

UPPER SACRAMENTO RIVER SALMON AND
STEELHEAD ADVISORY COMMITTEE

REPORT NO. 5

An Evaluation of the U.S. Department of Commerce 1987
Ten Point Program to Restore Sacramento River
Winter-Run Chinook Salmon

June, 1988

FOREWARD

In 1982 Mr. E. C. Fullerton, then Director of the California Department of Fish and Game (DFG) appointed a Citizens' Advisory Committee, The Upper Sacramento River Salmon and Steelhead Advisory Committee, to address salmon and steelhead problems in the Upper Sacramento River. He specifically asked the Committee to investigate those problems which were believed to be causing the precipitous decline in salmon and steelhead spawning populations, and to recommend corrective actions.

Since 1982 the Committee has investigated and produced comprehensive reports on four problem areas, which include numerous recommendations for corrective action. These reports include (1) Red Bluff Diversion Dam and the Tehama-Colusa Fish Facility, dated July 1983; (2) Coleman National Fish Hatchery, dated August 1984; (3) Chico Landing to Red Bluff Project, dated March 1985; and (4) Glenn-Colusa Irrigation District and the Sacramento River Fishery, dated September 1986.

This report addresses the adequacy of the United States Department of Commerce Ten Point Restoration Program for winter-run salmon in the Sacramento River.

Following is a list of current members of the Upper Sacramento River Salmon and Steelhead Advisory Committee.

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ABSTRACT

Winter-run salmon in the Sacramento River declined from a high of more than 117,000 in 1969 to less than 1,200 in 1980. The spawning population in 1988 is estimated to be less than 1,500 fish. The Committee evaluated a ten point winter-run salmon restoration program advanced by the U.S. Department of Commerce (DOC) which lists ten of the most important problems that must be corrected in order to insure restoration of winter-run salmon. The Committee report describes progress on each of the ten points and analyzes the program's effectiveness.

The Committee concludes that although the program is well intentioned and has achieved some progress to date, it does not provide sufficient grounds to delay listing the winter-run salmon as a threatened or endangered species under both the United States and California endangered species acts.

INTRODUCTION

Numbers of adult winter-run salmon that spawn in the Sacramento River declined from a high of more than 117,000 in 1969 to less than 1,200 in 1980. By 1987 their numbers still remained at a near extinction level of less than 2,500 fish. In 1988, the run is estimated to be less than 1,500.

The California Department of Fish and Game (DFG) issued a status report in 1985 summarizing what was then known about winter-run salmon, and in which the drastic decline in this species was described. In 1985 the American Fisheries Society (AFS) filed a petition to have winter-run salmon listed as a threatened species under the Federal Endangered Species Act. In 1986 the Sacramento River Preservation Trust and Tehama Fly Fishers filed a joint petition to have winter-run salmon listed as an endangered species under the California Endangered Species Act.

The DOC produced a "finding" in 1987, relative to the AFS petition that winter-run salmon did not need to be listed because an adequate restoration program for winter-run salmon already existed. This "finding" was published in the Federal Register on February 27, 1987, and it outlined a ten point restoration program. In early 1988, the California Fish and Game Commission accepted the joint Sacramento River Preservation Trust - Tehama Fly Fishers endangered species petition and listed winter-run salmon as a candidate species. Thus far, neither the United States nor the State of California have listed winter-run salmon as an endangered species.

This report evaluates the adequacy of the ten-point restoration program.

THE TEN POINT RESTORATION PROGRAM

Each of the ten points of the DOC restoration program is discussed separately below.

1. Raise Red Bluff Diversion Dam (RBDD) Gates from December 1 to April 1

Purpose:

The purpose of raising the gates at the Red Bluff Diversion Dam (RBDD) from December 1 to April 1 is to reduce the blockage of returning adult salmon and the loss of outmigrating juvenile salmon during that period.

The delay of adult salmon passing RBDD when the gates are down (closed) is related to flow, i.e., the greater the flow between 4,000 and 16,000 cubic feet per second, the longer the delay by those fish which eventually pass through the fishways. In addition, almost 38 percent of the winter-run salmon that approach the dam when the gates are down fail to pass and are forced to spawn downstream, where water temperatures are too warm for successful spawning during most years. Only about two-thirds of the total winter-run salmon that pass RBDD each year do so during the December 1 to April 1 period. Juvenile salmon produced by winter-run salmon that spawn successfully upstream from Red Bluff pass RBDD on their way to the sea primarily between late August and mid-November, when the dam gates are down.

Progress:

During the winter of 1986-87, the BR raised RBDD gates from December 1 to April 1 (except for 13 days in late January and early February) to provide unimpeded passage for adult salmon. This resulted in a desirable shift in the 1987 salmon spawning distribution as less than 10 percent of the total winter-run salmon spawned downstream from Red Bluff, where water temperatures were again unsatisfactory for successful production. However, in 1987-88, the gates were raised only from December 1, 1987 until February 18, 1988, and from March 5 to March 10, 1988. This resulted in approximately 80% of the winter run being blocked or delayed at Red Bluff.

Concerns:

Opening the gates at RBDD in 1986-87 and 1987-88 appears to have made a positive contribution towards winter-run salmon recovery. However, there is no binding commitment by BR for future gate openings. When the gates will be opened depends entirely on the discretion of BR. That BR places the interests of consumptive water users over the interest of winter-run salmon is illustrated by the gate closings in the 1987-88 period. In addition, the gate opening from December 1 to April 1 accommodates only two-thirds of the annual adult run and none of the juveniles migrating seaward.

Recommendations:

It is recommended that RBDD gates be raised (opened) during the non-irrigation season (December 1 to April 1) to facilitate

adult salmon passage, and that BR undertake a legally binding commitment to raise the gates during that period. An initial interim agreement for a six-year period, or two life cycles of winter-run salmon, should be made immediately. If, during the six-year period evidence continues to mount indicating a positive contribution towards population restoration, the interim agreement should be made permanent. However, if evidence of a sufficiently positive contribution does not develop, it is recommended that further changes in RBDD operation be studied; including (1) an extension of the gate opening period beyond April 1; and (2) other sources of water for Tehama-Colusa Canal deliveries during the extension period.

2. Develop Winter-Run Chinook Salmon Propagation Program at Coleman National Fish Hatchery (NFH)

Purpose:

Artificial propagation at Coleman NFH is to be used as a means to help restore winter-run salmon. At present, Coleman NFH does not have the facilities necessary for a successful winter-run salmon culture program.

Progress:

In the past, mortality among winter-run salmon being held at the hatchery for spawning has been high due primarily to warm water temperatures and disease. Some of the major facilities needed to correct these fish mortality problems include a deep holding pond for adult fish in which the water temperature can

be maintained below 55° F. Inexpensive power to operate chillers is also necessary to maintain the desired water temperature and water treatment facilities to help eliminate disease problems.

To carry out the proposed winter-run salmon production program (release of 2 million smolts annually) and not interfere with present hatchery mitigation production goals, Coleman NFH would have to complete their proposed total Station Development Plan at a present estimated cost of \$22 million. Coleman NFH received an appropriation of only \$2.1 million for construction of an adult winter-run salmon holding facility (pond). The lowest bid received to carry out this construction was \$2.75 million. The earliest that construction on the holding facilities could now start would be in the spring of 1988; and the first winter-run salmon eggs could not be handled before the spring of 1989.

Concerns:

Neither adequate funds nor a comprehensive winter-run salmon plan exists for Coleman NFH, both of which are necessary if Coleman is to make a positive contribution towards restoration of this species. Because of the near extinct population, it is doubtful that an adequate source of winter-run salmon eggs can be obtained.

Recommendations:

Since a successful hatchery propagation program is an essential element in restoring winter-run salmon, it is recommended that the total Coleman NFH station development plan

be funded and carried to completion. This will insure facilities to propagate winter-run salmon if eggs are available, and it will also insure that winter-run production will not interfere with present hatchery production goals. It is also recommended that the funding to do this, as well as the funding for Coleman operation and maintenance be shifted from the U.S. Fish and Wildlife Service (FWS) to the CVP and BR.

In addition to Coleman NFH, other propagation facilities for winter-run salmon should be evaluated such as Feather River Hatchery and a special hatchery for winter salmon on Clear Creek.

3. Restore Spawning Habitat in the Redding Area

Purpose:

Severe degradation of much of the present winter-run salmon spawning area downstream from Keswick Dam has been caused by loss of gravel recruitment from above Keswick Dam. Spawning riffle restoration will be needed in order to increase natural reproduction to desirable levels. It will be needed more as restoration of the salmon population increases the number of spawning fish. At present some areas of the streambed downstream from Keswick are composed almost entirely of cobbles and boulders too large for successful spawning.

Progress:

No riffle restoration has been accomplished relative to the

DOC ten point program. The CFG has a small riffle restoration program at two sites in the Redding area, both of which are used primarily by fall-run salmon.

Concerns:

There is no funding, nor is there a firm plan for gravel restoration, which will be needed as the spawning population increases.

Recommendations:

It is recommended that a comprehensive plan be developed, funded and initiated for spawning riffle restoration in the area utilized by winter-run salmon, by the end of 1988. The funding and effort should be expanded as the salmon population increases.

4. Develop Measures to Control Squawfish at RBDD

Purpose:

Sacramento Squawfish are a major predator on juvenile fall-run salmon each spring immediately downstream from RBDD. Between 1978 and 1985 an average of 18,000 squawfish passed RBDD annually. In May and June, 1977, an estimated 12,000 squawfish were concentrated below RBDD that had a potential daily consumption rate in excess of 100,000 juvenile salmon. In June, 1977, squawfish sampled (captured) below the dam had consumed an average of almost- 1.5 juvenile salmon shortly before capture. Data are lacking relative to the effect of squawfish predation

on juvenile winter-run salmon which pass RBDD in the fall, but it is assumed to be a factor contributing to their decline.

Progress:

There has been no real progress towards squawfish control at RBDD relative to the DOC ten point restoration program.

The National Marine Fisheries Service (NMFS) has conducted a survey to determine the feasibility of commercial harvest and marketing of squawfish. The NMFS has also stated that they have entered into a contract with the University of California at Davis to "evaluate long-term physical or biological means of controlling the abundance of the population in the vicinity of RBDD" (update, Actions to Restore Winter-Run Chinook Salmon, Sacramento River, November-1987). However, upon contacting the University in mid-March 1988, (Dr. Peter Moyle) it was learned by the Committee that no such contract exists, nor have any funds been made available for this type of research.

The DFG has made two excellent efforts, independent of the ten point restoration program, to develop a successful method of trapping or destroying squawfish in the RBDD fishways, but no DFG personnel are assigned full time to the problem.

Concerns:

The NMFS, which it is reported has assumed responsibility for implementing a squawfish evaluation and control program at RBDD is apparently not carrying out its responsibility; nor is any other agency assigned to and funded to carry out this much needed program.

Recommendations:

It is recommended that studies be funded and agencies assigned to develop a method or methods to reduce or eliminate squawfish predation immediately below RBDD. Their activity need not be confined to the University of California at Davis. Qualified private groups as well as other government agencies should be given an opportunity to contribute and made proposals, as well as receive funding.

5. Restrict In-River Fishery

Purpose:

The winter-run salmon population has declined to near extinction levels. Numbers of spawning salmon can be increased by restricting the total in-river salmon harvest during periods when winter-run salmon are present.

Progress:

During the 1986-87 season, the California Fish and Game Commission set a maximum in-river sport catch quota of 174 winter-run salmon. Only 37 were caught.

Concerns:

The Ocean/Bay-Delta salmon harvest may also be taking significant numbers of winter-run, especially during the mid-February through mid-April period.

Definitive data relative to the timing and location of winter-run salmon in the ocean, as well as in the Bay and Delta,

is lacking. However, a mark recovery program was conducted by Department of Fish and Game during the 1968-75 period which would provide some very useful information. Ignoring recovery data which was contaminated by duplicate markings of Trinity River Hatchery and Sacramento River salmon during the study years, it does not appear that winter-run salmon are ordinarily taken in the ocean north of Fort Bragg. Most landings appear to be confined to the Monterey to San Francisco area.

Most winter-run salmon enter the Sacramento River in February, March and April. Traditionally, the commercial fishing season in that area begins in mid-April. The sport season, however, ordinarily begins in mid-February. The data developed in the mark recovery program indicates that a significant number of 2-year old winter-run salmon are taken during the mid-February to mid-April period by the sport fishery.

Recommendations:

Detailed studies to determine migration patterns of adult winter-run salmon in the Ocean and Bay-Delta are badly needed and should be conducted without delay.

Furthermore, a careful analysis should be made to determine whether closing the sport season in the Monterey to San Francisco area until mid-April, or increasing the minimum size of fish that can be taken by the sport fishery during that period would significantly reduce the take of winter-run salmon and therefore increase the winter-run escapement ratio.

6. Develop Water Temperature Control for Warm Water Years

Purpose:

Existing water demands have resulted in releases from the Shasta-Keswick Dam complex of high temperature water during the summer and fall spawning periods for salmon which have caused serious mortality, especially to the winter and spring runs (water released in the spring is also often too cold for rapid growth of fall and late fall-run salmon juveniles). The releases of warm water during the summer and fall occur primarily during years of low precipitation and when storage is low in Shasta and Clair Engle Reservoirs, such as 1959, 1961, 1964, 1968, 1976, 1977 and 1985.

Releases of lethally high temperature water can be anticipated in the late summer and early fall of 1988, which could destroy the entire 1988 winter run. Furthermore, high temperature releases can be anticipated in most future years, with devastating effects on winter-run salmon.

Progress:

In 1986 the BR released some water through a previously unused (for fisheries), low elevation Shasta Dam Sacramento River outlet, instead of through the power generating outlets, to provide cooler water for salmon.

A draft report evaluating various temperature control alternatives for the Upper Sacramento River has been prepared by BR.

The BR has promised to install an experimental temperature control facility in 1989, but has refused to seek funds for the construction of a permanent multi-level outlet. In March, 1988, the California Regional Water Quality Control Board Central Valley Region adopted Waste discharge requirements taking effect in early 1989 which require BR releases to maintain water temperatures in the Sacramento River for fishery resources at no more than 56° F. at Red Bluff. The BR has appealed the discharge requirements to the State Water Resources Control Board.

Concerns:

The BR appears to view the installation of the experimental device at Shasta Dam as the most it should do to solve Sacramento River temperature problems. The experimental device, however, would appear to be far less effective than the installation of multiple outlet devices. Furthermore, there appear to be no studies underway aimed at gathering data necessary to develop an overall plan to insure proper temperature in the Sacramento River for the fishery resources, i.e., water no warmer than 56° F. at Red Bluff.

Of particular concern is the proposed BR operation plans for 1988, which indicate a drawdown of Shasta Lake to elevations similar to those which occurred during the 1976 and 1977 drought years. If this happens, water temperatures in the Sacramento River will eliminate all production of the 1988 year class of winter-run salmon, a population that has already declined to less than 1,000 spawners.

Recommendations:

The BR should take immediate steps to complete the proposed dry year, interim measures for controlling the temperature of water released from the Shasta-Keswick Dam complex, including a combination of structures at Shasta Dam and the use of Trinity River water. Temperature controls must be in effect in 1988. It is also recommended that BR fund and conduct essential-studies that will enable development of a plan which will insure correct fishery resource temperatures in the Upper Sacramento River during all years (year 2020 conditions).

One key to adequate Sacramento River temperature control is the timing of present volumes of cold Trinity River water released into the Sacramento River. Therefore, there must be a commitment for these timed deliveries of Trinity River water to the Sacramento River.

7. Correct Spring Creek Pollution Problems

Purpose:

One of the major factors contributing to the salmon population declines in the Sacramento River between Keswick Dam, and Anderson is pollution from Iron Mountain Mine, located in the Spring Creek drainage (a tributary to the Sacramento River near Redding). Historically, the acid mine waste from Spring Creek has polluted the Sacramento River since the 1880.'s when Iron Mountain Mine opened. However, prior to the construction of the Shasta-Keswick Dam complex high flows in Spring Creek

coincided with those of the Sacramento River which diluted the toxic waters, limiting fish kills to an area near the mouth of Spring Creek; they now occur as far downstream as Anderson. It is essential that this problem be corrected if the winter-run salmon population is to be restored, since most of them spawn in the area adversely affected by pollution from Iron Mountain Mine.

Progress:

There has been no real progress towards eliminating the Iron Mountain Mine pollution problem, relative to the DOC ten point restoration program. However, the U.S. Environmental Protection Agency (EPA) did place the Iron Mountain Hazardous Waste Site on its Superfund Priority list as early as August, 1986. The EPA also completed a Remedial Investigation/Feasibility Study of the problem, and there are now at least nine alternative clean-up plans that have been studied. The most cost-effective clean-up plan appears to involve a combination of source control, treatment and water management. The EPA and BR drafted an agreement which states that the EPA will fund the clean-up plan through its Superfund Program and the BR will be responsible for design and construction of the water management components. However, funds to initiate the clean-up plan were apparently cut from the EPA's program in fiscal year 1987.

Concerns:

Because there is no evidence of a commitment by EPA for

successful priority handling and funding of the problem, correcting the Iron Mountain Mine Pollution Problem represents one of the major flaws in the DOC winter-run salmon restoration program.

Recommendations

The DOC should obtain a written priority commitment from EPA to fund the clean-up program aimed at eliminating pollution problems created by the Iron Mountain Mine Hazardous Waste Site.

8. Correct Problem at the Anderson-Cottonwood Irrigation District (ACID) Dam

Purpose:

There are two major fishery problems associated with the ACID dam, (1) river flow reductions necessary to install and remove the flashboards; and (2) fish passage at a very ineffective fish ladder on the left bank abutment, when the dam is in place. The fluctuating flows cause spawning gravels to be exposed, stranding of incubating eggs and/or juveniles and adults, while the inefficient fish ladder results in delay or complete blockage of adults. Also, some losses of pre-emergent salmon probably occur each time the flashboards are adjusted during the irrigation season.

Progress:

No real progress has been made towards correcting the fishery problems caused by ACID dam.

Studies conducted by the U.S. Fish and Wildlife Service

(FWS) in 1987 point out that the area upstream from ACID dam is critically important for winter-run salmon production, as there is close to two million square feet of suitable (fair to good) spawning gravel between ACID and Keswick Dams.

Concerns:

Fluctuating flows resulting when ACID must install, adjust or remove flashboards has played a significant role in the decline of winter-run salmon, and even though these fluctuations are now reported to be more gradual, they still remain a problem. No solution to either the fluctuation or the fish ladder problem exists, although DFG has accepted the responsibility to find resolutions.

Recommendations:

The method of operating ACID dam should be altered to reduce fluctuations in the river, and a suitable fish ladder(s) should be constructed; or the boards in the dam removed. Removing the boards in the dam would require a new diversion point for the ACID canal or an alternate source of water, such as a pumping plant.

9. Correct Stilling Basin Problem at Keswick Dam

Purpose:

Adult salmon were often trapped in the Keswick Dam stilling basin following a spill. It was then necessary to physically remove them or they would eventually die.

Progress:

The BR has recently modified the existing fish ladder facility so that when spills occur and salmon enter the stilling basin, they can be led out of the basin into the Keswick Dam fish trap or be flushed back into the river without handling.

Concerns:

The Keswick Dam stilling basin is apparently no longer a problem, however, CFG and BR should continue to evaluate the effectiveness of the basin modifications at different river flows.

The Keswick Dam fish trapping facility is expected to be a key source of adults for the new winter-run salmon propagation program at Coleman NFH, and the entire facility is in a deteriorated condition, as well as being operational only at relatively low flows.

Recommendations:

The CFG and BR should continue to evaluate the effectiveness of the stilling basin and modification at various flows to see if other modifications or changes are necessary.

The BR should fund and modernize the fish trapping facility at Keswick Dam, as well as make it operational through a wider range of river flows than is presently possible.

10. Continue to Expand Studies on Winter-Run Chinook Salmon

Purpose:

Relatively good data has been developed on the spawning population size and on the timing of the adult migrations in the Sacramento River. Fairly good information has also been developed on their spawning distribution in the Sacramento River. In addition, limited information relative to the impact of RBDD on adult and juvenile winter-run Chinook has been, and is currently being developed by the FWS and DFG. However, additional data are either very limited or lacking.

Progress:

Only limited or token progress has been made towards gathering the additional winter run salmon data needed to develop a comprehensive restoration program. This has been primarily in relation to the impact of RBDD.

Concern:

A considerable amount of data relative to winter-run salmon must be obtained before a comprehensive restoration program can be developed, and the funding and studies do not now exist to gather this data.

Recommendations:

It is recommended that an initial funding of at least \$500,000 be obtained to conduct several winter-run salmon studies during the next six years, or two life cycles of these salmon. These studies include but are not limited to determining the following:

1. Time patterns of adult salmon in the-Ocean, Delta and Bay.
2. Impact of sport and commercial harvest on the salmon population.
3. Impact of chemical pollution from agricultural drains on adult and juvenile salmon.
4. Impacts of in-river and Delta diversions.
5. Impact of agricultural drains (Colusa Drain) and flood bypasses on adult and juvenile salmon.
6. Method or methods of determining the adult salmon escapement into the Upper Sacramento River with RBDD gates raised.
7. Impacts of river flow fluctuations on adult as well as eggs and juvenile salmon.
8. Impact of predation at RBDD on juvenile salmon migrating to the sea.
9. Impact of river bank stabilization projects, especially those utilizing rock riprap, on adult and juvenile salmon.
10. Methods of capturing juveniles for research marking studies, and adults for an artificial propagation egg supply.
11. Optimum time, size and release sites for hatching produced winter-run juveniles.
12. Timing and pattern of juveniles outmigration from the upper river to the ocean.

13. Impact of RBDD gate raising program on the adult migration.
14. River temperature patterns and requirements for successful spawning, incubating eggs and juvenile rearing.

PROBLEMS NOT ADDRESSED BY THE TEN POINT RESTORATION PROGRAM

There are major problems in the Sacramento River which affect or will affect winter-run salmon, none of which are addressed in the ten point program. They include:

1. Hydroelectric Development

The City of Redding continues to pursue construction of hydroelectric facilities at RBDD in Red Bluff and at the ACID Dam site in Redding. Both projects are adamantly opposed by the Upper Sacramento River Salmon and Steelhead Advisory Committee, DFG, and FWS unless it can be demonstrated that their construction and operation will not be harmful to the fishery. There is strong evidence that these projects would cause severe damage to winter-run salmon without a capacity to mitigate the damage. Neither the City of Redding nor the Federal Energy Regulatory Commission (FERC) are a part of the ten point program.

2. Additional Water Marketing

The BR has expressed its intent to market an additional 1.5 million acre feet of Sacramento River system water. Given the already severe temperature problems in the Sacramento River, the sale of any additional water from the Sacramento system would

certainly aggravate the already critical condition of the winter run.

3. Bank Stabilization

Sacramento River bank stabilization projects, especially those using rock riprap can seriously impact the survival of juvenile salmon. These projects are sponsored by the State Reclamation Board and constructed by the U. S. Army Corps of Engineers ("the Corps"), neither of which are part of the ten point program. These projects should not be commenced until proven without doubt to have no adverse affects on winter-run salmon.

4. Water Diversions

State and federal permits -for water diversions and channel modifications are presently being processed with no assessment of the impact on winter-run salmon. Most notable is the Glenn-Colusa Irrigation District (GCID) dredging and fill permit issued by the U.S. Corps of Engineers (the Corps). The permit conditions contain no reference to safeguards against the destruction of winter-run outmigrants, nor do the permit conditions require any evaluations of the present or future winter-run salmon losses at the GCID facility.

5. Gravel Extraction

Gravel extraction from streams tributary to the Sacramento River has greatly reduced salmon spawning habitat in the Sacramento River, especially north of Red Bluff. The single largest remaining contributor of spawning gravel north of Red

Bluff is Cottonwood Creek. Until recently gravel mining in Cottonwood Creek has been relatively minimal. However, numerous applications for large mining operations are now in process and some permits have been granted by local agencies. There is nothing to indicate that the counties involved, specifically Shasta and Tehama Counties, are aware of, much less are a part of the ten point program. Nor is there any indication that either the State Reclamation Board nor the Corps are taking the ten point program into account in considering gravel mining permits on Cottonwood Creek or on other tributaries to the Sacramento River. This constitutes a serious defect in the ten point program.

LACK OF ENFORCEABLE AGREEMENTS AND FUNDING

One of the principal shortcomings of the ten point program is that it is not supported by legally enforceable agreements guaranteeing the accomplishment of its objectives. Furthermore, funding for many of the elements of the program are inadequate or nonexistent, and in many cases, sufficient funding has not even been requested by the participating agencies. To guarantee success, it is essential that comprehensive memoranda of agreement signed by all necessary federal, state and local agencies be executed.

In addition, Congress should address funding for restoring winter-run salmon by making fishery resources a full project

purpose of the Central Valley Project (CVP), equal in priority to agriculture and power production as well as flood control. This would insure that the agencies and projects that have caused much of the decline would be responsible for evaluating and addressing the fishery restoration needs. Congress should also levy a small fee on all CVP water and power revenues to fund the restoration activities. Funds generated could then be managed in a manner modeled after the Northwest Power Act and the Columbia River Basin Restoration Program.

CONCLUSIONS

The ten point program addresses many important problems which must be corrected in order to restore winter-run salmon in the Sacramento River. However, progress in implementing the plan has been slow and in some cases nonexistent. Furthermore, the program is not supported by binding legally enforceable commitments, and in some instances does not include necessary state and federal agencies.

While listing the winter run as endangered species will not guarantee its restoration, listing offers advantages not available under the ten point program, including important effects on proposed hydroelectric development, the marketing of additional Sacramento River water, the construction of bank, stabilization projects, the continuation of large detrimental diversions such as GCID, and the granting of gravel mining

permits in tributaries of the Sacramento River. Furthermore, listing of the winter-run should not impede progress on the ten point program. Accordingly, it is recommended that the winter-run salmon be listed as a threatened or endangered species under both United States and California endangered species acts.