The Columbia River Multi-Species Framework: Principles and Progress[1]

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INTRODUCTION

Natural resource management often operates in crisis mode. The urgency of actions to address the needs of declining species as well as the acute impacts of change to economic and social interests pushes management toward small-scale measures aimed at short-term goals. Managers are usually in the position of fighting brush fires sparked by the latest endangered species listing, forecasted bad return or other crisis. Whether solutions to these brush fires add up to the collective long-term vision is rarely addressed.

The factors that lead to these crises often operate at much larger scales than do our solutions (Brown 1996; Holling and Meffe 1996). Global climate change and especially human population growth and changing demographics are examples of large-scale phenomena that produce the situations that we deal with using small scale actions. Our responses can be characterized as rear-guard actions that slow the retreat of existing natural systems in the face of widespread environmental modification.

Few areas of natural resource management exemplify these problems like the Columbia River. The basin presents a complex web of state, federal and tribal agencies spanning four states and extending into Canada. Myriad economic and social groups spar to defend their interests. Natural ecological systems in the basin have been greatly altered resulting in declines in native salmonid populations and other native species. Currently many chinook salmon populations in the basin are listed as endangered under the federal Endangered Species Act and most salmon populations have suffered serious declines (Nehlsen and others 1991).

The Columbia River Multi-Species Framework Project (http://www.nwframework.org/) is an on-going effort to address these problems of scale and purpose for fish and wildlife planning in the Columbia River Basin. It is a cooperative effort of state, federal and tribal natural resource managers organized by the Northwest Power Planning Council. The Framework Project is intended to provide the basis for development of a revised version of the Council's fish and wildlife program (NPPC 1994). The focus is the long-term vision for the basin and a set of strategies to achieve needed ecological change, It addresses the region at several nested geographic scales that are linked to a long-term, large-scale vision for the basin. This paper discusses the framework, the planning process and analysis, and expected future steps.

THE FRAMEWORK

The framework itself (as distinct from the Multi-Species Framework Project described below) provides a logical structure for regional planning and especially the fish and wildlife program of the Northwest Power Planning Council (Northwest Power Planning Council 1997). It stresses development of a long-term vision as a basis for ecological objectives and strategies. This avoids the tendency to focus on means prior to consideration of their ultimate purpose. The framework begins with a large-scale consideration of the basin and ultimately focuses on actions at the subbasin or smaller scale.

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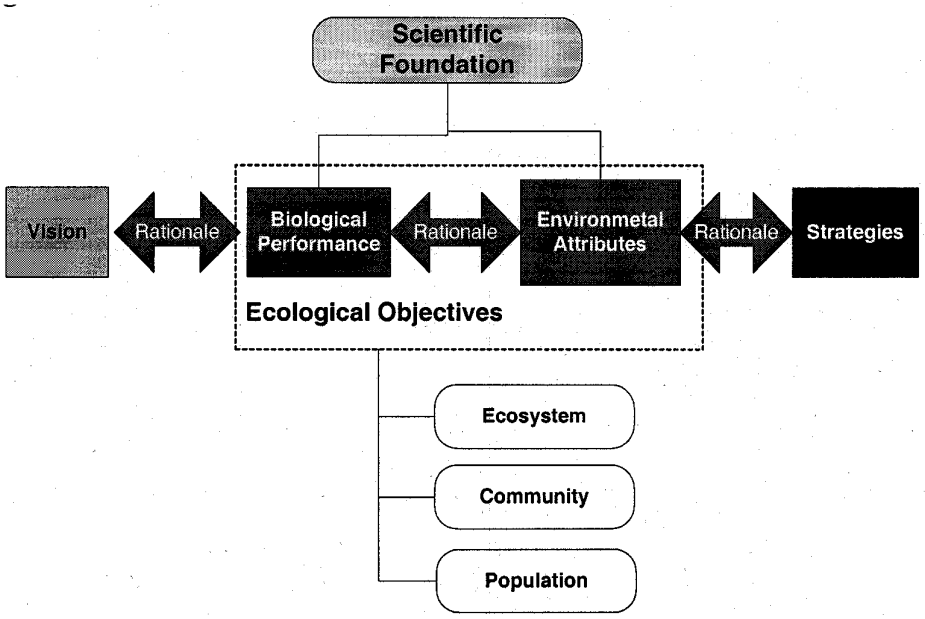
The Framework consists of three linked elements (Figure 1): the Vision, Ecological Objectives (Biological Performance and Environmental Attributes) and the Strategies. The objectives and strategies flow from the long-term Vision. We use the term vision rather than goals to stress the need to describe a future state for the Columbia River Basin. This might be in terms of fish and wildlife, environmental amenities and natural resource development. It can also include quantifiable goals for fish and wildlife as well as less easily quantified intrinsic and aesthetic goals.

Figure 1. Elements of the Framework.



If the Vision does not describe the existing situation, ecological change is needed. This is described by the Ecological Objectives. The objectives address aspects of the ecosystem, biological communities and populations of specific species. We distinguish two aspects of the Ecological Objectives. Environmental Attributes are descriptors of the physical and biological habitat. They include measures of habitat such as land use, ownership, slope, flow and water quality. Biological Performance is the biological response to the habitat condition, measured in terms of capacity, productivity, and life history diversity. Performance is described for specific aquatic and terrestrial species such as chinook salmon, bull trout, beaver and black bear.

Finally, Strategies are broad classes of actions that are designed to change Environmental Attributes and so move the system from the existing condition to the one described in the Ecological Objectives. A strategy might be, for example, the reduction in road densities in forested lands to reduce aquatic sediment load (an Environmental Attribute), Actions associated with this strategy would describe exactly when and where this strategy would be used.

An essential part of the Framework is the Scientific Foundation (Northwest Power Planning Council 1998). This is an explicit set of scientific assumptions and hypotheses linking the elements of the framework. The centerpiece is the set of Scientific Principles. These are ten statements of ecological principles stating our view of how species, including humans, relate to their environment. The Principles are the basis for the rationale (the arrows in Figure 1) that links the elements to form a logical, scientifically based program.

A final component of the Framework is the geographical structure. We distinguish at least four levels of ecological organization that affect the performance of the region's efforts to restore fish and wildlife in the Columbia Basin. Although unproved, it is our hypothesis that these hierarchical levels describe important spatial and temporal scales of ecological function and management (Holling and Meffe 1996). The overall extent of the, ecosystem (Wiens 1989) was defined with reference to the migratory range of chinook salmon. It includes two landscape components, the watershed of the Columbia River Basin and that portion of the northeast Pacific Ocean encompassed by the migration of Columbia River chinook salmon. Within the Columbia River Basin, we find ten ecological provinces. These are broad areas with distinct ecological character resulting, from large-scale differences in geology and climate. For example, the Columbia River Plateau Province is defined by the main extent of the Columbia River Basalt. The climate is arid and land use is generally agriculture based. Ecological change has resulted from irrigation and grazing in addition to hydropower development. This suggests a common set of solutions and the opportunity to coordinate actions within and between subbasins. Subbasins are watersheds (e.g., John Day River) contained within the provinces. Our fourth level and finest resolution or grain (Wiens 1989) is the HUC-6 (hydrologic unit code) of which there is about 7,500 within the Columbia River Basin. In most cases, the actions that are tied to the basin-wide vision occur within these HUC-6 sections. Organization of these actions into longer term and larger scale change occurs at the higher levels.

THE MULTI-SPECIES FRAMEWORK PROJECT

The framework itself is a structure without content. It provides an organization and a logical, scientific foundation for a fish and wildlife program. In the Multi-Species Framework Project, we are exploring a set of alternative futures for the Columbia River using the framework structure. It is intended to provide the Northwest Power Planning Council with a set of regionally developed alternatives for the future structured around the framework described above. They will be accompanied by an analysis of their ecological and human impacts. The "Multi-Species" aspect reflects our emphasis on breaking down the usual demarcations between terrestrial and aquatic management and between management of anadromous versus resident fish. The project is ambitious exercise in forging an ecosystem view of the Columbia River.

Seven alternative futures were derived from 27 concepts submitted by a variety of regional interests. The seven alternatives range from a system developed to restore and maintain natural ecological function to one that is developed primarily for maximizing economic gain to society. The type of ecological system needed to achieve these visions is described by a set of Ecological Objectives.

Ecological change is affected by combinations of some 108 strategies. These include actions to improve tributary habitat, upland terrestrial habitat, mainstem river habitats including hydroelectric conditions, artificial habitats to replace lost natural habitats and community actions including predator control and human harvest. These strategies are distributed across the ten ecological provinces.

THE FRAMEWORK ANALYSIS

The seven alternative futures are being analyzed in regard to whether the ecological objectives and strategies represent a plausible plan for achieving the vision for each alternative. The analysis will focus on the ecological impacts as well as human impacts of the alternatives. The analysis is presently being run and results are not yet available.

The ecological impacts are being assessed using Ecosystem Diagnosis and Treatment or EDT (MBI 1999). EDT is a habitat-based approach that begins with a detailed description of the habitat. Physical

habitat is described in terms of 44 environmental attributes at the level of the HUC-6. Habitat quality is judged with respect to the biological requirements of particular species. We are using chinook salmon, bull trout, black bear and beaver as biological "yardsticks" to gauge habitat quality. Habitat characteristics affect biological performance measured as the change in capacity, productivity and life history diversity.

The strategies in each alternative change various environmental attributes and the biological performance. The alternatives are compared in terms of the change each makes in capacity, productivity, life history diversity and habitat characteristics relative to the existing situation.

THE FUTURE

Alternatives are being analyzed to aid regional decision-making. For example, the analysis should provide important information on habitat quality and productivity of chinook salmon presently listed as endangered under the Endangered Species Act. This should help the National Marine Fisheries Service in their development of recovery plans for listed populations.

However, the main application of the Framework Project will be the development of the fish and wildlife program of the Northwest Power Planning Council (NPPC 1994). This plan, which directs over $127 million in annual expenditures by the Bonneville Power Administration for fish and wildlife recovery, will shortly be open for amendment. The Council hopes to structure the goals and actions of their next program around the framework. They may select one of the seven alternatives or use the analysis to craft a new alternative for inclusion in its fish and wildlife program. The framework analysis will also be the basis for future watershed-level planning. This will be aimed at development of specific subbasin plans to provide subbasin objectives and guide annual prioritization and selection of actions.

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