In Cooperation with the U.S. Forest Service and the U.S. Bureau of Land Management

Stream-Sediment Geochemistry in Mining-Impacted Streams: Prichard, Eagle, and Beaver Creeks, Northern Coeur d'Alene Mining District, Northern Idaho

Scientific Investigations Report 2004–5284

U.S. Department of the Interior
U.S. Geological Survey

COVER (clockwise from left)
Drainage from the Carlisle Mine portal, lower Carbon Creek; collapsed Idora mill building, upper Beaver Creek; recontoured and seeded cobble dredge spoils, Prichard Creek valley above Murray, Idaho; sampling suspended sediment from lower Beaver Creek during peak flow on April 14, 2000.

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Stream-Sediment Geochemistry in Mining-Impacted Streams: Prichard, Eagle, and Beaver Creeks, Northern Coeur d'Alene Mining District, Northern Idaho

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Abstract

This report presents the results of one aspect of an integrated watershed-characterization study that was undertaken to assess the impacts of historical mining and milling of silver-lead-zinc ores on water and sediment composition and on aquatic biota in streams draining the northern part of the Coeur d'Alene Mining District in northern Idaho. We present the results of chemical analyses of 62 samples of streambed sediment, 19 samples of suspended sediment, 23 samples of streambank soil, and 29 samples of mine- and mill-related artificial-fill material collected from the drainages of Prichard, Eagle, and Beaver Creeks, all tributaries to the North Fork of the Coeur d'Alene River. All samples were sieved into three grain-size fractions (<0.063, 0.063–0.25, and 0.25–1.0 mm) and analyzed for 40 elements after four-acid digestion by inductively coupled plasma atomic-emission spectrometry and for mercury by continuous-flow cold-vapor atomic-absorption spectrometry in the U.S. Geological Survey laboratory in Denver, Colo.

Historical mining of silver-lead-zinc ores in the headwater reaches of the Prichard Creek, Eagle Creek, and Beaver Creek drainages has resulted in enrichments of lead, zinc, mercury, arsenic, cadmium, silver, copper, cobalt, and, to a lesser extent, iron and manganese in streambed sediment. Using samples collected from the relatively unimpacted West Fork of Eagle Creek as representative of background compositions, streambed sediment in the vicinity of the mines and millsites has Pb and Zn contents of 20 to 100 times background values, decreasing to 2 to 5 times background values at the mouth of the each stream, 15 to 20 km downstream. Lesser enrichments (<10 times background values) of mercury and arsenic also are generally associated with, and decrease downstream from, historical silver-lead-zinc mining in the drainages. However, enrichments of arsenic and, to a lesser extent, mercury also are areally associated with the lode gold deposits along Prichard Creek near Murray, which were not studied here. Metal contents in samples of unfractionated suspended sediment collected during a high-flow event in April 2000 are generally similar to, but slightly higher than, those in the fine (<0.063-mm grain size) fraction of streambed sediment from the same sampling site. Although metal enrichment in streambed sediment typically begins adjacent to the mine portals and their associated mine-waste rock dumps, volumetrically larger inputs of metal-enriched materials were contributed by the ore-concentration millsites and their associated, more finely ground, more metal rich mill-tailings impoundments.

Introduction

The drainages of Prichard, Eagle, and Beaver Creeks, all tributaries to the North Fork of the Coeur d'Alene River in northern Idaho (figs. 1, 2), include sites of historical mining activities in the northern part of the Coeur d'Alene Mining District, one of the world's largest producers of silver and one of the Nation's largest historical producers of lead and zinc. Because of historical activities associated with the mining and milling of silver-lead-zinc ores, these streams have been significantly impacted both physically and chemically. The U.S. Forest Service (USFS) and the U.S. Bureau of Land Management (BLM) have large land holdings in this drainage basin. At their request, the U.S. Geological Survey (USGS) undertook a basinwide sampling program of surface water, ground water, stream sediment, minesite and other fill materials, and instream aquatic biota in 2000, 2001, and 2002. The surface- and ground-water data have been reported elsewhere (Brennan and others, 2001, 2003; O'Dell and others, 2002; Ott and Clark, 2003). This report presents sampling and analytical data for basinwide streambed and suspended sediment, for selected vertical sections of streambank soil, and for artificial-fill materials around selected mines and millsites; a companion report (Harper and Farag, in press) presents sampling and analytical data for instream aquatic biota.

Regional Setting

The drainage basin of Prichard, Eagle, and Beaver Creeks incorporates four major drainages of approximately equal size: upper Prichard Creek (above its confluence with Eagle Creek), the West and East Forks of Eagle Creek, and Beaver Creek (fig. 2). European-American settlement of the basin began in the early 1880s with the discovery of placer gold in Prichard Creek (Magnuson, 1968). Significant early placer gold operations were located on Prichard Creek, lower Eagle Creek, and Trail Creek, a tributary to Beaver Creek (fig. 2). Older gravel deposits were hydraulically mined around 1900 in the hills north of Prichard Creek between the town of Murray and Eagle Creek (Ransome and Calkins, 1908). Between 1917 and 1926, a large floating dredge worked most of the valley gravel for an 8-km reach of upper Prichard Creek in the vicinity of Murray, leaving large, coarse-cobble dredge-spoil piles (Campbell, 1927). Underground gold-quartz lode mines are located in the same general area as the placer gold workings; the two largest lode mines were the Golden Chest and Mother Lode Mines, flanking Prichard Creek a few kilometers above Murray. Several intermittent placer gold/gravel-mining operations along tributaries to Prichard Creek are the only mining activity in the basin today.

Underground mines that historically produced zinc, lead, and silver ore are located in the headwaters of Prichard Creek (fig. 3), the East Fork of Eagle Creek (fig. 4), and Beaver Creek (fig. 5). Although the largest mine production (1.4 million tons of ore) was in the upper Beaver Creek drainage, only about 0.5 million tons of ore was processed at millsites in this drainage. About 0.2 million tons of ore was mined and milled in upper Prichard Creek, and about 0.67 million tons in the upper East Fork of Eagle Creek (Jack Waite Mine and mill; Bennett and Mitchell, 1999; Kauffman and others, 1999b; K.R. Long, unpub. data, 2002). Ore-concentration mills in the drainages of upper Prichard Creek (Paragon/Blackhorse, Bear Top, and Monarch mills, fig. 3) and upper Beaver Creek (Carlisle/Ray Jefferson and Idora mills, fig. 5) that operated before 1925 as gravity ("jig") mills produced small-volume piles of fine- to coarse-grained, metal-enriched jig tailings, as well as trains of downstream, jig-tailings-contaminated flood plains and stream channels. Large-scale flotation mills that operated in the upper East Fork of Eagle Creek (Jack Waite mill, fig. 4) and upper Beaver Creek (rebuilt Carlisle mill, fig. 5) between 1926 and 1960 produced large-volume, less metal rich flotation-tailings piles. A small-volume flotation-tailings pile was also produced between 1928 and 1930 at the Silver Strike millsite (fig. 3) in Granite Gulch, a tributary to upper Prichard Creek. No zinc-lead mining is active in the basin today.

Prichard Creek, which has the largest drainage in the study area (fig. 2), flows northwesterly to its confluence with the North Fork of the Coeur d'Alene River. Placer gold was

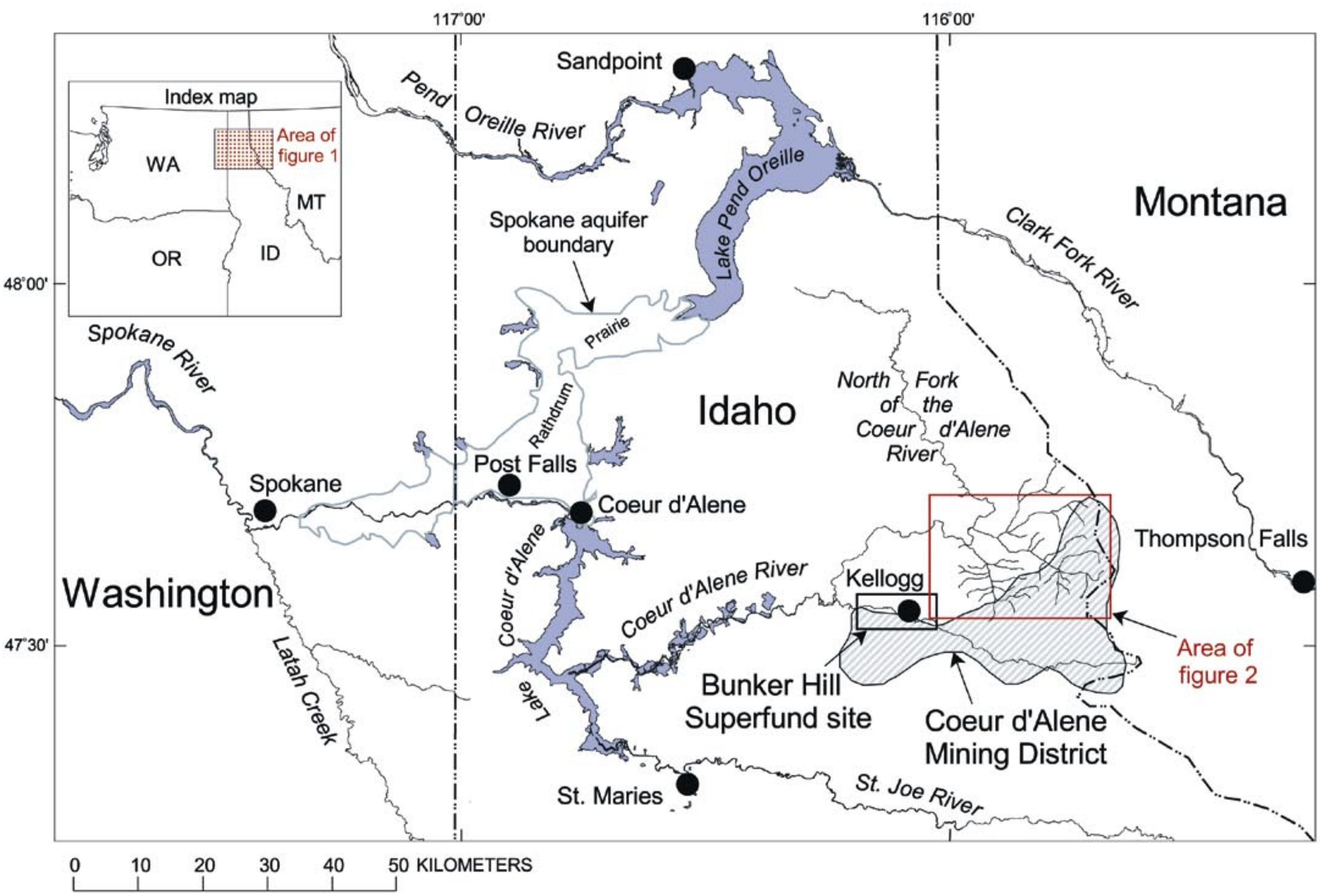


Figure 1. Coeur d'Alene-Spokane River drainage in eastern Washington, northern Idaho and western Montana, showing location of study area in the Coeur d'Alene Mining District (see fig. 2).

discovered near the junction of Prichard and Eagle Creeks in 1882, and a general gold rush of placer miners began in 1883, leading to the establishment of the town of Murray in the middle of the placered reach of Prichard Creek (Magnuson, 1968). By 1900, most of the major silver-lead-zinc deposits known in the drainage had been discovered (fig. 3). The history and total tailings production of ore-concentration mills in the drainage are shown in figure 6. Relatively coarse grained, metal-enriched jig tailings were produced by three mills between 1905 and 1921 (fig. 3): the Bear Top mill up Bear Gulch (Mitchell, 1997a), the Paragon/Blackhorse mill at the mouth of Paragon Gulch (Mitchell, 1998), and the Monarch mill along Prichard Creek below Paragon Gulch. Small-tonnage (<50,000 tons) streamside tailings impoundments were deposited at each site: below the Monarch and Paragon/Blackhorse millsites along Prichard Creek, and below the Bear Top millsite near the head of Bear Gulch. These impoundments have been somewhat eroded by the adjacent stream. For a few years in the late 1920s, two flotation mills operated in Granite Gulch: the Silver Strike and Giant Ledge mills. Tailings were impounded a short distance downstream from the Silver Strike millsite, but none are known from the Giant Ledge millsite.

Eagle Creek, a tributary to lower Prichard Creek, enters the larger stream from the north about 5.1 km above its mouth (fig. 2). The West and East Forks of Eagle Creek join about 2 km upstream of its confluence with Prichard Creek (fig. 4). The West Fork is relatively unaffected by mining; the only producing mine (Crystal Lead Mine) in the drainage operated intermittently from 1941 to 1952, producing 11,000 tons of ore that was trucked out of the drainage to be milled elsewhere (Long, 1998a). In contrast, the East Fork of Eagle Creek has been substantially impacted by mining and milling. The Jack Waite Mine and millsite is located near the headwaters of the drainage on Tributary Creek (figs. 2, 4); the mine produced about 670,000 tons of ore from 1928 to 1957, which was concentrated in the adjacent mill by a flotation process a few hundred meters downstream to produce about 570,000 tons of flotation tailings (fig. 6). The resulting fine-grained flotation tailings were released into Tributary Creek before December 1930 (Mitchell, 1997b), when, in response to complaints from downstream communi-

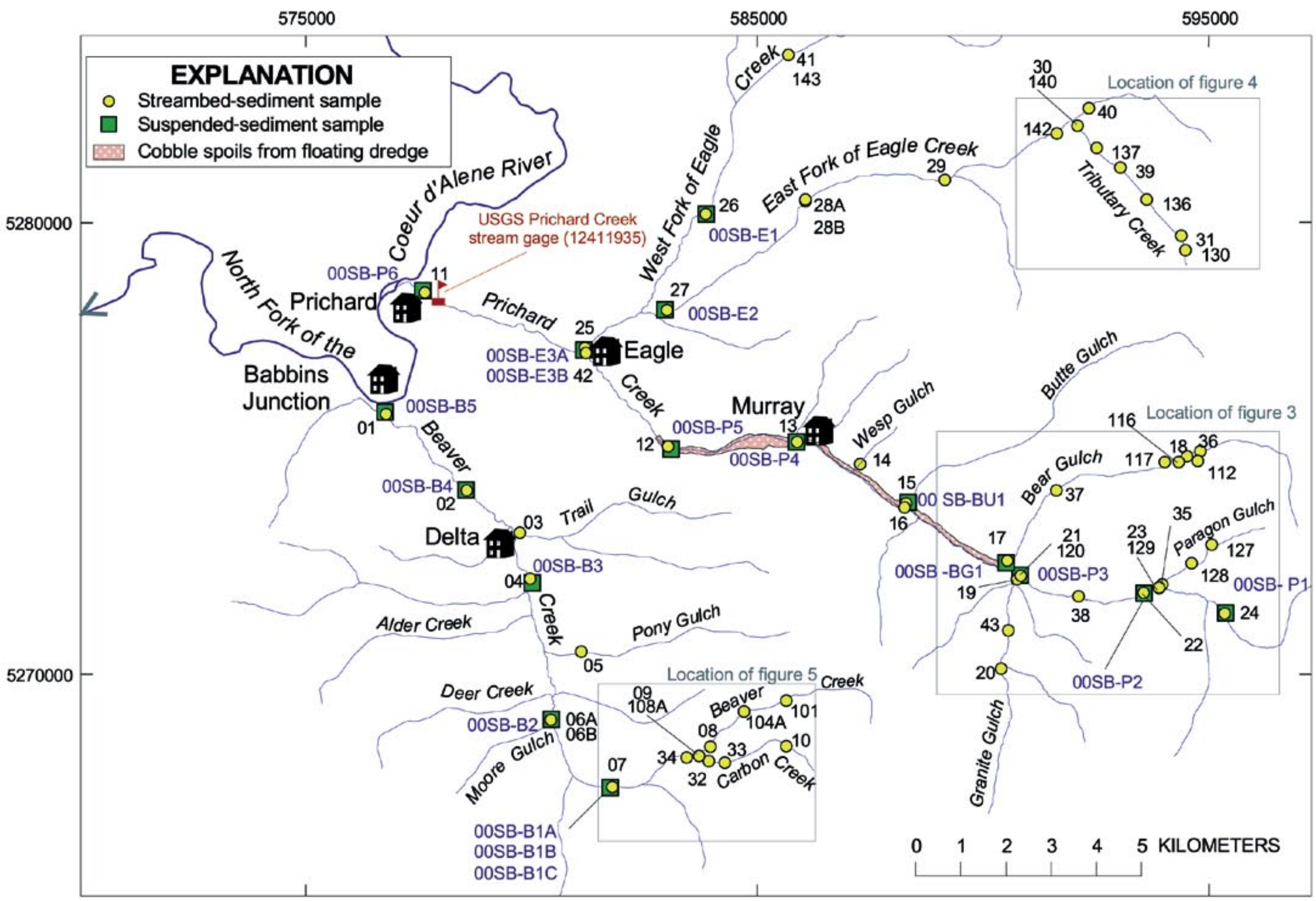


Figure 2. Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho, showing locations of sampling sites for streambed and suspended sediment. See figures 3 through 5 for locations of sampling sites for streambank soil and artificial-fill material.

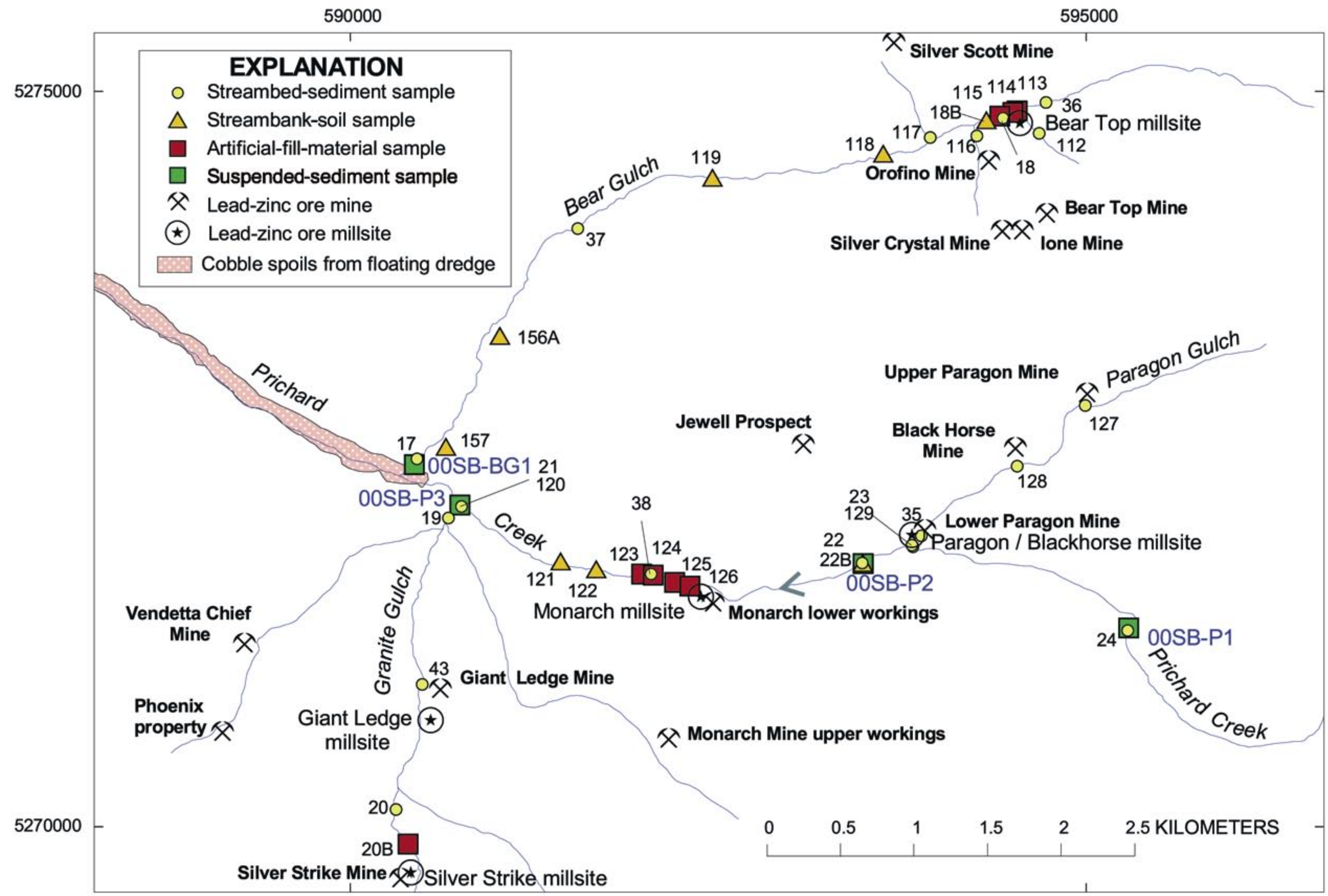


Figure 3. Upper Prichard Creek drainage in the northern Coeur d'Alene Mining District, northern Idaho (figs. 1, 2), showing locations of mines and millsites and of sampling sites for streambed sediment, suspended sediment, streambank soil, and artificial-fill material.

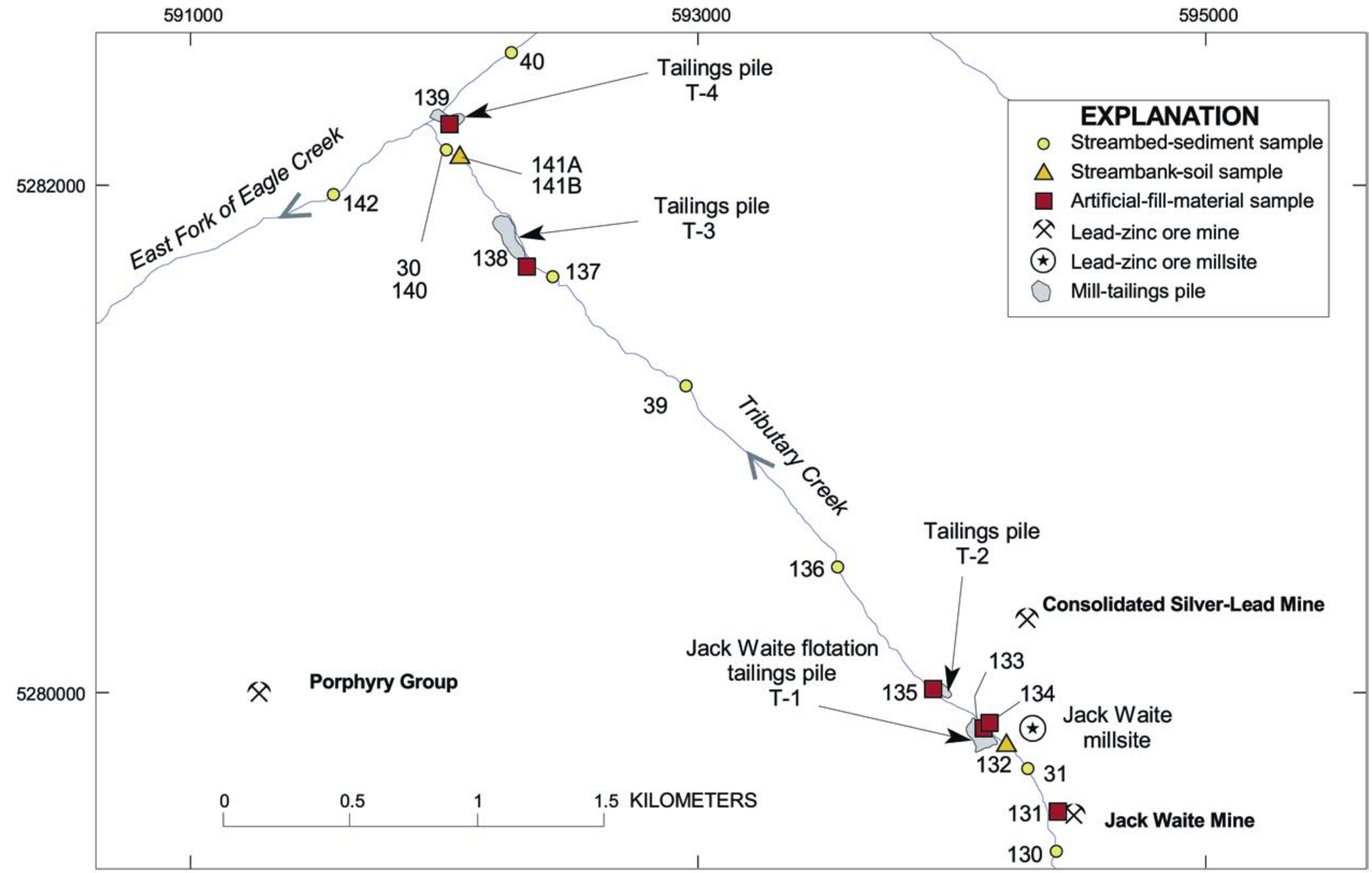


Figure 4. Tributary Creek and upper East Fork of Eagle Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho (figs. 1, 2), showing locations of mines, millsites, and tailings piles and of sampling sites for streambed sediment, suspended sediment, streambank soil, and artificial-fill material.

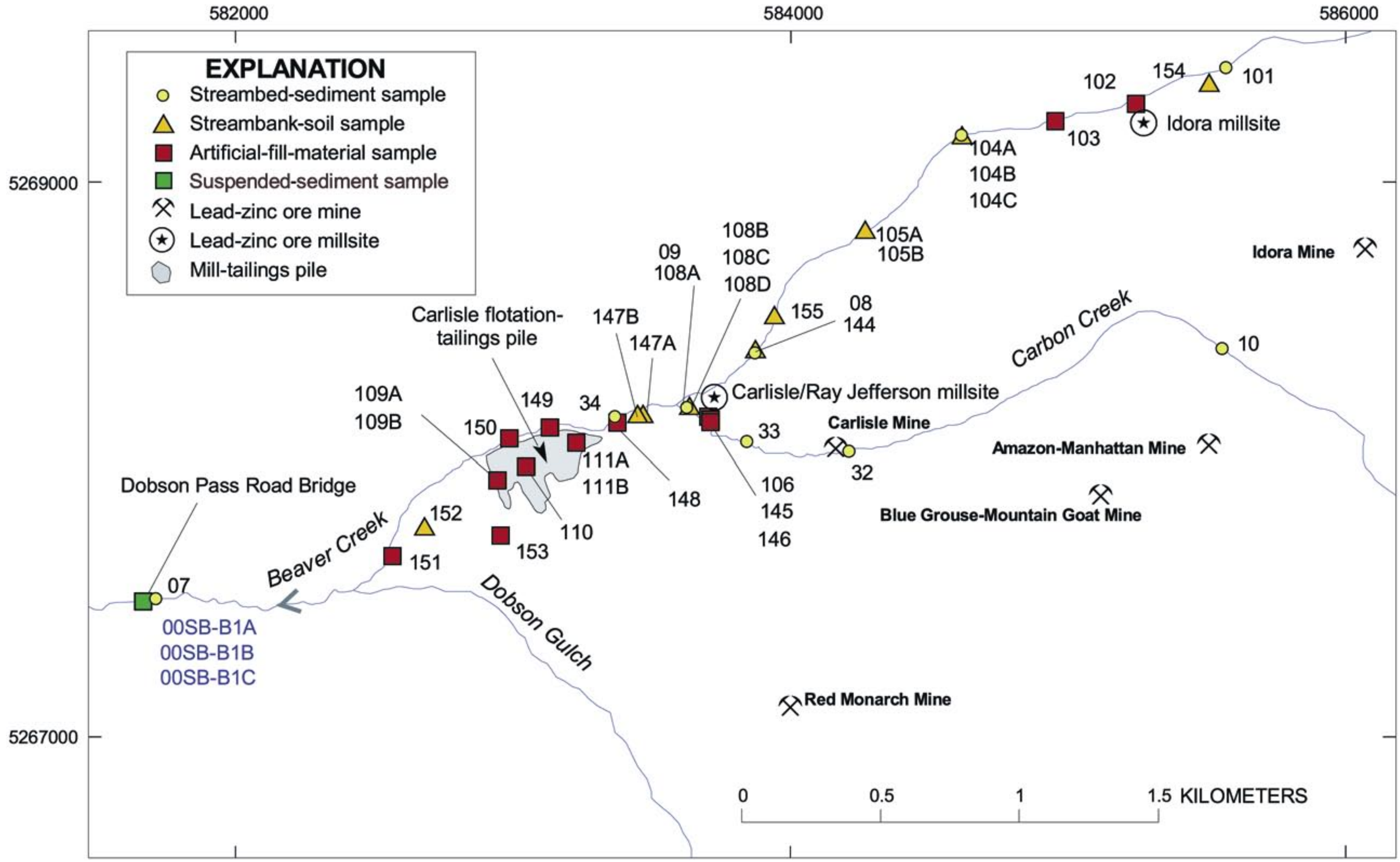


Figure 5. Upper Beaver Creek drainage in the northern Coeur d'Alene Mining District, northern Idaho (figs. 1, 2), showing locations of mines, millsites, and tailings piles and of sampling sites for streambed sediment, suspended sediment, streambank soil, and artificial-fill material.

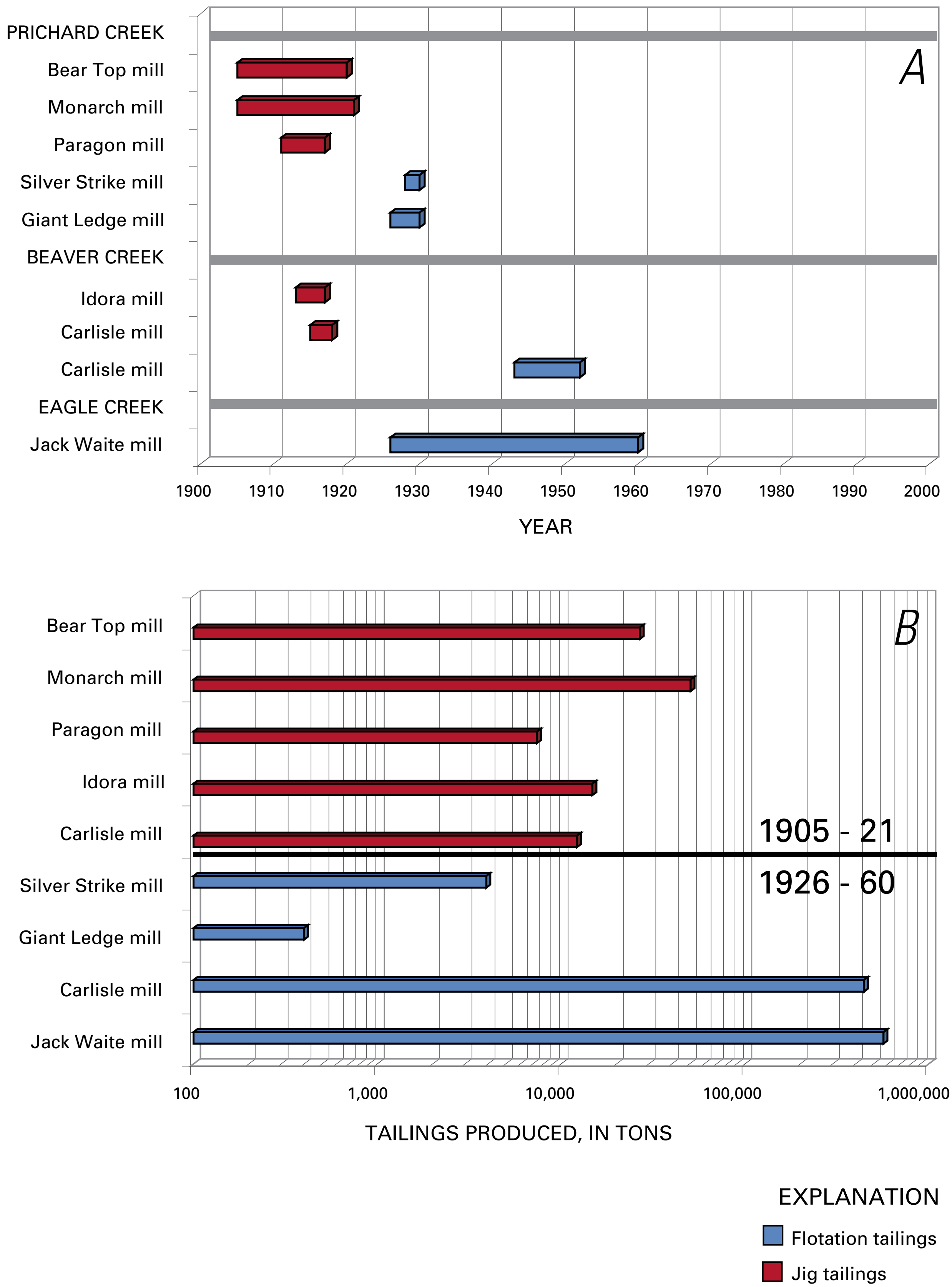


Figure 6. Years of operation of (*A*) and total output of tailings from (*B*) silver-lead-zinc ore-concentration mills in the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho (figs. 3-5). Data from K.R. Long (unpub. data, 2001).

ties, the operating mining company constructed streamside tailings impoundments or tailings piles (fig. 4) into which flotation tailings were transported by flume or pipe. These tailings piles have all been varyingly eroded by the adjacent stream.

Beaver Creek, the westernmost drainage in the study area (fig. 2), consists of one main branch that flows northwesterly to its confluence with the North Fork of the Coeur d'Alene River. Early placer gold mining began in the 1880s on Trail Creek and, to a lesser extent, on Beaver Creek below its confluence with Trail Creek (Ransome and Calkins, 1908). Significant production of silver-lead-zinc ores in the headwater reaches of the stream began after 1910, when small gravity mills operated on upper Beaver Creek (Idora) and Carbon Creek (Carlisle, then called Ray Jefferson, figs. 5, 6). Small, eroded jig-tailings impoundments remain adjacent to and downstream of the Idora millsite, but none has been identified below the Carlisle millsite. The portal to the Carlisle Mine is located in the valley bottom of Carbon Creek, about 0.5 km upstream from the Carlisle millsite (fig. 5); a significant waterflow emanates from the tunnel (Ott and Clark, 2003), passing over and along a large volume of angular non-ore or mine-waste rock (Kauffman and others, 1999a). Both the Idora and Carlisle gravity mills ceased operations before 1920. The Carlisle mill, which was rebuilt as a flotation mill in 1944, produced more than 440,000 tons of tailings before it ceased operation in 1952. Tailings were first piped to several small (30 by 30 by 1 m) impoundments downstream along Beaver Creek (sampling sites 148-151, fig. 5), all now varyingly eroded, followed by the establishment of a major, three-tiered tailings impoundment (gray area with sample sites 109-111, fig. 5) that incorporated the bulk of the tailings production. This large impoundment was placed across the existing stream channel, which was routed to the north around it. The north flank of the impoundment is armored with large boulders to protect it from erosion by Beaver Creek.

Sampling Methodology

Sample Collection

All samples were collected in 2000 and 2001 with a plastic trowel or shovel into plastic sample bags, using the chain-of-custody protocol of Murphy and others (1997). Sampling-site locations were marked directly onto 1:24,000-scale USGS topographic maps by inspection in the field, and the latitude and longitude (in coordinates of Universal Transverse Mercator [UTM], zone 11, NAD 1927 datum) were obtained by using a Garmin GPSMAP 76 global-positioning-satellite (GPS) receiver system, typically with an instrumental error of less than ±10 m in the horizontal plane. Where the GPS instrument would not give a location (too few satellites visible) or the instrumental error was greater than 10 m, the sampling-site location was transferred to the digital orthophoto quadrangle, using Arcview 3.2 software, and the digitized location was recorded in the table; those locations are inferred to have a larger error of about ±50 m. Sampling-site information was also recorded on sample-collection forms and on chain-of-custody forms in a looseleaf binder. Samples were transported to the laboratory at the end of each day.

Streambed Sediment

At each streambed-sediment-sampling site, a composite of three to five subsamples from within the high-water channel was collected from the upper 10 cm of sediment within a 10-m-diameter circle. One subsample was collected from beneath the water's edge at the time of sampling, and the other subsamples were collected above the low-water level on one side of the low-water stream and were mostly dry during sampling. Sampling was aimed at sand and finer material (<2-mm grain size), and subsampling was restricted to accumulations of that material in the typical sediment framework of cobble-size material. Digital photographs (available on request from the first author) were taken at each streambed-sediment-sampling site, looking upstream and downstream, as well as vertically downward from 1.5 m, to illustrate sediment characteristics. The locations of streambed-sediment-sampling sites are shown on figure 2 and listed in table 1.

Suspended Sediment

Samples of suspended sediment were collected within a 4-hour period during a single high-flow event on April 14, 2000 (table 2). Streamflow during this event at the USGS gage at the mouth of Prichard Creek (sta. 12411935, fig. 2) was the second highest recorded during the 4-year period of operation of the gage (10/01/98–09/30/02). All but two samples were collected from the stream center from bridges, using a 2-gal plastic bucket on the end of a rope. The sample was poured from the bucket into a prelabeled 1-gal plastic Ziplock bag, filled to capacity. Two samples (00SB–B4, 00SB–P5) were collected by wading into the stream and filling a 1-gal Plastic Ziplock bag directly. The sealed bag was placed in a second labeled plastic Ziplock bag, stored in a cardboard box in the vehicle, and transferred to the laboratory each night. The locations of suspended-sediment sampling sites are shown in figure 2.

Streambank Soil

Samples of streambank soil and surface material in the flood plain or in formerly active channels were collected at selected sites (table 3). At active-stream-cutbank sites ("channel" sampling method, table 3), the vertical cutbank was first cleaned of loose material with a trowel, and then a channel sample was collected over the indicated depth interval measured from the top of the cutbank. At flood-plain or formerly active channel sites ("composite" sampling method, table 3), only surficial material was sampled with a trowel from a few closely spaced holes; the depth of the holes is listed in table 3 (column labeled “Depth-interval bottom”). The locations of streambank-soil-sampling sites are shown in figures 3 through 5.

Artificial-Fill Materials

Samples of artificial-fill material of several types were collected at selected sites (table 4), mostly near mines or millsites, including impounded flotation tailings (14 sampling sites), impounded gravity (“jig”) tailings (8 sampling sites), millsite-fill material (2 sampling sites), railroad-bed material (2 sampling sites) and mine-waste rock at a mine portal (1 sampling site). At all but two sampling sites, the material was collected by channel-sampling the side of an excavated trench or a cleaned surface cut (“channel” sampling method, table 4), with the sample interval measured downward from the horizontal surface of the feature. Because of collection difficulties, the two exceptions (“composite” sampling method, table 4) were composited from three subsamples grabbed over the indicated interval. The locations of artificial-fill-sampling sites are shown in figures 3 through 5.

Sample Preparation

All samples (except those of suspended sediment) were dried in open sample bags at room temperature over a 2-week period after collection, with care taken to separate probable metal-enriched and metal-poor samples in order to avoid cross-contamination. The dried samples were then sorted in the sample-preparation laboratory of Eastern Washington University, Cheney, into nine different grain-size fractions (<0.063, 0.063–0.125, 0.125–0.25, 0.25–0.5, 0.5–1, 1–2, 2–4, 4–8, and >8 mm) using the protocol of Peacock and others (2002). Each sample was screened by using standard wire-mesh sieves mounted on a “rotap” agitator for 3 minutes. Screens were hand-brushed and blown out with compressed air after each sorting. Each fraction was weighed to within 0.1 g, and its percentage of the total weight of the sample calculated (table 5). Three fractions were sent to the USGS laboratory in Denver, Colo., for chemical analysis: (1) fine—less than 0.063 mm (clay and silt), (2) intermediate—0.063 to 0.25 mm (very fine to fine sand), and (3) coarse—0.25 to 1.0 mm (medium to coarse sand). The intermediate and coarse fractions were pulverized in preparation for chemical analysis, using the procedures of Taylor and Theodorakos (2002); the fine fraction was already fine enough for analysis and did not require further preparation.

Samples of stream water with suspended sediment were transported to the sample-preparation laboratory after collection, where they were allowed to settle in the sample bags for several days, after which the supernatant was decanted from each sample and its volume measured. The remaining cloudy water was centrifuged for 4 minutes, and supernatant was decanted from the centrifuge tube and its volume measured. The solid residues were transferred to preweighed glass sample vials and oven-dried at 60°C for 1–3 days, during which some mercury may have been lost to vaporization. After drying, the sample vials were reweighed, and the weight of each sample calculated. The suspended sediment concentration was calculated by dividing the dry sample weight by the total supernatant volume (table 6).

Chemical Analyses

All samples were analyzed by inductively coupled plasma atomic-emission spectrometry (ICP–AES) in the USGS laboratory in Denver, Colo., for 40 elements (all except Hg), using the procedure of Briggs (2002), and for mercury by continuous-flow cold-vapor atomic-absorption spectrometry, using the procedure of Brown and others (2002).

Standards, Replicate Samples, and Field Duplicates

A total of 365 samples were analyzed, of which about 7 percent were standards or replicate samples. The samples were analyzed in jobs of about 40 samples each; two batches of five jobs were analyzed about 1 year apart. Two National Institute of Standards & Technology (NIST) Standard Reference Materials (SRM 2710, SRM 2711) were analyzed with each year’s batch of five jobs (1 percent of total samples). Each year, six samples (3.1 percent of total) were split in the sample-preparation laboratory and submitted as replicates under different sample numbers. All standards and replicate samples were submitted “blind,” that is, without identifying them as such to the analytical laboratory.

A few field duplicates were collected to test within-site and temporal variations in sediment chemical composition. Of 19 samples of suspended sediment samples, 3 (16 percent of total) were field duplicates, 2 at one sampling site and 1 at another. At two of the year 2000 streambed-sediment-sampling sites, two subareas within 20 m of each other were sampled; a total of six analyses (two sites times three size fractions) can be compared. In 2001, samples of streambed sediment were recollected at four of the year 2000 sampling sites to test the year-to-year variation in sediment chemical composition; with size fractionation, a total of 12 analyses can be compared.

Results

Analytical Data

Analytical data for the 19 samples of unfractionated (bulk) suspended sediment are listed in table 6, and for the 114 fractionated samples of streambed sediment, streambank soil, and artificial-fill materials in tables 7 (<0.063-mm grain-size fraction), 8 (0.063- to 0.25-mm grain-size fraction), and 9 (0.25- to1.0-mm grain-size fraction), respectively.

Although analytical data were reported for 41 elements, the data for only 31 elements are reported here. Of the 41 elements, 6 were at or below instrumental detection limit for all the analyses (Au, <8 ppm; Bi, <10 ppm; Eu, <4 ppm; Ho, <4 ppm; Ta, <40 ppm; U, <100 ppm), and 4 were at or below 3 times the instrumental detection limit (Be, <1 ppm;

Mo, <2 ppm; Sn, <5 ppm; Yb, <1 ppm) in more than 94 percent of the analyses, resulting in such poor precision that we do not report those results here.

Analytical Accuracy and Precision

The accuracy of the analytical data was gauged by blind analyses of two NIST SRM samples each year. Analytical data for the NIST SRM samples are listed in table 10, along with the NIST-certified values for certain elements and their reported ranges and the uncertified values for 11 elements (Ce, Co, Ga, La, Mo, Nd, Sc, Sr, Th, Y Yb). For elements for which certified values are listed, all of our analyses are within 4 percent of the range of certified values, except for Ag, Hg, and P (which are within 8 percent) and Ti (which is within 50 percent).

The precision of the analytical data was gauged by blind analyses of six replicate samples each year, for which the precision for each element is gauged by its coefficient of variation (CV, standard deviation divided by the mean value of each element in each replicate pair):

Element	*Mean and standard deviation of CV (percent)*
Al---------	2±2
Ca---------	2±2
Fe---------	3±2
K----------	2±1
Mg--------	1±1
Na---------	1±1
P----------	4±6
Ti---------	4±3
Ag---------	1±1
As---------	5±5
Ba---------	2±2
Cd---------	6±4
Ce---------	3±3
Co---------	4±4
Cr---------	3±3
Cu---------	4±4
Ga---------	3±3
Hg---------	3±2
La---------	4±3
Mn--------	3±4
Nb---------	6±4
Nd---------	3±3
Ni---------	2±2
Pb---------	5±4
Sc---------	2±2
Sr---------	2±2
Th---------	4±4
V---------	1±1
Y---------	4±3
Zn---------	3±5

The mean of the CVs for each element ranges from 1 to 6 percent.

Within-Site and Temporal Geochemical Variations

The mean and standard deviation (SD) of the CV for each element in the field duplicates of the streambed and suspended sediment and in the annual replicate samples collected at four streambed-sediment-sampling sites are listed in table 11. For the samples of suspended sediment, the field duplicates test the variation in sediment chemical composition over 5–10-minute intervals. The means of the CVs for each element are all less than 11 percent, with a median of 3 percent (5 percent for mining-related elements). For the samples of streambed sediment, the field duplicates test the variation in sediment chemical composition for pairs of composite samples within 20 m along the high-water channel. The means of the CVs for each element are all less than 30 percent, with a median of 8 percent (14 percent for mining-related elements). For the annual replicate samples of streambed sediment, the comparisons test the variation in sediment chemical composition at the same streambed-sediment-sampling site 1 year apart. The means of the CVs for each element are all less than 33 percent, with a median value of 12 percent (26 percent for mining-related elements).

Grain-Size Analysis

The grain-size distributions for each sample of streambed sediment, streambank soil, and artificial-fill material are listed in table 5, and the average results for streambed sediment, streambank soil, gravity tailings, and flotation tailings are plotted in figure 7. Note that streambed sediment is relatively poor in fine material (8 weight percent fine sand, silt, and clay <0.25 mm), whereas flotation tailings are mostly composed of fine sediment (80 weight percent fine sand, silt, and clay), and gravity tailings and streambank soil have intermediate proportions of fine sediment. (The fine sand, silt, and clay fractions of the two media are 28 and 32 weight percent, respectively.) These data provide important information on the relative contribution of fine material from potential metal-enriched sources to streambed or suspended sediment by different media. For example, if equivalent masses of flotation and gravity tailings are eroded into the stream, the flotation tailings would contribute 3 times the mass of fine material contributed by the gravity tailings.

Discussion

Geochemistry of Premining Streambed Sediment

The streambed sediment that resided in drainages in the study area (fig. 2) before mining began has been eroded and mixed with sediment derived from mining activities, and so its premining geochemical characteristics are unknown. Although natural premining ore exposures may have resulted in higher metal contents in premining streambed sediment in the mined drainages (relative to unmined drainages), we suspect that the streambed sediment in other streams draining the regionally mineralized district but without historical mines provides an approximation to the streambed sediment that occupied the impacted drainages before mining began. These surrogate samples from other nearby drainages are either from the main drainages upstream from mining impacts, from unimpacted small tributaries, or from a similar-size unimpacted drainage. Because the West Fork of Eagle Creek is a relatively unimpacted drainage similar in size to Prichard Creek above the Eagle Creek confluence, to the East Fork of Eagle Creek, and to Beaver Creek, we consider its sediment to approximate the geochemical composition of premining streambed sediment in the other drainages. Although the West Fork of Eagle Creek is relatively unaffected by mining, one mine in the headwaters of the drainage that produced a small amount of ore might have slightly affected downstream sediment chemistry. The mean composition of the fine (<0.063-mm grain size) fractions of three samples of streambed sediment collected from the West Fork of Eagle Creek is compared with that of five samples either upstream of mining impacts (Tributary Creek, Prichard Creek) or from unimpacted tributaries (Butte Gulch, Trail Creek, East Fork of Eagle Creek above its confluence with Tributary Creek) in table 12. The two approaches yield nearly identical elemental "background" values for streambed sediment.

Geochemistry of Mining-Material Sources

Ore-concentration technology changed considerably during the history of mining and milling in the Coeur d'Alene Mining District (Long, 1998b). As a result, mill-waste materials ("tailings") also changed considerably over time in terms of their grain-size and element-enrichment characteristics. Early (before 1925) mills used a relatively inefficient gravity-concentration technique ("jigging"), and their gravity ("jig") tailings range in coarseness from clay and silt to fine gravel (fig. 7) and are highly enriched in ore-related elements. Later (after 1925) mills used a more efficient technique of flotation separation to concentrate ore minerals from more finely ground ore, and their tailings generally consist of fine sand, silt, and clay (fig. 7) and are much less enriched in ore-related elements.

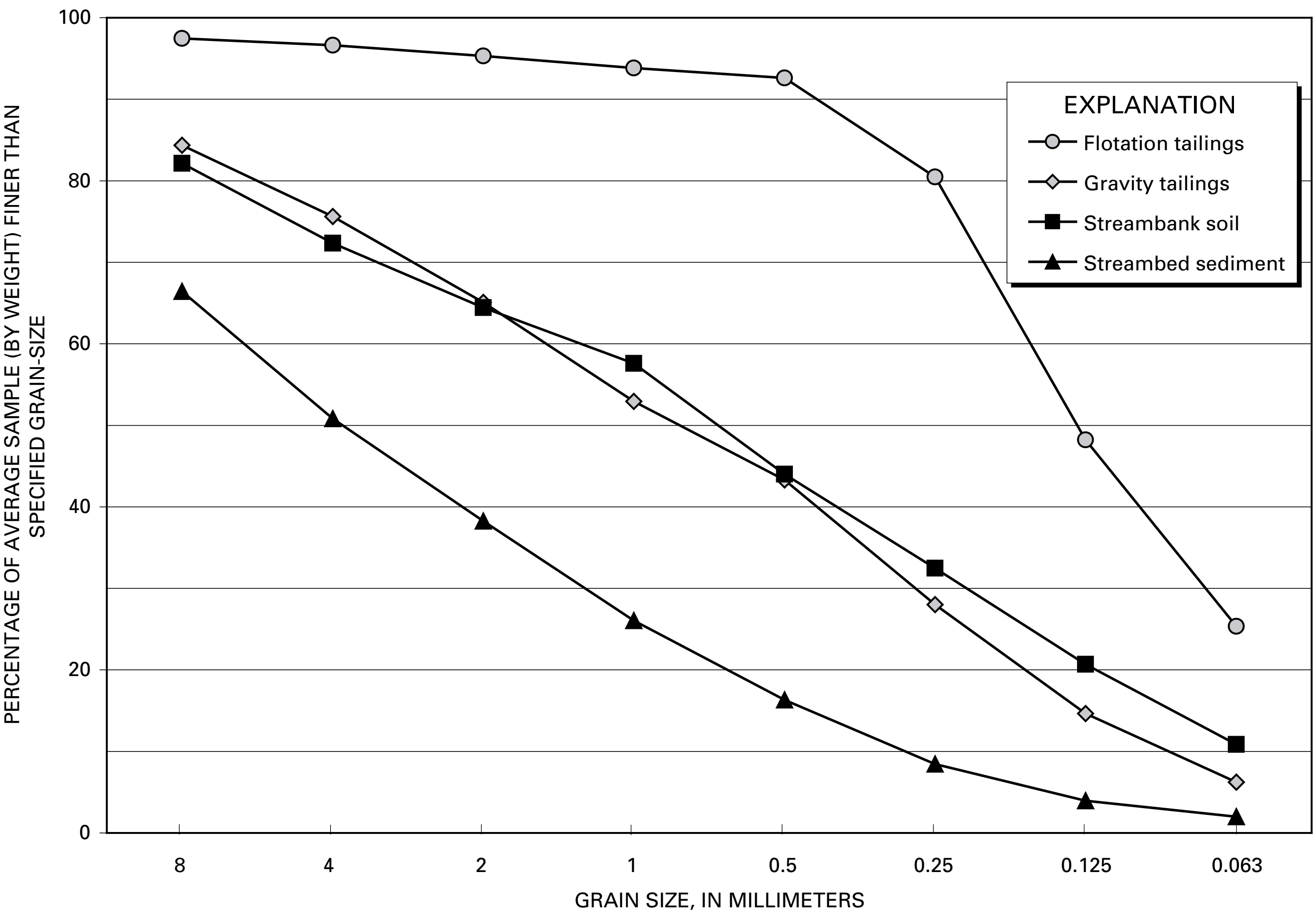


Figure 7. Average grain-size distributions in samples of streambed sediment (62 samples), streambank soil (23 samples), gravity tailings (8 samples) and flotation tailings (16 samples) collected from the northern Coeur d'Alene Mining District, northern Idaho (figs. 2–5).

To evaluate which elements have been enriched in sediment in the streams draining the mining district, we compare the chemical compositions of streambed sediment unaffected by mining with those of the tailings of ore-concentration mills in the mining district. In figure 8, we illustrate the relative element enrichments in mill tailings over the average chemical composition of three samples of streambed sediment collected from the unimpacted West Fork of Eagle Creek. The element enrichments (tailings composition divided by unimpacted-sediment composition) can be broadly considered as the number of times that the background values are exceeded. Data for samples of tailings collected from impoundments below the five gravity millsites in the mining district are plotted in figure 8*A*. A total of 10 elements are significantly enriched (3 or more times background values) in the gravity tailings (average enrichment factors in parentheses): Pb (650), Zn (400), Hg (140), Cd (80), Ag (30), Cu (11), As (7), Co (4), Fe (4), and Mn (3). For the flotation tailings (fig. 8*B*), enrichments in some elements (Pb, Ag, Hg) are consistently and significantly less than those in the gravity tailings; for the other mining-associated elements, enrichment factors overlap considerably between the samples of gravity and flotation tailings. However, if we compare elemental averages for samples of the two tailings types, all the mining-related elements are considerably less enriched in the flotation tailings relative to the gravity tailings.

Enrichments of Mining-Related Elements in Stream Sediment

Given the element enrichments that would be expected in stream sediment from release of the mining and milling source materials discussed above, we focus on four mining-related elements in our discussion: lead, zinc, mercury (the elements most enriched in tailings), and arsenic (an element with potential human-health impact). Several factors result in variation of mining-related elemental concentrations in sediment in and along each of the major drainages in the study area (figs. 1, 2). As discussed above, the composition of tailings varies between each mill because of differences in the original ore concentrations and in the efficiency of each mill in separating economic commodities from the mill waste. Each mill generated different amounts of tailings over different time periods and had varying success at keeping those tailings from entering the streambed. Also, the topographic variation in each stream valley influence the dispersion, dilution, and residence time of mining-related elements to the stream sediment. In the following section, the distributions of the above-mentioned four elements in the fine (<0.063-mm grain size) fraction of streambed sediment are summarized by element, followed by a more detailed presentation of the geochemical analyses of samples of streambed sediment, suspended sediment, streambank soil, and mining-related artificial-fill materials collected from each drainage basin.

Enrichments of Mining-Related Elements in the Fine Fraction of Streambed Sediment

Along-stream variations in Pb, Zn, As, and Hg contents in the fine (<0.063-mm grain size) fraction of streambed sediment throughout the study area (figs. 1, 2) are mapped in figure 9. Pb contents (fig. 9*A*) are as much as 128 times background value (max 10,500 ppm) and, in more than 80 percent of the samples, greater than 3 times background value (>250 ppm). Peak enrichments of lead (>4,000 ppm Pb) occur in a headwater branch (Bear Gulch) of Prichard Creek in the vicinity of the Bear Top millsite, on a short reach of a tributary to Prichard Creek (Paragon Creek) just below the Paragon/Blackhorse millsite, in the headwaters of the East Fork of Eagle Creek (Tributary Creek) downstream from the Jack Waite Mine/millsite area, and in upper Beaver Creek below the Idora millsite (fig. 9*A*). Below the severely impacted mine/millsite areas, Pb contents remain above 3 times background value in Prichard Creek to its mouth, in Tributary Creek and the East Fork of Eagle Creek to the mouth of Eagle Creek, and in Beaver Creek to about 5 km upstream of its mouth.

Zn contents in the fine (<0.063-mm grain size) fraction of streambed sediment (fig. 9*B*) are as much as 77 times background value (max 8,700 ppm), and greater than 2 times background value (>250 ppm) in more than 80 percent of the samples. Peak enrichments of zinc (>4,000 ppm Zn) occur on slightly different stream reaches than those of lead: on a shorter reach of Tributary Creek downstream from the Jack Waite Mine/millsite area, a different short tributary to Bear Gulch above the Bear Top millsite, and near the Carlisle Mine/millsite on Carbon Creek, a tributary to upper Beaver Creek (figs. 2–5). Below the severely impacted mine/millsite areas, Zn contents are greater than 2 times background value to the mouth of Prichard Creek, and greater than 4 times background value (>500 ppm Zn) to the mouths of both Eagle Creek and of Beaver Creek.

As contents in the fine (<0.063-mm grain size) fraction of streambed sediment (fig. 9*C*) are as much as 13 times background value (max 140 ppm), and greater than 2 times background value (>22 ppm) in about 50 percent of the samples. Peak enrichments of arsenic (>60 ppm As) occur in two areas: below the Silver Strike mill in Granite Gulch (a tributary to upper Prichard Creek), and along the middle and lower main stem of Prichard Creek, on a reach that is apparently associated with the area of lode gold deposits and with the valley floor that has been overturned by dredging (fig. 2). Weaker enrichments of arsenic are associated with the Jack Waite, Bear Top, Paragon, Idora, and Carlisle millsites.

Hg contents in the fine (<0.063-mm grain size) fraction of streambed sediment (fig. 9*D*) are as much as 100 times background value (max 6.1 ppm), and greater than 2 times background value (>0.12 ppm Hg) in 75 percent of the samples. Peak enrichments of mercury (>0.77 ppm Hg) occur in two areas: below the Jack Waite Mine/millsite in the headwaters of the upper East Fork of Eagle Creek, and near the Carlisle Mine/millsite on Carbon Creek, a tributary to upper Beaver Creek

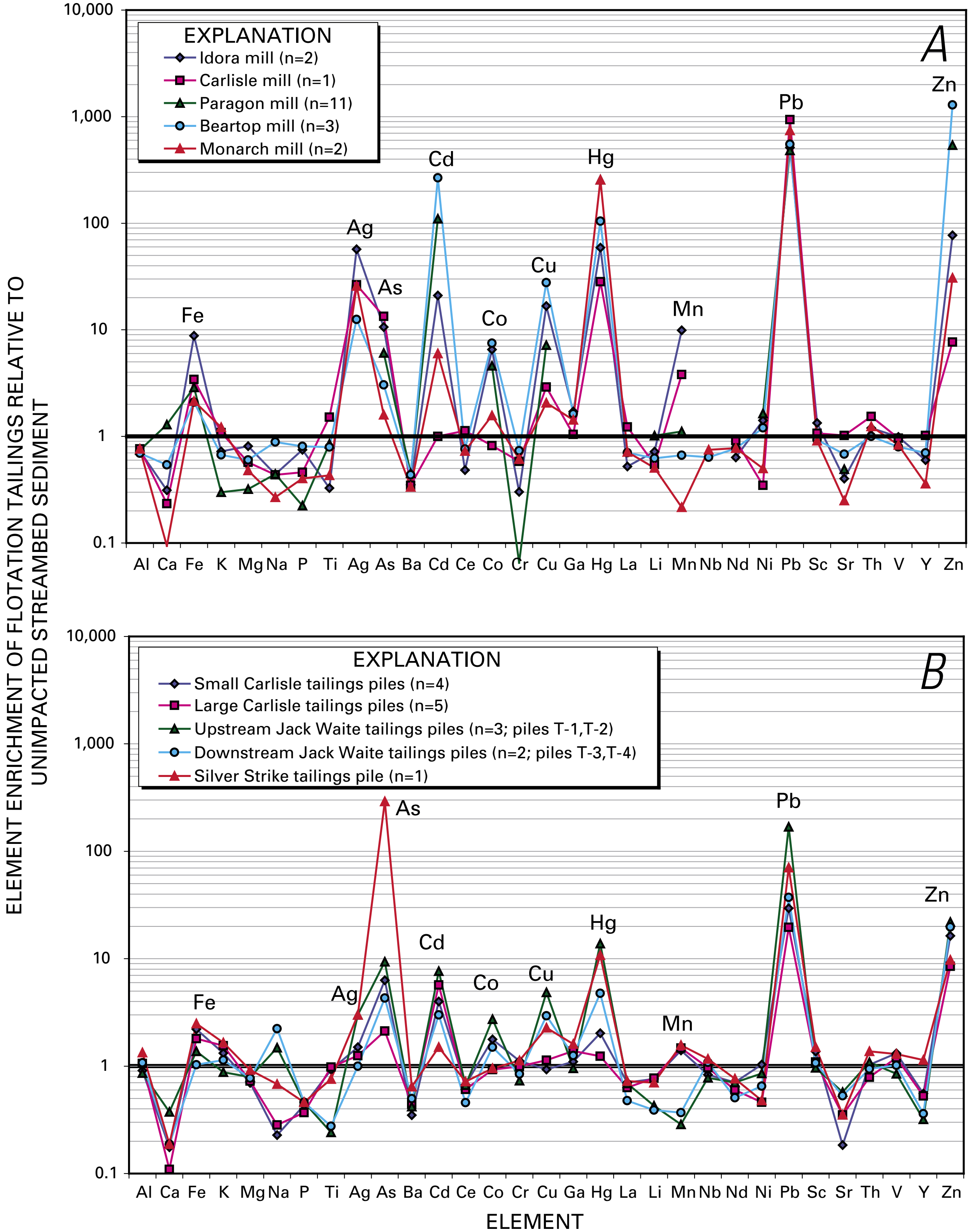


Figure 8. Element enrichments in samples of tailings piles (n, number of averaged samples) collected from the northern Coeur d'Alene Mining District, northern Idaho (figs. 3–5), relative to average composition of three samples of fine (<0.063-mm grain size) fraction of streambed sediment collected from the unimpacted West Fork of Eagle Creek; relatively enriched elements are noted above peaks. *A*, Gravity ("jig") tailings from five millsites. *B*, Flotation tailings associated with three different mills (data for Paragon mill gravity tailings from Johnson, 1999).

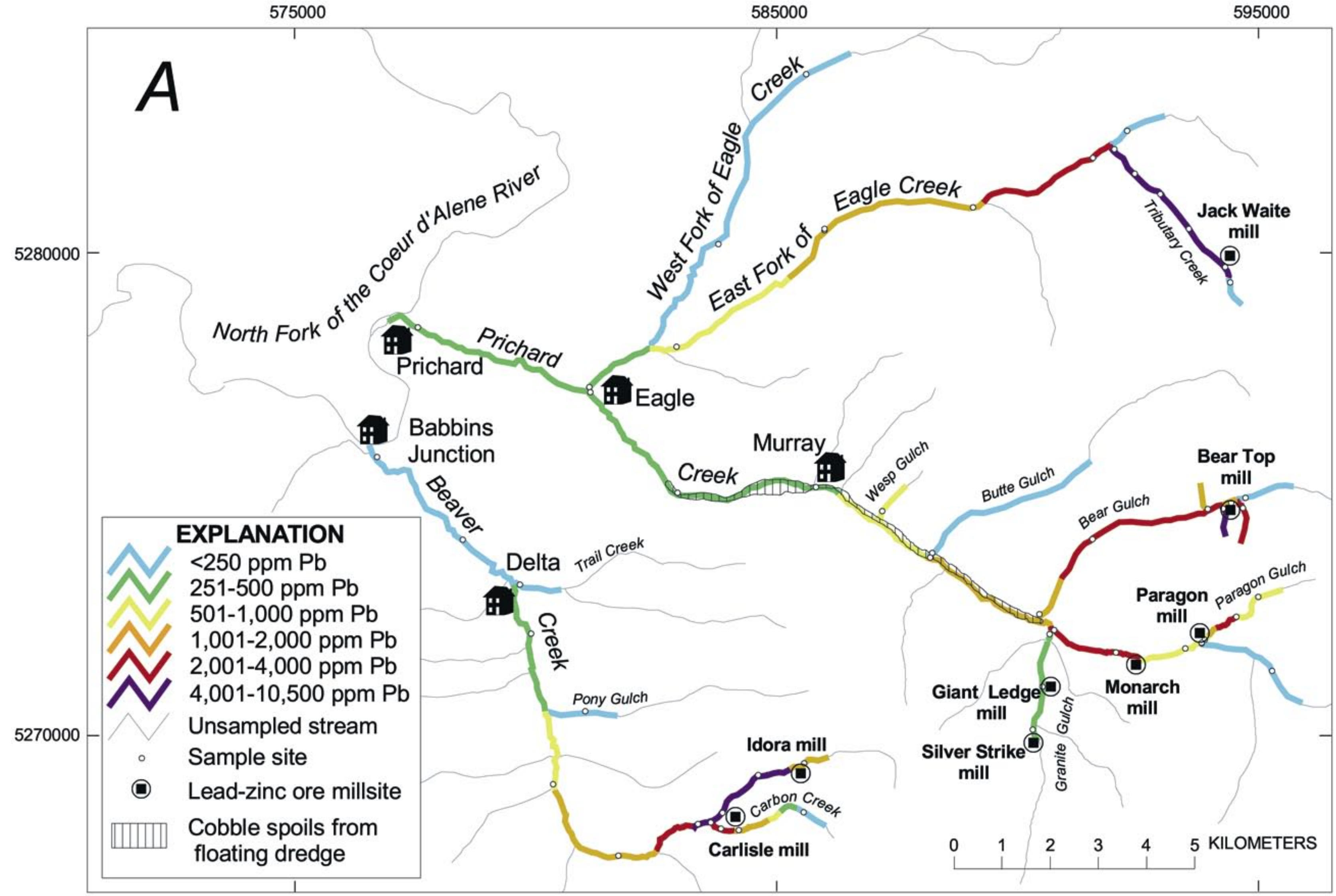
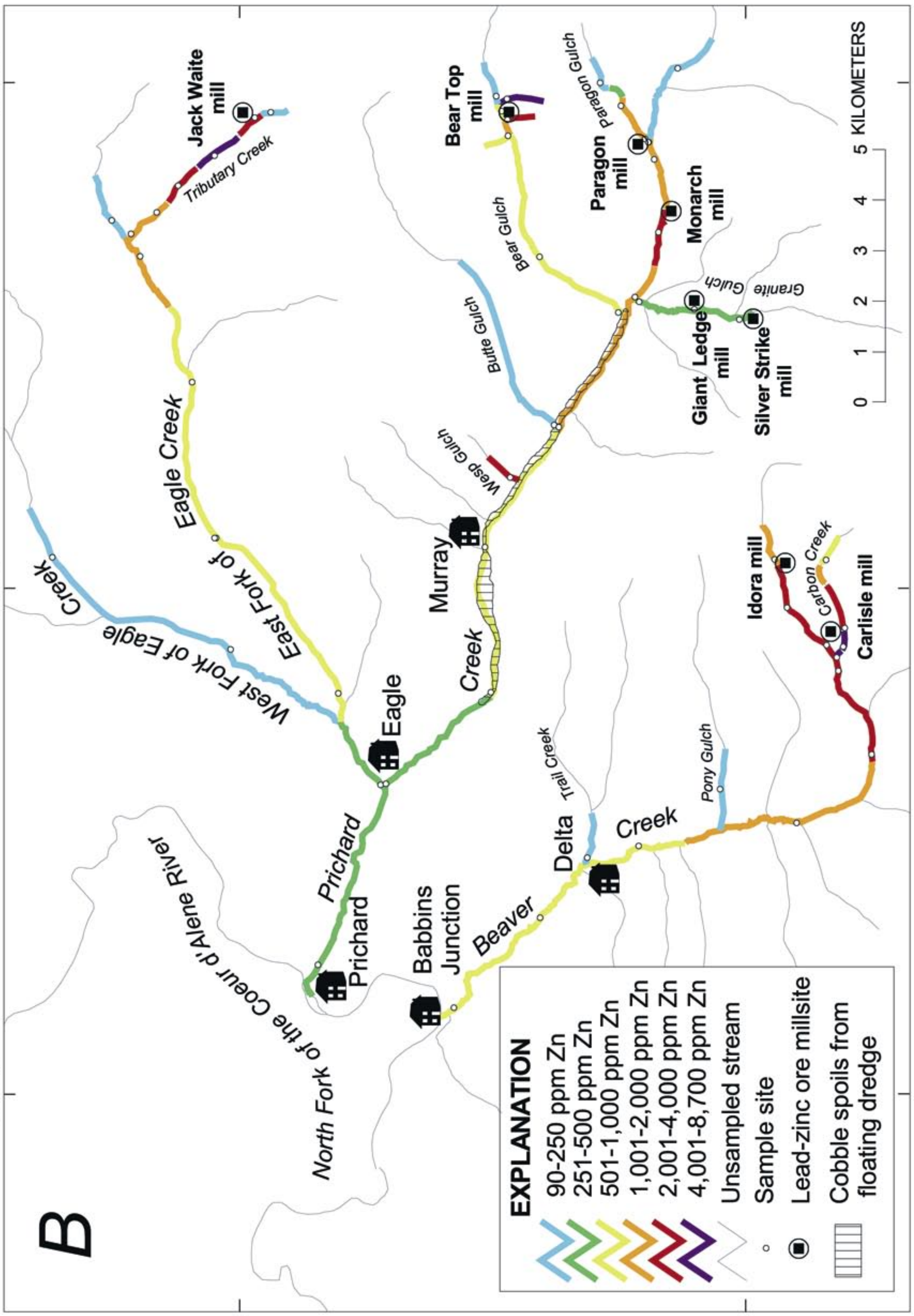


Figure 9. Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho (figs. 1, 2), showing ranges of Pb (*A*), Zn (*B*), As (*C*), and Hg (*D*) contents in fine (<0.063-mm grain size) fraction of streambed sediment along segments of streams, extrapolated from measured values at discrete sampling sites. Locations of stream-segment boundaries were interpolated from measured values at discrete sampling points or extrapolated to tributary junctions by inferred relations to either metal-poor or metal-enriched inflowing tributaries. Locations of major lead-zinc ore millsites, the source of a significant proportion of metal-enriched sediment, are also shown. Background values, based on samples from the unimpacted West Fork of Eagle Creek: Pb, 82±16 ppm; Zn, 113±15 ppm; As, 11±1 ppm; Hg, 0.06±0.01 ppm.



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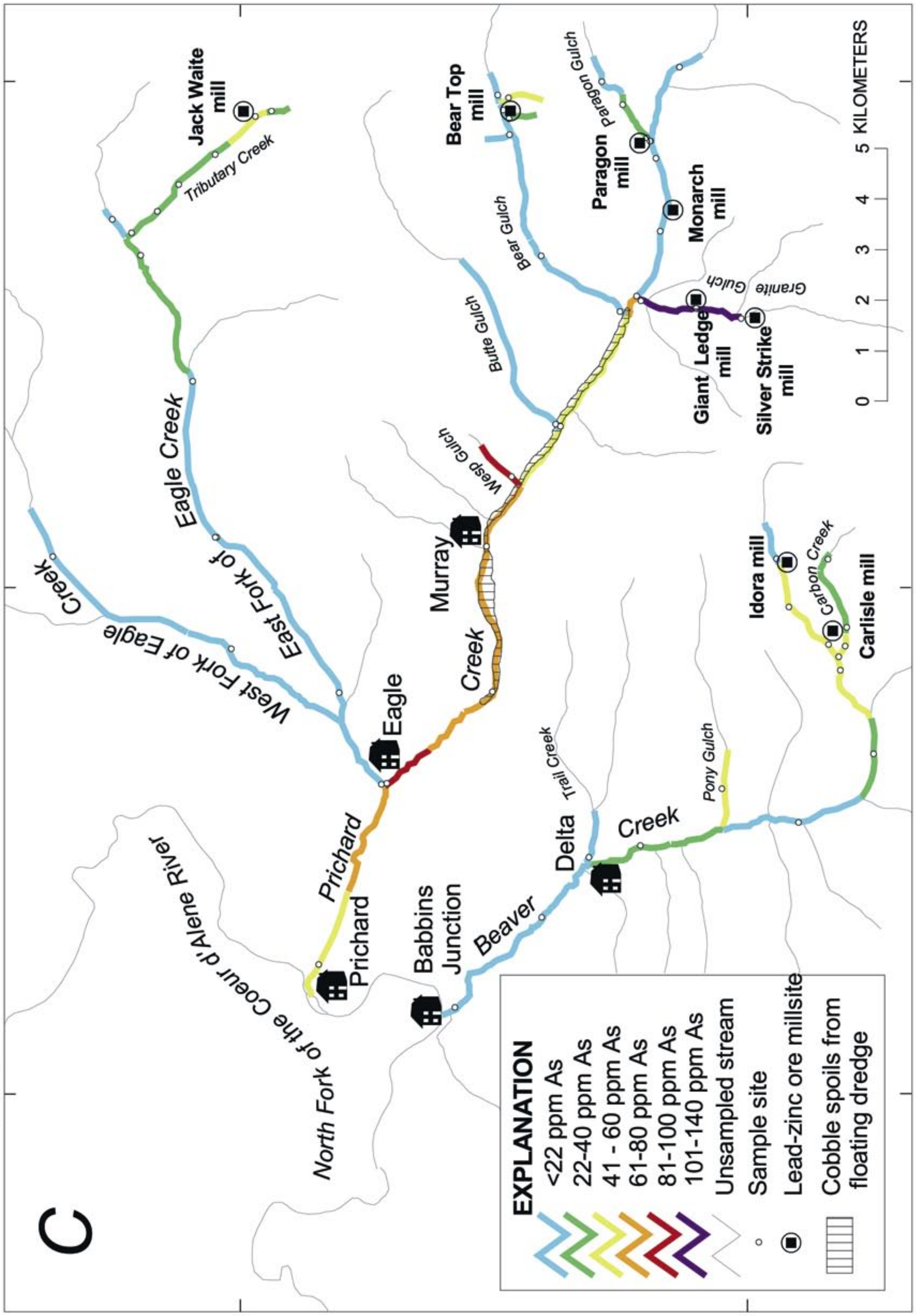

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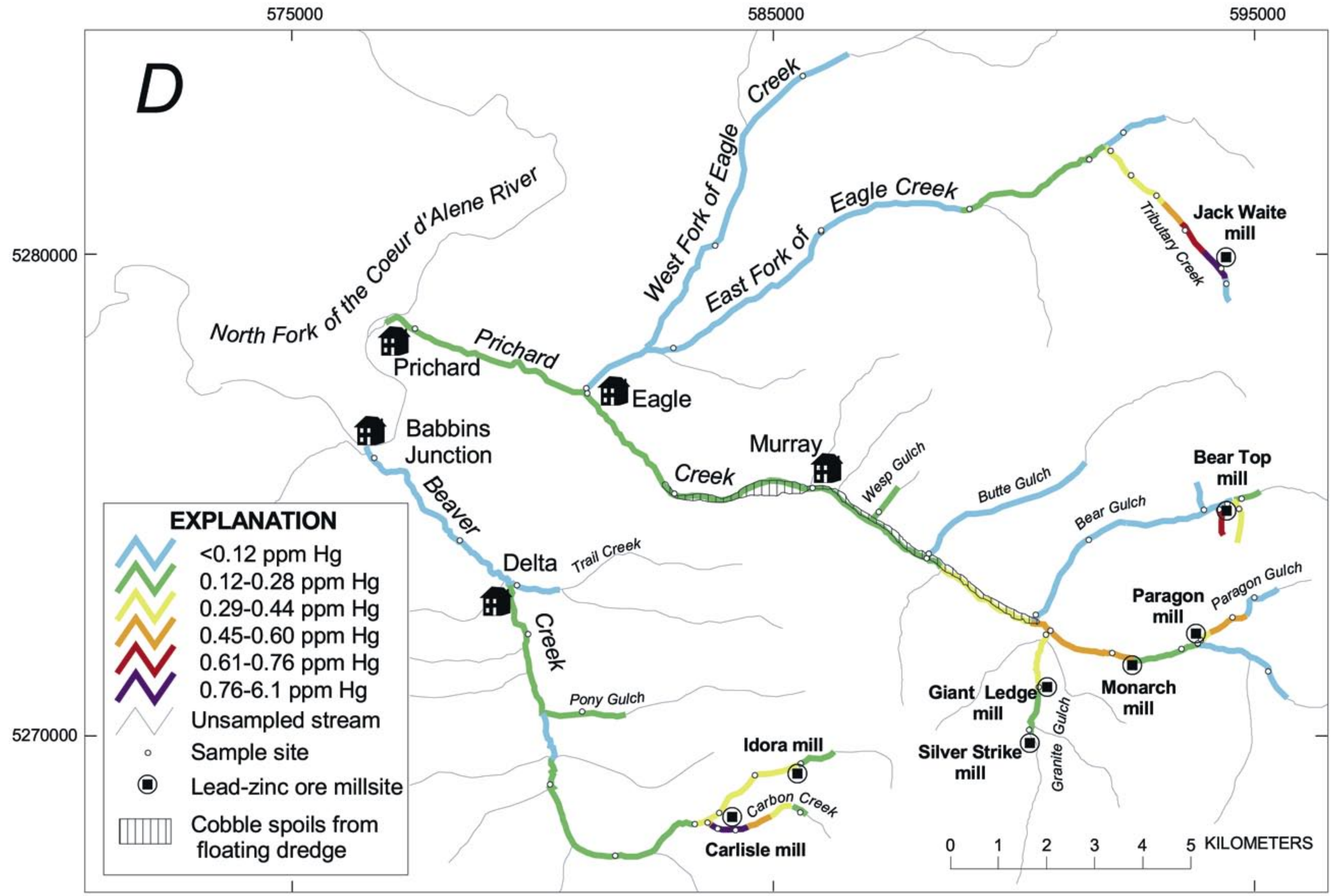

Figure 9.—Continued

(figs. 2-5). Weaker enrichments of mercury are also associated with the Bear Top, Paragon, Monarch, Giant Ledge, and Idora millsites. The downstream decrease in Hg content to less than 2 times background value occurs about 4 km below the confluence of Tributary Creek and the East Fork of Eagle Creek, and about 5 km below the confluence of Carbon and Beaver Creeks, although a minor enrichment of mercury due to input from Pony Gulch occurs in middle Beaver Creek. Hg contents are greater than 3 times background value to the mouth of Prichard Creek; the persistence of this enrichment of mercury may be due to a small but widespread contribution from discarded processing mercury associated with placer and lode gold mining in the Murray-Eagle area (fig. 2).

Prichard Creek

The locations of sampling sites for streambed and suspended sediment in Prichard Creek are shown in figure 2, and the locations of mines and millsites and of sampling sites for streambed sediment, streambank soil, and artificial-fill material along upper Prichard Creek and its tributaries are shown in figure 3. The Pb, Zn, As, and Hg contents in three grain-size fractions of streambed sediment and in suspended sediment from the main stem of Prichard Creek are plotted against distance upstream from its mouth in figure 10, along with data for the fine (<0.063-mm grain size) fraction from near the mouths of several tributaries (Eagle Creek and Bear, Paragon, Granite, and Wesp Gulches) at their confluences with Prichard Creek.

Maximum enrichments of mining-related elements in streambed sediment in Prichard Creek (fig. 10) generally occur upstream from Murray (figs. 2) except for arsenic, which peaks from Murray to Eagle. The farthest-upstream sample from Prichard Creek, upstream of mining impacts, has the lowest Pb and Zn contents in the entire sample set. Metal contents increase downstream past the Paragon millsite and again past the Monarch millsite. Pb, Zn, and Hg contents peak in Prichard Creek just below the Monarch millsite and decrease sharply to the vicinity of the town of Murray, then more gradually downstream. As content increases only slightly past the Paragon and Monarch millsites but increases sharply below the inflow of As-rich sediment from Granite Gulch, then again at Murray below the inflow of arsenic-rich sediment from Wesp Gulch (fig. 9*C*).

In the Prichard Creek drainage basin (figs. 2, 3), Hg contents consistently decrease with increasing grain size in all samples of streambed sediment (mean ratio in fine over coarse fractions, 3.5); Pb and Zn contents mostly decrease with increasing grain size (mean ratios in fine over coarse fractions, 1.5 and 1.3, respectively). As content is highest in the fine fractions of only three of eight samples and is highest in either the intermediate or coarse fraction of the other five samples.

During sampling of suspended sediment from the high-runoff event of April 14, 2000, Prichard Creek above the confluence of Butte Gulch (figs. 2, 3) was relatively clear (suspended-sediment concentration, 13–30 mg/L, table 6), and snow blanketed the streambanks. Chocolate-brown suspended-sediment-laden water (suspended-sediment concentration, 683 mg/L, with background metal contents; sample 00SB–BU1, table 6) flowed out of Butte Gulch into Prichard Creek, which remained highly turbid to its mouth. Upstream from the inflow of Butte Gulch, Pb and Zn contents were high in the sparse suspended sediment of Prichard Creek but lower than those in the fine (<0.063-mm grain size) fraction of streambed sediment at each sampling site (As and Hg contents were below analytical detection limits in the small samples.) At Murray, 3 km downstream from the inflow of Butte Gulch, Pb and Zn contents in suspended sediment were similar to, and As and Hg somewhat less than, those in the fine fraction of streambed sediment at the same sampling sites. By the mouth of Prichard Creek, all four metal contents are the same in suspended sediment and in the fine fraction of streambed sediment at the same sampling sites. This downstream increase in compositional similarity between suspended sediment and the fine fraction of streambed sediment presumably reflects a gradual substitution of suspended material inflowing into Prichard Creek from Butte Gulch with resuspended material from the fine fraction of streambed sediment in Prichard Creek.

The spatial and compositional relations between streambed sediment, streambank soil, and impounded tailings along upper Prichard Creek and its mined tributaries are illustrated in figure 11. Significant element enrichments in streambed sediment occur in each stream below each streamside millsite, although the metal contents in streambed sediment are significantly lower than those in adjacent impounded tailings. If the metal-enriched sediment is interpreted as a mixture of native sediment and tailings, only about 1 to 3 percent tailings would be required to account for the Pb (a relatively insoluble element) content in the fine (<0.063-mm grain size) fraction of streambed sediment below each millsite.

Streambank soil represents both a potential source (through erosion) of material to streambed sediment and a record of past overbank deposition during channel-overflow floods. Because overbank deposits are derived from mobilized streambed sediment, the compositions of historically deposited streambank-soil horizons can be compared with those of present streambed sediment to test for temporal changes in the composition of streambed sediment. For example, the high metal content in streambank soil just downstream from the Bear Top millsite (fig. 11) is similar to that of impounded tailings just upstream, suggesting that tailings were once the dominant component of stream sediment near the millsite. In contrast, the metal contents in samples of streambank soil collected along Prichard Creek below both the Paragon and Monarch millsites have that are the same as or less than those in samples of the adjacent streambed sediment; no evidence exists that tailings input to this reach of Prichard Creek was ever significantly more in the past than at present.

Eagle Creek

The locations of sampling sites for streambed and suspended sediment in Eagle Creek are shown in figure 2, and the locations of mines and millsites and of sampling sites for

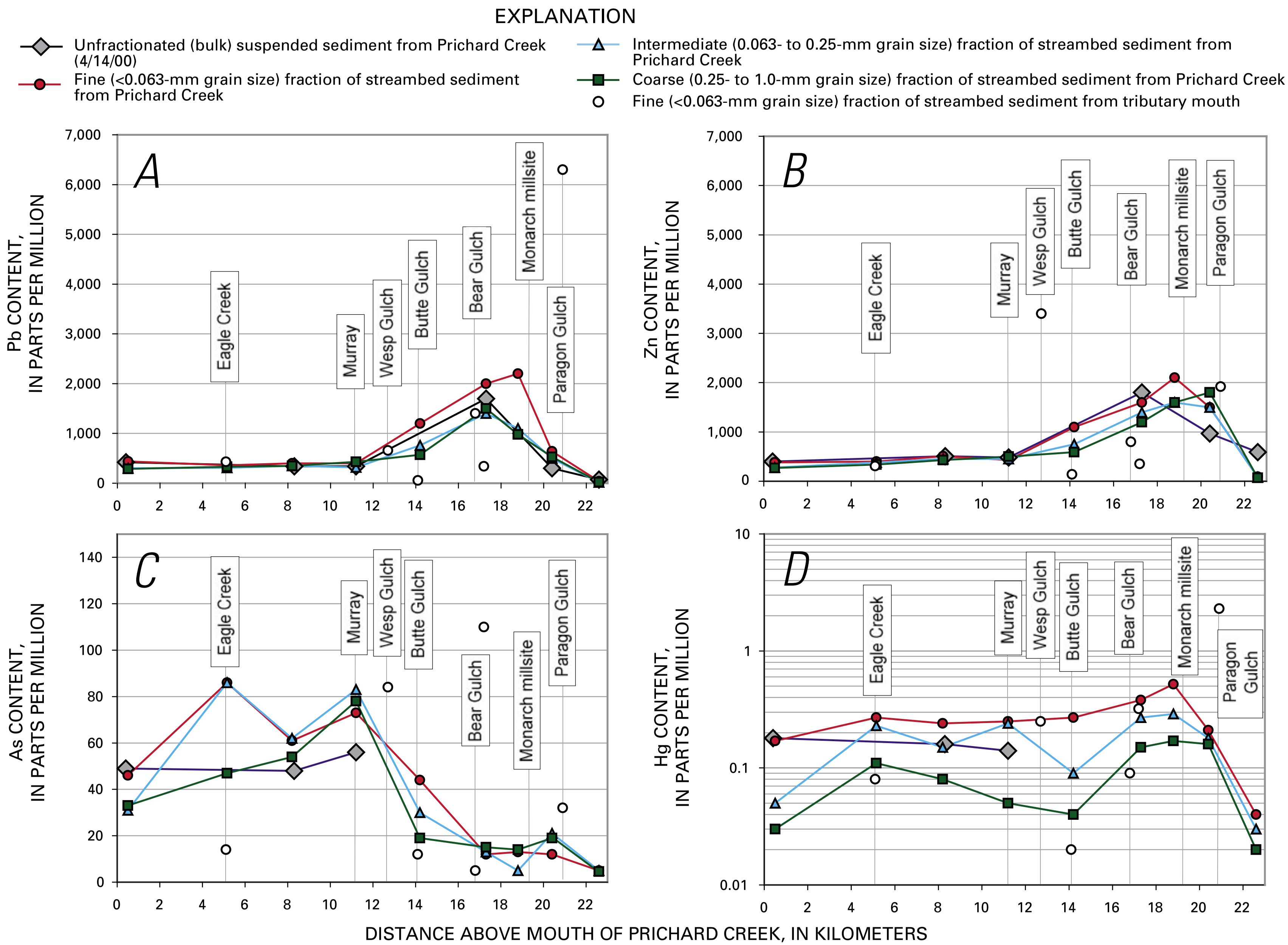

Figure 10. Pb (*A*), Zn (*B*), As (*C*), and Hg (*D*) contents in three grain-size fractions of samples of streambed sediment and in samples of unfractionated (bulk) suspended sediment collected from the Prichard Creek drainage basin in the northern Coeur d'Alene Mining District, northern Idaho (figs. 1, 2), versus distance upstream from mouth of Prichard Creek, beginning (at right) at head of Prichard Creek and continuing down to mouth. Data points for samples of fine (<0.063-mm grain size) fraction of streambed sediment from tributaries to Prichard Creek are plotted at location of confluence of tributary and Prichard Creek.

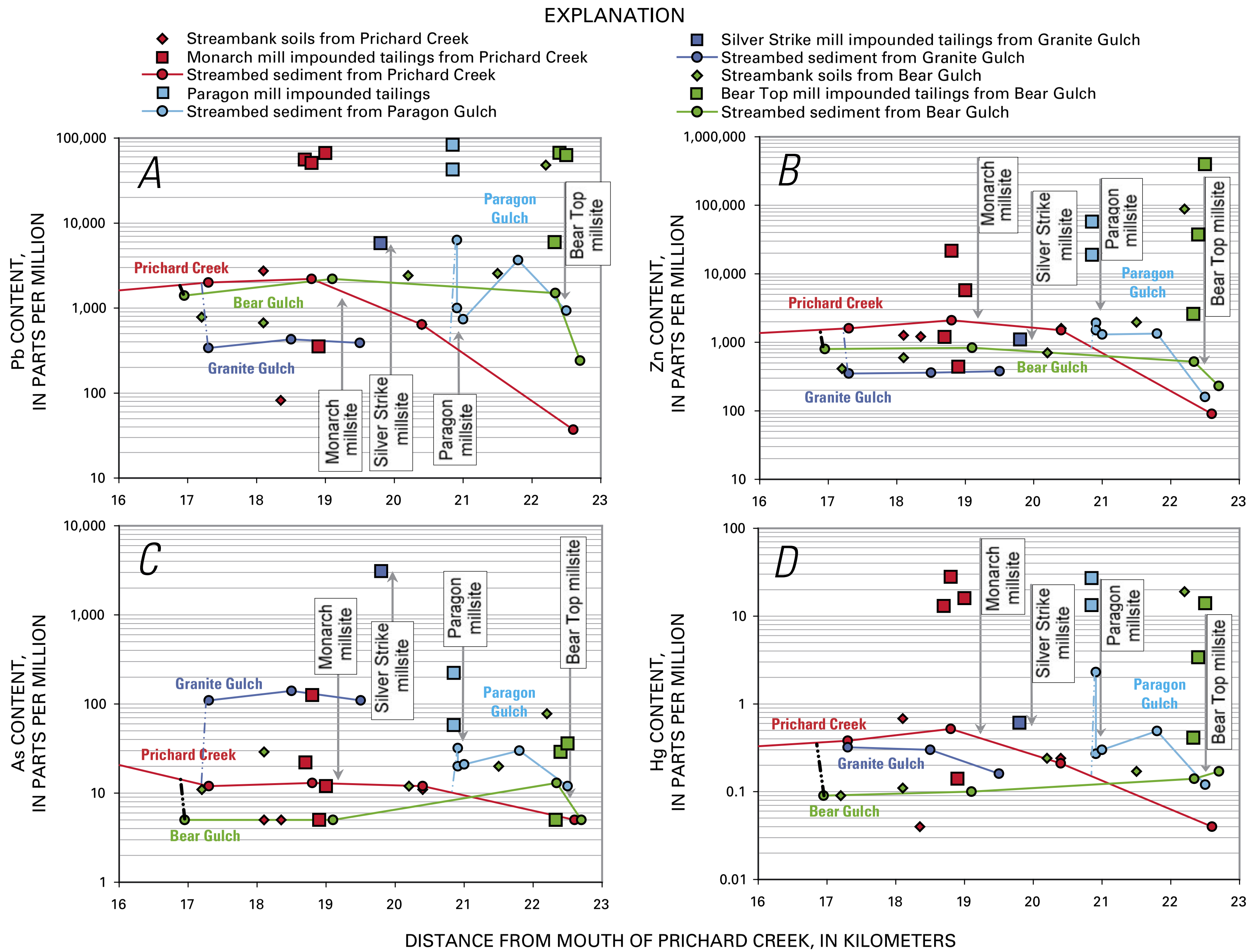

Figure 11. Pb (*A*), Zn (*B*), As (*C*), and Hg (*D*) contents in fine (<0.063-mm grain size) fraction of samples of streambed sediment, streambank soil, and impounded tailings collected from Prichard Creek and Paragon, Granite, and Bear Gulches in the northern Coeur d'Alene Mining District, northern Idaho (fig. 3), versus distance upstream from mouth of Prichard Creek, with locations of four historical lead-zinc ore-concentration mills along stream labeled. Data for Paragon mill gravity tailings from Johnson (1999).

streambed sediment, streambank soil, and artificial-fill material along Tributary Creek and the upper East Fork of Eagle Creek are shown in figure 4. The Pb, Zn, As, and Hg contents in three grain-size fractions of streambed sediment and in samples of suspended sediment collected from the main stem of Eagle Creek, the East Fork of Eagle Creek, and Tributary Creek versus distance upstream from the mouth of Eagle Creek are plotted in figure 12, along with data for the fine (<0.063-mm grain size) fraction of streambed sediment from near the mouths of two tributaries (upper East Fork of Eagle Creek above the Tributary Creek confluence, and the West Fork of Eagle Creek) at their confluence with the East Fork of Eagle Creek.

Maximum enrichments of mining-related elements (Pb, Zn, As, Hg) in streambed sediment of the Eagle Creek drainage basin (fig. 12) generally occur on Tributary Creek and on the East Fork of Eagle Creek for some distance below the Tributary Creek confluence (fig. 2). Streambed sediment from Tributary Creek 150 m upstream from the Jack Waite Mine portal (km 17.4, fig. 12) has background values of lead, zinc, and mercury but is relatively arsenic rich. Just below the mine portal (next sample downstream, fig. 12), Pb, As, and Hg contents peak in the Eagle Creek drainage basin (figs. 2, 4); Zn content peaks at the next sampling site downstream, below the Jack Waite millsite. Metal contents decrease sharply below the millsite and the first two tailings impoundments, and thence decrease irregularly to the confluence with the East Fork of Eagle Creek. Below the confluence of Tributary Creek and the East Fork of Eagle Creek, metal contents in streambed sediment decrease more gradually to the mouth of Eagle Creek.

In the Eagle Creek drainage basin (figs. 2, 4), the generalization that metal contents decrease with increasing grain size is consistently true only for mercury. The Hg content in the fine (<0.063-mm grain size) fraction of streambed sediment averages 4 times greater than that in the coarse (0.25- to 1.0-mm grain size) fraction. The difference in Pb and Zn contents between grain-size fractions is much less than that in Hg content; the average fine-fraction/coarse-fraction ratios for Pb and Zn contents are 1.7 and 1.3, respectively. Although the fine fraction of each sample generally has the highest Pb and Zn contents of the three grain-size fractions (with a few exceptions), the Pb and Zn contents in the coarse fraction can be either higher or lower than that in the intermediate (0.063- to 0.25-mm grain size) fraction. The coarse fraction has the highest As content in 7 of 11 samples, most commonly followed by the fine fraction. The metal contents in the two samples of suspended sediment collected from the main stem and East Fork of Eagle Creek are generally similar to, but slightly greater than, those in the fine fraction of streambed sediment at each sampling site.

The metal contents in the fine (<0.063-mm grain size) fraction of streambed sediment, streambank soil, and artificial-fill material at sampling sites of potential sources of metals along Tributary Creek above its confluence with the East Fork of Eagle Creek (figs. 2, 4) are plotted in figure 13. The metal contents in samples of streambed sediment are similar to, but slightly less than, those in samples collected from the Jack Waite mill tailings impoundments, suggesting that the fine fraction of streambed sediment is derived dominantly from tailings mixed with a much smaller component of the native premining sediment of Tributary Creek, represented by the sample upstream from the Jack Waite Mine portal. Samples of streambank soil near the confluence of Tributary Creek and the East Fork of Eagle Creek (figs. 4, 13), which have metal contents higher than those in the present stream sediment, are inferred to represent deposits either from tailings released to the stream before construction of the first tailings impoundment in December 1930, or from erosion of an early tailings impoundment by a major early flood, such as that of December 1933, the second- or third-largest flood since European-American settlement of the mining district.

Beaver Creek

The locations of sampling sites for streambed and suspended sediment in Beaver Creek are shown in figure 2, and the locations of mines and millsites and of sampling sites for streambed sediment, streambank soil, and artificial-fill material in the drainage of upper Beaver Creek are shown in figure 5. The Pb, Zn, As, and Hg contents in three grain-size fractions of streambed sediment and in unfractionated suspended sediment from the main stem of Beaver Creek versus distance upstream from its mouth are plotted in figure 14, along with data for the fine (<0.063-mm grain size) fraction of stream sediment from several tributaries (Pony Gulch and Carbon and Trail Creeks) at their confluences.

Maximum enrichments of mining-related elements (Pb, Zn, As, Hg) in streambed sediment of the Beaver Creek drainage basin (fig. 2) occur upstream from the Dobson Pass Road Bridge (fig. 5). Metal contents in the farthest-upstream samples from both Beaver and Carbon Creeks appear to be significantly higher than background values; presumably, the mine workings in each drainage above those points have contributed small amounts of metal-enriched sediment to the streams. Peak contents of various metals in the streambed sediment occur at different places along the stream. Pb content peaks just below the Idora millsite and decreases sharply to the Dobson Pass Road Bridge, then more gradually to the mouth of Beaver Creek. Zn and As contents also increase below the Idora millsite but peak just below the confluence of Carbon Creek, apparently owing to the addition of metal-enriched material from that drainage. Hg content also increases below the Idora millsite but peaks just above the confluence of Carbon Creek. Although Hg and As contents decrease from the Carbon Creek confluence to the mouth of Beaver Creek, both Hg and As contents increase slightly in the fine fraction of streambed sediment below Pony Gulch, apparently owing to the contribution of metal-enriched material from that drainage. Kauffman and others (1999a) reported the existence of a lode gold mine in upper Pony Gulch that may be the source of that material.

In the Beaver Creek drainage basin (figs. 2, 5), metal contents decrease with increasing grain size in all samples of streambed sediment for mercury (mean ratio in fine over

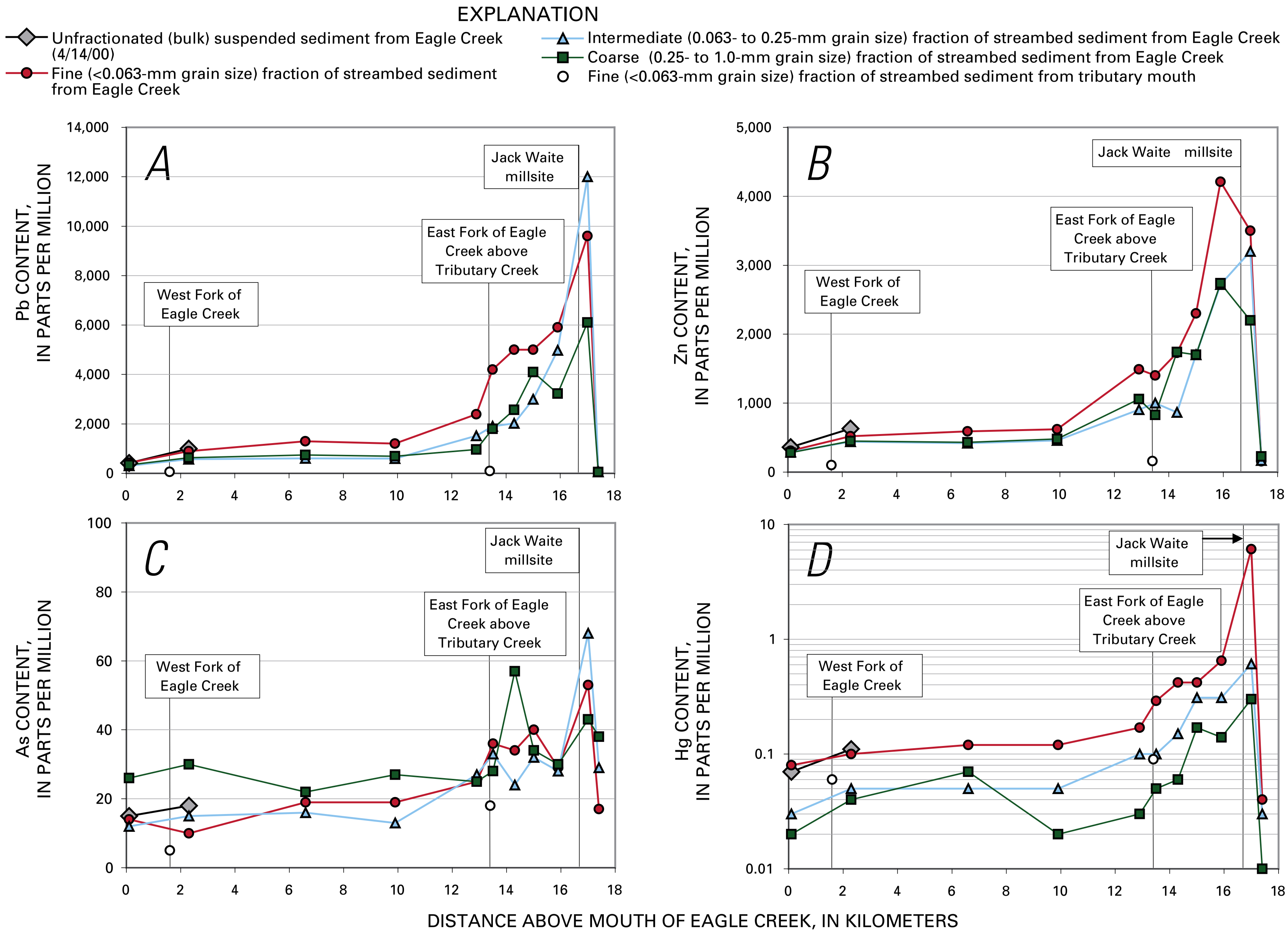

Figure 12. Pb (*A*), Zn (*B*), As (*C*), and Hg (*D*) contents in three grain-size fractions of samples of streambed sediment and in samples of unfractionated (bulk) suspended sediment collected from the Eagle Creek drainage basin in the northern Coeur d'Alene Mining District, northern Idaho (figs. 1, 2), versus distance upstream from mouth of Eagle Creek, beginning (at right) at head of Tributary Creek and continuing down the East Fork of Eagle Creek to mouth of main stem of Eagle Creek. Data points for fine (<0.063-mm grain size) fraction of streambed sediment from tributaries to Eagle Creek are plotted at confluence of tributary and Eagle Creek.

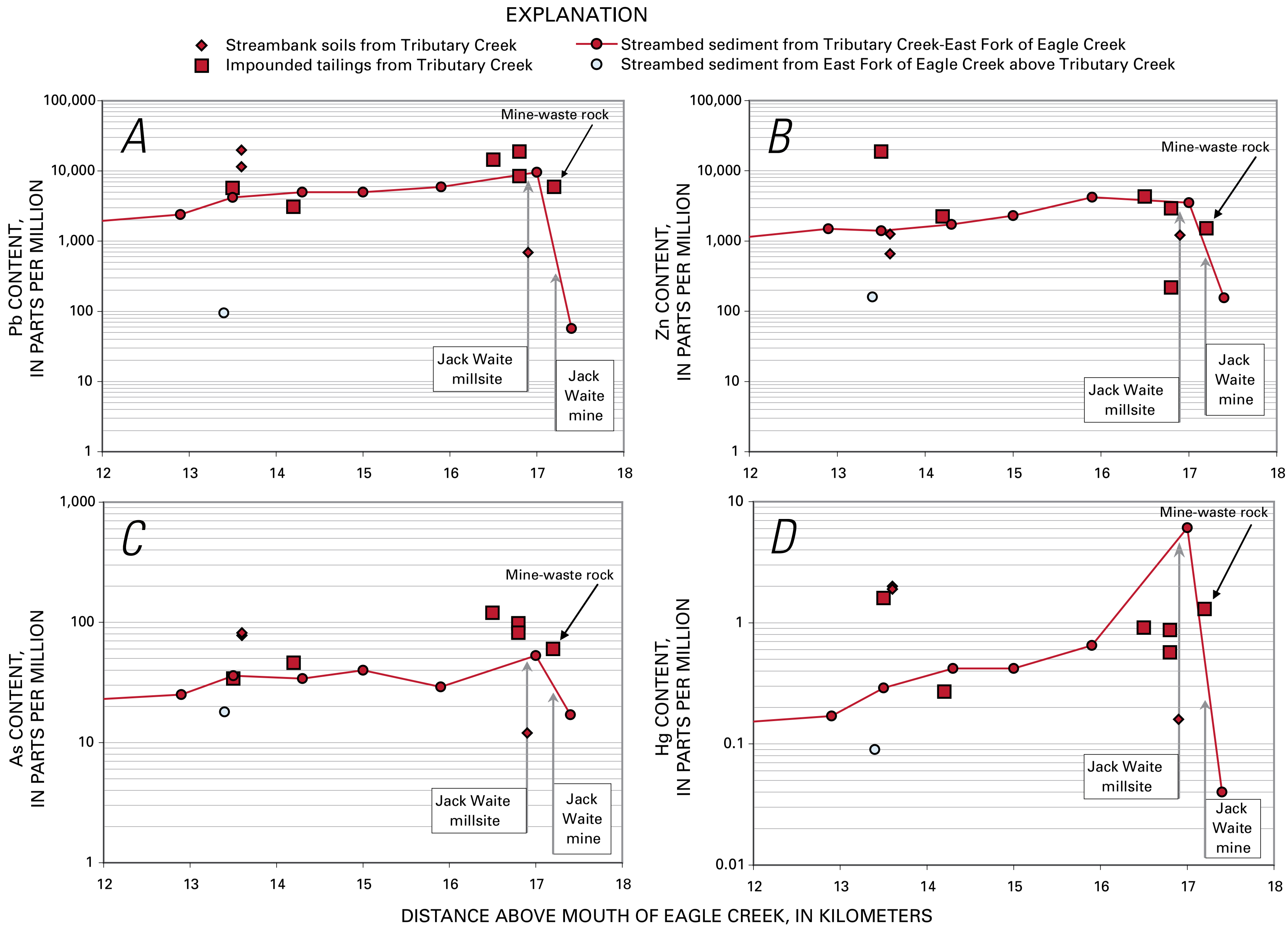

Figure 13. Pb (*A*), Zn (*B*), As (*C*), and Hg (*D*) contents in fine (<0.063-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material (impounded tailings except where noted) collected from Tributary Creek and immediately downstream segment of the East Fork of Eagle Creek in the northern Coeur d'Alene Mining District, northern Idaho (fig. 4), versus distance upstream from mouth of Eagle Creek, with locations of the Jack Waite (Pb-Zn) Mine and its ore-concentration mill along stream labeled.

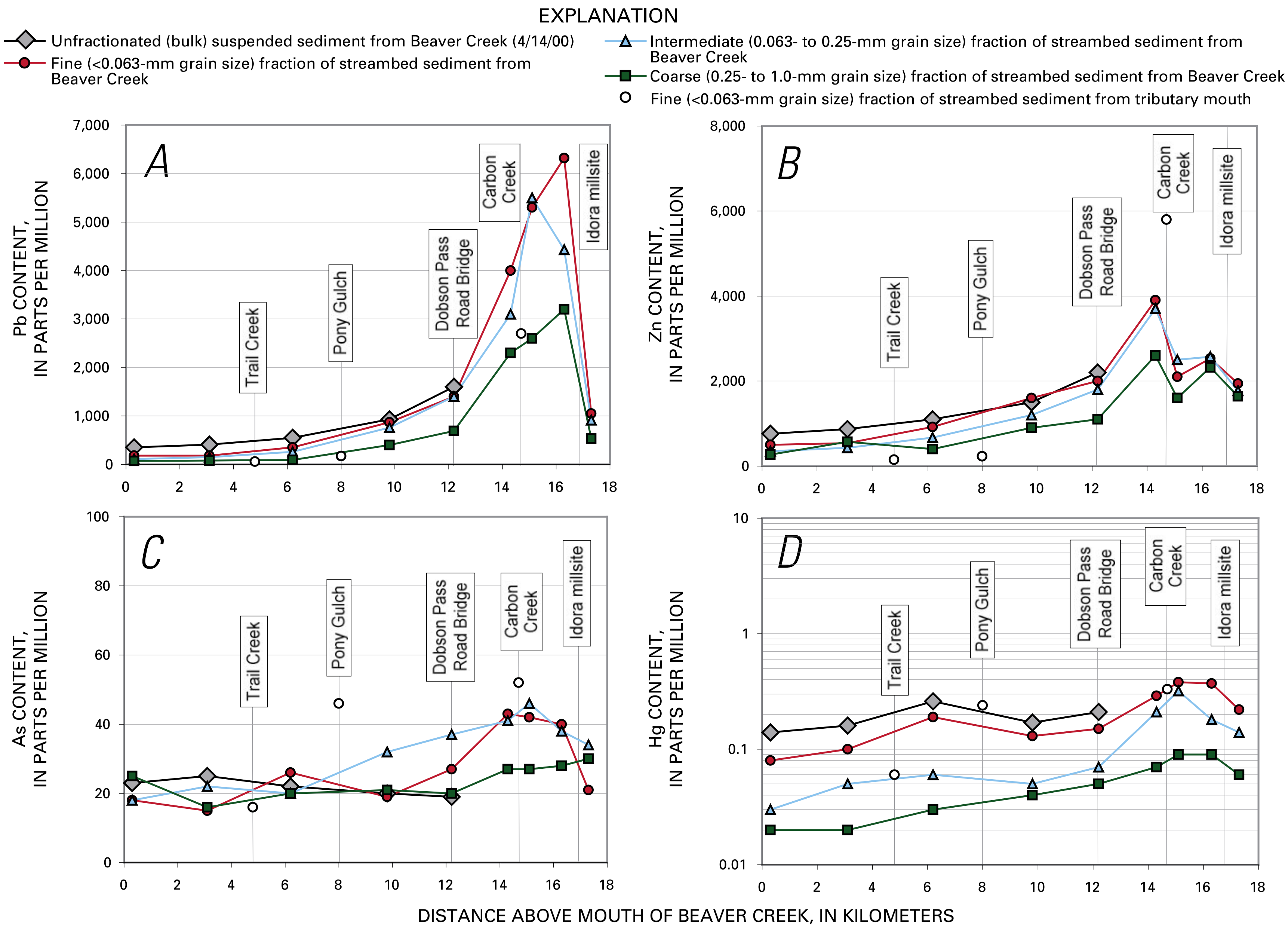

Figure 14. Pb (*A*), Zn (*B*), As (*C*), and Hg (*D*) contents in three grain-size fractions of samples of streambed sediment and in samples of unfractionated (bulk) suspended sediment in the Beaver Creek drainage basin in the northern Coeur d'Alene Mining District, northern Idaho (figs. 1, 2), versus distance upstream from mouth of Beaver Creek, beginning (at right) at head of creek and continuing down to mouth. Data points for samples of fine (<0.063-mm grain size) fraction of streambed sediment from tributaries to Beaver Creek are plotted at confluence of tributary and Beaver Creek.

coarse fractions, 4.2) and, less consistently, in most samples for lead and zinc (mean ratios in fine over coarse fraction, 2.3 and 1.5, respectively). As content is highest in the fine fraction of only a third of the samples and most typically (in five of nine samples) is highest in the intermediate (0.063- to 0.25-mm grain size) fraction. The Pb, Zn, and Hg contents in unfractionated samples of suspended sediment collected from Beaver Creek during the high-flow event of April 14, 2000, generally are slightly higher than those in the fine fraction of streambed sediment at each sampling site. However, the As content in suspended sediment, though generally similar to that in streambed sediment, shows no consistent relation to that in any of the grain-size fractions.

The metal contents in the fine (<0.063-mm grain size) fraction of streambed sediment, streambank soil, and artificial-fill material at sampling sites of potential sources of metals along upper Beaver Creek and its tributaries (figs. 2, 5) are plotted in figure 15. In upper Beaver Creek (above the Carbon Creek confluence), gravity tailings from the Idora mill, which show strong element enrichments over present streambed sediment, are clearly the source of the middle unit of streambank soil downstream (see next paragraph), on the basis of Pb and Hg contents. The metal contents in Carlisle mill flotation tailings are much lower, overlapping with, but mostly less than, those in adjacent streambed sediment. The high metal contents of the present streambed sediment of upper Beaver Creek cannot result from erosion of Carlisle mill flotation tailings but most likely are due to erosion of Idora mill tailings impoundments and of streambank soil rich in Idora mill tailings.

In the upper Beaver Creek drainage, unconsolidated streambank deposits (ranging in grain size from silt to coarse angular cobbles, here called simply “soil”) are here divided into lower, middle, and upper units, depending on their relative stratigraphic position. The lower unit consists of pebble to cobble conglomerate with a dark-brown, organic-rich fine matrix; the middle unit consists of red-brown sandy material; and the upper unit consists of light-colored, sand-poor, pebble-cobble gravel. As mentioned above, the high metal content in the middle unit of streambank soil and its downstream decrease suggests that this material represents overbank sediment deposited from the stream channel when aggraded with gravity tailings from the Idora mill. We suspect that aggradation of the streambed and deposition of the middle unit of streambank soil occurred during or soon after operation of the Idora mill (1913–17). The very high Zn content in sample 105A at km 14.7 (figs. 5, 15) may approximate that in the original unweathered tailings; this sample is the only unoxidized material collected from the middle unit of streambank soil or from the Idora mill gravity tailings (deposited behind a 1.5-m-high plank dam across the stream that was subsequently breached). The upper unit of streambank soil records overbank deposition of coarse, subangular streambed materials when the stream bed was aggraded by an influx of coarse colluvial material. Vertical black-and-white USFS aerial photographs taken in 1937 show large deforested areas on the slopes above upper Beaver Creek and several major avalanche chutes that had built visible debris cones of colluvial material in the valley bottom. We suspect that the heavy influx of this colluvial material would clog the stream channel and would result in more common overbank-flood events, depositing the coarse upper unit of streambank soil during that period. Subsequent to this aggradational episode, the previously aggraded deposits were eroded from the streambed, lowering its elevation and leaving an aggraded alluvial bench along the stream that is rarely inundated. Metal contents of the upper unit of streambank soil are intermediate between those of the jig-tailings-rich middle unit of streambank soil and the present streambed sediment (fig. 15).

Enrichments of mining-related elements in the streambed sediment of Carbon Creek show a pattern distinct from those in the streambed sediment of Beaver Creek (fig. 15). Metal contents in the farthest-upstream sample (10, fig. 5) collected from Carbon Creek are above background values, presumably owing to contributions from mine drainage and mine-waste-rock dumps still farther up the drainage. Metal contents increase downgradient, even upstream of the significant disturbances at the Carlisle Mine portal, most likely owing to contributions from mine drainage and mine-waste-rock dumps associated with the Amazon-Manhattan Mine/Blue Grouse-Mountain Goat Mine trend of workings (fig. 5). The Pb, Zn, and Hg contents in the streambed sediment of Carbon Creek peak below the Carlisle Mine portal and decrease farther downstream below the Carlisle millsite. Enrichments of mining-related elements in the streambed sediment of Carbon Creek above the Carlisle millsite cannot be the result of mill-tailings release but must be due primarily to erosion of mine-waste-rock dumps and to precipitation of dissolved elements from mine drainage (such as from the Carlisle Mine portal; see Ott and Clark, 2003) and, possibly, from ground water draining through the mine-waste-rock dumps.

Enrichments of Mining-Related Elements over Background Values

The enrichment of each of four mining-related elements (Pb, Zn, As, Hg) in streambed sediment over background values and their interrelations differ for each drainage in the study area (figs. 1, 2, 16). For example, in Eagle Creek, the relative order of enrichment is Pb>Zn>Hg>As consistently along the length of the stream (except for a spike in Hg content below the Jack Waite Mine portal). In contrast, Beaver Creek shows a similar pattern above its junction with Carbon Creek, but farther downstream the relative enrichment of lead decreases more rapidly than those of the other three elements, such that the relative order of enrichment is Zn>Pb>Hg>As in lower Beaver Creek. In Prichard Creek, no enrichment of arsenic is associated with those of the other three elements above Granite Gulch. The As content in stream sediment increases below the confluence with Granite Gulch but continues to increase farther downstream, suggesting other sources of arsenic enrichment (for example, waste materials from lode gold mines) along lower Prichard Creek.

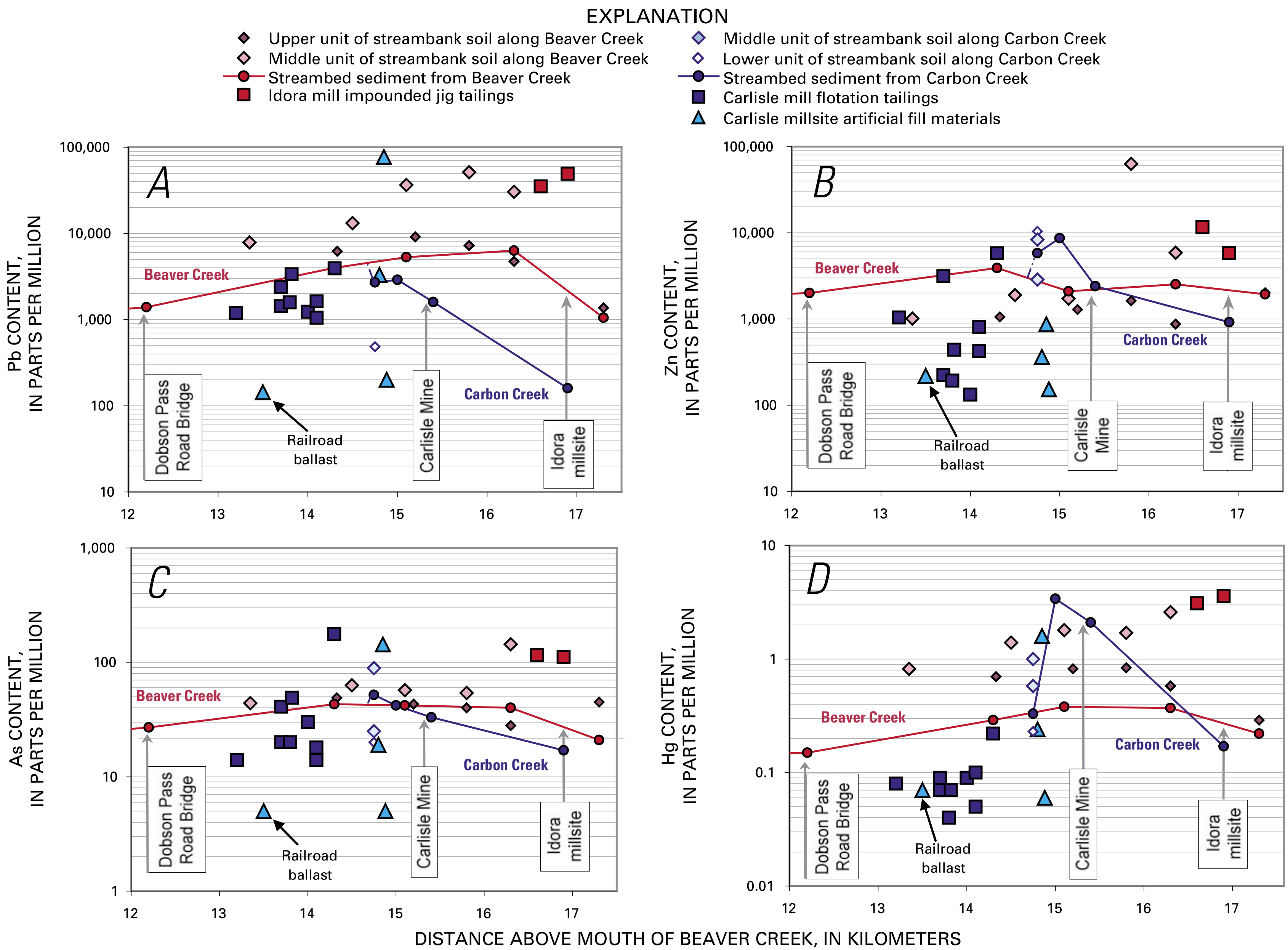

Figure 15. Pb (*A*), Zn (*B*), As (*C*), and Hg (*D*) contents in fine (<0.063-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material (impounded tailings except where noted) collected from Beaver and Carbon Creeks in the northern Coeur d'Alene Mining District, northern Idaho (fig. 5), versus distance upstream from mouth of Beaver Creek, with locations of two historical Pb-Zn ore-concentration mills and one major mine portal along stream labeled.

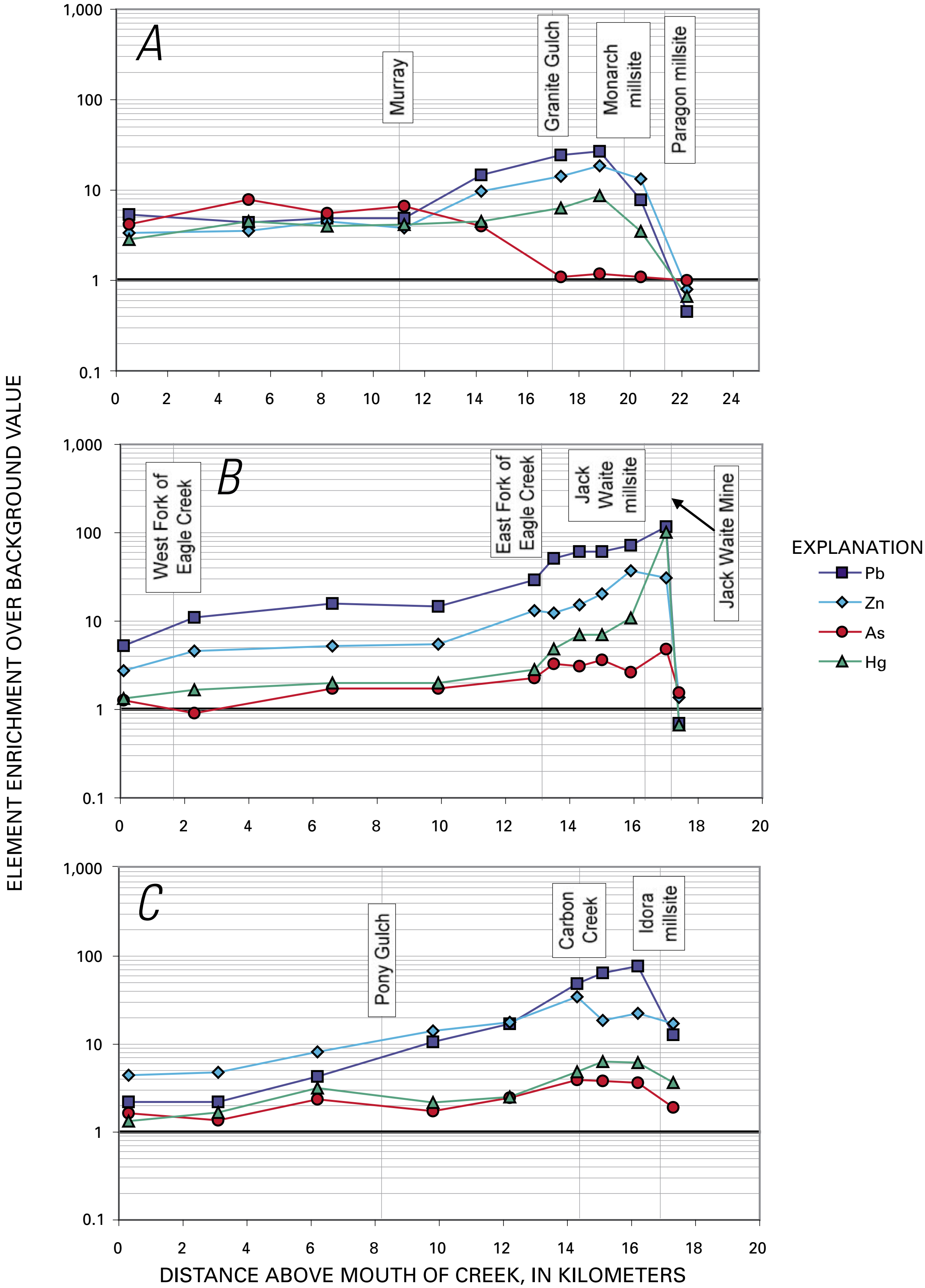

Figure 16. Enrichments of lead, zinc, arsenic and mercury over background values in fine (<0.063-mm grain size) fraction of samples of streambed sediment collected from Prichard Creek (*A*), Tributary Creek and East Fork and main stem of Eagle Creek (*B*), and Beaver Creek (*C*) in the northern Coeur d'Alene Mining District, northern Idaho (figs. 1, 2); background values based on mean Pb, Zn, As, and Hg contents in fine fraction of three samples of streambed sediment collected from the unimpacted West Fork of Eagle Creek.

Proportion of Metal Mass in the Fine Fraction of Streambed Sediment

In figures 10, 12, and 14, the metal contents in the fine (<0.063-mm grain size) fraction of streambed sediment are generally higher than those in either the intermediate (0.063- to 0.25-mm grain size) or the coarse (0.25- to 1.0-mm grain size) fraction. However, because the weight percentage of each grain-size fraction was measured (table 5), the proportion of the total mass of each metal in each analyzed sample that resides in each grain-size fraction can be calculated. A plot of the median percentages of the total mass of each metal in each grain-size fraction by drainage basin (fig. 17) shows that relatively little (~10 percent) is carried in the fine fraction (clay and silt) and that most (~65 percent) is carried in the coarse fraction (medium to coarse sand). This difference results from the much greater mass of the coarse fraction than of the other two fractions, even though the metal contents in the finer grain sizes actually are slightly higher. Although differences exist between drainages in the proportions of each metal carried in the fine fraction (fig. 18), in each drainage the percentage of metal mass in the fine fraction is highest for mercury, followed by lead, zinc, and arsenic. Plots of the percentage of the total mass of each metal in the fine fraction of each sample against downstream location (fig. 18) indicate relatively little systematic change downstream, although generally more of the metal load is carried in the fine fraction in the vicinity of the source mine/millsites.

Conclusions

Historical mining of silver-lead-zinc ores in the headwater reaches of the Prichard Creek, Eagle Creek, and Beaver Creek drainages (figs. 2–5) has resulted in enrichments of lead, zinc, mercury, arsenic, cadmium, silver, copper, cobalt, and, to a lesser extent, iron and manganese in streambed sediment. Using the metal contents in samples collected from the relatively unimpacted West Fork of Eagle Creek as representative of background values, the Pb and Zn contents in streambed sediment in the vicinity of the mines and millsites are 20 to 100 times background values, decreasing downstream to 2 to 5 times background values over 15 to 20 km to the mouth of the stream. Lesser enrichments (<10 times background values) of mercury and arsenic that are also generally associated with silver-lead-zinc mining decrease downstream, although enrichment of arsenic also is areally associated with the lode gold deposits near Murray, which were not studied here. Metal contents in suspended sediment collected during the high-flow event of April 14, 2000, are generally similar to, but slightly higher than,

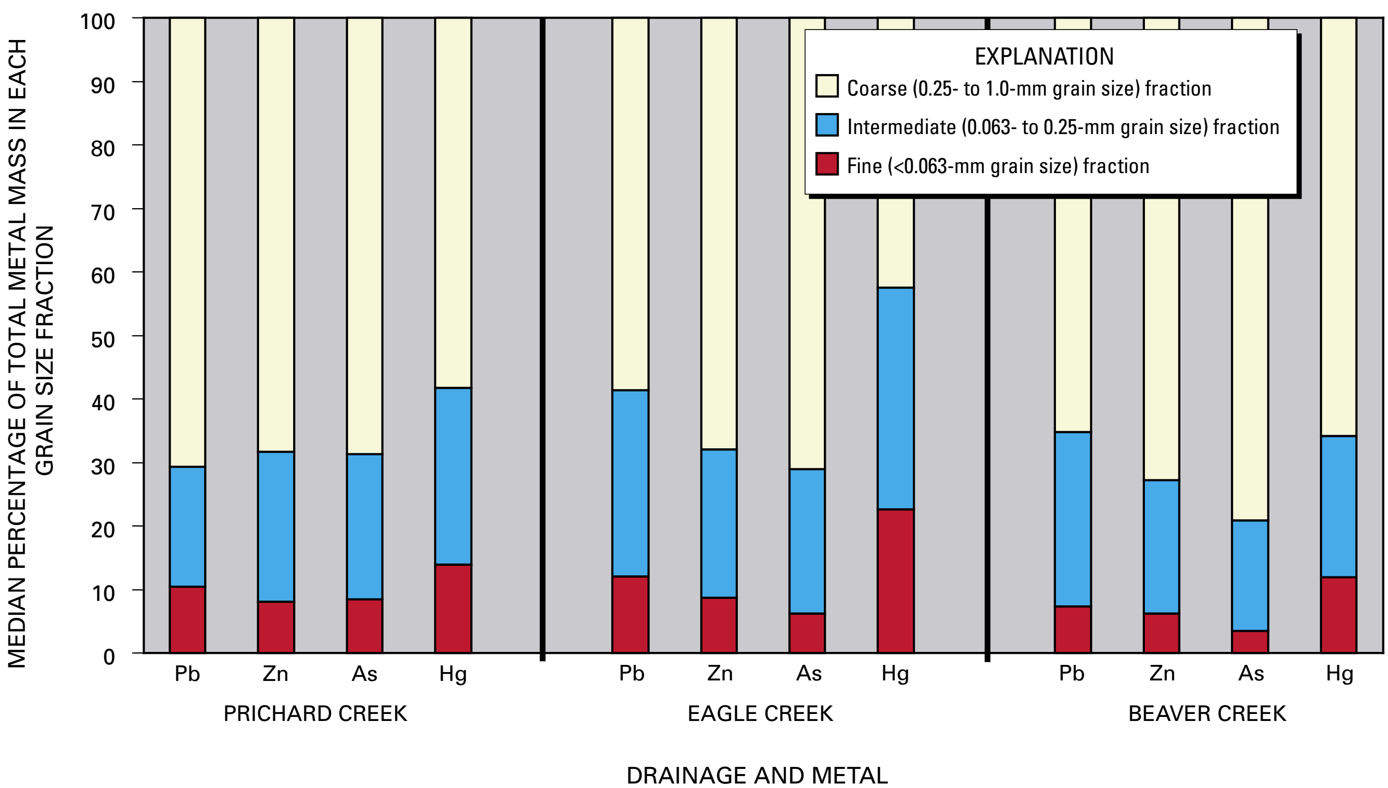

Figure 17. Partitioning of total mass of each of four metals (lead, zinc, arsenic, and mercury) in <1.0-mm-grain-size fraction of streambed sediment between coarse, intermediate, and fine fractions (using median percentages by drainage) in samples collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho (figs. 1, 2).

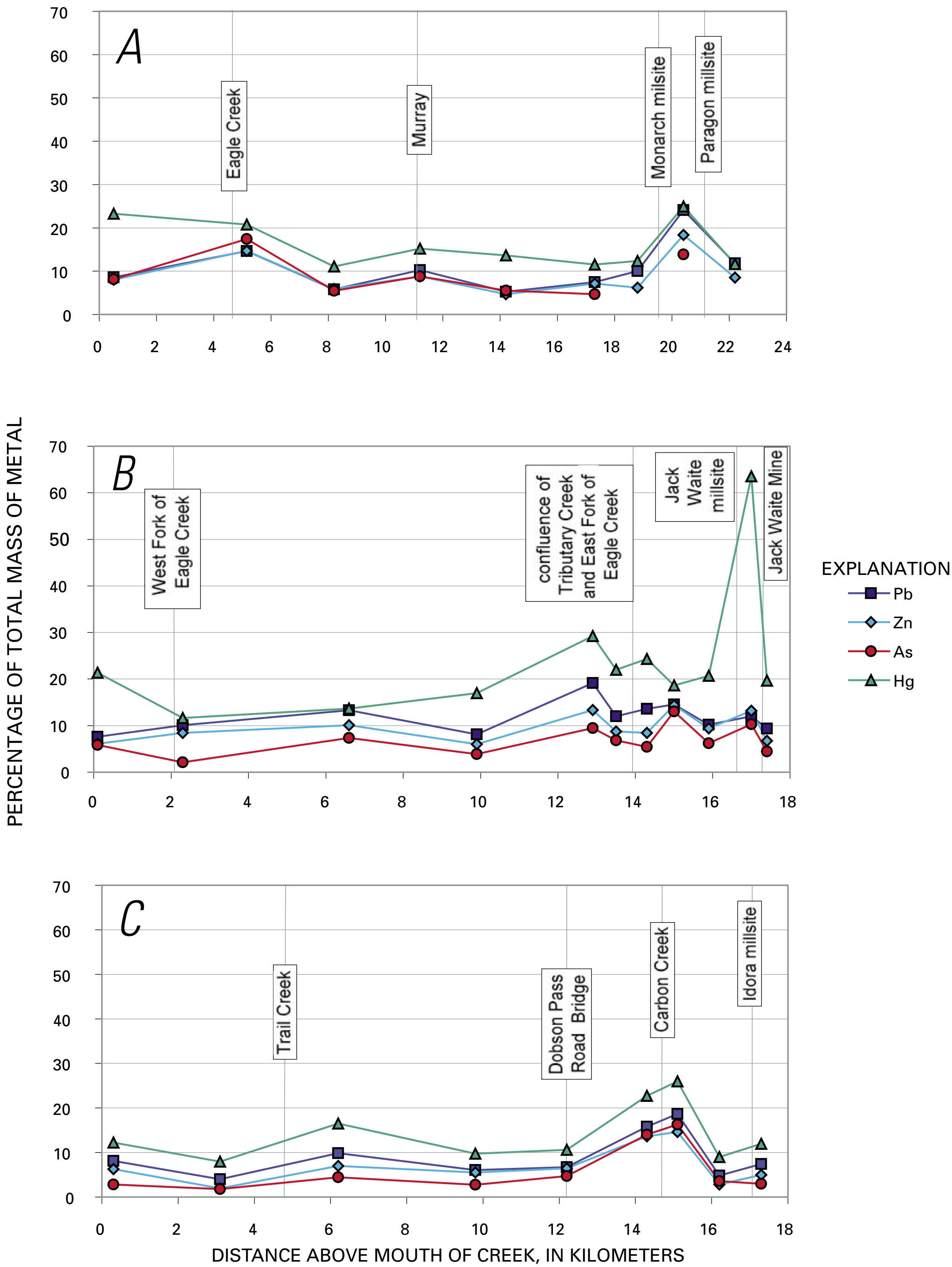

Figure 18. Percentages of total mass of lead, zinc, arsenic, and mercury that resides in the fine (<0.063-mm grain size) fraction of <1-mm grain-size fraction of samples of streambed sediment from Prichard Creek (*A*), Eagle Creek (*B*), and Beaver Creek (*C*) drainages in the northern Coeur d'Alene Mining District, northern Idaho (figs. 1, 2), versus distance upstream from mouth of creek.

those in the fine (<0.063-mm grain size) fraction of streambed sediment from the same sampling site. Although element enrichments in streambed sediment typically begin at the mine portals and their associated mine-waste-rock dumps, more volumetrically significant inputs of metal-enriched materials were contributed by the ore-concentration mills and their associated accumulations of more finely ground, more metal enriched tailings.

Metal enrichments in the streambed sediment of Eagle Creek originate at the inactive Jack Waite Mine/millsite in the headwater reaches of Tributary Creek, the largest ore producer in the study area (figs. 1, 2). The metal contents in samples of streambed sediment are similar to, but generally less than, those in samples of the Jack Waite flotation-tailings impoundments, suggesting that the fine fraction bears a significant component of eroded tailings mixed with a much smaller component of the native sediment of Tributary Creek. Historical records indicate that tailings were not initially impounded but were discarded directly into the stream. Streambank soil just above the confluence of Tributary Creek with the East Fork of Eagle Creek, which has metal contents higher than those of the present stream sediment, is inferred to represent overbank deposits from this early era of stream disposal of tailings.

Several abandoned Silver-Lead-Zinc mines and millsites are located along upper Prichard Creek and its tributaries (Paragon, Granite, and Bear Gulches, figs. 2–5). Streambed sediment of the Prichard Creek drainage basin is less enriched in lead and zinc than that of Tributary Creek, even though Pb and Zn contents in gravity tailings from mills in the Prichard Creek drainage are 5 to 10 times greater than in flotation tailings from the Jack Waite mill along Tributary Creek, suggesting that the release of tailings into Prichard Creek was much less than that into Eagle Creek. The absence of tailings-bearing streambank soils along Prichard Creek with much higher metal contents than those of the present streambed sediment suggests that tailings were always impounded and not directly released into Prichard Creek or its tributaries. High As contents were measured in samples of streambed sediment collected from Granite Gulch below the Silver Strike Mine/millsite and from Prichard Creek near Murray, where several lode gold mines apparently contributed arsenic-rich materials to the stream.

Although enrichments of mining-related elements in streambed sediment are associated with abandoned ore-concentration millsites in upper Beaver Creek (Idora millsite) and in its major tributary Carbon Creek (Carlisle millsite), lesser enrichments farther upstream are associated with mine portals and mine-waste-rock dumps (fig. 5). Early, highly metal-enriched gravity tailings were produced by each mill, although impounded gravity tailings are preserved only at the Idora millsite. Downstream from each millsite, the middle unit of streambank soil has high metal contents similar to those of the gravity tailings, indicating that both gravity mills sometimes discarded tailings directly into the streams, whereas the metal contents in the upper unit of streambank soil are intermediate between those in the gravity tailings and the present incised streambed. The progressive decrease of metal contents from the middle to upper units to those of the present streambed sediment apparently records reductions of the metal contents in streambed sediment over time since the end of operation of the early gravity mills. Major volumes of flotation tailings (second only to those from the Jack Waite mill) were generated at the Carlisle mill in the 1940s and 1950s; however, these tailings, which are generally less metal enriched than the adjacent streambed sediment, were more effectively impounded and so were never major contributors of metal to adjacent and downstream streambed sediment.

Acknowledgments

This research was supported by the USFS, BLM, and the USGS. We thank Ray Tesoro, Jeff Johnson, Jim Northrup, and Chris Dail of the USFS and Steve Moore and David Fortier of BLM for their support and encouragement. We appreciate the interaction with other USGS colleagues who undertook related studies of surface and ground waters (Dave Clark, Doug Ott, and Pat Lambert) and of aquatic biota (Aida Farag, Dave Harper, Jack Goldstein, and Terry Maret). We also thank Chris Murphy of the USGS analytical laboratory in Denver, Colo., for his careful oversight of sample handling, and Eastern Washington University, Cheney, for the use of their grain-size-fractionation facilities. Thanks also to George Havach for his careful editing of the manuscript.

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Tables 1–12

Table 1. Data on locations of samples of streambed sediment collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.

[UTM, Universal Transverse Mercator projection, zone 11, NAD27 datum; for samples from tributaries, distance above mouth of drainage basin is measured from mouth of tributary to mouth of the drainage, and distance above tributary mouth is measured to mouth of tributary. Do, ditto]

Sample	UTM east	UTM north	Sampling date	Elevation (ft)	1:24,000-scale USGS topographic map	Drainage basin	Distance above mouth of drainage basin (km)	Tributary name	Distance above tributary mouth (km)
01	576703	5275753	8/9/00	2,370	Prichard	Beaver Creek	.3	--	--
02	578484	5274055	8/9/00	2,460	Osburn	do	3.1	--	--
03	579667	5273116	8/9/00	2,520	do	do	4.8	Trail Creek	.1
04	579896	5272107	8/9/00	2,560	do	do	6.2	--	--
05	581021	5270489	8/9/00	2,700	do	do	8.0	Pony Gulch	.9
06A	580356	5268981	8/9/00	2,700	do	do	9.8	--	--
06B	580356	5268981	8/9/00	2,700	do	do	9.8	--	--
07	581709	5267498	8/9/00	2,840	do	do	12.2	--	--
08	583870	5268382	8/10/00	3,120	do	do	15.1	--	--
09	583623	5268185	8/10/00	3,060	do	do	14.7	Carbon Creek	.05
10	585554	5268397	8/9/00	3,990	Burke	do	14.7	do	2.2
11	577552	5278443	8/10/00	2,410	Prichard	Prichard Creek	0.5	--	--
12	582941	5275027	9/14/00	2,620	do	do	8.2	--	--
13	585810	5275137	9/14/00	2,752	Murray	do	11.2	--	--
14	587190	5274646	9/14/00	2,880	Burke	do	12.7	Wesp Gulch	.2
15	588222	5273772	8/16/00	2,885	do	do	14.1	Butte Gulch	.1
16	588182	5273680	8/16/00	2,885	do	do	14.2	--	--
17	590448	5272501	8/16/00	3,060	do	do	16.8	Bear Gulch	.15
18	594431	5274816	8/16/00	3,640	Thompson Pass	do	16.8	do	5.5
19	590662	5272097	9/14/00	3,060	Burke	do	17.2	Granite Gulch	.1
20	590309	5270117	9/14/00	3,320	do	do	17.2	do	2.3
21	590751	5272176	8/16/00	3,050	do	do	17.3	--	--
22	593477	5271793	8/16/00	3,990	do	do	20.4	--	--
23	593818	5271902	8/16/00	3,450	do	do	20.9	Paragon Gulch	.01
24	595277	5271332	8/16/00	3,860	Thompson Pass	do	22.6	--	--
25	581111	5277210	9/14/00	2,535	Prichard	Eagle Creek	5.1	--	--
26	583783	5280173	8/17/00	2,750	do	do	1.6	West Fork of Eagle Creek.	3.1
27	582915	5278045	8/17/00	2,620	do	do	2.3	--	--
28A	585991	5280462	8/17/00	2,850	Murray	do	6.6	--	--
28B	585991	5280494	8/17/00	2,850	do	do	6.6	--	--
29	589065	5280931	8/17/00	3,100	do	do	9.9	--	--
30	592006	5282138	8/17/00	3,420	do	do	13.4	Tributary Creek	.1

Table 1. Data on locations of samples of streambed sediment collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[UTM, Universal Transverse Mercator projection, zone 11, NAD27 datum; for samples from tributaries, distance above mouth of drainage basin is measured from mouth of tributary to mouth of the drainage, and distance above tributary mouth is measured to mouth of tributary. Do, ditto]

Sample	UTM east	UTM north	Sampling date	Elevation (ft)	1:24,000-scale USGS topographic map	Drainage basin	Distance above mouth of drainage basin (km)	Tributary name	Distance above tributary mouth (km)
31	594298	5279699	8/17/00	4,230	Black Peak	do	13.4	Tributary Creek	3.6
32	584210	5268028	8/10/00	3,280	Prichard	Beaver Creek	14.7	Carbon Creek	.7
33	583840	5268062	8/10/00	3,150	Osburn	do	14.7	do	.3
34	583364	5268152	8/10/00	3,030	do	do	14.3	--	--
35	593874	5271978	8/16/00	3,540	Thompson Pass	Prichard Creek	20.9	Paragon Gulch	.1
36	594723	5274924	8/16/00	3,670	do	do	16.8	Bear Gulch	5.9
37	591546	5274065	8/16/00	3,250	Burke	do	16.8	do	2.3
38	592038	5271716	8/16/00	3,200	do	do	18.8	--	--
39	592951	5281207	8/17/00	3,660	Murray	Eagle Creek	13.4	Tributary Creek	1.6
40	592263	5282520	8/17/00	3,440	do	do	13.9	--	--
41	585608	5283697	8/17/00	3,040	do	do	1.6	West Fork of Eagle Creek.	7.4
42	581132	5277103	9/14/00	2,535	Prichard	Prichard Creek	5.15	--	--
43	590484	5270965	9/14/00	3,200	Burke	do	17.2	Granite Gulch	1.3
101	585568	5269410	8/23/01	3,630	do	Beaver Creek	17.3	--	--
104A	584614	5269167	8/23/01	3,360	Osburn	do	15.2	--	--
108A	583623	5268185	8/23/01	3,060	do	do	14.7	Carbon Creek	.05
112	594676	5274713	9/25/01	3,820	Thompson Pass	Prichard Creek	16.8	Southern tributary to Bear Gulch.	5.8*
116	594253	5274693	9/25/01	3,700	do	do	16.8	do	5.3*
117	593936	5274683	9/25/01	3,580	do	do	16.8	Northern tributary to Bear Gulch.	5.0*
120	590751	5272176	9/25/01	3,050	Burke	do	17.3	--	--
127	594990	5272864	9/28/01	4,040	Thompson Pass	do	20.9	Paragon Gulch	1.6
128	594529	5272450	9/28/01	3,740	do	do	20.9	do	.9
129	593812	5271911	9/28/01	3,480	Burke	do	20.9	do	.01
130	594409	5279374	10/2/01	4,360	Black Peak	Eagle Creek	13.4	Tributary Creek	4.0
136	593547	5280494	10/2/01	3,940	Murray	do	13.4	Tributary Creek	2.5
137	592425	5281637	10/2/01	3,520	do	do	13.4	Tributary Creek	.9
140	592006	5282138	10/2/01	3,420	do	do	13.4	Tributary Creek	.1
142	591561	5281962	10/2/01	3,350	do	do	12.9	--	--
143	585608	5283697	10/2/01	3,040	do	do	1.6	West Fork of Eagle Creek	7.4

*Distance above mouth of Bear Creek to mouth of tributary to Bear Creek.

Table 2. Data on locations of samples of suspended sediment collected on April 14, 2000, from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.

[UTM, Universal Transverse Mercator projection, zone 11, NAD27 datum; for samples from tributaries, distance above mouth of drainage basin is measured from mouth of tributary to mouth of drainage, and distance above tributary mouth is measured to mouth of tributary; do, ditto]

Sample	UTM east	UTM north	Sampling time	Elevation (ft)	1:24,000-scale USGS topographic map	Drainage basin	Distance above mouth of drainage basin (km)	Tributary name	Distance above tributary mouth (km)
00SB–B1A	581664	5267487	09:25	2,840	Osburn	Beaver Creek	12.2	--	--
00SB–B1B	581664	5267487	09:30	2,840	do	do	12.2	--	--
00SB–B1C	581664	5267487	09:35	2,840	do	do	12.2	--	--
00SB–B2	580353	5268997	09:50	2,700	do	do	9.8	--	--
00SB–B3	579923	5272015	10:00	2,560	do	do	6.2	--	--
00SB–B4	578462	5274072	10:15	2,460	do	do	3.1	--	--
00SB–B5	576671	5275795	10:25	2,370	Prichard	do	.3	--	--
00SB–E1	583781	5280176	12:45	2,750	do	Eagle Creek	6.7	West Fork of Eagle Creek	3.0
00SB–E2	582882	5278062	12:55	2,620	do	do	2.3	--	--
00SB–E3A	581085	5277173	13:10	2,530	do	do	.1	--	--
00SB–E3B	581085	5277173	13:15	2,530	do	do	.1	--	--
00SB–P1	595288	5271349	11:00	3,860	Thompson Pass	Prichard Creek	22.6	--	--
00SB–P2	593484	5271789	11:10	3,380	Burke	do	20.4	--	--
00SB–P3	590741	5272186	11:20	3,050	do	do	17.3	--	--
00SB–BG1	590431	5272460	11:30	3,040	do	do	16.8	Bear Gulch	.1
00SB–BU1	588258	5273793	11:40	2,890	do	do	14.1	Butte Gulch	.1
00SB–P4	585782	5275129	12:00	2,750	Murray	do	11.2	--	--
00SB–P5	583002	5274978	12:10	2,620	Prichard	do	8.3	--	--
00SB–P6	577510	5278482	12:25	2,410	do	do	.4	--	--

Table 3. Data on locations of samples of streambank soil collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.

[UTM, Universal Transverse Mercator projection, zone 11, NAD27 datum; for samples from tributaries, distance above mouth of drainage basin is measured from mouth of tributary to mouth of drainage, and distance above tributary mouth is measured to mouth of tributary. Do, ditto]

Sample	UTM east	UTM north	Sampling date	Sample method	Elevation (ft)	1:24,000-scale USGS topographic map	Drainage basin	Distance above mouth of drainage basin (km)	Tributary name	Distance above tributary mouth (km)	Depth-interval top (m)	Depth-interval bottom (m)
18B	594316	5274802	8/16/00	Channel	3,590	Thompson Pass	Prichard Creek	16.8	Bear Gulch	5.4	0.10	0.30
22B	593477	5271793	8/16/00	do	3,990	Burke	do	20.4	--	--	.00	.10
104B	584614	5269167	8/23/01	do	3,360	Osburn	Beaver Creek	16.3	--	--	.30	.60
104C	584614	5269167	11/8/01	Composite	3,360	do	do	16.3	--	--	.00	.30
105A	584265	5268826	8/23/01	Channel	3,240	do	do	15.8	--	--	.00	.13
105B	584265	5268826	11/8/01	Composite	3,240	do	do	15.8	--	--	.00	.10
108B	583633	5268192	8/23/01	Channel	3,070	do	do	14.7	Carbon Creek	.05	2.00	2.40
108C	583633	5268192	8/23/01	do	3,070	do	do	14.7	do	.05	.80	1.60
108D	583633	5268192	8/23/01	Composite	3,070	do	do	14.7	do	.05	.00	.80
118	593619	5274573	9/25/01	do	3,500	Burke	Prichard Creek	16.8	Bear Gulch	4.7	.00	.05
119	592460	5274411	9/25/01	Channel	3,360	do	do	16.8	do	3.4	.00	.12
121	591428	5271801	9/28/01	do	3,150	do	do	18.1	--	--	.00	.50
122	591670	5271748	9/28/01	do	3,170	do	do	18.4	--	--	1.00	1.20
132	594212	5279802	10/2/01	do	4,210	Black Peak	Eagle Creek	13.4	Tributary Creek	3.5	.75	1.00
141A	592060	5282118	10/2/01	do	3,430	Murray	do	13.4	do	.2	.00	.35
141B	592060	5282118	10/2/01	do	3,430	do	do	13.4	do	.2	.35	.50
144	583870	5268395	10/9/01	do	3,120	Osburn	Beaver Creek	15.1	--	--	.00	.10
147A	583467	5268162	10/9/01	do	3,040	do	do	14.5	--	--	.10	.25
147B	583445	5268162	10/9/01	Composite	3,035	do	do	14.3	--	--	.00	.10
152	582679	5267758	10/9/01	do	2,950	do	do	13.4	--	--	.00	.25
154	585505	5269356	11/8/01	do	3,580	Burke	do	17.3	--	--	.00	.10
155	583941	5268518	11/8/01	do	3,140	Osburn	do	15.2	--	--	.00	.30
156A	591011	5273336	11/8/01	do	3,150	Burke	Prichard Creek	16.8	Bear Gulch	1.3	.00	.15
157	590644	5272580	11/8/01	do	3,070	do	do	16.8	do	.4	.00	.10

Table 4. Data on locations of samples of artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.

[UTM, Universal Transverse Mercator projection, zone 11, NAD27 datum; for samples from tributaries, distance above mouth of drainage basin is measured from mouth of tributary to mouth of drainage, and distance above tributary mouth is measured to mouth of tributary. Sample types: F, impounded flotation tailings; J, impounded jig tailings; M, millsite fill material; R, railroad ballast material; W, mine-waste rock. Do., ditto]

Sample	UTM east	UTM north	Sampling date	Sample method	Elevation (ft)	1:24,000-scale USGS topographic map	Drainage basin	Distance above mouth of drainage basin (km)	Tributary name	Distance above tributary mouth (km)	Sample type	Depth-interval top (m)	Depth-interval bottom (m)
20B	590389	5269882	9/14/00	Channel	3,380	Burke	Prichard Creek	17.2	Granite Gulch	2.6	F	0.00	0.50
102	585242	5269281	8/23/01	do	3,520	do	Beaver Creek	16.9	--	--	J	.00	1.00
103	584953	5269218	8/23/01	do	3,420	do	do	16.6	--	--	J	.00	1.00
106	583703	5268152	8/23/01	do	3,090	Osburn	do	14.7	Carbon Creek	.1	M	.00	3.50
109A	582943	5267924	8/24/01	do	2,990	do	do	13.7	--	--	F	.60	.75
109B	582943	5267924	8/24/01	do	2,990	do	do	13.7	--	--	F	.00	.60
110	583046	5267972	8/24/01	do	3,010	do	do	13.8	--	--	F	.15	.92
111A	583225	5268059	8/24/01	do	3,020	do	do	14.1	--	--	F	.63	.87
111B	583225	5268059	8/24/01	do	3,020	do	do	14.1	--	--	F	.00	.63
113	594531	5274865	9/25/01	do	3,630	Thompson Pass	Prichard Creek	16.8	Bear Gulch	5.7	J	.25	.55
114	594498	5274854	9/25/01	Composite	3,620	do	do	16.8	do	5.6	J	.00	4.00
115	594409	5274829	9/25/01	Channel	3,610	do	do	16.8	do	5.53	J	.20	1.07
123	591976	5271718	9/28/01	do	3,210	Burke	do	18.7	--	--	J	.00	.37
124	592054	5271710	9/28/01	do	3,220	do	do	18.8	--	--	R	.00	.30
125	592198	5271658	9/28/01	do	3,230	do	do	18.9	--	--	J	.00	.47
126	592304	5271635	9/28/01	do	3,250	do	do	19.0	--	--	J	.00	.55
131	594417	5279531	10/2/01	do	4,350	Black Peak	Eagle Creek	13.4	Tributary Creek	3.8	W	2.00	3.50
133	594124	5279859	10/2/01	do	4,180	do	do	13.4	do	3.4	F	(*)	(*)
134	594147	5279880	10/2/01	do	4,190	do	do	13.4	do	3.4	F	.20	4.70
135	593925	5280012	10/2/01	do	4,130	do	do	13.4	do	3.1	F	.00	2.40
138	592324	5281678	10/2/01	do	3,540	Murray	do	13.4	do	0.8	F	.00	.15
139	592019	5282239	10/2/01	Composite	3,400	do	do	13.5	--	--	F	.00	1.00
145	583710	5268142	10/9/01	Channel	3,095	Osburn	Beaver Creek	14.7	Carbon Creek	.15	F	.00	1.70
146	583710	5268133	10/9/01	do	3,100	do	do	14.7	do	.18	M	.00	1.20
148	583374	5268130	10/9/01	do	3,025	do	do	14.3	--	--	F	.00	.40
149	583131	5268114	10/9/01	do	3,000	do	do	14.0	--	--	F	.00	.50
150	582985	5268074	10/9/01	do	2,980	do	do	13.8	--	--	F	.00	.60
151	582562	5267652	10/9/01	do	2,920	do	do	13.2	--	--	F	.00	.35
153	582952	5267726	10/9/01	do	2,980	do	do	13.5	--	--	R	.00	.25

*Sample interval was 1.5 to 4.5 m above roadbed surface.

Table 5. Grain-size distributions in samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.

[All values in weight percent. Do, ditto]

Sample	Sample type	Fraction (mm)								
		>8	4–8	2–4	1–2	0.5–1.0	0.25–0.5	0.125–0.25	0.063–0.125	<0.063
01	Streambed	27	14	9.9	13	15	13	4.6	1.7	1.3
02	do	30	17	16	12	13	8.8	2.4	.8	.5
03	do	59	10	10	11	6.2	2.6	.8	.4	.4
04	do	51	12	8.9	13	8.5	4.0	1.4	.7	.5
05	do	59	12	10	10	4.7	1.5	.6	.6	1.0
06A	do	71	10	5.0	3.6	3.6	4.5	1.4	.4	.3
06B	do	0	0	.6	5.5	19	35	25	9.9	5.6
07	do	63	14	6.7	4.6	4.9	3.9	1.6	.5	.5
08	do	64	6.4	4.7	6.2	6.0	4.9	3.1	2.4	2.6
09	do	53	17	9.7	8.0	6.6	4.0	1.2	.4	.4
10	do	54	17	13	9.1	4.2	1.8	.6	.3	.3
11	do	54	9.0	5.7	6.3	8.2	9.7	4.5	1.5	1.5
12	do	26	13	6.7	6.3	6.6	24	12	3.2	2.5
13	do	19	8.5	3.5	7.0	8.7	18	21	7.9	6.0
14	do	44	21	15	12	5.5	1.9	.5	.2	.4
15	do	13	11	9.7	15	13	15	14	5.6	4.3
16	do	4.9	13	24	25	18	9.8	3.0	1.1	.9
17	do	37	14	9.6	14	12	8.7	2.5	.9	1.0
18	do	25	21	15	16	11	6.7	3.0	1.3	1.0
18B	Streambank	4.4	15	17	13	6.6	6.5	10	15	12
19	Streambed	26	18	20	17	11	5.8	1.6	.5	.6
20	do	43	6.5	3.4	23	12	5.2	2.9	1.7	1.7
20B	Artificial fill	2.5	0	2.1	0	1.4	15	24	32	23
21	Streambed	7.2	14	19	21	17	12	4.7	2.4	2.1
22	do	37	13	12	15	9.5	4.4	2.0	1.8	4.6
22B	Streambank	21	9.0	6.3	8.6	6.0	7.0	6.9	8.9	26
23	Streambed	25	25	20	12	7.3	4.7	2.7	1.6	1.7
24	do	27	13	14	15	13	9.3	4.4	2.3	2.1
25	do	31	12	8.8	9.2	7.4	11	13	4.4	3.0
26	do	36	6.5	6.7	20	20	9.0	1.5	.6	.7
27	do	16	1.8	1.8	6.9	20	32	12	5.3	3.9
28A	do	15	21	11	16	17	14	4.5	1.2	1.0
28B	do	7.0	1.5	1.5	4.4	14	31	25	8.7	6.4
29	do	27	12	8.4	9.7	11	18	9.2	2.6	2.0
30	do	17	17	15	17	15	9.9	5.4	1.8	1.9
31	do	33	18	15	14	8.7	5.4	2.6	1.4	1.9
32	do	24	22	19	16	9.1	5.4	2.3	1.2	1.5
33	do	45	19	12	11	7.9	3.4	.8	.3	.4
34	do	50	16	9.0	6.1	5.0	5.4	3.6	2.1	1.9
35	do	13	24	26	22	9.5	3.2	.9	.5	.7
36	do	37	26	14	9.4	6.0	4.4	2.1	1.0	.8
37	do	28	18	17	15	12	7.6	1.6	.5	.4
38	do	25	22	25	17	7.1	2.2	.9	.5	.5
39	do	25	16	14	14	8.9	7.0	7.4	3.7	3.4
40	do	39	19	15	14	7.1	3.4	1.2	.6	1.0
41	do	31	11	10	18	23	5.0	.7	.3	.4
42	do	26	13	14	14	9.2	7.6	7.4	4.0	4.3
43	do	48	11	11	14	7.2	3.3	1.7	1.1	2.0
101	do	36	22	1.9	17	13	6.2	2.4	1.3	1.0
102	Artificial fill	7.5	15	32	21	13	5.1	2.1	1.4	3.0
103	do	23	13	15	14	13	10	4.7	2.5	4.7
104A	Streambed	26	22	15	8.2	14	11	2.5	.6	.8
104B	Streambank	16	6.8	7.8	15	23	19	8.1	2.3	
104C	do	54	13	7.7	6.4	7.8	5.1	2.4	1.4	2.6
105A	do	30	8.4	8.6	6.1	10	12	12	9.9	3.7
105B	do	34	18	13	7.7	7.0	5.7	5.1	3.6	5.8
106	Artificial fill	30	16	10	9.7	7.5	4.9	3.3	3.9	14
108A	Streambed	29	31	19	8.9	7.8	3.5	.9	.3	.3

Table 5. Grain-size distributions in samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[All values in weight percent. Do, ditto]

Sample	Sample type	Fraction (mm)								
		>8	4–8	2–4	1–2	0.5–1.0	0.25–0.5	0.125–0.25	0.063–0.125	<0.063
108B	Streambank	40	21	12	10	9.8	4.1	1.5	.9	.6
108C	do	0	.5	2.2	3.6	3.5	3.5	7.2	19	61
108D	do	21	26	18	6.3	9.8	9.3	4.8	2.1	2.7
109A	Artificial fill	0	0	0	0	0	21	18	30	31
109B	do	0	0	0	0	.3	.5	12	42	46
110	do	0	0	0	0	.3	3.9	14	41	41
111A	do	0	0	0	0	.4	15	13	12	60
111B	do	0	0	0	0	.8	6.8	9.5	23	60
112	Streambed	53	23	12	6.2	3.5	1.3	.4	.2	.4
113	Artificial fill	0	.4	2.3	8.4	4.8	8.0	19	33	24
114	do	35	25	14	8.2	6.0	3.9	2.5	1.9	4.2
115	do	0	5.8	11	15	21	22	18	6.2	.5
116	Streambed	49	20	13	6.7	4.8	3.1	1.6	.9	.9
117	do	51	21	12	6.0	3.7	2.5	1.4	.8	1.2
118	Streambank	26	11	12	12	11	6.8	5.0	4.5	12
119	do	43	5.5	2.5	3.0	9.4	16	11	4.9	5.0
120	Streambed	30	23	20	15	7.8	2.6	.8	.5	.4
121	Streambank	0	0	.7	1.5	15	26	28	20	9.3
122	do	1.3	2.3	1.3	1.8	27	20	16	20	10
123	Artificial fill	2.5	.3	1.4	22	7.7	45	21	.5	.4
124	do	51	21	10	6.8	4.8	3.8	1.2	.4	.7
125	do	58	10	5.4	6.3	5.9	5.7	6.2	2.2	.7
126	do	.1	.3	3.8	1.4	5.7	23	35	19	12
127	Streambed	40	22	16	10	6.4	3.2	1.3	.8	1.0
128	do	18	20	25	18	11	4.3	1.6	.9	1.4
129	do	45	4.5	5.2	4.3	7.2	12	15	5.4	1.3
130	do	20	28	22	13	7.2	3.5	2.3	2.1	1.5
131	Artificial fill	33	18	15	12	9.6	6.1	3.5	1.8	.8
132	Streambank	19	18	11	8.9	6.1	6.6	6.2	6.3	17
133	Artificial fill	0	0	0	0	.2	4.8	50	32	13
134	do	18	3.5	3.1	1.9	1.5	4.8	36	20	12
135	do	0	0	0	0	.2	10	56	21	13
136	Streambed	29	27	21	12	6.5	2.7	1.2	.7	.7
137	do	16	11	16	19	14	6.8	9.9	4.4	2.6
138	Artificial fill	15	6.9	8.8	16	1.3	11	30	7.6	2.8
139	do	5.4	1.9	1.4	1.2	.9	3.9	42	27	16
140	Streambed	35	16	19	16	9.3	2.4	1.0	.3	.3
141A	Streambank	24	11	6.9	5.1	6.1	7.3	14	13	12
141B	do	.7	6.1	9.5	13	20	19	14	9.7	9.3
142	Streambed	55	17	13	6.7	4.1	1.7	1.0	.5	.8
143	do	36	16	17	10	11	6.0	2.2	1.0	1.2
144	Streambank	0	.4	1.7	3.7	48	11	17	13	5.8
145	Artificial fill	0	1.0	4.9	3.4	7.4	48	29	5.1	.7
146	do	40	19	14	11	8.2	3.7	1.9	1.4	.6
147A	Streambank	1.5	5.5	4.4	2.7	8.7	22	24	14	17
147B	do	13	8.6	4.4	3.3	5.4	13	20	16	16
148	Artificial fill	0	0	0	0	.4	15	62	18	4.3
149	do	0	0	.3	1.1	1.3	4.8	37	32	23
150	do	0	0	.1	.1	3.2	14	69	10	3.5
151	do	0	0	0	0	.3	16	14	14	56
152	Streambank	0	0	0	0	0	20	40	30	9.4
153	Artificial fill	19	15	13	11	9.6	8.1	6.4	5.5	12
154	Streambank	36	24	19	12	6.3	1.8	.5	.2	.6
155	do	40	18	13	8.1	6.9	5.4	2.9	1.5	3.7
156A	do	0	1.3	1.3	3.9	63	8.3	6.6	5.6	9.8
157	do	0	.8	2.4	3.8	33	11	14	15	20

Table 6. Geochemical data for samples of unfractionated (bulk) suspended sediment collected on April 14, 2000, from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.

[<, below listed analytical detection limit; dashes, insufficient material for analysis]

Sample	Suspended-sediment concentration (mg/L)	Al (wt pct)	Ca (wt pct)	Fe (wt pct)	K (wt pct)	Mg (wt pct)	Na (wt pct)	P (wt pct)	Ti (wt pct)	Ag (ppm)	As (ppm)	Ba (ppm)
00SB–B1A	554	7.7	0.39	4.7	2.7	0.70	0.70	0.07	0.33	2	19	580
00SB–B1B	478	7.8	.41	4.6	2.7	.72	.74	.07	.32	2	26	590
00SB–B1C	428	7.6	.42	4.4	2.6	.70	.71	.07	.31	3	19	580
00SB–B2	468	7.5	.34	4.2	2.8	.70	.72	.06	.29	<2	20	620
00SB–B3	451	7.7	.54	3.9	2.4	.71	.65	.09	.30	<2	22	700
00SB–B4	347	7.8	.50	3.9	2.5	.71	.66	.09	.27	<2	25	730
00SB–B5	382	7.6	.45	3.7	2.6	.68	.65	.08	.27	<2	23	720
00SB–E1	135	6.1	.54	2.6	2.2	.59	.76	.10	.26	<2	13	820
00SB–E2	119	7.3	.33	3.5	2.6	.69	.94	.06	.26	<2	18	630
00SB–E3A	248	7.6	.43	3.5	2.5	.76	.93	.07	.29	<2	15	740
00SB–E3B	437	7.9	.59	3.4	2.2	.70	1.0	.08	.33	<2	15	710
00SB–P1	30	6.5	.65	2.9	1.9	.61	.93	.10	.32	<7	<30	920
00SB–P2	20	6.3	1.00	3.0	1.8	.81	1.0	.10	.31	<5	<30	820
00SB–P3	13	6.5	.87	3.1	2.0	.80	1.0	.10	.29	<4	<20	760
00SB–BG1	33	7.0	.60	3.7	2.4	.76	.97	.09	.34	<3	<20	720
00SB–BU1	683	7.8	.35	4.9	2.7	.95	1.0	.06	.41	<2	18	690
00SB–P4	225	7.4	.36	4.5	2.8	.88	.99	.06	.35	<2	56	700
00SB–P5	276	7.7	.33	4.2	2.8	.80	.97	.06	.32	<2	48	710
00SB–P6	147	7.7	.32	3.6	2.7	.72	.84	.06	.28	<2	49	730

Sample	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Ga (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Mn (ppm)	Nb (ppm)	Nd (ppm)	Ni (ppm)
00SB–B1A	11	110	26	60	100	20	0.21	53	36	1,500	13	48	35
00SB–B1B	10	110	27	59	92	20	.22	52	37	1,500	14	46	37
00SB–B1C	10	110	28	58	89	20	.25	51	36	1,500	12	45	37
00SB–B2	6	90	18	58	57	20	.17	44	38	1,000	14	40	30
00SB–B3	5	110	17	56	54	19	.26	52	51	1,300	12	49	34
00SB–B4	5	100	16	58	48	19	.16	50	53	1,200	12	48	32
00SB–B5	4	100	14	55	45	19	.14	50	50	1,000	13	47	29
00SB–E1	<2	97	9	45	48	15	.17	46	27	960	12	42	19
00SB–E2	3	95	15	57	110	19	.11	47	28	720	17	42	26
00SB–E3A	<2	94	14	51	72	19	.07	44	36	750	14	41	24
00SB–E3B	<2	91	9	42	63	20	.07	42	37	790	14	38	24
00SB–P1	<7	110	10	45	340	20	- - -	51	30	1,100	10	45	20
00SB–P2	<5	110	10	49	94	20	- - -	51	32	1,100	10	46	30
00SB–P3	7	110	10	45	98	20	- - -	53	30	1,100	10	47	27
00SB–BG1	4	110	21	49	94	20	- - -	53	33	930	10	47	36
00SB–BU1	<2	130	34	69	49	21	.03	58	36	1,600	14	54	60
00SB–P4	2	100	28	64	52	20	.14	46	34	1,300	14	44	45
00SB–P5	2	100	23	64	48	20	.16	48	35	1,100	14	45	40
00SB–P6	<2	97	14	62	60	19	.18	46	33	800	16	43	28

Sample	Pb (ppm)	Sc (ppm)	Sr (ppm)	Th (ppm)	V (ppm)	Y (ppm)	Zn (ppm)
00SB–B1A	1,600	14	82	13	77	20	2,200
00SB–B1B	1,600	14	88	13	78	20	2,300
00SB–B1C	1,600	14	88	13	76	21	2,200
00SB–B2	930	14	77	12	74	17	1,500
00SB–B3	550	15	86	13	73	28	1,100
00SB–B4	410	15	80	13	75	26	870
00SB–B5	350	14	77	13	74	24	760
00SB–E1	160	10	77	11	56	17	130
00SB–E2	1,000	13	69	13	72	13	630
00SB–E3A	420	13	86	12	74	18	360
00SB–E3B	340	13	110	11	71	19	320
00SB–P1	72	10	100	10	57	20	590
00SB–P2	300	10	110	10	57	20	970
00SB–P3	1,700	10	100	10	59	20	1,800
00SB–BG1	1,500	10	89	10	69	20	840
00SB–BU1	62	17	88	13	110	22	170
00SB–P4	340	15	90	12	97	18	480
00SB–P5	340	14	96	12	90	16	510
00SB–P6	420	14	74	12	77	16	400

Table 7. Geochemical data for the fine (<0.063-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Al (wt pct)	Ca (wt pct)	Fe (wt pct)	K (wt pct)	Mg (wt pct)	Na (wt pct)	P (wt pct)	Ti (wt pct)	Ag (ppm)	As (ppm)	Ba (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)
01	Streambed	6.0	0.47	2.7	1.9	0.52	0.73	0.06	0.32	<2	18	570	2	110	8	40	52
02	do	6.2	.49	2.8	1.9	.52	.74	.06	.33	<2	15	580	2	110	10	40	54
03	do	6.4	.55	2.9	2.0	.51	.76	.06	.25	<2	16	610	<2	97	10	45	92
04	do	6.7	.59	3.0	2.0	.57	.78	.07	.32	<2	26	600	4	100	10	45	180
05	do	6.6	.70	2.7	1.9	.52	.92	.06	.30	<2	46	550	<2	95	10	42	61
06A	do	6.8	.56	4.1	2.1	.68	.82	.06	.46	<2	19	560	6	96	14	50	140
06B	do	6.8	.67	3.9	2.0	.67	.87	.07	.42	<2	13	560	7	100	13	43	79
07	do	7.5	.48	4.6	2.3	.66	.82	.07	.42	2	27	570	9	110	24	52	120
08	do	7.2	.57	6.1	2.1	.65	.94	.09	.38	11	42	500	12	90	35	46	230
09	do	7.3	.63	5.1	2.2	.67	.87	.08	.44	2	52	490	25	95	41	52	110
10	do	6.9	.80	4.2	1.9	.65	.84	.08	.40	<2	17	480	5	120	25	50	90
11	do	6.9	.32	3.2	2.3	.59	.92	.06	.31	<2	46	650	<2	100	9	44	60
12	do	6.9	.48	3.6	2.1	.64	1.1	.06	.38	<2	61	610	2	110	14	46	52
13	do	6.9	.44	4.2	2.1	.72	1.1	.06	.42	<2	73	590	<2	110	20	46	54
14	do	6.8	.68	3.5	2.0	.57	.96	.09	.29	<2	84	550	18	94	16	53	110
15	do	6.8	.45	4.4	2.1	.76	1.1	.06	.51	<2	12	560	<2	110	26	47	46
16	do	6.8	.61	3.5	2.1	.58	1.2	.08	.36	<2	44	660	5	92	14	40	74
17	do	7.1	.58	3.5	2.0	.64	1.2	.09	.34	<2	<10	710	4	110	17	46	100
18	do	6.4	.83	2.8	1.8	.55	1.3	.09	.35	<2	13	770	3	100	10	34	75
18B	Streambank	5.9	.05	6.9	2.1	.39	.65	.06	<0.005	46	78	320	190	95	50	38	4,700
19	Streambed	6.8	.79	3.6	2.0	.58	1.3	.10	.35	<2	110	620	<2	94	12	41	81
20	do	6.0	1.10	3.0	1.6	.51	1.2	.11	.32	<2	110	550	2	85	12	43	130
20B	Artificial fill	7.7	.12	5.8	3.2	.50	.67	.04	.22	6	3,100	510	<2	66	7	56	240
21	Streambed	6.4	.60	3.0	1.9	.53	1.1	.08	.33	<2	12	730	7	87	10	36	79
22	do	8.0	.93	3.2	1.7	.54	1.6	.14	.39	<2	12	730	7	83	4	30	88
22B	Streambank	8.6	1.00	3.2	1.6	.53	1.7	.13	.42	<2	11	690	7	83	4	26	90
23	Streambed	7.3	.75	4.2	2.0	.64	1.1	.10	.36	<2	20	660	7	110	22	42	74
24	do	6.4	.57	2.4	1.9	.54	1.1	.07	.34	<2	<10	840	<2	95	2	32	50
25	do	7.0	.49	3.2	2.0	.66	1.1	.06	.32	<2	14	640	<2	91	6	40	68
26	do	6.0	.68	2.4	1.8	.55	.96	.09	.28	<2	<10	770	<2	92	4	37	81
27	do	6.6	.34	3.3	2.0	.60	1.1	.06	.28	<2	10	550	2	95	8	44	100
28A	do	7.1	.35	3.4	2.2	.59	1.0	.06	.29	<2	19	590	3	96	10	48	150
28B	do	7.0	.29	3.6	2.2	.57	1.1	.05	.30	<2	19	580	2	100	15	45	150
29	do	6.8	.41	3.6	2.0	.60	1.1	.06	.32	<2	19	540	3	89	16	49	140
30	do	7.1	.30	3.8	2.2	.60	1.1	.05	.29	2	36	530	5	87	18	45	290
31	do	7.4	.55	5.2	2.3	.85	.96	.07	.29	4	53	610	18	100	35	59	270
32	do	7.2	.68	4.7	2.1	.66	.91	.08	.49	<2	33	500	11	110	25	53	64
33	do	7.0	.70	4.8	2.1	.65	.85	.08	.40	3	42	460	34	90	36	56	120

Table 7. Geochemical data for the fine (<0.063-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Al (wt pct	Ca (wt pct)	Fe (wt pct)	K (wt pct)	Mg (wt pct)	Na (wt pct)	P (wt pct)	Ti (wt pct)	Ag (ppm)	As (ppm)	Ba (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)
34	do	6.9	.61	5.7	2.1	.65	.93	.08	.45	7	43	470	16	89	27	50	170
35	do	7.3	.79	4.1	2.0	.63	1.2	.10	.35	<2	21	670	6	110	22	44	79
36	do	6.1	.90	2.6	1.7	.53	1.3	.10	.33	<2	<10	900	<2	85	12	34	87
37	do	6.5	.57	3.2	2.0	.58	1.2	.08	.32	<2	<10	670	4	95	14	44	120
38	do	6.1	.63	3.0	1.9	.52	1.0	.08	.31	<2	13	730	9	82	14	39	98
39	do	6.6	.42	4.2	2.0	.62	.10	.06	.25	3	40	480	8	73	22	46	260
40	do	6.9	.53	3.4	2.1	.56	.96	.07	.31	<2	18	610	<2	98	16	52	70
41	do	5.9	.60	2.3	2.0	.52	1.0	.08	.29	<2	11	770	<2	88	7	40	89
42	do	6.7	.38	3.5	2.2	.58	.87	.06	.35	<2	86	590	<2	100	13	47	42
43	do	7.2	.82	3.7	2.1	.59	1.2	.11	.37	<2	140	660	2	93	14	47	67
101	do	6.2	.81	4.5	1.9	.63	.97	.11	.37	<2	21	487	17	111	24	46	100
102	Artificial fill	5.0	.30	17.4	1.5	.47	.63	.09	.17	117	111	326	14	60	32	15	1,480
103	do	3.4	.10	23.6	1.3	.41	.24	.04	.02	111	116	232	70	29	64	<1	2,050
104A	Streambed	7.3	.60	5.6	2.0	.62	.92	.10	.35	10	40	464	15	110	26	52	321
104B	Streambank	4.5	.13	20.9	1.5	.41	.40	.05	.12	74	144	338	11	49	41	10	1,510
104C	do	7.6	.97	6.2	2.0	.65	1.5	.12	.35	13	28	451	3	103	19	45	279
105A	do	3.7	.09	13.6	1.4	.54	.39	.04	.06	105	54	159	328	36	45	7	2,660
105B	do	7.0	.81	8.5	1.8	.63	1.3	.10	.34	29	40	422	6	92	19	35	411
106	Artificial fill	6.7	.27	4.1	2.2	.44	.52	.05	.37	5	19	524	<2	78	13	54	77
108A	Streambed	7.2	.76	3.8	2.0	.66	1.2	.09	.36	<2	25	599	18	133	24	60	290
108B	Streambank	8.2	.54	4.5	1.7	.60	.84	.12	.39	<2	20	783	228	157	34	69	302
108C	do	5.3	.11	4.9	2.2	.42	.39	.03	.22	14	25	336	10	38	9	50	139
108D	do	5.9	.26	7.2	2.1	.56	.59	.06	.27	18	89	370	28	66	33	57	339
109A	Artificial fill	6.6	.05	3.4	3.5	.44	.17	.03	.21	2	20	400	41	39	12	59	162
109B	do	5.0	.04	5.9	2.2	.34	.21	.03	.33	3	41	271	<2	55	6	38	60
110	do	5.7	.11	4.5	2.7	.40	.51	.04	.37	3	20	331	<2	63	5	42	56
111A	do	6.5	.06	3.7	3.4	.40	.16	.03	.25	2	18	384	13	57	6	58	223
111B	do	6.7	.09	3.5	3.2	.39	.35	.03	.26	<2	14	366	<2	65	5	50	96
112	Streambed	6.9	.58	4.9	2.1	.61	.82	.08	.39	4	47	423	27	100	25	64	259
113	Artificial fill	0.8	.02	8.3	0.3	.7	.12	.06	<0.005	55	36	17	1,540	38	120	<1	6,880
114	do	5.1	.48	3.4	1.7	.39	1.2	.06	.11	18	29	360	48	64	32	37	1,710
115	do	6.1	.54	3.0	1.9	.52	1.3	.09	.35	2	<10	662	12	108	13	36	166
116	Streambed	6.5	.95	4.0	1.6	.60	1.1	.13	.34	2	34	425	10	118	29	38	311
117	do	6.7	.85	4.2	1.8	.60	1.1	.10	.36	2	15	567	7	111	20	59	178
118	Streambank	7.2	.97	3.3	1.8	.61	1.4	.14	.38	<2	20	720	15	107	15	38	94
119	do	7.1	.75	3.4	2.0	.60	1.4	.09	.38	<2	12	584	4	111	15	49	141
120	Streambed	6.3	.51	2.9	2.0	.50	1.1	.08	.33	<2	14	675	9	99	16	36	143
121	Streambank	7.0	.46	3.3	2.1	.56	1.2	.07	.36	2	<10	672	7	110	12	38	80
122	do	7.0	.48	3.2	2.5	.63	1.4	.05	.40	<2	<10	812	4	100	11	49	59

Table 7. Geochemical data for the fine (<0.063-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Al (wt pct)	Ca (wt pct)	Fe (wt pct)	K (wt pct)	Mg (wt pct)	Na (wt pct)	P (wt pct)	Ti (wt pct)	Ag (ppm)	As (ppm)	Ba (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)
123	Artificial fill	4.8	.06	5.0	2.6	.29	.20	.04	.14	43	22	390	2	76	9	37	110
124	do	4.3	.52	10.3	1.3	.51	.49	.07	.17	74	126	350	101	43	30	86	620
125	do	7.4	.93	3.2	1.7	.59	1.4	.08	.48	<2	<10	786	<2	74	12	41	62
126	do	4.0	.06	5.0	2.1	.23	.33	.03	.11	60	12	142	22	58	14	24	326
127	Streambed	6.1	.96	3.1	1.7	.59	1.3	.09	.37	<2	12	822	<2	107	16	54	130
128	do	6.5	.72	4.1	2.0	.60	1.1	.11	.32	2	30	643	6	129	21	53	182
129	do	6.0	.42	5.0	2.1	.50	1.0	.11	.25	4	32	528	5	119	26	54	277
130	do	6.6	.37	3.8	2.0	.66	.96	.07	.32	<2	17	633	<2	200	44	47	60
131	Artificial fill	8.0	.39	4.8	4.4	.10	.65	.04	.15	4	60	800	11	82	35	87	217
132	Streambank	7.3	.75	4.2	1.4	.60	1.2	.15	.50	<2	12	682	6	54	12	36	478
133	Artificial fill	5.0	.08	3.4	1.7	.30	1.1	.04	.13	6	98	376	<2	47	8	40	214
134	do	4.9	.36	3.0	1.6	.50	1.7	.04	.03	6	82	300	21	62	27	36	850
135	do	5.0	.28	3.2	1.8	.49	1.6	.04	.05	6	120	323	24	74	25	33	471
136	Streambed	5.8	.37	3.8	2.1	.59	1.1	.06	.24	2	29	480	15	79	18	47	415
137	do	6.0	.23	4.2	2.2	.54	1.1	.06	.30	3	34	486	6	100	21	46	330
138	Artificial fill	6.2	.12	2.4	2.2	.42	2.2	.04	.08	2	46	395	6	42	11	42	310
139	do	5.5	.37	3.1	2.0	.54	1.9	.06	.14	4	34	435	33	37	22	35	214
140	Streambed	5.8	.29	3.8	2.1	.57	1.1	.06	.22	<2	30	487	7	70	20	99	762
141A	Streambank	5.3	.06	3.8	1.7	.25	1.8	.04	.09	7	78	518	4	61	6	37	213
141B	do	5.5	.10	4.0	2.0	.46	1.0	.04	.21	10	82	580	<2	67	11	40	302
142	Streambed	5.8	.33	3.5	2.2	.58	.96	.07	.27	<2	25	552	7	104	15	85	424
143	do	5.4	.64	2.3	2.0	.56	1.0	.09	.30	<2	11	838	<2	96	11	72	146
144	Streambank	4.8	.20	13.4	1.7	.38	.56	.07	.20	81	57	339	<2	46	15	16	736
145	Artificial fill	4.4	.15	8.0	2.1	.31	.43	.04	.44	53	143	276	<2	104	6	29	306
146	do	6.5	.29	3.4	1.8	.41	.57	.04	.38	<2	<10	529	<2	76	12	47	59
147A	Streambank	5.3	.14	9.8	2.0	.47	.39	.05	.25	22	63	320	<2	46	13	39	334
147B	do	6.6	.53	6.6	2.1	.66	1.0	.09	.38	12	49	446	2	104	15	48	255
148	Artificial fill	3.9	.26	5.4	1.8	.37	.28	.04	.24	3	176	192	29	45	35	61	132
149	do	5.1	.07	5.8	2.3	.37	.21	.04	.36	4	30	252	<2	74	5	44	56
150	do	5.0	.06	5.9	2.4	.35	.22	.04	.26	2	49	267	<2	69	6	51	76
151	do	7.0	.06	3.5	3.7	.43	.19	.03	.21	<2	14	397	<2	59	6	66	128
152	Streambank	5.9	.38	7.4	1.8	.56	.87	.08	.33	12	44	392	<2	95	14	38	282
153	Artificial fill	6.0	.42	3.2	2.5	.98	.85	.05	.31	<2	<10	681	<2	96	14	54	63
154	Streambank	6.2	.61	5.7	2.4	.68	1.0	.11	.31	2	45	536	13	100	37	86	320
155	do	6.5	.83	7.3	2.0	.65	1.4	.10	.33	21	43	444	6	88	25	40	473
156A	do	5.1	.34	16.5	1.5	.47	.80	.16	.21	<2	29	514	6	77	28	15	155
157	do	5.8	.45	2.4	1.9	.56	1.1	.09	.31	<2	11	583	<2	89	7	39	90

Table 7. Geochemical data for the fine (<0.063-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Ga (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Mn (ppm)	Nb (ppm)	Nd (ppm)	Ni (ppm)	Pb (ppm)	Sc (ppm)	Sr (ppm)	Th (ppm)	V (ppm)	Y (ppm)	Zn (ppm)
01	Streambed	15	0.08	54	33	770	14	47	22	180	10	89	13	56	22	500
02	do	15	.10	54	35	760	14	48	24	180	11	92	13	56	23	540
03	do	15	.06	48	33	850	14	42	33	56	10	100	12	55	20	150
04	do	16	.19	50	39	840	15	44	27	350	11	94	12	58	23	920
05	do	16	.24	46	36	730	14	41	28	170	10	120	11	55	17	230
06A	do	17	.13	46	34	1,300	17	40	33	870	12	100	12	67	23	1,600
06B	do	17	.13	50	36	1,100	15	44	32	910	12	120	13	63	24	1,600
07	do	19	.15	52	35	1,400	16	46	38	1,400	13	100	14	70	26	2,000
08	do	19	.38	42	32	2,200	13	38	43	5,300	13	100	12	71	22	2,100
09	do	19	.33	44	38	1,700	16	38	50	2,700	13	150	12	73	25	5,800
10	do	18	.17	54	43	1,000	16	50	51	160	12	120	13	66	34	920
11	do	17	.17	50	25	710	15	44	24	440	12	76	13	62	20	380
12	do	17	.24	52	29	830	18	45	32	400	12	120	13	71	21	510
13	do	17	.25	51	27	1,100	16	44	39	400	14	110	13	82	22	430
14	do	17	.25	47	28	1,200	15	41	48	660	12	140	12	64	22	3,400
15	do	17	.02	54	26	1,100	15	46	44	54	14	100	12	90	23	140
16	do	17	.27	45	25	920	15	40	28	1,200	11	130	12	62	19	1,100
17	do	18	.09	48	30	920	17	44	35	1,400	12	120	13	65	21	800
18	do	16	.14	45	27	830	15	41	24	1,500	10	150	11	56	19	520
18B	Streambank	49	19	45	18	310	10	45	25	48,000	12	29	18	49	13	88,000
19	Streambed	17	.32	44	28	1,200	17	40	30	340	11	200	12	68	24	350
20	do	15	.16	43	21	1,300	13	39	30	390	9	270	9	59	23	380
20B	Artificial fill	23	.61	32	18	1,600	14	30	11	5,800	14	36	16	66	19	1,100
21	Streambed	15	.38	42	25	840	14	38	22	2,000	10	120	11	53	18	1,600
22	do	20	.21	33	34	580	18	29	24	640	10	180	10	61	18	1,500
22B	Streambank	21	.24	38	36	530	20	34	24	640	11	200	9	62	25	1,600
23	Streambed	19	.27	49	36	1,100	16	45	41	1,000	12	140	13	67	19	1,500
24	do	15	.04	45	28	680	15	40	17	37	9	110	11	48	16	90
25	do	17	.08	44	27	660	14	39	23	430	11	96	12	61	18	310
26	do	15	.06	44	26	960	13	39	20	64	10	110	12	51	20	100
27	do	17	.10	46	24	560	15	41	26	900	11	80	13	60	16	520
28A	do	18	.08	48	26	670	15	43	27	890	12	80	13	65	17	620
28B	do	18	.12	51	24	830	15	45	26	1,300	12	77	13	64	16	590
29	do	17	.12	43	26	870	14	38	32	1,200	12	89	13	69	17	620
30	do	18	.29	42	24	800	17	37	30	4,200	12	82	14	63	17	1,400
31	do	19	6.1	47	32	1,000	15	44	42	9,600	14	120	17	78	16	3,500
32	do	18	2.1	47	39	1,100	14	42	42	1,600	12	120	14	73	24	2,400
33	do	18	3.4	41	38	1,900	14	37	47	2,900	13	170	12	73	24	8,700

Table 7. Geochemical data for the fine (<0.063-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Ga (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Mn (ppm)	Nb (ppm)	Nd (ppm)	Ni (ppm)	Pb (ppm)	Sc (ppm)	Sr (ppm)	Th (ppm)	V (ppm)	Y (ppm)	Zn (ppm)
34	do	18	.29	42	34	1,800	12	37	39	4,000	13	130	13	74	20	3,900
35	do	18	.30	46	38	1,100	15	44	36	740	12	140	13	67	18	1,300
36	do	15	.17	36	26	900	12	34	19	240	9	150	10	54	15	230
37	do	16	.10	45	28	790	13	42	25	2,200	11	110	12	60	16	830
38	do	15	.52	39	27	940	13	37	22	2,200	10	120	12	54	17	2,100
39	do	17	.42	34	24	730	13	31	30	5,000	11	92	14	62	12	2,300
40	do	18	.09	47	30	890	15	43	38	95	12	100	13	65	16	160
41	do	14	.06	42	24	840	12	38	18	93	9	94	12	49	15	110
42	do	16	.27	47	28	810	15	43	27	360	12	93	14	69	18	400
43	do	18	.30	43	29	1,400	12	40	26	430	12	200	14	74	22	360
101	do	15	.22	53	29	1,530	12	48	48	1,050	12	136	11	67	26	1,940
102	Artificial fill	31	3.6	28	22	3,080	<4	33	28	49,400	13	68	19	60	10	5,820
103	do	18	3.1	18	15	17,100	<4	17	37	35,200	12	14	9	41	10	11,600
104A	Streambed	16	.37	52	33	2,260	10	46	45	6,320	14	109	13	69	26	2,530
104B	Streambank	17	2.6	26	18	7,040	<4	32	28	30,400	13	39	16	53	13	5,860
104C	do	17	.58	48	30	1,520	12	45	37	4,730	13	161	12	70	22	873
105A	do	18	1.7	20	14	5,590	<4	19	28	51,200	9	16	13	36	10	63,400
105B	do	20	.84	43	28	1,490	11	40	32	7,240	14	143	14	71	18	1,630
106	Artificial fill	20	.24	36	31	696	16	30	25	3,300	11	85	10	85	12	364
108A	Streambed	16	.74	65	30	1,310	17	57	41	3,040	13	135	12	70	26	2,910
108B	Streambank	18	.23	57	46	5,320	8	51	69	485	15	123	14	68	41	10,400
108C	do	14	.58	19	21	718	11	17	14	9,430	13	35	8	77	8	2,860
108D	do	17	1.0	32	30	2,320	7	31	61	20,500	14	68	11	82	14	8,350
109A	Artificial fill	24	.09	18	26	1,110	15	18	18	1,430	11	17	8	71	6	3,140
109B	do	15	.07	28	15	1,520	10	23	8	2,380	10	16	9	52	10	224
110	do	17	.04	32	18	1,920	10	25	8	1,580	9	80	10	56	10	193
111A	do	23	.10	28	21	1,440	10	24	11	1,630	10	17	9	66	8	812
111B	do	20	.05	33	19	1,520	13	28	8	1,050	11	49	10	61	10	425
112	Streambed	16	.34	51	35	1,810	13	43	47	3,460	14	147	12	69	28	6,520
113	Artificial fill	27	14	17	4	174	<4	21	35	63,000	5	7	10	8	5	397,000
114	do	25	3.4	30	16	946	8	28	25	67,100	12	82	14	50	18	37,400
115	do	18	.41	46	28	916	13	42	23	5,950	9	120	11	64	12	2,590
116	Streambed	15	.70	52	29	1,630	11	46	42	10,500	11	150	11	67	20	2,880
117	do	15	.12	50	27	1,280	14	45	43	1,150	12	137	11	66	21	723
118	Streambank	17	.17	44	33	1,400	13	36	26	2,550	11	169	12	68	18	1,970
119	do	16	.24	51	29	958	17	45	28	2,420	12	140	12	66	20	702
120	Streambed	14	.50	47	25	948	14	42	21	2,920	10	108	12	54	21	1,940
121	Streambank	15	.68	50	26	696	16	44	23	2,740	12	124	13	66	22	1,270

Table 7. Geochemical data for the fine (<0.063-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Ga (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Mn (ppm)	Nb (ppm)	Nd (ppm)	Ni (ppm)	Pb (ppm)	Sc (ppm)	Sr (ppm)	Th (ppm)	V (ppm)	Y (ppm)	Zn (ppm)
122	do	19	.04	44	24	368	18	39	33	82	12	142	11	84	18	1,210
123	Artificial fill	21	13	36	14	280	10	34	13	55,700	9	23	15	47	7	1,200
124	do	15	28	22	18	12,200	<4	15	49	50,800	10	92	12	42	14	21,700
125	do	19	.14	31	34	883	16	26	27	354	11	196	8	79	15	440
126	do	20	16	27	12	162	8	27	10	66,500	8	28	14	38	5	5,740
127	Streambed	15	.12	46	34	936	13	42	30	935	11	161	10	64	19	159
128	do	17	.49	55	38	1,140	11	53	43	3,670	12	127	11	68	22	1,340
129	do	23	2.3	52	30	1,420	9	52	36	6,300	11	87	12	66	17	1,920
130	do	17	.04	62	35	2,440	10	60	56	57	11	108	10	75	22	155
131	Artificial fill	28	1.3	38	26	734	15	41	44	5,910	14	246	19	103	6	1,510
132	Streambank	21	.16	29	33	628	18	20	20	691	10	153	8	91	15	1,210
133	Artificial fill	14	.87	23	12	167	10	20	12	18,800	9	60	15	47	5	218
134	do	13	.57	31	10	367	9	29	23	8,400	9	59	11	41	5	2,910
135	do	14	.91	37	11	344	9	34	24	14,500	9	56	12	42	6	4,300
136	Streambed	15	.65	40	22	594	13	35	29	5,910	11	83	12	61	12	4,210
137	do	16	.42	48	24	805	14	43	30	5,000	11	74	12	63	12	1,730
138	Artificial fill	18	.27	21	10	376	13	20	15	3,070	10	54	11	52	6	2,230
139	do	18	1.6	18	17	517	12	17	18	5,730	11	90	12	54	9	18,800
140	Streambed	15	.30	36	23	697	13	32	53	3,820	10	77	11	59	12	1,830
141A	Streambank	16	2.0	31	11	64	11	28	8	11,500	10	56	12	48	4	1,260
141B	do	17	1.9	32	21	381	15	29	17	19,900	12	60	14	60	7	659
142	Streambed	16	.17	51	28	779	15	47	46	2,390	11	82	11	65	14	1,490
143	do	14	.05	46	27	1,260	11	41	31	90	9	102	11	53	15	129
144	Streambank	19	1.8	23	18	577	6	25	17	36,600	11	58	11	56	9	1,720
145	Artificial fill	15	1.6	54	14	3,880	<4	36	8	77,200	10	104	18	49	17	866
146	do	18	.06	34	29	434	14	28	28	200	10	92	10	78	11	153
147A	Streambank	19	1.4	22	22	1,850	5	22	17	13,200	14	36	11	74	9	1,890
147B	do	18	.70	47	34	946	13	44	32	6,230	14	113	12	80	17	1,060
148	Artificial fill	10	.22	23	19	1,050	6	22	66	3,930	14	23	7	79	9	5,780
149	do	15	.09	37	18	1,490	9	32	8	1,230	11	16	14	54	10	133
150	do	14	.07	35	16	2,120	8	29	10	3,360	12	16	18	58	9	440
151	do	24	.08	29	25	1,060	17	28	11	1,190	14	20	9	77	9	1,040
152	Streambank	16	.82	44	29	1,120	10	40	29	7,880	12	92	11	69	15	1,010
153	Artificial fill	16	.07	49	38	709	13	44	23	144	12	92	10	71	21	220
154	Streambank	18	.29	46	34	2,240	10	44	70	1,370	13	112	11	78	18	2,020
155	do	22	.82	42	31	3,440	5	40	32	9,130	13	143	10	76	18	1,290
156A	do	11	.11	35	20	713	<4	43	27	671	13	85	7	62	21	597
157	do	15	.09	41	27	227	15	38	24	783	10	106	9	63	16	413

Table 8. Geochemical data for the intermediate (0.063- to 0.25-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Al (wt pct)	Ca (wt pct)	Fe (wt pct)	K (wt pct)	Mg (wt pct)	Na (wt pct)	P (wt pct)	Ti (wt pct)	Ag (ppm)	As (ppm)	Ba (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)
01	Streambed	6.0	0.28	2.7	2.3	0.49	0.52	0.04	0.36	<2	18	580	<2	110	10	43
02	do	6.2	.27	2.9	2.4	.53	.52	.04	.33	<2	22	620	<2	160	12	46
03	do	5.6	.33	3.1	2.2	.49	.51	.04	.33	<2	30	580	<2	130	14	40
04	do	6.2	.33	3.0	2.4	.58	.56	.05	.44	<2	20	600	3	140	10	49
05	do	6.3	.56	2.9	2.0	.54	.64	.06	.34	<2	41	520	<2	100	14	43
06A	do	7.1	.27	5.1	2.7	.67	.58	.05	.66	<2	32	590	4	170	21	55
06B	do	7.0	.39	4.4	2.5	.67	.64	.06	.47	<2	13	570	6	100	19	49
07	do	7.3	.22	5.8	2.8	.68	.59	.06	.51	<2	37	570	7	110	30	59
08	do	7.3	.40	7.0	2.5	.71	.73	.08	.47	8	46	530	16	100	44	58
09	do	7.4	.37	6.3	2.6	.75	.65	.06	.68	<2	87	500	23	110	50	69
10	do	7.3	.50	5.8	2.3	.69	.61	.07	.56	<2	32	500	5	180	34	57
11	do	5.9	.15	4.4	2.4	.53	.65	.04	.62	<2	31	570	<2	150	13	46
12	do	7.0	.27	4.4	2.6	.67	.86	.05	.54	<2	62	620	<2	130	19	52
13	do	7.1	.30	5.1	2.5	.80	.96	.05	.59	<2	83	610	<2	140	27	51
14	do	6.8	.47	5.3	2.4	.62	.58	.08	.75	<2	210	650	17	110	35	49
15	do	7.4	.38	6.2	2.4	1.0	1.0	.05	.99	<2	14	600	<2	140	38	60
16	do	6.6	.31	5.0	2.6	.56	.97	.05	.57	<2	30	650	3	110	21	44
17	do	7.1	.29	4.1	2.6	.64	.83	.06	.45	<2	14	700	2	130	19	48
18	do	5.5	.42	3.2	2.0	.53	.76	.05	.39	<2	<10	680	2	130	14	38
18B	Streambank	5.1	.03	5.5	1.8	.35	.46	.06	<.005	38	54	66	160	66	34	38
19	Streambed	7.4	.47	4.6	3.3	.43	1.5	.06	.44	<2	77	650	<2	130	13	38
20	do	5.9	.78	3.2	2.2	.48	1.2	.10	.38	<2	130	580	2	87	13	34
20B	Artificial fill	7.2	.10	4.5	3.0	.45	.81	.03	.27	5	2,000	510	<2	77	6	52
21	Streambed	6.0	.32	3.2	2.4	.53	.81	.06	.41	<2	13	730	4	100	17	38
22	do	6.2	.57	3.8	1.9	.54	1.0	.10	.48	<2	21	690	6	99	20	34
22B	Streambank	7.4	.87	3.1	1.6	.50	1.4	.11	.38	<2	13	650	8	92	14	24
23	Streambed	7.3	.51	4.8	2.5	.70	.87	.08	.62	<2	19	700	6	140	31	48
24	do	5.1	.31	2.3	2.1	.58	.70	.04	.35	<2	<10	810	<2	82	9	32
25	do	5.9	.21	3.3	2.5	.64	.85	.04	.36	<2	12	620	<2	120	13	44
26	do	5.0	.29	2.0	2.2	.51	.53	.05	.20	<2	<10	710	<2	100	6	31
27	do	6.8	.18	3.6	2.4	.59	.88	.05	.38	<2	15	560	<2	140	22	46
28A	do	6.3	.15	4.6	2.5	.61	.90	.04	.71	<2	20	570	<2	160	21	44
28B	do	6.3	.13	3.7	2.4	.55	.94	.04	.38	<2	16	520	<2	130	17	44
29	do	6.5	.20	4.3	2.3	.65	.97	.05	.54	<2	13	520	<2	150	20	45
30	do	6.3	.13	3.7	2.3	.54	1.1	.04	.35	<2	33	440	3	110	19	41
31	do	8.4	.24	5.8	3.1	.96	.9	.07	.28	5	68	600	13	120	42	59
32	do	7.5	.44	5.6	2.6	.73	.72	.07	.66	<2	40	530	8	110	36	58
33	do	7.4	.31	5.9	2.9	.70	.66	.06	.44	<2	40	550	25	100	44	64
34	do	7.0	.37	6.9	2.7	.74	.75	.07	.63	5	41	540	13	98	46	58
35	do	7.1	.55	5.0	2.4	.71	.87	.09	.62	<2	16	720	6	130	34	51

Table 8. Geochemical data for the intermediate (0.063- to 0.25-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Al (wt pct)	Ca (wt pct)	Fe (wt pct)	K (wt pct)	Mg (wt pct)	Na (wt pct)	P (wt pct)	Ti (wt pct)	Ag (ppm)	As (ppm)	Ba (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)
36	do	5.3	.45	2.8	2.0	.50	.77	.06	.28	<2	<10	810	<2	96	14	32
37	do	6.0	.27	4.2	2.4	.61	.80	.05	.62	<2	<10	670	2	110	19	42
38	do	5.5	.38	3.3	2.1	.50	.78	.06	.41	<2	<10	700	6	110	19	33
39	do	6.4	.22	3.4	2.2	.58	1.1	.05	.25	2	32	420	5	110	17	41
40	do	7.0	.36	4.8	2.4	.59	.68	.06	.65	<2	42	670	<2	220	27	44
41	do	5.2	.27	1.9	2.1	.48	.48	.04	.24	<2	11	680	<2	100	4	29
42	do	6.3	.23	3.4	2.4	.57	.71	.05	.42	<2	86	610	<2	110	20	44
43	do	6.5	.58	7.7	2.5	.48	1.4	.07	.52	<2	140	620	2	110	27	47
101	do	8.2	.57	5.3	2.6	.73	.76	.09	.52	<2	34	577	14	127	25	60
102	Artificial fill	6.6	.19	19.7	1.8	.38	.46	.09	.28	104	111	242	51	71	33	21
103	do	3.4	.10	25.7	1.0	.45	.19	.03	.01	72	60	168	113	21	50	<1
104A	Streambed	8.3	.27	6.1	2.7	.66	.70	.06	.43	6	38	536	11	111	26	54
104B	Streambank	5.7	.07	19.5	1.7	.38	.28	.04	.15	38	55	305	14	54	28	11
104C	do	7.9	.43	7.1	2.4	.64	.86	.09	.45	12	40	463	3	116	23	45
105A	do	5.3	.07	8.7	1.9	.40	.36	.03	.18	52	29	134	280	49	30	24
105B	do	7.4	.33	9.3	2.2	.59	.71	.08	.43	22	54	440	8	98	26	41
106	Artificial fill	8.9	.32	4.4	2.5	.42	.52	.07	.57	5	24	454	<2	99	12	65
108A	Streambed	8.2	.39	3.8	2.6	.63	.83	.07	.36	<2	14	664	12	173	22	50
108B	Streambank	9.0	.39	4.9	1.9	.62	.62	.11	.40	<2	22	492	208	150	32	52
108C	do	6.7	.09	3.3	2.6	.38	.33	.04	.29	11	22	319	15	46	10	73
108D	do	7.0	.13	5.0	2.7	.47	.40	.06	.37	14	57	354	45	54	23	81
109A	Artificial fill	8.8	.05	3.3	3.5	.46	.16	.02	.21	2	14	408	41	61	11	53
109B	do	6.0	.03	3.8	2.4	.32	.21	.02	.28	2	22	280	<2	77	4	42
110	do	7.4	.10	3.8	2.9	.38	.53	.02	.43	<2	24	370	<2	89	3	30
111A	do	9.3	.04	3.4	3.9	.45	.16	.02	.20	3	12	433	20	79	7	65
111B	do	8.0	.07	3.5	3.3	.39	.27	.03	.29	<2	14	371	<2	87	6	52
112	Streambed	8.2	.31	5.5	2.7	.69	.60	.06	.46	<2	82	484	21	125	31	62
113	Artificial fill	2.1	.03	5.7	.7	.12	.21	.05	<.005	28	17	46	1,700	43	82	6
114	do	5.6	.21	2.8	2.1	.27	.90	.05	.09	18	23	161	180	65	27	40
115	do	7.3	.39	2.5	2.3	.46	.96	.08	.37	<2	<10	598	10	120	9	41
116	Streambed	7.5	.60	4.6	2.0	.62	.81	.10	.38	3	58	449	9	141	34	41
117	do	6.9	.69	4.1	2.0	.56	.71	.09	.37	3	17	578	10	111	21	37
118	Streambank	7.3	.76	3.4	1.8	.57	.94	.14	.39	<2	13	743	18	108	19	35
119	do	7.3	.26	3.4	2.4	.56	.83	.05	.39	<2	12	632	2	132	14	40
120	Streambed	6.6	.32	3.2	2.3	.48	.78	.06	.42	<2	<10	679	7	105	13	36
121	Streambank	6.9	.34	3.1	2.1	.49	.84	.06	.34	2	<10	676	6	123	13	36
122	do	7.8	.49	3.2	2.1	.56	1.2	.06	.39	<2	<10	754	5	110	12	42
123	Artificial fill	6.3	.05	3.9	3.2	.28	.20	.05	.20	36	19	605	3	87	6	45
124	do	3.5	.32	21.4	.9	.60	.10	.04	.10	35	88	216	59	24	18	<1
125	do	8.6	1.00	3.0	1.9	.60	1.6	.10	.56	<2	<10	721	<2	74	9	47

Table 8. Geochemical data for the intermediate (0.063- to 0.25-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Al (wt pct)	Ca (wt pct)	Fe (wt pct)	K (wt pct)	Mg (wt pct)	Na (wt pct)	P (wt pct)	Ti (wt pct)	Ag (ppm)	As (ppm)	Ba (ppm)	Cd (ppm)	Ce (ppm)	Co (ppm)	Cr (ppm)
126	do	5.5	.04	4.0	2.9	.22	.24	.04	.14	47	11	279	53	47	11	38
127	Streambed	7.2	.77	3.4	1.9	.61	.84	.08	.38	<2	<10	826	<2	118	15	38
128	do	8.1	.54	4.2	2.3	.63	.76	.09	.42	<2	19	667	4	152	19	46
129	do	6.9	.36	4.3	2.1	.46	.77	.09	.26	4	26	510	4	113	24	44
130	do	8.5	.34	5.0	2.3	.65	.71	.07	.51	<2	29	654	<2	290	57	48
131	Artificial fill	12.0	.41	4.3	4.4	1.1	.65	.03	.16	2	42	857	7	111	23	76
132	Streambank	9.1	.84	4.2	1.8	.64	1.3	.21	.66	<2	16	668	10	85	14	48
133	Artificial fill	5.4	.03	2.2	1.7	.23	1.1	.02	.11	4	63	353	<2	73	4	32
134	do	5.6	.36	1.9	1.7	.44	1.5	.03	.05	4	43	275	14	66	12	30
135	do	5.9	.34	2.2	1.8	.47	1.4	.03	.06	6	72	297	20	82	15	29
136	Streambed	6.9	.24	3.4	2.2	.55	1.1	.05	.23	2	28	418	9	91	14	40
137	do	6.8	.10	3.2	2.2	.48	1.1	.04	.31	<2	24	390	2	134	11	39
138	Artificial fill	6.8	.13	2.1	2.0	.38	1.8	.04	.10	2	39	368	5	72	10	37
139	do	6.7	.15	2.0	2.0	.45	1.6	.03	.12	2	22	338	13	72	10	36
140	Streambed	6.8	.12	3.5	2.2	.49	1.0	.04	.30	<2	26	426	3	114	14	39
141A	Streambank	6.0	.04	2.9	1.8	.25	1.4	.03	.14	5	73	506	6	61	5	33
141B	do	6.6	.06	3.2	2.1	.38	.98	.03	.26	6	60	433	<2	98	12	37
142	Streambed	7.2	.22	4.1	2.3	.53	.80	.05	.43	<2	27	514	4	140	14	42
143	do	5.5	.32	1.8	2.0	.46	.47	.04	.22	<2	<10	668	<2	98	6	29
144	Streambank	6.6	.12	13.4	2.1	.34	.44	.06	.26	71	41	298	4	54	11	24
145	Artificial fill	6.8	.12	6.2	2.7	.33	.47	.03	.44	30	117	355	<2	70	4	35
146	do	9.0	.32	4.0	2.2	.42	.53	.05	.58	<2	10	474	<2	100	12	65
147A	Streambank	6.7	.08	5.9	2.5	.38	.32	.04	.32	24	28	294	<2	51	9	57
147B	do	7.5	.29	6.4	2.3	.65	.62	.07	.40	12	40	421	2	117	17	55
148	Artificial fill	4.9	.25	3.1	2.0	.38	.25	.03	.24	2	87	220	20	49	24	35
149	do	6.4	.05	3.9	2.6	.36	.18	.02	.32	<2	19	286	<2	80	4	31
150	do	5.8	.05	4.4	2.4	.32	.22	.03	.30	2	37	270	<2	70	4	47
151	do	9.0	.07	3.5	3.8	.45	.19	.03	.21	3	19	433	<2	73	10	64
152	Streambank	6.9	.29	6.5	2.0	.54	.64	.07	.37	23	35	370	<2	99	15	43
153	Artificial fill	7.8	.43	3.6	2.6	1.0	.60	.06	.39	<2	<10	688	<2	110	15	52
154	Streambank	8.4	.41	5.8	2.9	.71	.77	.08	.53	<2	48	582	10	115	32	59
155	do	7.2	.25	9.8	2.3	.58	.66	.06	.48	17	51	422	5	91	28	37
156A	do	5.0	.30	18.4	1.3	.40	.61	.19	.20	<2	43	503	6	88	32	8
157	do	7.1	.40	2.5	2.1	.57	.84	.07	.38	<2	<10	599	<2	111	7	40

Table 8. Geochemical data for the intermediate (0.063- to 0.25-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Cu (ppm)	Ga (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Mn (ppm)	Nb (ppm)	Nd (ppm)	Ni (ppm)	Pb (ppm)	Sc (ppm)	Sr (ppm)	Th (ppm)	V (ppm)	Y (ppm)	Zn (ppm)
01	Streambed	19	15	0.03	55	32	580	13	48	18	110	10	68	12	57	15	350
02	do	23	16	.05	73	36	650	13	70	20	150	11	65	12	62	15	430
03	do	28	15	.03	65	29	610	12	56	23	44	10	76	14	59	13	130
04	do	40	16	.06	67	37	710	15	58	22	260	11	76	12	64	16	670
05	do	31	15	.24	50	36	680	14	44	26	170	11	98	12	56	14	220
06A	do	84	18	.05	78	32	1,600	17	65	27	760	13	72	14	74	19	1,200
06B	do	65	18	.08	52	35	1,400	14	45	30	940	13	91	12	70	17	1,500
07	do	130	20	.07	53	33	2,000	15	46	32	1,400	14	68	13	78	13	1,800
08	do	360	20	.32	49	32	3,200	9	43	43	5,500	14	91	13	77	17	2,500
09	do	71	20	.19	50	41	1,700	18	41	44	2,000	15	96	14	95	16	5,800
10	do	49	19	.13	58	48	1,100	15	49	48	150	14	82	13	80	27	870
11	do	32	16	.05	75	21	700	16	65	20	300	11	55	14	70	12	280
12	do	37	18	.15	66	28	900	16	55	28	350	13	95	15	79	15	450
13	do	45	18	.24	67	30	1,200	16	56	36	320	15	94	14	94	21	450
14	do	52	18	.22	53	28	1,800	16	43	51	600	13	140	16	75	19	3,200
15	do	45	20	.02	70	31	1,400	19	56	45	51	18	95	15	120	24	170
16	do	40	18	.09	54	25	990	15	45	24	760	12	120	13	89	13	750
17	do	53	18	.04	63	30	800	16	54	28	940	13	72	13	69	14	610
18	do	35	14	.07	60	24	670	13	53	21	810	10	79	12	55	13	460
18B	Streambank	3,900	36	11	30	16	310	7	29	18	94,000	10	28	19	46	7	73,000
19	Streambed	48	20	.16	63	21	810	18	56	20	340	10	250	13	120	20	240
20	do	55	18	.10	43	22	1,300	14	39	22	280	9	250	12	66	18	320
20B	Artificial fill	160	23	.46	39	19	1,300	18	34	8	3,000	12	36	16	65	14	870
21	Streambed	55	18	.27	50	27	910	16	43	21	1,400	10	79	15	58	11	1,400
22	do	84	18	.18	45	29	730	20	40	22	500	9	110	12	60	12	1,500
22B	Streambank	89	20	.24	44	31	580	19	39	22	620	9	170	12	56	20	1,700
23	Streambed	74	22	.20	64	40	1,000	20	57	39	670	13	98	18	76	14	1,700
24	do	26	15	.03	38	29	520	15	35	15	18	8	62	12	48	8	79
25	do	61	19	.03	55	25	600	19	52	22	310	10	53	14	65	10	290
26	do	40	14	.03	48	24	560	13	45	15	32	8	47	11	47	9	74
27	do	96	19	.05	72	24	580	21	62	23	570	12	51	19	67	13	440
28A	do	110	20	.03	81	24	740	23	72	24	520	12	47	18	70	11	450
28B	do	120	19	.05	66	22	640	19	60	21	610	11	46	17	66	10	420
29	do	130	20	.05	73	26	760	19	65	26	600	12	53	18	77	11	460
30	do	370	18	.10	52	20	640	16	47	21	1,900	11	47	17	63	8	1,000
31	do	330	24	.61	56	32	980	21	53	39	12,000	15	76	25	86	9	3,200
32	do	49	22	.11	50	46	1,300	24	43	44	970	13	90	17	82	16	2,100
33	do	56	24	.21	49	45	1,800	19	45	42	1,700	14	95	16	94	13	7,200
34	do	190	23	.21	46	37	2,500	16	42	41	3,100	14	100	16	90	14	3,700
35	do	96	22	.22	59	40	1,200	19	54	39	650	13	100	18	83	14	1,400
36	do	26	14	.04	45	24	700	13	41	19	47	9	76	12	51	10	91

Table 8. Geochemical data for the intermediate (0.063- to 0.25-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Cu (ppm)	Ga (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Mn (ppm)	Nb (ppm)	Nd (ppm)	Ni (ppm)	Pb (ppm)	Sc (ppm)	Sr (ppm)	Th (ppm)	V (ppm)	Y (ppm)	Zn (ppm)
37	do	84	18	.04	56	28	720	19	50	25	940	11	61	15	65	10	640
38	do	70	16	.29	50	25	800	18	46	21	1,100	9	80	14	56	10	1,600
39	do	280	18	.31	53	20	670	18	48	21	3,000	11	58	17	62	9	1,700
40	do	34	20	.04	110	31	1,000	22	97	38	61	12	68	21	72	14	160
41	do	22	14	.03	52	21	470	16	45	14	46	8	42	13	44	13	61
42	do	30	18	.23	54	26	880	19	50	26	310	11	80	15	69	12	380
43	do	31	22	.17	56	23	1,300	16	49	22	240	10	230	16	230	16	240
101	do	64	18	.14	64	31	1,580	16	54	48	912	14	127	14	73	24	1,770
102	Artificial fill	1,430	30	2.9	35	22	3,950	<4	38	25	35,100	12	47	18	53	10	12,600
103	do	2,090	14	1.5	13	13	12,900	<4	16	32	19,600	10	7	6	31	7	18,600
104A	Streambed	238	19	.18	55	31	2,510	14	45	35	4,430	15	85	15	72	20	2,570
104B	Streambank	1,160	14	.91	28	19	4,550	<4	34	23	11,400	12	21	9	45	10	5,700
104C	do	237	19	.39	57	29	2,040	12	50	32	4,540	14	96	14	69	19	941
105A	do	1,480	18	1.1	25	18	3,020	<4	25	18	29,700	9	16	12	41	6	37,000
105B	do	367	19	.51	48	26	2,740	10	42	31	6,960	14	82	13	66	17	1,930
106	Artificial fill	63	22	.25	45	37	933	16	42	26	2,340	11	86	12	86	15	475
108A	Streambed	92	18	.29	87	31	1,050	17	77	31	2,550	15	72	16	69	18	2,300
108B	Streambank	88	19	.18	57	49	4,520	8	52	64	452	16	81	14	71	37	8,810
108C	do	108	15	.36	22	26	1,170	10	21	14	9,430	13	33	10	86	7	3,310
108D	do	154	17	.70	26	31	2,270	6	25	29	11,700	15	39	11	102	10	12,300
109A	Artificial fill	185	22	.11	32	28	997	17	26	17	1,520	15	19	12	71	18	3,210
109B	do	37	15	.04	39	17	783	14	32	7	1,490	12	16	9	55	11	151
110	do	42	18	.05	47	19	1,520	15	35	7	1,250	12	84	8	57	15	134
111A	do	440	23	.16	40	27	888	21	35	12	1,560	16	21	13	76	14	1,180
111B	do	92	20	.05	45	20	1,420	16	36	8	1,330	13	38	12	63	17	378
112	Streambed	78	18	.21	62	41	1,680	15	52	41	2,450	17	90	15	83	18	5,820
113	Artificial fill	4,880	27	8.4	19	8	168	<4	22	20	52,300	6	6	12	15	5	298,000
114	do	1,520	23	3.7	28	14	864	7	29	17	57,400	10	36	15	44	13	42,900
115	do	104	16	.30	54	29	783	11	52	17	4,230	9	88	11	55	11	2,320
116	Streambed	332	17	.72	67	32	1,870	12	59	40	10,400	13	92	14	68	17	2,880
117	do	85	15	.11	54	25	1,260	14	49	34	1,210	12	99	13	61	20	925
118	Streambank	87	16	.21	46	30	1,920	11	38	26	3,490	11	126	12	65	16	2,250
119	do	84	16	.11	64	28	828	16	55	22	1,480	13	64	13	60	17	554
120	Streambed	81	15	.80	52	24	959	14	45	19	2,340	11	79	12	54	15	1,760
121	Streambank	59	15	.69	53	25	806	13	46	22	2,520	11	95	12	58	17	1,170
122	do	47	17	.05	51	22	389	18	44	33	101	13	136	13	77	20	1,290
123	Artificial fill	85	21	10	41	17	234	11	40	11	41,900	9	22	16	50	7	1,340
124	do	158	10	18	14	14	16,000	<4	10	15	20,200	10	43	7	20	12	11,900
125	do	55	20	.11	31	41	956	15	27	25	346	10	214	8	78	16	524
126	do	328	21	11	22	15	182	10	23	10	52,200	8	19	12	43	4	12,400

Table 8. Geochemical data for the intermediate (0.063- to 0.25-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Cu (ppm)	Ga (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Mn (ppm)	Nb (ppm)	Nd (ppm)	Ni (ppm)	Pb (ppm)	Sc (ppm)	Sr (ppm)	Th (ppm)	V (ppm)	Y (ppm)	Zn (ppm)
127	Streambed	42	15	.10	54	33	846	12	49	23	869	12	127	12	62	18	132
128	do	117	18	.37	70	39	1,050	16	64	34	2,850	14	93	15	66	21	1,130
129	do	194	21	2.1	53	27	1,350	11	47	28	5,450	12	69	12	60	17	1,650
130	do	54	18	.03	110	37	2,810	13	98	59	60	15	86	16	74	24	168
131	Artificial fill	111	26	.82	56	24	538	20	52	32	3,520	20	228	25	97	11	1,020
132	Streambank	620	24	.14	44	43	1,010	14	35	22	725	10	169	10	98	18	1,590
133	Artificial fill	114	14	.55	37	10	61	11	32	6	7,200	8	39	10	41	6	155
134	do	649	13	.37	34	10	286	10	29	12	7,320	9	52	11	41	7	2,000
135	do	538	14	.74	42	11	298	10	37	15	9,060	10	51	12	43	7	3,560
136	Streambed	314	16	.31	47	18	524	13	40	20	4,980	12	56	16	55	10	2,720
137	do	256	16	.15	69	18	536	15	59	17	2,020	12	42	16	55	10	867
138	Artificial fill	384	16	.18	37	9	331	12	32	13	2,770	11	51	12	48	8	1,770
139	do	154	17	.49	38	12	282	13	32	11	3,400	11	48	13	49	8	7,060
140	Streambed	410	16	.13	58	18	667	14	50	20	2,140	12	42	15	55	11	973
141A	Streambank	138	16	1.2	31	11	94	12	27	6	5,520	10	40	11	47	7	1,520
141B	do	208	17	.95	49	17	484	14	42	15	7,870	12	40	15	55	9	658
142	Streambed	179	17	.10	71	24	754	16	61	26	1,520	13	54	16	60	16	906
143	do	26	12	.02	48	21	567	13	43	13	43	9	50	11	40	14	70
144	Streambank	711	17	1.4	27	21	674	8	29	14	33,500	11	45	12	52	7	2,070
145	Artificial fill	193	18	.89	38	17	2,980	10	26	6	28,200	12	93	12	54	18	610
146	do	53	20	.05	44	40	575	18	40	31	143	11	94	12	88	14	209
147A	Streambank	288	16	.64	24	24	1,680	7	23	12	9,010	12	28	9	74	7	1,500
147B	do	201	18	.53	57	31	1,500	13	50	28	5,000	16	78	15	79	17	1,030
148	Artificial fill	84	11	.19	24	19	1,460	7	21	37	3,710	14	22	8	84	9	5,740
149	do	22	16	.03	41	20	1,060	11	34	7	687	12	15	10	58	10	104
150	do	48	15	.05	36	16	1,500	11	29	8	2,010	12	17	12	58	14	303
151	do	179	23	.11	38	24	1,930	15	31	12	1,720	16	23	12	75	17	1,110
152	Streambank	278	17	.64	48	30	2,050	11	42	26	8,250	14	74	13	69	16	893
153	Artificial fill	37	16	.06	60	40	784	17	52	25	156	15	84	14	73	26	234
154	Streambank	82	20	.13	58	33	2,020	16	50	48	1,030	16	98	16	75	16	1,840
155	do	467	22	.45	46	27	4,290	5	38	28	7,710	14	73	13	69	16	1,460
156A	do	73	12	.11	40	18	766	<4	50	29	672	12	75	8	59	25	631
157	do	54	15	.12	55	28	251	18	49	25	813	12	91	12	61	18	425

Table 9. Geochemical data for the coarse (0.25- to 1.0-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Al (wt pct)	Ca (wt pct)	Fe (wt pct)	K (wt pct)	Mg (wt pct)	Na (wt pct)	P (wt pct)	Ti (wt pct)	Ag (ppm)	As (ppm)	Ba (ppm)	Cd (ppm)	Ce (ppm)
01	Streambed	6.6	0.12	2.9	2.7	0.45	0.54	0.03	0.21	<2	25	680	<2	120
02	do	5.9	.20	3.1	2.8	.48	.55	.04	.21	<2	16	720	<2	86
03	do	6.5	.17	3.6	2.8	.48	.62	.04	.16	<2	33	700	<2	98
04	do	7.4	.12	3.1	3.0	.52	.57	.03	.21	<2	20	690	<2	110
05	do	7.4	.19	3.0	2.7	.49	.59	.04	.21	<2	27	620	<2	100
06A	do	7.8	.13	3.8	3.1	.61	.62	.04	.25	<2	21	660	2	93
06B	do	7.5	.25	3.7	2.9	.64	.63	.05	.26	<2	15	640	4	91
07	do	7.9	.08	4.3	3.0	.63	.61	.04	.24	<2	20	600	3	93
08	do	7.8	.15	5.4	2.9	.66	.68	.05	.25	4	27	560	7	95
09	do	8.4	.12	4.5	3.2	.68	.62	.04	.29	<2	27	590	9	95
10	do	8.7	.15	5.0	3.1	.63	.61	.05	.33	<2	26	620	2	97
11	do	7.2	.09	4.0	3.0	.58	.71	.04	.24	<2	33	700	<2	92
12	do	7.9	.15	3.8	3.2	.65	.86	.04	.25	<2	54	720	2	79
13	do	8.2	.16	4.3	3.2	.70	.91	.04	.28	<2	78	740	<2	97
14	do	8.5	.16	5.6	3.3	.67	.50	.07	.26	<2	120	780	12	100
15	do	8.5	.19	5.0	3.2	.94	.77	.04	.39	<2	14	720	<2	100
16	do	7.8	.12	3.8	3.2	.61	.96	.03	.26	<2	19	750	<2	88
17	do	8.3	.11	4.2	3.2	.68	.86	.04	.26	<2	19	760	2	95
18	do	7.2	.14	2.9	2.9	.53	.89	.04	.27	<2	<10	820	2	98
18B	Streambank	6.6	.04	6.9	2.4	.42	.54	.07	<.005	49	74	250	89	84
19	Streambed	8.3	.29	3.3	3.7	.46	1.5	.04	.24	<2	42	830	<2	75
20	do	6.7	.67	2.9	2.6	.42	1.2	.08	.24	<2	110	680	2	74
20B	Artificial fill	8.1	.10	5.3	3.5	.48	.64	.04	.24	7	2,800	530	<2	58
21	Streambed	7.2	.13	3.2	3.0	.51	.86	.04	.26	<2	15	760	3	85
22	do	7.9	.34	4.1	2.9	.62	.91	.07	.29	<2	19	780	7	83
22B	Streambank	7.3	.60	3.3	2.1	.50	1.1	.11	.32	<2	17	690	16	87
23	Streambed	8.4	.22	4.2	3.1	.66	.78	.06	.28	<2	19	740	5	120
24	do	6.3	.12	2.1	2.7	.50	.77	.03	.25	<2	<10	880	<2	83
25	do	7.4	.13	4.8	3.0	.64	.62	.04	.25	<2	26	740	<2	110
26	do	6.1	.08	2.2	2.8	.51	.55	.03	.18	<2	<10	700	<2	81
27	do	8.2	.09	4.4	3.3	.66	.72	.04	.26	<2	30	680	<2	110
28A	do	8.6	.07	4.6	3.4	.67	.72	.04	.24	<2	18	710	<2	92
28B	do	8.1	.08	4.2	3.2	.64	.72	.04	.23	<2	22	680	<2	97
29	do	8.4	.10	5.2	3.2	.71	.70	.04	.26	<2	27	690	<2	120
30	do	8.2	.05	4.6	3.2	.63	.70	.04	.21	<2	28	640	2	92
31	do	8.6	.17	4.4	3.2	.81	.99	.04	.16	3	43	570	9	94
32	do	8.8	.12	4.8	3.4	.62	.59	.04	.32	<2	25	630	5	89
33	do	8.6	.10	4.5	3.4	.65	.57	.04	.32	<2	30	590	12	95

Table 9. Geochemical data for the coarse (0.25- to 1.0-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Al (wt pct)	Ca (wt pct)	Fe (wt pct)	K (wt pct)	Mg (wt pct)	Na (wt pct)	P (wt pct)	Ti (wt pct)	Ag (ppm)	As (ppm)	Ba (ppm)	Cd (ppm)	Ce (ppm)
34	do	8.3	.12	5.1	3.2	.67	.64	.04	.31	3	27	580	9	87
35	do	8.9	.15	4.3	3.3	.69	.78	.05	.28	<2	16	780	4	95
36	do	6.8	.27	2.7	2.6	.50	.95	.05	.27	<2	<10	900	<2	94
37	do	8.3	.07	4.0	3.3	.65	.86	.04	.29	<2	14	770	<2	97
38	do	7.6	.10	3.5	3.1	.56	.87	.04	.24	<2	14	770	5	80
39	do	8.2	.14	4.4	3.0	.62	.79	.05	.19	<2	34	600	6	92
40	do	8.8	.08	5.5	3.4	.62	.57	.04	.23	<2	25	800	<2	120
41	do	6.1	.05	1.9	2.8	.48	.53	.02	.15	<2	<10	720	<2	82
42	do	7.7	.16	3.9	3.1	.62	.79	.04	.24	<2	47	710	<2	90
43	do	7.9	.33	3.1	3.5	.43	1.5	.04	.22	<2	47	790	<2	70
101	do	9.3	.18	4.9	3.1	.67	.78	.06	.32	<2	30	597	8	117
102	Artificial fill	6.3	.05	12.6	2.3	.35	.44	.04	.15	51	49	293	41	60
103	do	4.0	.09	20.1	1.4	.49	.27	.03	.05	35	33	221	87	37
104A	Streambed	8.9	.10	5.2	2.9	.61	.75	.05	.26	5	28	529	9	103
104B	Streambank	6.1	.05	9.1	2.2	.40	.36	.03	.15	16	30	355	13	51
104C	do	8.6	.10	5.8	2.9	.59	.72	.06	.25	9	16	492	3	104
105A	do	6.0	.06	8.7	2.4	.44	.47	.03	.14	32	33	252	137	62
105B	do	7.6	.09	8.7	2.3	.45	.52	.05	.20	24	32	376	13	85
106	Artificial fill	8.3	.22	5.4	2.5	.48	.46	.07	.43	2	22	546	<2	108
108A	Streambed	9.2	.12	3.7	3.4	.59	1.0	.04	.26	<2	11	758	6	134
108B	Streambank	9.4	.12	4.9	3.0	.60	.68	.06	.33	<2	25	555	101	100
108C	do	7.9	.19	5.0	2.7	.52	.52	.09	.24	12	33	484	68	89
108D	do	6.7	.08	4.2	2.9	.49	.36	.04	.24	9	38	381	25	45
109A	Artificial fill	9.1	.04	3.6	3.8	.47	.18	.03	.21	3	24	414	53	57
109B	do	7.2	.14	8.0	2.4	.37	.39	.06	.26	11	65	356	<2	106
110	do	9.6	.05	4.8	3.9	.48	.40	.03	.24	2	36	454	<2	71
111A	do	10.8	.04	3.7	4.6	.48	.18	.03	.22	4	16	460	28	74
111B	do	9.8	.08	3.9	3.9	.45	.28	.03	.24	3	18	427	<2	74
112	Streambed	9.2	.10	4.5	3.1	.66	.64	.05	.30	<2	27	531	13	92
113	Artificial fill	3.0	.04	4.9	1.3	.17	.46	.04	<.005	34	31	45	1,050	27
114	do	4.8	.17	2.5	2.1	.25	1.0	.03	.06	8	10	205	310	44
115	do	7.0	.20	3.0	2.9	.52	.94	.07	.29	<2	13	797	12	125
116	Streambed	8.4	.25	4.6	2.6	.62	.87	.07	.28	<2	27	524	8	134
117	do	7.8	.42	3.9	2.6	.58	.71	.07	.28	<2	17	641	9	104
118	Streambank	7.3	.41	3.2	2.1	.51	.75	.10	.27	<2	13	713	18	95
119	do	8.7	.09	3.4	2.9	.59	.89	.04	.25	<2	18	674	3	125
120	Streambed	8.1	.08	3.2	3.0	.50	.87	.03	.24	<2	14	725	3	85
121	Streambank	7.2	.28	3.2	2.2	.48	.85	.07	.29	3	<10	728	12	116
122	do	8.5	.44	3.6	2.5	.60	1.2	.06	.40	<2	<10	852	8	109

Table 9. Geochemical data for the coarse (0.25- to 1.0-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Al (wt pct)	Ca (wt pct)	Fe (wt pct)	K (wt pct)	Mg (wt pct)	Na (wt pct)	P (wt pct)	Ti (wt pct)	Ag (ppm)	As (ppm)	Ba (ppm)	Cd (ppm)	Ce (ppm)
123	Artificial fill	5.9	.06	4.3	3.0	.31	.21	.04	.15	36	13	426	4	78
124	do	3.2	.22	17.2	1.2	.54	.08	.02	.06	20	46	201	47	27
125	do	8.0	.81	4.0	2.0	.64	1.3	.09	.50	<2	12	862	<2	88
126	do	5.0	.05	4.4	2.7	.24	.23	.03	.12	38	10	159	23	75
127	Streambed	8.3	.26	3.6	2.9	.59	.82	.05	.32	<2	16	875	<2	124
128	do	9.6	.16	4.1	3.1	.63	.82	.05	.28	<2	21	723	3	109
129	do	8.2	.18	4.7	2.6	.50	.86	.07	.22	3	24	556	8	107
130	do	9.6	.08	5.9	3.2	.70	.65	.06	.26	<2	38	761	<2	157
131	Artificial fill	10.1	.48	4.4	4.3	1.2	.83	.04	.15	2	30	1,000	7	106
132	Streambank	7.2	.60	4.9	1.8	.64	1.1	.15	.54	<2	10	739	8	82
133	Artificial fill	7.2	.03	3.8	2.2	.32	.95	.04	.13	8	72	503	<2	90
134	do	5.9	.27	1.5	1.7	.38	1.6	.03	.05	3	32	230	13	45
135	do	5.8	.25	1.6	1.7	.38	1.5	.03	.04	4	44	240	18	56
136	Streambed	8.9	.10	4.4	3.0	.62	.83	.04	.19	<2	30	530	7	116
137	do	8.9	.06	7.7	3.1	.61	.72	.06	.18	<2	57	656	7	156
138	Artificial fill	8.1	.15	2.4	2.4	.42	1.7	.05	.14	3	48	418	8	106
139	do	7.0	.22	2.2	1.9	.41	1.6	.05	.12	4	20	363	23	93
140	Streambed	9.4	.06	6.8	3.1	.64	.68	.05	.18	<2	48	624	6	145
141A	Streambank	7.3	.03	3.6	2.2	.36	1.2	.03	.12	4	53	423	3	104
141B	do	7.7	.03	3.1	2.3	.40	1.2	.03	.12	4	40	409	<2	96
142	Streambed	9.5	.06	5.6	3.2	.62	.65	.05	.22	<2	25	646	3	125
143	do	6.7	.09	2.0	2.7	.48	.54	.03	.15	<2	<10	692	<2	94
144	Streambank	5.9	.08	9.6	2.1	.33	.42	.05	.18	66	39	334	3	59
145	Artificial fill	7.3	.10	5.9	2.9	.34	.47	.03	.34	32	98	357	2	56
146	do	8.4	.22	5.1	2.3	.49	.40	.05	.43	<2	13	540	<2	102
147A	Streambank	6.6	.06	5.2	2.6	.40	.33	.04	.24	22	43	348	<2	64
147B	do	7.8	.16	5.4	2.4	.55	.54	.07	.26	15	30	414	6	102
148	Artificial fill	6.6	.15	3.2	2.5	.42	.28	.03	.20	3	57	290	27	47
149	do	7.0	.07	4.8	2.7	.34	.22	.04	.28	7	28	307	<2	86
150	do	6.9	.04	3.5	2.8	.34	.23	.03	.23	4	36	307	<2	65
151	do	9.8	.08	3.7	4.0	.46	.21	.03	.21	4	14	435	5	69
152	Streambank	7.3	.22	6.2	2.1	.54	.62	.10	.30	23	34	379	3	112
153	Artificial fill	7.6	.35	3.8	2.7	1.0	.57	.05	.34	<2	10	673	2	107
154	Streambank	8.3	.10	4.8	3.2	.63	.76	.04	.30	<2	24	555	6	99
155	do	8.1	.07	7.4	2.8	.57	.64	.04	.24	12	29	474	8	88
156A	do	5.6	.32	17.8	1.2	.41	.64	.20	.20	<2	35	474	12	88
157	do	6.9	.31	2.6	2.1	.57	.83	.08	.31	<2	<10	583	3	112

Table 9. Geochemical data for the coarse (0.25- to 1.0-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Co (ppm)	Cr (ppm)	Cu (ppm)	Ga (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Mn (ppm)	Nb (ppm)	Nd (ppm)	Ni (ppm)	Pb (ppm)	Sc (ppm)	Sr (ppm)	Th (ppm)	V (ppm)	Y (ppm)	Zn (ppm)
01	Streambed	9	42	16	18	0.02	61	34	520	17	58	16	70	10	49	14	61	14	270
02	do	16	35	26	19	.02	42	37	600	13	41	18	80	10	68	13	65	9	570
03	do	14	44	23	18	.02	49	30	550	13	46	21	29	11	60	14	64	10	120
04	do	6	49	24	20	.03	58	37	400	21	53	18	90	12	49	16	67	14	400
05	do	10	48	20	20	.08	51	37	410	20	45	22	69	12	44	16	65	14	150
06A	do	14	52	33	21	.04	48	33	780	22	42	23	400	13	56	16	72	14	900
06B	do	15	52	40	20	.09	46	36	960	15	42	27	620	12	67	15	72	15	1,200
07	do	22	56	49	22	.05	46	33	1,000	19	41	25	690	14	40	16	76	11	1,100
08	do	26	54	170	22	.09	50	30	2,200	16	44	27	2,600	14	42	16	76	14	1,600
09	do	31	69	35	23	.09	49	42	1,300	23	42	32	1,200	16	49	16	94	16	3,300
10	do	23	58	32	24	.04	50	51	730	25	43	38	80	14	40	18	81	23	620
11	do	14	48	31	19	.03	47	25	680	16	42	22	290	12	62	13	68	12	270
12	do	14	50	30	21	.08	41	30	820	19	36	24	350	14	110	12	75	15	430
13	do	20	58	38	22	.05	50	30	980	19	43	31	430	14	89	14	83	18	500
14	do	32	60	43	24	.06	54	32	1,800	17	48	49	360	16	78	15	82	17	2,700
15	do	26	74	34	23	<.02	55	30	920	20	47	38	44	18	65	14	110	19	150
16	do	12	50	28	21	.04	45	29	670	18	40	21	570	13	100	13	74	13	590
17	do	20	57	46	21	.02	50	34	840	18	43	28	720	15	48	14	78	17	560
18	do	11	45	28	18	.07	49	33	610	18	43	21	530	12	45	13	60	13	530
18B	Streambank	30	46	4,600	55	17	41	20	300	13	39	19	49,000	14	34	18	57	12	42,000
19	Streambed	6	36	34	22	.07	39	24	580	22	33	19	150	11	280	12	68	14	190
20	do	13	35	32	18	.10	39	21	980	14	35	20	340	10	290	10	60	19	320
20B	Artificial fill	8	62	210	24	.56	29	19	1,200	17	27	8	4,600	14	48	14	71	16	800
21	Streambed	15	45	39	19	.15	44	27	810	17	38	18	1,500	12	66	12	64	13	1,200
22	do	17	47	92	21	.16	42	35	700	18	37	22	530	14	63	12	73	14	1,800
22B	Streambank	17	33	110	19	.30	45	31	770	16	39	21	1,100	11	110	11	62	20	2,600
23	Streambed	16	55	41	22	.11	60	42	790	22	53	30	580	15	59	15	75	16	1,400
24	do	5	38	18	16	.02	45	30	360	16	39	13	21	10	38	11	50	14	69
25	do	22	51	54	20	.02	56	26	700	14	50	30	340	13	38	14	71	18	280
26	do	2	38	15	16	.01	40	23	310	14	36	14	25	10	27	10	52	11	59
27	do	14	56	63	22	.04	56	28	620	22	49	25	630	15	40	14	78	16	450
28A	do	16	61	59	23	<.02	48	29	610	20	43	24	550	16	41	15	82	13	440
28B	do	14	58	82	22	.07	51	28	690	20	45	23	740	15	42	14	78	14	430
29	do	19	61	70	23	.02	63	32	830	18	56	31	690	16	40	15	88	16	480
30	do	19	60	130	23	.05	48	29	750	19	43	27	1,800	16	39	15	78	12	830
31	do	15	60	210	24	.30	48	28	720	19	42	25	6,100	16	60	17	79	11	2,200
32	do	20	68	29	24	.06	46	45	940	19	40	32	830	16	41	14	86	17	1,600
33	do	26	71	30	24	.09	50	42	1,100	19	42	28	1,200	17	46	14	93	16	4,000

Table 9. Geochemical data for the coarse (0.25- to 1.0-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

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Sample	Sample type	Co (ppm)	Cr (ppm)	Cu (ppm)	Ga (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Mn (ppm)	Nb (ppm)	Nd (ppm)	Ni (ppm)	Pb (ppm)	Sc (ppm)	Sr (ppm)	Th (ppm)	V (ppm)	Y (ppm)	Zn (ppm)
34	do	26	63	90	23	.07	45	37	1,800	15	39	27	2,300	16	47	13	83	15	2,600
35	do	14	60	31	24	.10	50	44	720	20	44	29	400	16	51	15	78	12	1,200
36	do	12	40	21	18	.03	46	29	730	15	40	20	47	11	60	12	56	12	97
37	do	14	56	39	22	.02	52	36	570	22	45	24	760	15	40	15	74	15	500
38	do	11	48	61	21	.17	42	31	690	17	37	20	980	13	52	13	66	11	1,600
39	do	22	53	190	22	.17	48	27	930	19	43	26	4,100	15	46	15	73	12	1,700
40	do	18	60	34	25	.02	61	36	940	19	55	36	79	16	42	16	81	12	160
41	do	<1	35	11	16	<.02	41	22	330	13	37	13	28	9	20	10	47	8	55
42	do	11	48	28	20	.11	47	30	730	17	42	24	330	14	89	13	73	15	340
43	do	8	34	24	21	.06	37	24	600	20	33	16	180	10	290	12	69	13	170
101	do	22	48	39	24	.06	58	33	1,120	27	52	35	529	13	65	18	81	15	1,640
102	Artificial fill	26	26	1,050	22	.78	30	21	2,540	<4	32	16	16,600	11	24	10	100	6	100
103	do	35	<1	1,460	16	.76	21	14	15,600	<4	22	23	14,700	10	14	8	35	11	12,800
104A	Streambed	27	53	128	23	.09	50	31	2,260	21	46	28	3,200	13	49	18	75	12	2,320
104B	Streambank	23	29	586	17	.47	26	22	4,830	<4	23	16	9,000	10	25	9	51	7	4,060
104C	do	27	48	207	23	.15	49	31	2,170	18	46	26	3,540	13	42	16	74	12	1,040
105A	do	25	30	960	22	.52	31	20	2,690	<4	31	14	12,900	10	22	11	52	8	19,200
105B	do	25	30	531	19	.31	46	24	2,160	15	42	21	6,350	13	34	16	60	17	3,630
106	Artificial fill	27	68	53	26	.12	49	41	862	15	45	34	1,480	12	77	11	103	16	349
108A	Streambed	16	55	46	26	.10	63	35	614	30	63	24	1,160	13	46	18	79	9	1,690
108B	Streambank	26	58	42	26	.05	43	51	2,880	23	41	43	238	13	46	15	81	19	6,020
108C	do	75	64	350	21	.75	38	33	5,240	<4	35	34	15,700	14	55	10	89	20	7,260
108D	do	24	79	83	19	.40	22	28	1,960	7	20	22	9,750	15	30	9	110	8	7,050
109A	Artificial fill	12	54	213	29	.11	27	33	1,080	31	26	18	1,550	14	21	15	80	8	5,410
109B	do	10	48	156	19	.10	51	22	681	19	46	14	8,050	12	44	72	66	14	389
110	do	5	63	95	28	.06	35	25	738	34	31	11	2,700	15	52	15	84	10	319
111A	do	7	61	616	32	.19	35	32	959	38	34	14	1,690	16	23	17	90	16	2,160
111B	do	8	60	160	28	.10	36	26	1,380	26	33	11	1,530	14	42	17	81	12	903
112	Streambed	26	63	40	24	.08	44	43	1,360	23	42	32	1,540	15	50	16	91	12	4,820
113	Artificial fill	76	17	3,790	30	3.1	11	8	133	<4	16	25	63,300	6	11	9	27	4	200,000
114	do	32	34	1,180	26	2.9	21	11	412	7	22	15	21,700	8	28	10	43	10	63,100
115	do	16	49	107	21	.22	58	34	1,040	13	55	21	6,100	10	66	11	68	12	2,240
116	Streambed	27	50	160	24	.31	64	37	1,300	25	60	34	5,910	12	60	18	75	12	2,890
117	do	20	44	49	20	.06	52	28	954	23	48	30	829	12	72	18	68	14	1,010
118	Streambank	18	37	58	18	.11	43	30	1,610	20	36	24	2,510	10	80	14	62	11	2,720
119	do	16	48	55	23	.05	61	33	760	24	57	23	1,290	12	46	16	72	10	729
120	Streambed	14	42	34	21	.11	41	26	684	23	38	18	1,190	11	62	13	66	8	1,330
121	Streambank	21	37	72	20	.46	53	27	1,290	20	50	24	3,730	10	95	15	63	20	2,080
122	do	14	46	44	23	.04	48	24	458	30	44	38	120	12	151	14	88	22	2,240

Table 9. Geochemical data for the coarse (0.25- to 1.0-mm grain size) fraction of samples of streambed sediment, streambank soil, and artificial-fill material collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.—Continued

[<, below analytical detection limit; dashes, insufficient material for analysis]

Sample	Sample type	Co (ppm)	Cr (ppm)	Cu (ppm)	Ga (ppm)	Hg (ppm)	La (ppm)	Li (ppm)	Mn (ppm)	Nb (ppm)	Nd (ppm)	Ni (ppm)	Pb (ppm)	Sc (ppm)	Sr (ppm)	Th (ppm)	V (ppm)	Y (ppm)	Zn (ppm)
123	Artificial fill	9	44	88	20	9.4	37	16	472	10	34	13	75,500	9	31	16	52	7	1,520
124	do	17	<1	97	9	10	14	9	14,900	<4	12	13	14,500	8	20	5	19	12	11,100
125	do	15	46	45	23	.10	40	39	1,430	14	35	28	380	11	190	8	92	19	498
126	do	11	32	373	20	4.5	35	14	299	9	33	10	75,900	8	26	14	45	6	5,910
127	Streambed	13	47	23	22	.05	58	40	626	25	54	23	555	11	66	17	70	12	161
128	do	16	53	32	25	.10	52	45	717	29	50	29	1,190	12	53	15	77	11	897
129	do	28	47	204	27	1.1	52	29	1,400	21	49	24	5,420	12	51	16	68	12	2,710
130	do	49	54	48	27	.01	62	42	1,960	22	66	53	51	15	51	16	90	13	225
131	Artificial fill	20	50	64	29	.52	49	22	597	27	53	29	2,480	15	171	22	98	7	1,120
132	Streambank	27	47	605	26	.12	42	36	1,800	12	32	23	913	9	140	9	106	16	1,350
133	Artificial fill	12	40	164	20	.53	43	15	303	20	39	13	7,960	11	39	19	56	6	370
134	do	8	32	377	16	.14	22	10	224	16	20	9	3,760	8	48	13	42	4	2,360
135	do	9	30	412	17	.28	28	10	205	16	25	10	4,820	8	45	13	43	4	3,990
136	Streambed	19	48	167	24	.14	57	28	656	22	56	24	3,230	13	46	18	76	9	2,740
137	do	32	50	184	25	.06	75	30	1,160	19	78	44	2,570	14	40	17	79	12	1,740
138	Artificial fill	12	43	428	22	.20	53	14	449	22	46	16	3,160	11	62	18	61	9	3,220
139	do	13	32	198	18	.56	47	13	466	19	42	13	4,950	10	58	15	50	9	12,200
140	Streambed	27	52	162	25	.06	71	30	988	28	72	37	2,120	15	38	19	80	11	1,710
141A	Streambank	9	39	132	21	.50	52	17	232	21	49	12	4,000	12	37	18	59	6	920
141B	do	19	40	230	22	.32	47	18	505	21	44	15	5,740	12	34	17	62	6	657
142	Streambed	21	54	69	25	.03	60	32	816	27	60	31	965	14	40	16	80	10	1,060
143	do	6	32	15	17	.01	45	24	319	21	42	14	37	8	27	13	49	8	87
144	Streambank	13	27	649	19	1.2	30	18	797	7	28	11	44,000	10	41	11	51	8	1,730
145	Artificial fill	4	38	157	21	.69	28	18	2,180	19	22	8	20,900	11	91	12	59	13	945
146	do	20	69	48	24	.05	46	39	751	15	41	36	213	12	75	10	101	16	592
147A	Streambank	15	56	269	18	.45	30	22	3,380	<4	26	10	12,300	12	28	9	77	8	1,220
147B	do	31	49	240	21	.62	49	32	2,670	11	46	26	8,130	13	51	15	78	17	1,690
148	Artificial fill	28	67	136	17	.12	23	23	1,740	12	21	43	4,150	16	23	10	106	7	17,200
149	do	4	39	47	20	.09	42	20	857	18	36	9	2,400	11	22	27	61	10	215
150	do	4	52	42	20	.06	32	19	776	19	28	8	1,920	12	19	24	70	8	413
151	do	16	62	237	29	.11	32	27	2,920	22	29	14	2,150	14	26	13	83	11	1,840
152	Streambank	32	43	395	21	.93	52	32	5,020	<4	47	29	16,200	12	64	16	72	22	1,370
153	Artificial fill	16	54	34	20	.07	56	41	765	21	51	25	141	12	78	16	80	26	332
154	Streambank	21	58	40	24	.05	46	32	1,040	27	44	31	489	13	44	17	80	11	1,580
155	do	27	45	348	23	.18	43	30	4,080	8	38	24	5,380	12	36	15	70	11	2,190
156A	do	34	10	62	13	.11	40	18	763	<4	50	30	631	12	83	12	60	27	898
157	do	7	40	51	18	.08	54	28	207	24	49	26	1,050	10	82	14	65	19	651

Table 10. Results of blind analyses of National Institute of Standards & Technology (NIST) Standard Reference Materials (SRM2710, SRM2711; Montana soils).

[Major-element contents in weight percent; minor- and trace-element contents in parts per million. NIST gives only "noncertified" values for listed trace elements, with no ± variation listed. Difference from certified value is calculated relative to range of certified values: positive value is percent above high end of range, negative value is percent below low end of range, and 0 value is within range. <, below analytical detection limit]

SRM------	2710					2711				
		2000 analysis		2001 analysis			2000 analysis		2001 analysis	
Element	NIST certified value (±variation, in percent)	Analytical value	Difference from certified value (percent)	Analytical value	Difference from certified value (percent)	NIST certified value (±variation, in percent)	Analytical value	Difference from certified value (percent)	Analytical value	Difference from certified value (percent)
					Major elements					
Al---------	6.44 (1.2)	6.1	-4	6.4	0	6.53 (1.4)	6.5	0	6.5	0
Ca---------	1.25 (2.4)	1.2	-2	1.2	-2	2.88 (2.8)	2.9	0	2.9	0
Fe---------	3.38 (3.0)	3.3	0	3.4	0	2.89 (2.1)	2.9	0	2.9	0
K----------	2.11 (5.2)	2	0	2.1	0	2.45 (3.3)	2.4	0	2.6	3
Mg--------	.853 (4.9)	.84	0	.84	0	1.05 (2.9)	1	-2	1	-2
Na--------	1.14 (5.3)	1.1	0	1.1	0	1.14 (2.6)	1.1	-1	1.2	3
P----------	.106 (14.2)	.11	0	.13	7	.086 (8.1)	.08	0	.08	0
Ti---------	.283 (3.5)	.14	-49	.14	-49	.306 (7.5)	.28	-1	.28	-1
					Minor elements					
Ag--------	35 (4.3)	35	0	31	-7	4.63 (8.4)	5	0	4	0
As---------	626 (6.1)	630	0	614	0	105 (7.6)	100	0	99	0
Ba---------	707 (7.2)	680	0	705	0	726 (5.2)	720	0	727	0
Cd--------	21.8 (0.9)	21	-3	21	-3	41.7 (0.6)	41	-1	42	.1
Cu--------	2,950 (4.4)	2,900	0	2,800	-1	114 (1.8)	110	-2	114	0
Hg--------	32.6 (5.5)	29	-6	31	0	6.25 (3.0)	5.8	-4	5.6	-8
Mn--------	10,100 (4.0)	9,800	0	9,910	0	638 (4.4)	650	0	653	0
Ni---------	14.3 (7.0)	15	0	15	0	20.6 (5.3)	22	1	21	0
Pb---------	5,532 (1.4)	5,400	-1	5,630	-.3	1,162 (2.7)	1,200	1	1,160	0
V----------	76.6 (3.0)	72	-3	73	-2	81.6 (3.6)	81	0	81	0
Zn---------	6,952 (1.3)	6,700	-2	6,980	0	350.4 (1.4)	350	0	350	0
					Trace elements					
Ce---------	57	56	– – –	60	– – –	69	71	– – –	78	– – –
Co--------	10	3	– – –	13	– – –	10	9	– – –	11	– – –
Cr---------	39	33	– – –	31	– – –	47	47	– – –	44	– – –
Ga--------	34	36	– – –	39	– – –	15	15	– – –	14	– – –
La---------	34	30	– – –	32	– – –	40	37	– – –	42	– – –
Mo--------	19	14	– – –	19	– – –	1.6	<2	– – –	2	– – –
Nd--------	23	17	– – –	17	– – –	31	30	– – –	32	– – –
Sc---------	8.7	10	– – –	10	– – –	9	10	– – –	10	– – –
Sr---------	330	320	– – –	318	– – –	245.3	240	– – –	245	– – –
Th---------	13	14	– – –	16	– – –	14	14	– – –	15	– – –
Y----------	23	21	– – –	23	– – –	25	26	– – –	29	– – –
Yb--------	1.3	2	– – –	2	– – –	2.7	3	– – –	3	– – –

Table 11. Mean and standard deviation (SD) of the coefficients of variation (CV) for field duplicates of samples of suspended and streambed sediment and for annual replicate samples of streambed sediment collected from the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.

[All values in percent. Dashes, not calculable because most determinations were below analytical detection limit]

Element	Suspended sediment		Streambed sediment			
	Field duplicates 2000 (*n*=4)		Field duplicates 2000 (*n*=6)		Annual repeats 2000-1 (*n*=12)	
	Mean of CV	SD (pct)	Mean of CV	SD (pct)	Mean of CV	SD (pct)
Al -----	2	1	2	2	6	4
Ca -----	8	9	19	14	12	13
Fe -----	3	1	7	5	9	12
K ------	4	4	3	2	3	2
Mg ----	2	2	3	3	5	4
Na -----	3	2	4	3	7	11
P -------	2	5	9	7	9	9
Ti ------	4	3	14	17	10	12
Ag -----	---	---	---	---	---	---
As -----	11	13	23	20	33	33
Ba -----	1	1	3	2	7	6
Cd -----	---	---	---	---	---	---
Ce -----	1	1	10	14	13	12
Co -----	10	14	12	9	28	15
Cr ------	5	6	4	4	14	17
Cu -----	6	3	17	14	28	19
Ga -----	1	2	2	2	8	4
Hg -----	6	6	30	20	25	20
La -----	2	1	10	10	14	11
Li ------	1	1	5	2	7	6
Mn ----	1	2	12	3	17	14
Nb -----	5	4	10	10	14	10
Nd -----	4	2	9	9	15	15
Ni ------	2	2	6	4	15	14
Pb -----	4	7	18	10	13	10
Sc -----	0	0	3	3	6	5
Sr ------	7	7	8	7	8	7
Th -----	2	3	5	3	10	6
V ------	2	1	3	2	6	6
Y ------	3	2	5	2	15	13
Zn -----	4	3	8	8	26	20
Median----	3	2	8	7	12	12
Mean ------	4	3	9	7	13	8
Calculated only for mining-related elements (Fe, As, Co, Cu, Hg, Mn, Pb, Zn)						
Median----	5	4	14	10	26	17
Mean------	6	5	16	6	22	7

Table 12. Mean and standard deviation (SD) of the "background" composition of the fine (<0.063-mm grain size) fraction of samples of streambed sediment collected from a large unimpacted drainage (West Fork of Eagle Creek) relative to those of several smaller unimpacted tributaries or the upstream unimpacted reaches of impacted streams in the Prichard Creek, Eagle Creek, and Beaver Creek drainages in the northern Coeur d'Alene Mining District, northern Idaho.

[Major-element contents in weight percent; minor-element contents in parts per million. See figures 1 and 2 for locations. Samples from the West Fork of Eagle Creek were collected at sampling sites 26, 41, and 143, and samples from small unimpacted tributaries were collected at sampling sites 03, 15, 24, 40, and 130 (fig. 2). Dashes, below analytical detection limit of 2 ppm, which is presumed to be background value]

Element	West Fork of Eagle Creek (*n*=3)		Unimpacted small tributaries (*n*=5)	
	Mean composition	SD	Mean composition	SD
Major elements				
Al	5.8	0.3	6.6	0.2
Ca	.64	.04	.49	.08
Fe	2.3	.1	3.4	.8
K	1.9	.1	2.0	.1
Mg	.54	.02	.61	.10
Na	.99	.02	.98	.14
P	.09	.01	.07	.01
Ti	.3	.0	.3	.1
Minor elements				
Ag	2	– – –	2	– – –
As	11	1	15	3
Ba	793	39	651	109
Cd	2	– – –	2	– – –
Ce	92	4	120	45
Co	7	4	20	16
Cr	50	19	45	8
Cu	105	35	64	18
Ga	14	1	16	1
Hg	.06	.01	.05	.03
La	44	2	51	7
Li	26	2	30	4
Mn	1,020	216	1,192	713
Nb	12	1	14	2
Nd	39	2	46	8
Ni	23	7	38	14
Pb	82	16	60	21
Sc	9	1	11	2
Sr	102	8	104	5
Th	12	1	12	1
V	51	2	67	17
Y	17	3	19	3
Zn	113	15	139	28