Framework for Ecosystem Management in the Interior Columbia River Basin

WORKING DRAFT--Version 1

Subject to Revision and Change

May 1994

Prepared by

SCIENTIFIC INTEGRATION TEAM
Eastside Ecosystem Management Project
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The Forest Service of the U.S. Department of Agriculture is dedicated to the principal of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives - as directed by Congress - to provide increasingly greater service to a growing nation. The U.S. Department of Agriculture is an Equal Opportunity Employer. Applicants for all Department programs will be given equal consideration without regard to age, race, color, sex, religion, or national origin.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

EASTSIDE

ECOSYSTEM MANAGEMENT PROJECT

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May 3, 1994

In a letter dated January 21, 1994, the Chief of the USDA Forest Service and the Director of the USDI Bureau of Land Management initiated the Eastside Ecosystem Management Project. The lead paragraph in that letter described the essence of the assignment:

"In May 1993, a team led by Forest Service scientist Dr. Richard Everett completed an 'Eastside Forest Ecosystem Health Assessment.' In July, as part of his plan for ecosystem management in the Pacific Northwest, President Clinton directed 'the Forest Service to develop a scientifically sound and ecosystem-based strategy for management of eastside forests', and further stated that the 'strategy' should be based on the forest health study recently completed by agency scientists as well as other studies. To further elaborate and extend this charge, we are jointly directing that an ecosystem management framework and assessment be developed for lands administered by the Forest Service and the Bureau of Land Management on those lands east of the Cascade crest in Washington and Oregon and within the interior Columbia River Basin."

The Charter, attached to the above-mentioned letter, provides detailed direction on expectations for the products and process of the Eastside Ecosystem Management Project. The Science Integration Team is tasked with the development of an ecosystem management framework. This framework is to include recommended principles and processes the Forest Service and Bureau of Land Management might use in ecosystem analysis, planning, and management at all levels within the Basin. Action on development of an ecosystem management framework did not just begin with the initiation of the Eastside Ecosystem Management Project. Considerable thought, writing, and discussion has occurred prior to this project. A workshop sponsored by the Regional Planning Directors for R-1, R-4, and R-6 of the Forest Service was held in Missoula, Montana in early December 1993 to address a framework for broad-scale assessments. Information from this workshop proved valuable in the current effort. The Eastside Ecosystem Management Project held a workshop designed to assist in development of the framework. We express appreciation to all who have contributed throughout this process.

We are now making available the "Framework for Ecosystem Management in the Interior Columbia River Basin, Working Draft--Version 1" dated May 1994. It is made available, not because it is ready for wide-spread use, but because we believe our early thinking should be shared. We are seeking to initiate a dialog with managers, the broader scientific community, and the public on principles and processes for ecosystem management within the Columbia River Basin. We are anticipating considerable interaction with interested persons about this version. Our belief is that when version 2 is printed in mid-July, the framework will look considerably different. In fact we readily admit that portions of this fall short of our own expectations. We welcome constructive thoughts so that future versions will more nearly reflect the full complement of recommended principles and processes at all scales within the Columbia River Basin.

Written comments are welcome any time during our process. Please address your written comments with "Attention: Framework" on the letter. Those letters received by June 15, 1994, will provide us ample opportunity to consider them prior to version 2 being printed. The Framework will remain a "working draft" until November 1, 1994. Any written comments on the working draft will be considered up to early October. We plan to provide a "draft" on or about November 1, 1994. A final version will be published as a scientific publication, subject to scientific review, in early winter 1995.

Thomas M. Quigley, for
SCIENCE INTEGRATION TEAM
Eastside Ecosystem Management Project

Preface

The preface of the Framework sets the proper context for interpreting what is provided in "Working Draft--Version 1" of the Framework for Ecosystem Management. We initially describe where we are in the overall process of meeting our charge within the Eastside Ecosystem Management Project. This includes providing some background descriptions of the status of the framework and our expectations as the project progresses. We next provide the content of the direction the Chief of the Forest Service and the Director of the Bureau of Land Management have given us. This is in the form of a letter dated January 21, 1994, and the Eastside Ecosystem Management Project Charter. We have provided them in their entirety, so that our assignment might be understood by readers, reviewers, and users of the framework.

The Science Integration Team is tasked with the development of an ecosystem management framework. This framework is to include recommended principles and processes the Forest Service and Bureau of Land Management might use in ecosystem analysis, planning, and management at all levels within the Basin. Action on development of an ecosystem management framework did not just begin with the initiation of the Eastside Ecosystem Management Project. Considerable thought, writing, and discussion has occurred prior to this project. A workshop sponsored by the Regional Planning Directors for R-1, R-4, and R-6 of the Forest Service was held in Missoula, Montana in early December 1993 to address a framework for broad scale assessments. Information from this workshop proved valuable in the current effort. The Forest Ecosystem Management Assessment Team report has also provided considerable useful information.

We, as a Science Integration Team, are well aware of the significance of the Eastside Ecosystem Management Project and the potential it has to lead the way for change in resource management on Federally managed lands. We are dedicated to an open and evolving process. It is exciting and, at times, frustrating to work with a process that is not clearly defined at the outset. In trying to maintain an open atmosphere for our work, we decided to provide the framework in a "working draft" format early in the Project. The "working draft" concept allows the framework to adapt as the project progresses and more is learned.

The process of getting this version of the framework prepared involved many people. The Eastside Ecosystem Management Project held a workshop designed to assist in development of the framework. We had over 60 people engaged with us for several days in late March 1994 in Walla Walla, Washington. These people came from a wide spectrum of scientific, management, and public participation understanding. One public workshop involved over 100 persons in providing input and concepts. We express appreciation to all who have contributed throughout this process. It became apparent in late March that a small group of Science Integration Team members could more effectively bring the Framework to the working draft stage. We assigned a small working group, consisting of Russell Graham, Kristine Lee, Amy Horne, Paul Hessburg, and Steve McCool, to take the lead in drafting the actual document and incorporating comments. This current version is largely a result of their collective efforts in bringing together the results of the workshops, comments, input received to date, and other sources of information. The entire list of contributors is very large and won't be attempted here. We express our appreciation to all who contributed in anyway to this version.

We are now making available the "Framework for Ecosystem Management in the Interior Columbia River Basin, Working Draft - Version 1" dated May 1994. It is made available, not because it is ready for wide-spread use, but because we believe our early thinking should be shared. We are seeking to initiate a dialog with managers, the broader scientific community, and the public on principles and processes for ecosystem management within the Columbia River Basin. We are anticipating considerable interaction with interested persons about this version. Our belief is that when version 2 is printed in mid July 1994 the framework will look considerably different. In fact we readily admit that portions of this fall short of our own expectations. We welcome constructive comments so that future versions will more nearly reflect the full complement of recommended principles and processes at all scales within the Columbia River Basin.

Direction from the Chief of the Forest Service and Director of the Bureau of Land Management

Reply to: BLM: 1736
Date: Jan. 21, 1994
FS: 1400, 1900

Subject: Eastside Ecosystem Management Strategy Charter

To: BLM: State Directors, OR/WA, ID, MT
FS: Regional Foresters, R-1, R-4,
R-6 Station Directors, PNW, INT/RM

In May 1993, a team led by Forest Service scientist Dr. Richard Everett completed an "Eastside Forest Ecosystem Health Assessment." In July, as part of his plan for ecosystem management in the Pacific Northwest, President Clinton directed "the Forest Service to develop a scientifically sound and ecosystem-based strategy for management of eastside forests", and further stated that the "strategy" should be based on the forest health study recently completed by agency scientists as well as other studies. To further elaborate and extend this charge, we are jointly directing that an ecosystem management framework and assessment be developed for lands administered by the Forest Service (FS) and Bureau of Land Management (BLM) on those lands east of the Cascade crest in Washington and Oregon and within the interior Columbia River Basin (CRB).

We have jointly decided that the processes outlined in the Interim CRB Assessment and Eastside Ecosystems Management Strategy Project Charter are essential steps leading to sound management decisions. We, and our respective line officers, will use the science products (framework, assessment, and evaluation of alternative EM Strategies) derived from this process as input into our decision making processes. Line officers within the BLM and FS will develop management direction using the science products as a portion of the total input considered in developing such direction.

We have been motivated to request these products because management of the public resources within the interior CRB require new direction that is based on ecosystem concepts within the context of the larger Basin. Recent advances in our understanding of ecosystem principles, cumulative effects, biophysical interactions, and concerns of ecosystem integrity and species viability, point to the need to undertake the studies outlined in the Charter. Since current land and resource plans were signed, new information and changing conditions require a re-evaluation of management direction.

Therefore, updated management directions are needed for the Eastside National Forests and some lands administered by the Bureau of Land Management. From an ecosystem standpoint, an overall assessment is needed for the interior Columbia River Basin, so that management decisions can be made within this larger context.

Recognizing that ecosystems encompass lands that cross jurisdictions, and actions taken on lands administered by one agency affect outcomes on lands administered by another, there must be shared vision, commitment, and leadership among agencies in development of ecosystem management strategies and their implementation. The Forest Service is to take the lead responsibility in assembling the appropriate interagency structures and processes to accomplish this assignment. This includes invitations to State governors and tribal government leaders, local governments, key interested parties and affected parties, and other Federal and State agencies to participate in the process.

As part of this assignment, Jeff Blackwood, Forest Supervisor on the Umatilla National Forest, will assume the responsibilities of Project Manager for the project. Patrick Geehan will be the BLM Project Coordinator. Thomas M. Quigley, Manager, Blue Mountains Natural Resources Institute, will be the Science Team Leader, and George Pozzuto, District Ranger on the Lake Wenatchee Ranger District, will be the EIS Team Leader. Patty Burel, Public Affairs Officer for the Blue Mountain Natural Resource Institute, will be the Communications Team Leader. Kay Pennel and Cathy Weise will provide administrative support. Teams and activities will be located in Walla Walla, Washington. Team leaders will need your cooperation and support in filling needed positions and completing the project.

As further direction, we refer to several key points made by Assistant Secretary James Lyons in announcing the intent of the Forest Service to develop a new management strategy for national forests in eastern Oregon and Washington. The strategy will:

* be based on ecosystem management concepts;
* focus on restoring the health of forest ecosystems;
* be scientifically sound and ecosystem based;
* be based on the forest health study recently completed by agency scientists and other studies;
* be a multi-agency effort involving the public in an open process; and
* link with the development of a draft environmental impact statement to be completed by spring or summer of 1994.

Development of a scientifically sound and ecosystem-based management strategy for eastern Oregon and Washington will require (1) a framework for ecosystem management for the entire interior Columbia River Basin, and (2) a broad assessment of ecosystem processes and functions, species, social systems, and economic systems within the Basin.

This should lead to the development of an EIS useful to both the Forest Service and Bureau of Land Management that would result in decisions for implementing the strategy. The EIS would include the development of a wide array of alternative strategies for eastern Oregon and Washington and an evaluation of the consequences of each alternative based on the best technical and scientific information available. The EIS will be presented to the responsible federal decision makers for appropriate action.

Upon completion of each product, line officers within the Forest Service and BLM will consider the recommendations and make decisions to modify or retain existing management direction. The ultimate decision to adopt or reject the recommendations resides with us and our appropriate line officers. We will use the scientific information to enhance our understanding of trade-offs, interactions, consequences, and potential results. We will be issuing decision documents, policy statements, and other policy direction as we deem appropriate through the life of the Charter and following its completion.

Attached is the initial charter and summary of products we expect the team to produce over the next 9-12 months.

/s/ Jack Ward Thomas

JACK WARD THOMAS
Chief, Forest Service

/s/ Jim Baca

JIM BACA
Director, USDI Bureau of Land Management

INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT FRAMEWORK AND ASSESSMENT
and
EASTSIDE OREGON AND WASHINGTON ECOSYSTEM MANAGEMENT STRATEGY PROJECT CHARTER

"Eastside Ecosystem Management Project Charter"

Definitions

"Interior Columbia River Basin" includes lands in the continental United States tributary to the Columbia River east of the crest of the Cascade Mountain Range. For purposes of this Charter, the terms "Basin-wide" and "Basin" are interchangeable with "Interior Columbia River Basin". This will include portions of Forest Service Regions 1, 4, & 6 and portions of lands administered by the Bureau of Land Management (BLM) in Oregon, Washington, Idaho, and Montana.

"Eastside," in this charter, refers to the National Forests and appropriate BLM administered lands in eastern Washington and Oregon lying east of the crest of the Cascade Mountain Range. This may also include lands managed by other federal agencies within this geographic area.

Situation

Since forest plans were established in eastern Washington and Oregon in 1989 and 1990, a number of scientific and administrative studies have been conducted generating new information relevant to National Forest management. In July 1993, as part of his plan for ecosystem management in the Pacific Northwest, President Clinton directed "the Forest Service to develop a scientifically sound and ecosystem-based strategy for management of eastside forests," and further stated that the "strategy" should be based on the forest health study recently completed by agency scientists as well as other studies.

The Forest Service and BLM are considering implementing the interim direction to conserve Pacific Salmon throughout their range in Oregon, Washington, Idaho, and California. This interim direction will be followed by development of a long-term management strategy to address this issue in these states as well as Alaska. This Charter identifies, as a minimum, initial studies and plans appropriate to implement the Anadromous Fish Habitat and Watershed Conservation Strategy (formally called "PACFISH") within the interior Columbia River Basin.

The combined tasks of developing an ecosystem management strategy and implementing the Anadromous Fish Habitat and Watershed Conservation Strategy, necessitate an overall framework to guide planning for ecosystem management within the Interior Columbia River Basin. Additionally, a Basin-wide scientific assessment is needed. It should examine the ecologic, economic, and social systems, looking at current as well as historic conditions, and the probability that outcomes associated with current practices and trends will result in change within the systems it will provide essential information for evaluating and implementing ecosystem management within the Basin.

Ecosystems transcend administrative boundaries. The evaluations undertaken will use available data where appropriate or applicable. This effort is not intended to request new data from private land owners, enter their lands, or otherwise establish direction for management of those lands.

Project Expectations

Implementing an ecosystem management strategy will require the development of several products. Two initial studies will include a Basin-wide scientific framework and a Basin-wide scientific assessment. The interior Columbia River Basin (CRB) ecosystem management scientific framework will provide the broad concepts and analytical processes recommended for ecosystem analysis, planning, and management. The interior CRB scientific assessment will examine historic and current ecologic, economic, and social systems and discuss probable outcomes if current management practices and trends continue.

Drawing from the concepts and principles of the Basin-wide scientific framework and information from the Basin-wide scientific assessment and the environmental impact statement (EIS) scoping response, an EIS will be developed for the eastside National Forests that will array a variety of ecosystem management strategies for management of lands administered by the Forest Service and a portion of the Bureau of Land Management lands in eastern Oregon and Washington. The EIS will, as a minimum, address the Anadromous Fish Habitat and Watershed Conservation Strategy recommendations. This EIS will be supported by a scientific evaluation of the issues and alternatives identified by the National Environmental Policy Act (NEPA) scoping and public involvement process. The decision document(s) resulting will address the management of affected BLM and Forest Service managed lands. It is anticipated that similar decision documents will be issued in Idaho and portions of California, although the nature of the decisions in addition to the Anadromous Fish Habitat and Watershed Conservation Strategy for those states has not yet been determined. The Anadromous Fish Habitat and Watershed Conservation Strategy will be considered in Forest plan revisions and BLM resource management plans in Alaska. The decision documents and processes for those states will be done in a coordinated manner among the Regions and Districts involved. Through these activities, a Basin-wide framework for ecosystem management and a Basin-wide assessment of resource conditions should result in a comprehensive, coordinated approach to resource management within the Basin.

The Forest Service and Bureau of Land Management are proceeding as outlined in this Charter with the full expectation of bringing in other federal agencies (for example, Environmental Protection Agency, Fish and Wildlife Service, National Marine Fisheries Service, and Soil Conservation Service) as cooperators in the process.

The EIS process proposed in this Charter will provide a basis for the Forest Service and BLM to make decisions to amend or revise current land management plans for ecosystem management strategies on the National Forests and participating Bureau of Land Management lands of eastern Oregon and Washington. It is assumed that scientific expertise will be assembled from a wide array of disciplines, agencies, universities, and other organizations to evaluate the issues and alternatives.

The role of the scientists in this regard is to assess, based on the best information available, the tradeoffs, consequences, outcomes, and interactions that are associated with each alternative. It is the Federal EIS team members' role to develop the array of alternatives and to critically review the science products for possible use within the EIS. Any land management decisions based upon the EIS will be made by the appropriate line officers in BLM and the Forest Service.

Key Participants and Roles

Chief, USDA Forest Service, and Director, Bureau of Land Management: Authorize an Executive Steering Committee to oversee the processes outlined in the Charter. Any subsequent changes to the Charter will be with the concurrence of the Chief and the Director.

Columbia Basin WO Coordinators: Director, Land Management Planning, Forest Service, and the Science Advisor to the Director, Washington Office, BLM, shall receive progress reports and arrange for resolution of issues that exceed the scope of the Charter.

Columbia Basin Executive Steering Committee: Shall oversee the implementation of the Charter, monitor and report progress, propose needed amendments, ensure other appropriate participants are involved in its implementation, propose resolution to issues within the Charter, elevate issues and suggested resolutions to the Chief and Director for resolutions. The Executive Committee shall include:

Regional Forester, R-6	Regional Forester, R-1
Regional Forester, R-4	Station Director, PNW
Station Director, RM/INT	State BLM Director, Oregon-Washington
State BLM Director, Idaho	State BLM Director, Montana

The Executive Steering Committee will solicit the participation of other potential partners (e.g., National Marine Fisheries Service, Fish and Wildlife Service, Environmental Protection Agency, and Soil Conservation Service). They will be added to the Executive Committee as appropriate through amendment to this Charter.

Eastside Project Managers: Are responsible to the Executive Steering Committee for accomplishing the actions and products outlined in the Charter. The Project Manager is Jeff Blackwood; Science Team Leader is Thomas M. Quigley; and the Bureau of Land Management Project Coordinator is Patrick Geehan.

Coordination with States, Tribal Governments, and Key Interested Parties

An essential element of this process will be to coordinate with, and seek involvement of, affected State governors and tribal government leaders. In addition, local governments, key interested and affected parties, and other federal and state agencies will also be encouraged to participate.

Key Actions, Products and Timelines

Updated management directions are needed for the Eastside National Forests and lands administered by the Bureau of Land Management. Since current land and resource plans were signed, new information and changing conditions suggest a re-evaluation of management direction. From an ecosystem standpoint, an overall assessment is needed for the interior Columbia River Basin, so that management decisions can be made within this larger context. All products developed from this charter will be presented to the responsible federal decisionmakers. The expected actions, timelines, and products for the Columbia Basin Project are summarized below. The Eastside Project Managers will take the lead in developing the four primary products under the direction of the Executive Steering Committee. Primary direction for the Eastside EIS and Scientific Evaluation of alternative ecosystem management strategies will be provided by a subgroup of the Executive Steering Committee consisting of the R-6 Regional Forester, PNW Station Director, and State BLM Director for Oregon and Washington.

(1) SCIENTIFIC FRAMEWORK FOR ECOSYSTEM MANAGEMENT IN THE INTERIOR COLUMBIA RIVER BASIN

Objective:

Develop an ecosystem management framework that includes principles and processes which may be used in a NEPA process to develop management direction for federal agency ecosystem analysis, planning, and management at all levels within the Basin. Concepts and principles from the framework will link to subsequent products.

Framework Components:

The framework will be based on an ecosystem approach to management with emphasis on biological and human ecosystems. It will examine the interrelationships of the biophysical, social, and economic systems. It will consider public expectations, management capabilities, biological/ecological capabilities, science processes, and current scientific literature (e.g., Eastside Forest Health Assessment, the product of the

Forest Ecosystem Management Team (FEMAT), Eastside Forests Scientific Society Panel Report, and other material). The result will be principles and processes that can be used to develop management direction (consistent with NEPA, National Forest Management Act (NFMA), Federal Land Policy and Management Act (FLPMA), and applicable laws) for planning ecosystem management at all levels on federal public lands within the interior Columbia Basin.

These preliminary planning actions will identify the scale, coarse filters, viability and risk assessments, economic and social assessments, monitoring and evaluation, technology needs, and public participation processes that may be useful in implementing ecosystem management on these lands within the Basin.

Framework Product and Timeline:

A Basin-wide scientific framework for ecosystem management on lands administered by the Forest Service and Bureau of Land Management in the form of a scientific, peer-reviewed document that will be made available for public comment prior to final publication. It provides recommendations on linking science processes and products with planning on Federal lands. It is not a decision document. The draft scientific framework will take approximately 3 months from the date the Charter is effective.

(2) SCIENTIFIC ASSESSMENT FOR ECOSYSTEM MANAGEMENT IN THE INTERIOR COLUMBIA RIVER BASIN

Objective:

The broad scientific assessment of the resources within the interior Columbia River Basin will characterize and assess landscape, ecosystem, social, and economic processes and functions and describe probable outcomes of continued management practices and trends. It will identify the primary social and ecologic values and functions that will be addressed through the additional planning and implementation processes outlined within the ecosystem management framework for the Basin. Information generated through this assessment will be used, as a minimum, in the NEPA process which will be conducted to provide a basis for management direction to modify and implement the Anadromous Fish Habitat and Watershed Conservation Strategy within the Basin.

Scientific Assessment Components:

The broad scientific assessment of the natural resources within the interior Columbia Basin will characterize and assess landscape, ecosystem, social, cultural, and economic processes and functions. The assessment will describe relationships within and among ecologic, social, cultural, and economic systems and interpret effects of past human interactions. Primary components of the evaluation will include:

a. landscape, economic, cultural, and social characterization;

b. identify the probability that change may occur in the components of diversity (landscape, ecosystem processes and functions, species);

c. identify social, cultural, and economic systems;

d. identify emerging issues that relate to ecosystem management within the Basin;

e. identify the social and cultural values of natural resources.

f. identify technology gaps, research needs and opportunities to advance the state of knowledge.

Assessment Product and Timeline:

A Basin-wide narrative report on the ecologic, economic, cultural, and social systems, describing the relationship within and among systems while interpreting effects of past human interactions. In addition, a research, development, and application plan will be developed to fill knowledge gaps and advance technology. This will be published as a scientific, peer-reviewed document in a format useful to other public and private land managers and policy makers. The draft scientific assessment will take approximately 9 months from the date the Charter is effective. The Assessment will be made available for public comment prior to finalizing. This is not a decision document.

(3) EASTSIDE ENVIRONMENTAL IMPACT STATEMENT

Objective:

Develop an Eastside EIS proposing a broad array of alternative strategies that encompasses up to 10 eastside Washington and Oregon National Forests and portions of 4 BLM Districts. The EIS process will be consistent with the principles of the scientific ecosystem framework, incorporate information from the scientific assessment of the interior Columbia River Basin, and draw from the scientific evaluation described below. The scope of the EIS will include, as a minimum, all lands administered by the Forest Service east of the Cascade crest in the states of Oregon and Washington. It will also include eastside Bureau of Land Management lands within the existing range of the Pacific Salmon, forested lands, and bull trout habitat. The EIS process must include an open scoping process with the public.

EIS Components:

A NEPA scoping process will be used to identify issues. From that scoping and other information, a range of management alternatives will be developed that integrates considerations of sustained long-term economic, social, and ecological values of the region and issues identified in scoping. Analysis of alternatives for managing forest and rangelands will consider the Eastside Forest Ecosystem Health Assessment, recommendations of the Eastside Forests' Scientific Society Panel, and other information. A broad array of potential strategies will be developed. This array should reflect societal expectations for public lands within the planning area.

As a minimum, each alternative will take into account the following factors:

- effects on cultural, historic, and current public uses and values, including scenic quality, recreation, subsistence, and tourism;
- concepts of adaptive management;
- effects on environmental and ecological values, including air and water quality, habitat conservation, sustainability, threatened and endangered species, biodiversity, and long-term productivity;
- jobs attributable to natural resource management, both commodity and non-commodity oriented, including jobs attributable to investment and restoration associated with each alternative;
- economic and social effects on local communities and other governments including tribes, and effects on revenues to counties and the national treasury;
- economic and social effects associated with the protection and use of forest resources that might aid in transition of the Region's industries and communities to sustainable economies;
- economic and social benefits from ecological services within each alternative;
- regional, national, and international effects as they relate to timber supply, wood product prices, and other key economic and social variables;
- practicality of and barriers to implementation.

EIS Product and Timeline:

A legally sufficient EIS developed through an open public process from which a Record of Decision can be developed that may include adjustments to land and resource plans. The draft Eastside EIS will take approximately 9-12 months from the date the Charter is effective. The final EIS will follow as soon as public review and evaluation is complete. From the final EIS, a Record of Decision can then be issued by the responsible federal decision maker.

(4) EASTSIDE ECOSYSTEM MANAGEMENT SCIENTIFIC EVALUATION OF PLANNING ALTERNATIVES

Objective:

The Eastside Ecosystem Management Evaluation is a scientific evaluation of issues and alternatives identified through the NEPA scoping process for the Eastside EIS. This evaluation will be done in conjunction with an analysis of the effects of implementation on tribal values and rights. It will address the practicality of implementation of each alternative strategy.

Evaluation Components:

The evaluation should analyze each alternative in terms useful for analysis of costs and benefits, to the extent possible, and consider, as a minimum, the criteria listed under the EIS component of this charter.

The evaluation will be based on concepts documented in the ecosystem framework with consideration for maintenance and restoration of biological diversity, particularly that of late-successional and old-growth forest ecosystems; maintenance of long-term productivity; maintenance of sustainable levels of renewable natural resources, including timber, other forest products, grazing, fish, and other resource-related values of forests and rangelands; and maintenance of rural economies and communities. To the extent possible, the evaluations will link the biological, cultural, social, and economic concerns at each hierarchical scale.

Outcomes associated with each alternative should be evaluated relative to maintaining and/or restoring productivity, maintaining economic, social, and cultural systems, and maintaining and/or restoring forest and rangeland resources (commodity and non-commodity). The levels of protection, investment, and use that will be necessary to achieve the stated outcomes for each alternative will be described.

The evaluation should provide an integrated landscape characterization within a structural data base. This should include terrestrial and aquatic systems and, to the extent possible, social and cultural systems.

The evaluation should include implementing adaptive management within an ecosystem framework. The specific linkages to research, inventory, monitoring, and other ownerships should be highlighted, and ways should be discussed for transitioning to adaptive management.

The evaluation will consider long-term ecosystem health. It will carefully examine the role that natural processes and human activities have played in shaping the eastside ecosystems, landscape patterns, patch sizes, productive potentials, and resource changes. It will consider the variability nature has provided through these disturbance and change elements, the implications these elements have on sustainable long-term ecosystems, and ways disturbances and change can be accounted for in the overall management scheme. Also it will examine the alternative means by which disturbance elements can be mimicked on the landscape and the role these management activities might play providing ecological and social benefits.

In addressing biological diversity, consideration should not be limited to any one species and, to the extent possible, each alternative should be assessed for long-term management against viability. On eastside spotted owl Forests, the assessment should examine alternative measures to maintain spotted owl habitat within the FEMAT framework on those areas where such habitat is temporally highly dynamic and may be lost to natural successional and disturbance processes.

The evaluation will consider social and cultural diversity as well as elements of ecological diversity. Changes in social and cultural diversity associated with shifts in resource flows, availabilities, access, and conditions will be specifically addressed. Probable impacts on lifestyles, social interactions, and interdependencies will be described.

Product and Timeline:

A scientific peer-reviewed document evaluating the effects of implementing a variety of ecosystem management strategies on eastside National Forests. The draft scientific evaluation will be available for consideration by the Eastside EIS Team about 9 months from the date this charter is effective. It is anticipated the EIS Team will consider the Scientific Evaluation along with other information it considers relevant to preparing the draft EIS. This evaluation is not a decision document - it is a scientific evaluation of the effects of implementing the various ecosystem management strategies. It will be made available for review.

/s/ Jack Ward Thomas

JACK WARD THOMAS
Chief,
USDA Forest Service

/s/ Jim Baca

JIM BACA
Director,
USDI Bureau of Land

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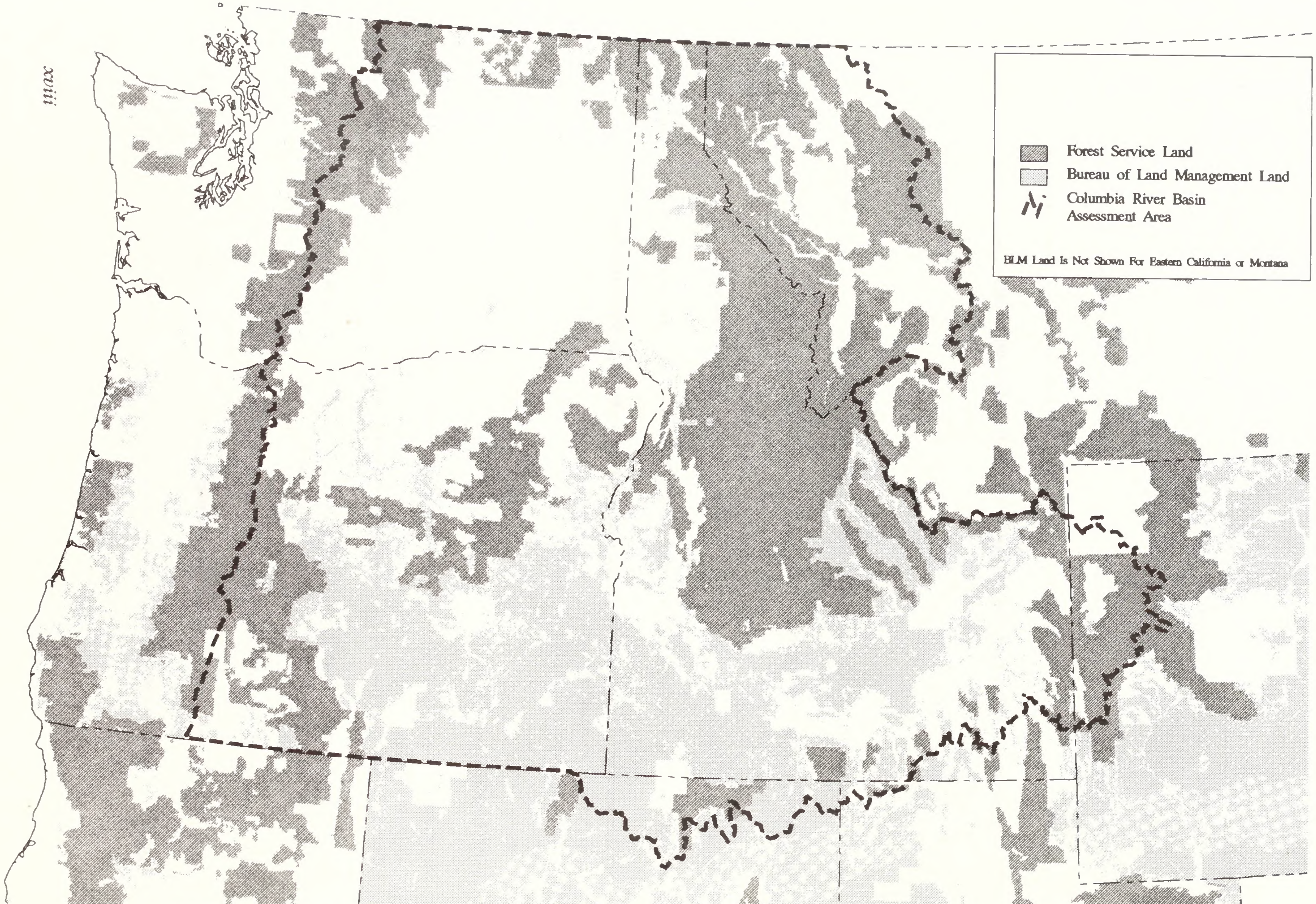


Figure 1 -- Columbia River Basin of the United States and portions of the Klamath River Basin and the Great Basin that will be assessed in developing an ecosystem approach for managing Forest Service and Bureau of Land Management lands of the Interior Northwest.

Introduction

The Columbia River Basin of the Inland and Pacific Northwest Basin (for purposes of this report, the Basin will include portions of the Great Basin in southeastern Oregon and portions of the Klamath River drainage in south central Oregon in addition to the Columbia River drainage) is home to millions of plants, animals, people, and other organisms (fig. 1). It is a land of extremes - from the depths of Hells Canyon to the heights of alpine peaks; from deserts to the magnificent Columbia River; from world-class fly-fishing streams to hardworking ranchers, loggers, and wheat farmers. These social and natural resources offer a heritage of exceptional significance to the nation and the world. Persistence of these resources depends on our interactions with each other and interactions with the land, water, and atmosphere. Conservation and management of these ecosystems are of vital importance to the people who live in the Basin and also to those who live outside the Basin and yet benefit from its social and ecological integrity, richness, and diversity. Recent advances in our understanding of how ecosystems and their components interact, underscore the high priority for developing and implementing integrated strategies for managing natural resources.

Dramatic shifts in resource flows in the Basin and changing expectations about goods and services that ecosystems produce require fundamental changes in how natural resources are managed. There are growing concerns about wildfire, forest insects and diseases, and declines in forest productivity and in some wildlife and fish populations. Concurrent with these concerns are opportunities to improve public participation processes, cooperate across agencies, begin adaptive management, maintain ecological structures and functions, and sustain resource conditions and flows for human expectations about the environment and natural resources.

In view of these concerns and opportunities in natural resource management, along with recent advances in the understanding of ecosystems, there is a need to develop a strategy for managing ecosystems. We define ecosystem management as an adaptive management, learning, and planning process that attempts to ensure that people's activities and expectations are consistent with the limits and capacities of ecosystems. Addressing all of these challenges and concerns necessitates a framework for action.

In July 1993, as part of his plan for ecosystem management in the Pacific Northwest, President Clinton directed "the Forest Service to develop a scientifically sound and ecosystem-based strategy for management of eastside forests," and further stated that the strategy should be based on the "Eastside Forest Ecosystem Health Assessment" (Everett and others 1994), recently completed by agency scientists as well as other studies. To implement this direction, the Chief of the Forest Service and the Director of the Bureau of Land Management jointly directed that an ecosystem management framework and assessment be developed for lands administered by the Forest Service (FS) and Bureau of Land Management (BLM) east of the Cascade crest in Washington and Oregon and other lands within the Basin.

The FS and BLM recognize that ecosystems cross political jurisdictions and ownerships, and management actions taken on lands administered by one agency may affect lands administered by another agency or owner. Therefore, there must be shared vision and commitment between agencies and communities of interest in developing and implementing ecosystem management strategies.

The two agencies, with the FS as lead, are charged with developing an ecosystem approach to guide assessment, planning, and management of forest, rangeland, and aquatic systems on FS- and BLM-administered lands within the Basin. This collaborative approach will recommend a management framework for the Basin that will be responsive to changing societal values and new information, and will ensure the maintenance of ecosystems. It will identify, describe, and recommend ecosystem principles, management procedures, public participation processes, and current scientific thinking and knowledge that can be used to analyze, plan, and manage natural resources within the Basin.

Framework Purpose:
To identify, describe, and recommend ecosystem principles, managment procedures, public participation processes, and current scientific thinking and knowledge that can be used to analyze, plan, and manage natuural resources within the basin.

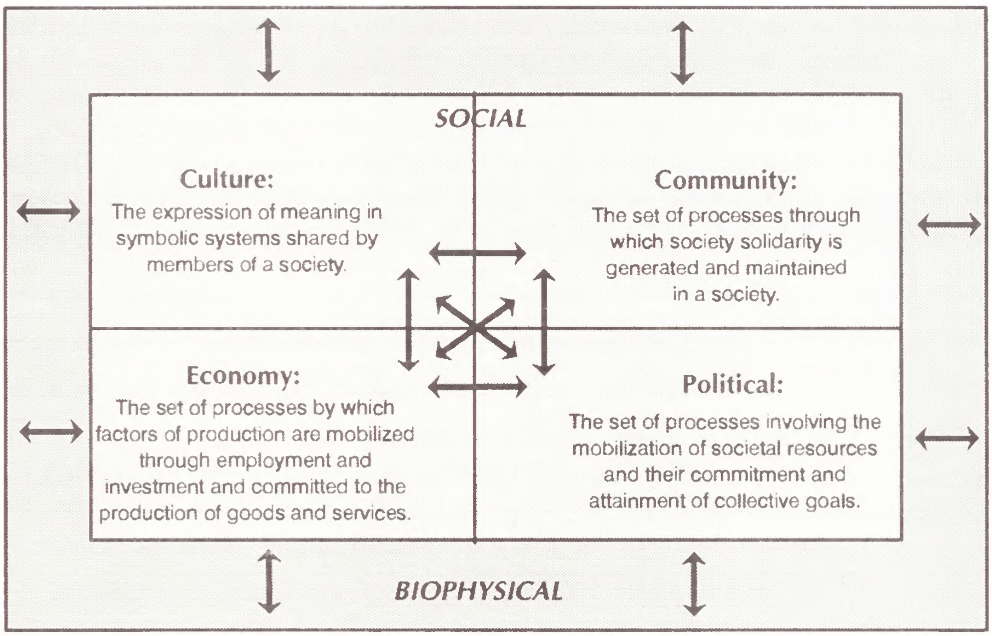
The framework recommends procedures to examine the interrelations between the biophysical (land, air, water, plant, and animal) and social (community, economic, cultural, and political) components of the Basin (fig. 2). It considers public expectations, management capabilities, ecological capabilities, science processes, and current scientific literature. It will identify appropriate scales of planning and analysis, plant and animal assessments, economic and social assessments, monitoring and evaluation needs, technology needs, and public participation processes that may be used in implementing ecosystem management. Once completed, managers of non-federal lands within the Basin and in other areas may find the framework useful.

FThe framework helps guide on-the-ground management to be responsive to policy questions such as:

* What actions are needed to conserve genetic, species, and landscape diversity, therefore ensuring abundance, distribution, and quality of habitats to support native terrestrial and aquatic species?
* What actions are needed to conserve long-term productive capacity of terrestrial and aquatic ecosystems?
* What actions are needed to ensure the maintenance of all options for flows of resources and values consistent with ecosystem capabilities?
* What actions are needed to ensure that disturbance processes and disturbance effects are operating within ranges expected for biophysical environments?
* What actions are needed to increase public understanding and support for ecosystem management? (It will be important to bring to agreement human expectations and activities consistent with ecosystem capabilities).

* What actions are needed to integrate public opinion into ecosystem management?
* What information is needed to understand anticipated effects of ecosystem management in the Basin on economic and social systems at local, regional, and national scales?
* What actions are needed to produce legal, planning, and management frameworks that will facilitate implementation of ecosystem management?
* What are the critical information, communication, and technology needs to implement ecosystem management?
* What will be needed to resolve conflicts associated with implementation of ecosystem management?

igure 2 -- The relationship of the social components of an ecosystem to the biophysical components (adapted from Lewis 1993).



Ecosystem Principles and Their Implications for Management

Basic tenets and theories of the ecological and social sciences underlying implementation of ecosystem management can be synthesized. Here we formalize insights from these and other science disciplines into a concise set of principles that form the foundation for regional planning and management of ecosystems at various scales. An ecosystem can be defined as a bounded, coherent, self-maintained system of varied living and non-living interacting parts that are self-organized into biophysical and social components (Golley 1994, Odum 1953, Slocombe 1993a).

An ecosystem is:
bounded, coherent, self-maintained system of living and non-living parts that are self-organized into biophysical and social compenents.

Ecosystem management is based on an understanding of the structure, functioning, and interactions of ecosystems and ecosystem components (Jensen and Bourgeron 1994, Slocombe 1993a). It necessitates defining management units according to ecological boundaries, and manages these units by using the best understanding of how ecosystems function. Science and managerial developments over the last 25 years have several common characteristics that can provide a basis for ecosystem management (McHarg 1969; Zonneveld 1988; Slocombe 1993a; 1993b; Bormann and others 1994; Oliver and others 1994). The main features of these approaches include:

* Clear description of components, ecosystems, environments, and interactions;
* A holistic, comprehensive, and interdisciplinary process;
* A system that includes people, their values, and activities;
* A clear description and understanding of ecosystem dynamics that considers system patterns, processes, structures, and functions;
* Consideration of different scales (temporal, spatial, and social organizational) of system structures and functions;
* Ecosystem delineation using biophysical and social criteria;
* Planning and management area delineation considering ecological boundaries and peoples' values, expectations, and social institutions.

Characteristics of ecosystem management:

* **description of components, ecosystems, environments, and interactions;**
* **holistic, comprehensive, and interdisciplinary process;**
* **people, their values and activities, are included;**
* **consideration for ecosystem dynamics;**
* **consideration for multiple scales; and**
* **delineation by biophysical and social criteria.**

There are three primary steps to implementing ecosystem management: 1) management unit delineation, 2) understanding ecosystem functions, and 3) a management plan. The first two steps point to the need to:

* Determine the kind of information needed to define management units (appendix one);
* Explore the implications for planning and management of using different data and methods to define ecosystems and management units;
* Design a multidisciplinary data collection scheme, including monitoring, of past and present ecosystem states, behaviors, and functioning;
* Explore methods to organize, display, and illustrate interrelations of data collected; and
* Design methods of multidisciplinary synthesis and interpretation of data.

The third step requires developing a socially acceptable system of institutions for administering ecosystem management units. Developing the administrative system requires knowledge and learning in several areas that:

* Reveal the kind and quantity of human demands for ecosystem products;
* Reveal the human values of interest groups that prompt the expectation for ecosystem products;
* Design efficient methods of acquiring information about human values and expectations by using public participation;
* Design methods to resolve conflicts arising from differences in expectations for ecosystem products;
* Design means (such as simulation of alternate management futures) to inform people of the consequences of alternate ecosystem product choices; and
* Allow organizations the adaptability to develop the appropriate mix of skills, performance incentives, and organizational flexibility to implement ecosystem management.

The implementation of ecosystem management requires consideration of at least four principles.

Principle 1. Ecosystems are dynamic and evolutionary.

Change is inherent in ecosystems; they develop along many pathways. Disturbances influencing ecosystem structure and function are common, causing ecosystem evolution to be nonlinear and discontinuous. Therefore, ecosystems are the products of their history. People have long been a source of disturbance through activities such as setting fires, clearing large areas, and introducing new species. Just as the actions of past generations helped shape the ecosystems of today, actions of this generation help shape ecosystems of the future. Past management decisions, combined with natural environmental conditions, have at times limited future options.

One management implication of the dynamic character of ecosystems is that management must be site-specific. Management organizations and resulting management boundaries should be flexible and can change over time. Management practices should consider historical and potential disturbance regimes, and their resultant patterns and effects. Managers must predict the consequences of management activities and consider their influence on ecosystem development including possible change in developmental pathways. Measurement variables and methods should be selected to evaluate changes in ecosystem structures and functions.

Principle 2. It is useful to view ecosystems as being organized within a hierarchy of scales of time and space.

Ecosystems and their components have temporal, spatial, and social dimensions. Ecosystems occur at different scales within hierarchies and their components interact with each other. Geographic units consist of several interactive hierarchies; for example, a small stream and its adjacent lands are nested within a larger watershed composed of many small streams and their adjacent lands, which is nested within a larger river basin composed of many watersheds. Within and among each of these hierarchical levels, a multitude of environmental constraints, vegetative patterns, human behavior, and disturbance processes exist. Within a social context individuals are nested within families, families within groups, and groups and communities within societies. Temporal hierarchies can be portrayed by the example of a year nested within a decade, which is nested within a century, which is nested within an epoch.

Viewing ecosystems as being organized hierarchically has several implications for management. Assessments should be made at several scales, looking at the larger scale to set context and the smaller scale to understand processes. The scales of analyses, characterizations, and decisions should be matched to the scales of issues. Ecological hierarchies should be defined and understood according to ecological patterns and processes. The manager should understand the effects of management practices at all scales. The impacts of decisions in one level of the hierarchy are likely felt in other levels including the impacts of the past on the present and future. Ecosystem management should consider the interaction of and evolution of patterns and processes, rather than merely the maintenance of existing patterns.

Monitoring ecosystems hierarchically will make it possible to assess multiple attributes of ecosystem development or change. Monitoring at several scales will help in assessing the effects of management decisions on different components of the ecosystem and the ecosystem as a whole. Monitoring at frequencies and scales appropriate to disturbance events can help management understand ecosystem development.

Principle 3. Ecosystems have biophysical and social limits.

In all ecosystems there are limits to the rate and amount of accumulation in biomass (plant, animal, and human). These limits determine the capability of the system to provide goods and services. However, people may make demands on ecosystems that exceed their biological or physical capabilities. Because of limited capabilities, resources can become scarce and must be allocated. People have the ability to modify their behavior to be consistent with the capabilities of the ecosystem and to organize a variety of social institutions to allocate resources.

A key management consideration is that conflicts arise when resources are scarce and in demand. Conflicts over ecosystem conditions, products, and services will inevitably occur in a pluralistic society with divergent communities of interest. A major challenge to managers and organizations is to develop the capability and skills to resolve conflict. Conflict resolution should focus on values that diverse communities of interest hold in common, and seek acceptable solutions for all interests to the extent possible. Practical considerations influencing conflict resolution include ecosystem limits, finite resources, organizational structure, current and future societal needs and expectations, and the compatibility of interests.

Principle 4. There are limits to the predictability of ecosystem patterns and processes; conditions and events may be predictable at some scales but not at others.

Some events are unexpected and unpredictable, such as an earthquake. Predictability varies over temporal, spatial, and social organizational scales. Some events are predictable but the frequency and the magnitude of those events are unpredictable within limits. For example, from year to year, wildfire occurrences are predictable based on time of year and environmental conditions, but the intensity, size, and exact location of fires are less predictable. Another example at the social scale, is the ability to predict crime rate at the regional or community level, but predicting the occurrence of a crime at the family level is more difficult.

While people generally prefer predictability, ecosystems and their management must acknowledge and prepare for the unexpected. Since communities of interest offer a variety of viewpoints, public participation in management can lead to strategies for dealing with uncertainty that will be more acceptable to the public. For example, knowledge gained from adaptive management and monitoring and development of flexible social and political processes help people prepare for unexpected events. Adaptive management strategies improve our ability to predict by increasing understanding; although long-term yields of ecosystem products and services may remain intrinsically unpredictable for some systems and scales. Management actions that change developmental trajectories may increase uncertainty. While models are always simplistic representations of real world systems, they may improve predictability. Such models are never error-free, but can be improved through adaptive management strategies. There is a need to continuously improve how models incorporate criteria for accuracy and realism (Slocombe 1993b).

Ecosystem principles:

1. **Ecosystems are dynamic and evolutionary;**
2. **Ecosystems can be viewed within a hierarchy of space and time;**
3. **Ecosystems have biophysical and social limits;**
4. **Ecosystem patterns and processes may not be predictable.**

General Planning Model for the Basin

Ecosystem management as an adaptive management, learning, and planning process can be framed in a conceptual model (USDA 1993, Kauffmann and others [in press], Borman and others 1994). A major premise of ecosystem management is that decisions on managing natural resources can be improved and made more acceptable than in the past. To accomplish this task, all of the components of the general planning model need to be founded in the principles of ecosystem management. As the concept of ecosystem management develops, the need for assessing social and biophysical components at various scales, identifying ecosystem needs and desired futures, resource monitoring, mutual learning, and developing these processes and the resulting decisions on sound ecosystem principles is becoming evident. These components are the essential elements of a general planning model for the Basin (fig. 3). Under this model, planning is a cyclical process involving iterative steps of assessment, decisions, implementation, and monitoring which cycles back to assessment. All steps occurring with a role for the public through a process of mutual learning. Mutual learning is also a cyclical process of sharing among scientists, managers, interested publics, and policy makers. Each party in the process shares (process description, intermediate results, probable outcomes, preferences, and expectations) and, in turn, learns (by gaining an understanding of and an appreciation for each party's shared information).

Good decisions are founded on good information. To accomplish this task, the status of ecosystem structures, processes, and functions within the Basin needs to be determined. Because the biophysical and social components of ecosystems are dynamic and evolutionary, knowledge of past ecosystem structure, process, and functioning is critical in understanding the present conditions and projecting the future trends. This understanding of the past, present, and likely future of the vegetation, communities, cultures, fish, wildlife, and other ecosystem components of the Basin can be used to make better natural resource decisions. This information can be developed by conducting scientific assessments at the various temporal and spatial scales. (fig. 4).

Using these assessments of the biophysical and social characteristics of the Basin desired futures and ecosystem needs can be developed. These desired futures and the means by which we choose to achieve them are determined by social values. For example, the assessments might determine that because of past mining in the upper part of the basin there is a potential for leaching of heavy metals (present) into stream waters and the leaching is likely to continue (future), degrading water quality and the associated riparian environment (fig. 5). At the basin scale, water quality might not be threatened in the short-term, but at the watershed and stream scale these metals could present an immediate threat to water quality and ultimately a threat to the water quality of the entire basin in the long-term. Based on these spatial and temporal scales, a desired future to reduce or stop the leaching of the heavy metals could be developed.

Figure 3 -- Initial components of the general planning model.

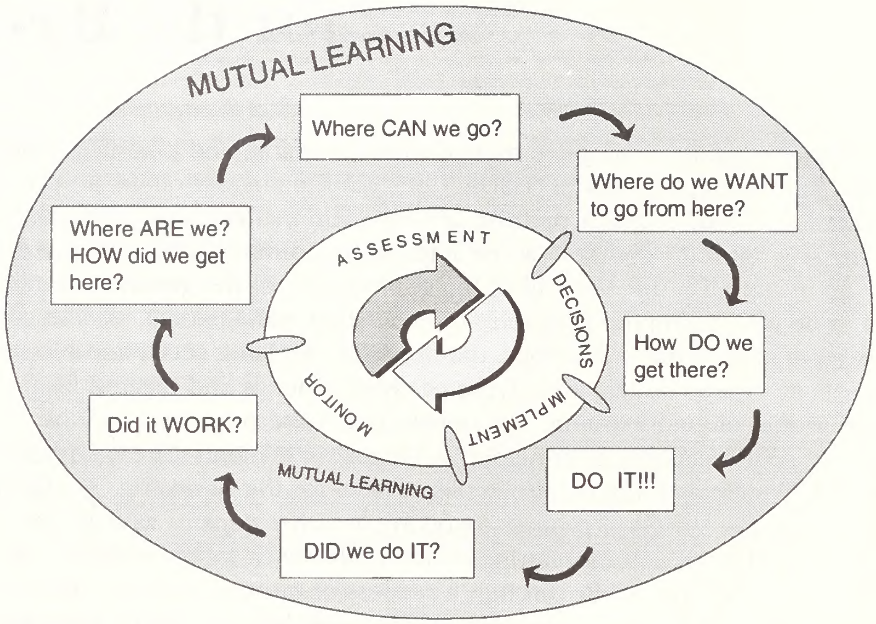
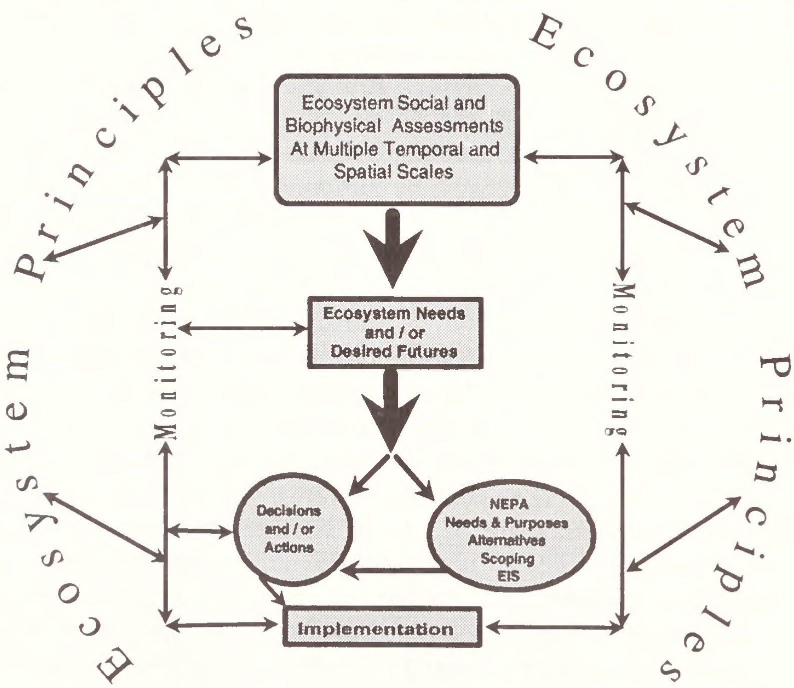
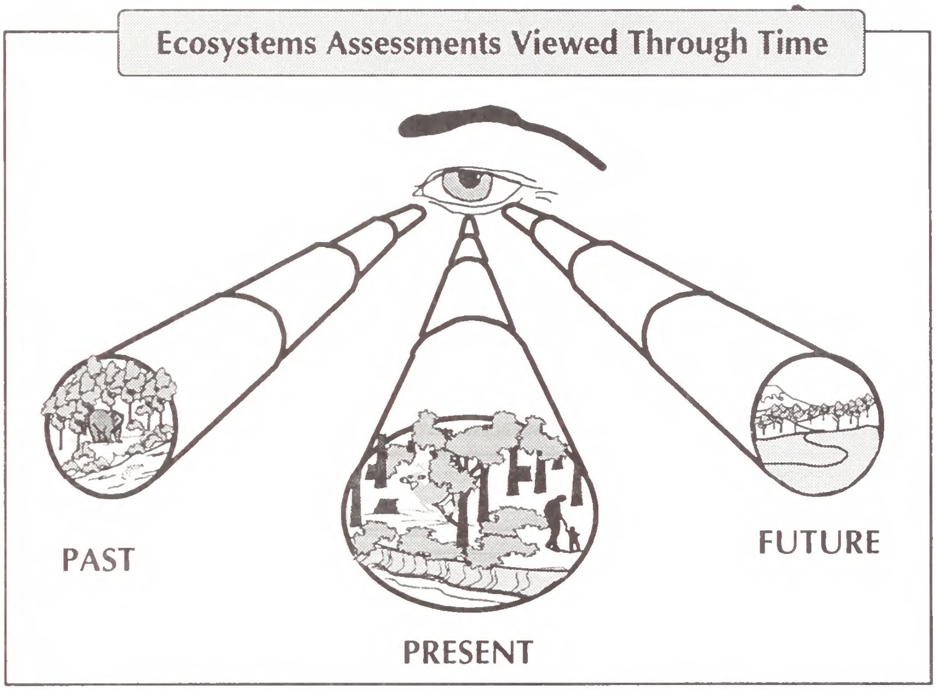


Figure 4 -- The initial components of the planning model enclosed within ecosystem principles, and monitoring. Using ecosystem assessments, ecosystem needs and/or desired futures can be determined. Using this information administrative actions can be initiated to implement projects.



Upon determining an ecosystem need and/or desired future, administrative actions can direct the ecosystem(s) toward the desired state. This can be accomplished by administrative directive or by using the NEPA process (fig. 4). At this point in the process, alternatives for addressing the heavy metal clean-up, in the above example, could be developed. The alternatives could include no action, damming the stream, covering the contaminated soils, or removing the soil. Administrative action or a decision using the NEPA process could lead to implementing a project in the upper Columbia Basin to address the potential of heavy metals leaching into the stream waters. In making decisions and implementing projects, institutions should treat management as a learning process. In the above example, the decision on how to treat the heavy metal problem should be continuously revisited and revised. By doing such monitoring, planners and decisionmakers can go forward in the face of uncertainty.

Figure 5 -- To understand the present condition and predict future trends of the social and biophysical components of ecosystems, an understanding of the past is needed.



A fundamental component of these planning processes is the monitoring of each step. Are the assessments supplying information at the different scales and time periods that is adequate to address ecosystem needs and/or desired futures? Did the implementation of the project have the desired results? These questions can be answered with a good monitoring plan.

An important component of ecosystem management is mutual learning at all phases of the process among tribal nations, scientists, public, individuals, counties, states, and public agencies. Mutual learning should be woven throughout the process making partners of all the groups in the process (fig. 6 & 7). But, mutual learning in the planning process does not necessarily make the decision a shared process.

Depending on the natural resource questions being addressed, the scale of the assessments and the resulting decisions and actions can be initiated at the national, regional, subregional, area, or project level (fig. 8). The information developed at one assessment scale will have applicability for more than one purpose or planning level.

Adhering to the ecosystem principles in developing ecosystem needs and desired futures will lead to better natural resource management decisions and actions. By building a good mutual learning process, relationships, understanding, and communication among groups with diverse interests can be improved. Mutual learning can be stressed throughout each of the planning components from the assessments to the monitoring, and throughout all scales. There are many thoughts about public participation processes and mutual learning. One thread of commonality in these thoughts is that participation must be meaningful for people. In our society of instant results and advanced technology, current information is important to people. Equally important to people is how comments and information provided to a large project are considered and used.

Figure 6 -- Mutual learning should be weaved through the components of the planning model.

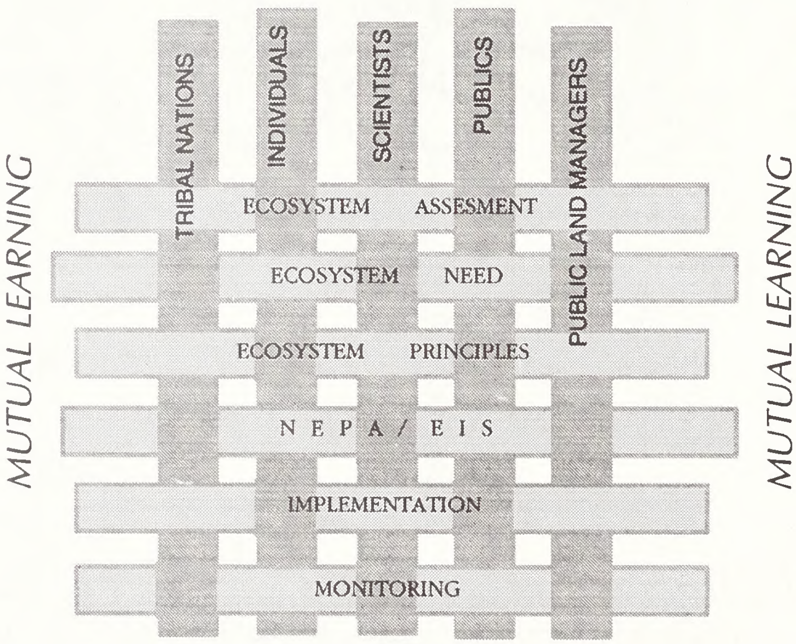


Figure 7 -- Using all of the components of the planning model should result in more accepted and better decisions on managing of natural resources.

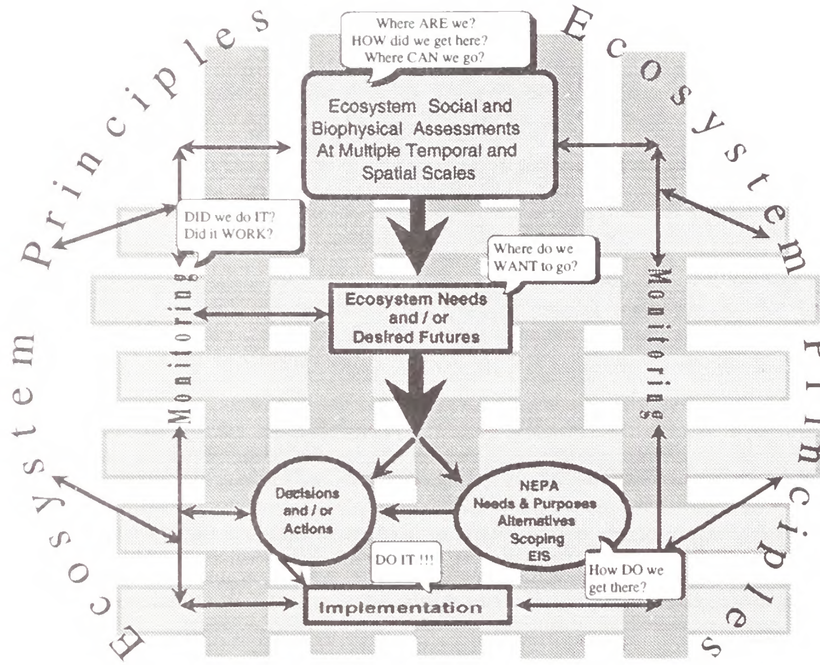
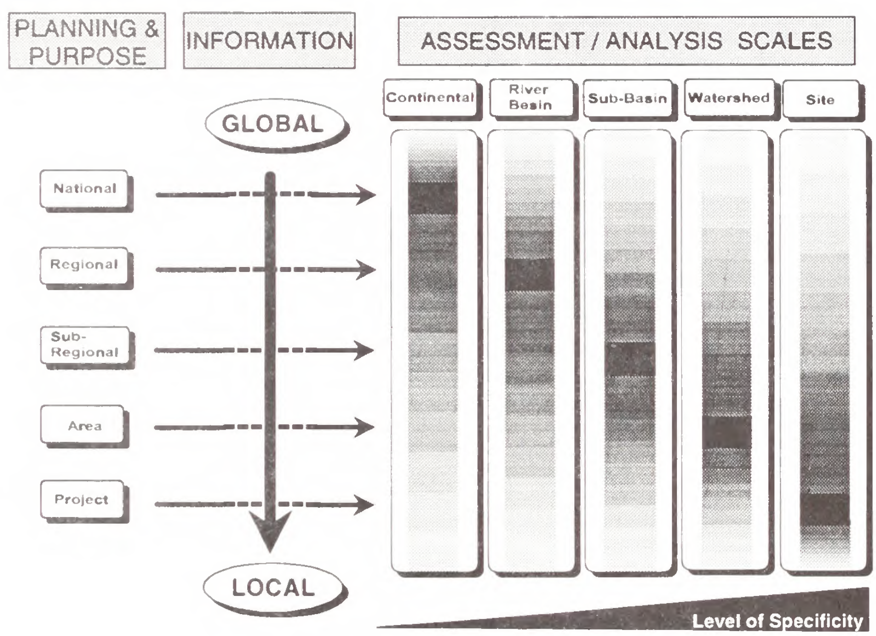


Figure 8 -- The planning model can be used for planning at various levels. At each planning level, information is needed from all assessment scales. Consequently, for planning at the National level most of the information would be needed at the continental scale with smaller and smaller amounts needed at the river basin through site scales. In contrast, for planning at the project level most of the needed information would be local, collected from site assessments, but some information at the river basin and continental scales would be needed. The greatest level of information specificity would be at the site scale and the least at the continental scale.



Public participation by a broad range of people is important to obtaining a better understanding of the biophysical and social components of the Basin. It is through early involvement and exchange of information that awareness and mutual learning are heightened by all participants.

By engaging diverse people in the process of scientific understanding, more opportunities are recognized for obtaining better research/science information. Using non-traditional approaches to gathering information will help reach a larger scientific community and extend communications with various individuals with unique or common visions, ideas, and knowledge.

Mutual learning occurs as both public and federal agencies work together in various ways. In this context, broad public participation includes bringing in local perspectives and non-local perspectives for scientific consideration.

Though engaging people in science is not a requirement of the agencies, it can be part of a strategy and an invitation for anyone to participate in science processes.

Participation begins through initial outreach efforts. In the science process, the first step starts by asking individuals if they would like to participate and what ways a process could be crafted that meets people's needs and the needs of the agencies. In recent years, the public has obtained a great deal of knowledge on how to work with federal agencies. Knowing the level of people's participation with agencies in the past and recognizing what works, is a starting point for developing new and innovative methods involving individuals, organizations, communities of interest, and local, county, and state governments. People want to be heard throughout all of the processes involved in ecosystem management. Establishing relationships and opening dialogue can begin to create better understandings.

As people are involved in this process, roles are more clearly defined for participation. For a new process with which most people are unfamiliar, it is important to understand in what ways participation can occur. Educating the public on participation opportunities is a critical step in the process.

Columbia Basin Assessment

Ecosystem management within the Basin requires assessment at several scales, from continental to basin to site (figure 8). No attempt is made here to provide a detailed description or list of all assessment elements at each scale. To date, more energy has been placed on describing the assessment components for the Basin wide assessment. Information and results from other assessments, for example FEMAT and the Eastside Forest Ecosystem Health Assessment (Everett report), will be useful in the current Basin assessment. Information and results from the Basin assessment will prove useful in the assessments at a finer scale of resolution (Eastern Oregon and Washington, and the Upper Columbia River area) including watershed analyses.

The Columbia River Basin assessment is a broad scientific assessment of the biophysical and social systems related to natural resources within the Basin. It will identify the probability that change may occur in the components of diversity (landscape, ecosystem processes and functions, and species), the emerging issues that are related to ecosystem management, and identify gaps in our understanding of ecosystems. The assessment will provide information that may be useful to managers in developing management direction.

The four ecosystem principles and their implications for resource management are the basis for conducting the Basin assessment: 1) ecosystems are dynamic and evolutionary; 2) ecosystems are organized within a hierarchy of temporal and spatial scales; 3) ecosystems have limits; and 4) there are limits to the predictability of ecosystem patterns and processes. Each of these principles has a bearing on how an assessment might be conducted for the Basin.

The first principle, that ecosystems are dynamic and evolutionary, reminds us that ecosystems change continually, and that their current status is a consequence of their evolutionary and ecological histories. Any assessment of ecosystem conditions and management potential should characterize and describe existing and historical ecosystem structure and functioning in the context of specific climatic, biologic, and geomorphic processes associated with each period. A characterization of existing conditions gives quantitative evidence of current structure and functioning. Historical characterizations provide insight into the kinds, magnitudes, and rates of change in ecosystem structure and functioning. Historical characterizations also provide insight into possible future ecosystem development pathways by providing evidence of dominant disturbance types and regimes, resultant vegetation patterns, typical environmental constraints, and variability of biotic patterns and processes.

The second principle of ecosystem organization in spatial and temporal hierarchies demonstrates the need to characterize ecosystems at multiple scales of space and time (fig. 5). Trends across time and space in disturbance processes, and biotic patterns and processes provide insight into current ecosystem development trajectories, and the potential for development along a given or alternate pathway. It is important that the scales of assessment are connected in terms of context and process. That is, the processes of a smaller scale are encompassed in the context of the larger scale (fig. 9). Principle three prompts us to consider limits of ecosystems dictated by climate and environment. Given that there are real limitations to the productive capacities, structure, and functioning that might be achieved within an ecosystem at any time, the assessment should characterize a plausible range of potential future ecosystem conditions considering climatic trends, biophysical environment conditions, historical development, current structure, organization, and disturbance regimes.

Principle four, concerning predictability of ecosystem patterns and processes, greatly influences the accuracy and specificity of planning and management expectations. Desired conditions become desired dynamics, and management prescriptions prefer a quantifiable range of plausible conditions to a single, narrowly defined target condition.

The assessment of the Basin should answer the following questions:

* What is the structure, composition, and functioning of the Basin today (what is there)?
* By what developmental pathways did it get to its current conditions (how did it get there)?

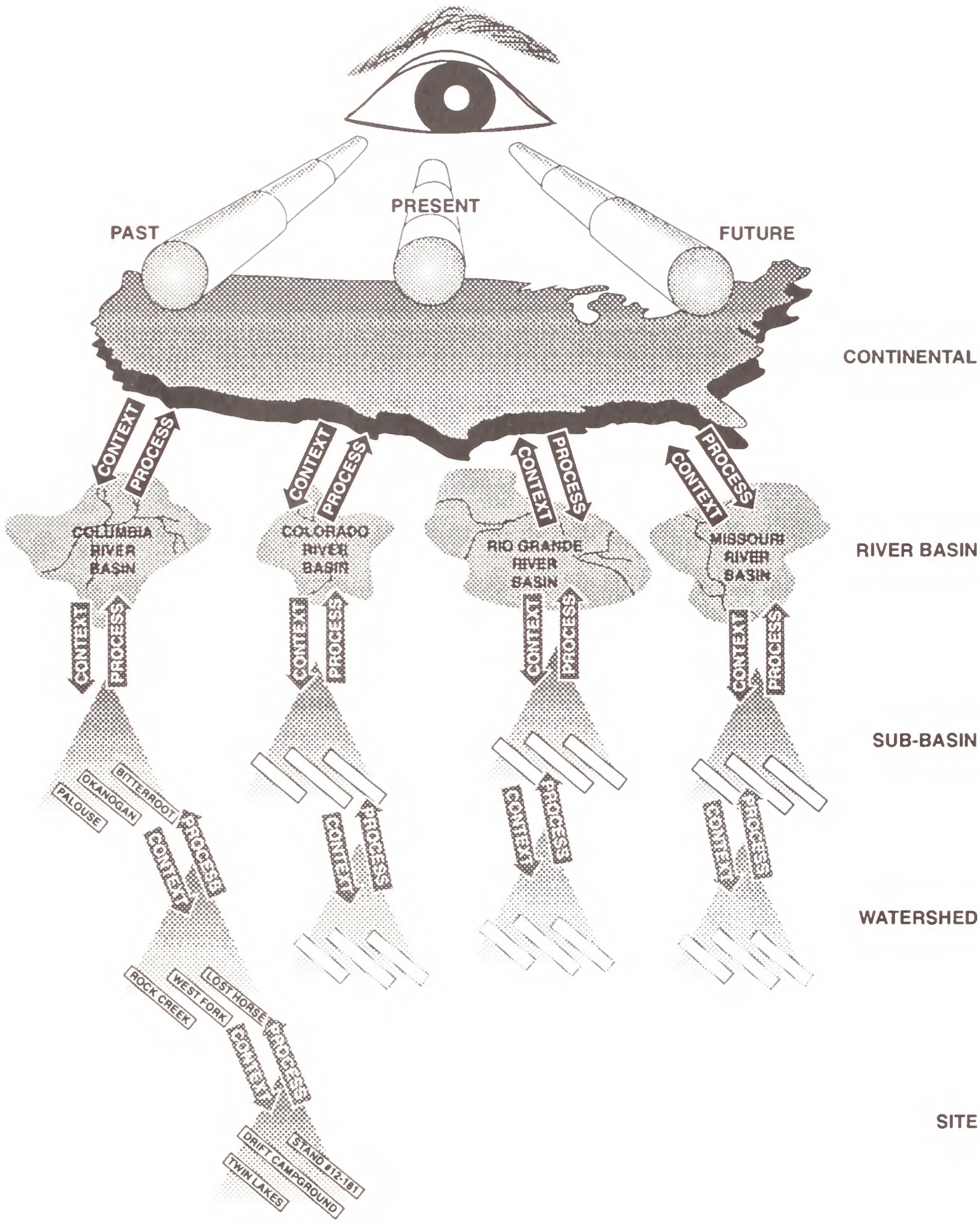
Columbia Basin Assessment:

* **Broad characterization of biophysical and social systems reltated to natural resources;**
* **identify the probability that change may occur in the components of diversity;**
* **identify emerging issues that relate to ecosystem management; and**
* **provides information useful to managers in developing further management direction.**

* What is a plausible range of future conditions (where is it going)?

The assessment will determine whether the resources of the Basin are meeting or can meet societal expectations based on current understanding of ecosystem condition and functioning, societal values and expectations, and technical and economic feasibility. In addition, using scenario planning, it will identify via simulation of a broad set of plausible management futures, outcomes and outputs of management in terms of key ecological and social values. For example, outputs might be fish populations, owl pairs, timber volumes, camas root, huckleberries, forage, edible mushrooms, or natural appearing views. Outcomes might be late-successional vegetation patches, change in fragmentation or diversity indices, or change in fire or insect disturbance magnitude or probability.

Figure 9 -- Scale designations for assessments are not fixed but they are arranged hierarchically. As shown here, they could range from the continent to the site for different time periods. Most importantly, the context at a higher scale encompasses the processes of the lower scale.



Involving People

Public participation is an integral part of the assessment. The public will have the opportunity to participate in all stages of the Basin assessment. Early public involvement will facilitate mutual learning, foster cooperation and mutual trust, and establish clear expectations from both the public and the agencies as to the uses of the assessment findings. It will also result in improved communication between agencies and the public, learning for all participants, and result in better ways to manage public lands.

Public Participation:

- **fosters cooperation and trust;**
- **establishes clear expectations;**
- **fosters mutual learning; and**
- **results in better land management.**

Public participation will help in understanding the values people derive from the Basin, a critical element in the assessment. People value many things available in the Basin from timber and fish, to outdoor recreation, to wildlife, to areas of breathtaking beauty. A variety of techniques can be used to identify the values people place on ecosystems and ecosystem components. They include surveys, analyzing current laws and regulations, public forums, and conducting customized surveys.

A variety of methods will be used to include the public in the assessment process. Methods will vary with the scale of assessment: the smaller the scale, the more direct the participation. Participation will include meetings, field trips, workshops, written and electronic correspondence, and opportunities for substantive input to and review of written documents. At any time during the draft stages of the Basin assessment, people can contribute information in writing. Science workshops allow for an exchange of information with a variety of people on topics or focused areas. The objectives are to allow for open and broad participation of public in areas concerning the development of the scientific assessment. Informational updates are provided at key stages to share information about upcoming ways to participate in the process and updates on development of an assessment. Some of the systems set in place for information exchange include:

- The electronic library -- a forum for people with access to a personal computer and modem to retrieve information;
- A toll free information number;
- Local information centers in eastern Oregon and eastern Washington communities; and
- Public meetings will be held extensively throughout the Basin.

All of these methods and others being developed, will allow all interested parties to keep informed about the Basin assessment and related topics.

Biophysical and Social Characterization and Description

An important component of the assessment is to describe current biophysical and social conditions in the Basin including both Federal and non-Federal lands. The list of items to be assessed includes diversity, distribution and abundance of plant and animal species; watershed conditions; and economic and cultural community trends. The assessment needs to be bounded in time, space, issues being considered, and depth of analysis (Walters 1986). Issues are born from conflicting values and will often involve more than one spatial or temporal scale. Therefore, the issues play a major role in defining the boundaries and scales to be analyzed.

As a foundation for much of the biophysical assessment, an evaluation of the landscape and a characterization of existing and historical conditions will be completed. Ecological types will be characterized relative to their composition, structure, function, and processes. Attributes collected and mapped will include slope, aspect, soil, climate, vegetative patterns, composition and dynamics, and fire history and risk. Disturbance processes will be described according to different probabilities of occurrence and intensities of effects. Weather, fire, floods, landslides, and volcanic eruptions are important physical disturbances.

The terrestrial assessment will characterize the historic, current, and potential future distribution and amount of macrohabitats, such as vegetation conditions (broad cover types, successional stages, etc.). These habitat components will then be used to assess potential habitat for selected species groups, aspects of biodiversity, and selected habitat management issues. Definitive population viability analyses are not possible with the anticipated data, so the condition and trends in potential habitat will be interpreted to form working hypotheses on the capability of habitats to support species and species groups over time.

The historical and current aquatic and riparian conditions of the Basin will be assessed and used to identify trends and potential in habitat conditions. The quality, distribution, and abundance of habitat for aquatic biota (including resident and anadromous fish) will be evaluated. Water quality and quantity will be components of the assessment of habitat condition. Habitat and riparian ecosystem conditions and trends, along with available data on fish populations, will be used to determine capabilities of the habitat to support fish populations and aquatic communities over time.

Assessments of the economic aspects of the Basin will focus on how the economic conditions and activities may be affected by fluctuations and changes in natural resource management. For example, the values of forest products, minerals, forage, recreation opportunities, and water permits relative to the total value of goods produced in the Basin could be assessed. Also, who, how many, and where people work in these activities and how much government revenue is generated would need to be characterized.

The economic assessment of the Basin will also influence the social assessment. Cultural, community, and political attributes, and the interaction of ecosystem attributes and economic components will be characterized. Cultural aspects examined will include quality-of-life attributes such as spiritual values, recreational opportunities, and signs of stress such as unemployment and crime. Similarly, the assessment of the political attributes could address such issues as power distribution and the ability of organizations to provide services to individuals, families, and communities.

Assessments need to analyze cause and effect relations and rates of change of various social and biophysical elements. Using these analyses, a general theoretical model that links biophysical patterns and processes at different scales with social elements can be developed. The scales of analysis for a given element are important. The aggregation of information at increasingly larger geographical areas tends to mask many relations and processes important at lower levels in the hierarchy. For example, physical conditions in one watershed that adversely impact water quality may not be present in other watersheds within a larger basin. Likewise, unemployment in several small timber dependent communities may be masked when combined with statistics for a whole county with diverse economic characteristics. In contrast, patterns of broad-scale processes, such as drought, cannot be evaluated at small scales.

The assessments of different emphasis areas will be integrated throughout the process. The ecosystem principles will be incorporated into the design and analysis of assessment components. As the assessment progresses, future drafts of the framework will provide more detail on the characterizations and analyses that will occur, particularly by hierarchical scales.

Linking Biophysical and Social Processes in the Basin Ecosystem

Learning is an essential component of adaptive strategies for ecosystem management. A number of tools are useful in promoting learning. Models and scenario planning inform society about implications and tradeoffs in ecosystem management. A model is a tentative description of a system that accounts for all of its presently known properties and predicts outcomes.

Systems modeling allows us to explicitly display causes, effects, and feedbacks stemming from management actions. Components of input to the model might include yield functions for timber and edible wild mushrooms, indicators of habitat quality, and available labor force. Solution variables (predicted outcomes) might include timber and mushroom production, habitat quality, forest conditions (such as seral stages and extent of disturbance), jobs, and degree of community stability.

A model for assessing ecosystems must describe the portions of biophysical and social subsystems relevant to policy questions, and their linkages. It must also define variables outside the ecosystem that affect its functioning (such as population projections). The model can be constantly refined to gain further insights and to revise underlying subsystem models. This evolving learning is a basic part of adaptive strategies for ecosystem management.

Another learning device is to apply models for scenario planning. This method visualizes a set of possible futures and explores their consequences. Each scenario displays potential outcomes for various goals for the assessment area. Each scenario might represent specific social values, but the entire set of scenarios should attempt to consider all known societal viewpoints.

Scenario planning differs from traditional planning approaches in that it explicitly accounts for uncertainty. The focus is on what might happen or go awry and on effective responses to an array of possible events. Scenario planning avoids assuming a single predetermined future; it promotes flexible thinking. People are more likely to discover socially acceptable and biophysically feasible solutions where multiple goals may likely be achieved simultaneously.

A set of potential policy questions focus the scenario planning. Relevant policy questions for the Basin are found in the introduction of this document. The next step is to clarify policy goals, underlying assumptions, and values.

The analysis also identifies the set of potential outcomes and measurements of management performance. Outcomes, not means to outcomes, should be the basis for evaluating performance. An example of this is the case of endangered salmonid species; the focus should be on fish populations (outcome) rather than riparian buffer zones (means). Criteria that people can use to select outcome variables for evaluating management performance include: relevance to policy questions, ease of modeling, appropriateness to scale, measurability in either quantitative or qualitative terms, and accurate response to management. Selected variables need to be powerful in that they are applicable across subsystems, comprehensive in that they reflect broad interactions, and yet succinct in application.

Biophysical and Social Characterization Components:

- **Terrestrial;**
- **Aquatic;**
- **Economic:**
- **Social; and**
- **Landscape**

Another step in scenario planning identifies appropriate management actions that translate policies to desired outcomes. Examples include wilderness designation, road closures, and timber harvest levels. Actions will vary in timing, location, and effect.

Scenarios project qualitative social and biological outcomes. These projections allow us to learn about the merits, pitfalls, and tradeoffs of ecosystem management choices and give information for making decisions. For example, timber stand growth and yield models project periodic volume accrual for alternative silvicultural treatments. In the same way, comprehensive ecosystem projections for various levels of management report major outcomes for social and biophysical subsystems. Subsequent analyses of uncertainty and risk in scenarios provide information about robustness of an outcome, that is, the likelihood of an outcome under slightly varying conditions. Another important index of performance is its legality. Policy analysis of scenarios needs to distinguish between results from management in a given scenario and naturally occurring changes.

Scenario Planning:

- **Integrates biophysical and social processes;**
- **tool for learning;**
- **can explore possible futures; and**
- **can model both quantitative and qualitative processes.**

Systematic synthesis through model building and scenario planning are parts of assessments that have been absent in the recent large-scale ecosystem management efforts (for example FEMAT). This synthesis informs planning and decisionmaking and consciously avoids value-laden, all-or-nothing choices. Synthesis makes explicit the often implied marginal cost and benefit analysis that has been the basis of past management decisions. This synthesis may enable policy makers to identify unexpected options that satisfy formerly conflicting scenarios. Policy debates can then be focused on specific elements rather than on generalities.

Assessing ecosystem components at various temporal and spatial scales provides the foundation for making better natural resource management decisions that will be more acceptable to the public. By describing past, present, and possible future trends in ecosystem development using inventories, models, and scenario planning, desired futures can be developed that are consistent with the ecosystem principles. Because there is a tremendous wealth of information on ecosystem components at various scales throughout the Basin, it would be advantageous for agencies to use it to affect future management of natural resources.

Prototypes for Ecosystem Planning and Analysis

This framework is not the first nor will it be the final approach developed for ecosystem management. There is a wealth of data collected and being collected that can be used along with the concepts in this framework to address natural resource management in the Basin. To speed this task as rapidly as possible, prototypes are planned that will be used as models to test the framework. They will provide examples of how the concepts and procedures outlined in the framework can be used and to disclose unexpected results and problems from implementing the framework. In addition, they can provide guidance to administrative units for assessing staffing needs, budgets, and organizational structure.

An immediate operational test of the framework will determine if adjustments to the framework are needed. This short-term strategy will also provide interim recommendations while the framework is being refined during the assessment of the Basin. Later applications of the framework will allow complete implementation using the full array of data collection, analysis, and mutual learning components presented in the framework. The areas chosen for the prototypes should demonstrate: assessments at a variety of temporal and spatial scales, mutual learning, a decision, project implementation, a monitoring plan, how these framework components relate to each other, and how they conform to the ecosystem principles.

Case study and pilot approaches are suggested for selecting the initial prototypes. Current efforts by individuals, agencies, or industries could be used as case studies for different steps of the framework and the results of implementation. Examples of known projects that could be potential case studies are:

* Elkhorn Landscape Analysis, Helena National Forest;
* FEMAT Watershed Analysis;
* Greater Yellowstone Ecosystem Framework;
* Blue Mountain Forest Health Report;
* Adaptive Management Areas;
* Eastside Forest Health Assessment; and
* Upper Grande Ronde Plan.

In the pilot approach, national forest(s) and/or BLM district(s) could be asked to implement the framework. There would be a direct link to the Basin assessment. The benefit of this approach is that it would provide one prototype to test the entire framework. Depending on the field unit(s) selected and the amount of in-place, applicable data, the pilot approach could result in a high cost in terms of personnel and budget.

Criteria for prototype selection:

* Data availability in areas where little or no additional data collection is needed or where already planned activities could be used for data collection. Such sources could include Forests conducting watershed assessments, Forests or BLM units assembling data for consultations on anadromous fish, or watersheds sampled during the Eastside Forest Ecosystem Health Assessment (Everett and others 1994);
* Areas within the Blue Mountain Forest Health Assessment;
* Areas where some form of ecosystem management or analysis is planned or ongoing such as watersheds being assessed following FEMAT procedures;
* Line officer commitment;
* Public/interagency mutual learning procedures are operational;
* Necessary FS and BLM staff are in place;
* Recognition of a range of issues and types of communities.

Also for showing the long-term consequences of using the framework, the selection prototypes involving more complex issues might be favored. These prototypes could demonstrate multi-agency and private participation, areas with contentious issues (Snake River Basin Section 7, consultation for anadromous fish), or FEMAT Adaptive Management Areas may be possible candidates.

It is preferable that more than one prototype be implemented so the framework can be evaluated across a range of issues, ecological types, and social environments. Conducting prototypes in more than one Forest Service region and BLM state could also help build ownership in the process and provide consistency in management.

Prototypes

* **Test framework components;**
* **Demonstrate assessments at several scales;**
* **Provide ability to monitor concurrent with assessment;**
* **Use existing activities to learn from.**

Strategies for Information Management and Evaluation Systems for Ecosystem Management

The collection, maintenance, analysis, and sharing of information regarding the conditions of ecosystems are integral parts of ecosystem management. Information management is the inventory, acquisition, storage, maintenance, and use of data and information. The degree of success with which resource managers develop and evaluate options has significant implications on the quality and cost-effectiveness of the work they perform. It is questionable whether organizations can be fully successful in implementing ecosystem management without a strategic plan for information management.

Although the layperson typically uses the terms information and data interchangeably, to the information manager, the distinction between them is important. Data are facts that result from the observation of physical phenomena. Information is data used in decision-making. One implication is that information is of relative importance; that is, what is of considerable importance in one situation or decision may be useless in another. A second implication is that information and decision-making are closely intertwined.

Information management is an integral part of the general planning model for the Basin (fig. 4). In the model, information is used to make decisions through analysis and evaluation of data. Data are acquired either externally (assessments) or through monitoring. Based on the information, a decision can be made and a course of action can be implemented. Monitoring provides essential feedback data for adaptive management decisions.

To facilitate the integrated management of information and effective evaluation across all scales of assessments and plans, an inter-organizational approach will accomplish the following:

* Strive to provide consistent and continuous information across all ownerships or analytical units;
* Provide linkages between scales;
* Develop consistent standards including definitions of terms and procedures for information management;
* Provide a uniform database that is usable for many resource areas;
* Develop a process for transition from implementation of short-term strategies to achievement of long-term goals for integrated information management;

* Recognize information as an essential resource and provide for its quality control and maintenance;
* Promote partnerships between organizations for data acquisition, storage, sharing, maintenance and analysis;
* Evaluate and implement the use of analytical tools to the extent practical; and
* Develop flexible information management systems capable of accommodating changing needs.

To accomplish these goals, the FS and BLM propose to establish a current, consistent, and accessible information network and coordinate analytical processes to support ecosystem management.

Cooperation and Mutual Learning

Resource issues have shifted from being primarily local to regional, national, and global in scope. Traditional approaches to information management within some organizations often have been focused on localized needs. To meet a broader focus, an inter-organizational approach is required where people, data, and technology are all part of product development and solutions.

Although spatial data and evaluation models are essential resources, other types of information will be valuable for implementing ecosystem management. There is a need to develop a strategy for effective management of these additional sources of information for ecosystem management. The strategy could address relevant information sources, such as public and private libraries, online catalogues, archives, electronic bulletin boards, and retrieval services. The objective would be to provide the best information to ecosystem managers, planners, and decision-makers. Types of information include books, articles, reports, proceedings, workshop summaries, legislation, historical accounts, maps, administrative and regulatory guidance, and others. The media of information would include print, electronic, visual, audible, and other forms.

People

Traditionally, people's attitudes and understandings of information have focused on single resource approaches to management. It is common to find multiple sources for similar information within an organization, sometimes with data being incompatible or inconsistent. With the focus on localized, narrow needs, it is difficult to understand and value uses of data beyond their original intent. Data access and maintenance are often not adequately provided for, resulting in less-than-optimal value received for the investment.

A key ingredient for information management is a work force well trained in the use and application of resource information, GIS, and associated technologies. People involved in resource management must develop an understanding of, and recognize the value of, an information management strategy within the context of ecosystem management.

Data

Traditionally, data have been difficult to integrate because the utility and long-term use have not been thoroughly considered. This has resulted in disparate data with gaps in information often making it difficult to bridge scales of data. Currently, no source exists that inventories and catalogues all available data sets for agencies and organizations. In most instances, data have not been adequately documented or treated with ample quality control.

The recommended approach involves incremental change during a transition from current data systems to a fully integrated database, particularly for spatial data. This strategy should use consistent methodologies and have a core set of common thematic layers.

Inventory and mapping needs to be consistent and integrated. A process for documenting data should be developed and include lineage, accuracy, and process. A multi-value, inter-organizational inventory strategy could be implemented and available to all interested parties. The characteristics of such a strategy would include:

- Common protocol;
- Coordinated database management;
- Coordinated quality control;
- Boundary neutrality;
- Multi-scale outputs--useful at all scales;
- Dynamic--includes trends;
- Social, economic, biological and physical components;
- Spatial explicity;
- Cost efficiency; and
- Adequate protection of proprietary and sensitive information.

Technology

Traditionally, technology has been agency-specific, with limited access. It is recommended that the appropriate technology be accessible to the people who need it, when they need it. Appropriate technology might include:

- Geographic information systems;
- Global positioning satellite;
- Image analysis (remote sensing);
- Database technologies (relational, object oriented);
- Decision support systems/expert systems; and
- Models (spatial, simulation, optimization, growth, etc.)

Other technologies may include virtual systems, dynamic linkages and coupled systems modeling.

State-of-the-art telecommunication technologies are extremely important. The essence of ecosystem management is cooperation among agencies and people and an atmosphere of mutual learning. Unless data, information, and routine communications are shared between the various organizations, it will be a struggle to implement ecosystem management.

Information management in the Interior Columbia River Basin should consist of cooperative efforts using common processes and sharing a common vision for a fully integrated information network to support all scales of ecosystem management. Recognition of the importance of an integrated approach to information management relative to ecosystem management is critical to its successful implementation. Investments in the data, people and technology, coordinated among organizations, will add to the value of individual efforts. A fully integrated information management strategy will have broad application beyond the Basin.

Information Management:

- **Is a cooperative process;**
- **requires an integrated approach; and**
- **requires investment in data, people, technology, and coordination.**

Summary

An ecosystem-based strategy will help guide management to be responsive to policy questions. It is a way of thinking and planning rather than a set of actions to implement. It includes consideration of the social element as well as biophysical processes and limitations.

The four main principles requiring consideration are:

* Ecosystems are dynamic and evolutionary.
* Ecosystems are organized within a hierarchy of scales of time and space.
* Ecosystems have biophysical and social limits.
* There are limits to the predictability of ecosystem patterns and processes.

Ecosystem management also encompasses the idea of adapting management based on new information. Planning, implementation, monitoring, and evaluating management activities form a loop rather than a linear process. Management is undertaken in a way that allows for learning and modification of the next round of implementation accounting for new information and changing systems. It is important that measures of success be defined at the outset of any planning cycle. These indicators are then monitored to enable evaluation.

Assessment of the present situation includes looking at the past and projecting to the future to the extent possible. Assessments include social and economic context as well as the biophysical parameters. The hierarchical nature of ecosystems requires that decisions at each scale be considered in light of impacts at the next larger and next smaller scale. Because ecosystems are of many scales--from the microscopic to the entire globe. No single set of scales are appropriate for all assessments or plans.

Systems modeling and scenario planning facilitate envisioning the possible future conditions resulting from potential management decisions. An important tool in organizing and displaying information is an integrated information system--integrated across ownership boundaries, agency processes, and political boundaries. Databases, software, and hardware for a geographic information system are necessary to support the modeling and planning efforts.

Scientists, individuals, tribal nations, public groups, counties, states, and land managers are involved throughout the process in appropriate ways. Public involvement in determining desired future condition and in discussions of possible results of actions (or inaction) is necessary. Inclusion of people with a variety of viewpoints in discussions allows consideration of the widest possible array of choices and fosters cooperation by allowing ownership in the process.

Measures of success of the ecosystem management concept as a whole would be healthy, functioning forests and human communities now and for future generations; a flexible process that accounts for changing systems and social demands; and a spirit of cooperation and trust in management of our natural resources.

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Appendix One
Provincial Boundaries

The President's Plan for Pacific Northwest forests uses the term "province." Provinces are now delineated on maps for western Washington and Oregon and for northern California. The province system described in the President's Plan is a watershed based delineation that includes the landscape, social values, and structures, and are used for watershed analysis and restoration. Within the context of this effort, provinces are usually defined at a scale below the river basin encompassing multiple watersheds (fig. 9). To eliminate common misunderstandings about past uses, intents and definitions of the term "province" herein the term province will be used generically as a subunit of the Basin. Finer analysis and decisionmaking levels will occur below this level (area, site).

There are significant differences in eastern Oregon and Washington landscapes and concerns compared to those occurring in the western portions of the states. This raises the question of how provinces should be used for planning and characterizing eastern Oregon, eastern Washington, Idaho, and western Montana, or even if the province concept should be used. The intent of this section is to review, discuss and recommend alternatives for the use of provinces.

To facilitate national resource planning, provinces are areas that can be used to set management priorities and to implement decisions. An initial assumption is that province boundaries would be fixed to define the appropriate communities of interest on given issues -- with provisions to change or modify the boundaries if justified. Ecosystem assessment and analysis would use the appropriate scales regardless of provincial boundaries.

By using provinces for planning, large areas such as the Basin can be divided into smaller units to facilitate assessments, decisionmaking, monitoring, and dissemination of information at a finer scale. Provinces can be used to integrate information and provide a reference to management boundaries for scientific assessments. Also, provinces can facilitate multi-agency, multi-ownership, multi-government collaboration.

Province boundaries are artificial and will vary according to the social and biophysical selection criteria and thereby, should be socially and politically acceptable. When integrating a variety of issues, based on the scale applicable to the issue, province boundaries could change through time. Fixed boundaries may or may not be desirable or even needed and the boundaries are likely to cross traditional administrative boundaries. The province structures developed for eastern Oregon, eastern Washington, Idaho, and western Montana should be compatible with the structure that is in place on the west side.

In addition to the social and biophysical considerations, management considerations should also be evaluated when establishing provincial boundaries. Administrative efficiency, budgets, personnel, laws, Native American government-to-government relationships, and land ownership patterns are a few of the management considerations. These considerations can be used to develop criteria for defining provincial boundaries.

Potential criteria for defining province boundaries were developed using social, biophysical, and management considerations. The establishment of province boundaries would usually strive to maximize within-province homogeneity in one or more of the following criteria:

* Follow watershed boundaries;
* Encompass similar patterns of disturbance regimes and/or land-use patterns;
* Ensure people have a sense of place or belonging to a province (community, river drainage, transportation network);
* Follow existing physiographic delineations;
* Encapsulate use corridors (interstate highways, rivers, animal migration);
* Maintain the integrity of boundaries for ceded, reservation, and allotted lands, or other lands pertaining to Native American rights;
* Ensure ease of record keeping for cost effectiveness of administration, multi-agency coordination and planning;
* Encompass areas of common decisions;
* Use state and congressional district boundaries;
* Encapsulate zones of trade (mining areas, farming, timber areas); or
* Encapsulate areas of similar inherent capabilities of the land, water, and climate over time (Palouse hills).

Options for Province Boundary Delineation

No alternatives or final provincial boundary can effectively address all the criteria or meet all desired uses. Therefore, these options describe different methods for meeting subsets of the criteria. Each option has its own theme, advantages, and disadvantages.

State Line

Provinces delineated primarily by state boundaries would be the simplest. Bounded on the west by the crest of the Cascade Range and separated by state lines, the proposed provinces would include eastern Washington, eastern Oregon, Idaho, and the portion of Montana in the Basin. The advantage of this option is that it would provide politically clear boundaries. Moreover, many of the social considerations (sense of ownership/place, private lands, economics, Native American Tribal reservations, and political boundaries), and management considerations are already included in these existing boundaries making acceptance likely.

A major disadvantage of province boundaries based on state lines is that boundaries would include only a few of the biophysical characteristics of the Basin. Such large provinces might inhibit management decisions and diminish a sense of ownership or belonging for some individuals or communities.

Watershed/Hydrologic Divide

Provinces delineated along watershed boundaries would address many of the biophysical considerations and fit into a hierarchical classification. These province delineations could easily facilitate data collection and analysis, mutual learning, and monitoring. Also, provinces based on watershed would be measurable and not change significantly through time making record keeping efficient.

Using watershed boundaries as the primary province boundaries would not easily accommodate ecological issues that cross watershed boundaries. For example many wildlife, use corridors, cultural, and economic issues are not easily bounded by watersheds. Also, political, administrative, Native American tribal lands/rights, and ownership boundaries often do not follow watersheds.

Centers of Cooperation

Province boundaries based on the concept of centers of cooperation are placed to maximize the efficiency in administration, planning, management and decision making, and cost reduction. Several centers within the Basin could be established, out of which task groups would operate. Location and number of centers would be based on work force needs and cost efficiency. Depending on the natural resource issue, a variety of units could collaborate to form a task group. Therefore, depending on the issue, provinces based on this concept could have multiple boundaries, one for each different issue.

Primary advantages of this concept are the emphasis on mutual learning, advancing knowledge, and cooperation. Boundaries would be flexible, reducing psychological hurdles that often limit cooperation. The resulting boundaries could be delineated using many of the managerial, social, and biophysical characteristics of the Basin.

Unclear boundaries developed using centers for cooperation would be new and different, and make many managers, communities of interest, and other individuals uncomfortable. There could be disagreement as to the location of the centers of cooperation, issue development, and the resulting provincial boundaries. Preparing and administering budgets would be difficult given the current political and administrative structure.

Physiographic Provinces

This option uses major land forms to delineate provinces within the Basin. Examples of these provinces include Okanogan Highlands, Columbia Plateau, and Blue Mountains. Several systems delineate physiographic provinces; each has different boundaries based on different criteria (Bailey USDA, Franklin and Dyrness and others 1994.

Physiographic provinces are already delineated from previous work, which is a major advantage in selecting this system of boundary establishment. The characterizations of the areas include broad correlations to human occupancy, resource capabilities, zones of supply and trade, people's sense of place, and ownership patterns. Also, by establishing planning provinces using physiographic provinces, boundaries tend to follow public land boundaries.

Using physiographic provinces to delineate planning provinces would separate upper basins from lower basins for the major rivers and make water-related issues more difficult to address. Physiographic province boundaries are not objectively determined, nor are they consistently located or identified on-the-ground. In addition, assessment areas may not coincide with physiographic provinces.

Interagency

This option recognizes the normal and desired "area of influence" for all the Federal agencies who have management responsibilities within subunits of the Basin. This option would consider the location of all Federal agencies and people with whom they normally work. The province would recognize the Federal and private land units to which individuals generally relate to. The local managers and the local public could best determine the boundaries of these units. An example might be the Okanogan/Colville areas of Federal lands in northeastern Washington or the Yakima Indian Reservation.

This option could easily consider most of the managerial and social components of the Basin but would minimally consider the biophysical characteristics.

Supply Area

This option for province delineation recognizes broad areas where major types of "supplies" may be or are being produced. Examples are large areas producing wheat or other agricultural crops, timber-producing areas, rangelands, key water-producing areas for cities, high elevation recreation or primitive-use areas, old-growth forests, and scenic river drainages.

Individuals and communities of interest could relate to areas with similar uses. Some provinces could be primarily or entirely on private lands. More local control of management could be obtained using provinces based on this concept and this might allow analysis and decisions to be made on the basis of land-use.

This option would minimally address the social characteristics of the Basin and not consider the biophysical components. This option would not easily relate to Native American tribal concerns, multi-agency concerns, or state or congressional district boundaries. In addition, some province areas could be beyond the primary scope or intent of the framework for ecosystem management.

No Provincial Boundaries

No provincial boundary delineation allows for all of the biophysical and social components to be addressed on a Basin-wide approach. This option could address large-scale issues, and cooperation and decisionmaking would include all parties of concern.

Without provincial boundaries, planning and decision processes could be overwhelmed with information and the numbers of participants involved. Small-scale issues would be difficult to deal with as would public information processes. Because of the large area, monitoring would be difficult. In addition, the Basin crosses many political divisions further complicating the management decisions made at that scale.

Processes for Determining Provinces/Recommendations

The options displayed for delineating province boundaries show some of the choices available. The selection of a province boundary could consider combining the best attributes of several options. Also, the decision on boundaries could be deferred until the assessment of the Basin is complete. Priorities for provincial boundaries should emerge from the biophysical and social assessments and the needs for planning. Premature identification of lines will risk perpetuating status quo. Three audiences need to validate any boundaries: the public, scientists, and managers.

Appendix Two Science Integration Team Members

Name	Background
Tom Quigley Science Team Leader	Bachelor of Science in Watershed Science from Utah State University (1971); Master of Science in Range Economics from Utah State University (1973); and a PhD. in Range Economics from Colorado State University (1985). Manager of the Blue Mountains Natural Resources Institute and Lab Coordinator for the forestry and Range Sciences Laboratory (USDA Forest Service) in La Grande, Oregon; Hydrologist and Range Conservationist for the Rio Grande National Forest (1977).
Jon Bumstead Social Sciences	Bachelor of Science degree in Forest Management from the University of Washington (1972); Master of Arts Degree in Applied Sociology from Northern Arizona University (1992). Regional Social Science Coordinator for the Southwestern Region of the Forest Service and University Liaison for the region since 1992.
Roger C. Clark Social Sciences	Bachelor's Degree in Forest Sciences from the University of Washington (1968); PhD. in Forest Sciences from the University of Washington (1971). Program Manager for the People and Natural Resource Research Development & Application Program with the USDA Forest Service, Pacific Northwest Research Station, Seattle, Washington. Co-founder of the Consortium for the Social Values of Natural Resources.
Lynn Decker Aquatic/Riparian	Master of Science in Wildland Resource Science from the University of California Berkeley; Bachelor of Science in Wildlife and Fisheries Biology from the University of California, Davis. Regional Fisheries Program Leader for the Pacific Southwest Region of the USDA Forest Service headquartered in San Francisco, California since 1991. Prior to 1991, Research Fisheries Biologist with the Pacific Southwest Research Station.
Russell Graham Deputy Science Team Leader	Bachelor of Science in Forestry from the University of Montana; Master of Science and PhD. in Forestry from the University of Idaho. Research Forester with the Intermountain Research Station USDA Forest Service (18 years) and Forester on the Bitterroot National Forest (3 years).

Name	Background
Wendel Hann Landscape Ecology	PhD. in Forest, Wildlife, and Range Ecology from the University of Idaho; Master of Science in Forest and Watershed Science from the Washington State University; and Bachelor of Science in Range and Wildlife Management from the Washington State University. Group Leader for Landscape/Ecosystem Assessment, in Missoula, Montana, for the Northern Region of the Forest Service (1984).
Richard Haynes Forest Policy and the Economics	Bachelor of Science and Master of Science in Forest Management from the Virginia Polytechnic Institute; and PhD. in Forest Economics from North Carolina State University. Program Manager with the U.S. Forest Service at the Pacific Northwest Research Station in Portland, Oregon (18 years).
Paul Hessburg Research Development and Application	PhD. in Botany and Plant Pathology from the Oregon State University of Minnesota. Plant Pathologist with the Forest Health and Productivity Research, Development and Application Program, USDA Forest Service, Pacific Northwest (PNW) Research Station in Wenatchee, Washington.
Amy L. Horne Forest Policy and Economics	Doctor of Forestry and Environmental Studies and a Master of Forest Science from the Yale School of Forestry and Environmental Studies; Master of Public Administration and a B.A. in economics from the University of Wisconsin. Work experience includes managing eastern hardwood forests to conducting tree physiology research for Weyerhaeuser Company, as well as working for the Office of Coastal Zone Management and the Environmental Law Institute in Washington, DC.
Mark E. Jensen Landscape Ecology	Honors Degree in Physical Geography from St. Andrews University, Scotland; Bachelor of Science in Natural Resource Management from the University of California Berkeley; and a PhD. in Soil Science from Oregon State University. Regional Soil Scientist for the USDA Forest Service, Northern Region, Missoula, Montana (1990). Soil Scientist on the Caribou National Forest, Region 4 (1978); Forest Hydrologist and Soil Scientist in the Humboldt National Forest (1982); Quantitative Ecologist for the Northern Region (1986).
Kristine M. Lee Terrestrial	Bachelor of Science in Biology from Washington State University; Master of Science in Fisheries Science from the University of Alaska, Fairbanks. Regional Program Manager for Planning and Budget in Fisheries and Wildlife, Intermountain Region, Forest Service (1990); District Biologist on the Clearwater National Forest; Professional Fish and Wildlife biologist with Federal and State government and private industry (4 years).

Name	Background
Stephen F. McCool Social Sciences	Bachelor of Science in Forest Resources Management from the University of Idaho; Master of Science and PhD. from the School of Forestry at the University of Minnesota, with emphasis on social aspects of outdoor recreation management. Currently on an intergovernmental assignment to the Pacific Northwest Research Station's People & Natural Resources Program; Professor of Wildland Recreation Management at the School of Forestry in the University of Montana (will return after assignment completed); Director of the Institute for Tourism and Recreation Research at the University of Montana (1987-1993); Staff Officer for Recreation and Wilderness on the Flathead National Forest in Montana (1986).
Bruce G. Marcot Terrestrial	PhD. in Wildlife Ecology at Oregon State University; Master and Bachelor of Science in Natural Resources Planning at Humboldt State University. Wildlife Ecologist and Technical Leader with the Ecological Framework for Management Research, Development, and Application Program, USDA Forest Service Research Station in Portland, Oregon; worked internationally in forest and watershed management, and has written publications in ecology and wildlife biology.
James R. Sedell Aquatic/Riparian	B.A. in Philosophy from Willamette University; PhD. in Environmental Biology with a minor in Forensic Chemistry from the University of Pittsburgh. Pacific Northwest Research Station as a Research Aquatic Ecologist (since 1980); member of the National Research Council on the National Academy of Science Committee on Forestry Research; Co-chair of Forest Service team to develop strategy for management of anadromous fish habitat; panelist in the President's Forest Conference.

Appendix Three
Framework Workshop

A workshop was used to gather information for producing the scientific framework for ecosystem management in the Interior Columbia River Basin. The participants in the workshop were invited experts, managers, and other knowledgeable individuals involved with natural resource issues. They came from Universities, State, Federal, private, and other organizations. A wide range of disciplines were represented including economics, social, wildlife, silviculture, hydrology, management, range ecology, forest ecology, wildlife, fisheries, and information systems to name a few. As a portion of the workshop, a facilitated meeting with the invited participants and the public was held to discuss the framework outline. The information was integrated along with other information produced during the week and used in preparation for a framework rough draft. The invited participants of the workshop were:

Jeff Blackwood
Pat Geehan
Russ Graham
George Pozzuto
Tom Quigley
Pat Bourgeron
Rick Brown
Mike Farrow
Carl Gossard
Colin Hardy
Paul Hessburg
Dave Holland
Jim Morrison
Russ Thurow
Jim Weigand
Elaine Zieroth
Jon Bumstead
David Iverson
Wayne Luderman

Tom Nygren
Jack O Brian
Bob Rainville
Joe Ritchie
Susan Boudreau
David Brooks
Kelly Burnett
Dan Camenson
Richard Haynes
Amy Horne
Jim Merzenich
JoEllen Force
Iris Goodman
Wendel Hann
Cathy Humphrey
Jim Jordon
Seva Joseph
Jeff Kershner
Kris Lee

Gary Wyke
Bob Davis
David Denton
Ken MacDonald
Richard Thompson
Jonalea Tonn
Joan Trent
Carl Almquist
Lewis Brown
Dick Dyrland
Becky Gravenmier
Steve Mader
John Steffenson
Steve Caruana
Lynn Decker
Okie Gossarth
Shirley Muse
Ayn Shlisky
Tim Tolle

Appendix Four
Glossary

Adaptive management - implementing management decisions as experiments that test assumptions and prediction; results are used to modify management policy in management plans.

Alternative - one of several projects, policies, or plans proposed in accordance with NEPA for making decisions. Alternatives are not part of assessment.

Anadromous - moving from the sea to fresh water for reproduction.

Assessment - collecting, integrating, and interpreting information derived from scientific techniques to help answer policy questions.

Basin - the area of land that drains water, sediment, and dissolved materials to a river.

Biodiversity - the variety of living organisms and their processes.

Biomass - the sum total of living plants and animals above and below ground in an area at a given time.

Biophysical subsystem - the conditions, processes, and variability of the biological and physical patterns and dynamics.

Climate - generalized statement of the prevailing weather conditions at a given place, based on statistics of a long period of record. Includes seasonality of temperature and moisture.

Community - an assemblage of species at a particular time and place, usually people.

Composition - the constituent elements of an entity; for example, the species that constitute a plant community.

Corridor - landscape elements that connect similar patches through a dissimilar matrix or aggregation of patches.

Cumulative effects - effects on the environment resulting from individual events that collectively become significant over a period of time.

Disturbance - any event, caused by people or other factors, that alters the structure, composition, or function of terrestrial or aquatic habitats.

Ecosystem - a community of plants and animals interacting with each other and with their environment; includes both biophysical and social components.

Ecosystem management - the careful and skillful use of ecological, economic, social, and managerial principles in managing ecosystems to produce, restore, or sustain ecosystem integrity and desired conditions, uses, products, values, and services over the long term.

Environment - the combination of external or extrinsic physical conditions affecting and influencing an organism or group of organisms.

Feedback loop - a closed chain of causal connections.

FEMAT - the Forest Ecosystem Management Assessment Team comprised of some 50 people from various federal agencies who developed the report titled "Forest Ecosystem: An Ecological, Economic, and Social Assessment." The FEMAT report released July 1, 1993, proposes a management plan for species related to late-successional and old-growth forest related species within the range of the northern spotted owl.

Function - the role or activity played in an ecosystem by a species, group of processes, structure, or developmental stage.

GIS - Geographic Information System; an information-processing technology to input, store, manipulate, analyze, and display spatial resource data to support decision-making.

Habitat - place where an animal or plant normally lives, often characterized by a dominant plant form or physical characteristic.

Hierarchy - a sequence of sets composed of smaller subsets.

Issue - a point of debate, discussion, or dispute.

Landscape - a heterogeneous land area composed of a cluster of interacting ecosystems that are repeated in similar form throughout.

Model - a tentative description of a system that accounts for all of its presently known properties.

Monitoring - collecting information to determine effects of resource management and to identify changing resource conditions or needs.

National Environmental Policy Act (NEPA) - an act that encourages productive and enjoyable harmony between humans and their environment; promotes efforts to prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humans; enriches the understanding of the ecological systems and natural resources important to the Nation; and establishes a Council on Environmental Quality.

Old growth - old forest often containing several canopy layers, variety in tree sizes and species, decadent old trees, standing and down dead woody material.

Outcomes - results of ecosystem processes and management including condition and flows of goods and services.

Pattern - a configuration of elements such as patches, corridors, or matrix in a landscape.

Process - a series of actions, or changes of functions which alter the state of an entity.

Plant community - an assemblage of plants living together and interacting in a specific location.

Restoration - to maintain or recover elements, structures, processes, and interactions of ecosystems or landscapes according to essential characteristics of a former condition.

Riparian - pertaining to land that is next to water, where plants dependent on a perpetual source of water reside.

Scenario - a tool for visualizing different future environments in which decisions might be played out.

Scenario planning - a learning device for expanding awareness of possible futures.

Seral stage - any of a predictable sequence of transitional plant communities that leads to the terminal or climax community.

Structure - the physical organization and arrangement of live or dead vegetation; the size and arrangement (both vertical and horizontal) of trees and tree parts.

System - an interconnected set of elements that is coherently organized around some purpose. It is more than the sum of its parts and may exhibit dynamic, adaptive, goal-seeking, self-preserving, and evolutionary behavior.

Value - a principle, standard, or quality regarded as worthwhile or desirable.

Viability - the likelihood of continued existence of populations of a species.

Watershed - total land area draining to any point in a stream; in the Blue Mountains of eastern Washington and Oregon, watersheds typically range in size from 10,000 to 50,000 acres.

Wildfire - human or naturally-caused fire that does not meet land management objectives.