The upper Blackfoot River in southeastern Idaho receives runoff from 12 large phosphate mines. Waste shales that are removed to access the phosphate ore are highly enriched with selenium, resulting in elevated selenium in runoff from the mine waste dumps. In 2001, in cooperation with the Bureau of Land Management, the U.S. Geological Survey (USGS) began monitoring stream flow, selenium, and other water-quality parameters at a single location near the outlet of the upper Blackfoot River to the Blackfoot Reservoir (USGS stream gage 13063000). Water samples primarily were collected by a flow triggered, automated pump sampler, supplemented by manual point and equal-width integrated manual samples.

The approach to monitoring concentrations and stream flow over time at a fixed location is ideal for evaluating temporal trends, but provides no information about the relative source contributions from the mine waste dumps draining into various tributaries. In 2001, the Idaho Department of Environmental Quality (IDEQ) began an annual, mid-May, synoptic survey of selenium concentrations and stream flow at 21 locations along the main stem Blackfoot River and its tributaries. Individually, neither the intensive USGS sampling at the outlet nor the IDEQ annual synoptic sampling provides a comprehensive view of selenium runoff in the Blackfoot River watershed. Together, the efforts are complementary; therefore, results are presented from both sampling efforts.

Dissolved selenium concentrations from 450 filtered samples collected at this site ranged from 0.5 to 11.4 micrograms per liter (μg/L). The State of Idaho chronic aquatic life criterion concentration of 5 μg/L was exceeded in 31 percent of the samples, with most exceedances occurring during May of each year. During the period of study, selenium concentrations had an upward trend during the low flow season of August–October. Time trends were not obvious during other seasons.

In tributaries, selenium concentrations ranged from less than 2 to 870 μg/L in 176 samples. In most years, the synoptic sampling showed that the majority of the selenium loads passing the the watershed could be attributed to a single tributary, East Mill Creek. Selenium loads decreased by about half from East Mill Creek before reaching the Blackfoot River, suggesting that much selenium is at least temporarily removed from the water column by uptake by aquatic vegetation or by losses to sediment. Similar decreases in selenium loads occurred through the main stem Blackfoot River before reaching the outlet in low flow years, but not in high flow years.