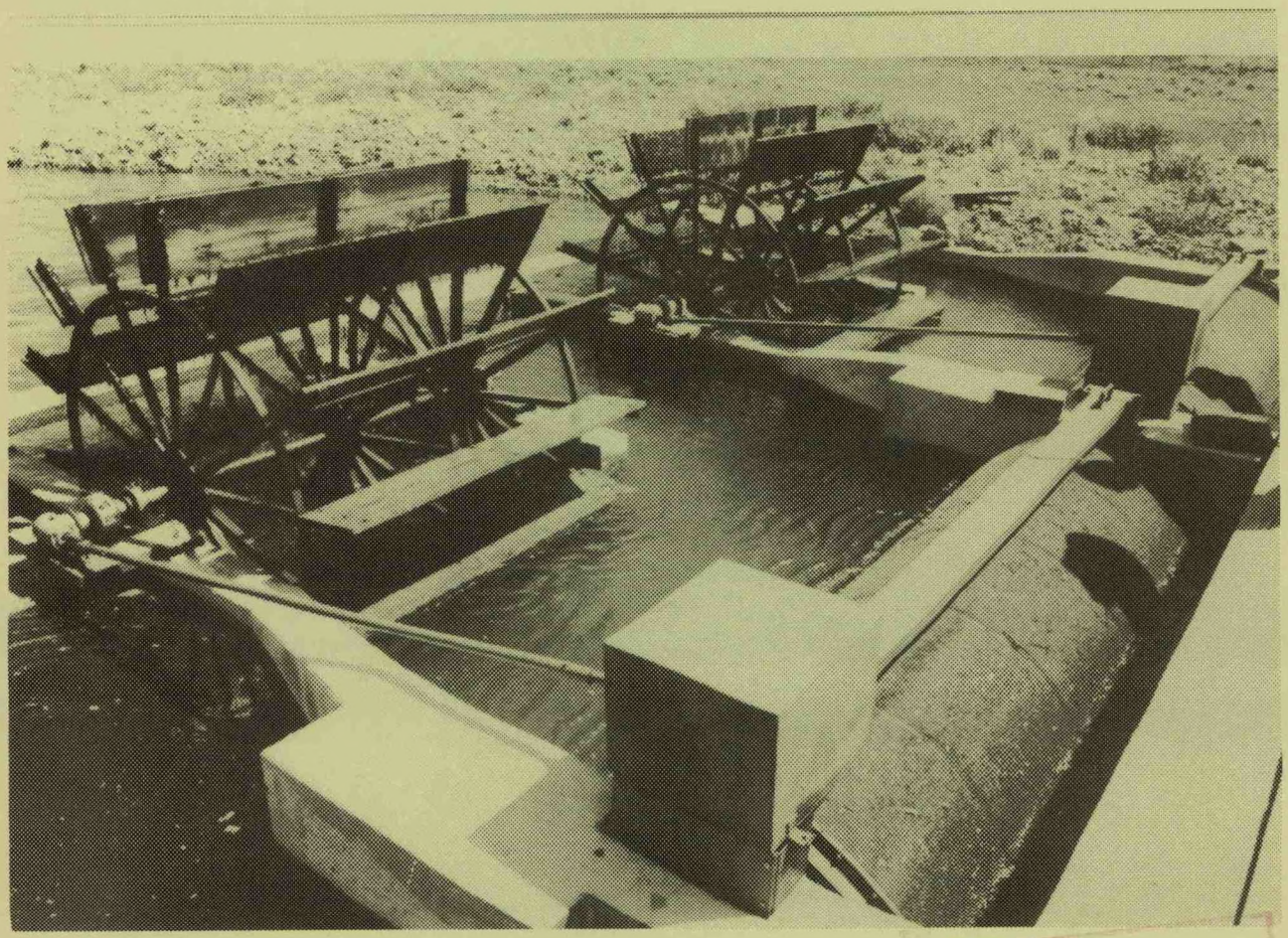
NOAA Technical Memorandum NMFS F/NWR-12

COLUMBIA RIVER FISHERIES DEVELOPMENT PROGRAM
SCREENING OF IRRIGATION DIVERSIONS

MICHAEL R. DELARM AND EINAR WOLD

JUNE 1985



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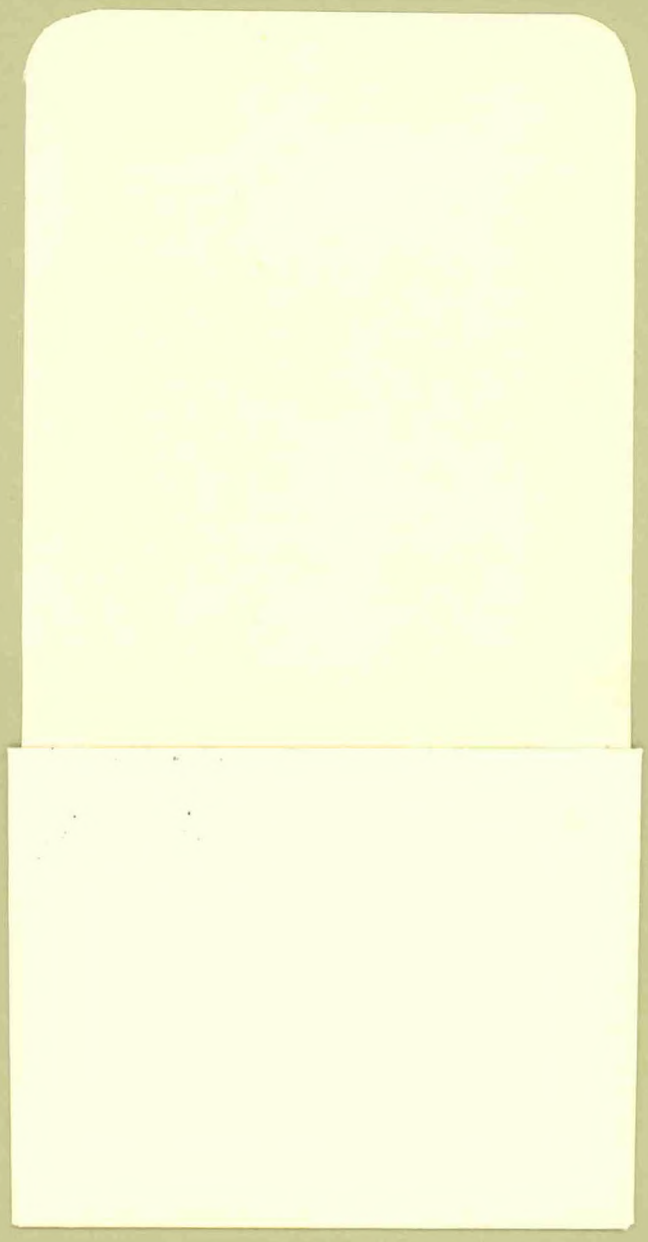

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U.S. DEPARTMENT OF COMMERCE
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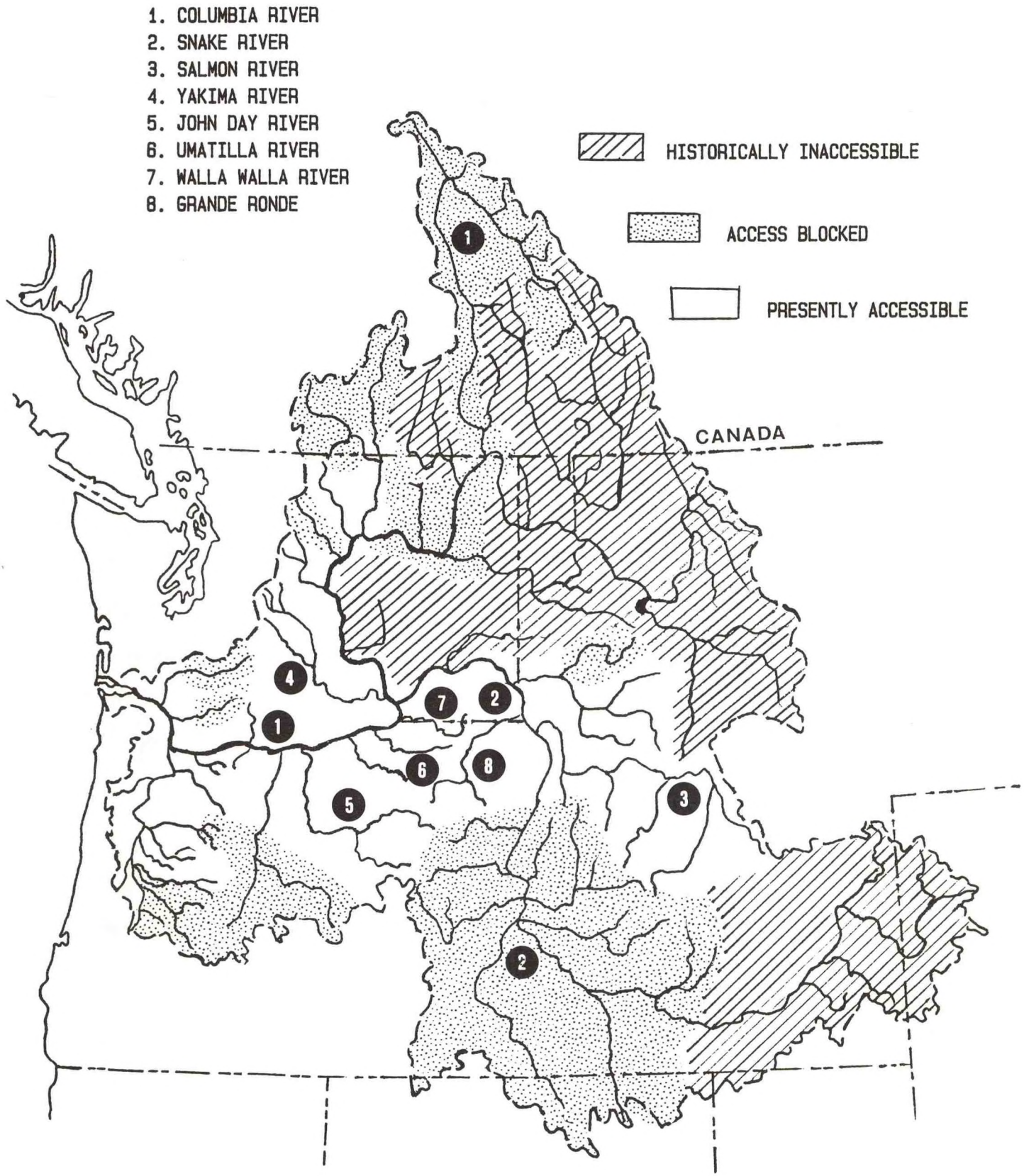
Introduction

Anadromous Pacific salmon (Oncorhynchus sp.) and steelhead trout (Salmo gairdnerii) resources have historically played an important role in the Columbia Basin. They continue to exert a major cultural influence to this day. Historically, salmonids migrated approximately 1,200 miles up the Columbia River to Lake Windermere in British Columbia. They also were present more than 900 miles east into the headwaters of Idaho's Salmon River and 900 miles south into the Nevada headwaters of the Owyhee River. The completion of Grand Coulee Dam in 1941 blocked more than 1,100 river miles of salmonid spawning and rearing habitat. Brownlee Dam on the mainstem Snake River, constructed in 1958, also terminated all fish passage to and from the upper Snake River Basin (Figure 1). As early as 1952, the Army Corps of Engineers' comprehensive "308" report stated that over 300 dam structures have been constructed in the Columbia Basin varying in size from splash and irrigation dams to Grand Coulee and Bonneville dams (Anonymous 1977). Anadromous fish have been eliminated from over half of their original spawning and rearing areas. By the early 1960's the number of salmon and steelhead returning to the Columbia Basin were much reduced.

There were several causes, in addition to mainstem hydroelectric projects, for the drastic reduction in the number of salmon and steelhead returning to the Columbia Basin. Early lumber operations destroyed much of the natural forest cover, resulting in rapid runoff, siltation, low flows, high water temperatures, debris, and destruction of food

FIGURE 1. - THE HISTORICAL AND PRESENT AREA AVAILABLE TO ANADROMOUS FISH IN THE COLUMBIA RIVER



organisms. Mining operations diverted water and chemical effluents from ore refining damaged fish and other aquatic life. Agricultural development resulted in demand for irrigation water which, unscreened, killed a great many juvenile downstream migrants.

In an attempt to partially mitigate for losses of salmon and steelhead, Congress passed the Mitchell Act (Public Law 75-502, May 11, 1938) and subsequently amended it in 1946 (Public Law 79-676, August 8, 1946). The Act provided a mechanism for conservation of the fishery resources of the Columbia Basin. Specifically mentioned in the Act was protection of migratory fish from irrigation projects. The Mitchell Act also created the mechanism for the establishment of the Columbia River Fisheries Development Program (CRFDP). The original objective of the CRFDP was to develop maximum salmon and steelhead runs in the tributaries of the Columbia River below McNary Dam. In 1956, the program was extended to include the upper basin.

The initial task in developing a screening program was to identify the actual need for screening of irrigation diversions. To define the problem, the CRFDP initiated watershed surveys of the mid-Columbia and Snake Rivers and their tributaries in the mid-1950's and early 1960's. The resulting sub-basin reports located and enumerated most unscreened irrigation diversions in the target watersheds. The reports described a serious problem needing corrective action. Construction began in the mid-1950's and has continued to some extent into the 1980's (Table 1).

Table 1. -- Number of Currently Inventoried Irrigation Screens Constructed by Year in Oregon, Idaho, and Washington.

Year	Oregon	Idaho	Wash.
Unknown	22		
1953	9		
1954	73		
1955	153		
1956	126		
1957	22		
1958	9	7	
1959	7	42	
1960	8	22	
1961	12	43	
1962	5	30	
1963	12	27	
1964	12	16	8
1965		8	8
1966	2		
1967	2		
1968	3		
1969	31		
1970	1		
1971	1	1	
1972	30		
1973	1	1	
1974	2		
1975			
1976	5	1	
1977	4	4	
1978		1	
1979		7	
1980	1	8	
1981	1	6	
1982	1	7	
1983		5	
1984	3		
1985	3		
	561	236	16

Columbia River Fisheries Development Program

The CRFDP was activated in 1948 with the States of Oregon and Washington participating. Prior to 1956 the CRFDP was called the Lower Columbia River Fishery Program and was limited to the Columbia River Basin below McNary Dam. After 1956 the CRFDP was extended above McNary Dam and Idaho became a participant. Since its creation the CRFDP has concentrated on three areas of salmonid enhancement; hatchery construction and operation, quality improvement studies, and stream improvement. Included under stream improvement is the screening of irrigation diversions. The CRFDP's goal in funding the screen program is to increase survival of wild and hatchery-reared juvenile anadromous fish and subsequently increase adult contribution to the various fisheries and escapement.

In 1958, as part of the reorganization of the Fish and Wildlife Service, it was agreed that the oversight of fish screens in the Columbia Basin anadromous fish range would rest with NMFS (then known as Bureau of Commercial Fisheries). However, operation of the screen projects in the Yakima Basin continued to be supervised by the USFWS (then known as the Bureau of Sport Fisheries and Wildlife).

Initially, policy was set which allowed money to be spent on improvement of lands not directly controlled or owned by the United States Government, providing that the State obtained title to, rights-of-way over, or licenses covering such lands. Based on this

policy, rights of way were obtained for screen placement in Washington and Idaho. Oregon operates under State statute which gives the State legal access to screen locations (Appendixes 4, 5, and 6).

Most diversions utilizing CRFDP funds for screening have been in existence since 1900, some as early as 1860. All are privately owned either by individuals or by companies. Idaho had no screens and Oregon had only a few in operation prior to CRFDP involvement. Washington, on the other hand had essentially already screened the majority of irrigation diversions in their State prior to CRFDP involvement. Through FY 1985 the CRFDP has provided a total of $8,607,900 dollars for construction, operation, and maintenance (Table 2).

The number of screens in operation each year have fluctuated since the program began in the mid-1950's. New construction, seasonly required irrigation ditches, and permanently abandoned ditches account for the variation in the number of operating screens each season. Abandoned irrigation ditches account for the majority of discontinued screens. Where irrigation ditches are permanently abandoned, the screen parts and material are salvaged for use at other installations. Oregon, Idaho, and Washington operate approximately 382, 196, and 12 screens, respectively, in any given year. The number of screens operating in any given year is fairly constant but will vary widely within the season due to weather and irrigation demand. A small number may be active one year and inactive the next.

TABLE 2. -- Funds Provided by the Columbia River Fisheries Development Program for Irrigation Screening, 1954 - 1985

FY	ODFW	IDFG	WDF	WDG	TOTAL
1954	183,500				183,500
1955	234,100				234,100
1956	18,000				18,000
1957	34,500				34,500
1958	40,000				40,000
1959	43,800	434,700			478,500
1960	44,800	196,400			241,200
1961	55,000	186,100			241,100
1962	51,100	44,400	28,000		123,500
1963	77,800	41,500			119,300
1964	104,700	108,800	60,500	26,000	300,000
1965	58,000	103,000			161,000
1966	63,000	199,300	3,300		265,600
1967	71,600	48,000	2,400	1,300	123,300
1968	73,100	54,200	2,200	1,500	131,000
1969	71,900	50,700	2,000	1,500	126,100
1970	69,500	64,400	2,000	1,100	137,000
1971	67,500	95,700	2,000	1,500	166,700
1972	76,000	67,400	3,500		146,900
1973	84,800	90,000	5,000		179,800
1974	86,000	84,000	5,000		175,000
1975	92,000	128,500	5,000		225,500
1976	118,000	142,400	6,000		266,400
Trans. Qtr.	27,500	46,000			73,500
1977	118,000	125,000	7,500		250,500
1978	124,000	261,100	8,000		393,100
1979	134,600	165,000	8,000		307,600
1980	176,300	184,500	43,500		404,300
1981	226,000	180,500	73,600		480,100
1982	230,400	210,000	62,500		502,900
1983	267,300	239,200	72,700		579,200
1984	303,800	295,400	82,700		681,900
1985	418,100	309,900	88,800		816,800
TOTAL	3,844,700	4,156,100	574,200	32,900	8,607,900

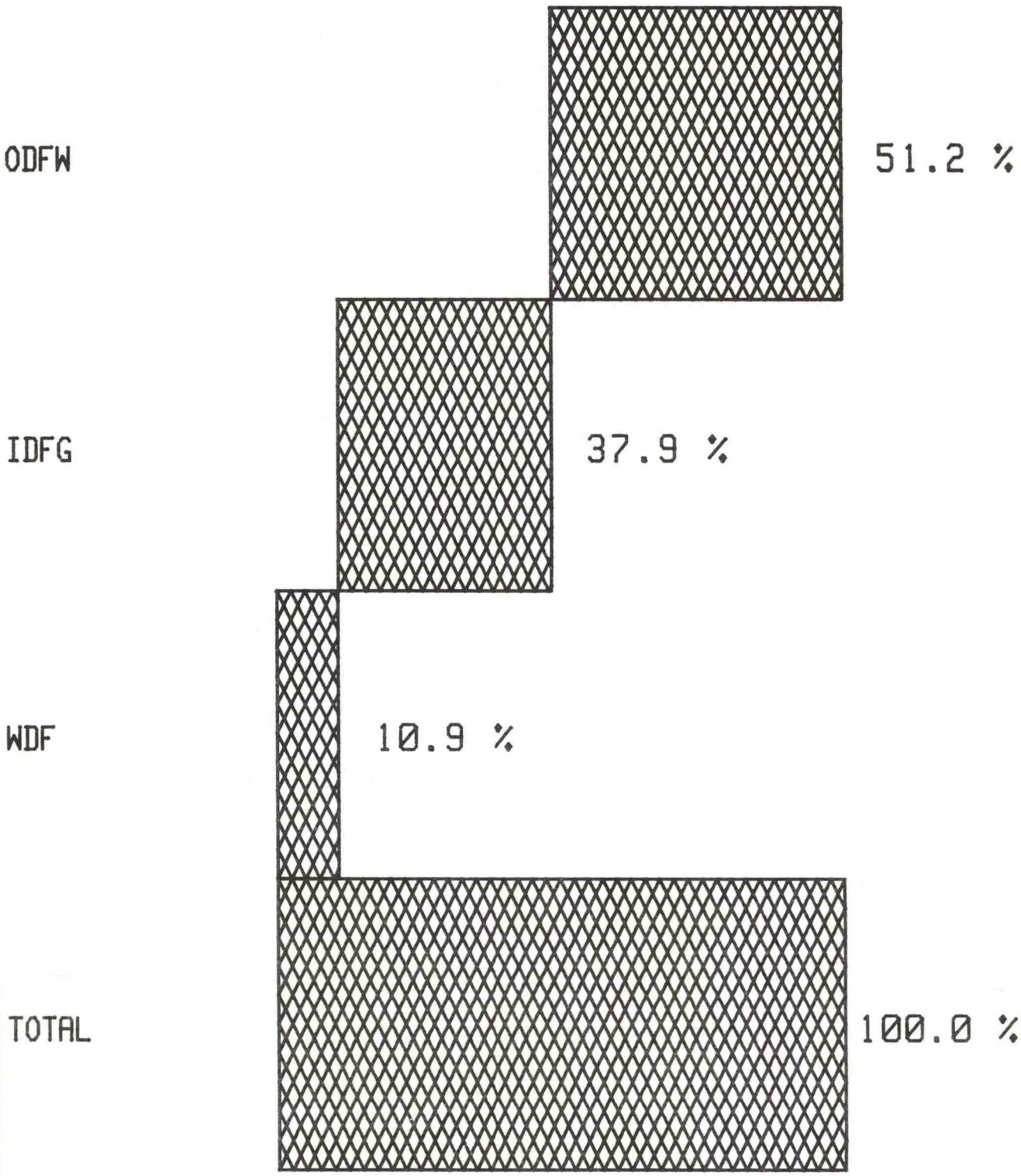
Annual agreements are signed between NMFS and Oregon Department of Fish and Wildlife (ODFW), Idaho Department of Fish and Game (IDFG), and Washington Department of Fisheries (WDF) for funding and operation of irrigation diversion screens. Prior to 1971 the Washington Department of Game was also involved with the program, but after that date WDF assumed responsibility for all Washington screens under the CRFDP.

From the mid-1950's to mid-1960's, emphasis was placed on screening as many irrigation diversions as possible. Initial high construction costs occurred at that time with subsequent costs lowering when only operation and maintenance were required. In recent years costs have again increased because of inflation and replacement of worn out screens. Since 1949, 5.5 percent of CRFDP funds have been spent on screens. Oregon currently receives the largest share of funds followed by Idaho and Washington with 51.2 percent, 37.9 percent, 10.9 percent, respectively (Figure 2). Total funds provided to Oregon, Idaho, and Washington since 1954 are $3,844,700, $4,156,100, and $574,200, respectively (Table 2).

Screen Operation

Irrigation has been practiced in the Northwest since the mid-1800's. Gebhards (1959) mentions irrigation in 1855 in the Lemhi River of Idaho. In the Columbia Basin, it is estimated that land under irrigation will increase by 4.2 million acres between 1970 and 2020, reaching a total of 11,200,000 acres (Swan, et al. 1980). The impact of water withdrawals on

FIGURE 2. - PERCENT OF FUNDS PROVIDED BY NMFS TO THE OREGON, IDAHO, AND WASHINGTON FISHERY AGENCIES FOR SCREENING IRRIGATION DIVERSIONS DURING FY 1985

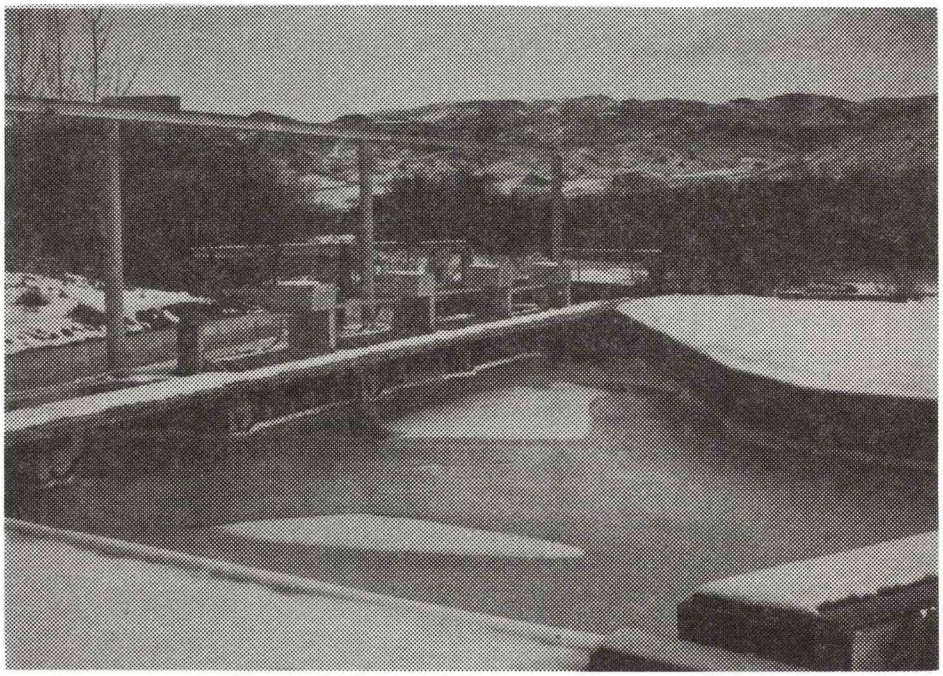


populations of anadromous fish is of concern due to potential losses from unprotected diversions. In addition, over-allocation of water can completely dewater sections of river bed requiring fish trapping and transport or ensuring that bypassed fish are passed back to river in areas with adequate water. Fish protective devices are required to provide protection and when properly installed and maintained are very effective.

The CRFDP screen inventory currently has approximately 813 screens on irrigation diversions in the three States. They include 561, 236, and 16 screens in Oregon, Idaho, and Washington, respectively. The number of operating screens in any given year is much smaller and varies each year due to climatic conditions, stream flow, and irrigation requirements. In years with abundant precipitation, many irrigators may not require water until early May, while in warm dry springs the majority of diversions begin operating in early April (Schill 1984). These fluctuations affect numbers of fish screened and instream flows for outmigrants since juvenile smolts migrate in April and May.

Screens are typically inspected in March or April by maintenance personnel who begin repairing winter damage due to frost, snow, and ice (Figure 3). Screens are placed into operation as the spring cleanup and repairs are completed and water is being diverted. Once in operation, screens are checked for proper operation a minimum of twice per week. However, during critical periods some screens are checked daily. Screen personnel perform routine maintenance, lubricate drive mechanisms, remove

FIGURE 3. - WINTER CONDITIONS (TOP PHOTO) AND SPRING TIME FLOODING (BOTTOM PHOTO) WHICH CAN BE ENCOUNTERED AT IRRIGATION SCREEN LOCATIONS

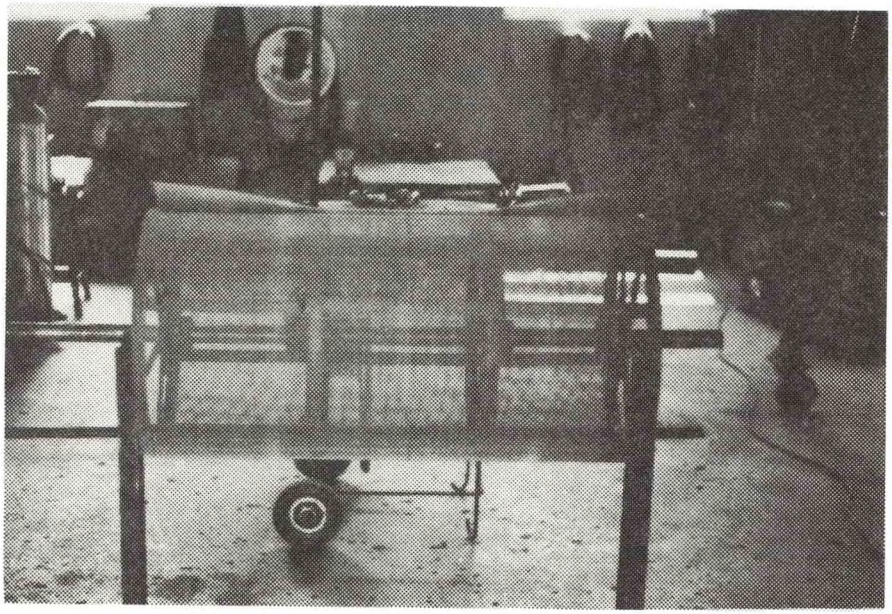


debris, test trip gates, and ensure the bypass is operating efficiently throughout the irrigation season. At the end of the irrigation season, usually in October, the screens are winterized and any needing major overhaul are removed and brought to the screen shop and repaired during winter (Figure 4).

A typical irrigation diversion consists of a temporary rock-log wing dam extending upstream and across the river although permanent concrete structures requiring adult fish passage facilities are also used (Figures 5, 6, and 7). The angle at which the diversion leaves the river can vary from a few degrees to 90 degrees. The diverted water in many cases passes through a headgate structure used to regulate flow. The water and fish move down the canal, through a trash rack and water passes through the screen; the fish are deflected by the screen into a bypass pipe which transports them back to the river downstream of the wing dam. Diversion flows range in size from less than one cubic feet per second (cfs) to well over 100 cfs. In general, Oregon has much smaller diversions than Idaho or Washington (Appendix Tables 1 - 3). In some cases diversions totally dewater a stream, causing migration problems to both juvenile and adult migrants. Without adequate screening and bypass facilities, juvenile fish would end up in ranchers' fields or be left stranded in the irrigation canal at the end of the season (Figure 8).

Unquantified losses of juvenile salmon and steelhead occurred into the mid-to-late 1950's. Beginning in the mid-1950's the States began screen construction utilizing both CRFDP and State funds. Lack of proper

FIGURE 4. - TYPICAL WINTER ACTIVITY INCLUDES REFURBISHING DRUM SCREENS AT SCREEN SHOP (TOP PHOTO). DRUM SCREENS (BOTTOM PHOTO) REFURBISHED AND READY FOR INSTALLATION.



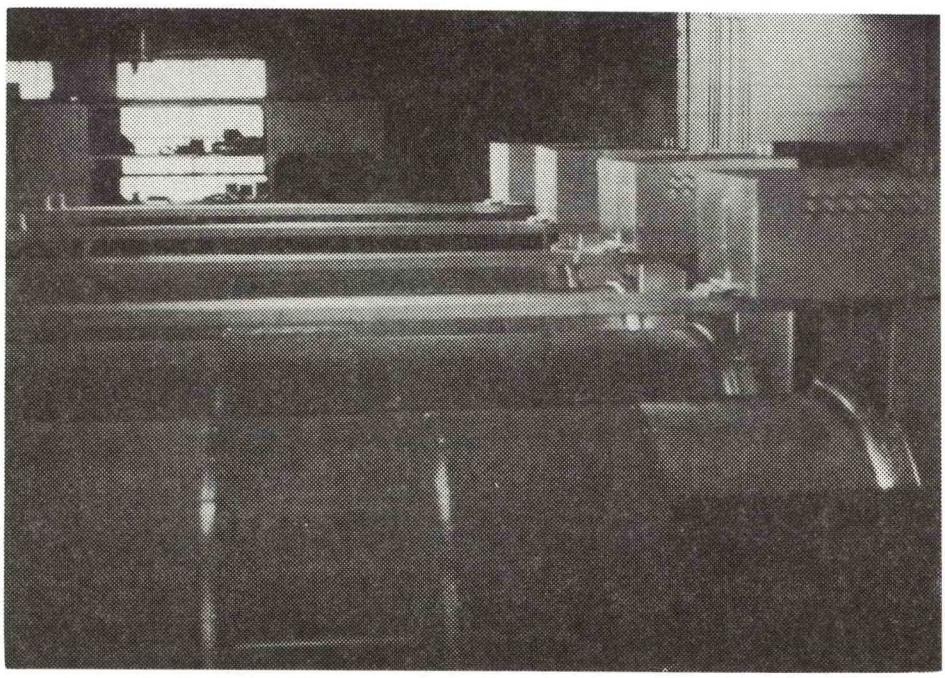


FIGURE 5. - TOP VIEW OF A TYPICAL IDAHO IRRIGATION DIVERSION, SCREEN FACILITY AND FISH BYPASS.

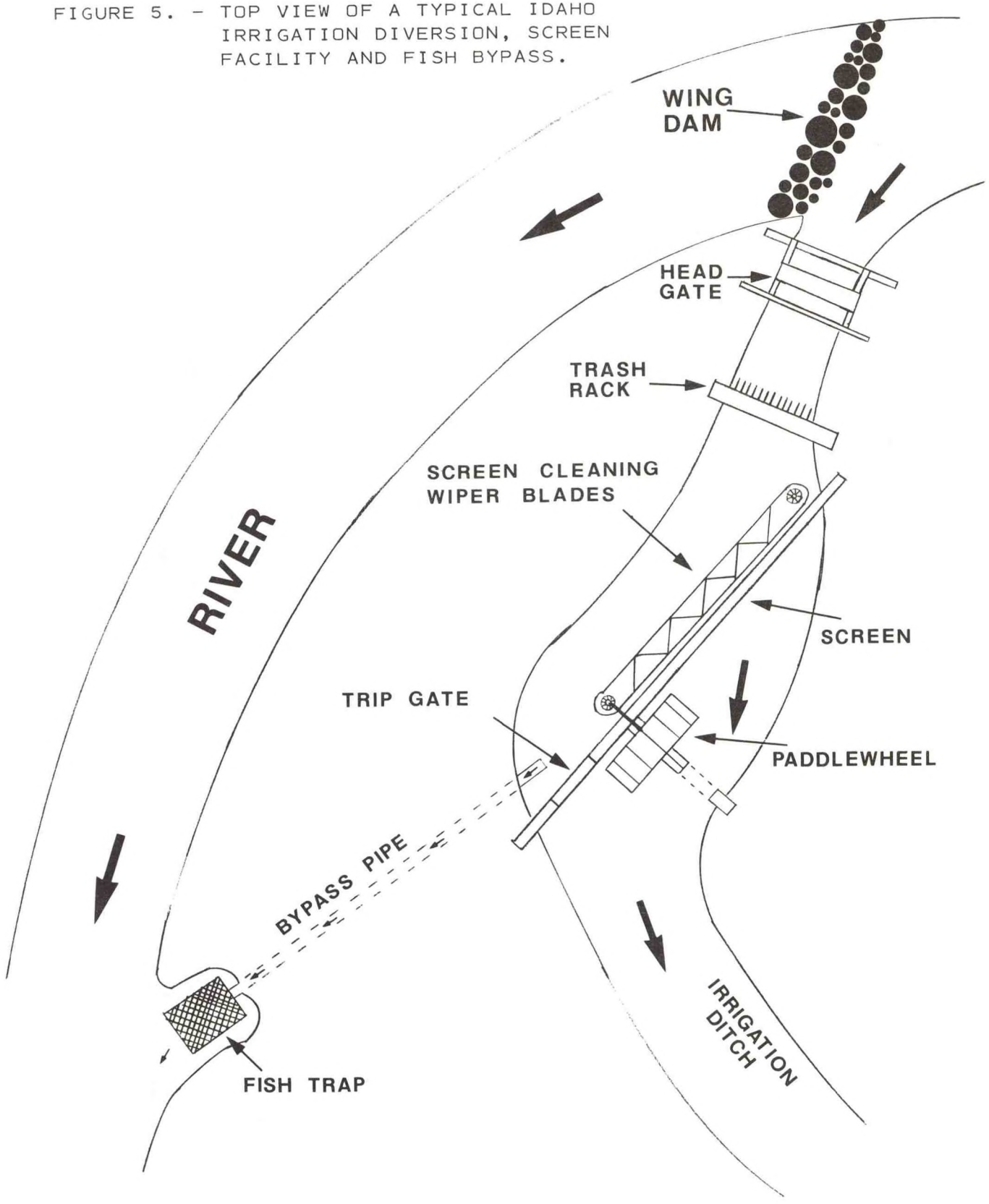
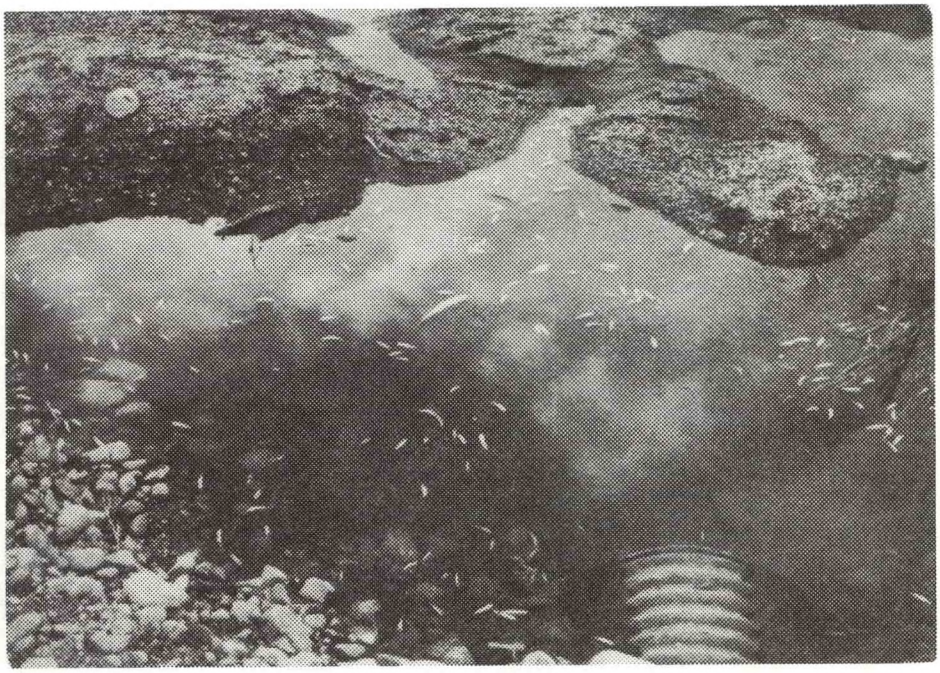


FIGURE 6. - TYPICAL ROCK AND DEBRIS WING DAM USED TO DIVERT WATER INTO IRRIGATION DIVERSIONS.

FIGURE 7. - WOOD AND CONCRETE WING DAM USED TO DIVERT WATER INTO IRRIGATION DIVERSIONS. THESE STRUCTURES ARE NOT AS ABUNDANT AS THOSE FOUND IN FIGURE 6.

FIGURE 8. - LOSSES OF JUVENILE SALMONIDS STRANDED IN UNSCREENED DIVERSIONS AT THE END OF THE IRRIGATION SEASON.



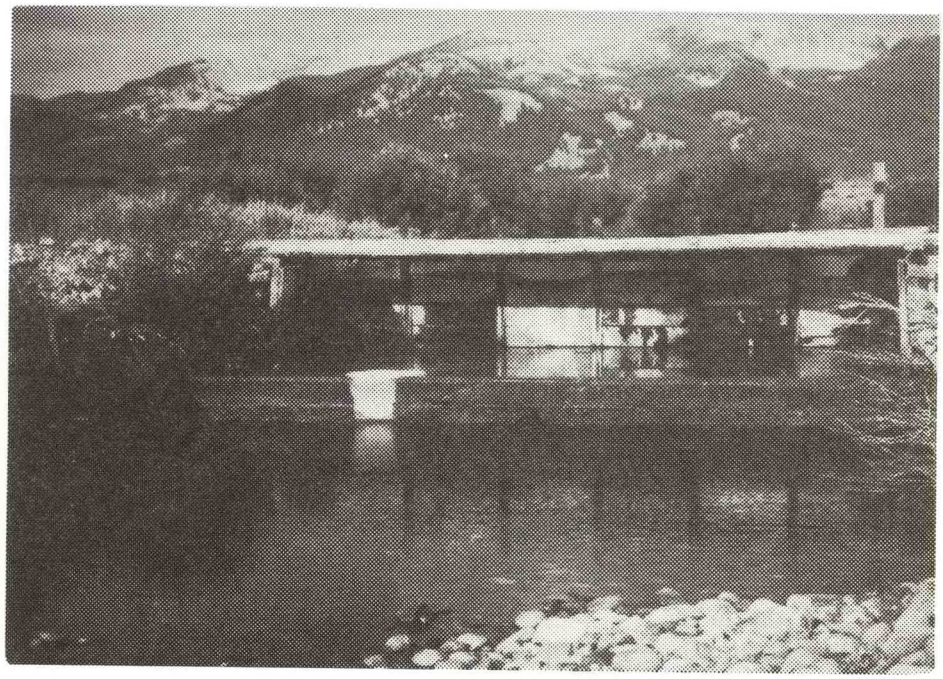
screening facilities prior to that time resulted in losses of tremendous numbers of juvenile fish and a corresponding reduction in adult returns. Correctly installed and operated screens are very effective. One screen in Idaho, tested in 1974, saved nearly 86,000 juvenile chinook salmon (Schill 1984). Prior to large-scale hatchery releases, it was estimated that a total screen program in Idaho could save upwards of 1 million juvenile salmon and steelhead annually (Fisher 1977). Oregon estimated saving over 500,000 salmon and steelhead in 1954 when only half of their screens on the John Day River had been constructed (Annual Report 1954). With current large hatchery releases from programs such as the Lower Snake River Compensation, the number of salmonids saved annually is probably well in excess of the above quoted figures. Also, hatchery releases of salmon and steelhead smolts will increase several times from the current levels by 1990 as additional compensation facilities are completed.

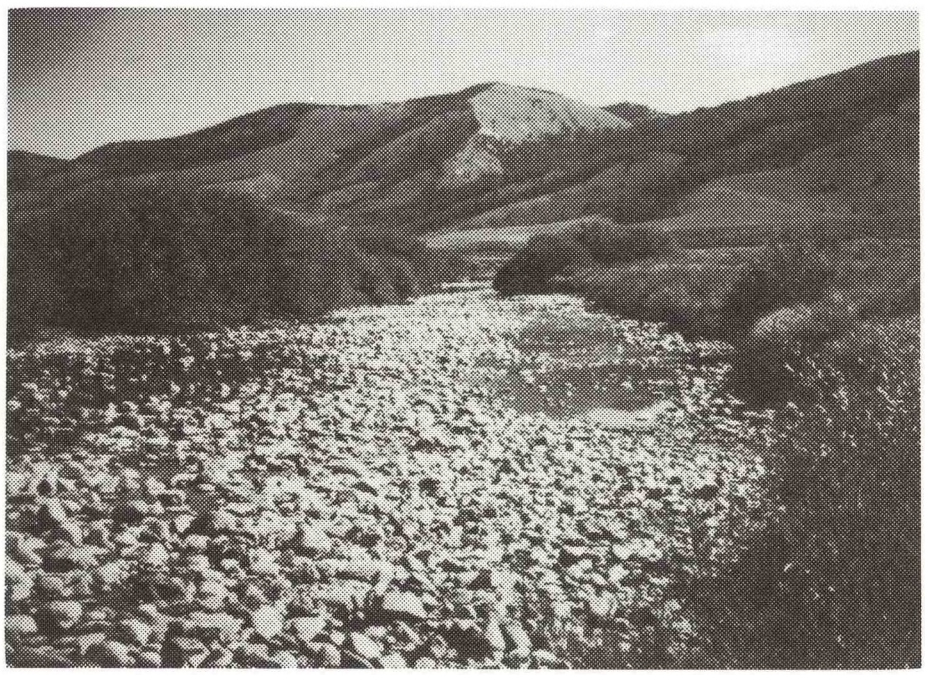
Impacts on salmonids from irrigation diversions include the loss of migrating juvenile salmonids as well as barriers to adult passage. Many tributary streams can be blocked by wing dams or lack of sufficient flow below a diversion (Figure 9). This can eliminate some of the most productive spawning and rearing habitats.

Screen Types

Screens have been employed to control movement of fish for more than

FIGURE 9. - UPSTREAM (TOP PHOTO) AND DOWNSTREAM (BOTTOM PHOTO) VIEWS OF DIVERSION DAM SHOWING TOTAL LOSS OF HABITAT FOR ADULT AND JUVENILE SALMONIDS ON THE SALMON RIVER, IDAHO.





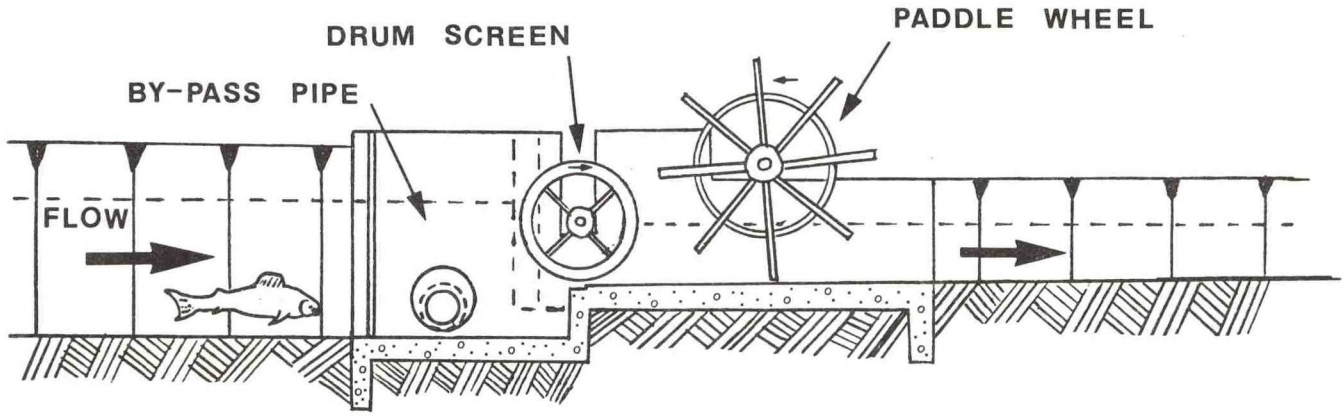
100 years. Basically, a fish screen permits passage of water at a diversion point while preventing entrainment of fish by the diverted flow. The CRFDP provides for operation of two basic screen designs, rotary drum screens and perforated plate wiper blade screens. Two other screen types are also used, one louver screen and one fixed Johnson plate screen. The volume of water screened ranges from less than 1 cfs to over 100 cfs. The NMFS' screening criteria is provided in Appendix 7.

Rotary Drum Screen

The rotary drum screen rotates on the horizontal axis and is self-cleaning. It has water level restrictions for correct operation. A water level too high will wash fish as well as debris over the screen. A water level too low will not allow debris to be carried over the screen causing a trash buildup. For correct operation, a water level approximately two-thirds up on the screen should be maintained (Figures 10 and 11). A trash rack upstream from the screen catches the large debris.

Paddlewheel water-driven and electrically-driven (Figures 12 and 13) are two types of rotary drum screens currently operated in Oregon, Idaho, and Washington. These screens require some maintenance during the irrigation season, mainly lubrication of moving parts, and are effective in preventing fish from entering farmers' fields.

Figure 10 - Side view of a paddle wheel-driven drum screen.



Perforated Plate Wiper Blade Screen

This is the second major screen type used in the CRFDP in Idaho. Since rotary drum screens are preferred, Idaho is currently replacing this type screen with drum screens as money and manpower allow. Both paddlewheel water-driven and electrically-driven screens are used (Figures 14 and 15). The perforated plate screens are set vertically in the channel and diagonally across the irrigation ditch at various angles (Figure 5). A system of wiper blades moving across the upstream surface of the screen, similar to windshield wipers found on motor vehicles, keep the perforated plate from plugging with debris. The debris then has to be removed manually since it will pile up in front of the screen.

Louver Screen

The CRFDP has one louver screen located on the Umatilla River in

FIGURE 11. - TOP VIEW OF WATER-DRIVEN PADDLEWHEEL (1) DRUM SCREEN (2).

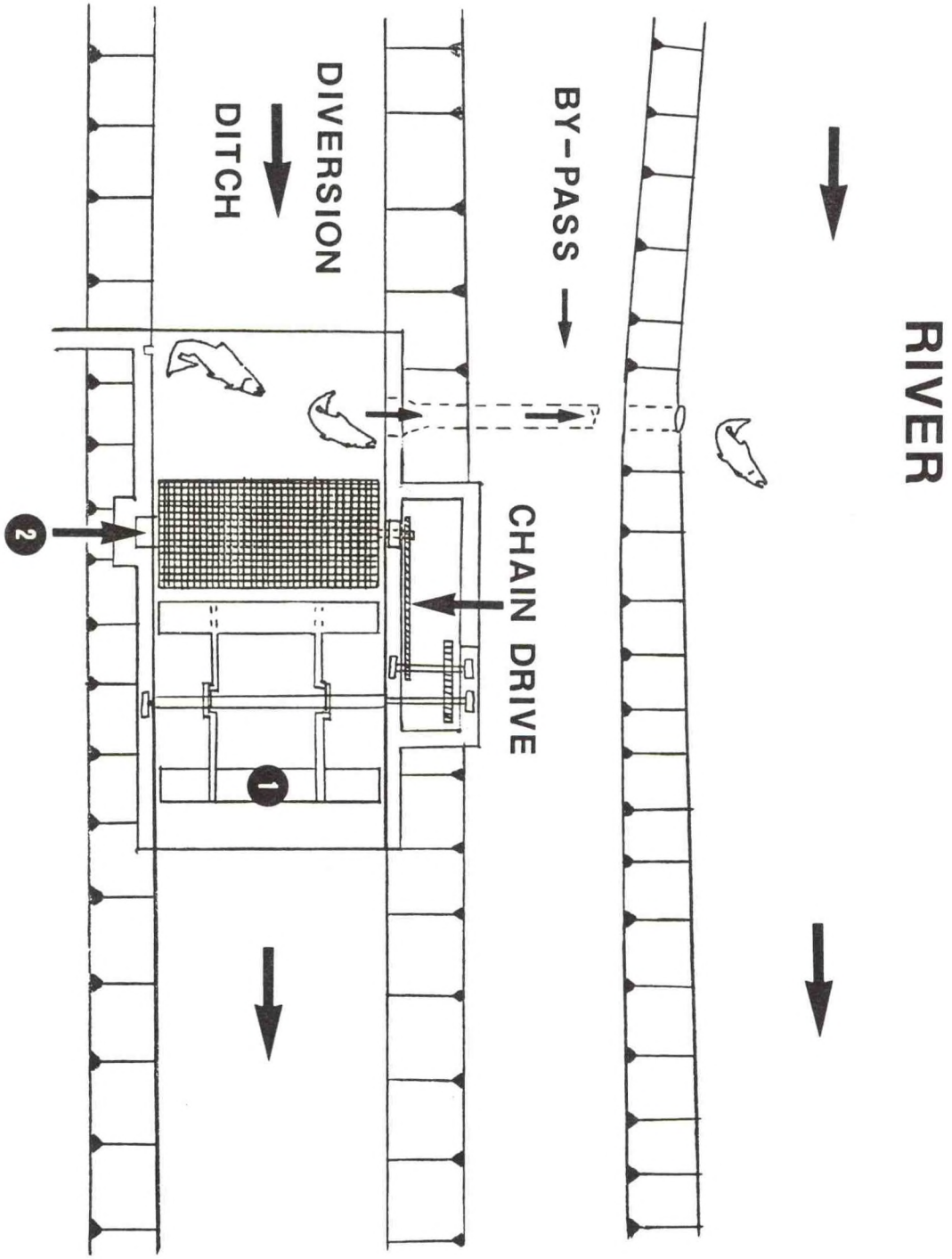


FIGURE 12. - TYPICAL ELECTRICAL-DRIVEN DRUM SCREEN FOUND IN IDAHO AND WASHINGTON.

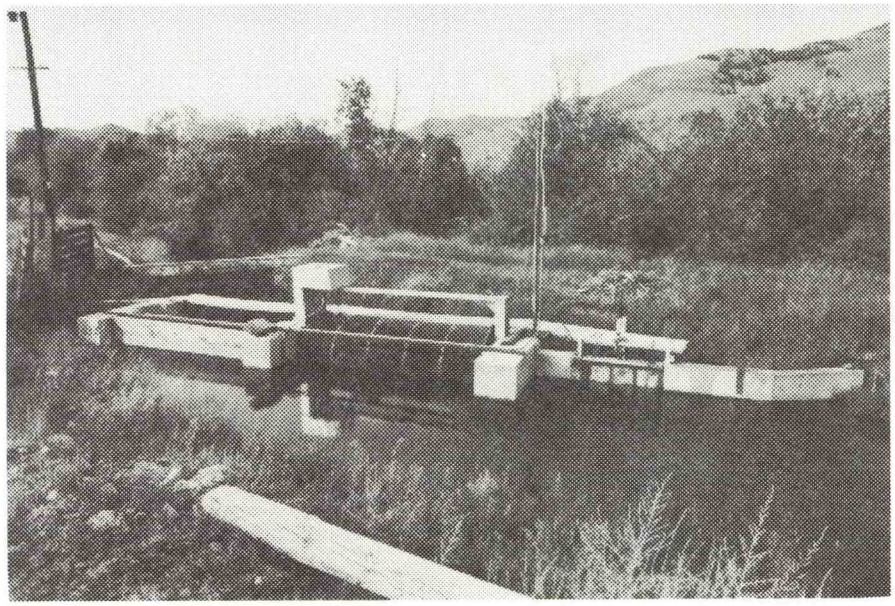


FIGURE 13. - TYPICAL PADDLE WHEEL-DRIVEN DRUM SCREEN FOUND IN OREGON, IDAHO, AND WASHINGTON.

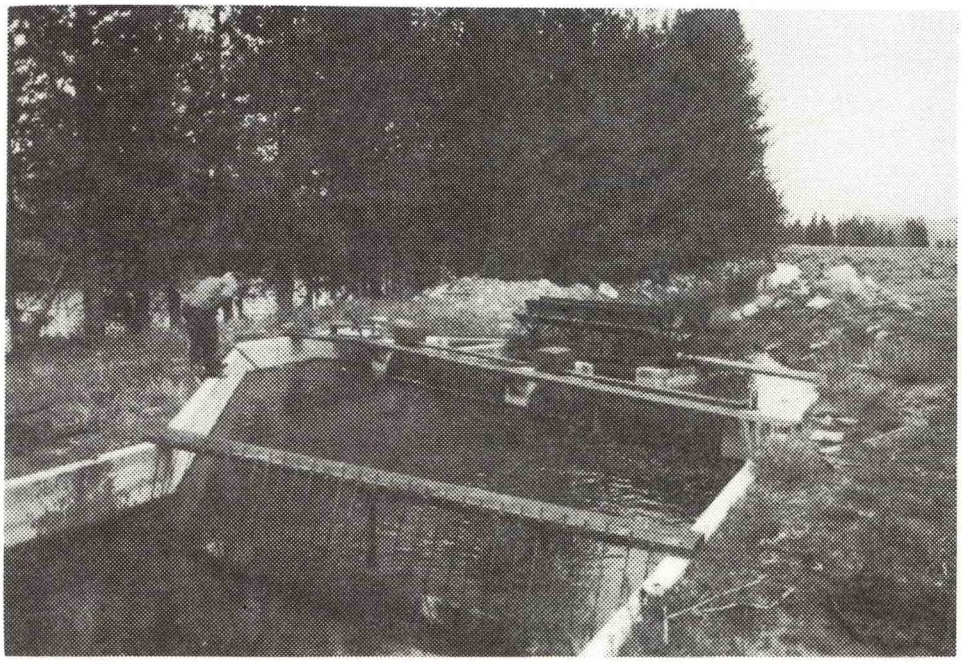


FIGURE 14. - ELECTRICALLY-DRIVEN PERFORATED-PLATE WIPER BLADE SCREEN FOUND IN IDAHO.

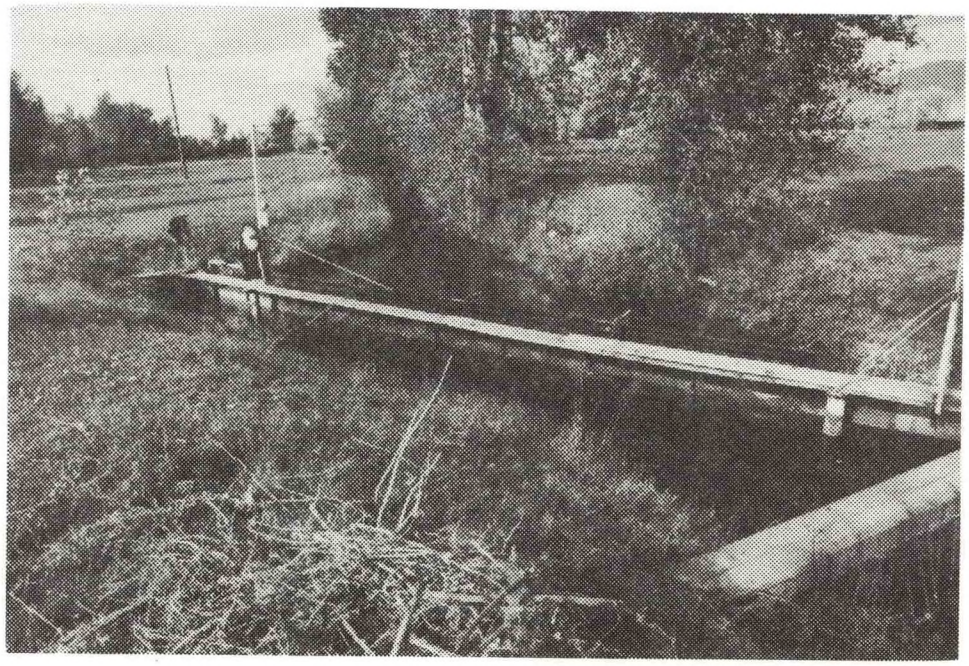


FIGURE 15. - PADDLE WHEEL-DRIVEN PERFORATED-PLATE WIPER BLADE SCREEN FOUND IN IDAHO.

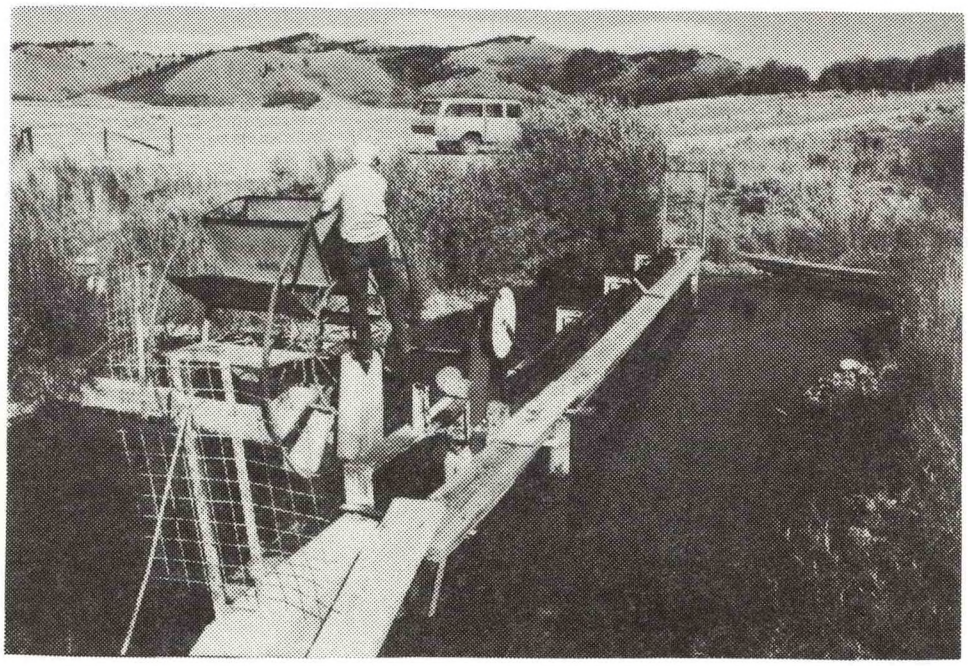


FIGURE 16. - VIEW UPSTREAM OF THE LOUVER SCREEN LOCATED AT THREE MILE DAM ON THE UMATILLA RIVER, OREGON.

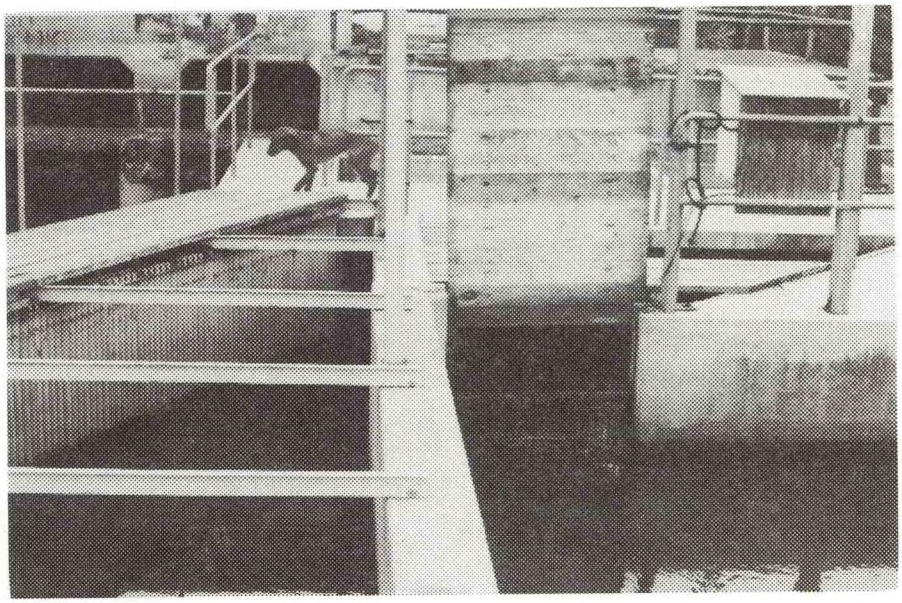
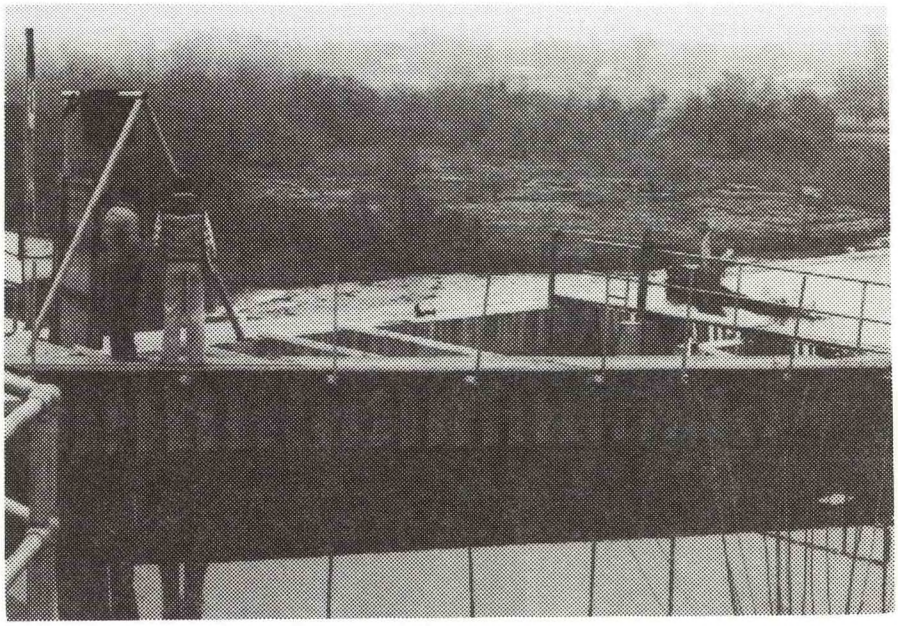


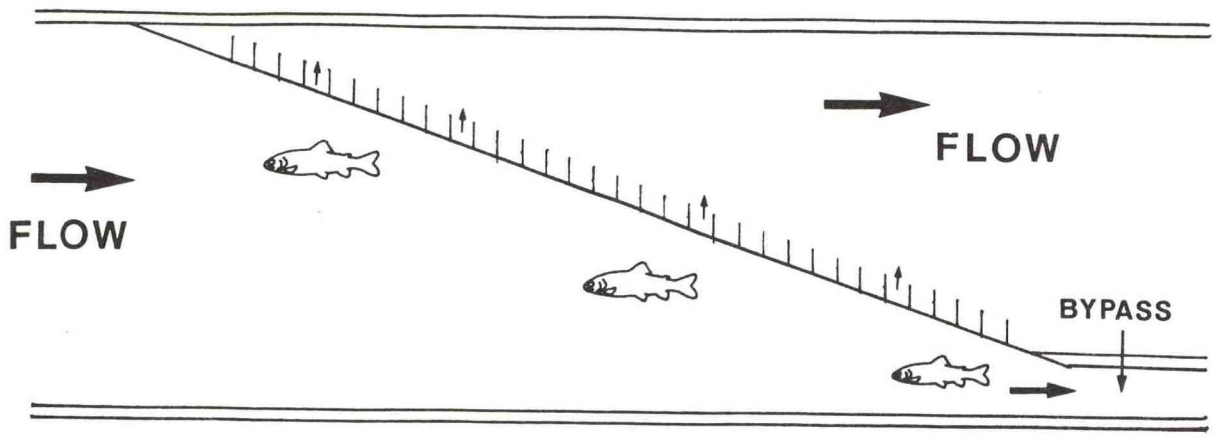
FIGURE 17. - VIEW DOWNSTREAM FROM THE LOUVER SCREEN LOCATED AT THREE MILE DAM ON THE UMATILLA RIVER, OREGON.



Oregon (Figures 16 and 17). The louver deflection system consists of a series of vertical steel slats placed at an angle to normal flow (Figure 18). As water passes through the louvers, turbulence is created. Fish approaching the screen avoid the turbulence and move along the line of louvers to a bypass channel located at the end of the louver section. The bypass channel empties out into the river below the diversion dam.

Studies have shown that collection and bypass of fish vary widely and are dependent on several factors including fish species and size, approach velocities, and guiding structures. In general, this type screen is more effective with larger-size fish such as steelhead smolts. Fish facilities which provide the best possible protection for fish and minimize delay, stress, and injury should be provided. Use of louvers will not provide the best protection and can be expected to result in significant and usually unacceptable fish losses.

Figure 18. - Louver screen showing vertical slats in relation to the water flow.



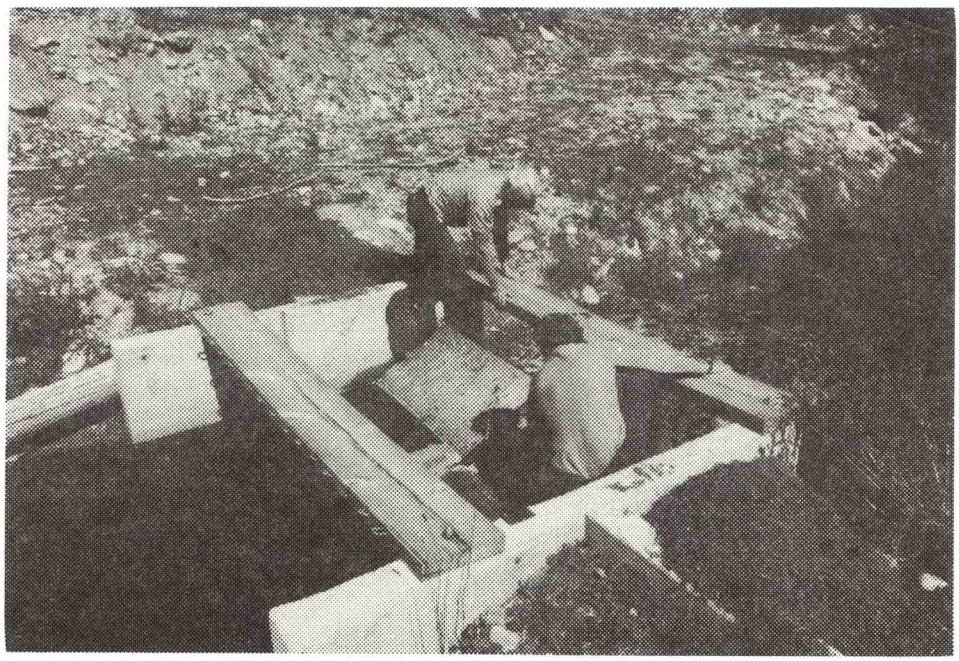
Johnson Plate Screen

The single Johnson plate screen is located in Idaho (Figure 19). The screen consists of a perforated plate set at an approximately 45-degree angle to the flow. This type screen can be used when a small volume of water is to be screened. The screen is easily clogged with debris as there is no mechanical method for its removal. During periods of high flow and debris load, trash must be removed daily by hand.

Oregon

Oregon was the first State to enter into an agreement with the CRFDP for construction and operation of irrigation diversion screens. The first screens were constructed and became operational in 1953 (FY 1954) on the John Day River. The State is authorized under State statute 498.248 to install screening devices in gravity water diversions of less than 30 cfs from bodies of water containing game fish (Appendix 4). No formal signed easement between the State and ditch owners were ever obtained. The law gives the State Commission the right of ingress and egress to such land for the purpose of installing, maintaining, and replacing such devices. The screening device may not materially diminish the flow of water in the diversion. On any gravity-fed diversion greater than 30 cfs or any pump irrigation, the landowner/ditch owner is to install and maintain a fish screen at his or her expense.

FIGURE 19. - JOHNSON PLATE SCREEN LOCATED IN IDAHO. NOTE THE FINE DEBRIS NEXT TO SCREEN STRUCTURE WHICH HAD TO BE REMOVED MANUALLY.

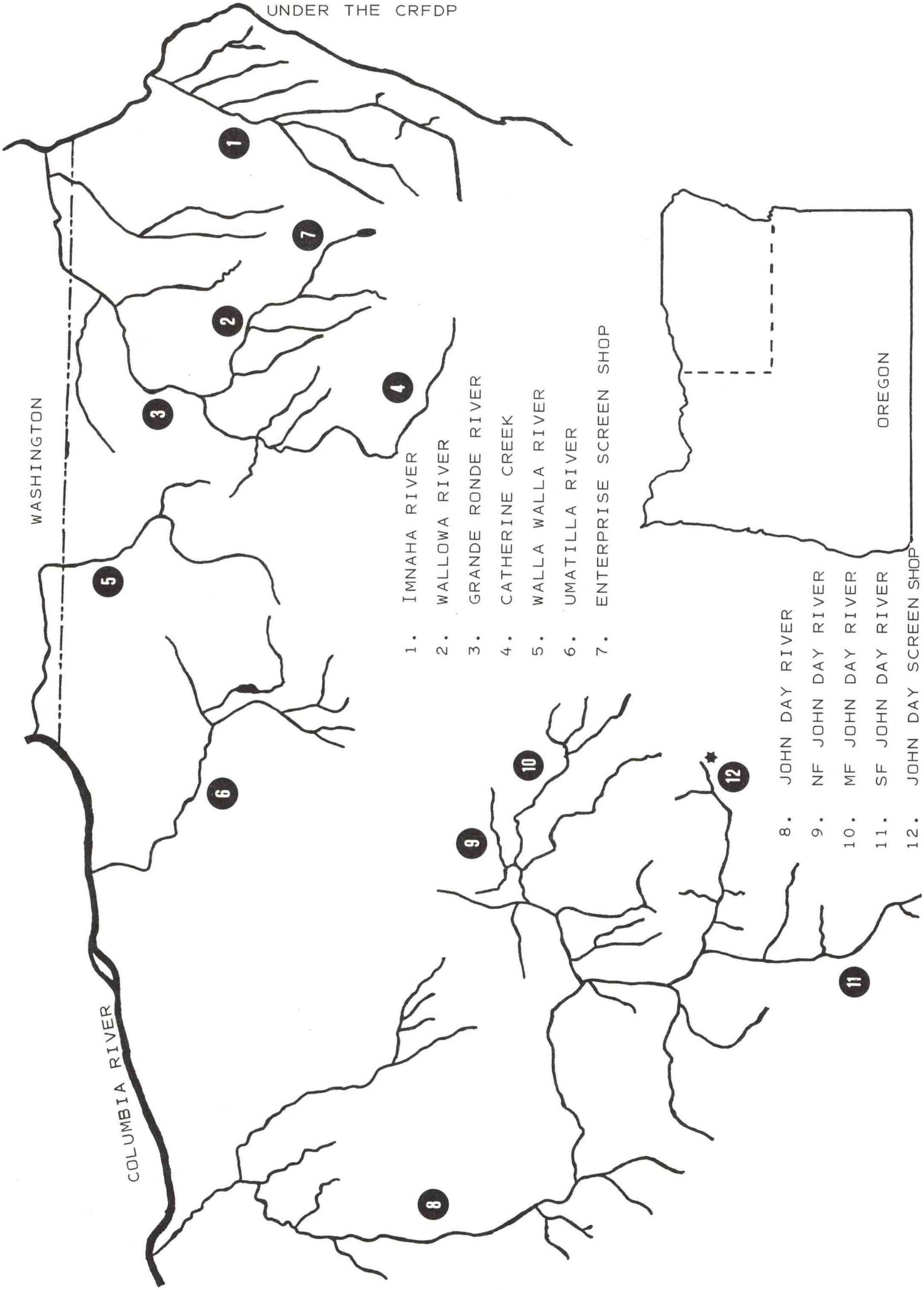


The CRFDP currently provides for operation and maintenance of irrigation screens by the State throughout northeastern Oregon (Figure 20). The number of screens on inventory and average number operated in a season are provided by river system in Table 3. Personnel from the John Day screen shop service screens on the John Day River while the Wallowa screen shop services screens on the Imnaha and Wallowa rivers. Catherine Creek screens are serviced from LaGrande and screens on the Umatilla and Walla Walla rivers are serviced from Pendleton.

Table 3. -- Number of Screens on Inventory and Average Number in Operation on Any Given Day During the Irrigation Season

River	Inventory	Average No. Active
John Day	474	300
Wallowa	73	70
Walla Walla	2	2
Umatilla	1	1
Catherine Cr.	11	9
Total	561	382

FIGURE 20. - NORTHEASTERN OREGON TRIBUTARIES TO THE COLUMBIA AND SNAKE RIVERS HAVING SCREENED IRRIGATION DIVERSIONS UNDER THE CRFDP

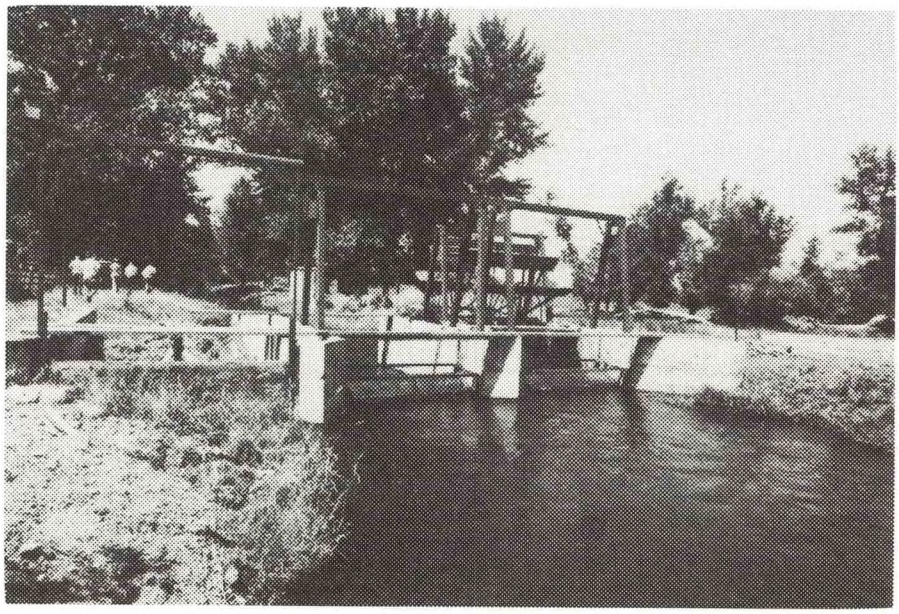


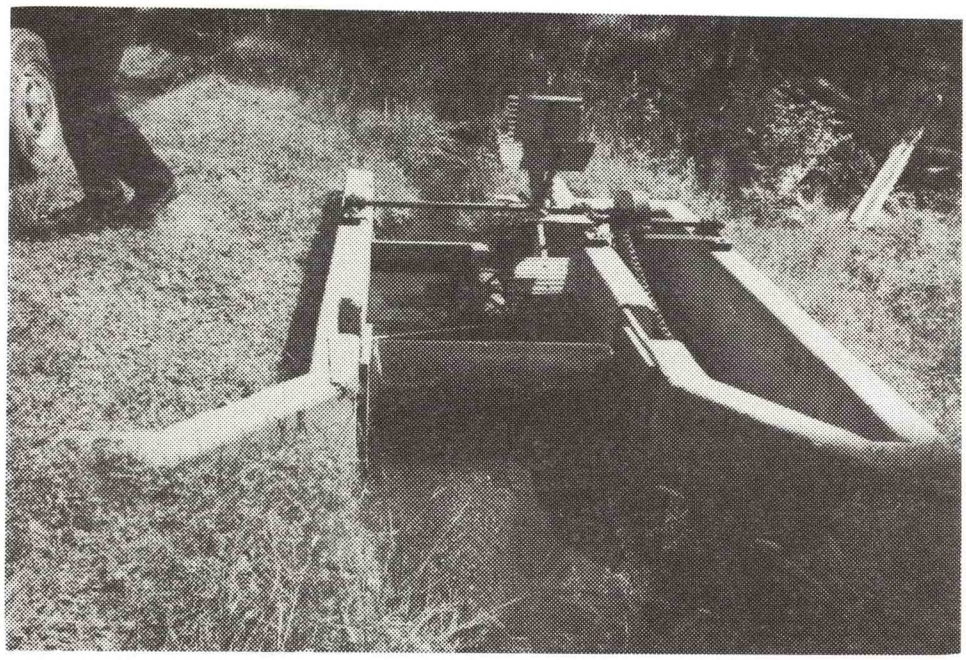
All screens may not be operated during the season and others may operate only short periods before closing down depending on weather and irrigation demand. The majority of drum screens are paddlewheel water-driven. In general, Oregon screens smaller irrigation ditches than either Idaho or Washington. The majority of registered water rights are less than 5 cfs (Figure 21). Approximately 300 screens are currently operated in the John Day River system in an average year. A number of the John Day screens have been discontinued because of abandoned ditches, insufficient water for screen operation, or lack of salmon or steelhead utilizing the stream.

An Armco sheet metal building, 36 feet by 80 feet was constructed on State property at Canyon City (near John Day) and is used as a screen shop and warehouse. This shop is currently the major screen fabrication plant for northeast Oregon. Additional covered storage was provided in 1982 for equipment and supplies. A second screen shop used for minor maintenance throughout the irrigation season is located on the Wallowa State hatchery at Enterprise. Major rejuvenation work is conducted at the John Day facility.

Recognizing potential problems may arise when increased numbers of hatchery-produced smolts are released in northeast Oregon streams from the Lower Snake River Compensation, the CRFDP is sponsoring an ODFW study to identify all irrigation screen problems and requirements for correction in the northeastern part of the state in 1985. All rivers in the area with anadromous fish will be surveyed to identify unscreened

FIGURE 21. - LARGER DRUM SCREEN (TOP PHOTO) AND TYPICAL SMALL DRUM SCREEN FOUND IN OREGON.





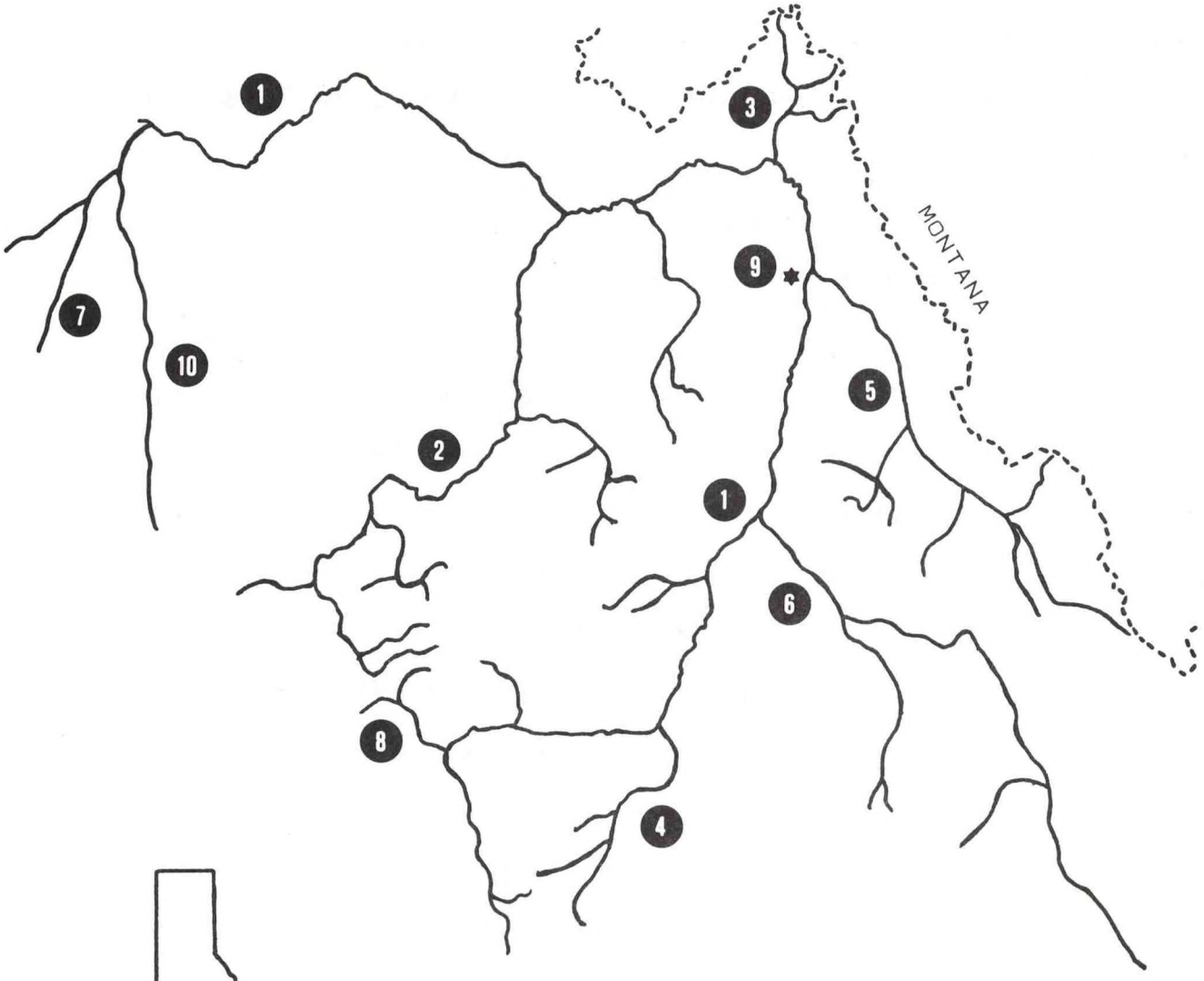
diversions and existing screens needing improvement, replacement or repair. A report will be provided to NMFS which identifies these problems and makes recommendations for their correction.

Idaho

In the mid-1950's, studies were conducted to determine the feasibility of screening irrigation canals on tributaries of the upper Salmon River (Gebhards, 1958). Construction of screens commenced in 1958 (FY 1959) after it was determined that upwards of one million salmonids could be saved annually. All irrigation screens in the State protecting anadromous salmonids are located in the Salmon River Basin and are funded through the CRFDP (Figure 22). The Salmon River originates in the Stanley Basin from creeks and springs. This river is responsible for draining approximately 3,760 square miles of central and eastern Idaho before it passes the city of Salmon. The volume increases as tributaries empty into the river, until at Whitebird, Idaho, the river drains approximately 13,500 square miles of land and has a mean annual flow of 10,700 cfs.

Idaho law requires the water diverter to provide screening when quantity of water diverted exceeds 125 cfs from any stream or lake where fish may exist (Appendix 5). For smaller diversions, State law permits construction and maintenance of irrigation screens by the Idaho Department of Fish and Game. Most diversions screened have been in existence since 1900 and in some instances on the Salmon River since the

FIGURE 22. - THE SALMON RIVER BASIN IN IDAHO SHOWING TRIBUTARIES WHERE IRRIGATION DIVERSION SCREENS ARE LOCATED



1. SALMON RIVER
2. MIDDLE FORK SALMON RIVER
3. NORTH FORK SALMON RIVER
4. EAST FORK SALMON RIVER
5. LEMHI RIVER
6. PAHSIMEROI RIVER
7. RAPID RIVER
8. VALLEY CREEK
9. IDAHO SCREEN SHOP
10. LITTLE SALMON RIVER

mid-1800's. All diversions are privately owned, either by individuals or companies. Losses of anadromous fish prior to screening were high and contributed along with the mainstem dams to the decline of the anadromous fish resource. The irrigation diversions screened are located on the North Fork and East Fork Salmon, Lemhi, Pahsimeroi, and main Salmon rivers, and their tributaries (Table 4).

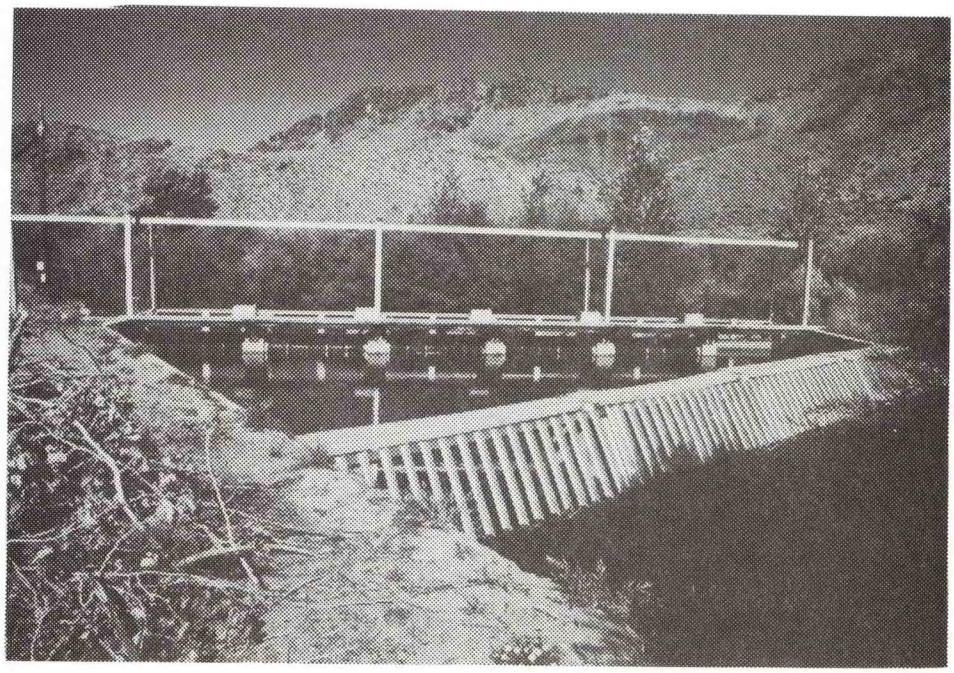
Idaho originally reviewed several screen designs and chose the vertical perforated plate utilizing both water and electrically-driven units (Figures 14 and 15). Wiper blades similar to windshield wiper blades are used to keep debris from the screen surface. The main problem is that debris must be removed manually from in front of the screen. As the original perforated plate screens wear out they are being replaced with drum screens. The advantage of drum screens is that the majority of debris is automatically passed over the screen facility. Idaho currently has the potential to convert 4 or 5 screens to drums each year. Both paddle wheel and electrically-driven units are installed (Figure 23). The major constraint with the conversions is manpower.

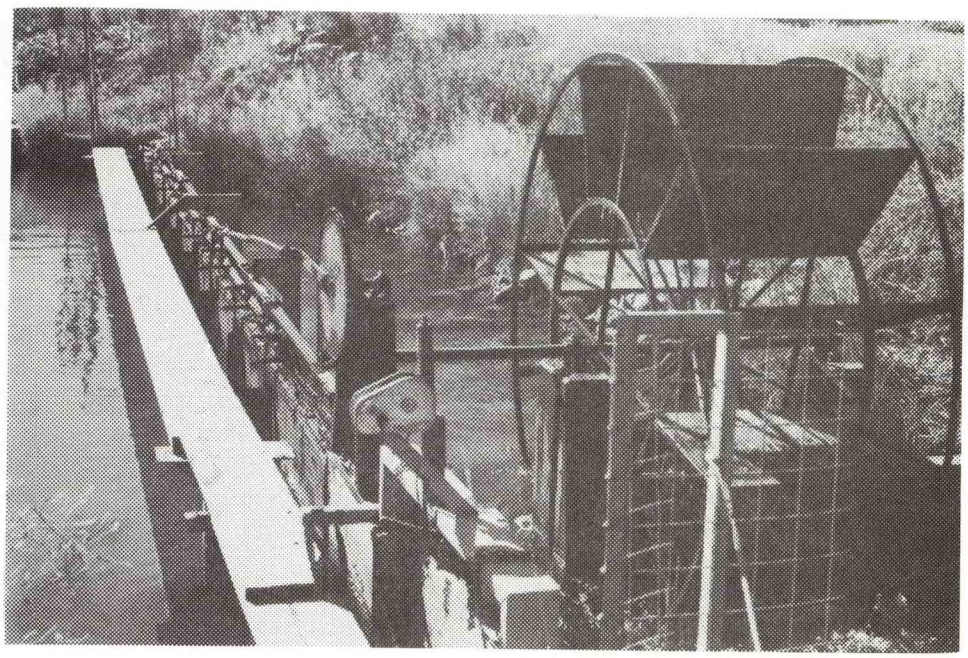
Table 4. -- Number of screened diversions in Idaho under the CRFDP and average number of active screens during a typical irrigation season.

River	Inventory	Ave. No. Active
Lemhi	97	89
East Fork Salmon	30	23
North Fork Salmon	18	15
Pahsimeroi	23	22
Main Salmon	52	47
Carmen Creek	16	0
Total	236	196

Since 1973 there have been 21 new drum screens installed in the Salmon River Basin. During this same period, an additional 20 perforated plate screens were converted to drum screens. There currently are 41 drum screens, 1 Johnson plate screen, and 194 perforated-plate wiper blade screens in operation (Figure 23).

FIGURE 23. - LARGE DRUM SCREEN (TOP PHOTO) AND TYPICAL PERFORATED PLATE WIPER BLADE SCREEN FOUND IN IDAHO.





Trip gates have been installed on all screen installations. These gates trip open when the screen becomes clogged with debris and the water level rises on the screen. The trip gates are spring operated and allow passage of water around the screen when it plugs. The trip gates assure uninterrupted water flow for irrigation as required by State law.

The average cost of screening in 1961 was $211.15 per cfs using plate screens. In 1972, for one drum screen installation, the cost was $497.51 dollars per cfs. From 1977, the average cost was $490.71 dollars per cfs for screening (Mel Ringold personal communication), basically unchanged from 1972 (Appendix Table 8). Increased productivity and efficiency have kept costs unchanged.

Initial construction occurred from 1958 to 1966 with over 200 screens built. In the mid-to-late 1970's about 25 additional screens were constructed, utilizing Bureau of Land Management (BLM) and U.S. Forest Service (USFS) funds. The CRFDP agreed to assume operation and maintenance costs for BLM and USFS-funded construction.

All IDFG irrigation screens for anadromous fish are fabricated at a screen shop located at Salmon, Idaho. Overall supervision and daily operation of the program is centralized at that location. There remains a few unscreened diversions located on the main Salmon River and corrective action is expected to occur when easement agreements have been signed between IDFG and land owners.

Large increases in hatchery production from the Lower Snake River Compensation is anticipated in the near future. By 1990, approximately 6.7 million Pacific salmon and steelhead trout smolts will be released each year into the upper Salmon River Basin, nearly five times the 1984 level. Combined fry releases of both species, presently numbering 2 million, are expected to double in the same period (Schill 1984). Past estimates of fish saved were made up mainly of wild fish. An extensive trapping program is needed to evaluate the effectiveness of screens on these larger-sized hatchery smolts. Such a program should yield up-to-date estimates on number of times an individual fish is likely to encounter an irrigation diversion as well as estimating numbers saved each year. This trapping program should also identify screens that delay migrants for atypically long periods of time.

Washington

Washington, unlike Oregon and Idaho, had already screened the majority of their irrigation diversions prior to CRFDP involvement. As a result, only 19 screens were constructed with CRFDP funds of which 16 are currently in operation (Table 5). In addition, the State supervises approximately 300 screens utilizing their own funds. The CRFDP screens are located in tributaries of the lower Snake and upper Columbia rivers (Table 5 and Figure 24). Originally, screens were constructed by both WDG and WDF with WDG assuming responsibility for lower Snake River screens and WDF for the others. Beginning July 1, 1971, WDF assumed

responsibility for all CRFDP screens located in the State. Drum screens have been installed at all of the diversions (Figure 25).

Table 5. -- Number of screened diversions in Washington funded by the CRFDP and average number of active screens during a typical irrigation season.

River	Inventory	Ave. No. Active
Touchet	6	6
Tucannon	1	1
Twisp	3	3
Methow	3	1
Entiat	1	0
Early Winters Creek	1	0
Rattlesnake Creek	1	1
Total	16	12

Sub-basin reports on the upper Columbia, Yakima, and lower Snake River systems were completed in 1961. These sub-basin reports identified unscreened diversions and were the basis for the CRFDP providing funds for screening. The original contracts for screens occurred July 1, 1962

FIGURE 24. - THE COLUMBIA RIVER BASIN IN WASHINGTON SHOWING TRIBUTARIES WHERE IRRIGATION DIVERSION SCREENS ARE LOCATED

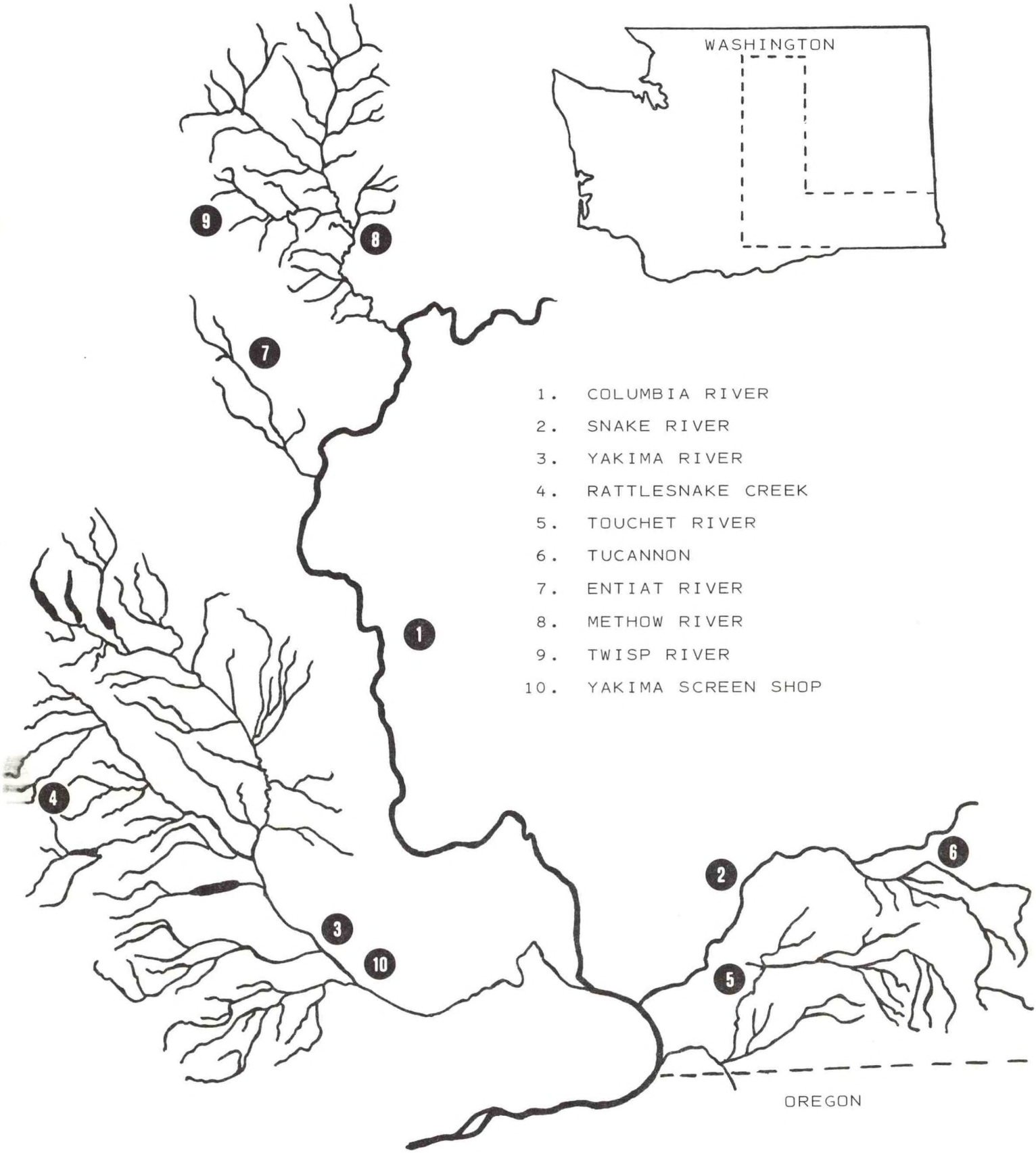
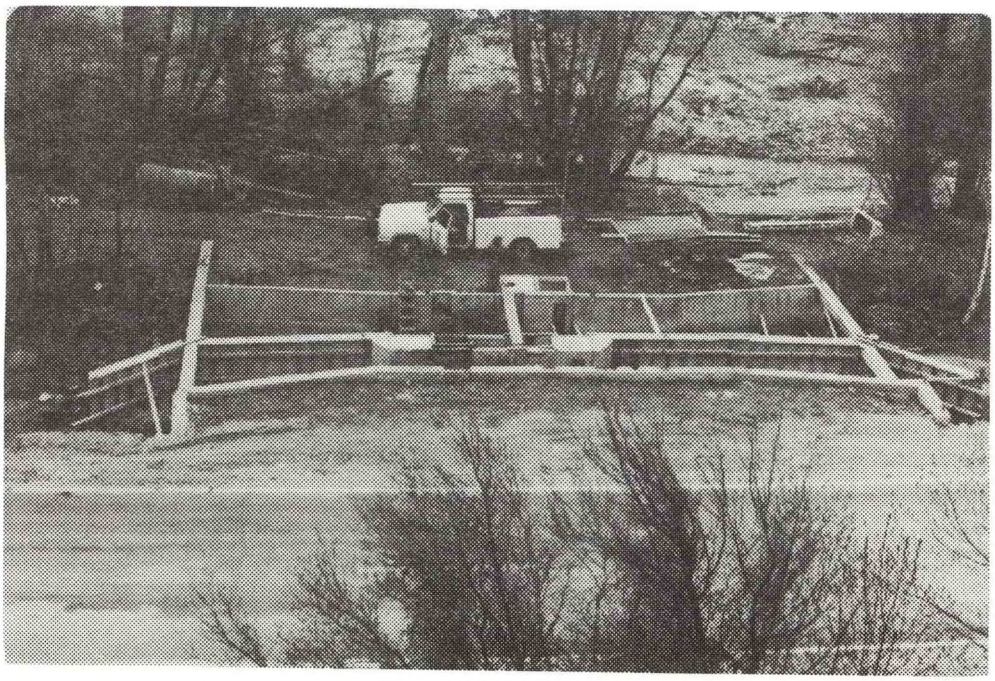
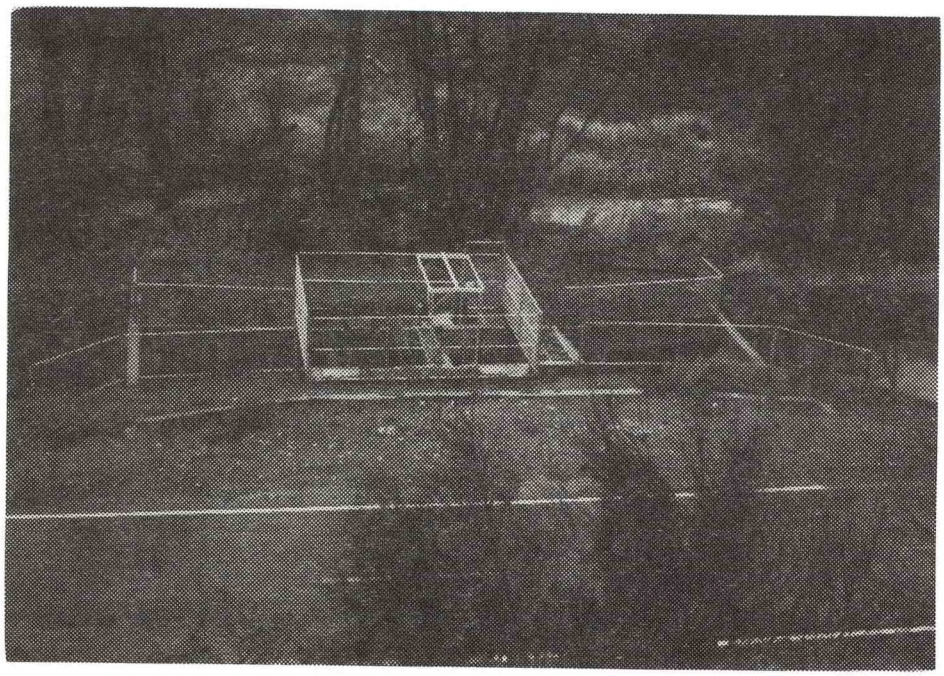


FIGURE 25. - TYPICAL DRUM SCREEN IN WASHINGTON DURING CONSTRUCTION (TOP PHOTO) AND AFTER COMPLETION (BOTTOM PHOTO).





but due to delays, construction was not completed until 1965. Nineteen screens were originally constructed but three were dismantled in 1973 when it was determined the irrigation ditches had been permanently abandoned.

State law requires ditch owners to construct, maintain, and operate fish screens (Appendix Table 6). The State statute was passed and became enforceable for irrigation facilities constructed after 1948. Screen installations were constructed under the CRFDP on irrigation ditches which preceded the State law requiring canal owners to provide screening facilities. The CRFDP constructed and provides for the operation and maintenance of screens on those irrigation ditches exempt from the State statute. Without Federal involvement, it is doubtful those irrigation diversions would have been screened.

Summary

The screen program has benefited the various species of Pacific salmon and steelhead trout originating from tributaries of the Snake and Columbia rivers. Oregon, Idaho, and Washington irrigation screens have saved countless millions of juvenile salmon and steelhead since the CRFDP became involved in the mid-1950's. These fish have contributed to fisheries as far away as Canada and Alaska in addition to providing local sport, Indian, and commercial catches. Future operation of irrigation screens will play an important role in speeding recovery of depleted stocks of fish as mitigation hatchery production increases and habitat improvement projects are completed.

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APPENDIX TABLE 1. INVENTORY OF OREGON IRRIGATION SCREENING FACILITIES CONSTRUCTED WITH COLUMBIA RIVER FISHERIES DEVELOPMENT PROGRAM FUNDS.

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-1	Grant	Indian Creek	18	13 S	33 E	.94	Fair	1955
6-2	Grant	Roberts Creek	24	14 S	34 E	?	Fair	1953
6-3	Grant	Little Indian Cr.	32	13 S	33 E	?	Fair	1955
6-5	Grant	John Day River	13	14 S	34 E	.27	Fair	1953
6-6	Grant	John Day River	13	14 S	34 E	1.75	Fair	1957
6-7	Grant	John Day River	12	14 S	34 E	5.33	Fair	1953
6-8	Grant	Laycock Cr.	36	13 S	30 E	3.0	Fair	1955
6-9	Grant	John Day River	12	14 S	34 E	0.76	Excellent	1972
6-10	Grant	John Day River	12	14 S	34 E	0.83	Fair	1953
6-11	Grant	John Day River	12	14 S	34 E	11.17	Fair	1956
6-12	Grant	John Day River	1	14 S	34 E	0.98	Poor	1953
6-13	Grant	John Day River	1	14 S	34 E	0.44	Fair	1954
6-14	Grant	Deardorff Cr.	36	13 S	34 E	?	Fair	1953
6-15	Grant	Deardorff Cr.	36	13 S	34 E	?	Fair	1953
6-16	Grant	Deardorff Cr.	36	13 S	34 E	?	Fair	1953
6-17	Grant	John Day River	10	13 S	34 E	?	Fair	1954
6-18	Grant	John Day River	26	13 S	34 E	7.23	Fair	1954
6-19	Grant	Reynolds Cr.	25	13 S	34 E	?	Fair	1953
6-20	Grant	John Day River	4	12 S	27 E	1.14	Fair	1954
6-21	Grant	Reynolds Cr.	26	13 S	34 E	?	Fair	1954
6-22	Grant	Reynolds Cr.	25	13 S	34 E	?	Fair	1972
6-23	Grant	John Day River	22	14 S	34 E	5.38	Fair	1954
6-24	Grant	John Day River	22	13 S	34 E	5.88	Fair	1955
6-25	Grant	John Day River	22	13 S	34 E	0.53	Fair	1954
6-26	Grant	John Day River	21	13 S	34 E	1.25	Fair	1956
6-27	Grant	John Day River	16	12 S	33 E	1.33	Fair	1954
6-28	Grant	John Day River	21	13 S	34 E	17.40	Poor	1955
6-29	Grant	John Day River	17	13 S	34 E	11.16	Fair	1954
6-30	Grant	John Day River	7	13 S	34 E	3.72	Fair	1954

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-31	Grant	John Day River	7	13 S	34 E	5.01	Fair	1972
6-32	Grant	John Day River	7	13 S	34 E	13.97	Fair	1972
6-33	Grant	John Day River	12	13 S	34 E	1.99	Fair	1956
6-34	Grant	John Day River	12	13 S	34 E	2.65	Fair	1972
6-35	Grant	John Day River	12	13 S	33 E	5.81	Fair	1954
6-36	Grant	John Day River	10	13 S	33 E	0.60	Fair	1972
6-37	Grant	John Day River	10	13 S	33 E	2.49	Fair	1972
6-38	Grant	John Day River	10	13 S	33 E	1.25	Fair	1956
6-39	Grant	Laycock Creek	36	13 S	30 E	3.00	Fair	1955
6-40	Grant	John Day River	9	12 S	33 E	3.33	Fair	1954
6-41	Grant	John Day River	9	13 S	33 E	1.98	Fair	1954
6-42	Grant	John Day River	17	13 S	33 E	7.21	Fair	1954
6-43	Grant	John Day River	17	13 S	32 E	1.38	Fair	1954
6-44	Grant	John Day River	13	13 S	32 E	0.71	Fair	1954
6-45	Grant	John Day River	14	13 S	32 E	0.84	Fair	1972
6-46	Grant	John Day River	15	13 S	32 E	?	Fair	1954
6-47	Grant	John Day River	21	13 S	32 E	2.64	Fair	1972
6-48	Grant	John Day River	21	13 S	32 E	0.14	Fair	1954
6-49	Grant	John Day River	21	13 S	32 E	2.84	Fair	1954
6-50	Grant	John Day River	20	13 S	32 E	1.41	Fair	1955
6-51	Grant	John Day River	30	13 S	32 E	1.26	Fair	1954
6-52	Grant	John Day River	25	13 S	31 E	4.94	Fair	1972
6-53	Grant	John Day River	10	13 S	34 E	0.83	Excellent	1981
6-54	Grant	Indian Creek	10	14 S	33 E	?	Fair	1955
6-55	Grant	Indian Creek	3	14 S	33 E	?	Fair	1955
6-56	Grant	Indian Creek	3	14 S	33 E	?	Fair	1955
6-57	Grant	Indian Creek	33	13 S	33 E	?	Fair	1955
6-58	Grant	Little Indian Cr.	32	13 S	33 E	?	Fair	1955
6-59	Grant	Little Indian Cr.	4	14 S	33 E	?	Fair	1955
6-60	Grant	Indian Creek	29	13 S	33 E	?	Fair	1972
6-61	Grant	Indian Creek	29	13 S	33 E	?	Fair	1955
6-62	Grant	Indian Creek	29	13 S	33 E	?	Fair	1972

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-63	Grant	Indian Creek	19	13 S	33 E	?	Fair	1955
6-64	Grant	Indian Creek	13	13 S	32 E	0.94	Fair	1955
6-65	Grant	Indian Creek	18	13 S	33 E	?	Fair	1955
6-66	Grant	John Day River	22	13 S	31 E	9.33	Fair	1955
6-67	Grant	John Day River	22	13 S	31 E	4.53	Fair	1972
6-68	Grant	John Day River	20	13 S	31 E	27.06	Fair	1955
6-69	Grant	John Day River	19	13 S	31 E	1.06	Fair	1954
6-70	Grant	John Day River	25	13 S	30 E	14.58	Fair	1955
6-71	Grant	John Day River	26	13 S	30 E	4.77	Fair	1954
6-75	Grant	Canyon Creek	19	13 S	31 E	?	Fair	1972
6-76	Grant	Canyon Creek	24	14 S	31 E	?	Fair	1954
6-77	Grant	Canyon Creek	25	14 S	31 E	?	Fair	1954
6-78	Grant	Canyon Creek	36	14 S	31 E	?	Fair	1972
6-79	Grant	Canyon Creek	11	14 S	31 E	3.00	Fair	1972
6-81	Grant	Canyon Creek	13	15 S	31 E	?	Fair	1972
6-82	Grant	John Day River	26	13 S	34 E	0.33	Fair	1954
6-83	Grant	Canyon Creek	2	16 S	32 E	0.01	Fair	1952
6-84	Grant	E.F. Canyon Cr.	29	15 S	32 E	?	Fair	1955
6-85	Grant	Canyon Creek	25	14 S	31 E	?	Excellent	1972
6-86	Grant	Canyon Creek	35	14 S	31 E	0.08	Excellent	1972
6-87	Grant	Canyon Creek	36	14 S	31 E	?	Excellent	1972
6-91	Grant	Reynolds Creek	26	13 S	34 E	?	Fair	1974
6-92	Grant	Reynolds Creek	25	13 S	34 E	?	Fair	1955
6-93	Grant	John Day River	28	13 S	29 E	4.59	Excellent	1972
6-94	Grant	John Day River	29	13 S	30 E	14.84	Fair	1954
6-95	Grant	John Day River	19	13 S	29 E	1.73	Excellent	1972
6-97	Grant	John Day River	23	13 S	29 E	7.71	Fair	1954
6-98	Grant	John Day River	27	13 S	29 E	8.09	Fair	1955
6-99	Grant	John Day River	21	13 S	29 E	4.12	Fair	1972
6-100	Grant	John Day River	20	13 S	29 E	0.25	Fair	1954
6-101	Grant	John Day River	21	13 S	29 E	0.98	Fair	1954
6-102	Grant	John Day River	19	13 S	28 E	3.06	Fair	1954

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-103	Grant	John Day River	18	13 S	29 E	0.40	Fair	1954
6-104	Grant	John Day River	13	13 S	28 E	3.32	Excellent	1976
6-105	Grant	Dixie Creek	11	12 S	33 E	?	Fair	1954
6-106	Grant	Canyon Creek	13	15 S	31 E	?	Fair	1954
6-107	Grant	Canyon Creek	23	13 S	31 E	3.00	Fair	1954
6-108	Grant	M.F. John Day R.	22	11 S	35 E	3.60	Fair	1954
6-109	Grant	M.F. John Day R.	23	11 S	35 E	?	Fair	1954
6-110	Grant	M.F. John Day R.	6	11 S	35 E	?	Fair	1954
6-111	Grant	Big Boulder Cr.	22	11 S	35 E	2.35	Fair	1955
6-112	Grant	M.F. John Day R.	21	11 S	35 E	3.60	Fair	1954
6-113	Grant	M.F. John Day R.	21	11 S	35 E	2.35	Fair	1954
6-114	Grant	Big Boulder Cr.	15	10 S	33 E	?	Fair	1955
6-115	Grant	M.F. John Day R.	20	11 S	35 E	?	Fair	1954
6-116	Grant	M.F. John Day R.	20	11 S	34 E	?	Fair	1954
6-117	Grant	M.F. John Day R.	19	11 S	34 E	?	Fair	1954
6-118	Grant	M.F. John Day R.	13	10 S	34 E	?	Fair	1954
6-119	Grant	M.F. John Day R.	27	10 S	33 E	?	Fair	1954
6-120	Grant	M.F. John Day R.	28	10 S	33 E	4.32	Fair	1954
6-121	Grant	M.F. John Day R.	20	10 S	33 E	0.34	Fair	1956
6-122	Grant	M.F. John Day R.	20	10 S	33 E	4.32	Fair	1954
6-123	Grant	M.F. John Day R.	20	10 S	33 E	3.64	Fair	1954
6-124	Grant	Big Boulder Cr.	26	10 S	33 E	?	Fair	1955
6-125	Grant	Elk Creek	13	10 S	32 E	0.71	Fair	1955
6-126	Grant	M.F. John Day R.	2	10 S	32 E	0.37	Fair	1955
6-127	Grant	M.F. John Day R.	31	8 S	31 E	0.13	Fair	1954
6-130	Grant	Indian Creek	35	13 S	32 E	?	Fair	1980
6-131	Grant	John Day River	21	13 S	33 E	2.20	Excellent	1976
6-132	Grant	John Day River	14	12 S	28 E	0.06	Fair	1954
6-133	Grant	John Day River	14	13 S	28 E	2.88	Fair	1954
6-134	Grant	John Day River	15	12 S	28 E	1.83	Fair	1954
6-135	Grant	John Day River	5	13 S	27 E	?	Fair	1957
6-136	Grant	John Day River	12	13 S	27 E	2.67	Fair	1954

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-137	Grant	John Day River	10	13 S	27 E	4.54	Fair	1955
6-138	Grant	John Day River	3	13 S	27 E	1.02	Fair	1954
6-139	Grant	John Day River	4	12 S	27 E	0.98	Fair	1961
6-140	Grant	John Day River	6	13 S	27 E	5.41	Fair	1955
6-141	Grant	John Day River	1	12 S	26 E	1.23	Fair	1954
6-142	Grant	John Day River	36	12 S	26 E	4.97	Fair	1954
6-143	Grant	John Day River	27	12 S	26 E	2.23	Fair	1954
6-144	Grant	John Day River	34	12 S	26 E	0.56	Fair	1954
6-145	Grant	John Day River	34	12 S	26 E	4.88	Fair	1954
6-146	Grant	John Day River	17	12 S	26 E	?	Fair	1956
6-147	Grant	John Day River	31	11 S	26 E	?	Fair	1954
6-148	Grant	John Day River	20	11 S	26 E	?	Fair	1954
6-149	Grant	John Day River	20	11 S	26 E	?	Fair	1954
6-150	Grant	Indian Creek	7	9 S	32 E	?	Fair	1955
6-151	Grant	N.F. John Day R.	3	9 S	27 E	?	Fair	1957
6-152	Grant	M.F. John Day R.	5	11 S	34 E	?	Fair	1954
6-153	Grant	John Day River	1	13 S	26 E	?	Fair	1954
6-154	Grant	John Day River	1	13 S	26 E	?	Fair	1954
6-155	Grant	S.F. John Day R.	7	13 S	27 E	?	Fair	1955
6-156	Grant	S.F. John Day R.	12	13 S	26 E	?	Fair	1954
6-157	Grant	Big Creek	21	9 S	32 E	0.32	Fair	1958
6-158	Grant	S.F. John Day R.	18	13 S	27 E	?	Fair	1954
6-159	Grant	S.F. John Day R.	18	13 S	27 E	?	Fair	1955
6-160	Grant	S.F. John Day R.	13	13 S	27 E	?	Fair	1954
6-161	Grant	S.F. John Day R.	24	13 S	26 E	?	Fair	1954
6-162	Grant	S.F. John Day R.	36	13 S	26 E	?	Fair	1954
6-163	Grant	S.F. John Day R.	24	14 S	26 E	?	Fair	1954
6-164	Grant	Davis Creek	20	11 S	35 E	?	Fair	1954
6-165	Grant	Clear Creek	35	11 S	35 E	1.17	Fair	1957
6-166	Grant	Davis Creek	19	11 S	34 E	?	Fair	1955
6-167	Grant	Beaver Creek	22	13 S	31 E	?	Fair	1955
6-168	Grant	Beaver Creek	20	13 S	31 E	?	Fair	1955

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-169	Grant	Camp Creek	19	10 S	33 E	0.53	Fair	1955
6-170	Grant	Camp Creek	19	10 S	32 E	0.53	Fair	1955
6-171	Grant	Camp Creek	25	10 S	32 E	0.53	Fair	1955
6-172	Grant	Camp Creek	25	10 S	32 E	0.53	Fair	1955
6-173	Grant	S.E. Long Cr.	20	10 S	31 E	3.00	Fair	1955
6-175	Grant	Laycock Cr.	24	14 S	30 E	?	Fair	1956
6-196	Grant	Canyon Creek	29	15 S	32 E	?	Fair	1961
6-197	Grant	Canyon Creek	11	15 S	31 E	?	Fair	1957
6-198	Grant	Ingle Creek	3	14 S	30 E	?	Fair	1957
6-200	Wheeler	Lone Rock Cr.	8	6 S	25 E	?	Fair	1955
6-201	Wheeler	Brow Creek	9	6 S	24 E	0.30	Fair	1955
6-202	Grant	Roberts Creek	24	14 S	34 E	?	Fair	1955
6-203	Grant	S.F. John Day R.	13	15 S	26 E	?	Fair	1955
6-204	Grant	Wind Creek	16	13 S	28 E	?	Fair	1955
6-205	Grant	S.F. John Day R.	24	15 S	26 E	?	Fair	1955
6-206	Grant	S.F. John Day R.	19	15 S	27 E	?	Fair	1955
6-207	Grant	Wind Creek	14	15 S	26 E	?	Fair	1955
6-208	Grant	Long Creek	12	10 S	30 E	?	Fair	1955
6-209	Grant	S.F. Long Cr.	29	10 S	31 E	?	Fair	1955
6-210	Grant	Dixie Creek	11	13 S	33 E	?	Fair	1955
6-211	Grant	John Day River	7	11 S	26 E	?	Fair	1957
6-212	Grant	Dixie Creek	2	13 S	33 E	?	Fair	1955
6-213	Grant	Laycock Creek	25	13 S	30 E	?	Fair	1957
6-214	Grant	Dixie Creek	2	13 S	33 E	?	Fair	1955
6-215	Grant	Dixie Creek	2	13 S	33 E	?	Fair	1955
6-216	Grant	Dixie Creek	26	12 S	33 E	?	Fair	1955
6-217	Grant	Dixie Creek	23	12 S	33 E	?	Fair	1955
6-218	Grant	Dixie Creek	11	12 S	33 E	1.00	Fair	1955
6-219	Grant	Granite Boulder Cr.	31	10 S	34 E	0.20	Fair	1957
6-220	Grant	Beech Creek	21	13 S	30 E	?	Fair	1955
6-221	Grant	Beech Creek	21	13 S	30 E	?	Fair	1956
6-222	Grant	Beech Creek	14	13 S	30 E	?	Fair	1961

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-223	Grant	Beech Creek	21	13 S	30 E	?	Fair	1955
6-224	Grant	Beech Creek	15	13 S	30 E	?	Fair	1956
6-225	Grant	Beech Creek	14	13 S	30 E	?	Fair	1956
6-226	Wheeler	Butte Creek	7	6 S	20 E	?	Fair	1955
6-227	Wheeler	Butte Creek	7	6 S	20 E	?	Fair	1955
6-228	Wheeler	Butte Creek	9	6 S	20 E	?	Fair	1956
6-229	Wheeler	Butte Creek	10	6 S	20 E	?	Fair	1955
6-230	Wheeler	Butte Creek	23	6 S	20 E	?	Fair	1955
6-231	Wheeler	Butte Creek	26	6 S	20 E	?	Fair	1955
6-232	Wheeler	Butte Creek	24	6 S	20 E	?	Fair	1955
6-233	Wheeler	Butte Creek	26	6 S	20 E	?	Fair	1955
6-234	Wheeler	Butte Creek	25	6 S	20 E	?	Fair	1955
6-235	Grant	Big Creek	21	9 S	32 E	?	Fair	1958
6-236	Wheeler	Butte Creek	32	6 S	21 E	?	Fair	1955
6-237	Grant	Rudio Creek	22	9 S	26 E	?	Fair	1955
6-238	Grant	Rudio Creek	27	9 S	26 E	?	Fair	1955
6-239	Wheeler	Butte Creek	34	6 S	20 E	?	Fair	1955
6-240	Wheeler	Butte Creek	34	6 S	21 E	3.00	Fair	1955
6-241	Wheeler	Butte Creek	3	6 S	21 E	?	Fair	1955
6-242	Grant	Rudio Creek	27	9 S	26 E	0.04	Fair	1955
6-243	Wheeler	Butte Creek	4	6 S	21 E	?	Fair	1955
6-244	Grant	Rudio Creek	36	9 S	26 E	0.04	Fair	1955
6-245	Wheeler	Butte Creek	32	7 S	22 E	?	Fair	1955
6-246	Wheeler	Butte Creek	8	6 S	19 E	?	Fair	1955
6-247	Wheeler	Butte Creek	8	6 S	19 E	?	Fair	1955
6-248	Grant	Long Creek	2	10 S	30 E	3.00	Fair	1955
6-249	Grant	Riley Creek	6	14 S	30 E	?	Fair	1955
6-250	Grant	Riley Creek	7	14 S	30 E	0.09	Fair	1955
6-251	Grant	Riley Creek	6	14 S	30 E	?	Fair	1958
6-252	Grant	Riley Creek	30	13 S	30 E	?	Fair	1955
6-253	Grant	Riley Creek	30	13 S	30 E	?	Fair	1955
6-254	Grant	Riley Creek	30	13 S	30 E	?	Fair	1955

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-255	Grant	Camas Creek	13	5 S	31 E	?	Fair	1955
6-256	Grant	Riley Creek	6	14 S	30 E	0.06	Fair	1955
6-257	Grant	Cottonwood Cr.	36	10 S	27 E	5.63	Fair	1955
6-258	Grant	Cottonwood Cr.	36	10 S	27 E	5.63	Fair	1955
6-259	Grant	Cottonwood Cr.	19	9 S	28 E	3.00	Fair	1955
6-260	Grant	Cottonwood Cr.	18	9 S	28 E	0.57	Fair	1955
6-261	Grant	Cottonwood Cr.	18	9 S	28 E	0.57	Fair	1955
6-262	Grant	Cottonwood Cr.	12	9 S	28 E	?	Fair	1955
6-264	Grant	Cottonwood Cr.	29	12 S	26 E	0.07	Fair	1955
6-265	Grant	Cottonwood Cr.	29	12 S	26 E	0.07	Fair	1955
6-266	Grant	Squaw Cr.	30	11 S	26 E	3.00	Fair	1958
6-267	Grant	Squaw Cr.	30	11 S	26 E	3.00	Fair	1955
6-270	Grant	Cottonwood Cr.	28	12 S	26 E	3.00	Fair	1955
6-271	Grant	Gilmore Cr.	36	9 S	26 E	?	Fair	1957
6-272	Wheeler	Tamarack Cr.	4	8 S	26 E	?	Fair	1957
6-273	Wheeler	Tamarack Cr.	4	8 S	25 E	?	Fair	1957
6-274	Grant	Kahler Cr.	26	8 S	24 E	3.00	Fair	1956
6-275	Wheeler	Service Cr.	7	9 S	23 E	?	Fair	1955
6-276	Wheeler	Service Cr.	7	9 S	23 E	?	Fair	1955
6-277	Wheeler	Service Cr.	1	9 S	22 E	?	Fair	1955
6-278	Wheeler	Service Cr.	36	8 S	22 E	?	Fair	1955
6-279	Wheeler	Service Cr.	36	8 S	22 E	?	Fair	1955
6-280	Grant	Rudio Cr.	1	10 S	26 E	?	Fair	1955
6-281	Wheeler	Service Cr.	25	8 S	22 E	?	Fair	1955
6-282	Grant	Rudio Cr.	13	10 S	26 E	?	Fair	1955
6-283	Wheeler	Service Cr.	25	8 S	22 E	?	Fair	1955
6-284	Grant	Rudio Cr.	22	9 S	26 E	2.08	Fair	1959
6-285	Wheeler	Service Cr.	23	8 S	22 E	?	Fair	1956
6-286	Wheeler	Service Cr.	25	8 S	22 E	?	Fair	1955
6-287	Grant	Parrish Cr.	2	9 S	24 E	?	Fair	1955
6-288	Grant	Parrish Cr.	35	8 S	24 E	?	Fair	1955
6-289	Grant	Straight Cr.	25	9 S	26 E	?	Fair	1959

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-290	Wheeler	Corn Cob Cr.	13	8 S	24 E	0.33	Fair	1955
6-291	Wheeler	Corn Cob Cr.	12	8 S	24 E	3.00	Fair	1955
6-292	Wheeler	Corn Cob Cr.	12	8 S	24 E	3.00	Fair	1955
6-293	Wheeler	Corn Cob Cr.	12	8 S	24 E	3.00	Fair	1955
6-294	Wheeler	Tamarack Cr.	4	8 S	25 E	?	Fair	1955
6-295	Wheeler	Tamarack Cr.	4	8 S	25 E	3.00	Fair	1955
6-296	Wheeler	Alder Cr.	26	8 S	23 E	?	Fair	1955
6-297	Grant	Alder Cr.	23	8 S	23 E	?	Fair	1955
6-298	Wheeler	Alder Cr.	13	8 S	23 E	?	Fair	1955
6-299	Grant	Alder Cr.	13	8 S	23 E	?	Fair	1955
6-300	Wheeler	Alder Cr.	12	8 S	23 E	?	Fair	1956
6-301	Grant	Ingle Cr.	15	14 S	30 E	?	Fair	1956
6-302	Grant	Ingle Cr.	8	13 S	30 E	?	Fair	1956
6-303	Grant	Ingle Cr.	8	13 S	30 E	?	Fair	1955
6-304	Grant	Ingle Cr.	33	13 S	30 E	?	Fair	1955
6-305	Grant	Ingle Cr.	34	13 S	30 E	?	Fair	1955
6-306	Grant	Ingle Cr.	34	13 S	30 E	?	Fair	1955
6-307	Grant	Ingle Cr.	34	13 S	30 E	?	Fair	1955
6-308	Grant	Ingle Cr.	33	13 S	30 E	?	Fair	1955
6-309	Grant	Ingle Cr.	3	14 S	30 E	?	Fair	1955
6-310	Grant	Ingle Cr.	10	14 S	30 E	?	Fair	1955
6-311	Grant	Ingle Cr.	10	14 S	30 E	?	Fair	1955
6-312	Grant	Ingle Cr.	10	14 S	30 E	0.50	Fair	1955
6-313	Grant	Ingle Cr.	15	14 S	30 E	?	Fair	1955
6-314	Grant	Granite Boulder Cr.	31	10 S	33 E	?	Fair	1955
6-315	Grant	Granite Boulder Cr.	26	10 S	33 E	?	Fair	1955
6-316	Grant	Vinegar Cr.	19	11 S	35 E	0.93	Excellent	1976
6-317	Grant	Granite Boulder Cr.	32	10 S	34 E	2.00	Fair	1955
6-318	Grant	Granite Boulder Cr.	32	10 S	33 E	0.55	Fair	1955
6-319	Grant	Granite Boulder Cr.	32	10 S	34 E	?	Fair	1955
6-320	Grant	Granite Boulder Cr.	28	10 S	34 E	?	Fair	1955
6-321	Grant	Fields Cr.	13	13 S	28 E	0.19	Fair	1955

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-324	Grant	Fields Cr.	24	13 S	28 E	?	Fair	1955
6-325	Grant	Fields Cr.	24	13 S	28 E	?	Fair	1955
6-326	Grant	Fields Cr.	25	13 S	28 E	0.26	Fair	1955
6-327	Grant	Fields Cr.	24	13 S	28 E	?	Fair	1955
6-328	Grant	Fields Cr.	24	13 S	28 E	?	Fair	1955
6-329	Grant	Fields Cr.	24	13 S	28 E	?	Fair	1955
6-330	Grant	Fields Cr.	24	13 S	28 E	?	Fair	1955
6-332	Grant	Fields Cr.	25	13 S	28 E	?	Fair	1955
6-333	Grant	Fields Cr.	26	13 S	28 E	?	Fair	1957
6-335	Grant	Fields Cr.	35	13 S	28 E	?	Excellent	1976
6-336	Grant	Widows Cr.	16	13 S	28 E	?	Fair	1956
6-337	Grant	Widows Cr.	21	13 S	28 E	?	Fair	1956
6-339	Grant	Widows Cr.	21	13 S	28 E	?	Fair	1956
6-340	Grant	Widows Cr.	21	13 S	28 E	?	Fair	1956
6-341	Grant	Widows Cr.	28	13 S	28 E	?	Fair	1956
6-349	Grant	Belshaw Cr.	13	13 S	28 E	?	Fair	1956
6-350	Grant	Belshaw Cr.	13	13 S	28 E	?	Fair	1956
6-351	Grant	Belshaw Cr.	18	13 S	29 E	?	Fair	1956
6-352	Grant	Belshaw Cr.	18	13 S	29 E	?	Fair	1956
6-353	Grant	Belshaw Cr.	7	13 S	29 E	?	Fair	1956
6-354	Grant	Moon Cr.	28	13 S	29 E	?	Fair	1956
6-355	Grant	Moon Cr.	28	13 S	29 E	?	Fair	1956
6-356	Grant	Moon Cr.	28	13 S	29 E	?	Fair	1956
6-357	Grant	Moon Cr.	28	13 S	29 E	?	Fair	1956
6-358	Grant	Moon Cr.	28	13 S	29 E	?	Fair	1956
6-359	Grant	Moon Cr.	33	13 S	29 E	?	Fair	1956
6-360	Grant	Moon Cr.	13	13 S	29 E	?	Fair	1956
6-361	Grant	Murderer's Cr.	32	14 S	27 E	?	Fair	1956
6-362	Grant	Murderer's Cr.	4	15 S	27 E	?	Fair	1956
6-363	Grant	Murderer's Cr.	10	15 S	27 E	?	Fair	1956
6-364	Grant	Murderer's Cr.	11	15 S	27 E	?	Fair	1956
6-365	Grant	Murderer's Cr.	12	15 S	27 E	?	Fair	1956

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-333	Grant	Fields Cr.	26	13 S	28 E	?	Fair	1957
6-335	Grant	Fields Cr.	35	13 S	28 E	?	Excellent	1976
6-336	Grant	Widows Cr.	16	13 S	28 E	?	Fair	1956
6-337	Grant	Widows Cr.	21	13 S	28 E	?	Fair	1956
6-339	Grant	Widows Cr.	21	13 S	28 E	?	Fair	1956
6-340	Grant	Widows Cr.	21	13 S	28 E	?	Fair	1956
6-341	Grant	Widows Cr.	28	13 S	28 E	?	Fair	1956
6-349	Grant	Belshaw Cr.	13	13 S	28 E	?	Fair	1956
6-350	Grant	Belshaw Cr.	13	13 S	28 E	?	Fair	1956
6-351	Grant	Belshaw Cr.	18	13 S	29 E	?	Fair	1956
6-352	Grant	Belshaw Cr.	18	13 S	29 E	?	Fair	1956
6-353	Grant	Belshaw Cr.	7	13 S	29 E	?	Fair	1956
6-354	Grant	Moon Cr.	28	13 S	29 E	?	Fair	1956
6-355	Grant	Moon Cr.	28	13 S	29 E	?	Fair	1956
6-356	Grant	Moon Cr.	28	13 S	29 E	?	Fair	1956
6-357	Grant	Moon Cr.	28	13 S	29 E	?	Fair	1956
6-358	Grant	Moon Cr.	28	13 S	29 E	?	Fair	1956
6-359	Grant	Moon Cr.	33	13 S	29 E	?	Fair	1956
6-360	Grant	Moon Cr.	13	13 S	29 E	?	Fair	1956
6-361	Grant	Murderer's Cr.	32	14 S	27 E	?	Fair	1956
6-362	Grant	Murderer's Cr.	4	15 S	27 E	?	Fair	1956
6-363	Grant	Murderer's Cr.	10	15 S	27 E	?	Fair	1956
6-364	Grant	Murderer's Cr.	11	15 S	27 E	?	Fair	1956
6-365	Grant	Murderer's Cr.	12	15 S	27 E	?	Fair	1956
6-372	Grant	Beech Cr.	12	13 S	30 E	?	Fair	1956
6-373	Grant	Beech Cr.	7	13 S	31 E	?	Fair	1956
6-374	Grant	Beech Cr.	7	13 S	31 E	?	Fair	1956
6-375	Wheeler	Rock Cr.	35	12 S	24 E	?	Fair	1956
6-376	Wheeler	Rock Cr.	2	13 S	24 E	?	Fair	1956
6-377	Wheeler	Rock Cr.	2	13 S	24 E	?	Fair	1956
6-378	Wheeler	Rock Cr.	11	13 S	24 E	?	Fair	1956
6-379	Wheeler	Rock Cr.	22	13 S	24 E	?	Fair	1956

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-380	Wheeler	Rock Cr.	22	13 S	24 E	?	Fair	1956
6-381	Wheeler	Rock Cr.	22	13 S	24 E	?	Fair	1956
6-382	Wheeler	Rock Cr.	11	13 S	24 E	?	Fair	1957
6-383	Wheeler	Bridge Cr.	24	10 S	20 E	?	Fair	1957
6-384	Wheeler	Mountain Cr.	14	12 S	23 E	?	Fair	1956
6-385	Wheeler	Mountain Cr.	13	12 S	23 E	?	Fair	1956
6-386	Wheeler	Mountain Cr.	14	12 S	23 E	?	Fair	1956
6-387	Wheeler	Mountain Cr.	14	12 S	23 E	?	Fair	1956
6-388	Wheeler	Mountain Cr.	14	12 S	23 E	?	Fair	1956
6-389	Wheeler	Mountain Cr.	14	12 S	23 E	?	Fair	1956
6-390	Wheeler	Mountain Cr.	14	12 S	23 E	?	Fair	1956
6-391	Wheeler	Mountain Cr.	22	12 S	23 E	?	Fair	1956
6-392	Wheeler	Mountain Cr.	22	12 S	23 E	?	Fair	1956
6-393	Wheeler	Mountain Cr.	16	12 S	23 E	?	Fair	1956
6-394	Wheeler	Mountain Cr.	16	12 S	23 E	?	Fair	1956
6-395	Wheeler	Mountain Cr.	17	12 S	23 E	?	Fair	1956
6-396	Wheeler	Mountain Cr.	17	12 S	23 E	?	Fair	1957
6-397	Wheeler	Mountain Cr.	7	12 S	23 E	?	Fair	1956
6-398	Wheeler	Mountain Cr.	7	12 S	23 E	?	Fair	1956
6-399	Wheeler	Mountain Cr.	13	12 S	22 E	?	Fair	1956
6-400	Wheeler	W. Branch Cr.	30	11 S	21 E	?	Fair	1956
6-401	Wheeler	W. Branch Cr.	25	11 S	20 E	?	Fair	1956
6-402	Wheeler	W. Branch Cr.	25	11 S	20 E	?	Fair	1956
6-403	Wheeler	W. Branch Cr.	35	11 S	20 E	?	Fair	1956
6-404	Wheeler	W. Branch Cr.	35	11 S	20 E	?	Fair	1956
6-405	Wheeler	W. Branch Cr.	35	11 S	20 E	?	Fair	1956
6-406	Wheeler	W. Branch Cr.	2	12 S	20 E	?	Fair	1956
6-407	Wheeler	W. Branch Cr.	3	12 S	20 E	?	Fair	1956
6-408	Wheeler	W. Branch Cr.	9	12 S	20 E	?	Fair	1956
6-409	Wheeler	W. Branch Cr.	10	12 S	20 E	?	Fair	1956
6-410	Wheeler	W. Branch Cr.	10	12 S	20 E	?	Fair	1956
6-411	Wheeler	W. Branch Cr.	15	12 S	20 E	?	Fair	1956

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-412	Wheeler	W. Branch Cr.	15	12 S	20 E	?	Fair	1956
6-413	Wheeler	W. Branch Cr.	15	12 S	20 E	?	Fair	1956
6-414	Wheeler	W. Branch Cr.	15	12 S	20 E	?	Fair	1956
6-415	Wheeler	W. Branch Cr.	15	12 S	20 E	?	Fair	1956
6-416	Wheeler	W. Branch Cr.	22	12 S	20 E	?	Fair	1956
6-417	Wheeler	W. Branch Cr.	22	12 S	20 E	?	Fair	1956
6-418	Wheeler	W. Branch Cr.	22	12 S	20 E	?	Fair	1956
6-419	Wheeler	W. Branch Cr.	22	12 S	20 E	?	Fair	1956
6-420	Wheeler	Bridge Cr.	9	11 S	21 E	?	Fair	1956
6-421	Wheeler	Bridge Cr.	21	11 S	21 E	?	Fair	1956
6-422	Wheeler	Bridge Cr.	5	11 S	21 E	?	Fair	1956
6-423	Wheeler	Bridge Cr.	24	10 S	20 E	?	Fair	1957
6-424	Wheeler	Bridge Cr.	31	10 S	21 E	?	Fair	1956
6-425	Wheeler	Bridge Cr.	14	10 S	20 E	?	Fair	1957
6-426	Wheeler	Bridge Cr.	11	10 S	20 E	?	Fair	1957
6-427	Wheeler	Bear Cr.	25	10 S	20 E	?	Fair	1956
6-428	Wheeler	Bear Cr.	26	10 S	20 E	1.13	Fair	1956
6-429	Wheeler	Bear Cr.	35	10 S	20 E	0.38	Fair	1956
6-430	Wheeler	Bear Cr.	35	10 S	20 E	0.38	Fair	1956
6-431	Wheeler	Bear Cr.	9	11 S	20 E	?	Fair	1956
6-432	Wheeler	Bear Cr.	9	11 S	20 E	?	Fair	1956
6-433	Wheeler	Bear Cr.	16	11 S	20 E	?	Fair	1956
6-434	Wheeler	Bear Cr.	17	11 S	20 E	?	Fair	1956
6-437	Wheeler	Bear Cr.	19	11 S	20 E	?	Fair	1956
6-438	Wheeler	Bear Cr.	30	11 S	20 E	?	Fair	1956
6-439	Wheeler	Bear Cr.	30	11 S	20 E	?	Fair	1956
6-450	Wheeler	Rock Cr.	35	12 S	24 E	?	Fair	1956
6-451	Wheeler	Rock Cr.	35	12 S	24 E	?	Fair	1956
6-452	Wheeler	Rock Cr.	15	12 S	29 E	?	Fair	1956
6-454	Grant	Rock Cr.	18	12 S	26 E	?	Fair	1958
6-456	Wheeler	Parrish Cr.	26	9 S	24 E	3.00	Fair	1958
6-457	Grant	Bear Cr.	11	10 S	32 E	?	Fair	1958

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-458	Grant	Bear Cr.	11	10 S	32 E	?	Fair	1958
6-460	Grant	Fields Cr.	13	13 S	28 E	?	Fair	1959
6-461	Grant	Fields Cr.	26	13 S	28 E	?	Fair	1959
6-462	Grant	Vincent Cr.	18	11 S	35 E	?	Fair	1959
6-463	Grant	M.F. John Day R.	34	9 S	32 E	?	Fair	1959
6-464	Wheeler	Butte Cr.	32	6 S	21 E	?	Fair	1959
6-468	Grant	Berry Cr.	36	14 S	31 E	1.80	Fair	1960
6-469	Grant	Berry Cr.	36	14 S	31 E	1.80	Fair	?
6-470	Grant	Berry Cr.	36	14 S	31 E	1.80	Fair	?
6-472	Wheeler	Bridge Cr.	36	11 S	21 E	?	Fair	1960
6-473	Wheeler	Bridge Cr.	36	11 S	21 E	?	Fair	1961
6-474	Wheeler	Bridge Cr.	26	11 S	21 E	?	Fair	1961
6-475	Wheeler	Bridge Cr.	26	11 S	21 E	?	Fair	1961
6-476	Wheeler	Bridge Cr.	26	11 S	21 E	?	Fair	1961
6-477	Grant	Dads Cr.	6	13 S	34 E	?	Fair	1960
6-478	Grant	Dads Cr.	6	13 S	34 E	?	Fair	1960
6-479	Grant	Vance Cr.	11	15 S	31 E	?	Fair	?
6-480	Grant	John Day R.	18	13 S	28 E	?	Fair	1960
6-481	Grant	John Day R.	11	13 S	27 E	?	Fair	1960
6-482	Grant	Butte Cr.	5	11 S	34 E	?	Fair	?
6-483	Grant	Beech Cr.	28	13 S	30 E	?	Fair	?
6-484	Wheeler	Bridge Cr.	3	10 S	20 E	?	Fair	1961
6-485	Grant	Vinegar Cr.	9	11 S	34 E	?	Fair	1961
6-486	Grant	John Day R.	8	13 S	34 E	?	Fair	1963
6-487	Grant	John Day R.	17	13 S	34 E	?	Fair	?
6-488	Grant	John Day R.	26	13 S	34 E	0.55	Fair	?
6-489	Grant	E.F. Beech Cr.	20	12 S	31 E	?	Fair	1969
6-490	Grant	E.F. Beech Cr.	20	12 S	31 E	?	Fair	1969
6-491	Grant	Reynolds Cr.	26	13 S	34 E	?	Fair	1969
6-492	Grant	Reynolds Cr.	25	13 S	34 E	?	Fair	?
6-493	Grant	Cummings Cr.	3	13 S	28 E	?	Fair	1969
6-494	Grant	E.F. Beech Cr.	20	12 S	31 E	?	Fair	1969

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
6-495	Wheeler	Mountain Cr.	13	12 S	22 E	?	Fair	1969
6-496	Wheeler	Alder Cr.	4	9 S	23 E	?	Fair	1969
6-497	Wheeler	Alder Cr.	4	9 S	23 E	?	Fair	1969
6-498	Wheeler	Alder Cr.	34	8 S	23 E	?	Fair	1969
6-499	Wheeler	Rock Cr.	16	12 S	25 E	?	Fair	1969
6-500	Grant	Clear Cr.	34	11 S	35 E	0.03	Fair	1969
6-501	Wheeler	Bridge Cr.	6	12 S	22 E	?	Fair	1969
6-502	Wheeler	Bridge Cr.	18	12 S	21 E	?	Fair	1969
6-503	Wheeler	Bridge Cr.	18	12 S	21 E	?	Fair	1969
6-504	Wheeler	Bridge Cr.	18	12 S	21 E	?	Fair	1969
6-505	Wheeler	Bridge Cr.	18	12 S	21 E	?	Fair	1969
6-506	Grant	Dixie Cr.	35	12 S	33 E	?	Fair	1969
6-507	Grant	Rudio Cr.	13	10 S	26 E	?	Fair	1969
6-508	Grant	Deardorff Cr.	31	13 S	33 E	?	Fair	1969
6-509	Grant	Deardorff Cr.	31	13 S	33 E	?	Fair	1969
6-511	Grant	John Day R.	10	13 S	33 E	0.54	Fair	1969
6-512	Grant	John Day R.	10	13 S	33 E	0.54	Fair	1973
6-513	Wheeler	Bologna Cr.	23	9 S	25 E	?	Fair	1969
6-514	Grant	Roberts Cr.	24	14 S	34 E	?	Fair	1969
6-515	Grant	S.F. John Day R.	18	13 S	27 E	?	Fair	1969
6-516	Grant	Riley Cr.	31	13 S	30 E	?	Fair	1969
6-518	Grant	Davis Cr.	19	11 S	35 E	?	Fair	1969
6-519	Grant	Canyon Cr.	14	15 S	31 E	?	Fair	1969
6-520	Grant	E.F. Canyon Cr.	29	15 S	32 E	?	Fair	1969
6-521	Grant	Murderer's Cr.	11	15 S	27 E	?	Fair	1969
6-523	Grant	Indian Cr.	29	13 S	33 E	?	Fair	1972
6-524	Grant	Indian Cr.	29	13 S	33 E	?	Fair	1972
6-525	Grant	Indian Cr.	19	13 S	33 E	?	Fair	1972
6-526	Grant	M.F. John Day R.	13	10 S	32 E	0.71	Fair	?
?	Umatilla	Umatilla R.	?	?	?	118.00	?	?
8-1	Wallowa	Lostine R.	15	1 S	43 E	1.98	Fair	1964
8-2	Wallowa	Lostine R.	15	1 S	43 E	1.12	Poor	1961

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
8-4	Wallowa	Wallowa R.	10	1 N	42 E	10.96	Poor	1964
8-6	Wallowa	Wallowa R.	20	1 N	43 E	1.88	Fair	1972
8-7	Wallowa	Lostine R.	22	1 S	43 E	19.00	Fair	1971
8-8	Wallowa	Lostine R.	27	1 S	43 E	43.75	Poor	1961
8-9	Wallowa	Wallowa R.	30	1 S	44 E	4.17	Poor	1955
8-11	Wallowa	Wallowa R.	3	1 N	42 E	14.99	Poor	1958
8-12	Wallowa	Wallowa R.	11	1 N	43 E	25.57	Fair	1980
8-13	Wallowa	Bear Cr.	22	1 N	42 E	1.98	Poor	1955
8-14	Wallowa	Bear Cr.	22	1 N	42 E	2.18	Excellent	1955
8-15	Wallowa	Wallowa R.	2	2 S	44 E	0.18	Poor	1957
8-16	Wallowa	Bear Cr.	22	1 N	42 E	33.18	Excellent	1955
8-17	Wallowa	Lostine R.	27	1 S	43 E	17.97	Fair	1967
8-18	Wallowa	Wallowa R.	12	2 S	44 E	5.18	Excellent	1984
8-20	Wallowa	Wallowa R.	24	2 S	44 E	8.94	Poor	1963
8-23	Wallowa	Hurricane Cr.	11	2 S	44 E	1.30	Fair	1970
8-24	Wallowa	Bear Cr.	15	1 N	42 E	5.53	Fair	1972
8-25	Wallowa	Bear Cr.	15	1 N	42 E	0.87	Fair	1964
8-26	Wallowa	Wallowa R.	30	1 S	44 E	1.60	Fair	1974
8-27	Wallowa	Lostine R.	9	1 S	43 E	13.05	Fair	1964
8-28	Wallowa	Lostine R.	9	1 S	43 E	16.10	Poor	1964
8-29	Wallowa	Wallowa R.	10	1 N	42 E	2.00	Fair	1963
8-31	Wallowa	Wallowa R.	4	1 N	42 E	1.18	Poor	1964
8-32	Wallowa	Lostine R.	33	1 N	43 E	42.69	Fair	1969
8-33	Wallowa	Wallowa R.	21	1 N	43 E	4.77	Fair	1977
8-34	Wallowa	Wallowa R.	24	1 S	43 E	5.04	Fair	1964
8-35	Wallowa	Wallowa R.	34	1 N	43 E	2.96	Excellent	1985
8-36	Wallowa	Lostine R.	29	1 N	43 E	2.96	Poor	1957
8-39	Wallowa	Wallowa R.	11	1 N	42 E	0.96	Fair	1964
8-40	Wallowa	Lostine R.	30	1 N	43 E	0.60	Fair	1963
8-41	Wallowa	Wallowa R.	4	1 N	42 E	0.18	Poor	1955
8-42	Wallowa	Clear Cr.	3	2 S	44 E	18.00	Fair	1963
8-44	Wallowa	Lostine R.	4	1 S	43 E	19.71	Poor	1963

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
8-46	Wallowa	Wallowa R.	3	1 S	43 E	8.45	Excellent	1984
8-47	Wallowa	Lostine R.	15	1 S	43 E	14.39	Poor	1972
8-48	Wallowa	Wallowa R.	34	1 N	43 E	2.70	Excellent	1984
8-49	Wallowa	Lostine R.	4	1 S	43 E	19.71	Poor	1960
8-50	Wallowa	Lostine R.	9	1 S	43 E	15.30	Fair	1967
8-52	Wallowa	Wallowa R.	11	1 S	43 E	2.00	Fair	1968
8-53	Wallowa	Wallowa R.	13	1 S	43 E	5.13	Poor	1964
8-56	Wallowa	Imnaha R.	10	1 S	48 E	0.24	Fair	1966
8-57	Wallowa	Imnaha R.	14	1 S	48 E	0.20	Poor	1954
8-62	Wallowa	Wallowa R.	2	2 S	44 E	0.33	Poor	1955
8-63	Wallowa	Hurricane Cr.	2	2 S	44 E	0.25	Poor	1968
8-64	Wallowa	Wallowa R.	1	2 S	44 E	0.20	Poor	1956
8-65	Wallowa	Wallowa R.	24	2 S	44 E	4.45	Fair	1961
8-66	Wallowa	Wallowa R.	24	2 S	44 E	23.13	Poor	1972
8-67	Wallowa	Wallowa R.	12	2 S	44 E	0.5	Poor	1963
8-71	Wallowa	Spring Cr.	11	2 S	44 E	0.8	Fair	1963
8-72	Wallowa	Wallowa R.	33	1 S	44 E	3.40	Fair	1963
8-73	Wallowa	Wallowa R.	25	1 S	43 E	0.84	Fair	1963
8-74	Wallowa	Camp Cr.	19	1 N	48 E	1.16	Fair	1969
8-76	Wallowa	Summit Cr.	23	3 S	48 E	1.88	Fair	1961
8-77	Wallowa	Wallowa R.	19	2 S	45 E		Poor	1949
8-88	Wallowa	Imnaha R.	27	3 S	48 E	0.81	Fair	1964
8-91	Wallowa	Grouse Cr.	4	3 S	48 E	6.25	Fair	1972
8-92	Wallowa	Big Sheep Cr.	5	1 S	48 E	0.14	Poor	1954
8-119	Wallowa	Wallowa R.	11	1 S	43 E	147.25	Excellent	1968
8-201	Wallowa	Summit Cr.	23	3 S	48 E	1.88	Excellent	1982
8-205	Wallowa	Freeze Out Cr.	11	2 S	48 E		Poor	1956
8-208	Wallowa	Wallowa R.	18	2 S	45 E		Fair	1963
8-209	Wallowa	Wallowa R.	18	2 S	45 E		Fair	1963
8-210	Wallowa	Wallowa R.	12	2 S	44 E	0.81	Fair	1962
8-211	Wallowa	Wallowa R.	12	2 S	44 E	0.81	Fair	1962
8-212	Wallowa	Wallowa R.	12	2 S	44 E	0.81	Fair	1962

APPENDIX TABLE 1 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
8-213	Wallowa	Bear Cr.	27	1 N	42 E	0.60	Fair	1964
8-214	Wallowa	Lostine R.	3	2 S	43 E	5.00	Excellent	1977
8-215	Wallowa	Wallowa R.	13	1 N	42 E		Fair	1964
8-216	Wallowa	Wallowa R.	21	1 N	43 E	15.98	Excellent	1977
8-217	Wallowa	Hurricane Cr.	13	2 S	44 E	2.12	Fair	1962
8-223	Wallowa	Elk Cr.	35	3 N	45 E	0.45	Fair	1977
8-225	Wallowa	Spring Cr.	3	2 S	44 E	10.00	Fair	1966
101	Union	Catherine Cr.	18	4 S	40 E	5.91	Poor	1950's
102	Union	Catherine Cr.	19	4 S	40 E	4.91	Poor	1950's
104	Union	Catherine Cr.	19	4 S	40 E	7.98	Poor	1950's
105	Union	Catherine Cr.	18	4 S	40 E	7.94	Poor	1950's
106	Union	Catherine Cr.	29	4 S	40 E	33.24	Poor	1950's
107	Union	Catherine Cr.	19	4 S	40 E	37.03	Fair	1950's
109	Union	Catherine Cr.	18	4 S	40 E	45.00	Fair	1950's
110	Union	Catherine Cr.	2	5 S	40 E	0.61	Poor	1950's
115	Union	Catherine Cr.	34	4 S	40 E	1.38	Poor	1950's
141	Union	Catherine Cr.	18	4 S	40 E	19.96	Poor	1950's
143	Union	Catherine Cr.	29	4 S	40 E	1.74	Poor	1950's
7-100	Umatilla	Walla Walla R.						1985
7-65	Umatilla	Walla Walla R.						1985

APPENDIX TABLE 2: INVENTORY OF IDAHO IRRIGATION SCREENING FACILITIES CONSTRUCTED WITH COLUMBIA RIVER FISHERIES DEVELOPMENT PROGRAM FUNDING.

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
SEF-1	Custer	E.F. Salmon R.	35	11 N	18 E	5.19	Excellent	1982
SEF-2	Custer	E.F. Salmon R.	36	11 N	18 E	23.60	Fair	1963
SEF-3	Custer	E.F. Salmon R.	12	10 N	18 E	14.83	Fair	1963
SEF-4	Custer	E.F. Salmon R.	13	10 N	18 E	20.27	Fair	1963
SEF-5	Custer	E.F. Salmon R.	24	10 N	18 E	15.19	Fair	1963
SEF-6	Custer	E.F. Salmon R.	24	10 N	18 E	1.42	Fair	1963
SEF-7	Custer	E.F. Salmon R.	35	10 N	18 E	12.57	Excellent	1982
SEF-8	Custer	E.F. Salmon R.	35	10 N	18 E	?	Fair	1963
SEF-9	Custer	E.F. Salmon R.	35	10 N	18 E	6.40	Fair	1964
SEF-10	Custer	E.F. Salmon R.	3	9 N	18 E	5.45	Fair	1963
SEF-11	Custer	E.F. Salmon R.	32	10 N	18 E	8.79	Fair	1963
SEF-12	Custer	E.F. Salmon R.	31	10 N	18 E	8.35	Fair	1964
SEF-13	Custer	E.F. Salmon R.	31	10 N	18 E	9.00	Fair	1964
SEF-14	Custer	E.F. Salmon R.	1	9 N	17 E	4.60	Fair	1963
SEF-15	Custer	E.F. Salmon R.	2	9 N	17 E	24.72	Fair	1963
SEF-16	Custer	E.F. Salmon R.	11	9 N	17 E	11.59	Excellent	1983
SEF-17	Custer	E.F. Salmon R.	11	9 N	17 E	15.00	Excellent	1983
SEF-19	Custer	E.F. Salmon R.	15	9 N	17 E	10.00	Fair	1964
SEF-20	Custer	E.F. Salmon R.	9	8 N	17 E	2.00	Fair	1964
SEF-21	Custer	E.F. Salmon R.	22	9 N	17 E	2.62	Fair	1964
SEF-22	Custer	E.F. Salmon R.	27	9 N	17 E	?	Fair	1964
SEF-23	Custer	E.F. Salmon R.	27	9 N	17 E	?	Fair	1964
SEF-24	Custer	E.F. Salmon R.	27	9 N	17 E	1.36	Fair	1964
SEF-25	Custer	E.F. Salmon R.	33	9 N	17 E	2.90	Fair	1964
SEF-30	Custer	E.F. Salmon R.	31	8 N	17 E	?	Fair	1964
SEFHC-1	Custer	Herd Cr.	35	10 N	18 E	2.58	Fair	1963
SEFHC-2	Custer	Herd Cr.	35	10 N	18 E	?	Fair	1963
SEFHC-3	Custer	Herd Cr.	16	9 N	19 E	7.00	Excellent	1981
SEFBC-1	Custer	Boulder Cr.	15	9 N	17 E	?	Excellent	1982

APPENDIX TABLE 2 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
SEFBC-2	Custer	Boulder Cr.	22	9 N	17 E	?	Fair	1965
SEFGC-1	Custer	Germainia Cr.	9	8 N	19 E	?	Poor	1963
P-1	Custer	Pahsimeroi R.	25	16 N	21 E	1.92	Poor	1962
P-2 & 3	Custer	Pahsimeroi R.	36	16 N	20 E	9.12	Fair	1962
P-4	Custer	Pahsimeroi R.	6	15 N	21 E	9.12	Fair	1962
P-4A	Custer	Pahsimeroi R.	7	15 N	21 E	5.56	Fair	1962
P-5	Custer	Pahsimeroi R.	7	15 N	21 E	51.90	Fair	1962
P-6	Lemhi	Pahsimeroi R.	8	15 N	21 E	13.18	Fair	1962
P-7	Custer	Pahsimeroi R.	8	15 N	21 E	23.00	Fair	1963
P-8	Custer	Pahsimeroi R.	21	15 N	21 E	13.67	Fair	1962
P-8A	Custer	Pahsimeroi R.	27	15 N	21 E	7.14	Fair	1962
P-9	Custer	Pahsimeroi R.	27	15 N	21 E	51.05	Fair	1962
P-10	Custer	Pahsimeroi R.	35	15 N	21 E	16.54	Fair	1963
P-11	Custer	Pahsimeroi R.	35	15 N	21 E	25.35	Fair	1962
P-12	Custer	Pahsimeroi R.	1	14 N	21 E	23.00	Fair	1962
P-13	Custer	Pahsimeroi R.	12	14 N	21 E	22.03	Fair	1963
PBSC-1	Lemhi	Pahsimeroi R.	22	15 N	21 E	36.70	Fair	1962
PBSC-2	Lemhi	Pahsimeroi R.	26	15 N	21 E	6.76	Fair	1962
PBSC-3	Lemhi	Pahsimeroi R.	26	15 N	21 E	48.00	Fair	1962
PBSC-4	Lemhi	Pahsimeroi R.	1	14 N	21 E	12.77	Fair	1962
PBSC-5	Lemhi	Pahsimeroi R.	6	14 N	22 E	7.95	Fair	1962
PBSC-6	Lemhi	Pahsimeroi R.	7	14 N	22 E	4.00	Fair	1962
PBSC-7	Lemhi	Pahsimeroi R.	8	14 N	22 E	6.15	Poor	1962
PBSC-8	Lemhi	Pahsimeroi R.	8	14 N	22 E	33.97	Poor	1962
PBSC-9	Lemhi	Pahsimeroi R.	8	14 N	22 E	12.31	Poor	1963
L-1	Lemhi	Lemhi R.	9	21 N	22 E	?	Fair	1961
L-2 & 2A	Lemhi	Lemhi R.	9	21 N	22 E	10.70	Fair	1961
L-2B	Lemhi	Lemhi R.	10	21 N	22 E	?	Fair	1962
L-3	Lemhi	Lemhi R.	10	21 N	22 E	36.80	Poor	1961
L-3A	Lemhi	Lemhi R.	14	21 N	22 E	11.73	Fair	1962
L-4	Lemhi	Lemhi R.	14	21 N	22 E	23.20	Excellent	1979
L-5	Lemhi	Lemhi R.	24	21 N	22 E	24.30	Fair	1959

APPENDIX TABLE 2 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
L-6	Lemhi	Lemhi R.	24	21 N	22 E	89.93	Excellent	1980
L-7	Lemhi	Lemhi R.	30	21 N	23 E	49.40	Excellent	1979
L-7A	Lemhi	Lemhi R.	30	21 N	23 E	9.08	Poor	1959
L-8	Lemhi	Lemhi R.	30	21 N	23 E	6.25	Poor	1959
L-8A	Lemhi	Lemhi R.	29	21 N	23 E	27.90	Poor	1959
L-9	Lemhi	Lemhi R.	28	21 N	23 E	17.35	Poor	1959
L-10	Lemhi	Lemhi R.	33	21 N	23 E	28.45	Poor	1961
L-11	Lemhi	Lemhi R.	34	21 N	23 E	26.46	Fair	1961
L-12	Lemhi	Lemhi R.	3	20 N	23 E	7.25	Fair	1961
L-13	Lemhi	Lemhi R.	3	20 N	23 E	31.02	Poor	1961
L-14	Lemhi	Lemhi R.	3	20 N	23 E	5.20	Fair	1958
L-15	Lemhi	Lemhi R.	10	20 N	23 E	14.25	Fair	1959
L-16	Lemhi	Lemhi R.	11	20 N	23 E	23.60	Fair	1961
L-17	Lemhi	Lemhi R.	11	20 N	23 E	35.77	Fair	1961
L-18	Lemhi	Lemhi R.	14	21 N	23 E	6.73	Fair	1959
L-19	Lemhi	Lemhi R.	14	20 N	23 E	9.37	Poor	1959
L-20	Lemhi	Lemhi R.	24	20 N	23 E	38.10	Poor	1960
L-21	Lemhi	Lemhi R.	24	20 N	23 E	21.05	Poor	1959
L-22	Lemhi	Lemhi R.	25	20 N	23 E	16.05	Poor	1958
L-22A	Lemhi	Lemhi R.	25	20 N	23 E	58.05	Fair	1960
L-23	Lemhi	Lemhi R.	30	20 N	24 E	36.61	Fair	1961
L-24	Lemhi	Lemhi R.	31	20 N	24 E	13.78	Fair	1959
L-25	Lemhi	Lemhi R.	6	19 N	24 E	10.27	Fair	1959
L-26	Lemhi	Lemhi R.	6	19 N	24 E	3.87	Fair	1959
L-27	Lemhi	Lemhi R.	7	19 N	24 E	7.52	Fair	1958
L-28	Lemhi	Lemhi R.	7	19 N	24 E	18.19	Poor	1959
L-29	Lemhi	Lemhi R.	8	19 N	24 E	14.32	Excellent	1980
L-30	Lemhi	Lemhi R.	20	19 N	24 E	36.05	Poor	1961
L-31	Lemhi	Lemhi R.	29	19 N	24 E	12.87	Poor	1961
L-31A	Lemhi	Lemhi R.	32	19 N	24 E	46.30	Excellent	1983
L-31B	Lemhi	Lemhi R.	29	19 N	24 E	3.00	Poor	1961
L-32	Lemhi	Lemhi R.	5	18 N	24 E	18.08	Poor	1961

APPENDIX TABLE 2 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
L-33	Lemhi	Lemhi R.	5	18 N	24 E	63.80	Poor	1958
L-34	Lemhi	Lemhi R.	5	18 N	24 E	2.00	Fair	1958
L-35	Lemhi	Lemhi R.	5	18 N	24 E	10.07	Fair	1959
L-35A	Lemhi	Lemhi R.	4	18 N	24 E	5.16	Fair	1959
L-36	Lemhi	Lemhi R.	8	18 N	24 E	10.80	Fair	1961
L-37	Lemhi	Lemhi R.	9	18 N	24 E	9.04	Fair	1961
L-38	Lemhi	Lemhi R.	16	18 N	24 E	5.82	Fair	1958
L-39	Lemhi	Lemhi R.	20	18 N	24 E	6.75	Fair	1959
L-40	Lemhi	Lemhi R.	21	18 N	24 E	8.70	Fair	1958
L-41	Lemhi	Lemhi R.	21	18 N	24 E	20.00	Excellent	1982
L-42	Lemhi	Lemhi R.	21	18 N	24 E	12.20	Poor	1961
L-43	Lemhi	Lemhi R.	28	18 N	24 E	3.00	Poor	1959
L-43A	Lemhi	Lemhi R.	33	18 N	24 E	13.72	Fair	1961
L-43B	Lemhi	Lemhi R.	33	18 N	24 E	6.15	Fair	1961
L-43C	Lemhi	Lemhi R.	33	18 N	24 E	30.40	Fair	1959
L-44	Lemhi	Lemhi R.	4	17 N	24 E	7.67	Fair	1961
L-45	Lemhi	Lemhi R.	4	17 N	24 E	5.92	Fair	1961
L-45A	Lemhi	Lemhi R.	10	17 N	24 E	8.90	Fair	1961
L-45B	Lemhi	Lemhi R.	14	17 N	24 E	3.90	Fair	1961
L-45C	Lemhi	Lemhi R.	14	17 N	24 E	11.01	Fair	1961
L-45D	Lemhi	Lemhi R.	14	17 N	24 E	27.35	Poor	1961
L-46	Lemhi	Lemhi R.	14	17 N	24 E	11.70	Fair	1959
L-46A	Lemhi	Lemhi R.	24	17 N	24 E	11.68	Fair	1961
L-47	Lemhi	Lemhi R.	25	18 N	24 E	23.00	Fair	1959
L-48	Lemhi	Lemhi R.	25	17 N	24 E	24.40	Fair	1959
L-49	Lemhi	Lemhi R.	25	17 N	24 E	34.75	Fair	1959
L-50	Lemhi	Lemhi R.	29	17 N	24 E	10.50	Fair	1959
L-51	Lemhi	Lemhi R.	32	17 N	24 E	7.00	Fair	1959
L-51A	Lemhi	Lemhi R.	32	17 N	24 E	?	Fair	1962
L-52	Lemhi	Lemhi R.	33	17 N	24 E	6.50	Fair	1959
L-52A	Lemhi	Lemhi R.	33	17 N	24 E	2.03	Fair	1961
L-53	Lemhi	Lemhi R.	33	17 N	24 E	2.00	Fair	1961

APPENDIX TABLE 2 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
L-54	Lemhi	Lemhi R.	33	17 N	24 E	13.87	Fair	1961
L-57	Lemhi	Lemhi R.	3	16 N	24 E	4.67	Fair	1659
L-58	Lemhi	Lemhi R.	3	16 N	24 E	10.52	Fair	1961
L-58A	Lemhi	Lemhi R.	10	16 N	24 E	6.89	Fair	1961
L-58B	Lemhi	Lemhi R.	11	16 N	24 E	19.40	Poor	1961
L-58C	Lemhi	Lemhi R.	12	16 N	24 E	30.20	Poor	1959
L-59	Lemhi	Lemhi R.	12	16 N	24 E	9.55	Fair	1961
L-60	Lemhi	Lemhi R.	18	16 N	26 E	12.68	Fair	1961
L-61	Lemhi	Lemhi R.	18	16 N	26 E	17.00	Excellent	1983
L-61A	Lemhi	Lemhi R.	18	16 N	26 E	8.95	Poor	1959
L-62	Lemhi	Lemhi R.	20	16 N	26 E	15.87	Poor	1959
L-63	Lemhi	Lemhi R.	28	16 N	26 E	28.45	Excellent	1983
LHC-1	Lemhi	Hayden Cr.	28	18 N	24 E	6.04	Fair	1959
LHC-3	Lemhi	Hayden Cr.	31	18 N	24 E	24.77	Poor	1971
LHC-4	Lemhi	Hayden Cr.	31	18 N	24 E	11.69	Fair	1961
LHC-5	Lemhi	Hayden Cr.	31	18 N	24 E	8.06	Fair	1961
LHC-6	Lemhi	Hayden Cr.	31	18 N	24 E	14.82	Fair	1959
LHC-7	Lemhi	Hayden Cr.	31	18 N	24 E	9.85	Fair	1961
LHC-8	Lemhi	Hayden Cr.	1	17 N	23 E	6.00	Fair	1959
LBSC-1	Lemhi	Big Spring Cr.	13	16 N	25 E	7.33	Fair	1961
LBSC-2	Lemhi	Big Spring Cr.	12	16 N	25 E	8.38	Fair	1961
LBSC-3	Lemhi	Big Spring Cr.	16	16 N	26 E	9.05	Fair	1961
LBSC-4	Lemhi	Big Spring Cr.	18	16 N	26 E	2.27	Fair	1961
LBSC-5	Lemhi	Big Spring Cr.	18	16 N	26 E	27.00	Poor	1961
LBSC-5A	Lemhi	Big Spring Cr.	18	16 N	26 E	0.94	Fair	1961
LBSC-6	Lemhi	Big Spring Cr.	20	16 N	26 E	8.94	Poor	1961
NF-1	Lemhi	N.F. Salmon R.	16	24 N	21 E	12.00	Fair	1959
NF-2	Lemhi	N.F. Salmon R.	8	24 N	21 E	2.00	Fair	1959
NF-3	Lemhi	N.F. Salmon R.	4	24 N	21 E	3.00	Fair	1959
NF-3A	Lemhi	N.F. Salmon R.	33	25 N	21 E	6.25	Poor	1962
NF-4 & 5	Lemhi	N.F. Salmon R.	28	25 N	21 E	27.00	Poor	1959
NF-6	Lemhi	N.F. Salmon R.	15	25 N	21 E	6.00	Fair	1959

APPENDIX TABLE 2 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
NF-7	Lemhi	N.F. Salmon R.	15	25 N	21 E	5.50	Fair	1962
NF-7A	Lemhi	N.F. Salmon R.	15	25 N	21 E	?	Fair	1962
NF-8	Lemhi	N.F. Salmon R.	11	25 N	21 E	5.00	Poor	1959
NF-9	Lemhi	N.F. Salmon R.	2	25 N	21 E	4.00	Fair	1959
NF-10	Lemhi	N.F. Salmon R.	2	25 N	21 E	?	Fair	1960
NF-11	Lemhi	N.F. Salmon R.	22	26 N	21 E	2.96	Fair	1960
NF-12	Lemhi	N.F. Salmon R.	26	26 N	21 E	1.99	Fair	1960
NF-13	Lemhi	N.F. Salmon R.	15	26 N	21 E	3.00	Fair	1959
NFSC-1	Lemhi	Sheep Cr.	14	25 N	21 E	13.95	Fair	1962
NFDC-1	Lemhi	Dahlonega Cr.	36	26 N	21 E	12.00	Fair	1960
NFDC-3	Lemhi	Dahlonega Cr.	28	26 N	21 E	2.00	Fair	1959
NFAC-1	Lemhi	Anderson Cr.	27	26 N	21 E	2.00	Fair	1959
LS-1	Idaho	Little Salmon R.	28	24 N	1 E	?	Excellent	1982
RR-1	Idaho	Rapid R.	6	23 N	1 E	?	Poor	1964
RR-2	Idaho	Rapid R.	5	23 N	1 E	?	Excellent	1982
RR-3	Idaho	Rapid R.	32	24 N	1 E	?	Excellent	1982
KNC-1	Custer	M.F. Salmon R.	18	12 N	12 E	7.00	Excellent	1984
KNC-2	Custer	M.F. Salmon R.	18	12 N	12 E	7.50	Excellent	1982
S-3	Lemhi	Salmon R.	12	23 N	21 E	4.07	Fair	1962
5-3A	Lemhi	Salmon R.	18	23 N	22 E	4.59	Fair	1960
S-5 & 6	Lemhi	Salmon R.	7	22 N	22 E	67.30	Poor	1963
S-7	Lemhi	Salmon R.	7	22 N	22 E	15.10	Poor	1960
S-9	Lemhi	Salmon R.	7	22 N	22 E	30.95	Poor	1963
S-10	Lemhi	Salmon R.	6	21 N	22 E	50.97	Excellent	1981
S-10A	Lemhi	Salmon R.	7	21 N	22 E	2.50	Fair	1960
S-10B	Lemhi	Salmon R.	7	21 N	22 E	7.83	Fair	1963
S-10C	Lemhi	Salmon R.	18	21 N	22 E	11.92	Fair	1963
S-10D	Lemhi	Salmon R.	18	21 N	22 E	6.40	Fair	1964
S-12	Lemhi	Salmon R.	31	21 N	22 E	35.72	Poor	1963
S-13	Lemhi	Salmon R.	20	20 N	22 E	24.80	Poor	1963
S-14	Lemhi	Salmon R.	5	20 N	22 E	58.10	Excellent	1977
S-15	Lemhi	Salmon R.	7	20 N	22 E	44.00	Fair	1964

APPENDIX TABLE 2 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
S-16	Lemhi	Salmon R.	24	20 N	21 E	36.16	Fair	1963
S-17	Lemhi	Salmon R.	36	20 N	21 E	14.42	Fair	1963
S-18A	Lemhi	Salmon R.	10	18 N	21 E	18.36	Fair	1963
S-19A	Lemhi	Salmon R.	25	16 N	20 E	6.03	Poor	1963
S-25	Custer	Salmon R.	11	13 N	19 E	23.05	Fair	1965
S-26	Custer	Salmon R.	10	13 N	19 E	42.00	Fair	1965
S-27	Custer	Salmon R.	15	13 N	19 E	54.20	Fair	1965
S-28	Custer	Salmon R.	16	13 N	19 E	142.00	Excellent	1976
S-29	Custer	Salmon R.	16	13 N	19 E	12.91	Fair	1965
S-30	Custer	Salmon R.	21	13 N	19 E	20.25	Fair	1965
S-32	Custer	Salmon R.	28	13 N	19 E	80.00	Excellent	1973
S-34	Custer	Salmon R.	36	12 N	18 E	11.68	Fair	1965
S-35	Custer	Salmon R.	10	7 N	14 E	16.55	Excellent	1978
S-36	Custer	Salmon R.	28	11 N	18 E	12.25	Fair	1965
S-38	Custer	Salmon R.	26	11 N	16 E	3.5	Excellent	1984
S-39	Custer	Salmon R.	15	10 N	13 E	16.40	Excellent	1980
S-39A	Custer	Salmon R.	22	10 N	13 E	11.46	Excellent	1979
S-40	Custer	Salmon R.	5	8 N	14 E	43.60	Excellent	1979
S-41	Custer	Salmon R.	5	8 N	14 E	33.00	Poor	1964
S-42	Custer	Salmon R.	8	8 N	14 E	13.00	Excellent	1979
S-43	Custer	Salmon R.	8	8 N	14 E	26.20	Poor	1964
S-45	Blaine	Salmon R.	10	7 N	14 E	34.42	Excellent	1981
S-46	Blaine	Salmon R.	10	7 N	14 E	30.00	Excellent	1981
S-47	Blaine	Salmon R.	26	7 N	14 E	7.67	Excellent	1980
VC-1	Custer	Valley Cr.	24	11 N	12 E	8.26	Excellent	1979
VC-2	Custer	Valley Cr.	13	11 N	12 E	8.46	Excellent	1979
VC-3	Custer	Valley Cr.	12	11 N	12 E	5.21	Excellent	1977
VC-4	Custer	Valley Cr.	12	11 N	12 E	4.36	Excellent	1977
VC-5	Custer	Valley Cr.	3	11 N	12 E	12.88	Excellent	1980
VC-6	Custer	Valley Cr.	3	11 N	12 E	35.00	Excellent	1977
SPC-1	Blaine	Pole Cr.	11	11 N	12 E	8.72	Excellent	1980
EC-1	Custer	Elk Cr.	16	11 N	12 E	?	Excellent	1980

APPENDIX TABLE 2 (continued)

Inventory Number	County	Water Source	Location			Water Right in CFS	Screen Condition	Year Constructed
			Section	Township	Range			
EC-2	Custer	Elk Cr.	16	11 N	12 E	?	Excellent	1980
CC-0	Lemhi	Carmen Cr.	7	22 N	22 E	7.28	Fair	1960
CC-1	Lemhi	Carmen Cr.	8	22 N	22 E	12.70	Fair	1960
CC-2	Lemhi	Carmen Cr.	8	22 N	22 E	1.55	Fair	1960
CC-3	Lemhi	Carmen Cr.	8	22 N	22 E	8.59	Fair	1960
CC-4	Lemhi	Carmen Cr.	9	22 N	22 E	5.11	Fair	1960
CC-5	Lemhi	Carmen Cr.	3	22 N	22 E	24.97	Fair	1962
CC-5A	Lemhi	Carmen Cr.	3	22 N	22 E	?	Fair	1962
CC-6	Lemhi	Carmen Cr.	2	22 N	22 E	?	Fair	1962
CC-7	Lemhi	Carmen Cr.	2	22 N	22 E	9.20	Fair	1960
CC-8	Lemhi	Carmen Cr.	2	22 N	22 E	9.00	Fair	1960
CC-9	Lemhi	Carmen Cr.	35	23 N	22 E	13.72	Fair	1960
CC-10	Lemhi	Carmen Cr.	35	23 N	22 E	11.85	Fair	1960
CC-11	Lemhi	Carmen Cr.	25	22 N	22 E	2.50	Fair	1960
CCEF-1	Lemhi	E.F. Carmen Cr.	35	23 N	22 E	2.94	Fair	1960
CCEF-2	Lemhi	E.F. Carmen Cr.	36	23 N	22 E	1.80	Fair	1960
CCEF-3	Lemhi	E.F. Carmen Cr.	31	23 N	23 E	3.62	Fair	1960

APPENDIX TABLE 3. INVENTORY OF WASHINGTON IRRIGATION SCREENING FACILITIES CONSTRUCTED WITH COLUMBIA RIVER FISHERIES DEVELOPMENT PROGRAM FUNDING.

Inventory Number	County	Water Source	Location			Water Right In CFS	Screen Condition	Year Constructed
			Section	Township	Range			
Van Voorst	Walla Walla	Touchet R.	2	7 N	33 E	?	Excellent	1965
Ward Hoskins	Columbia	Touchet R.	3	9 N	38 E	?	Excellent	1965
West End Irrigation Dist.	Columbia	Touchet R.	30	10 N	39 E	?	Excellent	1965
Hearn Irrigation Dist.	Columbia	Touchet R.	30	10 N	39 E	?	Excellent	1965
East End Irrigation Dist.	Columbia	Touchet R.	32	10 N	39 E	?	Excellent	1965
Ryerson	Columbia	Touchet R.	3	9 N	39 E	?	Excellent	1965
Starbuck Electric	Columbia	Tucannon R.	19	12 N	38 E	?	Excellent	1965
Brown Gillihan	Okanogan	Twisp R.	10	33 N	21 E	?	Excellent	1964
L.O.M.	Okanogan	Twisp R.	7	33 N	21 E	?	Excellent	1964
Ray Libby	Okanogan	Twisp R.	10	33 N	20 E	?	Excellent	1964
Rockview	Okanogan	Methow R.	15	35 N	20 E	?	Excellent	1964
Willis	Okanogan	Early Winters Cr.	27	36 N	19 E	?	Excellent	1964
Overturf	Okanogan	Methow R.	15	36 N	19 E	?	Poor	1964
Casal	Okanogan	Methow R.	8	36 N	19 E	?	Poor	1964
Johnson	Chelan	Entiat R.	29	26 N	20 E	?	Excellent	1964
McDaniels	Yakima	Rattlesnake Cr.	3	15 N	15 E	?	Excellent	1965

APPENDIX 4

Oregon Department of Fish and Wildlife
State Statutes

498.248

Commission authorized to install screening devices in gravity water diversions of less than 30 cubic feet per second. (1) The commission may install and maintain fish screening and by-pass devices in any gravity fed diversion that takes or received water at a rate of not more than 30 cubic feet per second from any body of water in this state in which game fish exist, in order to prevent fish from leaving the body of water and entering the diversion. The commission shall not install any fish screening or by-pass device that materially diminishes the flow of water in the diversion.

(2) The commission has the right of ingress and egress upon the lands of this state at those places where the commission determines that fish screening and by-pass devices are to be installed. The commission also has the use of such land for the purpose of installing, maintaining and replacing such devices.

(3) No person shall interfere with, tamper with, damage, destroy or remove any fish screening or by-pass device installed pursuant to this section. [1973 c.723 §130]

498.254

Person diverting water to install screening devices in diversions by pump or by gravity more than 30 cubic feet per second. (1) Any person who diverts water by gravity fed diversion at a rate of more than 30 cubic feet per second or by pump from any body of water in this state in which game fish exist shall install and maintain at his expense fish screening and by-pass devices at such places, in such number and of such design as the commission finds necessary to prevent fish from leaving the body of water and entering the diversion.

498.262

Exemption from screening requirements. ORS 498.248 and 498.254 do not require the installation of fish screening or by-pass devices in those water diversions for which the commission, by contract or other form of agreement with the person diverting the water, has made such other provision as the commission determines is adequate for the protection of the game fish in the body of water from which water is being diverted. [1973 c.723 §100]

498.274

Injunction to require compliance with screening or fishing requirements. The commission may maintain a suit to enjoin any person, including governmental agencies of this state and political subdivision of this state, from violating the provisions of ORS 498.248, 498.254 or 498.268. The circuit court for any county in which are situated any waters in which any such violations are threatened has jurisdiction of the suit authorized by this section. [1973 c.723 §102]

509.615

Screening artificial watercourse; replacing inadequate screen. (1) Any person, municipal corporation, political subdivision or governmental agency owning in whole or in part, or leasing, operating or having in charge any artificial watercourse, taking or receiving its waters from any stream or lake in which fish have been placed or may exist, shall, upon order of the commission, place or cause to be placed, and shall maintain, over the inlet of the watercourse a screen to prevent any fish from entering the watercourse, to the satisfaction of the commission.

(2) Inadequate screening devices may be ordered removed and new screens ordered installed, when, upon investigation after full hearing upon which all interested parties have had the right to be heard, it is determined that any screen, either by construction, operation or otherwise, is found to be inadequate by the commission.

APPENDIX 5

Idaho Department of Fish and Game
State Statutes

36-908

The department is authorized to establish or maintain screening devices in artificial watercourses. The department may install and maintain screening and bypass devices in any gravity-fed diversion taking or receiving one hundred twenty-five (125) cubic feet of water per second or less from any stream or lake in this state in which fish may exist.

36-906

Fishways in dams--Screens in diversions--Removal of unused dams-Penalty.--(a) Fishways Required. It is a misdemeanor for any person to construct or maintain a dam or other obstruction which restricts the free and uninterrupted passage of fish in any stream in this state without a proper fishway therein. Such fishway shall be installed and maintained at the owner's expense and shall be of a sufficient kind and capacity as to accommodate seasonal movements of fish up and down the stream. Said fishway shall be constructed according to plans and specifications approved by the director and such plans shall be incorporated into the (page missing)

36-909

Penalty.--Any person violating any of the provisions of this chapter relating to fish racks or traps, fishways, fish ladders or screens shall be guilty of a misdemeanor. Provided, that the continuance from day to day of the neglect or refusal to correct the violation shall constitute a separate offense for each day [I.C., § 36-909, as added by 1976, ch. 95, § 2, p. 315.].

APPENDIX 6

Washington Department of Fisheries
State Statutes

Construction Projects in State Waters
75.20.050

RCW 75.20.040

Fish guards required on diversion devices--Penalties, remedies for failure. A diversion device used for conducting water from a lake, river, or stream for any purpose shall be equipped with a fish guard approved by the director to prevent the passage of fish into the diversion device. The fish guard shall be maintained at all times when water is taken into the diversion device. The fish guards shall be installed at places and times prescribed by the director upon thirty days' notice to the owner of the diversion device. It is unlawful for the owner of a diversion device to fail to comply with this section.

Each day the diversion device is not equipped with an approved fish guard is a separate offense. If within thirty days after notice to equip a diversion device the owner fails to do so, the director may take possession of the diversion device and close the device until it is properly equipped. Expenses incurred by the department constitute the value of a lien upon the diversion device and upon the real and personal property of the owner. Notice of the lien shall be filed and recorded in the office of the county auditor of the county in which the action is taken. [1983 1st ex.s. c 46 § 70; 1955 c 12 § 75.20.040. Prior: 1949 c 112 § 45; Rem. Supp. 1949§ 5780-319.].

APPENDIX 7

Fish Screening Criteria Developed by
the National Marine Fisheries Service,
Environmental & Technical Services Division
Portland, Oregon
July 1, 1982

General Considerations

In designing an effective fish screen facility the swimming ability of the fish is a primary consideration. Swimming ability will vary depending on a number of factors, including the duration of swimming time required, species, size of the fish, level of dissolved oxygen, water temperature, light conditions, physical condition of the fish, migrational stage, and many others. For this reason, screening criteria must be expressed in somewhat general terms.

Natural migrational instincts to move either downstream or upstream at certain stages in a fish's life will frequently dictate screening facility design criteria, such as location of bypasses.

In many instances, site-specific variables make detailed and specific evaluation of the proposed project design mandatory. Such factors as local flow patterns, weather conditions (ice, wind, etc.), total discharge, seasonal operation, location of water intake, debris problems, etc., may require significant evaluation by project sponsors and fishery experts.

Proposed facilities which could have particularly significant impacts on fish, and new unproven screen designs frequently require development of biological basis for the concept, an acceptable plan for evaluating the prototype installation, and an alternate plan should it prove not acceptable.

Structural protection is usually required to protect the integrity of the screening material. Provision of a trashrack, log boom, sediment sluice, or other measures may be needed. A reliable ongoing maintenance and repair program is necessary to assure facilities are kept free of debris accumulation and that screen mesh, seals, drive units, and other components are functioning correctly.

Striped Bass, Herring, Shad, Cyprinids, etc.

Some of these fish have eggs and/or very small fry which are moved with any water current (tides, streamflows, etc.). Installation where these species are present sometimes require special-type screening and/or bypassing facilities including microscreen, and almost always require individual evaluation of the proposed project.

Juvenile Salmonids

1. Structure Placement

A. Streams and Rivers (flowing water)

a. Where physically practical, the screen shall be constructed at the diversion entrance parallel to the river flow and adjacent bankline. The screen face shall be aligned with the adjacent bankline and the bankline shall be shaped to smoothly match the face of the screen structure to prevent eddies in front, upstream, and downstream of the screen. Approach and bypass velocities shall meet the criteria in Nos. 2 and 3 below.

b. In flowing waters where it can be demonstrated that streamflow characteristics or site conditions make installation of fish screens at the diversion entrance physically impractical, the screens may be installed in the diversion canal downstream of the entrance at a more suitable location. All screens installed downstream from the diversion entrance shall be provided with an effective bypass system approved by NMFS on a case-by-case basis to collect juvenile fish and safely transport them back to the river. Screens placed in diversions shall be constructed at an angle to the approaching flow with the downstream end of the screen terminating at the bypass system entrance. The angle of the screen to flow should be adequate to effectively guide fish to the bypass. Approach and bypass velocities shall meet the criteria in Nos. 2 and 3 below.

B. Lakes and Reservoirs

Intakes shall be located offshore where feasible to minimize fish contact with the facility. Velocity from any direction toward the screen shall not exceed the approach velocities in No. 2 below.

2. Approach Velocity (velocity component perpendicular to and approximately three inches in front of the screen face)

A. Salmonid fry (max. length: 59 mm): The approach velocity shall not exceed 0.5 fps.

B. Salmonid fingerling (60 mm and longer): The approach velocity shall not exceed 1.0 fps.

C. The actual wetted screen area, excluding area affected by structural components, required at the minimum stream

stage is calculated by dividing the maximum diverted flow by the allowable approach velocity. Screen design must provide for even distribution of flow over the screen surface.

D. Fish screens shall be cleaned as frequently as necessary to prevent impedance of flow and violation of the approach velocity criteria.

3. Bypass Velocity Past Screens

A. Where flowing streams provide the bypass flow, the component of the velocity parallel and adjacent to the screen face shall be at least equal to the approach velocity.

Large stream-side installations may require formal fish bypasses at intermediate locations along the screen face in addition to the natural stream bypass flow. The need for and design of such bypass shall be approved on a case-by-case basis.

B. Where screens are installed in the diversion canal downstream of the point of diversion, a formal fish bypass system must be provided. The design of the bypass, including size, type, quantity of flow, velocity of flow and other aspects shall be approved on a case-by-case basis. Screen faces shall be placed flush with any adjacent screen bay, piers, or walls to allow unimpeded movement of fish parallel to the screen face and ready access to the bypass.

4. Screen Mesh or Perforations

A. Screen openings may be round, square, rectangular, continuous slot, or any combination thereof, provided structural integrity and cleaning operations are not impaired.

B. Fingerlings (min. length: 60 mm):

Screen openings shall not exceed 0.25 inch (6.4 mm) in the narrow direction.

C. Fry (max. length: 59 mm):

Screen openings shall not exceed 0.125 inch (3.2 mm) in the narrow direction.

D. Screen material shall provide a minimum of 40 percent open area.

ADDITIONAL CRITERIA FOR IRRIGATION SCREENS

A. Should meet standard "NMFS Fish Screening Criteria, July 1, 1982"

B. Bypass

1. Orifice edges shall be rounded to prevent injury to fish.

2. Bypass entrance design should allow convenient access for debris removal.

3. Pipe connections shall be made as smooth as possible.

4. Bypass pipe bends shall be gradual, large radius bends.

5. Bypass pipe interior shall be as smooth as possible.

6. Negative pressures within the pipe should be avoided.

7. If a slide gate is used to control bypass discharge, the upstream edge of the gate shall be rounded to prevent injury to fish. The slide gate should be designed to prevent movement by unauthorized personnel; also, slide gate should be of a type that does not result in a narrow slot entrance when partially opened.

8. Bypass orifices should be sized according to the ditch and be a minimum 6 inches if water is available and no smaller than 4 inches in any case.

9. Bypass outfall shall be located at a site appropriate to minimize predation.

C. Screening

1. For facilities with more than one screen drum, no extended pier should be constructed between them upstream of screen face. Upstream screen face should be flush with upstream nose of piers.

2. Velocity distribution should be uniform across the upstream screen face. Maximum velocity over gross area of screen should be in accordance with NMFS screening criteria (See A. above).

3. Concrete surfaces in contact with water upstream of screen should be finished as smooth as possible.

4. Screen area in contact with water should be free of sharp or protruding edges.

APPENDIX Table 8. - Estimated Costs for Construction of Concrete Structures and Installation of Drive Units and Bypass Pipe for Drum Screens in Idaho Irrigation Diversions.

Screen No.	Year Constructed	Construction Type	No. of Drums	Power Source	CFS Screened	Estimated Cost ($)
SEF-1	1982	Conversion	1	Water Wheel	5.19	11,500
SEF-7	1982	New	1	Electric	12.57	9,400
SEF-15	1984	Conversion	1	Water Wheel	24.72	8,000
SEF-16	1983	Conversion	1	Water Wheel	11.59	8,000
SEF-17	1983	Conversion	1	Water Wheel	15.00	8,000
SEFHC-3	1981	New	1	Water Wheel	7.00	9,000
SEFBC-1	1982	Conversion	1	Electric	12.00	9,000
L-4	1979	Conversion	1	Water Wheel	23.20	8,000
L-6	1980	Conversion	2	Electric	89.93	10,500
L-7	1979	Conversion	2	Electric	23.00	10,500
L-29	1980	Conversion	1	Electric	14.32	8,000
L-31A	1983	Conversion	2	Electric	46.30	9,400
L-41	1982	Conversion	1	Electric	20.00	8,000
L-61	1983	Conversion	1	Electric	17.00	8,000
L-63	1983	Conversion	1	Electric	35.00	8,000
LS-1	1982	Conversion	2	Electric	32.00	9,500
RR-2	1982	Conversion	1	Electric	10.00	8,000
RR-3	1982	Conversion	1	Electric	7.00	8,000
S-10	1981	Conversion	2	Electric	50.97	12,000
S-14	1977	Conversion	3	Electric	58.10	9,500
S-28	1976	Conversion	5	Electric	142.00	41,000
S-32	1973	New	5	Electric	80.00	47,000
S-35	1978	Conversion	1	Electric	16.55	8,000
S-38	1984	New	1	Water Wheel	12.00	8,500
S-39	1980	New	2	Water Wheel	16.40	10,500
S-39A	1979	New	2	Water Wheel	11.46	11,000
S-40	1979	New	2	Electric	43.60	15,500
S-42	1979	New	1	Electric	13.00	13,000
S-45	1981	New	2	Water Wheel	34.42	28,000
S-46	1981	New	2	Electric	30.00	23,500
S-47	1980	New	1	Electric	7.67	10,500
VC-1	1979	New	1	Electric	8.26	13,000
VC-2	1979	New	1	Electric	8.46	13,000

APPENDIX Table 8. - Estimated Costs for Construction of Concrete Structures and Installation of Drive Units and Bypass Pipe for Drum Screens in Idaho Irrigation Diversions. (Continued)

Screen No.	Year Constructed	Construction Type	No. of Drums	Power Source	CFS Screened	Estimated Cost ($)
VC-3	1977	New	1	Electric	5.21	12,000
VC-4	1977	New	1	Electric	4.36	12,000
VC-5	1980	New	1	Electric	12.88	13,000
VC-6	1977	New	1	Electric	35.00	14,500
EC-1	1980	New	1	Water Wheel	8.72	9,500
KNC-1	1984	New	1	Water Wheel	7.00	9,000
KNC-2	1984	New	1	Water Wheel	7.50	9,300
SPC-1	1980	New	1	Water Wheel	23.00	9,500

APPENDIX Table 9. - Current Estimated Costs for Construction of Various Size Drum Screens in Oregon (size is in inches and first number is length and second one width). Costs include construction of concrete structures and drums and installation of drive units and bypass pipe.

Size in Inches	Number of Drums	Estimated Cost ($)
24x14	1	1,980
24x18	1	2,140
30x14	1	2,100
36x14	1	2,045
36x18	1	2,205
36x24	1	2,355
48x14	1	2,200
48x14	1	2,320
48x24	1	2,500
60x14	1	2,385
60x18	1	2,775
60x24	1	2,900
60x30	1	3,100
72x18	1	2,600
72x24	1	2,900
84x18	1	2,900
84x24	1	3,095
96x24	1	3,416
96x30	1	4,697
96x30	2	9,700