GOLD POTENTIAL OF THE MAYA MOUNTAINS
BELIZE’S BEST KEPT SECRET?
Jean H. Cornec
Geologist
May 2010

Introduction:
Belize holds intriguing gold potential in an underexplored region that is politically secure while offering attractive mining deal terms. Alluvial gold was first described more than 60 years ago, and fine gold flakes can be panned in numerous drainages of the Maya Mountains. Very large portions of the Maya Mountains remain unexplored or underexplored for the bedrock sources of the gold using modern prospecting techniques. This is in part due to challenging surface conditions such as thick vegetation, rugged terrain and limited road access as well as the lack of knowledge in the mining industry of the gold potential.

Regional geology
Pre-Mesozoic crystalline, sedimentary and volcanic rocks crop out in the Maya Mountains, a horst feature covering 1.25 million acres bounded by an E-W trending northern fault and a WSW-ENE trending southern fault (Dixon, 1956, Bateson & Hall, 1977). Sedimentary rocks are mapped and described as the Late Pennsylvanian to Middle Permian Santa Rosa Group and consist of slightly metamorphosed (greenschist grade) fluvio-marine conglomerates, turbidites, graywackes, quartzites, sandstones, siltstones, shales and minor crinoidal limestones and are thought to occur in an extensional tectonic setting (see figure 1). The Santa Rosa Group appears to be younger than the three major granitoid intrusions outcropping at Mountain Pine Ridge (granite, granodiorite and tonalite), Hummingbird-Mullins River (granodiorite, monzonite) and Cockscomb-Sapote (granodiorite). These plutons, long thought to be of Triassic age, are now dated as Late Silurian (410 million years) based on new radiometric studies (Steiner, 1996 & 2005). Published ages and interpretation of geologic relations between metasediments and igneous bodies are contradictory (Ortega et al., 2006; Martens et al., 2010). Late Carboniferous-Middle Permian fossil-bearing sedimentary rocks are assumed to represent the depositional age for all of the metasedimentary units present in the Maya Mountains. However, much older strata are very likely present. Contact metamorphic minerals are present around the Hummingbird-Mullins River area within very poorly dated siliciclastics, indicating that some of the plutons postdate sediments presently included in the Santa Rosa Group but which may actually be much older than Late Pennsylvanian (pre-Silurian instead). Recent zircon geochronological results now strongly suggest that the Maya Mountains contain metasediments of pre-Lower Devonian age (Martens et al., 2010).

Within the Santa Rosa Group, the Bladen member is a felsic volcanic unit composed of rhyolites, andesites and associated volcaniclastic rocks. It occurs in the southern portion of the Maya Mountains, and is historically included in the Santa Rosa Group but is now suspected to be Lower Devonian based on geochronological dating of coeval volcanic equivalents in the Baldy Beacon area.

The tectonic history for the Maya block was extensional during the Late Paleozoic with a shallow marine basin that closed during tectonic convergence in early Mesozoic resulting in deformation, low-grade metamorphism and uplift, prior to subsidence by the Late Jurassic-Early Cretaceous.
Figure 1: Geologic map of Belize compiled by Cornec, J., 1985-2008. Main data sources for the Maya Mountains region are: Bateson & Hall, 1977 and Anschutz Co., 1974-1981 (Druker M., Flanders R., Schaffer M., Shipley W., Thoreson R.). Yellow dotted outlines highlight the areas deemed most prospective for occurrences of economic lode gold mineralization.
Gold exploration history

Alluvial gold has been reported to occur in the following drainages: Mopan River/Chiquibul Branch, Rio Ceibo Chico and Rio Ceibo Grande (& all tributaries), an unnamed tributary to the west of Ceibo Chico, Smokey Branch, Esperanza area, Waha Leaf Creek, Macal River (up to the mouth of Raspaculo Branch), Sittee Branch of South Stann Creek, Sittee River/Cocoa Branch, Silk Grass Creek, Macaroni Creek, South Branch of South Stann Creek and Upper Mullins River (see figure 1). In addition to the Ceibo Chico/Grande/Chiquibul watersheds, independent prospecting by the author also confirms the presence of gold flakes and flour gold in the Macal River at Guacamallo bridge, in Smokey Branch, in the Cocoa Branch of the Sittee River as well as in the Sittee Branch of South Stann Creek.

Limited past exploration for gold included work by C. Dixon (early 1950’s), D. Derry Ltd (late 1960’s), Anschutz Co (late 1970’s), F. Gegg (1980’s), BHP Ltd and Castle Exploration (1990’s), and G. Boiton Minerals and Erin Ventures (2000’s). Most of the prospecting efforts centered around Ceibo Chico Creek, the locus of sporadic artisanal placer activities in an alluvial fan and in gravel bars further upstream. The most significant exploration efforts for gold were by BHP and Castle Exploration in the 1990’s. This has been expanded by Erin Ventures since 2005 in a joint venture agreement with a Belizean Company, Boiton Minerals Ltd. To aid in funding hardrock exploration, Erin Ventures started a small placer operation in an alluvial fan located at the mouth of Ceibo Chico Creek in 2006. It produces fine and coarse alluvial gold including nuggets weighing between 0.25 ounce and 1.1 ounces. Total production for the period 1999 to 2008 was approximately 2,300 ounces with nearly 3/4 of this amount produced over the last two years. The alluvial gold (see figure 2) is derived from high-grade free gold mineralization (up to two ounces/ton) in quartz veins hosted in black argillites and siltstones. Quartz boulders have been found in the past which contained impressive free gold as blebs and wires, including one float which would have run many ounces (Derry, 1967). The known gold-bearing zones appear to be structurally controlled and the limited geophysical data available subtly suggests the presence of a buried intrusive feature beneath the area.

Figure 2: photos of alluvial gold production and processing from Ceibo Chico drainage, note translucent quartz crystals attached to small gold nugget in upper left-hand photo. (with permission of Erin Ventures)
Conclusions and recommendations:
In the Maya Mountains the widespread distribution and occurrences of alluvial gold indicate the potential for economic lode mineralization. Based on the geologic and tectonic setting, both orogenic and intrusive related gold systems are potential model types for precious metals exploration. Outside of the Ceibo Chico area, exploration has been minimal and thus stream sediment and other early stage exploration methods are required to locate gold targets. The first prospecting step would be the systematic panning of all drainages known to contain visible alluvial gold. It can be quite challenging to reproduce stream sediment geochemical results in areas of granitoid outcrops such as Mountain Pine Ridge (MPR), Mullins River-Hummingbird and Cockscomb plutons because of the difficulty in finding good silt traps. The presence of very large volumes of coarse sands can make stream bed material deficient in fines and frequent flash floods in steep mountain creeks during the rainy season can also cause depletion of silt-sized sediments in the stream bed load leaving mainly coarse sand, gravel and boulders. Since the only geophysical data available is an early 1970’s vintage, wide-spaced aeromagnetic data set, it is recommended to acquire a high resolution closely-spaced helicopter magnetic, electromagnetic and radiometric survey draping over rugged terrain to cover the most prospective areas so a detailed structural setting can be established to guide future exploration.

Three regions merit special consideration (see Maya Mountains geologic map, Figure 1):

**Sittee-Raspaculo area:**
Some of the alluvial gold occurrences appear to shed off a coherent trend that includes the upper watersheds of Sittee River/Cocoa Branch, Sittee Branch of South Stann Creek and the Raspaculo Branch of the Macal River. The area is underlain by quartzites, conglomerates, mudstones and limestones that outcrop to the north of the Cockscomb batholith. Abundant quartz floats were observed by the author in the uppermost reaches of Raspaculo Branch during an east-west reconnaissance traverse of the Maya Mountains range. This indicates a possible source in that area for the alluvial gold panned further downstream. Follow-up gold panning expeditions around Guacamallo bridge (Macal River) and in the Sittee Branch (South Stann Creek) revealed the presence of small gold flakes still attached to translucent quartz fragments. Earlier prospecting efforts had traced the alluvial gold found in the Macal River up to the mouth of Raspaculo Branch (Dixon, 1956).

**Mountain Pine Ridge (MPR) area:**
Gold anomalies in silts have been reported by Anschütz and BHP around the Mountain Pine Ridge plutons that warrant follow-up prospecting via a combination of additional stream sediment sampling and panning. A giant quartz vein is associated with the SSW-NNE trending Cooma Cairn fault gouge zone, a large lineament displaying left-lateral strike-slip and vertical motions, which can be traced over a 25 kilometers length. The core of the shear zone contains a quartz vein which varies in thickness from a few feet up to tens of feet, creating a distinct topographic high. It shows multiple stages of fracturing, brecciation and veining. It has not yet been adequately sampled.

**Ceibo Chico area:**
Erin Ventures Inc. reports the intent to drill mineralized zones in the Ceibo Chico region based on new geologic mapping and a re-evaluation of original BHP and Castle Exploration data.
Low-sulfide free-gold bearing quartz veins, even though they may be low tonnage, can be very high grade and mined underground, leaving a small environmental footprint as most of the ore can be treated using chemical-free gravity methods.

It took more than 50 years of exploration by oil companies to find the first commercial fields in Belize and perhaps with high gold prices the time has come for the mining industry to step up to the plate and help the country realize its hard rock mineral potential.

Useful links: The principal depository of information is the Geology & Petroleum Department at the Belize Government Ministry of Natural Resources and the Environment:
Email: geology@mnrei.gov.bz and Tel: 501-822-2178/2651; Fax: 501-822-3538.

Special thanks to William Bagby, Andre Cho, Robert Johnston, Dennis LaPoint, Douglas Milham and Craig Moore for their encouragement, information, comments and reviews.

Bibliography:
BHP Ltd internal company reports (1993-1996), unpubl.
Castle Exploration internal company reports (1997-1999), unpubl.
_________,1986, Gold potential of the Maya Mountains. GOB/UNDP, unpubl.
Dixon, C.G., 1956, Geology of Southern British Honduras, with notes on adjacent areas.
Belize Government Printer.
Hall D., 1985, Belize mineral potential, unpubl.
Ortega-Gutiérrez F. et al., 2006, The Maya-Chortis boundary: a tectonostratigraphic approach. Instituto de Geologia, UNAM.
Steiner, M. B., and Walker, J.D., 1996, Late Silurian plutons in Yucatán: