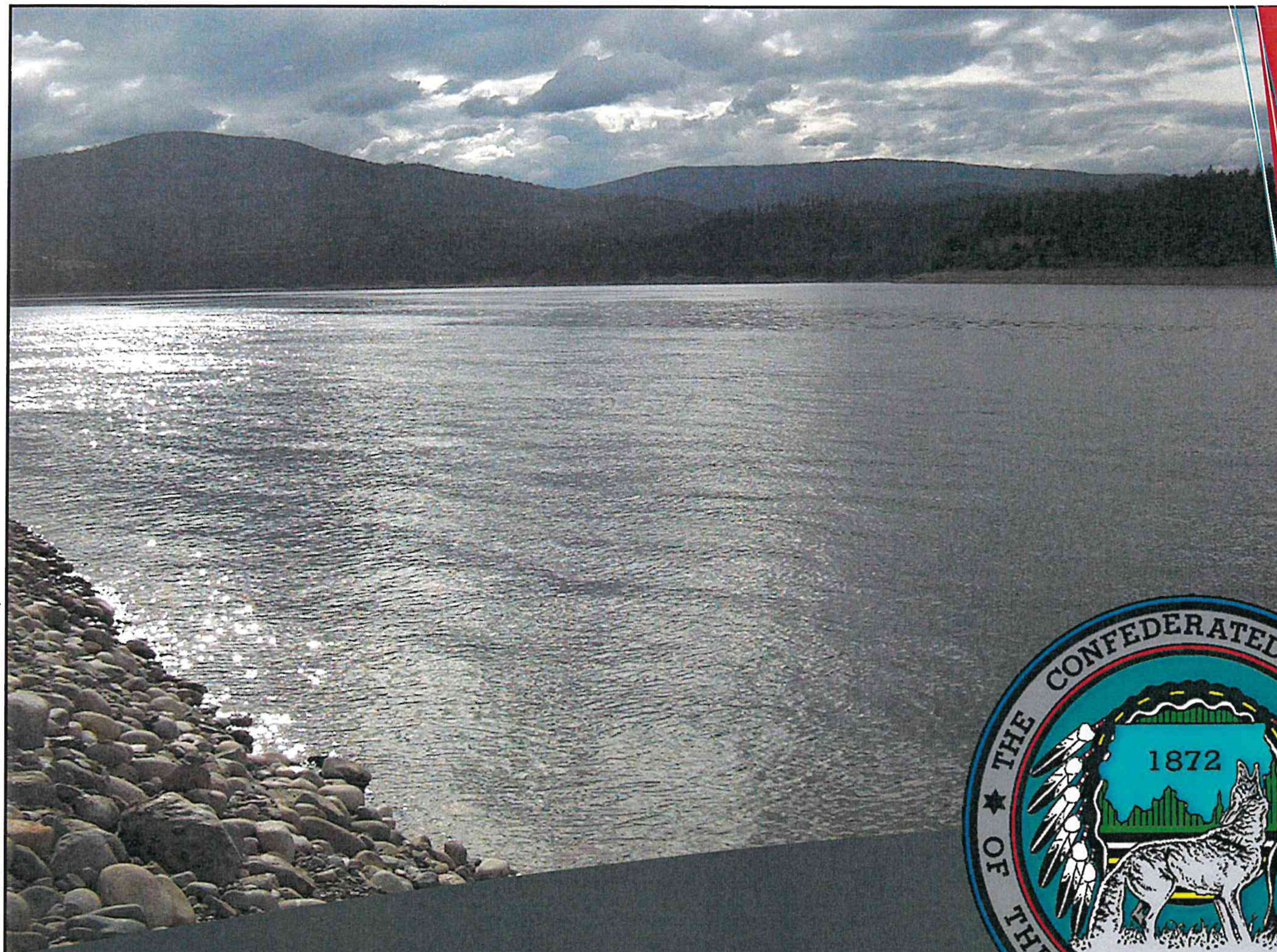

Upper Columbia River Toxics Monitoring: Caring for Sn̓x̌ʷn̓tkʷitkʷ

Phase 1, Historic Data Compilation

Prepared by:

Whitney Fraser

Lodestone Environmental Consulting

1122 East Pike Street #1317

Seattle, WA 98122

Publication Information

Each study funded by the U.S. Environmental Protection Agency (EPA) must have an approved Quality Assurance Project Plan (QAPP). This QAPP describes the first phase of a project selected by the EPA's Columbia River Basin Restoration Funding Assistance Program (CRBRP) – Middle and Upper Columbia River. The plan describes the objectives of the study and the procedures to be followed to achieve those objectives. After completion, the QAPP and final report will be posted on the webpage of the Environmental Trust Department of the Confederated Tribes of the Colville Reservation.[1] The authors are indebted to a prior study funded under the program (Columbia River Mainstem Fish Tissue and Water Quality Monitoring Framework) for sharing their approved QAPP from January 2021, which was written using the Washington State Department of Ecology's QAPP Template (revised 3/9/2020). This QAPP borrows some common sections from those prior works.

Contact Information

Confederated Tribes of the Colville Reservation: Rodney Cawston (Rodney.Cawston.ENV@colvilletribes.com)

Lodestone Environmental Consulting LLC: Whitney Fraser (fraser@lodestonellc.com)

COVER PHOTO: Upper Columbia River/Lake Roosevelt

PHOTO BY: Whitney Fraser

[1] https://www.colvilletribes.com/environmental-trust

Quality Assurance Project Plan

UPPER COLUMBIA RIVER TOXICS MONITORING:

CARING FOR SṅX̌ʷṅTKʷITKʷ

PHASE 1 – HISTORIC DATA COMPILATION

by Whitney Fraser

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Signature: RCawston Date: 4-6-23

Rodney Cawston, Project Manager, Confederated Tribes of the Colville Reservation

Signature: Whitney Fraser Date: April 7, 2023

Whitney Fraser, Author/Technical Consultant, Lodestone Environmental Consulting LLC

Signature: LAUREN MCDAID Digitally signed by LAUREN MCDAID Date: 2023.04.11 09:47:57 -06'00'

Lauren McDaid, Grant Project Officer, U.S. Environmental Protection Agency

Signature: Don Matheny Digitally signed by Don Matheny Date: 2023.04.11 09:35:59 -07'00'

QA Chemist, U.S. Environmental Protection Agency

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1.0 ABSTRACT

This Quality Assurance Project Plan (QAPP) pertains to the initial phase of a project to plan and pilot an innovative environmental monitoring and risk communication program that centers the needs of members of the Confederated Tribes of the Colville Reservation (CTCR) while being expansive enough to have relevance for all local residents and users of the 214-mile reach of the Columbia River from the US-Canada border through Lake Roosevelt and Lake Rufus Woods to the Chief Joseph Dam. The ultimate goal is to reduce uncertainty around what activities and resources are safe for CCT members and other local residents to do and use, and to initiate a program that will assess changes in contaminant levels in surface water, beach sediment, and fish tissue. To that end, this Phase 1 QAPP will cover the considerations necessary for compiling relevant historical data in order to initiate public communications and build a database that will allow us to track future trends.

This work will address the Columbia River Basin Restoration Program (CRBRP) priority "increased monitoring and access to data from monitoring in the Columbia River Basin with a focus on toxics with an impact on human health and fish and wildlife."

2.0 BACKGROUND

2.1 INTRODUCTION AND PROBLEM STATEMENT

The twelve nations of the CTCR trace a cultural connection up and down Sn̓x̌ʷn̓tkʷitkʷ (an n̓səl̓xcin̓/Colville Salish word for the Columbia River), stretching well into Canada. The CTCR government and its Environmental Trust Department (ETD) have a mission of achieving and maintaining a healthy environment, including the clean water, beaches, and fish required to support Tribal values, teachings, and subsistence uses. The Colville Indian Reservation (CIR) is bordered by 159 miles of the Columbia River down to the Chief Joseph Dam near Bridgeport, WA, and CTCR members have hunting and fishing rights in our traditional territory north of the CIR, bordered by an additional 55 miles of river upstream to the US-Canada border (see Figure 1).

Our goal is to develop a long-term monitoring program to assess the status and trends of contamination in fish, water, and beach sediment in the Columbia River mainstem, from the Canadian Border to Chief Joseph Dam. In this QAPP, we refer to this entire 214-mile reach as the Upper Columbia River and Lake Rufus Woods (UCR/LRW). This QAPP is prepared for the completion of Phase 1 (only) of this effort. Phase 1 is a historic data compilation exercise and will produce a database and web interface suitable for public communication. Phase 1 is expected to occur over a five-month period and is funded through an EPA grant. No field sampling or new data will be produced in Phase 1; historical data will be compiled and evaluated to help understand contaminant variability, identify data gaps, assess relevant locations for future sampling, and inform risk communication efforts. A separate QAPP will be produced for Phase 2 to cover field sampling.

Fishing and sharing fish as food play key social, nutritional, and cultural roles in the lives of CCT members, and those roles have been severely disrupted by decades of upstream industrial waste discharge, UCR fish advisories, and the resulting apprehension about whether it is safe for CCT members to use UCR/LRW resources. Today, elevated contaminants in the environment and fish consumption advisories applicable to the UCR are a source of decreased engagement with and increased concern for Sn̓x̌ʷn̓tkʷitkʷ. While toxics are not the sole reason that people spend less time with the River on a daily basis than they did in the past, fear that they would be exposing themselves and their families to health risks by spending their preferred amount of time on the River or by eating fish from its waters is an important factor.

Despite over 20 years' engagement with EPA related to environmental investigations at the UCR Site (a "CERCLA-like" site that is not on the National Priorities List), CCT members continue to distrust risk conclusions disseminated by EPA because of an inherent lack of faith that the federal government is taking into account the best interests of the Tribal community, the degree of influence the primary polluter has over the sampling designs, and the lack of ongoing relevance that one-time sampling provides in a dynamic river system with upstream major industry like the UCR/LRW. Numerous studies by federal, state, and other organizations since the 1980's have found elevated concentrations of contaminants in fish, beach sediment, and surface water of the UCR/LRW. These are summarized in Section 2.2.2 below.

2.2 STUDY AREA AND SURROUNDINGS

The Columbia River drains 260,452 square miles of western North America, flowing 1,245 miles from the river's headwaters at Columbia Lake in southeastern British Columbia until it reaches the Pacific Ocean along the border between Oregon and Washington in the United States. The river enters the United States in northeastern Washington, just south (downstream) of the confluence with the Pend Oreille River, between the municipalities of Trail, B.C., and Northport, WA (top right corner of Figure 1). Other major tributaries entering the UCR/LRW are the Kettle River, the Colville River, the Spokane River, and the San Poil River. The hydrology of the UCR/LRW is largely controlled by two major dams in the US, Grand Coulee Dam (blue marker in Figure 1) and Chief Joseph Dam (red marker in Figure 1), while Canadian dams control the timing and amount of flows coming into the US. Grand Coulee Dam was completed in 1941 and was built to provide power generation, irrigation, and flood control. The impoundment behind Grand Coulee Dam is called Lake Roosevelt. Chief Joseph Dam near the town of Bridgeport, WA, is a run-of-the-river project that was initially completed in 1955 and was raised 3 m in the 1970s. The impoundment behind Chief Joseph Dam is called Lake Rufus Woods.

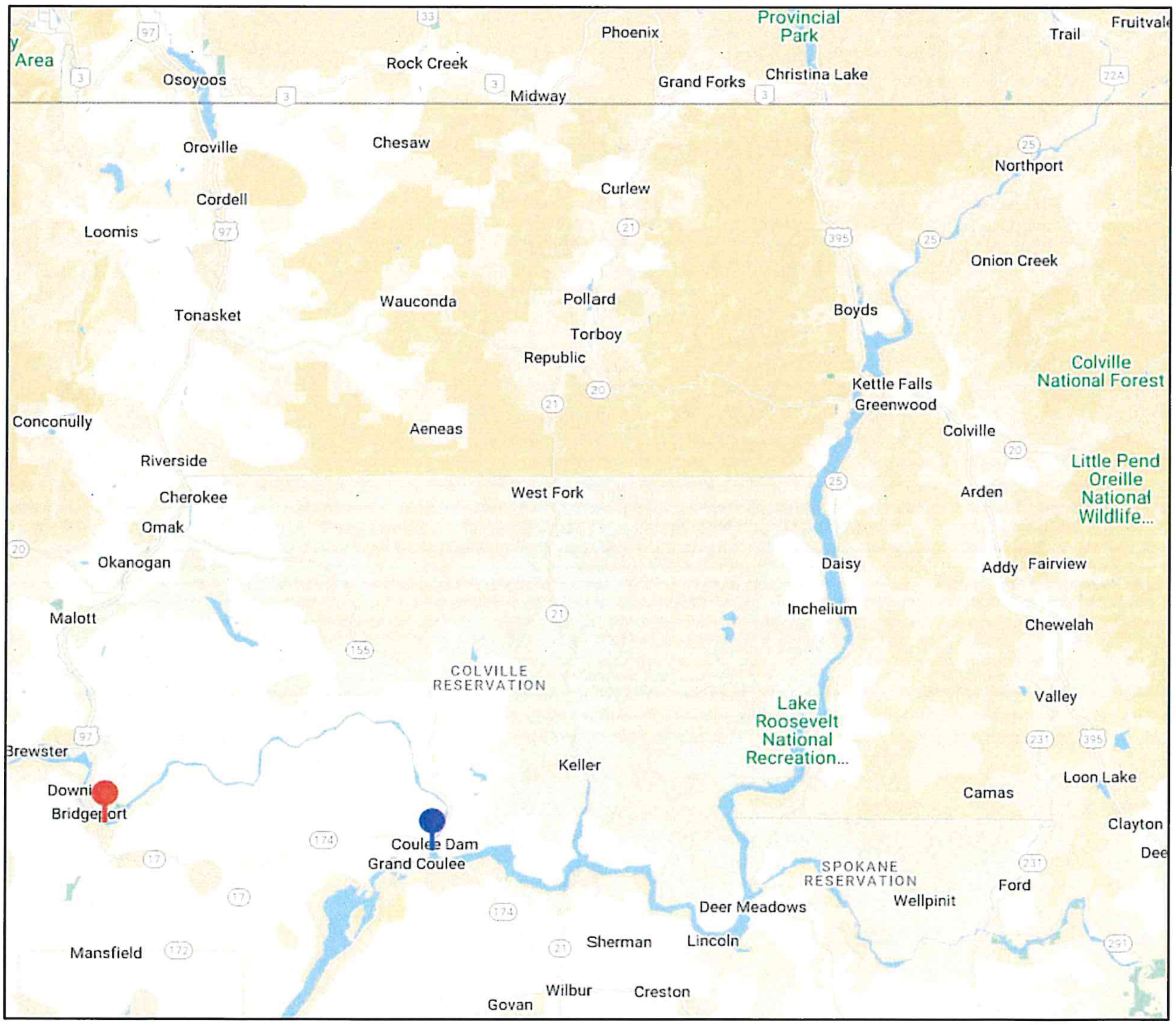

Figure 1: Map of study area

2.2.1 HISTORY OF STUDY AREA

Fish, wildlife, and people are exposed to many contaminants polluting the water and sediment of the Columbia River Basin. These contaminants come from current and past industrial discharges (point sources) to the air, land, and water and from more widespread sources such as runoff from farms and roads (nonpoint sources) and atmospheric deposition.

Indigenous people have occupied the vicinity of the UCR/LRW for more than 10,000 years. Prior to the influx of Canadian and European settlers in the mid-1850s, the ancestors of the twelve indigenous nations now comprising the CTCR (sṗaƛ̓muləxʷəxʷ/Methow, Sʔukʷnaʔqín/Okanogan, Sṅʕay̓ckstx/Arrow Lakes, Sṅpʕawílx/Sanpoil, Sx̌ʷy̓ʔiɬpx/Colville, Nspiləm/Nespelem, c̓əlámaxəxʷ/Chelan, šniyátkʷəxʷ/Entiat, šnq̇áw̓səxʷ/Moses-Columbia, Nṗəšqʷáw̓šəxʷ/Wenatchi, nímípuʔ/Nez Perce, and Snq̇ʷaʔmitx/Palus) were nomadic, following the seasons and their sources of food. Their aboriginal territories were grouped primarily around waterways such as the Columbia River, the Sanpoil River, the Okanogan River, the Snake River and the Wallowa River. Similarly, ancestors of the Spokane Tribe of Indians (STOI) lived a semi-nomadic way of life hunting, fishing, and gathering, living along the banks of the Spokane and Columbia rivers and up their tributaries. (USEPA 2021)

Many of the modern towns near the UCR/LRW were founded from the late 1850s through the 1880s as mining communities or as supply centers for the mining districts. Mining and mineral processing has been occurring in the UCR/LRW region since at least the late 1800s. A western power shortage associated with World War II led Franklin D. Roosevelt to authorize the Columbia Basin Project, including the Grand Coulee Dam and Banks Lake, a holding reservoir. The implementation of this project altered the historical, cultural, and natural resources of the UCR, leading to present day conditions. (USEPA 2021)

Since 1999, the EPA has been documenting sediment contamination along the UCR from the U.S. – Canada border to the Grand Coulee Dam, focused on metal contributions from smelting waste streams.[2]

2.2.2 SUMMARY OF PREVIOUS STUDIES AND EXISTING DATA

Numerous studies by federal, state, and other entities since the 1980s have found substantial concentrations of contaminants in fish, sediment, and the water of the Columbia River and its tributaries. Toxic contamination in the Columbia Basin has been documented for many years, but most studies target specific contaminants or focus on specific reaches or tributaries. In the UCR, most studies have focused on metals contamination, although some of those have included organic contaminants as well.

Repeat surface water data related to metals in the UCR are largely limited to one location—Northport, WA, near the U.S.-Canada border—where monthly sampling and analysis of dissolved and total metals have been conducted by the U.S. Geological Survey (USGS) (1951–2000, Station 12400520) and Ecology (1995–2007, Station 61A070) (USEPA 2009b). Data are also available for Waneta, B.C. (immediately above the U.S.-Canada border) where the Canadian government conducts weekly water quality monitoring. Information on conventional parameters is also included, and some data points include organic contaminants as well.

Table 1 summarizes many of the existing studies with potential data to contribute, from the most recent to oldest. The table indicates the timeframe and media analyzed. Results from past studies will be used as benchmarks for

[2] https://www.epa.gov/columbiariver/upper-columbia-river-remedial-investigation-feasibility-study

comparisons to future data, to determine trends over time, and to inform risk communication strategies. Additional sources such as Ecology 's Contaminated Sites database[3] and the state Environmental Information Management (EIM) database[4] will also be searched for relevant data.

Table 1. Major Contaminant Studies in the UCR/LRW, from Chief Joseph Dam to US-Canada Border.

Lead Agency	Sampling Location	Study Name	Sample Period	Notes	Citation
EPA/Teck	Lake Roosevelt	Northern Pike tissue study	2018	Composites analyzed for metals	TAI 2019a
EPA/Teck	UCR/Lake Roosevelt	Plant Tissue Study	2018	Some collocated soil samples were located on beaches	TAI 2019b
EPA/Teck	UCR/Lake Roosevelt	UCR Residential Soil Study	2016	Some areas sampled were beaches	TAI 2017a
EPA/Teck	Lake Roosevelt	Hatchery White Sturgeon tissue study	2016	Composites analyzed for metals, PCDD/Fs, PCBs, and PBDEs	TAI 2017b
EPA/Teck	Bossburg, WA	Bossburg Flat Beach Refined Sediment and Soil Study	2015	Beach sediment	TAI 2016
EPA	UCR	UCR Residential Soil Study	2014	Some areas sampled were beaches	USEPA 2016
EPA/Teck	UCR	Upland soil sampling	2014	Relict floodplains (RFDAs) are within or adjacent to beaches	TAI 2015
EPA/Teck	Lake Roosevelt	Upper Columbia River RI/FS Fish Tissue Sampling	2009	Extensive composites	TAI 2013
USGS and WA Ecology	UCR/Lake Roosevelt	Laboratory toxicity and benthic invertebrate field colonization	2008	Sediments were collected from shallow pits on dry point bars adjacent to the reservoir; analyzed for metals	Fairchild 2012
WA Ecology	RM 700 to RM 737	Field Reconnaissance and Sediment Sampling Report	2007	10 composite surface sediment samples from eight stations analyzed for metals	WDOE 2007
EPA	Lake Roosevelt	Upper Columbia River RI/FS Phase 1 Fish Tissue Sampling	2005	Tissues were analyzed for 23 metals, total mercury, PCB, Aroclors, and PCDD/Fs	USEPA 2007
EPA	Lake Roosevelt	Upper Columbia River RI/FS Phase 1 Beach Sediment Sampling	2005	Fifteen beaches, analyzed for inorganic and organic constituents	USEPA 2006
WA Ecology	Lake Roosevelt	PBDE flame retardants in Washington rivers and lakes	2005-2006	Included samples collected from water with semi-permeable membrane devices (SPMDs)	Johnson et al. 2006

[3] https://apps.ecology.wa.gov/cleanupsearch/reports/cleanup/all
[4] https://ecology.wa.gov/Research-Data/Monitoring-assessment/toxics-monitoring/Freshwater-fish-contaminant-monitoring

Lead Agency	Sampling Location	Study Name	Sample Period	Notes	Citation
USACE	Lake Rufus Woods	Sediment Quality Assessment of Lake Rufus Woods and Chief Joseph Dam	2004	Five sediment samples analyzed for metals	USACE 2009
USGS	Lake Roosevelt	Concentrations of Elements in Sediments and Selective Fractions of Sediments, and in Natural Waters in Contact with Sediments	2004	Surface water overlying sediment samples was analyzed for metals	Paulson et al. 2006
UCR White Sturgeon Recovery Team	UCR	Upper Columbia White Sturgeon Contaminant and Deformity Evaluation and Summary	2002	Data collected on white sturgeon include concentrations of metals, PCBs, chlorinated pesticides, dioxins/furans, and PBDEs.	Kruse & Webb 2006
USGS	Lake Roosevelt	Vertical Distribution of Trace Element Concentrations and Occurrence of Metallurgical Slag Particles in Accumulated Bed Sediments	2002	Evaluated the distributions of metals in cores and assessed sediment accumulation rates	Cox et al. 2005
USEPA	Lake Roosevelt	Upper Columbia River Expanded Site Inspection Report	2001	Sediment and one surface water sample	USEPA 2003
USGS	Lake Roosevelt	Concentrations and Distribution of Slag-Related Trace Elements and Mercury in Fine-Grained Beach and Bed Sediments	2001	Focused on drawdown areas to assess potential metals in windblown dust	Majewski et al. 2003
USEPA	Northport	Stevens County Mines and Mills Preliminary Assessments and Site Inspections	2001	Nine beach samples near Northport collected and analyzed for TAL metals.	E&E 2002
WA Ecology	Lake Roosevelt	Reassessment of Toxicity of Lake Roosevelt Sediments	2001	Sediments from nine sites were tested for metals concentrations and toxicity	Era & Serdar 2001
STOI	Lake Roosevelt	Trace metal concentrations in surface water of Lake Roosevelt	1998-2000	Conventional parameters and trace metals data between Evan's Landing and Spring Canyon	Scofield & Pavlik-Kunkel 2007
USGS	Lake Roosevelt	Contaminant trends in sport fish	1998	Mercury, dioxins and furans, and PCBs in Rainbow Trout, Mountain Whitefish, and Walleye	Munn 2000

Lead Agency	Sampling Location	Study Name	Sample Period	Notes	Citation
USGS	Northport and Grand Coulee	Biomonitoring of Environmental Status and Trends (BEST) Program: Environmental Contaminants and their Effects on Fish	1997	Part of a basin-wide review including metals and organic contaminants	Hinck et al. 2004 Hinck et al. 2006
USEPA	Lake Roosevelt	Lake Roosevelt Assessment of PCDD/Fs and PCBs in Fish Tissue 1984	1994	PCDD/Fs and PCBs in fillet tissue of kokanee, rainbow trout (wild and hatchery-raised), smallmouth bass, walleye, lake whitefish, and white sturgeon	EVS 1998
USGS	Lake Roosevelt	Concentrations of mercury and other trace elements in walleye, smallmouth bass, and rainbow trout	1994	Fish sampled from three areas – walleye and smallmouth bass were composited and rainbow trout (native and net-pen) were analyzed individually	Munn et al. 1995
USGS and WA Ecology	Northport	Contaminant trends in Lake Roosevelt	1992-1993	Analyzed PCDD/Fs from Northport surface water samples; also sampled fish.	Serdar et al. 1994
USGS	UCR/Lake Roosevelt	Sediment-quality assessment of Franklin D. Roosevelt Lake and the upstream reach of the Columbia River, Washington, 1992	1992	Surface sediment toxicity testing	Bortleson et al. 2001
WA Ecology	UCR/LRW	Polychlorinated Dioxins and -Furans in Lake Roosevelt (Columbia River) Sportfish, 1990	1990	Walleye, Rainbow Trout, Lake Whitefish, White Sturgeon, Kokanee, and Burbot were analyzed as composite samples	Johnson et al. 1991a
WA Ecology	Lake Roosevelt	Results of screen for EPA xenobiotics and spatial trends in TCDD/TCDF concentrations in sediment and bottom fish	1990	Sediment and Largescale Sucker tissue samples analyzed for PCDD/Fs and 44 other compounds	Johnson 1991b Johnson et al. 1991b
WA Ecology	Lake Roosevelt	Results of screen for dioxin and related compounds in Lake Roosevelt sport fish	1989	Walleye and White Sturgeon	Johnson 1990
WA Ecology	Lake Roosevelt	Metals Concentrations in Lake Roosevelt (Columbia River) Largescale Suckers	1989	Lead, mercury, and cadmium in bone, liver, and muscle of Largescale Suckers	Johnson & Serdar 1991
WA Ecology	Lake Roosevelt	Review of Metals, Bioassay, and Macroinvertebrate Data	1989	Includes surface water samples (called "bottom water")	Johnson 1991a

Lead Agency	Sampling Location	Study Name	Sample Period	Notes	Citation
WA Ecology	Lake Roosevelt	Survey of mercury and dioxin in Lake Roosevelt sport fish in 1989. Preliminary results for mercury.	1989	Fish tissue from 3 locations	Johnson & Yake 1989
WA Ecology	Several, including a LRW water sample	An Assessment of Metals Contamination in Lake Roosevelt	1986	The first large-scale study of metals in surface sediments in this part of the Columbia River. Also looks at fish and surface water.	Johnson et al. 1989
USFWS	Grand Coulee	National Contaminant Biomonitoring Program: Concentrations of Arsenic, Cadmium, Copper, Lead, Mercury, Selenium, and Zinc in U.S. Freshwater Fish, 1976-1984	1984-1985	Largescale Sucker and Walleye	Schmitt & Brumbaug h 1990
WA Ecology	Columbia R, at Northport	Basic Water Monitoring Program Fish Tissue and Sediment Sampling for 1984	1984	Fish tissue (Bridgelip Sucker) sampled for pesticides, PCBs, and metals; one sediment composite was analyzed for metals, pesticides, and a list of other contaminants.	Hopkins et al. 1985
Environ ment Canada	Waneta (at border)	Levels of Metals and Metallothionein in Fish of the Columbia River near the International Boundary	1980-1983	Fish and surface water sampled	Smith 1987
USFWS	Grand Coulee	National Contaminant Biomonitoring Program: Concentrations of seven elements in freshwater fish, 1978–1981	1978 and 1980	Three composite samples of three to five fish (Largescale Sucker, Yellow Perch, and Walleye) were analyzed for metals. Data may be available for PCBs and organochlorine pesticides.	Lowe et al. 1985

2.2.3 CONTAMINANTS OF INTEREST AND POTENTIAL SOURCES

The main contaminants of interest (COIs) are four toxic substances: DDT, mercury, PBDEs, and PCBs. These were identified as the pollutants of greatest concern in the Columbia River by EPA's State of the River Report (USEPA 2009a). Other contaminants will be considered because of past concerns, such as additional metals (Target Analyte List or "TAL" metals[5]). These contaminants and their potential sources are summarized below.

MERCURY

Mercury is widespread in the environment, being released to the atmosphere from varied sources and transported globally. Mercury readily volatilizes, such that 95 percent of atmospheric mercury is in the elemental form. Natural sources of mercury include weathering of mercury-bearing rocks and soil, volcanic activity, forest fires, and degassing from water surfaces. Anthropogenic sources include combustion of fossil fuels, metal production, and industrial processes. The major source of mercury in the UCR/LRW is liquid effluent directly discharged to the river by smelting operations at the Teck Smelter in Trail, BC, since 1896, which has led to elevated mercury levels in fish resulting in fish consumption advisories (WDOH 2012 and USEPA 2021).

PCBS

PCBs are a group of 209 synthetic chemicals whose production in the United States was virtually banned in 1979 due to their toxicity and persistence in the environment. PCBs were manufactured in complex mixtures to attain desirable properties for varied applications, such as fire-retarding properties for lubricating and electrical transformer oils. These mixtures were manufactured under many names, the most common being the "Aroclor" series. Throughout the world, PCBs are found in air, soil, waters, and biota. PCBs have low solubility in water yet have a high affinity for sediments and animal fats; they readily bioaccumulate in the aquatic food chain.[6] The major source of PCBs in the environment is from historical manufacturing, storage, use, and disposal practices (ATSDR 2000). PCBs are associated with a range of adverse human health effects including cancer and immune system impacts related to PCB metabolite effects on thyroid function. Some PCBs cause toxicity similar to that of polychlorinated dioxins and furans PCDD/Fs. This is discussed in the section on PCDD/Fs.

While there have been few efforts to locate sources of PCBs in the mainstem Columbia River, identification of sources in major tributaries is ongoing as a result of studies conducted by Ecology and others. Fish from the Spokane River have some of the highest levels of PCBs found in the state. Potential sources being investigated include municipal and industrial wastewater discharges, stormwater, spills, and groundwater (LimnoTech 2019).

DDT

Chlorinated pesticides have been used for decades as insecticides in agricultural and home environments. These compounds have low solubility in water and are not readily metabolized or excreted. They are readily stored in fat tissue and biomagnify to high concentrations in the food web. Many are neurotoxins and are suspected or known carcinogens. Many of these compounds (e.g., DDT, chlordanes, and dieldrin) were banned from use in the United States during the 1970s and 1980s as their hazards became evident. Due to their high persistence, chlorinated pesticides continue to be found in fish and wildlife throughout the world. (ATSDR 2022b)

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[5]Aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc
[6] https://www.epa.gov/pcbs/learn-about-polychlorinated-biphenyls-pcbs

PBDES

Polybrominated diphenyl ethers (PBDEs) are a group of chemicals used as flame retardants in electronics, plastics, building materials, and textiles. There are 209 theoretically possible congeners of PBDEs. Like PCBs, PBDEs are resistant to physical, chemical, and biologic degradation and some bioaccumulate in aquatic environments. PBDEs appear to be transported and distributed in the global environment similarly to PCBs. Information on the possible health impacts of PBDEs comes from animal toxicity studies. These studies indicate that PBDEs are associated with developmental neurotoxicity, thyroid hormone disruption, reproductive effects, and liver changes. Recent studies estimate diet as the main route of exposure to PBDEs for the general public. (ATSDR 2017)

Due to limited research on the possible consumer health risk from PBDEs, concern remains about the effects of these compounds on humans and biota. PBDEs were the focus of Washington's second Chemical Action Plan to be developed under the state's PBT Initiative (WDOE & WDOH 2006). Little work has been in the Columbia River basin to locate sources of PBDEs. Because of the prevalence of PBDEs in consumer products, sources could be numerous and diverse. The Spokane River has some of the highest concentrations of PBDEs in Washington's freshwater fish species (Johnson et al. 2006).

PCDD/FS

Dioxins and furans, commonly used terms for polychlorinated dibenzo-p-dioxins and dibenzofurans, or PCDD/Fs, are unintended byproducts of combustion processes, chlorine bleaching in paper production, and contaminants in some chlorinated pesticides. Like PCBs, they are highly persistent and widely distributed in the environment. Adverse health effects have been associated with the digestive, endocrine, immune, nervous, and reproductive systems. The dioxin compound, or congener, 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) is the most potent animal carcinogen EPA has evaluated and is a probable human carcinogen (ATSDR 1998 and ATSDR 2022a). There are 17 PCDD/F toxic congeners, and they have different levels of toxicity compared to 2,3,7,8-TCDD, the most toxic form. All of these congeners have the same mechanism of action, which allows the human and ecological risks posed by PCDD/F mixtures to be evaluated jointly. To assess the cumulative risks to human and environmental health of PCDD/F mixtures, the concentration of each PCDD/F congener present is expressed in terms of the concentration of an index compound, 2,3,7,8-TCDD that has the same level of toxicity. For example, a congener that was 10-fold less toxic than TCDD would have a "toxicity equivalent factor" (TEF) of 0.1, and would have a TCDD "toxic equivalent" (TEQ) of 0.1 x the concentration of that congener. TEQs for multiple congeners in a mixture can be added together to calculate the overall toxicity of a mixture. Various TEFs have been developed over time as a result of research into the toxicity of individual congeners. Unique TEFs are available for humans and other species. The 2005 World Health Organization (WHO) TEFs are used in summarizing results because they are based on recent research and are internationally accepted. These TEFs are described by Van den Berg et al. (2006). The overall toxicity of a mixture of PCDD/Fs (and PCBs with dioxin-like toxicity) may then be determined by summing the TEQ of all congeners present. These TEFs may be updated by WHO experts in the near future.[7]

The major source of PCDD/Fs in the Columbia River has been pulp and paper mills in Canada, Idaho, and Washington. A TMDL for PCDD/Fs (was developed for the Columbia and Snake River mainstems (USEPA 1991) which led to reductions in discharges of PCDD/Fs from these facilities. The paper mill in Celgar, B.C. was the most significant source of dioxins and furans upstream of the UCR/LRW until wastewater treatment processes were improved (USEPA 2009b).

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7 https://www.who.int/news/item/15-11-2022-who-expert-consultation-on-updating-the-2005-toxic-equivalency-factors-for-dioxin-like-compounds-including-some-polychlorinated-biphenyls

2.2.4 REGULATORY CRITERIA OR STANDARDS

NOT APPLICABLE.

2.3 WATER QUALITY IMPAIRMENT STUDIES

NOT APPLICABLE.

2.4 EFFECTIVENESS MONITORING STUDIES

NOT APPLICABLE.

3.0 PROJECT DESCRIPTION

3.1 PROJECT GOALS

Our goal is to reduce uncertainty around what activities and resources are safe for CTCR members and other local residents to do and use, and to initiate a program that will track future trends in contaminant levels. This project will be able to address local apprehension, addressing key questions about what analytes have been detected and what those detections represent in a meaningful way to CTCR members and other local residents. We plan to earn the trust of our concerned citizens through rigorous design and data collection with an emphasis on stakeholder input and the relevance of potential exposures.

3.2 PROJECT OBJECTIVES

The following objectives are part of this Phase 1 effort:

- Identify all relevant studies with historic concentrations of DDT, mercury, PBDEs, PCBs, and TAL metals in three media (fish, beach sediment, water) in the UCR/LRW.
- Compile data from relevant historic studies into a combined database.
- Characterize temporal trends in concentrations of the target analytes in each of the three media for locations where historical data are usable.
- Characterize spatial trends in concentrations of the target analytes in each of the three media for locations where historical data are usable.

These are **examples of questions** to be considered during the Phase 2 development of the sampling plan and risk communication approach, to be answered by combining historic data with data collected for this project:

- Is the river water getting cleaner, dirtier, or staying the same?
- Are contaminant concentrations in freshwater fish decreasing, increasing, or staying the same?
- Are toxic substance concentrations in beach sediment decreasing, increasing, or staying the same?
- How do past and current concentrations of contaminants compare to concentrations that may be harmful to exposed people?
- What are particular exposure concerns of CTCR members?

In Phase 2 of the project where sampling plans are developed, objectives and questions would be refined and focused for more specificity regarding location, media, COC, and temporal/spatial extent of sampling.

3.3 INFORMATION NEEDED AND SOURCES

Information about toxic contaminants in surface water, beach sediment, and fish tissue in the UCR/LRW will be assembled from existing studies. The main sources of information and data are expected to be acquired from federal, tribal, and state studies as described in Section 2.2.2 above. Geographic Information System (GIS) layers created as part of past studies may also be acquired if they are still relevant to developing a sampling plan and risk communication approach.

The following factors will be assessed for each source of data (as appropriate to the specific medium in question) to ensure that the final compilation consists of data that are of comparable precision and accuracy and together can tell a coherent story.

- Geospatial sample station coordinates (all media)
- Type of sample - composite vs discrete (all media)
- Digestion/analytical method and analytes (all media)
- Detection limits and units reported (all media)
- Sample depth information (beach sediment and surface water)
- Particle size (beach sediment)
- Species, tissue type, and dry vs wet weight reported (fish)

3.4 TASKS REQUIRED

Project tasks, activities, deliverables, timeline and milestones are described below.

The process of historic data compilation can be divided into two phases: study identification and data aggregation. In the first phase, the list of studies from Table 1 will be used as a starting point.

Study identification tasks (up to two months post-QAPP approval):

1. Acquire the source documents for studies listed in Table 1.
2. Identify and acquire any additional relevant studies through researching past efforts of federal, tribal, and state organizations.
3. Describe how information will be tracked, stored, and accessed.
4. Develop and explain specific criteria related to the bullet points from Section 3.3.
5. Compile a final list of studies with data points usable for this effort.

Deliverable 1: List of usable studies

Data aggregation tasks (two to five months post-QAPP approval):

1. Harmonize data inputs and develop unified database for each medium.
2. Describe compiled historic data by media, including trends where possible.
3. Assess how the future sampling program can ensure comparability with historic data.

Deliverable 2: Unified historic dataset for each medium (surface water, beach sediment, and fish tissue)

Deliverable 3: Initial risk communication plan based on historic data

Deliverable 4: Explanation of historic data for public-facing web site

Deliverable 5: Recommendations of key factors to address with future sampling program (e.g. specific parameters from Section 3.3) to ensure comparability with historic data.

3.5 SYSTEMATIC PLANNING PROCESS

NOT APPLICABLE.

4.0 ORGANIZATION AND SCHEDULE

4.1 KEY INDIVIDUALS AND THEIR RESPONSIBILITIES

Table 2 shows the responsibilities of those who will be involved in this project.

Table 2. Organization of project staff and responsibilities.

Staff	Title	Responsibilities
Name: Rodney Cawston Organization: CTCR ETD Phone: 509.634.2426	Project Co-Manager	Manages grant activities
Name: Whitney Fraser Organization: Lodestone Environmental Consulting LLC Phone: 206.739.5993	Technical Consultant, Sub-contractor to CTCR ETD	Provides technical support to CTCR ETD.
Name: Watershed Manager Organization: CTCR ETD Phone: 509.634.2428	Watershed Manager	Provides technical advice.
Name: Kathy Moses Organization: CTCR ETD Phone: 509.634.2413	Communications Specialist	Assists in developing communications materials.
Name: QA Chemist Organization: EPA Phone:206-553-XXXX	Quality Assurance Chemist	Reviews and approves QAPP.
Name: Robert Tan Organization: EPA Phone: 206-553-2580	Technical Liaison	Reviews and approves QAPP and assists in obtaining technical support from EPA.

4.2 SPECIAL TRAINING AND CERTIFICATIONS

Rodney Cawston (Nímípuʔ/Sn̓ʕaýckstx/Sʔukʷnaʔqín - Nez Perce/Lakes/Okanogan) is the Director of the CTCR Environmental Trust Department. Mr. Cawston has worked in Tribal Relations at state, tribal and federal government. He was the Self-Determination Branch Chief for the Navajo Regional Office. He served two Commissioners for the Washington State Department of Natural Resources working with all Washington tribes. His time at the Colville Tribe includes over 20 years managing various operations for the CTCR and four years elected to the tribal council, serving one year as the Natural Resources Committee Chair and three years as the Chairman of the Colville Business Council.

Whitney Fraser is the owner and Principal Scientist at Lodestone Environmental Consulting LLC. Ms. Fraser holds an MS from the University of Washington School of Aquatic and Fishery Sciences and has over twenty years of experience in environmental science, project management, and technical assistance for Tribes and other communities dealing with hazardous sites.

Katherine M. Moses is a CCT member (škwáxčənəxʷ/Moses-Columbia) who has worked for the CCT ETD since 2004 and brings communication and information technology expertise to the project. Ms. Moses creates outreach media related to water quality and other topics. She is the CCT Public Information Officer for natural disasters such as wildfires, responsible for direct communication with local communities and media outlets.

4.3 ORGANIZATION CHART

NOT APPLICABLE. See Table 3.

4.4 PROPOSED PROJECT SCHEDULE

See Section 3.4 for proposed project schedule details.

4.5 BUDGET AND FUNDING

The activities covered by this QAPP are a small portion of a larger project funded by EPA under the Columbia River Basin Restoration Program.

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