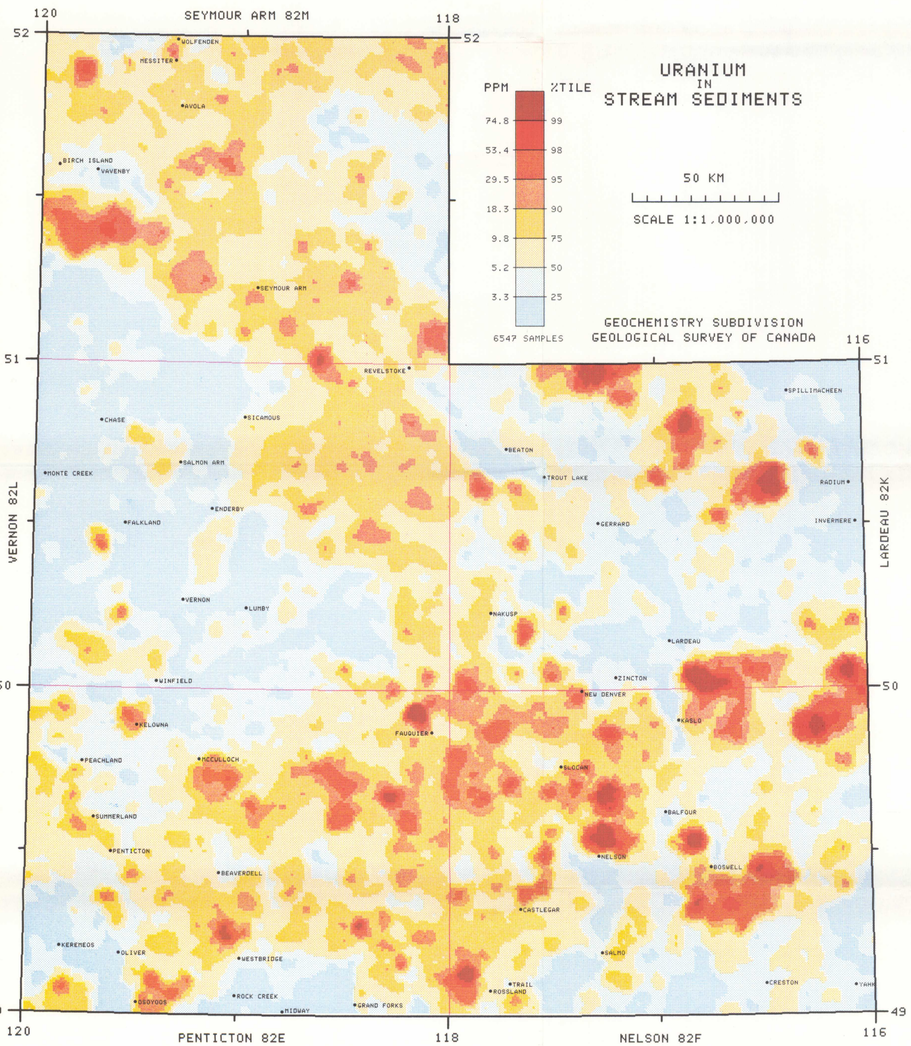
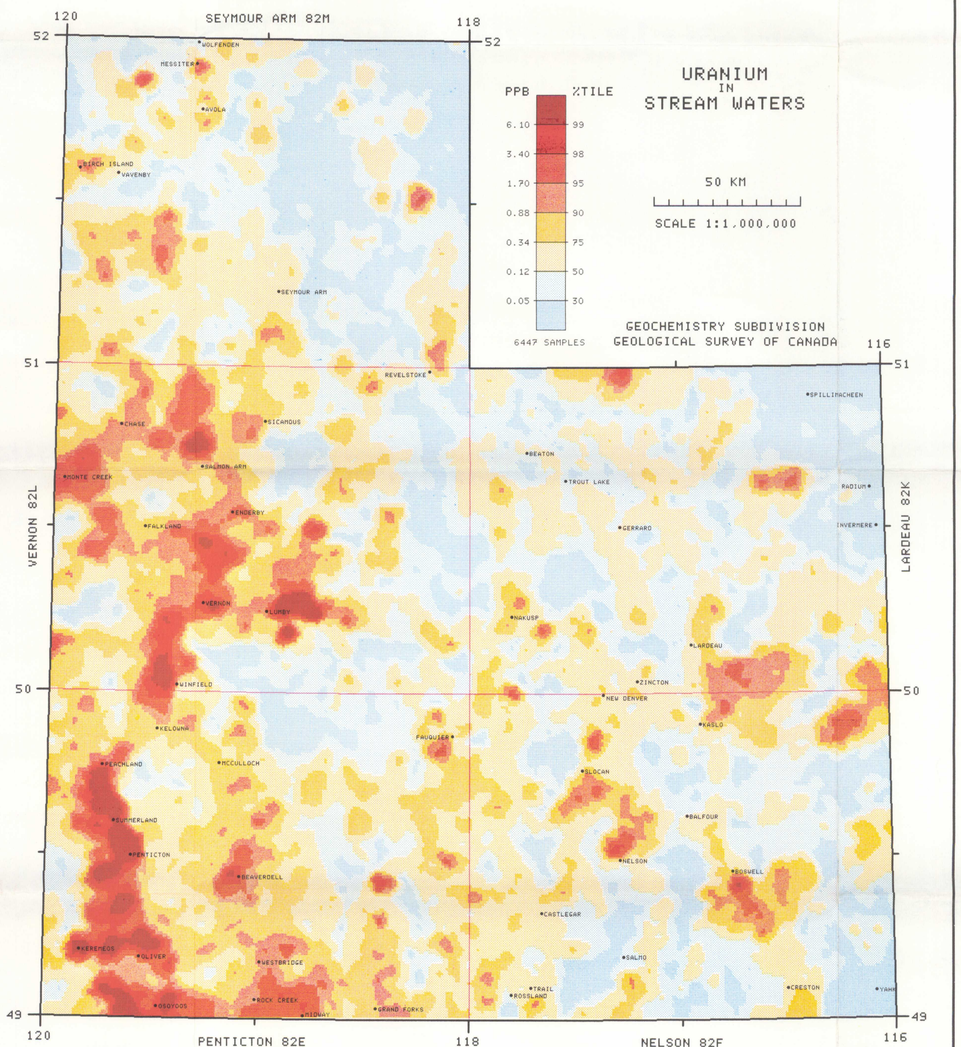
PROVINCE
OF
BRITISH COLUMBIA
MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES

DEPARTMENT
OF
ENERGY, MINES AND RESOURCES
GEOLOGICAL SURVEY OF CANADA

REGIONAL RECONNAISSANCE GEOCHEMISTRY IN PART OF SOUTHERN BRITISH COLUMBIA





DESCRIPTIVE NOTES

This map has been printed as part of an experiment to determine if colour maps prepared by computer can be readily converted to printed form for distribution. The major advantage of this procedure is to decrease the time required for manual cartographic work. The experimental maps offer the impact of colour, communicate the features of geochemical interest, and do so at reasonable costs of time and money, albeit at some reduction of cartographic excellence. The two maps and annotative material which lie within the frame have been prepared directly from digital data by a computer mapping package (APPMAP) being developed in the Resource Geochemistry Subdivision, Geological Survey of Canada. This package makes use of an Applicon colour plotter and Applicon library software resident on a CDC Cyber 74 computer at the Computer Science Centre of the Department of Energy, Mines and Resources. The legend, border and annotative material were entered through APPMAP directives, the geochemical survey data were accessed from archival data files. APPMAP interpolates from the irregularly spaced reconnaissance data to a regular grid, which for these data is 1600 m^2. The interpolation is in the form of a moving average where weighting is by an inverse distance function ($1/d^3$) using the nearest five data points. The effect of this moving average is to filter out the minor irregularities in the spatial data and emphasize the broader scale and regional features. Using the APPMAP software a black line separation file was prepared containing all title, border and annotative information; this was then plotted. The colour file prepared by APPMAP was plotted three times in red, once each for the three primary colours, red, blue and yellow, using a hardware feature of the Applicon plotter. The black line and three colour separations were submitted to the Cartographic Services group of the Geological Survey of Canada for additional work outside the frame and photomechanical processing. The map was printed by the Surveys and Mapping Branch of the Department of Energy, Mines and Resources, Ottawa.

Should the results of this experiment prove that the colour map production methods are cost effective it is planned to release further compilations of regional geochemical data. Such compilations may be accompanied by additional geological and mineral occurrence information together with more extensive interpretive notes. These would allow a fuller evaluation of the data from a variety of viewpoints, both geological and environmental. Should you have any comments on the utility and style of these maps these would be appreciated and should be directed to the Resource Geochemistry Subdivision in Ottawa. However, in order to place the data used to prepare these experimental maps in context a brief description of the survey work and some salient features of the data are presented below.

The data compiled on these maps were collected under the Canada - British Columbia Agreement on a Uranium Reconnaissance Program and were previously published as part of the National Geochemical Reconnaissance (GSC Open Files 409, 410, 514, 515 and 516).

Stream sediment and water samples were collected at an average density of one sample per 13 km^2 throughout the approximately 78800 km^2 survey area. The helicopter and 4-wheel drive truck supported sample collection was carried out during the summers of 1976 and 1977 by Stokes Exploration Management Co. Ltd., Vancouver, under the supervision of Geological Survey of Canada personnel.

The stream sediment samples were sieved to obtain the minus 80-mesh (177 microns) fraction, which was ball milled. Analyses for uranium, using a delayed neutron counting method, were carried out by Atomic Energy of Canada Ltd., Ottawa. The detection limit of the method used is 0.2 ppm uranium.

Uranium was determined in the stream water samples by a fluorometric method by Bondar-Clegg and Company Ltd. (1976) and Chemex Labs Ltd. (1977) laboratories, Vancouver. The detection limit of the analytical method used is 0.05 ppb uranium.

Statistical analyses of the total regional data yields a geometric mean for the 6547 stream sediment samples of 6.0 ppm uranium with a range of 0.2-430.0 ppm uranium. The 6447 stream waters have a geometric mean of 0.13 ppb uranium with a range of 0.02-43.80 ppb uranium. On the basis of individual N.T.S. map sheets Nelson (82F) and Kelowna (82E) have higher geometric means, 7.5 and 6.8 ppm uranium respectively, in stream sediments while Kelowna (82E) and Vernon (82L) have higher geometric means, 0.29 and 0.18 ppb uranium respectively, in stream waters. However, in assessing the regional uranium distribution it is equally important to examine variations due to the principal lithologies in the survey area, as the mean concentrations of uranium in stream sediments closely follows the mean uranium content observed in the various bedrock units.

The uranium in water and sediment distributions show two main regional features. Firstly, there is generally a good correlation between uranium in waters and sediments in areas draining granitoid bodies. Examples would include Nelson and Valhalla plutonic rocks north and northwest of Nelson, Coryell plutonic rocks west of Rossland, the Bayonne Batholith south of Boswell, the Fry Creek and White Creek batholiths east of Kaslo, the Horsethief Creek, Bugaboo and Battle Range batholiths northwest of Radium and the Barrier batholith south of Vavenby. These granitoids display a large range in uranium contents indicating that mineral composition and texture play an important role in the ability of the element to concentrate in these rocks. Some batholiths contain uranium enriched phases, and in the coarser grained varieties of each rock type uranium tends to concentrate mainly along intergranular mineral boundaries. This makes these rocks more susceptible to leaching, hence releasing labile uranium into the hydrological system. In these areas the more acid water conditions restrict hydromorphic dispersion of uranium and hence the water-sediment anomalies are generally coincident with the area underlain by the intrusive bodies. These regions may be considered as possible source areas for some types of genetic models for uranium mineralization.

The second dominant regional feature displayed in these data is the very poor correlation between uranium in water and associated sediments in the Okanagan Region between Osoyoos in the south and Chase and Salmon Arm in the north. Tertiary volcanic-sedimentary basins within this area contain alkali and siliceous rock units containing above average uranium concentrations. In this semi-arid valley region alkaline surface waters display the highest uranium concentrations within the survey area due to enrichment by bicarbonate complexing. The distribution of uranium in stream sediments demonstrates their inability to concentrate the element by adsorption and/or absorption under these alkaline conditions. In the Okanagan Highland region east of McCulloch and Beaverdell, where waters generally have a low bicarbonate content and the sediments a high sorption capacity, anomalies related to "basal-type" uranium mineralization are best represented in the stream sediment response.

The Shuswap Metamorphic Terrane north of Grand Forks and between Fauquier, Revelstoke, Seymour Arm and Wolfenden is characterized by a broad regional pattern in stream sediments. Areas within this regional feature, which are also supported by anomalous waters, may be underlain by uraniferous pegmatites. Areas where only the sediments are enriched, due to clastic dispersion, probably represent terranes typified by uranium-bearing resistate minerals.

In addition to regional features associated with areas underlain by mineralization, or high background lithologies, there are a number of patterns characterized by uraniferous waters which are related to fault and fracture zones. In the Okanagan Valley examples would include the Darke and Eaneas Creek fault zones north of Summerland, the Nkwala fault zone north of Penticton and the Blind Creek and Inkaneep area near Oliver. In the Okanagan Highland region both uranium in waters and sediments reveal a structurally related anomaly located in the Eugene Creek fault zone west and south of Beaverdell.

It is apparent from the regional features depicted on these maps that uranium anomalies in either waters, sediments or both media vary in response to factors such as climate, physiographic location, water chemistry, sediment composition and the mineralogy of the local bedrock, and any associated uranium bearing mineral occurrences. Both stream waters and sediments are considered as complimentary media required for the interpretation of uranium regional reconnaissance geochemical surveys in southern British Columbia.

Resource Geochemistry Subdivision
Resource Geophysics and Geochemistry Division
Geological Survey of Canada

Copies of this map may be obtained
from the Geological Survey of Canada
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100 West Pender Street, Vancouver, B.C. V6B 1R8
Geological Division, Mineral Resources Branch;
Ministry of Energy,Mines and Petroleum Resources;
Douglas Building, Victoria, British Columbia V8V 1X4

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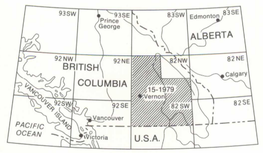
REGIONAL RECONNAISSANCE GEOCHEMISTRY, SOUTHERN BRITISH COLUMBIA

NATIONAL GEOCHEMICAL RECONNAISSANCE

URANIUM RECONNAISSANCE PROGRAM



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE

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