1991 REGIONAL GEOCHEMICAL SURVEY RELEASE, SOUTHEASTERN BRITISH COLUMBIA: DELIVERING A NEW GENERATION OF GEOCHEMICAL DATA* (82E, F, G, J, K, L, M)

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KEYWORDS: Regional Geochemical Survey, reconnaissance, multi-element, stream sediment, water, Fernie, Kananaskis Lakes, Penticton, Nelson, Lardeau, Vernon, Seymour Arm.

INTRODUCTION

Since the inception of the joint federal-provincial Regional Geochemical Survey (RGS) program in 1976, high-quality geochemical data have been effectively disseminated to the exploration and mining industry (Figure 4-1-1). A great many new mineral prospects have been discovered, old ones have been re-evaluated and a number of areas previously thought to have little mineral potential have been investigated as a result of these surveys. Over time, the program has evolved in its scope and mandate in response to the changing demands of the exploration industry, the development of fast, inexpensive high-quality analytical techniques, increased knowledge of trace element dispersion and the growing concern with environmental and land-use issues.

The 1990 programs covering southeastern British Columbia reflect the continued efforts of the Applied Geochemistry Unit to meet the needs of the exploration industry as well as to enhance the inherent qualities of the data as a tool for other research. Highlights of these programs include:

- The completion of two regional geochemical surveys in southeastern British Columbia, covering NTS map sheets, Fernie (82G) and Kananaskis Lakes (82J).
- The expansion of the RGS stream-sediment analytical suite to include neutron activation analyses of 26 additional metals and pathfinder elements.
- The expansion of the stream-water chemistry database to include analytical results for copper, lead, zinc, mercury, cadmium and arsenic.
- The analysis of 25 000 archived regional geochemical stream-sediment samples (seventeen 1:250 000 map sheets, Figure 4-1-1) for 26 previously undetermined elements. The 1991 release will include results from NTS map sheets Penticton (82E), Nelson (82F), Lardeau (82K), Vernon (82L) and Seymour Arm (82M).

The forthcoming 1991 RGS release will present explorationists with the formidable task of assessing over 500 000 analytical results from approximately 8400 sites covering 110 000 square kilometres of one of British Columbia's most diverse geological regions (Table 4-1-1). Preliminary interpretation of the data indicates that sites occurring within the Lower Paleozoic Lardeau group, Triassic-Jurassic Nicola and Rossland groups and Jurassic granodiorites contain a high proportion of samples anomalous in base and precious metals. Additionally, the expanded stream-water database will aid in the evaluation of the background metal concentrations in this area of high mineral potential.

TABLE 4-1-1
SAMPLE DISTRIBUTION IN SOUTHEASTERN BRITISH COLUMBIA

Map Sheet	Sample Year	Number of Sites	Area km sq.	Density km sq./site
82G - Fernie	1990	922	11400	12
82J - Kananaskis	1990	583	6500	11
82E - Penticton	1976	1631	16600	10
82F - Nelson	1977	1394	16600	12
82K - Lardeau	1977	1297	16400	13
82L - Vernon	1976	1385	16400	12
82M - Seymour Arm	1977	1219	16200	13
TOTALS		8431	100100	12

This report will outline the regional geologic setting and the associated mineralization found in the survey areas. Survey parameters (sample collection, preparation and analytical procedures) and a preliminary evaluation of the base and precious metal results are also presented.

REGIONAL SETTING

LOCATION

The areas surveyed in 1976, 1977 and 1990 cover southeastern British Columbia from 49° to 52° north latitude and 114° to 120° west longitude. The region is characterized by a varied physiography (Table 4-1-2) and complex geology (Figure 4-1-2).

PHYSIOGRAPHY

Southeastern British Columbia consists of two major physiographic regions, the Columbia Mountains and Southern Rockies, and the Interior Plateau (Holland, 1976). Extending westward from the Alberta border to the Monashee Range, the Columbia Mountains and Southern Rockies physiographic region accommodates the majority of the survey area. These parallel mountain belts trend northwest and are separated by the Rocky Mountain Trench.

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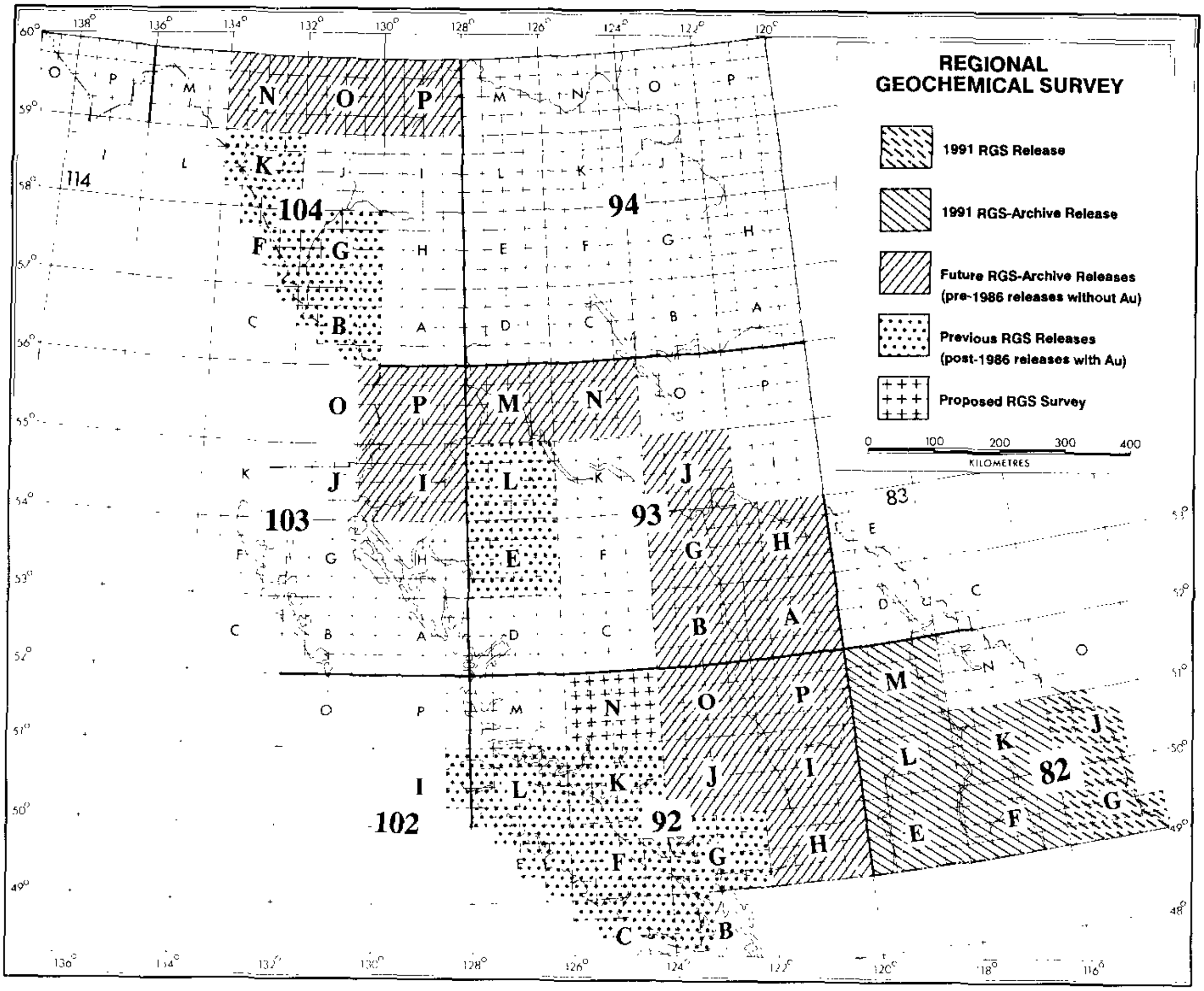

Figure 4-1-1. Current status of British Columbia Regional Geochemical Survey program.

The Rocky Mountains are strongly faulted, folded and glaciated. Summit elevations range above 2500 metres and extremely rugged mountains are separated by deep, narrow valleys. The peaks and ridges are predominantly exposed bedrock. The steeply sloping valley sides are covered with talus or colluvium and the valley bottoms contain alluvium and till. The primary and secondary stream drainages found in these high mountain areas are generally characterized by a herringbone pattern.

The Columbia Range averages 2000 metres in elevation. The peaks are well rounded and the corresponding stream patterns are primarily dendritic. Till and colluvium cover the middle to upper slopes and alluvium is found in the stream basins.

As many of the mountain ranges within this major physiographic region exceed 3000 metres elevation, they are very effective barriers to the eastward movement of moist Pacific air masses. This rainshadow effect produces drier climates in the major valleys such as the Rocky Mountain Trench, especially on their east-facing slopes. As a result, dry, overgrown creek beds, which no longer contain stream-sediment material, are commonly found in these areas.

The survey area also extends into the eastern margin of the Interior Plateau. The Shuswap and Okanagan Highlands consist of well-rounded ridges and summits ranging from 1500 to 2000 metres elevation. Glacial erosion has produced deep valleys with steeply sloping sides. The higher elevations are characterized by relatively resistant bedrock and the valley floors are covered with drift material. The drainage patterns are primarily dendritic.

GEOLOGY

The survey area includes parts of three of the five structurally and physiographically distinct belts which constitute the Canadian segment of the North American Cordillera. From east to west, these are: the Foreland Belt, the Omineca Belt and the Intermontane Belt.

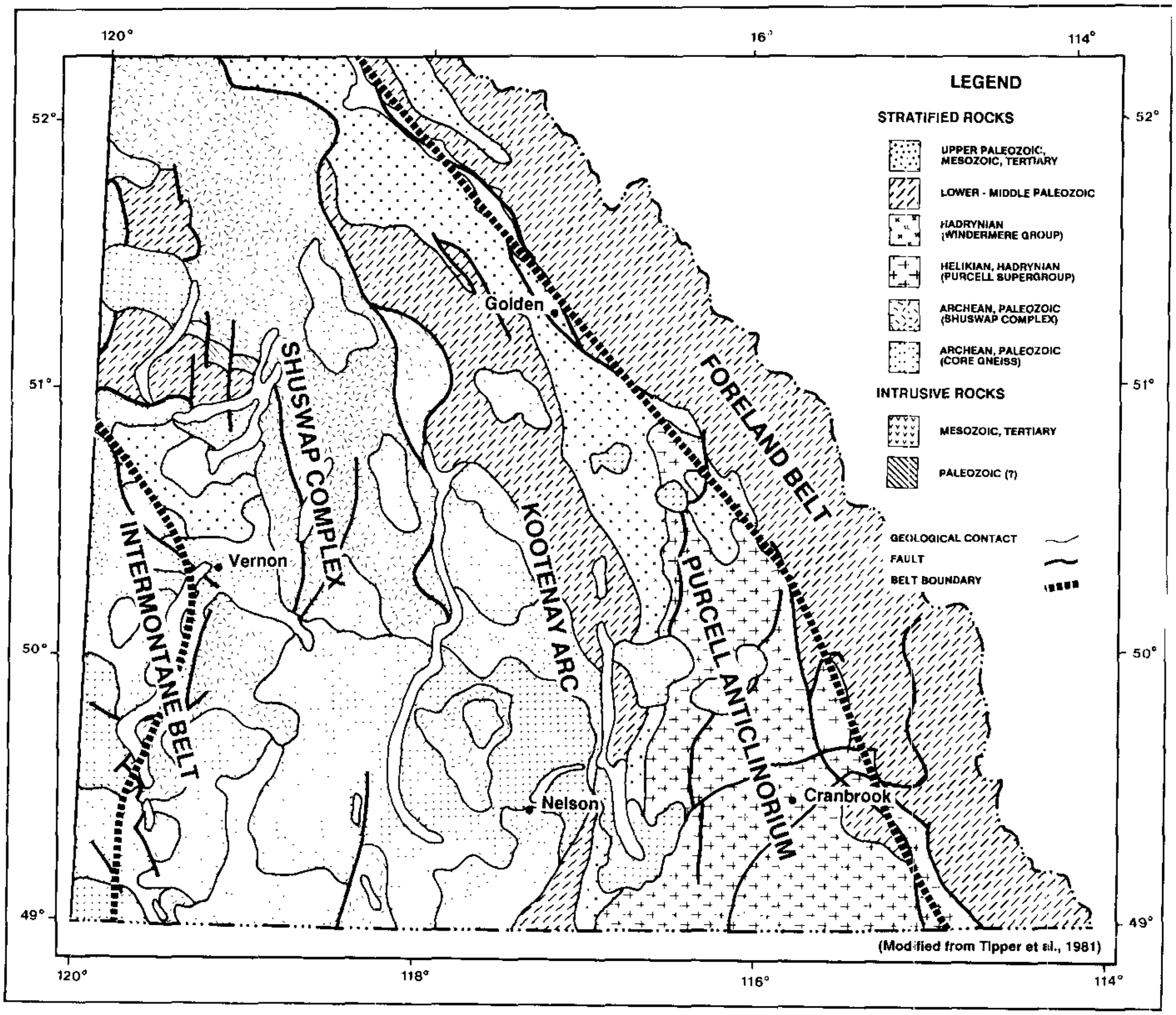

Figure 4-1-2. Geology of southeastern British Columbia.

The Foreland and Intermontane belts are primarily composed of unmetamorphosed and low-grade metamorphic stratified rocks. Separating these two belts, and characteristically distinct, is the Omineca Belt, a high-grade metamorphic and granitic belt that reflects a history of tectonic uplift and the intrusion of granitic rocks between mid-Jurassic and early Tertiary time.

On the eastern margin of southern British Columbia lie miogeoclinal clastic and carbonate sediments of mid-Proterozoic to Mesozoic age which comprise the Foreland Belt. These were deposited on the western edge of cratonic North America and subsequently thrust eastward during Mesozoic and Tertiary times. Small Cretaceous intrusions are found within this belt. The region is bounded by the Omineca Belt to the west.

Most of the study area lies within the Omineca Belt. It is characterized by a succession of strongly deformed and locally strongly metamorphosed Proterozoic and Paleozoic miogeoclinal rocks, younger volcanics, pelitic rocks and a large number of Mesozoic intrusions (Höy, 1983). The Purcell anticlinorium, Kootenay arc, and Shuswap metamorphic complex are structural provinces defined within this belt and host several important mineral deposits.

The Purcell anticlinorium comprises a succession of northward-plunging rocks of Proterozoic age. One of the largest known stratiform base metal deposits in the world, the Sullivan mine, is hosted by Helikian turbidites (Aldridge Formation) along the eastern edge of the Purcell anticlinorium and other deposits are found to the south, in the United States, in rocks equivalent to the Purcell Supergroup strata.

The Kootenay arc is described as a north-trending arcuate belt containing sediments of Hadrynian to early Mesozoic age which have been folded and thrust faulted. A major

TABLE 4-1-2
ABRIDGED DESCRIPTION OF PHYSIOGRAPHY AND GEOLOGY

PHYSIOGRAPHIC REGIONS	PHYSIOGRAPHIC SUBUNITS	GEOLOGY AND STRUCTURE
INTERIOR PLATEAU	Shuswap Highland	gneiss and schistose metamorphic rocks
	Okanagan Highland	metamorphic rocks (chiefly gneiss) with granitic intrusions
COLUMBIA MOUNTAINS AND SOUTHERN ROCKIES	Rocky Mountains	folded and faulted sedimentary and metasedimentary (chiefly limestone, quartzite, schist and slate) rocks
	Rocky Mountain Trench	chiefly Quaternary sediments
	Purcell Mountains	folded sedimentary and metamorphic rocks (chiefly quartzite, argillite and limestone) with granitic intrusions
	Selkirk Mountains	folded sedimentary and metamorphic rocks with granitic stocks and batholiths
	Monashee Mountains	folded sedimentary and metamorphic (chiefly gneiss) rocks with intrusions
	Cariboo Mountains	folded sedimentary and metamorphic rocks

regional structure, it is primarily a lead-zinc belt as is evidenced by the Salmo mining camp, Bluebell and Wigwam deposits, which are typified by shallow-water Lower Cambrian carbonate hosts. The Rossland volcanics of Jurassic age continue to be actively explored for large gold-bearing shear zones and the Cretaceous Nelson batholith is host to the old silver mining camp known as the "Silver Slocan".

The Shuswap metamorphic complex is separated from the Kootenay arc by the eastward-dipping Columbia River fault. The metamorphic complex consists primarily of Archean paragneisses which form domal structures containing core gneisses of Aphebian age. A number of large stratabound lead-zinc deposits, such as Big Ledge and Ruddock Creek, are found along its eastern margin.

The Intermontane Belt, west of the Omineca Belt, crosses the extreme southwest corner of the study area. Moderately folded upper Paleozoic strata, overlain unconformably by folded and faulted Late Triassic volcanics, are intruded by Late Triassic to Early Jurassic plutons which have caused low-grade metamorphism of the strata (Schau, 1970).

Mineral Deposits

The styles of mineralization found in the 1991 RGS-release area can be categorized according to tectonic terrane and deposit type. Table 4-1-3 is a compilation of some past and presently active exploration properties within the survey area (British Columbia Mineral Exploration Review 1990, Information Circular 1990-1).

The Omineca Belt remains the centre of exploration activity in southeastern British Columbia. Current exploration within the belt is concentrated on Sullivan-type deposits within the Purcell Supergroup. Other activities include the evaluation of lode gold deposits within the Rossland volcanics; sedex deposits in the Upper Proterozoic Dutch Creek Formation; massive sulphide deposits in the Eagle Bay assemblage; stratabound copper deposits found in the Grinnell Formation of the Purcell Supergroup; and gold in Cambrian limestones adjacent to the Sheep Creek camp.

In the Foreland Belt, recent exploration has centred on the Jubilee Formation carbonates which host lead-zinc-copper-(silver) mineralization at intrusive contacts; and on gold associated with Cretaceous alkalic intrusions in the Flathead area.

Most exploration within the Intermontane Belt is focused on porphyry deposits and gold-bearing skarns similar to the Nickel Plate deposit. Interesting possibilities also continue to be explored in the Eocene and Tertiary volcanic rocks of the area and several epithermal vein systems hosting gold have been discovered.

1990 PROGRAMS

RGS Program — Southern Rocky Mountains (82G, J)

STREAM-SEDIMENT AND STREAM-WATER SAMPLE COLLECTION

MPH Consulting Limited (Vancouver) was selected by competitive bid to carry out the 1990 RGS sampling program. The sample-collection team consisted of five samplers and a crew chief. Field operations were conducted from several strategically located base camps. Ministry representation was maintained throughout the 40-day program to ensure all aspects of sample collection, data recording, drying, packing and shipping were in accordance with standards set by the National Geochemical Reconnaissance Program.

TABLE 4-1-3
COMMON DEPOSIT TYPES AND ASSOCIATED GEOLOGICAL ENVIRONMENTS

CLASS	SUBCLASS	EXAMPLE	COMMODITIES	HOST ROCK
INTERMONTANE BELT				
PORPHYRY	Calc alkaline	Brenda	Cu, Mo	hosted within a zoned and composite quartz diorite body known as the Brenda stock
VEIN	Epithermal	Vault	Au	a deep, structurally complex epithermal vein system hosted by Eocene volcanic rocks
SKARN		Dividend-Lakeview	Au	hosted by Triassic Kobau or Paleozoic Anarchist groups, associated with Osoyoos batholith
		Crystal Peak	Industrial Garnet	hosted in an inlier of upper Triassic Nicola group granitite, associated with Bromley pluton
OMINECA BELT				
SHUSWAP METAMORPHIC COMPLEX				
MASSIVE SULPHIDE	Stratabound	Ruddock Creek	Zn, Pb, Ag, (F, Ba)	stratabound layers in quartzite, calc silicate gneiss, marble Helikian-Hadrynian(?) age
	Stratiform	Victory	Ag, Au, Cu, Zn, Pb	hosted by Eagle Bay assemblage and Fennell Formation, Samatosum mine extension?
	Volcanogenic Kuroko Type	Homestake	Pb, Zn, Cu, Ag, Ba	hosted by Eagle Bay assemblage in sequence of schists and felsic volcanic lenses
VEIN	Epithermal	Venner	Au	gold-bearing epithermal quartz carbonate vein in a trachytic volcaniclastic sequence
SKARN		Greenwood Camp	Au, Ag, Cu	associated with late Paleozoic Knob Hill group and rocks of the Triassic Brooklyn Formation
KOOTENAY ARC				
MASSIVE SULPHIDE	Sedex	Reeves-McDonald	Zn, Pb, Ag, (Cd, Ga, Ge)	well-banded, parallel lenses hosted by Reeves Formation dolomite (associated breccia)
	Volcanogenic Besshi Type	Goldstream	Cu, Zn, (Pb)	stratabound layers hosted in the Lardeau group
VEIN	Mesothermal	Rossland Camp	Au	lodes and replacements along fractures and faults cutting Jurassic Rossland volcanics
		Slocan Camp	Ag, Pb, Zn	lodes and replacements in Slocan group sediments and the Nelson batholith
SKARN		Tillicum Mountain	Au, Ag	hosted by Rossland volcanics associated with quartz monzonite sills
PORPHYRY-BRECCIA	Calc alkaline	Willa	Cu, Au	hosted by Rossland volcanics
PLACER	Gold	Wild Horse River	Au	
PURCELL ANTICLINORIUM				
MASSIVE SULPHIDE	Sedex	Sullivan	Pb, Zn, Ag	hosted by lower Middle Aldridge siltstone
	"Kupferschiefer"		Cu, U (Ag, Pb, Mo)	stratabound layers in Grinnell Formation sandstone red beds
VEIN		Vine	Zn, Pb, Cu	hosted by the Aldridge Formation; associated with fault zone
FORELAND BELT				
SKARN		Cash	Pb, Zn, Cu (Ag)	hosted by brecciated Jubilee Formation limestones at intrusive contacts with Cretaceous syenite
PORPHYRY	Alkaline	Flathead	Au	hosted by Cretaceous alkalic intrusions
INDUSTRIAL MINERALS		Mt. Brussilof	Magnesite	replacement in Cambrian Cathedral Formation

TABLE 4-1-4
METHODS AND SPECIFICATIONS FOR SAMPLE ANALYSES (AFTER MATYSEK *ET AL.*, 1989)

Element	Detection Limits	Sample Weight	Digestion Technique		Determination Method
Gold	1 ppb	10 g	fire assay fusion - Palladium inquarting agent	FA-AA	atomic absorption spectrophotometry after digestion of doré bead by aqua regia
Silver	100 ppb				
Cadmium	0.2 ppm	1 g	3 ml HNO_3 let sit overnight, add 1 ml HCl in 90°C water bath, for 2 hrs. cool, add 2 ml H_2O, wait 2 hrs.	AAS	atomic absorption spectrophotometry using air-acetylene burner and standard solutions for calibration, background corrections made for Pb, Ni, Co, Ag, Cd
Cobalt	2 ppm				
Copper	2 ppm				
Iron	0.02 pct				
Lead	2 ppm				
Manganese	5 ppm				
Nickel	2 ppm				
Zinc	2 ppm				
Molybdenum	1 ppm	0.5 g	Al added to above solution		
Barium	10 ppm	1 g	HNO_3 - HCl - HF taken to dryness, hot HCl added to leach residue		
Vanadium	5 ppm				
Chromium	5 ppm				
Bismuth	0.2 ppm	2 g	HCl - $KClO_2$ digestion, KI added to reduce Fe, MIBK and TOPO for extraction	AAS-H	organic layer analyzed by atomic absorption spectrophotometry with background correction
Antimony	0.2 ppm				
Tin	1 ppm	1 g	sintered with NH_4I, HCl and ascorbic acid leach	AAS	atomic absorption spectrophotometry
Arsenic	1 ppm	0.5 g	add 2 ml KI and dilute HCl to 0.8M HNO_3 • 0.2M HCl	AAS-H	2 ml borohydride solution added to produce AsH_3 gas which is passed through heated quartz tube in the light path of atomic absorption spectrophotometer
Mercury	10 ppb	0.5 g	20 ml HNO_3 • 1 ml HCl	AAS-F	10% stannous sulphate added to evolve mercury vapour, determined by atomic absorption spectrometry
Tungsten	1 ppm	0.5 g	K_2SO_4 fusion, HCl leach	COLOR	colorimetric: reduced tungsten complexed with toluene 3, 4 dithiol
Fluorine	40 ppm	0.25 g	$NaCO_3$ - KNO_3 fusion, H_2O leach	ION	citric acid added and diluted with water, fluorine determined with specific ion electrode
Uranium	0.5 ppm	1 g	nil	NADNC	neutron activation with delayed neutron counting
LOI	0.1 pct	0.5 g	ash sample at 500°C	GRAV	weight difference
pH - water	0.1 pH unit	25 ml	nil	GCE	glass - calomel electrode system
U - water	0.05 ppb	5 ml	add 0.5 ml fluran solution	LIF	place in Scintrex UA-3
F - water	20 ppb	25 ml	nil	ION	fluorine ion specific electrode

Stream-sediment and stream-water samples were collected from 922 sites within the Fernie map area (82G), and 583 sample sites were sampled within the Kananaskis Lakes map area (82J). The surveys covered approximately 18 000 square kilometres at an average density of one sample site every 11.9 square kilometres. Sixty-five per cent of the sites were accessed by truck or trail bike, the remainder were reached by helicopter. The program included sample collection in Kootenay National Park, Elk Lakes Recreation Area, Akamina Kishinena Recreation Area and Height of the Rockies Forest Wilderness Area. However, samples were not collected from Mount Assiniboine, Elk Lakes and Top of the World provincial parks.

In general, sample sites were restricted to primary and secondary drainages having catchment basins of less than 10 square kilometres. Contaminated or poor-quality sample sites were avoided by choosing an alternative stream or sampling a minimum of 100 metres upstream from the identified problem. At each site fine-grained stream sediments weighing 1 to 2 kilograms were collected from the active (subject to annual flooding) stream channel and placed in kraft-paper bags. Unfiltered water samples were collected in sterilized 250-millilitre bottles. Precautions were taken to ensure suspended solids were excluded from the water sample. Field observations regarding sample media, sample site and local terrain were recorded and, to assist follow-up, aluminum tags inscribed with a unique RGS sample identification number were fixed to permanent objects at each site. Numerous field-site checks were conducted to monitor, control and assess sample-collection procedures.

SAMPLE PREPARATION — FIELD

Collected samples were field processed by the sample collection contractor at a central facility in Cranbrook. Sediment samples were dried and all sediment material finer than 1 millimetre was recovered by sieving each sample through a −18 mesh ASTM screen. Samples were assessed for quality and content of fine-grained sediment and samples which appeared deficient in fine-grained material were routinely sieved through a −80 mesh screen (less than 177 microns). Sites yielding organic-rich samples and samples containing less than 40 grams of −80 mesh stream sediment were resampled.

SAMPLE PREPARATION — LAB

Field-processed sediment samples and the water samples were shipped to Rossbacher Analytical Laboratory in Burnaby for final preparation. Sediment samples were sieved to −80 mesh ASTM fraction and blind duplicate samples and control reference materials were inserted into each analytical batch of 20 sediment samples. Control reference water standards were also inserted into each analytical batch of 20 water samples. At this stage, a quantity of −80 mesh sediment and a representative sample of the +80 to −18 mesh fraction was archived for future studies.

TABLE 4-1-5
REPORTED DETECTION LIMITS FOR INSTRUMENTAL NEUTRON ACTIVATION ANALYSES

Element	Detection Limits	Element	Detection Limits
Gold	2 ppb	Molybdenum	1 ppm
Antimony	0.1 ppm	Nickel	10 ppm
Arsenic	0.5 ppm	Rubidium	5 ppm
Barium	100 ppm	Samarium	0.5 ppm
Bromine	0.5 ppm	Scandium	0.5 ppm
Cerium	10 ppm	Sodium	0.1 pct
Cesium	0.5 ppm	Tantalum	0.5 ppm
Chromium	5 ppm	Terbium	0.5 ppm
Cobalt	5 ppm	Thorium	0.5 ppm
Hafnium	1 ppm	Tungsten	2 ppm
Iron	0.2 pct	Uranium	0.2 ppm
Lantanum	5 ppm	Ytterbium	2 ppm
Lutetium	0.2 ppm	Zirconium	200 ppm

ANALYTICAL PROCEDURES

Table 4-1-4 outlines the standard RGS procedures used to analyze the sediment and water samples. These methods and specifications have been successfully employed in previous surveys. In addition to the standard RGS analytical package, the sediment samples will also be shipped to Becquerel Laboratories (Ontario) for analysis of 26 elements (Table 4-1-5) by instrumental neutron activation analyses.

Instrumental neutron activation analyses involves irradiating the sediment samples, which on average weigh 20 grams, for 20 minutes in a neutron flux. Most of the elements in the sample become radioactive and emit radiation in the form of gamma rays which have energies (wavelengths) characteristic of particular elements. Samples are then removed from the neutron flux and placed close to a gamma-ray detector, commonly a germanium crystal held at the temperature of liquid nitrogen. Counting data are accumulated on a computer and converted to concentrations.

Field site duplicates, blind analytical duplicates and control reference materials are used to ensure that analytical data satisfy National Geochemical Reconnaissance quality control standards.

EXPANDED STREAM-WATER CHEMISTRY DATABASE

BACKGROUND

Until quite recently, explorationists have made relatively little use of stream water as a sample medium for geochemical drainage surveys (Learned *et al.*, 1985). The recent availability of instrumentation allowing inexpensive, rapid and direct determination of metals in water to concentrations below the parts per billion level has made the collection and analysis of stream water more economically feasible. In order to test the relative effectiveness of stream water as a geochemical exploration medium, and to further the understanding of background metal concentrations (Cu, Pb, Zn, As, Cd, Hg) in stream waters, an additional water sample was collected from each RGS sample site. The results will also be used for developing water-quality objectives for existing and future mining operations, trans-boundary water-quality issues and the setting of water-quality criteria for fish habitat and human consumption.

SAMPLE COLLECTION AND PREPARATION

A total of 1259 water samples were collected and prepared according to Ministry of Environment (MOE) water-sampling protocols.

A 250-millilitre unfiltered water sample was taken in midstream from the same stream drainages sampled during the RGS program. Samples were stored in coolers immediately after collection. On average, sample preparation was completed within 6 to 8 hours and involved the filtering of a 125-millilitre portion of the unfiltered sample through a 0.45 micron cellulose acetate filter. Both the unfiltered and filtered samples were acidified with 1 millilitre of nitric acid to produce a pH below 2.

ANALYTICAL PROCEDURES

Can Test Laboratory (Vancouver) was selected by competitive bid to analyze water samples according to MOE guidelines and quality control and assurance standards.

Copper and lead concentrations in both field-filtered and unfiltered water will be determined by graphite-furnace atomic absorption spectrometry with a detection limit of 0.5 ppb. Zinc concentrations in both field-filtered and unfiltered waters will be estimated by flame atomic absorption with a 1.0 ppb detection limit. Cadmium and arsenic concentrations in unfiltered waters will be determined by graphite-furnace atomic absorption spectrometry with detection limits of 0.2 ppb and 1 ppb, respectively. Mercury concentrations in unfiltered waters will be determined by cold-vapour atomic absorption with a 0.05 ppb detection level.

ARCHIVE PROGRAM — KOOTENAYS (82E, F, K, L, M)

BACKGROUND

During the initial development of the National Reconnaissance Program the Geological Survey of Canada (GSC) recognized the importance of preserving RGS stream-sediment samples for future studies. At the completion of each survey, remaining sediment was routinely saved and stored at GSC facilities in Ottawa. To encourage mineral exploration in previously surveyed areas (Figure 4-1-1), over 24 500 of these archived sediment samples have been retrieved and analyzed for a number of previously undetermined elements, including gold. The analyses of archived pulps have been performed through nondestructive instrumental neutron activation analysis by Becquerel Laboratories in Ontario. The initiative has added over one million analytical determinations to the existing RGS database. Due to the size of the expanded data set, the results will be released over an extended period of time. The five Kootenay map sheets, originally surveyed in 1976 and 1977, will represent the first RGS Archive Program release.

1990 RGS ARCHIVE PROGRAM

Approximately 6900 stream-sediment and water samples were collected in southeastern British Columbia during the 1976 and 1977 Federal-Provincial Regional Geochemical Surveys (Figure 4-1-1). The samples were collected at an average density of 1 sample every 12 square kilometres and covered an area in excess of 82 000 square kilometres (Table 4-1-1). The field and analytical data were initially released as GSC Open Files 409 (82E), 410 (82L), 514 (82F), 515 (82K) and 516 (82M) and are available in hard copy and floppy diskette.

Original stream-sediment analytical data included results for Zn, Cu, Pb, Ni, Co, Ag, Mn, Fe, Mo, W, Hg and Sn. The methods and specifications of analyses are similar to those listed in Table 4-1-4. The additional elements determined by instrumental neutron activation analyses are listed in Table 4-1-5.

PRELIMINARY RESULTS

In order to assist explorationists in planning for their follow-up of the 1991 release of archive data, some preliminary comments and statistics for gold, copper, lead and zinc results are provided below. In addition, Figure 4-1-3 identifies key geologic formations (Okulitch and Woodsworth, 1977) within the survey area that contain a high proportion of anomalous base metal and gold samples.

GOLD (1990 DATA)

Over half of the gold analyses (n = 3060 samples) returned concentrations greater than the detection limit. The mean value is 10 ppb and the 90th, 95th and 98th percentile concentrations are 14, 28 and 62 ppb, respectively. The maximum value obtained was 3530 ppb. Anomalous gold results are particularly associated with samples collected from the Lower Paleozoic Lardeau Group, Carboniferous-Permian Thompson assemblage, Triassic-Jurassic Nicola and Rossland groups, and Early Cretaceous granodiorites.

COPPER (1976 AND 1977 DATA)

Over 99 per cent of the copper analyses (n = 6451 samples) returned concentrations greater than the detection limit. The mean value is 24 ppm and the 90th, 95th and 98th percentile concentrations are 46, 59 and 81 ppm, respectively. The maximum value obtained was 1800 ppm. Anomalous copper results are particularly associated with samples obtained from the Lower Paleozoic Lardeau Group, Triassic-Jurassic Nicola and Rossland groups, and Proterozoic Miette and Horsethief Creek groups.

LEAD (1976 AND 1977 DATA)

Over 82 per cent of the lead analyses (n = 5396 samples) returned concentrations greater than the detection limit. The mean value is 20 ppm and the 90th, 95th and 98th percentile concentrations are 25, 37 and 70 ppm, respectively. The maximum value obtained is 20 000 ppm. Anomalous lead results are particularly associated with samples

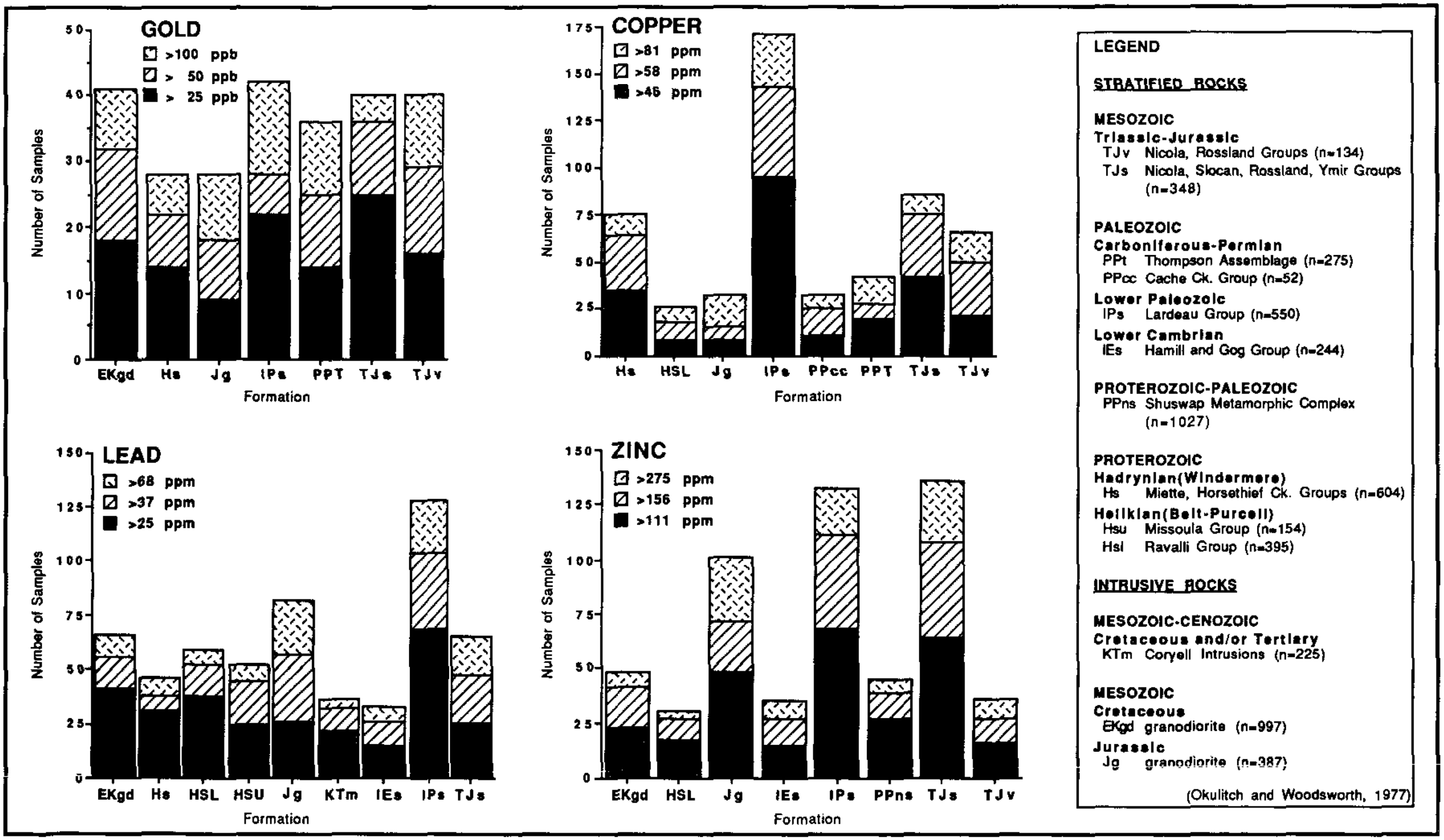

Figure 4-1-3. Number of samples exhibiting anomalous concentrations for selected elements (by formation).

collected from the Proterozoic Windermere and Purcell belts, Lower Paleozoic Lardeau Group, Triassic-Jurassic Nicola and Rossland groups, and Cretaceous and Jurassic granodiorite intrusions.

ZINC (1976 AND 1977 DATA)

All samples (n = 6540 samples) returned concentrations greater than the detection limit. The mean value is 94 ppm and the 90th, 95th and 98th percentile concentrations are 111, 156 and 275 ppm respectively. The maximum value obtained is 20 000 ppm. Anomalous zinc results are particularly associated with samples obtained from the Lower Paleozoic Lardeau Group, Triassic-Jurassic Nicola and Rossland groups, and Cretaceous and Jurassic granodiorite intrusions.

1991 RGS RELEASE INFORMATION

The 1991 RGS release will include field and analytical data from the 1990 surveys. The Open File data packages will be identified as follows:

- RGS-27 Fernie (NTS 82G)
- RGS-28 Kananaskis Lakes (NTS 82J).

The 1991 RGS-archive release will include field and analytical data from the original 1976 and 1977 surveys, plus results of the INAA program. The Open File data packages will be identified as follows:

- RGS-29 Penticton (NTS 82E)
- RGS-30 Nelson (NTS 82F)
- RGS-31 Lardeau (NTS 82K)
- RGS-32 Vernon (NTS 82L)
- RGS-33 Seymour Arm (NTS 82M)

The Open File data packages will be released in the following hard-copy and digital data formats:

- The hard-copy data packages will contain 1:100 000 and 1:500 000-scale sample-location maps, 1:500 000-scale geochemical maps for each element, listings of field and analytical data, and summary statistics and data analyses.
- Digital data packages will consist of MS-DOS formatted, 5¼″ floppy diskettes containing listings of field and analytical data together with files outlining methods and specifications. A 1:250 000-scale sample-location map will also be included.

All seven Open Files are tentatively scheduled for release in the spring of 1991. Release centres will be established in Nelson and Vancouver.

ACKNOWLEDGMENTS

The delivery of the 1990 RGS program required the cooperation and assistance of numerous private companies and government agencies. We acknowledge the high quality of work performed by contractors involved with sample collection, preparation and analyses. The valuable assistance provided by the Kootenay Park Warden Office (Environment Canada), the Invermere Forest District Office (Ministry of Forests), the East Kootenay District Office (Ministry of Parks), the Water Quality Unit (Ministry of Environment) and the Mineral Policy Branch (Ministry of Energy, Mines and Petroleum Resources) is also appreciated.

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