

THE FISH AND WILDLIFE RESOURCES
OF THE MIDDLE WILLAMETTE BASIN, OREGON,
AND THEIR WATER USE REQUIREMENTS

A Report to the
STATE WATER RESOURCES BOARD

by the
OREGON STATE GAME COMMISSION
Basin Investigations Section

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INTRODUCTION

A field survey crew was assigned by the Oregon State Game Commission in the fall of 1961 to study water use requirements of the fish and wildlife resources in several major drainage basins of Oregon. Principal goals of this study were to provide the State Water Resources Board with information concerning the status and importance of the resources to the state and to develop minimum stream flow requirements for maintenance and enhancement so that full consideration could be given these values in the beneficial water use programs formulated by the Board.

This report is the second to be prepared based on these studies. A similar report concerning the South Coast Basin was completed in December 1962. Study was concurrent in both basins beginning in the fall of 1961 and extending for a full year. Information included in this report is from these investigations in the Middle Willamette Basin, existing records and other field personnel.

Water quantity and quality for maintenance of resident and anadromous game fish populations is frequently inadequate in many of the basin streams in the summer and early fall months. Over a century of water and watershed abuses have contributed to this condition. Protection from further depletions during the critical periods must be provided if many of these waters are to continue producing fish. Water problems effecting game birds and animals exist but are less acute.

Recommendations for flows which would provide for the development of each stream's full potential were not made. In many cases supplemental water would be required to do this. At such time as water storage projects may be proposed for any stream in the Middle Willamette Basin, all fish and wildlife needs should be reviewed and, to the greatest degree that is compatible with the other project purposes, water supplies should be provided for these benefits. The report

contains resumés of the resources and their values by subbasin and an explanation of the study methods and tabulations of the data obtained along with our recommendations.

FISH RESOURCES OF THE MIDDLE WILLAMETTE BASIN

Willamette River

The Willamette River contains a great variety of fish life. In terms of total numbers, rough fish far outnumber game species, although sufficient numbers of the latter are present to provide substantial fisheries. Species present in the system are listed in Appendix XV.

Angling for trout, adult salmon and steelhead in the main stem of the river within the Middle Willamette Basin exists, but pressure is not heavy. Greater interest is directed upon warm-water game species, particularly in slough areas and "oxbow lakes" formed by old channels of the river. Limited sturgeon fishing is conducted in deep water areas. It is anticipated that introductions of channel catfish made in 1962 will provide another fishery.

The Willamette River main stem serves as an avenue for upstream and downstream migration of four salmonids--cutthroat trout, steelhead trout, chinook salmon and silver salmon. The river within the basin (and in the Upper Willamette Basin) contains large expanses of spawning gravels little used by the above species but which offer potential for another fish, the fall chinook. This race probably never utilized the Willamette River system above Oregon City prior to ladder construction over Oregon City falls due to passage difficulties encountered there with low flows during the fall migration period (Willis, Collins and Sams, 1960). Fall chinook have been stocked by the Fish Commission of Oregon but have not been recorded spawning in the river. Since laddering of the falls, temperature and

pollution blocks between Newberg and the mouth may have precluded their establishment. With continuing pollution control measures and cold water releases from upstream storage projects, establishment of the fall chinook is a distinct possibility. Description of potential Willamette River spawning areas within the basin is given in Table 1.

TABLE 1

Potential Willamette River Fall Chinook Spawning Areas^{1/}
Middle Willamette Basin

Area	No. of Bars	Description
Peoria-Corvallis (main channel only) (10 miles)	7	Four of the bars are quite large, extending across or well into the main channel. Could be utilized at nearly all flows and have excellent potential.
		Three bars are smaller and could be utilized during a narrow range of flows. Much usable gravel also exists between the bars.
Corvallis-Albany (12 miles)	1	Bar large, extending completely across river. Good potential.
Albany-Buena Vista	2	Both bars small and could be utilized only during ideal flows.
Buena Vista-Independence (10 miles)	3	Bars large, extending across entire river. Portions of each bar would be usable at varying flows. Potential good.
Independence-Salem (12 miles)	2	Bars large, extending well across the channel.
Salem-Wheatland (12 miles)	4	Two small gravel areas of limited value. Two extensive bars with good potential.
Wheatland-Yamhill R. (17 miles)	1	A small gravel riffle extending only a few yards across the channel.
Yamhill R.-Canby (20 miles)	0	

^{1/} Enumerated when flow at Salem was between 5,960 and 6,950 c.f.s. A lower flow may have revealed additional spawning areas.

Pollution of the Willamette River and several of its tributaries continues to be paramount in limiting resident and anadromous game fish populations. Much

effort has been expended by the State Sanitary Authority and others to correct this situation. Major pollution sources of the main stem are canneries, municipalities and paper product mills. Effluent from three mills--Spaulding Pulp and Paper near Newberg, Columbia River Paper Company at Salem, and Western Kraft Corporation near Albany--was observed during 1962. Cursory measurements revealed that all three continue to contribute heavily to deleterious water qualities for aquatic life. The cumulative efforts of pollution are shown in Appendix IX, which lists weekly summer dissolved oxygen concentrations obtained at seven Willamette River stations in 1962 by the State Sanitary Authority. From these readings the oxygen block which begins in July can be noted. Dissolved oxygen of five parts per million is generally considered to be the minimum concentration acceptable for salmonid survival.

A quotation from the conclusion of a 1945 pollution report (Dimick and Merryfield, 1945) generally applies today:

"Pollution in the Willamette River system is a State shame. Oregonians have long prided themselves in having an outstanding, if not the best, recreational Mecca of the nation. Yet, this magnificent river is at present in part an open sewer in which tremendous quantities of untreated human sewage and industrial wastes are disposed. Pollution in Oregon's great river, along with other detrimental activities, has depleted a world-famous commercial and game fish fauna. The Willamette River and many of its tributaries is a story of lost miles of fishing waters and of lost important spawning grounds for chinook salmon. Not only has the fishing interest suffered in the maltreatment of a natural resource, but all the people of Oregon have sacrificed a heritage in the aesthetic value of clean water.

"Untreated pollutants from many and varied sources have at times killed desirable fishes by depleting the oxygen supply of the water. The toxic action of some effluents is a major cause of fish and fish food decrease in various areas. Although some wastes that enter the river and tributaries are frequently not detrimental to fish life at points of discharge, their cumulative effects become inimical further downstream.

"Remnants of the native fish still remain from which the resource can be rebuilt. No substitution in kind should be made for rainbow and steelhead trout, cutthroat trout, and chinook salmon, except in river locations beyond repair. Definite action in pollution abatement is needed to accompany the progressive program of the Oregon State Game Commission for rebuilding the game fish resources. Even a sound management program based on research will fail if the environment is adversely affected for fishes. Pollution as it now exists in parts of the river system is one of the most serious contributing causes of unsatisfactory fish habitat."

Temperatures reach critical levels for fish survival, particularly in the lower river areas, as the summer progresses. Willamette River temperature records have also been obtained in the basin by Dimick and Merryfield (1945), the U. S. Army Corps of Engineers, U. S. Fish and Wildlife Service (Weber and Schedin, 1952) and others. Water temperature measurements are included in Appendix IX.

River temperatures measured in mid-September, 1962, at several locations between Canby and Peoria were uniform at all depths, suggesting little or no summer stratification. Maximum water temperature recorded in 1962 by the State Sanitary Authority was 77° F. at Newberg and Canby Ferry on July 31. Temperatures near the mouth of all major tributaries were found to be nearly identical to those of the main river with the exception of the Santiam River which, at 59° F., was four degrees cooler. Such records indicate the difficulty presented to fish which might attempt to escape formidable temperatures.

Two other factors known to create fisheries problems are scattered gravel removal operations which frequently cause high silt loads, and floods which strand downstream migrants, particularly in the spring. This latter problem is being alleviated somewhat by diking projects.

Willamette River anadromous fish populations are seriously affected by passage problems, both upstream and downstream, at Willamette Falls. Intensive

studies preliminary to installation of improved passage and protective structures have been conducted by the two state fish management agencies.

Santiam Subbasin

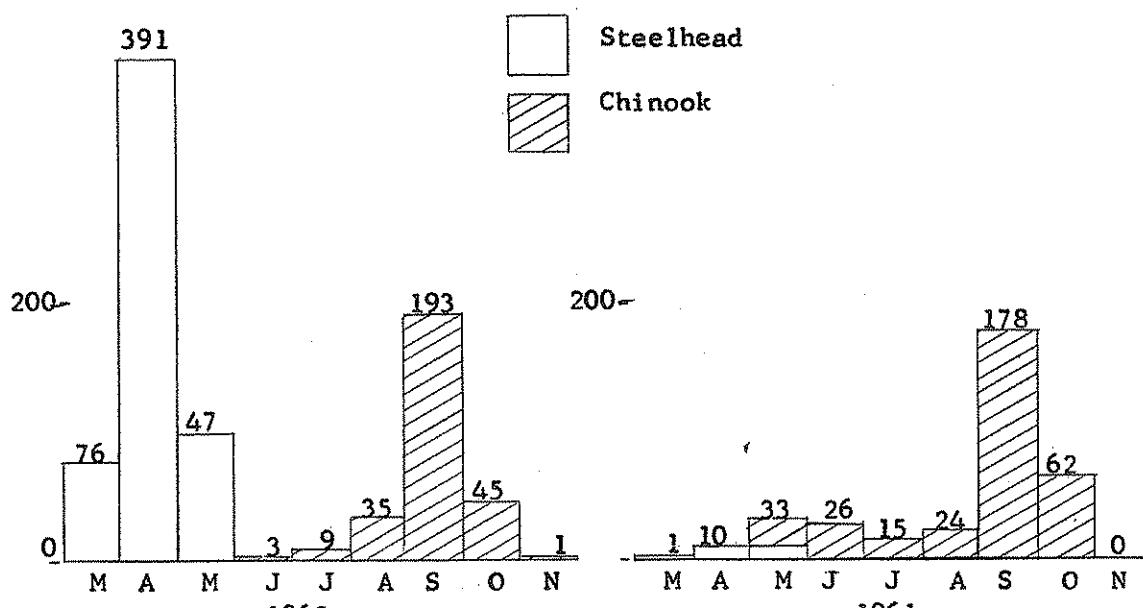
This subbasin is drained by streams of the Calapooya and Santiam River systems. The Santiam River system contains more potential for anadromous fish than any river system in the Middle Willamette Basin. Present populations also are considered to be the highest. Populations, however, fall far short of those which once existed or for which potential now exists.

Spring chinooks and winter steelhead are the most abundant anadromous fish. Silver salmon have been introduced, but no established runs have been recorded. Chinook are found in all major Santiam River tributaries maintaining adequate summer flows. Adults enter the streams in the spring and rest throughout the summer in deep pool areas before spawning in September and October. These selected pools, or "resting holes", are usually in or near headwater areas where summer stream temperatures remain relatively cool. Summer counts of adult chinook were initiated in Thomas and Crabtree Creeks in 1961 to obtain population trend data (Table 2). Spawning ground counts have been conducted for several years by the Fish Commission of Oregon (Willis, Collins and Sams, 1960) and the U. S. Fish and Wildlife Service (Green Peter Dam report, 1961) in the Santiam River system. An electronic fish counting instrument installed by the U. S. Fish and Wildlife Service in the Elkhorn Falls ladder on Little North Fork Santiam River has enumerated adult spring chinook and steelhead ascending the ladder since 1959. Count data are presented in Figure 1.

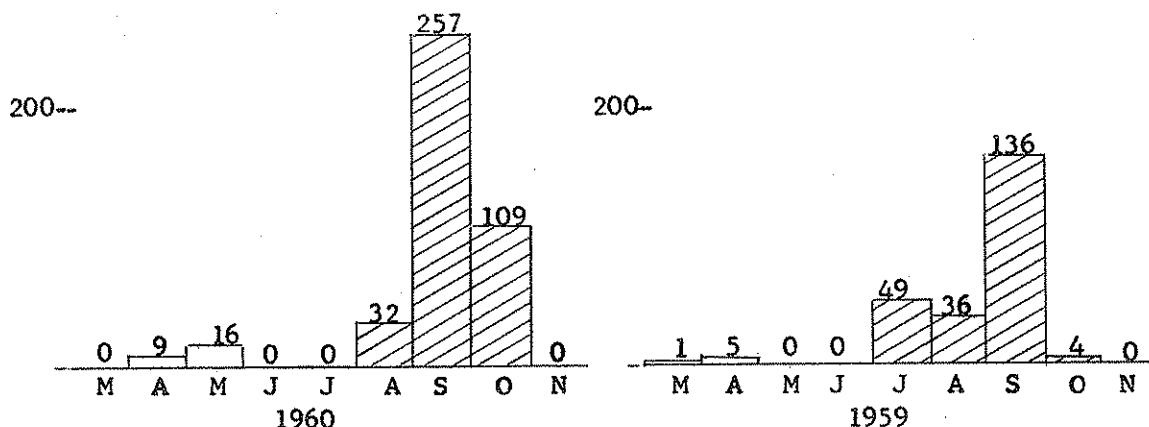
Small chinook populations remain in Wiley Creek (South Santiam River) and Calapooya River. Poaching of adults and poor upstream passage facilities over dams have contributed to dwindling numbers in both streams. Angling for chinook

FIGURE 1

Fishway Counts, Elkhorn Falls Fishway Electric Counter
Little North Santiam River ^{1/}



(Counter out of operation May 29-June 28)



1/ Data supplied by Eugene Maltzeff, Bureau of Commercial Fisheries

occurs during the spring migration and points of greatest angler concentration are below the Stayton dams (North Santiam River) and the Lebanon Ditch dam (South Santiam River).

TABLE 2

Spring Chinook Resting Hole Counts

Stream	Date	Adults	Jacks	Total Fish Observed	Area
Thomas Cr.	8-24-61	34	3	37	2nd Lulay Bros. logging road bridge to 0.3 miles above Indian Prairie Cr.(2.5 mi.)
	9-7-62	32	3	35	2nd Lulay Bros. logging road bridge upstream to Thomas Cr. Falls (4.5 mi)
Crabtree Cr.	8-25-61 ^{1/}			62	1.5 miles above Roaring River, downstream 6 miles.
	9-5-62	70	1	71	Downstream 4 miles from Roaring River
Molalla R.	1961 ^{1/}			238	Mouth of Trout Creek upstream to confluence of Table Rock Fork.(11 mi.) ^{2/}
	1962 ^{1/}			245	Mouth of Trout Creek upstream to Henry Creek falls (20 mi.) ^{2/}

1/ Counts made with aid of SCUBA gear.

2/ Short sections within the area not appearing to contain deep holes were not surveyed.

Steelhead spawn in the same streams utilized by chinooks as well as several smaller tributaries. Angling is widespread throughout the subbasin and concentrated from March to May. From Table 3, listing Santiam system creel census results, it can be noted that steelhead angling success is low when compared to Oregon coastal streams.

Small to moderate populations of native rainbow and cutthroat trout occur in headwater streams of the Santiam River drainage. These are supplemented by plants of legal-sized rainbows which furnish the bulk of stream trout fishing throughout

the Middle Willamette Basin. Numbers of trout stocked are listed in Appendix XII. Creel census data are presented in Table 4 and Appendixes XIII and XIV.

TABLE 3

Steelhead Creel Census Data, Santiam River System

Year	Number of Anglers	Hours Fished	Steelhead	Hours per Fish
1956	40	83	0	-
1957	40	52	0	-
1958	273	506	4	127
1959	163	299	9	33
1960	169	241	2	120
1961	124	114	7	16
1962	188	350	16	22

TABLE 4

Comparative Trout Angling Success by Various Areas
Middle Willamette Basin, 1962^{1/}

Water	No. of Anglers	Hours Fished	Size Groups		Total Fish Caught	Fish per Angler	Fish per Hour
			6-12	12+			
Detroit Reservoir	1,413	4,504	2,379	133	2,512	1.78	0.56
Cascade lakes	1,876	6,784	6,996	734	7,730	4.12	1.14
N. Santiam R. system	739	1,516	1,859	8	1,868	2.54	1.23
S. Santiam R. system	703	1,529	1,412	34	1,446	2.05	0.94
Pudding R. system	247	692	367	3	370	1.49	0.58
Willamette streams (west side)	344	1,024	902	2	904	2.62	0.88
Totals	5,322	16,049	13,915	914	14,830		

^{1/} Creel census data included in tables and appendixes of this report are from Oregon State Game Commission spot checks and do not indicate total annual angling pressures or catches (with the exception of Detroit Reservoir, Table 5).

Trout fishing in lakes, excluding high Cascade lakes, is confined almost entirely to Detroit Reservoir on the North Santiam River. Creel census data for that water, which has been collected since 1954, is presented in Table 5. Kokanee, small landlocked blueback salmon, have been introduced into the reservoir in recent years to provide a more diversified fishery. Several small lowland

lakes furnish excellent fishing for warm-water game fish. These, including species present, are listed in Appendix XI.

TABLE 5

Detroit Reservoir Creel Census Data

Year	Anglers Checked	Total Fish	Fish per Angler	Fish per Hour	Estimated Anglers	Estimated Catch
1954	3,559	9,868	2.74	0.54	49,062	131,796
1955	4,022	5,689	1.41	0.54	61,738	87,738
1956	2,446	3,381	1.38	0.39	64,787	89,406
1957	2,029	4,254	2.09	0.44	91,660	147,332
1958	1,452	2,546	1.75	0.42	97,950	171,412
1959	2,514	6,157	2.45	0.69	108,753	259,847
1960	2,808	3,817	1.36	0.39	134,331	227,639
1961	1,332	2,269	1.70	0.51	137,186	246,881
1962	1,413	2,512	1.78	0.56		
Totals	21,575	40,493			745,467	1,361,363

Hundreds of high elevation Cascade Mountain lakes furnish summer trout angling in Oregon. The Middle Willamette Basin contains 125 of these lakes having a combined area of approximately 1,060 surface acres. Sizes range from 0.5 acre to 325-acre Marion Lake. Of the total, 86 are 5 acres or smaller.

Pertinent high lake data, including stocking and creel census information, are given in Appendix X. Aerial fish plantings are conducted each summer by the Oregon State Game Commission. Stocking rates are determined from periodic lake surveys^{1/} and from creel census data. Rainbow and eastern brook trout are the predominant species stocked. Golden trout have been planted in three Mount Jefferson Primitive Area lakes. Twenty-one lakes are sustained entirely by natural reproduction. Most of the Cascade lakes are capable of withstanding greater angling pressures than they presently receive.

One major pollutant source is known to drastically retard fish habitat in

^{1/} Physical characteristics and fish populations of most Oregon Cascade lakes have been surveyed; information is contained in annual high lakes survey reports, 1952-196(2).

the subbasin. Sulfite effluent from the Crown Zellerbach Corporation mill in Lebanon renders the entire South Santiam River below that point useless for fishing or swimming or most other recreational uses through the summer months. Several young chinook salmon held just below the effluent outlet in 1955 died within seven minutes.^{2/} Dimick and Merryfield (1945) recorded dissolved oxygen concentrations of 0.0 ppm at Crabtree Bridge in August and September 1944. The State Sanitary Authority and others^{3/} have since conducted studies of pollution in this river section. Domestic wastes near Sweet Home and Lebanon, and releases from log ponds into Ames Creek and Wiley Creek contribute to the river's poor water quality.

Summer water temperatures reach critical levels for salmonid rearing in portions of many streams. Thermograph records for lower Thomas Creek and South Santiam River are presented in Appendixes V and VI.

Several dams which impede fish passage and associated water diversions without protective fish screens create added hazards. Construction of Detroit and Big Cliff Reservoirs on the North Santiam River precluded the use of many miles of former chinook salmon and steelhead spawning area. Downstream a complex of low concrete dams near Stayton, while laddered, impede proper upstream passage. A similar situation exists at the Lebanon diversion dam on the South Santiam River. Projects aimed at minimizing flood damage have occasionally been detrimental to spawning and rearing areas of several subbasin streams (See Figures 6, 7 and 8 of Appendix XVI.)

Descriptions of fish passage barriers in the Willamette River system are

2/ Observations of J. J. Wetherbee, Oregon State Game Commission.

3/ Graduate theses concerning pollution of South Santiam River, Rickreall Creek and Willamette River are available at Oregon State University, Fish and Game Department, Corvallis, Oregon.

discussed in reports by the U. S. Fish and Wildlife Service and fishery management agencies of Oregon. Studies of fish mortalities have been made at most of the diversions and hydroelectric power installations throughout the Willamette Valley. These show greater losses occurring in the Stayton Power Canal than in any other Middle Willamette diversion, although undesirable kills were found elsewhere.

Coast Range Subbasin

Stream systems of this subbasin containing important fish populations are the Luckiamute, Marys and Yamhill Rivers, Rickreall Creek and several smaller creeks tributary directly to the Willamette River.

Prior to Fish Commission of Oregon introductions initiated in 1952 there were few reports of anadromous fish use in any of these streams. During fish distribution studies in 1961 and 1962, (Appendix IV), the only anadromous fish believed to be of native origin were silver salmon in Rickreall Creek and steelhead in Luckiamute River. Introduced silver salmon have shown encouraging returns in streams of the South Yamhill River system. Limited numbers have been observed in Luckiamute River and Marys River drainages. Silver salmon spawning ground counts are presented in Table 6.

Good potentials for anadromous fish exist within the west side streams, but reasons for fish scarcity have never been fully understood. Low, warm summer stream flows and man-made barriers doubtlessly have been major influences. Two dams near the mouth of Marys River have not had adequate fish passage facilities. The lower dam was recently removed. The Yamhill (Lafayette) Dam and lock on the Yamhill River is nearly a complete barrier to upstream passage except at times when high flows occur simultaneously in the Yamhill and Willamette Rivers. An old wooden fish ladder at the dam forming Carlton Lake on the North Yamhill River is wholly inadequate. Continuing efforts are made to correct all of these situations.

TABLE 6

Silver Salmon Spawning Ground Counts
Coast Range Subbasin

Stream	1961				1962			
	No. of Fish ^{4/}	Miles Surveyed	Fish per Mile	Redds	No. of Fish ^{4/}	Miles Surveyed	Fish per Mile	Redds
Luckiamute River System								
Pedee Cr.	0 2/	0.5	0	1	4(1) 2/	0.5	8	2
Clayton Cr.	1 2/	1.0	1.0	3	5(1) 2/	1.0	5	4
	0 2/	1.0	0	0	0 2/	1.0	0	0
Marys River System								
Blakesly Cr.	0 2/	0.75	0	0	0 2/	0.75	0	0
Greasy Cr.	0 2/	1.0	0	0	0 2/	1.0	0	0
Mulkey Cr.	0 2/	0.5	0	0	0 2/	0.5	0	0
Oak Cr.	7 2/	1.5	4.7	4	0 2/	0.75	0	0
South Yamhill River System								
Agency Cr.	12(2) 1/	2.6	4.6	38	5(1) 1/	2.4	2.1	5
Cedar Cr.	2 2/	1.7	1.17	6	0 2/	1.2	0	0
Ead Cr.	0 1/	0.25	0	1				
Hanchet Cr.	1 1/	0.5	2	6				
Kitten Cr.	4(1) 1/	0.5	8	5				
Mill Cr.	0 1/	0.5	0	0				
Gooseneck Cr.	0 2/	1.0	0	0	12 3/	4	3	26
Rogue R.	1(1) 2/	2.0	0.5	1	2 3/	2.5	0.8	2
Willamina Cr.	0 1/	1.0	0	3				
Coast Cr.	1 1/	0.06	16.6	2				
Burton Cr.	13(2) 1/	4.5	2.9	21	6 1/	1.25	4.8	7
Gilbert Cr.	18(2) 1/	2	9.0	8	7 1/	0.5	14	9
	1 1/	0.1	10.0	2				

1/ Fish Commission of Oregon counts.

2/ Oregon State Game Commission counts.

3/ Fish Commission of Oregon and Oregon State Game Commission counts combined.

4/ Figures in parentheses indicate number of jacks included in total.

Substantial populations of cutthroat trout are found throughout even the smaller streams of the subbasin. Legal-sized cutthroat and rainbow are stocked annually in most larger streams (Appendix XIII). Creel census information is included in Table 4 and Appendixes XIII and XIV. Lake fishing is confined almost entirely to warm-water species in the several small lakes listed in Appendix XI. Some angling for these fish is done in the lower Yamhill River.

Warm, low summer and early fall flows prevail in nearly all streams of the subbasin. This condition results largely from the poor water retention character of the Coast Range headwater areas. Temperature records of a thermograph installed near the mouth of Mill Creek (South Yamhill River) in 1962 are given in Appendix VII. The temperatures and their patterns are quite representative of those which occurred in the lower portion of most west side streams, although flows in lower Mill Creek were decreased somewhat more than others by irrigation use.

Several additional barriers will require further attention if anadromous runs become better established in the subbasin. A few pollution problems are present. Discharges of pollutants from the Dallas sewage treatment plant and lesser sources cause poor water quality in Rickreall Creek from Dallas to the mouth. No salmonids were recovered below Dallas in 1961, although numerous recoveries were made above that city. The lower Yamhill River has dissolved oxygen levels below five parts per million for extended summer periods. Log pond discharges into the South Yamhill River at Willamina affect water quality.

Pudding Subbasin

Important fish-producing streams of the Pudding subbasin are the Molalla and Pudding Rivers, and Mill Creek, a Willamette tributary at Salem. Of these streams the Molalla River and its tributaries support the largest anadromous fish runs and have the highest potentials for these species. Steelhead are the most numerous, and spring chinook numbers are moderate. Silver salmon returns from Fish Commission plants begun in 1951 are known to exist, particularly in Milk Creek, but magnitudes of runs are unknown.

The majority of steelhead and chinook salmon spawning in the Molalla River system occurs above the confluence of North Fork. Chinook resting hole counts were initiated by the Oregon State Game Commission in 1961 using SCUBA gear. Results are included in Table 2.

Within the Pudding River system, Abiqua, Butte and Silver Creeks contain the best anadromous fish potentials; however, runs are only small to moderate in size. Steelhead utilize all three streams, and a remnant run of spring chinook salmon continues in Abiqua Creek. A spawning ground count from Abiqua Falls downstream four miles in 1961 revealed only eight chinook. U. S. Fish and Wildlife Service personnel observed approximately 200 spawning chinook in Abiqua Creek in 1940 (Parkhurst, Bryant and Nielson, 1950). The Silverton water supply dam built in 1951 has a record of severe fish migration impedance due to improper location of the fish ladder entrance.

Little information is available regarding anadromous fish use of Mill Creek. There are occasional reports of chinook salmon and steelhead observations but runs are low. Some fish are known to enter the system from the North Santiam River via the Salem ditch. Several unscreened diversions and unladdered or poorly laddered dams are present.

Practically all stream trout angler catches result from hatchery produced rainbow and wild immature salmon and steelhead. Stream creel census data are included in Table 4 and Appendixes XIII and XIV. Lake fishing is limited other than in the few Cascade and lowland lakes mentioned in Appendixes X and XI.

Stream flows and temperatures of the lower valley streams are not usually within acceptable salmonid tolerance limits throughout much of the summer rearing period. Upper tributaries and headwater areas of lower elevation streams maintain flow and temperature regimens more conducive to proper rearing of both trout and anadromous fishes. Thermograph records are presently being obtained by the Fish Commission of Oregon in the Molalla River, Willamina Creek and Little North Fork Santiam River. No major sources of pollution are known.

GAME RESOURCES OF THE MIDDLE WILLAMETTE BASIN

General

The extensive agricultural development of this basin provides excellent upland

game habitat typical of a mixed farming area. In addition, the forested uplands provide ideal blacktail deer habitat wherever logging, fires and farming have cleared away mature timber stands.

Generally, water quantity presents no problem as far as game and furbearing animal populations are concerned. Large water impoundments may flood out areas utilized by these forms, such as the important blacktail deer winter range inundated by Detroit Reservoir.

Water quality can effect waterfowl and furbearer populations in certain specific areas. For example, beaver index counts conducted along the Willamette River show a drastic population decline below Salem in recent years attributable to severe water pollution in this river section. A similar situation exists in the Pudding River below Woodburn where effluent from a food processing plant affects mink, muskrat and beaver numbers.

Big Game

Blacktail deer are very numerous throughout the Middle Willamette Basin and are especially concentrated where agricultural and wooded lands intermix and in logged off or burnt-over forest areas. Hunting pressure is heavy. In 1961 approximately 12,000 hunters killed 6,300 deer in this basin. This represents nearly 74,000 hunter-days of recreation.

Roosevelt elk are present only in limited numbers and are lightly hunted.

Black bear are quite numerous and have recently been classified as a game animal in the eastern part of the basin. At present they provide only a minor amount of hunting.

Upland Game

The ring-necked pheasant is the most popular game bird in this area. Throughout the basin pheasants are numerous on or near agricultural land and provide good to excellent hunting.

Moderate numbers of mountain and valley quail are present, but hunting pressure on these species is comparatively light. Bobwhite quail are present but provide little or no hunting. Blue and ruffed grouse are common in the wooded and forested areas and provide some hunting.

Mourning doves and band-tailed pigeons are plentiful during the summer and early fall. Both species are extensively hunted while available in the early fall season.

Silver gray squirrels are common in stands of deciduous trees and are occasionally hunted.

Waterfowl

Important breeding populations of mallard and wood ducks are found in the Middle Willamette Basin. Wintering and hunting season waterfowl populations are predominately mallard, pintail and baldpate ducks, and Western Canada geese (Table 7). Smaller numbers of gadwall, shoveller, teal and ruddy ducks can also be found.

Furbearers

A minor but important industry exists in the Middle Willamette Basin utilizing this renewable natural resource. Over 100 trappers harvest an annual wild fur crop worth over \$21,000 based on prices paid to the trapper in the 1961-62 season (Table 8). The beaver is the most valuable fur animal in terms of total worth, bringing in an average of over \$20,000 annually over the last ten years (Table 9). Other furbearers of this area are the river otter, mink, muskrat and raccoon. Striped and spotted skunk, red and gray fox, bobcat, feral nutria, weasel, marten and coyote are also trapped, but are of only minor importance.

Game Habitat Improvement

The Oregon State Game Commission, private groups and individuals have

expended considerable time and effort during the past fifteen years to improve and create game habitat. Typical operations include shrub and grass plantings, water developments, wood duck nest box construction and food crop production.

The E. E. Wilson Game Management Area is operated to provide highly productive game bird habitat. One thousand eight hundred sixty acres are devoted to game habitat, food crop plantings, game bird production and recreation.

There are several other potential game management areas or refuges in this area which are under consideration by wildlife agencies. These would develop the potential use by migratory waterfowl of some of the slough and swamp lands in the Willamette Valley.

TABLE 7

Winter Waterfowl Counts, Middle Willamette Basin
Approximate Total Numbers Present as Calculated from County-wide
Inventories Taken Early in January of Each Year

Year	Ducks	Geese and Other Waterfowl	Total Waterfowl
1962	17,382	10,524	27,906
1961	43,684	10,732	54,416
1960	42,851	15,673	58,524
1959	42,632	6,200	48,832
1958	12,201	5,100	17,301
1957	20,400	6,468	26,868
Average	29,858	9,116	38,974

TABLE 8

1961-62 Fur Catch, Middle Willamette
Estimate of Total Catch Calculated from Reports of 138
Licensed Trappers

	Beaver	Otter	Mink	Muskrat	Raccoon	Fox	Nutria	Misc.	Total
No. of Pelts	1,671	6	133	1,288	484	63	210	49	3,964
Total Value	\$16,200	114	1,187	800	894	78	118	102	\$19,503

TABLE 9

Beaver Catch, Middle Willamette Basin
1952 - 1962
Estimates of Total Catch Calculated from Beaver Report
Cards Returned by Trappers

Season	No. of Pelts	Value
1961-1962	1,671	\$ 16,200
1960-1961	2,007	22,110
1959-1960	2,131	26,300
1958-1959	1,888	17,055
1957-1958	2,080	21,395
1956-1957	2,058	19,020
1955-1956	1,735	20,545
1954-1955	2,212	28,270
1953-1954	1,762	14,425
1952-1953	1,853	19,390
Totals	19,397	\$204,710
Ten-year Average	1,940	\$ 20,471

STREAM FLOW STUDY

Stream flow studies in the Middle Willamette Basin were conducted concurrent with, and similar to, those in the South Coast Basin. Descriptions of study methods plus fresh water requirements of anadromous fish were contained in a South Coast Basin report presented to the State Water Resources Board in December 1962. Subsequently, repetition of study phases as they apply to the Middle Willamette Basin will be included in this report, although much of the role which water plays with successful fishery maintenance will not.

Recommended flows for spawning and rearing are presented for individual streams by semi-monthly periods in Appendix I. All flows listed are primarily for anadromous fish production. While not necessarily the best flows for angling, these flows if present would normally provide adequate volumes for this purpose as well as for maintenance of resident game fish.

No effort was made to determine minimum flows for either rearing or spawning

in the Willamette River or North Santiam River below Big Cliff Dam. Both streams possess adequate volume flows for these purposes, although releases of larger volumes of cold water from storage would be necessary at the present time to improve Willamette River water quality.

All listed flows are adequate for present and increaseable fish populations. No effort was made to determine true optimum flows for either rearing or spawning due to the complexity of inter-related factors concerned and the limited time available for the study. The flows are believed to be below the average annual discharges for most streams, but recommended rearing flows will frequently exceed to some degree those existing naturally, particularly in the smaller and lower elevation streams.

These recommendations reflect our best judgement, based on available information, of the fish resource needs for maintaining production at levels now existing or, wherever possible, to permit the populations to be increased to levels more nearly those which the streams can support. As knowledge increases or environmental conditions change, it may become necessary to adjust these recommendations either up or down to more properly fit the situations known to occur at that time.

Whenever possible, flow locations have been designated at lower ends of spawning areas, mouths or confluences of streams, or at some easily recognizable landmark. In the lists of locations the term "confluence of" means the flow just above, or excluding, the incoming stream and does not consider the water being added by that tributary. The flow at each location is that which should always arrive at and depart from the designated point and do so without regulation which would cause portions of the stream, either above or below that point, to vary drastically from the recommended volume.

Rearing Flows - Discussion and Study Methods

Streams of the basin were visited on several occasions within low flow periods of 1961 and 1962 to measure existing flows and temperatures and to determine volumes necessary for proper rearing of juvenile salmonids. The measured data are presented in Appendix II and show a similarity between existing flows and those recommended for fish rearing. A number of flow volumes were measured in a manner similar to U. S. Geological Survey procedures. Many, however, were calculations based on more simplified measurements. The greatest error of the calculated volumes is not believed to exceed 30 per cent, and the average should be considerably less than that. These two sets of figures are differentiated in the appendix for identification.

Due to the life history patterns of most anadromous fish species, some fresh water rearing occurs throughout the year. "Rearing" flows, however, are considered in this report to be those occurring during the summer or low flow months.

The size of a game fish population is dependent upon certain conditions to be found within the rearing area of a stream. These conditions or rearing requirements, basically food, shelter and a suitable medium in which to live, were discussed in the submitted South Coast Basin report. It was explained that food and shelter requirements are usually satisfied by proper stream volumes (flows), providing that accompanying water qualities are favorable. "A suitable medium in which to live" refers primarily to water quality factors. While water quality can be regulated to varying degrees by increased or decreased volume flows, no attempt was made during the study to determine such results. Instead, the recommended flows in the appendix are those which would be adequate providing that acceptable accompanying water qualities occur. In this list those streams which would probably have water quality problems even with the recommended flows are so designated.

Most water quality problems of the basin affecting fish production arise from excessive water temperatures and man-caused pollution. These are often

associated with and further intensified by widespread low summer stream flows. It has been mentioned that Coast Range subbasin streams and low elevation streams of the other two subbasins experience the most critical summer flows and temperatures. Various sources of pollution occur with municipalities, canneries and paper product mills being the largest contributors. Cumulative effects become progressively noticeable in the Willamette River towards its mouth. Extensive past and present logging in nearly all watersheds has contributed to low flows, excessive temperatures, siltation and jamming by logs and debris.

Creation of new criteria for the determination of proper flows has not been the foremost objective of the current Oregon State Game Commission basins study program, although efforts have continually been made to gain usable criteria and to make changes or improvements upon those available. Methods for measurement of rearing conditions are still largely in the formulative stages, not only in Oregon, but as far as can be determined elsewhere in the fishery field. It is probable that actual measurement of many of the integrated factors concerned will never be attainable and that flow analysis relating to fish needs will of necessity continue to rely on indices and judgement based upon a knowledge of fish, their environmental requirements and familiarity with each stream.

In an effort to satisfy all basic fish requirements it was determined that stream each/should be continually "alive", or maintain a certain flow over its entire length. This live flow must have a minimum depth of between one- and two-tenths of a foot over a substantial portion of each riffle regardless of stream size.

Such a flow satisfies one basic requirement, i.e. food, and at the same time normally satisfies the other two--shelter and a suitable medium in which to live--with possible exceptions created by undesirable water qualities. A flow of this depth enables juvenile salmonids to move between pool areas to avoid predation and/or crowded conditions and provides adequate flow for downstream migration.

Each riffle has individual characteristics and these often vary considerably from one to the next. It is not necessary to provide the minimum desirable depth over the entire area of every riffle so long as sufficient flow is present to provide the needed food production and passage conditions.

Spawning Flows - Discussion and Study Methods

Flows recommended for spawning are included in Appendix I. The timing of these flows may be determined by consulting the spawning periodicity chart, Appendix III.

To determine the volumes needed for spawning and passage, studies were conducted whenever possible at times of actual fish movement and spawning. Several surveys of an individual stream were often necessary because of the occurrence of more than one fish species, different runs of the same fish species, fluctuations of spawning intensity and periods of unfavorable water conditions. Sections of the major spawning areas were examined.

Measurements of the two primary criteria considered, water depth and velocity over the available spawning gravel, were obtained as were stream flow volumes. Current meters were employed for the measurements. Minimum water depth for chinook salmon spawning was considered to be 0.8 of a foot, while silver salmon and steelhead require at least 0.6 of a foot of water. Proper spawning velocities for all three species were considered to range between 1.0 and 2.5 feet per second as measured 0.4 of a foot from the stream bottom. These criteria were selected as the result of measurements at numerous redds of the three species concerned by Game Commission personnel and other fishery workers. Results of studies presently being conducted by the Basins Section of the Fish Commission of Oregon are integrated whenever possible into our spawning flow determinations.

Since it was occasionally difficult to visit a stream at ideal flow conditions, determination of desirable flow figures necessarily involved some extrapolation,

although changes made from actual measured flows were not large, being within a few cubic feet per second.

Straight-line transects were established on eleven basin streams to measure percentages of stream bed gravel available for salmon and steelhead spawning under varying flow volumes. Results also aided in checking the validity of the less detailed measurements used on other streams. Transects numbering between three to seven per stream were installed in these eleven streams: Calapooya River, Crabtree Creek, Luckiamute River, Little Luckiamute River, Marys River, Mill Creek (South Yamhill River), Rickreall Creek, South Santiam River, South Yamhill River, Thomas Creek and Wiley Creek.

Detailed water depth and velocity data were recorded during three to five study periods on each stream. Results are graphed for nine of these streams in Appendix VIII. Construction of the Marys River and Rickreall Creek graphs is pending receipt of flow information from the U. S. Geological Survey. Transects were located within major spawning areas of important, or potentially important, anadromous fish streams and placed whenever possible across gravel bars known to be used by spawning fish. One hundred per cent utilizable gravel was considered to be the gravel wetted at the mean winter flow. It should be realized that, due to formidable water velocities at higher volume flows, one hundred per cent gravel utilization in most streams would never be attainable. The curves drawn are considered to closely approximate spawning potentials that occur with flow variations despite the fact that the transects were not numerous or randomly selected. Though stream gravels will shift from year to year, the curves should remain applicable.

It may have been more desirable to base all spawning flow recommendations on data developed with transects; however, to do so much more time and effort would be required than was available for this study. Since the results of each approach were very similar, it was necessary to adopt the more expedient approach on many of

the basin streams.

FISH DISTRIBUTION STUDY

Studies were conducted in 1961 and 1962 to gain more accurate information on fish distribution in the basin than was available from existing records. The condensed data are presented in Appendix IV. Primary purposes of the study were:

1. To obtain knowledge of species presence for application to the corresponding flow study;
2. To obtain fish distribution information (both game and rough) for application in future water developments or uses;
3. To indicate relative fish numbers and stream values for individual species.

The fish distribution investigations were considered secondary to the coinciding flow study. Therefore, only limited time was allotted and complete coverage of the basin was not possible. Effort was directed principally upon the west side streams, since less information was available there for anadromous species. As a result, coverage of the Coast Range subbasin was quite complete.

Initially, most collection work was planned utilizing seines. Results were not considered adequate, so electro-fishing using a 200-volt electric generator (shocker), was employed. This machine, with either AC or DC outlets, proved highly successful in all waters. Weight of the shocker made long portages difficult, but the extensive Willamette Valley road network reduced the need for these to a minimum.

The number of sampling stations and the distances between stations were dictated mainly by stream lengths. As few stations were established as possible without sacrificing accuracy of basic objectives. Whenever possible, both riffle and pool areas were sampled at each station. Sections sampled averaged 195 feet in length. Normally, few fish escaped enumeration. Station locations

are given on Plate 5.

Distribution study results have been used to show fish distribution on Plates 2, 3 and 4. Information from other available sources is incorporated in these plates as well. Only known distributions are shown. Rough fish, for example, frequent far more streams than illustrated, but past investigations have not been sufficiently extensive to determine their over-all distributions.

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Appendix I
Rockwood Ranch Map for Rockville Millstone Basin

Stream	Location	July	Aug.	Sept.	Oct.	Nov.
		Dec.-May	June	July	Aug.	Sept.
Cañonero River	Below R. M. 45.5	140	140	140	140	140
Spanish Creek	Below R. M. 45.5	35	35	35	35	35
Laramie R. 3/4"	Boiling R. m. 38.5	200	200	200	200	200
Little Laramie R.	S. of R. 3	120	120	120	120	120
Maxfield Creek	None	22	22	22	22	22
Pedeo Creek	"	25	25	25	25	25
H. M. Pedeo Cr.	"	40	40	40	40	40
S. Sh. Pedeo Cr.	"	30	30	30	30	30
Price Creek	"	35	35	35	35	35
Bitter Creek	"	20	20	20	20	20
Playboy Cr.	"	5	5	5	5	5
Sheyenne R. 3/4"	"	15	15	15	15	15
Roaring River 3/4"	"	135	135	135	135	135
Wagon Mtn. 20	"	70	70	70	70	70
Wagon Mtn. 20	"	10	10	10	10	10
Blacktail Cr.	"	10	10	10	10	10
Greeny Cr.	"	4	4	4	4	4
Rock Cr.	"	2	2	2	2	2
Oak Cr.	"	2	2	2	2	2
Dutton R.	"	2	2	2	2	2
Tulkey Cr.	"	2	2	2	2	2
Redtop Ranch Cr.	"	2	2	2	2	2
H. P. H. Redtop Cr.	"	2	2	2	2	2
Olasina Cr.	"	2	2	2	2	2
Wood Cr.	"	2	2	2	2	2
Rolling R. 4/6/	"	2	2	2	2	2
Rolling R. 4/6/	"	2	2	2	2	2
Above contact. O. Table Rock Cr. 80	"	20	20	20	20	20
Above contact. O. Table Rock Cr. 80	"	5	5	5	5	5
Cedar Cr.	"	5	5	5	5	5
Dickey Cr.	"	5	5	5	5	5
Oasley Cr.	"	5	5	5	5	5
Gribble Cr.	"	5	5	5	5	5
Filk Cr.	"	5	5	5	5	5
Canyon Cr.	"	5	5	5	5	5
See Cr.	"	5	5	5	5	5
Will Cr.	"	5	5	5	5	5

Appendix I (continued)

Stream	Location	Dec-May	June	July	Aug.	Sept.	Oct.	Nov.
Jackson Creek	Mouth	12	6	3	1	1	2	12
Nate Creek	"	20	6	4	3	3	6	20
N. Fk. Nate Cr.	"	8	4	2	1	1	3	8
Woodcock Creek	1 mi. above mouth	10	3	2	1	1	3	10
N. Fk. Molalla River	Mouth	80	50	30	20	20	80	80
Ogle Creek	"	25	10	5	3	1	5	25
Pine Creek	"	50	7	5	4	3	10	50
Pudding R. <u>1/4</u>	Below Abiqua Creek	80	60	50	40	40	60	80
Pudding River	Above Silver Creek	50	25	15	10	4	30	50
Abiqua Creek	Mouth	75	60	40 <u>1/1</u>	25	15	10	40
L. Abiqua Creek	Confl. of L. Abiqua Cr.	50	50	20	15	10	30	50
Fowers Creek	Mouth	20	10	7	5	4	3	10
Butte Creek	"	25	10	5	3	3	3	20
Drift Creek	"	40	20	5	20	16 <u>1/1</u>	12 <u>1/1</u>	40
E. Fk. Drift Cr.	"	20	15	3	3	2	2	75
W. Fk. Drift Cr.	"	10	10	2	2	1	1	10
Silver Creek	"	60	50	35	20	16	12	30
Table Rock Fork	"	80	50	30	20	20	15	30
Trout Creek	"	35	8	6	4	4	4	80
Rickreall Creek	"	80	18	12	8	5 <u>1/1</u>	4 <u>1/1</u>	80
Santiam River	"	1500	1000	1000	1000	1000	1500	1500
North Santiam R.	"	1200	800	800	800	800	1200	1200
L.N.Fk. Santiam R. <u>1/6</u>	"	180	60	40	40	40	100	180
Cedar Creek	"	60	35	15	10	8	6	60
Elkhorn Creek	"	50	30	20	12	8	4	50
Evans Creek	"	30	15	8	5	4	2	30
✓ Mad Creek	"	25	10	5	3	2	2	25
Rock Creek	"	50	30	12	8	6	4	30
Stout Creek	"	20	10	6	4	3	3	20
S. Santiam River	Waterloo, R. mile 23.5	500	400	300	200 <u>1/1</u>	200	500	500
Cascadia, R. mile 50	"	90	80	70	60	50	90	90
Confl. of Soda Fk.	"	70	60	50	30	12	12	70
Ames Creek	Mouth	25	15	5	3	2	2	25
Canyon Creek	"	75	50	25	18	12	12	50
Owl Creek	1/4 mi. below Owl Cr.	65	30	20	12	6	10	65
Boundary Creek	"	40	30	12	8	4	10	40
Crabtree Creek	"	20	15	5	2	1	1	20
	"	100	50	40	35	35	100	100

Appendix 2 (continued)

Stream	Location	Dec.-May	June	July	Aug.	Sept.	Oct.	Nov.
Crabtree Creek	Confl. of Roaring R.	90	40	30	25	15	12	110
Hamilton Creek	Mouth	40	15	10	8	5/1	3/1	10
Scott Creek	Confl. of S. Fk.	14	3	2	1	1	5	20
S.Fk. Scott Cr.	Mouth	19	6	4	3	2	5	10
McDowell Creek	"	45	15	10	8	5/1	3/1	10
Middle Fk. Santiam R.	"	150	120	110	110	110	150	45
" "	Confl. of Bear Creek	100	70	50	30	30	100	150
Bear Creek	Mouth	25	20	10	5	5	20	100
Quartzville Creek	"	90	60	30	15	12	20	70
Canal Creek	Confl. of Canal Creek	70	60	30	15	10	15	40
" "	Mouth	60	30	20	15	10	10	60
Elk Creek	Confl. of Elk Creek	30	10	7	6	5	8	25
"	Mouth	50	5	4	3	2	6	12
Moose Creek	"	18	10	7	6	4	3	18
Rumbaugh Creek	"	25	12	10	8	6	4	20
Tally Creek	"	34	12	9	7	5	4	50
Whitcomb Creek	"	55	12	9	7	5	4	35
Moose Creek	"	55	15	8	6	4	4	55
Soda Creek	"	60	40	30	20	15	10	55
Thomas Creek	"	100	50	40	35	30/1	20/1	100
"	Jordon Riv. mi. 19	90	35	25	20	15	10	100
Indian Prairie Cr.	"	25	15	10	6	4	3	90
Jordan Creek	"	25	10	5	3	2	1	25
Neal Creek	"	60	20	12	10	7	6	60
✓ Wiley Creek	"	100	40	25	18	15	15/1	100
L. Wiley Creek	"	30	15	10	8	6	4	30
Yamhill River	"	90	80	70	60	40	30	90
North Yamhill R. $\frac{1}{2} \angle 4$	Pike. Riv. mi. 20.8	70	40	25	15	10	10	70
Baker Creek	3 mi. above mouth	30	12	9	7	6	4	30
Cedar Creek	"	12	6	4	3	2	1	25
Fairchild Creek	"	25	12	9	7	6	4	25
Haskins Creek	"	25	5	3	2	2	2	25
Panther Creek	"	25	6	4	3	3	3	25
Turner Creek	"	70	70	70	50	40	35/1	70
S. Yamhill R. $\frac{1}{2} \angle 4$	USGS gage 14-1940	200	150	100	60	40/1	40	200
" "	Sheridan Riv. mi. 37.5	150	70	40	25	20	35/1	150
" "	Just above Willamina Creek	150	70	40	25	20	35/1	150
Riv. mi. 43	Riv. mi. 43	80	25	20	15	10	8	80
Agency Creek	"	10	6	3	1	1	1	10
Wind R.	"							6

Appendix (continued)

Stream	Location	Dec-May	June	July	Aug.	Sept.	Oct.	Nov.
Casper Creek	Mouth	25	4	3	2	1	1	1
Deer Creek	Above Grohe Creek	15	5	2	1	1	1	1
Ed Creek	Mouth	25	5	4	3	3	3	25
Gold Creek	"	25	4	3	2	1	1	25
Hanchet Creek	"	11	2	1	1	1	1	11
Kitten Creek	"	16	2	1	1	1	1	16
Mill Creek	"	80	15	7	5/1	5/1	5/1	80.
Gooseneck Creek	"	10	5	4	2	1	1	80
Pierce Creek	"	12	5	4	2	1	1	12
Rock Creek	"	70	30	25	15	10	8/1	70.
Cow Creek	"	10	2	1	1	1	1	10.
Joe Day Creek	"	7	2	1	1	1	1	7
Rogue River	"	35	10	5	4	3	2	35
Rowell Creek	"	45	15	8	6	5	4	45
Williamina Creek	/6	70	50	30	20	20	20	70.
Coast Creek	"	35	25	15	6	4	4	45
Burton Creek	"	10	8	5	2	1	2	10
Canada Creek	"	20	16	8	3	2	2	20
E. Williamina Creek	"	30	25	20	15	10	8	30

/1 The recommended summer and early fall flows will not be adequate to correct the existing high temperature problems which limit the productive potentials of the main stems of these larger streams. The flow figures consider only quantity requirements and were developed in the same manner as those for streams not having such temperature problems. Adequate control of the high temperatures probably could be attained only through release of larger amounts of cold water from storage.

/2 Sufficient information is not available to include recommended flows in streams where flow figures are omitted for portions of the year.

/3 Minimum spawning flows for steelhead (December through May) are included for streams in the river system in which potentials exist, but the species might not be present (see Plates 1 and 2).

/4 Minimum spawning flows for silver salmon (November, December and January) are included for streams in the river system in which potentials exist but the species might not be present (see Plates 1 and 3).

/5 Minimum spawning flow for fall chinook if they should become established. Peak spawning would be expected in October and November. Potentials exist in several streams in which spawning flows for this race were not studied.

/6 Spawning flow recommendations by Fish Commission of Oregon.

APPENDIX II

STREAM FLOWS AND TEMPERATURES OBTAINED FROM MIDDLE WILLAMETTE BASIN STREAMS,
1961 and 1962

Stream	Date	Time	Temp. °F.			Flow Cfs	Location	Remarks
			Water	Air	Cfs			
Calapooya R.	9-12-62	2:20 PM	66	84			River mile 40	
" "	" "	12:10 PM	63	76			" 41	Crawfordsville
" "	" "	10:00 AM	60	74			" 41.6	
" "	" "	4:05 PM	65	83			" 47	
" "	10-2-61	4:00 PM	54		13.6*		" 65	
" "	10-17-61	1:30 PM	52	58			" 41.6	
" "	10-24-61	11:00 AM	47	54			" 41.6	
" "	6-18-62	10:00 AM	60	62			" 41.6	
" "	9-3-62	9:30 AM	60	73			" 45.6	Holley
" "	9-27-62	9:30 AM	60	64			" 45.6	"
Brush Cr.	9-3-62	9:00 AM	58	70	2.6		One mile abv. mouth	
" "	9-27-62	9:30 AM	57	64	3.0		"	
Luckiamute R.	8-18-61		63				0.5 mi abv. Hoskins	
" "	8-31-61	4:00 PM	63	66			"	
" "	10-12-61	1:30 PM	52				"	
" "	7-3-62	2:30 PM	58	81			River mile 42	
" "	7-3-62	3:30 PM	66	81			Helmick	
" "	" "	3:15 PM	65	81			Maple Grove	
" "	8-27-62	3:10 PM	66	78			River mile 37.5	
" "	" "	4:15 PM	68	78			Maple Grove	
" "	9-25-62	2:05 PM	64	68			"	
" "	10-25-62	12:30 PM	50	62			"	
Little Luckiamute R.	8-18-62	12:00 N	63				River mile 7.5	Highway 223

* Measured Flow

Appendix II continued

Stream	Date	Time	Temp. °F.			Flow Cfs	Location	Remarks
			Water	Air				
Little Luckiamute R.	9-7-61	4:00 PM	60	69			Bridgeport	Dry, 113
"	"	2:45 PM	61	72	16		River mile 7.5	
"	"	11:00 AM	54	68			" 12	
"	9-8-61	9:30 AM	56	74	15.1*		" 7.5	
"	10-16-61	10:00 AM	56	58	23.3*		" "	
"	"	11:00 AM	56	60			Bridgeport	
"	"	11:30 AM	54	64			River mile 12	
"	6-5-62	1:30 PM	52	64	90.3*		" 7.5	
"	6-19-62	10:00 AM	57	65	58*		" "	
"	7-3-62	2:30 PM	58	81			" "	
"	"	10:45 AM	57		19		One mile above Falls (City)	
"	9-25-62	2:20 PM	60	68	22		River mile 7.5	
Maxfield Cr.	6-19-62	2:00 PM	60	84			0.3 mi above mouth	
"	8-27-62	3:20 PM		78	0		"	Dry
"	9-25-62	12:40 PM	63	66	0.1		"	Intermittent
Pedee Cr.	8-27-62	3:50 PM	60	78	4		0.7 mi above mouth	
"	9-25-62	1:30 PM		74	4.7		"	
Pedee Cr., S. Fk.	8-27-62	3:55 PM	66	78	0.4		Confluence of North Fork	
"	9-25-62	1:40 PM	61	74	0.3		"	
Price Cr.	6-19-62	3:30 PM	63	84			0.5 mi above mouth	
"	8-27-62	3:15 PM	62	78	0.3		"	
"	9-25-62	12:50 PM	59	66	0.6		"	
Woods Cr.	6-19-62	3:00 PM	63	84			0.5 mi above mouth	
Ritner Cr.	6-29-62	12:00 N	62	75	8		0.5 mi above Sheythe Cr.	

Appendix II continued

Stream	Date	Time	Temp. °F.		Flow Cfs	Location	Remarks
			Water	Air			
Ritner Cr.	7-29-62	3:00 PM	65	75	12	Mouth	
	"	3:30 PM	60	78	2.2	"	
	"	3:40 PM	62	78	1.7	Just abv. Sheythe Cr.	
	"	1:20 PM	59	74	1.3	Mouth	
Clayton Cr.	9-25-62	1:15 PM		74	1.8	Just abv. Clayton Cr.	
	"	2:00 PM	64	75	2.5	Mouth	
	8-27-62	3:45 PM	64	78	0.3	"	
	"	1:20 PM			0.4	"	
Sheythe Cr.	6-29-62	1:00 PM	65	75	2.5	"	
	"	3:40 PM	62	78	0.5	"	
	"	1:15 PM	58	74	0.5	"	
Marys R.	9-15-61	1:45 PM	58	62	5.4*	River mile 27	
	"	10:15 AM	60	60		" 9.4	U.S.G.S. Station
	"	10:00 AM	54	58		" "	"
	"	12:15 PM		58		" 27	
"	6-13-62	1:00 PM		65	46.5*	" "	
	"	10:00 AM	59	60		River mile 11	
	"	10:15 AM	61	76		" 9.4	
	7-3-62	1:30 PM	57	81	14	" 32.8	
"	"	11:30 AM	68	80		" 31.5	0.5 mile below Tum Tum R.
	"	11:30 AM	68	80		" 9.4	
	"	1:15 PM	62	78	6	0.5 mile below Tum Tum R.	
	"	10:10 AM	62	65		River mile 9.4	
Blakesley Cr.	"	11:20 AM	58	65	7.2	0.5 mile below Tum Tum R.	
	"	11:10 AM	56	78	1.5	0.2 mile above mouth	
	7-25-62	12:45 PM	68	88	0.7	"	

Appendix II continued

Stream	Date	Time	Temp. °F.		Flow Cfs	Location	Remarks
			Water	Air			
Blakesley Cr.	8-27-62	1:00 PM	64	81	0.2	0.2 mile above mouth	
"	9-25-62	11:10 AM	59	70	0.2	"	
Greasy Cr.	7-3-62	10:30 AM	57	76	16	0.5 mile above mouth	
"	"	10:50 AM	55	74	9	Just above confluence of Rock Cr.	
"	7-11-62	1:30 PM	64		8.5	0.5 mile above mouth	
"	8-27-62	12:35 PM	62	81	5	"	
"	"	12:20 PM	59	81	4	Just abv. confluence of Rock Cr.	
"	9-25-62	10:30 AM	59	66	4.3	0.5 mi above mouth	
Rock Cr.	7-3-62	10:45 AM	56	77	5	0.2 mi abv. mouth	Hwy. 34
"	8-27-62	12:45 PM	62	81	1.2	"	"
"	9-25-62	10:45 AM	58	68	0.8	"	"
E. Fk Marys R.	7-24-62	3:30 PM	69	78	0.8	0.5 mi abv. mouth	
Oak Cr.	7-3-62	9:30 AM	62	75	1.5	Hwy. 34	Flow lower near mouth because of irrigation
"	"	10:00 AM	54	75	2.4	Just below Alder Cr.	
"	8-27-62	11:10 AM	61	79	0.7	Hwy. 34	
"	9-25-62	9:55 AM	59	59	1.4	"	
Tum Tum R.	7-3-62	11:45 AM	58	80	18	Mouth	
"	8-27-62	1:40 PM	57	76	4.5	"	
"	9-25-62	11:40 AM	57	63	4.6	"	
Mulkey Cr.	7-3-62	12:00 N	53	79	3	0.5 abv. mouth	
"	7-25-62	11:45 AM	61	78	2	"	
"	8-27-62	2:00 PM	58	78	1.8	"	
"	9-25-62	11:50 AM	56	61	1.5	"	
Shotpouch Cr.	7-3-62	1:00 PM	59	81	6.5	0.8 mi abv. mouth	
"	8-27-62	2:10 PM	60	78	2.5	"	

Appendix II continued

Stream	Date	Time	Temp. °F.			Flow Cfs	Location	Remarks
			Water	Air				
W. Fk Marys R.	7-3-62	1:45 PM	59	79	2.5		Two miles above mouth	
"	7-24-62	2:30 PM	64	76	3		0.2 mi abv. mouth	
"	"	1:00 PM	64	72	0		0.25 mi abv. Oleman Cr.	Some standing pools
"	"	12:00 N	63	77	2		0.8 mi abv. Oleman Cr.	
"	8-27-62	2:50 PM	60	78	1.5		"	
"	9-25-62	12:15 PM	57	63	0.8		"	
Oleman Cr.	7-3-62	1:55 PM	59	79	1.0		0.5 mi abv. mouth	
"	7-24-62	2:00 PM	64	74	1.0		"	
"	8-27-62	2:45 PM	60	78	1.0		"	
"	9-25-62	12:10 PM	57	62	1.2		"	
Woods Cr.	7-3-62	11:00 AM	58	78	4		1 mi abv. mouth	
"	8-27-62	12:50 PM	59	81	0.9		Mouth	
"	9-25-62	10:55 AM	58	73	0.5		"	
Molalla R.	7-4-62	11:00 AM	55		15		Just above Copper Cr.	
"	8-28-62	1:30 PM	57	66	20		Just above confluence of Table Rock Fork	
Cedar Cr.	7-4-62	9:30 AM	57	64	1		Mouth	
Copper Cr.	7-4-62	11:30 AM	56		8		Mouth	
Dickey Cr.	7-4-62	3:10 PM	62		0.7		Mouth	
"	8-28-62	11:45 AM	59	65	0.3		"	
"	9-26-62	11:00 AM	58	61	0.5		"	
Gawley Cr.	7-4-62	2:00 PM	54		9		Mouth	
"	8-28-62	2:00 PM	55	66	4		"	
"	9-26-62	2:35 PM	55	59	2.3		"	
Milk Cr.	6-6-62				83.7*		Just abv. mouth of Nate Cr.	

Appendix II continued

Stream	Date	Time	Temp., °F.			Flow Cfs	Location	Remarks
			Water	Air	Cfs			
Milk Cr.	7-4-62	2:00 PM	54		50.5*		Mouth	
"	8-28-62	10:30 AM	63	64	25		"	
"	"	10:45 AM	60	64	12		Just above mouth of Nate Cr.	
"	9-26-62	10:20 AM	58	61	8		"	
"	"	9:30 AM	61	64	18		Mouth	
Canyon Cr.	7-4-62	4:15 PM	58		6		Just above Bee Cr.	
"	8-28-62	11:00 AM	58	64	4		"	
"	9-26-62	10:38 AM	57	61	2.5		"	
Bee Cr.	6-6-62				12		Mouth	
"	7-4-62	4:20 PM	56		3		"	
"	8-28-62	11:00 AM	57	64	2.5		"	
"	9-26-62	10:40 AM	56	65	1.75		"	
Mill Cr.	6-6-62	12:00 N	55	65	9		Mouth	
Jackson Cr.	6-6-62				12		"	
Nate Cr.	6-6-62				20		"	
"	6-6-62	10:30 AM	53	60	12		Just abv confluence of N. Fk.	
"	7-4-62	3:30 PM	58		4		Mouth	
"	8-28-62	10:45 AM	60	64	3		"	
"	9-26-62	10:15 AM	58	61	2.8		"	
N. Fk. Nate Cr.	6-6-62				60	7	"	
Woodcock Cr.	7-4-62	3:20 PM	58		2.3		1 mi abv. mouth at diversion headgate	
"	8-28-62	11:30 AM	58	65	0.5		"	
"	9-26-62	10:55 AM	57	66	0.5		"	
N. Fk Molalla R.	8-28-62	12:00 N	60	65	20		Mouth	

Appendix II continued

Stream	Date	Time	Temp., °F.			Flow Cfs	Location	Remarks
			Water	Air				
N. Fk Molalla R.	9-26-62	12:15 PM	59	64	27.5*	Mouth		
Ogle Cr.	7-4-62	10:30 AM	54	64	2	"		
Pine Cr.	7-4-62	2:30 PM	55		6	Mouth		
"	8-28-62	12:30 PM	56	66	3.5	"		
"	9-26-62	3:00 PM	56	59	2.5	"		
Table Rock Fk.	7-4-62	1:30 PM	56			1 mi abv. mouth		
"	8-28-62	1:30 PM	58	66	25	Mouth		
"	9-26-62	2:00 PM	57	60	17	"		
Trout Cr.	7-4-62	3:00 PM	58		7	Mouth		
"	8-28-62	12:30 PM	59	65	4	"		
"	9-26-62	11:30 AM	57	62	2.5	"		
Pudding R.	6-19-62	3:20 PM	67			River mile 40.5	U.S.G.S. gage	
"	9-26-62	4:30 PM	62	60		"	"	
Abiqua Cr.	8-30-61	1:00 PM	64	77	25	2 miles abv. Silverton water supply dam		
"	"	2:00 PM	69	77	10	Just abov. Little Abiqua Cr.		
"	"	3:30 PM	58	68	8	Abiqua Falls		
"	9-22-61	12:00 N	56	62	19	Just abv. Little Abiqua Cr.		
"	9-28-61	1:45 PM	54	58	15.8*	1 mi abv Silverton water supply dam		
"	"	10:00 AM	50		8	Abiqua Falls	7 chinooks spawning or first riffle below falls	
"	10-26-61	9:30 AM	47	50		Just above Little Abiqua Cr.		
"	6-19-62	3:00 PM	69			1 mi above mouth		
"	8-28-62	9:15 AM	64	64	14	Highway 214		
"	"	3:30 PM	61	64	11	Just above Little Abiqua Cr.		
"	9-17-62	1:00 PM	61			Highway 214		

Appendix II continued

Stream	Date	Time	Temp. °F.			Flow Cfs	Location	Remarks
			Water	Air	Cfs			
Abiqua Cr.	9-26-62	4:45 PM	63	60	16		1 mi abv. mouth	
Little Abiqua Cr.	8-30-61	2:00 PM	61	77	5		Mouth	
"	9-22-61	12:00 N	52	62	4		"	
"	10-26-61	9:30 AM	48	50	6		"	
"	8-28-62	3:30 PM	58	64	3		"	
Powers Cr.	8-30-61	11:30 AM	65	72	3		Mouth	
Butte Cr.	6-19-62	4:00 PM	69		58*		2.5 miles above Monitor	
"	8-28-62	10:00 AM			4		Monitor	
"	9-17-62	4:45 PM	62		6		1 mile below Monitor	
"	9-26-62	4:00 PM	59	59	7		Monitor	
Silver Cr.	8-30-61	11:15 AM	64	68	12		Silverton	
"	9-22-61	9:30 AM	50	55	22		"	
"	6-19-62	2:30 PM	65				.5 mi abv. mouth	
"	8-28-62	9:00 AM	63	64	10		1 mi abv. mouth	
"	"	4:00 PM	63	64	7		Silverton	
"	9-26-62	5:00 PM	61	60	11		1 mil above Silverton	
Rickreall Cr.	8-18-61	10:30 AM	66				Dallas	
"	8-30-61	4:30 PM	72	80			Ellendale	
"	"	5:30 PM	74	80			Rickreall	
"	8-31-61	9:00 AM	67		2		3/4 mi abv. mouth	
"	9-8-61	6:30 PM			3.9*		2 miles above mouth	
"	10-11-61		58	58			Rickreall	
"	10-26-61		53	53			"	
"	9-4-62	2:45 PM	65	87	3.2		1 mi abv. mouth	

Appendix II continued

Stream	Date	Time	Temp., °F.			Flow Cfs	Location	Remarks
			Water	Air	Cfs			
Rickreall Cr.	9-25-62	3:00 PM			3	1 mi abv. mouth		
N. Santiam R.	7-5-62	9:25 AM	51	74			Mill City	
Blowout Cr.	7-12-62	10:45 AM	60	68	17		Mouth	
Beard Cr.	7-12-62	10:45 AM	57	68	1.2		Mouth	
Divide Cr.	7-12-62	10:30 AM	55	68	4		0.3 mi abv. mouth	
Kay Cr.	7-12-62	10:45 AM	57	68	2.5		Mouth	
Boulder Cr.	7-12-62	11:30 AM	60	70	8		Mouth	
Rock Cr.	7-6-62	1:00 PM	62	72	10		0.2 mi abv. mouth	
"	8-31-62	9:35 AM		75	0	"		Dry
Stout Cr.	7-6-62	1:30 PM	58	75	6		0.5 mi abv. mouth	
"	7-15-62	3:00 PM	62	75	4.5	"		
"	8-31-62	9:15 AM	59	74	1.9	"		
Tumble Cr.	7-12-62	12:30 PM	62	70	3.5		Mouth	
Little N. Fk. Santiam R.	8-17-61	3:00 PM	69				Elkhorn Falls	
"	8-23-61	5:00 PM	72	75			River mile 6.0	
"	8-23-61	2:00 PM	66	68	16.7*	0.3 mi abv. Elkhorn	Falls	
"	10-5-61		56				Mouth of Elkhorn Cr.	
"	7-6-62	12:00 N	53	65			Just abv Cedar Cr.	
"	7-15-62	2:15 PM	59	75	15	"		
"	8-31-62	11:00 AM	55	79	14	"		
"	"	12:45 PM	66	84			2 mi. abv mouth	
Cedar Cr.	7-6-62	12:00 N	53	65	12		Mouth	
"	7-15-62	2:15 PM	57	75	7	"		
"	8-31-62	11:00 AM	55	79	6	"		

Appendix II continued

Stream	Date	Time	Temp. °F.			Flow Cfs	Location	Remarks
			Water	Air	Cfs			
Elkhorn Cr.	7-6-62	10:30 AM	54	65	18	Mouth	"	
		12:00 N	59	83	3.8			
Evans Cr.	7-6-62	12:15 PM	54	65	6	"	"	
		1:00 PM	59	73	3.5			
"	7-15-62	10:20 AM	58	78	2	"	"	
		10:00 AM	54	62				
S. Santiam R.	9-26-61	3:00 PM	58	68		Sweet Home	Waterloo	
		2:00 PM	52	52				
"	6-26-62		65	70		River mile 27	Just above Soda Fk.	
		11:00 AM	56	75	12			
"	9-27-62	1:30 PM	58	68		Cascadia	Just above mill pond near mouth	
		4:00 PM	66		2.5			
Ames Cr.	8-16-62	10:00 AM	62	74	2.0	Mouth	"	
		11:20 AM	63	62				
Canyon Cr.	9-3-62	12:30 PM	61	82	12.5	Mouth	Just above Owl Cr.	
		12:00 N	60	81	2.9			
"	9-27-62	"	57	68	5.2	"	Mouth	
		11:30 AM	58	68	14			
Owl Cr.	9-3-62	12:10 PM	61	81	2.5	Mouth	"	
		11:00 AM	57	68	5.6			
Crabtree Cr.	8-17-61	10:00 AM	73			Just abv. Roaring R.	4 miles below Roaring R.	
		3:30 PM	68	82				
"	8-21-61	4:45 PM	75	87	23*	"	1.6 miles above mouth	
		3:40 PM	67	70	81.6*			

Appendix II continued

Stream	Date	Time	Temp. °F.			Flow Cfs	Location	Remarks
			Water	Air	Cfs			
Crabtree Cr.	9-18-61	2:00 PM	61	64	61.9*		1.6 miles above mouth	
"	"	5:00 PM	58	58			4 miles below Roaring R.	
"	9-29-61	1:00 PM	53	62			3 miles below Roaring R.	
"	10-3-61	2:30 PM	60		30		1 mile below Roaring R.	
"	7-6-62	3:00 PM	68	74	32		Just above Roaring R.	
"	"	3:30 PM	67	75	45		1.6 miles above mouth	
"	8-30-62	11:45 AM	67	83	18		"	
"	9-3-62	2:15 PM	70	82	8		Just above Roaring R.	
"	9-5-62	3:10 PM	67				4 miles below Roaring R.	
"	"	4:00 PM	63				0.25 mile below Roaring R.	
"	9-27-62	4:30 PM	63	65	37		Just above Roaring R.	
Roaring R.	8-17-61	10:00 AM	58				Mouth	
"	7-16-62	3:00 PM	59	72	24		"	
"	9-3-62	2:20 PM	55	82	9		"	
"	9-27-62	4:30 PM	54	65	24		"	
Hamilton Cr.	7-6-62	10:45 AM	58	76	4		Just above Scott Cr.	
"	"	10:30 AM	59	68	11		0.5 mi abv. mouth	
"	8-17-62	2:30 PM	68	74	3.5		1 mi abv. mouth	
"	9-3-62	1:30 PM	65	81	2.2		"	
"	9-27-62	3:50 PM	65	64	5		"	
"	"	4:00 PM	61	64	2		Just above Scott Cr.	
Scott Cr.	7-6-62	10:45 AM	56	76	6		Mouth	
"	"	11:00 AM		76	2		Above S. Fk. Scott Cr.	
"	9-3-62	1:45 PM	61	81	1.1		"	

Appendix II continued

Stream	Date	Time	Temp. °F.			Flow Cfs	Location	Remarks
			Water	Air	Cfs			
Scott Cr.	9-27-62	4:00 PM	60	64	2.5		Mouth	
S. Fk. Scott Cr.	7-6-62	11:00 AM		76	4		"	
"	9-3-62	1:50 PM	61	81	1.9		"	
McDowell Cr.	8-30-61	3:00 PM	70		3		1.5 mi abv. mouth	
"	9-12-61	12:00 N	58	76	4		Mouth	
"	9-25-61				2.9*		Mouth	
"	7-6-62	11:15 AM	57	76	11		1.5 mi abv. mouth	
"	"	11:30 AM	60	76	11		Mouth	
"	8-16-62	12:00 N	69		5		"	
"	9-3-62	1:00 PM	65	80	2.3		1.5 mi abv. mouth	
"	9-27-62	3:40 PM	61	64	3.5		Mouth	
Moose Cr.	9-3-62	10:30 AM	56	76	4.2		"	
"	9-27-62	11:45 AM	64	69	9.5		"	
Middle Fk. Santiam R.	8-30-62	2:55 PM	63	85			Just abv. Quartzville Cr. 1 mile abv. Canal Cr.	
Quartzville Cr.	7-6-62	2:00 PM	57	78				
"	8-30-62	2:55 PM	65	85	55		Mouth	
"	"	4:00 PM	63	82	13		Just abv. Canal Cr.	
"	9-26-62	4:00 PM	62	68	53*		Mouth	
"	"	2:50 PM	59	68	15		Just abv. Canal Cr.	
Canal Cr.	7-6-62	1:30 PM	60	78	7		Just abv Elk Cr.	
"	"	2:00 PM	61	78	19		Mouth	
"	8-30-62	4:00 PM	64	82	6		"	
"	"	3:45 PM	63	82	3.2		Just abv Elk Cr.	
"	9-26-62	2:30 PM	61	68	2.6		"	

Appendix II continued

Stream	Date	Time	Temp. °F.			Flow Cfs	Location	Remarks
			Water	Air	Cfs			
Canal Cr.	9-26-62	2:45 PM	59	68	9.5	Mouth		
Elk Cr.	7-6-62	1:30 PM	60	78	4	"		
"	8-30-62	3:45 PM	62	82	2.3	"		
"	9-26-62	2:30 PM	59	68	1.9	"		
Moose Cr.	7-6-62	2:30 PM	63	78	7	"		
"	8-30-62	3:10 PM	62	85	2.5	"		
"	9-26-62	1:40 PM	58	70	3.2	"		
Rumbaugh Cr	7-6-62	3:00 PM	65	78	2.7	"		
"	8-30-62	2:20 PM	61	86	1.0	"		
"	9-26-62	12:45 PM	58	69	1.9	"		
Tally Cr.	7-6-62	3:15 PM	62	79	12	"		
"	8-30-62	2:35 PM	62	86	4.6	"		
"	9-26-62	1:05 PM	58	69	7	"		
Moose Cr.	9-3-62	10:30 AM	56	76	4.2	"		
"	9-27-62	11:45 AM	64	69	9.5	"		
Thomas Cr.	8-16-61		74	78		1 mi abv mouth		
"	8-24-61	11:00 AM	59			Mouth of Indian Prairie Cr.		
"	8-25-61		74	77	9.7*	Gilkey		
"	"		59	66	15*	River mile 26		
"	9-5-61	2:00 PM	67	70	42*	Gilkey		
"	9-19-61		60	59	40*	Gilkey		
"	9-19-61	6:20 PM	55	55		River mile 26		
"	6-1-62		47			Mouth of Hall Cr.		
"	6-11-62	12:00 N	62	77	210*	Gilkey		
"	6-25-62	9:30 AM	68	70	98*	Gilkey		

Appendix II continued

Stream	Date	Time	Temp. °F.			Flow Cfs	Location	Remarks
			Water	Air	Cfs			
Thomas Cr.	6-25-62	12:00 N	61	75	60.4*		River mile 26	
"	7-6-62	2:00 PM	61	73	45		Mouth of Hall Cr.	
"	"	3:45 PM	69	75	65		Gilkey	
"	8-13-62	11:30 AM	70	74	56.4*		"	
"	8-14-62	3:15 PM	72	79	59.4*		River mile 15	
"	8-24-62	9:00 AM	65	71	31.3*		"	
"	9-7-62	3:00 PM	64	73	25*		"	
"	"	11:00 AM	57		9		River mile 31.6	At falls
Ella Cr.	9-6-61	12:45 PM	54	65	3.5		Mouth	
Hall Cr.	9-6-61	11:30 AM	53	65	2.5		Mouth	
Indian Prairie Cr.	9-6-61	12:00 N	52	65	3		"	
Jordan Cr.	8-24-61				0		"	Dry
Neal Cr.	8-24-61	10:00 AM	57		5		"	
"	9-19-61	2:40 PM			7.08*		"	
"	7-6-62	2:30 PM	64	73	13		"	
"	8-6-62	1:30 PM	61	63	7		"	
Wiley Cr.	6-18-62	2:00 PM	64				L.Wiley 0.5 mi abv. Cr.	
"	"	10:00 AM	62	74			"	
"	7-3-62		58	74			"	
"	"	12:15 PM	63	75			1 mi abv. mouth	
"	8-17-62	12:00 N	65	72			Mouth	
"	8-30-62	1:40 PM	66	86			U.S.G.S. gage	
"	"	1:45 PM	69	86			0.5 mi abv. mouth	
"	9-6-62	5:00 PM	68		4.5		Just above L. Wiley Cr.	
"	9-26-62	12:00 N	59	68			U.S.G.S. gage	

Appendix II continued

Stream	Date	Time	Temp., °F.			Flow Cfs	Location	Remarks
			Water	Air	Cfs			
Little Wiley Cr.	6-18-62	3:00 PM			18	Mouth		
"	7-3-62	10:30 AM	57		10	"		
"	8-17-62	12:00 N	65	72	6	"		
"	8-30-62	1:30 PM	65	85	3.2	"		
"	9-26-62	12:10 PM	58	68	3.8	"		
North Yamhill R	9-6-61	2:30 PM	58		6	1 mile below Fairchild		
"	9-20-61	1:30 PM	58	68		8 miles above Carlton		
"	7-5-62	10:15 AM	57	61		Pike		
"	"	10:50 AM	55	62	17	Fairdale		
"	8-10-62	1:00 PM	62	71	15	Just below Carlton		
"	"	11:45 AM	62		15	Just above Carlton Lake		
"	9-27-62	10:40 AM	58	64		Pike		
"	"	11:45 AM	56	60	7	Fairdale		
Cedar Cr.	9-6-61	3:00 PM	55		1.5	Mouth		
"	9-20-61	1:45 PM	54	68	2	"		
"	7-5-62	10:30 AM	54	61	2.5	"		
"	9-27-62	11:00 AM	55	60	1	"		
Fairchild Cr.	7-5-62	10:45 AM	54	61	9	"		
"	8-10-62	10:30 AM	54	64	3	"		
"	9-27-62	11:20 AM	55	60	3	"		
Haskins Cr.	7-5-62	11:00 AM	56	62	3.5	1.2 mi abv mouth		
"	8-9-62	3:00 PM	61	75	3.5	"		
"	"	4:00 PM	60	75	2.5	3.5 mi. abv. mouth		
"	9-27-62	1:00 PM	58	60	1.2	1.2 mi abv. mouth		

Appendix II continued

Stream	Date	Time	Temp., °F.		Flow Cfs	Location	Remarks
			Water	Air			
Panther Cr.	7-5-62	11:15 AM	54	62	4	5 mi abv. mouth	
	"	12:30 AM	59		6	2.7 mi abv. mouth	
	"	1:30 PM	58	60	2.5	5 mi abv. mouth	
Baker Cr.	7-5-62	11:30 AM	58		10	3 mi abv. mouth	
	"	11:30 AM	59	60	6	6 mi abv. mouth	
	"	2:00 PM	58		3.5	3 mi abv. mouth	
Turner Cr.	9-6-61	3:30 PM	58		1.5	Mouth	
	"	5:00 PM	60		7	Just below Yamhill water supply dam	
	"	10:15 AM	56	61	6	Mouth	
South Yamhill R.	9-20-61	10:30 AM	57	64	0.8	"	
	"	11:00 AM	60	60		½ mi below Mill Cr.	
	"	1:00 PM	62	64	36.3*	1 mi below Sheridan	
"	9-21-61	1:00 PM	58	70		1 mi below Sheridan	
	"	10-31-61	11:00 AM	59	72	220*	Sheridan
	"	10:30 AM	53	68	4.3*	Below confluence of Hanchet & Kitten Crs.	
"	6-28-62	10:30 AM	63		135*	1 mi below Sheridan	
	"	11:30 AM	68	75	45	"	
	8-13-62	12:30 PM	59	62	20	2 mi below mouth	
Agency Cr.	7-5-62	3:45 PM	69	85	6	Mouth	
	"	5:00 PM	59	58	6	"	
	"	10:00 AM	60	70	0.5	Mouth	
Wind R.	8-13-62	4:00 PM	65	85	0.4	"	
	"	5:20 PM	58	58	0.5	"	
	9-27-62	4:00 PM	58	75	4.5	0.6 mi abv. mouth	
Casper Cr.	6-14-62	PM					

Appendix II continued

Stream	Date	Time	Temp. °F.			Flow Cfs	Location	Remarks
			Water	Air	Cfs			
Ead Cr.	6-14-62	1:30 PM	56	73	5.5		0.8 mi abv. mouth	
"	"	2:30 PM	55	73	4.5		1.7 mi abv. mouth	
"	8-24-62	3:20 PM	64	85	4		Mouth	
"	9-27-62	4:30 PM	56	58	2.5		"	
Gold Cr.	6-14-62	5:00 PM	58	75	4.5		0.4 mi abv. mouth	
"	"	4:30 PM	57	75	4		1.5 mi abv. mouth	
"	8-24-62	5:00 PM	62	80	0.8		0.4 mi abv. mouth	
Hanchet Cr.	6-14-62	10:30 AM	50	65	2		Mouth	
"	8-24-62	2:40 PM	65	85	0.4		"	
"	9-27-62	3:40 PM	55	59	0.2		"	
Kitten Cr.	6-14-62	10:15 AM	53	65	2.3		"	
"	8-24-62	2:40 PM	61	85	0.6		"	
"	9-27-62	3:30 PM	58	59	0.3		"	
Mill Cr.	9-8-61	3:30 PM	68	72	2.87*		0.5 mi abv. mouth	
"	10-13-61	10:30 AM	57	74	36.9*		"	
"	6-13-62	2:15 PM	55				0.5 mi abv. S.Branch	
"	6-22-62	12:30 PM	69	84	18.9*		0.5 mi abv. mouth	
"	7-10-62	3:30 PM	68	80			U.S.G.S. gage	
"	7-11-62	11:30 AM	69	75	9.8*		0.5 mi abv. mouth	
"	9-4-62	1:45 PM	72	74	1.9*		"	
"	"	10:15 AM	57	72			U.S.G.S. gage	
Cedar Cr.	6-13-62	12:00 N	51		9		Mouth	
Gooseneck C	9-6-61	11:00 AM	63		0.5		0.5 mi abv. mouth	
"	9-8-61				0.5		Mouth	
"	10-13-61				2.5		0.5 mi abv. mouth	

Appendix II continued

Stream	Date	Time	Temp., °F.			Flow Cfs	Location	Remarks
			Water	Air	Cfs			
Pierce Cr.	6-14-62	12:30 PM	53	72	4.5	Mouth		
		2:50 PM	66	85	1.0	"		
		4:00 PM	58	59	0.7	"		
Rock Cr.	7-5-62	1:15 PM	62	60	25	1 mi abv. mouth		
		4:20 PM	72	85	11	"		
		6:00 PM	59	57	11	"		
Rogue R.	7-5-62	1:00 PM	60	60	5	Mouth		
		4:35 PM	65	85	1.2	1 mi abv. mouth		
		5:40 PM	57	58	1.3	"		
Rowell Cr.	7-5-62	1:25 PM	59	61	8	1 mi abv. mouth		
		4:50 PM	67	80	3.3	"		
		3:00 PM	58	68		Just abv E. Fk.		
Burton Cr.	6-12-62	3:30 PM	56		5.5	Mouth		
Canada Cr.	6-13-62	2:30 PM	51		11	"		
E Fk. Willamina Cr.	7-2-62	1:30 PM	59	68	7	"		
"	"	3:00 PM	65	72	7	1 mi abv. mouth		

APPENDIX III

Periodicity Chart Showing When Adult Anadromous Fish
are Present or Spawning in Middle Willamette Basin Streams

(Broken line indicates presence of adults in stream. Solid line indicates
period of heaviest spawning.)

Stream System	Spp. ^{1/}	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Calapooya R.	Ch		---	---						---	---	---	---
	St				---	---	---	---	---	---	---	---	---
Luckiamute R.	Sil			---	---	---							
	St				---	---	---	---	---	---	---		
Marys R.	Sil			---	---	---							
Molalla R.	Ch		---	---					---	---	---	---	---
	Sil			---	---	---							
	St				---	---	---	---	---	---	---		
Pudding R.	Ch		---	---					---	---	---	---	---
	St								---	---	---		
Rickreall Cr.	Sil				---	---	---						
Santiam R.	Ch		---	---					---	---	---	---	---
	St				---	---	---	---	---	---	---		
S. Yamhill R.	Sil				---	---	---						
Willamette R.	Ch								---	---	---	---	---
	Sil				---	---	---						
	St				---	---	---	---	---	---	---		

1/ Ch - chinook salmon
St - steelhead trout
Sil - silver salmon

APPENDIX IV

Results of Fish Distribution Studies Conducted in Streams of the Middle Willamette Basin
1961 and 1962

Stream	Tributary To	Sta. No.	Date	Flow (Cfs)	Temp. (°F.)	Method	Location (Stream Mile)	Species ³ and Numbers
Little Luckiamute R.	Luckiamute R.	1	11-9-61			Sh ¹ /	Highway 223 (8.0)	Wf 1, Cot 19, D 4, RSS 30, Su 4
"	"	"	2 11-9-61			Sh	Bridgeport School (9.6)	Sil 1, Ct 1, D 1, RSS 4, Cot 16
"	"	"	3 11-9-61			Sh	Falls City (12.7)	Ct 3, Sil 1, D 11, Su 1, L 3, Cot 14
"	"	"	4 7-13-62	19	57	Sh	0.8 miles above Falls City (14.4)	Ct 5, Cot 58 (16.3) Ct 13, Cot 92
"	"	"	5 7-13-62	12	55	Sh		(1.0) Ct 13, Cot 2
Everz Cr.	L. Luckiamute	1	11-10-61		48	Sh		(0.2) RSS 60, Su 1
Fern Cr.	L. Luckiamute R.	1	11-10-61			Se ^{2/}		
Maxfield Cr.	Luckiamute R.	1	6-19-62	2	60	Sh	Highway 223 (0.5)	Ct 13, Sil 6, Cot 1, D 1
"	"	"	2 6-19-62	3	60	Sh	First bridge above Hwy. 223 (2.1)	Ct 19, D 5, Cot 8
Pedee Cr., N. Fk.	Pedee Cr.	1	2-21-62			Sh	First road crossing above S. Fk. (0.4)	Ct 7, Cot 4
"	"	"	"	2	6-29-62	7	56	Cabin near end of (1.0) road
^{1/} Shocker								
^{2/} Seine								

St - steelhead, Rb - planted rainbow trout, Sil - silver salmon, ChS - spring chinook,

Wf - whitefish, LB - largemouth black bass, BG - bluegill, Cot - cottid (sculpin), D - dace, Su - sucker,

Sq - squawfish, Clm - chiselmouth, CRC - chub

RSS - redsided shiner, TP - troutperch, L - lamprey (Pacific & brook)

Appendix IV continued

Stream	Tributary To	Sta. No.	Date	Flow (cfs)	Temp. (°F.)	Method	Location	(Stream mile)	Species and Numbers	
Pedee Cr., S. Fk.	Pedee Cr.	1	2-21-62			Sh	Mouth		(C.C) WF 1, Sil 3, D 1, Cot 7	
" "	" "	" "	" "	2	2-21-62		Locked gate above mouth	(0.7)	Ct 3, Sil 7, Cot 5	
Price Cr.	Luckiamute R.	1	6-19-62	2	63	Sh	Highway 223	(0.6)	Ct 14, D 5, Cot 2	
" "	" "	" "	" "	2	6-19-62	1.5	Sh	First bridge above Highway 223	Ct 12, Sil 8	
Woods Cr.	Price Cr.	1	6-19-62	1	63	Sh	Culvert near mouth	(0.1)	Ct 3, Cot 4	
Ritner Cr.	Luckiamute R.	1	7-29-62	12	65	Sh	Mouth	(0.0)	Ct 6, Sil 1, Cot 4, L 1, D 13	
" "	" "	" "	" "	2	6-29-62	8	Sh	$\frac{1}{2}$ mile above Sheythe Cr.	Ct 24, Sil 18, Cot 10 (3.0)	
" "	" "	" "	" "	3	2-21-62		Sh		(3.7) Ct 1, Cot 1	
Clayton Cr.	Ritner Cr.	1-	6-29-62	2.5	64	Sh	Mouth		(0.0) Ct 3, Sil 3, TP 1, RSS 1 Cot 3	
Sheythe Cr.		" "	" "	1	6-29-62	2.5	65	Sh	Mouth	
Marys River, E. Fk. Marys R.		1	7-24-62	0.8	69	Sh	Bridge on Hoskins road	(1.5)	D 1, RSS 25, Cot 5	
" "	W. Fk.	" "	" "	1	7-24-62	3	64	Sh	East Fk. road	(0.25) Ct 1, Cot 4, L 1
" "	" "	" "	" "	2	7-24-62		64	Sh	Oleman Cr. road	(2.4) Sil 12, Cot 2
" "	" "	" "	" "	3	7-24-62	2	63	Sh	0.8 mi. above Oleman Cr.	(3.1) Ct 8, Cot 11, L 4

Appendix IV continued

Stream	Tributary To	Sta. No.	Date	Flow (cfs)	Temp. (°F.)	Method	Location (Stream mile)	Species and Numbers	
Oleman Cr.	W. Fk. Marys R.	1	7-24-62	64	Sh	Road bridge	(0.9)	Ct 5, D 1, Cot 2	
Blakesley Cr.	Marys R.	1	7-25-62	0.7	68	Sh	Culvert $\frac{1}{4}$ mi. above mouth	(0.25) Ct 46, Cot 20	
	" "	"	2	7-25-62	0.5	63	Sh	(1.25) Ct 47, Cot 20	
Greasy Cr.		" "	1	7-11-62	8.5	Sh	Just below dam near mouth	D 1 (0.2) Ct 4, Sil 2, Cot 8, RSS 2,	
	" "	" "	2	7-11-62	12	61	Sh	Bridge on Grange Hall Road	Ct 1, Cot 8, D 1, RSS 6, TP 3
	" "	" "	3	7-11-62	10	62	Sh	1.8 miles above mouth (1.8)	Ct 7, D 10, Cot 6, L 2
	" "	" "	4	11-29-61		Sh	$\frac{1}{4}$ mi above Rock Cr (4.4)	Ct 2, Cot 3, L 1	
	" "	" "	5	11-29-61		Sh	Beaver Cr. road	(5.1) Ct 13, Cot 9, D 3, L 1	
	" "	" "	5	7-10-62	5	58	Sh " " "	" " Cx 9, RSS 5, Cot 8, D 5, Su 1	
Rock Cr.	Greasy Cr.	1	7-10-62	7	62	Sh	Highway 34	(0.0) Ct 17, D 18, Cot 12	
	" "	" "	2	7-10-62	6.5	67	Sh	Rock Cr. pump sta. (1.0) Ct 18, Cot 5	
Oak Cr.	Marys R.	1	7-11-62	3.5	60	Sh		(4.0) Ct 9, Sil 11	
	" "	" "	2	11-30-61		Sh	$\frac{1}{2}$ mi above OSU Experimental Lab. (5.0)	Ct 11	
	" "	" "	2	7-11-62	2	59	Sh "	" " Ct 15, Cot 2	
Mulkey Cr.	Tum Tum R.	1	7-25-62	2	61	Sh	Just above mouth (0.1)	Ct 12, Sil 8, D 9, Cot 5, L 2	

Appendix IV continued

Stream	Tributary To	Sta. No.	Date	Flow (cfs)	Temp. (°F.)	Method	Location (Stream mile)	Species and Numbers
Mulkey Cr.	Tum Tum R.	2	7-25-62	2	59	Sh	First bridge above mouth	(0.7) Ct 12, Ct 5, L 4
Shotpouch Cr.	" "	1	7-24-62	4	68	Sh	First bridge on Shotpouch Cr. road	(C.8) Ct 11, D 3, Cot 18, L 1
" "	" "	2	7-24-62	2.7	63	Sh	Second bridge on Shotpouch Cr. road	(1.5) Ct 22, Cot 5
Woods Cr.	Marys R.	1	11-29-61	-	-	Sh	Old mill site	(1.0) Ct 1, RSS 12, D 24, Cot 2, L 1
" "	" "	2	11-29-61	-	-	48	-	(3.9) Ct 13, D 2, Cot 1
" "	" "	3	11-29-61	-	-	48	-	(5.4) Ct 18, Cot 1
Abiqua Cr.	Pudding R.	1	9-17-62	-	-	Sh	Highway 213	(5.9) Ct 2, St 1, Cot 19, D 27, RSS 30, Sq 4, Su 2
" "	" "	2	9-17-62	-	-	61	-	-
" "	" "	61	-	-	-	Sh	Just below Little Abiqua Cr.	(13.9) Ct 7, St 5, Cot 15, D 11
" "	" "	58	-	-	-	Sh	1½ mi above Little Abiqua Cr.	Ct. 28, St 2, Chs 7, Cot 39 D 5
Butte Cr.	" "	1	9-17-62	6	62	Sh	1 mi below Monitor(4.8)	RSS 100, Sq 2, Cot 15, D 60
" "	" "	2	9-17-62	7	60	Sh	Bridge between Silverton and Marquam	Ct 7, St 1, D 23, (9.7) RSS 34, Sq 1, Cot 24
Rickreall Cr.	Willamette R.	1	11-2-61	-	-	Se	Bridge on beanyard road near Eola	Cm 48, Sq 29, RSS 7, (1.0) Cot 1
" "	" "	1	11-3-61	-	-	Se	" "	LB 1, BG 1, RSS 18, Sq 38, Su 4, CRC 2

Appendix IV continued

Stream	Tributary To	Sta. No.	Date	Flow (cfs)	Temp. (°F.)	Method	Location	(Stream mile)	Species and Numbers
Rickreall Cr.	Williamette R.	2	11-2-61			Se	Highway 51 br.	(2.1)	Sq 1, RSS 4
"	"	"	"	99	91	Se	Near Greenwood Sch.	(4.2)	RSS 86, Cot 1, Su 1
"	"	"	"	99	91	Se	1 mi below Rickreall	(6.1)	RSS 32, Su 10
"	"	"	"	99	91	Se	Rickreall	(7.1)	RSS 113, Su 37
"	"	"	"	99	91	Se		(9.1)	D 7, Su 5, RSS 36
"	"	"	"	99	91	Se	1 mi below Dallas	(10.1)	Su 1
"	"	"	"	99	91	Se	Dallas Park just above	RSS 34, Su 4, Cot 6, D 4	
"	"	"	"	99	91	Se	Dallas Park dam	(12.2)	
"	"	"	"	99	91	Se		(14.4)	Sil 1, RSS 13, D 6, Su 1
"	"	"	"	99	91	Se	Cot 1		
"	"	"	"	99	91	Se	2 road miles above		
"	"	"	"	99	91	Se	Dallas	(15.7)	Sil 2, RSS 44, Su 4, L 1
"	"	"	"	99	91	Se	Dalton Ranch	(16.8)	Cot 2, D 2, Su 1
"	"	"	"	99	91	Se		(17.7)	Ct 5
"	"	"	"	99	91	Se		(18.6)	None in 4 hauls
"	"	"	"	99	91	Se	Near mouth of Canyon	(19.5)	None in 4 hauls
"	"	"	"	99	91	Sh	Cr.		
"	"	"	"	99	91	"	"	Ct 5, D 3	
"	"	"	"	99	91	Se		(20.7)	Ct 1
"	"	"	"	99	91	Se	0.7 mi below Dallas		
"	"	"	"	99	91	Se	storage dam	(23.3)	Ct 1

Appendix IV continued

Stream	Tributary To	Sta. No.	Date	Flow (cfs)	Temp. (°F.)	Method	Location	(Stream mile)	Species and Numbers
Rickreall Cr.	Willamette R.	17	11-3-61			Se	At storage dam	(24.0)	Ct 9, D 1
Canyon Cr.	Rickreall Cr.	1	11-3-61			Se	Mouth	(0.0)	Ct 3, D 1
" "	" "	1	11-10-61	1	49	Sh	"	"	Ct 23, Cot 1
Ellendale Cr.	" "	1	11-10-61	2	48	Sh	"	"	Sil 5, Ct 27, D 1
Ames Cr.	S. Santiam R.		8-16-62	2.5	66	Sh	Just above mill ponds	(1.1)	Ct 10, D 6, Cot 10
Crabtree Cr.	" "	" "	" "	1	12-1-61	Sh	Just above Roaring R.	(13.6)	Rss 4
" "	" "	" "	" "	2	12-1-61	Sh	2 miles above Roaring R.		St 17, WF 2, D 17, Cot 2,
Roaring R.	Crabtree Cr.	1	- 12-1-61			Sh	Second bridge above mouth	(15.6)	St 2, Su 5, D 6, Rss 2, Sq 1
Hamilton Cr.	S. Santiam R.	1	8-17-62	3.5	68	Sh	First bridge above mouth	(1.0)	Rb 8, Ct 5, Cot 1, L 1
" "	" "	" "	2	8-17-62	3	68	Third bridge above mouth	(2.7)	Ct 1, Rss 5, D 1, Cot 5, TP 1
Scott Cr.	Hamilton Cr.	1	2-20-62			Sh		"	(9.3) Ct 6, D 16, Cot 4, Rss 6
S. Fk. Scott Cr.	Scott Cr.	1	2-20-62			Sh	50 yds above mouth(0.0)		Rss 16, D 14, Cot 3
						Sh	100 yds above confluence of S.Fk.	(0.5)	Ct 4, Cot 9, L 1
						Sh	100 yds above mouth	(0.05)	Ct 3, Cot 10

Appendix IV continued

Stream	Tributary To	Sta. No.	Date	Flow (cfs)	Temp. (oF.)	Method	Location	(Stream mile)	Species and Numbers
McDowell Cr.	S. Santiam R.	1	8-16-62	5	69	Sh	Mouth	(0.0)	Ct 2, D 1, Cot 7
" "	" "	2	8-16-62	4	68	Sh	Third bridge above mouth	(1.8)	Rb 1, Cot 35, D 43
" "	" "	3	8-16-62	4	65	Sh	Fourth bridge above mouth	(4.0)	Ct 2, Cot 8, D 3
" "	" "	4	8-16-62	4	60	Sh	Just below falls	(6.2)	St 4, Cot 10
Rumbaugh Cr.	Mid. Santiam R.	1	2-20-62			Sh	First br. above mouth(0.1)	Cot 6	
" "	" "	2	2-20-62			Sh	Second crossing above mouth	(0.5)	Ct 12, Cot 3
" "	" "	3	2-20-62			Sh	Third crossing above mouth	(1.0)	Ct 2, Cot 27
Neal Cr.	Thomas Cr.	1	8-6-62	7	61	Sh	Mouth	(0.0)	Ct 1, St 1, RSS 7, Sq 1, D 9, Cot 5
" "	" "	2	8-6-62			Sh	Bridge 0.7 mi below falls	(3.0)	Ct 4, St 28, Cot 3
" "	" "	3	8-6-62	6	58	Sh	Just above falls	(3.8)	Ct 15, Cot 1
S. Fk. Neal Cr.	Neal Cr.	1	8-6-62	3.5	60	Sh	First bridge above mouth	(0.4)	Ct 1, Cot 3
" "	" "	2	8-6-62	3	60	Sh	0.5 mi above Burmester Cr.	(1.9)	Ct 7, Cot 68
Burmester Cr.	S. Fk. Neal Cr.	1	8-6-62	0.5	60	Sh	Mouth	(0.0)	Ct 2
Wiley Cr.	S. Santiam R.	1	9-6-62	4.5	68	Sh	Confluence of Little Wiley Cr.	(4.6)	St 21, D 103, Cot 19

Appendix IV continued

Stream	Tributary To	Sta. No.	Date	Flow (cfs)	Temp. (°F.)	Method	Location (Stream mile)	Species and Numbers
Wiley Cr.	S. Santiam R.	2	9-6-62	64	Sh	First bridge above Little Wiley Cr.	Ct. 2, St 18, ChS 1, D 27, Cot 17	
	" "	" "	" "	63	Sh		(6.1) St 18, Cot 18	
Little Wiley Cr.	Wiley Cr.	1	8-17-62	6	65	Sh	Mouth	(0.0) Ct 2, St 21, Cot 4, D 9
" "	" "	" "	" "	62	Sh	Just above small falls	Ct 19, St 15, Cot 4, D 8 (1.6)	
N. Yamhill R.	Yamhill R.	1	8-10-62	15	62	Sh	Just below Carlton Dam	Ct 1, Cot 1, Su 1, RSS 34 (10.0)
" "	" "	" "	" "	62	Sh	Bridge above Carlton Lake	Sq 1, D 2, RSS 31, Su 2, TP 15 (12.0)	
Fairchild Cr.	N. Yamhill R.	1	8-10-62	3	54	Sh	First bridge above Fairdale	Ct 34, Cot 4 (0.3)
Haskins Cr.	" "	" "	" "	51	Sh	Bridge on Oak Ridge School road	Ct. 6, RSS 18, D 6, Cot 15 (1.6)	
Panther Cr.	" "	" "	" "	60	Sh	Bridge on Kutch Sch. road	(3.8) Ct 18, Cot 19	
Baker Cr.	Panther Cr.	1	7-12-62	6	59	Sh	Bridge 2.75 miles above Baker Cr.	D 3, RSS 1, Cot 67, L 2 (3.8)
	" "	" "	" "	58	Sh	Just above Kane Cr.(7.0)	Ct 5, D 6, Cot 19	
	" "	" "	" "	56	Sh		(9.2) Ct 18, Cot 9	
	" "	" "	" "	59	Sh	2 miles below Huber Park	Rb 2, D 6, RSS 5, Cot 13 (5.6)	
	" "	" "	" "	59	Sh	Huber Park	Ct 5, Cot 2, D 2, RSS 2, L 2	

Appendix IV continued

Stream	Tributary To	Sta. No.	Date	Flow (cfs)	Temp. (oF.)	Method	Location (Stream mile)	Species and Numbers	
Baker Cr.	Panther Cr.	3	7-12-62	6	59	Sh	$\frac{1}{2}$ mi above water supply dam	(9.4) Ct 11, Cot 15, L 1	
Turner Cr.	N. Yamhill R.	1	6-28-62	11	60	Sh	Mouth	(0.0) Ct 4, Cot 13	
" "	" "	04	01	2	6-28-62	60	Sh	1 mi below Menefee Park (2.0) Ct 5, Cot 15	
" "	" "	01	01	3	6-15-62	8	Sh	Menefee Park (3.0) Ct 5, Cot 10	
" "	" "	09	01	4	6-28-62	7	Sh	Just below Yamhill water supply dam (4.0) Ct 14, Cot 2	
S. Yamhill R.	Yamhill R.	1	8-13-62	45	68	Sh	1 mi below Sheridan (36.5) Sq 1, Cot 2, D 6, RSS 8, Su 15, TP 6		
" "	" "	02	02	2	8-13-62	40	Sh	Junction, Hwys 18 and 22 (44.7) Su 1, Cot 6, RSS 9, TP 3 D 1	
" "	" "	03	01	3	8-13-62	7	Sh	Highway 22 br. (58.8) Ct 3, Si 14, Cot 16, RSS 2	
" "	" "	04	01	4	6-14-62	4.3	Sh	Fks of Kitten & Hanchet Crs. (61.9) Si 13, Ct 5, Cot 9	
Agency Cr.	S. Yamhill R.	1	8-9-62	10	61	Sh	Hwy 22 bridge (0.9) Si 15, Ct 7, Cot 4, D 2, RSS 1		
" "	" "	02	01	2	8-13-62	7	Sh	1.1 mi above mouth of Wind R. (4.4) Ct 19, Cot 9, D 4, L 4	
Wind R.	Agency Cr.	1	8-13-62	0.5	60	Sh	Mouth	(0.0) Ct 7, Si 17, Cot 3, D 2, L 2	
" "	" "	01	01	2	8-13-62	0.4	54	Sh	(1.5) Ct 18, Cot 5

Appendix IV continued

Stream	Tributary To	Sta. No.	Date	Flow (cfs)	Temp. (°F.)	Method	Location (Stream mile)	Species and Numbers
Casper Cr.	S. Yamhill R.	1	6-14-62	58	Sh		Bridge 0.2 mi. above falls near mouth (0.9)	Ct 1, Cot 8
Ead Cr.		11	94	1	6-14-62	5.5	Sh	(0.8) Ct 11, Sil 3, Cot 6
		11	94	2	6-14-62	4.5	Sh	(1.7) Ct 19, Cot 37
Gold Cr.		11	94	1	6-14-62	4.5	Sh	(0.4) Ct 8, Sil 5, D 2, Cot 10 L 1
		11	94	2	6-14-62	4	57	Sh Bridge 1.5 mi above Sta. No. 1 (1.9) Ct 4, Sil 6, Cot 28
Mill Cr.		91	91	1	11-15-61		40	Sh Mill Cr. School (0.9) Cot 15, Su 7, RSS 2
		91	91	2	11-15-61		40	Sh 1 mi above Highway 18 (1.9) Cot 38, RSS 79, Su 2, D 3
		91	91	3	11-15-61		43	Sh Buell Bridge (6.2) Sil 1, Cot 19, RSS 11, D 8
		91	91	4	11-15-61		43	Sh Private bridge (8.3) Cot 23, Sil 3, D 4
		91	91	5	11-15-61		43	Sh Willamette Valley Lbr. Co. Gate (9.6) Ct 2, Cot 29, D 20
		91	91	6	6-13-62		55	Sh Bridge 0.5 mi above South Branch (10.7) Ct 1, Sil 1, Cot 5
		91	91	7	6-12-62		53	Sh 1½ mi below Cedar Cr. (14.7) Ct 8, Sil 4, Cot 6
		91	91	8	11-16-61		Sh	Bridge 10½ road miles above Hwy 22 (17.4) Ct 5, Cot 2
Cedar Cr.	Mill Cr.	1	6-13-62	10	51	Sh	Just above mouth (0.1) Ct 25, Sil 1, Cot 8	

Appendix IV continued

Stream	Tributary To	Sta. No.	Date	Flow (cfs)	Temp. (°F.)	Method	Location (Stream mile)	Species and Numbers
Cedar Cr.	Mill Cr.	2	6-13-62	8	58	Sh		(1.3) Ct 35, Cot 5
Gooseneck Cr.	" "	1	14-15-61	40	Sh	Bridge crossing near mouth	(0.4) Ct 2, Cot 15, RSS 19, D 3	
" "	" "	2	14-15-61	40	Sh	1.7 miles above Hwy 22	(2.4) Si 12, Cot 37, D 12, RSS 3	
South Br. Mill Cr.	" "	3	14-15-61	40	Sh		(5.0) Ct 9, Sii 2, Cot 10	
" "	" "	1	14-16-61	38	Sh		(0.5) Ct 17, Cot 9	
" "	" "	2	14-16-61	38	Sh		(2.0) Ct 11, Cot 3	
Wind Cr.	" "	1	6-12-62		Sh	Just above culvert at mouth	(0.0) Ct 8, Cot 2	
Pierce Cr.	S. Yamhill R.	1	6-14-62	4.5	53	Sh		(0.5) Ct 20, Cot 8
Rock Cr.	" "	1	8-8-62	10	62	Sh	Crown-Zellerbach road bridge (0.9)	Ct 1, Cot 7, D 9
Rogue R.	" "	2	8-8-62	7	58	Sh	Bridge on C-Z logging road (4.4)	Ct 3, Cot 2
" "	" "	1	8-8-62	2	58	Sh		(0.75) Ct 1, Sii 1, Cot 4, D 5, RSS 11
Rowell Cr.	" "	2	8-7-62	1.5	60	Sh	Hwy 18 bridge	(3.0) Ct 8, Sii 2, Cot 8, D 8
" "	" "	1	8-8-62	4.5	60	Sh		(0.5) Ct 2, Sii 10, D 5, Cot 8, RSS 13
" "	" "	2	8-8-62	5	59	Sh		(2.25) Ct 15, Sii 10, Cot 4, D 4

Appendix IV continued

Stream	Tributary To	Sta. No.	Date	Flow (cfs)	Temp. (°F.)	Method	Location (Stream mile)	Species and Numbers
Williamina Cr.	S. Yamhill R.	1	7-2-62	15	58	Sh	Just above E. Flk. Williamina Cr.	Ct 4, Sil 6, Cot 6, D 1
Burton Cr.	Coast Cr.	1	6-12-62	5.5	56	Sh	Just above mouth	(0.1) Ct 10, Sil 20
	"	"	"	2	6-12-62	Sh		(1.2) Ct 2, Sil 6
	"	"	"	3	6-12-62	Sh		(1.9) Ct 4, Cot 1
Canada Cr.	"	"	"	1	6-13-62	51	Sh	Just above mouth (0.0) Ct 1
	"	"	"	2	6-13-62	11	Sh	Bridge 0.4 mi above mouth (0.4) Ct 6, Cot 6
	"	"	"	3	6-13-62	51	Sh	Bridge crossing (2.5) Ct 5, Cot 5
E. Flk. Williamina Cr.	Williamina Cr.	1	7-2-62	7	59	Sh	Just above mouth (0.1) RSS 1	Ct 2, Sil 4, Cot 4, D 7, D 9
	"	"	"	2	7-2-62	7	65	(1.0) Rb 2, RSS 24, Su 1, Cot 5 D 9

APPENDIX V

RECORDING THERMOGRAPH
DATA SHEET

STATION DESCRIPTION:

* No. Thomas Creek
 * Name Thomas Creek
 * Mile .5
 Board map no. 15-20246

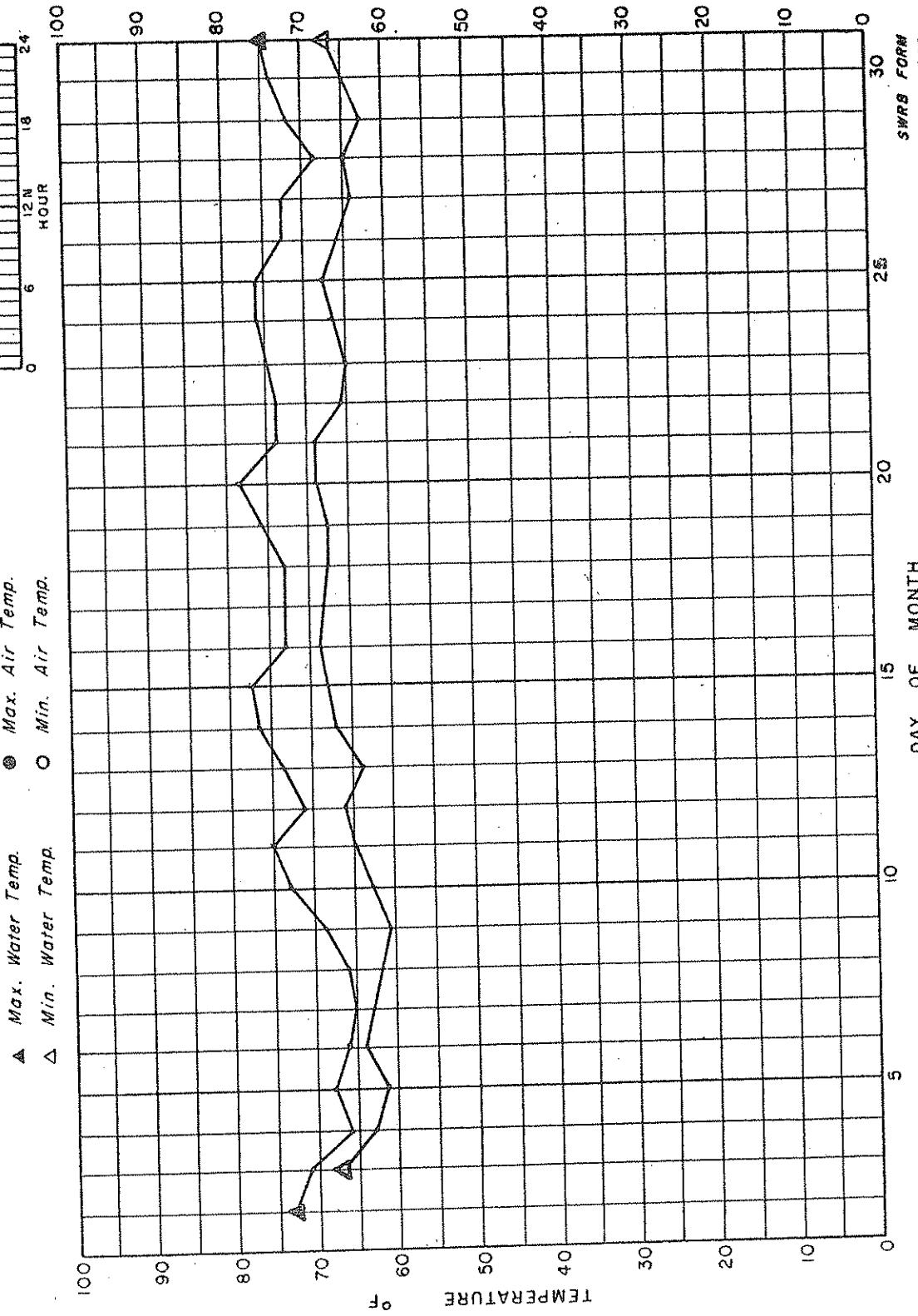
* as shown on State Water Resources

August 1962

TEMPERATURE, °F

DAY	WATER	AIR
	Max	Min
1		
2	73	
3	71	67
4	66	63
5	66	62
6	66	64
7	65	63
8	66	62
9	69	61
10	73	63
11	75	65
12	71	66
13	74	64
14	76	67
15	77	68
16	73	69
17	73	68
18	73	67
19	76	67
20	78	69
21	74	69
22	74	66
23	75	65
24	76	67
25	76	68
26	73	66
27	73	64
28	62	65
29	72	63
30	74	65
31	75	67
Ave.	72.4	65.5

Location: Right bank



Appendix V continued

RECORDING THERMOGRAPH DATA SHEET

STATION DESCRIPTION:

* No. **Thomas Creek** * Mile **.5**
Stream **Thomas Creek** * State Water Resources

* ~~AS-SHOWA~~ **Board of Water Resources**
~~AS-SHOWA~~ **15-20246**

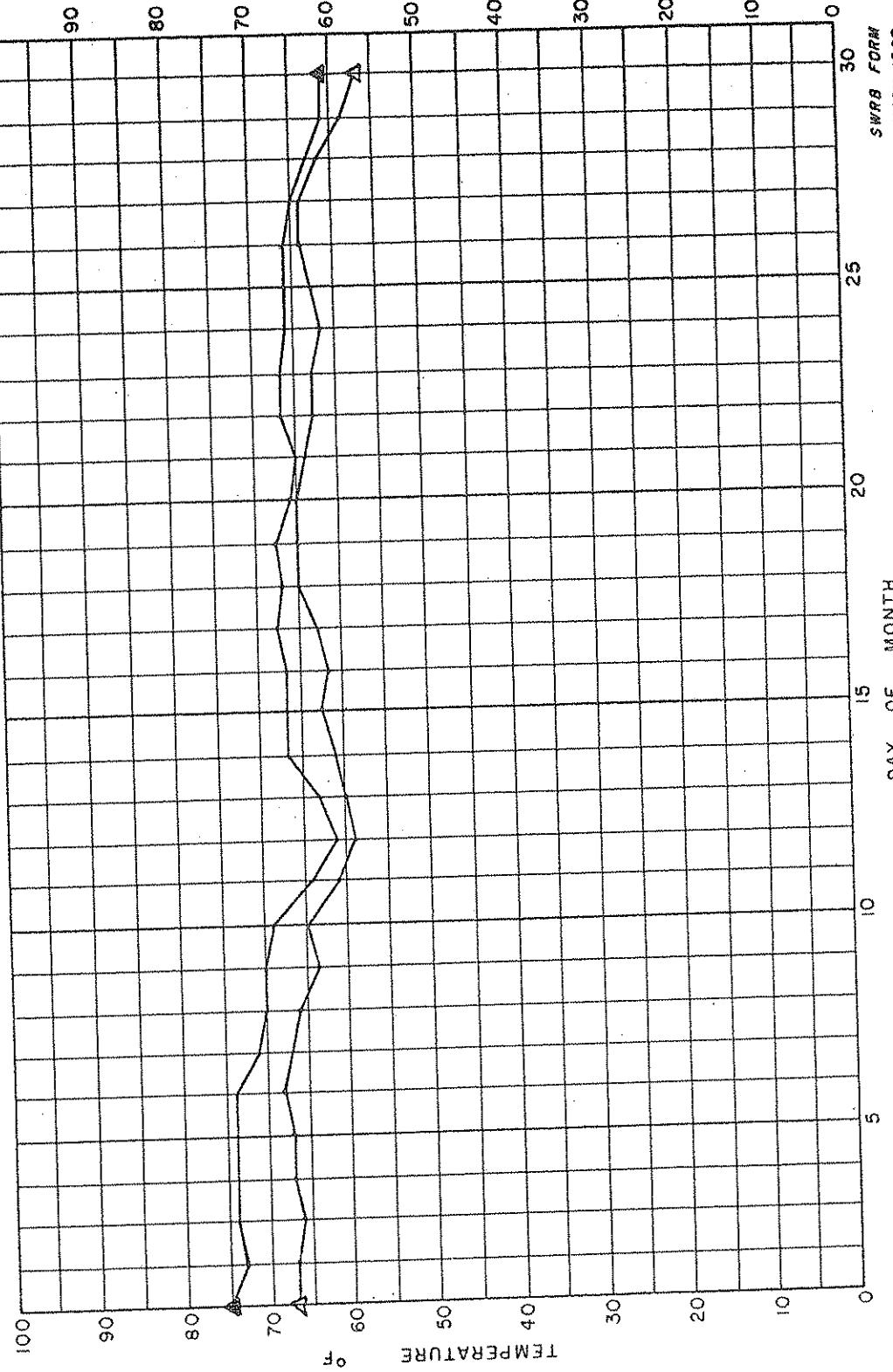
TEMPERATURE, °F

DAY	WATER	AIR
	Max	Min
1	75	67
2	73	67
3	74	66
4	74	67
5	74	67
6	74	68
7	71	67
8	70	66
9	70	64
10	69	65
11	64	61
12	61	59
13	63	60
14	67	61
15	67	63
16	67	62
17	68	63
18	67	65
19	68	65
20	66	65
21	65	64
22	67	63
23	67	63
24	69	62
25	66	63
26	66	64
27	65	64
28	63	62
29	61	59
30	61	57
31	63	63
Ave.	67.6	63.6

Location: Right bank

September 1962
DAILY TEMPERATURE

▲ Max. Water Temp. ◉ Max. Air Temp.
△ Min. Water Temp. ○ Min. Air Temp.



Date **1/63** By **OS&C**

SWR& FORM
JANUARY 1960

Appendix V continued

RECORDING THERMOGRAPH
DATA SHEET

STATION DESCRIPTION:

* No. Thomas Creek
Stream Thomas Creek * Mile 5

Board #SP-80-15-20246
Date Sept-60 on State Water Resources

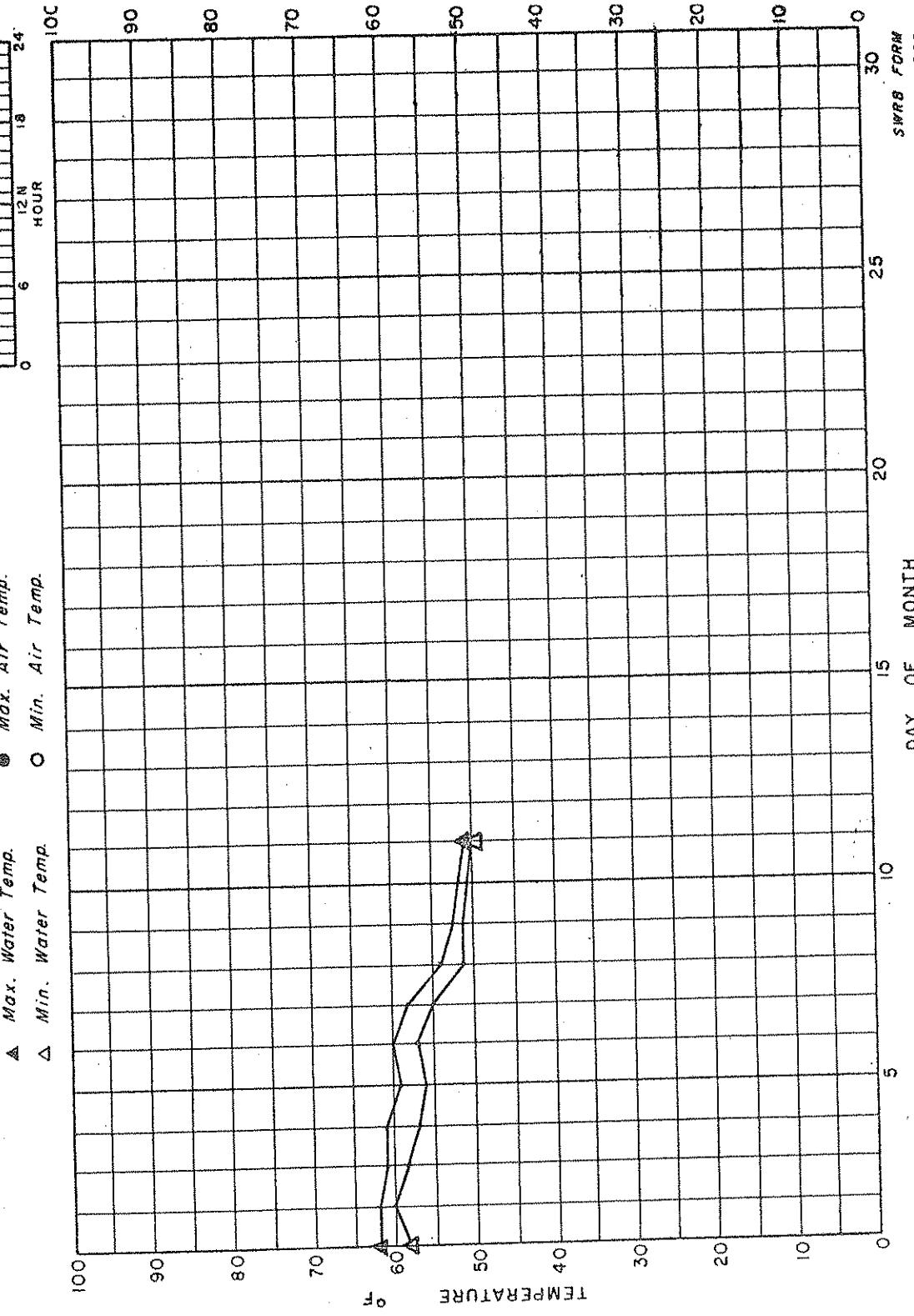
TEMPERATURE, °F

DAY	WATER	AIR
	Max	Min
1	62	58
2	62	60
3	61	58
4	61	57
5	59	56
6	60	57
7	57	55
8	54	52
9	53	52
10	52	51
11	51	50
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
Ave.	57.4	55.0

Location: Right bank

October 1962

DAILY TEMPERATURE



Date 1-6-3 By OSGC

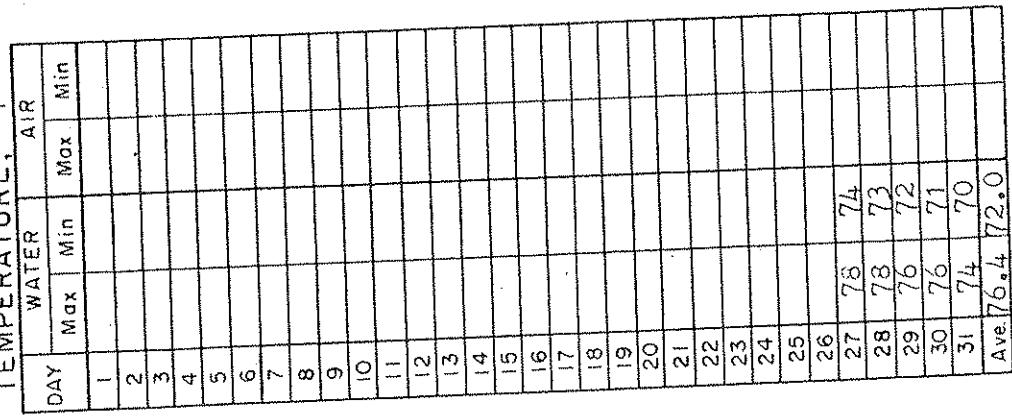
SWR8 FORM
JANUARY 1960

APPENDIX VI

**RECORDING THERMOGRAPH
DATA SHEET**

STATION DESCRIPTION:
* No. **Name** South Santiam R.
StreamSouth Santiam R. **Mile** 5.2

STATION DESCRIPTION:
No. Name South Santiam R.
Stream South Santiam R. Mile 5.2



STATION DESCRIPTION:

STATION DESCRIPTION:
* No. **[REDACTED]** Name South Santiam R.
Stream South Santiam R. * Mile 5.2

Location: Right Bank

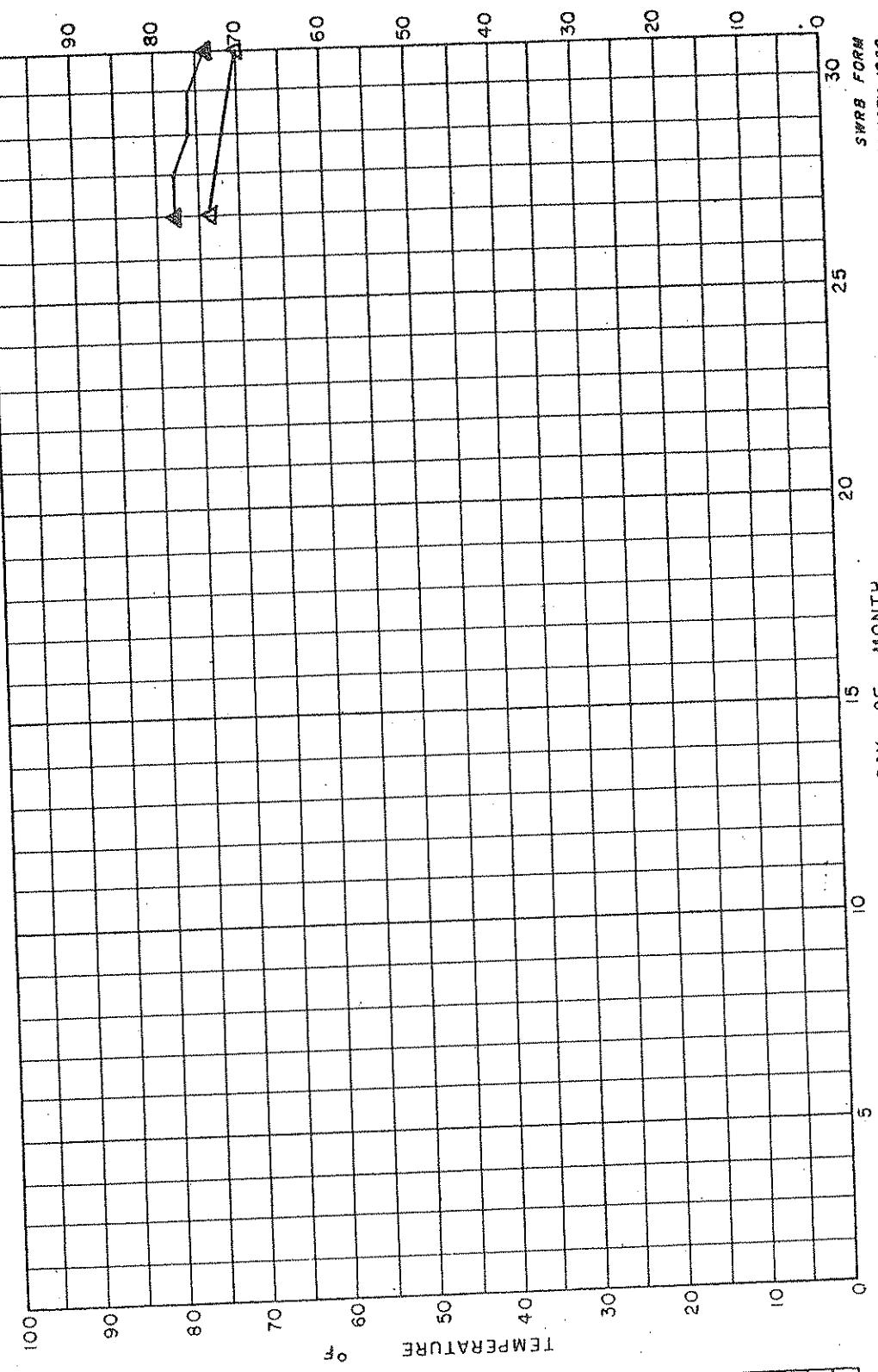
July 1962

DAILY TEMPERATURE

~~Serial no 153824~~

卷之三

▲ Max. Water Temp. ▲ Min. Water Temp. ● Max. Air Temp. ○ Min. Air Temp.



Date 1-6-3 By OSAGE

Appendix VI continued

RECORDING THERMOGRAPH
DATA SHEET

STATION DESCRIPTION:

* No. **15-20246**
Name South Santiam R.
Stream South Santiam R. * Mile 5.2

Board map no. 15-20246
Shows State Water Resources

Location: Right Bank
August 1962

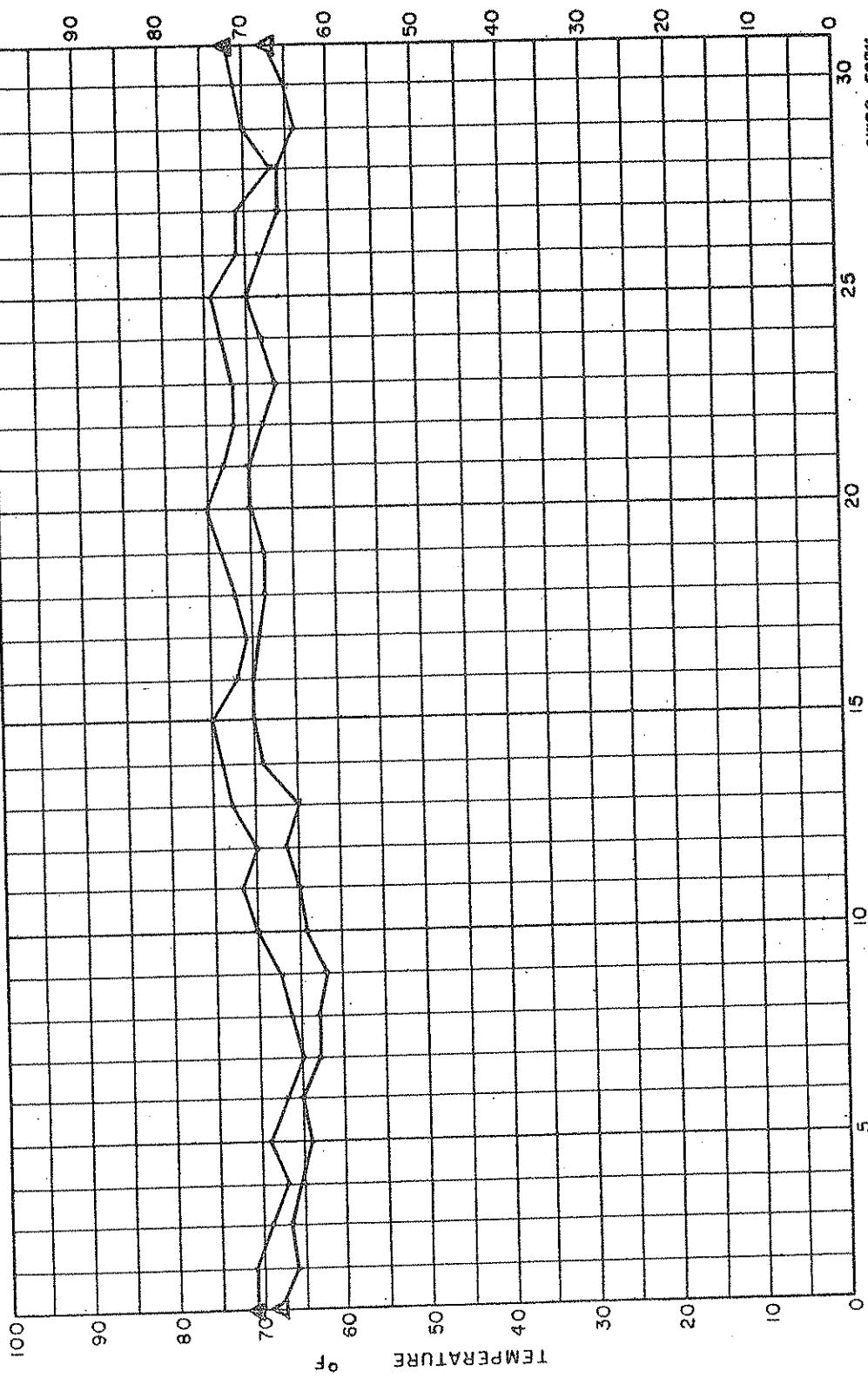
DAILY TEMPERATURE

TEMPERATURE, °F

	TEMPERATURE, °F			
DAY	WATER	AIR	Max	Min
1	71	68	71	68
2	71	66	71	66
3	69	67	69	67
4	67	65	67	65
5	69	64	69	64
6	67	65	67	65
7	65	63	65	63
8	66	63	66	63
9	67	62	67	62
10	70	64	70	64
11	72	65	72	65
12	70	67	70	67
13	73	65	73	65
14	74	69	74	69
15	75	70	75	70
16	72	70	72	70
17	71	69	71	69
18	72	68	72	68
19	74	68	74	68
20	75	70	75	70
21	73	70	73	70
22	72	68	72	68
23	72	67	72	67
24	73	68	73	68
25	74	70	74	70
26	71	68	71	68
27	71	66	71	66
28	67	66	67	66
29	70	64	70	64
30	71	65	71	65
31	72	67	72	67
Ave.		70.8	66.6	70.8

▲ Max. Water Temp. ◊ Max. Air Temp.

△ Min. Water Temp. ○ Min. Air Temp.



Date **1-63** By **OSGC**

SRB FORM
JANUARY 1960

APPENDIX VI continued

RECORDING THERMOGRAPH
DATA SHEET

STATION DESCRIPTION:
 * No. Name South Santiam R.
 Stream South Santiam River 5.2

* Oregon State Water Resources Board Report No. 15-20246

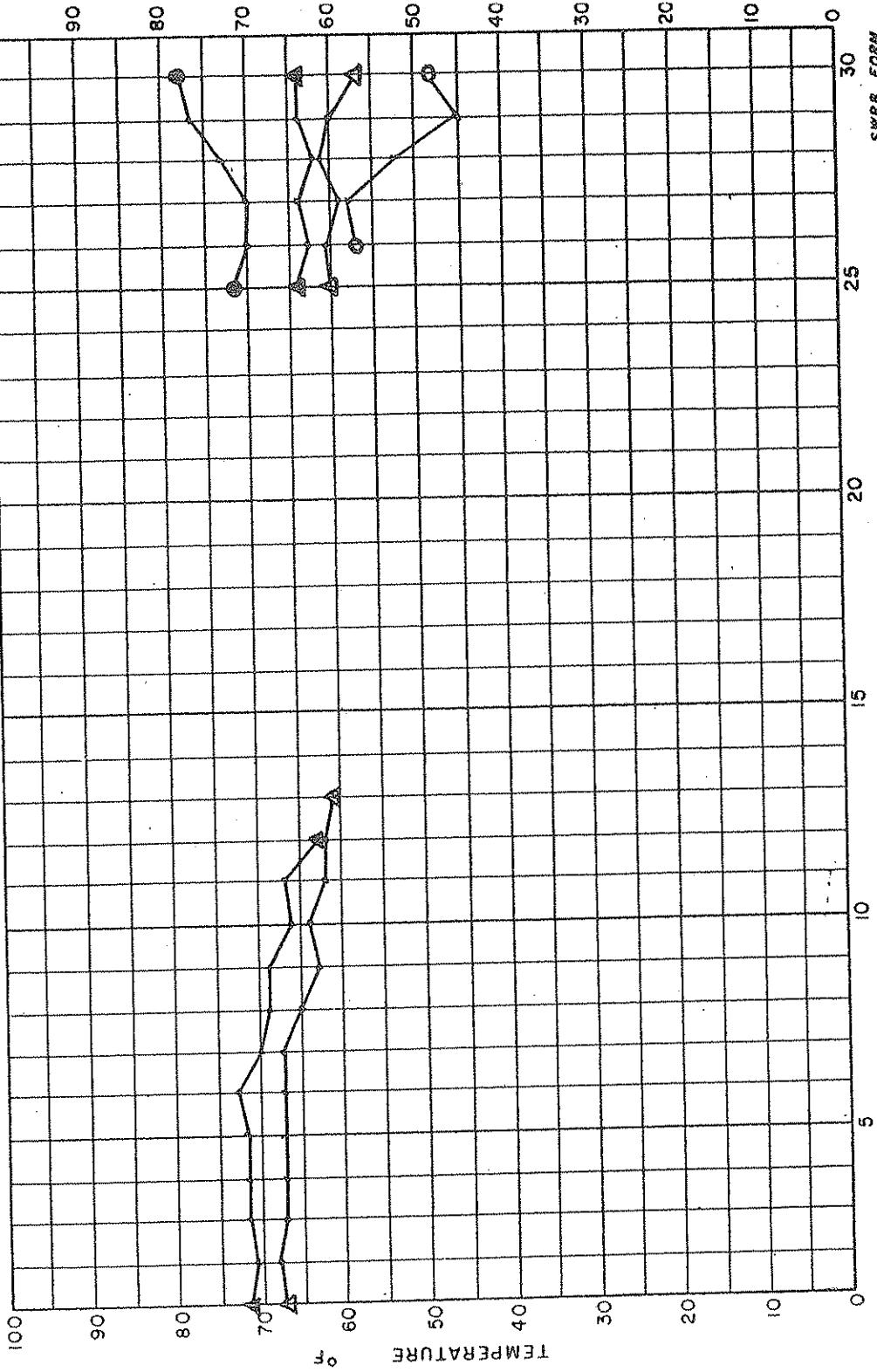
TEMPERATURE, °F

	TEMPERATURE, °F			
DAY	WATER	AIR	Max	Min
1	72	67		
2	71	68		
3	72	67		
4	72	67		
5	72	67		
6	73	67		
7	70	57		
8	69	65		
9	69	63		
10	66	64		
11	67	62		
12	63	62		
13	61			
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25	64	60	72	
26	63	61	70	57
27	64	59	70	58
28	62	61	73	53
29	64	60	77	45
30	64	57	78	48
31				
Ave.	67.6	63.1	73.3	52.2

Location: Right Bank
September 1962

DAILY TEMPERATURE

▲ Max. Water Temp. ◊ Max. Air Temp.
 △ Min. Water Temp. ○ Min. Air Temp.



Date 1-63 By OSRG

SWRB FORM
JANUARY 1960

Appendix VI continued

RECORDING THERMOGRAPH
DATA SHEET

STATION DESCRIPTION:

* No. **■ Name** South Santiam R.
Stream South Santiam R. * **Mile** 5.2

Boarding No. 15-29246
State Water Resources

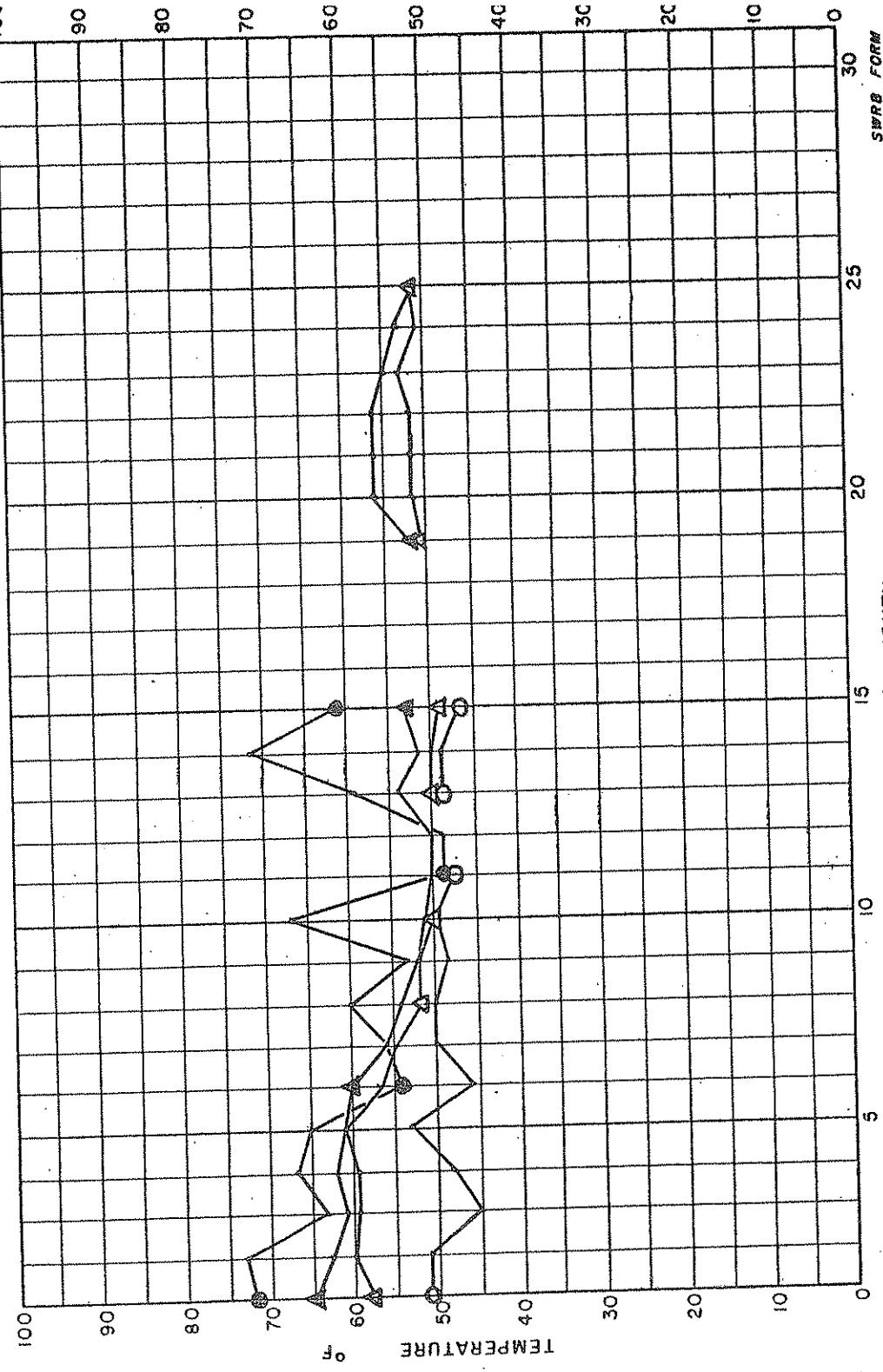
Location: Right Bank

October 1962

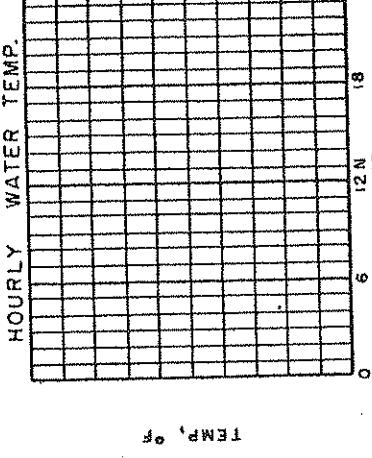
DAILY TEMPERATURE

TEMPERATURE, °F

WATER **AIR**



Date 1-6-3 By OSGC



APPENDIX VII

RECORDING THERMOGRAPH
DATA SHEET

STATION DESCRIPTION:

* No. Name Mill Creek (S. Tom.)

* Stream Mill Creek * Mile 0.4

* S.G.W.A. or State Water Resources Board Map No. 15-20246

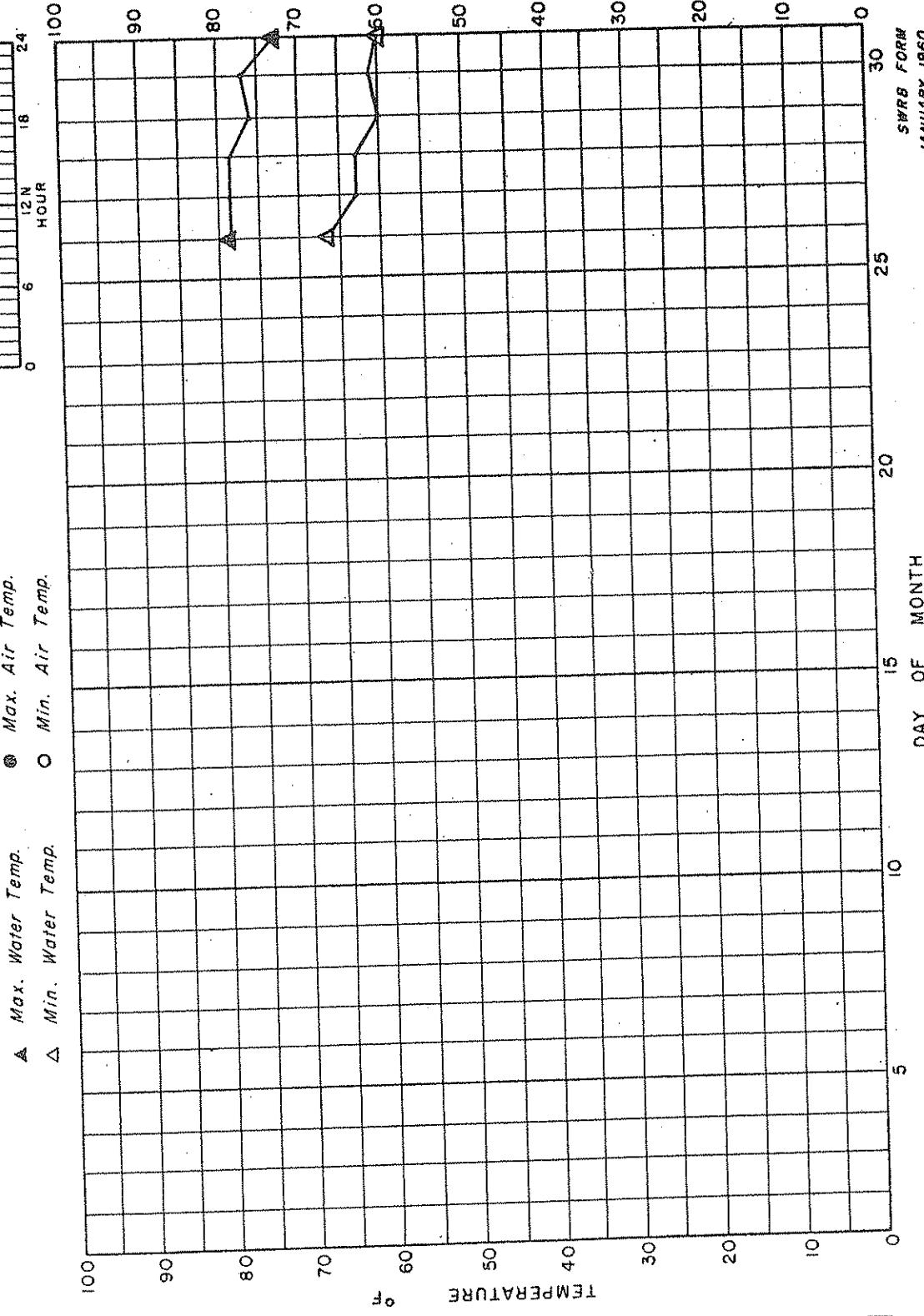
Temperature, °F

	WATER		AIR	
DAY	Max	Min	Max	Min
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
Ave.	77.6	62.3		

* Location: Left bank, 0.4 miles above mouth

July 1962

DAILY TEMPERATURE



Appendix VII continued

RECORDING THERMOGRAPH
DATA SHEET

STATION DESCRIPTION:

* No. Name Mill Creek (S. Fork) (1)

Stream Mill Creek * Mile 0.4

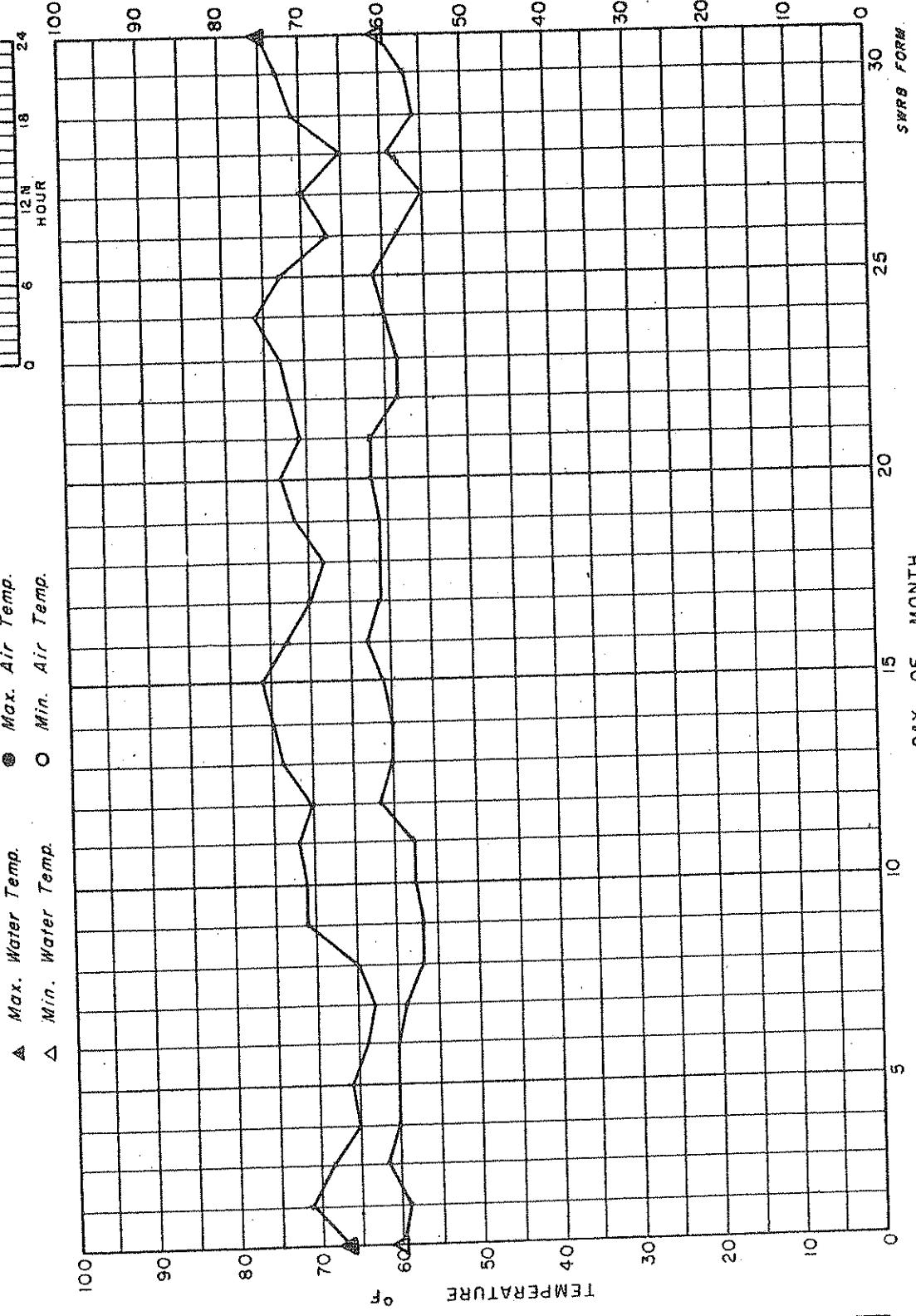
* S.S. SHEAR ON STATE WATER RESOURCES
BOER-MAP NO. 16-20246

Location: Left bank. 0.4 miles above mouth

August 1962

DAILY TEMPERATURE

	TEMPERATURE, °F			
DAY	WATER	AIR	Max	Min
1	67	60		
2	72	59		
3	68	62		
4	65	60		
5	66	60		
6	64	60		
7	63	59		
8	65	57		
9	72	57		
10	72	58		
11	73	58		
12	70	62		
13	74	60		
14	75	60		
15	76	61		
16	73	63		
17	70	61		
18	68	61		
19	72	61		
20	74	62		
21	71	62		
22	72	58		
23	73	58		
24	76	60		
25	73	61		
26	67	58		
27	70	55		
28	65	59		
29	71	56		
30	73	57		
31	75	60		
Ave.	70.1	59.5		



Date 1-6-3 By OS&C

Appendix VII continued

RECORDING THERMOGRAPH
DATA SHEET

STATION DESCRIPTION:

* No. **Mill Creek** (S. Yankill)

Stream **Mill Creek** * Mile **0.4**

~~90-2400-10-15-20-246~~

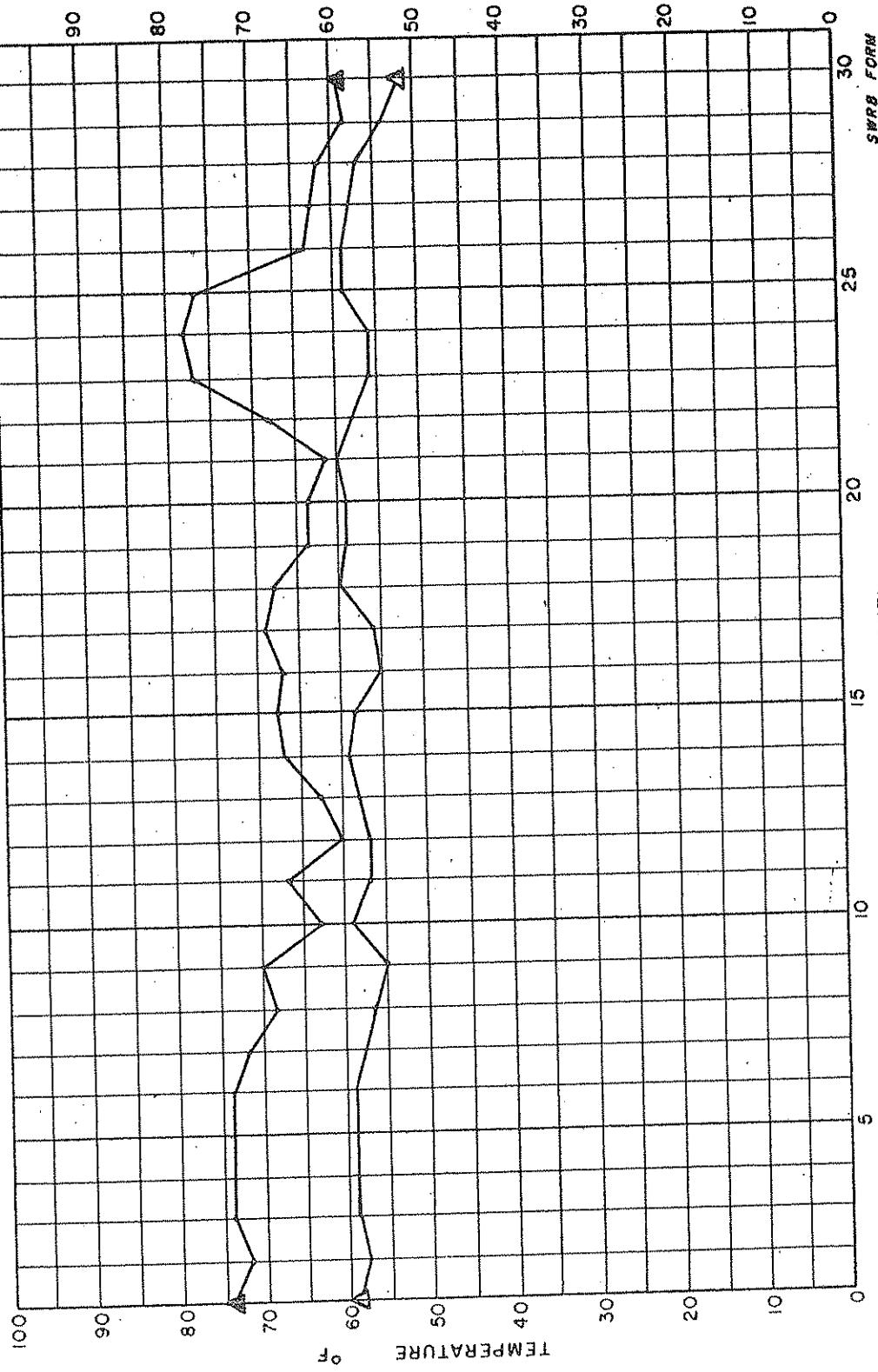
Location: Left bank, 0.4 mile above mouth

September 1962
DAILY TEMPERATURE

TEMPERATURE, °F

	WATER	AIR	TEMPERATURE, °F	
DAY	Max	Min	Max	Min
1	74	59		
2	72	58		
3	74	59		
4	74	59		
5	74	59		
6	74	59		
7	72	58		
8	68	57		
9	70	55		
10	63	52		
11	67	57		
12	60	57		
13	63	58		
14	67	52		
15	68	58		
16	67	55		
17	69	56		
18	68	60		
19	64	59		
20	64	53		
21	62	60		
22	68	58		
23	77	56		
24	78	55		
25	77	59		
26	64	59		
27	63	58		
28	62	57		
29	58	54		
30	59	52		
31				
Ave.	68.1	57.6		

Date **1-63** By **OSGC**



Appendix VII continued

**RECORDING THERMOGRAPH
DATA SHEET**

STATION DESCRIPTION:

* No. Name Mill Creek (S. Tamiami Stream Mill Creek * Mile 0.4

Location: Left bank, 0.4 mile above mouth

No. Name Stream Mill Creek * Mile Oak

* ASSESSMENT ON STATE-WATER RESOURCES

DAILY TEMPERATURE

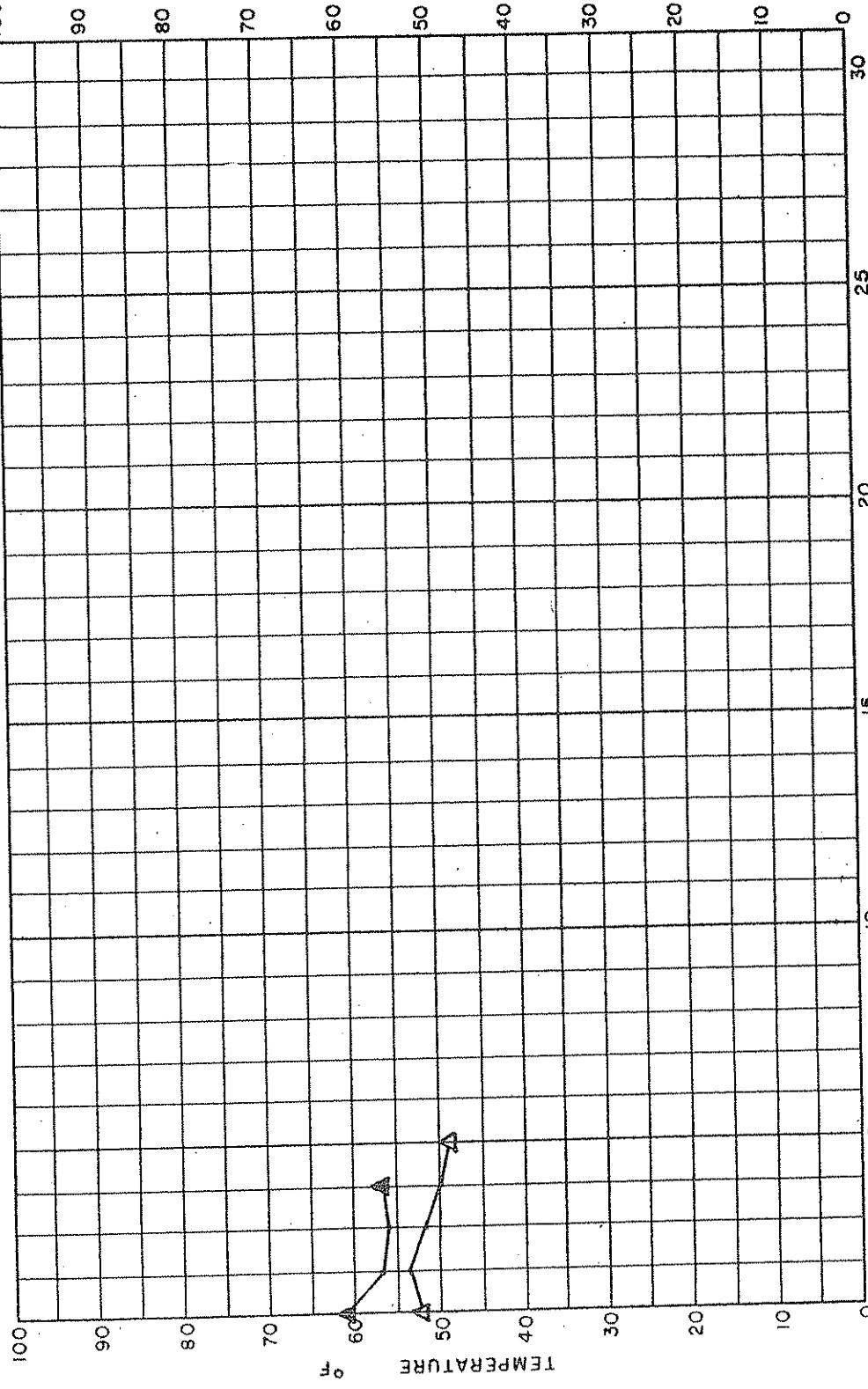
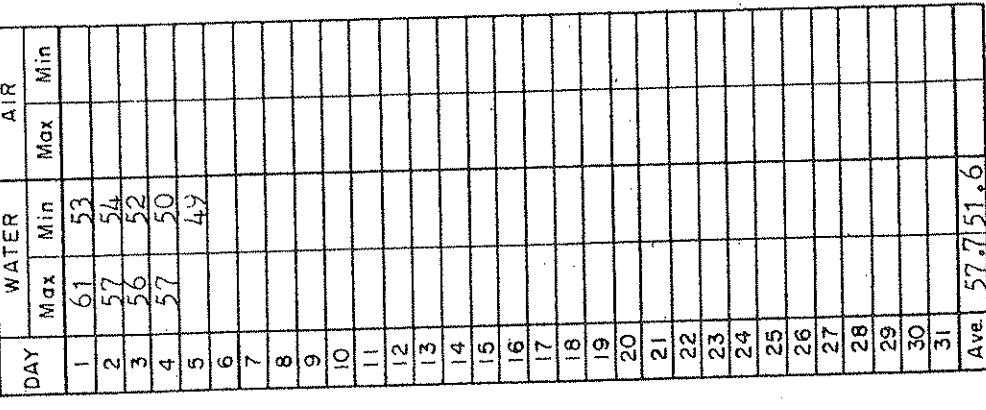
~~Board no. 1520246~~

~~Good-mornin' mornin'~~ 1520246

▲ Max. Water Temp. ● Max. Air Temp.

TEMPERATURE, ° F

Δ Min. Water Temp. \circ Min. Air Temp.



Date 1-63 By OSSE

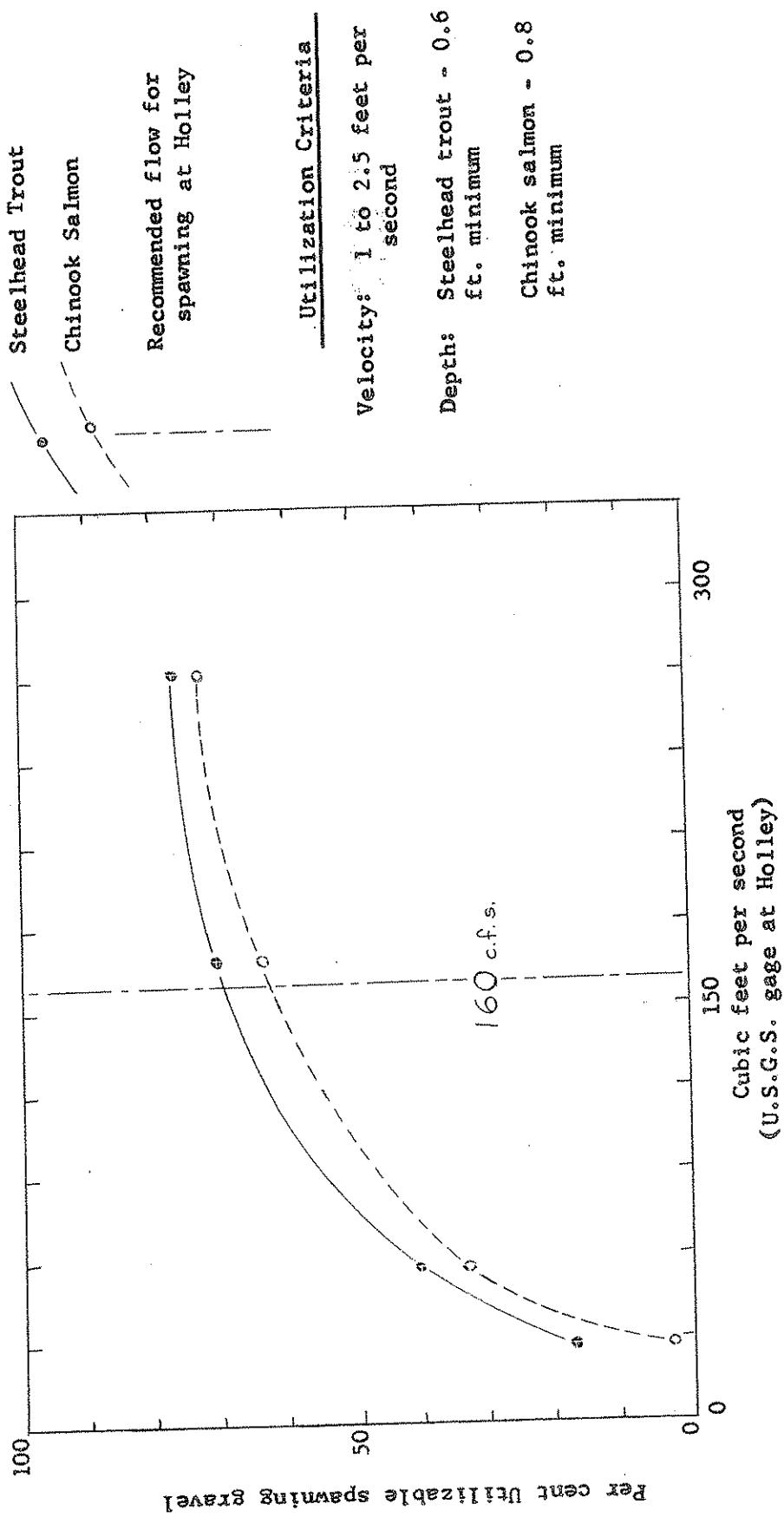
SURG FORM
JANUARY 1960

APPENDIX VIII.

Figure 1

Utilizable Spawning Gravel as Measured at Four Gravel Cross Sections
between River Miles 39.5 and 47.2
September 12, 1961 to June 18, 1962

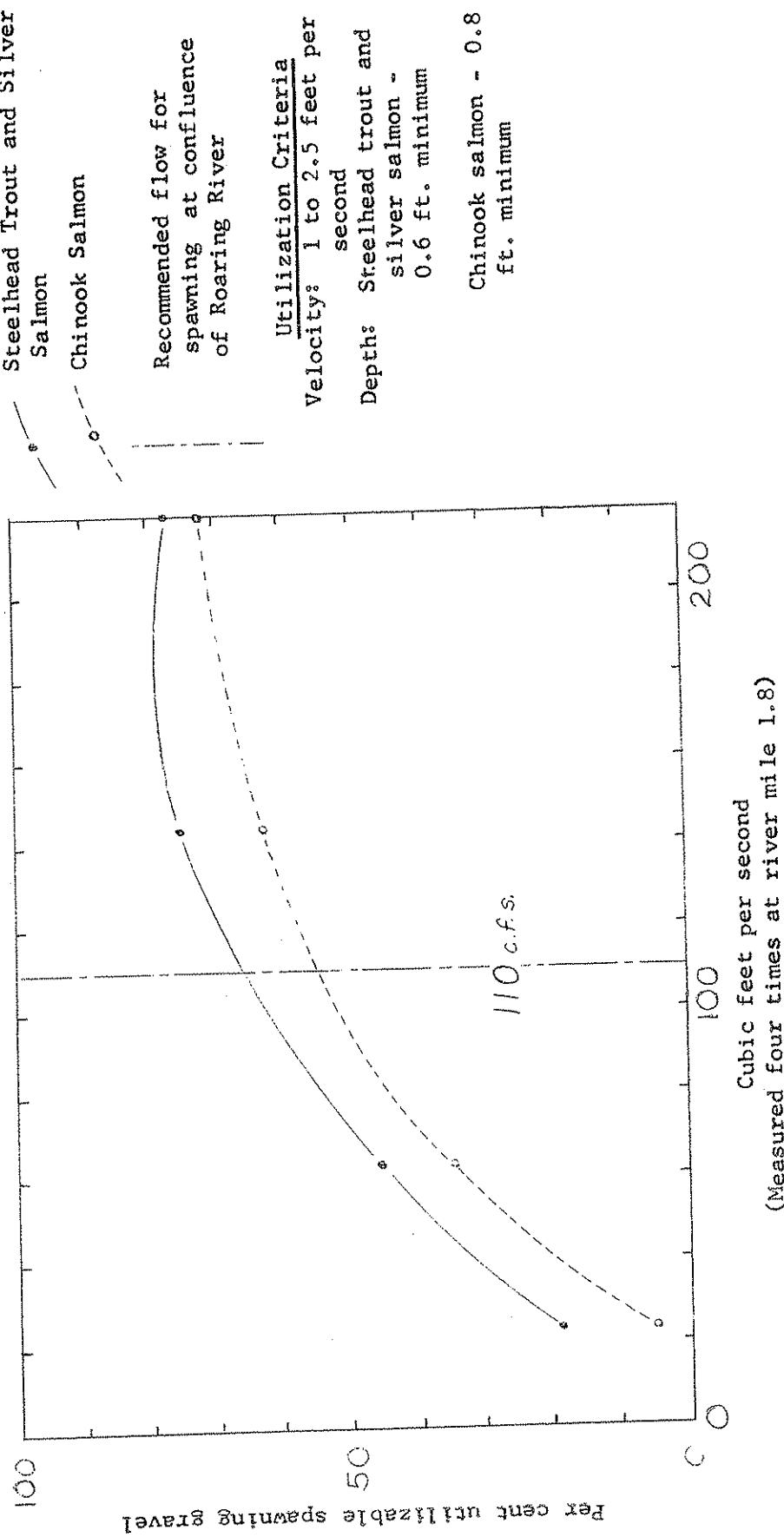
CALAPOOYA RIVER



Appendix VIII continued
Figure 2

Crabtree Creek

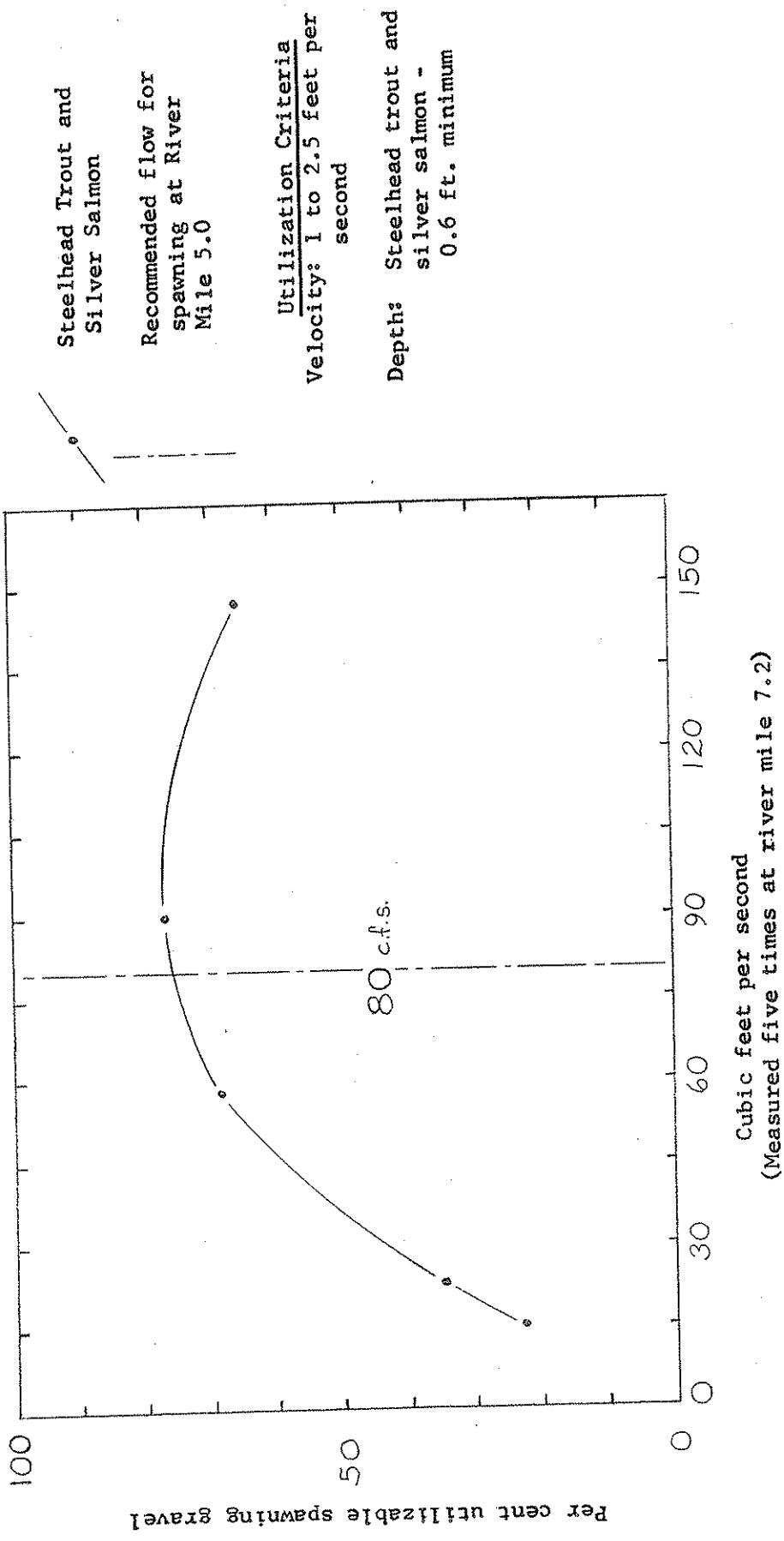
Utilizable Spawning Gravel as Measured at Three Gravel Cross Sections
between River Miles 1.8 and 13.5
August 21 to November 20, 1961



Appendix VIII continued
Figure 3

LITTLE LUCKIAMUTE RIVER

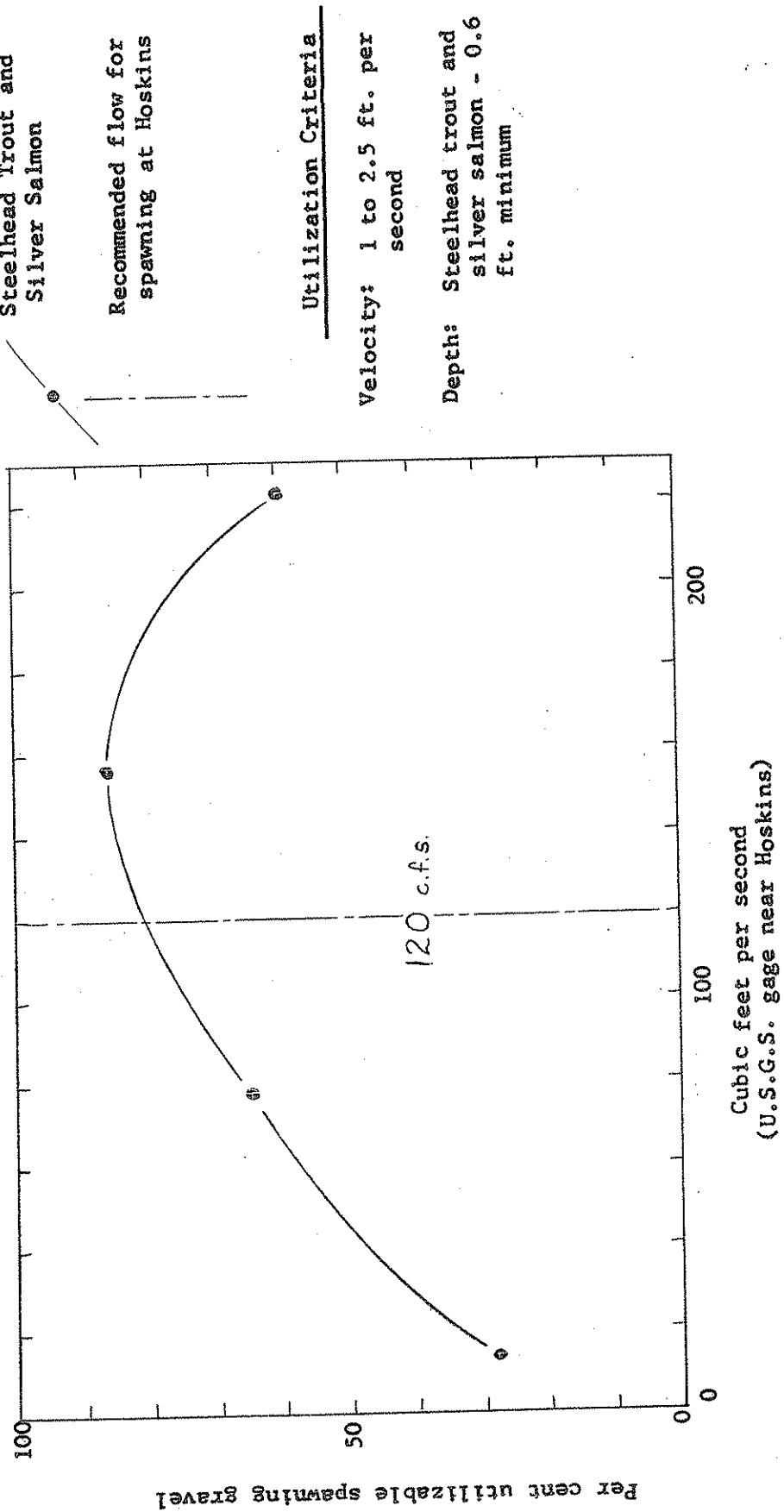
Utilizable Spawning Gravel as Measured at Three Gravel Cross Sections
between River Miles 7.2 and 11.0
September 8, 1961 to June 19, 1962



Appendix VIII continued
Figure 4

Utilizable Spawning Gravel as Measured at Four Gravel Cross Sections
between River Miles 39.2 and 45.6
August 31, 1961 to January 22, 1962

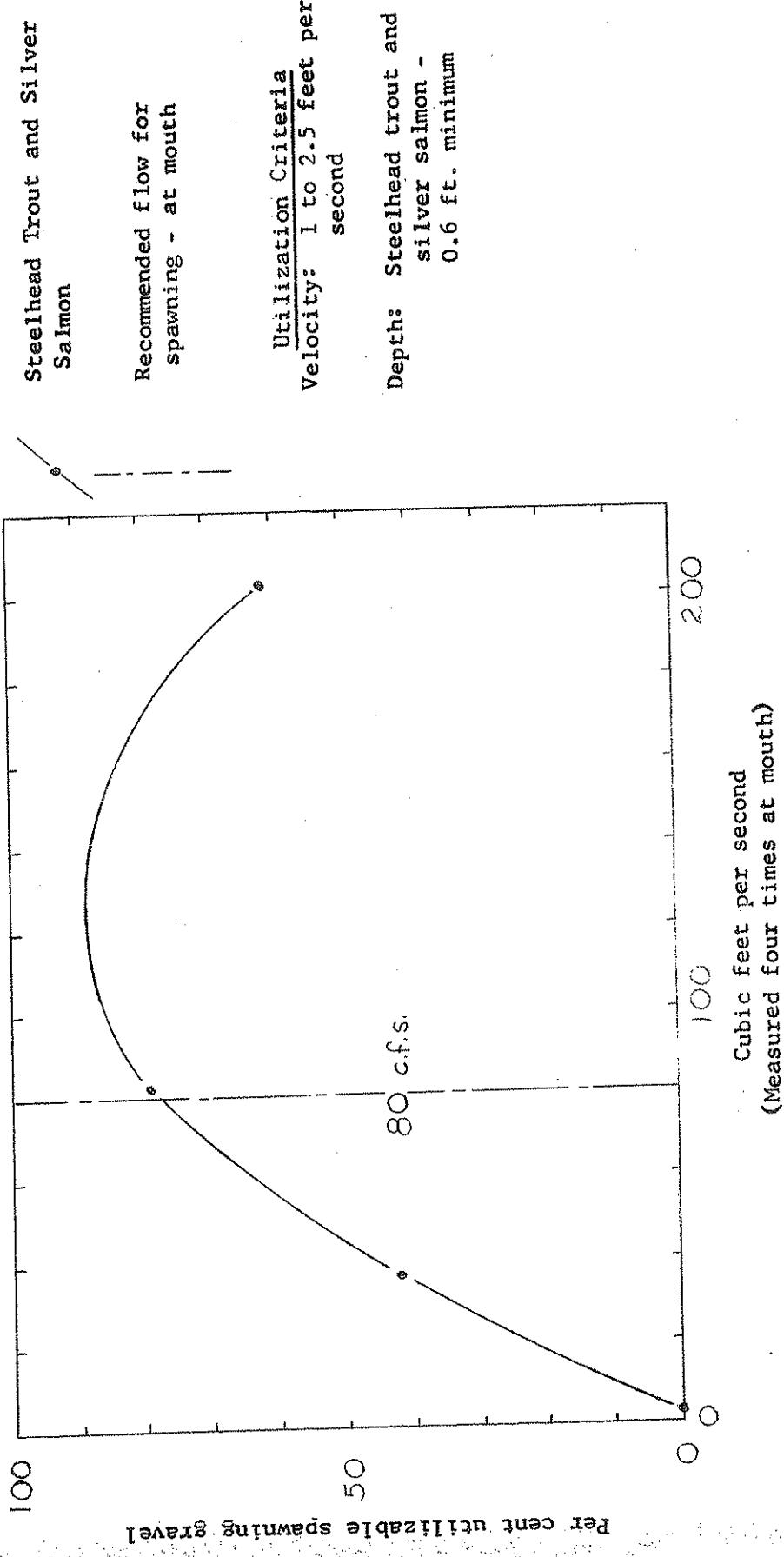
LUCKIAMUTE RIVER



Appendix VIII continued
Figure 5

MILL CREEK (S. Yamhill)

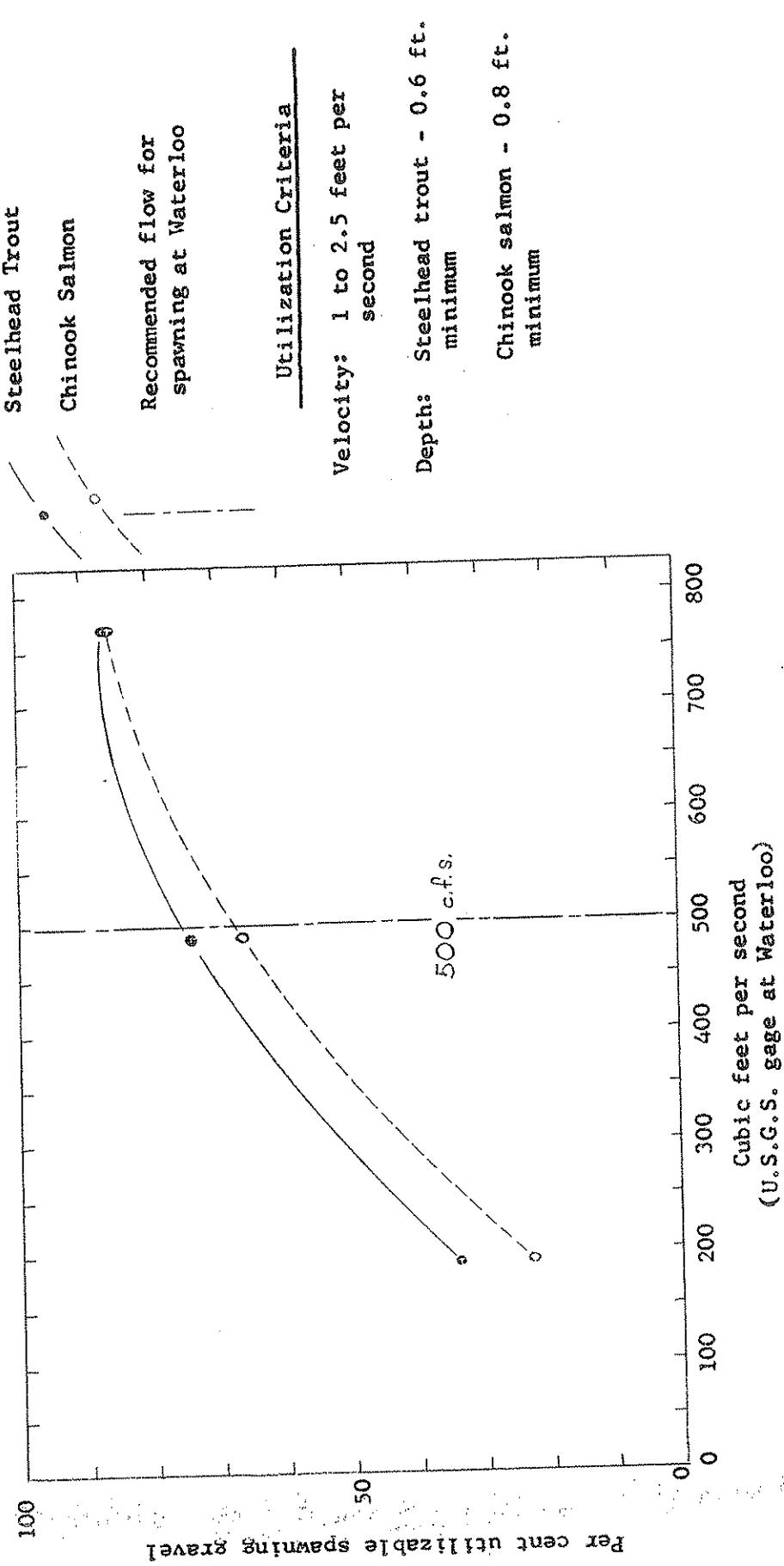
Utilizable Spawning Gravel as Measured at Four Gravel Cross Sections
between River Miles 0.3 and 6.0
September 8, 1961 to January 30, 1962



Appendix VIII continued
Figure 6

SOUTH SANTIAM RIVER

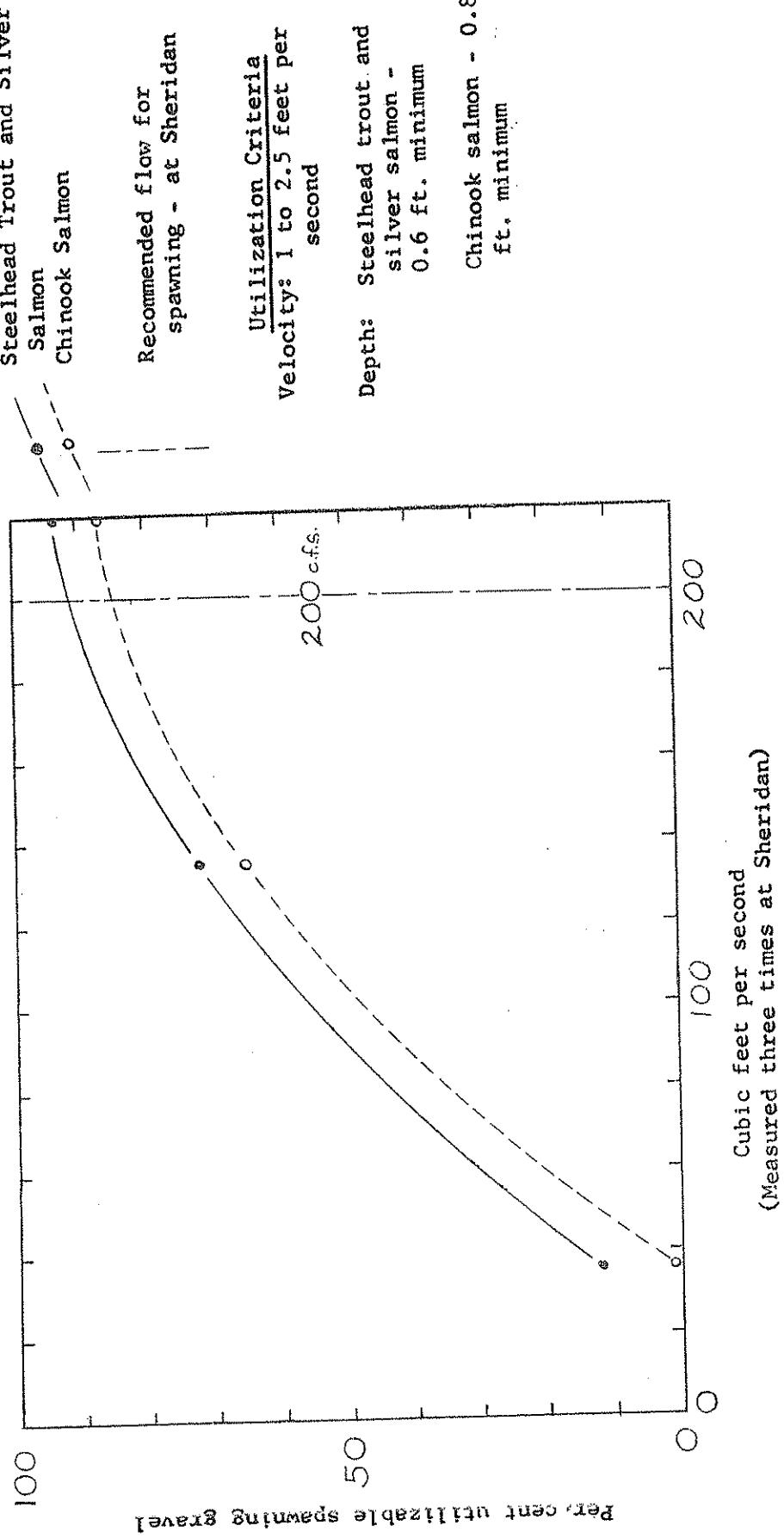
Utilizable Spawning Gravel as Measured at Seven Gravel Cross Sections
between River Miles 24 and 35
September 26, 1961 to June 26, 1962



Appendix VIII continued
Figure 7

SOUTH YAMHILL RIVER

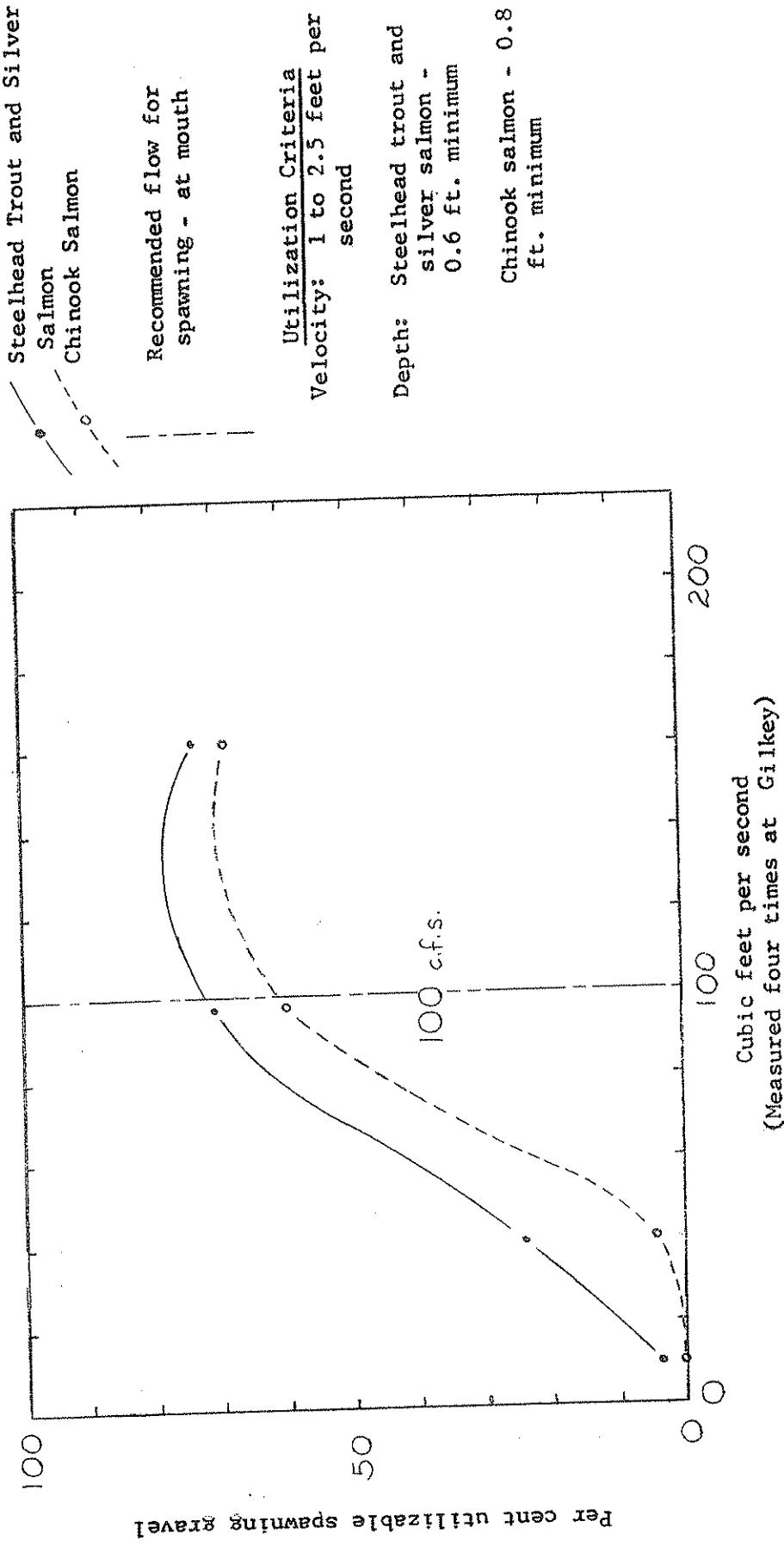
Utilizable Spawning Gravel as Measured at Five Gravel Cross Sections
between River Miles 35.5 and 40.3
September 21, 1961 to June 28, 1962



Appendix VIII continued
Figure 8

THOMAS CREEK

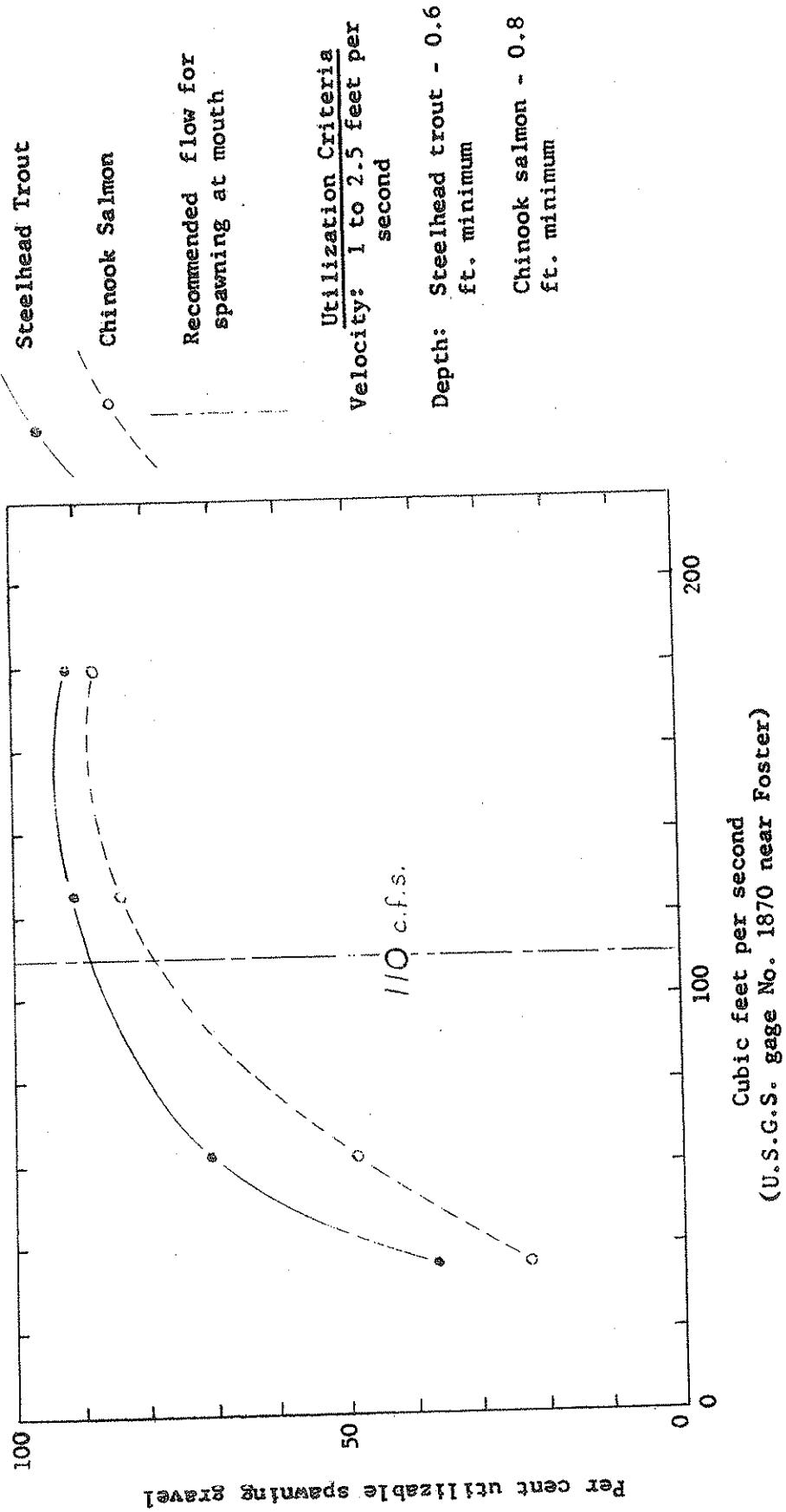
Utilizable Spawning Gravel as Measured at Four Gravel Cross Sections
between River Miles 4.8 and 25.7
August 25, 1961 to June 25, 1962



Appendix VIII continued
Figure 9

Utilizable Spawning Gravel as Measured at Five Gravel Cross Sections
between River Miles 0.7 and 6.5
February 28 to July 3, 1962

WILEY CREEK



APPENDIX IX
(Part 1)

Weekly Dissolved Oxygen and Water Temperature Measurements Obtained
in the Willamette River by the State Sanitary Authority, 1962 ^{1/}

Dissolved Oxygen Concentration in Parts per Million

Location:	Independence	Salem	Wheatland Ferry	Newberg	Canby Ferry	Sport Craft	S.P. & S. Railroad
June	19	9.8	-	9.6	8.2	7.8	7.5
"	26	9.5	9.3	9.3	8.1	8.2	7.5
July	3	10.2	9.4	9.4	8.5	8.0	6.9
"	10	9.6	8.8	8.8	7.8	7.9	7.4
"	17	9.9	9.2	9.2	8.3	7.3	6.3
"	24	9.8	9.1	8.7	7.5	7.7	6.6
"	31	9.3	8.6	8.9	7.9	7.7	6.2
August	7	8.9	8.4	8.3	7.8	7.4	6.8
"	14	9.6	8.6	8.2	6.1	6.6	6.5
"	21	9.5	9.1	8.6	7.6	6.7	6.4
"	28	8.9	8.3	8.2	8.1	6.2	6.1
Sept.	4	9.9	9.2	9.1	8.2	5.1	8.1
"	11	9.2	8.5	8.1	7.3	5.5	5.5
"	18	8.7	8.4	7.6	6.8	6.3	6.8
"	25	9.4	8.5	7.5	6.9	5.7	5.4
Oct.	2	-	8.8	8.3	7.1	6.8	6.7
"	11	10.0	9.8	9.7	9.6	9.2	10.1
"	17	10.2	10.0	9.7	9.4	9.0	9.6
"	23	9.7	9.0	8.4	7.9	7.2	8.2
"	30	9.5	9.1	8.6	7.9	7.1	7.6
Nov.	7	10.3	9.9	9.5	8.7	6.6	6.7
"	13	10.4	10.2	10.1	9.8	9.3	9.7

Appendix IX continued
(Part 2)

Temperature in Degrees Centigrade

Location:	Independence	Salem	Wheatland Ferry	Newberg	Canby Ferry	Sport Craft	S.P. & S. Railroad
June	19	19	-	18	18	18	17
"	26	18	19	18	18	20	19
July	3	20	19	20	20	20	18
"	10	20	20	20	20	20	19
"	17	20	19	20	20	19	19
"	24	23	23	23	22	21	20
"	31	23	22	24	25	24	21
August	7	17	17	18	17	19	21
"	14	22	22	22	21	21	20
"	21	20	21	21	21	21	20
"	28	18	17	19	19	20	20
Sept.	4	20	19	20	20	21	20
"	11	17	17	18	17	19	19
"	18	18	18	18	18	18	18
"	25	17	17	18	17	18	17
Oct.	2	-	16	16	17	16	16
"	11	16	16	17	16	17	16
"	17	17	17	17	16	12	12
"	23	13	13	13	12	12	11
"	30	12	12	12	12	12	12
Nov.	7	11	11	11	10	10	10
"	13	9	9	9	9	9	9

1/ Additional measurements (including other water quality factors) at these and other Willamette River locations were obtained in 1962 and in prior years.

APPENDIX X

Middle Willamette Basin Cascade Lakes, Including Fisheries Management Data

Lake	T. R.	S. .	Location	Acres	Max. Depth (ft.)	Species 1/ Present	Stocking Number	Stocking Frequency 2/ Bi	Creek Census			
									No. of Anglers	Fish Hour	Total Fish per Hour	
Abiqua	8S	2E	8	2.0	EB	5.5	Nat	4	12	1.50	1962	
Alforkis	12S	7E	36	4.0	EB	750	V	24	9	0.36	1961	
Alice	12S	7½E	26	1.0	EB	2,500	Bi	159	724	0.80	1962	
Ann	11S	7E	35	15.0	Rb	1,500	Bi	2	0	0.00	1962	
Averill	9S	8E	5-8	11.5	EB	5	X	4	4	0.40	1962	
Bays	10S	8E	11	9.0	20	GT	V	7	20	0.77	1962	
Bear	9S	8E	33	7.0	24	EB	1,000	Nat	7	2	0.29	1962
Bingham	11S	7½E	13	4.0	4	Ct	1,500	Bi	9	4	1.50	1962
Blue	12S	7½E	23	10.0	40	EB	1,000	Bi	7	2	0.29	1962
Bowerman	12S	7½E	23-24	5.0	10	EB	1,000	Bi	7	2	0.29	1962
L. Bowerman	12S	7½E	24	1.5	4	EB	500	V	4	0	0.00	1962
Bradley	12S	7E	33	4.0	13	EB	500	V	4	0	0.00	1962
Breitenbush	9S	8E	25	60.0	27	EB	10,000	Nat	55	195	0.78	1962
Bruno, Lower	10S	7E	30	1.0	20	EB	Nat	12	5	0.23	1962	
Bruno, Upper	10S	7E	30	1.0	9	EB	Nat	6	15	0.94	1962	
Butte (Fibre)	8S	3E	10	1.0	-	Rb	500	V	3	8	1.33	1962
Butte (Rhody)	8S	3E	11	4.0	10	EB	1,500	Bi	2	20	5.00	1962
Butte (Lookout)	8S	3E	11	2.0	-	EB	350	X	3	0	0.00	1961
Butterfly	9S	5E	32	1.0	5	EB	22	Nat	3	3	0.50	1962
Chiquito	12S	7½E	24	4.0	11	EB	500	V	3	3	0.50	1962
Chris	12S	7E	33	3.0	7	EB	500	V	4	10	0.50	1962
Cincha	12S	7E	36	2.0	14	EB	1,000	Bi	2	1	0.33	1961
L. Cincha	12S	7E	36	1.5	10	EB	500	V	2	1	0.33	1961
Claggett	9S	8E	30-31	6.0	5	EB	500	O	2	1	0.33	1961
Clear	5S	4E	14	1.0	5	EB	500	V	2	1	0.33	1961
Cleo	12S	7E	12	4.0	8	EB	O	2	1	0.33	1961	
Clinton	12S	7E	36	1.0	12	EB	500	V	2	1	0.33	1961
Cougar	6S	4E	24	7.0	6	EB	250	X	2	1	0.33	1961
Cougar	13S	6E	16	2.0	20	EB	500	V	2	1	0.33	1961
Coyote	11S	8E	6-7	1.0	12	EB	250	X	2	1	0.33	1961
Crabtree	11S	3E	16	5.0	-	Rb	100	Ann	3	0	0.00	1962
Crown	9S	8E	30	12.0	6	EB	2,500	V	61	213	1.23	1962
Daly	12S	6E	11	10.0	43	EB	500	V	4	10	1.00	1962
Davey	9S	8E	27	2.0	-	EB	500	V	2	1	0.33	1961

Appendix X Continued

Lake	Location			Max. Depth (ft.)	Species Present	Stocking Number	Creek Census			Year
	T. R.	R. S.	Acres				No. of Anglers	Total Fish	Fish per Hour	
Davis	12S	7½E	10	2.5	4	EB	500	V	2	1961
Dixie, North	12S	7½E	26	2.5	7.5	EB	500	V	2	1962
Dixie, South	12S	7½E	35	2.0	4	EB	500	V	2	1962
Don, Lower	12S	6E	4	2.5	24	Ct, EB			2	1962
Don, Upper	12S	6E	4	2.0	25	EB			3	1.39
Donaca	12S	5E	14	3.0	-	Ct			25	1962
Dry	13S	6E	9	1.4	-	EB	275	X	2	1962
Duffy	12S	7½E	34	30.0	30	Rb, EB	2,500	Ann	45	0.47
Duffy, Little	12S	7½E	34	2.0	8.5	EB	500	Bi	9	2.00
Dunlap	9S	6E	5	7.0	22	Rb	2,000	Ann	10	0.14
Emerald	6S	4E	29	4.0	25	Ct		Nat		1962
Elkhorn	9S	4E	3	4.0	9	EB	500	X		
Fay	12S	7E	21	6.0	15	EB, Rb	1,000	V, Ann	40	0.84
Fir	12S	7E	22	6.0	20	EB	1,500	V	25	1.02
Gebbler	9S	5E	12	2.0	7.5	EB	720	X		
Gordon, Lower	14S	5E	7	7.5	21	Ct		Nat		1961
Gordon, Upper	14S	5E	18	6.5	13	Ct		Nat		1961
Green Peak	12S	8E	18	6.0	12	Rb	500	V	10	0.20
Greenet	12S	7½E	22	4.0	15	Rb	500	V	11	0.06
Hanks	11S	8E	7	7.0	12	Rb	1,000	Bi	10	0.12
Hunts	11S	8E	7	7.0	13	Rb	1,000	V	15	1.39
Indian	9S	8E	9	4.0	13	EB	500	Bi		1962
Indian Prairie	10S	2E	33	12.0	46	Rb	2,500	Bi	34	1.10
Jenny	12S	7½E	11	3.0	9	EB	1,000	V	6	0.33
Jo Jo	10S	7E	19	2.0	31	Rb	500	V	11	0.25
Johnny	13S	5E	27	2.0	-	Ct		Nat	10	1.31
Johnn Jorn	12S	7½E	23	35.0	35	Rb	2,500	Ann	19	1.31
Ladigo	12S	7E	36	2.0	3.5	Rb	1,000	Bi	33	1.39
Lake of the Woods	11S	7½E	25	5.0	9	Br, EB		Nat		1962
Leone	9S	7E	31	4.0	16	EB	500	X		
Lizard	11S	7½E	11	1.0	-	EB	500	V		
Lula	12S	7½E	16	4.0	18	EB	30,000	Ann	306	893
Marion	12S	7½E	1,2	325.0	180	Rb	500	V	2	0
Maudie	12S	7½E	16	4.0	9	EB				1961

Appendix X continued

Lake	Location		Acres	Max. Depth (ft.)	Species Present	Stocking Frequency			Crest Census			
	T.	R.				E	B	500	V	No. of Anglers	Total Fish	Fish per Hour
Maxwell	13S	7E	1	1.2	13	EB	RB	1,000	V	11	13	0.62
Melis	12S	7½E	14	5.0	17	EB	EB	1,000	O			1962
Midget	11S	7½E	36	1.0	4	EB	EB	500	V			
Mildred	9S	8E	29	2.5	11	EB	EB	1,000	X			
Monty	12S	7½E	10	1.3	4	Ct	Nat	Nat		18	93	0.78
Monument	10S	4E	22	2.0	5	Ct	Nat	Nat				1962
Moose	13S	4E	7	8.0		EB	EB	5,000	Ann	57	178	0.64
Mowich	12S	7½E	27	54.0	45	EB	EB	5,000	Ann	3	13	1.08
Mudpuppy	10S	6E	22	2.0	40	EB	EB	0	O			
Neck	12S	7E	1	2.0	3	EB	EB	500	X			
North Peak	13S	6E	21	3.0	8	EB	EB	500	Nat	7	7	0.30
Opal	9S	5E	18	11.0	40	Ct	Nat	Nat		201	2,050	2.07
Pamelia	10S	7½E	1	45.0	12	EB	EB	1,000	V			
Park	10S	8E	10	2.0	8.5	EB	EB	5,000	V	59	400	1.30
Parvish	12S	6E	15	6.5	31	EB	EB	1,000	V	6	6	0.60
Pika	12S	7E	22	3.0	14	EB	EB	5,000	V			1962
Pineridge	12S	7E	2	4.5	19	RB	RB	1,000	Ann	2	8	1.00
Pinet	12S	7E	1	4.0	10	EB	EB	500	V	40	297	2.54
Presley	11S	7E	27	2.0	5	EB	EB	1,000	O	4	40	3.33
Prill	12S	8E	6	5.0	24	EB	EB	1,000	V	13	31	1.19
Pyramid	9S	8E	27	5.0	9	EB	EB	1,000	Bi			1962
Rainbow	10S	6E	28	10.0	34	EB	EB	500	O	9	7	0.39
Ralph's	12S	7½E	33	2.0	11	EB	EB	500	V	14	34	1.55
Randolph	8S	3E	30	0.5		EB	EB	0	O			
Raven	12S	7½E	34	1.2	3	EB	EB	1,500	Bi	23	49	0.96
Red	9S	7E	8	6.0	7	EB	EB	1,000	Bi			1962
Red Butte	12S	7½E	23	6.0	22	EB	EB	0	O			
Rock	10S	8E	10	2.0	9	EB	EB	400	X	5	28	1.40
Rog	12S	7E	1	5.0	3	Gt	EB	500	X			1962
Russell	10S	8E	11	7.0	27	EB	EB	2,500	Ann	49	288	0.84
Sad	11S	8E	31	2.0	10	EB	EB	0	X			1962
Santiam	13S	7½E	3	16.0	40	Gt	EB	400	X			
Scar	12S	6E	30	2.5	3	EB	EB	500	O			
Scout	10S	8E	15	7.0	31	Gt	EB	500	X			
Shale	11S	8E	7, 8	1.0	14	EB	EB	360	X			

Appendix X continued

Lake	Location		Acres	Max. Depth (ft.)	Species Present	Stocking		No. of Anglers Bi	Creek Census	
	T. R.	S.				Number	Frequency		Total Fish	Fish per Hour
Sheep	9S	8E	4	3.5	9.5	EB	500	X	8	0.46
Sheep	9S	8E	31	2.0	6	EB	500	V	26	0.46
Short	9S	7E	18	2.0	18	EB	750	V	0	0.00
Slideout	9S	8E	29	5.5	18	EB	1,000	V	4	0
Snag	12S	7E	1	2.0	4			O		
Spinning	9S	8E	22	3.0	8	EB	1,000	V	6	0.33
Stuart	12S	7½E	33	1.0	11			O		
Swallow	11S	8E	6	1.5	13	EB	500	V		
Taricha	12S	7E	1	4.0	3			O		
Temple	12S	7½E	9	7.0	9	Rb	1,000	Am	4	0.20
Teto	12S	7E	14	11.0	45	EB	Nat	Nat	11	2.05
Tom's	12S	7½E	34	1.5	9	EB	V	7	16	2.93
Toni	13S	7E	2	1.0	8.5	EB	500	X		
Rule	11S	6E	1	3.0	6	EB	500	X		
Tumble	9S	5E	32	20.0	18	EB	Nat	Nat	9	1.40
Turpentine	12S	7E	12	8.0	20	EB	1,000	V		
Wall	9S	8E	4	5.0	12	EB	2,000	Bi		
Whiskey	11S	8E	30	3.0	12	EB	500	V		
Williams	5S	4E	26	4.0	4	Ct		Nat		
Whitewater	10S	8E	20	2.5	12	EB	500	X	7	1.07
Widgeon	12S	7E	23	3.0	30	EB	300	V	6	0.85

1/
 Br = brown trout Gt = golden trout
 Ct = cutthroat Rb = rainbow

Nat	- Natural reproduction maintaining population
Ann	- Stocked annually
Bi	- Stocked biennially
X	- Has been experimentally stocked but survival rates uncertain
V	- Stocked irregularly depending on need
O	- No record of stocking, population unknown

APPENDIX XI

Low Elevation Lakes in Middle Willamette Basin,
Including Fish Species Present

Lake	County	Species ^{2/}
Black ^{1/}	Benton	Wm, B, YP, WC, BC, BG, Cp, Su, Sq
Carleton ^{1/}	Yamhill	LB, BC, BG, Wm, YP, B, Rb, Su, Sq, Cp
Colorado	Benton	BC, WC, BG, Wm, Ch, LB, Su, Sq, CRC, Cp
Clear	Marion	BG, B, BC, WC, Wm, LB, Su, Sq, CRC, Cp
Deep	Marion	WC, B, LB, Cp, CRC, Sq
Finney and Egan	Marion	WC, BC, B, LB, Sq, Su, Wm, Cp
Goose	Marion	B, WC, BC, BG, LB, Sq, Su, Cp
Hayden	Polk	WC, YP, BG, B, Wm, BC, LB, Su, Sq, Cp
Horseshoe	Marion	B, LB, WC, BC, BG, Wm, YP, Su, CRC, Cp
Horseshoe	Linn	WC, BG, LB, Su, Sq, Cp
Hubbard	Marion	WC, BC, LB, BG, Wm, B, Cp, Su, Sq, CRC
Humbug	Polk	B, BC, WC, YP, LB, Wm, PK, Su, Sq, CRC, Cp
Jefferson ^{1/}	Linn	B, LB, BG
Mcbee	Benton	WC, BG, LB, YP, B, CRC, Su, Sq, Cp
Meridian ^{1/}	Marion	BC, BG, LB, B, Wm, Su, Sq, Cp, Clm, CRC
Miller (Pine)	Benton	B, WC, BG, YP, LB, Wm, BC, Su, Cp, Sq
Mission	Marion	LB, Wm, BC, WC, B, BG, PK, Clm, Cp, Sq, Su, CRC
Porter	Marion	WC, BC, B, LB, Sq, Su, Wm, Cp
Skookum	Marion	B, BG, YP, Ct, WC, LB, Su, Sq, Cp
Thorton	Benton	WC, LB, Sq, Su, Cp
Timber ^{1/}	Linn	B, BG, LB, WC, Su, GF, Sq, Cp
Waverly ^{1/}	Linn	B, LB, BG, Su, Sq, Cp
Willow	Marion	B, LB, WC, BC, BG, Wm, Su, Sq, Cp
Wilson	Linn	BG, B, YP, LB, WC, Cp, Su, Sq, CRC
Winkle	Benton	WC, B, BG, LB
Withy ^{1/}	Yamhill	BG, LB, WC, B, Wm, Su, Sq, Cp
Fourth	Linn	WC, BG, LB, B, Cp, Su, Sq
Third	Linn	WC, BG, LB, B, Cp, Su, Sq
Second	Linn	WC, BG, LB, B, Cp, Su, Sq
First	Linn	WC, BG, LB, B, Cp, Su, Sq

1/ Free public access

2/ Bullhead - B
 Black Crappie - BC
 Bluegill - BG
 Chinook Salmon - Ch
 Carp - Cp
 Columbia River Chub - CRC
 Cutthroat - Ct
 Yellow Perch - YP

Largemouth Bass - LB
 Pumpkinseed - PK
 Rainbow - Rb
 Squawfish - Sq
 Sucker - Su
 White Crappie - WC
 Warmouth Bass - Wm
 Goldfish - GF

APPENDIX XII

Oregon State Game Commission Fish Releases in the Middle Willamette Basin

Stream	Specie ^{1/}	1955	1956	1957	1958	1959	1960	1961
Abiqua Cr.	Rb	3,970	10,163	10,012	11,000	11,958	11,639	10,002
	Ct	2,004						
Baker Cr.	Rb	990	1,002			1,003	3,004	1,000
	Ct	1,002	2,008	2,006	2,001	2,000		2,004
Big Luckiamute R.	Rb		2,000	8,005	3,000	10,012	7,998	9,993
	Ct				4,998		600	
Big Cliff Res.	Rb	34,402						
Blowout Cr.	Rb	4,640	3,000	5,000		5,002	3,149	5,000
Breitenbush R.	Rb	21,120	15,003	30,023	29,004	25,995	29,607	32,098
	Ct				4,003			
Butte Cr.	Rb	1,003	3,999	3,000	6,002	6,010	5,997	6,003
	Ct	2,660						
Calapooya R.	Rb	1,929	6,021	8,056	11,997	9,479	10,011	12,007
Crabtree Cr.	Rb	2,222	2,000	1,982	3,353	2,501	2,926	3,580
Deer Cr. (Yamhill)	Rb	1,056	996		999	1,033	1,002	1,002
Detroit Res.	Rb	250,293	254,914	353,504	305,491	389,770	282,979	495,454
	Ct		16,125				484,260	541,404
	K							430,916
French Cr.	Rb	1,003		1,003	4,003			2,001
Hamilton Cr.	Rb	1,000	1,002	1,000	1,000	1,002	1,002	1,002
Little Luckiamute R.	Rb	3,262	10,004	7,007	5,001	7,994	8,003	8,001
	Ct	1,859			2,997		300	
Little North Fork	Rb	10,249	10,007	20,006	20,007	19,512	20,018	12,555
Lost Lake Cr.	Rb				10,000			
Luckiamute R.	Rb	6,191	8,004	1,999	2,004		1,996	
Marion Cr.	Rb	2,520	2,000	5,003	10,002	5,007	4,071	4,995
Marys R.	Rb	3,251	3,000	4,002	5,003	4,997	4,997	5,011
	Ct	1,280				300		
McDowell Cr.	Rb	700	1,002	1,000	1,002	1,002	998	1,002

Appendix XII continued

Stream	Species	1955	1956	1957	1958	1959	1960	1961
McKay Cr.	Rb	1,002	997	998	1,003	2,002		
	Ct	1,001						
Milk Cr.	Rb	4,913	1,804	2,013	2,008	2,020	1,999	2,005
Mill Cr. (Willamette)	Rb	1,535	1,003	5,754	1,998	5,514	1,508	1,506
Mill Cr. (Yamhill)	Rb		671	885	999		2,002	2,000
Molalla R.	Rb	16,023	16,403	19,068	12,188	18,109	18,968	18,198
	Ct				3,000			
Panther Cr.	Rb		1,002	1,001	999			
	Ct	998						
Quartzville Cr.	Rb	3,963	8,149	6,996	8,993	8,997	8,978	9,989
Rickreall Cr.	Rb	1,008	4,009	3,002	3,003	2,998	2,999	3,007
	Ct	700						
Roaring R. (Crabtree Cr.)	Rb	2,987	1,059	1,003	1,713	1,501	1,094	2,476
	St				19			3
	Ct					146		
	Ch						4,997	
Rock Cr. (Pudding)	Rb	1,000	1,003		1,000		1,001	1,000
Santiam R., N. Fk. (Section I)	Rb	31,446	13,005	25,005	25,508	15,011	16,010	15,264
Santiam R., N. Fk. (Section II)	Rb	24,405	25,018	30,019	42,024	39,953	40,916	39,987
Santiam R., Mid. Fk.	Rb	5,043	7,004	4,008	2,996	2,998	2,999	999
Santiam R., S. Fk.	Rb	6,590	9,690	10,008	12,008	12,001	14,870	15,853
Silver Cr., N. Fk.	Rb		2,998	1,001	1,949	504		1,501
Silver Cr., S. Fk.	Rb	990		2,001	1,004	1,003	948	999
Stout Cr.	Rb			1,002	1,998			
Thomas Cr.	Rb	1,147	1,590	2,014	2,000	1,007	1,501	1,499
Wiley Cr.	Rb			1,001	1,501	1,003		

Appendix XII continued

Stream	Species	1955	1956	1957	1958	1959	1960	1961
Willamina Cr.	Rb	1,056	5,005	4,000	4,017	3,996	3,995	4,003
Yamhill R.	Rb	3,655	4,998	6,000	2,660	5,994	5,703	6,008
Yamhill R., N. Fk.	Rb	1,056	4,996	2,001	4,005	4,009	3,015	4,013

1/ Ch - Chinook salmon
 Ct - Cutthroat trout
 K - Kokanee
 Rb - Rainbow trout
 St - Steelhead

APPENDIX XIII

Creel Census - 1962
 Middle Willamette Basin Streams, Including Species
 in Catch

Stream	No. of Anglers	Hours Fished	Rb	Ct	K	St	Ch	Wf	Total Fish	Fish per Angler	Fish per Hour
N. Santiam R.	261	475	384	2	2		6	3	397	1.54	0.84
Breitenbush R.	223	401	711						711	3.95	1.77
Little North Fk.	166	464	574					1	575	3.46	1.24
Santiam R.	39	57			3				3	0.08	0.05
Blowout Cr.	16	37	64						64	4.00	1.73
Cedar Cr.	4	6	3						3	0.75	0.50
French Cr.	19	49	30	36					66	3.47	1.35
Marion Cr.	6	12	6	20					26	4.34	2.16
Pamelia Cr.	4	12			8				8	2.00	0.67
Tumble Cr.	1	3	5	1					6	6.00	2.00
S. Santiam R.	218	474	419	1	1	1			421	1.97	0.89
Canyon Cr.	4	16	4						4	1.00	0.25
Crabtree Cr.	21	14	46	1					47	2.24	3.36
Roaring R.	73	134	175	14					189	2.59	1.41
Hamilton Cr.	33	54	48	15					63	1.91	1.17
McDowell Cr.	16	40	50	7					57	3.56	1.42
Middle Santiam R.	7	22				2			2	0.28	0.09
Quartzville Cr.	175	435	521	2		6			529	2.95	1.22
Canal Cr.	9	13	5			2			7	0.77	0.59
Rumbaugh Cr.	5	20			1				1	0.20	0.05
Whitcomb Cr.	4	12	2	1					3	0.75	0.25
Thomas Cr.	53	78	62	2		4			68	1.28	0.87
Neal Cr.	21	53	5	14					19	0.90	0.36

Appendix XIII continued

Stream	No. of Anglers	Hours Fished	Rb	Ct	K	St	Ch	Wf	Total Fish	Fish per Angler	Fish per Hour
Wiley Cr.	63	161	10	25	1				36	0.57	0.22
Willamette R.	10	16		9					9	0.90	0.56
Calapooya R.	341	903	446	54	4		1		506	1.48	0.56
Luckiamute R.	38	94	76	16					92	2.42	0.98
L. Luckiamute R.	36	70	143	4					147	4.10	2.10
Teal Cr.	1	2		5					5	5.00	2.50
Pedee Cr.	1	1		2					2	2.00	2.00
Soap Cr.	4	3		1					1	0.25	0.33
Marys R.	61	207	102	49					151	2.48	0.73
Oliver Cr.	8	12		14					14	1.75	1.17
Marys R., W.Fk.	2	6		17					17	8.50	2.83
Woods Cr.	2	1							0	0.00	0.00
Molalla R.	36		51		2				53	1.50	0.60
Abiqua Cr.	194	475	266	12	3				281	1.45	0.58
Powers Cr.	6	19	1						1	0.17	0.05
Butte Cr.	23	66	11	40					51	2.22	0.77
Coal Cr.	4	24		8					8	2.00	0.33
Drift Cr.	5	25		2					2	0.40	0.08
Silver Cr., N.Fk.	14	82	12	15					27	1.93	0.33
Silver Cr., S.Fk.	1	1							0	0.00	0.00
Rickreall Cr.	47	113	10	52					62	1.32	0.55
South Yamhill R.	13	53	2	22					24	1.85	0.45
Rock Cr.	40	187	2	159					161	4.03	0.86
Mill Cr.	81	247	92	114					206	2.54	0.84
Cedar Cr.	3	6		11					11	3.67	1.86
Gooseneck Cr.	6	18		7			1		8	1.33	0.44
Mill Cr., S.Br.	1	5		3					3	3.00	0.60

APPENDIX XIV

A Comparison of Trout Angler Effort and Success
Middle Willamette Streams, 1959-1962

Streams	1959			1960			1961			1962		
	No. of Anglers	Total Fish	Fish per Hour	No. of Anglers	Total Fish	Fish per Hour	No. of Anglers	Total Fish	Fish per Hour	No. of Anglers	Total Fish	Fish per Hour
No. Santiam R.	244	506	1.01	726	1,347	0.77	317	846	1.56	264	397	0.84
Breitenbush R.	259	642	1.24	254	594	0.90	105	260	1.31	223	711	1.77
Little North Fork	194	424	1.08	148	360	0.91	166	180	0.41	166	575	1.24
Santiam R.	37	2	0.03	7	2	0.13	86	286	1.29	39	3	0.05
Blowout Cr.	47	240	2.20	63	298	1.45	4	0.80	4	16	64	1.73
Cedar Cr.	6	8	1.33	4	4	0.80	57	0.80	4	4	3	0.50
French Cr.	27	78	1.04	37	80	1.00	42	120	1.43	6	26	2.16
Marion Cr.	3	4	1.00	12	27	0.90	5	20	0.80	4	8	0.67
Pamelia Cr.							7	26	1.53	1	6	2.00
Tumble Cr.							76	112	1.15	218	421	0.89
Se. Santiam R.	175	559	0.98	134	122	0.37	3	0.21	4	0	4	0.25
Canyon Cr.				3	3	0.21	32	2	0.07	21	47	3.36
Crabtree Cr.	101	168	0.68	94	65	0.39	61	47	0.68	73	189	1.41
Roaring Cr.	56	69	0.64	63	72	0.53	23	13	0.39	9	69	1.17
Hamilton Cr.	22	14	0.50	23	39	0.70	5	2	0.33	16	57	1.42
McDowell Cr.	10	18	1.05	39	39	0.70	7	0.35	8	0	7	0.09
Middle Santiam R	42	48	0.44	4	7	0.35	333	0.90	172	341	0.92	175
Quartzville Cr.	106	105	0.44	157	27	0.29	9	6	0.33	9	7	0.59
Canal Cr.	5	6	0.85	25	12	0.45	25	17	0.52	53	68	0.87
Thomas Cr.	20	11	0.27	74	25	0.45	7	1	0.11	21	19	0.36
Neal Cr.	21	9	0.38	22	60	0.80	45	43	0.42	63	36	0.22
Wiley Cr.	48	49	0.58	74	227	0.68	106	248	0.28	10	9	0.56
Willamette R.							106	269	0.80	341	506	0.56
Calapooya R.	175	230	0.58	73	106	0.55	203	0.28	358	1.94	36	0.98
Luckiamute R.	138	383	0.79	74	227	0.68	98	269	0.80	38	92	-
Little Luckia- mуте R.	155	399	1.43	242	467	0.78	106	1.00	1	1	5	2.50
Teal Cr.	4	3	0.60	6	10	1.00				1	2	2.00
Pedee Cr.	2	2	0.33							4	1	0.33
Soap Cr.				3	0	-				151	0.73	-
Marys R.	12	10	0.44	35	83	0.90	17	22	0.65	61	0	-
Woods Cr.				4	5	0.25	11	8	0.53	2	-	-

Appendix XIV Continued

Streams	1959			1960			1961			1962		
	No. of Anglers	Total Fish	Fish per Hour	No. of Anglers	Total Fish	Fish per Hour	No. of Anglers	Total Fish	Fish per Hour	No. of Anglers	Total Fish	Fish per Hour
Mollalla R.	297	391	0.67	478	943	0.89	230	315	0.62	194	281	0.58
Abiqua Cr.	10	11	1.11	122	235	0.83	30	59	0.83	23	51	0.77
Powers Cr.	8	144	1.19	21	40	1.08	2	12	1.20	4	8	0.33
Butte Cr.	71	14	0.93							5	2	0.08
Coal Cr.	11											0.33
Drift Cr.	1	2	1.00							14	27	
Silver Cr., N.Fk.	5	8	0.88	16	34	0.95	24	23	0.32			
Silver Cr., S.Fk.	1	10	5.00	11	13	0.47	20	26	0.59	1	0	
Rickreall Cr.	41	72	0.64	81	147	0.68	85	184	1.12	47	62	0.55
South Yamhill R.										33	1.22	13
Rock Cr.										19	24	0.45
Mill Cr.										13	40	1.22
Ritner Cr.				6	10	34	0.95	13	28	161	2.81	81
Willamina Cr.					19	8	0.28	59	161		206	0.84
						5	0.45	12	28			0.82

APPENDIX XV

Fish Species Present in Middle Willamette Basin (Bond, 1961)

Acipenseridae - Sturgeons^{1/}
White Sturgeon, *Acipenser transmontanus*

Centrarchidae - Sunfishes^{1/}
Bluegill, *Lepomis macrochirus*
Black Crappie, *Pomoxis nigromaculatus*
White Crappie, *Pomoxis annularis*
Largemouth Bass, *Micropterus salmoides*
Smallmouth Bass, *Micropterus dolomieu*
Pumpkinseed, *Lepomis gibbosus*
Warmouth, *Chaenobryttus gulosus*

Cottidae - Sculpins
Cottus spp. (probably 5 species)

Catostomidae - Suckers
Mountain Sucker, *Pantosteus platyrhynchus*
Largescale Sucker, *Catostomus macrocheilus*

Cyprinidae - Minnows
Carp, *Cyprinus carpio*
Chiselmouth, *Acrocheilus alutaceus*
Columbia River Chub, *Mylocheilus caurinus*
Dace, *Rhinichthys* spp. (3 species)
Goldfish, *Carassius auratus*
Oregon Chub, *Hybopsis crameri*
Redside Shiner, *Richardsonius balteatus*

Gasterosteidae - Stickleback
Three-spined Stickleback, *Gasterosteus aculeatus microcephalus*

Ictaluridae - Catfishes
Black bullhead, *Ictalurus melas*^{1/}
Brown bullhead, *Ictalurus nebulosus*^{1/}
Yellowhead, *Ictalurus natalis*^{1/}
Channel catfish, *Ictalurus punctatus*^{1/}

Percidae - Perch
Yellow Perch, *Perca flavescens*^{1/}

Percopsidae - Trout perches
Sandroller, *Percopsis transmontana*

Petromyzonidae - Lamprey
Western Brook Lamprey, *Lampetra planeri*
Pacific Lamprey, *Lampetra tridentata*

Appendix XV continued

Salmonidae - Trout, Salmon and Whitefish ^{1/}

Brook Trout, *Salvelinus fontinalis*
Brown Trout, *Salmo trutta*
Chinook Salmon, *Oncorhynchus tshawytscha*
Coastal Cutthroat Trout, *Salmo clarki clarki*
Coho Salmon, *Oncorhynchus kisutch*
Dolly Varden Trout, *Salvelinus malma*
Golden Trout, *Salmo aguabonita*
Kokanee, *Oncorhynchus nerka kennerlyi*
Rainbow, *Salmo gairdneri*
Sockeye Salmon, *Oncorhynchus nerka*
Steelhead, *Salmo gairdneri gairdneri*
Whitefish, *Prosopium* sp.

1/ Species defined as "game fish" in Oregon Game Code, 1961-1962.

APPENDIX XVI

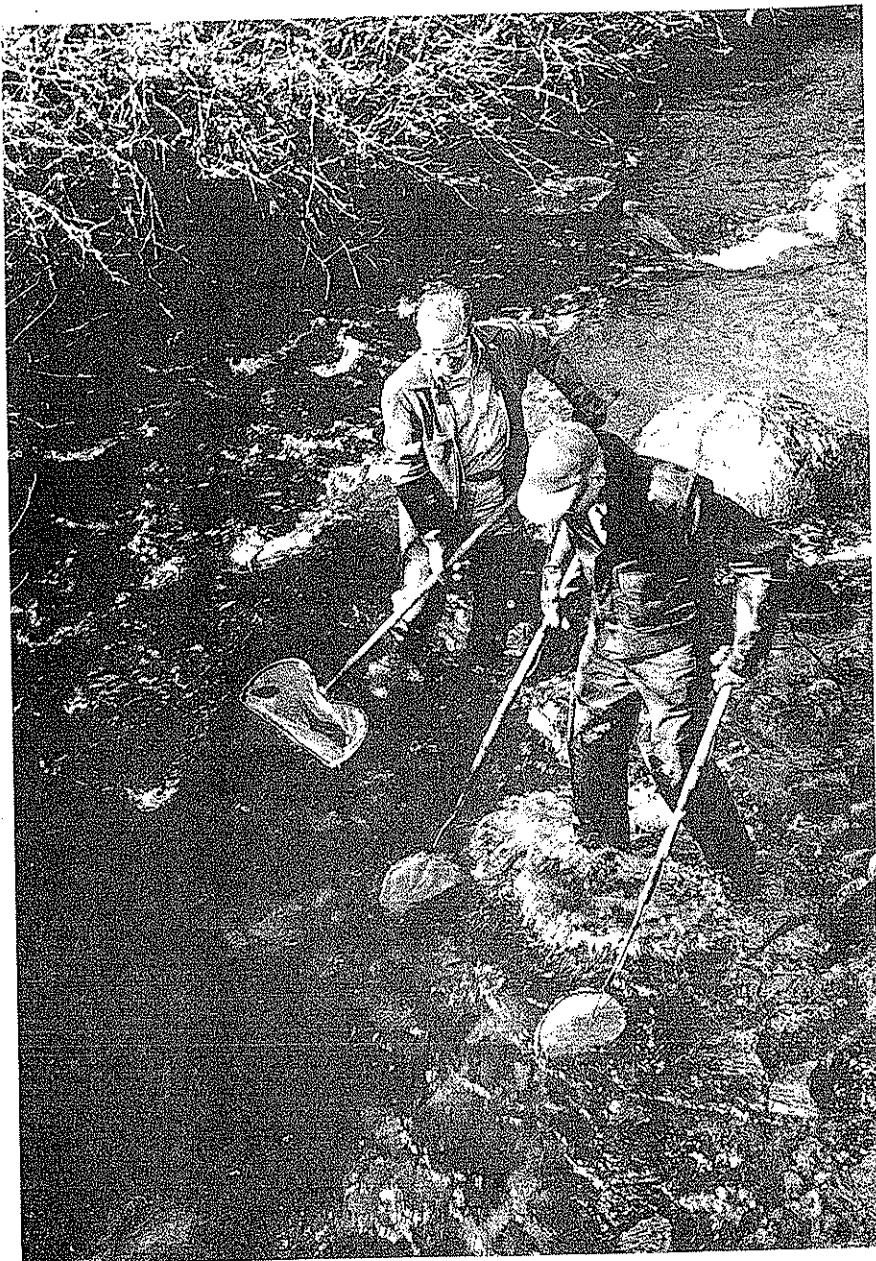


Figure 1. Fish collecting -- showing electrodes of shocker. 1962.

Appendix XVI continued

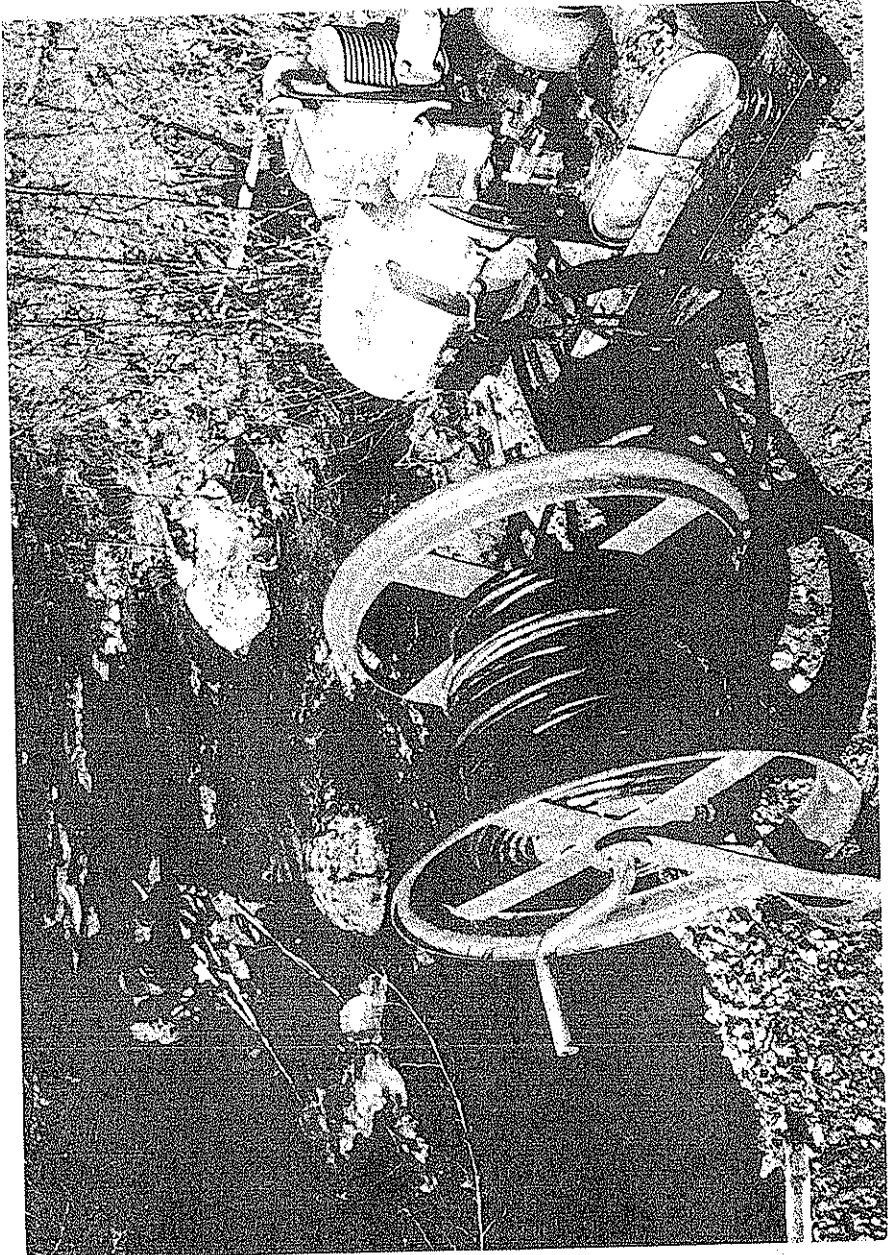


Figure 2. Electric shocker (220 volts) used in fish distribution study. 1962.

Appendix XVI continued

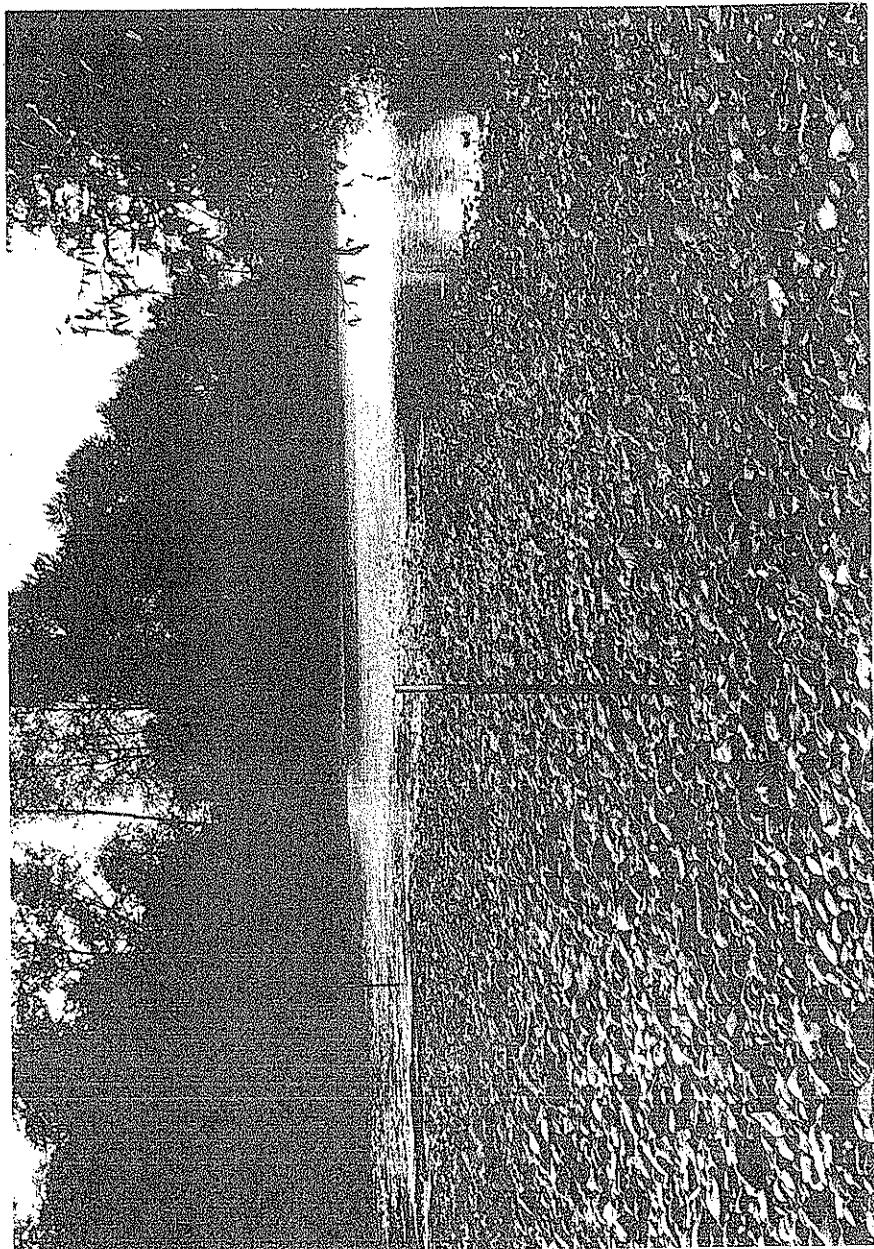


Figure 3. Spawning gravel transect in South Santiam River, river mile 24.0.
Flow 490 c.f.s. at U.S.G.S. Waterloo gage. October 19, 1961.

Appendix XVI continued

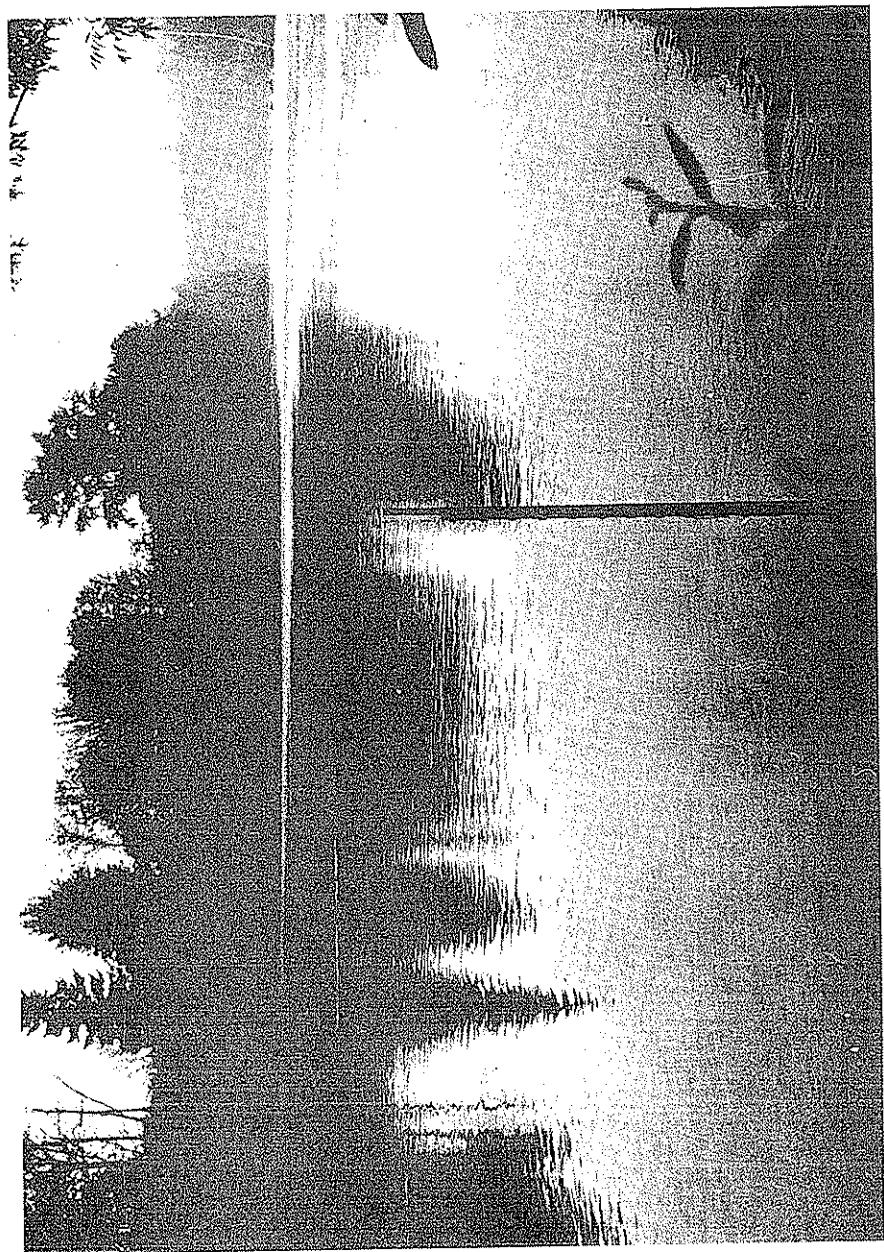


Figure 4. Spawning gravel transect in South Santiam River, river mile 26.7.
Flow 490 c.f.s. at U.S.G.S. Waterloo gage. October 19, 1961.

Appendix XVI continued

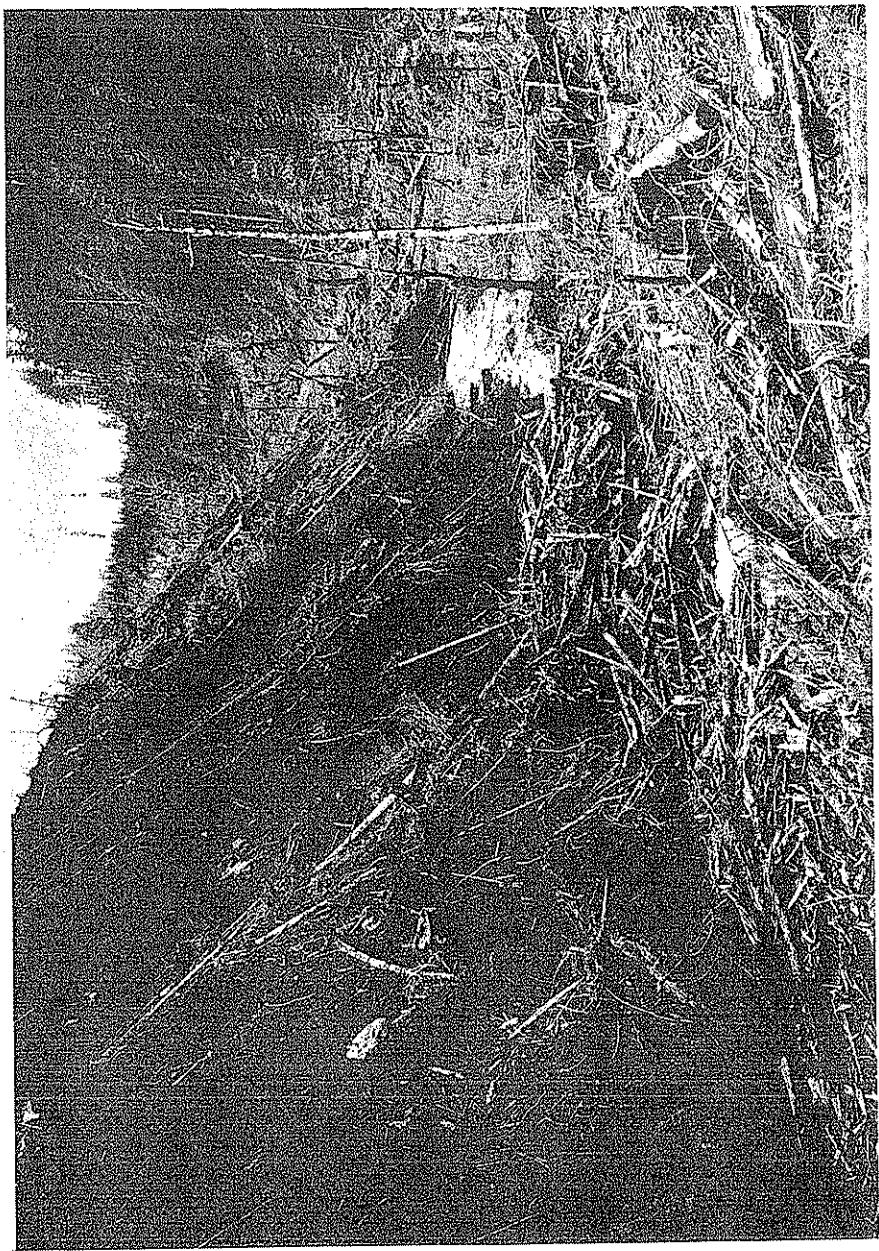


Figure 5. Severe stream obstruction from logging debris. Tally Creek (Middle Santiam River). January 26, 1962.

Appendix XVI continued

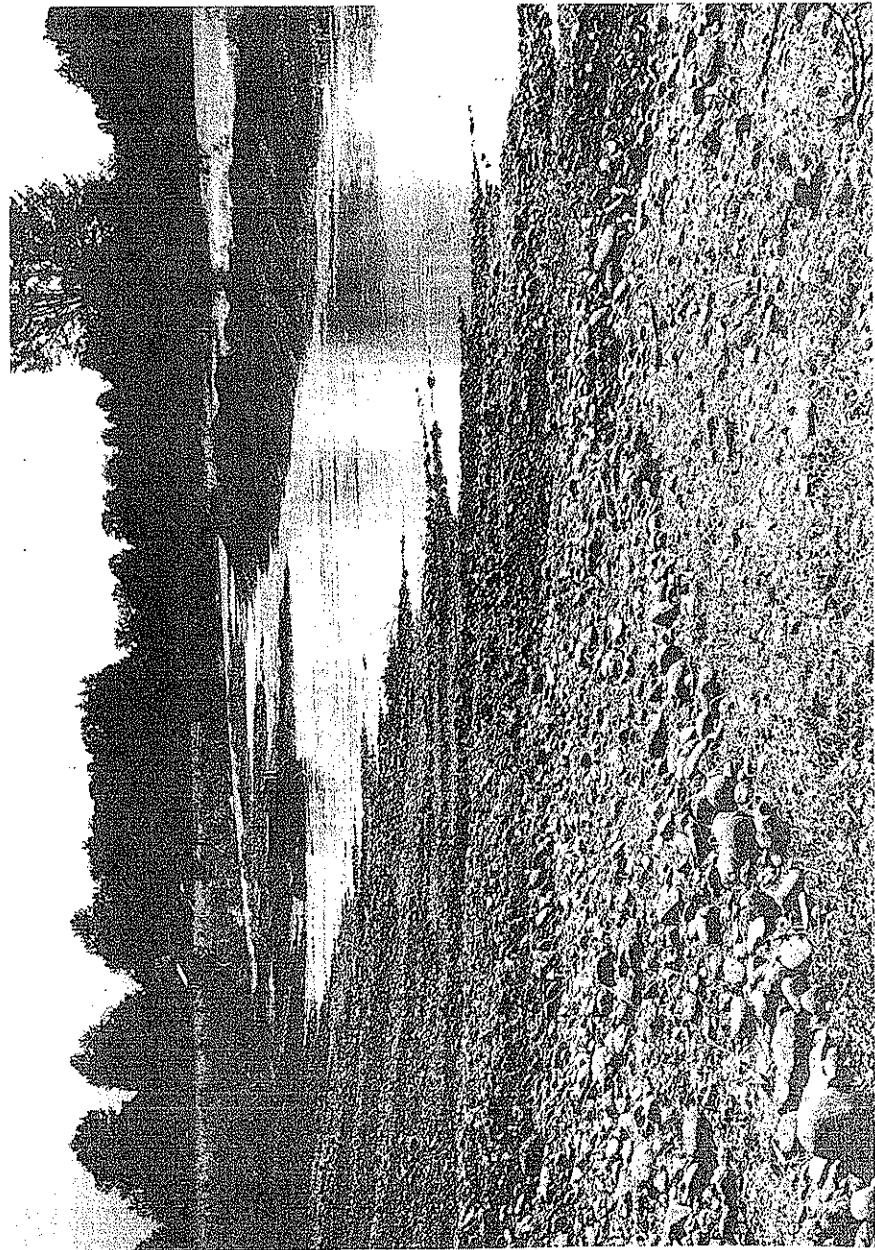


Figure 6. Removal of spawning gravel by channel straightening operation.
Crabtree Creek, August 1961.

Appendix XVI continued

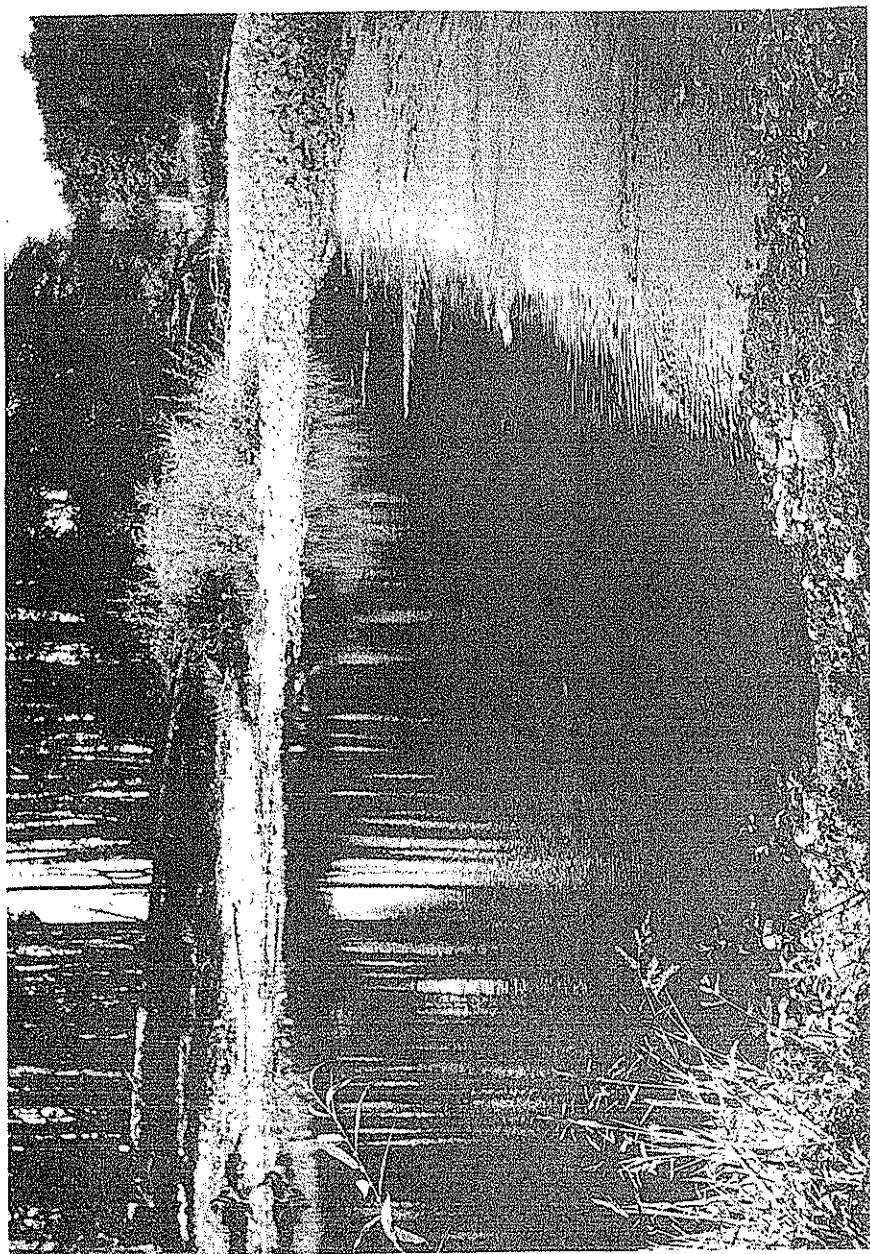


Figure 7. Spawning bar before channel straightening. Thomas Creek, river mile 10.0. August, 1961.

Appendix XVI continued

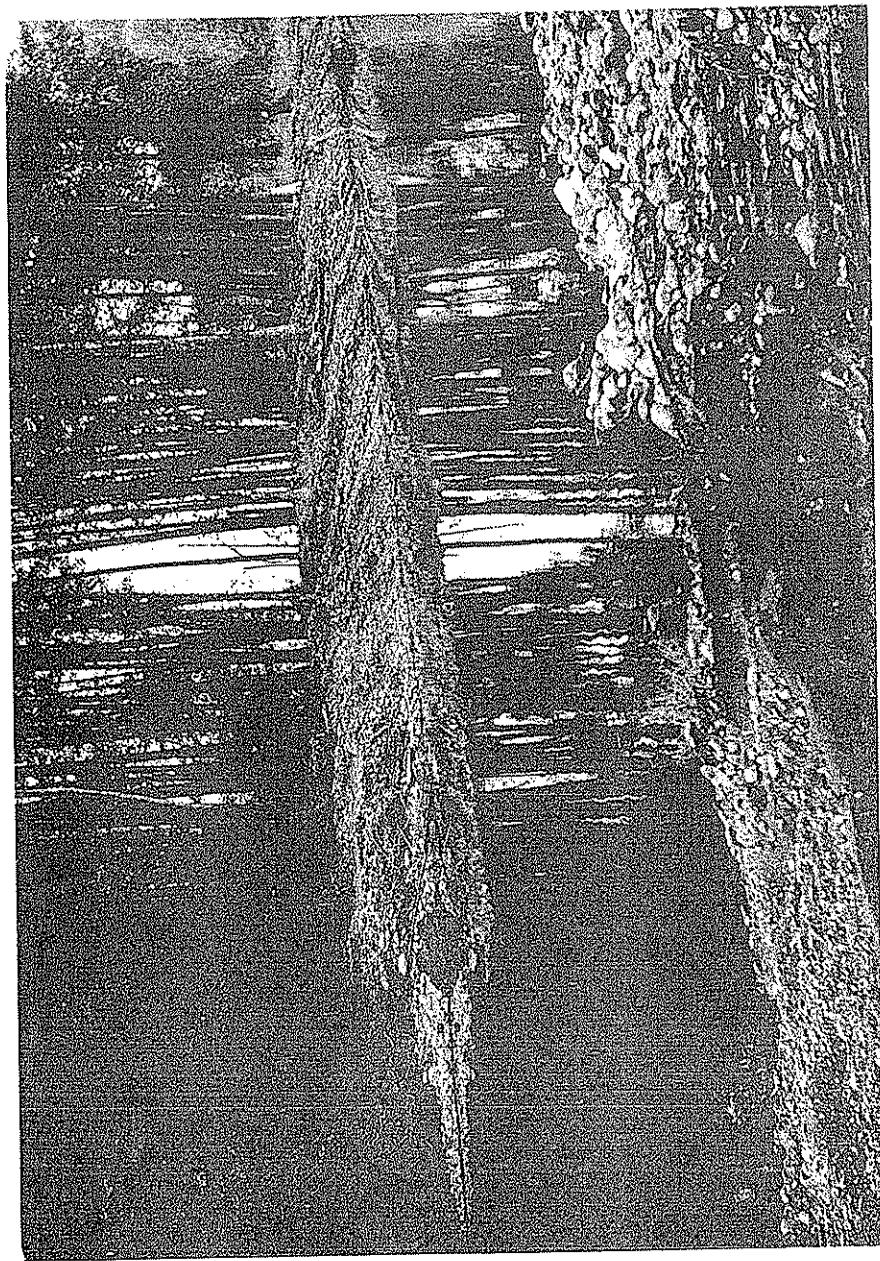


Figure 8. Spawning bar shown in Figure 7 after channel straightening. Thomas Creek, river mile 10.0. September, 1961.

This subbasin contains 221 private stocked fish ponds and one private hatchery. These are not open to the public except those operated on a fee-fishing basis.

Table II-36
Minimum flows for fish life recommended to Oregon State Water Resources Board
by Oregon State Game Commission (cfs) 1/

<u>Stream</u>	<u>Location</u>	<u>Dec.-May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>
Luckiamute River 2/	Mouth	200	70	50	40	30	25	2/
" "	Hoskins R. mi. 38.5	120	40	30	20	15	15	15
Little Luckiamute R.	River mile 5	80	50	35	25	20	15	20
Maxfield Creek	Mouth	12	3	1	1	1	1	2
Pedee Creek	"	25	12	8	6	5	5	10
N. Fk. Pedee Cr.	"	35	20	7	5	4	4	10
S. Fk. Pedee Cr.	"	6	2	1	1	1	1	2
Price Creek	"	25	4	2	1	1	1	2
Ritner Creek	"	45	8	6	4	3	2	4
Clayton Cr.	"	8	2	1	1	1	1	2
Sheythe Cr.	"	13	2	1	1	1	1	2
Marys River 3/	"	135	70	40	20	15	2/	15
" "	River mile 30	75	40	15	10	6	6	2/
Blakesly Cr.	Mouth	8	2	1	1	1	1	2
Greasy Cr.	"	30	20	15	10	7	5	10
Rock Cr.	"	25	7	5	4	2	2	4
Oak Creek	"	10	3	2	2	2	2	4
Tumtum River	"	30	20	15	10	6	4	10
Mulkey Cr.	"	9	4	3	2	1	1	2
Shotpouch Cr.	"	25	8	6	5	3	2	4
W. Fk. Marys R.	River mile 3	14	5	3	3	2	2	4
Oleman Cr.	Mouth	18	3	1	1	1	1	2
Woods Cr.	"	15	6	4	3	2	2	4
Rickreall Cr.	"	80	18	12	8	5	2/	5
Yamhill River	"	90	80	70	60	40	30	30
North Yamhill R.	Pike Riv. mi. 20.8	70	40	25	15	10	10	10
Baker Cr.	3 mi. upstream from mouth	30	12	9	7	6	4	6
Cedar Cr.	Mouth	12	6	4	3	2	1	4
Fairchild Cr.	"	25	12	9	7	6	4	8
Haskins Cr.	"	25	5	3	3	2	2	3
Panther Cr.	Just downstream from Kane Cr.	25	6	4	4	3	3	5
Turner Cr.	Mouth	25	8	6	5	3	2	3
South Yamhill R.	"	70	70	50	40	35	2/	40
" " "	Sheridan Riv. mi. 37.5	200	150	100	60	40	35	50
" " "	Just upstream from Willamina Cr. Riv. mi. 43	150	70	40	25	20	20	150
Agency Cr.	Mouth	80	25	20	15	10	8	6
Wind R.	"	10	6	3	1	1	1	6
Casper Cr.	"	25	4	3	2	1	1	4
Bad Cr.	"	25	5	4	3	3	3	5
Gold Cr.	"	25	4	3	2	1	1	2
Hanchet Cr.	"	11	2	1	1	1	1	2
Kitten Cr.	"	16	2	1	1	1	1	2
Mill Cr.	"	80	15	10	7	5	2/	80
Gooseneck Cr.	"	10	5	4	2	1	1	2
Pierce Cr.	"	12	5	4	2	1	1	2
Rock Cr.	"	70	30	25	20	15	10	4/
Cow Cr.	"	10	2	1	1	1	1	2
Joe Day Cr.	"	7	2	1	1	1	1	2
Rogue R.	"	35	10	5	4	3	2	4
Powell Cr.	"	45	15	8	6	5	4	8
Willamina Cr. 5/	"	70	50	30	20	20	20	40
Coast Cr.	"	35	25	15	6	4	4	25
Burton Cr.	"	10	8	5	2	1	1	5
Canada Cr.	"	20	16	8	3	2	2	10
E. Willamina Cr.	"	30	25	20	15	10	8	15
								30

1/ Where 2 figures are shown, minimums change during the month.

2/ The flow figures consider only quantity requirements and will not be adequate to correct the existing high temperature problems existing in these streams.

3/ Minimum spawning flows for coho salmon and steelhead are included where potential exists although the species might not be present.

4/ Minimum flows for fall chinook if they become established.

5/ Spawning flow recommendations by Fish Commission of Oregon.

Table II-42
Minimum flows for fish life recommended to Oregon State Water Resources Board
by Oregon State Game Commission (cfs) 1/

<u>Stream</u>	<u>Location</u>	<u>Dec.-May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>
Molalla R. 2/ 3/	Confl. with Pudding R.	300	200	150	100	80	80	300
" " 3/	Upstream from confl. of N. Fk. Molalla	140	120	90	50	50	140	140
" " 3/	Upstream from confl. of Table Rock	80	50	30	20	20	80	80
Cedar Cr.	Mouth	5	3	1	1	1	3	5
Dickey Cr.	"	5	3	2	2	2	3	5
Gawley Cr.	"	20	15	9	7	3	9	15
Gribble Cr.	"	13	13	10	7	3	6	10
Milk Cr.	"	85	60	45	40	30	20	40
Nate Cr.	Confl. of Nate Cr.	40	40	30	20	15	10	30
Nate Cr.	Mouth	30	8	6	4	4	4	8
Canyon Cr.	"	12	4	3	2	2	2	4
Bee Cr.	"	9	6	3	2	1	1	3
Mill Cr.	"	12	6	3	1	1	1	2
Jackson Cr.	"	20	6	4	3	3	3	6
Nate Cr.	Nate Cr., Randall 6/	8	4	2	1	1	1	3
Woodcock Cr.	1 mi. upstream from mouth	10	3	2	1	1	1	7
N. Fork Molalla R.	Mouth	80	50	30	20	20	20	80
Ogle Cr.	"	25	10	5	3	1	1	5
Pine Cr.	"	50	7	5	4	3	3	6
Pudding River 2/	"	80	60	40	50	40	40	80
Abiqua Cr.	"	75	60	40	25	20	15	60
"	Confl. of L. Abiqua Cr.	50	50	20	15	4/	4/	60
L. Abiqua Cr.	Mouth	20	10	9	5	4	10	40
Powers Cr.	"	25	10	5	3	3	3	50
Butte Cr.	"	75	50	35	20	16	12	75
Drift Cr.	"	40	20	5	3	2	2	40
E. Fk. Drift Cr.	"	20	15	3	3	1	1	20
W. Fk. Drift Cr.	"	10	10	2	2	1	1	10
Silver Cr.	"	60	50	35	20	16	12	30
Table Rock Fork	"	80	50	30	20	80	80	80
Trout Creek	"	35	8	6	4	4	10	15

Where 2 figures are shown, minimums change during the month.

2/ Minimum spawning flows for coho salmon are included where potential exists but the species might not be present.

3/ Spawning flow recommendations by Fish Commission of Oregon.

4/ The flow figures consider only quantity requirements and will not be adequate to correct the existing high temperature problems existing in these streams.

Canyon Cr. (cont.)	0.5 mile below Owl Cr. upstream <u>10/</u>	16	9	8	16	65	--	--	350	150	150	--	--	--	--	--
Owl Cr.	(Mouth) <u>10/</u>	5	3	4	5	40	--	--	200	90	50	--	--	--	--	--
Boundary	(Mouth) <u>10/</u>	1	0.7	0.6	1	20	--	--	10	10	--	--	--	--	--	--
Soda Fork	(Mouth) <u>10/</u>	9	5	4	9	60	--	--	150	250	--	--	--	--	--	--
Calapooia R.	Mouth to Holley (USGS gage 14-1735) <u>8/</u>	78	39	44	171	160	--	1300	400	--	250	1200	1800	--	2000	--
Holley upstream (USGS gage 14-1720) <u>8/</u>		70	41	44	151	140	--	1200	600	750	--	140	1800	150	250	2600
Brush Cr.	(Mouth) <u>10/</u>	5	3	3	15	35	--	--	400	150	--	--	--	--	--	--
Subbasin 6																
Yamhill R.	Mouth to Forks <u>8/</u>	128	69	108	505	90	--	--	--	--	--	--	--	--	--	--
S. Yamhill	Mouth to 2.5 miles below Deer Cr. <u>8/</u>	94	49	88	417	70	--	--	150	100	--	--	--	--	--	--
	2.5 miles below Deer Cr. to Willamina Cr. <u>8/</u>	94	49	88	417	200	--	700	400	300	--	225	--	950	1600	1500
	Willamina Cr. to Rock Cr. <u>8/</u>	41	25	50	217	150	--	150	150	60	--	150	--	200	700	500
	Rock Cr. upstream <u>16/</u>	29	20	41	165	70	--	100	850	550	--	70	--	60	550	400
Hill Cr.	Mouth <u>8/</u>	11	7	11	80	80	--	350	950	1300	--	80	--	300	500	500
	Gooseneck Mouth <u>10/</u>	1	0.5	0.5	3	10	--	--	200	200	--	--	--	--	--	--
	Willamina Mouth <u>8/</u>	32	21	23	74	70	--	150	700	250	300	70	--	200	450	60
	Coast Cr.															
Canada	Mouth <u>10/</u>	3	2	2	8	20	--	--	90	100	--	--	--	--	--	--
Burton	Mouth <u>10/</u>	1	0.7	0.9	4	10	--	--	50	40	--	--	--	--	--	--
E. Fork	Mouth <u>10/</u>	11	7	8	32	30	--	--	700	300	--	--	--	--	--	--
Willamina																
Gold Cr.	Mouth <u>10/</u>	2	0.8	2	9	25	--	--	200	100	--	--	--	--	--	--
Chesper Cr.	Mouth <u>10/</u>	2	0.7	1	8	25	--	--	--	--	--	--	--	--	--	--
Kewell Cr.	Mouth <u>10/</u>	8	3	6	35	45	--	--	500	300	--	--	--	--	--	--
Wick Cr.	Mouth <u>10/</u>	25	11	11	62	70	--	--	70	200	300	--	70	--	90	350

Addendum A (inued)

Stream	Stream Section or Measuring Point	Existing Summer Flows 2/ Monthly Mean (c.f.s.)			Minimum Flow Required for Balances of Year 3/			Present Potential Escapement			Optimum Flow (c.f.s.) & Resulting Additional Escapement 4/			
		July	August	Sept.	Oct.	S. Chin.	F. Chin.	H. Chin.	S. Coho	F. Coho	S. Chin.	S. Chin.	W. Chin.	S. Sthd.
Rock Cr. (cont.)	Mouth	No measurements				10	--	--	10	--	--	--	--	--
Cow Cr.	Mouth	No measurements				7	--	--	90	60	--	--	--	--
Joe Day	Mouth	5	1	1	7	35	--	--	350	200	--	--	--	--
Rogue R.	Mouth <u>10/</u>	20	6	6	34	80	--	--	850	500	--	--	--	--
Agency Cr.	Mouth <u>10/</u>	1	0.5	0.5	2.8	10	--	--	--	50	--	--	--	--
Wind R.	Mouth <u>10/</u>	9	4	3	14	25	--	--	100	80	--	--	--	--
Ead Cr.	Mouth <u>10/</u>	2	1	0.7	4	12	--	--	40	30	--	--	--	--
Pierce Cr.	Mouth <u>10/</u>	1	0.6	0.3	2	16	--	--	20	--	--	--	--	--
Kitten Cr.	Mouth <u>10/</u>	0.9	0.4	0.2	1	11	--	--	20	--	--	--	--	--
Hanchet	Mouth <u>10/</u>	34	20	20	88	70	--	--	650	400	--	70	--	200
N. Yamhill R.	Mouth to Pike <u>14/</u>	14	9	12	29	70	--	--	1100	600	--	--	--	--
Pike upstream <u>14/</u>		10	6	4	29	30	--	--	80	150	--	--	--	--
Baker Cr.	3 miles above mouth <u>10/</u>	4	2	3	12	25	--	--	250	200	--	--	--	--
Panther	Below Kane Cr. <u>10/</u>	6	3	1	18	25	--	--	200	100	--	--	--	--
Turner Cr.	Mouth <u>10/</u>	3	1	2	7	12	--	--	30	30	--	--	--	--
Cedar Cr.	Mouth <u>10/</u>	7	5	4	8	25	--	--	40	40	--	--	--	--
Haskins	Mouth <u>8/</u>	9	3	3	26	25	--	--	150	100	--	--	--	--
Fairchild	Mouth <u>10/</u>	8	4	7	44	80	--	--	500	400	--	80	--	600
Rickreall Cr.	Mouth <u>8/</u>	66	36	51	184	200	--	--	100	100	--	200	--	70
Luckiamute R.	Mouth to Pedee Cr. <u>8/</u>	40	23	29	105	200	--	--	250	40	--	200	--	150
Pedee to Haskins <u>8/</u>		22	14	20	73	120	--	--	200	1200	1000	120	--	80
Haskins upstream <u>8/</u>		21	13	19	23	80	--	--	100	350	200	80	--	70
L.Luckiamute	River mile 5 <u>10/</u>													200

Addendum A (continued)

Stream	Stream Section or Measuring Point	Existing Summer Flows 2/ Monthly Mean (c.f.s.)		Minimum Flow Required for Balance of Year 3/		Present Potential Escapement		Optimum Flow (c.f.s.) & Resulting Additional Escapement 4/			
		July	August	Sept.	Oct.	S. Chin.	F. Chin.	S. Coho	F. Chin.	W. Chin.	S. Coho
Molalla R. (cont.)	Table Rock Fk. upstream 8/	18	28	54	154	80	150	200	250	150	80
Milk Cr.	Mouth 10/ to Nate Cr. 10/	51	25	18	22	85	--	150	350	550	80
	Nate Cr. upstream 10/	26	12	8	54	40	--	--	600	350	--
Woodcock	Mouth to Sorenson Cr. 10/	2	0.5	0.5	3	10	--	--	200	--	--
Nate Cr.	Mouth 10/	4	3	3	19	20	--	--	250	150	--
N.F. Nate	Mouth 10/	3	1	1	8	8	--	--	30	--	--
Canyon	Mouth 10/	6	4	3	17	30	--	--	100	150	--
Bee Cr.	Mouth 10/	3	3	2	12	12	--	--	--	--	--
Jackson	Mouth 10/	4	2	2	13	12	--	--	30	--	--
Hill Cr.	Mouth 10/	3	0.6	0.6	10	9	--	--	40	--	--
Dickey Cr.	Mouth 10/	0.7	0.3	0.5	3	5	--	--	20	--	--
Cedar Cr.	Mouth 10/	1	0.5	0.5	3	5	--	--	40	--	--
N.F. Molalla	Mouth 10/	47	21	28	187	80	--	--	250	1600	--
Trout Cr.	Mouth 10/	7	4	3	17	35	--	--	20	100	--
Pine Cr.	Mouth 10/	6	4	3	17	50	--	--	80	--	--
Gawley Cr.	Mouth 10/	9	4	2	16	20	--	--	20	100	--
Table Rock Fk.	Mouth 10/	50	23	17	115	80	--	--	100	600	--
Ogle Cr.	Mouth 10/	2	0.9	0.9	6	25	--	--	--	--	--
Pudding R.	Mouth 8/	104	53	81	353	80	--	--	100	--	--
Butte Cr.	Mouth 10/	12	4	6	59	75	--	250	400	450	75
Abiqua Cr.	Mouth to L. Abiqua Cr. 10/	42	15	16	157	75	60	250	650	500	75
L. Abiqua	upstream 10/	32	11	19	186	50	40	--	600	350	50

Addendum A (continued)

- 1/ Fish estimates for tributaries where existing flows have not been designated have been assigned to the larger stream to which the tributary is joined.
- 2/ Designates natural flows, S for flows from storage; no notation indicates all natural flow.
- 3/ These minimum flows also apply in the summer months when existing flows are higher.
- 4/ To obtain the indicated escapement from listed flows, the following conditions must be maintained for salmon, steelhead, and other trout:
1. From egg deposition to fry emergence, water temperature should stay within the range of 45 to 55° F., and maximum stream flow should not exceed 4 times the optimum flow.
2. For rearing of juvenile salmonids, water temperature through the summer should normally be between 50 to 60° F.
3. In addition, all other water quality conditions necessary for fish production, such as dissolved oxygen, pH, turbidity, etc., must be met.
4. Project water releases should hold downstream surface level fluctuation rates to less than six inches per hour to prevent stranding of fish in the affected areas.

5/ Source of flows: USGS gage records 1956-1960.

- 6/ Flows indicated for this reach are required for upstream and downstream migration of anadromous fish. Year-round flows of 140 c.f.s. at Willamette Falls fishway must be augmented by the following flows for attraction water:

Period	Flow (c.f.s.)
January 1 thru April 15	910 c.f.s.
April 16 thru June 15	730 c.f.s.
June 16 thru October 31	260 c.f.s.
Nov. 1 thru Dec. 31	1,330 c.f.s.

7/ Source of flows: Observations by Fish Commission of Oregon.

8/ Source of flows: USGS gage records 1956-1965.

9/ Source of flows: All available USGS gage records 1956-1966.

10/ Source of flows: Oregon State Game Commission's miscellaneous stream-flow measurements.

11/ Source of flows: USGS gage records minus average monthly canal flows calculated by Eugene Water and Electric Board.

- 12/ Letter to Mr. Spidler, Federal Power Commission, from Assistant Secretary of the Interior, Kenneth Holm, concerning FPC License No. 2510, dated August 6, 1965.

13/ Letter to Mr. Spidler, FPC, from Assistant Secretary of the Interior, Kenneth Holm, concerning FPC License No. 2496, dated August 6, 1965.

14/ Source of flows: USGS gage records combined with OSOC measurements.

15/ Source of flows: USGS gage records minus Marmot Canal flow of 600 c.f.s. except a minimum flow of 35 c.f.s.