2.0 SUMMARY OF BASIN MODEL AND PROCESSES

This section sets the stage for development of the environmental monitoring plan, and summarizes the conceptual model used in the Basin RI/FS, ecological exposure pathways and receptors, and baseline (pre-remediation) conditions in surface water, groundwater, soil and sediment, and biological resources.

2.1 CONCEPTUAL SITE MODEL

The Basin Conceptual Site Model (CSM) was developed to summarize the sources of contamination, mechanisms of contaminant release, pathways of contaminant release and transport, and the ways in which humans and ecological resources are exposed to contaminants. The CSM provides a basis for assembling information about the Basin and data from diverse sources into a structure that allows systematic analysis of specific sources of contamination at an adequate level of detail, while maintaining an understanding of the overall context of the effects of all of the important sources of contamination. The underlying structure of the CSM was used in the RI/FS as a way of organizing, presenting, and analyzing site information. The detailed CSM is published under separate cover (CH2M Hill 2000) and is summarized in Part 1, Sections 2.0 and 3.3 of the RI (EPA 2001a).

To facilitate analysis of processes at work in the Basin, parts of the Basin with similar geomorphology, stream gradients, and amounts and types of mining wastes were grouped into five CSM units. Subsequently, the model was refined and simplified through use of four geographical areas. The areas have a fairly large geographic coverage, but are sufficiently homogeneous that types of waste sources, mechanisms of release and transport of waste, and the ecological resources affected by the release of contaminants are similar in each area. The four areas are listed below and shown in Figures 2-1 and 2-2.

- Upper Basin (CSM Units 1 and 2)
- Lower Basin (CSM Unit 3)
- Coeur d'Alene Lake (CSM Unit 4)
- Spokane River (CSM Unit 5)

The areas are described in greater detail in the following subsections.

The conceptual model is intended to be dynamic, and data collected during long-term monitoring will provide a basis for improving our understanding of Basin processes and conditions. As such, the model will be updated or modified as needed and appropriate to support the evolving understanding of Basin processes and the effects of the selected remedy on Basin conditions. This evolution is consistent with the principles of adaptive management or "learning from experience."

2.1.1 Upper Basin

The Upper Basin includes the high- and mid-gradient watersheds of the South Fork above its confluence with the North Fork (Figure 2-1)[1]. Upper Basin tributary watersheds include Canyon Creek, Ninemile Creek, Moon Creek, Big Creek, and Pine Creek. The Upper Basin contains most of the mine and mill sites that are the primary sources of continuing releases of metals from mining waste to the Coeur d'Alene River system.

The Upper Basin is also the location of some of the larger physical disturbances that have resulted from human use. These include the towns of Wallace and Kellogg, several smaller communities, former railroads, the Kellogg Airport, Interstate 90 (I-90) and the 21-square-mile Bunker Hill Superfund Site. To accommodate the infrastructure, and to make room for storing and disposing of mining wastes in the floodplain, the channel of the South Fork has been moved, channelized, armored, and otherwise altered, with only a few reaches still resembling a natural river. The river valley is wide enough through most the reach below Wallace to accommodate varying amounts of groundwater flow, and the exchange of surface and groundwater are important processes for adding dissolved metals (mainly zinc and cadmium) to the South Fork.

2.1.2 Lower Basin

The Lower Basin is the entire lower valley of the Coeur d'Alene River from the confluence of the North Fork and South Fork to the mouth of the river at Harrison (Figure 2-1). It includes the entire floodplain, lateral lakes, and associated wetlands. In the Lower Basin, the river form is low gradient with meanders; but the meanders are not very active because of natural and enhanced levees in many places, armoring to protect roads, bridges, and railroad beds in a few places, and very low current velocities created by backwater conditions from impoundment of Coeur d'Alene Lake.

Mining-related wastes within the Lower Basin are found in secondary sources that include the beds and banks of the river, contaminated floodplain soils, surface water, and groundwater. Concentrations of metals in surface water in the Lower Basin are lower than in the South Fork because of dilution by the larger North Fork. Groundwater contaminated with metals is believed to be an important source of metals loading within the Lower Basin; however, the locations and mechanisms of groundwater loading are not fully understood. Contaminated soils and sediments occur throughout the Lower Basin, with levels of contamination and depth of contamination generally being higher near the river and in lateral lakes where flows from the river enter during floods.

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[1] The North Fork watershed was not included in the remedy selected in the ROD; however, this plan includes one sampling location within the North Fork watershed (Enaville) to aid interpretation of monitoring data.

2.1.3 Coeur d'Alene Lake

Coeur d'Alene Lake is shown in Figure 2-1. The Coeur d'Alene River is the overwhelmingly dominant source of metals to Coeur d'Alene Lake. Metals enter the lake from the river in the dissolved phase or associated with colloids, suspended solids, and bed load solids.

A varying fraction of the metals entering Coeur d'Alene Lake are retained within the lake. Retention (input from the Coeur d'Alene River minus output to the Spokane River) of particulate metals is high. In lakebed sediments, the highest concentrations of lead, which enters the lake mainly in association with suspended and bedload sediments, are present near the delta at Harrison. Retention of dissolved metals entering the lake is lower. Zinc and cadmium, which enter the lake mainly as dissolved metals, have lower concentrations in deep-water sediments near the delta than in deep-water sediments at the north end of the lake near Coeur d'Alene. Settling of zinc and cadmium depends on the metals being converted to particulate form and settling to the lakebed. This conversion can result from physical (adsorption), chemical (complexation), and biological (assimilation) processes.

Water entering the lake from the Coeur d'Alene River is often of a different temperature than the water in the lake. Depending on the differences in density caused by the different temperatures, the metals-contaminated plume might sink or float without completely mixing with lake water. Incomplete mixing due to overflow, such as may occur during spring runoff when river water temperatures are higher than lake water temperatures, can result in lower retention of metals and higher loads to the Spokane River.

Nutrient input to Coeur d'Alene Lake has been raised as an issue with regard to release of metals from contaminated lakebed sediment. The trophic status (level of nutrient enrichment and phytoplankton production) of Coeur d'Alene Lake could change to the point where increased production of phytoplankton could cause reductions of oxygen levels in the deeper waters of the lake. This could allow the release of metals associated with oxyhydroxide precipitates found on the surface of the lake sediments. Nutrient enrichment of the lake water would be the most likely cause of increased phytoplankton production.

2.1.4 Spokane River

The Spokane River study area for the RI/FS extends from Coeur d'Alene Lake downstream to Fort Spokane on the Spokane Arm of Lake Roosevelt (Figure 2-2). The area included for ecological and human health actions in the ROD extends from the Idaho/Washington border to Upriver Dam near the city of Spokane.

Metals discharged from Coeur d'Alene Lake in dissolved and particulate form are carried down the Spokane River. Concentrations of dissolved metals decrease and alkalinity increases with distance down the Spokane River during lower flows due to the inflow of groundwater. Some of the particulate metals are deposited as sediments at shoreline sites and behind dams on the river.

Dissolved metals in the river water also interact with sediments and partition out of the water column. The concentrations of metals in the sediment deposits generally decrease from upstream to downstream.

2.2 ECOLOGICAL EXPOSURE

2.2.1 Exposure Media

The media that have been identified as either primary or secondary sources of contamination include the following:

- Sediment – alluvium and other materials typically covered by water
- Soil – includes alluvium and other materials that may have been transported by water to their present location and are typically not covered by water during low (base) flow conditions.
- Surface water
- Groundwater

The OU 3 ROD selected remedy for environmental protection consists of interim measures and does not address the groundwater contamination in the Basin.

2.2.2 Exposure Pathways

Exposure pathways are the routes by which humans and living natural resources (receptors) may be exposed to metals from the mining waste. As explained in more detail within Section 2.6 of the Coeur d'Alene Basin Ecological Risk Assessment (EPA 2001c), the routes by which ecological receptors may be exposed to chemicals of concern (COCs) in the Coeur d'Alene Basin include:

- Birds and mammals - ingestion of soil-sediment, surface water, and food
- Fish - ingestion and direct contact with sediment and surface water
- Benthic invertebrates - ingestion and direct contact with sediment or surface water
- Aquatic plants - root uptake and direct contact with sediment and surface water
- Amphibians - direct contact with surface water and soil-sediment
- Terrestrial plants - root uptake from soil-sediment
- Terrestrial invertebrates - ingestion and direct contact with soil-sediment
- Soil processes - direct contact of microbes with soil-sediment

2.2.3 Habitats and Receptors

Within the Basin, ecological risks to plants and animals associated with mining-related hazardous substances were evaluated within six habitat types. The occurrence of these habitats within different portions of the Basin varies, and the typical species associated with the habitats also vary from one portion of the Basin to another.

The habitats and typical species or receptors include:

- **Riverine** habitat includes the wetlands and deepwater habitats within the channels of creeks and rivers of the Upper Basin, Lower Basin, and Spokane River. Typical fish expected to occur in this habitat include westslope cutthroat and bull trout, sculpin, mountain whitefish, and, in some portions of the Basin, introduced species such as rainbow, brook, and brown trout. In lower-elevation areas typical fish species include chinook salmon, smallmouth bass, northern squawfish, and sucker. Characteristic wildlife species include salamanders, common merganser, osprey, bald eagle, spotted sandpiper, American dipper, water shrew, raccoon, mink, and river otter.
- **Lacustrine** habitat includes wetlands and deepwater habitats that occur in depressions (such as the lateral lakes and Coeur d'Alene Lake) or in dammed river channels (such as the Spokane River upstream of Post Falls Dam). Most plants occur as phytoplankton or as submerged vegetation. Typical fish include many of the same ones as in riverine habitat, plus the largemouth bass, yellow perch, and northern pike. Characteristic birds and mammals include tundra swan, lesser scaup, common goldeneye, common merganser, osprey, bald eagle, tree swallow, little brown myotis (bats), and river otter.
- **Palustrine** habitat includes wetlands that are dominated by trees, shrubs, and other persistent emergent wetland plants. This habitat occurs in smaller areas within the Upper Basin, Coeur d'Alene Lake, and the Spokane River, relative to larger areas within the Lower Basin. Typical plants include wild rice, water potato, equisetum (horsetail), cattail, cottonwood, and willow. Characteristic wildlife species include spotted frog, salamanders, great blue heron, Canada goose, tundra swan, wood duck, mallard, bald eagle, common snipe, little brown myotis (bats), raccoon, mink, beaver, muskrat, and white-tailed deer.
- **Riparian** habitat is terrestrial habitat that is associated with one of the previously mentioned wetland habitats, most often the riverine habitat. It occurs along stream channels and around lakes within the Upper Basin, Coeur d'Alene Lake, and the Spokane River, but is much more extensive in the Lower Basin. Typical plants include reed canary grass, cow-parsnip, spiraea, cottonwood, alder, and willow. Common wildlife include salamander, spotted frog, northern harrier, American kestrel, wild turkey, great horned owl, Swainson's thrush, American robin, song

sparrow, shrew, long-legged myotis (bats), raccoon, mink, white-tailed deer, muskrat, mice, and vole.

- **Agricultural** habitat includes portions of the Lower Basin that are used mostly for pasture and hay fields. Redtop, reed canary grass, oats, and barley are typical plants in this habitat, which may be seasonally flooded and used by waterfowl and other wetland species. Common wildlife species include Canada goose, northern harrier, wild turkey, common snipe, American robin, shrew, white-tailed deer, mice, and vole.
- **Upland** habitat occurs outside the floodplains of the creeks and the South Fork within the Upper Basin. Typical plants include grasses, shrubs, pine, hemlock, red cedar, Douglas-fir, and Rocky Mountain maple. Representative birds and mammals include American kestrel, ruffed grouse, wild turkey, great horned owl, Swainson's thrush, shrew, mule deer (which also serves as a surrogate for elk), mouse, and vole.

All of the bird species mentioned above are protected under the Migratory Bird Treaty Act except the wild turkey. Other receptors are considered to be "special-status species," which include federally listed endangered or threatened species, those identified by the USFWS as species of concern, state-listed sensitive plant species, and culturally significant plant species. Examples include the bald eagle, black tern, gray wolf, lynx, bull trout, westslope cutthroat trout, spotted frog, Ute ladies'-tresses, and water potato.

2.2.4 Key Biological Indicators

The results of the ecological risk assessment (EcoRA) were used to identify key indicators of ecosystem health. These key indicators can be used to develop a focused monitoring plan for biological resources within the Basin. Biological indicators were identified on a habitat-basis based on their abundance and response to environmental conditions. The key biological indicators identified for the primary Basin habitats include:

- Riverine habitat – aquatic macroinvertebrates, fish, aquatic habitat assessment
- Lacustrine/palustrine habitat – waterfowl
- Riparian habitat – songbirds, terrestrial macroinvertebrates, riparian vegetation

2.3 BASELINE ENVIRONMENTAL CONDITIONS

For the purpose of the BEMP, the conditions in the Basin at the signing of the ROD (9/12/02) are considered to represent baseline conditions. Monitoring data collected under the BEMP will be compared to these baseline conditions to evaluate any changes in the status or trends in the Basin. The baseline environmental conditions were evaluated for the three primary media addressed by the BEMP: surface water, soil/sediment, and biological resources.

Environmental conditions in the Basin were evaluated extensively during the development of the RI/FS and EcoRA. These documents relied on historical data collected by the mining companies, resource trustees, IDEQ, USGS, BLM, and others, as well as investigations conducted on behalf of EPA during the RI/FS process. When combined with subsequent and ongoing monitoring performed by USGS, USFWS, and others, these sources collectively form the data set for baseline environmental conditions in the Basin.

The BEMP baseline surface water and soil and sediment conditions were evaluated in terms of both averages and confidence intervals, assuming that the data fit lognormal distributions. This approach is consistent with the analyses performed for the RI/FS, EcoRA, and associated technical memoranda. Data sets also were evaluated for trends over time; however, baseline trends were generally discernable only for surface water at selected locations. Evaluation of the status and trends of biological resources in the Basin was limited by the amount and types of available data.

Baseline environmental conditions by media are presented on Tables 2-1 through 2-4. A detailed presentation of the calculation methods, data sources and calculation results is included in Appendix C. The following sections summarize baseline environmental conditions for surface water, soil/sediment and biological resources.

2.3.1 Baseline Surface Water Conditions

Transport of zinc and cadmium occurs primarily as dissolved metals, while lead travels primarily as particulate loading. Baseline surface water conditions are therefore presented for dissolved cadmium, dissolved zinc, and total lead. Baseline surface water status and trends for dissolved zinc, dissolved cadmium and total lead concentrations and loads for selected locations are summarized in Table 2-1. The source dataset for these analyses is the database compiled during the RI/FS and typically includes water quality data through water year 1999 (September 30, 1999). Table 2-1 presents the baseline concentrations as described by standard statistical analyses of the data (e.g. average, minimum, maximum, median, etc.) as well as by lognormal probabilistic analyses of the data, consistent with approach taken for the RI/FS. Baseline trend analysis results are presented as the slopes from least-squares linear regressions of the data sets. Additional detail on the background and methodology for the lognormal analyses is provided in Appendix C and in the Probabilistic Analysis of Post-Remediation Metal Loading Technical Memorandum (EPA 2001e).

Ambient water quality criteria (AWQC) ratio[2] baseline status and trend results for selected locations are presented on Table 2-2. The AWQC ratios are a primary metric for the fishery tiers cited in the benchmarks of the selected remedy (see OU 3 ROD Section 12.2.3). The data sources for Table 2-2 differ from Table 2-1 in that some of the early RI water quality sample

[2] The AWQC ratio is the concentration of a chemical in surface water divided by the ambient water quality criterion. Ambient water quality criteria are hardness-dependent for several metals, including cadmium and zinc.

analyses did not include hardness (from which hardness-dependent AWQC are calculated for cadmium, and zinc). The RI database was supplemented with more recent data from the USGS in order to characterize baseline AWQC ratio status and trends. Similar analyses (e.g. "statistical" and "lognormal") were performed on the AWQC ratio data set. Calculation details are provided in Appendix C.

2.3.2 Baseline Groundwater Conditions

Groundwater data are available for selected locations in the Basin; however, the data set is not comprehensive. The natural spatial variability of groundwater quality complicates the evaluation of baseline conditions within the basin. The limited groundwater data collected during the RI/FS are included in the RI database. Relative metals loading contributions and reductions via surface water/groundwater interaction may be inferred from mass balances of surface water metals loading within reaches along the river and its tributaries. Ongoing groundwater monitoring in the Box will continue to be potentially useful for gaining a better understanding of Basin processes. While groundwater monitoring is not explicitly included in the BEMP, the importance of the groundwater-surface water inter-relationship is recognized. Accordingly, groundwater monitoring will likely be an important component of remedial action-specific monitoring.

2.3.3 Baseline Soil and Sediment Conditions

The baseline status of soil and sediment concentrations was evaluated for the following areas: the Upper Basin, the Lower Basin, and the Spokane River. Baseline soil and sediment conditions are summarized in Table 2-3. When possible, baseline conditions were evaluated using surface soil and/or sediment samples included in the database for the RI (EPA 2001a). When the RI database was used for the development of summary statistics presented in Table 2-3, all RI surface soil and/or sediment samples were included for the given area, including samples that may represent background conditions. Future comparisons of sampling results to baseline conditions should include an evaluation of the comparability of the respective data sets.

In the Upper Basin and Lower Basin, surface soil and sediment data from only those areas that will be sampled as part of the soil and sediment-monitoring program (Section 4) were used to characterize baseline conditions. These areas include Ninemile Creek (segments NM02 and NM04), South Fork Coeur d'Alene River (segments USF01, MG01, and MG02), Pine Creek (segments PC01 and PC03), and the Lower Basin (CSM Unit 3). This limitation was used to increase the comparability between the baseline and monitoring data sets.

Baseline conditions for in-channel soil and sediment for the Spokane River near the Washington state line and near the eastern boundary of the Spokane Reservation are presented in Table 2-3 from the report: "The effect of mining and related activities on the sediment-trace element geochemistry of Lake Coeur d'Alene, Idaho, USA, Part III: Downstream effects; the Spokane River Basin" (Grosbois et al. 2001). This report contains data for grab samples of in-channel deposits collected along the Spokane River which were collected and analyzed in the same manner as in-channel samples collected for the soil and sediment monitoring program (Section 4).

Baseline conditions for sediment cores near the Harrison delta were evaluated based on sediment analytical data in the RI database for Segment 6 of the lower Coeur d'Alene River. The RI database does not contain sediment core data for mid and lower Long Lake. The baseline conditions presented on Table 2-3 for sediment in mid and lower Long Lake are the analytical results for three cores collected from Long Lake as reported by Grosbois et al., 2001.

Baseline *trends* in soil and sediment concentrations have not been quantitatively evaluated at this time. Bookstrom, et al. (2002) presents historical sediment concentration information for the Lower Basin. The annual sediment-monitoring program (as described in Section 4) will provide a means for evaluating time-trends in soil/sediment quality at key locations within the Basin. The availability of representative baseline concentration data for annual sampling locations will be evaluated after the precise annual sampling locations are defined during the first sampling event.

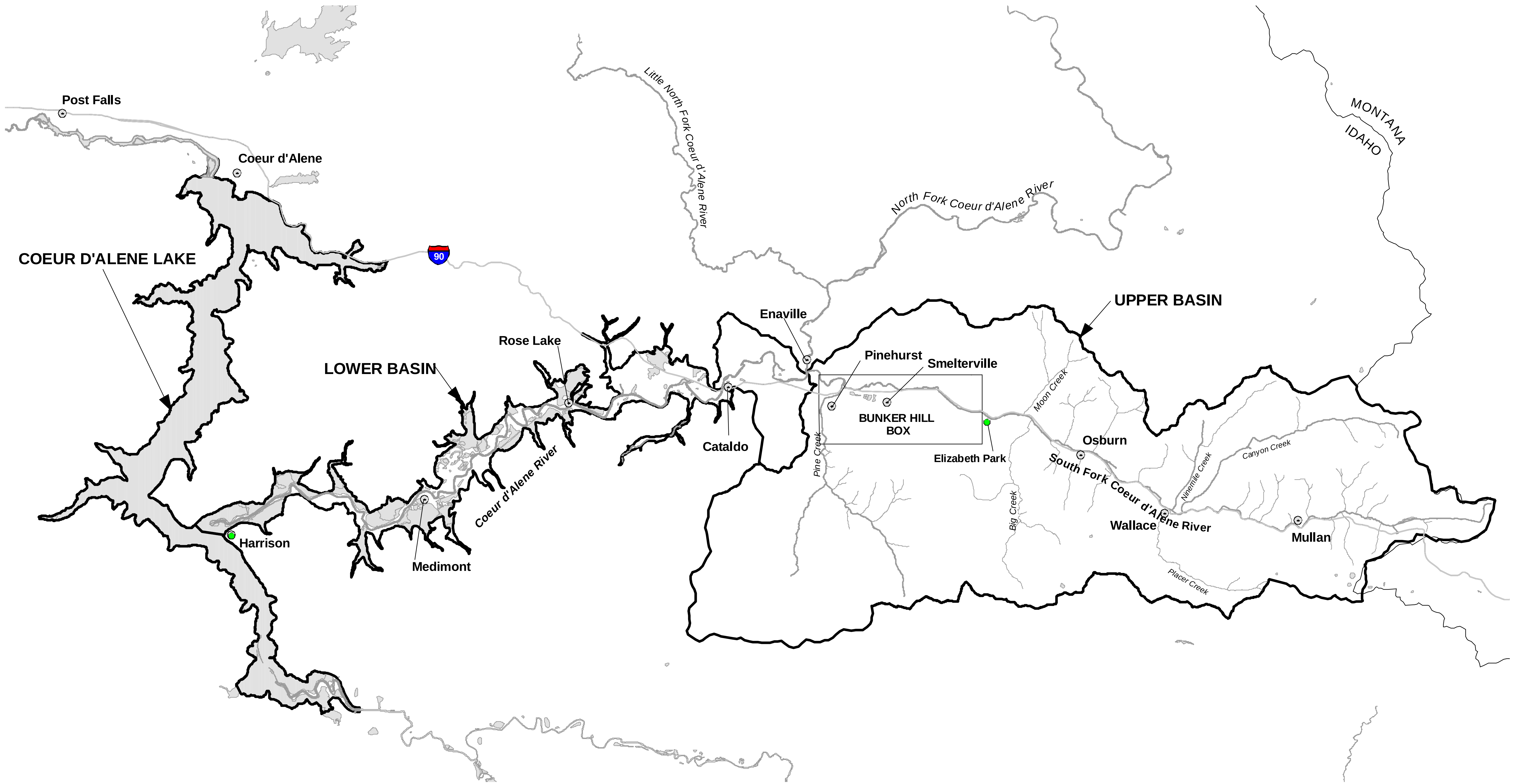
2.3.4 Baseline Biological Resources Conditions

Baseline status data exist to varying degrees for the biological resources monitoring parameters. Multiple groups have performed biological resources monitoring over time, and several reports have compiled and evaluated historical results. Notably, the Interim Fisheries Benchmarks Tech Memo (EPA 2001f), EcoRA (EPA 2001c), and Natural Resource Damage Assessment (Stratus 2000) address biological resource conditions in the Basin. The Fisheries Tech Memo summarizes a majority of the riverine biological resource and physical habitat conditions within the Basin, including descriptions of fishery tiers and characterization of current conditions as developed for the benchmarks of the ROD.

Baseline conditions for several biological resource monitoring components (e.g. songbird diversity/abundance, bull trout habitat and populations) have not been established or have a very limited baseline dataset. Other biological resources may have available baseline data; however, the data collection methods are not consistent with the methods specified for the BEMP. The working assumption for these groups of monitoring components is that the first round of monitoring results will serve as a baseline for comparison of subsequent monitoring data.

The data pool available for biological resources does not currently allow for an evaluation of time trends in the Basin.

Table 2-4 summarizes the sources of data available for biological resources baseline conditions. The available baseline data table includes references for existing data, which may be considered during the evaluation and interpretation of biological resources data collected under the BEMP.



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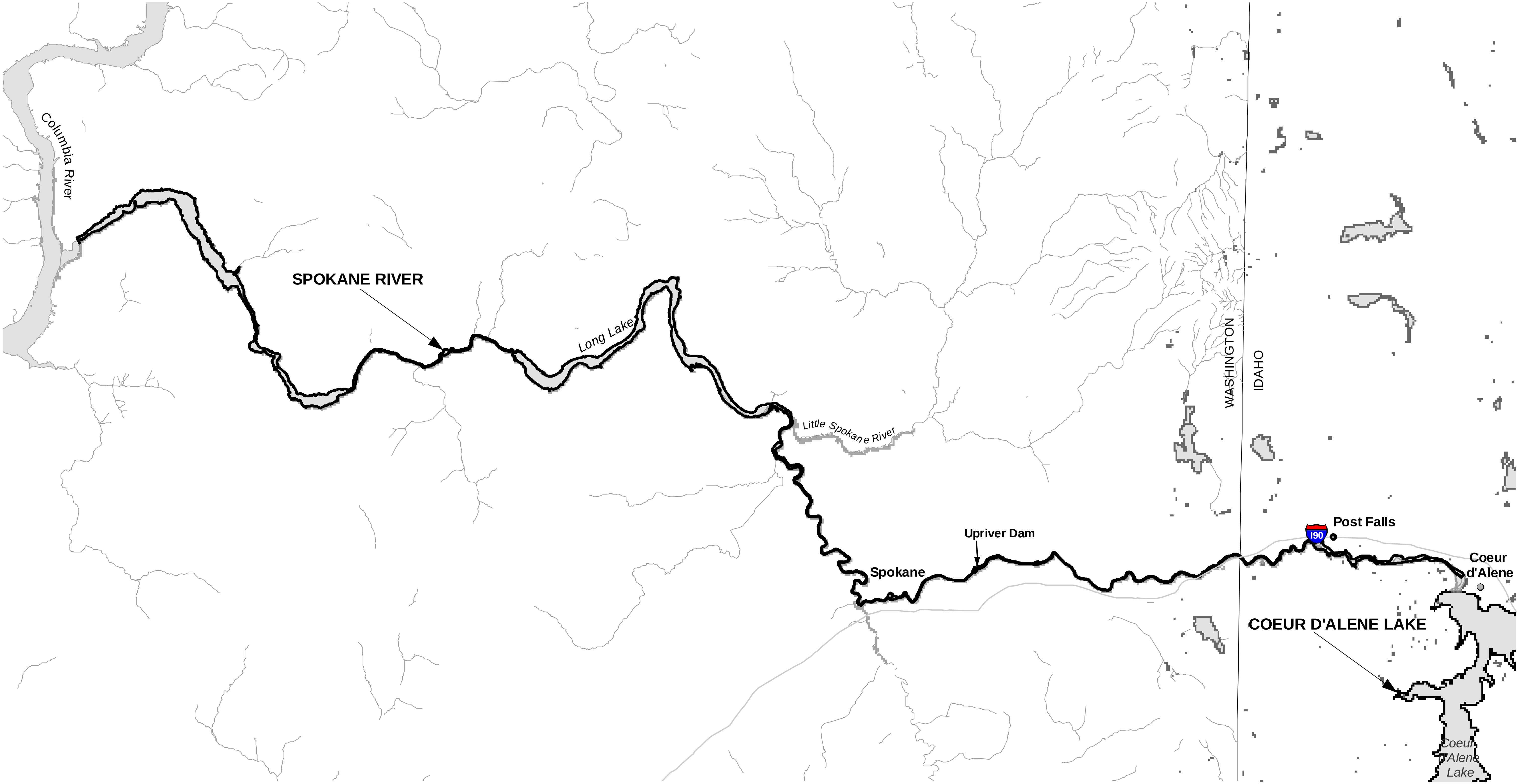
EPA REGION 10	095-RI-CO-102Q Coeur d'Alene Basin Environmental Monitoring Plan	DCN 4162500.07190.05.a March 26, 2004	Figure 2-1 **Map of Upper Basin, Lower Basin, and Coeur d'Alene Lake** **Coeur d'Alene Basin Environmental Monitoring Plan**



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Legend

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- City

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EPA REGION 10	095-RI-CO-102Q Coeur d'Alene Basin Environmental Monitoring Plan	DCN 4162500.07190.05.a March 26, 2004	Figure 2-2 **Map of Spokane River** **Coeur d'Alene Basin Environmental Monitoring Plan**

Table 2-1
Baseline Surface Water Metal Loads and Concentrations

				Statistical Summary of Historical Data								Lognormal Analysis Results for Historical Data			Historical Time-Trend Analysis			
Location	**Station ID**	**USGS Station ID**	**Water Quality Parameter [a]**	**RI Data Range**	**Number of Data Points**	**Minimum**	**Maximum**	**Median**	**Average**	**SD**	**CV**	**Expected Value**	**CV**	**R^2**	**Expected Slope E[B]; ln[X] = B[t] + a**	**R^2**	**95% LCL[B]**	**95% UCL[B]**
South Fork CdA River above Canyon Creek (Deadman Gulch)	SF-208	12413040	dis Cd conc.	5/16/91 - 8/31/99	19	0	1	1	0	0	0.43	1	2.34	0.54	0.22	0.31	-0.12	0.56
			dis Cd load	5/16/91 - 8/31/99	19	0	1	0	0	0	1.12	0	4.25	0.95	0.32	0.24	-0.27	0.91
			dis Zn conc.	5/16/91 - 8/31/99	19	3	59	8	11	13	1.12	12	1.09	0.92	-0.02	0.00	-0.37	0.32
			dis Zn load	5/16/91 - 8/31/99	19	0	24	4	4	5	1.19	5	1.81	0.93	0.08	0.03	-0.38	0.54
			tot Pb conc.	5/16/91 - 8/31/99	19	1	13	3	4	4	0.85	5	1.10	0.97	0.08	0.06	-0.26	0.43
			tot Pb load	5/16/91 - 8/31/99	19	0	26	1	3	6	1.85	5	4.68	0.97	0.19	0.07	-0.50	0.87
Mouth of Canyon Creek	CC-287/ CC-288	12413123	dis Cd conc.	10/5/91 - 8/30/99	92	4	200	20	22	21	0.96	22	0.74	0.93	-0.07	0.04	-0.18	0.04
			dis Cd load	10/5/91 - 8/30/99	92	1	559	3	10	58	5.59	6	1.20	0.78	0.12	0.08	-0.02	0.26
			dis Zn conc.	10/5/91 - 8/30/99	93	451	7,240	2,640	2,869	1,481	0.52	2,996	0.71	0.95	-0.10	0.10	-0.20	0.00
			dis Zn load	10/5/91 - 8/30/99	93	142	2,998	480	558	415	0.74	556	0.67	0.98	0.05	0.02	-0.06	0.15
			tot Pb conc.	10/5/91 - 8/30/99	93	0	2,000	61	135	233	1.73	174	1.99	0.71	0.09	0.03	-0.09	0.27
			tot Pb load	10/5/91 - 8/30/99	93	0	4,132	11	80	428	5.32	49	3.14	0.91	0.24	0.10	-0.01	0.48
Mouth of Ninemile Creek	NM-305	12413130	dis Cd conc.	5/15/91 - 9/1/99	96	6	48	21	21	8	0.37	22	0.48	0.93	-0.06	0.10	-0.13	0.01
			dis Cd load	5/15/91 - 9/1/99	96	0	10	1	2	1	0.90	2	0.86	0.96	0.04	0.01	-0.09	0.16
			dis Zn conc.	5/15/91 - 9/1/99	96	864	7,460	3,155	3,364	1,356	0.40	3,411	0.47	0.97	-0.06	0.07	-0.13	0.02
			dis Zn load	5/15/91 - 9/1/99	96	45	1,678	180	275	248	0.90	276	0.92	0.98	0.06	0.03	-0.07	0.19
			tot Pb conc.	5/15/91 - 9/1/99	98	5	800	67	93	98	1.06	92	0.80	0.88	0.03	0.01	-0.08	0.14
			tot Pb load	5/15/91 - 9/1/99	98	0	529	4	18	61	3.31	13	2.63	0.93	0.13	0.04	-0.10	0.36
Upper E Fork Ninemile Creek	NM-295	None	dis Cd conc.	5/16/91 - 11/15/98	18	4	60	14	15	11	0.74	16	0.68	0.88	0.14	0.24	-0.07	0.35
			dis Cd load	5/16/91 - 11/15/98	18	0	1	1	1	0	0.62	1	0.91	0.95	0.14	0.14	-0.15	0.44
			dis Zn conc.	5/16/91 - 11/15/98	18	1,390	11,800	2,595	2,972	2,265	0.76	2,995	0.61	0.84	0.11	0.18	-0.09	0.31
			dis Zn load	5/16/91 - 11/15/98	18	31	236	114	116	69	0.60	125	0.88	0.91	0.11	0.09	-0.18	0.40
			tot Pb conc.	5/16/91 - 11/15/98	18	13	74	20	23	14	0.59	23	0.50	0.81	0.06	0.08	-0.11	0.23
			tot Pb load	5/16/91 - 11/15/98	18	0	3	1	1	1	0.84	1	1.30	0.92	0.06	0.02	-0.34	0.46
Lower E Fork Ninemile Creek	NM-298	12413127	dis Cd conc.	10/27/93 - 9/1/99	50	6	90	42	40	18	0.45	43	0.66	0.89	-0.07	0.07	-0.20	0.06
			dis Cd load	10/27/93 - 9/1/99	50	0	6	1	1	1	0.83	1	0.77	0.97	0.07	0.05	-0.09	0.22
			dis Zn conc.	10/27/93 - 9/1/99	50	867	14,000	7,075	6,710	2,997	0.45	7,136	0.69	0.90	-0.06	0.05	-0.20	0.08
			dis Zn load	10/27/93 - 9/1/99	50	45	1,006	157	211	180	0.85	210	0.79	0.95	0.08	0.06	-0.08	0.23
			tot Pb conc.	10/27/93 - 9/1/99	50	48	4,000	162	264	542	2.05	234	0.88	0.85	-0.10	0.10	-0.26	0.06
			tot Pb load	10/27/93 - 9/1/99	50	1	109	4	10	18	1.86	9	1.41	0.92	0.04	0.01	-0.20	0.28
Elizabeth Park	SF-268	12413210	dis Cd conc.	5/15/91 - 8/30/99	67	1	14	6	7	3	0.46	7	0.61	0.94	-0.04	0.04	-0.15	0.07
			dis Cd load	5/15/91 - 8/30/99	67	3	34	8	9	6	0.67	9	0.68	0.97	0.03	0.02	-0.09	0.16
			dis Zn conc.	5/15/91 - 8/30/99	67	184	1,780	876	947	425	0.45	976	0.59	0.95	-0.05	0.07	-0.16	0.05
			dis Zn load	5/15/91 - 8/30/99	67	413	3,865	1,128	1,264	779	0.62	1,284	0.69	0.96	0.02	0.01	-0.10	0.15
			tot Pb conc.	5/15/91 - 8/30/99	67	5	526	14	37	83	2.24	32	1.58	0.69	0.09	0.07	-0.09	0.28
			tot Pb load	5/15/91 - 8/30/99	67	2	4,500	15	216	744	3.45	130	5.89	0.88	0.17	0.07	-0.18	0.52
Smelterville	SF-270	12413300	dis Cd conc.	10/29/93 - 3/9/99	45	3	31	10	11	6	0.52	11	0.52	0.98	-0.01	0.00	-0.13	0.11
			dis Cd load	10/29/93 - 3/9/99	45	3	63	13	16	12	0.77	16	0.9	0.98	0.08	0.03	-0.11	0.27
			dis Zn conc.	10/29/93 - 3/9/99	45	524	2,640	1,600	1,625	665	0.41	1,674	0.55	0.92	-0.04	0.02	-0.16	0.08
			dis Zn load	10/29/93 - 3/9/99	45	719	7,179	1,735	2,081	1,278	0.61	2,104	0.64	0.97	0.04	0.02	-0.10	0.19
			tot Pb conc.	10/29/93 - 3/9/99	45	8	542	21	48	90	1.88	43	1.26	0.77	0.14	0.08	-0.07	0.34
			tot Pb load	10/29/93 - 3/9/99	45	4	2,272	28	143	386	2.70	116	3.43	0.93	0.22	0.06	-0.16	0.59
Pine Creek Below Amy Gulch	PC-339	12413445	dis Cd conc.	5/16/98 - 8/31/99	16	0	1	1	1	0	0.26	1	0.37	0.45	NA*	NA*	NA*	NA*
			dis Cd load	5/16/98 - 8/31/99	16	0	4	1	1	1	1.01	2	4.02	0.93	NA*	NA*	NA*	NA*
			dis Zn conc.	5/16/98 - 8/31/99	16	35	168	96	96	41	0.43	102	0.64	0.89	NA*	NA*	NA*	NA*
			dis Zn load	5/16/98 - 8/31/99	16	10	572	120	158	169	1.07	212	2.32	0.96	NA*	NA*	NA*	NA*
			tot Pb conc.	5/16/98 - 8/31/99	14	1	31	1	5	8	1.79	5	2.52	0.77	NA*	NA*	NA*	NA*
			tot Pb load	5/16/98 - 8/31/99	14	0	223	2	24	57	2.44	59	26.75	0.97	NA*	NA*	NA*	NA*

Table 2-1 (Continued)
Baseline Surface Water Metal Loads and Concentrations

				Statistical Summary of Historical Data								Lognormal Analysis Results for Historical Data			Historical Time-Trend Analysis			
Location	URS Station ID	USGS Station ID	Water Quality Parameter [a]	RI Data Range	Number of Data Points	Minimum	Maximum	Median	Average	SD	CV	Expected Value	CV	R^2	Expected Slope E[B]; ln[X] = B[t] + a	R^2	95% LCL[B]	95% UCL[B]
Sout Fork at Pinehurst	SF271	12413150	dis Cd conc.	5/15//91 - 9/7/99	108	2	60	8	9	6	0.70	9	0.63	0.95	0.02	0.01	-0.07	0.11
			dis Cd load	5/15//91 - 9/7/99	108	3	220	18	21	23	1.09	21	0.87	0.98	0.05	0.03	-0.07	0.17
			dis Zn conc.	5/15//91 - 9/7/99	111	227	2,920	351	1,388	676	0.49	1,429	0.63	0.96	-0.03	0.02	-0.12	0.06
			dis Zn load	5/15//91 - 9/7/99	111	642	8,456	1,280	2,892	1,596	0.55	2,921	0.61	0.99	0.01	0.00	-0.08	0.09
			tot Pb conc.	5/15//91 - 9/7/99	68	13	790	26	63	126	1.99	56	1.34	0.81	0.11	0.12	-0.05	0.28
			tot Pb load	5/15//91 - 9/7/99	68	9	17,808	51	583	2,328	4.00	369	5.53	0.92	0.16	0.06	-0.18	0.49
Cataldo	LC50	12413500	dis Cd conc.	12/9/92 - 10/20/99	101	0	6	2	2	1	0.44	3	1.32	0.63	0.01	0.00	-0.12	0.15
			dis Cd load	12/9/92 - 10/20/99	101	0	107	18	24	21	0.88	27	1.32	0.94	-0.01	0.00	-0.18	0.15
			dis Zn conc.	12/9/92 - 10/20/99	102	51	809	342	370	187	0.51	354	0.61	0.94	-0.01	0.00	-0.10	0.09
			dis Zn load	12/9/92 - 10/20/99	102	133	10,191	3,011	3,315	2,080	0.63	3,217	0.72	0.94	-0.02	0.01	-0.14	0.09
			tot Pb conc.	10/29/96 - 10/20/99	44	4	355	9	25	61	2.39	21	1.43	0.76	-0.31	0.09	-0.53	-0.09
			tot Pb load	10/29/96 - 10/20/99	44	10	43,737	75	1,639	7,061	4.31	708	6.78	0.87	-0.56	0.08	-1.01	-0.12
Harrison	LC60	12413860	dis Cd conc.	10/6/92 - 9/9/99	91	1	5	2	2	1	0.37	2	0.37	0.95	-0.05	0.07	-0.11	0.01
			dis Cd load	10/6/92 - 9/9/99	91	2	165	18	28	29	1.04	29	1.39	0.99	-0.01	0.00	-0.19	0.17
			dis Zn conc.	10/6/92 - 9/9/99	91	90	920	322	342	148	0.43	344	0.48	0.99	-0.04	0.04	-0.12	0.04
			dis Zn load	10/6/92 - 9/9/99	91	500	18,153	2,868	4,028	3,263	0.81	4,187	1.02	0.99	-0.01	0.00	-0.15	0.14
			tot Pb conc.	10/29/96 - 9/9/99	32	15	430	30	54	84	1.55	52	1.08	0.77	0.16	0.04	-0.07	0.38
			tot Pb load	10/29/96 - 9/9/99	32	30	24,753	328	1,920	5,382	2.80	1,509	4.11	0.93	0.35	0.04	-0.14	0.83
Spokane River at Lake Outlet / Post Falls [b]	SR5/ SR50	12419500	dis Cd conc.	11/11/97 - 9/7/99	14	0	1	1	1	0	0.37	1	0.48	0.71	NA*	NA*	NA*	NA*
			dis Cd load	11/11/97 - 9/7/99	10	1	112	10	21	32	1.47	27	2.56	0.97	NA*	NA*	NA*	NA*
			dis Zn conc.	11/11/97 - 9/7/99	14	26	91	72	65	21	0.33	67	0.49	0.87	NA*	NA*	NA*	NA*
			dis Zn load	11/11/97 - 9/7/99	10	79	6,971	1,138	2,209	2,252	1.02	3,654	3.29	0.96	NA*	NA*	NA*	NA*
			tot Pb conc.	11/11/97 - 9/7/99	14	1	6	2	2	2	0.70	3	0.90	0.97	NA*	NA*	NA*	NA*
			tot Pb load	11/11/97 - 9/7/99	10	4	675	39	109	194	1.78	157	4.63	0.96	NA*	NA*	NA*	NA*
Spokane River near Stateline [c]	SR55	12419500	dis Cd conc.	4/15/99 - 9/9/99	6	1	1	1	1	0	0.35	NA	NA	NA	NA*	NA*	NA*	NA*
			dis Cd load	4/15/99 - 9/9/99	6	2	80	17	33	33	1.00	NA	NA	NA	NA*	NA*	NA*	NA*
			dis Zn conc.	4/15/99 - 9/9/99	6	24	90	44	51	23	0.44	NA	NA	NA	NA*	NA*	NA*	NA*
			dis Zn load	4/15/99 - 9/9/99	6	82	5,420	2,339	2,482	2,150	0.87	NA	NA	NA	NA*	NA*	NA*	NA*
			tot Pb conc.	4/15/99 - 9/9/99	6	1	4	2	2	1	0.50	NA	NA	NA	NA*	NA*	NA*	NA*
			tot Pb load	4/15/99 - 9/9/99	6	4	314	85	123	120	0.98	NA	NA	NA	NA*	NA*	NA*	NA*
North Fork at Enaville	NF50	12413000	dis Cd conc.	3/21/90 - 9/8/99	40	1	2	1	1	0	0.57	1	0.69	0.28	-0.07	0.37	-0.14	0.00
			dis Cd load	11/18/92 - 9/8/99	19	1	30	5	9	9	1.00	12	2.11	0.96	0.01	0.00	-0.51	0.53
			dis Zn conc.	3/21/90 - 9/8/99	40	2	66	10	10	10	1.02	10	0.91	0.94	-0.09	0.12	-0.27	0.10
			dis Zn load	11/18/92 - 9/8/99	19	4	895	101	169	219	1.29	236	2.99	0.98	-0.13	0.05	-0.72	0.47
			tot Pb conc.	1/19/92 - 9/8/99	59	0	17	1	2	3	1.70	2	1.69	0.85	-0.12	0.09	-0.34	0.10
			tot Pb load	12/9/92 - 9/8/99	41	0	761	5	56	154	2.75	64	8.49	0.97	-0.07	0.01	-0.60	0.47

[a] Units for metal concentrations are µg/L; units for metal loads are lbs/day.

[b] Results for Spokane River at Lake outlet (SR5) and Spokane River at Post Falls (SR50) are combined.

[c] Additional data collected by Washington Dept. of Ecology will be accessed and integrated with the RI baseline data.

Notes:
Historical data is not available for St. Joe River at Mouth (SJ60) because it is a new station.
NA - Lognormal analyses were not performed for Spokane River near Stateline (SR55) due to limited data set (6 data points).
NA* - Historical time-trend analyses were not performed for Pine Creek below Amy Gulch (PC339), Spokane River at Lake outlet/Post Falls (SR5/SR50), and Spokane River near Stateline (SR55) were not performed due to the limited time period of monitoring data.
SD - Standard Deviation
CV - Coefficient of Variation
R^2 - Coefficient of determination (represents the "goodness of fit" of the data to assumed distribnution or trendline)
Expected Slope E[B] - The estimated slope for the time trend of ln[X] = B[t] + a; where: [X] = Metal concentration or load, [t] = time (years), B = slope and a = intercept.
95% LCL[B] & 95% UCL[B] - Estimated lower and upper confidence levels on the true slope evaluated at 95% (one-sided) confidence. These levels are the bounds of the nominal 90% confidence interval on the true slope based on available data and assuming no data auto-correlation effects. Testing and correcting for auto-correlation effects could change the slope estimates, including the 95% confidence limits.

Table 2-2
Baseline Surface Water AWQC Ratios and Associated Metals Concentrations and Loads

Location	Station ID	USGS Station ID	Statistical Summary of Historical Data: Data Range	Number of Data Points	Water Quality Parameter [a]	Minimum	Maximum	Median	Average	SD	CV	Historical Time-Trend Analysis: Expected Slope E[B]; ln[X] = B[t]+a	R^2	95% LCL[B]	95% UCL[B]
Mouth of Canyon Creek	CC-287/ CC-288	12413123	10/27/93 - 9/19/01	75	**dis Zn AWQC Ratio**	**20.0**	**94**	**47**	**50**	**16**	**0.33**	**-0.032**	**0.044**	**-0.096**	**0.033**
					dis Zn Conc	451	7,240	2,710	2,809	1,383	0.49	-0.054	0.038	-0.172	0.063
					dis Zn Load	154	2,998	435	532	424	0.80	-0.022	0.006	-0.140	0.096
Elizabeth Park	SF-268	12413210	10/29/93 - 9/19/01	71	**dis Zn AWQC Ratio**	**8**	**22**	**13**	**13**	**3**	**0.20**	**0.004**	**0.002**	**-0.036**	**0.044**
					dis Zn Conc	184	1,580	941	908	328	0.36	-0.026	0.017	-0.117	0.064
					dis Zn Load	305	4,136	970	1,139	763	0.67	-0.023	0.007	-0.144	0.099
Sout Fork at Pinehurst	SF-271	12413150	11/18/92 - 9/19/01	105	**dis Zn AWQC Ratio**	**8**	**27**	**15**	**16**	**4**	**0.25**	**-0.054**	**0.278**	**-0.089**	**-0.019**
					dis Zn Conc	227	2,540	1,210	1,263	588	0.47	-0.054	0.056	-0.144	0.035
					dis Zn Load	598	8,456	2,317	2,626	1,610	0.61	-0.034	0.018	-0.135	0.066
Harrison	LC-60	12413860	10/6/94 - 9/9/99	61	**dis Zn AWQC Ratio**	**5**	**26**	**7**	**8**	**3**	**0.40**	**-0.058**	**0.079**	**-0.123**	**0.006**
					dis Zn Conc	90	920	305	334	151	0.45	-0.063	0.043	-0.159	0.034
					dis Zn Load	581	12,968	3,328	3,986	2,916	0.73	-0.012	0.001	-0.187	0.162

Notes and Definitions:

[a] Units for metal concentrations are µg/L; untits for metal loads are lbs/day. AWQC ratios are unitless.

AWQC - Ambient Water Quality Criteria for dissolved zinc (chronic), as published in the National Recommended Water Quality Criteria - Correction, EPA 822-ZZ-99-001, April 1999.

$AWQC_{(H)} = 0.986 * \exp(0.8473 * \ln(H) + 0.7614)$

where: $AWQC_{(H)}$ = Chronic ambient water quality criteria for dissolved zinc (µg/L)
H = Hardness (mg/L)

dis Zn AWQC Ratio - Ratio of measured dissolved zinc concentration to the calculated AWQC. Note that AWQC ratios are a primary metric for fisheries benchmarks. The data set used for the anaylses summarized above is limited to water quality results tat include both dissolved zinc and water hardness measurements.

SD - Standard Deviation

CV - Coefficient of Variation

Expected Slope E[B] - The estimated slope for the time trend of ln[X] = B[t] + a; where: [X] = Metal concentration or load, [t] = time (years), B = slope and a = intercept.

R^2 - Coefficient of determination (represents the "goodness of fit" of the data to assumed distribnution or trendline)

95% LCL[B] & 95% UCL[B] - The lower and upper confidence levels of the slope evaluated at 95% confidence. These levels are the bounds of the 90% confidence interval on the true slope based on available data.

Table 2-3
Baseline Soil and Sediment Metal Concentrations

				Cadmium								Lead								Zinc							
Soil/Sediment Monitoring Locations	Baseline Data Source	Sample Type	Size Fraction	# Samples	Min Date	Max Date	Average	Min	Max	Median	CV	# Samples	Min Date	Max Date	Average	Min	Max	Median	CV	# Samples	Min Date	Max Date	Average	Min	Max	Median	CV
Sentinel Locations: Annual sampling to evaluate time-history trends																											
Upper Basin and Lower Basin : Selected in-channel locations [a]	Not Available - Exact locations for sampling are TBD	Composite surface samples of in-channel deposits	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spokane River near Stateline	Grosbois et al. 2001 Upper Spokane River [b]	Grab sample of in-channel deposits	Bulk	15	1998-1999		5.8	0.8	23	-	-	15	1998-1999		320	21	1200	-	-	15	1998-1999		1200	2800	510	-	-
			<63 um	15	1998-1999		22	5.9	38	-	-	15	1998-1999		1000	36	2900	-	-	15	1998-1999		3500	1900	6400	-	-
Spokane River near eastern boundary of Spokane Reservation	Grosbois et al. 2001 Post Long Lake [b]		Bulk	8	1998-1999		1.9	0.1	6.8	-	-	8	1998-1999		22	56	9	-	-	8	1998-1999		310	39	940	-	-
			<63 um	8	1998-1999		1.5	0.3	2.6	-	-	8	1998-1999		39	24	60	-	-	8	1998-1999		340	130	660	-	-
Basin-Wide Assessment ("Snapshot") Locations: Sampling every 10 years to evaluate aggregated, area-wide temporal averages (i.e. ratio analysis)																											
Upper Basin : Ninemile Creek, South Fork, Pine Creek	Ninemile Creek: RI data, segs. NM02 & NM04	Area-wide Composite of RI Surface Soil/Sediment Sample Results	-	74	12/14/97	1/1/00	25	0.12	530	9	2.87	74	12/14/97	1/1/00	7714	10.7	59600	3265	1.69	77	12/14/97	1/1/00	10368	55.1	269000	1570	3.68
	South Fork: RI data, segs. USF01, MG01, MG02		-	542	1/1/97	1/1/00	10	0.06	225	4	1.94	542	1/1/97	1/1/00	2562	19	65700	527	2.26	542	1/1/97	1/1/00	1568	15	39400	507	1.95
	Pine Creek: RI data, segs. PC01& PC03		-	60	7/14/94	12/15/97	5	0.04	82.6	1	2.26	60	7/14/94	12/15/97	1625	5.16	8260	714	1.31	60	7/14/94	12/15/97	1285	10	8990	742.5	1.28
Lower Basin : Floodplain	RI data: CSM Unit 3		-	1257	1/1/91	1/1/00	30	0.01	105	26	0.80	1252	1/1/91	1/1/00	3621	18.1	29200	3415	0.74	1260	1/1/91	1/1/00	3183	0.07	21800	2440	0.97
Harrison Delta	RI data: LCDR Seg 06	Core samples	-	92	7/11/95	12/18/97	30 [c]	0.28 [c]	96.4 [c]	-	0.74 [c]	92	7/11/95	12/18/97	4050	10.7	19900	-	0.99	92	7/11/95	12/18/97	3160	45.4	11500	-	0.83
Mid and lower Long Lake	Grosbois et al. 2001 Long Lake Cores [b]	Core sample SRC-1 (mid Long Lake)	-	-	1998-1999		23	0.2	50	25	-	-	1998-1999		280	26	880	180	-	-	1998-1999		1800	63	2900	1800	-
		Core sample SRC-2 (lower Long Lake)	-	-	1998-1999		23	0.2	48	30	-	-	1998-1999		460	17	1600	320	-	-	1998-1999		1900	80	3400	2400	-
		Core sample SRC-3 (lower Long Lake)	-	-	1998-1999		27	6.6	75	25	-	-	1998-1999		530	180	1800	340	-	-	1998-1999		2300	990	3800	2200	-

[a] In-channel (low water) locations include: 1) South Fork above Canyon Creek, 2) Mouth of Canyon Creek, 3) Lower East Fork Ninemile Creek, 4) Mouth of Ninemile Creek, 5) Elizabeth Park, 6) Smelterville, 7) Pine Creek below Amy Gulch, 8) Pinehurst, 9) Enaville, 10) Cataldo, 11) Rose Lake, 12) Medimont, and 13) Harrison.

[b] Data Source = Grosbois, C.A., A.J. Horowitz, J.J. Smith and K.A. Elrick. 2001. The effect of mining and related activities on the sediment-trace element geochemistry of Lake Coeur d'Alene, Idaho, USA. Part III, Downstream effects; the Spokane River Basin. Hydrological Processes v. 15 no. 5. April 15.

[c] Statistical summaries for cadmium are based on detected values only. Cadmium was detected in 80 out of 92 samples. Lead and zinc were detected in all samples analyzed.

Notes:
Soil/sediment metals concentrations are in mg/kg.

Table 2-4
Summary of Available Baseline Data for Biological Resources

Parameter	Location(s)	Baseline Data Source(s)
Riverine Habitat		
Fish diversity/ abundance	Ninemile Creek, Pine Creek, South Fork (Wallace to Elizabeth Park)	Baseline data summarized in Fisheries Tech Memo (2001) Includes 1994-1998 NRT survey data, 1995-1998 BURP survey data, 2000 NAWQA data, and USFS 1993 survey data
		Maret and MacCoy, 2002
		Mebane et al., 2002
		R2 Resource Consultants in Report of Injury Assessment - Stratus Consulting 2000
Fish Tissue Metal Levels (Upper Basin and Spokane River)	Ninemile Creek, Pine Creek, South Fork (Wallace to Elizabeth Park), Spokane River near Stateline	Maret & Skinner, 2000 (1998 Data) NFCdA @ Enaville; SFCdA @ Mullan, Pinehurst; St. Joe @ Calder; SR @ 7-Mile
		Maret & Dutton, 1999 (1974- 1996 data) NFCdA @ Enaville; SFCdA @ Mullan, Silverton, E Park, Pinehurst; CdA @ Cataldo, Rose Lk; St. Joe @ St. Maries; SR @ Post Falls, UR Dam, 9-Mile.
		Bowers et al., 2003
		Farag et al., 1998
		USGS 1998-1999 cooperative study of Spokane River with WA Dept. of Ecology (MacCoy & Maret, 2003)
Bull Trout Habitat/ Temp. and Other Aquatic Resources Assessment	SFCdA River, Mainstem CdA River	Avista Temperature and Bathometric studies in 2003, State and Federal Agency fish population data - high concentrations of trout in small localized areas.
Bull Trout Population Survey and Assessment of Other Aquatic Resources	Areas of cold refuge (bull trout); Representative habitats in SFCdA and Mainstem CdA River (other aquatic resources) - Few areas in SFCdA	No Baseline Available
Macroinvertebrate diversity/abundance	Ninemile Creek, Pine Creek, SFCdA Wallace to Elizabeth Park (above Box), SFCdA at Pinehurst, Lower Basin, Spokane River near Stateline	Baseline data summarized in Fisheries Tech Memo (2001) Includes 1994-1998 NRT survey data, 1995-1998 BURP survey data, 2000 NAWQA data, and USFS 1993 survey data
		Maret et al., 2001
		Table 8-5 Report of Injury Assessment - Stratus Consulting, 2000
		USGS 1998-1999 cooperative study of Spokane River with WA Dept. of Ecology
Macroinvertebrate tissue metal levels	Ninemile Creek, Pine Creek, South Fork (Wallace to Elizabeth Park), Spokane River near Stateline	Farag et al., 1998
		Farag et al., 1999
		NAWQA and BURP
		Woodward et al., 1997
		USGS 1998-1999 cooperative study of Spokane River with WA Dept. of Ecology
Aquatic habitat quality	Ninemile Creek, Pine Creek, South Fork (Wallace to Elizabeth Park), Spokane River near Stateline	Baseline data summarized in Fisheries Tech Memo (2001) Includes 1994-1998 NRT survey data, 1995-1998 BURP survey data, 2000 NAWQA data, and USFS 1993 survey data
		Maret and MacCoy, 2002
Lacustrine / Palustrine Habitat		
Waterfowl population	Lower Basin	Audet et al. 1999 (Wildlife Use and Mortality Investigation in CdA Basin: 1992-1997 data)
Waterfowl mortality	Lower Basin	Audet et al. 1999 (Wildlife Use and Mortality Investigation in CdA Basin: 1992-1997 data); Beyer et al. 2000 (Relation of Waterfowl Poisoning to Sediment Lead concentrations in CdA Basin)
Waterfowl blood lead	4 Stations (including Harrison Slough)	Henny et al. 1999,
		Beyer et al., 2000
		Blus et al., 1995
		Page Pond IAG Monitoring Reports
Riparian Habitat		
Riparian vegetation / invertebrates	Ninemile Creek, Pine Creek, South Fork (Wallace to Elizabeth Park), Spokane River near Stateline	PLANNED - Avista/Parametrix Wetland & Riparian Habitat Mapping and Assessment (SR to Cataldo)
		EcoRA Appendix K Attachment 1
		Potential aerial photos. None known at present
Songbird diversity/abundance	Basin - 2 Monitoring Avian Productivity & Survivability survey routes (MAPS)	No MAPS Baseline Available
		Pacific Northwest MAPS database. Not CdA specific, but regional averages
Songbird blood lead	Ninemile Creek, Pine Creek, South Fork (Wallace to Elizabeth Park), Lower Basin (2 stations)	USFWS Sample collection complete; report has not been completed.
		Johnson et al. 1999
		Blus et al., 1995
		UCFWO data