

APPENDIX A

FRAMEWORK ELEMENTS

The program framework provides the foundation for the fish and wildlife program. It consists of an overall program goal, rebuilding targets for identified population management units, schedules to achieve the rebuilding targets, survival targets to define needed change, performance standards to track change and measures designed to meet survival targets. Not all of these elements have been provided in this strategy, but a process for completing them is described in Section 2.3. Once completed, the framework will provide a hierarchy of actions directed at achieving the program's overall goal.

COMPONENTS OF THE PROGRAM FRAMEWORK

Program Goals

The overall goals set the direction and scope of the program and provide the philosophy that guides the Council's selection of measures. Examples include goals to maintain and enhance stock diversity, restore weak runs and double overall salmon production. Collectively, the other elements of the program are expected to make significant progress toward or accomplish the overall goals.

Rebuilding Targets

Rebuilding targets provide the management intent, numeric target for rebuilding and the expected time to achieve this target. Rebuilding schedules refer to specific population management units and incorporate the idea of stock conservation units, minimum sustainable population size, compatibility with other stocks and expected variability. Rebuilding schedules are based on the biological needs of the fish, management goals and the projected effectiveness of actions. Numeric rebuilding targets for population management units are planning targets

that contribute to the Council's overall numeric goal. Like the overall goal, they are not intended to define or limit the obligation of any party under the Northwest Power Act. Rebuilding targets are dynamic elements that will likely change as knowledge increases and protection techniques are improved. Rebuilding targets do not serve as a ceiling on the Council's goals for restoring anadromous fish runs and are adopted with the understanding that the Council will continue to seek to rebuild the runs as rapidly as possible consistent with the program's biological diversity goal and genetic considerations.

Survival Targets

Survival targets state the amount of survival change needed in major program areas to meet the rebuilding schedule. While survival targets may incorporate policy concerns, they must be based on a sound technical and analytical foundation that incorporates all phases of the life cycle of salmon and steelhead. This will require development of analytical tools and information.

Survival targets address each stage in the salmon life cycle, including:

- juvenile passage survival;
- adult passage survival;
- critical habitat productivity;
- harvest; and
- depending upon genetic analyses, artificial production techniques to supplement rebuilding.

Performance Standards

The effectiveness of actions is often uncertain and depends on other actions. It will be important for the Council and the region to track measures in a timely manner. Performance standards for each action or set of actions should provide an easily measurable index that

relates to the type of biological or physical change intended. Performance standards provide a point of reference against which to monitor change, and units of measure to define change. They are not intended to state or limit obligations or to resolve technical uncertainties.

Measures

Program measures are specific actions to be undertaken and funded to contribute to achieving biological objectives and rebuilding schedules. When monitoring shows a program measure is not performing adequately, the measure should be modified or replaced. Measures must stand or fall on the basis of their demonstrated contribution toward the rebuilding target.

SAMPLE ELEMENTS OF A REBUILDING PLAN

Population Management Unit

The population management unit is the physical and biological description of the population that is referred to in the rebuilding plan. It often will be defined in terms of a specific area or counting site, for example, spring chinook above Lower Granite Dam on the Snake River. It should be a generally homogeneous population, but it can contain separate identifiable populations that may be the subject of further monitoring.

If the population management unit is defined as wild and naturally spawning spring chinook salmon originating above Lower Granite Dam on the Snake River, returns of fish to hatcheries above Lower Granite Dam would not be included in this population management unit. If monitoring indicates that escapement needs for individual populations are not being met, the Council may modify its definition.

Characteristics

This section provides a brief description of the population management unit to expand the definition.

In the case of the example used above, characteristics might include the following. These fish spawn mainly in tributaries to the Snake River. Juveniles rear for one year in the tributaries and migrate downstream as yearlings in the spring. Adults return after one to four years in the ocean in the spring and early summer. The assumed dates for passage of spring chinook at Lower Granite Dam are March 1 through June 17. Idaho Department of Fish and Game has identified 14 populations within this population management unit.

Present Condition

This section should provide a brief description of the present condition and its relation to historical returns. Important fluctuation in the population should be noted.

For example, the return trend for the naturally spawning spring chinook from above Lower Granite Dam is shown in Figure A-1. This population management unit declined sharply in 1979. Lower Granite Dam began operation in 1975 and reported its first fish counts in that year. Since 1979, returns have fluctuated around an average of 6,900 wild and naturally spawning fish with a low of 2,400 fish in 1991, returns far below historical averages.

Management Goal

The management goal for the population management unit should be described both in terms of harvests and biological aspects. If management goals are to be established for individual populations within the greater population management unit (Salmon River spring chinook, for example), they should be compatible with the goal for the population management unit.

The management goal at the level of the population management unit for the example we've been using is to achieve productive and biologically diverse wild and naturally spawning populations that can support carefully regulated fisheries above Lower Granite Dam and in the Columbia River. To do this, the population must also be compatible with mortality resulting from adult and juvenile passage through the mainstem after the region's best efforts to minimize these losses.

Rebuilding Targets and Schedules

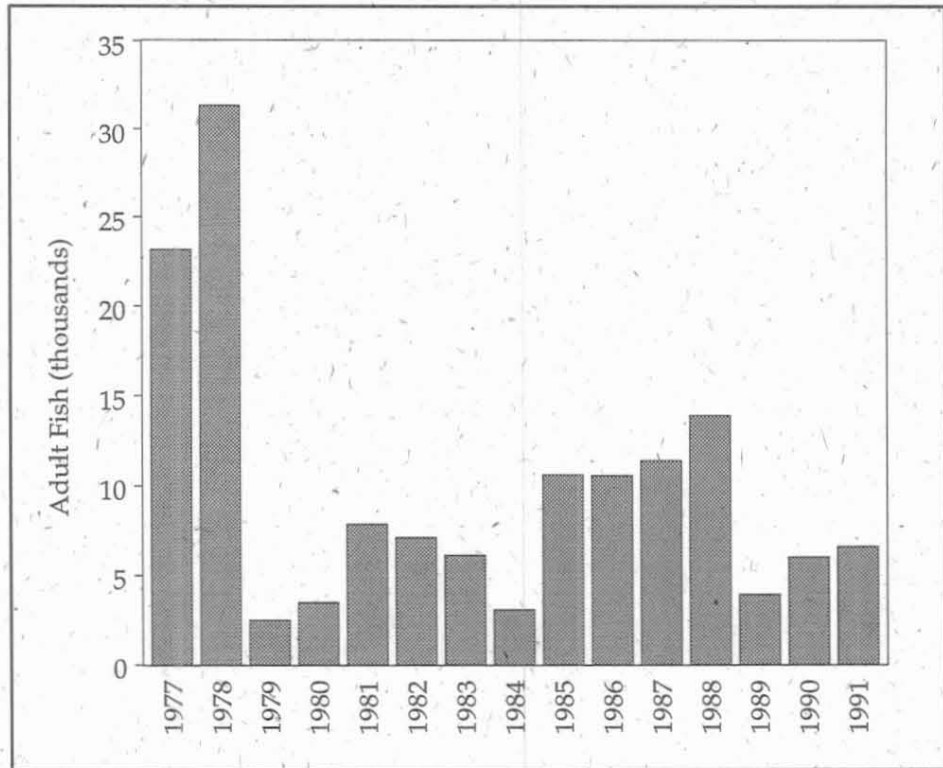
While rebuilding targets primarily reflect management goals, they also reflect what is reasonably achievable with the methods at hand. Rebuilding schedules should be based on available analytical projection methods and reflect available information. Because information should improve over time, rebuilding schedules will also change over time. Rebuilding schedules should reflect expected annual variation in returns to provide realistic expectations and to guide evaluation.

Performance Standards

The performance standard for the rebuilding target and schedule should provide a measure that is easily reported annually. Dam counts of salmon are one example. Performance standards should incorporate expected annual variation, with the goal of identifying if the region is on track toward achieving the desired rebuilding.

Spring Chinook Returns

Figure A-1
Lower Granite Adult Wild and Naturally Spawning Spring Chinook Returns



Population Monitoring

This section should describe additional monitoring that goes beyond the performance standard and beyond the level of the population management unit. It should include a list of populations that could be the target of intensive monitoring to identify stock status and important life history characteristics. The Council calls for development of the indicator stocks in Section 2.2A.

APPENDIX B

REFERENCE HABITAT PERFORMANCE STANDARDS

Sediment

1. Limit the percentage of fine sediments (less than 6.4 millimeters) in salmon and steelhead redds to no more than 20 percent just prior to fry emergence.
2. In subbasins currently limited by sediment problems, ensure no increase in sediment input from implementing measures.

Water Temperature

3. Water temperatures should not fall under or exceed the temperature ranges identified for upstream migration, spawning, incubation or preferred juvenile rearing, as specified in Table B-1.

Large Woody Debris

4. Provide for long-term recruitment of large woody debris at levels comparable to those observed throughout unmanaged areas.
5. Preclude the removal of existing large woody debris from stream channels (including non-fish producing waters) to protect the sediment and nutrient storage and processing function of stream ecosystems producing salmon and steelhead.

Large Pools

6. Manage for frequency of pools comparable to those observed in unmanaged areas to the extent needed to provide sufficient habitat for salmon and steelhead.

Water Quality Generally

7. Fully comply with applicable state and federal standards.
Other applicable reference sources include available information and recommendations found in state and federal regulations and statutes, existing best management practices, the watershed option in Alternatives for Management of Late-Successional Forests of the Pacific Northwest, Watershed Management Guide for the Interior Northwest, cumulative watershed effects program of the National Council of the Paper Industry for Air and Stream Improvement, recommendations of the relevant state agencies regarding riparian classification and protection, and other applicable sources.

Table B-1
Water Temperature Criteria for Salmon and Steelhead (°Fahrenheit)

Species	Upstream Migration	Spawning	Incubation	Preferred	Optimum	Upper Lethal
Chinook						
• Fall	51–67	42–57	41–58	45–58	54	77
• Spring	38–56	42–57	41–58	45–58	54	77
• Summer	56–68	42–57	41–58	45–58	54	77
Chum	47–60	45–55	40–56	52–58	56	78
Coho	45–60	40–60	40–56	53–58	—	78
Steelhead	—	39–49	—	45–58	50	75
Sockeye	45–60	51–54	—	52–58	—	—
Pink	45–60	45–55	—	42–58	—	—

APPENDIX C

GLOSSARY

acclimation pond

Concrete or earthen pond or a temporary structure used for rearing and imprinting juvenile fish in the water of a particular stream before their release into that stream.

adaptive management

A scientific policy that seeks to improve management of biological resources, particularly in areas of scientific uncertainty, by viewing program actions as vehicles for learning. Projects are designed and implemented as experiments so that even if they fail, they provide useful information for future actions. Monitoring and evaluation are emphasized so that the interaction of different elements of the system are better understood.

adult equivalent population

The number of fish that would have returned to the mouth of the Columbia River in the absence of any prior harvest.

anadromous fish

Fish that hatch in freshwater, migrate to the ocean, mature there and return to freshwater to spawn. For example, salmon or steelhead.

biodiversity

The variety of and variability in living organisms, with respect to genetics, life history, behavior and other fundamental characteristics.

captive brood stock

Fish raised and spawned in captivity.

carrying capacity

The number of individuals of one species that the resources of a habitat can support.

Coordinated Information System

Still under development, this system is designed to allow interested parties to access technical information about Columbia River salmon and steelhead.

deflector screens/diversion screens

Wire mesh screens placed at the point where water is diverted from a stream or river. The screens keep fish from entering the diversion channel or pipe.

demography

The study of characteristics of human populations, especially size, density, growth, distribution, migration and vital statistics and the effect of these on social and economic conditions.

drawdown

The release of water from a reservoir for power generation, flood control, irrigation or other water management activity.

economies of scale

Reductions in the average cost of a product that result from increased production.

ecosystem

The biological community considered together with the land and water that make up its environment.

embeddedness

The degree to which dirt is mixed in with spawning gravel.

escapement

The number of salmon and steelhead that return to a specified point of measurement after all natural mortality and harvest have occurred. Spawning escapement consists of those fish that survive to spawn.

evolutionary biology

The study of the processes by which living organisms have acquired distinguishing characteristics.

extinction

The natural or human-induced process by which a species, subspecies or population ceases to exist.

fish flows

Artificially increased flows in the river system called for in the fish and wildlife program to quickly move the young fish down the river during their spring migration period. (See "water budget.")

fish passage efficiency

The percentage of the total number of fish that pass a dam without passing through the turbine units.

flows

The rate at which water passes a given point in a stream or river, usually expressed in cubic-feet per second (cfs).

flow augmentation

Increased flow from release of water from storage dams.

gametes

The sexual reproductive cells, eggs and sperm.

gas supersaturation

The overabundance of gases in turbulent water, such as at the base of a dam spillway. Can cause fatal condition in fish similar to the bends.

genetic conservation refuge

Reserve area whose goal is to protect genetic diversity and natural evolutionary processes within and among natural populations, while allowing varying degrees of exploitation and modification.

genetic diversity

All of the genetic variation within a species. Genetic diversity includes both genetic differences among individuals in a breeding population and genetic differences among different breeding populations.

genetic integrity

The ability of a breeding population or group of breeding populations to remain adapted to its natural environment.

genotype

The complement of genes in an individual.

glides

Stream areas with velocities generally less than one cubicfoot per second and with a smooth surface. Water depth generally is less than two feet.

harvest controls

Regulations established for commercial and sport fisheries to ensure that the correct proportion of the different stocks escape to spawn.

impoundment

A body of water formed behind a dam.

imprinting

The physiological and behavioral process by which migratory fish assimilate environmental cues to aid their return to their stream of origin as adults.

mainstem

The main channel of the river in a river basin, as opposed to the streams and smaller rivers that feed into it. In the fish and wildlife program, mainstem refers to the Columbia and Snake rivers.

minimum operating pool

The lowest water level of an impoundment at which navigation locks can still operate.

mixed-stock fishery

A harvest management technique by which different species, strains, races or stocks are harvested together.

morphology

A study of the form and structure of animals and plants.

naturally spawning populations

Populations of fish that have completed their entire life cycle in the natural environment and may be the progeny of wild, hatchery or mixed parentage.

naturalization

The process by which introduced fish successfully establish a naturally spawning population.

outfall

The mouth or outlet of a river, stream, lake, drain or sewer.

PIT tags

PIT tags are used for identifying individual salmon for monitoring and research purposes. This miniaturized tag consists of an integrated microchip that is programmed to include specific fish information. The tag is inserted into the body cavity of the fish and decoded at selected monitoring sites.

plume

The area of the Pacific Ocean that is influenced by discharge from the Columbia River, up to 500 miles beyond the mouth of the river.

population

A group of organisms belonging to the same species that occupy a well-defined locality and exhibit reproductive continuity from generation to generation.

population vulnerability analysis

A systematic process for estimating species, location and time-specific criteria for persistence of a population.

redd

A spawning nest made in the gravel bed of a river by salmon or steelhead.

reproductive isolating mechanisms

Mechanisms that retain genetic diversity among populations. The primary reproductive isolating mechanism for anadromous fish is accuracy of homing, which can be reduced by improper hatchery operations. Stock transfers also reduce reproductive isolation.

resident fish

Fish that spend their entire life cycle in freshwater. For program purposes, resident fish includes landlocked anadromous fish (e.g., white sturgeon, kokanee and coho), as well as traditionally defined resident fish species.

riffle

A shallow extending across the bed of a stream over which water flows swiftly so that the surface of the water is broken in waves.

riparian habitat

Habitat along the banks of streams, lakes or rivers.

rule curves

Graphic guides to the use of storage water. They are developed to define certain operating rights, entitlements, obligations and limitations for each reservoir.

sinuosity

The amount of bending, winding and curving in a stream or river.

smolt

A juvenile salmon or steelhead migrating to the ocean and undergoing physiological changes (smoltification) to adapt its body from a freshwater to a saltwater existence.

spill

Releasing water through the spillway rather than through the turbine units.

spillway crest elevation

The point at which the reservoir behind a dam is level with the top of the dam's spillway.

stream morphology

The study of the form and structure of streams.

supplementation

The release of hatchery fry and juvenile fish in the natural environment to quickly increase or establish naturally spawning fish populations.

tailrace

The canal or channel that carries water away from the dam.

velocity

In this concept, the speed of water flowing in a watercourse, such as a river.

velocity barrier

A physical structure, such as a barrier dam or floating weir, built in the tailrace of a hydroelectric powerhouse, which blocks the tailrace from further adult salmon or steelhead migration to prevent physical injury or migration delay.

water budget

A means of increasing survival of downstream migrating juvenile fish by increasing Columbia and Snake river flows during the spring migration period. The water budget was developed by the Council, which oversees its use in conjunction with the fish and wildlife agencies and Indian tribes, the U.S. Army Corps of Engineers, the Bonneville Power Administration and the Bureau of Reclamation.

watershed

The area that drains into a stream or river.

weak stock

Listed in the Integrated System Plan's list of stocks of high or highest concern; listed in the American Fisheries Society report as at high or moderate risk of extinction; or stocks the National Marine Fisheries Service has listed. "Weak stock" is an evolving concept; the Council does not purport to establish a fixed definition. Nor does the Council imply that any particular change in management is required because of this definition.

wild populations

Fish that have maintained successful natural reproduction with little or no supplementation from hatcheries.

To Order

Volume II contains the program measures for the Strategy for Salmon. Volume I is an overview of the fish program. Volume II also lays the foundation for Volume I and discusses in greater detail the conclusions and recommendations of Volume I. To order, please call the Council's central office, 503-222-5161, or toll free 1-800-222-3355.

92-21 Columbia River Basin Fish and Wildlife Program—Strategy for Salmon—Volume I

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