FINAL REPORT
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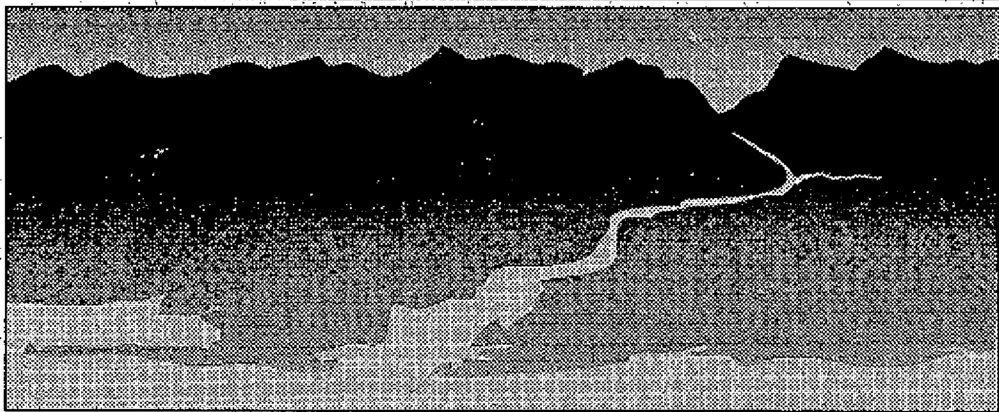
LOWER COLUMBIA RIVER



BI-STATE PROGRAM

ASSESSING HUMAN HEALTH RISKS FROM CHEMICALLY CONTAMINATED FISH IN THE LOWER COLUMBIA RIVER

RISK ASSESSMENT

MAY 1, 1996

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LOWER COLUMBIA RIVER WATER QUALITY STUDY

WASHINGTON STATE DEPARTMENT OF ECOLOGY

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY

WASHINGTON DEPARTMENTS OF ECOLOGY AND HEALTH
AND
OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY
AND HEALTH DIVISION

May 1, 1996

We are pleased to provide you with the Lower Columbia River Bi-State Water Quality Program study, "Assessing Human Health Risks from Chemically Contaminated Fish in the Lower Columbia River: Risk Assessment." As a background to the report, we offer the following information.

What is a human health risk assessment?

Human health risk assessment is a process that is used to evaluate the potential harmful effects caused by exposure to hazardous chemicals. A risk assessment evaluates the toxic properties of the chemicals present and the conditions of exposure in order to determine whether the health of people exposed will be affected.

What was the purpose of the Bi-State Program risk assessment study?

The Lower Columbia River Bi-State Program conducted the study because earlier studies showed that fish caught in the lower Columbia River contained chemicals known to be harmful to people's health. The purpose of the study was to determine the extent to which these chemicals accumulate in fish tissues, whether they accumulate differently in different kinds of fish, and whether the contaminant levels are high enough to harm the health of people who eat fish.

What are the results of the Bi-State Program risk assessment study?

The results of the study indicate that there may be some cause for concern about the concentrations of certain chemicals in fish tissues. The study showed that several chemicals of concern, in particular dioxins and furans, PCBs, DDT and derivatives, mercury, and arsenic, are found at levels of potential concern in both resident and migratory fish caught in the lower Columbia. These chemicals can cause cancer and/or non-cancer effects in people if ingested in large enough doses. In general, migratory salmonids contained the lowest levels of the contaminants, while bottom feeding resident fish contained higher levels.

How are health and environmental agencies using the results?

The health agencies used the information to perform a health analysis, in which they looked at fish consumption, health sensitivities, and other factors that are important when determining the possible effects to individuals from eating lower Columbia River fish. For example, certain individuals, such as children, pregnant and nursing women, older people, and those in poor health may be more sensitive than other people to certain contaminants. On the other hand, for certain people, the health benefits from eating fish may outweigh increased risks. For example, eating fish has been shown to have important beneficial effects on the heart and circulatory system.

The health analysis, which is in the form of a short report, is available from the Health Departments. It includes information on actions fish consumers can take to reduce their exposure to fish contaminants, such as preparing and cooking fish in a certain way or avoiding particular species of fish. The health analysis should help fish consumers understand the health implications of the risk assessment results and allow them to use this information to make personal decisions about whether they should modify their current fish consumption and cooking habits.

The environmental agencies consider the entire ecosystem when using the risk assessment information because environmental damage may occur even when there is no obvious threat to human health. They commonly adopt water or air quality standards designed to protect the most vulnerable people, to preserve overall ecosystem health, and to prevent the build-up of pollutants in the future. Without this protective approach, environmental agencies could not adequately protect and maintain a healthy environment, which includes a sustained and genetically diverse ecosystem and healthy wildlife and human populations.

What's next?

The study results raise several questions that the environmental agencies will be attempting to answer:

* Some of the chemicals detected (e.g. DDT and derivatives, PCBs) are no longer being manufactured. Are these chemicals simply persisting in the environment, or are there still sources that can be identified and controlled?
* Although the study examined fish that were caught in the lower Columbia River, it is not known for certain that the chemicals the fish were exposed to are all from the lower river. Salmon, for instance, may have been exposed in the upper part of the river, in tributaries, or in the ocean. Where are the pollutants coming from? Where are fish being exposed to them?

To address these issues, the environmental agencies will:

* Continue the work they've begun to identify the likely sources of pollutants of concern;
* Evaluate the effectiveness of current pollution control programs at reducing loadings of these pollutants to the Columbia River;
* Determine the most effective and efficient ways to further reduce loadings and availability of these pollutants;
* Continue monitoring to further refine our information and to assess the success of further pollutant reduction measures.

Copies of the Bi-State human health risk assessment are available from:

Don Yon, Oregon Department of Environmental Quality, (503) 229-5995
Helen Bresler, Washington Department of Ecology, (360) 407-6480
For telecommunication device for the deaf (TDD), (360) 407-6006

Copies of the health analysis are available from:

Denise Laflamme, Washington Department of Health, (360) 753-2410
Duncan Gilroy, Oregon Health Division, (503) 731-4015
TDD, 1-800-833-6388

ACKNOWLEDGMENTS

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Several subcontractors provided support for laboratory activities. The following laboratories provided analytical services for this project:

- Alden Analytical Labs - semivolatile organics, pesticides/PCBs
- Analytical Resources, Inc. - semivolatile organics, pesticides/PCBs, radionuclides
- Aquatic Research, Inc. - metals
- Battelle Marine Science Lab - metals
- Keystone/NEA - dioxins/furans
- Pacific Analytical, Inc. - dioxins/furans, polybutyl tins, semivolatile organics, pesticides/PCBs
- Precision Analytical, Inc. - metals
- Triangle Labs - dioxins/furans

This report was reviewed by members of the Lower Columbia River Bi-State Steering Committee. Additional comments, which have been addressed in this report, were received from the Human Health Risk Work Group created by the Bi-State Program and peer reviewers selected by the Bi-State Program.

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INTRODUCTION

This report examines potential risks to human health of eating fish from the lower Columbia River. The chemical concentration data used in this risk assessment are from three separate surveys, which are described in the section entitled, "Methods."

All three of the surveys and this report were sponsored by the Lower Columbia River Bi-State Water Quality Program (Bi-State Program), which was formed by the Oregon and Washington state legislatures in 1990 to study and document the water quality in the lower Columbia River, identify water quality problems, determine whether beneficial uses of the river are impaired, and develop solutions to problems identified in the river below Bonneville Dam. The Bi-State Program established a Human Health Risk Work Group (HHRWG) in March 1993 to recommend how an assessment should be conducted to determine whether contaminants in the river pose a risk to human health. The HHRWG was composed of representatives from Oregon and Washington Departments of Health, U.S. Environmental Protection Agency, Oregon Department of Environmental Quality, Washington Department of Ecology, Tetra Tech Inc., and individuals nominated to represent industrial and environmental interest groups. The technical approach to the risk assessment was approved by the HHRWG.

METHODS

Data for this report were collected in three separate surveys. The first two surveys, conducted during the summers of 1991 and 1993, were not specifically designed as human health risk assessment surveys, but included chemical analyses of whole-body samples of carp, crayfish, largescale sucker, peamouth, and filets of white sturgeon that could be used in this assessment. A more recent survey, designed specifically to collect human health risk assessment data, collected and analyzed filets of carp, largescale sucker, white sturgeon, steelhead trout, coho salmon, and chinook salmon during the period September 1994-February 1995.

The five different species collected during the first two surveys were selected because their feeding habits and high fat content meant that chemicals which were present in sediments could potentially bioaccumulate in their tissue. One of the objectives of these two surveys was to determine the concentrations of chemicals in the fish tissue to which fish-eating wildlife, such as mink and bald eagles, could be exposed. Thus the collection of whole-body samples was considered more appropriate than the collection of filet samples. Filet samples were however collected for white sturgeon because the large size of these fish makes them unlikely targets for fish-eating predators.

Designing the risk survey conducted in 1994-95 required several preliminary tasks. Fish species to be included in the risk assessment were selected by reviewing existing tissue contaminant data (1984-1994) for the lower Columbia River and by surveying fishing professionals (such as guides and fishing shop owners). Chemicals analyzed were selected by screening the tissue contaminant database for chemicals which have been previously detected at concentrations high enough to warrant concern regarding human health. The survey of fishing professionals indicated that white sturgeon, walleye, smallmouth bass, chinook and coho salmon, and steelhead were commonly caught and consumed by recreational fishers on the lower Columbia. Although included in the study design, walleye or bass could not be caught for the study because of the time of year (the study design called for collecting fish in late summer and fall, but the actual collection had to be delayed until winter, when fish were less accessible). In addition to gamefish, samples of largescale sucker and carp were collected and analyzed. Including both game and non-game species was intended to represent the fishing and dietary practices of many different populations, not just recreational fishers with boats.

Several different methods were used to collect the fish and crayfish. Largescale sucker, carp, steelhead, and peamouth were captured using a boat-mounted electrofishing unit. Peamouth were also captured using a sinking gill net, as were the white sturgeon. In 1995, white sturgeon were captured by hook-and-line from a boat. Adult chinook and coho salmon were collected from state hatcheries on both Oregon and Washington tributaries of the lower Columbia. Crayfish were collected using traps baited with cat food. For all the fish species except sturgeon, five or more individual fish or fish filets (with skin) were composited to form single samples. Analyzing composite samples is a cost-effective way to estimate average chemical concentrations in a large number of fish. Individual samples of sturgeon filets (without skin) were analyzed because of the difficulty in capturing large numbers of these fish. A total of 104 fish samples were analyzed during the three surveys. Samples from all years were analyzed for metals, semi-volatile organic compounds, dioxins and furans, and pesticides and PCBs. Samples from 1993 were also analyzed for radionuclides and butyltins.

THE RISK ASSESSMENT PROCESS

Risk assessment involves five steps: 1) hazard identification, 2) toxicity assessment, 3) exposure assessment, 4) risk characterization, and 5) uncertainty analysis. Each of these steps will be discussed briefly below.

- **Hazard identification** is determining which chemicals are potentially of concern. This was done by examining available data on contaminants in the lower Columbia to identify which hazardous chemicals might be present even at very minimal levels.

- **Exposure assessment** is determining how much fish people eat at a time and how often they eat it (ingestion rate), for how many years they eat fish (exposure duration), and what parts of the fish are eaten (fillet, eggs, etc.). For this project, exposure durations of 30 and 70 years were chosen to represent resident and subsistence fishers, respectively, of the lower Columbia River Basin. The study used ingestion rates recommended by the HHRWG which ranged from almost zero to 40 meals per month (300 g/day). A regional study of fish consumption practices has not been done for the lower Columbia River. This broad range of ingestion rates was selected to assist individuals, health departments, and regulatory agencies in making their own assessments of health risk based on these findings plus what they know about the fish eating habits of local populations.

- **Toxicity assessment** is calculating a dose for each chemical that could result in adverse health effects to humans. Dose is defined as concentration ingested (amount divided by body weight) over a specified period of time. Toxicity data for almost all of the chemicals analyzed for this project have been published by U.S. EPA (1994a, 1995a,b).

- **Risk characterization** integrates the information from the toxicity assessment with the information from the exposure assessment to estimate the potential for consumers of lower Columbia River fish to experience adverse health effects. Each fish species was evaluated separately, as were data from each of the surveys. Risk estimates were also made for combined data from more than one survey when data were sufficiently comparable. Estimates were made for both cancer and non-cancer effects. Both kinds of estimates assume that consumption rate and measured chemical concentrations remain constant over the entire exposure duration. Cancer risk estimates are the probability of getting cancer from eating fish, e.g. 1 chance in 10,000 over a lifetime. Non-cancer health effect estimates are calculated as a hazard quotient (HQ), a number which shows how much of a given chemical fish consumers are ingesting, compared to the maximum dose considered safe. HQs for different chemicals affecting the same organ or system were added together, producing an overall Hazard Index (HI) for that organ.

- **Uncertainty analysis** addresses the fact that this process requires that assumptions be made, which is an inherently uncertain process, and describes how this uncertainty affects the resulting estimates. Assumptions used in the risk assessment were based on U.S. EPA guidance, current literature, and best scientific judgement.

DEFINING ACCEPTABLE RISK

The assessment of what levels of risk are acceptable is a risk management decision that is typically made by public health agencies. The risk estimates provided in this document are designed to aid these agencies in making the necessary decisions. The process is somewhat different for cancer versus noncancer risks.

Cancer

States differ in what they consider to be an acceptable level of cancer risk. Cancer risk is defined in term of "excess risk," i.e. the amount of risk added by being exposed to a certain chemical. The U.S. EPA uses lifetime excess cancer risks ranging from 1 chance in 10,000 to 1 chance in a million of developing cancer as guidelines when determining whether chemical exposures represent a potentially unacceptable level of risk to public health.

Carcinogenic risk values from individual chemicals were added in order to derive an overall total risk for each fish species (Figure ES-1). For *filet* samples, the risk estimates were highest for carp, followed in decreasing order by sturgeon in 1991, sturgeon in 1995, sucker, chinook, coho, and steelhead. The total carcinogenic risk from these last three species was at least ten times lower than for the other species (Figure ES-1). None of these salmonid species reside permanently in the river, most having returned from the ocean within a few weeks of their capture. For *whole-body* samples, the risk estimates were highest for carp, followed in decreasing order by peamouth, sucker, and crayfish. At the U.S. average per capita fish consumption rate (6.5 g/day) and an exposure duration of 30 years, the excess cancer risk estimates for filet samples were all between 1 in 10,000 and 1 in 1,000,000. For whole-body samples, the cancer risks from carp and peamouth were slightly greater than 1 in 10,000 (Figure ES-1). The risk estimates for the whole-body samples were generally higher than the risk estimates for the filet samples.

For other exposure scenarios, the carcinogenic risk estimates were higher. For example, using a consumption rate representative of recreational fishers (54 g/day) and an exposure duration of 30 years, excess cancer risk estimates were between 1 in 1,000 and 1 in 100,000 for filet samples and between 1 in 1,000 and 1 in 10,000 for whole-body samples. The most extreme exposure scenario modeled was for subsistence fishers. Using a consumption rate of 176 g/day and an exposure duration of 70 years, excess cancer risk was as high as 1 in 100 for whole-body carp samples and 1 in 200 for filet carp samples.

Public health agencies typically make risk management decisions based on the total carcinogenic risk and noncarcinogenic health effects for each species. State environmental agencies, on the other hand, must also be aware of the individual chemicals and chemical classes which contribute the most to the overall risk so that trends can be monitored and solutions to problems can be implemented. The chemicals contributing the most to excess cancer risk are dioxins/furans, PCBs, arsenic, and to a lesser extent, organochlorine pesticides (particularly DDT and its derivatives). The percent contribution of PCBs (usually from Aroclors 1248, 1254, or 1260) was at least 20 percent of the total excess cancer risk (range 22 to 87 percent), with one exception. No PCBs were detected in crayfish in 1991; therefore, the percent contribution was zero. Dioxins/furans contributed at least 9 percent of the total risk for every species

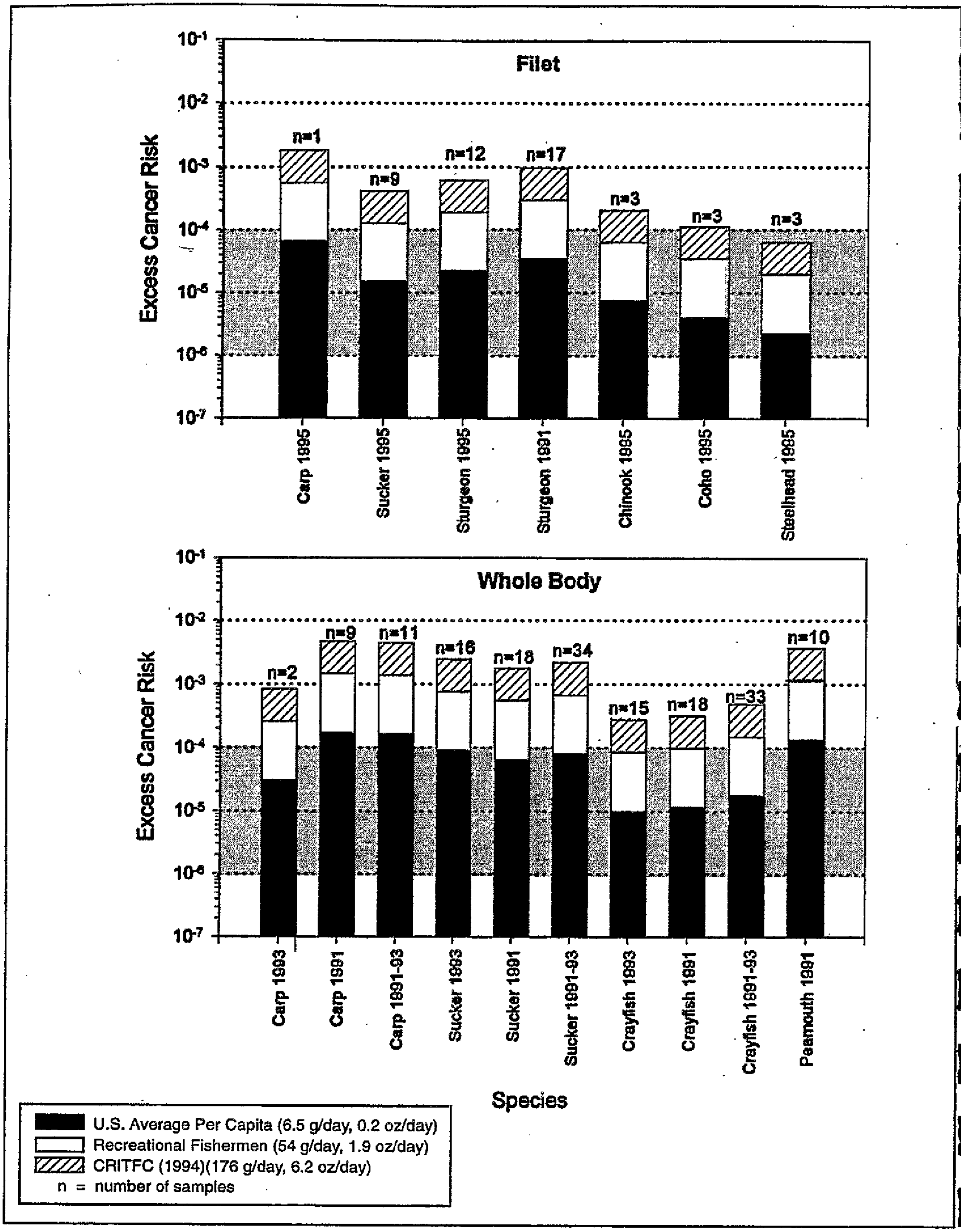


Figure ES-1 Estimated Excess Cancer Risk for 30-year Exposure (range 9 to 84 percent). The majority of the risk from dioxins/furans was due to the two tetra congeners (2,3,7,8-TCDD and 2,3,7,8-TCDF), although other congeners contributed significantly for certain species. Inorganic arsenic represented at least 10 percent of the total risk in some cases (sturgeon in 1995; chinook and steelhead in 1995). Organochlorine pesticides contributed less than 10 percent to the overall risk except for crayfish and peamouth in 1991 (14 and 18 percent, respectively). Semi-volatile organic compounds generally did not contribute significantly to the overall risk. One notable exception was the percent contribution of semi-volatiles for carp analyzed in 1991: semi-volatiles contributed 57 percent of the total risk in carp for this year, due primarily to a single high detected value of N-nitroso-di-n-propylamine.

Noncancer

Hazard Indices (HI) relating to the central nervous system, human development, and the immune system, are presented for each species in Figures ES-2, ES-3, and ES-4. HI are the sum of Hazard Quotients (HQ) for a specific organ system, which in turn are defined as the ratio of the estimated dose of chemical to the dose considered to have no adverse health effects. Thus, an HI of 1.0 or less would indicate little or no chance of adverse, non-carcinogenic health effects. At the lowest exposure level (6.5 g/day), the HI were all under 1.0. The HI for the three salmonid species were lower than HI for other species, particularly regarding development (Figure ES-3) and the immune system (Figure ES-4). These two endpoints also showed the largest difference between HI for whole-body (higher) and filet samples (lower). There was little difference between whole-body and filet samples for the central nervous system HI (Figure ES-2). At higher consumption rates, many of the HI were between 1 and 10. These results indicate some potential for adverse health effects.

As with cancer risk, the potential for noncancer health effects from the consumption of fish can be attributed to a relatively small number of toxic chemicals. For the CNS HI, the large majority of the value is attributable to metals, primarily mercury. For the developmental HI, PCBs were responsible for the majority of the total for all species except crayfish in 1991 (PCBs were not detected in these samples). The metals cadmium and selenium contributed as much as 50 percent to the total. All of the immunological HI is due to PCBs and dieldrin.

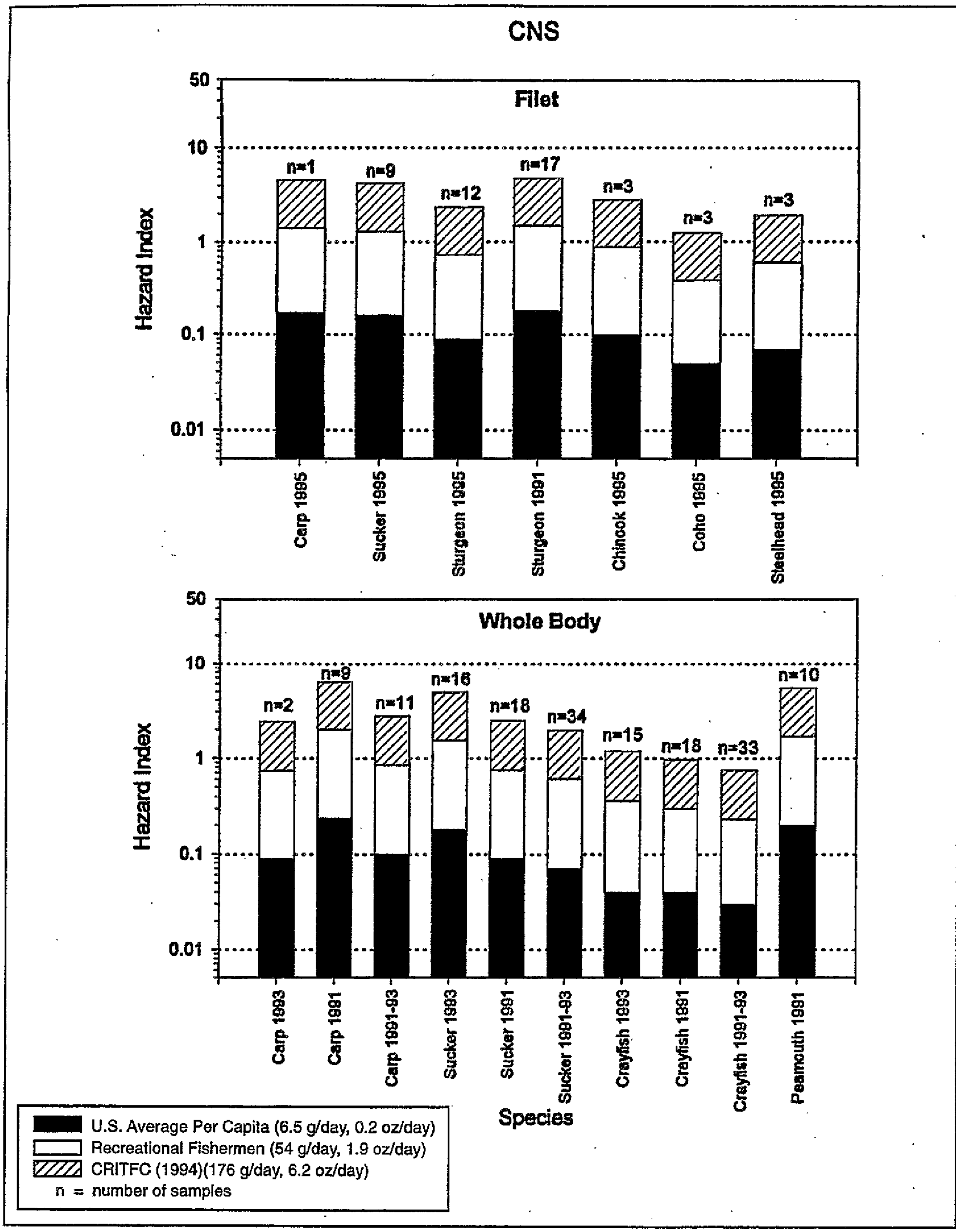


Figure ES-2 Estimated Hazard Indices for Central Nervous System (CNS) Endpoint

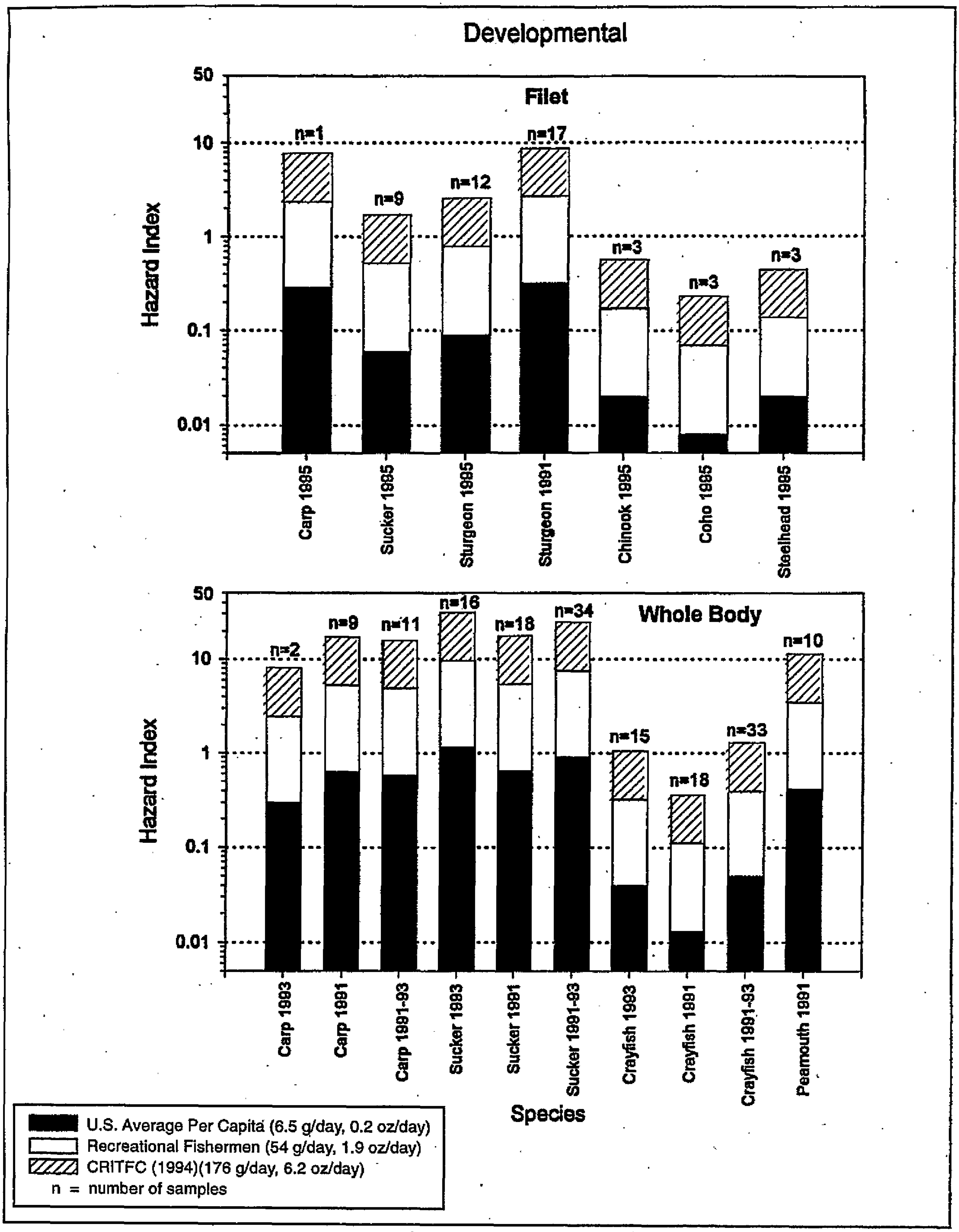


Figure ES-3 Estimated Hazard Indices for Developmental Endpoint

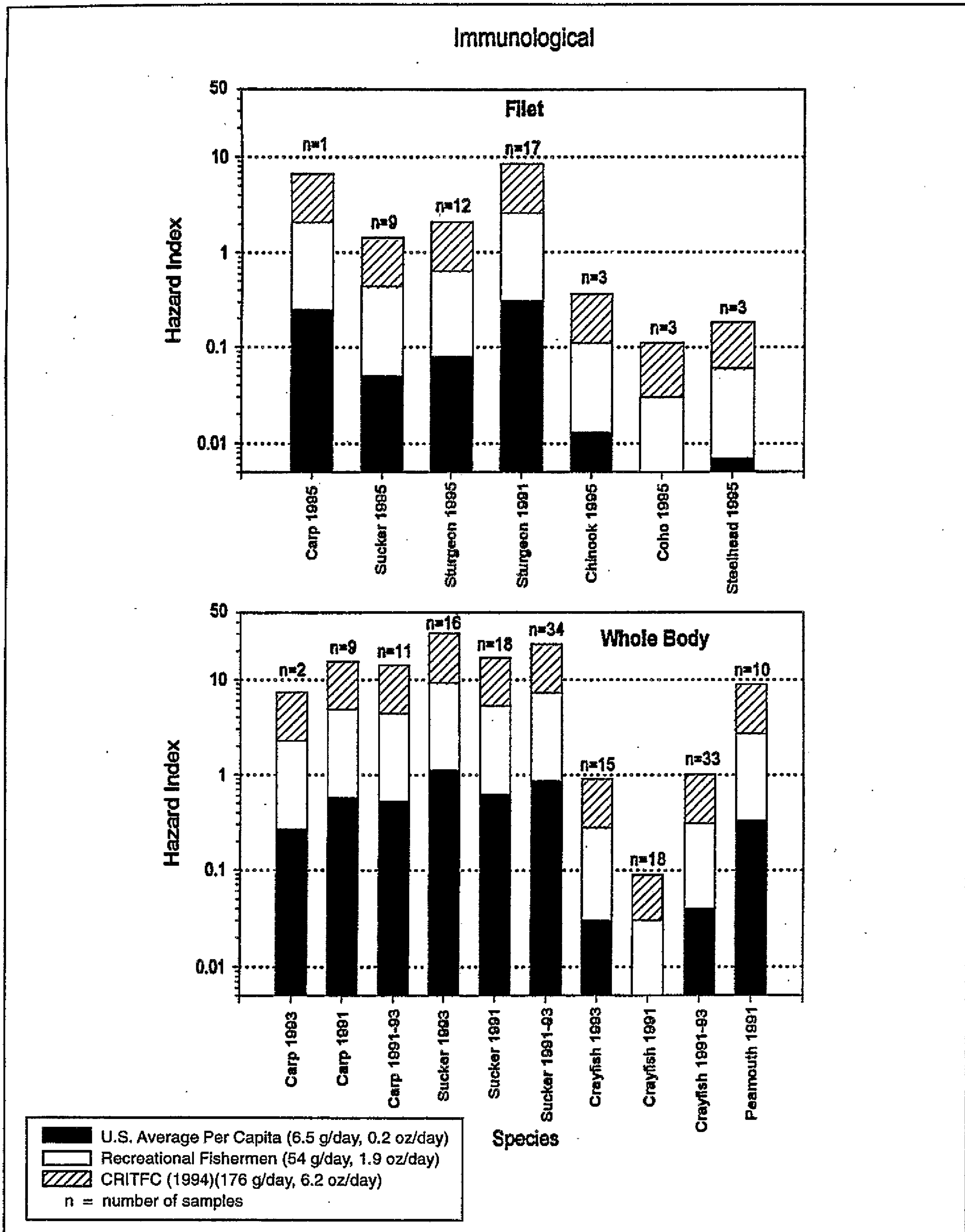


Figure ES-4 Estimated Hazard Indices for Immunological Endpoint

UNCERTAINTY OF RESULTS

Some of the key areas of uncertainty in this risk assessment are: 1) lack of toxicity values (reference doses or RfDs) for some chemicals, most importantly lead and dioxins/furans, 2) representativeness of the samples used to characterize exposure, 3) use of one-half detection limit for non-detect values, and 4) the limited number of samples analyzed for some species. The effect of each of these areas on the resulting risk estimates is discussed below.

Reference Doses

Except for lead and dioxins/furans, the risk or adverse health effect from most of the chemicals without published toxicity values was not assumed to be great, although these chemicals could not evaluated quantitatively. For lead, no consensus reference dose has been established. U.S. EPA has developed a model (IEUBK) to look at the health effects of lead to children, but the HHRWG decided not to include children as an exposure group.

For dioxins and furans, U.S. EPA established a RFD for 2,3,7,8-TCDD in 1985 of 1 pg/kg-day. This RFD has been withdrawn during U.S. EPA's reassessment of dioxins and furans. A RfD of 0.7 pg/kg-day for 2,3,7,8-TCDD has been proposed by ATSDR researchers (Pohl et al. 1995). Using the proposed RfD for TCDD, HQs were calculated for all detected dioxins/furans. For each congener other than TCDD, the proposed RfD was divided by the toxicity equivalency factor (TEF), yielding an adjusted RfD. At the lowest exposure level, the sum of the HQs for the detected dioxin/furan congeners was less than 0.6, with the exception of peamouth in 1991, for which the sum was 1.07. Using the proposed RfD, dioxins/furans are a major contributor to the developmental HI, contributing between 17 and 95 percent. The revised HI was slightly greater than 1.0 for some species collected in 1991 and 1993 (e.g., carp, largescale sucker, and peamouth).

Representativeness of Samples

The concentrations in the whole-body and hatchery samples may not be representative of the concentrations normally consumed by humans. The lipid (fat) content of a whole-body sample is typically higher than that in a filet sample because of lipid-dense organs such as the liver and gonads. Many of the organic compounds evaluated in this risk assessment accumulate in lipid-rich parts of the fish because of their hydrophobic nature. So the contaminant concentration in a filet might be lower than the concentration in the whole body of the same species. Thus the risk estimates for whole-body fish in this report could overestimate the risk to fish consumers who normally only eat filets.

This risk assessment makes the conservative assumption that skin and fatty areas of the fish are not removed during fileting and that there is no net reduction in contaminant concentrations during cooking. Fishermen who skin and trim away the fatty areas of filets and may reduce their exposure to the lipophilic contaminants by as much as 60 percent (Gall and Voiland 1990). It is also likely that fisherman cook the fish which, depending on the method, has been shown to also reduce contaminant concentrations by as much as 50 percent (Zabik and Zabik 1995, Skea et al. 1979). Because the effects of cooking were not considered in this risk assessment, it is likely that chemical concentrations and subsequently calculated risks may have been overestimated.

The salmon samples that were analyzed in 1995 were collected at three different hatcheries. The degree to which these salmon are representative of salmon that are typically consumed by people is affected by several factors, including 1) the differences between salmon from different hatcheries, 2) the differences between wild and hatchery salmon, and 3) the length of time the salmon reside in the river. The first two sources of uncertainty can not be evaluated using available data. Because most of the salmon caught by recreational fishers are caught near the mouth of the river (WDFW/ODFW 1994), the fish collected at the hatcheries probably resided in the lower Columbia River for a longer period of time than the majority of the fish caught by recreational fishers. Given that many of the chemicals were not detected in salmon or detected at concentrations very near the detection limit, the degree to which the concentrations in these fish are different from those in fish caught nearer the mouth of the river is probably minor.

Detection Limit Issues

A detection limit is a calculated minimum detectable concentration of a given chemical which is based on the sensitivity of available laboratory methods and equipment. When a chemical is not detected, it is assumed that the actual amount of the chemical present in the sample is somewhere between zero and whatever the detection limit for that chemical in that sample happens to be. Risk assessors generally take one of three approaches: assume a non-detect is zero, assume it is equal to the detection limit (conservative approach), or assume it is one half the detection limit. Which approach to take is a continual source of discussion for risk assessors. For the results of this report, which approach is taken makes little difference to the final risk and HI estimates. This is especially true for 1995 analyses: HI estimates for 1995 data are identical regardless of the approach taken. For most of the species collected in 1991 and 1993, the zero-detection limit and full-detection limit risk calculations are less than 20 percent lower and higher, respectively, than the half-detection limit calculations. Because public health agencies typically make decisions based on order of magnitude differences in cancer risk estimates, the treatment of non-detect values is probably not a major issue for the assessment of excess cancer risk. For the assessment of noncarcinogenic health effects, differences of less than an order of magnitude may be significant, although differences of 20 percent or less would be unlikely to affect risk-based decisions given the uncertainty of the estimates.

Sample Sizes

U.S. EPA (1993) has recommended that 3 or more fish samples be analyzed for a given fish species in a risk assessment. This recommendation was followed for all species except carp in 1995, for which only 1 sample could be collected and analyzed. Although 3 or more samples were analyzed for most species, the risk estimates are based on datasets which may differ in the degree to which they are representative of the true mean chemical concentrations for a species at the time they were analyzed.

SECTION 1.0
INTRODUCTION

1.0 INTRODUCTION

The Oregon and Washington state legislatures created the Lower Columbia River Bi-State Water Quality Program (Bi-State Program) in 1990. The Bi-State Program developed a multi-year plan designed to characterize water quality in the lower Columbia River, identify water quality problems, determine whether beneficial uses of the river are impaired, and develop solutions to problems identified in the river below Bonneville Dam (Bi-State Steering Committee 1990). The plan proposed a framework and precedence for conducting studies to evaluate water quality that consisted of: 1) an inventory of existing information; 2) reconnaissance surveys; 3) further evaluation of water quality (baseline studies); and 4) advanced studies. This Human Health Risk Assessment is an advanced study which utilizes information assembled in earlier Bi-State Program studies plus new information gathered specifically for this purpose to characterize some potential risks to humans associated with water quality problems in the lower Columbia River.

Specifically, this report characterizes potential human health risks associated with consuming fish from the lower Columbia River. The data for this risk assessment are from three separate surveys conducted in 1991, 1993, and 1994-1995. These data consist of chemical analyses of either whole body samples or filets of largescale sucker, carp, peamouth, crayfish, white sturgeon, steelhead trout, coho salmon, and chinook salmon.

This Introduction has four subsections. *Background* provides a historical overview of the Bi-State Program activities and oversight that contributed to the design and content of this health risk assessment report; *Environmental Setting* describes the study area and its fishery resources; *Overview of Approach* describes the process of risk assessment, and *Report Organization* is a preview of the contents of this report.

1.1 BACKGROUND

The inventory of existing information conducted by the Bi-State Program in 1991 showed that while there was a substantial amount of data available on contaminant levels in the river, there was great disparity in methods of analysis, types of chemicals analyzed, and time periods and areas of the river covered. The Bi-State Program undertook a reconnaissance survey of the lower river to collect data to be used to make a preliminary assessment of water quality and to guide future studies (Tetra Tech 1993a). This survey, the most extensive collection of water quality data for the lower Columbia River at the time of this writing, analyzed water, sediment, and tissue samples for a long list of chemicals of potential concern to aquatic life, wildlife, and humans. Data collected during this survey showed elevated levels of certain contaminants in a number of samples. After reviewing this information, the Lower Columbia River Bi-State Program Steering Committee met on October 20, 1992 to review and prioritize future study objectives for the Program. Characterizing potential human health risks associated with different uses of the river was ranked among the top four study objectives at this meeting (Lower Columbia River Bi-State Program 1992). Subsequently, the Bi-State Program established a Human Health Risk Work Group (HHRWG) in March 1993 to guide the conduct of this study

The HHRWG was composed of representatives from Oregon and Washington Departments of Health, U.S. Environmental Protection Agency, Oregon Department of Environmental Quality, Washington Department of Ecology, Tetra Tech, Inc., and individuals nominated to represent industrial and environmental interest groups. This work group met on four occasions during 1993-1994 to discuss objectives, methodologies, data needs, and uncertainties associated with conducting a human health risk assessment of the Lower Columbia River. At each meeting, several technical issues relevant to conducting a risk assessment were thoroughly discussed and evaluated by HHRWG members and attempts were made to formulate consensus, or when necessary majority, recommendations for conducting such an assessment. Readers interested in the content of these discussions should consult the minutes of these meetings (Lower Columbia River Bi-State Program 1993a,b,c; 1994). The study design and risk methodology used in this report was approved by the HHRWG.

1.2 ENVIRONMENTAL SETTING

1.2.1 Lower Columbia River Study Area

The Columbia River is the largest river entering the northeastern Pacific Ocean and the second largest river in the United States in terms of volume discharged. The river's drainage basin of 255,000 mi^2 (660,480 km^2) covers portions of seven western states and one Canadian province. The river flows approximately 1,210 mi (1,950 km) from its headwaters in southeast British Columbia. After crossing the U.S.-Canadian border, the river flows south across the Columbia Plateau of eastern Washington, then west along the border of Oregon and Washington to the Pacific Ocean.

The Lower Columbia River Bi-State Program study area is that part of the river between Bonneville Dam at river mile (RM) 146 [river kilometer (RK) 235] and the mouth, plus the basins of the lower river and its tributaries. The five largest tributaries to the lower river are the Willamette, Cowlitz, Lewis, Sandy, and Kalama rivers. Near Bonneville Dam the river is relatively narrow, as little as 0.2 mi (0.3 km) wide directly below the dam. There are a number of large islands along its course separating the main channel from backwater areas. The channel widens to a mile (1.6 km) or more at some locations. At RM 46 (RK 74) the river separates into two channels that pass around Puget Island, with the navigation channel following the Oregon side. Below Puget Island [RM 37 (RK 60)] the river opens into a broad estuary with islands and braided channels. Below about RM 25 (RK 40) the estuary opens into an expanse of bays and tide flats as wide as 5 mi (8 km) in some locations. At the mouth the river passes between two jetties approximately 2 mi (3 km) apart and enters the Pacific Ocean.

The flow of the lower Columbia River is distinctly seasonal and the tidal influence on water surface elevation is evident to the base of Bonneville Dam. However, tidal salinity intrudes no farther than approximately RM 23 (RK 37). Lowest flows generally occur during the early fall (September and October) when rainfall and snowmelt runoff is least. Highest flows occur in spring (April to June) due to snowmelt runoff from the Cascade and Rocky Mountains to the tributaries of the upper Columbia basin above Bonneville Dam. A second peak in flow is caused by heavy winter precipitation (November to March) in the tributary basins of the lower river, primarily the Willamette and Cowlitz rivers.

The lower Columbia River basin currently supports a variety of industrial, agricultural (including dairy and beef cattle grazing), silvicultural, commercial, and residential uses, for a diverse and growing population. The river also supports a commercial, recreational, and tribal fishery that has expanded beyond salmon to include sturgeon and a number of freshwater resident species.

The three Oregon counties that border the lower Columbia River had an estimated population of almost 690,000 in 1994. Major population centers on this side of the river include Portland (~450,000), Gresham (~75,000), Astoria (~10,000), and St. Helens (~8,000). The five Washington counties that border the lower Columbia (Clark, Cowlitz, Pacific, Skamania, and Wahkiakum) had an estimated population of 400,000 in 1994. Major population centers on this side of the river include Vancouver (~50,000), Longview (~32,000) and Camas/Washougal (~11,000).

1.2.2 Fishery Resources in the Lower Columbia River

Five resident aquatic species (white sturgeon, carp, largescale sucker, peamouth, and crayfish) and three anadromous fish species (chinook, coho, and steelhead) were evaluated for this risk assessment. This section briefly describes each of these species and indicates the degree to which they are targeted by recreational and commercial fishers.

1.2.2.1 Resident Species. White sturgeon is the largest freshwater fish species in North America; individuals over 10 feet in length and weighing over 1,000 pounds have been found in the lower Columbia River (Wydoski and Whitney 1979). In the lower Columbia River, white sturgeon migrate freely among various Oregon and Washington coastal bays and river systems. Sturgeon migrations appear to be primarily motivated by spawning, food availability, and water temperature (WDFW/ODFW 1994). The white sturgeon population downstream of Bonneville Dam is considered productive. Total catch (commercial and recreational) in 1993 was 50,900, which is close to the 10-year average (WDFW/ODFW 1994). The total 1994 catch was approximately 20 percent lower (39,900) than the 1993 catch (WDFW/ODFW 1995). The majority of the commercial catch is made during the fall (WDFW/ODFW 1994), but the recreational catch is spread mostly from February to October. Recreational catch in the winter months is typically much lower than in the other seasons (Melcher and King 1993). The two most popular catch areas are in the estuary and just downstream of the Bonneville Dam, although white sturgeon are caught throughout the lower river (Melcher and King 1993).

Catch statistics and population estimates for carp, largescale sucker, and peamouth are not available. Results from the reconnaissance surveys, however, suggest that these three species occur throughout the lower river (Tetra Tech 1993a, 1995a). All of these species may be targeted by ethnic populations in urban areas (Adolfson Associates, Inc. 1995).

Common carp, a species of minnow native to Asia, was introduced to North America because of its suitability for pond culture and its use as a food fish (Scott and Crossman 1973). It is the largest minnow found in Northwestern waters and is now considered a nuisance fish in many areas because of its competition with game fish and waterfowl for forage (Wydoski and Whitney 1979). Carp are omnivorous and consume plant and animal tissue and may selectively feed on bottom ooze and detritus. Animal prey items include aquatic insects, crustaceans, annelids, and molluscs (Scott and Crossman 1973). Carp was selected as an indicator organism primarily because it is a bottom-feeding fish with a relatively high lipid content; it readily bioaccumulates hydrophobic organic pollutants.

The largescale sucker is a bottom fish native to the Pacific Northwest. Spawning occurs during April and May in shallow water with a gravel or sand bottom. Larger individuals feed on a variety of bottom organisms including crustaceans, aquatic insect larvae, earthworms, snails, and detritus (Wydoski and Whitney 1979). Largescale sucker was selected as an indicator organism primarily because it is a bottom-feeding fish which, unlike carp, could be captured throughout the study area.

Peamouth is a species of minnow native to rivers and lakes of northwestern North America. It is comparatively large and long-lived for a minnow, though surpassed by carp in both respects (Wydoski and Whitney 1979). Peamouth spawn in gravel-covered areas of shallow water in May and early June. They are tolerant of brackish water and can therefore be captured in the estuarine portion of the lower Columbia River. Young fish feed on zooplankton, while older fish feed both pelagically and on the bottom on a variety of plant and animal matter including plankton, aquatic and terrestrial insects, snails, and occasionally small fish such as sculpins (Wydoski and Whitney 1979). The extent to which peamouth are presently consumed by humans along the river is not known; however, historically this fish was served in hotels of the Columbia River basin (Wydoski and Whitney 1979). Peamouth was selected as an indicator organism primarily because its diet and feeding habits differ from those of carp and largescale sucker. They occur throughout the study area, they are an important component of the diet of bald eagles, other wildlife, and game fish, and they have relatively high lipid contents.

Crayfish are omnivorous scavengers that feed on vegetation, detritus, and fresh or decomposed carrion (Mitchell and Smock 1991). Adults generally remain hidden in burrows or beneath stones or other debris in the daytime, and move and feed between dusk and dawn (Pennak 1978). Crayfish can be an important component of the diet of predatory fish (Mitchell and Smock 1991) and are harvested commercially and recreationally from the lower Columbia River for human consumption. A total of 22,011 pounds of crayfish was harvested commercially during 1991 from waters of the three Oregon counties that adjoin the lower Columbia River (Clatsop, Columbia, and Multnomah; Lukas, J., 11 May 1993, personal communication). Crayfish was selected as an indicator organism because it is a food source for aquatic and terrestrial wildlife, is harvested from the lower Columbia River for human consumption, is a bottom-dwelling organism, and is assumed to have a relatively limited range.

1.2.2.2 Non-resident Species. The fishery resources of the lower Columbia River have declined significantly from historical levels due to overfishing and hydroelectric development, but they still support viable commercial and sport fisheries for several species (WDFW/ODFW 1994). Salmon (coho and chinook), steelhead, sturgeon, smelt, and shad are the principal species harvested from the Columbia River (WDFW/ODFW 1994, Holland et al. 1989).

Chinook salmon are the largest and least abundant of the Northwest salmon species, and are highly prized by both commercial and recreational fishers. The chinook salmon evaluated in this project were fall chinook from the lower river hatchery (LRH) stock, as shown by the time and location of their return (see Section 2.1.2) (WDFW/ODFW 1994). Other chinook salmon stocks on the lower Columbia River include upriver spring chinook and summer chinook, although neither of these stocks has been harvested since 1977 (WDFW/ODFW 1994). The runs of lower Columbia River fall chinook stocks have declined steadily since 1987, when it was estimated that 415,700 fish returned to the river (WDFW/ODFW 1994). The estimated return in 1993 was 84,200 fish, the lowest number on record since estimates of natural spawners have been made (1980). Of the total number returning in 1993, 11,100 were caught by commercial fishers and 5,700 by recreational fishers. The low returns prompted the shortest commercial season in history (4 days) for fall chinook on the lower river (WDFW/ODFW). The total commercial and recreational catch of fall chinook was reduced to 3,700 fish. The 1995 season was even shorter than 1994 (two 12-hour openings in October) (King, S., 4 January 1996, personal communication). The catch statistics for the 1995 season have not been published.

Coho salmon are smaller than chinooks and less abundant on the Columbia, but still very popular with fishers. Coho salmon begin entering the Columbia River in August and continue through November. The coho salmon evaluated in this project were part of the late migration, which peaks in mid-October and is concentrated largely at the Cowlitz and Lewis river hatcheries in Washington (WDFW/ODFW 1994). The number of late stock coho adults entering the Columbia River in 1993 was 41,500, which is the lowest return since 1977 and only 15 percent of the recent 5-year average of 276,600 (WDFW/ODFW 1994). Of this number, 14,800 were caught by commercial fishers and 7,800 were caught by recreational fishers. The catch numbers were greater in 1994, with 63,800 being caught by commercial fishers and 6,700 by recreational fishers (WDFW/ODFW 1995).

Steelhead are a sea-run form of rainbow trout; they lose the characteristic "rainbow" stripe in the marine environment (Wydoski and Whitney 1979). They can be found in the lower Columbia River virtually year-round. Summer steelhead enter the river from March through October, with peak abundance in late June through early September. Winter steelhead enter the river from November through April. The steelhead evaluated in this project were winter steelhead destined primarily for tributaries below Bonneville Dam (WDFW/ODFW 1994). Peak catch months of winter steelhead are generally December and January and hatchery fish make up most of the catch. The number of winter steelhead entering the river in 1993-94 was 40,000, the lowest total on record (WDFW/ODFW 1994). Commercial catch of winter steelhead has been prohibited since 1975. Recreational catch in 1993-94 represented approximately 62 percent of the total estimated return (WDFW/ODFW 1994). In 1994-95, the recreational catch was 60 percent of the total estimated return (WDFW/ODFW 1995). The total estimated return in 1993 for summer steelhead was 240,000, but most of these fish were destined for upriver (above Bonneville) tributaries. Only 8,500 of these fish were captured by lower river recreational fishers.

1.3 OVERVIEW OF APPROACH

The risk assessment process involves characterizing the types of adverse health effects expected from exposure to a toxicant and estimating the probability of their occurrence. This process generally includes the following four steps (U.S. EPA 1989a):

- **Hazard identification** - identifying the chemicals of concern to be included in the risk assessment and characterizing the toxicological hazards posed by these chemicals in samples of fish.

- **Dose-response assessment** - quantitatively characterizing the relation between the dose of a toxicant and the potential for adverse health effects in exposed populations.

- **Exposure assessment** - characterizing magnitude, frequency, and duration of exposure to toxic chemicals of concern. In the case of fish tissue contamination, exposure assessment addresses how often people eat fish, how much and which portions of the fish are consumed (e.g., filet, eggs, etc.), and for how many years the consumption of fish extends in the life of an individual.

- **Risk characterization** - estimating the potential for adverse health effects by integrating the information from the dose-response assessment with the exposure assessment.

- **Uncertainty analysis** - discussing how assumptions made about each of the variables used in the calculation of the risk estimates contribute to the uncertainty of these estimates.

The following sections provide a brief overview of the approach used to accomplish each of the five steps listed above.

1.3.1 Hazard Identification

An extensive list of chemicals to be measured in fish tissue was developed for the Bi-State Program's 1991 reconnaissance survey (Tetra Tech 1991, 1993a). These chemicals were selected because of their persistence in the aquatic environment and high potential for bioaccumulation in fish tissue. Additional chemicals were analyzed because they were identified as part of an inventory of toxic chemicals entering the lower Columbia River from point and nonpoint pollutant sources (Tetra Tech 1992).

Following this reconnaissance survey, a risk-based screening assessment of the fish tissue data was conducted to re-evaluate the original list of chemicals and the analytical methods used to determine if the list or methods should be modified for a human health risk assessment (Tetra Tech 1993b). The list of chemicals was further evaluated by compiling and screening all available fish contaminant data collected in the lower Columbia River from 1984-1994 to identify chemicals that exceeded risk-based screening levels of concern (Tetra Tech 1994a). The final list of chemicals recommended for this risk assessment was reviewed and approved by the HHRWG (Tetra Tech 1994c).

Toxicological profiles for chemicals of concern were developed as part of the risk-based screening assessments and are included in Appendix C.

1.3.2 Dose-Response Assessment

Toxicological information for chemicals included in this risk assessment were obtained, in order of precedence, from U.S. EPA's (1995a) IRIS database, U.S. EPA (1994a) HEAST, and U.S. EPA (1995b). These databases were also the source of the toxicity values used for estimating cancer (slope factor) and non-cancer (reference dose) endpoints.

1.3.3 Exposure Assessment

A regional study of the consumption of fish from the lower Columbia River has not been conducted, so there is uncertainty regarding the exposure parameters (e.g., amount and frequency of fish consumption, type and portion of fish consumed, fish preparation methods) to be used in assessing human health risks. The HHRWG recommended that health risks be estimated for three general target populations: general public, recreational anglers, and subsistence anglers (Lower Columbia River Bi-State Program 1993b). In this report, exposure to chemical contaminants was assessed separately for each species analyzed in the three surveys. Because of the uncertainty involved in selecting representative fish consumption rates, risk is estimated over a range of consumption rates [0.1 - 300 g/day (0.004 - 10.6 oz/day)] and exposure durations (30 and 70 years). This approach is designed to assist individuals, regulatory agencies, and health departments in making their own assessments of the health risk associated with consuming varying amounts and types of fish from the lower Columbia River.

1.3.4 Risk Characterization

This report characterizes the potential health risks associated with consuming eight different species (see 1.2.2, above) from the lower Columbia River. Cancer risks and non-carcinogenic health effects are displayed graphically as a function of fish consumption rate. This presentation can be used by risk management agencies to help define acceptable fish consumption frequencies at whatever risk level is designated acceptable and to indicate the noncancer toxicity endpoint (i.e., developmental, immunological, or central nervous system) of greatest concern for consumption of different species of fish. The risk characterization also compares the relative risks of different chemicals and identifies the chemicals of greatest concern.

1.3.5 Uncertainty Analysis

In a quantitative risk assessment, assumptions must be made about each variable used in characterizing risk. Each of these assumptions contributes to the uncertainty of the resulting risk estimates. The uncertainty analysis section evaluates in a semi-quantitative manner the confidence associated with each assumption. Where possible, alternative risk estimates are made using different assumptions.

1.4 REPORT ORGANIZATION

This report is organized into seven sections. Section 1.0 (this section) provides the background, environmental setting, and overview of the approach for the risk assessment. Section 2.0 describes the study design and field and laboratory procedures. This section also includes brief sections on the QA/QC results from the laboratory analyses. Section 3.0 discusses the exposure assessment, including information on the populations being evaluated and the calculations made to determine the contaminant concentrations to which individuals in these populations are exposed by consuming fish. Section 4.0 describes how the toxicity of these contaminants was evaluated. Section 5.0 is the risk characterization, which includes a discussion of the carcinogenic and noncarcinogenic risk from the consumption of each of the six target fish species. Section 6.0 discusses the uncertainty associated with this risk assessment. Section 7.0 compares contamination data from the risk assessment with chemical concentrations in fish tissue collected elsewhere in the Columbia River basin and Puget Sound.

SECTION 2.0
STUDY DESIGNS/MET.

2.0 STUDY DESIGN AND METHODS

This section describes the study design and the field and laboratory methods used to generate the data for this study. It also includes a discussion of the quality assurance/quality control (QA/QC) results from the laboratory and an evaluation of the overall usability of the analytical data for accomplishing the objectives presented in Section 1.0.

2.1 STUDY DESIGN

Data on chemical contaminant levels in fish tissue were obtained from three separate sampling efforts. The first two, conducted in 1991 and 1993, were reconnaissance surveys. The scope of a reconnaissance survey is generally broad. These surveys were designed to test for the presence of a wide array of possible contaminants in water, sediments, and fish and shellfish tissue. A human health risk assessment is a much more focused and specific kind of study. However, the reconnaissance surveys did provide a considerable amount of data relevant to human health risk assessment, and these data have been supplemented by data from the third and most recent data collection effort. This effort, conducted in 1994-95, was specifically designed to collect data for risk assessment purposes. Study designs for all three efforts are briefly described below.

2.1.1 Reconnaissance Surveys

The primary objective of the 1991 and 1993 reconnaissance surveys was to identify potential water quality problems and direct future Bi-State studies (Tetra Tech 1993a, 1995a). Water, sediment, and fish and crayfish tissue samples were collected and analyzed for metals and organic compounds of potential concern. The stations at which fish and crayfish were captured were also sites for the collection of sediment (1991 and 1993) and water (1993 only) samples. The overall intent of the fish sampling portions of the surveys was to determine whether chemical concentrations in fish could be used to identify water quality problems.

One specific objective of the reconnaissance surveys was to measure concentrations of contaminants in tissues that fish-eating wildlife, such as mink and bald eagles, might consume. Thus whole-body samples were collected and tested for all fish and shellfish species except white sturgeon, for which fillets were collected. Because of their large size, white sturgeon were considered unlikely targets for fish-eating predators. In a data collection effort designed specifically for human health risk assessment, fillet samples would have been more appropriate for all species, as that is how fish are more commonly eaten by humans.

Five different resident target species were selected for the 1991 survey: largescale sucker, carp, peamouth, white sturgeon, and crayfish. For all species except white sturgeon, fish were collected from 20 stations previously sampled for fine-grained sediments (Figure 2-1). At very few stations was it possible to collect all four species. Crayfish and largescale sucker were collected at the same 18 stations. Carp and peamouth were collected at 9 and 10 stations, respectively, only 3 of which were the same. No white sturgeon were caught; this species was collected from fish processing facilities only (see Section 2.2.1.2).

The target species for the 1993 survey were largescale sucker, carp, and crayfish. These species were collected at 15 stations previously sampled for water and sediment (Figure 2-2). All three species were collected at 13 of the 15 stations, while only carp or carp and sucker were collected at the two remaining stations.

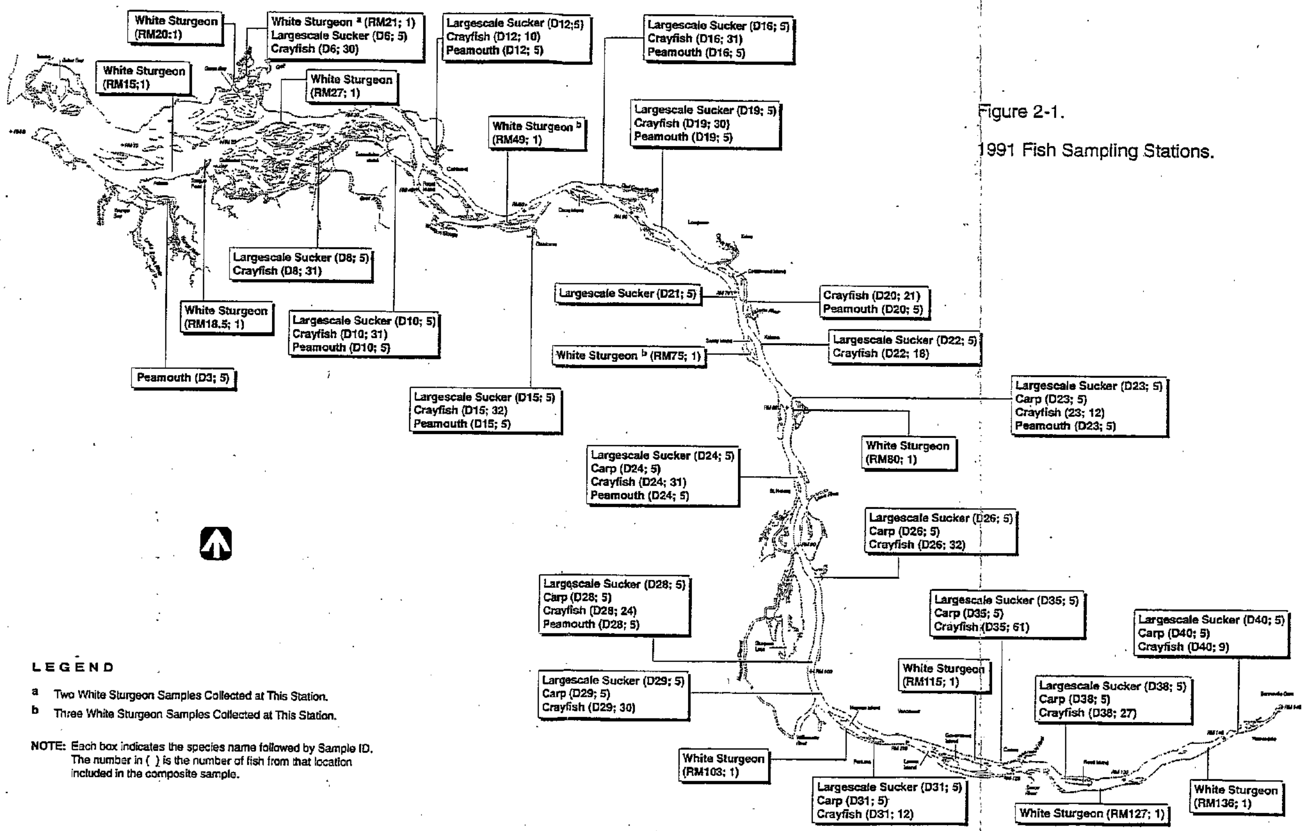
In accordance with U.S. EPA (1993) guidance, five individual fish were composited to form single composite samples in both 1991 and 1993.

2.1.2 Risk Assessment Survey

Several tasks were undertaken prior to finalizing the study design. The first task was to evaluate existing tissue contaminant data for the lower Columbia River to identify data gaps. The second task was to survey fishing professionals (e.g., guides and fishing shop owners) to gather information on preferred target species and fishing locations. The third task was to screen existing tissue contaminant data to identify chemicals which have previously been detected at concentrations high enough to warrant concern from a human health perspective. The results of this task were used to develop the target analyte list for

Figure 2-1.

1991 Fish Sampling Stations.



LEGEND

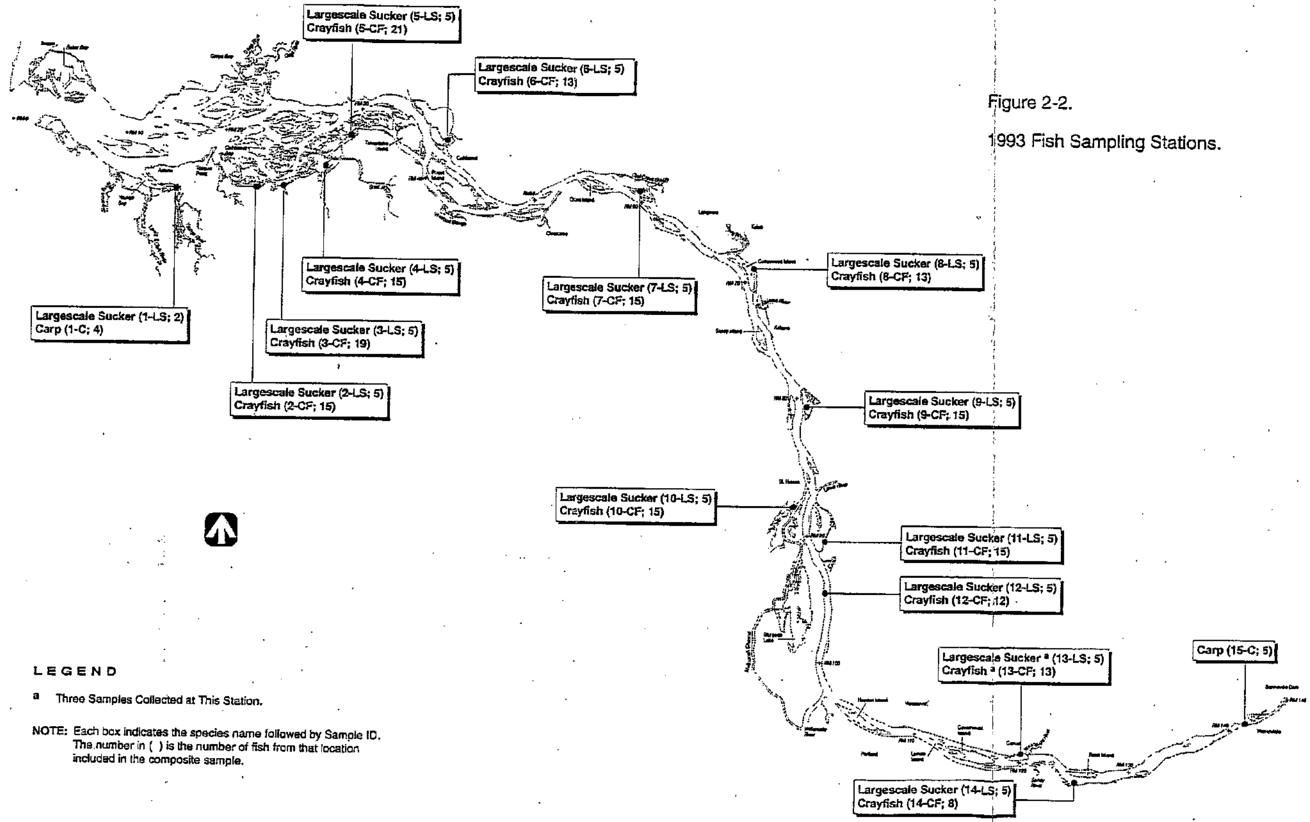
a Two White Sturgeon Samples Collected at This Station.

b Three White Sturgeon Samples Collected at This Station.

NOTE: Each box indicates the species name followed by Sample ID. The number in ( ) is the number of fish from that location included in the composite sample.

Figure 2-2.

1993 Fish Sampling Stations.



this sampling effort. Each of these tasks is described in greater detail in the Sampling and QA/QC plan (Tetra Tech 1994b).

Seven different target species were selected: two resident non-game species (largescale sucker and carp), two resident game species (walleye and smallmouth bass), and three anadromous game species (chinook salmon, coho salmon, and steelhead). For the resident species, the lower river was divided into thirds as follows:

- Estuary - River Mile 0 (Mouth) to River Mile 48
- Middle Section - River Mile 48 to River Mile 101 (Portland)
- Upper Section - River Mile 101 to River Mile 146 (Bonneville)

The division of sampling areas was based in part on the divisions proposed by the Oregon Department of Fish and Wildlife (Melcher and King 1993) for their recent survey of lower Columbia River recreational fisheries. Each of the three areas has distinctly different characteristics. The estuary region supports different assemblages of flora and fauna compared to the freshwater sections. The middle section of the river includes the majority of the industrial sites (e.g., Longview, St. Helens, Portland) on the lower river. The upper section, with the exception of Camas/Washougal, contains relatively little input from municipal or industrial sources.

Three composite samples, each made up of 8 fish, were to be collected for each of the four resident species in both the middle and the upper sections of the river. In the estuary section, three composites of both largescale sucker and carp were to be collected. Smallmouth bass and walleye were not expected to reside in the estuary portion of the river. For the three anadromous species, three composite samples (8 fish each) from each species were to be collected from hatcheries located on the tributaries of the lower Columbia River. Additional details on the rationale for the proposed sampling design are given in the Sampling and QA/QC plan (Tetra Tech 1994b).

As indicated in Section 2.2.1, the sampling design could not be fully implemented due to difficulties encountered in capturing some of the target species during the winter field effort. The capture locations of all fish analyzed in this survey are indicated in Figure 2-3.

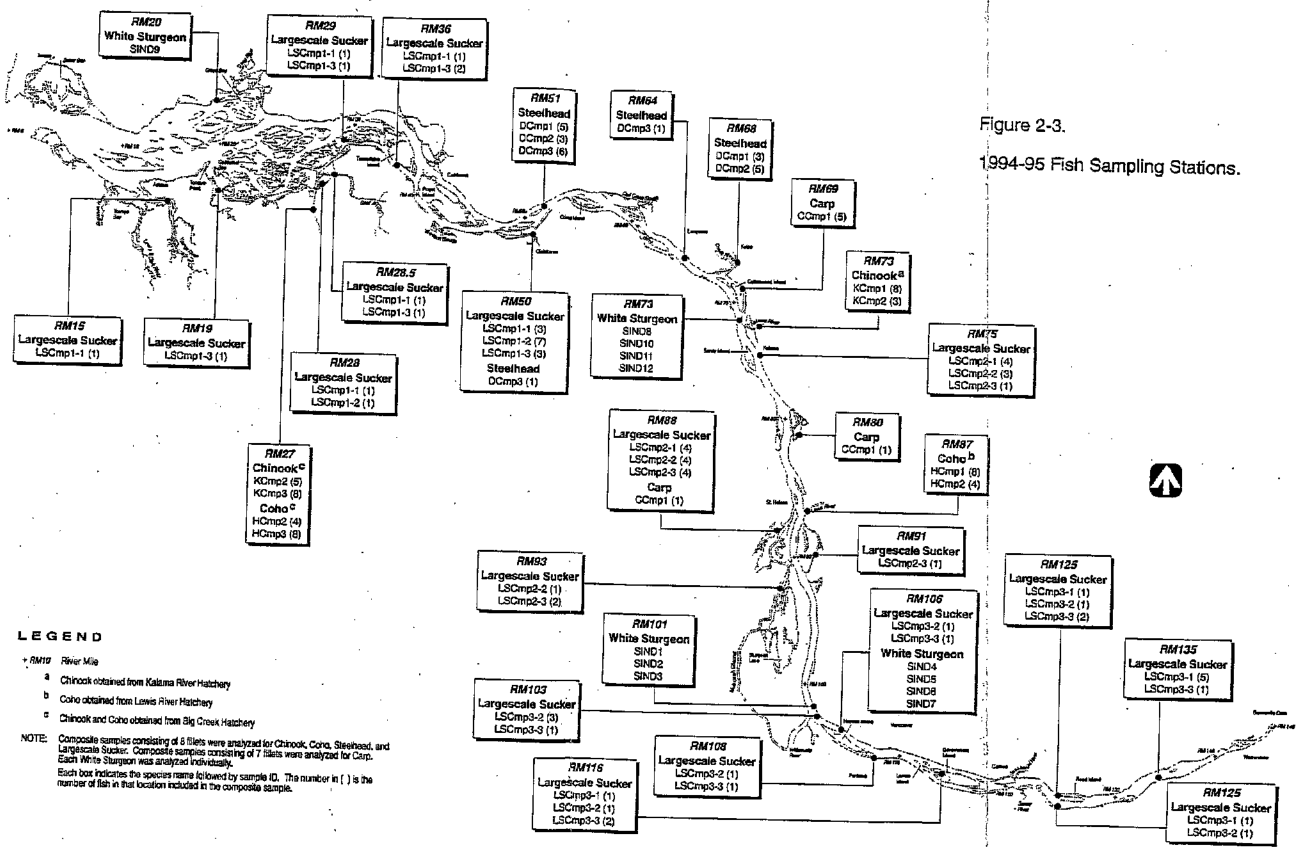


Figure 2-3.

1994-95 Fish Sampling Stations.

2.2 FIELD ACTIVITIES

Field activities will be described below in separate sections for fish collection methods, sample processing, sample compositing, and custody and shipping procedures. Where differences exist for the three different collection efforts, they will be noted. Details about the fish caught in each of the surveys, including size, weight, lipid content, sex (when available), and collection date and location, are provided in Appendix A.

2.2.1 Fish Collection Methods

Largescale sucker (all years), carp (all years), peamouth (1991), and steelhead (1994-95) were obtained by electrofishing. In 1991, largescale sucker and peamouth were also collected at some stations using gillnets. White sturgeon were collected by commercial fishers using gillnets (1991) or hook-and-line (1995). Crayfish (1991 and 1993) were obtained using traps baited with cat food. Coho and chinook salmon (1994) were obtained from state-run hatcheries in both Oregon and Washington. For the 1994-95 survey, two additional target species, walleye and smallmouth bass, could not be caught in the lower Columbia River despite repeated attempts using hook and line, gill nets, and electroshocking. Sampling was intended to occur during the summer months when both of these species are commonly targeted by recreational fishermen. During the winter, these two species apparently inhabit deeper water. Each of the collection methods is described below.

2.2.1.1 Electrofishing. In all three surveys, fish were collected using a boat-mounted electrofishing unit. Stunned fish were identified by field personnel and dip nets were used to transfer selected fish to holding containers aboard the boat. Upon retrieval, fish identification was verified by trained personnel and the total length of each specimen was measured. Each fish was sacrificed by a blow to the head with a wooden club, weighed, double wrapped in heavy-duty aluminum foil and placed in a plastic bag with a water-proof tag stating the species type, collection date, collection location, length, and weight. Each specimen was then immediately placed on dry ice in a cooler.

2.2.1.2 Gillnets. At stations located in the estuary, gillnets proved more effective than the electrofishing unit at capturing fish in 1991. Gillnets were not used to capture fish in the later surveys. Sinking 6 x 100-ft gillnets with 2- to 6-inch variable mesh were deployed for 2-hr periods. Fish of the target species (peamouth or largescale sucker) were retrieved from the net, measured, wrapped in aluminum foil, and placed on dry ice.

In 1991, white sturgeon were collected from fish-processing facilities at various locations along the river. The fish were caught by commercial fishers using gillnets. These fish would then be sold to fish buyers, who would deliver them to fish processing facilities. The fish were delivered to the buyer between 6 and 18 hours after capture and were stored on ice during that time.

2.2.1.3 Hook-and-Line. White sturgeon in 1994-95 were caught by hook-and-line. Each fish was sacrificed by a blow to the head with a wooden club. The fish were filleted at a shore station, double wrapped in heavy-duty aluminum foil and placed in a plastic bag with a water-proof tag stating the species type, collection date, approximate collection location, and length. Each specimen was then immediately placed on ice in a cooler.

2.2.1.4 Crayfish Traps. Crayfish in both 1991 and 1993 were captured using traps baited with canned catfood. Several holes were made in each can, which allowed the scent of the food to escape, but did not allow the crayfish to eat the food. The traps were deployed at each station and left overnight. Captured crayfish were then removed from the traps and placed on ice prior to weighing. Crayfish were individually wrapped in foil and frozen live on dry ice.

2.2.1.5 Hatchery Collection. Coho and chinook were obtained in 1994 from three State hatcheries. Male coho and chinook were obtained from Washington State hatchery facilities located on the Lewis River and Kalama River, respectively. Male coho salmon were obtained from the hatchery itself, while male chinook salmon were obtained from the Modrow trap, located several miles downstream of the Kalama River hatchery. The male fish received from the Washington hatcheries were sacrificed prior to spawning by a blow to the head with a wooden club. Female coho and chinook were obtained from the Oregon State hatchery located on Big Creek. The post-spawning female fish received from the Oregon hatchery were sacrificed by hatchery personnel by electrofishing followed by a blow to the head. All fish were immediately wrapped in aluminum foil and placed on ice.

2.2.2 Sample Processing

With the exception of the white sturgeon collected in 1991, all fish and crayfish samples from 1991 and 1993 were analyzed whole. Therefore, no sample processing for these species was done in the field other than that described in Section 2.2.1. All specimens in 1995 were analyzed as filets as described below.

Fish fillets were removed by trained personnel following guidance provided in U.S. EPA (1993). Before processing, each fish was partially thawed. These steps were followed during the processing of samples:

Step 1. The filleter's hands were washed with ivory soap, rinsed with tap water, and then rinsed with distilled water prior to filleting. Fish were processed on a cutting board covered with heavy duty aluminum foil which was changed between fish. Prior to processing each specimen, all stainless steel utensils were washed with soap, rinsed with tap water, and then rinsed with distilled water.

Step 2. The scales were removed (largescale sucker and carp only) by placing the specimen flat against the cutting board and scraping with the edge of a stainless steel knife. The specimen was then rinsed with distilled water to remove the scales.

Step 3. The initial incision consisted of a shallow cut through the skin on either side of the dorsal fin from the top of the head to the base of the tail. Additionally, an incision was made behind the entire length of the gill cover, cutting through the skin and flesh to the bone. Following this cut, a shallow incision was made along the belly from the base of the pectoral fin to the tail. Care was taken to ensure that there was no cut into the gut cavity so as to not contaminate fillet tissues. Finally, a single cut was made from behind the gill cover to the anus and followed by an incision made on both sides of the anal fin. The fillet was removed and the remaining carcass was discarded.

Step 4. The fillet was wrapped in heavy duty aluminum foil and placed in a plastic bag with the waterproof tag. The plastic bag was sealed and stored frozen.

Filets of white sturgeon (1991 and 1995) were prepared in a slightly different manner than described in Step 3 above. In 1991, filets were taken by individuals at the fish processing facilities. Each filet, which did not include any skin, internal organs, or fat, consisted of a 20-25 x 10 cm section taken from immediately behind the head near the dorsal surface. The filets were placed in a glass jar or double-wrapped in aluminum foil, assigned a sample number, and kept frozen until delivered to the laboratory for analysis. A similar type of sturgeon filet was taken in 1995. The fileting procedure more closely matched the above description because the processing was done simultaneously with the other fish species in the processing laboratory.

2.2.3 Sample Compositing

With the exception of white sturgeon, all samples from 1991 and 1993 were composites of whole individuals. All samples from 1994-95 were filets. For 1991, each composite sample consisted of 5 or more individuals. Composite samples of crayfish consisted of 9 to 30 individuals. Composite fish samples consisted of 5 individuals, with the exception of 7 samples of largescale sucker and peamouth, which consisted of 6 to 8 individuals. All sturgeon samples consisted of individual fillets. In 1994-95, each composite sample consisted of 8 fish, except for the single composite of carp, which consisted of 7 fish. Three composite samples from steelhead, chinook, and coho salmon and one composite sample from carp were analyzed. For largescale sucker, three composite samples from each of the following stretches of the lower Columbia River were analyzed: Estuary (RM 0-48), Middle (RM 48-101), Upper (RM 101-146).

The laboratory procedure used to form each composite sample is described in Section 2.3.1.

2.2.4 Sample Custody and Shipping Procedures

Samples obtained in the field were strictly controlled by chain-of-custody procedures. A field logbook was maintained to document the collection of each sample. Samples were wrapped in foil and placed in a resealable plastic bag. Waterproof labels, included with the samples in each bag, contained the following information: station location, sampling date, species type, and specimen's weight and length.

Prior to shipping, samples were securely packed in the cooler with chain-of-custody forms enclosed in a plastic bag and taped to the inside of the cooler. The chain-of-custody form records the number of samples included in the shipment and the requested analyses. The individuals relinquishing and receiving the samples signed, dated, and noted the time on the chain-of-custody form. The cooler was sealed with fiber tape and a custody seal. All samples were shipped to the laboratory frozen via overnight delivery or delivered in person.

2.3 LABORATORY ACTIVITIES

This section describes the process by which the analytical laboratories received, processed, and analyzed each fish sample. Because of differing laboratories, procedures, and target analytes in the three surveys, laboratory activities will be described separately for each survey.

The laboratories responsible for the analyses of fish and crayfish samples are listed below:

1991

Laboratory	Analyses
Alden Analytical Labs	Semi-volatile organics, pesticides/PCBs
Keystone/NEA	Dioxins/furans, lipids
Precision Analytics, Inc.	Metals
Washington State University (WSU)	Metals
Lauck's Testing Laboratories	Metals

1993

Analytical Resources, Inc.	Semi-volatile organics, pesticides/PCBs, radionuclides
Pacific Analytical, Inc.	Dioxins/furans, organotins, lipids
Aquatic Research, Inc.	Metals

1995

Pacific Analytical, Inc.	Dioxins/furans, semi-volatile organics, pesticides/PCBs, lipids
Battelle Marine Science Lab	Metals

2.3.1 Sample Processing

Sample processing refers to the manner in which the laboratory prepared the frozen fish and crayfish samples for analysis.

2.3.1.1 1991 Reconnaissance Survey. Keystone/NEA was responsible for all initial laboratory processing of fish and crayfish. Seventy-three samples were received frozen by overnight courier or hand delivery in several different batches and immediately placed in a freezer at -10^{o}C until processing. Each batch was processed separately. All individuals in each composite were homogenized together after partial thawing using a Hobart meat grinder with 5 mm holes in the inner plate and placed in individual jars. Sturgeon filets (one per sample) were prepared for homogenization by removing material which had previously been exposed to air. This was done because of the possible sources of contamination at the fish processing facility where the filets had originally been prepared. Forty-four of the 73 samples were analyzed by Keystone/NEA for dioxins/furans. Aliquots from each of the 73 samples were sent to the other laboratories for analysis.

2.3.1.2 1993 Reconnaissance Survey. Pacific Analytical was responsible for all initial laboratory processing of fish and crayfish. Thirty-two samples were received frozen by overnight courier in several different batches and immediately placed in a freezer at -10^{o}C until processing. Each batch was processed separately. All individuals in each composite were homogenized together after partial thawing using a Hobart buffalo chopper and placed in individual jars. Aliquots from each of the thirty-two samples were sent to the other laboratories for analysis

2.3.1.3 1995 Risk Assessment Survey. Pacific Analytical was responsible for all initial processing of fish fillets. The 31 samples were received frozen by overnight courier in 5 different batches and immediately placed in a freezer at -10^{0} C until processing. Each batch was processed separately. Each filet was homogenized separately after partial thawing using a Hobart meat grinder with 5 mm holes in the inner plate and placed in individual jars. Samples were composited in accordance with U.S. EPA (1993) recommended guidelines. For the 19 composite samples, aliquots for each of the analyses were prepared by taking equal amounts (weight dependent on the type of analysis) from each of the individual specimen jars. In this manner, each fish contributed equally to the total composite weight, thereby reducing possible bias from fish that were not equal in size. For the 12 samples consisting of individual filets (sturgeon), all of the required sample amount was taken from one jar. All homogenized tissue in excess of what Pacific Analytical needed for the three analyses they performed on each sample was shipped frozen by overnight courier to Battelle Marine Science Lab. Battelle prepared composite and individual samples in a manner identical to Pacific Analytical.

2.3.2 Sample Analysis

The extraction/digestion and analytical methods for each of the analyses are described in separate sections below and in Table 2-1. Similar analytical methods were used for most analyses, but the detection limits achieved by the different laboratories varied (Table 2-2). The effect that differences in detection limits may have had on the resulting risk estimates is discussed in sections 5 and 6.

2.3.2.1 1991 Reconnaissance Survey. Samples were analyzed for lipids, metals, semi-volatile organics, pesticides/PCBs, and dioxins/furans. Each analytical method is described briefly below.

Lipids. The percentage of lipid in each of the samples was determined gravimetrically using methylene chloride as a solvent. The methylene chloride fraction was partitioned from a homogenized aliquot (125 mL) of the sample and then evaporated using a rotary evaporator. The residue (i.e., lipid) was then weighed and compared to the original aliquot weight.

Metals. Eleven metals were analyzed by a variety of methods as indicated below:

Metal(s)	Method
Ag, Ni, Cu, Ba, Sb, Zn	ICP (EPA Method 6010) by Lauck's
Pb	ICP/MS (EPA Method 200.8) by WSU
As, Se, Cd	GFAA (EPA Methods 7060, 7740, 7131) by Precision Analytics
Hg	CVAA (EPA Method 7471) by Precision Analytics

For all metals except mercury, aliquots (approximately 2 g) of tissue samples were digested with concentrated nitric acid and 30% hydrogen peroxide. The digestate was then refluxed with either dilute hydrochloric acid (all ICP analyses) or dilute nitric acid (all GFAA analyses). For mercury, aliquots (0.2 g) of samples were digested by concentrated hydrochloric and nitric acids, followed by treatment with potassium permanganate. Compounds were quantified as described in the methods. Each batch included the analysis of all QC samples required by the methods.

Semi-volatile Organics. All samples were analyzed for semi-volatile organic compounds by GC/MS using U.S. EPA Method 8270. For each sample, a 30 g aliquot was ground with anhydrous sodium sulfate and methylene chloride in a tissue homogenizer. The sample was then soxhlet extracted

TABLE 2-1. ANALYTICAL METHODS USED FOR 1991, 1993, AND 1995 SURVEYS

Analytical Group	1991 Method	1993 Method	1995 Method
Metals			
Antimony	ICP (U.S. EPA Method 6010)	GFAA (U.S. EPA Method 7041)	ICP/MS (U.S. EPA Method 200.8)
Arsenic (total)	GFAA (U.S. EPA Method 7060)	GFAA (U.S. EPA Method 7060)	ICP/MS (U.S. EPA Method 200.8)
Barium	ICP (U.S. EPA Method 6010)	ICP (U.S. EPA Method 6010)	ICP/MS (U.S. EPA Method 200.8)
Cadmium	GFAA (U.S. EPA Method 7131)	GFAA (U.S. EPA Method 7131)	ICP/MS (U.S. EPA Method 200.8)
Chromium	not analyzed	GFAA (U.S. EPA Method 7191)	not analyzed
Copper	ICP (U.S. EPA Method 6010)	ICP (U.S. EPA Method 6010)	ICP/MS (U.S. EPA Method 200.8)
Lead	ICP/MS (U.S. EPA Method 200.8)	GFAA (U.S. EPA Method 7421)	ICP/MS (U.S. EPA Method 200.8)
Mercury	CVAA (U.S. EPA Method 7471)	CVAA (U.S. EPA Method 7471)	CVAA (U.S. EPA Method 7471)
Nickel	ICP (U.S. EPA Method 6010)	ICP (U.S. EPA Method 6010)	ICP/MS (U.S. EPA Method 200.8)
Selenium	GFAA (U.S. EPA Method 7740)	GFAA (U.S. EPA Method 7740)	GFAA (U.S. EPA Method 7740)
Silver	ICP (U.S. EPA Method 6010)	GFAA (U.S. EPA Method 7761)	ICP/MS (U.S. EPA Method 200.8)
Zinc	ICP (U.S. EPA Method 6010)	ICP (U.S. EPA Method 6010)	not analyzed
Arsenic			
inorganic	not analyzed	not analyzed	Hydride AA (Battelle MSL-M-035-01)
methylated	not analyzed	not analyzed	Hydride AA (Battelle MSL-M-035-01)
Semi-volatile organics	GC/MS (U.S. EPA Method 8270)	GC/MS with SIM (U.S. EPA Method 8270)	GC/MS with SIM (U.S. EPA Method 8270)
Pesticides/PCBs	GC/ECD (U.S. EPA Method 8080)	GC/ECD (U.S. EPA Method 8081)	GC/ECD (U.S. EPA Method 8081)
Dioxins/Furans	HRGC/HRMS (U.S. EPA Method 1613A)	HRGC/HRMS (U.S. EPA Method 1613A)	HRGC/HRMS (U.S. EPA Method 1613A)
Butyltins	not analyzed	GC/FPD (U.S. EPA Method 1656	not analyzed
Radionuclides			
alpha-emitters	not analyzed	U.S. EPA Method 907.0	not analyzed
gamma-emitters	not analyzed	U.S. EPA Method 901.1	not analyzed

Abbreviations

AA = atomic absorption
ICP = inductively-coupled plasma
GFAA = graphite furnace atomic absorption
CVAA = cold vapor atomic absorption
GC = gas chromatography
MS = mass spectroscopy
ECD = electron capture detector
SIM = selective ion monitoring
HR = high resolution
FPD = flame photometric detector

TABLE 2-2. DETECTION LIMIT RANGES FOR 1991, 1993, AND 1995 SURVEYS			
Analytical Group	1991	1993	1995
Metals (μg/kg)			
Antimony	200-4050	11-15	3-6
Arsenic (total)	240-640	33-46	< 98 [a]
Barium	100-500	n/a	8-50
Cadmium	10-70	0.4-0.4	3-12
Chromium	n/a	< 15 [a]	n/a
Copper	430-2000	n/a	< 151 [a]
Lead	20-30	9-840	3-38
Mercury	12-15	1-49	< 39 [a]
Nickel	430-2330	90-100	10-26
Selenium	240-640	33-46	< 100 [a]
Silver	120-600	4-4	1-2
Zinc	n/a	< 12300 [a]	< 1800 [a]
Semi-volatile organics (μg/kg)	200-4050	4.4-7400	10-20
Pesticides (μg/kg)	3-2000	2.5-12000	0.01-22.22
PCBs (μg/kg)	50-50	29-250	0.89-4.44
Dioxins/Furans (ng/kg)	0.05-3.83	0.1-5.6	0.01-7.75

n/a = not analyzed

[a] Element was detected in every sample. Detection limit less than value given.

using methylene chloride and concentrated to 2 mL using a Kuderna-Danish (KD) apparatus. Compounds were quantified as described in the method using a DB-5 GC column with a MS detector. Each batch included the analysis of all QC samples required by the method.

Pesticides/PCBs. All samples were analyzed for pesticides/PCBs by GC/electron capture detector (ECD) using U.S. EPA Method 8080. In addition to the compounds normally detected using this method, nine additional pesticides (dacthal; dicofol; malathion; mirex; methyl parathion; parathion; o,p-DDE; o,p-DDD; and o,p-DDT) were also analyzed. Additional calibration standards for these compounds were added to the initial and continuing calibration run sequences.

For each sample, a 30 g aliquot was ground with anhydrous sodium sulfate and petroleum ether in a tissue homogenizer. The sample was then concentrated to 2 mL using a Snyder column. Dual columns of dissimilar phase (RTX-5 and RTX-1701) were used for quantitation and confirmation. Each batch included the analysis of all QC samples required by the method.

Dioxins/Furans. Samples were analyzed for the seventeen 2,3,7,8-substituted polychlorinated dioxins/furans by isotope dilution high-resolution gas chromatography/high resolution mass spectroscopy (HRGC/HRMS) (U.S. EPA Method 1613A). Because Method 1613A does not cover extraction of fish tissue, extraction and sample clean-up followed general guidelines outlined in U.S. EPA Method 8290. After removing the moisture from 20 g of homogenized tissue with a Dean-Stark apparatus, the solid residue was soxhlet extracted. The extract was subjected to silica filtration, followed by mixed-bed silica, AX-21/silica, and alumina cleanups. HRGC/HRMS analysis proceeded as described in the method. All 2,3,7,8-congeners were quantified using a DB-5 GC column as primary. All positive results for 2,3,7,8-TCDF were confirmed using a dissimilar GC column (DB-225) as required by the method. The DB-225 results for this congener were reported. Each batch included the analysis of all QC samples required by the method.

2.3.2.2 1993 Reconnaissance Survey. Samples were analyzed for lipids, metals, semi-volatile organics, pesticides/PCBs, dioxins/furans, organotins, and radionuclides. Each analytical method is described briefly below.

Lipids. The percentage of lipid in each of the samples was determined gravimetrically using petroleum ether as a solvent. The petroleum ether fraction was partitioned from a homogenized aliquot of the sample and then evaporated. The lipid residue was then weighed and compared to the original aliquot weight.

Metals. Twelve metals were analyzed by a variety of methods as indicated below:

Metal(s)	Method
Ni, Cu, Ba, Zn	ICP (EPA Method 6010)
Sb, As, Cr, Pb, Ag, Se, Cd	GFAA (EPA Methods 7041, 7060, 7191, 7421, 7761, 7740, 7131)
Hg	CVAA (EPA Method 7471) by Precision Analytics

Analytical methods for metals were identical to those used in the 1991 Reconnaissance Survey; see Section 2.2.3.1.

Semi-volatile Organics. Each sample was analyzed for semi-volatile organics by GC/MS (U.S. EPA Method 8270). The polyaromatic hydrocarbons (PAHs) were also quantified using GC/MS in SIM mode.

For each sample, a 30 g aliquot was ground with anhydrous sodium sulfate and methylene chloride in a tissue homogenizer. The sample was then soxhlet extracted using methylene chloride and concentrated to 2 mL using a Kuderna-Danish (KD) apparatus. Compounds were quantified as described in the method using a DB-5 GC column with a MS detector in SIM mode (for PAHs only). Each batch included the analysis of all QC samples required by the method.

Pesticides and PCBs. All samples were analyzed for pesticides/PCBs by GC/electron capture detector (ECD) using U.S. EPA Method 8080. In addition to the compounds normally detected using this method, five additional pesticides (dicofol; methyl parathion; o,p-DDE; o,p-DDD; and o,p-DDT) were also analyzed. Additional calibration standards for these compounds were added to the initial and continuing calibration run sequences.

For each sample, a 30 g aliquot was ground with anhydrous sodium sulfate and petroleum ether in a tissue homogenizer. The sample was then concentrated to 2 mL using a Snyder column. The extracts were cleaned on florisil and alumina columns and further blown down to 0.2 mL. Dual megabore columns of dissimilar phase (DB-5 and DB-608) were used for quantitation and confirmation. Each batch included the analysis of all QC samples required by the method.

Dioxins/Furans. All 32 samples were analyzed for the seventeen 2,3,7,8-substituted polychlorinated dioxins/furans by isotope dilution high-resolution gas chromatography/high resolution mass spectroscopy (HRGC/HRMS) (U.S. EPA Method 1613A). After removing the moisture from 20 g of homogenized tissue with a Dean-Stark apparatus, the solid residue was soxhlet extracted. The extract was washed (back extracted) with base and acid, followed by silica gel and celite (AX-21) cleanups (used to remove nonpolar interferences) and alumina column cleanup (used to remove polar interferences). HRGC/HRMS analysis proceeded as described in the method. All 2,3,7,8-congeners were quantified using a DB-5 GC column as primary. All positive results for 2,3,7,8-TCDF were confirmed using a dissimilar GC column (Rtx-200) as required by the method. The lower of the concentrations from the two columns for this congener were reported. Each batch included the analysis of all QC samples required by the method.

Organotins. Tissue samples were analyzed for monobutyl, dibutyl, and tributyl tins using a GC/Flame Photometric Detector (FPD) system (U.S. EPA Method 1656). Dual megabore columns of dissimilar phase (DB-5 and DB-608) were used for quantitation and confirmation. The FPD included a 600 nm bypass filter. Each batch included the analysis of all QC samples required by the method.

Radionuclides. Tissue samples were analyzed for alpha-emitting radionuclides (Pu-239/240, Pu-238, and Am-241) by U.S. EPA Method 907.0 and for gamma-emitting radionuclides (Co-60, Cs-137, Eu-152, Eu-154, and Eu-155) by U.S. EPA Method 901.1. Digestion included the use of nitric and hydrochloric acids, as well as hydrogen peroxide to ensure dissolution of fatty materials.

Following digestion, alpha-emitting radionuclides and tracers were co-precipitated with ferric hydroxide. The sample precipitate was then dissolved in 9 N hydrochloric acid and passed through an anion exchanged column which binds with plutonium. The americium passes through the column. The americium was further processed with a crown ether column and then americium was separated from lanthanide elements in a second anion exchange column. The americium sample was then mounted on a filter with cerium fluoride for analysis. The plutonium fraction was eluted from the first column using hydrobromic acid. The purified fraction of plutonium was then co-precipitated with cerium fluoride for analysis. The results were corrected for internal standard recoveries of Pu-242 and Am-243 as well as method tracer blank and background concentrations.

The gamma-emitting radionuclides were quantified by placing a wet sub-sample on the detector for 1,000 minutes. The results from the detector were corrected for background radiation, including internal sample radiation effects due primarily to mass attenuation.

2.3.2.3 1995 Risk Assessment Survey. Samples were analyzed for lipids, metals, semi-volatile organics, pesticides/PCBs, and dioxins/furans. Each analytical method is described briefly below.

Lipids. The percentage of lipid in each of the samples was determined gravimetrically using petroleum ether as a solvent. The petroleum ether fraction was partitioned from a homogenized aliquot of the sample and then evaporated. The lipid residue was then weighed and compared to the original aliquot weight.

Metals. All samples were analyzed for ten trace metals (Ag, As, Ba, Cd, Cu, Hg, Ni, Pb, Sb, and Se). Concentrations of all metals except mercury and selenium were determined by inductively coupled plasma mass spectroscopy (ICP/MS)(U.S. EPA Method 200.8). Mercury was determined by cold vapor atomic absorption (CVAA) and selenium was determined by graphite furnace atomic absorption (GFAA). Total arsenic was determined by ICP/MS. Inorganic arsenic and methylated (mono-methyl and dimethyl) arsenic were determined by hydride AA. The difference between total arsenic and the sum of the inorganic and methylated forms of arsenic is generally assumed to be organoarsenic compounds which are not easily quantified.

Each sample was digested with a 4:1 mixture of nitric acid to perchloric acid in a teflon bomb heated to 130° C for 4 hours. All samples analyzed for arsenic speciation were digested instead with sodium hydroxide which was intended to dissolve the tissue without decomposing the organoarsenic compounds. The samples were analyzed following standard operating procedures used by Battelle MSL (MSL-M-024-01, MSL-M-031-00, and MSL-M-035-01) which are patterned closely after U.S. EPA methods. Each batch included the analysis of a procedural blank, laboratory duplicate, matrix spike, and standard reference material (DORM-2).

Semi-volatile Organics. Thirteen semi-volatile organic compounds were analyzed by GC/MS in the selective ion monitoring (SIM) mode (U.S. EPA Method 8270). These 13 compounds are a subset of the compounds normally quantified using Method 8270 and are listed in Appendix A. During the study design, it was determined that these compounds represented a potential source of risk to human health from the consumption of fish in the Columbia River (Tetra Tech 1994b).

For each composite or individual sample, a 30 g aliquot was ground with anhydrous sodium sulfate and methylene chloride in a tissue homogenizer. The sample was then soxhlet extracted using methylene chloride and concentrated to 2 mL using a Kuderna-Danish (KD) apparatus. The extract was cleaned using gel permeation chromatography (GPC), followed by further concentration using KD and nitrogen blowdown to 0.5 mL. Compounds were quantified as described in the method using a DB-5 GC column with a MS detector in SIM mode. Each batch included the analysis of all QC samples required by the method.

Pesticides and PCBs. Pesticides and PCBs were analyzed by GC/Electron Capture Detection (ECD) (U.S. EPA Method 8081). In addition to the compounds normally detected using this method, two additional pesticides (mirex and methyl parathion) and two semi-volatile organic compounds (hexachlorobenzene and hexachlorobutadiene) were also analyzed. Additional calibration standards for these compounds were added to the initial and continuing calibration run sequences. Hexachlorobenzene and hexachlorobutadiene were quantified using this method rather than method 8270 because of the lower detection limits that could be achieved.

For each composite or individual sample, a 30 g aliquot was ground with anhydrous sodium sulfate and petroleum ether in a tissue homogenizer. The sample was then concentrated to 2 mL using a Snyder column. The extract was cleaned using gel permeation chromatography (GPC), followed by a solvent exchange with hexane, and cleanup with sulfuric acid. The resulting extract was eluted through a Florisil column with petroleum ether (PCB fraction), 6 percent ethyl ether in petroleum ether (pesticide fraction 1), and 15 percent ethyl ether in petroleum ether (pesticide fraction 2). The PCB fraction was further cleaned using an acidic silica gel, followed by the use of KD and nitrogen blowdown which concentrated the extract to 0.2 mL. Each of the three fractions were analyzed on two dissimilar megabore GC columns (DB-608 and DB-1701) using an ECD detector. The DB-608 was typically used for quantitation, while the DB-1701 was used for confirmation. Each batch included the analysis of all QC samples required by the method.

Dioxins/Furans. All 31 samples were analyzed for the seventeen 2,3,7,8-substituted polychlorinated dioxins/furans by isotope dilution high-resolution gas chromatography/high resolution mass spectroscopy (HRGC/HRMS) (U.S. EPA Method 1613A). The sample size extracted was increased to 50 g (20 g samples are typical) in order to achieve lower detection limits. After removing the moisture from the homogenized tissue with a Dean-Stark apparatus, the solid residue was soxhlet extracted. The extract was washed (back extracted) with base and acid, followed by silica gel and celite (AX-21) cleanups (used to remove nonpolar interferences) and alumina column cleanup (used to remove polar interferences). HRGC/HRMS analysis proceeded as described in the method. All 2,3,7,8-congeners were quantified using a DB-5 GC column as primary. All positive results for 2,3,7,8-TCDF were confirmed using a dissimilar GC column (Rtx-200) as required by the method. The lower of the concentrations from the two columns for this congener were reported. Each batch included the analysis of all QC samples required by the method.

2.4 QA/QC RESULTS

A thorough data validation was performed for all data according to guidance provided by U.S. EPA (1994b,c,d). Several types of QA/QC data were examined, including initial and continuing calibration; instrument performance checks; preparation blanks; internal standard, surrogate, and matrix spike recoveries; laboratory control standards; certified reference materials; and laboratory duplicates. Data qualifiers were added, as appropriate.

With the exception of one sample from the 1991 survey, none of the tissue data collected during either study were qualified as unusable for the human health risk assessment (see Section 2.5). A brief summary of the data validation performed for the analytical data is provided by survey below for each analytical group. The summary includes an explanation for all data qualifiers that were added.

2.4.1 1991 Reconnaissance Survey

Seventy-three tissue samples were analyzed for metals, semi-volatile organics, and pesticides/PCBs. Forty-four of the seventy-three samples were also analyzed for dioxins/furans. The QA/QC results for each analytical group will be discussed separately below.

2.4.1.1 Metals. Samples were analyzed for the presence of 11 metals. Detected concentrations for barium, copper, lead, mercury, nickel, silver, and zinc were qualified as estimates for some samples. Calibration and check standard data for these metals could not be obtained from the laboratory. Because of the absence of this important component of the data package, all results (detected and non-detected) for these metals were qualified as estimates.

2.4.1.2 Semivolatile Organics. Samples were analyzed for the presence of 54 semivolatile organic compounds. None of the detected values were qualified as estimates based on the QA/QC results.

2.4.1.3 Pesticides/PCBs. Samples were analyzed for 37 pesticides and PCBs. Detected values for 13 pesticides were qualified as estimates for some samples. Each of these compounds is discussed individually below. Because of the low surrogate recovery for dibutylchorendate (16 percent), all of the sample results for one of the sucker samples were qualified as unusable. A surrogate recovery as low as 16 percent indicates that the associated sample concentrations may have been seriously underestimated.

Dieldrin. Detected values for five of the seventy-three tissue samples (three sturgeon and two carp) were qualified as estimates due to a high matrix spike recovery (168 percent). High matrix spike recoveries may indicate that the associated sample concentrations have been overestimated.

Endosulfan Sulfate. One detected value (crayfish) from seventy-three samples was qualified as an estimate because continuing calibration results did not meet QC criteria.

Endrin. Three detected values (two sturgeon and one carp) from seventy-three samples were qualified as estimates because matrix spike results (130 percent recovery) did not meet QC criteria.

Endrin Aldehyde. Two detected values (sturgeon) from seventy-three samples were qualified as estimates because continuing calibration results did not meet QC criteria.

Methoxychlor. Two detected values (sturgeon) from seventy-three samples were qualified as estimates because continuing calibration results did not meet QC criteria.

DDT and Metabolites. Twenty-one of the seventy-three samples (primarily sucker and carp) were qualified as estimates for DDT or one of its metabolites (p,p'-DDD; p,p'-DDE; o,p'-DDT; o,p'-DDD; and o,p'-DDE) because matrix spike recoveries were outside QC criteria.

Malathion. One detected value (peamouth) from the seventy-three samples was qualified as an estimate because of matrix interference. This interference made it difficult to detect this compound in the matrix spike.

Parathion. One detected value (peamouth) from the seventy-three samples was qualified as an estimate because of matrix interference. This interference made it difficult to detect this compound in the matrix spike.

2.4.1.4 Dioxins/Furans. Forty-four samples were analyzed for seventeen 2,3,7,8-substituted dioxin and furan congeners. Based on the review of QC data (calibration, ongoing precision and recovery, method blanks, matrix spikes, internal standard recovery), none of the data were qualified as estimates. However, the laboratory did qualify data as estimates for each of the 17 congeners based on the review of the chromatograms. The 'S' qualifier was added for sample results which were below the Lower Method Calibration Limit (LMCL). This qualifier indicates that the result is an estimate because it falls below the calibration scale. The 'M' qualifier was added for sample results which passed all QC criteria except for the analyte isotope ratios. This qualifier indicates that the result is an estimate due to co-eluting contaminants or other chemical interferences. For each congener, the number of samples qualified as 'S', 'M', or 'S/M' is given below.

Congener	Number of Samples Qualified with S	Number of Samples Qualified with S/M	Number of Samples Qualified with M
2378-TCDD	7	4	0
12378-PeCDD	7	18	0
123478-HxCDD	13	14	0
123678-HxCDD	20	6	0
123789-HxCDD	17	7	1
1234678-HpCDD	21	5	0
OCDD	18	5	0
2378-TCDF	0	0	1
12378-PeCDF	22	11	0
23478-PeCDF	24	12	0
123478-HxCDF	20	6	0
123678-HxCDF	15	11	0
234678-HxCDF	13	15	4
123789-HxCDF	10	5	0
1234678-HpCDF	16	14	0
1234789-HpCDF	10	8	0
OCDF	18	8	0

2.4.2 1993 Reconnaissance Survey

Thirty-three tissue samples were analyzed for metals, semi-volatile organics, pesticides/PCBs, dioxins/furans, organotins, and radionuclides. The QA/QC results from each analytical group will be discussed separately below.

*2.4.2.1 **Metals**.* Samples were analyzed for the presence of 12 metals. Detected values for seven metals (cadmium, chromium, lead, nickel, selenium, silver, and zinc) were qualified as estimates based on an evaluation of the QC results. In addition, several samples for three metals (chromium, lead, and mercury) were qualified as undetected due to blank contamination. Each of these metals is discussed separately below.

Cadmium. One of the thirty-three samples was qualified as an estimate because QC criteria for laboratory precision were not met for the analysis of a laboratory duplicate sample.

Chromium. Two of the thirty-three samples were qualified as estimates because QC criteria for laboratory precision were not met for the analysis of a laboratory duplicate sample. In addition, two samples were qualified as undetected due to blank contamination because sample concentrations (0.024-0.032 mg/kg) did not exceed the blank concentration by 5X.

Lead. All detected values (24 samples) were qualified as estimates because matrix spike recoveries, laboratory precision requirements, and continuing calibration verification did not meet QC criteria. In addition, seven samples were qualified as undetected due to blank contamination because sample concentrations (0.038-0.084 mg/kg) did not exceed the blank concentration by 5X.

Mercury. Two of the thirty-three samples were qualified as undetected due to blank contamination because sample concentrations (0.045-0.049 mg/kg) did not exceed the blank concentration by 5X.

Nickel. Two of the thirty-three samples were qualified as estimates because QC criteria for laboratory precision were not met for the analysis of a laboratory duplicate sample.

Selenium. All detected values (10 samples) were qualified as estimates because continuing calibration verification did not meet QC criteria.

Silver. Detected values for eight of the thirty-three samples were qualified as estimates because matrix spike recoveries, laboratory precision requirements, and continuing calibration verification did not meet QC criteria.

Zinc. All thirty-three concentrations were qualified as estimates because ICP serial dilution criteria were not met. This QC check is intended to determine whether significant physical or chemical interferences exist due to the sample matrix.

2.4.2.2 Semivolatile Organics. Samples were analyzed for the presence of 60 semivolatile organic compounds. No detected values were qualified as estimates for any semivolatile organic compound. Two compounds (naphthalene and 2-methylnaphthalene) were qualified as undetected for some samples due to blank contamination. These compounds are discussed separately below.

Naphthalene. Eight of thirty-three samples were qualified as undetected due to blank contamination because sample concentrations (4.4-9.9 μg/kg) did not exceed the blank concentration (2.5 μg/kg) by 5X.

2-Methylnaphthalene. Two of thirty-three samples were qualified as undetected due to blank contamination because sample concentrations (5.6-5.7 μg/kg) did not exceed the blank concentration (1.4 μg/kg) by 5X.

2.4.2.3 ***Pesticides/PCBs.*** Samples were analyzed for the presence of 34 pesticides and PCBs. Four of thirty-three values for p,p'-DDT were qualified as estimates based on exceedance of continuing calibration verification criteria.

2.4.2.4 ***Dioxins/Furans.*** Samples were analyzed for the presence of seventeen 2,3,7,8-substituted dioxin and furan congeners. Detected values for only one congener (2,3,7,8-TCDF) were qualified as estimates. Five of thirty-three values for this congener were qualified as estimates because of high matrix spike recoveries, possibly indicating that the associated sample concentrations were overestimated.

2.4.2.5 ***Organotins.*** Samples were analyzed for three butyltins. Some samples for each butyltin were qualified as described below.

Monobutyltin. One of the thirty-three samples was qualified as undetected due to blank contamination because the sample concentration (0.8 μg/kg) did not exceed the blank concentration (1.6 μg/kg) by 5X.

Dibutyltin. One of the thirty-three samples was qualified as an estimate because of a low surrogate recovery, possibly indicating that the associated sample concentration was underestimated.

Tributyltin. One of the thirty-three samples was qualified as an estimate because of a low surrogate recovery. In addition, six of the thirty-three samples were qualified as undetected due to blank contamination because sample concentrations (1.6-12 μg/kg) did not exceed the blank concentrations (1.2-6 μg/kg) by 5X.

2.4.2.6 Radionuclides. Samples were analyzed for the presence of 3 alpha-emitting and 5 gamma-emitting radionuclides. None of the samples were qualified as estimates for any radionuclide.

2.4.3 1995 Risk Assessment Survey

Thirty-one tissue samples were analyzed for metals, semi-volatile organics, pesticides/PCBs, and dioxins/furans. The QA/QC results from each analytical group will be discussed separately below.

2.4.3.1 Metals. Thirty-one fish tissue samples were analyzed for the presence of ten trace metals. The samples were analyzed in three batches. Quality control samples analyzed with each batch included preparation blanks, certified reference material (CRM) (DORM-2), laboratory control standards (two batches only), matrix spikes, and laboratory duplicates. If the results for any metal in a particular QC sample were outside the data quality objectives (Tetra Tech 1994b), all of the data for that metal in that batch were qualified.

Data qualifiers were not added to detected concentrations for the following metals: 1) antimony, 2) arsenic (total), 3) cadmium, 4) copper, and 5) mercury. Qualifiers for the other trace elements are described below.

Arsenic (inorganic). Six of the thirty-one samples were qualified as estimates (J_6) because a single matrix spike had a recovery outside the acceptable QC range of (75-125 percent). The percent recovery for this matrix spike was 58 percent. Low spike recoveries could indicate that the associated sample concentrations have been underestimated.

Barium. Ten of the thirty-one samples were qualified as estimates (J_8) because duplicate precision requirements ($\pm$30 percent) were not met. The relative percent difference (RPD) between the duplicates was 36 percent. In addition, two samples were also qualified as undetected due to blank contamination (BU) because sample concentrations were less than five times the blank concentration (i.e., the 5X rule). The concentration of barium detected in the blank (0.016 μg/g dry) was slightly higher than the detection limit (0.011 μg/g dry).

Lead. Twenty-five of the thirty-one samples were qualified during the QC review. Thirteen of the samples were qualified (BUJ_8) because sample concentrations did not exceed blank concentrations by

5X and duplicate precision requirements (±30 percent) were not met. Nine additional samples were also qualified as undetected due to blank contamination (BU) and three additional samples were qualified as estimates (J_8) because of duplicate analyses. RPDs for the two duplicate pairs which exceeded precision criteria were 84 and 53 percent. Lead was detected in two preparation blanks at concentrations 3X (0.044 vs. 0.014 μg/g dry) and 2X (0.006 vs. 0.003 μg/g dry) the detection limit.

Nickel. Six of the thirty-one samples were qualified as estimates (J_7) because reference material concentrations were slightly outside the acceptable QC range (70-130 percent) of the certified value. The RPDs between measured and certified values for two replicate measurements of the CRM were 34 and 42 percent. These results could indicate that the associated sample concentrations have been underestimated.

Selenium. Nine of the thirty-one samples were qualified as estimates (J_8) because a single duplicate analysis was outside precision criteria. The RPD for this duplicate sample analysis was 63 percent.

Silver. Six of the thirty-one samples were qualified as estimates (J_6) because of a single matrix spike recovery outside the acceptable QC range. The percent recovery for this matrix spike was 31 percent.

2.4.3.2 Semivolatile Organics. Thirty-one fish tissue samples were analyzed for the presence of thirteen semivolatile chemicals. These samples were analyzed in five batches. Quality control samples analyzed with each batch included method blanks, matrix spikes, and surrogate spikes (every sample). If the results for any compound or surrogate in a particular QC sample were outside the data quality objectives (Tetra Tech 1994b), all of the data for that compound or associated compounds in that batch were qualified.

Detected concentrations were qualified as estimates for at least a portion of the 31 samples for 3 of the 13 compounds. For the other 10 compounds, two undetected sample concentrations for each compound were qualified (UJ_5) because of surrogate spike recoveries outside acceptable QC recovery limits. The three compounds for which detected concentrations were qualified are described individually below.

bis(2-Ethylhexyl)phthalate. Thirty of the thirty-one samples were qualified in the QC review. Twenty-eight of the thirty-one samples were qualified undetected due to blank contamination (BU) because sample concentrations did not exceed blank concentrations by more than 10X. One sample was qualified as BUJ_5 because of blank contamination and low surrogate recoveries, while one additional sample was qualified as J_5 because of low surrogate spike recoveries. Low surrogate recoveries could indicate that the associated sample concentrations have been underestimated. Blank contamination was noted in each of the five batches at concentrations ranging from 8-60 μg/kg (nominal reporting limit = 10 μg/kg). Sample concentrations as high as 223 μg/kg were qualified as undetected because of the blank contamination. Contamination from bis(2-ethylhexyl)phthalate is commonly observed in this method.

4-Methylphenol. Five of the thirty-one samples were qualified in the QA review. Two samples were qualified (J_5) because surrogate spike recoveries were outside acceptable QC recovery limits. Three samples were qualified (J_1) because sample concentrations were below nominal reporting limits (10 μg/kg). The J_1 qualifier indicates that the analyst was confident that the compound was present in the sample, but the actual concentration reported is less certain than reported concentrations greater than 10 μg/kg.

Phenol. Twenty-five of the thirty-one samples were qualified in the QA review. Twenty-three samples were qualified as undetected due to blank contamination (BU) because sample concentrations did not exceed blank concentrations by more than 5X, and two samples were qualified (J_5) because surrogate spike recoveries were outside the acceptable QC recovery limits. Blank contamination was noted in four of the five batches at concentrations ranging from 8-17 μg/kg (nominal reporting limit = 10 μg/kg). Sample concentrations as high as 52 μg/kg were qualified as undetected because of the blank contamination.

2.4.3.3 Pesticides/PCBs. Thirty-one fish tissue samples were analyzed for the presence of thirty-two pesticides/PCBs. These samples were analyzed in five batches. Quality control samples analyzed with each batch included method blanks, matrix spikes, and surrogate spikes (every sample). If the results for any compound or surrogate in a particular QC sample were outside the data quality objectives (Tetra Tech 1994b), all of the data for that compound or associated compounds in that batch were qualified.

None of the compounds were qualified as estimates for any of the samples. Two compounds were qualified as undetected due to blank contamination for at least some samples. These compounds are described below.

Endrin Ketone. One of the thirty-one samples was qualified (BU) because the sample concentration (0.41 μg/kg) did not exceed the blank concentration (0.33 μg/kg) by more than 5X.

Hexachlorobutadiene. One of the thirty-one samples was qualified (BU) because the sample concentration (0.17 μg/kg) did not exceed the blank concentration (0.06 μg/kg) by more than 5X.

2.4.3.4 Dioxins/Furans. Thirty-one fish tissue samples were analyzed for the presence of 17 dioxins/furan congeners. These samples were analyzed in 5 batches. Quality control samples analyzed with each batch included method blanks, ongoing precision and recovery (OPR) samples, and internal standards (each sample). If the results for any compound or internal standard in a particular QC sample were outside the data quality objectives (Tetra Tech 1994b), all of the data for that compound or associated compounds in that batch were qualified. Four samples (KCmp2, KCmp3, HCmp2, and HCmp3) were reanalyzed by Triangle Labs because of blank contamination noted for 2,3,7,8-TCDD. Concentrations reported in Appendix A for these samples and used in the risk assessment were from the reanalyses.

None of the congeners were qualified as estimates for any of the samples. Several congeners were qualified as undetected due to blank contamination for at least one sample. These congeners are discussed below.

1,2,3,4,6,7,8-HpCDD. Two of the thirty-one samples were qualified (BU) because sample concentrations (0.08-0.16 ng/kg) did not exceed the blank concentration (5.9 ng/kg) by 5X. The laboratory believed the high concentration in the blank was due to defective glassware and not contamination in the analytical apparatus.

OCDD. One of the thirty-one samples was qualified (BU) because the sample concentration (0.17 ng/kg) did not exceed the blank concentration (90.4 ng/kg) by 5X. The laboratory believed the high concentration in the blank was due to defective glassware and not contamination in the analytical apparatus.

1,2,3,6,7,8-HxCDF. One of the thirty-one samples was qualified (BU) because the sample concentration (0.14 ng/kg) did not exceed the blank concentration (0.04 ng/kg) by more than 5X.

2,3,4,6,7,8-HxCDF. One of the thirty-one samples was qualified (BU) because the sample concentration (0.15 ng/kg) did not exceed the blank concentration (0.15 ng/kg) by more than 5X.

1,2,3,7,8,9-HxCDF. One of the thirty-one samples was qualified (BU) because the sample concentration (0.28 ng/kg) did not exceed the blank concentration (0.07 ng/kg) by 5X.

1,2,3,4,6,7,8-HpCDF. One of the thirty-one samples was qualified (BU) because the sample concentration (0.18 ng/kg) did not exceed the blank concentration (0.05 ng/kg) by 5X.

2.5 RELIABILITY OF DATA FOR RISK ASSESSMENT

There are several factors to consider in assessing the usability of environmental data for risk assessments (U.S. EPA 1990a). In addition to the data quality criteria goals, the source, documentation, analytical methods/detection limits, and level of review associated with the data can all affect the usability.

The data review and data validation results for this project were presented in Section 2.4. With the exception of a single sample analyzed for pesticides/PCBs, none of the data collected during any of the three studies were qualified as unusable for the human health risk assessment. Some sample results were qualified as estimates. Estimated data were considered useable for risk assessment purposes, although the uncertainty associated with risk assessments made from estimated data might be slightly higher than assessments made from unqualified data.

The source of analytical data used in risk assessments may be an issue if data from different investigations are used. Because different laboratories and in some cases different methods were used for the three surveys, risk estimates were made both separately for each survey and considering both 1991 and 1993 together. In this way, the effects of data source may be examined. The data for 1995 were not combined with the two previous datasets because of the differences in sample type (i.e., whole body vs. filet).

Documentation of field and laboratory procedures is important so the effect of any deviation from these procedures on data usability can be assessed. Extensive documentation was prepared for all three surveys (Tetra Tech 1993a; 1995a,b). No deviations from project guidelines were noted which would adversely affect the usability of the analytical data.

Detection limits can affect data usability if they are higher than risk-based screening concentrations. Potential risk from these chemicals can be quantified, but the uncertainty of these estimates is greater than that for chemicals for which the detection limit was lower than risk-based screening concentrations. The detection limits achieved for the 1995 survey were generally lower than those achieved for the 1993 survey, which in turn were generally lower than the 1991 survey (Table 2-2).

The level of analytical data review can also affect data usability. All data used in this risk assessment were subject to a thorough data reduction and validation process, as described in Section 2.4.

SECTION 3.0
EXPOSURE/ASSESS.

3.0 EXPOSURE ASSESSMENT

Exposure assessment consists of identifying the population that might be exposed to the pollutants under study; determining how they might be exposed (the pathway); and assigning values to parameters such as exposure duration and frequency, intake rate, and body weight in order to estimate the potential risk from the selected pathways. Exposure assessment also includes estimating, usually through the collection of analytical data, the chemical concentration to which the exposed population is potentially exposed. Each of these topics will be discussed in separate sections below.

3.1 IDENTIFICATION OF POTENTIALLY EXPOSED POPULATION

The HHRWG recommended that health risks be estimated for three general target populations: general public, recreational anglers, and subsistence anglers (Lower Columbia River Bi-State Program 1993b). A regional study of the consumption of fish from the lower Columbia River has not been conducted, although smaller-scale studies have been conducted for the Columbia Slough (Adolfson Associates 1995) and for four Columbia River Basin Indian tribes located upstream of the lower Columbia River (CRITFC 1994). Because of the lack of a regional study, there is uncertainty regarding the exposure parameters (e.g., amount and frequency of fish consumption, type and portion of fish consumed, fish preparation methods) to be used in assessing human health risks for each of these target populations. These issues will be discussed in more detail in Section 3.3.

3.2 IDENTIFICATION OF EXPOSURE PATHWAYS

An exposure pathway defines the course a chemical takes from its source to a potentially exposed individual (U.S. EPA 1989a). Each exposure pathway includes a source of the chemical, an impacted medium, an exposure or contact point with the impacted medium, and an exposure route. Although many different exposure pathways could be identified for the lower Columbia River, this risk assessment will only evaluate the potential risk from the consumption of fish and crayfish. This consensus decision was made by the HHRWG for the following reasons:

- Time and resources were insufficient to allow all exposure pathways to be evaluated

- Fish consumption is apparently the exposure pathway of greatest concern to the public

- The data to evaluate another potentially significant exposure pathway, drinking water, has not been collected by the Bi-State Program, which has only analyzed water prior to the treatment that takes place before reaches people's homes as drinking water.

3.3 QUANTIFICATION OF EXPOSURE

The quantification of exposure depends upon the concentration of the chemical detected in the contaminated media and the potential for exposure to that chemical. Exposure is normalized for time and body weight and a calculated chemical-specific chronic daily intake (CDI), an amount per body weight per time (mg/kg-day). The equation for CDI is:

$$CDI = \frac{C \times CF \times IR \times EF \times ED}{BW \times AT}$$

where:

CDI	=	Chronic daily intake of a specific chemical (mg/kg-day)
C	=	Chemical concentration (mg/kg)
CF	=	Conversion factor (kg/g)
IR	=	Ingestion (consumption) rate (g/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time for exposure duration (EF x ED for noncarcinogens and 70 years x 365 days/year for carcinogens)

Specific values and assumptions used in calculating the CDI were selected based on U.S. EPA (1989a, 1990b, 1991) guidance. For carcinogenic chemicals, the CDI was averaged over a 30 year (90 percent of the mean annual residency) and a 70 year (average U.S. lifespan) exposure duration (U.S. EPA 1990b). These values were considered as part of the Reasonable Maximum Exposure (RME) scenario for the general public and recreational anglers (i.e., 30 years) and for subsistence fishers (i.e., 70 years). For noncarcinogens, the CDI was averaged over a 30 year exposure duration. An exposure frequency of 350 days/year, which defines a resident who normally takes a two week annual vacation, was used for the 30 year exposure duration (U.S. EPA 1991). An exposure frequency of 365 days/year, which assumes year-round exposure, was used for the 70 year lifetime exposure duration (U.S. EPA 1989a). Exposure parameter values used in the calculation of CDI and their source and rationale are shown in Table 3-1.

3.3.1 Consumption Rates

Two surveys of fish consumption have been conducted in the Columbia River Basin recently (Adolfson Associates 1995, CRITFC 1994). The Adolfson Associates (1995) study examined fish consumption practices in the Columbia Slough and on Sauvie Island, both near Portland, Oregon. A total of 364 fishers were interviewed in the field and asked about fishing locations, ethnicity, type of fish caught, fate of fish, parts of fish consumed, and preparation of fish. No estimate of consumption rate for the entire survey population was made, but it was estimated that people who regularly ate their catch consumed 2.2 kg of fish over the 5-month warm-weather survey. The CRITFC (1994) study interviewed 513 randomly selected members of four tribes (Nez Perce, Warm Springs, Yakima, and Umatilla), including fishers and non-fishers. Subjects were asked about where they fished, type of fish caught, fate of fish, parts consumed, and preparation method. The specific consumption rates calculated included 58.7 g/day (mean of all adult respondents) and 176 g/day (95th percentile for all adult fish consumers).

Because of the limited scope of the two consumption surveys described above, there is uncertainty involved in selecting representative fish consumption rates for the entire lower Columbia River. To address this uncertainty, risk is estimated graphically over a range of consumption rates [0.1 - 300 g/day (0.004 - 10.6 oz/day)] and exposure durations (30 and 70 years). This approach is designed to assist individuals, regulatory agencies, and health departments in making their own assessments of the health risk associated with consuming varying amounts and types of fish from the lower Columbia River. The consumption rates representative of various populations and used in other risk assessments of chemically

TABLE 3-1. VALUES USED TO CALCULATE THE CHRONIC DAILY INTAKE		
Parameter	RME Value	Source/Rationale
Concentration (C)	Arithmetic mean in mg/kg	Species and chemical specific
Ingestion Rate (IR)	Variable 6.5 g/day 54 g/day 176 g/day	 National per-capita average (U.S. EPA 1990a) Recreational fisherman average (U.S. EPA 1991a) 95th percentile adult consumption (CRIFTC, 1994)
Exposure Frequency (EF)	350 days/year 365 days/year	Recreational Scenario (U.S. EPA 1991a) Assumes 365 days/year exposure
Exposure Duration (ED)	30 years 70 years	90% of residential ownership (U.S. EPA 1990a) Average lifetime expectancy (U.S. EPA 1990a)
Body Weight (BW)	70 kg	Average adult bodyweight (U.S. EPA 1990a)
Averaging Time (AT)	Noncarcinogens: EF x ED (days) Carcinogens: 25550 days	By definition (U.S. EPA 1991a)

contaminated fish are shown in Figure 3-1. It should be noted that some of the consumption rates in Figure 3-1 are for saltwater fish and may not be relevant to the consumption of freshwater fish and crayfish. In order for the reader to interpret and better understand the risk values, risk estimates were also made for three specific consumption rates and presented in tables. Each consumption rate was selected on the basis of its use in the regulatory community or from various fish consumption rate studies (Figure 3-1). The three ingestion rates include 6.5 g/day, 54 g/day, and 176 g/day. The ingestion rate of 6.5 g/day is considered the national per-capita average for fish consumption (U.S. EPA 1990b). This average includes all individuals who may consume fish as well as those who do not consume fish. The water quality criteria guidelines are based upon this ingestion rate. An ingestion rate of 54 g/day is a U.S. EPA-recommended standard for the recreational fisherman, based on a study of people who ingest finfish (U.S. EPA 1991). An ingestion rate of 176 g/day is the 95th percentile consumption rate for adult CRITFC (1994) tribal fish consumers (18 and older).

3.3.2 Exposure Point Concentrations

U.S. EPA guidance recommends that risk analyses demonstrate reasonable maximum exposure assumptions, defined as the highest exposure likely to occur at a site, in order to quantify risk (U.S. EPA 1989a). The exposure point concentration estimates for edible tissue of fish or shellfish are commonly based on the arithmetic mean concentrations (U.S. EPA 1989c). The arithmetic mean is representative of a concentration to which fish consumers would most likely be exposed to over the long period of time being used in this assessment. For the purposes of this risk assessment, mean concentrations were calculated for each fish species. For species which were sampled during both 1991 and 1993, cumulative mean concentrations were also calculated.

For each fish species, chemicals which were detected were evaluated separately from chemicals that were not detected. A flowchart which portrays the decision process for the calculation of EPCs for detected and non-detected chemicals is presented in Figure 3-2. If a chemical was detected in any of the samples for a given fish species, it was considered a detected chemical and was quantitatively evaluated for that species. For the calculation of the mean concentration for detected chemicals, one-half the detection limit was used for individual samples in which the chemical was not detected. Lists of detected and non-detected chemicals and mean concentrations for each species and sampling year combination are provided in Appendix B. Chemicals which were not detected in any sample for a given species were considered

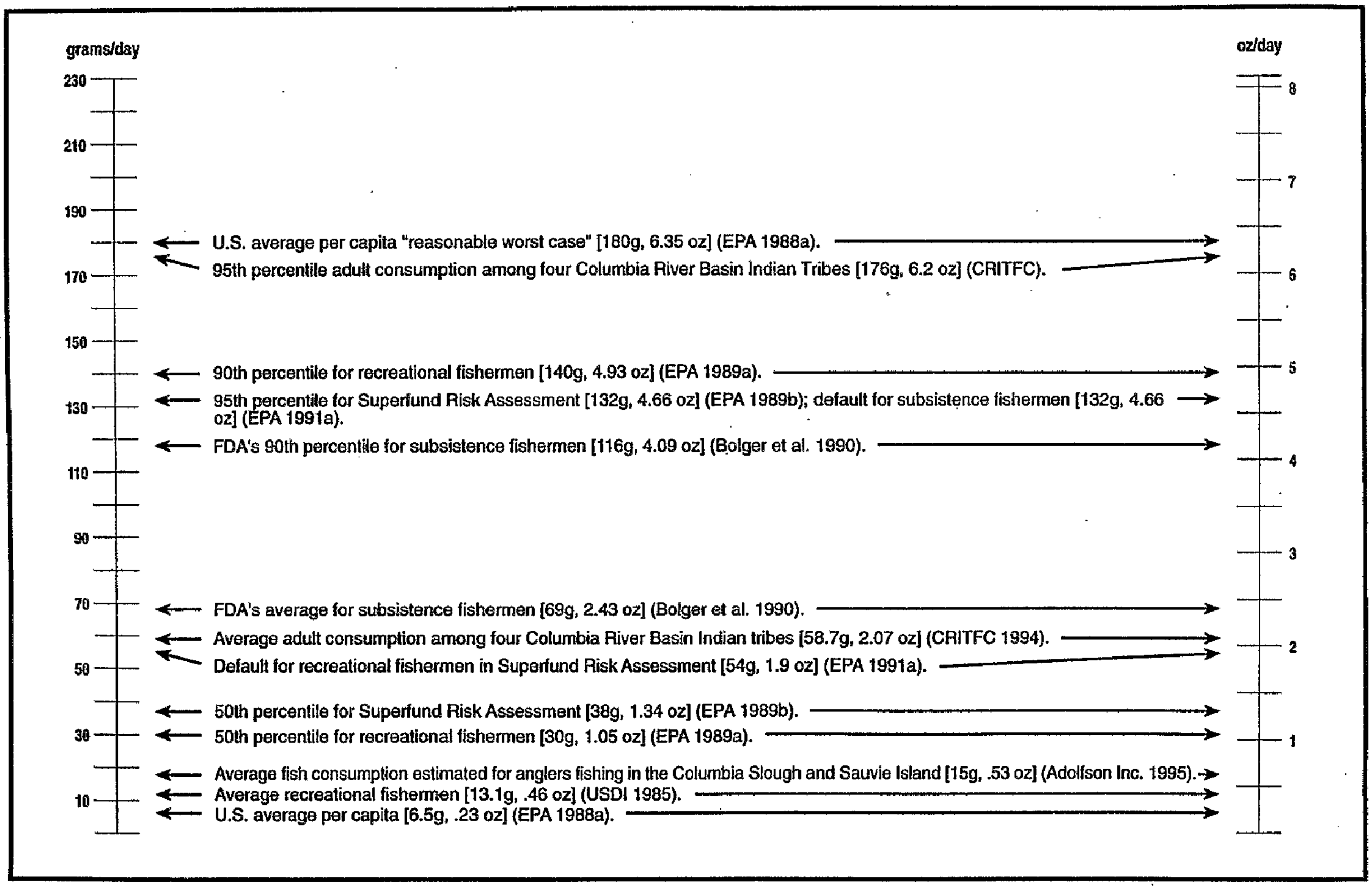


Figure 3-1. Comparison of Assumed Fish Consumption Rates.

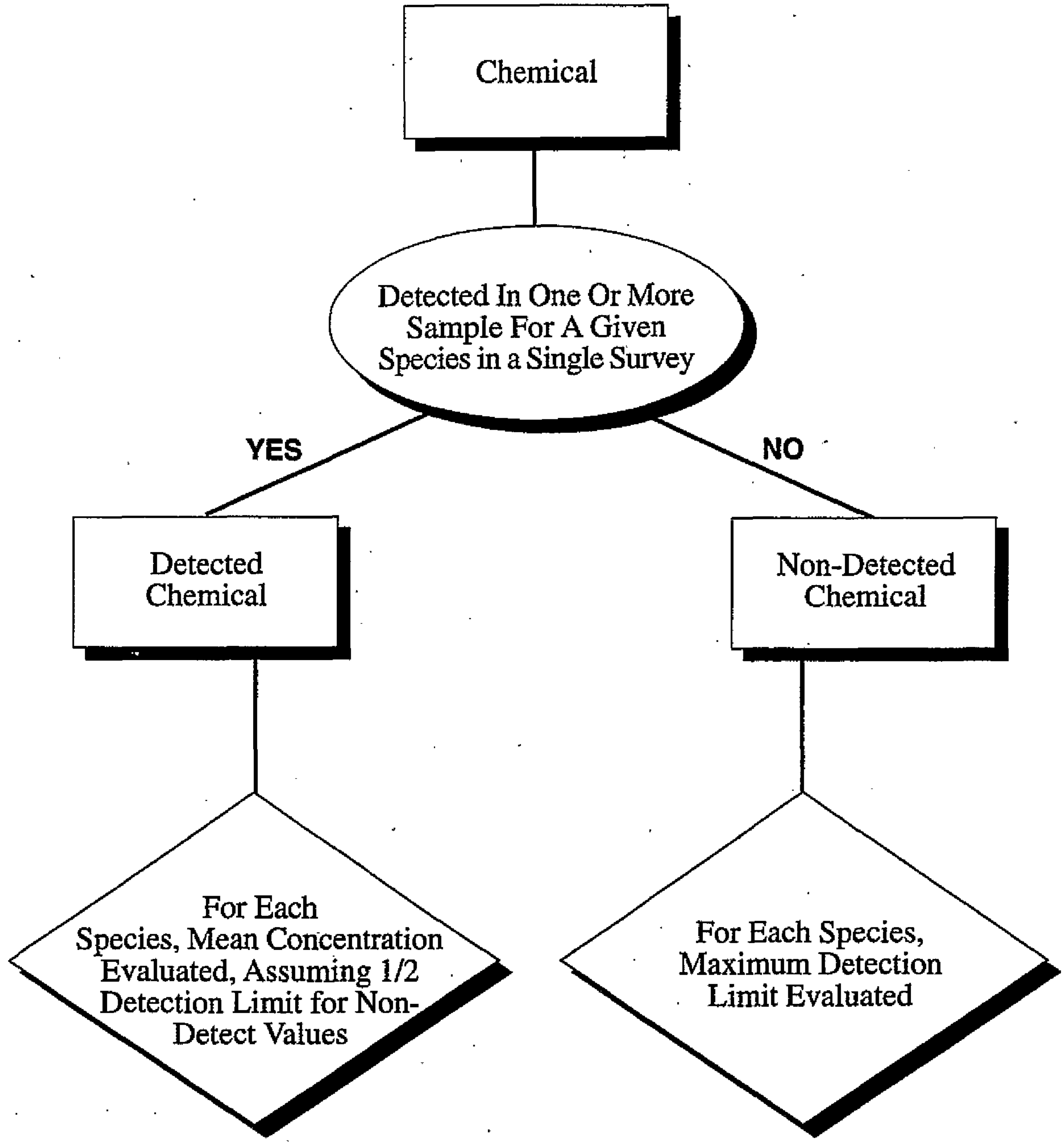


Figure 3-2. Decision Flowchart For Treatment of Non-Detect Values.

non-detected chemicals. For each species, potential risk from these chemicals was evaluated at the full detection limit in Section 5-2.

All the concentrations presented in Appendix B are based on results as submitted by the analytical laboratories, with the exception of arsenic from the 1991 and 1993 surveys. Detected values for arsenic in these years were multiplied by a fraction calculated from the analysis of inorganic and organic arsenic in 1995 (Tetra Tech 1995b) to derive a concentration of inorganic arsenic, which is generally thought to be the primary toxic species of arsenic. The fractions used were 0.0612 for largescale sucker, 0.0907 for white sturgeon, and 0.01 for crayfish. The latter value was suggested by U.S. FDA (1993) for converting total arsenic measurements to inorganic arsenic in shellfish.

SECTION 4.0
TOXICITY ASSESS.

4.0 TOXICITY ASSESSMENT

The toxicity assessment evaluates each chemical's potential to cause health effects based on available toxicological information. Toxicity information was obtained from U.S. EPA toxicity databases, including the second quarter edition of Integrated Risk Information System (IRIS) (U.S. EPA 1995a) and the 1994 supplement number two annual update of the Health Effects Assessment Summary Tables (HEAST) (U.S. EPA 1994a).

Each chemical is quantitatively evaluated on the basis of its non-carcinogenic and/or carcinogenic potential. For each detected chemical, a brief toxicological profile, which discusses the chemical's non-carcinogenic and carcinogenic effects based upon human and/or laboratory exposure, can be found in Appendix C.

4.1 TOXICITY VALUES FOR NON-CARCINOGENIC ENDPOINTS

This section presents the toxicity values used to assess chronic effects due to exposure from detected chemicals with noncarcinogenic endpoints. For each detected chemical, Table 4-1 presents the toxicity value used for evaluating exposure to noncarcinogens, defined as the reference dose (RfD), and the critical effects of that chemical. Some chemicals may have more than one critical effect. Table 4-1 indicates for each chemical which of the most common non-carcinogenic endpoints evaluated in Section 5.0 may be applicable. Table 4-2 presents a more detailed list of the noncarcinogenic endpoints associated with each detected chemical. The RfD is an estimate (with uncertainty spanning perhaps an order of magnitude or greater) of the daily exposure to the human population, including sensitive sub-populations, that is likely to be without an appreciable risk of deleterious effects during a lifetime. Table 4-1 also displays the confidence level in the RfD, a measure of uncertainty associated with the experimental procedure supporting the RfD; the uncertainty factor (UF), a measure of uncertainty associated within the data extrapolations for estimating the RfD (e.g., subchronic versus chronic study; rodent or primate

TABLE 4-1. ORAL NON-CARCINOGENIC TOXICITY VALUES (Page 1 of 2)						
Chemical	Oral RfD (mg/kg-day)	Confidence	UF/MF	Critical Effect	Hazard Index[h]	Source
1,2,4-Trichlorobenzene	1E-2	Medium	1000/1	Increased adrenal weights and CNS effects	CNS	IRIS
2,4-Dintrotoluene	2E-3	High	100/1	Hematopoietic effects	CNS, Dev	IRIS
2-Chlorophenol	5E-3	Low	1000/1	Hematopoietic effects	Dev	IRIS
4-Methylphenol	5E-3	-	1000/1	CNS effects	CNS	HEAST
4-Nitrophenol	6.2E-2	-	-	CNS effects	CNS	EPA Region III
Acenaphthene	6E-2	Low	3000/1	Hepatotoxicity	None	IRIS
Aldrin	3E-5	Medium	1000/1	CNS effects	CNS, Dev	IRIS
Antimony	4E-4	Low	1000/1	Hypertension	None	IRIS
Aroclor 1248	7E-5[a]	-	-	Immunological effects	Dev, Imm	-
Aroclor 1242	7E-5[a]	-	-	Immunological effects	Dev, Imm	-
Aroclor 1254	2E-5	Medium	100/1	Immunological effects	Dev, Imm	IRIS
Aroclor 1260	7E-5[a]	-	-	Immunological effects	Dev, Imm	-
Arsenic (inorganic)	3E-4	Medium	3/1	Hyperpigmentation, keratosis	CNS	IRIS
Barium	7E-2	Medium	3/1	Cardiovascular effects	None	IRIS
Benzyl alcohol	3E-1	-	100/1	Decreased weight	None	HEAST
Bis(2-ethylhexyl)-phthlate	2E-2	Medium	1000/1	Hepatotoxicity	None	IRIS
Cadmium (food)	1E-3	High	10/1	Renal toxicity	Dev	IRIS
Chromium (III)[e]	1E+0	Low	100/10	Renal necrosis	None	IRIS
Dacthal	1E-2	High	100/1	Hepatotoxicity	CNS, Imm	IRIS
DDD	5E-4[c]	-	-	CNS effects	CNS, Dev, Imm	-
DDE	5E-4[c]	-	-	CNS effects	CNS, Dev, Imm	-
DDT	5E-4	Medium	100/1	CNS effects	CNS, Dev, Imm	IRIS
Di-n-butylphthalate	1E-1	Low	1000/1	Increased mortality	None	IRIS
Dieldrin	5E-5	Medium	100/1	Altered fertility	Dev, Imm	IRIS
Endosulfan (I and II)	6E-3[b]	Medium	100/1	Decreased weight gain, glomerulonephrosis	None	IRIS
Endrin	3E-4	Medium	100/1	CNS effects	CNS	IRIS
Fluorene	4E-2	Medium	3000/1	Decreased RBC, cell volume & hemoglobin	None	IRIS
gamma-BHC (Lindane)	3E-4	Medium	1000/1	Hepatotoxicity, renal toxicity	CNS	IRIS
Heptachlor	5E-4	Low	300/1	Increased male liver weights	Dev	IRIS
Hexachlorobenzene	8E-4	Medium	100/1	Liver effects	None	IRIS
Hexachlorobutadiene	2E-4	-	1000/1	Renal effects	None	HEAST

TABLE 4-1. ORAL NON-CARCINOGENIC TOXICITY VALUES
(Page 2 of 2)

Chemical	Oral RfD (mg/kg-day)	Confidence	UF/MF	Critical Effect	Hazard Index[h]	Source
Isophorone	2E-1	Medium	1000/1	Renal necrosis	None	IRIS
Lead	N/A[d]	-	-	Hematological changes, CNS effects	None	IRIS
Malathion	2E-2	Medium	10/1	Depressed cholinesterase	CNS	IRIS
Mercury[g]	1E-4	Medium	10/1	CNS effects	CNS	IRIS
Methoxyclor	5E-3	Low	1000/1	Excess litter loss	Dev	IRIS
Methyl Parathion	2.5E-4	Medium	100/1	Cholinesterase inhibition, reduced hemoglobin and hematocrit	CNS	IRIS
Mirex	2E-4	High	300/1	CNS effects	CNS, Dev	IRIS
Nickel[f]	2E-2	Medium	300/1	Hematopoietic effects	None	IRIS
Parathion	6E-3	-	10/1	Hematopoietic effects	CNS	HEAST
Phenol	6E-1	Low	100/1	Hematopoietic effects	Dev	IRIS
Pyrene	3E-2	Low	3000/1	Renal effects	None	IRIS
Selenium	5E-3	High	3/1	CNS effects	CNS, Dev	IRIS
Silver	5E-3	Low	3/1	Skin discoloration	None	IRIS
Zinc	3E-1	Medium	3/1	Decrease in erythrocyte superoxide dismutase	None	IRIS

[a] Adopted from Aroclor 1016.
[b] Adopted from Endosulfan.
[c] Adopted from DDT.
[d] Currently there are no U.S. EPA-approved toxicity values for lead or dioxins/furans.
[e] Chromium was analyzed as total chromium. The oral RfD for Cr (III) was used for this toxicity evaluation because the trivalent form is more commonly found in biological organisms (Amdor et al. 1991).
[f] Nickel as soluble salts.
[g] Mercury RfD is based on methylmercury.
[h] Indicates to which of three hazard indices chemical belongs. Dev = Developmental, CNS = Central Nervous System, Imm = Immunological.

NA = Not available.

The following principle sources of toxicity values were used:

1) U.S. Environmental Protection Agency (EPA). 2[nd] Quarter 1995. Integrated Risk Information System (IRIS), Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH.

2) U.S. Environmental Protection Agency (EPA). 1994. Health Effects Assessment Summary Tables (HEAST), Office of Solid Waste and Emergency Response, Washington, DC.

3) U.S. Environmental Protection Agency (EPA) Region III. Risk Based Concentrations Table, March 1995.

TABLE 4-2. NONCARCINOGENIC ENDPOINTS FOR DETECTED CHEMICALS

	ENDPOINT								
ANALYTE	CNS	DEVELOP	HEPATIC	HEMATO	RENAL	CARDIAC	IMMUNO.	METABOLIC	OTHER
Acenaphthene			X						
Aldrin	X	x	x						
Antimony						X		x	
Aroclor 1016		x					X[a]		
Aroclor 1221		x					X[a]		
Aroclor 1232		x					X[a]		
Aroclor 1248		x					X[a]		
Aroclor 1254		x					X[a]		
Aroclor 1260		x					X[a]		
Aroclor 1242		x					X[a]		
Arsenic (inorganic)	X		x						x
Barium						X			
Benzyl alcohol									x[b]
Bis(2-ethylhexyl)phthalate			X						
Cadmium		X			x				
Chlordane, alpha	x		x	X					
Chlordane, gamma	x		x	X					
Chlorophenol, 2-		x		X					
Chromium (assumed trivalent)					X				
Dacthal	x		X	x			X		
DDD (p,p')	x	X[a]	x				X		x
DDE (p,p')	x	X[a]	x				X		x
DDT (p,p')	x	X[a]	x				X		x
Dieldrin		X[a]	x				X		
Dinitrotoluene, 2,4-	x	X		X[a]					
Endosulfan sulfate		X			x	x	x		
Endrin	X		x						
Fluorene			x	X[a]					
Heptachlor		x	X						
Heptachlor Epoxide		x	X						
Hexachlorobenzene			X						
Hexachlorobutadiene					X[b]				
Hexachlorocyclohexane, alpha-	X								
Hexachlorocyclohexane, beta-	X								
Hexachlorocyclohexane, delta-	X								
Hexachlorocyclohexane, gamma	X		x						
Isophorone					X				
Lead (and compounds) (inorganic)	X	x		x	x				
Malathion	x			X					
Mercury (methyl)	x								
Methoxychlor		X							
Methylparathion	x			X					
Methylphenol, 4-	X								
Mirex	X	x	x		x				
Nickel				X[a]					
Parathion	x			X[b]					
Phenol		x		X[a]					
Pyrene					X				
Selenium (and compounds)	X	x	x						
Trichlorobenzene, 1,2,4-	X							x	
Zinc				X[a]					
Grand Total	23	23	19	13	8	3	13	2	

HEMATO= hematopoietic effects; including pancytopenia, leukocytopenia, anemia, reduced hematocrit or MCV.
CARDIAC= Cardiovascular effects including hyperkalemia, myocardial arhythmia, or hypertension
IMMUNO= immunological effects.
Source assumed to be IRIS, 1995 unless otherwise denoted:
a = Caserett and Doull (1986)
b = HEAST (1994)
X= Major associated pathology

versus human study); and a modifying factor (MF), also based upon an evaluation of uncertainties of the data used to create an RfD, which typically ranges from 1-10 (U.S. EPA uses a default of one).

One class of chemicals, dioxins and furans, is not included in Tables 4-1 and 4-2, although non-carcinogenic endpoints are known to exist. The noncarcinogenic effects of dioxins and furans are currently under review by U.S. EPA. The effect of the absence of a RfD for dioxin on the overall hazard estimates is discussed in Section 6.0.

4.2 TOXICITY VALUES FOR CARCINOGENIC ENDPOINTS

This section presents toxicity values used to assess potential carcinogenic effects. For each detected chemical, the carcinogenic slope factor (SF), and its associated potential for carcinogenicity in humans, as expressed by the U.S. EPA classification as weight-of-evidence, are presented (Tables 4-3 and 4-4). The SF represents a plausible upper-bound estimate of the probability of response per unit intake of a chemical over a lifetime. The SF is based on a dose-response curve using available carcinogenic data for a given chemical. Mathematical models are used to extrapolate from high experimental doses to the low doses expected for human contact in the environment. These models assume that there is no concentration below which the probability of a carcinogenic response is zero. This mechanism for carcinogenesis is referred to as "nonthreshold". Based upon the evaluation of human and animal studies, each chemical falls into one of the following five U.S. EPA defined classes:

TABLE 4-3. DESCRIPTION OF CHEMICAL CLASSES

Weight-of-Evidence Classification	Category
A	Human carcinogen
B	Probable human carcinogen B1 - Limited human evidence B2 - Sufficient evidence in animals, no human evidence
C	Possible human carcinogen
D	Not classifiable as a human carcinogen
E	Evidence of noncarcinogenicity in humans

TABLE 4-4. ORAL CARCINOGENIC TOXICITY VALUES				
Chemical	Oral SF (kg-day/mg)	Weight of Evidence	Tumor Type/Location	Source
2,3,7,8 TCDD	1.5E+5	B2	Hepatocellular carcinomas	HEAST
1,4-Dichlorobenzene	2.4E-2	B2	Liver	HEAST
Aldrin	1.7E+1	B2	Liver carcinomas	IRIS
Aroclor 1242	7.7E+0[a]	B2	Hepatocellular carcinomas	-
Aroclor 1248	7.7E+0[a]	B2	Hepatocellular carcinomas	-
Aroclor 1254	7.7E+0[a]	B2	Hepatocellular carcinomas	-
Aroclor 1260	7.7E+0[a]	B2	Hepatocellular carcinomas	-
Arsenic (inorganic)	1.75E+0	A	Skin cancer, internal organs (lung, liver, kidney & colon)	IRIS
BHC, alpha	6.3E+0	B2	Hepatocellular carcinomas	IRIS
BHC, beta	1.8E+0	C	Hepatocellular carcinomas	IRIS
BHC, gamma (Lindane)	1.3E+0	B2-C	Liver tumors	HEAST
bis(2-ethylhexyl)phthalate	1.4E-2	B2	Hepatocellular carcinomas	IRIS
Cesium 137	3.16E-11[b]	A	All organs & tissues	HEAST
DDD	2.4E-1	B2	Lung, liver, thyroid	IRIS
DDE	3.4E-1	B2	Liver, thyroid	IRIS
DDT	3.4E-1	B2	Liver	IRIS
Dieldrin	1.6E+1	B2	Liver carcinomas	IRIS
Heptachlor	4.5E+0	B2	Hepatocellular carcinomas	IRIS
Hexachlorobenzene	1.6E+0	B2	Liver, thyroid, & kidney	IRIS
Hexachlorobutadiene	7.8E-2	C	Renal neoplasms	IRIS
Isophorone	9.5E-4	C	Preputial gland carcinomas	IRIS
Mirex	1.8E+0	B2	Liver carcinomas	EPA Region III
N-Nitroso-di-n-propylamine	7.0E+0	B2	Hepatocellular carcinomas	IRIS
Plutonium 238	2.95E-10[b]	A	All organs & tissues	HEAST
Plutonium 239/240	3.16E-10[b]	A	All organs & tissues	HEAST

[a] Adopted from PCBs.

[b] Slope factor in Risk/pCi.

The following principle sources of toxicity values were used:

U.S. Environmental Protection Agency (EPA), 2nd Quarter 1995, Integrated Risk Information System (IRIS), Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH.

U.S. Environmental Protection Agency (EPA), 1994, Health Effects Assessment Summary Tables (HEAST), Office of Solid Waste and Emergency Response, Washington, D.C.

U.S. Environmental Protection Agency (EPA) Region III, Risk Based Concentration Table, March 1995.

To evaluate the toxicity of chlorinated dibenzo-*p*-dioxin and dibenzo-furan (CDD/CDF) congeners, the U.S. EPA has adopted an interim procedure for estimating risks, because their toxicity varies with the position and number of chlorine atoms attached to the aromatic rings (U.S. EPA 1989b). This procedure utilizes a set of derived toxicity equivalency factors (TEFs) to convert the concentration of any CDD/CDF congener into an equivalent concentration of 2,3,7,8-TCDD (U.S. EPA 1989b). Table 4-5 presents a list of the seventeen 2,3,7,8-substituted congeners and their assigned TEF value. Each respective slope factor was derived by multiplying the slope factor for 2,3,7,8-TCDD by the congener-specific TEF value.

TABLE 4-5. ORAL CARCINOGENIC SLOPE FACTORS FOR DIOXIN AND FURAN CONGENERS		
Chemical	TEF Value[a]	Oral SF (kg-day/mg)
2,3,7,8-TCDD	1	1.5E+5
1,2,3,7,8-PeCDD	0.5	7.5E+4
1,2,3,4,7,8-HxCDD	0.1	1.5E+4
1,2,3,6,7,8-HxCDD	0.1	1.5E+4
1,2,3,7,8,9-HxCDD	0.1	1.5E+4
1,2,3,4,6,7,8-HpCDD	0.01	1.5E+3
OCDD	0.001	1.5E+2
2,3,7,8-TCDF	0.1	1.5E+4
1,2,3,7,8-PeCDF	0.05	7.5E+3
2,3,4,7,8-PeCDF	0.5	7.5E+4
1,2,3,4,7,8-HxCDF	0.1	1.5E+4
1,2,3,6,7,8-HxCDF	0.1	1.5E+4
1,2,3,7,8,9-HxCDF	0.1	1.5E+4
2,3,4,6,7,8-HxCDF	0.1	1.5E+4
1,2,3,4,6,7,8-HpCDF	0.01	1.5E+3
1,2,3,4,7,8,9-HpCDF	0.01	1.5E+3
OCDF	0.001	1.5E+2

[a] U.S. EPA 1989b

SECTION 5.0
RISK CHARACTERIZATION

5.0 RISK CHARACTERIZATION

The risk characterization integrates the results of the exposure assessment with chemical toxicity information to produce estimates of individual health risks potentially resulting from the presumed exposure pathways.

5.1 RISK CHARACTERIZATION EQUATIONS

Carcinogenic risks and non-carcinogenic health effects are evaluated separately due to fundamental differences in their critical toxicity values. Equations for each type of effect are presented in separate sections below.

5.1.1 Carcinogenic Risks

For chemicals with carcinogenic effects, the risk of cancer is proportional to dose with the assumption that there is no "threshold." In other words, there is never a zero probability of cancer risk when exposed to these chemicals. Carcinogenic risk probabilities are calculated by multiplying the estimated exposure level by the cancer slope factor (SF) for each chemical.

$$\text{Risk} = \text{CDI} \times \text{SF}$$

where:

Risk = Estimated chemical-specific individual excess lifetime cancer risk (unitless)
CDI = Chemical-specific Chronic Daily Intake (mg/kg-day)
SF = Route- and chemical-specific carcinogenic slope factor (kg-day/mg)

A variety of target risk levels are used by the U.S. EPA when determining whether chemical exposures represent a potentially unacceptable level of risk to public health. According to the National Contingency Plan (NCP) (U.S. EPA 1990c), excess carcinogenic risks from exposure to Superfund sites are considered to be unacceptable if greater than 1.0E-4 (1 chance in 10,000), while excess cancer risks smaller than 1.0E-6 (1 chance in 1 million) are considered to be of minimal concern. For the purposes of this risk assessment, an individual lifetime excess cancer risk of 1.0E-6 was used as the target risk level to assess the potential for adverse health impacts due to ingestion of contaminated fish.

The incremental individual lifetime cancer risk for simultaneous exposure to several carcinogens is assumed to be additive (U.S. EPA 1989a). Therefore, for each fish species, a calculation of overall carcinogenic risk was made in addition to the calculations for each individual chemical's carcinogenic risk.

5.1.2 Noncarcinogenic Health Effects

Chemicals with noncarcinogenic health effects are generally not toxic below a certain threshold; a critical chemical dose must be exceeded before health effects are observed. The potential for noncarcinogenic health effects is represented by the ratio of a chemical's exposure level and the route-specific reference dose (RfD), and is expressed in terms of a hazard quotient (HQ).

$$HQ = \frac{CDI}{RfD}$$

where:

HQ = Chemical-specific Hazard Quotient (unitless)
CDI = Chemical-specific Chronic Daily Intake (mg/kg-day)
RfD = Route- and chemical-specific RfD (mg/kg-day)

The hazard quotient is accepted by the U.S. EPA as a way to quantify the potential for noncarcinogenic health effects (U.S. EPA 1989a). A hazard quotient greater than one may indicate a potential adverse health effect from a chemical exposure. Hazard quotients are not risk probabilities; the probability an adverse effect will occur does not usually increase linearly with the calculated value.

For each fish species, hazard quotients for detected chemicals were summed in order to derive a Hazard Index (HI), defined as an estimate of the cumulative potential for noncarcinogenic effects due to exposure from multiple chemicals, for a specific endpoint. This approach, consistent with U.S. EPA guidance, assumes that simultaneous subthreshold exposure to several chemicals could result in an adverse health effect and the magnitude of the adverse effect is proportional to the sum of the toxic effects from each chemical (U.S. EPA 1989a). Chemicals which do not have one of the six critical effects (hepatic, CNS, immunological, hematopoietic, renal, or developmental) listed in Table 4-2 are not included in an HI.

5.2 EVALUATION OF NON-DETECTED CHEMICALS

As indicated in Figure 3-2, chemicals which were not detected in any fish species were evaluated separately from chemicals which were detected. For these chemicals, carcinogenic risk was evaluated using the maximum detection limit from each fish species sampled as a concentration, thereby demonstrating the potential for risk at the detection limit. The maximum detection limits for these chemicals are given in Appendix Tables B-7, B-8, and B-10, for the 1991, 1993, and 1995 surveys respectively. Consumption rates of 6.5 g/day [average U.S. annual fish consumption rate (U.S. EPA 1990a)], 54 g/day [recreational fisherman average consumption rate (U.S. EPA 1991)] and 176 g/day [95th percentile for fish tribal fish consumers (CRITFC 1994)] were used to evaluate the potential for exceeding a 1.0E-6 carcinogenic risk value for exposure durations of 30 and 70 years. The results of the cancer risk screening of the maximum detection limits for each of the three surveys are presented in Appendix D. Appendix Tables D-1 through D-6 indicate chemicals whose detection limits exceed a 1.0E-6 cancer risk for the specified exposure scenarios and also chemicals which do not exceed the threshold risk value. In general, approximately one-third of the detection limits for non-detected chemicals exceeded the threshold risk value, while two-thirds did not.

5.3 EVALUATION OF DETECTED CHEMICALS

The potential for carcinogenic risk or adverse health effects from detected chemicals is presented in several ways. The total carcinogenic risk from consuming each species from all chemicals combined is summarized in Section 5.3.1. This section also presents the HI for each species for the three specific endpoints given in Table 4-1. Section 5.3.2 discusses the carcinogenic risk and HQs for individual chemicals and Section 5.3.3 presents these data in relation to the total estimates provided in Section 5.3.1.

5.3.1 Summation of Risk Estimates and HI for Each Species

Carcinogenic risk values and noncarcinogenic HQs from individual chemicals were summed separately for each species in each year and for those fish species collected during both 1991 and 1993 (carp, crayfish, and largescale sucker) using combined 1991/1993 data (Tables 5-1 and 5-2). The three ingestion rates discussed in Section 3.3.1 are used as reference to aid the reader in interpreting the risk.

It should be noted that the number of samples on which the total risk or hazard index estimates are based is different. For example, the estimates for 1995 carp filets are based on a single composite of filets, while the estimates for the combined 1991-1993 carp data are based on 11 composite samples. A similar disparity exists for the largescale sucker data. The estimates for 1995 data are based on 9 composite filet samples, while the estimates for combined 1991-1993 largescale sucker data are based on 34 composite samples. The effects of different sample sizes on the risk and HI estimates for these and other species are discussed in Section 6.0.

5.3.1.1 Carcinogenic Risk. Table 5-1 and Figure 5-1 show that at an ingestion rate of 6.5 g/day and an exposure duration of 30 years, total carcinogenic risk for all species is greater than 1.0E-6. Under these exposure assumptions, 1991 risk values range from 1.17E-5 (crayfish) to 1.74E-4 (carp), 1993 risk values range from 1.01E-5 (crayfish) to 9.12E-5 (largescale sucker), and 1995 risk values range from 2.30E-6 (steelhead) to 6.66E-5 (carp). For an exposure duration of 70 years, total carcinogenic risk for all species except steelhead is greater than 1.0E-5 (Figure 5-2). Considering all fish species in 1991, the greatest potential for carcinogenic risk is associated with carp, followed in decreasing order by peamouth, largescale sucker, sturgeon, and crayfish. For the fish collected in 1993, risk is greatest for largescale sucker, followed by carp, then crayfish. For the 1995 data, total risk is greatest for carp, followed by sturgeon, largescale sucker, chinook, coho, and steelhead. The lowest risk estimates for any of the species are for the three salmonid species (chinook, coho, and steelhead) collected in 1995. The total carcinogenic risk from these three species was approximately an order of magnitude lower (at a minimum) than for the other species (Table 5-1). None of these species reside permanently in the river, most having returned from the ocean within a few weeks of their capture.

TABLE 5-1. TOTAL CARCINOGENIC RISK VALUES

	1991					1993		
Ingestion Rate	Carp	Crayfish	LS Sucker	Peamouth	Sturgeon	Carp	Crayfish	LS Sucker
30 Year Exposure								
6.5 g/day	1.74E-04	1.17E-05	6.55E-05	1.37E-04	3.49E-05	3.07E-05	1.01E-05	9.12E-05
54 g/day	1.45E-03	9.68E-05	5.45E-04	1.14E-03	2.90E-04	2.55E-04	8.40E-05	7.58E-04
176 g/day	4.72E-03	3.15E-04	1.77E-03	3.72E-03	9.45E-04	8.31E-04	2.74E-04	2.47E-03
70 Year Exposure								
6.5 g/day	4.24E-04	2.84E-05	1.60E-04	3.34E-04	8.49E-05	7.47E-05	2.46E-05	2.22E-04
54 g/day	3.52E-03	2.36E-04	1.33E-03	2.78E-03	7.05E-04	6.20E-04	2.04E-04	1.84E-03
176 g/day	1.15E-02	7.68E-04	4.32E-03	9.05E-03	2.30E-03	2.02E-03	6.66E-04	6.01E-03

1991 and 1993 Data Combined			
Ingestion Rate	Carp	Crayfish	LS Sucker
30 Year Exposure			
6.5 g/day	1.66E-04	1.78E-05	8.03E-05
54 g/day	1.38E-03	1.48E-04	6.67E-04
176 g/day	4.49E-03	4.82E-04	2.18E-03
70 Year Exposure			
6.5 g/day	4.03E-04	4.33E-05	1.95E-04
54 g/day	3.35E-03	3.60E-04	1.62E-03
176 g/day	1.09E-02	1.17E-03	5.28E-03

1995						
Ingestion Rate	Carp	Chinook	Coho	LS Sucker	Steelhead	Sturgeon
30 Year Exposure						
6.5 g/day	6.66E-05	7.44E-06	4.07E-06	1.52E-05	2.30E-06	2.24E-05
54 g/day	5.53E-04	6.18E-05	3.38E-05	1.27E-04	1.91E-05	1.86E-04
176 g/day	1.80E-03	2.01E-04	1.10E-04	4.12E-04	6.23E-05	6.07E-04
70 Year Exposure						
6.5 g/day	1.62E-04	1.81E-05	9.89E-06	3.71E-05	5.59E-06	5.45E-05
54 g/day	1.35E-03	1.50E-04	8.22E-05	3.08E-04	4.64E-05	4.53E-04
176 g/day	4.39E-03	4.90E-04	2.68E-04	1.00E-03	1.51E-04	1.48E-03

TABLE 5-2. TOTAL NONCARCINOGENIC HAZARD INDICES FOR SPECIFIC ENDPOINTS (Page 1 of 2)								
	1991					1993		
Ingestion Rate	Carp	Crayfish	LS Sucker	Peamouth	Sturgeon	Carp	Crayfish	LS Sucker
Developmental Endpoint								
6.5 g/day	0.63	0.013	0.65	0.42	0.32	0.30	0.04	1.15
54 g/day	5.24	0.11	5.42	3.45	2.67	2.45	0.32	9.56
176 g/day	17.08	0.36	17.65	11.24	8.71	8.00	1.04	31.15
Immunological Endpoint								
6.5 g/day	0.58	0.003	0.63	0.33	0.31	0.27	0.03	1.12
54 g/day	4.83	0.03	5.27	2.72	2.60	2.26	0.28	9.32
176 g/day	15.74	0.09	17.16	8.88	8.48	7.35	0.91	30.36
CNS Endpoint								
6.5 g/day	0.24	0.04	0.09	0.20	0.18	0.09	0.04	0.18
54 g/day	1.96	0.30	0.75	1.67	1.48	0.73	0.36	1.52
176 g/day	6.38	0.97	2.46	5.44	4.84	2.39	1.18	4.95
Hematopoietic Endpoint								
6.5 g/day	0.06	0.012	0.012	0.013	0.005	0.02	0.014	0.007
54 g/day	0.51	0.10	0.10	0.11	0.04	0.17	0.12	0.06
176 g/day	1.67	0.33	0.32	0.36	0.14	0.56	0.38	0.19
Hepatic Endpoint								
6.5 g/day	0.03	0.008	0.02	0.12	0.03	0.02	0.002	0.03
54 g/day	0.25	0.06	0.17	0.96	0.21	0.17	0.02	0.23
176 g/day	0.81	0.21	0.56	3.13	0.69	0.56	0.06	0.76
Renal Endpoint								
6.5 g/day	0.015	0.007	0.004	0.004	0.001	0.003	0.003	0.003
54 g/day	0.12	0.06	0.03	0.03	0.012	0.03	0.02	0.03
176 g/day	0.40	0.18	0.10	0.10	0.04	0.09	0.08	0.09

1991 and 1993 Data Combined			
Ingestion Rate	Carp	Crayfish	LS Sucker
Developmental Endpoint			
6.5 g/day	0.58	0.05	0.90
54 g/day	4.84	0.40	7.49
176 g/day	15.77	1.29	24.40
Immunological Endpoint			
6.5 g/day	0.53	0.04	0.87
54 g/day	4.37	0.31	7.20
176 g/day	14.24	1.01	23.48
CNS Endpoint			
6.5 g/day	0.10	0.03	0.07
54 g/day	0.84	0.23	0.60
176 g/day	2.73	0.75	1.95
Hematopoietic Endpoint			
6.5 g/day	0.06	0.02	0.010
54 g/day	0.50	0.15	0.08
176 g/day	1.64	0.50	0.26
Hepatic Endpoint			
6.5 g/day	0.03	0.014	0.04
54 g/day	0.29	0.12	0.34
176 g/day	0.93	0.38	1.11
Renal Endpoint			
6.5 g/day	0.011	0.005	0.003
54 g/day	0.09	0.04	0.03
176 g/day	0.30	0.14	0.09

TABLE 5-2. TOTAL NONCARCINOGENIC HAZARD INDICES FOR SPECIFIC ENDPOINTS (Page 2 of 2)

1995						
Ingestion Rate	Carp	Chinook	Coho	LS Sucker	Steelhead	Sturgeon
Developmental Endpoint						
6.5 g/day	0.29	0.02	0.008	0.06	0.02	0.09
54 g/day	2.37	0.17	0.07	0.52	0.14	0.78
176 g/day	7.73	0.57	0.23	1.70	0.44	2.54
Immunological Endpoint						
6.5 g/day	0.25	0.013	0.004	0.05	0.007	0.08
54 g/day	2.08	0.11	0.03	0.44	0.06	0.64
176 g/day	6.77	0.36	0.11	1.44	0.18	2.09
CNS Endpoint						
6.5 g/day	0.17	0.10	0.05	0.16	0.07	0.09
54 g/day	1.41	0.87	0.38	1.29	0.59	0.73
176 g/day	4.61	2.82	1.24	4.21	1.92	2.37
Hematopoietic Endpoint						
6.5 g/day	0.0001	0.0001	0.0001	0.0001	0.0001	0.0004
54 g/day	0.001	0.001	0.001	0.001	0.001	0.003
176 g/day	0.004	0.003	0.004	0.003	0.003	0.010
Hepatic Endpoint						
6.5 g/day	0.04	0.012	0.005	0.014	0.012	0.03
54 g/day	0.30	0.10	0.04	0.12	0.10	0.24
176 g/day	0.97	0.32	0.13	0.39	0.32	0.78
Renal Endpoint						
6.5 g/day	0.00001	0	0.0003	0.0003	0.0001	0.0001
54 g/day	0.0001	0	0.002	0.002	0.001	0.001
176 g/day	0.0003	0	0.008	0.007	0.002	0.003

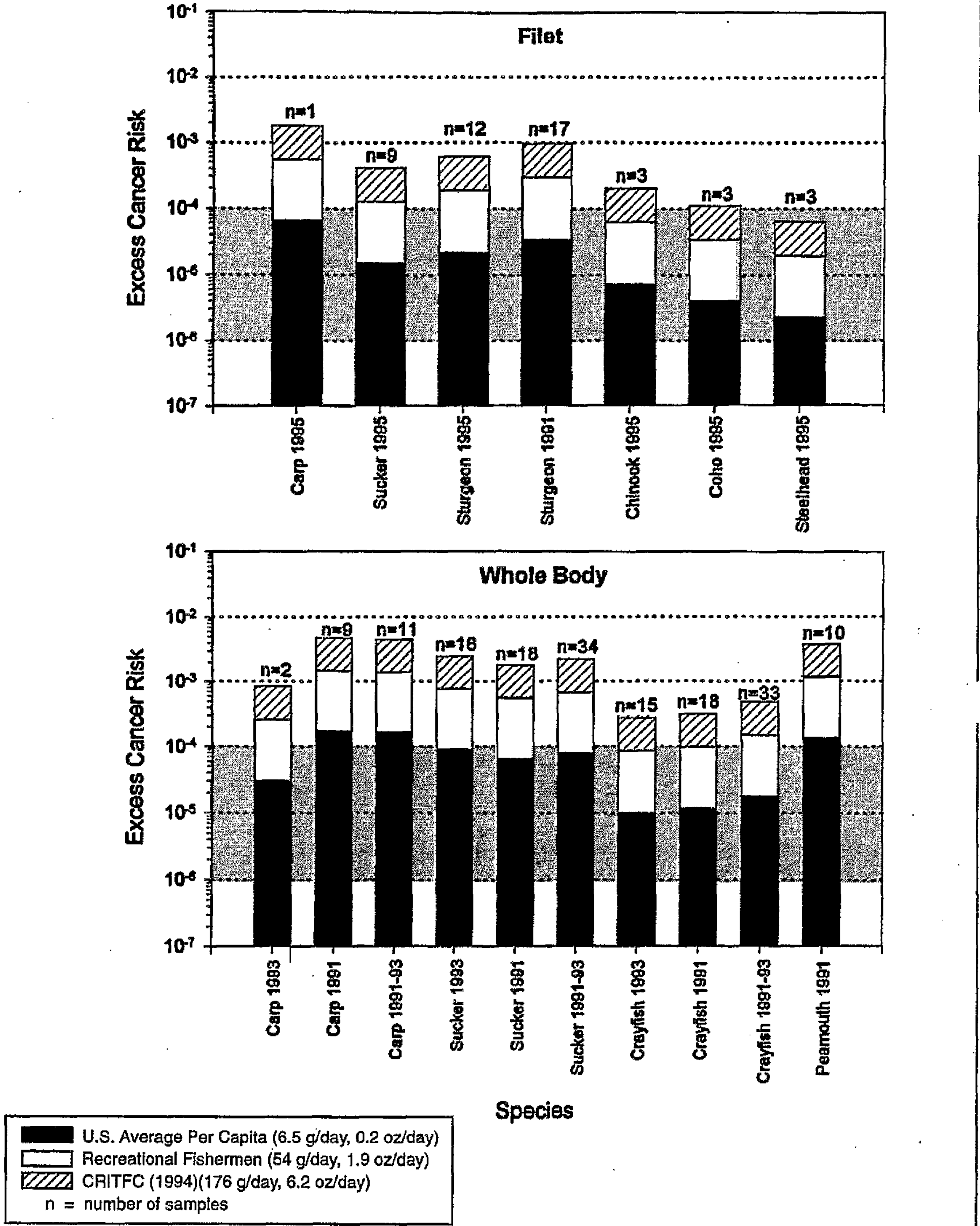


Figure 5-1 Estimated Excess Cancer Risk for 30-year Exposure

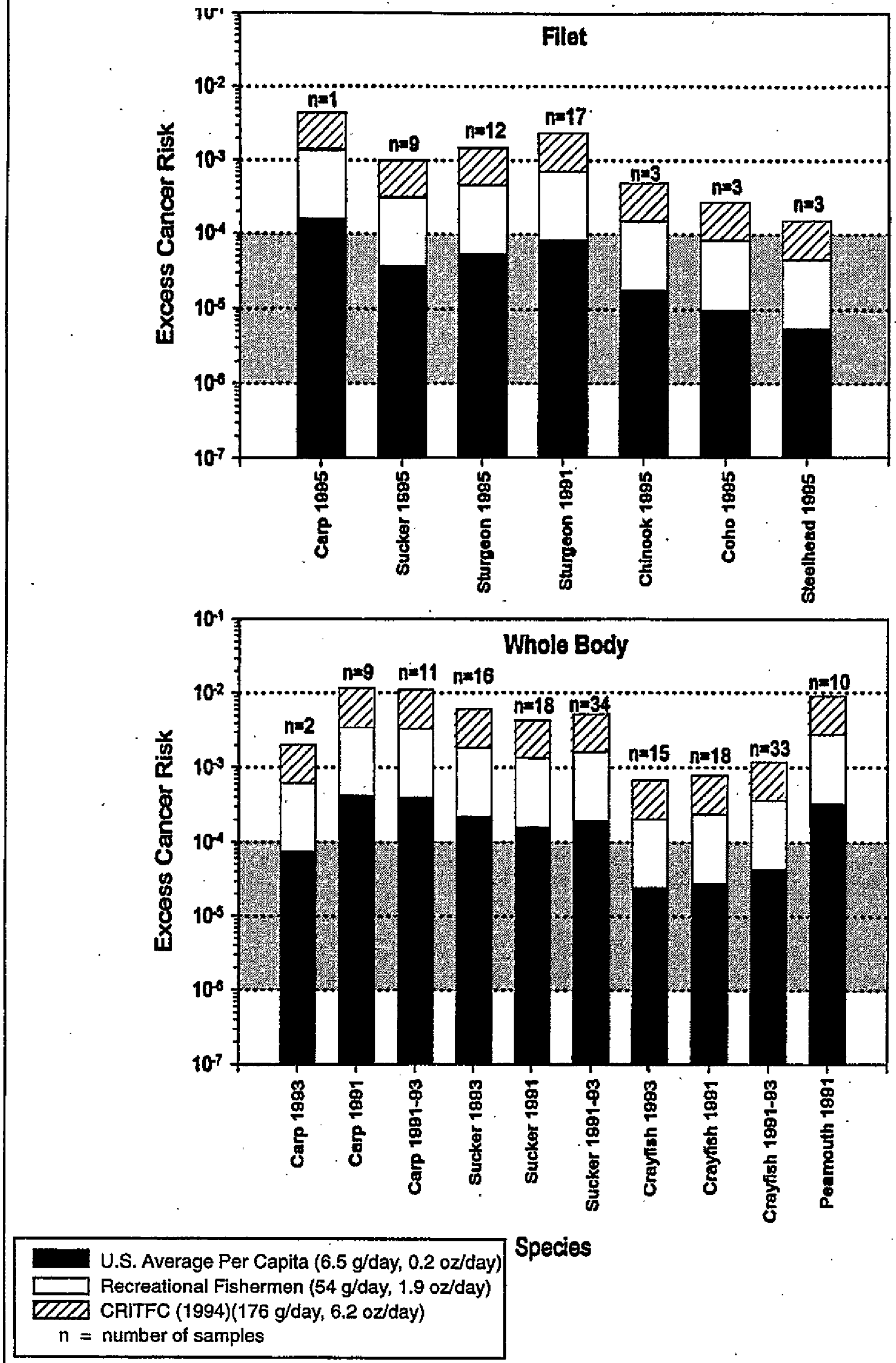


Figure 5-2 Estimated Excess Cancer Risk for 70-year Exposure

Carp and largescale sucker were collected in all three surveys. The fish collected in 1991 and 1993 were analyzed as whole specimens, while the fish collected in 1995 were analyzed as filets. The total risk from the whole-body samples exceeded the total risk from filet samples by a factor of two for carp (Figure 5-3) and five for largescale sucker (Figure 5-4). There are several possible explanations for the differences in species risk estimates between the three surveys including sampling season, sampling locations, temporal trends in concentrations, and lipid content of the fish. The first three explanations are discussed in Section 6.0. The lipid content of the two groups (1991/93 and 1995) of fish could explain the differences because many of the toxic chemicals, including dioxins/furans and PCBs, are hydrophobic (non-polar) and tend to accumulate in lipid-rich areas of tissue. The mean lipid content of the 1991/93 carp was 4.2 percent, compared to 4.4 percent for the single carp filet composite analyzed in 1995. The mean lipid content for 1991/93 largescale sucker was 3.1 percent, which was significantly higher ($p < 0.05$) than the 1.6 percent calculated for the 1995 fish. Thus, lipid content may partially explain the differences in total risk estimates for largescale sucker, but it does not appear to do so for carp.

Figure 5-5 presents the excess cancer risk for whole-body samples of crayfish and peamouth. The cancer risk for crayfish was almost an order of magnitude lower than the risk for peamouth. Figure 5-6 presents the excess cancer risk for filets of sturgeon analyzed in 1991 and 1995. The risk calculated for 1991 sturgeon filets was higher (by a factor of 1.6) than that calculated for 1995 sturgeon filets. Although the weight and length of several of the 1991 sturgeon could not be obtained from the fish processor, the mean length of the 1991 fish for which measurements were available was significantly greater ($p < 0.05$) than the mean length of the 1995 fish. Excess cancer risks for the three salmonid species analyzed in 1995 are presented in Figures 5-7 and 5-8. The risk for chinook was more than 3 times greater than the risk for steelhead, while the risk for coho was intermediate between the two other species.

5.3.1.2 Noncarcinogenic Hazard Indices. Table 5-2 shows the HI for six specific endpoints (developmental, CNS, immunological, renal, hepatic, and hematopoetic). These endpoints are the most commonly observed critical, noncarcinogenic effects as defined in IRIS. Of these six endpoints, HI for developmental, immunological, and CNS endpoints were much greater than the other three. These three are discussed below and shown in Figures 5-9 to 5-11. HQs for chemicals without any of the 6 critical effects were not summed in an HI and will be discussed in Section 5.3.2.2.

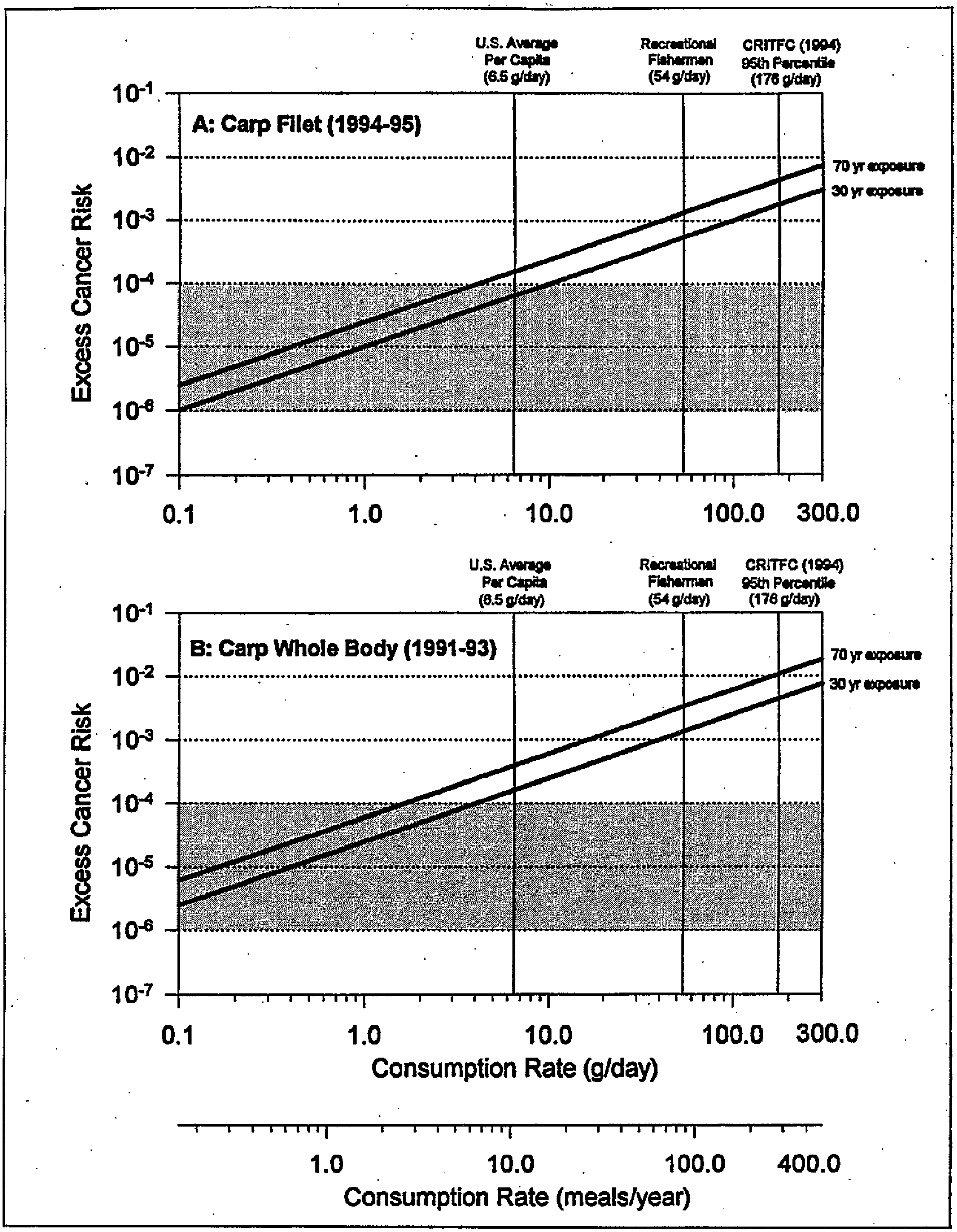


Figure 5-3 Estimated Excess Cancer Risk for Consuming A) Carp Filets and B) Carp Whole Body

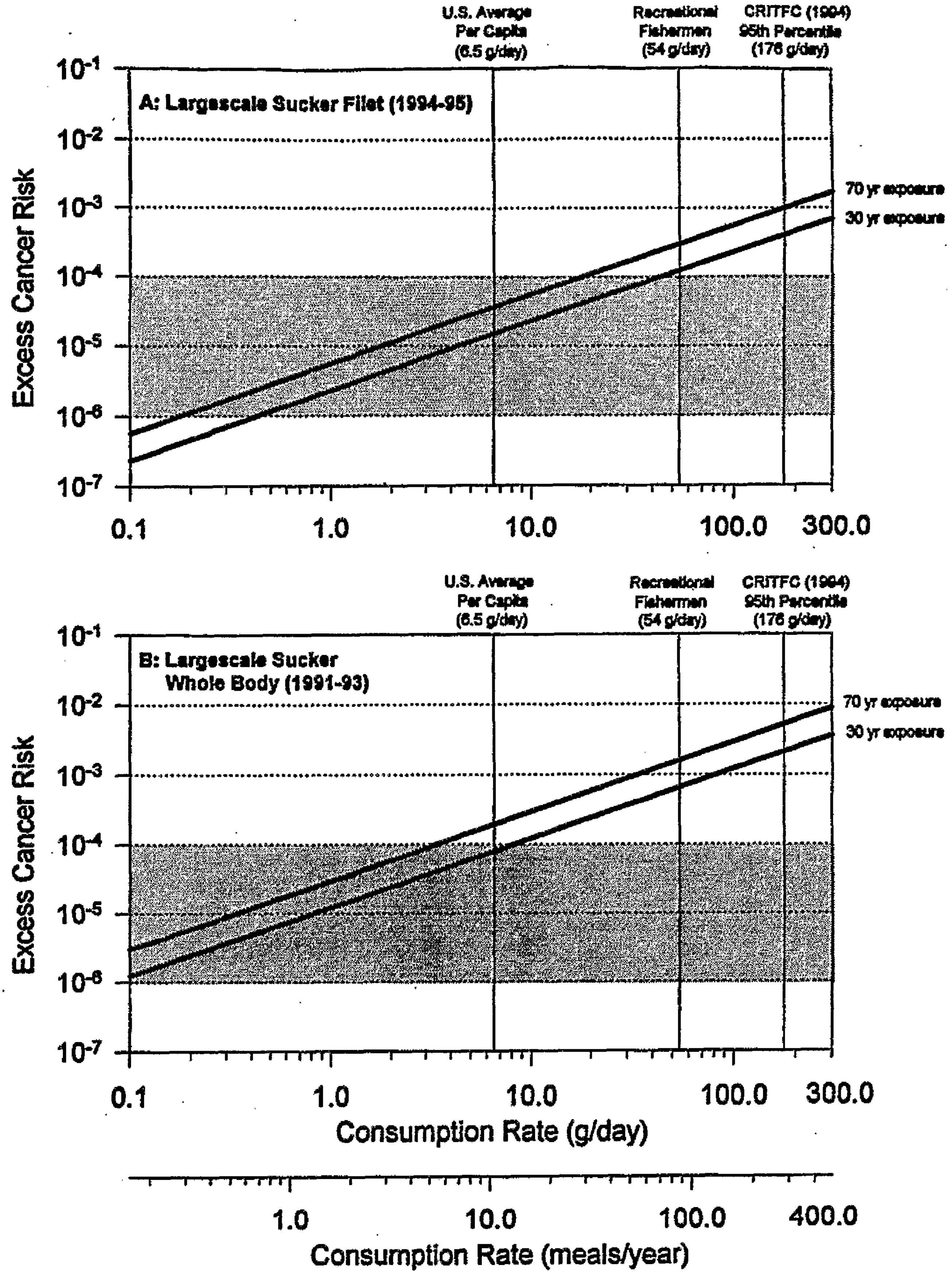


Figure 5-4 Estimated Excess Cancer Risk for Consuming A) Largescale Sucker Filets and B) Largescale Sucker Whole Body

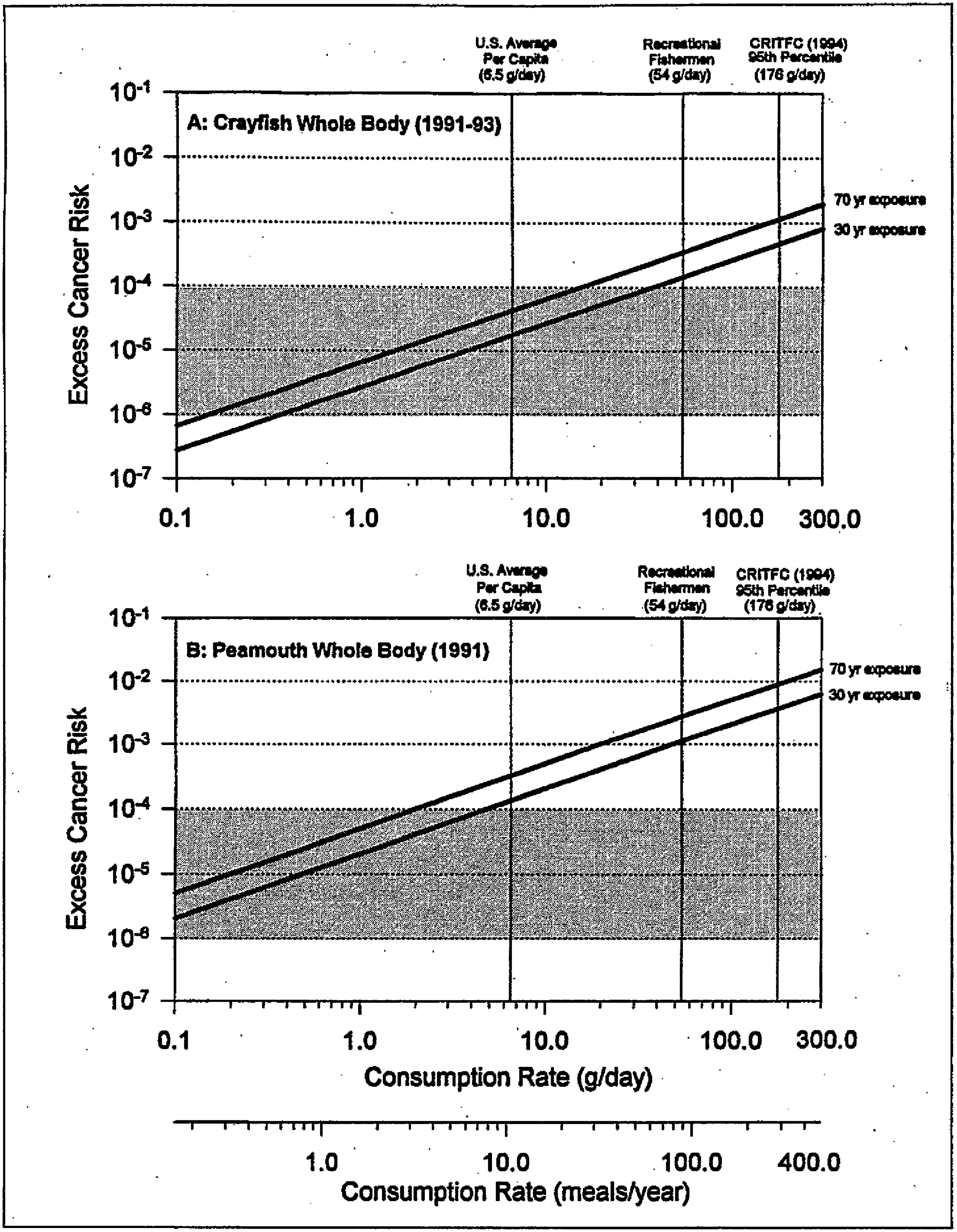


Figure 5-5 Estimated Excess Cancer Risk for Consuming A) Crayfish Whole Body and B) Peamouth Whole Body

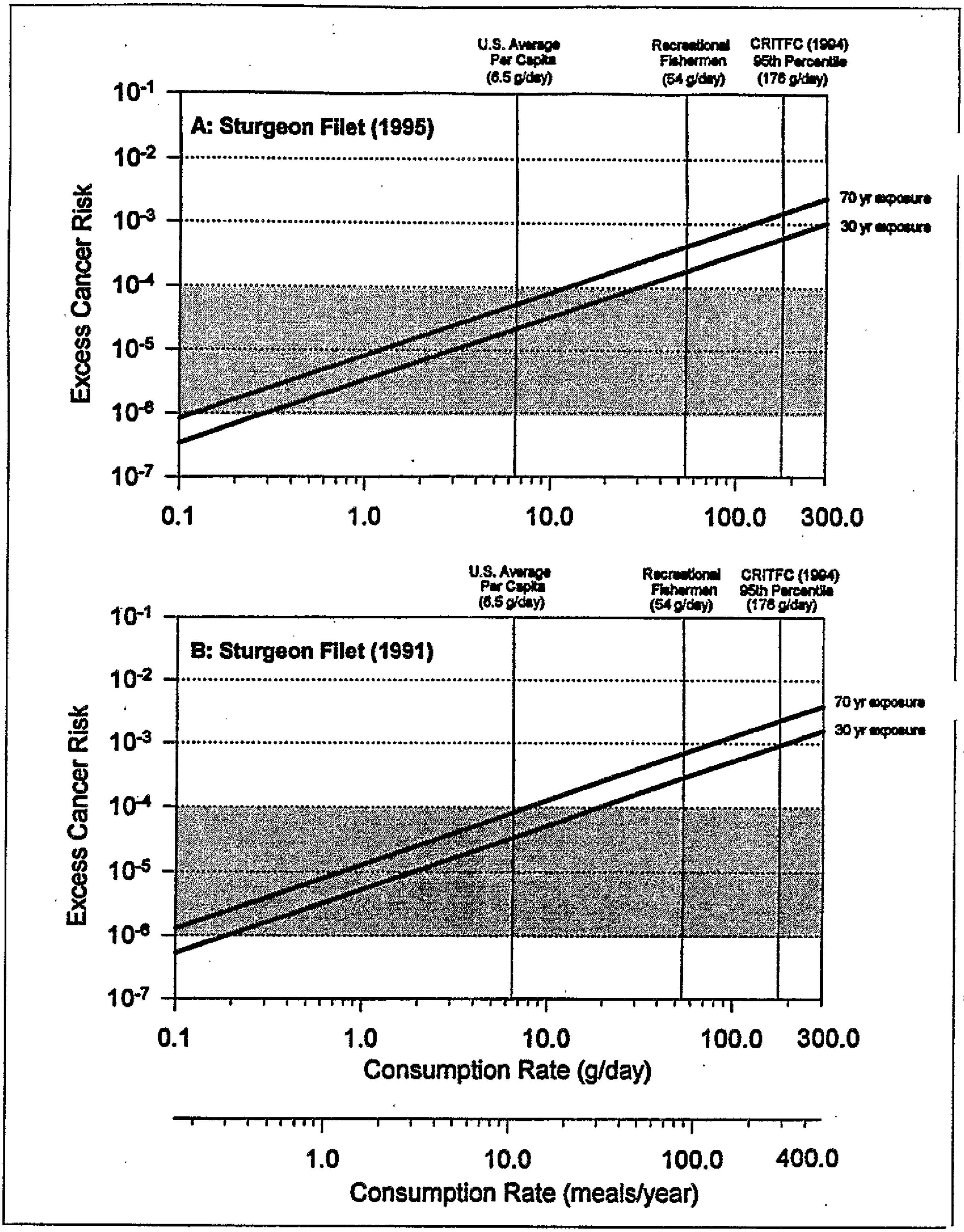


Figure 5-6 Estimated Excess Cancer Risk for Consuming A) Sturgeon Filets (1995) and B) Sturgeon Filets (1991)

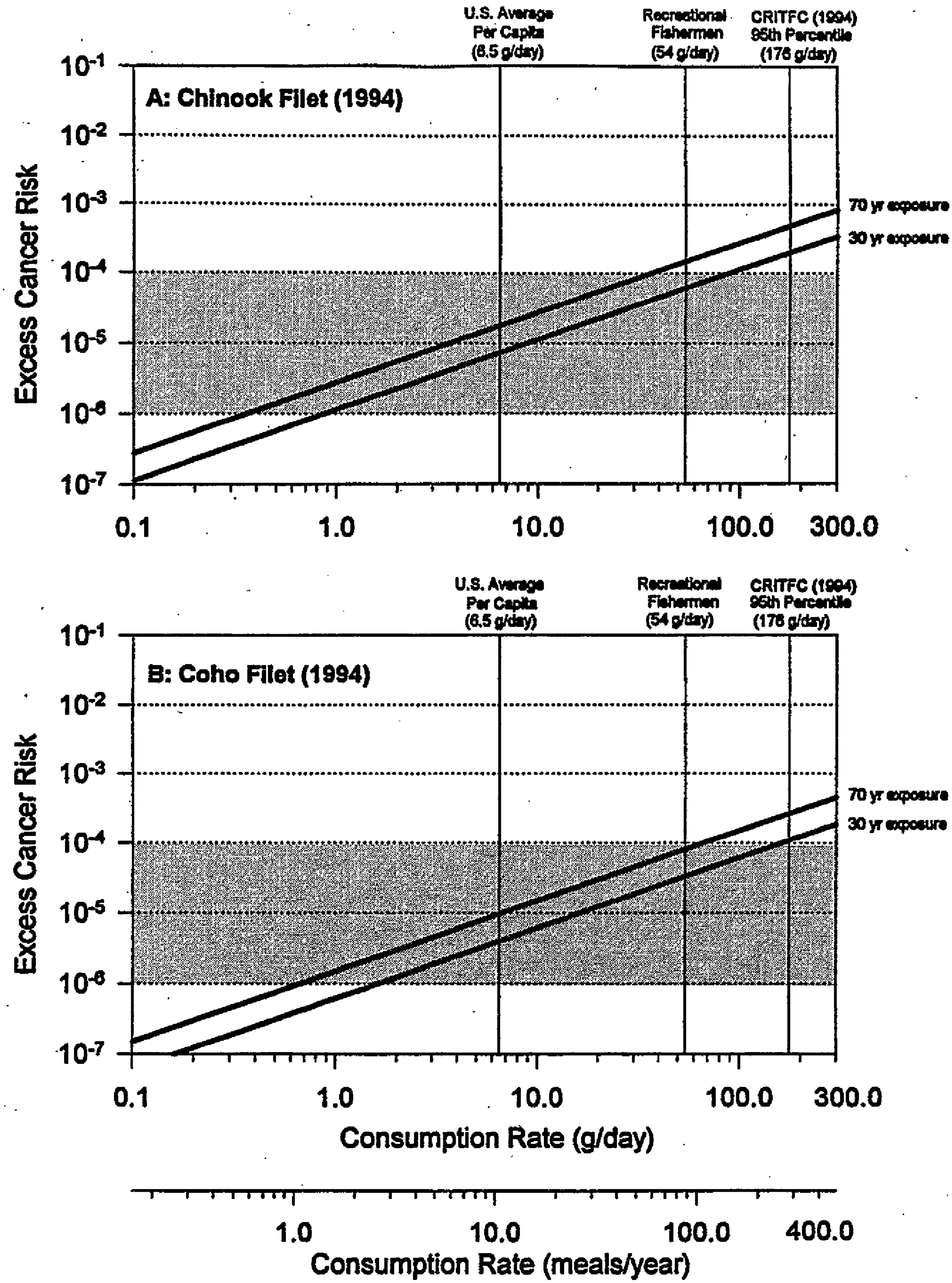


Figure 5-7 Estimated Excess Cancer Risk for Consuming A) Chinook Filets and B) Coho Filets

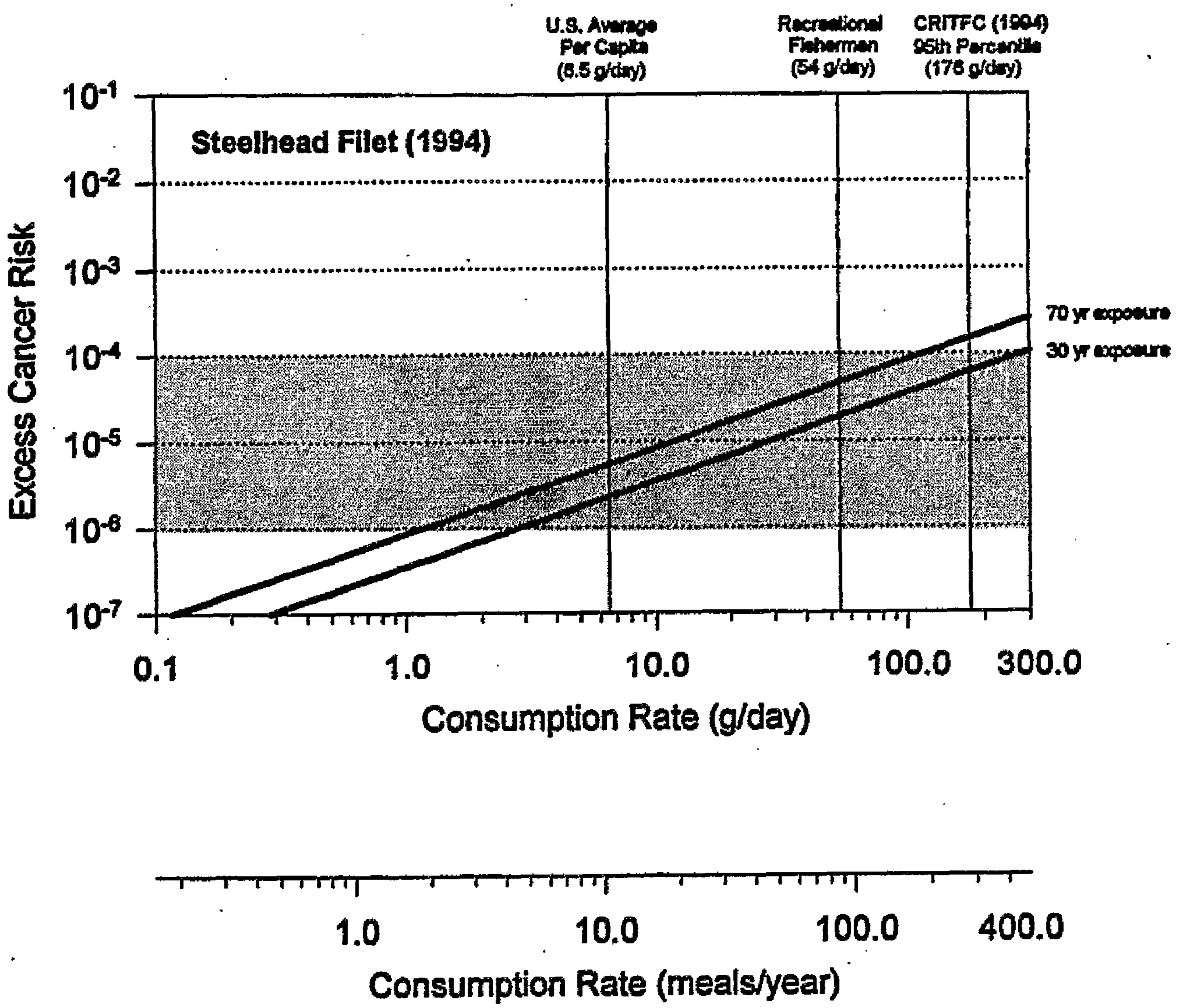


Figure 5-8 Estimated Excess Cancer Risk for Consuming Steelhead Filets

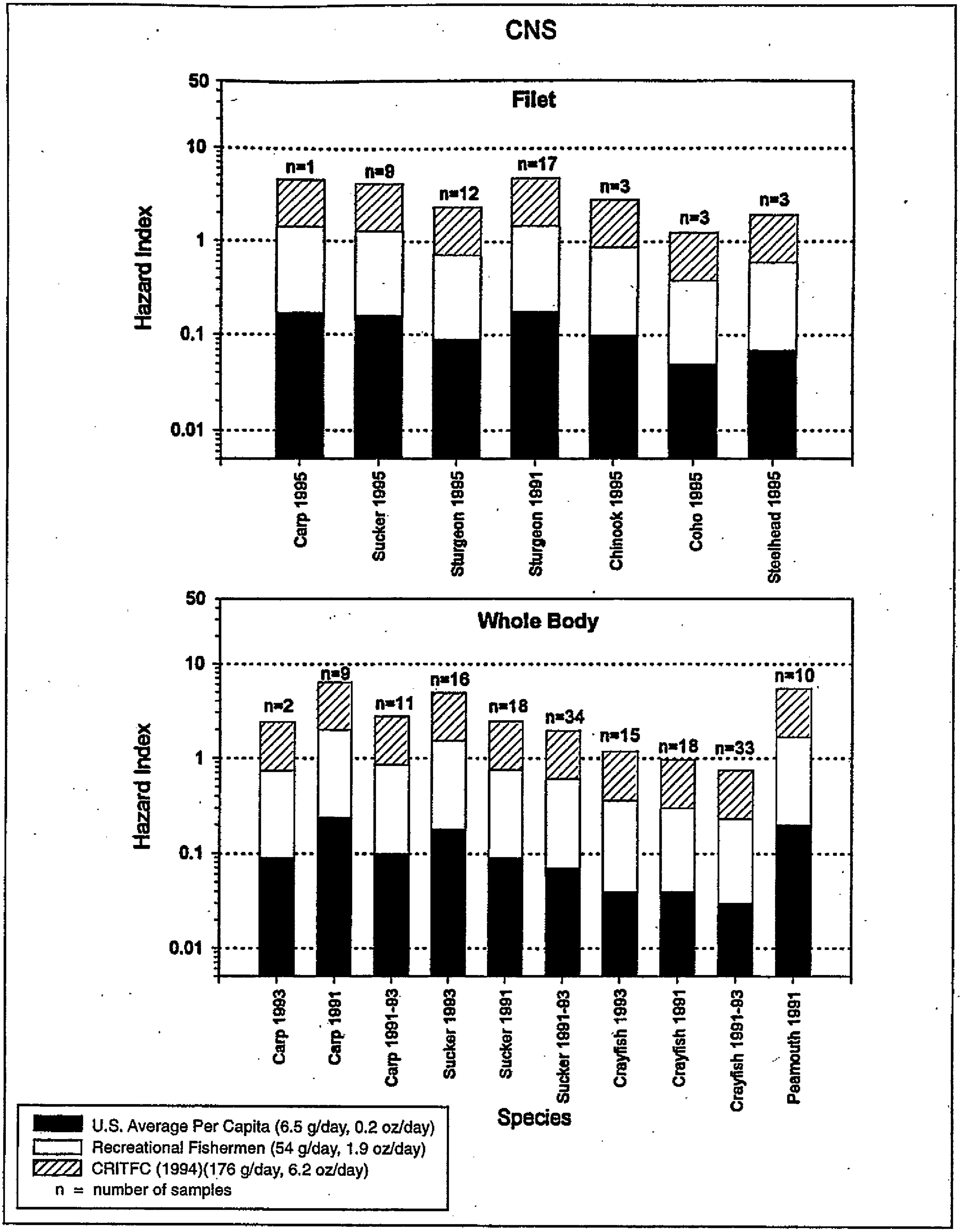


Figure 5-9 Estimated Hazard Indices for Central Nervous System (CNS) Endpoint

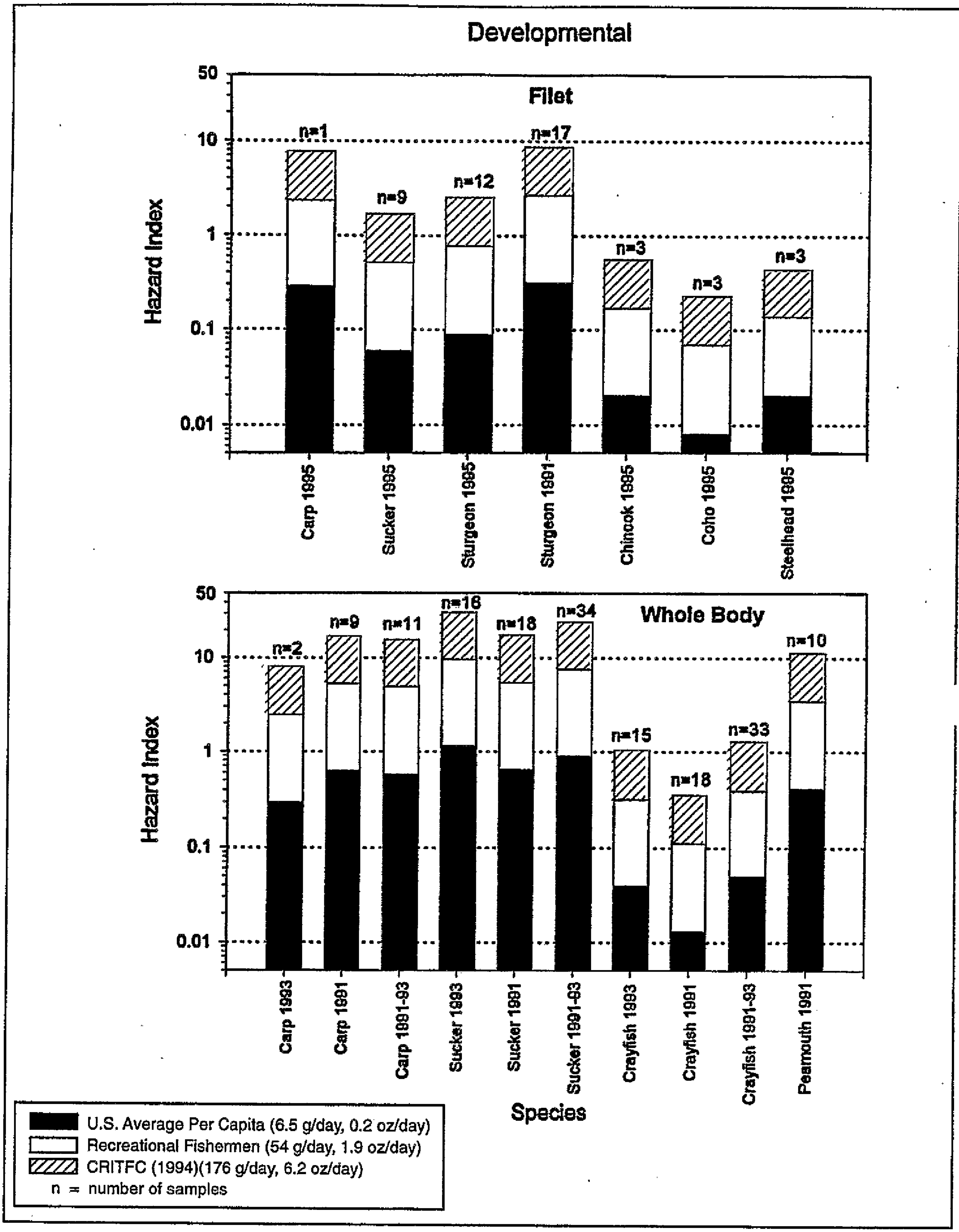


Figure 5-10 Estimated Hazard Indices for Developmental Endpoint

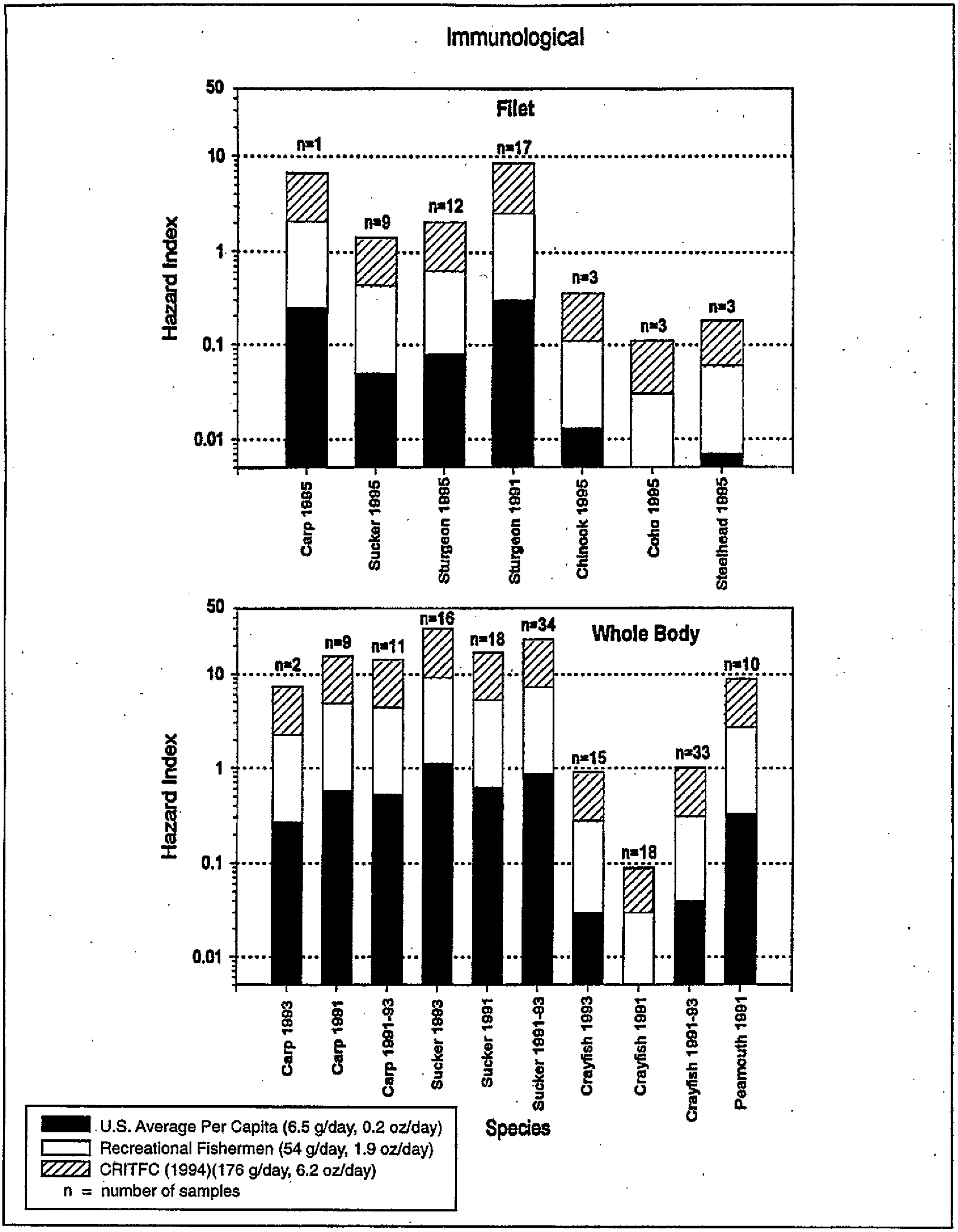


Figure 5-11 Estimated Hazard Indices for Immunological Endpoint

At the lowest exposure level (6.5 g/day), the endpoint-specific HI were all less than one, with the exception of largescale sucker in 1993 (1.15 for developmental, 1.12 for immunological; Table 5-2). At the highest exposure level (176 g/day), almost all HI for the developmental, CNS, and immunological endpoints were greater than one. For the three remaining endpoints (hematopoietic, hepatic, and renal), only the hematopoietic HI for carp in 1991 (1.67) and the hepatic HI for peamouth in 1991 (3.13) exceeded one at the 176 g/day exposure level.

For the 1991 data, interspecies variability for carp, largescale sucker, peamouth, and sturgeon was relatively low for the developmental, immunological, and CNS endpoints. These four species had HI at least three times higher than for crayfish.

For the 1993 and 1991/93 combined data, the highest HI was for largescale sucker (developmental; Table 5-2). The HI for carp and crayfish were lower and similar to each other.

For the 1995 data, the HI for each of the endpoints were relatively low. For each endpoint, the HI for carp was slightly higher than for any of the other 5 species. For all endpoints except hepatic, the HI were generally lower than estimated for either the 1991 or 1993 data. The hepatic HI were similar to those estimated for 1991 and 1993.

Both carp and largescale sucker were analyzed as whole-body in 1991 and 1993 and as filets in 1995. For carp, the CNS HI was similar between the two years, but the 1991/93 combined developmental and immunological HI were more than double the 1995 HI (Figure 5-12). A similar, but more pronounced trend was observed for largescale sucker (Figure 5-13). The CNS HI was similar between the two datasets (1991/93 and 1995), but the developmental and immunological HI for 1991/93 were more than an order of magnitude greater than in 1995.

Figure 5-14 presents non-carcinogenic data for both crayfish and peamouth. The HI for peamouth was 6-9 times greater for each of the three endpoints compared to crayfish. For sturgeon filets, the HI were 2-3 times greater in 1991 compared to 1995 (Figure 5-15). The HI for the three salmonid species are presented in Figures 5-16 and 5-17. HI for all three species are very low, with values for chinook slightly greater than values for steelhead, which in turn are slightly greater than values for coho.

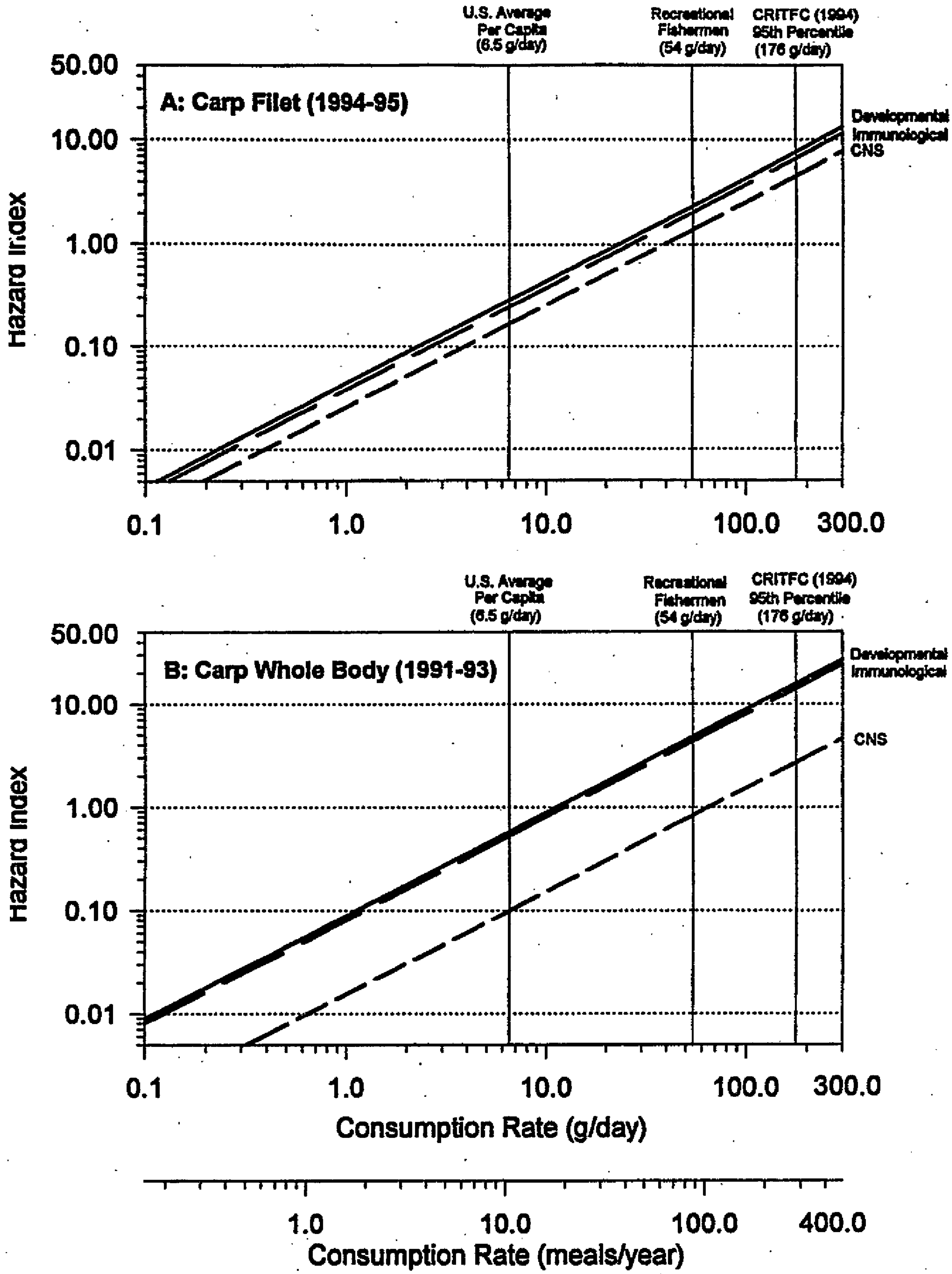


Figure 5-12 Estimated Hazard Indices for Consuming A) Carp Filets and B) Carp Whole Body

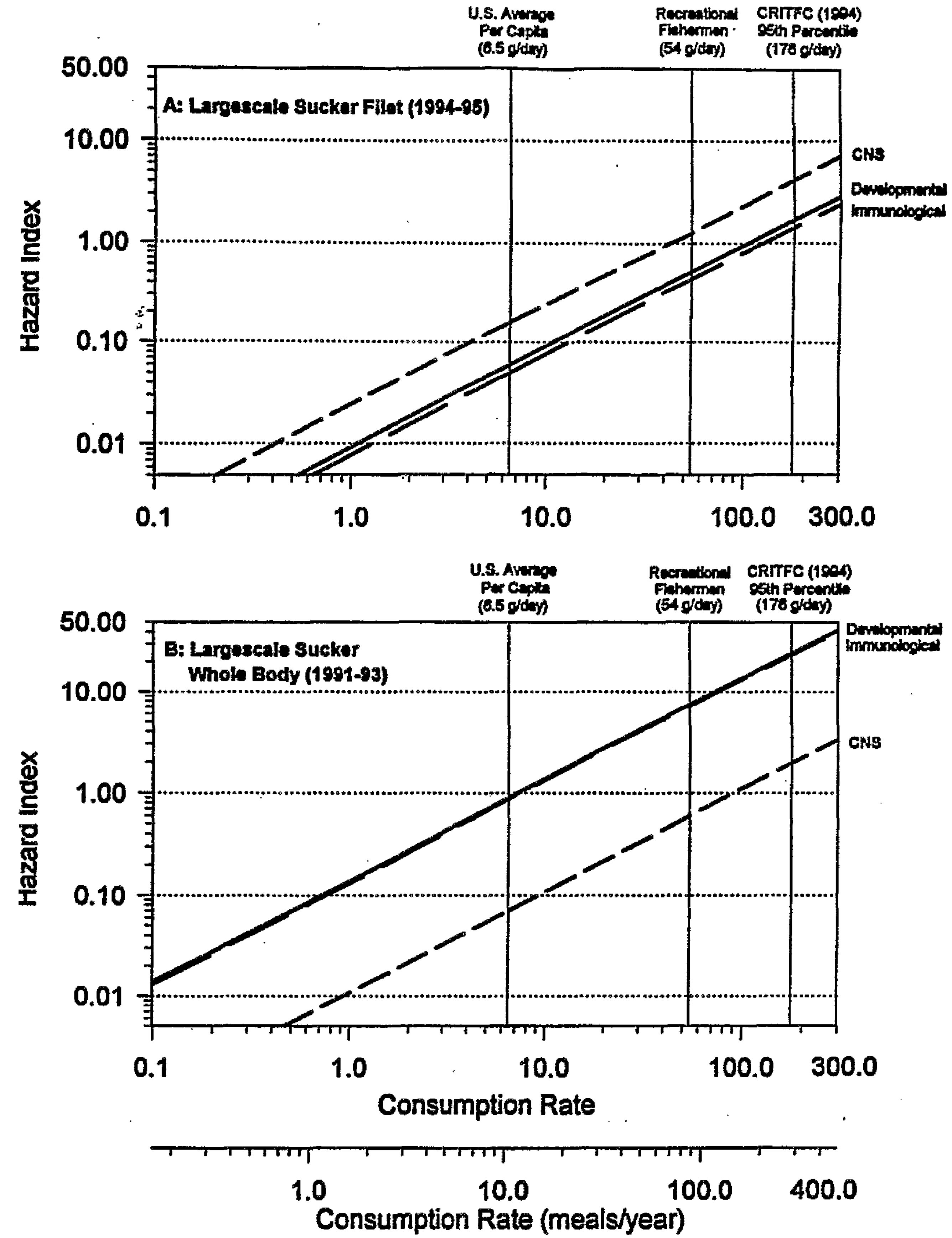


Figure 5-13 Estimated Hazard Indices for Consuming A) Largescale Sucker Filets and B) Largescale Sucker Whole Body

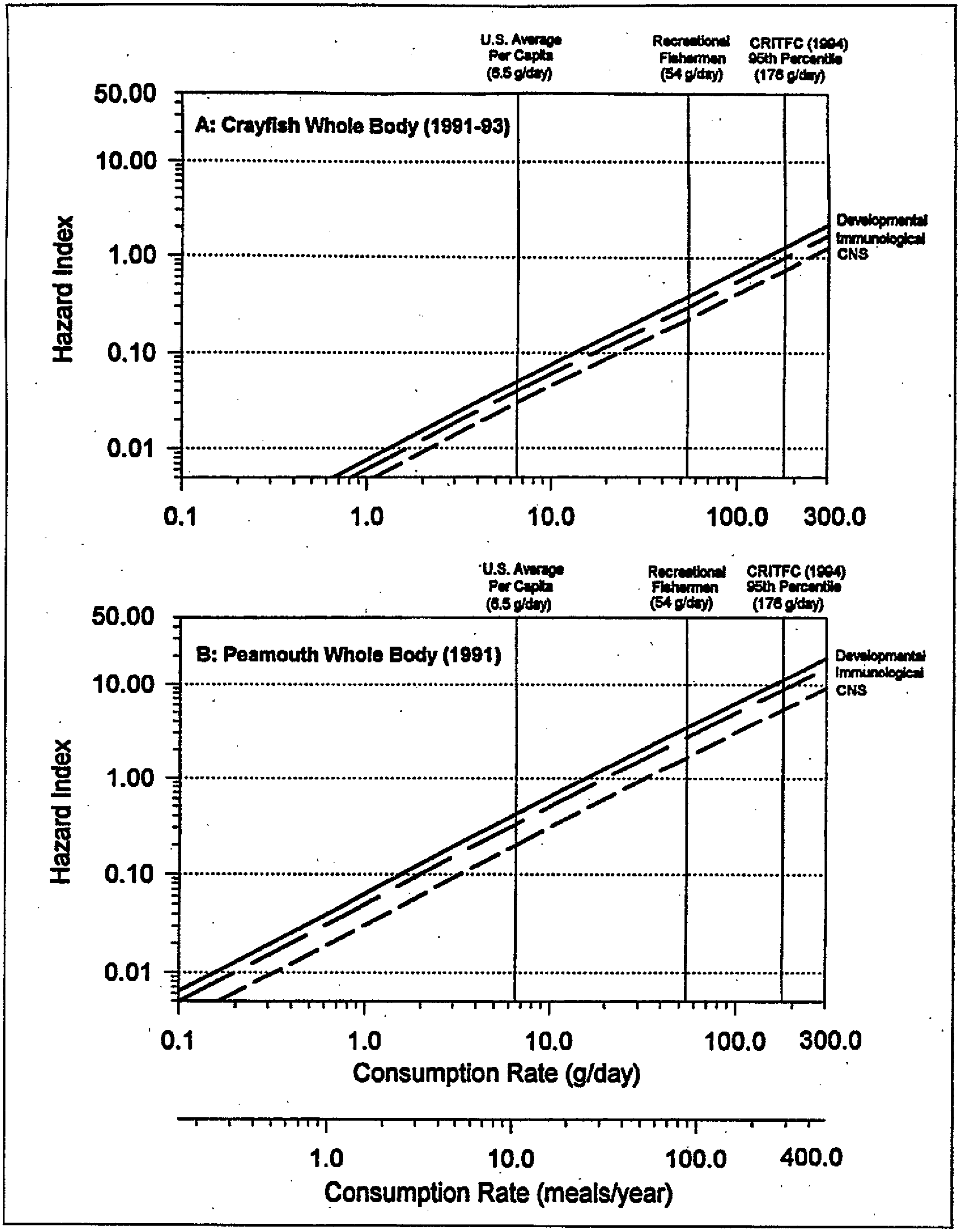


Figure 5-14 Estimated Hazard Indices for Consuming A) Crayfish Whole body and B) Peamouth Whole Body

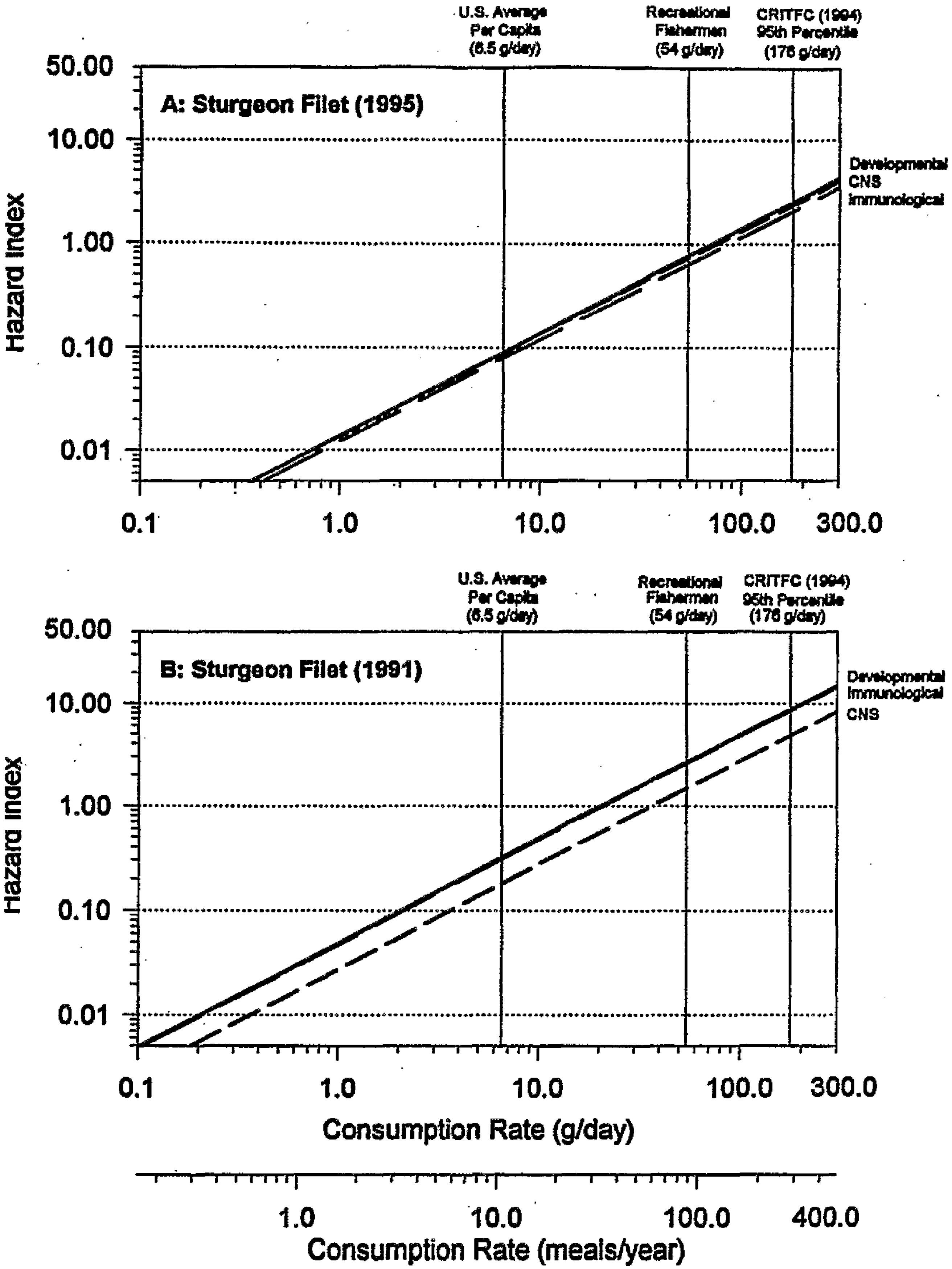


Figure 5-15 Estimated Hazard Indices for Consuming A) Sturgeon Filets (1995) and B) Surgeon Filets (1991)

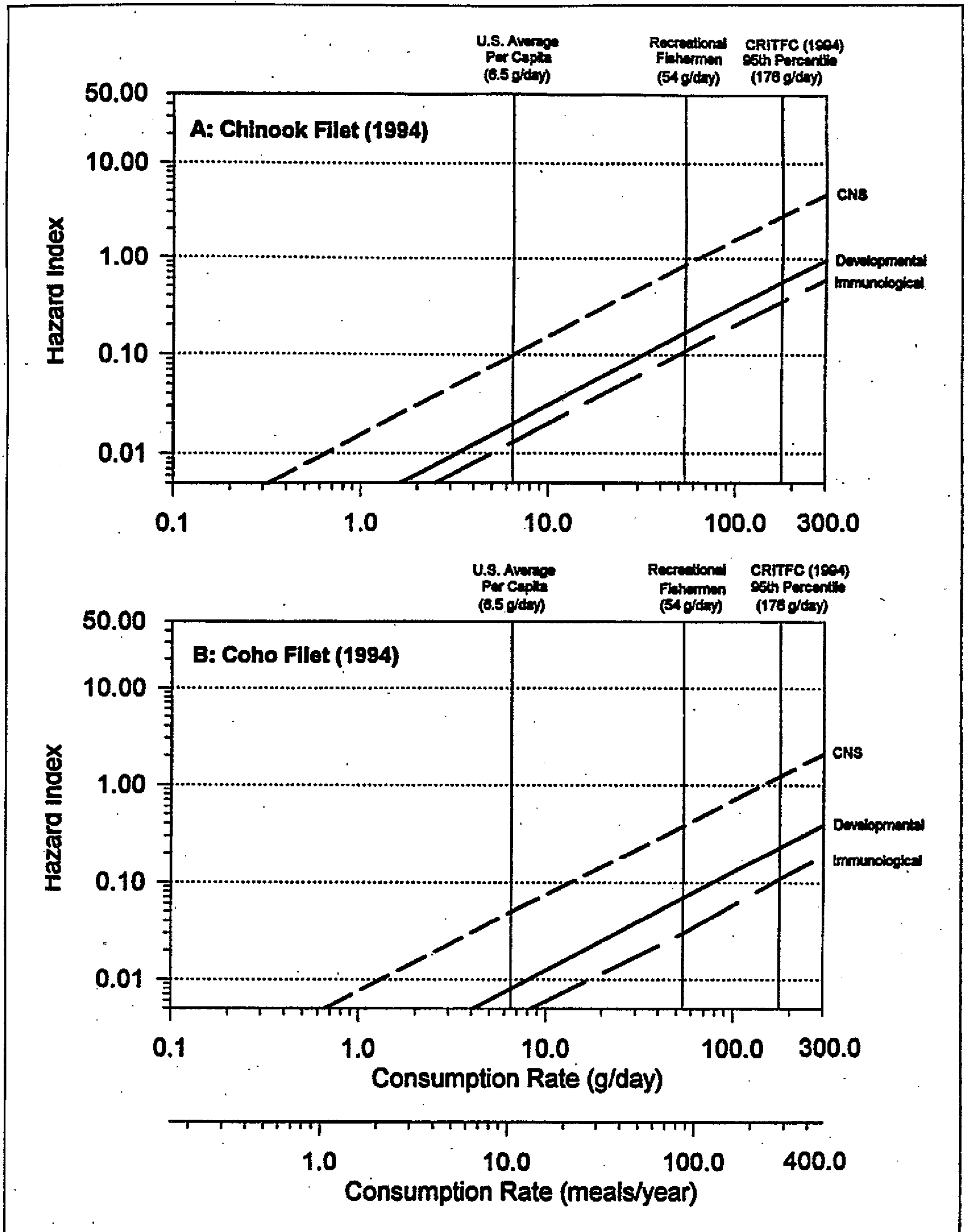


Figure 5-16 Estimated Hazard Indices for Consuming A) Chinook Filets and B) Coho Filets

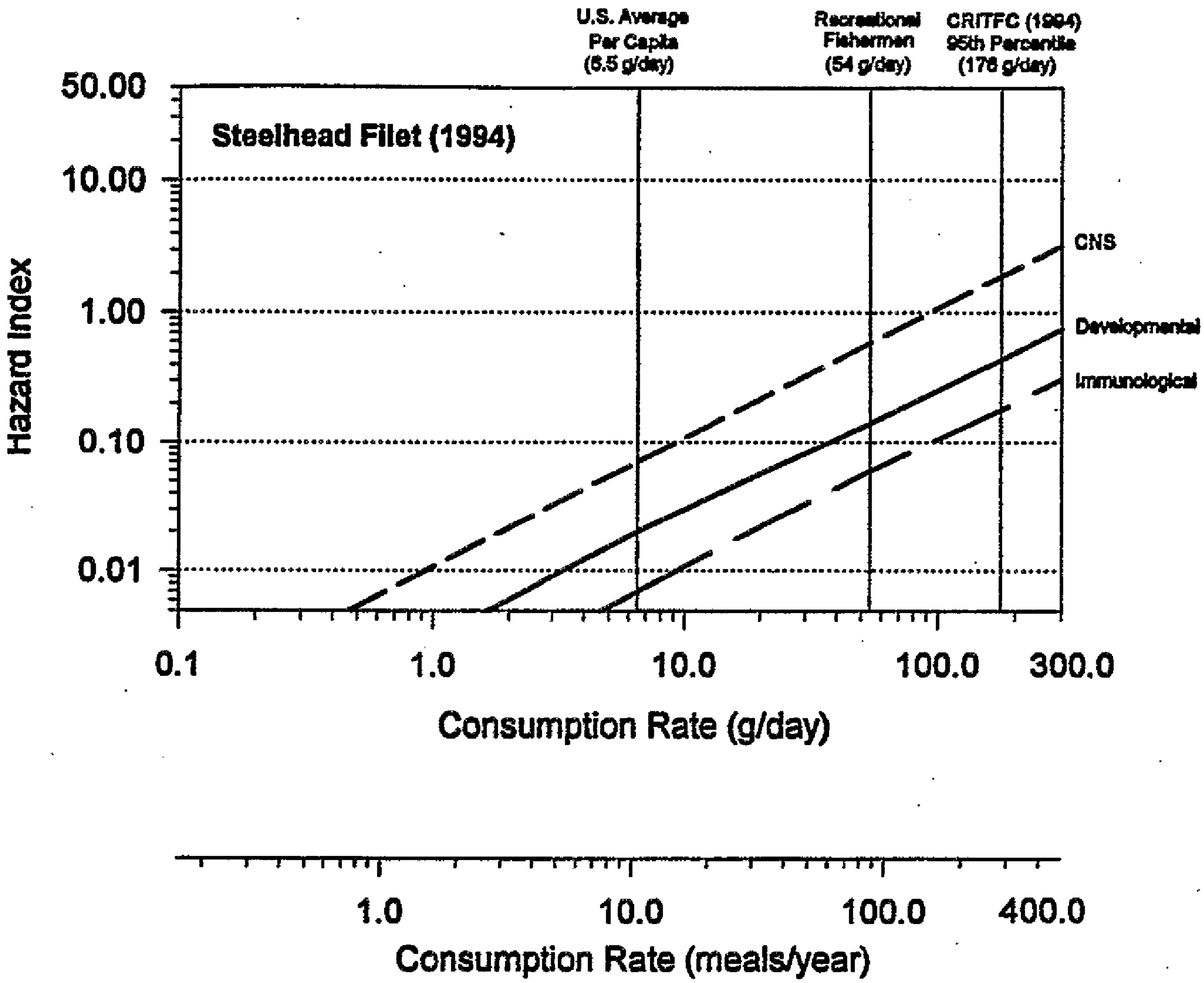


Figure 5-17 Estimated Hazard Indices for Consuming Steelhead Filets

5.3.2 Risk Estimates and HQs for Individual Chemicals

Chemicals of potential concern (COPC) to human health are those chemicals which exceed a carcinogenic risk of 1.0E-6 or a noncarcinogenic hazard quotient of one. Tables listing the risk estimates and HQs for each chemical/species/year combination are provided in Appendix D. A list of COPCs due to carcinogenic effects is provided in Table 5-3, while Table 5-4 lists COPCs due to noncarcinogenic health effects. Each of these tables is discussed in separate sections below.

5.3.2.1 Carcinogenic Risk. The carcinogenic risk for each of the species evaluated is discussed in separate sections below.

Carp. Carp were collected in all three years. For the 1991 data, 11 carcinogenic COPCs were identified at the lowest exposure level (6.5 g/day over 30 years) and 30 COPCs were identified at the highest exposure level (176 g/day over 70 years) (Table 5-3). The chemicals with the five highest risk values, in decreasing order, were N-nitroso-di-n-propylamine (9.79E-5 at lowest exposure and 6.45E-3 at highest exposure); Aroclor 1254; Aroclor 1260; 2,3,7,8-TCDD; and 2,3,7,8-TCDF.

For the 1993 data, 5 COPCs were identified at the lowest exposure level and 15 COPCs were identified at the highest exposure level (Table 5-3). The chemicals with the five highest risk values, in decreasing order, were Aroclor 1254 (1.48E-5 at lowest exposure and 9.78E-4 at highest exposure); Aroclor 1260; 2,3,7,8-TCDF; 1,2,3,7,8,9-HxCDF; and p,p'-DDE.

For the 1995 data, 7 COPCs were identified at the lowest exposure level and 13 COPCs were identified at the highest exposure level (Table 5-3). The chemicals with the five highest risk values, in decreasing order, were Aroclor 1260 (4.05E-5 at lowest exposure and 2.67E-3 at highest exposure); Aroclor 1248; 2,3,4,6,7,8-HxCDF; 2,3,7,8-TCDF; and p,p'-DDE.

The highest risk values for each of the three years are within a factor of 5 of each other, with the 1995 COPC (Aroclor 1260) intermediate in value between the 1991 COPC (N-nitroso-di-n-propylamine; highest) and the 1993 COPC (Aroclor 1254; lowest).

Crayfish. Crayfish were analyzed in both 1991 and 1993. For the 1991 data, 4 carcinogenic COPCs were identified at the lowest exposure level and 22 COPCs were identified at the highest exposure

TABLE 5-3. CHEMICALS EXCEEDING EXCESS CANCER RISK OF 1.0E-6 FOR VARIOUS CONSUMPTION RATES AND EXPOSURE DURATIONS (Page 1 of 9)

Common name	Year	Chemical Group	Chemical	6.5 g/day over 30 years	6.5 g/day over 70 years	54 g/day over 30 years	54 g/day over 70 years	176 g/day over 30 years	176 g/day over 70 years
Carp	1991	Semi-volatile	N-Nitroso-di-n-propylamine	9.79E-05	2.38E-04	8.14E-04	1.98E-03	2.65E-03	6.45E-03
Carp	1991	PCBs	Aroclor 1254	3.23E-05	7.87E-05	2.69E-04	6.53E-04	8.75E-04	2.13E-03
Carp	1991	PCBs	Aroclor 1260	1.46E-05	3.54E-05	1.21E-04	2.94E-04	3.94E-04	9.59E-04
Carp	1991	Dioxin/furans	2,3,7,8-TCDD	9.06E-06	2.20E-05	7.52E-05	1.83E-04	2.45E-04	5.97E-04
Carp	1991	Dioxin/furans	2,3,7,8-TCDF	4.42E-06	1.08E-05	3.67E-05	8.93E-05	1.20E-04	2.91E-04
Carp	1991	Dioxin/furans	1,2,3,7,8-PeCDD	4.17E-06	1.02E-05	3.47E-05	8.44E-05	1.13E-04	2.75E-04
Carp	1991	Dioxin/furans	2,3,4,7,8-PeCDF	2.80E-06	6.81E-06	2.33E-05	5.66E-05	7.58E-05	1.84E-04
Carp	1991	Pesticide	Aldrin	1.63E-06	3.96E-06	1.35E-05	3.29E-05	4.41E-05	1.07E-04
Carp	1991	Pesticide	Dieldrin	1.57E-06	3.83E-06	1.31E-05	3.18E-05	4.26E-05	1.04E-04
Carp	1991	Dioxin/furans	1,2,3,6,7,8-HxCDD	1.46E-06	3.55E-06	1.21E-05	2.95E-05	3.95E-05	9.61E-05
Carp	1991	Dioxin/furans	2,3,4,6,7,8-HxCDF	1.17E-06	2.84E-06	9.69E-06	2.36E-05	3.16E-05	7.69E-05
Carp	1991	Pesticide	p,p'-DDE	no	1.18E-06	4.03E-06	9.81E-06	1.31E-05	3.20E-05
Carp	1991	Dioxin/furans	1,2,3,4,7,8-HxCDD	no	1.09E-06	3.72E-06	9.05E-06	1.21E-05	2.95E-05
Carp	1991	Semi-volatile	Bis(2-ethylhexyl)phthalate	no	no	3.17E-06	7.72E-06	1.03E-05	2.51E-05
Carp	1991	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	no	no	2.73E-06	6.64E-06	8.90E-06	2.17E-05
Carp	1991	Semi-volatile	1,4-Dichlorobenzene	no	no	1.86E-06	4.53E-06	6.06E-06	1.48E-05
Carp	1991	Dioxin/furans	1,2,3,4,7,8-HxCDF	no	no	1.64E-06	3.98E-06	5.33E-06	1.30E-05
Carp	1991	Dioxin/furans	1,2,3,6,7,8-HxCDF	no	no	1.35E-06	3.29E-06	4.40E-06	1.07E-05
Carp	1991	Pesticide	Mirex	no	no	1.32E-06	3.21E-06	4.30E-06	1.05E-05
Carp	1991	Dioxin/furans	1,2,3,7,8,9-HxCDD	no	no	1.22E-06	2.96E-06	3.97E-06	9.65E-06
Carp	1991	Dioxin/furans	1,2,3,7,8-PeCDF	no	no	1.06E-06	2.57E-06	3.44E-06	8.37E-06
Carp	1991	Pesticide	Lindane	no	no	no	1.73E-06	2.31E-06	5.63E-06
Carp	1991	Dioxin/furans	OCDD	no	no	no	1.70E-06	2.27E-06	5.53E-06
Carp	1991	Pesticide	o,p'-DDE	no	no	no	1.43E-06	1.91E-06	4.65E-06
Carp	1991	Pesticide	p,p'-DDD	no	no	no	1.31E-06	1.76E-06	4.28E-06
Carp	1991	Dioxin/furans	1,2,3,7,8,9-HxCDF	no	no	no	1.24E-06	1.66E-06	4.04E-06
Carp	1991	Pesticide	p,p'-DDT	no	no	no	1.06E-06	1.42E-06	3.45E-06
Carp	1991	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	no	no	no	no	no	2.19E-06
Carp	1991	Pesticide	o,p'-DDT	no	no	no	no	no	2.13E-06
Carp	1991	Pesticide	o,p'-DDD	no	no	no	no	no	1.70E-06
Crayfish	1991	Dioxin/furans	2,3,7,8-TCDF	3.42E-06	8.32E-06	2.84E-05	6.91E-05	9.26E-05	2.25E-04
Crayfish	1991	Dioxin/furans	2,3,7,8-TCDD	2.66E-06	6.47E-06	2.21E-05	5.37E-05	7.19E-05	1.75E-04
Crayfish	1991	Dioxin/furans	2,3,4,7,8-PeCDF	1.78E-06	4.34E-06	1.48E-05	3.60E-05	4.82E-05	1.17E-04
Crayfish	1991	Pesticide	Dieldrin	1.09E-06	2.65E-06	9.05E-06	2.20E-05	2.95E-05	7.17E-05
Crayfish	1991	Dioxin/furans	2,3,4,6,7,8-HxCDF	no	1.30E-06	4.45E-06	1.08E-05	1.45E-05	3.53E-05
Crayfish	1991	Dioxin/furans	1,2,3,7,8-PeCDD	no	1.26E-06	4.31E-06	1.05E-05	1.40E-05	3.42E-05
Crayfish	1991	Pesticide	Heptachlor	no	no	2.38E-06	5.79E-06	7.75E-06	1.89E-05

TABLE 5-3. CHEMICALS EXCEEDING EXCESS CANCER RISK OF 1.0E-6 FOR VARIOUS CONSUMPTION RATES AND EXPOSURE DURATIONS (Page 2 of 9)

Common name	Year	Chemical Group	Chemical	6.5 g/day over 30 years	6.5 g/day over 70 years	54 g/day over 30 years	54 g/day over 70 years	176 g/day over 30 years	176 g/day over 70 years
Crayfish	1991	Semi-volatile	Bis(2-ethylhexyl)phthalate	no	no	1.59E-06	3.87E-06	5.18E-06	1.26E-05
Crayfish	1991	Dioxin/furans	1,2,3,6,7,8-HxCDD	no	no	1.23E-06	2.99E-06	4.00E-06	9.74E-06
Crayfish	1991	Pesticide	beta-BHC	no	no	1.07E-06	2.60E-06	3.48E-06	8.47E-06
Crayfish	1991	Dioxin/furans	1,2,3,7,8,9-HxCDD	no	no	no	2.17E-06	2.91E-06	7.09E-06
Crayfish	1991	Pesticide	p,p'-DDE	no	no	no	2.11E-06	2.82E-06	6.87E-06
Crayfish	1991	Dioxin/furans	1,2,3,4,7,8-HxCDF	no	no	no	2.01E-06	2.69E-06	6.54E-06
Crayfish	1991	Dioxin/furans	1,2,3,7,8,9-HxCDF	no	no	no	1.93E-06	2.59E-06	6.30E-06
Crayfish	1991	Dioxin/furans	1,2,3,6,7,8-HxCDF	no	no	no	1.84E-06	2.47E-06	6.00E-06
Crayfish	1991	Dioxin/furans	1,2,3,7,8-PeCDF	no	no	no	1.72E-06	2.30E-06	5.60E-06
Crayfish	1991	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	no	no	no	1.70E-06	2.28E-06	5.54E-06
Crayfish	1991	Dioxin/furans	1,2,3,4,7,8-HxCDD	no	no	no	1.40E-06	1.87E-06	4.56E-06
Crayfish	1991	Dioxin/furans	OCDD	no	no	no	1.33E-06	1.79E-06	4.35E-06
Crayfish	1991	Pesticide	p,p'-DDD	no	no	no	no	no	1.64E-06
Crayfish	1991	Pesticide	p,p'-DDT	no	no	no	no	no	1.38E-06
Crayfish	1991	Pesticide	o,p'-DDT	no	no	no	no	no	1.35E-06
Largescale Sucker	1991	PCBs	Aroclor 1254	3.73E-05	9.08E-05	3.10E-04	7.54E-04	1.01E-03	2.46E-03
Largescale Sucker	1991	PCBs	Aroclor 1260	9.06E-06	2.20E-05	7.53E-05	1.83E-04	2.45E-04	5.97E-04
Largescale Sucker	1991	Dioxin/furans	2,3,7,8-TCDD	5.67E-06	1.38E-05	4.71E-05	1.15E-04	1.54E-04	3.74E-04
Largescale Sucker	1991	Dioxin/furans	2,3,7,8-TCDF	4.04E-06	9.83E-06	3.36E-05	8.16E-05	1.09E-04	2.66E-04
Largescale Sucker	1991	Dioxin/furans	1,2,3,7,8-PeCDD	1.73E-06	4.22E-06	1.44E-05	3.51E-05	4.69E-05	1.14E-04
Largescale Sucker	1991	Dioxin/furans	2,3,4,7,8-PeCDF	1.66E-06	4.03E-06	1.38E-05	3.35E-05	4.48E-05	1.09E-04
Largescale Sucker	1991	Pesticide	Aldrin	1.28E-06	3.11E-06	1.06E-05	2.58E-05	3.46E-05	8.42E-05
Largescale Sucker	1991	Pesticide	Dieldrin	1.06E-06	2.58E-06	8.80E-06	2.14E-05	2.87E-05	6.98E-05
Largescale Sucker	1991	Dioxin/furans	2,3,4,6,7,8-HxCDF	no	2.02E-06	6.88E-06	1.67E-05	2.24E-05	5.46E-05
Largescale Sucker	1991	Pesticide	alpha-BHC	no	1.42E-06	4.84E-06	1.18E-05	1.58E-05	3.84E-05
Largescale Sucker	1991	Dioxin/furans	1,2,3,6,7,8-HxCDD	no	no	3.37E-06	8.21E-06	1.10E-05	2.67E-05
Largescale Sucker	1991	Dioxin/furans	1,2,3,7,8,9-HxCDD	no	no	1.78E-06	4.34E-06	5.81E-06	1.41E-05
Largescale Sucker	1991	Semi-volatile	Bis(2-ethylhexyl)phthalate	no	no	1.56E-06	3.79E-06	5.07E-06	1.23E-05
Largescale Sucker	1991	Pesticide	p,p'-DDD	no	no	1.25E-06	3.03E-06	4.06E-06	9.88E-06
Largescale Sucker	1991	Pesticide	o,p'-DDE	no	no	1.17E-06	2.85E-06	3.82E-06	9.30E-06
Largescale Sucker	1991	Dioxin/furans	1,2,3,4,7,8-HxCDD	no	no	1.15E-06	2.79E-06	3.73E-06	9.08E-06
Largescale Sucker	1991	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	no	no	1.14E-06	2.78E-06	3.72E-06	9.05E-06
Largescale Sucker	1991	Pesticide	beta-BHC	no	no	1.11E-06	2.70E-06	3.62E-06	8.81E-06
Largescale Sucker	1991	Dioxin/furans	1,2,3,4,7,8-HxCDF	no	no	1.04E-06	2.54E-06	3.40E-06	8.27E-06
Largescale Sucker	1991	Dioxin/furans	1,2,3,6,7,8-HxCDF	no	no	no	2.42E-06	3.24E-06	7.89E-06
Largescale Sucker	1991	Dioxin/furans	1,2,3,7,8,9-HxCDF	no	no	no	2.23E-06	2.98E-06	7.26E-06
Largescale Sucker	1991	Pesticide	Lindane	no	no	no	2.21E-06	2.96E-06	7.19E-06

TABLE 5-3. CHEMICALS EXCEEDING EXCESS CANCER RISK OF 1.0E-6 FOR VARIOUS CONSUMPTION RATES AND EXPOSURE DURATIONS (Page 3 of 9)									
Common name	Year	Chemical Group	Chemical	6.5 g/day over 30 years	6.5 g/day over 70 years	54 g/day over 30 years	54 g/day over 70 years	176 g/day over 30 years	176 g/day over 70 years
Largescale Sucker	1991	Pesticide	o,p'-DDD	no	no	no	1.76E-06	2.36E-06	5.75E-06
Largescale Sucker	1991	Pesticide	p,p'-DDT	no	no	no	1.72E-06	2.31E-06	5.61E-06
Largescale Sucker	1991	Dioxin/furans	1,2,3,7,8-PeCDF	no	no	no	1.45E-06	1.94E-06	4.73E-06
Largescale Sucker	1991	Dioxin/furans	OCDD	no	no	no	no	1.29E-06	3.14E-06
Largescale Sucker	1991	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	no	no	no	no	1.08E-06	2.63E-06
Peamouth	1991	PCBs	Aroclor 1260	5.57E-05	1.36E-04	4.63E-04	1.13E-03	1.51E-03	3.67E-03
Peamouth	1991	Dioxin/furans	2,3,7,8-TCDF	2.37E-05	5.76E-05	1.97E-04	4.78E-04	6.41E-04	1.56E-03
Peamouth	1991	Dioxin/furans	2,3,7,8-TCDD	1.58E-05	3.85E-05	1.31E-04	3.20E-04	4.28E-04	1.04E-03
Peamouth	1991	PCBs	Aroclor 1242	1.11E-05	2.70E-05	9.20E-05	2.24E-04	3.00E-04	7.30E-04
Peamouth	1991	Pesticide	Aldrin	1.00E-05	2.43E-05	8.31E-05	2.02E-04	2.71E-04	6.59E-04
Peamouth	1991	Pesticide	Dieldrin	8.64E-06	2.10E-05	7.18E-05	1.75E-04	2.34E-04	5.69E-04
Peamouth	1991	Dioxin/furans	2,3,4,7,8-PeCDF	2.95E-06	7.17E-06	2.45E-05	5.96E-05	7.98E-05	1.94E-04
Peamouth	1991	Pesticide	beta-BHC	2.59E-06	6.30E-06	2.15E-05	5.23E-05	7.01E-05	1.71E-04
Peamouth	1991	Dioxin/furans	1,2,3,7,8-PeCDD	2.37E-06	5.77E-06	1.97E-05	4.79E-05	6.42E-05	1.56E-04
Peamouth	1991	Pesticide	p,p'-DDE	1.89E-06	4.60E-06	1.57E-05	3.82E-05	5.11E-05	1.24E-04
Peamouth	1991	Pesticide	Lindane	no	1.53E-06	5.23E-06	1.27E-05	1.71E-05	4.15E-05
Peamouth	1991	Dioxin/furans	1,2,3,6,7,8-HxCDD	no	no	2.86E-06	6.96E-06	9.32E-06	2.27E-05
Peamouth	1991	Dioxin/furans	2,3,4,6,7,8-HxCDF	no	no	1.93E-06	4.70E-06	6.30E-06	1.53E-05
Peamouth	1991	Pesticide	p,p'-DDD	no	no	1.78E-06	4.32E-06	5.79E-06	1.41E-05
Peamouth	1991	Semi-volatile	Bis(2-ethylhexyl)phthalate	no	no	1.41E-06	3.43E-06	4.60E-06	1.12E-05
Peamouth	1991	Dioxin/furans	1,2,3,4,7,8-HxCDD	no	no	1.38E-06	3.36E-06	4.49E-06	1.09E-05
Peamouth	1991	Pesticide	o,p'-DDE	no	no	1.36E-06	3.32E-06	4.44E-06	1.08E-05
Peamouth	1991	Dioxin/furans	1,2,3,7,8-PeCDF	no	no	1.22E-06	2.96E-06	3.96E-06	9.64E-06
Peamouth	1991	Dioxin/furans	1,2,3,4,7,8-HxCDF	no	no	1.10E-06	2.68E-06	3.59E-06	8.73E-06
Peamouth	1991	Pesticide	o,p'-DDD	no	no	1.00E-06	2.44E-06	3.27E-06	7.97E-06
Peamouth	1991	Dioxin/furans	1,2,3,7,8,9-HxCDD	no	no	no	2.21E-06	2.96E-06	7.19E-06
Peamouth	1991	Dioxin/furans	1,2,3,6,7,8-HxCDF	no	no	no	1.85E-06	2.48E-06	6.03E-06
Peamouth	1991	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	no	no	no	1.34E-06	1.79E-06	4.36E-06
Peamouth	1991	Dioxin/furans	OCDD	no	no	no	no	1.07E-06	2.61E-06
Peamouth	1991	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	no	no	no	no	no	1.08E-06
White Sturgeon	1991	PCBs	Aroclor 1254	1.95E-05	4.74E-05	1.62E-04	3.94E-04	5.28E-04	1.28E-03
White Sturgeon	1991	Dioxin/furans	2,3,7,8-TCDF	6.19E-06	1.51E-05	5.14E-05	1.25E-04	1.68E-04	4.08E-04
White Sturgeon	1991	Dioxin/furans	2,3,7,8-TCDD	3.37E-06	8.20E-06	2.80E-05	6.81E-05	9.12E-05	2.22E-04
White Sturgeon	1991	Metal	Arsenic	2.44E-06	5.93E-06	2.03E-05	4.93E-05	6.60E-05	1.61E-04
White Sturgeon	1991	Pesticide	Dieldrin	1.66E-06	4.03E-06	1.38E-05	3.35E-05	4.48E-05	1.09E-04
White Sturgeon	1991	Dioxin/furans	2,3,4,7,8-PeCDF	no	2.37E-06	8.10E-06	1.97E-05	2.64E-05	6.42E-05
White Sturgeon	1991	Pesticide	p,p'-DDE	no	no	2.14E-06	5.21E-06	6.97E-06	1.70E-05

TABLE 5-3. CHEMICALS EXCEEDING EXCESS CANCER RISK OF 1.0E-6 FOR VARIOUS CONSUMPTION RATES AND EXPOSURE DURATIONS (Page 4 of 9)

Common name	Year	Chemical Group	Chemical	6.5 g/day over 30 years	6.5 g/day over 70 years	54 g/day over 30 years	54 g/day over 70 years	176 g/day over 30 years	176 g/day over 70 years
White Sturgeon	1991	Semi-volatile	bis(2-Ethylhexyl)phthalate	no	no	1.60E-06	3.89E-06	5.22E-06	1.27E-05
White Sturgeon	1991	Dioxin/furans	1,2,3,7,8-PeCDF	no	no	no	2.23E-06	2.98E-06	7.26E-06
White Sturgeon	1991	Pesticide	p,p'-DDT	no	no	no	1.25E-06	1.67E-06	4.06E-06
White Sturgeon	1991	Pesticide	o,p'-DDT	no	no	no	no	1.12E-06	2.72E-06
White Sturgeon	1991	Pesticide	p,p'-DDD	no	no	no	no	no	2.11E-06
White Sturgeon	1991	Pesticide	o,p'-DDE	no	no	no	no	no	1.91E-06
White Sturgeon	1991	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	no	no	no	no	no	1.77E-06
White Sturgeon	1991	Pesticide	o,p'-DDD	no	no	no	no	no	1.33E-06
Carp	1991/93	Semi-volatile	N-Nitroso-di-n-propylamine	9.79E-05	2.38E-04	8.14E-04	1.98E-03	2.65E-03	6.45E-03
Carp	1991/93	PCBs	Aroclor 1254	2.91E-05	7.09E-05	2.42E-04	5.89E-04	7.89E-04	1.92E-03
Carp	1991/93	PCBs	Aroclor 1260	1.34E-05	3.26E-05	1.11E-04	2.71E-04	3.63E-04	8.84E-04
Carp	1991/93	Dioxin/furans	2,3,7,8-TCDD	7.04E-06	1.71E-05	5.85E-05	1.42E-04	1.91E-04	4.64E-04
Carp	1991/93	Dioxin/furans	2,3,7,8-TCDF	3.77E-06	9.17E-06	3.13E-05	7.62E-05	1.02E-04	2.48E-04
Carp	1991/93	Dioxin/furans	1,2,3,7,8-PeCDD	3.31E-06	8.05E-06	2.75E-05	6.69E-05	8.96E-05	2.18E-04
Carp	1991/93	Dioxin/furans	2,3,4,7,8-PeCDF	2.14E-06	5.21E-06	1.78E-05	4.33E-05	5.80E-05	1.41E-04
Carp	1991/93	PCBs	Dieldrin	1.57E-06	3.81E-06	1.30E-05	3.16E-05	4.24E-05	1.03E-04
Carp	1991/93	PCBs	Aldrin	1.48E-06	3.60E-06	1.23E-05	2.99E-05	4.01E-05	9.75E-05
Carp	1991/93	Dioxin/furans	1,2,3,6,7,8-HxCDD	1.16E-06	2.81E-06	9.61E-06	2.34E-05	3.13E-05	7.62E-05
Carp	1991/93	Dioxin/furans	2,3,4,6,7,8-HxCDF	no	2.37E-06	8.08E-06	1.97E-05	2.63E-05	6.41E-05
Carp	1991/93	PCBs	p,p'-DDE	no	1.43E-06	4.89E-06	1.19E-05	1.60E-05	3.88E-05
Carp	1991/93	Dioxin/furans	1,2,3,7,8,9-HxCDF	no	1.06E-06	3.62E-06	8.82E-06	1.18E-05	2.87E-05
Carp	1991/93	Dioxin/furans	1,2,3,4,7,8-HxCDD	no	no	3.40E-06	8.28E-06	1.11E-05	2.70E-05
Carp	1991/93	Dioxin/furans	1,2,3,7,8-PeCDF	no	no	2.86E-06	6.96E-06	9.32E-06	2.27E-05
Carp	1991/93	Semi-volatile	Bis(2-ethylhexyl)phthalate	no	no	2.71E-06	6.61E-06	8.85E-06	2.15E-05
Carp	1991/93	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	no	no	2.29E-06	5.57E-06	7.46E-06	1.82E-05
Carp	1991/93	Semi-volatile	1,4-Dichlorobenzene	no	no	1.73E-06	4.20E-06	5.63E-06	1.37E-05
Carp	1991/93	Dioxin/furans	1,2,3,7,8,9-HxCDD	no	no	1.51E-06	3.69E-06	4.94E-06	1.20E-05
Carp	1991/93	Dioxin/furans	1,2,3,4,7,8-HxCDF	no	no	1.47E-06	3.59E-06	4.80E-06	1.17E-05
Carp	1991/93	PCBs	Mirex	no	no	1.32E-06	3.21E-06	4.30E-06	1.05E-05
Carp	1991/93	Dioxin/furans	1,2,3,6,7,8-HxCDF	no	no	1.27E-06	3.09E-06	4.14E-06	1.01E-05
Carp	1991/93	PCBs	p,p'-DDD	no	no	no	1.77E-06	2.36E-06	5.75E-06
Carp	1991/93	PCBs	Lindane	no	no	no	1.64E-06	2.20E-06	5.35E-06
Carp	1991/93	Dioxin/furans	OCDD	no	no	no	1.40E-06	1.87E-06	4.56E-06
Carp	1991/93	PCBs	o,p'-DDE	no	no	no	1.29E-06	1.73E-06	4.21E-06
Carp	1991/93	PCBs	p,p'-DDT	no	no	no	1.05E-06	1.40E-06	3.41E-06
Carp	1991/93	PCBs	o,p'-DDT	no	no	no	no	no	2.14E-06
Carp	1991/93	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	no	no	no	no	no	1.70E-06

TABLE 5-3. CHEMICALS EXCEEDING EXCESS CANCER RISK OF 1.0E-6 FOR VARIOUS CONSUMPTION RATES AND EXPOSURE DURATIONS (Page 5 of 9)									
Common name	Year	Chemical Group	Chemical	6.5 g/day over 30 years	6.5 g/day over 70 years	54 g/day over 30 years	54 g/day over 70 years	176 g/day over 30 years	176 g/day over 70 years
Carp	1991/93	PCBs	o,p'-DDD	no	no	no	no	no	1.67E-06
Crayfish	1991/93	PCBs	Aroclor 1260	7.39E-06	1.80E-05	6.14E-05	1.49E-04	2.00E-04	4.87E-04
Crayfish	1991/93	Dioxin/furans	2,3,7,8-TCDD	2.03E-06	4.94E-06	1.69E-05	4.10E-05	5.49E-05	1.34E-04
Crayfish	1991/93	Dioxin/furans	2,3,7,8-TCDF	2.00E-06	4.86E-06	1.66E-05	4.03E-05	5.40E-05	1.31E-04
Crayfish	1991/93	PCBs	Dieldrin	1.29E-06	3.13E-06	1.07E-05	2.60E-05	3.49E-05	8.48E-05
Crayfish	1991/93	Dioxin/furans	2,3,4,7,8-PeCDF	1.26E-06	3.07E-06	1.05E-05	2.55E-05	3.42E-05	8.33E-05
Crayfish	1991/93	Dioxin/furans	1,2,3,7,8-PeCDD	no	2.17E-06	7.42E-06	1.81E-05	2.42E-05	5.88E-05
Crayfish	1991/93	Metal	Arsenic	no	1.84E-06	6.29E-06	1.53E-05	2.05E-05	4.99E-05
Crayfish	1991/93	Dioxin/furans	2,3,4,6,7,8-HxCDF	no	no	2.82E-06	6.85E-06	9.18E-06	2.23E-05
Crayfish	1991/93	PCBs	Heptachlor	no	no	2.11E-06	5.13E-06	6.87E-06	1.67E-05
Crayfish	1991/93	Dioxin/furans	1,2,3,7,8,9-HxCDF	no	no	1.46E-06	3.56E-06	4.77E-06	1.16E-05
Crayfish	1991/93	Dioxin/furans	1,2,3,7,8,9-HxCDD	no	no	1.44E-06	3.50E-06	4.68E-06	1.14E-05
Crayfish	1991/93	Dioxin/furans	1,2,3,6,7,8-HxCDD	no	no	1.44E-06	3.49E-06	4.68E-06	1.14E-05
Crayfish	1991/93	Semi-volatile	Bis(2-ethylhexyl)phthalate	no	no	1.41E-06	3.42E-06	4.58E-06	1.11E-05
Crayfish	1991/93	Dioxin/furans	1,2,3,4,7,8-HxCDF	no	no	1.21E-06	2.95E-06	3.95E-06	9.61E-06
Crayfish	1991/93	Dioxin/furans	1,2,3,6,7,8-HxCDF	no	no	1.12E-06	2.73E-06	3.65E-06	8.88E-06
Crayfish	1991/93	Dioxin/furans	1,2,3,4,7,8-HxCDD	no	no	1.05E-06	2.55E-06	3.42E-06	8.31E-06
Crayfish	1991/93	PCBs	beta-BHC	no	no	no	2.21E-06	2.96E-06	7.19E-06
Crayfish	1991/93	PCBs	p,p'-DDE	no	no	no	1.95E-06	2.61E-06	6.35E-06
Crayfish	1991/93	Dioxin/furans	1,2,3,7,8-PeCDF	no	no	no	1.50E-06	2.01E-06	4.90E-06
Crayfish	1991/93	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	no	no	no	no	1.31E-06	3.19E-06
Crayfish	1991/93	Dioxin/furans	OCDD	no	no	no	no	1.02E-06	2.49E-06
Crayfish	1991/93	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	no	no	no	no	no	2.22E-06
Crayfish	1991/93	PCBs	p,p'-DDT	no	no	no	no	no	1.72E-06
Crayfish	1991/93	PCBs	o,p'-DDT	no	no	no	no	no	1.71E-06
Crayfish	1991/93	PCBs	p,p'-DDD	no	no	no	no	no	1.58E-06
Crayfish	1991/93	Dioxin/furans	1,2,3,4,7,8,9-HpCDF	no	no	no	no	no	1.53E-06
Largescale Sucker	1991/93	PCBs	Aroclor 1254	5.16E-05	1.26E-04	4.29E-04	1.04E-03	1.40E-03	3.40E-03
Largescale Sucker	1991/93	PCBs	Aroclor 1260	1.02E-05	2.49E-05	8.50E-05	2.07E-04	2.77E-04	6.74E-04
Largescale Sucker	1991/93	Dioxin/furans	2,3,7,8-TCDD	3.73E-06	9.07E-06	3.10E-05	7.54E-05	1.01E-04	2.46E-04
Largescale Sucker	1991/93	Dioxin/furans	2,3,7,8-TCDF	2.99E-06	7.27E-06	2.48E-05	6.04E-05	8.09E-05	1.97E-04
Largescale Sucker	1991/93	PCBs	Dieldrin	1.84E-06	4.48E-06	1.53E-05	3.72E-05	4.98E-05	1.21E-04
Largescale Sucker	1991/93	PCBs	Aldrin	1.40E-06	3.41E-06	1.16E-05	2.83E-05	3.79E-05	9.23E-05
Largescale Sucker	1991/93	Dioxin/furans	2,3,4,7,8-PeCDF	1.38E-06	3.37E-06	1.15E-05	2.80E-05	3.75E-05	9.12E-05
Largescale Sucker	1991/93	Dioxin/furans	1,2,3,7,8-PeCDD	1.35E-06	3.28E-06	1.12E-05	2.72E-05	3.65E-05	8.87E-05
Largescale Sucker	1991/93	PCBs	p,p'-DDE	no	1.87E-06	6.39E-06	1.56E-05	2.08E-05	5.07E-05
Largescale Sucker	1991/93	Dioxin/furans	1,2,3,7,8,9-HxCDF	no	1.69E-06	5.78E-06	1.41E-05	1.89E-05	4.59E-05

TABLE 5-3. CHEMICALS EXCEEDING EXCESS CANCER RISK OF 1.0E-6 FOR VARIOUS CONSUMPTION RATES AND EXPOSURE DURATIONS (Page 6 of 9)

Common name	Year	Chemical Group	Chemical	6.5 g/day over 30 years	6.5 g/day over 70 years	54 g/day over 30 years	54 g/day over 70 years	176 g/day over 30 years	176 g/day over 70 years
Largescale Sucker	1991/93	Dioxin/furans	2,3,4,6,7,8-HxCDF	no	1.58E-06	5.40E-06	1.31E-05	1.76E-05	4.28E-05
Largescale Sucker	1991/93	Metal	Arsenic	no	1.31E-06	4.49E-06	1.09E-05	1.46E-05	3.56E-05
Largescale Sucker	1991/93	PCBs	alpha-BHC	no	1.08E-06	3.70E-06	9.01E-06	1.21E-05	2.94E-05
Largescale Sucker	1991/93	Dioxin/furans	1,2,3,7,8-PeCDF	no	no	3.27E-06	7.95E-06	1.06E-05	2.59E-05
Largescale Sucker	1991/93	Dioxin/furans	1,2,3,6,7,8-HxCDD	no	no	2.37E-06	5.77E-06	7.73E-06	1.88E-05
Largescale Sucker	1991/93	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	no	no	2.29E-06	5.57E-06	7.46E-06	1.82E-05
Largescale Sucker	1991/93	Dioxin/furans	1,2,3,6,7,8-HxCDF	no	no	1.94E-06	4.72E-06	6.32E-06	1.54E-05
Largescale Sucker	1991/93	PCBs	p,p'-DDD	no	no	1.56E-06	3.79E-06	5.08E-06	1.24E-05
Largescale Sucker	1991/93	Dioxin/furans	1,2,3,7,8,9-HxCDD	no	no	1.51E-06	3.68E-06	4.93E-06	1.20E-05
Largescale Sucker	1991/93	Dioxin/furans	1,2,3,4,7,8-HxCDD	no	no	1.42E-06	3.47E-06	4.64E-06	1.13E-05
Largescale Sucker	1991/93	Semi-volatile	Bis(2-ethylhexyl)phthalate	no	no	1.22E-06	2.97E-06	3.97E-06	9.67E-06
Largescale Sucker	1991/93	Dioxin/furans	1,2,3,4,7,8-HxCDF	no	no	1.18E-06	2.86E-06	3.84E-06	9.33E-06
Largescale Sucker	1991/93	PCBs	o,p'-DDE	no	no	1.17E-06	2.84E-06	3.81E-06	9.26E-06
Largescale Sucker	1991/93	PCBs	p,p'-DDT	no	no	1.10E-06	2.66E-06	3.57E-06	8.69E-06
Largescale Sucker	1991/93	PCBs	o,p'-DDD	no	no	1.06E-06	2.57E-06	3.44E-06	8.38E-06
Largescale Sucker	1991/93	PCBs	beta-BHC	no	no	no	2.24E-06	3.01E-06	7.32E-06
Largescale Sucker	1991/93	PCBs	Lindane	no	no	no	1.74E-06	2.34E-06	5.69E-06
Largescale Sucker	1991/93	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	no	no	no	no	1.27E-06	3.10E-06
Largescale Sucker	1991/93	Dioxin/furans	OCDD	no	no	no	no	1.15E-06	2.80E-06
Common Carp	1993	PCBs	Aroclor 1254	1.48E-05	3.61E-05	1.23E-04	3.00E-04	4.02E-04	9.78E-04
Common Carp	1993	PCBs	Aroclor 1260	8.23E-06	2.00E-05	6.84E-05	1.66E-04	2.23E-04	5.42E-04
Common Carp	1993	Dioxin/furans	2,3,7,8-TCDF	2.15E-06	5.22E-06	1.78E-05	4.34E-05	5.81E-05	1.41E-04
Common Carp	1993	Dioxin/furans	1,2,3,7,8,9-HxCDF	1.37E-06	3.34E-06	1.14E-05	2.78E-05	3.72E-05	9.05E-05
Common Carp	1993	Pesticide	p,p'-DDE	1.06E-06	2.57E-06	8.78E-06	2.14E-05	2.86E-05	6.97E-05
Common Carp	1993	Dioxin/furans	1,2,3,7,8-PeCDF	no	2.16E-06	7.37E-06	1.79E-05	2.40E-05	5.85E-05
Common Carp	1993	Dioxin/furans	2,3,4,7,8-PeCDF	no	1.22E-06	4.16E-06	1.01E-05	1.36E-05	3.30E-05
Common Carp	1993	Dioxin/furans	2,3,4,6,7,8-HxCDF	no	1.18E-06	4.04E-06	9.84E-06	1.32E-05	3.21E-05
Common Carp	1993	Dioxin/furans	1,2,3,6,7,8-HxCDD	no	no	3.33E-06	8.10E-06	1.08E-05	2.64E-05
Common Carp	1993	Dioxin/furans	1,2,3,4,7,8-HxCDD	no	no	2.62E-06	6.36E-06	8.52E-06	2.07E-05
Common Carp	1993	Pesticide	p,p'-DDD	no	no	1.56E-06	3.80E-06	5.08E-06	1.24E-05
Common Carp	1993	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	no	no	1.19E-06	2.89E-06	3.87E-06	9.43E-06
Common Carp	1993	Pesticide	p,p'-DDT	no	no	no	no	1.33E-06	3.25E-06
Common Carp	1993	Dioxin/furans	OCDD	no	no	no	no	no	2.15E-06
Common Carp	1993	Radionuclide	Plutonium 239/240	no	no	no	no	no	2.13E-06
Crayfish	1993	PCBs	Aroclor 1260	7.44E-06	1.81E-05	6.18E-05	1.50E-04	2.02E-04	4.90E-04
Crayfish	1993	Dioxin/furans	2,3,7,8-TCDD	1.53E-06	3.71E-06	1.27E-05	3.09E-05	4.13E-05	1.01E-04
Crayfish	1993	Dioxin/furans	2,3,7,8-TCDF	no	2.09E-06	7.12E-06	1.73E-05	2.32E-05	5.65E-05

TABLE 5-3. CHEMICALS EXCEEDING EXCESS CANCER RISK OF 1.0E-6 FOR VARIOUS CONSUMPTION RATES AND EXPOSURE DURATIONS (Page 7 of 9)									
Common name	Year	Chemical Group	Chemical	6.5 g/day over 30 years	6.5 g/day over 70 years	54 g/day over 30 years	54 g/day over 70 years	176 g/day over 30 years	176 g/day over 70 years
Crayfish	1993	Metal	Arsenic	no	no	1.08E-06	2.62E-06	3.51E-06	8.54E-06
Crayfish	1993	Pesticide	p,p'-DDE	no	no	no	1.75E-06	2.35E-06	5.72E-06
Crayfish	1993	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	no	no	no	no	1.33E-06	3.23E-06
Crayfish	1993	Dioxin/furans	OCDD	no	no	no	no	no	1.01E-06
Largescale Sucker	1993	PCBs	Aroclor 1254	6.77E-05	1.65E-04	5.62E-04	1.37E-03	1.83E-03	4.46E-03
Largescale Sucker	1993	PCBs	Aroclor 1260	1.15E-05	2.81E-05	9.59E-05	2.33E-04	3.13E-04	7.60E-04
Largescale Sucker	1993	Dioxin/furans	2,3,7,8-TCDD	2.27E-06	5.53E-06	1.89E-05	4.59E-05	6.15E-05	1.50E-04
Largescale Sucker	1993	Dioxin/furans	2,3,7,8-TCDF	2.20E-06	5.36E-06	1.83E-05	4.45E-05	5.96E-05	1.45E-04
Largescale Sucker	1993	Pesticide	p,p'-DDE	1.26E-06	3.06E-06	1.05E-05	2.54E-05	3.41E-05	8.29E-05
Largescale Sucker	1993	Dioxin/furans	2,3,4,7,8-PeCDF	1.18E-06	2.87E-06	9.81E-06	2.39E-05	3.20E-05	7.78E-05
Largescale Sucker	1993	Dioxin/furans	1,2,3,7,8,9-HxCDF	1.14E-06	2.76E-06	9.44E-06	2.30E-05	3.08E-05	7.48E-05
Largescale Sucker	1993	Dioxin/furans	1,2,3,7,8-PeCDD	1.06E-06	2.57E-06	8.77E-06	2.13E-05	2.86E-05	6.95E-05
Largescale Sucker	1993	Dioxin/furans	1,2,3,7,8-PeCDF	no	1.54E-06	5.27E-06	1.28E-05	1.72E-05	4.18E-05
Largescale Sucker	1993	Dioxin/furans	2,3,4,6,7,8-HxCDF	no	1.26E-06	4.29E-06	1.05E-05	1.40E-05	3.41E-05
Largescale Sucker	1993	Dioxin/furans	1,2,3,6,7,8-HxCDF	no	no	2.65E-06	6.44E-06	8.62E-06	2.10E-05
Largescale Sucker	1993	Metal	Arsenic	no	no	2.04E-06	4.96E-06	6.65E-06	1.62E-05
Largescale Sucker	1993	Pesticide	p,p'-DDD	no	no	1.89E-06	4.60E-06	6.16E-06	1.50E-05
Largescale Sucker	1993	Dioxin/furans	1,2,3,4,7,8-HxCDD	no	no	1.63E-06	3.98E-06	5.33E-06	1.30E-05
Largescale Sucker	1993	Dioxin/furans	1,2,3,6,7,8-HxCDD	no	no	1.62E-06	3.94E-06	5.28E-06	1.28E-05
Largescale Sucker	1993	Pesticide	p,p'-DDT	no	no	1.51E-06	3.67E-06	4.91E-06	1.20E-05
Largescale Sucker	1993	Semi-volatile	Bis(2-ethylhexyl)phthalate	no	no	no	2.04E-06	2.74E-06	6.66E-06
Largescale Sucker	1993	Radionuclide	Plutonium 238	no	no	no	1.84E-06	2.47E-06	6.01E-06
Largescale Sucker	1993	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	no	no	no	1.18E-06	1.58E-06	3.84E-06
Largescale Sucker	1993	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	no	no	no	1.06E-06	1.42E-06	3.45E-06
Largescale Sucker	1993	Dioxin/furans	OCDD	no	no	no	no	1.05E-06	2.55E-06
Largescale Sucker	1993	Radionuclide	Cesium 137	no	no	no	no	no	2.01E-06
Carp	1995	PCBs	Arochlor 1260	4.05E-05	9.87E-05	3.37E-04	8.20E-04	1.10E-03	2.67E-03
Carp	1995	PCBs	Arochlor 1248	1.48E-05	3.61E-05	1.23E-04	3.00E-04	4.02E-04	9.78E-04
Carp	1995	Dioxin/furans	2,3,4,6,7,8-HxCDF	3.88E-06	9.43E-06	3.22E-05	7.83E-05	1.05E-04	2.55E-04
Carp	1995	Dioxin/furans	2,3,7,8-TCDF	2.50E-06	6.07E-06	2.07E-05	5.05E-05	6.76E-05	1.64E-04
Carp	1995	PCBs	p,p'-DDE	1.70E-06	4.15E-06	1.42E-05	3.45E-05	4.62E-05	1.12E-04
Carp	1995	Dioxin/furans	1,2,3,7,8-PeCDF	1.32E-06	3.22E-06	1.10E-05	2.67E-05	3.58E-05	8.71E-05
Carp	1995	Dioxin/furans	1,2,3,6,7,8-HxCDD	1.09E-06	2.66E-06	9.08E-06	2.21E-05	2.96E-05	7.20E-05
Carp	1995	Dioxin/furans	1,2,3,4,7,8-HxCDD	no	no	2.14E-06	5.21E-06	6.97E-06	1.70E-05
Carp	1995	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	no	no	1.85E-06	4.51E-06	6.04E-06	1.47E-05
Carp	1995	Metal	Arsenic-Inorg.	no	no	no	1.35E-06	1.81E-06	4.40E-06

TABLE 5-3. CHEMICALS EXCEEDING EXCESS CANCER RISK OF 1.0E-6 FOR VARIOUS CONSUMPTION RATES AND EXPOSURE DURATIONS (Page 8 of 9)

Common name	Year	Chemical Group	Chemical	6.5 g/day over 30 years	6.5 g/day over 70 years	54 g/day over 30 years	54 g/day over 70 years	176 g/day over 30 years	176 g/day over 70 years
Carp	1995	PCBs	p,p'-DDD	no	no	no	1.08E-06	1.45E-06	3.54E-06
Carp	1995	PCBs	Hexachlorobenzene	no	no	no	1.02E-06	1.37E-06	3.34E-06
Carp	1995	Dioxin/furans	OCDD	no	no	no	no	no	1.94E-06
Chinook Salmon	1995	PCBs	Arochlor 1260	2.93E-06	7.13E-06	2.43E-05	5.92E-05	7.93E-05	1.93E-04
Chinook Salmon	1995	Dioxin/furans	2,3,7,8-TCDD	1.35E-06	3.27E-06	1.12E-05	2.72E-05	3.64E-05	8.86E-05
Chinook Salmon	1995	Dioxin/furans	2,3,7,8-TCDF	no	2.25E-06	7.67E-06	1.87E-05	2.50E-05	6.08E-05
Chinook Salmon	1995	Metal	Arsenic-Inorg.	no	2.09E-06	7.12E-06	1.73E-05	2.32E-05	5.65E-05
Chinook Salmon	1995	Dioxin/furans	1,2,3,7,8-PeCDD	no	1.13E-06	3.84E-06	9.35E-06	1.25E-05	3.05E-05
Chinook Salmon	1995	Dioxin/furans	2,3,4,7,8-PeCDF	no	no	3.29E-06	8.00E-06	1.07E-05	2.61E-05
Chinook Salmon	1995	Dioxin/furans	1,2,3,4,7,8-HxCDD	no	no	no	1.00E-06	1.34E-06	3.27E-06
Chinook Salmon	1995	Dioxin/furans	1,2,3,6,7,8-HxCDD	no	no	no	1.62E-06	2.17E-06	5.28E-06
Chinook Salmon	1995	Dioxin/furans	1,2,3,7,8,9-HxCDD	no	no	no	1.27E-06	1.70E-06	4.15E-06
Chinook Salmon	1995	Dioxin/furans	1,2,3,7,8,9-HxCDF	no	no	no	1.08E-06	no	3.52E-06
Chinook Salmon	1995	PCBs	p,p'-DDE	no	no	no	2.24E-06	2.99E-06	7.29E-06
Chinook Salmon	1995	Dioxin/furans	1,2,3,6,7,8-HxCDF	no	no	no	no	no	1.89E-06
Chinook Salmon	1995	Dioxin/furans	1,2,3,4,7,8-HxCDF	no	no	no	no	no	2.33E-06
Chinook Salmon	1995	Dioxin/furans	1,2,3,7,8-PeCDF	no	no	no	no	no	2.01E-06
Chinook Salmon	1995	PCBs	p,p'-DDD	no	no	no	no	no	2.24E-06
Chinook Salmon	1995	PCBs	p,p'-DDT	no	no	no	no	no	1.25E-06
Coho Salmon	1995	Dioxin/furans	2,3,7,8-TCDD	1.85E-06	4.50E-06	1.54E-05	3.74E-05	5.01E-05	1.22E-04
Coho Salmon	1995	PCBs	Arochlor 1260	no	2.18E-06	7.45E-06	1.81E-05	2.43E-05	5.91E-05
Coho Salmon	1995	Dioxin/furans	2,3,7,8-TCDF	no	no	3.22E-06	7.83E-06	1.05E-05	2.55E-05
Coho Salmon	1995	Dioxin/furans	2,3,4,7,8-PeCDF	no	no	1.78E-06	4.34E-06	5.81E-06	1.41E-05
Coho Salmon	1995	Metal	Arsenic-Inorg.	no	no	1.48E-06	3.60E-06	4.82E-06	1.17E-05
Coho Salmon	1995	Dioxin/furans	1,2,3,6,7,8-HxCDF	no	no	1.08E-06	2.62E-06	3.51E-06	8.55E-06
Coho Salmon	1995	Dioxin/furans	1,2,3,6,7,8-HxCDD	no	no	no	2.43E-06	3.25E-06	7.92E-06
Coho Salmon	1995	Dioxin/furans	1,2,3,7,8-PeCDF	no	no	no	2.35E-06	3.15E-06	7.67E-06
Coho Salmon	1995	PCBs	p,p'-DDE	no	no	no	no	1.07E-06	2.59E-06
Coho Salmon	1995	Dioxin/furans	2,3,4,6,7,8-HxCDF	no	no	no	no	1.03E-06	2.51E-06
Coho Salmon	1995	Dioxin/furans	1,2,3,7,8,9-HxCDD	no	no	no	no	no	1.45E-06
Coho Salmon	1995	Dioxin/furans	1,2,3,4,7,8-HxCDF	no	no	no	no	no	2.07E-06
Largescale Sucker	1995	PCBs	Arochlor 1260	9.86E-06	2.40E-05	8.19E-05	1.99E-04	2.67E-04	6.49E-04
Largescale Sucker	1995	PCBs	Arochlor 1248	1.89E-06	4.59E-06	1.57E-05	3.82E-05	5.11E-05	1.24E-04
Largescale Sucker	1995	Metal	Arsenic-Inorg.	no	2.03E-06	6.93E-06	1.69E-05	2.26E-05	5.50E-05
Largescale Sucker	1995	Dioxin/furans	2,3,7,8-TCDF	no	1.76E-06	5.99E-06	1.46E-05	1.95E-05	4.75E-05
Largescale Sucker	1995	Dioxin/furans	1,2,3,7,8,9-HxCDF	no	no	2.97E-06	7.22E-06	9.67E-06	2.35E-05
Largescale Sucker	1995	Dioxin/furans	1,2,3,6,7,8-HxCDF	no	no	2.53E-06	6.15E-06	8.23E-06	2.00E-05

TABLE 5-3. CHEMICALS EXCEEDING EXCESS CANCER RISK OF 1.0E-6 FOR VARIOUS CONSUMPTION RATES AND EXPOSURE DURATIONS (Page 9 of 9)									
Common name	Year	Chemical Group	Chemical	6.5 g/day over 30 years	6.5 g/day over 70 years	54 g/day over 30 years	54 g/day over 70 years	176 g/day over 30 years	176 g/day over 70 years
Largescale Sucker	1995	PCBs	p,p'-DDE	no	no	2.50E-06	6.08E-06	8.15E-06	1.98E-05
Largescale Sucker	1995	Dioxin/furans	1,2,3,7,8-PeCDF	no	no	2.08E-06	5.07E-06	6.79E-06	1.65E-05
Largescale Sucker	1995	Dioxin/furans	2,3,4,6,7,8-HxCDF	no	no	1.56E-06	3.79E-06	5.08E-06	1.24E-05
Largescale Sucker	1995	Semi-volatile	bis(2-Ethylhexyl)phthalate	no	no	1.06E-06	2.59E-06	3.47E-06	8.43E-06
Largescale Sucker	1995	Dioxin/furans	1,2,3,6,7,8-HxCDD	no	no	no	2.31E-06	3.09E-06	7.52E-06
Largescale Sucker	1995	Dioxin/furans	1,2,3,4,7,8-HxCDD	no	no	no	2.07E-06	2.77E-06	6.75E-06
Largescale Sucker	1995	PCBs	p,p'-DDD	no	no	no	1.62E-06	2.17E-06	5.29E-06
Largescale Sucker	1995	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	no	no	no	no	no	2.26E-06
Largescale Sucker	1995	PCBs	Hexachlorobenzene	no	no	no	no	no	2.01E-06
Largescale Sucker	1995	PCBs	p,p'-DDT	no	no	no	no	no	1.45E-06
Largescale Sucker	1995	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	no	no	no	no	no	1.28E-06
Steelhead	1995	PCBs	Arochlor 1260	1.49E-06	3.62E-06	1.24E-05	3.01E-05	4.03E-05	9.80E-05
Steelhead	1995	Metal	Arsenic-Inorg.	no	1.06E-06	3.61E-06	8.78E-06	1.18E-05	2.86E-05
Steelhead	1995	Dioxin/furans	2,3,7,8-TCDF	no	no	1.13E-06	2.74E-06	3.67E-06	8.93E-06
Steelhead	1995	PCBs	Hexachlorobenzene	no	no	no	1.32E-06	1.76E-06	4.29E-06
Steelhead	1995	PCBs	p,p'-DDT	no	no	no	no	1.11E-06	2.71E-06
Steelhead	1995	Dioxin/furans	1,2,3,7,8-PeCDF	no	no	no	no	1.08E-06	2.64E-06
Steelhead	1995	Dioxin/furans	1,2,3,4,7,8-HxCDD	no	no	no	no	no	2.39E-06
Steelhead	1995	PCBs	p,p'-DDE	no	no	no	no	no	1.93E-06
Steelhead	1995	PCBs	p,p'-DDD	no	no	no	no	no	1.46E-06
White sturgeon	1995	PCBs	Arochlor 1260	1.36E-05	3.31E-05	1.13E-04	2.75E-04	3.69E-04	8.97E-04
White sturgeon	1995	PCBs	Arochlor 1248	3.44E-06	8.38E-06	2.86E-05	6.96E-05	9.32E-05	2.27E-04
White sturgeon	1995	Metal	Arsenic-Inorg.	2.61E-06	6.35E-06	2.17E-05	5.28E-05	7.07E-05	1.72E-04
White sturgeon	1995	Dioxin/furans	2,3,7,8-TCDF	1.54E-06	3.74E-06	1.28E-05	3.11E-05	4.17E-05	1.01E-04
White sturgeon	1995	PCBs	p,p'-DDE	no	1.32E-06	4.52E-06	1.10E-05	1.47E-05	3.58E-05
White sturgeon	1995	Dioxin/furans	2,3,4,7,8-PeCDF	no	no	1.68E-06	4.10E-06	5.49E-06	1.34E-05
White sturgeon	1995	Dioxin/furans	1,2,3,7,8,9-HxCDF	no	no	1.46E-06	3.54E-06	4.75E-06	1.16E-05
White sturgeon	1995	Dioxin/furans	1,2,3,7,8-PeCDF	no	no	no	1.32E-06	1.77E-06	4.30E-06
White sturgeon	1995	Dioxin/furans	2,3,4,6,7,8-HxCDF	no	no	no	1.17E-06	1.57E-06	3.82E-06
White sturgeon	1995	PCBs	p,p'-DDD	no	no	no	1.15E-06	1.54E-06	3.76E-06
White sturgeon	1995	PCBs	Hexachlorobenzene	no	no	no	no	no	1.52E-06
White sturgeon	1995	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	no	no	no	no	no	1.10E-06

no = Excess cancer risk does not exceed 1.0E-6 for this exposure scenario

TABLE 5-4. CHEMICALS EXCEEDING HAZARD QUOTIENT OF ONE FOR VARIOUS CONSUMPTION RATES						
Common name	Year	Chemical Group	Chemical	6.5 g/day over 30 years	54 g/day over 30 years	176 g/day over 30 years
Carp	1991	PCBs	Aroclor 1254	no	4.24	13.83
Carp	1991	Metal	Mercury	no	1.69	5.50
Carp	1991	PCBs	Aroclor 1260	no	no	1.78
Crayfish	1991	none	none	--	--	--
Largescale Sucker	1991	PCBs	Aroclor 1254	no	4.90	15.97
Largescale Sucker	1991	Metal	Mercury	no	no	2.03
Largescale Sucker	1991	PCBs	Aroclor 1260	no	no	1.11
Peamouth	1991	PCBs	Aroclor 1260	no	2.09	6.81
Peamouth	1991	Metal	Mercury	no	no	3.05
Peamouth	1991	PCBs	Aroclor 1242	no	no	1.35
Peamouth	1991	Pesticide	Aldrin	no	no	1.29
White Sturgeon	1991	PCBs	Aroclor 1254	no	2.56	8.34
White Sturgeon	1991	Metal	Mercury	no	1.31	4.28
Carp	1993	PCBs	Aroclor 1254	no	1.95	6.35
Carp	1993	Metal	Mercury	no	no	1.83
Carp	1993	PCBs	Aroclor 1260	no	no	1.01
Crayfish	1993	Metal	Mercury	no	no	1.09
Crayfish	1993	Metal	Barium	no	no	1.08
Largescale Sucker	1993	PCBs	Aroclor 1254	1.07	8.88	28.95
Largescale Sucker	1993	Metal	Mercury	no	1.30	4.22
Largescale Sucker	1993	PCBs	Aroclor 1260	no	no	1.41
Carp	1991/93	PCBs	Aroclor 1254	no	3.83	12.47
Carp	1991/93	PCBs	Aroclor 1260	no	no	1.64
Carp	1991/93	Metal	Mercury	no	1.46	4.77
Crayfish	1991/93	Metal	Antimony	no	1.15	3.76
Largescale Sucker	1991/93	PCBs	Aroclor 1254	no	6.77	22.07
Largescale Sucker	1991/93	PCBs	Aroclor 1260	no	no	1.25
Largescale Sucker	1991/93	Metal	Mercury	no	no	3.06
Carp	1995	PCBs	Aroclor 1260	no	1.52	4.96
Carp	1995	Metal	Mercury	no	1.12	3.65
Carp	1995	PCBs	Aroclor 1248	no	no	1.81
Chinook Salmon	1995	Metal	Mercury	no	no	2.51
Coho Salmon	1995	Metal	Mercury	no	no	1.11
Largescale Sucker	1995	Metal	Mercury	no	1.18	3.85
Largescale Sucker	1995	PCBs	Aroclor 1260	no	no	1.20
Steelhead	1995	Metal	Mercury	no	no	1.60
White Sturgeon	1995	PCBs	Aroclor 1260	no	no	1.67
White Sturgeon	1995	Metal	Mercury	no	no	1.59

no = Hazard quotient does not exceed one for this exposure scenario level (Table 5-3). The chemicals with the five highest risk values, in decreasing order, were 2,3,7,8-TCDF (3.42E-6 at lowest exposure and 2.25E-4 at highest exposure); 2,3,7,8-TCDD; 2,3,4,7,8-PeCDF; dieldrin; and 2,3,4,6,7,8-HxCDF.

For the 1993 data, 2 COPCs were identified at the lowest exposure level and 7 COPCs were identified at the highest exposure level (Table 5-3). The chemicals with the five highest risk values, in decreasing order, were Aroclor 1260 (7.44E-6 at lowest exposure and 4.90E-4 at highest exposure); 2,3,7,8-TCDD; 2,3,7,8-TCDF; arsenic; and p,p'-DDE.

Although fewer COPCs were identified in 1993, the highest individual risk value in 1993 (Aroclor 1260) was more than double the highest value in 1991 (2,3,7,8-TCDF).

Largescale sucker. Largescale sucker were analyzed in all three years. For the 1991 data, 8 carcinogenic COPCs were identified at the lowest exposure level and 27 COPCs were identified at the highest exposure level (Table 5-3). The chemicals with the five highest risk values, in decreasing order, were Aroclor 1254 (3.73E-5 at lowest exposure and 2.46E-3 at highest exposure); Aroclor 1260; 2,3,7,8-TCDD; 2,3,7,8-TCDF; and 1,2,3,7,8-PeCDD.

For the 1993 data, 8 COPCs were identified at the lowest exposure level and 22 COPCs were identified at the highest exposure level (Table 5-3). The chemicals with the five highest risk values, in decreasing order, were Aroclor 1254 (6.77E-5 at lowest exposure and 4.46E-3 at highest exposure); Aroclor 1260; 2,3,7,8-TCDD; 2,3,7,8-TCDF; and p,p'-DDE.

For the 1995 data, 2 COPCs were identified at the lowest exposure level, while 17 COPCs were identified at the highest exposure level (Table 5-3). The chemicals with the five highest risk values, in decreasing order, were Aroclor 1260 (9.86E-6 at lowest exposure and 6.49E-4 at highest exposure); Aroclor 1248; arsenic; 2,3,7,8-TCDF; and 1,2,3,7,8,9-HxCDF.

The highest risk values for the whole-body samples analyzed in 1991 and 1993 are approximately an order of magnitude higher than the highest risk value for the 1995 filet samples.

Peamouth. Peamouth were analyzed only in 1991. Ten carcinogenic COPCs were identified at the lowest exposure level and 25 COPCs were identified at the highest exposure level (Table 5-3). The chemicals with the five highest risk values, in decreasing order, were Aroclor 1260 (5.57E-5 at lowest exposure and 3.67E-3 at highest exposure); 2,3,7,8-TCDF; 2,3,7,8-TCDD; Aroclor 1242; and aldrin.

White sturgeon. Sturgeon filets were analyzed in 1991 and 1995. The potential cancer risk was calculated separately for each of the two datasets because the fish collected in 1991 were much larger (and presumably older) than the fish collected in 1995 (see Appendix A). For 1991 data, 5 carcinogenic COPCs were identified at the lowest exposure level and 15 COPCs were identified at the highest exposure level (Table 5-3). The chemicals with the five highest risk values, in decreasing order, were Aroclor 1254 (1.95E-5 at lowest exposure and 1.28E-3 at highest exposure); 2,3,7,8-TCDF; 2,3,7,8-TCDD; arsenic; and dieldrin.

For the 1995 data, 4 COPCs were identified at the lowest exposure level and 12 COPCs were identified at the highest exposure level (Table 5-3). The chemicals with the five highest risk values, in decreasing order, were Aroclor 1260 (1.36E-5 at lowest exposure and 8.97E-4 at highest exposure); Aroclor 1248; arsenic; 2,3,7,8-TCDF; and p,p'-DDE.

The chemicals with the highest risk values were similar between the two years, but the highest risk value in 1995 (Aroclor 1260) was approximately 50 percent higher than the highest risk value in 1991 (Aroclor 1254).

Chinook salmon. Chinook samples were analyzed only in 1995. Two carcinogenic COPCs were identified at the lowest exposure level and 16 COPCs were identified at the highest exposure level (Table 5-3). The chemicals with the five highest risk values, in decreasing order, were Aroclor 1260 (2.93E-6 at lowest exposure and 1.93E-4 at highest exposure); 2,3,7,8-TCDD; 2,3,7,8-TCDF; arsenic; and 1,2,3,7,8-PeCDD.

Coho salmon. Coho were analyzed only in 1995. One carcinogenic COPC was identified at the lowest exposure level and 12 COPCs were identified at the highest exposure level (Table 5-3). The chemicals with the five highest risk values, in decreasing order, were 2,3,7,8-TCDD (1.85E-6 at lowest exposure and 1.22E-4 at highest exposure); Aroclor 1260; 2,3,7,8-TCDF; 2,3,4,7,8-PeCDF; and arsenic.

Steelhead. Steelhead were analyzed only in 1995. One carcinogenic COPC was identified at the lowest exposure level and 9 COPCs were identified at the highest exposure level (Table 5-3). The chemicals with the five highest risk values, in decreasing order, were Aroclor 1260 (1.49E-6 at lowest exposure and 9.80E-5 at highest exposure); arsenic; 2,3,7,8-TCDF; hexachlorobenzene; and p,p'-DDT.

Of the highest risk values for the three salmonid species analyzed in 1995, all were within a factor of two of each other.

5.3.2.2 Noncarcinogenic Hazard Quotients. The hazard quotients (HQs) for each of the species evaluated is presented in separate sections below. At the lowest exposure level (6.5 g/day over 30 years), only a single chemical (Aroclor 1254 for largescale sucker in 1993) had an HQ exceeding one (Table 5-4).

Carp. Three chemicals exceeded an HQ of one at the highest exposure level (176 g/day) in each of the three years (Table 5-4), including Aroclor 1260 (all three years), Aroclor 1254 (1991 and 1993), Aroclor 1248 (1995), and mercury (all three years). The highest HQ values for each year were 13.83 (Aroclor 1254 in 1991), 6.35 (Aroclor 1254 in 1993), and 4.96 (Aroclor 1260 in 1995).

None of the chemicals not included in one of the three HI presented in Section 5.3.1.2 had HQs greater than one. The highest HQs for the "not included" chemicals were for zinc in 1991 (0.86), zinc in 1993 (0.51), and nickel in 1991 (0.36).

Crayfish. Only mercury (1.09) and barium (1.08) in 1993 had HQs exceeding one at the highest exposure level (Table 5-4). Barium was not included in any of the HI presented in Section 5.3.1.2, nor were other metals detected in crayfish, including silver (0.36 in 1991) and zinc (0.31 in 1993 and 0.22 in 1991).

Largescale sucker. The chemicals with HQs greater than one at the highest exposure level for largescale sucker are identical to carp for all years, with the exception of 1995, where the HQ for Aroclor

1248 in largescale sucker did not exceed one (Table 5-4). The HQs for 1991 and 1995 were similar between the two species, but the highest HQ for 1993 (Aroclor 1254 in both species) was more than 4 times higher for largescale sucker than carp.

None of the chemicals not included in one of the three HI presented in Section 5.3.1.2, had HQs greater than one. The highest HQs were for zinc in 1991 (0.25), zinc in 1993 (0.15), and barium in 1991 (0.10).

Peamouth. Two PCBs (Aroclors 1260 and 1242), mercury, and aldrin had HQs higher than one at the highest exposure level for peamouth analyzed in 1991 (Table 5-4). The highest HQ was for Aroclor 1260 (6.81). The HQs for zinc, nickel, and barium, which were not included in the HI presented in Section 5.3.1.2, were between 0.10 and 0.33.

White sturgeon. At the highest exposure level, both mercury and Aroclor 1254 had HQs greater than one for sturgeon analyzed in 1991 (Table 5-4). For the 1995 data, the chemicals with HQs exceeding one were, in decreasing order, Aroclor 1260 and mercury. The highest HQs for both years were similar. HQs for chemicals which were not included in the HI presented in Section 5.3.1.2 did not exceed 0.10.

Salmonids. For all three salmonid species analyzed in 1995 (chinook, coho, and steelhead), HQs at the highest exposure level exceeded one for mercury only (Table 5-4). HQs for chemicals which were not included in the HI presented in Section 5.3.1.2 did not exceed 0.10 for any of the three salmonid species.

5.3.3 Percent Contribution to Total Risk and Hazard Indices by Each Class of Chemicals

The total excess cancer risk and noncarcinogenic hazard indices presented in Section 5.3.1 provide an overall indication of the potential for adverse health effects from the consumption of lower Columbia River fish. This type of summary information does not allow the risk manager to determine the cause of the potential risk. Only by distributing the total risk or HI to particular individual chemicals or groups of chemicals is it possible to evaluate the means by which potential risks or hazards may be reduced. The percent contribution to total cancer risk or hazard indices from each class of chemicals is evaluated below in separate sections for carcinogenic and noncarcinogenic effects.

5.3.3.1 Carcinogenic Risk. The potential excess cancer risk from the consumption of fish can be attributed to a relatively small number of toxic chemicals. Table 5-5 presents for each chemical group the percent contribution to the total cancer risk calculated for each species. Within each group, the chemicals responsible for most of the risk from each group are given. As indicated at the top of each page of Table 5-5, the total cancer risk values for each species are quite variable. The percent contribution values given in this table should be interpreted in conjunction with the absolute risk values which they represent. For example, 10 percent of a very high risk is more cause for concern than 90 percent of a very low risk value. Also, the percent contribution from chemical groups may not be directly comparable between species because each percentage is based only on detected chemicals. Zero percent contribution from a given chemical group or individual chemical usually indicates that the chemical(s) were not detected for that species.

With the above qualifications, some general observations about Table 5-5 can be made. The chemicals contributing the most to excess cancer risk are dioxins/furans, PCBs, arsenic, and to a lesser extent, organochlorine pesticides. The percent contribution of PCBs (usually from Aroclors 1248, 1254, or 1260) was at least 20 percent of the total excess cancer risk (range 22.1 to 86.8 percent), with one exception. No PCBs were detected in crayfish in 1991; therefore, the percent contribution was zero. Dioxins/furans contributed at least 9 percent of the total risk for every species (range 9.2 to 83.9 percent). The majority of the risk from dioxins/furans was due to the two tetra congeners (2,3,7,8-TCDD and 2,3,7,8-TCDF), although other congeners contributed significantly for certain species. Inorganic arsenic represented at least 10 percent of the total risk in some cases (sturgeon in 1995; chinook and steelhead in 1995). Organochlorine pesticides contributed less than 10 percent to the overall risk except for crayfish and peamouth in 1991 (14.4 and 17.7 percent, respectively).

Semi-volatile organic compounds, and in 1993 radionuclides and butyltins (not shown in Table 5-5), generally did not contribute significantly to the overall risk. One notable exception was the percent contribution of semi-volatiles for carp analyzed in 1991. The semi-volatile group contributed 56.5 of the total risk for this year, due primarily to a single high detected value of N-nitroso-di-n-propylamine.

5.3.3.2 Noncarcinogenic Hazard Indices. As with carcinogenic risk, the potential for noncarcinogenic health effects from the consumption of fish can be attributed to a relatively small number of toxic chemicals. Table 5-6 presents for each chemical group the percent contribution to three of the endpoint-

TABLE 5-5. PERCENT CONTRIBUTION OF CONTAMINANT GROUPS AND INDIVIDUAL CHEMICALS TO EXCESS CANCER RISK (Page 1 of 3)

	1991 Data				
	Carp	Crayfish	LS Sucker	Peamouth	Sturgeon
Total Cancer Risk [a]	1.74E-04	1.17E-05	6.55E-05	1.37E-04	3.49E-05
Semi-volatiles	***56.5***	***1.7***	***0.3***	***0.1***	***0.6***
N-Nitroso-di-n-propylamine	56.2	0	0	0	0
Bis(2-ethylhexyl)phthalate	0.2	1.6	0.3	0.1	0.6
others	0.1	0.1	0	0	0
PCBs	***26.9***	***0***	***70.8***	***48.6***	***55.9***
Aroclor 1254	18.5	0	57.0	0	55.9
Aroclor 1260	8.4	0	13.8	40.7	0
Aroclor 1242	0	0	0	8.1	0
others	0	0	0	0	0
Dioxin/furans	***14.2***	***83.9***	***23.4***	***33.6***	***30.5***
2,3,7,8-TCDD	5.2	22.8	8.7	11.5	9.7
2,3,7,8-TCDF	2.5	29.3	6.2	17.2	17.7
1,2,3,7,8-PeCDD	2.4	4.5	2.6	1.7	0
2,3,4,7,8-PeCDF	1.6	15.3	2.5	2.1	2.8
2,3,4,6,7,8-HxCDF	0.7	4.6	1.3	0.2	0
others	1.8	7.4	2.1	0.9	0.3
Pesticides	***2.4***	***14.4***	***5.5***	***17.7***	***6.0***
Aldrin	0.9	0	2.0	7.3	0
Dieldrin	0.9	9.3	1.6	6.3	4.7
Heptachlor	0	2.5	0	0	0
others	0.6	2.6	1.9	4.1	1.3
Metals	***0***	***0***	***0***	***0***	***7.0***
Arsenic	0	0	0	0	7.0
others	0	0	0	0	0

TABLE 5-5. PERCENT CONTRIBUTION OF CONTAMINANT GROUPS AND INDIVIDUAL CHEMICALS TO EXCESS CANCER RISK (Page 2 of 3)

	1993 Data			1991/93 Data Combined		
	Carp	Crayfish	LS Sucker	Carp	Crayfish	LS Sucker
Total Cancer Risk [a]	3.07E-05	1.01E-05	9.12E-05	1.66E-04	1.78E-05	8.03E-05
Semi-volatiles	***0***	***0***	***0.1***	***59.5***	***0.9***	***0.2***
N-Nitroso-di-n-propylamine	0	0	0	59.1	0	0
Bis(2-ethylhexyl)phthalate	0	0	0.1	0.2	0.9	0.2
others	0	0	0	0.2	0	0
PCBs	***75.2***	***73.6***	***86.8***	***25.7***	***41.5***	***76.7***
Aroclor 1254	48.4	0	74.2	17.6	0	64.1
Aroclor 1260	26.8	73.6	12.6	8.1	41.5	12.6
others	0	0	0	0	0	0
Dioxin/furans	***20.5***	***24.2***	***10.8***	***12.4***	***43.1***	***15.7***
2,3,7,8-TCDD	0	15.1	2.5	4.2	11.4	4.6
2,3,7,8-TCDF	7.0	8.5	2.4	2.3	11.2	3.7
1,2,3,7,8,9-HxCDF	4.5	0	1.2	0.3	1.0	0.8
1,2,3,7,8-PeCDD	0	0	1.2	2.0	5.0	1.7
1,2,3,7,8-PeCDF	2.9	0	0.7	0.2	0.4	0.5
2,3,4,7,8-PeCDF	1.6	0	1.3	1.3	7.1	1.7
2,3,4,6,7,8-HxCDF	1.6	0	0.6	0.6	1.9	0.9
others	2.9	0.6	0.9	1.5	5.1	1.8
Pesticides	***4.2***	***0.9***	***1.8***	***2.4***	***10.3***	***6.5***
p,p'-DDE	3.4	0.9	1.4	0.4	0.5	1.0
Aldrin	0	0	0	0.9	0	1.7
Dieldrin	0	0	0	0.9	7.2	2.3
Heptachlor	0	0	0	0	1.4	0
others	0.8	0	0.4	0.2	1.2	1.5
Metals	***0***	***1.3***	***0.3***	***0***	***4.2***	***0.7***
Arsenic	0	1.3	0.3	0	4.2	0.7
others	0	0	0	0	0	0

TABLE 5-5. PERCENT CONTRIBUTION OF CONTAMINANT GROUPS AND INDIVIDUAL CHEMICALS TO EXCESS CANCER RISK (Page 3 of 3)						
	1995 Data					
	Carp	LS Sucker	Sturgeon	Chinook	Coho	Steelhead
Total Cancer Risk [a]	6.66E-05	1.52E-05	2.24E-05	7.44E-06	4.07E-06	2.30E-06
Semi-volatiles	***0***	***0.8***	***0***	***0***	***0***	***0***
Bis(2-ethylhexyl)phthalate	0	0.8	0	0	0	0
others	0	0	0	0	0	0
PCBs	***83.2***	***77.1***	***76.1***	***39.3***	***22.1***	***64.8***
Aroclor 1260	60.9	64.7	60.8	39.3	22.1	64.8
Aroclor 1248	22.3	12.4	15.3	0	0	0
others	0	0	0	0	0	0
Dioxin/furans	***14.0***	***13.8***	***9.2***	***42.3***	***71.9***	***9.5***
2,3,7,8-TCDD	0	0	0	27.6	53.4	0
2,3,7,8-TCDF	3.7	4.7	6.9	6	6.1	5.9
1,2,3,6,7,8-HxCDD	1.6	0.7	0	0	4.0	0
1,2,3,6,7,8-HxCDF	0	2	0	0.0	3.3	0
1,2,3,7,8-PeCDF	2.0	0	0.3	0	3.5	1.7
2,3,4,7,8-PeCDF	0.0	1.6	0.9	8.4	0	0
2,3,4,6,7,8-HxCDF	5.8	1.2	0.3	0	0	0
others	0.9	3.6	0.8	0.3	1.6	1.9
Pesticides	***2.7***	***2.8***	***3***	***2.2***	***1.4***	***6.9***
p,p'-DDE	2.5	2	2.4	1.4	0.9	1.3
p,p'-DDT	0	0.1	0.1	0.3	0.3	1.8
p,p'-DDD	0.1	0.5	0.3	0.5	0.2	1.0
Hexachlorobenzene	0.1	0.2	0	0	0	2.8
others	0	0	0.2	0	0	0
Metals	***0.1***	***5.5***	***11.6***	***12.5***	***4.4***	***18.9***
Arsenic	0.1	5.5	11.6	12.5	4.4	18.9
others	0	0	0	0	0	0

[a] Cancer risk for consumption rate of 6.5 g/day over a 30-year exposure duration (see Table 5-1)

TABLE 5-6. PERCENT CONTRIBUTION OF CONTAMINANT GROUPS AND INDIVIDUAL CHEMICALS TO ENDPOINT-SPECIFIC HAZARD INDICES (Page 1 of 3)

	1991 Data				
	Carp	Crayfish	LS Sucker	Peamouth	Sturgeon
CNS Hazard Index [a]	0.24	0.04	0.09	0.20	0.18
Metals	*86.3*	*87.4*	*82.6*	*56.1*	*94.2*
Mercury	86.3	87.4	82.6	56.1	87.9
Arsenic	0	0	0	0	6.3
Pesticides	*9.0*	*12.6*	*17.4*	*43.9*	*5.8*
Aldrin	3.3	0	6.7	23.8	0
p,p'-DDE	3.0	4.2	0	13.5	2.1
p,p'-DDD	0.6	1.4	3.4	2.2	0.4
Methyl parathion	0	5.3	0	0	1.0
others	2.1	1.7	7.1	4.4	2.3
Semi-volatiles	*4.7*	*0*	*0*	*0*	*0*
2,4-Dinitrotoluene	3.0	0	0	0	0
1,2,4-Trichlorobenzene	1.7	0	0	0	0
Developmental Hazard Index [a]	0.63	0.01	0.65	0.42	0.32
PCBs	*91.3*	*0*	*96.7*	*72.6*	*96.3*
Aroclor 1254	80.9	0	90.4	0	96.3
Aroclor 1260	10.4	0	6.3	60.6	0
Aroclor 1242	0	0	0	12.0	0
Metals	*2.1*	*50.8*	*0.6*	*0.9*	*0.4*
Cadmium	2.1	50.8	0.6	0.9	0.4
Pesticides	*3.9*	*49.2*	*2.7*	*26.5*	*3.3*
Aldrin	1.2	0	0.9	11.5	0
p,p'-DDE	1.1	11.2	0	6.5	1.2
Dieldrin	0.8	24.9	0.5	6.3	1.6
p,p'-DDD	0.2	3.8	0.5	1.0	0
others	0.6	9.3	0.8	1.2	0.5
Semi-volatiles	*2.7*	*0*	*0*	*0*	*0*
2-Chlorophenol	1.5	0	0	0	0
2,4-Dinitrotoluene	1.2	0	0	0	0
Immunological Hazard Index [a]	0.58	0.003	0.63	0.33	0.31
PCBs	*99.2*	*0*	*99.4*	*92.0*	*98.4*
Aroclor 1254	87.9	0	93	0	98.4
Aroclor 1260	11.3	0	6.4	76.7	0
Aroclor 1242	0	0	0	15.3	0
Pesticides	*0.8*	*100*	*0.6*	*8.0*	*1.6*
Dieldrin	0.8	100	0.6	8.0	1.6

TABLE 5-6. PERCENT CONTRIBUTION OF CONTAMINANT GROUPS AND INDIVIDUAL CHEMICALS TO ENDPOINT-SPECIFIC HAZARD INDICES (Page 2 of 3)	1993 Data			1991/93 Data Combined		
	Carp	Crayfish	LS Sucker	Carp	Crayfish	LS Sucker
CNS Hazard Index [a]	0.09	0.04	0.18	0.10	0.03	0.07
Metals	***77.7***	***95.1***	***86.2***	***62.3***	***62.9***	***59.2***
Mercury	76.6	92.7	85.2	58.2	42.5	52.3
Arsenic	0	1.4	0.6	0	12.6	3.5
Selenium	1.1	1.1	0.4	4.1	7.8	3.4
Pesticides	***22.3***	***2.9***	***13.8***	***22.0***	***32.0***	***40.8***
Aldrin	0	0	0	7.0	0	9.3
p,p'-DDE	17.2	2.9	9.8	8.4	5.0	15.3
p,p'-DDD	4.3	0	2.5	1.8	1.8	5.3
p,p'-DDT	0.8	0	1.4	0.7	1.4	2.6
Methyl parathion	0	0	0	0	22.6	0
others	0	0	0.1	4.1	1.2	8.3
Semi-volatiles	***0***	***2.0***	***0***	***15.7***	***5.1***	***0***
4-Methylphenol	0	2.0	0	0	5.1	0
1,2,4-Trichlorobenzene	0	0	0	3.5	0	0
2,4-Dinitrotoluene	0	0	0	12.2	0	0
Developmental Hazard Index [a]	0.30	0.04	1.15	0.58	0.05	0.90
PCBs	***91.9***	***87.4***	***97.4***	***89.5***	***69.9***	***95.6***
Aroclor 1254	79.3	0	92.9	79.1	0	90.5
Aroclor 1260	12.6	87.4	4.5	10.4	69.9	5.1
Metals	***1.5***	***9.3***	***0.4***	***2.6***	***15.2***	***0.7***
Cadmium	1.1	8.1	0.3	1.9	10.7	0.4
Selenium	0.4	1.2	0.1	0.7	4.5	0.3
Pesticides	***6.6***	***3.2***	***2.2***	***4.4***	***14.9***	***3.7***
Aldrin	0	0	0	1.2	0	0.7
p,p'-DDE	5.1	3.2	1.6	1.5	2.9	1.2
Dieldrin	0	0	0	0.8	8.2	0.6
p,p'-DDD	1.3	0	0.4	0.3	1.0	0.4
others	0.2	0	0.2	0.6	2.8	0.8
Semi-volatiles	***0***	***0***	***0***	***3.5***	***0***	***0***
2-Chlorophenol	0	0	0	1.4	0	0
2,4-Dinitrotoluene	0	0	0	2.1	0	0
Immunological Hazard Index [a]	0.27	0.03	1.12	0.53	0.04	0.87
PCBs	***100***	***100***	***100***	***99.1***	***89.5***	***99.3***
Aroclor 1254	86.3	0	95.4	87.6	0	94.0
Aroclor 1260	13.7	100	4.6	11.5	89.5	5.3
Pesticides	***0***	***0***	***0***	***0.9***	***10.5***	***0.7***
Dieldrin	0	0	0	0.9	10.5	0.7

TABLE 5-6. PERCENT CONTRIBUTION OF CONTAMINANT GROUPS AND INDIVIDUAL CHEMICALS TO ENDPOINT-SPECIFIC HAZARD INDICES (Page 3 of 3)

	1995 Data					
	Carp	LS Sucker	Sturgeon	Chinook	Coho	Steelhead
CNS Hazard Index [a]	0.17	0.16	0.09	0.10	0.05	0.07
Metals	*85.0*	*95.9*	*89.2*	*97.6*	*97.9*	*97.8*
Mercury	79.0	91.4	67.0	88.8	89.3	83.6
Selenium	5.8	2.0	8.4	5.0	6.8	11.4
Arsenic	0.2	3	13.8	3.8	1.8	2.8
Pesticides	*15.0*	*4.1*	*10.8*	*2.4*	*2.1*	*2.2*
p,p'-DDE	14.3	2.8	8.9	1.5	1.2	0.6
p,p'-DDD	0.6	1.1	1.3	0.7	0.4	0.6
others	0.1	0.2	0.6	0.2	0.5	1.0
Developmental Hazard Index [a]	0.29	0.06	0.09	0.02	0.01	0.02
PCBs	*87.6*	*84.6*	*82.2*	*63.0*	*48.5*	*41.6*
Aroclor 1260	64.2	71.0	65.6	63.0	48.5	41.6
Aroclor 1248	23.4	13.6	16.6	0	0	0
Metals	*3.5*	*5.4*	*7.9*	*24.8*	*40.7*	*49.4*
Selenium	3.5	5.0	7.9	24.8	37.4	49.4
Cadmium	0	0.4	0	0	3.3	0
Pesticides	*8.9*	*10.0*	*9.9*	*12.2*	*10.8*	*9.0*
p,p'-DDE	8.5	6.9	8.3	7.6	6.8	2.5
p,p'-DDT	0	0.5	0.2	1.3	1.8	3.7
p,p'-DDD	0.4	2.6	1.2	3.3	2.2	2.8
others	0	0	0.2	0	0	0
Immunological Hazard Index [a]	0.25	0.05	0.08	0.013	0.004	0.007
PCBs	*100*	*100*	*100*	*100*	*100*	*100*
Aroclor 1260	73.2	83.9	79.8	100	100	100
Aroclor 1248	26.8	16.1	20.2	0	0	0

[a] Hazard index for consumption rate of 6.5 g/day over a 30-year exposure duration (see Table 5-2)

specific HI (developmental, CNS, and immunological) calculated for each species. Within the percent contribution of each chemical group are the percent contribution (to the total) from individual chemicals within that group.

For the CNS HI, the large majority of the value is attributable to metals, primarily mercury. For all species except peamouth in 1991, at least 75 percent of the HI is due to metals (Table 5-6). Arsenic and selenium also contributed more than 5 percent for some species in one or more years. Pesticides, primarily DDT and its breakdown products, contributed to a lesser degree (usually less than 20 percent) to the HI.

For the developmental HI, PCBs were responsible for the majority of the total for all species except crayfish in 1991 (PCBs were not detected in these samples). The metals cadmium and selenium contributed as much as 50 percent to the total (Table 5-6). Pesticides such as aldrin, dieldrin, and DDT and its breakdown products typically contributed 10 percent or less to the total.

Similar calculations were performed for the immunological HI (Table 5-6). All of the immunological hazard is due to Aroclors and dieldrin. For the 1991 data, Aroclors contributed over 90 percent of the HI, with the exception of crayfish, for which Aroclors were not detected. For the 1993 and 1995 data, dieldrin was not detected, so Aroclor 1248, 1254, and 1260 contributed 100 percent of the HI.

SECTION 6.0
UNCERTAINTY ANALYSIS

6.0 UNCERTAINTY EVALUATION

There is a degree of uncertainty in any quantitative risk assessment. The toxicity values and exposure assumptions used for this risk assessment, which were based on U.S. EPA guidance, current literature, and best scientific judgement, are inherently uncertain. Therefore, the resulting risk estimates carry a degree of uncertainty. This section provides a discussion of some of the key uncertainties in this risk assessment.

6.1 UNCERTAINTY IN TOXICITY VALUES

The toxicity values used in a risk assessment (i.e., reference doses and slope factors) are typically extrapolated from high-dose to low-dose models, laboratory animal studies, and/or subchronic studies. In addition, carcinogenic toxicity values do not take into account the possibility of additive effects. For non-carcinogenic health effects, U.S. EPA uses uncertainty factors in an attempt to derive a toxicity value protective for the human population. Health-protective assumptions are typically used when toxicity data are missing or incomplete. However, because of the uncertainty of the extrapolation process in the derivation of slope factors and RfDs, the potential for carcinogenic risk or noncarcinogenic health effects may be either overestimated or underestimated.

There is considerable uncertainty associated with those chemicals for which there are no toxicity values because risks from these chemicals can not be quantified. Chemicals with no toxicity values include endrin ketone, endrin aldehyde, 2-methylnaphthalene, 4-chloro-3-methylphenol, endosulfan sulfate, and lead. In addition, reference doses for dioxins/furans, which are generally thought to have noncarcinogenic health effects, are still under development by U.S. EPA.

Endrin ketone, a photodegradation product of endrin, is difficult to purify in the laboratory. According to the ATSDR Toxicological Profile on endrin, endrin ketone appears to be less toxic than its parent compound (ATSDR 1994a). Endrin aldehyde is another breakdown product of endrin whose toxicity could not be evaluated. The only published study for this compound indicated liver dysfunction in rodents (see Appendix C). HQs for endrin were less than 0.03 for all species in which it was detected. Thus, it is unlikely the potential toxicity attributed to endrin ketone or endrin aldehyde is high enough to cause concern.

The semi-volatile compound 2-methylnaphthalene often co-occurs with naphthalene in field samples. It appears to be less toxic than naphthalene, but no RfD or slope factor is available. HQs for naphthalene were less than 0.1 for all species in which it was detected. Thus, it is unlikely the potential toxicity attributed to 2-methylnaphthalene is high enough to cause concern. The semi-volatile compound 4-chloro-3-methyl phenol may be acutely toxic to humans, but no RfD or slope factor is available (see Appendix C).

The toxicity of endosulfan sulfate may be very similar to that of its parent compound, endosulfan, according to the ATSDR (1994b) toxicological profile for endosulfan. The HQ for endosulfan was generally low (less than 0.003) for species collected in 1991. The pesticide was not detected in any samples collected in 1993 or 1995.

In the case of lead, the U.S. EPA has deferred the determination of a RfD because no consensus has been reached for a no observable adverse effect level (NOAEL) and there are insufficient quantitative data available to estimate the carcinogenic dose-response for lead (U.S. EPA 1995a). Low level exposure to lead in children has been shown to cause neurobehavioral deficits and growth retardation. At higher levels of exposure, lead causes brain and kidney damage. Risk assessments tend to vary in their approach toward the evaluation of lead. U.S. EPA developed the Integrated Exposure Uptake Biokinetic (IEUBK) model for lead to estimate exposure to lead in various media. The model uses pharmacokinetic equations to predict blood lead levels in children 6 months to 7 years old. This model has been widely used, particularly for exposure to lead from air, soil, and water. The HHRWG reached a consensus decision to not include children as a separate exposure group, therefore the IEUBK model was not applied for this risk assessment.

There is uncertainty in the manner in which the toxicity of PCBs was characterized. Carcinogenic toxicity values (e.g., slope factors) for detected Aroclors (mixtures of PCB congeners) were derived from the IRIS value for PCBs. The assumption that the carcinogenic effects of each of the Aroclor mixtures is equivalent to each other is probably incorrect given that each Aroclor contains a different percentage of chlorine and the position of the chlorine atoms on each congener has been shown to be a major determinant to toxicity (Hong et al. 1993). The carcinogenic risk from Aroclors may have been over- or underestimated. Non-carcinogenic toxicity values for several of the detected Aroclors were assumed to be equivalent to Aroclor 1016. The toxicity of these Aroclors (e.g., 1242, 1248, 1260) has not been established through experimental data. The RfD for Aroclor 1016 (0.00007 mg/kg-day) is higher than the RfD for Aroclor 1254 (0.00002 mg/kg-day). If the toxicity of the other Aroclor mixtures is more similar to Aroclor 1254 than Aroclor 1016, the hazard quotients for Aroclors may have been underestimated.

Toxicity values for dioxin/furan congeners were based upon their potency relative to 2,3,7,8-TCDD using toxicity equivalent factors (TEFs). TEFs have also been proposed for several PCB congeners (Hong et al. 1993), but they could not be applied to the data in this study because concentrations of individual congeners were not measured.

Currently, the toxicity of 2,3,7,8-TCDD is being re-evaluated based on a better understanding of the mechanisms of dioxin toxicity and of the carcinogenic and noncarcinogenic health effects on exposed populations. The slope factor currently in HEAST remains in use for risk evaluation until such time as U.S. EPA reissues it. The toxicity of co-planar PCBs, which are thought to have toxicological effects similar to some dioxins and furans, is also being examined as part of the U.S. EPA's reassessment of dioxins/furans.

In 1985, U.S. EPA established a RfD of 1 pg/kg-day for 2,3,7,8-TCDD. This RfD has been withdrawn during U.S. EPA's reassessment of dioxins. Other researchers have proposed revised RfDs. For example, researchers at ATSDR (Pohl et al. 1995) proposed a chronic RfD based on experimental data using monkeys. A chronic RfD of 0.7 pg/kg-day was based on a LOAEL (lowest observed adverse effects level) of 0.0002 μg/kg-day TCDD in the feed of monkeys that resulted in mild learning and behavioral impairment in their offspring. An uncertainty factor of 3 was applied for the use of a minimal

LOAEL, a factor of 10 was applied for interspecies extrapolation, and a factor of 10 was applied for human variability.

Using the proposed RfD for TCDD, HQs were calculated for all detected dioxins/furans (Table 6-1). For each congener other than TCDD, the proposed RfD was divided by the TEF, yielding an adjusted RfD. At the lowest exposure level (6.5 g/day), the sum of the HQs for the detected dioxin/furan congeners was less than 0.6, with the exception of peamouth in 1991, for which the sum was 1.07 (Table 6-1). The HQs for the 1995 data were lower than the HQs for the 1991 and 1993, particularly for the salmonids. The endpoint for the proposed RfD is developmental, so the HQs for dioxins/furans can be included in the developmental HI. The developmental HI including dioxins/furans exceeds 1.0 for carp (1991), peamouth (1991), and largescale sucker (1991 and 1993). Using the proposed RfD, dioxins/furans are a major contributor to the developmental HI (Table 6-1). The percent contribution to the developmental HI ranged from 17 (largescale sucker in 1993) to 95 percent (crayfish in 1991).

6.2 UNCERTAINTY IN EXPOSURE ASSUMPTIONS

Exposure assumptions, including exposure duration, were based on U.S. EPA guidance and best professional judgement. Although these assumptions were selected on the basis of their conservativeness, the potential for risk may actually be overestimated. For example, using a lifetime exposure duration of 70 years may overestimate the risk for fishermen who may not be exposed throughout their lifetime. Using the 90th percentile of a residence exposure duration (30 year) may also overestimate risk because a resident is more likely to live in a place for a duration of 9 years (the median residency) or 18 years (the mean residency). However, the mean or median duration at a single residence may not accurately reflect the duration of time spent fishing in a large body of water like the Columbia River, because people may fish in the same location even after moving.

All of the fish collected in 1991 and 1993 were analyzed as whole-body samples, with the exception of white sturgeon filets collected in 1991. The decision to collect whole-body samples was made to satisfy one of the reconnaissance survey's objectives, namely to characterize the pollutant concentrations to which fish-eating predators might be exposed. The concentrations in the whole-body samples may not be representative of the concentrations in portions of fish normally consumed by humans (i.e., filets).

TABLE 6-1. SUM OF DIOXIN/FURAN HQs AND DEVELOPMENTAL HI USING A DERIVED RfD OF 7E-10						
Year	Species	Ingestion Rate	Dev. HI without dioxins/furans	Sum of HQs of dioxins/furans	Dev. HI with dioxins/furans	% Contrib. of Dioxins/furans to HI
1991	Carp	6.5 g/day	0.63	0.57	1.20	
		54 g/day	5.24	4.74	9.98	47.5
		176 g/day	17.08	15.46	32.54	
1991	Crayfish	6.5 g/day	0.013	0.23	0.24	
		54 g/day	0.11	1.89	2.00	94.5
		176 g/day	0.36	6.15	6.51	
1991	Largescale sucker	6.5 g/day	0.65	0.36	1.01	
		54 g/day	5.42	2.96	8.38	35.3
		176 g/day	17.65	9.64	27.29	
1991	Peamouth	6.5 g/day	0.42	1.07	1.49	
		54 g/day	3.45	8.89	12.34	72.0
		176 g/day	11.24	28.97	40.21	
1991	Sturgeon	6.5 g/day	0.32	0.25	0.57	
		54 g/day	2.67	2.06	4.73	43.6
		176 g/day	8.71	6.70	15.41	
1993	Carp	6.5 g/day	0.30	0.15	0.45	
		54 g/day	2.45	1.21	3.66	33.1
		176 g/day	8.00	3.95	11.95	
1993	Crayfish	6.5 g/day	0.04	0.06	0.10	
		54 g/day	0.32	0.47	0.79	59.7
		176 g/day	1.04	1.54	2.58	
1993	Largescale sucker	6.5 g/day	1.15	0.23	1.38	
		54 g/day	9.56	1.90	11.46	16.6
		176 g/day	31.15	6.20	37.35	
1991/1993	Carp	6.5 g/day	0.58	0.47	1.05	
		54 g/day	4.84	3.94	8.78	44.9
		176 g/day	15.77	12.83	28.60	
1991/1993	Crayfish	6.5 g/day	0.05	0.18	0.23	
		54 g/day	0.40	1.50	1.90	78.9
		176 g/day	1.29	4.87	6.16	
1991/1993	Largescale sucker	6.5 g/day	0.90	0.29	1.19	
		54 g/day	7.49	2.43	9.92	24.5
		176 g/day	24.40	7.91	32.31	
1995	Carp	6.5 g/day	0.03	0.22	0.25	
		54 g/day	2.37	1.84	4.21	43.7
		176 g/day	7.73	6.00	13.73	
1995	Chinook	6.5 g/day	0.02	0.08	0.10	
		54 g/day	0.17	0.67	0.84	79.8
		176 g/day	0.57	2.19	2.76	
1995	Coho	6.5 g/day	0.008	0.07	0.08	
		54 g/day	0.07	0.56	0.63	89.0
		176 g/day	0.23	1.84	2.07	
1995	Largescale sucker	6.5 g/day	0.06	0.05	0.11	
		54 g/day	0.52	0.41	0.93	43.9
		176 g/day	1.70	1.33	3.03	
1995	Steelhead	6.5 g/day	0.02	0.005	0.03	
		54 g/day	0.14	0.04	0.18	22.9
		176 g/day	0.44	0.14	0.58	
1995	Sturgeon	6.5 g/day	0.09	0.05	0.14	
		54 g/day	0.78	0.40	1.18	33.8
		176 g/day	2.54	1.30	3.84	

The lipid content of a whole-body sample is typically higher than that in a fillet sample because of lipid-dense organs such as the liver and gonads. Many of the organic compounds evaluated in this risk screening are typically associated with lipid-dense regions in the fish because of their hydrophobic nature. Thus, the contaminant concentration in a filet might be expected to be lower than the concentration in the whole body of the same species. As such, the risk estimates made herein could overestimate the risk to fish consumers who normally only eat filets. Conversely, the risk calculated from whole-body concentrations could underestimate the risk to consumers of lipid-dense organs.

The salmon samples that were analyzed in 1995 were collected at three different hatcheries. The degree to which these salmon are representative of salmon that are typically consumed by people is affected by several factors, including 1) the differences between salmon from different hatcheries, 2) the differences between wild and hatchery salmon, and 3) the length of time the salmon reside in the river. The first two sources of uncertainty can not be evaluated using available data. The third source of uncertainty can be evaluated qualitatively. The large majority of salmon consumed by recreational fishers are from Washington and Oregon hatcheries (WDFW/ODFW 1994). Many of the hatchery salmon are captured along the Oregon and Washington coasts and never return to their place of birth. Of those fish that do return to the Columbia River, most are captured in the Buoy 10 fishery near the mouth of the river (WDFW/ODFW 1994). The salmon analyzed for this study were collected from the Big Creek, Kalama River, and Lewis River facilities, which are located approximately 20, 60, and 80 miles, respectively, upstream of the boundary of the Buoy 10 fishery. Thus, these fish resided in the lower Columbia River for a longer period of time than the majority of the fish caught by recreational fishers. Without knowing the chemical concentrations in salmon from the Buoy 10 fishery, it is difficult to determine the representativeness of the salmon analyzed in this study. However, given that many of the chemicals were not detected in salmon or detected at concentrations very near the detection limit, the degree to which the concentrations in these fish are different from those in fish caught in the Buoy 10 fishery is probably minor.

Although walleye and smallmouth bass were originally included as target species for the 1994-95 sampling effort, specimens could not be obtained. Because these species are predators, they might be expected to have higher levels of biomagnifying contaminants than species which feed lower on the food chain. The lack of data for these species may mean that the overall risk to recreational fishers was underestimated.

The use of the arithmetic mean as an exposure concentration also represents a source of uncertainty in the risk analysis. As discussed in Section 3.3, the use of the mean concentration was determined to be the best estimate for a potential exposure concentration given the data and sample size for each fish species. The mean concentration was calculated for samples collected during three different sampling periods, but these values were assumed to be present for the entire 30-year or 70-year exposure duration. If additional data were collected to be used in a risk assessment for the lower Columbia River, the mean concentration of contaminants in these fish species would likely be different. It can be argued that the mean concentration of COPCs will tend to decrease over time as a result of source control and lack of chemical production.

The manner in which non-detected values are treated is a continual source of discussion for risk assessors. For each fish species, uncertainties are associated with using one-half the detection limit for those chemicals which were not detected in a particular sample but were detected in at least one sample for a given species. This results in the calculation of risk which may or may not actually be present. Table 6-2 displays the carcinogenic risk and noncarcinogenic hazard indices calculated using the full detection limit and zero for the detection limit for those non-detected chemicals. The difference between the risk and HI estimates presented in Sectión 5.0 (and Table 6-2) using half-detection limits and the estimates made using zero- and full-detection limits is relatively minor. For most species, the zero-detection limit and full-detection limit calculations are less than 20 percent lower and higher, respectively, than the half-detection limit calculations (Table 6-2). Large differences between these calculations would only be expected if the chemicals of concern were detected infrequently. While many of the chemicals analyzed in the different fish species were not detected, those that were detected were often detected in most of the samples for that species. This is particularly true for the 1995 analyses. The HI estimates for the 1995 data are identical regardless of the treatment of non-detect values.

The number of samples of each species analyzed for the three surveys was not equal. Thus, the risk estimates presented in Section 5.0 are based on datasets which may differ in the degree to which they are representative of the true mean chemical concentrations for a species at the time they were analyzed.

This risk assessment makes the conservative assumption that skin and fatty areas of the fish are not removed during fileting and that there is no net reduction in contaminant concentrations during cooking. Fish tissue samples which were sent to the laboratory for analysis were filets with skin cut along the

TABLE 6-2. TOTAL CARCINOGENIC RISK AND NONCARCINOGENIC HAZARD INDEX ESTIMATES USING ZERO, HALF, AND FULL DETECTION LIMITS

			Excess Cancer Risk (30-yr)			CNS Hazard Index			Developmental Hazard Index			Immunological Hazard Index		
Year	Species	Ingestion Rate	Zero DL	Half DL	Full DL	Zero DL	Half DL	Full DL	Zero DL	Half DL	Full DL	Zero DL	Half DL	Full DL
1991	Carp	6.5 g/day	1.53E-04	1.74E-04	1.96E-04	0.22	0.24	0.24	0.55	0.63	0.71	0.52	0.58	0.67
		54 g/day	1.27E-03	1.45E-03	1.63E-03	1.87	1.96	2.03	4.56	5.24	5.93	4.30	4.83	5.54
		176 g/day	4.14E-03	4.72E-03	5.30E-03	6.09	6.38	6.63	14.85	17.08	19.32	14.02	15.74	18.06
1991	Crayfish	6.5 g/day	9.69E-06	1.17E-05	1.36E-05	0.03	0.04	0.04	0.009	0.013	0.02	0.002	0.003	0.01
		54 g/day	8.05E-05	9.68E-05	1.13E-04	0.28	0.30	0.32	0.08	0.11	0.14	0.02	0.03	0.08
		176 g/day	2.62E-04	3.15E-04	3.69E-04	0.90	0.97	1.04	0.25	0.36	0.47	0.07	0.09	0.25
1991	Sucker	6.5 g/day	5.58E-05	6.55E-05	7.53E-05	0.09	0.09	0.09	0.61	0.65	0.70	0.60	0.63	0.68
		54 g/day	4.63E-04	5.45E-04	6.26E-04	0.71	0.75	0.79	5.04	5.42	5.79	4.99	5.27	5.67
		176 g/day	1.51E-03	1.77E-03	2.04E-03	2.30	2.46	2.56	16.43	17.65	18.87	16.27	17.16	18.49
1991	Peamouth	6.5 g/day	1.18E-04	1.37E-04	1.57E-04	0.16	0.20	0.24	0.34	0.42	0.49	0.32	0.33	0.41
		54 g/day	9.81E-04	1.14E-03	1.30E-03	1.34	1.67	1.99	2.82	3.45	4.08	2.65	2.72	3.40
		176 g/day	3.20E-03	3.72E-03	4.24E-03	4.38	5.44	6.49	9.19	11.24	13.29	8.62	8.88	11.09
1991	Sturgeon	6.5 g/day	2.47E-05	3.49E-05	4.47E-05	0.17	0.18	0.18	0.23	0.32	0.41	0.23	0.31	0.41
		54 g/day	2.05E-04	2.90E-04	3.71E-04	1.42	1.49	1.53	1.90	2.67	3.45	1.89	2.60	3.42
		176 g/day	6.70E-04	9.45E-04	1.21E-03	4.64	4.84	4.99	6.18	8.71	11.24	6.16	8.48	11.15
1993	Carp	6.5 g/day	2.62E-05	3.07E-05	3.52E-05	0.09	0.09	0.09	0.28	0.30	0.31	0.27	0.27	0.31
		54 g/day	2.18E-04	2.55E-04	2.92E-04	0.73	0.73	0.74	2.31	2.45	2.60	2.26	2.26	2.56
		176 g/day	7.09E-04	8.31E-04	9.52E-04	2.39	2.39	2.40	7.53	8.00	8.48	7.35	7.35	8.35
1993	Crayfish	6.5 g/day	2.72E-06	1.01E-05	1.98E-05	0.02	0.04	0.06	0.01	0.04	0.07	0.004	0.03	0.07
		54 g/day	2.26E-05	8.40E-05	1.65E-04	0.17	0.36	0.48	0.06	0.32	0.58	0.03	0.28	0.55
		176 g/day	7.36E-05	2.74E-04	5.37E-04	0.54	1.18	1.57	0.20	1.04	1.88	0.11	0.91	1.78
1993	Sucker	6.5 g/day	8.30E-05	9.12E-05	1.04E-04	0.18	0.19	0.20	1.13	1.15	1.18	1.12	1.12	1.17
		54 g/day	6.90E-04	7.58E-04	8.66E-04	1.50	1.52	1.66	9.35	9.56	9.76	9.32	9.32	9.73
		176 g/day	2.25E-03	2.47E-03	2.82E-03	4.87	4.95	5.41	30.48	31.15	31.82	30.36	30.36	31.70
1995	Carp	6.5 g/day	6.66E-05	6.66E-05	6.66E-05	0.17	0.17	0.17	0.29	0.29	0.29	0.28	0.28	0.28
		54 g/day	5.53E-04	5.53E-04	5.53E-04	1.41	1.41	1.42	2.37	2.37	2.37	2.33	2.33	2.33
		176 g/day	1.80E-03	1.80E-03	1.80E-03	4.61	4.61	4.61	7.73	7.73	7.73	7.59	7.59	7.59
1995	Sucker	6.5 g/day	1.42E-05	1.52E-05	1.63E-05	0.16	0.16	0.16	0.06	0.06	0.06	0.05	0.05	0.05
		54 g/day	1.18E-04	1.26E-04	1.36E-04	1.29	1.29	1.33	0.52	0.52	0.52	0.44	0.44	0.44
		176 g/day	3.86E-04	4.12E-04	4.42E-04	4.21	4.21	4.33	1.70	1.70	1.70	1.44	1.44	1.44
1995	Sturgeon	6.5 g/day	2.20E-05	2.24E-05	2.28E-05	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08
		54 g/day	1.83E-04	1.86E-04	1.89E-04	0.73	0.73	0.75	0.78	0.78	0.78	0.64	0.64	0.64
		176 g/day	5.95E-04	6.07E-04	6.16E-04	2.37	2.37	2.44	2.54	2.54	2.54	2.09	2.09	2.09
1995	Chinook	6.5 g/day	5.79E-06	7.44E-06	9.44E-06	0.10	0.10	0.10	0.02	0.02	0.02	0.01	0.01	0.01
		54 g/day	4.81E-05	6.18E-05	7.84E-05	0.87	0.87	0.83	0.17	0.17	0.17	0.11	0.11	0.11
		176 g/day	1.57E-04	2.01E-04	2.56E-04	2.82	2.82	2.71	0.57	0.57	0.57	0.36	0.36	0.36
1995	Coho	6.5 g/day	3.52E-06	4.07E-06	5.29E-06	0.05	0.05	0.05	0.01	0.01	0.01	0.004	0.004	0.004
		54 g/day	2.92E-05	3.38E-05	4.40E-05	0.38	0.38	0.42	0.07	0.07	0.07	0.03	0.03	0.03
		176 g/day	9.52E-05	1.10E-04	1.43E-04	1.24	1.24	1.35	0.23	0.23	0.23	0.11	0.11	0.11
1995	Steelhead	6.5 g/day	2.22E-06	2.30E-06	2.33E-06	0.07	0.07	0.07	0.02	0.02	0.02	0.01	0.01	0.01
		54 g/day	1.85E-05	1.91E-05	1.93E-05	0.59	0.59	0.58	0.14	0.14	0.14	0.06	0.06	0.06
		176 g/day	6.02E-05	6.23E-05	6.30E-05	1.92	1.92	1.90	0.44	0.44	0.44	0.18	0.18	0.18

dorsal, lateral line, and included the belly flap. This sample probably represents a "worst case" scenario because it may have a greater concentration of contaminants (Zabik et al. 1982). Fishermen who skin and trim away the fatty areas of filets may reduce their exposure to the lipophilic contaminants by as much as 60 percent (Gall and Voiland 1990). It is also likely that fisherman cook the fish which, depending on the method, has been shown to also reduce contaminant concentrations (Skea et al. 1979; Zabik et al. 1979). For example, one study determined a PCB reduction ranging from 26-53 percent, depending upon the cooking method (Zabik et al. 1979). A similar study designed to determine the cooking loss for dioxins/furans calculated TCDD reduction ranging from 30-50 percent (Zabik and Zabik 1995). Neither of these studies considered cooking methods for which the contaminant loss would not be expected to be significant, including canning and boiling for use in soup. Because the effects of cooking were not considered in this risk assessment, it is likely that chemical concentrations and subsequently calculated risks may have been overestimated.

6.3 UNCERTAINTY OF RISK CHARACTERIZATION

Following U.S. EPA guidance, the risk characterization assumes that the risk from each chemical is additive for both carcinogens and noncarcinogens (for a given endpoint). Other mechanisms of chemical interaction including synergism and antagonism may be more appropriate in order to characterize the risk.

The recently-developed funnel hypothesis (Warne and Hawker 1995) suggests that as the number of organic, narcotic toxicants in an equitoxic mixture increases, the degree to which the overall toxicity of the mixture differs from the sum of the individual toxicities diminishes. A possible explanation for this trend is that the effects of synergistic or antagonistic reactions between two chemicals on the overall toxicity of a mixture tend to cancel each other given a sufficiently large number of chemicals in the mixture (Warne and Hawker 1995). The hypothesis also suggests that this trend is more pronounced for biological endpoints which require low toxicant concentrations (e.g., cancer) than for endpoints which require high toxicant concentrations (e.g., mortality). Although the data used to support the hypothesis are from aquatic systems in the laboratory, the hypothesis may be used to examine the results of this risk assessment.

The total excess cancer risk estimates presented in Table 5-1 are based on the summation of risk values from many different individual chemicals. The funnel hypothesis suggests that the summation of risk from 20-40 individual organic toxicants should approximate the toxicity of the mixture. This hypothesis should not be applied indiscriminately to the fish tissue datasets, because some of the chemicals analyzed in this study are not among the group of narcotic toxicants studied by Warne and Hawker (1995), which act principally by altering the properties of lipid membranes. Nonetheless, this hypothesis supports the U.S. EPA guidance that risk from individual chemicals can be summed.

SECTION 7.0
REGIONAL PERSPECTIVE

7.0 REGIONAL PERSPECTIVE OF LOWER COLUMBIA RIVER DATA

The concentration of chemicals in fish tissue has long been an area of concern for fish consumers and public health officials. This has resulted in several fish tissue sampling efforts in the Northwest besides those described in this report. This section compares the chemical concentration data used in this report with similar data collected in Columbia River basin locations outside the lower Columbia River (referred to herein as "other basin") and in Puget Sound during the past ten years.

Comparisons are made only for chemicals that contribute substantially to the estimated excess risk presented in Section 5.0 (DDT and its derivatives, PCBs, mercury, and dioxins/furans). In comparing these different sets of data, it should be noted that differences in analytical methods and achieved detection limits may influence the conclusions discussed in this section. The data for resident and non-resident fish are discussed in separate sections below.

7.1 RESIDENT SPECIES

Table 7-1 summarizes chemical concentrations measured in filet or whole body samples of resident fish collected in three regions: 1) the lower Columbia River basin (Bi-State Program data); 2) Columbia River basin locations outside the lower Columbia River basin ("other basin"); and 3) Puget Sound. Columbia River basin fish data were obtained from a chemical contaminant database maintained by Tetra Tech, Inc. Puget Sound fish data were collected as part of the Puget Sound Ambient Monitoring Program (PSAMP) (O'Neil et al. 1995).

7.1.1 DDT

Total DDT concentrations (calculated as the sum of DDT, DDE, and DDD) were generally higher in the Columbia River basin than in Puget Sound. Filet concentrations ranged from 3.0-325.1 μg/kg in Columbia River basin fish and from 1.0-9.4 μg/kg in Puget Sound fish. Within the Columbia River

TABLE 7-1. CONCENTRATIONS[a] OF SELECTED CHEMICALS OF CONCERN IN RESIDENT FISH SPECIES IN THE LOWER COLUMBIA RIVER AND OTHER NORTHWEST REGIONS (Page 1 of 8)

		Lower Columbia River[b]							Puget Sound			
		Carp		Crayfish	Peamouth	Sturgeon	Sucker		English sole	Quillback	Copper	Pacific cod
Chemical		Filet	Whole	Whole	Whole	Filet	Filet	Whole	Filet	Filet	Filet	Filet
DDD-op'	n	0	11	33	10	18	0	34	0	0	0	0
	Mean	-	2.8	2.0	13.2	2.2	-	13.5	-	-	-	-
	Min	-	1.5	1.5	1.5	1.5	-	1.5	-	-	-	-
	Max	-	10.0	2.5	49.0	9.1	-	130.0	-	-	-	-
	SD	-	2.5	0.5	13.4	2.0	-	30.7	-	-	-	-
DDD-pp'	n	1	11	33	10	30	9	34	0	0	0	0
	Mean	5.9	9.5	2.6	23.4	4.5	8.8	20.0	-	-	-	-
	Min	5.9	1.5	1.5	1.5	0.7	4.4	2.5	-	-	-	-
	Max	5.9	23.0	9.9	72.0	11.0	18.4	47.0	-	-	-	-
	SD	-	8.3	1.9	21.3	3.5	4.3	9.6	-	-	-	-
DDE-op'	n	0	11	33	10	18	0	34	0	0	0	0
	Mean	-	4.9	2.0	12.7	2.2	-	10.6	-	-	-	-
	Min	-	1.5	1.5	1.5	1.5	-	1.5	-	-	-	-
	Max	-	17.0	2.5	47.0	14.0	-	65.0	-	-	-	-
	SD	-	5.4	0.5	13.1	2.9	-	16.5	-	-	-	-
DDE-pp'	n	1	11	33	10	30	9	34	0	0	0	0
	Mean	131.4	45.4	7.4	145.6	28.1	23.2	58.3	-	-	-	-
	Min	131.4	1.5	1.5	1.5	1.5	7.5	1.5	-	-	-	-
	Max	131.4	100.0	17.0	480.0	76.6	44.6	180.0	-	-	-	-
	SD	-	34.3	4.5	146.9	21.7	10.7	44.1	-	-	-	-
DDT-op'	n	0	11	33	10	18	0	34	0	0	0	0
	Mean	-	2.5	2.0	9.2	3.1	-	8.4	-	-	-	-
	Min	-	1.5	1.5	1.5	1.5	-	1.5	-	-	-	-
	Max	-	6.9	3.0	12.5	30.0	-	105.0	-	-	-	-
	SD	-	1.6	0.5	5.3	6.7	-	24.5	-	-	-	-
DDT-pp'	n	1	11	33	10	30	9	34	0	0	0	0
	Mean	0.0	4.0	2.0	9.2	3.2	1.7	9.9	-	-	-	-
	Min	0.0	1.5	1.5	1.5	0.1	0.0	1.5	-	-	-	-
	Max	0.0	11.0	3.0	12.5	16.0	6.9	56.0	-	-	-	-
	SD	-	2.9	0.5	5.3	3.9	2.5	9.6	-	-	-	-
DDT-total[c]	n	1	11	33	10	30	9	34	161	38	12	24
	Mean	137.3	58.9	12.1	178.1	35.6	39.1	88.3	12.5	1.7	1.5	3.1
	Min	137.3	26.9	4.5	4.5	4.5	12.7	8.5	3.9	1.0	1.3	2.2
	Max	137.3	124.9	20.0	507.5	85.7	69.9	238.0	9.4	6.5	2.0	4.0
	SD	-	36.3	4.7	156.6	24.0	14.7	56.4	0.8	1.0	0.3	0.9
Aroclor 1242	n	1	9	18	10	20	9	18	0	0	0	0
	Mean	0.6	25.0	25.0	37.7	22.6	0.9	25.0	-	-	-	-
	Min	0.6	25.0	25.0	25.0	0.6	0.6	25.0	-	-	-	-
	Max	0.6	25.0	25.0	99.0	25.0	1.1	25.0	-	-	-	-
	SD	-	0.0	0.0	27.2	7.4	0.3	0.0	-	-	-	-

TABLE 7-1. CONCENTRATIONS OF SELECTED CHEMICALS OF CONCERN IN RESIDENT FISH SPECIES IN THE LOWER COLUMBIA RIVER AND OTHER NORTHWEST REGIONS (Page 2 of 8)

		Lower Columbia River							Puget Sound			
		Carp		Crayfish	Peamouth	Sturgeon	Sucker		English sole	Quillback	Copper	Pacific cod
Chemical		Filet	Whole	Whole	Whole	Filet	Filet	Whole	Filet	Filet	Filet	Filet
Aroclor 1248	n	1	11	33	10	26	9	34	0	0	0	0
	Mean	50.5	25.2	25.0	25.0	22.5	6.4	25.5	-	-	-	-
	Min	50.5	25.0	25.0	25.0	1.1	1.1	25.0	-	-	-	-
	Max	50.5	26.0	25.0	25.0	27.7	18.3	26.0	-	-	-	-
	SD	-	0.4	0.0	0.0	5.9	6.7	0.5	-	-	-	-
Aroclor 1254	n	1	11	33	10	20	9	34	0	0	0	0
	Mean	0.6	99.2	25.0	25.0	57.7	0.9	175.6	-	-	-	-
	Min	0.6	25.0	25.0	25.0	0.6	0.6	25.0	-	-	-	-
	Max	0.6	270.0	25.0	25.0	500.0	1.1	2700.0	-	-	-	-
	SD	-	96.0	0.0	0.0	109.3	0.3	451.6	-	-	-	-
Aroclor 1260	n	1	11	33	10	30	9	34	0	0	0	0
	Mean	138.0	45.6	25.2	189.6	33.5	33.5	34.8	-	-	-	-
	Min	138.0	25.0	25.0	80.0	22.5	13.9	14.5	-	-	-	-
	Max	138.0	110.0	30.0	520.0	86.5	57.7	130.0	-	-	-	-
	SD	-	29.8	0.9	129.2	16.7	13.2	25.2	-	-	-	-
PCB-total[d]	n	1	11	33	10	30	9	34	161	38	12	24
	Mean	189.1	170.0	75.2	239.6	91.6	43.0	235.9	19.7	11.4	9.2	11.1
	Min	189.1	88.0	75.0	130.0	31.8	15.0	78.0	6.0	4.0	6.6	6.6
	Max	189.1	320.0	80.0	570.0	550.0	68.1	2851.0	159.0	69.0	16.0	18.7
	SD	-	82.2	0.9	129.2	93.0	16.9	467.2	21.9	11.6	2.5	4.4
Hg	n	1	10	33	10	27	9	34	177	67	28	29
	Mean	145.0	189.7	38.1	121.2	128.8	153.0	121.7	56.0	220.0	107.0	109.0
	Min	145.0	0.5	6.0	54.0	6.0	120.0	22.0	20.0	60.0	40.0	60.0
	Max	145.0	1004.0	81.0	230.0	580.0	193.0	264.0	140.0	510.0	300.0	180.0
	SD	-	290.4	19.5	58.1	159.7	26.1	62.1	23.0	109.0	54.0	29.0
1234678-HpCDD	n	1	7	27	7	18	9	28	0	0	0	0
	Mean	3.90	4.82	0.85	1.16	0.32	0.34	1.61	-	-	-	-
	Min	3.90	1.20	0.10	0.24	0.07	0.08	0.40	-	-	-	-
	Max	3.90	9.81	5.21	2.81	0.63	0.90	4.36	-	-	-	-
	SD	-	3.50	1.20	0.88	0.19	0.34	1.03	-	-	-	-
1234678-HpCDF	n	1	7	27	7	17	9	28	0	0	0	0
	Mean	0.18	0.45	0.59	0.29	0.32	0.60	0.82	-	-	-	-
	Min	0.18	0.10	0.05	0.09	0.07	0.07	0.10	-	-	-	-
	Max	0.18	1.31	5.20	0.74	1.64	2.67	5.50	-	-	-	-
	SD	-	0.44	1.06	0.23	0.41	0.96	1.19	-	-	-	-
1234789-HpCDF	n	1	7	27	7	17	9	28	0	0	0	0
	Mean	0.14	0.14	0.41	0.10	0.22	0.17	0.23	-	-	-	-
	Min	0.14	0.06	0.04	0.04	0.04	-0.08	0.06	-	-	-	-
	Max	0.14	0.28	1.55	0.25	0.50	0.43	1.25	-	-	-	-
	SD	-	0.09	0.42	0.08	0.15	0.11	0.24	-	-	-	-

TABLE 7-1. CONCENTRATIONS OF SELECTED CHEMICALS OF CONCERN IN RESIDENT FISH SPECIES IN THE LOWER COLUMBIA RIVER AND OTHER NORTHWEST REGIONS (Page 3 of 8)

		Lower Columbia River							Puget Sound			
		Carp		Crayfish	Peamouth	Sturgeon	Sucker		English sole	Quillback	Copper	Pacific cod
Chemical		Filet	Whole	Whole	Whole	Filet	Filet	Whole	Filet	Filet	Filet	Filet
123478-HxCDD	n	1	7	27	7	19	9	28	0	0	0	0
	Mean	0.45	0.72	0.22	0.29	0.14	0.18	0.30	-	-	-	-
	Min	0.45	0.26	0.04	0.11	0.04	0.07	0.10	-	-	-	-
	Max	0.45	1.45	0.95	0.87	0.27	0.51	0.85	-	-	-	-
	SD	-	0.46	0.18	0.27	0.07	0.15	0.17	-	-	-	-
123678-HxCDD	n	1	7	27	7	17	9	28	0	0	0	0
	Mean	1.91	2.02	0.30	0.60	0.12	0.20	0.50	-	-	-	-
	Min	1.91	0.60	0.04	0.31	0.04	0.07	0.10	-	-	-	-
	Max	1.91	4.82	1.05	1.16	0.19	0.53	1.42	-	-	-	-
	SD	-	1.64	0.24	0.27	0.05	0.16	0.33	-	-	-	-
123789-HxCDD	n	1	7	27	7	18	9	28	0	0	0	0
	Mean	0.10	0.32	0.30	0.19	0.14	0.19	0.32	-	-	-	-
	Min	0.10	0.10	0.04	0.12	0.05	0.08	0.05	-	-	-	-
	Max	0.10	0.85	1.25	0.29	0.22	0.61	0.92	-	-	-	-
	SD	-	0.27	0.27	0.06	0.05	0.18	0.21	-	-	-	-
123478-HxCDF	n	1	7	27	7	18	9	28	0	0	0	0
	Mean	0.72	0.31	0.25	0.23	0.26	0.34	0.25	-	-	-	-
	Min	0.72	0.12	0.04	0.06	0.05	0.08	0.05	-	-	-	-
	Max	0.72	0.66	1.30	0.56	0.65	0.85	0.65	-	-	-	-
	SD	-	0.20	0.25	0.17	0.21	0.28	0.14	-	-	-	-
123678-HxCDF	n	1	7	27	7	19	9	28	0	0	0	0
	Mean	0.83	0.27	0.24	0.16	0.41	0.53	0.41	-	-	-	-
	Min	0.83	0.09	0.03	0.05	0.04	0.08	0.05	-	-	-	-
	Max	0.83	0.57	1.35	0.44	3.88	1.59	5.20	-	-	-	-
	SD	-	0.17	0.25	0.16	0.85	0.50	0.95	-	-	-	-
123789-HxCDF	n	1	7	27	7	18	9	28	0	0	0	0
	Mean	1.66	0.76	0.31	0.23	0.48	0.62	1.22	-	-	-	-
	Min	1.66	0.05	0.03	0.04	0.05	0.07	0.09	-	-	-	-
	Max	1.66	2.50	0.95	0.69	1.02	1.81	4.50	-	-	-	-
	SD	-	1.12	0.24	0.27	0.33	0.52	1.24	-	-	-	-
234678-HxCDF	n	1	7	27	7	16	9	28	0	0	0	0
	Mean	6.77	1.70	0.59	0.41	0.68	0.33	1.14	-	-	-	-
	Min	6.77	0.26	0.05	0.23	0.05	0.09	0.20	-	-	-	-
	Max	6.77	5.70	7.26	0.81	2.41	0.64	5.20	-	-	-	-
	SD	-	2.10	1.34	0.24	0.80	0.25	1.07	-	-	-	-
OCDD	n	1	7	27	7	19	9	28	0	0	0	0
	Mean	5.14	12.09	6.61	6.91	1.04	1.11	7.44	-	-	-	-
	Min	5.14	2.71	0.25	3.62	0.13	0.06	0.79	-	-	-	-
	Max	5.14	30.60	79.10	18.10	3.61	3.26	36.90	-	-	-	-
	SD	-	10.03	15.43	5.20	1.09	1.37	7.55	-	-	-	-

TABLE 7-1. CONCENTRATIONS OF SELECTED CHEMICALS OF CONCERN IN RESIDENT FISH SPECIES IN THE LOWER COLUMBIA RIVER AND OTHER NORTHWEST REGIONS (Page 4 of 8)

Chemical		Lower Columbia River							Puget Sound			
		Carp		Crayfish	Peamouth	Sturgeon	Sucker		English sole	Quillback	Copper	Pacific cod
		Filet	Whole	Whole	Whole	Filet	Filet	Whole	Filet	Filet	Filet	Filet
OCDF	n	1	7	27	7	19	9	28	0	0	0	0
	Mean	0.09	0.71	0.42	0.75	0.55	1.04	1.18	-	-	-	-
	Min	0.09	0.10	0.09	0.31	0.03	0.08	0.05	-	-	-	-
	Max	0.09	2.45	1.24	2.03	5.78	5.96	10.60	-	-	-	-
	SD	-	0.83	0.27	0.61	1.28	1.92	2.04	-	-	-	-
12378-PeCDD	n	1	7	27	7	18	9	28	0	0	0	0
	Mean	0.57	1.16	0.31	0.83	0.30	0.28	0.47	-	-	-	-
	Min	0.57	0.25	0.05	0.31	0.07	0.14	0.15	-	-	-	-
	Max	0.57	1.89	1.15	2.04	1.25	0.62	1.10	-	-	-	-
	SD	-	0.64	0.26	0.56	0.29	0.15	0.22	-	-	-	-
12378-PeCDF	n	1	7	27	7	19	9	28	0	0	0	0
	Mean	4.62	1.20	0.26	0.51	0.29	0.88	1.37	-	-	-	-
	Min	4.62	0.21	0.05	0.24	0.05	0.27	0.14	-	-	-	-
	Max	4.62	3.90	1.05	0.86	1.25	1.82	9.90	-	-	-	-
	SD	-	1.39	0.26	0.22	0.30	0.60	2.12	-	-	-	-
23478-PeCDF	n	1	7	27	7	18	9	28	0	0	0	0
	Mean	0.36	0.75	0.44	1.03	0.18	0.17	0.48	-	-	-	-
	Min	0.36	0.15	0.05	0.55	0.03	0.07	0.05	-	-	-	-
	Max	0.36	1.37	3.05	2.46	1.25	0.44	1.80	-	-	-	-
	SD	-	0.51	0.60	0.65	0.29	0.13	0.38	-	-	-	-
2378-TCDD	n	1	7	27	7	20	9	28	0	0	0	0
	Mean	0.57	1.23	0.35	2.76	0.29	0.19	0.65	-	-	-	-
	Min	0.57	0.15	0.05	1.44	0.05	0.07	0.05	-	-	-	-
	Max	0.57	2.10	1.00	4.41	1.66	0.39	1.56	-	-	-	-
	SD	-	0.67	0.26	0.97	0.36	0.12	0.42	-	-	-	-
2378-TCDF	n	1	7	27	7	20	9	28	0	0	0	0
	Mean	4.36	6.58	3.49	41.33	5.48	1.26	5.22	-	-	-	-
	Min	4.36	3.60	0.63	22.20	0.22	0.81	1.05	-	-	-	-
	Max	4.36	12.20	12.40	58.80	22.80	2.42	11.40	-	-	-	-
	SD	-	3.29	2.83	12.03	6.59	0.53	2.59	-	-	-	-
TEC[e]	n	1	7	27	7	20	9	28	0	0	0	0
	Mean	2.99	3.64	1.35	8.11	1.32	0.85	2.24	-	-	-	-
	Min	2.99	1.61	0.34	4.24	0.23	0.38	0.99	-	-	-	-
	Max	2.99	5.23	3.66	13.16	5.02	1.55	3.82	-	-	-	-
	SD	-	1.46	0.89	2.81	1.23	0.41	0.84	-	-	-	-

[a] All concentrations in μg/kg except for dioxins and furans, which are in ng/kg. One-half detection limit used for non-detect values

[b] Includes only data from the three surveys described in this document

[c] The sum of DDD-pp', DDE-pp', and DDT-pp'.

[d] The sum of routinely detected Aroclors (1248, 1254, and 1260). For Puget Sound data, all non-detected Aroclors were assumed to be 1.

[e] Toxicity Equivalent Concentrations calculated using method of U.S. EPA (1989b)

TABLE 7-1. CONCENTRATIONS OF SELECTED CHEMICALS OF CONCERN IN RESIDENT FISH SPECIES IN THE LOWER COLUMBIA RIVER AND OTHER NORTHWEST REGIONS (Page 5 of 8)

		Other Columbia River Basin								
		Carp		Crayfish		Peamouth	Sturgeon		Sucker	
Chemical		Filet	Whole	Filet	Whole	Whole	Filet	Whole	Filet	Whole
DDD-op'	n	0	4	2	3	1	0	0	1	21
	Mean	-	18.8	20.0	5.0	5.0	-	-	20.0	25.2
	Min	-	5.0	20.0	5.0	5.0	-	-	20.0	5.0
	Max	-	30.0	20.0	5.0	5.0	-	-	20.0	70.0
	SD	-	10.3	0.0	0.0	-	-	-	-	20.0
DDD-pp'	n	28	4	10	14	4	5	1	4	31
	Mean	10.4	78.8	5.0	9.8	32.5	51.4	111.0	5.8	118.5
	Min	1.0	5.0	1.3	0.5	10.0	40.6	111.0	1.0	5.0
	Max	63.0	140.0	20.0	60.0	60.0	72.2	111.0	20.0	420.0
	SD	15.1	55.7	7.9	18.9	26.3	12.9	-	9.5	126.2
DDE-op'	n	0	4	2	3	1	0	0	1	21
	Mean	-	10.0	10.0	5.0	5.0	-	-	10.0	11.0
	Min	-	5.0	10.0	5.0	5.0	-	-	10.0	5.0
	Max	-	20.0	10.0	5.0	5.0	-	-	10.0	30.0
	SD	-	7.1	0.0	0.0	-	-	-	-	10.1
DDE-pp'	n	28	5	10	15	5	6	2	4	51
	Mean	26.4	974.6	12.1	47.1	158.0	278.2	717.5	20.8	533.6
	Min	1.0	70.0	5.0	0.6	30.0	136.0	638.0	1.0	1.3
	Max	102.0	2493.0	37.0	160.0	340.0	368.0	797.0	80.0	3400.0
	SD	27.0	1072.5	9.1	42.6	136.6	84.4	112.4	39.5	814.1
DDT-op'	n	0	4	2	3	1	0	0	1	21
	Mean	-	6.3	20.0	5.0	10.0	-	-	20.0	7.1
	Min	-	5.0	20.0	5.0	10.0	-	-	20.0	5.0
	Max	-	10.0	20.0	5.0	10.0	-	-	20.0	30.0
	SD	-	2.5	0.0	0.0	-	-	-	-	6.2
DDT-pp'	n	28	4	10	14	3	5	1	4	35
	Mean	4.1	17.5	5.3	28.4	10.0	4.9	9.6	13.3	120.7
	Min	1.0	5.0	1.3	1.3	10.0	4.2	9.6	1.0	5.0
	Max	19.0	40.0	20.0	220.0	10.0	5.4	9.6	50.0	960.0
	SD	5.2	16.6	7.8	58.9	0.0	0.5	-	24.5	186.1
DDT-total[c]	n	28	5	10	15	5	6	2	4	52
	Mean	41.0	1051.6	22.4	82.7	190.0	325.1	777.8	39.8	675.3
	Min	3.0	80.0	7.5	0.6	40.0	136.0	758.6	3.0	1.3
	Max	168.0	2493.0	50.0	428.0	390.0	445.0	797.0	150.0	4770.0
	SD	41.6	1074.0	17.1	106.9	158.6	107.2	27.2	73.5	1067.5
Aroclor 1242	n	28	0	0	3	0	5	1	3	0
	Mean	14.4	-	-	20.0	-	18.0	20.0	12.5	-
	Min	1.5	-	-	20.0	-	15.0	20.0	12.5	-
	Max	121.0	-	-	20.0	-	20.0	20.0	12.5	-
	SD	21.5	-	-	0.0	-	2.7	-	0.0	-

TABLE 7-1. CONCENTRATIONS OF SELECTED CHEMICALS OF CONCERN IN RESIDENT FISH SPECIES IN THE LOWER COLUMBIA RIVER AND OTHER NORTHWEST REGIONS (Page 6 of 8)

Chemical		Other Columbia River Basin								
		Carp		Crayfish		Peamouth	Sturgeon		Sucker	
		Filet	Whole	Filet	Whole	Whole	Filet	Whole	Filet	Whole
Aroclor 1248	n	0	0	0	3	0	5	1	0	1
	Mean	0.0	-	-	20.0	-	18.0	20.0	-	100.0
	Min	0.0	-	-	20.0	-	15.0	20.0	-	100.0
	Max	0.0	-	-	20.0	-	20.0	20.0	-	100.0
	SD	0.0	-	-	0.0	-	2.7	-	-	-
Aroclor 1254	n	28	0	0	3	4	5	1	3	4
	Mean	43.5	-	-	20.0	77.5	70.4	20.0	12.5	175.0
	Min	1.5	-	-	20.0	10.0	53.0	20.0	12.5	100.0
	Max	360.0	-	-	20.0	100.0	80.1	20.0	12.5	400.0
	SD	80.9	-	-	0.0	45.0	11.5	-	0.0	150.0
Aroclor 1260	n	28	0	2	3	2	5	1	4	7
	Mean	70.9	-	50.0	20.0	100.0	51.9	112.0	21.9	101.4
	Min	1.5	-	50.0	20.0	100.0	34.8	112.0	12.5	100.0
	Max	1403.0	-	50.0	20.0	100.0	60.9	112.0	50.0	110.0
	SD	262.2	-	0.0	0.0	0.0	10.6	-	18.8	3.8
PCB-total[d]	n	28	0	2	3	4	5	1	4	9
	Mean	114.3	-	50.0	60.0	127.5	140.2	152.0	31.3	167.8
	Min	3.0	-	50.0	60.0	100.0	107.8	152.0	25.0	100.0
	Max	1415.5	-	50.0	60.0	200.0	158.0	152.0	50.0	500.0
	SD	270.7	-	0.0	0.0	48.6	20.3	-	12.5	131.7
Hg	n	18	1	0	12	4	7	2	5	66
	Mean	159.4	200.0	-	69.8	35.0	110.6	50050.0	105.4	129.3
	Min	20.0	200.0	-	25.0	20.0	25.0	100.0	50.0	25.0
	Max	460.0	200.0	-	140.0	50.0	173.0	100000.0	160.0	347.0
	SD	86.1	-	-	40.8	12.9	50.2	70640.0	42.4	60.7
1234678-HpCDD	n	0	7	0	6	1	8	2	1	18
	Mean	-	15.65	-	6.80	0.50	0.64	0.55	4.66	3.36
	Min	-	0.84	-	0.49	0.50	0.28	0.52	4.66	0.33
	Max	-	91.72	-	34.42	0.50	1.50	0.58	4.66	16.57
	SD	-	33.62	-	13.57	-	0.38	0.04	-	3.56
1234678-HpCDF	n	0	7	0	6	1	8	2	1	18
	Mean	-	1.66	-	1.52	0.50	0.29	0.48	0.64	1.85
	Min	-	0.17	-	0.22	0.50	0.08	0.24	0.64	0.23
	Max	-	8.88	-	6.44	0.50	0.73	0.72	0.64	2.67
	SD	-	3.20	-	2.42	-	0.22	0.34	-	1.05
1234789-HpCDF	n	0	7	0	6	1	8	2	1	18
	Mean	-	0.57	-	0.88	0.50	0.40	0.80	0.64	1.99
	Min	-	0.02	-	0.19	0.50	0.04	0.29	0.64	0.50
	Max	-	1.31	-	1.76	0.50	1.31	1.30	0.64	2.67
	SD	-	0.68	-	0.66	-	0.40	0.71	-	0.80

TABLE 7-1. CONCENTRATIONS OF SELECTED CHEMICALS OF CONCERN IN RESIDENT FISH SPECIES IN THE LOWER COLUMBIA RIVER AND OTHER NORTHWEST REGIONS (Page 7 of 8)

		Other Columbia River Basin								
		Carp		Crayfish		Peamouth	Sturgeon		Sucker	
Chemical		Filet	Whole	Filet	Whole	Whole	Filet	Whole	Filet	Whole
123478-HxCDD	n	0	7	0	6	1	8	2	1	18
	Mean	-	0.93	-	0.83	0.49	0.35	0.75	0.70	0.91
	Min	-	0.13	-	0.23	0.49	0.06	0.26	0.70	0.50
	Max	-	2.93	-	1.32	0.49	1.24	1.23	0.70	1.24
	SD	-	1.01	-	0.51	-	0.41	0.69	-	0.20
123678-HxCDD	n	0	7	0	6	1	8	2	1	18
	Mean	-	4.66	-	2.24	0.99	0.35	0.59	0.70	1.02
	Min	-	0.34	-	0.39	0.99	0.15	0.25	0.70	0.50
	Max	-	24.79	-	10.05	0.99	0.92	0.92	0.70	4.06
	SD	-	8.92	-	3.83	-	0.26	0.47	-	0.77
123789-HxCDD	n	0	7	0	6	1	8	2	1	18
	Mean	-	0.74	-	0.67	0.49	0.31	0.51	0.70	0.76
	Min	-	0.05	-	0.27	0.49	0.11	0.33	0.70	0.51
	Max	-	3.36	-	1.42	0.49	0.69	0.69	0.70	0.84
	SD	-	1.19	-	0.41	-	0.22	0.25	-	0.10
123478-HxCDF	n	0	7	0	6	1	8	2	1	8
	Mean	-	0.64	-	3.80	0.50	0.42	1.08	0.29	1.17
	Min	-	0.02	-	0.35	0.50	0.10	0.75	0.29	0.20
	Max	-	2.23	-	18.85	0.50	1.42	1.41	0.29	3.02
	SD	-	0.85	-	7.39	-	0.43	0.47	-	0.89
123678-HxCDF	n	0	7	0	6	1	8	2	1	18
	Mean	-	0.97	-	2.36	0.49	0.39	0.85	0.29	1.28
	Min	-	0.01	-	0.25	0.49	0.10	0.29	0.29	0.35
	Max	-	3.62	-	10.15	0.49	1.42	1.42	0.29	1.44
	SD	-	1.33	-	3.85	-	0.43	0.80	-	0.32
123789-HxCDF	n	0	7	0	6	1	8	2	1	18
	Mean	-	0.60	-	0.72	0.50	0.53	0.85	0.29	1.27
	Min	-	0.01	-	0.23	0.50	0.10	0.32	0.29	0.35
	Max	-	1.39	-	1.39	0.50	1.39	1.38	0.29	1.40
	SD	-	0.73	-	0.52	-	0.46	0.75	-	0.31
234678-HxCDF	n	0	7	0	6	1	8	2	1	18
	Mean	-	0.42	-	0.79	0.56	2.03	6.24	0.29	1.11
	Min	-	0.13	-	0.55	0.56	0.10	0.98	0.29	0.25
	Max	-	0.98	-	0.98	0.56	4.60	11.50	0.29	1.39
	SD	-	0.34	-	0.18	-	1.93	7.44	-	0.38
OCDD	n	0	4	0	3	1	7	1	0	1
	Mean	-	5.68	-	4.57	2.18	8.31	2.40	-	1.00
	Min	-	2.50	-	3.70	2.18	1.45	2.40	-	1.00
	Max	-	9.30	-	6.30	2.18	40.90	2.40	-	1.00
	SD	-	2.79	-	1.50	-	14.40	-	-	-

TABLE 7-1. CONCENTRATIONS OF SELECTED CHEMICALS OF CONCERN IN RESIDENT FISH SPECIES IN THE LOWER COLUMBIA RIVER AND OTHER NORTHWEST REGIONS (Page 8 of 8)

		Other Columbia River Basin								
		Carp		Crayfish		Peamouth	Sturgeon		Sucker	
Chemical		Filet	Whole	Filet	Whole	Whole	Filet	Whole	Filet	Whole
OCDF	n	0	4	0	3	1	7	1	0	1
	Mean	-	0.27	-	0.90	1.00	0.94	0.45	-	1.00
	Min	-	0.07	-	0.79	1.00	0.34	0.45	-	1.00
	Max	-	0.58	-	1.00	1.00	2.20	0.45	-	1.00
	SD	-	0.22	-	0.11	-	0.66	-	-	-
12378-PeCDD	n	0	7	0	6	1	8	2	1	18
	Mean	-	1.70	-	1.03	0.50	0.36	0.44	0.74	0.72
	Min	-	0.12	-	0.30	0.50	0.10	0.42	0.74	0.23
	Max	-	7.83	-	3.75	0.50	0.60	0.46	0.74	3.31
	SD	-	2.76	-	1.34	-	0.18	0.03	-	0.66
12378-PeCDF	n	0	7	0	6	1	8	2	1	18
	Mean	-	0.89	-	9.31	0.49	0.52	0.47	0.21	0.67
	Min	-	0.02	-	0.17	0.49	0.21	0.31	0.21	0.23
	Max	-	3.52	-	54.32	0.49	1.00	0.64	0.21	0.91
	SD	-	1.30	-	22.05	-	0.29	0.24	-	0.24
23478-PeCDF	n	0	7	0	6	1	8	2	1	17
	Mean	-	2.04	-	3.43	0.50	0.49	0.41	0.21	0.81
	Min	-	0.14	-	0.17	0.50	0.23	0.33	0.21	0.23
	Max	-	7.32	-	19.02	0.50	1.30	0.48	0.21	2.27
	SD	-	2.86	-	7.64	-	0.35	0.11	-	0.43
2378-TCDD	n	35	10	0	6	1	35	2	21	19
	Mean	1.48	11.48	-	0.78	0.22	1.56	1.72	0.29	1.32
	Min	0.16	0.41	-	0.16	0.22	0.25	1.30	0.09	0.19
	Max	6.80	56.02	-	2.61	0.22	5.20	2.14	0.97	5.12
	SD	1.66	18.63	-	0.91	-	1.20	0.59	0.19	1.19
2378-TCDF	n	35	10	0	6	1	35	2	21	19
	Mean	8.81	48.46	-	10.90	17.00	48.58	57.79	3.02	17.13
	Min	0.15	0.41	-	0.29	17.00	1.30	54.00	0.15	0.49
	Max	26.00	320.69	-	48.14	17.00	261.00	61.58	8.80	48.07
	SD	7.80	101.34	-	18.36	-	52.95	5.36	2.20	16.04
TEC[e]	n	35	10	0	6	1	35	2	21	19
	Mean	2.37	18.46	-	6.27	2.89	6.63	9.07	0.64	4.52
	Min	0.18	0.71	-	1.13	2.89	0.38	8.56	0.16	1.11
	Max	8.20	93.82	-	28.96	2.89	28.94	9.58	1.85	10.43
	SD	2.20	29.73	-	11.12	-	5.94	0.72	0.39	2.82

[a] All concentrations in μg/kg except for dioxins and furans, which are in ng/kg. One-half detection limit used for non-detect values

[b] Includes only data from the three surveys described in this document

[c] The sum of DDD-pp', DDE-pp', and DDT-pp'.

[d] The sum of routinely detected Aroclors (1248, 1254, and 1260). For Puget Sound data, all non-detected Aroclors were assumed to be 1.

[e] Toxicity Equivalent Concentrations calculated using method of U.S. EPA (1989b)

basin, total DDT concentrations in given species were higher in other basin locations than in the lower river basin. For example, the mean total DDT concentration in white sturgeon filets from other basin locations are approximately nine times higher than the mean concentration measured in lower basin sturgeon filets. It should be noted, however, that other basin DDT measurements have been made largely in areas or watersheds that have been subject to intensive studies because of elevated DDT levels (e.g., the Yakima River basin), rather than as part of a sampling design providing uniform coverage of the Columbia River basin. Thus, the observation that DDT concentrations in fish from the lower Columbia River basin are lower than concentrations in fish collected from other locations within the basin may be affected by these differences in the spatial coverage of sampling.

7.1.2 PCBs

Total PCB concentrations in Columbia River basin fish filets show a larger range of values than concentrations in Puget Sound filets. However, comparisons of mean concentrations show generally higher concentrations in Columbia River basin fish than in Puget Sound fish. Filet concentrations ranged from 3.0-1415.7 μg/kg in Columbia River basin fish, and from 4.0-140.0 μg/kg in Puget Sound fish (Table 7-1). Mean total PCB concentrations in filets range from 50.0-189.1 μg/kg in Columbia River basin samples and from 9.2-19.7 μg/kg in Puget Sound samples.

Total PCB concentrations in carp, crayfish, peamouth, largescale sucker, and white sturgeon are similar throughout the Columbia River basin.

7.1.3 Mercury

Mercury concentrations show a similar range in Columbia River basin and Puget Sound filets. Columbia river concentrations range from 6.0-580.0 μg/kg; Puget Sound concentrations range from 20.0-510.0 μg/kg. Individual fish species show similar mercury concentrations throughout the Columbia River basin (Table 7-1).

7.1.4 Dioxins/Furans

Dioxin and furan measurements are not available for Puget Sound fish. Mean 2,3,7,8-TCDD toxicity equivalent concentrations (TEC) within individual species are generally higher in other Columbia River basin locations than in the lower Columbia River basin. TEC values for carp, white sturgeon, and largescale sucker filets in the lower Columbia River range from 0.23-5.02 ng/kg; at other basin locations the range is from 0.16-28.94 ng/kg. TEC values are higher in whole-body fish samples than in filets. Concentrations in whole-body samples of carp, crayfish, peamouth, and largescale sucker range from 0.34-13.16 ng/kg in the lower Columbia River, and from 0.71-93.82 ng/kg at other basin locations.

7.2 NON-RESIDENT SPECIES

Table 7-2 summarizes corresponding data for non-resident fish: chemical concentrations measured in filet or whole body samples collected in the three regions described above in section 7.1. Data sources are also the same as for resident species.

7.2.1 DDT

The highest mean DDT concentrations in filets have been measured in salmonids collected in areas of the Columbia River basin outside of the lower Columbia River basin. The mean total DDT concentration in chinook filets collected from these other basin locations was 100.8 μg/kg, while the corresponding value measured by the Bi-State Program in the lower Columbia River was 13.7 μg/kg. Unlike chinook, mean total DDT concentrations in steelhead are similar for samples collected in the lower Columbia River and other areas of the Columbia River basin (7.9 μg/kg versus 9.1 μg/kg). Total DDT concentrations reported for chinook and coho collected in the Puget Sound are slightly higher than values measured by the Bi-State Program in the lower Columbia River. Mean total DDT concentrations were 22.2 μg/kg and 10.1 μg/kg in Puget Sound chinook and coho, respectively.

7.2.2 PCBs

Mean total PCB concentrations in salmonid filet samples were higher at other basin sites and in Puget Sound than they were in the lower Columbia River basin. Mean concentrations at lower Columbia River sites ranged from 3.9-10.6 μg/kg; at other basin sites the range was 49.2-56.7 μg/kg, and in Puget Sound the range was 26.7-50.0 μg/kg. Whole-body concentrations were similar to filet concentrations.

7.2.3 Mercury

Mean concentrations of mercury in salmonids showed a similar range of values in all three areas sampled, ranging overall from 44.0-113.8 μg/kg. Where both filet and whole-body samples were analyzed, concentrations in filet samples were higher.

TABLE 7-2. CONCENTRATIONS[a] OF SELECTED CHEMICALS OF CONCERN IN NON-RESIDENT FISH SPECIES IN THE LOWER COLUMBIA RIVER AND OTHER NORTHWEST REGIONS (Page 1 of 4)

		Lower Columbia River[b]			Other Col. River Basin				Puget Sound	
		Chinook	Coho	Steelhead	Chinook		Steelhead		Chinook	Coho
Chemical		Filet	Filet	Filet	Filet	Whole	Filet	Whole	Filet	Filet
DDD-op'	n	0	0	0	4	1	0	1	0	0
	Mean	-	-	-	20.0	20.0	-	20.0	-	-
	Min	-	-	-	20.0	20.0	-	20.0	-	-
	Max	-	-	-	20.0	20.0	-	20.0	-	-
	SD	-	-	-	0.0	-	-	-	-	-
DDD-pp'	n	3	3	3	7	2	4	2	0	0
	Mean	3.7	1.0	2.4	12.9	11.9	1.5	11.0	-	-
	Min	2.1	0.05	1.2	2.9	3.8	0.8	1.9	-	-
	Max	5.7	1.5	3.4	20.0	20.0	2.5	20.0	-	-
	SD	1.8	0.8	1.2	8.8	11.5	0.7	12.8	-	-
DDE-op'	n	0	0	0	4	1	0	1	0	0
	Mean	-	-	-	10.0	10.0	-	10.0	-	-
	Min	-	-	-	10.0	10.0	-	10.0	-	-
	Max	-	-	-	10.0	10.0	-	10.0	-	-
	SD	-	-	-	0.0	-	-	-	-	-
DDE-pp'	n	3	3	3	7	2	4	2	0	0
	Mean	8.5	3.0	2.3	75.7	268.2	5.1	53.4	-	-
	Min	4.6	2.3	1.4	10.1	16.3	3.8	6.7	-	-
	Max	11.3	4.5	3.9	390.0	520.0	6.8	100.0	-	-
	SD	3.5	1.3	1.4	139.2	356.2	1.3	66.0	-	-
DDT-op'	n	0	0	0	4	1	0	1	0	0
	Mean	-	-	-	20.0	20.0	-	20.0	-	-
	Min	-	-	-	20.0	20.0	-	20.0	-	-
	Max	-	-	-	20.0	20.0	-	20.0	-	-
	SD	-	-	-	0.0	-	-	-	-	-
DDT-pp'	n	3	3	3	7	2	4	2	0	0
	Mean	1.5	0.8	3.2	12.2	26.0	2.5	11.2	-	-
	Min	0.5	0.3	2.2	1.5	2.0	1.7	2.4	-	-
	Max	3.1	1.1	4.1	20.0	50.0	4.0	20.0	-	-
	SD	1.4	0.4	1.0	9.8	34.0	1.0	12.4	-	-
DDT-total[c]	n	3	3	3	7	2	4	2	66	66
	Mean	13.7	4.5	7.9	100.8	306.0	9.1	75.5	22.2	10.1
	Min	7.5	3.4	4.9	14.6	22.1	6.5	11.0	6.3	3.8
	Max	20.1	5.9	9.8	430.0	590.0	13.3	140.0	58.8	18.5
	SD	6.3	1.3	2.6	148.0	401.6	3.0	91.2	11.2	3.5
Aroclor 1242	n	3	3	3	3	1	4	1	0	0
	Mean	0.9	0.6	2.2	15.0	15.0	18.8	20.0	-	-
	Min	0.9	0.4	2.2	15.0	15.0	15.0	20.0	-	-
	Max	0.9	0.9	2.2	15.0	15.0	20.0	20.0	-	-
	SD	0.0	0.3	0.0	0.0	-	2.5	-	-	-

TABLE 7-2. CONCENTRATIONS OF SELECTED CHEMICALS OF CONCERN IN NON-RESIDENT FISH SPECIES IN THE LOWER COLUMBIA RIVER AND OTHER NORTHWEST REGIONS (Page 2 of 4)

		Lower Columbia River			Other Col. River Basin				Puget Sound	
		Chinook	Coho	Steelhead	Chinook		Steelhead		Chinook	Coho
Chemical		Filet	Filet	Filet	Filet	Whole	Filet	Whole	Filet	Filet
Aroclor 1248	n	3	3	3	3	1	4	1	0	0
	Mean	0.9	0.6	2.2	15.0	15.0	18.8	20.0	-	-
	Min	0.9	0.4	2.2	15.0	15.0	15.0	20.0	-	-
	Max	0.9	0.9	2.2	15.0	15.0	20.0	20.0	-	-
	SD	0.0	0.3	0.0	0.0	-	2.5	-	-	-
Aroclor 1254	n	3	3	3	3	1	4	1	0	0
	Mean	0.9	0.6	2.2	17.7	26.5	19.2	20.0	-	-
	Min	0.9	0.4	2.2	15.0	26.5	16.7	20.0	-	-
	Max	0.9	0.9	2.2	20.8	26.5	20.0	20.0	-	-
	SD	0.0	0.3	0.0	2.9	-	1.6	-	-	-
Aroclor 1260	n	3	3	3	7	2	4	2	0	0
	Mean	10.0	3.1	5.1	35.2	33.4	18.8	35.0	-	-
	Min	2.8	2.1	3.5	15.0	16.7	15.0	20.0	-	-
	Max	14.9	4.1	8.1	50.0	50.0	20.0	50.0	-	-
	SD	6.4	1.0	2.6	18.5	23.5	2.5	21.2	-	-
PCB-total[d]	n	3	3	3	7	2	4	2	66	66
	Mean	10.6	3.9	6.5	49.2	54.1	56.7	55.0	50.0	26.7
	Min	4.6	3.0	3.6	46.4	50.0	46.7	50.0	11.5	4.7
	Max	14.9	5.9	8.1	50.8	58.2	60.0	60.0	216.0	107.0
	SD	5.4	1.7	2.5	1.7	5.8	6.7	7.1	37.4	19.9
Hg	n	3	3	3	11	2	4	2	66	66
	Mean	99.7	44.0	63.7	94.5	45.5	113.8	61.0	99.0	55.0
	Min	80.0	39.0	58.0	48.0	24.0	91.0	32.0	60.0	30.0
	Max	130.0	48.0	68.0	164.0	67.0	133.0	90.0	160.0	110.0
	SD	26.7	4.6	5.1	41.6	30.4	18.3	41.0	25.0	17.0
1234678-HpCDD	n	3	3	3	3	1	4	1	0	0
	Mean	0.34	0.31	0.10	0.50	0.55	0.46	0.50	-	-
	Min	0.23	0.17	0.06	0.42	0.55	0.30	0.50	-	-
	Max	0.52	0.47	0.15	0.60	0.55	0.65	0.50	-	-
	SD	0.2	0.2	0.0	0.1	-	0.1	-	-	-
1234678-HpCDF	n	3	3	3	3	1	4	1	0	0
	Mean	0.07	0.27	0.08	0.12	0.07	0.28	0.27	-	-
	Min	0.06	0.06	0.06	0.09	0.07	0.12	0.27	-	-
	Max	0.09	0.38	0.11	0.15	0.07	0.45	0.27	-	-
	SD	0.02	0.18	0.03	0.03	-	0.14	-	-	-
1234789-HpCDF	n	3	3	3	3	1	4	1	0	0
	Mean	0.09	0.07	0.12	0.11	0.07	0.22	0.31	-	-
	Min	0.04	0.05	0.08	0.11	0.07	0.16	0.31	-	-
	Max	0.13	0.09	0.17	0.13	0.07	0.32	0.31	-	-
	SD	0.04	0.02	0.04	0.01	-	0.07	-	-	-

TABLE 7-2. CONCENTRATIONS OF SELECTED CHEMICALS OF CONCERN IN NON-RESIDENT FISH SPECIES IN THE LOWER COLUMBIA RIVER AND OTHER NORTHWEST REGIONS (Page 3 of 4)

		Lower Columbia River			Other Col. River Basin				Puget Sound	
		Chinook	Coho	Steelhead	Chinook		Steelhead		Chinook	Coho
Chemical		Filet	Filet	Filet	Filet	Whole	Filet	Whole	Filet	Filet
123478-HxCDD	n	3	3	3	3	1	4	1	0	0
	Mean	0.09	0.04	0.06	0.16	0.19	0.21	0.70	-	-
	Min	0.07	0.04	0.05	0.14	0.19	0.14	0.70	-	-
	Max	0.13	0.05	0.08	0.20	0.19	0.32	0.70	-	-
	SD	0.04	0.01	0.01	0.03	-	0.07	-	-	-
123678-HxCDD	n	3	3	3	3	1	4	1	0	0
	Mean	0.09	0.28	0.07	0.15	0.18	0.34	0.70	-	-
	Min	0.06	0.05	0.07	0.14	0.18	0.14	0.70	-	-
	Max	0.13	0.51	0.08	0.17	0.18	0.49	0.70	-	-
	SD	0.04	0.23	0.01	0.02	-	0.15	-	-	-
123789-HxCDD	n	3	3	3	3	1	4	1	0	0
	Mean	0.10	0.06	0.08	0.14	0.18	0.31	0.70	-	-
	Min	0.06	0.05	0.06	0.13	0.18	0.13	0.70	-	-
	Max	0.16	0.06	0.09	0.17	0.18	0.50	0.70	-	-
	SD	0.05	0.01	0.02	0.02	-	0.17	-	-	-
123478-HxCDF	n	3	3	3	3	1	4	1	0	0
	Mean	0.07	0.04	0.10	0.14	0.12	0.21	0.50	-	-
	Min	0.06	0.04	0.05	0.10	0.12	0.11	0.50	-	-
	Max	0.08	0.05	0.14	0.23	0.12	0.29	0.50	-	-
	SD	0.01	0.01	0.04	0.08	-	0.08	-	-	-
123678-HxCDF	n	3	3	3	3	1	4	1	0	0
	Mean	0.06	0.23	0.10	0.12	0.08	0.23	0.65	-	-
	Min	0.05	0.04	0.07	0.09	0.08	0.10	0.65	-	-
	Max	0.07	0.63	0.13	0.18	0.08	0.31	0.65	-	-
	SD	0.01	0.34	0.03	0.05	-	0.09	-	-	-
123789-HxCDF	n	3	3	3	3	1	4	1	0	0
	Mean	0.13	0.07	0.11	0.15	0.06	0.24	1.05	-	-
	Min	0.12	0.06	0.06	0.09	0.06	0.09	1.05	-	-
	Max	0.14	0.08	0.16	0.20	0.06	0.33	1.05	-	-
	SD	0.01	0.01	0.05	0.06	-	0.11	-	-	-
234678-HxCDF	n	3	3	3	3	1	4	1	0	0
	Mean	0.08	0.04	0.09	0.13	0.15	0.56	0.46	-	-
	Min	0.05	0.03	0.06	0.13	0.15	0.20	0.46	-	-
	Max	0.10	0.05	0.11	0.14	0.15	1.10	0.46	-	-
	SD	0.02	0.01	0.03	0.01	-	0.41	-	-	-
OCDD	n	3	3	3	3	1	4	1	0	0
	Mean	1.57	1.39	0.18	3.77	4.05	3.64	7.30	-	-
	Min	0.60	0.44	0.16	3.40	4.05	3.00	7.30	-	-
	Max	3.15	2.63	0.21	4.30	4.05	4.55	7.30	-	-
	SD	1.38	1.12	0.02	0.47	-	0.66	-	-	-

TABLE 7-2. CONCENTRATIONS OF SELECTED CHEMICALS OF CONCERN IN NON-RESIDENT FISH SPECIES IN THE LOWER COLUMBIA RIVER AND OTHER NORTHWEST REGIONS (Page 4 of 4)

		Lower Columbia River			Other Col. River Basin				Puget Sound	
		Chinook	Coho	Steelhead	Chinook		Steelhead		Chinook	Coho
Chemical		Filet	Filet	Filet	Filet	Whole	Filet	Whole	Filet	Filet
OCDF	n	3	3	3	3	1	4	1	0	0
	Mean	0.15	0.28	0.07	0.36	0.24	0.50	0.65	-	-
	Min	0.08	0.09	0.04	0.26	0.24	0.36	0.65	-	-
	Max	0.26	0.56	0.12	0.47	0.24	0.72	0.65	-	-
	SD	0.10	0.25	0.04	0.11	-	0.16	-	-	-
12378-PeCDD	n	3	3	3	3	1	4	1	0	0
	Mean	0.20	0.34	0.09	0.10	0.11	0.34	0.85	-	-
	Min	0.14	0.11	0.07	0.09	0.11	0.12	0.85	-	-
	Max	0.23	0.66	0.12	0.13	0.11	0.55	0.85	-	-
	SD	0.05	0.28	0.03	0.02	-	0.18	-	-	-
12378-PeCDF	n	3	3	3	3	1	4	1	0	0
	Mean	0.18	0.49	0.14	0.17	0.18	0.28	0.42	-	-
	Min	0.15	0.07	0.11	0.14	0.18	0.15	0.42	-	-
	Max	0.24	1.10	0.18	0.22	0.18	0.39	0.42	-	-
	SD	0.05	0.54	0.04	0.04	-	0.10	-	-	-
23478-PeCDF	n	3	3	3	3	1	4	1	0	0
	Mean	0.20	0.03	0.08	0.15	0.19	0.21	0.30	-	-
	Min	0.15	0.03	0.05	0.12	0.19	0.14	0.30	-	-
	Max	0.25	0.05	0.10	0.18	0.19	0.29	0.30	-	-
	SD	0.05	0.01	0.03	0.03	-	0.08	-	-	-
2378-TCDD	n	3	3	3	13	1	4	1	0	0
	Mean	0.33	0.38	0.05	0.14	0.07	0.19	0.44	-	-
	Min	0.09	0.12	0.01	0.05	0.07	0.08	0.44	-	-
	Max	0.64	0.89	0.07	0.30	0.07	0.26	0.44	-	-
	SD	0.28	0.44	0.04	0.08	-	0.08	-	-	-
2378-TCDF	n	3	3	3	13	1	4	1	0	0
	Mean	0.72	0.43	0.24	2.51	1.10	0.52	0.74	-	-
	Min	0.59	0.10	0.21	0.64	1.10	0.38	0.74	-	-
	Max	0.94	0.94	0.27	7.80	1.10	0.72	0.74	-	-
	SD	0.19	0.45	0.03	2.11	-	0.15	-	-	-
TEC[e]	n	3	3	3	13	1	4	1	0	0
	Mean	0.80	0.80	0.23	0.45	0.45	0.77	1.62	-	-
	Min	0.52	0.37	0.15	0.18	0.45	0.43	1.62	-	-
	Max	1.03	1.54	0.29	0.98	0.45	0.95	1.62	-	-
	SD	0.26	0.64	0.07	0.21	-	0.24	-	-	-

[a] All concentrations in μg/kg except for dioxins and furans, which are in ng/kg. One-half detection limit used for non-detect values

[b] Includes only data from the three surveys described in this document

[c] The sum of DDD-pp', DDE-pp', and DDT-pp'.

[d] The sum of routinely detected Aroclors (1248, 1254, and 1260). For Puget Sound data, all non-detected Aroclors were assumed to be 1.

[e] Toxicity Equivalent Concentrations calculated using method of U.S. EPA (1989b)

7.2.4 Dioxins/Furans

Dioxin and furan measurements are not available for Puget Sound fish. The mean Toxicity Equivalent Concentrations (TEC) for all dioxin and furan congeners were similar and less than 2 for all areas of the Columbia River basin.

7.3 SUMMARY

DDT concentrations appear to be lower in the Bi-State study area (Columbia River basin below Bonneville Dam) than in other areas sampled, for both resident and non-resident fish species. For PCBs, concentrations in resident species are higher in the Columbia River basin than in Puget Sound, but concentrations in non-resident species are lower in the Columbia River basin generally, and in the Bi-State study area in particular. Mercury concentrations do not show any notable trend by region or resident/non-resident status. Dioxin/furan data are not available for Puget Sound. In the Columbia River basin, tissue concentrations of these contaminants are higher in resident than in non-resident species, and concentrations in resident fish species are higher for fish collected outside of the lower Columbia River.

SECTION 8.0
REFERENCES

8.0 REFERENCES

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SECTION 9.0
GLOSSARY

APPENDIX A

APPENDIX A

DESCRIPTIVE DATA FOR FISH SAMPLES

APPENDIX A

DESCRIPTIVE DATA FOR FISH SAMPLES

TABLE A-1. DESCRIPTIVE INFORMATION ABOUT EACH FISH AND CRAYFISH SAMPLE COLLECTED FOR 1991 AND 1993 LOWER COLUMBIA RIVER RECONNAISSANCE SURVEYS (Page 1 of 2)											
		River	Sample	Number	Weight (g)			Length (in.)			Percent
Species	Year	Mile	Number	of Individ.	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Lipid
Carp	1991	80	D23	5	1300	475	2000	15.7	11.3	17.8	2.5
Carp	1991	85	D24	5	587	250	1050	12.3	9.6	15.5	6.5
Carp	1991	92	D26	5	1670	1100	2750	16.9	15.2	20.2	5.8
Carp	1991	99	D28	5	1264	450	1760	15.2	11.0	17.3	2.8
Carp	1991	101	D29	5	1805	1150	3125	17.6	15.6	21.7	2.3
Carp	1991	106	D31	5	1647	1400	2420	17.1	15.8	20.5	6.0
Carp	1991	118	D35	5	2380	1900	3300	17.1	15.4	19.3	4.0
Carp	1991	125	D38	5	1800	1500	2100	16.3	15.4	17.3	3.3
Carp	1991	142	D40	5	2860	2000	3000	18.5	16.5	20.5	4.0
Carp	1993	14	1-C	4	3275	2375	4509	20.9	19.9	23.0	6.0
Carp	1993	141	15-C	5	1739	1248	2252	17.5	15.6	19.1	3.0
Crayfish	1991	21	D6	30	27.7	12.2	47.7	n/a	n/a	n/a	1.3
Crayfish	1991	27	D8	31	51.0	20.9	132.4	n/a	n/a	n/a	1.8
Crayfish	1991	39	D10	31	29.5	13.4	63.7	n/a	n/a	n/a	1.5
Crayfish	1991	40	D12	10	33.2	19.5	51.7	n/a	n/a	n/a	1.4
Crayfish	1991	50	D15	32	30.0	13.9	68.7	n/a	n/a	n/a	1.6
Crayfish	1991	58	D16	31	37.7	13.3	65.4	n/a	n/a	n/a	1.6
Crayfish	1991	63	D19	30	64.2	33.9	124.4	n/a	n/a	n/a	2.4
Crayfish	1991	71	D20	21	69.8	25.0	132.0	n/a	n/a	n/a	1.8
Crayfish	1991	76	D22	18	33.0	2.7	77.3	n/a	n/a	n/a	0.8
Crayfish	1991	80	D23	12	50.4	20.2	103.2	n/a	n/a	n/a	1.1
Crayfish	1991	85	D24	31	41.4	13.4	121.2	n/a	n/a	n/a	1.3
Crayfish	1991	92	D26	32	46.6	25.0	78.5	n/a	n/a	n/a	1.5
Crayfish	1991	99	D28	24	48.5	27.2	85.6	n/a	n/a	n/a	2.6
Crayfish	1991	101	D29	30	41.2	6.9	89.6	n/a	n/a	n/a	2.1
Crayfish	1991	106	D31	12	34.2	7.9	84.3	n/a	n/a	n/a	1.4
Crayfish	1991	118	D35	61	43.6	6.4	117.4	n/a	n/a	n/a	1.4
Crayfish	1991	125	D38	27	49.0	22.0	79.0	n/a	n/a	n/a	2.3
Crayfish	1991	142	D40	9	59.6	27.0	86.9	n/a	n/a	n/a	1.3
Crayfish	1993	21	2-CF	15	59.0	29.9	91.4	n/a	n/a	n/a	1.6
Crayfish	1993	23	3-CF	19	42.3	19.2	85.3	n/a	n/a	n/a	2.0
Crayfish	1993	26	4-CF	15	56.6	28.0	98.9	n/a	n/a	n/a	1.8
Crayfish	1993	29	5-CF	21	39.3	16.8	95.9	n/a	n/a	n/a	0.8
Crayfish	1993	36	6-CF	13	32.3	5.6	100.0	n/a	n/a	n/a	1.0
Crayfish	1993	59	7-CF	15	33.0	16.1	51.1	n/a	n/a	n/a	0.8
Crayfish	1993	68	8-CF	13	39.4	5.0	93.5	n/a	n/a	n/a	1.0
Crayfish	1993	81	9-CF	15	33.5	14.2	64.3	n/a	n/a	n/a	1.2
Crayfish	1993	88	10-CF	15	57.3	21.3	117.8	n/a	n/a	n/a	0.6
Crayfish	1993	90	11-CF	15	92.1	48.3	137.7	n/a	n/a	n/a	1.8
Crayfish	1993	95	12-CF	12	43.2	14.6	79.2	n/a	n/a	n/a	2.0
Crayfish	1993	120	13-1-CF	13	58.3	9.9	114.0	n/a	n/a	n/a	2.0
Crayfish	1993	120	13-2-CF	13	59.0	32.9	115.8	n/a	n/a	n/a	1.4
Crayfish	1993	120	13-3-CF	13	50.4	18.5	86.9	n/a	n/a	n/a	1.4
Crayfish	1993	124	14-CF	8	47.1	21.8	77.4	n/a	n/a	n/a	2.2
Largescale sucker	1991	21	D6	5	976	745	1500	16.3	15.0	17.7	2.2
Largescale sucker	1991	27	D8	5	944	625	1250	16.6	14.8	18.5	2.7
Largescale sucker	1991	39	D10	5	940	500	1250	16.7	14.0	18.5	3.6
Largescale sucker	1991	40	D12	5	788	530	1125	15.8	13.8	17.3	3.0
Largescale sucker	1991	50	D15	5	675	450	950	15.0	12.6	17.7	2.9
Largescale sucker	1991	58	D16	5	584	400	700	14.7	12.6	16.2	3.5
Largescale sucker	1991	63	D19	5	490	275	725	13.5	11.0	16.0	2.4
Largescale sucker	1991	71	D20	5	870	650	1050	16.5	15.2	17.3	1.4

TABLE A-1. DESCRIPTIVE INFORMATION ABOUT EACH FISH AND CRAYFISH SAMPLE COLLECTED FOR 1991 AND 1993 LOWER COLUMBIA RIVER RECONNAISSANCE SURVEYS (Page 2 of 2)

Species	Year	River Mile	Sample Number	Number of Individ.	Weight (g) Mean	Weight (g) Minimum	Weight (g) Maximum	Length (in.) Mean	Length (in.) Minimum	Length (in.) Maximum	Percent Lipid
Largescale sucker	1991	76	D22	5	950	750	1350	16.7	15.4	17.7	2.4
Largescale sucker	1991	80	D23	5	805	700	1025	16.3	15.5	17.4	2.2
Largescale sucker	1991	85	D24	5	520	300	725	14.0	11.8	16.1	3.1
Largescale sucker	1991	92	D26	5	980	700	1200	17.7	15.6	18.9	3.1
Largescale sucker	1991	99	D28	6	542	260	800	14.7	11.6	18.1	3.6
Largescale sucker	1991	101	D29	5	900	725	1150	17.0	15.8	18.5	2.4
Largescale sucker	1991	106	D31	5	704	500	1050	16.2	14.8	18.1	3.5
Largescale sucker	1991	118	D35	5	1020	900	1200	16.4	15.6	17.3	2.3
Largescale sucker	1991	125	D38	6	461	197	581	13.5	9.9	15.8	3.3
Largescale sucker	1991	142	D40	8	378	320	592	14.3	12.2	17.3	3.7
Largescale Sucker	1993	14	1-LS	2	1153	955	1351	17.5	16.5	18.5	4.6
Largescale Sucker	1993	21	2-LS	5	767	580	1235	15.7	14.2	18.7	4.6
Largescale Sucker	1993	23	3-LS	5	795	651	1118	16.4	15.0	18.5	3.4
Largescale Sucker	1993	26	4-LS	5	726	437	976	15.5	12.8	17.1	6.6
Largescale Sucker	1993	29	5-LS	5	858	678	1147	16.6	15.4	18.3	4.8
Largescale Sucker	1993	36	6-LS	5	376	94	674	11.9	8.1	14.6	8.4
Largescale Sucker	1993	59	7-LS	5	496	362	574	13.4	12.2	14.0	2.8
Largescale Sucker	1993	68	8-LS	5	867	546	1418	16.1	14.4	18.9	1.8
Largescale Sucker	1993	81	9-LS	5	473	140	666	13.3	9.3	15.2	0.6
Largescale Sucker	1993	88	10-LS	5	309	40	774	9.9	6.1	15.8	4.8
Largescale Sucker	1993	90	11-LS	5	633	524	863	14.9	13.4	16.5	3.8
Largescale Sucker	1993	95	12-LS	5	363	92	586	11.7	8.1	14.4	3.8
Largescale Sucker	1993	120	13-1-LS	5	703	453	1150	15.5	13.0	18.9	1.4
Largescale Sucker	1993	120	13-2-LS	5	612	417	947	14.7	13.0	17.5	1.0
Largescale Sucker	1993	120	13-3-LS	5	433	194	581	12.9	10.0	14.4	3.0
Largescale Sucker	1993	124	14-LS	5	651	422	1026	15.1	13.2	17.5	2.2
Peamouth	1991	13	D3	9	199	123	302	9.6	8.5	11.0	12.2
Peamouth	1991	39	D10	5	131	52	165	8.6	6.4	9.5	3.9
Peamouth	1991	40	D12	5	77	22	128	7.3	5.1	8.9	4.2
Peamouth	1991	50	D15	7	101	44	137	8.0	6.3	9.2	5.9
Peamouth	1991	58	D16	8	60	21	143	6.6	5.2	8.9	5.9
Peamouth	1991	63	D19	7	51	27	75	6.4	5.3	7.4	6.2
Peamouth	1991	70	D21	5	66	31	103	6.8	5.4	8.2	6.9
Peamouth	1991	80	D23	5	66	50	100	6.1	5.1	7.8	8.1
Peamouth	1991	85	D24	5	107	46	200	8.3	6.5	10.2	5.1
Peamouth	1991	99	D28	5	92	67	125	8.0	7.1	8.9	2.4
White sturgeon	1991	15	RM 15	1	17300	n/a	n/a	49.3	n/a	n/a	0.7
White sturgeon	1991	18.5	RM 18.5	1	11500	n/a	n/a	43.7	n/a	n/a	1.1
White sturgeon	1991	20	RM 20	1	10900	n/a	n/a	45.5	n/a	n/a	0.4
White sturgeon	1991	21	RM 21	1	11800	n/a	n/a	49.1	n/a	n/a	0.3
White sturgeon	1991	21	RM 21	1	11800	n/a	n/a	49.1	n/a	n/a	0.7
White sturgeon	1991	27	RM 27	1	n/a	n/a	n/a	n/a	n/a	n/a	7.1
White sturgeon	1991	49	RM 49	1	10500	n/a	n/a	44.1	n/a	n/a	2.4
White sturgeon	1991	49	RM 49	1	20000	n/a	n/a	52.0	n/a	n/a	0.3
White sturgeon	1991	49	RM 49	1	17200	n/a	n/a	49.1	n/a	n/a	0.2
White sturgeon	1991	75	RM 75	1	28600	n/a	n/a	58.0	n/a	n/a	4.3
White sturgeon	1991	75	RM 75	1	10400	n/a	n/a	42.0	n/a	n/a	8.5
White sturgeon	1991	75	RM 75	1	19500	n/a	n/a	50.0	n/a	n/a	9.5
White sturgeon	1991	80	RM 80	1	14100	n/a	n/a	n/a	n/a	n/a	4.9
White sturgeon	1991	103	RM 103	1	n/a	n/a	n/a	n/a	n/a	n/a	2.3
White sturgeon	1991	115	RM 115	1	n/a	n/a	n/a	n/a	n/a	n/a	1.8
White sturgeon	1991	127	RM 127	1	n/a	n/a	n/a	n/a	n/a	n/a	0.9
White sturgeon	1991	136	RM 136	1	n/a	n/a	n/a	n/a	n/a	n/a	1.8

TABLE A-2. CAPTURE DATE, METHOD, LOCATION, AND PHYSICAL INFORMATION FOR EACH LOWER COLUMBIA RIVER SPECIMEN COLLECTED IN 1994-95 (Page 1 of 5)

Specimen #	Species	Date Captured	Method	Location	Length (in)	Weight (g)	Sex
126	Carp	12/7/94	EF	Martin Slough	20.9	2437.7	M
153	Carp	2/6/95	EF	Carrolls Channel	21.6	2086.2	M
154	Carp	2/6/95	EF	Carrolls Channel	22.4	2449	M
155	Carp	2/6/95	EF	Carrolls Channel	26.0	3718.8	M
156	Carp	2/7/95	EF	Scappoose Bay	25.0	3809.5	F
157	Carp	2/6/95	EF	Carrolls Channel	23.8	3537.4	F
158	Carp	2/6/95	EF	Carrolls Channel	26.0	3809.5	M
1	Chinook	9/22/94	Hatchery	Kalama River	35.2	n/a	M
3	Chinook	9/29/94	Hatchery	Big Creek	27.7	3306	F
11	Chinook	9/29/94	Hatchery	Big Creek	34.8	n/a	F
12	Chinook	9/29/94	Hatchery	Big Creek	34.1	n/a	F
13	Chinook	9/29/94	Hatchery	Big Creek	36.4	n/a	F
14	Chinook	9/29/94	Hatchery	Big Creek	34.1	n/a	F
15	Chinook	9/29/94	Hatchery	Big Creek	30.5	n/a	F
16	Chinook	9/29/94	Hatchery	Big Creek	31.0	n/a	F
17	Chinook	9/29/94	Hatchery	Big Creek	31.4	n/a	F
18	Chinook	9/29/94	Hatchery	Big Creek	29.7	n/a	F
22	Chinook	9/22/94	Hatchery	Kalama River	32.0	n/a	M
26	Chinook	9/29/94	Hatchery	Big Creek	27.6	3080	F
28	Chinook	9/22/94	Hatchery	Kalama River	33.5	n/a	M
32	Chinook	9/29/94	Hatchery	Big Creek	30.4	4738	F
33	Chinook	9/22/94	Hatchery	Kalama River	36.0	n/a	M
34	Chinook	9/22/94	Hatchery	Kalama River	34.0	n/a	M
35	Chinook	9/22/94	Hatchery	Kalama River	31.6	n/a	M
37	Chinook	9/29/94	Hatchery	Big Creek	30.3	4178	F
40	Chinook	9/22/94	Hatchery	Kalama River	30.5	n/a	M
41	Chinook	9/22/94	Hatchery	Kalama River	31.4	n/a	M
43	Chinook	9/22/94	Hatchery	Kalama River	38.2	n/a	M
45	Chinook	9/22/94	Hatchery	Kalama River	38.1	n/a	M
46	Chinook	9/22/94	Hatchery	Kalama River	35.3	n/a	M
48	Chinook	9/29/94	Hatchery	Big Creek	30.0	3986	F
2	Coho	9/29/94	Hatchery	Big Creek	25.0	2270	F
4	Coho	9/29/94	Hatchery	Big Creek	26.1	2944	M

TABLE A-2. CAPTURE DATE, METHOD, LOCATION, AND PHYSICAL INFORMATION FOR EACH LOWER COLUMBIA RIVER SPECIMEN COLLECTED IN 1994-95 (Page 2 of 5)

Specimen #	Species	Date Captured	Method	Location	Length (in)	Weight (g)	Sex
5	Coho	9/22/94	Hatchery	Lewis River	27.5	3305	M
6	Coho	9/29/94	Hatchery	Big Creek	25.0	2236	F
7	Coho	9/22/94	Hatchery	Lewis River	27.4	3040	M
8	Coho	9/22/94	Hatchery	Lewis River	23.3	1941	M
9	Coho	9/29/94	Hatchery	Big Creek	23.4	1822	F
10	Coho	9/29/94	Hatchery	Big Creek	22.0	1563	F
19	Coho	9/22/94	Hatchery	Lewis River	25.0	2401	M
20	Coho	9/29/94	Hatchery	Big Creek	22.8	1377	F
21	Coho	9/29/94	Hatchery	Big Creek	26.1	2192	F
23	Coho	9/29/94	Hatchery	Big Creek	23.6	1812	F
24	Coho	9/22/94	Hatchery	Lewis River	24.9	2243	M
25	Coho	9/29/94	Hatchery	Big Creek	20.8	1411	F
27	Coho	9/22/94	Hatchery	Lewis River	25.2	2513	M
29	Coho	9/22/94	Hatchery	Lewis River	25.6	2396	M
30	Coho	9/22/94	Hatchery	Lewis River	25.9	2488	M
31	Coho	9/22/94	Hatchery	Lewis River	25.1	2441	M
36	Coho	9/29/94	Hatchery	Big Creek	20.6	1271	F
38	Coho	9/22/94	Hatchery	Lewis River	25.0	2546	M
39	Coho	9/22/94	Hatchery	Lewis River	26.1	2658	M
42	Coho	9/29/94	Hatchery	Big Creek	23.6	2395	F
44	Coho	9/29/94	Hatchery	Big Creek	25.5	2297	F
47	Coho	9/22/94	Hatchery	Lewis River	24.1	2319	M
49	LS Sucker	12/2/94	EF	Cottonwood Point	17.0	855.8	F
50	LS Sucker	12/1/94	EF	Bridal Veil	17.2	n/a	M
51	LS Sucker	12/3/94	EF	Hayden Island	20.2	1408	F
52	LS Sucker	12/3/94	EF	Pearcy Island	20.8	1441.2	F
53	LS Sucker	12/2/94	EF	Government Island	19.4	1100.3	F
54	LS Sucker	12/2/94	EF	Cottonwood Point	18.8	1071.2	F
55	LS Sucker	12/3/94	EF	Tomahawk Island	16.6	736	M
56	LS Sucker	12/1/94	EF	Bridal Veil	19.0	n/a	F
57	LS Sucker	12/3/94	EF	Hayden Island	19.2	1152.7	F
58	LS Sucker	12/3/94	EF	Pearcy Island	17.7	967.5	F
59	LS Sucker	12/3/94	EF	Tomahawk Island	18.0	855.3	F

TABLE A-2. CAPTURE DATE, METHOD, LOCATION, AND PHYSICAL INFORMATION FOR EACH LOWER COLUMBIA RIVER SPECIMEN COLLECTED IN 1994-95 (Page 3 of 5)

Specimen #	Species	Date Captured	Method	Location	Length (in)	Weight (g)	Sex
60	LS Sucker	12/3/94	EF	Pearcy Island	17.4	824.9	F
61	LS Sucker	12/2/94	EF	Government Island	20.1	1204	F
62	LS Sucker	12/3/94	EF	Pearcy Island	17.5	815.3	F
63	LS Sucker	12/1/94	EF	Bridal Veil	16.0	n/a	F
64	LS Sucker	12/2/94	EF	Cottonwood Point	15.6	630.3	F
65	LS Sucker	12/1/94	EF	Bridal Veil	19.3	n/a	F
66	LS Sucker	12/1/94	EF	Bridal Veil	18.1	n/a	F
67	LS Sucker	12/2/94	EF	Government Island	19.9	1165	F
68	LS Sucker	12/2/94	EF	Flag Island	18.4	1066	F
69	LS Sucker	12/2/94	EF	Government Island	18.3	908	F
70	LS Sucker	12/2/94	EF	Cottonwood Point	16.8	655	M
71	LS Sucker	12/1/94	EF	Bridal Veil	18.9	n/a	F
72	LS Sucker	12/2/94	EF	Flag Island	19.4	1145	F
100	LS Sucker	12/9/94	EF	Kalama River Marina	18.5	n/a	F
101	LS Sucker	12/9/94	EF	Kalama River Marina	18.5	n/a	F
102	LS Sucker	12/9/94	EF	Kalama River Marina	19.5	n/a	F
103	LS Sucker	12/9/94	EF	Kalama River Marina	16.3	n/a	F
104	LS Sucker	12/9/94	EF	Kalama River Marina	20.5	n/a	F
105	LS Sucker	12/9/94	EF	Kalama River Marina	19.5	n/a	F
106	LS Sucker	12/9/94	EF	Kalama River Marina	17.3	n/a	F
107	LS Sucker	12/9/94	EF	Kalama River Marina	18.5	n/a	F
108	LS Sucker	12/8/94	EF	Scappoose Bay	18.5	n/a	F
109	LS Sucker	12/8/94	EF	Scappoose Bay	17.8	n/a	F
110	LS Sucker	12/8/94	EF	Scappoose Bay	15.0	n/a	F
111	LS Sucker	12/8/94	EF	Scappoose Bay	16.8	n/a	F
112	LS Sucker	12/8/94	EF	Scappoose Bay	16.5	n/a	F
113	LS Sucker	12/8/94	EF	Scappoose Bay	18.5	n/a	F
114	LS Sucker	12/8/94	EF	Scappoose Bay	17.8	n/a	M
115	LS Sucker	12/8/94	EF	Scappoose Bay	18.0	n/a	F
116	LS Sucker	12/7/94	EF	Coon Island	15.3	n/a	M
117	LS Sucker	12/7/94	EF	Coon Island	20.5	1133.8	F
119	LS Sucker	12/7/94	EF	Coon Island	20.5	1247.2	F
120	LS Sucker	12/8/94	EF	Scappoose Bay	16.5	n/a	F

TABLE A-2. CAPTURE DATE, METHOD, LOCATION, AND PHYSICAL INFORMATION FOR EACH LOWER COLUMBIA RIVER SPECIMEN COLLECTED IN 1994-95 (Page 4 of 5)

Specimen #	Species	Date Captured	Method	Location	Length (in)	Weight (g)	Sex
121	LS Sucker	12/8/94	EF	Scappoose Bay	18.3	n/a	F
122	LS Sucker	12/8/94	EF	Scappoose Bay	18.5	n/a	F
123	LS Sucker	12/8/94	EF	Scappoose Bay	20.0	n/a	F
127	LS Sucker	12/4/94	EF	Bachelor Isl. Slough	20.3	1275.5	F
128	LS Sucker	2/2/95	EF	Clatskanie River	18.5	n/a	F
129	LS Sucker	2/2/95	EF	Clatskanie River	17.7	n/a	F
130	LS Sucker	2/2/95	EF	Clatskanie River	15.6	n/a	F
131	LS Sucker	2/5/95	EF	Knappa Slough	16.7	n/a	F
132	LS Sucker	2/2/95	EF	Clatskanie River	18.2	n/a	F
133	LS Sucker	2/2/95	EF	Clatskanie River	17.5	n/a	F
134	LS Sucker	2/5/95	EF	Blind Slough	16.7	n/a	F
135	LS Sucker	2/2/95	EF	Clatskanie River	19.3	n/a	F
136	LS Sucker	2/6/95	EF	Clatskanie River	15.7	n/a	F
137	LS Sucker	12/29/94	EF	Near Bug Hole	19.0	n/a	F
138	LS Sucker	2/2/95	EF	Clatskanie River	14.8	n/a	F
139	LS Sucker	2/6/95	EF	Clatskanie River	19.5	n/a	F
140	LS Sucker	2/2/95	EF	Clatskanie River	20.3	n/a	F
141	LS Sucker	12/29/94	EF	John Day River	17.0	n/a	F
142	LS Sucker	2/5/95	EF	Knapper Slough	15.6	n/a	F
143	LS Sucker	2/6/95	EF	Clatskanie River	15.9	n/a	F
144	LS Sucker	2/5/95	EF	Blind Slough	17.5	n/a	F
145	LS Sucker	2/3/95	EF	Clifton Channel	17.9	n/a	F
146	LS Sucker	2/3/95	EF	Clifton Channel	19.3	n/a	F
147	LS Sucker	2/2/95	EF	Clatskanie River	14.8	n/a	M
148	LS Sucker	2/3/95	EF	Clifton Channel	16.5	n/a	F
149	LS Sucker	12/29/94	EF	Near Bug Hole	19.5	n/a	F
150	LS Sucker	12/30/94	EF	Young's Bay	21.0	n/a	F
151	LS Sucker	2/2/95	EF	Clatskanie River	18.9	n/a	F
152	LS Sucker	2/9/95	EF	Clatskanie River	17.5	n/a	F
73	Steelhead	12/28/94	EF	Cowlitz River	32.0	n/a	M
74	Steelhead	12/28/94	EF	Cowlitz River	27.5	n/a	M
75	Steelhead	12/28/94	EF	Cowlitz River	29.0	n/a	M
76	Steelhead	12/28/94	EF	Cowlitz River	27.0	n/a	M

TABLE A-2. CAPTURE DATE, METHOD, LOCATION, AND PHYSICAL INFORMATION FOR EACH LOWER COLUMBIA RIVER SPECIMEN COLLECTED IN 1994-95 (Page 5 of 5)

Specimen #	Species	Date Captured	Method	Location	Length (in)	Weight (g)	Sex
77	Steelhead	12/27/94	EF	Eagle Cliff	28.0	n/a	M
78	Steelhead	12/27/94	EF	Eagle Cliff	26.0	n/a	F
79	Steelhead	12/28/94	EF	Cowlitz River	31.0	n/a	F
80	Steelhead	12/28/94	EF	Cowlitz River	29.0	n/a	F
81	Steelhead	12/28/94	EF	Cowlitz River	30.0	n/a	F
82	Steelhead	12/16/94	EF	Eagle Cliff	26.2	n/a	M
83	Steelhead	12/28/94	EF	Cowlitz River	25.8	n/a	M
84	Steelhead	12/16/94	EF	Eagle Cliff	24.8	n/a	F
85	Steelhead	12/16/94	EF	Eagle Cliff	32.3	n/a	F
86	Steelhead	12/16/94	EF	Eagle Cliff	26.2	n/a	F
87	Steelhead	12/16/94	EF	Eagle Cliff	27.2	n/a	M
88	Steelhead	12/16/94	EF	Eagle Cliff	34.6	n/a	M
89	Steelhead	12/16/94	EF	Eagle Cliff	25.6	n/a	M
90	Steelhead	12/15/94	EF	Eagle Cliff	27.9	n/a	M
91	Steelhead	12/16/94	EF	Eagle Cliff	25.4	n/a	M
92	Steelhead	12/16/94	EF	Eagle Cliff	29.3	n/a	F
93	Steelhead	12/15/94	EF	Eagle Cliff	24.8	n/a	F
94	Steelhead	12/16/94	EF	Eagle Cliff	31.9	n/a	M
124	Steelhead	12/11/94	EF	Clatskanie River	25.8	n/a	M
125	Steelhead	12/10/94	EF	Longview	25.3	n/a	M
95	Sturgeon	1/11/95	Hook	Mouth of Willamette	45.5	6258.5	F
96	Sturgeon	1/11/95	Hook	Mouth of Willamette	43.0	6848.1	M
97	Sturgeon	1/11/95	Hook	Mouth of Willamette	46.0	10249.4	M
159	Sturgeon	1/17/95	Hook	Hayden Island	42.0	n/a	n/a
160	Sturgeon	1/17/95	Hook	Hayden Island	42.0	n/a	n/a
161	Sturgeon	1/17/95	Hook	Hayden Island	45.0	n/a	n/a
162	Sturgeon	1/17/95	Hook	Hayden Island	45.5	n/a	n/a
163	Sturgeon	3/17/95	Hook	Near Trojan NPP	47.5	n/a	M
164	Sturgeon	2/17/95	Hook	Briz Bay	43.5	n/a	M
165	Sturgeon	2/18/95	Hook	Near Trojan NPP	45.5	n/a	F
166	Sturgeon	2/18/95	Hook	Near Trojan NPP	n/a	n/a	n/a
167	Sturgeon	2/18/95	Hook	Near Trojan NPP	47.5	n/a	F

EF = Electrofishing
Hook = Rod and Reel
n/a = Information not available

TABLE A-3. COMPOSITE IDENTIFICATION FOR 1994-95 SAMPLES (Page 1 of 2)

Composite ID	Species	Number in Composite	Specimen #			
LSCmp1-1	LS Sucker	8	138 (F)	139 (F)	142 (F)	144 (F)
			145 (F)	149 (F)	150 (F)	152 (F)
LSCmp1-2	LS Sucker	8	128 (F)	130 (F)	131 (F)	132 (F)
			133 (F)	135 (F)	136 (F)	143 (F)
LSCmp1-3	LS Sucker	8	129 (F)	134 (F)	137 (F)	140 (F)
			141 (F)	146 (F)	148 (F)	151 (F)
LSCmp2-1	LS Sucker	8	101 (F)	103 (F)	106 (F)	107 (F)
			110 (F)	112 (F)	114 (M)	121 (F)
LSCmp2-2	LS Sucker	8	102 (F)	104 (F)	105 (F)	109 (F)
			113 (F)	115 (F)	119 (F)	122 (F)
DCmp1	Steelhead	8	78 (F)	79 (F)	80 (F)	81 (F)
			84 (F)	85 (F)	86 (F)	92 (F)
DCmp2	Steelhead	8	73 (M)	74 (M)	75 (M)	76 (M)
			77 (M)	82 (M)	83 (M)	87 (M)
DCmp3	Steelhead	8	88 (M)	89 (M)	90 (M)	91 (M)
			93 (F)	94 (M)	124 (M)	125 (M)
KCmp1	Chinook	8	1 (M)	22 (M)	28 (M)	33 (M)
			34 (M)	35 (M)	40 (M)	41 (M)
KCmp2	Chinook	8	3 (F)	26 (F)	32 (F)	37 (F)
			43 (M)	45 (M)	46 (M)	48 (F)

TABLE A-3. COMPOSITE IDENTIFICATION FOR 1994-95 SAMPLES (Page 2 of 2)

Composite ID:	LSCmp2-3				Composite ID:	KCmp3			
Species:	LS Sucker				Species:	Chinook			
Number in Composite:	8				Number in Composite:	8			
Specimen #:	100 (F)	108 (F)	111 (F)	116 (M)	Specimen #:	11 (F)	12 (F)	13 (F)	14 (F)
	117 (F)	120 (F)	123 (F)	127 (F)		15 (F)	16 (F)	17 (F)	18 (F)
Composite ID:	LSCmp3-1				Composite ID:	HCmp1			
Species:	LS Sucker				Species:	Coho			
Number in Composite:	8				Number in Composite:	8			
Specimen #:	50 (M)	63 (F)	65 (F)	66 (F)	Specimen #:	5 (M)	7 (M)	8 (M)	19 (M)
	69 (F)	70 (M)	71 (F)	72 (F)		24 (M)	27 (M)	29 (M)	30 (M)
Composite ID:	LSCmp3-2				Composite ID:	HCmp2			
Species:	LS Sucker				Species:	Coho			
Number in Composite:	8				Number in Composite:	8			
Specimen #:	49 (F)	51 (F)	52 (F)	53 (F)	Specimen #:	4 (M)	25 (F)	31 (M)	38 (M)
	55 (M)	58 (F)	62 (F)	68 (F)		39 (M)	42 (F)	44 (F)	47 (M)
Composite ID:	LSCmp3-3				Composite ID:	HCmp3			
Species:	LS Sucker				Species:	Coho			
Number in Composite:	8				Number in Composite:	8			
Specimen #:	54 (F)	56 (F)	57 (F)	59 (F)	Specimen #:	2 (F)	6 (F)	9 (F)	10 (F)
	60 (F)	61 (F)	64 (F)	67 (F)		20 (F)	21 (F)	23 (F)	36 (F)
Composite ID:	CCmp1								
Species:	Carp								
Number in Composite:	7								
Specimen #:	126 (M)	153 (M)	154 (M)	155 (M)					
	156 (F)	157 (F)	158 (M)						

Sex of each specimen given in parentheses next to specimen number

TABLE A-4. BIOLOGICAL DATA FOR EACH FISH SAMPLE COLLECTED IN 1994-95						
Sample ID	Species	Number Fillets per Sample	Mean Length (in)	Mean Weight (g)	% Lipid	% Moisture
LSCmp1-1	Largescale Sucker	8	17.9	n/a	1.17	79.08
LSCmp1-2	Largescale Sucker	8	17.2	n/a	0.79	80.09
LSCmp1-3	Largescale Sucker	8	18.3	n/a	1.08	79.80
LSCmp2-1	Largescale Sucker	8	17.3	n/a	1.45	80.85
LSCmp2-2	Largescale Sucker	8	19.1	n/a	2.06	78.68
LSCmp2-3	Largescale Sucker	8	18.3	n/a	2.26	77.94
LSCmp3-1	Largescale Sucker	8	18.0	n/a	1.41	79.55
LSCmp3-2	Largescale Sucker	8	18.5	1048.8	2.88	80.86
LSCmp3-3	Largescale Sucker	8	18.5	986.2	1.69	79.88
CCmp1	Carp	7	23.7	3121.2	4.37	72.51
DCmp1	Steelhead	8	28.5	n/a	2.87	73.86
DCmp2	Steelhead	8	27.9	n/a	4.06	74.39
DCmp3	Steelhead	8	28.0	n/a	4.82	70.60
KCmp1	Chinook	8	33.3	n/a	3.51	66.52
KCmp2	Chinook	8	32.1	3566.5	1.71	73.99
KCmp3	Chinook	8	33.2	n/a	0.72	76.24
HCmp1	Coho	8	25.6	2548.4	1.67	71.80
HCmp2	Coho	8	24.6	2384.6	0.48	73.52
HCmp3	Coho	8	24.0	1896.0	0.85	74.22
SIND1	White Sturgeon	1	45.5	6258.5	2.17	78.78
SIND2	White Sturgeon	1	43.0	6848.1	1.69	76.73
SIND3	White Sturgeon	1	46.0	10249.4	0.86	77.75
SIND4	White Sturgeon	1	42.0	n/a	1.00	77.71
SIND5	White Sturgeon	1	42.0	n/a	0.69	77.07
SIND6	White Sturgeon	1	45.0	n/a	2.46	75.02
SIND7	White Sturgeon	1	45.5	n/a	0.99	77.03
SIND8	White Sturgeon	1	47.5	n/a	0.88	77.83
SIND9	White Sturgeon	1	43.5	n/a	0.04	80.26
SIND10	White Sturgeon	1	45.5	n/a	0.14	81.80
SIND11	White Sturgeon	1	na	n/a	0.36	80.64
SIND12	White Sturgeon	1	47.5	n/a	0.41	80.55

n/a= not available

APPENDIX B

APPENDIX B

LISTS OF DETECTED AND NON-DETECTED CHEMICALS
AND EXPOSURE POINT CONCENTRATIONS FOR EACH SPECIES
AND SAMPLING YEAR COMBINATION

APPENDIX B

LISTS OF DETECTED AND NON-DETECTED CHEMICALS
AND EXPOSURE POINT CONCENTRATIONS FOR EACH SPECIES
AND SAMPLING YEAR COMBINATION

TABLE B-1. 1991 LIST OF DETECTED CHEMICALS FOR EACH FISH SPECIES (Page 1 of 2)

	CARP	CRAYFISH	LSSUCKER	PEAMOUTH	STURGEON
Metals					Arsenic
	Barium	Barium	Barium	Barium	
	Cadmium	Cadmium	Cadmium	Cadmium	Cadmium
	Copper	Copper	Copper	Copper	Copper
	Lead	Lead	Lead	Lead	Lead
	Mercury	Mercury	Mercury	Mercury	Mercury
	Nickel	Nickel	Nickel	Nickel	Nickel
		Silver			Silver
	Zinc	Zinc	Zinc	Zinc	Zinc
Semi-Volatiles	1,2,4-Trichlorobenzene				
	1,4-Dichlorobenzene				
	2,4-Dinitrotoluene				
	2-Chlorophenol				
	2-Methylnaphthalene		2-Methylnaphthalene		
	4-Chloro-3-methylphenol				
	4-Nitrophenol				
	Acenaphthene				
	Bis(2-ethylhexyl)phthalate	Bis(2-ethylhexyl)phthalate	Bis(2-ethylhexyl)phthalate	Bis(2-ethylhexyl)phthalate	Bis(2-ethylhexyl)phthalate
					Butyl benzyl phthalate
	Di-n-butylphthalate	Di-n-butylphthalate			Di-n-butylphthalate
		Isophorone			
	N-Nitroso-di-n-propylamine				
	Naphthalene				
	Phenol				
	Pyrene				
Pesticides/PCBs	Aldrin		Aldrin	Aldrin	
			alpha-BHC		
				Aroclor 1242	
	Aroclor 1254		Aroclor 1254		Aroclor 1254
	Aroclor 1260		Aroclor 1260	Aroclor 1260	
		beta-BHC	beta-BHC	beta-BHC	
				Dacthal	
	Dieldrin	Dieldrin	Dieldrin	Dieldrin	Dieldrin
			Endosulfan I	Endosulfan I	Endosulfan I
		Endosulfan II			
		Endosulfan sulfate	Endosulfan sulfate		Endosulfan sulfate
	Endrin				Endrin
			Endrin aldehyde	Endrin aldehyde	Endrin aldehyde
		Heptachlor			
	Lindane		Lindane	Lindane	
				Malathion	
		Methoxychlor	Methoxychlor		Methoxychlor
		Methyl parathion			Methyl parathion
	Mirex				
	o,p'-DDD		o,p'-DDD	o,p'-DDD	o,p'-DDD
	o,p'-DDE		o,p'-DDE	o,p'-DDE	o,p'-DDE

TABLE B-1. 1991 LIST OF DETECTED CHEMICALS FOR EACH FISH SPECIES (Page 2 of 2)					
	CARP	CRAYFISH	LSSUCKER	PEAMOUTH	STURGEON
(con't.)	o,p'-DDT	o,p'-DDT			o,p'-DDT
	p,p'-DDD	p,p'-DDD	p,p'-DDD	p,p'-DDD	p,p'-DDD
	p,p'-DDE	p,p'-DDE		p,p'-DDE	p,p'-DDE
	p,p'-DDT	p,p'-DDT	p,p'-DDT		p,p'-DDT
			Parathion	Parathion	
Dioxins/Furans	2,3,7,8-TCDD	2,3,7,8-TCDD	2,3,7,8-TCDD	2,3,7,8-TCDD	2,3,7,8-TCDD
	2,3,4,7,8-PeCDF	2,3,4,7,8-PeCDF	2,3,4,7,8-PeCDF	2,3,4,7,8-PeCDF	2,3,4,7,8-PeCDF
	2,3,4,6,7,8-HxCDF	2,3,4,6,7,8-HxCDF	2,3,4,6,7,8-HxCDF	2,3,4,6,7,8-HxCDF	
	1,2,3,7,8-PeCDF	1,2,3,7,8-PeCDF	1,2,3,7,8-PeCDF	1,2,3,7,8-PeCDF	1,2,3,7,8-PeCDF
	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDD	
	1,2,3,7,8,9-HxCDF	1,2,3,7,8,9-HxCDF	1,2,3,7,8,9-HxCDF		
	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDD	
	1,2,3,6,7,8-HxCDF	1,2,3,6,7,8-HxCDF	1,2,3,6,7,8-HxCDF	1,2,3,6,7,8-HxCDF	
	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDD	
	1,2,3,4,7,8-HxCDF	1,2,3,4,7,8-HxCDF	1,2,3,4,7,8-HxCDF	1,2,3,4,7,8-HxCDF	
	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDD	
	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8,9-HpCDF	
	1,2,3,4,6,7,8-HpCDF	1,2,3,4,6,7,8-HpCDF	1,2,3,4,6,7,8-HpCDF	1,2,3,4,6,7,8-HpCDF	
	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDD
	OCDD	OCDD	OCDD	OCDD	OCDD
	OCDF	OCDF	OCDF	OCDF	

TABLE B-2. 1991 LIST OF NON-DETECTED CHEMICALS FOR EACH FISH SPECIES (Page 1 of 3)

	CARP	CRAYFISH	LSSUCKER	PEAMOUTH	STURGEON
Metals	Antimony	Antimony	Antimony	Antimony	Antimony
					Barium
	Arsenic	Arsenic	Arsenic	Arsenic	
	Selenium	Selenium	Selenium	Selenium	Selenium
	Silver		Silver	Silver	
Semi-volatiles		1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene
	1,2-Dichlorobenzene	1,2-Dichlorobenzene	1,2-Dichlorobenzene	1,2-Dichlorobenzene	1,2-Dichlorobenzene
	1,3-Dichlorobenzene	1,3-Dichlorobenzene	1,3-Dichlorobenzene	1,3-Dichlorobenzene	1,3-Dichlorobenzene
		1,4-Dichlorobenzene	1,4-Dichlorobenzene	1,4-Dichlorobenzene	1,4-Dichlorobenzene
	2,4,6-Trichlorophenol	2,4,6-Trichlorophenol	2,4,6-Trichlorophenol	2,4,6-Trichlorophenol	2,4,6-Trichlorophenol
	2,4-Dichlorophenol	2,4-Dichlorophenol	2,4-Dichlorophenol	2,4-Dichlorophenol	2,4-Dichlorophenol
	2,4-Dimethylphenol	2,4-Dimethylphenol	2,4-Dimethylphenol	2,4-Dimethylphenol	2,4-Dimethylphenol
	2,4-Dinitrophenol	2,4-Dinitrophenol	2,4-Dinitrophenol	2,4-Dinitrophenol	2,4-Dinitrophenol
		2,4-Dinitrotoluene	2,4-Dinitrotoluene	2,4-Dinitrotoluene	2,4-Dinitrotoluene
	2,6-Dinitrotoluene	2,6-Dinitrotoluene	2,6-Dinitrotoluene	2,6-Dinitrotoluene	2,6-Dinitrotoluene
	2-Chloronaphthalene	2-Chloronaphthalene	2-Chloronaphthalene	2-Chloronaphthalene	2-Chloronaphthalene
		2-Chlorophenol	2-Chlorophenol	2-Chlorophenol	2-Chlorophenol
		2-Methylnaphthalene		2-Methylnaphthalene	2-Methylnaphthalene
	2-Methylphenol	2-Methylphenol	2-Methylphenol	2-Methylphenol	2-Methylphenol
	2-Nitrophenol	2-Nitrophenol	2-Nitrophenol	2-Nitrophenol	2-Nitrophenol
	3,3'-Dichlorobenzidine	3,3'-Dichlorobenzidine	3,3'-Dichlorobenzidine	3,3'-Dichlorobenzidine	3,3'-Dichlorobenzidine
	4-Bromophenyl phenyl ether	4-Bromophenyl phenyl ether	4-Bromophenyl phenyl ether	4-Bromophenyl phenyl ether	4-Bromophenyl phenyl ether
		4-Chloro-3-methylphenol	4-Chloro-3-methylphenol	4-Chloro-3-methylphenol	4-Chloro-3-methylphenol
	4-Chlorophenylphenylether	4-Chlorophenylphenylether	4-Chlorophenylphenylether	4-Chlorophenylphenylether	4-Chlorophenylphenylether
	4-Methylphenol	4-Methylphenol	4-Methylphenol	4-Methylphenol	4-Methylphenol
		4-Nitrophenol	4-Nitrophenol	4-Nitrophenol	4-Nitrophenol
		Acenaphthene	Acenaphthene	Acenaphthene	Acenaphthene
	Acenaphthylene	Acenaphthylene	Acenaphthylene	Acenaphthylene	Acenaphthylene
	Anthracene	Anthracene	Anthracene	Anthracene	Anthracene
	Benz[a]anthracene	Benz[a]anthracene	Benz[a]anthracene	Benz[a]anthracene	Benz[a]anthracene
	Benzo[a]pyrene	Benzo[a]pyrene	Benzo[a]pyrene	Benzo[a]pyrene	Benzo[a]pyrene
	Benzo[b]fluoranthene	Benzo[b]fluoranthene	Benzo[b]fluoranthene	Benzo[b]fluoranthene	Benzo[b]fluoranthene
	Benzo[g,h,i]perylene	Benzo[g,h,i]perylene	Benzo[g,h,i]perylene	Benzo[g,h,i]perylene	Benzo[g,h,i]perylene
	Benzo[k]fluoranthene	Benzo[k]fluoranthene	Benzo[k]fluoranthene	Benzo[k]fluoranthene	Benzo[k]fluoranthene
	Bis(2-chloroethoxy)methane	Bis(2-chloroethoxy)methane	Bis(2-chloroethoxy)methane	Bis(2-chloroethoxy)methane	Bis(2-chloroethoxy)methane
	Bis(2-chloroethyl)ether	Bis(2-chloroethyl)ether	Bis(2-chloroethyl)ether	Bis(2-chloroethyl)ether	Bis(2-chloroethyl)ether
	Bis(2-chloroisopropyl)ether	Bis(2-chloroisopropyl)ether	Bis(2-chloroisopropyl)ether	Bis(2-chloroisopropyl)ether	Bis(2-chloroisopropyl)ether
	Butyl benzyl phthalate	Butyl benzyl phthalate	Butyl benzyl phthalate	Butyl benzyl phthalate	
	Chrysene	Chrysene	Chrysene	Chrysene	Chrysene
			Di-n-butylphthalate	Di-n-butylphthalate	
	Di-n-octylphthalate	Di-n-octylphthalate	Di-n-octylphthalate	Di-n-octylphthalate	Di-n-octylphthalate
	Dibenz[a,h]anthracene	Dibenz[a,h]anthracene	Dibenz[a,h]anthracene	Dibenz[a,h]anthracene	Dibenz[a,h]anthracene
	Diethyl phthalate	Diethyl phthalate	Diethyl phthalate	Diethyl phthalate	Diethyl phthalate
	Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate
	Fluoranthene	Fluoranthene	Fluoranthene	Fluoranthene	Fluoranthene
	Fluorene	Fluorene	Fluorene	Fluorene	Fluorene

TABLE B-2. 1991 LIST OF NON-DETECTED CHEMICALS FOR EACH FISH SPECIES (Page 2 of 3)

	CARP	CRAYFISH	LSSUCKER	PEAMOUTH	STURGEON
(con't.)	Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene
	Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	Hexachlorocyclopentadiene
	Hexachloroethane	Hexachloroethane	Hexachloroethane	Hexachloroethane	Hexachloroethane
	Indeno[1,2,3-cd]pyrene	Indeno[1,2,3-cd]pyrene	Indeno[1,2,3-cd]pyrene	Indeno[1,2,3-cd]pyrene	Indeno[1,2,3-cd]pyrene
	Isophorone		Isophorone	Isophorone	Isophorone
		N-Nitroso-di-n-propylamine	N-Nitroso-di-n-propylamine	N-Nitroso-di-n-propylamine	N-Nitroso-di-n-propylamine
	N-Nitrosodiphenylamine	N-Nitrosodiphenylamine	N-Nitrosodiphenylamine	N-Nitrosodiphenylamine	N-Nitrosodiphenylamine
		Naphthalene	Naphthalene	Naphthalene	Naphthalene
	Nitrobenzene	Nitrobenzene	Nitrobenzene	Nitrobenzene	Nitrobenzene
	Phenanthrene	Phenanthrene	Phenanthrene	Phenanthrene	Phenanthrene
		Phenol	Phenol	Phenol	Phenol
		Pyrene	Pyrene	Pyrene	Pyrene
Pesticides/	alpha-BHC			alpha-BHC	
PCBs	Aroclor 1016		Aroclor 1016	Aroclor 1016	
		Aldrin			Aldrin
		alpha-BHC			alpha-BHC
		Aroclor 1016			Aroclor 1016
	Aroclor 1221	Aroclor 1221	Aroclor 1221	Aroclor 1221	Aroclor 1221
	Aroclor 1232	Aroclor 1232	Aroclor 1232	Aroclor 1232	Aroclor 1232
	Aroclor 1242	Aroclor 1242	Aroclor 1242		Aroclor 1242
	Aroclor 1248	Aroclor 1248	Aroclor 1248	Aroclor 1248	Aroclor 1248
		Aroclor 1254		Aroclor 1254	
		Aroclor 1260			Aroclor 1260
	beta-BHC				beta-BHC
	Chlordane	Chlordane	Chlordane	Chlordane	Chlordane
	Dacthal	Dacthal	Dacthal		Dacthal
	delta-BHC	delta-BHC	delta-BHC	delta-BHC	delta-BHC
	Dicofol	Dicofol	Dicofol	Dicofol	Dicofol
	Endosulfan I	Endosulfan I			
	Endosulfan II		Endosulfan II	Endosulfan II	Endosulfan II
	Endosulfan sulfate			Endosulfan sulfate	
		Endrin		Endrin	
	Endrin aldehyde	Endrin aldehyde			
	Heptachlor		Heptachlor	Heptachlor	Heptachlor
	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide
	Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene
		Lindane			Lindane
	Malathion	Malathion	Malathion		Malathion
	Methoxychlor			Methoxychlor	
	Methyl parathion		Methyl parathion	Methyl parathion	
		Mirex	Mirex	Mirex	Mirex
		o,p'-DDD			
		o,p'-DDE			
			o,p'-DDT	o,p'-DDT	

TABLE B-2. 1991 LIST OF NON-DETECTED CHEMICALS FOR EACH FISH SPECIES (Page 3 of 3)

	CARP	CRAYFISH	LSSUCKER	PEAMOUTH	STURGEON
(con't.)			p,p'-DDE		
				p,p'-DDT	
	Parathion	Parathion			Parathion
	Pentachlorophenol	Pentachlorophenol	Pentachlorophenol	Pentachlorophenol	Pentachlorophenol
	Toxaphene	Toxaphene	Toxaphene	Toxaphene	Toxaphene
Dioxins/ Furans					1,2,3,7,8-PeCDD
					1,2,3,4,7,8-HxCDD
					1,2,3,6,7,8-HxCDD
					1,2,3,7,8,9-HxCDD
					1,2,3,4,7,8-HxCDF
					1,2,3,6,7,8-HxCDF
				1,2,3,7,8,9-HxCDF	1,2,3,7,8,9-HxCDF
					2,3,4,6,7,8-HxCDF
					1,2,3,4,6,7,8-HpCDF
					1,2,3,4,7,8,9-HpCDF
					OCDF

TABLE B-3. 1993 LIST OF DETECTED CHEMICALS FOR EACH FISH SPECIES	CARP	CRAYFISH	LSSUCKER
Metals		Antimony	
		Arsenic	Arsenic
	Barium	Barium	Barium
	Cadmium	Cadmium	Cadmium
	Chromium	Chromium	Chromium
	Copper	Copper	Copper
	Lead	Lead	Lead
	Mercury	Mercury	Mercury
	Nickel	Nickel	Nickel
	Selenium	Selenium	Selenium
	Silver	Silver	Silver
	Zinc	Zinc	Zinc
Butyltins	Dibutyltin		Dibutyltin
	Tributyltin		Tributyltin
Semi-volatiles		2-Methylnaphthalene	2-Methylnaphthalene
		4-Methylphenol	
		Acenaphthene	
		Benzyl Alcohol	
			Bis(2-ethylhexyl)phthalate
		Di-n-butylphthalate	Di-n-butylphthalate
		Dibenzofuran	
		Fluorene	
		Naphthalene	Naphthalene
		Phenanthrene	
		Phenol	
Pesticides/PCBs	Aroclor 1254		Aroclor 1254
	Aroclor 1260	Aroclor 1260	Aroclor 1260
	p,p'-DDD		p,p'-DDD
	p,p'-DDE	p,p'-DDE	p,p'-DDE
	p,p'-DDT		p,p'-DDT
Dioxins/furans	2,3,7,8-TCDF	2,3,7,8-TCDF	2,3,7,8-TCDF
		2,3,7,8-TCDD	2,3,7,8-TCDD
	2,3,4,7,8-PeCDF		2,3,4,7,8-PeCDF
	2,3,4,6,7,8-HxCDF		2,3,4,6,7,8-HxCDF
	1,2,3,7,8-PeCDF		1,2,3,7,8-PeCDF
			1,2,3,7,8-PeCDD
	1,2,3,7,8,9-HxCDF		1,2,3,7,8,9-HxCDF
			1,2,3,6,7,8-HxCDF
	1,2,3,6,7,8-HxCDD		1,2,3,6,7,8-HxCDD
	1,2,3,4,7,8-HxCDD		1,2,3,4,7,8-HxCDD
		1,2,3,4,6,7,8-HpCDF	1,2,3,4,6,7,8-HpCDF
	1,2,3,4,6,7,8-HpCDD		1,2,3,4,6,7,8-HpCDD
	OCDD	OCDD	OCDD
			OCDF
Radionuclides			Cesium 137
			Plutonium 238
	Plutonium 239/240		Plutonium 239/240

TABLE B-4. 1993 LIST OF NON-DETECTED CHEMICALS FOR EACH FISH SPECIES Page (1 of 3)			
	CARP	CRAYFISH	LSSUCKER
Metals	Antimony		Antimony
	Arsenic		
Butyltins		Dibutyltin	
	Monobutyltin	Monobutyltin	Monobutyltin
		Tributyltin	
Semi-volatiles	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene
	1,2-Dichlorobenzene	1,2-Dichlorobenzene	1,2-Dichlorobenzene
	1,3-Dichlorobenzene	1,3-Dichlorobenzene	1,3-Dichlorobenzene
	1,4-Dichlorobenzene	1,4-Dichlorobenzene	1,4-Dichlorobenzene
	2,4,5-Trichlorophenol	2,4,5-Trichlorophenol	2,4,5-Trichlorophenol
	2,4,6-Trichlorophenol	2,4,6-Trichlorophenol	2,4,6-Trichlorophenol
	2,4-Dichlorophenol	2,4-Dichlorophenol	2,4-Dichlorophenol
	2,4-Dimethylphenol	2,4-Dimethylphenol	2,4-Dimethylphenol
	2,4-Dinitrophenol	2,4-Dinitrophenol	2,4-Dinitrophenol
	2,4-Dinitrotoluene	2,4-Dinitrotoluene	2,4-Dinitrotoluene
	2,6-Dinitrotoluene	2,6-Dinitrotoluene	2,6-Dinitrotoluene
	2-Chloronaphthalene	2-Chloronaphthalene	2-Chloronaphthalene
	2-Chlorophenol	2-Chlorophenol	2-Chlorophenol
	2-Methylnaphthalene		
	2-Methylphenol	2-Methylphenol	2-Methylphenol
	2-Nitroaniline	2-Nitroaniline	2-Nitroaniline
	2-Nitrophenol	2-Nitrophenol	2-Nitrophenol
	3,3'-Dichlorobenzidine	3,3'-Dichlorobenzidine	3,3'-Dichlorobenzidine
	3-Nitroaniline	3-Nitroaniline	3-Nitroaniline
	4,6-Dinitro-2-methylphenol	4,6-Dinitro-2-methylphenol	4,6-Dinitro-2-methylphenol
	4-Bromophenyl phenyl ether	4-Bromophenyl phenyl ether	4-Bromophenyl phenyl ether
	4-Chloro-3-methylphenol	4-Chloro-3-methylphenol	4-Chloro-3-methylphenol
	4-Chloroaniline	4-Chloroaniline	4-Chloroaniline
	4-Chlorophenylphenylether	4-Chlorophenylphenylether	4-Chlorophenylphenylether
	4-Methylphenol		4-Methylphenol
	4-Nitroaniline	4-Nitroaniline	4-Nitroaniline
	4-Nitrophenol	4-Nitrophenol	4-Nitrophenol
	Acenaphthene		Acenaphthene
	Acenaphthylene	Acenaphthylene	Acenaphthylene
	Anthracene	Anthracene	Anthracene
	Benz[a]anthracene	Benz[a]anthracene	Benz[a]anthracene
	Benzo[a]pyrene	Benzo[a]pyrene	Benzo[a]pyrene
	Benzo[b,k]fluoranthene	Benzo[b,k]fluoranthene	Benzo[b,k]fluoranthene
	Benzo[g,h,i]perylene	Benzo[g,h,i]perylene	Benzo[g,h,i]perylene
	Benzoic acid	Benzoic acid	Benzoic acid
	Benzyl Alcohol		Benzyl Alcohol
	Bis(2-chloroethoxy)methane	Bis(2-chloroethoxy)methane	Bis(2-chloroethoxy)methane
	Bis(2-chloroethyl)ether	Bis(2-chloroethyl)ether	Bis(2-chloroethyl)ether
	Bis(2-chloroisopropyl)ether	Bis(2-chloroisopropyl)ether	Bis(2-chloroisopropyl)ether
	Bis(2-ethylhexyl)phthalate	Bis(2-ethylhexyl)phthalate	
	Butyl benzyl phthalate	Butyl benzyl phthalate	Butyl benzyl phthalate
	Carbazole	Carbazole	Carbazole
	Chrysene	Chrysene	Chrysene
	Di-n-butylphthalate		
	Di-n-octylphthalate	Di-n-octylphthalate	Di-n-octylphthalate
	Dibenz[a,h]anthracene	Dibenz[a,h]anthracene	Dibenz[a,h]anthracene
	Dibenzofuran		Dibenzofuran
	Diethyl phthalate	Diethyl phthalate	Diethyl phthalate
	Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate
	Fluoranthene	Fluoranthene	Fluoranthene

TABLE B-4. 1993 LIST OF NON-DETECTED CHEMICALS FOR EACH FISH SPECIES (Page 2 of 3)

	CARP	CRAYFISH	LSSUCKER
(con't.)	Fluorene		Fluorene
	Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene
	Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	Hexachlorocyclopentadiene
	Indeno[1,2,3-cd]pyrene	Indeno[1,2,3-cd]pyrene	Indeno[1,2,3-cd]pyrene
	Isophorone	Isophorone	Isophorone
	Naphthalene		
	Nitrobenzene	Nitrobenzene	Nitrobenzene
	Phenanthrene		Phenanthrene
	Phenol		Phenol
	Pyrene	Pyrene	Pyrene
Pesticides/PCBs	Aldrin	Aldrin	Aldrin
	alpha-BHC	alpha-BHC	alpha-BHC
	alpha-Chlordane	alpha-Chlordane	alpha-Chlordane
	Aroclor 1221	Aroclor 1221	Aroclor 1221
	Aroclor 1232	Aroclor 1232	Aroclor 1232
	Aroclor 1242/1016	Aroclor 1242/1016	Aroclor 1242/1016
	Aroclor 1248	Aroclor 1248	Aroclor 1248
		Aroclor 1254	
	beta-BHC	beta-BHC	beta-BHC
	delta-BHC	delta-BHC	delta-BHC
	Dicofol	Dicofol	Dicofol
	Dieldrin	Dieldrin	Dieldrin
	Endosulfan I	Endosulfan I	Endosulfan I
	Endosulfan II	Endosulfan II	Endosulfan II
	Endosulfan sulfate	Endosulfan sulfate	Endosulfan sulfate
	Endrin	Endrin	Endrin
	Endrin aldehyde	Endrin aldehyde	Endrin aldehyde
	Endrin ketone	Endrin ketone	Endrin ketone
	gamma-Chlordane	gamma-Chlordane	gamma-Chlordane
	Heptachlor	Heptachlor	Heptachlor
	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide
	Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene
	Lindane	Lindane	Lindane
	Methoxychlor	Methoxychlor	Methoxychlor
	Methyl parathion	Methyl parathion	Methyl parathion
	o,p'-DDD	o,p'-DDD	o,p'-DDD
	o,p'-DDE	o,p'-DDE	o,p'-DDE
	o,p'-DDT	o,p'-DDT	o,p'-DDT
		p,p'-DDD	
		p,p'-DDT	
	Pentachlorophenol	Pentachlorophenol	Pentachlorophenol
	Toxaphene	Toxaphene	Toxaphene
Dioxins/Furans	2,3,7,8-TCDD		
	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDD	
		1,2,3,7,8-PeCDF	
		2,3,4,7,8-PeCDF	
		1,2,3,4,7,8-HxCDD	
		1,2,3,6,7,8-HxCDD	
	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDD
	1,2,3,4,7,8-HxCDF	1,2,3,4,7,8-HxCDF	1,2,3,4,7,8-HxCDF
	1,2,3,6,7,8-HxCDF	1,2,3,6,7,8-HxCDF	
		1,2,3,7,8,9-HxCDF	
		2,3,4,6,7,8-HxCDF	
		1,2,3,4,6,7,8-HpCDD	
	1,2,3,4,6,7,8-HpCDF		

TABLE B-4. 1993 LIST OF NON-DETECTED CHEMICALS FOR EACH FISH SPECIES (Page 3 of 3)			
	CARP	CRAYFISH	LSSUCKER
(con't.)	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8,9-HpCDF
	OCDF	OCDF	
Radionuclides	Americium 241	Americium 241	Americium 241
	Cesium 137	Cesium 137	
	Cobalt 60	Cobalt 60	Cobalt 60
	Europium 152	Europium 152	Europium 152
	Europium 154	Europium 154	Europium 154
	Europium 155	Europium 155	Europium 155
	Plutonium 238	Plutonium 238	
		Plutonium 239/240	

TABLE B-5. 1995 LIST OF DETECTED CHEMICALS FOR EACH FISH SPECIES						
	CHINOOK	COHO	LS SUCKER	STURGEON	STEELHEAD	CARP
			Antimony			
		Barium	Barium	Barium	Barium	Barium
		Cadmium	Cadmium			
	Arsenic	Arsenic	Arsenic	Arsenic	Arsenic	Arsenic
	Copper	Copper	Copper	Copper	Copper	Copper
	Mercury	Mercury	Mercury	Mercury	Mercury	Mercury
	Nickel	Nickel	Nickel	Nickel	Nickel	Nickel
	Selenium	Selenium	Selenium	Selenium	Selenium	Selenium
	Lead	Lead	Lead			
	Silver	Silver				
Semi-Volatiles	Phenol	Phenol	Phenol			
			4-Methylphenol	4-Methylphenol	4-Methylphenol	
			4-Nitrophenol	4-Nitrophenol	4-Nitrophenol	4-Nitrophenol
			bis(2-ethylhexyl)phthalate			
Pesticides/PCBs				Aldrin		
				alpha-BHC	alpha-BHC	alpha-BHC
			Aroclor 1248	Aroclor 1248		Aroclor 1248
	Aroclor 1260	Aroclor 1260	Aroclor 1260	Aroclor 1260	Aroclor 1260	Aroclor 1260
	DDD	DDD	DDD	DDD	DDD	DDD
	DDE	DDE	DDE	DDE	DDE	DDE
	DDT	DDT	DDT	DDT	DDT	
		Endrin			Endrin	
				Endrin ketone		
				gamma-BHC		gamma-BHC
			Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene
				Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene
				Mirex		
Dioxin/Furans	2,3,7,8-TCDD	2,3,7,8-TCDD				
	2,3,7,8-TCDF	2,3,7,8-TCDF	2,3,7,8-TCDF	2,3,7,8-TCDF	2,3,7,8-TCDF	2,3,7,8-TCDF
	1,2,3,7,8-PeCDD					
	1,2,3,7,8-PeCDF	1,2,3,7,8-PeCDF	1,2,3,7,8-PeCDF	1,2,3,7,8-PeCDF	1,2,3,7,8-PeCDF	1,2,3,7,8-PeCDF
	2,3,4,7,8-PeCDF	2,3,4,7,8-PeCDF		2,3,4,7,8-PeCDF		
	1,2,3,4,7,8-HxCDD		1,2,3,4,7,8-HxCDD		1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDD
	1,2,3,4,7,8-HxCDF	1,2,3,4,7,8-HxCDF				
	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDD			1,2,3,6,7,8-HxCDD
	1,2,3,6,7,8-HxCDF	1,2,3,6,7,8-HxCDF	1,2,3,6,7,8-HxCDF			
	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDD				
	1,2,3,7,8,9-HxCDF		1,2,3,7,8,9-HxCDF	1,2,3,7,8,9-HxCDF		
		2,3,4,6,7,8-HxCDF	2,3,4,6,7,8-HxCDF	2,3,4,6,7,8-HxCDF		2,3,4,6,7,8-HxCDF
	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDD
		1,2,3,4,6,7,8-HpCDF	1,2,3,4,6,7,8-HpCDF	1,2,3,4,6,7,8-HpCDF		
	1,2,3,4,7,8,9-HpCDF					
	OCDD		OCDD	OCDD		OCDD
	OCDF	OCDF	OCDF	OCDF		

TABLE B-6. 1995 LIST OF NON-DETECTED CHEMICALS FOR EACH FISH SPECIES (Page 1 of 2)

	CHINOOK	COHO	LS SUCKER	STURGEON	STEELHEAD	CARP
Metals	Antimony	Antimony		Antimony	Antimony	Antimony
	Barium					
	Cadmium			Cadmium	Cadmium	Cadmium
				Lead	Lead	Lead
			Silver	Silver	Silver	Silver
Semi-volatiles	1,4-Dichlorobenzene	1,4-Dichlorobenzene	1,4-Dichlorobenzene	1,4-Dichlorobenzene	1,4-Dichlorobenzene	1,4-Dichlorobenzene
	2,4-Dinitrophenol	2,4-Dinitrophenol	2,4-Dinitrophenol	2,4-Dinitrophenol	2,4-Dinitrophenol	2,4-Dinitrophenol
	2,4-Trichlorobenzene	2,4-Trichlorobenzene	2,4-Trichlorobenzene	2,4-Trichlorobenzene	2,4-Trichlorobenzene	2,4-Trichlorobenzene
	2-Chlorophenol	2-Chlorophenol	2-Chlorophenol	2-Chlorophenol	2-Chlorophenol	2-Chlorophenol
	4-Methylphenol	4-Methylphenol				4-Methylphenol
	4-Nitrophenol	4-Nitrophenol				
	Acenaphthene	Acenaphthene	Acenaphthene	Acenaphthene	Acenaphthene	Acenaphthene
	bis(2-ethylhexyl)phthalate	bis(2-ethylhexyl)phthalate		bis(2-ethylhexyl)phthalate	bis(2-ethylhexyl)phthalate	bis(2-ethylhexyl)phthalate
	Chrysene	Chrysene	Chrysene	Chrysene	Chrysene	Chrysene
	Isophorone	Isophorone	Isophorone	Isophorone	Isophorone	Isophorone
	N-nitroso-di-n-propylamine	N-nitroso-di-n-propylamine	N-nitroso-di-n-propylamine	N-nitroso-di-n-propylamine	N-nitroso-di-n-propylamine	N-nitroso-di-n-propylamine
				Phenol	Phenol	Phenol
	Pyrene	Pyrene	Pyrene	Pyrene	Pyrene	Pyrene
Pesticides/PCBs	Aldrin	Aldrin	Aldrin		Aldrin	Aldrin
	alpha-BHC	alpha-BHC	alpha-BHC			
	alpha-Chlordane	alpha-Chlordane	alpha-Chlordane	alpha-Chlordane	alpha-Chlordane	alpha-Chlordane
	Aroclor1016	Aroclor1016	Aroclor1016	Aroclor1016	Aroclor1016	Aroclor 1016
	Aroclor1221	Aroclor1221	Aroclor1221	Aroclor1221	Aroclor1221	Aroclor 1221
	Aroclor1232	Aroclor1232	Aroclor1232	Aroclor1232	Aroclor1232	Aroclor 1232
	Aroclor1242	Aroclor1242	Aroclor1242	Aroclor1242	Aroclor1242	Aroclor 1242
	Aroclor1248	Aroclor1248			Aroclor1248	
	Aroclor1254	Aroclor1254	Aroclor1254	Aroclor1254	Aroclor1254	Aroclor 1254
	beta-BHC	beta-BHC	beta-BHC	beta-BHC	beta-BHC	beta-BHC
						DDT
	delta-BHC	delta-BHC	delta-BHC	delta-BHC	delta-BHC	delta-BHC
	Dieldrin	Dieldrin	Dieldrin	Dieldrin	Dieldrin	Dieldrin
	Endosulfan I	Endosulfan I	Endosulfan I	Endosulfan I	Endosulfan I	Endosulfan I
	Endosulfan II	Endosulfan II	Endosulfan II	Endosulfan II	Endosulfan II	Endosulfan II
	Endosulfan sulfate	Endosulfan sulfate	Endosulfan sulfate	Endosulfan sulfate	Endosulfan sulfate	Endosulfan sulfate
	Endrin		Endrin	Endrin		Endrin
	Endrin aldehyde	Endrin aldehyde	Endrin aldehyde	Endrin aldehyde	Endrin aldehyde	Endrin aldehyde
	Endrin ketone	Endrin ketone	Endrin ketone		Endrin ketone	Endrin ketone
	gamma-BHC	gamma-BHC	gamma-BHC		gamma-BHC	
	gamma-Chlordane	gamma-Chlordane	gamma-Chlordane	gamma-Chlordane	gamma-Chlordane	gamma-Chlordane
	Heptachlor	Heptachlor	Heptachlor	Heptachlor	Heptachlor	Heptachlor
	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide
	Hexachlorobenzene	Hexachlorobenzene				
	Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene			
	Methoxychlor	Methoxychlor	Methoxychlor	Methoxychlor	Methoxychlor	Methoxychlor
	Methyl parathion	Methyl parathion	Methyl parathion	Methyl parathion	Methyl parathion	Methyl parathion
	Mirex	Mirex	Mirex		Mirex	Mirex
	Toxaphene	Toxaphene	Toxaphene	Toxaphene	Toxaphene	Toxaphene

TABLE B-6. 1995 LIST OF NON-DETECTED CHEMICALS FOR EACH FISH SPECIES (Page 2 of 2)

	CHINOOK	COHO	LS SUCKER	STURGEON	STEELHEAD	CARP
Dioxin/Furans			2,3,7,8-TCDD	2,3,7,8-TCDD	2,3,7,8-TCDD	2,3,7,8-TCDD
		1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDD
			2,3,4,7,8-PeCDF		2,3,4,7,8-PeCDF	2,3,4,7,8-PeCDF
		1,2,3,4,7,8-HxCDD		1,2,3,4,7,8-HxCDD		
				1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDD	
			1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDD
			1,2,3,4,7,8-HxCDF	1,2,3,4,7,8-HxCDF	1,2,3,4,7,8-HxCDF	1,2,3,4,7,8-HxCDF
				1,2,3,6,7,8-HxCDF	1,2,3,6,7,8-HxCDF	1,2,3,6,7,8-HxCDF
		1,2,3,7,8,9-HxCDF			1,2,3,7,8,9-HxCDF	1,2,3,7,8,9-HxCDF
	2,3,4,6,7,8-HxCDF				2,3,4,6,7,8-HxCDF	
	1,2,3,4,6,7,8-HpCDF				1,2,3,4,6,7,8-HpCDF	1,2,3,4,6,7,8-HpCDF
		1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8,9-HpCDF
		OCDD			OCDD	
					OCDF	OCDF

TABLE B-7. 1991 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 1 of 11)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Common Carp	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	5.74E-03	9.81E-03	0
Common Carp	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	5.82E-04	1.31E-03	0
Common Carp	Dioxin/furans	1,2,3,4,7,8,9-HpCDF	1.25E-04	5.60E-04	80
Common Carp	Dioxin/furans	1,2,3,4,7,8-HxCDD	7.82E-04	1.45E-03	0
Common Carp	Dioxin/furans	1,2,3,4,7,8-HxCDF	3.44E-04	6.60E-04	0
Common Carp	Dioxin/furans	1,2,3,6,7,8-HxCDD	2.55E-03	4.82E-03	0
Common Carp	Dioxin/furans	1,2,3,6,7,8-HxCDF	2.84E-04	5.70E-04	0
Common Carp	Dioxin/furans	1,2,3,7,8,9-HxCDD	2.56E-04	5.00E-04	20
Common Carp	Dioxin/furans	1,2,3,7,8,9-HxCDF	1.07E-04	3.40E-04	80
Common Carp	Dioxin/furans	1,2,3,7,8-PeCDD	1.46E-03	1.89E-03	0
Common Carp	Dioxin/furans	1,2,3,7,8-PeCDF	4.44E-04	7.60E-04	0
Common Carp	Dioxin/furans	2,3,4,6,7,8-HxCDF	2.04E-03	5.70E-03	0
Common Carp	Dioxin/furans	2,3,4,7,8-PeCDF	9.78E-04	1.37E-03	0
Common Carp	Dioxin/furans	2,3,7,8-TCDD	1.58E-03	2.10E-03	0
Common Carp	Dioxin/furans	2,3,7,8-TCDF	7.72E-03	1.22E-02	0
Common Carp	Dioxin/furans	OCDD	1.47E-02	3.06E-02	0
Common Carp	Dioxin/furans	OCDF	9.11E-04	2.45E-03	40
Common Carp	Metal	Antimony	1.96E+02	4.80E+02	100
Common Carp	Metal	Arsenic	2.61E+02	6.40E+02	100
Common Carp	Metal	Barium	2.34E+03	3.40E+03	0
Common Carp	Metal	Cadmium	1.40E+02	3.50E+02	0
Common Carp	Metal	Copper	1.50E+03	1.82E+03	0
Common Carp	Metal	Lead	1.46E+02	2.30E+02	0
Common Carp	Metal	Mercury	2.19E+02	1.00E+03	0
Common Carp	Metal	Nickel	2.83E+03	1.73E+04	63
Common Carp	Metal	Selenium	2.61E+02	6.40E+02	100
Common Carp	Metal	Silver	1.18E+02	2.90E+02	100
Common Carp	Metal	Zinc	1.03E+05	1.34E+05	0
Common Carp	PCBs	Aroclor 1016	2.50E+01	5.00E+01	100
Common Carp	PCBs	Aroclor 1221	2.50E+01	5.00E+01	100
Common Carp	PCBs	Aroclor 1232	2.50E+01	5.00E+01	100
Common Carp	PCBs	Aroclor 1242	2.50E+01	5.00E+01	100
Common Carp	PCBs	Aroclor 1248	2.50E+01	5.00E+01	100
Common Carp	PCBs	Aroclor 1254	1.10E+02	2.70E+02	44
Common Carp	PCBs	Aroclor 1260	4.96E+01	1.10E+02	56
Common Carp	Pesticide	Aldrin	2.51E+00	9.60E+00	89
Common Carp	Pesticide	alpha-BHC	1.50E+00	3.00E+00	100
Common Carp	Pesticide	beta-BHC	1.50E+00	3.00E+00	100
Common Carp	Pesticide	Chlordane	1.50E+00	3.00E+00	100
Common Carp	Pesticide	Dacthal	1.56E+00	4.00E+00	100
Common Carp	Pesticide	delta-BHC	1.50E+00	3.00E+00	100
Common Carp	Pesticide	Dicofol	1.50E+01	3.00E+01	100
Common Carp	Pesticide	Dieldrin	2.58E+00	1.00E+01	78
Common Carp	Pesticide	Endosulfan I	1.50E+00	3.00E+00	100
Common Carp	Pesticide	Endosulfan II	1.50E+00	3.00E+00	100
Common Carp	Pesticide	Endosulfan sulfate	1.50E+00	3.00E+00	100
Common Carp	Pesticide	Endrin	2.27E+00	1.20E+01	89
Common Carp	Pesticide	Endrin aldehyde	1.61E+00	5.00E+00	100
Common Carp	Pesticide	Heptachlor	1.50E+00	3.00E+00	100
Common Carp	Pesticide	Heptachlor epoxide	1.56E+00	4.00E+00	100
Common Carp	Pesticide	Hexachlorobenzene	1.00E+02	2.00E+02	100
Common Carp	Pesticide	Lindane	1.72E+00	3.50E+00	89
Common Carp	Pesticide	Malathion	1.72E+00	6.00E+00	100
Common Carp	Pesticide	Methoxychlor	1.50E+01	3.00E+01	100
Common Carp	Pesticide	Methyl parathion	1.94E+00	1.00E+01	100
Common Carp	Pesticide	Mirex	2.31E+00	8.80E+00	89

TABLE B-7. 1991 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 2 of 11)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Common Carp	Pesticide	o,p'-DDD	2.81E+00	2.00E+01	89
Common Carp	Pesticide	o,p'-DDE	5.44E+00	1.70E+01	67
Common Carp	Pesticide	o,p'-DDT	2.49E+00	8.00E+00	89
Common Carp	Pesticide	p,p'-DDD	7.10E+00	2.30E+01	33
Common Carp	Pesticide	p,p'-DDE	3.74E+01	9.10E+01	22
Common Carp	Pesticide	p,p'-DDT	4.03E+00	1.10E+01	44
Common Carp	Pesticide	Parathion	1.50E+00	3.00E+00	100
Common Carp	Pesticide	Pentachlorophenol	5.00E+02	1.00E+03	100
Common Carp	Pesticide	Toxaphene	7.50E+01	1.50E+02	100
Common Carp	Semi-volatile	1,2,4-Trichlorobenzene	4.33E+02	3.10E+03	89
Common Carp	Semi-volatile	1,2-Dichlorobenzene	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	1,3-Dichlorobenzene	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	1,4-Dichlorobenzene	2.44E+02	1.80E+03	89
Common Carp	Semi-volatile	2,4,6-Trichlorophenol	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	2,4-Dichlorophenol	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	2,4-Dimethylphenol	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	2,4-Dinitrophenol	5.00E+02	1.00E+03	100
Common Carp	Semi-volatile	2,4-Dinitrotoluene	1.56E+02	1.00E+03	89
Common Carp	Semi-volatile	2,6-Dinitrotoluene	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	2-Chloronaphthalene	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	2-Chlorophenol	5.11E+02	4.20E+03	89
Common Carp	Semi-volatile	2-Methylnaphthalene	7.57E+01	2.30E+02	78
Common Carp	Semi-volatile	2-Methylphenol	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	2-Nitrophenol	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	3,3'-Dichlorobenzidine	5.00E+02	1.00E+03	100
Common Carp	Semi-volatile	4-Bromophenyl phenyl ether	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	4-Chloro-3-methylphenol	7.11E+02	5.60E+03	89
Common Carp	Semi-volatile	4-Chlorophenylphenylether	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	4-Methylphenol	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	4-Nitrophenol	8.89E+02	4.00E+03	89
Common Carp	Semi-volatile	Acenaphthene	4.67E+02	3.80E+03	89
Common Carp	Semi-volatile	Acenaphthylene	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Anthracene	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Benz[a]anthracene	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Benzo[a]pyrene	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	Benzo[b]fluoranthene	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	Benzo[g,h,i]perylene	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	Benzo[k]fluoranthene	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	Bis(2-chloroethoxy)methane	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Bis(2-chloroethyl)ether	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Bis(2-chloroisopropyl)ether	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Bis(2-ethylhexyl)phthalate	7.14E+02	1.50E+03	11
Common Carp	Semi-volatile	Butyl benzyl phthalate	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Chrysene	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Di-n-butylphthalate	7.11E+01	1.60E+02	78
Common Carp	Semi-volatile	Di-n-octylphthalate	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	Dibenz[a,h]anthracene	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	Diethyl phthalate	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	Dimethyl phthalate	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Fluoranthene	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Fluorene	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Hexachlorobutadiene	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Hexachlorocyclopentadiene	2.50E+02	5.00E+02	100
Common Carp	Semi-volatile	Hexachloroethane	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	Indeno[1,2,3-cd]pyrene	1.00E+02	2.00E+02	100
Common Carp	Semi-volatile	Isophorone	5.00E+01	1.00E+02	100

TABLE B-7. 1991 LOWER COLUMBIA RIVER DATA ($\mu g/kg$)(Page 3 of 11)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Common Carp	Semi-volatile	N-Nitroso-di-n-propylamine	3.67E+02	2.90E+03	89
Common Carp	Semi-volatile	N-Nitrosodiphenylamine	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Naphthalene	6.89E+01	2.20E+02	89
Common Carp	Semi-volatile	Nitrobenzene	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Phenanthrene	5.00E+01	1.00E+02	100
Common Carp	Semi-volatile	Phenol	6.00E+02	5.00E+03	89
Common Carp	Semi-volatile	Pyrene	6.22E+02	5.20E+03	89
Crayfish	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	1.47E-03	5.21E-03	8
Crayfish	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	2.55E-04	7.00E-04	42
Crayfish	Dioxin/furans	1,2,3,4,7,8,9-HpCDF	9.63E-05	3.50E-04	92
Crayfish	Dioxin/furans	1,2,3,4,7,8-HxCDD	1.21E-04	3.90E-04	75
Crayfish	Dioxin/furans	1,2,3,4,7,8-HxCDF	1.73E-04	4.20E-04	67
Crayfish	Dioxin/furans	1,2,3,6,7,8-HxCDD	2.58E-04	8.90E-04	58
Crayfish	Dioxin/furans	1,2,3,6,7,8-HxCDF	1.59E-04	4.00E-04	67
Crayfish	Dioxin/furans	1,2,3,7,8,9-HxCDD	1.88E-04	7.60E-04	75
Crayfish	Dioxin/furans	1,2,3,7,8,9-HxCDF	1.67E-04	7.10E-04	83
Crayfish	Dioxin/furans	1,2,3,7,8-PeCDD	1.81E-04	8.30E-04	92
Crayfish	Dioxin/furans	1,2,3,7,8-PeCDF	2.97E-04	1.02E-03	33
Crayfish	Dioxin/furans	2,3,4,6,7,8-HxCDF	9.37E-04	7.26E-03	8
Crayfish	Dioxin/furans	2,3,4,7,8-PeCDF	6.23E-04	3.05E-03	0
Crayfish	Dioxin/furans	2,3,7,8-TCDD	4.64E-04	8.60E-04	0
Crayfish	Dioxin/furans	2,3,7,8-TCDF	5.97E-03	1.24E-02	0
Crayfish	Dioxin/furans	OCDD	1.15E-02	7.91E-02	0
Crayfish	Dioxin/furans	OCDF	4.13E-04	1.24E-03	50
Crayfish	Metal	Antimony	1.09E+03	4.05E+03	100
Crayfish	Metal	Arsenic	1.92E+02	5.40E+02	100
Crayfish	Metal	Barium	1.44E+03	3.50E+03	0
Crayfish	Metal	Cadmium	7.28E+01	1.20E+02	0
Crayfish	Metal	Copper	3.01E+04	4.64E+04	0
Crayfish	Metal	Lead	2.31E+01	5.00E+01	22
Crayfish	Metal	Mercury	3.37E+01	7.80E+01	17
Crayfish	Metal	Nickel	4.13E+02	1.02E+03	89
Crayfish	Metal	Selenium	1.92E+02	5.40E+02	100
Crayfish	Metal	Silver	7.23E+02	1.54E+03	17
Crayfish	Metal	Zinc	2.68E+04	3.88E+04	0
Crayfish	PCBs	Aroclor 1016	2.50E+01	5.00E+01	100
Crayfish	PCBs	Aroclor 1221	2.50E+01	5.00E+01	100
Crayfish	PCBs	Aroclor 1232	2.50E+01	5.00E+01	100
Crayfish	PCBs	Aroclor 1242	2.50E+01	5.00E+01	100
Crayfish	PCBs	Aroclor 1248	2.50E+01	5.00E+01	100
Crayfish	PCBs	Aroclor 1254	2.50E+01	5.00E+01	100
Crayfish	PCBs	Aroclor 1260	2.50E+01	5.00E+01	100
Crayfish	Pesticide	Aldrin	1.50E+00	3.00E+00	100
Crayfish	Pesticide	alpha-BHC	1.50E+00	3.00E+00	100
Crayfish	Pesticide	beta-BHC	1.87E+00	5.60E+00	89
Crayfish	Pesticide	Chlordane	1.50E+00	3.00E+00	100
Crayfish	Pesticide	Dacthal	1.50E+00	3.00E+00	100
Crayfish	Pesticide	delta-BHC	1.50E+00	3.00E+00	100
Crayfish	Pesticide	Dicofol	1.50E+01	3.00E+01	100
Crayfish	Pesticide	Dieldrin	1.78E+00	6.60E+00	94
Crayfish	Pesticide	Endosulfan I	1.50E+00	3.00E+00	100
Crayfish	Pesticide	Endosulfan II	1.87E+00	7.60E+00	94
Crayfish	Pesticide	Endosulfan sulfate	1.58E+00	3.00E+00	94
Crayfish	Pesticide	Endrin	1.53E+00	4.00E+00	100
Crayfish	Pesticide	Endrin aldehyde	1.50E+00	3.00E+00	100
Crayfish	Pesticide	Heptachlor	1.67E+00	4.50E+00	94

TABLE B-7. 1991 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 4 of 11)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Crayfish	Pesticide	Heptachlor epoxide	1.50E+00	3.00E+00	100
Crayfish	Pesticide	Hexachlorobenzene	1.00E+02	2.00E+02	100
Crayfish	Pesticide	Lindane	1.50E+00	3.00E+00	100
Crayfish	Pesticide	Malathion	1.50E+00	3.00E+00	100
Crayfish	Pesticide	Methoxychlor	1.73E+01	4.00E+01	89
Crayfish	Pesticide	Methyl parathion	5.14E+00	3.80E+01	83
Crayfish	Pesticide	Mirex	1.50E+00	3.00E+00	100
Crayfish	Pesticide	o,p'-DDD	1.50E+00	3.00E+00	100
Crayfish	Pesticide	o,p'-DDE	1.50E+00	3.00E+00	100
Crayfish	Pesticide	o,p'-DDT	1.58E+00	3.00E+00	94
Crayfish	Pesticide	p,p'-DDD	2.72E+00	9.90E+00	89
Crayfish	Pesticide	p,p'-DDE	8.04E+00	1.70E+01	11
Crayfish	Pesticide	p,p'-DDT	1.61E+00	4.00E+00	94
Crayfish	Pesticide	Parathion	1.50E+00	3.00E+00	100
Crayfish	Pesticide	Pentachlorophenol	5.00E+02	1.00E+03	100
Crayfish	Pesticide	Toxaphene	7.50E+01	1.50E+02	100
Crayfish	Semi-volatile	1,2,4-Trichlorobenzene	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	1,2-Dichlorobenzene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	1,3-Dichlorobenzene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	1,4-Dichlorobenzene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	2,4,6-Trichlorophenol	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	2,4-Dichlorophenol	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	2,4-Dimethylphenol	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	2,4-Dinitrophenol	5.00E+02	1.00E+03	100
Crayfish	Semi-volatile	2,4-Dinitrotoluene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	2,6-Dinitrotoluene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	2-Chloronaphthalene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	2-Chlorophenol	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	2-Methylnaphthalene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	2-Methylphenol	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	2-Nitrophenol	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	3,3'-Dichlorobenzidine	5.00E+02	1.00E+03	100
Crayfish	Semi-volatile	4-Bromophenyl phenyl ether	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	4-Chloro-3-methylphenol	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	4-Chlorophenylphenylether	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	4-Methylphenol	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	4-Nitrophenol	5.00E+02	1.00E+03	100
Crayfish	Semi-volatile	Acenaphthene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Acenaphthylene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Anthracene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Benz[a]anthracene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Benzo[a]pyrene	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	Benzo[b]fluoranthene	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	Benzo[g,h,i]perylene	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	Benzo[k]fluoranthene	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	Bis(2-chloroethoxy)methane	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Bis(2-chloroethyl)ether	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Bis(2-chloroisopropyl)ether	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Bis(2-ethylhexyl)phthalate	3.58E+02	3.10E+03	28
Crayfish	Semi-volatile	Butyl benzyl phthalate	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Chrysene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Di-n-butylphthalate	5.33E+01	1.10E+02	94
Crayfish	Semi-volatile	Di-n-octylphthalate	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	Dibenz[a,h]anthracene	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	Diethyl phthalate	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	Dimethyl phthalate	5.00E+01	1.00E+02	100

TABLE B-7. 1991 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 5 of 11)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Crayfish	Semi-volatile	Fluoranthene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Fluorene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Hexachlorobutadiene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Hexachlorocyclopentadiene	2.50E+02	5.00E+02	100
Crayfish	Semi-volatile	Hexachloroethane	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	Indeno[1,2,3-cd]pyrene	1.00E+02	2.00E+02	100
Crayfish	Semi-volatile	Isophorone	1.30E+02	4.30E+02	61
Crayfish	Semi-volatile	N-Nitroso-di-n-propylamine	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	N-Nitrosodiphenylamine	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Naphthalene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Nitrobenzene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Phenanthrene	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Phenol	5.00E+01	1.00E+02	100
Crayfish	Semi-volatile	Pyrene	5.00E+01	1.00E+02	100
Largescale Sucker	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	2.40E-03	4.36E-03	0
Largescale Sucker	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	6.98E-04	1.79E-03	0
Largescale Sucker	Dioxin/furans	1,2,3,4,7,8,9-HpCDF	1.52E-04	4.30E-04	0
Largescale Sucker	Dioxin/furans	1,2,3,4,7,8-HxCDD	2.41E-04	5.30E-04	0
Largescale Sucker	Dioxin/furans	1,2,3,4,7,8-HxCDF	2.19E-04	4.50E-04	0
Largescale Sucker	Dioxin/furans	1,2,3,6,7,8-HxCDD	7.09E-04	1.42E-03	0
Largescale Sucker	Dioxin/furans	1,2,3,6,7,8-HxCDF	2.09E-04	3.60E-04	0
Largescale Sucker	Dioxin/furans	1,2,3,7,8,9-HxCDD	3.75E-04	9.20E-04	0
Largescale Sucker	Dioxin/furans	1,2,3,7,8,9-HxCDF	1.93E-04	6.00E-04	0
Largescale Sucker	Dioxin/furans	1,2,3,7,8-PeCDD	6.06E-04	1.10E-03	0
Largescale Sucker	Dioxin/furans	1,2,3,7,8-PeCDF	2.51E-04	4.90E-04	0
Largescale Sucker	Dioxin/furans	2,3,4,6,7,8-HxCDF	1.45E-03	2.77E-03	0
Largescale Sucker	Dioxin/furans	2,3,4,7,8-PeCDF	5.78E-04	1.21E-03	0
Largescale Sucker	Dioxin/furans	2,3,7,8-TCDD	9.91E-04	1.56E-03	0
Largescale Sucker	Dioxin/furans	2,3,7,8-TCDF	7.06E-03	1.14E-02	0
Largescale Sucker	Dioxin/furans	OCDD	8.32E-03	2.13E-02	0
Largescale Sucker	Dioxin/furans	OCDF	1.82E-03	1.06E-02	0
Largescale Sucker	Metal	Antimony	2.45E+02	3.38E+03	100
Largescale Sucker	Metal	Arsenic	2.14E+02	5.20E+02	100
Largescale Sucker	Metal	Barium	2.73E+03	5.40E+03	0
Largescale Sucker	Metal	Cadmium	3.83E+01	6.00E+01	0
Largescale Sucker	Metal	Copper	9.87E+02	1.23E+03	0
Largescale Sucker	Metal	Lead	1.79E+02	8.60E+02	22
Largescale Sucker	Metal	Mercury	8.07E+01	1.37E+02	0
Largescale Sucker	Metal	Nickel	5.40E+02	1.36E+03	78
Largescale Sucker	Metal	Selenium	2.14E+02	5.20E+02	100
Largescale Sucker	Metal	Silver	9.64E+01	2.40E+02	100
Largescale Sucker	Metal	Zinc	2.98E+04	9.80E+04	0
Largescale Sucker	PCBs	Aroclor 1016	2.50E+01	5.00E+01	100
Largescale Sucker	PCBs	Aroclor 1221	2.50E+01	5.00E+01	100
Largescale Sucker	PCBs	Aroclor 1232	2.50E+01	5.00E+01	100
Largescale Sucker	PCBs	Aroclor 1242	2.50E+01	5.00E+01	100
Largescale Sucker	PCBs	Aroclor 1248	2.50E+01	5.00E+01	100
Largescale Sucker	PCBs	Aroclor 1254	1.27E+02	3.80E+02	6
Largescale Sucker	PCBs	Aroclor 1260	3.08E+01	1.30E+02	94
Largescale Sucker	Pesticide	Aldrin	1.97E+00	5.60E+00	82
Largescale Sucker	Pesticide	alpha-BHC	2.42E+00	1.00E+01	88
Largescale Sucker	Pesticide	beta-BHC	1.95E+00	8.00E+00	94
Largescale Sucker	Pesticide	Chlordane	1.50E+00	3.00E+00	100
Largescale Sucker	Pesticide	Dacthal	1.50E+00	3.00E+00	100
Largescale Sucker	Pesticide	delta-BHC	1.50E+00	3.00E+00	100
Largescale Sucker	Pesticide	Dicofol	1.50E+01	3.00E+01	100

TABLE B-7. 1991 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 6 of 11)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Largescale Sucker	Pesticide	Dieldrin	1.74E+00	4.50E+00	94
Largescale Sucker	Pesticide	Endosulfan I	1.61E+00	3.30E+00	94
Largescale Sucker	Pesticide	Endosulfan II	1.50E+00	3.00E+00	100
Largescale Sucker	Pesticide	Endosulfan sulfate	1.79E+00	6.00E+00	94
Largescale Sucker	Pesticide	Endrin	2.86E+00	1.20E+01	88
Largescale Sucker	Pesticide	Endrin aldehyde	1.75E+00	4.20E+00	94
Largescale Sucker	Pesticide	Heptachlor	1.50E+00	3.00E+00	100
Largescale Sucker	Pesticide	Heptachlor epoxide	1.50E+00	3.00E+00	100
Largescale Sucker	Pesticide	Hexachlorobenzene	1.00E+02	2.00E+02	100
Largescale Sucker	Pesticide	Lindane	2.20E+00	7.70E+00	82
Largescale Sucker	Pesticide	Malathion	1.50E+00	3.00E+00	100
Largescale Sucker	Pesticide	Methoxychlor	1.79E+01	6.50E+01	94
Largescale Sucker	Pesticide	Methyl parathion	3.28E+00	1.60E+01	100
Largescale Sucker	Pesticide	Mirex	1.50E+00	3.00E+00	100
Largescale Sucker	Pesticide	o,p'-DDD	9.53E+00	2.90E+01	65
Largescale Sucker	Pesticide	o,p'-DDE	1.09E+01	4.20E+01	47
Largescale Sucker	Pesticide	o,p'-DDT	2.26E+00	1.50E+01	100
Largescale Sucker	Pesticide	p,p'-DDD	1.64E+01	3.00E+01	12
Largescale Sucker	Pesticide	p,p'-DDE	2.39E+01	7.00E+01	100
Largescale Sucker	Pesticide	p,p'-DDT	6.56E+00	1.60E+01	24
Largescale Sucker	Pesticide	Parathion	2.74E+00	1.50E+01	88
Largescale Sucker	Pesticide	Pentachlorophenol	5.00E+02	1.00E+03	100
Largescale Sucker	Pesticide	Toxaphene	7.50E+01	1.50E+02	100
Largescale Sucker	Semi-volatile	1,2,4-Trichlorobenzene	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	1,2-Dichlorobenzene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	1,3-Dichlorobenzene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	1,4-Dichlorobenzene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	2,4,6-Trichlorophenol	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	2,4-Dichlorophenol	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	2,4-Dimethylphenol	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	2,4-Dinitrophenol	5.00E+02	1.00E+03	100
Largescale Sucker	Semi-volatile	2,4-Dinitrotoluene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	2,6-Dinitrotoluene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	2-Chloronaphthalene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	2-Chlorophenol	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	2-Methylnaphthalene	5.50E+01	1.40E+02	94
Largescale Sucker	Semi-volatile	2-Methylphenol	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	2-Nitrophenol	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	3,3'-Dichlorobenzidine	5.00E+02	1.00E+03	100
Largescale Sucker	Semi-volatile	4-Bromophenyl phenyl ether	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	4-Chloro-3-methylphenol	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	4-Chlorophenylphenylether	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	4-Methylphenol	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	4-Nitrophenol	5.00E+02	1.00E+03	100
Largescale Sucker	Semi-volatile	Acenaphthene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Acenaphthylene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Anthracene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Benz[a]anthracene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Benzo[a]pyrene	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	Benzo[b]fluoranthene	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	Benzo[g,h,i]perylene	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	Benzo[k]fluoranthene	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	Bis(2-chloroethoxy)methane	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Bis(2-chloroethyl)ether	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Bis(2-chloroisopropyl)ether	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Bis(2-ethylhexyl)phthalate	3.51E+02	1.10E+03	56

TABLE B-7. 1991 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 7 of 11)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Largescale Sucker	Semi-volatile	Butyl benzyl phthalate	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Chrysene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Di-n-butylphthalate	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Di-n-octylphthalate	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	Dibenz[a,h]anthracene	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	Diethyl phthalate	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	Dimethyl phthalate	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Fluoranthene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Fluorene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Hexachlorobutadiene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Hexachlorocyclopentadiene	2.50E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	Hexachloroethane	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	Indeno[1,2,3-cd]pyrene	1.00E+02	2.00E+02	100
Largescale Sucker	Semi-volatile	Isophorone	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	N-Nitroso-di-n-propylamine	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	N-Nitrosodiphenylamine	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Naphthalene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Nitrobenzene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Phenanthrene	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Phenol	5.00E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Pyrene	5.00E+01	1.00E+02	100
Peamouth	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	1.16E-03	2.81E-03	0
Peamouth	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	2.86E-04	7.40E-04	14
Peamouth	Dioxin/furans	1,2,3,4,7,8,9-HpCDF	1.04E-04	5.00E-04	43
Peamouth	Dioxin/furans	1,2,3,4,7,8-HxCDD	2.90E-04	8.70E-04	0
Peamouth	Dioxin/furans	1,2,3,4,7,8-HxCDF	2.31E-04	7.10E-04	29
Peamouth	Dioxin/furans	1,2,3,6,7,8-HxCDD	6.01E-04	1.16E-03	0
Peamouth	Dioxin/furans	1,2,3,6,7,8-HxCDF	1.60E-04	6.40E-04	29
Peamouth	Dioxin/furans	1,2,3,7,8,9-HxCDD	1.91E-04	4.70E-04	14
Peamouth	Dioxin/furans	1,2,3,7,8,9-HxCDF	2.29E-04	1.38E-03	100
Peamouth	Dioxin/furans	1,2,3,7,8-PeCDD	8.29E-04	2.04E-03	0
Peamouth	Dioxin/furans	1,2,3,7,8-PeCDF	5.11E-04	8.60E-04	0
Peamouth	Dioxin/furans	2,3,4,6,7,8-HxCDF	4.06E-04	1.61E-03	29
Peamouth	Dioxin/furans	2,3,4,7,8-PeCDF	1.03E-03	2.46E-03	0
Peamouth	Dioxin/furans	2,3,7,8-TCDD	2.76E-03	4.41E-03	0
Peamouth	Dioxin/furans	2,3,7,8-TCDF	4.13E-02	5.88E-02	0
Peamouth	Dioxin/furans	OCDD	6.91E-03	1.81E-02	0
Peamouth	Dioxin/furans	OCDF	7.51E-04	2.03E-03	14
Peamouth	Metal	Antimony	1.70E+02	3.70E+02	100
Peamouth	Metal	Arsenic	2.26E+02	4.90E+02	100
Peamouth	Metal	Barium	2.65E+03	4.20E+03	0
Peamouth	Metal	Cadmium	3.80E+01	8.00E+01	0
Peamouth	Metal	Copper	4.79E+03	2.78E+04	0
Peamouth	Metal	Lead	2.36E+02	1.35E+03	0
Peamouth	Metal	Mercury	1.21E+02	2.30E+02	0
Peamouth	Metal	Nickel	8.53E+02	3.42E+03	80
Peamouth	Metal	Selenium	2.26E+02	4.90E+02	100
Peamouth	Metal	Silver	1.02E+02	2.20E+02	100
Peamouth	Metal	Zinc	2.92E+04	4.42E+04	0
Peamouth	PCBs	Aroclor 1016	2.50E+01	5.00E+01	100
Peamouth	PCBs	Aroclor 1221	2.50E+01	5.00E+01	100
Peamouth	PCBs	Aroclor 1232	2.50E+01	5.00E+01	100
Peamouth	PCBs	Aroclor 1242	3.77E+01	9.90E+01	80
Peamouth	PCBs	Aroclor 1248	2.50E+01	5.00E+01	100
Peamouth	PCBs	Aroclor 1254	2.50E+01	5.00E+01	100
Peamouth	PCBs	Aroclor 1260	1.90E+02	5.20E+02	0

TABLE B-7. 1991 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 8 of 11)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Peamouth	Pesticide	Aldrin	1.54E+01	6.70E+01	70
Peamouth	Pesticide	alpha-BHC	9.20E+00	2.50E+01	100
Peamouth	Pesticide	beta-BHC	3.77E+01	1.60E+02	80
Peamouth	Pesticide	Chlordane	9.20E+00	2.50E+01	100
Peamouth	Pesticide	Dacthal	1.04E+01	2.50E+01	90
Peamouth	Pesticide	delta-BHC	1.03E+01	4.00E+01	100
Peamouth	Pesticide	Dicofol	9.20E+01	2.50E+02	100
Peamouth	Pesticide	Dieldrin	1.42E+01	4.00E+01	80
Peamouth	Pesticide	Endosulfan I	2.72E+01	8.50E+01	70
Peamouth	Pesticide	Endosulfan II	9.20E+00	2.50E+01	100
Peamouth	Pesticide	Endosulfan sulfate	9.20E+00	2.50E+01	100
Peamouth	Pesticide	Endrin	9.20E+00	2.50E+01	100
Peamouth	Pesticide	Endrin aldehyde	1.30E+01	4.00E+01	90
Peamouth	Pesticide	Heptachlor	9.45E+00	2.50E+01	100
Peamouth	Pesticide	Heptachlor epoxide	9.20E+00	2.50E+01	100
Peamouth	Pesticide	Hexachlorobenzene	1.10E+02	4.00E+02	100
Peamouth	Pesticide	Lindane	1.27E+01	4.00E+01	90
Peamouth	Pesticide	Malathion	2.43E+01	1.10E+02	80
Peamouth	Pesticide	Methoxychlor	9.20E+01	2.50E+02	100
Peamouth	Pesticide	Methyl parathion	9.80E+00	2.50E+01	100
Peamouth	Pesticide	Mirex	9.20E+00	2.50E+01	100
Peamouth	Pesticide	o,p'-DDD	1.32E+01	4.90E+01	90
Peamouth	Pesticide	o,p'-DDE	1.27E+01	4.70E+01	90
Peamouth	Pesticide	o,p'-DDT	9.20E+00	2.50E+01	100
Peamouth	Pesticide	p,p'-DDD	2.34E+01	7.20E+01	70
Peamouth	Pesticide	p,p'-DDE	1.46E+02	4.80E+02	30
Peamouth	Pesticide	p,p'-DDT	9.20E+00	2.50E+01	100
Peamouth	Pesticide	Parathion	1.11E+01	3.50E+01	90
Peamouth	Pesticide	Pentachlorophenol	5.50E+02	2.00E+03	100
Peamouth	Pesticide	Toxaphene	5.48E+02	1.50E+03	100
Peamouth	Semi-volatile	1,2,4-Trichlorobenzene	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	1,2-Dichlorobenzene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	1,3-Dichlorobenzene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	1,4-Dichlorobenzene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	2,4,6-Trichlorophenol	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	2,4-Dichlorophenol	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	2,4-Dimethylphenol	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	2,4-Dinitrophenol	5.50E+02	2.00E+03	100
Peamouth	Semi-volatile	2,4-Dinitrotoluene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	2,6-Dinitrotoluene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	2-Chloronaphthalene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	2-Chlorophenol	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	2-Methylnaphthalene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	2-Methylphenol	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	2-Nitrophenol	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	3,3'-Dichlorobenzidine	5.50E+02	2.00E+03	100
Peamouth	Semi-volatile	4-Bromophenyl phenyl ether	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	4-Chloro-3-methylphenol	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	4-Chlorophenylphenylether	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	4-Methylphenol	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	4-Nitrophenol	5.50E+02	2.00E+03	100
Peamouth	Semi-volatile	Acenaphthene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Acenaphthylene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Anthracene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Benz[a]anthracene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Benzo[a]pyrene	1.10E+02	4.00E+02	100

TABLE B-7. 1991 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 9 of 11)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Peamouth	Semi-volatile	Benzo[b]fluoranthene	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	Benzo[g,h,i]perylene	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	Benzo[k]fluoranthene	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	Bis(2-chloroethoxy)methane	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Bis(2-chloroethyl)ether	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Bis(2-chloroisopropyl)ether	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Bis(2-ethylhexyl)phthalate	3.18E+02	7.70E+02	10
Peamouth	Semi-volatile	Butyl benzyl phthalate	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Chrysene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Di-n-butylphthalate	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Di-n-octylphthalate	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	Dibenz[a,h]anthracene	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	Diethyl phthalate	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	Dimethyl phthalate	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Fluoranthene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Fluorene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Hexachlorobutadiene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Hexachlorocyclopentadiene	2.75E+02	1.00E+03	100
Peamouth	Semi-volatile	Hexachloroethane	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	Indeno[1,2,3-cd]pyrene	1.10E+02	4.00E+02	100
Peamouth	Semi-volatile	Isophorone	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	N-Nitroso-di-n-propylamine	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	N-Nitrosodiphenylamine	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Naphthalene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Nitrobenzene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Phenanthrene	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Phenol	5.50E+01	2.00E+02	100
Peamouth	Semi-volatile	Pyrene	5.50E+01	2.00E+02	100
White Sturgeon	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	4.69E-04	1.25E-03	71
White Sturgeon	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	2.75E-04	8.40E-04	100
White Sturgeon	Dioxin/furans	1,2,3,4,7,8,9-HpCDF	3.41E-04	1.00E-03	100
White Sturgeon	Dioxin/furans	1,2,3,4,7,8-HxCDD	2.07E-04	5.30E-04	100
White Sturgeon	Dioxin/furans	1,2,3,4,7,8-HxCDF	4.52E-04	1.30E-03	100
White Sturgeon	Dioxin/furans	1,2,3,6,7,8-HxCDD	1.57E-04	3.80E-04	100
White Sturgeon	Dioxin/furans	1,2,3,6,7,8-HxCDF	3.79E-04	1.10E-03	100
White Sturgeon	Dioxin/furans	1,2,3,7,8,9-HxCDD	1.74E-04	4.20E-04	100
White Sturgeon	Dioxin/furans	1,2,3,7,8,9-HxCDF	7.21E-04	2.04E-03	100
White Sturgeon	Dioxin/furans	1,2,3,7,8-PeCDD	5.44E-04	2.50E-03	100
White Sturgeon	Dioxin/furans	1,2,3,7,8-PeCDF	3.85E-04	2.50E-03	86
White Sturgeon	Dioxin/furans	2,3,4,6,7,8-HxCDF	1.27E-03	4.81E-03	100
White Sturgeon	Dioxin/furans	2,3,4,7,8-PeCDF	3.41E-04	2.50E-03	86
White Sturgeon	Dioxin/furans	2,3,7,8-TCDD	5.89E-04	1.66E-03	86
White Sturgeon	Dioxin/furans	2,3,7,8-TCDF	1.08E-02	2.28E-02	0
White Sturgeon	Dioxin/furans	OCDD	1.51E-03	3.61E-03	14
White Sturgeon	Dioxin/furans	OCDF	3.14E-04	8.20E-04	100
White Sturgeon	Metal	Antimony	3.65E+02	2.40E+03	100
White Sturgeon	Metal	Arsenic	3.66E+01[3]	1.38E+03	63
White Sturgeon	Metal	Barium	9.69E+01	5.00E+02	100
White Sturgeon	Metal	Cadmium	1.41E+01	7.00E+01	88
White Sturgeon	Metal	Copper	3.83E+02	2.00E+03	88
White Sturgeon	Metal	Lead	1.00E+02	1.12E+03	0
White Sturgeon	Metal	Mercury	1.70E+02	5.80E+02	13
White Sturgeon	Metal	Nickel	4.29E+02	2.33E+03	94
White Sturgeon	Metal	Selenium	1.99E+02	5.50E+02	100

TABLE B-7. 1991 LOWER COLUMBIA RIVER DATA (µg/kg)(Page 10 of 11)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
White Sturgeon	Metal	Silver	1.16E+02	6.00E+02	94
White Sturgeon	Metal	Zinc	4.83E+03	1.60E+04	6
White Sturgeon	PCBs	Aroclor 1016	2.50E+01	5.00E+01	100
White Sturgeon	PCBs	Aroclor 1221	2.50E+01	5.00E+01	100
White Sturgeon	PCBs	Aroclor 1232	2.50E+01	5.00E+01	100
White Sturgeon	PCBs	Aroclor 1242	2.50E+01	5.00E+01	100
White Sturgeon	PCBs	Aroclor 1248	2.50E+01	5.00E+01	100
White Sturgeon	PCBs	Aroclor 1254	6.64E+01	5.00E+02	76
White Sturgeon	PCBs	Aroclor 1260	2.50E+01	5.00E+01	100
White Sturgeon	Pesticide	Aldrin	1.50E+00	3.00E+00	100
White Sturgeon	Pesticide	alpha-BHC	1.50E+00	3.00E+00	100
White Sturgeon	Pesticide	beta-BHC	1.50E+00	3.00E+00	100
White Sturgeon	Pesticide	Chlordane	1.50E+00	3.00E+00	100
White Sturgeon	Pesticide	Dacthal	1.50E+00	3.00E+00	100
White Sturgeon	Pesticide	delta-BHC	1.50E+00	3.00E+00	100
White Sturgeon	Pesticide	Dicofol	1.50E+01	3.00E+01	100
White Sturgeon	Pesticide	Dieldrin	2.71E+00	1.20E+01	71
White Sturgeon	Pesticide	Endosulfan I	1.73E+00	4.90E+00	94
White Sturgeon	Pesticide	Endosulfan II	1.59E+00	5.00E+00	100
White Sturgeon	Pesticide	Endosulfan sulfate	1.76E+00	5.50E+00	94
White Sturgeon	Pesticide	Endrin	2.61E+00	3.00E+01	88
White Sturgeon	Pesticide	Endrin aldehyde	2.34E+00	8.40E+00	88
White Sturgeon	Pesticide	Heptachlor	1.50E+00	3.00E+00	100
White Sturgeon	Pesticide	Heptachlor epoxide	1.50E+00	3.00E+00	100
White Sturgeon	Pesticide	Hexachlorobenzene	1.00E+02	2.00E+02	100
White Sturgeon	Pesticide	Lindane	1.53E+00	4.00E+00	100
White Sturgeon	Pesticide	Malathion	1.50E+00	3.00E+00	100
White Sturgeon	Pesticide	Methoxychlor	2.88E+01	1.80E+02	82
White Sturgeon	Pesticide	Methyl parathion	4.88E+00	2.20E+01	82
White Sturgeon	Pesticide	Mirex	1.50E+00	3.00E+00	100
White Sturgeon	Pesticide	o,p'-DDD	2.21E+00	9.10E+00	88
White Sturgeon	Pesticide	o,p'-DDE	2.24E+00	1.40E+01	94
White Sturgeon	Pesticide	o,p'-DDT	3.18E+00	3.00E+01	94
White Sturgeon	Pesticide	p,p'-DDD	3.50E+00	1.60E+01	82
White Sturgeon	Pesticide	p,p'-DDE	1.98E+01	5.10E+01	12
White Sturgeon	Pesticide	p,p'-DDT	4.75E+00	1.60E+01	53
White Sturgeon	Pesticide	Parathion	1.50E+00	3.00E+00	100
White Sturgeon	Pesticide	Pentachlorophenol	5.00E+02	1.00E+03	100
White Sturgeon	Pesticide	Toxaphene	7.50E+01	1.50E+02	100
White Sturgeon	Semi-volatile	1,2,4-Trichlorobenzene	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	1,2-Dichlorobenzene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	1,3-Dichlorobenzene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	1,4-Dichlorobenzene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	2,4,6-Trichlorophenol	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	2,4-Dichlorophenol	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	2,4-Dimethylphenol	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	2,4-Dinitrophenol	5.00E+02	1.00E+03	100
White Sturgeon	Semi-volatile	2,4-Dinitrotoluene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	2,6-Dinitrotoluene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	2-Chloronaphthalene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	2-Chlorophenol	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	2-Methylnaphthalene	5.00E+01	1.00E+02	100

TABLE B-7. 1991 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 11 of 11)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
White Sturgeon	Semi-volatile	2-Methylphenol	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	2-Nitrophenol	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	3,3'-Dichlorobenzidine	5.00E+02	1.00E+03	100
White Sturgeon	Semi-volatile	4-Bromophenyl phenyl ether	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	4-Chloro-3-methylphenol	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	4-Chlorophenylphenylether	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	4-Methylphenol	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	4-Nitrophenol	5.00E+02	1.00E+03	100
White Sturgeon	Semi-volatile	Acenaphthene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Acenaphthylene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Anthracene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Benz[a]anthracene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Benzo[a]pyrene	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	Benzo[b]fluoranthene	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	Benzo[g,h,i]perylene	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	Benzo[k]fluoranthene	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	Bis(2-chloroethoxy)methane	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Bis(2-chloroethyl)ether	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Bis(2-chloroisopropyl)ether	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Bis(2-ethylhexyl)phthalate	3.61E+02	1.50E+03	47
White Sturgeon	Semi-volatile	Butyl benzyl phthalate	1.05E+02	9.90E+02	94
White Sturgeon	Semi-volatile	Chrysene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Di-n-butylphthalate	8.62E+01	1.90E+02	71
White Sturgeon	Semi-volatile	Di-n-octylphthalate	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	Dibenz[a,h]anthracene	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	Diethyl phthalate	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	Dimethyl phthalate	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Fluoranthene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Fluorene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Hexachlorobutadiene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Hexachlorocyclopentadiene	2.50E+02	5.00E+02	100
White Sturgeon	Semi-volatile	Hexachloroethane	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	Indeno[1,2,3-cd]pyrene	1.00E+02	2.00E+02	100
White Sturgeon	Semi-volatile	Isophorone	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	N-Nitroso-di-n-propylamine	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	N-Nitrosodiphenylamine	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Naphthalene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Nitrobenzene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Phenanthrene	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Phenol	5.00E+01	1.00E+02	100
White Sturgeon	Semi-volatile	Pyrene	5.00E+01	1.00E+02	100

[1] Concentrations are the mean of the detected values for each species.
For the samples where the chemical was not detected, a value of one-half the detection limit was used.
[2] Percent frequency of non-detects
[3] Estimate of inorganic arsenic derived from use of species-specific conversion factor applied to total arsenic (see Section 3.3.2)
Note: For chemicals which were not detected (% ND = 100), the max represents the maximum detection limit for that species

TABLE B-8. 1993 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 1 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Common Carp	Butyltin	Dibutyltin	1.95E+00	5.20E+00	50
Common Carp	Butyltin	Monobutyltin	1.70E+00	3.40E+00	100
Common Carp	Butyltin	Tributyltin	1.47E+01	2.88E+01	50
Common Carp	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	2.50E-03	3.80E-03	0
Common Carp	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	1.25E-04	3.00E-04	100
Common Carp	Dioxin/furans	1,2,3,4,7,8,9-HpCDF	1.75E-04	5.00E-04	100
Common Carp	Dioxin/furans	1,2,3,4,7,8-HxCDD	5.50E-04	1.60E-03	50
Common Carp	Dioxin/furans	1,2,3,4,7,8-HxCDF	2.25E-04	6.00E-04	100
Common Carp	Dioxin/furans	1,2,3,6,7,8-HxCDD	7.00E-04	1.60E-03	50
Common Carp	Dioxin/furans	1,2,3,6,7,8-HxCDF	2.25E-04	5.00E-04	100
Common Carp	Dioxin/furans	1,2,3,7,8,9-HxCDD	4.75E-04	1.70E-03	100
Common Carp	Dioxin/furans	1,2,3,7,8,9-HxCDF	2.40E-03	2.50E-03	0
Common Carp	Dioxin/furans	1,2,3,7,8-PeCDD	4.00E-04	1.10E-03	100
Common Carp	Dioxin/furans	1,2,3,7,8-PeCDF	3.10E-03	3.90E-03	0
Common Carp	Dioxin/furans	2,3,4,6,7,8-HxCDF	8.50E-04	1.00E-03	0
Common Carp	Dioxin/furans	2,3,4,7,8-PeCDF	1.75E-04	3.00E-04	50
Common Carp	Dioxin/furans	2,3,7,8-TCDD	3.50E-04	1.10E-03	100
Common Carp	Dioxin/furans	2,3,7,8-TCDF	3.75E-03	3.90E-03	0
Common Carp	Dioxin/furans	OCDD	5.70E-03	7.50E-03	0
Common Carp	Dioxin/furans	OCDF	2.00E-04	6.00E-04	100
Common Carp	Metal	Antimony	6.00E+00	1.20E+01	100
Common Carp	Metal	Arsenic	1.78E+01	3.60E+01	100
Common Carp	Metal	Barium	1.10E+03	1.20E+03	0
Common Carp	Metal	Cadmium	3.60E+01	3.90E+01	0
Common Carp	Metal	Chromium	4.50E+01	7.80E+01	50
Common Carp	Metal	Copper	1.01E+03	1.26E+03	0
Common Carp	Metal	Lead	1.45E+02	1.73E+02	0
Common Carp	Metal	Mercury	7.28E+01	1.45E+02	50
Common Carp	Metal	Nickel	4.15E+02	7.80E+02	50
Common Carp	Metal	Selenium	5.53E+01	9.30E+01	50
Common Carp	Metal	Silver	4.50E+00	5.00E+00	0
Common Carp	Metal	Zinc	6.09E+04	9.21E+04	0
Common Carp	PCBs	Aroclor 1221	2.60E+01	5.20E+01	100
Common Carp	PCBs	Aroclor 1232	2.60E+01	5.20E+01	100
Common Carp	PCBs	Aroclor 1242/1016	2.60E+01	5.20E+01	100
Common Carp	PCBs	Aroclor 1248	2.60E+01	5.20E+01	100
Common Carp	PCBs	Aroclor 1254	5.05E+01	6.50E+01	0
Common Carp	PCBs	Aroclor 1260	2.80E+01	5.20E+01	50
Common Carp	Pesticide	Aldrin	1.25E+00	2.50E+00	100
Common Carp	Pesticide	alpha-BHC	1.25E+00	2.50E+00	100
Common Carp	Pesticide	alpha-Chlordane	1.25E+00	2.50E+00	100
Common Carp	Pesticide	beta-BHC	1.25E+00	2.50E+00	100
Common Carp	Pesticide	delta-BHC	1.25E+00	2.50E+00	100
Common Carp	Pesticide	Dicofol	1.30E+01	2.60E+01	100
Common Carp	Pesticide	Dieldrin	2.50E+00	5.00E+00	100
Common Carp	Pesticide	Endosulfan I	1.25E+00	2.50E+00	100
Common Carp	Pesticide	Endosulfan II	2.50E+00	5.00E+00	100
Common Carp	Pesticide	Endosulfan sulfate	2.50E+00	5.00E+00	100
Common Carp	Pesticide	Endrin	2.50E+00	5.00E+00	100
Common Carp	Pesticide	Endrin aldehyde	2.50E+00	5.00E+00	100
Common Carp	Pesticide	Endrin ketone	1.40E+01	3.50E+01	100
Common Carp	Pesticide	gamma-Chlordane	2.40E+00	5.00E+00	100
Common Carp	Pesticide	Heptachlor	1.25E+00	2.50E+00	100
Common Carp	Pesticide	Heptachlor epoxide	1.25E+00	2.50E+00	100
Common Carp	Pesticide	Hexachlorobenzene	1.49E+02	5.00E+02	100

TABLE B-8. 1993 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 2 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Common Carp	Pesticide	Lindane	1.25E+00	2.50E+00	100
Common Carp	Pesticide	Methoxychlor	1.25E+01	2.50E+01	100
Common Carp	Pesticide	Methyl parathion	1.30E+01	2.60E+01	100
Common Carp	Pesticide	o,p'-DDD	2.60E+00	5.20E+00	100
Common Carp	Pesticide	o,p'-DDE	2.60E+00	5.20E+00	100
Common Carp	Pesticide	o,p'-DDT	2.60E+00	5.20E+00	100
Common Carp	Pesticide	p,p'-DDD	2.05E+01	2.10E+01	0
Common Carp	Pesticide	p,p'-DDE	8.15E+01	1.00E+02	0
Common Carp	Pesticide	p,p'-DDT	3.80E+00	3.90E+00	0
Common Carp	Pesticide	Pentachlorophenol	3.60E+03	1.20E+04	100
Common Carp	Pesticide	Toxaphene	1.25E+02	2.50E+02	100
Common Carp	Radionuclide	Americium 241	6.75E-03	1.40E-02	100
Common Carp	Radionuclide	Cesium 137	1.00E-02	2.00E-02	100
Common Carp	Radionuclide	Cobalt 60	1.00E-02	2.00E-02	100
Common Carp	Radionuclide	Europium 152	1.00E-01	2.00E-01	100
Common Carp	Radionuclide	Europium 154	1.00E-01	2.00E-01	100
Common Carp	Radionuclide	Europium 155	2.50E-02	5.00E-02	100
Common Carp	Radionuclide	Plutonium 238	6.50E-03	1.70E-02	100
Common Carp	Radionuclide	Plutonium 239/240	1.50E-03	2.00E-03	0
Common Carp	Semi-volatile	1,2,4-Trichlorobenzene	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	1,2-Dichlorobenzene	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	1,3-Dichlorobenzene	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	1,4-Dichlorobenzene	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	2,4,5-Trichlorophenol	7.45E+02	2.50E+03	100
Common Carp	Semi-volatile	2,4,6-Trichlorophenol	7.45E+02	2.50E+03	100
Common Carp	Semi-volatile	2,4-Dichlorophenol	4.48E+02	1.50E+03	100
Common Carp	Semi-volatile	2,4-Dimethylphenol	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	2,4-Dinitrophenol	1.49E+03	5.00E+03	100
Common Carp	Semi-volatile	2,4-Dinitrotoluene	7.45E+02	2.50E+03	100
Common Carp	Semi-volatile	2,6-Dinitrotoluene	7.45E+02	2.50E+03	100
Common Carp	Semi-volatile	2-Chloronaphthalene	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	2-Chlorophenol	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	2-Methylnaphthalene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	2-Methylphenol	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	2-Nitroaniline	7.45E+02	2.50E+03	100
Common Carp	Semi-volatile	2-Nitrophenol	7.45E+02	2.50E+03	100
Common Carp	Semi-volatile	3,3'-Dichlorobenzidine	7.45E+02	2.50E+03	100
Common Carp	Semi-volatile	3-Nitroaniline	7.45E+02	2.50E+03	100
Common Carp	Semi-volatile	4,6-Dinitro-2-methylphenol	1.49E+03	5.00E+03	100
Common Carp	Semi-volatile	4-Bromophenyl phenyl ether	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	4-Chloro-3-methylphenol	2.98E+02	1.00E+03	100
Common Carp	Semi-volatile	4-Chloroaniline	1.98E+02	5.00E+02	100
Common Carp	Semi-volatile	4-Chlorophenylphenylether	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	4-Methylphenol	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	4-Nitroaniline	7.45E+02	2.50E+03	100
Common Carp	Semi-volatile	4-Nitrophenol	7.45E+02	2.50E+03	100
Common Carp	Semi-volatile	Acenaphthene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Acenaphthylene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Anthracene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Benz[a]anthracene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Benzo[a]pyrene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Benzo[b,k]fluoranthene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Benzo[g,h,i]perylene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Benzoic acid	1.49E+03	5.00E+03	100
Common Carp	Semi-volatile	Benzyl Alcohol	1.49E+02	5.00E+02	100

TABLE B-8. 1993 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 3 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Common Carp	Semi-volatile	Bis(2-chloroethoxy)methane	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Bis(2-chloroethyl)ether	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Bis(2-chloroisopropyl)ether	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Bis(2-ethylhexyl)phthalate	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Butyl benzyl phthalate	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Carbazole	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Chrysene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Di-n-butylphthalate	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Di-n-octylphthalate	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Dibenz[a,h]anthracene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Dibenzofuran	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Diethyl phthalate	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Dimethyl phthalate	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Fluoranthene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Fluorene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Hexachlorobutadiene	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Hexachlorocyclopentadiene	7.45E+02	2.50E+03	100
Common Carp	Semi-volatile	Hexachloroethane	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Indeno[1,2,3-cd]pyrene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Isophorone	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Naphthalene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Nitrobenzene	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Phenanthrene	4.90E+00	1.00E+01	100
Common Carp	Semi-volatile	Phenol	1.49E+02	5.00E+02	100
Common Carp	Semi-volatile	Pyrene	4.90E+00	1.00E+01	100
Crayfish	Butyltin	Dibutyltin	2.60E+00	5.20E+00	100
Crayfish	Butyltin	Monobutyltin	1.70E+00	3.40E+00	100
Crayfish	Butyltin	Tributyltin	3.31E+00	9.60E+00	100
Crayfish	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	3.47E-04	2.30E-03	100
Crayfish	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	8.57E-04	5.60E-03	93
Crayfish	Dioxin/furans	1,2,3,4,7,8,9-HpCDF	6.53E-04	3.10E-03	100
Crayfish	Dioxin/furans	1,2,3,4,7,8-HxCDD	3.00E-04	1.90E-03	100
Crayfish	Dioxin/furans	1,2,3,4,7,8-HxCDF	3.20E-04	2.60E-03	100
Crayfish	Dioxin/furans	1,2,3,6,7,8-HxCDD	3.37E-04	2.10E-03	100
Crayfish	Dioxin/furans	1,2,3,6,7,8-HxCDF	2.97E-04	2.70E-03	100
Crayfish	Dioxin/furans	1,2,3,7,8,9-HxCDD	3.93E-04	2.50E-03	100
Crayfish	Dioxin/furans	1,2,3,7,8,9-HxCDF	4.20E-04	1.90E-03	100
Crayfish	Dioxin/furans	1,2,3,7,8-PeCDD	4.17E-04	2.30E-03	100
Crayfish	Dioxin/furans	1,2,3,7,8-PeCDF	2.30E-04	2.10E-03	100
Crayfish	Dioxin/furans	2,3,4,6,7,8-HxCDF	3.17E-04	1.20E-03	100
Crayfish	Dioxin/furans	2,3,4,7,8-PeCDF	2.97E-04	2.80E-03	100
Crayfish	Dioxin/furans	2,3,7,8-TCDD	2.67E-04	1.00E-03	80
Crayfish	Dioxin/furans	2,3,7,8-TCDF	1.50E-03	2.62E-03	0
Crayfish	Dioxin/furans	OCDD	2.68E-03	2.37E-02	87
Crayfish	Dioxin/furans	OCDF	4.33E-04	1.50E-03	100
Crayfish	Metal	Antimony	9.60E+00	1.80E+01	60
Crayfish	Metal	Arsenic	1.94E+00[3]	4.60E+01	93
Crayfish	Metal	Barium	3.00E+04	4.72E+04	0
Crayfish	Metal	Cadmium	3.36E+01	5.30E+01	7
Crayfish	Metal	Chromium	7.28E+01	9.50E+01	0
Crayfish	Metal	Copper	2.17E+04	3.11E+04	0
Crayfish	Metal	Lead	1.52E+02	4.44E+02	7
Crayfish	Metal	Mercury	4.33E+01	8.10E+01	13
Crayfish	Metal	Nickel	5.56E+02	1.33E+03	13
Crayfish	Metal	Selenium	2.37E+01	4.70E+01	80

TABLE B-8. 1993 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 4 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Crayfish	Metal	Silver	4.89E+01	1.03E+02	7
Crayfish	Metal	Zinc	3.71E+04	8.33E+04	0
Crayfish	PCBs	Aroclor 1221	5.00E+01	1.00E+02	100
Crayfish	PCBs	Aroclor 1232	2.50E+01	5.00E+01	100
Crayfish	PCBs	Aroclor 1242/1016	2.50E+01	5.00E+01	100
Crayfish	PCBs	Aroclor 1248	2.50E+01	5.00E+01	100
Crayfish	PCBs	Aroclor 1254	2.50E+01	5.00E+01	100
Crayfish	PCBs	Aroclor 1260	2.53E+01	5.00E+01	93
Crayfish	Pesticide	Aldrin	1.25E+00	2.50E+00	100
Crayfish	Pesticide	alpha-BHC	1.25E+00	2.50E+00	100
Crayfish	Pesticide	alpha-Chlordane	1.25E+00	2.50E+00	100
Crayfish	Pesticide	beta-BHC	1.25E+00	2.50E+00	100
Crayfish	Pesticide	delta-BHC	1.25E+00	2.50E+00	100
Crayfish	Pesticide	Dicofol	3.10E+01	6.20E+01	100
Crayfish	Pesticide	Dieldrin	2.50E+00	5.00E+00	100
Crayfish	Pesticide	Endosulfan I	1.25E+00	2.50E+00	100
Crayfish	Pesticide	Endosulfan II	2.50E+00	5.00E+00	100
Crayfish	Pesticide	Endosulfan sulfate	2.50E+00	5.00E+00	100
Crayfish	Pesticide	Endrin	2.50E+00	5.00E+00	100
Crayfish	Pesticide	Endrin aldehyde	2.50E+00	5.00E+00	100
Crayfish	Pesticide	Endrin ketone	2.50E+00	5.00E+00	100
Crayfish	Pesticide	gamma-Chlordane	1.25E+00	2.50E+00	100
Crayfish	Pesticide	Heptachlor	1.25E+00	2.50E+00	100
Crayfish	Pesticide	Heptachlor epoxide	1.25E+00	2.50E+00	100
Crayfish	Pesticide	Hexachlorobenzene	4.82E+01	9.90E+01	100
Crayfish	Pesticide	Lindane	1.25E+00	2.50E+00	100
Crayfish	Pesticide	Methoxychlor	1.25E+01	2.50E+01	100
Crayfish	Pesticide	Methyl parathion	3.10E+01	6.20E+01	100
Crayfish	Pesticide	o,p'-DDD	2.50E+00	5.00E+00	100
Crayfish	Pesticide	o,p'-DDE	2.50E+00	5.00E+00	100
Crayfish	Pesticide	o,p'-DDT	2.50E+00	5.00E+00	100
Crayfish	Pesticide	p,p'-DDD	2.50E+00	5.00E+00	100
Crayfish	Pesticide	p,p'-DDE	6.69E+00	1.40E+01	7
Crayfish	Pesticide	p,p'-DDT	2.50E+00	5.00E+00	100
Crayfish	Pesticide	Pentachlorophenol	2.41E+02	5.00E+02	100
Crayfish	Pesticide	Toxaphene	1.25E+02	2.50E+02	100
Crayfish	Radionuclide	Americium 241	5.67E-03	2.60E-02	100
Crayfish	Radionuclide	Cesium 137	6.00E-02	1.20E-01	100
Crayfish	Radionuclide	Cobalt 60	7.50E-02	1.50E-01	100
Crayfish	Radionuclide	Europium 152	2.00E-01	4.00E-01	100
Crayfish	Radionuclide	Europium 154	1.25E-01	2.50E-01	100
Crayfish	Radionuclide	Europium 155	2.50E-01	5.00E-01	100
Crayfish	Radionuclide	Plutonium 238	4.47E-03	1.80E-02	100
Crayfish	Radionuclide	Plutonium 239/240	2.17E-03	1.10E-02	100
Crayfish	Semi-volatile	1,2,4-Trichlorobenzene	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	1,2-Dichlorobenzene	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	1,3-Dichlorobenzene	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	1,4-Dichlorobenzene	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	2,4,5-Trichlorophenol	2.41E+02	5.00E+02	100
Crayfish	Semi-volatile	2,4,6-Trichlorophenol	2.41E+02	5.00E+02	100
Crayfish	Semi-volatile	2,4-Dichlorophenol	1.44E+02	3.00E+02	100
Crayfish	Semi-volatile	2,4-Dimethylphenol	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	2,4-Dinitrophenol	2.41E+02	5.00E+02	100
Crayfish	Semi-volatile	2,4-Dinitrotoluene	2.41E+02	5.00E+02	100
Crayfish	Semi-volatile	2,6-Dinitrotoluene	2.41E+02	5.00E+02	100

TABLE B-8. 1993 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 5 of 8)

Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Crayfish	Semi-volatile	2-Chloronaphthalene	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	2-Chlorophenol	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	2-Methylnaphthalene	1.03E+01	2.00E+01	13
Crayfish	Semi-volatile	2-Methylphenol	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	2-Nitroaniline	2.41E+02	5.00E+02	100
Crayfish	Semi-volatile	2-Nitrophenol	2.41E+02	5.00E+02	100
Crayfish	Semi-volatile	3,3'-Dichlorobenzidine	2.41E+02	5.00E+02	100
Crayfish	Semi-volatile	3-Nitroaniline	2.41E+02	5.00E+02	100
Crayfish	Semi-volatile	4,6-Dinitro-2-methylphenol	4.82E+02	9.90E+02	100
Crayfish	Semi-volatile	4-Bromophenyl phenyl ether	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	4-Chloro-3-methylphenol	9.73E+01	2.00E+02	100
Crayfish	Semi-volatile	4-Chloroaniline	1.44E+02	3.00E+02	100
Crayfish	Semi-volatile	4-Chlorophenylphenylether	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	4-Methylphenol	4.87E+01	9.90E+01	93
Crayfish	Semi-volatile	4-Nitroaniline	2.41E+02	5.00E+02	100
Crayfish	Semi-volatile	4-Nitrophenol	2.41E+02	5.00E+02	100
Crayfish	Semi-volatile	Acenaphthene	4.98E+00	9.90E+00	93
Crayfish	Semi-volatile	Acenaphthylene	4.82E+00	9.90E+00	100
Crayfish	Semi-volatile	Anthracene	4.82E+00	9.90E+00	100
Crayfish	Semi-volatile	Benz[a]anthracene	4.82E+00	9.90E+00	100
Crayfish	Semi-volatile	Benzo[a]pyrene	4.82E+00	9.90E+00	100
Crayfish	Semi-volatile	Benzo[b,k]fluoranthene	4.82E+00	9.90E+00	100
Crayfish	Semi-volatile	Benzo[g,h,i]perylene	4.82E+00	9.90E+00	100
Crayfish	Semi-volatile	Benzoic acid	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	Benzyl Alcohol	5.02E+01	9.90E+01	87
Crayfish	Semi-volatile	Bis(2-chloroethoxy)methane	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	Bis(2-chloroethyl)ether	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	Bis(2-chloroisopropyl)ether	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	Bis(2-ethylhexyl)phthalate	2.67E+02	1.10E+03	100
Crayfish	Semi-volatile	Butyl benzyl phthalate	1.92E+03	7.40E+03	100
Crayfish	Semi-volatile	Carbazole	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	Chrysene	4.82E+00	9.90E+00	100
Crayfish	Semi-volatile	Di-n-butylphthalate	5.85E+02	3.10E+03	93
Crayfish	Semi-volatile	Di-n-octylphthalate	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	Dibenz[a,h]anthracene	4.82E+00	9.90E+00	100
Crayfish	Semi-volatile	Dibenzofuran	4.73E+00	9.90E+00	93
Crayfish	Semi-volatile	Diethyl phthalate	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	Dimethyl phthalate	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	Fluoranthene	4.88E+00	1.10E+01	100
Crayfish	Semi-volatile	Fluorene	4.84E+00	9.90E+00	93
Crayfish	Semi-volatile	Hexachlorobutadiene	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	Hexachlorocyclopentadiene	2.41E+02	5.00E+02	100
Crayfish	Semi-volatile	Hexachloroethane	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	Indeno[1,2,3-cd]pyrene	4.82E+00	9.90E+00	100
Crayfish	Semi-volatile	Isophorone	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	Naphthalene	1.15E+01	5.70E+01	53
Crayfish	Semi-volatile	Nitrobenzene	4.82E+01	9.90E+01	100
Crayfish	Semi-volatile	Phenanthrene	5.00E+00	9.90E+00	93
Crayfish	Semi-volatile	Phenol	1.45E+02	6.90E+02	67
Crayfish	Semi-volatile	Pyrene	4.82E+00	9.90E+00	100
Largescale Sucker	Butyltin	Dibutyltin	2.34E+00	5.20E+00	69
Largescale Sucker	Butyltin	Monobutyltin	1.60E+00	3.40E+00	100
Largescale Sucker	Butyltin	Tributyltin	1.56E+01	5.43E+01	25
Largescale Sucker	Dioxin/furans	1,2,3,4,6,7,8-HpCDD	1.02E-03	2.60E-03	0
Largescale Sucker	Dioxin/furans	1,2,3,4,6,7,8-HpCDF	9.16E-04	5.50E-03	75

TABLE B-8. 1993 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 6 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Largescale Sucker	Dioxin/furans	1,2,3,4,7,8,9-HpCDF	2.88E-04	2.50E-03	100
Largescale Sucker	Dioxin/furans	1,2,3,4,7,8-HxCDD	3.44E-04	1.70E-03	81
Largescale Sucker	Dioxin/furans	1,2,3,4,7,8-HxCDF	2.69E-04	1.30E-03	100
Largescale Sucker	Dioxin/furans	1,2,3,6,7,8-HxCDD	3.41E-04	1.70E-03	88
Largescale Sucker	Dioxin/furans	1,2,3,6,7,8-HxCDF	5.56E-04	5.20E-03	94
Largescale Sucker	Dioxin/furans	1,2,3,7,8,9-HxCDD	2.75E-04	1.80E-03	100
Largescale Sucker	Dioxin/furans	1,2,3,7,8,9-HxCDF	1.98E-03	4.50E-03	6
Largescale Sucker	Dioxin/furans	1,2,3,7,8-PeCDD	3.69E-04	1.40E-03	94
Largescale Sucker	Dioxin/furans	1,2,3,7,8-PeCDF	2.22E-03	9.90E-03	25
Largescale Sucker	Dioxin/furans	2,3,4,6,7,8-HxCDF	9.03E-04	5.20E-03	19
Largescale Sucker	Dioxin/furans	2,3,4,7,8-PeCDF	4.13E-04	1.80E-03	88
Largescale Sucker	Dioxin/furans	2,3,7,8-TCDD	3.97E-04	1.80E-03	88
Largescale Sucker	Dioxin/furans	2,3,7,8-TCDF	3.85E-03	6.50E-03	6
Largescale Sucker	Dioxin/furans	OCDD	6.77E-03	3.69E-02	0
Largescale Sucker	Dioxin/furans	OCDF	6.94E-04	2.70E-03	63
Largescale Sucker	Metal	Antimony	5.81E+00	1.20E+01	100
Largescale Sucker	Metal	Arsenic	2.49E+00[3]	3.85E+02	94
Largescale Sucker	Metal	Barium	1.69E+03	3.50E+03	0
Largescale Sucker	Metal	Cadmium	3.64E+01	6.60E+01	0
Largescale Sucker	Metal	Chromium	1.67E+02	5.27E+02	6
Largescale Sucker	Metal	Copper	8.28E+02	1.23E+03	0
Largescale Sucker	Metal	Lead	1.62E+02	8.40E+02	50
Largescale Sucker	Metal	Mercury	1.68E+02	2.64E+02	0
Largescale Sucker	Metal	Nickel	2.87E+02	2.26E+03	63
Largescale Sucker	Metal	Selenium	3.98E+01	2.07E+02	63
Largescale Sucker	Metal	Silver	2.44E+00	6.00E+00	88
Largescale Sucker	Metal	Zinc	1.83E+04	2.37E+04	0
Largescale Sucker	PCBs	Aroclor 1221	2.60E+01	5.20E+01	100
Largescale Sucker	PCBs	Aroclor 1232	2.60E+01	5.20E+01	100
Largescale Sucker	PCBs	Aroclor 1242/1016	2.60E+01	5.20E+01	100
Largescale Sucker	PCBs	Aroclor 1248	2.60E+01	5.20E+01	100
Largescale Sucker	PCBs	Aroclor 1254	2.30E+02	2.70E+03	0
Largescale Sucker	PCBs	Aroclor 1260	3.93E+01	2.50E+02	50
Largescale Sucker	Pesticide	Aldrin	2.36E+00	3.80E+01	100
Largescale Sucker	Pesticide	alpha-BHC	1.25E+00	2.50E+00	100
Largescale Sucker	Pesticide	alpha-Chlordane	1.45E+00	6.00E+00	100
Largescale Sucker	Pesticide	beta-BHC	1.27E+00	3.00E+00	100
Largescale Sucker	Pesticide	delta-BHC	2.77E+00	1.00E+01	100
Largescale Sucker	Pesticide	Dicofol	1.30E+01	2.60E+01	100
Largescale Sucker	Pesticide	Dieldrin	4.38E+00	6.50E+01	100
Largescale Sucker	Pesticide	Endosulfan I	1.25E+00	2.50E+00	100
Largescale Sucker	Pesticide	Endosulfan II	2.50E+00	5.00E+00	100
Largescale Sucker	Pesticide	Endosulfan sulfate	2.50E+00	5.00E+00	100
Largescale Sucker	Pesticide	Endrin	2.50E+00	5.00E+00	100
Largescale Sucker	Pesticide	Endrin aldehyde	2.56E+00	6.00E+00	100
Largescale Sucker	Pesticide	Endrin ketone	1.89E+01	2.00E+02	100
Largescale Sucker	Pesticide	gamma-Chlordane	3.49E+00	4.40E+01	100
Largescale Sucker	Pesticide	Heptachlor	1.25E+00	2.50E+00	100
Largescale Sucker	Pesticide	Heptachlor epoxide	2.27E+00	2.20E+01	100
Largescale Sucker	Pesticide	Hexachlorobenzene	1.23E+02	5.00E+02	100
Largescale Sucker	Pesticide	Lindane	1.25E+00	2.50E+00	100
Largescale Sucker	Pesticide	Methoxychlor	1.25E+01	2.50E+01	100
Largescale Sucker	Pesticide	Methyl parathion	1.30E+01	2.60E+01	100
Largescale Sucker	Pesticide	o,p'-DDD	1.85E+01	2.60E+02	100
Largescale Sucker	Pesticide	o,p'-DDE	1.08E+01	1.30E+02	100

TABLE B-8. 1993 LOWER COLUMBIA RIVER DATA (µg/kg)(Page 7 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Largescale Sucker	Pesticide	o,p'-DDT	1.54E+01	2.10E+02	100
Largescale Sucker	Pesticide	p,p'-DDD	2.48E+01	4.70E+01	0
Largescale Sucker	Pesticide	p,p'-DDE	9.70E+01	1.80E+02	0
Largescale Sucker	Pesticide	p,p'-DDT	1.40E+01	5.60E+01	0
Largescale Sucker	Pesticide	Pentachlorophenol	3.02E+03	1.20E+04	100
Largescale Sucker	Pesticide	Toxaphene	1.25E+02	2.50E+02	100
Largescale Sucker	Radionuclide	Americium 241	7.41E-03	2.70E-02	100
Largescale Sucker	Radionuclide	Cesium 137	1.41E-02	1.20E-01	88
Largescale Sucker	Radionuclide	Cobalt 60	1.41E-02	1.50E-01	100
Largescale Sucker	Radionuclide	Europium 152	1.00E-01	2.00E-01	100
Largescale Sucker	Radionuclide	Europium 154	1.02E-01	2.50E-01	100
Largescale Sucker	Radionuclide	Europium 155	3.91E-02	5.00E-01	100
Largescale Sucker	Radionuclide	Plutonium 238	4.53E-03	1.10E-02	94
Largescale Sucker	Radionuclide	Plutonium 239/240	1.34E-03	6.00E-03	19
Largescale Sucker	Semi-volatile	1,2,4-Trichlorobenzene	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	1,2-Dichlorobenzene	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	1,3-Dichlorobenzene	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	1,4-Dichlorobenzene	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	2,4,5-Trichlorophenol	6.15E+02	2.50E+03	100
Largescale Sucker	Semi-volatile	2,4,6-Trichlorophenol	6.15E+02	2.50E+03	100
Largescale Sucker	Semi-volatile	2,4-Dichlorophenol	3.70E+02	1.50E+03	100
Largescale Sucker	Semi-volatile	2,4-Dimethylphenol	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	2,4-Dinitrophenol	1.23E+03	5.00E+03	100
Largescale Sucker	Semi-volatile	2,4-Dinitrotoluene	6.15E+02	2.50E+03	100
Largescale Sucker	Semi-volatile	2,6-Dinitrotoluene	6.15E+02	2.50E+03	100
Largescale Sucker	Semi-volatile	2-Chloronaphthalene	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	2-Chlorophenol	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	2-Methylnaphthalene	7.89E+00	2.30E+01	69
Largescale Sucker	Semi-volatile	2-Methylphenol	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	2-Nitroaniline	6.15E+02	2.50E+03	100
Largescale Sucker	Semi-volatile	2-Nitrophenol	6.15E+02	2.50E+03	100
Largescale Sucker	Semi-volatile	3,3'-Dichlorobenzidine	6.15E+02	2.50E+03	100
Largescale Sucker	Semi-volatile	3-Nitroaniline	6.15E+02	2.50E+03	100
Largescale Sucker	Semi-volatile	4,6-Dinitro-2-methylphenol	1.23E+03	5.00E+03	100
Largescale Sucker	Semi-volatile	4-Bromophenyl phenyl ether	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	4-Chloro-3-methylphenol	2.47E+02	1.00E+03	100
Largescale Sucker	Semi-volatile	4-Chloroaniline	3.54E+02	1.50E+03	100
Largescale Sucker	Semi-volatile	4-Chlorophenylphenylether	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	4-Methylphenol	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	4-Nitroaniline	6.15E+02	2.50E+03	100
Largescale Sucker	Semi-volatile	4-Nitrophenol	6.15E+02	2.50E+03	100
Largescale Sucker	Semi-volatile	Acenaphthene	4.82E+00	1.00E+01	100
Largescale Sucker	Semi-volatile	Acenaphthylene	4.82E+00	1.00E+01	100
Largescale Sucker	Semi-volatile	Anthracene	4.82E+00	1.00E+01	100
Largescale Sucker	Semi-volatile	Benz[a]anthracene	4.82E+00	1.00E+01	100
Largescale Sucker	Semi-volatile	Benzo[a]pyrene	4.82E+00	1.00E+01	100
Largescale Sucker	Semi-volatile	Benzo[b,k]fluoranthene	4.82E+00	1.00E+01	100
Largescale Sucker	Semi-volatile	Benzo[g,h,i]perylene	4.82E+00	1.00E+01	100
Largescale Sucker	Semi-volatile	Benzoic acid	1.23E+03	5.00E+03	100
Largescale Sucker	Semi-volatile	Benzyl Alcohol	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	Bis(2-chloroethoxy)methane	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	Bis(2-chloroethyl)ether	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	Bis(2-chloroisopropyl)ether	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	Bis(2-ethylhexyl)phthalate	1.89E+02	7.60E+02	88
Largescale Sucker	Semi-volatile	Butyl benzyl phthalate	1.23E+02	5.00E+02	100

TABLE B-8. 1993 LOWER COLUMBIA RIVER DATA (μg/kg)(Page 8 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Largescale Sucker	Semi-volatile	Carbazole	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	Chrysene	4.82E+00	1.00E+01	100
Largescale Sucker	Semi-volatile	Di-n-butylphthalate	1.47E+02	5.00E+02	94
Largescale Sucker	Semi-volatile	Di-n-octylphthalate	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	Dibenz[a,h]anthracene	4.82E+00	1.00E+01	100
Largescale Sucker	Semi-volatile	Dibenzofuran	4.82E+00	1.00E+01	100
Largescale Sucker	Semi-volatile	Diethyl phthalate	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	Dimethyl phthalate	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	Fluoranthene	4.82E+00	1.00E+01	100
Largescale Sucker	Semi-volatile	Fluorene	4.82E+00	1.00E+01	100
Largescale Sucker	Semi-volatile	Hexachlorobutadiene	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	Hexachlorocyclopentadiene	6.15E+02	2.50E+03	100
Largescale Sucker	Semi-volatile	Hexachloroethane	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	Indeno[1,2,3-cd]pyrene	4.82E+00	1.00E+01	100
Largescale Sucker	Semi-volatile	Isophorone	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	Naphthalene	6.33E+00	1.30E+01	69
Largescale Sucker	Semi-volatile	Nitrobenzene	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	Phenanthrene	4.82E+00	1.00E+01	100
Largescale Sucker	Semi-volatile	Phenol	1.23E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	Pyrene	4.82E+00	1.00E+01	100

[1] Concentrations are the mean of the detected values for each species.
For the samples where the chemical was not detected, a value of one-half the detection limit was used.

[2] Percent frequency of non-detects

[3] Mean arsenic value is estimate of inorganic arsenic derived from use of species-specific conversion factor applied to total arsenic (see Section 3.3.2)

Note: For chemicals which were not detected (% ND = 100), the max represents the maximum detection limit for that species

TABLE B-9. CALCULATED CONCENTRATIONS FOR 1991 AND 1993 SPECIES COMBINED (μg/kg)(Page 1 of 8)

CommonName	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Largescale Sucker	Butyltin	Dibutyltin	2.34E+00	2.60E+00	69
Largescale Sucker	Butyltin	Monobutyltin	1.60E+00	1.70E+00	100
Largescale Sucker	Butyltin	Tributyltin	1.56E+01	5.43E+01	25
Largescale Sucker	Dioxin/Furan	1,2,3,4,6,7,8-HpCDD	1.61E+00	4.36E+00	0
Largescale Sucker	Dioxin/Furan	1,2,3,4,6,7,8-HpCDF	8.23E-01	5.50E+00	43
Largescale Sucker	Dioxin/Furan	1,2,3,4,7,8,9-HpCDF	2.29E-01	1.25E+00	57
Largescale Sucker	Dioxin/Furan	1,2,3,4,7,8-HxCDD	3.00E-01	8.50E-01	46
Largescale Sucker	Dioxin/Furan	1,2,3,4,7,8-HxCDF	2.48E-01	6.50E-01	57
Largescale Sucker	Dioxin/Furan	1,2,3,6,7,8-HxCDD	4.99E-01	1.42E+00	50
Largescale Sucker	Dioxin/Furan	1,2,3,6,7,8-HxCDF	4.08E-01	5.20E+00	54
Largescale Sucker	Dioxin/Furan	1,2,3,7,8,9-HxCDD	3.18E-01	9.20E-01	57
Largescale Sucker	Dioxin/Furan	1,2,3,7,8,9-HxCDF	1.22E+00	4.50E+00	4
Largescale Sucker	Dioxin/Furan	1,2,3,7,8-PeCDD	4.70E-01	1.10E+00	54
Largescale Sucker	Dioxin/Furan	1,2,3,7,8-PeCDF	1.37E+00	9.90E+00	14
Largescale Sucker	Dioxin/Furan	2,3,4,6,7,8-HxCDF	1.14E+00	5.20E+00	11
Largescale Sucker	Dioxin/Furan	2,3,4,7,8-PeCDF	4.84E-01	1.80E+00	50
Largescale Sucker	Dioxin/Furan	2,3,7,8-TCDD	6.51E-01	1.56E+00	50
Largescale Sucker	Dioxin/Furan	2,3,7,8-TCDF	5.22E+00	1.14E+01	4
Largescale Sucker	Dioxin/Furan	OCDD	7.44E+00	3.69E+01	0
Largescale Sucker	Dioxin/Furan	OCDF	1.18E+00	1.06E+01	36
Largescale Sucker	Metal	Antimony	1.32E+02	1.69E+03	100
Largescale Sucker	Metal	Arsenic	8.09E+00[3]	3.85E+02	97
Largescale Sucker	Metal	Barium	2.24E+03	5.40E+03	0
Largescale Sucker	Metal	Cadmium	3.74E+01	6.60E+01	0
Largescale Sucker	Metal	Chromium	1.67E+02	5.27E+02	6
Largescale Sucker	Metal	Copper	9.12E+02	1.23E+03	0
Largescale Sucker	Metal	Lead	1.71E+02	8.60E+02	35
Largescale Sucker	Metal	Mercury	1.22E+02	2.64E+02	0
Largescale Sucker	Metal	Nickel	4.21E+02	2.26E+03	71
Largescale Sucker	Metal	Selenium	1.32E+02	2.60E+02	82
Largescale Sucker	Metal	Silver	5.22E+01	1.20E+02	94
Largescale Sucker	Metal	Zinc	2.44E+04	9.80E+04	0
Largescale Sucker	Pesticide/PCB	Aldrin	2.16E+00	1.90E+01	91
Largescale Sucker	Pesticide/PCB	alpha-BHC	1.85E+00	5.00E+00	94
Largescale Sucker	Pesticide/PCB	alpha-Chlordane	1.45E+00	3.00E+00	100
Largescale Sucker	Pesticide/PCB	Aroclor 1016	2.50E+01	2.50E+01	100
Largescale Sucker	Pesticide/PCB	Aroclor 1221	2.55E+01	2.60E+01	100
Largescale Sucker	Pesticide/PCB	Aroclor 1232	2.55E+01	2.60E+01	100
Largescale Sucker	Pesticide/PCB	Aroclor 1242	2.50E+01	2.50E+01	100
Largescale Sucker	Pesticide/PCB	Aroclor 1242/1016	2.60E+01	2.60E+01	100
Largescale Sucker	Pesticide/PCB	Aroclor 1248	2.55E+01	2.60E+01	100
Largescale Sucker	Pesticide/PCB	Aroclor 1254	1.76E+02	2.70E+03	3
Largescale Sucker	Pesticide/PCB	Aroclor 1260	3.48E+01	1.30E+02	74
Largescale Sucker	Pesticide/PCB	beta-BHC	1.62E+00	4.10E+00	97
Largescale Sucker	Pesticide/PCB	Chlordane	1.50E+00	1.50E+00	100
Largescale Sucker	Pesticide/PCB	Dacthal	1.50E+00	1.50E+00	100
Largescale Sucker	Pesticide/PCB	delta-BHC	2.11E+00	5.00E+00	100
Largescale Sucker	Pesticide/PCB	Dicofol	1.41E+01	1.50E+01	100
Largescale Sucker	Pesticide/PCB	Dieldrin	3.02E+00	3.25E+01	97
Largescale Sucker	Pesticide/PCB	Endosulfan I	1.43E+00	3.30E+00	97
Largescale Sucker	Pesticide/PCB	Endosulfan II	1.98E+00	2.50E+00	100
Largescale Sucker	Pesticide/PCB	Endosulfan sulfate	2.14E+00	3.50E+00	97
Largescale Sucker	Pesticide/PCB	Endrin	2.69E+00	1.20E+01	94
Largescale Sucker	Pesticide/PCB	Endrin aldehyde	2.14E+00	4.20E+00	97
Largescale Sucker	Pesticide/PCB	Endrin ketone	1.89E+01	1.00E+02	100
Largescale Sucker	Pesticide/PCB	gamma-Chlordane	3.49E+00	2.20E+01	100
Largescale Sucker	Pesticide/PCB	Heptachlor	1.38E+00	1.50E+00	100
Largescale Sucker	Pesticide/PCB	Heptachlor epoxide	1.86E+00	1.10E+01	100

TABLE B-9. CALCULATED CONCENTRATIONS FOR 1991 AND 1993 SPECIES COMBINED (μg/kg)(Page 2 of 8)					
CommonName	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Largescale Sucker	Pesticide/PCB	Hexachlorobenzene	1.11E+02	2.50E+02	100
Largescale Sucker	Pesticide/PCB	Hexachlorobutadiene	8.43E+01	2.50E+02	100
Largescale Sucker	Pesticide/PCB	Isophorone	8.53E+01	2.50E+02	100
Largescale Sucker	Pesticide/PCB	Lindane	1.74E+00	7.70E+00	91
Largescale Sucker	Pesticide/PCB	Malathion	1.50E+00	1.50E+00	100
Largescale Sucker	Pesticide/PCB	Methoxychlor	1.53E+01	6.50E+01	97
Largescale Sucker	Pesticide/PCB	Methyl parathion	7.85E+00	1.30E+01	100
Largescale Sucker	Pesticide/PCB	Mirex	1.50E+00	1.50E+00	100
Largescale Sucker	Pesticide/PCB	o,p'-DDD	1.39E+01	1.30E+02	82
Largescale Sucker	Pesticide/PCB	o,p'-DDE	1.08E+01	6.50E+01	73
Largescale Sucker	Pesticide/PCB	o,p'-DDT	8.63E+00	1.05E+02	100
Largescale Sucker	Pesticide/PCB	p,p'-DDD	2.05E+01	4.70E+01	6
Largescale Sucker	Pesticide/PCB	p,p'-DDE	5.93E+01	1.80E+02	52
Largescale Sucker	Pesticide/PCB	p,p'-DDT	1.02E+01	5.60E+01	12
Largescale Sucker	Pesticide/PCB	Parathion	2.74E+00	1.50E+01	88
Largescale Sucker	Pesticide/PCB	Toxaphene	9.92E+01	1.25E+02	100
Largescale Sucker	Radionuclide	Americium 241	7.41E-03	1.35E-02	100
Largescale Sucker	Radionuclide	Cesium 137	1.41E-02	6.00E-02	88
Largescale Sucker	Radionuclide	Cobalt 60	1.41E-02	7.50E-02	100
Largescale Sucker	Radionuclide	Europium 152	1.00E-01	1.00E-01	100
Largescale Sucker	Radionuclide	Europium 154	1.02E-01	1.25E-01	100
Largescale Sucker	Radionuclide	Europium 155	3.91E-02	2.50E-01	100
Largescale Sucker	Radionuclide	Plutonium 238	4.53E-03	1.10E-02	94
Largescale Sucker	Radionuclide	Plutonium 239/240	1.34E-03	3.00E-03	19
Largescale Sucker	Semi-volatile	1,2,4-Trichlorobenzene	1.11E+02	2.50E+02	100
Largescale Sucker	Semi-volatile	1,2-Dichlorobenzene	8.43E+01	2.50E+02	100
Largescale Sucker	Semi-volatile	1,3-Dichlorobenzene	8.43E+01	2.50E+02	100
Largescale Sucker	Semi-volatile	1,4-Dichlorobenzene	8.43E+01	2.50E+02	100
Largescale Sucker	Semi-volatile	2,4,5-Trichlorophenol	6.15E+02	1.25E+03	100
Largescale Sucker	Semi-volatile	2,4,6-Trichlorophenol	3.43E+02	1.25E+03	100
Largescale Sucker	Semi-volatile	2,4-Dichlorophenol	2.27E+02	7.50E+02	100
Largescale Sucker	Semi-volatile	2,4-Dimethylphenol	8.43E+01	2.50E+02	100
Largescale Sucker	Semi-volatile	2,4-Dinitrophenol	8.43E+02	2.50E+03	100
Largescale Sucker	Semi-volatile	2,4-Dinitrotoluene	3.16E+02	1.25E+03	100
Largescale Sucker	Semi-volatile	2,6-Dinitrotoluene	3.16E+02	1.25E+03	100
Largescale Sucker	Semi-volatile	2-Chloronaphthalene	8.43E+01	2.50E+02	100
Largescale Sucker	Semi-volatile	2-Chlorophenol	8.43E+01	2.50E+02	100
Largescale Sucker	Semi-volatile	2-Methylnaphthalene	3.28E+01	1.40E+02	82
Largescale Sucker	Semi-volatile	2-Methylphenol	1.11E+02	2.50E+02	100
Largescale Sucker	Semi-volatile	2-Nitroaniline	6.15E+02	1.25E+03	100
Largescale Sucker	Semi-volatile	2-Nitrophenol	3.43E+02	1.25E+03	100
Largescale Sucker	Semi-volatile	3,3'-Dichlorobenzidine	5.54E+02	1.25E+03	100
Largescale Sucker	Semi-volatile	3-Nitroaniline	6.15E+02	1.25E+03	100
Largescale Sucker	Semi-volatile	4,6-Dinitro-2-methylphenol	1.23E+03	2.50E+03	100
Largescale Sucker	Semi-volatile	4-Bromophenyl phenyl ether	1.11E+02	2.50E+02	100
Largescale Sucker	Semi-volatile	4-Chloro-3-methylphenol	1.69E+02	5.00E+02	100
Largescale Sucker	Semi-volatile	4-Chloroaniline	3.54E+02	7.50E+02	100
Largescale Sucker	Semi-volatile	4-Chlorophenylphenylether	8.43E+01	2.50E+02	100
Largescale Sucker	Semi-volatile	4-Methylphenol	1.11E+02	2.50E+02	100
Largescale Sucker	Semi-volatile	4-Nitroaniline	6.15E+02	1.25E+03	100
Largescale Sucker	Semi-volatile	4-Nitrophenol	5.54E+02	1.25E+03	100
Largescale Sucker	Semi-volatile	Acenaphthene	2.87E+01	5.00E+01	100
Largescale Sucker	Semi-volatile	Acenaphthylene	2.87E+01	5.00E+01	100
Largescale Sucker	Semi-volatile	Anthracene	2.87E+01	5.00E+01	100
Largescale Sucker	Semi-volatile	Benz[a]anthracene	2.87E+01	5.00E+01	100
Largescale Sucker	Semi-volatile	Benzo[a]pyrene	5.52E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Benzo[b,k]fluoranthene	4.82E+00	5.00E+00	100
Largescale Sucker	Semi-volatile	Benzo[b]fluoranthene	1.00E+02	1.00E+02	100

TABLE B-9. CALCULATED CONCENTRATIONS FOR 1991 AND 1993 SPECIES COMBINED (µg/kg)(Page 3 of 8)					
CommonName	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Largescale Sucker	Semi-volatile	Benzo[g,h,i]perylene	5.52E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Benzo[k]fluoranthene	1.00E+02	1.00E+02	100
Largescale Sucker	Semi-volatile	Benzoic acid	1.23E+03	2.50E+03	100
Largescale Sucker	Semi-volatile	Benzyl Alcohol	1.23E+02	2.50E+02	100
Largescale Sucker	Semi-volatile	Bis(2-chloroethoxy)methane	8.43E+01	2.50E+02	100
Largescale Sucker	Semi-volatile	Bis(2-chloroethyl)ether	8.43E+01	2.50E+02	100
Largescale Sucker	Semi-volatile	Bis(2-chloroisopropyl)ether	8.43E+01	2.50E+02	100
Largescale Sucker	Semi-volatile	Bis(2-ethylhexyl)phthalate	2.75E+02	1.10E+03	71
Largescale Sucker	Semi-volatile	Butyl benzyl phthalate	8.43E+01	2.50E+02	100
Largescale Sucker	Semi-volatile	Carbazole	1.23E+02	2.50E+02	100
Largescale Sucker	Semi-volatile	Chrysene	2.87E+01	5.00E+01	100
Largescale Sucker	Semi-volatile	Di-n-butylphthalate	9.55E+01	4.30E+02	97
Largescale Sucker	Semi-volatile	Di-n-octylphthalate	1.11E+02	2.50E+02	100
Largescale Sucker	Semi-volatile	Dibenz[a,h]anthracene	5.52E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	Dibenzofuran	4.82E+00	5.00E+00	100
Largescale Sucker	Semi-volatile	Diethyl phthalate	1.11E+02	2.50E+02	100
Largescale Sucker	Semi-volatile	Dimethyl phthalate	8.43E+01	2.50E+02	100
Largescale Sucker	Semi-volatile	Fluoranthene	2.87E+01	5.00E+01	100
Largescale Sucker	Semi-volatile	Fluorene	2.87E+01	5.00E+01	100
Largescale Sucker	Semi-volatile	Hexachlorocyclopentadiene	4.22E+02	1.25E+03	100
Largescale Sucker	Semi-volatile	Hexachloroethane	1.11E+02	2.50E+02	100
Largescale Sucker	Semi-volatile	Indeno[1,2,3-cd]pyrene	5.52E+01	1.00E+02	100
Largescale Sucker	Semi-volatile	N-Nitroso-di-n-propylamine	5.00E+01	5.00E+01	100
Largescale Sucker	Semi-volatile	N-Nitrosodiphenylamine	5.00E+01	5.00E+01	100
Largescale Sucker	Semi-volatile	Naphthalene	2.95E+01	5.00E+01	85
Largescale Sucker	Semi-volatile	Nitrobenzene	8.43E+01	2.50E+02	100
Largescale Sucker	Semi-volatile	Pentachlorophenol	1.68E+03	6.00E+03	100
Largescale Sucker	Semi-volatile	Phenanthrene	2.87E+01	5.00E+01	100
Largescale Sucker	Semi-volatile	Phenol	8.43E+01	2.50E+02	100
Largescale Sucker	Semi-volatile	Pyrene	2.87E+01	5.00E+01	100
Crayfish	Butyltin	Dibutyltin	2.60E+00	2.60E+00	100
Crayfish	Butyltin	Monobutyltin	1.70E+00	1.70E+00	100
Crayfish	Butyltin	Tributyltin	3.31E+00	4.80E+00	100
Crayfish	Dioxin/Furan	1,2,3,4,6,7,8-HpCDD	8.45E-01	5.21E+00	59
Crayfish	Dioxin/Furan	1,2,3,4,6,7,8-HpCDF	5.89E-01	5.20E+00	70
Crayfish	Dioxin/Furan	1,2,3,4,7,8,9-HpCDF	4.06E-01	1.55E+00	96
Crayfish	Dioxin/Furan	1,2,3,4,7,8-HxCDD	2.20E-01	9.50E-01	89
Crayfish	Dioxin/Furan	1,2,3,4,7,8-HxCDF	2.55E-01	1.30E+00	85
Crayfish	Dioxin/Furan	1,2,3,6,7,8-HxCDD	3.02E-01	1.05E+00	81
Crayfish	Dioxin/Furan	1,2,3,6,7,8-HxCDF	2.36E-01	1.35E+00	85
Crayfish	Dioxin/Furan	1,2,3,7,8,9-HxCDD	3.02E-01	1.25E+00	89
Crayfish	Dioxin/Furan	1,2,3,7,8,9-HxCDF	3.08E-01	9.50E-01	93
Crayfish	Dioxin/Furan	1,2,3,7,8-PeCDD	3.12E-01	1.15E+00	96
Crayfish	Dioxin/Furan	1,2,3,7,8-PeCDF	2.60E-01	1.05E+00	70
Crayfish	Dioxin/Furan	2,3,4,6,7,8-HxCDF	5.92E-01	7.26E+00	59
Crayfish	Dioxin/Furan	2,3,4,7,8-PeCDF	4.41E-01	3.05E+00	56
Crayfish	Dioxin/Furan	2,3,7,8-TCDD	3.54E-01	1.00E+00	44
Crayfish	Dioxin/Furan	2,3,7,8-TCDF	3.49E+00	1.24E+01	0
Crayfish	Dioxin/Furan	OCDD	6.61E+00	7.91E+01	48
Crayfish	Dioxin/Furan	OCDF	4.24E-01	1.24E+00	78
Crayfish	Metal	Antimony	5.98E+02	2.03E+03	82
Crayfish	Metal	Arsenic	1.13E+01[3]	2.70E+02	97
Crayfish	Metal	Barium	1.44E+04	4.72E+04	0
Crayfish	Metal	Cadmium	5.50E+01	1.20E+02	3
Crayfish	Metal	Chromium	7.28E+01	9.50E+01	0
Crayfish	Metal	Copper	2.63E+04	4.64E+04	0
Crayfish	Metal	Lead	8.18E+01	4.44E+02	15
Crayfish	Metal	Mercury	3.81E+01	8.10E+01	15

TABLE B-9. CALCULATED CONCENTRATIONS FOR 1991 AND 1993 SPECIES COMBINED (μg/kg)(Page 4 of 8)

CommonName	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Crayfish	Metal	Nickel	4.78E+02	1.33E+03	55
Crayfish	Metal	Selenium	1.15E+02	2.70E+02	91
Crayfish	Metal	Silver	4.16E+02	1.54E+03	12
Crayfish	Metal	Zinc	3.15E+04	8.33E+04	0
Crayfish	Pesticide/PCB	Aldrin	1.39E+00	1.50E+00	100
Crayfish	Pesticide/PCB	alpha-BHC	1.39E+00	1.50E+00	100
Crayfish	Pesticide/PCB	alpha-Chlordane	1.25E+00	1.25E+00	100
Crayfish	Pesticide/PCB	Aroclor 1016	2.50E+01	2.50E+01	100
Crayfish	Pesticide/PCB	Aroclor 1221	3.64E+01	5.00E+01	100
Crayfish	Pesticide/PCB	Aroclor 1232	2.50E+01	2.50E+01	100
Crayfish	Pesticide/PCB	Aroclor 1242	2.50E+01	2.50E+01	100
Crayfish	Pesticide/PCB	Aroclor 1242/1016	2.50E+01	2.50E+01	100
Crayfish	Pesticide/PCB	Aroclor 1248	2.50E+01	2.50E+01	100
Crayfish	Pesticide/PCB	Aroclor 1254	2.50E+01	2.50E+01	100
Crayfish	Pesticide/PCB	Aroclor 1260	2.52E+01	3.00E+01	97
Crayfish	Pesticide/PCB	beta-BHC	1.59E+00	5.60E+00	94
Crayfish	Pesticide/PCB	Chlordane	1.50E+00	1.50E+00	100
Crayfish	Pesticide/PCB	Dacthal	1.50E+00	1.50E+00	100
Crayfish	Pesticide/PCB	delta-BHC	1.39E+00	1.50E+00	100
Crayfish	Pesticide/PCB	Dicofol	2.23E+01	3.10E+01	100
Crayfish	Pesticide/PCB	Dieldrin	2.11E+00	6.60E+00	97
Crayfish	Pesticide/PCB	Endosulfan I	1.39E+00	1.50E+00	100
Crayfish	Pesticide/PCB	Endosulfan II	2.15E+00	7.60E+00	97
Crayfish	Pesticide/PCB	Endosulfan sulfate	2.00E+00	3.00E+00	97
Crayfish	Pesticide/PCB	Endrin	1.97E+00	2.50E+00	100
Crayfish	Pesticide/PCB	Endrin aldehyde	1.95E+00	2.50E+00	100
Crayfish	Pesticide/PCB	Endrin ketone	2.50E+00	2.50E+00	100
Crayfish	Pesticide/PCB	gamma-Chlordane	1.25E+00	1.25E+00	100
Crayfish	Pesticide/PCB	Heptachlor	1.48E+00	4.50E+00	97
Crayfish	Pesticide/PCB	Heptachlor epoxide	1.39E+00	1.50E+00	100
Crayfish	Pesticide/PCB	Hexachlorobenzene	7.65E+01	1.00E+02	100
Crayfish	Pesticide/PCB	Hexachlorobutadiene	4.92E+01	5.00E+01	100
Crayfish	Pesticide/PCB	Isophorone	9.28E+01	4.30E+02	79
Crayfish	Pesticide/PCB	Lindane	1.39E+00	1.50E+00	100
Crayfish	Pesticide/PCB	Malathion	1.50E+00	1.50E+00	100
Crayfish	Pesticide/PCB	Methoxychlor	1.51E+01	3.40E+01	94
Crayfish	Pesticide/PCB	Methyl parathion	1.69E+01	3.80E+01	91
Crayfish	Pesticide/PCB	Mirex	1.50E+00	1.50E+00	100
Crayfish	Pesticide/PCB	o,p'-DDD	1.95E+00	2.50E+00	100
Crayfish	Pesticide/PCB	o,p'-DDE	1.95E+00	2.50E+00	100
Crayfish	Pesticide/PCB	o,p'-DDT	2.00E+00	3.00E+00	97
Crayfish	Pesticide/PCB	p,p'-DDD	2.62E+00	9.90E+00	94
Crayfish	Pesticide/PCB	p,p'-DDE	7.42E+00	1.70E+01	9
Crayfish	Pesticide/PCB	p,p'-DDT	2.02E+00	3.00E+00	97
Crayfish	Pesticide/PCB	Parathion	1.50E+00	1.50E+00	100
Crayfish	Pesticide/PCB	Toxaphene	9.77E+01	1.25E+02	100
Crayfish	Radionuclide	Americium 241	5.67E-03	1.30E-02	100
Crayfish	Radionuclide	Cesium 137	6.00E-02	6.00E-02	100
Crayfish	Radionuclide	Cobalt 60	7.50E-02	7.50E-02	100
Crayfish	Radionuclide	Europium 152	2.00E-01	2.00E-01	100
Crayfish	Radionuclide	Europium 154	1.25E-01	1.25E-01	100
Crayfish	Radionuclide	Europium 155	2.50E-01	2.50E-01	100
Crayfish	Radionuclide	Plutonium 238	4.47E-03	9.00E-03	100
Crayfish	Radionuclide	Plutonium 239/240	2.17E-03	5.50E-03	100
Crayfish	Semi-volatile	1,2,4-Trichlorobenzene	7.65E+01	1.00E+02	100
Crayfish	Semi-volatile	1,2-Dichlorobenzene	4.92E+01	5.00E+01	100
Crayfish	Semi-volatile	1,3-Dichlorobenzene	4.92E+01	5.00E+01	100
Crayfish	Semi-volatile	1,4-Dichlorobenzene	4.92E+01	5.00E+01	100

TABLE B-9. CALCULATED CONCENTRATIONS FOR 1991 AND 1993 SPECIES COMBINED (μg/kg)(Page 5 of 8)					
CommonName	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Crayfish	Semi-volatile	2,4,5-Trichlorophenol	2.41E+02	2.50E+02	100
Crayfish	Semi-volatile	2,4,6-Trichlorophenol	1.64E+02	2.50E+02	100
Crayfish	Semi-volatile	2,4-Dichlorophenol	1.20E+02	1.50E+02	100
Crayfish	Semi-volatile	2,4-Dimethylphenol	4.92E+01	5.00E+01	100
Crayfish	Semi-volatile	2,4-Dinitrophenol	3.82E+02	5.00E+02	100
Crayfish	Semi-volatile	2,4-Dinitrotoluene	1.37E+02	2.50E+02	100
Crayfish	Semi-volatile	2,6-Dinitrotoluene	1.37E+02	2.50E+02	100
Crayfish	Semi-volatile	2-Chloronaphthalene	4.92E+01	5.00E+01	100
Crayfish	Semi-volatile	2-Chlorophenol	4.92E+01	5.00E+01	100
Crayfish	Semi-volatile	2-Methylnaphthalene	3.19E+01	5.00E+01	61
Crayfish	Semi-volatile	2-Methylphenol	7.65E+01	1.00E+02	100
Crayfish	Semi-volatile	2-Nitroaniline	2.41E+02	2.50E+02	100
Crayfish	Semi-volatile	2-Nitrophenol	1.64E+02	2.50E+02	100
Crayfish	Semi-volatile	3,3'-Dichlorobenzidine	3.82E+02	5.00E+02	100
Crayfish	Semi-volatile	3-Nitroaniline	2.41E+02	2.50E+02	100
Crayfish	Semi-volatile	4,6-Dinitro-2-methylphenol	4.82E+02	4.95E+02	100
Crayfish	Semi-volatile	4-Bromophenyl phenyl ether	7.65E+01	1.00E+02	100
Crayfish	Semi-volatile	4-Chloro-3-methylphenol	9.88E+01	1.00E+02	100
Crayfish	Semi-volatile	4-Chloroaniline	1.44E+02	1.50E+02	100
Crayfish	Semi-volatile	4-Chlorophenylphenylether	4.92E+01	5.00E+01	100
Crayfish	Semi-volatile	4-Methylphenol	7.67E+01	1.00E+02	97
Crayfish	Semi-volatile	4-Nitroaniline	2.41E+02	2.50E+02	100
Crayfish	Semi-volatile	4-Nitrophenol	3.82E+02	5.00E+02	100
Crayfish	Semi-volatile	Acenaphthene	2.95E+01	5.00E+01	97
Crayfish	Semi-volatile	Acenaphthylene	2.95E+01	5.00E+01	100
Crayfish	Semi-volatile	Anthracene	2.95E+01	5.00E+01	100
Crayfish	Semi-volatile	Benz[a]anthracene	2.95E+01	5.00E+01	100
Crayfish	Semi-volatile	Benzo[a]pyrene	5.67E+01	1.00E+02	100
Crayfish	Semi-volatile	Benzo[b,k]fluoranthene	4.82E+00	4.95E+00	100
Crayfish	Semi-volatile	Benzo[b]fluoranthene	1.00E+02	1.00E+02	100
Crayfish	Semi-volatile	Benzo[g,h,i]perylene	5.67E+01	1.00E+02	100
Crayfish	Semi-volatile	Benzo[k]fluoranthene	1.00E+02	1.00E+02	100
Crayfish	Semi-volatile	Benzoic acid	4.82E+01	4.95E+01	100
Crayfish	Semi-volatile	Benzyl Alcohol	5.02E+01	6.80E+01	87
Crayfish	Semi-volatile	Bis(2-chloroethoxy)methane	4.92E+01	5.00E+01	100
Crayfish	Semi-volatile	Bis(2-chloroethyl)ether	4.92E+01	5.00E+01	100
Crayfish	Semi-volatile	Bis(2-chloroisopropyl)ether	4.92E+01	5.00E+01	100
Crayfish	Semi-volatile	Bis(2-ethylhexyl)phthalate	3.17E+02	3.10E+03	61
Crayfish	Semi-volatile	Butyl benzyl phthalate	9.00E+02	3.70E+03	100
Crayfish	Semi-volatile	Carbazole	4.82E+01	4.95E+01	100
Crayfish	Semi-volatile	Chrysene	2.95E+01	5.00E+01	100
Crayfish	Semi-volatile	Di-n-butylphthalate	2.95E+02	1.55E+03	94
Crayfish	Semi-volatile	Di-n-octylphthalate	7.65E+01	1.00E+02	100
Crayfish	Semi-volatile	Dibenz[a,h]anthracene	5.67E+01	1.00E+02	100
Crayfish	Semi-volatile	Dibenzofuran	4.73E+00	4.95E+00	93
Crayfish	Semi-volatile	Diethyl phthalate	7.65E+01	1.00E+02	100
Crayfish	Semi-volatile	Dimethyl phthalate	4.92E+01	5.00E+01	100
Crayfish	Semi-volatile	Fluoranthene	2.95E+01	5.00E+01	100
Crayfish	Semi-volatile	Fluorene	2.95E+01	5.00E+01	97
Crayfish	Semi-volatile	Hexachlorocyclopentadiene	2.46E+02	2.50E+02	100
Crayfish	Semi-volatile	Hexachloroethane	7.65E+01	1.00E+02	100
Crayfish	Semi-volatile	Indeno[1,2,3-cd]pyrene	5.67E+01	1.00E+02	100
Crayfish	Semi-volatile	N-Nitroso-di-n-propylamine	5.00E+01	5.00E+01	100
Crayfish	Semi-volatile	N-Nitrosodiphenylamine	5.00E+01	5.00E+01	100
Crayfish	Semi-volatile	Naphthalene	3.25E+01	5.70E+01	79
Crayfish	Semi-volatile	Nitrobenzene	4.92E+01	5.00E+01	100
Crayfish	Semi-volatile	Pentachlorophenol	3.82E+02	5.00E+02	100
Crayfish	Semi-volatile	Phenanthrene	2.95E+01	5.00E+01	97

TABLE B-9. CALCULATED CONCENTRATIONS FOR 1991 AND 1993 SPECIES COMBINED (μg/kg)(Page 6 of 8)					
CommonName	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Crayfish	Semi-volatile	Phenol	9.32E+01	6.90E+02	85
Crayfish	Semi-volatile	Pyrene	2.95E+01	5.00E+01	100
Common Carp	Butyltin	Dibutyltin	1.95E+00	2.60E+00	50
Common Carp	Butyltin	Monobutyltin	1.70E+00	1.70E+00	100
Common Carp	Butyltin	Tributyltin	1.47E+01	2.88E+01	50
Common Carp	Dioxin/Furan	1,2,3,4,6,7,8-HpCDD	4.82E+00	9.81E+00	0
Common Carp	Dioxin/Furan	1,2,3,4,6,7,8-HpCDF	4.51E-01	1.31E+00	29
Common Carp	Dioxin/Furan	1,2,3,4,7,8,9-HpCDF	1.39E-01	2.80E-01	86
Common Carp	Dioxin/Furan	1,2,3,4,7,8-HxCDD	7.16E-01	1.45E+00	14
Common Carp	Dioxin/Furan	1,2,3,4,7,8-HxCDF	3.10E-01	6.60E-01	29
Common Carp	Dioxin/Furan	1,2,3,6,7,8-HxCDD	2.02E+00	4.82E+00	14
Common Carp	Dioxin/Furan	1,2,3,6,7,8-HxCDF	2.67E-01	5.70E-01	29
Common Carp	Dioxin/Furan	1,2,3,7,8,9-HxCDD	3.19E-01	8.50E-01	43
Common Carp	Dioxin/Furan	1,2,3,7,8,9-HxCDF	7.62E-01	2.50E+00	57
Common Carp	Dioxin/Furan	1,2,3,7,8-PeCDD	1.16E+00	1.89E+00	29
Common Carp	Dioxin/Furan	1,2,3,7,8-PeCDF	1.20E+00	3.90E+00	0
Common Carp	Dioxin/Furan	2,3,4,6,7,8-HxCDF	1.70E+00	5.70E+00	0
Common Carp	Dioxin/Furan	2,3,4,7,8-PeCDF	7.49E-01	1.37E+00	14
Common Carp	Dioxin/Furan	2,3,7,8-TCDD	1.23E+00	2.10E+00	29
Common Carp	Dioxin/Furan	2,3,7,8-TCDF	6.58E+00	1.22E+01	0
Common Carp	Dioxin/Furan	OCDD	1.21E+01	3.06E+01	0
Common Carp	Dioxin/Furan	OCDF	7.08E-01	2.45E+00	57
Common Carp	Metal	Antimony	1.58E+02	2.40E+02	100
Common Carp	Metal	Arsenic	2.13E+02	3.20E+02	100
Common Carp	Metal	Barium	2.09E+03	3.40E+03	0
Common Carp	Metal	Cadmium	1.19E+02	3.50E+02	0
Common Carp	Metal	Chromium	4.50E+01	7.80E+01	50
Common Carp	Metal	Copper	1.40E+03	1.82E+03	0
Common Carp	Metal	Lead	1.46E+02	2.30E+02	0
Common Carp	Metal	Mercury	1.90E+02	1.00E+03	10
Common Carp	Metal	Nickel	2.34E+03	1.73E+04	60
Common Carp	Metal	Selenium	2.20E+02	3.20E+02	90
Common Carp	Metal	Silver	9.49E+01	1.45E+02	80
Common Carp	Metal	Zinc	9.43E+04	1.34E+05	0
Common Carp	Pesticide/PCB	Aldrin	2.28E+00	9.60E+00	91
Common Carp	Pesticide/PCB	alpha-BHC	1.45E+00	1.50E+00	100
Common Carp	Pesticide/PCB	alpha-Chlordane	1.25E+00	1.25E+00	100
Common Carp	Pesticide/PCB	Aroclor 1016	2.50E+01	2.50E+01	100
Common Carp	Pesticide/PCB	Aroclor 1221	2.52E+01	2.60E+01	100
Common Carp	Pesticide/PCB	Aroclor 1232	2.52E+01	2.60E+01	100
Common Carp	Pesticide/PCB	Aroclor 1242	2.50E+01	2.50E+01	100
Common Carp	Pesticide/PCB	Aroclor 1242/1016	2.60E+01	2.60E+01	100
Common Carp	Pesticide/PCB	Aroclor 1248	2.52E+01	2.60E+01	100
Common Carp	Pesticide/PCB	Aroclor 1254	9.92E+01	2.70E+02	36
Common Carp	Pesticide/PCB	Aroclor 1260	4.56E+01	1.10E+02	55
Common Carp	Pesticide/PCB	beta-BHC	1.45E+00	1.50E+00	100
Common Carp	Pesticide/PCB	Chlordane	1.50E+00	1.50E+00	100
Common Carp	Pesticide/PCB	Dacthal	1.56E+00	2.00E+00	100
Common Carp	Pesticide/PCB	delta-BHC	1.45E+00	1.50E+00	100
Common Carp	Pesticide/PCB	Dicofol	1.46E+01	1.50E+01	100
Common Carp	Pesticide/PCB	Dieldrin	2.56E+00	5.60E+00	82
Common Carp	Pesticide/PCB	Endosulfan I	1.45E+00	1.50E+00	100
Common Carp	Pesticide/PCB	Endosulfan II	1.68E+00	2.50E+00	100
Common Carp	Pesticide/PCB	Endosulfan sulfate	1.68E+00	2.50E+00	100
Common Carp	Pesticide/PCB	Endrin	2.31E+00	6.00E+00	91
Common Carp	Pesticide/PCB	Endrin aldehyde	1.77E+00	2.50E+00	100
Common Carp	Pesticide/PCB	Endrin ketone	1.40E+01	1.75E+01	100
Common Carp	Pesticide/PCB	gamma-Chlordane	2.40E+00	2.50E+00	100

TABLE B-9. CALCULATED CONCENTRATIONS FOR 1991 AND 1993 SPECIES COMBINED (μg/kg)(Page 7 of 8)					
CommonName	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Common Carp	Pesticide/PCB	Heptachlor	1.45E+00	1.50E+00	100
Common Carp	Pesticide/PCB	Heptachlor epoxide	1.50E+00	2.00E+00	100
Common Carp	Pesticide/PCB	Hexachlorobenzene	1.09E+02	2.50E+02	100
Common Carp	Pesticide/PCB	Hexachlorobutadiene	6.80E+01	2.50E+02	100
Common Carp	Pesticide/PCB	Isophorone	6.80E+01	2.50E+02	100
Common Carp	Pesticide/PCB	Lindane	1.64E+00	3.50E+00	91
Common Carp	Pesticide/PCB	Malathion	1.72E+00	3.00E+00	100
Common Carp	Pesticide/PCB	Methoxychlor	1.45E+01	1.50E+01	100
Common Carp	Pesticide/PCB	Methyl parathion	3.95E+00	1.30E+01	100
Common Carp	Pesticide/PCB	Mirex	2.31E+00	8.80E+00	89
Common Carp	Pesticide/PCB	o,p'-DDD	2.77E+00	1.00E+01	91
Common Carp	Pesticide/PCB	o,p'-DDE	4.93E+00	1.70E+01	73
Common Carp	Pesticide/PCB	o,p'-DDT	2.51E+00	6.90E+00	91
Common Carp	Pesticide/PCB	p,p'-DDD	9.54E+00	2.30E+01	27
Common Carp	Pesticide/PCB	p,p'-DDE	4.54E+01	1.00E+02	18
Common Carp	Pesticide/PCB	p,p'-DDT	3.99E+00	1.10E+01	36
Common Carp	Pesticide/PCB	Parathion	1.50E+00	1.50E+00	100
Common Carp	Pesticide/PCB	Toxaphene	8.41E+01	1.25E+02	100
Common Carp	Radionuclide	Americium 241	6.75E-03	7.00E-03	100
Common Carp	Radionuclide	Cesium 137	1.00E-02	1.00E-02	100
Common Carp	Radionuclide	Cobalt 60	1.00E-02	1.00E-02	100
Common Carp	Radionuclide	Europium 152	1.00E-01	1.00E-01	100
Common Carp	Radionuclide	Europium 154	1.00E-01	1.00E-01	100
Common Carp	Radionuclide	Europium 155	2.50E-02	2.50E-02	100
Common Carp	Radionuclide	Plutonium 238	6.50E-03	8.50E-03	100
Common Carp	Radionuclide	Plutonium 239/240	1.50E-03	2.00E-03	0
Common Carp	Semi-volatile	1,2,4-Trichlorobenzene	3.82E+02	3.10E+03	91
Common Carp	Semi-volatile	1,2-Dichlorobenzene	6.80E+01	2.50E+02	100
Common Carp	Semi-volatile	1,3-Dichlorobenzene	6.80E+01	2.50E+02	100
Common Carp	Semi-volatile	1,4-Dichlorobenzene	2.27E+02	1.80E+03	91
Common Carp	Semi-volatile	2,4,5-Trichlorophenol	7.45E+02	1.25E+03	100
Common Carp	Semi-volatile	2,4,6-Trichlorophenol	2.17E+02	1.25E+03	100
Common Carp	Semi-volatile	2,4-Dichlorophenol	1.63E+02	7.50E+02	100
Common Carp	Semi-volatile	2,4-Dimethylphenol	6.80E+01	2.50E+02	100
Common Carp	Semi-volatile	2,4-Dinitrophenol	6.80E+02	2.50E+03	100
Common Carp	Semi-volatile	2,4-Dinitrotoluene	2.63E+02	1.25E+03	91
Common Carp	Semi-volatile	2,6-Dinitrotoluene	1.76E+02	1.25E+03	100
Common Carp	Semi-volatile	2-Chloronaphthalene	6.80E+01	2.50E+02	100
Common Carp	Semi-volatile	2-Chlorophenol	4.45E+02	4.20E+03	91
Common Carp	Semi-volatile	2-Methylnaphthalene	6.28E+01	2.30E+02	82
Common Carp	Semi-volatile	2-Methylphenol	1.09E+02	2.50E+02	100
Common Carp	Semi-volatile	2-Nitroaniline	7.45E+02	1.25E+03	100
Common Carp	Semi-volatile	2-Nitrophenol	2.17E+02	1.25E+03	100
Common Carp	Semi-volatile	3,3'-Dichlorobenzidine	5.45E+02	1.25E+03	100
Common Carp	Semi-volatile	3-Nitroaniline	7.45E+02	1.25E+03	100
Common Carp	Semi-volatile	4,6-Dinitro-2-methylphenol	1.49E+03	2.50E+03	100
Common Carp	Semi-volatile	4-Bromophenyl phenyl ether	1.09E+02	2.50E+02	100
Common Carp	Semi-volatile	4-Chloro-3-methylphenol	6.36E+02	5.60E+03	91
Common Carp	Semi-volatile	4-Chloroaniline	1.98E+02	2.50E+02	100
Common Carp	Semi-volatile	4-Chlorophenylphenylether	6.80E+01	2.50E+02	100
Common Carp	Semi-volatile	4-Methylphenol	1.09E+02	2.50E+02	100
Common Carp	Semi-volatile	4-Nitroaniline	7.45E+02	1.25E+03	100
Common Carp	Semi-volatile	4-Nitrophenol	8.63E+02	4.00E+03	91
Common Carp	Semi-volatile	Acenaphthene	3.83E+02	3.80E+03	91
Common Carp	Semi-volatile	Acenaphthylene	4.18E+01	5.00E+01	100
Common Carp	Semi-volatile	Anthracene	4.18E+01	5.00E+01	100
Common Carp	Semi-volatile	Benz[a]anthracene	4.18E+01	5.00E+01	100
Common Carp	Semi-volatile	Benzo[a]pyrene	8.27E+01	1.00E+02	100

TABLE B-9. CALCULATED CONCENTRATIONS FOR 1991 AND 1993 SPECIES COMBINED (μg/kg)(Page 8 of 8)

CommonName	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Common Carp	Semi-volatile	Benzo[b,k]fluoranthene	4.90E+00	5.00E+00	100
Common Carp	Semi-volatile	Benzo[b]fluoranthene	1.00E+02	1.00E+02	100
Common Carp	Semi-volatile	Benzo[g,h,i]perylene	8.27E+01	1.00E+02	100
Common Carp	Semi-volatile	Benzo[k]fluoranthene	1.00E+02	1.00E+02	100
Common Carp	Semi-volatile	Benzoic acid	1.49E+03	2.50E+03	100
Common Carp	Semi-volatile	Benzyl Alcohol	1.49E+02	2.50E+02	100
Common Carp	Semi-volatile	Bis(2-chloroethoxy)methane	6.80E+01	2.50E+02	100
Common Carp	Semi-volatile	Bis(2-chloroethyl)ether	6.80E+01	2.50E+02	100
Common Carp	Semi-volatile	Bis(2-chloroisopropyl)ether	6.80E+01	2.50E+02	100
Common Carp	Semi-volatile	Bis(2-ethylhexyl)phthalate	6.12E+02	1.50E+03	27
Common Carp	Semi-volatile	Butyl benzyl phthalate	6.80E+01	2.50E+02	100
Common Carp	Semi-volatile	Carbazole	1.49E+02	2.50E+02	100
Common Carp	Semi-volatile	Chrysene	4.18E+01	5.00E+01	100
Common Carp	Semi-volatile	Di-n-butylphthalate	8.53E+01	2.50E+02	82
Common Carp	Semi-volatile	Di-n-octylphthalate	1.09E+02	2.50E+02	100
Common Carp	Semi-volatile	Dibenz[a,h]anthracene	8.27E+01	1.00E+02	100
Common Carp	Semi-volatile	Dibenzofuran	4.90E+00	5.00E+00	100
Common Carp	Semi-volatile	Diethyl phthalate	1.09E+02	2.50E+02	100
Common Carp	Semi-volatile	Dimethyl phthalate	6.80E+01	2.50E+02	100
Common Carp	Semi-volatile	Fluoranthene	4.18E+01	5.00E+01	100
Common Carp	Semi-volatile	Fluorene	4.18E+01	5.00E+01	100
Common Carp	Semi-volatile	Hexachlorocyclopentadiene	3.40E+02	1.25E+03	100
Common Carp	Semi-volatile	Hexachloroethane	1.09E+02	2.50E+02	100
Common Carp	Semi-volatile	Indeno[1,2,3-cd]pyrene	8.27E+01	1.00E+02	100
Common Carp	Semi-volatile	N-Nitroso-di-n-propylamine	3.67E+02	2.90E+03	89
Common Carp	Semi-volatile	N-Nitrosodiphenylamine	5.00E+01	5.00E+01	100
Common Carp	Semi-volatile	Naphthalene	5.73E+01	2.20E+02	91
Common Carp	Semi-volatile	Nitrobenzene	6.80E+01	2.50E+02	100
Common Carp	Semi-volatile	Pentachlorophenol	1.06E+03	6.00E+03	100
Common Carp	Semi-volatile	Phenanthrene	4.18E+01	5.00E+01	100
Common Carp	Semi-volatile	Phenol	5.18E+02	5.00E+03	91
Common Carp	Semi-volatile	Pyrene	5.10E+02	5.20E+03	91

[1] Concentrations are the mean of the detected values for each species.
For the samples where the chemical was not detected, a value of one-half the detection limit was used.

[2] Percent frequency of non-detects

[3] Mean arsenic value is estimate of inorganic arsenic derived from use of species-specific conversion factor applied to total arsenic (see Section 3.3.2)

Note: For chemicals which were not detected (% ND = 100), the max represents the maximum detection limit for that species

TABLE B-10. 1995 LOWER COLUMBIA RIVER DATA (μg/kg) (Page 1 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Carp	Dioxin/Furan	1,2,3,4,6,7,8-HpCDD	3.90E-03	3.90E-03	0
Carp	Dioxin/Furan	1,2,3,4,6,7,8-HpCDF	1.75E-04	1.75E-04	100
Carp	Dioxin/Furan	1,2,3,4,7,8,9-HpCDF	1.40E-04	1.40E-04	100
Carp	Dioxin/Furan	1,2,3,4,7,8-HxCDD	4.50E-04	4.50E-04	0
Carp	Dioxin/Furan	1,2,3,4,7,8-HxCDF	7.15E-04	7.15E-04	100
Carp	Dioxin/Furan	1,2,3,6,7,8-HxCDD	1.91E-03	1.91E-03	0
Carp	Dioxin/Furan	1,2,3,6,7,8-HxCDF	8.25E-04	8.25E-04	100
Carp	Dioxin/Furan	1,2,3,7,8,9-HxCDD	1.00E-04	1.00E-04	100
Carp	Dioxin/Furan	1,2,3,7,8,9-HxCDF	1.66E-03	1.66E-03	100
Carp	Dioxin/Furan	1,2,3,7,8-PeCDD	5.70E-04	5.70E-04	100
Carp	Dioxin/Furan	1,2,3,7,8-PeCDF	4.62E-03	4.62E-03	0
Carp	Dioxin/Furan	2,3,4,6,7,8-HxCDF	6.77E-03	6.77E-03	0
Carp	Dioxin/Furan	2,3,4,7,8-PeCDF	3.55E-04	3.55E-04	100
Carp	Dioxin/Furan	2,3,7,8-TCDD	5.70E-04	5.70E-04	100
Carp	Dioxin/Furan	2,3,7,8-TCDF	4.36E-03	4.36E-03	0
Carp	Dioxin/Furan	OCDD	5.14E-03	5.14E-03	0
Carp	Dioxin/Furan	OCDF	9.00E-05	9.00E-05	100
Carp	Metal	Antimony	2.50E+00	2.50E+00	100
Carp	Metal	Arsenic-Inorg.	1.00E+00	1.00E+00	0
Carp	Metal	Arsenic-Meth.	2.00E+01	2.00E+01	0
Carp	Metal	Barium	1.02E+02	1.02E+02	0
Carp	Metal	Cadmium	6.00E+00	6.00E+00	100
Carp	Metal	Copper	1.24E+03	1.24E+03	0
Carp	Metal	Lead	1.40E+01	1.40E+01	100
Carp	Metal	Mercury	1.45E+02	1.45E+02	0
Carp	Metal	Nickel	3.00E+01	3.00E+01	0
Carp	Metal	Selenium	5.30E+02	5.30E+02	0
Carp	Metal	Silver	1.00E+00	1.00E+00	100
Carp	Pesticide/PCB	Aldrin	5.00E-03	5.00E-03	100
Carp	Pesticide/PCB	alpha-BHC	2.10E-01	2.10E-01	0
Carp	Pesticide/PCB	alpha-Chlordane	5.00E-03	5.00E-03	100
Carp	Pesticide/PCB	Aroclor 1016	5.55E-01	5.55E-01	100
Carp	Pesticide/PCB	Aroclor 1221	5.55E-01	5.55E-01	100
Carp	Pesticide/PCB	Aroclor 1232	5.55E-01	5.55E-01	100
Carp	Pesticide/PCB	Aroclor 1242	5.55E-01	5.55E-01	100
Carp	Pesticide/PCB	Aroclor 1248	5.05E+01	5.05E+01	0
Carp	Pesticide/PCB	Aroclor 1254	5.55E-01	5.55E-01	100
Carp	Pesticide/PCB	Aroclor 1260	1.38E+02	1.38E+02	0
Carp	Pesticide/PCB	beta-BHC	5.00E-03	5.00E-03	100
Carp	Pesticide/PCB	delta-BHC	5.00E-03	5.00E-03	100
Carp	Pesticide/PCB	Dieldrin	1.00E-02	1.00E-02	100
Carp	Pesticide/PCB	Endosulfan I	5.00E-03	5.00E-03	100
Carp	Pesticide/PCB	Endosulfan II	1.00E-02	1.00E-02	100
Carp	Pesticide/PCB	Endosulfan Sulfate	1.00E-02	1.00E-02	100
Carp	Pesticide/PCB	Endrin	1.00E-02	1.00E-02	100
Carp	Pesticide/PCB	Endrin Aldehyde	1.00E-02	1.00E-02	100
Carp	Pesticide/PCB	Endrin Ketone	1.00E-02	1.00E-02	100
Carp	Pesticide/PCB	gamma-BHC	2.30E-01	2.30E-01	0
Carp	Pesticide/PCB	gamma-Chlordane	5.00E-03	5.00E-03	100
Carp	Pesticide/PCB	Heptachlor	5.00E-03	5.00E-03	100
Carp	Pesticide/PCB	Heptachlor epoxide	5.00E-03	5.00E-03	100
Carp	Pesticide/PCB	Hexachlorobenzene	8.30E-01	8.30E-01	0
Carp	Pesticide/PCB	Hexachlorobutadiene	2.00E-02	2.00E-02	0
Carp	Pesticide/PCB	Methoxychlor	5.50E-02	5.50E-02	100
Carp	Pesticide/PCB	Methyl parathion	1.10E-01	1.10E-01	100
Carp	Pesticide/PCB	Mirex	1.00E-02	1.00E-02	100
Carp	Pesticide/PCB	p,p'-DDD	5.86E+00	5.86E+00	0
Carp	Pesticide/PCB	p,p'-DDE	1.31E+02	1.31E+02	0

TABLE B-10. 1995 LOWER COLUMBIA RIVER DATA (μg/kg) (Page 2 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Carp	Pesticide/PCB	p,p'-DDT	1.00E-02	1.00E-02	100
Carp	Pesticide/PCB	Toxaphene	2.78E+00	2.78E+00	100
Carp	Semi-volatile	1,2,4-Trichlorobenzene	1.00E+01	1.00E+01	100
Carp	Semi-volatile	1,4-Dichlorobenzene	1.00E+01	1.00E+01	100
Carp	Semi-volatile	2,4-Dinitrotoluene	1.00E+01	1.00E+01	100
Carp	Semi-volatile	2-Chlorophenol	1.00E+01	1.00E+01	100
Carp	Semi-volatile	4-Methylphenol	1.00E+01	1.00E+01	100
Carp	Semi-volatile	4-Nitrophenol	1.06E+02	1.06E+02	0
Carp	Semi-volatile	Acenaphthene	1.00E+01	1.00E+01	100
Carp	Semi-volatile	bis(2-Ethylhexyl)phthalate	1.15E+01	1.15E+01	100
Carp	Semi-volatile	Chrysene	1.00E+01	1.00E+01	100
Carp	Semi-volatile	Isophorone	1.00E+01	1.00E+01	100
Carp	Semi-volatile	N-nitroso-di-n-propylamine	1.00E+01	1.00E+01	100
Carp	Semi-volatile	Phenol	9.00E+00	9.00E+00	100
Carp	Semi-volatile	Pyrene	1.00E+01	1.00E+01	100
Chinook Salmon	Dioxin/Furan	1,2,3,4,6,7,8-HpCDD	2.40E-04	5.20E-04	67
Chinook Salmon	Dioxin/Furan	1,2,3,4,6,7,8-HpCDF	6.17E-05	9.00E-05	100
Chinook Salmon	Dioxin/Furan	1,2,3,4,7,8,9-HpCDF	8.17E-05	1.25E-04	67
Chinook Salmon	Dioxin/Furan	1,2,3,4,7,8-HxCDD	8.67E-05	1.30E-04	67
Chinook Salmon	Dioxin/Furan	1,2,3,4,7,8-HxCDF	6.17E-05	8.00E-05	67
Chinook Salmon	Dioxin/Furan	1,2,3,6,7,8-HxCDD	1.40E-04	1.90E-04	67
Chinook Salmon	Dioxin/Furan	1,2,3,6,7,8-HxCDF	5.00E-05	7.00E-05	67
Chinook Salmon	Dioxin/Furan	1,2,3,7,8,9-HxCDD	1.10E-04	1.60E-04	67
Chinook Salmon	Dioxin/Furan	1,2,3,7,8,9-HxCDF	9.33E-05	1.40E-04	67
Chinook Salmon	Dioxin/Furan	1,2,3,7,8-PeCDD	1.62E-04	2.25E-04	67
Chinook Salmon	Dioxin/Furan	1,2,3,7,8-PeCDF	1.07E-04	1.60E-04	67
Chinook Salmon	Dioxin/Furan	2,3,4,6,7,8-HxCDF	7.00E-05	9.50E-05	100
Chinook Salmon	Dioxin/Furan	2,3,4,7,8-PeCDF	1.38E-04	1.70E-04	67
Chinook Salmon	Dioxin/Furan	2,3,7,8-TCDD	2.35E-04	6.40E-04	67
Chinook Salmon	Dioxin/Furan	2,3,7,8-TCDF	1.61E-03	2.70E-03	0
Chinook Salmon	Dioxin/Furan	OCDD	1.23E-03	3.15E-03	67
Chinook Salmon	Dioxin/Furan	OCDF	2.55E-04	4.00E-04	33
Chinook Salmon	Metal	Antimony	1.67E+00	2.00E+00	100
Chinook Salmon	Metal	Arsenic-Inorg.	1.28E+01	2.30E+01	33
Chinook Salmon	Metal	Arsenic-Meth.	5.07E+01	8.00E+01	0
Chinook Salmon	Metal	Barium	2.08E+01	2.50E+01	100
Chinook Salmon	Metal	Cadmium	2.17E+00	2.50E+00	100
Chinook Salmon	Metal	Copper	8.60E+02	1.01E+03	0
Chinook Salmon	Metal	Lead	7.00E+00	1.00E+01	33
Chinook Salmon	Metal	Mercury	9.97E+01	1.30E+02	0
Chinook Salmon	Metal	Nickel	1.83E+01	3.00E+01	33
Chinook Salmon	Metal	Selenium	2.80E+02	3.40E+02	0
Chinook Salmon	Metal	Silver	1.33E+00	2.00E+00	0
Chinook Salmon	Pesticide/PCB	Aldrin	2.00E-02	2.00E-02	100
Chinook Salmon	Pesticide/PCB	alpha-BHC	2.00E-02	2.00E-02	100
Chinook Salmon	Pesticide/PCB	alpha-Chlordane	2.00E-02	2.00E-02	100
Chinook Salmon	Pesticide/PCB	Aroclor 1016	8.90E-01	8.90E-01	100
Chinook Salmon	Pesticide/PCB	Aroclor 1221	8.90E-01	8.90E-01	100
Chinook Salmon	Pesticide/PCB	Aroclor 1232	8.90E-01	8.90E-01	100
Chinook Salmon	Pesticide/PCB	Aroclor 1242	8.90E-01	8.90E-01	100
Chinook Salmon	Pesticide/PCB	Aroclor 1248	8.90E-01	8.90E-01	100
Chinook Salmon	Pesticide/PCB	Aroclor 1254	8.90E-01	8.90E-01	100
Chinook Salmon	Pesticide/PCB	Aroclor 1260	9.97E+00	1.49E+01	0
Chinook Salmon	Pesticide/PCB	beta-BHC	2.00E-02	2.00E-02	100
Chinook Salmon	Pesticide/PCB	delta-BHC	2.00E-02	2.00E-02	100
Chinook Salmon	Pesticide/PCB	Dieldrin	4.50E-02	4.50E-02	100
Chinook Salmon	Pesticide/PCB	Endosulfan I	2.00E-02	2.00E-02	100
Chinook Salmon	Pesticide/PCB	Endosulfan II	4.50E-02	4.50E-02	100

TABLE B-10. 1995 LOWER COLUMBIA RIVER DATA (µg/kg) (Page 3 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Chinook Salmon	Pesticide/PCB	Endosulfan Sulfate	4.50E-02	4.50E-02	100
Chinook Salmon	Pesticide/PCB	Endrin	4.50E-02	4.50E-02	100
Chinook Salmon	Pesticide/PCB	Endrin Aldehyde	4.50E-02	4.50E-02	100
Chinook Salmon	Pesticide/PCB	Endrin Ketone	4.50E-02	4.50E-02	100
Chinook Salmon	Pesticide/PCB	gamma-BHC	2.00E-02	2.00E-02	100
Chinook Salmon	Pesticide/PCB	gamma-Chlordane	2.00E-02	2.00E-02	100
Chinook Salmon	Pesticide/PCB	Heptachlor	2.00E-02	2.00E-02	100
Chinook Salmon	Pesticide/PCB	Heptachlor epoxide	2.00E-02	2.00E-02	100
Chinook Salmon	Pesticide/PCB	Hexachlorobenzene	1.00E-02	1.00E-02	100
Chinook Salmon	Pesticide/PCB	Hexachlorobutadiene	1.00E-02	1.00E-02	100
Chinook Salmon	Pesticide/PCB	Methoxychlor	2.20E-01	2.20E-01	100
Chinook Salmon	Pesticide/PCB	Methyl parathion	4.45E-01	4.45E-01	100
Chinook Salmon	Pesticide/PCB	Mirex	4.50E-02	4.50E-02	100
Chinook Salmon	Pesticide/PCB	p,p'-DDD	3.71E+00	5.67E+00	0
Chinook Salmon	Pesticide/PCB	p,p'-DDE	8.52E+00	1.13E+01	0
Chinook Salmon	Pesticide/PCB	p,p'-DDT	1.47E+00	3.07E+00	0
Chinook Salmon	Pesticide/PCB	Toxaphene	2.96E+00	4.45E+00	100
Chinook Salmon	Semi-volatile	1,2,4-Trichlorobenzene	6.67E+00	1.00E+01	100
Chinook Salmon	Semi-volatile	1,4-Dichlorobenzene	6.67E+00	1.00E+01	100
Chinook Salmon	Semi-volatile	2,4-Dinitrotoluene	6.67E+00	1.00E+01	100
Chinook Salmon	Semi-volatile	2-Chlorophenol	6.67E+00	1.00E+01	100
Chinook Salmon	Semi-volatile	4-Methylphenol	6.67E+00	1.00E+01	100
Chinook Salmon	Semi-volatile	4-Nitrophenol	6.67E+00	1.00E+01	100
Chinook Salmon	Semi-volatile	Acenaphthene	6.67E+00	1.00E+01	100
Chinook Salmon	Semi-volatile	bis(2-Ethylhexyl)phthalate	3.02E+01	3.95E+01	100
Chinook Salmon	Semi-volatile	Chrysene	6.67E+00	1.00E+01	100
Chinook Salmon	Semi-volatile	Isophorone	6.67E+00	1.00E+01	100
Chinook Salmon	Semi-volatile	N-nitroso-di-n-propylamine	6.67E+00	1.00E+01	100
Chinook Salmon	Semi-volatile	Phenol	7.90E+01	1.91E+02	67
Chinook Salmon	Semi-volatile	Pyrene	6.67E+00	1.00E+01	100
Coho Salmon	Dioxin/Furan	1,2,3,4,6,7,8-HpCDD	1.97E-04	4.70E-04	67
Coho Salmon	Dioxin/Furan	1,2,3,4,6,7,8-HpCDF	1.43E-04	3.80E-04	67
Coho Salmon	Dioxin/Furan	1,2,3,4,7,8,9-HpCDF	3.17E-05	5.00E-05	100
Coho Salmon	Dioxin/Furan	1,2,3,4,7,8-HxCDD	2.83E-05	4.00E-05	100
Coho Salmon	Dioxin/Furan	1,2,3,4,7,8-HxCDF	5.50E-05	1.00E-04	67
Coho Salmon	Dioxin/Furan	1,2,3,6,7,8-HxCDD	2.10E-04	5.10E-04	33
Coho Salmon	Dioxin/Furan	1,2,3,6,7,8-HxCDF	2.27E-04	6.30E-04	33
Coho Salmon	Dioxin/Furan	1,2,3,7,8,9-HxCDD	3.83E-05	5.00E-05	67
Coho Salmon	Dioxin/Furan	1,2,3,7,8,9-HxCDF	3.67E-05	7.50E-05	100
Coho Salmon	Dioxin/Furan	1,2,3,7,8-PeCDD	2.33E-04	6.55E-04	100
Coho Salmon	Dioxin/Furan	1,2,3,7,8-PeCDF	4.07E-04	1.10E-03	33
Coho Salmon	Dioxin/Furan	2,3,4,6,7,8-HxCDF	6.67E-05	9.00E-05	33
Coho Salmon	Dioxin/Furan	2,3,4,7,8-PeCDF	7.50E-05	1.10E-04	33
Coho Salmon	Dioxin/Furan	2,3,7,8-TCDD	3.23E-04	8.90E-04	0
Coho Salmon	Dioxin/Furan	2,3,7,8-TCDF	6.77E-04	9.40E-04	0
Coho Salmon	Dioxin/Furan	OCDD	2.58E-04	4.40E-04	100
Coho Salmon	Dioxin/Furan	OCDF	2.15E-04	5.60E-04	67
Coho Salmon	Metal	Antimony	1.50E+00	1.50E+00	100
Coho Salmon	Metal	Arsenic-Inorg.	2.67E+00	7.00E+00	67
Coho Salmon	Metal	Arsenic-Meth.	4.33E+01	6.00E+01	0
Coho Salmon	Metal	Barium	1.09E+02	1.47E+02	0
Coho Salmon	Metal	Cadmium	3.00E+00	5.00E+00	67
Coho Salmon	Metal	Copper	8.10E+02	8.50E+02	0
Coho Salmon	Metal	Lead	4.17E+00	9.00E+00	67
Coho Salmon	Metal	Mercury	4.40E+01	4.80E+01	0
Coho Salmon	Metal	Nickel	3.20E+01	4.30E+01	0
Coho Salmon	Metal	Selenium	1.68E+02	1.88E+02	0
Coho Salmon	Metal	Silver	6.67E-01	1.00E+00	67

TABLE B-10. 1995 LOWER COLUMBIA RIVER DATA (μg/kg) (Page 4 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Coho Salmon	Pesticide/PCB	Aldrin	2.00E-02	2.00E-02	100
Coho Salmon	Pesticide/PCB	alpha-BHC	2.00E-02	2.00E-02	100
Coho Salmon	Pesticide/PCB	alpha-Chlordane	2.00E-02	2.00E-02	100
Coho Salmon	Pesticide/PCB	Aroclor 1016	5.93E-01	8.90E-01	100
Coho Salmon	Pesticide/PCB	Aroclor 1221	5.93E-01	8.90E-01	100
Coho Salmon	Pesticide/PCB	Aroclor 1232	5.93E-01	8.90E-01	100
Coho Salmon	Pesticide/PCB	Aroclor 1242	5.93E-01	8.90E-01	100
Coho Salmon	Pesticide/PCB	Aroclor 1248	5.93E-01	8.90E-01	100
Coho Salmon	Pesticide/PCB	Aroclor 1254	5.93E-01	8.90E-01	100
Coho Salmon	Pesticide/PCB	Aroclor 1260	3.05E+00	4.08E+00	0
Coho Salmon	Pesticide/PCB	beta-BHC	2.00E-02	2.00E-02	100
Coho Salmon	Pesticide/PCB	delta-BHC	2.00E-02	2.00E-02	100
Coho Salmon	Pesticide/PCB	Dieldrin	4.50E-02	4.50E-02	100
Coho Salmon	Pesticide/PCB	Endosulfan I	2.00E-02	2.00E-02	100
Coho Salmon	Pesticide/PCB	Endosulfan II	4.50E-02	4.50E-02	100
Coho Salmon	Pesticide/PCB	Endosulfan Sulfate	4.50E-02	4.50E-02	100
Coho Salmon	Pesticide/PCB	Endrin	2.70E-01	7.20E-01	67
Coho Salmon	Pesticide/PCB	Endrin Aldehyde	4.50E-02	4.50E-02	100
Coho Salmon	Pesticide/PCB	Endrin Ketone	4.50E-02	4.50E-02	100
Coho Salmon	Pesticide/PCB	gamma-BHC	2.00E-02	2.00E-02	100
Coho Salmon	Pesticide/PCB	gamma-Chlordane	2.00E-02	2.00E-02	100
Coho Salmon	Pesticide/PCB	Heptachlor	2.00E-02	2.00E-02	100
Coho Salmon	Pesticide/PCB	Heptachlor epoxide	2.00E-02	2.00E-02	100
Coho Salmon	Pesticide/PCB	Hexachlorobenzene	1.00E-02	1.00E-02	100
Coho Salmon	Pesticide/PCB	Hexachlorobutadiene	1.00E-02	1.00E-02	100
Coho Salmon	Pesticide/PCB	Methoxychlor	2.20E-01	2.20E-01	100
Coho Salmon	Pesticide/PCB	Methyl parathion	4.45E-01	4.45E-01	100
Coho Salmon	Pesticide/PCB	Mirex	4.50E-02	4.50E-02	100
Coho Salmon	Pesticide/PCB	p,p'-DDD	9.92E-01	1.53E+00	33
Coho Salmon	Pesticide/PCB	p,p'-DDE	3.03E+00	4.51E+00	0
Coho Salmon	Pesticide/PCB	p,p'-DDT	8.13E-01	1.07E+00	0
Coho Salmon	Pesticide/PCB	Toxaphene	2.96E+00	4.45E+00	100
Coho Salmon	Semi-volatile	1,2,4-Trichlorobenzene	5.00E+00	5.00E+00	100
Coho Salmon	Semi-volatile	1,4-Dichlorobenzene	5.00E+00	5.00E+00	100
Coho Salmon	Semi-volatile	2,4-Dinitrotoluene	5.00E+00	5.00E+00	100
Coho Salmon	Semi-volatile	2-Chlorophenol	5.00E+00	5.00E+00	100
Coho Salmon	Semi-volatile	4-Methylphenol	5.00E+00	5.00E+00	100
Coho Salmon	Semi-volatile	4-Nitrophenol	5.00E+00	5.00E+00	100
Coho Salmon	Semi-volatile	Acenaphthene	5.00E+00	5.00E+00	100
Coho Salmon	Semi-volatile	bis(2-Ethylhexyl)phthalate	3.38E+01	4.65E+01	100
Coho Salmon	Semi-volatile	Chrysene	5.00E+00	5.00E+00	100
Coho Salmon	Semi-volatile	Isophorone	5.00E+00	5.00E+00	100
Coho Salmon	Semi-volatile	N-nitroso-di-n-propylamine	5.00E+00	5.00E+00	100
Coho Salmon	Semi-volatile	Phenol	3.57E+01	6.10E+01	67
Coho Salmon	Semi-volatile	Pyrene	5.00E+00	5.00E+00	100
Largescale Sucker	Dioxin/Furan	1,2,3,4,6,7,8-HpCDD	3.40E-04	9.00E-04	67
Largescale Sucker	Dioxin/Furan	1,2,3,4,6,7,8-HpCDF	6.00E-04	2.67E-03	78
Largescale Sucker	Dioxin/Furan	1,2,3,4,7,8,9-HpCDF	1.69E-04	4.30E-04	100
Largescale Sucker	Dioxin/Furan	1,2,3,4,7,8-HxCDD	1.79E-04	5.10E-04	89
Largescale Sucker	Dioxin/Furan	1,2,3,4,7,8-HxCDF	3.40E-04	8.45E-04	100
Largescale Sucker	Dioxin/Furan	1,2,3,6,7,8-HxCDD	1.99E-04	5.30E-04	89
Largescale Sucker	Dioxin/Furan	1,2,3,6,7,8-HxCDF	5.31E-04	1.59E-03	78
Largescale Sucker	Dioxin/Furan	1,2,3,7,8,9-HxCDD	1.93E-04	6.05E-04	100
Largescale Sucker	Dioxin/Furan	1,2,3,7,8,9-HxCDF	6.24E-04	1.81E-03	67
Largescale Sucker	Dioxin/Furan	1,2,3,7,8-PeCDD	2.81E-04	6.20E-04	100
Largescale Sucker	Dioxin/Furan	1,2,3,7,8-PeCDF	8.76E-04	1.82E-03	67
Largescale Sucker	Dioxin/Furan	2,3,4,6,7,8-HxCDF	3.28E-04	6.40E-04	89
Largescale Sucker	Dioxin/Furan	2,3,4,7,8-PeCDF	1.74E-04	4.35E-04	100

TABLE B-10. 1995 LOWER COLUMBIA RIVER DATA (μg/kg) (Page 5 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Largescale Sucker	Dioxin/Furan	2,3,7,8-TCDD	1.91E-04	3.85E-04	100
Largescale Sucker	Dioxin/Furan	2,3,7,8-TCDF	1.26E-03	2.42E-03	0
Largescale Sucker	Dioxin/Furan	OCDD	1.11E-03	3.26E-03	67
Largescale Sucker	Dioxin/Furan	OCDF	1.04E-03	5.96E-03	56
Largescale Sucker	Metal	Antimony	1.11E+00	2.00E+00	33
Largescale Sucker	Metal	Arsenic-Inorg.	1.25E+01	3.80E+01	11
Largescale Sucker	Metal	Arsenic-Meth.	6.50E+00	1.10E+01	11
Largescale Sucker	Metal	Barium	1.11E+02	1.85E+02	0
Largescale Sucker	Metal	Cadmium	2.83E+00	4.50E+00	89
Largescale Sucker	Metal	Copper	5.29E+02	7.70E+02	0
Largescale Sucker	Metal	Lead	1.28E+01	2.00E+01	33
Largescale Sucker	Metal	Mercury	1.53E+02	1.93E+02	0
Largescale Sucker	Metal	Nickel	2.66E+01	6.00E+01	22
Largescale Sucker	Metal	Selenium	1.69E+02	2.60E+02	0
Largescale Sucker	Metal	Silver	5.00E-01	5.00E-01	100
Largescale Sucker	Pesticide/PCB	Aldrin	8.33E-03	1.00E-02	100
Largescale Sucker	Pesticide/PCB	alpha-BHC	8.33E-03	1.00E-02	100
Largescale Sucker	Pesticide/PCB	alpha-Chlordane	8.33E-03	1.00E-02	100
Largescale Sucker	Pesticide/PCB	Aroclor 1016	9.25E-01	1.11E+00	100
Largescale Sucker	Pesticide/PCB	Aroclor 1221	9.25E-01	1.11E+00	100
Largescale Sucker	Pesticide/PCB	Aroclor 1232	9.25E-01	1.11E+00	100
Largescale Sucker	Pesticide/PCB	Aroclor 1242	9.25E-01	1.11E+00	100
Largescale Sucker	Pesticide/PCB	Aroclor 1248	6.42E+00	1.83E+01	56
Largescale Sucker	Pesticide/PCB	Aroclor 1254	9.25E-01	1.11E+00	100
Largescale Sucker	Pesticide/PCB	Aroclor 1260	3.35E+01	5.77E+01	0
Largescale Sucker	Pesticide/PCB	beta-BHC	8.33E-03	1.00E-02	100
Largescale Sucker	Pesticide/PCB	delta-BHC	8.33E-03	1.00E-02	100
Largescale Sucker	Pesticide/PCB	Dieldrin	1.67E-02	2.00E-02	100
Largescale Sucker	Pesticide/PCB	Endosulfan I	8.33E-03	1.00E-02	100
Largescale Sucker	Pesticide/PCB	Endosulfan II	1.67E-02	2.00E-02	100
Largescale Sucker	Pesticide/PCB	Endosulfan Sulfate	1.67E-02	2.00E-02	100
Largescale Sucker	Pesticide/PCB	Endrin	1.67E-02	2.00E-02	100
Largescale Sucker	Pesticide/PCB	Endrin Aldehyde	1.67E-02	2.00E-02	100
Largescale Sucker	Pesticide/PCB	Endrin Ketone	1.67E-02	2.00E-02	100
Largescale Sucker	Pesticide/PCB	gamma-BHC	8.33E-03	1.00E-02	100
Largescale Sucker	Pesticide/PCB	gamma-Chlordane	8.33E-03	1.00E-02	100
Largescale Sucker	Pesticide/PCB	Heptachlor	8.33E-03	1.00E-02	100
Largescale Sucker	Pesticide/PCB	Heptachlor epoxide	8.33E-03	1.00E-02	100
Largescale Sucker	Pesticide/PCB	Hexachlorobenzene	5.00E-01	1.53E+00	0
Largescale Sucker	Pesticide/PCB	Hexachlorobutadiene	5.00E-03	5.00E-03	100
Largescale Sucker	Pesticide/PCB	Methoxychlor	9.17E-02	1.10E-01	100
Largescale Sucker	Pesticide/PCB	Methyl parathion	1.83E-01	2.20E-01	100
Largescale Sucker	Pesticide/PCB	Mirex	1.67E-02	2.00E-02	100
Largescale Sucker	Pesticide/PCB	p,p'-DDD	8.77E+00	1.84E+01	0
Largescale Sucker	Pesticide/PCB	p,p'-DDE	2.32E+01	4.46E+01	0
Largescale Sucker	Pesticide/PCB	p,p'-DDT	1.70E+00	6.93E+00	33
Largescale Sucker	Pesticide/PCB	Toxaphene	4.63E+00	5.56E+00	100
Largescale Sucker	Semi-volatile	1,2,4-Trichlorobenzene	5.00E+00	5.00E+00	100
Largescale Sucker	Semi-volatile	1,4-Dichlorobenzene	5.00E+00	5.00E+00	100
Largescale Sucker	Semi-volatile	2,4-Dinitrotoluene	5.00E+00	5.00E+00	100
Largescale Sucker	Semi-volatile	2-Chlorophenol	5.00E+00	5.00E+00	100
Largescale Sucker	Semi-volatile	4-Methylphenol	7.33E+00	1.10E+01	56
Largescale Sucker	Semi-volatile	4-Nitrophenol	2.96E+01	9.90E+01	67
Largescale Sucker	Semi-volatile	Acenaphthene	5.00E+00	5.00E+00	100
Largescale Sucker	Semi-volatile	bis(2-Ethylhexyl)phthalate	2.40E+02	1.10E+03	78
Largescale Sucker	Semi-volatile	Chrysene	5.00E+00	5.00E+00	100
Largescale Sucker	Semi-volatile	Isophorone	5.00E+00	5.00E+00	100
Largescale Sucker	Semi-volatile	N-nitroso-di-n-propylamine	5.00E+00	5.00E+00	100

TABLE B-10. 1995 LOWER COLUMBIA RIVER DATA (μg/kg) (Page 6 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Largescale Sucker	Semi-volatile	Phenol	1.21E+01	2.30E+01	67
Largescale Sucker	Semi-volatile	Pyrene	5.00E+00	5.00E+00	100
Steelhead	Dioxin/Furan	1,2,3,4,6,7,8-HpCDD	9.50E-05	1.50E-04	67
Steelhead	Dioxin/Furan	1,2,3,4,6,7,8-HpCDF	8.33E-05	1.10E-04	100
Steelhead	Dioxin/Furan	1,2,3,4,7,8,9-HpCDF	1.15E-04	1.65E-04	100
Steelhead	Dioxin/Furan	1,2,3,4,7,8-HxCDD	6.33E-05	7.50E-05	67
Steelhead	Dioxin/Furan	1,2,3,4,7,8-HxCDF	9.67E-05	1.35E-04	100
Steelhead	Dioxin/Furan	1,2,3,6,7,8-HxCDD	7.17E-05	8.00E-05	100
Steelhead	Dioxin/Furan	1,2,3,6,7,8-HxCDF	9.83E-05	1.25E-04	100
Steelhead	Dioxin/Furan	1,2,3,7,8,9-HxCDD	7.50E-05	9.00E-05	100
Steelhead	Dioxin/Furan	1,2,3,7,8,9-HxCDF	1.13E-04	1.55E-04	100
Steelhead	Dioxin/Furan	1,2,3,7,8-PeCDD	9.17E-05	1.20E-04	100
Steelhead	Dioxin/Furan	1,2,3,7,8-PeCDF	1.40E-04	1.80E-04	33
Steelhead	Dioxin/Furan	2,3,4,6,7,8-HxCDF	8.83E-05	1.10E-04	100
Steelhead	Dioxin/Furan	2,3,4,7,8-PeCDF	8.00E-05	9.50E-05	100
Steelhead	Dioxin/Furan	2,3,7,8-TCDD	4.67E-05	7.00E-05	100
Steelhead	Dioxin/Furan	2,3,7,8-TCDF	2.37E-04	2.70E-04	0
Steelhead	Dioxin/Furan	OCDD	1.77E-04	2.05E-04	100
Steelhead	Dioxin/Furan	OCDF	6.67E-05	1.15E-04	100
Steelhead	Metal	Antimony	2.67E+00	3.00E+00	100
Steelhead	Metal	Arsenic-Inorg.	6.50E+00	1.80E+01	33
Steelhead	Metal	Arsenic-Meth.	2.83E+01	3.30E+01	0
Steelhead	Metal	Barium	1.17E+01	2.10E+01	67
Steelhead	Metal	Cadmium	5.67E+00	6.00E+00	100
Steelhead	Metal	Copper	7.47E+02	8.10E+02	0
Steelhead	Metal	Lead	1.53E+01	1.90E+01	100
Steelhead	Metal	Mercury	6.37E+01	6.80E+01	0
Steelhead	Metal	Nickel	2.30E+01	2.80E+01	33
Steelhead	Metal	Selenium	4.30E+02	4.40E+02	0
Steelhead	Metal	Silver	1.00E+00	1.00E+00	100
Steelhead	Pesticide/PCB	Aldrin	2.00E-02	2.00E-02	100
Steelhead	Pesticide/PCB	alpha-BHC	8.67E-02	2.20E-01	67
Steelhead	Pesticide/PCB	alpha-Chlordane	2.00E-02	2.00E-02	100
Steelhead	Pesticide/PCB	Aroclor 1016	2.22E+00	2.22E+00	100
Steelhead	Pesticide/PCB	Aroclor 1221	2.22E+00	2.22E+00	100
Steelhead	Pesticide/PCB	Aroclor 1232	2.22E+00	2.22E+00	100
Steelhead	Pesticide/PCB	Aroclor 1242	2.22E+00	2.22E+00	100
Steelhead	Pesticide/PCB	Aroclor 1248	2.22E+00	2.22E+00	100
Steelhead	Pesticide/PCB	Aroclor 1254	2.22E+00	2.22E+00	100
Steelhead	Pesticide/PCB	Aroclor 1260	5.06E+00	8.07E+00	0
Steelhead	Pesticide/PCB	beta-BHC	2.00E-02	2.00E-02	100
Steelhead	Pesticide/PCB	delta-BHC	2.00E-02	2.00E-02	100
Steelhead	Pesticide/PCB	Dieldrin	4.50E-02	4.50E-02	100
Steelhead	Pesticide/PCB	Endosulfan I	2.00E-02	2.00E-02	100
Steelhead	Pesticide/PCB	Endosulfan II	4.50E-02	4.50E-02	100
Steelhead	Pesticide/PCB	Endosulfan Sulfate	4.50E-02	4.50E-02	100
Steelhead	Pesticide/PCB	Endrin	2.20E-01	5.70E-01	67
Steelhead	Pesticide/PCB	Endrin Aldehyde	4.50E-02	4.50E-02	100
Steelhead	Pesticide/PCB	Endrin Ketone	9.83E-02	2.05E-01	100
Steelhead	Pesticide/PCB	gamma-BHC	2.00E-02	2.00E-02	100
Steelhead	Pesticide/PCB	gamma-Chlordane	2.00E-02	2.00E-02	100
Steelhead	Pesticide/PCB	Heptachlor	2.00E-02	2.00E-02	100
Steelhead	Pesticide/PCB	Heptachlor epoxide	2.00E-02	2.00E-02	100
Steelhead	Pesticide/PCB	Hexachlorobenzene	1.07E+00	2.20E+00	0
Steelhead	Pesticide/PCB	Hexachlorobutadiene	1.35E-01	3.10E-01	67
Steelhead	Pesticide/PCB	Methoxychlor	2.20E-01	2.20E-01	100
Steelhead	Pesticide/PCB	Methyl parathion	4.45E-01	4.45E-01	100
Steelhead	Pesticide/PCB	Mirex	4.50E-02	4.50E-02	100

TABLE B-10. 1995 LOWER COLUMBIA RIVER DATA (μg/kg) (Page 7 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Steelhead	Pesticide/PCB	p,p'-DDD	2.43E+00	3.40E+00	0
Steelhead	Pesticide/PCB	p,p'-DDE	2.26E+00	3.87E+00	0
Steelhead	Pesticide/PCB	p,p'-DDT	3.17E+00	4.13E+00	0
Steelhead	Pesticide/PCB	Toxaphene	1.11E+01	1.11E+01	100
Steelhead	Semi-volatile	1,2,4-Trichlorobenzene	5.00E+00	5.00E+00	100
Steelhead	Semi-volatile	1,4-Dichlorobenzene	5.00E+00	5.00E+00	100
Steelhead	Semi-volatile	2,4-Dinitrotoluene	5.00E+00	5.00E+00	100
Steelhead	Semi-volatile	2-Chlorophenol	5.00E+00	5.00E+00	100
Steelhead	Semi-volatile	4-Methylphenol	1.07E+01	1.20E+01	0
Steelhead	Semi-volatile	4-Nitrophenol	2.53E+01	2.80E+01	0
Steelhead	Semi-volatile	Acenaphthene	5.00E+00	5.00E+00	100
Steelhead	Semi-volatile	bis(2-Ethylhexyl)phthalate	1.57E+01	2.75E+01	100
Steelhead	Semi-volatile	Chrysene	5.00E+00	5.00E+00	100
Steelhead	Semi-volatile	Isophorone	5.00E+00	5.00E+00	100
Steelhead	Semi-volatile	N-nitroso-di-n-propylamine	5.00E+00	5.00E+00	100
Steelhead	Semi-volatile	Phenol	1.75E+01	2.05E+01	100
Steelhead	Semi-volatile	Pyrene	5.00E+00	5.00E+00	100
Sturgeon	Dioxin/Furan	1,2,3,4,6,7,8-HpCDD	1.72E-04	4.80E-04	83
Sturgeon	Dioxin/Furan	1,2,3,4,6,7,8-HpCDF	2.93E-04	1.64E-03	83
Sturgeon	Dioxin/Furan	1,2,3,4,7,8,9-HpCDF	1.02E-04	3.15E-04	100
Sturgeon	Dioxin/Furan	1,2,3,4,7,8-HxCDD	9.25E-05	1.85E-04	100
Sturgeon	Dioxin/Furan	1,2,3,4,7,8-HxCDF	1.08E-04	3.65E-04	100
Sturgeon	Dioxin/Furan	1,2,3,6,7,8-HxCDD	9.33E-05	1.70E-04	100
Sturgeon	Dioxin/Furan	1,2,3,6,7,8-HxCDF	4.05E-04	3.88E-03	100
Sturgeon	Dioxin/Furan	1,2,3,7,8,9-HxCDD	1.11E-04	2.20E-04	100
Sturgeon	Dioxin/Furan	1,2,3,7,8,9-HxCDF	3.06E-04	8.70E-04	42
Sturgeon	Dioxin/Furan	1,2,3,7,8-PeCDD	1.10E-04	1.65E-04	100
Sturgeon	Dioxin/Furan	1,2,3,7,8-PeCDF	2.28E-04	5.70E-04	92
Sturgeon	Dioxin/Furan	2,3,4,6,7,8-HxCDF	1.01E-04	4.10E-04	92
Sturgeon	Dioxin/Furan	2,3,4,7,8-PeCDF	7.08E-05	2.00E-04	92
Sturgeon	Dioxin/Furan	2,3,7,8-TCDD	1.02E-04	1.60E-04	100
Sturgeon	Dioxin/Furan	2,3,7,8-TCDF	2.69E-03	5.94E-03	0
Sturgeon	Dioxin/Furan	OCDD	5.96E-04	2.89E-03	83
Sturgeon	Dioxin/Furan	OCDF	6.51E-04	5.78E-03	75
Sturgeon	Metal	Antimony	2.17E+00	2.50E+00	100
Sturgeon	Metal	Arsenic-Inorg.	3.91E+01	5.00E+01	0
Sturgeon	Metal	Arsenic-Meth.	2.34E+01	1.30E+02	0
Sturgeon	Metal	Barium	1.17E+02	4.40E+02	0
Sturgeon	Metal	Cadmium	4.50E+00	5.00E+00	100
Sturgeon	Metal	Copper	2.24E+02	3.50E+02	0
Sturgeon	Metal	Lead	1.15E+01	1.70E+01	100
Sturgeon	Metal	Mercury	6.33E+01	1.11E+02	0
Sturgeon	Metal	Nickel	7.40E+01	5.90E+02	50
Sturgeon	Metal	Selenium	3.99E+02	5.30E+02	0
Sturgeon	Metal	Silver	7.92E-01	1.00E+00	100
Sturgeon	Pesticide/PCB	Aldrin	2.29E-02	1.20E-01	83
Sturgeon	Pesticide/PCB	alpha-BHC	3.08E-02	1.30E-01	58
Sturgeon	Pesticide/PCB	alpha-Chlordane	7.08E-03	1.00E-02	100
Sturgeon	Pesticide/PCB	Aroclor 1016	7.86E-01	1.11E+00	100
Sturgeon	Pesticide/PCB	Aroclor 1221	7.86E-01	1.11E+00	100
Sturgeon	Pesticide/PCB	Aroclor 1232	7.86E-01	1.11E+00	100
Sturgeon	Pesticide/PCB	Aroclor 1242	7.86E-01	1.11E+00	100
Sturgeon	Pesticide/PCB	Aroclor 1248	1.17E+01	2.77E+01	42
Sturgeon	Pesticide/PCB	Aroclor 1254	7.86E-01	1.11E+00	100
Sturgeon	Pesticide/PCB	Aroclor 1260	4.64E+01	8.65E+01	0
Sturgeon	Pesticide/PCB	beta-BHC	7.08E-03	1.00E-02	100
Sturgeon	Pesticide/PCB	delta-BHC	7.08E-03	1.00E-02	100
Sturgeon	Pesticide/PCB	Dieldrin	1.42E-02	2.00E-02	100

TABLE B-10. 1995 LOWER COLUMBIA RIVER DATA ($\mu g/kg$) (Page 8 of 8)					
Species	Chemical Group	Chemical	Mean[1]	Maximum	% of ND[2]
Sturgeon	Pesticide/PCB	Endosulfan I	7.08E-03	1.00E-02	100
Sturgeon	Pesticide/PCB	Endosulfan II	1.42E-02	2.00E-02	100
Sturgeon	Pesticide/PCB	Endosulfan Sulfate	1.42E-02	2.00E-02	100
Sturgeon	Pesticide/PCB	Endrin	1.42E-02	2.00E-02	100
Sturgeon	Pesticide/PCB	Endrin Aldehyde	1.42E-02	2.00E-02	100
Sturgeon	Pesticide/PCB	Endrin Ketone	2.75E-02	1.80E-01	92
Sturgeon	Pesticide/PCB	gamma-BHC	2.14E-01	2.26E+00	83
Sturgeon	Pesticide/PCB	gamma-Chlordane	7.08E-03	1.00E-02	100
Sturgeon	Pesticide/PCB	Heptachlor	7.08E-03	1.00E-02	100
Sturgeon	Pesticide/PCB	Heptachlor epoxide	7.08E-03	1.00E-02	100
Sturgeon	Pesticide/PCB	Hexachlorobenzene	3.77E-01	1.01E+00	0
Sturgeon	Pesticide/PCB	Hexachlorobutadiene	2.28E-01	5.80E-01	25
Sturgeon	Pesticide/PCB	Methoxychlor	7.79E-02	1.10E-01	100
Sturgeon	Pesticide/PCB	Methyl parathion	1.56E-01	2.20E-01	100
Sturgeon	Pesticide/PCB	Mirex	6.58E-02	5.10E-01	83
Sturgeon	Pesticide/PCB	p,p'-DDD	6.23E+00	1.05E+01	0
Sturgeon	Pesticide/PCB	p,p'-DDE	4.19E+01	7.66E+01	0
Sturgeon	Pesticide/PCB	p,p'-DDT	1.07E+00	2.84E+00	0
Sturgeon	Pesticide/PCB	Toxaphene	3.94E+00	5.56E+00	100
Sturgeon	Semi-volatile	1,2,4-Trichlorobenzene	5.00E+00	5.00E+00	100
Sturgeon	Semi-volatile	1,4-Dichlorobenzene	5.00E+00	5.00E+00	100
Sturgeon	Semi-volatile	2,4-Dinitrotoluene	5.00E+00	5.00E+00	100
Sturgeon	Semi-volatile	2-Chlorophenol	5.00E+00	5.00E+00	100
Sturgeon	Semi-volatile	4-Methylphenol	8.42E+00	1.80E+01	58
Sturgeon	Semi-volatile	4-Nitrophenol	4.61E+01	1.19E+02	42
Sturgeon	Semi-volatile	Acenaphthene	5.00E+00	5.00E+00	100
Sturgeon	Semi-volatile	bis(2-Ethylhexyl)phthalate	2.25E+01	6.80E+01	100
Sturgeon	Semi-volatile	Chrysene	5.00E+00	5.00E+00	100
Sturgeon	Semi-volatile	Isophorone	5.00E+00	5.00E+00	100
Sturgeon	Semi-volatile	N-nitroso-di-n-propylamine	5.00E+00	5.00E+00	100
Sturgeon	Semi-volatile	Phenol	7.25E+00	1.05E+01	100
Sturgeon	Semi-volatile	Pyrene	5.00E+00	5.00E+00	100

[1] Concentrations are the mean of the detected values for each species sampled. For the samples where the chemical was not detected, a value of one-half the detection limit was used.

[2] Percent frequency of non-detects.

APPENDIX C

APPENDIX C

TOXICOLOGICAL PROFILES

APPENDIX C. TOXICOLOGICAL PROFILES

C.1. Metals

Antimony; CASRN 7440-36-0

The oral RfD 4E-4, is based upon a rat chronic bioassay study, with observed critical effects including: decreased blood glucose levels, altered cholesterol levels and decreased longevity. Excessive oral ingestion by humans has demonstrated gastrointestinal irritation. An uncertainty factor of 1000 is used to account for interspecies conversion, sensitive subpopulations and for the lack of a NOEL. Confidence in the RfD is low due to the fact that the RfD is based upon only one study using one dose level, no NOEL was established, and gross pathology and histopathology were not well described. Antimony has not been evaluated for carcinogenic potential.

Arsenic-inorganic; CASRN 7440-38-2

The oral RfD 3E-4, is based upon a human chronic oral exposure study, with observed critical effects including: blackfoot disease, hyperpigmentation, hyperkeratosis and neurotoxic effects (sensory changes, paresthesia and motor dysfunctioning). Arsenic compounds have been reported to be teratogenic, fetotoxic and embryotoxic in several animal species. An uncertainty factor of 3 is used to account for both the lack of data to preclude reproductive toxicity as a critical effect and for sensitive populations. Confidence in the RfD is medium based upon the supporting human toxicity data base which is extensive but the doses are not well characterized. Arsenic is a classified by the EPA as an A carcinogen based upon increased skin cancer incidence in several populations consuming drinking water with high arsenic concentrations. The carcinogenic slope factor is 1.75E+0.

Barium; CASRN 7440-39-3

The oral RfD 7E-2, is based upon a subchronic human study and several oral chronic animal studies, which observed hypertension (increased blood pressure) in the exposed populations. An uncertainty factor of 3 is used to account for sensitive individuals. Confidence in the RfD is medium because the EPA does not believe that a single study considered alone is adequate to calculate an RfD. Barium has not been evaluated by the EPA for evidence of human carcinogenic potential.

Cadmium; CASRN 7440-43-9

Because the fraction ingested for cadmium varies with the source (food versus water), the RfD for food was used for this assessment. The oral RfD 1E-3, is based on the highest level of Cd in the human renal cortex (critical level) not associated with significant proteinuria (critical effect). An uncertainty factor of 10 is used to account for intrahuman variability and lack of specific data on sensitive individuals. Confidence in the RfD is high based on the consistency of the data from many human and animal studies. Cadmium is classified by the EPA as a B1 carcinogen on the basis of inhalation exposure. Seven studies in rats and mice in which cadmium salts (acetate, sulfate, chloride) were administered orally have shown no evidence of carcinogenic response.

Chromium; CASRN 16065-83-1

Chromium (III) is more commonly found in nature and in biological organisms. The oral RfD for Chromium (III) 1E+0, is based upon a rat chronic feeding study. An uncertainty factor of 100 is used to account for interhuman and interspecies variability, and a modifying factor of 10 is used to reflect uncertainty in the NOEL. There is an absence of toxic and carcinogenic effects demonstrated after administration of high doses of chromium in several subacute and long-term feeding experiments in animals. Confidence is low due to the lack of an observed effect level. The evaluation for carcinogenic potential of this chemical is under review by an inter-office Agency work group.

Copper; CASRN 7440-50-8

The oral RfD 3.7E-2, is based upon the current drinking water standard of 1.3 mg/L assuming a 2 l/day ingestion rate and a 70 kg person body weight. Acute doses of soluble salts cause gastrointestinal damage. Copper is classified as a noncarcinogen as there are no human data, inadequate animal data from assays of copper compounds, and equivocal mutagenicity data.

Lead; CASRN 7439-92-1

Currently there is no approved toxicity values for lead because no consensus can be reached for a no observed effect level. There has not been an exposure level at which no adverse effects have been demonstrated in children. Acute toxicity in children has been shown to cause colic, developmental disorders and neurological development interferences. Chronic toxicity in adults has been shown to cause increased blood pressure in men, hematological effects, muscle weakness and brain and kidney damage. The weight of evidence for carcinogenicity classifies lead as a B2 carcinogen based on sufficient animal evidence. Ten rat bioassays and one mouse assay have shown statistically significant increases in renal tumors with dietary and subcutaneous exposure to several soluble lead salts. Animal assays provide reproducible results in several laboratories, in multiple rat strains with some evidence of multiple tumor sites. Short term studies show that lead affects gene expression. Human evidence is inadequate.

Mercury; CASRN 22967-92-6

Mercury in biological organisms is considered to be up to 90% methylmercury. Therefore, organic mercury is considered more relevant to fish contamination and is subsequently used for toxicity analysis. The oral RfD for methylmercury 3E-4, is based upon several human poisonings, which demonstrated CNS deficits including loss of sensory and motor coordination. Mercury has also been shown to be a developmental toxicant. An uncertainty factor of 10 is used to account for the use of a LOAEL. Confidence in the RfD is medium because of the lack of a NOEL. The potential for carcinogenicity is currently under review.

Nickel-soluble salts; CASRN 7440-02-0

The oral RfD 2E-2, is based upon a rat chronic bioassay study, which observed critical effects including: decreased organ body weights, neonatal mortality and dermal toxicity. While no reproductive effects have been associated with nickel exposure to humans, several studies in laboratory animals have demonstrated fetotoxicity. An uncertainty factor of 300 is used to account for interspecies extrapolation, sensitive populations and inadequacies in the reproductive studies. Confidence in the RfD is medium due to inadequacies in the reproductive studies. Ingestion of soluble salts of nickel have not been evaluated for carcinogenic potential.

Selenium; CASRN 7782-49-2

The oral RfD 5E-3, is based upon a human epidemiological study, which observed critical effects including: liver dysfunction and clinical signs of selenosis (i.e., hair or nail loss, morphological changes of the nails, etc.). Chronic toxic effects include: lowered hemoglobin levels, mottled teeth, skin lesions and CNS abnormalities. An uncertainty factor of 3 is used to account for sensitive individuals. Confidence in the RfD is high based upon the many animal studies and epidemiologic studies supporting the principal study. Selenium is not classifiable as a human carcinogen based on inadequate human and animal studies.

Silver; CASRN 7440-22-4

The oral RfD 5E-3, is based upon human poisonings, with the critical effect of argyria, a medically benign but permanent bluish-gray discoloration of the skin. Argyria results from the deposition of silver in the dermis and also from silver-induced production of melanin. No pathologic changes or inflammatory reactions have been shown to result from silver deposition. An uncertainty factor of 3 is used to account for minimal effects in a subpopulation which exhibited an increased propensity for the development of argyria. Confidence in the RfD can be considered low-to-medium because of the lack of control in the studies and lack of dose extrapolations. The weight of evidence for carcinogenicity is classified as D based upon no reports of cancer in humans and inadequate evidence in animals.

Zinc; CASRN 7440-66-6

The oral RfD 3E-1, is based upon human studies which included sensitive individuals, and detected a 47% decrease in erythrocyte superoxide dismutase concentrations in adult females after ten weeks of zinc exposure. Zinc toxicity from excessive ingestion may cause gastrointestinal distress. An uncertainty factor of 3 is used to account for the use of a LOAEL and for consideration that this is an essential dietary nutrient. Confidence in the RfD is medium based on the short duration of the studies. The weight of evidence for carcinogenicity is classified as D based on inadequate evidence in humans and animals.

C.2 Semi-Volatiles

1,2,4-Trichlorobenzene; CASRN 120-82-1

The oral RfD 1E-2, is based on a rodent reproductive study, which observed critical effects including: increased adrenal weights, central nervous system stimulation and various internal organ damage in humans. An uncertainty factor of 1000 is used to account for the intra-species extrapolation, sensitive subpopulations for a lack of chronic studies. There is a medium degree of confidence for the RfD since it was performed by a multigenerational study with multiple endpoints. The weight of evidence for carcinogenicity is classified as D, not classifiable as a human carcinogen; there is no human carcinogenicity data and inadequate animal data.

1,4-Dichlorobenzene; CASRN 106-46-7

There is no oral RfD for this chemical. A rodent study in which exposure occurred via oral gavage demonstrated liver tumors. Therefore, this chemical has been classified as a B2 carcinogen and has a slope factor of 2.4E-2. Other critical effects include hemolytic anemia and liver necrosis.

2,4-Dinitrotoluene; CASRN 121-14-2

The oral RfD 2E-3, is based upon a two year study in which beagle dogs were fed gelatin capsules with 2,4-Dinitrotoluene. The observed critical effect was neurotoxicity, characterized by incoordination and paralysis. Another similar study showed dogs with brain lesion characterized by gliosis, edema, and demyelination of the cerebellum, spinal cord, and brain stem. An uncertainty factor of 100 is applied based upon interspecies and intraspecies variability. Confidence in the RfD is high based upon the number of animals used and the variety of gross, histological, hematologic, and clinical endpoints that were evaluated. This chemical has not been evaluated by the EPA for evidence of human carcinogenic potential.

2-Chlorophenol; CASRN 95-57-8

The oral RfD 5E-3, is based upon a rodent subchronic drinking water study which showed reproductive effects in the high dose group. An uncertainty factor of 1000 is used to account for interspecies and intraspecies variability, and for the use of subchronic data. Confidence in the RfD is low because the study only evaluated reproductive and hematological effects and no other subchronic, chronic, carcinogenicity or teratogenicity studies are available. This chemical has not been evaluated by the EPA for evidence of human carcinogenic potential.

2-Methylnaphthalene; CASRN 91-57-6

This compound commonly occurs in a mixture with Naphthalene. Only one study has been found regarding the effects of this compound and indicated that it does not cause hematological changes in dogs. It was, however, mildly toxic to the animal upon intraperitoneal injection. No oral RfD or SF was found on either IRIS or HEAST.

4-Chloro-3-methylphenol; CASRN 59-50-7

A related compound of phenol, there is no RfD or SF listed on IRIS or HEAST for this chemical. One source has rated p-chloro-m-cresol as very toxic, with a probable lethal dose to humans of 50 to 500 mg/kg. Acute exposure has been demonstrated to cause hypotension and tachycardia as well as liver and kidney damage, CNS effects (seizures, comas and eventual death) and is potentially immunotoxic. No carcinogenic evaluation could be found for this chemical.

4-Methylphenol; CASRN 106-44-5

Also known as p-cresol, The oral RfD 5E-3, was withdrawn on 08/01/91 as a result of further review. A new RfD summary is in preparation by the RfD/RfC Work Group. The RfD that is used for this evaluation is from HEAST with an uncertainty factor of 1000. This RfD was based upon a rabbit gestation study in which noted effects included: CNS effects (hypoactivity), respiratory distress and maternal death. The weight of evidence for carcinogenicity is classified as C based on an increased incidence of skin papillomas in mice during an initiation-promotion study.

4-Nitrophenol; CASRN 100-02-7

The oral RfD 6.2E-2, is taken from EPA Region III Risk Based Screening Concentration Tables. There is little information on the toxicity for humans. Animal studies have demonstrated adverse effects on the central and peripheral nervous system, blood (methemoglobinemia) and respiratory system (dyspnea). A risk assessment is currently being conducted by an EPA workgroup for this chemical.

Acenaphthene; CASRN 83-32-9

The oral RfD 6E-2, is based on a rodent study that only used body weight, absolute liver weight and liver regeneration to observe toxicity. Target organs include the liver, kidneys and skin. An uncertainty factor of 3000 is used to account for interspecies and intraspecies variability, for the use of a subchronic study for chronic RfD derivation, for the lack of adequate data in a second species and for the lack of reproductive and developmental data. Confidence is low because the observed effects were adaptive and not considered adverse. This chemical is under evaluation for evidence of human carcinogenic potential.

Benzyl alcohol; CASRN 100-51-6

The oral RfD 3E-1, obtained from HEAST, is based upon a rodent oral gavage study which demonstrated adverse effects in the forestomach (epithelial hyperplasia) and an overall decrease in weight. An uncertainty factor of 1000 is used to account for interspecies and intraspecies variability and for the sensitive subpopulation. This chemical has not been evaluated by the EPA for evidence of carcinogenic potential.

bis(2-Ethylhexyl) Phthalate (DEHP); CASRN 117-81-7

The oral RfD 2E-2, is based upon a guinea pig study which observed significant increases in relative liver weights. An uncertainty factor of 1000 is used to account for interspecies variation, for protection of sensitive human subpopulations and for the lack of chronic exposure data. Confidence in the RfD is medium because the study used only two concentrations of DEHP. The weight of evidence for carcinogenicity is classified as B2 based upon orally administered DEHP produced significant dose-related increases in liver tumor responses in rats and mice of both sexes. The slope factor is 1.4E-2.

Butylbenzylphthalate; CASRN 85-68-7

The oral RfD 2E-1, is based upon a chronic rodent study which observed significantly increased liver to body weight and liver to brain weight ratios. An uncertainty factor of 1000 is used to account for intraspecies and interspecies variability and for extrapolating from subchronic to chronic NOAELs. Confidence is medium since the critical study used only male rats and there is no adequate supporting studies of chronic duration. The weight of evidence for carcinogenicity is classified as C based on statistically significant increase in mononuclear cell leukemia in female rats; the response in male rats was inconclusive and there was no such response in mice.

di-n-butyl Phthalate; CASRN 84-74-2

Also known as Dibutyl phthalate, the oral RfD 1E-1, is based upon a rodent study which observed increased mortality. An uncertainty factor of 1000 is used to account for interspecies variation, to protect the sensitive human subpopulations, and to account for both the less-than-chronic duration of the study and deficiencies in the study, such as the use of only male animals. Confidence is low because of the few animals and only single sex used in this study. The weight of evidence for carcinogenicity is classified as D based on the fact that pertinent data was not located in the available literature, according to IRIS.

Dibenzofuran; CASRN 132-64-9

There is no available oral RfD or SF for this chemical. The weight of evidence for carcinogenicity is classified as D based on no human data and no animal data for dibenzofuran alone. Studies have evaluated exposure to a mixture of polychlorinated biphenyls (PCBs), polychlorinated dibenzofurans (PCDFs) and polychlorinated quinones (PCQs) by consumption of contaminated rice oil (Yusho incident) (reviewed in U.S. EPA, 1986, 1987). However, these studies have limited value because they do not assess dibenzofuran or correlate exposure with cancer risk.

Fluorene; CASRN 86-73-7

The oral RfD 4E-2, is based on a rodent subchronic study which observed decreased red blood cells, packed cell volume and hemoglobin in the exposed population. An uncertainty factor of 3000 is used to account for the use of a subchronic study for chronic RfD derivation, for interspecies and intraspecies variability, for the lack of adequate toxicity data in a second species and for the lack of reproductive and developmental data. Althoughthe study was well designed study that examined and identified both a LOAEL and NOAEL for several sensitive endpoints using an adequate number of animals, confidence is medium because developmental, reproductive, and chronic toxicity following oral exposure to fluorene were not tested. The weight of evidence for carcinogenicity is classified as D, based on no human data and inadequate data from animal bioassays.

Isophorone; CASRN 78-59-1

The oral RfD 2E-2, is based upon a 90 day dog feeding study in which there were no observed effects. Chronic effects in rodents include: kidney lesions, liver disease, adverse neurological effects and stomach irritation. An uncertainty factor of 1000 is used to account for the interspecies and intraspecies differences and for the use of a subchronic study. The critical study is of adequate quality and is given a medium confidence rating. The weight of evidence for carcinogenicity is classified as C based on no data in humans; limited evidence of carcinogenicity of one tumor type (preputial gland carcinoma) in one sex of one animal species as shown by an increase of preputial gland carcinomas in male rats. The slope factor for this chemical is 9.5E-4.

N-Nitrosodi-n-propylamine; CASRN 621-64-7

There is no data available on IRIS or HEAST for an oral RfD. Short term exposure has demonstrated liver injury and death in rodents. Long term effects in either humans or animals are not known. The weight of evidence for carcinogenicity is classified as a B2 carcinogen based upon increased tumor incidence (hepatocellular carcinomas) at multiple sites in two rodent species and in monkeys. The slope factor for this chemical is 7E+0.

Naphthalene; CASRN 91-20-3

The oral RfD is currently under review by an EPA workgroup so the oral RfD pre-revision of 4E-2 was used for this evaluation. Naphthalene has been shown to affect the renal and hepatic systems in rodents and in study cases of humans who ingested Naphthalene (in the form of mothballs). Hemolytic anemia is the most common effect due to exposure to Naphthalene. The weight of evidence for carcinogenicity is classified as D based on no human data and inadequate data from animal bioassays.

Phenanthrene; CASRN 85-01-8

There is no oral RfD for this chemical. Phenanthrene is classified as a polycyclic aromatic hydrocarbon (PAH) of which demonstrate adverse hematopoietic effects (aplastic anemia, pancytioenia) and has been shown to ultimately lead to death in certain strains of mice. No human adverse effects have been noted. Adverse kidney and liver effects have also been noted in rodents when exposed to PAH mixtures. The weight of evidence for carcinogenicity is classified as D based on no human data and inadequate data from a single gavage study in rats and skin painting and injection studies in mice.

Phenol; CASRN 108-95-2

The oral RfD 6E-1, is based on a rodent oral developmental study which observed reduced fetal body weight. An uncertainty factor of 100 is used to account for interspecies extrapolation and for sensitive subpopulations. Confidence in the study is low because of the gavage nature of the dose administration although there are several supporting studies. The weight of evidence for carcinogenicity is classified as D based on no human carcinogenicity data and inadequate animal data.

Pyrene; CASRN 129-00-0

The oral RfD 3E-2, is based upon a rodent oral subchronic bioassay which observed kidney effects (nephropathy). An uncertainty factor of 3000 is used to account for intraspecies and interspecies variability, for the use of a subchronic study for chronic RfD derivation, to account for the lack of both toxicity studies in a second species and for the lack of developmental and reproductive studies. Confidence is low due to the lack of supporting subchronic, chronic, and developmental/reproductive studies. The weight of evidence for carcinogenicity is classified as D based on no human data and inadequate data from animal bioassays.

C.3. Pesticides/PCBs

Aldrin; CASRN 309-00-2

The oral RfD 3E-4, is based upon a rodent study which observed liver and kidney lesions. Organochlorine pesticides are neurotoxicants for which acute signs of toxicity include: hyperexcitability, seizures, convulsions and dizziness; and chronic signs of toxicity include: intermittent muscle twitching, psychological disorders, loss of consciousness and convulsions. An uncertainty factor of 1000 is used to account for extrapolation from animals to humans, for sensitive subpopulations, and to account for the use of a LOAEL. Confidence in the RfD is medium because the study only performed histopathologic analysis and lacks other toxicologic parameters. The weight of evidence for carcinogenicity is classified as B2 based on studies which produced increases in tumor responses (liver carcinomas) in three different strains of mice (both sexes) upon oral administration. The slope factor is 1.7E+1. Tumor induction has also been observed for structurally related chemicals, including dieldrin, a metabolite.

Dacthal; CASRN 1861-32-1

The oral RfD 2E-2, is based upon a rodent chronic feeding study which demonstrated effects on the lungs, liver, kidney, thyroid glands, and in the eyes of females. An uncertainty factor of 100 is used to account for interspecies extrapolation and intraspecies variability. Confidence in the RfD is high based on good studies which support the primary basis for the oral RfD. This chemical has not been evaluated for carcinogenic potential.

DDD; CASRN 72-54-8
DDE; CASRN 72-55-9
DDT; CASRN 50-29-3

DDT, and its structural analogs DDE and DDD, are organochlorine pesticides. The RfD for DDT 5E-4, is based on a chronic rodent feeding study which observed liver lesions in the exposed population. This RfD was adopted for DDD and DDE. Immunological effects and developmental toxicity have also been associated with DDT. Organochlorine pesticides are neurotoxicants for which acute signs of toxicity include parathesia, ataxia and dizziness; and chronic signs of toxicity include: anorexia, mild anemia, tremors, seizures, muscular weakness, hyperexcitability and nervous tension. An uncertainty factor of 100 is used to account for interspecies conversion and to protect sensitive human subpopulations. Confidence in the RfD is medium to low because the study was of shorter duration, and lacked a clear NOEL for reproductive effects. The weight of evidence is classified as a B2 carcinogen based upon the observation of tumors (generally of the liver) in seven studies in various mouse strains and three studies in rats. DDD and DDE, due to its similar structure, are also probable carcinogens. The slope factor for DDT is 3.4E-1. DDD, which is considered less toxic than DDT, has a slope factor of 2.4E-1 based on an increased incidence liver tumors in male mice and thyroid tumors in male rats.

Dieldrin; CASRN 60-57-1

The oral RfD 5E-5, is based on a chronic rodent study which observed liver lesions (increased liver weight and liver/body weight ratio). Organochlorine pesticides are neurotoxicants for which acute signs of toxicity include: hyperexcitability, seizures, convulsions and dizziness; and chronic signs of toxicity include: intermittent muscle twitching, psychological disorders, loss of consciousness and convulsions. An uncertainty factor of 100 is used to account for interspecies variability and for the sensitive subpopulation. Confidence in the RfD is medium because the study is older for which detailed data are not available and reproductive studies are lacking. The weight of evidence for carcinogenicity is classified as B2 based upon carcinogenic effects in seven strains of mice when administered orally. Dieldrin is structurally related to compounds (aldrin, chlordane, heptachlor, heptachlor epoxide, and chlorendic acid) which produce tumors in rodents. The slope factor is 1.6E+1.

Endosulfan: Endosulfan I; CASRN 959-98-8; Endosulfan II; CASRN 33213-65-9

Endosulfan, a mixture consisting of both alpha and beta isomers, has an oral RfD of 6E-3. This oral RfD was adopted for both alpha and beta isomers because of their similar toxicities. Endosulfan has been shown to affect the whole body by decreased weight gain, the kidney causing glomerulonephrosis and blood vessels causing aneurysms. Developmental and cardiac toxicity have also been associated with endosulfan. Organochlorine pesticides are neurotoxicants for which acute signs of toxicity include: hyperexcitability, seizures, convulsions and dizziness; and chronic signs of toxicity include: intermittent muscle twitching, psychological disorders, loss of consciousness and convulsions. Neurological effects have been demonstrated at extremely high doses. An uncertainty factor of 100 is used to account for intraspecies variability and interspecies extrapolations. Confidence in the RfD is medium due to the lack of developmental data in a second species. This chemical is currently under evaluationby the EPA for evidence of human carcinogenic potential.

Endosulfan Sulfate; CASRN 1031-07-8

This compound is an Endosulfan reaction product (from either oxidation, biotransformation or photolysis). According to the ATSDR Toxicological Profile for Endosulfan, there is very little difference in toxicity between these two products. There is no RfD or SF listed on IRIS or HEAST.

Endrin; CASRN 72-20-8

The oral RfD 3E-4, is based on a dog chronic oral bioassay study which observed mild histological lesions in the liver and kidney, and CNS effects. There is also evidence of developmental effects in rodents. Organochlorine pesticides are neurotoxicants for which acute signs of toxicity include: hyperexcitability, seizures, convulsions and dizziness; and chronic signs of toxicity include: intermittent muscle twitching, psychological disorders, loss of consciousness and convulsions. An uncertainty factor of 100 is used to account for interspecies extrapolations and for the sensitive subpopulation. Confidence is medium because the study was of average quality and reproductive effects are lacking. Human exposure to Endrin has demonstrated severe nervous system toxicity. The weight of evidence for carcinogenicity is classified as D based on oral administration of endrin did not produce carcinogenic effects in either sex of two strains of rats and three strains of mice.

Endrin Aldehyde; CASRN 7421-36-3

This compound is a breakdown and an impurity of endrin. Only one study was performed on this compound and demonstrated liver dysfunction in rodents. There is no oral RfD or SF for this compound listed on IRIS or in HEAST.

Endrin Ketone; CASRN 53494-70-5

This compound is a photodegredation product of endrin for which there is no oral RfD. Only one study was performed on this compound and demonstrated liver dysfunction in rodents.

Heptachlor; CASRN 76-44-8

The oral RfD 5E-4, is based upon a chronic rodent feeding study which observed liver weight increases in males. Organochlorine pesticides are neurotoxicants for which acute signs of toxicity include: hyperexcitability, seizures, convulsions and dizziness; and chronic signs of toxicity include: intermittent muscle twitching, psychological disorders, loss of consciousness and convulsions. An uncertainty factor of 300 is used to account for interspecies and intraspecies differences and to account for the lack of chronic toxicity data in a second species. Confidence in the RfD is low due to the low quality of the study and incompleteness of the chronic toxicity information. The weight of evidence for carcinogenicity is classified as B2; there is inadequate human data, but sufficient evidence exist from studies in which benign and malignant liver tumors were induced in three strains of mice of both sexes. The slope factor is 4.5E+0.

Hexachlorobenzene; CASRN

The oral RfD 8E-4, is based upon a chronic rodent feeding study which observed liver effects. Exposure in humans demonstrated neurotoxicity, liver damage, reduced growth and arthritic changes in the appendages of children who were directly or indirectly (i.e., through breast milk) exposed. An uncertainty factor of 100 is used to account for interspecies and intraspecies variability. Organochlorine pesticides are neurotoxicants for which acute signs of toxicity include: hyperexcitability, seizures, convulsions and dizziness; and chronic signs of toxicity include: intermittent muscle twitching, psychological disorders, loss of consciousness and convulsions. Confidence in the RfD is medium due to the lack of observing the critical endpoint (porphyria). The weight of evidence for carcinogenicity is classified as a B2 carcinogen; it has been shown to induce tumors in the liver, thyroid and kidney in three rodent species. The slope factor is 1.6E+0.

Hexachlorobutadiene; CASRN 87-68-3

The oral RfD 2E-4, is based upon a chronic rodent study which observed kidney effects (renal tubule regeneration). The oral RfD was withdrawn from IRIS on 5/93, and currently remains in HEAST. An uncertainty factor of 1000 is used to account for interspecies and intraspecies variability and for sensitive subpopulations. The weight of evidence for carcinogenicity is classified as a C carcinogen on the basis of observed renal neoplasms in male and female rodents which occurred in one study.

Hexachlorocyclohexane (HCH), alpha-, beta-, gamma-; CASRN 319-84-6, 319-85-7, 58-89-9

Formerly known as benzene hexachloride (BHC), alpha-, beta- and gamma- HCH are isomers which are typically found as a mixture in the environment. The oral RfD for gamma HCH (also known as Lindane) 3E-4, is based upon a rodent subchronic oral bioassay study which demonstrated liver and kidney toxicity. Alpha and beta isomers have also demonstrated liver toxicity due to chronic exposure in animals. Organochlorine pesticides are neurotoxicants for which acute signs of toxicity include parathesia, ataxia and dizziness; and chronic signs of toxicity include: anorexia, mild anemia, tremors, seizures, muscular weakness, hyperexcitability and nervous tension. An uncertainty factor of 1000 is used to account for subchronic v.s. a chronic study, for interspecies variation and to protect sensitive human subpopulations. Confidence in the RfD is medium. The weight of evidence for carcinogenicity is classified as B2 based upon an increased incidence of liver tumors in five mouse strains and in one rat strain for all isomers of HCH. The slope factors for alpha-, beta- and gamma- HCH are: 6.3E+0, 1.8E+0, and 1.3E+0, respectively.

Malathion; CASRN 121-75-5

The oral RfD 2E-2, is based upon a subchronic human study which observed hematological effects (decreased red blood cells cholinesterase activity) upon exposure. Organophosphorus insecticides are potent inactivators of acetylcholinesterase, the enzyme responsible for regulating the neurotransmitter acetylcholine. Toxic effects due to organophosphorus insecticides include: stimulation of the parasympathetic and sympathetic autonomic nervous system, thereby effecting the gastrointestinal, respiratory, cardiovascular and skeletal systems; and adverse effects on the central nervous system, causing restlessness, ataxia, lethargy, loss of memory, weakness, convulsions, cyanosis and coma. An uncertainty factor of 10 is used to account for sensitive subpopulations. Confidence in the RfD is medium because the RfD is based upon a subchronic versus a chronic study. This chemical has not been evaluated for carcinogenic potential.

Methoxychlor; CASRN 72-43-5

The oral RfD 5E-3, is based on a rabbit teratology study which observed excessive loss of litters in the exposed populations. Short term exposure in rodents has demonstrated CNS depression, progressive weakness, loss of body weight, growth retardation and eventual death. Organochlorine pesticides are neurotoxicants for which acute signs of toxicity include parathesia, ataxia and dizziness; and chronic signs of toxicity include: anorexia, mild anemia, tremors, seizures, muscular weakness, hyperexcitability and nervous tension. An uncertainty factor of 1000 is used to account for the interspecies and intraspecies variability and for the poor quality of the study. Confidence is low since no conclusions could be made about the maternal or developmental toxicity and due to the small number of litters available for evaluation. The weight of evidence for carcinogenicity is classified as D based on inconclusive animal data and lack of human data.

Methyl parathion; CASRN 298-00-0

The oral RfD 2.5E-4, is based on a rodent chronic feeding study which observed changes in red blood cells (cholinesterase inhibition, reduction in red blood cells, hemoglobin and hematocrit). An additional rodent study demonstrated neurological changes, although this has yet to be confirmed. Organophosphorus insecticides are potent inactivators of acetylcholinesterase, the enzyme responsible for regulating the neurotransmitter acetylcholine. Toxic effects due to organophosphorus insecticides include: stimulation of the parasympathetic and sympathetic autonomic nervous system, thereby affecting the gastrointestinal, respiratory, cardiovascular and skeletal systems; and adverse effects on the central nervous system, causing restlessness, ataxia, lethargy, loss of memory, weakness, convulsions, cyanosis and coma. An uncertainty factor of 100 is used to account for interspecies and intraspecies variability. Confidence in the RfD is medium because of the lack of information regarding potential neurological effects. This chemical has not been evaluated for carcinogenic potential.

Mirex; CASRN 2385-85-5

The oral RfD 2E-4, is based upon a rodent chronic feeding study which observed liver effects (cytomegaly, fatty metamorphosis and amgiectasis) and thyroid effects (cysts). Developmental effects have also been observed. An uncertainty factor of 300 is used to account for interspecies and intraspecies variability and for the lack of a generational study to observe reproductive effects. Organochlorine pesticides are neurotoxicants for which acute signs of toxicity include parathesia, ataxia and dizziness; and chronic signs of toxicity include: anorexia, mild anemia, tremors, seizures, muscular weakness, hyperexcitability and nervous tension. Confidence in the RfD is high to medium because of the lack of a generational study. The weight of evidence for carcinogenicity is classified as B2 based on rodent study which demonstrated liver adenomas and carcinomas. The slope factor is 1.8E+0.

Parathion; CASRN 56-38-2

The oral RfD 6E-3, is based upon human exposure which observed adverse effects of the central nervous system (decreased cholinesterase activity). Organophosphorus insecticides are potent inactivators of acetylcholinesterase, the enzyme responsible for regulating the neurotransmitter acetylcholine. Toxic effects due to organophosphorus insecticides include: stimulation of the parasympathetic and sympathetic autonomic nervous system, thereby affecting the gastrointestinal, respiratory, cardiovascular and skeletal systems; and adverse effects on the central nervous system, causing restlessness, ataxia, lethargy, loss of memory, weakness, convulsions, cyanosis and coma. An uncertainty factor of 10 is used to account for the sensitive subpopulation. The weight of evidence for carcinogenicity is classified as C based on increased adrenal cortical tumors in female and male rodents and positive trends for thyroid follicular adenomas and pancreatic islet-cell carcinomas in male rats in one study.

Polychlorinated biphenyls (PCBs)
Aroclor 1242, Aroclor 1248, Aroclor 1254 and Aroclor 1260

PCBs are mixtures of chlorinated congeners, with the last two digits indicating the percentage of chlorine in the compound (i.e., 42% for Aroclor 1242 and 54% for Aroclor 1254). PCBs are persistent in the environment due to their extreme stability and are found as a mixture of various chlorinated biphenyl compounds in the environment. PCBs are not acutely toxic and have a high chronic exposure toxicity. The oral RfD for Aroclor 1248, 1254 and 1260 was adopted from Aroclor 1016 (7E-5), which is based upon a primate reproductive bioassay study which demonstrated reduced birth weights. Other studies have indicated potential neurobehavioral deficits in primates, and adverse effects on the gastrointestinal, hematological, musculoskeletal, hepatic, renal, immunological and reproductive systems in humans and animals exposed to PCB mixtures. An uncertainty factor of 100 is used to account for the sensitive subpopulation and interspecies variability. Confidence in the RfD is medium because the RfD was based upon only one study. The oral RfD for Aroclor 1254 (2E-5), is based upon primate clinical and immunological studies which demonstrated ocular exudate, inflamed and prominent eyelid Meibomian glands, distorted fingernail and toenail growth and decreased antibody (IgG and IgM) responses. Similar changes have been documented in humans for accidental oral ingestion of PCBs. An uncertainty factor of 300 is used to account for sensitive individuals and for the extrapolation from rhesus monkeys to humans. Confidence in the RfD is medium due to inconsistencies in effect levels for reproductive toxicity.

PCBs have been classified as a B2 carcinogen based upon hepatocellular carcinomas in three strains of rats and two strains of mice and inadequate yet suggestive evidence of excess risk of liver cancer in humans by ingestion. The oral slope factor of 7.7E+0 was adopted for each Aroclor mixture in order to evaluate their carcinogenic potential.

Tributyltin; CASRN 56573-85-4

There is no RfD for tributyltin (TBT), or its breakdown product, dibutyltin. Large doses of TBT have been shown to damage the reproductive and central nervous systems, bone structure and gastrointestinal tract of mammals. Although one rodent study demonstrated pituitary gland tumors after exposure to high levels of TBT, the evidence was inconclusive and the carcinogenic status has not been defined.

C.4. Radionuclides

Cesium 137; CASRN 10045-97-3
Plutonium 238; CASRN 13981-16-3

Plutonium 239; CASRN 15117-48-3
Plutonium 240; CARSN 14119-33-6

Ionizing radiation has been shown to be a carcinogen, a mutagen and a teratogen. EPA classifies all radionuclides as Class A carcinogens. Radionuclides demonstrate the potential to cause cancer in nearly all tissues and/or organs in both humans and animals, with the probability of cancer induction increasing with increasing radiation dose. The slope factors for radionuclides were derived using health effects data and dose and risk models based on each chemicals unique metabolic and radioactive properties. Unlike other slope factors, slope factors for radionuclides are based on the average risk per unit intake and are not expressed as a function of body weight or time, and do not require correction for gastrointestinal absorption. The oral slope factors take into account: the amount of radionuclide transported into the bloodstream from the gastrointestinal tract following ingestion; the ingrowth and decay of radioactive progeny produced within the body subsequent to intake; the distribution and retention of each radionuclide in body tissues and organs; the radiation dose delivered to body tissues and organs from the radionuclide; and the sex, age, and organ-specific risk factors over the lifetime of exposure. Slope factors for radionuclides are currently listed in HEAST.

C.5 Dioxin/Furans

Dioxin is a general term referring to 2,3,7,8- tetrachlorodibenzo-p-dioxin (TCDD) and its related congeners. There are seventeen substituted tetra through octa chlorinated dibenzo-p-dioxins and dibenzofurans. The toxicity of dioxin varies with the position and number of chlorines attached to the aromatic rings. Generally, the toxicity increases with increased substitution. Those dioxins with halogens at the 2, 3 and 7 positions are particularly toxic with 2,3,7,8-TCDD considered to be the most toxic of all the dioxin congeners. The liver appears to be the target organ for acute exposure. Acute exposure effects include: hepatotoxicity, weight loss, psychological alterations, suppression of the immune system and death. Chronic exposure effects include: teratogenicity, fetotoxicity, reproductive dysfunction, carcinogenicity and immunotoxicity. Dioxin has a high cancer potency rating; target organs for carcinogenic tumors in animals include: the liver, thyroid, lung, skin and soft tissue. The EPA has classified 2,3,7,8-TCDD as a class B2 carcinogen with a slope factor of 1.5E+5, based on hepatocellular carcinomas observed in rodents. Currently, the slope factor is being re-evaluated due to a better understanding of the mechanisms of dioxin toxicity and of the carcinogenic and noncarcinogenic health effects on exposed populations. However, because the EPA has not yet issued a revised slope factor-the slope factor currently listed on HEAST is used for this evaluation.

Although the dose necessary to elicit a toxic response differs between congeners, the relative potency of the different compounds (in comparison to 2,3,7,8-TCDD) is generally consistent for each endpoint. This general consistency has allowed the EPA to develop a toxicity equivalent factor (TEF) approach to convert any of the seventeen congener into an equivalent concentration of 2,3,7,8-TCDD. Although this approach is commonly used today in the evaluation of risk due to dioxin, it is an "interim" method and does not replace the need congener specific data. TEF values are listed in the actual report.

APPENDIX D

APPENDIX D

RISK ESTIMATES

APPENDIX D

RISK ESTIMATES

TABLE D-1. NON-DETECTED CHEMICALS WHICH EXCEED A 1.0E-6 EXCESS CANCER RISK AT THE DETECTION LIMIT FOR 1991(Page 1 of 2)

CARP	CRAYFISH	LS SUCKER	PEAMOUTH	STURGEON
6.5 g/day consumption rate, 30 & 70 year exposure				
				1,2,3,7,8-PeCDD
			1,2,3,7,8,9-HxCDF	1,2,3,7,8,9-HxCDF
				2,3,4,6,7,8-HxCDF
				1,2,3,6,7,8-HxCDF
				1,2,3,4,7,8-HxCDF
3,3'-Dichlorobenzidine	3,3'-Dichlorobenzidine	3,3'-Dichlorobenzidine	3,3'-Dichlorobenzidine	3,3'-Dichlorobenzidine
	Aldrin			Aldrin
alpha-BHC	alpha-BHC		alpha-BHC	alpha-BHC
Aroclor 1016	Aroclor 1016	Aroclor 1016	Aroclor 1016	Aroclor 1016
Aroclor 1221	Aroclor 1221	Aroclor 1221	Aroclor 1221	Aroclor 1221
Aroclor 1232	Aroclor 1232	Aroclor 1232	Aroclor 1232	Aroclor 1232
Aroclor 1242	Aroclor 1242	Aroclor 1242		Aroclor 1242
Aroclor 1248	Aroclor 1248	Aroclor 1248	Aroclor 1248	Aroclor 1248
	Aroclor 1254		Aroclor 1254	
	Aroclor 1260			Aroclor 1260
Arsenic	Arsenic	Arsenic	Arsenic	
Benz[a]anthracene	Benz[a]anthracene	Benz[a]anthracene	Benz[a]anthracene	Benz[a]anthracene
Benzo[a]pyrene	Benzo[a]pyrene	Benzo[a]pyrene	Benzo[a]pyrene	Benzo[a]pyrene
Benzo[b]fluoranthene	Benzo[b]fluoranthene	Benzo[b]fluoranthene	Benzo[b]fluoranthene	Benzo[b]fluoranthene
Benzo[k]fluoranthene	Benzo[k]fluoranthene	Benzo[k]fluoranthene	Benzo[k]fluoranthene	Benzo[k]fluoranthene
Bis(2-chloroethyl)ether	Bis(2-chloroethyl)ether	Bis(2-chloroethyl)ether	Bis(2-chloroethyl)ether	Bis(2-chloroethyl)ether
			Chlordane	
Dibenz[a,h]anthracene	Dibenz[a,h]anthracene	Dibenz[a,h]anthracene	Dibenz[a,h]anthracene	Dibenz[a,h]anthracene
Dicofol	Dicofol	Dicofol	Dicofol	Dicofol
Heptachlor		Heptachlor	Heptachlor	Heptachlor
	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide
	Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene
			Hexachlorobutadiene	
Indeno[1,2,3-cd]pyrene	Indeno[1,2,3-cd]pyrene	Indeno[1,2,3-cd]pyrene	Indeno[1,2,3-cd]pyrene	Indeno[1,2,3-cd]pyrene
			Mirex	
	N-Nitroso-di-n-propylamine	N-Nitroso-di-n-propylamine	N-Nitroso-di-n-propylamine	N-Nitroso-di-n-propylamine
		p,p'-DDE		
Pentachlorophenol	Pentachlorophenol	Pentachlorophenol	Pentachlorophenol	Pentachlorophenol
Toxaphene	Toxaphene	Toxaphene	Toxaphene	Toxaphene
54 g/day consumption rate (in addition to list under 6.5 g/day), 30 & 70 year exposure				
				1,2,3,4,7,8-HxCDD
				1,2,3,7,8,9-HxCDD
	1,4-Dichlorobenzene	1,4-Dichlorobenzene	1,4-Dichlorobenzene	1,4-Dichlorobenzene
beta-BHC				beta-BHC
Chlordane	Chlordane	Chlordane		Chlordane
			Chrysene	
Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene		

TABLE D-1. NON-DETECTED CHEMICALS WHICH EXCEED A 1.0E-6 EXCESS CANCER RISK AT THE DETECTION LIMIT FOR 1991(Page 2 of 2)

CARP	CRAYFISH	LS SUCKER	PEAMOUTH	STURGEON
54 g/day consumption rate (in addition to list under 6.5 g/day), 30 & 70 year exposure				
Hexachloroethane	**Hexachloroethane**	**Hexachloroethane**	Hexachloroethane	**Hexachloroethane**
	Lindane			Lindane
	Mirex	Mirex		Mirex
		o,p'-DDT	o,p'-DDT	
			p,p'-DDT	
176 g/day consumption rate (in addition to lists under 6.5 and 54 g/day), 30 & 70 year exposure				
				1,2,3,6,7,8-HxCDD
				1,2,3,4,6,7,8-HpCDF
				1,2,3,4,7,8,9-HpCDF
Chrysene	**Chrysene**	**Chrysene**		**Chrysene**
Heptachlor epoxide				
Hexachlorobenzene				
				Hexachlorobutadiene
N-Nitrosodiphenylamine	**N-Nitrosodiphenylamine**	**N-Nitrosodiphenylamine**	N-Nitrosodiphenylamine	**N-Nitrosodiphenylamine**
	o,p'-DDD			
	o,p'-DDE			

Chemicals in bold exceed threshold risk value for 70-year exposure, but not for 30-year exposure

TABLE D-2. NON-DETECTED CHEMICALS WHICH DO NOT EXCEED A 1.0E-6 EXCESS CANCER RISK (at 176 g/day, 70-year exposure) FOR 1991 (Page 1 of 2)

CARP	CRAYFISH	LS SUCKER	PEAMOUTH	STURGEON
	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene
1,2-Dichlorobenzene	1,2-Dichlorobenzene	1,2-Dichlorobenzene	1,2-Dichlorobenzene	1,2-Dichlorobenzene
1,3-Dichlorobenzene	1,3-Dichlorobenzene	1,3-Dichlorobenzene	1,3-Dichlorobenzene	1,3-Dichlorobenzene
2,4,6-Trichlorophenol	2,4,6-Trichlorophenol	2,4,6-Trichlorophenol	2,4,6-Trichlorophenol	2,4,6-Trichlorophenol
2,4-Dichlorophenol	2,4-Dichlorophenol	2,4-Dichlorophenol	2,4-Dichlorophenol	2,4-Dichlorophenol
2,4-Dimethylphenol	2,4-Dimethylphenol	2,4-Dimethylphenol	2,4-Dimethylphenol	2,4-Dimethylphenol
2,4-Dinitrophenol	2,4-Dinitrophenol	2,4-Dinitrophenol	2,4-Dinitrophenol	2,4-Dinitrophenol
	2,4-Dinitrotoluene	2,4-Dinitrotoluene	2,4-Dinitrotoluene	2,4-Dinitrotoluene
2,6-Dinitrotoluene	2,6-Dinitrotoluene	2,6-Dinitrotoluene	2,6-Dinitrotoluene	2,6-Dinitrotoluene
2-Chloronaphthalene	2-Chloronaphthalene	2-Chloronaphthalene	2-Chloronaphthalene	2-Chloronaphthalene
	2-Chlorophenol	2-Chlorophenol	2-Chlorophenol	2-Chlorophenol
	2-Methylnaphthalene		2-Methylnaphthalene	2-Methylnaphthalene
2-Methylphenol	2-Methylphenol	2-Methylphenol	2-Methylphenol	2-Methylphenol
2-Nitrophenol	2-Nitrophenol	2-Nitrophenol	2-Nitrophenol	2-Nitrophenol
4-Bromophenyl phenyl ether	4-Bromophenyl phenyl ether	4-Bromophenyl phenyl ether	4-Bromophenyl phenyl ether	4-Bromophenyl phenyl ether
	4-Chloro-3-methylphenol	4-Chloro-3-methylphenol	4-Chloro-3-methylphenol	4-Chloro-3-methylphenol
4-Chlorophenylphenylether	4-Chlorophenylphenylether	4-Chlorophenylphenylether	4-Chlorophenylphenylether	4-Chlorophenylphenylether
4-Methylphenol	4-Methylphenol	4-Methylphenol	4-Methylphenol	4-Methylphenol
	4-Nitrophenol	4-Nitrophenol	4-Nitrophenol	4-Nitrophenol
	Acenaphthene	Acenaphthene	Acenaphthene	Acenaphthene
Acenaphthylene	Acenaphthylene	Acenaphthylene	Acenaphthylene	Acenaphthylene
Anthracene	Anthracene	Anthracene	Anthracene	Anthracene
Antimony	Antimony	Antimony	Antimony	Antimony
				Barium
Benzo[g,h,i]perylene	Benzo[g,h,i]perylene	Benzo[g,h,i]perylene	Benzo[g,h,i]perylene	Benzo[g,h,i]perylene
Bis(2-chloroethoxy)methane	Bis(2-chloroethoxy)methane	Bis(2-chloroethoxy)methane	Bis(2-chloroethoxy)methane	Bis(2-chloroethoxy)methane
Bis(2-chloroisopropyl)ether	Bis(2-chloroisopropyl)ether	Bis(2-chloroisopropyl)ether	Bis(2-chloroisopropyl)ether	Bis(2-chloroisopropyl)ether
Butyl benzyl phthalate	Butyl benzyl phthalate	Butyl benzyl phthalate	Butyl benzyl phthalate	
Dacthal	Dacthal	Dacthal		Dacthal
delta-BHC	delta-BHC	delta-BHC	delta-BHC	delta-BHC
		Di-n-butylphthalate	Di-n-butylphthalate	
Di-n-octylphthalate	Di-n-octylphthalate	Di-n-octylphthalate	Di-n-octylphthalate	Di-n-octylphthalate
Diethyl phthalate	Diethyl phthalate	Diethyl phthalate	Diethyl phthalate	Diethyl phthalate
Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate
Endosulfan I	Endosulfan I			
Endosulfan II		Endosulfan II	Endosulfan II	Endosulfan II
Endosulfan sulfate			Endosulfan sulfate	
	Endrin		Endrin	
Endrin aldehyde	Endrin aldehyde			
Fluoranthene	Fluoranthene	Fluoranthene	Fluoranthene	Fluoranthene
Fluorene	Fluorene	Fluorene	Fluorene	Fluorene
Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	Hexachlorocyclopentadiene
Isophorone		Isophorone	Isophorone	Isophorone
Malathion	Malathion	Malathion		Malathion
Methoxychlor			Methoxychlor	

TABLE D-2. NON-DETECTED CHEMICALS WHICH DO NOT EXCEED A 1.0E-6 EXCESS CANCER RISK (at 176 g/day, 70-year exposure) FOR 1991 (Page 2 of 2)

CARP	CRAYFISH	LS SUCKER	PEAMOUTH	STURGEON
Methyl parathion		Methyl parathion	Methyl parathion	
	Naphthalene	Naphthalene	Naphthalene	Naphthalene
Nitrobenzene	Nitrobenzene	Nitrobenzene	Nitrobenzene	Nitrobenzene
				OCDF
Parathion	Parathion			Parathion
Phenanthrene	Phenanthrene	Phenanthrene	Phenanthrene	Phenanthrene
	Phenol	Phenol	Phenol	Phenol
	Pyrene	Pyrene	Pyrene	Pyrene
Selenium	Selenium	Selenium	Selenium	Selenium
Silver		Silver	Silver	

TABLE D-3. NON-DETECTED CHEMICALS WHICH EXCEED A 1.0E-6 EXCESS CANCER RISK AT THE DETECTION LIMIT FOR 1993 (Page 1 of 2)

CARP	CRAYFISH	LS SUCKER
6.5 g/day consumption rate, 30 & 70 year exposure		
2,3,7,8-TCDD		
	2,3,4,7,8-PeCDF	
	1,2,3,4,7,8-HxCDF	**1,2,3,4,7,8-HxCDF**
1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDD
1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDD	
	2,3,4,6,7,8-HxCDF	
	1,2,3,7,8-PeCDF	
	1,2,3,7,8,9-HxCDF	
	1,2,3,6,7,8-HxCDF	
	1,2,3,6,7,8-HxCDD	
	1,2,3,4,7,8-HxCDD	
1,4-Dichlorobenzene		**1,4-Dichlorobenzene**
2,4,5-Trichlorophenol		2,4,5-Trichlorophenol
3,3'Dichlorobenzidine	3,3'Dichlorobenzidine	3,3'Dichlorobenzidine
Aldrin	Aldrin	Aldrin
alpha-BHC	**alpha-BHC**	**alpha-BHC**
Aroclor 1221	Aroclor 1221	Aroclor 1221
Aroclor 1232	Aroclor 1232	Aroclor 1232
Aroclor 1242/1016	Aroclor 1242/1016	Aroclor 1242/1016
Aroclor 1248	Aroclor 1248	Aroclor 1248
	Aroclor 1254	
Arsenic		
Benzo[a]pyrene	Benzo[a]pyrene	Benzo[a]pyrene
Bis (2-chloroethyl)ether	Bis (2-chloroethyl)ether	Bis (2-chloroethyl)ether
	Bis (2-ethylhexyl)phthalate	
Dibenzo[a,h]anthracene	Dibenzo[a,h]anthracene	Dibenzo[a,h]anthracene
Dicofol	Dicofol	**Dicofol**
Dieldrin	Dieldrin	Dieldrin
		gamma-Chlordane
Heptachlor	**Heptachlor**	**Heptachlor**
Heptachlor epoxide	**Heptachlor epoxide**	Heptachlor epoxide
Hexachlorobenzene	Hexachlorobenzene	Hexachlorobenzene
Hexachlorobutadiene		Hexachlorobutadiene
		o,p'-DDD
		o,p'-DDE
		o,p'-DDT
Pentachlorophenol	Pentachlorophenol	Pentachlorophenol
Toxaphene	Toxaphene	Toxaphene
54 g/day consumption rate (in addition to list under 6.5 g/day), 30 & 70 year exposure		
	1,4-Dichlorobenzene	
	2,4,5-Trichlorophenol	
1,2,3,4,7,8-HxCDF		
1,2,3,6,7,8-HxCDF		
	1,2,3,4,6,7,8-HpCDD	
	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8,9-HpCDF
alpha-Chlordane	alpha-Chlordane	alpha-Chlordane
Benz[a]anthracene	Benz[a]anthracene	Benz[a]anthracene
beta-BHC	beta-BHC	beta-BHC
Bis (2-ethylhexyl)phthalate		
Carbazole	**Carbazole**	Carbazole
gamma-Chlordane	gamma-Chlordane	
Hexachloroethane	**Hexachloroethane**	Hexachloroethane
	Hexachlorobutadiene	
Indeno[1,2,3-cd]pyrene	Indeno[1,2,3-cd]pyrene	Indeno[1,2,3-cd]pyrene

TABLE D-3. NON-DETECTED CHEMICALS WHICH EXCEED A 1.0E-6 EXCESS CANCER RISK AT THE DETECTION LIMIT FOR 1993 (Page 2 of 2)		
CARP	CRAYFISH	LS SUCKER
54 g/day consumption rate (in addition to list under 6.5 g/day), 30 & 70 year exposure		
Lindane	Lindane	Lindane
o,p'-DDE	**o,p'-DDE**	
o,p'-DDT	**o,p'-DDT**	
	p,p'-DDT	
176 g/day consumption rate (in addition to lists under 6.5 and 54 g/day), 30 & 70 year exposure		
1,2,3,4,6,7,8-HpCDF		
1,2,3,4,7,8,9-HpCDF		
Isophorone		**Isophorone**
o,p'-DDD	o,p'-DDD	
	p,p'-DDD	

Chemicals in bold exceed threshold risk value for 70-year exposure, but not for 30-year exposure

TABLE D-4. NON-DETECTED CHEMICALS WHICH DO NOT EXCEED A 1.0E-6 EXCESS CANCER RISK (at 176 g/day, 70-year exposure) FOR 1993 (Page 1 of 2)		
CARP	CRAYFISH	LS SUCKER
1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene
1,2-Dichlorobenzene	1,2-Dichlorobenzene	1,2-Dichlorobenzene
1,3-Dichlorobenzene	1,3-Dichlorobenzene	1,3-Dichlorobenzene
2,4,6-Trichlorophenol	2,4,6-Trichlorophenol	2,4,6-Trichlorophenol
2,4-Dichlorophenol	2,4-Dichlorophenol	2,4-Dichlorophenol
2,4-Dimethylphenol	2,4-Dimethylphenol	2,4-Dimethylphenol
2,4-Dinitrophenol	2,4-Dinitrophenol	2,4-Dinitrophenol
2,4-Dinitrotoluene	2,4-Dinitrotoluene	2,4-Dinitrotoluene
2,6-Dinitrotoluene	2,6-Dinitrotoluene	2,6-Dinitrotoluene
2-Chloronaphthalene	2-Chloronaphthalene	2-Chloronaphthalene
2-Chlorophenol	2-Chlorophenol	2-Chlorophenol
2-Methylnaphthalene		
2-Methylphenol	2-Methylphenol	2-Methylphenol
2-Nitroaniline	2-Nitroaniline	2-Nitroaniline
2-Nitrophenol	2-Nitrophenol	2-Nitrophenol
3-Nitroaniline	3-Nitroaniline	3-Nitroaniline
4,6-Dinitro-2-methylphenol	4,6-Dinitro-2-methylphenol	4,6-Dinitro-2-methylphenol
4-Bromophenyl phenyl ether	4-Bromophenyl phenyl ether	4-Bromophenyl phenyl ether
4-Chloro-3-methylphenol	4-Chloro-3-methylphenol	4-Chloro-3-methylphenol
4-Chloroaniline	4-Chloroaniline	4-Chloroaniline
4-Chlorophenylphenylether	4-Chlorophenylphenylether	4-Chlorophenylphenylether
4-Methylphenol		4-Methylphenol
4-Nitroaniline	4-Nitroaniline	4-Nitroaniline
4-Nitrophenol	4-Nitrophenol	4-Nitrophenol
Acenaphthene		Acenaphthene
Acenaphthylene	Acenaphthylene	Acenaphthylene
Americium 241	Americium 241	Americium 241
Anthracene	Anthracene	Anthracene
Antimony		Antimony
Benzo[b,k]fluoranthene	Benzo[b,k]fluoranthene	Benzo[b,k]fluoranthene
Benzo[g,h,i]perylene	Benzo[g,h,i]perylene	Benzo[g,h,i]perylene
Benzoic acid	Benzoic acid	Benzoic acid
Benzyl Alcohol		Benzyl Alcohol
Bis(2-chloroethoxy)methane	Bis(2-chloroethoxy)methane	Bis(2-chloroethoxy)methane
Bis(2-chloroisopropyl)ether	Bis(2-chloroisopropyl)ether	Bis(2-chloroisopropyl)ether
Butyl benzyl phthalate	Butyl benzyl phthalate	Butyl benzyl phthalate
Cesium 137	Cesium 137	
Chrysene	Chrysene	Chrysene
Cobalt 60	Cobalt 60	Cobalt 60
delta-BHC	delta-BHC	delta-BHC
Di-n-butylphthalate		
Di-n-octylphthalate	Di-n-octylphthalate	Di-n-octylphthalate
Dibenzofuran		Dibenzofuran
	Dibutyltin	
Diethyl phthalate	Diethyl phthalate	Diethyl phthalate
Dimethyl phthalate	Dimethyl phthalate	Dimethyl phthalate
Endosulfan I	Endosulfan I	Endosulfan I
Endosulfan II	Endosulfan II	Endosulfan II
Endosulfan sulfate	Endosulfan sulfate	Endosulfan sulfate
Endrin	Endrin	Endrin
Endrin aldehyde	Endrin aldehyde	Endrin aldehyde
Endrin ketone	Endrin ketone	Endrin ketone
Europium 152	Europium 152	Europium 152
Europium 154	Europium 154	Europium 154
Europium 155	Europium 155	Europium 155
Fluoranthene	Fluoranthene	Fluoranthene
Fluorene		Fluorene
Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	Hexachlorocyclopentadiene

TABLE D-4. NON-DETECTED CHEMICALS WHICH DO NOT EXCEED A 1.0E-6 EXCESS CANCER RISK (at 176 g/day, 70-year exposure) FOR 1993 (Page 2 of 2)		
CARP	CRAYFISH	LS SUCKER
	Isophorone	
Methoxychlor	Methoxychlor	Methoxychlor
Methyl parathion	Methyl parathion	Methyl parathion
Monobutyltin	Monobutyltin	Monobutyltin
Naphthalene		
Nitrobenzene	Nitrobenzene	Nitrobenzene
OCDF	OCDF	
Phenanthrene		Phenanthrene
Phenol		Phenol
Plutonium 238	Plutonium 238	
	Plutonium 239/240	
Pyrene	Pyrene	Pyrene
	Tributyltin	

TABLE D-5. NON-DETECTED CHEMICALS WHICH EXCEED A 1.0E-6 EXCESS CANCER RISK AT THE DETECTION LIMIT FOR 1995

CARP	CHINOOK	COHO	LS SUCKER	STEELHEAD	STURGEON
6.5 g/day consumption rate, 30 & 70 year exposure					
2,3,7,8-TCDD			2,3,7,8-TCDD	**2,3,7,8-TCDD**	2,3,7,8-TCDD
1,2,3,7,8-PeCDD		1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDD	**1,2,3,7,8-PeCDD**	**1,2,3,7,8-PeCDD**
2,3,4,7,8-PeCDF			2,3,4,7,8-PeCDF	**2,3,4,7,8-PeCDF**	
1,2,3,4,7,8-HxCDF			**1,2,3,4,7,8-HxCDF**		**1,2,3,4,7,8-HxCDF**
1,2,3,6,7,8-HxCDF					1,2,3,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF					
			1,2,3,7,8,9-HxCDD		
	Aroclor 1016	**Aroclor 1016**	**Aroclor 1016**	Aroclor 1016	**Aroclor 1016**
	Aroclor 1221	**Aroclor 1221**	**Aroclor 1221**	Aroclor 1221	**Aroclor 1221**
	Aroclor 1232	**Aroclor 1232**	**Aroclor 1232**	Aroclor 1232	**Aroclor 1232**
	Aroclor 1242	**Aroclor 1242**	**Aroclor 1242**	Aroclor 1242	**Aroclor 1242**
	Aroclor 1248	**Aroclor 1248**		Aroclor 1248	
	Aroclor 1254	**Aroclor 1254**	**Aroclor 1254**	Aroclor 1254	**Aroclor 1254**
N-nitroso-di-n-propylamine	N-nitroso-di-n-propylamine	N-nitroso-di-n-propylamine	N-nitroso-di-n-propylamine	N-nitroso-di-n-propylamine	N-nitroso-di-n-propylamine
			Toxaphene	**Toxaphene**	**Toxaphene**
54 g/day consumption rate (in addition to list under 6.5 g/day), 30 & 70 year exposure					
1,2,3,7,8,9-HxCDD		**1,2,3,7,8,9-HxCDD**		**1,2,3,7,8,9-HxCDD**	1,2,3,7,8,9-HxCDD
	2,3,4,6,7,8-HxCDF			2,3,4,6,7,8-HxCDF	
		1,2,3,4,7,8-HxCDF		1,2,3,4,7,8-HxCDF	
				1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDD
				1,2,3,6,7,8-HxCDF	
					1,2,3,4,7,8-HxCDD
				1,2,3,7,8,9-HxCDF	
	Dieldrin	**Dieldrin**		**Dieldrin**	
Toxaphene	Toxaphene	Toxaphene			
		bis(2-Ethylhexyl)phthalate			
Aroclor 1016					
Aroclor 1221					
Aroclor 1232					
Aroclor 1242					
Aroclor 1254					
176 g/day consumption rate (in addition to lists under 6.5 and 54 g/day), 30 & 70 year exposure					
			Dieldrin		**Dieldrin**
	Aldrin	**Aldrin**		**Aldrin**	
1,4-Dichlorobenzene	**1,4-Dichlorobenzene**				
	bis (2-ethylhexyl) phthalate			**bis(2-Ethylhexyl)phthalate**	bis(2-Ethylhexyl)phthalate
1,2,3,4,7,8,9-HpCDF			1,2,3,4,7,8,9-HpCDF	**1,2,3,4,7,8,9-HpCDF**	**1,2,3,4,7,8,9-HpCDF**
		2,3,4,6,7,8-HxCDF			
		2,3,4,7,8-PeCDF			
1,2,3,4,6,7,8-HpCDF					
	1,2,3,6,7,8-HxCDF				
	1,2,3,4,7,8-HxCDF				
	1,2,3,7,8-PeCDF				
	1,2,3,4,7,8-HxCDD				
	1,2,3,6,7,8-HxCDD				
	1,2,3,7,8,9-HxCDF				
	1,2,3,7,8,9-HxCDD				
	1,2,3,7,8-PeCDD				

Note: Chemicals in bold exceed threshold risk value for 70-year exposure, but not for 30-year exposure

TABLE D-6. NON-DETECTED CHEMICALS WHICH DO NOT EXCEED A $1.0E^{-6}$ EXCESS CANCER RISK (at 176 g/day, 70 year exposure) FOR 1995

CARP	CHINOOK	COHO	LS SUCKER	STEELHEAD	STURGEON
	1,2,3,4,6,7,8-HpCDF			1,2,3,4,6,7,8-HpCDF	
1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2,4-Trichlorobenzene
	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8,9-HpCDF			
2,4-Dinitrotoluene	2,4-Dinitrotoluene	2,4-Dinitrotoluene	2,4-Dinitrotoluene	2,4-Dinitrotoluene	2,4-Dinitrotoluene
		1,4-Dichlorobenzene	1,4-Dichlorobenzene	1,4-Dichlorobenzene	1,4-Dichlorobenzene
2-Chlorophenol	2-Chlorophenol	2-Chlorophenol	2-Chlorophenol	2-Chlorophenol	2-Chlorophenol
4-Methylphenol	4-Methylphenol	4-Methylphenol			
	4-Nitrophenol	4-Nitrophenol			
Acenaphthene	Acenaphthene	Acenaphthene	Acenaphthene	Acenaphthene	Acenaphthene
Aldrin			Aldrin		
	alpha-BHC	alpha-BHC	alpha-BHC		
alpha-Chlordane	alpha-Chlordane	alpha-Chlordane	alpha-Chlordane	alpha-Chlordane	alpha-Chlordane
Antimony	Antimony	Antimony		Antimony	Antimony
beta-BHC	beta-BHC	beta-BHC	beta-BHC	beta-BHC	beta-BHC
bis(2-Ethylhexyl)phthalate					
	Barium				
Cadmium	Cadmium			Cadmium	Cadmium
Chrysene	Chrysene	Chrysene	Chrysene	Chrysene	Chrysene
delta-BHC	delta-BHC	delta-BHC	delta-BHC	delta-BHC	delta-BHC
Dieldrin					
Endosulfan I	Endosulfan I	Endosulfan I	Endosulfan I	Endosulfan I	Endosulfan I
Endosulfan II	Endosulfan II	Endosulfan II	Endosulfan II	Endosulfan II	Endosulfan II
Endosulfan Sulfate	Endosulfan Sulfate	Endosulfan Sulfate	Endosulfan Sulfate	Endosulfan Sulfate	Endosulfan Sulfate
Endrin	Endrin		Endrin		Endrin
Endrin Aldehyde	Endrin Aldehyde	Endrin Aldehyde	Endrin Aldehyde	Endrin Aldehyde	Endrin Aldehyde
Endrin Ketone	Endrin Ketone	Endrin Ketone	Endrin Ketone	Endrin Ketone	
	gamma-BHC	gamma-BHC	gamma-BHC	gamma-BHC	
gamma-Chlordane	gamma-Chlordane	gamma-Chlordane	gamma-Chlordane	gamma-Chlordane	gamma-Chlordane
Heptachlor	Heptachlor	Heptachlor	Heptachlor	Heptachlor	Heptachlor
Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide	Heptachlor epoxide
	Hexachlorobenzene	Hexachlorobenzene			
	Hexachlorobutadiene	Hexachlorobutadiene	Hexachlorobutadiene		
Isophorone	Isophorone	Isophorone	Isophorone	Isophorone	Isophorone
Lead				Lead	Lead
Methoxychlor	Methoxychlor	Methoxychlor	Methoxychlor	Methoxychlor	Methoxychlor
Methyl parathion	Methyl parathion	Methyl parathion	Methyl parathion	Methyl parathion	Methyl parathion
Mirex	Mirex	Mirex	Mirex	Mirex	
				OCDD	
OCDF				OCDF	
p,p'-DDT					
Phenol				Phenol	Phenol
Pyrene	Pyrene	Pyrene	Pyrene	Pyrene	Pyrene
Silver			Silver	Silver	Silver

TABLE D-7. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 30-YEAR EXPOSURE DURATION-1991 DATA (Page 1 of 3)						
Chemical	Ingestion Rate	Common Carp	Crayfish	Largescale Sucker	Peamouth	White Sturgeon
1,2,3,4,6,7,8-HpCDD	6.5 g/day	3.29E-07	8.40E-08	1.37E-07	6.62E-08	2.69E-08
	54 g/day	2.73E-06	6.98E-07	1.14E-06	5.50E-07	2.23E-07
	176 g/day	8.90E-06	2.28E-06	3.72E-06	1.79E-06	7.27E-07
1,2,3,4,6,7,8-HpCDF	6.5 g/day	3.33E-08	1.46E-08	4.00E-08	1.64E-08	
	54 g/day	2.77E-07	1.21E-07	3.32E-07	1.36E-07	
	176 g/day	9.02E-07	3.95E-07	1.08E-06	4.44E-07	
1,2,3,4,7,8,9-HpCDF	6.5 g/day	7.16E-09	5.51E-09	8.68E-09	5.97E-09	
	54 g/day	5.94E-08	4.58E-08	7.21E-08	4.96E-08	
	176 g/day	1.94E-07	1.49E-07	2.35E-07	1.62E-07	
1,2,3,4,7,8-HxCDD	6.5 g/day	4.48E-07	6.92E-08	1.38E-07	1.66E-07	
	54 g/day	3.72E-06	5.75E-07	1.15E-06	1.38E-06	
	176 g/day	1.21E-05	1.87E-06	3.73E-06	4.49E-06	
1,2,3,4,7,8-HxCDF	6.5 g/day	1.97E-07	9.92E-08	1.25E-07	1.32E-07	
	54 g/day	1.64E-06	8.24E-07	1.04E-06	1.10E-06	
	176 g/day	5.33E-06	2.69E-06	3.40E-06	3.59E-06	
1,2,3,6,7,8-HxCDD	6.5 g/day	1.46E-06	1.48E-07	4.06E-07	3.44E-07	
	54 g/day	1.21E-05	1.23E-06	3.37E-06	2.86E-06	
	176 g/day	3.95E-05	4.00E-06	1.10E-05	9.32E-06	
1,2,3,6,7,8-HxCDF	6.5 g/day	1.63E-07	9.11E-08	1.20E-07	9.16E-08	
	54 g/day	1.35E-06	7.57E-07	9.95E-07	7.61E-07	
	176 g/day	4.40E-06	2.47E-06	3.24E-06	2.48E-06	
1,2,3,7,8,9-HxCDD	6.5 g/day	1.47E-07	1.08E-07	2.15E-07	1.09E-07	
	54 g/day	1.22E-06	8.94E-07	1.78E-06	9.07E-07	
	176 g/day	3.97E-06	2.91E-06	5.81E-06	2.96E-06	
1,2,3,7,8,9-HxCDF	6.5 g/day	6.12E-08	9.56E-08	1.10E-07		
	54 g/day	5.09E-07	7.95E-07	9.15E-07		
	176 g/day	1.66E-06	2.59E-06	2.98E-06		
1,2,3,7,8-PeCDD	6.5 g/day	4.17E-06	5.19E-07	1.73E-06	2.37E-06	
	54 g/day	3.47E-05	4.31E-06	1.44E-05	1.97E-05	
	176 g/day	1.13E-04	1.40E-05	4.69E-05	6.42E-05	
1,2,3,7,8-PeCDF	6.5 g/day	1.27E-07	8.50E-08	7.18E-08	1.46E-07	1.10E-07
	54 g/day	1.06E-06	7.06E-07	5.96E-07	1.22E-06	9.15E-07
	176 g/day	3.44E-06	2.30E-06	1.94E-06	3.96E-06	2.98E-06
1,4-Dichlorobenzene	6.5 g/day	2.24E-07				
	54 g/day	1.86E-06				
	176 g/day	6.06E-06				
2,3,4,6,7,8-HxCDF	6.5 g/day	1.17E-06	5.36E-07	8.28E-07	2.33E-07	
	54 g/day	9.69E-06	4.45E-06	6.88E-06	1.93E-06	
	176 g/day	3.16E-05	1.45E-05	2.24E-05	6.30E-06	
2,3,4,7,8-PeCDF	6.5 g/day	2.80E-06	1.78E-06	1.66E-06	2.95E-06	9.75E-07
	54 g/day	2.33E-05	1.48E-05	1.38E-05	2.45E-05	8.10E-06
	176 g/day	7.58E-05	4.82E-05	4.48E-05	7.98E-05	2.64E-05

TABLE D-7. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 30-YEAR EXPOSURE DURATION-1991 DATA (Page 2 of 3)						
Chemical	Ingestion Rate	Common Carp	Crayfish	Largescale Sucker	Peamouth	White Sturgeon
2,3,7,8-TCDD	6.5 g/day	9.06E-06	2.66E-06	5.67E-06	1.58E-05	3.37E-06
	54 g/day	7.52E-05	2.21E-05	4.71E-05	1.31E-04	2.80E-05
	176 g/day	2.45E-04	7.19E-05	1.54E-04	4.28E-04	9.12E-05
2,3,7,8-TCDF	6.5 g/day	4.42E-06	3.42E-06	4.04E-06	2.37E-05	6.19E-06
	54 g/day	3.67E-05	2.84E-05	3.36E-05	1.97E-04	5.14E-05
	176 g/day	1.20E-04	9.26E-05	1.09E-04	6.41E-04	1.68E-04
Aldrin	6.5 g/day	1.63E-06		1.28E-06	1.00E-05	
	54 g/day	1.35E-05		1.06E-05	8.31E-05	
	176 g/day	4.41E-05		3.46E-05	2.71E-04	
alpha-BHC	6.5 g/day			5.83E-07		
	54 g/day			4.84E-06		
	176 g/day			1.58E-05		
Aroclor 1242	6.5 g/day				1.11E-05	
	54 g/day				9.20E-05	
	176 g/day				3.00E-04	
Aroclor 1254	6.5 g/day	3.23E-05		3.73E-05		1.95E-05
	54 g/day	2.69E-04		3.10E-04		1.62E-04
	176 g/day	8.75E-04		1.01E-03		5.28E-04
Aroclor 1260	6.5 g/day	1.46E-05		9.06E-06	5.57E-05	
	54 g/day	1.21E-04		7.58E-05	4.63E-04	
	176 g/day	3.94E-04		2.45E-04	1.51E-03	
Arsenic	6.5 g/day					2.44E-06
	54 g/day					2.03E-05
	176 g/day					6.60E-05
beta-BHC	6.5 g/day		1.29E-07	1.34E-07	2.59E-06	
	54 g/day		1.07E-06	1.11E-06	2.15E-05	
	176 g/day		3.48E-06	3.62E-06	7.01E-05	
Bis(2-ethylhexyl)phthalate	6.5 g/day	3.82E-07	1.91E-07	1.87E-07	1.70E-07	1.93E-07
	54 g/day	3.17E-06	1.59E-06	1.56E-06	1.41E-06	1.60E-06
	176 g/day	1.03E-05	5.18E-06	5.07E-06	4.60E-06	5.22E-06
Dieldrin	6.5 g/day	1.57E-06	1.09E-06	1.06E-06	8.64E-06	1.66E-06
	54 g/day	1.31E-05	9.05E-06	8.80E-06	7.18E-05	1.38E-05
	176 g/day	4.26E-05	2.95E-05	2.87E-05	2.34E-04	4.48E-05
Heptachlor	6.5 g/day		2.86E-07			
	54 g/day		2.38E-06			
	176 g/day		7.75E-06			
Isophorone	6.5 g/day		4.71E-09			
	54 g/day		3.92E-08			
	176 g/day		1.28E-07			
Lindane	6.5 g/day	8.54E-08		1.09E-07	6.30E-07	
	54 g/day	7.10E-07		9.07E-07	5.23E-06	
	176 g/day	2.31E-06		2.96E-06	1.71E-05	

TABLE D-7. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 30-YEAR EXPOSURE DURATION-1991 DATA (Page 3 of 3)						
Chemical	Ingestion Rate	Common Carp	Crayfish	Largescale Sucker	Peamouth	White Sturgeon
Mirex	6.5 g/day	1.59E-07				
	54 g/day	1.32E-06				
	176 g/day	4.30E-06				
N-Nitroso-di-n-propylamine	6.5 g/day	9.79E-05				
	54 g/day	8.14E-04				
	176 g/day	2.65E-03				
o,p'-DDD	6.5 g/day	2.57E-08		8.73E-08	1.21E-07	2.02E-08
	54 g/day	2.14E-07		7.25E-07	1.00E-06	1.68E-07
	176 g/day	6.97E-07		2.36E-06	3.27E-06	5.47E-07
o,p'-DDE	6.5 g/day	7.06E-08		1.41E-07	1.64E-07	2.90E-08
	54 g/day	5.87E-07		1.17E-06	1.36E-06	2.41E-07
	176 g/day	1.91E-06		3.82E-06	4.44E-06	7.85E-07
o,p'-DDT	6.5 g/day	3.23E-08	2.05E-08			4.12E-08
	54 g/day	2.68E-07	1.71E-07			3.42E-07
	176 g/day	8.74E-07	5.56E-07			1.12E-06
OCDD	6.5 g/day	8.39E-08	6.60E-08	4.76E-08	3.96E-08	8.66E-09
	54 g/day	6.97E-07	5.48E-07	3.96E-07	3.29E-07	7.20E-08
	176 g/day	2.27E-06	1.79E-06	1.29E-06	1.07E-06	2.35E-07
OCDF	6.5 g/day	5.21E-09	2.36E-09	1.04E-08	4.30E-09	
	54 g/day	4.33E-08	1.96E-08	8.65E-08	3.57E-08	
	176 g/day	1.41E-07	6.39E-08	2.82E-07	1.16E-07	
p,p'-DDD	6.5 g/day	6.50E-08	2.49E-08	1.50E-07	2.14E-07	3.21E-08
	54 g/day	5.40E-07	2.07E-07	1.25E-06	1.78E-06	2.66E-07
	176 g/day	1.76E-06	6.75E-07	4.06E-06	5.79E-06	8.68E-07
p,p'-DDE	6.5 g/day	4.85E-07	1.04E-07		1.89E-06	2.58E-07
	54 g/day	4.03E-06	8.67E-07		1.57E-05	2.14E-06
	176 g/day	1.31E-05	2.82E-06		5.11E-05	6.97E-06
p,p'-DDT	6.5 g/day	5.23E-08	2.09E-08	8.52E-08		6.17E-08
	54 g/day	4.35E-07	1.74E-07	7.08E-07		5.12E-07
	176 g/day	1.42E-06	5.66E-07	2.31E-06		1.67E-06

TABLE D-8. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 70-YEAR EXPOSURE DURATION-1991 DATA (Page 1 of 3)						
Chemical	Ingestion Rate	Common Carp	Crayfish	Largescale Sucker	Peamouth	White Sturgeon
1,2,3,4,6,7,8-HpCDD	6.5 g/day	8.00E-07	2.05E-07	3.34E-07	1.61E-07	6.54E-08
	54 g/day	6.64E-06	1.70E-06	2.78E-06	1.34E-06	5.43E-07
	176 g/day	2.17E-05	5.54E-06	9.05E-06	4.36E-06	1.77E-06
1,2,3,4,6,7,8-HpCDF	6.5 g/day	8.11E-08	3.55E-08	9.73E-08	3.99E-08	
	54 g/day	6.73E-07	2.95E-07	8.08E-07	3.31E-07	
	176 g/day	2.19E-06	9.62E-07	2.63E-06	1.08E-06	
1,2,3,4,7,8,9-HpCDF	6.5 g/day	1.74E-08	1.34E-08	2.11E-08	1.45E-08	
	54 g/day	1.45E-07	1.11E-07	1.76E-07	1.21E-07	
	176 g/day	4.71E-07	3.63E-07	5.72E-07	3.93E-07	
1,2,3,4,7,8-HxCDD	6.5 g/day	1.09E-06	1.68E-07	3.35E-07	4.04E-07	
	54 g/day	9.05E-06	1.40E-06	2.79E-06	3.36E-06	
	176 g/day	2.95E-05	4.56E-06	9.08E-06	1.09E-05	
1,2,3,4,7,8-HxCDF	6.5 g/day	4.79E-07	2.41E-07	3.05E-07	3.22E-07	
	54 g/day	3.98E-06	2.01E-06	2.54E-06	2.68E-06	
	176 g/day	1.30E-05	6.54E-06	8.27E-06	8.73E-06	
1,2,3,6,7,8-HxCDD	6.5 g/day	3.55E-06	3.60E-07	9.88E-07	8.38E-07	
	54 g/day	2.95E-05	2.99E-06	8.21E-06	6.96E-06	
	176 g/day	9.61E-05	9.74E-06	2.67E-05	2.27E-05	
1,2,3,6,7,8-HxCDF	6.5 g/day	3.96E-07	2.22E-07	2.91E-07	2.23E-07	
	54 g/day	3.29E-06	1.84E-06	2.42E-06	1.85E-06	
	176 g/day	1.07E-05	6.00E-06	7.89E-06	6.03E-06	
1,2,3,7,8,9-HxCDD	6.5 g/day	3.57E-07	2.62E-07	5.22E-07	2.66E-07	
	54 g/day	2.96E-06	2.17E-06	4.34E-06	2.21E-06	
	176 g/day	9.65E-06	7.09E-06	1.41E-05	7.19E-06	
1,2,3,7,8,9-HxCDF	6.5 g/day	1.49E-07	2.33E-07	2.68E-07		
	54 g/day	1.24E-06	1.93E-06	2.23E-06		
	176 g/day	4.04E-06	6.30E-06	7.26E-06		
1,2,3,7,8-PeCDD	6.5 g/day	1.02E-05	1.26E-06	4.22E-06	5.77E-06	
	54 g/day	8.44E-05	1.05E-05	3.51E-05	4.79E-05	
	176 g/day	2.75E-04	3.42E-05	1.14E-04	1.56E-04	
1,2,3,7,8-PeCDF	6.5 g/day	3.09E-07	2.07E-07	1.75E-07	3.56E-07	2.68E-07
	54 g/day	2.57E-06	1.72E-06	1.45E-06	2.96E-06	2.23E-06
	176 g/day	8.37E-06	5.60E-06	4.73E-06	9.64E-06	7.26E-06
1,4-Dichlorobenzene	6.5 g/day	5.45E-07				
	54 g/day	4.53E-06				
	176 g/day	1.48E-05				
2,3,4,6,7,8-HxCDF	6.5 g/day	2.84E-06	1.30E-06	2.02E-06	5.66E-07	
	54 g/day	2.36E-05	1.08E-05	1.67E-05	4.70E-06	
	176 g/day	7.69E-05	3.53E-05	5.46E-05	1.53E-05	
2,3,4,7,8-PeCDF	6.5 g/day	6.81E-06	4.34E-06	4.03E-06	7.17E-06	2.37E-06
	54 g/day	5.66E-05	3.60E-05	3.35E-05	5.96E-05	1.97E-05
	176 g/day	1.84E-04	1.17E-04	1.09E-04	1.94E-04	6.42E-05
2,3,7,8-TCDD	6.5 g/day	2.20E-05	6.47E-06	1.38E-05	3.85E-05	8.20E-06
	54 g/day	1.83E-04	5.37E-05	1.15E-04	3.20E-04	6.81E-05
	176 g/day	5.97E-04	1.75E-04	3.74E-04	1.04E-03	2.22F

TABLE D-8. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 70-YEAR EXPOSURE DURATION-1991 DATA (Page 2 of 3)

Chemical	Ingestion Rate	Common Carp	Crayfish	Largescale Sucker	Peamouth	White Sturgeon
2,3,7,8-TCDF	6.5 g/day	1.08E-05	8.32E-06	9.83E-06	5.76E-05	1.51E-05
	54 g/day	8.93E-05	6.91E-05	8.16E-05	4.78E-04	1.25E-04
	176 g/day	2.91E-04	2.25E-04	2.66E-04	1.56E-03	4.08E-04
Aldrin	6.5 g/day	3.96E-06		3.11E-06	2.43E-05	
	54 g/day	3.29E-05		2.58E-05	2.02E-04	
	176 g/day	1.07E-04		8.42E-05	6.59E-04	
alpha-BHC	6.5 g/day			1.42E-06		
	54 g/day			1.18E-05		
	176 g/day			3.84E-05		
Aroclor 1242	6.5 g/day				2.70E-05	
	54 g/day				2.24E-04	
	176 g/day				7.30E-04	
Aroclor 1254	6.5 g/day	7.87E-05		9.08E-05		4.74E-05
	54 g/day	6.53E-04		7.54E-04		3.94E-04
	176 g/day	2.13E-03		2.46E-03		1.28E-03
Aroclor 1260	6.5 g/day	3.54E-05		2.20E-05	1.36E-04	
	54 g/day	2.94E-04		1.83E-04	1.13E-03	
	176 g/day	9.59E-04		5.97E-04	3.67E-03	
Arsenic	6.5 g/day					5.93E-06
	54 g/day					4.93E-05
	176 g/day					1.61E-04
beta-BHC	6.5 g/day		3.13E-07	3.25E-07	6.30E-06	
	54 g/day		2.60E-06	2.70E-06	5.23E-05	
	176 g/day		8.47E-06	8.81E-06	1.71E-04	
Bis(2-ethylhexyl)phthalate	6.5 g/day	9.29E-07	4.66E-07	4.56E-07	4.13E-07	4.69E-07
	54 g/day	7.72E-06	3.87E-06	3.79E-06	3.43E-06	3.89E-06
	176 g/day	2.51E-05	1.26E-05	1.23E-05	1.12E-05	1.27E-05
Dieldrin	6.5 g/day	3.83E-06	2.65E-06	2.58E-06	2.10E-05	4.03E-06
	54 g/day	3.18E-05	2.20E-05	2.14E-05	1.75E-04	3.35E-05
	176 g/day	1.04E-04	7.17E-05	6.98E-05	5.69E-04	1.09E-04
Heptachlor	6.5 g/day		6.96E-07			
	54 g/day		5.79E-06			
	176 g/day		1.89E-05			
Isophorone	6.5 g/day		1.15E-08			
	54 g/day		9.53E-08			
	176 g/day		3.11E-07			
Lindane	6.5 g/day	2.08E-07		2.66E-07	1.53E-06	
	54 g/day	1.73E-06		2.21E-06	1.27E-05	
	176 g/day	5.63E-06		7.19E-06	4.15E-05	
Mirex	6.5 g/day	3.86E-07				
	54 g/day	3.21E-06				
	176 g/day	1.05E-05				
N-Nitroso-di-n-propylamine	6.5 g/day	2.38E-04				
	54 g/day	1.98E-03				
	176 g/day	6.45E-03				

TABLE D-8. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 70-YEAR EXPOSURE DURATION-1991 DATA (Page 3 of 3)						
Chemical	Ingestion Rate	Common Carp	Crayfish	Largescale Sucker	Peamouth	White Sturgeon
o,p'-DDD	6.5 g/day	6.26E-08		2.12E-07	2.94E-07	4.92E-08
	54 g/day	5.20E-07		1.76E-06	2.44E-06	4.08E-07
	176 g/day	1.70E-06		5.75E-06	7.97E-06	1.33E-06
o,p'-DDE	6.5 g/day	1.72E-07		3.44E-07	3.99E-07	7.06E-08
	54 g/day	1.43E-06		2.85E-06	3.32E-06	5.86E-07
	176 g/day	4.65E-06		9.30E-06	1.08E-05	1.91E-06
o,p'-DDT	6.5 g/day	7.86E-08	5.00E-08			1.00E-07
	54 g/day	6.53E-07	4.15E-07			8.33E-07
	176 g/day	2.13E-06	1.35E-06			2.72E-06
OCDD	6.5 g/day	2.04E-07	1.61E-07	1.16E-07	9.63E-08	2.11E-08
	54 g/day	1.70E-06	1.33E-06	9.63E-07	8.00E-07	1.75E-07
	176 g/day	5.53E-06	4.35E-06	3.14E-06	2.61E-06	5.71E-07
OCDF	6.5 g/day	1.27E-08	5.75E-09	2.53E-08	1.05E-08	
	54 g/day	1.05E-07	4.77E-08	2.10E-07	8.70E-08	
	176 g/day	3.44E-07	1.56E-07	6.86E-07	2.83E-07	
p,p'-DDD	6.5 g/day	1.58E-07	6.07E-08	3.65E-07	5.20E-07	7.80E-08
	54 g/day	1.31E-06	5.04E-07	3.03E-06	4.32E-06	6.48E-07
	176 g/day	4.28E-06	1.64E-06	9.88E-06	1.41E-05	2.11E-06
p,p'-DDE	6.5 g/day	1.18E-06	2.54E-07		4.60E-06	6.27E-07
	54 g/day	9.81E-06	2.11E-06		3.82E-05	5.21E-06
	176 g/day	3.20E-05	6.87E-06		1.24E-04	1.70E-05
p,p'-DDT	6.5 g/day	1.27E-07	5.09E-08	2.07E-07		1.50E-07
	54 g/day	1.06E-06	4.23E-07	1.72E-06		1.25E-06
	176 g/day	3.45E-06	1.38E-06	5.61E-06		4.06E-06

TABLE D-9. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 30-YEAR EXPOSURE DURATION-1993 DATA (Page 1 of 2)				
Chemicals	Ingestion Rate	Common Carp	Crayfish	Largescale Sucker
1,2,3,4,6,7,8-HpCDD	6.5 g/day	1.43E-07		5.83E-08
	54 g/day	1.19E-06		4.84E-07
	176 g/day	3.87E-06		1.58E-06
1,2,3,4,6,7,8-HpCDF	6.5 g/day		4.90E-08	5.24E-08
	54 g/day		4.07E-07	4.35E-07
	176 g/day		1.33E-06	1.42E-06
1,2,3,4,7,8-HxCDD	6.5 g/day	3.15E-07		1.97E-07
	54 g/day	2.62E-06		1.63E-06
	176 g/day	8.52E-06		5.33E-06
1,2,3,6,7,8-HxCDD	6.5 g/day	4.01E-07		1.95E-07
	54 g/day	3.33E-06		1.62E-06
	176 g/day	1.08E-05		5.28E-06
1,2,3,6,7,8-HxCDF	6.5 g/day			3.18E-07
	54 g/day			2.65E-06
	176 g/day			8.62E-06
1,2,3,7,8,9-HxCDF	6.5 g/day	1.37E-06		1.14E-06
	54 g/day	1.14E-05		9.44E-06
	176 g/day	3.72E-05		3.08E-05
1,2,3,7,8-PeCDD	6.5 g/day			1.06E-06
	54 g/day			8.77E-06
	176 g/day			2.86E-05
1,2,3,7,8-PeCDF	6.5 g/day	8.87E-07		6.34E-07
	54 g/day	7.37E-06		5.27E-06
	176 g/day	2.40E-05		1.72E-05
2,3,4,6,7,8-HxCDF	6.5 g/day	4.87E-07		5.17E-07
	54 g/day	4.04E-06		4.29E-06
	176 g/day	1.32E-05		1.40E-05
2,3,4,7,8-PeCDF	6.5 g/day	5.01E-07		1.18E-06
	54 g/day	4.16E-06		9.81E-06
	176 g/day	1.36E-05		3.20E-05
2,3,7,8-TCDD	6.5 g/day		1.53E-06	2.27E-06
	54 g/day		1.27E-05	1.89E-05
	176 g/day		4.13E-05	6.15E-05
2,3,7,8-TCDF	6.5 g/day	2.15E-06	8.57E-07	2.20E-06
	54 g/day	1.78E-05	7.12E-06	1.83E-05
	176 g/day	5.81E-05	2.32E-05	5.96E-05
Aroclor 1254	6.5 g/day	1.48E-05		6.77E-05
	54 g/day	1.23E-04		5.62E-04
	176 g/day	4.02E-04		1.83E-03
Aroclor 1260	6.5 g/day	8.23E-06	7.44E-06	1.15E-05
	54 g/day	6.84E-05	6.18E-05	9.59E-05
	176 g/day	2.23E-04	2.02E-04	3.13E-04
Arsenic	6.5 g/day		1.30E-07	2.46E-07
	54 g/day		1.08E-06	2.04E-06
	176 g/day		3.51E-06	6.65E-06
Bis(2-ethylhexyl)phthalate	6.5 g/day			1.01E-07
	54 g/day			8.40E-07
	176 g/day			2.74E-06
Cesium 137	6.5 g/day			3.05E-08
	54 g/day			2.53E-07
	176 g/day			8.25E-07
OCDD	6.5 g/day	3.26E-08	1.53E-08	3.87E-08
	54 g/day	2.71E-07	1.27E-07	3.22E-07
	176 g/day	8.83E-07	4.15E-07	1.05E-06
OCDF	6.5 g/day			3.97E-09
	54 g/day			3.30E-08
	176 g/day			1.08E-07

TABLE D-9. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 30-YEAR EXPOSURE DURATION-1993 DATA (Page 2 of 2)

p,p'-DDD	6.5 g/day	1.88E-07		2.27E-07
	54 g/day	1.56E-06		1.89E-06
	176 g/day	5.08E-06		6.16E-06
p,p'-DDE	6.5 g/day	1.06E-06	8.68E-08	1.26E-06
	54 g/day	8.78E-06	7.21E-07	1.05E-05
	176 g/day	2.86E-05	2.35E-06	3.41E-05
p,p'-DDT	6.5 g/day	4.93E-08		1.81E-07
	54 g/day	4.10E-07		1.51E-06
	176 g/day	1.33E-06		4.91E-06
Plutonium 238	6.5 g/day			9.12E-08
	54 g/day			7.58E-07
	176 g/day			2.47E-06
Plutonium 239/240	6.5 g/day	3.24E-08		2.90E-09
	54 g/day	2.69E-07		2.41E-08
	176 g/day	8.77E-07		7.85E-08

TABLE D-10. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 70-YEAR EXPOSURE DURATION-1993 DATA (Page 1 of 2)				
Chemicals	Ingestion Rate	Common Carp	Crayfish	Largescale Sucker
1,2,3,4,6,7,8-HpCDD	6.5 g/day	3.48E-07		1.42E-07
	54 g/day	2.89E-06		1.18E-06
	176 g/day	9.43E-06		3.84E-06
1,2,3,4,6,7,8-HpCDF	6.5 g/day		1.19E-07	1.28E-07
	54 g/day		9.91E-07	1.06E-06
	176 g/day		3.23E-06	3.45E-06
1,2,3,4,7,8-HxCDD	6.5 g/day	7.66E-07		4.79E-07
	54 g/day	6.36E-06		3.98E-06
	176 g/day	2.07E-05		1.30E-05
1,2,3,6,7,8-HxCDD	6.5 g/day	9.75E-07		4.74E-07
	54 g/day	8.10E-06		3.94E-06
	176 g/day	2.64E-05		1.28E-05
1,2,3,6,7,8-HxCDF	6.5 g/day			7.75E-07
	54 g/day			6.44E-06
	176 g/day			2.10E-05
1,2,3,7,8,9-HxCDF	6.5 g/day	3.34E-06		2.76E-06
	54 g/day	2.78E-05		2.30E-05
	176 g/day	9.05E-05		7.48E-05
1,2,3,7,8-PeCDD	6.5 g/day			2.57E-06
	54 g/day			2.13E-05
	176 g/day			6.95E-05
1,2,3,7,8-PeCDF	6.5 g/day	2.16E-06		1.54E-06
	54 g/day	1.79E-05		1.28E-05
	176 g/day	5.85E-05		4.18E-05
2,3,4,6,7,8-HxCDF	6.5 g/day	1.18E-06		1.26E-06
	54 g/day	9.84E-06		1.05E-05
	176 g/day	3.21E-05		3.41E-05
2,3,4,7,8-PeCDF	6.5 g/day	1.22E-06		2.87E-06
	54 g/day	1.01E-05		2.39E-05
	176 g/day	3.30E-05		7.78E-05
2,3,7,8-TCDD	6.5 g/day		3.71E-06	5.53E-06
	54 g/day		3.09E-05	4.59E-05
	176 g/day		1.01E-04	1.50E-04
2,3,7,8-TCDF	6.5 g/day	5.22E-06	2.09E-06	5.36E-06
	54 g/day	4.34E-05	1.73E-05	4.45E-05
	176 g/day	1.41E-04	5.65E-05	1.45E-04
Aroclor 1254	6.5 g/day	3.61E-05		1.65E-04
	54 g/day	3.00E-04		1.37E-03
	176 g/day	9.78E-04		4.46E-03
Aroclor 1260	6.5 g/day	2.00E-05	1.81E-05	2.81E-05
	54 g/day	1.66E-04	1.50E-04	2.33E-04
	176 g/day	5.42E-04	4.90E-04	7.60E-04
Arsenic	6.5 g/day		3.15E-07	5.97E-07
	54 g/day		2.62E-06	4.96E-06
	176 g/day		8.54E-06	1.62E-05
Bis(2-ethylhexyl)phthalate	6.5 g/day			2.46E-07
	54 g/day			2.04E-06
	176 g/day			6.66E-06
Cesium 137	6.5 g/day			7.41E-08
	54 g/day			6.16E-07
	176 g/day			2.01E-06
OCDD	6.5 g/day	7.94E-08	3.73E-08	9.43E-08
	54 g/day	6.60E-07	3.10E-07	7.83E-07
	176 g/day	2.15E-06	1.01E-06	2.55E-06

TABLE D-10. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS
FOR A 70-YEAR EXPOSURE DURATION-1993 DATA (Page 2 of 2)

OCDF	6.5 g/day			9.66E-09
	54 g/day			8.03E-08
	176 g/day			2.62E-07
p,p'-DDD	6.5 g/day	4.57E-07		5.54E-07
	54 g/day	3.80E-06		4.60E-06
	176 g/day	1.24E-05		1.50E-05
p,p'-DDE	6.5 g/day	2.57E-06	2.11E-07	3.06E-06
	54 g/day	2.14E-05	1.75E-06	2.54E-05
	176 g/day	6.97E-05	5.72E-06	8.29E-05
p,p'-DDT	6.5 g/day	1.20E-07		4.41E-07
	54 g/day	9.97E-07		3.67E-06
	176 g/day	3.25E-06		1.20E-05
Plutonium 238	6.5 g/day			2.22E-07
	54 g/day			1.84E-06
	176 g/day			6.00E-06
Plutonium 239/240	6.5 g/day	7.87E-08		7.05E-09
	54 g/day	6.54E-07		5.86E-08
	176 g/day	2.13E-06		1.91E-07

TABLE D-11. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 30-YEAR EXPOSURE DURATION-1991/93 DATA (Page 1 of 2)

Chemical	Ingestion Rate	Carp	Crayfish	LS Sucker
1,2,3,4,6,7,8-HpCDD	6.5 g/day	2.76E-07	4.84E-08	2.76E-07
	54 g/day	2.29E-06	4.02E-07	2.29E-06
	176 g/day	7.46E-06	1.31E-06	7.46E-06
1,2,3,4,6,7,8-HpCDF	6.5 g/day	2.58E-08	3.37E-08	4.71E-08
	54 g/day	2.15E-07	2.80E-07	3.91E-07
	176 g/day	7.00E-07	9.13E-07	1.27E-06
1,2,3,4,7,8,9-HpCDF	6.5 g/day	7.97E-09	2.32E-08	1.31E-08
	54 g/day	6.62E-08	1.93E-07	1.09E-07
	176 g/day	2.16E-07	6.29E-07	3.55E-07
1,2,3,4,7,8-HxCDD	6.5 g/day	4.10E-07	1.26E-07	1.72E-07
	54 g/day	3.40E-06	1.05E-06	1.42E-06
	176 g/day	1.11E-05	3.42E-06	4.64E-06
1,2,3,4,7,8-HxCDF	6.5 g/day	1.77E-07	1.46E-07	1.42E-07
	54 g/day	1.47E-06	1.21E-06	1.18E-06
	176 g/day	4.80E-06	3.95E-06	3.84E-06
1,2,3,6,7,8-HxCDD	6.5 g/day	1.16E-06	1.73E-07	2.85E-07
	54 g/day	9.61E-06	1.44E-06	2.37E-06
	176 g/day	3.13E-05	4.68E-06	7.73E-06
1,2,3,6,7,8-HxCDF	6.5 g/day	1.53E-07	1.35E-07	2.33E-07
	54 g/day	1.27E-06	1.12E-06	1.94E-06
	176 g/day	4.14E-06	3.65E-06	6.32E-06
1,2,3,7,8,9-HxCDD	6.5 g/day	1.82E-07	1.73E-07	1.82E-07
	54 g/day	1.51E-06	1.44E-06	1.51E-06
	176 g/day	4.94E-06	4.68E-06	4.93E-06
1,2,3,7,8,9-HxCDF	6.5 g/day	4.36E-07	1.76E-07	6.96E-07
	54 g/day	3.62E-06	1.46E-06	5.78E-06
	176 g/day	1.18E-05	4.77E-06	1.89E-05
1,2,3,7,8-PeCDD	6.5 g/day	3.31E-06	8.93E-07	1.35E-06
	54 g/day	2.75E-05	7.42E-06	1.12E-05
	176 g/day	8.96E-05	2.42E-05	3.65E-05
1,2,3,7,8-PeCDF	6.5 g/day	3.44E-07	7.44E-08	3.93E-07
	54 g/day	2.86E-06	6.18E-07	3.27E-06
	176 g/day	9.32E-06	2.01E-06	1.06E-05
1,4-Dichlorobenzene	6.5 g/day	2.08E-07		
	54 g/day	1.73E-06		
	176 g/day	5.63E-06		
2,3,4,6,7,8-HxCDF	6.5 g/day	9.72E-07	3.39E-07	6.50E-07
	54 g/day	8.08E-06	2.82E-06	5.40E-06
	176 g/day	2.63E-05	9.18E-06	1.76E-05
2,3,4,7,8-PeCDF	6.5 g/day	2.14E-06	1.26E-06	1.38E-06
	54 g/day	1.78E-05	1.05E-05	1.15E-05
	176 g/day	5.80E-05	3.42E-05	3.75E-05
2,3,7,8-TCDD	6.5 g/day	7.04E-06	2.03E-06	3.73E-06
	54 g/day	5.85E-05	1.69E-05	3.10E-05
	176 g/day	1.91E-04	5.49E-05	1.01E-04
2,3,7,8-TCDF	6.5 g/day	3.77E-06	2.00E-06	2.99E-06
	54 g/day	3.13E-05	1.66E-05	2.48E-05
	176 g/day	1.02E-04	5.40E-05	8.09E-05
Aldrin	6.5 g/day	1.48E-06		1.40E-06
	54 g/day	1.23E-05		1.16E-05
	176 g/day	4.01E-05		3.79E-05
alpha-BHC	6.5 g/day			4.46E-07
	54 g/day			3.70E-06
	176 g/day			1.21E-05
Aroclor 1254	6.5 g/day	2.91E-05		5.16E-05
	54 g/day	2.42E-04		4.29E-04
	176 g/day	7.89E-04		1.40E-03
Aroclor 1260	6.5 g/day	1.34E-05	7.39E-06	1.02E-05
	54 g/day	1.11E-04	6.14E-05	8.50E-05
	176 g/day	3.63E-04	2.00E-04	2.77E-04

TABLE D-11. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 30-YEAR EXPOSURE DURATION-1991/93 DATA (Page 2 of 2)

Chemical	Ingestion Rate	Carp	Crayfish	LS Sucker
Arsenic	6.5 g/day		7.57E-07	5.40E-07
	54 g/day		6.29E-06	4.49E-06
	176 g/day		2.05E-05	1.46E-05
beta-BHC	6.5 g/day		1.09E-07	1.11E-07
	54 g/day		9.07E-07	9.23E-07
	176 g/day		2.96E-06	3.01E-06
Bis(2-ethylhexyl)phthalate	6.5 g/day	3.27E-07	1.69E-07	1.47E-07
	54 g/day	2.71E-06	1.41E-06	1.22E-06
	176 g/day	8.85E-06	4.58E-06	3.97E-06
Cesium 137	6.5 g/day			3.05E-08
	54 g/day			2.53E-07
	176 g/day			8.25E-07
Dieldrin	6.5 g/day	1.57E-06	1.29E-06	1.84E-06
	54 g/day	1.30E-05	1.07E-05	1.53E-05
	176 g/day	4.24E-05	3.49E-05	4.98E-05
Heptachlor	6.5 g/day		2.54E-07	
	54 g/day		2.11E-06	
	176 g/day		6.87E-06	
Isophorone	6.5 g/day		3.36E-09	
	54 g/day		2.80E-08	
	176 g/day		9.11E-08	
Lindane	6.5 g/day	8.12E-08		8.63E-08
	54 g/day	6.74E-07		7.17E-07
	176 g/day	2.20E-06		2.34E-06
Mirex	6.5 g/day	1.59E-07		
	54 g/day	1.32E-06		
	176 g/day	4.30E-06		
N-Nitroso-di-n-propylamine	6.5 g/day	9.79E-05		
	54 g/day	8.14E-04		
	176 g/day	2.65E-03		
o,p'-DDD	6.5 g/day	2.54E-08		1.27E-07
	54 g/day	2.11E-07		1.06E-06
	176 g/day	6.88E-07		3.44E-06
o,p'-DDE	6.5 g/day	6.39E-08		1.41E-07
	54 g/day	5.31E-07		1.17E-06
	176 g/day	1.73E-06		3.81E-06
o,p'-DDT	6.5 g/day	3.26E-08	2.59E-08	
	54 g/day	2.70E-07	2.16E-07	
	176 g/day	8.81E-07	7.03E-07	
OCDD	6.5 g/day	6.92E-08	3.78E-08	4.26E-08
	54 g/day	5.75E-07	3.14E-07	3.54E-07
	176 g/day	1.87E-06	1.02E-06	1.15E-06
OCDF	6.5 g/day	4.05E-09	2.43E-09	6.73E-09
	54 g/day	3.37E-08	2.02E-08	5.59E-08
	176 g/day	1.10E-07	6.57E-08	1.82E-07
p,p'-DDD	6.5 g/day	8.73E-08	2.40E-08	1.88E-07
	54 g/day	7.26E-07	1.99E-07	1.56E-06
	176 g/day	2.36E-06	6.50E-07	5.08E-06
p,p'-DDE	6.5 g/day	5.89E-07	9.63E-08	7.70E-07
	54 g/day	4.89E-06	8.00E-07	6.39E-06
	176 g/day	1.60E-05	2.61E-06	2.08E-05
p,p'-DDT	6.5 g/day	5.18E-08	2.61E-08	1.32E-07
	54 g/day	4.30E-07	2.17E-07	1.10E-06
	176 g/day	1.40E-06	7.08E-07	3.57E-06
Plutonium 238	6.5 g/day			9.12E-08
	54 g/day			7.58E-07
	176 g/day			2.47E-06
Plutonium 239/240	6.5 g/day	3.24E-08		2.90E-09
	54 g/day	2.69E-07		2.41E-08
	176 g/day	8.77E-07		7.85E-08

TABLE D-12. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 70-YEAR EXPOSURE DURATION-1991/93 DATA (PAGE 1 of 2)

Chemical	Ingestion Rate	Carp	Crayfish	LS Sucker
1,2,3,4,6,7,8-HpCDD	6.5 g/day	6.71E-07	1.18E-07	6.71E-07
	54 g/day	5.57E-06	9.78E-07	5.57E-06
	176 g/day	1.82E-05	3.19E-06	1.82E-05
1,2,3,4,6,7,8-HpCDF	6.5 g/day	6.29E-08	8.21E-08	1.15E-07
	54 g/day	5.22E-07	6.82E-07	9.52E-07
	176 g/day	1.70E-06	2.22E-06	3.10E-06
1,2,3,4,7,8,9-HpCDF	6.5 g/day	1.94E-08	5.65E-08	3.19E-08
	54 g/day	1.61E-07	4.70E-07	2.65E-07
	176 g/day	5.25E-07	1.53E-06	8.65E-07
1,2,3,4,7,8-HxCDD	6.5 g/day	9.97E-07	3.07E-07	4.17E-07
	54 g/day	8.28E-06	2.55E-06	3.47E-06
	176 g/day	2.70E-05	8.31E-06	1.13E-05
1,2,3,4,7,8-HxCDF	6.5 g/day	4.32E-07	3.55E-07	3.45E-07
	54 g/day	3.59E-06	2.95E-06	2.86E-06
	176 g/day	1.17E-05	9.61E-06	9.33E-06
1,2,3,6,7,8-HxCDD	6.5 g/day	2.81E-06	4.20E-07	6.94E-07
	54 g/day	2.34E-05	3.49E-06	5.77E-06
	176 g/day	7.62E-05	1.14E-05	1.88E-05
1,2,3,6,7,8-HxCDF	6.5 g/day	3.72E-07	3.28E-07	5.68E-07
	54 g/day	3.09E-06	2.73E-06	4.72E-06
	176 g/day	1.01E-05	8.88E-06	1.54E-05
1,2,3,7,8,9-HxCDD	6.5 g/day	4.44E-07	4.21E-07	4.43E-07
	54 g/day	3.69E-06	3.50E-06	3.68E-06
	176 g/day	1.20E-05	1.14E-05	1.20E-05
1,2,3,7,8,9-HxCDF	6.5 g/day	1.06E-06	4.28E-07	1.69E-06
	54 g/day	8.82E-06	3.56E-06	1.41E-05
	176 g/day	2.87E-05	1.16E-05	4.59E-05
1,2,3,7,8-PeCDD	6.5 g/day	8.05E-06	2.17E-06	3.28E-06
	54 g/day	6.69E-05	1.81E-05	2.72E-05
	176 g/day	2.18E-04	5.88E-05	8.87E-05
1,2,3,7,8-PeCDF	6.5 g/day	8.38E-07	1.81E-07	9.57E-07
	54 g/day	6.96E-06	1.50E-06	7.95E-06
	176 g/day	2.27E-05	4.90E-06	2.59E-05
1,4-Dichlorobenzene	6.5 g/day	5.06E-07		
	54 g/day	4.20E-06		
	176 g/day	1.37E-05		
2,3,4,6,7,8-HxCDF	6.5 g/day	2.37E-06	8.25E-07	1.58E-06
	54 g/day	1.97E-05	6.85E-06	1.31E-05
	176 g/day	6.41E-05	2.23E-05	4.28E-05
2,3,4,7,8-PeCDF	6.5 g/day	5.21E-06	3.07E-06	3.37E-06
	54 g/day	4.33E-05	2.55E-05	2.80E-05
	176 g/day	1.41E-04	8.33E-05	9.12E-05
2,3,7,8-TCDD	6.5 g/day	1.71E-05	4.94E-06	9.07E-06
	54 g/day	1.42E-04	4.10E-05	7.54E-05
	176 g/day	4.64E-04	1.34E-04	2.46E-04
2,3,7,8-TCDF	6.5 g/day	9.17E-06	4.86E-06	7.27E-06
	54 g/day	7.62E-05	4.03E-05	6.04E-05
	176 g/day	2.48E-04	1.31E-04	1.97E-04
Aldrin	6.5 g/day	3.60E-06		3.41E-06
	54 g/day	2.99E-05		2.83E-05
	176 g/day	9.75E-05		9.23E-05
alpha-BHC	6.5 g/day			1.08E-06
	54 g/day			9.01E-06
	176 g/day			2.94E-05
Aroclor 1254	6.5 g/day	7.09E-05		1.26E-04
	54 g/day	5.89E-04		1.04E-03
	176 g/day	1.92E-03		3.40E-03
Aroclor 1260	6.5 g/day	3.26E-05	1.80E-05	2.49E-05
	54 g/day	2.71E-04	1.49E-04	2.07E-04
	176 g/day	8.84E-04	4.87E-04	6.74E-04

TABLE D-12. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 70-YEAR EXPOSURE DURATION (Page 2 of 2)				
Chemical	Ingestion Rate	Carp	Crayfish	LS Sucker
Arsenic	6.5 g/day		1.84E-06	1.31E-06
	54 g/day		1.53E-05	1.09E-05
	176 g/day		4.99E-05	3.56E-05
beta-BHC	6.5 g/day		2.66E-07	2.70E-07
	54 g/day		2.21E-06	2.24E-06
	176 g/day		7.19E-06	7.32E-06
Bis(2-ethylhexyl)phthalate	6.5 g/day	7.95E-07	4.12E-07	3.57E-07
	54 g/day	6.61E-06	3.42E-06	2.97E-06
	176 g/day	2.15E-05	1.11E-05	9.67E-06
Cesium 137	6.5 g/day			7.41E-08
	54 g/day			6.16E-07
	176 g/day			2.01E-06
Dieldrin	6.5 g/day	3.81E-06	3.13E-06	4.48E-06
	54 g/day	3.16E-05	2.60E-05	3.72E-05
	176 g/day	1.03E-04	8.48E-05	1.21E-04
Heptachlor	6.5 g/day		6.17E-07	
	54 g/day		5.13E-06	
	176 g/day		1.67E-05	
Isophorone	6.5 g/day		8.19E-09	
	54 g/day		6.80E-08	
	176 g/day		2.22E-07	
Lindane	6.5 g/day	1.98E-07		2.10E-07
	54 g/day	1.64E-06		1.74E-06
	176 g/day	5.35E-06		5.69E-06
Mirex	6.5 g/day	3.86E-07		
	54 g/day	3.21E-06		
	176 g/day	1.05E-05		
N-Nitroso-di-n-propylamine	6.5 g/day	2.38E-04		
	54 g/day	1.98E-03		
	176 g/day	6.45E-03		
o,p'-DDD	6.5 g/day	6.18E-08		3.10E-07
	54 g/day	5.13E-07		2.57E-06
	176 g/day	1.67E-06		8.38E-06
o,p'-DDE	6.5 g/day	1.56E-07		3.42E-07
	54 g/day	1.29E-06		2.84E-06
	176 g/day	4.21E-06		9.26E-06
o,p'-DDT	6.5 g/day	7.92E-08	6.31E-08	
	54 g/day	6.58E-07	5.25E-07	
	176 g/day	2.14E-06	1.71E-06	
OCDD	6.5 g/day	1.68E-07	9.21E-08	1.04E-07
	54 g/day	1.40E-06	7.65E-07	8.60E-07
	176 g/day	4.56E-06	2.49E-06	2.80E-06
OCDF	6.5 g/day	9.86E-09	5.91E-09	1.64E-08
	54 g/day	8.19E-08	4.91E-08	1.36E-07
	176 g/day	2.67E-07	1.60E-07	4.43E-07
p,p'-DDD	6.5 g/day	2.13E-07	5.84E-08	4.56E-07
	54 g/day	1.77E-06	4.85E-07	3.79E-06
	176 g/day	5.75E-06	1.58E-06	1.24E-05
p,p'-DDE	6.5 g/day	1.43E-06	2.34E-07	1.87E-06
	54 g/day	1.19E-05	1.95E-06	1.56E-05
	176 g/day	3.88E-05	6.35E-06	5.07E-05
p,p'-DDT	6.5 g/day	1.26E-07	6.36E-08	3.21E-07
	54 g/day	1.05E-06	5.29E-07	2.66E-06
	176 g/day	3.41E-06	1.72E-06	8.69E-06
Plutonium 238	6.5 g/day			2.22E-07
	54 g/day			1.84E-06
	176 g/day			6.00E-06
Plutonium 239/240	6.5 g/day	7.87E-08		7.05E-08
	54 g/day	6.54E-07		5.86E-07
	176 g/day	2.13E-06		1.91E-06

TABLE D-13. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 30-YEAR EXPOSURE DURATION-1995 DATA (Page 1 of 2)

Chemical	Ingestion Rate	Carp	Chinook Salmon	Coho Salmon	Largescale Sucker	Steelhead	Sturgeon
1,2,3,4,6,7,8-HpCDD	6.5 g/day	2.23E-07	1.37E-08	1.13E-08	1.95E-08	5.44E-09	9.85E-09
	54 g/day	1.85E-06	1.14E-07	9.35E-08	1.62E-07	4.52E-08	8.18E-08
	176 g/day	6.04E-06	3.72E-07	3.05E-07	5.28E-07	1.47E-07	2.67E-07
1,2,3,4,6,7,8-HpCDF	6.5 g/day			8.20E-09	3.43E-08		1.68E-08
	54 g/day			6.82E-08	2.85E-07		1.39E-07
	176 g/day			2.22E-07	9.30E-07		4.54E-07
1,2,3,4,7,8,9-HpCDF	6.5 g/day		4.67E-09				
	54 g/day		3.88E-08				
	176 g/day		1.27E-07				
1,2,3,4,7,8-HxCDD	6.5 g/day	2.58E-07	4.96E-08		1.02E-07	3.63E-08	
	54 g/day	2.14E-06	4.12E-07		8.51E-07	3.01E-07	
	176 g/day	6.97E-06	1.34E-06		2.77E-06	9.82E-07	
1,2,3,4,7,8-HxCDF	6.5 g/day		3.53E-08	3.15E-08			
	54 g/day		2.93E-07	2.62E-07			
	176 g/day		9.56E-07	8.52E-07			
1,2,3,6,7,8-HxCDD	6.5 g/day	1.09E-06	8.01E-08	1.20E-07	1.14E-07		
	54 g/day	9.08E-06	6.66E-07	9.99E-07	9.48E-07		
	176 g/day	2.96E-05	2.17E-06	3.25E-06	3.09E-06		
1,2,3,6,7,8-HxCDF	6.5 g/day		2.86E-08	1.30E-07	3.04E-07		
	54 g/day		2.38E-07	1.08E-06	2.53E-06		
	176 g/day		7.75E-07	3.51E-06	8.23E-06		
1,2,3,7,8,9-HxCDD	6.5 g/day		6.30E-08	2.19E-08			
	54 g/day		5.23E-07	1.82E-07			
	176 g/day		1.70E-06	5.94E-07			
1,2,3,7,8,9-HxCDF	6.5 g/day		5.34E-08		3.57E-07		1.75E-07
	54 g/day		4.44E-07		2.97E-06		1.46E-06
	176 g/day		1.45E-06		9.67E-06		4.75E-06
1,2,3,7,8-PeCDD	6.5 g/day		4.63E-07				
	54 g/day		3.84E-06				
	176 g/day		1.25E-05				
1,2,3,7,8-PeCDF	6.5 g/day	1.32E-06	3.05E-08	1.16E-07	2.51E-07	4.01E-08	6.52E-08
	54 g/day	1.10E-05	2.54E-07	9.67E-07	2.08E-06	3.33E-07	5.42E-07
	176 g/day	3.58E-05	8.27E-07	3.15E-06	6.79E-06	1.08E-06	1.77E-06
2,3,4,6,7,8-HxCDF	6.5 g/day	3.88E-06		3.82E-08	1.88E-07		5.80E-08
	54 g/day	3.22E-05		3.17E-07	1.56E-06		4.81E-07
	176 g/day	1.05E-04		1.03E-06	5.08E-06		1.57E-06
2,3,4,7,8-PeCDF	6.5 g/day		3.96E-07	2.15E-07			2.03E-07
	54 g/day		3.29E-06	1.78E-06			1.68E-06
	176 g/day		1.07E-05	5.81E-06			5.49E-06
2,3,7,8-TCDD	6.5 g/day		1.35E-06	1.85E-06			
	54 g/day		1.12E-05	1.54E-05			
	176 g/day		3.64E-05	5.01E-05			
2,3,7,8-TCDF	6.5 g/day	2.50E-06	9.23E-07	3.87E-07	7.21E-07	1.35E-07	1.54E-06
	54 g/day	2.07E-05	7.67E-06	3.22E-06	5.99E-06	1.13E-06	1.28E-05
	176 g/day	6.76E-05	2.50E-05	1.05E-05	1.95E-05	3.67E-06	4.17E-05

TABLE D-13. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 30-YEAR EXPOSURE DURATION-1995 DATA (Page 2 of 2)							
Chemical	Ingestion Rate	Carp	Chinook Salmon	Coho Salmon	Largescale Sucker	Steelhead	Sturgeon
Aldrin	6.5 g/day						1.49E-08
	54 g/day						1.24E-07
	176 g/day						4.03E-07
Aroclor 1248	6.5 g/day	1.48E-05			1.89E-06		3.44E-06
	54 g/day	1.23E-04			1.57E-05		2.86E-05
	176 g/day	4.02E-04			5.11E-05		9.32E-05
Aroclor 1260	6.5 g/day	4.05E-05	2.93E-06	8.97E-07	9.86E-06	1.49E-06	1.36E-05
	54 g/day	3.37E-04	2.43E-05	7.45E-06	8.19E-05	1.24E-05	1.13E-04
	176 g/day	1.10E-03	7.93E-05	2.43E-05	2.67E-04	4.03E-05	3.69E-04
Arsenic	6.5 g/day	6.68E-08	8.57E-07	1.78E-07	8.35E-07	4.34E-07	2.61E-06
	54 g/day	5.55E-07	7.12E-06	1.48E-06	6.93E-06	3.61E-06	2.17E-05
	176 g/day	1.81E-06	2.32E-05	4.82E-06	2.26E-05	1.18E-05	7.07E-05
bis(2-Ethylhexyl)phthalate	6.5 g/day				1.28E-07		
	54 g/day				1.06E-06		
	176 g/day				3.47E-06		
gamma-BHC	6.5 g/day	1.14E-08					1.06E-08
	54 g/day	9.48E-08					8.83E-08
	176 g/day	3.09E-07					2.88E-07
Hexachlorobenzene	6.5 g/day	5.07E-08			3.05E-08	6.51E-08	2.30E-08
	54 g/day	4.21E-07			2.54E-07	5.41E-07	1.91E-07
	176 g/day	1.37E-06			8.27E-07	1.76E-06	6.23E-07
Hexachlorobutadiene	6.5 g/day	5.95E-11				4.02E-10	6.78E-10
	54 g/day	4.95E-10				3.34E-09	5.64E-09
	176 g/day	1.61E-09				1.09E-08	1.84E-08
Mirex	6.5 g/day						4.52E-09
	54 g/day						3.76E-08
	176 g/day						1.22E-07
OCDD	6.5 g/day	2.94E-08	7.06E-09		6.36E-09		3.41E-09
	54 g/day	2.44E-07	5.86E-08		5.28E-08		2.84E-08
	176 g/day	7.97E-07	1.91E-07		1.72E-07		9.24E-08
OCDF	6.5 g/day		1.46E-09	1.23E-09	5.93E-09		3.73E-09
	54 g/day		1.21E-08	1.02E-08	4.93E-08		3.10E-08
	176 g/day		3.95E-08	3.33E-08	1.61E-07		1.01E-07
p,p'-DDD	6.5 g/day	5.37E-08	3.40E-08	9.08E-09	8.03E-08	2.22E-08	5.71E-08
	54 g/day	4.46E-07	2.82E-07	7.55E-08	6.67E-07	1.85E-07	4.74E-07
	176 g/day	1.45E-06	9.20E-07	2.46E-07	2.17E-06	6.02E-07	1.54E-06
p,p'-DDE	6.5 g/day	1.70E-06	1.11E-07	3.94E-08	3.01E-07	2.93E-08	5.44E-07
	54 g/day	1.42E-05	9.19E-07	3.27E-07	2.50E-06	2.43E-07	4.52E-06
	176 g/day	4.62E-05	2.99E-06	1.07E-06	8.15E-06	7.93E-07	1.47E-05
p,p'-DDT	6.5 g/day		1.90E-08	1.06E-08	2.21E-08	4.12E-08	1.38E-08
	54 g/day		1.58E-07	8.77E-08	1.83E-07	3.42E-07	1.15E-07
	176 g/day		5.15E-07	2.86E-07	5.98E-07	1.11E-06	3.75E-07

TABLE D-14. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 70-YEAR EXPOSURE DURATION-1995 DATA (Page 1 of 2)

Chemical	Ingestion Rate	Carp	Chinook Salmon	Coho Salmon	Largescale Sucker	Steelhead	Sturgeon
1,2,3,4,6,7,8-HpCDD	6.5 g/day	5.43E-07	3.34E-08	2.74E-08	4.74E-08	1.32E-08	2.40E-08
	54 g/day	4.51E-06	2.78E-07	2.28E-07	3.93E-07	1.10E-07	1.99E-07
	176 g/day	1.47E-05	9.05E-07	7.42E-07	1.28E-06	3.58E-07	6.49E-07
1,2,3,4,6,7,8-HpCDF	6.5 g/day			2.00E-08	8.36E-08		4.08E-08
	54 g/day			1.66E-07	6.94E-07		3.39E-07
	176 g/day			5.41E-07	2.26E-06		1.10E-06
1,2,3,4,7,8,9-HpCDF	6.5 g/day		1.14E-08				
	54 g/day		9.45E-08				
	176 g/day		3.08E-07				
1,2,3,4,7,8-HxCDD	6.5 g/day	6.27E-07	1.21E-07		2.49E-07	8.82E-08	
	54 g/day	5.21E-06	1.00E-06		2.07E-06	7.33E-07	
	176 g/day	1.70E-05	3.27E-06		6.75E-06	2.39E-06	
1,2,3,4,7,8-HxCDF	6.5 g/day		8.59E-08	7.66E-08			
	54 g/day		7.14E-07	6.36E-07			
	176 g/day		2.33E-06	2.07E-06			
1,2,3,6,7,8-HxCDD	6.5 g/day	2.66E-06	1.95E-07	2.93E-07	2.78E-07		
	54 g/day	2.21E-05	1.62E-06	2.43E-06	2.31E-06		
	176 g/day	7.20E-05	5.28E-06	7.92E-06	7.52E-06		
1,2,3,6,7,8-HxCDF	6.5 g/day		6.96E-08	3.16E-07	7.40E-07		
	54 g/day		5.79E-07	2.62E-06	6.15E-06		
	176 g/day		1.89E-06	8.55E-06	2.00E-05		
1,2,3,7,8,9-HxCDD	6.5 g/day		1.53E-07	5.34E-08			
	54 g/day		1.27E-06	4.44E-07			
	176 g/day		4.15E-06	1.45E-06			
1,2,3,7,8,9-HxCDF	6.5 g/day		1.30E-07		8.69E-07		4.27E-07
	54 g/day		1.08E-06		7.22E-06		3.54E-06
	176 g/day		3.52E-06		2.35E-05		1.16E-05
1,2,3,7,8-PeCDD	6.5 g/day		1.13E-06				
	54 g/day		9.35E-06				
	176 g/day		3.05E-05				
1,2,3,7,8-PeCDF	6.5 g/day	3.22E-06	7.43E-08	2.83E-07	6.10E-07	9.75E-08	1.59E-07
	54 g/day	2.67E-05	6.17E-07	2.35E-06	5.07E-06	8.10E-07	1.32E-06
	176 g/day	8.71E-05	2.01E-06	7.67E-06	1.65E-05	2.64E-06	4.30E-06
2,3,4,6,7,8-HxCDF	6.5 g/day	9.43E-06		9.29E-08	4.57E-07		1.41E-07
	54 g/day	7.83E-05		7.71E-07	3.79E-06		1.17E-06
	176 g/day	2.55E-04		2.51E-06	1.24E-05		3.82E-06
2,3,4,7,8-PeCDF	6.5 g/day		9.63E-07	5.22E-07			4.93E-07
	54 g/day		8.00E-06	4.34E-06			4.10E-06
	176 g/day		2.61E-05	1.41E-05			1.34E-05
2,3,7,8-TCDD	6.5 g/day		3.27E-06	4.50E-06			
	54 g/day		2.72E-05	3.74E-05			
	176 g/day		8.86E-05	1.22E-04			
2,3,7,8-TCDF	6.5 g/day	6.07E-06	2.25E-06	9.43E-07	1.76E-06	3.30E-07	3.74E-06
	54 g/day	5.05E-05	1.87E-05	7.83E-06	1.46E-05	2.74E-06	3.11E-05
	176 g/day	1.64E-04	6.08E-05	2.55E-05	4.75E-05	8.93E-06	1.01E-04

TABLE D-14. CARCINOGENIC RISK VALUES FOR DETECTED CHEMICALS FOR A 70-YEAR EXPOSURE DURATION-1995 DATA (Page 2 of 2)							
Chemical	Data	Carp	Chinook Salmon	Coho Salmon	Largescale Sucker	Steelhead	Sturgeon
Aldrin	6.5 g/day						3.62E-08
	54 g/day						3.01E-07
	176 g/day						9.80E-07
Aroclor 1248	6.5 g/day	3.61E-05			4.59E-06		8.38E-06
	54 g/day	3.00E-04			3.82E-05		6.96E-05
	176 g/day	9.78E-04			1.24E-04		2.27E-04
Aroclor 1260	6.5 g/day	9.87E-05	7.13E-06	2.18E-06	2.40E-05	3.62E-06	3.31E-05
	54 g/day	8.20E-04	5.92E-05	1.81E-05	1.99E-04	3.01E-05	2.75E-04
	176 g/day	2.67E-03	1.93E-04	5.91E-05	6.49E-04	9.80E-05	8.97E-04
Arsenic	6.5 g/day	1.63E-07	2.09E-06	4.33E-07	2.03E-06	1.06E-06	6.35E-06
	54 g/day	1.35E-06	1.73E-05	3.60E-06	1.69E-05	8.78E-06	5.28E-05
	176 g/day	4.40E-06	5.65E-05	1.17E-05	5.50E-05	2.86E-05	1.72E-04
bis(2-Ethylhexyl)phthalate	6.5 g/day				3.11E-07		
	54 g/day				2.59E-06		
	176 g/day				8.43E-06		
gamma-BHC	6.5 g/day	2.78E-08					2.59E-08
	54 g/day	2.31E-07					2.15E-07
	176 g/day	7.52E-07					7.00E-07
Hexachlorobenzene	6.5 g/day	1.23E-07			7.43E-08	1.58E-07	5.60E-08
	54 g/day	1.02E-06			6.17E-07	1.32E-06	4.65E-07
	176 g/day	3.34E-06			2.01E-06	4.29E-06	1.52E-06
Hexachlorobutadiene	6.5 g/day	1.45E-10				9.78E-10	1.65E-09
	54 g/day	1.20E-09				8.12E-09	1.37E-08
	176 g/day	3.92E-09				2.65E-08	4.47E-08
Mirex	6.5 g/day						1.10E-08
	54 g/day						9.14E-08
	176 g/day						2.98E-07
OCDD	6.5 g/day	7.16E-08	1.72E-08		1.55E-08		8.30E-09
	54 g/day	5.95E-07	1.43E-07		1.29E-07		6.90E-08
	176 g/day	1.94E-06	4.65E-07		4.19E-07		2.25E-07
OCDF	6.5 g/day		3.55E-09	2.99E-09	1.44E-08		9.07E-09
	54 g/day		2.95E-08	2.49E-08	1.20E-07		7.54E-08
	176 g/day		9.62E-08	8.11E-08	3.91E-07		2.46E-07
p,p'-DDD	6.5 g/day	1.31E-07	8.27E-08	2.21E-08	1.95E-07	5.41E-08	1.39E-07
	54 g/day	1.08E-06	6.87E-07	1.84E-07	1.62E-06	4.49E-07	1.15E-06
	176 g/day	3.54E-06	2.24E-06	5.98E-07	5.29E-06	1.46E-06	3.76E-06
p,p'-DDE	6.5 g/day	4.15E-06	2.69E-07	9.58E-08	7.32E-07	7.12E-08	1.32E-06
	54 g/day	3.45E-05	2.24E-06	7.96E-07	6.08E-06	5.92E-07	1.10E-05
	176 g/day	1.12E-04	7.29E-06	2.59E-06	1.98E-05	1.93E-06	3.58E-05
p,p'-DDT	6.5 g/day		4.63E-08	2.57E-08	5.37E-08	1.00E-07	3.37E-08
	54 g/day		3.85E-07	2.13E-07	4.46E-07	8.32E-07	2.80E-07
	176 g/day		1.25E-06	6.95E-07	1.45E-06	2.71E-06	9.12E-07

TABLE D-15. NONCARCINOGENIC HAZARD QUOTIENTS FOR DETECTED CHEMICALS-1991 DATA (Page 1 of 3)						
Chemical	Ingestion Rate	Common Carp	Crayfish	Largescale Sucker	Peamouth	White Sturgeon
1,2,4-Trichlorobenzene	6.5 g/day	4.02E-03				
	54 g/day	3.34E-02				
	176 g/day	1.09E-01				
2,4-Dinitrotoluene	6.5 g/day	7.22E-03				
	54 g/day	6.00E-02				
	176 g/day	1.96E-01				
2-Chlorophenol	6.5 g/day	9.49E-03				
	54 g/day	7.89E-02				
	176 g/day	2.57E-01				
4-Nitrophenol	6.5 g/day	1.33E-03				
	54 g/day	1.11E-02				
	176 g/day	3.60E-02				
Acenaphthene	6.5 g/day	7.22E-04				
	54 g/day	6.00E-03				
	176 g/day	1.96E-02				
Aldrin	6.5 g/day	7.77E-03		6.10E-03	4.77E-02	
	54 g/day	6.46E-02		5.07E-02	3.97E-01	
	176 g/day	2.10E-01		1.65E-01	1.29E+00	
Aroclor 1242	6.5 g/day				5.00E-02	
	54 g/day				4.15E-01	
	176 g/day				1.35E+00	
Aroclor 1254	6.5 g/day	5.11E-01		5.90E-01		3.08E-01
	54 g/day	4.24E+00		4.90E+00		2.56E+00
	176 g/day	1.38E+01		1.60E+01		8.34E+00
Aroclor 1260	6.5 g/day	6.57E-02		4.09E-02	2.52E-01	
	54 g/day	5.46E-01		3.40E-01	2.09E+00	
	176 g/day	1.78E+00		1.11E+00	6.81E+00	
Arsenic	6.5 g/day					1.13E-02
	54 g/day					9.39E-02
	176 g/day					3.06E-01
Barium	6.5 g/day	3.10E-03	1.92E-03	3.63E-03	3.52E-03	
	54 g/day	2.58E-02	1.59E-02	3.01E-02	2.92E-02	
	176 g/day	8.40E-02	5.19E-02	9.82E-02	9.52E-02	
Bis(2-ethylhexyl)phthalate	6.5 g/day	3.32E-03	1.66E-03	1.63E-03	1.48E-03	1.67E-03
	54 g/day	2.76E-02	1.38E-02	1.35E-02	1.23E-02	1.39E-02
	176 g/day	8.98E-02	4.50E-02	4.41E-02	4.00E-02	4.53E-02
Cadmium	6.5 g/day	1.30E-02	6.76E-03	3.56E-03	3.53E-03	1.31E-03
	54 g/day	1.08E-01	5.61E-02	2.96E-02	2.93E-02	1.08E-02
	176 g/day	3.52E-01	1.83E-01	9.64E-02	9.55E-02	3.54E-02

TABLE D-15. NONCARCINOGENIC HAZARD QUOTIENTS FOR DETECTED CHEMICALS-1991 DATA (Page 2 of 3)						
Chemical	Ingestion Rate	Common Carp	Crayfish	Largescale Sucker	Peamouth	White Sturgeon
Dacthal	6.5 g/day				9.61E-05	
	54 g/day				7.98E-04	
	176 g/day				2.60E-03	
Di-n-butylphthalate	6.5 g/day	6.60E-05	4.95E-05			8.00E-05
	54 g/day	5.49E-04	4.11E-04			6.65E-04
	176 g/day	1.79E-03	1.34E-03			2.17E-03
Dieldrin	6.5 g/day	4.79E-03	3.31E-03	3.22E-03	2.63E-02	5.04E-03
	54 g/day	3.98E-02	2.75E-02	2.68E-02	2.18E-01	4.18E-02
	176 g/day	1.30E-01	8.97E-02	8.73E-02	7.12E-01	1.36E-01
Endosulfan I	6.5 g/day			2.49E-05	4.21E-04	2.68E-05
	54 g/day			2.06E-04	3.50E-03	2.22E-04
	176 g/day			6.73E-04	1.14E-02	7.25E-04
Endosulfan II	6.5 g/day		2.89E-05			
	54 g/day		2.40E-04			
	176 g/day		7.82E-04			
Endrin	6.5 g/day	7.02E-04		8.87E-04		8.07E-04
	54 g/day	5.83E-03		7.37E-03		6.70E-03
	176 g/day	1.90E-02		2.40E-02		2.18E-02
Heptachlor	6.5 g/day		3.10E-04			
	54 g/day		2.57E-03			
	176 g/day		8.38E-03			
Isophorone	6.5 g/day		6.04E-05			
	54 g/day		5.01E-04			
	176 g/day		1.63E-03			
Lindane	6.5 g/day	5.33E-04		6.81E-04	3.93E-03	
	54 g/day	4.43E-03		5.66E-03	3.27E-02	
	176 g/day	1.44E-02		1.84E-02	1.06E-01	
Malathion	6.5 g/day				1.13E-04	
	54 g/day				9.37E-04	
	176 g/day				3.05E-03	
Mercury	6.5 g/day	2.03E-01	3.13E-02	7.50E-02	1.13E-01	1.58E-01
	54 g/day	1.69E+00	2.60E-01	6.23E-01	9.35E-01	1.31E+00
	176 g/day	5.50E+00	8.48E-01	2.03E+00	3.05E+00	4.28E+00
Methoxychlor	6.5 g/day		3.21E-04	3.33E-04		5.35E-04
	54 g/day		2.67E-03	2.77E-03		4.45E-03
	176 g/day		8.69E-03	9.02E-03		1.45E-02
Methyl parathion	6.5 g/day		1.91E-03			1.81E-03
	54 g/day		1.59E-02			1.51E-02
	176 g/day		5.17E-02			4.91E-02
Mirex	6.5 g/day	1.07E-03				
	54 g/day	8.91E-03				
	176 g/day	2.91E-02				

TABLE D-15. NONCARCINOGENIC HAZARD QUOTIENTS FOR DETECTED CHEMICALS-1991 DATA (Page 3 of 3)						
Chemical	Ingestion Rate	Common Carp	Crayfish	Largescale Sucker	Peamouth	White Sturgeon
Naphthalene	6.5 g/day	1.60E-04				
	54 g/day	1.33E-03				
	176 g/day	4.33E-03				
Nickel	6.5 g/day	1.31E-02	1.92E-03	2.51E-03	3.96E-03	1.99E-03
	54 g/day	1.09E-01	1.59E-02	2.08E-02	3.29E-02	1.65E-02
	176 g/day	3.55E-01	5.20E-02	6.79E-02	1.07E-01	5.39E-02
o,p'-DDD	6.5 g/day	5.22E-04		1.77E-03	2.45E-03	4.10E-04
	54 g/day	4.34E-03		1.47E-02	2.04E-02	3.40E-03
	176 g/day	1.41E-02		4.79E-02	6.64E-02	1.11E-02
o,p'-DDE	6.5 g/day	1.01E-03		2.02E-03	2.35E-03	4.15E-04
	54 g/day	8.40E-03		1.68E-02	1.95E-02	3.45E-03
	176 g/day	2.74E-02		5.47E-02	6.36E-02	1.12E-02
o,p'-DDT	6.5 g/day	4.62E-04	2.94E-04			5.90E-04
	54 g/day	3.84E-03	2.44E-03			4.90E-03
	176 g/day	1.25E-02	7.96E-03			1.60E-02
p,p'-DDD	6.5 g/day	1.32E-03	5.06E-04	3.04E-03	4.34E-03	6.50E-04
	54 g/day	1.10E-02	4.20E-03	2.53E-02	3.60E-02	5.40E-03
	176 g/day	3.57E-02	1.37E-02	8.23E-02	1.17E-01	1.76E-02
p,p'-DDE	6.5 g/day	6.94E-03	1.49E-03		2.70E-02	3.69E-03
	54 g/day	5.77E-02	1.24E-02		2.25E-01	3.06E-02
	176 g/day	1.88E-01	4.04E-02		7.32E-01	9.98E-02
p,p'-DDT	6.5 g/day	7.49E-04	2.99E-04	1.22E-03		8.83E-04
	54 g/day	6.22E-03	2.49E-03	1.01E-02		7.33E-03
	176 g/day	2.03E-02	8.10E-03	3.30E-02		2.39E-02
Parathion	6.5 g/day			4.23E-05	1.71E-04	
	54 g/day			3.52E-04	1.42E-03	
	176 g/day			1.15E-03	4.63E-03	
Phenol	6.5 g/day	9.29E-05				
	54 g/day	7.71E-04				
	176 g/day	2.51E-03				
Pyrene	6.5 g/day	1.93E-03				
	54 g/day	1.60E-02				
	176 g/day	5.21E-02				
Silver	6.5 g/day		1.34E-02			2.15E-03
	54 g/day		1.12E-01			1.79E-02
	176 g/day		3.63E-01			5.83E-02
Zinc	6.5 g/day	3.18E-02	8.28E-03	9.24E-03	9.05E-03	1.50E-03
	54 g/day	2.64E-01	6.88E-02	7.67E-02	7.52E-02	1.24E-02
	176 g/day	8.61E-01	2.24E-01	2.50E-01	2.45E-01	4.05E-02

TABLE D-16. NONCARCINOGENIC HAZARD QUOTIENTS FOR DETECTED CHEMICALS-1993 DATA (Page 1 of 2)				
Chemicals	Ingestion Rate	Common Carp	Crayfish	Largescale Sucker
4-Methylphenol	6.5 g/day		9.05E-04	
	54 g/day		7.52E-03	
	176 g/day		2.45E-02	
Acenaphthene	6.5 g/day		7.70E-06	
	54 g/day		6.40E-05	
	176 g/day		2.09E-04	
Antimony	6.5 g/day		2.23E-03	
	54 g/day		1.85E-02	
	176 g/day		6.03E-02	
Aroclor 1254	6.5 g/day	2.34E-01		1.07E+00
	54 g/day	1.95E+00		8.88E+00
	176 g/day	6.35E+00		2.89E+01
Aroclor 1260	6.5 g/day	3.71E-02	3.36E-02	5.21E-02
	54 g/day	3.09E-01	2.79E-01	4.33E-01
	176 g/day	1.01E+00	9.10E-01	1.41E+00
Arsenic	6.5 g/day		6.00E-04	1.14E-03
	54 g/day		4.99E-03	9.45E-03
	176 g/day		1.63E-02	3.08E-02
Barium	6.5 g/day	1.46E-03	3.98E-02	2.24E-03
	54 g/day	1.21E-02	3.30E-01	1.86E-02
	176 g/day	3.95E-02	1.08E+00	6.07E-02
Benzyl Alcohol	6.5 g/day		1.55E-05	
	54 g/day		1.29E-04	
	176 g/day		4.21E-04	
Bis(2-ethylhexyl)phthalate	6.5 g/day			8.79E-04
	54 g/day			7.30E-03
	176 g/day			2.38E-02
Cadmium	6.5 g/day	3.34E-03	3.12E-03	3.38E-03
	54 g/day	2.78E-02	2.59E-02	2.81E-02
	176 g/day	9.05E-02	8.45E-02	9.15E-02
Chromium	6.5 g/day	4.18E-06	6.76E-06	1.55E-05
	54 g/day	3.47E-05	5.62E-05	1.29E-04
	176 g/day	1.13E-04	1.83E-04	4.21E-04
Di-n-butylphthalate	6.5 g/day		5.44E-04	1.36E-04
	54 g/day		4.52E-03	1.13E-03
	176 g/day		1.47E-02	3.69E-03
Fluorene	6.5 g/day		1.12E-05	
	54 g/day		9.34E-05	
	176 g/day		3.04E-04	
Mercury	6.5 g/day	6.76E-02	4.02E-02	1.56E-01
	54 g/day	5.61E-01	3.34E-01	1.30E+00
	176 g/day	1.83E+00	1.09E+00	4.22E+00
Naphthalene	6.5 g/day		2.68E-05	1.47E-05
	54 g/day		2.23E-04	1.22E-04
	176 g/day		7.26E-04	3.98E-04
Nickel	6.5 g/day	1.93E-03	2.58E-03	1.33E-03
	54 g/day	1.60E-02	2.14E-02	1.11E-02
	176 g/day	5.22E-02	6.99E-02	3.61E-02
p,p'-DDD	6.5 g/day	3.81E-03		4.61E-03
	54 g/day	3.16E-02		3.83E-02
	176 g/day	1.03E-01		1.25E-01

TABLE D-16. NONCARCINOGENIC HAZARD QUOTIENTS FOR DETECTED CHEMICALS-1993 DATA (Page 2 of 2)				
Chemicals	Ingestion Rate	Common Carp	Crayfish	Largescale Sucker
p,p'-DDE	6.5 g/day	1.51E-02	1.24E-03	1.80E-02
	54 g/day	1.26E-01	1.03E-02	1.50E-01
	176 g/day	4.10E-01	3.36E-02	4.88E-01
p,p'-DDT	6.5 g/day	7.06E-04		2.60E-03
	54 g/day	5.86E-03		2.16E-02
	176 g/day	1.91E-02		7.03E-02
Phenol	6.5 g/day		2.24E-05	
	54 g/day		1.86E-04	
	176 g/day		6.07E-04	
Selenium	6.5 g/day	1.03E-03	4.40E-04	7.40E-04
	54 g/day	8.52E-03	3.65E-03	6.15E-03
	176 g/day	2.78E-02	1.19E-02	2.00E-02
Silver	6.5 g/day	8.36E-05	9.08E-04	4.53E-05
	54 g/day	6.94E-04	7.54E-03	3.76E-04
	176 g/day	2.26E-03	2.46E-02	1.23E-03
Zinc	6.5 g/day	1.88E-02	1.15E-02	5.66E-03
	54 g/day	1.56E-01	9.54E-02	4.70E-02
	176 g/day	5.10E-01	3.11E-01	1.53E-01

TABLE D-17. NONCARCINOGENIC HAZARD QUOTIENTS FOR DETECTED CHEMICALS-1991/93 DATA (Page 1 of 3)				
Chemical	Ingestion Rate	Carp	Crayfish	LS Sucker
1,2,4-Trichlorobenzene	6.5 g/day	3.54E-03		
	54 g/day	2.94E-02		
	176 g/day	9.60E-02		
2,4-Dinitrotoluene	6.5 g/day	1.22E-02		
	54 g/day	1.01E-01		
	176 g/day	3.30E-01		
2-Chlorophenol	6.5 g/day	8.27E-03		
	54 g/day	6.87E-02		
	176 g/day	2.24E-01		
4-Methylphenol	6.5 g/day		1.42E-03	
	54 g/day		1.18E-02	
	176 g/day		3.86E-02	
4-Nitrophenol	6.5 g/day	1.29E-03		
	54 g/day	1.07E-02		
	176 g/day	3.50E-02		
Acenaphthene	6.5 g/day	5.92E-04	4.57E-05	
	54 g/day	4.92E-03	3.80E-04	
	176 g/day	1.60E-02	1.24E-03	
Aldrin	6.5 g/day	7.06E-03		6.68E-03
	54 g/day	5.87E-02		5.55E-02
	176 g/day	1.91E-01		1.81E-01
Antimony	6.5 g/day		1.39E-01	
	54 g/day		1.15E+00	
	176 g/day		3.76E+00	
Aroclor 1254	6.5 g/day	4.60E-01		8.15E-01
	54 g/day	3.83E+00		6.77E+00
	176 g/day	1.25E+01		2.21E+01
Aroclor 1260	6.5 g/day	6.05E-02	3.34E-02	4.62E-02
	54 g/day	5.03E-01	2.77E-01	3.84E-01
	176 g/day	1.64E+00	9.03E-01	1.25E+00
Arsenic	6.5 g/day		3.51E-03	2.50E-03
	54 g/day		2.92E-02	2.08E-02
	176 g/day		9.50E-02	6.78E-02
Barium	6.5 g/day	2.77E-03	1.91E-02	2.97E-03
	54 g/day	2.30E-02	1.59E-01	2.47E-02
	176 g/day	7.51E-02	5.18E-01	8.06E-02
Benzyl Alcohol	6.5 g/day		1.55E-05	
	54 g/day		1.29E-04	
	176 g/day		4.21E-04	
Bis(2-ethylhexyl)phthalate	6.5 g/day	2.84E-03	1.47E-03	1.28E-03
	54 g/day	2.36E-02	1.22E-02	1.06E-02
	176 g/day	7.69E-02	3.98E-02	3.45E-02
Cadmium	6.5 g/day	1.11E-02	5.10E-03	3.47E-03
	54 g/day	9.20E-02	4.24E-02	2.89E-02
	176 g/day	3.00E-01	1.38E-01	9.41E-02
Chromium	6.5 g/day	4.18E-06	6.76E-06	1.55E-05
	54 g/day	3.47E-05	5.62E-05	1.29E-04
	176 g/day	1.13E-04	1.83E-04	4.21E-04
Di-n-butylphthalate	6.5 g/day	7.92E-05	2.74E-04	8.87E-05
	54 g/day	6.58E-04	2.28E-03	7.36E-04
	176 g/day	2.14E-03	7.42E-03	2.40E-03

TABLE D-17. NONCARCINOGENIC HAZARD QUOTIENTS FOR DETECTED CHEMICALS-1991/93 DATA (Page 2 of 3)				
Chemical	Ingestion Rate	Carp	Crayfish	LS Sucker
Dieldrin	6.5 g/day	4.76E-03	3.92E-03	5.60E-03
	54 g/day	3.96E-02	3.25E-02	4.65E-02
	176 g/day	1.29E-01	1.06E-01	1.52E-01
Endosulfan I	6.5 g/day			2.22E-05
	54 g/day			1.84E-04
	176 g/day			6.01E-04
Endosulfan II	6.5 g/day		3.33E-05	
	54 g/day		2.77E-04	
	176 g/day		9.03E-04	
Endrin	6.5 g/day	7.15E-04		8.32E-04
	54 g/day	5.94E-03		6.91E-03
	176 g/day	1.94E-02		2.25E-02
Fluorene	6.5 g/day		6.84E-05	
	54 g/day		5.68E-04	
	176 g/day		1.85E-03	
Heptachlor	6.5 g/day		2.74E-04	
	54 g/day		2.28E-03	
	176 g/day		7.43E-03	
Isophorone	6.5 g/day		4.31E-05	
	54 g/day		3.58E-04	
	176 g/day		1.17E-03	
Lindane	6.5 g/day	5.06E-04		5.38E-04
	54 g/day	4.21E-03		4.47E-03
	176 g/day	1.37E-02		1.46E-02
Mercury	6.5 g/day	1.76E-01	3.54E-02	1.13E-01
	54 g/day	1.46E+00	2.94E-01	9.39E-01
	176 g/day	4.77E+00	9.58E-01	3.06E+00
Methoxychlor	6.5 g/day		2.81E-04	2.84E-04
	54 g/day		2.33E-03	2.36E-03
	176 g/day		7.60E-03	7.70E-03
Methyl parathion	6.5 g/day		6.27E-03	
	54 g/day		5.21E-02	
	176 g/day		1.70E-01	
Mirex	6.5 g/day	1.07E-03		
	54 g/day	8.91E-03		
	176 g/day	2.91E-02		
Naphthalene	6.5 g/day	1.33E-04	7.55E-05	6.84E-05
	54 g/day	1.10E-03	6.27E-04	5.68E-04
	176 g/day	3.60E-03	2.04E-03	1.85E-03
Nickel	6.5 g/day	1.09E-02	2.22E-03	1.96E-03
	54 g/day	9.04E-02	1.84E-02	1.62E-02
	176 g/day	2.95E-01	6.01E-02	5.29E-02
o,p'-DDD	6.5 g/day	5.15E-04		2.58E-03
	54 g/day	4.28E-03		2.14E-02
	176 g/day	1.39E-02		6.99E-02
o,p'-DDE	6.5 g/day	9.15E-04		2.01E-03
	54 g/day	7.60E-03		1.67E-02
	176 g/day	2.48E-02		5.45E-02
o,p'-DDT	6.5 g/day	4.66E-04	3.71E-04	
	54 g/day	3.87E-03	3.09E-03	
	176 g/day	1.26E-02	1.01E-02	
p,p'-DDD	6.5 g/day	1.77E-03	4.87E-04	3.80E-03
	54 g/day	1.47E-02	4.04E-03	3.16E-02
	176 g/day	4.80E-02	1.32E-02	1.03E-01

TABLE D-17. NONCARCINOGENIC HAZARD QUOTIENTS FOR DETECTED CHEMICALS-1991/93 DATA (Page 3 of 3)				
Chemical	Ingestion Rate	Carp	Crayfish	LS Sucker
p,p'-DDE	6.5 g/day	8.43E-03	1.38E-03	1.10E-02
	54 g/day	7.01E-02	1.15E-02	9.15E-02
	176 g/day	2.28E-01	3.73E-02	2.98E-01
p,p'-DDT	6.5 g/day	7.41E-04	3.74E-04	1.89E-03
	54 g/day	6.16E-03	3.11E-03	1.57E-02
	176 g/day	2.01E-02	1.01E-02	5.11E-02
Parathion	6.5 g/day			4.23E-05
	54 g/day			3.52E-04
	176 g/day			1.15E-03
Phenol	6.5 g/day	8.02E-05	1.44E-05	
	54 g/day	6.66E-04	1.20E-04	
	176 g/day	2.17E-03	3.90E-04	
Selenium	6.5 g/day	4.09E-03	2.14E-03	2.45E-03
	54 g/day	3.40E-02	1.78E-02	2.03E-02
	176 g/day	1.11E-01	5.80E-02	6.63E-02
Silver	6.5 g/day	1.76E-03	7.73E-03	9.69E-04
	54 g/day	1.46E-02	6.43E-02	8.05E-03
	176 g/day	4.77E-02	2.09E-01	2.62E-02
Zinc	6.5 g/day	2.92E-02	9.74E-03	7.55E-03
	54 g/day	2.43E-01	8.09E-02	6.28E-02
	176 g/day	7.91E-01	2.64E-01	2.05E-01

TABLE D-18. NON-CARCINOGENIC HAZARD QUOTIENTS FOR DETECTED CHEMICALS-1995 DATA (Page 1 of 2)							
Chemical	Ingestion Rate	Carp	Chinook Salmon	Coho Salmon	Largescale Sucker	Steelhead	Sturgeon
4-Methylphenol	6.5 g/day				1.36E-04	1.98E-04	1.56E-04
	54 g/day				1.13E-03	1.65E-03	1.30E-03
	176 g/day				3.69E-03	5.36E-03	4.23E-03
4-Nitrophenol	6.5 g/day	1.59E-04			4.43E-05	3.79E-05	6.90E-05
	54 g/day	1.32E-03			3.68E-04	3.15E-04	5.73E-04
	176 g/day	4.30E-03			1.20E-03	1.03E-03	1.87E-03
Aldrin	6.5 g/day						7.09E-05
	54 g/day						5.89E-04
	176 g/day						1.92E-03
alpha-BHC	6.5 g/day	3.10E-09				1.28E-09	4.54E-10
	54 g/day	2.57E-08				1.06E-08	3.78E-09
	176 g/day	8.38E-08				3.46E-08	1.23E-08
Antimony	6.5 g/day				2.58E-04		
	54 g/day				2.14E-03		
	176 g/day				6.98E-03		
Aroclor 1248	6.5 g/day	6.70E-02			8.52E-03		1.55E-02
	54 g/day	5.57E-01			7.08E-02		1.29E-01
	176 g/day	[redacted]			2.31E-01		4.21E-01
Aroclor 1260	6.5 g/day	1.83E-01	1.32E-02	4.05E-03	4.45E-02	6.72E-03	6.15E-02
	54 g/day	[redacted]	1.10E-01	3.36E-02	3.70E-01	5.58E-02	5.11E-01
	176 g/day	[redacted]	3.58E-01	1.10E-01	[illegible]	1.82E-01	[illegible]
Arsenic	6.5 g/day	3.10E-04	3.97E-03	8.25E-04	3.87E-03	2.01E-03	1.21E-02
	54 g/day	2.57E-03	3.30E-02	6.86E-03	3.21E-02	1.67E-02	1.01E-01
	176 g/day	8.38E-03	1.08E-01	2.23E-02	1.05E-01	5.45E-02	3.28E-01
Barium	6.5 g/day	1.35E-04		1.44E-04	1.47E-04	1.55E-05	1.56E-04
	54 g/day	1.12E-03		1.20E-03	1.22E-03	1.29E-04	1.29E-03
	176 g/day	3.66E-03		3.90E-03	3.98E-03	4.19E-04	4.21E-03
bis(2-Ethylhexyl)phthalate	6.5 g/day				1.11E-03		
	54 g/day				9.24E-03		
	176 g/day				3.01E-02		
Cadmium	6.5 g/day			2.79E-04	2.63E-04		
	54 g/day			2.31E-03	2.19E-03		
	176 g/day			7.54E-03	7.12E-03		
Copper	6.5 g/day	3.11E-03	2.16E-03	2.03E-03	1.33E-03	1.87E-03	5.63E-04
	54 g/day	2.59E-02	1.79E-02	1.69E-02	1.10E-02	1.56E-02	4.68E-03
	176 g/day	8.43E-02	5.84E-02	5.50E-02	3.59E-02	5.07E-02	1.52E-02
Endrin	6.5 g/day			8.36E-05		6.81E-05	
	54 g/day			6.94E-04		5.66E-04	
	176 g/day			2.26E-03		1.84E-03	

TABLE D-18. NON-CARCINOGENIC HAZARD QUOTIENTS FOR DETECTED CHEMICALS-1995 DATA (Page 2 of 2)							
Chemical	Ingestion Rate	Carp	Chinook Salmon	Coho Salmon	Largescale Sucker	Steelhead	Sturgeon
gamma-BHC	6.5 g/day	7.12E-05					6.63E-05
	54 g/day	5.91E-04					5.51E-04
	176 g/day	1.93E-03					1.79E-03
Hexachlorobenzene	6.5 g/day	9.63E-05			5.80E-05	1.24E-04	4.37E-05
	54 g/day	8.00E-04			4.82E-04	1.03E-03	3.63E-04
	176 g/day	2.61E-03			1.57E-03	3.35E-03	1.18E-03
Hexachlorobutadiene	6.5 g/day	9.29E-06				6.27E-05	1.06E-04
	54 g/day	7.71E-05				5.21E-04	8.79E-04
	176 g/day	2.51E-04				1.70E-03	2.87E-03
Mercury	6.5 g/day	1.35E-01	9.25E-02	4.09E-02	1.42E-01	5.91E-02	5.87E-02
	54 g/day	[redacted]	7.69E-01	3.39E-01	[redacted]	4.91E-01	4.88E-01
	176 g/day	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Mirex	6.5 g/day						3.06E-05
	54 g/day						2.54E-04
	176 g/day						8.28E-04
Nickel	6.5 g/day	1.39E-04	8.51E-05	1.49E-04	1.23E-04	1.07E-04	3.44E-04
	54 g/day	1.16E-03	7.07E-04	1.23E-03	1.02E-03	8.87E-04	2.85E-03
	176 g/day	3.77E-03	2.30E-03	4.02E-03	3.34E-03	2.89E-03	9.30E-03
p,p'-DDD	6.5 g/day	1.09E-03	6.89E-04	1.84E-04	1.63E-03	4.51E-04	1.16E-03
	54 g/day	9.04E-03	5.72E-03	1.53E-03	1.35E-02	3.74E-03	9.61E-03
	176 g/day	2.95E-02	1.87E-02	4.99E-03	4.41E-02	1.22E-02	3.13E-02
p,p'-DDE	6.5 g/day	2.44E-02	1.58E-03	5.63E-04	4.31E-03	4.19E-04	7.78E-03
	54 g/day	2.03E-01	1.32E-02	4.68E-03	3.58E-02	3.48E-03	6.47E-02
	176 g/day	6.61E-01	4.29E-02	1.53E-02	1.17E-01	1.13E-02	2.11E-01
p,p'-DDT	6.5 g/day		2.72E-04	1.51E-04	3.16E-04	5.89E-04	1.98E-04
	54 g/day		2.26E-03	1.25E-03	2.62E-03	4.90E-03	1.65E-03
	176 g/day		7.38E-03	4.09E-03	8.55E-03	1.60E-02	5.36E-03
Phenol	6.5 g/day		1.22E-05	5.52E-06	1.87E-06		
	54 g/day		1.02E-04	4.59E-05	1.55E-05		
	176 g/day		3.31E-04	1.49E-04	5.05E-05		
Selenium	6.5 g/day	9.84E-03	5.20E-03	3.13E-03	3.14E-03	7.99E-03	7.41E-03
	54 g/day	8.18E-02	4.32E-02	2.60E-02	2.61E-02	6.63E-02	6.16E-02
	176 g/day	2.67E-01	1.41E-01	8.46E-02	8.49E-02	2.16E-01	2.01E-01
Silver	6.5 g/day		2.48E-05	1.24E-05			
	54 g/day		2.06E-04	1.03E-04			
	176 g/day		6.70E-04	3.35E-04			

APPENDIX E

APPENDIX E

1991 TISSUE BIOACCUMULATION DATA

E1. CARP BIOACCUMULATION DATA

E2. CRAYFISH BIOACCUMULATION DATA

E3. PEAMOUTH BIOACCUMULATION DATA

E4. WHITE STURGEON BIOACCUMULATION DATA

E5. LARGESCALE SUCKER BIOACCUMULATION DATA

APPENDIX E1. CARP TISSUE BIOACCUMULATION DATA

(Note: All concentrations are presented on a wet-weight basis.)

APPENDIX E2. CRAYFISH TISSUE BIOACCUMULATION DATA

(Note: All concentrations are presented on a wet-weight basis.)

APPENDIX E3. PEAMOUTH TISSUE BIOACCUMULATION DATA

(Note: All concentrations are presented on a wet-weight basis.)

TABLE E1-1. METALS IN CARP WHOLE-BODY COMPOSITES

River Segment	Station	Antimony Measured* Conc. (mg/kg)	Antimony Qualifier Code	Arsenic Measured* Conc. (mg/kg)	Arsenic Qualifier Code	Barium Measured* Conc. (mg/kg)	Barium Qualifier Code	Cadmium Measured* Conc. (mg/kg)	Cadmium Qualifier Code	Copper Measured* Conc. (mg/kg)	Copper Qualifier Code	Lead Measured* Conc. (mg/kg)	Lead Qualifier Code
3A	D24	0.39	U/E	0.52	U	2.6	E	0.03		1.48	E	0.10	E
3B	D26	0.48	U/E	0.64	U	1.6	E	0.35		1.82	E	0.13	E
3B	D28	0.41	U/E	0.55	U	3.3	E	0.11		1.47	E	0.22	E
3B	D29	0.37	U/E	0.49	U	2.9	E	0.10		1.20	E	0.07	E
4A	D31	0.30	U/E	0.40	U	1.4	E	0.04		1.46	E	0.02	E
4A	D35	0.38	U/E	0.51	U	2.2	E	0.08		1.37	E	0.18	E
4B	D38	0.36	U/E	0.49	U	3.4	E	0.29		1.68	E	0.22	E
4B	D40	0.44	U/E	0.58	U	1.3	E	0.12		1.51	E	0.23	E

U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
* Metals data normalized to wet weight.

River Segment	Station	Mercury Measured* Conc. (mg/kg)	Mercury Qualifier Code	Nickel Measured* Conc. (mg/kg)	Nickel Qualifier Code	Selenium Measured* Conc. (mg/kg)	Selenium Qualifier Code	Silver Measured* Conc. (mg/kg)	Silver Qualifier Code	Zinc Measured* Conc. (mg/kg)	Zinc Qualifier Code
3A	D24	0.056	E	0.91	U/E	0.52	U	0.23	U/E	88.4	E
3B	D26	0.166	E	1.12	U/E	0.64	U	0.29	U/E	112.0	E
3B	D28	0.090	E	1.85	E	0.55	U	0.25	U/E	133.7	E
3B	D29	0.073	E	0.86	U/E	0.49	U	0.22	U/E	78.5	E
4A	D31	0.146	E	0.70	U/E	0.40	U	0.18	U/E	100.0	E
4A	D35	0.087	E	1.17	E	0.51	U	0.23	U/E	109.5	E
4B	D38	0.129	E	17.29	E	0.49	U	0.22	U/E	109.6	E
4B	D40	0.104	E	1.02	U/E	0.58	U	0.26	U/E	89.9	E

TABLE E1-2. PHENOLIC COMPOUNDS IN CARP WHOLE-BODY COMPOSITES

River Segment	Station	Phenol Measured Conc. (ug/kg)	Phenol Norm. Conc.* (ug/g lipid)	Phenol Qualifier Code	2-Methylphenol Measured Conc. (ug/kg)	2-Methylphenol Norm. Conc.* (ug/g lipid)	2-Methylphenol Qualifier Code	4-Methylphenol Measured Conc. (ug/kg)	4-Methylphenol Norm. Conc.* (ug/g lipid)	4-Methylphenol Qualifier Code	2,4-Dimethylphenol Measured Conc. (ug/kg)	2,4-Dimethylphenol Norm. Conc.* (ug/g lipid)	2,4-Dimethylphenol Qualifier Code
3A	D23	100		U	200		U	200		U	100		U
3A	D24	100		U	200		U	200		U	100		U
3B	D26	100		U	200		U	200		U	100		U
3B	D28	100		U	200		U	200		U	100		U
3B	D29	5000	220		200		U	200		U	100		U
4A	D31	100		U	200		U	200		U	100		U
4A	D35	100		U	200		U	200		U	100		U
4B	D38	100		U	200		U	200		U	100		U
4B	D40	100		U	200		U	200		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Pentachlorophenol Measured Conc. (ug/kg)	Pentachlorophenol Norm. Conc.* (ug/g lipid)	Pentachlorophenol Qualifier Code	2-Chlorophenol Measured Conc. (ug/kg)	2-Chlorophenol Norm. Conc.* (ug/g lipid)	2-Chlorophenol Qualifier Code	2,4-Dichlorophenol Measured Conc. (ug/kg)	2,4-Dichlorophenol Norm. Conc.* (ug/g lipid)	2,4-Dichlorophenol Qualifier Code	4-Chloro-3-methylphenol Measured Conc. (ug/kg)	4-Chloro-3-methylphenol Norm. Conc.* (ug/g lipid)	4-Chloro-3-methylphenol Qualifier Code
3A	D23	1000		U	100		U	200		U	200		U
3A	D24	1000		U	100		U	200		U	200		U
3B	D26	1000		U	100		U	200		U	200		U
3B	D28	1000		U	100		U	200		U	200		U
3B	D29	1000		U	4200	185		200		U	5600	247	
4A	D31	1000		U	100		U	200		U	200		U
4A	D35	1000		U	100		U	200		U	200		U
4B	D38	1000		U	100		U	200		U	200		U
4B	D40	1000		U	100		U	200		U	200		U

River Segment	Station	2,4-Dinitrophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	2-Nitrophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	4-Nitrophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	2,4,6-Trichlorophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
3A	D23	1000		U	200		U	1000		U	200		U
3A	D24	1000		U	200		U	1000		U	200		U
3B	D26	1000		U	200		U	1000		U	200		U
3B	D28	1000		U	200		U	1000		U	200		U
3B	D29	1000		U	200		U	4000	176		200		U
4A	D31	1000		U	200		U	1000		U	200		U
4A	D35	1000		U	200		U	1000		U	200		U
4B	D38	1000		U	200		U	1000		U	200		U
4B	D40	1000		U	200		U	1000		U	200		U

TABLE E1-3. SEMIVOLATILES IN CARP WHOLE-BODY COMPOSITES: HALOGENATED ETHERS

River Segment	Station	bis(2-Chloroethyl) ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	bis(2-Chloroethoxy) methane Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	bis(2-Chloroisopropyl) ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
3A	D23	100		U	100		U	100		U
3A	D24	100		U	100		U	100		U
3B	D26	100		U	100		U	100		U
3B	D28	100		U	100		U	100		U
3B	D29	100		U	100		U	100		U
4A	D31	100		U	100		U	100		U
4A	D35	100		U	100		U	100		U
4B	D38	100		U	100		U	100		U
4B	D40	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	4-Bromophenyl phenyl ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	4-Chlorophenyl phenyl ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
3A	D23	200		U	100		U
3A	D24	200		U	100		U
3B	D26	200		U	100		U
3B	D28	200		U	100		U
3B	D29	200		U	100		U
4A	D31	200		U	100		U
4A	D35	200		U	100		U
4B	D38	200		U	100		U
4B	D40	200		U	100		U

TABLE E1-4. SEMIVOLATILES IN CARP WHOLE-BODY COMPOSITES: NITROAROMATICS

River Segment	Station	2,4-Dinitrotoluene Measured Conc. (ug/kg)	2,4-Dinitrotoluene Norm. Conc.* (ug/g lipid)	2,4-Dinitrotoluene Qualifier Code	2,6-Dinitrotoluene Measured Conc. (ug/kg)	2,6-Dinitrotoluene Norm. Conc.* (ug/g lipid)	2,6-Dinitrotoluene Qualifier Code	Nitrobenzene Measured Conc. (ug/kg)	Nitrobenzene Norm. Conc.* (ug/g lipid)	Nitrobenzene Qualifier Code
3A	D23	100		U	100		U	100		U
3A	D24	100		U	100		U	100		U
3B	D26	100		U	100		U	100		U
3B	D28	100		U	100		U	100		U
3B	D29	1000	44		100		U	100		U
4A	D31	100		U	100		U	100		U
4A	D35	100		U	100		U	100		U
4B	D38	100		U	100		U	100		U
4B	D40	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

TABLE E1-5. SEMIVOLATILES IN CARP WHOLE-BODY COMPOSITES: NITROSAMINES

River Segment	Station	N-Nitrosodi-n-propylamine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	N-Nitrosodiphenylamine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
3A	D23	100		U	100		U
3A	D24	100		U	100		U
3B	D26	100		U	100		U
3B	D28	100		U	100		U
3B	D29	2900	128		100		U
4A	D31	100		U	100		U
4A	D35	100		U	100		U
4B	D38	100		U	100		U
4B	D40	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

TABLE E1-6. SEMIVOLATILES IN CARP WHOLE-BODY COMPOSITES: NAPHTHALENES

River Segment	Station	2-Chloronaphthalene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	2-Methylnaphthalene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
3A	D23	100		U	100		U
3A	D24	100		U	100		U
3B	D26	100		U	100		U
3B	D28	100		U	100		U
3B	D29	100		U	101	4.4	
4A	D31	100		U	100		U
4A	D35	100		U	230	5.8	
4B	D38	100		U	100		U
4B	D40	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

TABLE E1-7. SEMIVOLATILES IN CARP WHOLE-BODY COMPOSITES: POLYNUCLEAR AROMATICS

River Segment	Station	Acenaphthene Measured Conc. (ug/kg)	Acenaphthene Norm. Conc.* (ug/g lipid)	Acenaphthene Qualifier Code	Acenaphthylene Measured Conc. (ug/kg)	Acenaphthylene Norm. Conc.* (ug/g lipid)	Acenaphthylene Qualifier Code	Anthracene Measured Conc. (ug/kg)	Anthracene Norm. Conc.* (ug/g lipid)	Anthracene Qualifier Code	Benzo(a)anthracene Measured Conc. (ug/kg)	Benzo(a)anthracene Norm. Conc.* (ug/g lipid)	Benzo(a)anthracene Qualifier Code
3A	D23	100		U	100		U	100		U	100		U
3A	D24	100		U	100		U	100		U	100		U
3B	D26	100		U	100		U	100		U	100		U
3B	D28	100		U	100		U	100		U	100		U
3B	D29	3800	167		100		U	100		U	100		U
4A	D31	100		U	100		U	100		U	100		U
4A	D35	100		U	100		U	100		U	100		U
4B	D38	100		U	100		U	100		U	100		U
4B	D40	100		U	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Benzo(b)fluoranthene Measured Conc. (ug/kg)	Benzo(b)fluoranthene Norm. Conc.* (ug/g lipid)	Benzo(b)fluoranthene Qualifier Code	Benzo(k)fluoranthene Measured Conc. (ug/kg)	Benzo(k)fluoranthene Norm. Conc.* (ug/g lipid)	Benzo(k)fluoranthene Qualifier Code	Benzo(a)pyrene Measured Conc. (ug/kg)	Benzo(a)pyrene Norm. Conc.* (ug/g lipid)	Benzo(a)pyrene Qualifier Code	Benzo(g,h,i)perylene Measured Conc. (ug/kg)	Benzo(g,h,i)perylene Norm. Conc.* (ug/g lipid)	Benzo(g,h,i)perylene Qualifier Code
3A	D23	200		U	200		U	200		U	200		U
3A	D24	200		U	200		U	200		U	200		U
3B	D26	200		U	200		U	200		U	200		U
3B	D28	200		U	200		U	200		U	200		U
3B	D29	200		U	200		U	200		U	200		U
4A	D31	200		U	200		U	200		U	200		U
4A	D35	200		U	200		U	200		U	200		U
4B	D38	200		U	200		U	200		U	200		U
4B	D40	200		U	200		U	200		U	200		U

River Segment	Station	Chrysene Measured Conc. (ug/kg)	Chrysene Norm. Conc.* (ug/g lipid)	Chrysene Qualifier Code	Dibenzo(a,h)anthracene Measured Conc. (ug/kg)	Dibenzo(a,h)anthracene Norm. Conc.* (ug/g lipid)	Dibenzo(a,h)anthracene Qualifier Code	Fluoranthene Measured Conc. (ug/kg)	Fluoranthene Norm. Conc.* (ug/g lipid)	Fluoranthene Qualifier Code	Fluorene Measured Conc. (ug/kg)	Fluorene Norm. Conc.* (ug/g lipid)	Fluorene Qualifier Code
3A	D23	100		U	200		U	100		U	100		U
3A	D24	100		U	200		U	100		U	100		U
3B	D26	100		U	200		U	100		U	100		U
3B	D28	100		U	200		U	100		U	100		U
3B	D29	100		U	200		U	100		U	100		U
4A	D31	100		U	200		U	100		U	100		U
4A	D35	100		U	200		U	100		U	100		U
4B	D38	100		U	200		U	100		U	100		U
4B	D40	100		U	200		U	100		U	100		U

River Segment	Station	Indeno(1,2,3-c,d)pyrene Measured Conc. (ug/kg)	Indeno(1,2,3-c,d)pyrene Norm. Conc.* (ug/g lipid)	Indeno(1,2,3-c,d)pyrene Qualifier Code	Naphthalene Measured Conc. (ug/kg)	Naphthalene Norm. Conc.* (ug/g lipid)	Naphthalene Qualifier Code	Phenanthrene Measured Conc. (ug/kg)	Phenanthrene Norm. Conc.* (ug/g lipid)	Phenanthrene Qualifier Code	Pyrene Measured Conc. (ug/kg)	Pyrene Norm. Conc.* (ug/g lipid)	Pyrene Qualifier Code
3A	D23	200		U	100		U	100		U	100		U
3A	D24	200		U	100		U	100		U	100		U
3B	D26	200		U	100		U	100		U	100		U
3B	D28	200		U	100		U	100		U	100		U
3B	D29	200		U	100		U	100		U	5200	229	
4A	D31	200		U	100		U	100		U	100		U
4A	D35	200		U	220	5.5		100		U	100		U
4B	D38	200		U	100		U	100		U	100		U
4B	D40	200		U	100		U	100		U	100		U

TABLE E1-8. SEMIVOLATILES IN CARP WHOLE-BODY COMPOSITES: CHLORINATED BENZENES

River Segment	Station	1,3-Dichlorobenzene			1,2-Dichlorobenzene			1,4-Dichlorobenzene			1,2,4-Trichlorobenzene		
		Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
3A	D23	100		U	100		U	100		U	200		U
3A	D24	100		U	100		U	100		U	200		U
3B	D26	100		U	100		U	100		U	200		U
3B	D28	100		U	100		U	100		U	200		U
3B	D29	100		U	100		U	1800	79		3100	137	
4A	D31	100		U	100		U	100		U	200		U
4A	D35	100		U	100		U	100		U	200		U
4B	D38	100		U	100		U	100		U	200		U
4B	D40	100		U	100		U	100		U	200		U
Tissue Reference Levels		na***			na***			na***			1300		

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	Hexachlorobenzene			Hexachlorobutadiene			Hexachloroethane			Hexachlorocyclopentadiene		
		Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
3A	D23	200		U	100		U	200		U	500		U
3A	D24	200		U	100		U	200		U	500		U
3B	D26	200		U	100		U	200		U	500		U
3B	D28	200		U	100		U	200		U	500		U
3B	D29	200		U	100		U	200		U	500		U
4A	D31	200		U	100		U	200		U	500		U
4A	D35	200		U	100		U	200		U	500		U
4B	D38	200		U	100		U	200		U	500		U
4B	D40	200		U	100		U	200		U	500		U
Tissue Reference Levels		na***			na***			na***			na***		

TABLE E1-9. CONCENTRATIONS OF BENZIDINES IN CARP TISSUE

River Segment	Station	3,3'-Dichlorobenzidine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
3A	D23	1000		U
3A	D24	1000		U
3B	D26	1000		U
3B	D28	1000		U
3B	D29	1000		U
4A	D31	1000		U
4A	D35	1000		U
4B	D38	1000		U
4B	D40	1000		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

TABLE E1-10. SEMIVOLATILES IN CARP WHOLE-BODY COMPOSITES: PHTHALATE ESTERS

River Segment	Station	Dimethyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Diethyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Di-n-butyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
3A	D23	100		U	200		U	100		U
3A	D24	100		U	200		U	100		U
3B	D26	100		U	200		U	100		U
3B	D28	100		U	200		U	130	4.6	
3B	D29	100		U	200		U	100		U
4A	D31	100		U	200		U	100		U
4A	D35	100		U	200		U	100		U
4B	D38	100		U	200		U	160	4.9	
4B	D40	100		U	200		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Benzyl butyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	bis(2-Ethylhexyl) phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Di-n-octyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
3A	D23	100		U	1100	44		200		U
3A	D24	100		U	530	8.1		200		U
3B	D26	100		U	100		U	200		U
3B	D28	100		U	450	16		200		U
3B	D29	100		U	660	30		200		U
4A	D31	100		U	480	8.1		200		U
4A	D35	100		U	850	21		200		U
4B	D38	100		U	790	24		200		U
4B	D40	100		U	1500	37		200		U

TABLE E1-11. PESTICIDES IN CARP WHOLE-BODY COMPOSITES

River Segment	Station	o,p-DDD Measured Conc. (ug/kg)	o,p-DDD Norm. Conc.* (ug/g lipid)	o,p-DDD Qualifier Code	o,p-DDE Measured Conc. (ug/kg)	o,p-DDE Norm. Conc.* (ug/g lipid)	o,p-DDE Qualifier Code	o,p-DDT Measured Conc. (ug/kg)	o,p-DDT Norm. Conc.* (ug/g lipid)	o,p-DDT Qualifier Code	4,4'-DDD Measured Conc. (ug/kg)	4,4'-DDD Norm. Conc.* (ug/g lipid)	4,4'-DDD Qualifier Code
3A	D23	3		U	3		U	4*		U	7.6	0.30	E
3A	D24	3		U	3		U	8*		U	4.4	0.07	E
3B	D26	20*		U	17	0.29		3		U	23	0.39	E
3B	D28	3		U	11	0.39	E	6.9	0.24	E	3.5	0.12	E
3B	D29	3.3	0.15	E	4*		U	3		U	3		U
4A	D31	3		U	11	0.18	E	3		U	7*		U
4A	D35	3		U	3		U	3		U	3		U
4B	D38	3		U	4*		U	4*		U	4.9	0.15	E
4B	D40	6		U	3		U	3		U	14	0.34	E
Tissue Reference Levels		200			200			200			200		

U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
* Reporting limits adjusted due to coeluting interfering peaks.
** Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	4,4'-DDE Measured Conc. (ug/kg)	4,4'-DDE Norm. Conc.* (ug/g lipid)	4,4'-DDE Qualifier Code	4,4'-DDT Measured Conc. (ug/kg)	4,4'-DDT Norm. Conc.* (ug/g lipid)	4,4'-DDT Qualifier Code	Heptachlor Measured Conc. (ug/kg)	Heptachlor Norm. Conc.* (ug/g lipid)	Heptachlor Qualifier Code	Heptachlor epoxide Measured Conc. (ug/kg)	Heptachlor epoxide Norm. Conc.* (ug/g lipid)	Heptachlor epoxide Qualifier Code
3A	D23	18	0.72	E	3		U	3		U	3		U
3A	D24	21	0.32	E	3		U	3		U	3		U
3B	D26	3		U	11	0.19	E	3		U	4*		U
3B	D28	37	1.31	E	3		U	3		U	3		U
3B	D29	22	0.97		3.5	0.15	E	3		U	3		U
4A	D31	91	1.53	E	7	0.12	E	3		U	3		U
4A	D35	38	0.96		3		U	3		U	3		U
4B	D38	88	2.67		5.3	0.16	E	3		U	3		U
4B	D40	40*		U	3.5	0.77	E	3		U	3		U
Tissue Reference Levels		200			200			200			na***		

River Segment	Station	Chlordane Measured Conc. (ug/kg)	Chlordane Norm. Conc.* (ug/g lipid)	Chlordane Qualifier Code	Aldrin Measured Conc. (ug/kg)	Aldrin Norm. Conc.* (ug/g lipid)	Aldrin Qualifier Code	Dieldrin Measured Conc. (ug/kg)	Dieldrin Norm. Conc.* (ug/g lipid)	Dieldrin Qualifier Code	Mirex Measured Conc. (ug/kg)	Mirex Norm. Conc.* (ug/g lipid)	Mirex Qualifier Code
3A	D23	3		U	3		U	3		U	3		U
3A	D24	3		U	3		U	3		U	3		U
3B	D26	3		U	4*		U	10*		U	8.8	0.15	
3B	D28	3		U	3		U	3		U	3		U
3B	D29	3		U	9.6	0.42		3		U	3		U
4A	D31	3		U	4*		U	5.6	0.09	E	3		U
4A	D35	3		U	3		U	3		U	3		U
4B	D38	3		U	3		U	3.6	0.11	E	3		U
4B	D40	3		U	3		U	3		U	3		U
Tissue Reference Levels		na***			120			120			300		

River Segment	Station	Dacthal Measured Conc. (ug/kg)	Dacthal Norm. Conc.* (ug/g lipid)	Dacthal Qualifier Code	Dicofol Measured Conc. (ug/kg)	Dicofol Norm. Conc.* (ug/g lipid)	Dicofol Qualifier Code	Methyl parathion Measured Conc. (ug/kg)	Methyl parathion Norm. Conc.* (ug/g lipid)	Methyl parathion Qualifier Code	Parathion Measured Conc. (ug/kg)	Parathion Norm. Conc.* (ug/g lipid)	Parathion Qualifier Code
3A	D23	3		U	30		U	3		U	3		U
3A	D24	3		U	30		U	3		U	3		U
3B	D26	4*		U	30		U	3		U	3		U
3B	D28	3		U	30		U	3		U	3		U
3B	D29	3		U	30		U	3		U	3		U
4A	D31	3		U	30		U	3		U	3		U
4A	D35	3		U	30		U	4*		U	3		U
4B	D38	3		U	30		U	3		U	3		U
4B	D40	3		U	30		U	10*		U	3		U
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	Malathion Measured Conc. (ug/kg)	Malathion Norm. Conc.* (ug/g lipid)	Malathion Qualifier Code	Toxaphene Measured Conc. (ug/kg)	Toxaphene Norm. Conc.* (ug/g lipid)	Toxaphene Qualifier Code	Isophorone Measured Conc. (ug/kg)	Isophorone Norm. Conc.* (ug/g lipid)	Isophorone Qualifier Code	Endosulfan I Measured Conc. (ug/kg)	Endosulfan I Norm. Conc.* (ug/g lipid)	Endosulfan I Qualifier Code
3A	D23	3		U	150		U	100		U	3		U
3A	D24	3		U	150		U	100		U	3		U
3B	D26	4*		U	150		U	100		U	3		U
3B	D28	3		U	150		U	100		U	3		U
3B	D29	3		U	150		U	100		U	3		U
4A	D31	3		U	150		U	100		U	3		U
4A	D35	3		U	150		U	100		U	3		U
4B	D38	3		U	150		U	100		U	3		U
4B	D40	6*		U	150		U	100		U	3		U
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	Endosulfan II Measured Conc. (ug/kg)	Endosulfan II Norm. Conc.* (ug/g lipid)	Endosulfan II Qualifier Code	Endosulfan sulfate Measured Conc. (ug/kg)	Endosulfan sulfate Norm. Conc.* (ug/g lipid)	Endosulfan sulfate Qualifier Code	Endrin Measured Conc. (ug/kg)	Endrin Norm. Conc.* (ug/g lipid)	Endrin Qualifier Code	Endrin aldehyde Measured Conc. (ug/kg)	Endrin aldehyde Norm. Conc.* (ug/g lipid)	Endrin aldehyde Qualifier Code
3A	D23	3		U	3		U	3		U	3		U
3A	D24	3		U	3		U	3		U	3		U
3B	D26	3		U	3		U	12*		U	5*		U
3B	D28	3		U	3		U	3		U	3		U
3B	D29	3		U	3		U	3		U	3		U
4A	D31	3		U	3		U	3		U	3		U
4A	D35	3		U	3		U	3		U	3		U
4B	D38	3		U	3		U	3.9	0.12	E	3		U
4B	D40	3		U	3		U	3		U	3		U
Tissue Reference Levels		na***			na***			25			na***		

River Segment	Station	Methoxychlor Measured Conc. (ug/kg)	Methoxychlor Normalized** Conc. (ug/kg)	Methoxychlor Qualifier Code	alpha-BHC Measured Conc. (ug/kg)	alpha-BHC Normalized** Conc. (ug/kg)	alpha-BHC Qualifier Code	beta-BHC Measured Conc. (ug/kg)	beta-BHC Normalized** Conc. (ug/kg)	beta-BHC Qualifier Code	delta-BHC Measured Conc. (ug/kg)	delta-BHC Normalized** Conc. (ug/kg)	delta-BHC Qualifier Code
3A	D23	30		U	3		U	3		U	3		U
3A	D24	30		U	3		U	3		U	3		U
3B	D26	30		U	3		U	3		U	3		U
3B	D28	30		U	3		U	3		U	3		U
3B	D29	30		U	3		U	3		U	3		U
4A	D31	30		U	3		U	3		U	3		U
4A	D35	30		U	3		U	3		U	3		U
4B	D38	30		U	3		U	3		U	3		U
4B	D40	30		U	3		U	3		U	3		U
Tissue Reference Levels		na***			100			100			100		

River Segment	Station	gamma-BHC Measured Conc. (ug/kg)	gamma-BHC Norm. Conc.* (ug/g lipid)	gamma-BHC Qualifier Code
3A	D23	3		U
3A	D24	3		U
3B	D26	3.5	0.06	
3B	D28	3		U
3B	D29	3		U
4A	D31	3		U
4A	D35	3		U
4B	D38	3		U
4B	D40	3		U
Tissue Reference Levels		100		

TABLE E1-12. PCBS IN CARP WHOLE-BODY COMPOSITES

River Segment	Station	Aroclor-1016 Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Aroclor-1221 Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Aroclor-1232 Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Aroclor-1242 Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
3A	D23	50		U	50		U	50		U	50		U
3A	D24	50		U	50		U	50		U	50		U
3B	D26	50		U	50		U	50		U	50		U
3B	D28	50		U	50		U	50		U	50		U
3B	D29	50		U	50		U	50		U	50		U
4A	D31	50		U	50		U	50		U	50		U
4A	D35	50		U	50		U	50		U	50		U
4B	D38	50		U	50		U	50		U	50		U
4B	D40	50		U	50		U	50		U	50		U
Tissue Reference Levels		na***			na***			na***			na***		

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	Aroclor-1248 Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Aroclor-1254 Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Aroclor-1260 Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Total Detected PCBs Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)
3A	D23	50		U	50		U	69	2.8		69	2.8
3A	D24	50		U	50		U	62	1.0		62	1.0
3B	D26	50		U	50		U	80	1.4		80	1.4
3B	D28	50		U	270	9.6		50		U	270	9.6
3B	D29	50		U	190	8.4		50		U	190	8.4
4A	D31	50		U	260	4.4		50		U	260	4.4
4A	D35	50		U	60	1.5		50		U	60	1.5
4B	D38	50		U	110	3.3		50		U	110	3.3
4B	D40	50		U	50		U	110	2.7		110	2.7
Tissue Reference Levels		na***			na***			na***			110	

TABLE E1-13. DIOXINS AND FURANS IN CARP WHOLE-BODY COMPOSITES

River Segment	Station	2,3,7,8-TCDD Measured Conc. (pg/g)	2,3,7,8-TCDD Norm. Conc** (ng/g lipid)	2,3,7,8-TCDD Qualifier Code	1,2,3,7,8-PeCDD Measured Conc. (pg/g)	1,2,3,7,8-PeCDD Norm. Conc** (ng/g lipid)	1,2,3,7,8-PeCDD Qualifier Code	1,2,3,4,7,8-HxCDD Measured Conc. (pg/g)	1,2,3,4,7,8-HxCDD Norm. Conc** (ng/g lipid)	1,2,3,4,7,8-HxCDD Qualifier Code	1,2,3,6,7,8-HxCDD Measured Conc. (pg/g)	1,2,3,6,7,8-HxCDD Norm. Conc** (ng/g lipid)	1,2,3,6,7,8-HxCDD Qualifier Code
3A	D24	1.57	0.025		1.89	0.030	S/M	1.45	0.023	S/M	4.82	0.078	
3B	D28	1.64	0.057		1.77	0.061	S/M	1.18	0.041	S	3.73	0.129	
4A	D35	1.32	0.034		1.11	0.028	S/M	0.62	0.016	S/M	1.53	0.039	S/M
4B	D38	1.28	0.085		0.84	0.056	S/M	0.26	0.017	S	0.73	0.049	S
4B	D40	2.1	0.030		1.68	0.024	S/M	0.4	0.006	S/M	1.93	0.028	S
Tissue Reference Levels		na***			na***			na***			na***		

U = Compound was not detected.
E = Analyte not detected at or above the sample specific Estimated Detection Limit (EDL). The EDL is reported.
L = Analyte not detected at or above the Lower Method Calibration Limit (LMCL). The LMCL is reported.
M = Estimated Maximum Possible Concentration.
MD = Estimated Maximum Possible Concentration with Diphenyl Ether interferences.
S = Analyte detected below the Lower Method Calibration Limit. Value should be considered an estimate.
* Obtained from a DB-225 column.
** Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	1,2,3,7,8,9-HxCDD Measured Conc. (pg/g)	1,2,3,7,8,9-HxCDD Norm. Conc** (ng/g lipid)	1,2,3,7,8,9-HxCDD Qualifier Code	1,2,3,4,6,7,8-HpCDD Measured Conc. (pg/g)	1,2,3,4,6,7,8-HpCDD Norm. Conc** (ng/g lipid)	1,2,3,4,6,7,8-HpCDD Qualifier Code	OCDD Measured Conc. (pg/g)	OCDD Norm. Conc** (ng/g lipid)	OCDD Qualifier Code	2,3,7,8-TCDF Measured Conc. (pg/g)	2,3,7,8-TCDF Norm. Conc** (ng/g lipid)	2,3,7,8-TCDF Qualifier Code
3A	D24	0.5	0.008	S	9.81	0.158		20.1	0.324		4.37	0.070	*
3B	D28	0.36		U/E	9.5	0.328		30.6	1.055		4.89	0.169	*
4A	D35	0.21	0.005	S/M	3.42	0.088		12.3	0.315		9.53	0.244	*
4B	D38	0.12	0.008	S/M	1.59	0.106	S	2.71	0.181		7.6	0.507	*
4B	D40	0.27	0.004	S/M	4.39	0.064		7.54	0.109		12.2	0.177	*
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	1,2,3,7,8-PeCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	2,3,4,7,8-PeCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,4,7,8-HxCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,6,7,8-HxCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code
3A	D24	0.76	0.012	S	1.37	0.022	S	0.66	0.011	S	0.57	0.009	S
3B	D28	0.57	0.020	S/M	1.37	0.047	S	0.52	0.018	S	0.42	0.014	S/M
4A	D35	0.29	0.007	S	0.73	0.019	S/M	0.23	0.006	S/M	0.18	0.005	S
4B	D38	0.21	0.014	S	0.46	0.031	S	0.12	0.008	S	0.09	0.006	S/M
4B	D40	0.39	0.006	S	0.96	0.014	S	0.19	0.003	S/M	0.16	0.002	S
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	2,3,4,6,7,8-HxCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,7,8,9-HxCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,4,6,7,8-HpCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,4,7,8,9-HpCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code
3A	D24	5.7	0.092	MD	0.3		U/E	0.75	0.012	S	0.11		U/E
3B	D28	3.5	0.121	MD	0.34		U/E	1.31	0.045	S	0.18		U/E
4A	D35	0.33	0.008	S/M	0.21		U/E	0.4	0.010	S	0.12	0.003	S
4B	D38	0.26	0.017	S	0.05	0.003	S/M	0.18	0.012	S/M	0.56		U/E
4B	D40	0.4	0.006	S/M	0.12		U/E	0.27	0.004	S/M	0.16		U/E
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	OCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	TEC (FULL) Calculated Conc. (pg/g)	TEC (HALF) Calculated Conc. (pg/g)	TEC (ZERO) Calculated Conc. (pg/g)
3A	D24	0.86	0.014	S/M	5.20	5.19	5.17
3B	D28	2.45	0.084	S	3.24	4.84	4.80
4A	D35	0.84	0.022	S	2.27	3.58	3.57
4B	D38	0.29		U/E	1.61	2.89	2.88
4B	D40	0.52		U/E	2.96	5.06	5.05
Tissue Reference Levels		na***			3	3	3

TABLE E2-1. CONCENTRATIONS OF METALS IN CRAYFISH WHOLE-BODY COMPOSITES

River Segment	Station	Antimony Measured * Conc. (mg/kg)	Antimony Qualifier Code	Arsenic Measured * Conc. (mg/kg)	Arsenic Qualifier Code	Barium Measured * Conc. (mg/kg)	Barium Qualifier Code	Cadmium Measured * Conc. (mg/kg)	Cadmium Qualifier Code	Copper Measured * Conc. (mg/kg)	Copper Qualifier Code	Lead Measured * Conc. (mg/kg)	Lead Qualifier Code
1C	D6	2.80	U/E	0.37	U	1.6	E	0.08		37.33	E	0.02	E
1C	D8	2.89	U/E	0.38	U	1.5	E	0.08		30.77	E	0.02	E
1C	D10	2.48	U/E	0.33	U	1.3	E	0.07		41.39	E	0.02	E
2A	D12	2.72	U/E	0.36	U	0.8	E	0.05		19.93	E	0.04	E
2B	D15	2.45	U/E	0.33	U	0.6	E	0.08		27.80	E	0.02	E
2B	D15d	3.25	U/E	**	**	1.9	E	0.13		28.17	E	0.02	E
2C	D16	2.30	U/E	0.31	U	0.6	E	0.03		21.47	E	0.02	U/E
2C	D19	2.72	U/E	0.36	U	1.2	E	0.07		38.05	E	0.02	U/E
2C	D20	4.05	U/E	0.54	U	3.5	E	0.08		27.00	E	0.03	U/E
3A	D22	0.35	U/E	0.46	U	1.6	E	0.05		17.94	E	0.05	E
3A	D23	0.31	U/E	0.42	U	1.5	E	0.06		25.00	E	0.02	E
3A	D24	0.37	U/E	0.49	U	1.6	E	0.05		24.55	E	0.02	E
3B	D26	0.38	U/E	0.48	U	2.5	E	0.08		46.40	E	0.03	E
3B	D26d	0.37	U/E	**	**	2.5	E	0.10		44.73	E	0.02	U/E
3B	D28	1.98	U/E	0.26	U	1.1	E	0.09		35.73	E	0.01	E
4A	D29	2.40	U/E	0.32	U	1.0	E	0.10		25.60	E	0.02	U/E
4A	D31	1.84	U/E	0.25	U	0.9	E	0.09		37.99	E	0.03	E
4A	D35	1.78	U/E	0.24	U	1.0	E	0.02		26.17	E	0.01	E
4A	D38	4.05	U/E	0.54	U	1.6	E	0.11		29.70	E	0.03	E
4B	D40	3.42	U/E	0.46	U	2.1	E	0.12		29.60	E	0.05	E

U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
* Metals data normalized to wet weight
** Not reported.

River Segment	Station	Mercury Measured * Conc. (mg/kg)	Mercury Qualifier Code	Nickel Measured * Conc. (mg/kg)	Nickel Qualifier Code	Selenium Measured * Conc. (mg/kg)	Selenium Qualifier Code	Silver Measured * Conc. (mg/kg)	Silver Qualifier Code	Zinc Measured * Conc. (mg/kg)	Zinc Qualifier Code
1C	D6	0.056	E	0.65	U/E	0.37	U	0.17	U/E	26.1	E
1C	D8	0.038	E	0.67	U/E	0.38	U	1.17	E	26.9	E
1C	D10	0.013	U/E	0.58	U/E	0.33	U	0.94	E	24.8	E
2A	D12	0.021	E	0.63	U/E	0.36	U	0.82	E	23.5	E
2B	D15	0.022	E	0.57	U/E	0.33	U	0.80	E	24.5	E
2B	D15d	0.061	E	0.76	U/E	**	**	1.13	E	21.0	E
2C	D16	0.022	E	0.54	U/E	0.31	U	1.03	E	24.5	E
2C	D19	0.036	E	0.63	U/E	0.36	U	0.16	U/E	29.0	E
2C	D20	0.022	E	0.95	U/E	0.54	U	1.54	E	29.7	E
3A	D22	0.049	E	0.81	U/E	0.46	U	0.48	E	21.9	E
3A	D23	0.078	E	0.73	U/E	0.42	U	0.38	E	20.2	E
3A	D24	0.042	E	0.86	U/E	0.49	U	0.34	E	21.1	E
3B	D26	0.015	U/E	1.01	E	0.48	U	0.23	U/E	38.8	E
3B	D26d	0.057	E	1.23	E	**	**	0.22	U/E	33.7	E
3B	D28	0.060	E	0.46	U/E	0.26	U	0.58	E	26.5	E
4A	D29	0.012	U/E	0.56	U/E	0.32	U	1.01	E	27.2	E
4A	D31	0.053	E	0.43	U/E	0.25	U	0.55	E	25.7	E
4A	D35	0.056	E	1.02	E	0.24	U	0.61	E	27.4	E
4A	D38	0.018	E	0.95	U/E	0.54	U	1.11	E	29.7	E
4B	D40	0.014	E	0.80	U/E	0.46	U	1.37	E	34.2	E

TABLE E2-2. PHENOLIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES

River Segment	Station	Phenol			2-Methylphenol			4-Methylphenol			2,4-Dimethylphenol		
		Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	100		U	200		U	200		U	100		U
1C	D8	100		U	200		U	200		U	100		U
1C	D10	100		U	200		U	200		U	100		U
2A	D12	100		U	200		U	200		U	100		U
2B	D15	100		U	200		U	200		U	100		U
2C	D16	100		U	200		U	200		U	100		U
2C	D19	100		U	200		U	200		U	100		U
2C	D20	100		U	200		U	200		U	100		U
3A	D22	100		U	200		U	200		U	100		U
3A	D23	100		U	200		U	200		U	100		U
3A	D24	100		U	200		U	200		U	100		U
3B	D26	100		U	200		U	200		U	100		U
3B	D28	100		U	200		U	200		U	100		U
4A	D29	100		U	200		U	200		U	100		U
4A	D31	100		U	200		U	200		U	100		U
4A	D35	100		U	200		U	200		U	100		U
4A	D38	100		U	200		U	200		U	100		U
4B	D40	100		U	200		U	200		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Pentachlorophenol Measured Conc. (ug/kg)	Pentachlorophenol Norm. Conc.* (ug/g lipid)	Pentachlorophenol Qualifier Code	2-Chlorophenol Measured Conc. (ug/kg)	2-Chlorophenol Norm. Conc.* (ug/g lipid)	2-Chlorophenol Qualifier Code	2,4-Dichlorophenol Measured Conc. (ug/kg)	2,4-Dichlorophenol Norm. Conc.* (ug/g lipid)	2,4-Dichlorophenol Qualifier Code	4-Chloro-3-methylphenol Measured Conc. (ug/kg)	4-Chloro-3-methylphenol Norm. Conc.* (ug/g lipid)	4-Chloro-3-methylphenol Qualifier Code
1C	D6	1000		U	100		U	200		U	200		U
1C	D8	1000		U	100		U	200		U	200		U
1C	D10	1000		U	100		U	200		U	200		U
2A	D12	1000		U	100		U	200		U	200		U
2B	D15	1000		U	100		U	200		U	200		U
2C	D16	1000		U	100		U	200		U	200		U
2C	D19	1000		U	100		U	200		U	200		U
2C	D20	1000		U	100		U	200		U	200		U
3A	D22	1000		U	100		U	200		U	200		U
3A	D23	1000		U	100		U	200		U	200		U
3A	D24	1000		U	100		U	200		U	200		U
3B	D26	1000		U	100		U	200		U	200		U
3B	D28	1000		U	100		U	200		U	200		U
4A	D29	1000		U	100		U	200		U	200		U
4A	D31	1000		U	100		U	200		U	200		U
4A	D35	1000		U	100		U	200		U	200		U
4A	D38	1000		U	100		U	200		U	200		U
4B	D40	1000		U	100		U	200		U	200		U

River Segment	Station	2,4-Dinitrophenol			2-Nitrophenol			4-Nitrophenol			2,4,6-Trichlorophenol		
		Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	1000		U	200		U	1000		U	200		U
1C	D8	1000		U	200		U	1000		U	200		U
1C	D10	1000		U	200		U	1000		U	200		U
2A	D12	1000		U	200		U	1000		U	200		U
2B	D15	1000		U	200		U	1000		U	200		U
2C	D16	1000		U	200		U	1000		U	200		U
2C	D19	1000		U	200		U	1000		U	200		U
2C	D20	1000		U	200		U	1000		U	200		U
3A	D22	1000		U	200		U	1000		U	200		U
3A	D23	1000		U	200		U	1000		U	200		U
3A	D24	1000		U	200		U	1000		U	200		U
3B	D26	1000		U	200		U	1000		U	200		U
3B	D28	1000		U	200		U	1000		U	200		U
4A	D29	1000		U	200		U	1000		U	200		U
4A	D31	1000		U	200		U	1000		U	200		U
4A	D35	1000		U	200		U	1000		U	200		U
4A	D38	1000		U	200		U	1000		U	200		U
4B	D40	1000		U	200		U	1000		U	200		U

TABLE E2-3. SEMIVOLATILES IN CRAYFISH WHOLE-BODY COMPOSITES: HALOGENATED ETHERS

River Segment	Station	bis(2-Chloroethyl) ether			bis(2-Chloroethoxy) methane			bis(2-Chloroisopropyl) ether		
		Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	100		U	100		U	100		U
1C	D8	100		U	100		U	100		U
1C	D10	100		U	100		U	100		U
2A	D12	100		U	100		U	100		U
2B	D15	100		U	100		U	100		U
2C	D16	100		U	100		U	100		U
2C	D19	100		U	100		U	100		U
2C	D20	100		U	100		U	100		U
3A	D22	100		U	100		U	100		U
3A	D23	100		U	100		U	100		U
3A	D24	100		U	100		U	100		U
3B	D26	100		U	100		U	100		U
3B	D28	100		U	100		U	100		U
4A	D29	100		U	100		U	100		U
4A	D31	100		U	100		U	100		U
4A	D35	100		U	100		U	100		U
4A	D38	100		U	100		U	100		U
4B	D40	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	4-Bromophenyl phenyl ether			4-Chlorophenyl phenyl ether		
		Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	200		U	100		U
1C	D8	200		U	100		U
1C	D10	200		U	100		U
2A	D12	200		U	100		U
2B	D15	200		U	100		U
2C	D16	200		U	100		U
2C	D19	200		U	100		U
2C	D20	200		U	100		U
3A	D22	200		U	100		U
3A	D23	200		U	100		U
3A	D24	200		U	100		U
3B	D26	200		U	100		U
3B	D28	200		U	100		U
4A	D29	200		U	100		U
4A	D31	200		U	100		U
4A	D35	200		U	100		U
4A	D38	200		U	100		U
4B	D40	200		U	100		U

TABLE E2-4. SEMIVOLATILES IN CRAYFISH WHOLE-BODY COMPOSITES: NITROAROMATICS

River Segment	Station	2,4-Dinitrotoluene Measured Conc. (ug/kg)	2,4-Dinitrotoluene Norm. Conc.* (ug/g lipid)	2,4-Dinitrotoluene Qualifier Code	2,6-Dinitrotoluene Measured Conc. (ug/kg)	2,6-Dinitrotoluene Norm. Conc.* (ug/g lipid)	2,6-Dinitrotoluene Qualifier Code	Nitrobenzene Measured Conc. (ug/kg)	Nitrobenzene Norm. Conc.* (ug/g lipid)	Nitrobenzene Qualifier Code
1C	D6	100		U	100		U	100		U
1C	D8	100		U	100		U	100		U
1C	D10	100		U	100		U	100		U
2A	D12	100		U	100		U	100		U
2B	D15	100		U	100		U	100		U
2C	D16	100		U	100		U	100		U
2C	D19	100		U	100		U	100		U
2C	D20	100		U	100		U	100		U
3A	D22	100		U	100		U	100		U
3A	D23	100		U	100		U	100		U
3A	D24	100		U	100		U	100		U
3B	D26	100		U	100		U	100		U
3B	D28	100		U	100		U	100		U
4A	D29	100		U	100		U	100		U
4A	D31	100		U	100		U	100		U
4A	D35	100		U	100		U	100		U
4A	D38	100		U	100		U	100		U
4B	D40	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

TABLE E2-5. SEMIVOLATILES IN CRAYFISH WHOLE-BODY COMPOSITES: NITROSAMINES

River Segment	Station	N-Nitrosodi-n-propylamine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	N-Nitrosodiphenylamine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	100		U	100		U
1C	D8	100		U	100		U
1C	D10	100		U	100		U
2A	D12	100		U	100		U
2B	D15	100		U	100		U
2C	D16	100		U	100		U
2C	D19	100		U	100		U
2C	D20	100		U	100		U
3A	D22	100		U	100		U
3A	D23	100		U	100		U
3A	D24	100		U	100		U
3B	D26	100		U	100		U
3B	D28	100		U	100		U
4A	D29	100		U	100		U
4A	D31	100		U	100		U
4A	D35	100		U	100		U
4A	D38	100		U	100		U
4B	D40	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

TABLE E2-6. SEMIVOLATILES IN CRAYFISH WHOLE-BODY COMPOSITES: NAPHTHALENES

River Segment	Station	2-Chloronaphthalene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	2-Methylnaphthalene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	100		U	100		U
1C	D8	100		U	100		U
1C	D10	100		U	100		U
2A	D12	100		U	100		U
2B	D15	100		U	100		U
2C	D16	100		U	100		U
2C	D19	100		U	100		U
2C	D20	100		U	100		U
3A	D22	100		U	100		U
3A	D23	100		U	100		U
3A	D24	100		U	100		U
3B	D26	100		U	100		U
3B	D28	100		U	100		U
4A	D29	100		U	100		U
4A	D31	100		U	100		U
4A	D35	100		U	100		U
4A	D38	100		U	100		U
4B	D40	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

TABLE E2-7. SEMIVOLATILES IN CRAYFISH WHOLE-BODY COMPOSITES: POLYNUCLEAR AROMATICS

River Segment	Station	Acenaphthene Measured Conc. (ug/kg)	Acenaphthene Norm. Conc.* (ug/g lipid)	Acenaphthene Qualifier Code	Acenaphthylene Measured Conc. (ug/kg)	Acenaphthylene Norm. Conc.* (ug/g lipid)	Acenaphthylene Qualifier Code	Anthracene Measured Conc. (ug/kg)	Anthracene Norm. Conc.* (ug/g lipid)	Anthracene Qualifier Code	Benzo[a]anthracene Measured Conc. (ug/kg)	Benzo[a]anthracene Norm. Conc.* (ug/g lipid)	Benzo[a]anthracene Qualifier Code
1C	D6	100		U	100		U	100		U	100		U
1C	D8	100		U	100		U	100		U	100		U
1C	D10	100		U	100		U	100		U	100		U
2A	D12	100		U	100		U	100		U	100		U
2B	D15	100		U	100		U	100		U	100		U
2C	D16	100		U	100		U	100		U	100		U
2C	D19	100		U	100		U	100		U	100		U
2C	D20	100		U	100		U	100		U	100		U
3A	D22	100		U	100		U	100		U	100		U
3A	D23	100		U	100		U	100		U	100		U
3A	D24	100		U	100		U	100		U	100		U
3B	D26	100		U	100		U	100		U	100		U
3B	D28	100		U	100		U	100		U	100		U
4A	D29	100		U	100		U	100		U	100		U
4A	D31	100		U	100		U	100		U	100		U
4A	D35	100		U	100		U	100		U	100		U
4A	D38	100		U	100		U	100		U	100		U
4B	D40	100		U	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Benzo(b)fluoranthene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Benzo(k)fluoranthene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Benzo(a)pyrene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Benzo(g,h,i)perylene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	200		U	200		U	200		U	200		U
1C	D8	200		U	200		U	200		U	200		U
1C	D10	200		U	200		U	200		U	200		U
2A	D12	200		U	200		U	200		U	200		U
2B	D15	200		U	200		U	200		U	200		U
2C	D16	200		U	200		U	200		U	200		U
2C	D19	200		U	200		U	200		U	200		U
2C	D20	200		U	200		U	200		U	200		U
3A	D22	200		U	200		U	200		U	200		U
3A	D23	200		U	200		U	200		U	200		U
3A	D24	200		U	200		U	200		U	200		U
3B	D26	200		U	200		U	200		U	200		U
3B	D28	200		U	200		U	200		U	200		U
4A	D29	200		U	200		U	200		U	200		U
4A	D31	200		U	200		U	200		U	200		U
4A	D35	200		U	200		U	200		U	200		U
4A	D38	200		U	200		U	200		U	200		U
4B	D40	200		U	200		U	200		U	200		U

River Segment	Station	Chrysene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Dibenzo[a,h]anthracene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Fluoranthene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Fluorene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	100		U	200		U	100		U	100		U
1C	D8	100		U	200		U	100		U	100		U
1C	D10	100		U	200		U	100		U	100		U
2A	D12	100		U	200		U	100		U	100		U
2B	D15	100		U	200		U	100		U	100		U
2C	D16	100		U	200		U	100		U	100		U
2C	D19	100		U	200		U	100		U	100		U
2C	D20	100		U	200		U	100		U	100		U
3A	D22	100		U	200		U	100		U	100		U
3A	D23	100		U	200		U	100		U	100		U
3A	D24	100		U	200		U	100		U	100		U
3B	D26	100		U	200		U	100		U	100		U
3B	D28	100		U	200		U	100		U	100		U
4A	D29	100		U	200		U	100		U	100		U
4A	D31	100		U	200		U	100		U	100		U
4A	D35	100		U	200		U	100		U	100		U
4A	D38	100		U	200		U	100		U	100		U
4B	D40	100		U	200		U	100		U	100		U

River Segment	Station	Indeno(1,2,3-c,d)pyrene			Naphthalene			Phenanthrene			Pyrene		
		Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	200		U	100		U	100		U	100		U
1C	D8	200		U	100		U	100		U	100		U
1C	D10	200		U	100		U	100		U	100		U
2A	D12	200		U	100		U	100		U	100		U
2B	D15	200		U	100		U	100		U	100		U
2C	D16	200		U	100		U	100		U	100		U
2C	D19	200		U	100		U	100		U	100		U
2C	D20	200		U	100		U	100		U	100		U
3A	D22	200		U	100		U	100		U	100		U
3A	D23	200		U	100		U	100		U	100		U
3A	D24	200		U	100		U	100		U	100		U
3B	D26	200		U	100		U	100		U	100		U
3B	D28	200		U	100		U	100		U	100		U
4A	D29	200		U	100		U	100		U	100		U
4A	D31	200		U	100		U	100		U	100		U
4A	D35	200		U	100		U	100		U	100		U
4A	D38	200		U	100		U	100		U	100		U
4B	D40	200		U	100		U	100		U	100		U

TABLE E2-8. SEMIVOLATILES IN CRAYFISH WHOLE-BODY COMPOSITES: CHLORINATED BENZENES

River Segment	Station	1,3-Dichlorobenzene Measured Conc. (ug/kg)	1,3-Dichlorobenzene Norm. Conc.* (ug/g lipid)	1,3-Dichlorobenzene Qualifier Code	1,2-Dichlorobenzene Measured Conc. (ug/kg)	1,2-Dichlorobenzene Norm. Conc.* (ug/g lipid)	1,2-Dichlorobenzene Qualifier Code	1,4-Dichlorobenzene Measured Conc. (ug/kg)	1,4-Dichlorobenzene Norm. Conc.* (ug/g lipid)	1,4-Dichlorobenzene Qualifier Code	1,2,4-Trichlorobenzene Measured Conc. (ug/kg)	1,2,4-Trichlorobenzene Norm. Conc.* (ug/g lipid)	1,2,4-Trichlorobenzene Qualifier Code
1C	D6	100		U	100		U	100		U	200		U
1C	D8	100		U	100		U	100		U	200		U
1C	D10	100		U	100		U	100		U	200		U
2A	D12	100		U	100		U	100		U	200		U
2B	D15	100		U	100		U	100		U	200		U
2C	D16	100		U	100		U	100		U	200		U
2C	D19	100		U	100		U	100		U	200		U
2C	D20	100		U	100		U	100		U	200		U
3A	D22	100		U	100		U	100		U	200		U
3A	D23	100		U	100		U	100		U	200		U
3A	D24	100		U	100		U	100		U	200		U
3B	D26	100		U	100		U	100		U	200		U
3B	D28	100		U	100		U	100		U	200		U
4A	D29	100		U	100		U	100		U	200		U
4A	D31	100		U	100		U	100		U	200		U
4A	D35	100		U	100		U	100		U	200		U
4A	D38	100		U	100		U	100		U	200		U
4B	D40	100		U	100		U	100		U	200		U
Tissue Reference Levels		na***			na***			na***			1300		

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	Hexachlorobenzene Measured Conc. (ug/kg)	Hexachlorobenzene Norm. Conc.* (ug/g lipid)	Hexachlorobenzene Qualifier Code	Hexachlorobutadiene Measured Conc. (ug/kg)	Hexachlorobutadiene Norm. Conc.* (ug/g lipid)	Hexachlorobutadiene Qualifier Code	Hexachloroethane Measured Conc. (ug/kg)	Hexachloroethane Norm. Conc.* (ug/g lipid)	Hexachloroethane Qualifier Code	Hexachlorocyclopentadiene Measured Conc. (ug/kg)	Hexachlorocyclopentadiene Norm. Conc.* (ug/g lipid)	Hexachlorocyclopentadiene Qualifier Code
1C	D6	200		U	100		U	200		U	500		U
1C	D8	200		U	100		U	200		U	500		U
1C	D10	200		U	100		U	200		U	500		U
2A	D12	200		U	100		U	200		U	500		U
2B	D15	200		U	100		U	200		U	500		U
2C	D16	200		U	100		U	200		U	500		U
2C	D19	200		U	100		U	200		U	500		U
2C	D20	200		U	100		U	200		U	500		U
3A	D22	200		U	100		U	200		U	500		U
3A	D23	200		U	100		U	200		U	500		U
3A	D24	200		U	100		U	200		U	500		U
3B	D26	200		U	100		U	200		U	500		U
3B	D28	200		U	100		U	200		U	500		U
4A	D29	200		U	100		U	200		U	500		U
4A	D31	200		U	100		U	200		U	500		U
4A	D35	200		U	100		U	200		U	500		U
4A	D38	200		U	100		U	200		U	500		U
4B	D40	200		U	100		U	200		U	500		U
Tissue Reference Levels		na***			na***			na***			na***		

TABLE E2-9. SEMIVOLATILES IN CRAYFISH WHOLE-BODY COMPOSITES: BENZIDINES

River Segment	Station	3,3'-Dichlorobenzidine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	1000		U
1C	D8	1000		U
1C	D10	1000		U
2A	D12	1000		U
2B	D15	1000		U
2C	D16	1000		U
2C	D19	1000		U
2C	D20	1000		U
3A	D22	1000		U
3A	D23	1000		U
3A	D24	1000		U
3B	D26	1000		U
3B	D28	1000		U
4A	D29	1000		U
4A	D31	1000		U
4A	D35	1000		U
4A	D38	1000		U
4B	D40	1000		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

TABLE E2-10. SEMIVOLATILES IN CRAYFISH WHOLE-BODY COMPOSITES: PHTHALATE ESTERS

River Segment	Station	Dimethyl phthalate Measured Conc. (ug/kg)	Dimethyl phthalate Norm. Conc.* (ug/g lipid)	Dimethyl phthalate Qualifier Code	Diethyl phthalate Measured Conc. (ug/kg)	Diethyl phthalate Norm. Conc.* (ug/g lipid)	Diethyl phthalate Qualifier Code	Di-n-butyl phthalate Measured Conc. (ug/kg)	Di-n-butyl phthalate Norm. Conc.* (ug/g lipid)	Di-n-butyl phthalate Qualifier Code
1C	D6	100		U	200		U	100		U
1C	D8	100		U	200		U	100		U
1C	D10	100		U	200		U	100		U
2A	D12	100		U	200		U	100		U
2B	D15	100		U	200		U	100		U
2C	D16	100		U	200		U	100		U
2C	D19	100		U	200		U	100		U
2C	D20	100		U	200		U	100		U
3A	D22	100		U	200		U	100		U
3A	D23	100		U	200		U	110	10	
3A	D24	100		U	200		U	100		U
3B	D26	100		U	200		U	100		U
3B	D28	100		U	200		U	100		U
4A	D29	100		U	200		U	100		U
4A	D31	100		U	200		U	100		U
4A	D35	100		U	200		U	100		U
4A	D38	100		U	200		U	100		U
4B	D40	100		U	200		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Benzyl butyl phthalate Measured Conc. (ug/kg)	Benzyl butyl phthalate Norm. Conc.* (ug/g lipid)	Benzyl butyl phthalate Qualifier Code	bis(2-Ethylhexyl) phthalate Measured Conc. (ug/kg)	bis(2-Ethylhexyl) phthalate Norm. Conc.* (ug/g lipid)	bis(2-Ethylhexyl) phthalate Qualifier Code	Di-n-octyl phthalate Measured Conc. (ug/kg)	Di-n-octyl phthalate Norm. Conc.* (ug/g lipid)	Di-n-octyl phthalate Qualifier Code
1C	D6	100		U	100		U	200		U
1C	D8	100		U	140	7.8		200		U
1C	D10	100		U	200	13		200		U
2A	D12	100		U	100		U	200		U
2B	D15	100		U	140	8.9		200		U
2C	D16	100		U	170	11		200		U
2C	D19	100		U	150	6.3		200		U
2C	D20	100		U	120	69.0		200		U
3A	D22	100		U	980	129		200		U
3A	D23	100		U	100		U	200		U
3A	D24	100		U	470	36		200		U
3B	D26	100		U	3100	203		200		U
3B	D28	100		U	260	10		200		U
4A	D29	100		U	100		U	200		U
4A	D31	100		U	110	7.8		200		U
4A	D35	100		U	240	18		200		U
4A	D38	100		U	120	5.3		200		U
4B	D40	100		U	100		U	200		U

TABLE E2-11. PESTICIDES IN CRAYFISH WHOLE-BODY COMPOSITES

River Segment	Station	o,p-DDD Measured Conc. (ug/kg)	o,p-DDD Norm. Conc** (ug/g lipid)	o,p-DDD Qualifier Code	o,p-DDE Measured Conc. (ug/kg)	o,p-DDE Norm. Conc** (ug/g lipid)	o,p-DDE Qualifier Code	o,p-DDT Measured Conc. (ug/kg)	o,p-DDT Norm. Conc** (ug/g lipid)	o,p-DDT Qualifier Code	4,4'-DDD Measured Conc. (ug/kg)	4,4'-DDD Norm. Conc** (ug/g lipid)	4,4'-DDD Qualifier Code
1C	D6	3		U	3		U	3		U	3		U
1C	D8	3		U	3		U	3		U	5*		U
1C	D10	3		U	3		U	3		U	9.9	0.65	
2A	D12	3		U	3		U	3		U	3		U
2B	D15	3		U	3		U	3		U	9.6	0.61	
2C	D16	3		U	3		U	3		U	3		U
2C	D19	3		U	3		U	3		U	3		U
2C	D20	3		U	3		U	3		U	3		U
3A	D22	3		U	3		U	3		U	3		U
3A	D23	3		U	3		U	3	0.29		3		U
3A	D24	3		U	3		U	3		U	3		U
3B	D26	3		U	3		U	3		U	3		U
3B	D28	3		U	3		U	3		U	3		U
4A	D29	3		U	3		U	3		U	8*		U
4A	D31	3		U	3		U	3		U	3		U
4A	D35	3		U	3		U	3		U	7*		U
4A	D38	3		U	3		U	3		U	3		U
4B	D40	3		U	3		U	3		U	3		U
Tissue Reference Levels		200			200			200			200		

U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
* Reporting limits adjusted due to coeluting interfering peaks.
** Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	4,4'-DDE Measured Conc. (ug/kg)	4,4'-DDE Norm. Conc** (ug/g lipid)	4,4'-DDE Qualifier Code	4,4'-DDT Measured Conc. (ug/kg)	4,4'-DDT Norm. Conc** (ug/g lipid)	4,4'-DDT Qualifier Code	Heptachlor Measured Conc. (ug/kg)	Heptachlor Norm. Conc** (ug/g lipid)	Heptachlor Qualifier Code	Heptachlor epoxide Measured Conc. (ug/kg)	Heptachlor epoxide Norm. Conc** (ug/g lipid)	Heptachlor epoxide Qualifier Code
1C	D6	4.7	0.36		3		U	3		U	3		U
1C	D8	5.4	0.30		3		U	3		U	3		U
1C	D10	8.5	0.56		3		U	3		U	3		U
2A	D12	3.3	2.40		3		U	3		U	3		U
2B	D15	6.8	0.43		3		U	3		U	3		U
2C	D16	3.4	0.22		3		U	3		U	3		U
2C	D19	9.8	0.41		3		U	3		U	3		U
2C	D20	11	0.63		3	0.17		3		U	3		U
3A	D22	7.2	0.95		3		U	3		U	3		U/E
3A	D23	14	1.33		3		U	3		U	3		U
3A	D24	8.7	0.67		3		U	3		U	3		U
3B	D26	7.8	0.51		3		U	3		U	3		U
3B	D28	3		U	3		U	3		U	3		U
4A	D29	11	0.52		3		U	3		U	3		U
4A	D31	17	1.21		3		U	3		U	3		U
4A	D35	3		U	4*		U	3		U	3		U
4A	D38	17	0.76		3		U	4.5	0.20		3		U
4B	D40	6.1	0.48		3		U	3		U	3		U
Tissue Reference Levels		200			200			200			na***		

River Segment	Station	Chlordane Measured Conc. (ug/kg)	Chlordane Norm. Conc** (ug/g lipid)	Chlordane Qualifier Code	Aldrin Measured Conc. (ug/kg)	Aldrin Norm. Conc** (ug/g lipid)	Aldrin Qualifier Code	Dieldrin Measured Conc. (ug/kg)	Dieldrin Norm. Conc** (ug/g lipid)	Dieldrin Qualifier Code	Mirex Measured Conc. (ug/kg)	Mirex Norm. Conc** (ug/g lipid)	Mirex Qualifier Code
1C	D6	3		U	3		U	3		U	3		U
1C	D8	3		U	3		U	3		U	3		U
1C	D10	3		U	3		U	3		U	3		U
2A	D12	3		U	3		U	3		U	3		U
2B	D15	3		U	3		U	3		U	3		U
2C	D16	3		U	3		U	3		U	3		U
2C	D19	3		U	3		U	3		U	3		U
2C	D20	3		U	3		U	3		U	3		U
3A	D22	3		U	3		U/E	3		U/E	3		U
3A	D23	3		U	3		U/E	3		U/E	3		U
3A	D24	3		U	3		U/E	3		U/E	3		U
3B	D26	3		U	3		U/E	3		U/E	3		U
3B	D28	3		U	3		U	3		U	3		U
4A	D29	3		U	3		U	3		U	3		U
4A	D31	3		U	3		U	6.6	0.47		3		U
4A	D35	3		U	3		U	3		U	3		U
4A	D38	3		U	3		U	3		U	3		U
4B	D40	3		U	3		U	3		U	3		U
Tissue Reference Levels		na***			120			120			300		

River Segment	Station	Dacthal Measured Conc. (ug/kg)	Dacthal Norm. Conc** (ug/g lipid)	Dacthal Qualifier Code	Dicofol Measured Conc. (ug/kg)	Dicofol Norm. Conc** (ug/g lipid)	Dicofol Qualifier Code	Methyl parathion Measured Conc. (ug/kg)	Methyl parathion Norm. Conc** (ug/g lipid)	Methyl parathion Qualifier Code	Parathion Measured Conc. (ug/kg)	Parathion Norm. Conc** (ug/g lipid)	Parathion Qualifier Code
1C	D6	3		U	30		U	38	2.88		3		U
1C	D8	3		U	30		U	3		U	3		U
1C	D10	3		U	30		U	3		U	3		U
2A	D12	3		U	30		U	3		U	3		U
2B	D15	3		U	30		U	3		U	3		U
2C	D16	3		U	30		U	10	0.64		3		U
2C	D19	3		U	30		U	3		U	3		U
2C	D20	3		U	30		U	3		U	3		U
3A	D22	3		U	30		U	3		U	3		U
3A	D23	3		U	30		U	7*		U	3		U
3A	D24	3		U	30		U	17	1.31		3		U
3B	D26	3		U	30		U	3		U	3		U
3B	D28	3		U	30		U	3		U	3		U
4A	D29	3		U	30		U	8*		U	3		U
4A	D31	3		U	30		U	3		U	3		U
4A	D35	3		U	30		U	4*		U	3		U
4A	D38	3		U	30		U	3		U	3		U
4B	D40	3		U	30		U	3		U	3		U
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	Malathion			Toxaphene			Isophorone			Endosulfan I		
		Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code
1C	D6	3		U	150		U	100		U	3		U
1C	D8	3		U	150		U	120	6.7		3		U
1C	D10	3		U	150		U	100		U	3		U
2A	D12	3		U	150		U	100		U	3		U
2B	D15	3		U	150		U	100		U	3		U
2C	D16	3		U	150		U	100		U	3		U
2C	D19	3		U	150		U	430	17.9		3		U
2C	D20	3		U	150		U	100		U	3		U
3A	D22	3		U	150		U	110	14.5		3		U/E
3A	D23	3		U	150		U	100		U	3		U/E
3A	D24	3		U	150		U	210	16.2		3		U/E
3B	D26	3		U	150		U	280	18.3		3		U/E
3B	D28	3		U	150		U	330	12.8		3		U
4A	D29	3		U	150		U	100		U	3		U
4A	D31	3		U	150		U	310	22.0		3		U
4A	D35	3		U	150		U	100		U	3		U
4A	D38	3		U	150		U	100		U	3		U
4B	D40	3		U	150		U	100		U	3		U
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	Endosulfan II Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Endosulfan sulfate Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Endrin Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Endrin aldehyde Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code
1C	D6	3		U	3		U/E	3		U	3		U
1C	D8	3		U	3		U/E	3		U	3		U
1C	D10	3		U	3		U/E	3		U	3		U
2A	D12	3		U	3		U/E	3		U	3		U
2B	D15	3		U	3		U/E	3		U	3		U
2C	D16	3		U	3		E	3		U	3		U
2C	D19	3		U	3		U/E	3		U	3		U
2C	D20	3		U	3		U/E	3		U	3		U
3A	D22	3		U	3		U	3		U	3		U/E
3A	D23	3		U	3		U	3		U	3		U/E
3A	D24	3		U	3		U	3		U	3		U/E
3B	D26	3		U	3		U	3		U	3		U/E
3B	D28	3		U	3		U	3		U	3		U
4A	D29	7.6	0.36		3		U/E	4*		U	3		U
4A	D31	3		U	3		U	3		U	3		U
4A	D35	4*		U	3		U	3		U	3		U
4A	D38	3		U	3		U/E	3		U	3		U
4B	D40	3		U	3		U/E	3		U	3		U
Tissue Reference Levels		na***			na***			25			na***		

River Segment	Station	Methoxychlor Measured Conc. (ug/kg)	Methoxychlor Norm. Conc** (ug/g lipid)	Methoxychlor Qualifier Code	alpha-BHC Measured Conc. (ug/kg)	alpha-BHC Norm. Conc** (ug/g lipid)	alpha-BHC Qualifier Code	beta-BHC Measured Conc. (ug/kg)	beta-BHC Norm. Conc** (ug/g lipid)	beta-BHC Qualifier Code	delta-BHC Measured Conc. (ug/kg)	delta-BHC Norm. Conc** (ug/g lipid)	delta-BHC Qualifier Code
1C	D6	30		U/E	3		U	3		U	3		U
1C	D8	30		U/E	3		U	3		U	3		U
1C	D10	30		U/E	3		U	3		U	3		U
2A	D12	30		U/E	3		U	3		U	3		U
2B	D15	32	2.04	E	3		U	3		U	3		U
2C	D16	30		U/E	3		U	5.6	0.36		3		U
2C	D19	30		U/E	3		U	3		U	3		U
2C	D20	30		U/E	3		U	3		U	3		U
3A	D22	30		U	3		U	3		U	3		U/E
3A	D23	40*		U	3		U	3		U	3		U/E
3A	D24	34	2.62		3		U	3		U	3		U/E
3B	D26	30		U	3		U	3		U	3		U/E
3B	D28	30		U	3		U	3		U	3		U
4A	D29	30		U/E	3		U	3		U	3		U
4A	D31	30		U	3		U	3		U	3		U
4A	D35	30		U	3		U	3		U	3		U
4A	D38	30		U/E	3		U	4.1	0.18		3		U
4B	D40	30		U/E	3		U	3		U	3		U
Tissue Reference Levels		ns***			100			100			100		

River Segment	Station	gamma-BHC Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code
1C	D6	3		U
1C	D8	3		U
1C	D10	3		U
2A	D12	3		U
2B	D15	3		U
2C	D16	3		U
2C	D19	3		U
2C	D20	3		U
3A	D22	3		U
3A	D23	3		U
3A	D24	3		U
3B	D26	3		U
3B	D28	3		U
4A	D29	3		U
4A	D31	3		U
4A	D35	3		U
4A	D38	3		U
4B	D40	3		U
Tissue Reference Levels		100		

TABLE E2-12. PCBS IN CRAYFISH WHOLE-BODY COMPOSITES

River Segment	Station	Aroclor-1016 Measured Conc. (ug/kg)	Aroclor-1016 Norm. Conc.* (ug/g lipid)	Aroclor-1016 Qualifier Code	Aroclor-1221 Measured Conc. (ug/kg)	Aroclor-1221 Norm. Conc.* (ug/g lipid)	Aroclor-1221 Qualifier Code	Aroclor-1232 Measured Conc. (ug/kg)	Aroclor-1232 Norm. Conc.* (ug/g lipid)	Aroclor-1232 Qualifier Code	Aroclor-1242 Measured Conc. (ug/kg)	Aroclor-1242 Norm. Conc.* (ug/g lipid)	Aroclor-1242 Qualifier Code
1C	D6	50		U	50		U	50		U	50		U
1C	D8	50		U	50		U	50		U	50		U
1C	D10	50		U	50		U	50		U	50		U
2A	D12	50		U	50		U	50		U	50		U
2B	D15	50		U	50		U	50		U	50		U
2C	D16	50		U	50		U	50		U	50		U
2C	D19	50		U	50		U	50		U	50		U
2C	D20	50		U	50		U	50		U	50		U
3A	D22	50		U	50		U	50		U	50		U
3A	D23	50		U	50		U	50		U	50		U
3A	D24	50		U	50		U	50		U	50		U
3B	D26	50		U	50		U	50		U	50		U
3B	D28	50		U	50		U	50		U	50		U
4A	D29	50		U	50		U	50		U	50		U
4A	D31	50		U	50		U	50		U	50		U
4A	D35	50		U	50		U	50		U	50		U
4A	D38	50		U	50		U	50		U	50		U
4B	D40	50		U	50		U	50		U	50		U
Tissue Reference Levels		na**			na**			na**			na**		

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.
** Tissue reference level not available for this compound.

River Segment	Station	Aroclor-1248 Measured Conc. (ug/kg)	Aroclor-1248 Norm. Conc.* (ug/g lipid)	Aroclor-1248 Qualifier Code	Aroclor-1254 Measured Conc. (ug/kg)	Aroclor-1254 Norm. Conc.* (ug/g lipid)	Aroclor-1254 Qualifier Code	Aroclor-1260 Measured Conc. (ug/kg)	Aroclor-1260 Norm. Conc.* (ug/g lipid)	Aroclor-1260 Qualifier Code	Total Detected PCBs Measured Conc. (ug/kg)	Total Detected PCBs Norm. Conc.* (ug/g lipid)
1C	D6	50		U	50		U	50		U	0	
1C	D8	50		U	50		U	50		U	0	
1C	D10	50		U	50		U	50		U	0	
2A	D12	50		U	50		U	50		U	0	
2B	D15	50		U	50		U	50		U	0	
2C	D16	50		U	50		U	50		U	0	
2C	D19	50		U	50		U	50		U	0	
2C	D20	50		U	50		U	50		U	0	
3A	D22	50		U	50		U	50		U	0	
3A	D23	50		U	50		U	50		U	0	
3A	D24	50		U	50		U	50		U	0	
3B	D26	50		U	50		U	50		U	0	
3B	D28	50		U	50		U	50		U	0	
4A	D29	50		U	50		U	50		U	0	
4A	D31	50		U	50		U	50		U	0	
4A	D35	50		U	50		U	50		U	0	
4A	D38	50		U	50		U	50		U	0	
4B	D40	50		U	50		U	50		U	0	
Tissue Reference Levels		na**			na**			na**			110	

TABLE E2-13. DIOXINS AND FURANS IN CRAYFISH WHOLE-BODY COMPOSITES

River Segment	Station	2,3,7,8-TCDD Measured Conc. (pg/g)	2,3,7,8-TCDD Norm. Conc** (ng/g lipid)	2,3,7,8-TCDD Qualifier Code	1,2,3,7,8-PeCDD Measured Conc. (pg/g)	1,2,3,7,8-PeCDD Norm. Conc** (ng/g lipid)	1,2,3,7,8-PeCDD Qualifier Code	1,2,3,4,7,8-HxCDD Measured Conc. (pg/g)	1,2,3,4,7,8-HxCDD Norm. Conc** (ng/g lipid)	1,2,3,4,7,8-HxCDD Qualifier Code	1,2,3,6,7,8-HxCDD Measured Conc. (pg/g)	1,2,3,6,7,8-HxCDD Norm. Conc** (ng/g lipid)	1,2,3,6,7,8-HxCDD Qualifier Code
1C	D6	0.44	0.033	S	0.19		U/E	0.16		U/E	0.16		U/E
1C	D8	0.45	0.025	S	0.18		U/E	0.08		U/E	0.07		U/E
1C	D10	0.45	0.030	S	0.17		U/E	0.13		U/E	0.38	0.025	S/M
2B	D15	0.39	0.025	S/M	0.14		U/E	0.08		U/E	0.07		U/E
2C	D19	0.62	0.026		0.66		U/E	0.21		U/E	0.3		U/E
2C	D20	0.39	0.022	S/M	0.09		U/E	0.3		U/E	0.3		U/E
3A	D23	0.43	0.041	S	0.32		U/E	0.1		U/E	0.31	0.030	
3A	D24	0.47	0.036	S	0.83		U/E	0.39	0.030	S	0.89	0.068	S
3B	D28	0.86	0.033		0.32		U/E	0.16	0.006	S/M	0.32	0.012	S/M
4A	D35	0.4	0.030	S/M	0.48	0.036	S	0.15	0.011	S/M	0.53	0.039	S
4A	D38	0.4	0.018	S/M	0.27		U/E	0.24		U/E	0.25		U/E
4B	D40	0.27	0.021	S	0.22		U/E	0.2		U/E	0.19		U/E
Tissue Reference Levels		na***			na***			na***			na***		

U = Compound was not detected.
E = Analyte not detected at or above the sample specific Estimated Detection Limit (EDL). The EDL is reported.
L = Analyte not detected at or above the Lower Method Calibration Limit (LMCL). The LMCL is reported.
M = Estimated Maximum Possible Concentration.
MD = Estimated Maximum Possible Concentration with Diphenyl Ether interferences.
S = Analyte detected below the Lower Method Calibration Limit. Value should be considered an estimate.
* Obtained from a DB-225 column.
** Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	1,2,3,7,8,9-HxCDD Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,4,6,7,8-HpCDD Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	OCDD Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	2,3,7,8-TCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code
1C	D6	0.16		U/E	0.42	0.032	S/M	2.22	0.168	S	4.66	0.353	*
1C	D8	0.07		U/E	0.67	0.037	S/M	4.12	0.230	S	4.72	0.264	*
1C	D10	0.12		U/E	1.57	0.103	S	7.81	0.514		4.41	0.290	*
2B	D15	0.07		U/E	0.53	0.034	S/M	3.38	0.215	S	4.12	0.262	*
2C	D19	0.18		U/E	1.18	0.049	S	6.52	0.272		9.52	0.397	*
2C	D20	0.29		U/E	0.47	0.027	S	3.33	0.190	S	5.64	0.322	*
3A	D23	0.15	0.014	M	0.71	0.068	S	4.67	0.445	S	6.08	0.579	*
3A	D24	0.76	0.058	S/M	4.01	0.308		16.7	1.285		6.39	0.492	*
3B	D28	0.19		U/E	5.21	0.202		79.1	3.066		12.4	0.481	*
4A	D35	0.59	0.044	S	2.07	0.153	S	5.72	0.424		4.1	0.304	*
4A	D38	0.25		U/E	0.32		U/E	1.62	0.072	S/M	4.83	0.215	*
4B	D40	0.18		U/E	0.62	0.048	S	3.12	0.244	S	4.81	0.376	*
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	1,2,3,7,8-PeCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	2,3,4,7,8-PeCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,4,7,8-HxCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,6,7,8-HxCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code
1C	D6	0.14	0.011	S	0.23	0.017	S	0.27		U/E	0.27		U/E
1C	D8	0.11	0.006	S/M	0.22	0.012	S/M	0.24		U/E	0.22		U/E
1C	D10	0.16		U/E	0.24	0.016	S/M	0.26		U/E	0.25		U/E
2B	D15	0.19		U/E	0.29	0.018	S/M	0.09		U/E	0.09		U/E
2C	D19	1.02	0.043	S	3.05	0.127		0.35	0.015	S	0.24	0.010	S
2C	D20	0.17	0.010	S	0.2	0.011	S	0.09		U/E	0.1		U/E
3A	D23	0.25	0.024	S/M	0.42	0.040	S/M	0.07		U/E	0.06		U/E
3A	D24	0.67	0.052	S	0.98	0.075	S	0.36	0.028	S	0.32	0.025	S
3B	D28	0.39	0.015	S/M	0.85	0.033	S/M	0.28	0.011	S	0.32	0.012	S/M
4A	D35	0.3	0.022	S	0.48	0.036	S/M	0.21	0.016	S	0.18	0.013	S/M
4A	D38	0.42		U/E	0.29	0.013	S/M	0.42		U/E	0.4		U/E
4B	D40	0.26		U/E	0.22	0.017	S/M	0.32		U/E	0.31		U/E
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	2,3,4,6,7,8-HxCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,7,8,9-HxCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,4,6,7,8-HpCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,4,7,8,9-HpCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code
1C	D6	0.32		U/E	0.41		U/E	0.13		U/E	0.15		U/E
1C	D8	0.21	0.012	S/M	0.31		U/E	0.1		U/E	0.13		U/E
1C	D10	0.26	0.017	S	0.35		U/E	0.29	0.019	S	0.16		U/E
2B	D15	0.28	0.018	S	0.16		U/E	0.27	0.017	S/M	0.16		U/E
2C	D19	0.46	0.019	S	0.05		U/E	0.31		U/E	0.09		U/E
2C	D20	0.35	0.020	S	0.12		U/E	0.13		U/E	0.17		U/E
3A	D23	0.33	0.031	S	0.09		U/E	0.37	0.035	S/M	0.27		U/E
3A	D24	0.84	0.065	S	0.23	0.018	S	0.7	0.054	S	0.19	0.015	S
3B	D28	7.26	0.281		0.71		U/E	0.31	0.012	S/M	0.35		U/E
4A	D35	0.48	0.036	S	0.13	0.010	S/M	0.29	0.021	S	0.07		U/E
4A	D38	0.34	0.015	S/M	0.59		U/E	0.45	0.020	S/M	0.24		U/E
4B	D40	0.27	0.021	S/M	0.5		U/E	0.09		U/E	0.14		U/E
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	OCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	TEC (FULL) Calculated Conc. (pg/g)	TEC (HALF) Calculated Conc. (pg/g)	TEC (ZERO) Calculated Conc. (pg/g)
1C	D6	0.29		U/E	1.31	1.17	1.03
1C	D8	0.18		U/E	1.26	1.17	1.07
1C	D10	0.35		U/E	1.31	1.20	1.10
2B	D15	0.52		U/E	1.12	1.06	0.99
2C	D19	0.56	0.023	S	3.68	3.48	3.27
2C	D20	0.44		U/E	1.27	1.19	1.11
3A	D23	0.49	0.047	S/M	1.55	1.45	1.36
3A	D24	0.63	0.048	S	2.49	2.29	2.08
3B	D28	1.24	0.048	S/M	3.77	3.64	3.51
4A	D35	0.42	0.031	S/M	1.56	1.56	1.56
4A	D38	0.6	0.027	S/M	1.45	1.26	1.07
4B	D40	0.24		U/E	1.19	1.05	0.90
Tissue Reference Levels		na***			3	3	3

TABLE E3-1. CONCENTRATIONS OF METALS IN PEAMOUTH WHOLE-BODY COMPOSITES

River Segment	Station	Antimony Measured Conc. (mg/kg)	Antimony Qualifier Code	Arsenic Measured Conc. (mg/kg)	Arsenic Qualifier Code	Barium Measured Conc. (mg/kg)	Barium Qualifier Code	Cadmium Measured Conc. (mg/kg)	Cadmium Qualifier Code	Copper Measured Conc. (mg/kg)	Copper Qualifier Code	Lead Measured Conc. (mg/kg)	Lead Qualifier Code
1B	D3	0.36	U	0.48	U	2.4	E	0.02		1.60	E	0.12	E
1C	D10	0.35	U	0.47	U	2.3	E	0.07		1.73	E	0.09	E
2A	D12	0.33	U	0.44	U	2.6	E	0.04		1.27	E	0.10	E
2B	D15	0.33	U	0.44	U	4.2	E	0.08		27.81	E	1.35	E
2C	D16	0.35	U	0.46	U	2.2	E	0.02		0.90	E	0.06	E
2C	D19	0.31	U	0.41	U	2.5	E	0.02		1.20	E	0.10	E
2C	D21	0.36	U	0.48	U	2.0	E	0.02		1.65	E	0.08	E
3A	D23	0.32	U	0.43	U	1.9	E	0.02		1.10	E	0.07	E
3A	D24	0.37	U	0.49	U	3.2	E	0.05		8.54	E	0.34	E
3B	D28	0.32	U	0.42	U	3.2	E	0.04		2.06	E	0.05	E

U = Compound was not detected. Value given is the lower quantification limit.

E = Estimated value.

* Metals data normalized to wet weight.

River Segment	Station	Mercury Measured Conc. (mg/kg)	Mercury Qualifier Code	Nickel Measured Conc. (mg/kg)	Nickel Qualifier Code	Selenium Measured Conc. (mg/kg)	Selenium Qualifier Code	Silver Measured Conc. (mg/kg)	Silver Qualifier Code	Zinc Measured Conc. (mg/kg)	Zinc Qualifier Code
1B	D3	0.230	E	0.84	U/E	0.48	U	0.21	U/E	23.9	E
1C	D10	0.126	E	0.82	U/E	0.47	U	0.21	U/E	28.1	E
2A	D12	0.096	E	0.77	U/E	0.44	U	0.20	U/E	30.8	E
2B	D15	0.054	E	1.97	E	0.44	U	0.20	U/E	44.2	E
2C	D16	0.142	E	0.81	U/E	0.46	U	0.21	U/E	23.1	E
2C	D19	0.094	E	0.72	U/E	0.41	U	0.19	U/E	22.7	E
2C	D21	0.095	E	0.83	U/E	0.48	U	0.21	U/E	28.6	E
3A	D23	0.088	E	0.75	U/E	0.43	U	0.20	U/E	30.1	E
3A	D24	0.212	E	3.42	E	0.49	U	0.22	U/E	29.3	E
3B	D28	0.075	E	0.74	U/E	0.42	U	0.19	U/E	31.5	E

TABLE E3-2. PHENOLIC COMPOUNDS IN PEAMOUTH WHOLE-BODY COMPOSITES

River Segment	Station	Phenol Measured Conc. (ug/kg)	Phenol Norm. Conc.* (ug/g lipid)	Phenol Qualifier Code	2-Methylphenol Measured Conc. (ug/kg)	2-Methylphenol Norm. Conc.* (ug/g lipid)	2-Methylphenol Qualifier Code	4-Methylphenol Measured Conc. (ug/kg)	4-Methylphenol Norm. Conc.* (ug/g lipid)	4-Methylphenol Qualifier Code	2,4-Dimethylphenol Measured Conc. (ug/kg)	2,4-Dimethylphenol Norm. Conc.* (ug/g lipid)	2,4-Dimethylphenol Qualifier Code
1B	D3	200		U	400		U	400		U	200		U
1C	D10	100		U	200		U	200		U	100		U
2A	D12	100		U	200		U	200		U	100		U
2B	D15	100		U	200		U	200		U	100		U
2C	D16	100		U	200		U	200		U	100		U
2C	D19	100		U	200		U	200		U	100		U
2C	D21	100		U	200		U	200		U	100		U
3A	D23	100		U	200		U	200		U	100		U
3A	D24	100		U	200		U	200		U	100		U
3B	D28	100		U	200		U	200		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Pentachlorophenol Measured Conc. (ug/kg)	Pentachlorophenol Norm. Conc.* (ug/g lipid)	Pentachlorophenol Qualifier Code	2-Chlorophenol Measured Conc. (ug/kg)	2-Chlorophenol Norm. Conc.* (ug/g lipid)	2-Chlorophenol Qualifier Code	2,4-Dichlorophenol Measured Conc. (ug/kg)	2,4-Dichlorophenol Norm. Conc.* (ug/g lipid)	2,4-Dichlorophenol Qualifier Code	4-Chloro-3-methylphenol Measured Conc. (ug/kg)	4-Chloro-3-methylphenol Norm. Conc.* (ug/g lipid)	4-Chloro-3-methylphenol Qualifier Code
1B	D3	2000		U	200		U	400		U	400		U
1C	D10	1000		U	100		U	200		U	200		U
2A	D12	1000		U	100		U	200		U	200		U
2B	D15	1000		U	100		U	200		U	200		U
2C	D16	1000		U	100		U	200		U	200		U
2C	D19	1000		U	100		U	200		U	200		U
2C	D21	1000		U	100		U	200		U	200		U
3A	D23	1000		U	100		U	200		U	200		U
3A	D24	1000		U	100		U	200		U	200		U
3B	D28	1000		U	100		U	200		U	200		U

River Segment	Station	2,4-Dinitrophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	2-Nitrophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	4-Nitrophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	2,4,6-Trichlorophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	D3	2000		U	400		U	2000		U	400		U
1C	D10	1000		U	200		U	1000		U	200		U
2A	D12	1000		U	200		U	1000		U	200		U
2B	D15	1000		U	200		U	1000		U	200		U
2C	D16	1000		U	200		U	1000		U	200		U
2C	D19	1000		U	200		U	1000		U	200		U
2C	D21	1000		U	200		U	1000		U	200		U
3A	D23	1000		U	200		U	1000		U	200		U
3A	D24	1000		U	200		U	1000		U	200		U
3B	D28	1000		U	200		U	1000		U	200		U

TABLE E3-3. SEMIVOLATILES IN PEAMOUTH WHOLE-BODY COMPOSITES: HALOGENATED ETHERS

River Segment	Station	bis(2-Chloroethyl) ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	bis(2-Chloroethoxy) methane Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	bis(2-Chloroisopropyl) ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	D3	200		U	200		U	200		U
1C	D10	100		U	100		U	100		U
2A	D12	100		U	100		U	100		U
2B	D15	100		U	100		U	100		U
2C	D16	100		U	100		U	100		U
2C	D19	100		U	100		U	100		U
2C	D21	100		U	100		U	100		U
3A	D23	100		U	100		U	100		U
3A	D24	100		U	100		U	100		U
3B	D28	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	4-Bromophenyl phenyl ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	4-Chlorophenyl phenyl ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	D3	400		U	200		U
1C	D10	200		U	100		U
2A	D12	200		U	100		U
2B	D15	200		U	100		U
2C	D16	200		U	100		U
2C	D19	200		U	100		U
2C	D21	200		U	100		U
3A	D23	200		U	100		U
3A	D24	200		U	100		U
3B	D28	200		U	100		U

TABLE E3-4. SEMIVOLATILES IN PEAMOUTH WHOLE-BODY COMPOSITES: NITROAROMATICS

River Segment	Station	2,4-Dinitrotoluene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	2,6-Dinitrotoluene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Nitrobenzene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	D3	200		U	200		U	200		U
1C	D10	100		U	100		U	100		U
2A	D12	100		U	100		U	100		U
2B	D15	100		U	100		U	100		U
2C	D16	100		U	100		U	100		U
2C	D19	100		U	100		U	100		U
2C	D21	100		U	100		U	100		U
3A	D23	100		U	100		U	100		U
3A	D24	100		U	100		U	100		U
3B	D28	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

TABLE E3-5. SEMIVOLATILES IN PEAMOUTH WHOLE-BODY COMPOSITES: NITROSAMINES

River Segment	Station	N-Nitrosodi-n-propylamine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	N-Nitrosodiphenylamine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	D3	200		U	200		U
1C	D10	100		U	100		U
2A	D12	100		U	100		U
2B	D15	100		U	100		U
2C	D16	100		U	100		U
2C	D19	100		U	100		U
2C	D21	100		U	100		U
3A	D23	100		U	100		U
3A	D24	100		U	100		U
3B	D28	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

TABLE E3-6. SEMIVOLATILES IN PEAMOUTH WHOLE-BODY COMPOSITES: NAPHTHALENES

River Segment	Station	2-Chloronaphthalene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	2-Methylnaphthalene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	D3	200		U	200		U
1C	D10	100		U	100		U
2A	D12	100		U	100		U
2B	D15	100		U	100		U
2C	D16	100		U	100		U
2C	D19	100		U	100		U
2C	D21	100		U	100		U
3A	D23	100		U	100		U
3A	D24	100		U	100		U
3B	D28	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

TABLE E3-7. SEMIVOLATILES IN PEAMOUTH WHOLE-BODY COMPOSITES:
POLYNUCLEAR AROMATICS

River Segment	Station	Acenaphthene Measured Conc. (ug/kg)	Acenaphthene Norm. Conc.* (ug/g lipid)	Acenaphthene Qualifier Code	Acenaphthylene Measured Conc. (ug/kg)	Acenaphthylene Norm. Conc.* (ug/g lipid)	Acenaphthylene Qualifier Code	Anthracene Measured Conc. (ug/kg)	Anthracene Norm. Conc.* (ug/g lipid)	Anthracene Qualifier Code	Benzo(a)anthracene Measured Conc. (ug/kg)	Benzo(a)anthracene Norm. Conc.* (ug/g lipid)	Benzo(a)anthracene Qualifier Code
1B	D3	200		U	200		U	200		U	200		U
1C	D10	100		U	100		U	100		U	100		U
2A	D12	100		U	100		U	100		U	100		U
2B	D15	100		U	100		U	100		U	100		U
2C	D16	100		U	100		U	100		U	100		U
2C	D19	100		U	100		U	100		U	100		U
2C	D21	100		U	100		U	100		U	100		U
3A	D23	100		U	100		U	100		U	100		U
3A	D24	100		U	100		U	100		U	100		U
3B	D28	100		U	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Benzo(b)fluoranthene Measured Conc. (ug/kg)	Benzo(b)fluoranthene Norm. Conc.* (ug/g lipid)	Benzo(b)fluoranthene Qualifier Code	Benzo(k)fluoranthene Measured Conc. (ug/kg)	Benzo(k)fluoranthene Norm. Conc.* (ug/g lipid)	Benzo(k)fluoranthene Qualifier Code	Benzo(a)pyrene Measured Conc. (ug/kg)	Benzo(a)pyrene Norm. Conc.* (ug/g lipid)	Benzo(a)pyrene Qualifier Code	Benzo(g,h,i)perylene Measured Conc. (ug/kg)	Benzo(g,h,i)perylene Norm. Conc.* (ug/g lipid)	Benzo(g,h,i)perylene Qualifier Code
1B	D3	400		U	400		U	400		U	400		U
1C	D10	200		U	200		U	200		U	200		U
2A	D12	200		U	200		U	200		U	200		U
2B	D15	200		U	200		U	200		U	200		U
2C	D16	200		U	200		U	200		U	200		U
2C	D19	200		U	200		U	200		U	200		U
2C	D21	200		U	200		U	200		U	200		U
3A	D23	200		U	200		U	200		U	200		U
3A	D24	200		U	200		U	200		U	200		U
3B	D28	200		U	200		U	200		U	200		U

River Segment	Station	Chrysene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Dibenzo(a,h)anthracene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Fluoranthene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Fluorene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	D3	200		U	400		U	200		U	200		U
1C	D10	100		U	200		U	100		U	100		U
2A	D12	100		U	200		U	100		U	100		U
2B	D15	100		U	200		U	100		U	100		U
2C	D16	100		U	200		U	100		U	100		U
2C	D19	100		U	200		U	100		U	100		U
2C	D21	100		U	200		U	100		U	100		U
3A	D23	100		U	200		U	100		U	100		U
3A	D24	100		U	200		U	100		U	100		U
3B	D28	100		U	200		U	100		U	100		U

River Segment	Station	Indeno(1,2,3-c,d)pyrene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Naphthalene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Phenanthrene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Pyrene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	D3	400		U	200		U	200		U	200		U
1C	D10	200		U	100		U	100		U	100		U
2A	D12	200		U	100		U	100		U	100		U
2B	D15	200		U	100		U	100		U	100		U
2C	D16	200		U	100		U	100		U	100		U
2C	D19	200		U	100		U	100		U	100		U
2C	D21	200		U	100		U	100		U	100		U
3A	D23	200		U	100		U	100		U	100		U
3A	D24	200		U	100		U	100		U	100		U
3B	D28	200		U	100		U	100		U	100		U

TABLE E3-8. SEMIVOLATILES IN PEAMOUTH WHOLE-BODY COMPOSITES: CHLORINATED BENZENES

River Segment	Station	1,3-Dichlorobenzene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	1,2-Dichlorobenzene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	1,4-Dichlorobenzene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	1,2,4-Trichlorobenzene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	D3	200		U	200		U	200		U	400		U
1C	D10	100		U	100		U	100		U	200		U
2A	D12	100		U	100		U	100		U	200		U
2B	D15	100		U	100		U	100		U	200		U
2C	D16	100		U	100		U	100		U	200		U
2C	D19	100		U	100		U	100		U	200		U
2C	D21	100		U	100		U	100		U	200		U
3A	D23	100		U	100		U	100		U	200		U
3A	D24	100		U	100		U	100		U	200		U
3B	D28	100		U	100		U	100		U	200		U
Tissue Reference Levels		na***			na***			na***			1300		

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

*** Tissue reference level not available for this compound.

River Segment	Station	Hexachlorobenzene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Hexachlorobutadiene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Hexachloroethane Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Hexachlorocyclopentadiene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	D3	400		U	200		U	400		U	1000		U
1C	D10	200		U	100		U	200		U	500		U
2A	D12	200		U	100		U	200		U	500		U
2B	D15	200		U	100		U	200		U	500		U
2C	D16	200		U	100		U	200		U	500		U
2C	D19	200		U	100		U	200		U	500		U
2C	D21	200		U	100		U	200		U	500		U
3A	D23	200		U	100		U	200		U	500		U
3A	D24	200		U	100		U	200		U	500		U
3B	D28	200		U	100		U	200		U	500		U
Tissue Reference Levels		na***			na***			na***			na***		

TABLE E3-9. SEMIVOLATILES IN PEAMOUTH WHOLE-BODY COMPOSITES: BENZIDINES

River Segment	Station	3,3'-Dichlorobenzidine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	D3	2000		U
1C	D10	1000		U
2A	D12	1000		U
2B	D15	1000		U
2C	D16	1000		U
2C	D19	1000		U
2C	D21	1000		U
3A	D23	1000		U
3A	D24	1000		U
3B	D28	1000		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

TABLE E3-10. SEMIVOLATILES IN PEAMOUTH WHOLE-BODY COMPOSITES: PHTHALATE ESTERS

River Segment	Station	Dimethyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Diethyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Di-n-butyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	D3	200		U	400		U	200		U
1C	D10	100		U	200		U	100		U
2A	D12	100		U	200		U	100		U
2B	D15	100		U	200		U	100		U
2C	D16	100		U	200		U	100		U
2C	D19	100		U	200		U	100		U
2C	D21	100		U	200		U	100		U
3A	D23	100		U	200		U	100		U
3A	D24	100		U	200		U	100		U
3B	D28	100		U	200		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Benzyl butyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	bis(2-Ethylhexyl) phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Di-n-octyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	D3	200		U	740	6.1		400		U
1C	D10	100		U	190	4.9		200		U
2A	D12	100		U	260	6.2		200		U
2B	D15	100		U	100		U	200		U
2C	D16	100		U	270	4.6		200		U
2C	D19	100		U	200	3.2		200		U
2C	D21	100		U	180	2.6		200		U
3A	D23	100		U	770	9.5		200		U
3A	D24	100		U	310	6.1		200		U
3B	D28	100		U	210	8.7		200		U

TABLE E3-11. PESTICIDES IN PEAMOUTH WHOLE-BODY COMPOSITES

River Segment	Station	o,p-DDD Measured Conc. (ug/kg)	o,p-DDD Norm. Conc** (ug/g lipid)	o,p-DDD Qualifier Code	o,p-DDE Measured Conc. (ug/kg)	o,p-DDE Norm. Conc** (ug/g lipid)	o,p-DDE Qualifier Code	o,p-DDT Measured Conc. (ug/kg)	o,p-DDT Norm. Conc** (ug/g lipid)	o,p-DDT Qualifier Code	4,4'-DDD Measured Conc. (ug/kg)	4,4'-DDD Norm. Conc** (ug/g lipid)	4,4'-DDD Qualifier Code
1B	D3	49	0.40		47	0.39	E	25		U	50*		U
1C	D10	25		U/E	25		U/E	25		U/E	30*		U/E
2A	D12	3		U	3		U	3		U	3		U
2B	D15	10*		U	3		U	3		U	38	0.65	
2C	D16	3		U	3		U	3		U	3		U
2C	D19	25		U	25		U	25		U	38	0.61	
2C	D21	25		U	25		U	25		U	30*		U
3A	D23	25		U	25		U	25		U	72	0.89	
3A	D24	25		U	25		U	25		U	30*		U
3B	D28	25		U	25		U	25		U	25		U
Tissue Reference Levels		200			200			200			200		

U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
* Reporting limits adjusted due to coeluting interfering peaks.
** Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	4,4'-DDE Measured Conc. (ug/kg)	4,4'-DDE Norm. Conc** (ug/g lipid)	4,4'-DDE Qualifier Code	4,4'-DDT Measured Conc. (ug/kg)	4,4'-DDT Norm. Conc** (ug/g lipid)	4,4'-DDT Qualifier Code	Heptachlor Measured Conc. (ug/kg)	Heptachlor Norm. Conc** (ug/g lipid)	Heptachlor Qualifier Code	Heptachlor epoxide Measured Conc. (ug/kg)	Heptachlor epoxide Norm. Conc** (ug/g lipid)	Heptachlor epoxide Qualifier Code
1B	D3	270	2.21	E	25		U	25		U	25		U
1C	D10	55*		U/E	25		U/E	25		U/E	25		U/E
2A	D12	3		U	3		U	3		U	3		U
2B	D15	83	1.41		3		U	3		U	3		U
2C	D16	3		U	3		U	8*		U	3		U
2C	D19	140	2.25	E	25		U	25		U	25		U
2C	D21	170	2.47	E	25		U	25		U	25		U
3A	D23	200	2.48	E	25		U	25		U	25		U
3A	D24	480	9.60	E	25		U	25		U	25		U
3B	D28	82	3.39	E	25		U	25		U	25		U
Tissue Reference Levels		200			200			200			na***		

River Segment	Station	Chlordane			Aldrin			Dieldrin			Mirex		
		Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code
1B	D3	25		U	25		U	40*		U	25		U
1C	D10	25		U/E	25		U/E	25		U/E	25		U/E
2A	D12	3		U	3		U	3		U	3		U
2B	D15	3		U	11	0.19		3		U	3		U
2C	D16	3		U	3.7	0.06		3		U	3		U
2C	D19	25		U	67		U	25		U	25		U
2C	D21	25		U	42	0.61		35	0.51		25		U
3A	D23	25		U	25		U	32	0.40		25		U
3A	D24	25		U	25		U	25		U	25		U
3B	D28	25		U	25		U	25		U	25		U
Tissue Reference Levels		na***			120			120			300		

River Segment	Station	Dacthal			Dicofol			Methyl parathion			Parathion		
		Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code
1B	D3	25		U	250		U	25		U	26	0.21	E
1C	D10	25		U/E	250		U/E	25		U/E	25		U/E
2A	D12	3		U	30		U	3		U	3		U
2B	D15	3		U	30		U	15*		U	3		U
2C	D16	13	0.22		30		U	3		U	3		U
2C	D19	25		U	250		U	25		U	35*		U
2C	D21	25		U	250		U	25		U	25		U
3A	D23	25		U	250		U	25		U	25		U
3A	D24	25		U	250		U	25		U	25		U
3B	D28	25		U	250		U	25		U	25		U
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	Malathion			Toxaphene			Isophorone			Endosulfan I		
		Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code
1B	D3	25		U	1500		U	200		U	45	0.37	
1C	D10	110	2.82	E	1500		U/E	100		U/E	25		U/E
2A	D12	3		U	150		U	100		U	3		U
2B	D15	3		U	150		U	100		U	5*		U
2C	D16	3		U	150		U	100		U	3		U
2C	D19	25		U	1500		U	100		U	60*		U
2C	D21	25		U	1500		U	100		U	69	1.00	
3A	D23	25		U	1500		U	100		U	85	1.05	
3A	D24	66	1.31		1500		U	100		U	25		U
3B	D28	25		U	1500		U	100		U	25		U
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	Endosulfan II			Endosulfan sulfate			Endrin			Endrin aldehyde		
		Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc** (ug/g lipid)	Qualifier Code
1B	D3	25		U	25		U	25		U/E	40*		U
1C	D10	25		U/E	25		U/E	25		U/E	25		U/E
2A	D12	3		U	3		U	3		U/E	3		U
2B	D15	3		U	3		U	3		U	3		U
2C	D16	3		U	3		U	3		U	3		U
2C	D19	25		U	25		U	25		U/E	30*		U
2C	D21	25		U	25		U	25		U/E	40	0.68	
3A	D23	25		U	25		U	25		U/E	25		U
3A	D24	25		U	25		U	25		U/E	25		U
3B	D28	25		U	25		U	25		U/E	25		U
Tissue Reference Levels		na***			na***			25			na***		

River Segment	Station	Methoxychlor Measured Conc. (ug/kg)	Methoxychlor Norm. Conc** (ug/g lipid)	Methoxychlor Qualifier Code	alpha-BHC Measured Conc. (ug/kg)	alpha-BHC Norm. Conc** (ug/g lipid)	alpha-BHC Qualifier Code	beta-BHC Measured Conc. (ug/kg)	beta-BHC Norm. Conc** (ug/g lipid)	beta-BHC Qualifier Code	delta-BHC Measured Conc. (ug/kg)	delta-BHC Norm. Conc** (ug/g lipid)	delta-BHC Qualifier Code
1B	D3	250		U	25		U	100*		U	40*		U
1C	D10	250		U/E	25		U/E	40*		U/E	25		U/E
2A	D12	30		U	3		U	13	0.31		3		U
2B	D15	30		U	3		U	3		U	3		U
2C	D16	30		U	3		U	25*		U	9*		U
2C	D19	250		U	25		U	25		U	25		U
2C	D21	250		U	25		U	150	2.18		25		U
3A	D23	250		U	25		U	160*		U	25		U
3A	D24	250		U	25		U	50*		U	25		U
3B	D28	250		U	25		U	25		U	25		U
Tissue Reference Levels		na***			100			100			100		

River Segment	Station	gamma-BHC Measured Conc. (ug/kg)	gamma-BHC Norm. Conc** (ug/g lipid)	gamma-BHC Qualifier Code
1B	D3	40*		U
1C	D10	25		U/E
2A	D12	3		U
2B	D15	14	0.24	
2C	D16	3		U
2C	D19	40*		U
2C	D21	40*		U
3A	D23	25		U
3A	D24	25		U
3B	D28	25		U
Tissue Reference Levels		100		

TABLE E3-12. PCBS IN PEAMOUTH WHOLE-BODY COMPOSITES

River Segment	Station	Aroclor-1016 Measured Conc. (ug/kg)	Aroclor-1016 Norm. Conc.* (ug/g lipid)	Aroclor-1016 Qualifier Code	Aroclor-1221 Measured Conc. (ug/kg)	Aroclor-1221 Norm. Conc.* (ug/g lipid)	Aroclor-1221 Qualifier Code	Aroclor-1232 Measured Conc. (ug/kg)	Aroclor-1232 Norm. Conc.* (ug/g lipid)	Aroclor-1232 Qualifier Code	Aroclor-1242 Measured Conc. (ug/kg)	Aroclor-1242 Norm. Conc.* (ug/g lipid)	Aroclor-1242 Qualifier Code
1B	D3	50		U	50		U	50		U	99	0.8	
1C	D10	50		U	50		U	50		U	50		U
2A	D12	50		U	50		U	50		U	50		U
2B	D15	50		U	50		U	50		U	50		U
2C	D16	50		U	50		U	50		U	50		U
2C	D19	50		U	50		U	50		U	50		U
2C	D21	50		U	50		U	50		U	50		U
3A	D23	50		U	50		U	50		U	50		U
3A	D24	50		U	50		U	50		U	50		U
3B	D28	50		U	50		U	50		U	78	3.2	
Tissue Reference Levels		na***			na***			na***			na***		

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	Aroclor-1248 Measured Conc. (ug/kg)	Aroclor-1248 Norm. Conc.* (ug/g lipid)	Aroclor-1248 Qualifier Code	Aroclor-1254 Measured Conc. (ug/kg)	Aroclor-1254 Norm. Conc.* (ug/g lipid)	Aroclor-1254 Qualifier Code	Aroclor-1260 Measured Conc. (ug/kg)	Aroclor-1260 Norm. Conc.* (ug/g lipid)	Aroclor-1260 Qualifier Code	Total Detected PCBs Measured Conc. (ug/kg)	Total Detected PCBs Norm. Conc.* (ug/g lipid)
1B	D3	50		U	50		U	280	2.3		379	3.1
1C	D10	50		U	50		U	80	2.1		80	2.1
2A	D12	50		U	50		U	130	3.1		130	3.1
2B	D15	50		U	50		U	170	2.9		170	2.9
2C	D16	50		U	50		U	120	2.0		120	2.0
2C	D19	50		U	50		U	180	2.9		180	2.9
2C	D21	50		U	50		U	160	2.3		160	2.3
3A	D23	50		U	50		U	170	2.1		170	2.1
3A	D24	50		U	50		U	520	10.3		520	10.3
3B	D28	50		U	50		U	86	3.6		164	6.8
Tissue Reference Levels		na***			na***			na***			110	

TABLE E3-13. DIOXINS AND FURANS IN PEAMOUTH WHOLE-BODY COMPOSITES

River Segment	Station	2,3,7,8-TCDD Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,7,8-PeCDD Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,4,7,8-HxCDD Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,6,7,8-HxCDD Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code
1C	D10	2.32	0.059		0.5	0.013	S	0.11	0.003	S/M	0.31	0.008	S
2B	D15	1.44	0.024		0.31	0.005	S	0.11	0.002	S	0.39	0.007	S
2C	D19	3.29	0.053		0.7	0.011	S	0.14	0.002	S	0.51	0.008	S
2C	D21	2.77	0.040		0.76	0.011	S	0.21	0.003	S/M	0.63	0.009	S
3A	D23	3.1	0.038		0.83	0.010	S	0.39	0.005	S/M	0.62	0.008	S/M
3A	D24	4.41	0.087		2.04	0.040	S/M	0.87	0.017	S/M	1.16	0.023	S
3B	D28	2	0.083		0.66	0.027	S	0.2	0.008	S/M	0.59	0.024	S
Tissue Reference Levels		na***			na***			na***			na***		

U = Compound was not detected.
E = Analyte not detected at or above the sample specific Estimated Detection Limit (EDL). The EDL is reported.
L = Analyte not detected at or above the Lower Method Calibration Limit (LMCL). The LMCL is reported.
M = Estimated Maximum Possible Concentration.
S = Analyte detected below the Lower Method Calibration Limit. Value should be considered an estimate.
* Obtained from a DB-225 column.
** Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	1,2,3,7,8,9-HxCDD Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	1,2,3,4,6,7,8-HpCDD Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	OCDD Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code	2,3,7,8-TCDF Measured Conc. (pg/g)	Norm. Conc** (ng/g lipid)	Qualifier Code
1C	D10	0.14	0.004	S	0.65	0.017	S	3.62	0.093	S	40	1.026	*
2B	D15	0.12	0.002	S/M	0.74	0.013	S	5.67	0.096		22.2	0.377	*
2C	D19	0.15	0.002	S	0.73	0.012	S	4.47	0.072	S	52.1	0.838	*
2C	D21	0.18	0.003	S	1.09	0.016	S	4.21	0.061	S	41.2	0.598	
3A	D23	0.29	0.004	S/M	0.24	0.003	S	3.91	0.048	S	42.5	0.527	*
3A	D24	0.47		U/E	2.81	0.056		18.1	0.358		58.8	1.164	*
3B	D28	0.22	0.009	S	1.83	0.076	S/M	8.4	0.347		32.5	1.343	*
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	1,2,3,7,8-PeCDF Measured Conc. (pg/g)	1,2,3,7,8-PeCDF Norm. Conc** (ng/g lipid)	1,2,3,7,8-PeCDF Qualifier Code	2,3,4,7,8-PeCDF Measured Conc. (pg/g)	2,3,4,7,8-PeCDF Norm. Conc** (ng/g lipid)	2,3,4,7,8-PeCDF Qualifier Code	1,2,3,4,7,8-HxCDF Measured Conc. (pg/g)	1,2,3,4,7,8-HxCDF Norm. Conc** (ng/g lipid)	1,2,3,4,7,8-HxCDF Qualifier Code	1,2,3,6,7,8-HxCDF Measured Conc. (pg/g)	1,2,3,6,7,8-HxCDF Norm. Conc** (ng/g lipid)	1,2,3,6,7,8-HxCDF Qualifier Code
1C	D10	0.31	0.008	S	0.59	0.015	S	0.11		U/E	0.1		U/E
2B	D15	0.24	0.004	S	0.55	0.009	S	0.12	0.002	S	0.05	0.001	S
2C	D19	0.58	0.009	S/M	0.94	0.015	S	0.13	0.002	S	0.07	0.001	S/M
2C	D21	0.56	0.008	S	0.9	0.013	S	0.16	0.002	S	0.06	0.001	S/M
3A	D23	0.65	0.008	S/M	0.95	0.012	S/M	0.71		U/E	0.64		U/E
3A	D24	0.86	0.017	S	2.46	0.049	S	0.56	0.011	S/M	0.44	0.009	S/M
3B	D28	0.38	0.016	S	0.82	0.034	S	0.24	0.010	S	0.13	0.005	S
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	2,3,4,6,7,8-HxCDF Measured Conc. (pg/g)	2,3,4,6,7,8-HxCDF Norm. Conc** (ng/g lipid)	2,3,4,6,7,8-HxCDF Qualifier Code	1,2,3,7,8,9-HxCDF Measured Conc. (pg/g)	1,2,3,7,8,9-HxCDF Norm. Conc** (ng/g lipid)	1,2,3,7,8,9-HxCDF Qualifier Code	1,2,3,4,6,7,8-HpCDF Measured Conc. (pg/g)	1,2,3,4,6,7,8-HpCDF Norm. Conc** (ng/g lipid)	1,2,3,4,6,7,8-HpCDF Qualifier Code	1,2,3,4,7,8,9-HpCDF Measured Conc. (pg/g)	1,2,3,4,7,8,9-HpCDF Norm. Conc** (ng/g lipid)	1,2,3,4,7,8,9-HpCDF Qualifier Code
1C	D10	0.26	0.007	S/M	0.15		U/E	0.21	0.005	S	0.06	0.002	S/M
2B	D15	0.25	0.004	S	0.08		U/E	0.16	0.003	S/M	0.04	0.001	S
2C	D19	0.23	0.004	S/M	0.11		U/E	0.2	0.003	S	0.08		U/E
2C	D21	0.29	0.004	S	0.14		U/E	0.18	0.003	S	0.07	0.001	S/M.
3A	D23	1.38		U/E	1.09		U/E	0.17		U/E	0.18		U/E
3A	D24	1.61		U/E	1.38		U/E	0.74	0.015	S	0.5		U/E
3B	D28	0.32	0.013	S	0.26		U/E	0.43	0.018	S	0.18	0.007	S/M
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	OCDF Measured Conc. (pg/g)	OCDF Norm. Conc** (ng/g lipid)	OCDF Qualifier Code	TEC (FULL) Calculated Conc. (pg/g)	TEC (HALF) Calculated Conc. (pg/g)	TEC (ZERO) Calculated Conc. (pg/g)
1C	D10	0.31	0.008	S	7.01	6.99	6.98
2B	D15	0.38	0.006	S	4.23	4.23	4.22
2C	D19	0.53	0.009	S	9.50	9.49	9.49
2C	D21	0.41	0.006	S/M	7.93	7.93	7.92
3A	D23	1.18		U/E	8.80	8.60	8.41
3A	D24	2.03	0.040	S	13.29	13.12	12.94
3B	D28	1.01	0.042	S/M	6.24	6.23	6.21
Tissue Reference Levels		na***			3	3	3

APPENDIX E4. WHITE STURGEON TISSUE BIOACCUMULATION DATA

(Note: All concentrations are presented on a wet-weight basis.)

TABLE E4-1. CONCENTRATIONS OF METALS IN WHITE STURGEON STEAKS

River Segment	Station	Antimony Measured Conc. (mg/kg)	Antimony Qualifier Code	Arsenic Measured Conc. (mg/kg)	Arsenic Qualifier Code	Barium Measured Conc. (mg/kg)	Barium Qualifier Code	Cadmium Measured Conc. (mg/kg)	Cadmium Qualifier Code	Copper Measured Conc. (mg/kg)	Copper Qualifier Code	Lead Measured Conc. (mg/kg)	Lead Qualifier Code
1B	RM 15	0.33	U	0.49		0.2	U/E	0.02	U	0.66	U/E	0.06	E
1B	RM 18.5	0.35	U	0.46	U	0.2	U/E	0.02	U	0.69	U/E	0.02	E
1C	RM 21	0.20	U	0.26	U	0.1	U/E	0.01	U	0.45	E	0.01	E
1C	RM 21	1.00	U	0.27	U	0.5	U/E	0.07	U	2.00	U/E	0.07	E
1C	RM 27	0.45	U/E	0.40		0.2	U/E	0.03	U	0.90	U/E	0.03	E
2B	RM 49	2.16	U	0.29	U	0.1	U/E	0.02	U	0.43	U/E	0.02	E
2B	RM 49	0.32	U	1.38		0.2	U/E	0.02	U	0.63	U/E	0.02	E
2B	RM 49	0.33	U	1.07		0.2	U/E	0.02	U	0.65	U/E	0.02	E
2C	RM 67	0.26	U	1.86		0.1	U/E	0.02	U	0.53	U/E	0.02	E
3A	RM 75	0.30	U	0.40	U	0.2	U/E	0.04		0.60	U/E	1.12	E
3A	RM 75	0.34	U	0.45	U	0.2	U/E	0.02	U	0.68	U/E	0.07	E
3A	RM 75	0.34	U	0.55	U	0.2	U/E	0.02	U	0.68	U/E	0.02	E
3A	RM 80	0.31	U	0.42	U	0.2	U/E	0.02	U	0.63	U/E	0.02	E
4A	RM 103	0.33	U/E	0.44	U	0.2	U/E	0.02	U	0.66	U/E	0.02	E
4A	RM 115	0.33	U/E	0.44	U	0.2	U/E	0.02		0.66	U/E	0.04	E
4B	RM 127	2.40	U	0.27		0.1	U/E	0.02	U	0.48	U/E	0.02	E
4B	RM 136	2.20	U	0.84		0.1	U/E	0.02	U	0.50	E	0.04	E

U = Compound was not detected. Value given is the lower quantification limit.

E = Estimated value.

* Metals data normalized to wet weight

River Segment	Station	Mercury Measured Conc. (mg/kg)	Mercury Qualifier Code	Nickel Measured Conc. (mg/kg)	Nickel Qualifier Code	Selenium Measured Conc. (mg/kg)	Selenium Qualifier Code	Silver Measured Conc. (mg/kg)	Silver Qualifier Code	Zinc Measured Conc. (mg/kg)	Zinc Qualifier Code
1B	RM 15	0.012	U/E	0.76	U/E	0.44	U	0.20	U/E	5.0	E
1B	RM 18.5	0.047	E	0.81	U/E	0.46	U	0.21	U/E	1.8	U/E
1C	RM 21	0.110	E	0.46	U/E	0.26	U	0.12	U/E	3.4	E
1C	RM 21	0.521	E	2.33	U/E	0.27	U	0.60	U/E	16.0	E
1C	RM 27	0.051	E	1.05	U/E	0.52	U	0.27	U/E	6.3	E
2B	RM 49	0.068	E	0.50	U/E	0.29	U	0.23	E	2.3	E
2B	RM 49	0.058	E	0.74	U/E	0.42	U	0.19	U/E	3.8	E
2B	RM 49	0.106	E	0.76	U/E	0.40	U	0.20	U/E	5.2	E
2C	RM 67	0.094	E	0.61	U/E	0.35	U	0.16	U/E	5.4	E
3A	RM 75	0.347	E	0.70	U/E	0.40	U	0.18	U/E	5.2	E
3A	RM 75	0.094	E	0.80	U/E	0.45	U	0.21	U/E	3.9	E
3A	RM 75	0.013	U/E	0.80	U/E	0.55	U	0.21	U/E	3.9	E
3A	RM 80	0.127	E	0.73	U/E	0.42	U	0.19	U/E	4.0	E
4A	RM 103	0.021	E	0.77	U/E	0.44	U	0.20	U/E	3.7	E
4A	RM 115	0.045	E	0.77	U/E	0.44	U	0.20	U/E	5.7	E
4B	RM 127	0.061	E	0.56	U/E	0.32	U	0.14	U/E	3.8	E
4B	RM 136	0.076	E	0.59	E	0.29	U	0.13	U/E	4.2	E

TABLE E4-2. PHENOLIC COMPOUNDS IN WHITE STURGEON STEAKS

River Segment	Station	Phenol			2-Methylphenol			4-Methylphenol			2,4-Dimethylphenol		
		Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	100		U	200		U	200		U	100		U
1B	RM 18.5	100		U	200		U	200		U	100		U
1C	RM 20	100		U	200		U	200		U	100		U
1C	RM 21	100		U	200		U	200		U	100		U
1C	RM 21	100		U	200		U	200		U	100		U
1C	RM 27	100		U	200		U	200		U	100		U
2B	RM 49	100		U	200		U	200		U	100		U
2B	RM 49	100		U	200		U	200		U	100		U
2B	RM 49	100		U	200		U	200		U	100		U
2C	RM 67	100		U/E	200		U/E	200		U/E	100		U/E
3A	RM 75	100		U	200		U	200		U	100		U
3A	RM 75	100		U	200		U	200		U	100		U
3A	RM 75	100		U	200		U	200		U	100		U
3A	RM 80	100		U	200		U	200		U	100		U
4A	RM 103	100		U	200		U	200		U	100		U
4A	RM 115	100		U	200		U	200		U	100		U
4B	RM 127	100		U	200		U	200		U	100		U
4B	RM 136	100		U	200		U	200		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
E = Value estimated.
* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Pentachlorophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	2-Chlorophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	2,4-Dichlorophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	4-Chloro-3-methylphenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	1000		U	100		U	200		U	200		U
1B	RM 18.5	1000		U	100		U	200		U	200		U
1C	RM 20	1000		U	100		U	200		U	200		U
1C	RM 21	1000		U	100		U	200		U	200		U
1C	RM 21	1000		U	100		U	200		U	200		U
1C	RM 27	1000		U	100		U	200		U	200		U
2B	RM 49	1000		U	100		U	200		U	200		U
2B	RM 49	1000		U	100		U	200		U	200		U
2B	RM 49	1000		U	100		U	200		U	200		U
2C	RM 67	1000		U/E	100		U/E	200		U/E	200		U/E
3A	RM 75	1000		U	100		U	200		U	200		U
3A	RM 75	1000		U	100		U	200		U	200		U
3A	RM 75	1000		U	100		U	200		U	200		U
3A	RM 80	1000		U	100		U	200		U	200		U
4A	RM 103	1000		U	100		U	200		U	200		U
4A	RM 115	1000		U	100		U	200		U	200		U
4B	RM 127	1000		U	100		U	200		U	200		U
4B	RM 136	1000		U	100		U	200		U	200		U

River Segment	Station	2,4-Dinitrophenol Measured Conc. (ug/kg)	2,4-Dinitrophenol Norm. Conc.* (ug/g lipid)	2,4-Dinitrophenol Qualifier Code	2-Nitrophenol Measured Conc. (ug/kg)	2-Nitrophenol Norm. Conc.* (ug/g lipid)	2-Nitrophenol Qualifier Code	4-Nitrophenol Measured Conc. (ug/kg)	4-Nitrophenol Norm. Conc.* (ug/g lipid)	4-Nitrophenol Qualifier Code	2,4,6-Trichlorophenol Measured Conc. (ug/kg)	2,4,6-Trichlorophenol Norm. Conc.* (ug/g lipid)	2,4,6-Trichlorophenol Qualifier Code
1B	RM 15	1000		U	200		U	1000		U	200		U
1B	RM 18.5	1000		U	200		U	1000		U	200		U
1C	RM 20	1000		U	200		U	1000		U	200		U
1C	RM 21	1000		U	200		U	1000		U	200		U
1C	RM 21	1000		U	200		U	1000		U	200		U
1C	RM 27	1000		U	200		U	1000		U	200		U
2B	RM 49	1000		U	200		U	1000		U	200		U
2B	RM 49	1000		U	200		U	1000		U	200		U
2B	RM 49	1000		U	200		U	1000		U	200		U
2C	RM 67	1000		U/E	200		U/E	1000		U/E	200		U/E
3A	RM 75	1000		U	200		U	1000		U	200		U
3A	RM 75	1000		U	200		U	1000		U	200		U
3A	RM 75	1000		U	200		U	1000		U	200		U
3A	RM 80	1000		U	200		U	1000		U	200		U
4A	RM 103	1000		U	200		U	1000		U	200		U
4A	RM 115	1000		U	200		U	1000		U	200		U
4B	RM 127	1000		U	200		U	1000		U	200		U
4B	RM 136	1000		U	200		U	1000		U	200		U

TABLE E4-3. SEMIVOLATILES IN WHITE STURGEON STEAKS: HALOGENATED ETHERS

River Segment	Station	bis(2-Chloroethyl) ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	bis(2-Chloroethoxy) methane Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	bis(2-Chloroisopropyl) ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	100		U	100		U	100		U
1B	RM 18.5	100		U	100		U	100		U
1C	RM 20	100		U	100		U	100		U
1C	RM 21	100		U	100		U	100		U
1C	RM 21	100		U	100		U	100		U
1C	RM 27	100		U	100		U	100		U
2B	RM 49	100		U	100		U	100		U
2B	RM 49	100		U	100		U	100		U
2B	RM 49	100		U	100		U	100		U
2C	RM 67	100		U/E	100		U/E	100		U/E
3A	RM 75	100		U	100		U	100		U
3A	RM 75	100		U	100		U	100		U
3A	RM 75	100		U	100		U	100		U
3A	RM 80	100		U	100		U	100		U
4A	RM 103	100		U	100		U	100		U
4A	RM 115	100		U	100		U	100		U
4B	RM 127	100		U	100		U	100		U
4B	RM 136	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	4-Bromophenyl phenyl ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	4-Chlorophenyl phenyl ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	200		U	100		U
1B	RM 18.5	200		U	100		U
1C	RM 20	200		U	100		U
1C	RM 21	200		U	100		U
1C	RM 21	200		U	100		U
1C	RM 27	200		U	100		U
2B	RM 49	200		U	100		U
2B	RM 49	200		U	100		U
2B	RM 49	200		U	100		U
2C	RM 67	200		U/E	100		U/E
3A	RM 75	200		U	100		U
3A	RM 75	200		U	100		U
3A	RM 75	200		U	100		U
3A	RM 80	200		U	100		U
4A	RM 103	200		U	100		U
4A	RM 115	200		U	100		U
4B	RM 127	200		U	100		U
4B	RM 136	200		U	100		U

TABLE E4-4. SEMIVOLATILES IN WHITE STURGEON STEAKS: NITROAROMATICS

River Segment	Station	2,4-Dinitrotoluene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	2,6-Dinitrotoluene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Nitrobenzene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	100		U	100		U	100		U
1B	RM 18.5	100		U	100		U	100		U
1C	RM 20	100		U	100		U	100		U
1C	RM 21	100		U	100		U	100		U
1C	RM 21	100		U	100		U	100		U
1C	RM 27	100		U	100		U	100		U
2B	RM 49	100		U	100		U	100		U
2B	RM 49	100		U	100		U	100		U
2B	RM 49	100		U	100		U	100		U
2C	RM 67	100		U/E	100		U/E	100		U/E
3A	RM 75	100		U	100		U	100		U
3A	RM 75	100		U	100		U	100		U
3A	RM 75	100		U	100		U	100		U
3A	RM 80	100		U	100		U	100		U
4A	RM 103	100		U	100		U	100		U
4A	RM 115	100		U	100		U	100		U
4B	RM 127	100		U	100		U	100		U
4B	RM 136	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
* Lipid-normalized data presented only when a compound is detected.

TABLE E4-5. SEMIVOLATILES IN WHITE STURGEON STEAKS: NITROSAMINES

River Segment	Station	N-Nitrosodi-n-propylamine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	N-Nitrosodiphenylamine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	100		U	100		U
1B	RM 18.5	100		U	100		U
1C	RM 20	100		U	100		U
1C	RM 21	100		U	100		U
1C	RM 21	100		U	100		U
1C	RM 27	100		U	100		U
2B	RM 49	100		U	100		U
2B	RM 49	100		U	100		U
2B	RM 49	100		U	100		U
2C	RM 67	100		U/E	100		U/E
3A	RM 75	100		U	100		U
3A	RM 75	100		U	100		U
3A	RM 75	100		U	100		U
3A	RM 80	100		U	100		U
4A	RM 103	100		U	100		U
4A	RM 115	100		U	100		U
4B	RM 127	100		U	100		U
4B	RM 136	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
* Lipid-normalized data presented only when a compound is detected.

TABLE E4-6. SEMIVOLATILES IN WHITE STURGEON STEAKS: NAPHTHALENES

River Segment	Station	2-Chloronaphthalene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	2-Methylnaphthalene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	100		U	100		U
1B	RM 18.5	100		U	100		U
1C	RM 20	100		U	100		U
1C	RM 21	100		U	100		U
1C	RM 21	100		U	100		U
1C	RM 27	100		U	100		U
2B	RM 49	100		U	100		U
2B	RM 49	100		U	100		U
2B	RM 49	100		U	100		U
2C	RM 67	100		U/E	100		U/E
3A	RM 75	100		U	100		U
3A	RM 75	100		U	100		U
3A	RM 75	100		U	100		U
3A	RM 80	100		U	100		U
4A	RM 103	100		U	100		U
4A	RM 115	100		U	100		U
4B	RM 127	100		U	100		U
4B	RM 136	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

E = Estimated value.

* Lipid-normalized data presented only when a compound is detected.

TABLE E4-7. SEMIVOLATILES IN WHITE STURGEON STEAKS: POLYNUCLEAR AROMATICS

River Segment	Station	Acenaphthene Measured Conc. (ug/kg)	Acenaphthene Norm. Conc.* (ug/g lipid)	Acenaphthene Qualifier Code	Acenaphthylene Measured Conc. (ug/kg)	Acenaphthylene Norm. Conc.* (ug/g lipid)	Acenaphthylene Qualifier Code	Anthracene Measured Conc. (ug/kg)	Anthracene Norm. Conc.* (ug/g lipid)	Anthracene Qualifier Code	Benzo[a]anthracene Measured Conc. (ug/kg)	Benzo[a]anthracene Norm. Conc.* (ug/g lipid)	Benzo[a]anthracene Qualifier Code
1B	RM 15	100		U	100		U	100		U	100		U
1B	RM 18.5	100		U	100		U	100		U	100		U
1C	RM 20	100		U	100		U	100		U	100		U
1C	RM 21	100		U	100		U	100		U	100		U
1C	RM 21	100		U	100		U	100		U	100		U
1C	RM 27	100		U	100		U	100		U	100		U
2B	RM 49	100		U	100		U	100		U	100		U
2B	RM 49	100		U	100		U	100		U	100		U
2B	RM 49	100		U	100		U	100		U	100		U
2C	RM 67	100		U/E	100		U/E	100		U/E	100		U/E
3A	RM 75	100		U	100		U	100		U	100		U
3A	RM 75	100		U	100		U	100		U	100		U
3A	RM 75	100		U	100		U	100		U	100		U
3A	RM 80	100		U	100		U	100		U	100		U
4A	RM 103	100		U	100		U	100		U	100		U
4A	RM 115	100		U	100		U	100		U	100		U
4B	RM 127	100		U	100		U	100		U	100		U
4B	RM 136	100		U	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

E = Estimated value.

* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Benzo(b)fluoranthene Measured Conc. (ug/kg)	Benzo(b)fluoranthene Norm. Conc.* (ug/g lipid)	Benzo(b)fluoranthene Qualifier Code	Benzo(k)fluoranthene Measured Conc. (ug/kg)	Benzo(k)fluoranthene Norm. Conc.* (ug/g lipid)	Benzo(k)fluoranthene Qualifier Code	Benzo(a)pyrene Measured Conc. (ug/kg)	Benzo(a)pyrene Norm. Conc.* (ug/g lipid)	Benzo(a)pyrene Qualifier Code	Benzo(g,h,i)perylene Measured Conc. (ug/kg)	Benzo(g,h,i)perylene Norm. Conc.* (ug/g lipid)	Benzo(g,h,i)perylene Qualifier Code
1B	RM 15	200		U	200		U	200		U	200		U
1B	RM 18.5	200		U	200		U	200		U	200		U
1C	RM 20	200		U	200		U	200		U	200		U
1C	RM 21	200		U	200		U	200		U	200		U
1C	RM 21	200		U	200		U	200		U	200		U
1C	RM 27	200		U	200		U	200		U	200		U
2B	RM 49	200		U	200		U	200		U	200		U
2B	RM 49	200		U	200		U	200		U	200		U
2B	RM 49	200		U	200		U	200		U	200		U
2C	RM 67	200		U/E	200		U/E	200		U/E	200		U/E
3A	RM 75	200		U	200		U	200		U	200		U
3A	RM 75	200		U	200		U	200		U	200		U
3A	RM 75	200		U	200		U	200		U	200		U
3A	RM 80	200		U	200		U	200		U	200		U
4A	RM 103	200		U	200		U	200		U	200		U
4A	RM 115	200		U	200		U	200		U	200		U
4B	RM 127	200		U	200		U	200		U	200		U
4B	RM 136	200		U	200		U	200		U	200		U

River Segment	Station	Chrysene Measured Conc. (ug/kg)	Chrysene Norm. Conc.* (ug/g lipid)	Chrysene Qualifier Code	Dibenzo(a,h)anthracene Measured Conc. (ug/kg)	Dibenzo(a,h)anthracene Norm. Conc.* (ug/g lipid)	Dibenzo(a,h)anthracene Qualifier Code	Fluoranthene Measured Conc. (ug/kg)	Fluoranthene Norm. Conc.* (ug/g lipid)	Fluoranthene Qualifier Code	Fluorene Measured Conc. (ug/kg)	Fluorene Norm. Conc.* (ug/g lipid)	Fluorene Qualifier Code
1B	RM 15	100		U	200		U	100		U	100		U
1B	RM 18.5	100		U	200		U	100		U	100		U
1C	RM 20	100		U	200		U	100		U	100		U
1C	RM 21	100		U	200		U	100		U	100		U
1C	RM 21	100		U	200		U	100		U	100		U
1C	RM 27	100		U	200		U	100		U	100		U
2B	RM 49	100		U	200		U	100		U	100		U
2B	RM 49	100		U	200		U	100		U	100		U
2B	RM 49	100		U	200		U	100		U	100		U
2C	RM 67	100		U/E	200		U/E	100		U/E	100		U/E
3A	RM 75	100		U	200		U	100		U	100		U
3A	RM 75	100		U	200		U	100		U	100		U
3A	RM 75	100		U	200		U	100		U	100		U
3A	RM 80	100		U	200		U	100		U	100		U
4A	RM 103	100		U	200		U	100		U	100		U
4A	RM 115	100		U	200		U	100		U	100		U
4B	RM 127	100		U	200		U	100		U	100		U
4B	RM 136	100		U	200		U	100		U	100		U

River Segment	Station	Indeno(1,2,3-c,d)pyrene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Naphthalene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Phenanthrene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Pyrene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	200		U	100		U	100		U	100		U
1B	RM 18.5	200		U	100		U	100		U	100		U
1C	RM 20	200		U	100		U	100		U	100		U
1C	RM 21	200		U	100		U	100		U	100		U
1C	RM 21	200		U	100		U	100		U	100		U
1C	RM 27	200		U	100		U	100		U	100		U
2B	RM 49	200		U	100		U	100		U	100		U
2B	RM 49	200		U	100		U	100		U	100		U
2B	RM 49	200		U	100		U	100		U	100		U
2C	RM 67	200		U/E	100		U/E	100		U/E	100		U/E
3A	RM 75	200		U	100		U	100		U	100		U
3A	RM 75	200		U	100		U	100		U	100		U
3A	RM 75	200		U	100		U	100		U	100		U
3A	RM 80	200		U	100		U	100		U	100		U
4A	RM 103	200		U	100		U	100		U	100		U
4A	RM 115	200		U	100		U	100		U	100		U
4B	RM 127	200		U	100		U	100		U	100		U
4B	RM 136	200		U	100		U	100		U	100		U

TABLE E4-8. SEMIVOLATILES IN WHITE STURGEON STEAKS: CHLORINATED BENZENES

River Segment	Station	1,3-Dichlorobenzene			1,2-Dichlorobenzene			1,4-Dichlorobenzene			1,2,4-Trichlorobenzene		
		Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	100		U	100		U	100		U	200		U
1B	RM 18.5	100		U	100		U	100		U	200		U
1C	RM 20	100		U	100		U	100		U	200		U
1C	RM 21	100		U	100		U	100		U	200		U
1C	RM 21	100		U	100		U	100		U	200		U
1C	RM 27	100		U	100		U	100		U	200		U
2B	RM 49	100		U	100		U	100		U	200		U
2B	RM 49	100		U	100		U	100		U	200		U
2B	RM 49	100		U	100		U	100		U	200		U
2C	RM 67	100		U/E	100		U/E	100		U/E	200		U/E
3A	RM 75	100		U	100		U	100		U	200		U
3A	RM 75	100		U	100		U	100		U	200		U
3A	RM 75	100		U	100		U	100		U	200		U
3A	RM 80	100		U	100		U	100		U	200		U
4A	RM 103	100		U	100		U	100		U	200		U
4A	RM 115	100		U	100		U	100		U	200		U
4B	RM 127	100		U	100		U	100		U	200		U
4B	RM 136	100		U	100		U	100		U	200		U
Tissue Reference Levels		na***			na***			na***			1300		

U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
* Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	Hexachlorobenzene			Hexachlorobutadiene			Hexachloroethane			Hexachlorocyclopentadiene		
		Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	200		U	100		U	200		U	500		U
1B	RM 18.5	200		U	100		U	200		U	500		U
1C	RM 20	200		U	100		U	200		U	500		U
1C	RM 21	200		U	100		U	200		U	500		U
1C	RM 21	200		U	100		U	200		U	500		U
1C	RM 27	200		U	100		U	200		U	500		U
2B	RM 49	200		U	100		U	200		U	500		U
2B	RM 49	200		U	100		U	200		U	500		U
2B	RM 49	200		U	100		U	200		U	500		U
2C	RM 67	200		U/E	100		U/E	200		U/E	500		U/E
3A	RM 75	200		U	100		U	200		U	500		U
3A	RM 75	200		U	100		U	200		U	500		U
3A	RM 75	200		U	100		U	200		U	500		U
3A	RM 80	200		U	100		U	200		U	500		U
4A	RM 103	200		U	100		U	200		U	500		U
4A	RM 115	200		U	100		U	200		U	500		U
4B	RM 127	200		U	100		U	200		U	500		U
4B	RM 136	200		U	100		U	200		U	500		U
Tissue Reference Levels		na***			na***			na***			na***		

TABLE E4-9. SEMIVOLATILES IN WHITE STURGEON STEAKS: BENZIDINES

River Segment	Station	3,3'-Dichlorobenzidine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	1000		U
1B	RM 18.5	1000		U
1C	RM 20	1000		U
1C	RM 21	1000		U
1C	RM 21	1000		U
1C	RM 27	1000		U
2B	RM 49	1000		U
2B	RM 49	1000		U
2B	RM 49	1000		U
2C	RM 67	1000		U/E
3A	RM 75	1000		U
3A	RM 75	1000		U
3A	RM 75	1000		U
3A	RM 80	1000		U
4A	RM 103	1000		U
4A	RM 115	1000		U
4B	RM 127	1000		U
4B	RM 136	1000		U

U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
* Lipid-normalized data presented only when a compound is detected.

TABLE E4-10. SEMIVOLATILES IN WHITE STURGEON STEAKS: PHTHALATE ESTERS

River Segment	Station	Dimethyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Diethyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Di-n-butyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	100		U	200		U	100		U
1B	RM 18.5	100		U	200		U	150	14	
1C	RM 20	100		U	200		U	100		U
1C	RM 21	100		U	200		U	100		U
1C	RM 21	100		U	200		U	150		U
1C	RM 27	100		U	200		U	100		U
2B	RM 49	100		U	200		U	100		U
2B	RM 49	100		U	200		U	110	38	
2B	RM 49	100		U	200		U	100		U
2C	RM 67	100		U/E	200		U/E	100		U/E
3A	RM 75	100		U	200		U	170	4	
3A	RM 75	100		U	200		U	190	2	
3A	RM 75	100		U	200		U	100		U
3A	RM 80	100		U	200		U	100		U
4A	RM 103	100		U	200		U	100		U
4A	RM 115	100		U	200		U	160		U
4B	RM 127	100		U	200		U	160	18	
4B	RM 136	100		U	200		U	160		U

U = Compound was not detected. Value given is the lower quantification limit.

E = Estimated value.

* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Benzyl butyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	bis(2-Ethylhexyl) phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Di-n-octyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	100		U	100		U	200		U
1B	RM 18.5	100		U	500	47		200		U
1C	RM 20	100		U	1500	349		200		U
1C	RM 21	100		U	590	203		200		U
1C	RM 21	100		U	650	92		200		U
1C	RM 27	100		U	100		U	200		U
2B	RM 49	100		U	100		U	200		U
2B	RM 49	100		U	500	172		200		U
2B	RM 49	100		U	190	86		200		U
2C	RM 67	100		U/E	1300	813		200		U/E
3A	RM 75	100		U	1200		U	200		U
3A	RM 75	990	12		100		U	200		U
3A	RM 75	100		U	100		U	200		U
3A	RM 80	100		U	100		U	200		U
4A	RM 103	100		U	240	10		200		U
4A	RM 115	100		U	790	45		200		U
4B	RM 127	100		U	100		U	200		U
4B	RM 136	100		U	220	12		200		U

TABLE E4-11. PESTICIDES IN WHITE STURGEON STEAKS

River Segment	Station	o,p-DDD			o,p-DDE			o,p-DDT			4,4'-DDD		
		Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	3		U	3		U	3		U	3		U
1B	RM 18.5	3		U	3		U	3		U	3		U
1C	RM 20	3		U	3		U	3		U	3		U
1C	RM 21	3		U	3		U	3		U	3		U
1C	RM21	4*		U	3		U	3		U	3		U
1C	RM 27	3		U	3		U	3		U	11	0.15	
2B	RM 49	3		U	3		U	3		U	3		U
2B	RM 49	3		U	3		U	3		U	3		U
2B	RM 49	3		U	3		U	3		U	3		U
2C	RM 67	3		U	3		U	3		U	3		U
3A	RM 75	3		U	14	0.33	E	30	0.70	E	16*		U
3A	RM 75	3		U	3		U	3		U	6*		U
3A	RM 75	9.1	0.10	E	3		U	3		U	7*		U
3A	RM 80	3		U	3		U	3		U	3		U
4A	RM 103	3		U	3		U	3		U	11	0.47	
4A	RM 115	3		U	3		U	3		U	6.5	0.37	
4B	RM 127	3		U	3		U	3		U	3		U
4B	RM 136	5.4	0.30		3		U	3		U	3		U
Tissue Reference Levels		200			200			200			200		

U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
* Reporting limits adjusted due to coeluting interfering peaks.
** Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	4,4'-DDE			4,4'-DDT			Heptachlor			Heptachlor epoxide		
		Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	5.5	0.85		3		U	3		U	3		U
1B	RM 18.5	9.9	0.93		3		U	3		U	3		U
1C	RM 20	11	2.56		3		U	3		U	3		U
1C	RM 21	5.4	1.86		3		U	3		U	3		U
1C	RM21	5.8	0.82		3		U	3		U	3		U
1C	RM 27	51	0.71		3.5	0.05		3		U	3		U
2B	RM 49	6.6	0.28		14	0.59		3		U	3		U
2B	RM 49	3.9	1.34		3		U	3		U	3		U
2B	RM 49	3		U	3		U	3		U	3		U
2C	RM 67	3		U	3		U	3		U	3		U
3A	RM 75	24*		U	9*		U	3		U	3		U
3A	RM 75	50	0.59		8.6	0.10	E	3		U	3		U
3A	RM 75	50	0.53	E	8	0.08	E	3		U	3		U
3A	RM 80	16	0.33		3		U	3		U	3		U
4A	RM 103	48	2.05		5.8	0.25		3		U	3		U
4A	RM 115	34	1.93		5.3	0.30		3		U	3		U
4B	RM 127	5.8	0.64		3.1	0.34		3		U	3		U
4B	RM 136	21	1.17		16	0.89		3		U	3		U
Tissue Reference Levels		200			200			200			na***		

River Segment	Station	Chlordane Measured Conc. (ug/kg)	Chlordane Norm. Conc.* (ug/g lipid)	Chlordane Qualifier Code	Aldrin Measured Conc. (ug/kg)	Aldrin Norm. Conc.* (ug/g lipid)	Aldrin Qualifier Code	Dieldrin Measured Conc. (ug/kg)	Dieldrin Norm. Conc.* (ug/g lipid)	Dieldrin Qualifier Code	Mirex Measured Conc. (ug/kg)	Mirex Norm. Conc.* (ug/g lipid)	Mirex Qualifier Code
1B	RM 15	3		U	3		U	3		U	3		U
1B	RM 18.5	3		U	3		U	3		U	3		U
1C	RM 20	3		U	3		U	3		U	3		U
1C	RM 21	3		U	3		U	3		U	3		U
1C	RM21	3		U	3		U	3		U	3		U
1C	RM 27	3		U	3		U	3	0.04		3		U
2B	RM 49	3		U	3		U	3		U	3		U
2B	RM 49	3		U	3		U	3		U	3		U
2B	RM 49	3		U	3		U	3		U	3		U
2C	RM 67	3		U	3		U	3		U	3		U
3A	RM 75	3		U	3		U	12	0.28	E	3		U
3A	RM 75	3		U	3		U	5.4	0.06	E	3		U
3A	RM 75	3		U	3		U	4.1	0.04	E	3		U
3A	RM 80	3		U	3		U	3		U	3		U
4A	RM 103	3		U	3		U	3.1	0.13		3		U
4A	RM 115	3		U	3		U	3		U	3		U
4B	RM 127	3		U	3		U	3		U	3		U
4B	RM 136	3		U	3		U	4*		U	3		U
Tissue Reference Levels		na***			120			120			300		

River Segment	Station	Dacthal Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Dicofol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Methyl parathion Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Parathion Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	3		U	30		U	3		U	3		U
1B	RM 18.5	3		U	30		U	3		U	3		U
1C	RM 20	3		U	30		U	5*		U	3		U
1C	RM 21	3		U	30		U	3		U	3		U
1C	RM21	3		U	30		U	3		U	3		U
1C	RM 27	3		U	30		U	16	0.22		3		U
2B	RM 49	3		U	30		U	20*		U	3		U
2B	RM 49	3		U	30		U	3		U	3		U
2B	RM 49	3		U	30		U	3		U	3		U
2C	RM 67	3		U	30		U	3		U	3		U
3A	RM 75	3		U	30		U	10*		U	3		U
3A	RM 75	3		U	30		U	3		U	3		U
3A	RM 75	3		U	30		U	5*		U	3		U
3A	RM 80	3		U	30		U	3		U	3		U
4A	RM 103	3		U	30		U	22	0.94		3		U
4A	RM 115	3		U	30		U	10	0.57		3		U
4B	RM 127	3		U	30		U	3		U	3		U
4B	RM 136	3		U	30		U	3		U	3		U
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	Malathion Measured Conc. (ug/kg)	Malathion Norm. Conc.* (ug/g lipid)	Malathion Qualifier Code	Toxaphene Measured Conc. (ug/kg)	Toxaphene Norm. Conc.* (ug/g lipid)	Toxaphene Qualifier Code	Isophorone Measured Conc. (ug/kg)	Isophorone Norm. Conc.* (ug/g lipid)	Isophorone Qualifier Code	Endosulfan I Measured Conc. (ug/kg)	Endosulfan I Norm. Conc.* (ug/g lipid)	Endosulfan I Qualifier Code
1B	RM 15	3		U	150		U	100		U	3		U
1B	RM 18.5	3		U	150		U	100		U	3		U
1C	RM 20	3		U	150		U	100		U	3		U
1C	RM 21	3		U	150		U	100		U	3		U
1C	RM21	3		U	150		U	100		U	3		U
1C	RM 27	3		U	150		U	100		U	4.9	0.07	
2B	RM 49	3		U	150		U	100		U	3		U
2B	RM 49	3		U	150		U	100		U	3		U
2B	RM 49	3		U	150		U	100		U	3		U
2C	RM 67	3		U	150		U	100		U	3		U
3A	RM 75	3		U	150		U	100		U	4*		U
3A	RM 75	3		U	150		U	100		U	3		U
3A	RM 75	3		U	150		U	100		U	3		U
3A	RM 80	3		U	150		U	100		U	3		U
4A	RM 103	3		U	150		U	100		U	3		U
4A	RM 115	3		U	150		U	100		U	3		U
4B	RM 127	3		U	150		U	100		U	3		U
4B	RM 136	3		U	150		U	100		U	3		U
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	Endosulfan II Measured Conc. (ug/kg)	Endosulfan II Norm. Conc.* (ug/g lipid)	Endosulfan II Qualifier Code	Endosulfan sulfate Measured Conc. (ug/kg)	Endosulfan sulfate Norm. Conc.* (ug/g lipid)	Endosulfan sulfate Qualifier Code	Endrin Measured Conc. (ug/kg)	Endrin Norm. Conc.* (ug/g lipid)	Endrin Qualifier Code	Endrin aldehyde Measured Conc. (ug/kg)	Endrin aldehyde Norm. Conc.* (ug/g lipid)	Endrin aldehyde Qualifier Code
1B	RM 15	3		U	3		U	3		U	3		U
1B	RM 18.5	3		U	3		U	3		U	3		U
1C	RM 20	3		U	3		U	3		U	3		U
1C	RM 21	3		U	3		U	3		U	3		U
1C	RM21	3		U	3		U	3		U	3		U
1C	RM 27	4*		U	3		U	3		U	3		U
2B	RM 49	3		U	3		U	3		U	3		U
2B	RM 49	3		U	3		U	3		U	3		U
2B	RM 49	3		U	3		U	3		U	3		U
2C	RM 67	3		U	3		U	3		U	3		U
3A	RM 75	3		U	3		U	30*		U	6*		U
3A	RM 75	3		U	4*		U	5.1	0.06	E	7	0.08	E
3A	RM 75	3		U	5.5	0.06		3.2	0.03	E	8.4	0.09	E
3A	RM 80	3		U	3		U	3		U	3.7		U
4A	RM 103	5*		U	3		U	3		U	3		U
4A	RM 115	3		U	3		U	3		U	3		U
4B	RM 127	3		U	3		U	3		U	3		U
4B	RM 136	3		U	3		U	3		U	3		U
Tissue Reference Levels		na***			na***			25			na***		

River Segment	Station	Methoxychlor Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	alpha-BHC Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	beta-BHC Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	delta-BHC Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	30		U	3		U	3		U	3		U
1B	RM 18.5	30		U	3		U	3		U	3		U
1C	RM 20	30		U	3		U	3		U	3		U
1C	RM 21	30		U	3		U	3		U	3		U
1C	RM21	30		U	3		U	3		U	3		U
1C	RM 27	50	0.70		3		U	3		U	3		U
2B	RM 49	30		U	3		U	3		U	3		U
2B	RM 49	30		U	3		U	3		U	3		U
2B	RM 49	30		U	3		U	3		U	3		U
2C	RM 67	30		U	3		U	3		U	3		U
3A	RM 75	180	4.20	E	3		U	3		U	3		U
3A	RM 75	30		U	3		U	3		U	3		U
3A	RM 75	30		U	3		U	3		U	3		U
3A	RM 80	30		U	3		U	3		U	3		U
4A	RM 103	30		U	3		U	3		U	3		U
4A	RM 115	30		U	3		U	3		U	3		U
4B	RM 127	30		U	3		U	3		U	3		U
4B	RM 136	50	2.80		3		U	3		U	3		U
Tissue Reference Levels		na***			100			100			100		

River Segment	Station	gamma-BHC Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1B	RM 15	3		U
1B	RM 18.5	3		U
1C	RM 20	3		U
1C	RM 21	3		U
1C	RM21	3		U
1C	RM 27	3		U
2B	RM 49	3		U
2B	RM 49	3		U
2B	RM 49	3		U
2C	RM 67	3		U
3A	RM 75	3		U
3A	RM 75	3		U
3A	RM 75	3		U
3A	RM 80	3		U
4A	RM 103	3		U
4A	RM 115	3		U
4B	RM 127	4*		U
4B	RM 136	3		U
Tissue Reference Levels		100		

TABLE E4-12. PCBS IN WHITE STURGEON STEAKS

River Segment	Station	Aroclor-1016 Measured Conc. (ug/kg)	Aroclor-1016 Norm. Conc.* (ug/g lipid)	Aroclor-1016 Qualifier Code	Aroclor-1221 Measured Conc. (ug/kg)	Aroclor-1221 Norm. Conc.* (ug/g lipid)	Aroclor-1221 Qualifier Code	Aroclor-1232 Measured Conc. (ug/kg)	Aroclor-1232 Norm. Conc.* (ug/g lipid)	Aroclor-1232 Qualifier Code	Aroclor-1242 Measured Conc. (ug/kg)	Aroclor-1242 Norm. Conc.** (ug/g lipid)	Aroclor-1242 Qualifier Code
1B	RM 15	50		U	50		U	50		U	50		U
1B	RM 18.5	50		U	50		U	50		U	50		U
1C	RM 20	50		U	50		U	50		U	50		U
1C	RM 21	50		U	50		U	50		U	50		U
1C	RM21	50		U	50		U	50		U	50		U
1C	RM 27	50		U	50		U	50		U	50		U
2B	RM 49	50		U	50		U	50		U	50		U
2B	RM 49	50		U	50		U	50		U	50		U
2B	RM 49	50		U	50		U	50		U	50		U
2C	RM 67	50		U	50		U	50		U	50		U
3A	RM 75	50		U	50		U	50		U	50		U
3A	RM 75	50		U	50		U	50		U	50		U
3A	RM 75	50		U	50		U	50		U	50		U
3A	RM 80	50		U	50		U	50		U	50		U
4A	RM 103	50		U	50		U	50		U	50		U
4A	RM 115	50		U	50		U	50		U	50		U
4B	RM 127	50		U	50		U	50		U	50		U
4B	RM 136	50		U	50		U	50		U	50		U
Tissue Reference Levels		na***			na***			na***			na***		

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	Aroclor-1248 Measured Conc. (ug/kg)	Aroclor-1248 Norm. Conc.* (ug/g lipid)	Aroclor-1248 Qualifier Code	Aroclor-1254 Measured Conc. (ug/kg)	Aroclor-1254 Norm. Conc.* (ug/g lipid)	Aroclor-1254 Qualifier Code	Aroclor-1260 Measured Conc. (ug/kg)	Aroclor-1260 Norm. Conc.* (ug/g lipid)	Aroclor-1260 Qualifier Code	Total Detected PCBs Measured Conc. (ug/kg)	Total Detected PCBs Norm. Conc.** (ug/g lipid)
1B	RM 15	50		U	50		U	50		U	0	
1B	RM 18.5	50		U	50		U	50		U	0	
1C	RM 20	50		U	50		U	50		U	0	
1C	RM 21	50		U	50		U	50		U	0	
1C	RM21	50		U	50		U	50		U	0	
1C	RM 27	50		U	50		U	50		U	0	
2B	RM 49	50		U	50		U	50		U	0	
2B	RM 49	50		U	50		U	50		U	0	
2B	RM 49	50		U	50		U	50		U	0	
2C	RM 67	50		U	50		U	50		U	0	
3A	RM 75	50		U	500	11.7		50		U	500	11.7
3A	RM 75	50		U	96	1.1		50		U	96	1.1
3A	RM 75	50		U	150	1.6		50		U	150	1.6
3A	RM 80	50		U	57	1.2		50		U	57	1.2
4A	RM 103	50		U	50		U	50		U	0	
4A	RM 115	50		U	50		U	50		U	0	
4B	RM 127	50		U	50		U	50		U	0	
4B	RM 136	50		U	50		U	50		U	0	
Tissue Reference Levels		na***			na***			na***			110	

TABLE E4-13. DIOXINS AND FURANS IN WHITE STURGEON STEAKS

River Segment	Station	2,3,7,8-TCDD Measured Conc. (pg/g)	2,3,7,8-TCDD Norm. Conc.** (ng/g lipid)	2,3,7,8-TCDD Qualifier Code	1,2,3,7,8-PeCDD Measured Conc. (pg/g)	1,2,3,7,8-PeCDD Norm. Conc.** (ng/g lipid)	1,2,3,7,8-PeCDD Qualifier Code	1,2,3,4,7,8-HxCDD Measured Conc. (pg/g)	1,2,3,4,7,8-HxCDD Norm. Conc.** (ng/g lipid)	1,2,3,4,7,8-HxCDD Qualifier Code	1,2,3,6,7,8-HxCDD Measured Conc. (pg/g)	1,2,3,6,7,8-HxCDD Norm. Conc.** (ng/g lipid)	1,2,3,6,7,8-HxCDD Qualifier Code
1B	RM 18.5	1		U/E	1.02		U/E	0.5		U/E	0.36		U/E
1C	RM 27	1.07		U/E	2.5		U/L	0.18		U/E	0.17		U/E
2B	RM 49	0.92		U/E	1.14		U/E	0.53		U/E	0.38		U/E
2C	RM 67	0.79		U/E	0.92		U/E	0.4		U/E	0.3		U/E
3A	RM 75	0.72		U/E	0.87		U/E	0.43		U/E	0.33		U/E
3A	RM 75	1.66	0.017		0.9		U/E	0.42		U/E	0.31		U/E
4A	RM 115	0.59		U/E	0.61		U/E	0.47		U/E	0.35		U/E
4B	RM 127	0.62		U/E	0.57		U/E	0.37		U/E	0.3		U/E
Tissue Reference Levels		na***			na***			na***			na***		

U = Compound was not detected.

E = Analyte not detected at or above the sample specific Estimated Detection Limit (EDL). The EDL is reported.

L = Analyte not detected at or above the Lower Method Calibration Limit (LMCL). The LMCL is reported.

M = Estimated Maximum Possible Concentration.

S = Analyte detected below the Lower Method Calibration Limit. Value should be considered an estimate.

** Lipid-normalized data presented only when a compound is detected.

*** Tissue reference level not available for this compound.

River Segment	Station	1,2,3,7,8,9-HxCDD Measured Conc. (pg/g)	1,2,3,7,8,9-HxCDD Norm. Conc.** (ng/g lipid)	1,2,3,7,8,9-HxCDD Qualifier Code	1,2,3,4,6,7,8-HpCDD Measured Conc. (pg/g)	1,2,3,4,6,7,8-HpCDD Norm. Conc.** (ng/g lipid)	1,2,3,4,6,7,8-HpCDD Qualifier Code	OCDD Measured Conc. (pg/g)	OCDD Norm. Conc.** (ng/g lipid)	OCDD Qualifier Code	2,3,7,8-TCDF Measured Conc. (pg/g)	2,3,7,8-TCDF Norm. Conc.** (ng/g lipid)	2,3,7,8-TCDF Qualifier Code
1B	RM 18.5	0.4		U/E	1.25		U/E	0.61		U/E	1.54	0.144	*
1C	RM 27	0.19		U/E	0.35	0.005	S	0.25	0.004	S	5.52	0.077	*
2B	RM 49	0.42		U/E	1.09		U/E	0.98	0.445	S/M	6.41	2.914	*
2C	RM 67	0.33		U/E	1		U/E	2.22	1.388	S/M	1.66	1.038	*
3A	RM 75	0.36		U/E	0.87		U/E	2.9	0.034	S	22.6	0.266	*
3A	RM 75	0.34		U/E	1.03		U/E	1.48	0.016	S/M	22.8	0.239	*
4A	RM 115	0.39		U/E	0.5	0.028	S/M	3.61	0.205	S/M	13.3	0.756	*
4B	RM 127	0.33		U/E	0.63		U/E	1.07	0.059	S	3.53	0.196	
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	1,2,3,7,8-PeCDF Measured Conc. (pg/g)	1,2,3,7,8-PeCDF Norm. Conc.** (ng/g lipid)	1,2,3,7,8-PeCDF Qualifier Code	2,3,4,7,8-PeCDF Measured Conc. (pg/g)	2,3,4,7,8-PeCDF Norm. Conc.** (ng/g lipid)	2,3,4,7,8-PeCDF Qualifier Code	1,2,3,4,7,8-HxCDF Measured Conc. (pg/g)	1,2,3,4,7,8-HxCDF Norm. Conc.** (ng/g lipid)	1,2,3,4,7,8-HxCDF Qualifier Code	1,2,3,6,7,8-HxCDF Measured Conc. (pg/g)	1,2,3,6,7,8-HxCDF Norm. Conc.** (ng/g lipid)	1,2,3,6,7,8-HxCDF Qualifier Code
1B	RM 18.5	0.32		U/E	0.28		U/E	1.02		U/E	0.83		U/E
1C	RM 27	2.5		U/L	2.5		U/L	0.31		U/E	0.31		U/E
2B	RM 49	0.25		U/E	0.24		U/E	1.15		U/E	0.88		U/E
2C	RM 67	0.27		U/E	0.24		U/E	0.72		U/E	0.62		U/E
3A	RM 75	0.29		U/E	0.28		U/E	1.08		U/E	0.9		U/E
3A	RM 75	0.73	0.008	S/M	0.49	0.005	S/M	1.3		U/E	1.1		U/E
4A	RM 115	0.31		U/E	0.28		U/E	0.8		U/E	0.7		U/E
4B	RM 127	0.26		U/E	0.21		U/E	0.67		U/E	0.58		U/E
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	2,3,4,6,7,8-HxCDF Measured Conc. (pg/g)	2,3,4,6,7,8-HxCDF Norm. Conc.** (ng/g lipid)	2,3,4,6,7,8-HxCDF Qualifier Code	1,2,3,7,8,9-HxCDF Measured Conc. (pg/g)	1,2,3,7,8,9-HxCDF Norm. Conc.** (ng/g lipid)	1,2,3,7,8,9-HxCDF Qualifier Code	1,2,3,4,6,7,8-HpCDF Measured Conc. (pg/g)	1,2,3,4,6,7,8-HpCDF Norm. Conc.** (ng/g lipid)	1,2,3,4,6,7,8-HpCDF Qualifier Code	1,2,3,4,7,8,9-HpCDF Measured Conc. (pg/g)	1,2,3,4,7,8,9-HpCDF Norm. Conc.** (ng/g lipid)	1,2,3,4,7,8,9-HpCDF Qualifier Code
1B	RM 18.5	3.83		U/E	1.67		U/E	0.58		U/E	0.79		U/E
1C	RM 27	0.35		U/E	0.41		U/E	0.2		U/E	0.26		U/E
2B	RM 49	3.09		U/E	1.74		U/E	0.73		U/E	1		U/E
2C	RM 67	1.95		U/E	1.09		U/E	0.59		U/E	0.78		U/E
3A	RM 75	4.81		U/E	1.78		U/E	0.47		U/E	0.63		U/E
3A	RM 75	3.66		U/E	2.04		U/E	0.84		U/E	0.57		U/E
4A	RM 115	1.27		U/E	1.33		U/E	0.53		U/E	0.84		U/E
4B	RM 127	0.83		U/E	1.13		U/E	0.5		U/E	0.69		U/E
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	OCDF Measured Conc. (pg/g)	Norm. Conc.** (ng/g lipid)	Qualifier Code	TEC (FULL) Calculated Conc. (pg/g)	TEC (HALF) Calculated Conc. (pg/g)	TEC (ZERO) Calculated Conc. (pg/g)
1B	RM 18.5	0.65		U/E	2.71	1.43	0.15
1C	RM 27	0.29		U/E	4.45	3.81	3.18
2B	RM 49	0.82		U/E	3.11	1.86	0.64
2C	RM 67	0.93		U/E	2.12	1.14	0.17 .
3A	RM 75	0.82		U/E	4.06	3.41	2.26
3A	RM 75	0.72		U/E	5.62	4.92	4.22
4A	RM 115	0.49		U/E	2.93	2.14	1.34
4B	RM 127	0.61		U/E	1.82	1.09	0.35
Tissue Reference Levels		na***			3	3	3

APPENDIX E5. LARGESCALE SUCKER TISSUE BIOACCUMULATION DATA

(Note: All concentrations are presented on a wet-weight basis.)

TABLE E5-1. CONCENTRATIONS OF METALS IN LARGESCALE SUCKER WHOLE-BODY COMPOSITES

River Segment	Station	Antimony Measured Conc. (mg/kg)	Antimony Qualifier Code	Arsenic Measured Conc. (mg/kg)	Arsenic Qualifier Code	Barium Measured Conc. (mg/kg)	Barium Qualifier Code	Cadmium Measured Conc. (mg/kg)	Cadmium Qualifier Code	Copper Measured Conc. (mg/kg)	Copper Qualifier Code	Lead Measured Conc. (mg/kg)	Lead Qualifier Code
1C	D6	0.25	U/E	0.34	U	2.5	E	0.04		1.23	E	0.23	E
1C	D8	0.39	U/E	0.52	U	2.9	E	0.03		1.13	E	0.08	E
1C	D10	0.35	U/E	0.47	U	2.0	E	0.05		1.16	E	0.22	E
2A	D12	0.32	U/E	0.42	U	3.2	E	0.04		1.18	E	0.16	E
2B	D15	0.39	U/E	0.52	U	3.1	E	0.05		0.99	E	0.10	E
2C	D16	0.32	U/E	0.43	U	1.2	E	0.02		0.90	E	0.12	E
2C	D19	0.26	U/E	0.35	U	1.1	E	0.02		0.92	E	0.02	U/E
2C	D20	0.32	U/E	0.42	U	2.5	E	0.04		1.04	E	0.20	E
3A	D22	0.34	U/E	0.45	U	1.9	E	0.02		1.23	E	0.86	E
3A	D23	0.31	U/E	0.42	U	3.6	E	0.02		0.86	E	0.02	U/E
3A	D24	0.35	U/E	0.46	U	2.6	E	0.05		1.03	E	0.12	E
3B	D26	0.28	U/E	0.37	U	3.0	E	0.04		0.84	E	0.04	E
3B	D28	0.30	U/E	0.40	U	2.4	E	0.04		1.08	E	0.22	E
3B	D29	0.37	U/E	0.49	U	3.2	E	0.05		1.06	E	0.25	E
4A	D31	3.38	U/E	0.45	U	5.4	E	0.05		0.70	E	0.02	U/E
4A	D35	0.25	U/E	0.33	U	1.4	E	0.03		0.91	E	0.02	U/E
4B	D38	0.31	U/E	0.42	U	3.6	E	0.04		0.75	E	0.41	E
4B	D40	0.32	U/E	0.43	U	3.7	E	0.06		0.75	E	0.17	E

U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
* Metals data normalized to wet weight

River Segment	Station	Mercury Measured Conc. (mg/kg)	Qualifier Code	Nickel Measured Conc. (mg/kg)	Qualifier Code	Selenium Measured Conc. (mg/kg)	Qualifier Code	Silver Measured Conc. (mg/kg)	Qualifier Code	Zinc Measured Conc. (mg/kg)	Qualifier Code
1C	D6	0.082	E	0.69	U/E	0.34	U	0.15	U/E	22.0	E
1C	D8	0.093	E	0.92	U/E	0.52	U	0.24	U/E	23.3	E
1C	D10	0.117	E	0.82	U/E	0.47	U	0.21	U/E	20.7	E
2A	D12	0.071	E	0.74	U/E	0.42	U	0.19	U/E	18.7	E
2B	D15	0.065	E	0.91	U/E	0.52	U	0.23	U/E	28.6	E
2C	D16	0.054	E	0.75	U/E	0.43	U	0.19	U/E	18.0	E
2C	D19	0.061	E	0.61	U/E	0.35	U	0.16	U/E	17.3	E
2C	D20	0.072	E	0.74	U/E	0.42	U	0.19	U/E	23.4	E
3A	D22	0.094	E	1.05	E	0.45	U	0.21	U/E	97.7	E
3A	D23	0.137	E	0.73	U/E	0.42	U	0.19	U/E	20.6	E
3A	D24	0.038	E	0.81	U/E	0.46	U	0.21	U/E	19.8	E
3B	D26	0.137	E	0.65	U/E	0.37	U	0.17	U/E	18.7	E
3B	D28	0.071	E	1.36	E	0.40	U	0.18	U/E	98.0	E
3B	D29	0.022	E	1.08	E	0.49	U	0.22	U/E	21.8	E
4A	D31	0.087	E	0.79	U/E	0.45	U	0.20	U/E	22.1	E
4A	D35	0.070	E	0.96	E	0.33	U	0.15	U/E	19.9	E
4B	D38	0.051	E	0.73	U/E	0.42	U	0.19	U/E	22.9	E
4B	D40	0.131	E	0.75	U/E	0.43	U	0.19	U/E	23.7	E

TABLE E5-2. PHENOLIC COMPOUNDS IN LARGESCALE SUCKER WHOLE-BODY COMPOSITES

River Segment	Station	Phenol			2-Methylphenol			4-Methylphenol			2,4-Dimethylphenol		
		Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	100		U	200		U	200		U	100		U
1C	D8	100		U	200		U	200		U	100		U
1C	D10	100		U	200		U	200		U	100		U
2A	D12	100		U	200		U	200		U	100		U
2B	D15	100		U	200		U	200		U	100		U
2C	D16	100		U	200		U	200		U	100		U
2C	D19	100		U	200		U	200		U	100		U
2C	D20	100		U	200		U	200		U	100		U
3A	D22	100		U	200		U	200		U	100		U
3A	D23	100		U	200		U	200		U	100		U
3A	D24	100		U	200		U	200		U	100		U
3B	D26	100		U	200		U	200		U	100		U
3B	D28	100		U	200		U	200		U	100		U
3B	D29	100		U	200		U	200		U	100		U
4A	D31	100		U	200		U	200		U	100		U
4A	D35	100		U	200		U	200		U	100		U
4B	D38	100		U	200		U	200		U	100		U
4B	D40	100		U	200		U	200		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Pentachlorophenol Measured Conc. (ug/kg)	Pentachlorophenol Norm. Conc.* (ug/g lipid)	Pentachlorophenol Qualifier Code	2-Chlorophenol Measured Conc. (ug/kg)	2-Chlorophenol Norm. Conc.* (ug/g lipid)	2-Chlorophenol Qualifier Code	2,4-Dichlorophenol Measured Conc. (ug/kg)	2,4-Dichlorophenol Norm. Conc.* (ug/g lipid)	2,4-Dichlorophenol Qualifier Code	4-Chloro-3-methylphenol Measured Conc. (ug/kg)	4-Chloro-3-methylphenol Norm. Conc.* (ug/g lipid)	4-Chloro-3-methylphenol Qualifier Code
1C	D6	1000		U	100		U	200		U	200		U
1C	D8	1000		U	100		U	200		U	200		U
1C	D10	1000		U	100		U	200		U	200		U
2A	D12	1000		U	100		U	200		U	200		U
2B	D15	1000		U	100		U	200		U	200		U
2C	D16	1000		U	100		U	200		U	200		U
2C	D19	1000		U	100		U	200		U	200		U
2C	D20	1000		U	100		U	200		U	200		U
3A	D22	1000		U	100		U	200		U	200		U
3A	D23	1000		U	100		U	200		U	200		U
3A	D24	1000		U	100		U	200		U	200		U
3B	D26	1000		U	100		U	200		U	200		U
3B	D28	1000		U	100		U	200		U	200		U
3B	D29	1000		U	100		U	200		U	200		U
4A	D31	1000		U	100		U	200		U	200		U
4A	D35	1000		U	100		U	200		U	200		U
4B	D38	1000		U	100		U	200		U	200		U
4B	D40	1000		U	100		U	200		U	200		U

River Segment	Station	2,4-Dinitrophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	2-Nitrophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	4-Nitrophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	2,4,6-Trichlorophenol Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	1000		U	200		U	1000		U	200		U
1C	D8	1000		U	200		U	1000		U	200		U
1C	D10	1000		U	200		U	1000		U	200		U
2A	D12	1000		U	200		U	1000		U	200		U
2B	D15	1000		U	200		U	1000		U	200		U
2C	D16	1000		U	200		U	1000		U	200		U
2C	D19	1000		U	200		U	1000		U	200		U
2C	D20	1000		U	200		U	1000		U	200		U
3A	D22	1000		U	200		U	1000		U	200		U
3A	D23	1000		U	200		U	1000		U	200		U
3A	D24	1000		U	200		U	1000		U	200		U
3B	D26	1000		U	200		U	1000		U	200		U
3B	D28	1000		U	200		U	1000		U	200		U
3B	D29	1000		U	200		U	1000		U	200		U
4A	D31	1000		U	200		U	1000		U	200		U
4A	D35	1000		U	200		U	1000		U	200		U
4B	D38	1000		U	200		U	1000		U	200		U
4B	D40	1000		U	200		U	1000		U	200		U

TABLE E5-3. SEMIVOLATILES IN LARGESCALE SUCKER WHOLE-BODY COMPOSITES: HALOGENATED ETHERS

River Segment	Station	bis(2-Chloroethyl) ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	bis(2-Chloroethoxy) methane Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	bis(2-Chloroisopropyl) ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	100		U	100		U	100		U
1C	D8	100		U	100		U	100		U
1C	D10	100		U	100		U	100		U
2A	D12	100		U	100		U	100		U
2B	D15	100		U	100		U	100		U
2C	D16	100		U	100		U	100		U
2C	D19	100		U	100		U	100		U
2C	D20	100		U	100		U	100		U
3A	D22	100		U	100		U	100		U
3A	D23	100		U	100		U	100		U
3A	D24	100		U	100		U	100		U
3B	D26	100		U	100		U	100		U
3B	D28	100		U	100		U	100		U
3B	D29	100		U	100		U	100		U
4A	D31	100		U	100		U	100		U
4A	D35	100		U	100		U	100		U
4B	D38	100		U	100		U	100		U
4B	D40	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	4-Bromophenyl phenyl ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	4-Chlorophenyl phenyl ether Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	200		U	100		U
1C	D8	200		U	100		U
1C	D10	200		U	100		U
2A	D12	200		U	100		U
2B	D15	200		U	100		U
2C	D16	200		U	100		U
2C	D19	200		U	100		U
2C	D20	200		U	100		U
3A	D22	200		U	100		U
3A	D23	200		U	100		U
3A	D24	200		U	100		U
3B	D26	200		U	100		U
3B	D28	200		U	100		U
3B	D29	200		U	100		U
4A	D31	200		U	100		U
4A	D35	200		U	100		U
4B	D38	200		U	100		U
4B	D40	200		U	100		U

TABLE E5-4. SEMIVOLATILES IN LARGESCALE SUCKER WHOLE-BODY COMPOSITES: NITROAROMATICS

River Segment	Station	2,4-Dinitrotoluene Measured Conc. (ug/kg)	2,4-Dinitrotoluene Norm. Conc.* (ug/g lipid)	2,4-Dinitrotoluene Qualifier Code	2,6-Dinitrotoluene Measured Conc. (ug/kg)	2,6-Dinitrotoluene Norm. Conc.* (ug/g lipid)	2,6-Dinitrotoluene Qualifier Code	Nitrobenzene Measured Conc. (ug/kg)	Nitrobenzene Norm. Conc.* (ug/g lipid)	Nitrobenzene Qualifier Code
1C	D6	100		U	100		U	100		U
1C	D8	100		U	100		U	100		U
1C	D10	100		U	100		U	100		U
2A	D12	100		U	100		U	100		U
2B	D15	100		U	100		U	100		U
2C	D16	100		U	100		U	100		U
2C	D19	100		U	100		U	100		U
2C	D20	100		U	100		U	100		U
3A	D22	100		U	100		U	100		U
3A	D23	100		U	100		U	100		U
3A	D24	100		U	100		U	100		U
3B	D26	100		U	100		U	100		U
3B	D28	100		U	100		U	100		U
3B	D29	100		U	100		U	100		U
4A	D31	100		U	100		U	100		U
4A	D35	100		U	100		U	100		U
4B	D38	100		U	100		U	100		U
4B	D40	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

TABLE E5-5. SEMIVOLATILES IN LARGESCALE SUCKER WHOLE-BODY COMPOSITES: NITROSAMINES

River Segment	Station	N-Nitrosodi-n-propylamine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	N-Nitrosodiphenylamine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	100		U	100		U
1C	D8	100		U	100		U
1C	D10	100		U	100		U
2A	D12	100		U	100		U
2B	D15	100		U	100		U
2C	D16	100		U	100		U
2C	D19	100		U	100		U
2C	D20	100		U	100		U
3A	D22	100		U	100		U
3A	D23	100		U	100		U
3A	D24	100		U	100		U
3B	D26	100		U	100		U
3B	D28	100		U	100		U
3B	D29	100		U	100		U
4A	D31	100		U	100		U
4A	D35	100		U	100		U
4B	D38	100		U	100		U
4B	D40	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

TABLE E5-6. SEMIVOLATILES IN LARGESCALE SUCKER WHOLE-BODY COMPOSITES: NAPHTHALENES

River Segment	Station	2-Chloronaphthalene Measured Conc. (ug/kg)	2-Chloronaphthalene Norm. Conc.* (ug/g lipid)	2-Chloronaphthalene Qualifier Code	2-Methylnaphthalene Measured Conc. (ug/kg)	2-Methylnaphthalene Norm. Conc.* (ug/g lipid)	2-Methylnaphthalene Qualifier Code
1C	D6	100		U	100		U
1C	D8	100		U	100		U
1C	D10	100		U	100		U
2A	D12	100		U	100		U
2B	D15	100		U	100		U
2C	D16	100		U	100		U
2C	D19	100		U	100		U
2C	D20	100		U	100		U
3A	D22	100		U	100		U
3A	D23	100		U	100		U
3A	D24	100		U	100		U
3B	D26	100		U	100		U
3B	D28	100		U	100		U
3B	D29	100		U	100		U
4A	D31	100		U	100		U
4A	D35	100		U	140		
4B	D38	100		U	100		U
4B	D40	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

TABLE E5-7. SEMIVOLATILES IN LARGESCALE SUCKER WHOLE-BODY COMPOSITES: POLYNUCLEAR AROMATICS

River Segment	Station	Acenaphthene Measured Conc. (ug/kg)	Acenaphthene Norm. Conc.* (ug/g lipid)	Acenaphthene Qualifier Code	Acenaphthylene Measured Conc. (ug/kg)	Acenaphthylene Norm. Conc.* (ug/g lipid)	Acenaphthylene Qualifier Code	Anthracene Measured Conc. (ug/kg)	Anthracene Norm. Conc.* (ug/g lipid)	Anthracene Qualifier Code	Benzo(a)anthracene Measured Conc. (ug/kg)	Benzo(a)anthracene Norm. Conc.* (ug/g lipid)	Benzo(a)anthracene Qualifier Code
1C	D6	100		U	100		U	100		U	100		U
1C	D8	100		U	100		U	100		U	100		U
1C	D10	100		U	100		U	100		U	100		U
2A	D12	100		U	100		U	100		U	100		U
2B	D15	100		U	100		U	100		U	100		U
2C	D16	100		U	100		U	100		U	100		U
2C	D19	100		U	100		U	100		U	100		U
2C	D20	100		U	100		U	100		U	100		U
3A	D22	100		U	100		U	100		U	100		U
3A	D23	100		U	100		U	100		U	100		U
3A	D24	100		U	100		U	100		U	100		U
3B	D26	100		U	100		U	100		U	100		U
3B	D28	100		U	100		U	100		U	100		U
3B	D29	100		U	100		U	100		U	100		U
4A	D31	100		U	100		U	100		U	100		U
4A	D35	100		U	100		U	100		U	100		U
4B	D38	100		U	100		U	100		U	100		U
4B	D40	100		U	100		U	100		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Benzo(b)fluoranthene Measured Conc. (ug/kg)	Benzo(b)fluoranthene Norm. Conc.* (ug/g lipid)	Benzo(b)fluoranthene Qualifier Code	Benzo(k)fluoranthene Measured Conc. (ug/kg)	Benzo(k)fluoranthene Norm. Conc.* (ug/g lipid)	Benzo(k)fluoranthene Qualifier Code	Benzo(a)pyrene Measured Conc. (ug/kg)	Benzo(a)pyrene Norm. Conc.* (ug/g lipid)	Benzo(a)pyrene Qualifier Code	Benzo(g,h,i)perylene Measured Conc. (ug/kg)	Benzo(g,h,i)perylene Norm. Conc.* (ug/g lipid)	Benzo(g,h,i)perylene Qualifier Code
1C	D6	200		U	200		U	200		U	200		U
1C	D8	200		U	200		U	200		U	200		U
1C	D10	200		U	200		U	200		U	200		U
2A	D12	200		U	200		U	200		U	200		U
2B	D15	200		U	200		U	200		U	200		U
2C	D16	200		U	200		U	200		U	200		U
2C	D19	200		U	200		U	200		U	200		U
2C	D20	200		U	200		U	200		U	200		U
3A	D22	200		U	200		U	200		U	200		U
3A	D23	200		U	200		U	200		U	200		U
3A	D24	200		U	200		U	200		U	200		U
3B	D26	200		U	200		U	200		U	200		U
3B	D28	200		U	200		U	200		U	200		U
3B	D29	200		U	200		U	200		U	200		U
4A	D31	200		U	200		U	200		U	200		U
4A	D35	200		U	200		U	200		U	200		U
4B	D38	200		U	200		U	200		U	200		U
4B	D40	200		U	200		U	200		U	200		U

River Segment	Station	Chrysene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Dibenzo(a,h)anthracene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Fluoranthene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Fluorene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	100		U	200		U	100		U	100		U
1C	D8	100		U	200		U	100		U	100		U
1C	D10	100		U	200		U	100		U	100		U
2A	D12	100		U	200		U	100		U	100		U
2B	D15	100		U	200		U	100		U	100		U
2C	D16	100		U	200		U	100		U	100		U
2C	D19	100		U	200		U	100		U	100		U
2C	D20	100		U	200		U	100		U	100		U
3A	D22	100		U	200		U	100		U	100		U
3A	D23	100		U	200		U	100		U	100		U
3A	D24	100		U	200		U	100		U	100		U
3B	D26	100		U	200		U	100		U	100		U
3B	D28	100		U	200		U	100		U	100		U
3B	D29	100		U	200		U	100		U	100		U
4A	D31	100		U	200		U	100		U	100		U
4A	D35	100		U	200		U	100		U	100		U
4B	D38	100		U	200		U	100		U	100		U
4B	D40	100		U	200		U	100		U	100		U

River Segment	Station	Indeno(1,2,3-c,d)pyrene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Naphthalene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Phenanthrene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Pyrene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	200		U	100		U	100		U	100		U
1C	D8	200		U	100		U	100		U	100		U
1C	D10	200		U	100		U	100		U	100		U
2A	D12	200		U	100		U	100		U	100		U
2B	D15	200		U	100		U	100		U	100		U
2C	D16	200		U	100		U	100		U	100		U
2C	D19	200		U	100		U	100		U	100		U
2C	D20	200		U	100		U	100		U	100		U
3A	D22	200		U	100		U	100		U	100		U
3A	D23	200		U	100		U	100		U	100		U
3A	D24	200		U	100		U	100		U	100		U
3B	D26	200		U	100		U	100		U	100		U
3B	D28	200		U	100		U	100		U	100		U
3B	D29	200		U	100		U	100		U	100		U
4A	D31	200		U	100		U	100		U	100		U
4A	D35	200		U	100		U	100		U	100		U
4B	D38	200		U	100		U	100		U	100		U
4B	D40	200		U	100		U	100		U	100		U

TABLE E5-8. SEMIVOLATILES IN LARGESCALE SUCKER WHOLE-BODY COMPOSITES: CHLORINATED BENZENES

River Segment	Station	1,3-Dichlorobenzene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	1,2-Dichlorobenzene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	1,4-Dichlorobenzene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	1,2,4-Trichlorobenzene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	100		U	100		U	100		U	200		U
1C	D8	100		U	100		U	100		U	200		U
1C	D10	100		U	100		U	100		U	200		U
2A	D12	100		U	100		U	100		U	200		U
2B	D15	100		U	100		U	100		U	200		U
2C	D16	100		U	100		U	100		U	200		U
2C	D19	100		U	100		U	100		U	200		U
2C	D20	100		U	100		U	100		U	200		U
3A	D22	100		U	100		U	100		U	200		U
3A	D23	100		U	100		U	100		U	200		U
3A	D24	100		U	100		U	100		U	200		U
3B	D26	100		U	100		U	100		U	200		U
3B	D28	100		U	100		U	100		U	200		U
3B	D29	100		U	100		U	100		U	200		U
4A	D31	100		U	100		U	100		U	200		U
4A	D35	100		U	100		U	100		U	200		U
4B	D38	100		U	100		U	100		U	200		U
4B	D40	100		U	100		U	100		U	200		U
Tissue Reference Levels		na***			na***			na***			1300		

U = Compound was not detected. Value given is the lower quantification limit.

* Lipid-normalized data presented only when a compound is detected.

*** Tissue reference level not available for this compound.

River Segment	Station	Hexachlorobenzene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Hexachlorobutadiene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Hexachloroethane Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Hexachlorocyclopentadiene Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	200		U	100		U	200		U	500		U
1C	D8	200		U	100		U	200		U	500		U
1C	D10	200		U	100		U	200		U	500		U
2A	D12	200		U	100		U	200		U	500		U
2B	D15	200		U	100		U	200		U	500		U
2C	D16	200		U	100		U	200		U	500		U
2C	D19	200		U	100		U	200		U	500		U
2C	D20	200		U	100		U	200		U	500		U
3A	D22	200		U	100		U	200		U	500		U
3A	D23	200		U	100		U	200		U	500		U
3A	D24	200		U	100		U	200		U	500		U
3B	D26	200		U	100		U	200		U	500		U
3B	D28	200		U	100		U	200		U	500		U
3B	D29	200		U	100		U	200		U	500		U
4A	D31	200		U	100		U	200		U	500		U
4A	D35	200		U	100		U	200		U	500		U
4B	D38	200		U	100		U	200		U	500		U
4B	D40	200		U	100		U	200		U	500		U
Tissue Reference Levels		na***			na***			na***			na***		

TABLE E5-9. SEMIVOLATILES IN LARGESCALE SUCKER WHOLE-BODY COMPOSITES: BENZIDINES

River Segment	Station	3,3'-Dichlorobenzidine Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	1000		U
1C	D8	1000		U
1C	D10	1000		U
2A	D12	1000		U
2B	D15	1000		U
2C	D16	1000		U
2C	D19	1000		U
2C	D20	1000		U
3A	D22	1000		U
3A	D23	1000		U
3A	D24	1000		U
3B	D26	1000		U
3B	D28	1000		U
3B	D29	1000		U
4A	D31	1000		U
4A	D35	1000		U
4B	D38	1000		U
4B	D40	1000		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

TABLE E5-10. SEMIVOLATILES IN LARGESCALE SUCKER WHOLE-BODY COMPOSITES: PHTHALATE ESTERS

River Segment	Station	Dimethyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Diethyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Di-n-butyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	100		U	200		U	100		U
1C	D8	100		U	200		U	100		U
1C	D10	100		U	200		U	100		U
2A	D12	100		U	200		U	100		U
2B	D15	100		U	200		U	100		U
2C	D16	100		U	200		U	100		U
2C	D19	100		U	200		U	100		U
2C	D20	100		U	200		U	100		U
3A	D22	100		U	200		U	100		U
3A	D23	100		U	200		U	100		U
3A	D24	100		U	200		U	100		U
3B	D26	100		U	200		U	100		U
3B	D28	100		U	200		U	100		U
3B	D29	100		U	200		U	100		U
4A	D31	100		U	200		U	100		U
4A	D35	100		U	200		U	100		U
4B	D38	100		U	200		U	100		U
4B	D40	100		U	200		U	100		U

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.

River Segment	Station	Benzyl butyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	bis(2-Ethylhexyl) phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Di-n-octyl phthalate Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	100		U	100		U	200		U
1C	D8	100		U	100		U	200		U
1C	D10	100		U	100		U	200		U
2A	D12	100		U	100		U	200		U
2B	D15	100		U	1100	37		200		U
2C	D16	100		U	100		U	200		U
2C	D19	100		U	800	33		200		U
2C	D20	100		U	100		U	200		U
3A	D22	100		U	850	36		200		U
3A	D23	100		U	370	17		200		U
3A	D24	100		U	100		U	200		U
3B	D26	100		U	100		U	200		U
3B	D28	100		U	100		U	200		U
3B	D29	100		U	470	20		200		U
4A	D31	100		U	680	20		200		U
4A	D35	100		U	440	19		200		U
4B	D38	100		U	100		U	200		U
4B	D40	100		U	1100	29		200		U

TABLE E5-11. PESTICIDES IN LARGESCALE SUCKER WHOLE-BODY COMPOSITES

River Segment	Station	o,p-DDD Measured Conc. (ug/kg)	o,p-DDD Norm. Conc.* (ug/g lipid)	o,p-DDD Qualifier Code	o,p-DDE Measured Conc. (ug/kg)	o,p-DDE Norm. Conc.* (ug/g lipid)	o,p-DDE Qualifier Code	o,p-DDT Measured Conc. (ug/kg)	o,p-DDT Norm. Conc.* (ug/g lipid)	o,p-DDT Qualifier Code	4,4'-DDD Measured Conc. (ug/kg)	4,4'-DDD Norm. Conc.* (ug/g lipid)	4,4'-DDD Qualifier Code
1C	D6	3		U	4*		U	3		U	5*		U
1C	D8	3		U/R	3		U/R	3		U/R	5.6	0.21	R
1C	D10	3		U	4*		U	3		U	23	0.63	E
2A	D12	3		U	3		U	3		U	7*		U
2B	D15	24	0.82		24	0.82		3		U	24	0.82	E
2C	D16	3		U	10	0.29		3		U	13	0.37	E
2C	D19	3		U	23	0.96		15*		U	16	0.67	E
2C	D20	3		U	3		U	3		U	13	0.95	E
3A	D22	24	1.02		14	0.59		3		U	8.7	0.37	E
3A	D23	24	1.07		21	0.94		5*		U	23	1.03	E
3A	D24	3		U	5.5	1.80	E	3		U	21	0.68	E
3B	D26	3		U	8*		U	3		U	30	0.97	E
3B	D28	8*		U	16	0.44		5*		U	18	0.50	E
3B	D29	24	1.01		14	0.59		6*		U	6.1	0.26	E
4A	D31	29	0.84		42	1.22		10*		U	26	0.75	E
4A	D35	18	0.78		3		U	3		U	8.5	0.37	E
4B	D38	3		U	3		U	3		U	24	0.74	E
4B	D40	3		U	3		U	3		U	18	0.48	E
Tissue Reference Levels		200			200			200			200		

U = Compound was not detected. Value given is the lower quantification limit.

E = Estimated value.

* Reporting limits adjusted due to coeluting interfering peaks.

** Lipid-normalized data presented only when a compound is detected.

*** Tissue reference level not available for this compound.

River Segment	Station	4,4'-DDE Measured Conc. (ug/kg)	4,4'-DDE Norm. Conc.* (ug/g lipid)	4,4'-DDE Qualifier Code	4,4'-DDT Measured Conc. (ug/kg)	4,4'-DDT Norm. Conc.* (ug/g lipid)	4,4'-DDT Qualifier Code	Heptachlor Measured Conc. (ug/kg)	Heptachlor Norm. Conc.* (ug/g lipid)	Heptachlor Qualifier Code	Heptachlor epoxide Measured Conc. (ug/kg)	Heptachlor epoxide Norm. Conc.* (ug/g lipid)	Heptachlor epoxide Qualifier Code
1C	D6	3		U	4.5	0.21	E	3		U	3		U
1C	D8	26	0.97	R	3		U/R	3		U/R	3		U/R
1C	D10	59*		U	11	0.30	E	3		U	3		U
2A	D12	45*		U	3		U	3		U	3		U
2B	D15	45*		U	16	0.54		3		U	3		U
2C	D16	70*		U	4.2	0.12	E	3		U	3		U
2C	D19	38*		U	4*		U	3		U	3		U
2C	D20	60*		U	5.8	0.42	E	3		U	3		U
3A	D22	45*		U	6.1	0.26	E	3		U	3		U
3A	D23	63*		U	11	0.49	E	3		U	3		U
3A	D24	53*		U	9.6*		U	3		U	3		U
3B	D26	62*		U	13	0.42	E	3		U	3		U
3B	D28	57*		U	5.1	0.14	E	3		U	3		U
3B	D29	45*		U	4	0.17	E	3		U	3		U
4A	D31	61*		U	12*		U	3		U	3		U
4A	D35	50*		U	3.9	0.17	E	3		U	3		U
4B	D38	5*		U	5.2	0.16	E	3		U	3		U
4B	D40	50*		U	7.5	0.20	E	3		U	3		U
Tissue Reference Levels		200			200			200			na***		

River Segment	Station	Chlordane Measured Conc. (ug/kg)	Chlordane Norm. Conc.* (ug/g lipid)	Chlordane Qualifier Code	Aldrin Measured Conc. (ug/kg)	Aldrin Norm. Conc.* (ug/g lipid)	Aldrin Qualifier Code	Dieldrin Measured Conc. (ug/kg)	Dieldrin Norm. Conc.* (ug/g lipid)	Dieldrin Qualifier Code	Mirex Measured Conc. (ug/kg)	Mirex Norm. Conc.* (ug/g lipid)	Mirex Qualifier Code
1C	D6	3		U	3		U	3		U	3		U
1C	D8	3		U/R	3		U/R	3		U/R	3		U/R
1C	D10	3		U	3.9	0.11		3		U	3		U
2A	D12	3		U	5.6	0.19		3		U	3		U
2B	D15	3		U	3		U	3		U	3		U
2C	D16	3		U	3		U	3		U	3		U
2C	D19	3		U	3		U	3		U	3		U
2C	D20	3		U	3		U	3		U	3		U
3A	D22	3		U	3		U	3		U	3		U
3A	D23	3		U	3		U	4*		U	3		U
3A	D24	3		U	3		U	3		U	3		U
3B	D26	3		U	3		U	4.5	0.15		3		U
3B	D28	3		U	3		U	3		U	3		U
3B	D29	3		U	3		U	3		U	3		U
4A	D31	3		U	3		U	3		U	3		U
4A	D35	3		U	3		U	3		U	3		U
4B	D38	3		U	3		U	4*		U	3		U
4B	D40	3		U	3	0.80		3		U	3		U
Tissue Reference Levels		na***			120			120			300		

River Segment	Station	Dacthal Measured Conc. (ug/kg)	Dacthal Norm. Conc.* (ug/g lipid)	Dacthal Qualifier Code	Dicofol Measured Conc. (ug/kg)	Dicofol Norm. Conc.* (ug/g lipid)	Dicofol Qualifier Code	Methyl parathion Measured Conc. (ug/kg)	Methyl parathion Norm. Conc.* (ug/g lipid)	Methyl parathion Qualifier Code	Parathion Measured Conc. (ug/kg)	Parathion Norm. Conc.* (ug/g lipid)	Parathion Qualifier Code
1C	D6	3		U	30		U	6*		U	6*		U
1C	D8	3		U	30		U	5*		U	7.8	0.29	R
1C	D10	3		U	30		U	16*		U	3		U
2A	D12	3		U	30		U	12*		U	3		U
2B	D15	3		U	30		U	9*		U	3		U
2C	D16	3		U	30		U	7*		U	7.5	0.21	
2C	D19	3		U	30		U	3		U	3		U
2C	D20	3		U	30		U	16*		U	15	1.09	
3A	D22	3		U	30		U	5*		U	3		U
3A	D23	3		U	30		U	3		U	3		U
3A	D24	3		U	30		U	3		U	3		U
3B	D26	3		U	30		U	3		U	3		U
3B	D28	3		U	30		U	3		U	3		U
3B	D29	3		U	30		U	3		U	3		U
4A	D31	3		U	30		U	3		U	3		U
4A	D35	3		U	30		U	6*		U	3		U
4B	D38	3		U	30		U	5*		U	3		U
4B	D40	3		U	30		U	10*		U	3		U
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	Malathion			Toxaphene			Isophorone			Endosulfan I		
		Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	3		U	150		U	100		U	3		U
1C	D8	3		U/R	150		U/R	100		U/R	3		U/R
1C	D10	3		U	150		U	100		U	3.3	0.09	
2A	D12	3		U	150		U	100		U	3		U
2B	D15	3		U	150		U	100		U	3		U
2C	D16	3		U	150		U	100		U	3		U
2C	D19	3		U	150		U	100		U	3		U
2C	D20	3		U	150		U	100		U	3		U
3A	D22	3		U	150		U	100		U	3		U
3A	D23	3		U	150		U	100		U	3		U
3A	D24	3		U	150		U	100		U	3		U
3B	D26	3		U	150		U	100		U	3		U
3B	D28	3		U	150		U	100		U	3		U
3B	D29	3		U	150		U	100		U	3		U
4A	D31	3		U	150		U	100		U	3		U
4A	D35	3		U	150		U	100		U	3		U
4B	D38	3		U	150		U	100		U	3		U
4B	D40	3		U	150		U	100		U	3		U
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	Endosulfan II Measured Conc. (ug/kg)	Endosulfan II Norm. Conc.* (ug/g lipid)	Endosulfan II Qualifier Code	Endosulfan sulfate Measured Conc. (ug/kg)	Endosulfan sulfate Norm. Conc.* (ug/g lipid)	Endosulfan sulfate Qualifier Code	Endrin Measured Conc. (ug/kg)	Endrin Norm. Conc.* (ug/g lipid)	Endrin Qualifier Code	Endrin aldehyde Measured Conc. (ug/kg)	Endrin aldehyde Norm. Conc.* (ug/g lipid)	Endrin aldehyde Qualifier Code
1C	D6	3		U	3		U	3		U	3		U
1C	D8	3		U/R	3		U/R	3		U/R	3		U/R
1C	D10	3		U	3		U	4*		U	4*		U
2A	D12	3		U	6*		U	3		U	4.2	0.14	
2B	D15	3		U	3		U	6*		U	4*		U
2C	D16	3		U	3		U	3		U	3		U
2C	D19	3		U	3		U	3		U	3		U
2C	D20	3		U	3		U	6*		U	3		U
3A	D22	3		U	3		U	3		U	3		U
3A	D23	3		U	3		U	12	0.54		4*		U
3A	D24	3		U	3		U	6*		U	3		U
3B	D26	3		U	3		U	8*		U	3		U
3B	D28	3		U	3		U	3		U	3		U
3B	D29	3		U	3		U	6.7	0.28		3		U
4A	D31	3		U	6*		U	3		U	3		U
4A	D35	3		U	3.5	0.15		3		U	3		U
4B	D38	3		U	3		U	3		U	3		U
4B	D40	3		U	3		U	3		U	3		U
Tissue Reference Levels		na***			na***			25			na***		

River Segment	Station	Methoxychlor Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	alpha-BHC Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	beta-BHC Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code	delta-BHC Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	30		U	3		U	3		U	3		U
1C	D8	30		U/R	3		U/R	3		U/R	3		U/R
1C	D10	30		U	5*		U	3		U	3		U
2A	D12	30		U	10*		U	3		U	3		U
2B	D15	65	2.21		7*		U	8*		U	3		U
2C	D16	30		U	3		U	3		U	3		U
2C	D19	30		U	8*		U	8*		U	3		U
2C	D20	30		U	3		U	3		U	3		U
3A	D22	30		U	3		U	3		U	3		U
3A	D23	30		U	3	0.13		3		U	3		U
3A	D24	30		U	9*		U	3		U	3		U
3B	D26	30		U	3.7	0.12		3		U	3		U
3B	D28	30		U	3		U	3		U	3		U
3B	D29	30		U	3		U	4.1	0.17		3		U
4A	D31	30		U	3		U	3		U	3		U
4A	D35	30		U	3		U	3		U	3		U
4B	D38	30		U	3		U	3		U	3		U
4B	D40	30		U	3		U	3		U	3		U
Tissue Reference Levels		na***			100			100			100		

River Segment	Station	gamma-BHC Measured Conc. (ug/kg)	Norm. Conc.* (ug/g lipid)	Qualifier Code
1C	D6	3		U
1C	D8	3		U/R
1C	D10	3		U
2A	D12	3		U
2B	D15	3		U
2C	D16	5.6	0.16	
2C	D19	7.7	0.32	
2C	D20	3		U
3A	D22	3		U
3A	D23	3		U
3A	D24	3.1	0.10	
3B	D26	3		U
3B	D28	3		U
3B	D29	3		U
4A	D31	3		U
4A	D35	3		U
4B	D38	3		U
4B	D40	3		U
Tissue Reference Levels		100		

TABLE E5-12. PCBS IN LARGESCALE SUCKER WHOLE-BODY COMPOSITES

River Segment	Station	Aroclor-1016 Measured Conc. (ug/kg)	Aroclor-1016 Norm. Conc.* (ug/g lipid)	Aroclor-1016 Qualifier Code	Aroclor-1221 Measured Conc. (ug/kg)	Aroclor-1221 Norm. Conc.* (ug/g lipid)	Aroclor-1221 Qualifier Code	Aroclor-1232 Measured Conc. (ug/kg)	Aroclor-1232 Norm. Conc.* (ug/g lipid)	Aroclor-1232 Qualifier Code	Aroclor-1242 Measured Conc. (ug/kg)	Aroclor-1242 Norm. Conc.* (ug/g lipid)	Aroclor-1242 Qualifier Code
1C	D6	50		U	50		U	50		U	50		U
1C	D8	50		U	50		U	50		U	50		U
1C	D10	50		U	50		U	50		U	50		U
2A	D12	50		U	50		U	50		U	50		U
2B	D15	50		U	50		U	50		U	50		U
2C	D16	50		U	50		U	50		U	50		U
2C	D19	50		U	50		U	50		U	50		U
2C	D20	50		U	50		U	50		U	50		U
3A	D22	50		U	50		U	50		U	50		U
3A	D23	50		U	50		U	50		U	50		U
3A	D24	50		U	50		U	50		U	50		U
3B	D26	50		U	50		U	50		U	50		U
3B	D28	50		U	50		U	50		U	50		U
3B	D29	50		U	50		U	50		U	50		U
4A	D31	50		U	50		U	50		U	50		U
4A	D35	50		U	50		U	50		U	50		U
4B	D38	50		U	50		U	50		U	50		U
4B	D40	50		U	50		U	50		U	50		U
Tissue Reference Levels		na***			na***			na***			na***		

U = Compound was not detected. Value given is the lower quantification limit.
* Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	Aroclor-1248 Measured Conc. (ug/kg)	Aroclor-1248 Norm. Conc.* (ug/g lipid)	Aroclor-1248 Qualifier Code	Aroclor-1254 Measured Conc. (ug/kg)	Aroclor-1254 Norm. Conc.* (ug/g lipid)	Aroclor-1254 Qualifier Code	Aroclor-1260 Measured Conc. (ug/kg)	Aroclor-1260 Norm. Conc.* (ug/g lipid)	Aroclor-1260 Qualifier Code	Total Detected PCBs Measured Conc. (ug/kg)	Total Detected PCBs Norm. Conc.* (ug/g lipid)
1C	D6	50		U	110	5.1		50		U	110	5.1
1C	D8	50		U	70	2.6		50		U	70	2.6
1C	D10	50		U	210	5.8		50		U	210	5.8
2A	D12	50		U	110	3.7		50		U	110	3.7
2B	D15	50		U	66	2.2		50		U	66	2.2
2C	D16	50		U	76	2.2		50		U	76	2.2
2C	D19	50		U	63	2.6		50		U	63	2.6
2C	D20	50		U	130	9.5		50		U	130	9.5
3A	D22	50		U	61	2.6		50		U	61	2.6
3A	D23	50		U	160	7.1		50		U	160	7.1
3A	D24	50		U	120	3.9		50		U	120	3.9
3B	D26	50		U	150	4.8		50		U	150	4.8
3B	D28	50		U	380	10.6		50		U	380	10.6
3B	D29	50		U	160	6.8		50		U	160	6.8
4A	D31	50		U	210	6.1		50		U	210	6.1
4A	D35	50		U	55	2.4		50		U	55	2.4
4B	D38	50		U	130	4.0		50		U	130	4.0
4B	D40	50		U	50		U	130	3.5		130	3.5
Tissue Reference Levels		na***			na***			na***			110	

TABLE E5-13. DIOXINS AND FURANS IN LARGESCALE SUCKER WHOLE-BODY COMPOSITES

River Segment	Station	2,3,7,8-TCDD			1,2,3,7,8-PeCDD			1,2,3,4,7,8-HxCDD			1,2,3,6,7,8-HxCDD		
		Measured Conc. (pg/g)	Norm. Conc.** (ng/g lipid)	Qualifier Code	Measured Conc. (pg/g)	Norm. Conc.** (ng/g lipid)	Qualifier Code	Measured Conc. (pg/g)	Norm. Conc.** (ng/g lipid)	Qualifier Code	Measured Conc. (pg/g)	Norm. Conc.** (ng/g lipid)	Qualifier Code
1C	D6	0.49	0.023	S	0.46	0.021	S/M	0.18	0.008	S	0.68	0.032	S/M
1C	D8	0.82	0.031		0.65	0.024	S/M	0.23	0.009	S	0.97	0.036	S
1C	D10	1.56	0.043		1.1	0.030	S/M	0.53	0.015	S	1.01	0.028	S
2B	D15	0.88	0.030		0.51	0.017	S/M	0.19	0.006	S/M	0.74	0.025	S
2C	D19	1.32	0.055		0.64	0.027	S/M	0.23	0.010	S	0.87	0.036	S
2C	D20	0.76	0.055		0.4	0.029	S/M	0.13	0.009	S/M	0.33	0.024	S/M
3A	D23	0.92	0.041		0.43	0.019	S/M	0.13	0.006	S/M	0.44	0.020	S
3A	D24	1.01	0.033		0.58	0.019	S/M	0.22	0.007	S	0.65	0.021	S
3B	D28	1.41	0.039		0.9	0.025	S/M	0.35	0.010	S	1.42	0.039	S
4A	D35	0.62	0.027		0.4	0.017	S/M	0.2	0.009	S	0.18	0.008	S
4B	D38	1.38	0.042		0.72	0.022	S/M	0.33	0.010	S	0.81	0.025	S
4B	D40	0.72	0.019		0.48	0.013	S/M	0.17	0.005	S/M	0.41	0.011	S
Tissue Reference Levels		na***			na***			na***			na***		

U = Compound was not detected.
E = Analyte not detected at or above the sample specific Estimated Detection Limit (EDL). The EDL is reported.
L = Analyte not detected at or above the Lower Method Calibration Limit (LMCL). The LMCL is reported.
M = Estimated Maximum Possible Concentration.
MD = Estimated Maximum Possible Concentration with Diphenyl Ether interferences.
S = Analyte detected below the Lower Method Calibration Limit. Value should be considered an estimate.
* Obtained from a DB-225 column.
** Lipid-normalized data presented only when a compound is detected.
*** Tissue reference level not available for this compound.

River Segment	Station	1,2,3,7,8,9-HxCDD Measured Conc. (pg/g)	1,2,3,7,8,9-HxCDD Norm. Conc.** (ng/g lipid)	1,2,3,7,8,9-HxCDD Qualifier Code	1,2,3,4,6,7,8-HpCDD Measured Conc. (pg/g)	1,2,3,4,6,7,8-HpCDD Norm. Conc.** (ng/g lipid)	1,2,3,4,6,7,8-HpCDD Qualifier Code	OCDD Measured Conc. (pg/g)	OCDD Norm. Conc.** (ng/g lipid)	OCDD Qualifier Code	2,3,7,8-TCDF Measured Conc. (pg/g)	2,3,7,8-TCDF Norm. Conc.** (ng/g lipid)	2,3,7,8-TCDF Qualifier Code
1C	D6	0.43	0.020	S	2.07	0.096	S	4.04	0.188	S	5.24	0.244	*
1C	D8	0.45	0.017	S	2.44	0.091	S	4.41	0.165	S	7.97	0.299	*
1C	D10	0.92	0.025	S	3.35	0.092		6.67	0.184		5.45	0.150	*
2B	D15	0.42	0.014	S	2.45	0.083	S	6.43	0.219		4.69	0.160	*
2C	D19	0.48	0.020	S	2.98	0.125		9.28	0.388		8.79	0.368	*
2C	D20	0.16	0.012	S	1.66	0.121	S	13.7	1.000		2.46	0.180	*M
3A	D23	0.19	0.008	S	1.1	0.049	S	5.25	0.234		6.36	0.284	*
3A	D24	0.28	0.009	S	3.11	0.101		21.3	0.694		7.24	0.236	*
3B	D28	0.36	0.010	S	4.36	0.121		20.1	0.558		6.98	0.194	*
4A	D35	0.11	0.005	S	1.04	0.045	S	3.79	0.165	S	7.09	0.308	*
4B	D38	0.38	0.012	S	2.41	0.074	S	4.12	0.127	S	11.4	0.351	*
4B	D40	0.32	0.009	S/M	1.82	0.049	S	0.79	0.021	S	11	0.295	*
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	1,2,3,7,8-PeCDF Measured Conc. (pg/g)	1,2,3,7,8-PeCDF Norm. Conc.** (ng/g lipid)	1,2,3,7,8-PeCDF Qualifier Code	2,3,4,7,8-PeCDF Measured Conc. (pg/g)	2,3,4,7,8-PeCDF Norm. Conc.** (ng/g lipid)	2,3,4,7,8-PeCDF Qualifier Code	1,2,3,4,7,8-HxCDF Measured Conc. (pg/g)	1,2,3,4,7,8-HxCDF Norm. Conc.** (ng/g lipid)	1,2,3,4,7,8-HxCDF Qualifier Code	1,2,3,6,7,8-HxCDF Measured Conc. (pg/g)	1,2,3,6,7,8-HxCDF Norm. Conc.** (ng/g lipid)	1,2,3,6,7,8-HxCDF Qualifier Code
1C	D6	0.18	0.008	S	0.43	0.020	S	0.18	0.008	S	0.23	0.011	S
1C	D8	0.23	0.009	S	0.52	0.019	S	0.21	0.008	S	0.21	0.008	S/M
1C	D10	0.49	0.013	S	1.21	0.033	S	0.39	0.011	S	0.33	0.009	S/M
2B	D15	0.2	0.007	S	0.48	0.016	S	0.2	0.007	S	0.22	0.007	S
2C	D19	0.34	0.014	S/M	0.69	0.029	S	0.27	0.011	S	0.22	0.009	S
2C	D20	0.14	0.010	S	0.33	0.024	S	0.14	0.010	S	0.09	0.007	S
3A	D23	0.16	0.007	S	0.38	0.017	S	0.13	0.006	S/M	0.11	0.005	S/M
3A	D24	0.28	0.009	S/M	0.5	0.016	S	0.22	0.007	S/M	0.18	0.006	S
3B	D28	0.42	0.012	S	0.92	0.026	S	0.45	0.013	S	0.25	0.007	S
4A	D35	0.18	0.008	S	0.31	0.013	S	0.08	0.003	S	0.16	0.007	S
4B	D38	0.23	0.007	S/M	0.72	0.022	S	0.27	0.008	S/M	0.36	0.011	S
4B	D40	0.16	0.004	S/M	0.45	0.012	S/M	0.09	0.002	S	0.15	0.004	S/M
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	2,3,4,6,7,8-HxCDF			1,2,3,7,8,9-HxCDF			1,2,3,4,6,7,8-HpCDF			1,2,3,4,7,8,9-HpCDF		
		Measured Conc. (pg/g)	Norm. Conc.** (ng/g lipid)	Qualifier Code	Measured Conc. (pg/g)	Norm. Conc.** (ng/g lipid)	Qualifier Code	Measured Conc. (pg/g)	Norm. Conc.** (ng/g lipid)	Qualifier Code	Measured Conc. (pg/g)	Norm. Conc.** (ng/g lipid)	Qualifier Code
1C	D6	1.35	0.063	S/MD	0.13	0.006	S	0.29	0.013	S/MD	0.06	0.003	S
1C	D8	2.17	0.081	S/M	0.14	0.005	S	0.36	0.013	S	0.08	0.003	S/M
1C	D10	0.78	0.021	S	0.6	0.017	S	0.85	0.023	S	0.43	0.012	S
2B	D15	1.65	0.056	S/MD	0.12	0.004	S/M	1.03	0.035	S/MD	0.1	0.003	S/M
2C	D19	1.41	0.059	S/M	0.18	0.008	S	1.05	0.044	S/MD	0.13	0.005	S
2C	D20	0.4	0.029	S	0.09	0.007	S/M	0.33	0.024	S/M	0.12	0.009	S/M
3A	D23	0.49	0.022	S/M	0.09	0.004	S	0.23	0.010	S/M	0.09	0.004	S
3A	D24	0.54	0.018	S/M	0.17	0.006	S	0.55	0.018	S	0.15	0.005	S/M
3B	D28	1.5	0.042	S/M	0.33	0.009	S	0.7	0.019	S	0.3	0.008	S
4A	D35	1.61	0.070	S/MD	0.11	0.005	S	0.9	0.039	S	0.1	0.004	S
4B	D38	2.69	0.083	MD	0.18	0.006	S	1.79	0.055	S/MD	0.15	0.005	S
4B	D40	2.77	0.074	MD	0.17	0.005	S/M	0.3	0.008	S/M	0.11	0.003	S/M
Tissue Reference Levels		na***			na***			na***			na***		

River Segment	Station	OCDF Measured Conc. (pg/g)	Norm. Conc.** (ng/g lipid)	Qualifier Code	TEC (FULL) Calculated Conc. (pg/g)	TEC (HALF) Calculated Conc. (pg/g)	TEC (ZERO) Calculated Conc. (pg/g)
1C	D6	0.3	0.014	S	1.81	1.81	1.81
1C	D8	0.35	0.013	S	2.69	2.69	2.69
1C	D10	1.2	0.033	S	3.79	3.79	3.79
2B	D15	0.47	0.016	S	2.25	2.25	2.25
2C	D19	1.03	0.043	S	3.30	3.30	3.30
2C	D20	1.44	0.105	S	1.55	1.55	1.55
3A	D23	0.56	0.025	S	2.15	2.15	2.15
3A	D24	1.76	0.057	S	2.58	2.58	2.58
3B	D28	3.07	0.085	S	3.58	3.58	3.58
4A	D35	0.35	0.015	S/M	1.96	1.96	1.96
4B	D38	0.69	0.021	S	3.80	3.80	3.80
4B	D40	10.6	0.284		2.73	2.73	2.73
Tissue Reference Levels		na***			3	3	3

APPENDIX F

APPENDIX F

1993 TISSUE BIOACCUMULATION DATA

F1. CRAYFISH TISSUE BIOACCUMULATION DATA

F2. FISH TISSUE BIOACCUMULATION DATA

APPENDIX F1

CRAYFISH TISSUE BIOACCUMULATION DATA

TABLE F1-1. METALS IN CRAYFISH WHOLE-BODY COMPOSITES
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		METALS											
		Antimony	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc
River Mile	Sample Number	Conc. (mg/kg)	Conc. (mg/kg)	Conc. (mg/kg)	Conc. (mg/kg)	Conc. (mg/kg)	Conc. (mg/kg)	Conc. (mg/kg)	Conc. (mg/kg)	Conc. (mg/kg)	Conc. (mg/kg)	Conc. (mg/kg)	Conc. (mg/kg)
RM 21	2-CF	0.012	0.036 U/E	31.5	0.047	0.079 E	29.3	0.148 E	0.065	0.56	0.045 E	0.103	32.3 E
RM 23	3-CF	0.012 U	0.036 U/E	31.0	0.043	0.055	31.1	0.108 E	0.049 U/B	0.83	0.036 U/E	0.057 E	28.5 E
RM 26	4-CF	0.012 U	0.036 U	38.5	0.037	0.056	21.8	0.145 E	0.029	0.10 U	0.036 U/E	0.070	30.2 E
RM 29	5-CF	0.011 U	0.033 U	8.5	0.029	0.035	20.9	0.174 E	0.048	0.24	0.033 U/E	0.062	31.4 E
RM 36	6-CF	0.012 U	0.036 U	31.2	0.027	0.089	22.3	0.113 E	0.044	0.10 U	0.036 U	0.028 E	35.5 E
RM 59	7-CF	0.012 U	0.036 U	47.2	0.038	0.089	24.2	0.096 E	0.045 U/B	1.33	0.036 U	0.018	33.9 E
RM 68	8-CF	0.012 U	0.035 U	35.6	0.0004 U	0.088	14.9	0.174 E	0.081	0.29	0.035 U	0.004 U	31.9 E
RM 81	9-CF	0.015 U	0.046 U	24.4	0.042	0.095	18.5	0.168 E	0.055	0.64 E	0.046 U	0.043 E	83.3 E
RM 88	10-CF	0.015	0.036	36.9	0.027	0.093	15.9	0.124 E	0.039	0.36	0.047 E	0.057	33.6 E
RM 90	11-CF	0.012 U	0.036 U/E	11.1	0.021	0.077	24.7	0.048 U/B	0.029	1.23	0.036 U/E	0.025	37.8 E
RM 95	12-CF	0.012 U	0.036 U	33.5	0.053	0.090	21.8	0.163 E	0.032	0.68	0.036 U/E	0.091	35.2 E
RM 120	13-1-CF	0.014	0.035 U/E	31.5	0.026	0.063	20.0	0.114 E	0.045	0.69	0.035 U/E	0.035	31.2 E
RM 120	13-2-CF	0.018	0.038 U/E	32.3	0.030	0.066	18.1	0.141 E	0.050	0.40	0.038 U/E	0.035 E	24.6 E
RM 120	13-3-CF	0.013	0.035 U/E	29.0	0.033	0.074	20.1	0.148 E	0.034	0.53	0.035 U/E	0.053	31.4 E
RM 124	14-CF	0.017	0.036 U/E	27.6	0.051	0.063	21.8	0.444 E	0.052	0.46	0.044 E	0.054	55.7 E
Wildlife Reference Value[1]		na*	na*	na*	na*	na*	na*	na*	na*	na*	na*	na*	na*

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was undetected. Value given is the lower quantification limit.
E = Estimated value
U/B = Undetected due to blank contamination.
* = Reference value not available.
[1] Wildlife reference value from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-2. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 1 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PHENOLS														
		Phenol			2-Methylphenol			4-Methylphenol			2,4-Dimethylphenol			Pentachlorophenol		
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	
RM 21	2-CF	94		U	94		U	94		U	94		U	470		U
RM 23	3-CF	94		U	94		U	94		U	94		U	470		U
RM 26	4-CF	94		U	94		U	94		U	94		U	470		U
RM 29	5-CF	530	66.3		94		U	94		U	94		U	470		U
RM 36	6-CF	690	69.0		96		U	96		U	96		U	480		U
RM 59	7-CF	240	30.0		99		U	99		U	99		U	500		U
RM 68	8-CF	99		U	99		U	99		U	99		U	500		U
RM 81	9-CF	130	10.8		96		U	56	4.7	J/M	96		U	480		U
RM 88	10-CF	100	16.7		93		U	93		U	93		U	460		U
RM 90	11-CF	98		U	98		U	98		U	98		U	490		U
RM 95	12-CF	95		U	95		U	95		U	95		U	470		U
RM 120	13-1-CF	99		U	99		U	99		U	99		U	490		U
RM 120	13-2-CF	98		U	98		U	98		U	98		U	490		U
RM 120	13-3-CF	98		U	98		U	98		U	98		U	490		U
RM 124	14-CF	99		U	99		U	99		U	99		U	500		U
Wildlife Reference Level[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-2. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 2 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PHENOLS (cont.)														
		2-Chlorophenol			2,4-Dichlorophenol			4-Chloro-3-methylphenol			2,4-Dinitrophenol			2-Nitrophenol		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	94		U	280		U	190		U	470		U	470		U
RM 23	3-CF	94		U	280		U	190		U	470		U	470		U
RM 26	4-CF	94		U	280		U	190		U	470		U	470		U
RM 29	5-CF	94		U	280		U	190		U	470		U	470		U
RM 36	6-CF	96		U	290		U	190		U	480		U	480		U
RM 59	7-CF	99		U	300		U	200		U	500		U	500		U
RM 68	8-CF	99		U	300		U	200		U	500		U	500		U
RM 81	9-CF	96		U	290		U	190		U	480		U	480		U
RM 88	10-CF	93		U	280		U	190		U	460		U	460		U
RM 90	11-CF	98		U	290		U	200		U	490		U	490		U
RM 95	12-CF	95		U	280		U	190		U	470		U	470		U
RM 120	13-1-CF	99		U	300		U	200		U	490		U	490		U
RM 120	13-2-CF	98		U	290		U	200		U	490		U	490		U
RM 120	13-3-CF	98		U	290		U	200		U	490		U	490		U
RM 124	14-CF	99		U	300		U	200		U	500		U	500		U
Wildlife Reference Level[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-2. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 3 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PHENOLS (cont.)												HALOGENATED ETHERS		
		4-Nitrophenol			2,4,5-Trichlorophenol			2,4,6-Trichlorophenol			4,6-Dinitro-2-methylphenol			bis(2-Chloroethyl)ether		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	470		U	470		U	470		U	940		U	94		U
RM 23	3-CF	470		U	470		U	470		U	940		U	94		U
RM 26	4-CF	470		U	470		U	470		U	940		U	94		U
RM 29	5-CF	470		U	470		U	470		U	940		U	94		U
RM 36	6-CF	480		U	480		U	480		U	960		U	96		U
RM 59	7-CF	500		U	500		U	500		U	990		U	99		U
RM 68	8-CF	500		U	500		U	500		U	990		U	99		U
RM 81	9-CF	480		U	480		U	480		U	960		U	96		U
RM 88	10-CF	460		U	460		U	460		U	930		U	93		U
RM 90	11-CF	490		U	490		U	490		U	980		U	98		U
RM 95	12-CF	470		U	470		U	470		U	950		U	95		U
RM 120	13-1-CF	490		U	490		U	490		U	990		U	99		U
RM 120	13-2-CF	490		U	490		U	490		U	980		U	98		U
RM 120	13-3-CF	490		U	490		U	490		U	980		U	98		U
RM 124	14-CF	500		U	500		U	500		U	990		U	99		U
Wildlife Reference Level[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-2. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 4 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		HALOGENATED ETHERS (cont.)											
		bis(2-Chloroethoxy)methane			4-Bromophenyl-phenylether			4-Chlorophenyl-phenylether			2,2'-Oxybis(1-chloropropane)		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	94		U	94		U	94		U	94		U
RM 23	3-CF	94		U	94		U	94		U	94		U
RM 26	4-CF	94		U	94		U	94		U	94		U
RM 29	5-CF	94		U	94		U	94		U	94		U
RM 36	6-CF	96		U	96		U	96		U	96		U
RM 59	7-CF	99		U	99		U	99		U	99		U
RM 68	8-CF	99		U	99		U	99		U	99		U
RM 81	9-CF	96		U	96		U	96		U	96		U
RM 88	10-CF	93		U	93		U	93		U	93		U
RM 90	11-CF	98		U	98		U	98		U	98		U
RM 95	12-CF	95		U	95		U	95		U	95		U
RM 120	13-1-CF	99		U	99		U	99		U	99		U
RM 120	13-2-CF	98		U	98		U	98		U	98		U
RM 120	13-3-CF	98		U	98		U	98		U	98		U
RM 124	14-CF	99		U	99		U	99		U	99		U
Wildlife Reference Level[1]		na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-2. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 5 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		NITROAROMATICS									
		2,4-Dinitrotoluene		2,6-Dinitrotoluene		Nitrobenzene		2-Nitroaniline		3-Nitroaniline	
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	470 U		470 U		94 U		470 U		470 U	
RM 23	3-CF	470 U		470 U		94 U		470 U		470 U	
RM 26	4-CF	470 U		470 U		94 U		470 U		470 U	
RM 29	5-CF	470 U		470 U		94 U		470 U		470 U	
RM 36	6-CF	480 U		480 U		96 U		480 U		480 U	
RM 59	7-CF	500 U		500 U		99 U		500 U		500 U	
RM 68	8-CF	500 U		500 U		99 U		500 U		500 U	
RM 81	9-CF	480 U		480 U		96 U		480 U		480 U	
RM 88	10-CF	460 U		460 U		93 U		460 U		460 U	
RM 90	11-CF	490 U		490 U		98 U		490 U		490 U	
RM 95	12-CF	470 U		470 U		95 U		470 U		470 U	
RM 120	13-1-CF	490 U		490 U		99 U		490 U		490 U	
RM 120	13-2-CF	490 U		490 U		98 U		490 U		490 U	
RM 120	13-3-CF	490 U		490 U		98 U		490 U		490 U	
RM 124	14-CF	500 U		500 U		99 U		500 U		500 U	
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-2. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 6 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		NITROAROMATICS (cont.)			POLYNUCLEAR AROMATIC HYDROCARBONS											
		4-Nitroaniline			Acenaphthene			Acenaphthylene			Anthracene			Benzo(a)anthracene		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	470		U	9.4		U	9.4		U	9.4		U	9.4		U
RM 23	3-CF	470		U	9.4		U	9.4		U	9.4		U	9.4		U
RM 26	4-CF	470		U	9.4		U	9.4		U	9.4		U	9.4		U
RM 29	5-CF	470		U	9.4		U	9.4		U	9.4		U	9.4		U
RM 36	6-CF	480		U	9.6		U	9.6		U	9.6		U	9.6		U
RM 59	7-CF	500		U	9.9		U	9.9		U	9.9		U	9.9		U
RM 68	8-CF	500		U	7.3	0.7	J	9.9		U	9.9		U	9.9		U
RM 81	9-CF	480		U	9.6		U	9.6		U	9.6		U	9.6		U
RM 88	10-CF	460		U	9.3		U	9.3		U	9.3		U	9.3		U
RM 90	11-CF	490		U	9.8		U	9.8		U	9.8		U	9.8		U
RM 95	12-CF	470		U	9.5		U	9.5		U	9.5		U	9.5		U
RM 120	13-1-CF	490		U	9.9		U	9.9		U	9.9		U	9.9		U
RM 120	13-2-CF	490		U	9.8		U	9.8		U	9.8		U	9.8		U
RM 120	13-3-CF	490		U	9.8		U	9.8		U	9.8		U	9.8		U
RM 124	14-CF	500		U	9.9		U	9.9		U	9.9		U	9.9		U
Wildlife Reference Level[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-2. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 7 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		POLYNUCLEAR AROMATIC HYDROCARBONS (cont.)									
		Benzo(b,k)fluoranthene		Benzo(a)pyrene		Benzo(ghi)perylene		Chrysene		Dibenzo(a,h)anthracene	
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)
RM 21	2-CF	9.4	U	9.4	U	9.4	U	9.4	U	9.4	U
RM 23	3-CF	9.4	U	9.4	U	9.4	U	9.4	U	9.4	U
RM 26	4-CF	9.4	U	9.4	U	9.4	U	9.4	U	9.4	U
RM 29	5-CF	9.4	U	9.4	U	9.4	U	9.4	U	9.4	U
RM 36	6-CF	9.6	U	9.6	U	9.6	U	9.6	U	9.6	U
RM 59	7-CF	9.9	U	9.9	U	9.9	U	9.9	U	9.9	U
RM 68	8-CF	9.9	U	9.9	U	9.9	U	9.9	U	9.9	U
RM 81	9-CF	9.6	U	9.6	U	9.6	U	9.6	U	9.6	U
RM 88	10-CF	9.3	U	9.3	U	9.3	U	9.3	U	9.3	U
RM 90	11-CF	9.8	U	9.8	U	9.8	U	9.8	U	9.8	U
RM 95	12-CF	9.5	U	9.5	U	9.5	U	9.5	U	9.5	U
RM 120	13-1-CF	9.9	U	9.9	U	9.9	U	9.9	U	9.9	U
RM 120	13-2-CF	9.8	U	9.8	U	9.8	U	9.8	U	9.8	U
RM 120	13-3-CF	9.8	U	9.8	U	9.8	U	9.8	U	9.8	U
RM 124	14-CF	9.9	U	9.9	U	9.9	U	9.9	U	9.9	U
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-2. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 8 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		POLYNUCLEAR AROMATIC HYDROCARBONS (cont.)														
		Fluoranthene			Fluorene			Indeno(1,2,3-cd)pyrene			Naphthalene			Phenanthrene		
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	
RM 21	2-CF	9.4		U	9.4		U	9.4		U	4.7		U/B	9.4		U
RM 23	3-CF	11.0		U	9.4		U	9.4		U	7.5		U/B	9.4		U
RM 26	4-CF	9.4		U	9.4		U	9.4		U	15.0	0.8		9.4		U
RM 29	5-CF	9.4		U	9.4		U	9.4		U	17.0	2.1		9.4		U
RM 36	6-CF	9.6		U	9.6		U	9.6		U	13.0	1.3		9.6		U
RM 59	7-CF	9.9		U	9.9		U	9.9		U	6.9		U/B	9.9		U
RM 68	8-CF	9.9		U	5.3	0.5	J	9.9		U	6.4		U/B	7.7	0.8	J
RM 81	9-CF	9.6		U	9.6		U	9.6		U	57.0	4.8		9.6		U
RM 88	10-CF	9.3		U	9.3		U	9.3		U	12.0	2.0		9.3		U
RM 90	11-CF	9.8		U	9.8		U	9.8		U	4.4		U/B	9.8		U
RM 95	12-CF	9.5		U	9.5		U	9.5		U	9.5	0.5		9.5		U
RM 120	13-1-CF	9.9		U	9.9		U	9.9		U	9.9		U/B	9.9		U
RM 120	13-2-CF	10.0		U	9.8		U	9.8		U	9.8		U/B	9.8		U
RM 120	13-3-CF	9.8		U	9.8		U	9.8		U	9.8		U/B	9.8		U
RM 124	14-CF	9.9		U	9.9		U	9.9		U	20.0	0.9		9.9		U
Wildlife Reference Level[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-2. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 9 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		POLYNUCLEAR AROMATIC HYDROCARBONS (cont.)									NAPHTHALENES			CHLORINATED BENZENES		
		Pyrene			2-Methylnaphthalene			Dibenzofuran			2-Chloronaphthalene			1,3-Dichlorobenzene		
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	
RM 21	2-CF	9.4		U	**5.5**	**0.3**	M	9.4		U	94		U	94		U
RM 23	3-CF	9.4		U	**7.4**	**0.4**	M	9.4		U	94		U	94		U
RM 26	4-CF	9.4		U	**14.0**	**0.8**		9.4		U	94		U	94		U
RM 29	5-CF	9.4		U	**20.0**	**2.5**		9.4		U	94		U	94		U
RM 36	6-CF	9.6		U	**12.0**	**1.2**		9.6		U	96		U	96		U
RM 59	7-CF	9.9		U	**7.7**	**1.0**		9.9		U	99		U	99		U
RM 68	8-CF	9.9		U	5.6		U/B	**3.6**	**0.4**	M	99		U	99		U
RM 81	9-CF	9.6		U	**16.0**	**1.3**		9.6		U	96		U	96		U
RM 88	10-CF	9.3		U	**14.0**	**2.3**		9.3		U	93		U	93		U
RM 90	11-CF	9.8		U	5.7		U/B	9.8		U	98		U	98		U
RM 95	12-CF	9.5		U	**5.3**	**0.3**	M	9.5		U	95		U	95		U
RM 120	13-1-CF	9.9		U	**9.9**	**0.5**		9.9		U	99		U	99		U
RM 120	13-2-CF	9.8		U	**9.8**	**0.7**		9.8		U	98		U	98		U
RM 120	13-3-CF	9.8		U	**9.8**	**0.7**		9.8		U	98		U	98		U
RM 124	14-CF	9.9		U	**17.0**	**0.8**		9.9		U	99		U	99		U
Wildlife Reference Level[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-2. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 10 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		CHLORINATED BENZENES (cont.)														
		1,2-Dichlorobenzene			1,4-Dichlorobenzene			1,2,4-Trichlorobenzene			Hexachlorobenzene			Hexachlorobutadiene		
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	
RM 21	2-CF	94		U	94		U	94		U	94		U	94		U
RM 23	3-CF	94		U	94		U	94		U	94		U	94		U
RM 26	4-CF	94		U	94		U	94		U	94		U	94		U
RM 29	5-CF	94		U	94		U	94		U	94		U	94		U
RM 36	6-CF	96		U	96		U	96		U	96		U	96		U
RM 59	7-CF	99		U	99		U	99		U	99		U	99		U
RM 68	8-CF	99		U	99		U	99		U	99		U	99		U
RM 81	9-CF	96		U	96		U	96		U	96		U	96		U
RM 88	10-CF	93		U	93		U	93		U	93		U	93		U
RM 90	11-CF	98		U	98		U	98		U	98		U	98		U
RM 95	12-CF	95		U	95		U	95		U	95		U	95		U
RM 120	13-1-CF	99		U	99		U	99		U	99		U	99		U
RM 120	13-2-CF	98		U	98		U	98		U	98		U	98		U
RM 120	13-3-CF	98		U	98		U	98		U	98		U	98		U
RM 124	14-CF	99		U	99		U	99		U	99		U	99		U
Wildlife Reference Level[1]		na **			na **			1300			na **			na **		

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-2. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 11 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		CHLORINATED BENZENES (cont.)				BENZIDINES		PHTHALATE ESTERS			
		Hexachloroethane		Hexachlorocyclopentadiene		3,3'-Dichlorobenzidine		Dimethyl phthalate		Diethyl phthalate	
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 21	2-CF	94	U	470	U	470	U	94	U	94	U
RM 23	3-CF	94	U	470	U	470	U	94	U	94	U
RM 26	4-CF	94	U	470	U	470	U	94	U	94	U
RM 29	5-CF	94	U	470	U	470	U	94	U	94	U
RM 36	6-CF	96	U	480	U	480	U	96	U	96	U
RM 59	7-CF	99	U	500	U	500	U	99	U	99	U
RM 68	8-CF	99	U	500	U	500	U	99	U	99	U
RM 81	9-CF	96	U	480	U	480	U	96	U	96	U
RM 88	10-CF	93	U	460	U	460	U	93	U	93	U
RM 90	11-CF	98	U	490	U	490	U	98	U	98	U
RM 95	12-CF	95	U	470	U	470	U/E	95	U	95	U
RM 120	13-1-CF	99	U	490	U	490	U	99	U	99	U
RM 120	13-2-CF	98	U	490	U	490	U	98	U	98	U
RM 120	13-3-CF	98	U	490	U	490	U	98	U	98	U
RM 124	14-CF	99	U	500	U	500	U	99	U	99	U
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-2. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 12 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PHTHALATE ESTERS (cont.)											
		Di-n-butyl phthalate			Benzyl butyl phthalate			bis(2-Ethyl-hexyl)phthalate			Di-n-octyl phthalate		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	2200		U	4700		U	1000		U	94		U
RM 23	3-CF	2000		U	7400		U	970		U	94		U/E
RM 26	4-CF	840		U	4100		U	330		U	94		U
RM 29	5-CF	240	30		5200		U	320		U	94		U
RM 36	6-CF	660		U	4600		U	820		U	96		U
RM 59	7-CF	830		U	2500		U	760		U	99		U
RM 68	8-CF	910		U	2300		U	660		U	99		U
RM 81	9-CF	260		U	3000		U	640		U	96		U
RM 88	10-CF	1400		U	5200		U	320		U	93		U
RM 90	11-CF	960		U	2200		U	290		U	98		U
RM 95	12-CF	3100		U	7100		U/E	1100		U/E	95		U/E
RM 120	13-1-CF	730		U	1900		U	110		U	99		U
RM 120	13-2-CF	1100		U	2700		U	480		U	98		U
RM 120	13-3-CF	690		U	2100		U	98		U	98		U
RM 124	14-CF	1400		U	2600		U	99		U	99		U
Wildlife Reference Level[1]		na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-2. SEMIVOLATILE ORGANIC COMPOUNDS IN CRAYFISH WHOLE-BODY COMPOSITES (page 13 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		MISCELLANEOUS														
		Carbazole			Benzyl Alcohol			Benzoic Acid			Isophorone			4-Chloroaniline		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	94		U	94		U	94		U	94		U	280		U
RM 23	3-CF	94		U	94		U	94		U	94		U	280		U
RM 26	4-CF	94		U	94		U	94		U	94		U	280		U
RM 29	5-CF	94		U	94		U	94		U	94		U	280		U
RM 36	6-CF	96		U	96		U	96		U	96		U	290		U
RM 59	7-CF	99		U	99		U	99		U	99		U	300		U
RM 68	8-CF	99		U	99		U	99		U	99		U	300		U
RM 81	9-CF	96		U	59	4.9	J/M	96		U	96		U	290		U
RM 88	10-CF	93		U	93		U	93		U	93		U	280		U
RM 90	11-CF	98		U	68	3.8	J/M	98		U	98		U	290		U
RM 95	12-CF	95		U	95		U	95		U	95		U	280		U
RM 120	13-1-CF	99		U	99		U	99		U	99		U	300		U
RM 120	13-2-CF	98		U	98		U	98		U	98		U	290		U
RM 120	13-3-CF	98		U	98		U	98		U	98		U	290		U
RM 124	14-CF	99		U	99		U	99		U	99		U	300		U
Wildlife Reference Level[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
J = Estimated value less than specified detection limit.
M = Value detected with low spectral match parameters.
U/B = Undetected due to blank contamination.
E = Estimated value.
* = Lipid-normalized value presented only when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-3. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES (page 1 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PESTICIDES														
		Alpha-BHC			Beta-BHC			Delta-BHC			Lindane			Heptachlor		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 23	3-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 26	4-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 29	5-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 36	6-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 59	7-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 68	8-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 81	9-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 88	10-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 90	11-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 95	12-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 120	13-1-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 120	13-2-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 120	13-3-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 124	14-CF	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
Wildlife Reference Levels[1]		100			100			100			100			na **		

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
J = Estimated value is less than the specified detection limit.
* = Lipid-normalized value only given when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-3. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES (page 2 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PESTICIDES (cont.)														
		Aldrin			Heptachlor Epoxide			Endosulfan I			Dieldrin			p,p'-DDE		
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	
RM 21	2-CF	2.5		U	2.5		U	2.5		U	5		U	6.0	0.4	
RM 23	3-CF	2.5		U	2.5		U	2.5		U	5		U	3.8	0.2	E
RM 26	4-CF	2.5		U	2.5		U	2.5		U	5		U	3.5	0.2	E
RM 29	5-CF	2.5		U	2.5		U	2.5		U	5		U	4.5	0.6	E
RM 36	6-CF	2.5		U	2.5		U	2.5		U	5		U	3.5	0.4	E
RM 59	7-CF	2.5		U	2.5		U	2.5		U	5		U	5.0		U
RM 68	8-CF	2.5		U	2.5		U	2.5		U	5		U	2.8	0.3	E
RM 81	9-CF	2.5		U	2.5		U	2.5		U	5		U	3.0	0.3	E
RM 88	10-CF	2.5		U	2.5		U	2.5		U	5		U	2.4	0.4	E
RM 90	11-CF	2.5		U	2.5		U	2.5		U	5		U	9.3	0.5	
RM 95	12-CF	2.5		U	2.5		U	2.5		U	5		U	10.6	0.5	
RM 120	13-1-CF	2.5		U	2.5		U	2.5		U	5		U	10.0	0.5	
RM 120	13-2-CF	2.5		U	2.5		U	2.5		U	5		U	13.0	0.9	
RM 120	13-3-CF	2.5		U	2.5		U	2.5		U	5		U	12.0	0.9	
RM 124	14-CF	2.5		U	2.5		U	2.5		U	5		U	14.0	0.6	
Wildlife Reference Levels[1]		120			na **			na **			120			200		

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
J = Estimated value is less than the specified detection limit.
* = Lipid-normalized value only given when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-3. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES (page 3 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PESTICIDES (cont.)									
		Endrin		Endosulfan II		p,p'-DDD		Endosulfan Sulfate		p,p'-DDT	
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)
RM 21	2-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 23	3-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 26	4-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 29	5-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 36	6-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 59	7-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 68	8-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 81	9-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 88	10-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 90	11-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 95	12-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 120	13-1-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 120	13-2-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 120	13-3-CF	5 U		5 U		5 U		5 U/E		5 U	
RM 124	14-CF	5 U		5 U		5 U		5 U/E		5 U	
Wildlife Reference Levels[1]		25		na **		200		na **		200	

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
J = Estimated value is less than the specified detection limit.
* = Lipid-normalized value only given when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-3. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES (page 4 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PESTICIDES (cont.)														
		Methoxychlor			Endrin Ketone			Endrin Aldehyde			Gamma-Chlordane			Alpha-Chlordane		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
RM 23	3-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
RM 26	4-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
RM 29	5-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
RM 36	6-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
RM 59	7-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
RM 68	8-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
RM 81	9-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
RM 88	10-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
RM 90	11-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
RM 95	12-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
RM 120	13-1-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
RM 120	13-2-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
RM 120	13-3-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
RM 124	14-CF	25		U	5		U/E	5		U	2.5		U	2.5		U
Wildlife Reference Levels[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
J = Estimated value is less than the specified detection limit.
* = Lipid-normalized value only given when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-3. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES (page 5 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PESTICIDES (cont.)													
		Toxaphene			o,p'-DDE			o,p'-DDD			o,p'-DDT			Dicofol		
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	
RM 21	2-CF	250		U	5		U	5		U	5		U	62		U
RM 23	3-CF	250		U	5		U	5		U	5		U	62		U
RM 26	4-CF	250		U	5		U	5		U	5		U	62		U
RM 29	5-CF	250		U	5		U	5		U	5		U	62		U
RM 36	6-CF	250		U	5		U	5		U	5		U	62		U
RM 59	7-CF	250		U	5		U	5		U	5		U	62		U
RM 68	8-CF	250		U	5		U	5		U	5		U	62		U
RM 81	9-CF	250		U	5		U	5		U	5		U	62		U
RM 88	10-CF	250		U	5		U	5		U	5		U	62		U
RM 90	11-CF	250		U	5		U	5		U	5		U	62		U
RM 95	12-CF	250		U	5		U	5		U	5		U	62		U
RM 120	13-1-CF	250		U	5		U	5		U	5		U	62		U
RM 120	13-2-CF	250		U	5		U	5		U	5		U	62		U
RM 120	13-3-CF	250		U	5		U	5		U	5		U	62		U
RM 124	14-CF	250		U	5		U	5		U	5		U	62		U
Wildlife Reference Levels[1]		na **			200			200			200			na **		

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
J = Estimated value is less than the specified detection limit.
* = Lipid-normalized value only given when a compound is detected.
** = Wildlife reference level not available.
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TABLE F1-3. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES (page 6 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PESTICIDES (cont.)			PCBs												
		Methyl Parathion			Aroclor 1242/1016			Aroclor 1248			Aroclor 1254			Aroclor 1260			
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		
RM 21	2-CF	62		U	50		U	50		U	50		U	50		U	
RM 23	3-CF	62		U	50		U	50		U	50		U	50		U	
RM 26	4-CF	62		U	50		U	50		U	50		U	50		U	
RM 29	5-CF	62		U	50		U	50		U	50		U	50		U	
RM 36	6-CF	62		U	50		U	50		U	50		U	50		U	
RM 59	7-CF	62		U	50		U	50		U	50		U	50		U	
RM 68	8-CF	62		U	50		U	50		U	50		U	50		U	
RM 81	9-CF	62		U	50		U	50		U	50		U	50		U	
RM 88	10-CF	62		U	50		U	50		U	50		U	30	1.5	J	
RM 90	11-CF	62		U	50		U	50		U	50		U	50		U	
RM 95	12-CF	62		U	50		U	50		U	50		U	50		U	
RM 120	13-1-CF	62		U	50		U	50		U	50		U	50		U	
RM 120	13-2-CF	62		U	50		U	50		U	50		U	50		U	
RM 120	13-3-CF	62		U	50		U	50		U	50		U	50		U	
RM 124	14-CF	62		U	50		U	50		U	50		U	50		U	
Wildlife Reference Levels[1]		na **			na **			na **			na **			na **			

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
J = Estimated value is less than the specified detection limit.
* = Lipid-normalized value only given when a compound is detected.
** = Wildlife reference level not available.
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TABLE F1-3. PESTICIDES AND PCBs IN CRAYFISH WHOLE-BODY COMPOSITES (page 7 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PCBs (cont.)								
		Aroclor 1221			Aroclor 1232			Total PCBs		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 21	2-CF	100		U	50		U	350		U
RM 23	3-CF	100		U	50		U	350		U
RM 26	4-CF	100		U	50		U	350		U
RM 29	5-CF	100		U	50		U	350		U
RM 36	6-CF	100		U	50		U	350		U
RM 59	7-CF	100		U	50		U	350		U
RM 68	8-CF	100		U	50		U	350		U
RM 81	9-CF	100		U	50		U	350		U
RM 88	10-CF	100		U	50		U	30	1.5	J
RM 90	11-CF	100		U	50		U	350		U
RM 95	12-CF	100		U	50		U	350		U
RM 120	13-1-CF	100		U	50		U	350		U
RM 120	13-2-CF	100		U	50		U	350		U
RM 120	13-3-CF	100		U	50		U	350		U
RM 124	14-CF	100		U	50		U	350		U
Wildlife Reference Levels[1]		na **			na **			110		

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
J = Estimated value is less than the specified detection limit.
* = Lipid-normalized value only given when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-4. DIOXINS AND FURANS IN CRAYFISH WHOLE-BODY COMPOSITES (page 1 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		DIOXINS																	
		2378-TCDD			12378-PeCDD			123478-HxCDD			123678-HxCDD			123789-HxCDD			1234678-HpCDD		
River Mile	Sample Number	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)	
RM 21	2-CF	0.4		U/E	1.1		U/E	0.7		U/E	0.8		U/E	0.9		U/E	0.5		U/E
RM 23	3-CF	0.4		U/E	1.3		U/E	0.7		U/E	0.7		U/E	0.9		U/E	0.7		U/E
RM 26	4-CF	0.3		U/E	0.8		U/E	0.7		U/E	1.0		U/E	1.0		U/E	0.5		U/E
RM 29	5-CF	0.3		U/E	1.5		U/E	0.8		U/E	1.0		U/E	1.0		U/E	1.2		U/E
RM 36	6-CF	1.0	0.10		2.3		U/E	1.9		U/E	2.1		U/E	2.5		U/E	2.3		U/E
RM 59	7-CF	0.4		U/E	0.3		U/E	0.4		U/E	0.5		U/E	0.5		U/E	0.2		U/E
RM 68	8-CF	0.1		U/E	0.6		U/E	0.3		U/E	0.3		U/E	0.4		U/E	0.6		U/E
RM 81	9-CF	0.2		U/E	0.3		U/E	0.3		U/E	0.3		U/E	0.3		U/E	0.2		U/E
RM 88	10-CF	0.1		U/E	0.1		U/E	0.7		U/E	0.7		U/E	0.9		U/E	1.9		U/E
RM 90	11-CF	0.3		U/E	0.4		U/E	0.3		U/E	0.3		U/E	0.4		U/E	0.5		U/E
RM 95	12-CF	0.1		U/E	1.0		U/E	0.4		U/E	0.4		U/E	0.5		U/E	0.3		U/E
RM 120	13-1-CF	0.2		U/E	0.5		U/E	0.3		U/E	0.4		U/E	0.5		U/E	0.4		U/E
RM 120	13-2-CF	0.2		U/E	0.8		U/E	0.5		U/E	0.5		U/E	0.6		U/E	0.3		U/E
RM 120	13-3-CF	0.8	0.06		0.6		U/E	0.4		U/E	0.5		U/E	0.6		U/E	0.4		U/E
RM 124	14-CF	0.7	0.03		0.9		U/E	0.6		U/E	0.6		U/E	0.8		U/E	0.4		U/E
Wildlife Reference Value[o]		na **			na **			na **			na **			na **			na **		

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
E = Estimated value.
[a] = From second-column confirmation using a Rtx-200 column.
* = Lipid-normalized value only given when a compound is detected.
** = Tissue reference value not available for this compound.
[o] Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to the full lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to half the lower detection limit.
[4] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE F1-4. DIOXINS AND FURANS IN CRAYFISH WHOLE-BODY COMPOSITES (page 2 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		DIOXINS (cont.)			FURANS														
		OCDD			2378-TCDF		12378-PeCDF			23478-PeCDF			123478-HxCDF			123678-HxCDF			
River Mile	Sample Number	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		
RM 21	2-CF	1.4		U/E	**2.23[a]**	**0.14**	0.3		U/E	0.4		U/E	0.9		U/E	0.8		U/E	
RM 23	3-CF	2.8		U/E	**1.50[a]**	**0.08**	0.8		U/E	0.9		U/E	0.8		U/E	0.7		U/E	
RM 26	4-CF	2.3		U/E	**2.02[a]**	**0.11**	0.6		U/E	0.7		U/E	0.7		U/E	0.6		U/E	
RM 29	5-CF	1.9		U/E	**1.58[a]**	**0.20**	0.7		U/E	0.9		U/E	1.0		U/E	0.7		U/E	
RM 36	6-CF	1.8		U/E	**1.27[a]**	**0.13**	2.1		U/E	2.8		U/E	2.6		U/E	2.7		U/E	
RM 59	7-CF	**6.7**	**0.8**		**0.78[a]**	**0.10**	0.2		U/E	0.2		U/E	0.3		U/E	0.3		U/E	
RM 68	8-CF	2.7		U/E	**1.05[a]**	**0.11**	0.2		U/E	0.2		U/E	0.2		U/E	0.2		U/E	
RM 81	9-CF	0.6		U/E	**0.63[a]**	**0.05**	0.1		U/E	0.1		U/E	0.1		U/E	0.1		U/E	
RM 88	10-CF	**23.7**	**4.0**		**0.70[a]**	**0.12**	0.1		U/E	0.1		U/E	0.2		U/E	0.1		U/E	
RM 90	11-CF	1.1		U/E	**2.24[a]**	**0.12**	0.2		U/E	0.3		U/E	0.3		U/E	0.3		U/E	
RM 95	12-CF	0.5		U/E	**2.62[a]**	**0.13**	0.3		U/E	0.4		U/E	0.3		U/E	0.3		U/E	
RM 120	13-1-CF	1.1		U/E	**1.30[a]**	**0.07**	0.1		U/E	0.2		U/E	0.2		U/E	0.2		U/E	
RM 120	13-2-CF	1.3		U/E	**1.06[a]**	**0.08**	0.4		U/E	0.5		U/E	0.4		U/E	0.4		U/E	
RM 120	13-3-CF	0.9		U/E	**1.60[a]**	**0.11**	0.5		U/E	0.7		U/E	0.8		U/E	0.7		U/E	
RM 124	14-CF	1.1		U/E	**1.88[a]**	**0.09**	0.3		U/E	0.5		U/E	0.8		U/E	0.8		U/E	
Wildlife Reference Value°		na **			na **		na **			na **			na **			na **			

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
E = Estimated value.
[a] = From second-column confirmation using a Rtx-200 column.
* = Lipid-normalized value only given when a compound is detected.
** = Tissue reference value not available for this compound.
° Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to the full lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to half the lower detection limit.
[4] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE F1-4. DIOXINS AND FURANS IN CRAYFISH WHOLE-BODY COMPOSITES (page 3 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		FURANS (cont.)									
		123789-HxCDF		234678-HxCDF		1234678-HpCDF		1234789-HpCDF		OCDF	
River Mile	Sample Number	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)
RM 21	2-CF	1.3	U/E	1.1	U/E	1.2	U/E	2.1	U/E	0.8	U/E
RM 23	3-CF	1.2	U/E	0.9	U/E	0.8	U/E	1.5	U/E	1.5	U/E
RM 26	4-CF	1.2	U/E	0.9	U/E	0.6	U/E	1.5	U/E	1.3	U/E
RM 29	5-CF	1.5	U/E	1.2	U/E	1.1	U/E	2.6	U/E	1.5	U/E
RM 36	6-CF	1.9	U/E	1.1	U/E	5.6	U/E	0.3	U/E	0.7	U/E
RM 59	7-CF	0.5	U/E	0.4	U/E	1.0	U/E	1.5	U/E	0.3	U/E
RM 68	8-CF	0.4	U/E	0.3	U/E	1.4	U/E	3.1	U/E	1.5	U/E
RM 81	9-CF	0.2	U/E	0.1	U/E	0.4	U/E	0.7	U/E	0.3	U/E
RM 88	10-CF	0.2	U/E	0.2	U/E	0.2	U/E	0.4	U/E	1.4	U/E
RM 90	11-CF	0.4	U/E	0.3	U/E	0.3	U/E	0.5	U/E	0.5	U/E
RM 95	12-CF	0.5	U/E	0.4	U/E	0.5	U/E	0.9	U/E	0.3	U/E
RM 120	13-1-CF	0.4	U/E	0.3	U/E	0.4	U/E	0.8	U/E	0.9	U/E
RM 120	13-2-CF	0.6	U/E	0.5	U/E	0.7	U/E	1.3	U/E	0.7	U/E
RM 120	13-3-CF	1.1	U/E	0.9	U/E	5.2	0.4	0.5	U/E	0.7	U/E
RM 124	14-CF	1.2	U/E	0.9	U/E	1.1	U/E	1.9	U/E	0.6	U/E
Wildlife Reference Value°		na **		na **		na **		na **		na **	

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
E = Estimated value.
[a] = From second-column confirmation using a Rtx-200 column.
* = Lipid-normalized value only given when a compound is detected.
** = Tissue reference value not available for this compound.
° Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to the full lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to half the lower detection limit.
[4] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE F1-4. DIOXINS AND FURANS IN CRAYFISH WHOLE-BODY COMPOSITES (page 4 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		2,3,7,8-TCDD Toxicity Equivalency Concentrations[1]					
River Mile	Sample Number	TEC[2] (FULL) (pg/g)	Lipid Norm. TEC[2] (ng/g lipid)	TEC[3] (HALF) (pg/g)	Lipid Norm. TEC[3] (ng/g lipid)	TEC[4] (ZERO) (pg/g)	Lipid Norm. TEC[4] (ng/g lipid)
RM 21	2-CF	2.1	0.13	1.2	0.08	0.2	0.01
RM 23	3-CF	2.3	0.12	1.2	0.06	0.2	0.01
RM 26	4-CF	1.9	0.11	1.1	0.06	0.2	0.01
RM 29	5-CF	2.5	0.31	1.3	0.16	0.2	0.03
RM 36	6-CF	5.3	0.53	3.2	0.32	1.1	0.11
RM 59	7-CF	1.1	0.14	0.6	0.08	0.1	0.01
RM 68	8-CF	0.9	0.09	0.5	0.05	0.1	0.01
RM 81	9-CF	0.6	0.05	0.3	0.03	0.1	0.01
RM 88	10-CF	0.6	0.10	0.4	0.07	0.1	0.02
RM 90	11-CF	1.1	0.06	0.7	0.04	0.2	0.01
RM 95	12-CF	1.4	0.07	0.8	0.04	0.3	0.02
RM 120	13-1-CF	0.9	0.05	0.5	0.03	0.1	0.01
RM 120	13-2-CF	1.4	0.10	0.7	0.05	0.1	0.01
RM 120	13-3-CF	2.2	0.16	1.6	0.11	1.0	0.07
RM 124	14-CF	2.2	0.10	1.5	0.07	0.9	0.04
Wildlife Reference Value°		3.0		3.0		3.0	

Note: All concentrations are reported in a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
E = Estimated value.
ᵃ = From second-column confirmation using a Rtx-200 column.
* = Lipid-normalized value only given when a compound is detected.
** = Tissue reference value not available for this compound.
° Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to the full lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to half the lower detection limit.
[4] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE F1-5. POLYBUTYL TINS FOUND IN CRAYFISH WHOLE-BODY COMPOSITES LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		POLYBUTYL TINS					
		n-Butyltin trichloride		di-n-Butyltin dichloride		tri-n-Butyltin chloride	
River Mile	Sample Number	Concentration (μg Sn/kg)		Concentration (μg Sn/kg)		Concentration (μg Sn/kg)	
RM 21	2-CF	3.4	U	5.2	U	6.4	U
RM 23	3-CF	3.4	U	5.2	U	6.4	U
RM 26	4-CF	3.4	U	5.2	U	6.4	U
RM 29	5-CF	3.4	U	5.2	U	6.4	U
RM 36	6-CF	3.4	U	5.2	U	6.4	U
RM 59	7-CF	3.4	U	5.2	U	6.4	U
RM 68	8-CF	3.4	U	5.2	U	6.4	U
RM 81	9-CF	3.4	U	5.2	U	6.4	U/B
RM 88	10-CF	3.4	U	5.2	U	6.4	U
RM 90	11-CF	3.4	U	5.2	U	6.4	U
RM 95	12-CF	3.4	U	5.2	U	6.4	U
RM 120	13-1-CF	3.4	U	5.2	U	9.6	U/B
RM 120	13-2-CF	3.4	U	5.2	U	6.4	U
RM 120	13-3-CF	3.4	U	5.2	U	6.4	U
RM 124	14-CF	3.4	U	5.2	U	6.4	U
Wildlife Reference Va		na*		na*		na*	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample.
U = Compound was not detected. Value given is the lower quantification limit.
U/B = Undetected due to blank contamination.
RM = River mile.
* = Reference value not available.
[1] Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F1-6. RADIONUCLIDES IN CRAYFISH WHOLE-BODY COMPOSITES
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		RADIONUCLIDES																					
River	Sample	Plutonium 239/240				Plutonium 238				Americium 241				Cobalt 60		Cesium 137		Europium 152		Europium 154		Europium 155	
Mile	Number	(pCi/g)		error	LLD	(pCi/g)		error	LLD	(pCi/g)		error	LLD	(pCi/g)		(pCi/g)		(pCi/g)		(pCi/g)		(pCi/g)	
RM 21	2-CF	0.001	U	±0.002	0.003	-0.001	U	±0.003	0.006	0.004	U	±0.006	0.008	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 23	3-CF	-0.001	U	±0.002	0.003	0.000	U	±0.003	0.006	0.003	U	±0.005	0.007	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 26	4-CF	0.000	U	±0.001	0.003	-0.001	U	±0.003	0.006	0.000	U	±0.006	0.011	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 29	5-CF	0.000	U	±0.001	0.003	0.003	U	±0.004	0.005	0.002	U	±0.006	0.01	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 36	6-CF	0.001	U	±0.003	0.005	-0.006	U	±0.008	0.016	-0.005	U	±0.014	0.026	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 59	7-CF	0.000	U	±0.003	0.008	-0.001	U	±0.009	0.018	-0.001	U	±0.006	0.011	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 68	8-CF	0.000	U	±0.002	0.006	-0.001	U	±0.004	0.010	-0.001	U	±0.005	0.01	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 81	9-CF	0.004	U	±0.005	0.005	-0.002	U	±0.004	0.010	-0.004	U	±0.010	0.019	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 88	10-CF	0.001	U	±0.002	0.003	-0.004	U	±0.005	0.010	-0.003	U	±0.006	0.014	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 90	11-CF	0.002	U	±0.006	0.011	0.004	U	±0.009	0.015	0.002	U	±0.005	0.009	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 95	12-CF	0.001	U	±0.003	0.004	-0.001	U	±0.004	0.008	-0.003	U	±0.005	0.012	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 120	13-1-CF	0.002	U	±0.002	0.003	-0.001	U	±0.003	0.006	0.001	U	±0.005	0.008	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 120	13-2-CF	0.001	U	±0.002	0.003	-0.001	U	±0.004	0.008	-0.001	U	±0.006	0.011	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 120	13-3-CF	0.000	U	±0.001	0.003	0.001	U	±0.004	0.006	-0.001	U	±0.004	0.008	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
RM 124	14-CF	0.000	U	±0.001	0.002	0.000	U	±0.003	0.004	0.003	U	±0.004	0.006	0.15	U	0.12	U	0.40	U	0.25	U	0.50	U
Wildlife Reference Value[1]		na*				na*				na*				na*		na*		na*		na*		na*	

Note: All concentrations are reported on a wet weight basis.

CF = Crayfish sample
RM = River mile
U = Compound was not detected. The value given is the lower quantification limit.
LLD = Lower limit of detection.
* = Reference value not available.
[1] Wildlife reference value from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

APPENDIX F2

FISH TISSUE BIOACCUMULATION DATA

TABLE F2-1. METALS IN FISH WHOLE-BODY COMPOSITES
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	METALS: Antimony Conc. (mg/kg)	Arsenic Conc. (mg/kg)	Barium Conc. (mg/kg)	Cadmium Conc. (mg/kg)	Chromium Conc. (mg/kg)	Copper Conc. (mg/kg)	Lead Conc. (mg/kg)	Mercury Conc. (mg/kg)	Nickel Conc. (mg/kg)	Selenium Conc. (mg/kg)	Silver Conc. (mg/kg)	Zinc Conc. (mg/kg)
RM 14	1-LS	0.012 U	0.036 U	0.34	0.012	0.129	0.72	0.172 E	0.245	0.10 U	0.043 E	0.004 U/E	19.3 E
RM 14	1-C	0.012 U	0.036 U	1.00	0.033	0.024 U/B	0.76	0.173 E	0.145	0.78	0.093 E	0.004 E	29.6 E
RM 21	2-LS	0.011 U	0.034 U	1.40	0.028	0.050	0.71	0.060 U/B	0.264	0.09 U	0.034 U/E	0.004 U/E	18.9 E
RM 23	3-LS	0.012 U	0.385	0.64	0.036	0.043	0.53	0.507 E	0.189	0.28 E	0.207 E	0.004 U/E	16.2 E
RM 26	4-LS	0.012 U	0.037 U	0.66	0.020	0.032 U/B	0.39	0.010 U	0.117	0.10 U	0.037 U/E	0.004 U/E	12.3 E
RM 29	5-LS	0.012 U	0.037 U	0.60	0.057	0.139	0.96	0.056 U/B	0.131	0.10 U	0.037 U/E	0.005 E	14.8 E
RM 36	6-LS	0.012 U	0.037 U	1.70	0.023	0.071	0.86	0.038 U/B	0.100	0.10 U	0.037 U	0.004 U/E	15.2 E
RM 59	7-LS	0.012 U	0.036 U	0.95	0.017 E	0.153 E	0.71	0.077 U/B	0.102	0.77	0.054 E	0.006 E	19.3 E
RM 68	8-LS	0.012 U	0.037 U	1.40	0.046	0.080	0.73	0.161 E	0.222	0.10 U	0.040 E	0.004 U/E	20.0 E
RM 81	9-LS	0.011 U	0.034 U	0.96	0.025	0.053	0.73	0.068 U/B	0.178	0.39	0.045 E	0.004 U/E	22.8 E
RM 88	10-LS	0.011 U	0.034 U	2.20	0.010	0.092	0.74	0.106 E	0.213	0.09 U	0.034 U	0.004 U/E	15.6 E
RM 90	11-LS	0.012 U	0.035 U	1.20	0.026	0.066	0.60	0.084 U/B	0.123	0.10 U	0.035 U	0.004 U/E	20.1 E
RM 95	12-LS	0.011 U	0.034 U	1.70	0.042	0.170	0.79	0.204 E	0.111	0.09 U	0.072 E	0.004 U/E	17.5 E
RM 120	13-1-LS	0.012 U	0.035 U	3.20	0.066	0.314	1.16	0.183 E	0.215	0.10 U	0.035 U	0.004 U/E	20.7 E
RM 120	13-2-LS	0.012 U	0.036 U	3.10	0.059	0.325	1.23	0.376 E	0.161	0.28	0.036 U	0.004 U/E	22.4 E
RM 120	13-3-LS	0.011 U	0.034 U	3.50	0.053	0.527	1.18	0.296 E	0.119	2.26	0.034 U	0.004 U/E	13.7 E
RM 124	14-LS	0.011 U	0.034 U	3.50	0.062	0.450	1.21	0.009 U	0.196	0.13	0.034 U	0.004 U/E	23.7 E
RM 141	15-C	0.012 U	0.035 U	1.20	0.039	0.078	1.26	0.116 E	0.001 U	0.10 U	0.035 U	0.005 E	92.1 E
Wildlife Reference Value[1]		na*	na*	na*	na*	na*	na*	na*	na*	na*	na*	na*	na*

Note: All concentrations are reported on a wet weight basis

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
U/B = Undetected due to blank contamination.
E = Estimated value based on evaluation of QC data
* = Reference value not available.
[1] Wildlife reference value from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-2. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 1 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PHENOLS														
		Phenol			2-Methylphenol			4-Methyl phenol			2,4-Dimethylphenol			Pentachlorophenol		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	99		U	99		U	99		U	99		U	2500		U/E
RM 14	1-C	96		U	96		U	96		U	96		U	2400		U/E
RM 21	2-LS	500		U	500		U	500		U	500		U	12000		U/E
RM 23	3-LS	100		U	100		U	100		U	100		U	2500		U/E
RM 26	4-LS	97		U	97		U	97		U	97		U	2400		U/E
RM 29	5-LS	490		U	490		U	490		U	490		U	12000		U/E
RM 36	6-LS	98		U	98		U	98		U	98		U	2400		U/E
RM 59	7-LS	98		U	98		U	98		U	98		U	2400		U/E
RM 68	8-LS	490		U	490		U	490		U	490		U	12000		U/E
RM 81	9-LS	99		U	99		U	99		U	99		U	2500		U/E
RM 88	10-LS	490		U	490		U	490		U	490		U	12000		U/E
RM 90	11-LS	98		U	98		U	98		U	98		U	2400		U/E
RM 95	12-LS	99		U	99		U	99		U	99		U	2500		U/E
RM 120	13-1-LS	96		U	96		U	96		U	96		U	2400		U/E
RM 120	13-2-LS	480		U	480		U	480		U	480		U	12000		U/E
RM 120	13-3-LS	98		U	98		U	98		U	98		U	2500		U/E
RM 124	14-LS	500		U	500		U	500		U	500		U	12000		U/E
RM 141	15-C	500		U	500		U	500		U	500		U	12000		U/E
Wildlife Reference Level[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-2. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 2 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PHENOLS (cont.)									
		2-Chlorophenol		2,4-Dichlorophenol		4-Chloro-3-methylphenol		2,4-Dinitrophenol		2-Nitrophenol	
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)
RM 14	1-LS	99	U	300	U	200	U	990	U	490	U
RM 14	1-C	96	U	290	U	190	U	960	U	480	U
RM 21	2-LS	500	U	1500	U	1000	U	5000	U	2500	U
RM 23	3-LS	100	U	299	U	200	U	1000	U	500	U
RM 26	4-LS	97	U	290	U	190	U	970	U	480	U
RM 29	5-LS	490	U	1500	U	980	U	4900	U	2400	U
RM 36	6-LS	98	U	290	U	200	U	980	U	490	U
RM 59	7-LS	98	U	290	U	200	U	980	U	490	U
RM 68	8-LS	490	U	1500	U	990	U	4900	U	2500	U
RM 81	9-LS	99	U	300	U	200	U	990	U	490	U
RM 88	10-LS	490	U	1500	U	990	U	4900	U	2500	U
RM 90	11-LS	98	U	290	U	200	U	980	U	490	U
RM 95	12-LS	99	U	300	U	200	U	990	U	490	U
RM 120	13-1-LS	96	U	290	U	190	U	960	U	480	U
RM 120	13-2-LS	480	U	1400	U	960	U	4800	U	2400	U
RM 120	13-3-LS	98	U	290	U	200	U	980	U	490	U
RM 124	14-LS	500	U	1500	U	990	U	5000	U	2500	U
RM 141	15-C	500	U	1500	U	1000	U	5000	U	2500	U
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-2. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 3 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PHENOLS (cont.)														HALOGENATED ETHERS		
		4-Nitrophenol			2,4,5-Trichlorophenol			2,4,6-Trichlorophenol			4,6-Dinitro-2-methylphenol					bis(2-Chloroethyl)ether		
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)				Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	
RM 14	1-LS	490		U	490		U	490		U	990		U			99		U
RM 14	1-C	480		U	480		U	480		U	960		U			96		U
RM 21	2-LS	2500		U	2500		U	2500		U	5000		U			500		U
RM 23	3-LS	500		U	500		U	500		U	1000		U			100		U
RM 26	4-LS	480		U	480		U	480		U	970		U			97		U
RM 29	5-LS	2400		U	2400		U	2400		U	4900		U			490		U
RM 36	6-LS	490		U	490		U	490		U	980		U			98		U
RM 59	7-LS	490		U	490		U	490		U	980		U			98		U
RM 68	8-LS	2500		U	2500		U	2500		U	4900		U			490		U
RM 81	9-LS	490		U	490		U	490		U	990		U			99		U
RM 88	10-LS	2500		U	2500		U	2500		U	4900		U			490		U
RM 90	11-LS	490		U	490		U	490		U	980		U			98		U
RM 95	12-LS	490		U	490		U	490		U	990		U			99		U
RM 120	13-1-LS	480		U	480		U	480		U	960		U			96		U
RM 120	13-2-LS	2400		U	2400		U	2400		U	4800		U			480		U
RM 120	13-3-LS	490		U	490		U	490		U	980		U			98		U
RM 124	14-LS	2500		U	2500		U	2500		U	5000		U			500		U
RM 141	15-C	2500		U	2500		U	2500		U	5000		U			500		U
Wildlife Reference Level[1]		na **			na **			na **			na **					na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-2. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 4 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		HALOGENATED ETHERS (cont.)											
		bis(2-Chloroethoxy)methane			4-Bromophenylphenylether			4-Chlorophenylphenylether			2,2'-Oxybis(1-chloropropane)		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	99		U	99		U	99		U	99		U
RM 14	1-C	96		U	96		U	96		U	96		U
RM 21	2-LS	500		U	500		U	500		U	500		U
RM 23	3-LS	100		U	100		U	100		U	100		U
RM 26	4-LS	97		U	97		U	97		U	97		U
RM 29	5-LS	490		U	490		U	490		U	490		U
RM 36	6-LS	98		U	98		U	98		U	98		U
RM 59	7-LS	98		U	98		U	98		U	98		U
RM 68	8-LS	490		U	490		U	490		U	490		U
RM 81	9-LS	99		U	99		U	99		U	99		U
RM 88	10-LS	490		U	490		U	490		U	490		U
RM 90	11-LS	98		U	98		U	98		U	98		U
RM 95	12-LS	99		U	99		U	99		U	99		U
RM 120	13-1-LS	96		U	96		U	96		U	96		U
RM 120	13-2-LS	480		U	480		U	480		U	480		U
RM 120	13-3-LS	98		U	98		U	98		U	98		U
RM 124	14-LS	500		U	500		U	500		U	500		U
RM 141	15-C	500		U	500		U	500		U	500		U
Wildlife Reference Level[1]		na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-2. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 5 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		NITROAROMATICS														
		2,4-Dinitrotoluene			2,6-Dinitrotoluene			Nitrobenzene			2-Nitroaniline			3-Nitroaniline		
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	
RM 14	1-LS	490		U	490		U	99		U	490		U	490		U
RM 14	1-C	480		U	480		U	96		U	480		U	480		U
RM 21	2-LS	2500		U	2500		U	500		U	2500		U	2500		U
RM 23	3-LS	500		U	500		U	100		U	500		U	500		U
RM 26	4-LS	480		U	480		U	97		U	480		U	480		U
RM 29	5-LS	2400		U	2400		U	490		U	2400		U	2400		U
RM 36	6-LS	490		U	490		U	98		U	490		U	490		U
RM 59	7-LS	490		U	490		U	98		U	490		U	490		U
RM 68	8-LS	2500		U	2500		U	490		U	2500		U	2500		U
RM 81	9-LS	490		U	490		U	99		U	490		U	490		U
RM 88	10-LS	2500		U	2500		U	490		U	2500		U	2500		U
RM 90	11-LS	490		U	490		U	98		U	490		U	490		U
RM 95	12-LS	490		U	490		U	99		U	490		U	490		U
RM 120	13-1-LS	480		U	480		U	96		U	480		U	480		U
RM 120	13-2-LS	2400		U	2400		U	480		U	2400		U	2400		U
RM 120	13-3-LS	490		U	490		U	98		U	490		U	490		U
RM 124	14-LS	2500		U	2500		U	500		U	2500		U	2500		U
RM 141	15-C	2500		U	2500		U	500		U	2500		U	2500		U
Wildlife Reference Level[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-2. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 6 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		NITROAROMATICS (cont.)			POLYNUCLEAR AROMATIC HYDROCARBONS											
		4-Nitroaniline			Acenaphthene			Acenaphthylene			Anthracene			Benzo(a)anthracene		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	490		U	9.9		U	9.9		U	9.9		U	9.9		U
RM 14	1-C	480		U	9.6		U	9.6		U	9.6		U	9.6		U
RM 21	2-LS	2500		U	10		U	10		U	10		U	10		U
RM 23	3-LS	500		U	10		U	10		U	10		U	10		U
RM 26	4-LS	480		U	9.7		U	9.7		U	9.7		U	9.7		U
RM 29	5-LS	2400		U	9.8		U	9.8		U	9.8		U	9.8		U
RM 36	6-LS	490		U	9.8		U	9.8		U	9.8		U	9.8		U
RM 59	7-LS	490		U	9.8		U	9.8		U	9.8		U	9.8		U
RM 68	8-LS	2500		U	7.8		U	7.8		U	7.8		U	7.8		U
RM 81	9-LS	490		U	9.9		U	9.9		U	9.9		U	9.9		U
RM 88	10-LS	2500		U	9.9		U	9.9		U	9.9		U	9.9		U
RM 90	11-LS	490		U	9.8		U	9.8		U	9.8		U	9.8		U
RM 95	12-LS	490		U	9.9		U	9.9		U	9.9		U	9.9		U
RM 120	13-1-LS	480		U	9.6		U	9.6		U	9.6		U	9.6		U
RM 120	13-2-LS	2400		U	8.5		U	8.5		U	8.5		U	8.5		U
RM 120	13-3-LS	490		U	9.8		U	9.8		U	9.8		U	9.8		U
RM 124	14-LS	2500		U	9.9		U	9.9		U	9.9		U	9.9		U
RM 141	15-C	2500		U	10		U	10		U	10		U	10		U
Wildlife Reference Level[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-2. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 7 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		POLYNUCLEAR AROMATIC HYDROCARBONS (cont.)									
		Benzo(b,k)fluoranthene		Benzo(a)pyrene		Benzo(ghi)perylene		Chrysene		Dibenzo(a,h)anthracene	
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)
RM 14	1-LS	9.9	U	9.9	U	9.9	U	9.9	U	9.9	U
RM 14	1-C	9.6	U	9.6	U	9.6	U	9.6	U	9.6	U
RM 21	2-LS	10	U	10	U	10	U	10	U	10	U
RM 23	3-LS	10	U	10	U	10	U	10	U	10	U
RM 26	4-LS	9.7	U	9.7	U	9.7	U	9.7	U	9.7	U
RM 29	5-LS	9.8	U	9.8	U	9.8	U	9.8	U	9.8	U
RM 36	6-LS	9.8	U	9.8	U	9.8	U	9.8	U	9.8	U
RM 59	7-LS	9.8	U	9.8	U	9.8	U	9.8	U	9.8	U
RM 68	8-LS	7.8	U	7.8	U	7.8	U	7.8	U	7.8	U
RM 81	9-LS	9.9	U	9.9	U	9.9	U	9.9	U	9.9	U
RM 88	10-LS	9.9	U	9.9	U	9.9	U	9.9	U	9.9	U
RM 90	11-LS	9.8	U	9.8	U	9.8	U	9.8	U	9.8	U
RM 95	12-LS	9.9	U	9.9	U	9.9	U	9.9	U	9.9	U
RM 120	13-1-LS	9.6	U	9.6	U	9.6	U	9.6	U	9.6	U
RM 120	13-2-LS	8.5	U	8.5	U	8.5	U	8.5	U	8.5	U
RM 120	13-3-LS	9.8	U	9.8	U	9.8	U	9.8	U	9.8	U
RM 124	14-LS	9.9	U	9.9	U	9.9	U	9.9	U	9.9	U
RM 141	15-C	10	U	10	U	10	U	10	U	10	U
Wildlife Reference Level[1]		na **		na **		na **		na **		na **	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
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TABLE F2-2. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 8 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		POLYNUCLEAR AROMATIC HYDROCARBONS (cont.)														
		Fluoranthene			Fluorene			Indeno(1,2,3-cd)pyrene			Naphthalene			Phenanthrene		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	9.9		U	9.9		U	9.9		U	11.0	0.2		9.9		U
RM 14	1-C	9.6		U	9.6		U	9.6		U	9.6		U	9.6		U
RM 21	2-LS	10		U	10		U	10		U	10.0		U	10		U
RM 23	3-LS	10		U	10		U	10		U	10.0		U	10		U
RM 26	4-LS	9.7		U	9.7		U	9.7		U	9.7		U	9.7		U
RM 29	5-LS	9.8		U	9.8		U	9.8		U	9.8		U	9.8		U
RM 36	6-LS	9.8		U	9.8		U	9.8		U	8.3	0.1	J	9.8		U
RM 59	7-LS	9.8		U	9.8		U	9.8		U	9.8		U	9.8		U
RM 68	8-LS	7.8		U	7.8		U	7.8		U	7.8		U	7.8		U
RM 81	9-LS	9.9		U	9.9		U	9.9		U	9.9		U	9.9		U
RM 88	10-LS	9.9		U	9.9		U	9.9		U	13.0	0.3		9.9		U
RM 90	11-LS	9.8		U	9.8		U	9.8		U	10.0	0.3		9.8		U
RM 95	12-LS	9.9		U	9.9		U	9.9		U	9.9		U	9.9		U
RM 120	13-1-LS	9.6		U	9.6		U	9.6		U	9.6		U	9.6		U
RM 120	13-2-LS	8.5		U	8.5		U	8.5		U	8.5		U	8.5		U
RM 120	13-3-LS	9.8		U	9.8		U	9.8		U	6.6	0.2	J	9.8		U
RM 124	14-LS	9.9		U	9.9		U	9.9		U	9.9		U	9.9		U
RM 141	15-C	10		U	10		U	10		U	10.0		U	10		U
Wildlife Reference Level[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
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TABLE F2-2. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 9 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		POLYNUCLEAR AROMATIC HYDROCARBONS (cont.)									NAPHTHALENES			CHLORINATED BENZENES		
		Pyrene			2-Methylnaphthalene			Dibenzofuran			2-Chloronaphthalene			1,3-Dichlorobenzene		
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	
RM 14	1-LS	9.9		U	**10.0**	**0.2**		9.9		U	99		U	99		U
RM 14	1-C	9.6		U	9.6		U	9.6		U	96		U	96		U
RM 21	2-LS	10		U	10.0		U	10		U	500		U	500		U
RM 23	3-LS	10		U	10.0		U	10		U	100		U	100		U
RM 26	4-LS	9.7		U	9.7		U	9.7		U	97		U	97		U
RM 29	5-LS	9.8		U	9.8		U	9.8		U	490		U	490		U
RM 36	6-LS	9.8		U	**8.8**	**0.1**	J	9.8		U	98		U	98		U
RM 59	7-LS	9.8		U	9.8		U	9.8		U	98		U	98		U
RM 68	8-LS	7.8		U	7.8		U	7.8		U	490		U	490		U
RM 81	9-LS	9.9		U	9.9		U	9.9		U	99		U	99		U
RM 88	10-LS	9.9		U	**23.0**	**0.5**		9.9		U	490		U	490		U
RM 90	11-LS	9.8		U	**22.0**	**0.6**		9.8		U	98		U	98		U
RM 95	12-LS	9.9		U	9.9		U	9.9		U	99		U	99		U
RM 120	13-1-LS	9.6		U	9.6		U	9.6		U	96		U	96		U
RM 120	13-2-LS	8.5		U	8.5		U	8.5		U	480		U	480		U
RM 120	13-3-LS	9.8		U	**10.0**	**0.3**		9.8		U	98		U	98		U
RM 124	14-LS	9.9		U	9.9		U	9.9		U	500		U	500		U
RM 141	15-C	10		U	10.0		U	10		U	500		U	500		U
Wildlife Reference Level[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
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TABLE F2-2. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 10 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		CHLORINATED BENZENES (cont.)														
		1,2-Dichlorobenzene			1,4-Dichlorobenzene			1,2,4-Trichlorobenzene			Hexachlorobenzene			Hexachlorobutadiene		
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	
RM 14	1-LS	99		U	99		U	99		U	99		U	99		U
RM 14	1-C	96		U	96		U	96		U	96		U	96		U
RM 21	2-LS	500		U	500		U	500		U	500		U	500		U
RM 23	3-LS	100		U	100		U	100		U	100		U	100		U
RM 26	4-LS	97		U	97		U	97		U	97		U	97		U
RM 29	5-LS	490		U	490		U	490		U	490		U	490		U
RM 36	6-LS	98		U	98		U	98		U	98		U	98		U
RM 59	7-LS	98		U	98		U	98		U	98		U	98		U
RM 68	8-LS	490		U	490		U	490		U	490		U	490		U
RM 81	9-LS	99		U	99		U	99		U	99		U	99		U
RM 88	10-LS	490		U	490		U	490		U	490		U	490		U
RM 90	11-LS	98		U	98		U	98		U	98		U	98		U
RM 95	12-LS	99		U	99		U	99		U	99		U	99		U
RM 120	13-1-LS	96		U	96		U	96		U	96		U	96		U
RM 120	13-2-LS	480		U	480		U	480		U	480		U	480		U
RM 120	13-3-LS	98		U	98		U	98		U	98		U	98		U
RM 124	14-LS	500		U	500		U	500		U	500		U	500		U
RM 141	15-C	500		U	500		U	500		U	500		U	500		U
Wildlife Reference Level[1]		na **			na **			1300			na **			na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
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TABLE F2-2. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 11 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		CHLORINATED BENZENES (cont.)						BENZIDINES			PHTHALATE ESTERS					
		Hexachloroethane			Hexachlorocyclopentadiene			3,3'-Dichlorobenzidine			Dimethylphthalate			Diethylphthalate		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	99		U	490		U	490		U	99		U	99		U
RM 14	1-C	96		U	480		U	480		U	96		U	96		U
RM 21	2-LS	500		U	2500		U	2500		U	500		U	500		U
RM 23	3-LS	100		U	500		U	500		U	100		U	100		U
RM 26	4-LS	97		U	480		U	480		U	97		U	97		U
RM 29	5-LS	490		U	2400		U	2400		U	490		U	490		U
RM 36	6-LS	98		U	490		U	490		U	98		U	98		U
RM 59	7-LS	98		U	490		U	490		U	98		U	98		U
RM 68	8-LS	490		U	2500		U	2500		U	490		U	490		U
RM 81	9-LS	99		U	490		U	490		U	99		U	99		U
RM 88	10-LS	490		U	2500		U	2500		U	490		U	490		U
RM 90	11-LS	98		U	490		U	490		U	98		U	98		U
RM 95	12-LS	99		U	490		U	490		U	99		U	99		U
RM 120	13-1-LS	96		U	480		U	480		U	96		U	96		U
RM 120	13-2-LS	480		U	2400		U	2400		U	480		U	480		U
RM 120	13-3-LS	98		U	490		U	490		U	98		U	98		U
RM 124	14-LS	500		U	2500		U	2500		U	500		U	500		U
RM 141	15-C	500		U	2500		U	2500		U	500		U	500		U
Wildlife Reference Level[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
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TABLE F2-2. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 12 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PHTHALATE ESTERS (cont.)												MISCELLANEOUS		
		Di-n-butyl phthalate			Benzyl butyl phthalate			bis(2-Ethylhexyl)phthalate			Di-n-octyl phthalate			Carbazole		
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	
RM 14	1-LS	99		U	99		U	99		U	99		U	99		U
RM 14	1-C	96		U	96		U	96		U	96		U	96		U
RM 21	2-LS	500		U	500		U	500		U	500		U	500		U
RM 23	3-LS	430	12.6		100		U	100		U	100		U	100		U
RM 26	4-LS	97		U	97		U	760	11.5		97		U	97		U
RM 29	5-LS	490		U	490		U	490		U	490		U	490		U
RM 36	6-LS	98		U	98		U	400	4.8		98		U	98		U
RM 59	7-LS	98		U	98		U	98		U	98		U	98		U
RM 68	8-LS	490		U	490		U	490		U	490		U	490		U
RM 81	9-LS	99		U	99		U	99		U	99		U	99		U
RM 88	10-LS	490		U	490		U	490		U	490		U	490		U
RM 90	11-LS	98		U	98		U	98		U	98		U	98		U
RM 95	12-LS	99		U	99		U	99		U	99		U	99		U
RM 120	13-1-LS	96		U	96		U	96		U	96		U	96		U
RM 120	13-2-LS	480		U	480		U	480		U	480		U	480		U
RM 120	13-3-LS	98		U	98		U	98		U	98		U	98		U
RM 124	14-LS	500		U	500		U	500		U	500		U	500		U
RM 141	15-C	500		U	500		U	500		U	500		U	500		U
Wildlife Reference Level[1]		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
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TABLE F2-2. SEMIVOLATILES IN FISH WHOLE-BODY COMPOSITES (page 13 of 13)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

MISCELLANEOUS (cont.)		Benzyl Alcohol			Benzoic Acid			Isophorone			4-Chloroaniline		
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)		Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	
RM 14	1-LS	99		U	990		U	99		U	300		U
RM 14	1-C	96		U	960		U	96		U	290		U
RM 21	2-LS	500		U	5000		U	500		U	1500		U
RM 23	3-LS	100		U	1000		U	100		U	299		U
RM 26	4-LS	97		U	970		U	97		U	290		U
RM 29	5-LS	490		U	4900		U	490		U	1500		U
RM 36	6-LS	98		U	980		U	98		U	290		U
RM 59	7-LS	98		U	980		U	98		U	290		U
RM 68	8-LS	490		U	4900		U	490		U	1500		U
RM 81	9-LS	99		U	990		U	99		U	300		U
RM 88	10-LS	490		U	4900		U	490		U	1500		U
RM 90	11-LS	98		U	980		U	98		U	290		U
RM 95	12-LS	99		U	990		U	99		U	300		U
RM 120	13-1-LS	96		U	960		U	96		U	290		U
RM 120	13-2-LS	480		U	4800		U	480		U	1400		U
RM 120	13-3-LS	98		U	980		U	98		U	290		U
RM 124	14-LS	500		U	5000		U	500		U	990		U
RM 141	15-C	500		U	5000		U	500		U	500		U
Wildlife Reference Level[1]		na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on QA/QC evaluation.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference level not available.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-3. PESTICIDES AND PCBs IN FISH WHOLE-BODY COMPOSITES (page 1 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PESTICIDES														
		Alpha-BHC			Beta-BHC			Delta-BHC			Lindane			Heptachlor		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	2.5		U	2.5		U	8.0		U/E	2.5		U	2.5		U
RM 14	1-C	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 21	2-LS	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 23	3-LS	2.5		U	2.5		U	5.0		U/E	2.5		U	2.5		U
RM 26	4-LS	2.5		U	2.5		U	2.5		U/E	2.5		U	2.5		U
RM 29	5-LS	2.5		U	2.5		U	3.0		U/E	2.5		U	2.5		U
RM 36	6-LS	2.5		U	2.5		U	7.5		U/E	2.5		U	2.5		U
RM 59	7-LS	2.5		U/E	2.5		U	10		U	2.5		U/E	2.5		U
RM 68	8-LS	2.5		U/E	3.0		U	7.5		U/E	2.5		U/E	2.5		U
RM 81	9-LS	2.5		U/E	2.5		U	2.5		U	2.5		U/E	2.5		U
RM 88	10-LS	2.5		U/E	2.5		U	8.0		U	2.5		U/E	2.5		U
RM 90	11-LS	2.5		U/E	2.5		U	7.0		U	2.5		U/E	2.5		U
RM 95	12-LS	2.5		U/E	2.5		U	2.5		U	2.5		U/E	2.5		U
RM 120	13-1-LS	2.5		U/E	2.5		U	2.5		U	2.5		U/E	2.5		U
RM 120	13-2-LS	2.5		U/E	2.5		U	10		U/E	2.5		U/E	2.5		U
RM 120	13-3-LS	2.5		U/E	2.5		U	7.5		U/E	2.5		U/E	2.5		U
RM 124	14-LS	2.5		U/E	2.5		U	2.5		U/E	2.5		U/E	2.5		U
RM 141	15-C	2.5		U/E	2.5		U	2.5		U/E	2.5		U/E	2.5		U
Wildlife Reference Values[1]		100			100			100			100			na**		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile

QUALIFIERS:
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
C = Value is an estimate due to matrix interferences.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference value not available for this compound.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-3. PESTICIDES AND PCBs IN FISH WHOLE-BODY COMPOSITES (page 2 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PESTICIDES (cont.)									
		Aldrin		Heptachlor Epoxide		Endosulfan I		Dieldrin		p,p'-DDE	
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)
RM 14	1-LS	2.5	U	2.5	U	2.5	U	5	U	110	2.4
RM 14	1-C	2.5	U	2.5	U	2.5	U	5	U	63	1.1
RM 21	2-LS	2.5	U	2.5	U	2.5	U	5	U	100	2.2
RM 23	3-LS	2.5	U	2.5	U	2.5	U	5	U	110	3.2
RM 26	4-LS	2.5	U	2.5	U	2.5	U	5	U	65	1.0
RM 29	5-LS	2.5	U	2.5	U	2.5	U	5	U	100	2.1
RM 36	6-LS	2.5	U	2.5	U	2.5	U	5	U	69	0.8
RM 59	7-LS	2.5	U	2.5	U	2.5	U	5	U	76	2.7
RM 68	8-LS	2.5	U	2.5	U	2.5	U	5	U	92	5.1
RM 81	9-LS	2.5	U	2.5	U	2.5	U	5	U	37	6.2
RM 88	10-LS	38	U	22	U	2.5	U	65	U	86	1.8 C
RM 90	11-LS	2.5	U	6.1	U	2.5	U	5	U	160	4.2
RM 95	12-LS	2.5	U	2.5	U	2.5	U	5	U	93	2.4
RM 120	13-1-LS	2.5	U	2.5	U	2.5	U	5	U	180	12.9
RM 120	13-2-LS	2.5	U	2.5	U	2.5	U	5	U	98	9.8
RM 120	13-3-LS	2.5	U	12	U	2.5	U	5	U	78	2.6
RM 124	14-LS	2.5	U	2.5	U	2.5	U	5	U	98	4.5
RM 141	15-C	2.5	U	2.5	U	2.5	U	5	U	100	3.3
Wildlife Reference Values[1]		120		na**		na**		120		200	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile

QUALIFIERS:
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
C = Value is an estimate due to matrix interferences.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference value not available for this compound.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 19[illegible]) for the protection of fish-eating wildlife.

TABLE F2-3. PESTICIDES AND PCBs IN FISH WHOLE-BODY COMPOSITES (page 3 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PESTICIDES (cont.)														
		Endrin			Endosulfan II			p,p'-DDD			Endosulfan Sulfate			p,p'-DDT		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	5		U	5		U	31	0.7		5		U/E	12	0.3	
RM 14	1-C	5		U	5		U	20	0.3		5		U/E	3.7	0.1	J
RM 21	2-LS	5		U	5		U	18	0.4		5		U/E	16	0.3	
RM 23	3-LS	5		U	5		U	23	0.7		5		U/E	13	0.4	
RM 26	4-LS	5		U	5		U	16	0.2		5		U/E	8.8	0.1	
RM 29	5-LS	5		U	5		U	28	0.6		5		U/E	11	0.2	
RM 36	6-LS	5		U	5		U	19	0.2		5		U/E	9.9	0.1	
RM 59	7-LS	5		U/E	5		U	21	0.8		5		U	11	0.4	E
RM 68	8-LS	5		U	5		U/E	19	1.1		5		U/E	6.3	0.4	
RM 81	9-LS	5		U/E	5		U	9.4	1.6		5		U	4	0.7	J/E
RM 88	10-LS	5		U/E	5		U	31	0.6		5		U	56	1.2	C/E
RM 90	11-LS	5		U/E	5		U	47	1.2		5		U	13	0.3	E
RM 95	12-LS	5		U/E	5		U	29	0.8		5		U	8.6	0.2	E
RM 120	13-1-LS	5		U/E	5		U	31	2.2		5		U	27	1.9	E
RM 120	13-2-LS	5		U	5		U/E	21	2.1		5		U/E	7.5	0.8	
RM 120	13-3-LS	5		U	5		U/E	27	0.9		5		U/E	9.6	0.3	
RM 124	14-LS	5		U	5		U/E	27	1.2		5		U/E	10	0.5	
RM 141	15-C	5		U	5		U/E	21	0.7		5		U/E	3.9	0.1	J
Wildlife Reference Values[1]		25			na**			200			na**			200		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile

QUALIFIERS:
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
C = Value is an estimate due to matrix interferences.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference value not available for this compound.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-3. PESTICIDES AND PCBs IN FISH WHOLE-BODY COMPOSITES (page 4 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PESTICIDES (cont.)									
		Methoxychlor		Endrin Ketone		Endrin Aldehyde		Gamma-Chlordane		Alpha-Chlordane	
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)
RM 14	1-LS	25	U	50	U/E	6	U	5	U	2.5	U
RM 14	1-C	25	U	21	U/E	5	U	5	U	2.5	U
RM 21	2-LS	25	U	42	U/E	6	U	4	U	2.6	U
RM 23	3-LS	25	U	20	U/E	5	U	3.5	U	2.7	U
RM 26	4-LS	25	U	8	U/E	5	U	3.5	U	2.5	U
RM 29	5-LS	25	U	30	U/E	5	U	3.5	U	2.5	U
RM 36	6-LS	25	U	30	U/E	5	U	3.5	U	2.5	U
RM 59	7-LS	25	U	40	U	5	U	4.0	U	2.5	U
RM 68	8-LS	25	U	25	U/E	5	U	5.0	U	2.5	U
RM 81	9-LS	25	U	10	U	5	U	2.5	U	2.5	U
RM 88	10-LS	25	U	200	U	5	U	44	U	6.0	U
RM 90	11-LS	25	U	50	U	5	U	6.1	U	3.5	U
RM 95	12-LS	25	U	5	U	5	U	4.5	U	2.6	U
RM 120	13-1-LS	25	U	5	U	5	U	5.5	U	3.6	U
RM 120	13-2-LS	25	U	30	U/E	5	U	3.1	U	2.5	U
RM 120	13-3-LS	25	U	35	U/E	5	U	10	U	3.0	U
RM 124	14-LS	25	U	25	U/E	5	U	4.0	U	2.5	U
RM 141	15-C	25	U	35	U/E	5	U	4.6	U	2.5	U
Wildlife Reference Values[1]		na**		na**		na**		na**		na**	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile

QUALIFIERS:
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
C = Value is an estimate due to matrix interferences.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference value not available for this compound.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-3. PESTICIDES AND PCBs IN FISH WHOLE-BODY COMPOSITES (page 5 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PESTICIDES (cont.)									
		Toxaphene		o,p'-DDE		o,p'-DDD		o,p'-DDT		Dicofol	
River Mile	Sample Number	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)	Conc. (μg/kg)	Norm.* Conc. (μg/g lipid)
RM 14	1-LS	250	U	130	U	260	U	210	U	26	U
RM 14	1-C	250	U	5.2	U	5.2	U	5.2	U	26	U
RM 21	2-LS	250	U	5.2	U	5.2	U	5.2	U	26	U
RM 23	3-LS	250	U	5.2	U	5.2	U	5.2	U	26	U
RM 26	4-LS	250	U	5.2	U	5.2	U	5.2	U	26	U
RM 29	5-LS	250	U	5.2	U	5.2	U	5.2	U	26	U
RM 36	6-LS	250	U	5.2	U	5.2	U	5.2	U	26	U
RM 59	7-LS	250	U	5.2	U	5.2	U	5.2	U	26	U
RM 68	8-LS	250	U	5.2	U	5.2	U	5.2	U	26	U
RM 81	9-LS	250	U	5.2	U	5.2	U	5.2	U	26	U
RM 88	10-LS	250	U	130	U	260	U	210	U	26	U
RM 90	11-LS	250	U	9.5	U	5.2	U	5.2	U	26	U
RM 95	12-LS	250	U	5.2	U	5.2	U	5.2	U	26	U
RM 120	13-1-LS	250	U	5.2	U	5.2	U	5.2	U	26	U
RM 120	13-2-LS	250	U	5.2	U	5.2	U	5.2	U	26	U
RM 120	13-3-LS	250	U	13	U	5.2	U	5.2	U	26	U
RM 124	14-LS	250	U	5.2	U	5.2	U	5.2	U	26	U
RM 141	15-C	250	U	5.2	U	5.2	U	5.2	U	26	U
Wildlife Reference Values[1]		na**		200		200		200		na**	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile

QUALIFIERS:
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
C = Value is an estimate due to matrix interferences.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference value not available for this compound.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-3. PESTICIDES AND PCBs IN FISH WHOLE-BODY COMPOSITES (page 6 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PESTICIDES (cont.)			PCBs											
		Methyl Parathion			Aroclor 1242/1016			Aroclor 1248			Aroclor 1254			Aroclor 1260		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	26		U	52		U	52		U	98	2.1		54	1.2	
RM 14	1-C	26		U	52		U	52		U	65	1.1		30	0.5	J
RM 21	2-LS	26		U	52		U	52		U	84	1.8		51	1.1	J
RM 23	3-LS	26		U	52		U	52		U	70	2.1		36	1.1	J
RM 26	4-LS	26		U	52		U	52		U	47	0.7	J	52		U
RM 29	5-LS	26		U	52		U	52		U	53	1.1		27	0.6	J
RM 36	6-LS	26		U	52		U	52		U	42	0.5	J	52		U
RM 59	7-LS	26		U	52		U	52		U	62	2.2		52		U
RM 68	8-LS	26		U	52		U	52		U	55	3.1		31	1.7	J
RM 81	9-LS	26		U	52		U	52		U	33	5.5	J	52		U
RM 88	10-LS	26		U	52		U	52		U	2700	56.3		250		U
RM 90	11-LS	26		U	52		U	52		U	86	2.3		41	1.1	J
RM 95	12-LS	26		U	52		U	52		U	52	1.4		29		U
RM 120	13-1-LS	26		U	52		U	52		U	68	4.9		56	4.0	
RM 120	13-2-LS	26		U	52		U	52		U	26	2.6	J	52		U
RM 120	13-3-LS	26		U	52		U	52		U	170	5.7		37	1.2	J
RM 124	14-LS	26		U	52		U	52		U	38	1.7	J	52		U
RM 141	15-C	26		U	52		U	52		U	36	1.2	J	52		U
Wildlife Reference Values[1]		na**			na**			na**			na**			na**		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile

QUALIFIERS:
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
C = Value is an estimate due to matrix interferences.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference value not available for this compound.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 198[illegible] the protection of fish-eating wildlife.

TABLE F2-3. PESTICIDES AND PCBs IN FISH WHOLE-BODY COMPOSITES (page 7 of 7)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		PCBs (cont.)								
		Aroclor 1221			Aroclor 1232			Total PCBs		
River Mile	Sample Number	Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)		Conc. (µg/kg)	Norm.* Conc. (µg/g lipid)	
RM 14	1-LS	52		U	54	1.2		152	3.3	
RM 14	1-C	52		U	30	0.5	J	95	1.6	
RM 21	2-LS	52		U	51	1.1	J	135	2.9	
RM 23	3-LS	52		U	36	1.1	J	106	3.1	
RM 26	4-LS	52		U	52		U	47	0.7	J
RM 29	5-LS	52		U	27	0.6	J	80	1.7	
RM 36	6-LS	52		U	52		U	42	0.5	J
RM 59	7-LS	52		U	52		U	62	2.2	
RM 68	8-LS	52		U	31	1.7	J	86	4.8	
RM 81	9-LS	52		U	52		U	33	5.5	J
RM 88	10-LS	52		U	250		U	2700	56.3	
RM 90	11-LS	52		U	41	1.1	J	127	3.3	
RM 95	12-LS	52		U	29	0.8	J	81	2.1	
RM 120	13-1-LS	52		U	56	4.0		124	8.9	
RM 120	13-2-LS	52		U	52		U	26	2.6	J
RM 120	13-3-LS	52		U	37	1.2	J	207	6.9	
RM 124	14-LS	52		U	52		U	38	1.7	J
RM 141	15-C	52		U	52		U	36	1.2	J
Wildlife Reference Values[1]		na**			na**			110		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile

QUALIFIERS:
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value.
C = Value is an estimate due to matrix interferences.
J = Estimated value less than specified detection limit.
* = Lipid-normalized data only presented when a compound is detected.
** = Wildlife reference value not available for this compound.
[1] Wildlife reference level from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-4. DIOXINS AND FURANS IN FISH WHOLE-BODY COMPOSITES (page 1 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		DIOXINS																
		2378-TCDD			12378-PeCDD			123478-HxCDD			123678-HxCDD			123789-HxCDD			1234678-HpCDD	
River Mile	Sample Number	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)
RM 14	1-LS	0.1		U/E	1.4		U/E	0.7		U/E	0.8		U/E	0.7		U/E	1.1	0.02
RM 14	1-C	1.1		U/E	1.1		U/E	1.6		U/E	1.6		U/E	1.7		U/E	3.8	0.06
RM 21	2-LS	0.6		U/E	0.5		U/E	0.5		U/E	0.6		U/E	0.5		U/E	0.4	0.01
RM 23	3-LS	0.8		U/E	0.7		U/E	1.1		U/E	0.5	0.02		0.1		U/E	2.6	0.08
RM 26	4-LS	0.9	0.01		0.7		U/E	0.4	0.01		0.2		U/E	0.2		U/E	0.8	0.01
RM 29	5-LS	0.9		U/E	0.8		U/E	1.7		U/E	1.7		U/E	1.8		U/E	0.7	0.01
RM 36	6-LS	1.4		U/E	1.1		U/E	0.6		U/E	0.6		U/E	0.6		U/E	1.1	0.01
RM 59	7-LS	1.8		U/E	1.0		U/E	0.8		U/E	0.8		U/E	0.8		U/E	2.1	0.08
RM 68	8-LS	0.3		U/E	0.3		U/E	0.3		U/E	0.4		U/E	0.4		U/E	1.3	0.07
RM 81	9-LS	0.4		U/E	0.8		U/E	0.3	0.13		0.4		U/E	0.4		U/E	0.8	0.13
RM 88	10-LS	0.7		U/E	1.1		U/E	1.1		U/E	1.2		U/E	1.2		U/E	1.2	0.03
RM 90	11-LS	0.7		U/E	0.7		U/E	0.4		U/E	0.6	0.02		0.4		U/E	1.2	0.03
RM 95	12-LS	0.6		U/E	0.5		U/E	0.4		U/E	0.5		U/E	0.4		U/E	0.5	0.01
RM 120	13-1-LS	0.4		U/E	0.4		U/E	0.3		U/E	0.4		U/E	0.3		U/E	0.4	0.03
RM 120	13-2-LS	0.7	0.07		0.5	0.05		0.5	0.05		0.3		U/E	0.3		U/E	0.9	0.09
RM 120	13-3-LS	0.4		U/E	0.5		U/E	0.5		U/E	0.6		U/E	0.5		U/E	0.8	0.03
RM 124	14-LS	0.4		U/E	0.3		U/E	0.2		U/E	0.2		U/E	0.2		U/E	0.4	0.02
RM 141	15-C	0.3		U/E	0.5		U/E	0.3	0.02		0.6	0.01		0.2		U/E	1.2	0.04
Wildlife Reference Value°		na **			na **			na **			na **			na **			na **	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on evalutation of QC data.
* = Lipid-normalized data only presented when a compound is detected.
** = Tissue reference value not available for this compound.
° Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to the full lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to half the lower detection limit.
xicity Equivalency Concentration calculations assume that the concentrations for und l compounds are equal to zero.

TABLE F2-4. DIOXINS AND FURANS IN FISH WHOLE-BODY COMPOSITES (page 2 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		DIOXINS (cont.)		FURANS														
		OCDD		2378-TCDF			12378-PeCDF			23478-PeCDF			123478-HxCDF			123678-HxCDF		
River Mile	Sample Number	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)	
RM 14	1-LS	5.6	0.12	4.9	0.11	E	9.9	0.22		0.9		U/E	1.3		U/E	5.2	0.11	
RM 14	1-C	7.5	0.13	3.6	0.06		2.3	0.04		0.3		U/E	0.6		U/E	0.5		U/E
RM 21	2-LS	3.3	0.07	5.0	0.11		5.6	0.12		0.7		U/E	0.3		U/E	0.3		U/E
RM 23	3-LS	36.9	1.09	3.2	0.09	E	2.7	0.08		0.6		U/E	0.6		U/E	0.6		U/E
RM 26	4-LS	5.6	0.08	2.6	0.04		1.8	0.03		0.3		U/E	0.4		U/E	0.4		U/E
RM 29	5-LS	3.6	0.08	5.2	0.11	E	0.6		U/E	0.6		U/E	0.5		U/E	0.5		U/E
RM 36	6-LS	4.9	0.06	5.9	0.07	E	1.4	0.02		1.3		U/E	0.8		U/E	0.8		U/E
RM 59	7-LS	9.9	0.35	5.4	0.19	E	2.0	0.07		0.1		U/E	0.7		U/E	0.7		U/E
RM 68	8-LS	8.9	0.49	2.6	0.14		1.5	0.08		0.2		U/E	0.2		U/E	0.2		U/E
RM 81	9-LS	3.9	0.65	1.6	0.27		0.4		U/E	1.0	0.17		0.3		U/E	0.4		U/E
RM 88	10-LS	5.4	0.11	2.1		U/E	1.2	0.03		0.5		U/E	1.0		U/E	0.9		U/E
RM 90	11-LS	2.6	0.07	6.5	0.17		3.9	0.10		1.1		U/E	0.8		U/E	0.9		U/E
RM 95	12-LS	2.2	0.06	3.8	0.10		1.7	0.04		0.3		U/E	0.3		U/E	0.3		U/E
RM 120	13-1-LS	1.5	0.11	4.8	0.34		0.3	0.02		0.5		U/E	0.3		U/E	0.3		U/E
RM 120	13-2-LS	4.3	0.43	2.7	0.27		0.6		U/E	1.8	0.18		0.7		U/E	0.7		U/E
RM 120	13-3-LS	6.0	0.20	2.2	0.07		2.2	0.07		0.2		U/E	0.3		U/E	0.3		U/E
RM 124	14-LS	3.7	0.17	4.1	0.19		0.9		U/E	0.3		U/E	0.1		U/E	0.1		U/E
RM 141	15-C	3.9	0.13	3.9	0.13		3.9	0.13		0.2	0.01		0.3		U/E	0.4		U/E
Wildlife Reference Value°		na **		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on evalutation of QC data.
* = Lipid-normalized data only presented when a compound is detected.
** = Tissue reference value not available for this compound.
° Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to the full lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to half the lower detection limit.
[4] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE F2-4. DIOXINS AND FURANS IN FISH WHOLE-BODY COMPOSITES (page 3 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		FURANS (cont.)														
		123789-HxCDF			234678-HxCDF			1234678-HpCDF			1234789-HpCDF			OCDF		
River Mile	Sample Number	Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)		Conc. (ng/kg)	Lipid Norm.* Conc. (ng/g lipid)	
RM 14	1-LS	**2.4**	**0.05**		**5.2**	**0.11**		**5.5**	**0.12**		0.5		U/E	**2.7**	**0.06**	
RM 14	1-C	**2.5**	**0.04**		1.0	**0.02**		0.3		U/E	0.5		U/E	0.6		U/E
RM 21	2-LS	**4.5**	**0.10**		**1.2**	**0.03**		0.3		U/E	0.6		U/E	0.2		U/E
RM 23	3-LS	**0.8**	**0.02**		**1.6**	**0.05**		0.7		U/E	0.4		U/E	**2.4**	**0.07**	
RM 26	4-LS	**1.1**	**0.02**		0.4		U/E	0.7		U/E	1.2		U/E	0.3		U/E
RM 29	5-LS	**3.4**	**0.07**		**0.8**	**0.02**		0.4		U/E	0.2		U/E	0.2		U/E
RM 36	6-LS	**1.3**	**0.02**		**0.3**	**0.00**		0.5		U/E	0.2		U/E	0.2		U/E
RM 59	7-LS	**2.1**	**0.08**		**0.6**	**0.02**		**1.3**	**0.05**		0.4		U/E	**1.3**	**0.05**	
RM 68	8-LS	**1.6**	**0.09**		**0.4**	**0.02**		0.8		U/E	1.2		U/E	**0.9**	**0.05**	
RM 81	9-LS	**0.9**	**0.15**		**0.3**	**0.05**		0.7		U/E	0.2		U/E	0.4		U/E
RM 88	10-LS	1.7		U/E	1.1		U/E	1.3		U/E	2.5		U/E	0.8		U/E
RM 90	11-LS	**4.0**	**0.11**		1.0	**0.03**		**0.4**	**0.01**		0.4		U/E	0.3		U/E
RM 95	12-LS	**1.7**	**0.04**		**0.4**	**0.01**		0.4		U/E	0.3		U/E	0.1		U/E
RM 120	13-1-LS	**2.8**	**0.20**		**0.7**	**0.05**		0.3		U/E	0.2		U/E	0.1		U/E
RM 120	13-2-LS	**1.3**	**0.13**		**0.5**	**0.05**		**4.0**	**0.40**		0.4		U/E	**2.0**	**0.20**	
RM 120	13-3-LS	**1.6**	**0.05**		**0.5**	**0.02**		0.6		U/E	0.3		U/E	0.4		U/E
RM 124	14-LS	**1.4**	**0.06**		0.4		U/E	0.2		U/E	0.2		U/E	**0.3**	**0.01**	
RM 141	15-C	**2.3**	**0.08**		**0.7**	**0.02**		0.2		U/E	0.2		U/E	0.2		U/E
Wildlife Reference Value°		na **			na **			na **			na **			na **		

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on evalutation of QC data.
* = Lipid-normalized data only presented when a compound is detected.
** = Tissue reference value not available for this compound.
° Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to the full lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to half the lower detection limit.
[4] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE F2-4. DIOXINS AND FURANS IN FISH WHOLE-BODY COMPOSITES (page 4 of 4)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		2,3,7,8-TCDD Toxicity Equivalency Concentrations[1]					
River Mile	Sample Number	TEC[2] (FULL) (pg/g)	Lipid Norm. TEC[2] (ng/g lipid)	TEC[3] (HALF) (pg/g)	Lipid Norm. TEC[3] (ng/g lipid)	TEC[4] (ZERO) (pg/g)	Lipid Norm. TEC[4] (ng/g lipid)
RM 14	1-LS	3.9	0.08	3.1	0.07	2.3	0.05
RM 14	1-C	3.3	0.06	2.1	0.04	0.9	0.02
RM 21	2-LS	2.8	0.06	2.1	0.05	1.4	0.03
RM 23	3-LS	2.5	0.07	1.7	0.05	0.8	0.02
RM 26	4-LS	2.1	0.03	1.8	0.03	1.4	0.02
RM 29	5-LS	3.2	0.07	2.1	0.04	1.0	0.02
RM 36	6-LS	3.8	0.05	2.3	0.03	0.8	0.01
RM 59	7-LS	3.7	0.13	2.3	0.08	1.0	0.04
RM 68	8-LS	1.3	0.07	0.9	0.05	0.6	0.03
RM 81	9-LS	1.8	0.30	1.3	0.22	0.8	0.13
RM 88	10-LS	2.6	0.05	1.4	0.03	0.1	0.002
RM 90	11-LS	3.3	0.09	2.4	0.06	1.4	0.04
RM 95	12-LS	1.9	0.05	1.3	0.03	0.7	0.02
RM 120	13-1-LS	1.9	0.14	1.4	0.10	0.9	0.06
RM 120	13-2-LS	2.6	0.26	2.5	0.25	2.4	0.24
RM 120	13-3-LS	1.5	0.05	1.0	0.03	0.6	0.02
RM 124	14-LS	1.4	0.06	1.0	0.05	0.6	0.03
RM 141	15-C	1.7	0.06	1.4	0.05	1.1	0.04
Wildlife Reference Value°		3.0		3.0		3.0	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
U = Compound was not detected. Value given is the lower quantification limit.
E = Estimated value based on evalutation of QC data.
* = Lipid-normalized data only presented when a compound is detected.
** = Tissue reference value not available for this compound.
° Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.
[1] Toxicity Equivalency Concentrations calculated using Barnes et al (1989).
[2] Toxicity Equivalency Concentration calculations assumes that the concentrations for undetected compounds are equal to the full lower detection limit.
[3] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to half the lower detection limit.
[4] Toxicity Equivalency Concentration calculations assume that the concentrations for undetected compounds are equal to zero.

TABLE F2-5. POLYBUTYL TINS IN FISH WHOLE-BODY COMPOSITES
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		POLYBUTYL TINS					
		n-Butyltin trichloride		di-n-Butyltin dichloride		tri-n-Butyltin chloride	
River Mile	Sample Number	Concentration (μg Sn/kg)		Concentration (μg Sn/kg)		Concentration (μg Sn/kg)	
RM 14	1-LS	3.4	U	5.2	U	1.6	U/B
RM 14	1-C	3.4	U	1.3	J	28.8	
RM 21	2-LS	0.3	U/B	1.6	J	38.4	
RM 23	3-LS	3.4	U	5.2	U	16.0	
RM 26	4-LS	3.4	U	5.2	U	12.8	
RM 29	5-LS	3.4	U	1.3	J	28.8	
RM 36	6-LS	3.4	U	2.6	J	54.3	
RM 59	7-LS	3.4	U/E	1.6	J/E	6.4	J/E
RM 68	8-LS	3.4	U	5.2	U	12.8	
RM 81	9-LS	3.4	U	5.2	U	3.2	U/B
RM 88	10-LS	3.4	U	1.8	J	25.6	
RM 90	11-LS	3.4	U	5.2	U	12.8	
RM 95	12-LS	3.4	U	5.2	U	16.0	
RM 120	13-1-LS	3.4	U	5.2	U	6.4	
RM 120	13-2-LS	3.4	U/E	5.2	U/E	6.4	U/E
RM 120	13-3-LS	3.4	U	5.2	U	12.8	
RM 124	14-LS	3.4	U	5.2	U	3.2	U/B
RM 141	15-C	3.4	U	5.2	U	1.3	U/B
Wildlife Reference V		na*		na*		na*	

C = Carp sample.
LS = Largescale sucker sample.
U = Compound was not detected. Value given is the lower quantification limit.
U/B = Undetected due to blank contamination.
J = Value detected below specified detection limit.
E = Estimated value based on evaluation of QC data.
RM = River mile.
* = Reference value not available.
[1] Wildlife reference value from New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-6. RADIONUCLIDES IN FISH WHOLE-BODY COMPOSITES (page 1 of 2)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

		RADIONUCLIDES																		
River	Sample	Plutonium 239/240				Plutonium 238				Americium 241				Cobalt 60		Cesium 137			Europium 152	
Mile	Number	(pCi/g)		error	LLD	(pCi/g)		error	LLD	(pCi/g)		error	LLD	(pCi/g)		(pCi/g)	error	LLD	(pCi/g)	
RM 14	1-LS	**0.001**		**±0.001**	**0.000**	**0.011**		**±0.006**	**0.007**	0.003	U	±0.012	0.020	0.02	U	U		0.02	0.20	U
RM 14	1-C	**0.002**		**±0.002**	**0.000**	0.002	U	±0.004	0.009	-0.001	U	±0.007	0.014	0.02	U	U		0.02	0.20	U
RM 21	2-LS	**0.001**		**±0.001**	**0.000**	0.000	U	±0.004	0.008	0.003	U	±0.008	0.015	0.02	U	U		0.02	0.20	U
RM 23	3-LS	**0.001**		**±0.001**	**0.000**	0.001	U	±0.003	0.007	-0.004	U	±0.011	0.024	0.02	U	U		0.02	0.20	U
RM 26	4-LS	**0.000**		**±0.000**	**0.000**	0.001	U	±0.004	0.007	-0.003	U	±0.005	0.010	0.02	U	U		0.02	0.20	U
RM 29	5-LS	**0.001**		**±0.002**	**0.000**	0.001	U	±0.004	0.008	-0.004	U	±0.007	0.014	0.02	U	U		0.02	0.20	U
RM 36	6-LS	**0.001**		**±0.002**	**0.000**	-0.001	U	±0.005	0.010	0.002	U	±0.009	0.017	0.02	U	U		0.02	0.20	U
RM 59	7-LS	**0.003**		**±0.003**	**0.000**	0.003	U	±0.006	0.011	-0.002	U	±0.013	0.027	0.02	U	U		0.02	0.20	U
RM 68	8-LS	**0.001**		**±0.001**	**0.000**	0.001	U	±0.004	0.007	0.001	U	±0.008	0.015	0.02	U	U		0.02	0.20	U
RM 81	9-LS	**0.001**		**±0.002**	**0.000**	0.001	U	±0.004	0.008	0.003	U	±0.009	0.017	0.02	U	**0.016**	**±0.009**	**0.02**	0.20	U
RM 88	10-LS	**0.001**		**±0.001**	**0.000**	-0.002	U	±0.006	0.011	0.002	U	±0.010	0.018	0.15	U	U		0.12	0.20	U
RM 90	11-LS	**0.002**		**±0.002**	**0.000**	0.001	U	±0.005	0.010	0.004	U	±0.006	0.009	0.02	U	U		0.02	0.20	U
RM 95	12-LS	**0.001**		**±0.001**	**0.000**	0.003	U	±0.004	0.007	0.007	U	±0.007	0.010	0.02	U	U		0.02	0.20	U
RM 120	13-1-LS	**0.003**		**±0.003**	**0.000**	0.003	U	±0.005	0.008	0.005	U	±0.006	0.010	0.02	U	U		0.02	0.20	U
RM 120	13-2-LS	0.001	U	±0.002	0.003	0.002	U	±0.004	0.008	0.002	U	±0.005	0.009	0.02	U	**0.020**	**±0.009**	**0.02**	0.20	U
RM 120	13-3-LS	**0.001**		**±0.001**	**0.000**	0.002	U	±0.004	0.007	0.004	U	±0.007	0.012	0.02	U	U		0.02	0.20	U
RM 124	14-LS	0.000	U	±0.003	0.006	0.001	U	±0.003	0.006	0.000	U	±0.005	0.010	0.02	U	U		0.02	0.20	U
RM 141	15-C	**0.001**		**±0.003**	**0.000**	0.001	U	±0.008	0.017	-0.002	U	±0.006	0.013	0.02	U	U		0.02	0.20	U
Wildlife Reference Value[1]		na*				na*				na*				na*		na*			na*	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
LLD = Lower limit of detection
U = Compound was not detected. Value given is the lower quantification limit.
* = Reference value not available.
[1] Wildlife reference value from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

TABLE F2-6. RADIONUCLIDES IN FISH WHOLE-BODY COMPOSITES (page 2 of 2)
LOWER COLUMBIA RIVER BACKWATER RECONNAISSANCE SURVEY 1993

River Mile	Sample Number	Europium 154 (pCi/g)		Europium 155 (pCi/g)	
RM 14	1-LS	0.20	U	0.05	U
RM 14	1-C	0.20	U	0.05	U
RM 21	2-LS	0.20	U	0.05	U
RM 23	3-LS	0.20	U	0.05	U
RM 26	4-LS	0.20	U	0.05	U
RM 29	5-LS	0.20	U	0.05	U
RM 36	6-LS	0.20	U	0.05	U
RM 59	7-LS	0.20	U	0.05	U
RM 68	8-LS	0.20	U	0.05	U
RM 81	9-LS	0.20	U	0.05	U
RM 88	10-LS	0.25	U	0.50	U
RM 90	11-LS	0.20	U	0.05	U
RM 95	12-LS	0.20	U	0.05	U
RM 120	13-1-LS	0.20	U	0.05	U
RM 120	13-2-LS	0.20	U	0.05	U
RM 120	13-3-LS	0.20	U	0.05	U
RM 124	14-LS	0.20	U	0.05	U
RM 141	15-C	0.20	U	0.05	U
Wildlife Reference Value[1]		na*		na*	

Note: All concentrations are reported on a wet weight basis.

C = Carp sample
LS = Largescale sucker sample
RM = River mile
LLD = Lower limit of detection
U = Compound was not detected. Value given is the lower quantification limit.
* = Reference value not available.
[1] Wildlife reference value from the New York State guidelines (Newell et al. 1987) for the protection of fish-eating wildlife.

APPENDIX G

APPENDIX G

1995 TISSUE BIOACCUMULATION DATA

G-1. CARP TISSUE BIOACCUMULATION DATA

G-2. CHINOOK TISSUE BIOACCUMULATION DATA

G-3. COHO TISSUE BIOACCUMULATION DATA

G-4. LARGESCALE SUCKER TISSUE BIOACCUMULATION DATA

G-5. STEELHEAD TISSUE BIOACCUMULATION DATA

G-6. WHITE STURGEON TISSUE BIOACCUMULATION DATA

APPENDIX G1

CARP TISSUE BIOACCUMULATION DATA

TABLE G1-1. METAL RESULTS FROM ONE COMPOSITE OF SEVEN CARP
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	Silver (Ag) 7440-22-4			Arsenic (As)-ICP/MS 7440-38-2			Barium (Ba) 7440-39-3			Cadmium (Cd) 7440-43-9			Copper (Cu) 7440-50-8		
Sample	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.
CCMP1	0.002		U	0.221	5.06		0.102	2.33		0.012		U	1.237	28.31	

Chemical CAS #	Mercury (Hg) 7439-97-6			Nickel (Ni) 7440-02-0			Lead (Pb) 7439-92-1			Antimony (Sb) 7440-36-0			Selenium (Se) 7782-49-2			Arsenic Speciation Inorganic			Arsenic Speciation Methylated		
Sample	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	(ug/g lipid)	Data qual.
CCMP1	0.145	3.31		0.030	0.69		0.028		BU	0.005		U	0.528	12.08	J_8	0.001	0.03		0.020	0.45	

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.
J_8= Estimated value due to precision of duplicate analyses not meeting QC criteria.

TABLE G1-2. SEMI-VOLATILE RESULTS FROM ONE COMPOSITE OF SEVEN CARP
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	Phenol 108-95-2			2-Chlorophenol 95-57-8			1,4-Dichlorobenzene 106-46-7			4-Methylphenol 106-44-5		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
CCMP1	18		BU	20		U	20		U	20		U

Chemical CAS #	N-nitroso-di-n-propylamine 621-44-5			Isophorone 78-59-1			1,2,4-Trichlorobenzene 120-82-1			Acenaphthene 83-32-9		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
CCMP1	20		U	20		U	20		U	20		U

Chemical CAS #	4-Nitrophenol 100-02-7			2,4-Dinitrotoluene 121-14-2			Pyrene 129-00-0			Chrysene 218-01-9			bis(2-Ethylhexyl)phthalate 117-81-7		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
CCMP1	106	2.4		20		U	20		U	20		U	23		BU

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.

TABLE G1-3. PESTICIDE/PCB RESULTS FROM ONE COMPOSITE OF SEVEN CARP
COLUMBIA RIVER BI-STATE PROGRAM

Chemical	Hexachlorobutadiene			Hexachlorobenzene			alpha-BHC			gamma-BHC			Heptachlor			Aldrin			beta-BHC			Methyl parathion		
CAS #	87-68-3			118-74-1			319-84-6			58-89-9			76-44-8			309-00-2			319-85-7			298-00-0		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
CCMP1	0.02	0.0005		0.83	0.02		0.21	0.005		0.23	0.01		0.01		U	0.01		U	0.01		U	0.22		U

Chemical	delta-BHC			Heptachlor Epoxide			Endosulfan I			gamma-Chlordane			alpha-Chlordane			p,p'-DDE			Dieldrin			Endrin		
CAS #	319-86-8			1024-57-3			959-98-8			5566-34-7			5103-71-9			72-55-9			60-57-1			72-20-8		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
CCMP1	0.01		U	0.01		U	0.01		U	0.01		U	0.01		U	131.4	3.01		0.02		U	0.02		U

Chemical	p,p'-DDD			Endosulfan II			p,p'-DDT			Endrin Aldehyde			Mirex			Endosulfan Sulfate			Methoxychlor			Endrin Ketone		
CAS #	72-54-8			33213-65-9			50-29-3			7421-93-4			2385-85-5			1031-07-8			72-43-5			53494-70-5		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
CCMP1	5.86	0.13		0.02		U	0.02		U	0.02		U	0.02		U	0.02		U	0.11		U	0.02		U

Chemical	Arochlor 1016			Arochlor 1221			Arochlor 1232			Arochlor 1242			Arochlor 1248			Arochlor 1254			Arochlor 1260			Toxaphene		
CAS #	12674-11-2			1110-428-2			1114-116-5			5346-921-9			1267-229-6			1109-769-1			1109-682-5			8001-35-2		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
CCMP1	1.11		U	1.11		U	1.11		U	1.11		U	50.5	1.16		1.11		U	138	3.16		5.56		U

* = lipid-normalized data presented only when a compound is detected.

U = Compound was not detected at the detection limit shown.

TABLE G1-4. DIOXIN/FURAN RESULTS FROM ONE COMPOSITE OF SEVEN CARP
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	2,3,7,8-TCDD 1746-01-6			1,2,3,7,8-PeCDD 40321-76-4			1,2,3,4,7,8-HxCDD 39227-28-6			1,2,3,6,7,8-HxCDD 57653-85-7			1,2,3,7,8,9-HxCDD 19408-74-3		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
CCMP1	1.14		U	1.14		U	0.45	0.01		1.91	0.04		0.20		U

Chemical CAS #	1,2,3,4,6,7,8-HpCDD 35822-46-9			OCDD 3268-87-9			2,3,7,8-TCDF 51207-31-9			1,2,3,7,8-PeCDF 57177-41-6			2,3,4,7,8-PeCDF 57117-31-4		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
CCMP1	3.90	0.09		5.14	0.12		4.36	0.10		4.62	0.11		0.71		U

Chemical CAS #	1,2,3,4,7,8-HxCDF 70648-26-9			1,2,3,6,7,8-HxCDF 57117-44-9			1,2,3,7,8,9-HxCDF 72918-21-9			2,3,4,6,7,8-HxCDF 60851-34-5			1,2,3,4,6,7,8-HpCDF 67562-39-4		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
CCMP1	1.43		U	1.65		U	3.32		U	6.77	0.15		0.35		U

Chemical CAS #	1,2,3,4,7,8,9-HpCDF 55673-89-7			OCDF 39001-02-0			TEC (FULL)			TEC (HALF)			TEC (ZERO)		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
CCMP1	0.28		U	0.18		U	4.36			2.99			1.62		

* = lipid-normalized data presented only when a compound is detected.
U = Compound was not detected at the detection limit shown.

APPENDIX G2

CHINOOK TISSUE BIOACCUMULATION DATA

TABLE G2-1. METAL RESULTS FROM THREE COMPOSITES OF EIGHT CHINOOK SALMON
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	Silver (Ag) 7440-22-4			Arsenic (As)-ICP/MS 7440-38-2			Barium (Ba) 7440-39-3			Cadmium (Cd) 7440-43-9			Copper (Cu) 7440-50-8		
Sample	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.
KCMP1	0.002	0.07		1.235	35.20		0.050		U	0.005		U	1.011	28.81	
KCMP2	0.001	0.08		0.884	51.72		0.039		U	0.004		U	0.770	45.02	
KCMP3	0.001	0.18		0.760	105.60		0.036		U	0.004		U	0.804	111.71	

Chemical CAS #	Mercury (Hg) 7439-97-6			Nickel (Ni) 7440-02-0			Lead (Pb) 7439-92-1			Antimony (Sb) 7440-36-0			Selenium (Se) 7782-49-2			Arsenic Speciation Inorganic			Arsenic Speciation Methylated		
Sample	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	(ug/g lipid)	Data qual.
KCMP1	0.089	2.54		0.020		UJ_7	0.004		BUJ_8	0.004		U	0.338	9.63		0.023	0.65	J_6	0.038	1.09	
KCMP2	0.080	4.67		0.030	1.76	J_7	0.010	0.61	J_8	0.003		U	0.263	15.36		0.001		UJ_6	0.078	4.56	
KCMP3	0.130	18.05		0.015	2.05	J_7	0.009	1.25	J_8	0.003		U	0.241	33.50		0.015	2.11	J_6	0.034	4.79	

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.
J_6= Estimated value due to matrix spike recoveries not meeting QC criteria.
J_7= Estimated value due to accuracy of reference material analysis not meeting QC criteria.
J_8= Estimated value due to precision of duplicate analysis not meeting QC criteria.

TABLE G2-2. SEMI-VOLATILE RESULTS FROM THREE COMPOSITES OF EIGHT CHINOOK SALMON
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	Phenol 108-95-2			2-Chlorophenol 95-57-8			1,4-Dichlorobenzene 106-46-7			4-Methylphenol 106-44-5		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
Kcmp1	49		BU	20		U	20		U	20		U
Kcmp2	43		BU	10		U	10		U	10		U
Kcmp3	191	26.5		10		U	10		U	10		U

Chemical CAS #	N-nitroso-di-n-propylamine 621-44-5			Isophorone 78-59-1			1,2,4-Trichlorobenzene 120-82-1			Acenaphthene 83-32-9		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
Kcmp1	20		U	20		U	20		U	20		U
Kcmp2	10		U	10		U	10		U	10		U
Kcmp3	10		U	10		U	10		U	10		U

Chemical CAS #	4-Nitrophenol 100-02-7			2,4-Dinitrotoluene 121-14-2			Pyrene 129-00-0			Chrysene 218-01-9			bis(2-Ethylhexyl)phthalate 117-81-7		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
Kcmp1	20		U	20		U	20		U	20		U	64		BU
Kcmp2	10		U	10		U	10		U	10		U	79		BU
Kcmp3	10		U	10		U	10		U	10		U	38		BU

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.

TABLE G2-3. PESTICIDE/PCB RESULTS FROM THREE COMPOSITES OF EIGHT CHINOOK SALMON
COLUMBIA RIVER BI-STATE PROGRAM

Chemical	Hexachlorobutadiene			Hexachlorobenzene			alpha-BHC			gamma-BHC			Heptachlor			Aldrin			beta-BHC			Methyl parathion		
CAS #	87-68-3			118-74-1			319-84-6			58-89-9			76-44-8			309-00-2			319-85-7			298-00-0		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
KCMP1	0.02		U	0.02		U	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	0.89		U
KCMP2	0.02		U	0.02		U	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	0.89		U
KCMP3	0.02		U	0.02		U	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	0.89		U

Chemical	delta-BHC			Heptachlor Epoxide			Endosulfan I			gamma-Chlordane			alpha-Chlordane			p,p'-DDE			Dieldrin			Endrin		
CAS #	319-86-8			1024-57-3			959-98-8			5566-34-7			5103-71-9			72-55-9			60-57-1			72-20-8		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
KCMP1	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	11.33	0.32		0.09		U	0.09		U
KCMP2	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	4.57	0.27		0.09		U	0.09		U
KCMP3	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	9.67	1.34		0.09		U	0.09		U

Chemical	p,p'-DDD			Endosulfan II			p,p'-DDT			Endrin Aldehyde			Mirex			Endosulfan Sulfate			Methoxychlor			Endrin Ketone		
CAS #	72-54-8			33213-65-9			50-29-3			7421-93-4			2385-85-5			1031-07-8			72-43-5			53494-70-5		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
KCMP1	5.67	0.16		0.09		U	3.07	0.09		0.09		U	0.09		U	0.09		U	0.44		U	0.09		U
KCMP2	2.13	0.12		0.09		U	0.80	0.05		0.09		U	0.09		U	0.09		U	0.44		U	0.09		U
KCMP3	3.33	0.46		0.09		U	0.53	0.07		0.09		U	0.09		U	0.09		U	0.44		U	0.09		U

Chemical	Arochlor 1016			Arochlor 1221			Arochlor 1232			Arochlor 1242			Arochlor 1248			Arochlor 1254			Arochlor 1260			Toxaphene		
CAS #	12674-11-2			1110-428-2			1114-116-5			5346-921-9			1267-229-6			1109-769-1			1109-682-5			8001-35-2		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
KCMP1	1.78		U	1.78		U	1.78		U	1.78		U	1.78		U	1.78		U	14.88	0.42		8.89		U
KCMP2	0.89		U	0.89		U	0.89		U	0.89		U	0.89		U	0.89		U	2.77	0.16		4.44		U
KCMP3	0.89		U	0.89		U	0.89		U	0.89		U	0.89		U	0.89		U	12.25	1.70		4.44		U

* = lipid-normalized data presented only when a compound is detected.

U = Compound was not detected at the detection limit shown.

TABLE G2-4. DIOXIN/FURAN RESULTS FROM THREE COMPOSITES OF EIGHT CHINOOK SALMON
COLUMBIA RIVER BI-STATE PROGRAM

Chemical	2,3,7,8-TCDD			1,2,3,7,8-PeCDD			1,2,3,4,7,8-HxCDD			1,2,3,6,7,8-HxCDD			1,2,3,7,8,9-HxCDD		
CAS #	1746-01-6			40321-76-4			39227-28-6			57653-85-7			19408-74-3		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
KCMP1	0.64	0.02		0.45		U	0.26		U	0.26		U	0.32		U
KCMP2	0.05		U	0.16	0.01		0.08	0.005		0.19	0.01		0.12	0.01	
KCMP3	0.08		U	0.20		U	0.10		U	0.20		U	0.10		U

Chemical	1,2,3,4,6,7,8-HpCDD			OCDD			2,3,7,8-TCDF			1,2,3,7,8-PeCDF			2,3,4,7,8-PeCDF		
CAS #	35822-46-9			3268-87-9			51207-31-9			57177-41-6			57117-31-4		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
KCMP1	0.52	0.01		3.15	0.09		0.94	0.03		0.32		U	0.29		U
KCMP2	0.20		U	0.70		U	1.2	0.07		0.12	0.01		0.17	0.01	
KCMP3	0.20		U	0.40		U	2.7	0.38		0.08		U	0.20		U

Chemical	1,2,3,4,7,8-HxCDF			1,2,3,6,7,8-HxCDF			1,2,3,7,8,9-HxCDF			2,3,4,6,7,8-HxCDF			1,2,3,4,6,7,8-HpCDF		
CAS #	70648-26-9			57117-44-9			72918-21-9			60851-34-5			67562-39-4		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
KCMP1	0.12		U	0.10		U	0.28		BU	0.19		U	0.18		BU
KCMP2	0.08	0.005		0.07	0.004		0.09	0.01		0.15		BU	0.09		U
KCMP3	0.09		U	0.06		U	0.10		U	0.08		U	0.10		U

Chemical	1,2,3,4,7,8,9-HpCDF			OCDF			TEC (FULL)			TEC (HALF)			TEC (ZERO)		
CAS #	55673-89-7			39001-02-0											
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
KCMP1	0.25		U	0.23		U	1.29			1.03			0.77		
KCMP2	0.07	0.004		0.40	0.02		0.97			0.85			0.72		
KCMP3	0.10		U	0.25	0.03		0.81			0.52			0.23		

* = lipid-normalized data presented only when a compound is detected.

B = Background levels may impact this data point.

U = Compound was not detected at the detection limit shown.

APPENDIX G3

COHO TISSUE BIOACCUMULATION DATA

TABLE G3-1. METAL RESULTS FROM THREE COMPOSITES OF EIGHT COHO SALMON
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	Silver (Ag) 7440-22-4			Arsenic (As)-ICP/MS 7440-38-2			Barium (Ba) 7440-39-3			Cadmium (Cd) 7440-43-9			Copper (Cu) 7440-50-8		
Sample	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.
HCMP1	0.001	0.08		0.415	24.82		0.147	8.80		0.005	0.27		0.854	51.17	
HCMP2	0.001		U	0.344	71.72		0.082	17.05		0.004		U	0.829	172.67	
HCMP3	0.001		U	0.361	42.46		0.097	11.43		0.004		U	0.750	88.26	

Chemical CAS #	Mercury (Hg) 7439-97-6			Nickel (Ni) 7440-02-0			Lead (Pb) 7439-92-1			Antimony (Sb) 7440-36-0			Selenium (Se) 7782-49-2			Arsenic Speciation					
																Inorganic			Methylated		
Sample	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	(ug/g lipid)	Data qual.
HCMP1	0.045	2.67		0.043	2.55	J_7	0.003		BUJ_8	0.003		U	0.155	9.29		0.001		UJ_6	0.056	3.38	
HCMP2	0.048	10.04		0.025	5.13	J_7	0.004		BUJ_8	0.003		U	0.188	39.17		0.007	1.38	J_6	0.029	6.07	
HCMP3	0.039	4.58		0.028	3.31	J_7	0.009	1.03	J_8	0.003		U	0.162	19.11		0.001		UJ_6	0.039	4.55	

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.
J_6= Estimated value due to matrix spike recoveries not meeting QC criteria.
J_7= Estimated value due to accuracy of reference material analysis not meeting QC criteria.
J_8= Estimated value due to precision of duplicate analyses not meeting QC criteria.

TABLE G3-2. SEMI-VOLATILE RESULTS FROM THREE COMPOSITES OF EIGHT COHO SALMON
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	Phenol 108-95-2			2-Chlorophenol 95-57-8			1,4-Dichlorobenzene 106-46-7			4-Methylphenol 106-44-5		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
Hcmp1	52		BU	10		U	10		U	10		U
Hcmp2	40		BU	10		U	10		U	10		U
Hcmp3	61	7.2	J_5	10		UJ_5	10		UJ_5	10		UJ_5

Chemical CAS #	N-nitroso-di-n-propylamine 621-44-5			Isophorone 78-59-1			1,2,4-Trichlorobenzene 120-82-1			Acenaphthene 83-32-9		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
Hcmp1	10		U	10		U	10		U	10		U
Hcmp2	10		U	10		U	10		U	10		U
Hcmp3	10		UJ_5	10		UJ_5	10		UJ_5	10		UJ_5

Chemical CAS #	4-Nitrophenol 100-02-7			2,4-Dinitrotoluene 121-14-2			Pyrene 129-00-0			Chrysene 218-01-9			bis(2-Ethylhexyl)phthalate 117-81-7		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
Hcmp1	10		U	10		U	10		U	10		U	49		BU
Hcmp2	10		U	10		U	10		U	10		U	61		BU
Hcmp3	10		UJ_5	10		UJ_5	10		UJ_5	10		UJ_5	93		BUJ_5

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.
J_5= Estimated value due to surrogate spike recoveries not meeting QC criteria.

TABLE G3-3. PESTICIDE/PCB RESULTS FROM THREE COMPOSITES OF EIGHT COHO SALMON
COLUMBIA RIVER BI-STATE PROGRAM

Chemical	Hexachlorobutadiene			Hexachlorobenzene			alpha-BHC			gamma-BHC			Heptachlor			Aldrin			beta-BHC			Methyl parathion		
CAS #	87-68-3			118-74-1			319-84-6			58-89-9			76-44-8			309-00-2			319-85-7			298-00-0		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
HCMP1	0.02		U	0.02		U	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	0.89		U
HCMP2	0.02		U	0.02		U	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	0.89		U
HCMP3	0.02		U	0.02		U	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	0.89		U

Chemical	delta-BHC			Heptachlor Epoxide			Endosulfan I			gamma-Chlordane			alpha-Chlordane			p,p'-DDE			Dieldrin			Endrin		
CAS #	319-86-8			1024-57-3			959-98-8			5566-34-7			5103-71-9			72-55-9			60-57-1			72-20-8		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
HCMP1	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	4.51	0.27		0.09		U	0.09		U
HCMP2	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	2.26	0.47		0.09		U	0.72	0.15	
HCMP3	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	2.33	0.27		0.09		U	0.09		U

Chemical	p,p'-DDD			Endosulfan II			p,p'-DDT			Endrin Aldehyde			Mirex			Endosulfan Sulfate			Methoxychlor			Endrin Ketone		
CAS #	72-54-8			33213-65-9			50-29-3			7421-93-4			2385-85-5			1031-07-8			72-43-5			53494-70-5		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
HCMP1	1.40	0.08		0.09		U	0.60	0.04		0.09		U	0.09		U	0.09		U	0.44		U	0.09		U
HCMP2	0.09		U	0.09		U	1.07	0.22		0.09		U	0.09		U	0.09		U	0.44		U	0.09		U
HCMP3	1.53	0.18		0.09		U	1.07	0.13		0.09		U	0.09		U	0.09		U	0.44		U	0.09		U

Chemical	Arochlor 1016			Arochlor 1221			Arochlor 1232			Arochlor 1242			Arochlor 1248			Arochlor 1254			Arochlor 1260			Toxaphene		
CAS #	12674-11-2			1110-428-2			1114-116-5			5346-921-9			1267-229-6			1109-769-1			1109-682-5			8001-35-2		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
HCMP1	1.78		U	1.78		U	1.78		U	1.78		U	1.78		U	1.78		U	4.08	0.24		8.89		U
HCMP2	0.89		U	0.89		U	0.89		U	0.89		U	0.89		U	0.89		U	2.09	0.44		4.44		U
HCMP3	0.89		U	0.89		U	0.89		U	0.89		U	0.89		U	0.89		U	2.99	0.35		4.44		U

* = lipid-normalized data presented only when a compound is detected.
U = Compound was not detected at the detection limit shown.

TABLE G3-4. DIOXIN/FURAN RESULTS FROM THREE COMPOSITES OF EIGHT COHO SALMON
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	2,3,7,8-TCDD 1746-01-6			1,2,3,7,8-PeCDD 40321-76-4			1,2,3,4,7,8-HxCDD 39227-28-6			1,2,3,6,7,8-HxCDD 57653-85-7			1,2,3,7,8,9-HxCDD 19408-74-3		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
HCMP1	0.89	0.05		1.31		U	0.08		U	0.51	0.03		0.10		U
HCMP2	0.03	0.01		0.05		U	0.04		U	0.09	0.02		0.04	0.01	
HCMP3	0.05	0.01		0.04		U	0.05		U	0.06		U	0.05		U

Chemical CAS #	1,2,3,4,6,7,8-HpCDD 35822-46-9			OCDD 3268-87-9			2,3,7,8-TCDF 51207-31-9			1,2,3,7,8-PeCDF 57177-41-6			2,3,4,7,8-PeCDF 57117-31-4		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
HCMP1	0.47	0.03		0.88		U	0.94	0.06		1.10	0.07		0.09		U
HCMP2	0.16		BU	0.50		U	0.50	0.10		0.07	0.01		0.07	0.01	
HCMP3	0.08		BU	0.17		BU	0.59	0.07		0.10		U	0.11	0.01	

Chemical CAS #	1,2,3,4,7,8-HxCDF 70648-26-9			1,2,3,6,7,8-HxCDF 57117-44-9			1,2,3,7,8,9-HxCDF 72918-21-9			2,3,4,6,7,8-HxCDF 60851-34-5			1,2,3,4,6,7,8-HpCDF 67562-39-4		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
HCMP1	0.10		U	0.63	0.04		0.15		U	0.06		U	0.38	0.02	
HCMP2	0.03		U	0.02		U	0.03		U	0.08	0.02		0.03		U
HCMP3	0.10	0.01		0.04	0.005		0.04		U	0.09	0.01		0.07		U

Chemical CAS #	1,2,3,4,7,8,9-HpCDF 55673-89-7			OCDF 39001-02-0			TEC (FULL)			TEC (HALF)			TEC (ZERO)		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
HCMP1	0.10		U	0.56	0.03		1.91			1.54			1.16		
HCMP2	0.03		U	0.07		U	0.66			0.49			0.33		
HCMP3	0.06		U	0.10		U	0.47			0.37			0.27		

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.

APPENDIX G4

LARGESCALE SUCKER TISSUE BIOACCUMULATION DATA

TABLE G4-1. METAL RESULTS FROM NINE COMPOSITES OF EIGHT LARGESCALE SUCKER
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	Silver (Ag) 7440-22-4			Arsenic (As)-ICP/MS 7440-38-2			Barium (Ba) 7440-39-3			Cadmium (Cd) 7440-43-9			Copper (Cu) 7440-50-8		
Sample	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.
LSCMP1-1	0.001		U	0.151	12.95		0.098	8.35		0.009		U	0.745	63.65	
LSCMP1-2	0.001		U	0.133	16.78		0.087	10.96		0.008		U	0.577	73.09	
LSCMP1-3	0.001		U	0.143	13.24		0.064	5.93		0.008		U	0.772	71.45	
LSCMP2-1	0.001		UJ_6	0.113	7.77		0.095	6.54		0.003		U	0.398	27.47	
LSCMP2-2	0.001		UJ_6	0.181	8.77		0.185	8.97		0.004	0.20		0.458	22.25	
LSCMP2-3	0.001		UJ_6	0.170	7.51		0.133	5.88		0.004		U	0.483	21.38	
LSCMP3-1	0.001		UJ_6	0.098	6.93		0.156	11.04		0.004		U	0.451	31.98	
LSCMP3-2	0.001		UJ_6	0.178	6.17		0.080	2.76		0.003		U	0.433	15.02	
LSCMP3-3	0.001		UJ_6	0.168	9.93		0.099	5.86		0.004		U	0.453	26.79	

Chemical CAS #	Mercury (Hg) 7439-97-6			Nickel (Ni) 7440-02-0			Lead (Pb) 7439-92-1			Antimony (Sb) 7440-36-0			Selenium (Se) 7782-49-2			Arsenic Speciation Inorganic			Arsenic Speciation Methylated		
Sample	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	(ug/g lipid)	Data qual.
LSCMP1-1	0.120	10.30		0.060	5.13		0.038		BU	0.004		U	0.257	21.99	J_8	0.017	1.45		0.007	0.59	
LSCMP1-2	0.125	15.85		0.047	5.97		0.026		BU	0.004		U	0.263	33.27	J_8	0.024	3.02		0.004	0.53	
LSCMP1-3	0.140	12.92		0.040	3.74		0.035		BU	0.004		U	0.265	24.50	J_8	0.038	3.55		0.007	0.69	
LSCMP2-1	0.154	10.63		0.010	0.67		0.008	0.54		0.0004	0.03		0.121	8.32		0.012	0.81		0.004	0.26	
LSCMP2-2	0.141	6.85		0.029	1.41		0.020	0.97		0.001	0.06		0.126	6.11		0.008	0.40		0.007	0.34	
LSCMP2-3	0.193	8.53		0.025	1.10		0.017	0.77		0.001	0.03		0.099	4.39		0.004	0.16		0.011	0.48	
LSCMP3-1	0.189	13.41		0.018	1.26		0.008	0.59		0.0004	0.03		0.137	9.72		0.006	0.39		0.001		U
LSCMP3-2	0.170	5.91		0.010		U	0.006	0.20		0.001	0.02		0.096	3.32		0.001		U	0.011	0.38	
LSCMP3-3	0.145	8.57		0.010		U	0.007	0.40		0.001	0.04		0.155	9.17		0.003	0.15		0.007	0.43	

* = lipid-normalized data presented only when a compound is detected.

B = Background levels may impact this data point.

U = Compound was not detected at the detection limit shown.

J_6= Estimated value due to matrix spike recoveries not meeting QC criteria.

J_8= Estimated value due to precision of duplicate analyses not meeting QC criteria.

TABLE G4-2. SEMI-VOLATILE RESULTS FROM NINE COMPOSITES OF EIGHT LARGESCALE SUCKER (Page 1 of 2)
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	Phenol 108-95-2			2-Chlorophenol 95-57-8			1,4-Dichlorobenzene 106-46-7			4-Methylphenol 106-44-5		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
LSCMP1-1	24		BU	10		U	10		U	10		U
LSCMP1-2	24		BU	10		U	10		U	10		U
LSCMP1-3	18		BU	10		U	10		U	10		U
LSCMP2-1	10		U	10		U	10		U	10		U
LSCMP2-2	10		U	10		U	10		U	10		U
LSCMP2-3	23	1.0		10		U	10		U	11	0.5	
LSCMP3-1	15	1.1		10		U	10		U	11	0.8	
LSCMP3-2	21	0.7	J_5	10		UJ_5	10		UJ_5	10	0.3	J_5
LSCMP3-3	13		U	10		U	10		U	9	0.5	J_1

Chemical CAS #	N-nitroso-di-n-propylamine 621-44-5			Isophorone 78-59-1			1,2,4-Trichlorobenzene 120-82-1			Acenaphthene 83-32-9		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
LSCMP1-1	10		U	10		U	10		U	10		U
LSCMP1-2	10		U	10		U	10		U	10		U
LSCMP1-3	10		U	10		U	10		U	10		U
LSCMP2-1	10		U	10		U	10		U	10		U
LSCMP2-2	10		U	10		U	10		U	10		U
LSCMP2-3	10		U	10		U	10		U	10		U
LSCMP3-1	10		U	10		U	10		U	10		U
LSCMP3-2	10		UJ_5	10		UJ_5	10		UJ_5	10		UJ_5
LSCMP3-3	10		U	10		U	10		U	10		U

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.
J_1= Value is below nominal reporting limit.
J_5= Estimated value due to surrogate spike recoveries not meeting QC criteria.

TABLE G4-2. SEMI-VOLATILE RESULTS FROM NINE COMPOSITES OF EIGHT LARGESCALE SUCKER (Page 2 of 2)
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	4-Nitrophenol 100-02-7			2,4-Dinitrotoluene 121-14-2			Pyrene 129-00-0			Chrysene 218-01-9			bis(2-Ethylhexyl)phthalate 117-81-7		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
LSCMP1-1	99	8.5		10		U	10		U	10		U	223		BU
LSCMP1-2	48	6.1		10		U	10		U	10		U	29		BU
LSCMP1-3	89	8.2		10		U	10		U	10		U	23		BU
LSCMP2-1	10		U	10		U	10		U	10		U	61		BU
LSCMP2-2	10		U	10		U	10		U	10		U	781	37.9	
LSCMP2-3	10		U	10		U	10		U	10		U	116		BU
LSCMP3-1	10		U	10		U	10		U	10		U	22		BU
LSCMP3-2	10		UJ_5	10		UJ_5	10		UJ_5	10		UJ_5	1101	38.2	J_5
LSCMP3-3	10		U	10		U	10		U	10		U	74		BU

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.
J_5= Estimated value due to surrogate spike recoveries not meeting QC criteria.

TABLE G4-3. PESTICIDE/PCB RESULTS FROM NINE COMPOSITES OF EIGHT LARGESCALE SUCKER (Page 1 of 2)
COLUMBIA RIVER BI-STATE PROGRAM

Chemical	Hexachlorobutadiene			Hexachlorobenzene			alpha-BHC			gamma-BHC			Heptachlor			Aldrin			beta-BHC			Methyl parathion		
CAS #	87-68-3			118-74-1			319-84-6			58-89-9			76-44-8			309-00-2			319-85-7			298-00-0		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
LSCMP1-1	0.01		U	1.53	0.13		0.01		U	0.01		U	0.01		U	0.01		U	0.01		U	0.22		U
LSCMP1-2	0.01		U	0.20	0.03		0.01		U	0.01		U	0.01		U	0.01		U	0.01		U	0.22		U
LSCMP1-3	0.01		U	0.30	0.03		0.01		U	0.01		U	0.01		U	0.01		U	0.01		U	0.22		U
LSCMP2-1	0.01		U	0.32	0.02		0.02		U	0.02		U	0.02		U	0.02		U	0.02		U	0.44		U
LSCMP2-2	0.01		U	0.66	0.03		0.02		U	0.02		U	0.02		U	0.02		U	0.02		U	0.44		U
LSCMP2-3	0.01		U	0.24	0.01		0.02		U	0.02		U	0.02		U	0.02		U	0.02		U	0.44		U
LSCMP3-1	0.01		U	0.25	0.02		0.02		U	0.02		U	0.02		U	0.02		U	0.02		U	0.44		U
LSCMP3-2	0.01		U	0.68	0.02		0.02		U	0.02		U	0.02		U	0.02		U	0.02		U	0.44		U
LSCMP3-3	0.01		U	0.32	0.02		0.02		U	0.02		U	0.02		U	0.02		U	0.02		U	0.44		U

Chemical	delta-BHC			Heptachlor Epoxide			Endosulfan I			gamma-Chlordane			alpha-Chlordane			p,p'-DDE			Dieldrin			Endrin		
CAS #	319-86-8			1024-57-3			959-98-8			5566-34-7			5103-71-9			72-55-9			60-57-1			72-20-8		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
LSCMP1-1	0.01		U	0.01		U	0.01		U	0.01		U	0.01		U	36.23	3.10		0.02		U	0.02		U
LSCMP1-2	0.01		U	0.01		U	0.01		U	0.01		U	0.01		U	31.83	4.03		0.02		U	0.02		U
LSCMP1-3	0.01		U	0.01		U	0.01		U	0.01		U	0.01		U	30.22	2.80		0.02		U	0.02		U
LSCMP2-1	0.02		U	0.02		U	0.02		U	0.02		U	0.02		U	7.50	0.52		0.04		U	0.04		U
LSCMP2-2	0.02		U	0.02		U	0.02		U	0.02		U	0.02		U	28.03	1.36		0.04		U	0.04		U
LSCMP2-3	0.02		U	0.02		U	0.02		U	0.02		U	0.02		U	24.32	1.08		0.04		U	0.04		U
LSCMP3-1	0.02		U	0.02		U	0.02		U	0.02		U	0.02		U	27.07	1.92		0.04		U	0.04		U
LSCMP3-2	0.02		U	0.02		U	0.02		U	0.02		U	0.02		U	44.63	1.55		0.04		U	0.04		U
LSCMP3-3	0.02		U	0.02		U	0.02		U	0.02		U	0.02		U	28.10	1.66		0.04		U	0.04		U

* = lipid-normalized data presented only when a compound is detected.

U = Compound was not detected at the detection limit shown.

TABLE G4-3. PESTICIDE/PCB RESULTS FROM NINE COMPOSITES OF EIGHT LARGESCALE SUCKER (Page 2 of 2)
COLUMBIA RIVER BI-STATE PROGRAM

Chemical	p,p'-DDD			Endosulfan II			p,p'-DDT			Endrin Aldehyde			Mirex			Endosulfan Sulfate			Methoxychlor			Endrin Ketone		
CAS #	72-54-8			33213-65-9			50-29-3			7421-93-4			2385-85-5			1031-07-8			72-43-5			53494-70-5		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
LSCMP1-1	5.87	0.50		0.02		U	0.42	0.04		0.02		U	0.02		U	0.02		U	0.11		U	0.02		U
LSCMP1-2	4.43	0.56		0.02		U	0.43	0.05		0.02		U	0.02		U	0.02		U	0.11		U	0.02		U
LSCMP1-3	6.29	0.58		0.02		U	0.48	0.04		0.02		U	0.02		U	0.02		U	0.11		U	0.02		U
LSCMP2-1	5.18	0.36		0.04		U	1.23	0.08		0.04		U	0.04		U	0.04		U	0.22		U	0.04		U
LSCMP2-2	10.43	0.51		0.04		U	2.15	0.10		0.04		U	0.04		U	0.04		U	0.22		U	0.04		U
LSCMP2-3	9.05	0.40		0.04		U	0.02		U	0.04		U	0.04		U	0.04		U	0.22		U	0.04		U
LSCMP3-1	7.60	0.54		0.04		U	2.45	0.17		0.04		U	0.04		U	0.04		U	0.22		U	0.04		U
LSCMP3-2	18.37	0.64		0.04		U	6.93	0.24		0.04		U	0.04		U	0.04		U	0.22		U	0.04		U
LSCMP3-3	11.67	0.69		0.04		U	4.57	0.27		0.04		U	0.04		U	0.04		U	0.22		U	0.04		U

Chemical	Arochlor 1016			Arochlor 1221			Arochlor 1232			Arochlor 1242			Arochlor 1248			Arochlor 1254			Arochlor 1260			Toxaphene		
CAS #	12674-11-2			1110-428-2			1114-116-5			5346-921-9			1267-229-6			1109-769-1			1109-682-5			8001-35-2		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
LSCMP1-1	1.11		U	1.11		U	1.11		U	1.11		U	18.33	1.57		1.11		U	49.17	4.20		5.56		U
LSCMP1-2	1.11		U	1.11		U	1.11		U	1.11		U	11.47	1.45		1.11		U	34.00	4.30		5.56		U
LSCMP1-3	1.11		U	1.11		U	1.11		U	1.11		U	10.86	1.01		1.11		U	34.49	3.19		5.56		U
LSCMP2-1	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	13.87	0.96		11.11		U
LSCMP2-2	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	39.62	1.92		11.11		U
LSCMP2-3	2.22		U	2.22		U	2.22		U	2.22		U	11.6	0.51		2.22		U	45.37	2.01		11.11		U
LSCMP3-1	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	28.6	2.03		11.11		U
LSCMP3-2	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	57.66	2.00		11.11		U
LSCMP3-3	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	29.14	1.72		11.11		U

* = lipid-normalized data presented only when a compound is detected.

U = Compound was not detected at the detection limit shown.

TABLE G4-4. DIOXIN/FURAN RESULTS FROM NINE COMPOSITES OF EIGHT LARGESCALE SUCKER (Page 1 of 2)
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	2,3,7,8-TCDD 1746-01-6			1,2,3,7,8-PeCDD 40321-76-4			1,2,3,4,7,8-HxCDD 39227-28-6			1,2,3,6,7,8-HxCDD 57653-85-7			1,2,3,7,8,9-HxCDD 19408-74-3		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
LSCMP1-1	0.77		U	0.55		U	0.16		U	0.17		U	0.19		U
LSCMP1-2	0.14		U	0.38		U	0.14		U	0.14		U	0.17		U
LSCMP1-3	0.22		U	0.42		U	0.16		U	0.17		U	0.19		U
LSCMP2-1	0.22		U	0.64		U	0.21	0.01		0.35	0.02		0.15		U
LSCMP2-2	0.73		U	1.24		U	1.02		U	1.06		U	1.21		U
LSCMP2-3	0.51		U	0.70		U	0.59		U	0.61		U	0.7		U
LSCMP3-1	0.17		U	0.34		U	0.21		U	0.21		U	0.25		U
LSCMP3-2	0.44		U	0.51		U	0.38		U	0.39		U	0.45		U
LSCMP3-3	0.24		U	0.27		U	0.14		U	0.14		U	0.16		U

Chemical CAS #	1,2,3,4,6,7,8-HpCDD 35822-46-9			OCDD 3268-87-9			2,3,7,8-TCDF 51207-31-9			1,2,3,7,8-PeCDF 57177-41-6			2,3,4,7,8-PeCDF 57117-31-4		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
LSCMP1-1	0.18		U	0.28		U	0.87	0.07		0.76		U	0.30		U
LSCMP1-2	0.15		U	0.20		U	0.81	0.10		0.54		U	0.21		U
LSCMP1-3	0.16		U	0.34		U	1.06	0.10		0.74		U	0.19		U
LSCMP2-1	0.61		U	3.26	0.22		0.88	0.06		1.66	0.11		0.19		U
LSCMP2-2	0.90	0.04		2.47	0.12		1.13	0.05		1.63		U	0.87		U
LSCMP2-3	0.48	0.02		1.13		U	1.66	0.07		2.82		U	0.43		U
LSCMP3-1	0.24		U	0.11		U	0.98	0.07		0.82		U	0.15		U
LSCMP3-2	0.89	0.03		3.01	0.10		2.42	0.08		1.82	0.06		0.66		U
LSCMP3-3	0.24		U	0.45		U	1.53	0.09		0.75	0.04		0.13		U

* = lipid-normalized data presented only when a compound is detected.
U = Compound was not detected at the detection limit shown.

TABLE G4-4. DIOXIN/FURAN RESULTS FROM NINE COMPOSITES OF EIGHT LARGESCALE SUCKER (Page 2 of 2)
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	1,2,3,4,7,8-HxCDF 70648-26-9			1,2,3,6,7,8-HxCDF 57117-44-9			1,2,3,7,8,9-HxCDF 72918-21-9			2,3,4,6,7,8-HxCDF 60851-34-5			1,2,3,4,6,7,8-HpCDF 67562-39-4		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
LSCMP1-1	0.22		U	0.20		U	0.70	0.06		0.20		U	0.15		U
LSCMP1-2	0.16		U	0.16		U	0.23		U	0.17		U	0.13		U
LSCMP1-3	0.23		U	0.22		U	0.62	0.06		0.19		U	0.14		U
LSCMP2-1	0.24		U	0.84	0.06		1.81	0.12		0.64	0.04		0.25		U
LSCMP2-2	0.99		U	1.59	0.08		1.25		U	0.94		U	0.61		U
LSCMP2-3	1.69		U	1.70		U	1.33		U	1.27		U	0.37		U
LSCMP3-1	0.70		U	0.67		U	0.45		U	0.37		U	1.81	0.13	
LSCMP3-2	1.42		U	1.31		U	1.58		U	1.18		U	2.67	0.09	
LSCMP3-3	0.47		U	0.44		U	0.13		U	0.30		U	0.19		U

Chemical CAS #	1,2,3,4,7,8,9-HpCDF 55673-89-7			OCDF 39001-02-0			TEC (FULL)			TEC (HALF)			TEC (ZERO)		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
LSCMP1-1	0.22		U	0.18		U	1.52			0.84			0.17		
LSCMP1-2	0.18		U	0.17		U	0.67			0.38			0.09		
LSCMP1-3	0.15		U	0.25		U	0.88			0.54			0.20		
LSCMP2-1	0.24		U	0.16		U	1.24			0.90			0.56		
LSCMP2-2	0.86		U	0.87	0.04		2.81			1.55			0.28		
LSCMP2-3	0.41		U	0.48		U	2.19			1.18			0.17		
LSCMP3-1	0.27		U	5.96	0.42		0.89			0.52			0.14		
LSCMP3-2	0.39		U	1.63	0.06		2.13			1.28			0.43		
LSCMP3-3	0.32		U	0.25	0.01		0.82			0.50			0.19		

* = lipid-normalized data presented only when a compound is detected.
U = Compound was not detected at the detection limit shown.

APPENDIX G5

STEELHEAD TISSUE BIOACCUMULATION DATA

TABLE G5-1. METAL RESULTS FROM THREE COMPOSITES OF EIGHT STEELHEAD
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	Silver (Ag) 7440-22-4			Arsenic (As)-ICP/MS 7440-38-2			Barium (Ba) 7440-39-3			Cadmium (Cd) 7440-43-9			Copper (Cu) 7440-50-8		
Sample	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.
DCMP1	0.002		U	0.677	23.59		0.020		BUJ_8	0.011		U	0.784	27.32	
DCMP2	0.002		U	0.753	18.55		0.021	0.51	J_8	0.011		U	0.809	19.93	
DCMP3	0.002		U	0.703	14.58		0.008		BUJ_8	0.012		U	0.650	13.48	

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Chemical CAS #	Mercury (Hg) 7439-97-6			Nickel (Ni) 7440-02-0			Lead (Pb) 7439-92-1			Antimony (Sb) 7440-36-0			Selenium (Se) 7782-49-2			Arsenic Speciation Inorganic			Methylated		
Sample	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	(ug/g lipid)	Data qual.
DCMP1	0.065	2.25		0.028	0.99		0.038		BUJ_8	0.005		U	0.405	14.12		0.018	0.62		0.021	0.72	
DCMP2	0.058	1.43		0.028	0.69		0.026		BUJ_8	0.005		U	0.438	10.79		0.001	0.03		0.033	0.82	
DCMP3	0.068	1.42		0.026		U	0.028		BUJ_8	0.006		U	0.444	9.21		0.001		U	0.031	0.64	

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.
J_8 = Estimated value due to precision of duplicate analyses not meeting QC criteria.

TABLE G5-2. SEMI-VOLATILE RESULTS FROM THREE COMPOSITES OF EIGHT STEELHEAD
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	Phenol 108-95-2			2-Chlorophenol 95-57-8			1,4-Dichlorobenzene 106-46-7			4-Methylphenol 106-44-5		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
DCMP1	41		BU	10		U	10		U	12	0.4	
DCMP2	35		BU	10		U	10		U	9	0.2	J_1
DCMP3	29		BU	10		U	10		U	11	0.2	

Chemical CAS #	N-nitroso-di-n-propylamine 621-44-5			Isophorone 78-59-1			1,2,4-Trichlorobenzene 120-82-1			Acenaphthene 83-32-9		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
DCMP1	10		U	10		U	10		U	10		U
DCMP2	10		U	10		U	10		U	10		U
DCMP3	10		U	10		U	10		U	10		U

Chemical CAS #	4-Nitrophenol 100-02-7			2,4-Dinitrotoluene 121-14-2			Pyrene 129-00-0			Chrysene 218-01-9			bis(2-Ethylhexyl)phthalate 117-81-7		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
DCMP1	25	0.9		10		U	10		U	10		U	20		BU
DCMP2	23	0.6		10		U	10		U	10		U	55		BU
DCMP3	28	0.6		10		U	10		U	10		U	19		BU

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.
J_1 = Value is below nominal reporting limit.

TABLE G5-3. PESTICIDE/PCB RESULTS FROM THREE COMPOSITES OF EIGHT STEELHEAD
COLUMBIA RIVER BI-STATE PROGRAM

Chemical	Hexachlorobutadiene			Hexachlorobenzene			alpha-BHC			gamma-BHC			Heptachlor			Aldrin			beta-BHC			Methyl parathion		
CAS #	87-68-3			118-74-1			319-84-6			58-89-9			76-44-8			309-00-2			319-85-7			298-00-0		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
DCMP1	0.02		U	0.55	0.02		0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	0.89		U
DCMP2	0.17		BU	0.45	0.01		0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	0.89		U
DCMP3	0.31	0.01		2.2	0.05		0.22	0.005		0.04		U	0.04		U	0.04		U	0.04		U	0.89		U

Chemical	delta-BHC			Heptachlor Epoxide			Endosulfan I			gamma-Chlordane			alpha-Chlordane			p,p'-DDE			Dieldrin			Endrin		
CAS #	319-86-8			1024-57-3			959-98-8			5566-34-7			5103-71-9			72-55-9			60-57-1			72-20-8		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
DCMP1	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	1.55	0.05		0.09		U	0.57	0.02	
DCMP2	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	1.35	0.03		0.09		U	0.09		U
DCMP3	0.04		U	0.04		U	0.04		U	0.04		U	0.04		U	3.87	0.08		0.09		U	0.09		U

Chemical	p,p'-DDD			Endosulfan II			p,p'-DDT			Endrin Aldehyde			Mirex			Endosulfan Sulfate			Methoxychlor			Endrin Ketone		
CAS #	72-54-8			33213-65-9			50-29-3			7421-93-4			2385-85-5			1031-07-8			72-43-5			53494-70-5		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
DCMP1	1.15	0.04		0.09		U	2.2	0.08		0.09		U	0.09		U	0.09		U	0.44		U	0.41		BU
DCMP2	3.4	0.08		0.09		U	4.13	0.10		0.09		U	0.09		U	0.09		U	0.44		U	0.09		U
DCMP3	2.73	0.06		0.09		U	3.19	0.07		0.09		U	0.09		U	0.09		U	0.44		U	0.09		U

Chemical	Arochlor 1016			Arochlor 1221			Arochlor 1232			Arochlor 1242			Arochlor 1248			Arochlor 1254			Arochlor 1260			Toxaphene		
CAS #	12674-11-2			1110-428-2			1114-116-5			5346-921-9			1267-229-6			1109-769-1			1109-682-5			8001-35-2		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
DCMP1	4.44		U	4.44		U	4.44		U	4.44		U	4.44		U	4.44		U	3.51	0.12		22.22		U
DCMP2	4.44		U	4.44		U	4.44		U	4.44		U	4.44		U	4.44		U	3.61	0.09		22.22		U
DCMP3	4.44		U	4.44		U	4.44		U	4.44		U	4.44		U	4.44		U	8.07	0.17		22.22		U

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.

TABLE G5-4. DIOXIN/FURAN RESULTS FROM THREE COMPOSITES OF EIGHT STEELHEAD
COLUMBIA RIVER BI-STATE PROGRAM

Chemical	2,3,7,8-TCDD			1,2,3,7,8-PeCDD			1,2,3,4,7,8-HxCDD			1,2,3,6,7,8-HxCDD			1,2,3,7,8,9-HxCDD		
CAS #	1746-01-6			40321-76-4			39227-28-6			57653-85-7			19408-74-3		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
DCMP1	0.01		U	0.14		U	0.05	0.002		0.13		U	0.12		U
DCMP2	0.13		U	0.17		U	0.15		U	0.16		U	0.18		U
DCMP3	0.14		U	0.24		U	0.13		U	0.14		U	0.15		U

Chemical	1,2,3,4,6,7,8-HpCDD			OCDD			2,3,7,8-TCDF			1,2,3,7,8-PeCDF			2,3,4,7,8-PeCDF		
CAS #	35822-46-9			3268-87-9			51207-31-9			57177-41-6			57117-31-4		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
DCMP1	0.15	0.01		0.32		U	0.23	0.01		0.13	0.005		0.10		U
DCMP2	0.15		U	0.33		U	0.21	0.01		0.22		U	0.19		U
DCMP3	0.12		U	0.41		U	0.27	0.01		0.18	0.004		0.19		U

Chemical	1,2,3,4,7,8-HxCDF			1,2,3,6,7,8-HxCDF			1,2,3,7,8,9-HxCDF			2,3,4,6,7,8-HxCDF			1,2,3,4,6,7,8-HpCDF		
CAS #	70648-26-9			57117-44-9			72918-21-9			60851-34-5			67562-39-4		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
DCMP1	0.10		U	0.14		BU	0.12		U	0.12		U	0.12		U
DCMP2	0.21		U	0.20		U	0.31		U	0.22		U	0.16		U
DCMP3	0.27		U	0.25		U	0.25		U	0.19		U	0.22		U

Chemical	1,2,3,4,7,8,9-HpCDF			OCDF			TEC (FULL)			TEC (HALF)			TEC (ZERO)		
CAS #	55673-89-7			39001-02-0											
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
DCMP1	0.16		U	0.08		U	0.24			0.15			0.05		
DCMP2	0.20		U	0.23		U	0.49			0.26			0.02		
DCMP3	0.33		U	0.09		U	0.54			0.29			0.04		

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.

APPENDIX G6

WHITE STURGEON TISSUE BIOACCUMULATION DATA

TABLE G6-1. METAL RESULTS FROM TWELVE INDIVIDUAL WHITE STURGEON COLUMBIA RIVER BI-STATE PROGRAM

Chemical	Silver (Ag)			Arsenic (As)-ICP/MS			Barium (Ba)			Cadmium (Cd)			Copper (Cu)		
CAS #	7440-22-4			7440-38-2			7440-39-3			7440-43-9			7440-50-8		
Sample	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.
SIND1	0.001		U	1.793	82.63		0.133	6.14	J_8	0.009		U	0.236	10.85	
SIND2	0.002		U	0.563	33.32		0.176	10.44	J_8	0.010		U	0.230	13.60	
SIND3	0.002		U	0.558	64.94		0.44	50.97	J_8	0.009		U	0.352	40.88	
SIND4	0.002		U	0.533	53.27		0.096	9.58	J_8	0.009		U	0.261	26.08	
SIND5	0.002		U	0.275	39.88		0.058	8.37	J_8	0.010		U	0.151	21.83	
SIND6	0.002		U	0.485	19.70		0.149	6.04	J_8	0.010		U	0.219	8.89	
SIND7	0.002		U	0.395	39.91		0.115	11.60	J_8	0.010		U	0.189	19.12	
SIND8	0.002		U	0.357	40.56		0.067	7.56		0.009		U	0.226	25.70	
SIND9	0.001		U	0.669	1672.97		0.037	92.78		0.008		U	0.223	557.66	
SIND10	0.001		U	0.748	534.30		0.051	36.14		0.008		U	0.198	141.70	
SIND11	0.001		U	0.240	66.68		0.039	10.81		0.008		U	0.207	57.54	
SIND12	0.001		U	0.311	75.90		0.046	11.20		0.008		U	0.193	47.15	

Chemical	Mercury (Hg)			Nickel (Ni)			Lead (Pb)			Antimony (Sb)			Selenium (Se)			Arsenic Speciation Inorganic			Methylated		
CAS #	7439-97-6			7440-02-0			7439-92-1			7440-36-0			7782-49-2								
Sample	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	Conc.* (ug/g lipid)	Data qual.	Conc. (ug/g)	(ug/g lipid)	Data qual.
SIND1	0.067	3.08		0.065	3.00		0.023		BUJ$_8$	0.004		U	0.405	18.68		0.034	1.56		0.038	1.76	
SIND2	0.057	3.39		0.024	1.40		0.012		BUJ$_8$	0.005		U	0.312	18.45		0.011	0.63		0.023	1.38	
SIND3	0.045	5.28		0.587	68.30		0.032		BUJ$_8$	0.004		U	0.490	56.92		0.047	5.43		0.019	2.20	
SIND4	0.049	4.86		0.040	4.03		0.030		BUJ$_8$	0.004		U	0.368	36.78		0.045	4.46		0.013	1.27	
SIND5	0.053	7.68		0.021		U	0.034		BUJ$_8$	0.005		U	0.280	40.54		0.050	7.31		0.007	1.00	
SIND6	0.056	2.29		0.043	1.76		0.029		BUJ$_8$	0.005		U	0.440	17.87		0.047	1.93		0.009	0.37	
SIND7	0.061	6.13		0.071	7.22		0.019		BUJ$_8$	0.005		U	0.432	43.62		0.039	3.94		0.010	1.04	
SIND8	0.071	8.04		0.020		U	0.034		BU	0.004		U	0.528	59.96	J_8	0.040	4.53		0.003	0.35	
SIND9	0.087	218.62		0.018		U	0.016		BU	0.004		U	0.428	1070.90	J_8	0.043	108.57		0.010	26.16	
SIND10	0.111	79.04		0.016		U	0.014		BU	0.004		U	0.320	228.80	J_8	0.033	23.40		0.130	93.21	
SIND11	0.049	13.55		0.017		U	0.014		BU	0.004		U	0.368	102.18	J_8	0.039	10.76		0.009	2.64	
SIND12	0.053	12.81		0.018		U	0.020		BU	0.004		U	0.410	100.10	J_8	0.041	9.96		0.010	2.42	

* = lipid-normalized data presented only when a compound is detected.

B = Background levels may impact this data point.

U = Compound was not detected at the detection limit shown.

J_8= Estimated value due to precision of duplicate analyses not meeting QC criteria.

TABLE G6-2. SEMI-VOLATILE RESULTS FROM TWELVE INDIVIDUAL WHITE STURGEON (Page 1 of 2)
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	Phenol 108-95-2			2-Chlorophenol 95-57-8			1,4-Dichlorobenzene 106-46-7			4-Methylphenol 106-44-5		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
SIND1	16		BU	10		U	10		U	10		U
SIND2	12		BU	10		U	10		U	10		U
SIND3	13		BU	10		U	10		U	10		U
SIND4	14		BU	10		U	10		U	10		U
SIND5	12		BU	10		U	10		U	10		U
SIND6	11		BU	10		U	10		U	10		U
SIND7	12		BU	10		U	10		U	10		U
SIND8	19		BU	10		U	10		U	15	1.7	
SIND9	17		BU	10		U	10		U	18	45.0	
SIND10	14		BU	10		U	10		U	12	8.6	
SIND11	13		BU	10		U	10		U	12	3.3	
SIND12	21		BU	10		U	10		U	9	2.2	J_1

Chemical CAS #	N-nitroso-di-n-propylamine 621-44-5			Isophorone 78-59-1			1,2,4-Trichlorobenzene 120-82-1			Acenaphthene 83-32-9		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
SIND1	10		U	10		U	10		U	10		U
SIND2	10		U	10		U	10		U	10		U
SIND3	10		U	10		U	10		U	10		U
SIND4	10		U	10		U	10		U	10		U
SIND5	10		U	10		U	10		U	10		U
SIND6	10		U	10		U	10		U	10		U
SIND7	10		U	10		U	10		U	10		U
SIND8	10		U	10		U	10		U	10		U
SIND9	10		U	10		U	10		U	10		U
SIND10	10		U	10		U	10		U	10		U
SIND11	10		U	10		U	10		U	10		U
SIND12	10		U	10		U	10		U	10		U

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.
J_1 = Value is below nominal reporting limit.

TABLE G6-2. SEMI-VOLATILE RESULTS FROM TWELVE INDIVIDUAL WHITE STURGEON (Page 2 of 2)
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	4-Nitrophenol 100-02-7			2,4-Dinitrotoluene 121-14-2			Pyrene 129-00-0			Chrysene 218-01-9			bis(2-Ethylhexyl)phthalate 117-81-7		
Sample	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc. * (mg/kg lipid)	Data qual.
SIND1	69	3.2		10		U	10		U	10		U	25		BU
SIND2	69	4.1		10		U	10		U	10		U	26		BU
SIND3	24	2.8		10		U	10		U	10		U	62		BU
SIND4	89	8.9		10		U	10		U	10		U	47		BU
SIND5	71	10.3		10		U	10		U	10		U	30		BU
SIND6	87	3.5		10		U	10		U	10		U	16		BU
SIND7	119	12.0		10		U	10		U	10		U	59		BU
SIND8	10		U	10		U	10		U	10		U	32		BU
SIND9	10		U	10		U	10		U	10		U	42		BU
SIND10	10		U	10		U	10		U	10		U	24		BU
SIND11	10		U	10		U	10		U	10		U	136		BU
SIND12	10		U	10		U	10		U	10		U	42		BU

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.

TABLE G6-3. PESTICIDE/PCB RESULTS FROM TWELVE INDIVIDUAL WHITE STURGEON (Page 1 of 2)
COLUMBIA RIVER BI-STATE PROGRAM

Chemical	Hexachlorobutadiene			Hexachlorobenzene			alpha-BHC			gamma-BHC		
CAS #	87-68-3			118-74-1			319-84-6			58-89-9		
Sample	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.
SIND1	0.01		U	0.53	0.02		0.11	0.01		0.01		U
SIND2	0.01		U	0.20	0.01		0.01		U	0.01		U
SIND3	0.01		U	0.17	0.02		0.02	0.002		0.01		U
SIND4	0.09	0.01		0.46	0.05		0.01		U	0.01		U
SIND5	0.06	0.01		0.27	0.04		0.01		U	0.01		U
SIND6	0.11	0.004		1.01	0.04		0.13	0.01		2.26	0.09	
SIND7	0.06	0.01		0.48	0.05		0.01		U	0.01		U
SIND8	0.46	0.05		0.70	0.08		0.04	0.005		0.02		U
SIND9	0.51	1.28		0.12	0.30		0.02		U	0.02		U
SIND10	0.36	0.26		0.01		U	0.02		U	0.02		U
SIND11	0.58	0.16		0.50	0.14		0.02	0.01		0.02		U
SIND12	0.49	0.12		0.07	0.02		0.02		U	0.24	0.06	

Chemical	Heptachlor			Aldrin			beta-BHC			Methyl parathion		
CAS #	76-44-8			309-00-2			319-85-7			298-00-0		
Sample	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.
SIND1	0.01		U	0.01		U	0.01		U	0.22		U
SIND2	0.01		U	0.01		U	0.01		U	0.22		U
SIND3	0.01		U	0.01		U	0.01		U	0.22		U
SIND4	0.01		U	0.01		U	0.01		U	0.22		U
SIND5	0.01		U	0.01		U	0.01		U	0.22		U
SIND6	0.01		U	0.01		U	0.01		U	0.22		U
SIND7	0.01		U	0.01		U	0.01		U	0.22		U
SIND8	0.02		U	0.02		U	0.02		U	0.44		U
SIND9	0.02		U	0.09	0.23		0.02		U	0.44		U
SIND10	0.02		U	0.02		U	0.02		U	0.44		U
SIND11	0.02		U	0.12	0.03		0.02		U	0.44		U
SIND12	0.02		U	0.02		U	0.02		U	0.44		U

Chemical	delta-BHC			Heptachlor Epoxide			Endosulfan I			gamma-Chlordane		
CAS #	319-86-8			1024-57-3			959-98-8			5566-34-7		
Sample	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.
SIND1	0.01		U	0.01		U	0.01		U	0.01		U
SIND2	0.01		U	0.01		U	0.01		U	0.01		U
SIND3	0.01		U	0.01		U	0.01		U	0.01		U
SIND4	0.01		U	0.01		U	0.01		U	0.01		U
SIND5	0.01		U	0.01		U	0.01		U	0.01		U
SIND6	0.01		U	0.01		U	0.01		U	0.01		U
SIND7	0.01		U	0.01		U	0.01		U	0.01		U
SIND8	0.02		U	0.02		U	0.02		U	0.02		U
SIND9	0.02		U	0.02		U	0.02		U	0.02		U
SIND10	0.02		U	0.02		U	0.02		U	0.02		U
SIND11	0.02		U	0.02		U	0.02		U	0.02		U
SIND12	0.02		U	0.02		U	0.02		U	0.02		U

Chemical	alpha-Chlordane			p,p'-DDE			Dieldrin			Endrin		
CAS #	5103-71-9			72-55-9			60-57-1			72-20-8		
Sample	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (µg/kg)	Conc.* (mg/kg lipid)	Data qual.
SIND1	0.01		U	76.60	3.53		0.02		U	0.02		U
SIND2	0.01		U	33.88	2.00		0.02		U	0.02		U
SIND3	0.01		U	27.22	3.17		0.02		U	0.02		U
SIND4	0.01		U	38.95	3.90		0.02		U	0.02		U
SIND5	0.01		U	22.57	3.27		0.02		U	0.02		U
SIND6	0.01		U	60.50	2.46		0.02		U	0.02		U
SIND7	0.01		U	47.27	4.77		0.02		U	0.02		U
SIND8	0.02		U	52.93	6.01		0.04		U	0.04		U
SIND9	0.02		U	13.17	32.93		0.04		U	0.04		U
SIND10	0.02		U	29.63	21.16		0.04		U	0.04		U
SIND11	0.02		U	59.16	16.43		0.04		U	0.04		U
SIND12	0.02		U	34.97	8.53		0.04		U	0.04		U

* = lipid-normalized data presented only when a compound is detected.

U = Compound was not detected at the detection limit shown.

TABLE G6-3. PESTICIDE/PCB RESULTS FROM TWELVE INDIVIDUAL WHITE STURGEON (Page 2 of 2)
COLUMBIA RIVER BI-STATE PROGRAM

Chemical	p,p'-DDD			Endosulfan II			p,p'-DDT			Endrin Aldehyde			Mirex			Endosulfan Sulfate			Methoxychlor			Endrin Ketone		
CAS #	72-54-8			33213-65-9			50-29-3			7421-93-4			2385-85-5			1031-07-8			72-43-5			53494-70-5		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
SIND1	8.09	0.37		0.02		U	1.03	0.05		0.02		U	0.02		U	0.02		U	0.11		U	0.02		U
SIND2	8.48	0.50		0.02		U	1.2	0.07		0.02		U	0.02		U	0.02		U	0.11		U	0.02		U
SIND3	3.80	0.44		0.02		U	0.36	0.04		0.02		U	0.02		U	0.02		U	0.11		U	0.02		U
SIND4	6.74	0.67		0.02		U	0.09	0.01		0.02		U	0.02		U	0.02		U	0.11		U	0.02		U
SIND5	2.56	0.37		0.02		U	0.48	0.07		0.02		U	0.02		U	0.02		U	0.11		U	0.02		U
SIND6	0.69	0.03		0.02		U	0.12	0.005		0.02		U	0.02		U	0.02		U	0.11		U	0.02		U
SIND7	6.33	0.64		0.02		U	0.28	0.03		0.02		U	0.02		U	0.02		U	0.11		U	0.02		U
SIND8	10.48	1.19		0.04		U	1.37	0.16		0.04		U	0.04		U	0.04		U	0.22		U	0.04		U
SIND9	3.68	9.20		0.04		U	1.09	2.73		0.04		U	0.04		U	0.04		U	0.22		U	0.04		U
SIND10	4.60	3.29		0.04		U	1.16	0.83		0.04		U	0.04		U	0.04		U	0.22		U	0.04		U
SIND11	9.99	2.78		0.04		U	2.84	0.79		0.04		U	0.15	0.04		0.04		U	0.22		U	0.18	0.05	
SIND12	9.32	2.27		0.04		U	2.78	0.68		0.04		U	0.51	0.12		0.04		U	0.22		U	0.04		U

Chemical	Arochlor 1016			Arochlor 1221			Arochlor 1232			Arochlor 1242			Arochlor 1248			Arochlor 1254			Arochlor 1260			Toxaphene		
CAS #	12674-11-2			1110-428-2			1114-116-5			5346-921-9			1267-229-6			1109-769-1			1109-682-5			8001-35-2		
Sample	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.	Conc. (ug/kg)	Conc.* (mg/kg lipid)	Data qual.
SIND1	1.11		U	1.11		U	1.11		U	1.11		U	25.14	1.16		1.11		U	59.67 84.81	2.75		5.56		U
SIND2	1.11		U	1.11		U	1.11		U	1.11		U	18.17	1.08		1.11		U	26.33 44.50	1.56		5.56		U
SIND3	1.11		U	1.11		U	1.11		U	1.11		U	13.33	1.55		1.11		U	22.50 35.83	2.62		5.56		U
SIND4	1.11		U	1.11		U	1.11		U	1.11		U	17.67	1.77		1.11		U	40.00 57.67	4.00		5.56		U
SIND5	1.11		U	1.11		U	1.11		U	1.11		U	10.07	1.46		1.11		U	26.62 36.69	3.86		5.56		U
SIND6	1.11		U	1.11		U	1.11		U	1.11		U	27.67	1.12		1.11		U	86.50 114.17	3.52		5.56		U
SIND7	1.11		U	1.11		U	1.11		U	1.11		U	23.00	2.32		1.11		U	75.33 98.33	7.61		5.56		U
SIND8	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	54.39	6.18		11.11		U
SIND9	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	32.78	81.95		11.11		U
SIND10	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	40.37	28.84		11.11		U
SIND11	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	61.10	16.97		11.11		U
SIND12	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	2.22		U	30.70	7.49		11.11		U

* = lipid-normalized data presented only when a compound is detected.

U = Compound was not detected at the detection limit shown.

TABLE G6-4. DIOXIN/FURAN RESULTS FROM TWELVE INDIVIDUAL WHITE STURGEON (Page 1 of 2)
COLUMBIA RIVER BI-STATE PROGRAM

Chemical	2,3,7,8-TCDD			1,2,3,7,8-PeCDD			1,2,3,4,7,8-HxCDD			1,2,3,6,7,8-HxCDD			1,2,3,7,8,9-HxCDD		
CAS #	1746-01-6			40321-76-4			39227-28-6			57653-85-7			19408-74-3		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
SIND1	0.28		U	0.20		U	0.37		U	0.34		U	0.44		U
SIND2	0.23		U	0.32		U	0.15		U	0.16		U	0.18		U
SIND3	0.20		U	0.18		U	0.20		U	0.21		U	0.24		U
SIND4	0.19		U	0.31		U	0.15		U	0.16		U	0.18		U
SIND5	0.31		U	0.25		U	0.27		U	0.29		U	0.32		U
SIND6	0.32		U	0.33		U	0.22		U	0.23		U	0.26		U
SIND7	0.22		U	0.20		U	0.19		U	0.19		U	0.23		U
SIND8	0.21		U	0.22		U	0.14		U	0.13		U	0.17		U
SIND9	0.18		U	0.18		U	0.21		U	0.21		U	0.26		U
SIND10	0.09		U	0.13		U	0.13		U	0.13		U	0.16		U
SIND11	0.12		U	0.14		U	0.11		U	0.11		U	0.13		U
SIND12	0.10		U	0.17		U	0.08		U	0.08		U	0.10		U

Chemical	1,2,3,4,6,7,8-HpCDD			OCDD			2,3,7,8-TCDF			1,2,3,7,8-PeCDF			2,3,4,7,8-PeCDF		
CAS #	35822-46-9			3268-87-9			51207-31-9			57177-41-6			57117-31-4		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
SIND1	0.48	0.02		1.40		BU	5.70	0.26		1.14		U	0.40		U
SIND2	0.20		U	0.47		U	4.46	0.26		0.50	0.03		0.14		U
SIND3	0.23		U	1.02		BU	1.70	0.20		0.41		U	0.12		U
SIND4	0.14		U	0.30		U	4.30	0.43		0.32		U	0.12		U
SIND5	0.15		U	0.53		U	1.61	0.23		0.22		U	0.11		U
SIND6	0.25		U	0.58		U	5.94	0.24		0.83		U	0.19		U
SIND7	0.15		U	0.35		U	2.63	0.27		0.66		U	0.12		U
SIND8	0.39	0.04		0.85		U	2.70	0.31		0.33		U	0.08	0.01	
SIND9	0.20		U	0.35		U	0.22	0.55		0.09		U	0.13		U
SIND10	0.44		U	0.26		U	0.51	0.36		0.14		U	0.07		U
SIND11	0.31		U	1.21	0.34		1.10	0.31		0.14		U	0.06		U
SIND12	0.32		U	2.89	0.70		1.38	0.34		0.19		U	0.08		U

* = lipid-normalized data presented only when a compound is detected.
B = Background levels may impact this data point.
U = Compound was not detected at the detection limit shown.

TABLE G6-4. DIOXIN/FURAN RESULTS FROM TWELVE INDIVIDUAL WHITE STURGEON (Page 2 of 2)
COLUMBIA RIVER BI-STATE PROGRAM

Chemical CAS #	1,2,3,4,7,8-HxCDF 70648-26-9			1,2,3,6,7,8-HxCDF 57117-44-9			1,2,3,7,8,9-HxCDF 72918-21-9			2,3,4,6,7,8-HxCDF 60851-34-5			1,2,3,4,6,7,8-HpCDF 67562-39-4		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
SIND1	0.73		U	7.75		U	0.87	0.04		0.41	0.02		1.06	0.05	
SIND2	0.20		U	0.38		U	0.59	0.03		0.24		U	0.18		U
SIND3	0.19		U	0.19		U	0.19		U	0.16		U	0.14		U
SIND4	0.16		U	0.14		U	0.36	0.04		0.18		U	0.21		U
SIND5	0.25		U	0.24		U	0.17		U	0.14		U	0.20		U
SIND6	0.24		U	0.23		U	0.51	0.02		0.13		U	0.16		U
SIND7	0.20		U	0.22		U	0.36	0.04		0.14		U	0.13		U
SIND8	0.18		U	0.17		U	0.36	0.04		0.14		U	0.17		U
SIND9	0.14		U	0.12		U	0.20		U	0.15		U	0.17		U
SIND10	0.11		U	0.11		U	0.25		U	0.09		U	1.64	1.17	
SIND11	0.09		U	0.08		U	0.10		U	0.15		U	0.14		U
SIND12	0.09		U	0.08		U	0.17	0.04		0.09		U	0.13		U

Chemical CAS #	1,2,3,4,7,8,9-HpCDF 55673-89-7			OCDF 39001-02-0			TEC (FULL)			TEC (HALF)			TEC (ZERO)		
Sample	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.	Conc. (ng/kg)	Conc.* (ug/kg lipid)	Data qual.
SIND1	0.32		U	0.67	0.03		2.42			2.01			1.59		
SIND2	0.24		U	0.20		U	1.13			0.83			0.53		
SIND3	0.11		U	0.22		U	0.69			0.43			0.18		
SIND4	0.12		U	0.15		U	1.00			0.74			0.48		
SIND5	0.14		U	0.23		U	0.84			0.51			0.17		
SIND6	0.17		U	0.25		U	1.42			1.04			0.66		
SIND7	0.11		U	0.20		U	0.86			0.59			0.32		
SIND8	0.26		U	0.24		U	0.78			0.57			0.35		
SIND9	0.17		U	0.26		U	0.50			0.26			0.02		
SIND10	0.63		U	5.78	4.13		0.38			0.23			0.07		
SIND11	0.07		U	0.06		U	0.42			0.27			0.11		
SIND12	0.11		U	0.46	0.11		0.45			0.30			0.16		

* = lipid-normalized data presented only when a compound is detected.
U = Compound was not detected at the detection limit shown.