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The distribution of selenium in stream sediments and soils in the Humboldt River basin and surrounding area

In 1995, the U.S. Bureau of Land Management identified selenium along with 12 other elements to investigate within the Humboldt River basin located in northern Nevada. These elements are important because of their role as pathfinder elements for mineral deposits or as potential toxins in the environment. This report is one of the 13 separate published reports (MF-2407-A-M) that integrate the results of two geochemical studies conducted by the U.S. Geological Survey and that present geochemical maps created using computer models of stream-sediment and soil geochemistry. The other 12 reports present geochemical maps for Ag, As, Au, Ce, Co, Cu, Fe, Ni, Pb, Sb, Sc, and Zn. These geochemical maps provide a visual aid to interpreting the trends and anomalies in element concentration when combined with information about the geology, topography, and mining districts in the Humboldt River basin.

The Humboldt River basin is a naturally occurring, internally draining river basin that covers approximately 43,700 km² (16,900 mi²) and forms a substantial part of the larger Great Basin. The Humboldt River basin includes the upper reaches of the Little Humboldt River in Elko County, the Reese River in Lander County, and the main Humboldt River and its many tributaries that flow ultimately westward into the Humboldt Sink. Figure 1 shows the map area and the Humboldt River basin.

Selenium (Se) has been identified as an element of interest because of its association as a pathfinder element for ore deposits and for potential toxicity to wildlife within the Humboldt River basin. It is considered an essential nutrient; however, deficiencies and excesses can cause adverse health effects in humans, wildlife, plants, and especially freshwater biota (Eisler, 1985).

References

Briggs, Ian C., 1974, Machine contouring using minimum curvature: Geophysics, v. 39, no. 1, p. 39-48.

Eisler, R., 1985, Selenium hazards to fish, wildlife, and invertebrates: a synoptic review: U.S. Fish and Wildlife Service, Biological Report 85(1.5), Contaminant Hazard Reviews Report No.5, 57 p.

Folger, H.W., 2000, Analytical results and sample locations of reanalyzed NURE stream-sediment and soil samples for the Humboldt River basin Mineral Environmental Resource Assessment, northern Nevada: U.S. Geological Survey Open-File Report 00-421, 491 p.

EXPLANATION

log value (ppm Se)
Winnemucca-Surprise dataset
[Mean log value is -1.515;
geometric mean Se is 0.03]

- 1.665 to 3.255   (46.2)
- 0.075 to 1.665   (1.20 to 46.2)
- -1.515 to 0.075   (0.03 to 1.20)
- -3.105 to -1.515 (0.001 to 0.03)
- -4.695 to -3.105 (<0.001)

– – – Humboldt River basin boundary

——— 0.6 (ppm Se) contour interval
——— 1.8 (ppm Se) contour interval

Figure 1. Index map of study area.

Figure 2. Sample localities of NURE samples reanalyzed by ICP-AES (red) and HAAS (green) methods for the Humboldt River basin mineral and environmental assessment.

Figure 3. Overlapping histograms of log-transformed selenium values. Humboldt River basin in blue and Winnemucca-Surprise in yellow, and where there is overlap, the histograms are green.

Figure 4. Continuous surface model of Se analyses.

Se ppm

SCALE 1:500,000

CONTOUR INTERVAL 500 FEET
NATIONAL VERTICAL GEODETIC DATUM OF 1929

Base from U.S. Geological Survey, 1965
Lambert Conformal Conic Projection
based on standard parallels 33° and 45°

Map Showing Selenium Concentrations from Stream Sediments and Soils Throughout the Humboldt River Basin and Surrounding Areas, Northern Nevada

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