

# The Nyac Mining District

## Southwestern Alaska



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# **The Nyac Mining District, southwestern Alaska**

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## **Introduction**

Since the discovery of placer gold in 1908, more than one-half million ounces have been produced from the Nyac district. Although no large lode systems have been identified, gold occurs in hornfelsed volcanic rocks, shear zones, and quartz veins associated with early Cretaceous granitic rocks that intrude a Jurassic island-arc volcanic-sedimentary package.

The Nyac District is an excellent example of the Thermal Aureole Gold (TAG) model described by Wall (1999). TAG deposits include numerous world-class and other large plutonic-hosted gold systems around the world.

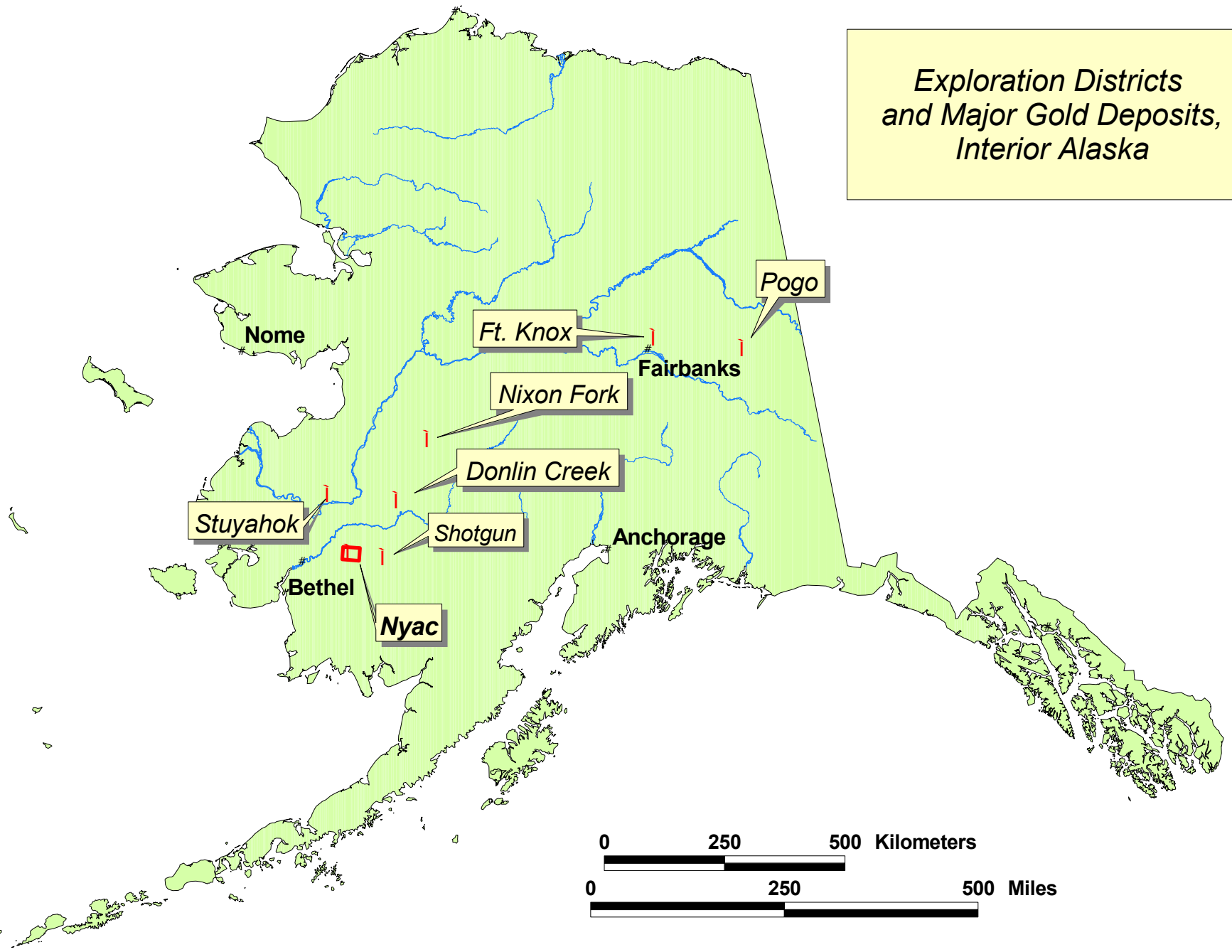
The Nyac District is in the Kilbuck Mountains, within the Kuskokwim Gold Belt, the southwestern extension of the recently recognized Tintina Gold Belt. Radiometric ages, ore mineral assemblages and geochemistry indicate the Nyac district is more similar to the oxidized Fort Knox and Pogo deposits in east-central Alaska than to other more refractory gold deposits in southwestern Alaska.

## **Location**

Nyac is located in southwestern Alaska's Kilbuck Mountains, 63 miles east of Bethel and 330 miles west of Anchorage (figure 1). The district is covered by the USGS 1:63,360-scale map quadrangles: Bethel D2 - D4 and Russian Mission A2 - A4.

Access to the Nyac area in the summer is primarily by chartered flight from Bethel or Aniak. A 4,800-foot gravel airstrip (lower strip) accommodates aircraft as large as the Lockheed C-130 Hercules. A 2,700-ft gravel airstrip (upper strip) is also available for light aircraft.

*Exploration Districts  
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At Nyac, a twenty-six mile gravel road system links the Calista-owned lower camp with the two airstrips, the Nyac townsite (upper camp), and the California, Rock, Bonanza, and Bear Creek drainages. A gravel road extends eight miles westward from the lower camp to the Tuluksak River crossing.

## **Regional Geology**

Regional bedrock can be broadly divided into four units (figure 2) (Cady et al, 1955; Box, et al, 1993; Decker, et al, 1994; and Bundtzen and Miller, 1997): (1) complex assemblage of Early Cretaceous and older accretionary terranes, which includes the Nyac terrane; (2) thick, highly deformed sequence of Upper Cretaceous clastic sedimentary rocks of the Kuskokwim Group; (3) gently deformed Late Cretaceous to early Tertiary intermediate to felsic volcanic and plutonic rocks that are part of a broad belt of magmatism; and (4) Quaternary olivine basalt flows.

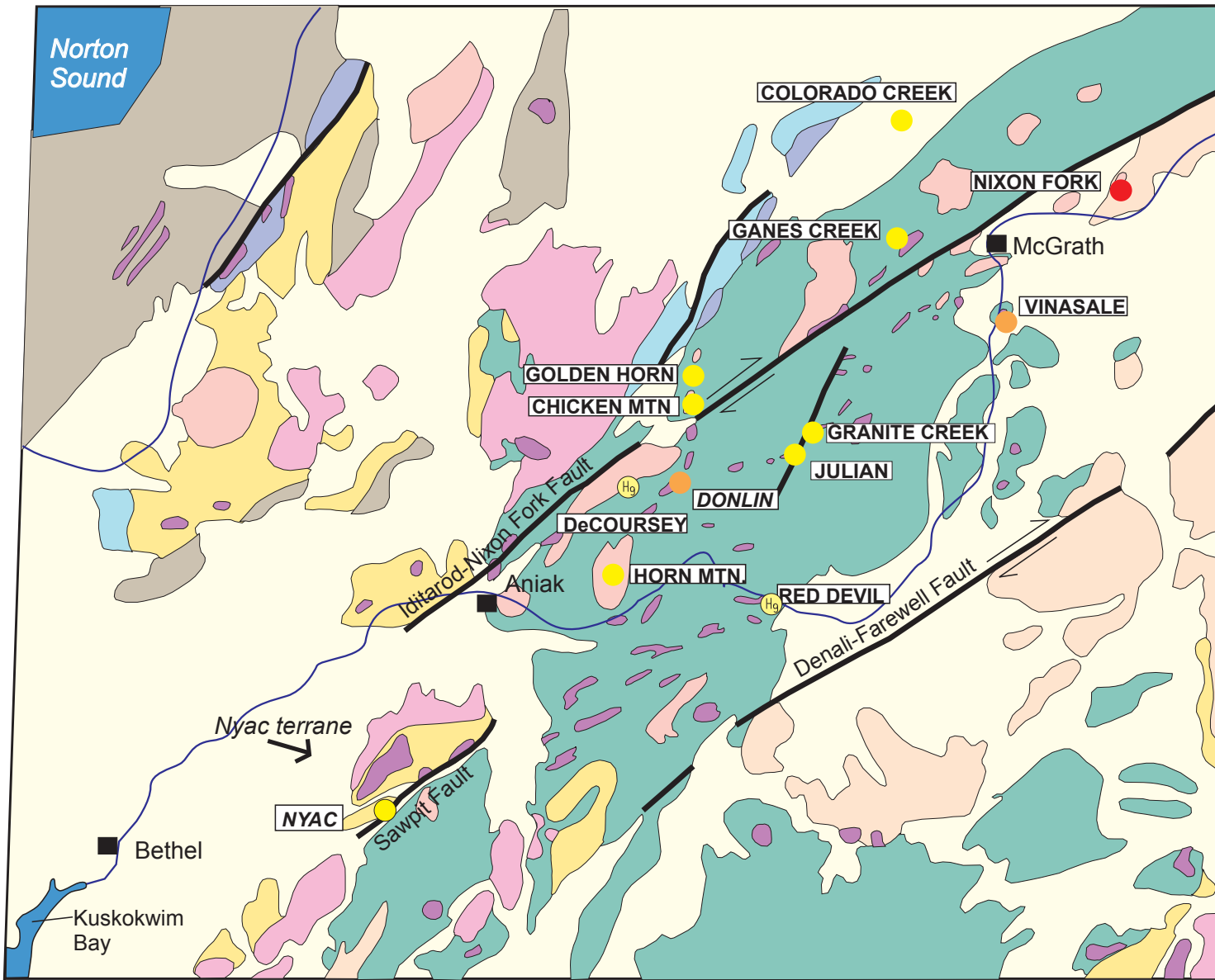
Regional structure is dominated by two major northeast-trending right-lateral fault systems which traverse southwest Alaska; the Denali-Farewell Fault and the Iditarod-Nixon Fork Fault (Figure 2). Latest Cretaceous to Tertiary right-lateral offsets of 90 km to 150 km characterize both faults (Decker, *et al*, 1994). Structural fabric in southwest Alaska is controlled by these and other related northeast-trending faults. Pluton emplacement is often subparallel to these northeast structures.

## **Local Geology**

The Nyac terrane comprises Jurassic volcanic and associated sedimentary rocks of island arc origin and is juxtaposed with Cretaceous turbidites of the Kuskokwim Group along the Sawpit-Golden Gate Fault system (Figure 3). The Nyac terrane includes andesitic, basaltic, and dacitic volcanics and volcanoclastics interbedded with graywacke, siltstone, impure limestone, and conglomerate. Lower greenschist facies metamorphism characterizes the Nyac terrane. The volcanoclastic package is extensively hornfelsed and is intruded by numerous porphyritic dacite dikes.

Intruding the Nyac terrane are 108 – 111 m.a. granitic multi-phase plutons, including the Nyac and VABM Bonanza plutons (Layer and Drake, 1998). The largest of

# SOUTHWEST ALASKA Regional Geologic Map



## EXPLANATION

-  Tertiary sediments
-  Volcanic plutonic complexes (LK-ET)
-  Volcanic fields (LK-ET)
-  Granite porphyry complexes (LK-ET)
-  Kuskokwim Group
-  Yukon-Koyukuk flysch basin
-  Pericratonal terranes
-  Oceanic terranes
-  Cratonal terranes
-  Arc related and flyschoid terranes
-  Right-lateral faults



100 Kilometers



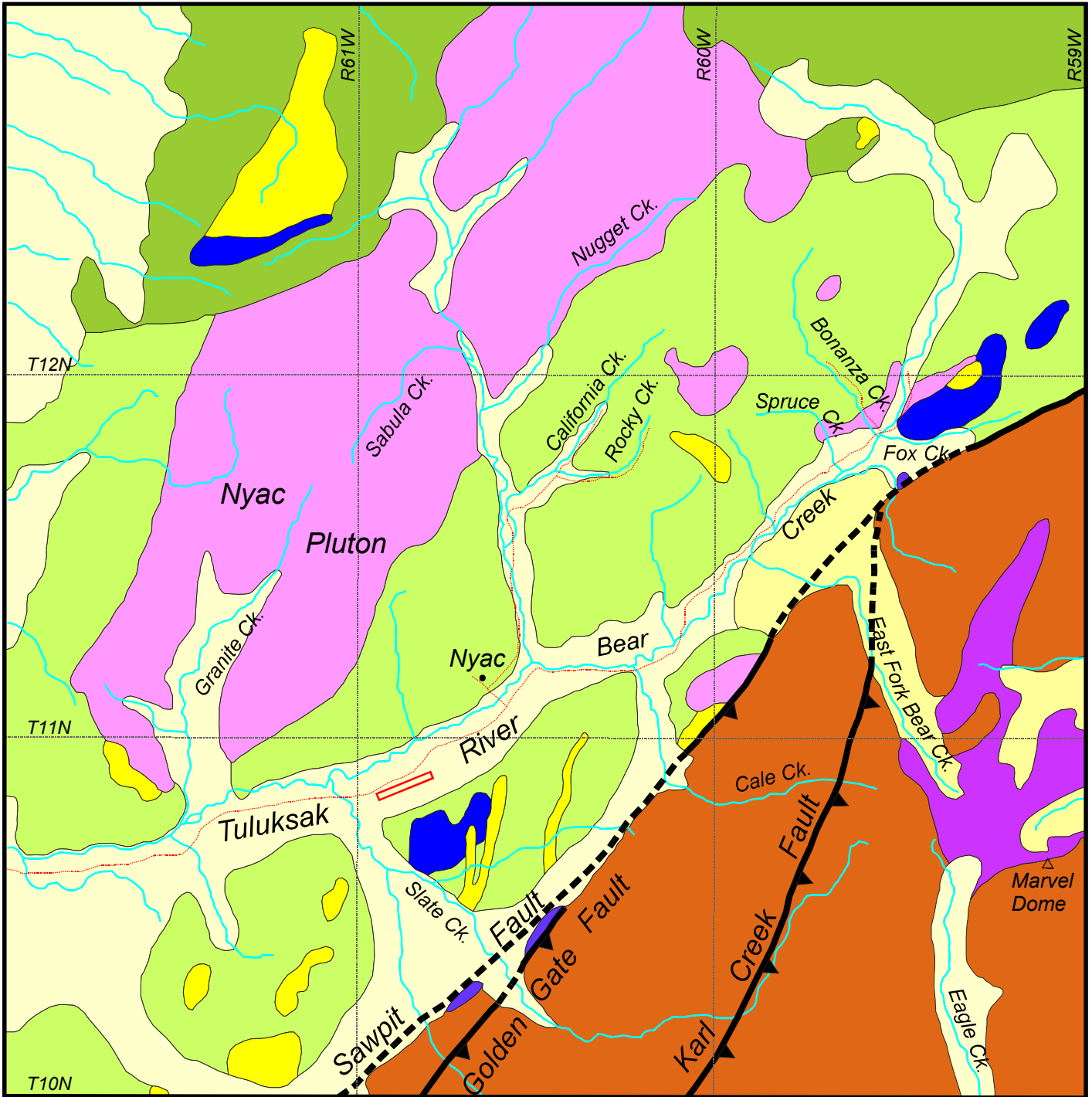
these plutons are elongate subparallel to the Sawpit-Golden Gate Fault system. Younger igneous bodies crosscut the older plutons, the Nyac terrane, and the Kuskokwim Group rocks. These younger intrusive rocks are part of a broad northeast trending belt of calc-alkaline stocks, volcano-plutonic complexes, and volcanic fields (Buntzen and Miller, 1997).

## **Economic Geology**

Approximately fifteen million grams (600-700 thousand ounces) of placer gold has been recovered from the district since the discovery of placer gold there in 1908 (T.K. Bundtzen, 1999, personal communication). Nyac Mining Company is currently placer mining on Spruce Creek under a lease agreement with Calista Corporation. Historic placer mining occurred on California, Rock, Bear, Granite and Bonanza Creeks, and throughout the upper Tuluksak River drainage.

Gold occurs in hornfelsed quartz-sericite-pyrite altered volcanics, iron-carbonate quartz-altered shear zones, and in narrow, sparse, quartz-chlorite-sericite-pyrite-chalcopyrite veins cutting dacite dikes, hornfels, and quartz monzonite plutons. Visible native gold occurs in vuggy, coarsely crystalline quartz veins within dacite dikes and in monzonite. High-grade quartz vein samples within the Bonanza Pluton assay up to 24.6 g/t gold.

Ore and sulfide minerals include: native gold, chalcopyrite, pyrite, arsenopyrite, unknown bismuth-bearing mineral, pyrrhotite, galena, cinnabar, native mercury, sphalerite(?), and stibnite(?). Alteration assemblages associated with native gold or geochemically anomalous gold samples include: quartz-chlorite +/- calcite-limonite, quartz-carbonate ( $\text{FeCO}_3$ )-limonite, quartz-limonite after pyrite, quartz-sericite-pyrite altered volcanic rocks (Bonanza color anomaly), quartz-tourmaline-limonite (probably after pyrite), and quartz-sericite-limonite (Bonanza pluton on Rock Creek). Heavy mineral concentrates contain gold, tellurides and rarely, platinum-group metals.



# Geologic Map of the Nyac District

## Southwestern Alaska

- Quaternary alluvial and terrace deposits
- Quaternary glacial till and moraine deposits
- Early Tertiary - Late Cretaceous granodiorite
- Mafic plutonic rocks, including diorite and gabbro
- Altered rhyolite and dacite porphyritic rocks
- Early Cretaceous granite and quartz monzonite
- Silica-carbonate altered serpentinite
- Kuskokwim Group Cretaceous marine turbidite sequence
- Late and Middle Jurassic volcanoclastic rocks
- Middle Jurassic andesitic flows and marine epiclastic rocks

2 miles



- Fault zone, dashed where inferred
- Road
- Airstrip
- Calista conveyed and selected lands

## **Target Areas**

### **1. California Creek - Rock Creek Area**

A limonite-stained hornfelsed area is present on the ridge between Rock Creek and California Creek. This area contains float of limonite-quartz vein material containing up to 25.6 g/t Au. An altered monzonite plug outcrops on the right limit of Rock Creek. Adjacent to this zone, chlorite and quartz-chlorite veins and alteration are common in the hornfelsed volcanic rocks. Soil samples collected from this zone contain up to 490 ppb Au. The east-striking fault zone on the ridge between California and Rock Creeks yields samples containing as much as 3,040 ppb Au in quartz-limonite-pyrite veins and fault gouge.

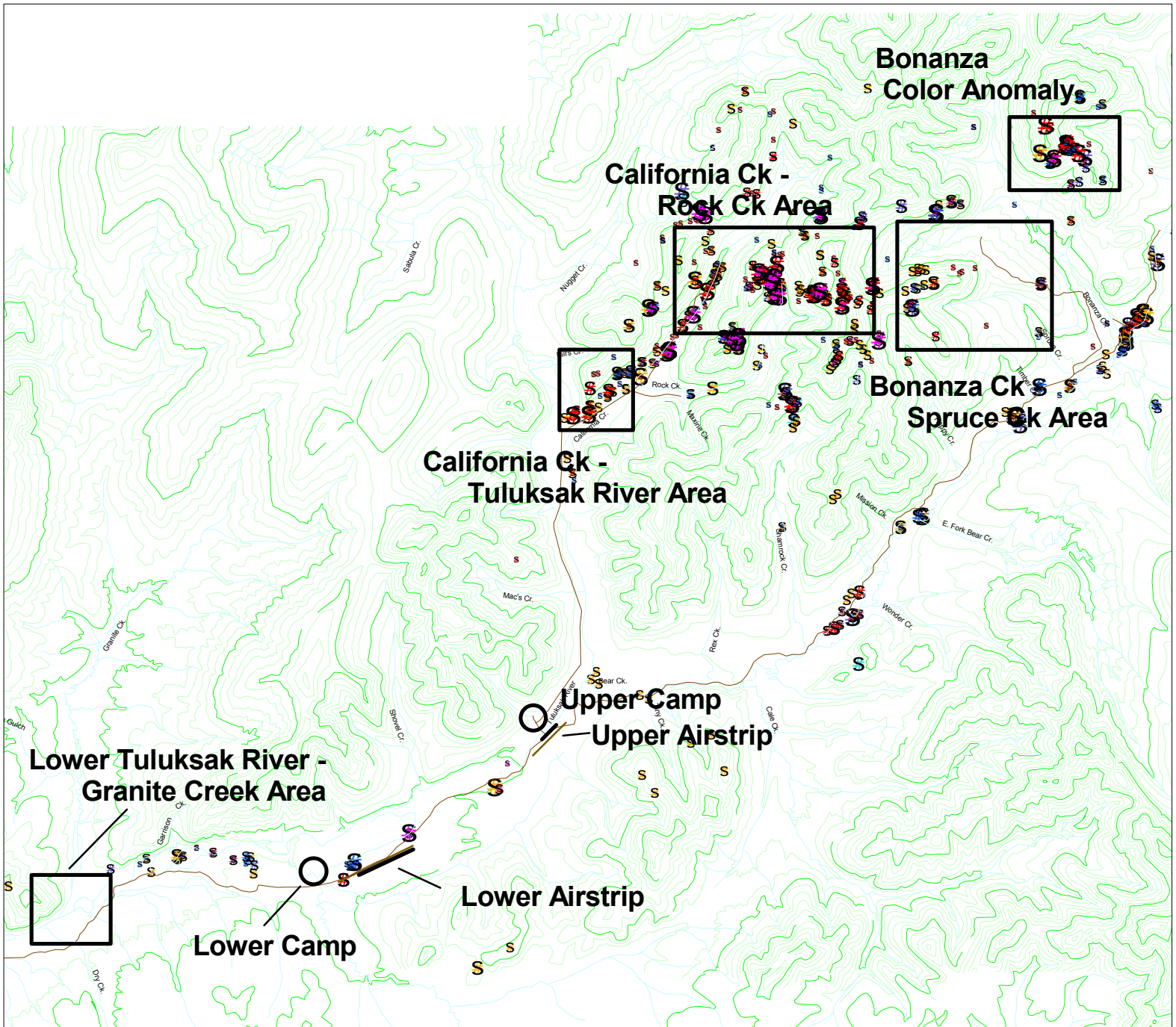
### **2. Bonanza Color Anomaly Zone**

East of Bonanza Creek a large limonite gossan area, coincident with a carbonate-altered shear zone, yielded up to 12 g/t Au in hand-trench samples. A 4,100-ft-wide felsic dike swarm occurs within and adjacent to the shear zone. The shear zone predominantly consists of iron-stained, silica- and pyrite-altered volcanoclastic rocks. In the center of the shear zone is a small zone of magnetite-tourmaline-clay alteration. Tourmaline and magnetite also occur within volcanoclastic rocks northwest of the shear zone. Minor chalcopyrite in quartz-veined hornfelsed volcanoclastic rocks also occurs in this area. A soil and rock chip sample grid, more extensive trenching and ground geophysics should be conducted in this area to identify drill targets.

### **3. Bonanza Creek - Spruce Creek Drainage Area**

Extensive placer deposits in Bonanza Creek and Spruce Creek are coincident with a large, structurally disrupted zone delineated by airborne magnetic data. This west-trending zone may be part of a belt of mineralization which includes areas 1 and 2. The upper Bonanza Creek valley has not been explored in detail. Because thick brush and





**Previous Rock and Soil Samples**

**Bi (ppm)**

- s 25 - 50
- S 50 - 100
- \$ >100

**As (ppm)**

- s 100 - 500
- S 501 - 1500
- \$ 1501 - 4000
- \$ >4000

**Au (ppb)**

- s 25 - 100
- S 101 - 250
- \$ 251 - 1000
- \$ >1000

**Cu (ppb)**

- s 100 - 500
- S 501 - 1000
- \$ >1000

**Sb (ppb)**

- s 25 - 100
- S 101 - 1000
- \$ >1000

**Pb (ppb)**

- s 100 - 500
- S 501 - 1000
- \$ >1000



**Lode Gold Targets in the Nyac Mining District**

soil cover the valley floors, ground geophysical methods, soil-auger sampling or shallow drilling will be required to test this target.

#### **4. Lower Tuluksak River - Granite Creek**

“Quartz-rich” rhyolite sampled by churn-drilling into lower Tuluksak River bedrock during the 1950’s averaged 0.1 - 0.5 opt Au. Little is known about this area and it deserves more detailed investigation. Rhyolite bedrock is described in placer tailings, and on ridges above Mary Lou Gulch. The rhyolite association may be yet another mode of gold mineralization in the Nyac area.

#### **5. California Creek - Tuluksak River**

In 1945, Robert E. Wallace, a USGS geologist reported free gold associated with quartz and telluride (?) minerals at the divide between lower California Creek and the Tuluksak River. Seven free gold-bearing samples were collected from a 1-ft<sup>3</sup> volume of frost-riven rubble where a granitic porphyry intrudes volcanic rocks. The reported location is within 20 ft of the ridge crest, 500 ft above the valley floor and 1 mile northeast of the confluence of the two streams. Wallace determined the gold-quartz material to be associated with a 40-ft-wide, 300-ft-long, steeply-dipping, northeast-striking granitic dike.

In 1975, Resource Associates of Alaska (RAA) reported A 30-x 50-ft area had been cleared with a bulldozer in the vicinity of the area reported by Wallace. There, RAA reported “ small stockworks of gold-bearing quartz-chlorite veins in diorite...adjacent to the hornfelsed sedimentary contact”.

The ridge between the mouth of California Creek and the Tuluksak river is now overgrown with alders. A soil/rock chip sampling grid and ground-based geophysical surveys are recommended in this area.

## **6. Other Areas**

Areas of productive placers may correspond to buried lode sources. These include the intersection of Maxine Gulch and Rock Creek, lower-most Rock Creek, Spruce Creek, and Bonanza Creek at Bear Creek. Rich placers in the district are thought to overly structural features including faults and shear zones that control the position of streams. The richest placers occur at the intersections of these features and may be the surface expression of high-grade lode deposits.

## **Summary**

The Nyac District is a very productive placer gold district with plutonic-hosted lode gold targets of multiple types occurring in several areas. The district has not been comprehensively explored by modern methods. Airborne magnetic survey data, distribution of placer deposits and surface mapping indicate that mineralization is structurally controlled within and near the margins of the Nyac and Bonanza plutons. Geochemical and mineralogic data indicate that the district hosts polymetallic mineral occurrences with a pronounced Au-As-Bi-Sb-Cu-Te signature.

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**Maps:**

Figure1: State location map, major gold deposits of interior AK

Figure2: Location and geology map, Southwestern AK

Figure3: Land Status, Nyac District

Figure4: Geology, Nyac District

Figure5: Geochem, Target areas, structures, Nyac District