SYSTEM OPERATIONAL REQUEST: #2000-25

- *The following State and Federal Salmon Managers have participated in the preparation and support this SOR: Oregon Department of Fish & Wildlife, U.S. Fish & Wildlife Service, Washington Department of Fish and Wildlife, and the National Marine Fisheries Service.*

TO:	**Brigadier General Strock**	**COE-NPD**
	William Branch	**COE-Water Management**
	Cindy Henriksen	**COE-RCC**
	Doug Arndt	**COE-P**
	Col. Randall J. Butler	**COE-Portland District**
	Lieut. Col. W.E. Bulen, Jr.	**COE-Walla Walla District**
	J. William McDonald	**USBR-Boise Regional Director**
	Judith Johansen	**BPA-Administrator**
	Greg Delwiche	**BPA-PG-5**

Marvin S. Yoshinaka

FROM: **Marv Yoshinaka, Chairperson, Salmon Managers**

DATE: **June 28, 2000**

SUBJECT: Summer Operations Brownlee and Dworshak Reservoir

SPECIFICATIONS:

- Pass inflow at Brownlee through July 4, 2000. Beginning July 5, draft Brownlee at the established draft rate limitation of one foot per day from July 31.
- Implement the Biological Opinion measures at Dworshak Reservoir. Reduce discharge from Dworshak to 3.2 kcfs at an outflow temperature of 48° F through July 2.Pass inflow at Dworshak from July 2 through July 4, 2000, at an outflow temperature of 48° F.
- Increase outflow from Dworshak to 10 kcfs on July 5, utilizing the ramping rate of 4,000 per hour. Maintain an outflow of 10 kcfs through July 9, 2000 at an outflow of 48°F.
- Increase outflow from Dworshak to 14 kcfs on July 10, 2000. Maintain outflow of 14 kcfs until August 31, 2000.

JUSTIFICATION:

Water Temperature

An extensive literature review was compiled for the Environmental Protection Agency by Dale McCullough, CRITFC, entitled, "A Review and Synthesis of Effects of Alterations to the Water Temperature Regime on Freshwater Life Stages of Salmonids with Special Reference to Chinook Salmon". This review establishes water temperature as an important factor in all life stages of salmon. The review documents the detrimental effects of elevated water temperatures on all life stages of salmon, both juvenile and adult. The literature review has identified a water temperature of 21 degrees C as the incipient lethal temperature for adult salmon. Washington State water quality standards for temperatures in the mainstem Snake and Columbia Rivers is 20 degrees centigrade.

Studies conducted on migration and survival of wild juvenile fall chinook in the Snake River by USFWS indicate that colder water from Dworshak Dam and water from Brownlee Dam should be

released when Lower Granite tailrace temperatures exceed 17 degrees centigrade. The tailrace temperature at Lower Granite Dam on June 27 was 17.6 degrees centigrade. The Lower Granite tailrace temperature has been near or exceeded 17 degrees centigrade since June 24. Lower Granite scroll case temperatures have been at or near 17 degrees centigrade since June 23.

Temperature modeling provided by EPA (attached) indicates that water temperatures will exceed the acceptable levels for adults and juvenile salmon in July and August throughout the lower Snake River in July, August and September, under the present forecasted conditions. The cold water releases from Dworshak are requested to provide a better water temperature regime for juvenile fall chinook migrating to Lower Granite dam and through the lower Snake River. EPA modeling projects that water temperature will continue to exceed acceptable limits for adult chinook salmon through most of September without mitigating actions. EPA modeling shows that drafting cool water from Dworshak, as anticipated in the Biological Opinion will improve flow and temperature conditions for juvenile fall chinook and should provide an adult benefit by moderating temperatures.

Flows

The BIOP flow objective for Lower Granite in 2000 is 51 kcfs. Flows at Lower Granite are already below that objective and will remain so for the remainder of the summer season even with the implementation of the Biological Opinion measures.

Travel Time Survival of juvenile fall chinook

In the recent compilation of travel time and survival data by NMFS "Travel Time/Survival White Paper" (March 2000), NMFS concludes that "Estimated survival probability from release points in the Snake River Basin to Lower Granite Dam was significantly correlated with flow, water temperature and turbidity". NMFS also concludes that the high correlation among variables precludes the determination of effects of these variables individually. A flow travel time relationship has been established for sub-yearling chinook migrants (attached). The flow travel time relationship has been confirmed consistently in various studies and monitoring programs.

Historical passage timing and distribution of wild and hatchery fall chinook are attached. These data show that 90 % of the wild chinook passage at Lower Granite occurs prior to August 30. Hatchery sub-yearling fall chinook of Clearwater and Snake River origin pass Lower Granite Dam in identical patterns, with 97 % of passage occurring prior to August 30. The average passage distribution of wild Clearwater and Snake River sub-yearling migrants at Lower Granite Dam for 1995 through 1998 shows that 95% of the wild Snake River run passed Lower Granite prior to August 30. For the same years 60% of the Clearwater wild fall chinook run passed Lower Granite prior to August 30.

The present PIT tag recaptures at Lower Granite Dam show that PIT tagged fall chinook from the Captain Johns, Pittsburg Landing Snake river release sites and wild Snake River chinook and Clearwater River migrants from Big Canyon Creek have been passing Lower Granite Dam since the first week of June (attached).

These data indicate that the majority of sub-yearling migrants of wild and hatchery origin pass Lower Granite in the July through August time period.

Clearwater River temperature

The status of Clearwater origin fall chinook has been a concern in the summer operations at Dworshak Reservoir. The attached plot shows the water temperature data from dissolved gas monitors in the Clearwater River at Peck and at Lewiston. These data show that the water temperature in the Clearwater River in warmer this year than it was in 1999. In general, data has shown that warmer water temperature results in accelerated growth in the egg to smolt life stage of fall chinook.

Clearwater River dissolved gas

Attached is a summary plot of dissolved gas monitoring data, which was conducted in the Clearwater River in 1995 – 1997.

Reservoir considerations

The potential impacts on kokanee and bull trout from implementing the proposed operation at Dworshak Dam were considered in developing this request. USFWS provided information on Kokanee and Bull Trout in the reservoir. Radio tracking data indicates that Bull Trout have largely moved into tributaries. USFWS has indicated that they do not expect that drafting the reservoir to 1520 or to 1500 will cause access to tributary problems for Kokanee. Concern about reservoir productivity was discussed in the development of the summer operation. Drawdown of Dworshak Reservoir in the summer and fall is likely to increase productivity in three ways assuming that water is taken from the mid to upper hypolimnion or lower metalimnion (William Connor, US Fish and Wildlife Service, personal communication; David Bennett, University of Idaho, personal communication; Michael Falter, University of Idaho, personal communication). These include:

1) Nutrients, zooplankton, and phytoplankton are largely concentrated in the epilimnion and upper boundary of the metalimnion during the summer. Therefore, reducing the volume of the hypolimnion by withdrawing water from this layer would actually concentrate nutrients and plankton.

2) The mean water temperature in the reservoir would increase as a result of reducing the volume of hypolimnetic water.

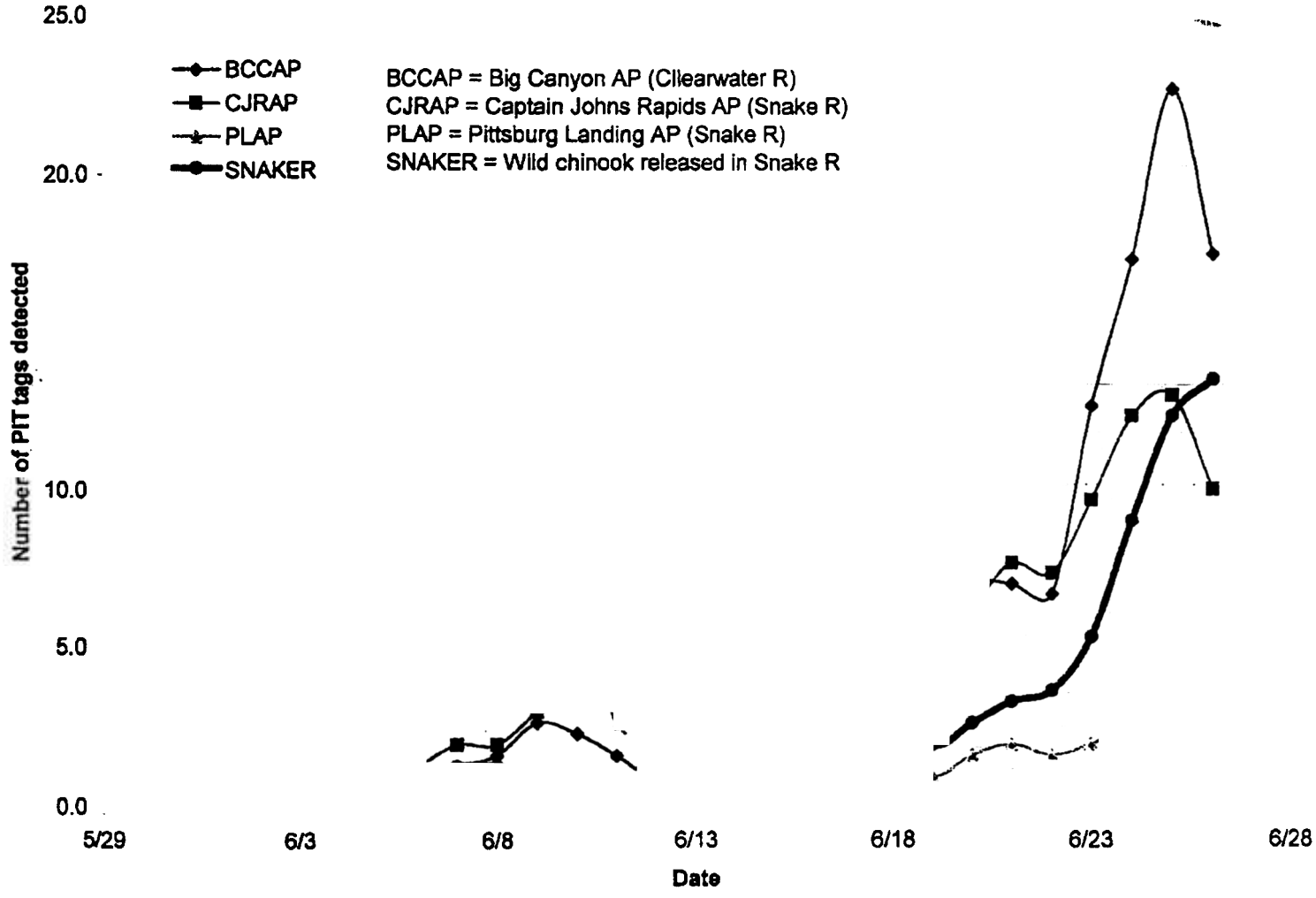
3) During fall turnover, there would be less water to mix. Mixing of reservoir water would occur more rapidly and the resulting nutrient concentration after mixing would be higher with drawdown than without drawdown.

The selector gates at Dworshak Dam are capable of withdrawing water from various depths between reservoir elevations of 1,500' and 1,600' so water can be withdrawn from the hypolimnion or metalimnion

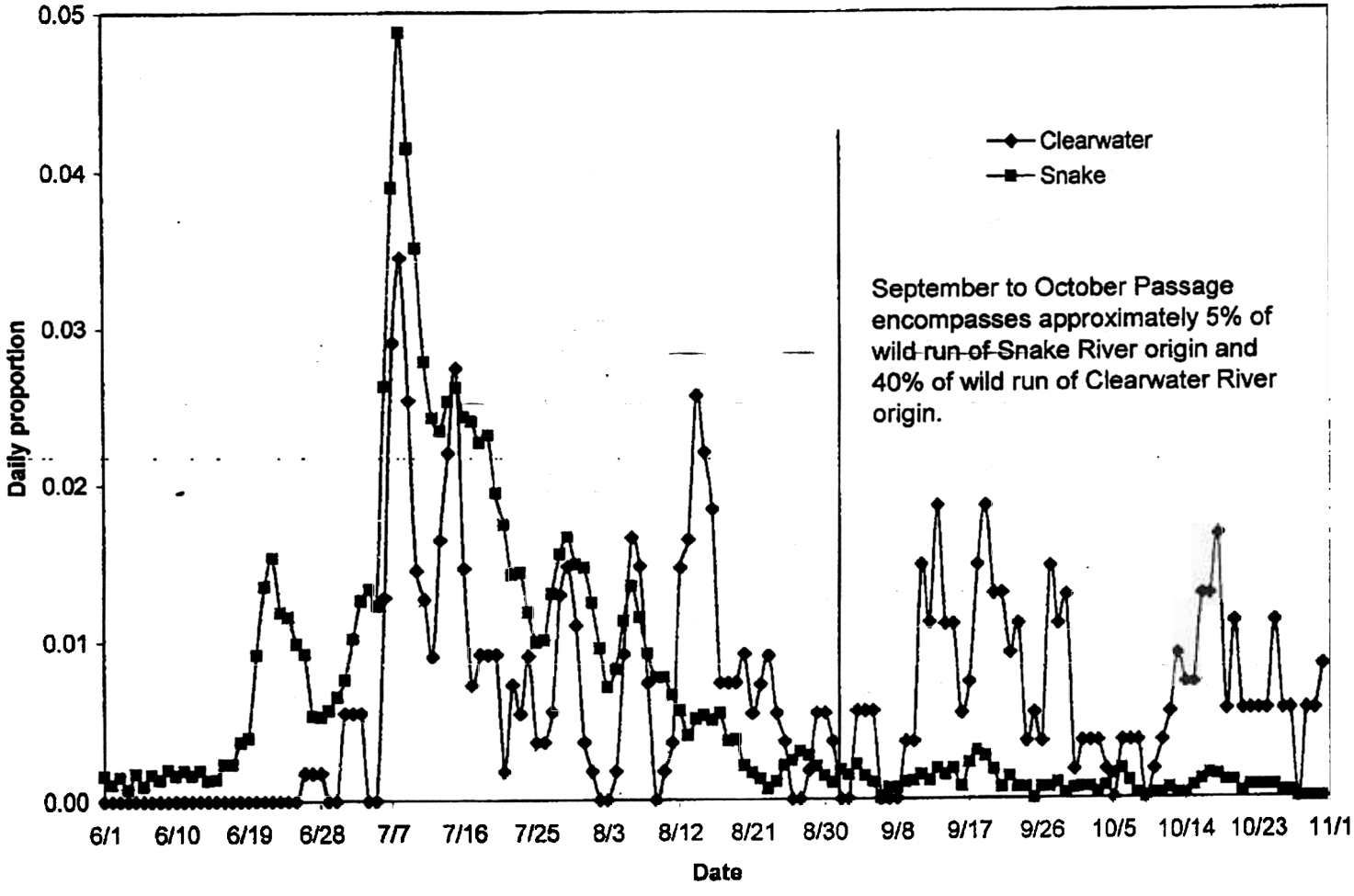
September Considerations

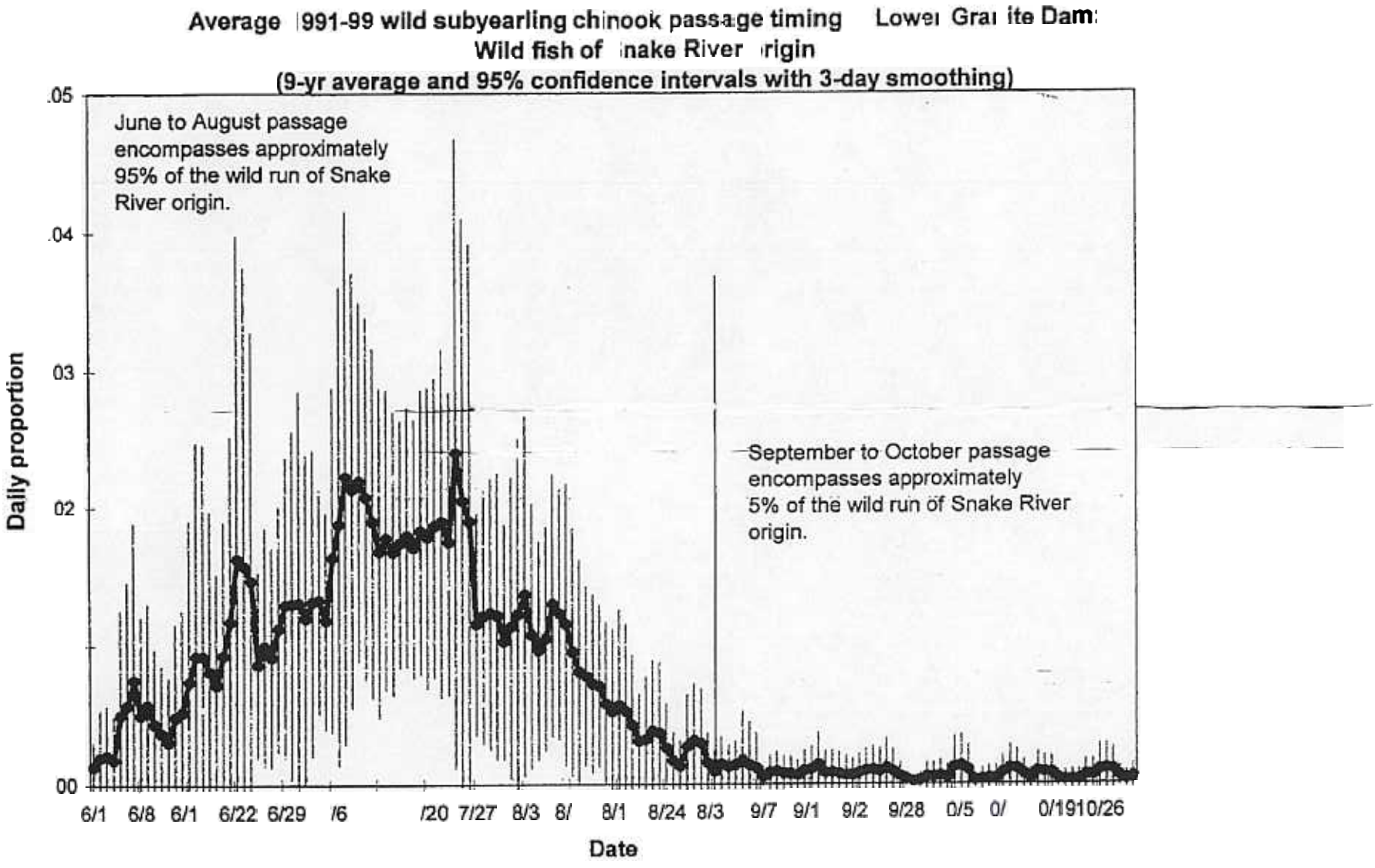
Review of the EPA temperature model simulations indicates that water temperatures in September will exceed acceptable levels for adult and juvenile salmon. Actions should be considered to address the apparent impact of hydrosystem development and operations on water temperature, adult passage and juvenile fish passage in September.

Passage timing of subyearling chinook at Lower Granite Dam in Year 2000 (line smoothed with 3-day moving average)

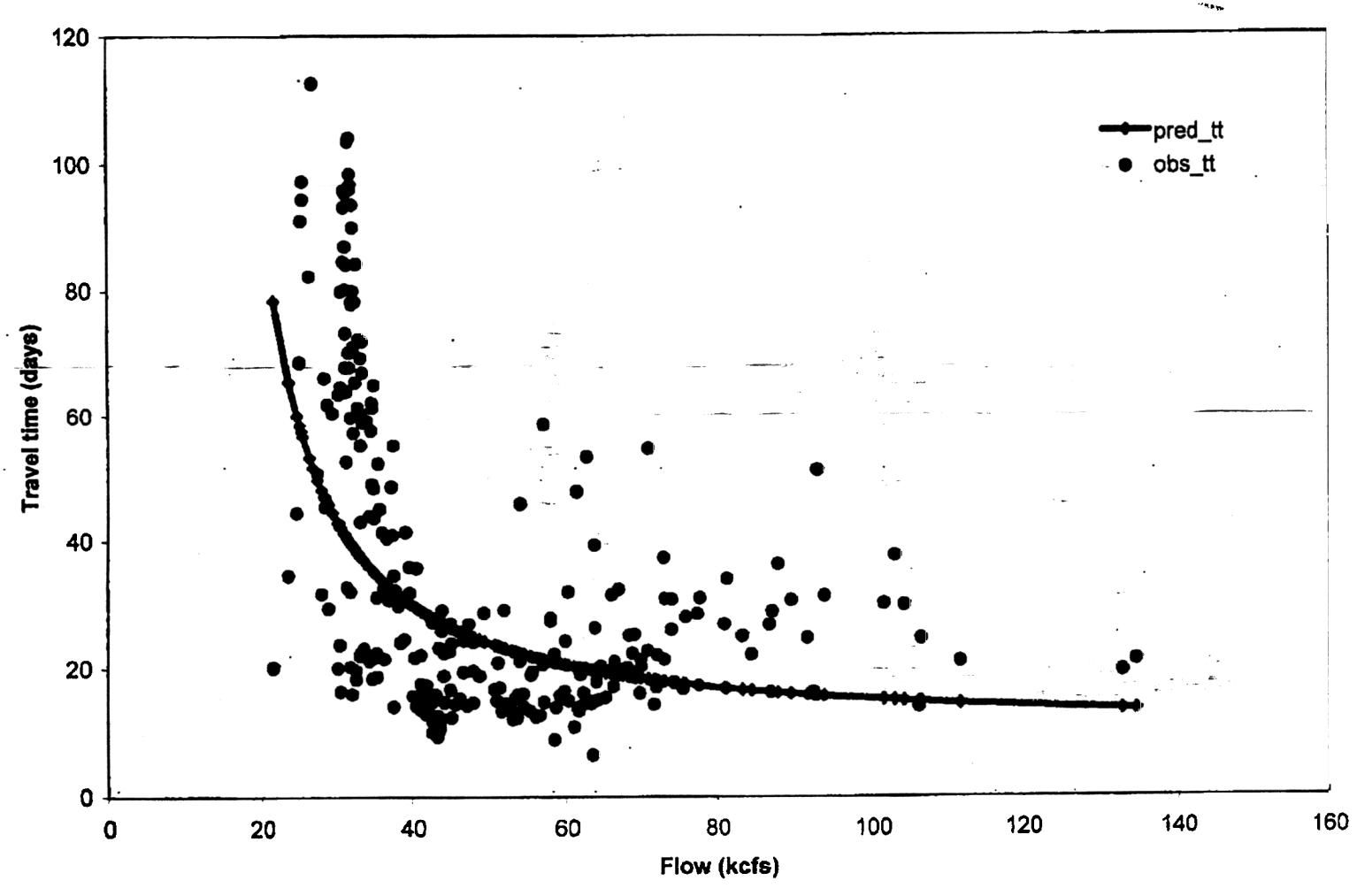


Average 1995 and 1998 wild subyearling chinook passage at Lower Granite Dam:
Wild fish of Clearwater River vs Snake River origin
(2-year average with 3-day smoothing)

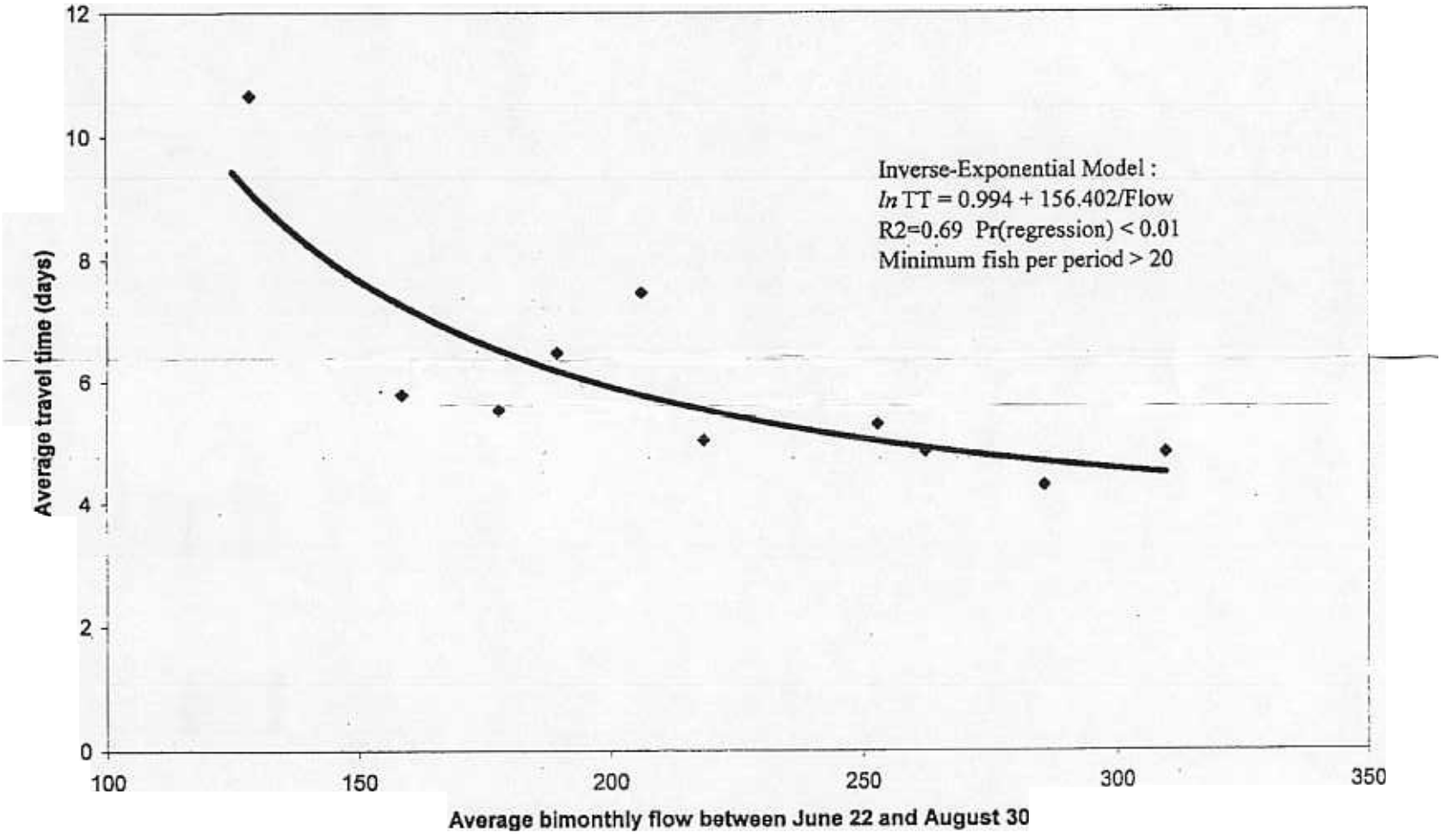



Average 1991-99 wild subyearling chinook passage timing Lower Granite Dam
Wild fish of Snake River origin
(9-yr average and 95% confidence intervals with 3-day smoothing)
June to August passage encompasses approximately 95% of the wild run of Snake River origin.
September to October passage encompasses approximately 5% of the wild run of Snake River origin.
Daily proportion
.05
.04
03
02
00
6/1 6/8 6/1 6/22 6/29 /6 /20 7/27 8/3 8/ 8/1 8/24 8/3 9/7 9/1 9/2 9/28 0/5 0/ 0/1910/26
Date

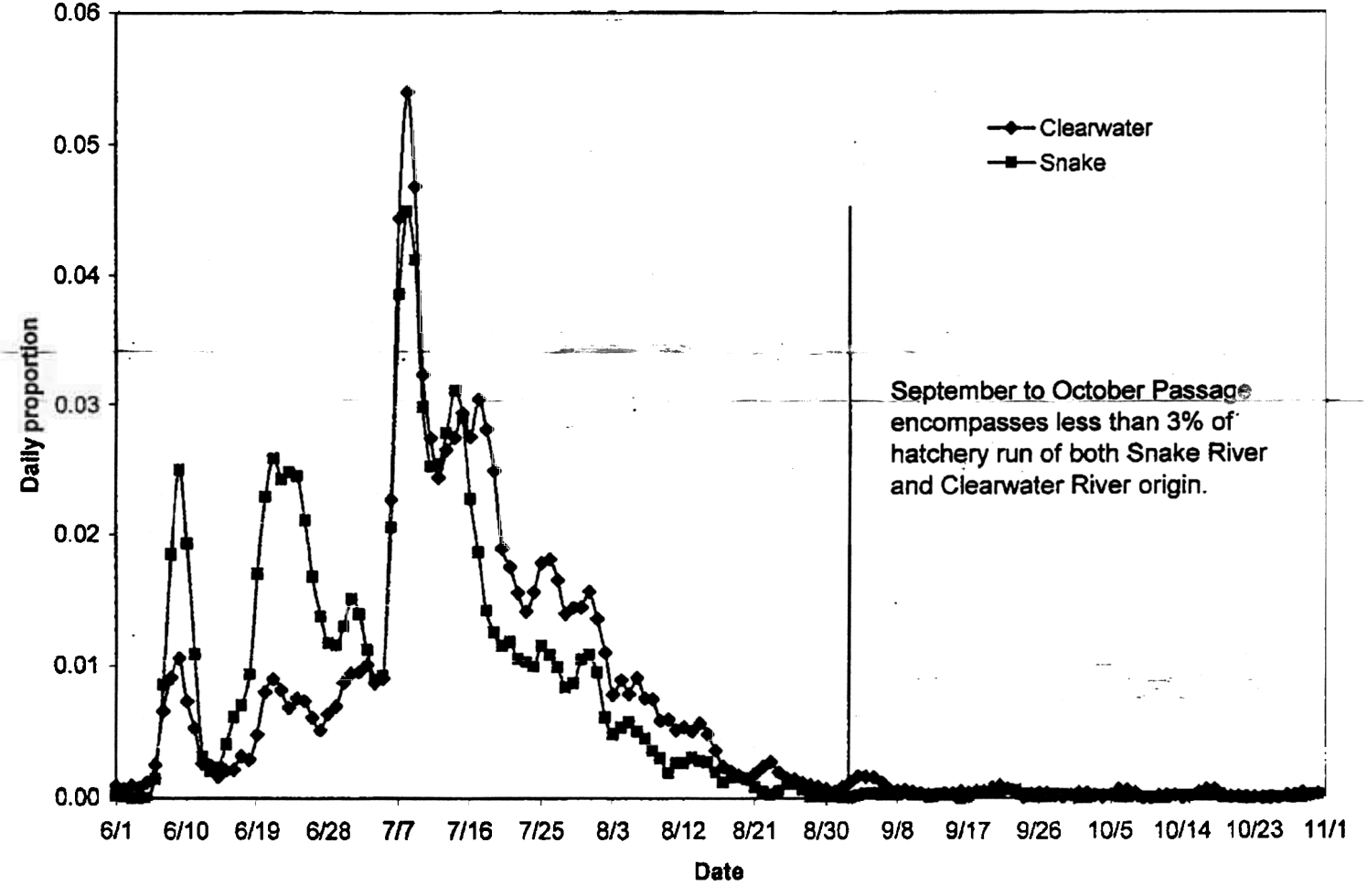
Travel time of wild subyearling chinook from Lower Granite Dam to McNary Dam, 1991-1997



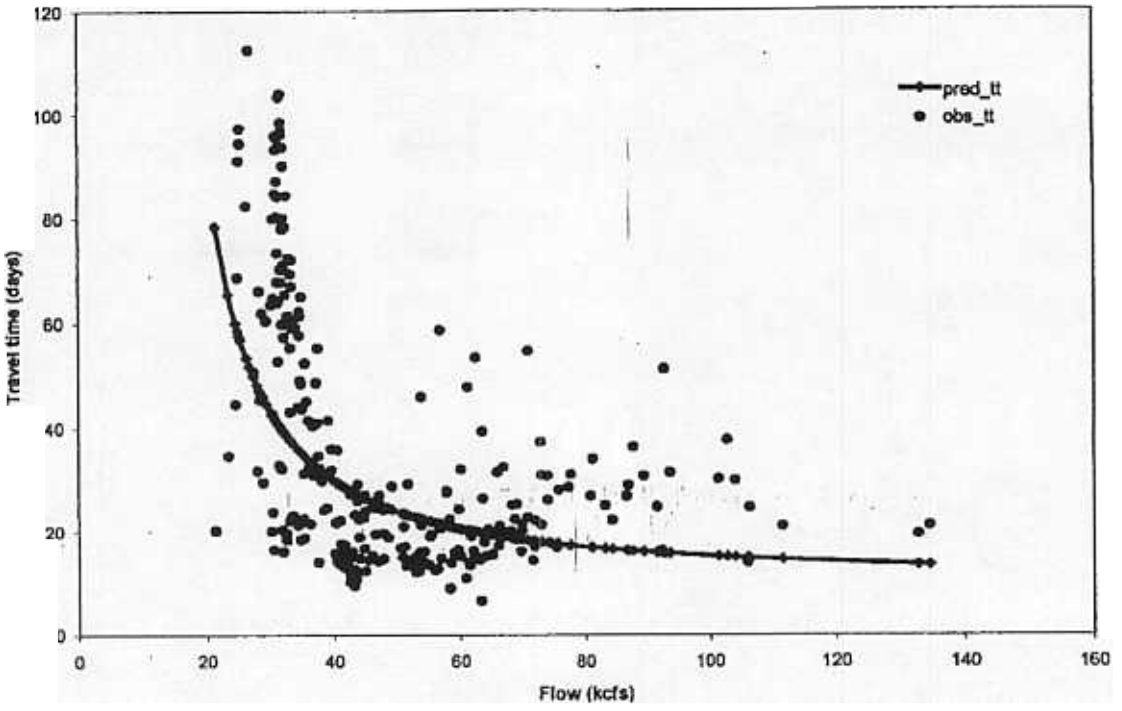
Bimonthly average travel time (TT) versus flow for subyearling chinook of Snake River origin between McNary and Bonneville dams (1997-99)



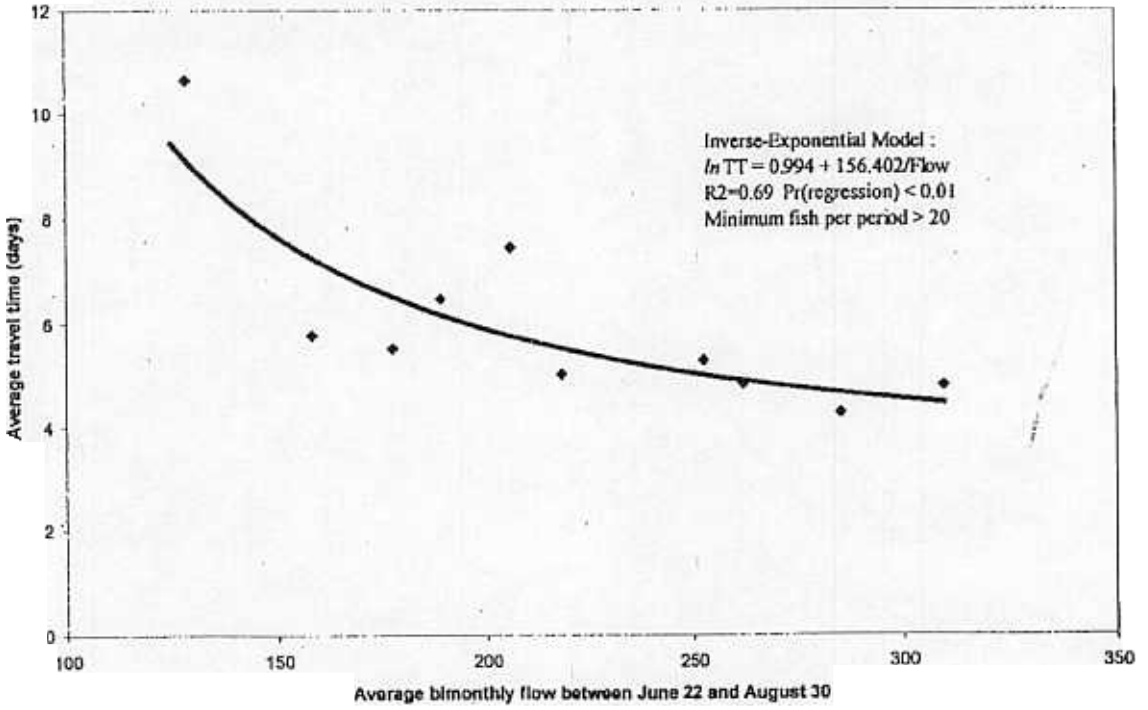
Average 1997-1999 hatchery subyearling chinook pasasge at Lower Granite Dam:
Hatchery fish of Clearwater River vs Snake River origin
(3-year average with 3-day smoothing)

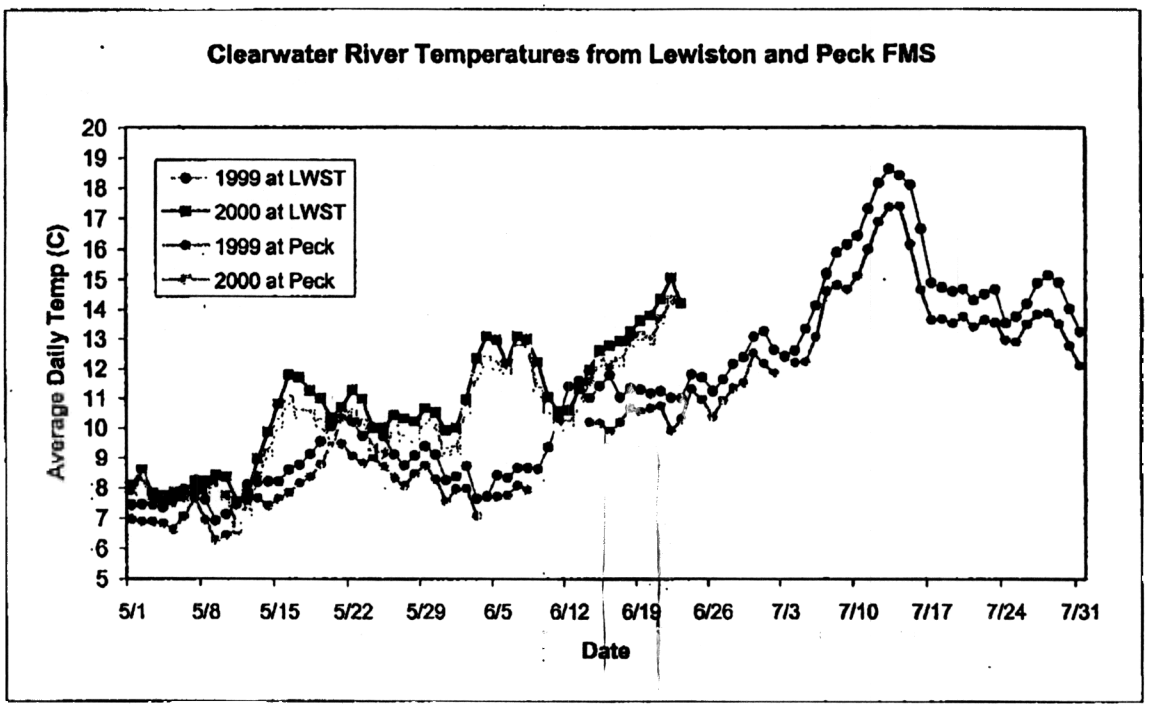


Travel time of wild subyearling chinook from Lower Granite Dam to McNary Dam, 1991-1997



Bimonthly average travel time (TT) versus flow for subyearling chinook of Snake River origin between McNary and Bonneville dams (1997-99)




Clearwater River Temperatures from Lewiston and Peck FMS
Average Daily Temp (C)
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
1999 at LWST
2000 at LWST
1999 at Peck
2000 at Peck
5/1
5/8
5/15
5/22
5/29
6/5
6/12
6/19
6/26
7/3
7/10
7/17
7/24
7/31
Date

Summary of GBT monitoring in Clearwater River

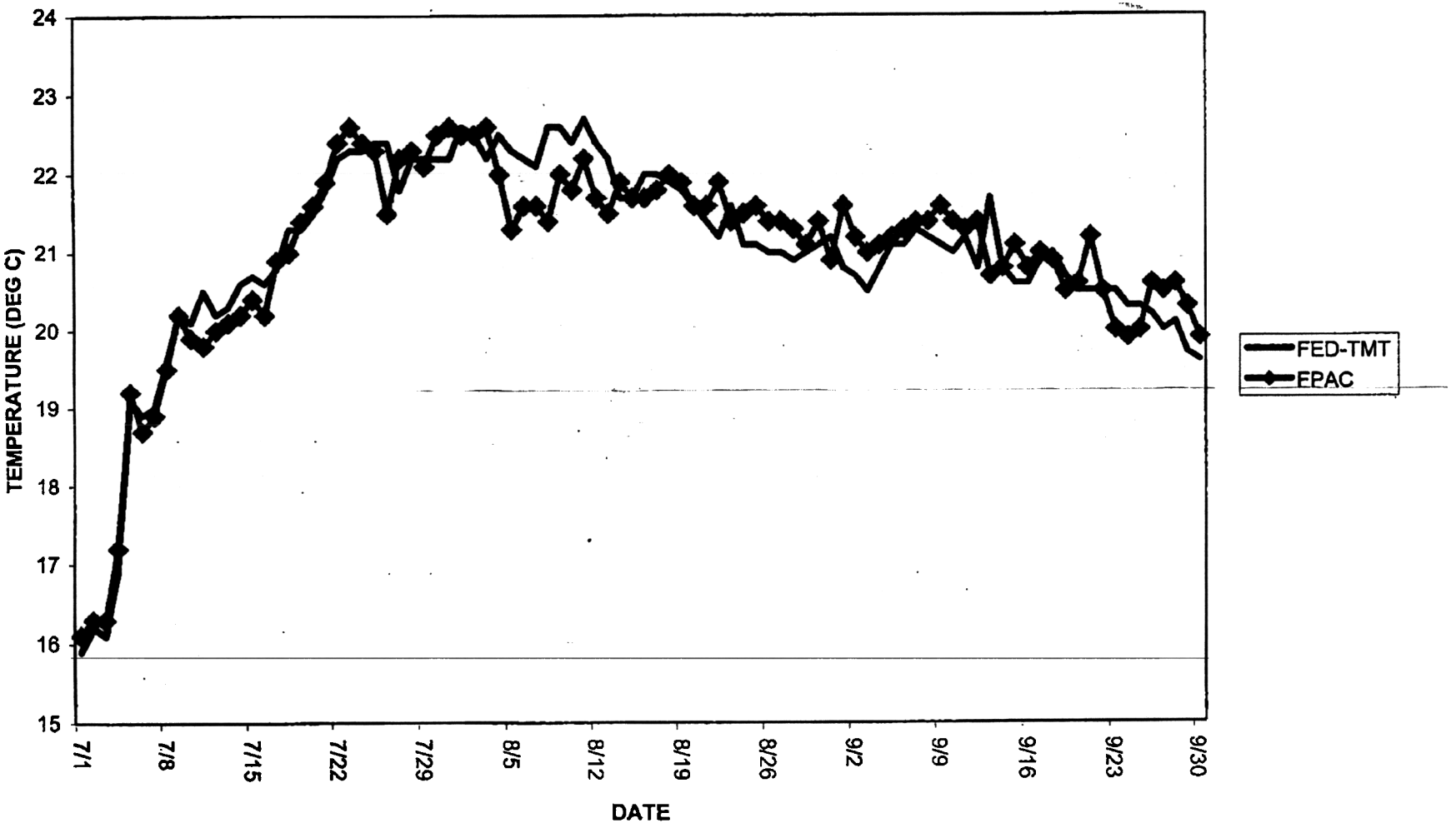
1995 Species code*	Number of Fish Exams	Number with GBT	Percent with GBT
Resident Salmonids	110	15	1.2
Other Resident Species	273	2	0.1
Migratory Salmonids	268	0	0.0
Combined	651	17	0.3

1996 Species code*	Number of Fish Exams	Number with GBT	Percent with GBT
Resident Salmonids	1032	12	1.2
Other Resident Species	5770	7	0.1
Migratory Salmonids	2	0	0.0
Combined	6804	19	0.3

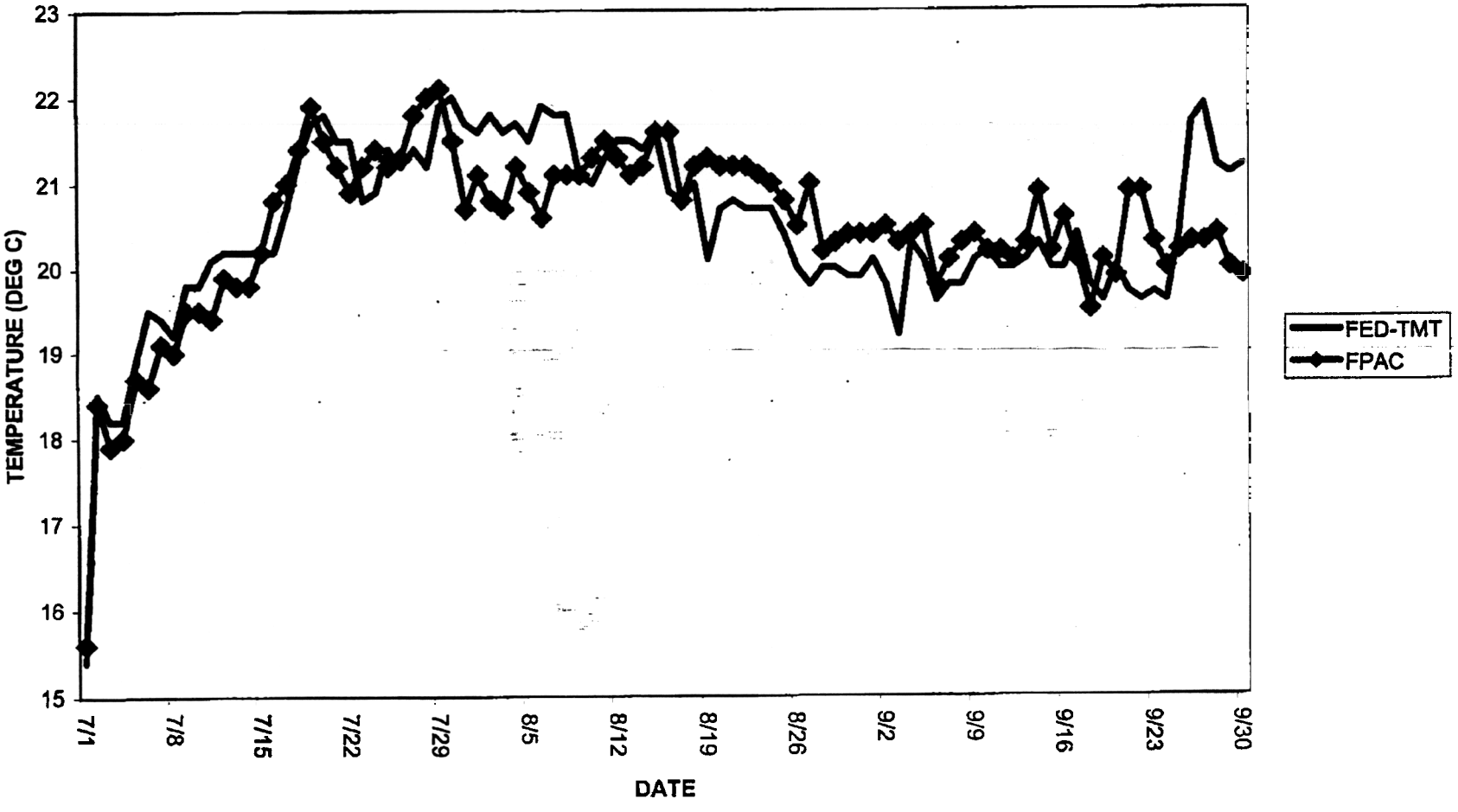
1997 Species code*	Number of Fish Exams	Number with GBT	Percent with GBT
Resident Salmonids	1290	37	2.9
Other Resident Species	7118	46	0.6
Migratory Salmonids	2	0	0.0
Combined	8410	83	1.0

*Other Resident Species include sucker, chiselmouth, crappie and bass
*Resident Salmonids such as wild or hatchery rainbow trout, and kokanee
*Migratory Salmonids includes chinook and, steelhead

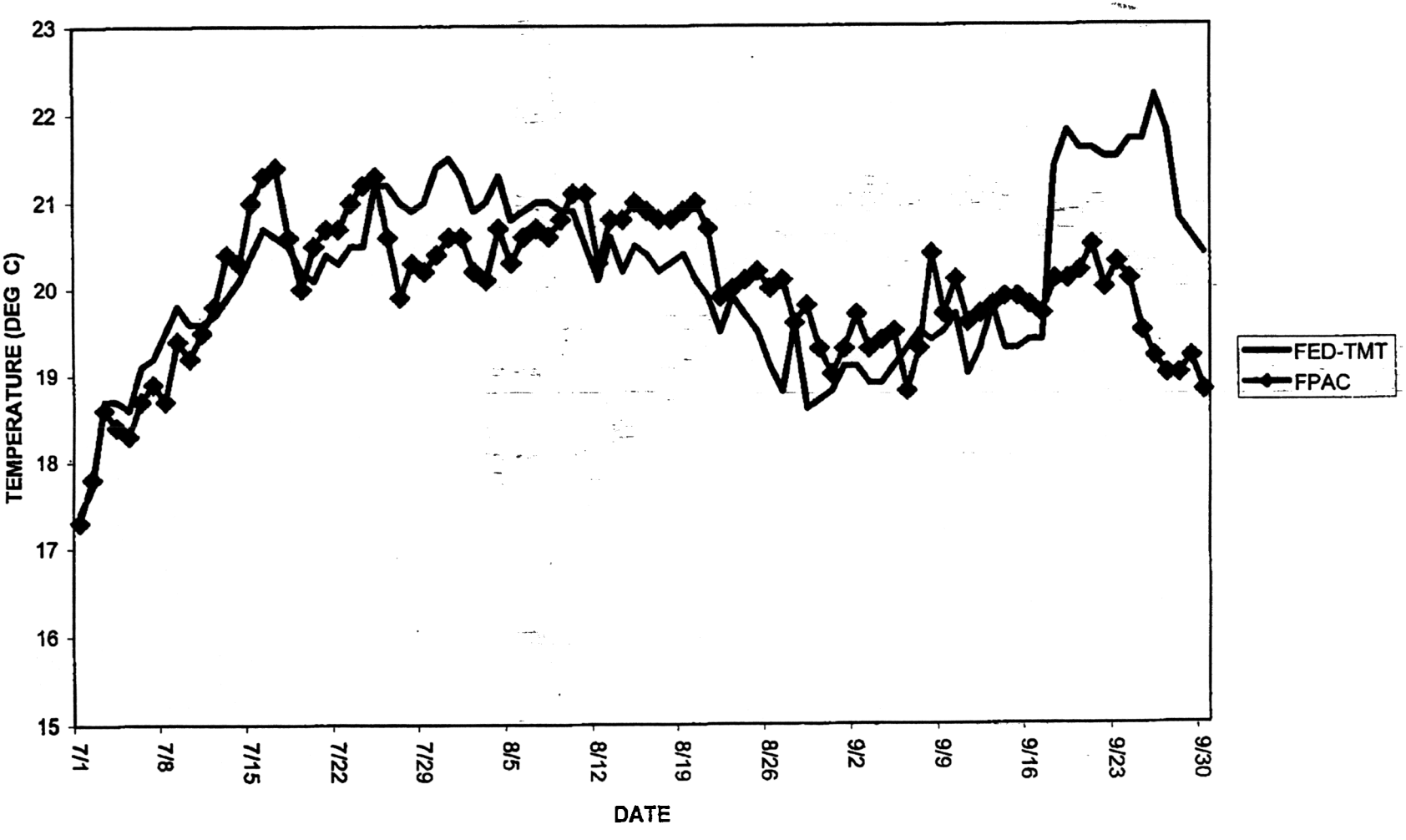
ICE HARBOR SIMULATED WATER TEMPERATURE 2000



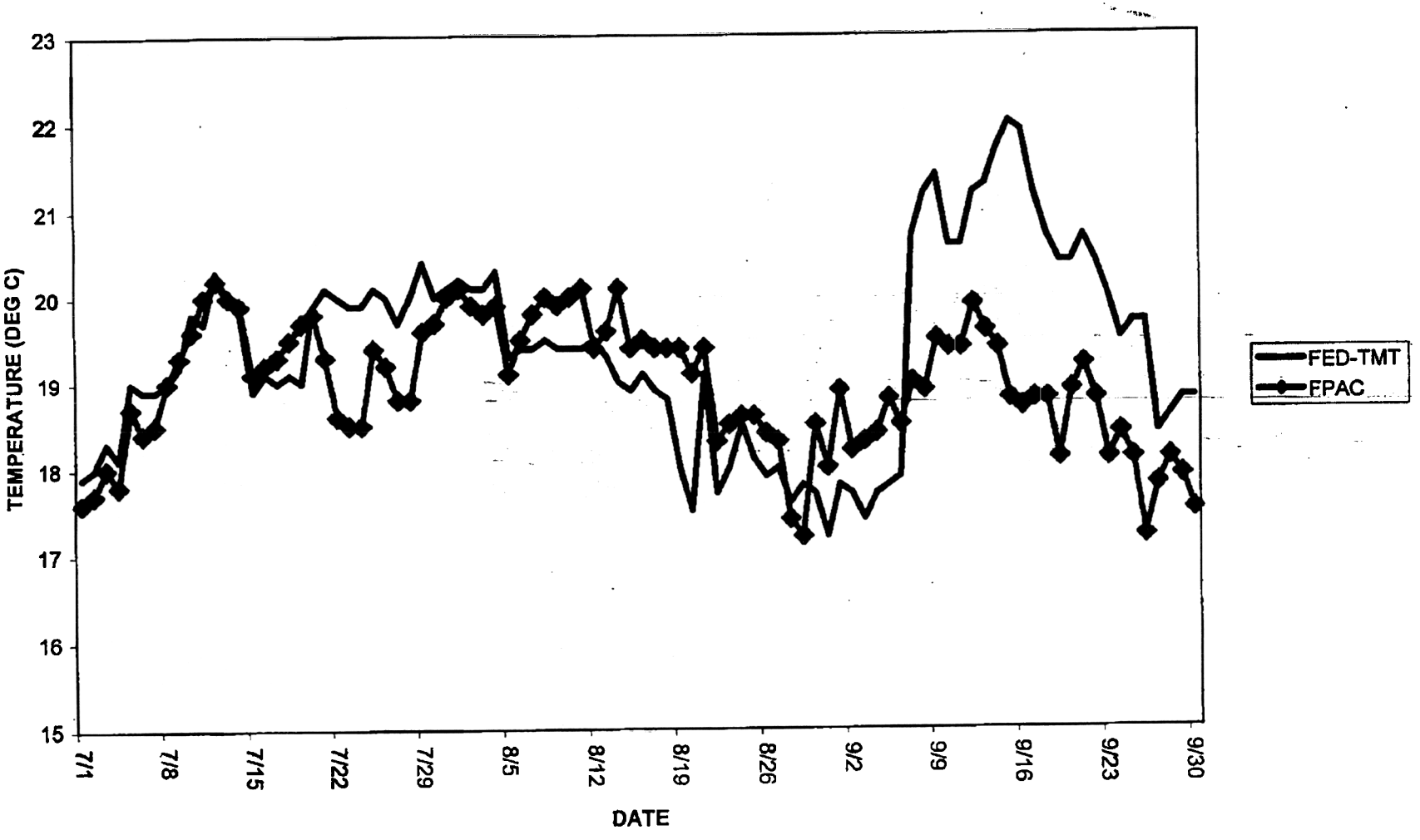
LOWER MONUMENTAL SIMULATED WATER TEMPERATURE
2000

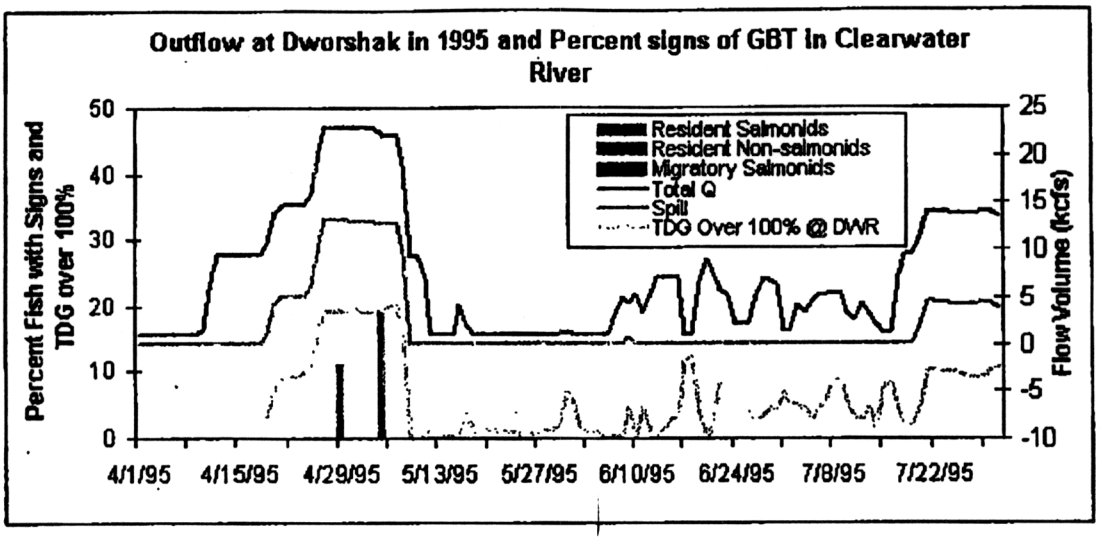


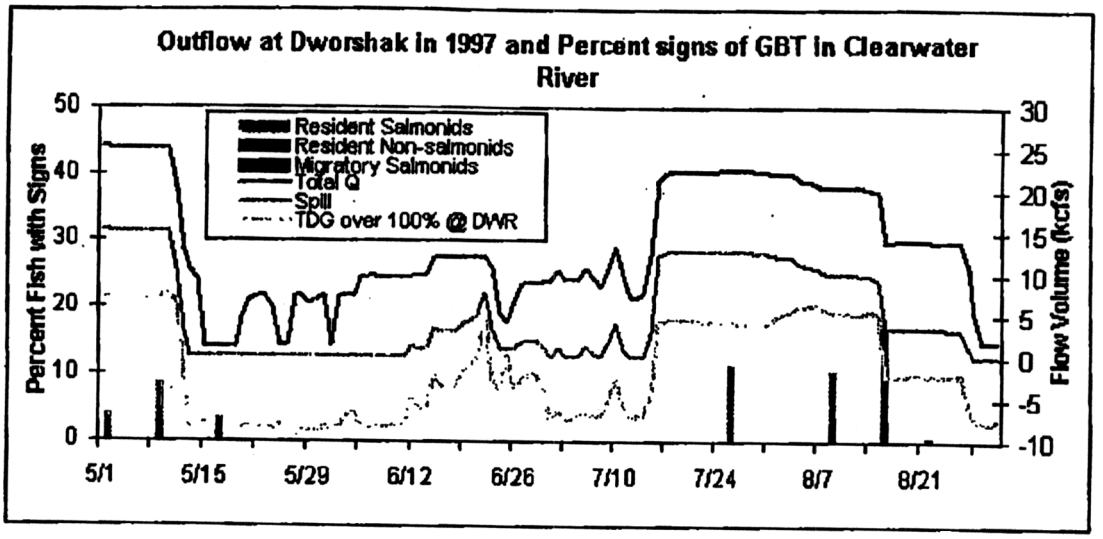
LITTLE GOOSE SIMULATED WATER TEMPERATURE 2000



LOWER GRANITE SIMULATED WATER TEMPERATURE 2000




Outflow at Dworshak in 1995 and Percent signs of GBT in Clearwater River
Percent Fish with Signs and TDG over 100%
Flow Volume (kcfs)
Resident Salmonids
Resident Non-salmonids
Migratory Salmonids
Total Q
Spill
TDG Over 100% @ DWR
50
40
30
20
10
0
25
20
15
10
5
0
-5
-10
4/1/95
4/15/95
4/29/95
5/13/95
5/27/95
6/10/95
6/24/95
7/8/95
7/22/95


Outflow at Dworshak in 1997 and Percent signs of GBT in Clearwater River
Resident Salmonids
Resident Non-salmonids
Migratory Salmonids
Total Q
Spill
TDG over 100% @ DWR
Percent Fish with Signs
Flow Volume (kcfs)
50
40
30
20
10
0
30
25
20
15
10
5
0
-5
-10
5/1
5/15
5/29
6/12
6/26
7/10
7/24
8/7
8/21