State of Washington Department of Ecology

STATE WATER PROGRAM

W.W.I.R.P.P. Series – No. 1

CEDAR-SAMMAMISH BASIN

INSTREAM RESOURCES PROTECTION PROGRAM

Including

PROPOSED ADMINISTRATIVE RULES, AND

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

(Water Resource Inventory Area 8)

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

August 1979

CEDAR-SAMMAMISH BASIN

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PROPOSED ADMINISTRATIVE RULES, AND

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(Water Resource Inventory Area 8)

Prepared by

Water Resources Policy Development Section
Washington State Department of Ecology

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INTRODUCTION

The Western Washington Instream Resources Protection Program (WWIRPP) is designed to develop and adopt instream flow regulations for most Water Resource Inventory Areas (WRIA) in Western Washington pursuant to Chapter 90.54 RCW (Water Resources Act of 1971), 90.22 RCW (minimum water flows and levels), and 173-500 WAC.

Prior to 1969, the primary statutory authority for protection of instream flows was provided by the State Fisheries Code (Chapter 75.20 RCW). The WWIRPP program will codify the surface water limitations established under Chapter 75.20 RCW. The program will further set forth additional streams to be closed to future appropriations as provided in Chapter 173-500-020(3) WAC.

The regulations contained in this Basin Document represent the first phase in development of the state's Water Resources Management Program. By establishing instream flows and codifying previously imposed surface water limitations, the possibility of future overallocation of water resources can be minimized. Establishment of adequate instream flows assures sufficient water for food and game fish propagation, hydropower generation, navigation and lock operation, maintenance of lake levels for protection of shoreline facilities, recreation, and enhancement of aesthetic values.

In all areas, instream flows will be set at a level adequate to maintain state water quality standards.

PROGRAM OVERVIEW

An environmental impact statement and program overview document has been prepared and circulated to the public and governmental agencies. The overview provides a detailed description of the overall Western Washington Instream Resources Protection Program. Copies are available from Department of Ecology (DOE, Olympia). The conceptual approach and technical procedures used to determine the instream flows require determination of the control stations that will be used to monitor flow levels. Future water rights are conditioned to instream flow levels measured at specific control stations. Where possible, United States Geological Survey (USGS) gaging stations have been selected as control stations, providing a historical record of streamflow. Where tributaries of a higher order (smaller in size) are too remote from control stations to adequately judge the effects of future water appropriations, provisions may be made to establish new control stations nearer to those streams as dictated by new water demands.

Instream Flows

State law provides that perennial streams and rivers shall be retained with base flows necessary to provide for preservation of wildlife, fish, scenic, aesthetic, and other environmental and navigational values (RCW 90.54.020(3)(a) 1971). These are flows that can be expected in the stream a relatively high percentage of the time under natural conditions. Flows established will be adopted under both Chapter 90.54 RCW and Chapter 90.22 RCW (Minimum Water Flows and Levels), and will be referred to as "instream flows." Each stream selected for instream flow regulation is rated by an instream flow classification committee consisting of representatives from the Department of Ecology, departments of Fisheries and Game, Department of Natural Resources, Department of Highways, and the Interagency Committee for Outdoor Recreation. A high rated stream, having greater navigational, fish, wildlife, or environmental and scenic values, will require higher levels of instream flow. The procedure is described in the overview document.

The Instream Resource Protection Program does not affect any existing water rights.

Public Participation

All interested individuals, private groups, and public agencies are encouraged to comment on any aspect of the recommended measures for streams in the Cedar-Sammamish Basin. A public draft of an environmental impact statement (EIS) covering the overall program initiated public involvement activities under the Western Washington Instream Resource Protection Program. A draft program proposal document (program overview), describing objectives and technical procedures, was made available at the same time. The review and comment period for both publications terminated on June 1, 1979. The final EIS and program overview were issued June 20, 1979.

Distribution of a draft of this Basin Document and supplemental EIS initiated public involvement in the Instream Resources Protection Program for the Cedar-Sammamish River Basin, Water Resource Inventory Area (No. 8). Public comments were accepted during public hearings held in Snohomish and King counties on Tuesday, July 24, 1979. The Snohomish County hearing was conducted at the Library Building, 236th and 52nd Avenue W. in Mountlake Terrace. The King County hearing was at the Seattle Water Department Operations Control Center, 2700 Airport Way South, Seattle, Washington. Written comments were accepted until August 1, 1979. Written comments and oral testimony were fully considered in preparation of the final program document, supplemental EIS and proposed rules. A summary of oral testimony and copies of all written comments are contained in Appendix vi.

The Instream Resources Protection Program Rules for the Cedar-Sammamish Basin (WRIA 8) as proposed in this document were adopted September 5, 1979, in a public adoption proceeding at the Department of Ecology (see Appendix A).

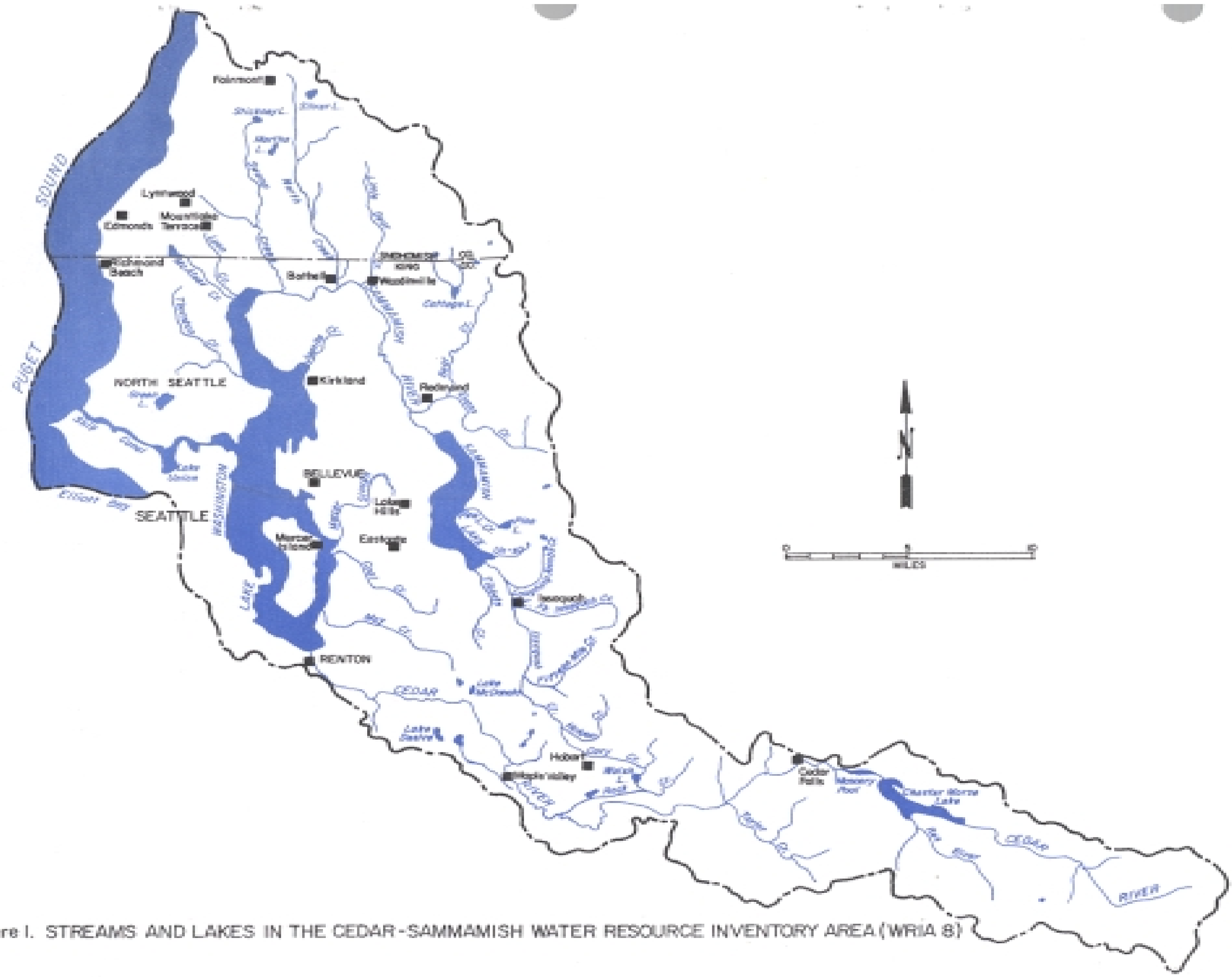
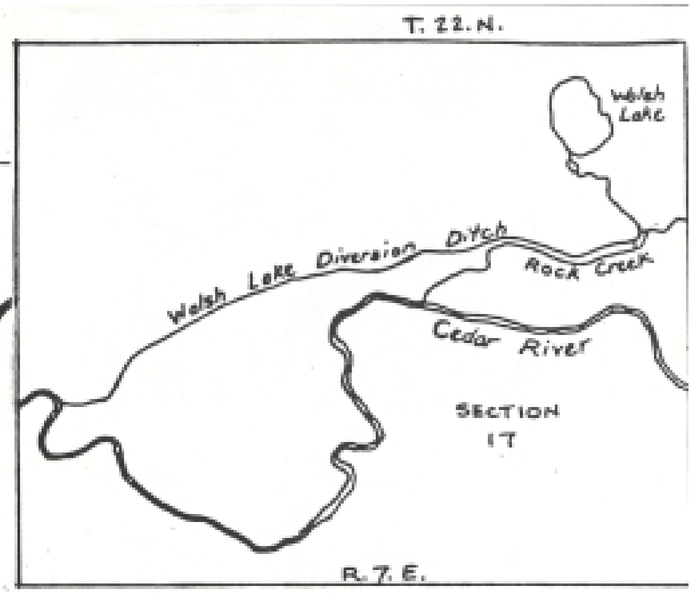


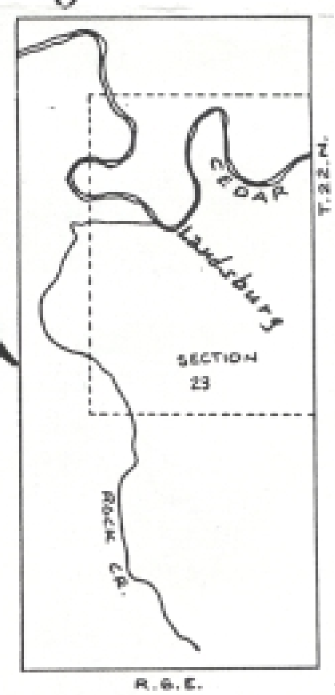
Figure I. STREAMS AND LAKES IN THE CEDAR-SAMMAMISH WATER RESOURCE INVENTORY AREA (WRIA 8)

ERRATA SHEET

Figure 1, page 3, has mislabeled the Walsh Lake Diversion Ditch as Rock Creek, a tributary of the Cedar River closed to future consumptive diversions by chapter 173-508 WAC.

The figure inset, upper right, correctly identifies the Rock Creek located above Landsburg.





The figure inset, lower right, indicates the location of a second Rock Creek below Landsburg. This is the Rock Creek closed to additional consumptive appropriations by chapter 173-508 WAC.

CEDAR-SAMMAMISH
BASIN DOCUMENT

SUMMARY

The Cedar-Sammamish Water Resource Inventory Area (WRIA 8) is comprised of three major subbasins, the Cedar River Basin, the Sammamish River, including Lake Sammamish, and Lake Washington with its independent tributaries. These waterways form one continuous hydrologic system which constitutes the Lake Washington drainage basin. An annual average outflow of 941,200 acre feet drains to Puget Sound through the Hiram M. Chittenden Locks system.

Surface levels in Lake Washington are currently regulated at a level between 20 and 22 feet by the U.S. Corps of Engineers.[1/] To assure continuance of surface levels adequate for navigation, lock operation, anadromous fish production, and shoreline facilities protection, it is necessary to maintain sufficient levels of inflow from contributing drainages.

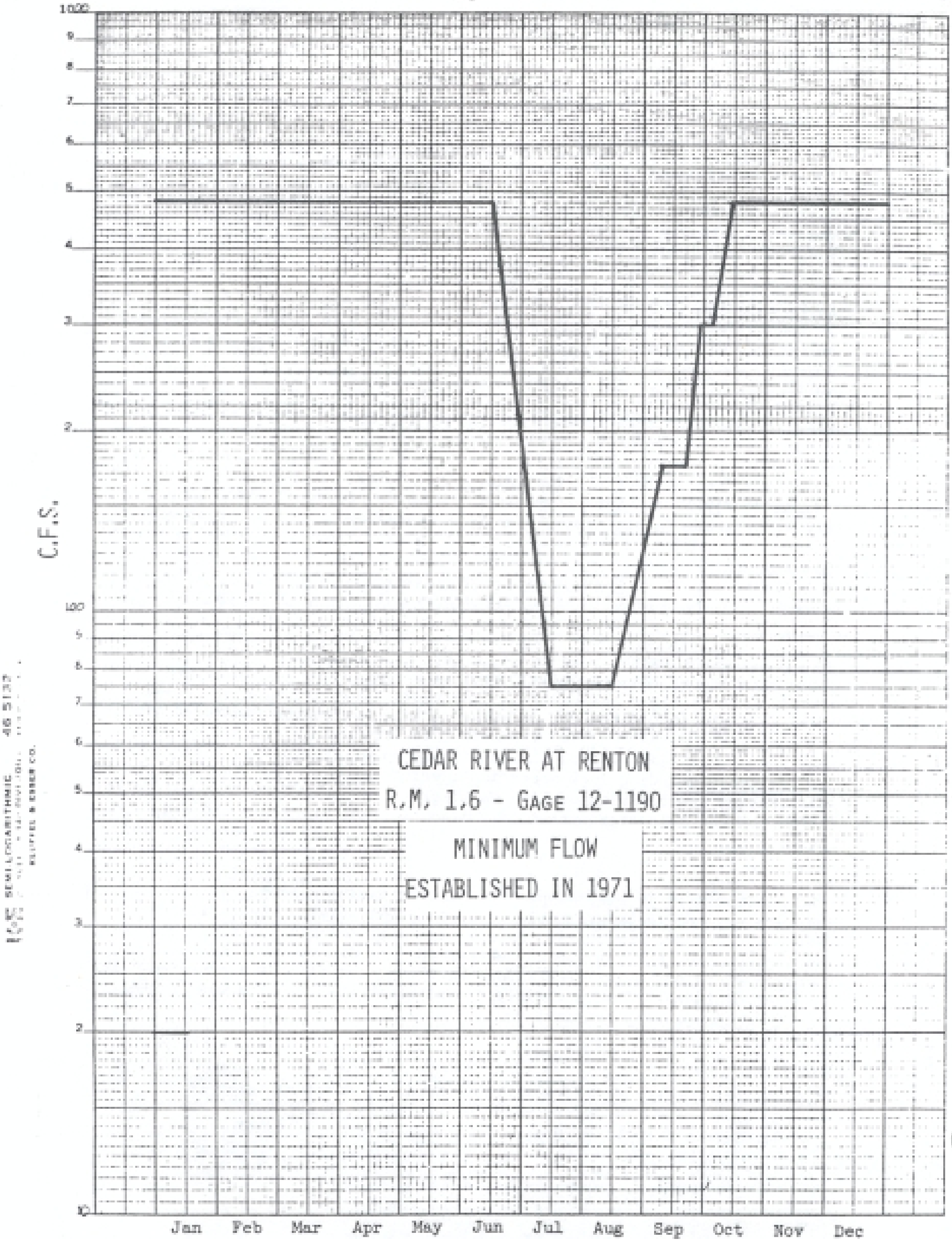
Most streams and lakes in the Cedar-Sammamish Basin (excluding the Cedar River Basin and its tributaries) have been closed to further appropriation or are under low flow limitations consistent with the intent of Chapter 75.20 RCW, the state fisheries code. Exceptions are Lake Washington, the Sammamish River, and Lake Sammamish, including feeder streams, Tibbets Creek, Laughing Jacobs Creek, Pine Lake Creek, and other minor streams. Because of problems in maintaining water quality in Lake Sammamish and the Sammamish River, and the importance of both waterways in providing water to Lake Washington, <u>the Lake Sammamish drainage, including contributing streams and the Sammamish River are proposed for closure to further appropriations.</u>

The Cedar River is the only river in the state for which minimum flows have been established (Chapter 173-30 WAC) pursuant to Chapter 90.22 RCW (Minimum Water Flows and Levels). The Cedar River supplies an annual average of 511,500 acre-feet of water to Lake Washington (measured over a 32-year period, 1945-1977). The waters of the Cedar River are essential for the propagation of food and game fish, power generation, recreation, navigation (including lock operation), maintenance of the level of Lake Washington, and flushing of Lake Washington and Lake Union for control of pollution and saltwater intrusion. Also of great value are the competing out-of-stream uses of the Cedar River water for power and municipal and industrial water supply in the Seattle Metropolitan area.

The minimum flow levels, adopted by administrative rule in 1971 (See Figure 2), are not routinely available on a year-round basis. Operation of Seattle's Masonry Dam storage facility to meet the minimum flow requirements during low flow periods (to the extent that it did not conflict with Seattle's claimed water rights) has benefited the fisheries resource. The drought of 1976-1977 more clearly demonstrated that Seattle cannot meet those demands during critical dry periods.

1/ 22 feet C.O.E. = 15-18 National Geodetic Vertical Datum (NGVD)
22 feet C.O.E. = 21.43 Mean Low Low Water (MLLW)
21.85 feet C.O.E. = Ordinary High Water (in the lake)

Figure 2.



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CEDAR RIVER AT RENTON
R.M. 1.6 - GAGE 12-1190
MINIMUM FLOW
ESTABLISHED IN 1971

To mitigate negative impacts on navigation, lock operations, and surface levels in Lake Washington, and to preserve the significant Cedar River fisheries resource, it is proposed to adopt adjusted instream flows for the Cedar River, including provisions for reduced flows during critical low flow years and to repeal the Cedar River Minimum Flow Regulation adopted in 1971. The reduced flows for critical years are higher than the existing minimum flows during the low flow periods.

A fourth drainage area, located in the upper northwest portion of WRIA 8, contains 20 independent short-run tributaries draining directly into Puget Sound between Mukilteo and Shilshole Bay. Of these streams only two, Pipers Creek and Hidden Lake Creek, are accessible to anadromous fish. Both streams are proposed for closure.

PROPOSED ACTIONS

The Western Washington Instream Resource Protection Program proposes to close to further diversion all waterways in the Lake Washington drainage basin above the Hiram M. Chittenden Locks, except the Cedar River and its tributaries. Included are a number of streams closed in the past or given low flows upon recommendations of the departments of Fisheries and/or Game per Chapter 75.20.050 RCW, the state fisheries code (see Table 1). The major streams without previous administrative actions now proposed to be closed are listed in Table 2. Adjusted instream flows for normal and critical years are proposed for the Cedar River as illustrated in Figure 3, Cedar River Instream Flow Hydrograph.

BASIN DESCRIPTION

The Cedar-Sammamish Water Resources Inventory Area (WRIA 8) includes the most highly urbanized area in the state of Washington. It includes the greater Seattle metropolitan area and the towns of Mountlake Terrace, Kenmore, Kirkland, Bellevue, and Renton, situated generally around Lake Washington, and Redmond and Issaquah, near Lake Sammamish. It contains the Lake Washington drainage system and its outflow waterways to Puget Sound - the Lake Washington Ship Canal and Lake Union (See Figure 1).

The Lake Washington hydrologic system drains 607 square miles and is comprised of three major drainage basins: the Cedar River, the Sammamish River and Lake Sammamish, and Lake Washington. These water bodies with their tributaries join to form a continuous surface water system (illustrated in Figure 4). Fifty-four (54) percent of the Lake Washington inflow is contributed by the Cedar River, 37 percent by the Sammamish River, and the remaining 9 percent by independent streams and direct precipitation. Refer to Figure 5. Low flows or low lake levels resulting from low water conditions and/or diversion of water at any point in the system would impact directly the primary receiving waters and eventually the level of Lake Washington and the water quality in Lake Washington. Thus, it is important to maintain stream flows and lake levels throughout the system, as well as stored ground water which contributes water to the surface system.

Other streams in the Cedar-Sammamish Basin include the 20 independent short-run tributaries draining directly into Puget Sound between Mukilteo and Shilshoal Bay. Of these streams, only two, Pipers Creek and Hidden Lake Creek, are accessible to anadromous fish.

Table 1. Current Administrative Status of Streams and Lakes
Cedar-Sammamish Basin – WRIA 8

Stream or Lake	Tributary To	Status	Proposed Action
(Little) Bear Creek	Sammamish River	Low flow (3.0 cfs)	Closure
Cedar River (including tributaries)	Lake Washington	Minimum flow (variable)	Instream Flow Levels
Coal Creek	Lake Washington	Low flow (6.0 cfs)	Closure
Cottage Lake Creek and tributaries,	Sammamish River	Closed	Closure
Bear Creek		Closed	Closure
Evans Creek		Closed	Closure
Haller Lake	Thornton Creek	Closed	Closure
Issaquah Creek	Sammamish Lake	Closed	Closure
N. Fork Issaquah		Closed	Closure
E. Fork Issaquah		Closed	Closure
Unnamed Stream		Closed	Closure
Fifteen Mile Creek		Closed	Closure
Holder Creek		Closed	Closure
Carey Creek		Closed	Closure
Larson Lake (including tributaries)	Lake Washington	Low flow (1.0 cfs)	Closure
Lyon Creek	Lake Washington	Closed	Closure
Martha Lake	Swamp Creek	Lake level (93.0 ft)	Closure
May Creek	Lake Washington	Low flow (2.5 cfs)	Closure
McAleer Creek		Closed	Closure
Lake Ballinger (McAleer Lake)	Lake Washington	Lake level (278.5 ft)	Closure
Mercer Slough	Lake Washington	Closed	Closure
Kelsey Creek		Closed	Closure
Kinsley Creek		Closed	Closure
Mercer Slough Creek		Closed	Closure
North Creek	Sammamish River	Closed	Closure
Silver Lake		Closed	Closure
Rock Creek	Cedar River	Closed	Closure
Swamp Creek	Sammamish River	Closed	Closure
Unnamed Springs	Sammamish Lake	Low flow (0.5 ft) (1/2 flow bypass pt.)	Closure
Unnamed Stream (11-26-3E) (Hidden Lake Cr./Boeing Cr.)	Puget Sound	Low flow (1.0 cfs)	Closure
Unnamed Stream (12-24-t#)	Sammamish Lake	Low flow (0.75 cfs) (No documentation)	Closure
Unnamed Stream (Jones Creek)	Cedar River	Closed	Closure
Unnamed Stream (Juanita Creek)	Lake Washington	Closed	Closure
Unnamed Stream (Northrup Creek)	Lake Washington	Low flow (1/2 flow bypass pt.)	Closure
Unnamed Stream (Wildcat Creek)	Sammamish River	Low flow (1.0 cfs)	Closure
Thornton Creek	Lake Washington	Closed	Closure

Table 2. Major Streams and Lakes Without Surface Water Limitations
Cedar9Sammamish Basin – WRIA 8

Stream or Lake	Tributary To	Status	Proposed Action
Lake Washington	Puget Sound	Open	Closure
Sammamish River	Lake Washington	Open	Closure
Lake Sammamish	Sammamish River	Open	Closure
Tibbets Creek	Sammamish Lake	Open	Closure
Pine Lake and Unnamed Stream (Pine Lake Creek)	Sammamish Lake	Open	Closure
Laughing Jacobs Creek	Sammamish Lake	Open	Closure
Pipers Creek	Puget Sound	Open	Closure

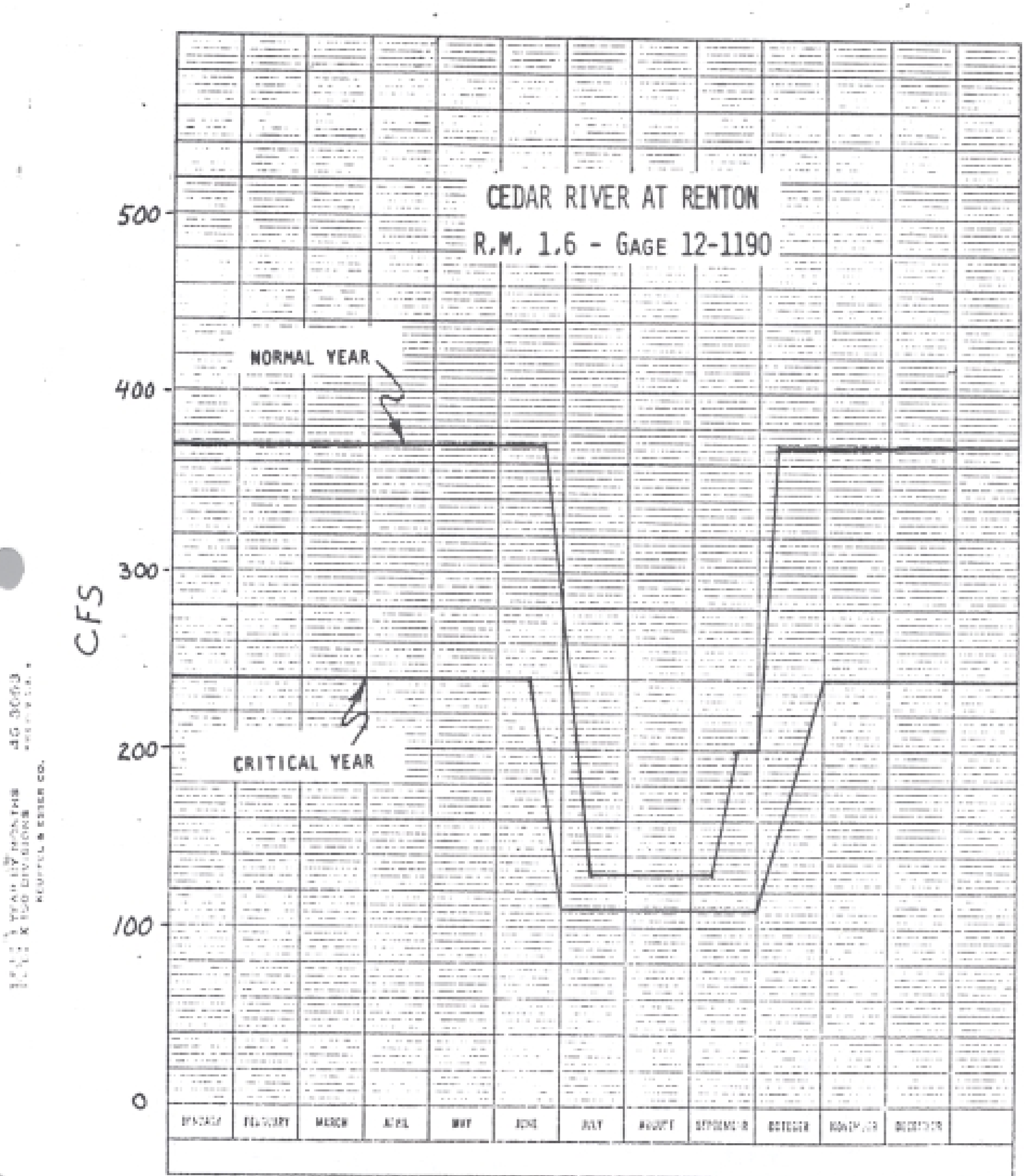

Figure 3. Proposed Instream Flows for the Cedar River for Normal and Critical Years.

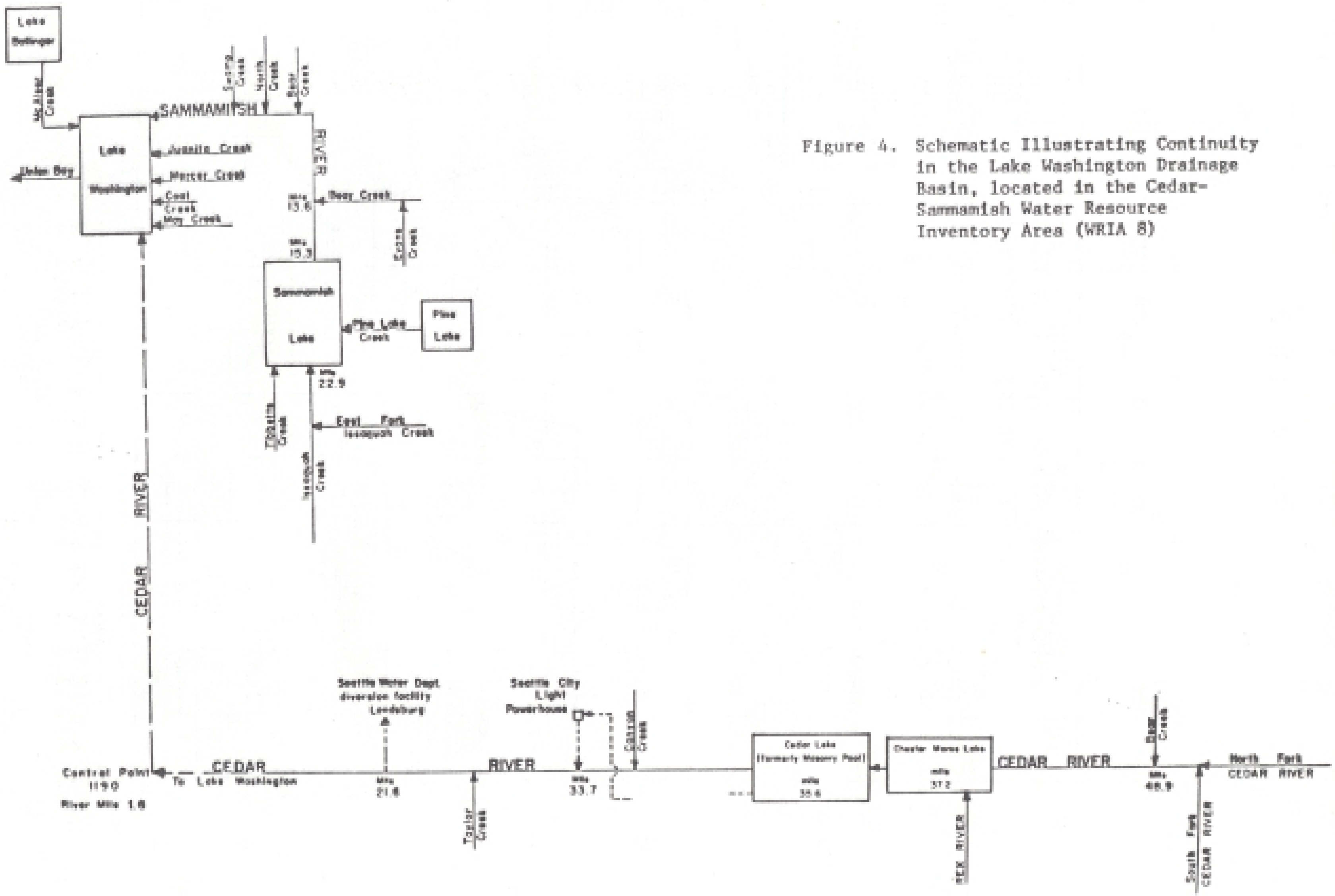

Figure 4. Schematic Illustrating Continuity in the Lake Washington Drainage Basin, located in the Cedar-Sammamish Water Resource Inventory Area (WRIA 8)

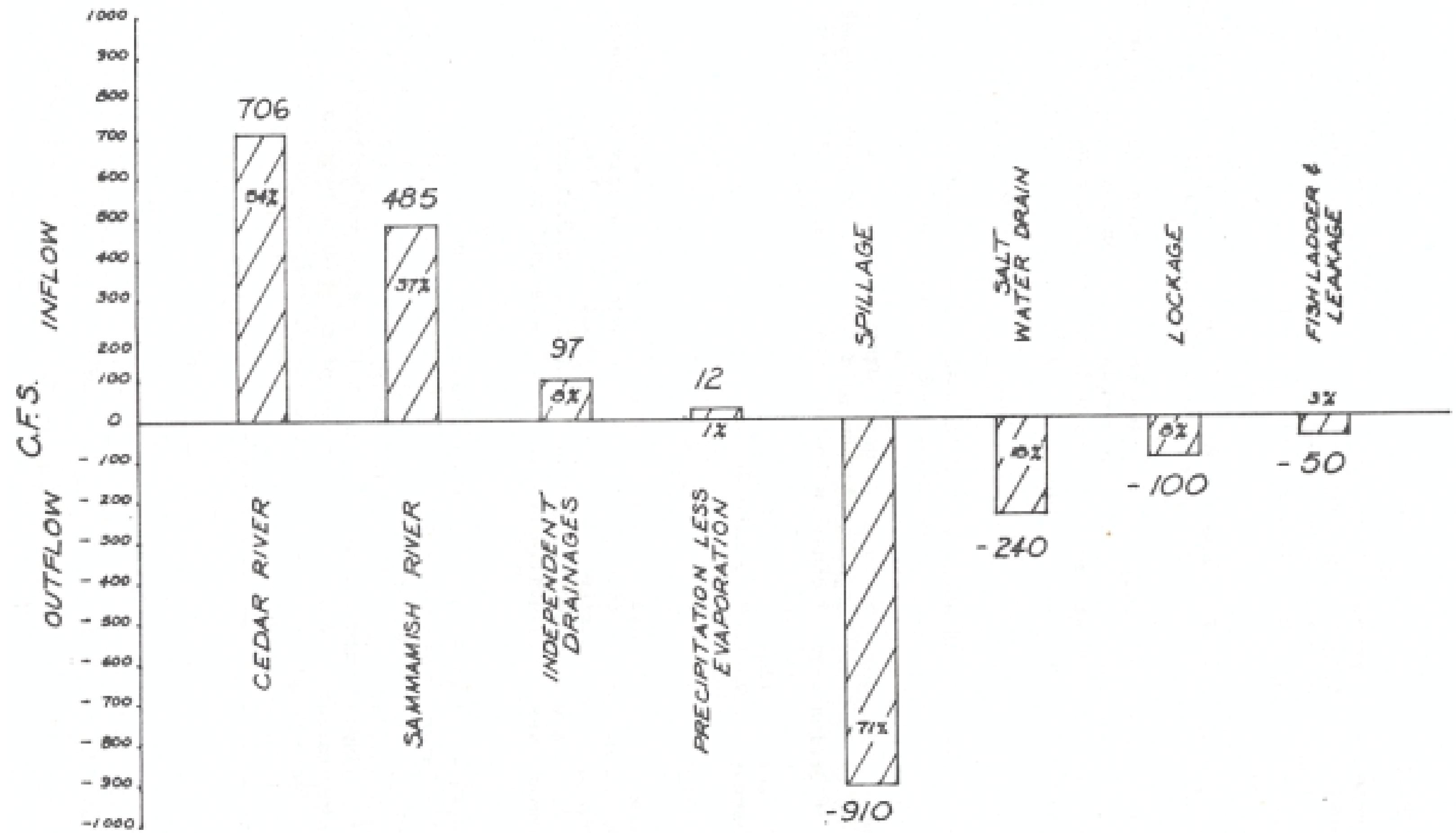

FIG. 5: AVERAGE ANNUAL WATER BALANCE FOR LAKE WASHINGTON

WATER RESOURCES

SURFACE WATERS

Lake Washington

Lake Washington, the second largest natural lake in the state, is located within the boundaries of metropolitan Seattle. The lake and ship canal are bordered by intensive residential, commercial, and industrial developments. It is economically important for its use for navigation, fish production and recreation.

Lake Washington has a surface area of approximately 22,138 acres (34.6 square miles), is 19-1/2 miles long, ranges in width from one to four miles, and has a circumference of 58 miles. Maximum depth of the lake is 210 feet, with a mean depth of 110 feet. In addition to its two main contributors, the Cedar and Sammamish Rivers, Lake Washington receives inflow from several small independent drainages, mostly contained in heavily urbanized areas where they are subjected to high contamination levels.

Lake Sammamish

Lake Sammamish is located about four miles east of Lake Washington and is connected to Lake Washington by the Sammamish River. The lake is approximately eight miles long, 1.5 miles wide, and has a surface area of 4,897 acres (about eight square miles). It has a maximum depth of 102 feet with a mean depth of 58 feet. Major inflow to Lake Sammamish is from Issaquah Creek, which drains over 17 square miles of area south and east of Issaquah. Together, Issaquah Creek and Tibbetts Creek contribute approximately 70 percent of the total inflow to the lake. Other minor inflow streams are Laughing Jacobs Creek and Pine Lake Creek.

Sammamish River

Outflow from Sammamish Lake to Lake Washington is via the Sammamish River through the Sammamish Valley, a lowland area consisting mainly of cleared level farmland, that experiences increasing urbanization. Located on the Sammamish River are two incorporated municipalities, Bothel and Redmond; two smaller communities, Woodinville and Kenmore; three golf courses; and five parks.

The Sammamish River is 14 miles long and drains an area of 240 square miles to discharge an annual average of 485 cfs into Lake Washington. Its tributaries are small and drain foothills with gentle gradient. As a result of the gentle gradient of the Sammamish valley, the Sammamish River characteristically displays conditions of sluggish flow accompanied by heavy bottom sedimentation. The lower six miles of the river (near Lake Washington) were completely dredged, channelized, and widened to a flow capacity of 1,900 cfs. Improved channelization has significantly reduced drainage problems in the Sammamish River.

Cedar River

The Cedar River is located in the central Puget Sound Region east of Puget Sound. It originates in the Cascade Mountains, northeast of Enumclaw near Stampede Pass, and flows for 50 miles in a generally west-northwest direction. The River drains an area of 186 sq. miles before discharging into the southern end of Lake Washington at Renton.

There are three dams, two reservoirs, and a hydroelectric power plant on the Cedar River which supply electric power and municipal and industrial water to the Seattle metropolitan area.

Other instream uses of the Cedar River's waters are propagation of food and game fish, recreation, navigation, provision of water for lock operation, lake level maintenance, and lake flushing for pollution control in Lake Washington and Lake Union.

Highest flows in the Cedar River usually occur during the months of December and January; low flow conditions occur during the months of July, August, and September. The Cedar River has supplied an annual average of 511,500 acre-feet of water to the Lake Washington hydrologic system over a 32-year period (1945-1977).

GROUND WATER

Instream flows and lake levels are directly affected by ground water levels and movement. Practically all recharge to the lowland aquifers in the Cedar-Sammamish Basin is by infiltration of precipitation. Natural discharge of ground water occurs mostly in the lower drainages of the Cedar and Sammamish rivers and into Lake Washington and Lake Sammamish, as well as Puget Sound. High yield aquifers, fed by local inflow below Landsburg, occur near the mouth of the Cedar River at Renton and beneath the valley of Issaquah Creek near Issaquah. The Cedar River aquifer between Landsburg and Chester Morse Lake is partially recharged by local inflow and seepage loss from the reservoir. In the area between Issaquah and Renton, aquifers occur in consolidated rock. Recharge to these aquifers is inadequate and may be further affected by sustained development.

The City of Renton pumps water for municipal water from the alluvial Cedar River aquifer. Some water is supplied by many small capacity wells in the area for individual household and livestock uses.

INSTREAM VALUES

Instream resource protection through establishment of base flows or levels is directed at the maintenance of wildlife, food and game fish, aesthetic values, navigation, and high water quality. The streams and lakes of most Water Resource Inventory Areas will be rated by a committee of state agencies concerned with resource management in the basin. Those streams receiving the highest ratings are presumed to be richest in environmental and navigational values and will require the highest level of resource protection.

In the case of the Cedar-Sammamish Basin, information compiled from studies conducted by the U.S. Corps of Engineers Washington departments of Fisheries and Game, Seattle Water Department, and the Department of Ecology during more than two-and-a-half years of Cedar River water resource management planning was used to evaluate the streams and lakes. (Refer to "The Cedar River Report" available at the Department of Ecology upon request.)

Navigation/Lock Operation

The Cedar-Sammamish Basin contains two established ports, the Port of Seattle and the Port of Edmonds. In addition to the saltwater harbors, Seattle has an inner freshwater harbor consisting of Lake Union and Lake Washington, connected with each other and with Puget Sound by the Lake Washington ship canal and the Hiram M. Chittenden navigational locks.

The surface level in Lake Washington must be kept between 20-feet and 22-feet (Corps of Engineers' Datum). 22-feet on the Corps of Engineers' Datum equals 21.43 feet above mean lower low water (MLLW). At the lower level (20-feet), flood control storage and protection of docks and other shoreline facilities are provided, although navigation is somewhat affected. The 22-feet level is better for navigation and provides adequate water storage for lock operations, but subjects some shoreline facilities to wave damage during periods of high winds such as occur in the fall and winter months. Another primary purpose for the narrow range in the lake levels is to prevent damage to the two floating bridges.

While all drainages within the system contribute water to Lake Washington, surface water levels are controlled by releases of water from the City of Seattle's Masonry Dam storage facility on the Cedar River and by operation of the Hiram M. Chittenden locks.

Recently, new lockage studies conducted by the Corps of Engineers have indicated an increased future demand for lockage. In order to avoid long delays caused by heavy traffic at the locks, more people are extending their weekend trips to begin as early as Thursday and return on Monday. With the traffic more spread out, a greater number of lockages is required to pass, the same number of boats. This trend is expected to continue into the future and will require increasing amounts of water from the Lake Washington system.

Wildlife Values

By maintaining sufficient water in stream courses during low flow periods, vegetation in the riparian environment will be supported and will continue to provide habitat for wildlife. Instream flows will also provide drinking water for a variety of wildlife species.

Fisheries

The Lake Washington drainage basin contains 700 linear miles of rivers and creeks with their tributaries and independent streams. Not all of these streams flow into the Lake Washington system as surface water. Of the total, 656 linear miles drain into the Lake Washington-Lake Sammamish system. Many of the basin's streams provide suitable spawning and rearing habitat or transportation for anadromous and resident fishes.

Three fish hatcheries are located within the confines of the Lake Washington Basin. One, located on Issaquah Creek near Issaquah, is operated by the Department of Fisheries for the purpose of enhancing sockeye salmon production. The second, a salmon hatchery, located on the ship canal, is operated by the University of Washington for fishery research purposes. A third, located at Seward Park on Lake Washington, is a trout hatchery also operated by the University of Washington for research purposes.

Anadromous fish utilization of the Lake Washington drainages is by the Chinook, Coho, and Sockeye salmon and such game fishes as steelhead, and cutthroat trout present as both sea-run and resident populations. Resident fishes include smallmouth and largemouth bass, crappie, bullhead and stickleback, whitefish, Dolly Varden, char, kokanee (a non-migratory race of sockeye salmon), rainbow trout and yellow perch.

Major limiting factors to fish production in the Lake Washington drainages include low stream flows, seasonal flooding, high water temperatures associated with low stream flows, and poor water quality resulting from urban and agricultural runoff. Habitat deterioration has resulted from flood control projects such as the Sammamish River channelizing project and the Cedar River channeling and bank stabilization projects. Many of the small feeder streams to Lake Sammamish contain natural obstructions that limit anadromous fish utilization to short reaches above the stream mouths. It is believed by the Department of Fisheries that the extra rearing area provided by Lake Washington and Lake Sammamish is the reason many of the streams have maintained runs in spite of degradation and stream losses.

Recreation

All of the major waterways in the Cedar-Sammamish Basin as well as Lake Washington and Lake Sammamish receive extensive recreational use including swimming, waterskiing, boating, skin and scuba diving, and fishing.

Depletion of water from streams and prolonged periods of low flow would greatly diminish recreational values in the Cedar-Sammamish Basin. The Instream Resource Protection Program will provide protection for those values.

Water Quality

Lake Washington: A major threat of pollution in Lake Washington is saltwater intrusion associated with lock operation. Each time the locks are used, freshwater is released from the system and salt water is allowed to intrude into the ship canal. Since salt water is heavier than freshwater, it travels along the bottom of the waterway. If this saltwater wedge migrates far enough eastward, it could spill over a submerged "lip" in the Mountlake Cut area of the canal and into the bottom of Lake Washington. If this were to happen, it would create an irreversible process that could adversely affect aquatic life. Consequently, a special drain system is employed for flushing out the salt water. This flushing requires an even greater amount of water than operation of the locks.

Establishment of base flows on selected waterways will help to assure availability of adequate flushing water in Lake Washington.

Lake Washington Feeder Streams (excluding the Cedar River): All of the Lake Washington feeder streams are located in urbanizing areas and are subjected, at least in segments, to high pollution pressures associated with urban runoff. Some streams have high total coliform levels and could cause public health problems when used for contact recreation. Aesthetic values along many streams are degraded by trash and litter which, in many cases, impedes the passage of migrating fish. Algae in the stream bottoms and high turbidity created from construction erosion is common to all of these streams. On Thornton Creek, urban runoff contributes more than half of the stream contaminant load for biochemical oxygen demand (BOD), total dissolved solids, oil and grease, and heavy metals.

Storms that occur after extended dry periods during the summer and early fall wash accumulated pollutants into receiving waters, endangering downstream water quality. The Sammamish River and Lake Sammamish both suffer the effects of these shock-load impacts as well as heavy siltation and bottom sedimentation associated with urban development. As a result, anadromous sockeye salmon spawning in Lake Sammamish is restricted to the beach sub-strata, and although chinook salmon have been observed utilizing the area immediately below the sill at the outlet of the lake, both Lake Sammamish and the Sammamish River function primarily as rearing and transport waters for anadromous fish and for recreation.

Lake Sammamish: The greatest source of pollution in Lake Sammamish is phosphorous concentration derived from two sources: (1) flushing from the tributaries and surrounding land, and (2) internal releases from the bottom sediments related to anaerobic conditions.

Cedar River: Since the Cedar River is the source of 70 percent of the municipal and industrial water supply for the Seattle metropolitan area, the city manages the watershed above the Landsburg diversion facility to protect the resources from contamination associated with development.

Natural sediment transport in the river is minimal. Steep slopes in the upper drainages are densely vegetated, helping prevent bank erosion. In addition, much of the sediment is deposited in lakes and swamps before reaching the streams.

Developed lands occur in the downstream reaches near Renton and Lake Washington. There the Cedar River has been subjected to occasional releases of toxic materials in and around the Renton area.

The Instream Resource Protection Program will have a beneficial effect upon water quality in the basin. By retaining water in the streams through instream flow provisions on future appropriations, the program will assist in attaining 1983 water quality goals of fishable and swimmable waters. Water quality maintenance should be especially beneficial in the upper tributaries where low flow seasonal conditions are most critical.

CONSUMPTIVE AND PARTIALLY CONSUMPTIVE USES

Irrigation

The United States Department of Agriculture has estimated the total acres currently being irrigated from the Cedar River to be approximately 1,100 acres. Total diversion requirements are estimated at 2,400 acre feet per year. Irrigation water distribution requirements for the basin are four percent for May, 20 percent for June, 33 percent for July, 29 percent for August, and 14 percent for September.

Irrigation permits and certificates in the Water Resource Inventory Area are summarized in Appendix V of the supplemental Environmental Impact Statement.

Municipal and Industrial Water Supply

Currently, the City of Seattle Water Department is diverting an average of 170.5 cfs (110 MGD) from the facility at Landsburg on the Cedar River. This is the major totally consumptive demand on Cedar River water at the present time and is in competition with instream water uses.

Hydropower Generation

Seattle City Light uses up to 700 cfs from the Cedar River for hydropower generation. Water is diverted from the reservoir behind Masonry Dam, run through the power plant, and returned to the Cedar River 1.5 miles downstream. Of this 700 cfs, Seattle holds a certificated water right for 200 cfs and has filed a vested claim for 500 cfs.

CURRENT ADMINISTRATIVE STATUS

Most of the streams and lakes in the Cedar-Sammamish Water Resource Inventory Area, except the Cedar River and its tributaries, have been closed to further appropriations or are under low flow limitations established pursuant to Chapter 75.20.050 state Fisheries Code. Exceptions are Lake Washington, the Sammamish River, and Lake Sammamish including feeder streams, Tibbets Creek, Laughing Jacobs Creek, Pine Lake Creek, and other minor streams.

The Cedar River and its tributaries have been under a minimum flow regulation established in accordance with Chapter 90.22 RCW (Minimum Water Flows and Levels) since 1971. Flow levels are indicated in Figure 2. The instream flows established by the Cedar River Minimum Flow regulation are not always available. Deficient flows have in the past been augmented by releases from storage at the Masonry Dam secured by negotiation between Seattle Water Department, departments of Fisheries and Game, and the Department of Ecology. During critical dry periods, sufficient water is not available for augmentation.

PROPOSED ADMINISTRATIVE STATUS

The Department of Ecology is proposing, pursuant to Chapter 90.54 RCW, Chapter 90.22 RCW, and Chapter 173-500 WAC, to close to further consumptive appropriation other than for in-house domestic use, all streams and lakes in the Lake Washington drainage basin above the Hiram M. Chittenden Locks, except the Cedar River and its tributaries. Adjusted normal year and critical year flows for the Cedar River are proposed for incorporation into new administrative rules

(Proposed Chapter 173-508 WAC). Minimum flows established for the Cedar River in 1971 (Chapter 173-30 WAC) are proposed for repeal.

Normal year flows are flows which must be maintained at all times unless a critical condition is declared by the Director. The Director, or his designee may authorize, in consultation with the State Departments of Fisheries and Game, a reduction in instream flows during a critical condition period. At no time are diversions subject to this regulation permitted for any reason that cause the instream flows to fall below critical year flows, except where a declaration of overriding considerations of public interest is made by the Director.

Critical year flows represent flows below which the department believes substantial damage to instream values will occur.

Two independent streams, Boeing/Hidden Lake Creek and Pipers Creek, discharge into Puget Sound and are not contiguous with the Lake Washington system. Both are accessible to anadromous fish passage from Puget Sound and are proposed for closure.

The regulations will be reviewed by the Department of Ecology at least once in every five year period.

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Chapter 75.20
Chapter 90.22
Chapter 90.54

Washington Administrative Code:

Chapter 173-30
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APPENDIX A

ADMINISTRATIVE RULES

State of Washington Department of Ecology

STATE WATER PROGRAM

Chapter 173-508 WAC

Instream Resources Protection Program

Cedar-Sammamish Water Resource Inventory Area (WRIA 8)

Authorities:

Chapter 90.54 RCW Water Resources Act of 1971
Chapter 90.22 RCW Minimum Water Flow and Levels
Chapter 173-500 WAC Water Resources Program

DEPARTMENT OF ECOLOGY

STATEMENT OF PURPOSE, NEW/AMENDED REGULATIONS

Rule/Amendment Title: Adopting chapter 173-508 WAC--Instream Resources protection Program—Cedar-Sammamish Basin, Water Resource Inventory Area (WRIA) 8, and repealing ch. 173-30 WAC--Minimum Water Flows--Cedar River.
Rule/Amendment Docket Number: DE 79-9

Statutory Authority for Rule/Amendment: Chapters 90.22 and 90.54 RCW

Rule/Amendment Purpose and Description:
This chapter closes to further appropriation certain streams in the Cedar-Sammamish basin and establishes instream flows for the Cedar River.

Names of opponents and/or proponents, if any:

Opponents: None; however, there were minor objections from the cities of Seattle and Renton concerning water supply.

Proponents: Washington State departments of Fisheries and Game, Western Washington Indian tribes, environmental and fishery groups, and federal fishery agencies.

Date of hearing(s): July 24, 1979 (two hearings at different locations)

Date of adoption: September 5, 1979

Effective date: Filed with Code Reviser on September 6, 1979; effective 30 days thereafter.

Agency comments, recommendations, interpretations, and locations of environmental impact statements, if any:

Final environmental impact statement on file at the Department of Ecology.

For further information concerning the rule/amendment, contact:

Eugene F. Wallace
Division Supervisor
Water Resource Management Division
Department of Ecology
Olympia, Washington 98504

Telephone: (206) 753-2829

FORM OF ORDER AND TRANSMITTAL BY AGENCY HAVING SINGLE HEAD

State of Washington

DEPARTMENT OF ECOLOGY
(agency name)

Administrative Order No. DE 79-9

(1) I, Elmer C. Vogel, deputy director of the Department of Ecology do promulgate and adopt at the Department of Ecology, Lacey, Washington, (place) the annexed rules relating to:

Adopting chapter 173-508 WAC--Instream Resources Protection Program--Cedar-Sammamish Basin, Water Resource Inventory Area (WRIA) 8, and repealing chapter 173-30 WAC--Minimum Water Flows--Cedar River.

(2) ALTERNATIVE A. **Use only for Adoption of Permanent Rules.**
This action is taken pursuant to Notice No. WSR 79-06-114 **filed with the code reviser on** June 6, 1979 . **Such rules shall take effect:**
☒ pursuant to RCW 34.04.040(2).
☐ at a later date, such date being ______.

(2) ALTERNATIVE B. **Use only for Adoption of Emergency Rules.**
I, ______, find that an emergency exists and that the foregoing order is necessary for the preservation of the public health, safety, or general welfare and that observance of the requirements of notice and opportunity to present views on the proposed action would be contrary to public interest. A statement of the facts constituting such emergency is:

Such rules are therefore adopted as emergency rules to take effect upon filing with the code reviser.

(3) Pursuant to the requirements of RCW 34.04.___ (1977 c 19 § 2)[1] that "every agency shall incorporate the most specific, but in no case omit all, of the following language alternatives when adopting or amending rules" (fill in statement (a), (b), or (c) as appropriate):

☒ (a) This rule is promulgated pursuant to ~~RCW~~ chapters 90.54 and 90.22 RCW and is intended to administratively implement that statute.

☐ (b) This rule is promulgated pursuant to RCW ______ which directs that the ______ (agency) has authority to implement the provisions of ______ (name of act or RCW citation)

☐ (c) This rule is promulgated under the general rule-making authority of the ______ (agency) as authorized in RCW ______

(4) The undersigned hereby declares that he has complied with the provisions of the Open Public Meetings Act (chapter 42.30 RCW), the Administrative Procedure Act (chapter 34.04 RCW) or the Higher Education Administrative Procedure Act (chapter 28B.19 RCW), as appropriate, and the State Register Act (chapter 34.08 RCW).

(5) This order after being first recorded in the order register of this agency is herewith transmitted to the Code Reviser for filing pursuant to chapter 34.04 RCW and chapter 1-12 WAC.

APPROVED AND ADOPTED September 5, 1979

By [signature]
Elmer C. Vogel
Deputy Director
Title

STATE OF WASHINGTON
FILED
SEP 6 1979
CODE REVISER'S OFFICE
WSR 79-10-002

[Form CR-7: Effective 12/1/77]

Chapter 173-508 WAC

INSTREAM RESOURCES PROTECTION PROGRAM--
CEDAR-SAMMAMISH BASIN, WATER RESOURCE INVENTORY AREA (WRIA) 8

NEW SECTION

WAC 1.73-508-010 AUTHORITY. This chapter is promulgated pursuant to chapter 90.54 RCW (Water Resources Act of 1971), chapter 90.22 RCW (Minimum Water Flows and Levels), and in accordance with chapter 173-500 WAC (Water Resource Management Program).

NEW SECTION

WAC 173-508-020 PURPOSE. The purpose of this chapter is to retain perennial rivers, streams, and lakes in Lake Washington drainages with instream flows and levels necessary to provide for preservation of wildlife, fish, scenic, aesthetic and other environmental values, navigational values, and to preserve water quality.

NEW SECTION

WAC 173-508-030 CLOSURES AND INSTREAM FLOWS. (1) The department of ecology has determined that additional diversions of water from the Lake Washington drainage system would deplete instream flows and lake levels required to support the uses described in WAC 173-508-020. Therefore, lakes and streams contributing to the Lake Washington drainage above the Hiram M. Chittenden Locks, excluding the Cedar River drainage, shall be closed to further consumptive appropriations. Regulation to protect instream flows in the Cedar River and its tributaries shall be undertaken pursuant to WAC 173-508-060.

(2) WAC 173-508-040--Table 1, includes specific named and unnamed surface water sources in Water Resource Inventory Area 8 with restrictions indicated. All tributaries in the Lake Washington drainage not specifically included in Table 1 are closed.

NEW SECTION

WAC 173-508-040 TABLE 1. Cedar-Sammamish Basin - WRIA 8

Stream or Lake	Tributary To	Restriction
(Little) Bear Creek	Sammamish River	Closure
Cedar River (including tributaries)	Lake Washington	Instream Flow Levels
Coal Creek	Lake Washington	Closure
Cottage Lake Creek and tributaries,	Sammamish River	Closure
Bear Creek		Closure
Evans Creek		Closure
Haller Lake	Thornton Creek	Closure
Issaquah Creek	Sammamish Lake	Closure
N. Fork Issaquah		Closure
E. Fork Issaquah		Closure
Unnamed Stream		Closure
Fifteen Mile Creek		Closure
Holder Creek		Closure
Carey Creek		Closure
Lake Washington	Puget Sound	Closure
Sammamish River	Lake Washington	Closure
Lake Sammamish	Sammamish River	Closure
Tibbets Creek	Sammamish Lake	Closure
Pine Lake and Unnamed Stream (Pine Lake Creek)	Sammamish Lake	Closure
Laughing Jacobs Creek	Sammamish Lake	Closure
Larson Lake (including tributaries)	Lake Washington	Closure
Lyon Creek	Lake Washington	Closure
Martha Lake	Swamp Creek	Closure
May Creek	Lake Washington	Closure
McAleer Creek		Closure
Lake Ballinger (McAleer Lake)	Lake Washington	Closure
Mercer Slough	Lake Washington	Closure
Kelsey Creek		Closure
Kinsley Creek		Closure
Mercer Slough Creek		Closure
North Creek	Sammamish River	Closure
Silver Lake		Closure
Pipers Creek	Puget Sound	Closure
Rock Creek	Cedar River	Closure
Swamp Creek	Sammamish River	Closure
Unnamed Springs	Sammamish Lake	Closure
Unnamed Stream (11-26-3E)	Puget Sound	Closure
Unnamed Stream (12-24-5E)	Sammamish Lake	Cloture
Unnamed Stream (Jones Creek)	Cedar River	Closure
Unnamed Stream (Juanita Creek)	Lake Washington	Closure
Unnamed Stream (Northrup Creek)	Lake Washington	Closure
Unnamed Stream (Wildcat Creek)	Sammamish River	Closure
Thornton Creek	Lake Washington	Closure

NEW SECTION

WAC 173-508-050 GROUND WATER. In future permitting actions relating to ground water withdrawals, the natural interrelationship of surface and ground waters shall be fully considered in water allocation decisions to assure compliance with the intent of this chapter.

NEW SECTION

WAC 173-508-060 INSTREAM FLOWS FOR THE CEDAR RIVER. (1) The instream flows established in this section apply to waters of the Cedar River and affect the entire watershed drained by the Cedar River including all tributaries thereto.

(2) Instream flows established in this section shall be measured at the existing U.S. Geological Survey gaging station No. 12.1190.00 on the Cedar River at Renton, Washington.

(3) Except as provided herein (critical year flows), water flows in the Cedar River and tributaries thereto shall, to the extent depletion under existing rights and natural flow conditions permit, be maintained throughout each year at levels which, during the time periods designated, do not fall below the following measurements:

(a) Normal Year Flow

January 1 to June 20:	370 cfs
June 20 to July 15:	Linear decrease from 370 cfs on June 20 to 130 cfs on July 15
July 15 to September 10:	130 cfs
September 10 to September 20:	Linear increase from 130 cfs on September 10 to 200 cfs on September 20
September 20 to October 1:	200 cfs
October 1 to October 10:	Linear increase from 200 cfs on October 1 to 370 cfs on October 10
October 10 to January 1:	370 cfs

Normal year flows must be maintained at all times unless a critical condition is declared by the director. If natural Cedar River flows fall below the 1 in 10 year Cedar River flow frequency, the director, or his designee, may authorize flows below the normal year flows, but not lower than the critical year flow except where a declaration of overriding considerations of public interest is made by the director. All requests to deplete below the established instream flow level will be considered on a case-by-case basis.

(b) Critical Year Flow

January 1 to June 15:	250 cfs
June 15 to July 1:	Linear decrease f rom- 250 cfs on June 15 to 110 cfs on July 1
July 1 to October 1:	110.cfs
October 1 to November 1:	Linear increase from 110 cfs on October 1 to 250 cfs on November 1
November 1 to January 1:	250 cfs

Critical year flows represent flows below which the department believes substantial damage to instream values will occur. Critical year flows are expected to be met unless natural Cedar River flows fall below the one in fifty year Cedar River flow frequency.

NEW SECTION

WAC 173-508-070 FUTURE RIGHTS. No water rights to divert or store public surface waters of the Cedar-Sammamish Basin WRIA 8 shall hereafter be granted which shall conflict with the instream flows and closures established in this chapter. Future rights for nonconsumptive uses may be granted the provisions of this chapter.

NEW SECTION

WAC 173-508-080 EXEMPTIONS. (1) Nothing in this chapter shall affect any existing water rights, riparian, appropriative, or otherwise, existing on the effective date of this chapter; nor shall it affect existing rights relating to the operation of any navigation, hydroelectric or water storage reservoir or related facilities.

(2) Domestic inhouse use for a single residence and stock watering, except that related to feedlots, shall be exempt from this chapter.

NEW SECTION

WAC 173-508-090 ENFORCEMENT. In enforcement of this chapter, the department of ecology may impose such sanctions as appropriate under authorities vested in it, including but not limited to the issuance of regulatory orders under RCW 43.27A.190 and civil penalties under RCW 43.83B.335.

NEW SECTION

WAC 173-508-100 REGULATION REVIEW The rules in this chapter shall be reviewed by the department at least once in every five year period.

REPEALER

Chapter 173-30 WAC of the Washington Administrative Code is repealed in its entirety as follows:

(1) WAC 173-30-010 - BACKGROUND AND AUTHORITY

(2) WAC 173-30-020 - APPLICATION

(3) WAC 173-30-030 - MEASUREMENT

(4) WAC 173-30-040 - DECLARATION OF MINIMUM FLOWS

(5) WAC 173-30-050 - FUTURE RIGHTS

(6) WAC 173-30-060 - ENFORCEMENT

(7) WAC 173-30-070 - PUBLIC INFORMATION

APPENDIX B

SUPPLEMENTAL
ENVIRONMENTAL IMPACT STATEMENT

FINAL

SUPPLEMENTAL

Environmental Impact Statement

Cedar-Sammamish Basin
Instream Resources Protection Program

State of Washington
Department of Ecology

August 1979

INTRODUCTION

The Washington State Department of Ecology proposes to adopt the preceding regulation affecting the streams within the Cedar-Sammamish Basin which drain into and through Lake Washington. The regulation would also close to further water appropriation, two small streams draining directly into Puget Sound. The program under which this regulation is being proposed was analyzed in a programmatic environmental impact statement entitled "Western Washington Instream Resource Protection Program" (draft issued April 27, 1979, final issued June 21, 1979). What follows is a supplement to that EIS containing information specific to the Cedar-Sammamish Basin.

The programmatic EIS as well as the references within it are incorporated into this supplemental EIS by reference. Also included is the preceding Cedar-Sammamish program document as well as additional references listed in Appendix i.

One reference listed in Appendix i is the Cedar River Report. In it, DOE has assembled background information it possesses. Since the history of discussions dealing with the basin is long and complex, this is a large volume. It is available on request. A summary is contained in Appendix i. Information which it contains, like information in other references, is included into this EIS by reference.

<u>Lead Agency</u>: Washington State Department of Ecology

Responsible Official:	Eugene Wallace, Division Supervisor Water Resources Management
Contact Person:	Jeanne Holloman Washington State Department of Ecology Olympia, WA 98504 Phone (206) 753-2807

<u>Author</u>: Tom Elwell, Department of Ecology Environmental Review Section

<u>Licenses Required</u>: Department of Ecology - Adoption of proposed rules.

<u>Background Data</u>: See Appendix i.

<u>Cost to the Public:</u> Individual copies of this EIS may be obtained free from the DOE prior to August 1, 1979.

<u>Date of Issue</u>: June 25, 1979.

<u>Comments Due</u>: August 1, 1979.

<u>Distribution</u>: See Appendix ii.

TABLE OF CONTENTS

SUMMARY

This impact statement is supplemental to the programmatic EIS published for the entire Western Washington Instream Resources Protection Program (WWIRPP). The current proposal is to implement the program in the Cedar-Sammamish Basin by adopting a regulation setting forth instream flow protection measures. The proposed regulation would close to further appropriation all freshwater bodies within the Lake Washington drainage basin except the Cedar River and its tributaries which would have a revised instream flow established. Two small streams draining directly into Puget Sound would be closed as well. This should have the desired effect of protecting instream resources.

Since the City of Seattle obtains part of its water supply from the Cedar River, there is concern for the way in which this regulation will affect the future of this supply. Existing rights will not be affected, however, future expansion may be limited.

The proposal will protect the fishery resource in the system. The water sources proposed for closure include lakes Washington and Sammamish. Since only in-house domestic use and stock watering are exempted from the closure, new permits for lawn and garden irrigation would not be issued. Since many persons are irrigating lawns and gardens with only an unsubstantiated claim, their future right to do so could be in jeopardy.

Alternatives include, 1) "No-Action," in which case the current administrative status will remain in effect; 2) select a different low flow on the Cedar; 3) make an allowance for lawn and garden irrigation; 4) establish a moratorium on future water rights; and, 5) do a complete basin plan.

PROPOSED ACTION

The proposed action is adoption of the proposed regulation; Chapter 173-508 WAC, by the Washington State Department of Ecology, Olympia, Washington 98504. This would close all streams within the Lake Washington drainage basin to further appropriation with the exception of the Cedar River and its tributaries. On the Cedar River, an instream flow would be established and future water rights would be conditioned to this flow. Under normal conditions, new diversions would be curtailed when flows dropped below the prescribed instream flow. No existing rights would be affected.

A "critical year flow" is also established. If the director of DOE determines that a critical water condition exists, he could authorize flows below the normal year flow but not lower than the critical year flow. Only in the rare event that the director determines that "overriding considerations of public interest" require, could streamflow fall below the critical year level. All requests to deplete below the established instream flow level would be considered on a "case-by-case" basis. As a "rule-of-thumb," a flow greater than the natural 1 in 10 year low flow would not be considered "critical."

The Cedar-Sammamish Basin has been the subject of numerous interagency meetings and studies since 1969. There is currently a minimum flow established for the Cedar River under Chapter 90.22 RCW. Most other streams in the basin have been closed to new appropriations under Chapter 75.20 RCW.

The proposal is not directly affected by any comprehensive land use plans. It is not expected to be in conflict with any shoreline management plans. The referenced City of Seattle Comprehensive Regional Water Plan is related to the proposal. The section on municipal and industrial water supply discusses future plans.

EXISTING CONDITIONS AND ENVIRONMENTAL EFFECTS

In addition to the preceding program document, several references present excellent descriptions of the existing conditions in the basin. These include the METRO areawide water quality plan, the DOE 303(e) plan, the Puget Sound and Adjacent Waters Study referenced in the programmatic EIS, the DOE Cedar River Report, and the Seattle Water Department Cedar Tolt Watershed Management Plan EIS referenced in Appendix i to this EIS. The recently released Seattle Comprehensive Water Plan EIS is also a source of information.

As described in the programmatic EIS, the purpose of regulating instream flows is to protect instream values including fish, recreation, navigation, water quality, wildlife, and aesthetics. The proposal for the Cedar-Sammamish Basin is designed to accomplish these goals and is the product of a long and involved interagency negotiation process.

This proposal is quite different from proposals which ordinarily are considered in EISs in that the proposal is really one to <u>not</u> do something. Closure or low flow limits will mean that water will <u>not</u> be diverted for out-of-stream uses or will <u>not</u> be diverted if the stream would be depleted below the low flow limit. In this sense, the proposal will <u>not</u> lead to adverse environmental impacts. In fact, the purpose of the proposal is to protect instream values from the dangers of over-appropriation. However, there may be out-of-stream uses (new irrigation, new municipal and industrial water supply, etc.) precluded. This would be viewed as adverse by the potential users. Conversely, some proponents of instream values (fisheries interests, recreational users, etc.) may feel that the proposed low flows are too low and that their interests would be better served by setting a different low flow level. In the case of the Cedar-Sammamish Basin, negotiations have already taken place and flow information has been thoroughly considered.

The programmatic EIS discussed these issues in general. What follows is supplemental to that document and focuses only on those issues of major concerns to the Cedar-Sammamish Basin.

Navigation

a. <u>Existing Conditions</u>

The program document describes the existing navigation situation. Essentially, all of lakes Washington and Union are accessible by medium draft vessels through the locks in Ballard and the Lake Washington ship canal. The U.S. Army Corps of Engineers maintain the locks and the ship canal. In the summer, the lake level is maintained at about 22 feet to provide maximum navigation, and in the winter, the level is lowered to near 20 feet to protect shoreline facilities from wave action. Water from the various streams draining into the lake is necessary to maintain lake level, operate the locks, and prevent saltwater intrusion.

Above Lake Washington, the Sammamish River is navigable to small boats as is Lake Sammamish and the lower portion of the Cedar River.

b. Effects

The proposal will not adversely affect navigation because the Corps of Engineers has a priority right to the water it needs to maintain Lake Washington between 20 and 22 feet and to operate the locks and flush out intruding salt water. By stopping further appropriations on all but the Cedar River and by establishing a low flow on the Cedar, small boat navigation above Lake Washington will be protected.

Irrigation

a. Existing Conditions

The Puget Sound and adjacent waters study, Appendix VII, presents an overview of the irrigation situation in 1970. According to DOE personnel who administer water rights in the area, there have been no recent requests for surface water irrigation. Indeed, most streams except the Cedar have been administratively closed or placed under low flow limitations. Ground water supplies irrigation water for several large truck farms and what few new agriculturally related applications are received are for ground water.

Appendix v gives a summary of the surface water rights on record with DOE. There are over 60 cfs and 5000 acres devoted to irrigated agriculture according to water right records. This record does not show the actual usage but rather that usage for which certificates or permits have been issued. Actual usage is probably much less since many farms have been converted to residential developments.

A related issue is lawn and garden irrigation. According to the DOE person in charge of water rights in this area, a very large percentage of persons in the basin irrigate lawns and gardens with surface water. This is especially true around lakes Sammamish and Washington. The tables in Appendix v show about 10 cfs and 460 acres appropriated for this purpose. In addition to these appropriated amounts which are protected by law and would be unaffected by the proposal, DOE estimates a large amount of littoral irrigation or irrigation where only a water right claim has been filed. A water right claim is a claim to water based on usage prior to 1917. Experience has shown that only 10-15 percent of claims may be upheld if tested. A total of 1,802 claims are recorded for this basin.

If the water user has waterfront property, he may be protected by the principle of riparian (or littoral) rights. This holds that a person has a right to that water which passes through or abutts his property as long as it is used only on the adjacent land (cannot be diverted to nonadjacent properties). However, if the riparian right has not been exercised continuously since before 1917, it might not be upheld. If a right is not upheld, a new water right would be required. If the area is closed, new permits are not allowed except for in-house domestic use and other uses would have to cease. We do not know how many water users are irrigating without substantiable rights.

b. Effects:

Irrigation under existing permits and certificates will not be affected. On the Cedar River, new permits will be processed but will be subject to the established low flows. This will make them unattractive and ground water will probably be the preferable alternative.

On other streams and lakes, no new rights will be issued. Ground water, which is not in direct hydraulic continuity with surface water or public systems, will be used instead. Ground water which is in direct hydraulic continuity with surface water will be regulated along with that surface water.

Lawn and garden irrigation will also be affected. If permits or certificates have not been issued, users without substantiable claims will be in jeopardy. Unsubstantiated claims will not be replaced by permits. Other means of lawn irrigation will be necessary for these users. Wells may be dug or community water used. This could tax these systems to an unknown amount. We have no estimate of the number of persons affected.

Municipal and Industrial Water Supply

a. Existing Conditions:

The municipal and industrial water supply system on the Cedar River is described in Appendix VI of the Puget Sound and adjacent waters study and in the Cedar-Tolt Management plan EIS. Olson (1978) also describes the facilities. The following is quoted from the Cedar-Tolt report:

> "The City of Seattle Water Department provides high quality, unfiltered drinking water to over 992,000 people in the Seattle Metropolitan Area and outlying districts of approximately 83% of the King County population. This includes an area from Edmonds on the north to Des Moines on the south; east

to Lake Sammamish and west to Puget Sound (see figure on next page). The average daily consumption is 150 million gallons per day (mgd) while summer peak use has reached 340 MGD. Approximately two-thirds of this water is sold directly to city retail customers, and the remaining at wholesale rates to suburban water districts and municipalities.

"Total usable water storage capacity between Chester Morse Lake, the Lake Youngs impoundment, South Fork Tolt reservoir and the Tolt Regulating Basin exceeds 110,000 acre-feet, over 35 billion gallons (see table on page 7). Combined management of the Cedar and Tolt River Supply System together with the distribution system storage can meet peaking rates of 340 million gallons per day.

"Water is impounded in 1,680 acre Chester Morse Lake behind a wooden crib dam which is followed downstream by a larger masonry structure. The main water diversion site is off the Cedar River 12 miles downstream at Landsburg where water is screened, treated, and carried to the Lake Young's reservoir by a 96" pipeline that later divides into two 78" lines which can enter or bypass the reservoir. Pipelines from both the reservoir and the bypass run into the control works located southwest of Renton. The water then travels into the city distribution system by four large pipelines. The Cedar River system serves the southern region of Seattle and parts of South King County."

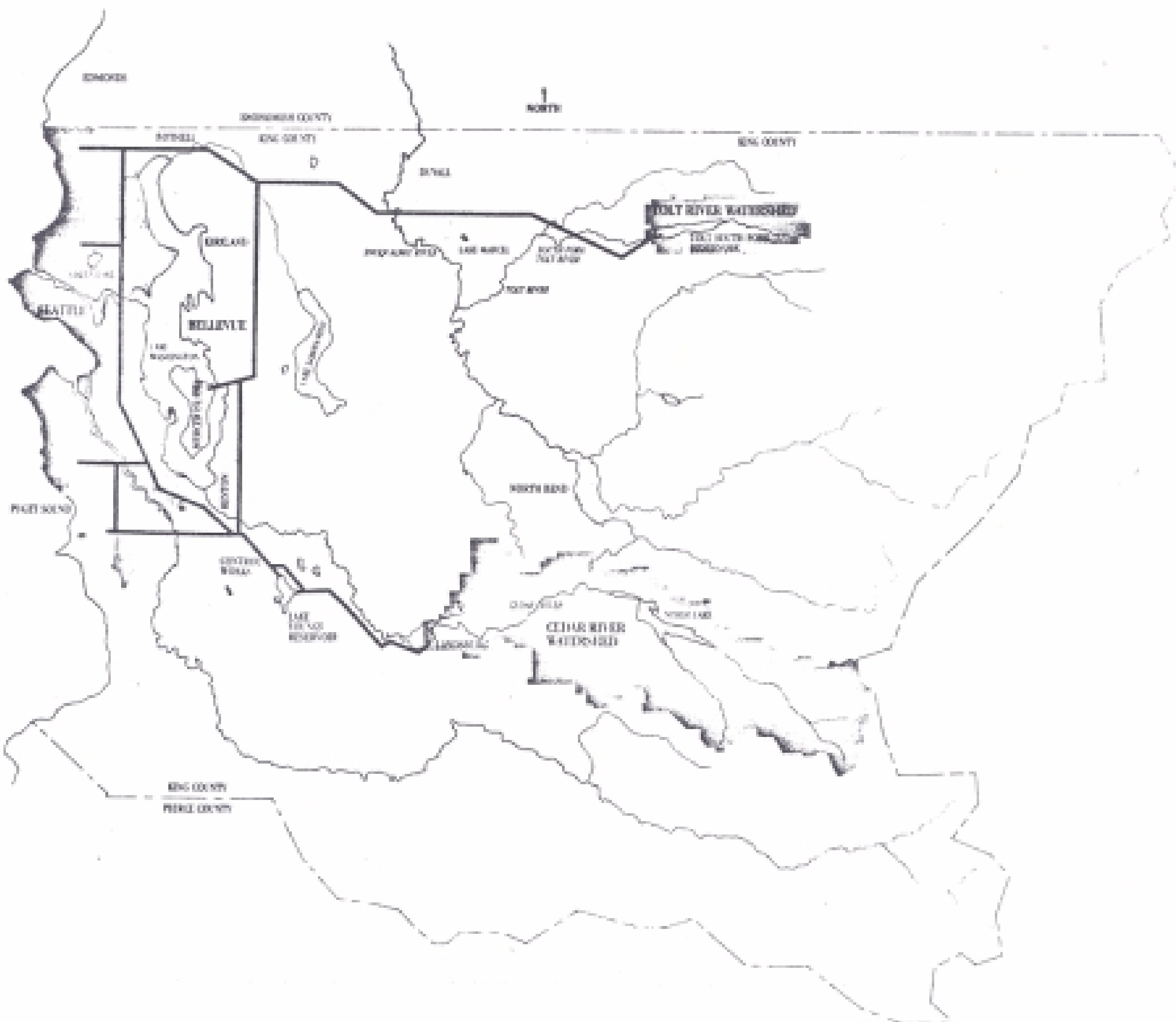
The Cedar River watershed is controlled, meaning that the utility owns or has control of the use of the entire watershed above the diversion point. This means that a lesser degree of treatment is required before delivery to the public.

The administrative history of municipal and industrial water supply on the Cedar River is somewhat confusing.

The major claims and water rights held on the Cedar River are by the Seattle Water Department and Seattle City Light. No claims or rights were recorded prior to 1961, when Seattle City Light was granted a certificate for (200 cfs) for power generation. In 1974, an additional (500 cfs) was claimed for power production.

The Seattle Water Department filed a water right claim to Cedar River waters in 1974 for storage rights of 160,000 acre-feet and diversion rights of 465 cfs (300 mgd). The 160,000 acre-feet for storage is based upon the design capacity of the Masonry Dam. Claimed date of the priority is 1914 or earlier.

Seattle Water Department Service Area



MAJOR STORAGE FACILITIES ON THE
CEDAR AND TOLT RIVER WATER SUPPLY SYSTEM

Facility	Storage Capacity (Acre Feet)	System Capacity Annual Average (MGD)	System Capacity Peak Flow (MGD)	Elevation (Feet)
Chester Morse Lake	39,145			1,555
Landsburg	---	150*	240	538
Lake Youngs	14,768	---		493
South Fork Tolt Reservoir	56,000	60	100	1,765*
Tolt Regulating Basin	675	---		760
TOTAL	(110,588)	(210)	(340)	

* with ring gate down

* 85 firm

The claimed date of priority for the 465 cfs diversion is January 1901 (although preparatory steps began in 1888). The claim is based on legal doctrines of appropriation and/or riparian acquisition by purchase and/or condemnation statutes. This is only a claim by the City of Seattle and has not been adjudicated or otherwise confirmed.

The U.S. Army Corps of Engineers claims a right to the instream use of Cedar River water up to the full natural flow of the river. Natural flow is defined as the amount of water expected from a river in its natural undeveloped state. In the case of the Cedar River, the effects of the Masonry Dam and the Seattle Water Department's diversion must be mathematically eliminated.

The Corps takes the legal position that it has the right to waters of the Cedar River, paramount to any water rights of the city, in the event that withdrawal or impoundment of the Cedar River water by the city would impair the navigability of the locks.

This claim is made under the Commerce Clause of the U.S. Constitution, which gives Congress authority over navigation and all navigable waters of the United States; and further authorizes Congress to exercise its commerce jurisdiction over nonnavigable waterways and tributaries where the navigable capacity of a navigable waterway is affected, or if interstate commerce is otherwise affected. The U.S. Corps of Engineers is the administering federal agency of this clause.

Since the City of Seattle has only a claim and not an appropriative right, the claim would be subject to adjudication. As the reader will find from reading the City of Seattle's comment letter, the city and DOE do not agree on what the outcome of adjudication would be. The city's current use is 110 mgd. Its maximum use was 137 mgd about 1960. The system capacity is 150 mgd.

Meanwhile, the city has proposed some improvements in their recently released draft Comprehensive Regional Water Plan. The following is a quote from that document:

<u>Cedar Masonry Dam Improvements</u>

> "This improvement program consists of two major elements. The first is to provide funds in anticipation of dam safety modifications required by the COE dam inspection which found the Cedar Masonry Dam to be unsafe. The COE has proposed a multipurpose project to increase the storage capacity of the masonry dam to provide for 20 mgd additional water supply, additional flood control, and fishery enhancement. The costs associated with this multipurpose project, which is being developed by the COE, were allocated to the various benefiting uses. It was assumed that City Water and City Light would split equally the

> costs allocated to the city. This results in $23 million being included in the COMPLAN.
>
> "The proposed COE project is urgently needed not only for dam safety purposes but also to provide adequate storage to meet the revised lockage flow requirements. Without additional storage on the Cedar River, the existing yield would drop to 85 mgd by 2025 according to a recent COE yield study. The present yield is 150 mgd."

This is based on a modeling effort by the Corps of Engineers which projected navigational needs to the year 2025, based on 1000 years of simulated flow data. The Corps projects that much more water will be required for the locks in years to come because more boats will require more lockages. Based on a 1 in 50 year drought flow for the basin and instream flow requirements developed by the University of Washington Fisheries Research Institute, the Corps model predicts that only 85 mgd would be firmly available for the city water supply.

Meanwhile, the Masonry Dam is in need of repairs. The Corps proposes to enlarge the dam and provide more storage capacity in the process of fixing it. This would not only provide greater flood protection along the Cedar River, but also would provide a greater firm water supply for the city. The Corps model predicts that 170 mgd would be available as firm supply (current firm 85 mgd) in 2025 if the project is built. This increased firm supply is considered a benefit to the project and contributes to the positive benefit/cost ratio. The Corps has indicated that without the increased water supply benefits, the project loses economic feasibility and all benefits, including flood protection, would be lost. The dam must be repaired in any case to assure its safety.

An interesting possibility would be for fisheries agencies to contribute monetarily to the project and in turn receive part of the available storage to be used for fishery enhancement. This would help the benefit/cost ratio but would reduce firm supply to Seattle.

An important aspect of the Corps model is that it used the river flows calculated by the FRI study to protect instream values. Thus, the model assigned a first priority to meeting navigational requirements, a second priority to the FRI flows, and a third priority to the city water supply. Therefore, the model result, and thus the economic feasibility of the project, is very sensitive to instream flow requirements. If instream flows are set significantly higher than the FRI values, the project might not be built as proposed because of a lower benefit/cost ratio.

b. Effects:

Existing rights will not be affected; however, Seattle does not have an existing confirmed appropriative right. It has a vested right (claim) which has not been officially adjudicated. DOE feels that it is reasonable to assume that if it were adjudicated, the amount would not be greater than that which has been used in the past. The city disagrees, as evidenced by its comment letter.

With the Corps project, available water could be raised from 150 to 170 mgd; however, at a minimum, the extra 20 mgd would be subject to the proposed low flows established by DOE and the appropriative water right procedures prescribed in Chapter 90.03 RCW. Since the 20 mgd (31 cfs) is predicated on the FRI flow regime, any low flow significantly greater than the FRI values would erode the 20 mgd figure.

Of course this assumes that the city would get the 20 mgd. Fisheries agencies could lay claim to part of it. In fact, since Seattle does not have an official application submitted, anyone could apply for this water.

The DOE proposal is significantly higher than the FRI values for a normal year but not for a critical year. Assuming that a critical year was declared when necessary, the amount of water available to the city should not be much less than the 20 mgd from the Corps model.

Of course, the model reflects 20 mgd based on extreme conditions - a combination of maximum lockage requirements and a 1 in 50 year drought. At other times, the city would have more water at its disposal. The Seattle comprehensive water plan EIS describes alternative means of insuring future supplies to the city.

Power

a. Existing Conditions

Cedar Falls, established in 1904, was the first hydroelectric facility in the Seattle City Light system. The present facility, owned by Seattle City Light, dates from 1921 when the powerhouse was built on the Cedar River. Water released by penstock from behind the Masonry Dam is used to drive two turbines which, with associated generators, have a peaking capability of 30 megawatts (Reid, 1973) and a critical period annual average capability of 7 megawatts. The average annual energy production at Cedar Falls is 96,200 megawatt hours (Federal Power Commission, 1972).

Since the powerhouse is upstream of the water system intake water can be used to generate power and then diverted for municipal and industrial use. However, since not nearly as much water can be diverted at Landsburg as can be put through the turbines at the powerhouse, close coordination between the water and power utilities is important.

b. Effects

Seattle City Light filed a claim for 500 cfs for power generation in 1974. This is in addition to the 200 cfs already granted by certificate. This allows the facility to peak to its full capacity of 30 mw. According to a personal communication with City Light, there are no current plans to expand generation facilities on the river.

Since existing rights will not be affected, there will be no impact on power except as many occur with project modifications for dam safety repairs and/or from Corps project activity. Seattle City Light is party to both of these activities.

Fisheries

a. Existing Conditions

The following is from "Program Report No. 82 - 1971 status of Puget Sound Sockeye Salmon and Recommendations for Management" by the Washington Department of Fisheries:

"Predictions of the Lake Washington sockeye run have been prepared for the past 11 years. The prediction methodology has varied year-to-year depending on which run size relationship was considered to be the most reliable.

"Two pieces of important prediction data are the pre-smolt population in the lake estimated by the Fisheries Research Institute (FRI) and corresponding adult returns. There are now 8 consecutive brood years (1967-1974) of pre-smolt and adult return data (Table 1). These data have been considered in predicting the 1979 return.

"Returns in 1979 will be from the 1975 brood years; 1975 escapement was 120,000 sockeye, the lowest number observed since observation began in 1964 (Table 2). Additionally, the 1975 brood was subjected to a major flood of 8,000 cfs during the period of egg incubation, the highest flood recorded. The 1975 brood year pre-smolt population in Lake Washington was estimated at 1,140,000, next to the lowest estimate since this program began. Application of the average observed marine survival (7.85%) (Table 1) to the pre-smolt estimate results in a 1979 prediction to Puget Sound of 89,000 adults.

Table 1. Lake Washington sockeye brood year data – 1964-1976.

Brood year	Escapement	Peak Cedar River flow (cfs) at Renton	Pre-smolt population estimate x 10^6 (FRI)	Resulting adult run size	Percent marine survival	Return/spawner
1964	137,500	5,300	-	274,165	-	1.99
1965	132,000	1,570	-	267,338	-	2.03
1966	123,000	2,960	-	129,634	-	1.05
1967	383,000	2,910	7.5	538,685	7.2	1.41
1968	252,000	3,720	3.2	299,461	9.4	1.19
1969	200,000	2,290	3.3	435,853	11.5	2.18
1970	124,000	2,730	2.5	149,159	6.0	1.21
1971	183,000	6,210	1.8	143,657	8.0	0.79
1972	249,000	3,090	3.6	180,283	5.0	0.72
1973	330,000	3,190	2.5[1/]	593,142	[3/]	1.80
1974	126,000	3,280	0.8[2/]	311,443[4/]	[3/]	2.47
1975	120,000	8,800	1.1			
1976	159,000					
1977	435,000					
1978	290,000					

Mean marine survival 19697-1972 brood years = 7.85%.
Mean return/spawner 1964-1973 brood years = 1.53.
Mean adult run size 1964-1973 brood years = 302,074.

[1/] Thought to be conservative at the time of the estimate. Adult returns in 1977 proved this assumption to be true.
[2/] Thought to be conservative.
[3/] Unknown because of lack of accurate pre-smolt estimate.
[4/] Preliminary data.

Table 2. Estimated catches and escapement of Lake Washington sockeye in numbers of fish, all age groups combined, 1967-1978.

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978[6/]
Convention waters catch												
B.C.	1,593	4,737	9,193	107	10,023	7,537	11,912	7,781	10,038	17,523[6/]	30,244[6/]	2,807
U.S.	851	3,210	10,302	504	12,254	4,434	64,050	1,520	7,672	212[6/]	56,758[6/]	1,977
Discovery Bay												
Treaty					4		0	0	17	0	2	0
Non-treaty	442	76	3,098	39	59,067	615	3	0	0	139	7,659	278[5/]
Admiralty												
Treaty								0	13	2	2	3
Non-treaty	68	3,179	22,637	781	72	994	0	9	22	66	2	14
Seattle area												
Treaty	0	1,464	456	14	632			0	133[2/]	706[1,2/]	2,601[1,2/]	162[2/]
Non-treaty	2,947	9,499	21,652[1/]	3,128[1/]	264,376	1,944[1/]	524[1/]	396[1/]	0	3[1,2/]	5[1,2/]	94
Marine sport	0[3/]	0[3/]	0[3/]	0[3/]	0[3/]	0[3/]	0[3/]	80	39	0	352	70
<u>Freshwater</u>												
Lake Washington												
Treaty	0	0	0	0	9,257	6,653	29,364	5,182	354	37	35,932	0
Non-treaty	0	0	0	1,061	0	0	0	0	0	0	0	0
Lake Sammamish treaty	0	0	0	0	0	0	0	0	5,070	811	0	970
Lake Washington sport	0[3/]	0[3/]	0[3/]	0[3/]	0[3/]	28,284	0[3/]	8,655	0	0		0
Lake Sammamish sport	0[3/]	0[3/]	0[3/]	0[3/]	0[3/]	0[3/]	0[3/]	31	0	0	12,769	0
Cedar River enhancement						0		0	200[7/]	1,231[4/]	11,816[4/]	15,068 [4/]
Issaquah Hatchery						0		105	99	552	0	0
<u>Subtotals</u>												
Convention catch	2,444	7,947	19,495	611	22,277	11,971	75,962	9,301	17,710	17,735	87,002	4,784
Marine treaty	0	1,464	456	14	636	0	0	0	163	709	2,605	165
Marine non-treaty	3,457	12,754	47,387	3,948	323,515	3,553	527	485	61	208	8,018	456
Freshwater treaty	0	0	0		9,257	6,653	29,364	5,182	5,424	848	35,932	970
Freshwater non-treaty	0	0	0	1,061	0	28,284	0	8,686	0	0	12,769	-
Total catch	5,901	22,165	67,338	5,634	355,685	50,461	105,853	23,654	23,358	19,499	146,326	6,375
Escapement[7/]	383,00	252,000	200,000	124,000	183,000	249,000	330,000	126,000	120,000	159,000	435,000	290,000
Actual run size	388,901	274,165	267,338	129,634	538,685	299,461	435,853	149,759	143,657	180,283	593,142	311,443
Predicted run size	None	250-300,000	200-300,000	250-300,000	750,000+	300-400,000	<1972 run	200,000	130,000	300,000	201,000	160,000

1/ Includes East-West Passage catch.
2/ Includes Duwamish River and Elliott Bay catches.
3/ Sport catches occurred but species can't be apportioned to total catch.
4/ Dennis Wilson (personal communication).
5/ Includes all of Catch Area 6B.
6/ Preliminary data—subject to change (January 24-CCS).

"If the historic relationship between winter flood levels and the number of smolts per spawner is applied to the 1975 escapement level, the predicted run size would be 55,000 sockeye. However, the 1975 flood level of 8,800 cfs is in excess of any level in our data base and the relationship may be altered at such high levels. It is felt the higher number is based on a better relationship. Either number, however, is well below the escapement goal.

"Based upon recent Canadian fishing patterns and the projected season for 1979, the Canadian Area 19 and 20 (Strait of Juan de Fuca) fishery will harvest approximately 5 percent of the run (4,000 fish) prior to its entry into U.S. waters. An additional harvest of 2 percent (2,000 fish) may occur by U.S. fishermen, depending upon actual IPSFC regulations. Thus, the projected run size entering Lake Washington is 83,000 sockeye. An additional 1,000 fish harvest may occur incidental to fall fisheries for chinook and coho in Lake Washington and Lake Sammamish.

"In summary, the 1979 Lake Washington sockeye run is projected to be 83,000 sockeye at its point of entry into Lake Washington (Ballard Locks). The escapement goal is 350,000 fish.

"The escapement will be estimated again in 1979 by enumeration at Ballard Locks. It is also presently planned to continue the Cedar River tower program whereby sockeye are enumerated as they enter the Cedar River.

"Management Recommendations

Based on the above, there is no harvestable surplus expected in 1979. As with all run size predictions, a possibility of error is present. To assess the actual run size, an enumeration study will again occur as the run passes Ballard Locks. Seven years of daily sockeye counting data are shown in Table 3 [not included]. A run size projection will be made from these counts by about July 1. If the projected run size is significantly greater than 350,000 sockeye, a sport and net fishery can be allowed.

"Regulations have already been adopted by the department to close the sport fishery for sockeye in the Lake Washington system. To minimize the incidental commercial harvest of the 1979 Lake Washington sockeye salmon run, the following recommendations are made:

Area 4B, 5, 6, & 6C - Minimum gill net mesh restriction of 6-1/2 inches from June 1 through June 23 and purse seines must release all sockeye (IPSFC control begins on June 24), unless consideration for other stocks requires more restrictive measures.

Area 6B - From June 1 through July 23, this area must be closed to protect sockeye. There are no other stocks present during this period in this area which cannot be harvested without loss in other areas at a later date.

Area 9, 9A, 10 & 10A - From June 6 to July 31, these area must be closed to protect sockeye. There are no other stocks present during this period in this area which cannot be harvested without loss in other areas at a later date.

Area 10B - No fishery should occur prior to July 31. A minimum mesh restriction of 6-1/2 inches from August 1 to August 15 if chinook fishery is to occur in this area and purse seines must release all sockeye.

Area 10C - No fishery should occur prior to August 1. A minimum mesh restriction of 6-1/2 inches to protect sockeye during chinook fishery from August 1 to August 15 and purse seines must release all sockeye. Closure of beach spawning areas will also be required.

Area 10D & Cedar River - No fishery for sockeye should occur.

Note: The limiting factor at present for the Lake Washington sockeye run seems to be the low egg to fry survival due to abnormally repetitive Cedar River floods. The department has initiated artificial enhancement to alleviate this problem. The cycle of protecting the spawning stock by restrictive harvest regulations only to have environmental conditions destroy our efforts must be broken. Attempts to collect eggs for egg box hatching in 1977 were largely successful and the program was continued in 1978 when 13,100,000 eggs were taken for egg box incubation. This program will continue in 1979. Additionally, the state Legislature funded a major enhancement project on the Cedar River and planning for this project is well underway.

Adequate streamflows are of critical importance to anadromous and resident fish which utilize the Cedar River. Sockeye and chinook salmon and steelhead trout utilize the mainstem Cedar River for spawning and rearing while coho salmon primarily use tributary streams for spawning and use the main stem for rearing.

Appendix XI of the Puget Sound and adjacent waters study contains a review of the fisheries resources of the basin. The Department of Fisheries catalogue of streams (referenced in the programmatic EIS) has an excellent and detailed presentation. Olson (1978) also contains an excellent summary of the existing conditions. In brief, the basin has major populations of resident and anadromous fish. The following tables were extracted from the PS&AW study report.

Since the Puget Sound and adjacent waters study was published, the Cedar River system has been subjected to close scrutiny by several agencies. A minimum flow has been established for the Cedar itself and most other streams have been administratively closed or placed under low flow limitations in order to protect the fishery resource. The referenced Cedar River Report contains details of these proceedings and is available on request.

Because flows necessary for fisheries is an important issue, the FRI report and the Fisheries Department review of the report have been extracted from the Cedar River Report and included as appendices iii and iv, respectively. The following assessment is extracted from the Cedar River Report:

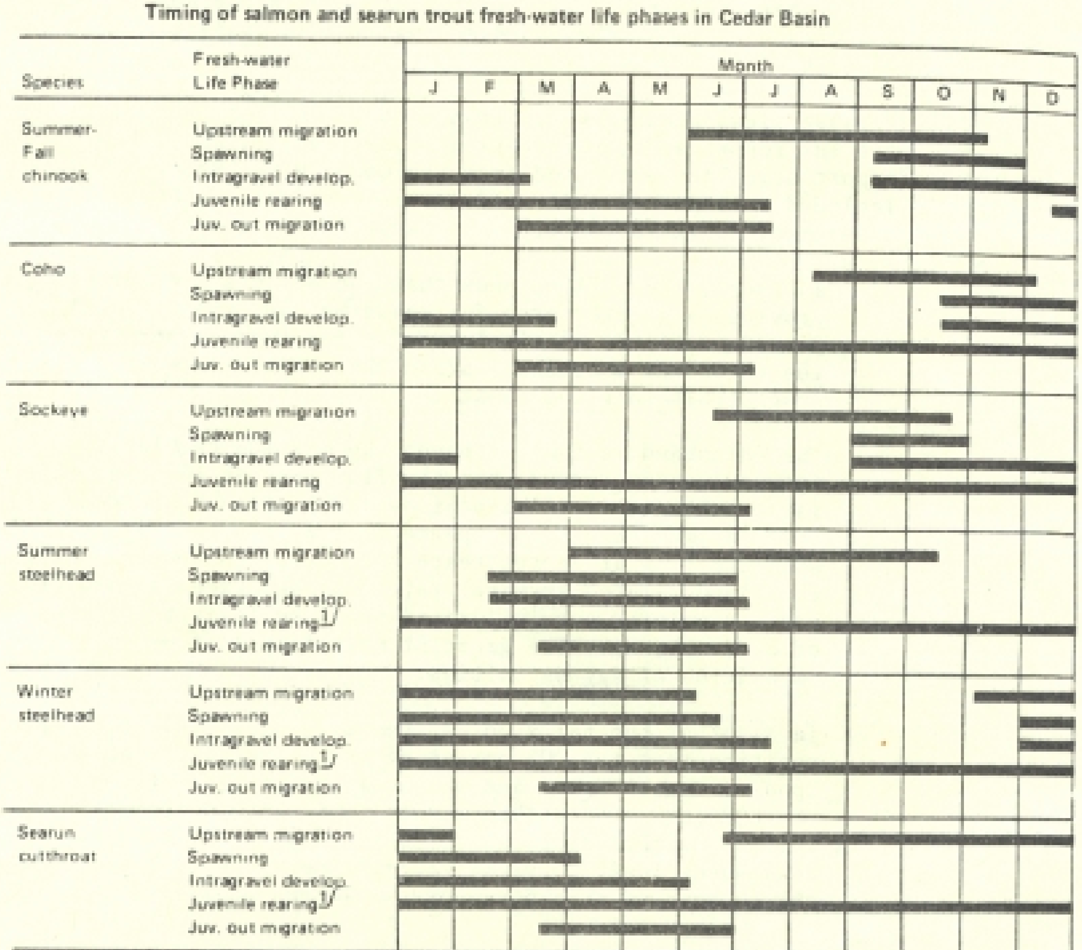
> In short, the WDF contends that the 480 cfs DOE curve provides a greater area for spawning, and that it will provide a higher survival rate by forcing spawners from the turbulent midchannel areas where eggs are more susceptible to flood damage.
>
> The FRI stand is that although the maximum cumulative spawnable area occurs when the flow reaches 480 cfs, this is actually an inefficient flow level since 80 percent of this maximum cumulative spawnable area can be utilized when the flow at Renton reaches 250 cfs. Moreover, while the flood-related survival rates may be higher at 480 cfs, density-related survival rates would be lower as a result of overcrowding. The greatest mortality is from superimposition of egg deposition.
>
> In light of the FRI studies, the City of Seattle took the position that the DOE operating curve was ". . . based upon erroneous data, and was no longer valid. Following the DOE curve would then result in a waste of water as well as overcrowding on available spawning areas with its consequent lower survival rates. Therefore, the FRI flow should be used as a base for developing minimum flows."

Significant spawning reaches for anadromous fish and resident game fish, Cedar-Green Basins[1]

Stream	Section	Stream Mileage	Type of Spawning Area
Lake Washington drainage	Lake areas	--	Numerous lake areas having gravel bottom suitable for sockeye "beach" spawning
(Other than Sammamish or Cedar R. system)	Lake Washington tribs.	Totals over 15 mi.	Smaller drainages containing both riffle and patch type gravel
Sammamish R. drainage	Sammamish Lake and Sammamish R. tribs.	Totals over 50 mi. *	Mostly small drainages containing both riffle and patch type gravel
Cedar R. drainage	Mouth to Maple Valley	0.0-13.0	Numerous broad riffles, some patch gravel areas
	Maple Valley to Landsburg Dam	13.0-19.0	Few large riffles, considerable patch gravel
Green R.	Kent area to gorge	22.0-38.0	Numerous broad riffles, some beach and patch gravel
	Gorge to Tacoma diversion	38.0-52.0	Occasional riffles, mostly patch gravel sections
Newaukum Cr.	Mouth to point near headwaters	0.0-11.0	Many short riffles, some patch gravel areas
Big Soos Cr.	Mouth to point near headwaters	0.0-9.0	Numerous riffles, many patch gravel sections

[1] Additional spawning area is provided by virtually all tributaries entering within described reaches.

Timing of salmon and searun trout fresh-water life phases in Cedar Basin



[1] Normally extends over a two-year period.

Alterable factors limiting anadromous and resident fish production in Cedar-Green Basins

Streams	Flooding	Low Flows	Dams-Diversions	Unstable Streamflow	Unstable Streambed	Log-Debris Barriers	Limited Spawning Area	Limited Rearing Area	Poor Water Quality	Profile Changes[2]	Chinook	Coho	Sockeye	Chum	Steelhead	Searun Cutthroat	Resident Trout
	Limiting Factor[1]										Species Affected						
Lake Washington																	
Drainages			X						X		X	X	X		X	X	X
Mercer Slough Cr.		X		X						X	X	X	X		X	X	X
Coal Cr.		X		X						X		X			X	X	X
May Cr.		X		X						X		X			X	X	X
Juanita Cr.		X		X						X		X			X	X	X
Sammamish R.		X					X	X	X	X		X	X		X	X	X
Swamp Cr.		X		X						X		X	X		X	X	X
North Cr.		X								X		X			X	X	X
Bear Cr.		X								X		X			X	X	X
Big Bear Cr.		X								X	X	X			X	X	X
Sammamish Lake																	
Tibbetts Cr.		X								X		X			X	X	X
Issaquah Cr.	X	X								X	X	X	X		X	X	X
Cedar R.	X	X	X		X			X		X		X	X		X	X	X
Downs Cr.		X										X			X	X	X
Rock Cr.		X										X			X	X	X
Duwamish R.	X	X							X		X	X		X	X	X	X
Black R.		X							X	X		X		X	X	X	X
Spring Brook Cr.		X					X		X	X		X			X	X	X
Hill Cr.		X							X			X		X	X	X	X
Green R.	X	X	X								X	X		X	X	X	X
Big Soos Cr.		X								X		X			X	X	X
Burns Cr.		X				X	X					X		X	X	X	X
Crisp Cr.		X	X			X	X					X		X	X	X	X
Newaukum Cr.		X							X			X			X	X	X
Independent																	
Drainages																	
Miller Cr.		X	X	X	X			X	X	X		X			X	X	X
Bow Lake Cr.		X	X	X	X			X	X	X		X			X	X	X
Joes Cr.		X										X			X	X	X

1/ Competition and predation generally affect all waters and are most serious in lake environments.

2/ Includes watershed development.

Under encouragement from the Ad Hoc Committee, the Department of Fisheries and Fisheries Research Institute met in August 1977 in an attempt to resolve their differences. The following conclusions were drawn by an attending DOE representative:

CONCLUSIONS:

1. There appear to be only minor differences between FRI and WDF on the total wetted area below Landsburg at any given discharge rate.

   (89.3 x 21.6 x 5280 = 10,184,486 $ft.^2$ = 1.13 x 10^6 $yd.^2$, discharge @ 500 cfs.)

2. FRI estimated wetted area on the upper 17.3 miles (RM 4.3 to RM 21.6). WDF and Miller[8/] used the total distance, 21.6 miles.

3. FRI, WDF, and Miller each used different assumptions in calculating the spawnable portion of the wetted area.

   a. FRI - Average 30 percent of wetted area for17.3 miles (RM 4.3 to RM 21.6) (236,300 yd^2) (@ 500 cfs)

   b. Miller - Average 10 percent of wetted area for 4.3 miles (RM 0.0 to RM 4.3) and 30% of wetted are for 17.3 miles (RM 4.3 to RM 21.6) (293,000 $yd.^2$)

   c. WDF - Average 32.7 percent of wetted area for 21.6 miles (RM 0.0 to RM 21.6) (370,000 $yd.^2$)

   This is where the difference in philosophy begins to develop and we end up with one escapement goal that is 40 percent higher than the other.

4. Another point of disagreement is the spawner density used in the various studies, and the female to male ratio.

   a. FRI - 0.47 females/$yd.^2$ and a male:female ratio of 40:60.

   b. Miller - 1.0 spawners/$yd.^2$ and 60 percent females.

   c. WDF - 0.67 to 1.0 females/$yd.^2$ and 57 percent females.

8/ Master's Thesis, Jim Miller, "The Effects of Minimum and Peak Cedar River Streamflows on Fish Production and Water Supply. University of Washington. 1976.

5. Interpolations from the three dimensional graph shown in the FRI report as Exhibit 4 shows about 22 percent increase in egg production by increasing spawners from 250,000 to 350,000 at a discharge of 500 cfs. A copy of the figures used in constructing this graph would be useful in evaluating egg production at other discharge rates and spawner magnitudes.

b. Effects

The proposal is designed to have a positive effect on the fisheries resource. By closing all streams and water bodies, but the Cedar, they are protected to the maximum extent possible.

On the Cedar River a two-stage regulation has been selected. As the following figures show, during normal years, the low flow is established close to the Washington Department of Fisheries recommendation. During a critical year the low flow is set close to the flow recommended by the Fisheries Research Institute. The proposed summer flow is considerably higher than that in the present minimum flow regulation.

As a review of appendices iii and iv will show, we cannot make a definitive statement about the numbers of fish which will result from the flow. We can say that during a normal year, the flows will be no lower than the "peak spawning discharge" recommended by the FRI report.

Flooding

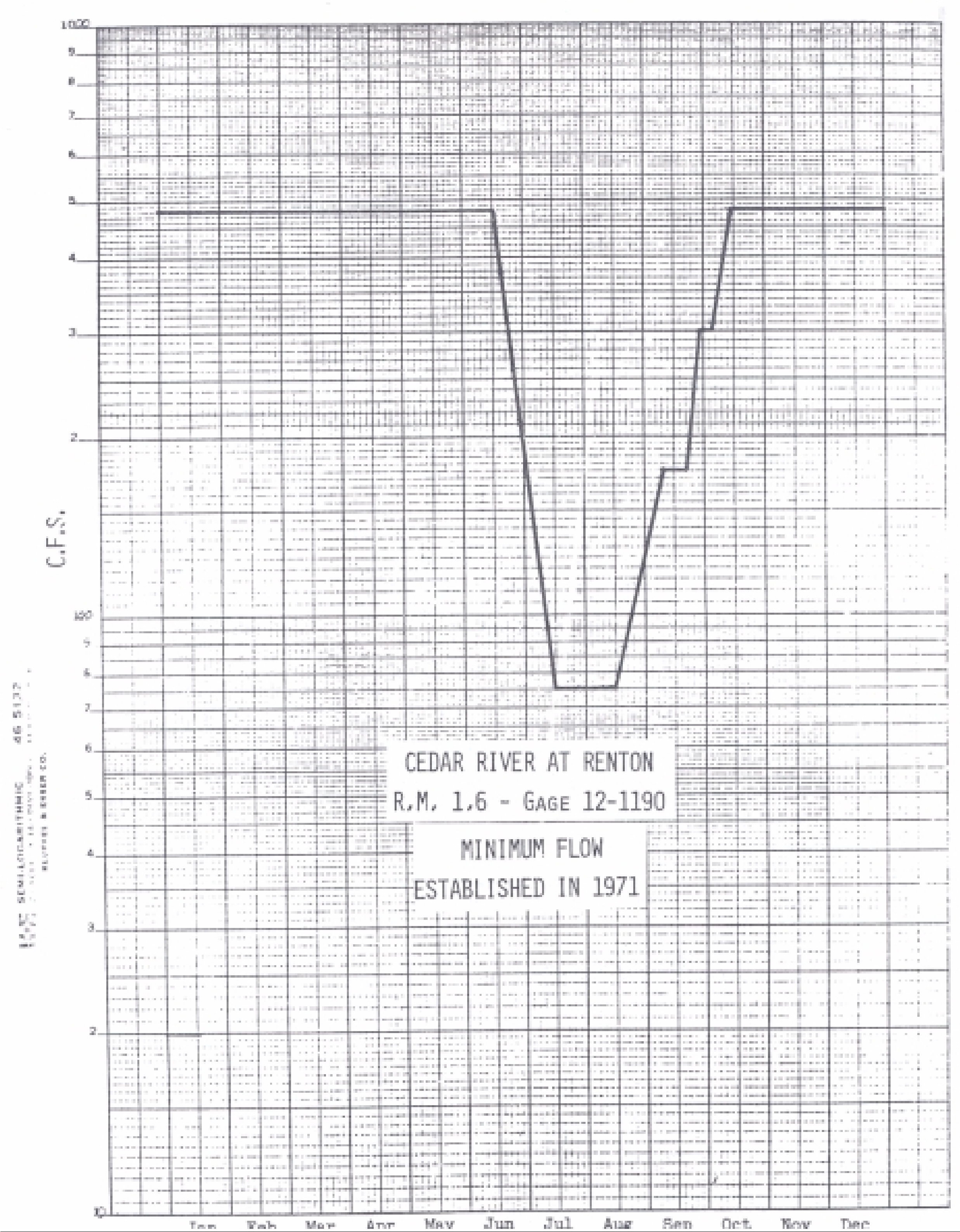
a. Existing Conditions:

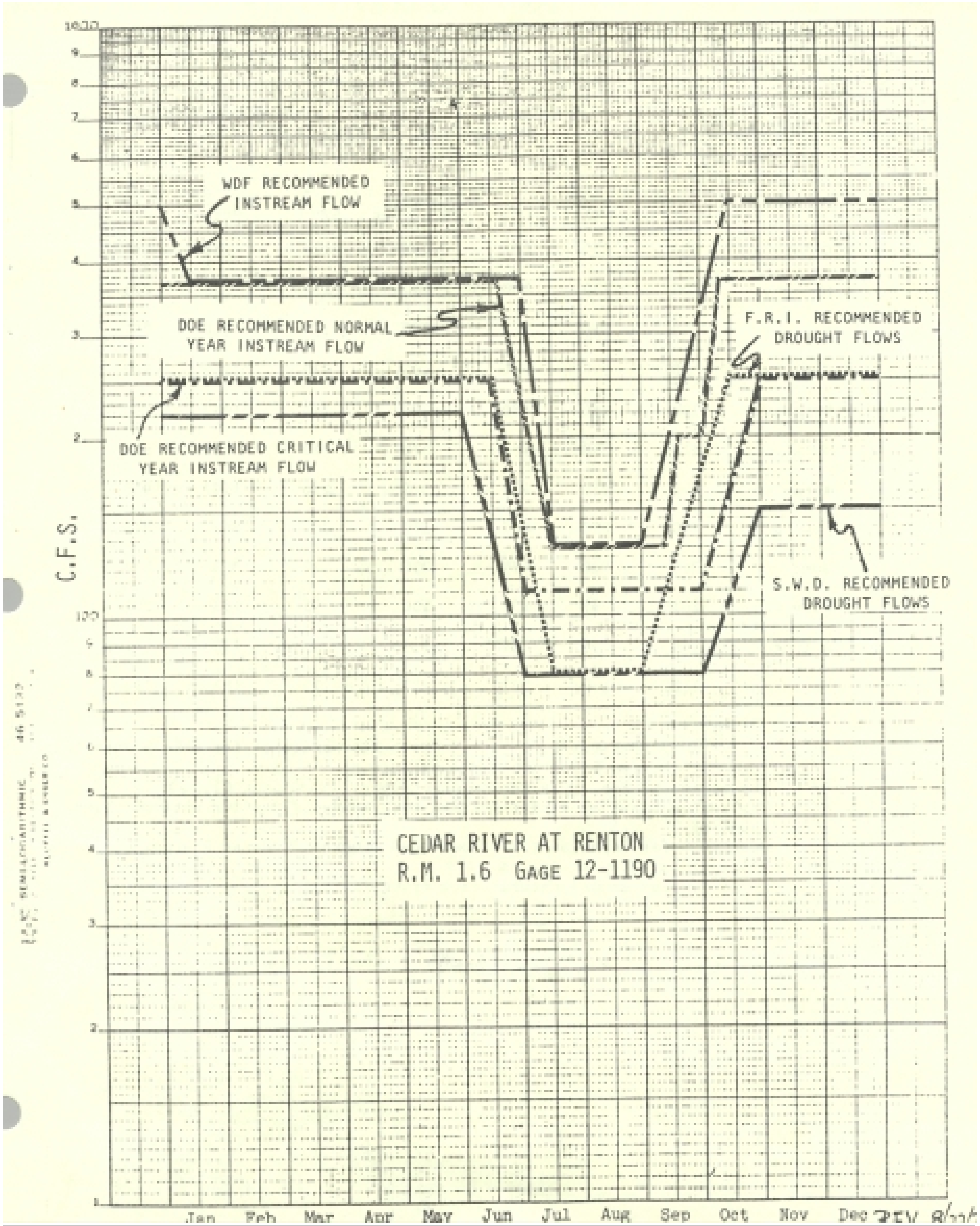
The Cedar and Sammamish basins are flood-prone areas. The Puget Sound and adjacent waters study provides an excellent presentation of the existing conditions.

b. Effects:

The proposal will have no direct effect on flooding. The Corps of Engineers has plans to improve the Cedar River system by increasing the storage capabilities of Chester Morse Lake. According to Corps personnel, part of the benefits in the cost-benefit analysis is attributable to improved water supply. Since the proposed low flow will limit future water supplies to some extent, this cost-benefit analysis could be affected. If the project becomes unattractive and is not constructed, flood prevention benefits would be lost.

9/ Figure 4 in "Establishment of a Sockeye Salmon Escapement Goal for the Cedar River," by Q. J. Stober, taken from Ph.D. Thesis, Bryant, Mason David, 1976. University of Washington. (Appendix VI).


CEDAR RIVER AT RENTON
R.M. 1.6 - GAGE 12-1190
MINIMUM FLOW
ESTABLISHED IN 1971
C.F.S.
Jun
Jul
Aug
Sep
Oct.
Nov
Dec



WDF RECOMMENDED INSTREAM FLOW
DOE RECOMMENDED NORMAL YEAR INSTREAM FLOW
F.R.I. RECOMMENDED DROUGHT FLOWS
DOE RECOMMENDED CRITICAL YEAR INSTREAM FLOW
S.W.D. RECOMMENDED DROUGHT FLOWS
C.F.S.
CEDAR RIVER AT RENTON
R.M. 1.6 GAGE 12-1190
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Renton Minimum Flow Criteria (cfs)

	COE[1/]	FRI[2/]	DOE[3/]	Fisheries[4/]	SWD[5/]	1958[6/]	1 in 50[7/]
October	380	235	435	408	113	218	381
November	400	250	480	500	150	515	723
December	40	250	480	500	150	1100	752
January	0	250	480	403	220	1212	820
February	220	250	480	370	220	1303	690
March	310	250	480	370	220	604	627
April	400	250	480	370	220	1127	958
May	270	250	480	370	220	841	815
June	360	228	429	370	111	324	518
July	201	97	135	130	75	167	201
August	140	75	89	130	75	117	136
September	110	133	201	222	75	181	114

1/ Corps' 2025 Lockages/1-50-year drought flow critical for Lake Washington.
2/ Fisheries Research Institute drought flows.
3/ Department of Ecology's Renton base flows. (minimum flows)
4/ Washington Department of Fisheries recommended flows for optimum salmon spawning.
5/ Seattle Water Department's recommended drought flows at Renton.
6/ 1958 natural flow at Renton.
7/ 1- in 50-year annual natural flow drought.

Source: Corps of Engineers. Seattle District

Water Quality

a. <u>Existing Conditions</u>

The Department of Ecology Water Quality Assessment Report referenced in the programmatic EIS contains information on the existing conditions. Generally, most of the basin is Class B with Issaquah Creek and the lower Cedar River classed A. The upper Cedar is AA. Bacterial densities have been a problem in some parts of the basin, but not the Cedar. Dissolved oxygen has been a problem in the Sammamish River. Turbidity levels have been acceptable.

Water temperature has been the most pervasive problem with the Sammamish and lower Cedar rivers as well as many tributaries experiencing many days of water temperatures over 16°C.

b. <u>Effects</u>

Instream flows affect water quality by providing dilution. In general, the greater the amount of water which can be maintained in the stream, the greater the dilution and thus the better the water quality.

The proposed action closes all waters in the basin except the Cedar to further appropriation. Thus the program will not adversely affect water quality on these waters.

The Cedar River is not closed. A METRO publication "Cedar River Temperature Study" projects temperature effects of various flow regions. The following is the "Summary and Conclusions" from this report. Note that the "DOE flow" is the existing minimum flow. The results indicate that the current DOE proposal will not make things worse, but will not make them better either.

SUMMARY AND CONCLUSIONS

This study was undertaken at the request of the City of Seattle to the Municipality of Metropolitan Seattle to evaluate effects of alternative flow curves on Cedar River temperatures. The following paragraphs summarize the approach taken to evaluate these effects and reiterate major findings of the study.

1. A mathematical model of water temperature was applied to the Cedar River downstream from the City of Seattle diversion works at Landsburg. The model was calibrated for maximum daily temperatures using summer 1972 data and verified using summer 1977 data.

2. Seven years were selected as historical periods having water temperatures possibly critical to the Cedar River fishery. These years were selected based on low streamflows and maximum daily temperatures recorded at the USGS gaging station near Landsburg. The years were 1952, 1957, 1958, 1960, 1967, 1972, and 1977.

3. Results of the temperature simulations clearly show that the DOE temperature standard of 18°C has been historically violated and would have been violated under natural conditions. The maximum frequency of violations was found to be 23 days during the summer months of 1958. Fisheries agencies will have to determine whether DOE temperature violations create significant problems for fish in the Cedar River.

4. Several alternative flow curves which would guarantee minimum flows at Renton were evaluated by simulating water temperatures which would have occurred during two critical years selected from the critical historical periods. These flow curves were suggested by the Fisheries Research Institute, the Department of Ecology, the Corps of Engineers, and the Seattle Water Department.

5. The FRI, DOE and 1 in 50 year minimum flow curves result in essentially identical temperature conditions at Renton. These flow curves would result in the most extreme temperature conditions. The simulated maximum daily temperature peaked at 23°C for these flow curves which equalled simulated 1958 historical conditions and exceeded simulated 1958 natural conditions by 2°C. In terms of violation of DOE temperature standards (18°), the three flow curves each had 16 days of violations, which was an improvement of seven days compared with simulated 1958 conditions. The 9 in 10 year minimum flow curve caused the second worst temperature conditions based primarily on the simulated peak maximum daily temperature of 22°C. The remaining flow Curves were considered essentially equal. The 1958 conditions are considered to have a recurrence interval of approximately 1 in 25 years.

6. Maximum temperatures at Renton may be reduced by 2°C through withdrawal of water from the hypolimnion of Chester Morse Lake.

7. Ground water inflows were found to be a significant factor in maintaining cooler water temperatures under certain release conditions. Proposals which would alter ground water flows should be thoroughly evaluated for effects on Cedar River temperatures.

ECONOMICS

The economic impacts of this proposal have been described in qualitative terms elsewhere in this statement. Preliminary attempts to assign quantitative magnitudes have not led to useful results for the reasons indicated below.

1. Water Supply - Increments to existing water supply capacity will depend upon the completion of proposed flood control projects. This program has no bearing upon the status of that proposal.

2. Irrigation - No legally established, presently existing rights will be impaired. Given the lack of any major new applications for irrigation withdrawal rights, it seems reasonable to conclude that this proposal will have no significant impacts upon future development.

3. Hydroelectric Power

   This program will not impact existing rights. Constraints may apply if dam safety repairs and/or Corps project activities result in applications for increased water for power generation.

4. Fisheries - In that the instream flows proposed under this program are somewhat (critical year) to considerably (normal year) higher during the low flow summer months than the minimum flows established under current regulation, benefits to fisheries should occur. The relationship between fish production (and value) and various degrees of flood control has been addressed.1/ However, there has not been a generally agreed upon analysis of the connection between fish production and minimum instream flows. Neither does there seem to be the data required in order to attempt estimation of such a relationship.

ALTERNATIVES AND POSSIBLE MITIGATION

The programmatic EIS contains a general discussion of the alternatives. The following is supplemental to that discussion:

1. No Action: If the "no-action" alternative were chosen, the existing administrative closures and minimum flow would remain in effect. Streams not yet closed would remain open and subject to appropriation. Environmental damage could result.

1/ Ames, Jim and Bill Parente, 1976. Sockeye salmon benefits will be proposed flood reduction project on the Cedar River. Washington State Department of Fisheries, Olympia, WA., 11 pages.

The minimum flow on the Cedar has been found too high for part of the year and too low for the summer months. This awkward situation would continue. Arguments and debate would continue and future water-related planning would be hampered by uncertainty.

2. Select a Different tow Flow on the Cedar: Tables and graphs have been presented showing the various flows proposed over the years. Given the debate over the optimum flow for fisheries, its difficult to make a definitive statement, but, given the other existing uses of the river, DOE feels that none would be significantly better for fisheries than the proposal.

   A lower flow could enhance the economic feasibility of the Seattle Water Department/Corps of Engineers proposed project by a slight, but unquantified, amount.

3. Do not Close to Lawn and Garden Use: As pointed out in the section on irrigation, there may be many persons whose present irrigation of lawns and gardens will be in jeopardy. It would be possible to rewrite the proposal to allow future out-of-house domestic uses on otherwise closed streams and lakes. This would allow persons who discover that their claim is not valid to apply for and obtain permits to legalize their use.

   This would place further pressure on the resource, especially if persons who had not previously been doing so decided to begin irrigating from surface water.

   It would be possible to limit these future permits to those who had been using water as of the date of the regulation. This would mean that the use would be no greater than at present. Present lawn and garden irrigation; although unquantified is not felt to be a significant pressure on the resource.

UNAVOIDABLE ADVERSE IMPACTS

No unavoidable adverse impacts are foreseen.

THE RELATIONSHIP BETWEEN SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Refer to programmatic EIS.

APPENDIX i

Documents Incorporated by Reference

The following documents are incorporated by reference and are to be considered part of this EIS:

- Seattle Water Department, 1979. Draft EIS - Cedar Tolt Watershed Management Plan. Seattle Water Department, Seattle, WA, 434 pages.

  This draft EIS contains descriptions of the Seattle water system including the Cedar River system.

- Olson, Paul R., 1978. Existing Bodies of Water on the Cedar and Tolt River Watersheds and their Potential for Fisheries Production. Seattle Water Department, Seattle, WA, 55 pages.

  This is an overview of the fishery resource in the Cedar River system.

- City of Seattle, 1979. Seattle Comprehensive Regional Water Plan and Draft EIS. Seattle Water Department, Seattle, WA.

  This document presents the city's future plans for its water supply.

- METRO, 1978. Cedar River Temperature Study. Municipality of Metropolitan Seattle, Seattle, WA. 123 page.

  This document presents temperature models for the Cedar River.

- State of Washington Department of Fisheries, 1979. 1979 Status of Puget Sound Sockeye Salmon and Recommendations for Management. WDF Olympia, WA. 9 pages.

  This is an excellent summary of the Cedar River sockeye run.

- Washington State Department of Ecology, 1979 Cedar River Report. DOE, Olympia, WA.

  This document is a history of the negotiations that have occurred regarding the Cedar River system. It is available on request from DOE.

  Since this is an important document, the following summary is included here:

Summary

Minimum flows were established for the Cedar River by the Department of Ecology in 1971 at the request of the Department of Fisheries. The minimum flow levels were based upon studies conducted by the Department of Fisheries and the U.S. Geological Survey to determine the flows that would be most conducive to sockeye salmon spawning. It was realized that the specific flows would not be available 100 percent of the time.

The minimum flows were not to affect existing water rights, including those of the City of Seattle, although Seattle's vested water rights had never been legally quantified.

In December of 1974, the River Basin Commission published a Water Resources Management Report. It called for the City of Seattle to pursue an agreement specifying the amount of water that can be diverted from the Cedar River, for municipal and industrial use, and for the Department of Ecology to review the minimum flow regulation in light of the information provided by the studies.

At the same time the Corps of Engineers (COE) was engaged in a study to reduce flood damages in the Cedar River Basin. The COE Checkpoint I report published in 1975 presented a preliminary plan involving additional storage development of the Cedar River through modification of the City of Seattle's existing Masonry Dam Morse Lake project.

The recommended plan called for more detailed feasibility studies addressing the needs of FLOOD CONTROL, M & I WATER SUPPLY, ANADROMOUS AND RESIDENT FISH PRODUCTION, WATER QUALITY, FLUSHING AND LAKE LEVEL MAINTENANCE FOR LAKE WASHINGTON, and OPERATION OF THE HIRAM M. CHITTENDEN LOCKS.

In order to complete the second phase of the study, the Corps requested local agreement as to specific project purposes, particularly instream flow requirements.

After the adoption of the Cedar River minimum flow regulations in 1971, water was released from Seattle's storage facilities at the Masonry Dam to augment instream flows during low flow periods. These flows were negotiated by the Department of Ecology, departments of Fisheries and Game, and the Seattle Water Department on an "as needed" basis during the periods of low flow. It became evident during the drought of 1976-77 that the minimum flow could not be met during critical dry periods.

On October 28, 1976, the Cedar River Ad Hoc Water Resources Management Committee was formed to seek solutions for the problems surrounding the use of Cedar River waters. Primary objectives were: a) to quantify Seattle's existing rights; b) to negotiate acceptable minimum streamflows; and c) to develop an implementable program which would allow a fair distribution of the water resources between consumptive and instream uses.

Members of the Ad Hoc Committee agreed that there clearly appeared to be benefits for flood control, water supply, and fisheries interests from further Cedar River storage development. It had become expedient for the Ad Hoc Committee and the Corps of Engineers to coordinate efforts for the development of minimum flows and flood damage reduction for the Cedar River.

It was agreed that the DOE would mediate the negotiations and that the vehicle for arriving at the Cedar River minimum flow agreement was the Corps' Feasibility Report.

There were two major impediments to the Ad Hoc Committee negotiations: 1) disagreement over the amount of Seattle's vested water right for Cedar River water; and, 2) differences in the results of studies conducted by the Department of Fisheries (WDF) and those conducted by the Fisheries Research Institute (FRI) to determine acceptable minimum flow levels for sockeye salmon spawning.

To date, Seattle's vested water rights are still unquantified. It was determined by the Ad Hoc Committee that the differences in FRI and WDF study conclusions resulted from the differences in methodologies used for computing cumulative spawning area, including length of riverbed measured. In addition, Fisheries measured the potential spawning area and FRI measured actual area being used for spawning at a particular point in time.

As a result of the different purposes underlying the two studies and the different methodologies applied, there will never be an agreement between the two.

Later, the WDF/FRI controversy over the efficiency of recommended minimum flow levels was overshadowed by the Corps of Engineer's studies which indicated that changing trends in lockage requirements would result in increasing demands for water.

By October 1977, it was evident to the Cedar River Ad Hoc Committee that discussions for development of a memorandum of understanding for use of the Cedar resource could not continue until more information was available. A technical meeting was held in May of 1978 to assess progress on the studies to determine lockage requirements, natural streamflows, firm yield for municipal and industrial water supply, and economic studies relating fish production to alternative minimum flow curves. The studies had not been completed and meetings were postponed to await results of the studies.

In early 1979, the Department of Ecology initiated the Western Washington Instream Resources Protection Program (WWIRPP) to establish instream flows in sufficient quantities to support food and game fish populations in 22 of the 26 water resource inventory areas in Western Washington. This is being done as a first step in the development of water resource management programs in accordance with Chapter 173-500 WAC, pursuant to Chapter 90.54 RCW.

The Cedar River is located in Water Resource Inventory Area 8 and constitutes one of the three subbasins of the Lake Washington drainage system.

Most of the streams and lakes in the Cedar-Sammamish Water Resource Inventory area, except the Cedar River and its tributaries, have been closed to further appropriations or are under administrative low flow restrictions pursuant to the Fisheries Code (RCW 75.20.050). The WWIRPP Program will codify the surface water limitations mandated by Chapter 75.20 RCW and proposes to close to any further appropriations all waters in the Lake Washington drainage system above the Hiram M. Chittenden Locks, excepting the Cedar River. Adjusted normal year and critical year flow regulations for the Cedar River are proposed for adoption (Chapter 173-508 WAC). Minimum flows established for the Cedar River in 1971 (Chapter 173-30 WAC) are proposed for repeal.

The Cedar River Water Resource Management Ad Hoc Committee reconvened May 24, 1979 to consider DOE's proposed regulations for the Cedar River. A second meeting was held on June 1, 1979 to consider alternative instream flow levels. A proposal for normal year and critical year instream flows was presented by the Department of Ecology. The flows were adjusted to incorporate the committee's views and the Department of Ecology proceeded with the Cedar-Sammamish Instream Resource Protection Program.

Draft copies of the basin document and proposed regulations were submitted to the Departments of Fish and Game, City of Seattle, and Corps of Engineers for review on June 8, 1979.

Public hearings are scheduled for July 24, 1979. Adoption proceeding will be held September 5, 1979.

APPENDIX ii

DISTRIBUTION LIST

Federal Agencies

- National Fisheries Research Center
- National Marine Fisheries Service
- U.S. Fish and Wildlife Service
- U.S. Corps of Engineers, Seattle District
- U.S. Geological Survey
- U.S. Forest Service
- Bureau of Outdoor Recreation
- Indian Tribes
- Federal Energy Regulatory Commission
- U.S. Environmental Protection Agency, Region X
- Bonneville Power
- Soil Conservation District
- Department of Health, Education and Welfare, Region X

State Agencies

- Washington State Ecological Commission
- Department of Natural Resources
- Department of Social and Health Services
- Department of Game
- Department of Fisheries
- Department of Agriculture
- Department of Commerce and Economic Development
- State Energy Office
- Utilities and Transportation Commission
- Planning and Community Affairs Agency
- Governors Office of Financial Management
- Parks and Recreation Commission
- Interagency Commission for Outdoor Recreation
- Department of Transportation
- Oceanographic Commission
- Energy Facility Site Evaluation Council
- Washington Public Power Supply System
- State Conservation Commission
- University of Washington, SEPA Information Center
- University of Washington, Fisheries Research Institute
- University of Washington, College of Forest Resources
- University of Washington, Department of Engineering
- Association of Washington Counties
- Association of Washington Cities

Regional Agencies

Pacific Northwest River Basins Commission
Puget Sound Council of Governments
Municipality of Metropolitan Seattle
Port of Seattle
King County Subregional Council
Snohomish County Subregional Council
Interim Basin Coordinating Committee
Cedar-Snohomish Joint Feasibility Study Committee

King County Agencies

Department of Budget and Program Development
Department of Planning and Community Development
King County Public Works
King County Regional Libraries
King County Extension Service

Snohomish County Agencies

Snohomish County Planning Department
Snohomish County Public Works
Snohomish PUD

City of Seattle Agencies

Seattle Water Department
Seattle City Light
SEPA Information Center
Seattle City Council
Board of Public Works
Building Department
Department of Community Development
Engineering Department
Fire Department
Lighting Department
Office of Management and Budget
Office of Policy Planning
Department of Parks and Recreation
Police Department
Seattle-King County Department of Public Health
Citizens Service Bureau
Seattle Environmental Review Committee
Office of Urban Conservation, Seattle Design Commission

Libraries

University of Washington Library
Seattle Public Library, Main and Branches
Seattle Public Library, Municipal Branch
Bellevue Library, City of Bellevue

Organizations

Friends of the Earth
Sierra Club
Washington Environmental Council
League of Women Voters
Seattle Chamber of Commerce
Municipal League of Seattle and King County
Washington State Nurseryman's Association
Seattle-King County Economic Development Council
Association of Washington Cities
Anti-Fluoridationist League
Audubon Society
Washington State Farm Bureau
Pacific Northwest Waterways Association
Washington State Commercial Passenger Fishing Vessel Association

Water Districts and Municipal Agencies

Water District #14, Three Tree Point
Water District #20, Boulevard Park
Water District #25, Duwamish
Water District #42, North City
Water District #45, White Center
Water District #49, Burien
Water District #57, Lakeridge
Water District #58, Renton
Water District #63, Lakeridge
Water District #69, Skyway
Water District #75, Midway
Water District #77, Skyway
Water District #78, Renton (Cedar River)
Water District #79, Kenmore
Water District #81, Kirkland (Rose Hill)
Water District #83, Lake Forest Shopping Center
Water District #85, Seahurst
Water District #88, Skyway

Water District #90, Renton Hill
Water District #104, Woodinville
Water District #107, Hazelwood, Newport Hills, Factoria
Water District #108, Cedar Mountain
Water District #119, Lake Marcel
Water District #125, Riverton Heights, Foster
Bellevue
Bothell
Duvall
Edmonds
Mercer Crest
Mercer Island
Normandy Park
Olympic View
Renton
Tukwila

Individuals

Honorable John Spellman, King County Executive
Honorable Charles J. Delaurenti, Mayor of Renton
Honorable Gary A. Zimmerman, City of Bellevue
Honorable Charles Royer, City of Seattle
Honorable H. G. Herrington, Mayor of Issaquah
Honorable Isabel Hogan, Mayor of Kent
Honorable Selwyn L. Young, Mayor of Redmond

ESTABLISHMENT OF A SOCKEYE SALMON ESCAPEMENT GOAL FOR THE CEDAR RIVER

by

Q. J. Stober
Fisheries Research Institute
University of Washington

for the

Cedar River Ad Hoc Water Resource Committee

During 1972 and 1973, hydraulic and biological investigations were conducted on the Cedar River (Stober and Graybill, 1974). The relationship between discharge and sockeye salmon spawning area was determined following the USGS technique (Collings, et al., 1972). This study determined 250 cfs (referenced to Renton gage) as the mean "peak" spawning discharge as well as the relationship of cumulative spawnable area to discharge for eleven study reaches (Exhibit #1). The concept of maximizing spawning area in the Cedar River was demonstrated by the accumulation of spawning area which would occur if the controlled discharge was increased during the spawning season from 50 to 500 cfs. Timing of the controlled discharge would begin in late August at 50 cfs, increasing linearly to 250 cfs by mid-October during the peak of the sockeye run, and continue to 500 cfs by linear increase to late November, near the end of the sockeye spawning season.

The capacity of the Cedar River to accommodate spawning sockeye was estimated to range from about 167,000 to 376,000 spawners in the 1974 study. This range of values for escapement was based on both estimated extremes and observed utilization of the spawnable area in the river with a known escapement of 314,000 spawners in 1973. This was the second largest number of spawners ever to escape to the river and the largest since intensive studies began in 1972. These estimates were made without the benefit of egg density data, survival rates, or fry production data which have been obtained from 1975 to the present.

The method utilized to estimate spawner capacity in the Cedar River was detailed in Stober and Graybill, 1974, pages 31 to 34. It was based on the total wetted area and discharge in the upper 17.3 miles (RM 4.3 to 21.6) of the river. The width of the river was measured at each transect (four per station) at discharges ranging from about 50 to over 500 cfs. The total wetted area for a particular discharge was then calculated by multiplying the mean width (Table.1) for Stations 1 to 10 by the effective length of the river (17.3 miles). Thus, at 100 cfs, the wetted area was estimated at 6.2×10^6 ft^2 and it increased to 8.16×10^6 ft^2 at 500 cfs.

Table 1. Mean river width versus discharge.

Width	Q (cfs)
67.9	100
79.0	200
82.8	300
83.8	400
86.6	450
89.3	500

Although this amount of wetted area was potentially available, only a fraction was utilized by spawning sockeye. The area suitable for spawning from the detailed depth and velocity surveys (SYMAP analysis) averaged 40% of the total wetted area in all study stations combined. In addition, during the 1973 spawning season, 40% of the total area of the study stations was actually spawned by sockeye. However, the locations for the study stations were chosen on the basis of previous spawning activity and did not include other reach types such as pools or chutes. Therefore, the 40% estimate based entirely on the study stations was considered an over-estimate of the utilization for the entire 17.3 miles. It, therefore, was presented only for the purpose of providing an extreme upper limit of the potential spawnable area.

The 17.3 miles (RM 4.3 to 21.6) of river was floated each week of the spawning season during 1972 and 1973. A crew of two floated the river with photocopies of aerial photographs (scale - 1:2400) on which the distribution of spawning sockeye was outlined. This determined the area actually spawned in the large portion of river between the eleven stations and allowed reference of the spawning areas to actual landmarks. Aerial photographs utilized for this purpose in 1973 were taken on August 20, and provided full black and white stereo coverage at 60% overlap of the entire river channel below Landsburg. A "square grid" (each square = 1/64 in^2) was then used to measure the area occupied each week by the spawning sockeye salmon.

The 1973 float trip data indicated that an area of 1.55×10^6 ft^2 was spawned at the peak of the season on October 16, 1973 (Exhibit #2). This area amounted to approximately 20% of the total wetted area in the 17.3 miles and represented the maximum instantaneous spawned area on which detailed observations have thus far been made. The total area utilized over the entire 1973 spawning season was estimated at 2.37×10^6 ft^2 at 450 cfs, which amounted to an over-all 30% utilization of the total wetted area. This area was obtained by accumulating the spawned area each week throughout the season to achieve a total. The discharge during this period increased from about 100 cfs in mid-September to about 500 cfs in mid-November, 1973.

The limits ranging from 20 to 40% were considered reasonable lower and upper bounds on the percent of the river utilized, and are therefore bounds on the estimate of the spawning capacity of the river; however, it was felt that 40% utilization was very likely an extreme upper limit. The areas representing 20, 30, and 40% were divided by 0.67 females/yd^2 to determine the number of females which could be accommodated. A male:female sex ratio of 40:60 was used to yield the total number of spawners. However, recent data and further study have caused us to revise our estimate downward from the maximum of 376,000 spawners suggested in the 1974 report.

It is clear at this point that there exists a major discrepancy between the FRI and WDF estimates of the spawning area in the Cedar River. The WDF survey which was used to determine available spawning area only included the upper half of the river and apparently was not conducted during the spawning season, since spawnable area was based on judgements as to whether the substrate "looked" appropriate or "where an increasing flow regime would provide proper depths and velocities"(WSDF, 1977). The assumption that the upper river survey can be extrapolated (doubled) to account for spawnable area in the lower river is invalid for two reasons: (1) the width of the lower river actually decreases due to the effects of rip-rapping; and (2) the spawned area in the lower river is frequently less than that observed in the upper and middle sections of the 17.3 miles under consideration as the major spawning area. In addition, with the acceptance of the USGS method as the best currently available, it is inappropriate to extrapolate spawning area above 500 cfs if the objective is to maximize spawning area at discharges which normally occur during the spawning season. Therefore, the method used by WDF to calculate spawnable area in the Cedar River results in an extreme over-estimation, and hence, a very large escapement goal.

Recently Completed Studies

Miller (1976) calculated the total spawning area utilized (TA_u) based on FRI data and the following assumptions:

1. 10% of the wetted area from RM 0 to 4.3 was utilized. This was to account for minimal spawning activity in this area and resulted in an estimate far in excess of the number of spawners utilizing this reach based on observations by either the WDF or FRI.

2. 30% of the wetted area from RM 4.3 to 21.6 was utilized. This was based on the large 1973 run and it was also in the middle of the 20 to 40% range suggested by Stober and Graybill (1974).

3. Wetted area can be approximated by average river width x length.

4. The average width of the Cedar River at 500 cfs is 89.3 ft.

TA_u = 0.1 (4.3 miles) (89.3 ft) + 0.3 (17.3 miles) (89.3 ft)

$TA_u = 2.65 \times 10^6$ ft^2 @ 500 cfs

He then related the cumulative spawnable area at 500 cfs for the eleven study reaches, i.e., 88,000 ft^2 to the entire river by calculating a multiplying factor F.

$$F = \frac{TA_u}{CA_t} = \frac{2.65 \times 10^6 \; ft^2}{88 \times 10^3 \; ft^2} = 30$$

where: F = multiplying factor for applying the spawning area on the study reaches to the entire river

TA_u = Total area utilized @ 500 cfs

CA_t = Cumulative spawnable area in the study reaches @ 500 cfs

For simplicity, this multiplier was assumed applicable at any discharge which was considered conservative, since lower discharges have higher multipliers. The total utilizable area available for spawning at any discharge level or spawning season flow regime was then computed from the cumulative spawnable area curve.

For any spawning season flow regime, a fixed amount of area is known and for a known amount of spawners ascending the river, the density of spawners can be determined from the expression:

$$S_D = k \frac{S}{TA_u}$$

where: S_D = spawning density in spawners/yd^2

k = conversion unit, 9 ft^2/yd^2

S = number of spawners

TA_u = total area utilized

Substituting, and converting to the proper units,

$$S_D = k \frac{S}{F \cdot CA_t} = \frac{9\, ft^2 / yd^2}{30} \cdot \frac{S}{CA_t}$$

$$S_D = 0.3 \frac{S}{CA_t}$$

where: S_D = spawning density in spawners/yd^2

S = number of spawners

CA_t = cumulative spawning area in the eleven FRI study reaches

A figure (Exhibit #3) was provided to aid conversion of number of spawners to spawning density, S_D, depending on the starting and ending spawning flows Q_S, Q_E. Utilizing a maximum spawner density of 1.0 spawners/yd^2 and 60% females, a flow regime of 75 to 500 cfs would accommodate 293,000 spawners. A low flow regime of 75 to 250 cfs would provide area for 247,000 spawners.

Bryant (1976) also addressed the question of spawnable area in the Cedar River noting that the extended (12-week) spawning season increased the potential for redd superimposition by successive waves of spawners over the same preferred spawnable area. The average redd life for Cedar River sockeye was estimated by Fraser (1910) at 6.7 days. Thus, with a spawning season of 12 weeks, it is possible for 12 waves of spawners to use a single redd area.

Bryant (1976), using data provided by Stober and Graybill (1974), calculated the total cumulative spawnable area for the Cedar River sockeye. The spawnable area was 2.45×10^6 ft^2 at 500 cfs; however, he rounded upward to 250×10^3 m^2 or 2.69×10^6 ft^2. The model by McNeil (1964) was then applied to address the problem of determining actual egg deposition at the completion of spawning. McNeil proposed that

$$R = L\,(1 - e^{-E/L})$$

where: R = eggs/m^2

E = potential egg deposition/m^2

L = upper limit (maximum density) of eggs/m^2

with the following assumptions: (1) the number of eggs in the gravel is limited by space for redds; (2) egg density in the gravel approaches an upper limit asymptotically; and (3) redds are randomly dispersed over spawnable areas. McNeil's model was adapted to estimate egg deposition as affected by redd superimposition on the Cedar River spawning grounds.

$$R = L\,\left(1 - e^{\left(\frac{Fx.58P}{A_{max}(1 - e^{-BV})}\right)/L}\right)$$

where: R = eggs/m^2

F = fecundity (3500 eggs/female accounting for egg retention)

P = escapement (variable 50,000 to 550,000 spawners in 10,000 fish increments)

A_{max} = 250,000 m^2 (max. cumulative spawnable area) = 2.69×10^6 ft^2

B = .011 (for discharge in cfs) needed for metric conversion

V = seasonal discharge regime 50 to 500 cfs in 50 cfs increments

L = 2000 eggs/m^2 = 186 eggs/ft^2 (McNeil, 1969)

Total egg production was equal to R x A, where A was spawnable area. Egg production curves were produced for each discharge regime in the model (Exhibit #4). The effect of increasing egg production with each discharge increment reflects the additional spawnable area. The decrease in egg production per spawner simulates redd superimposition effects. This analysis indicated that escapement above 250,000 fish would be of little additional value in terms of egg production.

Studies in Progress

Although the data obtained from hydraulic sampling for eggs and alevins on two reaches of the Cedar River are only partially analyzed (Stober, et al., 1976), indications are that substantial egg loss occurred during the 1975 and 1976 spawning seasons. Pre-flood egg densities determined from sampling data in October and November 1975 approached a maximum of 165 eggs-alevins/ft^2, far below the calculated potential egg-alevin densities which ranged from 345 to 476 eggs/ft^2, based on the number of females spawning in the reach. These densities occurred with a spawning escapement of 114,100 spawners in 1975. The December 1976 sample densities were 109 and 206 eggs-alevins/ft^2 on reaches 5 and 2, respectively. Reach 5 exhibited extreme superimposition effects with calculated potential densities of 500 eggs/ft^2 by mid-December. Even though densities reached 206 eggs-alevins/ft^2 on Reach 2, the calculated potential density reached 475 eggs/ft^2 by mid-December 1976, which suggests that superimposition was common to both reaches. The escapement in 1976 was 139,000 spawners.

Although survival estimates and fry production need to be included to complete analysis of the data collected during the last two years, there is a strong indication that egg loss due to superimposition is occurring at escapements of 114,100 and 139,000 spawners. Fry survival in 1977 will only be about 8.2%, which seems low when considering the moderate environmental conditions which existed in the river from spawning through emergence. It may be necessary to sample egg densities at much lower escapements in order to obtain values which more closely approach the potential. Nevertheless, these data have lead to the following considerations and assumptions in our calculations:

1. Utilization of 30% of the total wetted area between RM 4.3 and 21.6 is the highest justified in calculating spawnable area. This is based on field observations of the 1973 escapement of 313,000 spawners, as well as more recent observations.

2. 10% of the wetted area from RM 0 to 4.3 greatly overestimates the spawning activity in this area.

3. The assumption that a linear increase in discharge can or will be achieved each year is extremely idealistic and makes the calculation very conservative.

4. Recognition of the fact that as the discharge in the Cedar River increases from 50 to 250 cfs, 90% of the total spawnable area is accrued. Less than 10% is added by increasing through 500 cfs.

5. Based on recently collected egg density data in the Cedar River, 186 eggs-alevins/ft^2 (McNeil, 1969) is a reasonable approximate upper limit which may be realized under ideal conditions, i.e., with a minimized amount of redd superimposition.

6. Minimum fecundity of Cedar River sockeye minus egg retention is 3500 eggs per female.

7. The approximate sex ratio is 58:42 (female to male).

The spawnable area of 2.65 x 10^6 ft^2 at 500 cfs under ideal uniform egg distribution could hold 4.93 x 10^8 eggs at a density of 186/ft^2. In order to achieve this goal, 140,829 females and 101,979 males would be required, totaling 242,808 spawners. Therefore, a more realistic and conservative maximum escapement goal is in the order of 250,000 spawners, which is in close agreement with Bryant (1976) and Miller (1976). It should be understood, however, that a uniform spawner or egg distribution can never be achieved; therefore, estimates based on the assumption of uniformity will tend to overestimate escapement needs and are extremely conservative. Determination of egg survival and fry production on several runs spawning at different densities may be needed to assure the fishery manager of the validity of these estimates. It is indicated from fry survival this year that the smolt production from the 1976 escapement of 139,000 spawners may exceed that from the 1967 escapement, estimated by WDF to be 365,000 (revised from an original estimate of 189,000).

There is nothing to be gained by allowing overutilization of the prime spawning areas in the Cedar River in order to attempt to force additional fish into marginal spawning habitat. It is absurd to cause egg loss by superimposition in the best spawning habitat in the hope of forcing some spawners to utilize less suitable gravel. Fry produced in marginal habitat are likely to show poor condition and lower survival. Due to the extended egg deposition period (12 weeks) in the Cedar River, it is not clear that spawners can be forced into other areas. Such a strategy leads to an excessive escapement goal which, if realized, results in loss of adults to a fishery, egg loss due to redd superimposition, and decreased fry survival and production. It is likely that further analysis of the Cedar River data will indicate higher fry survival and production at escapement levels considerably below 250,000 spawners.

The impacts of flood discharges on eggs distributed in mid-channel have not been discussed, but information has been collected to show it is a major cause of egg and alevin mortality. However, if minimum flows are increased to distribute spawners away from mid-channel where flood impacts are greatest, the majority of the spawnable area will be eliminated from production. The escapement goal will then have to be reduced in order to limit egg loss due to superimposition in a reduced amount of spawning area.

EXHIBIT #1

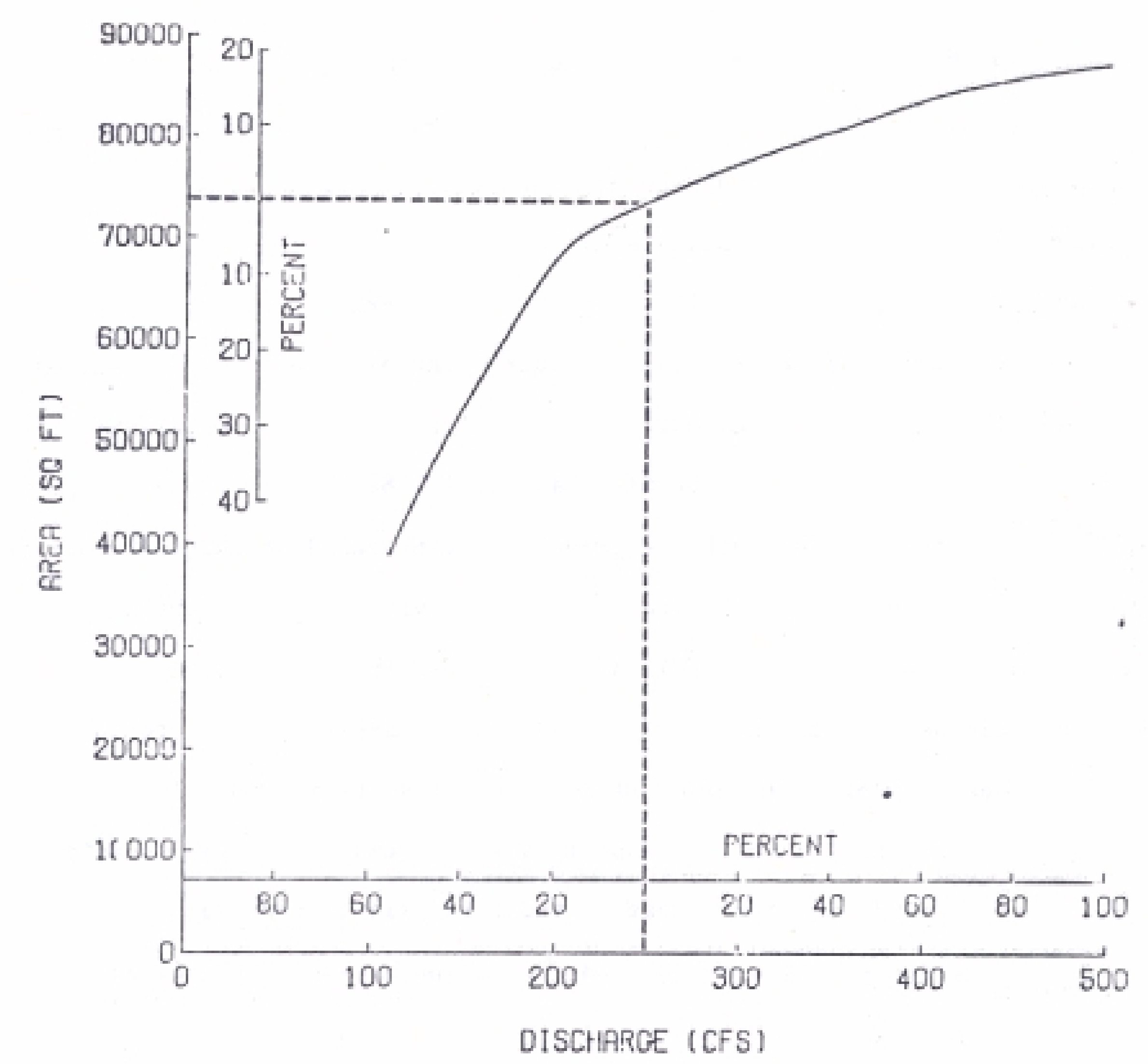


Fig. 17. Effects of discharge on sockeye salmon spawning area above and below the mean peak spawning discharge of 250 cfs referenced to the Renton gage with 60 cfs inflow.

Source: Stober, Q. J. and J. P. Graybill. 1974. Effects of discharge in the Cedar River on sockeye salmon spawning area. Final Report, FRI-UW-7407, June 15, 1972 to June 14, 1974 to City of Seattle Water Department. 39 p.

EXHIBIT #2

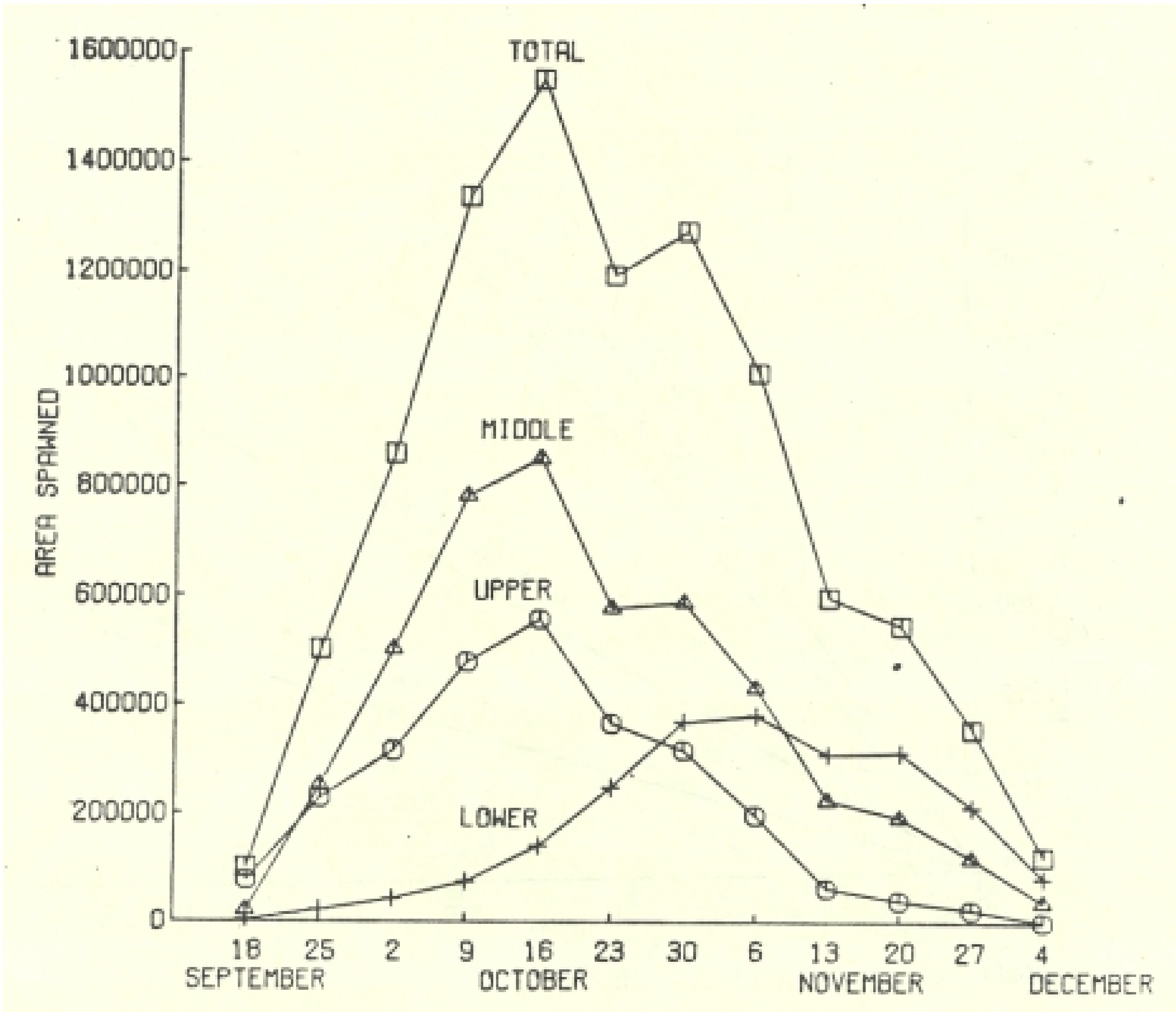


Fig. 8. Total area of the Cedar River spawned by sockeye salmon each week during 1973 determined from float trip data. Data expressed for 17.3 miles (total) and approximately equal divisions (upper, middle and lower thirds) of the river.

Source: Stober, Q. J. and J. P. Graybill. 1974. Effects of discharge in the Cedar River on sockeye salmon spawning area. Final Report, FRI-UW-7407, June 15, 1972 to June 14, 1974 to City of Seattle Water Department. 39 p.

EXHIBIT #3

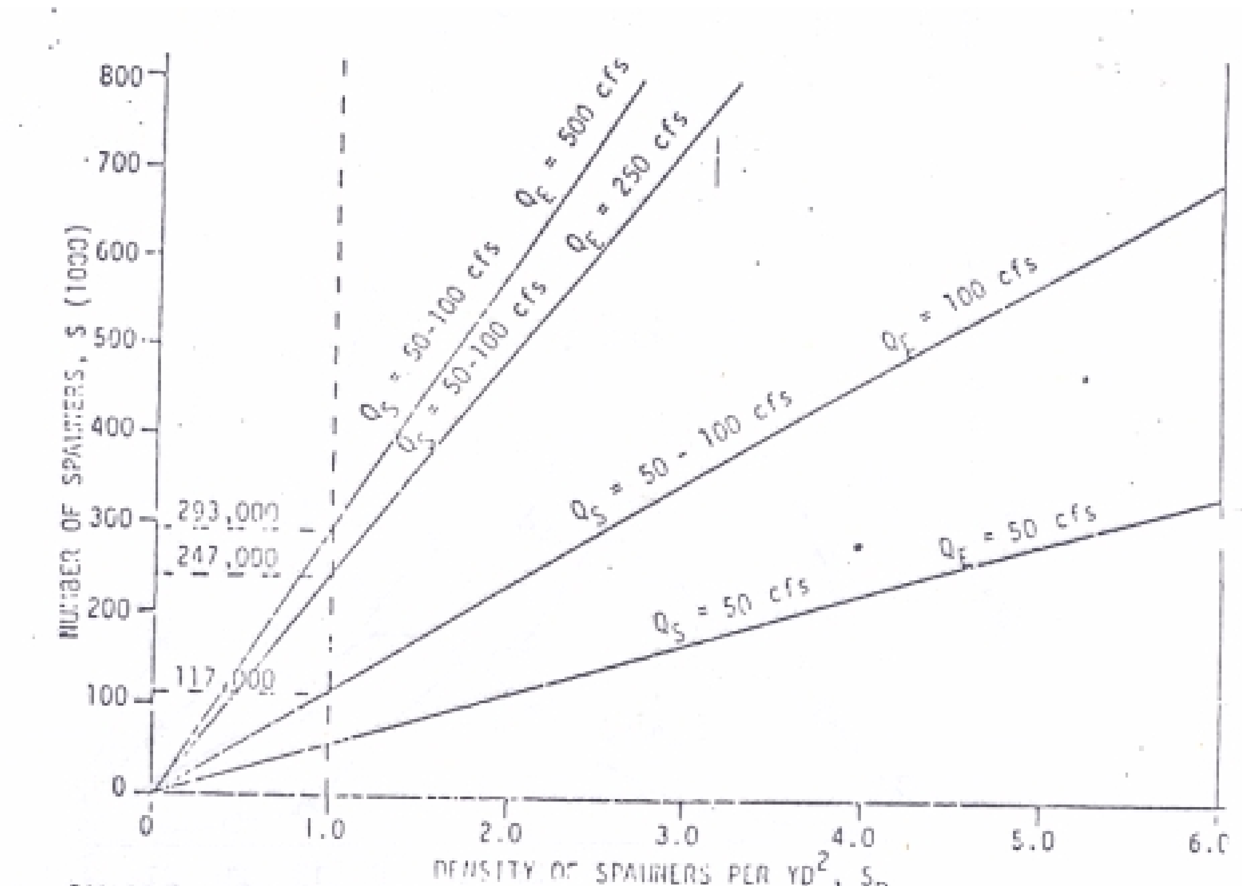


FIGURE 16. CEDAR RIVER SPAWNER DENSITY

Source: Miller, James William. 1976. The effects of minimum and peak Cedar River streamflows on fish production and water supply. M.S. thesis, Civil Engineering, Univ. Washington, Seattle, Washington.

EXHIBIT #4

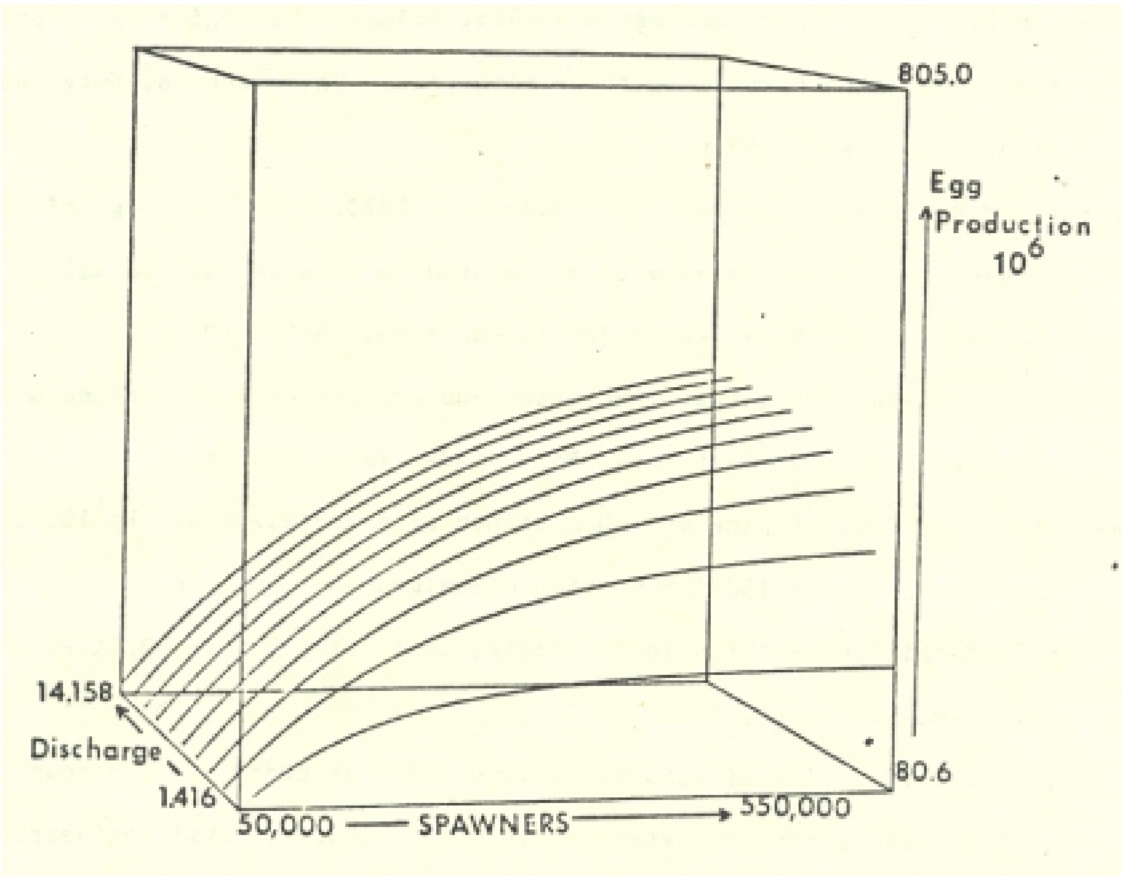


Fig. 4. Predicted egg production of sockeye salmon in the Cedar River spawning area under seasonal discharge regimes from 1.416 m^3/sec (50 cfs) to 14.158 m^3/sec (500 cfs).

Source: Bryant, Mason David. 1976. Lake Washington sockeye salmon biological production; and a simulated harvest by three fisheries. Ph.D. thesis, Univ. Washington. 159 p.

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A REVIEW OF THE STOBER ESCAPEMENT GOAL METHODOLOGY
by
WASHINGTON DEPARTMENT OF FISHERIES

This statement is the Washington Department of Fisheries (WDF) response to Dr. Stober's proposed escapement goal for Cedar River sockeye salmon. The WDF has stated its position on the current sockeye escapement goal in a paper dated May 16, 1977. That position is unchanged. The WDF is deeply concerned by the possibility that members of the Cedar River Ad Hoc Water Resource Committee will accept Dr. Stober's opinion without due regard for the WDF viewpoint. As a result, we have prepared the following rebuttal to portions of the Stober report. Unless otherwise identified, quotations are taken directly from the paper titled "Establishment of a Sockeye Salmon Escapement Goal for the Cedar River", by Q. J. Stober. This is the final response that the Department of Fisheries plans to make on this subject for the above referenced committee. It seems pointless to embark on an endless round of rebuttal and counter-rebuttal, but we do feel that the effort involved in the preparation of this discussion is justified because of the serious difference of opinion that has developed.

Review of the Stober Paper

The first three and one-half pages of the Stober paper present a summary of his 1972-73 studies. It is not the purpose of this discussion to review that investigation. We will, however, offer rebuttal to several sections of that study that are used in justification of Dr. Stober's escapement goal.

Page 4.

> "It is clear at this point that there exists a major discrepancy between the FRI and WDF estimates of the spawning area in the Cedar River. The WDF survey which was used to determine available spawning area only included the upper half of the river and apparently was not conducted during the spawning season, since spawnable area was based on judgments as to whether the substrate "looked" appropriate or “where an increasing flow regime would provide proper depths and velocities” (WSDF, 1971)."

It is true that there is a discrepancy between the two figures; however, the difference is not as great as Dr. Stober suggests. The magnitude of this difference will be discussed later. The WDF spawning area survey was conducted in much the same manner that the FRI estimate was developed, with the exception that spawning sockeye were not present. Since the objective of the survey was to estimate the potential spawning area, and not the area used by whatever arbitrary number of fish happened to be in the river that year, it was felt, that the presence of fish would only complicate the estimate. The judgments that were made were based on the surveyor's experience observing spawning sockeye in Alaska, British Columbia, and three previous seasons on the Cedar River. This method is admittably subjective, but it was justified since the cost of physically surveying the river in its entirety is prohibitive. Dr. Stober apparently feels that this approach should not be used, but it seems that he must have used a similar method during the first year of his investigations on the Cedar River. Since he and his staff had no prior experience on the river, he must have selected some study reaches that "looked" right in his judgment.

Page 4.

> "The assumption that the upper river survey can be extrapolated (doubled) to account for spawnable area in the lower river is invalid for two reasons: (1) the width of the lower river actually decreases due to the effects of rip-rapping; and (2) the spawned area in the lower river is frequently less than that observed in the upper and middle sections of the 17.3 miles under consideration as the major spawning area."

WDF still feels that doubling the spawning area value from the upper river survey provides a reasonable estimate for the entire river. Dr. Stober's statement that lower river decreases in width is not borne out by actual measurement. River widths measured on large-scale King County maps (1 inch=200 ft) at 200-ft intervals reveal that the river averaged 87.1 ft between Landsburg and Cedar Grove Bridge (R.M. 11.3), and 93.4 ft from Cedar Grove Bridge downstream to the end of the map series (P.M. 6.3). The second point above considers only the spawning use of the lower river by sockeye in recent years. The WDF estimate of spawnable area was concerned only with how much potential area was available. While actual spawner use of the lower river has been moderate to light in recent years, this area received heavy use in years prior to Dr. Stober's investigations. A final point on the doubling of the up-river value: the lower river segment is 1 mile longer (11.3 miles) than the upper section (10.3 miles).

Page 4.

> "In addition, with the acceptance of the USGS method as the best currently available, it is inappropriate to extrapolate spawning area above 500 cfs if the objective is to maximize spawning area at discharges which normally occur during the spawning season."

WDF did not extrapolate above 500 cfs in the May 16, 1977 position paper. The number that was presented was 370,000 yd^2 at 480 cfs.

Page 5.

> "Therefore, the method used by WDF to calculate spawnable area in the Cedar River results in an extreme over-estimation, and hence, a very large escapement goal."

The statement that the WDF figure for spawnable area is an "extreme over-estimate" seems a little strong. The WDF value for the entire river is 370,000 yd^2. Dr. Stober's value for 263,300 yd^2 does not include the lower 4.3 miles of river. If his value is increased proportionally to represent the entire river (the area used in the WDF estimate), his figure would become 328,800 yd^2. Since Dr. Stober's estimate represents only the actual use by sockeye in 1973, and the WDF value is for potential use, the two figures don't seem that different.

The above statement by Dr. Stober implies that the WDF estimate of potential spawning area was used to develop "a very large escapement goal". The WDF position paper stated that 370,000 yd^2 of spawnable area would provide space for between 434,900 and 649,100 spawners. Since both values are considerably higher than the established escapement goal of 350,000 sockeye, they obviously were not used to derive the goal.

Page 7.

> “Utilizing a maximum spawner density of 1.0 spawner/yd^2 and 60% females, a flow regime of 75 to 500 cfs would accommodate 293,000 spawners. A low flow regime of 75 to 250 cfs would provide area for 247,000 spawners.”

Pages 5 and 6 are a summary of a portion of Jim Miller's (Seattle Water Department) recent thesis. The above quotation summarizes Miller's results. A review of Miller's thesis is not the objective of this discussion, but we do offer the following comments to the section presented by Dr. Stober. Miller's method estimated 293,000 spawners using 1.0 spawners/yd^2 and 60% females with a 75-500 cfs flow regime, or in other terms, he used a value of .6 females/yd^2 and 293,000 yd^2 of potential area. If we apply the values currently accepted by WDF (a range of .67 to 1.0 females/yd^2 and 57% females in the run) to the 293,000 yd^2, we would have a range of values of 344,400 to 514,000 sockeye spawners. Thus, Miller's estimate of available spawning area justifies the present WDF escapement goal even if the lower value of 0.67 females/yd^2 is used.

Page 7.

> "Bryant (1976) also addressed the question of spawnable area in the Cedar River noting that the extended (12-week) spawning season increased the potential for redd superimposition by successive waves of spawners over the same preferred spawnable area.

> The average redd life for Cedar River sockeye was estimated by Fraser (1970) at 6.7 days. Thus, with a spawning season of 12 weeks, it is possible for 12 waves of spawners to use a single redd area."

Bryant and Stober depend on Fraser's estimate of 6.7 days redd life for Cedar River sockeye. This estimate is probably low and, if so, artificially increases estimates of the numbers of spawners using a riffle and the potential egg desposition. Fraser observed 15 tagged male and 15 tagged female sockeye on one riffle for 15 days, October 12-27, 1969. He found that the females in his sample averaged 8.06 days on the redd, while males averaged 5.33 days. The average for both sexes was 6.7 days. Since his study fish were not enclosed, he had no way of knowing if fish that disappeared were dead or had moved to other areas and, in fact, fish that disappeared too quickly were dropped from the sample. This was a very limited effort (under-graduate student paper) and probably does not represent overall redd life.

WDF tagging and survey data show that the average stream life[1/] of Cedar River sockeye is approximately 15 days. Early run sockeye do hold for an undetermined time before spawning, but normal and late run fish begin spawning soon after reaching the grounds. Stober and Graybill (1974) reached the same conclusion about the 1973 run: "...Thus, the sockeye entering the river in mid-October (second mode) moved onto the spawning grounds with less delay than those which entered the river in late September." It seems very unlikely that the average sockeye holds for more than 8 days and spawns for less than 7 days.

Page 8.

> "This analysis indicated that escapement above 250,000 fish would be of little additional value in terms of egg production."

Pages 7 and 8 contain a portion of Mason Bryant's 1976 thesis on Cedar River sockeye. WDF will not review that paper here, but will comment only on the above quote. Dr. Stober provides two and one-half pages of graphs and formulae from Bryant's thesis, but no final values are presented. Instead, there is Dr. Stober's judgment that "...escapement above 250,000 fish would be of little value in terms of egg production." WDF does not agree. Bryant's data are presented in

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[1/] Stream life is the total time that a living adult salmon spends in the stream. Redd life is that part of stream life in which the spawner is on a spawning riffle; selecting, building, and defending its redd.

graph form (Stober's Exhibit No. 4), and the scale makes it difficult to extract exact figures. By looking at the 14.158 m^3/sec (500 cfs) curve, there is an increase in egg production of approximately 55% between 250,000 and 550,000 spawners. Increasing the escapement from 250,000 to 350,000 spawners results in an increased egg production of approximately 22%.

Page 8 and 9.

> "Although the data obtained from hydraulic sampling for eggs and alevins on two reaches of the Cedar River are only partially analyzed (Stober, et al., 1976), indications are that substantial egg loss occurred during the 1975 and 1976 spawning seasons. Pre-flood egg densities determined from sampling data in October and November 1975 approached a maximum of 165 eggs-alevins/ft^2, far below the calculated potential egg-alevin densities which ranged from 345 to 476 eggs/ft^2, based on the number of females spawning in the reach. These densities occurred with a spawning escapement of 114,100 spawners in 1975. The December 1976 sample densities were 109 and 206 eggs-alevins/ft^2 on reaches 5 and 2, respectively. Reach 5 exhibited extreme superimposition effects with calculated potential densities of 500 eggs/ft^2 by mid-December. Even though densities reached 206 egg-alevins/ft^2 on Reach 2, the calculated potential density reached 475 eggs/ft^2 by mid-December 1976, which suggests that superimposition was common to both reaches. The escapement in 1976 was 139,000 spawners."

WDF has the following comments on the material presented in the above quotation. The values of 165, 109, and 206 eggs-alevins/ft^2 assume 100% sampling efficiency. Dr. Stober and his staff have developed new hydraulic sampling equipment, the efficiency of which has, to our knowledge, never been reported. WDF's extensive experience with various types of hydraulic sampling equipment indicates that 100% sampling efficiency is simply not possible. As a result, WDF believes that Stober's egg-alevins/ft^2 values are low by an undetermined amount.

Dr. Stober's calculated potential egg densities are based on: an average redd life of 7.0 days, a female to male ratio of 60:40, and 3,400 eggs/female (Stober et al., Dec. 1976). As was discussed earlier, the redd life value from the Fraser (1970) paper is probably low. Even if Fraser's values were acceptable, they have been incorrectly applied in Dr. Stober's analysis. When calculating potential egg densities “... based on the number of female spawning in the reach”, it is not appropriate to use a redd life based in part on male spawners. Fraser's value for female spawners was 8.06 days on the redd, and if that number had been employed, Stober's potential egg densities would have been lower. The result of using low egg-alevins/ft^2 and high egg potential deposition rates is to artificially inflate the difference between the two values, creating the impression that losses due to superimposition of redds is more severe than it is in reality.

The superimposition referred to on Reach 5, though overstated because of the above reasons, is not unexpected. Reaches 1 and 5 (the two reaches sampled in 1975) were suggested to Dr. Stober as study sites by WDF staff, precisely because they are heavily spawned regardless of escapement level. These sites offered good opportunities to measure preferred depths and velocities, but they are definitely atypical and to suggest that the entire river is over-spawned because these two reaches are experiencing some superimposition is unwarranted.

Page 9.

> "Although survival estimates and fry production need to be included to complete analysis of the data collected during the last two years, there is a strong indication that egg loss due to superimposition is occurring at escapements of 114,100 and 139,000 spawners."

Certainly some egg loss occurs at any escapement level, but WDF does not believe it is happening in the Cedar River in the magnitude implied by Dr. Stober's report. The egg density and potential deposition rates presented on the top of Page 9 suggest that between 52% and 78% of the potential eggs are being improperly deposited. This simply is not happening, since the observation of loose eggs in the Cedar River is a rare occurrence.

Page 9.

> "Nevertheless, these data have lead to the following considerations and assumptions in our calculations:
>
> 1. Utilization of 30% of the total wetted area between RM 4.3 and 21.6 is the highest justified in calculating spawnable area. This is based on field observations of the 1973 escapement of 313,000 spawners, as well as more recent observations."

As was stated in the WDF position paper, this 30% value is arbitrary and is dependent on 1973 Cedar River flow levels and on the number of spawners that spawned that year. If there had been more spawners, there would have been more area utilized.

Page 9.

> "2. 10% of the wetted area from RM 0 to 4.3 greatly overestimates the spawning activity in this area."

Again, this statement deals only with current levels of use. Use of this area was much higher in years prior to the Stober study, and we feel it will be used in future years.

Page 10.

> "3. The assumption that a linear increase in discharge can or will be achieved each year is extremely idealistic and makes the calculation very conservative."

The Cedar River is a partially controlled system. It is assumed that linear increases in discharge will occur in all but low flow years. It is probable that with less than adequate flows (e.g., Dr. Stober's proposed flow regime) there will only be room for the magnitude escapement that Stober recommends.

Page 10.

"4. Recognition of the fact that as the discharge in the Cedar River increases from 50 to 250 cfs, 90% of the total spawnable area is accrued. Less than 10% is added by increasing through 500 cfs.

WDF does not agree with the basis for this conclusion. The reaches in the study are not necessarily representative of the entire river. WDF staff are familiar with six of the 11 study sites. All six are broad spawning reaches with extensive center channel spawning areas. Naturally this type area has a high percentage of the total spawnable area in mid-stream. None of the areas we are familiar with are representative of the other major type of spawning area that of peripheral spawning. Extensive areas in the Cedar River provide spawning area in strips along one or both banks. The majority of these areas do not receive proper spawning depths and velocities until flows reach 300 cfs and above. If these areas were properly considered, the spawning area accumulated at flows above 250 cfs would be considerably above Stober's 10% value.

Page 10.

"5. Based on recently collected egg density data in the Cedar River, 186 eggs-alevins/ft^2 (McNeil, 1969) is a reasonable approximate upper limit which may be realized under ideal conditions, i.e., with a minimized amount of redd superimposition."

The 186 eggs-alevins/ft^2 value is from McNeil's study of pink salmon in Alaskan streams. The pink salmon of Alaska are, needless to say, different from Cedar River sockeye: they have a different size at maturity, different redd size requirements, a lower average fecundity, and they spawn in entirely different types of streams. It is simply not appropriate to apply pink salmon data to sockeye.

Dr. Stober has measured egg densities on just three of his 11 test reaches. Densities as high as 206 eggs-alevin/ft^2 have been measured on one reach. Since these egg densities may be conservative because of sampling methods, as was discussed earlier, it is possible that a higher average value could be justified.

Page 10.

"6. Minimum fecundity of Cedar River sockeye minus egg retention is 3,500 eggs per female."

Throughout all of his previous work, Dr. Stober has consistently used the WDF value of 3,400 eggs/female (fecundity minus retention). This change upward reduces the number of fish in the calculated escapement goal.

Page 10.

"7. The approximate sex ratio is 58:42 (female to male)."

WDF presented the correct sex ratio (57 females to 43 males) in the May 16, 1977 position paper.

Page 10.

"The spawnable area of 2.65×10^6 ft^2 at 500 cfs under ideal uniform egg distribution could hold 4.93×10^8 eggs at a density of $186/ft^2$. In order to achieve this goal, 140,829 females and 101,979 males would be required, totaling 242,808 spawners. Therefore, a more realistic and conservative maximum escapement goal is in the order of 250,000 spawners, which is in close agreement with Bryant (1976) and Miller (1976)."

WDF believes it has taken a responsible approach to calculating the escapement goal. To achieve egg densities that are appropriate for Alaskan pink salmon, there is no allowance for error. Every egg not retained in the body of the female spawner must be successfully deposited in the stream bottom. There can be no predation on eggs, no eggs lost in the spawning act, absolutely no overlapping of redds, and the distribution of spawners must be perfect. Since none of the above conditions can be met, it is obvious that in actual practice the egg densities resulting from a 250,000 spawning escapement would be far below the 186 $eggs/ft^2$ value. The fact that two other recent studies arrive at values that are similar to Dr. Stober's 250,000 escapement goal is not surprising since both Bryant and Miller drew heavily on Stober's data and assumptions in the development of their work.

Page 10.

"It should be understood, however, that a uniform spawner or egg distribution can never be achieved; therefore, estimates based on the assumption of uniformity will tend to overestimate escapement needs and are extremely conservative."

Here we have the most serious difference of opinion between the WDF thinking and Dr. Stober's analysis. We are told that putting the exact number of spawners into the river to achieve a theoretical optimum egg density results in excessive escapements because the fish do not distribute themselves evenly. We do not accept the logic of allowing less than optimum numbers of spawners into the river, especially since the exact opposite course of action is necessary to achieve optimum egg or spawner densities.

The International Pacific Salmon Fisheries Commission (IPSFC) discussed this same problem in their September 30, 1971 letter to WDF (attachment to May 16, 1977 WDF position paper). They stated that a density of 0.67 females/yd^2 was optimum, but that because the spawners do not distribute themselves uniformly it is desirable to have a spawner density of 0.67 to 1.0 females/yd^2. The higher value of 1.0 females/yd^2 represents 50% more spawners than the theoretical optimum density. By way of comparison, Dr. Stober's methodology would result in a density of 0.47 females/yd^2, far below the IPSFC values.

Page 11.

> "It is indicated from fry survival this year that the smolt production from the 1976 escapement of 139,000 spawners may exceed that from the 1967 escapement, estimated by WDF to be 365,000..."

As much as WDF would like to see this occur, the chances are extremely remote. The exceptional 1976 brood fry survival is a product of the total lack of flooding on the Cedar River this past winter, and is not the result of a relatively small spawning escapement. The 1967 brood smolt production was estimated to be 7.5 million fish, the largest production on record. Unfortunately, data are not available on the numbers of fry that entered Lake Washington from that brood. The most recent information available to WDF is that Dr. Stober has determined the outmigration of 1976 brood Cedar River sockeye fry to be about 23 million. Fry from other spawning areas will raise the total. Lake Washington fry population to about 26 million fish at the end of June. This value can be compared with 31.5 million fish in August of 1970. By March of 1971, this group of sockeye juveniles had declined to a population of 3.8:million pre-smolts. It is unreasonable to assume that the smaller 1976 brood fry population will produce more than twice as many smolts as the 1969 brood, and thereby exceed the 7.5 million smolts from the 1967 brood.

Page 11.

> "There is nothing to be gained by a1lowing overutilization of the prime spawning areas in the Cedar River in order to attempt to force additional fish into marginal spawning habitat. It is absurd to cause egg loss by superimposition in the best spawning habitat in the hope of forcing some spawners to utilize less suitable gravel. Fry produced in marginal habitat are likely to show poor condition and lower survival. Due to the extended egg

> deposition period (12 weeks) in the Cedar River, it is not clear that spawners can be forced into other areas. Such a strategy leads to an excessive escapement goal which, if realized, results in loss of adults to a fishery, egg loss due to redd superimposition, and decreased fry survival and production. It is likely that further analysis of the Cedar River data will indicate higher fry survival and production at escapement levels considerably below 250,000 spawners."

No one is suggesting that Cedar River sockeye be forced to spawn on bedrock or unsuitable substrate. Dr. Stober's own work shows that significant areas on his study reaches were not being used by the sockeye, even though depths and velocities were optimum. In addition, extensive non-study areas are grossly underutilized at the escapement levels that have been experienced in recent years. Dr. Stober has repeatedly stated that the spawning reaches in the lower river are underutilized, and this has also been WDF's observation. Egg loss caused by superimposition is an inevitable result of sockeye salmon spawning at nearly all escapement levels. The objective of an escapement goal is to maximize the production of juvenile fish, and this is accomplished by maximizing the numbers of eggs deposited in the gravel. The time to limit the number of spawners is when the escapement reaches a level where increasing the egg density requires more spawners than the additional eggs will produce. It becomes a simple benefit-cost problem, where the benefits (increased production of sockeye) must outweigh the costs (losses to fisheries by allowing additional escapement). At the escapement levels that have been achieved on the Cedar River, there is no indication that the larger escapements are resulting in lower production of juvenile fish. This subject will be discussed in the following section of this report.

Page 11.

> "The impacts of flood discharges on eggs distributed in mid-channel have not been discussed, but information has been collected to show it is a major cause of egg and alevin mortality. However, if minimum flows are increased to distribute spawners away from mid-channel where flood impacts are greatest, the majority of the spawnable area will be eliminated from production. The escapement goal will then have to be reduced in order to limit egg loss due to superimposition in a reduced amount of spawning area.

It is the WDF's impression that there is not sufficient water available to provide the flows that would distribute the majority of spawning fish away from center channel areas. If such flows could be provided, there is little doubt that a given number of fish could be produced with fewer spawners than are currently necessary. This does not, however, automatically mean that the optimum number of spawners would be reduced. Depending on flood frequencies, it is possible that production on low and moderate flood years would be large enough to justify the maintenance of some center channel spawning. The net result might be that higher flows would shift a higher percentage of the spawning onto the relatively flood-safe peripheral areas while maintaining a lower percentage of spawners in the center channel, flood damage area. Over a number of years, this might increase overall production without requiring increased numbers of spawners. Of course this is mainly supposition at this time, and a great deal more data on the effects of flooding must be collected before fry survival with differing spawning flow regimes can be predicted.

Discussion

The preceding review of the methods used by Dr. Stober to develop his escapement goal for Cedar River sockeye salmon has shown that nearly every factor utilized in the Stober analysis is subject to different interpretation. To this point, however, the major fault with Dr. Stober's approach has not been discussed. Factors used by Dr. Stober to arrive at his theoretical escapement goal are not based on actual production data. The factors used are arbitrary: the amount of area used by the 1973 spawners, with no attempt to relate that area to potential; and egg deposition rates from Alaskan pink salmon streams. There are now six brood years (1967 through 1972) for which complete production information (brood escapement, smolt production, and adult returns) is available. These production data cannot be ignored, since the actual production of sockeye is the only objective of an escapement goal. Theoretical factors are meaningless if they do not relate to actual production figures.

Dr. Stober's paper presents an analysis from Mason Bryant's 1976 thesis that employs nearly identical methods as Stober's approach, resulting in identical escapement goals. What is not presented in the Stober paper is the analysis from Bryant's thesis which uses only actual production data. Bryant prepared a Ricker spawner-recruit curve for the 1964-1971 brood years (Attachment #1). Bryant states: "The nearly linear fit of the estimate curve through the range of points in Fig. 9 implies no density related mortality with the range of spawning escapements given in Table 6." In other words, there is no evidence of reduced survival because of over-spawning for escapements ranging from 110,000 to 365,000 spawners. Bryant goes on to say: "A more likely explanation is that density-independent mortality effects, such as flooding, masked any density-dependent mortality effects."

It is possible to use actual production data to test Dr. Stober's statement, “It is likely that further analysis of the Cedar River data will indicate higher fry survival and production at escapement levels considerably below 250,000 spawners” (emphasis added). It is a simple matter to compare the production that resulted from the highest (365,000 in 1967) and the lowest (110,000 in 1970) escapements during the years with complete escapement data. The effects of flooding must be considered but, coincidentally, the peak floods were nearly identical: 2,910 cfs for the 1967 brood, and 2,730 cfs for the 1970 brood. This means that the production data for the 2 years can be compared directly. The 1967 escapement of 365,000 sockeye produced a total of 7.5 million smolts, for a 19.9 smolt/spawner ratio. The 1970 escapement of 110,000 sockeye produced a total of 2.5 million smolts, for a 20.1 smolt/spawner ratio. The largest escapement had essentially an identical production rate as the lowest escapement in recent years. This is direct evidence that Dr. Stober's theories on increased spawner densities that reduce production are not valid for any level of escapement that has yet occurred in the Cedar River.

We will provide one final test of Dr. Stober's estimate. An excellent method of checking any escapement goal methodology is to apply the technique to a river system where escapement requirements have been defined by years of actual production results. The International Pacific Salmon Fisheries Commission (IPSFC), acknowledged experts in sockeye salmon management, has provided data on the Adams River run of sockeye salmon (attachment to May 16, 1977, WDF position paper). They have determined that the desirable range of spawner densities is between 0.67 and 1.0 females/yd^2, and that escapement should range between 675,000 and 1,500,000 spawners. The IPSFC also provided the area utilized by spawners in the Adams River for three years. Using Stober's methodology with the largest amount of area utilized, it is possible to compare Stober's escapement estimate to the known escapement requirements. The highest area used (710,000 yd^2 in 1954) would provide space for 585,000 spawners using the Stober method. It can be seen that Stober's approach results in an escapement goal for the Adams River that is less than one-half the actual escapement goal.

The WDF is charged with the statutory authority of managing the salmon resource of Washington State. This authority includes the establishment of escapement goals. With this authority comes the responsibility to manage the fish in a manner that will accrue the greatest possible value to the citizens of the state. We must by necessity take the pragmatic approach of using real production data for making management decisions. This is the approach that WDF is taking in the establishment of an escapement goal for Cedar River sockeye. At this time, available production data shows no indication that the 350,000 escapement goal is excessive. Until production data show that another goal is more appropriate, the 350,000 goal will remain in effect.

Washington Department of Fisheries
August 8, 1977

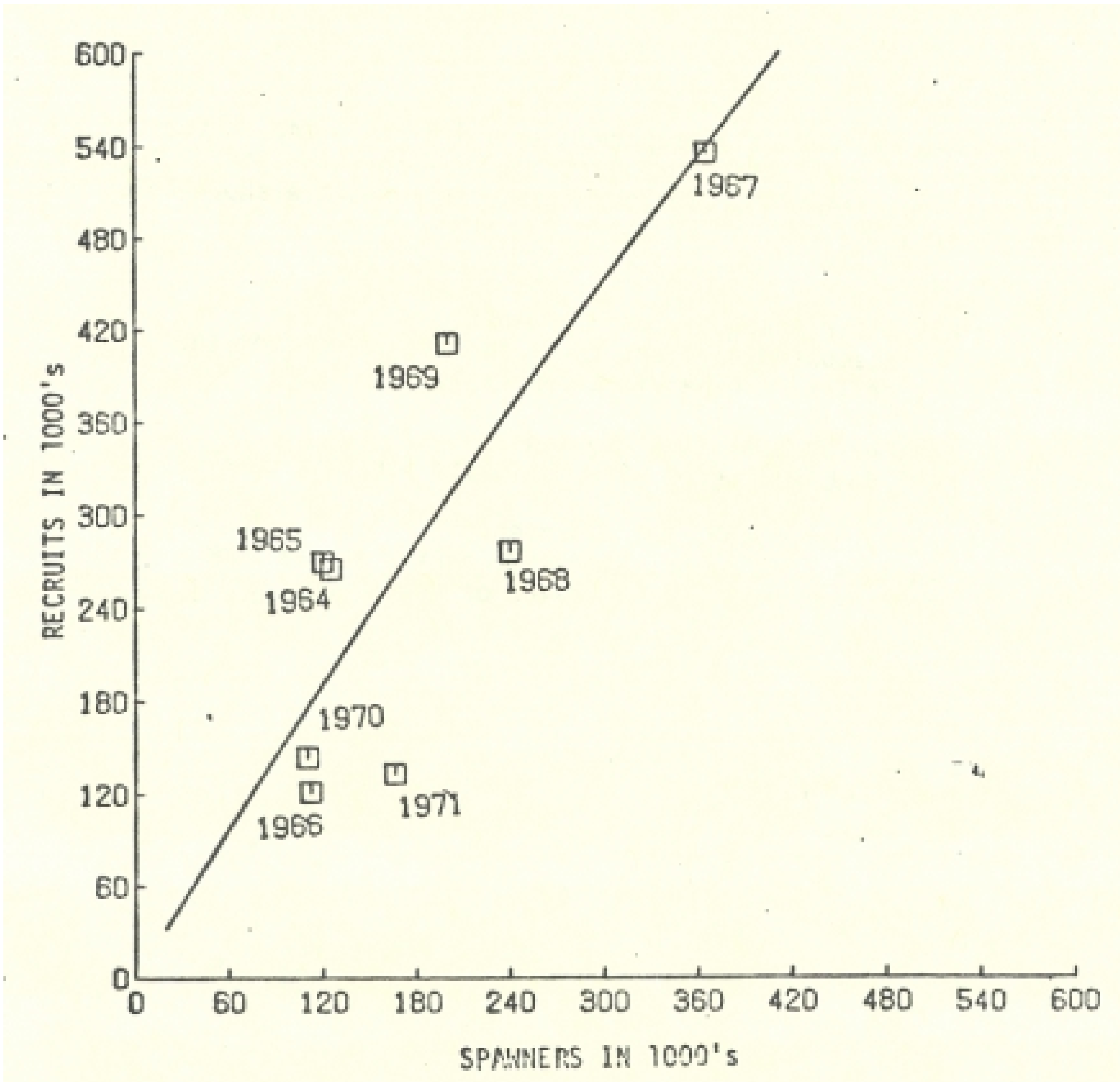


Fig. 9. Ricker spawner-recruit curve estimate from 1964-1971 data for the Lake Washington sockeye. Observed data points given around the calculated curve.

ERRATA SHEET

A REVIEW OF THE STOBER ESCAPEMENT GOAL METHODOLOGY

by

WASHINGTON DEPARTMENT OF FISHERIES

The above cited report, recently prepared for and distributed to the Cedar River Ad Hoc Water Resource Committee, on August 10, 1977 contained three typographical errors which require attention. The corrected sentences are shown below with the changes indicated in italics.

Page 6. First paragraph, second sentence:
"As discussed earlier, the redd life value from the Fraser (1970) paper is probably low."

Page 7. Last paragraph, first sentence:
"WDF does not agree with the basis for this conclusion."

Page 12. Second paragraph, third sentence:
"Factors used by Dr. Stober to arrive at his theoretical escapement goal are not based on actual production data."

Washington Department of Fisheries

August 16, 1977

SOCKEYE SALMON ESCAPEMENT GOAL

FOR THE CEDAR RIVER

The objective of this statement is to explain the Washington Department of Fisheries' reasons for maintaining the present escapement goal for Cedar River sockeye salmon. The purpose of an escapement goal for any naturally spawning stock of salmon is to maximize the biomass of juvenile outmigrants subsequent to incubation and freshwater rearing under average environmental conditions.

The two major factors that must be considered when establishing an escapement goal for Cedar River sockeye salmon are the potential rearing capacity of Lake Washington and the number of spawners that can be accommodated in the river. At a 1976 meeting on sockeye enhancement in Lake Washington, Dr. Burgner of the Fisheries Research Institute (FRI) indicated that Lake Washington could support rearing populations of juvenile sockeye from two to four times higher than the numbers of juveniles produced by the record high escapement of 365,000 sockeye in 1967. Because of this, the capacity of Cedar River spawning grounds will be the major factor that will limit the potential run size of this sockeye population.

An escapement goal for Cedar River sockeye salmon was first established by the Washington Department of Fisheries (WDF) in 1970 when it became obvious that the growth of the sockeye run would allow commercial harvests. Escapement estimates at that time were ranging between 160,000 and 200,000 spawners, and it was felt that since run size was doubling with each cycle, the spawning escapements should be increased in steps until the potential of the system was reached. A goal of 350,000 spawners was established to test the effects of a higher escapement level. This value was not intended to be the ultimate escapement level for the river, and it was expected that the goal would be raised or lowered depending on the results of studies during years when 350,000 fish escapement occurred. Unfortunately, the 350,000 escapement level has not been achieved in the years since the goal was established, but the 1973 escapement did reach 314,000 spawners. The 350,000 goal is still considered to be a test level for the system, and it will be changed up or down when studies indicate that a different value is more suitable.

In the years since the 350,000 escapement value was adopted, studies have provided information that indicates that the goal is realistic. More accurate methods of estimating escapement have been developed using tagging studies, and weir and tower counts. This new methodology has made it possible to recalculate escapements from past years, and it was discovered that past run sizes were much larger than originally thought. The 1967 escapement to the Cedar River which was originally estimated to be 189,000 sockeye, was reestimated at 365,000 spawners. This new escapement value, the largest number of sockeye to ever escape to the Cedar River, cleared up some of the confusion that had surrounded this run of fish. The 1967 escapement had produced the record crop of yearling sockeye (7.5 million) to leave Lake Washington, and the largest return of sockeye (554,000 catch plus escapement in 1971) to inner Puget Sound. It seemed illogical that an average sized escapement of 189,000 spawners would produce such a large return, however, the 365,000 estimate made the return rate proportional to production from other years. Probably the strongest evidence that indicates that the present escapement goal is not excessive is the fact that in 1971 the goal was exceeded resulting in the largest return of sockeye ever experienced, and with no reduction in the normal rates of production.

An effort was made in 1970 by WDF to determine how much spawning area was available to sockeye in the Cedar River. The upper half of the river (RM 11.3-21.6) was floated and the amount of stream bottom area suitable for spawning was delineated on large scale maps (200 ft/in.). Suitable spawning area was defined for this purpose as areas where stream bottom material was appropriate for spawning, and where an increasing flow regime would provide proper depths and velocities sometime during the spawning season. Spawning areas were measured with a planimeter and it was determined that with a flow regime increasing to a high of 480 cfs, the available spawning area in the upper 10.3 miles of the Cedar River would be a minimum of 185,000 square yards. The lower river was not mapped because of the press of other duties, but it can safely be assumed that the spawning area in this part of the river is equal to, or exceeds, the value for upstream areas. The entire river has a minimum of 370,000 square yards of spawning area with a flow regime rising to a high of 480 cfs.

To predict the numbers of spawners that can be accommodated by the available area in the Cedar River, it is necessary to make a comparison with a sockeye production area where desired spawner densities have been well defined. To accomplish this, the WDF corresponded with International Pacific Salmon Fisheries Commission (IPSFC) in 1971, and received information on optimum spawner densities in Fraser River system streams (see attached letter). The IPSFC response indicated that 0.67 females per square yard would normally be an optimum density, but because the fish do not distribute themselves evenly on the spawning grounds, a range of 0.67 to 1.0 females per sq. yd. is desirable. It should be noted that this range of densities will probably result in a conservative estimate for the Cedar River sockeye because Fraser River fish are larger by an average of one pound. Maximum spawner densities are dependent on the size of the fish, and if a single density factor was used for the Cedar River sockeye, the 1.0 female per sq. yd. value would probably be more appropriate.

To calculate the theoretical number of spawners for the Cedar River, the 370,000 available square yards are multiplied by the female per sq. yd. factors, and male fish are added in normal proportions. The average Lake Washington sockeye return is composed of 57% females, 38% males, and 5% jack males. Using the 0.67 factor, the 370,000 square yards could accommodate 247,900 female sockeye and 187,000 males, for a total spawning population of 434,900 fish. The 1.0 factor would estimate 370,000 females and 279,100 males; a total of 649,100 spawners. Both of these numbers are considerably higher than the present escapement goal of 350,00 sockeye even though conservative values were used throughout the calculations.

In 1972, Dr. Stober (FRI) began studies to better define the dynamics of the reproductive cycle of Cedar River sockeye. The WDF has been supportive of these studies since they are supplying the type of information that is necessary to manage the sockeye and Cedar River water. To date, WDF staff members have seen no definitive evidence that 350,000 spawners is an excessive escapement, and in fact, various aspects of the FRI study tend to support the present goal.

During the 1973 season FRI conducted studies on a sockeye escapement estimated at 314,000 fish. Information collected from this run of sockeye is particularly important because the escapement was the highest that has occurred since the 350,000 goal was established. By examining the amount of area utilized by the 1973 spawning escapement, as defined by the FRI study, it is possible to determine if the number of spawners exceeded the densities considered desirable by IPSFS. The FRI study estimated that the total area utilized by spawning sockeye over the entire season was 2.37 million sq. ft. (263,300 sq. yds). The lower 4.3 miles of the river were not included in this total because of low spawner utilization. A range of escapements for the 263,300 sq. yds. of area utilized can be calculated using the previously discussed factors; a range of 0.67 to 1.0 females per sq. yd., and 43% males (adults plus jacks) in an average run. With 0.67 females per sq. yd. the 263,000 sq. yds would provide space for 176,400 female and 133,100 male spawners, for a total of 309,500 fish. This number is nearly identical to the actual 1973 escapement since an estimated 2,500 sockeye spawned downstream of RM 4.3 that year. The 1.0 female per sq. yd. factor would accommodate 263,300 female and 198,600 male sockeye; a total of 461,900 fish. These figures indicate that the 1973 escapement did not exceed the capacity of the river.

Since the actual density of sockeye spawners in 1973 exactly equaled the lower end of the IPSFC desired density range, it might be suggested that the 1973 escapement represented an optimum spawner density for the Cedar River. There are various reasons why an optimum level would be higher than the 1973 escapement, all of which would increase the number of spawners.

> The IPSFC range of desired densities are probably conservative because Cedar River sockeye are smaller than Canadian fish.
>
> If more sockeye had escaped to the Cedar River in 1973, more spawning area would have been utilized because of competition for available space.
>
> Streamflows during the primary spawning period did not maximize available area (October mean flow 368 cfs).
>
> The lower 4.3 miles of the Cedar River were not included in the area utilized in 1973.

A major problem when trying to determine an optimum sockeye escapement is the distribution of spawners. While it is possible to calculate the theoretical number of spawners for a given area, it is impossible to make the fish distribute themselves so that every square yard is spawned equally. There are riffles in the Cedar River that receive excessive numbers of spawning sockeye even on low escapement years, and there are other riffles that will probably never have significant numbers of spawners at any escapement level. To maximize sockeye production from the Cedar River it may be necessary to allow as much as 30% of available spawning area to be over-utilized to force spawners into the greatest possible area. This will probably require more escaping fish than the theoretical number of spawners based on optimum spawning densities.

This discussion has dealt only with the factors of available spawning area and spawner densities. Based on current knowledge, these factors are the most important to be considered when establishing an escapement goal. Since the ultimate objective of an escapement is to maximize production, additional factors may have to be considered in the future. The continuing research by FRI into such areas as egg densities, incubation success, flood effects, and fry output will help to refine escapement goals. It is hoped that continuing funding can be found for these studies so that this research can be continued to completion.

The Washington Department of Fisheries is continuing to reassess the experimental 350,000 sockeye escapement goal for the Cedar River. The two overriding considerations at this time are that the 1967 escapement exceeded the present goal and resulted in a record returning run size, and that theoretical escapements, based on available area and optimum spawner density, also exceed the 350,000 fish goal. At the present time, the available information supports the 350,000 sockeye escapement goal for the Cedar River, and it will remain in use until future studies indicate that it should be raised or lowered.

Washington Department of Fisheries
May 16, 1977

INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

ESTABLISHED BY THE CONVENTION
BETWEEN CANADA
AND THE UNITED STATES
FOR THE PROTECTION
PRESERVATION AND EXTENSION
OF THE SOCKEYE SALMON FISHERIES
OF THE FRASER RIVER SYSTEM

A.C. COOPER
DIRECTOR

OFFICE AND LABORATORY
P.O. BOX 30
NEW WESTMINSTER, B.C.

TELEPHONE
521-3771

September 30, 1971.

Mr. Thor C. Tollefson, Director
Washington State Department of Fisheries
Rm. 115, General Administration Bldg.
Olympia, Washington 98501

Dear Mr. Tollefson:

In reply to your letter of September 21 requesting information on the Adams River spawning area, we offer the following comments on the questions you asked.

1. The minimum discharge of Adams River that has occurred at the peak of a dominant cycle spawning population is approximately 1,000 cfs. This occurred in October 1946, when the spawning population was 1,841,000 sockeye. The average discharge at peak of spawning is approximately 1,600 cfs, and the maximum is 3,930 cfs.

2. The total wetted area of Adams River at a flow of 1,520 cfs is 786,500 sq yd. At a flow of 630 cfs, the area is 586,500 sq yd, but eliminating areas we consider unsuitable, the usable spawning ground is about 505,000 sq yd. Probably the same deduction should be made from the area at 1,520 cfs. Areas actually used by the fish at various flows are as given in the following table.

Density of Spawners in Adams River

Year	Spawning Ground Area Utilized sq yd	Estimated Total Wetted Area sq yd	Number of Female Spawners	Females per sq yd	Flow cfs
1946	No data	786,500	1,170,876		1,520
1950	646,000	725,700	398,795	0.62	1,250
1954	710,000	916,700	847,956	1.19	2,100
1958	425,000	826,700	796,426	1.87	1,700

3. From the foregoing, it can be seen that the portion of the area used by the fish varies from about 51% (1958) to 89% (1950).

4. On the basis of study of density of sockeye spawners in many streams on the Fraser River system, we consider a density of 0.67 females per sq yd to be about optimum. Assuming a 50-50 sex ratio, this would indicate a population of 674,000 spawners for Adams River on the basis of the 505,000 sq yd area. Actual spawning populations on the dominant cycle have ranged from 845,500 in 1950 to 1,841,000 in 1946 and 1,730,000 in 1958. Since the 1954 population of 1,533,000 produced the large 1958 run, it is difficult to argue that this population was excessive. On the other hand, the larger populations in 1946 and 1958 had very poor returns. Reasons for these poor returns have been discussed in the 1950 and 1962 Annual Reports. In addition to the reasons given in these reports, it is possible the very high density of spawners in those years contributed to reduced survival from eggs to fry. On the basis of these considerations, we believe that a population of 675,000 to 700,000 spawners in Adams River is about the minimum desired for a dominant cycle, and a population of about l,500,000 spawners is about the maximum desired. Coupled with this we believe it is desirable to keep the density of spawners in the range from 0.67 to 1.0 females per sq yd. As shown by the 1958 run, the fish do not always distribute uniformly over the entire available areas

I hope this answers your questions. We have a lot of other data on density of spawners from other areas, such as Chilko which may also be of interest.

Yours very truly,

INTERNATIONAL PACIFIC SALMON
FISHERIES COMMISSION

A.C. Cooper
Director

STATE OF WASHINGTON - DEPARTMENT OF ECOLOGY
SUMMARY OF VALID SURFACE WATER RIGHT QUANTITIES
ANNUAL RATES OF DIVERSION - QA
PERIOD OF APPROPRIATION INCLUDES THE DATE - JULY15TH

STAGES RC1

SUMMARY UNITS AND PURPOSE OF USE	USE TYPE	SINGLE USE AC.FT/YR	NO. OF ENTRIES	COMMON USE AC.FT/YR	NO. OF ENTRIES	RE-USE AC.FT/YR	NO. OF ENTRIES	MAXIMUM AC.FT/YR	NO. OF ENTRIES
BLOCK TOTALS, W.R.I. AREAS 06 THROUGH 08									
PRIME RIGHT - QA									
IRRIGATION	C	3,109.650	226	71.600	13	16.000	1	3,197.250	240
IRRIGATION LAWN &/OR GARDEN	C	444.100	167	13.600	8			457.700	175
COMM/INDUST MISCELLANEOUS	C	2,350.500	6	1,060.400	3			3,410.900	9
COMM/INDUST METAL PROCESSING	C	17,300.000	1					17,300.000	1
COMM/INDUST PETROLEUM REFIN	N	3.400	1					3.400	1
DOMESTIC GENERAL	C	340.000	4					340.000	4
DOMESTIC MULT./PRIV CONTROL	C	223.283	23	31.500	7			254.783	30
DOMESTIC MUNICIPAL SERVICE	C	2,330.000	4					2,330.000	4
DOMESTIC SINGLE	C	214.866	146	35.200	19			250.066	165
DOMESTIC NONMUNIC/MUNIC CONT	C	20.000	1					20.000	1
FISH PROPAGATION	N	404.000	2	.500	1	16.000	1	420.500	4
BEAUTIFICATION	N			1.500	2			1.500	2
RECREATION	C			3.000	1			3.000	1
STOCK GENERAL	C	9.027	14	28.000	8			37.027	22
UNDEFINED UNSPECIFIED USE	C	60.000	1					60.000	1
WILDLIFE PROPAGATION	N			.500	1			.500	1
FIRE PROTECTION	C			88.900	10			88.900	10
FIRE PROTECTION	N			2.000	1			2.000	1
ACTUAL WATER RIGHT TOTALS	N	409.400						409.400	
	C	27,093.466		1,182.600		16.000		28,292.066	
SUPPLEMENTAL RIGHT - QA, P-GROUP									
IRRIGATION	C	17.000	2					17.000	2
ACTUAL WATER RIGHT TOTALS	C	17.000						17.000	
SUPPLEMENTAL RIGHT - QA, S-GROUP									
IRRIGATION	C	45.500	3	22.000	1			67.500	4
DOMESTIC GENERAL	C			22.000	1			22.000	1
DOMESTIC SINGLE	C	1.000	2					1.000	2
DOMESTIC NONMUNIC/MUNIC CONT	C	265.000	1					265.000	1
ACTUAL WATER RIGHT TOTALS	C	311.500		22.000				333.500	

C = Consumptive
F = Fish + Beautification
N = Non Consumptive
V = Hydroelectric
P = partially consumptive
T = Transfer Between Streams

APPENDIX C

REPORT DATE 06/01/79 PAGE 2

SUMMARY UNITS AND PURPOSE OF USE	USE TYPE	SINGLE USE AC.FT/YR	NO. OF ENTRIES	COMMON USE AC.FT/YR	NO. OF ENTRIES	RE-USE AC.FT/YR	NO. OF ENTRIES	MAXIMUM AC.FT/YR	NO. OF ENTRIES
TOTAL NUMBER OF ACTIVE WATER RIGHT RECORDS -		609							

STATE OF WASHINGTON - DEPARTMENT OF ECOLOGY
SUMMARY OF VALID SURFACE WATER RIGHT QUANTITIES
IRRIGATED ACRES
PERIOD OF APPROPRIATION INCLUDES THE DATE - JULY15TH

STAGES PCJ

REPORT DATE 06/01/79 PAGE 1

SUMMARY UNITS AND PURPOSE OF USE	USE TYPE	ACRES ASSOC. W/SINGLE USE QI OR QA	NO. OF ENTRIES	ACRES ASSOC. W/COMMON USE QI OR QA	NO. OF ENTRIES	ACRES ASSOC. W/RE-USE QI OR QA	NO. OF ENTRIES	MAXIMUM ACRES	NO. OF ENTRIES
BLOCK TOTALS, W.R.I. AREAS 08 THROUGH 08									
PRIME RIGHT - ACRES									
IRRIGATION	C	4,556.87	375	517.57	104	20.50	7	5,094.94	486
IRRIGATION LAWN &/OR GARDEN	C	261.14	162	151.72	35			412.86	197
ACTUAL WATER RIGHT TOTALS	C	4,818.01		669.29		20.50		5,507.80	
SUPPLEMENTAL RIGHT - ACRES, P-GROUP									
IRRIGATION	C	8.50	2	40.00	1			48.50	3
ACTUAL WATER RIGHT TOTALS	C	8.50		40.00				48.50	
SUPPLEMENTAL RIGHT - ACRES, S-GROUP									
IRRIGATION	C	33.00	5	11.00	1	15.00	1	59.00	7
IRRIGATION LAWN &/OR GARDEN	C	.50	1					.50	1
ACTUAL WATER RIGHT TOTALS	C	33.50		11.00		15.00		59.50	
ADDITIONAL RIGHT - ACRES, X-GROUP									
IRRIGATION	C	94.75	6					94.75	6
ACTUAL WATER RIGHT TOTALS	C	94.75						94.75	
TOTAL NUMBER OF ACTIVE WATER RIGHT RECORDS -		700							

STATE OF WASHINGTON - DEPARTMENT OF ECOLOGY
SUMMARY OF VALID SURFACE-WATER RIGHT QUANTITIES
INSTANTANEOUS RATES OF DIVERSION - QI
PERIOD OF APPROPRIATION INCLUDES THE DATE - JULY15TH

STAGES PCJ

WATER RESOURCE INVENTORY AREA - 06

PRIME RIGHT - QI

SUMMARY UNITS AND PURPOSE OF USE	USE TYPE	SINGLE USE CFS	NO. OF ENTRIES	COMMON USE CFS	NO. OF ENTRIES	RE-USE CFS	NO. OF ENTRIES	MAXIMUM CFS	NO. OF ENTRIES
IRRIGATION	C	31.0275	387	8.8936	121	.3500	7	60.2711	515
IRRIGATION LAWN &/OR GARDEN	C	4.6950	169	4.5250	53			9.2200	222
COMM/INDUST MISCELLANEOUS	C	21.3100	4	11.6580	5			32.9680	9
COMM/INDUST MISCELLANEOUS	P	.4100	2			.0100	1	.4200	3
COMM/INDUST FOOD PROCESSING	P			2.0000	1			2.0000	1
COMM/INDUST SAND & GRAVEL	C	2.6900	2					2.6900	2
COMM/INDUST SAND & GRAVEL	P	4.9000	4	2.0000	1			6.9000	5
COMM/INDUST SAND & GRAVEL	N	1.7000	2					1.7000	2
COMM/INDUST LUMBER & SHINGLE	C	.0500	1					.0500	1
COMM/INDUST METAL PROCESSING	C	25.0000	1					25.0000	1
COMM/INDUST PULP & PAPER MFG	C			.5400	2			.5400	2
COMM/INDUST PETROLEUM REFIN	N	.0300	1					.0300	1
DOMESTIC GENERAL	C	11.6300	7	.4700	2			12.1000	9
DOMESTIC GENERAL	P	3.1100	1					3.1100	1
DOMESTIC MULT./PRIV CONTROL	C	5.2030	62	10.9766	38			16.1796	100
DOMESTIC MUNICIPAL SERVICE	C	27.1200	6					27.1200	6
DOMESTIC SINGLE	C	4.4325	371	11.3020	148	.0400	2	15.7745	521
DOMESTIC NONMUNIC/MUNIC CONT	C	1.1000	2	1.0000	1			2.1000	3
ENVIRONMENTAL QUALITY	N			.0100	1			.0100	1
FISH PROPAGATION	C	.2400	1					.2400	1
FISH PROPAGATION	T	.0800	1					.0800	1
FISH PROPAGATION	P	14.2050	24	3.1400	9	.1900	1	17.5350	34
FISH PROPAGATION	N	23.4930	53	7.1787	36	.1100	4	30.7817	93
HEAT EXCHANGE	C	.0400	2	5.0000	1			5.0400	3
HEAT EXCHANGE	P	150.0000	1					150.0000	1
HEAT EXCHANGE	N	.0700	1					.0700	1
MINING GENERAL	C	.5000	1	.1000	1			.6000	2
MINING GENERAL	P	.7500	1	2.0000	1			2.7500	2
POWER GENERAL	P	2.0000	1					2.0000	1
POWER GENERAL	N	.0050	1					.0050	1
POWER HYDRO-ELECTRIC	P	200.0000	1	2.3500	3	.1900	1	202.5400	5
POWER HYDRO-ELECTRIC	N	.0500	1	1.0400	2			1.0900	3
POWER HYDRAULIC RAM	P	.0400	1					.0400	1
POWER HYDRAULIC RAM	N	.6300	5	.3200	4			.9500	9
BEAUTIFICATION	C	.1100	2	.0600	2			.1700	4
BEAUTIFICATION	P	.0750	3	.1500	3			.2250	6
BEAUTIFICATION	N	2.2320	19	1.2987	21	.0300	1	3.5607	41
RECREATION	C			.1100	2			.1100	2
RECREATION	P	.3350	5	.5950	3	.0100	1	.9400	9
RECREATION	N	.0100	1	1.5300	9	.1500	1	1.6900	11
STOCK GENERAL	C	.1870	23	1.0140	31			1.2010	34

SUMMARY UNITS AND PURPOSE OF USE	USE TYPE	SINGLE USE CFS	NO. OF ENTRIES	COMMON USE CFS	NO. OF ENTRIES	RE-USE CFS	NO. OF ENTRIES	MAXIMUM CFS	NO. OF ENTRIES
STOCK GENERAL	P			.0200	1			.0200	1
STOCK DAIRYING	C	.0300	1	.0200	1			.0500	2
STOCK FUR BEARING ANIM. FARM	C	.1000	1					.1000	1
UNDEFINED UNSPECIFIED USE	C	1.0000	1					1.0000	1
WILDLIFE PROPAGATION	C			.0500	1			.0500	1
WILDLIFE PROPAGATION	P			.5750	2			.5750	2
WILDLIFE PROPAGATION	N	.2400	4	.8300	7	.2000	1	1.2700	12
FIRE PROTECTION	C	.1400	2	2.9450	28	.0300	1	3.1150	31
FIRE PROTECTION	N			.1000	3			.1000	3
ACTUAL WATER RIGHT TOTALS	N	28.4600		3.9737				32.4337	
	P	375.8250		2.5950		.1900		378.6100	
	T	.0800						.0800	
	C	156.8050		37.3316		.3600		194.4966	

SUPPLEMENTAL RIGHT - GI, P-GROUP

SUMMARY UNITS AND PURPOSE OF USE	USE TYPE	SINGLE USE CFS	NO. OF ENTRIES	COMMON USE CFS	NO. OF ENTRIES	RE-USE CFS	NO. OF ENTRIES	MAXIMUM CFS	NO. OF ENTRIES
IRRIGATION	C	.0900	2	1.5000	1			1.5900	3
IRRIGATION LAWN &/OR GARDEN	C			.0030	1			.0030	1
DOMESTIC MULT./PRIV CONTROL	C	.2850	7					.2850	7
DOMESTIC MUNICIPAL SERVICE	C	1.5000	1					1.5000	1
DOMESTIC SINGLE	C	.0723	7	1.5350	4			1.6073	11
WILDLIFE PROPAGATION	N	.0300	1					.0300	1
ACTUAL WATER RIGHT TOTALS	N	.0300						.0300	
	C	1.9473		1.5050				3.4523	

SUPPLEMENTAL RIGHT - GI, U-GROUP

SUMMARY UNITS AND PURPOSE OF USE	USE TYPE	SINGLE USE CFS	NO. OF ENTRIES	COMMON USE CFS	NO. OF ENTRIES	RE-USE CFS	NO. OF ENTRIES	MAXIMUM CFS	NO. OF ENTRIES
DOMESTIC SINGLE	C	.0600	7					.0600	7
ACTUAL WATER RIGHT TOTALS	C	.0600						.0600	

SUPPLEMENTAL RIGHT - GI, A-GROUP

SUMMARY UNITS AND PURPOSE OF USE	USE TYPE	SINGLE USE CFS	NO. OF ENTRIES	COMMON USE CFS	NO. OF ENTRIES	RE-USE CFS	NO. OF ENTRIES	MAXIMUM CFS	NO. OF ENTRIES
DOMESTIC SINGLE	C	.0200	2					.0200	2
FISH PROPAGATION	N	.0200	2					.0200	2
ACTUAL WATER RIGHT TOTALS	N	.0200						.0200	
	C	.0200						.0200	

SUPPLEMENTAL RIGHT - GI, S-GROUP

SUMMARY UNITS AND PURPOSE OF USE	USE TYPE	SINGLE USE CFS	NO. OF ENTRIES	COMMON USE CFS	NO. OF ENTRIES	RE-USE CFS	NO. OF ENTRIES	MAXIMUM CFS	NO. OF ENTRIES
IRRIGATION	C	.1800	3			.1500	1	.3300	4
DOMESTIC MULT./PRIV CONTROL	C	.0100	1					.0100	1
DOMESTIC SINGLE	C	.0150	2					.0150	2
DOMESTIC NONMUNIC/MUNIC CONT	C	.3700	1					.3700	1
ACTUAL WATER RIGHT TOTALS	C	.5750				.1500		.7250	

WRIA-08 - CONTINUED

SUMMARY UNITS AND PURPOSE OF USE	USE TYPE	SINGLE USE CFS	NO. OF ENTRIES	COMMON USE CFS	NO. OF ENTRIES	RE-USE CFS	NO. OF ENTRIES	MAXIMUM CFS	NO. OF ENTRIES

TOTAL NUMBER OF ACTIVE WATER RIGHT RECORDS - 1317

STATE OF WASHINGTON - DEPARTMENT OF ECOLOGY
SUMMARY OF VALID RESERVOIR STORAGE RIGHT QUANTITIES
STORAGE VOLUMES - QA
PERIOD OF APPROPRIATION INCLUDES THE DATE - JULY 15TH

STAGES PCJ

REPORT DATE 06/04/79

SUMMARY UNITS AND PURPOSE OF USE	USE TYPE	SINGLE USE AC.FT/YR	NO. OF ENTRIES	COMMON USE AC.FT/YR	NO. OF ENTRIES	RE-USE AC.FT/YR	NO. OF ENTRIES	MAXIMUM AC.FT/YR	NO. OF ENTRIES
BLOCK TOTALS, W.R.I. AREAS 08 THROUGH 08									
PRIME RIGHT - QA									
IRRIGATION	C			105.000	2			105.000	2
COMM/INDUST SAND & GRAVEL	C			15.000	1			15.000	1
DOMESTIC MUNICIPAL SERVICE	C	33.000	1					33.000	1
DOMESTIC SINGLE	C			105.000	2			105.000	2
FISH PROPAGATION	F			2,723.000	4			2,723.000	4
POWER HYDRO-ELECTRIC	V			15.000	1			15.000	1
RECREATION & BEAUTIFICATION	F	64.000	1					64.000	1
RECREATION	F			129.000	1			129.000	1
WILDLIFE PROPAGATION	F			2,500.000	1			2,500.000	1
FIRE PROTECTION	C			4.000	1			4.000	1
ACTUAL WATER RIGHT TOTALS	F	64.000		2,429.000				2,693.000	
	C	33.000		[illegible]				142.000	

TOTAL NUMBER OF ACTIVE WATER RIGHT RECORDS - 7

STATE OF WASHINGTON - DEPARTMENT OF ECOLOGY
SUMMARY OF VALID RESERVOIR STORAGE RIGHT QUANTITIES
IRRIGATED ACRES
PERIOD OF APPROPRIATION INCLUDES THE DATE - JULY 15TH

STAGES PCJ

REPORT DATE 06/04/79

SUMMARY UNITS AND PURPOSE OF USE	USE TYPE	ACRES ASSOC. W/SINGLE USE QI OR QA	NO. OF ENTRIES	ACRES ASSOC. W/COMMON USE QI OR QA	NO. OF ENTRIES	ACRES ASSOC. W/RE-USE QI OR QA	NO. OF ENTRIES	MAXIMUM ACRES	NO. OF ENTRIES
WATER RESOURCE INVENTORY AREA - 08									
SUPPLEMENTAL RIGHT - ACRES, X-GROUP									
IRRIGATION	C			16.00	1			16.00	1
ACTUAL WATER RIGHT TOTALS	C			16.00				16.00	
ADDITIONAL RIGHT - ACRES, X-GROUP									

TOTAL NUMBER OF ACTIVE WATER RIGHT RECORDS - 1

APPENDIX VI

Following are the comments received on the draft program document and supplemental EIS. We sincerely thank those agencies and individuals who took the time to formally respond. All comments will be considered in the departments' deliberations. For ease of reference, the comments have been numbered. The following list shows the page number on which responses to the comments will be found.

1

B. STATEMENT OF DEPARTMENT OF GAME
CEDAR-SAMMAMISH INSTREAM RESOURCES PROTECTION PROGRAM

July 24, 1979

We commend the Department of Ecology for proposing to close the majority of Lake Washington Basin to further diversions. This important step will go a long way toward preserving the highly valuable game fish and salmon resources of this watershed. We especially encourage and fully support adoption of the revised minimum flow schedule proposed for Cedar River.

Over the past several years, we have worked closely with the Department of Ecology, Department of Fisheries, and Seattle Water Department in trying to resolve the long-standing problem of securing adequate minimum flows in the Cedar River. It was and is very clear that the minimum flow regulation of 1971, now in effect, is woefully inadequate and cannot protect Cedar River game fish production, particularly the important steelhead runs that depend on this river.

Summer flows are especially critical to steelhead production. The inadequacy of the existing 75 c.f.s. summer minimum flows was underscored when in August of 1977, flows of 83 to 85 c.f.s. resulted in substantial fish kills directly related to insufficient flow.

The proposed normal and critical year summer flows are absolutely necessary to preserve Cedar River steelhead production and, at the same time, allow reasonable water diversion by the City of Seattle to supply the needs of citizens in the Seattle Metropolitan area.

Cedar River and Lake Washington Basin game fish runs are highly valuable resources. We urge adoption of these proposed regulations, so that they may be protected. Thank you.

STATE OF WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF FISHERIES

[illegible] General Administration Building, Olympia, Washington [illegible] [illegible]

Statement of the Washington Department of Fisheries
before the

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Cedar-Sammamish Basin
Instream Resources Protection Program
including
Proposed Administrative Rules and Draft
Supplemental Environmental Impact Statement
(Water Resource Inventory Area l8)
July 24, 1979

The Washington Department of Fisheries appreciates the opportunity to express its views on the Department of Ecology's Cedar-Sammamish River Basin Instream Resources Protection Program.

The Cedar-Sammamish Basin supports significant runs of chinook, coho and sockeye salmon. The sockeye run is the largest in the continental United States, averaging over 300,000 fish annually during the last 11 years, with the 1977 run exceeding 590,000 fish. The Cedar River spawning grounds account for approximately 90 percent of this production. This sockeye run presents a unique fishing experience in Lake Washington for thousands of Seattle area residents. Because of the high interest, local groups including sports clubs, service clubs, schools and other citizen groups have entered into several cooperative projects with our Department and local governments to enhance stream environment and increase salmon runs.

In order to fulfill increasing demands for salmon by Indian and non-Indian commercial fishermen, sports fishermen, and the general public, it is necessary to maintain the production of naturally produced salmon. Existing levels of natural production will continue to be threatened by ever-increasing demand for the water resource. We do not anticipate that population and industrial growth will abate, especially in the Puget Sound region. Once over-appropriated, there is no way to replenish water in the stream. Therefore, base flows must be established in order to maintain present levels of salmon production in Western Washington.

We are very pleased with the DOE proposal to close to further appropriation all streams and lakes above the Hiram M. Chittenden Locks, excluding the Cedar River drainage. These smaller streams include many important salmon producing areas, and are also the focus of several of the cooperative enhancement efforts to restore damaged habitat and increase fish usage.

The Department has worked closely with the Department of Game and Ecology to establish the proposed Cedar River flows for the protection of the fishery resources under our jurisdiction. To this end, our department in cooperation with the other involved fishery agencies has made extensive instream flow measurements in the Cedar River.

Our Department in cooperation with the U.S. Geological Service has developed methodology for determining flows that would provide protection for the fishery resources. In addition we have also reviewed actual salmon spawning populations occurring on specific dates and flow regimes within the basin. This review included spawner distribution and density in relation to stream flow throughout the heaviest utilized areas.

Our Department recognizes the severe competition for water in the Cedar River. Because of the conflicting uses of this limited water supply, we have, at this time, accepted the proposed instream flow regime for the Cedar River (Figure 3) as outlined in the Department of Ecology Draft EIS. However, the Department of Fisheries would prefer the flow regime depicted on page 17l (Appendix B, Supplemental EIS) labeled "WDF Recommended Instream Flow." Because of our concerns we will closely monitor the effect of the proposed DOE base flow on Cedar River salmon runs. We note that provisions are included for automatic review of the regulations by DOE at least once in every five year period. If adverse impacts to the salmon runs are observed this department will immediately request of DOE a review of these base flows.

The Department of Ecology is well aware of our concerns and they have been adequately documented in your Cedar River Report and Appendices III-XIII (June 1979).

I. PUBLIC HEARING COMMENTS

Two public hearings were held on July 24, 1979. One was held at 2 p.m. at the Mountlake Terrace Library and one was held at 7 p.m. at the Seattle Water Department Operations Control Center. Following is a summary of the testimony:

Afternoon

A. Howard Capple, Private Citizen (Owner of property on Lyon Creek, tributary to Lake Washington). Mr. Capple expressed appreciation for the attention given by the Department of Ecology to the Cedar River and other big streams and recognized the necessity of those being addressed first. His purpose in attending the public hearing was to identify major problems on small streams in the Cedar-Sammamish Basin. His major concerns were:

1. Pollution of small streams tributary to Lake Washington by land developers.

2. Depletion of fish in those small streams as a result of siltation of streams occurring with runoff from construction sites.

3. Preservation of fish populations currently in streams.

4. Excessive diminution of stream flows due to pumping by individuals (usually occurring between 7 p.m. and midnight).

5. Mr. Capple believes that developers should have some appreciation for land and water values, and that ". . . . there is a real need for someone with expertise to get in there and show developers how to do it (control erosion and siltation of streams due to development).

6. "Some means should be developed by the Department of Ecology for alerting people in the basin as to what the department wants to happen there, and how individuals can help to accomplish it."

B. Statement of Department of Game (See letter No. B).

C. Statement of Department of Fisheries (See letter No. C).

Evening

D. Paul Locke, Private Citizen: Mr. Locke was concerned about the limitations that were being imposed by the Instream Resource Protection Program. He felt it was important to maintain the flow in the Cedar River, but that restrictions of water usage from Lake Washington and tributary streams for any one purpose is not in the best interests of the public. Mr. Locke felt that available resources should be managed for the maximization of multiple uses, such as protection of fish, lock operation, drinking water, and far greater, hydroelectric power, especially from the Cedar River.

E. Robert E. Leaver, Washington Division of Health (DSHS): Mr. Leaver stated that the Instream Resources Protection Program places drinking water in a secondary position as compared to other uses; namely, fish and game. It was his feeling that a watershed that supplies drinking water is a precious resource, and that it is wrong to allow recreation, fish, and other uses to be placed ahead of drinking water uses.

F. Robert V. Emerson, King County Outdoor Sports Council: The position of the King County Outdoor Sports Council generally supports the Instream Resources Program. Mr. Emerson stated, "After upstream diversions, there should be enough water in the river (Cedar River) for use by sportsmen and boaters. There is high recreational use on the streams during the summer months, especially by junior high and high school youngsters for swimming and rubber rafts. Increasing the minimum flow from 75 cfs to 110 cfs will allow a lot more use during the summer months when the river is usually super low."

G. James W. Miller - Seattle Water Department (S.W.D.): The legal position of the Seattle Water Department on water rights is that they have a right to 300 mgd (twice what they use now).

   S.W.D. prefers the DOE proposed flows to the old minimum flow.

   Thinks higher summer flows would make poorer fall flows and trade a few steelhead for a lot of sockeye.

   Would prefer less steep slope in fall rise.

   Wants better definition of what a critical year is. Lower flows are not necessarily bad for fish.

   Net benefits have not been analyzed.

H. W. L. Trowbridge, Washington State Association of Water Districts: The Washington State Association of Water Districts (WSAWD) represents 32 different purveyors in King County and 64 throughout the state. Mr. Trowbridge stated that since anything that affects the Seattle Water Department, affects WSAWD (whether it is low cost water, shortage of water, or a flood), the Association supports the Seattle Water Department's view.

I. Chuck Judkins, President, Northwest Steelhead and Salmon Council: The Northwest Steelheaders support the flow recommendations of the Department of Fisheries, especially for the fall months. Mr. Judkins stated that the month of October is when the heaviest fishery cycle is occurring, with salmon going up the river as well as spawning, and that is when the most water is required. Mr. Judkins challenged the proposed flows for the months of September and October and recommended that the flows meet the Department of Fisheries requirements for those months.

J. Questions and Answers: A major issue was raised concerning the ground water section of the proposed rules. As written, it could eliminate all new wells and preclude expansion of small water districts.

LETTERS OF COMMENTS

K.

July 28, 1979

John F. Spencer
Assistant Director
Office of Water Programs
Department of Ecology
Olympia, WA 98504

Dear Mr. Spencer:

1 After reviewing the Draft Cedar-Sammamish Basin Instream Resource Protection Program I have found it to be complete and will serve it's purpose well.

The problem that I am addressing is the chance that the public could be involved in the public hearings that addressed the Cedar-Sammamish Basin Instream Resource Protection Program.

The only public hearings that were held was in the areas that would be least
affected by the restrictions set down in the document. The East Side of Lake
Washington which has almost all of the streams/creeks/rivers/lakes mentioned
2 didn't have a single hearing in the area. You had a hearing is the Mountlake
Terrace area which is in the corner of the Cedar-Sammamish Basin at two
o'clock, a time that most people work but is convenient for those who jobs deal
with this. The other hearing was held in Seattle which has only 1 of the creeks
mentioned but it was handy for the Seattle Water Department since it was at
their control center and since they may be the most affected by the restrictions
on the Cedar River. The Seattle Water Department building wasn't even on any
of the major bus routes that serve Seattle or the East side of Lake Washington.

I found that the places did not encourage or provide a chance for the public to express concerns about the document via a public hearing. The only purpose that the public hearings served was to satisfy the requirement of having one.

I hope in the future that D.O.E. will consider this when planning such activities and not just do something to satisfy a requirement but to do it to benefit.

3 I would like to be kept informed (via a mailing list or something) of water projects or activities that will affect the Metropolitan Seattle area.

Sincerely,

Ed J. Foster
1832 177th Ave. N.E.
Bellevue, WA 98008

L.

Puget Sound Power & Light Company Puget Power Building Bellevue, Washington 98009 (206) 454-6363

July 30, 1979

State of Washington
Department of Ecology
Water Resources Policy
Development Section
Olympia, Washington 98504

Western Washington
Instream Resources Protection Program
Cedar-Sammamish and Snohomish Basins

Gentlemen:

We have reviewed the draft Supplemental Environmental Impact Statements and proposed administrative rules for both the Cedar-Sammamish and Snohomish Basins. It is our understanding that the Instream Program does not affect any existing water rights under any flow regimes nor existing rights related to the operation of hydroelectric facilities. With that understanding, we have no comments to offer at this time.

Thank you for the opportunity to comment on the documents.

Very truly yours,

W. J. Finnegan, Director
Conservation & Environmental Affairs

M.

Office of the Mayor
City of Seattle

Charles Royer, Mayor

July 30, 1979

cc: Spencer / Kelley

Wilbur G. Hallauer, Director
Department of Ecology
St. Martin's College
Olympia, Washington 98504

Re: Comments on Cedar-Sammamish Basin Instream Resources Protection Program – Proposed Administrative Rules and DEIS

Dear Mr. Hallauer:

I am writing to provide you with the City of Seattle's comments and recommendations on the proposed instream flow regulation for the Cedar-Sammamish Basin and its accompanying Supplemental Draft Environmental Impact Statement (DEIS). We have attempted to summarize and address the key issues in this letter and put specific comments on the DEIS in an attachment. Our comments include those provided to us by the University of Washington Fisheries Research Institute.

5 In summary, we are pleased with your proposal to repeal the existing minimum streamflow regulation for the Cedar River Chapter 173-30 WAC. We are greatly supportive of the approach taken in the proposed replacement regulation, Chapter 173-508 WAC. However, there are some modifications which we recommend in order to improve its workability. These are discussed in this letter and are summarized at the end.

On behalf of the City of Seattle, I would like to commend your Department for the extra effort that was spent trying to develop a workable solution to the complicated problem of water management on the Cedar River. Although it was a time-consuming process, we at the City believe that all of the work that went into it will pay off in the long run for the benefit of the general public.

6 Seattle has had facilities on the Cedar River since 1901. We use this source to supply about two-thirds of our service area which contains over one million people. We use a multi-purpose approach in the management of the river's water. This includes providing flood control and fish spawning flows in addition to our primary uses of river water for Municipal and Industrial Water Supply and Power Generation. There is ample evidence that shows the fish benefits resulting from the careful operation of our facilities. For example, the large sockeye salmon run in the Cedar River has increased at about three times its natural growth rate as a result of flood control provided by the City's Masonry Dam.

7 It was out of a concern for the best multi-purpose use of water that the City, in 1972, asked the University of Washington's Fisheries Research Institute (FRI) to analyze the instream water needs of the Cedar River sockeye and to recommend the flow regimes or minimum flows that would adequately protect and preserve this run of salmon. Several hundred thousand dollars have been spent on this research effort during the past seven years and we believe that a very objective and scientific study has been performed by FRI. However, we are somewhat concerned that the valuable information and recommendations derived by this research has not been fully utilized by the Department of Ecology (DOE) in the formulation of the proposed instream flow regulation.

8 Before getting into the proposed instream flows, the City's position on water rights should be stated. It is the City of Seattle's position, based on legal advice from the City Attorney, that the City of Seattle has the following existing water rights on the Cedar River:

A. Diversion Right - 300 MGD annual average

B. Storage Right - 160,000 acre-feet

These rights were claimed in 1974 in compliance with the Water Right Registration Act (RCW 90.14). Furthermore, as existing water rights, State Laws (RCW 90.22 and 90.54) insure that they cannot be affected by the establishment of minimum flow or base flows (or instream flows, which is the latest generic term).

9 We disagree with DOE's assumption that, if adjudicated, Seattle's water right would as a maximum only be that which has been used in the past. The maximum diversion rate from the Cedar River was 137 MGD in 1961 prior to the development of the Tolt River supply.

10 Relative to the proposed instream flow levels, the City supports DOE's approach of having two instream flow curves, one for normal conditions and one for critical or dry conditions. This represents a vast improvement over the "one curve" approach that was expected to cover all conditions. This approach has proved to be impractical because of the stream flow variability.

11 ↓ As you are aware, there has been a considerable number of flow curves that have been proposed over the years including several by the City of Seattle. It appears that DOE's proposed normal and critical flow curves represent a compromise between the numerous proposals. However, we believe that, while the curves are generally reasonable for most of the year, some improvements can still be made that would significantly improve their benefit to both the fish resource and water users.

11 ↓ First, let us consider the “normal” flow curve. This is the curve that would control flow releases and diversions from the Cedar River a majority of the time. (Attachment B contains a plot of the normal and critical year curves being proposed by DOE.) While most of the year appears reasonable, the flow requirements during the summer (i.e. July 15 to September 10) and early fall during the spawning are too high and will result in lower sockeye salmon production in the opinion of our fishery consultant (i.e. FRI).

The 130 cfs called for during the low summer period apparently was intended to provide higher rearing flows for fish like steelhead that are in the river during that time. The incremental benefit of increasing the minimum flow 73% from the existing requirement of 75 cfs is not in the DEIS and to our knowledge it has never been determined. We don’t believe that this benefit would be sufficient to offset the lower sockeye salmon production resulting from water being dumped from storage in the summer to meet these flow requirements and therefore would not be available to provide more optimum sockeye spawning flows in the fall.

It should be remembered that during the months of July, August and September the demand for water for fish and man (i.e. water supply) normally exceeds the natural flow in the river. Therefore water from storage is being drafted at its highest rates. Historically, the flow has dropped to between 50 and 70 cfs. Two out of the last five years the average flow during August was about 110 cfs and this was during a time when our annual average diversion rate was only around 100 MGD compared to our 150 MGD Cedar system pipeline capacity. So, it appears obvious that the 130 cfs is too high and will only create problems for both fish and water supply.

We would concur with the Washington Department of Fisheries (WDF) recommendation on their June 14, 1979 letter to you wherein they recommend 110 cfs as the flow level during the low summer months instead of 130 cfs. This (i.e. 110 cfs) is presently the proposed critical year flow during the summer. We suggest that 100 cfs be used for the critical flow curve.

The second area of concern on the normal curve is the rate of flow increase durding the fall sockeye spawning season. This is the period of the year that was specifically addressed by the Fisheries Research Institute (FRI) studies. It is important to point out that, while there were differences of opinion between FRI and WDF regarding the desired sockeye escapement goal, they were in general agreement on the relationship between flow and spawnable area. Therefore, regardless of the escapement goal used (e.g. 250,000 or 350,000), the curves derived by FRI using basically the USGS method give a mutually agreed upon cumulative spawnable area for different discharge levels in the Cedar River.

The key curve showing this relationship is shown on Appendix C to this letter. The proposed DOE normal year flow curve calls for an increase in flow during the spawning season (see Attachment B) to 370 by October 10. This date is approximately the middle of the sockeye spawning run coming upstream. From

11 ↓ the curve in Attachment C it can be determined that 94% of the available spawnable area has been provided if flow has been increased to 370 cfs. Yet only 50% of the spawners have come upstream. Therefore, it is obvious that the DOE normal flow curve increases much too fast ahead of the spawners in the fall and not only wastes water but wastes valuable spawnable area.

In addition, from a water availability standpoint, there will not normally be enough water to follow the “normal curve” during October. In three of the last five years with cooperative water management between the City, DOE and WDF the flow has been at or below the proposed curve and we are only diverting about two-thirds of our pipeline capacity (i.e. 100 MDG vs. 150 MGD).

October is a key month from a water supply standpoint in that if fall rain do not come as “scheduled” then water demand remains high and storage becomes depleted because of low runoff. This makes good water management very important during this time.

We believe that the proposed DOE normal curve is just not workable during October for the following reasons:

1. It will reduce spawnable area and therefore fish production because of overcrowding.

2. It is impractical because the water will not normally be available.

3. It will jeopardize water supply by depleting storage capacity.

Therefore, we strongly recommend that the spawning flow increase recommended by FRI based on spawnable area be used by DOE. This is shown on Attachment B. Specifically, we believe that starting on October 1st the flow should increase linearly to 370 cfs on November 6th. Basically, we concur with the WDF proposal (in June 14, 1979) letter) for the entire year except for this period between October 1st and November 6th. No scientifically supported information has been provided to support the WDF requested and DOE proposed accelerated flow increase rate during October. Until this is provided, we do not believe that DOE has any basis for deviating from the FRI recommended spawning flow increase.

12 In the proposed regulation, the statement is made that, “Critical year flows represent flows below which the department (i.e. DOE) believes substantial damage to instream values will occur.” This claim is not substantiated in the DEIS. Since the lockage flow requirements are treated in another manner, we assume that this refers to fish damage. Yet, the historical evidence shows that even with flows significantly below the proposed critical flow curve fish production has not been significantly impaired.

The most dramatic example occurred in 1967 when largest recorded sockeye run returned to the Cedar River (365,000). Flow levels in the Cedar River were below 100 cfs for most of September, 80 cfs on October 1st and 130 cfs as late as October 20th when the fall rains finally came. Not only are these flows considerably below the critical curve but WDF has claimed that these are disastrous flows for fish. But, if one checks the figure on page 15 of Appendix iv of the DEIS which was provided by WDF, it can be seen that the fish production resulting from the 1967 spawning was quite normal and unaffected by the low spawning flows.

Furthermore, our attempts to correlate minimum spawning flows with fish production have indicated that until the flows at the end of the spawning season (i.e. November/December) get down below 150 cfs there is no correlation either positive or negative. So if the critical flow curve was only intended to protect or preserve the fish resource (per RCW 90.22 or 90.54) then it could be lowered. In drought conditions, a compromise flow of 200 cfs is probably reasonable (see Attachment B).

13 The EIS should include an evaluation of net benefits for the people of the state resulting from the proposed instream flows as directed by the 1971 Water Resources Act (RCW 90.54). Also, the alternative flow regimes should be more thoroughly discussed and evaluated, particularly the one that we are recommending in this letter.

14 In summary, in order to improve the DOE proposal for <u>all</u> parties involved, we recommend that the following changes made to sections in your proposed administrative rules Chapter 173-508 WAC – Minimum Water Flows – Cedar River:

a – 1. <u>-050</u> define how hydraulic continuity of ground water and surface water will be interpreted. (This could be important for future ground water supplies.)

b – 2. -060(3) delete the words "depletion under". (They are unnecessary.)

c – 3. -060(3a) change normal year flow to flows recommended in Attachment B.

d – 4. -060(3b) change critical year flow to flows recommended in Attachment B and since there is no mechanism for declaring a critical condition,
e____________ (include the paragraph from the bottom of Page 1 of the DEIS.

5
16 As in the past we are prepared to spend whatever effort is required to work with you and your staff to develop a program of multi-purpose water management that will serve the needs of all water users. In fact, we suggest that the Cedar River Ad Hoc Committee

review the comments on the DOE proposal and make a final recommendation to DOE as its swan song. We look forward to your positive response to our recommendations which were made not only with the City's interest in mind but that of fisheries and other users as well.

Sincerely,

Charles Royer

CR:jmc

cc: Colonel Leon K. Moraski, District Engineer
Corps of Engineers

Gordon Sandison, Director
Department of Fisheries

Ralph Larson, Director
Department of Game

John D. Spellman
County Executive, King County

Paul Kraabel
Seattle City Council

Kenneth M. Lowthian, Superintendent
Seattle Water Department

Robert Murray, Superintendent
City Light Department

Darel Grothaus, Director
Department of Community Development

July 30, 1979

ATTACHMENT A

CITY OF SEATTLE'S

SPECIFIC COMMENTS ON THE CEDAR-SAMMAMISH BASIN

INSTREAM RESOURCES PROTECTION PROGRAM – APPENDIX B

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

17 Pg. 8 Para. 4 Sentence 2. This is a misleading statement. Adjudication would involve more than just determining actual use prior to 1917 because in Seattle's case the pre-1917 storage capacity and post-1917 water usage, among other factors, will form the basis for the City's water right should it be adjudicated.

18 Pg. 9 b. effects Sentence 3. We disagree with this statement. We do not believe that it is "reasonable" to assume that if Seattle's water right were adjudicated, the amount would not be greater than that which has been used in the past. Based on our legal advice, we have every reason to believe that it would be substantially in excess of the 137 MGD maximum average annual amount diverted in the past.

19 Pg. 11 Para 5. The contention for 480 cfs demonstrates faulty reasoning by ignoring the following considerations. It was demonstrated (Stober et al., 1978a) that under the present conditions flood control is not adequate to reduce all egg loss due to flooding in the Cedar. However, management of instream flows during the spawning season by rapidly increasing the discharge during the early part of the spawning season to discourage spawning in mid-channel presumes that floods will occur every year. This of course is not the case and such a water management scheme therefore minimizes sockeye production in the river channel every year, by allowing no more production than can be achieved along the river margins at a high discharge. This water management strategy results in a greater degree of egg loss due to redd superimposition and ensures that it will occur every year. In light of the extremely large WDF escapement goal set for the Cedar River it does not make efficient use of water or the large numbers of spawners to cause a reduction in the spawning area by increasing the discharge prematurely, especially since the spawning season for sockeye lasts over a three-month period. The normal year instream flow proposed by DOE will also reduce the productivity of sockeye, however, not to the extent of that suggested by WDF. The discharge curve recommended by F.R.I. (Stober and Graybill, 1974) optimized the timing and rate of discharge increase to allow maximum seeding of the spawnable area and production of sockeye.

Pg. 14 Conclusions

20 These conclusions drawn by DOE did not recognize the difference in the methods utilized in calculating spawnable area. The F.R.I. estimate based on the amount of area actually utilized by 314,284 spawners which escaped during 1973. Basing an estimate on the area utilized throughout 17.3 miles of the channel by a large escapement is more accurate than the WDF method because the fish indicated by their presence that a combination of environmental factors (i.e., depth, velocity, substrate size, etc.) are suitable for spawning. On the other hand WDF only surveyed the upper half of the river when adult sockeye were not present and subjectively estimated the area of the river which "looked" appropriate for spawning. This is a very difficult set of judgements to make by even the most experienced fishery biologist because one must make a combination of subjective judgements on depth, velocity and substrate suitability. The tendency is to over-estimate the spawnable area. The extrapolation of this area to the lower half of the river simply compounded the error and resulted in a gross over-estimate of the spawnable area. This constitutes the major difference in the estimates made by F.R.I. and WDF. The calculation of the number of spawners which can be accommodated in the estimated area varied in minor ways due to variations in the sex ratio and number of females per unit area, but these did not account for the major difference due to spawnable area estimates.

21 Pg. 15 b. Effects, para. 2. The WDF recommendation has no scientific basis so it is unclear why it was followed for the normal year curve. The F.R.I. recommendation was based on scientific data and intended to optimize the use of spawnable area. Also, no reason or basis is given for raising the minimum summer flows to 130 cfs.

Pg. 15 Flooding

a. Existing conditions

22 The effects of the worst flood of record on the Cedar River have been reported by Stober et al., 1978a, and Stober et al., 1978b. The studies indicated the amount by which the 1975 flood reduced egg/alevin densities in the spawning gravel and where reductions were most severe. The most important observation to come out of monitoring the 1976 and 1977 spawning runs indicated that a severe reduction in spawning habitat (suitable gravel) occurred during the 1975 flood which was sustained throughout the two subsequent years for which monitoring was conducted. Flood control is of major importance in the Cedar River in order to maintain the maximum level of fish production. It not know how long it will take for the spawning habitat (suitable gravel) to increase again to pre-1975 levels, but with two dams on the system it may be some time. Since a reduction in the escapement goal, which was based on a pre-1975 estimate of the spawning area, did not follow the 1975 reduction in habitat, we can only assume that a very large over-escapement will occur if 350,000 spawners are allowed to enter the river. Reduction of the spawning habitat as a result of severe flooding should be followed by downward adjustment in the escapement goal.

23 Pg. 17 The so-called "FRI Recommended Drought Flows" curve is incorrectly plotted on the graph. We assume that the low runoff regime is being cited from Stober and Graybill (1974). FRI recommended a linear increase from 80 cfs on September 1 to 250 cfs on October 15, where the discharge would remain during critical dry years. The designation of the F.R.I. curve as a "drought flow" is incorrect and if followed would result in an optimum release of water for spawning sockeye. During normal years the discharge was recommended to increase linearly from 250 cfs on October 15 to 500 cfs on November 30 (maximizing regime for spawning area). Spawning flows for sockeye in

the 1974 F.R.I. report took the position that the thousands of sockeye utilizing the river were of more importance than any other species. A relatively low summer flow was traded for an optimum fall sockeye spawning flow because high summer flows were likely to impact the recommended sockeye spawning flows.

A review of 11 total wetted area curves indicate that summer rearing flows of 130 cfs are probably reasonable if the only concern was for those species that use the Cedar River for rearing. However, with minimum summer flows of 130 cfs a trade-off between a few thousand of coho, steelhead and cutthroat and several hundred thousand sockeye must be considered. It is not likely that both can be optimized. It makes more sense to store water to insure adequate spawning water for the large sockeye run rather than release it in order to increase summer flows for rearing.

Pg. 19 Economics

24 4. Fisheries – Sentence 1. This assumption is not substantiated by the numerous studies conducted on sockeye salmon in the Cedar River. Benefits to fisheries cannot occur if sockeye are not allowed to fully and as evenly as possible utilize the total spawnable area in the river channel. The DOE proposed normal flow is too high and too early and will minimize the spawning area in mid-channel and maximize redd superimposition and egg loss near the channel margins.

Sentence 3 & 4. The relationship between instream flow and fish production on the Cedar River was addressed by Miller (1976). While this was not a rigorous analysis based on fry production data, he found that there was no impact on fish production of any significance until the instream flows at the end of spawning were below 150 cfs. (See pg. 174, Figure 52 Miller (1976)).

Pg. 20 Alternatives

25 2. The timing of the flow of water is critical to the production and survival of sockeye. This has not been adequately addressed by DOE. We must take issue with the statement that DOE feels that no flow regime would be significantly better for fisheries than the proposal. The FRI recommendation which we support would definitely be better for fisheries.

Pg. 20 Last sentence. A comprehensive review of the scientific studies available on the Cedar River does not justify this statement as previously pointed out.

26

Pg. 24 Para. 3. The Ad Hoc Committee did not conduct a critical review of the methodologies utilized by either F.R.I. or WDF and now DOE is content with adoption of this cursory evaluation. A very important difference exists between estimation of potential and actual spawning area in the Cedar River, especially when the actual area was measured with a known escapement of 324,284 sockeye in 1973. This escapement closely approaches the WDF goal of 350,000 sockeye and provides the most accurate measure of the actual spawnable area in the Cedar River since intensive observations began. However, one must keep in mind that the spawnable area based on 314,284 spawners was sharply reduced by the severe 1975 flood and it is not known when the spawning habitat will recover to pre-1975 levels. A critical review of all the available fisheries information on the Cedar River by a qualified DOE fisheries scientist would avoid some obvious errors in evaluation.

27

28 Para. 4 is incorrect and does not belong in any EIS. The meaning of the DOE reference to the “different purposes underlying the two studies” is not clear. We can only answer that F.R.I. had but one purpose and that was to obtain the best possible information within the constraints of available funding and time, on the most efficient water requirements and fisheries management strategies for spawning sockeye in the Cedar River. To insinuate that either group had any other “purposes” is simply not correct or justified. To flatly state that “there will never be an agreement between” WDF and F.R.I. is nonsense. WDF is a fisheries management agency and F.R.I. is a University fisheries research organization and F.R.I. expects to be involved in controversy as it develops new and better information related to current problems. We can only hope that qualified members of management and regulatory agencies will come to accept and apply this new information before further mistakes are made.

29 Para. 5. To dismiss the controversy over the efficiency of fish flow requirements on the basis of higher lockage requirements by the COE does not mean that further consideration of fish requirements can be ignored. On the contrary, higher flows earlier in the season will serve to limit sockeye reproductive habitat in years when flooding does not occur or in all years if adequate flood control is achieved through future development. The fish populations should not be left simply to tolerate higher lockage flows and if they are, changes in the abundance of some species over other should be expected.

REFERENCES
CITED

Stober, Q.J. and J.P. Graybill. 1974. Effects of discharge in the Cedar River on sockeye salmon spawning area. Final Report to City of Seattle Water Dept., University of Washington, College of Fisheries, Fisheries Research Institute, FRI-UW-7407, 39 pp.

Stober, Q.J., R.E. Norita and A.H. Hamalainen. 1978a. Instream flow and the reproductive efficiency of sockeye salmon. Completion Report for Matching Grant Project, OWRT Proj. #B-065-Wash., OWRT Agreement #14-31-0001-6132. Washington Water Research Center, Seattle Water Dept., METRO, University of Washington Fisheries Research Institute, #RI-UW-7808, 124 pp.

Stober, Q.J., S. Crumley and R.L. McComas. 1978b. Pre-spawning mortality and the reproductive efficiency of Cedar River sockeye salmon. Supplemental Completion Report for Matching Grant Project, OWRT Proj. #B-065-Wash., OWRT Agreement No. 14-31-0001-6132. Washington Water Research Center, Seattle Water Dept., METRO, University of Washington, Fisheries Research Institute, FRI-UW—78-09, 53 pp.

ATTACHMENT B

CITY OF SEATTLE RECOMMENDATIONS TO MODIFY THE PROPOSED DOE INSTREAM FLOWS

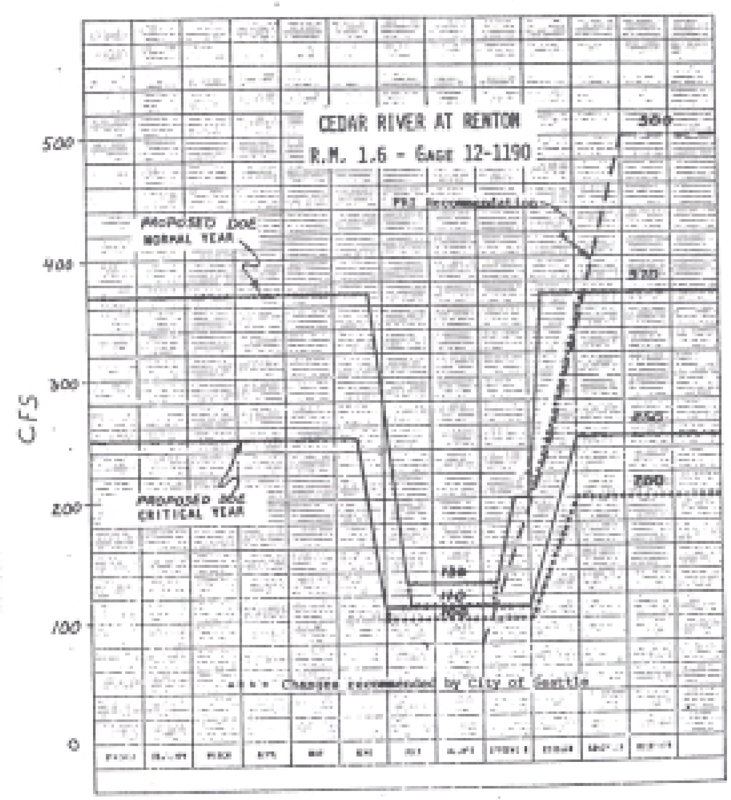


Figure 3. Proposed Instream Flows for the Cedar River for Normal and Critical Years.

Original from Pg. 8 CEDAR-SAMMAMISH BASIN Document (June 1979) Department of Ecology

ATTACHMENT C

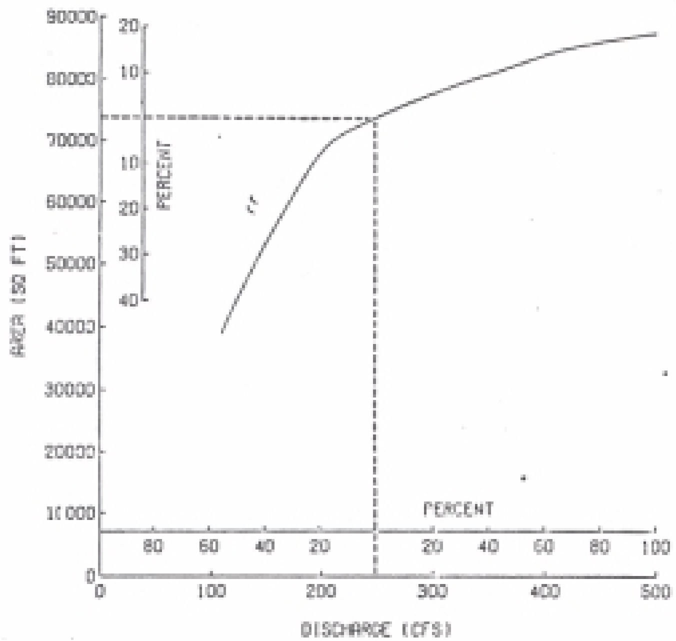


Fig. 17. Effects of discharge on sockeye salmon spawning area above and below the mean peak spawning discharge of 250 cfs referenced to the Renton gage with 80 cfs inflow.

Source: Stober, Q. J. and J. P. Graybill. 1974. Effects of discharge in the Cedar River on sockeye salmon spawning area. Final Report, FRI-UW-7407, June 15, 1972 to June 14, 1974 to City of Seattle Water Department. 39 p.

METRO
Municipality of Metropolitan Seattle
Exchange Bldg. • 821 Second Ave., Seattle, Washington 98104

August 14, 1979

Jeanne Holloman
Department of Ecology
Mail Stop PV-11
Olympia, Washington 98504

Dear Ms. Holloman:

Draft Environmental Impact Statement
Cedar-Sammamish Basin Instream Resources Protection Program

30 Metro staff has reviewed this proposal and anticipates no adverse impacts to its wastewater facilities or public transit system, and appreciates the assistance of the Department of Ecology in facilitating this response.

Metro staff supports the efforts of the Department of Ecology to establish minimum flow criteria for the protection of instream resources in the Cedar-Sammamish Basin.

This program should have many positive water quality benefits for the surface waters of the basin, especially in the numerous small streams which presently experience adverse impacts from minimum flows related to increased temperatures and loss of wetted areas. Closing all further surface water appropriations in the Basin will help in this regard.

The higher base flow proposed for the Cedar River should improve several significant water quality problems presently found in the Basin. The salt water intrusion problem in Lake Union and the Lake Washington Ship Canal associated with the operation of the Hiram M. Chittenden Locks can be better controlled with the additional water for flushing. This should help offset impacts of salt water intrusion from increased utilization of the locks.

We note that the DEIS does not include an analysis of the effects of your proposal on temperatures in the Cedar River. To assist you in this regard, a copy of “Cedar River Temperature” (March 1979) is included with this response. We believe that the conclusions and recommendations derived in this study will be supportive of your proposal. The specific recommendation to restrict groundwater withdrawals should be of particular interest.

We are particularly encouraged by your plans to close Piper Creek since part of this stream is located next to Metro’s Carkeek Park Treatment Plant. Metro intends to phase out the plant and will be considering various stream restoration alternatives as part of the removal.

Jeanne Holloman
August 14, 1979
Page two

Since Metro is involved in the Salmon Enhancement Program in cooperation with King County, the Department of Fisheries, the Cities of Seattle and Bellevue, we are of course interested in the impacts of this proposal on the fisheries resources of the Cedar River. We believe that the potential for improved water quality as a result of this proposal should enhance this resource.

Thank you for the opportunity to review and comment.

Very truly yours,

Rodney G. Proctor, Manager
Environmental Planning Division

RGP:apm
Enclosure

CITY OF RENTON

CHARLES J. DELAURENTI
MAYOR

PUBLIC WORKS DEPARTMENT
WARREN C. GONNASON, P.E. • DIRECTOR
MUNICIPAL BUILDING 200 MILL AVE. SO. RENTON, WASH. 98055
206 235-2569

August 10, 1979

Mr. John F. Spencer
Assistant Director
Office of Water Programs
Department of ecology
Olympia, WA 98504

Subject: Cedar-Sammamish Basin Instream Resources Protection Program

Reference is made to your letter of June 25, 1979 requesting comments on the draft of the Cedar-Sammamish Basin Instream Resources Protection Program document including
31 proposed administrative rules (chapter 173-508 WAC). For some reason or other, this office was not in receipt of this document until this date and I contacted your office and they indicated we could submit comments at this time.

As you know, the City of Renton gets its principal supply by means of pumping ground water from the Cedar River aquifer. At the present time, the City has water rights through your department for a series of wells in a total amount of 14.6 MGD. We also have an observation well for future supply and have, in our long range program, anticipated a need for 22 to 25 MGD of total supply to serve the future needs of the City of Renton's service area when fully developed.

We therefore oppose your new section WAC 173-508-070 – FUTURE RIGHTS which states as follows: "No right to divert or store public surface waters of the Cedar-Sammamish WRIA-8 shall hereafter be granted which shall conflict with the instream flows and closures established in this chapter. Future rights for nonconsumptive uses, subject to the conditions herein established, may be granted."

The City of Renton desires to protect its interests and rights to the use of Cedar River aquifer to a total amount of 25 MGD.

Mr. John F. Spencer -2- August 10, 1979
Department of Ecology

Your consideration of our request is appreciated and should you desire further information on this matter, please contact the undersigned.

Very truly yours,

Warren C. Gonnason, P.E.
Public Works Director

WCG:jt

cc: Mayor Delaurenti
City Attorney Warren
City Council Members
Richard Houghton

P. **King County Water and Sewer District No. 82**

2918 228th Ave. S.E., Issaquah, Washington 98027 392-6256

July 30, 1979

Water Resources Policy Development Section
Washington State Dept. of Ecology
Olympia, Wa 98504

Subject: Cedar-Sammamish Basin Instream Resources Protection Program.

Gentlemen:

Water District No. 82 serves a rapidly growing residential area on the East Sammamish Plateau. In addition to our district, several smaller water utilities exist in the area, serving an estimated 3,500 customers. In view of recent growth trends, it is not unreasonable to expect this total number of customers to triple within the next ten years.

All of the districts in the area now utilize ground water, and our future planning continues to rely on this resource. The ground water resource on the plateau is questionable with regard to its ability to serve anticipated population growth, therefore the district is considering other options, including wells near Lake Sammamish (within ½ mile) and the high yield aquifer near Issaquah Creek.

32

We note that the proposed regulations emphasize surface water closures, and that "ground water in direct hydraulic continuity with surface water shall be considered part of the drainage system." Since the term "direct hydraulic continuity" could be interpreted differently by different people we are most anxious to understand how it will be interpreted. I realize that infiltration wells near the shores of lakes or water courses are in direct hydraulic continuity, and indeed are designed to use the surface water, filtering it through natural sands and gravels. But would the same definition apply to a well that intercepts subsurface springs discharging into a lake (such a well could be a considerable distance from the lake, but be in hydraulic contact through its aquifer).

Also, wells that are drilled in alluvial deposits also may be some distance from a body of water, but they still may be in hydraulic contact with surface water.

If the latter two examples would be considered part of the surface drainage system under WAC 173-508-050, we wish to voice our objection the the proposed chapter. If on the other hand, the proposed regulation applies only to direct infiltration wells or Banny types collectors, we would have no problem with the regulation.

Your clarification of the intent of the regulation as it affects ground water would be greatly appreciated.

Sincerely,

Mark F. Spahr, Manager

STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF GAME
Seattle Regional Office—[illegible] Fairview Avenue North, Seattle [illegible]. Telephone: [illegible]

August 1, 1979

Eugene Wallace
Division Supervisor
Water Resources Management
Department of Ecology
Olympia, Washington 98504

Cedar-Sammamish Basin Instream Resources Protection Program, Proposed Administrative Rules and Supplemental EIS.

Dear Mr. Wallace:

We commend the Department of Ecology for proposals to close the majority of Lake
Washington Basin to further appropriations. The basin already suffers from stresses
33 induced by insufficient water availability during low flow seasons. Any additional
withdrawals of water will only serve to aggravate this condition.

↓

We especially encourage and support adoption of the revised minimum flow proposed for Cedar River. Over the years since adoption of 1971 regulation for that river, its inability to protect Cedar River game fish population, particularly steelhead trout, has become abundantly clear. Especially sensitive and critical are summer flows. Though 130 cfs is below optimum, this minimum is a substantial improvement over the present regulation. It represents an important step to truly protect Cedar River instream values and game fish production.

We do, however, have reservations about the proposed regulation during the spring. Our
recommendation called for the spring to summer cutback in flow to start no earlier than
July 1. Our concern is that allowing the flow to decrease (from 370 to 130 cfs) starting
34 June 20, developing eggs and preemergent fry may not have adequate opportunity to
successfully emerge before flows drop too low. We, therefore, reserve the right to seek
and secure modification of the proposed regime based on results of future evaluation of
run timing, spawning locations and emergence timing.

For the purposes of specifically determining when it is necessary to depart from the
"normal" flow regime, we would appreciate designation of criteria to be used. "Natural
35 flows" will play a significant role in this process. Whose version of natural flow will be
used, the City of Seattle's, the Corps of Engineers' or yet a third version?

36 We would hope that when it becomes necessary to depart from the normal year flow
regime, that instream flows are not unilaterally cut back without a demonstrated and
effective commitment on the part of diversion interests that conservation measures have been implemented. We do not question the need to supply citizens with adequate drinking water. There are, however, uses that can and should be cut back to prevent needless damage to public resources. To quote the City of Seattle:

> The Seattle and Puget Sound region are blessed with abundant water resources. Our water supply is limited only by our reservoir, transmission and distribution facilities.

This is simply not true. Water supplies are limited and this fact must be recognized in water use management and planning decisions.

<u>Specific Comments</u>:

There is a third fish hatchery facility in the basin located at Seward Park on Lake
Washington. This installation, formerly operated by the Game Department, was recently
37 turned over to the University of Washington for research and teaching purposes (page
13).

38 Resident game fish present in the basin also include whitefish, Dolly Varden char,
kokanee (a nonmigratory race of sockeye salmon), rainbow trout and yellow perch.
Cutthroat trout are present as both sea-run and resident populations (page 14).

We hope these comments will assist you. Thank you for the opportunity to review your proposal document.

Very truly yours,

THE DEPARTMENT OF GAME

R. Gary Engman
Wildlife Project Leader

RGE:dg

cc: Hearings Examiner – This Proceeding

STATE OF WASHINGTON **R.** DEPARTMENT OF FISHERIES
115 General Administration Building, Olympia, Washington 98504 206/753-6600

Dixy Lee Ray
Governor

August 1, 1979

Mr. Eugene Wallace
District Supervisor
Water Resources Management
Department of Ecology
Olympia, Washington 98504

Dear Mr. Wallace:

The Washington Department of Fisheries has reviewed the Draft Cedar-Sammamish Basin Instream Resources Protection Program including the proposed Administrative Rules and Supplemental Environmental Impact Statement.

This Department presented a prepared statement at your public hearing at Montlake Terrace on July 24, 1979 in support of the Instream Resources Protection Program. The statement also explained our department's recognition of the severe competition for water in the Cedar River, and because of this we have, at this time, accepted the proposed instream flow regime for the Cedar River as outlined in your draft document. It was also
39 stated that we would prefer the flow regime depicted on page 17 of the Supplemental EIS labeled "WDF recommended instream flow." We are hopeful that the provision for automatic review of the regulations at least once in every five year period will give us the opportunity to monitor results of these flows, and request review by the Department of Ecology if this appears needed.

40 Our statement also expressed appreciation with the closures of all areas above the Hiram M. Chittenden locks, excluding the Cedar River drainage. These smaller streams include many important salmon producing areas, and this action will go far in protecting their future value to the resource.

We have several specific comments on the draft documents:

(1) Program Document

41 a. Page 12, Instream Values. Reference is made to stream ratings. Should these values be included some place within these documents?

b. Page 15, Water Quality, Lake Washington Feeder Streams. It is stated that neither the Sammamish River nor Lake Sammamish provides spawning
42 grounds for anadromous fish. This is incorrect, since there is significant beach spawning by sockeye within Lake Sammamish, and occasionally chinook salmon have been observed utilizing the area immediately below the sill at the outlet of the lake.

c. Page 15, Water Quality, Cedar River. Bank sloughing and movement of bed
43 materials are said to have been reduced by channel improvement in the Cedar River. This is also incorrect, since the "improvement" has typically confined the channel in a number of places resulting in accelerated movement of streambed materials and loss of spawning areas.

d. Page 16, Proposed Administrative Status. Critical year flows are discussed,
44 including the statement that these represent flows below which the department believes substantial damage to instream values will occur. This implies that no damage will occur until this flow level is reached, and is very misleading. Substantial damage to fisheries production will occur before this level is reached.

(2) Supplemental EIS

45 a. Page 9, Cedar Masonry Dam Improvements: It is suggested that the fisheries agencies should contribute monetarily to the project for improvements in the Cedar River for storage purposes. This would be establishing a precedent for which there is little or no basis, and is contrary to similar actions taken in other areas. For the record, salmon produced in the Cedar River are caught by U.S. and Canadian citizens.

The effects of stream flows with a Corps of Engineers project are discussed. In recent personal communication with the Corps we have been advised that the
46 chances of flows equaling or exceeding those recommended by fisheries agencies are very high, particularly for the month of October where we have high concern. It would be very desirable to include in the Final EIS what those chances are, by month, of equaling or exceeding WDF recommended flows with a Corps of Engineers project, after satisfying the projected City of Seattle increases.

b. Page 11, Fisheries, Existing Conditions. Information on existing conditions for fisheries is virtually absent. The one sentence states "In brief, the basin has major populations of resident and anadromous fish." Certainly it would appear that some quantification of numbers or values should be included on salmon runs as important as these. For example, the sockeye population in the Cedar
47 River is the largest in the continental United States. We are enclosing some recent status reports on Puget Sound stocks that may be of some value in updating this section. We also believe that the use of timing as shown from the Puget Sound Adjacent Water Study should be deleted in favor or more accurate information such as that in the Department of Fisheries Stream Catalog.

A considerable portion of the existing conditions is given to the conflict between WDF and FRI. We note that conclusion 4a (Page 14) shows that FRI
48 used a figure of 0.67 females per square yard. We believe that this is incorrect since our calculations show it to be closer to 0.47 females per square yard (see Pages 8 and 10 of the Department's response to the FRI report in Appendix iv.)

c. Page 18, Optimum Minimum Flow Criteria Table. The Footnote 4 indicates that these were WDF recommended optimum flows. We did not classify them
49 as optimum flows, nor will they optomize fish production.

d. Page 19, Economics, Fisheries. It is pointed out that the low summer flows under the proposed base flows will be higher than under the currently established minimum flow regulation, and that benefits to fisheries should
50 occur. This statement is true only for steelhead and coho, but the difference between the proposed base flows and the current minimum flow regulation will not benefit sockeye. Potential losses due to flow during the sockeye spawning period could far outweigh any gains for rearing species during summer months.

e. Page 20, Alternatives and Possible Mitigation, No. 2, Select a different low flow on the Cedar. DOE concluded that none of the alternative flows presented would be significantly better for fisheries than the existing proposal.
51 As indicated in our prepared statement at the DOE hearing we disagree with this statement. We also wonder if it is proper for DOE to make such judgments, since the Departments of Game and Fisheries are the state agencies given these resource responsibilities.

f. Page 22, Appendix i, Summary. The minimum flows established in the Cedar
52 River were based upon studies conducted by the Department of Fisheries and the U.S. Geological Survey. This was not a unilateral study. The same paragraph refers to those flows being declared "optimum" in that they provide for enhancement of the resource. We have carefully avoided referring to these flows as being optimum, and reiterate that they will not optimize salmon production in the Cedar River.

Appendices iii and iv include reports by FRI and the Department of Fisheries. A earlier report by the Washington Department of Fisheries entitled "Sockeye Salmon Escapement
53 Goal for the Cedar River", Washington Department of Fisheries, May 16, 1977 also provides pertinent information, and you may wish to consider its inclusion.

54 We again reiterate our support for the Instream Resources Protection Program, and greatly appreciate your considerable efforts in the difficult task of establishing flows that will satisfy frequently conflicting interests.

Sincerely,

Gordon Sandison
Director

mr

cc: Game

enclosures

STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF TRANSPORTATION KF-01

July 12, 1979

Ms. Jeanne Holloman
Department of Ecology, PV-11
Olympia, Washington 98504

Washington State Department of Ecology
Cedar – Sammamish Basin Instream
Resources Protection Program
Supplemental Draft Environmental
Impact Statement

Dear Ms. Holloman:

55 We have reviewed the subject document and have no comments to offer regarding the proposal.

Thank you for the opportunity to review this information.

Sincerely,

ROBERT S. NIELSEN
Assistant Secretary
Public Transportation and Planning

By: WM. P. ALBOHN
Environmental Planner

RSN:cm
WPA/WBH

cc: J. D. Zirkle
R. Albert
Environmental Section

T.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Room 360 U. S. Courthouse; Spokane. Washington 99201

July 24, 1979

John F. Spencer, Assistant Director
Office of Water Programs
Washington State Department of Ecology
Olympia, Washington 98504

Ref. Review Comments – Cedar-Sammamish Basin Instream Resource Protection Program

In review of the draft Instream Resource Protection Program document for the Cedar-Sammamish Basin, we have made the following observations:

56 Withdrawals from the Cedar River for irrigation use are not shown on Figure 4.

57 Irrigation use is not mentioned in paragraph 3, page 12.

58 Irrigation use should be included under Consumptive and Partially Consumptive Uses, page 15. Total acres presently irrigated from the Cedar River are estimated at 1100 acres. Total diversion requirement is estimated at 2400 acre feet per year. Irrigation water distribution requirements for the Basin are 4% - May, 20% - June, 33% - July, 29% - August, and 14% - September.

Galen S. Bridge
State Conservationist

cc: Maurice Jernstedt, Spokane SCS
Warren Lee, Bellevue SCS
Joe Henry, Renton SCS

U.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Environmental & Technical Services Division
P.O. Box 4332, Portland, OR 97208

July 31, 1979 FNW5:WDP

Mr. John F. Spencer
Assistant Director
Department of Ecology
Olympia, Washington 98504

Dear Mr. Spencer:

We have reviewed your draft document entitled "Cedar-Sammamish Instream Resources Protection Program Including Proposed Administrative Rules, and Draft Supplemental Environmental Impact Statement (Water Resources Inventory 8)" and have the following comments:

General Comments

The majority of our comments will address instream flows and flood control protection for anadromous fish for the proposed Corps of Engineers Flood Damage Reduction project on the Cedar River.

59 We estimated that the annual average benefits for sockeye salmon would be approximately $2.7 million dollars for 55,000 acre feet of storage with control flows of 2,500 cfs (letter attached). In an October 8, 1978 letter from our agency to the Corps of Engineers we recommended that the following instantaneous minimum stream flows for anadromous fish be maintained from the City of Seattle diversion dam to Lake Washington in order to assure the sockeye salmon benefits.

↓

A. September 1 thru October 31: Linear increase from 130 cubic feet per second (cfs) on September 1 to 500 cfs on October 1.

B. November 1 to December 31: 500 cfs.

C. January 1 to January 15: Linear decrease from 500 cfs on January 1 to 370 cfs on January 15.

D. January 16 to June 30: 370 cfs.

E. July 1 to July 14: Linear decrease from 370 cfs on June 15 to 130 cfs on July 14.

F. July 15 to August 31: 130 cfs.

Stream flow augmentation from the proposed project would also provide about $60,000 additional benefits for steelhead trout.

Preliminary information from the Corps of Engineers indicates that with the above Corps project instream flows during the critical month of October can be equaled or exceeded 93% of the time. With this percentage of reliability sockeye benefits should be assured.

Specific Comments

CEDAR-SAMMAMISH BASIN DOCUMENT:

SUMMARY

PROPOSED ACTIONS

Page 6, paragraph 3. The proposed adjusted instream flows for normal and critical years
for the Cedar River are unacceptable to our agency with the proposed Corps of
60 Engineer's project. These flows will not provide sufficient instream flows necessary to
achieve the 500,000 average annual run size for sockeye salmon. As we indicated in our
General Comment section, we recommended higher minimum instream flows than the
Department of Ecology's recommended normal year flows.

CURRENT ADMINISTRATIVE STATUS

Page 16, paragraph 3. In order to avoid serious low flows in the Cedar River during
61 critical flow years, we recommend that the Department of Ecology consider implementing
plans for water conservation measures with the Seattle Water Department.

APPENDIX B.

DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

CEDAR-SAMMAMISH BASIN INSTREAM RESOURCES PROTECTION PROGRAM

PROPOSED ACTION

Page 1, paragraph 6. We recommend that a public hearing be held whenever the Director
of the Department of Ecology proposes to authorize flows below normal year flows. A
62 public hearing would provide a means for the public and agency representatives to
evaluate the impacts of a lower stream flow regime.

EXISTING CONDITIONS AND ENVIRONMENTAL EFFECTS

Municipal and Industrial Water Supply

Cedar Masonry Dam Improvements

Page 9, paragraph 3. We estimated an annual average benefit of $2.7 million dollars for
sockeye salmon after the proposed flood damage reduction project of the Corps of
Engineers is constructed. It appears to our agency that sockeye salmon provide the largest
63 single monetary benefit for the Corps of Engineer's project. Without adequate instream
flows for sockeye salmon a serious loss of benefits to this project would occur.

Page 9, paragraph 5. This paragraph states that "if instream flows are set significantly
higher than the FRI values the project might not be built as proposed because of a lower
64 benefit/cost ratio." Our agency recommended an instream minimum flow regime to the
Corps of Engineers (October 8, 1978 letter) for benefit of anadromous fish. This flow
regime was coordinated with the Washington Department of Fisheries, Washington
Department of Game, and U.S. Fish and Wildlife Service. The most recent Corps of
Engineers model uses these recommended flows to protect instream values. To date, the
Corps of Engineers has not shown any indication that these recommended flows would
not be feasible for their project.

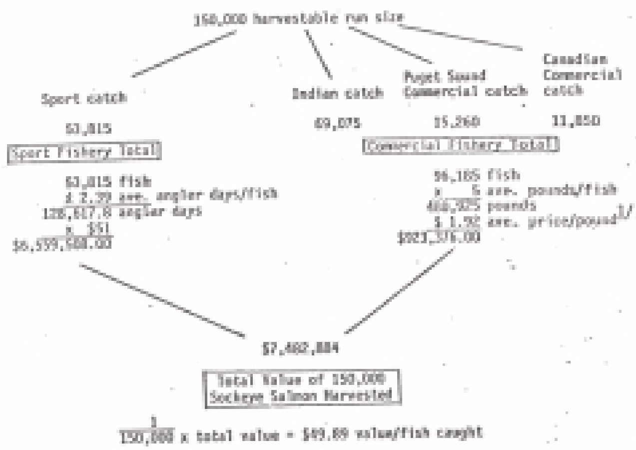
Sincerely yours,

for Dale R. Evans
Division Chief

Attachment

cc: Washington Department of Fisheries
Washington Department of Game
Fish and Wildlife Service, ES, Olympia

Table 1. Calculation of Net Monetary Value of Average Cedar River Sockeye Salmon Harvest With Project - Calendar Year 1978



1/ Personal communication, Dale Ward, WDF

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Environmental & Technical Services Division(FNW5)
P.O. Box 4332, Portland, Oregon 97208

January 17, 1979 FNW5:WDP

Mr. Sydney Knutson, Asst. Chief
Engineering Division
Seattle District, Corps of Engineers
Seattle, Washington 98124

Dear Mr. Knutson:

We are providing an update of flood control benefits for Cedar River sockeye
65 salmon as requested in your letter dated December 13, 1978.

Sockeye salmon benefits were derived by applying the most recently available economic evaluation for sport-caught salmon (Charbonneau and Hay, March 1978) and the 1978 average ex-vessel price per pound for commercial and Indian-caught sockeye. The $28 per angler day previously used to estimate the benefit for sport-caught sockeye has been updated to $51 per angler day[1/]; the $1.00 per pound used to estimate the benefit for commercial and Indian-caught sockeye has been updated to $1.92 per pound[2/]: The average value per sockeye caught is estimated to be $49.89 (table 1 enclosed).

The 55,000 acre-feet of storage alternative, which has a control flow of 2,500 cubic feet per second at Renton, will have an annual sockeye benefit of $2,694,000 (table 2 enclosed).

We hope this information will be helpful in the preparation of your draft feasibility report. If you have questions regarding these benefits, please contact Bill Parente at FTS 8-429-4093.

1/ Paper presented at the 43rd North American Wildlife and Natural Resources Conference by Charbonneau, J. John and Michael Hay March 1978.
2/ Personal communication, Dale Ward, WDF

Sincerely yours,

Dale R. Evans
Division Chief

Enclosures

cc: Gary Engman, WDG, Olympia w/enc.
Grant Fiscus, WDF, Olympia w/enc.
Martin Kenny, FWS, Olympia, w/enc.

Table 2

Curve B

Based on 33,000 acre-feet of storage in Chester Morse Lake – 10 year

Control Flows (cfs)	Area (inches^2)	Sockeye Production Increase (numbers)[1/]	Average Annual Benefits
2,000	4.34	43,400	$2,165,226
2,500	4.09	40,900	2,040,501
3,000	3.50	35,000	1,746,150
3,500	2.51	25,100	1,252,239
4,000	1.98	19,800	987,822

Curve C

Based on 55,000 acre-feet of storage in Chester Horse Lake – 25 year

Control Flows (cfs)	Area (inches^2)	Sockeye Production Increase (numbers)[1/]	Average Annual Benefits
2,000	5.68	56,800	$2,833,752
2,500	5.40	54,000	2,694,060
3,000	4.82	48,200	2,404,698
3,500	3.84	38,400	1,915,776
4,000	3.17	31,700	1,581,513

1/ $49.89 value/fish caught

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services

2625 Parkmont Lane, S.W., Bldg. B-3

Olympia, Washington 98502

V.

August 1, 1979

John F. Spencer, Assistant Director
Office of Water Programs
Washington Department of Ecology
Olympia, WA 98504
ATTN: Hearing Officer

Dear Mr. Spencer:

We have reviewed your draft Cedar-Sammamish Basin Instream Resources Protection Program. Your agency should be aware that flow recommendations for the Cedar River were contained within our draft Fish and Wildlife Coordination Act Report dated September 21, 1978 on the Corps of Engineers' proposed Cedar River Flood Reduction Project. These flow recommendations were developed in cooperation with Washington Department of Game, Washington Department of Fisheries and National Marine Fisheries Service. A copy of this report was sent to the Department of Ecology for review on January 30, 1979.

66 ↓

The flow recommendations contained in our fish and wildlife report were based upon the proposed modification of Masonry Dam and construction of a new channel near the crib dam which would increase the active storage of Chester Morse Lake. Based upon the increased storage of the lake, we recommended the following streamflow regime be incorporated into the proposed project:

> Maintain an instantaneous streamflow regime for resident an anadromous fish from the City of Seattle's Masonry Dam to Lake Washington. The following streamflows as measured at the City of Renton gauging station would be necessary to guarantee that flood control benefits to anadromous fish are realized:
>
> September 1 to October 31: Linear increase from 130 cubic feet per second (cfs) on September 1 to 500 cfs on October 31.
>
> November 1 to December 31: 500 cfs.
>
> January 1 to January 14: Linear decrease from 500 cfs on January 1 to 370 cfs on January 14.

Save Energy and You Serve America!

January 15 to June 30: 370 cfs.

July 1 to July 14: Linear decrease from 370 cfs on June 30 to 130 cfs on July 14.

July 15 to August 31: 130 cfs.

67 Adequate streamflows are of critical importance to anadromous and resident fish which utilize the Cedar River. Sockeye and chinook salmon and steelhead trout utilize the mainstem Cedar River for spawning and rearing while coho salmon primarily use tributary streams for spawning and use the mainstem for rearing.

68 In addition it should be noted that the Cedar River contains the largest run of sockeye salmon in the 48 contiguous United States. During 1968-1976 the Lake Washington watershed has produced runs averaging 276,000 sockeye salmon annually prior to harvest. Fishery removals by all gear during this same nine-year period averaged 82,000 fish with the highest catch being 371,000. In 1977, the Cedar River produced a record run of 561,000 adult sockeye salmon (catch plus 1977 Cedar River spawning escapement).[1] The average value per sockeye caught is estimated to be $49.89.[2] With large annual runs of sockeye and the economic values associated with this fishery, we strongly recommend the streamflow regime discussed above be adopted by the State of Washington.

69 We are particularly concerned about drought years when the Cedar River may be operated below minimum streamflow levels which will be adopted by your agency. We request that when established flows cannot be maintained that Washington Department of Fisheries, Washington Department of Game, National Marine Fisheries Service and our agency be notified in advance of the situation and a meeting be held to discuss a modified streamflow regime. In such situations as a drought year we would expect that City of Seattle to initiate an immediate water conservation contingency program. We envision such a program would be of considerable help in alleviating serious low flow conditions which could seriously jeopardize the fishery resources of the Cedar River.

We appreciate the opportunity to review this draft document.

Sincerely,

Gary L. Kline
Acting Field Supervisor

cc: NMFS, Portland, Attn: Bill Parente
WDF, Olympia, Attn: Grant Fiscus
WDG, Seattle, Attn: Gary Engman

1/ Grant Fiscus; Washington Department of Fisheries, Olympia; Personal communication, August 1978.

2/ National Marine Fisheries Service's letter dated January 17, 1979 to Seattle District, Corps of Engineers.

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION X
1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

Reply to Attn of: M/S 443

AUG 2 1979

John F. Spencer
Assistant Director, Office of Water Programs
State of Washington, Department of Ecology
Mail Stop PV-11
Olympia, Washington 98504

Dear Mr. Spencer:

We have completed our review of the draft Cedar-Sammamish Basin Instream Resources Protection Program and draft Supplemental Environmental Impact Statement. We have the following comments for your consideration.

70 The document discusses impacts primarily in qualitative terms. While in some cases this may be necessary due to the lack of information, we feel that some of the impacts could be quantified. One specific example is the effects of this proposal on the various City of Seattle water supply proposals described in COMPLAN, published this spring.

71 The document should include more information on existing and future water quality. This should include a description of the state water quality standards, past violations, and an evaluation of how these proposals might help achieve these standards.

72 The document would be clearer if some of the terms used throughout the document were better defined. What is the difference between critical year flows and the existing minimum flows? How will these new critical year flows affect the actual amount of water flow compared to the existing minimum flows? Are there sufficient amounts of unappropriated water left in all waterways to meet these flows? Will the lower minimum flow requirements during the nonsummer months beneficially affect the availability of water for instream flows during the summer months? (Compare Figures 2 and 3).

We appreciate the opportunity to comment on this document.

Sincerely,

Alexandra B. Smith, Chief
Environmental Evaluation Branch

X.

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
PO BOX C-3755
SEATTLE, WASHINGTON 98124

NPSEN-PL-RP

26 JUL 1979

Hearing Officer
Washington State Department of Ecology
Olympia, Washington 98504

Dear Sir:

The U.S. Army Corps of Engineers supports the Washington State Instream Resources Protection Program for the Cedar-Sammamish River basin. Though the relatively short review period has not permitted the Seattle District to fully evaluate the effects of the
73 proposed Cedar River instream flows on existing or proposed Corps projects, we believe the information provided by this program will be helpful in planing for the optimum use of water resources within the basin.

The Federal Government is legally entitled to natural flow from the Cedar River for
74 operation of Hiram M. Chittenden Locks. However, the Corps of Engineers supports a management program which seeks to conserve the resource so that water needs of fisheries, water quality, hydropower, navigation and municipal and industrial supply may be met.

We appreciate the opportunity to review and comment on your program.

Sincerely,

HARRY [illegible]. CARPENTER, JR.
Lt. Colonel, Corps of Engineers
Acting District Engineer

y.

ROBINSON & NOBLE, INCORPORATED

August 16, 1979

Hearing Officer
DEPARTMENT OF ECOLOGY
Olympia, WA 98504

Mail Stop P.V.-11

Subject: Cedar-Sammamish Basin Instream Resources Protection Program Including Proposed Administrative Rules, and Supplemental Environmental Impact Statements (Water Resource Inventory Area 8) Draft, 1979

Gentlemen:

We have reviewed the above documents and respectfully request that you consider these comments, even though they are after the August 1, 1979, acceptance date.
75 Unfortunately, we were not aware of the proposed rules until August 7th and received the Draft on August 9th. We understand that many of the water purveyors (including KCWD
↓ 82) in the affected area were not made aware of the proposed rules until very recently.

The intent of the proposed rules, to minimize the possibility of over-allocation of water resources, is justified. However, the potential conflicts complicate enactment, and could obscure the intent. The conflict between the Corps of Engineers and the City of Seattle is well documented. We are concerned that these interests may override the interest of other water purveyors in the area. These other interests are equal to those of the Corps or the City of Seattle.

Many water purveyors in the area utilizing ground water which may have hydraulic connection to surface waters in the area. The new section, WAC 173-508-050 GROUND WATER, which states: “Ground water in direct hydraulic continuity with surface water shall be considered part of the drainage system …” could have tremendous impact. In fact, as stated, the act virtually curtails all ground water development in the drainage basin.

We respectfully request that those sections of the Rules dealing with ground water be rewritten to allow conditional use of the resource. Where investigation shows no significant detrimental effect, water rights should be granted. Permits for ground water development should be issued to those purveyors who propose thorough ground water investigation to determine the impact of their proposed withdrawals.

Except for that portion which evaporates or transpires, all ground water withdrawn is returned to the hydrologic system, as direct run-off or as septic effluent. In most cases, the amount of diminishment should be immeasurable. In addition, some pumped ground water may actually bring water into the drainage basin. Credit for such water brought into the basin should also be granted.

In our opinion these changes are vital to the code. If any of these suggestions require further explanation, please contact us.

Sincerely yours,

ROBINSON & NOBLE, INC.
Ground Water Geologists

James R. Carr
Vice President

JRC/in
c.c. Eastside Consultants, Inc.
King County Water District 82

RESPONSES TO LETTERS OF COMMENTS

APPENDIX VII

Responses to Comments

Responses are keyed to numbers which appear on the comment letters.

PUBLIC HEARINGS

A. Response to Mr. Howard Capple:

1-2. The Instream Resources Protection Program has no authority over land development or siltation of streams resulting from related construction activities. A statewide assessment of urban runoff problems is currently being planned by the Department of Ecology. METRO-Municipality of Metropolitan Seattle is now involved in several activities to improve water quality and conditions for salmon enhancement in many of the small streams in the Cedar-Sammamish Basin. The activities include cleanup of debris and removal of natural obstructions in the streams.

3. The WWIRPP Program will help retain fish habitat by maintaining flow levels.

4. This problem has been referred to DOE's regional water management people.

5. The King County Soil Conservation District reviews subdivision development plans and, for a fee, will develop an urban runoff control plan for proposed projects. If used by developers, this service should result in mitigation of stream siltation and stream bottom sedimentation.

6. It is our feeling that the Instream Resources Protection Program is a means of alerting people to the water resource management activities of the Department of Ecology in individual Water Resource Inventory Areas.

   We welcome, and freely solicit, via our program review and public meeting/hearing process, the input of private citizens as well as government agencies and private organizations. Thank you for your participation.

B. Response to Department of Game: Thank you for your support. Additional comments are in the WDG letter of comment and DOE responses in the following section.

C. Response to Department of Fisheries: Thank you for your support. Your reservations in accepting the proposed flows are noted. For additional comments, see WDF letter and DOE responses in the following section.

D. <u>Response to Mr. Paul Locke</u>: It is the purpose of the Instream Resource Protection Program to assure adequate water in the state's streams and lakes to permit management of the water resources for maximization of multiple uses such as you mention. It is our position that current diversions in the Cedar-Sammamish hydrologic system are taxing the resource to limits beyond which maximum utilization of multiple uses could be achieved.

Page 15 of the above document contains discussion of hydropower generation.

E. <u>Response to Robert Leaver of DSHS</u>: We agree that use of the Cedar River for municipal water supply purposes is very important. The proposed instream flows will allow as much as 170 million gallons per day of firm water supply from that system when the multipurpose storage project is brought on line. This is an increase of 20 million gallons per day over present use and double the present firm water supply. The Cedar River is not exclusively a water supply source. It also supports important runs of salmon, steelhead, and resident fish and wildlife and supports important recreational use.

It is not the intent of the department to foreclose further utilization of ground water. Ground water is recognized as a significant source of water supply, particularly in suburban and rural areas. The department's intent is, however, to protect surface water from depletion from nearby ground water withdrawals. Section 173-508-050 of the proposed rules has been changed to try to clarify this intent somewhat. A standard operating procedure is being developed in conjunction with this program to provide procedures and standards for determining the potential effects on surface water from proposed ground water development. The Water Resources Act of 1971 provides guidance to the department in this regard where it says, "Full recognition shall be given in the administration of water allocation and use programs to the natural interrelationships of surface and groundwaters" (RCW 90.54.020(8)).

F. <u>Response to King County Outdoor Sports Council</u>: Thank you for your support.

G. <u>Response to Seattle Water Department:</u>

The position of the Department of Ecology regarding Seattle's existing water right claims is that Seattle may be entitled to its historical maximum diversion is probably covered (137 million gallons per day). The department must insist, however, that any further development of capacity, i.e., up to the full firm yield will require that Seattle apply for permits to appropriate state waters.

The proposed instream flows are the result of compromise by all interested parties. Seattle may prefer lower summer flows and lower and later fall flows. Fisheries agencies, naturally, would prefer just the opposite. We believe the proposed flows are an appropriate compromise.

The definition of critical and normal year curves and expected frequencies are in the program document text and proposed rules. The net benefits comment is answered in Response 13 in the following section.

H. Response to Washington State Association of Water Districts: Noted.

I. Response to Northwest Steelhead and Salmon Council: Please see comments submitted by the departments of Fisheries and Game.

J. WAC 173-508-050 - Ground water, has been revised.

K. <u>Responses to Ed J. Foster:</u>

1. Noted, thank you.

2. Your point is well taken. In the future, more consideration will be given to the convenience of affected parties in the selecting of sites for public hearings for the Instream Resource Protection Program.

3. Your name has been placed on the mailing list to receive the "Environmental Watch", a newsletter that announces public hearings and meetings.

L. <u>Responses to Puget Sound Power and Light Co.:</u>

4. Noted

M. <u>Responses to City of Seattle:</u>

5. Noted, thank you.

6. Noted

7. Please refer to:

   a. Department of Ecology. Office Report No. 69, A Documentary of the Activities of the Cedar River Water Resource Management Ad Hoc Committee 1976-1979. Prepared by Jeanne Holloman, June, 1979 (See pages 20-27).

   b. Appendices iii and iv, Cedar-Sammamish Basin Instream Resources Protection Program Supplemental EIS. (Appendix B of this document)

8. The City of Seattle filed a water right claim in 1974 for an annual average diversion rate of 465 cfs (300 mgd) and storage rights of 160,000 acre-feet. The amount of 465 cfs was claimed for the present (1974) and determined future development of the City of Seattle municipal and industrial water supply system. The highest annual average diversion rate from the Cedar River by the Seattle Water Department has been 212 cfs (137 mgd).

   The department has now determined, based upon conclusions drawn from the Cedar River Ad Hoc Committee studies and negotiations that no additional water is available in the Cedar River for appropriations over and above those currently being diverted during normal years and that during critical flow periods, it may be necessary to curtail even normal diversions.

   In the event that Seattle wishes to expand its diversion facilities in the future, in conjunction with the proposed multipurpose storage project on the Cedar River, it is the position of the Department of Ecology that a water right application will have to be filed and a permit obtained prior to beginning construction.

9. Noted: Adjudication would finally determine the City's water rights. See responses G and 8.

10. Noted

11. Although the Department of Fisheries can get by with lower instream flows during the early part of the summer, this happens to be a critical period for the steelhead and anadromous fish. The Department of Game requested an absolute minimum of 130 cfs.

    The FRI Study looked at the sockeye salmon program and did not consider the need for other anadromous fish, water quality, lockage, lake level, etc.

12. The 1967 year was not a typical runoff year for the Cedar River. The large and late sockeye escapement and the lack of significant flooding during the 1967-68 winter probably accounted for the resulting high adult run size. The return rate was still below calculated and below normal return per spawner.

13. The Water Resources Act of 1971 provides fundamentals to guide the department in its water resources management and planning functions. Among these is declaration of beneficial uses (RCW 90.54.020(l)), the provision regarding allocation of water resources based generally on securing maximum net benefits to the people of the state, (RCW 90.54.020(2)), and that in the protection of the natural environment, rivers and streams of the state shall be retained with base flows necessary to provide for preservation of instream uses (RCW 90.54.020(3)(a)).

    This act, when considered in combination with the Chapter 90.22 RCW (Minimum Water Flows and Levels), provides a very strong priority for the establishment of instream flows in the state's rivers and streams.

    It is the department's view that the maximum net benefits policy is designed primarily, taking all the fundamentals of the Water Resource Act of 1971 into account, to apply to that portion of the water resources above the minimum instream flow requirement mandated by RCW 90.54020(3)(a). See also Chapter 90.22 RCW.

14.

a. Section 173-508-050 - Ground water has been rewritten to allow more flexibility for groundwater use. See Response No. E.

b. Deletion made.

c. With all due respect, we will not do this. We believe the flows as proposed are an appropriate compromise acceptable in the long run to all interested parties.

d. Same response as 14 c, above.

e. Revised to incorporate.

15. Noted, thank you.

16. The Basin Document, including proposed instream flows and supplemental EIS, has been reviewed by the individual ad hoc committee members and the agencies which they represent. The comments of those agencies are incorporated herein.

17. Revised accordingly.

18. Refer to responses G, 8, and 9.

19. Noted. Refer to appendices iii and iv of the supplemental EIS for detailed narrative of Stober's work and Department of Fisheries response.

20. Noted

21. DOE is concerned with multiple instream uses. Historically, flows adequate to provide the propagational needs of anadromous fish provide enough water to meet other needs such as recreation and water quality. We endeavored to coordinate alternative flows recommended by: 1) the Corps of Engineers for navigational needs, including lock operation, saltwater flushing, and maintenance of surface water elevation in Lake Washington; 2) Department of Fisheries for propagation of fish; 3) Department of Game for propagation of sports fish; and, 4) Seattle Water Department for municipal and industrial supply.

    Please note the table on page 23 indicates that the Corps of Engineers 2025 lockage requirements for a 1 in 50 years drought flow is 140 cfs during August. This is 10 cfs higher than the DOE proposed normal year flow for that same month.

22. The 1977 sockeye salmon escapement of 435,000 does not support your assumption, even though the 1978 escapement dropped to 290,000. This was still 164,000 above the 1974 figure of 126,000. The latest information from the Department of Fisheries (WDF) indicates that the escapement in 1979 from the

1975 flood year return will be over 250,000. Information from the WDF 1979 Progress Report has been added to the EIS.

23. Correction made.

24. Comment noted.

25. Please refer to the Departments of Fisheries and Game comment letters as well as responses 33 through 54 and 51.

26. We disagree.

27. If we are correct in our interpretation of your referral to "methodologies," you are speaking solely of the USGS mathematical process of establishing a flow curve which was applied by both WDF and FRI for developing minimum flows. In our use of the term "methodologies," we are referring to the entire system of methods applied to establishment of the flow curves. This includes the different field methods used by WDF and FRI to generate data upon which basic assumptions were developed in each study.

    You are correct in your statement that a very important difference exists between estimation of <u>potential</u> and actual spawning area. Please refer to appendices iii and iv of the EIS which explore the Cedar River minimum flow issues. Also see Response 22.

28. The paragraph you refer to is part of the summary of the report of the negotiations of the Cedar River Ad Hoc Committee.

    Our "different purposes underlying the two studies" refers to: 1) the purpose of the Department of Fisheries study to relate spawnable area available to certain flow levels; and 2) the purpose of the Fisheries Research Institute Study to determine the <u>efficiency</u> of flows in relation to fish production. (See Cedar River Report, pages 20-26, 37, 38. See also appendices iii and iv of the Supplemental Environmental Impact Statement, and Response 27).

29. Please refer to the letters of comment from the departments of Fisheries and Game and DOE responses.

N. <u>Response to METRO:</u>

30. Thank you for your letter and the information it contained. Your point concerning the temperature in the Cedar River is well taken, and this information has been added to the text of the EIS.

O. Response to City of Renton:

31. See Response E in the earlier section responding to public hearing comments.

P. Response to King County Water and Sewer District 82:

32. See Response E in the earlier section responding to public hearing comments.

Q. Responses to Department of Game:

33. Noted, thank you.

34. Comment noted.

35. The specifics for this will be provided in the standard operating procedures.

36. Noted. This will be considered in development of standard operating procedures. Existing and planned emergency water conservation measures will be an important consideration in evaluation of a request for relief from the normal year flow requirements.

37. Thank you. Information has been incorporated.

38. Thank you. Information has been incorporated.

R. Responses to Department of Fisheries:

39. We expect that a full evaluation of the results of the adopted flows will be carried out in the five year (or before) review.

40. Noted, thank you.

41. This paragraph is misleading. It was developed as a part of the overall Western Washington Instream Resource Protection Program, and will be implemented in most other basins for which less information is available than was the case for the Cedar-Sammamish Basin. The paragraph has been revised to more accurately reflect activities in the Cedar-Sammamish Basin.

42. Document text has been revised to incorporate your information.

43. Sentence deleted from text.

44. Noted. We agree that potential production will be affected by lower than normal flows due to loss of spawning area and rearing area. Whether such incremental effects are substantial is a subjective judgment.

45. Noted.

46. The real flow exceedance for October with the Corps' project will not be known until all design studies have been completed.

47. This is a good point. The section has been modified to include the sockeye status report.

48. Correction made.

49. Correction made.

50. If future experience indicates that this is the case, then changes to the summer flows may have to be considered. The five year(or sooner) review should provide this opportunity.

51. It appears that you have misread the statement. It reads "tables and graphs have been presented showing the various flows proposed over the years. Given the debate over the optimum flow for fisheries, it is difficult to make a definitive statement, but, <u>given the other existing uses of the river, DOE feels that none would be significantly better for fisheries than the proposal.</u>

52. Correction made.

53. This report has been added to Appendix iv.

54. Noted, thank you.

S. <u>Response to Department of Transportation</u>

55. Noted.

T. <u>Responses to U.S. Soil Conservation Service:</u>

56. The purpose of Figure 4 is to illustrate continuity in the Lake Washington hydrologic system. Although Seattle's hydropower and water diversion facilities are located, it would be impossible to depict the numerous minute sites of irrigation withdrawals.

57. Paragraph 3, page 12 lists instream uses. Irrigation is an out-of-stream use.

58. Good point. Your information concerning irrigation from the Cedar River has been incorporated under "Consumptive and Partially Consumptive Uses", page 15.

irrigation permits in the overall Water Resource Inventory Area are listed in Appendix vi of the Supplemental EIS.

U. Responses to National Marine Fisheries Service:

59. Your proposed flows are related to increased storage that would be available with the Corps of Engineers proposed flood reduction project and sockeye salmon average annual run size of 500,000 fish. Instream flows will be established regardless of whether the project is authorized. Please refer to the letters of comment from the departments of Fisheries and Game and the DOE responses.

60. We have been informed by the Washington Department of Fisheries that the sockeye salmon escapement goal remains at 350,000. Your recommendation is noted. See comments from the departments of Fisheries and Game.

61. Good recommendation. We will consider conservation practices in the development of standard operating procedures for implementation of the instream flow regulations. See Response 36.

62. If and when it becomes necessary for the director to authorize flows below normal year flows, the time element will preclude the lengthy public hearing process. It will be necessary to rely upon established operating procedures.

63. Please refer to Response 59.

64. Please refer to Response 59.

65. Please refer to Response 59.

V. Response to U.S. Fish and Wildlife Service:

66. See Response 59.

67. Noted, this paragraph has been inserted into the text.

68. Noted, we have added information from the Department of Fisheries. See Response 47.

69. Your concern about drought conditions making necessary a departure from normal year flows is acknowledged. It has always been our intent in this regard to seek the immediate involvement of state fishery agencies when a request to depart from the normal year curve is received. We will also be happy to inform the federal fisheries agencies as well and to discuss the modified flow requirements with you.

Evaluation of any proposal to depart from the normal year requirements will include consideration of existing or planned emergency water conservation measures outlined by the project operator.

These elements will be included in the implementing procedures (standard operating procedures) after adoption of the proposed rules.

W. Responses to U.S. Environmental Protection Agency:

70. The document has been as specific as possible regarding the COMPLAN. The specific quantity of water which would be affected by the proposed regulation will expand upon two factors not yet quantified: 1) a resolution of Seattle's existing water rights and, 2) a resolution of the specific quantity of waters which could result from the proposed Corps project.

71 The proposal will not improve water quality. It will help prevent further degradation by retaining instream flows (and thus dilution) at or near present levels. A section on water quality has been added.

72. "Critical year flow" is the absolute low streamflow that will be permitted during a critical dry year. Instream flows as low as the critical year flow will occur on a given stream on a frequency of approximately 1 in 50 years. Critical year flows will be established for all streams on which storage projects or water supply diversions are planned.

During the summer months when instream, flows are normally lowest, the critical year flow will protect 35 cfs more water in the stream than the existing minimum flow regulation (see figures 2 and 3). More storage will be required in the watershed before additional water can be appropriated.

More storage will provide better protection from instream flood damage and some stored water can be used to augment streamflow during low flow periods.

X. Responses to U.S. Army Corps of Engineers:

73. Noted.

74. Noted.

Y. Response to Robinson & Noble Inc.:

75. Thank you for your support. Your concerns for ground water are legitimate, and we have revised the proposed regulations to more adequately consider ground water resources. See also Response E in the earlier section responding to public hearing comments.