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GEOCHEMICAL DATA FROM THE PAYETTE NATIONAL FOREST AND CONTIGUOUS AREAS, IDAHO

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INTRODUCTION

One of the roles of the USGS in the past few years has been to assess the mineral resource potential and environmental impact of mineral resource exploitation on public lands in order to provide unbiased information to the various land management agencies and to the public in general. One of these multidiscplinary studies was conducted in the Payette National Forest (PNF), Idaho, in cooperation with the U.S. Forest Service, and other branches within the geological survey. As one phase of these studies, scientists in the Branch of Geochemistry compiled existing geochemical data from samples of stream sediment, water, and rock. These existing data were collected during earlier programs by the USGS and during the National Uranium Resource Evaluation (NURE) program. The existing data were further supplemented by reanalyses of archived NURE samples and by additional field sampling and geochemical analysis. This report contains a complete release, in digital form, of all geochemical data utilized in the mineral resource appraisal of the PNF.

The PNF comprises 2.3 million acres of highlands in west-central Idaho (fig. 1). The PNF includes portions of the Grangeville, Baker, Elk City, and Challis 1° X 2° quadrangle sheets (1:250,000 scale). The geochemical data released in this report were gathered between latitudes 44° 00' 00"-45° 30' 00'' and longitudes 114° 30' 00"-117° 10' 00" and therefore extend beyond the boundaries of the PNF.

The PNF is separated by broad north-trending valleys into distinct western and eastern segments characterized by contrasting geology, topography, and climate. The western segment of the PNF is bordered on the west by the northward-flowing course of the Snake River where it forms the boundary between Oregon and Idaho, and on the east by the Little Salmon River and the Long Valley of the North Payette River. The Hells Canyon National Monument occupies portions of the western forest bordering the Snake River. The Rapid River Wild and Scenic River Wilderness located a few miles east of the Hells Canyon National Monument is also part of the western PNF.

The eastern segment of the PNF is bounded on the west by the Little Salmon River, on the east by the Middle Fork of the Salmon Wild and Scenic River, and on the north by the main Salmon River of No Return. Most of the eastern segment of the PNF is contained within the Frank Church River of No Return Wilderness.

Acknowledgement

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BACKGROUND DATA COMPILATION AND SAMPLING

The initial data compilation consisted of a large file of all available geochemical data in the region that included surrounding areas as well as the PNF. As discussed in the introduction to this report, the data sources included previous USGS studies and sample collection and analyses from the National Uranium Resource Assessment (NURE) program augmented by reanalyses of samples from the NURE collection by USGS methods, and by

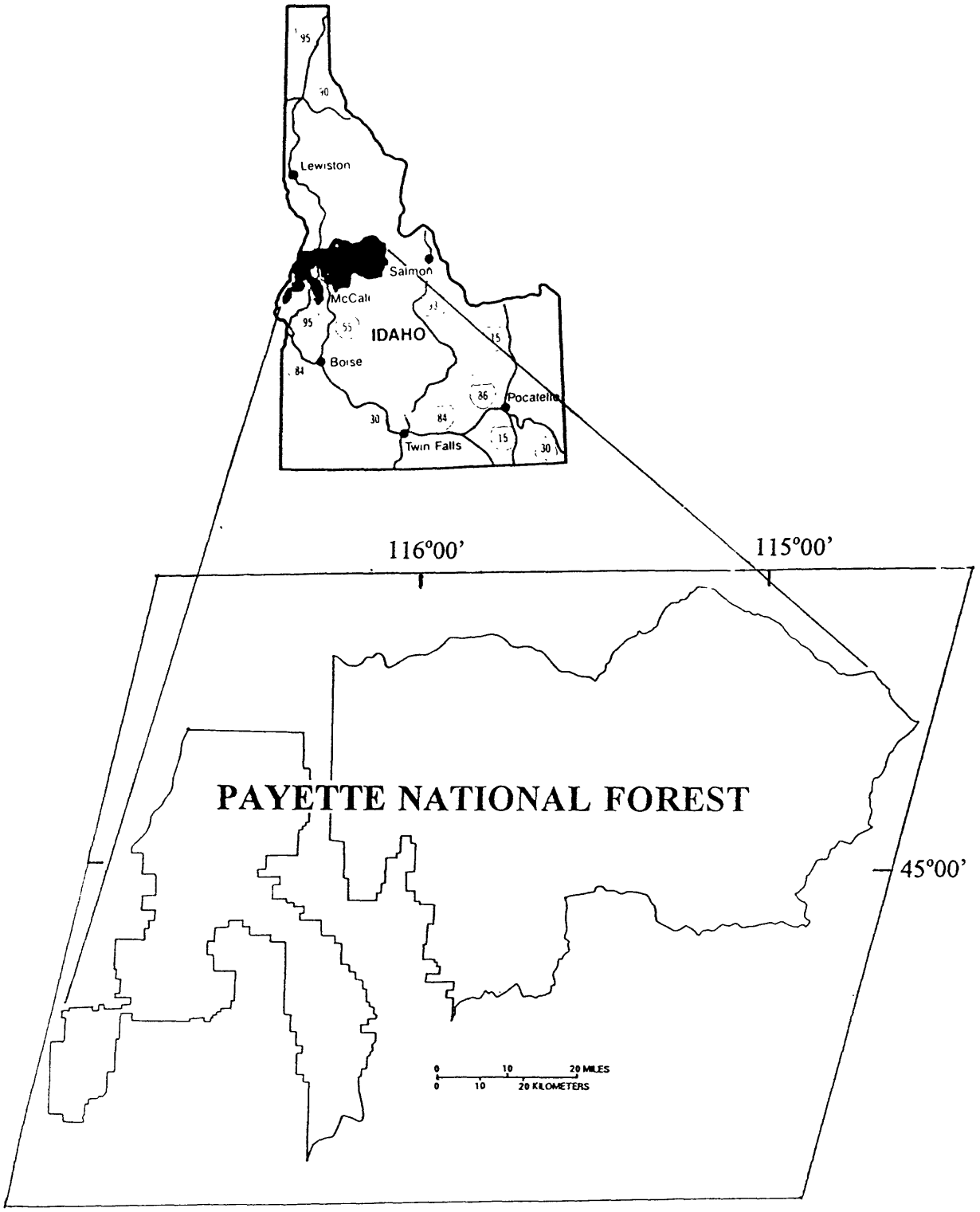

Figure 1. Index map of Idaho showing location of Payette National Forest.

new field sampling and analysis by the USGS.

Data from previous USGS investigations include: (1) stream sediment samples and rock chip samples from the Hells Canyon and Rapid River Wilderness study (Simmons and others, 1983); (2) stream sediment and heavy mineral concentrate samples collected from USGS studies of additions to the River of No Return Wilderness (Adrian and others, 1984; Hopkins, 1985; Hopkins and others, 1985a-d; Leonard and others, 1984), and (3) stream sediment and stream sediment concentrate (heavy minerals) samples from the French Creek/ Patrick Butte and South Fork Salmon River Special Management Areas and the Payette Crest (Needles) and Secesh Proposed Wilderness areas (H.N. Barton, unpublished data; Bullock and others, 1991). Data on stream sediment, soils, and rock samples collected in the Idaho Primitive area study (Cater and others, 1973) were examined but as they were not in digital form, they were not used in the data compilation.

The methods of sample collection used in the NURE program are described by Price and Jones (1979). The NURE data included 1122 stream sediment samples from the Payette Forest part of the Elk City (Broxton and Beyth, 1980) NTMS quadrangle. These data are the chief basis for evaluation of the part of Payette Forest east of longitude 115 15.

Stream sediment samples collected from the PNF portion of the Baker NTMS quadrangle during the NURE program number 488, but far fewer than those were analysed for the 37 elements listed (Bernardi and Robins, 1982; Cook, 1981). A few samples from the Challis NTMS quadrangle were used for the area south of latitude 45 degrees in the eastern part of the forest but elements analysed did not include many of interest for this study, and hence were of limited application.

There were no samples collected during the NURE program in the Grangeville NTMS quadrangle, in the northwest part of the forest, but there were preexisting USGS data, which were supplemented by sampling during the present study.

Several areas of data gap were sampled in the summer of 1992. The principle focus of this supplemental sampling was western PNF where the largest data gaps existed. In total 247 stream sediment samples and the same number of heavy mineral samples were collected. Compilation of data from other sources resulted in a file of 631 heavy mineral samples collected from the PNF and contiguous areas. As this sample medium was only collected during USGS studies, the chemistry and mineralogy of these samples were used chiefly as a supplement.

ANALYTICAL TECHNIQUES

Samples collected during the NURE program were analysed chiefly by the Savannah River Laboratories (Bernardi and Robins, 1982; Cook, 1981; Thayer and Cook, 1980; Broxton and Beth, 1980) . The chief methods of analyses included X-Ray Fluorescence (Hansel and Martell, 1977), and Neutron Activation Analysis (NAA).

All USGS stream sediment and heavy mineral concentrate samples used in this study were analysed for 30-37 elements by a direct current arc emission spectrography (E-Spec) method (Grimes and Marranzino, 1968). Samples analyzed for gold in this study were by a flameless graphite furnace (GF-AA) method (O'Leary and Meier, 1990; McHugh and others, 1993). Some of the older gold analyses, such as those for the Hells Canyon area were by a flame atomic absorption (AA) method modified from Thompson and others (1968). An induction coupled plasma-atomic emission spectrography (ICP-AES) method (Motooka, 1990)

was used to analyze samples for this study, and most of the recent wilderness studies whose data are used here. The method gives data on ten elements (Ag, As, Au, Bi, Cd, Cu, Mo, Pb, Sb, and Zn) and is particularily useful for mineral resource and environmental investigations because it chiefly extracts metals held in non-silicate lattice positions, which are the positions in which metal-rich products of secondary dispersion from decomposing mineral deposits usually accumulate.

All samples collected by Savannah River Laboratories during the NURE program from the eastern one-half Baker quadrangle were selected from USGS archives and reanalyzed by E-Spec, GF-AA, and ICP-AES using USGS methods. Many of these samples had been analyzed only for uranium, although there were data fields for 37 elements.

DATA DISKETTE

The diskette accompanying this report contains all of the geochemical data used in the geochemical studies of Payette National Forest, Idaho. The files include: (1) data collected and analyzed by the USGS, (2) samples collected during the NURE program in Baker 2-degree NTMS quadrangle (1:250,000 scale) and reanalyzed using E-Spec, ICP-AES, and GF-AA by USGS methods, and (3) geochemical data generated by the NURE program from the Baker and Elk City 2-degree NTMS quadrangles. The files are briefly described in an ASCII file titled README. The data are in an archival compressed format generated by the LHA.212 archival shareware program. The files can be decompressed using the same program which is included on the accompanying diskette, along with instructions for software execution. The resultant data files after decompression will be in a dBase File (dBF III) format compatible with most other spreadsheet software such as Quattro-Pro 4.0 by Borland. The data then can be manipulated on an IBM 286 or better personal computer (PC).

Qualifying codes found in the data sets on this diskette indicate that analytical values for any given element were indeterminate. The codes are as follows: B-no analysis; N-not detected at lowest level of determination; L-detected but below level of determination; G-value above upper level of determination.

Sample site coordinates in degrees latitude and longitude are found in columns 1 and 2 of the geochemical data sets.

REFERENCES

Adrian, B.M., Sharkey, J.D., and Nowlan, G.A., 1984, Analytical results and sample locality map for stream-sediment and panned-concentrate samples from the Pinnacles Addition to the River of No Return Wilderness, Valley County, Idaho: U.S. Geological Survey Open-File Report 84-833, 17 p.

Bullock, J.H., Jr., King, H.D., Hopkins, R.T., Jr., Motooka, J.M., Hageman, P.L., and Roushey, B.H., 1991, Analytical results and sample locality map of stream-sediment, and heavy-mineral-concentrate samples from the Payette Crest, Secesh, and South Fork Roadless Study Areas, Valley and Idaho Counties, Idaho: U.S. Geological Survey Open-File Report 91-0438-A and B, 38p.

Bernardi, M. L., and Robins, J.B., 1982, National Uranium Resource Evaluation, Baker Quadrangle, Oregon and Idaho: Bendix Field Engineering Corporation Open-File

Report PGJ/F-112 (82), 29 p.
Broxton, D.E., and Beyth, Michael, 1980, Uranium hydrogeochemical and stream sediment reconnaissance data release for the Elk City NTMS quadrangle, Idaho/Montana, including concentrations of forty-five additional elements: U.S. Department of Energy Report GJBX-176 (80), 212 p.
Cater, F.W., Pinckney, D.M., Hamilton, W.B., Parker, R.L., Welden, R.D., Close, T.J., and Zilka, N.T., 1973, Mineral resources of the Idaho Primitive Area and vicinity, Idaho: U.S. Geological Survey Bulletin 1304, 431 p.
Cook, J.R., 1981, Baker 1 x 2 NTMS Area, Oregon and Idaho; data report (abbreviated); hydrogeochemical and stream sediment reconnaissance: Aiken, South Carolina, E.I. du Pont de Nemours, Savannah River Laboratory, Report No. GJBX-231-81, 17 p.
Grimes, D.J., and Marranzino, A.P., 1968, Direct-current arc and alternating-current spark emission spectrographic field methods for the semi-quantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.
Hansel, J.M., and Martell, C.J., 1977, Automated energy-dispersive x-ray determination of trace elements in streams, GJBX-52(77), US ERDA, Grand Junction, Co, 8 p.
Hopkins, R.T., Jr., 1985, Analytical results and sample locality map for stream-sediment and panned-concentrate samples from the McEleny Addition and a part of the West Panther Creek Addition to the Frank Church-River of No Return Wilderness, Lemhi County, Idaho: U.S. Geological Survey Open-File Report 85-702, 23 p.
Hopkins, R.T. Jr., Roemer, T.A., Kelley, D.L., and Nowlan, G.A., 1985a, Analytical results and sample locality map for stream-sediment and panned-concentrate samples from the Gospel Hump North Addition to the Frank Church-River of No Return Wilderness, Idaho County, Idaho: U.S. Geological Survey Open-File Report 85-703, 18 p.
Hopkins, R.T. Jr., Roemer, T.A., and Nowlan, G.A., 1985b, Analytical results and sample locality map for stream-sediment and panned-concentrate samples from the Mallard and Upper Bargamin Additions to the Frank Church-River of No Return Wilderness, Idaho County, Idaho: U.S. Geological Survey Open-File Report 85-704, 18 p.
Hopkins, R.T. Jr., Sharkey, J.D., Romine, K.A., and Nowlan, G.A., 1985c, Analytical results and sample locality map for stream-sediment and panned-concentrate samples from the Camas Creek Addition to the Frank Church-River of No Return Wilderness, Custer and Lemhi Counties, Idaho: U.S. Geological Survey Open-File Report 85-705, 23 p.
Hopkins, R.T., Roemer, T.A., Kelley, D.L., and Nowlan, G.A., 1985d, Analytical results and sample locality map for stream-sediment and panned-concentrate samples from the Gospel Hump North Addition to the Frank Curch-River of No Return Wilderness, Idaho County, Idaho: U.S. Geological Survey Open-File Report 85-703, 18 p.
McHugh, J.B., Watts, K.C., Jr., Barton, H.N., and King, H.D., 1993, Gold analyses of 881 stream sediment samples from the western Payette National Forest and contiguous areas, Idaho: U.S. Geological Survey Open-File Report OF-93-527.
Motooka, J.M., 1990, Organometallic halide extraction applied to the analysis of geologic materials for 10 elements by inductively coupled plasma-atomic emission spectrometry, in Arbogast, B.F., Quality Assurance Manual for the Branch of Geochemistry: U.S. Geological Survey Open-File Report 90-668, p. 92-96.
0'Leary, R.M., and Meier, A.L., 1990, Determination of gold in samples of rock, soil, stream sediment, and heavy-mineral concentrate by flame and graphite furnace atomic absorption spectrophotometry following dissolution by HBr-Br_2, in Arbogast, B.F.,

Quality Assurance Manual for the Branch of Geochemistry: U.S. Geological Survey Open-File Report 90-668, p. 46-51.

Price, Vaneat, and Jones, P.L., 1979, Training manual for water and sediment geochemical reconaissance: Aiken, South Carolina, E.I. du Pont de Nemours, Savannah River Laboratory Report No. GJBX-420-81, 104 p.

Simmons, G.C., Gualtieri, J.L., Close, T.J., Federspiel, F.E., and Leszcykowski, A.M., and Hyndman, P.C., 1983, Mineral resource potential of the Hells Canyon Wilderness and contiguous roadless areas, Wallowa County, Oregon and Idaho, Nez Perce and Adams Counties, Idaho: U.S. Geological Survey Open-File Report 83-397, 20p.

Thayer, P.A., and Cook, S.R., 1980, Challis 1x2 NTMS area, Idaho, Data Report, National Uranium Resource Evaluation Program, Hydrogeochemical and Stream Sediment Reconnaissance, Savannah River Laboratory Report DPST-80-146-5, 45 p.

Thompson, C.E., Nakagawa, H.M., and Van Sickle, G.H., 1968, An atomic-absorption method for the determination of gold in large samples of geologic materials: U.S. Geological Survey Circular 561, 4 p.