STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

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April 9, 1991

TO: Gerry Jewett, Bob Barwin and Carl Nuechterlein

THROUGH: Bill Yake

FROM: Dave Serdar, Art Johnson and Stuart Magoon

SUBJECT: Second Progress Report on Ecology's Dioxin/Furan Survey of the Middle Columbia River.

The Washington Department of Ecology (Ecology) is conducting a survey of polychlorinated dioxins and furans in the Middle Columbia River in response to concerns over possible contamination with these compounds. The purpose of the survey is to:

1) measure concentrations of dioxins and furans in edible sportfish species from popular fishing areas;

2) determine concentration gradients of dioxins and furans in the Columbia using sediments and bottom fish; and

3) assess the occurrence and concentrations of dioxins and furans in major tributaries.

This report summarizes the status of the project and provides analytical results of thirty sportfish samples. Field work for the project was completed in November 1990. A total of 46 sportfish, 9 bottom fish, and 9 sediment samples were collected from 11 sites (Figure 1). Dioxin, furan and other chemical analyses (EPA xenobiotics) of bottom fish and sediment samples will be done by EPA's Environmental Research Laboratory in Duluth, Minnesota. These are tentatively scheduled for completion by the end of March 1991. Sixteen sportfish samples are still awaiting analysis. The results should be available in mid-to-late April 1991. Table 1 shows the status of sportfish analyses.

Results of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and 2,3,7,8-tetrachlorodibenzofuran (TCDF) analyses of the thirty sportfish samples are presented in Table 2. Twenty-two samples are from the Middle Columbia and eight samples are from background locations.

Five composite fall-run chinook salmon samples collected from the Priest Rapids Spawning Channel had low to non-detectable levels of TCDD and low levels of TCDF. Toxicity Equivalents, or TEQs*, ranged from 0.2 to 0.9 parts per trillion (ppt). Concentrations are consistent with those previously reported in spring-run chinook from the Leavenworth National Fish Hatchery (Serdar *et al.*, 1991). Data on background TCDD and TCDF concentrations in anadromous species is provided by analysis of five returning chinook samples from the Columbia River Mouth. TCDD was not detected in these samples and TCDF concentrations were low (0.3 - 1.3 ppt).

Five individual white sturgeon collected from Lake Wallula had a mean TCDD concentration of 3.4 ppt (range = 2.1 - 5.2 ppt) and mean TCDF of 57.5 ppt (range = 29.8 - 87.4 ppt). Mean TEQs of the Ecology samples (9.2 ppt) were comparable to those found in Lake Wallula sturgeon in a study done for the Northwest Pulp and Paper Association (8.0 ppt) (Beak Consultants, Inc., 1989). Sample No. 458164 had the highest TEQ (12.7 ppt) and will be re-analyzed for all 2,3,7,8-substituted polychlorinated dioxins and furans.

Rainbow trout, walleye and lake whitefish samples were obtained from Rufus Woods Lake, the furthest upstream collection site in the Middle Columbia survey. Lake whitefish from this site contain the highest TEQs of any Mid-Columbia samples analyzed to date (14.3 and 18.4 ppt). One lake whitefish sample (368108) was analyzed for all 2,3,7,8-substituted dioxins and furans. However, TCDD and TCDF were the only congeners detected. Mean TEQs for Rufus Woods walleye and rainbow trout were 0.8 and 0.6 ppt, respectively. A detailed discussion of Rufus Woods results are contained in Ecology's Lake Roosevelt report (Johnson *et al.*, in prep) which is scheduled for release this month.

Three mountain whitefish samples from Lake Wenatchee serve as background for resident sportfish species. TCDD was not detected and TCDF was low (0.2 - 0.4 ppt).

All results have been transmitted to Department of Health for a human health risk assessment. A draft of the final Middle Columbia report should be completed by the end of April 1991.

DS:krc

cc: Steve Hunter, Steve Saunders, Dick Cunningham, Jim Krull, Patrick Spurgin, Norm Glenn, Lynn Singleton, Dick Burkhalter, Will Kendra, Mike Lewellyn

* Note - TEQs are used to convert toxicities of polychlorinated dioxin and furan congeners to that of TCDD. Each congener is assigned a factor relative to the toxicity of TCDD. For example, TCDF is assigned a factor of 0.1 (1/10 the toxicity of TCDD) and TCDD is assigned a factor of 1. In this report, TEQs are calculated using the formula TCDD + (0.1)TCDF.

REFERENCES

Beak Consultants, Incorporated. Columbia River Fish Study: Fish Collection, Fish Tissue, and Age of Fish Sampled, for Northwest Pulp and Paper Association, Bellevue, WA, 1989.

Johnson, A, D. Serdar, and S. Magoon. (in prep). Polychlorinated Dioxins and Furans in Lake Roosevelt (Columbia River) Sportfish, 1990. Washington Department Ecology.

Serdar, D., A. Johnson, and S. Magoon. First Progress Report on Ecology's Dioxin/Furan Survey of the Middle Columbia River. Washington Department Ecology, 1991.

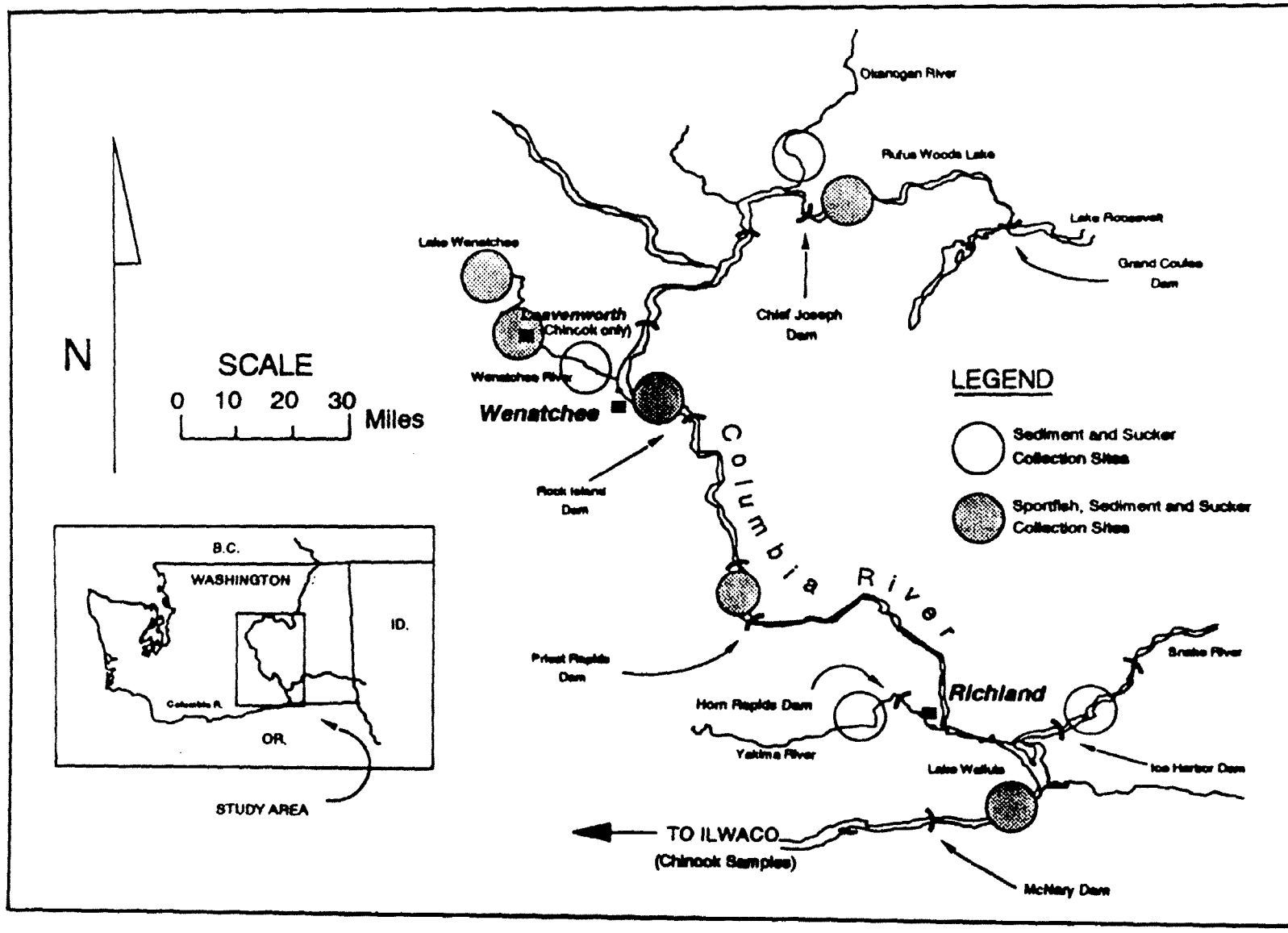

Figure 1. Location of Fish and Sediment Sampling Sites

Table 1. Status of TCDD/TCDF Analysis of Middle Columbia Sportfish as of March, 1991.

LOCATION	SPECIES	SAMPLE SIZE	ANALYSIS	
			COMPLETED	PENDING
Rufus Woods Lake	Walleye	2 (5)	2	0
	Rainbow Trout	3 (5)	3	0
	Lake Whitefish	2 (5)	2	0
Rock Island	Walleye	2 (5)	0	2
	Lake Whitefish	1 (2)	0	1
Priest Rapids	Smallmouth Bass	1 (2)	0	1
	Carp	3 (5)	0	3
	Chinook	5 (4)	5	0
Lake Wallula	Largemouth Bass	2 (5)	0	2
	Carp	3 (5)	0	3
	Channel Catfish	3 (5)	0	3
	White Sturgeon	5 (1)	5	0
Lake Wenatchee	Mountain Whitefish	3 (5)	3	0
	Rainbow Trout	1 (4)	0	1
Leavenworth Hatchery	Chinook	5 (4)	5	0
Ilwaco (River Mouth)	Chinook	5 (4)	5	0
	totals =	46	30	16

Note: Figure in parenthesis corresponds to number of fish composited in each sample

Table 2. TCDD and TCDF Concentrations in Sportfish Muscle Tissue Collected May - November, 1990 [concentrations in parts per trillion (ng/kg), wet weight basis; each sample a 5 fish composite except for chinook (4) and sturgeon (1)].

Sample No.	Species	Mean Length (mm)	Mean Weight (g)	Percent Lipid	2,3,7,8-TCDD	2,3,7,8-TCDF	TEQ
			LEAVENWORTH HATCHERY				
218005	Spring Chinook	834	6001	5.0	ND (0.6)	2.3	0.5
218006	Spring Chinook	841	6178	1.7	0.2 EMPC	1.1	0.3
218007	Spring Chinook	866	6838	9.3	0.2 EMPC	1.8	0.4
218008	Spring Chinook	862	6002	8.6	ND (0.1)	1.3	0.2
218009	Spring Chinook	858	5958	4.2	0.2 EMPC	1.1	0.3
			PRIEST RAPIDS HATCHERY				
448090	Fall Chinook	912	N/A	3.7	ND (0.1)	3.8	0.4
448091	Fall Chinook	808	N/A	1.9	ND (0.1)	2.7	0.2
448092	Fall Chinook	905	N/A	4.0	ND (0.1)	3.2	0.4
448093	Fall Chinook	863	N/A	3.6	0.2 EMPC	5.3	0.7
448094	Fall Chinook	1000	N/A	5.4	0.2 EMPC	7.8	0.9
			COLUMBIA RIVER MOUTH (BACKGROUND SAMPLES)				
398180	Fall Chinook	941	11180	9.6	ND (0.5)	1.3	0.4
398181	Fall Chinook	972	11272	8.5	ND (0.2)	0.6	0.2
398182	Fall Chinook	882	9102	4.0	ND (0.2)	0.3 EMPC	0.1
398183	Fall Chinook	908	10102	4.8	ND (0.3)	0.8	0.2
398184	Fall Chinook	862	9166	6.0	ND (0.1)	0.7	0.1
			RUFUS WOODS LAKE				
368110	Walleye	474	1169	0.5	ND (0.4)	1.7	0.4
368111	Walleye	445	898	0.9	ND (1.8)	3.6	1.3
368105	Rainbow Trout	329	427	1.8	0.2 EMPC	4.5	0.6
368106	Rainbow Trout	317	356	1.4	0.2 EMPC	3.6	0.6
368107	Rainbow Trout	315	353	1.6	0.2 EMPC	4.9	0.7
368108	Lake Whitefish	500	1578	10.5	2.2	163	18.4
368109	Lake Whitefish	520	1582	8.0	2.1	122	14.3
			LAKE WALLULA				
458163	Sturgeon	1118	6810	4.0	5.2	29.8	8.2
458164	Sturgeon	1219	8626	7.0	4.2	84.6	12.7
458165	Sturgeon	1245	10442	8.5	3.0	87.4	11.8
458166	Sturgeon	1219	9534	4.2	2.7	38.6	6.6
458167	Sturgeon	1118	6356	6.1	2.1	47.1	6.8
			LAKE WENATCHEE (BACKGROUND SAMPLES)				
398185	Mt. Whitefish	319	392	5.5	ND (0.3)	0.4 EMPC	0.2
398186	Mt. Whitefish	297	287	4.0	ND (0.2)	0.2	0.1
398187	Mt. Whitefish	305	284	2.6	ND (0.1)	0.3	0.1

N/A = Not Available
ND = Not Detected; detection limits shown in parenthesis
EMPC = Estimated Maximum Possible Concentration
TEQ = 2,3,7,8-TCDD Toxic Equivalents [TCDD + (0.1)TCDF]
Note: Where TCDD not detected, 1/2 detection limit used for TEQ calculation