Saskatchewan Gold: Mineralization Styles and Mining History

R.M. Morelli[1] and K. MacLachlan[2]

[1]SK Geological Survey

[2]Association of Professional Engineers & Geoscientists of SK

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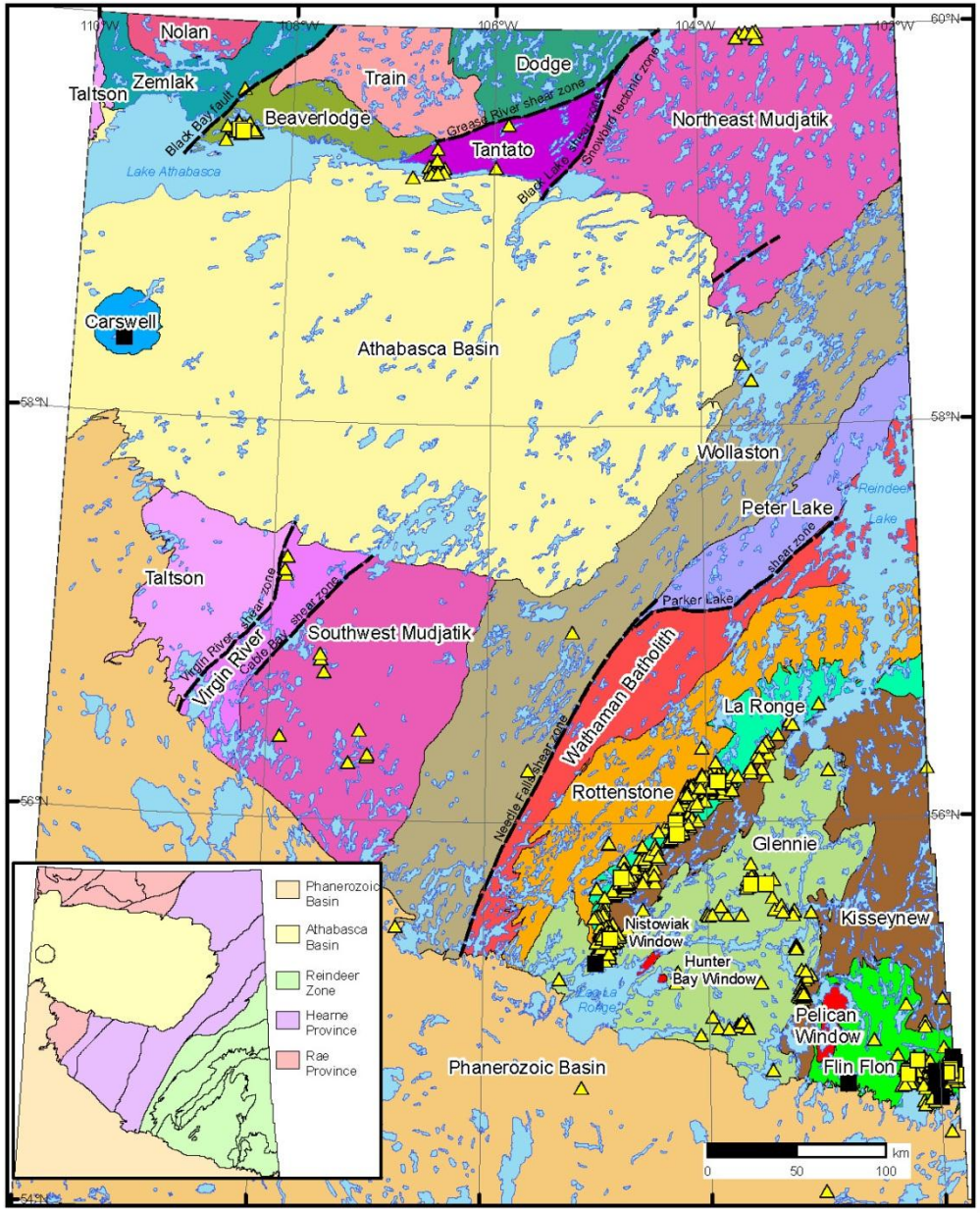


Distribution of gold showings (5 geological 'regions'):

Rae – Beaverlodge, Tantato domains

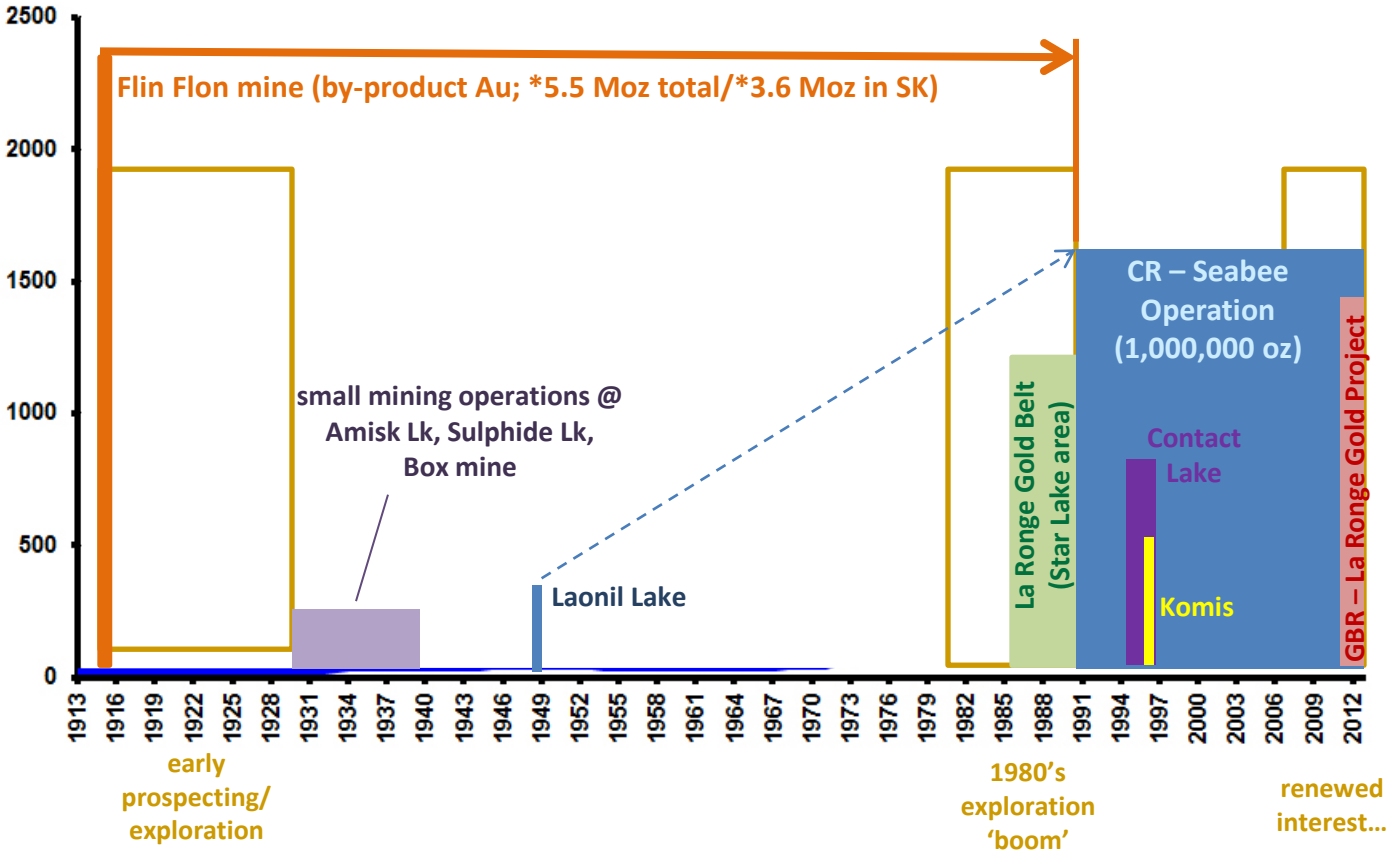
Hearne – Mudjatik ('Ennadai'), ±Virgin River domains

Reindeer Zone – La Ronge, Glennie, Flin Flon domains

Athabasca Basin – not significantly (Au) mineralized

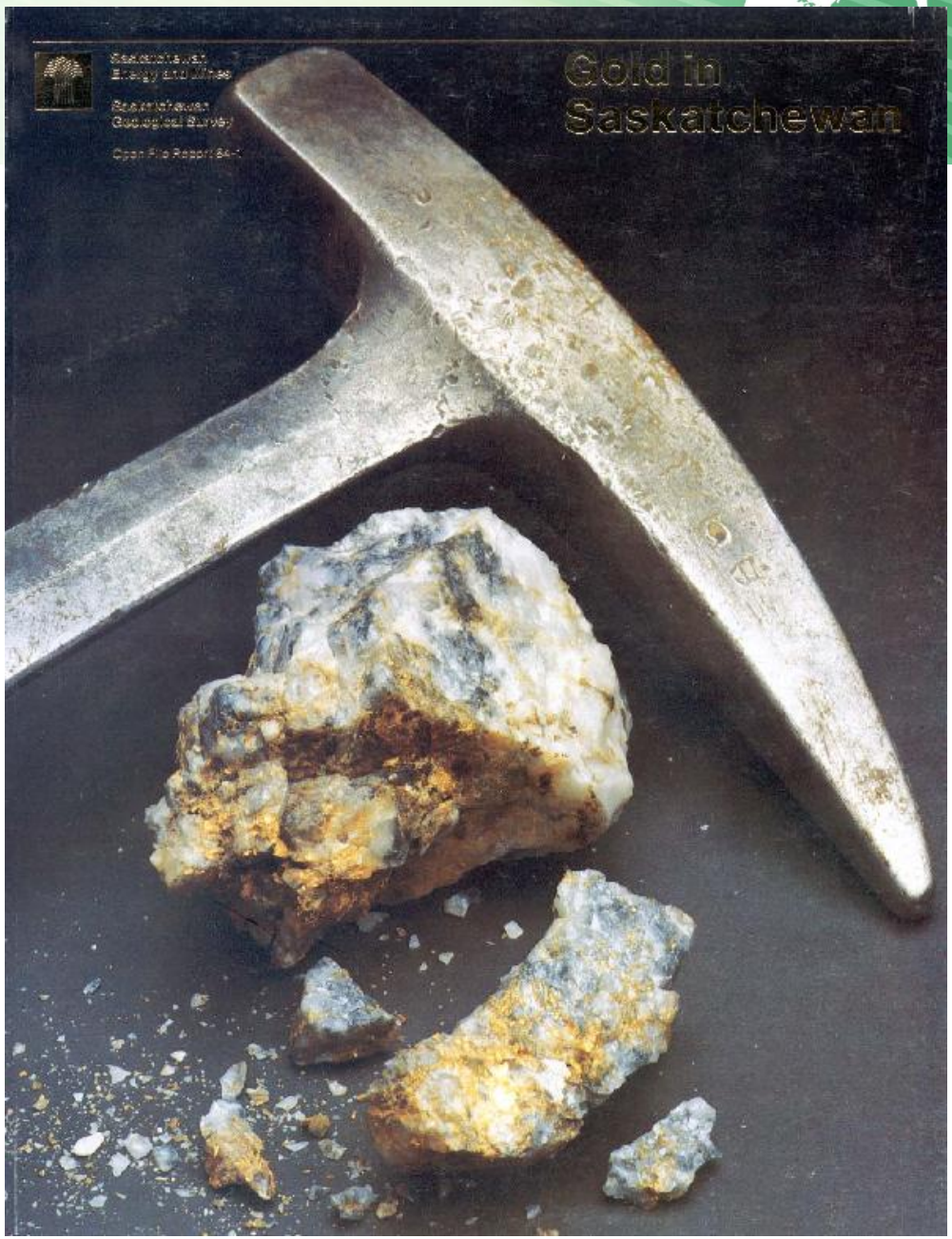
Phanerozoic – Cambrian through modern paleoplacer/ placer Au; uneconomic

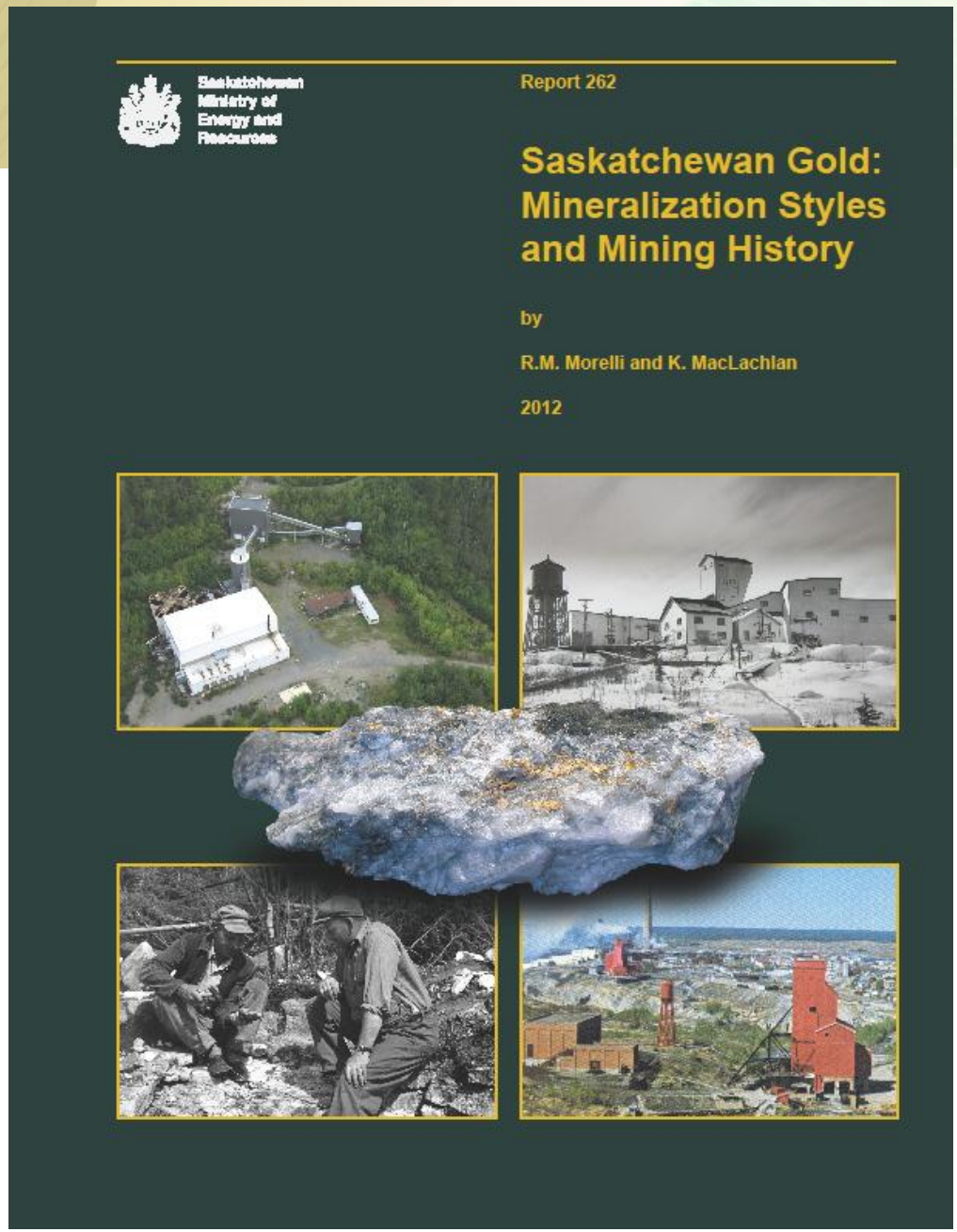
SK Gold Exploration History



W. Coombe:
"Gold In Saskatchewan"

- published in 1984
- has since served as a primary resource for characterization of SK gold resources
- reflection of knowledge of time (e.g. SGS mapping)
- however, becoming outdated in some respects (e.g. exploration stage, new discoveries, genetic models, etc.), thus impetus for update……





"Saskatchewan Gold"

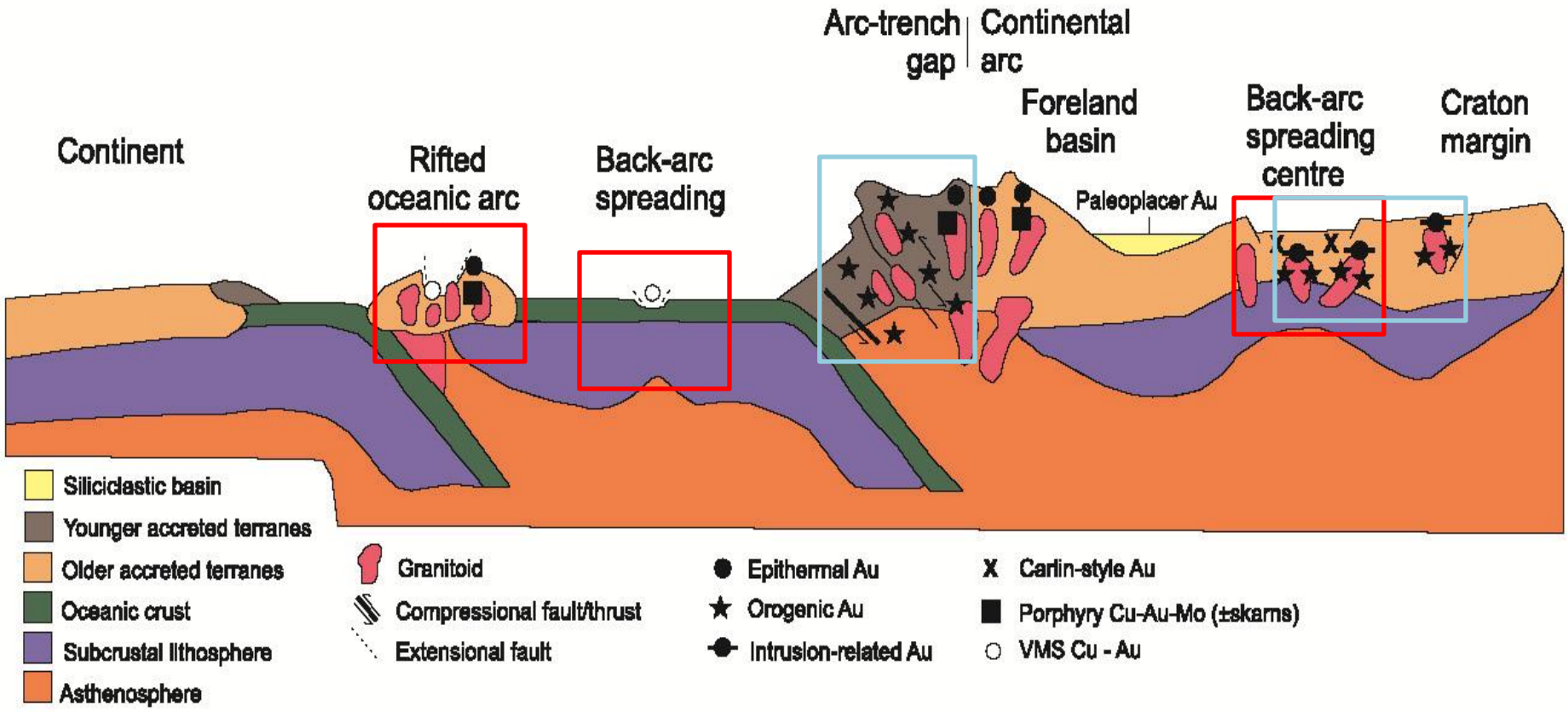
- released in April 2012
- current as of January 1st, 2012
- available on website (http://www.er.gov.sk.ca/) *Geoscience Publications>Reports and Maps>Final Reports>Report 262*
- compilation: 45-50 'significant' deposits
- public domain sources only
- focus on exploration history, showing descriptions in context of ore genesis
- interpreted metallogenic history
- includes appendix with all known gold showings (SMDI)

SK Gold Mineralization Styles

Two principal styles (*refer to Rogers, 2011*)**:**

1) **Structurally-Controlled, Epigenetic ('Orogenic') Au**
   - most common style in all 4 regions
   - coincident with thermotectonism at convergent margins
   - Au is dominant commodity (also Ag)
   - low sulphide content; more difficult for exploration

2) **Volcanogenic Massive Sulphide (VMS-) Related Au**
   - syngenetic with volcanism
   - associated w/ extensive alteration zones and massive sulphide; stronger geophysical signature
   - economically very important gold sources, but much less common (mainly Flin Flon Domain)
   - Au with Cu, Zn, Pb, Ag, etc.



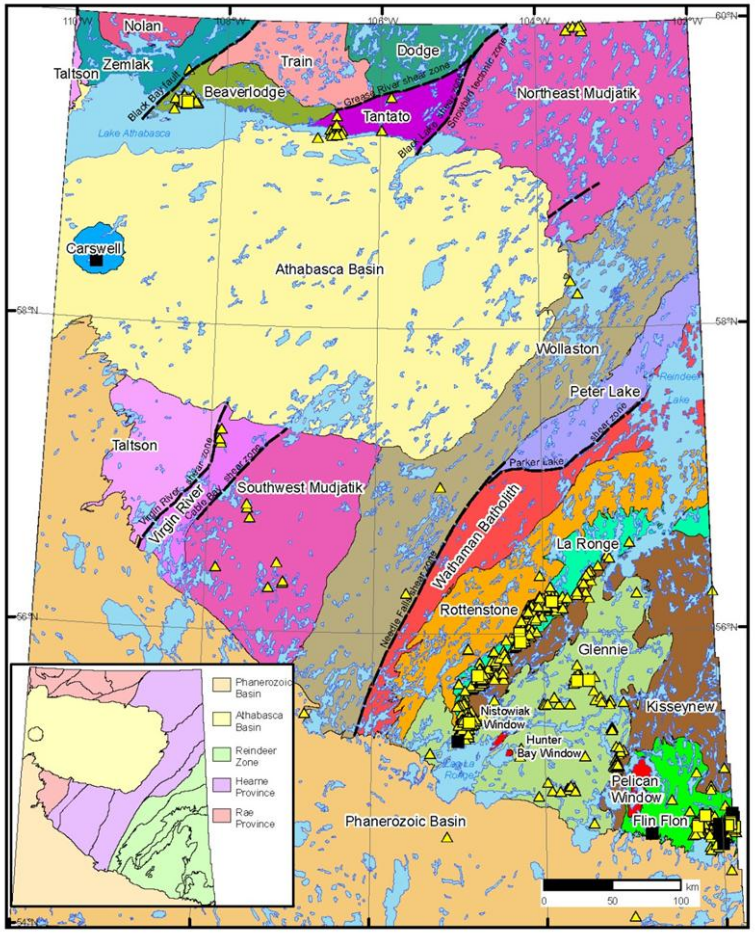
modified from Groves et al. (1998); Galley et al. (2007)

SK Gold Mineralization Styles

Other known (but rare) styles:

- Epithermal Gold (e.g. ?Laurel Lake/Amisk Gold, Flin Flon Domain)
- Disseminated sediment-hosted gold-sulphide (e.g. Greywacke, La Ronge Domain)
- Porphyry-related (e.g. Phantom Lake, Flin Flon Domain)
- Beaverlodge-type vein U (e.g. Nicholson Bay, Beaverlodge Domain)
- Unconformity-associated U (e.g. Cluff Lake D zone)
- Paleoplacer/Placer (Phanerozoic, Southern SK)
- Glacial till-hosted (EP mine, La Ronge Domain)

I. Rae Province
(e.g. ***Box Deposit***, Beaverlodge Domain)



- discovered in Goldfields area by prospectors T. Box and G. Nyman in 1934
- produced 64,066 oz Au in 1939-42
- extensive exploration history
- currently owned by Brigus Gold Corp.
- Pre-Feasibility study (Box and Athona) completed in 2011
- current Reserves of 800,000 oz (16,500,000 t @ 1.51 g/t) at Box; 220,000 oz (5,830,000 t @ 1.17 g/t) at Athona

Box Mine/Deposit (SMDI #12010a)

Location: on Box Point, north shore of Lake Athabasca (UTM 6595762 mN, 300285 mE)

Status: past-producing mine with Reserves

Metal Associations: Au (Ag, Zn, Pb, Cu, Mo)

Exploration/Development History: ……

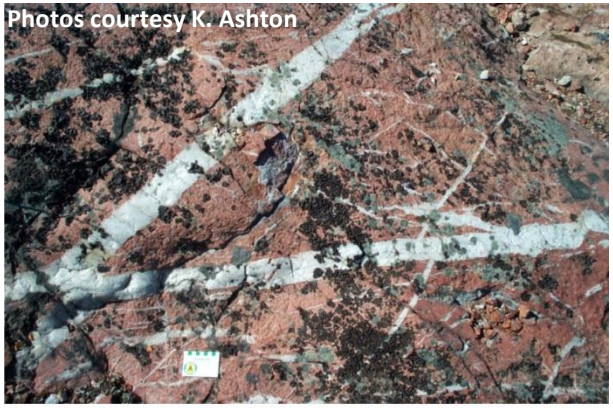
Geological Character: …….

Inferred Deposit Type: orogenic gold

Associated Showings: Athona (1257); Frontier (1211), etc.

Production and Reserves/Resources: Gold production between 1939 and 1942 (Table 1); updated Reserve estimate in 2011 (Table 2)

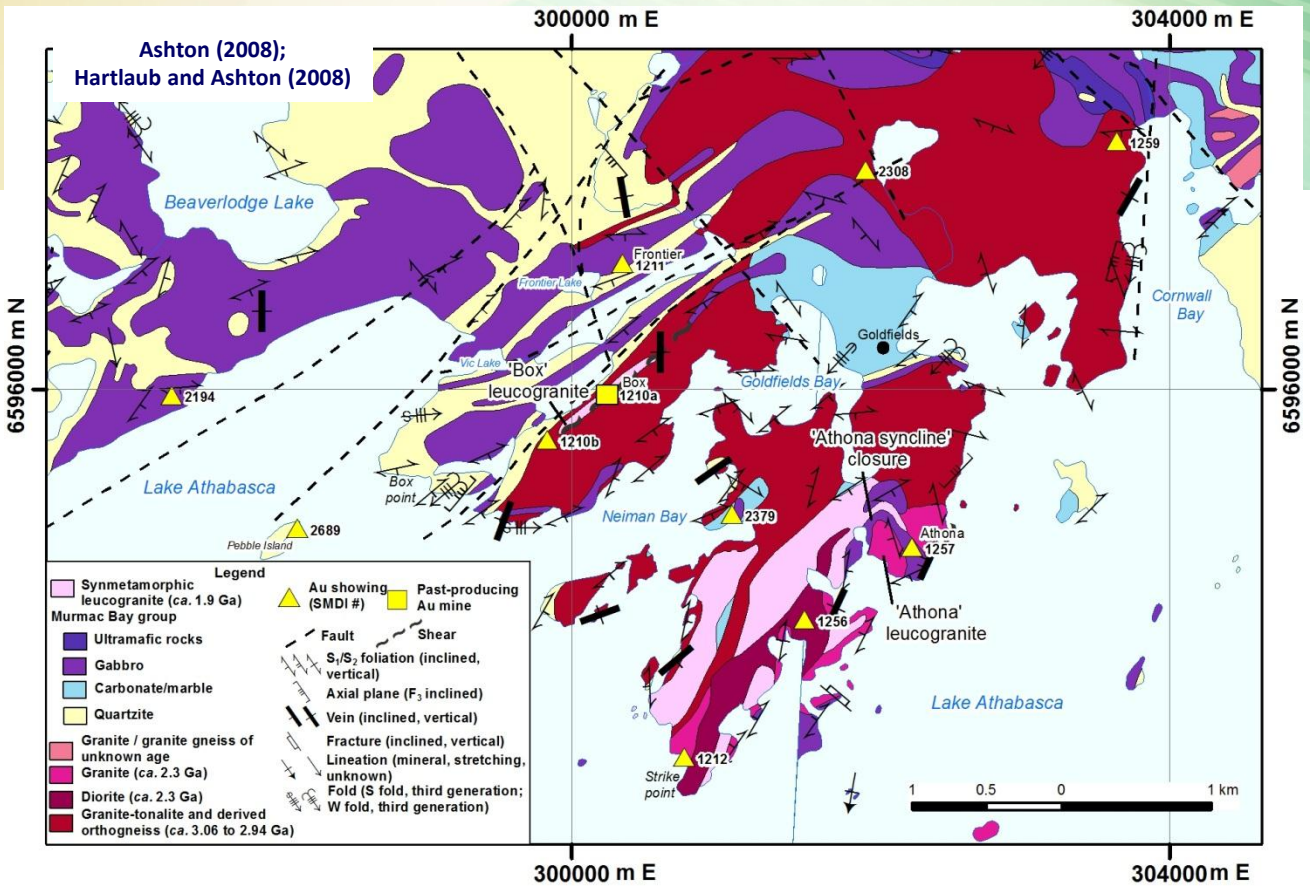
Box Deposit – Salient Features



Box Mine/Deposit (SMDI #12010a)

Geological Character:

- ca 1.95 Ga granite host, 700x400m, moderately SE dipping; dimensions coincident with mineralized zone
- gold in pyrite on margins of stockwork quartz veins; shears at Athona but not Box
- epigenetic: formed with Athona syncline during WNW-directed shortening (σ3=099°/76°)
- minor chlorite, albite, microcline, tourmaline and/or muscovite in veins
- most gold is coating on or filling fractures in pyrite (gold paragenetically late; Rees, 1992)
- high density, low salinity, aqueous-carbonic fluid of metamorphic origin, ~300°C (Rees, 1992)

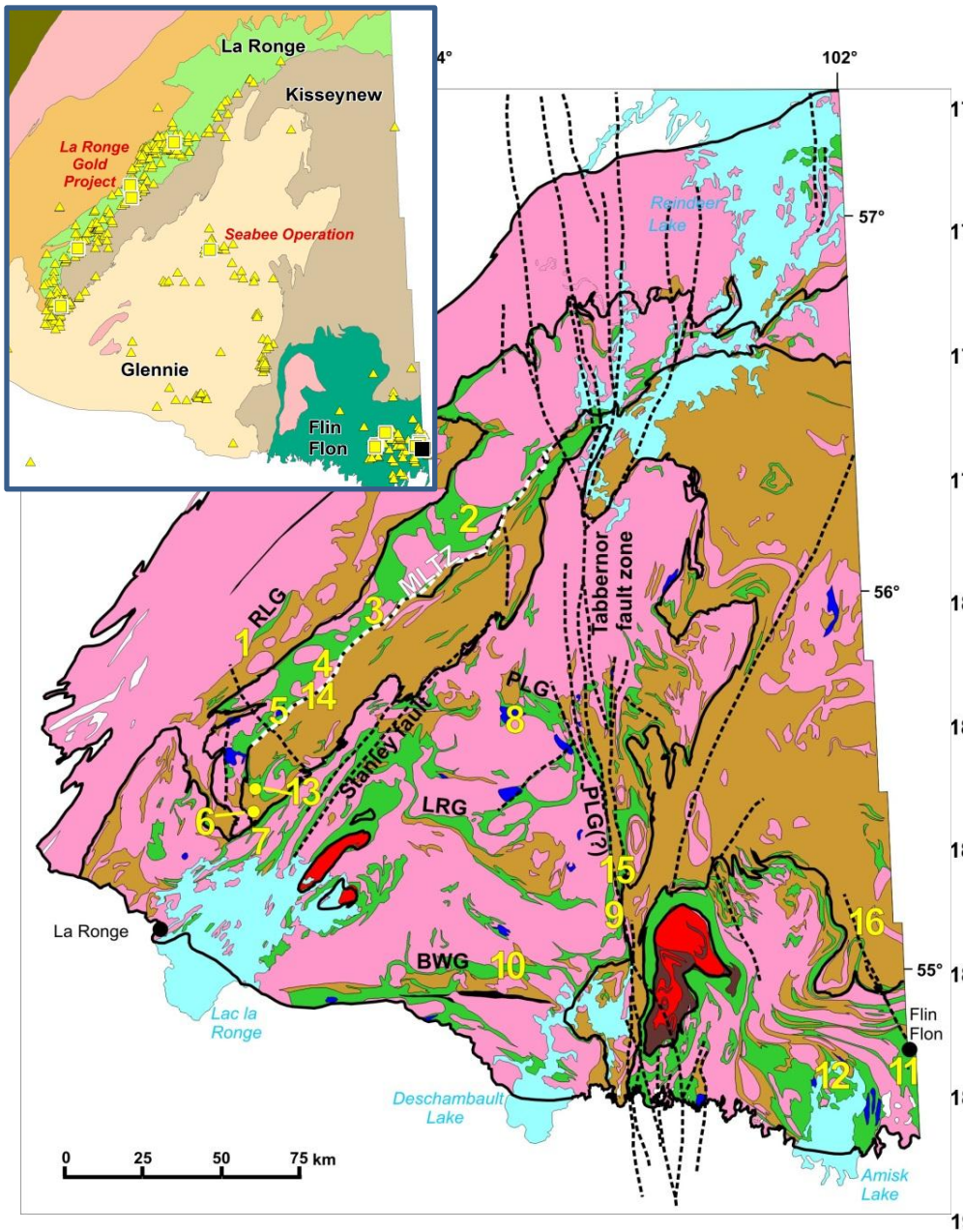


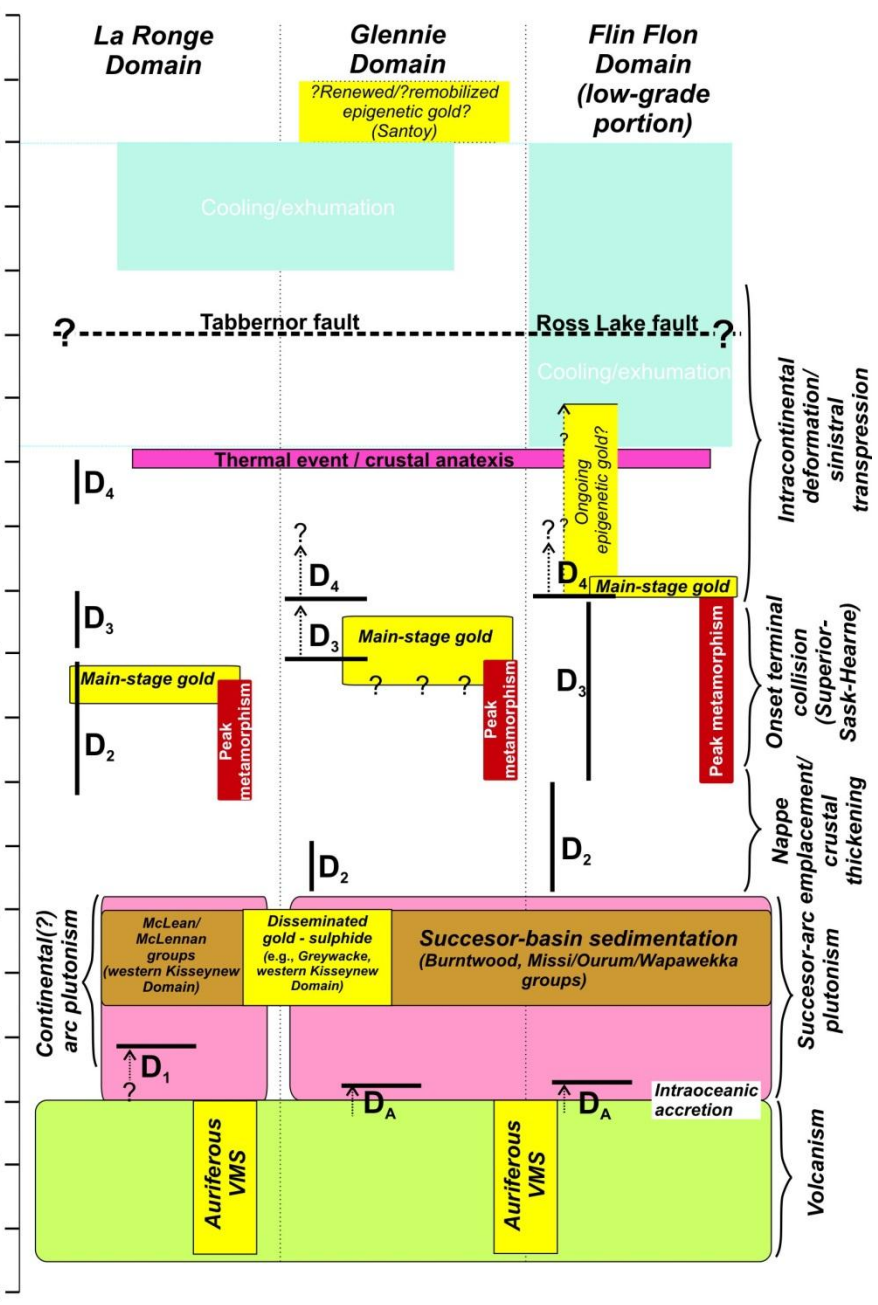
Important Relationships/Outstanding Questions:

- epigenetic; fracturing of competent granite, influx of auriferous fluid
- formed with Athona syncline during WNW-directed shortening (σ3=099°/76°)
- anomalously low grade host rocks (peak metamorphism at ~1.9 Ga)
- significance of proximity to basement unconformity?
- Paleoproterozoic reworking, but D_3 or D_4 deformation?

II. Hearne Province

III. Reindeer Zone – Regional Considerations





Reindeer Zone – Key Features of Mineralization

- association with long-lived regional structures; deposits in subsidiary structures
- mineralized shears commonly exhibit evidence for reverse and oblique kinematics
- mineralized shears localized at lithologic boundaries in greenstone belts, esp. plutons
- proximity to regional uncomformities (molasse-type sediments)
- correlation w/ greenschist to lr amphibolite facies host rocks (exploration bias?)
- gold in or adjacent to single/composite, shear associated quartz veins; veins commonly deformed
- alteration - potassic, silicic, carbonate, chloritic; also sulphides, tourmaline

Summary

- History of gold exploration/development in SK is cyclical; coincident w/ ↑ gold price
- Precambrian of SK is relatively underexplored for gold and has strong potential for expansion of known zones and new discoveries
- Precambrian Shield most prospective
- SK gold dominantly epigenetic (orogenic); economic VMS in Reindeer Zone (Flin Flon Domain); other styles present but rare
- most (if not all) epigenetic gold is Paleoproterozoic (1900 to 1780 Ma); dominantly during Trans-Hudson thermotectonism
- greenstone belts (?low grade) most prospective
- lithologic/compositional boundaries important for focusing mineralized shears
- long-lived structures near unconformities
- Report 262 – “Saskatchewan Gold” released in 2012

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