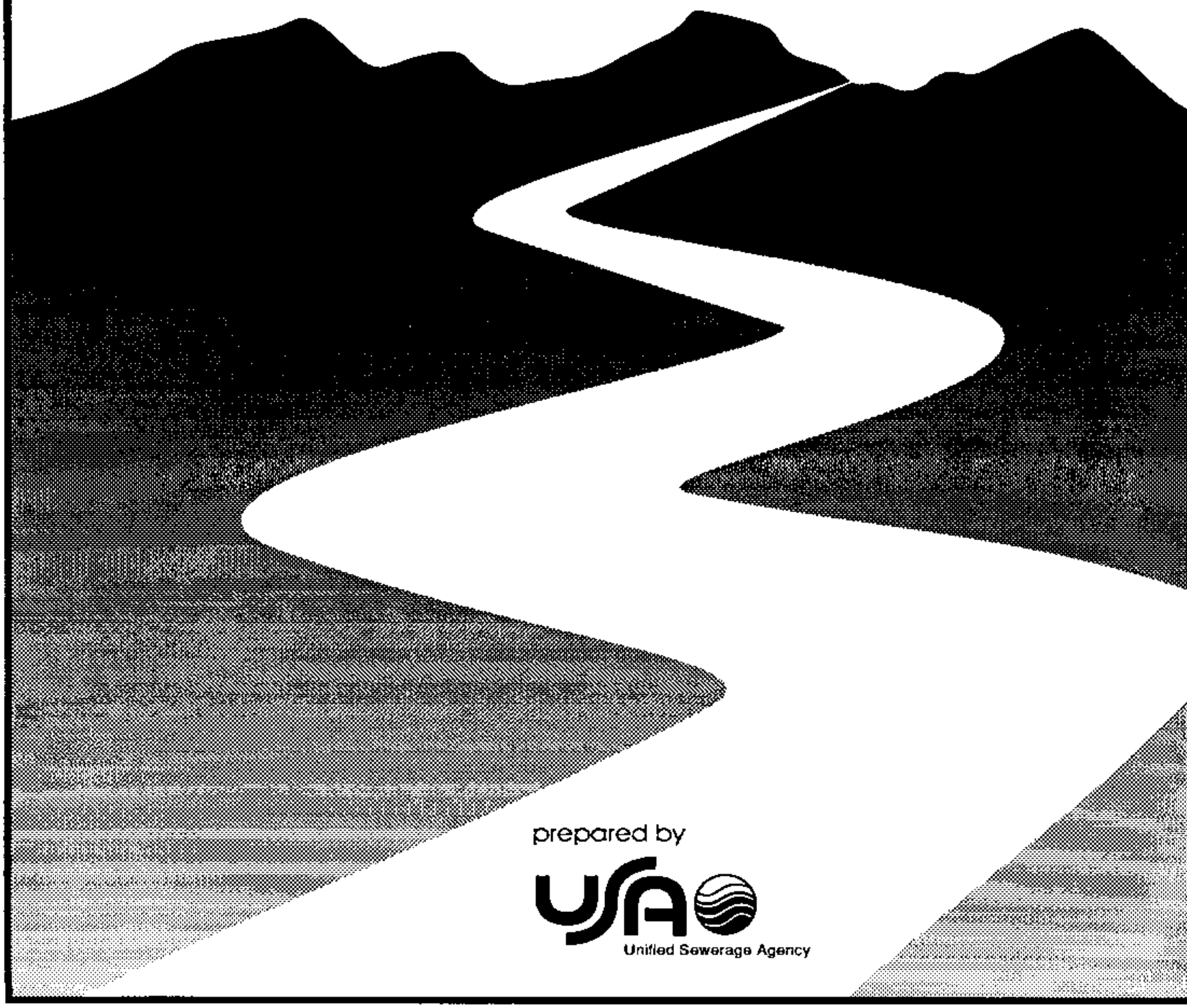
1993 ANNUAL REPORT

TUALATIN RIVER FLOW MANAGEMENT TECHNICAL COMMITTEE



prepared by

USA

Unified Sewerage Agency

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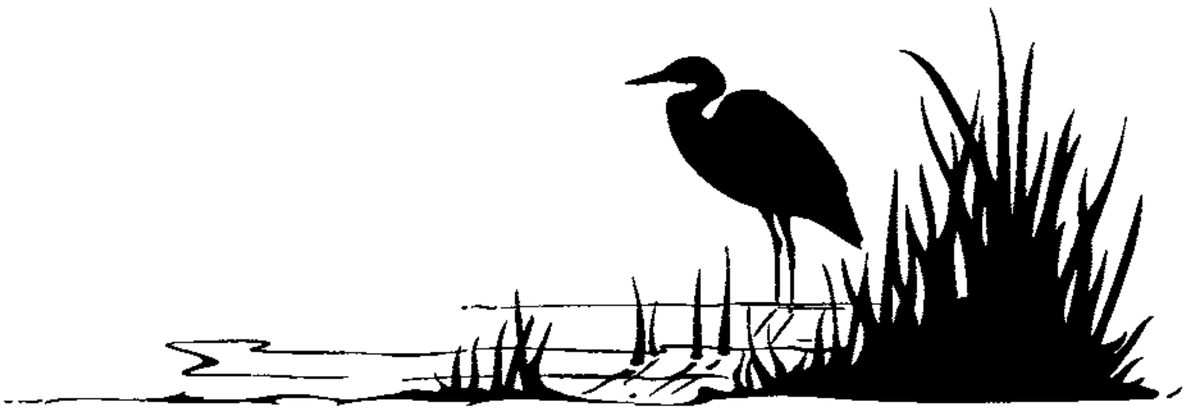
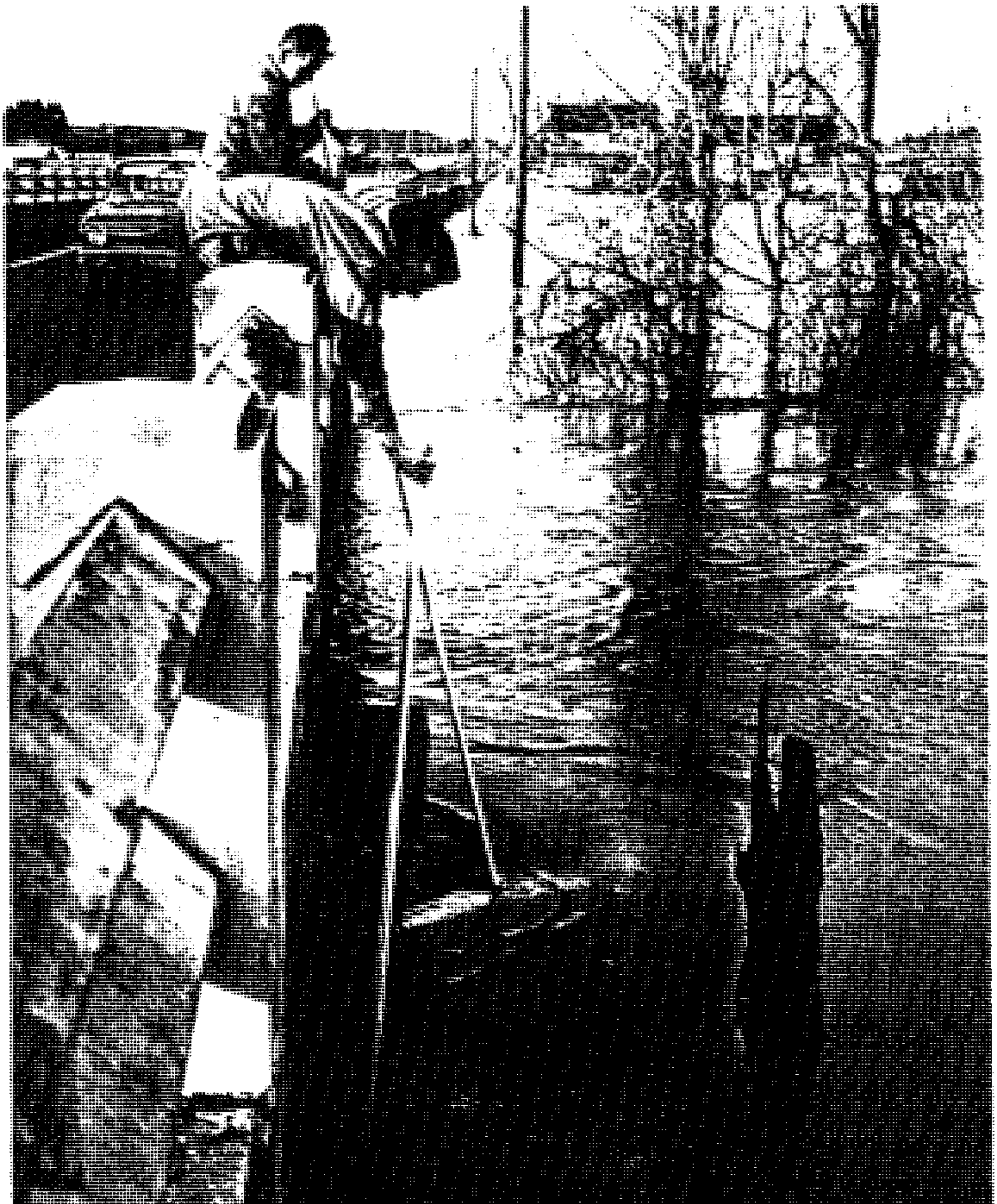


Prepared By:
Unified Sewerage Agency
Planning Division
In Cooperation With
Oregon Water Resources Department



Tualatin River at Farmington (Harris) Bridge in December, 1964.

TUALATIN RIVER FLOW MANAGEMENT TECHNICAL COMMITTEE

COMMITTEE MEMBERS:

Jan Miller, Chair	Unified Sewerage Agency
Carlo Spani	Unified Sewerage Agency
Tom VanderPlaat	Unified Sewerage Agency
Wally Otto	Tualatin Valley Irrigation District
Dan Wilson	Tualatin Valley Irrigation District
Van Burrus	Joint Water Commission
Chuck Schaefer	Lake Oswego Corporation
Jerry Rodgers	Oregon Water Resources Department

TUALATIN RIVER FLOW MANAGEMENT TECHNICAL COMMITTEE

1993 ANNUAL REPORT

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EXECUTIVE SUMMARY

In 1987, a committee was established of the major water users in the Tualatin River Basin. The committee was named the Tualatin River Flow Management Technical Committee. The members include Unified Sewerage Agency (USA), Tualatin Valley Irrigation District (TVID), Joint Water Commission (JWC), Lake Oswego Corporation (LOC), and the Oregon Water Resources Department (OWRD). This report is to give a review of the committees' activities during 1993. During this past year representatives of other organizations and agencies have joined in to discuss issues related to the flow management of the Tualatin River.

The committee provides a mechanism for the coordination and management of the Tualatin River. The members of the committee are technical staff who have detailed knowledge of the specific characteristics of the flow in the Tualatin River. An expanding on-going flow monitoring system has provided valuable information for management of stored water and natural flow availability in the basin. Since the issue of water quality has come to the forefront, the monitoring system has been an excellent example of inter-agency coordination. This coordination has saved dollars for the agencies involved, and the information gathered is used by other agencies and organizations.

The committee meets monthly from March through November to review the flow and reservoir supply conditions. The attached hydrographs show the differences between 1992 and 1993 (See Appendix A). The 1993 water year in contrast to the 1992 drought, was very wet and cool until July. Early summer precipitation levels were well above normal.

Due to the very wet months of May and June, streamflow for the main Tualatin and tributaries remained much higher than in 1992. Average precipitation for the months of May, June and July is 4.03 inches. However in 1993 precipitation for those 3 months was 8.80 inches, or 218% of normal. The contract holders of stored water from Scoggins Reservoir started releases much later in the year than usual. The later starting dates along with increased flow management efficiency provided extra reservoir storage that probably would have been released prior to November 1 in order to reach the required flood pool. This excess storage provided USA, in cooperation with the Flow Management Technical Committee, the opportunity to conduct a high flow experiment that would monitor the impacts on the growth of algae in the lower section of the river. This experiment provided important water quality information to the United States Geological Survey (USGS), currently conducting a 3-year study of the Tualatin Basin.

BACKGROUND

The Tualatin River Basin comprises an area of 712 square miles situated in the Northwest corner of Oregon and is a subbasin of the Willamette River. The headwaters are in the Coast Range and flow in a generally easterly direction to the confluence with the Willamette River. The basin lies almost entirely in Washington County. The Tualatin River is 83 miles in length and has a very flat gradient for most of its length.

The mountain reach (RM. 85 - 58) is steep with an average gradient of 80 feet per mile. At RM. 78 water released from Barney Reservoir (which is on the Middle Fork of the North Fork of the Trask River) enters the Tualatin River via an aqueduct over a low Coast Range divide. Barney Reservoir (capacity 4,040 acre-feet) stores water for the Cities of Hillsboro and Forest Grove. Water is released during the summer low-flow season to supplement shortages in natural flow. At RM. 73.2 water is diverted by the City of Hillsboro at the Cherry Grove Intake, for municipal and industrial purposes.

RM. 60 is the confluence of the Tualatin and Scoggins Creek. In the early 1970's the Bureau of Reclamation built an earthen dam on Scoggins Creek. The reservoir has a active storage capacity of 53,640 acre-feet. Scoggins Reservoir (Henry Hagg Lake) is a multipurpose facility with contracted water for irrigation, municipal and industrial, and water quality uses. Recreation is a major activity during the summer months on the reservoir. During the winter it serves as a flood control structure.

Near RM. 5 on Scoggins Creek, the Tualatin Valley Irrigation District (TVID) operates the Patton Valley Pump Station. This pump station can divert water via a low pressure pipeline into the upper Tualatin River above the city of Gaston. The water is released at two outlets, one at RM. 63.2 and the other at RM. 64. This water is used to serve irrigators in the Wapato Improvement District (Onion Lake) and TVID users upstream of the Scoggins confluence.

The meander reach (RM. 58 - 33) has an average gradient of 2.8 feet per mile. The Springhill Pumping Plant (SHPP), the largest diversion facility on the river is located at RM. 56.3. This pump plant is jointly operated by the Tualatin Valley Irrigation District (TVID) and the Joint Water Commission (JWC). Both TVID and JWC have natural flow water rights that are used in the early part of the season and release contracted stored water from Scoggins Reservoir to augment declined natural flow in the summer.

TVID is the agricultural water service agency, which serves approximately 20,000 acres of irrigated cropland. They have a pumping capacity of approximately 140 cubic feet per second (CFS) or 90 million gallons per day (MGD) at the SHPP. TVID pumps into a pressure pipeline irrigation system that serves about 10,000 acres of irrigated cropland. The remaining 10,000 acres are served directly from the Tualatin River.

The JWC serves as the municipal water purveyor for the cities of Hillsboro and parts of Beaverton and Forest Grove. Their SHPP capacity is approximately 45 CFS (30 MGD).

The Unified Sewerage Agency (USA) provides sanitary and stormwater services to the urban areas of Washington County. USA has two major wastewater treatment plants that have permits to discharge water during the summer into the Tualatin River. During the months of May to October, the Rock Creek facility discharges at RM. 38.1 and the second facility, Durham, discharges at RM. 9.4. Each has an average release of 23 CFS (15 MGD). USA also releases storage water from Scoggins Reservoir for flow augmentation during the seasonal low flow periods. The goal is to maintain 150 CFS (100 MGD) at the Tualatin River at Farmington Road Bridge Gage (RM. 33.3).

The reservoir reach (RM. 33 - 3.4) has an estimated gradient of 0.05 feet per mile. This reach winds through the basin with a very slow travel time. The reach has several deep pools and is very different is appearance than the upper reaches. A portion of the Tualatin flow is diverted at RM. 6.7 by the Lake Oswego Corporation through the Lake Oswego Canal. A headwork structure regulates the flow into this mile long canal that feeds into Lake Oswego. The water is used to generate power below the dam at the east end of Lake Oswego. The Lake Oswego Corporation has a natural flow water right with a priority date of 1906 for 57.5 cfs and 500 acre-feet of contracted stored water for consumptive uses from Hagg Lake. At RM. 3.4 a combination diversion dam\fish ladder structure is used during low flow periods to elevate the Tualatin River enough to divert the flow at the canal. During most of year the river elevation is adequate to allow diversion of the LOC water right, however in the summer flash boards are installed to increase the water level. This dam raises the Tualatin 2-3 feet and effects the water surface elevation for about 25 river miles. The slow movement of the water causes this reach to act much like a lake.

The riffle reach (RM. 3.4 - 0) has an average gradient of 10 feet per mile. The Tualatin flows through a short reservoir section and drops into a narrow gorge in the City of West Linn to the Willamette River. The mouth of the Tualatin is just upstream from the Willamette River Falls at Oregon City.

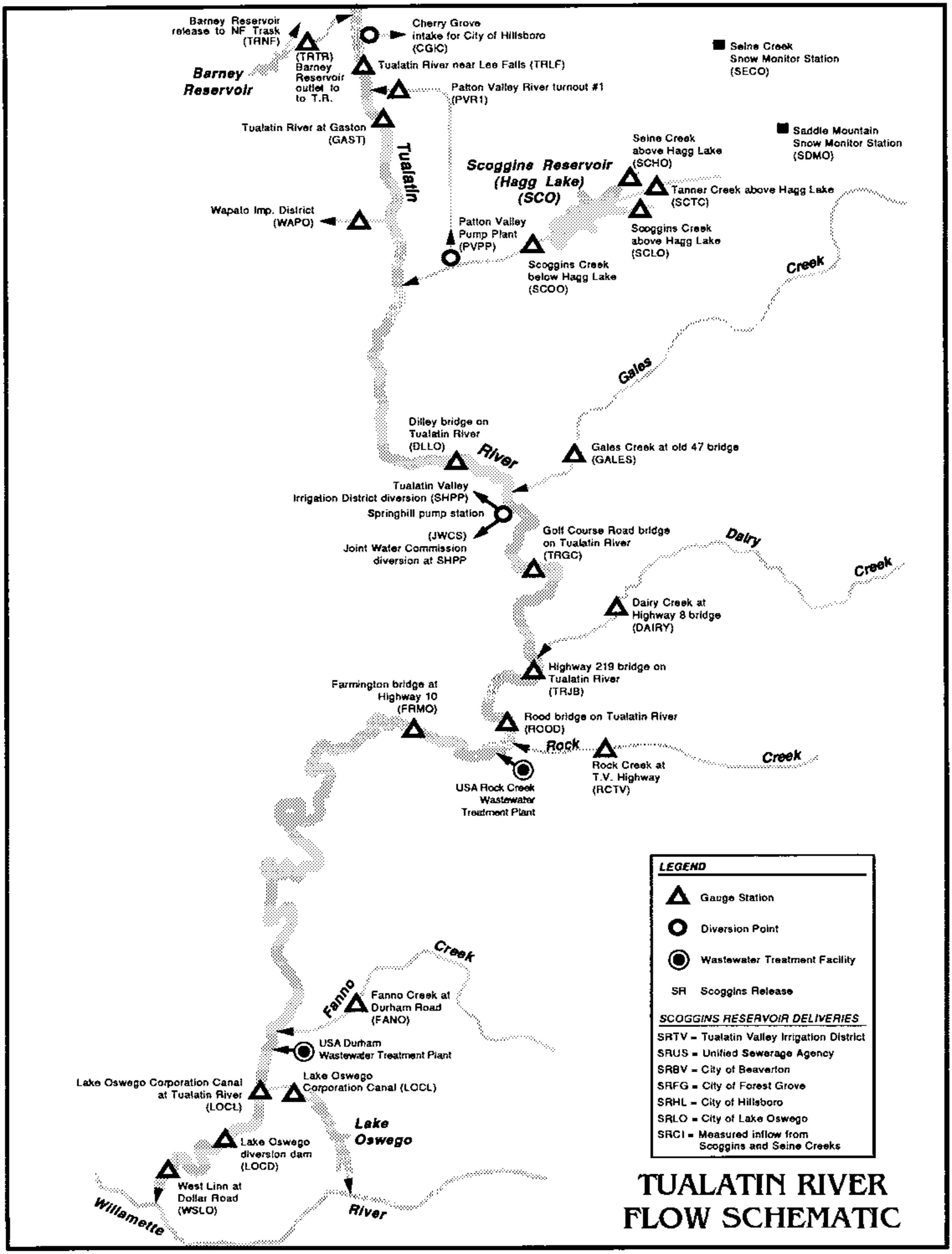
Rainfall in the Tualatin Basin ranges from 110 inches on the eastern slopes of the Coast Range to 37 inches in the southeastern area of the drainage basin. The amount of stream flow from snow is minimal. The peak months for rainfall are November through February while June through October are normally driest. The peak streamflow month is usually February with flow in August normally the lowest.

INFORMATION AND DATA COLLECTION SYSTEM

A coordinated information system was developed to provide flow information to all members of the committee. Because any one of the entities use or release of water can impact the other users, coordination of flow information is an important aspect of the committee's work. The data is collected by field staffs of the cooperating entities or from the Corps of Engineers via telemetry. A system of gaging stations, precipitation and other flow monitoring equipment has been developed during the past five years to monitor the flows on the Tualatin and the major tributaries. Significant releases and diversions are also monitored. (See Table F) The data collected is relayed to the local Watermaster office on a weekly basis where it is downloaded to USA's mainframe computer. Hydrographs (Appendix A) which show the previous year and current years data, were developed to identify and address problems related to the flow. Rainfall is shown as total weekly accumulation and three stations are currently being graphed.

A second set of hydrographs (Appendix B) was developed to show the available natural flow at various points on the mainstem of the Tualatin. These graphs depict the volume of natural flow by taking the measured flow and subtracting the storage flow. The storage flow is calculated on the releases from Scoggins and Trask Reservoirs. An evaporation loss factor reduces the storage flow and is based on an estimated loss of 0.25% of the flow per river mile. The main purpose for calculation of the natural flow is to determine when natural flow is no longer adequate in various river reaches. The key point in the analysis of the graphs is to detect when the available natural flow is below zero. When the natural flow graphs show flows less than zero, the reach does not have adequate water to serve all users and regulation is needed. Regulation is handled by the local Watermaster office and is done on a priority basis as required by Oregon Water Law.

The Tualatin River Flow Management Technical Committee meets monthly from March through November. The meetings focus mainly on the review of the hydrographs and current status of the reservoirs. A variety of other water issues and problems are discussed. Each member is usually asked to update the committee on any changes that could impact the flow management of the Tualatin. Minutes are recorded and reviewed at the next meeting.



Source: Unified Sewerage Agency

1993 ENTITIES REPORTS

UNIFIED SEWERAGE AGENCY

(Written by Carlo Spani)

1993 was another unique year for Unified Sewerage Agency's (USA) flow management program. In contrast to the 1992 drought conditions, late spring and early summer were unseasonably wet.

The resulting minimal water use by the Scoggins Reservoir contractors, allowed a two week "high water flow test" to take place the first two weeks of September. In spite of relatively dry conditions in the fall, USA was able to meet target river flows of 180 - 200 CFS.

USA was notified that the Scoggins Reservoir fill curve was reached on April 7, 1993, thus allowing USA access to the full amount of its storage allocation for the 1993 season. Also in April, USA again requested permission from the Bureau of Reclamation (BOR) to deviate from the stipulated release schedule and instead, release water based on maintaining a target river flow at the Farmington gage. USA also requested that the BOR again consider allowing USA the option to purchase 3,000 to 6,000 acre-ft. of additional storage water. Within the month, the BOR approved the deviation from the proscribed release schedule and said it would evaluate the possibility of a sale of additional water to USA.

Due to an unusually wet spring, the Tualatin River flows did not approach 150 CFS until the first week of July. USA's water release for water quality was initiated on July 3, 1993, with a target river flow goal of 150 CFS on a seven day moving average basis (7DMA) with no individual day under 120 CFS.

By August, it became apparent that Scoggins Reservoir had ample water to allow a real world test of high flow conditions during summer climatic conditions. In preparation for the test, the river flow target was lowered to 120 CFS for last ten days of August. This was followed by two weeks of flow targeted near 300 CFS. (Actual mean flow measured = 287 CFS). To complete the experiment i.e. stimulate an algae bloom, the last two weeks of September were targeted for 120 CFS river flow. It is significant to note that the BOR provided the 5,000 acre feet of water required to run this test and therefore, none of the contractors had to consume an extra portion of their allocations.

Data from the high flow test allowed further refinement of the travel time data for the continuously monitored gage stations. The time of travel from Scoggins Reservoir to the Dilley, Golf Course, Farmington, and West Linn gages are 9 hours, 18 hours, 36 hours, and 55 hours respectively.

Table A is a tabular summary of USA's water release for 1993 and a summary of Tualatin River flow on a monthly basis.

Table A.
Water Released from Scoggins Reservoir
for Water Quality (Acre-feet)

	Max. Available	1993 Available	Consumption
Storage	12,618	12,618	11,685
Natural Flow Credit	4,282	954	954
Purchased Water	3,000	0	0
			*12,639

* Release Season 7/3/1993 to 12/1/1993 (150 days)

Table B.
1993 River Flow Data Summary
(Cubic Feet per Second)

Month	Farmington Daily Min/Max	Farmington 7DMA Min/Max	Farmington Month Average	USA Release Month Average
June	222/1,157	268/1,067	541	0
July	122/230	169/238	192	9
August	98/229	117/184	155	25
September	102/316	115/296	208	35
October	155/303	127/229	199	68
November	178/282	185/239	216	70
Season Min.	98	115	155	
Season Max.	316	296	216	
Season Ave.	194			42

7DMA = 7 Day Moving Average

TUALATIN VALLEY IRRIGATION DISTRICT
(Written By Wally Otto)

1993 was a unique year for water use in regards to agriculture in the Tualatin Basin. It stands out significantly because of the high precipitation amounts recorded during field preparation, planting, growing and in some cases even during harvest times. The following are the 1993 monthly precipitation totals as recorded at Scoggins Dam and the corresponding percent of average for each month. The percentages are based on 24 continuous years of readings at the SCOO weather station located down stream of the Dam.

Table C

1993 Precipitation at Scoggins Dam

April	6.71" or 191% of normal
May	3.95" or 198% of normal
June	2.26" or 156% of normal
July	2.59" or 439% of normal
Aug.	.78" or 22% of normal
Sept.	.02" or 1% of normal
Oct.	1.21" or 40% of normal
Nov.	1.93" or 26% of normal

Tualatin Valley Irrigation District (TVID) ordered its first release of stored water on July 2, for the water year 1993 and only used stored water for 15 of the 31 days in July! This came to a total of 708 acre feet for July as compared to 4,895 acre feet used during the same month in 1992. The Irrigation District will only use a total of about 8,555 acre feet from storage in 1993 due to the wet season. This compares to over 18,200 acre feet being drawn from storage in 1992. TVID also recalibrated the flowmeter at the Springhill Pump Plant (SHPP) prior to the irrigation season and the meter was accessed daily from Scoggins Dam to confirm that storage releases were greater than actual use and matched the daily water orders.

Scoggins Dam was 43 km from a 5.5 earthquake on the morning of March 25. Three strong motion acceleragraphs measured three dimensional movements of the right abutment, crest and the toe. All inspections and subsequent evaluation of collected data have shown that the structure incurred no damage.

Full pool of the reservoir was reached on May 1, 1993 - the assigned target date from the Corps of Engineers. Drawdown did not begin until July 2, when both TVID and the Unified Sewerage Agency (USA) ordered stored water. The available telemetry on the Tualatin River at Golf Course Road Bridge averted a disastrous condition about midnight on July 8. The demand for water at SHPP continued higher than expected and the river dropped to a low of 11.5 cfs. A release from Scoggins Reservoir was made at midnight to place greater flows in the river before the peak demands began between 6 and 8 a.m. the following morning.

All members of the Tualatin River Flow Management Technical Committee supported the two week "high flow" test on the Tualatin River in September. The Bureau of Reclamation granted approval to augment additional flows in the River with up to 180 cfs (5,000 acre feet) for 14 days because water would probably have to be spilled before November 1 to make room for flood control storage space. During this time USA and TVID monitored the River, adjacent land and pump sites. The additional flow flooded land in the Dilley area and impacted the pumping sites of several local irrigators. No damage was reported during the experiment. The U.S. Geological Survey (USGS) designed and conducted the experiment to determine if higher flows would actually reduce phytoplankton residence periods while improving pH and DO conditions in the lower River. (See special report starting on page 16)

JOINT WATER COMMISSION

(Written by Van Burrus)

The Hillsboro/Forest Grove/Beaverton Joint Water Treatment Plant started releasing stored water from Scoggins Reservoir for the summer season July 7, then resumed natural flows July 16. It was an unusually wet spring and summer. Scoggins Reservoir releases started again July 27. We are continuing to release water from Scoggins Reservoir as of November 22, due to the dry fall.

The flow to the Tualatin River was also supplemented with releases from Barney Reservoir from June 7 through the present. This was an unusual year for Barney Reservoir. CH2M Hill working on the environmental impact and associated studies for increasing the impoundment from 4,000 acre feet to 20,000 acre feet. Part of these studies included drawing the reservoir down lower than normal. All Hillsboro and Forest Grove's releases were from Barney until October 15, when we began the season's draw for Hillsboro and Forest Grove. Hillsboro went on natural river flow November 16, through the joint treatment plant. Forest Grove and Beaverton are still using released from Scoggins Reservoir.

Table D
1993 Scoggins Dam Releases for The Joint Water Commission
(Acre-Feet)

Month	Beaverton	Hillsboro	Forest Grove	Total
June	0	0	0	0
July	270	0	0	270
August	851	0	0	851
September	853	0	0	853
October	748	159	95	1002
November	536	95	123	754
December	18	0	2	20
Total	3276	254	220	3750

LAKE OSWEGO CORPORATION

(Written by Chuck Schaefer)

The 1993 water management and water quality program of Oswego Lake, its canals, and embayments continue to challenge us.

Lake Oswego Corporation (LOC) primary concerns are nutrient levels and siltation. LOC objectives continue to be for water safety, protection of water rights, land use planning and protection of the beneficial uses of the lake.

The LOC Directors support the Tualatin River cleanup order by the Environmental Quality Commission (EQC) and applauds Unified Sewerage Agency, the City of Lake Oswego, and the Counties in achieving an improved water management program. Any appreciable cleanup of the lake is not possible without substantial improvement of the Tualatin River water quality and surface water runoff in the lakes drainage basin.

Oswego Lake had additional challenges which are unique to its status as a lake. We continue to work on five problem areas including:

1. Excessive nutrients
2. Excessive sedimentation
3. Rooted aquatic plants
4. Fecal coliform
5. Debris pollution

1993 was a lake drain year. This was accomplished in the first quarter with the lake refilled by April 10. Our inspection and construction depth was 9'6" elevation of normal lake top mark.

This season LOC contracted and completed a major dredging project in West Bay. Twenty thousand (20,000) cubic yards were removed covering this 7 acre embayment. The new navigation and secchi disk depth is 1 1/2 meters through out 98% of West Bay. Accomplishments resulting from this dredging project were: removal of lake bed nutrients loaded silt, safer swimming and boating, and improved property values.

In May, a 9,000 pound alum treatment was applied to West Bay to clear the water column and drop the pH from 9.6 to natures balance of 7.0. Ideally, less or no copper should then need to be applied. Some degree of success to control algal growth was attained. However some copper was applied during the summer months in West Bay as renewed algae growth caused the pH to climb back up to 9.2.

LOC also applied a major alum application in Lakewood Bay (downtown area). Thirty-nine (39,000) pounds were place in this 28 acre embayment having an approximate 13 foot depth with a beginning pH of 9.4. A much greater success rate appeared in this bay. The pH dropped to 6.9 and stayed in the low 7.2 to 7.6 area, together with little or no algae blooms most of the summer. No copper sulfate was applied to this bay in 1993.

The weather, a colder spring, cooler summer nights, several overcast or cloudy days, along with more natural water flow and storage water in the Tualatin Watershed, made 1993 a healthier water quality year.

Our lake temperatures were more moderate in 1993 with the highest readings in late June through the middle of August, according to our data taken of 73 degrees Fahrenheit.

LOC broadened its water sampling program to develop a better data base. The parameters being monitored monthly and bi-monthly include depths from epilimnium to hypolimnium on Dissolved Oxygen DO, temperature, secchi, Total Phosphorus, pH, Chlorophyll-A, Nitrate, conductivity, alkalinity, copper and fecals.

Phosphorus (TP,PO4) samples are taken monthly at the Tualatin River canal entrance. Per LOC lake management requirements, additional samplings may be taken in the months March through May if and when the readings are above 0.20mg/l which would dictate a restricted flow of less than 57.5 cfs. A cross section of 1993 readings ranged as follows: 2/93 0.221; 3/93 0.187; 4/93 0.178; 5/93 0.185; 6/93 0.165; 7/93 0.266 (above) acceptable TMDL. 1993 overall was better. LOC joined the entire basin and bureau in conducting the additional flow tests for improved water quality. Some minor diversion dam adjustments were necessary and a close normal pool level was maintained. Some improved results were observed during this test. Visually, the lower Tualatin River algal blooms disappeared and water temperatures dropped. On Oswego Lake temperatures dropped from 68 to 59 degrees, the secchi disk readings increased from 1.5 meters visibility to 3.5 meters, where as algae reductions were minimal. We think other weather factors may have affected these blooms.

LOC dropped all diversion dam flaps on September 24, and then began replacement and repair work on September 27, 28, and 29. Upon completion 43 flaps were again raised to re-establish a necessary pool required per our water right.

Overall 1993 has been in improved year with more water available, and cooler weather, but to continue to improve the lake's water quality to a 2 meter secchi disk depth remains a major task. A management plan must function within long and short term objectives. A major objective for LOC water quality program is to work hard to reduce phosphorus input to the point that substantial reductions in copper applications can be achieved.

A stronger community effort to educate stockholders and basin members must come abut regarding the effects of high phosphorus in fertilizers and household uses.

LOC sees a real need to continue our in-house program to monitor nutrient levels. Modeling and annual evaluations help lake and river managers to develop good alternative methods to improve and guarantee water quality and maintain adequate water resources.

OREGON WATER RESOURCES DEPARTMENT

(Written by Jerry Rodgers)

The Tualatin Basin Watermaster office contributed to flow management by monitoring and calibrating the gaging network and secondly by regulating withdrawals in the basin. The gaging network provides information on flow levels throughout the basin and provides the framework for decisions on regulatory activity and releases from Scoggins Reservoir. Staffing to accomplish the necessary stream gaging is a cooperative funding effort by the agencies with contracted water from Scoggins Reservoir. Table F lists the stations monitored.

The upgrading of gaging stations continued with the installation of a permanent recording station on Rock Creek at Hwy. 8 during October. TVID installed the stilling well. This office installed the gagehouse and recording equipment.

Development of the WRIP (Tualatin River Drainage Water Right Information Program) continued with the addition of the Gales Creek Subbasin. All water rights for Gales Creek and tributaries are now entered in a relational database. Information includes water rights by individual tax lot, by priority date, and diversion point by river mile. The database allows the generation of water right holders for any reach of the stream by priority date. Water users can be targeted for regulatory actions or informational releases related to their area.

Work continues on adding tributaries to this database during the off season. The East and West Forks of Dairy Creek are planned to be added by the summer of 94.

By knowing both flow and demand the Watermaster can make decisions on who was entitled to natural flow. Information cards were send out to all regulated users informing them when they were on alternate supplies or off. This provides a clear cut fair picture of who is entitled to available water. Table E lists regulation that occurred during 1993.

Overall the water supply in 1993 was significantly greater than 1992. Spring rains lasted well into the summer, allowing reservoir supplies to be held longer. Although the late season was dry, high reservoir carry-over eliminated fall shortages.

TABLE E
1993 OWRD Tualatin Basin Regulation Summary

DATE	STREAM REGULATED	PRIORITY DATE
7/9	Tualatin R ab Dairy Cr.	2/20/1963
7/27	Entire Basin except Gales Creek & Tualatin R.	10/8/1976
7/30	Gales Creek & Tualatin R.	10/8/1976
8/27	Tualatin R ab Dairy Cr.	1/28/1948
9/3	Gales Creek Drainage	1/28/1948
9/3	End of season notices - WRIP list	

Table F
Tualatin Basin 1993 Streamflow Stations

Stream	Stream Mile	Type
Beaverton Cr @ 216th	1.2	Staff
Carpenter Cr - upper	3.5	Staff
Carpenter Cr - lower	1.9	Staff
Chicken Cr	2.3	Staff
Dairy Cr at Hwy 8	2.1	Recorder
Dairy Cr at Schefflin	8.5	Staff-winter
EF Dairy Cr at Dairy Cr Rd	12.5	Staff
EF Dairy Cr nr Mountaindale	8.4	Staff
EF Dairy Cr nr Roy	1.2	Staff
WF Dairy Cr @ Banks	7.7	Staff
WF Dairy Cr @ Evers Rd	1.9	Staff
*Fanno Cr @ Durham	1.2	USGS-Recorder
Fanno Cr @ Tuckerwood	7.3	Staff
Fanno Cr @ Scholls nr Allen	9.4	Staff
Fanno Cr @ Shattuck Rd	12.8	Staff
Gales Cr @ Hwy 47	2.4	Recorder
Gales Cr @ Clapshaw Rd	12.4	Staff
McKay Cr @ Hornecker Rd	2.2	Staff-summer
McKay Cr @ Glenco	4.3	Staff-winter
McKay Cr @ Northup Rd	15.3	Staff
EF McKay Cr @ Dixie Mtn Rd	0.6	Staff
Oswego Canal		Recorder
Rock Cr @ Hwy 8	1.2	New Recorder
Rock Cr @ Quatama Rd	4.9	Staff
Sain Cr ab Scoggins Res	1.6	Recorder
*Scoggins Cr ab Scoggins Res	8.0	Recorder
*Scoggins Cr be Scoggins Res	4.8	USGS-Recorder
Tanner Cr ab Scoggins Res	1.6	Staff
*Tualatin R @ Dilley	58.8	USGS-Recorder
Tualatin R @ Elsner	16.2	Staff
*Tualatin R @Farmington	33.3	Recorder
Tualatin R @ Gaston	63.9	Recorder
*Tualatin R @ Golf Course Rd	51.5	Recorder
Tualatin R @ Hwy 219	44.4	Staff
Tualatin R be Lee Falls	70.5	Staff
*Tualatin R @ Oswego Canal (elevation only)	6.7	Recorder
Tualatin R @ Rood Br	38.4	Recorder
*Tualatin R @ West Linn	1.8	USGS-Recorder
Wapato Canal(from Tualatin R)	61.9	Staff

* Telemetry

HIGH-FLOW EXPERIMENT - USA
(Written by Jan Miller)

A high-flow experiment was conducted on the Tualatin River in September 1993. The purpose of the experiment was to assess the response of the river to a prolonged high-flow condition during summer months, focusing on chlorophyll a, phosphorus, and dissolved oxygen. The experiment was made possible because of historically high reservoir water levels. This was due to an unseasonably wet late spring and early summer.

THE PLAN

The United States Geological Survey (USGS), realizing the value of this excess water to the study of algal growth dynamics, proposed releasing some of the water during a controlled experiment. The experimental protocol, presented to the Tualatin River Flow Management Technical Committee on August 18, 1993, called for holding the river at 120 cfs for two weeks, followed by an increase in the flow to 300 cfs for two weeks. This would produce the maximum possible variation in river conditions without jeopardizing water quality. The flow committee felt it could provide valuable information and agreed to start the low-flow portion immediately.

The committee members sought and received permission from all parties impacted by the experiment. Approval was received from the Bureau of Reclamation to use up to 5,000 acre-feet from Hagg Lake over the two week high-flow period. This would result in the extra 150 cfs needed to reach 300 cfs. This water was not charged to any of the users' accounts.

Several farmers were contacted since the increased river depth was expected to flood one piece of property and cause irrigation withdrawal problems on several others in the Dilley area. Between the efforts of TVID and USA, all the farmers concerns were addressed. Lake Oswego Corporation removed boards on their diversion dam to maintain the river height in the lower Tualatin River throughout the experiment; the Department of Environmental Quality was notified; and a press release informed all other interested parties.

THE EXPERIMENT

LOW-FLOW: Between August 18th and 31st, the flows from Hagg Lake were decreased. The goal was to hold the river at 120 cfs at Farmington for two weeks.

HIGH-FLOW: Between September 1st and 17th, the flows were increased from Hagg Lake. By careful monitoring of flooding property and irrigation equipment it was possible to release sufficient water to exceed 300 cfs at Farmington for several days. During this portion of the experiment sunlight conditions were excellent, but the average air temperature dropped about 5 degrees C on September 11, cooling the water during the last part of the experiment (see Graph 1).

RECOVERY: Between September 18th and 30th, the plan was to drop the flows from Hagg Lake to the low-flow conditions. An the algae recovery would demonstrate that changes in river conditions were due to the high flow and not to normal seasonal cooling in general, or the 5 degree temperature drop in particular. Unfortunately, because of unusually high levels of ammonia from the Durham Wastewater Treatment Plant (River Mile 9.6), flow could only be reduced to an average of 148 cfs at Farmington during this time period.

THE DATA (see Appendix D)

During the six-week experiment samples were collected two mornings a week at all the usual river and tributary sites for field and chemical analysis. In addition, once a week afternoon measurements were taken at selected sites in the lower Tualatin River.

On the graphs and tables that follow, the data from the Elsner Bridge (River Mile 16.5) sample site are used. This sample site is in the reservoir section and upstream of the Durham Treatment Plant. Flow measurements were taken at Farmington Bridge at (River Mile 33.3). Data are also available from other sample sites on the Tualatin River and can be obtained from USA.

Data have been plotted for selected parameters. If there is a water quality standard for the parameter, it is shown as a solid line on the graph. When measured values are relatively constant over a flow regime, a line is drawn showing the mean and the mean value is given in the key for that line. When there is an increasing or decreasing trend during the flow regime, a line is statistically fit to the data; this is referred to as "LIN REG" in the key for that line. When values are neither constant nor showing a trend, lines are hand-drawn; in this case no notation is made in the key for the line. On all graphs the high-flow data points are circled.

TABLE 1-4: RAW DATA

Flow and water quality data for the entire study are shown in Table 1. Tables 2 - 4 display low-flow, high-flow and recovery period data and statistics. A key is provided that explains the column headings.

GRAPH 1: AIR TEMPERATURE

Air temperatures at the Lake Oswego Diversion Dam (River Mile 3.4) during the study. The 5 degree C drop in temperature in early September is noted with an arrow.

GRAPH 2: FLOW and CHLOROPHYLL a

FLOW: The average flow over the two week low-flow period at Farmington was 121 cfs, ranging from 98 to 146 cfs. The average flow over the two week high-flow period was 275 cfs, ranging from 212 to 316 cfs. During the recovery period flows dropped to 107 cfs before the decision was made to return the flows to normal levels (150 cfs) due to the high ammonia being released from the Durham Wastewater Treatment Plant.

CHLOROPHYLL a: Chlorophyll a levels are used to measure the concentration of algae. To understand the algal growth dynamics, it is important to know how much algae is coming into the system, how long the algae will be in the system (residence time), and other growing conditions such as amount of sunlight, water temperature, and nutrient concentration.

To determine the amount of algae coming into the system, the chlorophyll a measurement from the upstream sample point was used. In this case it was Scholls (River Mile 27.1). To determine how long the algae were in the system, the travel time between the upstream sample point and Elsner was used.

During the low-flow period the travel time between Scholls and Elsner was about 4.5 days, the concentration of chlorophyll a increased from 6 ug/l to 12 ug/l at Scholls, and the water and air temperatures were favorable and constant. An algal bloom developed at Elsner, the chlorophyll a concentration increasing from 25 ug/l to a maximum of about 65 ug/l, where it stabilized.

The concentration of soluble orthophosphorus decreased as the algae consumed it, reaching its lowest concentration as the chlorophyll a reached its peak.

Under high-flow conditions, chlorophyll a at Elsner dropped dramatically from 65 ug/l to 12 ug/l as the algae were flushed out of the system. The algal population remained low and constant during the remainder of the high-flow period. The water quality criteria of 15 ug/l was met during this period.

The algae levels remained low for several reasons. First, the travel time dropped to about 2.2 days. Second, there was less algae entering the system -- the level of chlorophyll a at Scholls dropped to an average of 3 ug/l. Minor contributing factors were the decrease in both air and water temperatures.

During the recovery phase, the levels of algae increased again. The increase was not as dramatic as the low-flow period because the travel time was not increased to the full 4.5 days and the levels of chlorophyll a from Scholls only averaged 5 ug/l. In addition, the water temperature did not return to the earlier conditions.

GRAPH 3: SOLUBLE ORTHOPHOSPHORUS and TOTAL PHOSPHOROUS

SOLUBLE ORTHOPHOSPHORUS: As the algal bloom was developing during low-flow (Graph 2), the level of soluble orthophosphorus -- the biologically available form -- was decreasing rapidly due to uptake by algae. The soluble orthophosphorus reached a minimum at about the same time the algal bloom reached its maximum. The concentration of soluble orthophosphorus then began to increase again.

By the beginning of the high-flow portion, the levels of soluble orthophosphorus had returned to the pre-bloom concentrations. The concentration dropped again under high-flow conditions due to dilution.

During the recovery period, orthophosphorus returned to about 90% of low-flow concentrations. It decreased at the end of the period due to the release of additional water to bring flow levels back to normal.

TOTAL PHOSPHORUS: Phosphorus in algae, as well as in the river water, is measured by the total phosphorus test, so it does not disappear as the algae assimilate it.

Total phosphorous increased during low-flow due to less dilution, and decreased during high-flow as it was diluted and the algae washed out of the reservoir. During the recovery period, total phosphorus increased again until additional water was released from the reservoir to increase river flows.

The total phosphorus did not drop below the TMDL of 0.07 mg/l during any portion of the experiment. Total phosphorus alone cannot be used to predict levels of algae; residence time and the amount of algae entering the system play a much greater role.

GRAPH 4: pH and DISSOLVED OXYGEN

pH: Algae convert CO_2 to organic matter during photosynthesis. In the process, hydrogen ions are removed from the water, thus increasing pH. Since most photosynthesis takes place in the middle of the day, pH levels are highest then. On the graph, samples collected at this time are indicated by arrows.

Respiration, the opposite of photosynthesis, takes place constantly in the system. During respiration CO_2 and hydrogen ions are released, causing the pH to decrease. At night, when photosynthesis is not taking place, the pH decreases. During algal blooms there can be pronounced pH swings over a 24 hour period.

The pH levels were higher during the low-flow portion of the experiment. In one case the pH water quality standard was violated because of the bloom. During high flow the algae were washed out and the pH stabilized at a lower level. During the recovery period pH levels remained stable.

In the absence of algal blooms, the pH was very stable and well within the water quality standard of 6.5 to 8.5.

DISSOLVED OXYGEN: Dissolved oxygen (DO) behaves similarly to pH. During photosynthesis oxygen is produced, reaching a peak at midday (samples collected at this time are indicated by arrows on the graph). During the night, when photosynthesis is not taking place, respiration consumes the DO. Therefore, DO swings are the most pronounced during an algae bloom.

Dissolved oxygen levels were higher on average during low-flow due to the algae bloom. DO dropped and stabilized during high-flow because the algae were washed out. Levels remained stable during the recovery period because the algal populations did not return to low-flow levels.

The DO level remained above the water quality standard of 6.0 mg/l for the entire experiment. Although high DO is generally good, it can be a problem if saturation goes above 150%. On the day the DO was 14.2 mg/l, the percent saturation was 152%.

GRAPH 5: TEMPERATURE and CONDUCTIVITY

TEMPERATURE: The temperature was relatively constant at an average of 18.5 degrees C during the low-flow period. This is above the water quality standard of 17.8.

The temperature dropped dramatically during the high-flow portion to less than 13.7 degrees C. Part of the decrease was due to the cooler water from Hagg Lake and the other due to the cooler weather. The average temperature of the water discharged from Hagg Lake during the experiment was 9.4 degrees C.

Because of cooler air temperature, the water temperature only recovered to an average of 13.8 degrees C during the recovery period.

CONDUCTIVITY: This shows the pattern expected of a conservative compound. When the flow is low, the concentration is the highest. Conversely when the flow is high, the concentration is the lowest.

During low-flow period the concentration was relatively stable and constant. During high-flow the concentration dropped dramatically and then remained relatively stable. During the recovery period the concentration almost returns to low-flow levels, but plateaus when flows are increased at the end.

HIGH FLOW EXPERIMENT SUMMARY:

It is important to remember that the high flow conditions used here were experimental and did not represent a natural state for the Tualatin River during the summer season. It may not be possible to reduce the chlorophyll a levels as low during the peak growing season with these flow levels. While high flow would have beneficial effects, it could also have come negative impacts. High flow may decrease zooplankton concentrations, which are the main prey for young-of-the-year bass and bluegill. The higher flows would also create significant flooding problems for at least one piece of land.

Nevertheless, the results from this experiment are very significant. They provide real-time-data which will enhance the ability of the mathematical models to predict which control strategies will reduce algae growth rates in the lower Tualatin River. This experiment separated out two major components -- residence time and algal growth factors. We now know that flow (residence time) has a much larger impact than growth factors (nutrients) on the expected algae levels in the Tualatin River.

The flow committee would like to thank Ralph Vaga of the USGS for designing the experiment, working with the flow committee to determine the flows, and assisting with the interpretation of the data.

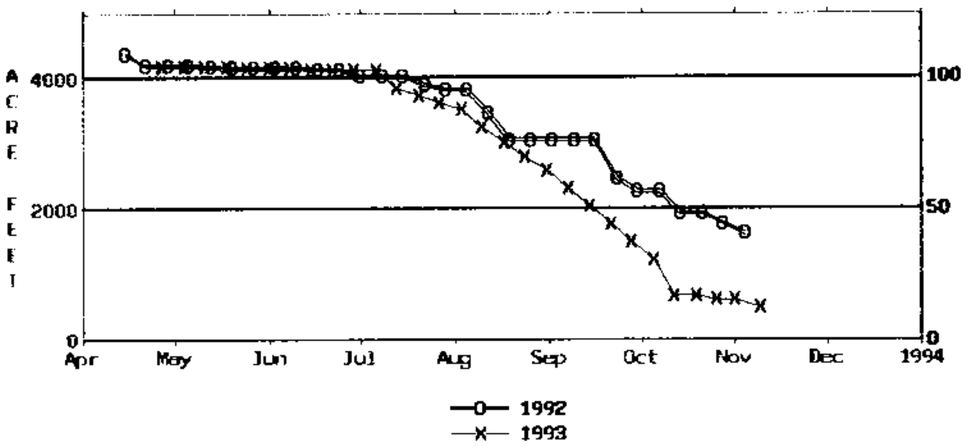
REPORT SUMMARY

The Tualatin River Flow Management Technical Committee has been and will continue to be an important part of the water resources management activities in the Tualatin Basin. The information system and monitoring network will need telemetry and equipment improvements to enhance current information and improve reservoir release efficiencies. Additional stations may need to be established where data gaps are found. The committee has provided the vehicle for coordination and awareness of impacts caused by each entities operations. In 1993 due to the cool wet conditions, the committee continued to gain experience coordinating flow information and providing maximum utilization of limited stored water. This coordination provided a unique opportunity to conduct the High Flow Experiment in September. The experiment provided valuable data to understand how higher flow conditions impacted water quality. Data collected will provide decision makers with some of the key information needed to make those difficult choices when there are conflicts on water management issues.

APPENDIX A

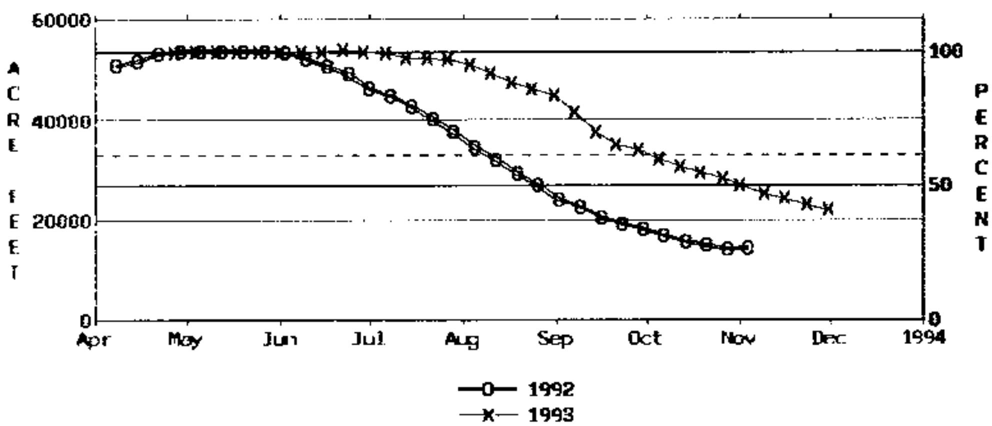
HYDROGRAPHS FOR FLOW MONITORING SITES

TRASK (BARNEY RESERVOIR CONTENT) (TBRC)



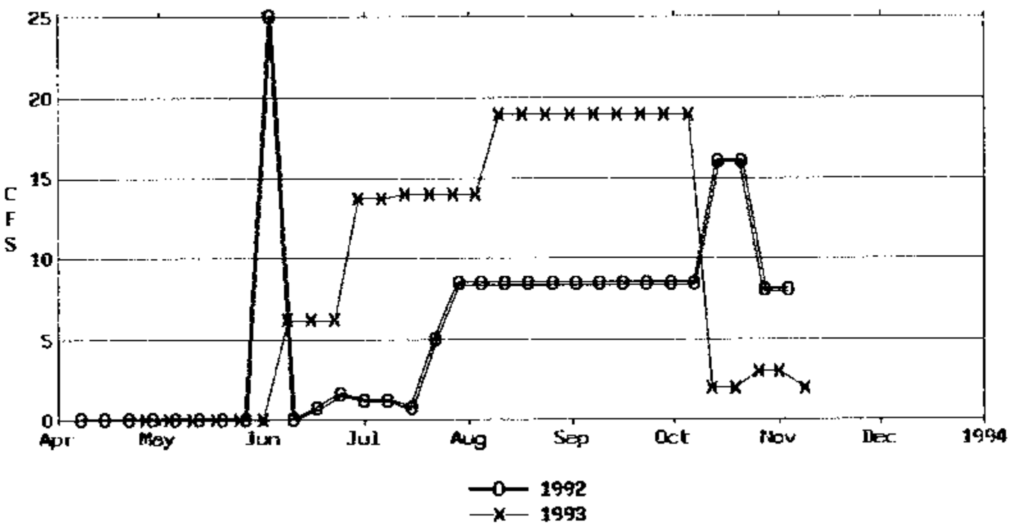
MAXIMUM POOL = 4040.8 AF AT 1590.8 FEET
MINIMUM POOL = 0.0 AF AT 1530 FEET

SCOGGIN RESERVOIR STORAGE CONTENT (SCO)

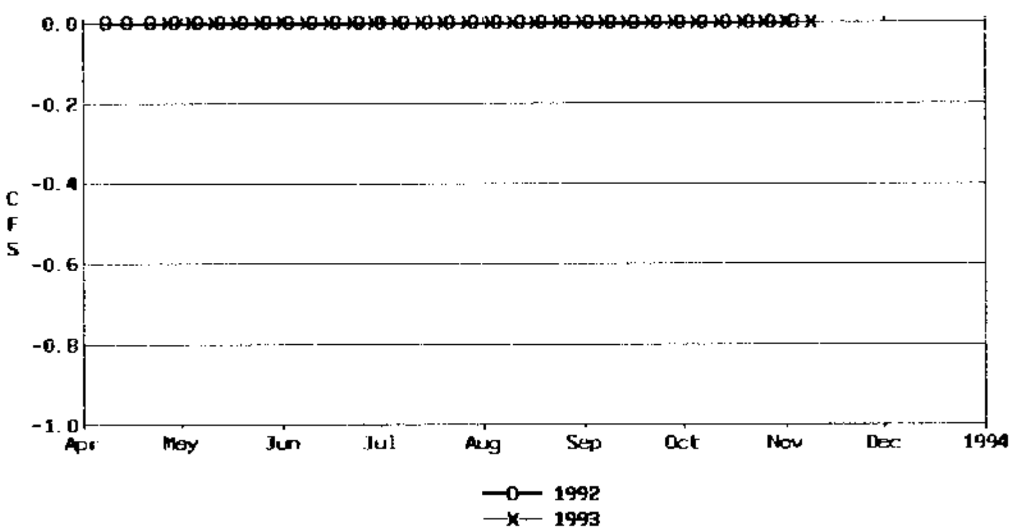


MAXIMUM POOL = 53638 AF AT 303.50 FEET (MAY 1)
MINIMUM POOL = 33040 AF AT 283.50 FEET (NOV 1)
ACTIVE CAPACITY = 0 AF AT 235.3 FEET

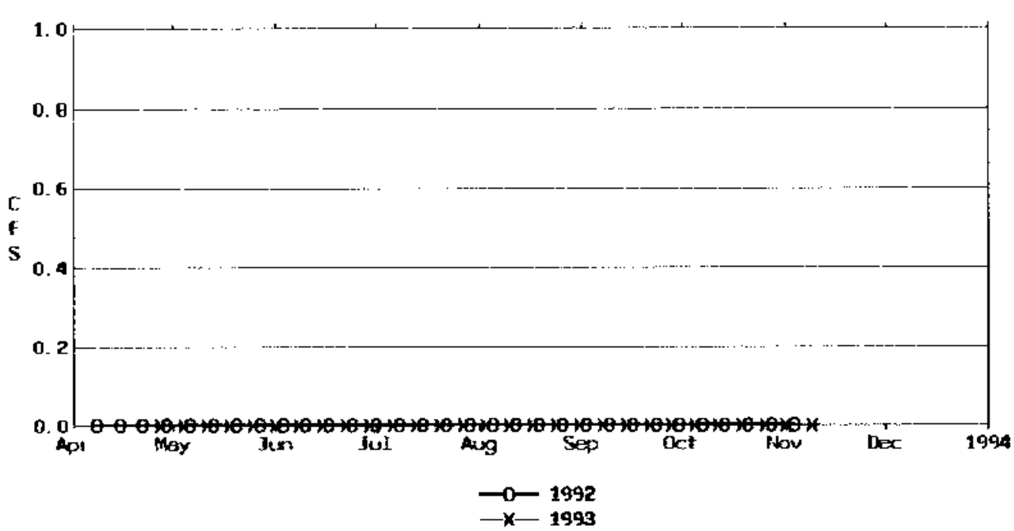
TRASK RELEASE TO TUALATIN RIVER (TRTR)



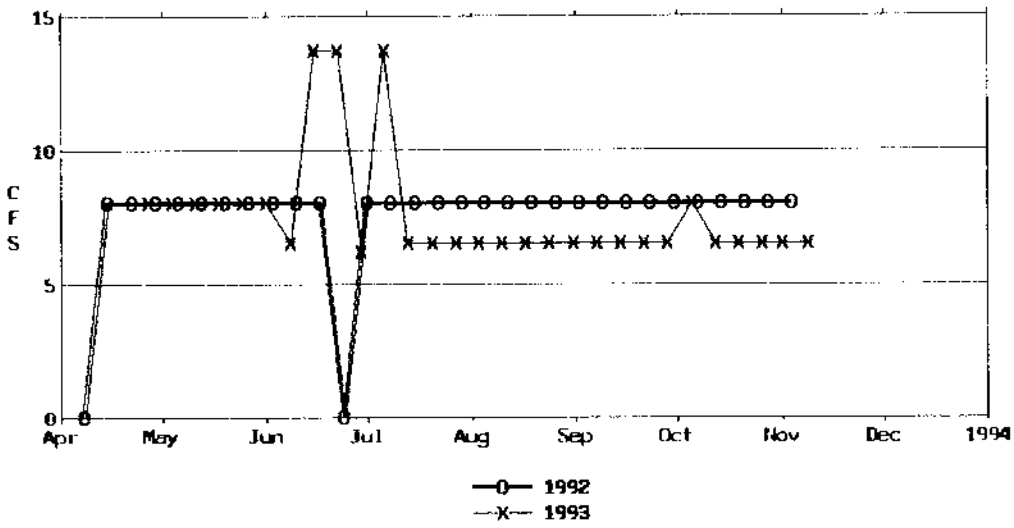
TRASK RELEASE FOR WATER QUALITY (TRWQ)



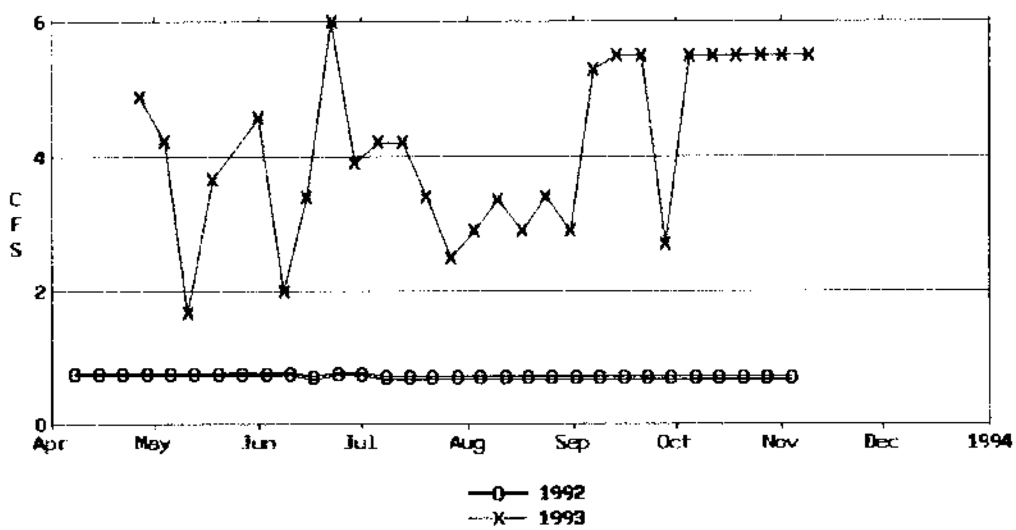
TRASK RELEASE FOR EXCHANGE (TREX)



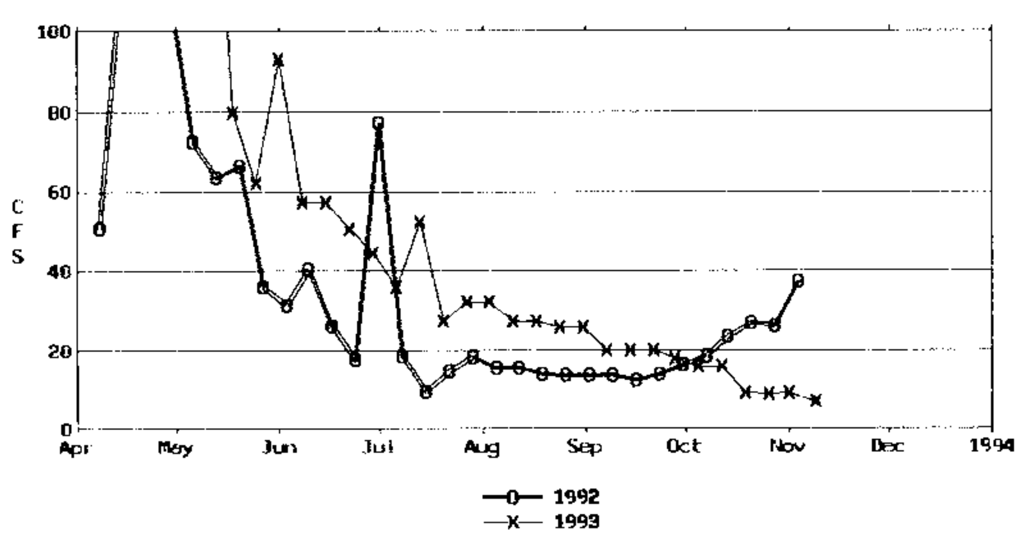
TRASK RELEASE TO NF TRASK RIVER (TRNF)



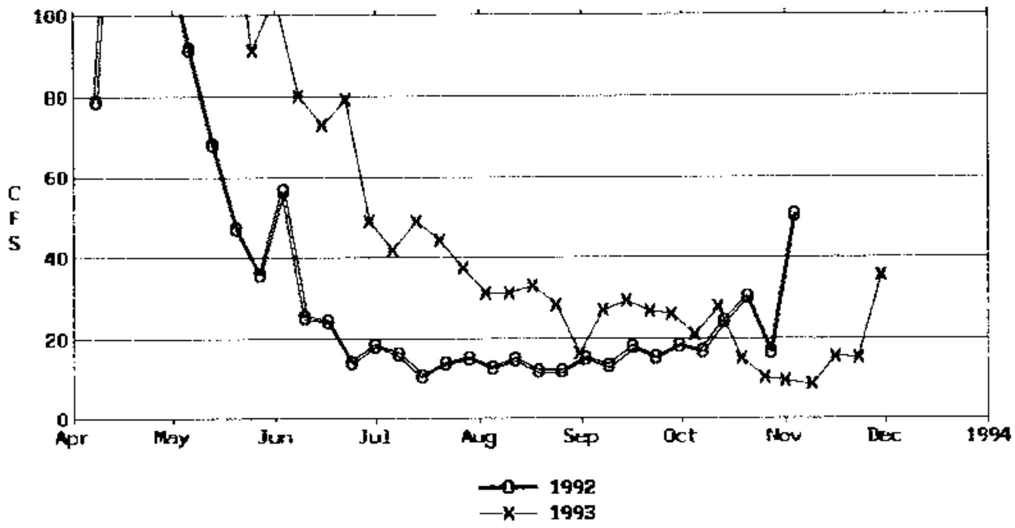
CHERRY GROVE INTAKE - HILLSBORO (CGIC)



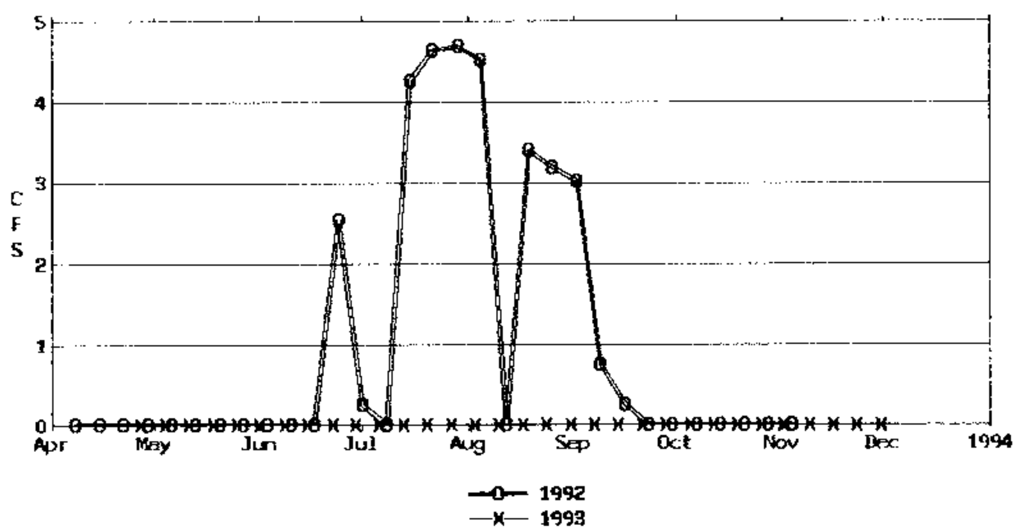
TUALATIN RIVER BELOW LEE FALLS (TRLF)



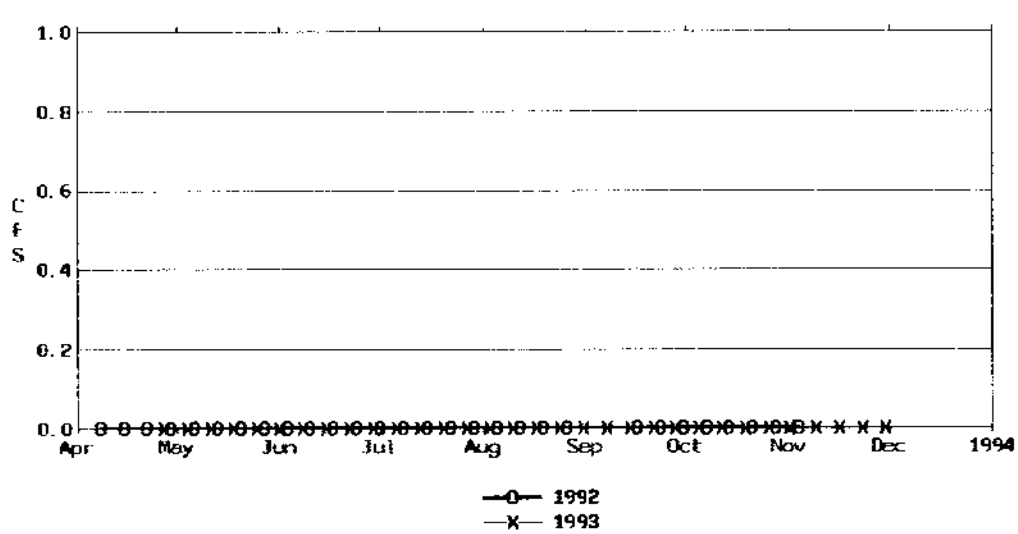
TUALATIN RIVER ABOVE GASTON (GAST)



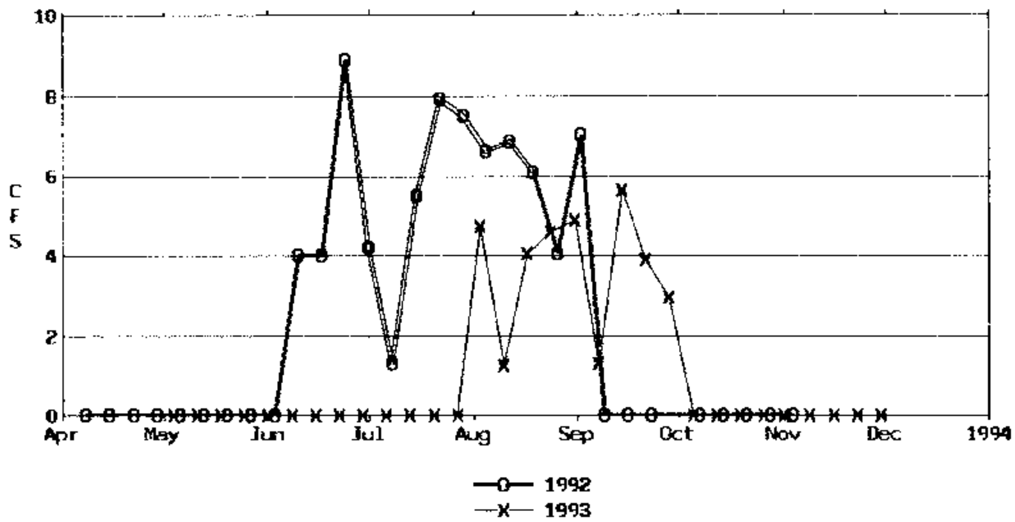
TVID - PATTON VALLEY RIV. TURNOUT #1 (PVR1)



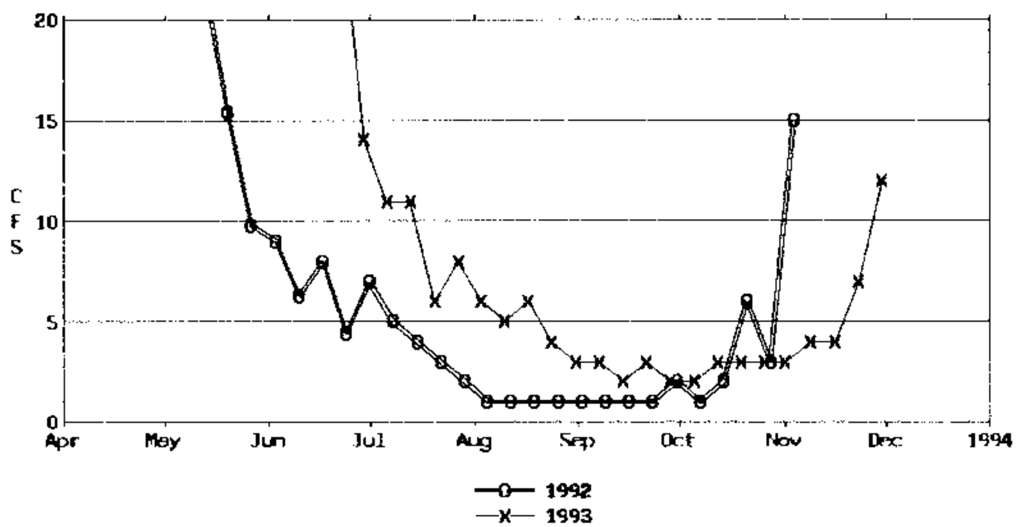
TVID - PATTON VALLEY RIV. TURNOUT #2 (PVR2)



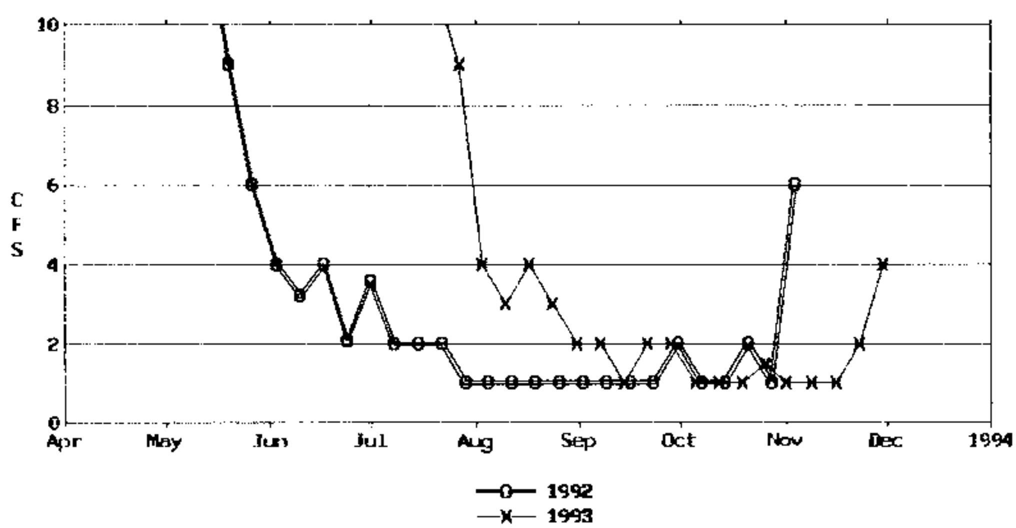
WAPATO CANAL DIVERSION (WAPO)



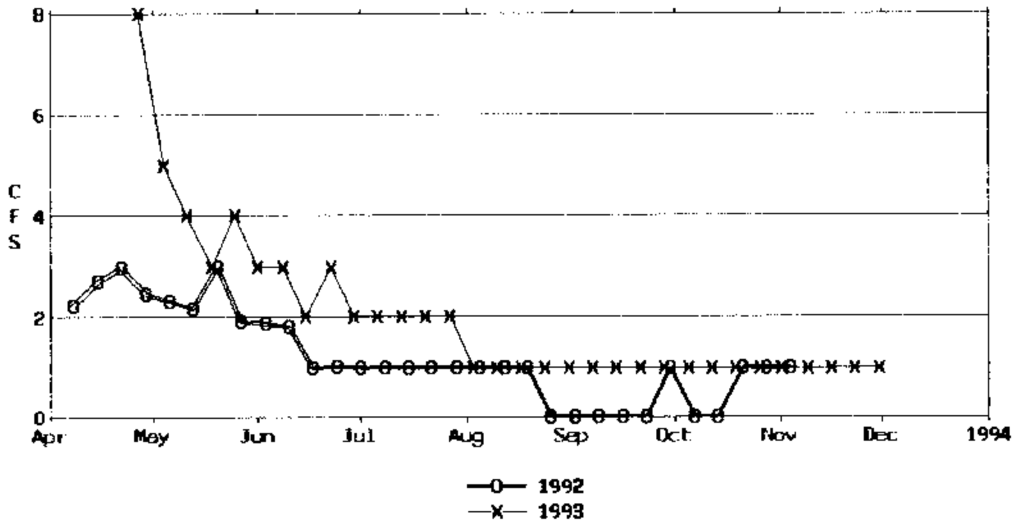
SCOGGIN CREEK ABOVE HAGG LAKE (SCLO)



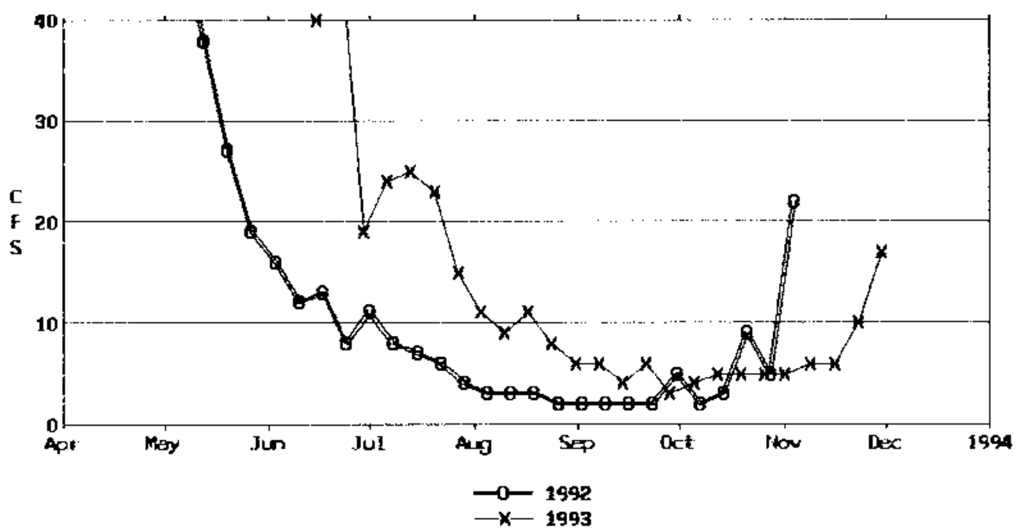
SAIN CREEK ABOVE HAGG LAKE (SCHO)



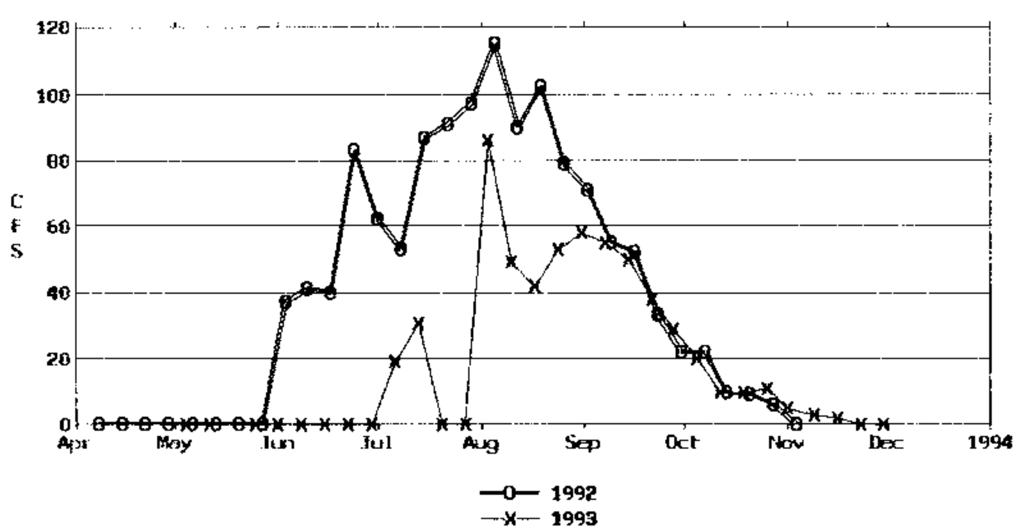
TANNER CREEK ABOVE HAGG LAKE (TANO)



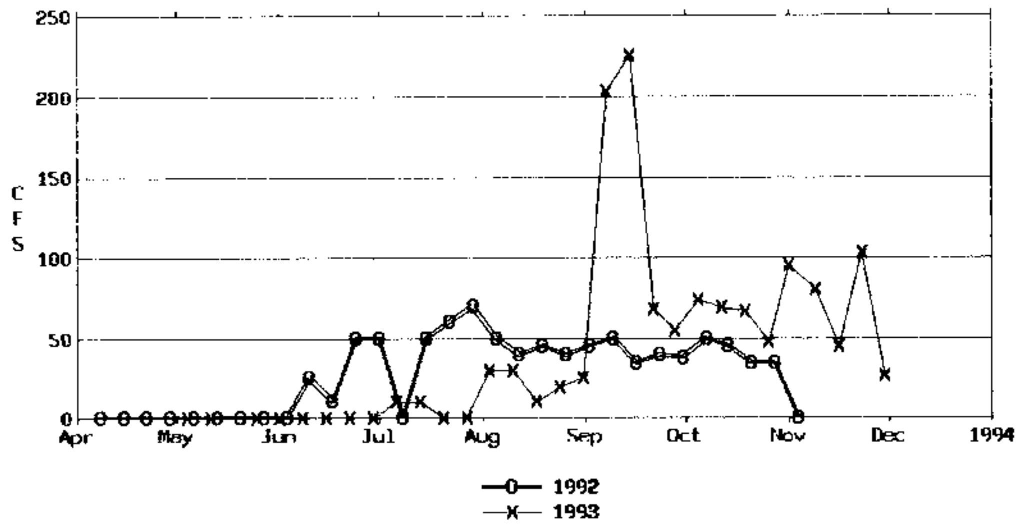
SCOGGINS RESERVOIR COMP. INFLOW (SRCI)



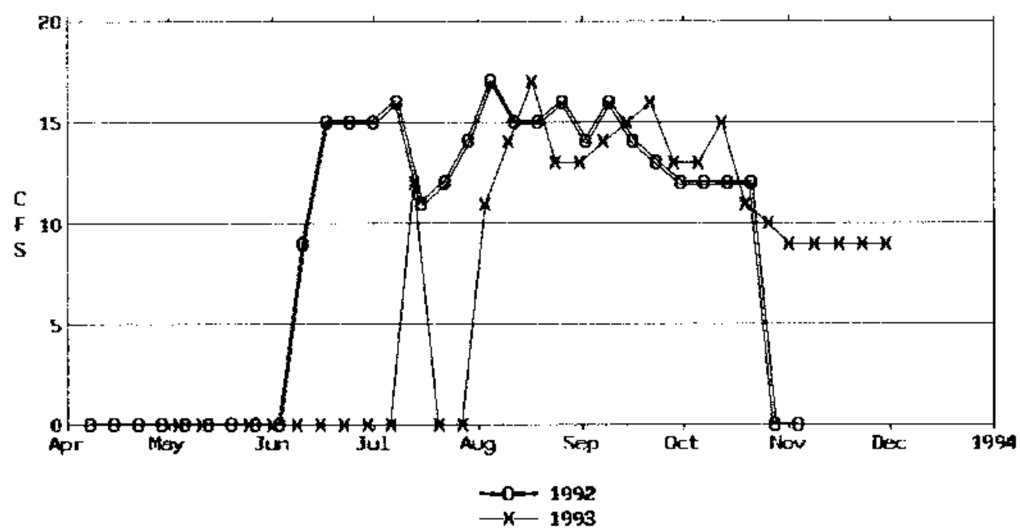
TVID RELEASE FROM SCOGGIN RES. (SRTV)



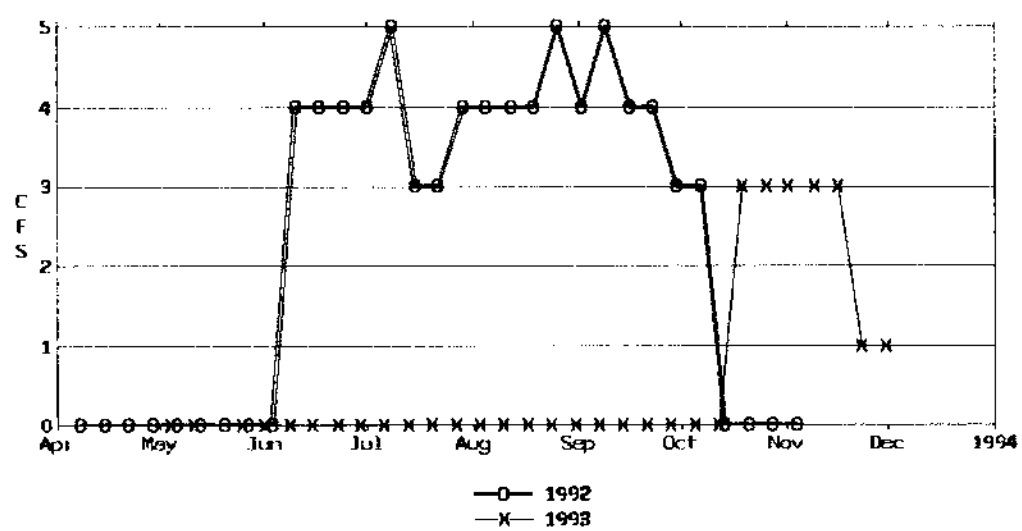
USA RELEASE FROM SCOGGIN RES. (SRUS)



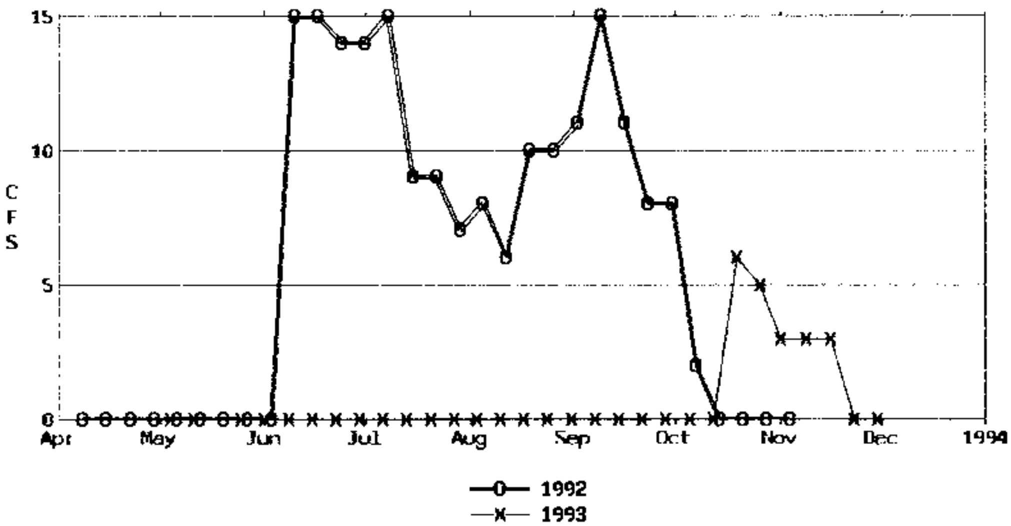
BEAVERTON RELEASE FROM SCOGGIN RES. (SRBV)



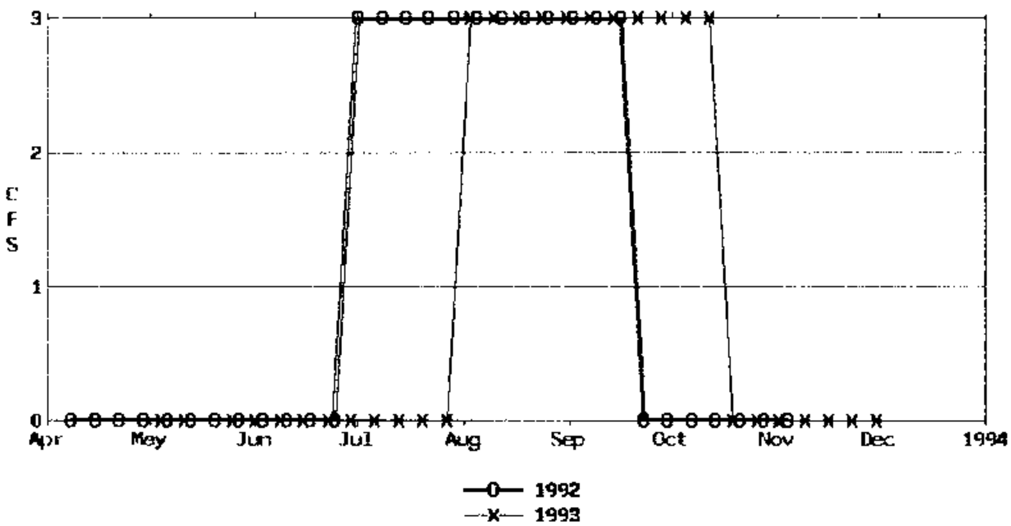
FOREST GROVE RELEASE FROM SCOG. RES. (SRFG)



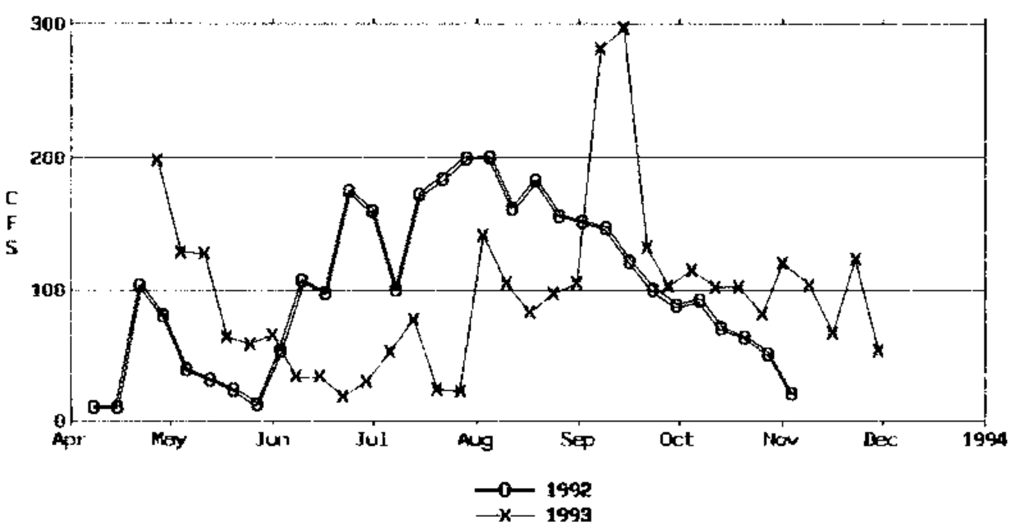
HILLSBORO RELEASE FROM SCOGGIN RES. (SRHL)



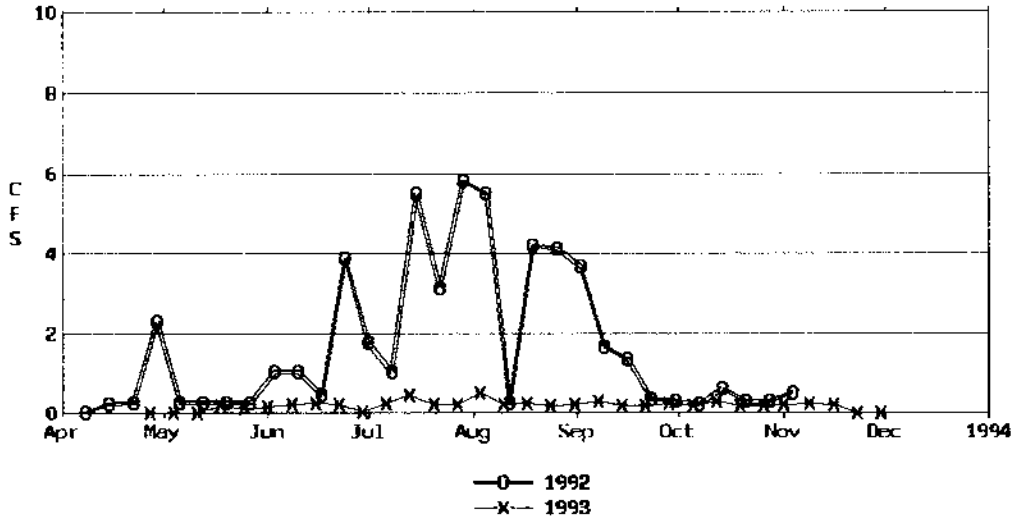
LOC RELEASE FROM SCOGGIN RES. (SRLO)



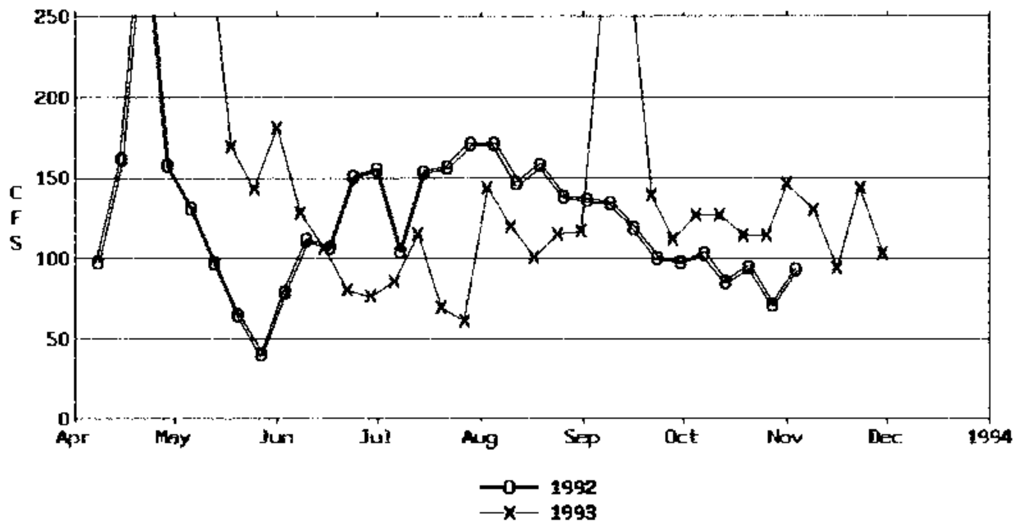
SCOGGIN CR. BELOW HAGG LAKE (RELEASE) (SCOO)



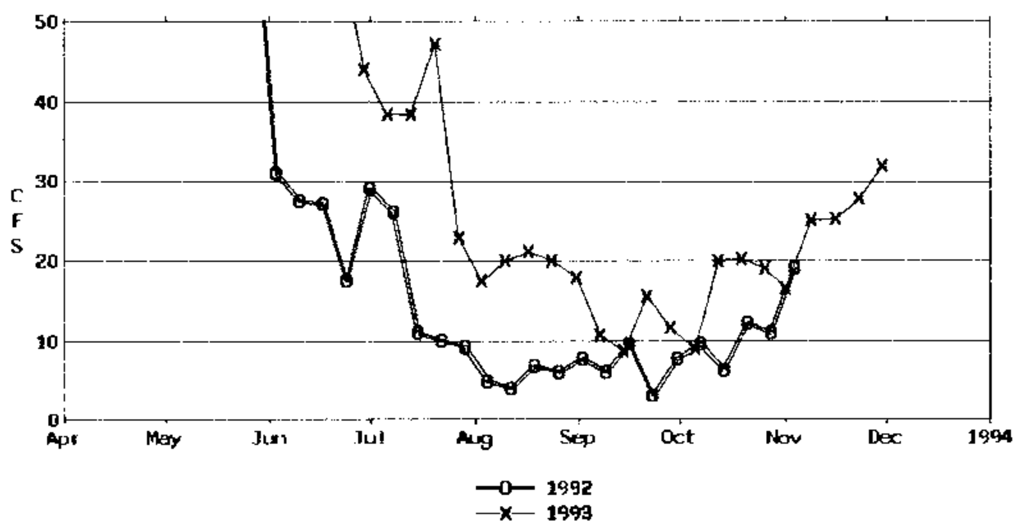
TVID - PATT. VALLEY PUMP PLANT DIV. (PVPP)



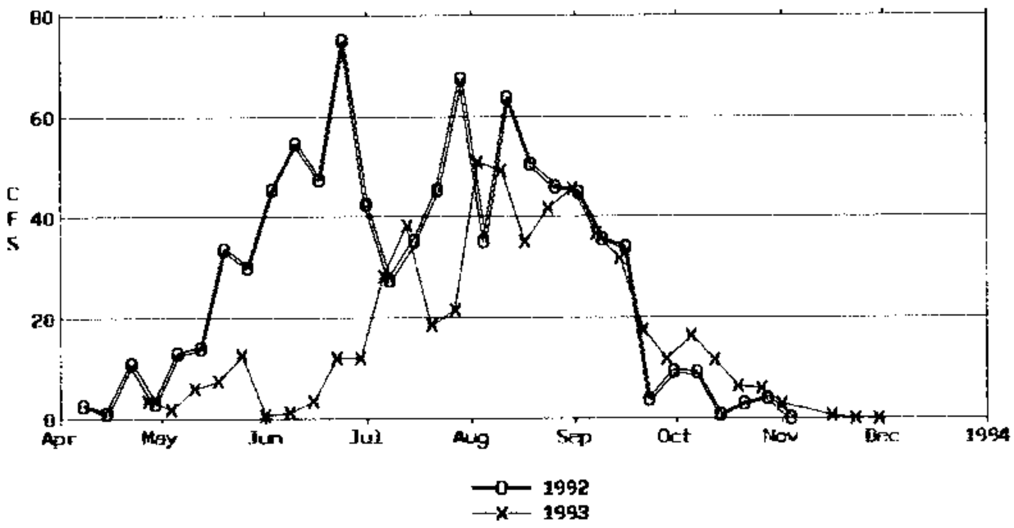
TUALATIN RIV. AT DILLEY BR. (DLLO)



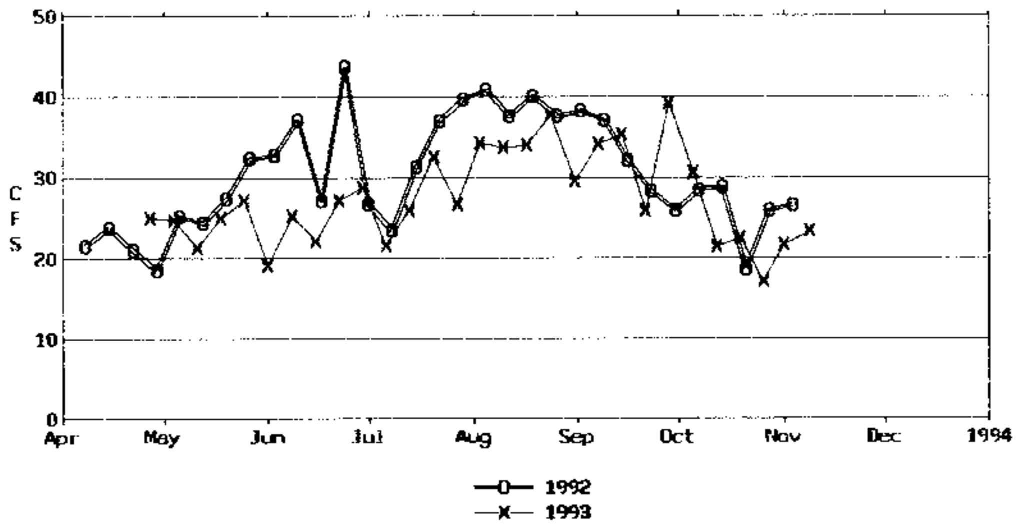
GALES CR. ON OLD HWY 47 BRIDGE (GALES)



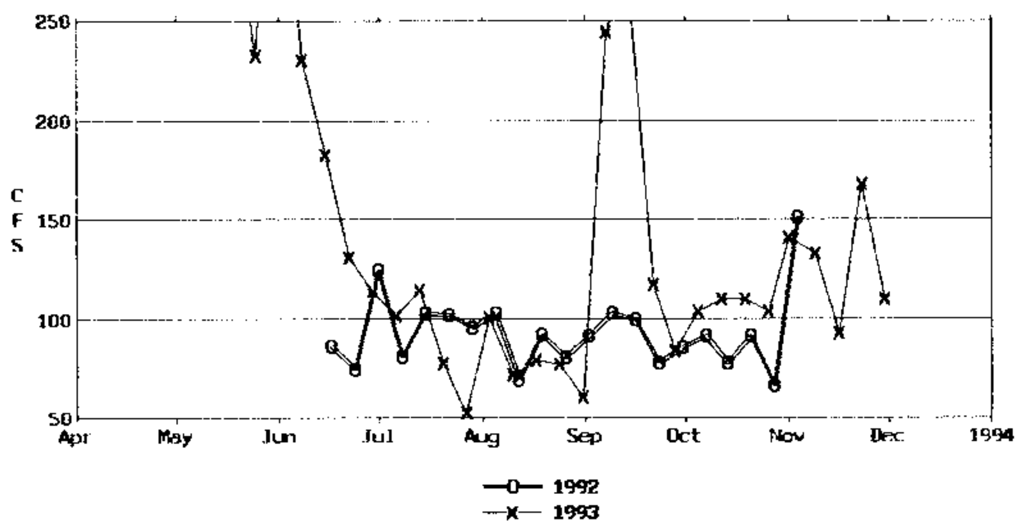
TVID - SPRINGHILL PUMP PLANT DIV. (SHPP)



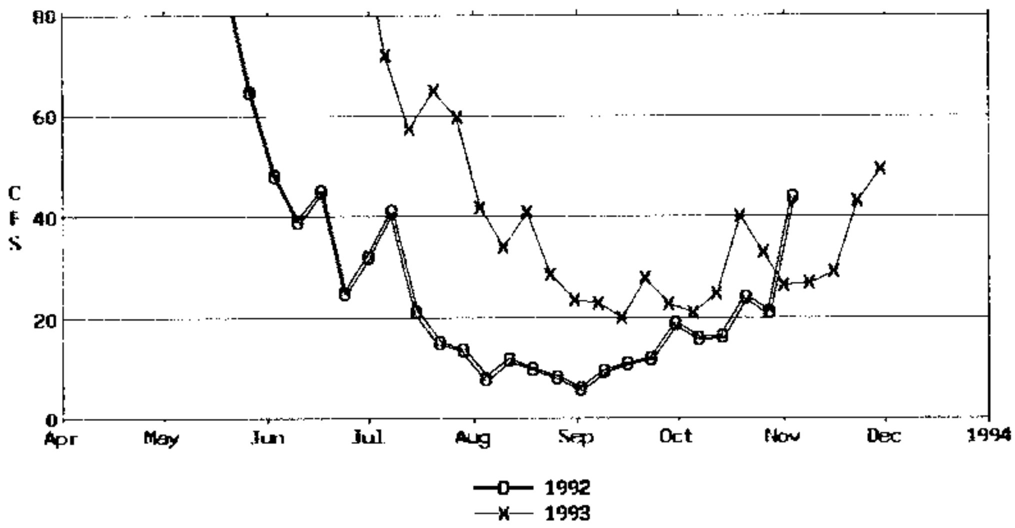
JOINT WATER DIVERSION AT SHPP PLANT (JWCS)



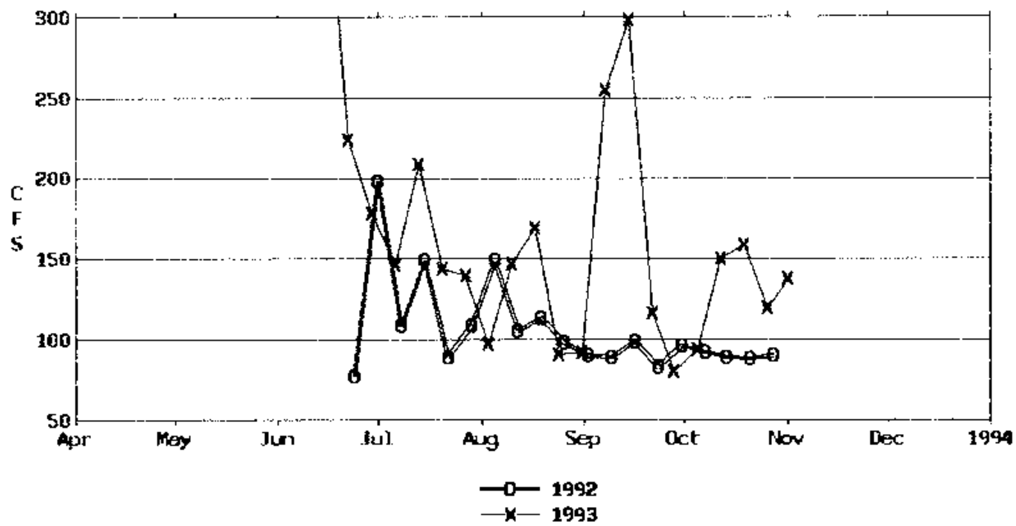
TUALATIN RIV. AT GOLF COURSE RD. (TRGC)



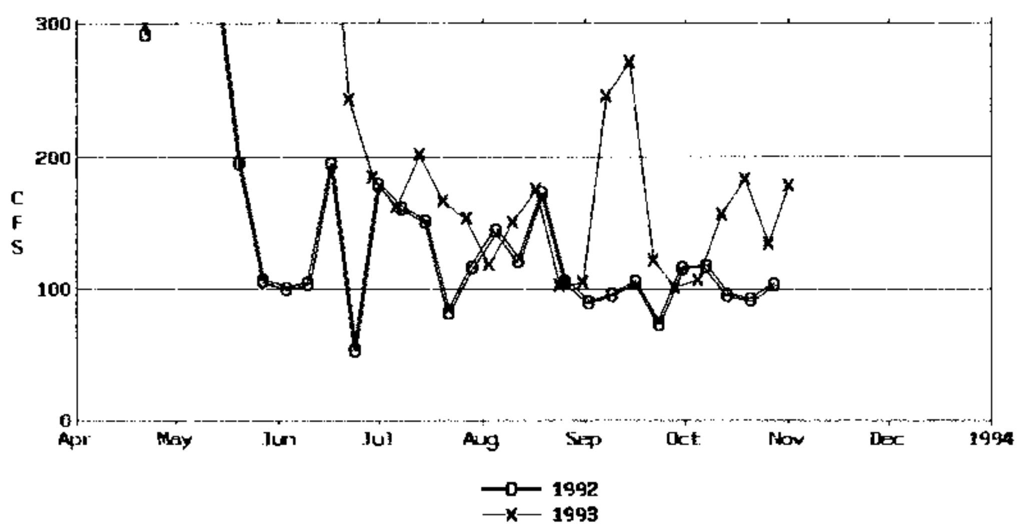
DAIRY CREEK AT HWY 8 BRIDGE (DAIRY)



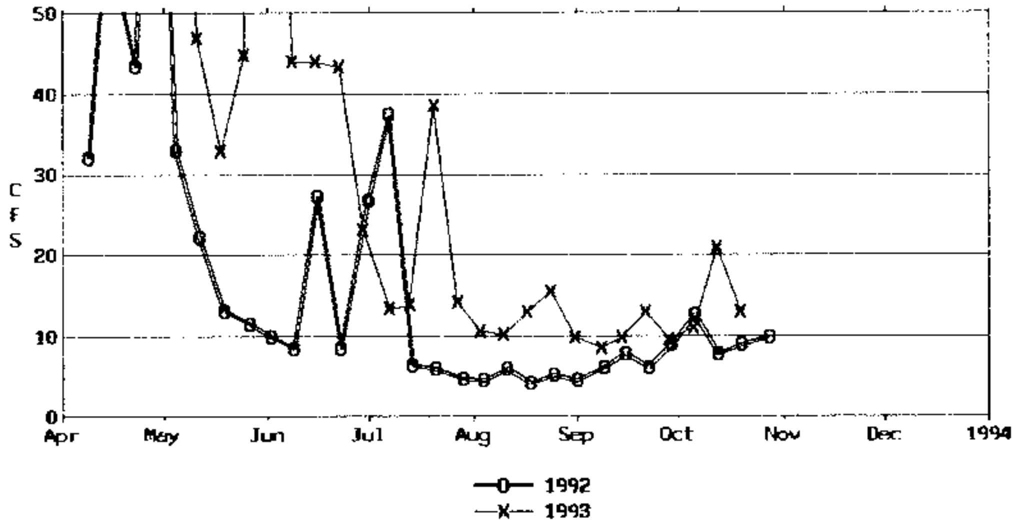
TUALATIN RIV. AT HWY 219 BRIDGE (TRJB)



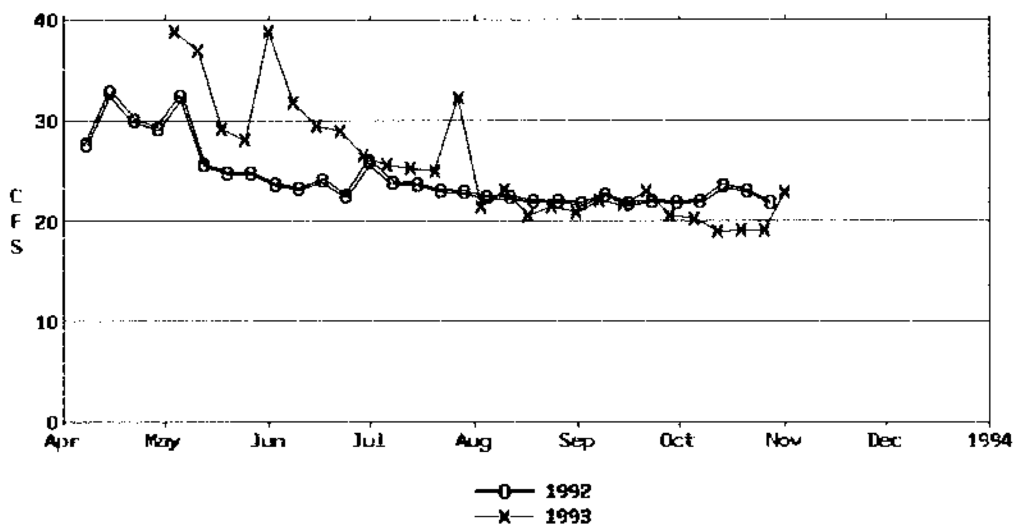
TUALATIN RIV. AT ROOD RD. BRIDGE (ROOD)



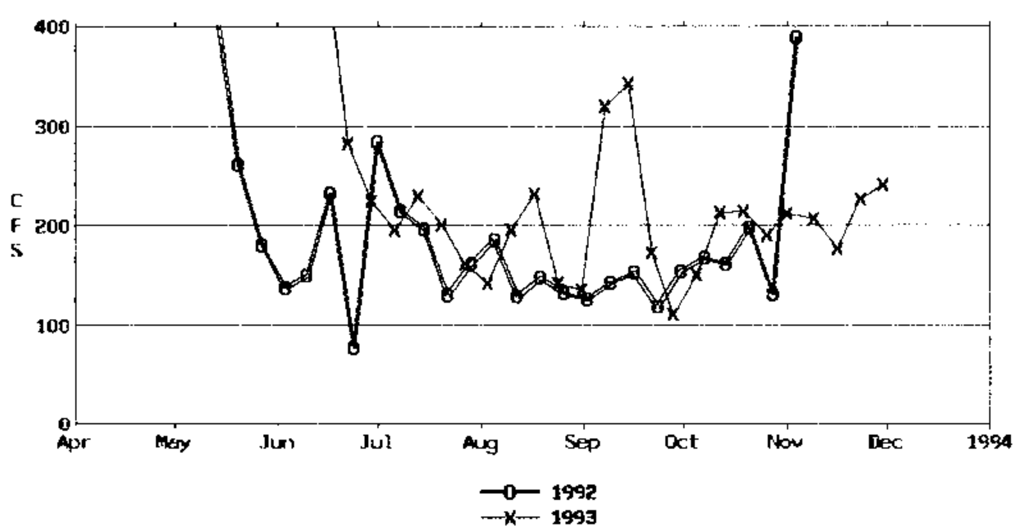
ROCK CREEK AT TV HWY (RCTV)



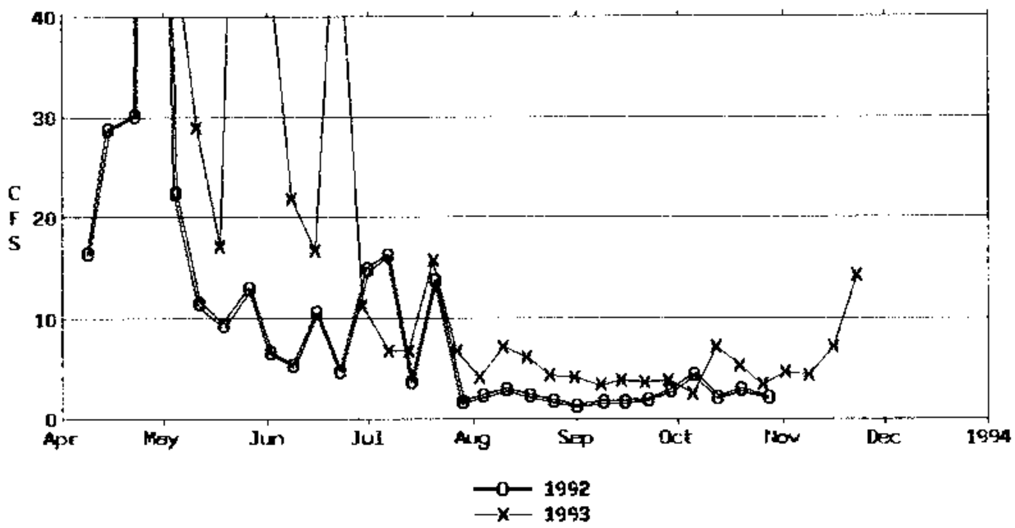
USA ROCK CREEK WWTP DISCHARGE (USARC)



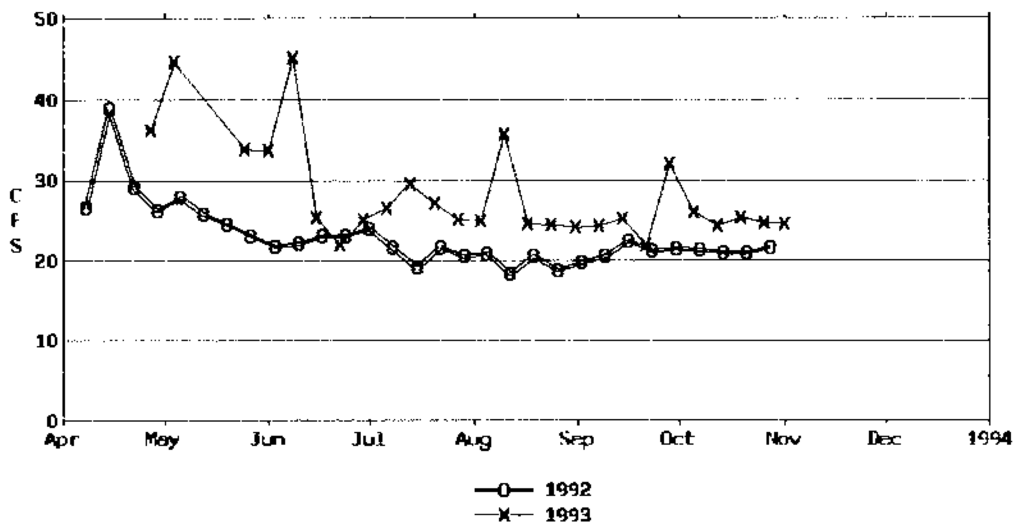
TUALATIN R. AT FARMINGTON RD. BRIDGE (FRMO)



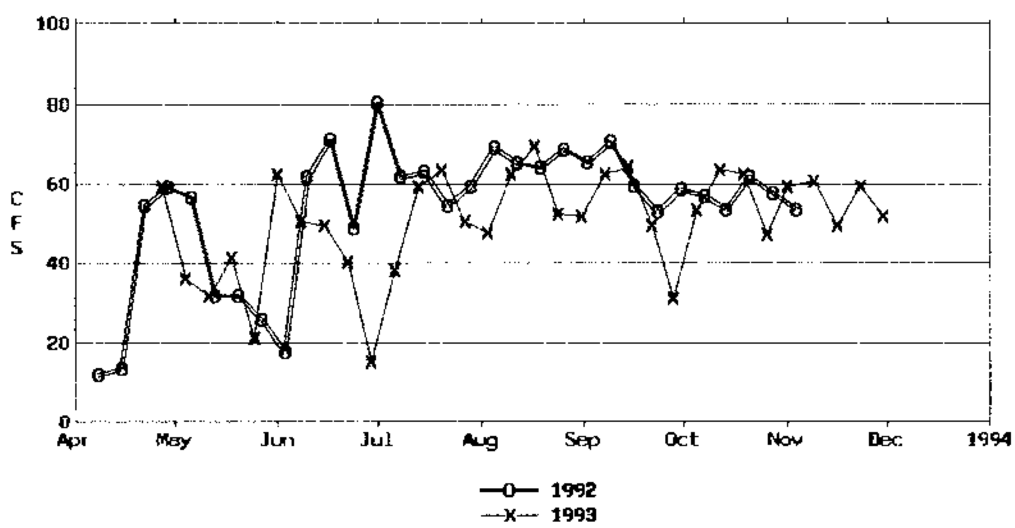
FANNO CREEK AT DURHAM RD. BRIDGE (FANO)



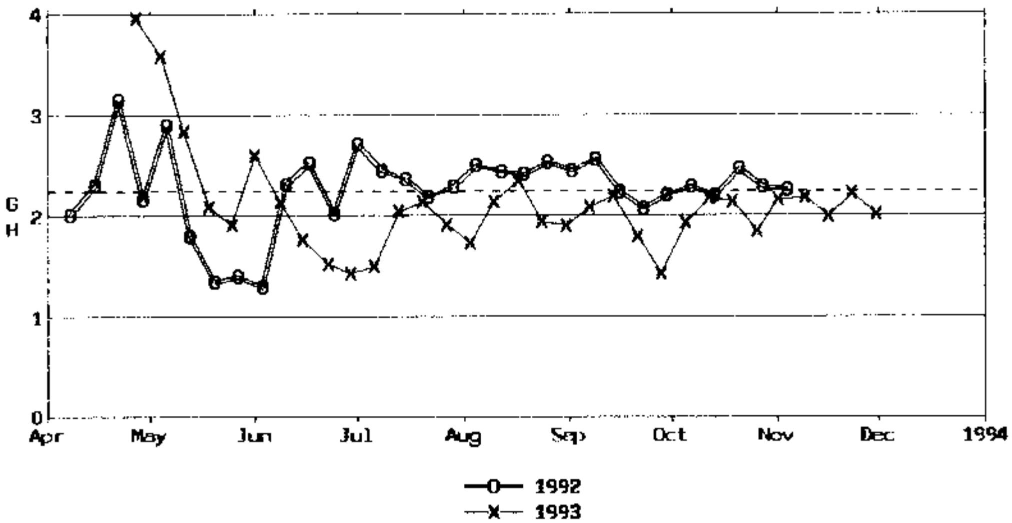
USA DURHAM WWTP DISCHARGE (USADH)



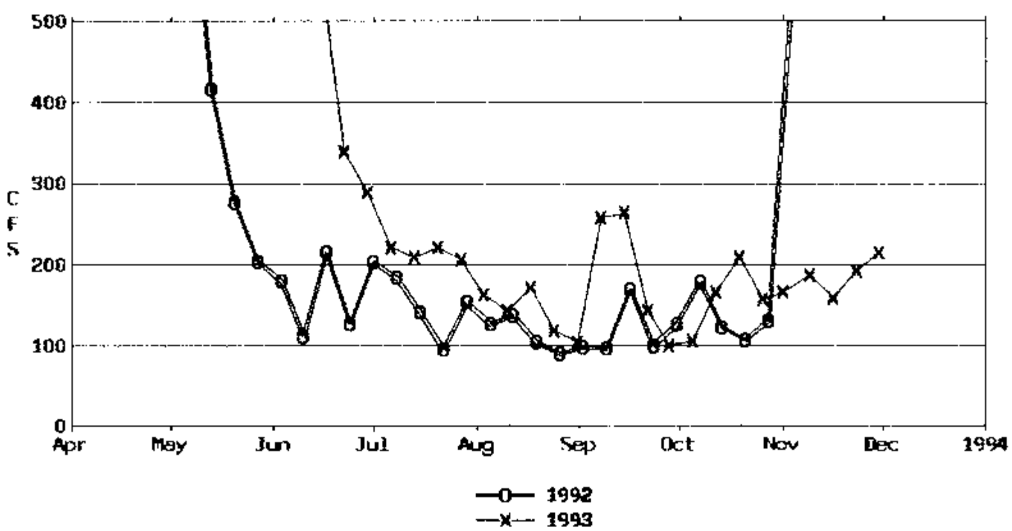
LAKE OSWEGO CORP. CANAL DIVERSION (LOCL)



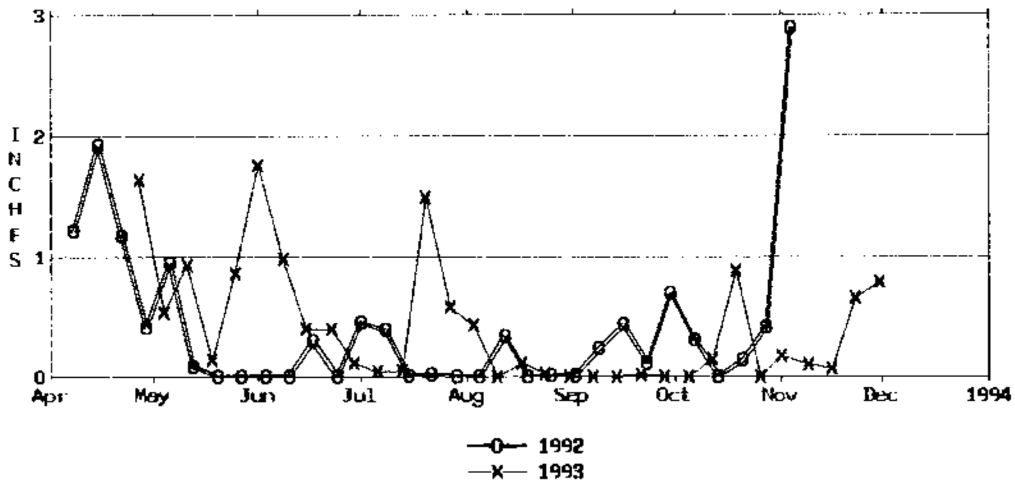
TUALATIN RIV. AT LOC CANAL (LOCS)



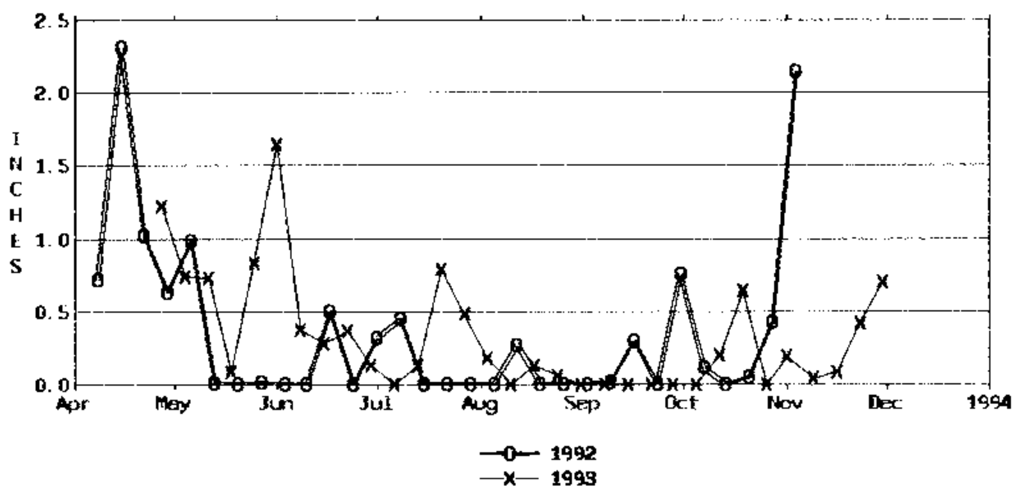
TUALATIN RIV. AT WEST LINN (WSLO)



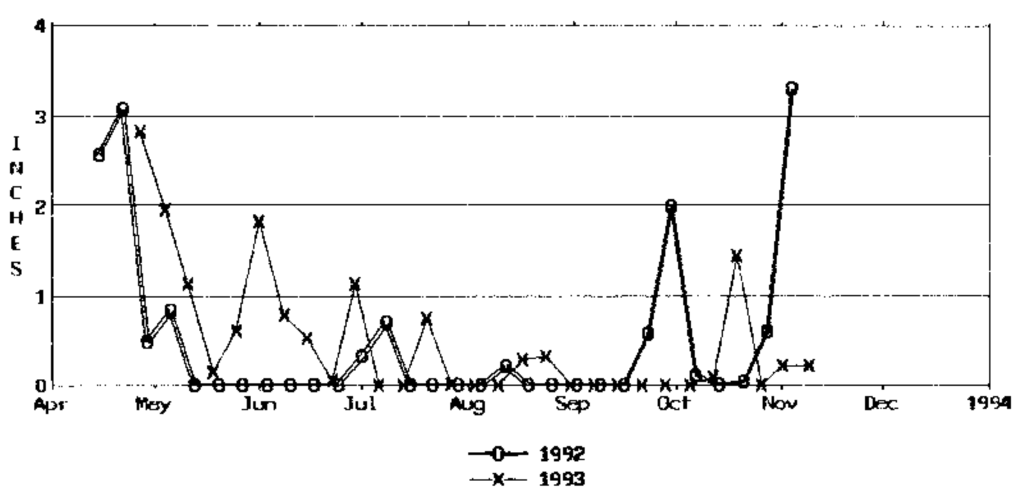
SCOGGIN RESERVOIR STATION (SCOP)
PREVIOUS 7 DAYS ACCUMULATED PRECIPITATION



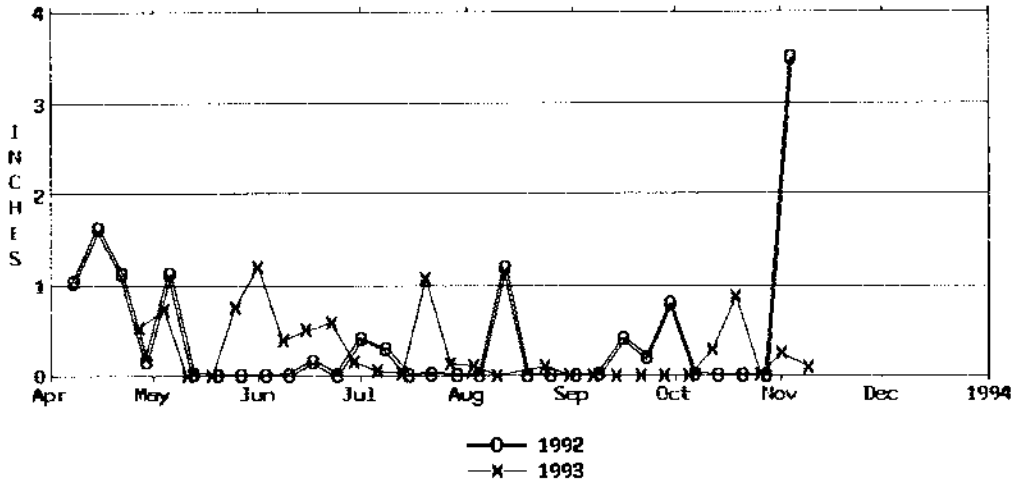
FOREST GROVE STATION (FGOP)
PREVIOUS 7 DAYS ACCUMULATED PRECIPITATION



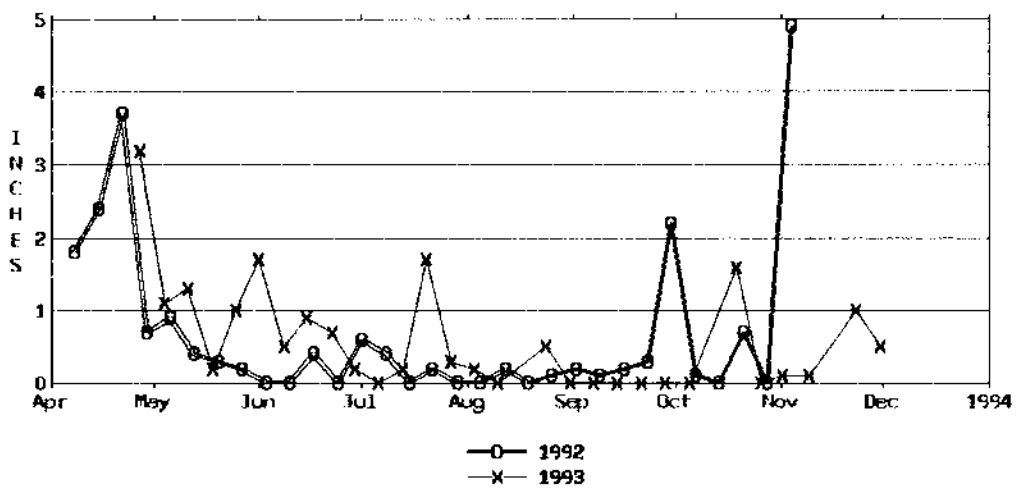
HAINES FALLS STATION (HFOP)
PREVIOUS 7 DAYS ACCUMULATED PRECIPITATION



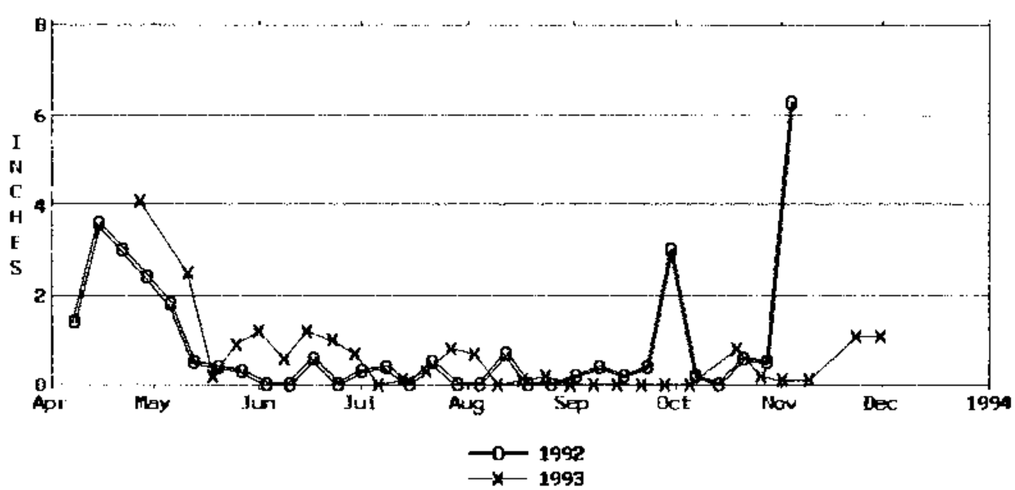
JOINT WATER PLANT STATION (JWOP)
PREVIOUS 7 DAYS ACCUMULATED PRECIPITATION



SAIN CREEK STATION (SECO)
PREVIOUS 7 DAYS ACCUMULATED PRECIPITATION



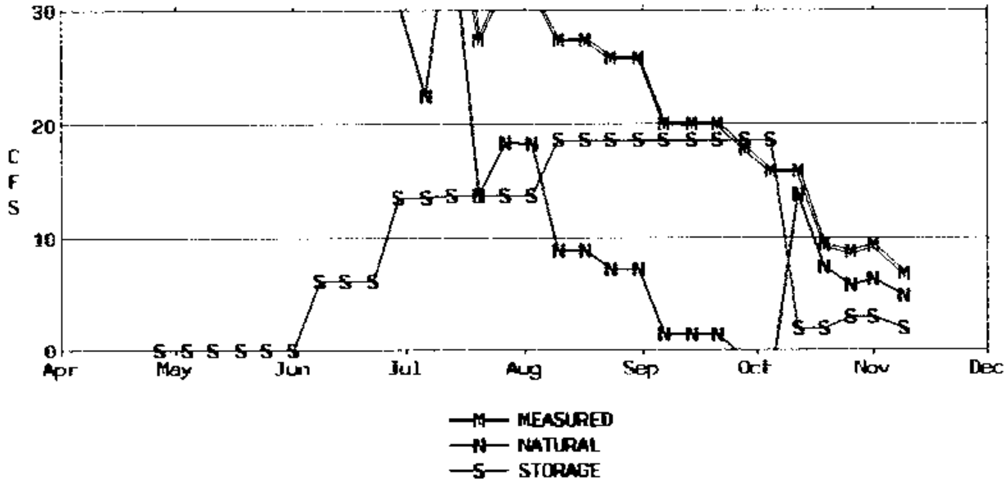
SADDLE MOUNTAIN STATION (SDMO)
PREVIOUS 7 DAYS ACCUMULATED PRECIPITATION



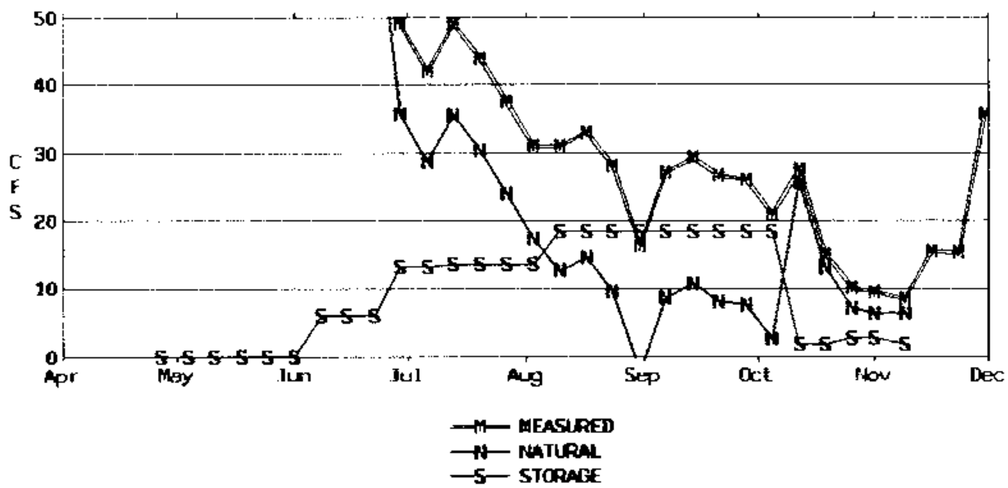
APPENDIX B

HYDROGRAPHS FOR NATURAL FLOW DETERMINATION AND DATA TABLES

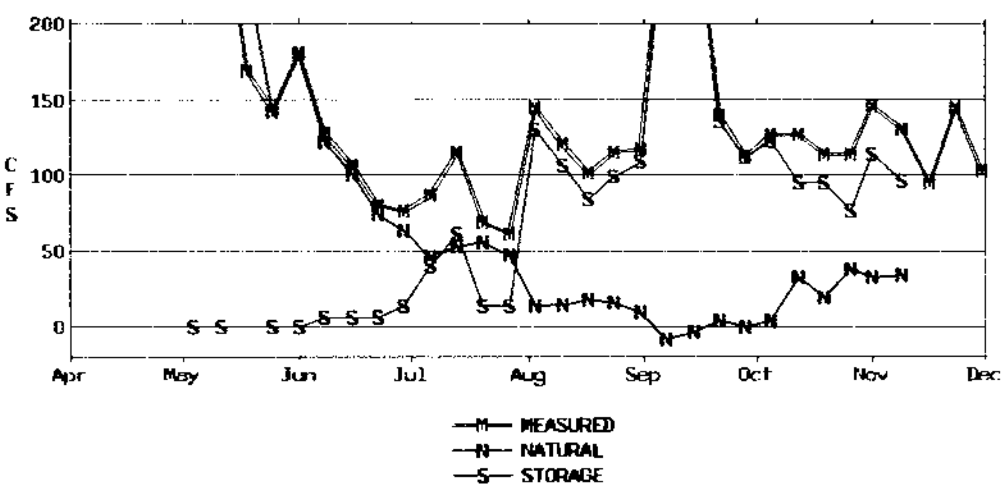
NATURAL FLOW
AT LEE FALLS ON TUALATIN RIVER (NFTRLF)



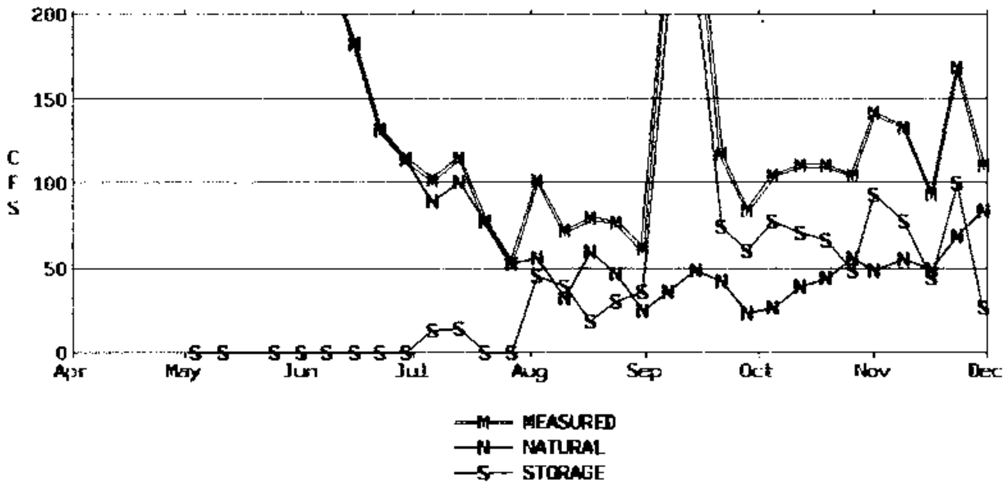
NATURAL FLOW
AT GASTON GAUGE ON TUALATIN RIVER (NFGAST)



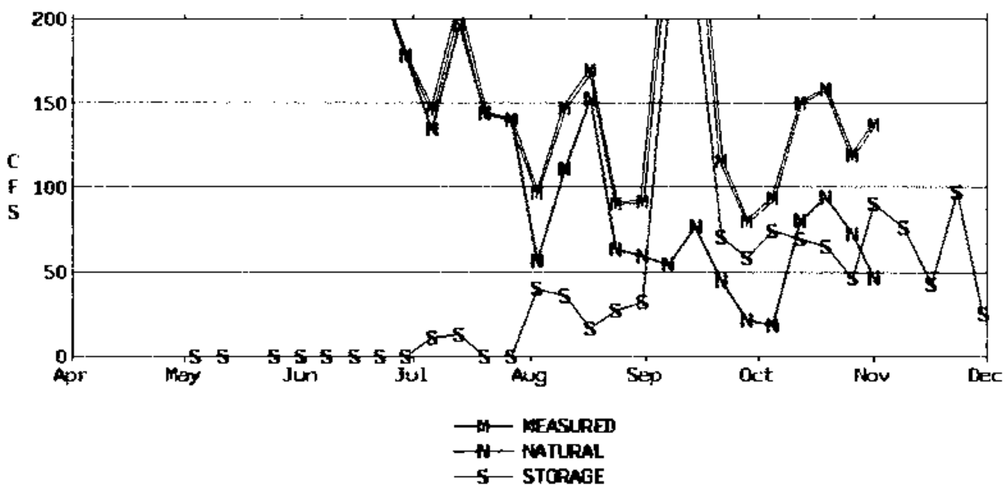
NATURAL FLOW
AT DILLEY GAUGE ON TUALATIN RIVER (NFDLLO)



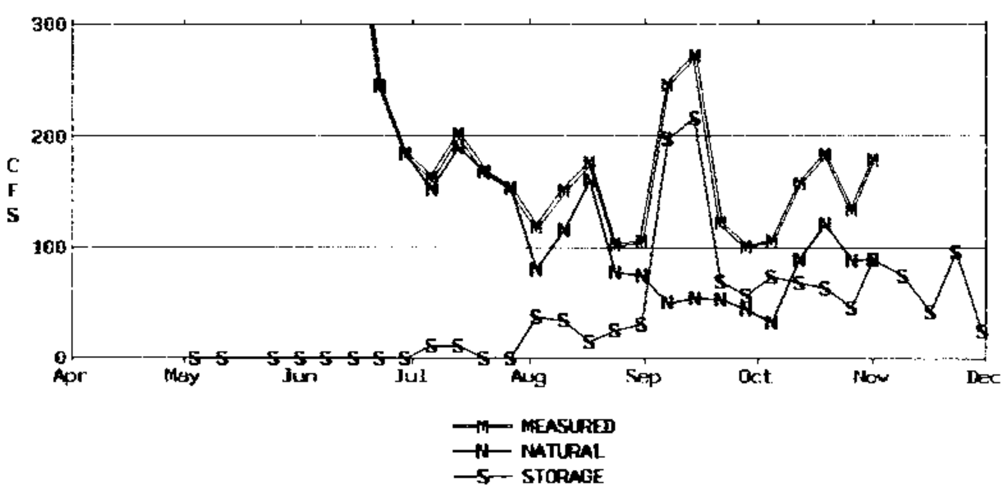
NATURAL FLOW
AT GOLF COURSE BRIDGE GAUGE ON T.R. (NFTRGC)



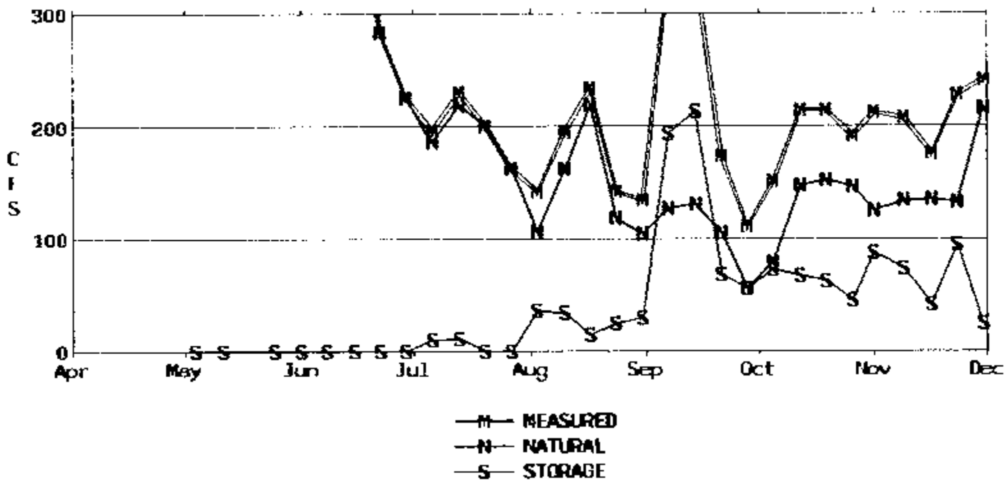
NATURAL FLOW
AT HWY 219 BRIDGE GAUGE ON T.R. (NFTRJB)



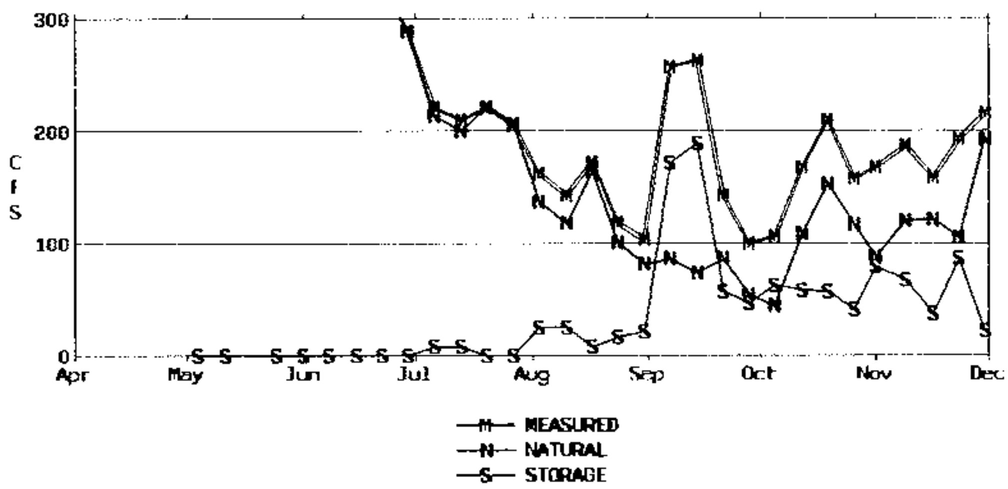
NATURAL FLOW
AT ROOD BRIDGE RD. ON T.R. (NFROOD)



NATURAL FLOW
AT FARMINGTON RD. BRIDGE ON T.R. (NFFRMO)



NATURAL FLOW
AT WEST LINN ON TUALATIN RIVER (NFWSLO)



NATURAL FLOW
AT LEE FALLS ON TUALATIN RIVER

	NFTRLF	TRLF	STORAGE	TRTR	LOSS (2%)
27-APR-93			0.000	0.0	0.000
04-MAY-93	219.000	219.00	0.000	0.0	0.000
10-MAY-93					
11-MAY-93	183.000	183.00	0.000	0.0	0.000
18-MAY-93	79.600	79.60	0.000	0.0	0.000
25-MAY-93	62.300	62.30	0.000	0.0	0.000
01-JUN-93	92.900	92.90	0.000	0.0	0.000
02-JUN-93					
08-JUN-93	51.024	57.10	6.076	6.2	0.124
14-JUN-93					
15-JUN-93	51.024	57.10	6.076	6.2	0.124
22-JUN-93	44.324	50.40	6.076	6.2	0.124
29-JUN-93	30.874	44.30	13.426	13.7	0.274
06-JUL-93	22.374	35.80	13.426	13.7	0.274
07-JUL-93					
12-JUL-93					
13-JUL-93	38.580	52.30	13.720	14.0	0.280
20-JUL-93	13.680	27.40	13.720	14.0	0.280
27-JUL-93	18.380	32.10	13.720	14.0	0.280
03-AUG-93	18.280	32.00	13.720	14.0	0.280
09-AUG-93					
10-AUG-93	8.780	27.40	18.620	19.0	0.380
17-AUG-93	8.780	27.40	18.620	19.0	0.380
24-AUG-93	7.180	25.80	18.620	19.0	0.380
31-AUG-93	7.180	25.80	18.620	19.0	0.380
07-SEP-93	1.380	20.00	18.620	19.0	0.380
08-SEP-93					
13-SEP-93					
14-SEP-93	1.380	20.00	18.620	19.0	0.380
21-SEP-93	1.380	20.00	18.620	19.0	0.380
28-SEP-93	-0.820	17.80	18.620	19.0	0.380
05-OCT-93	-2.820	15.80	18.620	19.0	0.380
12-OCT-93	13.840	15.80	1.960	2.0	0.040
19-OCT-93	7.340	9.30	1.960	2.0	0.040
26-OCT-93	5.830	8.77	2.940	3.0	0.060
01-NOV-93	6.360	9.30	2.940	3.0	0.060
02-NOV-93					
09-NOV-93	4.880	6.84	1.960	2.0	0.040
16-NOV-93					
23-NOV-93					
30-NOV-93					

NFTRLF = TRLF - STORAGE
WHERE STORAGE = TRTR - LOSS
WHERE LOSS = TRTR * .02

NATURAL FLOW
AT GASTON GAUGE ON TUALATIN RIVER

	NFGAST	GAST	STORAGE	TRTR	LOSS (3%)	PVR2
27-APR-93	380.000	380.00	0.000	0.0	0.000	0
04-MAY-93	250.000	250.00	0.000	0.0	0.000	0
10-MAY-93						
11-MAY-93	180.000	180.00	0.000	0.0	0.000	0
18-MAY-93	138.000	138.00	0.000	0.0	0.000	0
25-MAY-93	91.000	91.00	0.000	0.0	0.000	0
01-JUN-93	104.000	104.00	0.000	0.0	0.000	0
02-JUN-93						
08-JUN-93	73.886	79.90	6.014	6.2	0.186	0
14-JUN-93						
15-JUN-93	66.986	73.00	6.014	6.2	0.186	0
22-JUN-93	72.986	79.00	6.014	6.2	0.186	0
29-JUN-93	35.711	49.00	13.289	13.7	0.411	0
06-JUL-93	28.711	42.00	13.289	13.7	0.411	0
07-JUL-93						
12-JUL-93						
13-JUL-93	35.420	49.00	13.580	14.0	0.420	0
20-JUL-93	30.420	44.00	13.580	14.0	0.420	0
27-JUL-93	23.920	37.50	13.580	14.0	0.420	0
03-AUG-93	17.420	31.00	13.580	14.0	0.420	0
09-AUG-93						
10-AUG-93	12.570	31.00	18.430	19.0	0.570	0
17-AUG-93	14.570	33.00	18.430	19.0	0.570	0
24-AUG-93	9.670	28.10	18.430	19.0	0.570	0
31-AUG-93	-2.230	16.20	18.430	19.0	0.570	0
07-SEP-93	8.670	27.10	18.430	19.0	0.570	0
08-SEP-93						
13-SEP-93						
14-SEP-93	10.770	29.20	18.430	19.0	0.570	0
21-SEP-93	8.170	26.60	18.430	19.0	0.570	0
28-SEP-93	7.570	26.00	18.430	19.0	0.570	0
05-OCT-93	2.570	21.00	18.430	19.0	0.570	0
12-OCT-93	25.660	27.60	1.940	2.0	0.060	0
19-OCT-93	13.060	15.00	1.940	2.0	0.060	0
26-OCT-93	7.090	10.00	2.910	3.0	0.090	0
01-NOV-93	6.470	9.38	2.910	3.0	0.090	0
02-NOV-93						
09-NOV-93	6.480	8.42	1.940	2.0	0.060	0
16-NOV-93		15.50				0
23-NOV-93		15.20				0
30-NOV-93		35.60				0

NFGAST = GAST - STORAGE
WHERE STORAGE = (TRTR - LOSS) + PVR2
WHERE LOSS = TRTR * .03

NATURAL FLOW
AT DILLEY GAUGE ON TUALATIN RIVER

	NFDLLO	DLLO	STORAGE	TRTR	SRUS	SRTV	SRHL	SRFG	SRLO	SRBV
27-APR-93		587.0		0.0						
04-MAY-93	373.0000	373.0	0.0000	0.0	0	0	0	0	0	0
10-MAY-93										
11-MAY-93	320.0000	320.0	0.0000	0.0	0	0	0	0	0	0
18-MAY-93		169.0		0.0						
25-MAY-93	143.0000	143.0	0.0000	0.0	0	0	0	0	0	0
01-JUN-93	181.0000	181.0	0.0000	0.0	0	0	0	0	0	0
02-JUN-93										
08-JUN-93	122.0170	128.0	5.9830	6.2	0	0	0	0	0	0
14-JUN-93										
15-JUN-93	100.0170	106.0	5.9830	6.2	0	0	0	0	0	0
22-JUN-93	74.0170	80.0	5.9830	6.2	0	0	0	0	0	0
29-JUN-93	62.7795	76.0	13.2205	13.7	0	0	0	0	0	0
06-JUL-93	46.6280	86.0	39.3720	13.7	10	19	0	0	0	0
07-JUL-93										
12-JUL-93										
13-JUL-93	53.3365	115.0	61.6635	14.0	10	31	0	0	0	12
20-JUL-93	55.4900	69.0	13.5100	14.0	0	0	0	0	0	0
27-JUL-93	47.4900	61.0	13.5100	14.0	0	0	0	0	0	0
03-AUG-93	13.3390	144.0	130.6610	14.0	30	86	0	0	3	11
09-AUG-93										
10-AUG-93	13.7535	120.0	106.2465	19.0	30	49	0	0	3	14
17-AUG-93	17.2380	101.0	83.7620	19.0	10	42	0	0	3	17
24-AUG-93	15.8945	115.0	99.1055	19.0	20	53	0	0	3	13
31-AUG-93	8.7270	117.0	108.2730	19.0	25	58	0	0	3	13
07-SEP-93	-8.4025	270.0	278.4025	19.0	203	55	0	0	3	14
08-SEP-93										
13-SEP-93										
14-SEP-93	-3.2550	293.0	296.2550	19.0	225	50	0	0	3	15
21-SEP-93	3.7070	139.0	135.2930	19.0	68	38	0	0	3	16
28-SEP-93	-0.0365	112.0	112.0365	19.0	55	29	0	0	3	13
05-OCT-93	4.4450	127.0	122.5550	19.0	74	20	0	0	3	13
12-OCT-93	32.4300	127.0	94.5700	2.0	69	10	0	0	3	15
19-OCT-93	19.4300	114.0	94.5700	2.0	67	10	6	3	0	11
26-OCT-93	37.8615	114.0	76.1385	3.0	48	11	5	3	0	10
01-NOV-93	32.6125	146.0	113.3875	3.0	95	5	3	3	0	9
02-NOV-93										
09-NOV-93	33.7895	130.0	96.2105	2.0	80	3	3	3	0	9
16-NOV-93		94.3			45	2	3	3	0	9
23-NOV-93		144.0			103	0	0	1	0	9
30-NOV-93		103.0			27	0	0	1	0	9

NFDLLO = DLLO - STORAGE
WHERE STORAGE = (TRTR + SRUS + (SRTV*.90) + SRHL + SRFG + SRLO + SRBV) - LOSS
WHERE LOSS = (TRTR + SRUS + (SRTV*.90) + SRHL + SRFG + SRLO + SRBV) * .035

NATURAL FLOW
AT DILLEY GAUGE ON TUALATIN RIVER

	LOSS (3.5%)
27-APR-93	
04-MAY-93	0.0000
10-MAY-93	
11-MAY-93	0.0000
18-MAY-93	
25-MAY-93	0.0000
01-JUN-93	0.0000
02-JUN-93	
08-JUN-93	0.2170
14-JUN-93	
15-JUN-93	0.2170
22-JUN-93	0.2170
29-JUN-93	0.4795
06-JUL-93	1.4280
07-JUL-93	
12-JUL-93	
13-JUL-93	2.2365
20-JUL-93	0.4900
27-JUL-93	0.4900
03-AUG-93	4.7390
09-AUG-93	
10-AUG-93	3.8535
17-AUG-93	3.0380
24-AUG-93	3.5945
31-AUG-93	3.9270
07-SEP-93	10.0975
08-SEP-93	
13-SEP-93	
14-SEP-93	10.7450
21-SEP-93	4.9070
28-SEP-93	4.0635
05-OCT-93	4.4450
12-OCT-93	3.4300
19-OCT-93	3.4300
26-OCT-93	2.7615
01-NOV-93	4.1125
02-NOV-93	
09-NOV-93	3.4895
16-NOV-93	
23-NOV-93	
30-NOV-93	

NFDLLO = DLLO - STORAGE
WHERE STORAGE = (TRTR + SRUS + (SRTV*.90) + SRHL + SRFG + SRLO + SRBV) - LOSS
WHERE LOSS = (TRTR + SRUS + (SRTV*.90) + SRHL + SRFG + SRLO + SRBV) * .035

NATURAL FLOW
AT GOLF COURSE BRIDGE GAUGE ON T.R.

	NFTRGC	TRGC	STORAGE	SRUS	SRTV	SRLO	LOSS (3.4%)
27-APR-93		1045.0					
04-MAY-93	720.00000	720.0	0.00000	0	0	0	0.00000
10-MAY-93							
11-MAY-93	573.00000	573.0	0.00000	0	0	0	0.00000
18-MAY-93		313.0					
25-MAY-93	232.00000	232.0	0.00000	0	0	0	0.00000
01-JUN-93	370.00000	370.0	0.00000	0	0	0	0.00000
02-JUN-93							
08-JUN-93	230.00000	230.0	0.00000	0	0	0	0.00000
14-JUN-93							
15-JUN-93	183.00000	183.0	0.00000	0	0	0	0.00000
22-JUN-93	131.00000	131.0	0.00000	0	0	0	0.00000
29-JUN-93	114.00000	114.0	0.00000	0	0	0	0.00000
06-JUL-93	89.40336	102.0	12.59664	10	19	0	0.44336
07-JUL-93							
12-JUL-93							
13-JUL-93	100.54864	115.0	14.45136	10	31	0	0.50864
20-JUL-93	78.00000	78.0	0.00000	0	0	0	0.00000
27-JUL-93	52.60000	52.6	0.00000	0	0	0	0.00000
03-AUG-93	55.82984	101.0	45.17016	30	86	3	1.58984
09-AUG-93							
10-AUG-93	32.54856	72.0	39.45144	30	49	3	1.38856
17-AUG-93	59.95048	79.0	19.04952	10	42	3	0.67048
24-AUG-93	46.69032	77.1	30.40968	20	53	3	1.07032
31-AUG-93	24.98752	61.0	36.01248	25	58	3	1.26752
07-SEP-93	36.50320	244.0	207.49680	203	55	3	7.30320
08-SEP-93							
13-SEP-93							
14-SEP-93	48.02400	276.0	227.97600	225	50	3	8.02400
21-SEP-93	42.54072	117.0	74.45928	68	38	3	2.62072
28-SEP-93	23.48976	84.0	60.51024	55	29	3	2.12976
05-OCT-93	26.52680	104.0	77.47320	74	20	3	2.72680
12-OCT-93	38.90240	110.0	71.09760	69	10	3	2.50240
19-OCT-93	43.73240	110.0	66.26760	67	10	0	2.33240
26-OCT-93	55.93184	104.0	48.06816	48	11	0	1.69184
01-NOV-93	48.45720	141.0	92.54280	95	5	0	3.25720
02-NOV-93							
09-NOV-93	55.25632	133.0	77.74368	80	3	0	2.73632
16-NOV-93	49.42088	93.2	43.77912	45	2	0	1.54088
23-NOV-93	68.50200	168.0	99.49800	103	0	0	3.50200
30-NOV-93	83.91800	110.0	26.08200	27	0	0	0.91800

NFTRGC = TRGC - STORAGE
WHERE STORAGE = (SRUS + (SRTV * .16) + SRLO) - LOSS
WHERE LOSS = (SRUS + (SRTV * .16) + SRLO) * .034

NATURAL FLOW
AT HWY 219 BRIDGE GAUGE ON T.R.

	NFTRJB	TRJB	STORAGE	SRUS	SRTV	SRLO	LOSS (5.2%)
27-APR-93							
04-MAY-93	1350.00000	1350.00	0.00000	0	0	0	0.00000
10-MAY-93							
11-MAY-93			0.00000	0	0	0	0.00000
18-MAY-93		634.00					
25-MAY-93	466.70000	466.70	0.00000	0	0	0	0.00000
01-JUN-93	850.00000	850.00	0.00000	0	0	0	0.00000
02-JUN-93							
08-JUN-93	629.00000	629.00	0.00000	0	0	0	0.00000
14-JUN-93							
15-JUN-93	426.00000	426.00	0.00000	0	0	0	0.00000
22-JUN-93	224.00000	224.00	0.00000	0	0	0	0.00000
29-JUN-93	178.00000	178.00	0.00000	0	0	0	0.00000
06-JUL-93	134.53868	146.00	11.46132	10	19	0	0.62868
07-JUL-93							
12-JUL-93							
13-JUL-93	196.28732	209.00	12.71268	10	31	0	0.69732
20-JUL-93	144.00000	144.00	0.00000	0	0	0	0.00000
27-JUL-93	140.00000	140.00	0.00000	0	0	0	0.00000
03-AUG-93	56.44792	96.70	40.25208	30	86	3	2.20792
09-AUG-93							
10-AUG-93	110.60628	147.00	36.39372	30	49	3	1.99628
17-AUG-93	152.09624	168.80	16.70376	10	42	3	0.91624
24-AUG-93	63.26916	90.60	27.33084	20	53	3	1.49916
31-AUG-93	59.43776	92.03	32.59224	25	58	3	1.78776
07-SEP-93	53.97660	255.00	201.02340	203	55	3	11.02660
08-SEP-93							
13-SEP-93							
14-SEP-93	77.34200	298.70	221.35800	225	50	3	12.14200
21-SEP-93	44.82936	116.10	71.27064	68	38	3	3.90936
28-SEP-93	22.09188	80.10	58.00812	55	29	3	3.18188
05-OCT-93	18.61840	93.70	75.08160	74	20	3	4.11840
12-OCT-93	80.70120	150.00	69.29880	69	10	3	3.80120
19-OCT-93	94.04120	158.60	64.55880	67	10	0	3.54120
26-OCT-93	72.34892	119.00	46.65108	48	11	0	2.55892
01-NOV-93	46.41860	137.00	90.58140	95	5	0	4.96860
02-NOV-93							
09-NOV-93			76.15284	80	3	0	4.17716
16-NOV-93			42.86856	45	2	0	2.35144
23-NOV-93			97.64400	103	0	0	5.35600
30-NOV-93			25.59600	27	0	0	1.40400

NFTRJB = TRJB - STORAGE
WHERE STORAGE = (SRUS + (SRTV * .11) + SRLO) - LOSS
WHERE LOSS = (SRUS + (SRTV * .11) + SRLO) * .052

NATURAL FLOW
AT ROOD BRIDGE RD. ON T.R.

	NFROOD	ROOD	STORAGE	SRUS	SRLO	SRTV	LOSS (6.6%)
27-APR-93		1670.0					
04-MAY-93	1180.00000	1180.0	0.00000	0	0	0	0.00000
10-MAY-93							
11-MAY-93	998.00000	998.0	0.00000	0	0	0	0.00000
18-MAY-93		601.0					
25-MAY-93	460.00000	460.0	0.00000	0	0	0	0.00000
01-JUN-93	944.00000	944.0	0.00000	0	0	0	0.00000
02-JUN-93							
08-JUN-93	640.00000	640.0	0.00000	0	0	0	0.00000
14-JUN-93							
15-JUN-93	465.00000	465.0	0.00000	0	0	0	0.00000
22-JUN-93	244.00000	244.0	0.00000	0	0	0	0.00000
29-JUN-93	185.00000	185.0	0.00000	0	0	0	0.00000
06-JUL-93	151.24032	162.0	10.75968	10	0	19	0.76032
07-JUL-93							
12-JUL-93							
13-JUL-93	190.34368	202.0	11.65632	10	0	31	0.82368
20-JUL-93	167.00000	167.0	0.00000	0	0	0	0.00000
27-JUL-93	153.00000	153.0	0.00000	0	0	0	0.00000
03-AUG-93	80.75208	118.0	37.24792	30	3	86	2.63208
09-AUG-93							
10-AUG-93	115.51672	150.0	34.48328	30	3	49	2.43672
17-AUG-93	159.71976	175.0	15.28024	10	3	42	1.07976
24-AUG-93	76.95784	102.4	25.44216	20	3	53	1.79784
31-AUG-93	74.71424	105.2	30.48576	25	3	58	2.15424
07-SEP-93	49.38640	245.9	196.51360	203	3	55	13.88640
08-SEP-93							
13-SEP-93							
14-SEP-93	54.51200	271.2	216.68800	225	3	50	15.31200
21-SEP-93	52.64664	121.8	69.15336	68	3	38	4.88664
28-SEP-93	44.66112	101.0	56.33888	55	3	29	3.98112
05-OCT-93	33.28760	106.7	73.41240	74	3	20	5.18760
12-OCT-93	89.00480	157.0	67.99520	69	3	10	4.80480
19-OCT-93	120.57480	183.9	63.32520	67	0	10	4.47480
26-OCT-93	88.34608	134.0	45.65392	48	0	11	3.22608
01-NOV-93	89.89640	179.0	89.10360	95	0	5	6.29640
02-NOV-93							
09-NOV-93			74.94416	80	0	3	5.29584
16-NOV-93			42.17944	45	0	2	2.98056
23-NOV-93			96.20200	103	0	0	6.79800
30-NOV-93			25.21800	27	0	0	1.78200

NFROOD = ROOD - STORAGE
WHERE STORAGE = SRUS + SRLO + (SRTV * .08) - LOSS
WHERE LOSS = (SRUS + SRLO + (SRTV * .08)) * .066

NATURAL FLOW
AT FARMINGTON RD. BRIDGE ON T.R.

	NFFRMO	FRMO	STORAGE	SRUS	SRLO	SRTV	LOSS (8.0%)
27-APR-93		2117.0					
04-MAY-93	1670.0000	1670.0	0.0000	0	0	0	0.0000
10-MAY-93							
11-MAY-93	1234.0000	1234.0	0.0000	0	0	0	0.0000
18-MAY-93		680.0					
25-MAY-93	511.0000	511.0	0.0000	0	0	0	0.0000
01-JUN-93	1098.0000	1098.0	0.0000	0	0	0	0.0000
02-JUN-93							
08-JUN-93	724.0000	724.0	0.0000	0	0	0	0.0000
14-JUN-93							
15-JUN-93	476.0000	476.0	0.0000	0	0	0	0.0000
22-JUN-93	283.0000	283.0	0.0000	0	0	0	0.0000
29-JUN-93	225.0000	225.0	0.0000	0	0	0	0.0000
06-JUL-93	185.5764	196.0	10.4236	10	0	19	0.9064
07-JUL-93							
12-JUL-93							
13-JUL-93	218.8036	230.0	11.1964	10	0	31	0.9736
20-JUL-93	200.0000	200.0	0.0000	0	0	0	0.0000
27-JUL-93	162.0000	162.0	0.0000	0	0	0	0.0000
03-AUG-93	106.1016	142.0	35.8984	30	3	86	3.1216
09-AUG-93							
10-AUG-93	161.4844	195.0	33.5156	30	3	49	2.9144
17-AUG-93	218.3352	233.0	14.6648	10	3	42	1.2752
24-AUG-93	117.4268	142.0	24.5732	20	3	53	2.1368
31-AUG-93	104.5048	134.0	29.4952	25	3	58	2.5648
07-SEP-93	126.9380	320.0	193.0620	203	3	55	16.7880
08-SEP-93							
13-SEP-93							
14-SEP-93	130.0200	343.0	212.9800	225	3	50	18.5200
21-SEP-93	105.2328	173.0	67.7672	68	3	38	5.8928
28-SEP-93	55.7724	111.0	55.2276	55	3	29	4.8024
05-OCT-93	78.8720	151.0	72.1280	74	3	20	6.2720
12-OCT-93	146.7160	213.6	66.8840	69	3	10	5.8160
19-OCT-93	151.7160	214.0	62.2840	67	0	10	5.4160
26-OCT-93	146.1316	191.0	44.8684	48	0	11	3.9016
01-NOV-93	124.2780	212.0	87.7220	95	0	5	7.6280
02-NOV-93							
09-NOV-93	133.2068	207.0	73.7932	80	0	3	6.4168
16-NOV-93	134.4712	176.0	41.5288	45	0	2	3.6112
23-NOV-93	132.2400	227.0	94.7600	103	0	0	8.2400
30-NOV-93	216.1600	241.0	24.8400	27	0	0	2.1600

NFFRMO = FRMO - STORAGE
WHERE STORAGE = SRUS + SRLO + (SRTV * .07) - LOSS
WHERE LOSS = (SRUS + SRLO + (SRTV * .07)) * .080

NATURAL FLOW
AT WEST LINN ON TUALATIN RIVER

	NFWSLO	WSLO	STORAGE	SRUS	LOSS (16%)
27-APR-93		2478			
04-MAY-93	1971.00	1971	0.00	0	0.00
10-MAY-93					
11-MAY-93	1452.00	1452	0.00	0	0.00
18-MAY-93		812			
25-MAY-93	643.00	643	0.00	0	0.00
01-JUN-93	754.00	754	0.00	0	0.00
02-JUN-93					
08-JUN-93	868.00	868	0.00	0	0.00
14-JUN-93					
15-JUN-93	563.00	563	0.00	0	0.00
22-JUN-93	338.00	338	0.00	0	0.00
29-JUN-93	289.00	289	0.00	0	0.00
06-JUL-93	212.60	221	8.40	10	1.60
07-JUL-93					
12-JUL-93					
13-JUL-93	200.60	209	8.40	10	1.60
20-JUL-93	221.00	221	0.00	0	0.00
27-JUL-93	206.00	206	0.00	0	0.00
03-AUG-93	136.80	162	25.20	30	4.80
09-AUG-93					
10-AUG-93	117.80	143	25.20	30	4.80
17-AUG-93	163.60	172	8.40	10	1.60
24-AUG-93	101.20	118	16.80	20	3.20
31-AUG-93	82.00	103	21.00	25	4.00
07-SEP-93	86.48	257	170.52	203	32.48
08-SEP-93					
13-SEP-93					
14-SEP-93	74.00	263	189.00	225	36.00
21-SEP-93	85.88	143	57.12	68	10.88
28-SEP-93	53.80	100	46.20	55	8.80
05-OCT-93	43.84	106	62.16	74	11.84
12-OCT-93	109.04	167	57.96	69	11.04
19-OCT-93	152.72	209	56.28	67	10.72
26-OCT-93	116.68	157	40.32	48	7.68
01-NOV-93	87.20	167	79.80	95	15.20
02-NOV-93					
09-NOV-93	119.80	187	67.20	80	12.80
16-NOV-93	121.20	159	37.80	45	7.20
23-NOV-93	105.48	192	86.52	103	16.48
30-NOV-93	192.32	215	22.68	27	4.32

NFWSLO = WSLO - STORAGE
WHERE STORAGE = SRUS - LOSS
WHERE LOSS = SRUS * .16

APPENDIX C

SCOGGINS DAM
MONTHLY RESERVOIR OPERATION REPORTS

SCOGGINS DAM - RESERVOIR OPERATIONS

for the Month of January 1993 File: 193

	MEASURED INFLOW				HENRY HAGG LAKE						TUALATIN RIVER				WEATHER			WATER DELIVERIES					
DAY	SCHO CFS	SCLO CFS	TANO CFS	TOTAL INFLO CFS	W.S. ELEV FT	STOR CONT AF	CHANGE STOR AF	CHANGE STOR CFS	REL CFS	COMP INFLO CFS	DLLO CFS	GOLF CFS	FRMO CFS	WSLO CFS	PREC INCHES	TEMP MAX F	TEMP MIN F	TVID CFS	USA CFS	LO CFS	HLSBO CFS	FG CFS	BVRTN CFS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
						24152																	
1	40	77		117	273.85	24423	271	137	11	148	283	689	1929	2313	0.02	36	31	0	0	0	0	0	0
2	36	67		103	274.14	24669	246	124	11	135	242	606	1699	2016	0.16	34	33						
3	33	60		93	274.39	24882	213	107	11	118	228	535	1489	1753	0.06	37	33						
4	37	74	3	114	274.75	25189	307	155	11	166	289	637	1524	1909	0.46	40	31						
5	34	60	3	97	275.08	25472	283	143	11	154	313	691	1817	2144	0.47	39	29						
6	30	53	3	86	275.28	25644	172	87	11	98	283	680	1840	2246	0.00	35	22						
7	29	49		78	275.52	25850	206	104	11	115	255	591	1662	2107	0.00	31	24						
8	28	46	3	77	275.71	26014	164	83	11	94	234	540	1478	1813	0.11	34	23						
9	25	43		68	275.90	26179	165	83	11	94	212	493	1300	1587	0.00	31	24						
10	24	39		63	276.09	26344	165	83	11	94	191	435	1149	1397	0.00	39	23						
11	19	33	2	54	276.23	26465	121	61	11	72	164	395	1004	1218	0.00	37	13						
12	20	33		53	276.37	26587	122	62	11	73	162	375	897	1064	0.00	30	12						
13	19	32	2	53	276.51	26709	122	62	11	73	155	349	835	990	0.00	38	25						
14	18	31		49	276.63	26814	105	53	11	64	145	324	768	902	0.03	32	26						
15	18	30	2	50	276.76	26927	113	57	11	68	139	303	727	845	0.37	37	29						
16	18	27		45	276.87	27023	96	48	11	59	133	284	674	795	0.00	48	30						
17	17	26		43	276.99	27129	106	53	11	64	127	266	639	752	0.00	36	30						
18	16	25		41	277.08	27208	79	40	11	51	122	247	600	715	0.00	45	31						
19	17	29	2	48	277.18	27295	87	44	11	55	118	238	566	673	0.22	44	31						
20	137	312		449	277.89	27921	626	316	13	329	408	734	1179	1475	2.13	48	32						
21	91	212		303	279.15	29044	1123	566	11	577	1156	1421	2384	3698	0.50	47	32						
22	81	190		271	280.08	29882	838	422	11	433	1060	1603	3504	4364	0.53	41	32						
23	65	146		211	280.79	30528	646	326	11	337	731	1605	3513	4316	0.01	48	32						
24	59	128		187	281.41	31004	476	240	11	251	608	1475	3590	4413	0.47	37	34						
25	90	230		320	282.25	31871	867	437	11	448	770	1445	3707	4330	0.34	52	36						
26	85	215		300	283.12	32680	809	408	11	419	870	1515	3650	4292	0.02	56	39						
27	75	190		265	283.91	33422	742	374	11	385	725	1533	3563	4197	0.01	49	36						
28	70	171		241	284.55	34027	605	305	12	317	598	1451	3486	4054	0.24	49	34						
29	72	178	4	254	285.21	34654	627	316	12	328	594	1370	3417	3996	0.10	49	41						
30	61	153		214	285.77	35207	553	279	12	291	556	1283	3222	3800	0.00	51	36						
31	55	132		187	286.27	35666	459	231	12	243	499	1154	3039	3597	0.00	56	34						
TOTAL															6.25								
CFS	1419	3091	24	4534				5805	347	6152	12370	25267	60851	73771	MAX	56		0	0	0	0	0	0
AC-FT	2815	6131	48	8993			11514	11514	688	12202	24536	50117	120698	146325	MIN		12	0	0	0	0	0	0

SCOGGINS DAM - RESERVOIR OPERATIONS

For the Month of February 1993

File: 293

	MEASURED INFLOW				HENRY HAGG LAKE						TUALATIN RIVER				WEATHER			WATER DELIVERIES					
DAY	SCHO CFS	SCLO CFS	TANO CFS	TOTAL INFLO CFS	W.S. ELEV FT	STOR CONT AF	CHANGE STOR AF	CHANGE STOR CFS	REL CFS	COMP INFLO CFS	DLLO CFS	GOLF CFS	FRMO CFS	WSLO CFS	PREC INCHES	TEMP MAX F	TEMP MIN F	TVID CFS	USA CFS	LO CFS	HLSBO CFS	FG CFS	BVRTN CFS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
						35666																	
1	49	112	3	164	286.68	36061	395	199	12	211	439	993	2856	3378	0.00	54	30						
2	42	97	3	142	287.01	36379	318	160	12	172	380	842	2530	3079	0.02	51	31						
3	39	88	3	130	287.34	36699	320	161	12	173	304	725	2117	2598	0.00	52	34						
4	37	82	3	122	287.61	36961	262	132	10	142	275	635	1761	2153	0.00	48	32						
5	34	74	3	111	287.86	37204	243	123	10	133	246	571	1515	1830	0.01	54	36						
6	32	69	3	104	288.10	37438	234	118	10	128	226	512	1331	1644	0.00	53	39						
7	32	67	2	101	288.38	37712	274	138	10	148	214	473	1195	1483	0.00	54	42						
8	30	66	2	98	288.53	37859	147	74	10	84	209	452	1114	1277	0.00	58	43						
9	30	64	2	96	288.72	38046	187	94	10	104	202	434	1028	1168	0.06	56	39						
10	28	63	2	93	288.91	38233	187	94	10	104	197	415	970	1098	0.01	53	35						
11	28	63	2	93	289.11	38430	197	99	10	109	195	401	916	1044	0.06	50	36						
12	25	53	2	80	289.31	38627	197	99	10	109	185	382	865	977	0.00	52	39						
13	28	53	2	83	289.45	38766	139	70	10	80	174	359	810	926	0.00	49	39						
14	27	52	2	81	289.60	38914	148	75	10	85	164	338	749	868	0.00	57	34						
15	25	48	2	75	289.74	39054	140	71	10	81	157	317	700	812	0.00	53	37						
16	25	47	2	74	289.86	39192	138	70	10	80	147	293	653	768	0.00	46	26						
17	25	44	2	71	290.01	39321	129	65	10	75	141	279	614	736	0.00	35	24						
18	24	42	2	68	290.11	39421	100	50	10	60	136	270	572	689	0.00	39	26						
19	24	41	3	68	290.25	39560	139	70	10	80	138	269	567	663	0.34	41	28						
20	23	40	2	65	290.36	39670	110	55	10	65	132	261	587	663	0.11	38	29						
21	23	40	2	65	290.48	39790	120	61	10	71	134	263	634	746	0.27	37	32						
22	22	35	2	59	290.65	39960	170	86	10	96	147	283	684	834	0.33	40	31						
23	22	34	2	58	298.74	40050	90	45	10	55	142	271	680	845	0.00	39	29						
24	21	33	2	56	290.85	40160	110	55	10	65	136	261	640	806	0.00	39	26						
25	20	31	2	53	290.94	40250	90	45	10	55	131	246	593	736	0.00	45	24						
26	20	29	2	51	291.02	40330	80	40	10	50	127	231	550	694	0.00	47	24						
27	20	29	2	51	291.09	40401	71	36	10	46	121	224	514	653	0.00	50	28						
28	19	29	2	50	291.17	40481	80	40	10	50	117	215	493	614	0.00	50	28						
29																							
30																							
31																							
TOTAL															1.21								
CFS	774	1525	63	2362				2428	286	2714	5316	11215	28238	33782	MAX	58		0	0	0	0	0	0
AC-FT	1535	3025	125	4685			4815	4815	567	5382	10544	22245	56010	67007	MIN		24	0	0	0	0	0	0

SCOGGINS DAM - RESERVOIR OERATIONS

For the Month of March 993

	MEASURED INFLOW				HENRY HAGG LAKE						TUALATN RIVER				WEATHER			WATER DELIVERIES					
DAY	SCHO CFS	SCLO CFS	TANO CFS	TOTAL INFLO CFS	W.S. ELEV FT	STOR CONT AF	CHANGE STOR AF	CHANGE STOR CFS	REL CFS	COMP INFLO CFS	DLLO CFS	GOLF CFS	FRMO CFS	WSLO CFS	PREC INCHES	TEMP MAX F	TEMP MIN F	TVID CFS	USA CFS	LO CFS	HLSBO CFS	FG CFS	BVRTN CFS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
						40481																	
1	20	34	3	57	291.28	40592	111	56	10	66	116	212	477	594	0.19	52	29						
2	26	46	3	75	291.46	40773	181	91	10	101	170	350	682	779	0.36	46	36						
3	29	53	4	86	291.62	40935	162	82	10	92	176	342	869	1084	0.31	48	39						
4	50	127	NA	177	291.81	41127	192	97	10	107	211	411	997	1240	0.31	56	39						
5	83	228	NA	311	292.56	41888	761	384	10	394	436	1014	1335	1390	0.52	51	45						
6	63	172	NA	235	293.10	42439	551	278	11	289	489	1056	2002	2007	0.03	54	41						
7	53	138	NA	191	293.53	42880	441	222	11	233	439	1059	2085	2419	0.00	64	40						
8	45	115	5	165	293.90	43260	380	192	11	203	417	809	1949	2380	0.00	58	43						
9	36	109	4	149	294.21	43580	320	161	10	171	331	691	1717	2116	0.00	62	38						
10	33	85	4	122	294.44	43818	238	120	10	130	288	601	1511	1830	0.00	63	40						
11	31	75	4	110	294.67	44057	239	120	10	130	256	528	1302	1572	0.00	58	37						
12	28	65	4	97	294.85	44244	187	94	10	104	228	471	1127	1344	0.00	60	40						
13	27	56	4	87	295.02	44421	177	89	10	99	206	428	995	1183	0.00	53	38						
14	27	58	3	88	295.22	44629	208	105	10	115	191	395	906	1071	0.00	53	45						
15	30	79	3	112	295.45	44869	240	121	11	132	255	498	1045	1197	0.45	55	44						
16	28	70	4	102	295.66	45089	220	111	11	122	255	498	1051	1154	0.05	45	41						
17	44	114	5	163	296.02	45466	377	190	11	201	352	686	1240	1563	0.92	46	41						
18	56	145	6	207	296.46	45929	463	233	11	244	428	945	1846	2025	0.48	48	42						
19	45	119	5	169	296.83	46320	391	197	11	208	442	933	2109	2419	0.00	52	40						
20	42	109	5	156	297.17	46686	366	185	11	196	414	854	2024	2518	0.00	55	39						
21	37	92	5	134	297.46	46995	309	156	11	167	366	762	1921	2972	0.00	61	41						
22	35	85	4	124	297.72	47273	278	140	11	151	321	667	1735	2153	0.39	63	39						
23	75	185	5	265	298.23	47820	547	276	11	287	487	981	1949	2803	0.96	55	47						
24	60	150	5	215	298.74	48370	550	277	11	288	545	1146	2648	3058	t	58	35						
25	51	125	5	181	298.92	48565	195	98	112	210	541	1099	2582	3207	0.00	58	32						
26	44	103	5	152	299.11	48770	205	103	101	204	502	1006	2440	3015	0.00	61	34						
27	39	85	4	128	299.26	48933	163	82	101	183	459	891	2239	2715	0.00	64	38						
28	35	73	4	112	299.41	49096	163	82	37	119	338	738	1957	2419	0.00	66	39						
29	33	70	4	107	299.62	49325	229	115	22	137	295	619	1650	2043	0.15	63	43						
30	33	68	4	105	299.83	49555	230	116	13	129	269	554	1417	1694	0.22	51	39						
31	30	61	4	95	300.04	49784	229	115	13	128	259	521	1299	1499	0.06	60	41						
TOTAL															5.40								
CFS	1268	3094	115	4477				4690	652	5342	10482	21765	49106	59463	MAX	66		0	0	0	0	0	0
AC-FT	2515	6137	228	8880			9303	9303	1293	10596	20791	43171	97402	117945	MIN		29	0	0	0	0	0	0

SCOGGINS DAM - RESERVOIR OPERATIONS

For the Month of April 1993

File: 493

DAY	MEASURED INFLOW SCHO CFS (1)	SCLO CFS (2)	TANO CFS (3)	TOTAL INFLO CFS (4)	HENRY HAGG LAKE W.S. ELEV FT (5)	STOR CONT AF (6)	CHANGE STOR AF (7)	CHANGE STOR CFS (8)	REL CFS (9)	COMP INFLO CFS (10)	TUALATIN RIVER OLLO CFS (11)	GOLF CFS (12)	FRMO CFS (13)	WSLO CFS (14)	WEATHER PREC INCHES (15)	TEMP MAX F (16)	TEMP MIN F (17)	WATER DELIVERIES TVID CFS (18)	USA CFS (19)	LO CFS (20)	HL580 CFS (21)	FG CFS (22)	BVRTN CFS (23)
						49784																	
1	32	70	4	106	300.24	50004	220	111	11	122	227	506	1216	1436	0.35	61	42						
2	33	71	4	108	300.48	50267	263	199	11	144	240	548	1231	1390	0.23	53	45						
3	50	117	5	172	300.84	50664	397	200	11	211	350	750	1354	1452	0.60	56	49						
4	42	99	5	146	301.15	51006	342	172	11	183	365	795	1907	2007	0.07	60	41						
5	38	86	5	129	301.44	51328	322	162	11	173	325	728	1957	2265	0.03	59	38						
6	36	76	5	117	301.69	51606	278	140	11	151	284	652	1809	2162	0.00	58	39						
7	33	70	5	108	301.91	51851	245	124	11	135	258	600	1658	1935	0.04	58	38						
8	38	83	5	126	302.15	52119	268	135	11	146	234	540	1469	1728	0.36	63	41						
9	70	150	NA	220	302.37	52365	246	124	102	226	368	727	1536	1753	1.02	61	44						
10	97	288	NA	385	302.42	52421	56	28	340	368	956	1222	2412	2171	1.03	50	40						
11	93	239	NA	332	302.87	52926	505	255	199	454	1371	1472	3015	3292	0.37	52	37						
12	72	180	NA	252	303.14	53231	305	154	185	339	1123	1680	3164	3766	0.00	60	36						
13	62	145	NA	207	302.92	52983	-248	-125	372	247	1117	1533	3256	3721	0.10	51	38						
14	52	119	NA	171	302.49	52500	-483	-244	453	209	1104	1462	3297	3800	0.06	58	36						
15	50	109	NA	159	302.55	52567	67	34	175	209	688	1382	3269	3789	0.30	62	41						
16	45	95	NA	140	302.52	52533	-34	-17	179	162	581	1213	3182	3777	0.00	60	39						
17	45	94	NA	139	302.62	52645	112	56	134	190	524	1056	2971	3732	0.33	58	45						
18	42	88	NA	130	302.69	52724	79	40	134	174	495	947	2856	3575	0.10	57	43						
19	39	81	NA	120	302.71	52747	23	12	132	144	461	842	2587	3378	0.00	58	35						
20	36	73	NA	109	302.79	52836	89	45	101	146	409	751	2228	2940	0.00	58	35						
21	36	75	NA	111	302.90	52960	124	63	79	142	368	688	1886	2498	0.30	68	46						
22	33	68	NA	101	302.98	53050	90	45	79	124	333	652	1795	2246	0.06	63	43						
23	35	75	5	115	302.10	53186	136	69	79	148	317	618	1670	2079	0.15	55	45						
24	51	119	6	176	303.16	53253	67	34	170	204	452	797	1652	2181	0.43	52	45						
25	48	113	6	167	303.18	53276	23	12	198	210	504	864	1848	2190	0.15	59	47						
26	63	143	8	214	303.20	53298	22	11	199	210	529	898	1998	2360	0.50	54	44						
27	62	138	8	208	303.28	53389	91	46	198	244	587	1045	2117	2478	0.05	59	38						
28	54	121	8	183	303.34	53457	68	34	198	232	578	1071	2223	2538	0.00	62	39						
29	48	109	6	163	303.35	53468	11	6	174	180	541	1015	2118	2618	0.05	60	47						
30	43	90	5	138	303.46	53592	124	63	100	163	451	888	2109	2578	0.03	66	45						
31																							
TOTAL															6.71								
CFS	1478	3384	90	4952				1920	4068	5988	16140	27942	65790	77835	MAX	68		0	0	0	0	0	0
AC-FT	2932	6712	179	9822			3808	3808	8069	11877	32014	55423	130494	154386	MIN		35	0	0	0	0	0	0

SCOGGINS DAM - RESERVOIR OPERATIONS

For the Month of May 1993

File: 593

DAY	SCHO CFS (1)	SCLO CFS (2)	TANO CFS (3)	TOTAL INFLO CFS (4)	W.S. ELEV FT (5)	STOR CONT AF (6)	CHANGE STOR AF (7)	CHANGE STOR CFS (8)	REL CFS (9)	COMP INFLO CFS (10)	OLLO CFS (11)	GOLF CFS (12)	FRMO CFS (13)	WSLO CFS (14)	PREC INCHES (15)	TEMP MAX F (16)	TEMP MIN F (17)	TVID CFS (18)	USA CFS (19)	LO CFS (20)	HLSBO CFS (21)	FG CFS (22)	BVRTN CFS (23)
	-- MEASURED INFLOW --				-- HENRY HAGG LAKE --						-- TUALATIN RIVER --				-- WEATHER --			-- WATER DELIVERIES --					
						53592																	
1	39	71	4	114	303.48	53615	23	12	146	158	429	781	1884	2342	0.00	60	44						
2	37	64	4	105	303.47	53604	-11	-6	146	140	407	740	1690	2079	0.02	55	42						
3	42	85	5	132	303.47	53604	0	0	147	147	390	688	1565	1944	0.48	65	48						
4	36	68	5	109	303.51	53649	45	23	132	155	373	720	1670	1971	0.16	60	42						
5	34	62	4	100	303.50	53640	-9	-5	128	123	343	637	1557	1865	0.01	57	39						
6	33	56	4	93	303.50	53640	0	0	128	128	350	605	1421	1762	0.34	65	45						
7	37	58	4	99	303.46	53592	-48	-24	128	104	321	591	1403	1644	0.03	62	40						
8	46	79	5	130	303.54	53683	91	46	112	158	384	664	1306	1612	0.37	50	43						
9	39	71	5	115	303.54	53683	0	0	128	128	379	659	1351	1571	0.00	62	38						
10	34	65	5	104	303.52	53660	-23	-12	128	116	352	620	1327	1547	0.02	67	45						
11	32	58	4	94	303.48	53615	-45	-23	128	105	320	573	1234	1452	0.00	83	45						
12	31	55	4	90	303.50	53640	25	13	101	114	271	509	1149	1359	0.00	74	50						
13	29	51	4	84	303.50	53640	0	0	98	98	257	470	1036	1270	0.14	71	49						
14	26	47	3	76	303.47	53604	-36	-18	98	80	238	422	977	1154	0.00	72	50						
15	25	43	3	71	303.48	53615	11	6	75	81	206	391	864	1057	0.00	67	53						
16	24	40	3	67	303.48	53615	0	0	75	75	193	378	788	951	0.00	71	47						
17	23	37	3	63	303.48	53615	0	0	75	75	185	342	739	862	0.00	76	49						
18	22	35	3	60	303.48	53615	0	0	66	66	169	313	680	812	0.00	86	52						
19	22	33	3	58	303.49	53626	11	6	53	59	153	272	623	746	0.00	83	57						
20	23	36	3	62	303.53	53672	46	23	53	76	162	294	612	845	0.26	78	53						
21	22	35	3	60	303.55	53694	22	11	59	70	160	288	682	736	0.19	72	52						
22	21	31	3	55	303.55	53694	0	0	59	59	158	302	643	768	0.05	64	49						
23	20	30	3	53	303.55	53694	0	0	59	59	151	280	605	741	0.00	65	48						
24	19	27	3	49	303.52	53660	-34	-17	59	42	144	241	552	673	0.00	81	55						
25	21	30	4	55	303.53	53672	12	6	59	65	143	232	511	643	0.36	86	55						
26	19	24	4	47	303.53	53672	0	0	59	59	148	268	569	653	0.05	66	54						
27	18	25	4	47	303.52	53660	-12	-6	59	53	137	237	549	653	0.23	78	55						
28	24	26	4	54	303.47	53604	-56	-28	145	117	348	461	840	779	0.96	70	54						
29	21	31	4	56	303.47	53604	0	0	66	66	177	368	1280	1204	0.00	64	49						
30	21	31	3	55	303.46	53592	-12	-6	66	60	162	309	961	1270	0.10	75	56						
31	24	46	3	73	303.48	53615	23	12	66	78	181	325	849	1126	0.18	66	55						
TOTAL															3.95								
CFS	864	1450	116	2430				12	2901	2913	7791	13980	31917	38091	MAX	86		0	0	0	0	0	0
AC-FT	1714	2876	230	4820			23	23	5754	5777	15453	27729	63307	75553	MIN		38	0	0	0	0	0	0

SCOGGINS DAM - RESERVOIR OPERATIONS

For the Month of June 1993

File: 693

DAY	MEASURED INFLOW				HENRY HAGG LAKE						TUALATIN RIVER				WEATHER			WATER DELIVERIES					
	SCHO CFS	SCLO CFS	TANO CFS	TOTAL INFLO CFS	W.S. ELEV FT	STOR CONT AF	CHANGE STOR AF	CHANGE STOR CFS	REL CFS	COMP INFLO CFS	DLLO CFS	GOLF CFS	FRMO CFS	WSLO CFS	PREC INCHES	TEMP MAX F	TEMP MIN F	TVID CFS	USA CFS	LO CFS	HLSBO CFS	FG CFS	BVRTN CFS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
						53615																	
1	23	40	3	66	303.49	53626	11	6	66	72	181	370	1098	757	0.24	64	53						
2	24	38	4	66	303.51	53649	23	12	83	95	209	420	1153	1352	0.52	60	50						
3	22	34	4	60	303.49	53626	-23	-12	86	74	192	385	1140	1284	0.05	65	40						
4	23	38	4	65	303.48	53615	-11	-6	75	69	178	342	1020	1226	0.28	68	45						
5	22	32	4	58	303.47	53604	-11	-6	66	60	166	331	928	1112	0.05	67	54						
6	20	31	4	55	303.46	53592	-12	-6	66	60	160	322	881	1071	0.07	67	53						
7	19	28	3	50	303.45	53581	-11	-6	66	60	154	286	815	951	0.01	63	50						
8	18	27	3	48	303.48	53615	34	17	34	51	128	230	724	868	0.00	67	47						
9	18	26	3	47	303.49	53626	11	6	34	40	119	227	650	790	0.00	67	53						
10	18	27	3	48	303.52	53660	34	17	34	51	126	235	591	725	0.08	67	47						
11	19	30	3	52	303.54	53683	23	12	46	58	129	236	558	679	0.13	62	45						
12	17	25	3	45	303.51	53649	-34	-17	68	51	141	263	573	653	0.00	63	48						
13	17	23	3	43	303.49	53626	-23	-12	58	46	133	231	549	648	0.00	70	49						
14	17	22	2	41	303.45	53581	-45	-23	58	35	129	214	498	604	0.16	73	49						
15	16	22	2	40	303.45	53581	0	0	36	36	106	183	476	563	0.03	72	54						
16	15	22	2	39	303.50	53640	59	30	12	42	83	160	444	553	0.00	71	48						
17	15	22	2	39	303.51	53649	9	5	24	29	94	164	399	486	0.00	74	51						
18	14	21	2	37	303.51	53649	0	0	28	28	89	155	392	441	0.00	81	51						
19	14	19	2	35	303.50	53640	-9	-5	28	23	87	138	373	416	0.00	84	54						
20	14	18	2	34	303.49	53626	-14	-7	28	21	85	134	341	383	0.00	77	50						
21	14	17	2	33	303.48	53615	-11	-6	29	23	82	130	291	352	0.00	79	54						
22	19	27	3	49	303.54	53683	68	34	19	53	80	131	283	338	0.40	65	46						
23	15	20	2	37	303.50	53640	-43	-22	65	43	131	213	392	364	0.12	63	43						
24	15	17	2	34	303.48	53615	-25	-13	39	26	98	156	426	416	0.00	69	47						
25	14	16	2	32	303.48	53615	0	0	19	19	77	113	328	424	0.00	80	51						
26	14	15	2	31	303.48	53615	0	0	10	10	66	95	251	368	0.00	88	60						
27	13	15	2	30	303.52	53660	45	23	12	35	64	106	216	316	0.00	76	55						
28	13	15	2	30	303.55	53694	34	17	12	29	63	98	223	295	0.00	65	46						
29	13	14	2	29	303.53	53672	-22	-11	30	19	76	114	225	289	0.12	70	49						
30	13	13	2	28	303.51	53649	-23	-12	30	18	75	102	233	289	0.00	71	51						
31																							
TOTAL															2.26								
CFS	508	714	79	1301				17	1261	1278	3501	6284	16471	19013	MAX	88		0	0	0	0	0	0
AC-FT	1008	1416	157	2581			34	34	2501	2535	6944	12464	32670	37712	MIN		40	0	0	0	0	0	0

SCOGGINS DAM - RESERVOIR OPERATIONS

For the Month of July 1993

File: 793

DAY	MEASURED INFLOW SCHO CFS (1)	SCLO CFS (2)	TANO CFS (3)	TOTAL INFLO CFS (4)	HENRY HAGG LAKE W.S. ELEV FT (5)	STOR CONT AF (6)	CHANGE STOR AF (7)	CHANGE STOR CFS (8)	REL CFS (9)	COMP INFLO CFS (10)	TUALATIN RIVER OLLO CFS (11)	GOLF CFS (12)	FRMO CFS (13)	WSLO CFS (14)	WEATHER PREC INCHES (15)	TEMP MAX F (16)	TEMP MIN F (17)	WATER DELIVERIES TVID CFS (18)	USA CFS (19)	LO CFS (20)	HLSBO CFS (21)	FG CFS (22)	BVRTN CFS (23)
						53649																	
1	12	13	2	27	303.50	53640	-9	-5	28	23	70	84	205	282	0.00	74	52	0	0	0	0	0	0
2	12	13	2	27	303.50	53640	0	0	23	23	66	81	183	245	0.01	71	53	0	0	0	0	0	0
3	12	12	2	26	303.48	53615	-25	-13	53	40	85	107	178	233	0.03	70	53	15	10	0	0	0	0
4	12	12	2	26	303.44	53570	-45	-23	53	30	114	114	190	206	0.00	69	50	15	10	0	0	0	0
5	12	12	2	26	303.38	53502	-68	-34	53	19	121	121	199	215	0.00	75	51	15	10	0	0	0	0
6	11	11	2	24	303.30	53411	-91	-46	53	7	102	102	196	221	0.00	73	51	15	10	0	0	0	0
7	11	11	2	24	303.23	53332	-79	-40	42	2	74	89	177	184	0.00	71	44	0	0	0	0	0	0
8	11	11	2	24	303.20	53298	-34	-17	23	6	57	53	156	187	0.00	76	48	0	0	0	0	0	0
9	10	9	2	21	303.09	53174	-124	-63	70	7	114	44	128	182	0.00	82	47	17	20	0	0	0	12
10	10	10	2	22	302.91	52972	-202	-102	114	12	138	116	130	134	0.00	72	48	51	30	0	0	0	12
11	10	9	2	21	302.74	52780	-192	-97	114	17	144	124	196	143	0.00	75	49	51	30	0	0	0	12
12	11	9	2	22	302.53	52544	-236	-119	114	-5	147	144	233	182	0.00	69	51	50	30	0	0	0	12
13	12	11	2	25	302.45	52455	-89	-45	78	33	115	115	230	209	0.05	64	55	31	10	0	0	0	12
14	14	16	2	32	302.43	52432	-23	-12	59	47	100	113	208	215	0.32	69	50	15	0	0	0	0	12
15	13	12	2	27	302.40	52399	-33	-17	48	31	93	100	211	233	0.24	70	50	10	0	0	0	0	11
16	12	11	2	25	302.34	52331	-68	-34	43	9	91	88	218	224	0.04	69	53	9	0	0	0	0	9
17	12	11	2	25	302.34	52331	0	0	25	25	78	93	199	221	0.76	66	55	0	0	0	0	0	0
18	12	11	2	25	302.34	52331	0	0	24	24	75	89	212	215	0.00	68	50	0	0	0	0	0	0
19	11	9	2	22	302.31	52298	-33	-17	25	8	69	66	205	212	0.00	78	56	0	0	0	0	0	0
20	11	10	2	23	302.34	52331	33	17	25	42	69	78	200	221	0.13	67	54	0	0	0	0	0	0
21	6	9	2	17	302.30	52287	-44	-22	25	3	69	89	203	239	0.43	71	51	0	0	0	0	0	0
22	7	10	2	19	302.29	52275	-12	-6	25	19	72	76	235	233	0.15	69	54	0	0	0	0	0	0
23	7	10	2	19	302.28	52264	-11	-6	25	19	72	93	218	239	0.00	72	56	0	0	0	0	0	0
24	6	10	2	18	302.27	52253	-11	-6	25	19	68	94	213	233	T	69	56	0	0	0	0	0	0
25	6	10	2	18	302.26	52242	-11	-6	25	19	66	88	194	226	0.00	65	51	0	0	3	0	0	0
26	5	9	2	16	302.25	52231	-11	-6	25	19	65	84	183	224	0.00	74	54	0	0	3	0	0	0
27	5	8	2	15	302.22	52197	-34	-17	73	56	61	50	162	206	0.00	77	54	0	0	3	0	0	0
28	5	8	2	15	302.22	52197	0	0	76	76	101	88	164	187	0.04	83	52	17	30	3	0	0	11
29	5	9	2	16	302.03	51985	-212	-107	76	-31	104	108	153	182	0.39	65	49	16	30	3	0	0	11
30	6	9	2	17	301.91	51851	-134	-68	76	8	104	106	207	182	0.00	70	49	15	30	3	0	0	11
31	6	9	2	17	301.80	51728	-123	-62	76	14	98	110	195	192	0.00	77	52	15	30	3	0	0	11
TOTAL															2.59								
CFS	295	324	62	681				-969	1594	625	2802	2907	5981	6507	MAX	83		357	280	21	0	0	136
AC-FT	585	643	123	1351			-1921	-1921	3162	1241	5558	5766	11863	12907	MIN		44	708	555	42	0	0	270

SCOGGINS DAM - RESERVOIR OPERATIONS

For the Month of August 1993

File: 893

DAY	MEASURED INFLOW				HENRY HAGG LAKE						TUALATIN RIVER				WEATHER			WATER DELIVERIES					
	SCHO CFS	SCLO CFS	TANO CFS	TOTAL INFLO CFS	W.S. ELEV FT	STOR CONT AF	CHANGE STOR AF	CHANGE STOR CFS	REL CFS	COMP INFLO CFS	OLLO CFS	GOLF CFS	FRMO CFS	WSLO CFS	PREC INCHES	TEMP MAX F	TEMP MIN F	TVID CFS	USA CFS	LO CFS	HLSBO CFS	FG CFS	BVRTN CFS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
						51728																	
1	7	7	2	16	301.66	51572	-156	-79	76	-3	99	81	162	198	0.00	86	57	16	30	3	0	0	11
2	5	6	2	13	301.55	51450	-122	-62	76	14	96	70	141	182	0.00	90	65	19	30	3	0	0	11
3	4	6	1	11	301.30	51173	-277	-140	141	1	144	101	142	162	0.00	95	65	86	30	3	0	0	11
4	4	6	1	11	301.06	50907	-266	-134	148	14	153	94	135	134	0.00	98	62	93	30	3	0	0	11
5	3	5	1	9	300.78	50598	-309	-156	163	7	160	103	174	110	0.00	95	58	106	30	3	0	0	14
6	3	5	1	9	300.49	50278	-320	-161	163	2	163	108	104	118	0.00	90	57	106	30	3	0	0	14
7	3	6	1	10	300.23	49993	-285	-144	138	-6	145	103	173	126	0.00	75	59	74	40	3	0	0	14
8	3	6	1	10	299.98	49730	-263	-133	138	5	145	112	181	130	0.00	73	59	74	40	3	0	0	14
9	3	6	1	10	299.75	49467	-263	-133	138	5	149	122	195	139	0.00	73	57	74	40	3	0	0	14
10	3	5	1	9	299.57	49271	-196	-99	105	6	120	72	195	143	0.00	75	51	49	30	3	0	0	14
11	3	5	1	9	299.32	48999	-272	-137	123	-14	134	97	152	145	0.00	76	51	64	30	3	0	0	17
12	3	4	1	8	299.28	48738	-261	-132	132	0	141	103	152	139	0.00	78	51	74	30	3	0	0	17
13	3	5	1	9	298.81	48445	-293	-148	144	-4	154	98	164	134	0.00	74	54	75	40	3	0	0	17
14	4	5	1	10	298.58	48197	-248	-125	143	18	141	110	166	134	0.01	66	58	73	40	3	0	0	17
15	4	8	1	13	298.38	47981	-216	-109	127	18	139	123	200	134	0.07	67	57	54	40	3	0	0	17
16	4	6	1	11	298.15	47734	-247	-125	127	2	142	119	223	148	0.04	74	58	56	40	3	0	0	17
17	4	5	1	10	298.00	47573	-161	-81	83	2	101	79	223	172	0.02	73	49	47	10	3	0	0	17
18	4	5	1	10	297.87	47433	-140	-71	77	6	97	52	155	190	0.00	81	53	41	10	3	0	0	13
19	3	4	1	8	297.75	47305	-128	-65	86	21	100	64	122	157	0.03	86	54	52	10	3	0	0	13
20	3	4	1	8	297.54	47112	-193	-97	86	-11	102	62	125	139	0.00	86	54	52	10	3	0	0	13
21	3	4	1	8	297.39	46920	-192	-97	97	0	110	73	119	126	0.00	75	58	53	20	3	0	0	13
22	3	4	1	8	297.18	46696	-224	-113	97	-16	107	80	132	116	0.00	75	57	53	20	3	0	0	13
23	3	4	1	8	297.03	46537	-159	-80	97	17	115	89	146	116	0.00	84	54	53	20	3	0	0	13
24	3	4	1	8	296.84	46331	-206	-104	97	-7	115	77	142	116	0.00	75	45	53	20	3	0	0	13
25	3	4	1	8	296.66	46140	-191	-96	81	-15	99	66	125	112	TR	70	40	57	0	3	0	0	13
26	2	4	1	7	296.53	46003	-137	-69	79	10	97	41	119	108	0.00	70	46	56	0	3	0	0	13
27	2	3	1	6	296.33	45792	-211	-106	105	-1	116	75	98	103	0.00	79	49	63	20	3	0	0	13
28	2	3	1	6	296.14	45592	-200	-101	105	4	117	76	114	99	0.00	78	59	53	30	3	0	0	13
29	2	3	1	6	295.91	45351	-241	-122	105	-17	118	87	123	99	0.00	73	53	53	30	3	0	0	13
30	2	3	1	6	295.75	45183	-168	-85	105	20	120	86	142	99	0.00	81	48	53	30	3	0	0	13
31	2	3	1	6	295.49	44911	-272	-137	105	-32	119	61	134	103	0.00	87	54	58	25	3	0	0	13
TOTAL															0.17								
CFS	100	148	33	281				-3437	3487	50	3858	2684	4678	4131	MAX	98		1890	805	93	0	0	429
AC-FT	198	294	65	557			-6817	-6817	6916	99	7652	5324	9279	8194	MIN		40	3749	1597	184	0	0	851

SCOGGINS DAM - RESERVOIR OPERATIONS

For the Month of September 1993

File: 993

DAY	MEASURED INFLOW SCHO CFS (1)	SCLO CFS (2)	TANO CFS (3)	TOTAL INFLO CFS (4)	HENRY HAGG LAKE W.S. ELEV FT (5)	STOR CONT AF (6)	CHANGE STOR AF (7)	CHANGE STOR CFS (8)	REL CFS (9)	COMP INFLO CFS (10)	TUALATIN RIVER OLLO CFS (11)	GOLF CFS (12)	FRMO CFS (13)	WSLO CFS (14)	WEATHER PREC INCHES (15)	TEMP MAX F (16)	TEMP MIN F (17)	WATER DELIVERIES TVIO CFS (18)	USR CFS (19)	LO CFS (20)	HLSBO CFS (21)	FG CFS (22)	BVRTN CFS (23)
						44911																	
1	2	3	1	6	295.30	44712	-199	-100	105	5	118	65	108	103	0.00	88	50	66	17	3	0	0	13
2	2	3	1	6	294.92	44317	-395	-199	199	-0	205	154	106	103	0.00	80	50	71	17	3	0	0	13
3	2	3	1	6	294.56	43943	-374	-189	257	68	240	204	192	100	0.00	87	50	65	17	3	0	0	14
4	2	3	1	6	293.93	43291	-652	-329	277	-52	260	224	251	126	0.00	88	50	63	17	3	0	0	14
5	2	3	1	6	293.39	42736	-555	-280	283	3	265	247	280	177	0.00	80	52	51	17	3	0	0	14
6	2	3	1	6	292.85	42183	-553	-279	282	3	270	257	308	257	0.00	81	53	43	17	3	0	0	14
7	2	3	1	6	292.32	41643	-540	-272	281	9	270	244	320	257	0.00	93	55	55	17	3	0	0	14
8	2	3	1	6	291.75	41066	-577	-291	303	12	288	243	292	257	0.00	91	59	72	17	3	0	0	15
9	1	2	1	4	291.17	40481	-585	-295	303	8	288	246	289	251	0.00	93	56	68	17	3	0	0	15
10	1	2	1	4	290.58	39890	-591	-298	302	4	284	246	300	251	0.00	91	56	63	17	3	0	0	15
11	1	2	1	4	289.94	39252	-638	-322	300	-22	289	258	291	251	0.00	88	49	65	17	3	0	0	15
12	1	2	1	4	289.40	38716	-536	-270	299	29	287	284	308	251	0.00	75	50	41	17	3	0	0	15
13	1	2	1	4	288.80	38125	-591	-298	298	0	291	280	334	251	0.00	75	48	40	17	3	0	0	15
14	1	2	1	4	288.19	37526	-599	-302	297	-5	293	276	343	278	0.00	80	47	50	17	3	0	0	15
15	1	2	1	4	287.59	36942	-584	-294	296	2	291	280	335	278	0.00	72	52	55	17	3	0	0	16
16	1	2	1	4	287.19	36553	-389	-196	205	9	205	187	326	266	0.00	70	48	55	17	3	0	0	16
17	1	2	1	4	286.85	36225	-328	-165	156	-9	177	143	256	269	0.00	77	50	53	80	3	0	0	16
18	1	2	1	4	286.58	35964	-261	-132	131	-1	140	107	196	221	0.00	77	43	40	68	3	0	0	16
19	1	2	1	4	286.31	35705	-259	-131	131	0	141	113	166	187	0.00	67	46	40	68	3	0	0	16
20	2	3	1	6	286.05	35455	-250	-126	131	5	141	122	171	159	0.00	66	40	38	68	3	0	0	16
21	2	3	1	6	285.79	35207	-248	-125	131	6	139	117	173	143	0.02	70	41	38	68	3	0	0	16
22	1	2	1	4	285.52	34949	-258	-130	131	1	142	108	174	143	0.00	72	42	43	68	3	0	0	13
23	1	2	1	4	285.28	34721	-228	-115	109	-6	122	91	169	143	0.00	75	45	39	50	3	0	0	13
24	1	2	1	4	285.13	34578	-143	-72	79	7	102	74	138	143	0.00	79	44	39	20	3	0	0	13
25	1	2	1	4	284.96	34416	-162	-82	79	-3	96	63	118	NA	0.00	85	52	24	35	3	0	0	13
26	1	2	1	4	284.81	34274	-142	-72	79	7	97	59	106	NA	0.00	77	46	24	35	3	0	0	13
27	1	2	1	4	284.64	34112	-162	-82	79	-3	100	63	108	103	0.00	73	48	24	35	3	0	0	13
28	1	2	0	3	284.45	33932	-180	-91	103	12	112	84	111	100	0.00	82	53	29	55	3	0	0	13
29	1	2	0	3	284.20	33695	-237	-119	123	4	139	98	134	157	0.00	84	51	49	55	3	0	0	13
30	1	2	0	3	283.89	33403	-292	-147	147	-0	153	119	148	130	0.00	91	53	58	70	3	0	0	13
31																							
TOTAL															0.02								
CFS	40	70	27	137				-5802	5896	94	5945	5056	6551	5355	MAX	93		1461	1047	90	0	0	430
AC-FT	79	139	54	272			-11508	-11508	11695	187	11792	10029	12994	10622	MIN		40	2898	2077	179	0	0	853

SCOGGINS DAM - RESERVOIR OPERATIONS

For the Month of October 1993 File: 1093

	MEASURED INFLOW				HENRY HAGG LAKE						TUALATIN RIVER				WEATHER			WATER DELIVERIES					
DAY	SCHO CFS	SCLO CFS	TANO CFS	TOTAL INFLO CFS	W.S. ELEV FT	STOR CONT AF	CHANGE STOR AF	CHANGE STOR CFS	REL CFS	COMP INFLO CFS	OLLO CFS	GOLF CFS	FRMO CFS	WSLO CFS	PREC INCHES	TEMP MAX F	TEMP MIN F	TVID CFS	USA CFS	LO CFS	HLSBO CFS	FG CFS	BVRTN CFS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
						33403																	
1	1	2	1	4	283.59	33121	-282	-142	147	5	150	112	162	96	0.00	84	48	29	82	3	0	0	13
2	1	2	1	4	283.37	32914	-207	-104	114	10	124	98	159	118	0.00	81	47	20	58	3	0	0	13
3	1	2	1	4	283.13	32690	-224	-113	114	1	125	98	156	124	0.00	88	47	20	58	3	0	0	13
4	1	2	1	4	282.90	32475	-215	-108	114	6	128	99	152	120	0.00	86	47	20	58	3	0	0	13
5	1	2	1	4	282.66	32242	-233	-117	114	-3	133	104	151	106	0.00	83	47	20	58	3	0	0	13
6	1	3	1	5	282.39	32000	-242	-122	134	12	146	127	167	114	0.00	68	50	18	78	3	0	0	15
7	1	3	1	5	282.16	31787	-213	-107	139	32	150	131	191	122	0.07	62	48	17	83	3	0	0	15
8	1	3	1	5	281.84	31492	-295	-149	138	-11	150	141	205	134	0.01	63	44	16	83	3	0	0	15
9	1	3	1	5	281.59	31262	-230	-116	138	22	148	135	225	143	0.00	68	48	17	82	3	0	0	15
10	1	3	1	5	281.32	31013	-249	-126	138	12	148	135	232	152	0.00	74	50	17	82	3	0	0	15
11	1	3	1	5	281.02	30738	-275	-139	137	-2	150	140	222	155	0.00	66	50	17	81	3	0	0	15
12	1	3	1	5	280.84	30574	-164	-83	102	19	127	110	222	167	0.07	63	50	10	69	3	0	0	15
13	2	3	1	6	280.67	30419	-155	-78	102	24	129	105	200	195	0.13	63	52	12	66	3	0	0	15
14	2	3	1	6	280.46	30227	-192	-97	102	5	123	112	197	172	0.07	65	53	12	66	3	0	0	15
15	4	12	4	20	280.32	30100	-127	-64	102	38	123	123	208	187	0.60	59	53	12	66	3	0	0	15
16	3	6	2	11	280.20	29991	-109	-55	102	47	131	64	292	221	0.08	63	49	12	59	0	6	3	11
17	3	4	1	8	279.97	29783	-208	-105	102	-3	115	124	338	233	0.00	60	48	10	64	0	6	3	11
18	2	4	1	7	279.77	29602	-181	-91	102	11	114	111	265	245	0.00	63	44	10	65	0	6	3	11
19	1	3	1	5	279.57	29422	-180	-91	102	11	114	110	220	209	0.00	59	45	10	67	0	6	3	11
20	1	3	1	5	279.40	29269	-153	-77	81	4	97	94	201	192	0.00	63	44	10	48	0	5	3	10
21	1	3	1	5	279.23	29116	-153	-77	83	6	106	112	178	182	0.00	68	44	12	48	0	5	3	10
22	1	3	1	5	279.02	28928	-188	-95	82	-13	99	103	178	164	0.00	65	44	11	48	0	5	3	10
23	1	3	1	5	278.84	28766	-162	-82	82	0	102	107	187	157	0.00	62	46	11	48	0	5	3	10
24	1	3	1	5	278.65	28597	-169	-85	82	-3	102	106	192	157	0.00	66	43	11	48	0	5	3	10
25	1	3	1	5	278.48	28445	-152	-77	82	5	107	111	191	157	0.00	64	40	11	48	0	5	3	10
26	1	3	1	5	278.28	28267	-178	-90	82	-8	114	104	191	157	0.00	68	41	11	48	0	5	3	10
27	1	3	1	5	278.10	28107	-160	-81	82	1	114	101	182	157	0.00	71	43	11	48	0	5	3	10
28	1	3	1	5	277.89	27921	-186	-94	82	-12	113	102	175	148	0.00	67	47	11	48	0	5	3	10
29	1	3	1	5	277.71	27762	-159	-80	82	2	113	97	176	130	0.00	69	45	11	35	0	5	3	10
30	1	3	1	5	277.48	27559	-203	-102	98	-4	128	119	173	134	0.00	70	46	14	48	0	3	3	9
31	1	3	1	5	277.24	27348	-211	-106	104	-2	129	129	195	141	0.18	67	46	14	54	0	3	3	9
TOTAL															1.21								
CFS	41	102	35	178				-3053	3265	212	3852	3464	6183	4889	MAX	88		437	1894	45	80	48	377
AC-FT	81	202	69	353			-6055	-6055	6476	421	7640	6871	12264	9697	MIN		40	867	3757	89	159	95	748

SCOGGINS DAM - RESERVOIR OPERATIONS

For the Month of November 1993

File: 1193

DAY	MEASURED INFLOW				HENRY HAGG LAKE						TUALATIN RIVER				WEATHER			WATER DELIVERIES					
	SCHO CFS (1)	SCLO CFS (2)	TANO CFS (3)	TOTAL INFLO CFS (4)	W.S. ELEV FT (5)	STOR CONT AF (6)	CHANGE STOR AF (7)	CHANGE STOR CFS (8)	REL CFS (9)	COMP INFLO CFS (10)	DLLO CFS (11)	GOLF CFS (12)	FRMO CFS (13)	WSLO CFS (14)	PREC INCHES (15)	TEMP MAX F (16)	TEMP MIN F (17)	TVID CFS (18)	USA CFS (19)	LO CFS (20)	HLSBO CFS (21)	FG CFS (22)	BVRTN CFS (23)
						27348																	
1	1	3	1	5	276.99	27129	-219	-110	104	-6	129	126	215	157	0.00	61	36	14	49	0	3	3	9
2	1	3	1	5	276.74	26910	-219	-110	120	10	146	141	212	167	0.00	60	36	5	74	0	3	3	9
3	1	4	1	6	276.45	26657	-253	-128	120	-8	144	150	228	167	0.11	57	44	4	74	0	3	3	9
4	1	4	1	6	276.19	26430	-227	-114	120	6	151	152	234	177	0.00	62	39	4	74	0	3	3	9
5	1	4	1	6	275.92	26196	-234	-118	119	1	147	151	239	179	0.00	55	37	3	74	0	3	3	9
6	1	4	1	6	275.64	25954	-242	-122	119	-3	143	150	239	182	0.00	59	33	3	74	0	3	3	9
7	1	4	1	6	275.39	25738	-216	-109	102	-7	129	137	205	184	0.00	59	34	1	74	0	3	3	9
8	1	4	1	6	275.16	25540	-198	-100	104	4	130	125	224	187	0.00	53	32	3	74	0	3	3	9
9	1	4	1	6	274.88	25300	-240	-121	104	-17	130	133	207	187	0.00	49	34	3	77	0	3	3	9
10	1	4	1	6	274.64	25095	-205	-103	104	1	130	134	207	182	0.00	50	34	3	72	0	3	3	9
11	1	4	1	6	274.40	24890	-205	-103	103	-0	126	131	217	177	0.00	58	32	2	67	0	3	3	9
12	1	4	1	6	274.15	24677	-213	-107	103	-4	128	127	216	177	0.00	46	37	2	67	0	3	3	9
13	1	4	1	6	274.00	24500	-177	-89	68	-21	94	97	205	177	0.00	51	36	2	45	0	3	3	9
14	1	4	1	6	273.82	24398	-102	-51	68	17	92	93	182	172	0.00	54	28	2	45	0	3	3	9
15	1	4	1	6	273.66	24262	-136	-69	68	-1	96	95	176	157	0.04	51	31	2	45	0	3	3	9
16	1	4	1	6	273.51	24136	-126	-64	68	4	94	93	176	152	0.07	42	32	2	42	0	3	3	9
17	1	6	1	8	273.37	24018	-118	-59	67	8	96	92	238	150	0.25	44	36	1	40	0	0	1	9
18	1	6	1	8	273.24	23908	-110	-55	67	12	94	92	191	162	0.25	48	32	0	48	0	0	1	9
19	1	5	1	7	273.08	23774	-134	-68	67	-1	94	99	187	167	0.02	44	33	0	48	0	0	1	9
20	1	5	1	7	272.91	23631	-143	-72	81	9	NA	106	186	159	0.00	51	36	0	49	0	0	1	9
21	1	5	1	7	272.69	23447	-184	-93	81	-12	NA	104	190	157	0.00	39	36	0	47	0	0	1	9
22	3	9	1	13	272.56	23338	-109	-55	81	26	107	105	209	190	0.32	46	33	0	58	0	0	1	9
23	2	7	1	10	272.25	23080	-258	-130	123	-7	144	168	227	192	0.07	39	25	0	82	0	0	1	9
24	1	4	1	6	271.90	22790	-290	-146	156	10	178	202	261	198	0.00	34	19	0	119	0	0	1	9
25	1	3	1	5	271.58	22525	-265	-134	115	-19	134	156		215	0.00	38	24	0	99	0	0	1	9
26	1	3	1	5	271.27	22270	-255	-129	115	-14	136	145	244	221	0.00	39	22	0	99	0	0	1	9
27	2	6	1	9	271.16	22179	-91	-46	65	19	93	106		209	0.08	44	23	0	31	0	0	1	9
28	3	6	1	10	270.99	22043	-136	-69	65	-4	92	104		203	0.00	44	34	0	30	0	0	1	9
29	5	12	2	19	270.87	21945	-98	-49	65	16	93	103	202	215	0.56	43	35	0	36	0	0	1	9
30	4	12	1	17	270.80	21888	-57	-29	54	25	103	110	241	215	0.15	44	36	0	27	0	0	1	9
31																							
TOTAL															1.92								
CFS	49	151	31	225				-2753	2796	43	3373	3727	5758	5434	MAX	62		56	1840	0	48	62	270
AC-FT	85	300	61	446			-5460	-5460	5546	86	6690	7393	11421	10778	MIN		19	111	3650	0	95	123	536

SCOGGINS DAM - RESERVOIR OPERATIONS

For the Month of Dec 1993

File: 1293

	MEASURED INFLOW				HENRY HAGG LAKE						TUALATIN RIVER				WEATHER			WATER DELIVERIES					
	SCHO	SCLO	TANO	TOTAL INFLO	W.S. ELEV	STOR CONT	CHANGE STOR	CHANGE STOR	REL	COMP INFLO	OLLO	GOLF	FRMO	WSLO	PREC	TEMP MAX	TEMP MIN	TVID	USA	LO	HLSBO	FG	BVRTN
DAY	CFS	CFS	CFS	CFS	FT	AF	AF	CFS	CFS	CFS	CFS	CFS	CFS	CFS	INCHES	F	F	CFS	CFS	CFS	CFS	CFS	CFS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
						21888																	
1	30	94	5	129	271.13	22155	267	135	55	190	260	345	427	383	1.99	49	40	0	25	0	0	1	9
2	17	44	3	64	271.57	22517	362	183	10	193	271	667	1159	931	0.83	55	41	0	0	0	0	0	0
3	9	24	1	34	271.67	22599	82	41	10	51	126	281	1107	1220	0.04	53	43						
4	9	28	1	38	271.75	22666	67	34	10	44	113	183	655	1019	0.15	52	41						
5	7	23	1	31	271.81	22715	49	25	10	35	101	196	479	667	0.18	49	34						
6	6	18	1	25	271.88	22773	58	29	10	39	87	98	407	541	0.00	48	32						
7	30	67	6	103	272.02	22906	133	67	11	78	96	149	352	453	1.09	46	34						
8	33	109	6	148	272.48	23272	366	185	11	196	271	559	737	694	0.80	47	41						
9	60	191	10	261	273.30	23959	687	346	11	357	478	967	1935	1556	1.54	48	41						
10	54	195	8	257	274.14	24669	710	358	11	369	562	1166	2313	2280	0.62	59	44						
11	102	337	12	451	275.27	25635	966	487	71	558	980	1394	2794	3335	1.68	48	44						
12	54	183	8	245	276.18	26422	787	397	19	416	837	1519	3111	3432	0.15	48	35						
13	36	132	5	173	276.71	26884	462	233	11	244	608	1414	3119	3378	0.01	46	38						
14	29	103	4	136	277.13	27251	367	185	11	196	458	1112	3026	3281	0.31	45	39						
15	23	83	3	109	277.34	27436	185	93	70	163	426	919	2860	3112	0.05	47	40						
16	19	68	2	89	277.42	27506	70	35	75	110	355	732	2496	2776	0.00	47	35						
17	17	58	2	77	277.45	27533	27	14	75	89	302	608	1919	2242	0.00	42	30						
18	15	50	2	67	277.60	27665	132	67	10	77		468	1429	1714	0.00	48	32						
19	14	44	2	60	277.77	27815	150	76	10	86		388	1118	1325	0.00	46	31						
20	12	38	2	52	277.85	27886	71	36	10	46	160	346	928	1071	0.00	48	34						
21	12	35	2	49	277.99	28010	124	63	10	73	144	299	815	895	0.00	47	27						
22	11	32	2	45	278.09	28099	89	45	10	55	134	269	712	789	0.00	48	30						
23	10	30	2	42	278.18	28178	79	40	10	50	126	240	638	705	0.00	42	28						
24	10	28	2	40	278.25	28241	63	32	10	42	122	219	579	646	0.00	42	25						
25	10	26	2	38	278.32	28303	62	31	10	41	115	204	526	589	0.00	40	23						
26	9	25	2	36	278.39	28365	62	31	10	41	na	195	496	531	0.00	38	27						
27	9	23	2	34	278.46	28427	62	31	10	41	106	184	467	491	0.00	43	24						
28	8	22	2	32	278.52	28481	54	27	10	37	102	175	444	472	0.00	44	29						
29	8	21	2	31	278.55	28508	27	14	10	24	98	165	414	444	0.02	44	29						
30	8	20	2	30	278.62	28570	62	31	10	41	96	159	400	417	0.03	42	34						
31	11	27		38	278.74	28677	107	54	11	65	135	207	443	491	0.50	47	36						
TOTAL															9.99								
CFS	682	2178	104	2964				3423	622	4045	7669	15827	38305	41880	MAX	59		0	25	0	0	1	9
AC-FT	1353	4320	206	5879			6789	6789	1234	8023	15211	31399	75978	83069	MIN		23	0	50	0	0	2	18

APPENDIX D

HIGH FLOW EXPERIMENT
DATA TABLES - GRAPHS

KEY
HIGH-FLOW EXPERIMENT TABLES

DATE	Date of sample or data
FARM CFS	Flow in CFS (cubic feet per second) from the Tualatin River at Farmington Road River Mile 33.3
HAGG CFS	Flow in CFS from Hagg Lake to Scoggins Creek. Enters the Tualatin River at River Mile 60.
LO-AIR DEG C	Low air temperature in degrees centigrade at the Lake Oswego Diversion Dam at River Mile 3.4.
HI-AIR DEG C	High air temperature at the Lake Oswego Diversion Dam.
TEMP DEG C	Water Temperature of the Tualatin River at the Elsner sample site, River Mile 16.5.
DO MG/L	Dissolved Oxygen at the Elsner sample site.
DO SAT %	Percent Dissolved Oxygen at the Elsner sample site.
COND umho/cm	Conductivity at the Elsner sample site.
pH UNITS	pH at the Elsner sample site.
NH3-N MG/L	Ammonia as nitrogen at the Elsner sample site.
NO2/NO3-N MG/L	Nitrite plus Nitrate as nitrogen at the Elsner sample site.
S-OPO4-P MG/L	Soluble Orthophosphorus (sometimes referred to as SRP or Soluble Reactive Phosphorus) at the Elsner sample site.
T-PO4-P MG/L	Total Phosphorus at the Elsner sample site.
SOP/TP %	Soluble Orthophosphorus divided by Total Phosphorus multiplied by 100, or the ratio of soluble orthophosphorus to total phosphorus expressed as a percentage.
CHLOR_A UG/L	Corrected Chlorophyll a at the Elsner sample site.

TABLE 1
HIGH-FLOW EXPERIMENT

DATE	FARM CFS	HAGG CFS	LO-AIR DEG C	HI-AIR DEG C	TEMP DEG C	DO MG/L	DO SAT %	COND UMHO/CM	pH UNITS	NH3-N MG/L	NO2NO3-N MG/L	S-OPO4-P MG/L	T-PO4-P MG/L	SOP/TP %	CHLOR_A UG/L
19-AUG-93	117.6	86	17.17	26.20	18.2	8.2	87.0	178	7.3	0.020	1.600	0.042	0.098	42.9	25.80
20-AUG-93	122.3	86	16.82	21.18	...	...	...	...	...	...	...	...	...	...	...
21-AUG-93	120.7	97	15.45	24.59	...	...	...	...	...	...	...	...	...	...	...
22-AUG-93	134.7	97	12.18	27.11	...	...	...	...	...	...	...	...	...	...	...
23-AUG-93	145.5	97	13.21	19.70	18.9	9.0	97.0	174	7.9	0.019	0.998	0.037	0.104	35.6	41.40
24-AUG-93	136.2	97	9.21	19.50	...	...	...	...	...	...	...	...	...	...	...
25-AUG-93	122.3	81	7.42	21.51	19.2	11.9	129.0	...	8.3	...	...	...	...	...	...
26-AUG-93	111.5	79	8.64	27.07	18.6	9.7	104.0	208	7.5	0.010	1.650	0.026	0.120	21.7	61.50
27-AUG-93	97.5	105	9.94	25.10	...	...	...	...	...	...	...	...	...	...	...
28-AUG-93	114.6	105	10.53	22.28	...	...	...	...	...	...	...	...	...	...	...
29-AUG-93	122.3	105	10.17	28.08	...	...	...	...	...	...	...	...	...	...	...
30-AUG-93	134.7	105	10.61	30.41	18.0	10.2	108.0	205	7.6	0.020	1.360	0.032	0.133	24.1	66.40
31-AUG-93	119.2	105	12.16	25.43	...	...	...	...	...	...	...	...	...	...	...
01-SEP-93	100.6	105	11.52	25.19	18.6	14.2	152.0	208	8.8	...	...	...	...	...	...
02-SEP-93	113.0	199	11.59	26.88	18.0	10.5	111.0	217	7.6	0.019	1.580	0.031	0.103	30.1	64.50
03-SEP-93	212.1	257	13.00	28.90	...	...	...	...	...	...	...	...	...	...	...
04-SEP-93	233.7	277	12.75	26.55	...	...	...	...	...	...	...	...	...	...	...
05-SEP-93	261.6	283	14.34	25.22	...	...	...	...	...	...	...	...	...	...	...
06-SEP-93	291.0	282	13.12	29.45	...	...	...	...	...	...	...	...	...	...	...
07-SEP-93	284.8	281	15.20	29.76	17.2	7.9	82.0	148	7.3	0.020	1.130	0.044	0.102	43.1	12.40
08-SEP-93	270.9	303	14.14	30.51	16.3	8.6	87.0	127	7.3	...	...	...	...	...	...
09-SEP-93	270.9	303	12.67	30.27	15.7	8.3	83.0	132	7.2	0.023	0.957	0.039	0.088	44.3	6.33
10-SEP-93	272.4	302	12.75	29.51	...	...	...	...	...	...	...	...	...	...	...
11-SEP-93	278.6	300	11.00	19.81	...	...	...	...	...	...	...	...	...	...	...
12-SEP-93	295.7	299	11.41	23.25	...	...	...	...	...	...	...	...	...	...	...
13-SEP-93	315.8	298	8.83	26.90	15.0	8.2	81.0	125	7.2	0.062	0.875	0.033	0.075	44.0	6.19
14-SEP-93	311.1	297	11.46	19.98	...	...	...	...	...	...	...	...	...	...	...
15-SEP-93	308.0	296	10.73	20.62	14.3	8.5	83.0	115	7.2	...	...	...	...	...	...
16-SEP-93	289.5	205	8.12	25.00	13.7	8.4	81.0	123	7.2	0.044	1.000	0.031	0.072	43.1	4.22
17-SEP-93	226.0	156	8.43	23.65	...	...	...	...	...	...	...	...	...	...	...
18-SEP-93	192.0	131	7.77	18.55	...	...	...	...	...	...	...	...	...	...	...
19-SEP-93	167.2	131	8.27	17.02	...	...	...	...	...	...	...	...	...	...	...
20-SEP-93	173.4	131	7.38	17.42	13.3	8.0	76.0	122	7.3	0.028	0.935	0.033	0.076	43.4	7.18
21-SEP-93	173.4	131	4.84	21.23	...	...	...	...	...	...	...	...	...	...	...
22-SEP-93	173.4	131	8.21	23.64	13.9	8.2	79.0	140	7.2	...	...	...	...	...	...
23-SEP-93	167.2	109	9.29	24.60	13.5	8.1	78.0	152	7.0	0.024	1.340	0.035	0.077	45.5	17.20
24-SEP-93	137.8	79	6.12	20.48	...	...	...	...	...	...	...	...	...	...	...
25-SEP-93	117.6	79	7.71	22.98	...	...	...	...	...	...	...	...	...	...	...
26-SEP-93	106.8	79	11.69	28.59	...	...	...	...	...	...	...	...	...	...	...
27-SEP-93	111.5	79	8.75	25.49	13.6	7.9	75.0	169	7.0	0.057	1.510	0.039	0.094	41.5	18.00
28-SEP-93	111.5	103	10.31	23.16	...	...	...	...	...	...	...	...	...	...	...
29-SEP-93	133.1	123	12.76	27.88	14.4	8.7	85.0	175	7.2	...	...	...	...	...	...
30-SEP-93	156.3	147	11.02	23.71	14.3	7.9	78.0	175	7.1	0.010	1.570	0.035	0.070	50.0	22.00

TABLE 2
LOW-FLOW PERIOD

DATE	FARM CFS	HAGG CFS	LO-AIR DEG C	HI-AIR DEG C	TEMP DEG C	DO MG/L	DO SAT %	COND UMHO/CM	pH UNITS	NH3-N MG/L	NO2NO3-N MG/L	S-OPO4-P MG/L	T-PO4-P MG/L	SOP/TP %	CHLOR_A UG/L
19-AUG-93	117.6	86	17.17	26.20	18.2	8.2	87.0	178	7.3	0.020	1.600	0.042	0.098	42.9	25.8
20-AUG-93	122.3	86	16.82	21.18	...	...	...	...	...	...	...	...	...	...	...
21-AUG-93	120.7	97	15.45	24.59	...	...	...	...	...	...	...	...	...	...	...
22-AUG-93	134.7	97	12.18	27.11	...	...	...	...	...	...	...	...	...	...	...
23-AUG-93	145.5	97	13.21	19.70	18.9	9.0	97.0	174	7.9	0.019	0.998	0.037	0.104	35.6	41.4
24-AUG-93	136.2	97	9.21	19.50	...	...	...	...	...	...	...	...	...	...	...
25-AUG-93	122.3	81	7.42	21.51	19.2	11.9	129.0	...	8.3	...	...	...	...	...	...
26-AUG-93	111.5	79	8.64	27.07	18.6	9.7	104.0	208	7.5	0.010	1.650	0.026	0.120	21.7	61.5
27-AUG-93	97.5	105	9.94	25.10	...	...	...	...	...	...	...	...	...	...	...
28-AUG-93	114.6	105	10.53	22.28	...	...	...	...	...	...	...	...	...	...	...
29-AUG-93	122.3	105	10.17	28.08	...	...	...	...	...	...	...	...	...	...	...
30-AUG-93	134.7	105	10.61	30.41	18.0	10.2	108.0	205	7.6	0.020	1.360	0.032	0.133	24.1	66.4
31-AUG-93	119.2	105	12.16	25.43	...	...	...	...	...	...	...	...	...	...	...
01-SEP-93	100.6	105	11.52	25.19	18.6	14.2	152.0	208	8.8	...	...	...	...	...	...
02-SEP-93	113.0	199	11.59	26.88	18.0	10.5	111.0	217	7.6	0.019	1.580	0.031	0.103	30.1	64.5
	*****	****	*****	*****	*****	****	*****	*****	*****	*****	*****	*****	*****	*****	*****
MIN	97.5	79	7.42	19.50	18.0	8.2	87.0	174	7.3	0.010	0.998	0.026	0.098	21.7	25.8
MAX	145.5	199	17.17	30.41	19.2	14.2	152.0	217	8.8	0.020	1.650	0.042	0.133	42.9	66.4
MEAN	120.8	103	11.77	24.68	18.5	10.5	112.6	198	7.9	0.018	1.438	0.034	0.112	30.9	51.9
MEDIAN	120.7	97	11.52	25.19	18.6	10.2	108.0	207	7.6	0.019	1.580	0.032	0.104	30.1	61.5
COUNT	15.0	15	15.00	15.00	7.0	7.0	7.0	6	7.0	5.000	5.000	5.000	5.000	5.0	5.0

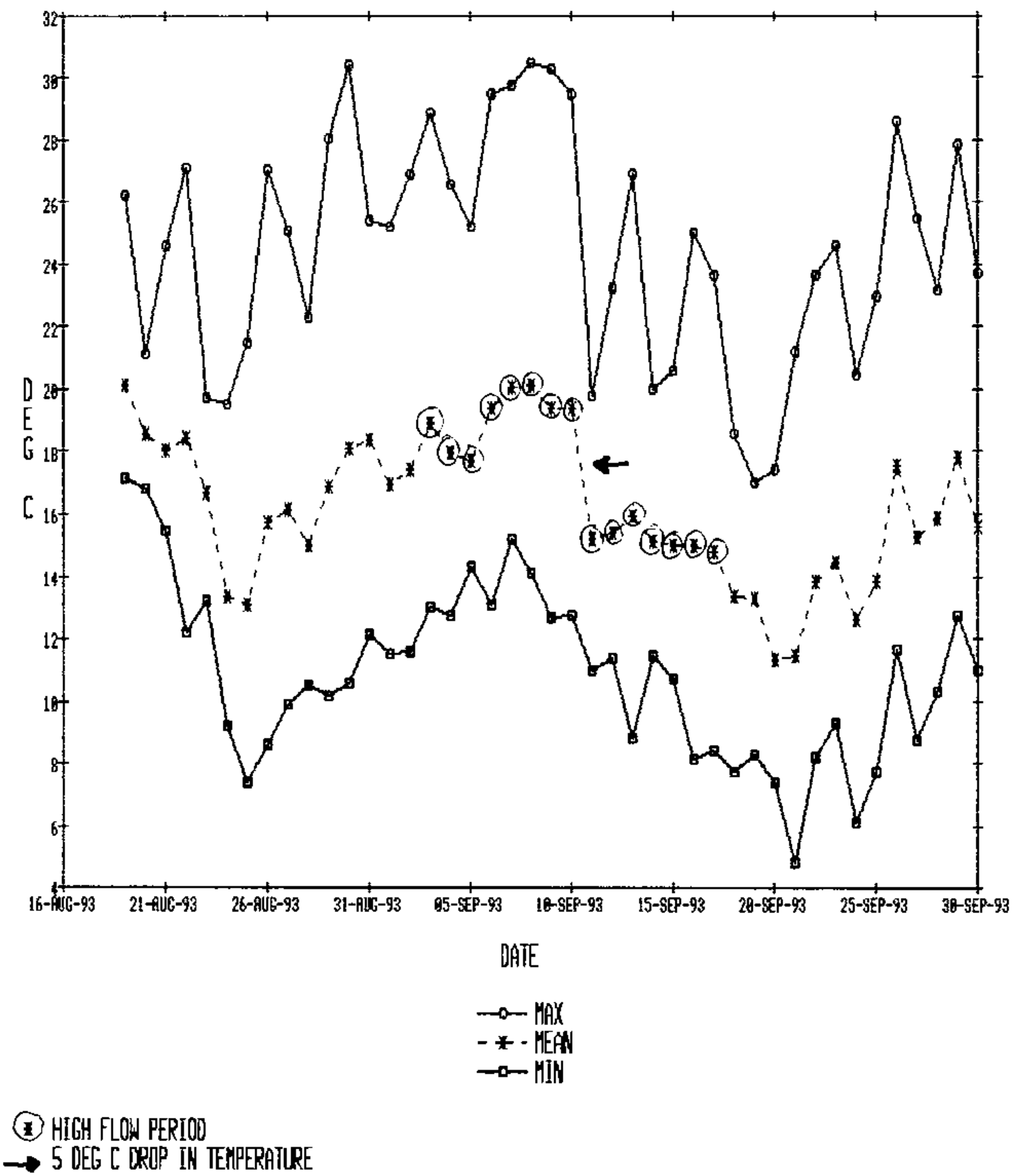
TABLE 3
HIGH-FLOW PERIOD

DATE	FARM CFS	HAGG CFS	LO-AIR DEG C	HI-AIR DEG C	TEMP DEG C	DO MG/L	DO SAT %	COND UMHO/CM	pH UNITS	NH3-N MG/L	NO2NO3-N MG/L	S-OPO4-P MG/L	T-PO4-P MG/L	SOP/TP %	CHLOR_A UG/L
03-SEP-93	212.1	257	13.00	28.90	...	...	...	...	...	...	...	...	...	...	...
04-SEP-93	233.7	277	12.75	26.55	...	...	...	...	...	...	...	...	...	...	...
05-SEP-93	261.6	283	14.34	25.22	...	...	...	...	...	...	...	...	...	...	...
06-SEP-93	291.0	282	13.12	29.45	...	...	...	...	...	...	...	...	...	...	...
07-SEP-93	284.8	281	15.20	29.76	17.2	7.9	82.0	148	7.3	0.020	1.130	0.044	0.102	43.1	12.40
08-SEP-93	270.9	303	14.14	30.51	16.3	8.6	87.0	127	7.3	...	...	...	...	...	...
09-SEP-93	270.9	303	12.67	30.27	15.7	8.3	83.0	132	7.2	0.023	0.957	0.039	0.088	44.3	6.33
10-SEP-93	272.4	302	12.75	29.51	...	...	...	...	...	...	...	...	...	...	...
11-SEP-93	278.6	300	11.00	19.81	...	...	...	...	...	...	...	...	...	...	...
12-SEP-93	295.7	299	11.41	23.25	...	...	...	...	...	...	...	...	...	...	...
13-SEP-93	315.8	298	8.83	26.90	15.0	8.2	81.0	125	7.2	0.062	0.875	0.033	0.075	44.0	6.19
14-SEP-93	311.1	297	11.46	19.98	...	...	...	...	...	...	...	...	...	...	...
15-SEP-93	308.0	296	10.73	20.62	14.3	8.5	83.0	115	7.2	...	...	...	...	...	...
16-SEP-93	289.5	205	8.12	25.00	13.7	8.4	81.0	123	7.2	0.044	1.000	0.031	0.072	43.1	4.22
17-SEP-93	226.0	156	8.43	23.65	...	...	...	...	...	...	...	...	...	...	...
	*****	****	*****	*****	*****	****	*****	*****	*****	*****	*****	*****	*****	*****	*****
MIN	212.1	156	8.12	19.81	13.7	7.9	81.0	115	7.2	0.020	0.875	0.031	0.072	43.1	4.22
MAX	315.8	303	15.20	30.51	17.2	8.6	87.0	148	7.3	0.062	1.130	0.044	0.102	44.3	12.40
MEAN	274.8	276	11.86	25.96	15.4	8.3	82.8	128	7.2	0.037	0.991	0.037	0.084	43.6	7.29
MEDIAN	278.6	296	12.67	26.55	15.4	8.4	82.5	126	7.2	0.034	0.979	0.036	0.082	43.6	6.26
COUNT	15.0	15	15.00	15.00	6.0	6.0	6.0	6	6.0	4.000	4.000	4.000	4.000	4.0	4.00

TABLE 4
RECOVERY PERIOD

DATE	FARM CFS	HAGG CFS	LO-AIR DEG C	HI-AIR DEG C	TEMP DEG C	DO MG/L	DO SAT %	COND UMHO/CM	pH UNITS	NH3-N MG/L	NO2NO3-N MG/L	S-OPO4-P MG/L	T-PO4-P MG/L	SOP/TP %	CHLOR_A UG/L
18-SEP-93	192.0	131	7.77	18.55	...	...	...	...	...	...	...	...	...	...	...
19-SEP-93	167.2	131	8.27	17.02	...	...	...	...	...	...	...	...	...	...	...
20-SEP-93	173.4	131	7.38	17.42	13.3	8.0	76.0	122	7.3	0.028	0.935	0.033	0.076	43.4	7.18
21-SEP-93	173.4	131	4.84	21.23	...	...	...	...	...	...	...	...	...	...	...
22-SEP-93	173.4	131	8.21	23.64	13.9	8.2	79.0	140	7.2	...	...	...	...	...	...
23-SEP-93	167.2	109	9.29	24.60	13.5	8.1	78.0	152	7.0	0.024	1.340	0.035	0.077	45.5	17.20
24-SEP-93	137.8	79	6.12	20.48	...	...	...	...	...	...	...	...	...	...	...
25-SEP-93	117.6	79	7.71	22.98	...	...	...	...	...	...	...	...	...	...	...
26-SEP-93	106.8	79	11.69	28.59	...	...	...	...	...	...	...	...	...	...	...
27-SEP-93	111.5	79	8.75	25.49	13.6	7.9	75.0	169	7.0	0.057	1.510	0.039	0.094	41.5	18.00
28-SEP-93	111.5	103	10.31	23.16	...	...	...	...	...	...	...	...	...	...	...
29-SEP-93	133.1	123	12.76	27.88	14.4	8.7	85.0	175	7.2	...	...	...	...	...	...
30-SEP-93	156.3	147	11.02	23.71	14.3	7.9	78.0	175	7.1	0.010	1.570	0.035	0.070	50.0	22.00
	*****	****	*****	*****	*****	****	*****	*****	*****	*****	*****	*****	*****	*****	*****
MIN	106.8	79	4.84	17.02	13.3	7.9	75.0	122	7.0	0.010	0.935	0.033	0.070	41.5	7.18
MAX	192.0	147	12.76	28.59	14.4	8.7	85.0	175	7.3	0.057	1.570	0.039	0.094	50.0	22.00
MEAN	147.8	112	8.78	22.67	13.8	8.1	78.5	156	7.1	0.030	1.339	0.036	0.079	45.1	16.10
MEDIAN	156.3	123	8.27	23.16	13.8	8.1	78.0	161	7.2	0.026	1.425	0.035	0.077	44.4	17.60
COUNT	13.0	13	13.00	13.00	6.0	6.0	6.0	6	6.0	4.000	4.000	4.000	4.000	4.0	4.00

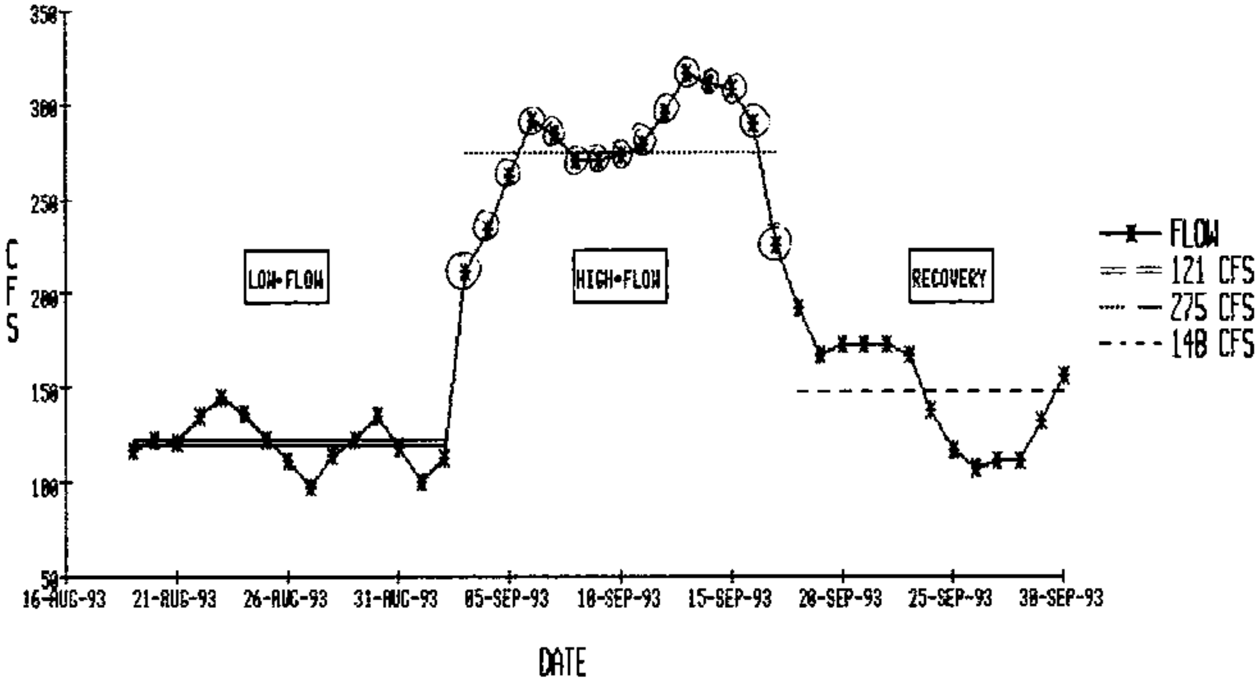
GRAPH 1
AIR TEMPERATURE
LAKE OSWEGO DIVERSION DAM (RIVER MILE 3.4)



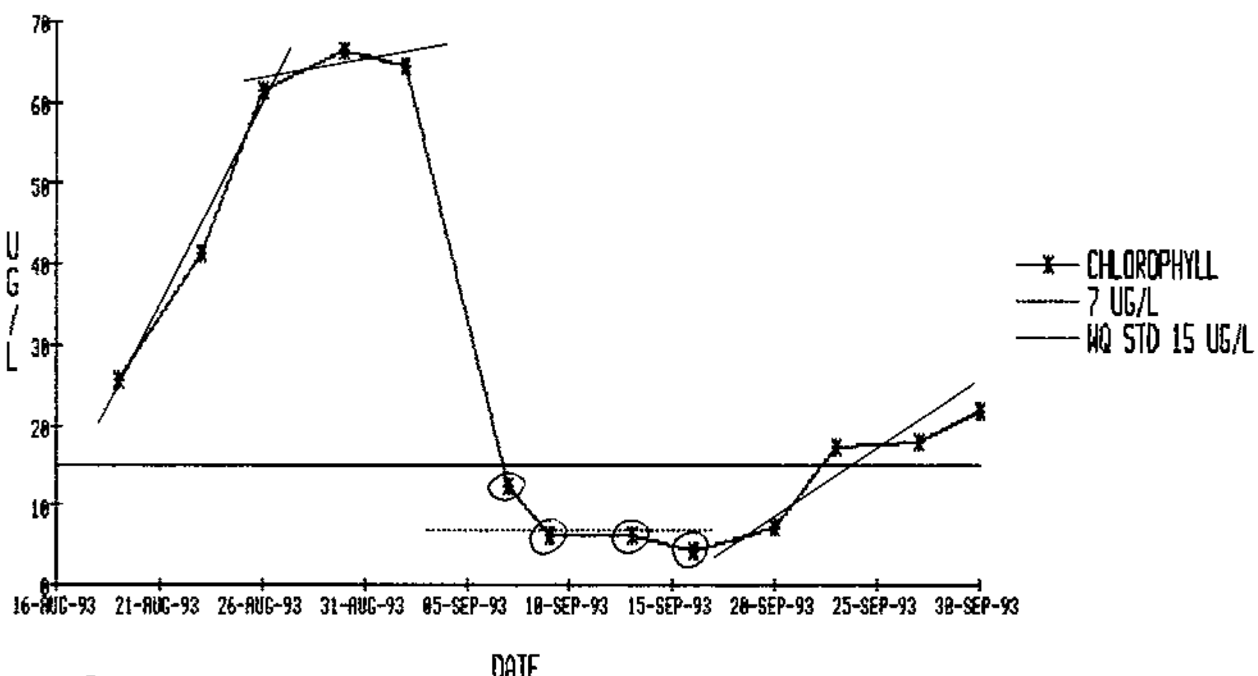
GRAPH 2

HIGH-FLOW EXPERIMENT

FARMINGTON (RM 33.3) FLOW



ELSNER (RM 16.5) CHLOROPHYLL a

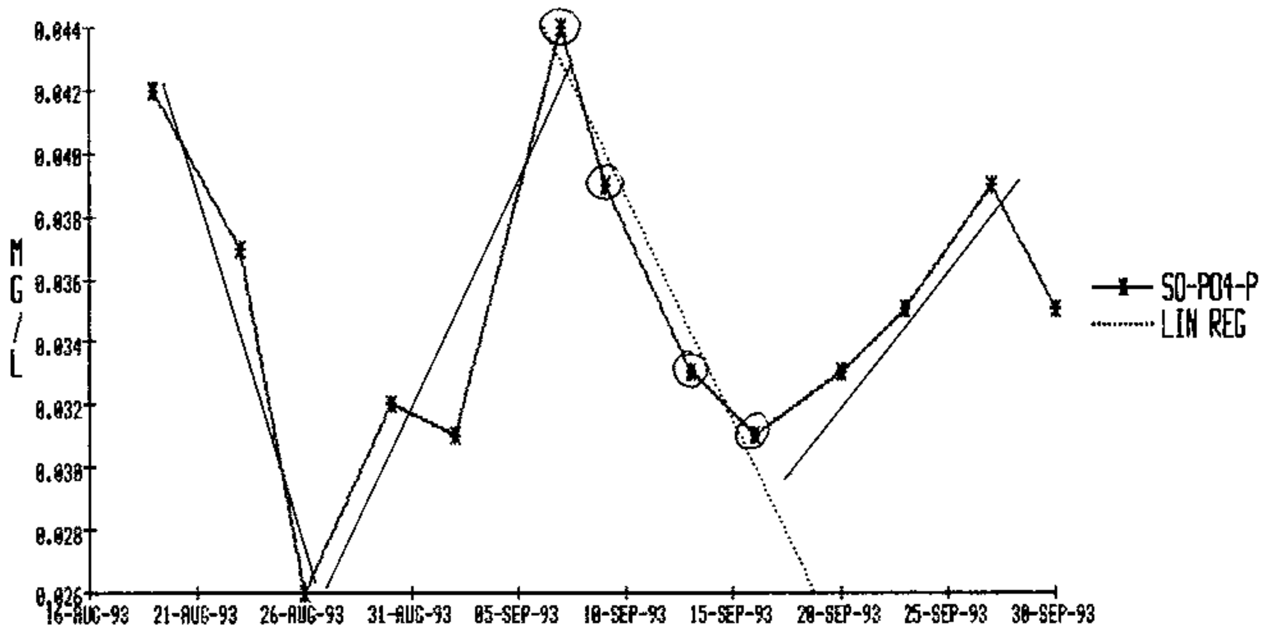


(*) HIGH-FLOW PERIOD

GRAPH 3

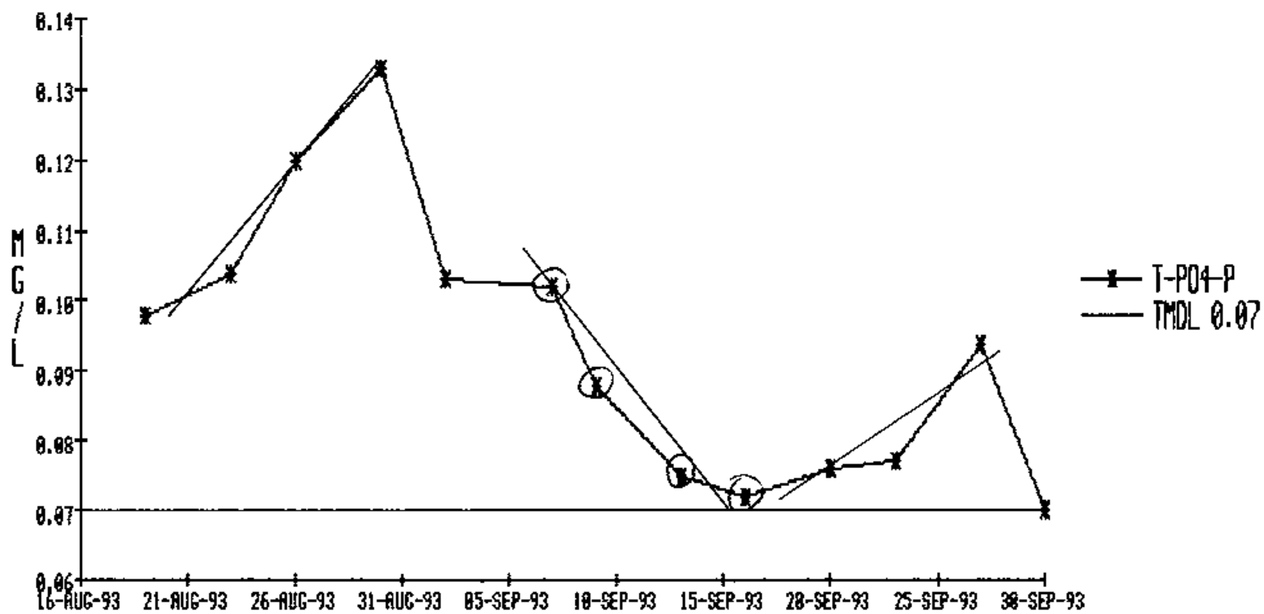
HIGH-FLOW EXPERIMENT

ELSNER (RM 16.5) SOLUBLE ORTHO PHOSPHORUS



DATE

ELSNER (RM 16.5) TOTAL PHOSPHORUS



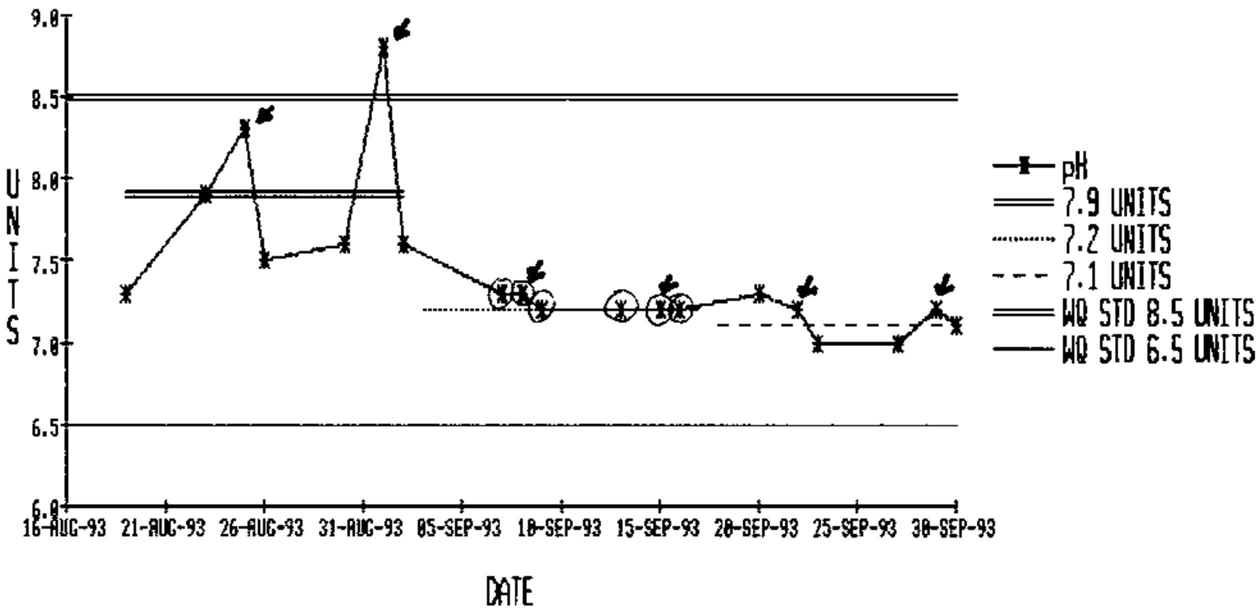
DATE

(*) HIGH-FLOW PERIOD

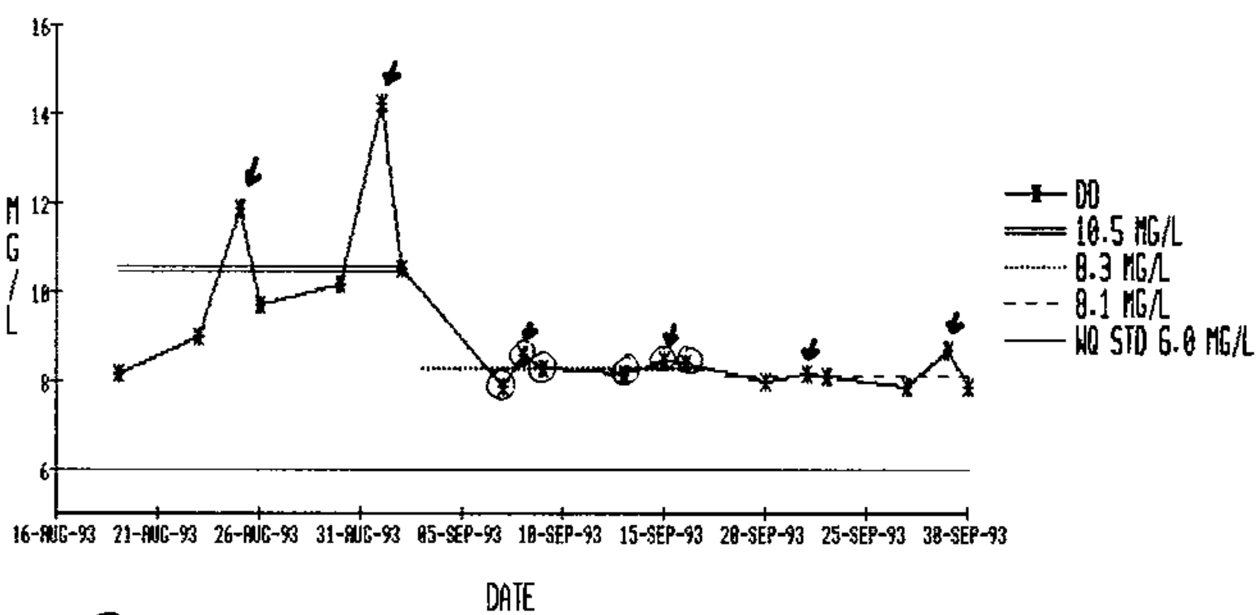
GRAPH 4

HIGH-FLOW EXPERIMENT

ELSNER (RM 16.5) pH



ELSNER (RM 16.5) DISSOLVED OXYGEN

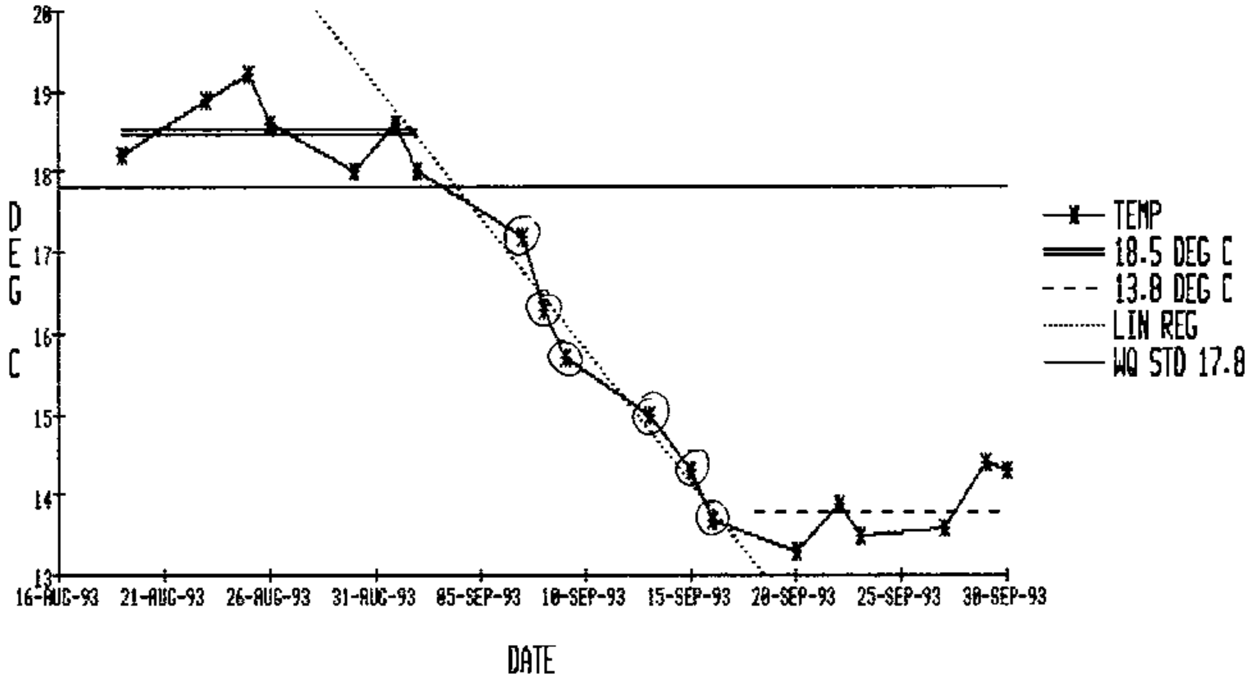


HIGH-FLOW PERIOD

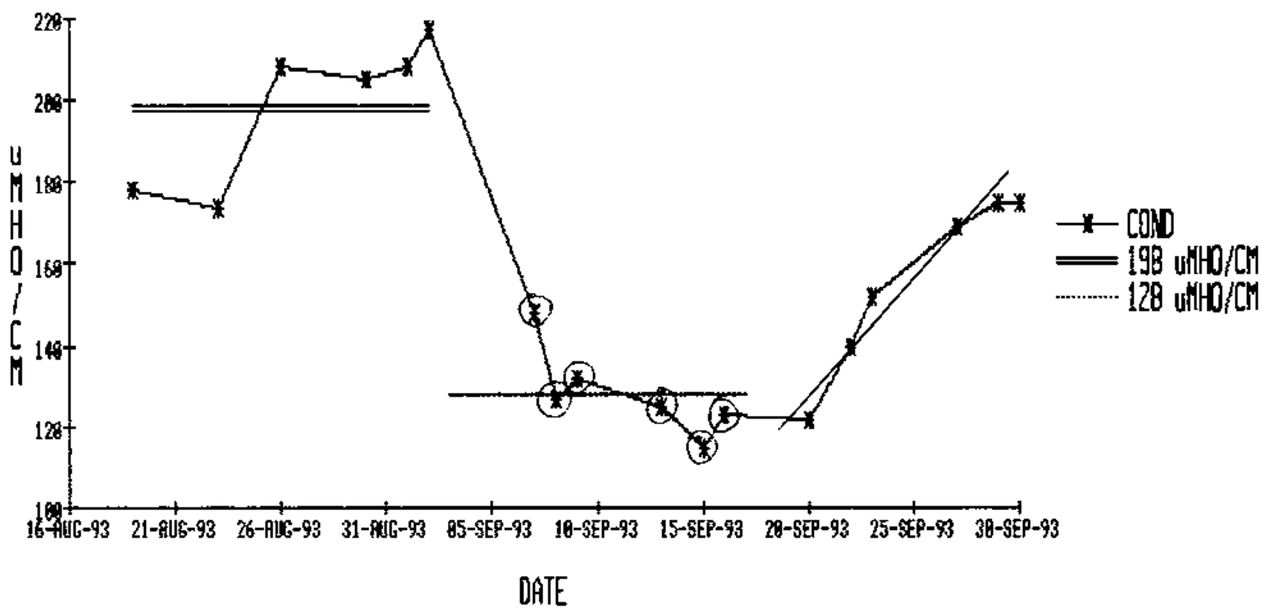
AFTERNOON SAMPLES

GRAPH 5
HIGH-FLOW EXPERIMENT

ELSNER (RM 16.5) TEMPERATURE



ELSNER (RM 16.5) CONDUCTIVITY



HIGH-FLOW PERIOD

APPENDIX E

MAINSTEM TUALATIN RIVER
RIVER MILE INDEX

TUALATIN RIVER
RIVER MILE INDEX
(0211400300)

River Mile miles	**Description**	**Drainage Area** sq. miles	**Elev.** feet
0.0	Mouth of Tualatin River at Willamette River, River Mile 28.5 (LB Willamette)	712	50
0.2	Weiss Bridge- Petes Mtn Rd.		
1.6	Fields Creek (RB-02114003000010)		
1.7	State Hwy 212 Bridge (Fields Bridge)		
1.8	West Linn Stream Gage Station (USGS #14-2075.0)	710	86
2.4	Tate Creek (LB-02114003000020)		
3.4	Lake Oswego Corp. Diversion Dam		
4.3	Interstate 205 Bridge		
4.6	Wilson Creek (LB-02114003000080)		
5.3	Shipley Creek (LB-02114003000100)		
5.4	Shipley Bridge- Stafford Rd. (NWS Wire Weight Gage)		
5.7	Pecan Creek (LB-02114003000120)		
6.0	Athey Creek (RB-02114003000123)		
6.7	Saum Creek (RB-02114003000130)		
6.7	Oswego Canal Diversion (LB; River Elevation Recording Gage, Headgate, and Canal Recording Gage #14-2070.00)		

River Mile miles	Description	Drainage Area sq. miles	Elev. feet
7.8	Clackamas/Washington Counties Line		
8.2	Interstate 5 Bridge		
8.6	Boones Ferry Road Bridge		
8.7	Hedges Creek (RB-02114003000150)		
8.9	Tualatin Park Boat Launch (RB) Southern Pacific RR Bridge		
9.3+	Fanno Creek (LB-02114003000180)		
9.35	Durham Treatment Plant Outfall (LB)		
9.4	Oregon Electric RR Bridge		
10.0	Cook Park Boat Launch LB)		
11.5	Hwy. 99W Bridge (Pacific Highway)		
12.7	Overhead BPA Transmission Line; Vancouver-Eugene		
15.2	Rock Creek-South (RB-02114003000250)		
15.5	Chicken Creek (RB-02114003000270)		
16.1	Chicken Creek Drainage Ditch (RB)		
16.2	Shamberg Bridge (Elsner Road) Rated Staff Gage for Stream Flow		
21.1	Overhead BPA Transmission Line; Big Eddy-Keeler		
26.9	State Hwy. 210 bridge (Scholls)		
28.2	McFee Creek (RB-02114003000310)		
30.8	Unnamed Stream (LB-02114003000320) (Jacktown)		
31.6	Burris Creek (RB-02114003000330)		

River Mile miles	Description	Drainage Area sq. miles	Elev. feet
31.9	Christensen Creek (RB-02114003000350)		
33.3	Harris Bridge (State Highway 208) Farmington Recording Stream Gage (#14-2065.00) (LB)	568	112
35.7	Butternut Creek (LB-02114003000380)		
37.4	Gordon Creek (LB-02114003000400)		
38.1	Rock Creek Treatment Plant Outfall (LB)		
38.1+	Rock Creek (LB-02114003000420) Beaverton Creek (LB-02114003000420060)		
38.4	Rood Bridge Road Bridge Tualatin River at Rood Bridge Recording Stream Gage		
40.2	Davis Creek (RB-02114003000430)		
41.6	Minter Bridge Road Bridge		
43.9	Jackson Slough (LB) Jackson Bottom Wetlands Hillsboro Treatment Plant Effluent Outfall (LB)		
44.4	State Highway 219 Bridge Rated Staff Gage for Stream Flow		
44.7	Dairy Creek (LB-02114003000480) Mckay Creek (LB-02114003000480020) East Fork Dairy Creek (02114003000480080) West Fork Dairy Creek (02114003000480090)		
51.5	Golf Course Road Bridge Tualatin River at Golf Course Road Bridge Recording Stream Gage		
53.8	LaFollett Road Bridge		
55.2	Forest Grove Treatment Plant Outfall Fern Hill Wetlands		

River **Mile** miles	**Description**	Drainage **Area** sq. miles	**Elev.** feet
55.3	Fernhill Road Bridge		
56.0	Springhill Pump Plant Intake		
56.8	Gales Creek (LB-02114003000560)		
57.4	Carpenter Creek (LB-02114003000580)		
57.8	Dilley Creek (LB-02114003000600)		
58.1	Johnson Creek (LB-02114003000602)		
58.8	Springhill Road Bridge Tualatin River at Dilley Stream Gage (LB) (USGS 14-2035.00)	133	158
59.0	O'Neil Creek (LB-02114003000620)		
60.0	Scoggins Creek (LB-02114003000640)		
60.1	Wapato Creek (RB-02114003000670) Wapato Creek Improvement District Return Flow		
61.9	Wapato Improvement District Headgate (RB)		
62.2	Southern Pacific RR Bridge		
62.2	State Highway 47 Bridge (Gaston)		
62.3	Bates Road Bridge		
62.8	Black Jack Creek (LB-02114003000700)		
62.9	Overhead BPA Transmission Line; Forest Grove-McMinnville		
63.2	TVID Patten Valley Pump Station Outfall		
63.9	Tualatin River at Gaston Recording Stream Gage (RB) (14-2025.00)	48.5	
64.0	TVID Patten Valley Pump Station Outfall		

River Mile miles	Description	Drainage Area sq. miles	Elev. feet
65.3	Mercer Creek (RB-02114003000730)		
65.9	Mt. Richmond Road Bridge		
67.3	Hering Creek (LB-02114003000760)		
67.8	South Road Bridge (Cherry Grove)		
68.4	Roaring Creek (RB-02114003000790)		
69.5	Little Lee Falls		
70.5	Raines Bridge- Tualatin River below Lee Falls Rated Staff Gage for Stream Flow (LB)		
71.1	Lee Falls		
73.2	Haines Falls		
73.2+	City of Hillsboro Haines Falls Intake		
74.0	Lee Creek (LB-02114003000860)		
74.1	Patten Creek (RB-02114003000870)		
75.7	Sunday Creek (LB-02114003000900)		
76.6	Maple Creek (LB-02114003000940)		
78.0	Barney Reservoir Aqueduct Outfall (RB)		
79.3	Headwaters of Tualatin River		

River miles based on USGS 1:24000 quad maps
Underlined tributaries indicate planned stream mile index
Prepared by Tualatin Basin Watermaster - June 1993

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