

AUGMENTED FISH HEALTH MONITORING IN OREGON

Annual Report
June 2, 1987 - May 31, 1988

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EXECUTIVE SUMMARY

1. To accomplish the augmented fish health monitoring activities in this contract, a new fish pathology laboratory was established at LaGrande, Oregon to provide health monitoring of Oregon middle and upper Columbia River tributary salmonid stocks.
2. With this contract, monitoring was increased approximately 40% in monthly checks of juveniles, 60% in various tests on smolts and 90% in examination of prespawning mortality and fish health of adult spawners.
3. Many of the adult prespawning mortalities were found to have multiple infections of Ceratomyxa shasta, Aeromonas salmonicida, Yersinia ruckeri and external fungi.
4. Bacterial kidney disease was detected in nearly all spawning stocks examined.
5. Erythrocytic inclusion body syndrome was detected in only one spawning stock, Bonneville upriver fall chinook, but was found in yearling coho or chinook at six different hatcheries (Big Creek, Bonneville, Cascade, Oxbow, Wahkeena Pond, and Lookingglass).
6. Infectious hematopoietic necrosis virus was detected in spawning fish at six different fish culture facilities including: Lookingglass, Round Butte, South Santiam, Minto Pond, Bonneville, and Clackamas.
7. An epizootic of IHN occurred in yearling spring chinook at Clackamas Hatchery. This is the first recorded IHNV caused loss of yearling chinook reported in Oregon.
8. Myxobolus cerebralis was found in Northeast Oregon in December, 1986. This contract provided the means to quickly analyze samples collected from most Oregon Columbia River tributaries. This parasite was endemic in wild fish in the Grande Ronde and Imnaha watersheds. Adult chinook and steelhead returning to these systems were also positive.
9. Privately stocked ponds in the John Day, Snake, Powder, and North Santiam rivers, and Willow Creek, contained presumptive Myxobolus cerebralis infected fish examinations are in progress.
10. A water sampling plan for chemical analyses of hatchery water supplies was prepared.
11. A list of facility impediments to fish health was prepared.

INTRODUCTION

Diminished natural fish production in the Columbia River Basin has prompted increased artificial propagation to compensate both for losses of anadromous salmonids related to hydroelectric facilities and for other causes. The health and quality of artificially propagated smolts probably is a major influence on survival. Smolt survival varies greatly from one location to another, among different species and from one year to the next. Fish health monitoring is necessary to identify cause of mortality, assist in producing a healthy smolt, and provide a means for improving hatchery effectiveness.

The Bonneville Power Administration (BPA) conducted a series of meetings to define the minimum "needed" level of fish health monitoring, determine what was presently being done and what additional effort was needed in the Basin's 54 anadromous fish hatcheries. Funding for the additional effort in Oregon began June 2, 1987. The goal of this project is to increase smolt-to-adult survival by accomplishing the following: (1) increase monitoring for specific fish pathogens and fish health parameters; (2) measure hatchery water supply quality; (3) identify facility impediments to fish health; (4) create a database of hatchery and fish health information; (5) establish a technical steering committee to evaluate and refine the project annually; and (6) increase communication and technology application among personnel in hatcheries, research, management, other agencies and the public. This report gives the results for the first year of this project, through March 15, 1988.

DESCRIPTION OF PROJECT AREA

Augmented fish health monitoring project is conducted at 19 Oregon Columbia River tributary hatcheries in addition to several satellite and acclimation ponds. Location of each facility is noted in Figure 1. Fifty-five anadromous fish stocks are being monitored at these facilities, (Table 1). Stock code designation shown in Table 1 are explained in Table 2.

OREGON DEPARTMENT OF FISH AND WILDLIFE FISH PROPAGATION FACILITIES

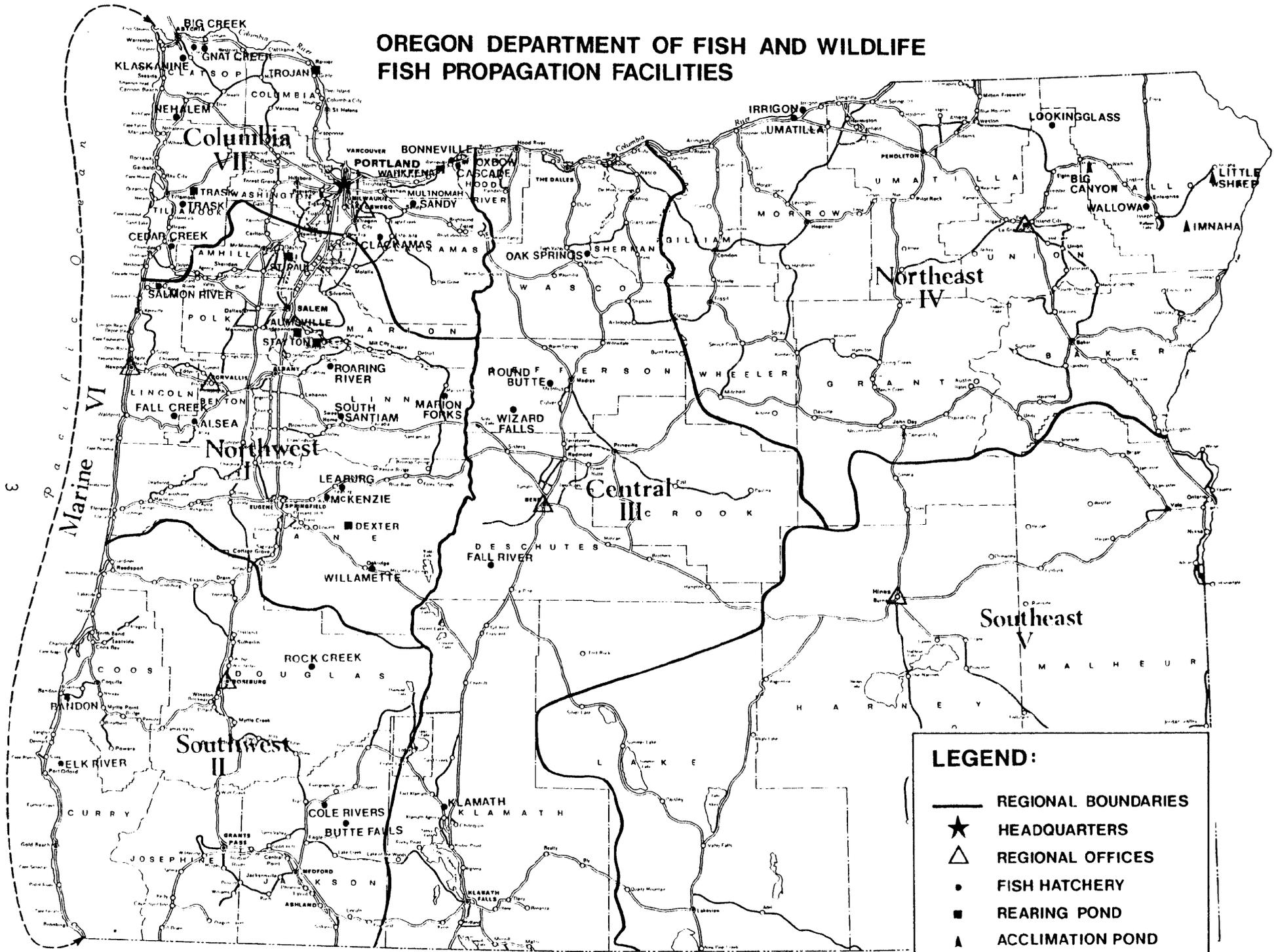


Figure 1. Location of Oregon Department of Fish and Wildlife Fish Propagation Facilities

Table 1. List of Oregon Department of Fish and Wildlife Columbia River tributary anadromous fish facilities and stocks involved in the augmented fish health monitoring program.

Facility	Drainage	Stock	a Code	b Species
Aumsville-Stayton Ponds	No. Santiam River/Willamette River	14		ChF
Big Canyon Creek (acclimation pond)	Wallowa River/Grande Ronde	81		ChS
		56		StS
Big Creek Hatchery	Big Creek/Lower Columbia River	13	Co, ChF, StW, CS	
		52		ChF
Bonneville Hatchery	Tanner Creek/Lower Columbia River	14		ChF, Co
		95		ChF, ChR
		75		ChS
Cascade Hatchery	Eagle Creek/Lower Columbia River	14		co
Clackamas Hatchery	Clackamas River/Willamette River	19		ChS
		19		StW
Dexter Ponds	Middle Fork Willamette River	22		ChS
		24		ChS
Gnat Creek Hatchery	Gnat Creek/Lower Columbia River	13		StW
		24		StS
Irrigon Hatchery	Mid-Columbia River	56		StS
		29		StS
		85		ChS
		95		ChF
Klaskanine Hatchery	Klaskanine River/Lower Columbia River	15		co
		13		ChF
		15		StW
Leaburg Hatchery	McKenzie River/Willamette River	23		StS
Little Sheep Creek (acclimation pond)	Little Sheep Creek/Imnaha River	29		StS
Lookingglass Hatchery	Lookingglass Creek/Grande Ronde	85		ChS
		29		ChS
		81		ChS
Marion Forks Hatchery	North Santiam River/Willamette River	21		ChS, StW
		19		ChS
		22		ChS
		23		ChS

a Stock codes are listed in Table 2.

b Species abbreviations: ChF = fall chinook, ChS = spring chinook, ChR = summer chinook, StS = summer steelhead, StW = winter steelhead, CS = chum, Co = coho.

Table 1. Continued

Facility	Drainage	Stock Code	Species
McKenzie Hatchery	McKenzie River/Willamette River	23	ChS
		26	ChS
		23	StS
		24	StS
Oak Springs Hatchery	Lower Deschutes	24	StS
Oxbow Hatchery (Herman Creek Pond)	Lower Columbia River	14	Co, ChF
		19	ChS
Roaring River Hatchery	Roaring River/Willamette River	24	StS
		13	StW
Round Butte Hatchery	Deschutes River	66	ChS, StS
Sandy Hatchery	Sandy River/Lower Columbia River	11	co
So. Santiam Hatchery	So. Santiam River/Willamette River	24	ChS, StS
Wallowa Hatchery	Wallowa River/Grande Ronde River	56	StS
Willamette Hatchery	Salmon Creek/Mid-Fork Willamette River	22	ChS
		24	ChS

TABLE 2. Stock codes used by Oregon Department of Fish and Wildlife fish propagation.

<u>STOCK ORIGIN</u>	<u>STOCK ORIGIN</u>
01 ST. PAUL PONDS	51 KLAMATH HATCHERY
02 NECANICUM RAND TRIBS	52 ROGUE R (COLE R HATCHERY)
03 RES. REDBANDS	53 OAK SPRINGS HATCHERY
04 MIAMI R AND TRIBS	54 ROARJNG RIVER HATCHERY
05 FLORAS CR & NEW RIVER	55 UMPQUA R (ROCK CR HT)
06 EUCHER CR AND TRIBS	56 WALLOWA R
07 WINCHUCK RAND TRIBS	57 WILLAME'ITE R
08 HUNTER CR AND TRIBS	58 WIZARD FALLS HATCHERY
09 WHISKEY CREEK	59 LEABURG HATCHERY
10 SCOGGINS CR, TUALATIN R	60 USF&W (EXCEPT HAGERMAN)
11 SANDY R (SANDY HT)	61 L CULTUS LAKE
12 OXBOW	62 APPLGATE R
13 BIG CREEK (BIG CR HT)	63 EEL LAKE
14 TANNER CR	64 DAVIS LAKE
15 KLASKANINE R	65 KLAMATH LAKE
16 EAGLE CR (CASCADE HT)	66 DESCHUTES R
17 PISTOL R AND TRIBS	67 EAST & PAULINA LAKES
18 COW CR (S. UMPQUA)	68 WICKIUP RES
19 CLACK. R EARLY (EAGLE CR HT USFWS)	69 ODELL LAKE
20 CLACKAMAS R LATE	70 CANADA
21 N SANTIAM R	71 CALIFORNIA
22 M WJLLAMETTE R (WILLAM. HT/DEXTER)	72 WASHINGTON TULES (EX CARSON AND COWLITZ) AND CAPE COD RAINBOWS
23 MCKENZIE R (MCKENZIE HT)	73 MONTANA
24 S SANTIAM R (SO. SANTIAM HT)	74 WYOMING
25 FALL CR RES (CARSON)	75 CARSON (WASHINGTON)
26 FAL CR RES (WJLLAMETTE)	76 KILCHIS R (COAL CR)
27 MIAMI R	77 HAGERMAN (IDAHO)
28 GORDONCREEK	78 PARSNIP RES
29 IMNAHA R AND TRIBS	79 CRESCENT LAKE
30 YAQUINA R	80 UPPER GRANDE RONDE (TEMP. CHANGE- FORMERLY LAVA LK)
31 FALL CREEK (ALSEA R)	81 LOOKINGGLASS CR
32 N FK NEHALEM AND TRIBS	82 COLORADO
33 SILETZ R (SILETZ HT)	83 DETROIT RESERVOIR
34 TRASK R (TRASK HT)	84 LOBSTER CR (ROGUE)
35 ELK R (ELK R HT)	85 IDAHO
36 SALMON R (SALMON R HT)	86 UTAH
37 COOS R	87 IRRIGON HATCHERY
38 SUISLAW R	88 TEN MILE LKS (EX EEL LK)
39 BURNT HILL CREEK	89 FOSTER RESERVOIR
40 MAIN NEHALEM & TRIBS	90 SUTTLE LAKE
41 ROUND BUTTE HATCHERY	91 UMATILLA R
42 MAINE	92 GOLD LAKE
43 ALSEA R AND TRIBS (EX FALL CR)	93 NTWINLAKE
44 COQUJLLE R (BANDON HAT)	94 MANN LAKE
45 WASHINGTON BRIGHTS	95 COLUMBIA R (UPRIVER STOCKS)
46 BUTTE FALLS HATCHERY	96 CHETCO R (JACK CR TRAP)
47 NESTUCCA R (CEDAR C HAT)	97 SNAKE R
48 DIAMOND LAKE	98 COWLITZ R
49 FALL R HATCHERY	99 FISH HAWK LK (NEHALEM R)
50 HOOD R	

METHODS AND MATERIALS

Complete Start-up Phase (Objective 1.0)

To accomplish the tasks required in augmented fish health monitoring, it was necessary to acquire additional staff and equipment, establish a fish pathology laboratory in Northeast Oregon, and supplement laboratories already located on and convenient to lower Columbia system propagation facilities. The Fish Pathology Section of ODFW already maintained laboratories, at Clackamas, Oregon and at the Department of Microbiology, Oregon State University, Corvallis, Oregon. Our staff at these two laboratories consisted of four fish pathologists, a fish virologist, and one virology technician.

Our new LaGrande Fish Pathology laboratory is located at Eastern Oregon College, staffed by a fish pathologist-virologist, Dr. Warren Groberg, and a Microbiologist I, Mr. Sam Onjukka. The remodeling and equipping of this laboratory was completed in November, 1987. Enhanced monitoring of Northeast Oregon anadromous stocks from the LaGrande Laboratory began in November 1987. This laboratory and the Corvallis lab both have capabilities to conduct virological analyses.

A Microbiologist I, Ms. Sharon Vendshus, was hired and stationed at the Clackamas Pathology Laboratory, she is responsible for collection and processing of samples from lower Columbia River hatcheries. At the Corvallis Fish Pathology laboratory, Microbiologist I, Ms. Leslie Smith, conducts similar monitoring duties at Willamette and Deschutes River facilities. The sampling of fish for pathogens and other tasks in the project have required the added efforts by all pathology personnel in addition to the newly added staff members.

Additional staff necessary to accomplish the database system are located in Portland. A programmer was hired to integrate the pond management data required by this program into our mainframe computer system and a part-time clerical assistant helps with data processing, error checks and data retrieval. Additional workloads have been absorbed, so far, by our hatchery data system planner/analyst, the hatchery data systems operator, and a fish staff biologist in the fish propagation administration group in Portland. We continue to work toward an integrated system of microcomputers at hatcheries with sections feeding data to a mainframe computer for analysis, reporting, and transfer.

Technical Steering Committee (Objective 2.0)

Methods involved to accomplish this objective include:

- (1) attendance of quarterly meetings, preparation of activity reports and resolution of problems associated with the conduct of this project.
- (2) development of plans to accomplish technology transfer and efficient communications between personnel in fisheries management, hatcheries, research, other agencies, and the public.
- (3) survey hatchery facilities to identify "facility impediments" to fish health list, and estimate cost and benefits to remove these impediments.

Augmented Fish Health Monitoring Objective(3.0)

The list of analyses, life stage, numbers of fish to be sampled, frequency of sampling and methods are given in Appendix A. The organosomatic analyses (Task 3.1 1) as developed by Goede (1987) is to be applied to smolts at four index hatcheries: summer steelhead trout at South Santiam, fall chinook salmon at Bonneville, coho salmon at Sandy and spring chinook salmon at Willamette Hatchery.

A summary of the methods employed in testing for specific pathogens (Task 3.2), in Table 3, shows the type of samples collected from adult and juvenile salmonids at each facility. In general methods are those described in the American Fisheries Society (AFS) Blue Book (Amos, 1985).

TABLE 3. Summary of methods involved in augmented monitoring for pathogens, 1987-88.

<u>ANADROMOUS SALMONID POPULATION</u>	<u>NO. FISH SAMPLED AND FREQUENCY</u>	<u>PATHOGENS EXAMINED FOR</u>	<u>TEST METHOD^a</u>
1. Mature (spawners)	60 fish/lot/year	a) Culturable viruses	Ovarian fluid (3 fish pools) placed on EPC cells pyloric caeca, kidney, spleen (5 fish pools) placed on CHSE214.
		b) EIBS virus	Stain-Pinacyanol chloride as per Leek (1987)
		c) <u>R. salmoninarum</u>	Individual kidney or ovarian fluid smears, direct fluorescent antibody (DFAT).
2. Adult (pre-spawning mortality)	up to 20 dead/lot/location/year	a) <u>R. salmoninarum</u>	DFAT of kidney smears
		b) Ceratomyxa	Wet mount of lower gut and observe by microscope.
		c) bacteria	Place samples of kidney and/or lesions on TSA and Cytophaga or TYE agar.
3. Juveniles (live)	3-6/lot/location/month	a) parasites	Prepare wet mounts of gill and skin tissue and observe microscopically.
4. Juvenile mortality or moribund fish	10 dead/lot/location/month	a) <u>R. salmoninarum</u>	DFAT of kidney smears
	If necessary have hatchery personnel collect and freeze 10 dead fish during month.	b) Ceratomyxa	Wet mount of lower gut. Surface water supply hatcheries during June-October.
		c) EIBS virus	Sample blood of moribund fish if CWD, BKD or fungi present.

^a Methods in general follow AFS Blue Book (Amos, 1985).

TABLE 3. Continued

<u>ANADROMOUS SALMONID POPULATION</u>	<u>NO. FISH SAMPLED AND FRFQUENCY</u>	<u>PATHOGENS EXAMINED FOR</u>	<u>TESTMETHODa</u>
		d) bacteria	Place sample of kidney tissue on TSA and Cytophaga or TYE agar.
		e) PKX	Examine mortalities if kidney swollen. Use histopathology methods.
		f) other	Use appropriate methods as described in AFS Blue Book.
5. Midterm juvenile (live)	60 live fish/lot/ location in late summer or early fall excludes steelhead trout.	a) <u>R. salmoninarum</u>	DFAT of kidney smears
		b) EIBS virus	Blood smears prepared if previous history of EIBS at location. Stained as per Leek (1987).
6. Preliberation of smolts	60 live fish/lot/location	a) <u>R. salmoninarum</u>	DFAT of kidney smears
		b) EIBS virus	Stain blood smears as per Leek (1987)
		c) culturable viruses	Pyloric caeca, kidney and spleen on CHSE214 (5 fish pools).
		d) <u>M. cerebralis</u>	Examine most susceptible species for spores using enzyme digest method. Fish must be at least 5 months of age. Confirm by histological examination.

Increased Monitoring for *Myxobolus cerebralis* (Task 3.2.1)

See page 16 for an explanation of why this task unique to Oregon's fish health monitoring contract was needed. Using project and state management program funds, ODFW fish biologists collected fish samples from a multitude of sources including fish from many streams, public hatcheries, trout from a known *M. cerebralis* positive location, private hatcheries, fish privately stocked in ponds and from major Columbia River tributaries at more than 150 different locations throughout Oregon. Feral fish were collected by several sampling methods including seining, angling, electrofishing and trapping. Primarily, juvenile steelhead, rainbow, brook, and cutthroat trout, kokanee and coho salmon were captured. Adult steelhead and chinook salmon returning to areas in northeastern Oregon were also examined.

Our contract with BPA was modified to allow us to subcontract for immediate analysis of these samples. The processing of the heads and analyses for *M. cerebralis* was subcontracted to the Department of Microbiology, Oregon State University. This work was performed under supervision of Dr. J. L. Fryer and Dr. J. R. Rohovec by Ms. H. V. Lorz. Entire fish or only the heads were frozen and delivered to the laboratory for preparation and examination. Additional heads were fixed in 10% buffered formalin for subsequent histological examinations. The enzyme digest method (AFS Blue Book) was used in most cases, but was modified by the use of formalin for stopping digestion and resuspending the pellets. The presence of spores with typical size and shape of *M. cerebralis* was considered presumptively positive. Histological examination demonstrating spores in cartilaginous tissue was then done for confirmation.

A comparison of the plankton centrifuge and enzyme digest methods for detecting *M. cerebralis* was also conducted. Groups of 50 juvenile rainbow trout were collected from a hatchery where whirling disease was diagnosed. The heads were removed just posterior to the opercula. The gills were removed and each head cut in half longitudinally to provide material for each detection method. The tissue was pooled (50 halves) and heated in 50-60°C water for 15 minutes. The heads were defleshed and approximately 30 g of material was processed by either the plankton centrifuge or enzyme digest method. The spores were enumerated using a hemocytometer. Results of this test are given on page 32.

Monitor Hatchery Water Supplies (Objective 4.0)

A water supply sampling plan was submitted for BPA approval (Task 4.1). Water samples will be collected twice per year from each hatchery water supply (Task 4.2). One sample each is to be collected during the period of each seasonally high flow and low flow where applicable (surface water). Water samples will be shipped to BPA designated locations for chemical analyses.

Flow index and loading density (Task 4.3) follows the method described in Piper (1982).

Record, Analyze and Replot Fish Health Monitoring and Related Data (Objective 5.0)

A fish examination report form was developed and submitted to BPA for approval. A database system incorporating data from fish health monitoring for pathogens and fish culture parameters is being developed at the ODFW Portland headquarters. Information listed in Appendix B will be recorded in this database. A copy of the approved examination record form is included as Appendix C. Fish health examination data is being entered on microcomputers for some analysis and summarization. It will be transferred to the mainframe where detailed analysis will be done when programming is completed.

Estimate Project Benefits (Objective 6.0)

We are examining fish, collecting information, and collating data in preparation for analysis to determine the variations within our fish propagation program. Hatchery methods and identification of the specific variables within the program may be keys to fish health. Overall survival of adults is another parameter necessary to such analysis.

RESULTS AND DISCUSSION

During the first few months of the contract much time was spent hiring staff, ordering equipment and establishing the pathology laboratory at LaGrande, Oregon. By Fall, 1987 we had implemented the increased project monitoring for fish pathogens in both spawning anadromous adults and juvenile salmonids throughout the basin.

We continue with organizing the data input and storage capability necessary to the collecting of flow index and loading density data for each lot of fish at each facility, collection of fish health monitoring data, and reporting results as required by the contract. We are able now to report results but our ability to summarize and analyze is still limited.

Objective 2.0. Serve on the Project Technical Steering Committee

Task 2.1 Quarterly Meetings

The project leader and fish pathologist attended quarterly meetings except for the Bozeman, Montana, June, 1987 meeting.

Task 2.2 Plan to Accomplish Technology Transfer

Appendix D outlines the methods in use and being developed (plan) to accomplish technology transfer and communications among personnel in fish management, hatcheries, research other agencies, and the public. These include obtaining funding for pathologists and fish culturists to attend training or annual fish culture meetings to provide research information in a timely manner to fish managers, culturists, other agencies, and the public, and through distribution of literature or operation instructions, copies of disease examination results, summaries and production reports to hatcheries and other interested parties. Although we have provided some of this information in the past this project is facilitating the inclusion of fish health data in more report formats and will help give these data better availability to agency and public entities alike.

T a s k List of Facility Impediments to Fish Health and Improvements

The list of Impediments, shown in Appendix E is followed by a general list of improvements that applies to most hatcheries followed by a listing of improvements for specific hatcheries, estimated costs and benefits where known. In this next year we will refine the list; add to it; and begin to prioritize the items to allow planning and use of any funds which may become available.

Objective 3.0: Augmented Fish Health Monitoring

Task 3.1 Organosomatic analysis at index hatcheries

A workshop provided by Mr. Ron Goede is scheduled in the spring 1988 to train fish pathology personnel to conduct the proper analyses on smolts at the four index hatcheries.

Hatchery personnel will improve collection of fish length and fish weight and water flow measurements on a monthly basis for all lots to provide calculation of flow index and loading density.

Task 3.2 Tests for pathogens and parasites

A summary of sampling for culturable viruses in adult and juvenile salmonids for May 15, 1987 - March 15, 1988 is shown in Appendix F. Table 4 shows the levels of BKD, EIBS and culturable viruses in spawning stocks. The BKD and EIBS sampling was greatly expanded through the fish health monitoring project. Infectious Hematopoietic Necrosis Virus was detected in brood fish at six different hatcheries, in part through additional project sampling. Erythrocytic inclusion body syndrome was found in spawning adults in only one stock, the Bonneville upper Columbia River fall chinook salmon. Bacterial kidney disease was present in nearly all spawning stocks.

TABLE 4. Pathogens found in spawned adult salmon and their occurrence at Oregon Columbia River tributary hatcheries, June 2, 1987 to March 15, 1988.

<u>FACILITY</u>	<u>DATES(S)</u>	<u>STOCK</u>	<u>SITE</u>	<u>BKD^a</u>	<u>FIBS^a</u>	<u>CULTURABLE VIRUSES^{a,b}</u>
Big Creek	9/22/87	13	ChF/Tule	19/70	0/71	0/539
	1 0/18-1 1/9/87	52	ChF/Rouge River	11/24	0/17	0/73
	10/23/87	13	Co/Big Creek	19/56	0/68	0/55
	1/20-1/28/88	13	StW/Big Creek	INC^c	0/24	0/99
	11/13-11/30/87	13	SC/Big Creek	N.D.^d	N.D.	0/31
Bonneville	1 1/19-1 2/10/87	95	ChF/Upper Columbia	INC	21/59	378/1 870 IHNV
	9/21-1 0/5/87	14	ChF/Tule	13/60	0/70	0/41 8
Cascade	1 0/28-11/5/87	14	Co/Tanner Creek	9/30	0/88	0/1 24
Clackamas	9/16-1 0/20/87	19	ChS/Clackamas River	30/101	0/52	0/1 33
	2/5-2/15/87	19	Colviuld coho Clackamas River	28/48	INC	30/20 IHNV
Lookingglass	8/1 7-9/1 4/87	29	ChS/Imnaha River	INC	0/74	0/77
	8/24-9/1 4/87	81	ChS/Lookingglass Creek	INC	0/60	9/491 IHNV
Leaburg	1/19-2/9/88	23	StS/McKanzie River	INC	INC	0/225
McKenzie	9/8-9/1 4/87 2	3	ChS/McKenzie River	6/60	0/57	0/60
	9/1 4/87	26	ChS/Fall Creek Reservoir	0/2	0/2	0/12
Minto Pond	5/1 8/87	21	StS/No. Santiam River	N.D.	N.D.	24/68 IHNV
	9/1 4/87	21	ChS/No. Santiam River	25/62	0/60	0/381
Round Butte	8/26-9/8/87	66	ChS/Deschutes River	27/50	0/60	1281207 IHNV
	1/27/88	66	StS/Deschutes	INC	INC	1451328 IHNV
Sandy	1 1/16/87	11	Co/Cedar Creek	INC	0/64	0/60
So. Santiam	9/1 5/87	24	ChS/So. Santiam River	15/59	0/60	0/763
	1/5/88	24	StS/So. Santiam River	INC	INC	1/458 IHNV
Willamette	9/8-9/1 8/87 2	2	CsS/Mid Fork Willamette River	2/60	0/60	0/1 68

a Ratio is number positive fish/number fish sampled (e.g. the occurrences of the pathogen in the sample).

b Estimated prevalence of IHN. Most sample pools consist of more than 1 fish. This estimate assumes that a positive pool contains only 1 fish.

c INC = Not complete.

d ND = Not done.

The fish health monitoring project has provided for increased sampling for pathogen activities. Table 5, Examination of prespawning adult mortality provides a 90% increase over previous sampling and revealed prevalent levels of Ceratomyxa shasta, Aeromonas salmonicida and Yersinia ruckeri. Table 6, Monthly monitoring of juvenile mortality is an increase of some 40% in available data. Table 7, Summary of increased loss investigations of juvenile fish shows a 10% increase in sampling. Results of midterm examinations of juvenile salmonids for BKD and EIBS, Table 8, is an entirely new program. Table 9, Summary of preliberation of smolts for BKD, EIBS and culturable viruses represents an increased effort of 60%.

Myxobolus cerebralis was found in salmonids in Northeast Oregon in December, 1986. This was the first report of this parasite in the Columbia River drainage since its occurrence in Nevada in 1966. An urgent need was perceived to quickly identify the distribution of this parasite in Columbia River drainages particularly within Oregon. This information was needed to make sound management decisions in the transfer of salmonid stocks between watersheds. Figure 2 shows some of the locations where fish were collected. Appendix G summarizes the results of all M. cerebralis examinations conducted this year. Appendix H lists those sites where the parasite was presumptively identified. Figure 3 shows locations in watersheds where either wild fish or fish living in the wild (▲) and those held in private ponds (●) were found to be positive. Table 10 summarizes where presumptive M. cerebralis was found in Oregon. Histological confirmation was achieved in juvenile and adult fish from both the Grande Ronde and Imnaha watersheds. Table 11 lists watersheds where spores similar in size to M. cerebralis were found but histological examination is yet to be completed. In the course of this survey several different sizes of myxosporidan spores were found. Much M. insidiosus and Henneguya sp. were observed. Myxobolus sp. from brain tissue was commonly found often in the same fish that contained M. cerebralis spores.

The comparison of processing by plankton centrifuge versus enzyme digestion demonstrated spore counts by digestion averaging 125×10^2 spores/ml compared to 3.75×10^2 spores/ml by centrifuge. In this test, the enzyme digest was more sensitive.

Objective 4.0: Monitoring of hatchery water supplies

A water sampling plan, Appendix I, was submitted to BPA for their review. Water samples will be collected when a contractor for BPA is identified.

Objective 5.0:

Task 5.1 Examination report forms have been accepted by BPA and have been put into use. The form format is shown in Appendix C.

Task We have procured microcomputers for use by the pathologists and are in the process of entering fish examination results. These data will be up-loaded onto our agency mainframe computer as programs are completed there for entry and summary report preparation.

Objective 6.0:

The staffing for this year was not adequate to allow completion of prior years data for inclusion in the database. We are programming our microcomputer now and expect to include those reports in our mainframe program during the next few months. Clarification of some details in this objective will be sought as the programs are developed. Not all of the site data listed in Appendix Table C will be available from the historical files.

TABLE 5. Examination of pre-spawning mortality among Oregon Columbia River tributary anadromous stocks for fish pathogens, ODFW, June 2, 1987 through March 15, 1988.

FACILITY	DATE	STOCK	DISEASES DETECTED ^a		
			BKD INC ^b	CERATOMYXOSIS	OTHER
Big Creek	10/22/87	Co(13)		14/14	FUR (11/14), ICH (14/14), ERM (1/14), CWD (1/14), External fungi (9/14)
	11/9/88	StW(13)	0/1	0/1	ERM (1/1), fungi (1/1)
Bonneville	9/21-9/29/87	ChF(14)Tule	2/20	0/20	APS
Cascade	11/2-11/5/87	Co(14)	7/20	17/20	Neg
Clackamas	9/25-10/12/87	ChS(14)	0/23	16/27	Neg
	2/2/88	Co(19)	1/5	0/5	
Dexter	9/16/87	ChS(22)	0/1	1/1	Neg
Leaburg	9/16-12/7/87	StS(23)	0/18	5/18	FUR (1/18), ERM (1/18), APS (1/18)
McKenzie	9/8-10/2/87	ChS(23)	14/27	11/27	FUR (6/27), ERM (4/20), APS (4/27), COL (1/27)
Minto Pond	9/14-9/22/87	ChS(21)	4/18	4/19	ERM (4/19), FUR (2/19), APS (8/18) opport.
Round Butte	8/26/87	ChS(66)	1/3	0/3	No pathogens APS (6/20)
	1/27/88	StS(66)	1/20	0/20	
So. Santiam	9/15-9/22/87	ChS(24)	3/23	10/23	FUR (5/23), ERM (14/23), APS (5/23)
	9/15-12/2/87	StS(24)	3/29	10/24	FUR (13/29), ERM (10/29), APS (5/29)
Willamette	8/26-9/8/87	ChS(22)	10/22	8/22	FUR (7/22), external fungi (14/22), APS (19/22), COL (1/22)

a Ratio = No. positive fish/No. of fish sampled.

b Abbreviations: INC = incomplete, FUR = furunculosis, ICH = Ichthyophthirius, ERM = enteric red mouth, CWD = coldwater disease, APS = Aeromonas-Pseudomonas, COL = columnaris disease, opport. = opportunists.

TABLE 6. Summary of monthly monitoring of Oregon Department of Fish and Wildlife Columbia River hatcheries; August, 1987 through March, 15 1988.

<u>FACILITY</u>	<u>DATE</u>	<u>STOCK</u> ^a	<u>RESULTS</u> ^b
Aumsville	12/31/87	14.87 ChF	APS (16/1 6)
	1/15/88	14.87 ChF	CWD (3/11)
	2/5/88	14.87 ChF	No pathogens
Big Creek	9/29/87	13.86 Co	No pathogens
	9/29/87	52.86 ChF	Ich
	10/22/87	13.86 Co	CWD 7/31, <u>Trichodina</u>
	10/22/87	13.87 StW	CWD (1 /15), <u>Trichodina</u>
	11/19/87	13.87 StW	No pathogens
	11/19/87	13.86 Co	CWD (3/12)
	1/6/88	13.87 StW	No pathogens
	1/6/88	13.86 Co	CWD (2/10), APS (2/10)
	1/26/88	13.87 StW	APS (3/4)
	1/28/88	13.87 ChF	APS (10110)
	1/26-28/88	13.87 Co	CWD (5/6), APS (2/6)
Bonneville	9/28/87	75.86 ChS	No pathogens
	9/28/87	95.86 ChF	CWD
	9/28/87	95.86 ChR	APS
	10/26/87	75.86 ChS	No pathogens
	10/26/87	95.86 ChF	EIBS (2/60)
	10/26/87	95.86 ChR	No pathogens
	11/17/87	75.86 ChS	CWD (1/8)
	12/7/87	95.86 ChF	CWD (7/12)
	12/15/87	14.87 ChF	CWD (1 1/14)
	12/15/87	14.86 Co	CWD (12/12)
	12/15/87	75.86 ChS	No pathogens
	1/20/88	14.87 ChF	APS (10110)
	1/20/88	14.86 Co	APS (3/3)
	1/20/88	95.86 ChF	CWD (5/11), APS (6/11)
	1/20/88	75.86 ChS	CWD (1/11), APS (5/11)
Cascade	9/16/87	14.86 Co	CWD
	10/27/87	14/86 Co	EIBS (1 1/60), CWD
	11/2/87	14.86 Co	No pathogens
	12/7/87	14.86 Co	CWD (1 0/12), EIBS (17122)
	1/14/88	14.86 Co	CWD (22/24)

a The lot numbers in this column consist of (1) stock codes (see Table 2) which are the first two numbers and (2) brood year i.e. last two numbers, indicating year eggs were collected. Each stock of fish at ODFW hatcheries are identified by a lot number.

b Abbreviations:

- APS = Aeromonas Pseudomonas opportunists
- CWD = coldwater disease
- Ich = Ichthyophthirius
- EIBS = erythrocytic inclusion body syndrome
- FUR = furunculosis
- COL = columnaris disease
- BGD = bacterial gill disease
- ERM = enteric red mouth disease
- BKD = bacterial kidney disease

TABLE 6. Continued

<u>FACILITY</u>	<u>DATE</u>	<u>STOCK^a</u>	<u>RESULTS^b</u>
Clackamas	9/15/87	20.87 StW	No pathogens detected
	9/15/87	19.86 ChS	FUR
	10/12/87	19.86 ChS	FUR
	11/18/87	19122.86 ChS	FUR (12/12)
	11/18/87	20.87 StW	No pathogens
	12/8/87	9122.86 ChS	FUR (6.24), CWD (9/24)
	12/8/87	20.87 StW	IHNW
	1/7/88	19122.86 ChS	IHNW, FUR (1/21), CWD (1/21, APS (9/21)
	1/7/88	20.87 StW	IHNW, APS (7/7)
	Dexter Ponds	9/11/87	22.86 ChS
9/11/87		24.86 ChS	COL (2/10), APS (1/10)
10/7/87		22.86 ChS	No pathogens
10/12/87		24.86 ChS	APS (1/6)
11/5/87		22.86 ChS	No pathogens
12/9/87		22.86 ChS	No pathogens
12/9/87		24.86 ChS	No pathogens
1/15/88		22.86 ChS	APS (1 /10), tail rot
1/15/88		24.86 ChS	tail rot
2/11/88		22.88 ChS	No pathogens
2/11/88	24.86 ChS	BKD 1/18	
Gnat Creek	9/23/87	13.87 StW	CWD, APS, BGD
	9/23/87	24.87 StS	CWD, APS, BGD
	10/28/87	13.87 StW	CWD (1 /10), APS (3/10), Ich
	10/28/87	24.87 StS	CWD (1/5), APS (1/5)
	11/19/87	13.87 StS	CWD (4/10), APS (4/10), Pinheads
	11/19/87	24.87 StS	APS (4/10)
	1/6/88	13.87 StW	CWD (3/10)
	1/6/88	24.87 StS	APS (2/10)
	1/26/88	13/87 StW	APS (1/10)
	1/26/88	24.87 StS	APS (3/10)
Irrigon	1/21/88	29.87 StS	No pathogens
	1/21/88	56.87 StS	No pathogens
	1/21/88	80.87 StS	No pathogens
	1/22/88	85.87 ChS	No pathogens
Klaskanine	9/23/87	15/86 Co	No pathogens
	10/28/87	15/86 Co	APS (1/3), <u>Trichodina</u>
	11/19/87	15.86 Co	CWD (4/7), deformed fish, <u>Trichodina</u>
	1/6/87	15.86 Co	CWD (6/10), APS (3/10), deformed fish (CWD aftermath), <u>Trichodina</u>
	1/6/87	13.87 StW	No pathogens

TABLE 6. Continued

<u>FACILITY</u>	<u>DATE</u>	<u>STOCK</u> ^a	<u>RESULTS</u> ^b
Klaskanine (continued)	1/28/88	15.86 Co	CWD (12/14), <u>Trichodina</u> , deformed fish
	1/28/88	13.87 StW	No pathogens
Leaburg	9/16/87	23.87 StS	FUR (1/9), <u>Ich</u> , <u>Trichodina</u> , blood flukes, gill metacercariae
	10/19/87	23.87 StS	<u>Gyrodactylus</u> , <u>Trichodina</u> , <u>Ich</u> , blood flukes
	11/9/87	23.87 StS	FUR (1/1), <u>Gyrodactylus</u> , <u>Ich</u> , <u>Trichodina</u>
	12/7/87	23.87 StS	<u>Trichodina</u> , <u>Gyrodactylus</u>
	1/9/88 2/17/88	23.87 StS 23.87 StS	<u>Trichodina</u> , <u>Gyrodactylus</u> <u>Trichodina</u>
Lookingglass	11/23/87	85.86 ChS	EIBS (4/60)
	11/23/87	29.86 ChS	EIBS (18/40)
	11/23/87	81.86 ChS	EIBS (1/40)
	12/22/87	85.86 ChS	EIBS (4/60)
	12/23/87	29.86 ChS	EIBS (23/40)
	12/23/87	81.86 ChS	EIBS (2/40)
	1/20/88	85.86 ChS	EIBS (6/60)
	1/20/88 1/20/88	29.86 ChS 81.86 ChS	EIBS (24/40) EIBS (1/40)
Marion Forks	8/31/87	21.86 ChS	<u>Ichthyobodo</u>
	8/31/87	21.86 StW	<u>Gyrodactylus</u> , APS (1/4)
	8/31/87	21.87 StW	CWD (3/10), APS (1/10), <u>Ichthyobodo</u>
	10/23/87	21.86 ChS	<u>Trichodina</u>
	10/23/87	21.86 StW	<u>Gyrodactylus</u>
	10/23/87	21.87 StW	CWD (4/10), APS (2/10)
	11/20/87	21.86 ChS	<u>Trichodina</u>
	11/20/87	21.86 StW	<u>Gyrodactylus</u>
	11/20/87	21.87 StW	ERM (9/10)
	12/17/87	21.86 ChS	CWD (4/12), <u>Trichodina</u>
	12/17/87	21.86 StW	<u>Gyrodactylus</u>
	12/17/87	21.87 StW	CWD (1/4), APS (1/4)
	1/21/88	21.86 ChS	Tail rot (gray tail)
	1/21/88	21.86 StW	<u>Gyrodactylus</u> , caudal fin erosion
	1/21/88	21.87 StW	No pathogens
2/10/88	21.86 ChS	No pathogens	
2/10/88	21.86 StW	<u>Gyrodactylus</u> , <u>Trichodina</u>	
2/10/88	21.87 StW	CWD (7/10), Aeromonas (1 /10)	

TABLE 6. Continued

<u>FACILITY</u>	<u>DATE</u>	<u>STOCK</u> ^a	<u>RESULTS</u> ^b	
McKenzie	9/14/87	23.86 ChS	FUR (6/10), APS (1/10), blood flukes, gill ameba, <u>Trichodina</u> , <u>Nanophyetus</u> , metacercariae on gills	
	10/12/87	23.86 ChS	FUR (16/16), <u>Ich</u> , blood flukes, <u>Trichodina</u>	
	10/12/87	24.87 StS	<u>Nanophyetus salminocola</u>	
	11/9/87	23.87 ChS	FUR (9/12), APS (2/10), <u>Trichodina</u> , blood flukes, gill metacercariae	
	11/9/87	24.87 StS	<u>Trichodina</u>	
	12/7/87	23.87 StS	CWD (1/11), APS (1/11), <u>Trichodina</u> , <u>Gyrodactylus</u>	
	12/7/87	23.86 ChS	BKD (2/10), FUR (11/14), <u>Trichodina</u> body fungus, caudal fin erosion	
	1/19/88	23.87 StS	CWD (2/10), <u>Trichodina</u>	
	1/19/88	24.87 StS	BKD (2/10), APS (2/10)	
	1/19/88	23.86 ChS	BKD (1/10), FUR (3/16), CWD (3/16), APS (2/16), body fungus, gray tail.	
	1/25/88	23.87 ChS	ERM (type 1) (1/0/12), <u>Trichodina</u>	
	1/25/88	23.86 ChS	CWD (12/12), EIBS (7/9), fungi	
	2/9/88	23.87 StS	No pathogens	
	2/17/88	23.86 ChS	CWD (19/20), AER (4/20)	
	2/17/88	23.87 ChS	CWD (1/10), AER (1/10)	
	2/17/88	24.87 StS	<u>Gyrodactylus</u>	
	2/17/88	23.87 StS	<u>Gyrodactylus</u>	
	Oak Springs	9/18/87	24.87 StS	No pathogens
		10/29/87	24.87 StS	BGD
11/25/87		24.87 StS	APS (3/3)	
11/25/87		91.87 StS	No pathogens	
12/22/87		24.87 StS	ERM (12/12)	
12/22/87		91.87 StS	No pathogens	
1/7/88		24.87 StS	APS (5/10), <u>Lactobacillus</u> (2/10), <u>Trichodina</u>	
1/7/88		91.87 StS	No pathogens	
Oxbow (Herman Creek Ponds)	9/11/87	14.86 Co	CWD	
	10/23/87	14.86 Co	CWD (9/16), BGD, <u>Pistophora</u> , deformed fish, EIBS (4/23)	
	11/3/87	14.86 Co	CWD	

TABLE 6. Continued

<u>FACILITY</u>	<u>DATE</u>	<u>STOCK</u> ^a	<u>RESULTS</u> ^b
Oxbow (continued)	12/7/87	14.86 Co	CWD (10/12), APS (2/12)
	1/20/88	14.86 Co	CWD (1 1/12)
	1/27/88	19.87 ChS	CWD (1/10), APS (9/10)
Roaring River	9/17/87	15.87 StW	CWD
	9/17/87	24.87 StS	No pathogens
	10/22/87	15.87 StW	No pathogens
	10/22/87	24.87 StS	CWD
	11/30/87	24.87 StS	CWD (3/10), <u>Trichodina</u>
	11/30/87	15.87 StW	CWD (5/10), clubbed gills
	1/4/88	15.87 StW	<u>Trichodina</u>
	1/4/88	24.87 StS	No pathogens
1/12/88	15.87 StW	No pathogens	
Round Butte	10/20/87	66.87 StS	No pathogens
	10/20/87	66.86 ChS	No pathogens
	1/27/88	66.86 ChS	No pathogens
	1/27/88	66.87 StS	No pathogens
Sandy	9/15/87	11.86 co	No pathogens
	10/28/87	11.86 co	No pathogens
	11/20/87	11.86 co	APS (3/7)
	12/8/87	11.86 co	APS (3/10), CWD (1/10)
	1/27/88	11.86 co	CWD (7/7)
South Santiam	9/15/87	20.86 Co	CWD (1/10), APS (2/10)
	9/15/87	22.86 ChS	FUR (9/10), <u>Ich</u>
	9/15/87	24.86 ChS	<u>Ich</u>
	9/15/87	24.87 StS	<u>Ich, Ichthyobodo</u>
	10/8/87	20.86 Co	CWD (2/10)
	10/8/87	22.86 ChS	FUR (2/8)
	10/8/87	24.87 ChS	FUR (3/10), <u>Ich</u>
	10/8/87	24.87 StS	<u>Ich</u>
	11/6/87	20.86 Co	<u>Trichophrya</u>
	11/6/87	22.86 ChS	FUR (6/9), APS (2/9)
	11/6/87	24.86 ChS	<u>Trichophrya</u>
	11/6/87	24.87 StS	<u>Ich, Trichophrya</u>
	12/2/87	20.86 Co	<u>Trichophrya</u>
	12/2/87	24.86 ChS	BKD (2/10), CWD (1/10)
	12/2/87	24.87 StS	No pathogens
	1/5/88	20.86 Co	BKD (3/10), APS (2/10), <u>Trichodina</u>
	1/5/88	24.86 ChS	Gray tail, tail rot
	1/5/88	24.87 StS	CWD (1/10)
	1/20/88	20.86 Co	No pathogens
2/16/88	20.86 Co	BKD (2/10)	
2/16/88	24.87 StS	No pathogens	
2/16/88	24.86 ChS	BKD (7/10), CWD (1/10)	
Wahkeena Pond	11/25/87	1 I/ 4.86 Co	EIBS (3/60), <u>Trichophrya</u>
	12/31/87	1 I/ 4.86 co	<u>Trichophrya</u>

TABLE 6. Continued

<u>FACILITY</u>	<u>DATE</u>	<u>STOCK^a</u>	<u>RESULTS^b</u>
Wahkeena Pond (continued)	1/25/88	1 1/14.86 Co	CWD (4/7), APS (3/7), <u>Trichophrya</u>
Willamette	8/26/87	22.86 ChS	BKD (3/10), APS (5/10)
	8/26/87	24.86 ChS	APS (3/10)
	10/7/87	24.86 ChS	APS (4/12)
	10/7/87	22.86 ChS	APS (2/8)
	11/5/87	22.86 ChS	APS (1/10)
	11/5/87	24.86 ChS	No pathogens
	12/9/87	22.86 ChS	No pathogens
	12/9/87	24.86 ChS	No pathogens
	1/15/88	22.86 ChS	BKD (1/15), gray tail
	1/15/88	24.86 ChS	BKD (l/l), fungi, gray tail
	1/15/88	22.87 ChS	APS (1/10)
	2/11/88	22.86 ChS	AER (1/3)
	2/11/88	24.86 ChS	AER (4/5) internal fungus
	2/11/88	24.87 ChS	Internal fungus
2/11/88	22.87 ChS	Internal fungus	

TABLE 7. Summary of increased loss investigations of juvenile anadromous fish at Oregon Columbia River tributary hatcheries; May 15, 1987 through March 15, 1988^a.

<u>FACILITY</u>	<u>MONTH/YEAR</u>	<u>STOCK</u>	<u>RESULTS^b</u>
Aumsville			None
Big Creek	5/87	13.86 Co	Damaged eye (bum-eye)
	7/87	13.86 Co	EIBS and CWD
	9/87	13.86 Co	Unknown
Bonneville	5/87	14.86 Co	CWD, EIBS, BKD
	10/87	95.86 ChR	CWD, precocity
	11/87	95.86 ChF	EIBS, CWD
	12/87	95.86 ChF	EIBS
	1/88	95.86 ChF	EIBS
Cascade	10/87	14.86 Co	EIBS, CWD
	11/87	14.86 Co	EIBS
	1/88	14.86 Co	CWD, EIBS
	2/88	14.86 Co	CWD, EIBS
Clackamas	6/87	19.86 ChS	External fungi
	6/87	19.86 ChS	FUR, gill fungi
	7/87	19.87 StW	FUR, COL, ICH
	7/86	19.86 ChS	COL, ICH
	8/86	19.87 StW	COL, ICH, FUR, BGD
	8/86	19.86 ChS	COL, ICH, FUR
	9/87	19.86 ChS	ICH, FUR, COL
	9/87	19.87 StW	FUR, CWD, BGD, ICH
	12/87	19.86 ChS	IHNV, FUR, CWD, External fungi
	1/88	19.86 ChS	IHNV
	2/88	19.86 ChS	IHNV
	3/88	19.86 ChS	IHNV
Dexter			None
Gnat Creek	6/87	13.87 StW	Tail rot
	8/87	24.87 StS	Drop-out disease
	9/87	13.87 StW	BGD, CWD
	9/87	24.87 StS	BGD, CWD
Irrigon			None
Klaskanine	5/87	15.87 Co	Damaged eye
	7/87	15.87 Co	Botulism type E
Leaburg	5/87	23.87 StS	Chlorine kill
	8/87	23.87 StS	FUR
Lookingglass	5/87	85.86 ChS	Unknown cause
	3/88	29.86 ChS	CWD, EIBS
Marion Forks			None

a May samples partially completed after project started on June 2. Sampling here recorded through March 15 only to allow for report preparation and review.

b Abbreviations: EIBS = erythrocytic inclusion body syndrome, CWD = cold-water disease, FUR = furunculosis, COL = columnaris disease, ICH = Ichthyophthirius BGD = bacterial gill disease, BKD = bacterial kidney disease, IHNV = infectious hematopoietic necrosis virus, TRI = Trichodina, ICB = Ichthyobodo.

TABLE 7. Continued

<u>FACILITY</u>	<u>MONTH/YEAR</u>	<u>STOCK</u>	<u>RESULTS^b</u>
McKenzie	5/87	23.86 ChS	External fungi
	5/87	23.86 ChS	External fungi
	6/87	23.86 ChS	External fungi
	8/87	23.86 ChS	FUR
	9/87	23.86 ChS	FUR, opportunists
	10/87	23.86 ChS	FUR
	11/87	23.86 ChS	FUR, <u>Aeromonas</u> sp.
	12/87	23.86 ChS	FUR
	1/87	21.87 StS	TRI
	1/87	23.87 ChS	ERM
	1/87	23.86 ChS	CWD
	1/87	23.87 StS	TRI
	2/87	23.86 ChS	CWD
	2/87	23.87 ChS	ICB
Oxbox (Herman Creek)	5/87	14.86 Co	Tail fungus
	9/87	14.86 Co	CWD
	10/87	14.86 Co	EIBS, CWD, BGD
	11/87	14.86 Co	CWD
Roaring River	8/87	24.87 StS	<u>Ichthyobodo</u>
Round Butte			None
So. Santiam	8/87	22.86 ChS	FUR
	8/87	20.86 Co	CWD
	9/87	22.86 ChS	FUR, ICH
	10/87	22.86 ChS	FUR
	10/87	24.86 ChS	FUR, BKD
11/87	20.86 Co	BKD	
Stayton Pond			None
Walbwa	3/88	56.87 StS	Eye damage and unknown cause
Willamette	6/87	22.86 ChS	ERM
	6/87	24.86 ChS	ERM
	2/88	24.87 ChS	Internal fungus

TABLE 8. Midterm fish health examination of juvenile anadromous salmonids at Oregon Columbia River hatcheries; June 2, 1987 - March 15, 1988.

<u>FACILITY</u>	<u>DATE</u>	<u>STOCK</u>	<u>DISEASES DETECTED^a</u>	
			<u>BKD</u>	<u>FIBS</u>
Big Creek	10/22/87	13.86 Co	INC	1/60
Bonneville	10/26/87	95.86 ChF	INC	4/60
Cascade	10/23/87	14.86 Co	INC	11/60
	10/26/87	95.86 ChR	INC	INC
Clackamas	11127-l 2/3/87	19.86 ChS	INC	0/75
Klaskanine	10/28/87	15.86 Co	INC	0/60
Lookingglass	11/23/87	81.86 ChS	INC	2/40
	12/22/87	85.86 ChS	INC	4/60
	12/23/87	29/86 ChS	INC	23/40
Marion Forks	10/23/87	21.86 ChS	INC	ND
McKenzie	10/12/87	23.86 ChS	0/60	1/60
Oxbow (Herman Creek Ponds)	10/23/87	14.86 co	INC	21/58
Round Butte	10/20/87	66.86 ChS	INC	0/60
Sandy	10/27/87	11.86 co	INC	0/60
So. Santiam	10/8/87	22.86 ChS	3/60	2/60
Wahkeena Pond 11	1/25/87	11114.86 Co	INC	3/60
Willamette	10/7/87	22.86 ChS	3/60	0/60

a Ratio = Number positive fish/number total fish sampled.

TABLE 9. Summary of examinations of smolts for BKD, EIBS, and culturable viruses at Oregon Columbia River hatcheries, June 2, 1987 through March 15, 1988.

<u>FACILITY</u>	<u>DATE</u>	<u>STOCK</u>	<u>DISEASES DETECTED^a</u>		
			<u>BKD</u>	<u>EIBS</u>	<u>CULTURABLE VIRUS</u>
Bonneville	10/26/87	95.86 ChR	INC	42/56	ND
Cascade	3/7/88	14.86 Co	INC	14/80	INC
Clackamas	9/15-10/12/87	19.86 ChS	INC	14/62	ND
	2/16/88	24.86 ChS	INC	0/60	2/60 IHNV
	3/22/88	19.86 ChS	INC	INC	INC
Dexter Pond	10/12/87	22.86 ChS	5/60	0/60	0/60
	10/12/87	24.86 ChS	0/60	0/60	0/60
	2/11/88	22.86 ChS	INC	INC	0/60
	2/11/88	24.86 ChS	INC	INC	0/60
Lookingglass	10/21/87	85.86 ChS	INC	5/60	0/60
Marion Forks	2/10/88	21.86 ChS	INC	INC	0/60
	3/8/88	21.86 StW	INC	INC	0/60
McKenzie	10/12/87	23.86 ChS	0/60	1/60	0/60
	2/17/88	23.86 ChS	INC	INC	0/60
	3/15/88	24.87 StS	INC	INC	0/60
	3/15/88	23.87 StS	INC	INC	0/60
So. Santiam	10/8/87	24.86 ChS	2/60	0/60	0/60
	2/16/88	24.86 ChS	INC	INC	0/60
	3/16/88	24.87 StS	INC	INC	0/60
Willamette	2/11/88	24.86 ChS	INC	INC	0/60
	2/11/88	22.86 ChS	INC	INC	0/60
	1/15/88	22.86 ChS	1/15	INC	0/60
	3/9/88	22.86 ChS	INC	INC	0/60

a Ratio = No. positive fish/No. total fish sampled.

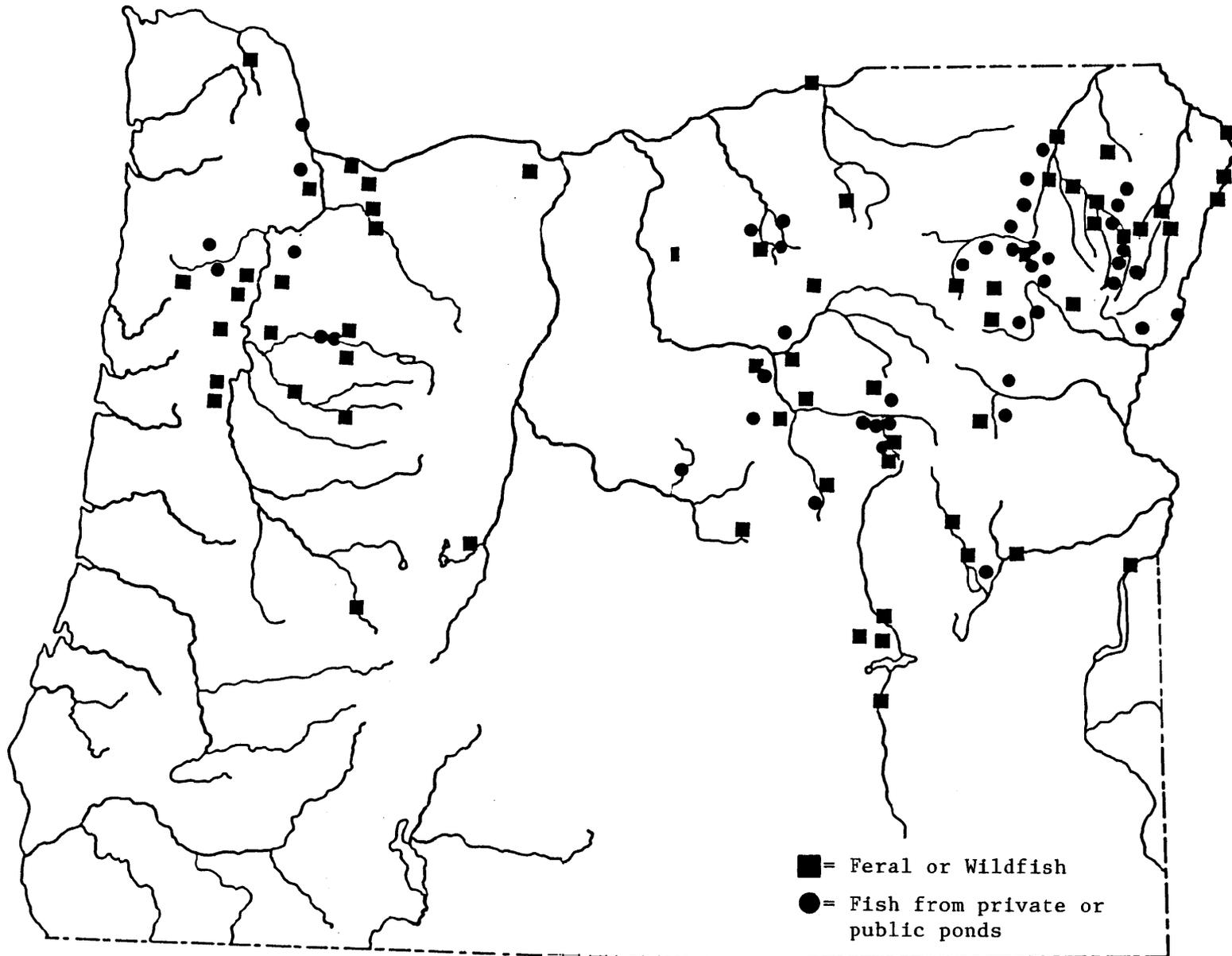


Figure 2. Location where salmonids were collected for *Myxobolus cerebralis* examination, 1987-88

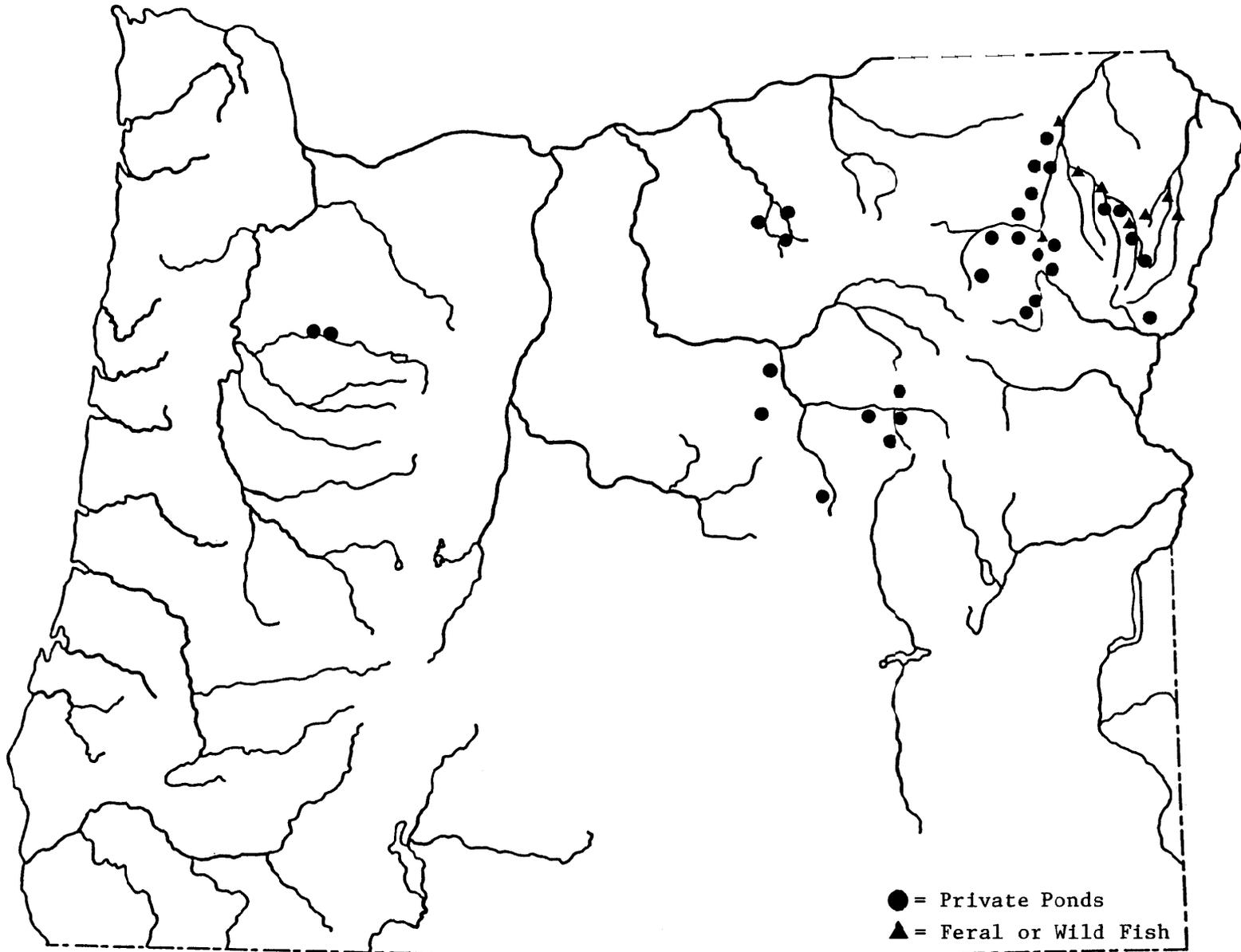


Figure 3. Locations In Oregon where presumptively positive fish were found, 1987-88.

TABLE 10. Summary of *Myxobolus cerebralis* occurrence in salmonids in Oregon, 1987-1988^a.

- A. Watersheds where *M. cerebralis* was found in wild fish, in Oregon Department of Fish and Wildlife hatcheries and in privately owned ponds.
1. Grande Ronde River
 - a. In rainbow/steelhead trout, brook trout and chinook salmon in tributaries of the Grande Ronde River.
 - b. In rainbow trout yearlings and adult summer steelhead at Wallowa Hatchery (ODFW).
 - c. In adult spring chinook salmon returning to Lookingglass Hatchery (ODFW).
 - d. In fish from 37 privately owned ponds.
 2. Imnaha River
 - a. In wild yearling rainbow and steelhead trout.
 - b. In returning adult summer steelhead trout and spring chinook salmon.
- B. Watersheds in Oregon where *Myxobolus cerebralis* was found in fish in privately owned ponds but not in wild fish in nearby streams.
1. Powder River, Baker County (9 private ponds positive)
 2. Snake River, Malheur County (1 private pond positive)
 3. John Day River, Wheeler and Grant County (18 private ponds positive)
 4. Willow Creek, Umatilla County (3 private ponds positive)
 5. North Santiam River, Marion County (2 private ponds positive)

a Results are presumptively positive, i.e. spores of typical morphology were observed using the digestion method (AFS, Blue Book, 1985).

TABLE 11. Oregon Columbia River watersheds where spores similar to Myxobolus cerebralis were found in wild fish and histology for confirmation is in progress, Oregon Department of Fish and Wildlife, 1987-1988.

1. Powder River
2. South Fork Burnt River
3. Blitzen River
4. North Pine Creek (tributary to Snake River)
5. Clatskanie River (tributary to Lower Columbia River)
6. Willamette River
 - a. Mill Creek (tributary to North Santiam River)
 - b. North Santiam River at Lyons
 - c. Stout Creek (tributary to North Santiam River)
 - d. McKenzie River
7. John Day River, main stem
8. Greasey Creek (tributary to the Mary's River - Willamette River)

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APPENDIX A. Analyses and methods employed in sampling fish in augmented fish health monitoring.

ANALYSES	LIFE STAGE	SAMPLES PER LOT	FISH LOTS	FREQUENCY OF SAMPLING	METHODS/REMARKS
I. <u>PHYSIOLOGICAL ANALYSIS</u>					
A. <u>Physiological Quality</u>					
1. Organosomatic Analyses	Smolt	60	all	Pre-lib	Do only BPA approved species at "index locations; (South Santiam Summer Steelhead, Willamette spring chinook, Bonneville Fall chinook and Sandy coho salmon) Use method of Goede.
2. Length/weight Frequency and visual appearance	Smolt	60	all	Pre-lib	Use Piper et al., 1982.
II. <u>WATER PARAMETERS</u>					
1. Flow Index	all	1	all	monthly	Use Piper et al., 1982
2. Loading Density	all	1	all	monthly	Use Piper et al., 1982
3. Sample Water Supply	N/A	N/A	N/A	Twice/year	Refer to water sampling plan.
III. <u>MONTHLY MONITORING</u>	Juvenile	10	all	monthly	Examine 10 dying or dead fish for diseases and examine at least 3 active fish for gill condition and parasites.
IV. <u>INFECTIOUS DISEASES</u>					
A. <u>Parasitic Diseases</u>					
1. Whirling Disease (M.cerebralis)	Juvenile (4-12 mos.)	60	susceptible species only	Annually	Only sample in surface water supplies, unless typical signs are present. Use AFS (1985).

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APPENDIX A. Continued

ANALYSES	LIFE STAGE	SAMPLES PER LOT	FISH LOTS	FREQUENCY OF SAMPLING	METHODS/REMARKS
2. Ceratomyxosis (C.shasta)	Juvenile Adult	10 up to 20	all	monthly year	Sample morts in surface water supplies only, June through October. Consider as a factor in pre-spawning mortality. Use AFS (1985).
3. Proliferative Kidney Disease (PKX)	Juvenile	10	all	see remarks	Sample morts in surface water supplies, if kidneys are swollen. Analysis by histopath (Smith et al., 1984)
B. <u>Viral Diseases</u>					
1. Infectious Hematopoietic Necrosis (IHN)	Juvenile Adults Smolts	10 60 60	all all all	If signs exist at spawning	Use tissue culture methods, AFS (1985). Pools no bigger than 5 fish.
2. Infectious Pancreatic Necrosis (IPN)	Smolts Adults	60 60	all all	Pre-lib at spawning	Use tissue culture methods, AFS (1985).
3. Erythrocytic Inclusion Body Syndrome (EIBS)	Juveniles Smolts Adults	sample 60 60	moribund if anemic, CWD, BKD, or fungus present. all all	Pre-lib spawning	Blood smear as per Leek (1987) and electron microscopy for confirmation at locations not previously confirmed. Blood smear as per Leek (1987) and electron microscopy for confirmation at locations not previously confirmed.

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APPENDIX A. Continued

ANALYSES	LIFE STAGE	SAMPLES PER LOT	FISH LOTS	FREQUENCY OF SAMPLING	METHODS/REMARKS
C . Bacterial Diseases					
1. Bacterial Kidney Disease (<i>R. salmoninarum</i>)	Juveniles	60	all	Mid-term Pre-lib at spawning	Omit juvenile steelhead. Use fluorescent antibody technique (FAT) described in AFS (1985).
	Smolts	60	all		
	Adults	60	all		
2. Coldwater Disease (<i>C. psychrophila</i>)	Fry-smolts	10	all	When mortality is occurring mortality.	Culture on Cytophaga AFS (1985) or TYE (Fujihara and Nakatani, 1971) agar. Pre-spawning
	Adults	up to 20 morts			
3. Furunculosis (<i>A. salmonicida</i>)	Fry-smolts	10	all	When mortality is occurring sample during monthly visit. Pre-spawning mortality.	AFS (1985), culture on TSA media.
	Adults	up to 20	all		
4. Enteric red mouth (<i>Y. ruckeri</i>)	Fry-smolts.	10	all	When mortality is occurring, sample during monthly visit. all	Culture on TSA per AFS (1985). Pre-spawning mortality.
	Adults	up to 20 morts			

APPENDIX B. Data required in anadromous fish health monitoring reports.

Input	Definition
1. Location	Place where fish were reared or collected.
2. Date	Month, day, and year of examination.
3. Brood year	Year in which the majority of eggs were taken for this lot.
4. Species	See AFS special publication 12.
5. Stock	Origin of eggs in this lot.
6. Lot Number	Identification number assigned to each group of fish in this lot.
7. Tag Code	Coded wire tag code(s), if any.
8. Exam type	Type of inspection, (i.e., Routine, Diagnoses, Prerelease, or Certification).
9. Average fish weight	Average weight of fish in this lot (i.e., number of fish per pound), converted to average metric weight.
10. Number of fish	Number of fish in this lot (identified above) at the time of examination.
11. Water temperature	Water temperature in °C (convert from °F to °C).
12. Date last handled	Date (month, day, year) when this lot was last handled (i.e., received, graded, split, moved, etc.).
13. Diet type	Name of diet being fed to this lot and manufacturer.
14. Pellet size	Size of pellet fed to this lot.
15. Water inflow/pond	Water inflow (in gpm) to this lot.
16. Pond volume	Volume of pond (in ft ³) occupied by this lot.
17. Re-use percent	The percentage of water supplied to this lot, that was used previously in fish culture.
18. Re-use type	Type of water reuse (i.e., serial, biologically treated, etc.)
19. Pond number	Number of the pond from which fish were collected and examined.
20. Pond type and construction	Raceway, circular, Burrows, net pen, pond; concrete, dirt, other (name).
21. Water source	Water source for pond (i.e., spring, well, etc.)
22. Examiner(s)	Investigating fish pathologist.

APPENDIX B. Continued

Input

	Definition
23. Percent loss/day	Estimated mortality for the day of examination.
24. Mortality	Subjective judgment of mortality, normal, above normal.
25. Number of fish examined	Number of fish examined of different types.
26. Remarks	Remark of note including previous treatment, clinical signs, etc.
27. Recommendations	Recommended treatment.
28. Type of analysis and results	Type of analysis including tissues tested and results, [i.e., necropsy, (i.e., gross and microscopic in the field) viral (i.e., cell culture) bacterial (i.e., culture, FAT, Gram stain of tissues) histopathological (i.e., section of tissues or other].
29. Diagnoses	If mortality is above normal subjective, judgment of cause of mortality.
30. Previous month's total mortality in this lot.	From hatchery manager.

APPENDIX D: Technology Transfer Plan

1. Data input
 - a. through microcomputers at hatcheries to our mainframe computer in Portland.
 - b. through data entry in Portland for hatcheries that do not yet have microcomputers.
 - c. through specialist sections such as pathology, nutrition, fish identification, mark recovery, etc.
2. Data storage
 - a. on microcomputer at hatchery/section.
 - b. on mainframe in Portland.
3. Data transfer
 - a. via data message lines to and via the mainframe.
 - b. by exchange of disks between microcomputer sites.
 - c. by printouts.
4. Data exchange
 - a. by providing printed summaries of data in storage.
 - b. by exchanging disks or tapes.
 - c. eventually through electronic connections to other agencies.
 - d. through meetings such as American Fisheries Society, Oregon Chapter, Pacific Northwest Fish Health Protection Committee, Fish Health Monitoring steering committee meetings, and participation in university seminars and other professional groups sponsored seminars and training sessions.
 - e. interface with hatchery personnel on a one-to-one basis during monthly visits and at agency training meetings planning meetings at regional and agency level.
 - f. News releases, articles in professional journals, and development of instruction materials are an ongoing effort.

APPENDIX E: List of facility impediments to fish health at Oregon Department of Fish and Wildlife
Columbia River tributary fish culture facilities

As part of the BPA Augmented Fish Health Monitoring contract, Task 2.3 calls for a listing of facility impediments to fish health at each ODFW hatchery. In addition, the renovations necessary to correct the impediments, an estimate of cost, and itemized benefits must be included in this task. Many of the impediments are common to all facilities so first we prepared a general list of facility impediments. This is followed by a general or generic list of improvements applicable to most facilities and finally a listing of improvements for specific hatcheries with costs and benefits.

- A. List of Facility Impediments to Fish Health in Oregon.
 - 1. Water Supply Impediments
 - a. Fish pathogen contaminated surface water supply.
 - b. Excessive silt and debris containing water supply.
 - c. Inaccurate **influent** flow estimate.
 - d. Insufficient water flow at critical periods, hence excess densities of fish.
 - e. Deteriorated intake dam.
 - f. Improper water temperature resulting in too rapid or slow growth.
 - 2. Adult Holding Impediments
 - a. Different lots of adults held in the same pond, exposed to same water and pathogens.
 - b. Effluent from juvenile stocks enter adult pond.
 - c. Difficulty in handling and sorting adults to allow administration of multiple injections of antibiotics.

APPENDIX E: Continued

- d. Lack of facilities to remove chemotherapeutants from effluent water.
 - e. Blood and ovarian fluids from spawning area are washed into the adult holding pond.
3. Egg Incubation and Early Rearing Impediments
- a. Unable to segregate family groups to avoid vertically transmitted diseases.
 - b. Difficulties in safely administering egg treatment chemicals i.e. formalin.
 - c. Unable to quarantine potential contaminated stocks until viral exams are completed. Effluent from incubation supply passes over fish.
 - d. Unable to start fry in good fish culture conditions e.g. Canadian troughs.
4. Juvenile through smolt rearing facility impediments
- a. Bird predation and bird enhanced spread of disease.
 - b. Unsatisfactory means of cleaning large asphalt ponds.
 - c. Damage from handling smolts during inventory at liberation.
 - d. Mechanical injury to smolts when transported in liberation trucks.
 - e. Inaccurate equipment to measure fish weight.
5. Miscellaneous Impediments
- a. Lack of training of fish culturists in new culture methods, fish health and chemical handling.
 - b. Lack of microcomputers to assist in record keeping.

APPENDIX E: Continued

B. General Improvements to ODFW Culture Facilities to Remove Facility Impediments

Provide a pathogen-free water supply (either by increased well or spring water or disinfection of surface water) to prevent horizontal transfer of fish pathogens.

Equipment to accurately determine water flow and oxygen levels should be obtained for each facility.

Additional adult ponds should be constructed to allow segregation of different stocks.

Adult ponds must be modified to allow ease of handling for antibiotic injections and prevention of spawning products from entering adult ponds.

To allow treatment of fungi on adult salmon, construct charcoal facilities to remove chemotherapeutants from effluent of these ponds.

Sufficient egg incubation facilities must be available to allow segregation of family groups and disinfection of effluent water.

An automated egg treatment system including formalin chemical pumps should be installed.

Additional Canadian troughs are needed to start fish.

Bird covers on ponds will prevent predation and spread of pathogens.

An efficient means to clean large asphalt ponds must be developed.

APPENDIX E: Continued

To avoid excessive stressful handling, an efficient means of inventorying smolts is needed.

Accurate digital tare balances are needed for fish weight determination.

Fish culturists must have computers and training for efficient operation of fish culture facilities.

Training in fish husbandry and fish health is vital to sound fish culture practices.

C. List of Improvements at Specific Oregon Department of Fish and Wildlife Fish Culture Facilities to Remove Fish Health Impediments

<u>Facility</u>	<u>Improvement</u>	<u>Preliminary Cost Estimate</u>	<u>Benefit^a</u>
Big Creek Hatchery	1. Modify adult holding pond to allow separate holding of stocks, handling and antibiotic administration.	185,000	H
	2. Pond covers to prevent bird predation.	40,000	M
	3. Automated formalin treatment system for eggs and a fan to evacuate fumes from incubation room.	10,000	M

a H = high, M = medium, L = low.

APPENDIX E: Continued

<u>Facility</u>	<u>Improvement</u>	<u>Preliminary Cost Estimate</u>	<u>Benefit^a</u>
Bonneville Hatchery	1. Construct 2 additional adult ponds to separate stocks. Include power crowder to handle adults.	410,000	M
	2. Pond cover to prevent bird predation.	160,000	M
	3. Replace pond bottoms in Battery A.	150,000	M
	4. Automated formalin treatment system for eggs.	10,000	M
	5. Modify egg incubator facilities to allow segregation of groups and treatment of effluent. Replace bulk incubation.	300,000	M
	6. Repair Tanner Creek intake dam and pipeline.	160,000	M
	7. Provide solids filtration system for incubation water (Tanner Creek)	40,000	M
	8. Automatic fish feeders for Battery A and B.	200,000	M
	9. New fish pump.	25,000	M
	10. Fish inventory counter for volitional release.	5,000	M

APPENDIX E: Continued

Facility	<u>Improvement</u>	Preliminary Cost Estimate	<u>Benefit</u> ^a
	11. Egg counting and sorting equipment.	10,000	M
	12. Increase well water to run two adult holding ponds.	500,000	M
Cascade Hatchery	1. Modify adult holding pond for better flow pattern and install a fish lift for sorting adults.	50,000	M
	2. Screen system to remove silt from incubation system.	20,000	M
	3. Canadian troughs for starting fish.	20,000	M
	4. Pond covers for bird predation.	100,000	M
	5. Automated egg treatment system with fan.	10,000	M
	6. Well water for pathogen free incubation and to prevent slush ice.	100,000	H
	7. New fish rack and removal of gravel behind rack.	50,000	H
	8. Electric weir at intake dam to stop adult migration.	50,000	M

APPENDIX E: Continued

<u>Facility</u>	<u>Improvement</u>	Preliminary Cost Estimate	<u>Benefit</u>^a
	9. Remove rocks and gravel in water supply line to increase flows.	25,000	H
	10. Oxygen supplementation for periods of high density and low flows.	25,000	M
Clackamas Hatchery	1 . Pathogen-free incubation and early rearing system either well or disinfected water.	40,000	H
	2. Modify adult holding pond for handling, sorting and adult antibodoc injection administration.	12,000	M
	3. Means to clean large asphalt ponds.	25,000	H
	4. Automated formalin egg treatment system and building fan.	10,000	M
	5. A means of adding supplemental oxygen during periods of low oxygen.	25,000	M

APPENDIX E: Continued

<u>Facility</u>	<u>Improvement</u>	Preliminary Cost Estimate	<u>Benefit</u>^a
	6. A safer, more automated method of treatment with formalin in the rearing lakes and raceways.	5,000	M
Dexter Ponds	1. Cover on asphalt pond to prevent bird predation.	60,000	M
	2. Modification of smolt release system.	10,000	H
Gnat Creek Hatchery	1. Pond cover to prevent bird predation.	40,000	M
	2. Oxygen supplementation or increase flow during the summer-fall.	25,000	M
Irrigon Hatchery	1. Oxygen supplementation at critical periods of high fish loading.	50,000	H
	2. Separate water supply to each pond.	100,000	M

APPENDIX E: Continued

Facility	Improvement	Preliminary Cost Estimate	Benefit ^a
Klaskanine Hatchery	1. Oxygen supplementation during low flows.	25,000	L
	2. Adult handling facilities.	60,000	M
	3. Pond covers on raceways to prevent bird predation.	40,000	M
Leaburg Hatchery	1. Pond covers to prevent bird predation.	40,000	L
	2. Modification of adult handling system.	70,000	H
	3. Shade covers for ponds to improve feeding.	30,000	L
	4. Automated egg disinfection system.	10,000	H
Lookingglass Hatchery	1. Additional well water.	70,000	H
	2. Modify raceway effluent channel to prevent backup of water into raceways.	100,000	M
	3. Improved adult barrier on Lookingglass Creek at hatchery intake.	70,000	M

APPENDIX E: Continued

<u>Facility</u>	<u>Improvement</u>	Preliminary Cost Estimate	<u>Benefit^a</u>
	4. Water temperature control with chillers for early rearing.	50,000	M
	5. Pond covers to prevent bird predation.	60,000	L
	6. Modify smolt release system to avoid sump and sharp right angle turn.	10,000	M
Marion Forks Hatchery	1. Ground water development	50,000	H
	2. Weir on Marion and Hom Creek to stop anadromous adult fish.	100,000	M
	3. Pond covers to prevent bird predation.	40,000	L
McKenzie Hatchery	1. Additional Canadian troughs to reduce densities.	20,000	H
	2. Chilled water to retard growth for spring release.	30,000	H
	3. Improved smolt release in outfall channel.	20,000	M
	4. Improve adult attraction system (dredging).	20,000	H

APPENDIX E: Continued

<u>Facility</u>	<u>Improvement</u>	<u>Preliminary Cost Estimate</u>	<u>Beneficial</u>
	5. Automatic feeders.	100,000	L
	6. Pond covers to prevent bird predation.	40,000	L
	7. Improve inflow pipes to raceways to prevent debris accumulation.	30,000	H
	8. Means to remove chemotherapeutants from adult pond effluent.	25,000	M
Minto Pond	1. Provide isolation and incubation building with pathogen-free water.	40,000	M
	2. Electric weir to stop fish passage over Minto Dam.	50,000	M
Oak Springs Hatchery	1. Constant diversion dam to prevent irrigation run-off concentrations of springs.	100,000	H
	2. Develop springs for enhanced water supply to reduce loads and develop raceway type ponds.	1,300,000	M
	3. Pond covers to prevent bird predation.	80,000	M

APPENDIX E: Continued

Facility	<u>Improvement</u>	<u>Preliminary Cost Estimate</u>	<u>Beneficial</u>
Oxbow Hatchery and Herman Creek	1. Ground water development.	50,000	M
	2. Means to effectively clean large asphalt rearing ponds.	25,000	M
Roaring River Hatchery	1. Clean water supply - reduce silt load.	50,000	H
	2. Pond covers to prevent bird predation.	40,000	M
	3. Replace old ponds - 8 total.	400,000	H
	4. Automatic feeders - plus control panels.	35,000	M
Round Butte Hatchery	1. Virus-free water supply.	50,000	H
	2. Pond covers to prevent predation.	40,000	M
	3. Removal of rocks in water supply line.	15,000	M
	4. Fish counter for smolts leaving ladder rearing area.	20,000	M
	5. Oxygen diffusers for liberation truck.	5,000	M
	6. Improved road to fish ladder.	20,000	M

APPENDIX E: Continued

<u>Facility</u>	<u>Improvement</u>	<u>Preliminary Cost Estimate</u>	<u>Benefit^a</u>
Sandy Hatchery	1. Oxygen supplementation or ground water during low flow periods.	25,000	M
South Santiam Hatchery	1. Pathogen-free water supply for incubation.	50,000	H
	2. Pond covers to prevent bird predation.	40,000	M
	3. Improve means to release smolts.	20,000	M
	4. Modify Burrows ponds to raceway style.	150,000	M
	5. New adult pond to separately hold steelhead adults.	1,400,000	H
	6. Improve adult handling and sorting facilities.	included in 5	M
	7. Improve adult handling facilities at collection site.	included in 5	M
Stayton Pond	1. Construct early rearing ponds at Stayton to replace Aumsville dirt bottom ponds.	200,000	M
	2. Modify outlet capture facility for smolt release.	30,000	H

APPENDIX E: Continued

<u>Facility</u>	<u>Improvement</u>	<u>Preliminary Cost Estimate</u>	<u>Benefit^a</u>
Wallowa Hatchery	3. Modify the upper pond to allow water level reduction for removing fish and rotenone treatment.	20,000	M
	4. Replace culvert at outlet of Stayton Pond.	5,000	M
	1. Provide pathogen-free water to prevent M cerebralis infection.	50,000	M
	2. Re-route effluent from spawning area and effluent from egg incubation room away from adult entry area.	10,000	M
	3. Modify adult holding pond to allow separation of stocks.	15,000	M
Wallowa Hatchery	4. Conduct riparian restoration on Spring Creek (part of hatchery water supply).	100,000	M
	5. Develop spring water for acclimation pond water supply.	60,000	M

APPENDIX E: Continued

<u>Facility</u>	<u>Improvement</u>	Preliminary Cost Estimate	<u>Benefita</u>
	6. Construct settling pond for Spring Creek water.	100,000	M
	7. Chillers to provide 40-45°F water temperature for incubation (presently 59oF).	50,000	M
Willamette Hatchery	1. Screen system to remove silt and debris for incubation system.	50,000	M
	2. Travelling screen (self cleaning) to protect entire water supply.	400,000	H
	3. Canadian troughs for starting fish.	20,000	M
	4. Egg counting and sorting equipment.	10,000	M
	5. Improve intake dam.	70,000	H
	6. Modification of water supply pipes, need valves and blow-outs on lateral lines.	60,000	M

APPENDIX E: Continued

Facility	<u>Improvement</u>	Preliminary Cost Estimate	Benefita
	7. Modify adult pond to allow better flow pattern for treatments and adult handling. Also water level alarm system.	20,000	M
	8. Means to remove chemotherapeutants from adult pond effluent.	25,000	H
	9. Pond covers to prevent bird predation.	100,000	M

APPENDIX F. Summary of Oregon Department of Fish and Wildlife sampling for culturable viruses at Columbia River tributary hatcheries: June 2, 1987 to March 15, 1988.

Location	Date	Stock	No. Fish	Sample Type ¹	Results	Percent IHN ²
Big Creek	9/17/87	ChF/tule	60 F	20 OF, 12 PKS	Neg	
	9/21/87	ChF/tule	60 F	20 OF	Neg	
	9/22/87	ChF/tule	60 F	20 OF	Neg	
	9/24/87	ChF/tule	60 F	20 OF	Neg	
	9/28/87	ChF/tule	60 F	20 OF	Neg	
	9/29/87	ChF/tule	120 F	40 OF	Neg	
	10/12/87	ChF/tule	71 F	31 OF	Neg	
	10/18/87	ChF/Rogue	11 F	6 OF	Neg	
	10/23/87	ChF/Rogue	14 F	7 OF	Neg	
	10/23/87	Co	53 F, 2 M	20 OF, 12 PKS	Neg	
	10/24/87	ChF/Rogue	7 F, 2 M	3 OF, 2 PKS	Neg	
	10/27/87	ChF/Rogue	10 F	2 OF	Neg	
	10/29/87	ChF/Rogue	10 F, 5 M	4 OF, 1 M, 3 PKS	Neg	
	11/9/87	ChF/Rogue	5 F	5 OF	Neg	
	11/13/87	CS	4 F	2 OF	Neg	
	11/17/87	CS	9 F	3 OF, 3 S	Neg	
	11/23/87	CS	13 F	5 OF	Neg	
	11/30/87	CS	5 F	2 OF, 1 S	Neg	
	1/20/88	StW	60 F	20 OF, 12 PKS	Neg	
	1/27/88	Ct	60 F	20 OF, 12 PKS	Neg	
	1/27/88	StW	39 F	13 OF	Neg	
	Bonneville Hatchery	5/28/87	ChF/URB	44 juv	9 WV	Neg
6/4/87		ChF/URB	67 juv	12 WV	Neg	
6/11/87		ChF/URB	33 juv	12 WV	Neg	
6/19/87		ChF/URB	70 juv	14 WV	Neg	
6/25/87		ChF/URB	74 juv	15 WV	Neg	
9/21/87		ChF/tule	60 F	20 OF, 12 PKS	Neg	
9/22/87		ChF/tule	60 F	20 OF	Neg	
9/25/87		ChF/tule	60 F	20 OF	Neg	
9/28/87		ChF/tule	58 F	19 OF	Neg	
9/29/87		ChF/tule	60 F	20 OF	Neg	
10/1/87		ChF/tule	60 F	20 OF	Neg	
10/5/87		ChF/tule	60 F	20 OF	Neg	
11/12/87		ChF/URB	66 F, 46 M	44 OF, 22 M, 23 PKS	IHNV	6.8%
11/13/87		ChF/URB	20 F, 68 M	67 OF, 34 M, 34 KS	IHNV	5.1%
11/17/87		ChF/URB	168 F, 56 M	28 OF, 28 M, 28 S	IHNV	18.7%
11/19/87		ChF/URB	198 F, 66 M	66 OF, 33 M, 33 S	IHNV	13.6%
11/23/87		ChF/URB	210 F, 70 M	70 OF, 35 M, 35 S	IHNV	16.8%
11/24/87		ChF/URB	169 F, 58 M	58 OF, 29 M, 29 S	IHNV	28.8%
12/4/87		ChF/URB	288 F, 96 M	96 OF, 48 M, 48 S	IHNV	33.8%
12/16/87		ChF/URB	84 F, 26 M	28 OF, 19 M, 19 S	IHNV	33.6%
12/30/87	ChF/URB	15 juv	5 B, 5 K, 5 S	Neg		

¹Abbreviations used: visc = whole viscera, WF = whole fish; OF = ovarian fluid, M = milt, PKS = pyloric caeca/kidney/spleen, F = female, M = Male, INC = incomplete, B = brain, G = gill, AD = adult, S = spleen, L = liver.

²Estimated percent prevalence of IHN. Most sample pools consist of more than 1 fish. This estimate assumes that a positive pool contains only 1 positive fish.

APPENDIX F. Continued

Location	Date	Stock	No. Fish	Sample Type ¹	Results	Percent IHN ^v + ²
Cascade Hatchery	10/28/87	Co	89 F	30 OF, 5 PKS	Neg	
	11/5/87	Co	35 F	7 PKS	Neg	
	12/30/87	Co	9 juv	3 PKS	Neg	
Clackamas Hatchery	9/16/87	ChS/EC	5 F	5 OF	Neg	
	9/28/87	ChS	47 F	6 OF, 9 PKS	Neg	
	9/29/87	ChS	12 F	3 OF, 3 PKS	Neg	
	10/1/87	ChS	8 F	3 OF	Neg	
	10/6/87	ChS	43 F	15 OF	Neg	
	10/9/87	ChS	14 F	5 OF	Neg	
	10/12/87	ChS(19.85)	60 juv	12 PKS	Neg	
	10/12/87	ChS	4 F	2 OF	Neg	
	11/27/87	ChS	16 juv	5 PKS	Neg	
	12/3/87	ChS	15 juv	5 B	IHN ^v	100%
	12/9/87	ChS	18 juv	6 B, 1 P, 1 L	IHN ^v	100%
	12/17/87	ChS	48 juv	28 B, 28 G, 28 KS	IHN ^v	100%
	12/17/87	StW	64 juv	22 B, 22 G, 22 KS	Neg	
	12/17/87	ChS	12 juv	12 B, 12 K	IHN ^v	100%
	12/18/87	ChS(S.Sant)	60 juv	20 B, 20 G, 20 KS	IHN ^v	100%
	12/22/87	StW	1 juv	1 B, 1 G, 1 KS	Neg	
	1/7/88	ChS	30 juv	10 KS	IHN ^v	100%
	1/7/88	ChS	8 juv	3 KS	Neg	
	1/7/88	StW	3 juv	1 KS	Neg	
	1/12/88	ChS	18 juv	6 B, 6 G, 6 KS	IHN ^v	100%
	1/12/88	ChS	2 juv	1 G, 1 KS	Neg	
	1/12/88	StW	1 juv	1 G, 1 KS	Neg	
	1/25/88	StW	6 juv	3 G, 3 KS	IHN ^v	66.6%
	1/25/88	ChS	72 juv	44 G, 44 KS	IHN ^v	90.0%
	1/25/88	ChS	72 juv	44 G, 44 KS	IHN ^v	90.0%
	1/25/88	ChS	9 juv	3 G, 3 KS	Neg	
	2/1/88	Co	2 F, 2 M	2 OF, 2 M, 4 PKS, 4 G	Neg	
	2/5/88	StW	10 juv	4 G, 4 KS	IHN ^v	50.0%
	2/5/88	ChS	72 juv	24 G, 24 KS	IHN ^v	100%
	2/5/88	ChS	6 juv	2 G, 2 KS	Neg	
	2/5/88	Co	1 F, 1 M	1 OF, 1 M, 2 PKS, 2 G	Neg	
	2/8/88	Co	1 F, 2 M	1 OF, 2 M, 3 PKS, 3 G	Neg	
	2/15/88	Co	2 F, 2 M	2 OF, 2 M, 4 PKS, 4 G	Neg	
	2/16/88	StW	14 juv	6 KS	IHN ^v	16.6%
	2/16/88	ChS	8 juv	4B, 4 KS	IHN ^v	25.0%
	2/16/88	ChS	24 juv	8 B, 8 KS	IHN ^v	100%
2/19/88	Co	1 F, 2 M	1 OF, 2 M, 3 PKS, 3 G	Neg		
2/25/88	Co	5 F, 3 M	5 OF, 3 M, 7 PKS, 3 G	IHN ^v	62.5%	
3/2/88	Co	3 F, 3 M	3 OF, 3 M, 6 PKS, 6 G	Neg		
3/8/88	Co	4 F, 3 M	4 OF, 3 M, 7 PKS, 7 G	Neg		
3/14/88	Co	5 F, 7 M	5 OF, 7 M, 10 PKS	INC		
Dexter Ponds	10/12/87	ChS(24.)	60 juv	12 PKS	Neg	
	10/12/87	ChS(22.)	60 juv	12 PKS	Neg	
	2/11/88	ChS	60 juv	12 PKS	Neg	
	2/11/88	ChS	60 juv	12 PKS	Neg	
Gnat Creek Hatchery	6/30/87	StS(S. Sant)	60 juv	12 WV	Neg	

APPENDIX F. Continued

Location	Date	Stock	No. Fish	Sample Type ¹	Results	Percent IHN ^V + ²
Imnaha River	8/17/87	ChS	3 F, 5 M	3 OF, 2 M, 3 PKS	Neg	
	8/21/87	ChS	5 F, 6 M	5 OF, 3 M, 3 PKS	Neg	
	8/24/87	ChS	6 F, 6 M	6 OF, 3 M, 6 PKS	Neg	
	8/28/87	ChS	9 F, 10 M	9 OF, 5 M, 10 PKS	Neg	
	8/31/87	ChS	10 F, 10 M	10 OF, 5 M, 13 PKS	Neg	
	9/4/87	ChS	2 F, 5 M	2 OF, 2 M, 7 PKS	Neg	
	9/8/87	ChS	2 F, 3 M	2 OF, 1 M, 2 PKS	Neg	
	9/14/87	ChS	2 F, 2 M	2 OF, 1 M, 2 PKS	Neg	
Irrigon Hatchery	7/16/87	StS(Wal/Imn)	60 juv	12 WV	Neg	
	7/28/87	StS	128 juv	26 WV	Neg	
	8/11/87	StS	120 juv	26 WV	Neg	
	8/24/87	StS(Wal/Imn)	128 fry	26 visc	Neg	
Klaskanine Hatchery	1/27/88	StW	60 F	20 OF, 12 PKS	Neg	
Leaburg Hatchery	5/27/87	StS	10 fry	2 G, 2 B, 2 visc	Neg	
	1/19/87	StS	28 F, 28 M	14 OF, 14 M, 14 S, 11 PKS	Neg	
	1/27/88	StS	25 F, 25 M	12 OF, 12 S, 1 PKS	Neg	
	2/9/88	StS	35 F	17 OF	Neg	
	2/9/88	StS	50 F, 34 M	25 OF, 17 M, 17 S	Neg	
Lookingglass Hatchery	8/24/87	ChS	124 F, 84 M	124 OF, 42 M, 84 PKS	IHN ^V	2.9%
	8/31/87	ChS	134 F, 90 M	134 OF, 45 M, 90 PKS	IHN ^V	3.1%
	9/8/87	ChS	35 F, 24 M	35 OF, 12 M, 24 PKS	IHN ^V	1.7%
Marion Forks	12/17/87	ChS	5 juv	2 B, 2 PKS	Neg	
	2/10/88	ChS	60 juv	12 PKS	Neg	
McKenzie Hatchery	9/8/87	ChS(23.)	18 F	6 OF, 4 PKS	Neg	
	9/14/87	ChS(26.)	1 F, 1 M	1 OF, 1 PKS	Neg	
	9/14/87	ChS(23.)	38 F, 4 M	15 OF, 14 PKS	Neg	
	10/2/87	ChS(23.)	60 F	20 OF	Neg	
	10/12/87	ChS(23.)	70 juv	14 PKS	Neg	
Minto Ponds	5/18/87	StW	41 F, 27 M	20 OF, 26 M, 27 PKS	IHN ^V	35.3
	9/14/87	ChS	50 F, 50 M	25 OF, 22 M, 39 PKS	Neg	
	9/15/87	ChS	56 F, 56 M	28 OF, 27 M, 28 KS	Neg	
	9/21/87	ChS	32 F, 32 M	32 OF, 27 M, 32 KS	Neg	
	9/22/87	ChS	21 F, 21 M	21 OF, 22 M, 22 KS	Neg	
Oak Springs Hatchery	6/2/87	StS(S.Sant)	11 fry	2 WF	Neg	
Oxbow Hatchery					None	
Round Butte Hatchery	6/2/87	StS	9 fry	3 WF	Neg	
	7/1/87	ChS	10 fry	2 WF	Neg	
	8/26/87	ChS	79 F, 27 M	79 OF, 27 M, 79 S	IHN ^V	45.3%
	9/8/87	ChS	74 F, 27 M	74 OF, 27 M, 101 S	IHN ^V	79.2%
	1/27/88	StS	95 F, 99 M	95 OF, 99 M, 194 S, 12 PKS	IHN ^V	49.1%
	2/8/88	StS	56 F, 78 M	49 OF, 78 M, 127 S	IHN ^V	37.3%
	3/1/88	StS	78 F, 51 M	78 OF, 51 M, 129 S, 129 G	IHN ^V	84.5%

APPENDIX F. Continued

Location	Date	Stock	No. Fish	Sample Type ¹	Results	Percent IHN ⁺ + ²
Sandy Hatchery	11/16/87	Co	60 F	20 OF, 12 PKS	Neg	
South Santiam	9/15/87	ChS	96 F, 96 M	48 OF, 48 M, 79 PKS	Neg	
	9/18/87	SS	7 F, 4 M	11 PKS	Neg	
	9/22/87	ChS	93 F, 93 M	93 OF, 93 M, 93 KS	Neg	
	9/28/87	ChS	132 F, 132 M	66 OF, 60 M, 60 KS	Neg	
	10/6/87	ChS	61 F, 60 M	44 OF, 44 M, 44 Ks	Neg	
	10/8/87	SS	2 F, 2 M	1 PKS	Neg	
	12/22/87	StS	12 F, 12 M	12 OF, 12 M, 12 PKS	Neg	
	1/5/88	StS	41 F, 41 M	41 OF, 41 M, 41 S, 9 PKS	Neg	
	1/20/87	StS	63 F, 62 M	63 OF, 62 M, 62 S, 7 PKS	Neg	
	2/9/88	StS	17 M	17 M, 17 KS	Neg	
	2/16/88	ChS	60 juv		Neg	
	2/16/88	StS	55 F, 55 M	55 OF, 55 M, 55 S	Neg	
	3/2/88	StS	50 F, 50 M	50 OF, 50 M, 50 S	IHN ⁺	1.0%
Wallowa Hatchery					None	
Willamette Hatchery	9/8/87	ChS	60 F	20 OF, 12 PKS	Neg	
	9/18/87	ChS	57 F	19 OF	Neg	
	9/25/87	ChS	51 F	17 OF	Neg	
	1/15/87	ChS	15 juv	3 PKS	Neg	
	2/11/88	ChS	15 juv	3 PKS	Neg	
	2/11/88	ChS	60 juv	12 PKS	Neg	

APPENDIX G: SUMMARY OF MYXOBOLUS CEREBRALIS EXAMINATIONS OF OREGON COLUMBIA RIVER TRIBUTARY SALMONID FISH FOR DECEMBER, 1986 THROUGH MARCH, 1988.

SAMPLE NO.	DISTRICT BIOLOGIST	WATERSHED	LOCATION	COLLECTION DATE*	SPECIES	FISH		
						NO. FISH	SIZE (MM)/AGE	RESULTS**
87-298	West	Burnt River	LOVERIN POND (TRIBUTARY TO SO. FORK BURNT RIVER)	08/28/87	Fb	1	625	N
87-304	West	Burnt River	SOUTH FORK BURNT RIVER	08/28/87	Fb	12	85-130	P/N
87-310	West	Burnt River	H. MURRAY RESERVIOR	08/28/87	Fb	2	300-350	N
87-313	West	Burnt River	LOVERIN POND (SO. FORK OF BURNT RIVER)	08/28/87	Fb	3	600	N
87-108	Knispel	Columbia River	TROJAN POND (LOWER COLUMBIA RIVER)	05/11/87	StW	60	160	N
87-323	Massey	Columbia River	BONNEVILLE HATCHERY - WELL WATER	09/03/87	Fb	60	20/lb	N
87-343	Massey	Columbia River	CLATSKANIE RIVER (TRIBUTARY TO LOWER COLUMBIA RIVER)	09/09/87	St	10	110-140	P/N
87-055	Newton	Deschutes River	DESCHUTES RIVER (NEAR NENA CREEK, RM 62)	03/13/87	Fb	24	120-250	N
87-056	Newton	Deschutes River	OAK SPRINGS HATCHERY	01/00/87	Fb	40	100	N
87-069	Schwartz	Deschutes River	GRINDSTONE RESERVOIR	03/23/87	Fb	14	>350	N
87-122	Schwartz	Deschutes River	ALLEN CREEK (CROOKED RIVER)	06/23/87	Fb	10	152-203	N
87-123	Schwartz	Deschutes River	NORTH FORK CROOKED RIVER (BELOW ALLEN CREEK RESERVOIR)	06/23/87	Fb	8	152-254	N
87-141	Schwartz	Deschutes River	DESCHUTES RIVER	06/00/87	ChS	60	Adults	N
87-266	Fies	Deschutes River	FALL RIVER HATCHERY	09/00/87	Bt	60	76	N
87-348	Fies	Deschutes River	PAULINA LAKE	10/00/87	Ko	60	adult	N
86-001	Witty	Grande Ronde River	LOSTINE RIVER (POLE BRIDGE)	12/00/86	Fb	10	102	N
86-002	Witty	Grande Ronde River	LOSTINE RIVER (ABOVE STRATHERNS LAKE)	12/00/86	BT	4	102-152	N
86-003	Witty	Grande Ronde River	LOSTINE RIVER (ABOVE STRATHERNS LAKE, INLET CANAL)	12/00/86	ChS	6	76	N
86-004	Witty	Grande Ronde River	LOSTINE RIVER (ABOVE STRATHERNS LAKE, INLET CANAL)	12/00/86	Fb	18	25-127	P
86-005	Witty	Grande Ronde River	LOSTINE RIVER (CHANNEL INTO STRATHERNS LAKE)	12/00/86	BT	20	76-152	P
86-006	Witty	Grande Ronde River	LOSTINE RIVER (CHANNEL INTO STRATHERNS LAKE)	12/00/86	Fb	10	76-127	N
86-007	Witty	Grande Ronde River	LOSTINE RIVER (CHANNEL INTO STRATHERNS LAKE)	12/00/86	ChS	8	76	N
86-008	Witty	Grande Ronde River	LOSTINE RIVER (COLEMAN SPRINGS)	12/00/86	BT	25	127-178	N
86-009	Witty	Grande Ronde River	LOSTINE RIVER (COLEMAN SPRINGS)	12/00/86	Fb	8	76-152	P
86-010	Witty	Grande Ronde River	LOSTINE RIVER (COLEMAN SPRINGS)	12/00/86	ChS	3	76	N
86-011	Witty	Grande Ronde River	LOSTINE RIVER (GOBLE SPRINGS)	12/00/86	Fb	1	127	N
86-012	Witty	Grande Ronde River	LOSTINE RIVER (GOBLE SPRINGS)	12/00/86	BT	16	76-254	N
86-013	Witty	Grande Ronde River	LOSTINE RIVER (GOBLE SPRINGS)	12/00/86	ChS	6	76	N
86-014	Witty	Grande Ronde River	LOSTINE RIVER, 1 MILE FROM WALLOWA RIVER	12/00/86	Fb	19	76-127	P
86-015	Witty	Grande Ronde River	LOSTINE RIVER, 1 MILE FROM WALLOWA RIVER	12/00/86	BT	1	305	N
86-016	Witty	Grande Ronde River	LOSTINE RIVER, 1 MILE FROM WALLOWA RIVER	12/00/86	ChS	2	76	P
86-017	Witty	Grande Ronde River	WALLOWA HATCHERY	12/00/86	Fb	60	127-152	N
87-006	West	Grande Ronde River	ELK CREEK	01/00/87	Fb	12	102-254	N
87-009	Witty	Grande Ronde River	STRATHERNS LAKE	01/00/87	BT	1	adult	N
87-010	Witty	Grande Ronde River	STRATHERNS LAKE	01/00/87	Fb	2	adult	N
87-013	Witty	Grande Ronde River	SHILO RANCH (WALLOWA)	01/00/87	Fb	9	adult	N
87-015	West	Grande Ronde River	LOOKINGGLASS HATCHERY	01/06/87	ChS	21	120-150	N
87-016	Witty	Grande Ronde River	WALLOWA RIVER (APPROX. 3 MILES ABOVE WALLOWA HATCHERY)	01/00/87	Rb,Bt,ChS	20	152-203	P
* Collection date refers to the day fish were obtained from each site. Those with a "00" date were collected sometime during the month, but actual day was not recorded.								
** All positive results (P) are presumptively positive, i.e. spores of typical morphology were observed using the digestion method (AFS Blue Book); those marked P/N contain a few spores of appropriate M. cerebralis size, but morphologically were not quite typical. Both presumptive positive and P/N samples require histological examination for confirmation of spores within the cartilaginous tissue. N denotes no spores or none of appropriate size or shape.								

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APPENDIX G: CONTINUED

SAMPLE NO.	DISTRICT BIOLOGIST	WATERSHED	LOCATION	COLLECTION DATE	SPECIES	NO. FISH	FISH		RESULTS*
							SIZE (MM)	AGE	
87-020	Witty	Grande Ronde River	PRAIRIE CREEK 4-5 MILES ABOVE ENTERPRISE	01/00/87	Rb	14	102-adult	P	
87-021	Witty	Grande Ronde River	WALLOWA RIVER AT ROCK CREEK, RM 19	01/26/87	Rb	9	120-220	P	
87-022	Witty	Grande Ronde River	WALLOWA RIVER AT ROCK CREEK, RM 19	01/26/87	ChS	3	102-127	P	
87-023	Witty	Grande Ronde River	WALLOWA RIVER RM. 34 BELOW HATCHERY	01/26/87	Rb	14	76-adult	P	
87-029	Witty	Grande Ronde River	SPRING CREEK (TRIBUTARY TO WALLOWA RIVER)	01/14/87	BT, Ch, Rb	17	120-200	N	
87-030	Witty	Grande Ronde River	INDIAN CREEK - 1/4 MILE ABOVE OVERHOLT CREEK	02/06/87	Rb, Ct	26	76-152	N	
87-031	West	Grande Ronde River	INDIAN CREEK - KUHL RANCH	02/06/87	Rb, StS	33	76-152	N	
87-049	West	Grande Ronde River	GRANDE RONDE RIVER	02/00/87	ChS	11	76-102	N	
87-050	West	Grande Ronde River	GRANDE RONDE RIVER	02/00/87	Rb	10	102-152	N	
87-051	West	Grande Ronde River	LOOKINGGLASS CREEK	02/00/87	ChS	6	76-102	N	
87-052	West	Grande Ronde River	LOOKINGGLASS CREEK	02/00/87	Rb	15	102-127	N	
87-053	West	Grande Ronde River	CATHERINE CREEK NEAR UNION	02/00/87	ChS	7	76-102	N	
87-054	West	Grande Ronde River	CATHERINE CREEK NEAR UNION	02/00/87	Rb, StS	14	102-152	P/N	
87-059	West	Grande Ronde River	LOOKINGGLASS HATCHERY (RAPID RIVER STOCK)	01/06/87	ChS	23	120	N	
87-060	West	Grande Ronde River	LOOKINGGLASS HATCHERY (RAPID RIVER STOCK)	01/06/87	ChS	24	120	N	
87-061	Witty	Grande Ronde River	WALLOWA RIVER ABOVE LOSTINE NEAR WADE POINT	03/00/87	Rb	1	unk	N	
87-066	Witty	Grande Ronde River	FRED CASADY POND	03/19/87	Rb, ChS, Bt	7	127-178	P	
87-067	Witty	Grande Ronde River	FRED KAUP POND	03/19/87	Rb	2	adults	P	
87-068	Witty	Grande Ronde River	E. VANBLARICOM - POND	03/19/87	Rb, Bt	10	152	P	
87-082	Witty	Grande Ronde River	WALLOWA HATCHERY	04/08/87	Rb	60	200	P	
87-084	Witty	Grande Ronde River	WALLOWA HATCHERY	03/00/87	StS	76	200	N	
87-085	Witty	Grande Ronde River	WALLOWA HATCHERY	04/00/87	StS	60	adults	P	
87-097	Witty	Grande Ronde River	WALLOWA HATCHERY	04/29/87	Rb	28	250	P	
87-098	Witty	Grande Ronde River	SPRING CREEK ABOVE WALLOWA HATCHERY	04/29/87	Rb, Bt, ChS	24	75-250	P	
87-099	Witty	Grande Ronde River	DEER CREEK (BIG CANYON)	04/30/87	Rb	10	76-102	P	
87-100	Witty	Grande Ronde River	RON SCHENCK POND	03/23/87	Rb, Bt	4	152	P	
87-101	Witty	Grande Ronde River	BIG CANYON WEIR	04/30/87	StS	6	adults	P	
87-103	Witty	Grande Ronde River	WALLOWA HATCHERY (1 SALTS, REARED AS JUVENILES AT LYONS FERRY, WA)	04/00/87	StS	15	adults	P	
87-104	Witty	Grande Ronde River	WALLOWA HATCHERY (2 SALTS, REARED AS JUVENILES AT LYONS FERRY, WA)	04/00/87	StS	15	adults	P	
87-105	Witty	Grande Ronde River	WALLOWA HATCHERY (1 SALTS, REARED AS JUVENILES AT IRRIGON HATCHERY)	04/00/87	StS	15	adults	P	
87-113	Witty	Grande Ronde River	WALLOWA RIVER (1 MILE BELOW MINAM), RB PLANTS, 1986	06/04/87	Rb	1	320	P	
87-114	Witty	Grande Ronde River	WALLOWA RIVER (MINAM TO RONDOWA)	06/04/87	Rb	2	320	P	
87-115	Witty	Grande Ronde River	LOWER GRANDE RONDE RIVER	06/04/87	Rb	2	200-320	P	
87-116	Witty	Grande Ronde River	UPPER GRANDE RONDE RIVER	06/04/87	Rb	1	>450	P	
87-117	Witty	Grande Ronde River	UPPER GRANDE RONDE RIVER	06/04/87	Rb	1	320	P	
87-118	Witty	Grande Ronde River	WALLOWA LAKE	06/00/87	Ko	5	225	N	
87-128	Witty	Grande Ronde River	WALLOWA HATCHERY (SPRING WATER SUPPLY)	07/00/87	Bt	4	juvenile	N	
87-129	Witty	Grande Ronde River	WALLOWA HATCHERY	07/00/87	Ob	60	juvenile	N	
87-132	Witty	Grande Ronde River	DON NEWARK (HURRICANE CREEK)	07/22/87	Rb	3	203-254	P	
87-133	Witty	Grande Ronde River	CLYDE STONEBRINK POND	07/22/87	Rb	4	203-305	P	
87-134	Witty	Grande Ronde River	BEAR CREEK (TRIBUTARY TO WALLOWA RIVER)	07/24/87	Rb, bull trout	5	203-305	N	
87-135	Witty	Grande Ronde River	SHILO RANCH POND	04/23/87	Rb	1	203-305	P	
87-136	Witty	Grande Ronde River	SHILO RANCH POND	04/23/87	BT	6	203-305	P	
87-142	Witty	Grande Ronde River	FRANK HEATH POND (LITTLE HURRICANE CREEK)	07/30/87	Rb	4	254-305	P	

APPENDIX G: CONTINUED

SAMPLE NO.	DISTRICT BIOLOGIST	WATERSHED	LOCATION	COLLECTION DATE	SPECIES	FISH		
						NO. FISH	SIZE (MM)/ AGE	RESULTS*
87-143	Witty	Grande Ronde River	MARR POND	07/30/87	Rb	4	152-203	N
87-144	Witty	Grande Ronde River	KINNEY LAKE	07/30/87	Rb	13	254-431	N
87-145	Witty	Grande Ronde River	FORD PETERSON POND	07/30/87	Rb, BT	5	254-457	P
87-146	Witty	Grande Ronde River	CHESNIMNUS CREEK (AT PINE CREEK, WILD FISH)	07/31/87	Rb	4	102-152	N
87-147	Witty	Grande Ronde River	MCCOLLOCK POND	07/31/87	BT	4	254	N
87-158	Witty	Grande Ronde River	WALLOWA HATCHERY (MORTALITY)	07/00/87	Rb	7	152-178	P
87-163a	West	Grande Ronde River	TURNBULL PONDS	07/27/87	Rb	8	254-356	P
87-163b	West	Grande Ronde River	TURNBULL PONDS	07/27/87	Bt	6	203-356	N
87-167	West	Grande Ronde River	TOM CRAIG POND (MILL CREEK)	08/03/87	Rb	15	76-203	P
87-168	West	Grande Ronde River	DUANE SCHUBERT POND	08/04/87	Rb	1	419	P
87-169	West	Grande Ronde River	ANTONE CREEK (3 MILES BELOW ANTHONY LAKE)	07/00/87	Bt	10	51-152	N
87-170	West	Grande Ronde River	WILBUR SMITH POND (CATHERINE CREEK)	08/03/87	Rb	10	225-263	P
87-171	West	Grande Ronde River	G. ROYES POND	08/00/87	Rb	14	250-363	P
87-173	West	Grande Ronde River	LEE INSKO POND	08/04/87	Rb	10	213-275	P
87-174	West	Grande Ronde River	GRANDE RONDE RIVER (BELOW GRANDE RONDE LAKE)	08/04/87	Bt	14	95-178	N
87-175a	West	Grande Ronde River	DON HENDRICKS POND	08/04/87	Bt	4	400-475	P
87-175b	West	Grande Ronde River	DON HENDRICKS POND	08/04/87	Rb	4	400-475	P
87-177	West	Grande Ronde River	CHARLES WINGET POND	08/03/87	Rb	2	305-406	P/N
87-178a	West	Grande Ronde River	ALBERT JACOBS POND (NEAR CATHERINE CREEK)	07/24/87	Bt	11	125-275	N
87-178b	West	Grande Ronde River	ALBERT JACOBS POND (NEAR CATHERINE CREEK)	07/24/87	Rb	10	225-350	P
87-179	West	Grande Ronde River	R.D. MACGRAVEL CO. POND	07/29/87	Rb	10	175-225	P
87-180	West	Grande Ronde River	CABIN CREEK (TRIBUTARY TO GRANDE RONDE)	07/31/87	Rb/StS	18	50-175	P/N
87-182	West	Grande Ronde River	HERMAN YOUNG POND (NEAR LOOKINGGLASS CREEK)	07/29/87	Bt	6	200	P
87-183	West	Grande Ronde River	ELTON WILSON POND (NEAR CATHERINE CREEK)	07/24/87	Rb	10	350-425	P
87-184	West	Grande Ronde River	HERMAN YOUNG POND (NEAR LOOKINGGLASS CREEK)	07/29/87	Rb	5	175-250	P
87-186a	West	Grande Ronde River	LOOKINGGLASS CREEK	07/31/87	Rb/StS	12	150	P
87-186b	West	Grande Ronde River	LOOKINGGLASS CREEK	07/31/87	Rb/StS	16	25	N
87-187	West	Grande Ronde River	JAMES CAGLEY POND (NEAR NORTH CABIN CREEK)	07/31/87	Rb	1	200	P/N
87-188	West	Grande Ronde River	RUSSEL PERRY POND (NEAR WILLOW CREEK)	07/24/87	Rb	8	250-325	P
87-189	West	Grande Ronde River	FRANK GOSHORN POND	07/31/87	Bt	3	250-300	P/N
87-191	West	Grande Ronde River	GRANDE RONDE LAKE	07/28/87	Rb	11	200-250	N
87-193	West	Grande Ronde River	ANTHONY LAKE	07/28/87	Bt	2	127-178	N
87-194	West	Grande Ronde River	FLOYD FEIK POND (NEAR MILL CREEK)	07/31/87	Rb	10	229-267	P
87-195	West	Grande Ronde River	ELLIS SCOTT POND	07/27/87	Rb	7	254-305	P
87-196	West	Grande Ronde River	FRANK GOSHORN POND (NEAR FIR CREEK AND MILL CREEK)	07/31/87	Rb	1	229	N
87-197	West	Grande Ronde River	TOM CRAIG POND (NEAR MILL CREEK)	07/31/87	Rb	4	343-406	P
87-198	West	Grande Ronde River	ELTON WILSON POND (NEAR CATHERINE CREEK)	07/24/87	Bt	2	330-432	N
87-199	West	Grande Ronde River	MINAM RIVER AT MINAM BRIDGE	07/29/87	ChS	9	75-100	N
87-200	West	Grande Ronde River	ANTHONY LAKE	07/28/87	Bt	10	200-250	N
87-201	West	Grande Ronde River	MINAM RIVER AT MINAM BRIDGE	07/29/87	Rb/StS	13	50-255	P
87-202	West	Grande Ronde River	DR EDGAR SHIROMA POND	07/26/87	Rb	9	254-356	P
87-203	West	Grande Ronde River	JOE JACOBS POND	07/24/87	Rb	11	152-356	P
87-204	West	Grande Ronde River	JAY WILSON POND	07/24/87	Rb	4	229-305	P
87-248	Witty	Grande Ronde River	VICK COGGINS POND	08/04/87	Bt	4	203-254	N

APPENDIX G: CONTINUED

SAMPLE NO.	DISTRICT	WATERSHED	LOCATION	COLLECTION DATE	SPECIES	FISH		RESULTS*
						NO.	SIZE (MM)/AGE	
87-249	Witty	Grande Ronde River	LIGHTNING CREEK POND	08/06/87	Rb	2	152-203	P
87-250	Witty	Grande Ronde River	LARRY MILLER POND	08/03/87	3 Rb - 1 Bt	4	203-305	P
87-251	Witty	Grande Ronde River	DALLAS MCCRAE POND	08/04/87	Rb	1	457	N
87-252	Witty	Grande Ronde River	MELVIN BRINK POND	08/10/87	5 ChS - 1 Rb	6	127- 254	N
87-253	Witty	Grande Ronde River	MYRL DUNLAP POND	08/06/87	Rb	2	250-300	P
87-254	Witty	Grande Ronde River	LEO GOBLE POND	08/03/87	Rb	1	288-300	P
87-255	Witty	Grande Ronde River	CHRIS CUNNINGHAM POND	08/11/87	Rb	4	102-127	N
87-256	Witty	Grande Ronde River	DAVE CLOUGH POND	08/10/87	3 Rb, 1 Bt	4	279-430	P
87-296	West	Grande Ronde River	PETE HOFFMAN POND	08/10/87	Rb	3	250-360	P
87-308	West	Grande Ronde River	RON DAKE POND	08/11/87	Rb	10	180-280	P
87-314	Witty	Grande Ronde River	WYNAN'S POND (1985 BROOD)	10/01/87	Bt	5	150	P
87-321	West	Grande Ronde River	LOOKINGGLASS HATCHERY	08/00/87	Chs	18	adult	P
87-324	West	Grande Ronde River	LOOKINGGLASS HATCHERY	01/06/88	ChS	25	80-120	N
87-326	West	Grande Ronde River	LOOKINGGLASS HATCHERY (IMNAHA RIVER CHS)	01/06/88	ChS	17	130-160	N
87-327	Witty	Grande Ronde River	WALLOWA LAKE	09/21/87	Ko	26	220-330	N
87-342	West	Grande Ronde River	MINAM RIVER	10/29/87	Dolly Varden	1	425	N
86-020	Newton	Hood River	MT. HOOD TROUT N. TREE FARM	12/00/86	Rb	10	127-152	N
87-262	Newton	Hood River	UPPER BALDWIN CREEK	08/17/87	Ct	10	45-175	N
87-024	Witty	Imnaha River	BIG SHEEP CREEK - 2 MILES ABOVE LITTLE SHEEP CREEK	02/05/87	Rb, StS	14	120-200	P
87-025	Witty	Imnaha River	IMNAHA RIVER - 3 MILES ABOVE BIG SHEEP CREEK	02/05/87	Ch	10	120-200	N
87-026	Witty	Imnaha River	IMNAHA RIVER - 3 MILES ABOVE BIG SHEEP CREEK	02/05/87	Rb, StS	11	120-200	P
87-027	Witty	Imnaha River	LITTLE SHEEP CREEK, RAIL CANYON	02/05/87	Rb, StS	8	120-200	P
87-028	Witty	Imnaha River	LITTLE SHEEP, RAIL CANYON	02/05/87	StS	4	220	N
87-087	Witty	Imnaha River	LITTLE SHEEP CREEK	04/00/87	StS	20	adults	N
87-120	Witty	Imnaha River	LITTLE SHEEP CREEK (WILD STOCK)	05/00/87	StS	6	adults	P
87-121	Witty	Imnaha River	LITTLE SHEEP CREEK (HATCHERY STOCK)	05/00/87	StS	60	adults	P
87-320	Witty	Imnaha River	IMNAHA RIVER	08/00/87	ChS	60	adult	P
87-033	Claire	John Day River	MOUNTAIN CREEK - 1 MILE BELOW ANTONE ROAD	02/09/87	Rb, wild StS	14	76-127	N
87-034	Claire	John Day River	S.F. JOHN DAY RIVER (MALHEUR FOREST BOUNDARY)	02/04/87	Rb	18	102-152	N
87-035	Claire	John Day River	S.F. JOHN DAY RIVER (1 MILE BELOW PINE CREEK)	02/04/87	Rb	19	76-203	N
87-036	Claire	John Day River	ROCK CREEK (WHEELER CO.)	02/09/87	Rb, StS	18	76-152	N
87-037	Claire	John Day River	CANYON CREEK (WICKIUP)	02/05/87	Rb	21	76-127	N
87-038	Claire	John Day River	CANYON CREEK (0.5 MI ABOVE CANYON CITY)	02/05/87	Rb	33	76-152	N
87-039	Claire	John Day River	UPPER ROCK CREEK	02/09/87	Rb, StS	18	76-203	N
87-046	Claire	John Day River	GRUB CREEK	02/13/87	Rb	28	76-203	N
87-047	Claire	John Day River	RUDIO CREEK	02/12/87	Rb, StS	19	76-203	N
87-048	Claire	John Day River	THIRTY MILE CREEK	02/12/87	Rb, StS	16	76-adult	N
87-086	Claire	John Day River	PATTERSON POND, JOHN DAY LUMBER CO.	03/23/87	Rb	10	305	P
87-094	Claire	John Day River	WAYNE BERRY POND	04/17/87	Rb	10	127	P
87-095	Claire	John Day River	TOWELL POND	04/00/87	Rb	12	unk	P
87-102	Claire	John Day River	JOHN DAY RIVER (RM 210)	05/00/87	Rb	8	152	N
87-109	Claire	John Day River	TOWILL POND	05/00/87	Br, Rb	15	>250	P
87-110	Claire	John Day River	JOE WEST - RICKMAN POND	05/00/87	Rb	15	203-254	P
87-111	Claire	John Day River	JOE WEST - RICKMAN POND	05/00/87	Rb	3	381-533	P

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APPENDIX G: CONTINUED

SAMPLE NO.	DISTRICT BIOLOGIST	WATERSHED	LOCATION	COLLECTION DATE	SPECIES	NO. FISH	FISH		RESULTS*
							SIZE (MM)	AGE	
87-137	Claire	John Day River	CLINT HARRIS POND	07/15/87	Rb	12	203-305		P
87-148	Claire	John Day River	BURGETT POND	07/00/87	Rb	10	305-381		P
87-149	Claire	John Day River	BERRY CREEK (ABOVE LOTT POND, WILD FISH)	07/00/87	Rb	15	102-152		N
87-150	Claire	John Day River	MAINSTREAM JOHN DAY, BYPASS TRAP	07/00/87	Rb	14	127-203		P/N
87-151	Claire	John Day River	GABLES POND	07/00/87	Rb	5	305-381		P
87-152	Claire	John Day River	LOTT POND	07/00/87	Bt	10	450		P
87-153	Claire	John Day River	ZICKLER POND	07/00/87	Rb	3	400		N
87-154	Claire	John Day River	JOHN HYDAM POND	07/31/87	Rb	10	300		P
87-155	Claire	John Day River	STAN PHILLIPS POND	08/02/87	Rb	15	102-152		P
87-156	Claire	John Day River	CONLEE POND (LITTLE PINE CREEK)	07/00/87	Rb/Bt	10	300		P
87-232	Claire	John Day River	MIDDLE FORK, JOHN DAY RIVER	08/04/87	Rb	13	102-229		N
87-233	Claire	John Day River	JACK JOHNS POND	08/00/87	Rb	8	200-300		P
87-234	Claire	John Day River	LONG CREEK AT HWY 395	08/00/87	Rb	15	120-170		N
87-235	Claire	John Day River	LONG CREEK AT BORGENSEN/ROGERS	08/00/87	Rb	17	120-200		N
87-236	Claire	John Day River	W. R. ROGERS POND	08/00/87	Rb	4	200-225		P
87-237	Claire	John Day River	W. R. ROGERS POND	08/00/87	Rb	4	200-225		P
87-238	Claire	John Day River	W. R. ROGERS POND	08/00/87	Rb	4	200-225		P
87-239	Claire	John Day River	W. R. ROGERS POND	08/00/87	Rb	4	250-300		N
87-240	Claire	John Day River	LEE WILSON POND	08/00/87	Rb	6	200-225		N
87-241	Claire	John Day River	WILSON'S POND, LOWER PINE CREEK	08/00/87	Rb/StS	13	150-200		N
87-242	Claire	John Day River	WILSON'S POND, UPPER PINE CREEK	08/00/87	Rb/StS	13	120-240		N
87-243	Claire	John Day River	FORK CREEK BELOW SMITH CREEK	08/00/87	Rb	13	150-250		N
87-244	Claire	John Day River	BEECH CREEK ABOVE WARM SPRING CREEK	08/07/87	Rb	15	120-150		N
87-245	Claire	John Day River	WILL REEVES POND (CUPPER CREEK DRAINAGE)	08/07/87	Rb	10	200-225		P
87-246	Claire	John Day River	BEECH CREEK BELOW WARM SPRINGS CREEK	08/07/87	Rb	16	120-150		N
87-247	Claire	John Day River	GERALD RUSSELL POND	08/07/87	Rb	8	200-250		N
87-277	Claire	John Day River	LARRY WADE POND	09/17/87	Rb	8	288-336		P
87-278	Claire	John Day River	KINZUA CORP. POND	09/00/87	Rb	8	384-432		P
87-279	Claire	John Day River	DITCH CREEK BELOW CUTSFORTH RESERVOIR	08/24/87	Rb/StS	14	102-203		N
87-280	Claire	John Day River	E. P. SMITH POND	09/17/87	Rb	4	180-200		N
87-281	Claire	John Day River	LIEMMAN'S POND	09/00/87	Rb	4	180		N
87-088	Hosford	Malheur River	LYLE VICKERS POND	03/31/87	Rb	1	adult		N
87-089	Hosford	Malheur River	LYLE VICKERS POND	04/10/87	Bt	2	adult		N
87-268	Hosford	Malheur River	NO. F. MALHEUR (ABOVE BEULAH RESERVOIR)	09/00/87	Rb	22	85-165		N
87-269	Hosford	Malheur River	NO. F. MALHEUR (BELOW BEULAH RESERVOIR)	09/00/87	Rb	20	254-430		N
87-270	Hosford	Malheur River	MALHEUR RIVER (MAINSTREAM)	09/02/87	Rb	18	85-430		N
87-267	Hosford	Malheur Lake	BLITZEN RIVER	07/25/87	Rb	8	85-430		P/N
87-271	Hosford	Malheur Lake	SILVIES RIVER (BELOW MYRTLE CREEK)	08/24/87	Rb	4	85-430		N
87-272	Hosford	Malheur Lake	SILVIES RIVER (RM 40)	08/20/87	Rb	8	85-430		N
87-273	Hosford	Malheur Lake	SILVIES RIVER (RM 51)	08/00/87	Rb	15	85-430		N
87-322	Hosford	Malheur Lake	CHICKAHOMINY RESERVIOR	06/00/87	Rb	1	360		N
87-106	Hosford	Mann Lake	MANN LAKE	05/00/87	Ct	12	adults		N
87-124	Hosford	Mann Lake	MANN LAKE	06/00/87	Rb	1	adults		N
87-090	Hosford	Owyhee River	OWYHEE RIVER, BELOW OWYHEE RESERVOIR	04/15/87	Rb	6	120-250		N

APPENDIX G: CONTINUED

SAMPLE NO.	DISTRICT	WATERSHED	LOCATION	COLLECTION DATE	SPECIES	NO. FISH	FISH		RESULTS*
							SIZE (MM)	AGE	
87-091	Hosford	Owyhee River	OWYHEE RIVER, BELOW OWYHEE RESERVOIR	04/15/87	Rb	4	>250		N
87-092	Hosford	Owyhee River	OWYHEE RIVER, BELOW OWYHEE RESERVOIR	04/15/87	Rb	7	<120		N
87-093	Hosford	Owyhee River	OWYHEE RIVER, 3 MILES BELOW OWYHEE RESERVOIR	03/28/87	Rb	2	unk		N
87-299	West	Pine Creek	NORTH PINE CREEK	08/05/87	Rb	11	65-130		P/N
87-305	West	Pine Creek	PINE CREEK (NEAR CORNUCOPIA)	09/05/87	Rb	10	65-240		N
87-162	West	Powder River	HAINES POND	07/24/87	Rb	8	302-254		N
87-164	West	Powder River	NORTH POWDER POND 1	07/23/87	Rb	6	203-279		N
87-165	West	Powder River	203 POND	07/24/87	Rb	7	203-254		N
87-166	West	Powder River	NORTH POWDER POND 2	07/23/87	Rb	6	203-279		P/N
87-172	West	Powder River	WEST EAGLE CREEK - MEADOWS FORK	07/28/87	Bt	11	102-178		N
87-176	West	Powder River	CRACKER CREEK	08/04/87	Rb	8	32-152		N
87-185	West	Powder River	WEST EAGLE CREEK	07/28/87	Rb	15	125-275		N
87-190	West	Powder River	EAGLE CREEK - POWDER RIVER	07/28/87	Rb	18	63-275		N
87-192	West	Powder River	EAGLE - POWDER RIVER	07/28/87	Bt	3	125-150		N
87-293	West	Powder River	TWIN LAKE	08/05/87	Bt	1	280		N
87-294	West	Powder River	CHERYL MARTIN POND	08/19/87	Rb	1	400		P
87-295	West	Powder River	DR. BILL HEISER POND	08/05/87	Rb	6	150-280		P
87-297	West	Powder River	WILBUR SULLEN'S POND	08/10/87	Rb	1	380		P
87-300	West	Powder River	FORREST SCHROEDER POND	08/10/87	Rb/Bt	8	115-215		P
87-301	West	Powder River	ROY DALGLEISH POND	08/19/87	Rb	1	210		P
87-302	West	Powder River	RUSSELL BRATCHER POND	09/00/87	Bt	3	180-280		P
87-303	West	Powder River	BOB BENNETT POND	08/10/87	Rb	2	350-450		P/N
87-306	West	Powder River	TWIN LAKE	08/05/87	Rb	1	190		N
87-307	West	Powder River	SULLEN POND	08/18/87	Rb	5	180-220		P
87-309	West	Powder River	WAYNE PHILLIPS POND	08/11/87	Bt	3	150-280		P
87-311	West	Powder River	WAYNE PHILLIPS POND	08/11/87	Bt	1	180		N
87-312	West	Powder River	TIM KERN POND	08/11/87	Bt	3	340-450		N
87-314a	West	Powder River	ELDON BUCKNER POND	08/05/87	Rb	5	250-300		P
87-328	Massey	Sandy River	SALMON RIVER (ARRAHA WANNA)	09/00/87	Rb	4	180		N
87-329	Massey	Sandy River	ALDER CREEK (TRIBUTARY TO SANDY RIVER)	09/01/87	Rb	6	120-220		N
87-330	Massey	Sandy River	MILL CREEK (TRIBUTARY TO SANDY RIVER)	09/01/87	Rb	5	120-220		P/N
87-040	Witty	Snake River	SLUICE CREEK (TRIBUTARY TO SNAKE RIVER)	02/19/87	Rb, StS	11	76-127		N
87-041	Witty	Snake River	TEMPERANCE CREEK (TRIBUTARY TO SNAKE RIVER)	02/19/87	Rb, StS	13	76-152		N
87-042	Witty	Snake River	SADDLE CREEK (TRIBUTARY SNAKE RIVER)	02/19/87	Rb, StS	16	102-152		N
87-043	Witty	Snake River	WOLF CREEK (TRIBUTARY SNAKE RIVER)	02/20/87	Rb, StS	8	76-102		N
87-044	Witty	Snake River	SNAKE RIVER	02/19/87	StS	3	adult		N
87-045	Witty	Snake River	SNAKE RIVER (HATCHERY ORIGIN)	02/19/87	Rb	3	200		N
87-073	Hosford	Snake River	CHUCK SYKES POND	04/02/87	1985 Rb	6	>300		N
87-074	Hosford	Snake River	CHUCK SYKES POND	04/02/87	1986 Rb	6	200		P
87-083	West	Snake River	OXBOW DAM HATCHERY	04/00/87	St	59	adults		N
87-107	West	Snake River	OXBOW DAM HATCHERY	04/00/87	StS	60	adults		N
86-018	Phelps	Umatilla River	IRRIGON HATCHERY	12/00/86	StS	60	127-152		N
87-079	Phelps	Umatilla River	LITTLE BUTTER CREEK	04/03/87	Rb	10	152-178		N
86-019	Wetherbee	Willamette River	CHARLES CRUSON POND (NORTH SANTIAM)	12/23/86	BT	16	104-178		P

APPENDIX G: CONTINUED

SAMPLE NO.	DISTRICT BIOLOGIST	WATERSHED	LOCATION	COLLECTION DATE	SPECIES	NO. FISH	FISH		RESULTS*
							SIZE (MM)	AGE	
87-002	Hutchison	Willamette River	WILLAMETTE HATCHERY	01/05/87	StW	10	120-150		N
87-014	Haxton	Willamette River	RAINBOW TROUT GARDENS	01/13/87	Rb	56	220		N
87-017	Haxton	Willamette River	R. VON POND, CARLTON, OR	12/00/86	Rb	12	76-203		N
87-018	Haxton	Willamette River	R. VON POND, CARLTON, OR	12/00/86	Rb, Bt	11	76-203		N
87-057	Massey	Willamette River	CLEAR CREEK TROUT FARM (TRIBUTARY TO CLACKAMAS RIVER)	01/05/87	Rb	6	305		N
87-058	Wetherbee	Willamette River	GOOSE NECK CREEK/MILE CREEK	03/00/87	Ch, Ct	2	120-250		N
87-062	Massey	Willamette River	LAMPA POND	03/16/87	Ko	5	203		N
87-063	Hutchison	Willamette River	MCKENZIE HATCHERY	03/03/87	ChS	60	150		N
87-064	Massey	Willamette River	KENNETT LAMPA POND	03/16/87	Ko	12	203		N
87-065	Wetherbee	Willamette River	LOWELL CREEK POND, NORTH SANTIAM RIVER	03/19/87	Bt	2	350-400		P
87-070	Wetherbee	Willamette River	SOUTH SANTIAM HATCHERY	03/00/87	ChS	18	150		N
87-071	Hutchison	Willamette River	LEABURG HATCHERY	03/00/87	Rb	57	150-250		N
87-072	Wetherbee	Willamette River	SOUTH SANTIAM HATCHERY	03/00/87	StS	30	180		N
87-075	Wetherbee	Willamette River	CRUSON POND (NORTH SANTIAM RIVER)	02/19/87	Rb	4	>200		N
87-076	Wetherbee	Willamette River	CRUSON POND (NORTH SANTIAM RIVER)	02/19/87	Bt	7	>200		P
87-096	Wetherbee	Willamette River	LOWELL CREEK POND, NORTH SANTIAM RIVER, MILL CITY	04/01/87	Rb	5	unk		N
87-112	Massey	Willamette River	KEN LAMPA POND (MCKAY CREEK)	03/28/87	Rb	2	400		N
87-119	Wetherbee	Willamette River	SOUTH SANTIAM HATCHERY	06/00/87	StS	30	adults		N
87-125	Wetherbee	Willamette River	ROCK CREEK	07/13/87	Rb, St	10	127		N
87-126	Wetherbee	Willamette River	MAD CREEK	07/13/87	Rb, St	10	127		N
87-127	Wetherbee	Willamette River	ELKHORN CREEK (TRIBUTARY OF NORTH SANTIAM RIVER)	07/14/87	Rb	8	102-127		N
87-130	Wetherbee	Willamette River	LOWELL CREEK POND (LIVE BOX HELD FISH)	07/16/87	StS	8	75-120		N
87-131	Wetherbee	Willamette River	CHARLES CRUSON POND (LIVE BOX HELD FISH)	07/16/87	StS	8	75-120		N
87-157	Wetherbee	Willamette River	CHARLES CRUSON POND (LIVE BOX HELD FISH)	08/05/87	StS	23	60		N
87-159	Haxton	Willamette River	GOOSENECK CREEK (WILD FISH)	07/22/87	Ct	10	76-203		N
87-160	Haxton	Willamette River	PANTHER CREEK (WILD FISH; TRIBUTARY TO N. YAMHILL)	07/00/87	Ct	7	76-203		N
87-161	Haxton	Willamette River	BULL CREEK(WILD FISH, TRIBUTARY TO MILK CREEK, MOLLALA)	07/00/87	Ct	12	76-203		N
87-257	Wetherbee	Willamette River	NORTH SANTIAM RIVER AT STAYTON, OR	07/24/87	Rb, St	11	120-150		N
87-258	Wetherbee	Willamette River	THOMAS CREEK (TRIBUTARY TO S. SANTIAM RIVER)	08/17/87	Rb, St	10	100-150		N
87-259	Wetherbee	Willamette River	STOUT CREEK (TRIBUTARY TO N. SANTIAM RIVER)	07/22/87	Rb, St	10	100-150		P/N
87-260	Wetherbee	Willamette River	NORTH SANTIAM RIVER (LYONS, OR)	07/24/87	Rb, St	29	85-225		P/N
87-261	Haxton	Willamette River	RICREALL CREEK	08/11/87	Co, StW, Ct	15	38-140		N
87-263	Haxton	Willamette River	RITNER CREEK (TRIBUTARY TO LUCKAMUTE RIVER)	08/31/87	Ct, Co	14	60-240		N
87-264	Wetherbee	Willamette River	CRUSON POND (LIVE BOX HELD FISH)	09/10/87	StS	8	89-152		N
87-265	Wetherbee	Willamette River	CREEK POND (LIVE BOX HELD FISH)	09/10/87	StS	27	102-140		N
87-274	Haxton	Willamette River	GREASY CREEK (TRIBUTARY TO MARYS RIVER)	09/14/87	Co, Ct, StW	15	67-200		P/N
87-275	Hutchison	Willamette River	WILLAMETTE, MID. FORK	09/17/87	Rb	19	140-240		N
87-276	Hutchison	Willamette River	MCKENZIE RIVER AT LEABURG DAM	09/15/87	Rb	19	130-230		P/N
87-317	Hutchison	Willamette River	DEXTER PONDS	10/12/87	ChS	60	160-180		N
87-318	Massey	Willamette River	CLACKAMAS HATCHERY	10/12/87	ChS	60	160-180		N
87-325	Massey	Willamette River	TUALATIN RIVER - LEE FALLS	09/03/87	Rb	15	50-280		N
87-331	Massey	Willamette River	GALES CREEK (TRIBUTARY TO TUALATIN RIVER)	10/21/87	Ct/Rb	16	145		N
87-332	Massey	Willamette River	COLLAWASH RIVER (TRIBUTARY TO CLACKAMAS RIVER)	10/23/87	Rb	16	110-150		N
87-333	Massey	Willamette River	CLACKAMAS RIVER	10/22/87	Rb	24	95-150		N

APPENDIX G: CONTINUED

SAMPLE NO.	DISTRICT BIOLOGIST	WATERSHED	LOCATION	COLLECTION DATE	SPECIES	NO. FISH	FISH		RESULTS*
							SIZE (MM)	AGE	
87-355	Wetherbee	Willamette River	CALAPOOIA RIVER	08/28/87	Rb/Ct	11	120-200		N
87-077	Phelps	Willow Creek	MARIE CANTON POND (HINTON CREEK)	04/02/87	Rb	8	254-305		P
87-078	Phelps	Willow Creek	KIT GEORGE POND (BALM CREEK)	04/02/87	Rb	6	254		P
87-080	Phelps	Willow Creek	THORN CREEK (TRIBUTARY TO RHEA CREEK)	04/03/87	Rb	10	152-178		N
87-081	Phelps	Willow Creek	BOB MAHONEY POND (SPRING HOLLOW CREEK)	04/02/87	Rb	10	76-127		P

APPENDIX H: LOCATIONS IN THE OREGON COLUMBIA RIVER DRAINAGE WHERE FISH WERE FOUND TO BE PRESUMPTIVELY POSITIVE FOR MYXOBOLUS CEREBRALIS OR CONTAINED SPORES OF SIMILAR MORPHOLOGY. SUMMARIZED FROM EXAMINATIONS CONDUCTED FROM DECEMBER, 1986 THROUGH MARCH, 1988.

SAMPLE NO.	DISTRICT	WATERSHED	LOCATION	COLLECTION DATE*	SPECIES	NO. FISH	FISH		RESULTS**
							SIZE (MM)	AGE	
87-304	West	Burnt River	SOUTH FORK BURNT RIVER	08/28/87	Rb	12	85-130		P/N
87-343	Massey	Columbia River	CLATSKANIE RIVER (TRIBUTARY TO LOWER COLUMBIA RIVER)	09/09/87	St	10	110-140		P/N
86-004	Witty	Grande Ronde River	LOSTINE RIVER (ABOVE STRATHERNS LAKE, INLET CANAL)	12/00/86	Rb	18	25-127		P
86-005	Witty	Grande Ronde River	LOSTINE RIVER (CHANNEL INTO STRATHERNS LAKE)	12/00/86	BT	20	76-152		P
86-009	Witty	Grande Ronde River	LOSTINE RIVER (COLEMAN SPRINGS)	12/00/86	Rb	8	76-152		P
86-014	Witty	Grande Ronde River	LOSTINE RIVER, 1 MILE FROM WALLOWA RIVER	12/00/86	Rb	19	76-127		P
86-016	Witty	Grande Ronde River	LOSTINE RIVER, 1 MILE FROM WALLOWA RIVER	12/00/86	ChS	2	76		P
87-016	Witty	Grande Ronde River	WALLOWA RIVER (APPROX. 3 MILES ABOVE WALLOWA HATCHERY)	01/00/87	Rb, Bt, ChS	20	152-203		P
87-020	Witty	Grande Ronde River	PRAIRIE CREEK 4-5 MILES ABOVE ENTERPRISE	01/00/87	Rb	14	102-adult		P
87-021	Witty	Grande Ronde River	WALLOWA RIVER AT ROCK CREEK, RM 19	01/26/87	Rb	9	120-220		P
87-022	Witty	Grande Ronde River	WALLOWA RIVER AT ROCK CREEK, RM 19	01/26/87	ChS	3	102-127		P
87-023	Witty	Grande Ronde River	WALLOWA RIVER RM. 34 BELOW HATCHERY	01/26/87	Rb	14	76-adult		P
87-066	Witty	Grande Ronde River	FRED CASADY POND	03/19/87	Rb, ChS, Bt	7	127-178		P
87-067	Witty	Grande Ronde River	FRED KAUP POND	03/19/87	Rb	2	adults		P
87-068	Witty	Grande Ronde River	E. VANBLARICOM - POND	03/19/87	Rb, Bt	10	152		P
87-082	Witty	Grande Ronde River	WALLOWA HATCHERY	04/08/87	Rb	60	200		P
87-085	Witty	Grande Ronde River	WALLOWA HATCHERY	04/00/87	StS	60	adults		P
87-097	Witty	Grande Ronde River	WALLOWA HATCHERY	04/29/87	Rb	28	250		P
87-098	Witty	Grande Ronde River	SPRING CREEK ABOVE WALLOWA HATCHERY	04/29/87	Rb, Bt, ChS	24	75-250		P
87-099	Witty	Grande Ronde River	DEER CREEK (BIG CANYON)	04/30/87	Rb	10	76-102		P
87-100	Witty	Grande Ronde River	RONSCHENCK POND	03/23/87	Rb, Bt	4	152		P
87-101	Witty	Grande Ronde River	BIG CANYON WEIR	04/30/87	StS	6	adults		P
87-103	Witty	Grande Ronde River	WALLOWA HATCHERY (1 SALTS, REARED AS JUVENILES AT LYONS FERRY, WA)	04/00/87	StS	15	adults		P
87-104	Witty	Grande Ronde River	WALLOWA HATCHERY (2 SALTS, REARED AS JUVENILES AT LYONS FERRY, WA)	04/00/87	StS	15	adults		P
87-105	Witty	Grande Ronde River	WALLOWA HATCHERY (1 SALTS, REARED AS JUVENILES AT IRRIGON HATCHERY)	04/00/87	StS	15	adults		P
87-113	Witty	Grande Ronde River	WALLOWA RIVER (1 MILE BELOW MINAM), RB PLANTS, 1986	06/04/87	Rb	1	320		P
87-114	Witty	Grande Ronde River	WALLOWA RIVER (MINAM TO RONDOWA)	06/04/87	Rb	2	320		P
87-115	Witty	Grande Ronde River	LOWER GRANDE RONDE RIVER	06/04/87	Rb	2	200-320		P
87-116	Witty	Grande Ronde River	UPPER GRANDE RONDE RIVER	06/04/87	Rb	1	>450		P
87-117	Witty	Grande Ronde River	UPPER GRANDE RONDE RIVER	06/04/87	Rb	1	320		P
87-132	Witty	Grande Ronde River	DON NEWARK (HURRICANE CREEK)	07/22/87	Rb	3	203-254		P
87-133	Witty	Grande Ronde River	CLYDE STONEBRINK POND	07/22/87	Rb	4	203-305		P
87-135	Witty	Grande Ronde River	SHILO RANCH POND	04/23/87	Rb	1	203-305		P
87-136	Witty	Grande Ronde River	SHILO RANCH POND	04/23/87	BT	6	203-305		P
87-142	Witty	Grande Ronde River	FRANK HEATH POND (LITTLE HURRICANE CREEK)	07/30/87	Rb	4	254-305		P
87-145	Witty	Grande Ronde River	FORD PETERSON POND	07/30/87	Rb, BT	5	254-457		P
87-158	Witty	Grande Ronde River	WALLOWA HATCHERY (MORTALITY)	07/00/87	Rb	7	152-178		P
87-163a	West	Grande Ronde River	TURNBULL PONDS	07/27/87	Rb	8	254-356		P

* Collection date refers to the day fish were obtained from each site. Those with a "00" date were collected sometime during the month, but actual day was not recorded.

** All positive results (P) are presumptively positive, i.e. spores of typical morphology were observed using the digestion method (AFS Blue Book); those marked P/N contain a few spores of appropriate M. cerebralis size, but morphologically were not quite typical. Both presumptive positive and P/N samples require histological examination for confirmation of spores within the cartilaginous tissue.

APPENDIX H: CONTINUED

SAMPLE NO.	DISTRICT BIOLOGIST	WATERSHED	LOCATION	COLLECTION DATE	SPECIES	NO. FISH	FISH		RESULTS*
							SIZE (MM)/	AGE	
87-167	West	Grande Ronde River	TOM CRAIG POND (MILL CREEK)	08/03/87	Rb	15	76-203		P
87-168	West	Grande Ronde River	DUANE SCHUBERT POND	08/04/87	Rb	1	419		P
87-170	West	Grande Ronde River	WILBUR SMITH POND (CATHERINE CREEK)	08/03/87	Rb	10	225-263		P
87-171	West	Grande Ronde River	G. ROYES POND	08/00/87	Rb	14	250-363		P
87-173	West	Grande Ronde River	LEE INSKO POND	08/04/87	Rb	10	213-275		P
87-175a	West	Grande Ronde River	DON HENDRICKS POND	08/04/87	Bt	4	400-475		P
87-175b	West	Grande Ronde River	DON HENDRICKS POND	08/04/87	Rb	4	400-475		P
87-178b	West	Grande Ronde River	ALBERT JACOBS POND (NEAR CATHERINE CREEK)	07/24/87	Rb	10	225-350		P
87-179	West	Grande Ronde River	R.D. MACGRAVEL CO. POND	07/29/87	Rb	10	175-225		P
87-182	West	Grande Ronde River	HERMAN YOUNG POND (NEAR LOOKINGGLASS CREEK)	07/29/87	Bt	6	200		P
87-183	West	Grande Ronde River	ELTON WILSON POND (NEAR CATHERINE CREEK)	07/24/87	Rb	10	350-425		P
87-184	West	Grande Ronde River	HERMAN YOUNG POND (NEAR LOOKINGGLASS CREEK)	07/29/87	Rb	5	175-250		P
87-186a	West	Grande Ronde River	LOOKINGGLASS CREEK	07/31/87	Rb/SIS	12	150		P
87-188	West	Grande Ronde River	RUSSEL PERRY POND (NEAR WILLOW CREEK)	07/24/87	Rb	8	250-325		P
87-194	West	Grande Ronde River	FLOYD FEIK POND (NEAR MILL CREEK)	07/31/87	Rb	10	229-267		P
87-195	West	Grande Ronde River	ELLIS SCOTT POND	07/27/87	Rb	7	254-305		P
87-197	West	Grande Ronde River	TOM CRAIG POND (NEAR MILL CREEK)	07/31/87	Rb	4	343-406		P
87-201	West	Grande Ronde River	MINAM RIVER AT MINAM BRIDGE	07/29/87	Rb/SIS	13	50-255		P
87-202	West	Grande Ronde River	DR EDGAR SHIROMA POND	07/26/87	Rb	9	254-356		P
87-203	West	Grande Ronde River	JOE JACOBS POND	07/24/87	Rb	11	152-356		P
87-204	West	Grande Ronde River	JAY WILSON POND	07/24/87	Rb	4	229-305		P
87-249	Witty	Grande Ronde River	LIGHTNING CREEK POND	08/06/87	Rb	2	152-203		P
87-250	Witty	Grande Ronde River	LARRY MILLER POND	08/03/87	3 Rb - 1 Bt	4	203-305		P
87-253	Witty	Grande Ronde River	MYRL DUNLAP POND	08/06/87	Rb	2	250-300		P
87-254	Witty	Grande Ronde River	LEO GOBLE POND	08/03/87	Rb	1	288-300		P
87-256	Witty	Grande Ronde River	DAVE CLOUGH POND	08/10/87	3 Rb, 1 Bt	4	279-430		P
87-296	West	Grande Ronde River	PETE HOFFMAN POND	08/10/87	Rb	3	250-360		P
87-308	West	Grande Ronde River	RON DAKE POND	08/11/87	Rb	10	180-280		P
87-314	Witty	Grande Ronde River	WYNAN'S POND (1985 BROOD)	10/01/87	Bt	5	150		P
87-321	West	Grande Ronde River	LOOKINGGLASS HATCHERY	08/00/87	Chs	18	adult		P
87-054	West	Grande Ronde River	CATHERINE CREEK NEAR UNION	02/00/87	Rb, SIS	14	102-152		P/N
87-177	West	Grande Ronde River	CHARLES WINGET POND	08/03/87	Rb	2	305-406		P/N
87-180	West	Grande Ronde River	CABIN CREEK (TRIBUTARY TO GRANDE RONDE)	07/31/87	Rb/SIS	18	50-175		P/N
87-187	West	Grande Ronde River	JAMES CAGLEY POND (NEAR NORTH CABIN CREEK)	07/31/87	Rb	1	200		P/N
87-189	West	Grande Ronde River	FRANK GOSHORN POND	07/31/87	Bt	3	250-300		P/N
87-024	Witty	Imnaha River	BIG SHEEP CREEK - 2 MILES ABOVE LITTLE SHEEP CREEK	02/05/87	Rb, SIS	14	120-200		P
87-026	Witty	Imnaha River	IMNAHA RIVER - 3 MILES ABOVE BIG SHEEP CREEK	02/05/87	Rb, SIS	11	120-200		P
87-027	Witty	Imnaha River	LITTLE SHEEP CREEK, RAIL CANYON	02/05/87	Rb, SIS	8	120-200		P
87-120	Witty	Imnaha River	LITTLE SHEEP CREEK (WILD STOCK)	05/00/87	SIS	6	adults		P
87-121	Witty	Imnaha River	LITTLE SHEEP CREEK (HATCHERY STOCK)	05/00/87	SIS	60	adults		P
87-320	Witty	Imnaha River	IMNAHA RIVER	08/00/87	Chs	60	adult		P
87-086	Claire	John Day River	PATTERSON POND, JOHN DAY LUMBER CO.	03/23/87	Rb	10	305		P
87-094	Claire	John Day River	WAYNE BERRY POND	04/17/87	Rb	10	127		P
87-095	Claire	John Day River	TOWELL POND	04/00/87	Rb	12	unk		P

APPENDIX H: CONTINUED

SAMPLE NO.	DISTRICT BIOLOGIST	WATERSHED	LOCATION	COLLECTION DATE	SPECIES	FISH		
						NO. FISH	SIZE (MM)/ AGE	RESULTS*
87-109	Claire	John Day River	TOWILL POND	05/00/87	Br, Rb	15	>250	P
87-110	Claire	John Day River	JOE WEST - RICKMAN POND	05/00/87	Rb	15	203-254	P
87-111	Claire	John Day River	JOE WEST - RICKMAN POND	05/00/87	Rb	3	381-533	P
87-137	Claire	John Day River	CLINT HARRIS POND	07/15/87	Rb	12	203-305	P
87-148	Claire	John Day River	BURGETT POND	07/00/87	Rb	10	305-381	P
87-151	Claire	John Day River	GABLES POND	07/00/87	Rb	5	305-381	P
87-152	Claire	John Day River	LOTT POND	07/00/87	Bt	10	450	P
87-154	Claire	John Day River	JOHN HYDAM POND	07/31/87	Rb	10	300	P
87-155	Claire	John Day River	STAN PHILLIPS POND	08/02/87	Rb	15	102-152	P
87-156	Claire	John Day River	CONLEE POND (LITTLE PINE CREEK)	07/00/87	Rb/Bt	10	300	P
87-233	Claire	John Day River	JACK JOHNS POND	08/00/87	Rb	8	200-300	P
87-236	Claire	John Day River	W. R. ROGERS POND	08/00/87	Rb	4	200-225	P
87-237	Claire	John Day River	W. R. ROGERS POND	08/00/87	Rb	4	200-225	P
87-238	Claire	John Day River	W. R. ROGERS POND	08/00/87	Rb	4	200-225	P
87-245	Claire	John Day River	WILL REEVES POND (CUPPER CREEK DRAINAGE)	08/07/87	Rb	10	200-225	P
87-277	Claire	John Day River	LARRY WADE POND	09/17/87	Rb	8	288-336	P
87-278	Claire	John Day River	KINZUA CORP. POND	09/00/87	Rb	8	384-432	P
87-150	Claire	John Day River	MAINSTREAM JOHN DAY, BYPASS TRAP	07/00/87	Rb	14	127-203	P/N
87-267	Hosford	Malheur Lake	BLITZEN RIVER	07/25/87	Rb	8	85-430	P/N
87-299	West	Pine Creek	NORTH PINE CREEK	08/05/87	Rb	11	65-130	P/N
87-294	West	Powder River	CHERYL MARTIN POND	08/19/87	Rb	1	400	P
87-295	West	Powder River	DR. BILL HEISER POND	08/05/87	Rb	6	150-280	P
87-297	West	Powder River	WILBUR SULLEN'S POND	08/10/87	Rb	1	380	P
87-300	West	Powder River	FORREST SCHROEDER POND	08/10/87	Rb/Bt	8	115-215	P
87-301	West	Powder River	ROY DALGLEISH POND	08/19/87	Rb	1	210	P
87-302	West	Powder River	RUSSELL BRATCHER POND	09/00/87	Bt	3	180-280	P
87-307	West	Powder River	SULLEN POND	08/18/87	Rb	5	180-220	P
87-309	West	Powder River	WAYNE PHILLIPS POND	08/11/87	Bt	3	150-280	P
87-314a	West	Powder River	ELDON BUCKNER POND	08/05/87	Rb	5	250-300	P
87-166	West	Powder River	NORTH POWDER POND 2	07/23/87	Rb	6	203-279	P/N
87-303	West	Powder River	BOB BENNETT POND	08/10/87	Rb	2	350-450	P/N
87-330	Massey	Sandy River	MILL CREEK (TRIBUTARY TO SANDY RIVER)	09/01/87	Rb	5	120-220	P/N
87-074	Hosford	Snake River	CHUCK SYKES POND	04/02/87	1986 Rb	6	200	P
86-019	Wetherbee	Willamette River	CHARLES CRUSON POND (NORTH SANTIAM)	12/23/86	BT	16	104-178	P
87-065	Wetherbee	Willamette River	LOWELL CREE POND, NORTH SANTIAM RIVER	03/19/87	Bt	2	350-400	P
87-076	Wetherbee	Willamette River	CRUSON POND (NORTH SANTIAM RIVER)	02/19/87	Bt	7	>200	P
87-259	Wetherbee	Willamette River	STOUT CREEK (TRIBUTARY TO N. SANTIAM RIVER)	07/22/87	Rb, St	10	100-150	P/N
87-260	Wetherbee	Willamette River	NORTH SANTIAM RIVER (LYONS, OR)	07/24/87	Rb, St	29	85-225	P/N
87-274	Haxton	Willamette River	GREASY CREEK (TRIBUTARY TO MARYS RIVER)	09/14/87	Co, Ct, St/W	15	67-200	P/N
87-276	Hutchison	Willamette River	MCKENZIE RIVER AT LEABURG DAM	09/15/87	Rb	19	130-230	P/N
87-077	Phelps	Willow Creek	MARIE CANTON POND (HINTON CREEK)	04/02/87	Rb	8	254-305	P
87-078	Phelps	Willow Creek	KIT GEORGE POND (BALM CREEK)	04/02/87	Rb	6	254	P
87-081	Phelps	Willow Creek	BOB MAHONEY POND (SPRING HOLLOW CREEK)	04/02/87	Rb	10	76-127	P

APPENDIX I

Table 1. Water sampling plan for Oregon Department of Fish and Wildlife rearing facilities, Task 4.1 of BPA augmented fish health monitoring^a.

<u>Facility</u>	<u>Water Source to be Tested</u>
Aumsville	1. Aumsville Canal
Stayton Ponds	1. North Santiam River
Big Creek Hatchery	1. Big Creek 2. Mill Creek 3. Upper Spring supply to hatchery building 4. Lower Spring supply to hatchery building
Big Canyon Creek Pond	1. Big Canyon Creek
Bonneville Hatchery	1. Tanner Creek 2. Wells (7)
Cascade Hatchery	1. Eagle Creek
Clackamas Hatchery	1. Clackamas River 2. Well
Dexter Ponds	1. Middle Fork of Willamette River
Gnat Creek Hatchery	1. Gnat Creek 2. Spring Creek
Imnaha Pond	1. Imnaha River
Irrigon Hatchery	1. Wells (2)
Klaskanine Hatchery	1. North Fork Klaskanine River
Lookingglass Hatchery	1. Lookingglass Creek 2. Wells (4)
Leaburg Hatchery	1. McKenzie River 2. Well
Little Sheep Creek Pond	1. Little Sheep Creek
Marion Forks Hatchery	1. Marion Creek 2. Horn Creek
McKenzie Hatchery	1. McKenzie River 2. Cogswell Creek
Oak Springs Hatchery	1. Springs (3)

^aOregon Department of Fish and Wildlife personnel will collect water samples twice annually from each water supply source listed in Table 1. With surface water supplies, one sample will be collected during seasonal high flow and the other at low flow. Wells and springs will be sampled in the winter and summer. Samples will be collected, labelled, preserved, and shipped to BPA designated location(s) for chemical analyses as per contractor (other than ODFW) instructions. A complete list of water parameters, frequency of testing and responsible parties are shown in Table 2.

APPENDIX I. Continued

<u>Facility</u>	<u>Water Source to be Tested</u>
Oxbow Hatchery	1. Oxbow Springs 2. Herman Creek
Roaring River Hatchery	1. RoaringRiver 2. Well
Round Butte Hatchery	1. Spring 2. Deschutes River
Sandy Hatchery	1. Cedar Creek 2. Spring
South Santiam Hatchery	1. South Santiam River
Trojan Ponds	1. Columbia River
Wahkeena Pond	1. Mist Falls Creek
Wallowa Hatchery	1. Wallowa River (via Clear Creek) 2. Upper spring 3. Lower spring 4. Spring Creek 5. Wells (2) 6. Wells (4)
Willamette Hatchery	1. Salmon Creek

APPENDIX I. Continued

Table 2. List of water parameters to be tested in Oregon Department of Fish and Wildlife rearing facility water supplies.

<u>Parameters</u>	<u>Frequency Tested</u>	<u>Responsbile Party</u>
Total dissolved gas	Twice/year	ODFW
Dissolved nitrogen	Twice/year	ODFW
Dissolved oxygen ^a	Weekly	ODFW
Temperature	Daily	ODFW
pH	Monthly	ODFW
Flow	Monthly	ODFW
Total hardness (as CaCO ₃)	Twice/year	Contractor ^b
Total alkalinity (as CaCO ₃)	Twice/year	Contractor
Total dissolved solids	Twice/year	Contractor
Total settleable solids	Twice/year	Contractor
Total suspended solids	Twice/year	Contractor
Ammonia	Twice/year	Contractor
Nitrate	Twice/year	Contractor
Nitrite	Twice/year	Contractor
Copper	Twice/year	Contractor
Zinc	Twice/year	Contractor
Lead	Twice/year	Contractor
Cadmium	Twice/year	Contractor
Mercury	Twice/year	Contractor
Iron	Twice/year	Contractor
Manganese	Twice/year	Contractor
Chromium	Twice/year	Contractor
Magnesium	Twice/year	Contractor
Aluminum	Twice/year	Contractor
Arsenic	Twice/year	Contractor
Barium	Twice/year	Contractor
Chloride	Twice/year	Contractor
Fluoride	Twice/year	Contractor
Nickel	Twice/year	Contractor
Potassium	Twice/year	Contractor
Selenium	Twice/year	Contractor
Sodium	Twice/year	Contractor
Silver	Twice/year	Contractor
Sulfate	Twice/year	Contractor
Other		
Petroleum	Twice/year	Contractor
Hydrogen sulfide	Twice/year	Contractor
Silica dioxide	Twice/year	Contractor
Carbon dioxide	Twice/year	Contractor
Polychlorinated biphenyls (PCB's)	Twice/year	Contractor
Organophosphates	Twice/year	Contractor
Herbicides, pesticides, defoliant	Twice/year	Contractor

^a Sampled influent water and effluent at heaviest stocked pond at warmest daily temperature period.

^b Chemical analyses performed by a contractor designated by BPA.