GEOLOGY OF THE FORREST KERR- MESS CREEK AREA, Northwestern British Columbia (NTS 104B/10, 15 & 104G/2 & 7W)

By James M. Logan, P.Geo, John R. Drobe and William C. McClelland

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Frontispiece: View west up the Andrei Glacier.
SUMMARY

The Forrest Kerr-Mess Creek map area straddles the boundary between the Intermontane and the Coast belts in northwestern British Columbia. This region is underlain by rocks comprising the western boundary of the Stikine Terrane (Stikinia). At this latitude Stikinia consists of well stratified, middle Paleozoic to Mesozoic sedimentary rocks and volcanic and comagmatic plutonic rocks of island-arc affinity which include: the Early Devonian to Permian Paleozoic Stikine assemblage, the Late Triassic Stuhini Group and the Early Jurassic Hazelton Group. These are overlapped by Middle Jurassic to early Tertiary successor-basin sediments of the Bowser Lake and Sustut Groups, Late Cretaceous to Tertiary continental volcanic rocks of the Sloko Group, and Late Tertiary to Recent bimodal shield volcanism of the Edziza and Spectrum ranges. Warm-spring, tufa deposits forming in the Mess Creek valley attest to areas of dynamic geological evolution in modern day.

Polyphase deformation affects rocks that are older than Late Cretaceous, and crustal scale faults affect rocks in the area as young as Tertiary. Early and middle Devonian rocks within the map area have been subjected to up to four phases of folding and deformation. Mid-Carboniferous to Early Permian rocks record as few as two phases of deformation, whereas the Late Triassic and Jurassic strata record no more than two phases of deformation in addition to a regionally important post-Norian unconformity. Mid-Devonian, northeast-verging D₁ structures correspond to a northern Cordilleran-wide event correlative with the Antler Orogeny of the southwest U.S. and Ellesmerian Orogeny in the arctic. Pre-Norian, Permo-Triassic (Tahltanian Orogeny) D₂ deformation was accompanied by upper greenschist facies metamorphism. Early Jurassic, D₃ (circa 185 Ma) deformation broadly warped and folded the rocks into upright, open structures. Late Jurassic to Tertiary contraction (D₄), produced northeast-verging structures related to development of the Skeena Fold and Thrust Belt. The youngest structures record east-west extension and northerly translation, thought to post date the Eocene.

The Late Paleozoic and Mesozoic volcanic and plutonic rocks within the map area are characterized by metal deposits related to island-arc volcanic centres. Mineral production is not recorded within the map area although large copper, gold and molybdenum mineral resources are defined for porphyry deposits at Schaft Creek (971 495 000 tonnes grading 0.298 %Cu, 0.033 %MoS₂, 0.14 g/t Au and 1.20 g/t Ag; Spilsbury, 1995 ) and Galore Creek (Central zone: 233 900 000 tonnes grading 0.67 %Cu, 0.35 g/t Au and 7.0 g/t Ag; Enns et al., 1995). Mineral occurrences and prospects in the Forrest Kerr - Mess Lake area can be grouped into four main categories: calcalkaline Cu-Mo-Au and alkaline Cu-Au porphyries; Cu and Cu-Au skarns; subvolcanic Cu-Ag-Au (As-Sb) fault and shear-hosted veins and carbonate hosted replacement; and, stratiform volcanogenic massive sulphide and carbonate hosted (?Irish-type) Zn-Pb-Ag deposits. Mineral occurrences, within the map area, display (except stratiform types) a direct correlation with north and northeast striking faults and Late Triassic to Early Jurassic intrusive rocks.
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CHAPTER 1

INTRODUCTION AND REGIONAL GEOLOGY

LOCATION AND ACCESS

The Forrest Kerr Creek, More Creek and Mess Creek map areas comprise a 3,000 km² area, which is located east of the Coast Mountains, between Iskut River and Mess Lake, approximately 100 kilometres southeast of Telegraph Creek in northwestern British Columbia (Figure 1-1). The large tonnage Schaft Creek calcalkaline porphyry copper-gold-molybdenum deposit is located within the area mapped. The three map sheets, 104B/15 and part of 104B/10, 104G/2 and 104G/7W, lie between latitudes 56°40 and 57°30 north, and longitudes 130°30 and 131°00 west. Results of regional mapping and sampling carried out between 1989 and 1992 are summarized here. This report and accompanying map incorporates new data and revisions to the 1:50000 geology and mineral occurrence maps, Open File 1990-2, Open File 1992-1 and Open File 1993-6. The focus of the project was to produce detailed geological maps and a database to better understand the geological setting of the mineral deposits in the area between Forrest Kerr and Mess Creek areas and aid in making new discoveries.

The area mapped is located along the western margin of the Intermontane Belt, adjacent to the high-relief mountains of the Coast Belt. Topography is rugged, typical of mountainous and glaciated terrain with numerous snowfields and elevating glaciers. Elevations range from 100 metres on the Iskut River flood plain to over 2662 metres atop Hankin Peak in the More Creek area. Permanent icefields and alpine glaciers cover approximately one-third of the Forrest Kerr map area, less of the More Creek area, and only small isolated areas in the Mess Creek area. The map area covers two physiographic regions, the high, rugged Boundary Ranges, on the southwest and the more subdued Tahltan Highlands which cover the area east of Mess Creek and north of More Creek (Holland, 1976). West of the map area, the Coast Mountains are covered by large icefields, remnants of the Quaternary ice sheet, which feed glaciers descending north and eastward into the headwaters of the Forrest Kerr Creek (frontispiece). The Andrei Glacier is one of the larger, approximately 2 kilometres wide and terminates at an elevation of less than 600 metres. North in the More Creek area the More glacier carries both medial and lateral moraines which merge to cover the ice completely. Natavas and Alexander glaciers are somewhat smaller than Andrei Glacier; Matthew Glacier is a large ice sheet which covers the high peaks south and east of Hankin Peak.

The Iskut north project area is wholly contained within the drainage basin of the Stikine River. The south and eastern areas drain southward into the Iskut River; the west and northern areas drain northward into Schaft and Mess creeks. Both are tributaries of the Stikine River, the Iskut River is it’s largest and forms the south boundary to the map area. The Iskut River occupies a broad, one to two kilometre wide steep-sided valley for the most part, which flows east crossing the structural grain of the Coast Belt and joins the Stikine approximately 50 kilometres upstream from its mouth. Near the confluence of Forrest Kerr Creek the Stikine is confined to a narrow canyon for approximately 20 kilometres, where it has eroded through 10 metres of Recent basalt flows in the last 3600 to 3800 years (B.C. Hydro, 1985, in Hauksdottir et al., 1994). Physiography of the Stikine valley varies from mature, broad steep-walled to youthful canyons over its length from its source on the Stikine Plateau to where it discharges into Frederick Strait near Wrangell, Alaska. Northeast of Telegraph Creek the steep-walled “Grand Canyon” is a post-Tertiary drainage feature. Pre-Quaternary, the river may have flowed southwesterly from the head of this canyon, rejoining the present lower Stikine valley near the mouth of Mess Creek, or have been diverted into the Iskut valley (Kerr, 1948a, Mathews, 1991). In the Flood Glacier area the river occupies a broad, mature valley 3 to 4 kilometres wide. During high water, material carried into the Stikine from tributary streams exceeds the river budget and the river aggrades its channel. The result is a sinuous braided river of constantly shifting bars and channels (Souther, 1972). The Sphaler Creek area drains northward through the valleys of Galore Creek and the South Scud River into the west-flowing Scud River, a tributary of the Stikine River and westward down Sphaler Creek into the Porcupine River which joins the Stikine 9 kilometres west of Mount Scotsimpson. The north-trending drainages occupy fault-controlled valleys. Similar structures control the Mess and Iskut valleys farther east.

Historically the Stikine River and its tributaries provided access through the Coast Mountains into the interior of the province. One of the main routes to the Klondike and Atlin Lake discoveries of 1896 and 1898 was up the Stikine to Telegraph Creek, then overland to Teslin or Atlin Lake (Kerr, 1948a). Paddle-wheel riverboats navigated between tidewater at Wrangell, Alaska as far upstream as the Stikine Canyon at Telegraph Creek until the late 1960s. Fixed-wing aircraft fly charters from Smithers, Dease Lake and Telegraph Creek to the Bronson airstrip located 25 kilometres west at the Snip Mine. A gravel airstrip is located at Schaft Creek and a third, though shorter gravel strip is located at the headwaters of Forrest Kerr Creek. Access to the remaining areas is by helicopter. During summer field seasons in the past, helicopters have been stationed at Galore Creek, Scud strip, Forrest Kerr strip and Bronson strip. A helicopter base is located 80 kilometres to the southwest at Bob Quinn Lake and 150 kilometres north at Dease Lake. With the development of the Eskay Creek deposit into one of the highest grade gold and silver producing mines in the country, an all weather gravel road was constructed in 1994 linking the
Figure 1-1. Location map showing compilation sources and previous work and the physiography of the map area.
mine to the highway and providing access to the southeastern corner of the study area.

Wrangell, Alaska located on tidewater 90 kilometres to the southwest, provides commercial air connections to Anchorage, Alaska or Seattle, Washington. Between 1991 and mid-1996 Cominco Ltd. operated a hovercraft between Wrangell and the Bronson air strip on the Iskut River, 30 kilometres south of the map area.

HISTORY OF EXPLORATION

The first recorded mineral assessment of the area was conducted by a group of Russian geologists who explored along the Stikine River in 1863 (Alaska Geographic Society, 1979). Placer gold was mined from bars on the Stikine River a short distance south of Telegraph Creek and later production is recorded from the Barrington River, during the late 1800s and early 1900s. Exploration for lode deposits began in the 1900s along access corridors provided by the Stikine River and its tributaries. Hudson Bay Mining and Smelting Company Limited initiated prospecting in the more remote parts of the Galore Creek map area in 1955, using helicopter-supported field parties. Discovery of the Galore Creek porphyry copper deposit in 1955 was a direct result of this program and focused porphyry exploration activity on the area. The Schaft Creek (Liard Copper) deposits were staked in 1957. The recent resurgence of mineral exploration in the map area has been in response to its geological similarities with the Sulphurets, Iskut and Golden Bear gold camps. Mining and exploration companies active in the map area during the fieldwork included Pamicon Development Limited (Forrest claims), Cominco Ltd. (Foremore), Noranda Exploration Company Limited (GOZ/RDN and Lucifer), Gulf International Minerals Limited (McLymont-NW), Kestrel Resources (Tic-Arc-Mon) and Keewatin Engineering Ltd. (Little Les - Arctic claims).

PREVIOUS GEOLOGICAL WORK

Forrest Kerr carried out the first geological mapping along the Stikine and Iskut rivers from 1924 to 1929, but it was not until 1948 that his data were published (Kerr, 1948a, b). Kerr proposed the original Permian and pre-Permian subdivision of Paleozoic strata, and from his work in the Taku River valley of the Tulsequah map area, he defined the Late Triassic Stuhini Group, much of which underlies the current study area. In 1956, a helicopter-supported reconnaissance of the Telegraph Creek map area was conducted by the Geological Survey of Canada (1957, Operation Stikine). Other work by the Geological Survey of Canada (Figure 1-1) includes that of Souther (1971, 1972, 1988, 1992), Monger (1970, 1977a) and Anderson (1984, 1989). Jack Souther masterminded Operation Stikine and produced 1:250 000-scale geological maps of the Telegraph Creek sheet (104G), Tulsequah sheet (104K) and 1:50 000-scale detailed studies of Mount Edziza (1988, 1992), James Monger (1977a) further subdivided the late Paleozoic rocks and informally named them the Stikine assemblage. Robert Anderson’s work includes studies to the north on the Hotailah (1983) and Stikine batholiths (1984) and, more recently, a 1:250 000-scale geological map of the Iskut River area (Anderson, 1989). Peter Read has conducted regional mapping for the Geological Survey of Canada in the Stikine Canyon area (Read, 1983) and feasibility studies for B.C. Hydro in the Forrest Kerr Creek area (Read et al., 1989).

Regional metallogeny studies and mapping by D.J. Alldrick, J.M. Britton and others of the British Columbia Geological Survey Branch have covered the Sulphurets, Unuk River and Snippaker areas to the south (Alldrick and Britton, 1988; Alldrick et al., 1989, 1990). To the west, A. Panteleyev carried out mapping in the immediate area of Galore Creek, in conjunction with a study of the deposit between 1973 and 1975 (Panteleyev, 1973, 1974, 1975, 1976, 1983). Geological mapping was completed at 1:50 000 scale in the Galore Creek area (Sphaler Creek and Flood Glacier map sheets) in 1988 (Logan et al., 1989; Logan and Koyanagi, 1995). Concurrent British Columbia Geological Survey projects have completed 1:50 000 scale map coverage north and west of the Iskut-north project area in the Scud River, Yehiniko Lake, Chutin River and Tahltan Lake map areas (Brown et al., 1996).

Further descriptions of the geology and mineral prospects within the area can be found in various Annual Reports of the British Columbia Minister of Mines dating from the early 1900s and assessment reports on file with the Ministry of Energy, Mines and Petroleum Resources.

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REGIONAL GEOLOGY

TECTONIC SETTING

The study area (Figure 1-2) straddles the boundary between the Intermontane Belt and the Coast Belt and is underlain mainly by rocks of the Stikine Terrane (Stikinia), the westernmost terrane of the Intermontane Superterrane. Stikinia is the largest of the allochthonous terranes. Like other terranes of the North American Cordillera, its pre-Jurassic geological history, paleontological and paleomagnetic signatures are unique. They have been interpreted to indicate that it originated far removed from the margin of ancestral North America (Gabrielse et al., 1991) and was amalgamated with the Cache Creek, Quesnel and Slide Mountain terranes prior to accretion to the North American craton (Figure 1-2). Recent studies suggest that the Stikine terrane developed adjacent to the ancestral margin of North America (McClelland, 1992; Mihalynuk et al., 1994).

Stikinia’s outboard (western) position relative to the Cache Creek Terrane in British Columbia is an enigma (Monger, 1977b). Wernicke and Klepacki (1988) proposed that Stikinia and Quesnellia are segments of a single arc generated by Mesozoic subduction of the Cache Creek Terrane, which through subsequent collision with Wrangellia and complex dextral movement, produced the present configuration. The result is a doubling up of the arc terranes, with Stikinia separated from Quesnellia, by the Cache Creek Terrane. Geological studies in southeastern Alaska (Gehrels et al., 1990; Rubin and Saleeby, 1991) and northwestern British Columbia (Gareau, 1991; McClelland 1992) correlate metamorphic rocks west of and within the Coast Belt with rocks of the Yukon-Tanana Terrane. As well, McClelland and Mattinson (1991) and McClelland (1992) suggest that parts of the Paleozoic Stikine assemblage are correlative with and depositionally tied to Paleozoic rocks of the Yukon-Tanana Terrane. Depositional ties between the Quesnel and Yukon-Tanana terranes are also known and this together with the hook-like geometry of the 0.706 initial 87Sr/86Sr line around the northern end of Stikinia (Figure 1-2) led Nelson and Mihalynuk (1993) to propose a single arc model consisting of the Quesnel, Yukon Tanana, Nisling and Stikine terranes. Neodymium isotope studies (Samson et al., 1989) suggest the Stikine Terrane in the Iskut River area comprises juvenile (Phanerozoic) crustal material that evolved in an intra-oceanic environment with no continental detrital influences. Diverse isotopic signatures may reflect construction of a late Paleozoic arc that was transitional across continental slope deposits to distal intra-oceanic settings, a modern analog being the Aleutian arc of western Alaska.

Mihalynuk et al. (1994) envisage the Late Triassic arc to have subsequently been deformed into an orocline that encloses the Cache Creek Terrane. The orocline closed by
Middle Jurassic time, after which emplacement of Quesnellia onto North America began (Gabrielse and Yorath, 1991; Murphy et al., 1995). These models use geological, faunal, isotopic and paleomagnetic data that are not always consistent but are compatible with each model.

The major tectonic elements of the northern Intermontane Belt include the Bowser Basin and the northeast-trending Stikine Arch. The Forrest Kerr - Mess Creek area is within the Stikine Arch. The Bowser Basin is confined between the Stikine and Skeena arches, rests on Stikinia and consists of marine and non marine elastic rocks. It is a Middle Jurassic to Middle Cretaceous successor basin, initiated during amalgamation of the Intermontane Superterrane (Ricketts et al., 1992). Overlying all the older rocks, the Cretaceous to Tertiary Sustut Group records fluviial and alluvial fan deposition derived initially from the east (Omineca Belt) and later from the west (Stikinia and the Coast Belt). The Coast Plutonic Complex intrudes the western boundary of the Stikine Terrane. It is a long and narrow magmatic belt that extends the length of the Canadian Cordillera and is, comprised predominantly of calcalkaline granitoid rocks of Jurassic to Paleogene age. Cooling ages and uplift history are complex across the belt. Plutonic rocks of the Coast Belt are mid-Cretaceous and older on the west side of the belt and mainly Late Cretaceous and Tertiary on the east. In the study area, which is on the east (Figure 1-3), voluminous postorogenic Tertiary bodies obscure the western margin of Stikinia. Eocene Sloko Group continental volcanic rocks erupted from centres located north and northwest of the study area.

At this latitude Stikinia consists of well stratified middle Paleozoic to Mesozoic sedimentary rocks and volcanic and comagmatic plutonic rocks of probable island arc affinity which include: the Paleozoic Stikine assemblage, the Late Triassic Stuhini Group and the Early Jurassic Hazelton Group. These are overlapped by Middle Jurassic to early Tertiary successor-basin sediments of the Bowser Lake and Sustut Groups, Late Cretaceous to Tertiary continental volcanic rocks of the Sloko Group, and Late Tertiary to Recent bimodal shield volcanism of the Edziza and Spectrum ranges.

**REGIONAL STRATIGRAPHY**

Rocks of the Stikine assemblage are the structurally and stratigraphically lowest supraclastial rocks observed in the Forrest Kerr - Mess Creek area. Stikine assemblage rocks were informally named by Monger (1977b) to include all upper Paleozoic rocks (within Stikinia) which cropped out around the periphery of the Bowser Basin. The assemblage consists of Permian, Upper Carboniferous, Lower Carboniferous and Devonian age (using the geological time scale of, Harland et al., 1990) rocks. The dominant lithologies are tholeiitic to calcalkaline, mafic and bimodal flows and volcanioclastics, interbedded carbonate, minor shale and chert (Table 1-1). The Permian carbonates and volcanics are a distinctive part of the Stikine assemblage, traceable for over 500 kilometres from north of the Stikine River to south of Terrace. Correlative Permian strata east of the Bowser Basin are assigned to the Asitka Group, a name applied to all Paleozoic strata in Stikinia (Wheeler and McFeely 1991).

Unconformably overlying the Stikine assemblage are Lower to Middle Triassic sedimentary and Upper Triassic volcanic rocks. Similar Upper Triassic volcanic rocks are exposed the length of the Canadian Cordillera. Across the northern end of the Intermontane Belt there is little difference in age, lithology or chemistry of the Triassic strata from one tectonostratigraphic terrane to the next (i.e., between Takla and Stuhini). Unconformities separate the Upper Triassic Stuhini Group, which is mainly submarine volcanic rocks, from the Jurassic Hazelton Group which is mainly subaerial volcanic and sedimentary rocks in the map area. Rocks of the Hazelton Group encircle the northern Bowser Basin inboard (basinward) of the Upper Triassic Stuhini volcanic arc (Figure 1-3). The Hazelton Group consists of a lower sequence of intermediate flows and volcanioclastics, a middle felsic volcanic interval and an upper unit of sedimentary and submarine bimodal volcanic rocks.

The pre-amalgamation Paleozoic and Mesozoic volcanic archipelagos, carbonate platforms and related clastic basins are overlapped by Middle Jurassic to Upper Cretaceous and Lower Tertiary successor basin sediments of the Bowser Lake and Sustut groups respectively, and
<table>
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<th>ERA</th>
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<th>GROUP OR FORMATION</th>
<th>MAP UNIT</th>
<th>LITHOLOGY</th>
<th>THICKNESS (metres)</th>
<th>INTRUSIVE SUITES</th>
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| LATE CRETACEOUS | SUSTUT GROUP | kSs | conglomerate, quartzose sandstone, arkose | ? | |
| | BOWSER LAKE GROUP | Jbp | greywacke, shale, minor cross bedded sandstone | 500 | |

| MIDDLE JURASSIC TO CRETACEOUS | HAZELTON GROUP | Jw | brecciated and fractured dark green silicic siltstone | 1000-2000 | |
| | | mJHsl | siltstone, sandstone, minor tuff | | |
| | | mJHb | pillow basalt | | |
| | | UHv | purple, maroon, and green andesite | | |
| | | UJhr | felsic welded ash-flow tuff, rhyolite flows | | |
| | | UJHn | tan sandstone, plagioclase-crystal tuffs, peperite | | |
| | | UHss | graphitic siltstone | | |

| LOWER JURASSIC | STUHINI GROUP | uTs | unbedded volcanics | 200-300 | |
| | | uTsv | plagioclase crystal tuff | | |
| | | uTv | pink flow-layered rhyolite | | |
| | NEWMONT LAKE faces | uTs | hornblende-plagioclase phryic andesite | | |
| | | uTsva | thick plagioclase-pyroxene porphyry flows, interbedded tuff | | |
| | | uTsvpp | massive pale weathering crystal tuff, lapilli tuff | | |
| | | uTsv | massive basalt flows and tuff | 800 | |
| | | uTsm | serpentinized basaltic tuff | | |
| | MESS LAKE faces | uTs | pale green grey tuffs, minor basalt flows | 1500 | |
| | | uTs | thick poorly bedded sandstone | | |
| | | uTs | grey sparsely crinoidal limestone | | |
| | | uTs | well bedded feldspathic sandstone | | |
| | | uTsd | thin laminated black siltstone | | |

| UPPER TRIASSIC | STIKINE | uSc | phyllitic siltstone, graphitic argillite, tuffaceous phylite | | |
| | | uCSc | massive and foliated limestone, chert, siltstone | | |
| | | uCsr | maroon to grey, flow-layered and spherulitic rhyolite | 500-1000 | |
| | | uCsm | maroon tuff and lapilli tuff, ash-flow tuff | | |
| | | uCsb | massive amygdaloidal basalt | | |
| | | uCsgc | volcanic conglomerate | | |
| | | uCss | siltstone, sandstone, tuffaceous wacke | | |
| | MID CARBONIFEROUS | uSc | biotitic limestone | 200 | |

| PALEOZOIC | DEVONIAN TO EARLY MISSISSIPPIAN | DMSv | pillow basalt - andesite, hyaloclastite and breccia | >2000-3000 | More Creek Pluton: Forrest Kerr Pluton: biotite granite (LDg/EMg), hornblende diorite (LDE/EMD), gabro, hornblende, clinopyroxene (LDum) pyroxene diorite (EDg) |
| | | DMSvr | hyaloclastite flow breccia, tuff and subvolcanic intrusives | | |
| | | lMDSv | intermediate to felsic plagioclase-phyric tuffs | | |
| | | lMDSc | deformed thin-beded to massive limestone | | |
| | | lMDS | thin-beded siltstone, sandstone and argillite | | |
| | | lMDSa | green and purple schistose tuffs | | |
| | | lMDS | quartz sericite schist | | |
| | | lMDSg | graphitic schist | | |

| EARLY PERMIAN | STIKINE | PSu | unbedded metavolcanic and metasedimentary rocks | ? | |
| | | IPSc | medium bedded to massive fossiliferous carbonate | <200 | |
| | | IPSa | deformed tuff | | |

| CARBONIFEROUS | STIKINE | CSst | phylitic siltstone, graphitic argillite, tuffaceous phylite | | |
| | | uCSc | massive and foliated limestone, chert, siltstone | | |
| | | uCSR | maroon to grey, flow-layered and spherulitic rhyolite | 500-1000 | |
| | | uCSR | maroon tuff and lapilli tuff, ash-flow tuff | | |
| | | uCSb | massive amygdaloidal basalt | | |
| | | uCSgc | volcanic conglomerate | | |
| | | uCSS | siltstone, sandstone, tuffaceous wacke | | |
| | Mid CARBONIFEROUS | mCSc | biotitic limestone | 200 | |

| LOWER AND MIDDLE DEVONIAN | STIKINE | lMDSt | pillow basalt - andesite, hyaloclastite and breccia | >2000-3000 | More Creek Pluton: Forrest Kerr Pluton: biotite granite (LDg/EMg), hornblende diorite (LDE/EMD), gabro, hornblende, clinopyroxene (LDum) pyroxene diorite (EDg) |
| | | lMDSq | hyaloclastite flow breccia, tuff and subvolcanic intrusives | | |
| | | lMDS | intermediate to felsic plagioclase-phyric tuffs | | |
| | | lMDS | deformed thin-beded to massive limestone | | |
| | | lMDS | thin-beded siltstone, sandstone and argillite | | |
| | | lMDS | green and purple schistose tuffs | | |
| | | lMDS | quartz sericite schist | | |
| | | lMDS | graphitic schist | | |
north-trending Late Cretaceous to Tertiary continental volcanic rocks of the Sloko Group. (Figure 1-3).

Neogene to Recent volcanic rocks comprise the 700 km² bimodal Mount Edziza volcanic complex that is situated north and east of the study area (Souther, 1992) and the volcanic centre located at Hoodoo Mountain, which is located to the southwest on the Iskut River (Edwards and Russell, 1994). Related Pliocene basalt flows also mantle the Iskut River valley bottom near the junction with Forrest Kerr Creek (Read et al., 1989). The alkaline volcanic rocks are byproducts of continental rifting related to north-trending, deep-seated (lower crustal) structures which tapped mantle-derived magmas.

**REGIONAL PLUTONISM**

Workers in the area recognize at least seven discrete plutonic episodes: Late Devonian, Early Mississippian, Middle (?) to Late Triassic, Late Triassic to Early Jurassic, late Early Jurassic, Middle Jurassic and Eocene in the Stewart-Iskut-Stikine area of northwestern Stikinia (Figure 1-4). These distinctions are based on detailed work by Anderson (1989), Anderson and Bevier (1990), Brown and Gunning (1989a), Holbek (1988), McClelland et al. (1993) and others. In a gross sense these episodes young westward, suggesting the magmatic front migrated westward in time from the Forrest Kerr pluton to the Coast Belt. Missing from this part of northwestern Stikinia are the three episodes of plutonism that span 100 million years from late Jurassic (155 Ma) through Cretaceous (65 Ma). This report follows the informal terminology of Woodsworth et al. (1991) for the plutonic suites.

Late Devonian plutonism, unknown elsewhere in Stikinia, is represented by a composite body of tholeiitic hornblende diorite and younger calcalkaline granodiorite and tonalite to trondjhemite phases of the Forrest Kerr pluton in the Forrest Kerr area. The Early Mississippian More Creek pluton is a mineralologically similar, but younger body that intrudes Devonian rocks in the More Creek area (Figure 1-4). Both intrusions have primitive isotopic signatures and lack continental inheritance.

Middle (?) to Late Triassic plutonic rocks of the Polaris Ultramafic Suite and the Stikine suite intrude Stuhini Group volcanics and are considered to be comagmatic and coeval with them. The Polaris suite consists of numerous, small Alaskan-type ultramafic bodies; the Stikine suite, tholeiitic...
to calcalkaline granitoid plutons. The Hickman batholith, comprising the Nightout and Hickman I-type plutons and the Hickman Ultramafic Complex, contains both suites (Figure 1-4).

In northwestern British Columbia, the Late Triassic to Early Jurassic Copper Mountain Plutonic Suite consists of numerous small alkaline and associated ultramafic bodies that occupy a north-northwest-trending belt along the east side of the Coast Range. They lie within Stikinia, are hosted by Upper Triassic Stuhini Group volcanics and include the Bronson, Zippa Mountain and Galore Creek intrusions. These intrusives and their counterparts in Quesnellia host important alkaline porphyry copper-gold mineralization.

The Early Jurassic Texas Creek Plutonic Suite consists of calcalkaline, I-type bodies that are slightly younger than the Copper Mountain suite. These plutons crop out discontinuously between the Coast and Intermontane belts. Characteristically they are deformed, north-trending bodies that are metamorphosed to greenschist grade. They are cospatial and coeval with Hazelton Group volcanic rocks. Middle Jurassic plutons of the Three Sisters suite comprise calcalkaline, felsic intrusive phases of the Hotailuh batholith (Anderson, 1983) and Stikine batholith (Anderson, 1984) of the Stikine Arch. The Middle Jurassic Yehiniko pluton intrudes the centre of the Hickman batholith (Holbek, 1988) and two additional Middle Jurassic intrusions, the Warm Springs and Middle Mountain bodies (Bevier and Anderson, 1991) are exposed west of the map area (Figure 1-4).

Rocks of the Paleogene Hyder Plutonic Suite, which represent the last major magmatic episode of the northern Cordillera, form the core of the Coast Plutonic Complex. This mainly Eocene event is characterized by plutons that are relatively more siliceous, biotite rich and unaltered. They occupy a wide belt west of the Stikine River.

UNCONFORMITIES AND OROGENIC EVENTS

Three regionally important unconformities are exposed in the study area: a Late Devonian - Early Carboniferous disconformity and nonconformity, a Late Permian - Early Triassic disconformity, and a Late Triassic - Early Jurassic angular unconformity and nonconformity (Figure 1-5, 1-6). Each represents important hiatuses in the rock record and reflect episodes of contraction and/or extension and uplift which characterized the Paleozoic through Mesozoic evolution of Stikinia, prior to its amalgamation and accretion to ancestral North America. Unconformities that separate Mesozoic from Cretaceous rocks and Cretaceous from Tertiary record various episodes of tectonism and magmatism during the last 180 Ma that can be related to changes in the relative motions of North America, Pacific, Kula and Farallon Plates, in particular, the change from Mesozoic contraction to Eocene extension (Engelbreton, 1985). Cenozoic magmatism, extension and dextral strike-slip regimes re-

Figure 1-5. Schematic Paleozoic stratigraphic column, Forrest Kerr-Mess Lake area. Biostratigraphic and radiometric age constraints are discussed in the text.

Figure 1-6. Schematic Mesozoic to Cenozoic stratigraphic column, Forrest Kerr-Mess Lake area.
sulted in numerous local unconformities within Tertiary to Recent volcanic rocks.

The Late Paleozoic and early Mesozoic history of Stikinia is interpreted to have encompassed an island arc setting similar to the modern day southwest Pacific. The oldest recognized unconformity places Visean to Bashkirian (Lower to mid-Carboniferous) carbonate on Lower Devonian volcanic and Late Devonian plutonic rocks. Carbonate deposition directly on an intrusive substrata implies significant uplift and unroofing of the intruded Lower Devonian arc by Early Carboniferous time. The timing of uplift coincides with the Antler Orogeny in the southwestern U.S. and a similar aged, but less well understood, event in the Kootenay Arc of Southeastern B.C. (unnamed) and the Ellesmerian Orogeny in northwestern Canada (Figure 1-5).

The disconformity at the top of the Early Permian carbonate is exposed in at least two areas east of Mess Creek. It corresponds to the Sonoma Orogeny of the western U.S. cordillera described by Wyld (1991) and the Tahltanian Orogeny of Souther (1971). This tectonic event affected Stikinia, Quesnellia, and Slide Mountain Terrane (Gabrielse and Yorath, 1991) and seems to have been a global phenomenon (Gabrielse, 1991). The earliest Triassic rocks deposited on the Permian carbonate are thin bedded marine sediments, followed by mafic, picritic tuffs, which mark the onset of Upper Triassic Stuhini volcanism (Figure 1-6).

Lower Jurassic marine sediments lie with angular unconformity on Late Triassic volcanic arc rocks and Lower Jurassic fluvial conglomerate also nonconformably overlies subvolcanic diorite in the study area. Both contacts are well-exposed and provide clear evidence for tectonism at the Triassic - Jurassic boundary (Figure 1-6). The same unconformity sharply separates flat-lying, homoclinal Toarcian volcanic rocks from folded, steeply inclined Late Triassic tuffaceous sediments to the north in the Yeheniko Lake area (Brown and Greig, 1990; Brown et al., 1992). A regionally significant unconformity preempted sub-Sinemurian, Early to Middle Jurassic Hazelton volcanism and sedimentation in the Iskut River area (Henderson et al., 1992).

The Early Jurassic marked the transition from terrane-specific events in the northern Cordillera to the development of overlap assemblages in the Middle Jurassic. The main deformation of the Intermontane Belt occurred during collision of Stikinia, Quesnellia and the Cache Creek terrane and formation of the Omineca Belt during the Middle and Late Jurassic (Gabrielse, 1991). Development of the Bowser Lake overlap assemblage is attributed to initial collision of the Intermontane Superterranne with the craton in northern B.C. (Gabrielse and Yorath, 1991) and obduction and southwestward emplacement of the Cache Creek terrane onto Stikinia along the King Salmon Fault by Middle Jurassic, Aalenian time (Ricketts et al., 1992).

Marine sedimentation in the Bowser Basin foreland ended when the Insular Superterranne collided with the Intermontane Superterranne, possibly in mid-Cretaceous time (Monger et al., 1982) or as early as Late Jurassic time (McClelland et al., 1992; van der Heyden, 1992). Northeastward contraction of supracrustal rocks of the Bowser Basin (shortening has been estimated at 44 per cent) formed the Skeena fold belt in the Late Cretaceous (Evenchick, 1991a, b). The structural style of the Bowser Basin suggests a basal detachment surface(s) underlies the Mesozoic sedimentary sequence (Gabrielse, 1991) and roots to the west in the Coast Belt. Cretaceous terrigenoclastic sediments of the Sustut Group were deposited with angular unconformity on folded and uplifted Mesozoic and Paleozoic rocks. In the study area, Cretaceous sandstone overlies the Early Mississippian More Creek pluton.

Cretaceous to Early Cenozoic right lateral transform motions and regional extension (Gabrielse, 1985) resulted in volcanic activity that formed the older units of the Mount Edziza complex. These were erupted onto a peneplain of Mesozoic and Paleozoic rocks. Recent flows filled valleys after erupting through faults in the More Creek Pluton. Periods of volcanic quiescence are marked by paleosols and occur at levels in the volcanic stratigraphy (Souther, 1972, 1992).