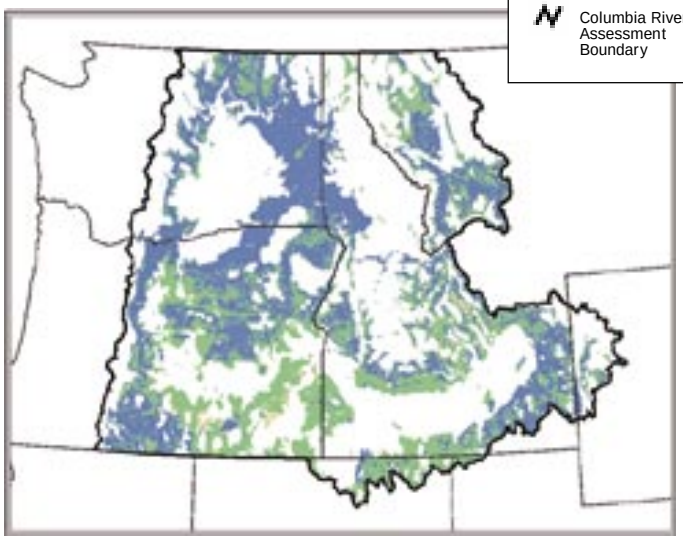


Photo by John Hutmacher

Scientists understood that noxious weeds were a problem in the basin; however, they were surprised that the weeds had invaded so quickly and extensively. Noxious weeds crowd out native grass species, which decreases wildlife habitat and reduces forage for grazing. Cheatgrass and spotted knapweed are but two of the noxious weed species aggressively invading the basin.

HISTORIC KEY SALMONID PRESENCE

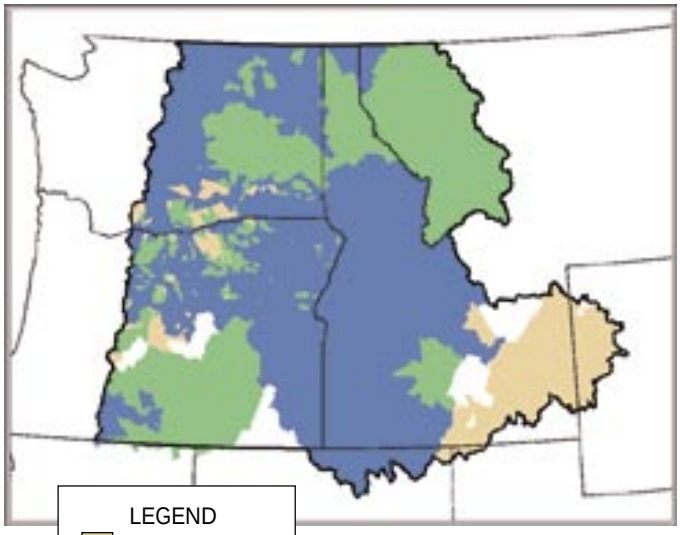
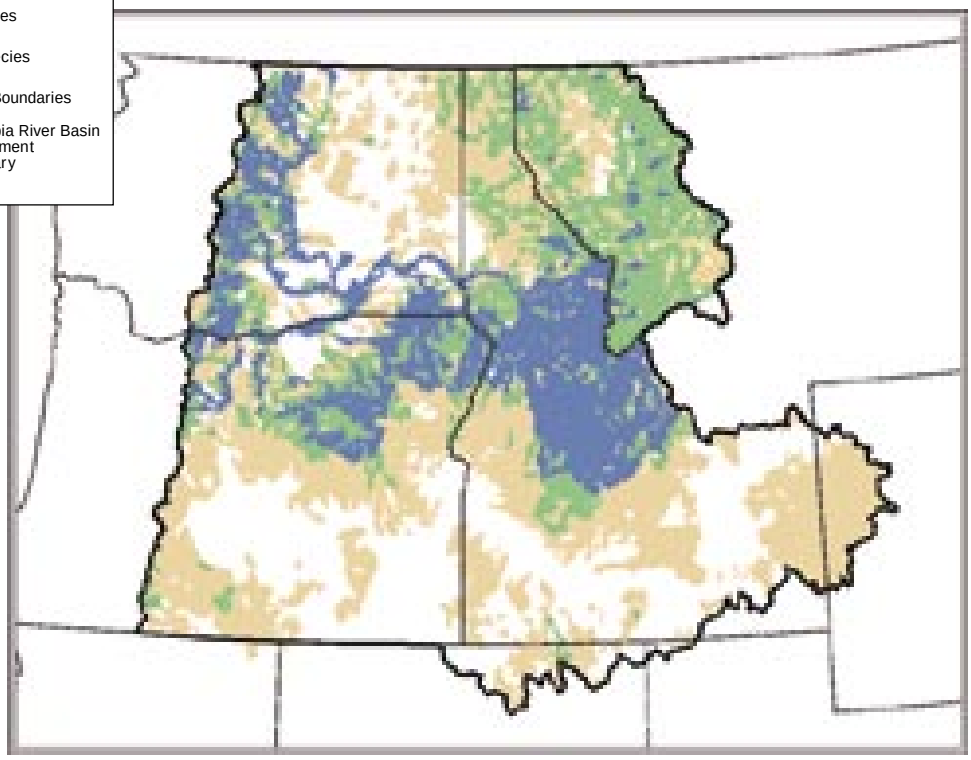


Photo by John Hutmacher

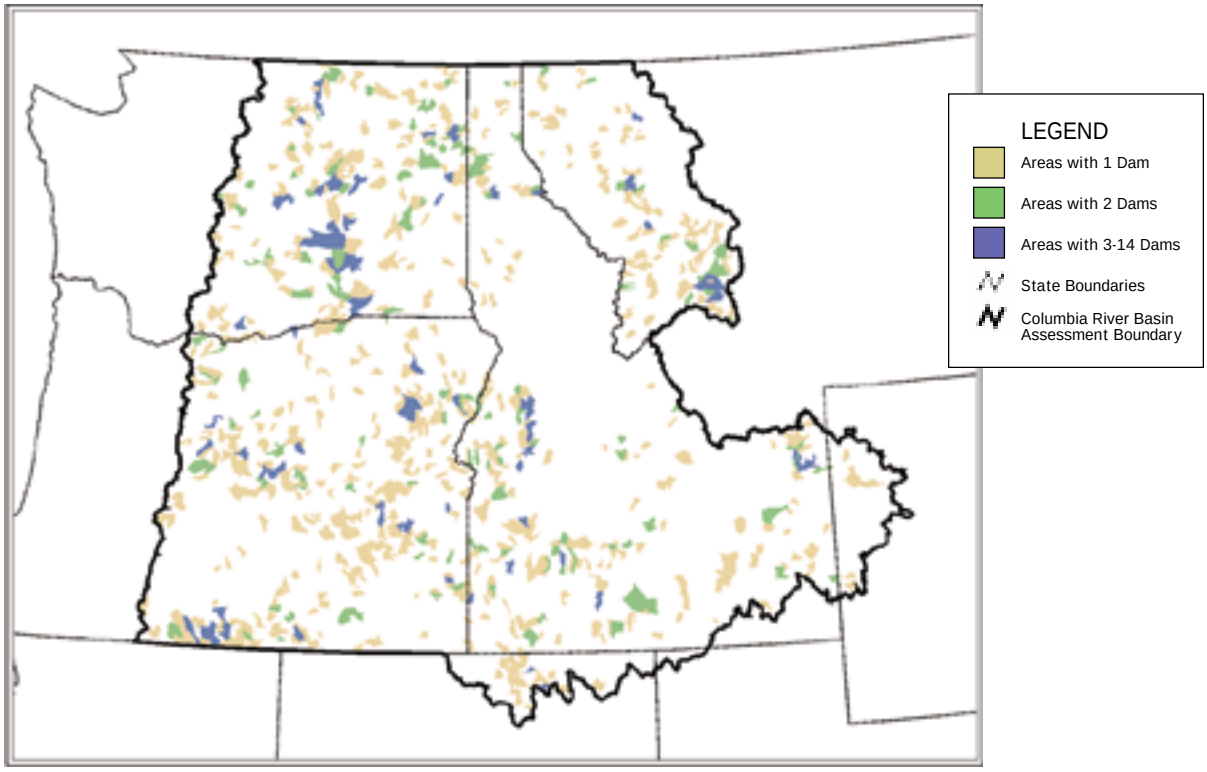
The seven salmonids (spawning trout and salmon) chosen for detailed study were bull trout, westslope cutthroat trout, Yellowstone cutthroat trout, redband trout, steelhead, and both ocean- and stream-type chinook salmon. Prior to Euro-American settlement, their distribution was widespread within the basin. These native species are considered key species for aquatic systems within the basin.

CURRENT KEY SALMONID PRESENCE



The basin has experienced widespread and dramatic change in the composition, structure, and distribution of fish communities. Salmonids occupy a fraction of their historic range. Strong populations inhabit an even smaller area. Depending on the species, strong salmonid populations inhabit between 0.1 and 33 percent of their historical habitat.

DAMS



Habitat, and populations in turn, have declined as a result of dams, agriculture and rangeland conversions, timber harvest, road building, and competition with introduced fish species. Salmonid habitat protection and restoration alone will not ensure future healthy populations. The effects of dams, hatcheries, fish harvest, and introduced fish species also must be addressed.

Much of the native ecosystem has been altered, but core areas remain for rebuilding and maintaining functioning native aquatic systems.

RAINBOW TROUT DISTRIBUTION

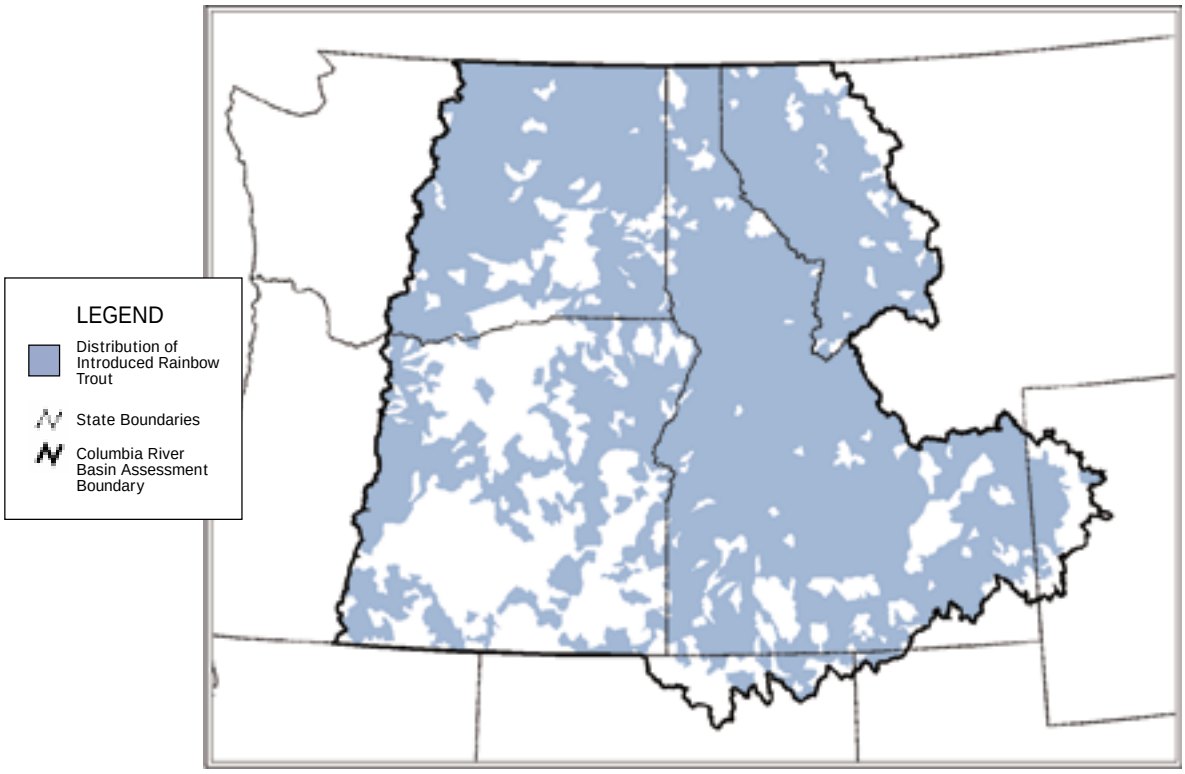


Photo by John Hutmacher

Nonnative fish species are important for recreation and other purposes, yet their presence complicates restoration and maintenance of native fish species. Not only do nonnative fish compete for high-quality habitat, some interbreed with native fish, adversely affecting native genetic stock.

AQUATIC STRONGHOLDS AND AREAS OF PREDICTED ROAD DENSITY

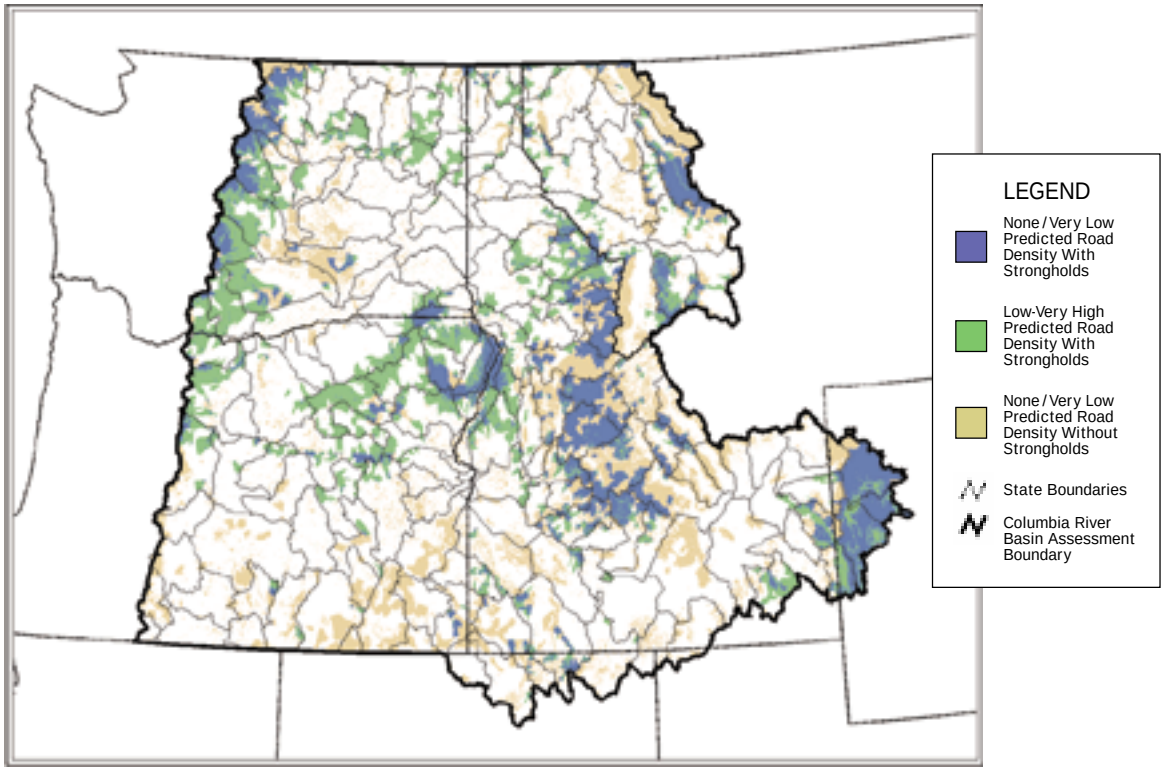
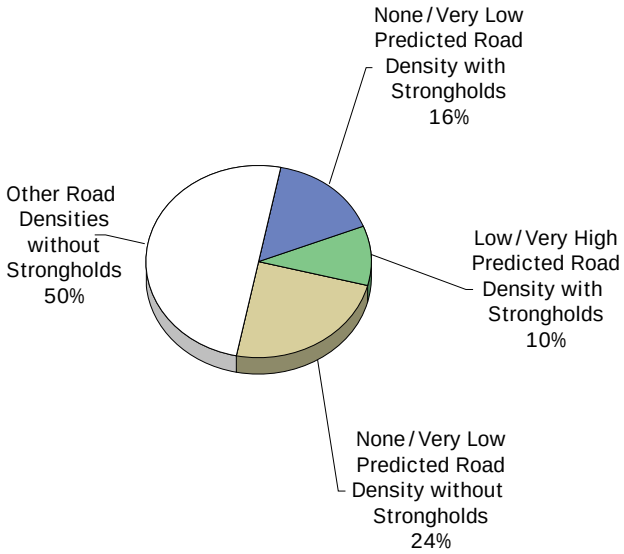


Photo by John Hutmacher

About 58 percent of subwatersheds with the strong salmonid communities have no roads or very low road densities (less than 0.1 mile of road per square mile). The remaining strong populations are generally located in areas with low-density road systems (0.1-0.7 mile of road per square mile). Half of the Forest Service- and BLM-administered areas with low road density have strong populations of salmonids.

AQUATIC STRONGHOLDS AND ACREAGE OF PREDICTED ROAD DENSITY ON FS / BLM-ADMINISTERED LANDS

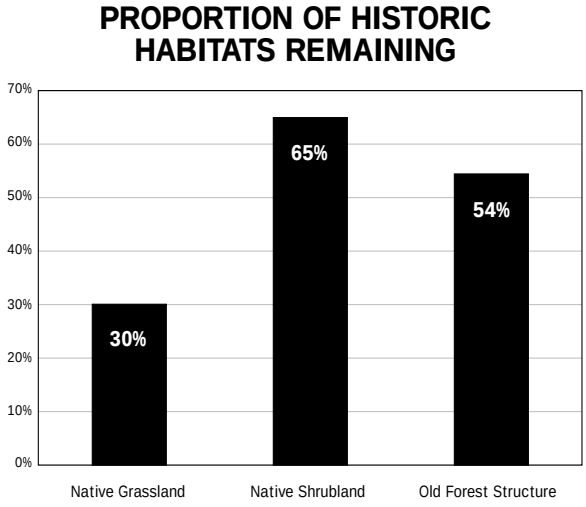


Terrestrial Species

Species associated with old forests, native grasslands, and native shrublands have lost much of their original habitat. Conserving and restoring these habitats will be important for the well being of these species.

Using only a species-specific approach to manage at-risk species is not likely to be successful. A broader, ecosystem approach is necessary. Similarly, a broad scale strategy alone is not likely to conserve all species and their ecological functions. Broad scale analysis will be most effective when combined with mid and fine scale analyses.

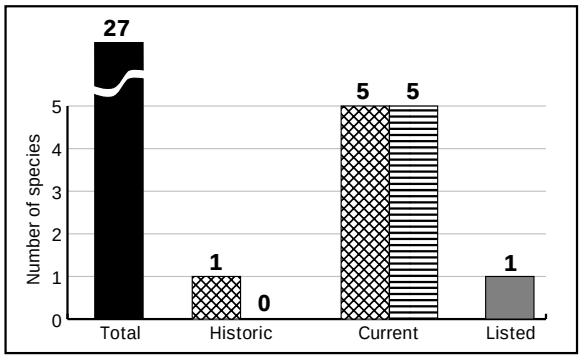
The science team presented criteria by which long-term evolutionary potential of species can be provided, an analysis of prehistoric changes in species communities, and an evaluation of potential effects of regional climate change on species and communities.



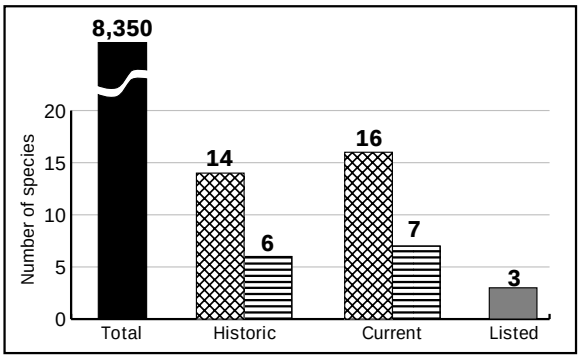
Native grasslands have experienced dramatic declines in terrestrial habitats. The most significant change for native grasslands has been their conversion to agriculture, a societal choice.

Photo by Tom Iraci

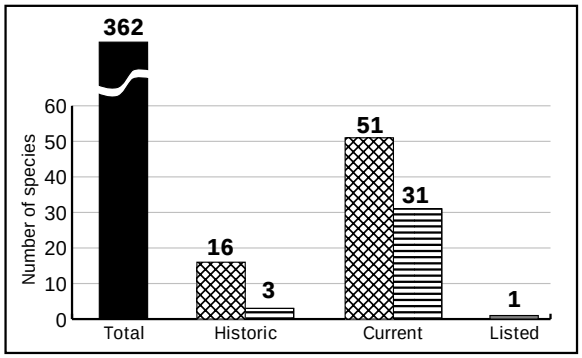
BROADSCALE TERRESTRIAL SPECIES HABITAT STATUS IN THE BASIN



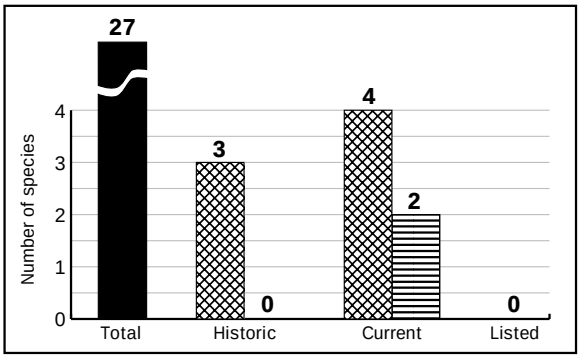
Amphibians



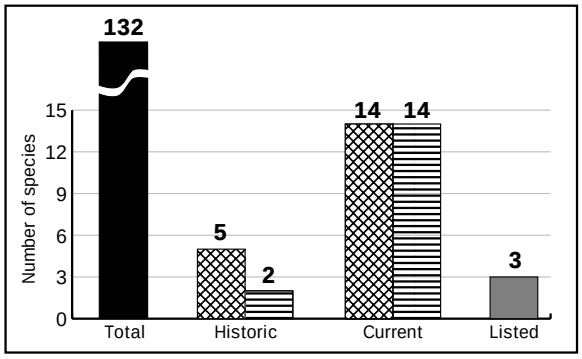
Plants



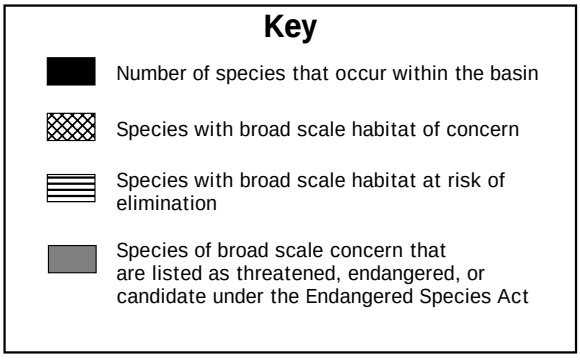
Birds



Reptiles



Mammals



The status of over 8,000 vascular plants and 548 terrestrial vertebrates that occur within the basin was reviewed. Over 150 plant species were of rangewide concern, but only 37 species occur broadly enough to allow analysis at a broad scale. For the vertebrates, 336 were determined not to be of concern due to their abundance and distribution, 39 are distributed so narrowly that analysis at the basin scale was not appropriate, and 173 were analyzed in detail. Of these 37 plants and 173 animals, 39 were scarcely distributed and thus of concern even under historical conditions. Ninety were of concern currently. Of these species of concern, 11 were at significant risk of elimination from broad parts of the basin even under historical conditions. Fifty-nine species are currently considered to be at significant risk of elimination from some or most of the basin.

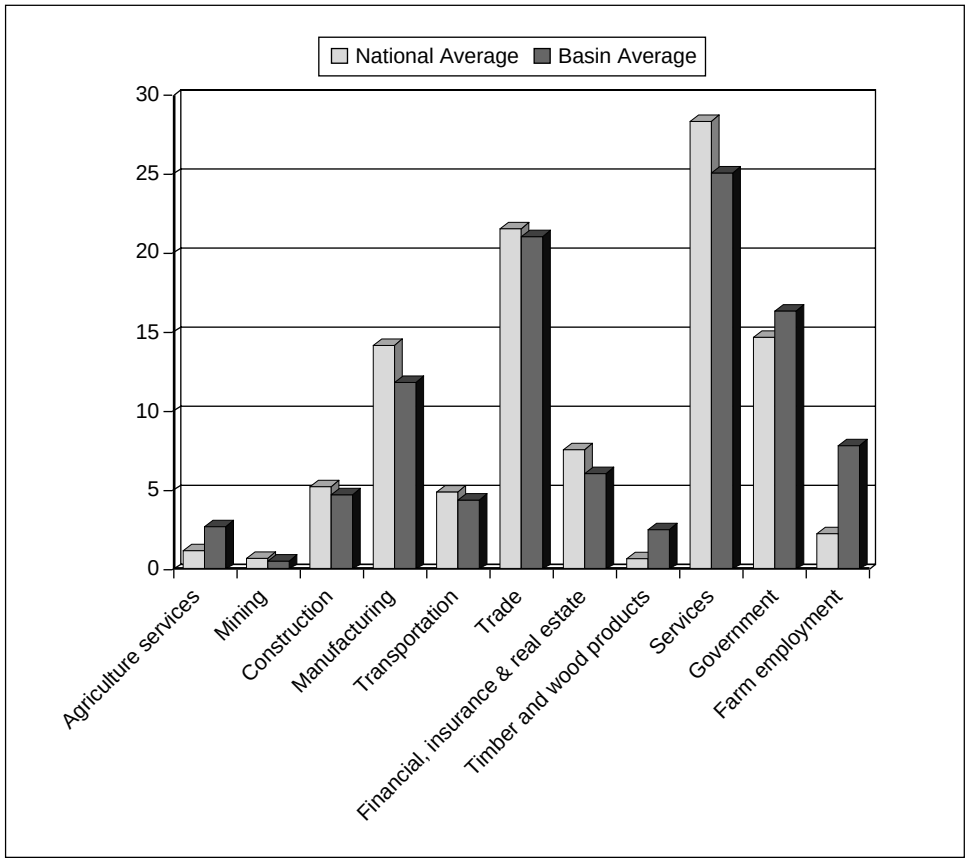
Socioeconomics

The project area's regional economy is healthy, diverse, and adaptable. Natural resource production plays a relatively small role in today's regional economy: just 4 percent of the total area's employment depends directly on timber, grazing, and mining. This is not true for many of the region's highly rural counties, many of which are highly reliant on Federal lands. Additionally, some counties depend on Federal revenue sharing to support infrastructure and social services. Some of these counties and communities within the basin do not have strong, robust economies.

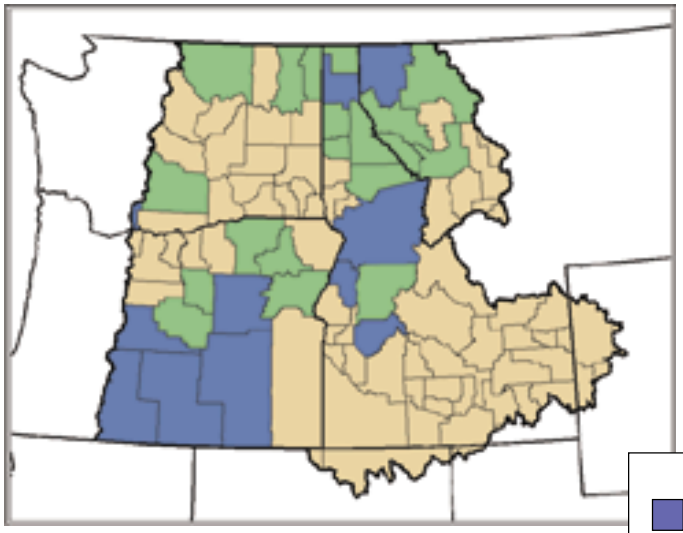
Photo by John Hutmacher

EMPLOYMENT IN ECONOMIC SECTORS IN THE UNITED STATES AND THE BASIN

Employment within the basin is above the national average for agricultural services, timber and wood products, government, and farm employment. Those economic sectors where basin employment is considerably less than the national average include manufacturing, FIRE (finance, insurance, and real-estate), and services.



RELIANCE ON BLM / FS TIMBER HARVEST



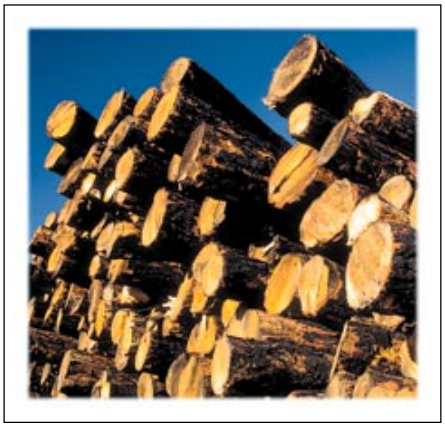
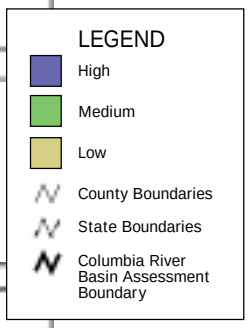
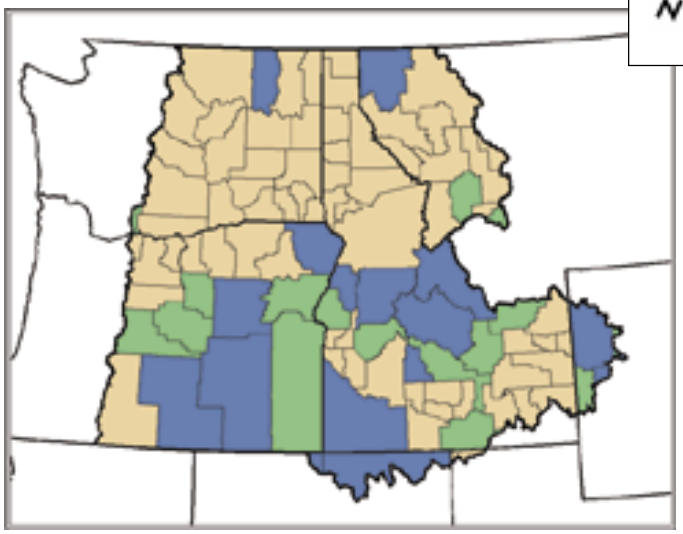


Photo by John Hutmacher



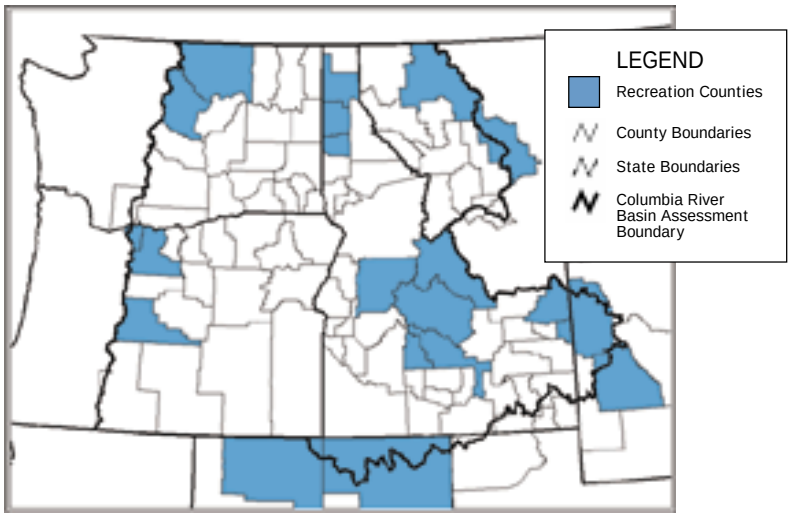
RELIANCE ON BLM / FS FORAGE



Some of the basin's counties are more reliant on Federal grazing and timber than others.

RECREATION COUNTIES

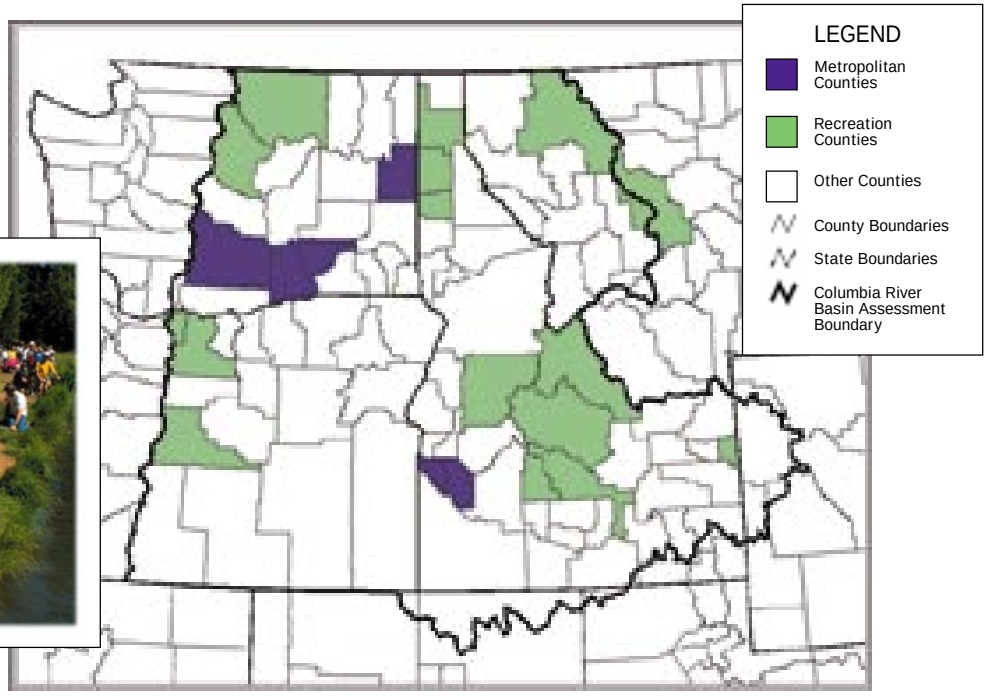
Photo by Tom Iraci



Recreation is becoming increasingly important in the basin. About 40 percent of these Federal lands provide primitive or semiprimitive recreational opportunities.

COUNTIES EXPECTING HIGH POPULATION GROWTH

Photo by John Hutmacher



Population increases are projected for counties that have more recreational opportunities or are associated with metropolitan areas projected to increase in population.

American Indian Peoples

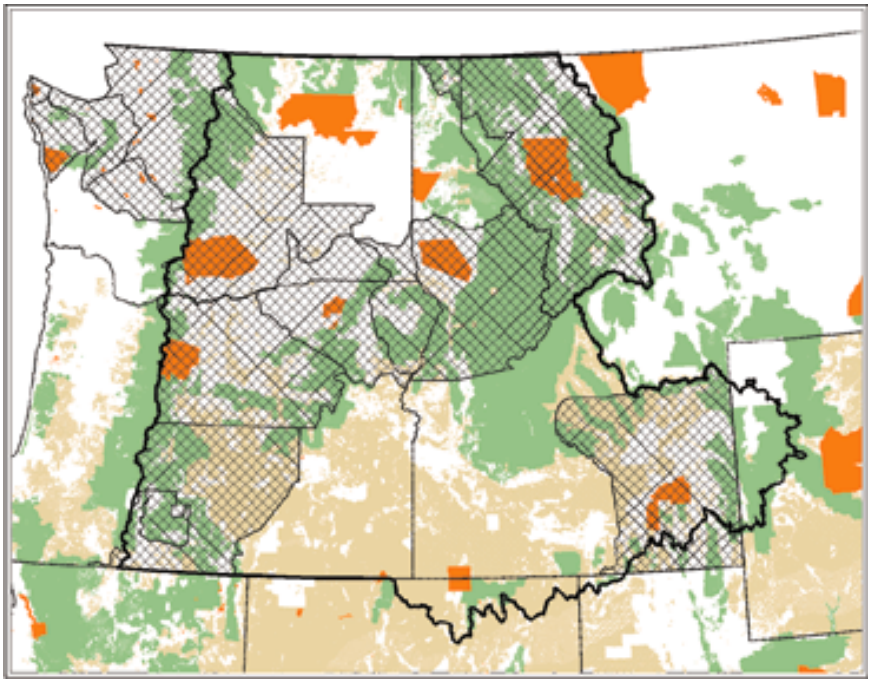
The Federal government holds certain trust responsibilities and obligations to tribes. These are based on various legal agreements, including treaties, which have implications for ecosystem management.

There is a great deal of overlap between issues expressed by American Indians and those voiced by the general public regarding ecosystem management; however, the legal status of American Indians, the sovereignty of tribal governments, and the nature of tribal rights merit separate attention.

There are 22 federally recognized tribes and a number of off-reservation traditional Indian communities that have interest in lands within the project area.

When Federal agencies develop land management plans, American Indians do not view themselves as another "special interest" that needs to be factored in (or traded) with other interests. This has developed into increased tribal participation at all agency planning levels. Strong interest exists among the Indian communities for harvestable, rather than the lower threshold of "viable," populations of fish, wildlife, and plants. The scientific findings include literally hundreds of plant and animal species identified by American Indian communities as being of significance for their customs and culture.

TRIBAL CEDED LANDS



LEGEND

- National Forest System
- Bureau of Land Management
- Indian Reservation Boundaries
- Tribal Ceded Lands
- Tribal Ceded Boundaries
- State Boundaries
- Columbia River Basin Assessment Boundary

Tribes retain special hunting, fishing, and access rights on ceded lands.

Photo by John Hutmacher

Photo by John Hutmacher

THE MANAGEMENT STRATEGY

Another unique aspect of this project is the science-management partnership. Managers are already using selected information gathered during the scientific assessment. The information forms the basis for the Environmental Impact Statements (EISs). These documents will shape the future management of 72 million acres of Forest Service- and BLM-administered lands. Management strategies are being developed in two EISs.

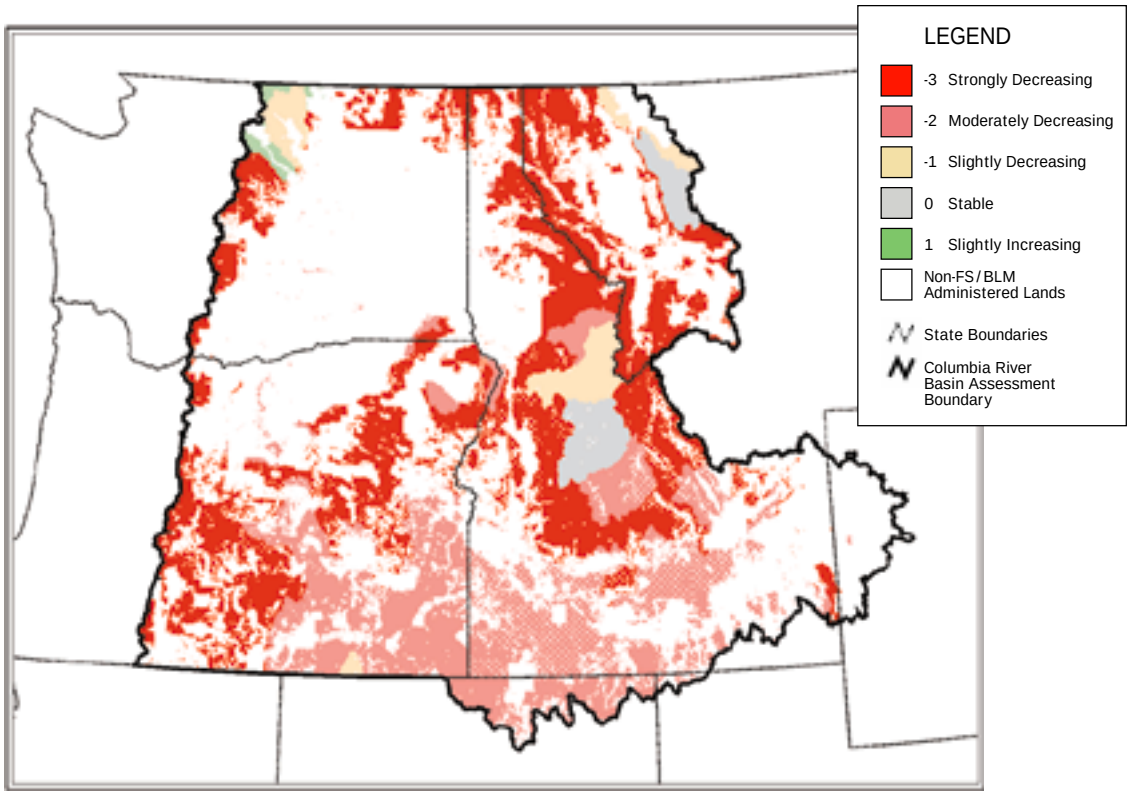
Scientists do not make management decisions. They provide information that helps land managers identify risks and opportunities and determine the consequences of implementing alternative management strategies.

For this scientific assessment, three management options were explored. Scientists projected the outcomes of each option by using historic and current trends and conditions. They also examined interactions among ecosystem components. These options provided useful background information as management alternatives were being developed for the EISs.

It's a question of balance: what the land will allow, what people want, and what society can afford.

Option 1: What if we continued current management?

LONG-TERM TRENDS IN ECOLOGICAL INTEGRITY: MANAGEMENT OPTION 1

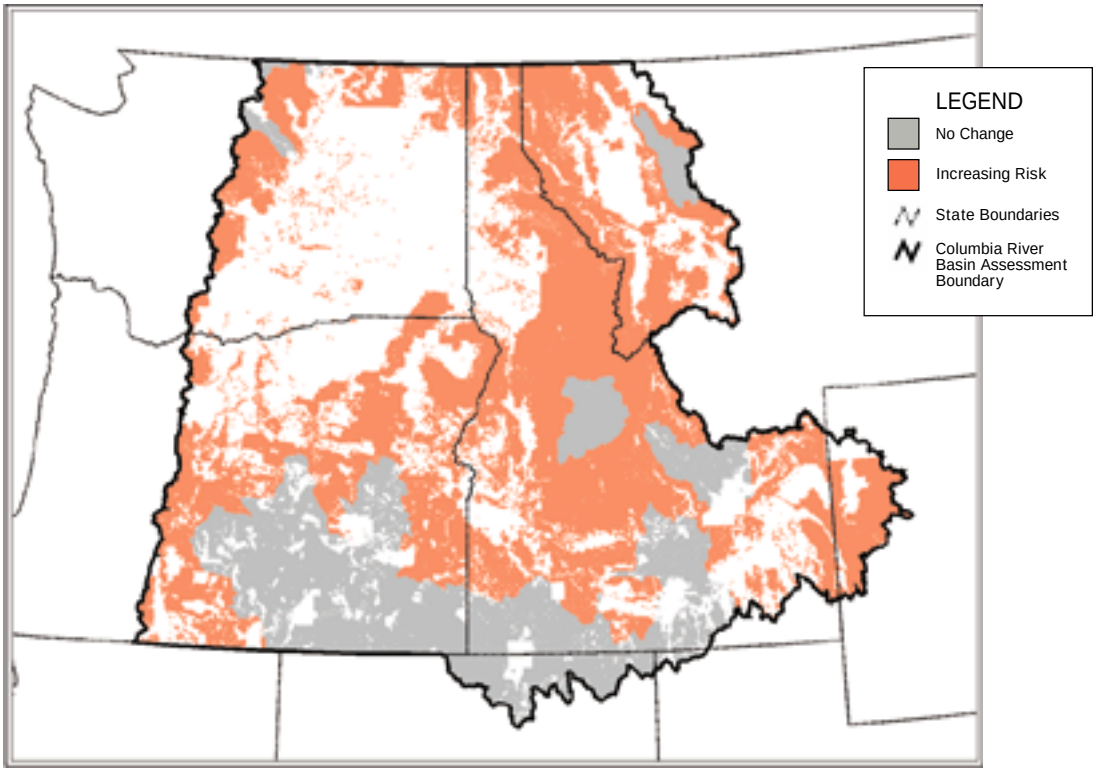


Ecological integrity is projected to mostly decline under this management option.

Under this option:

- Strategies outlined in current land management plans continue.
- It is assumed that funding remains at recent levels.
- No interim direction (such as new riparian management directives) applies.
- Timber and livestock production are emphasized.
- Resources such as wildlife, fisheries, water, and scenery are managed and protected.
- In many areas, management emphasis is focused on wilderness, fisheries, or cultural resources.
- Management strategies are unit specific; there is little emphasis on coordinating management strategies across Forest Service and BLM jurisdictional boundaries.

LONG-TERM TRENDS IN RISK OF HUMAN-ECOLOGICAL INTERACTION: MANAGEMENT OPTION 1



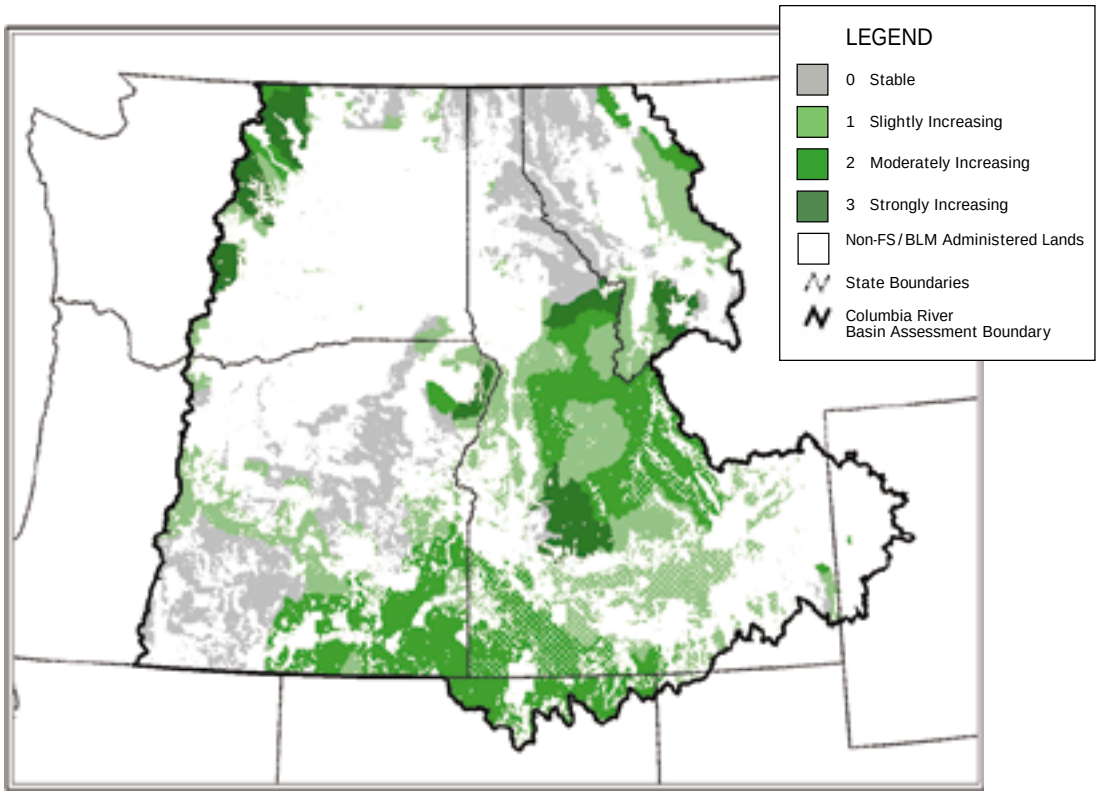
Under this option, humans run a higher risk of adversely affecting the environment through activities such as road building, grazing, and logging. Likewise, the environment has a high likelihood of adversely affecting human assets through catastrophic wildfires and a long-term inability to provide human-desired goods and services.

Effects include:

- Wildfire and smoke occurrence increases.
- Vegetation most susceptible to insects and disease increases.
- Expansion of exotic plants continues.
- Terrestrial habitat continues to decline.
- Aquatic and riparian ecosystem function not maintained.
- Social and economic systems become less predictable.

Option 2: What if we emphasized active restoration?

LONG-TERM TRENDS IN ECOLOGICAL INTEGRITY: MANAGEMENT OPTION 2

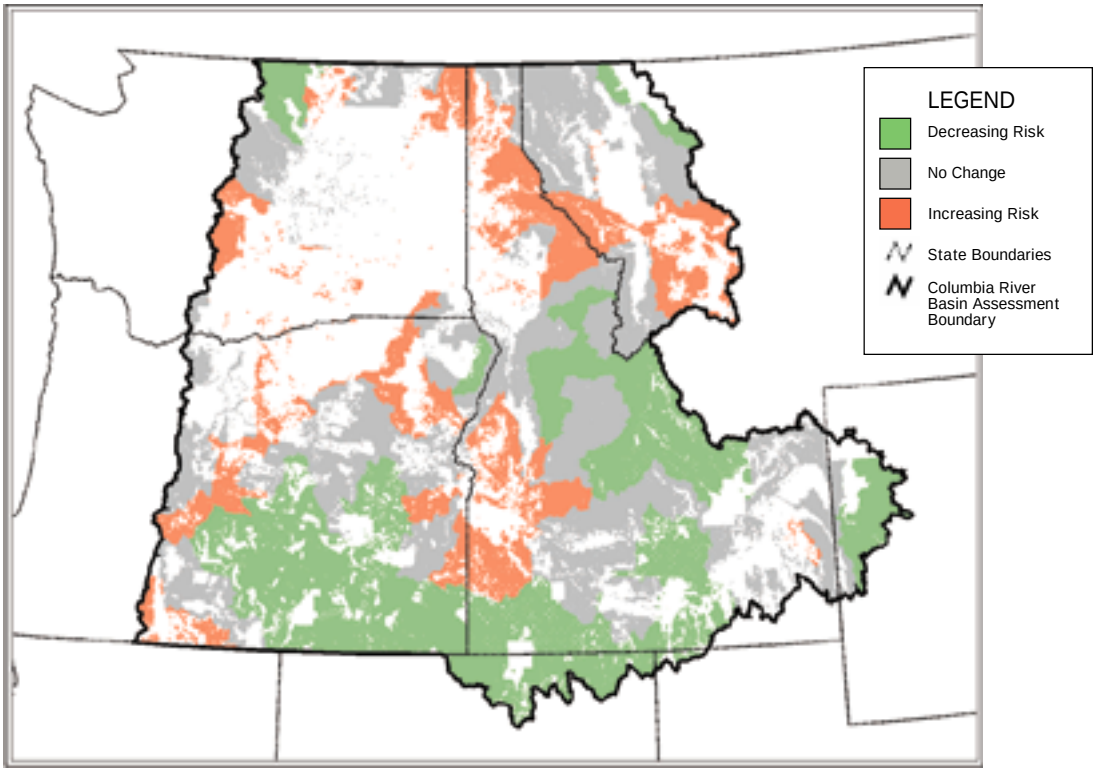


For the most part, ecological integrity improves following restoration activities.

Under this option:

- Reduction of risk to ecological integrity and species viability is emphasized.
- Management practices aggressively restore ecosystem health through strategies resembling natural disturbance processes, such as insects, disease, and fire.
- Healthy ecosystems are better able to meet society's social and economic needs.
- Restoration activities are economically beneficial whenever possible.
- Restoration strategies account for variable conditions across Forest Service and BLM jurisdictional boundaries.

LONG-TERM TRENDS IN RISK OF HUMAN-ECOLOGICAL INTERACTION: MANAGEMENT OPTION 2



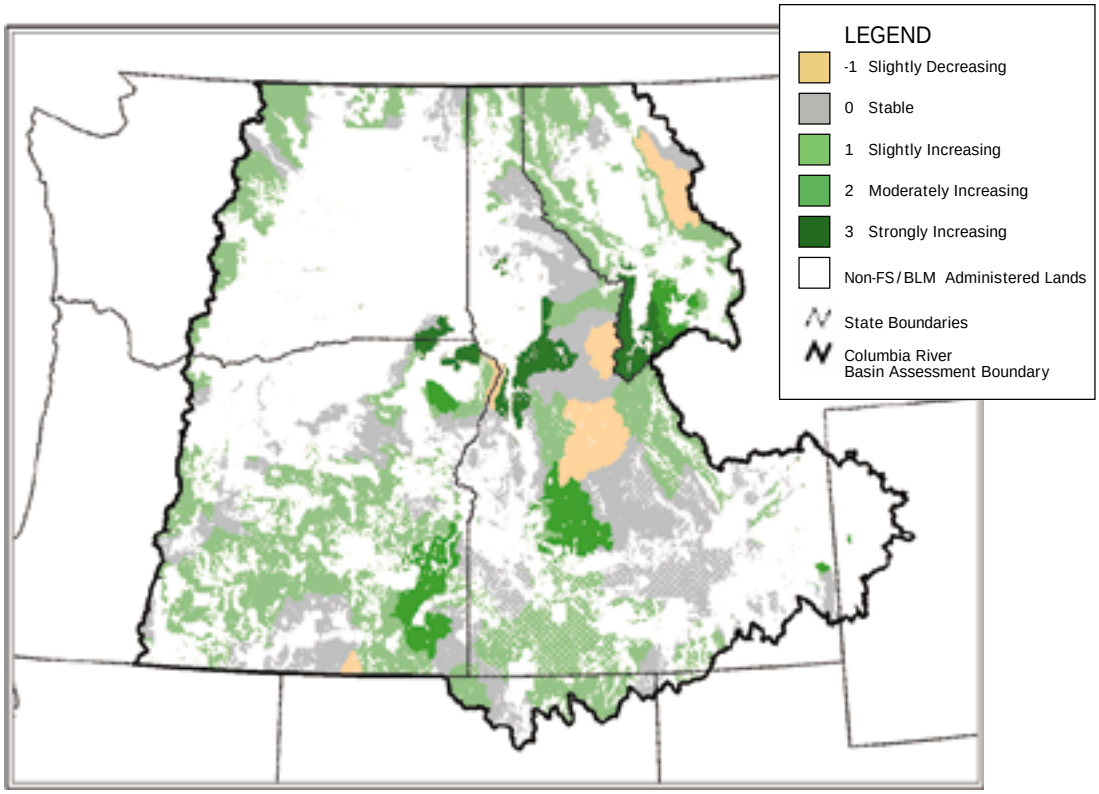
Active restoration activities decrease the severity and frequency of wildfires and other natural disturbances. Human-caused impacts are better aligned with ecological conditions. As a result, this option offers relatively low levels of risk to human assets and the environment.

Effects include:

- Smoke from prescribed fire is increased; wildfire smoke is decreased.
- Smoke timing is changed and total quantity is reduced.
- Vegetation composition and structure are more consistent with inherent disturbance regimes.
- Vegetation susceptible to insects and disease is reduced.
- Exotic plant expansion is curbed, although not stopped.
- Terrestrial species habitat experiences moderate improvements.
- Negative economic impacts may be experienced in 16 timber-reliant counties.
- Riparian areas are maintained; riparian functions are protected.
- Managers have increased flexibility.

Option 3: What if we set aside a system of reserves and allowed nature to heal itself?

LONG-TERM TRENDS IN ECOLOGICAL INTEGRITY: MANAGEMENT OPTION 3

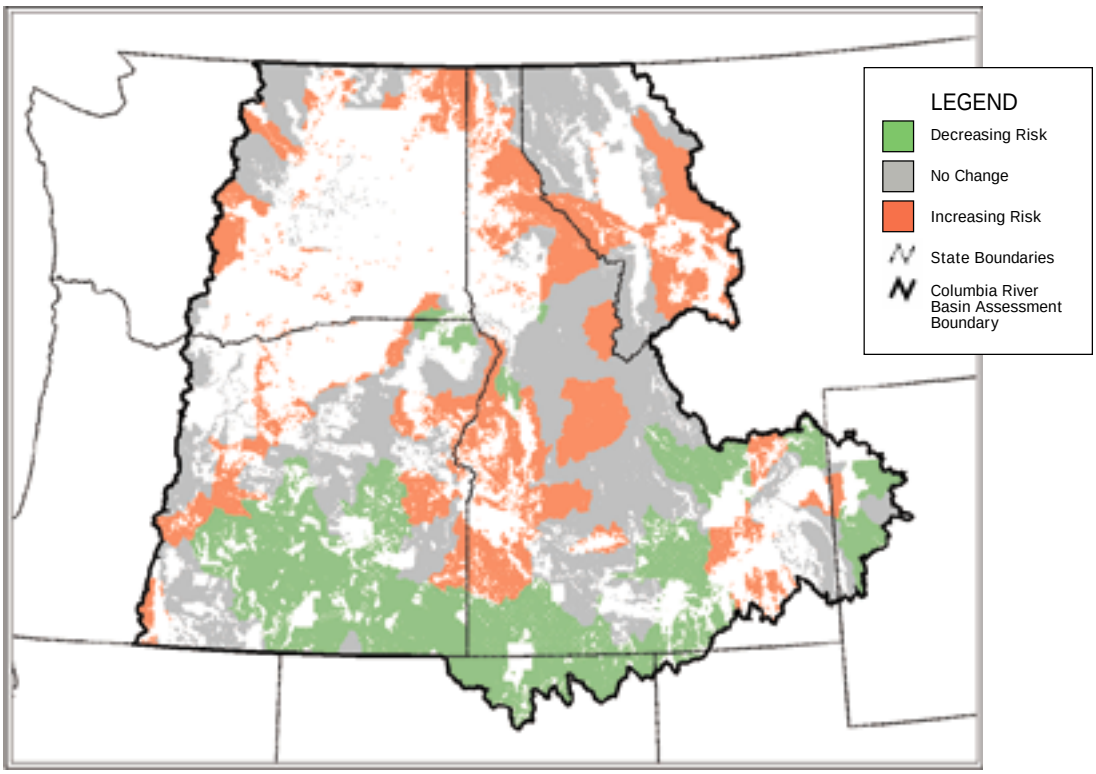


In general, ecological integrity trends improve under option 3.

Under this option:

- All types of vegetation are included in the reserves, which are large enough to contain forest fires and other natural disturbances.
- Reserves encompass Forest Service- and BLM-administered lands only.
- Human use levels within the reserves are relatively low.
- Management inside the reserves occurs only if disturbance events (such as wildfires) are likely to affect adjacent land or management efforts are necessary to achieve long-term goals (such as maintaining threatened or endangered species habitat).

LONG-TERM TRENDS IN RISK OF HUMAN-ECOLOGICAL INTERACTION: MANAGEMENT OPTION 3

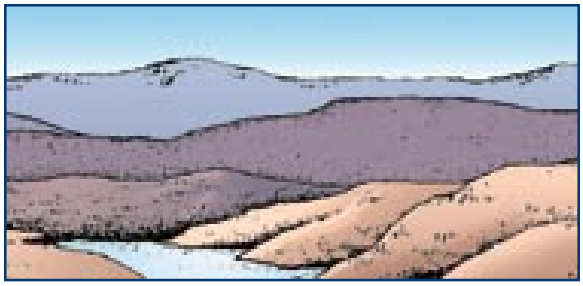


On one hand, decreased human activity within the reserves will reduce the risk of ecological damage. On the other hand, the lack of restoration activities within the reserves makes them susceptible to wildfire and other natural disturbances. As a result, the risk to both human assets and the environment would increase in some areas.

Effects include:

- Large wildfire potential increases, even with fire suppression efforts, which poses risk for people in adjacent areas.
- Vegetation susceptible to insects and disease is increased.
- Exotic plant species continue to expand.
- Terrestrial species habitat experiences moderate improvements.
- Negative economic impacts are experienced in some timber-reliant counties and some grazing-reliant counties.
- Riparian areas and riparian functions are mostly maintained.

THE NEXT STEPS



Filling Science Gaps

The scientific assessment brought information together, giving us a better understanding of the ecosystem and its conditions. It also highlighted significant gaps in our understanding. As a result, future research and development will be focused in areas such as:

- Determining how disturbance processes, such as wildfires and floods, affect ecological integrity
- Developing conservation and restoration strategies for rare aquatic and terrestrial species
- Evaluating short- and long-term relative risks of active and passive management
- Developing basic studies on taxonomy, occurrence, distribution, and life history of most organisms, especially plants and invertebrates
- Determining how providing goods and services can be managed in concert with ecological integrity
- Understanding how rangeland integrity can be restored in concert with livestock production

Technology Transfer

A lasting legacy of this project will be the information, databases, and GIS data. The data are currently being shared with the public and agencies. The information is also being made available on the Internet and in workshops, public meetings, and scientific publications.

Quigley, Thomas M.; Bigler Cole, Heidi, 1997. Highlighted scientific findings of the Interior Columbia Basin Ecosystem Management Project. Gen. Tech. Rep. PNW-GTR-404. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; U.S. Department of the Interior, Bureau of Land Management. 34 p.

Decisions regarding 72 million acres of Forest Service- and Bureau of Land Management- administered lands will be based on scientific findings brought forth in the Interior Columbia Basin Ecosystem Management Project. Some highlights of the scientific findings are presented here. The scientific assessment highlighted a wide variety of risks important to ecological and socioeconomic systems. It also brought forth numerous opportunities to restore ecological systems and provide goods and services. To realize the opportunities, managers must recognize and manage the risks. Three management options were analyzed: current direction, active restoration, and reserve system establishment. Analysis revealed that active restoration was effective in addressing basinwide risks and opportunities.

Keywords: Ecosystem management, ecosystem assessment, ecological integrity, socioeconomic resiliency, risk management.

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