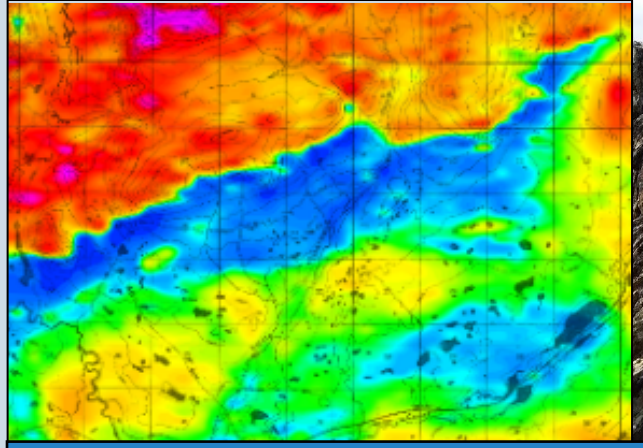
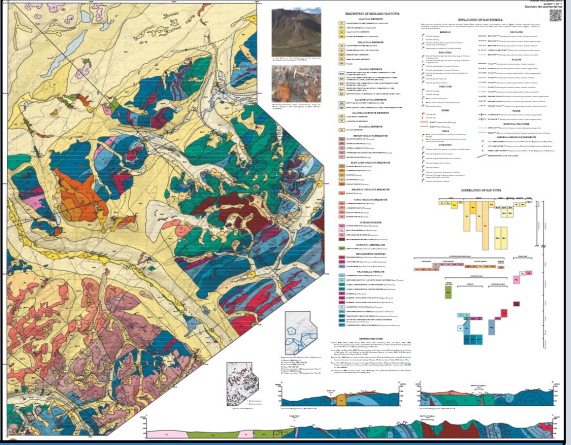


Alaska's Critical Mineral Potential

Supply chain starts in the rocks

David LePain
Alaska Division of Geological & Geophysical Surveys
August 22, 2022


Source: Greg Johnson, Agnico Eagle (USA) Ltd.


Source: Brodie Sutherland, High Gold Inc.


Source: novaminerals.com.au


Source: www.teck.com

Critical vs Strategic Minerals

Critical means you need it; strategic means you don't have it:

Critical Mineral – non-fuel mineral or mineral material essential to the economic and national security of the United States (minerals you need)

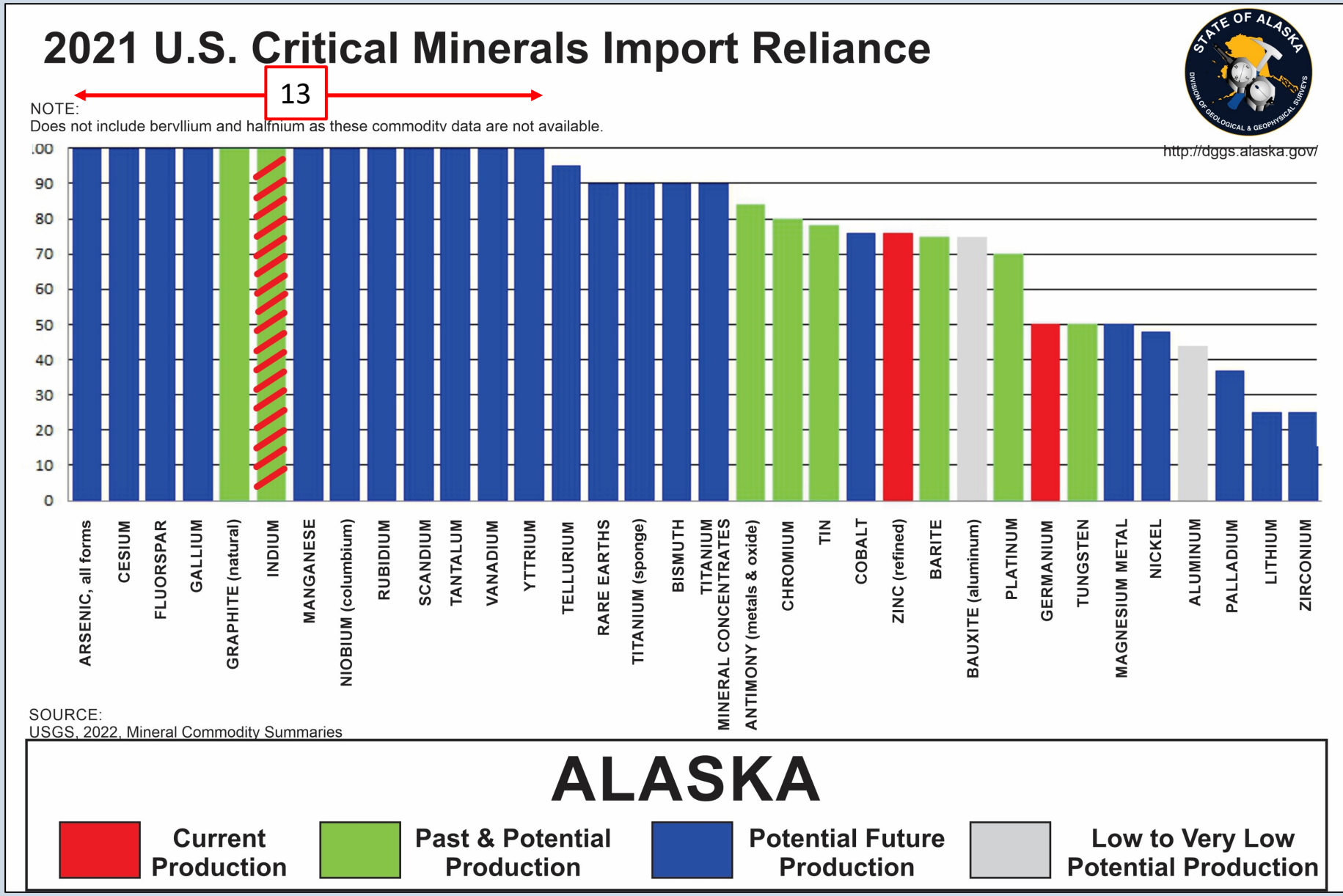
Strategic Mineral – Essential non-fuel mineral or mineral material for which the United States is heavily reliant on imports (minerals you don't have)

U.S. Critical Mineral Import Reliance vs Alaska's Potential

Many *critical minerals* needed for economic and national security are supplied by countries with adversarial relationships with the United States

Most of the 34 critical minerals shown on chart are strategic

Alaska has the potential to supply many of these commodities



Q - What is the State of Alaska Doing to Characterize Alaska's Critical Mineral Potential?

- Alaska Division of Geological & Geophysical Surveys (DGGS) has a long-standing program of airborne geophysics combined with large-scale bedrock geological mapping to provide baseline data and geologic context for Alaska's mineral potential
- DGGS' program recently expanded due to a significant increase in funding from the U.S. Geological Survey's Earth Mapping Resources Initiative (USGS Earth MRI)
- Earth MRI base funding - $10.6M/year nationwide, with an additional $64M/year from Bipartisan Infrastructure & Jobs Act (5-7-year timeframe for increased funding)
- Partnership between the USGS and state geological surveys throughout U.S.

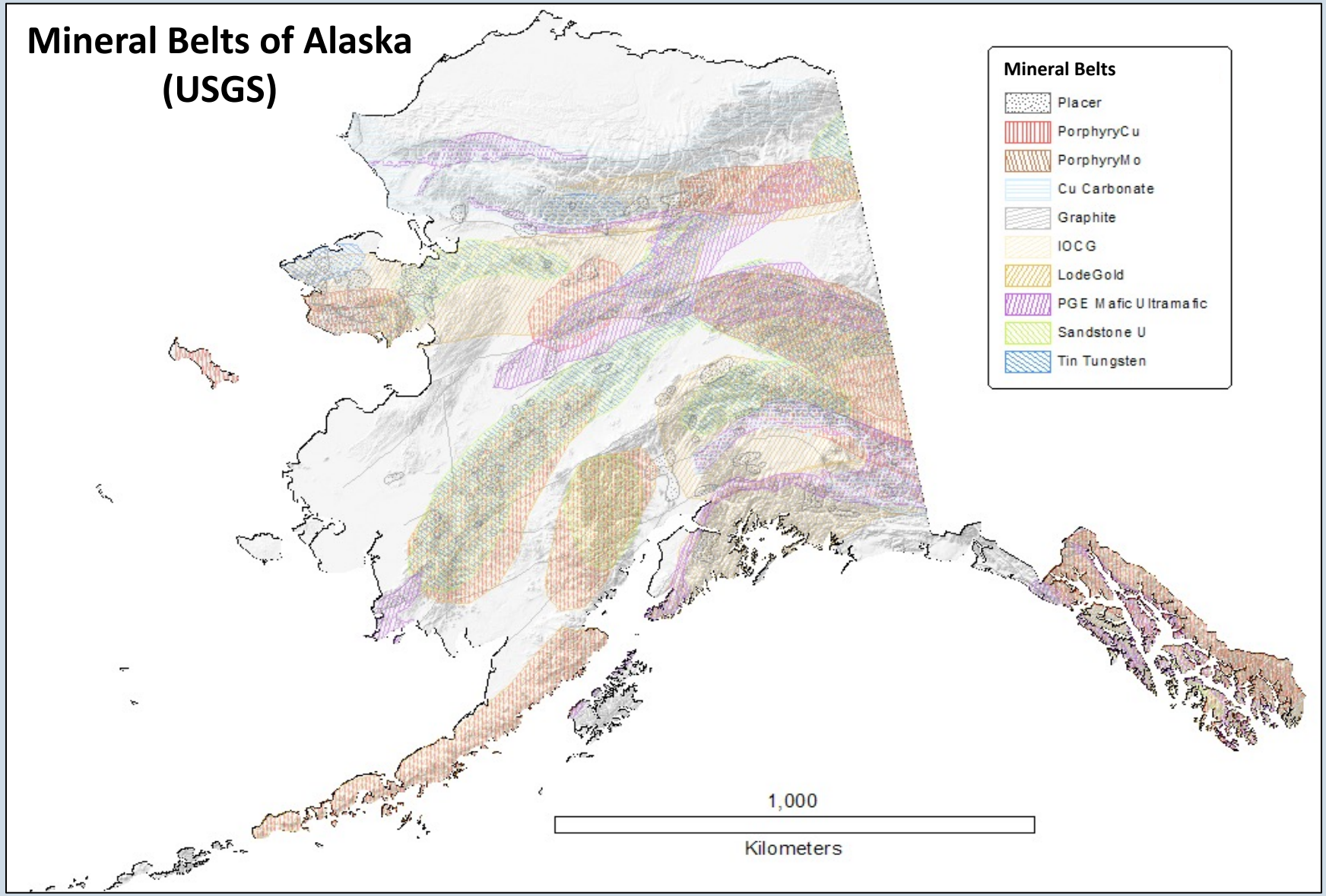
Supply chain starts here with rocks in the "wild"

Need to know where look

Geologic maps are essential!

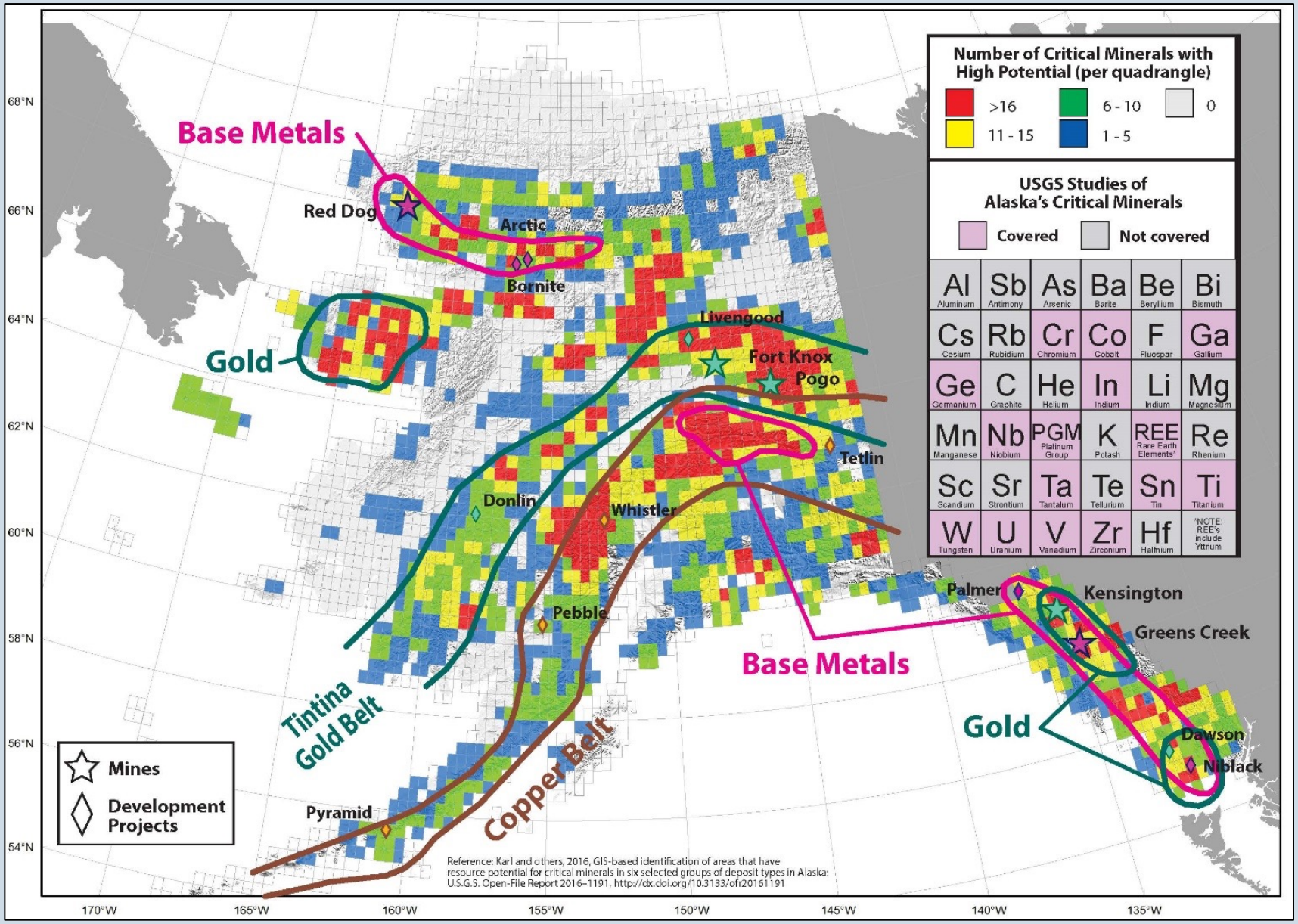
SOA's Approach to Mapping Alaska's Critical Mineral Areas

- Use available geologic data to ID mineral belts with high-potential
- High-potential belts cover a large part of the state
- While enough information is available to recognize high-potential areas, the high-quality data required by industry for investment decisions are lacking
- To fill data gaps, DGGS prioritizes the areas where multiple potential deposit types overlap

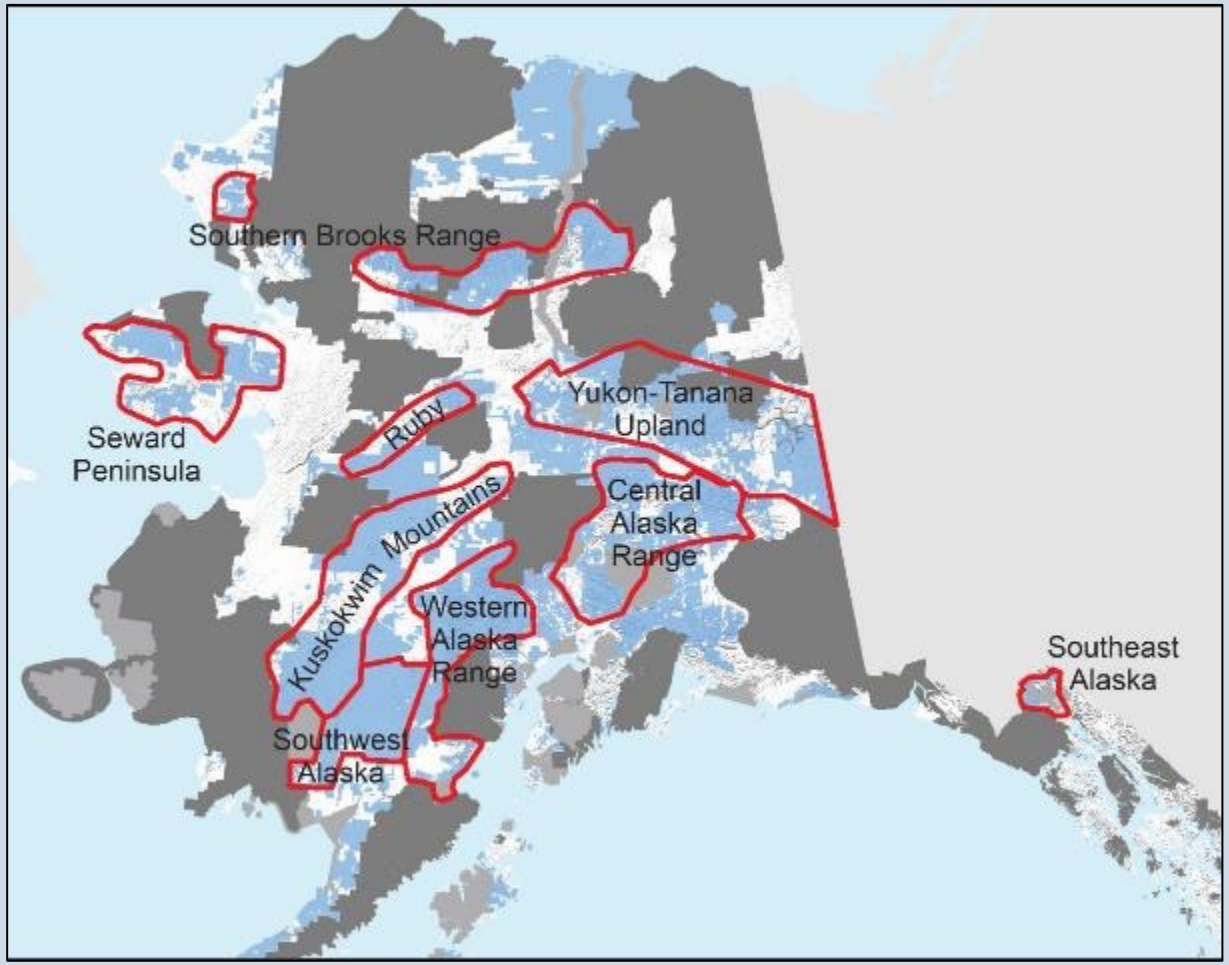


SOA's Approach to Mapping Alaska's Critical Mineral Areas

Most of Alaska's mineral belts have potential for one or more critical minerals



SOA's Approach to Mapping Alaska's Critical Mineral Areas



Dark and light gray – Federal and state land, respectively, closed to mineral entry

White – Federal and Native lands potentially open to mineral entry

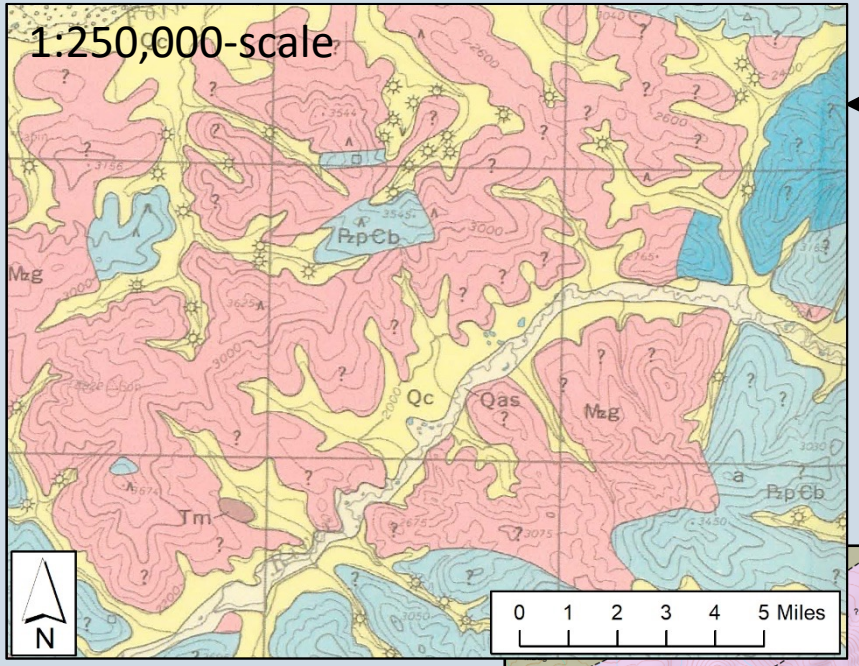
Blue – State land open to mineral entry

Data type	High Mineral Potential Area Completeness	Remaining to Complete
Magnetic	33.4%	242,768 sq. km
Radiometric	3.2%	345,113 sq. km
Electromagnetic	15.6%	300,912 sq. km
Geology	32.4%	242,800 sq. km
Geochemistry	16.6%	32,944 samples

- In addition to prioritizing focus areas of greatest overlap, ***DGGS focuses on mapping state lands open to mineral entry (blue) within mineral belts (red)***
- To ensure complete coverage of mineral belts DGGS coordinates Earth MRI efforts with USGS MRP-funded research to provide essential context for interpretation and regional synthesis

Status of Bedrock Geological Mapping in Alaska

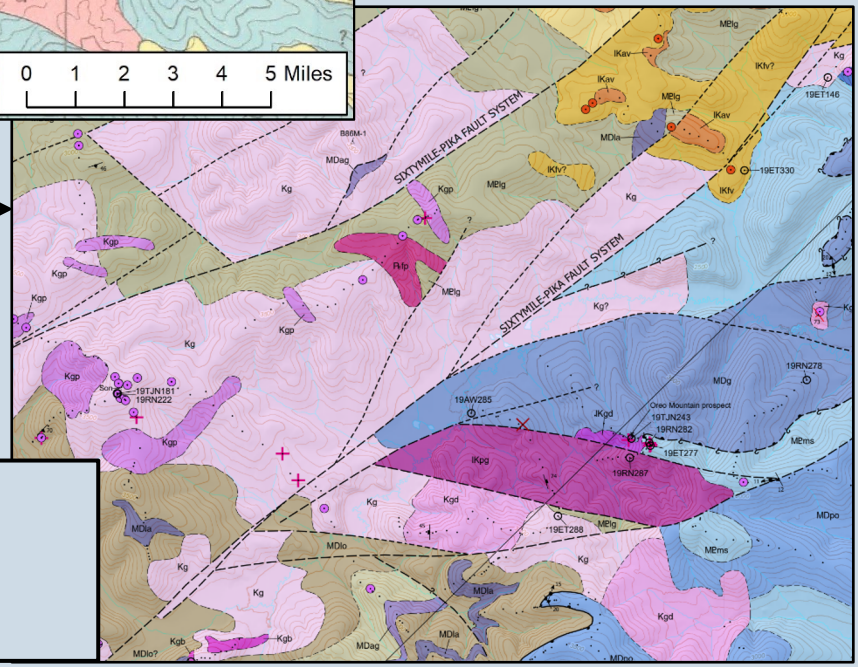
- Most of Alaska's mineral belts are mapped at 1:250,000 scale or smaller
- Most of these maps were completed in the 1950s to 1980s and lack detail necessary to guide industry exploration
- Larger-scale maps provide more geological detail necessary for characterizing mineral potential
- 1:100,000 scale bedrock geological maps provide sufficient detail for explorers to assess large areas while limiting mapping costs
- 32% of the state has been mapped at 1:100,000 or larger scale
- Detailed geologic maps and supporting data provide geologic context and help explorers find prospects and make discoveries



Existing 1960s reconnaissance geological map

Geologic maps help locate the start of the supply chain

FFY2019 Earth MRI map of same area



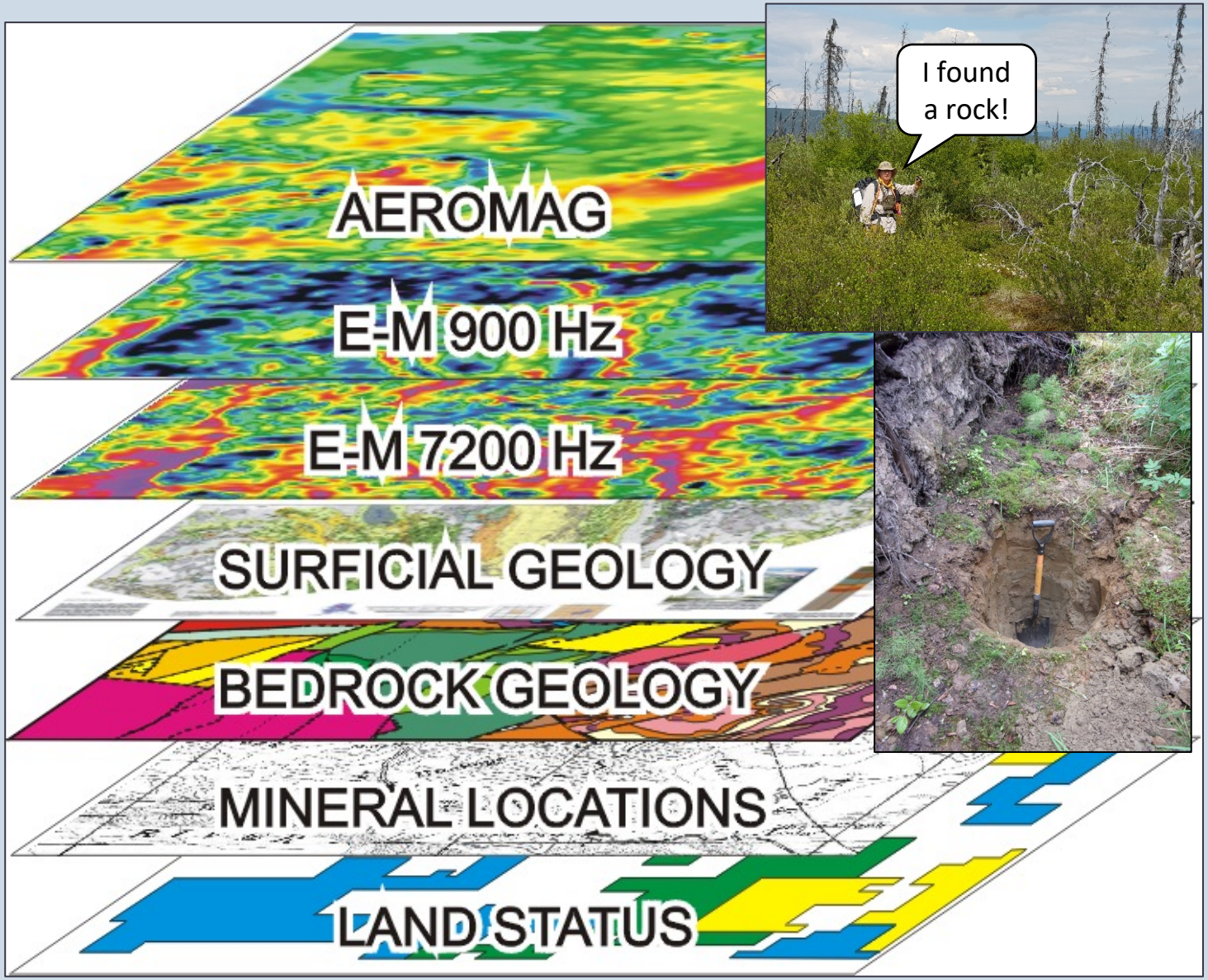
Regional strike-slip fault system
Two distinct metamorphic terranes
14 distinct intrusive units

Twelker and others (2019), Geologic investigations of the Ladue-Mount Fairplay area, eastern Alaska

DGGS Integrated Mapping

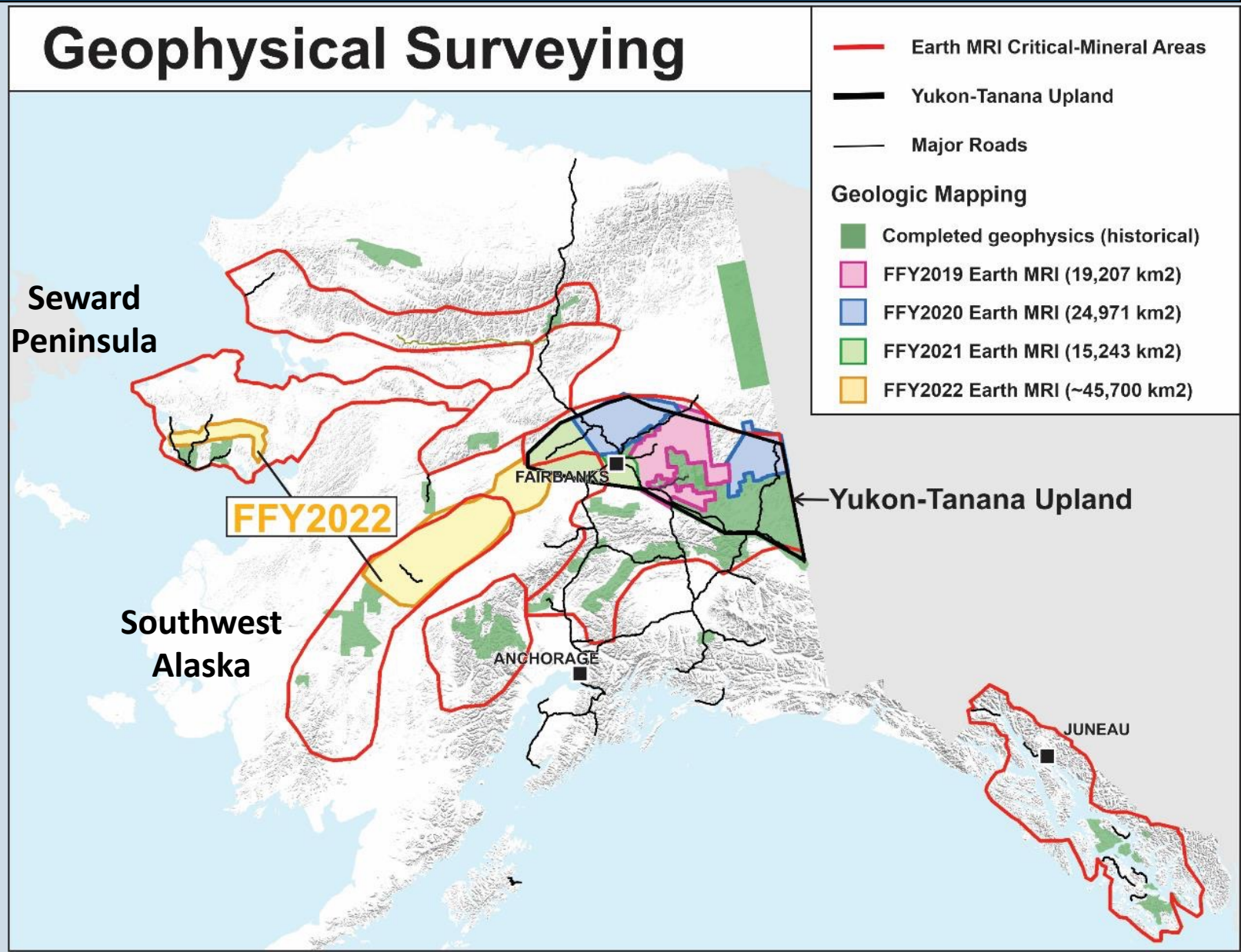
DGGS takes an integrated approach to geological mapping:

1. In consultation with Geological Mapping Advisory Board, select area to map
2. Acquire airborne geophysics to guide “boots-on-the-ground” geological mapping
3. Deploy field team to map bedrock geology – data collected using pad devices, uploaded to field server, and shared with all field team members
4. Preliminary analysis of rock samples in field for rock ID; samples collected for robust laboratory analyses, age dating etc.
5. Map production using GIS and USGS geological map database schema (GeMS)
6. Publish map and associated data – available for free download from DGGS website (https://dggs.alaska.gov/)



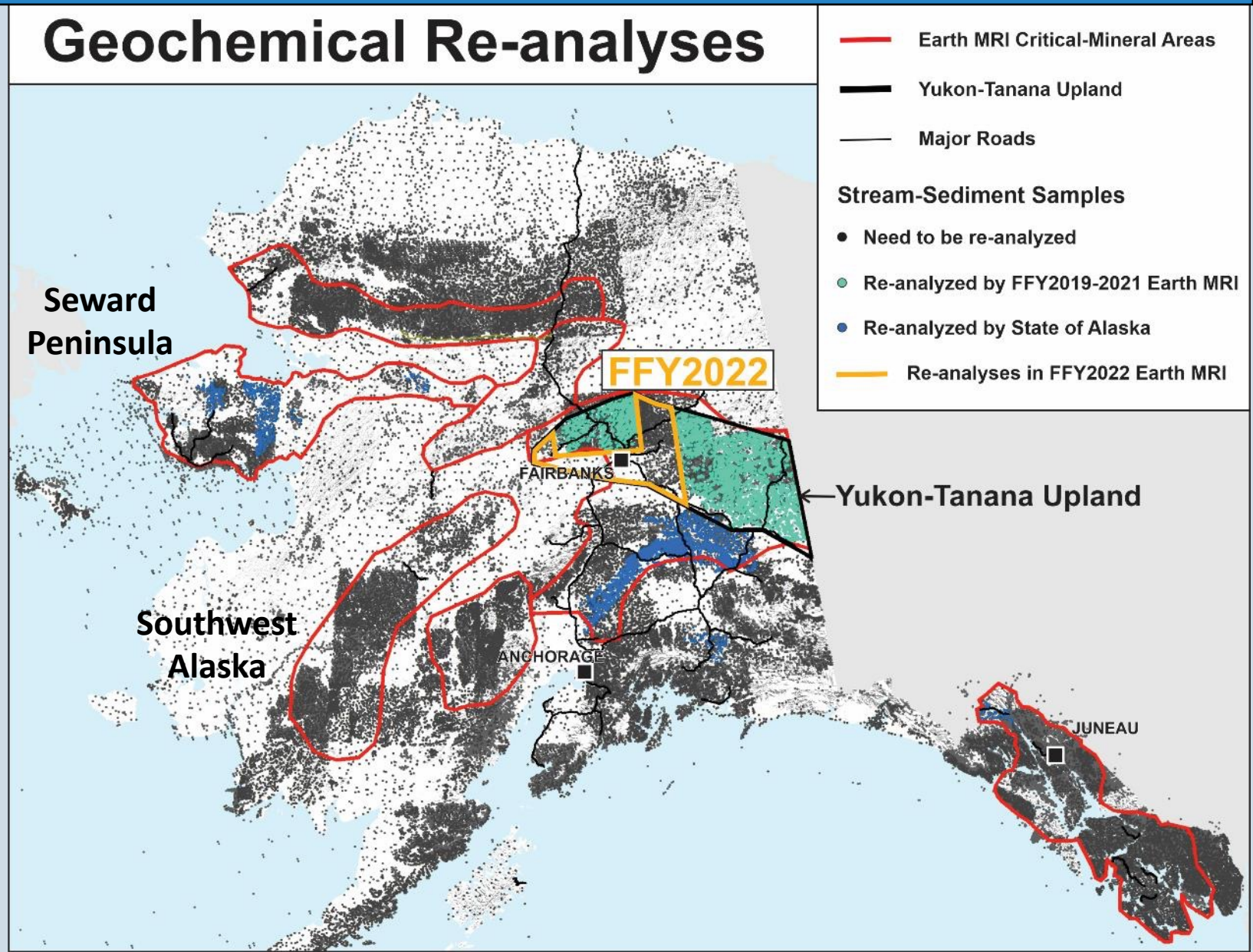
Planned Earth MRI Geophysical Surveying - FFY2022-26

- FFY2022 - Contract electromagnetic survey on Seward Peninsula and magnetic + radiometric survey in Southwest Alaska. Summer 2023
- Expand the State's geophysical-surveying capabilities by hiring 1-2 additional geophysicists
- FFY2023-FFY2026 - Complete surveying of Seward Peninsula and Southwest Alaska regions; start next region
- Extended goal - complete surveying of all of Alaska's critical mineral belts (red outlines) in 10 yrs



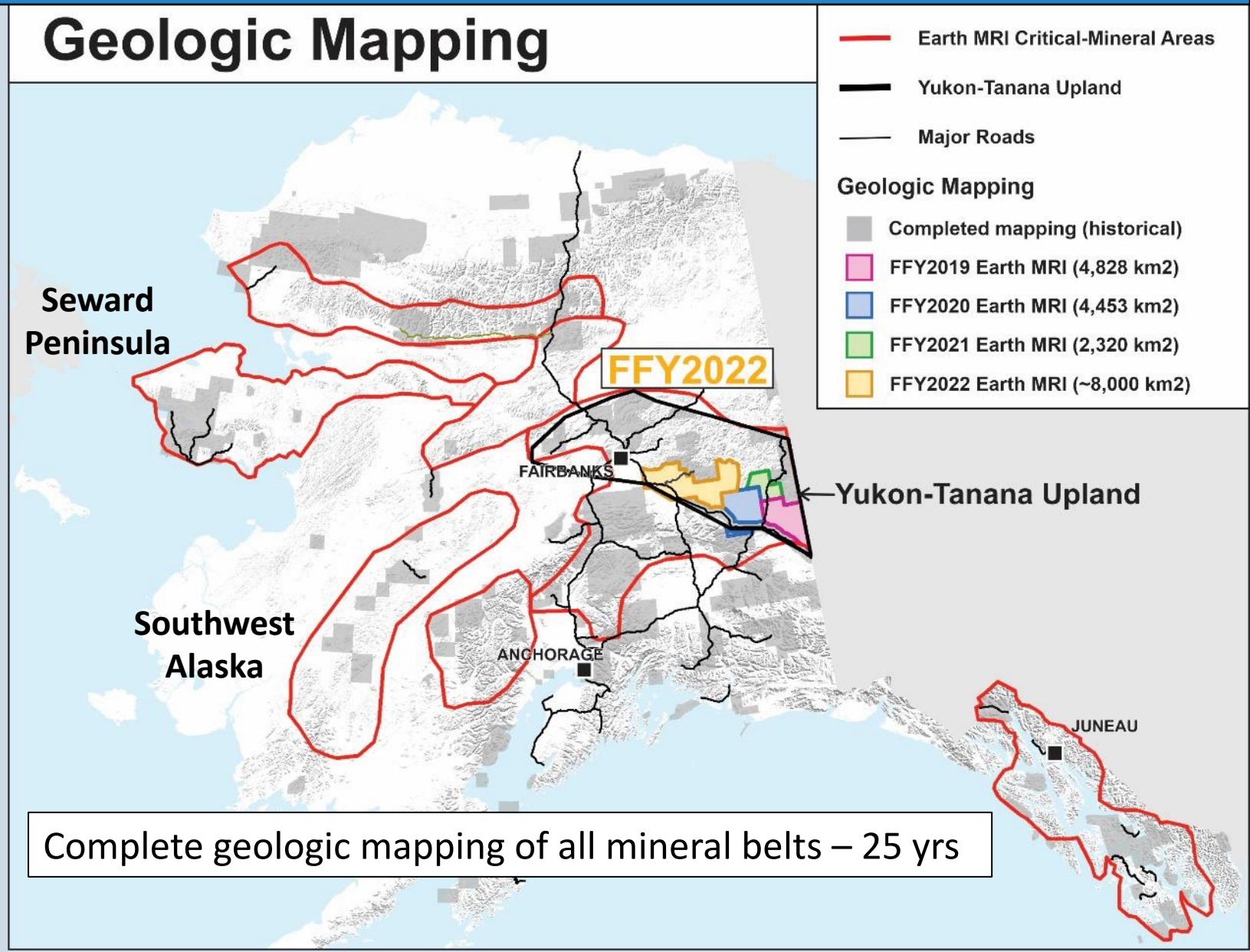
Planned Geochemical Re-Analyses - FFY2022-26

- New geochemical anomalies can be found by re-analyzing historical stream-sediment samples with modern analytical methods
- Older data is missing elements of interest, has poor detection limits, or used non-quantitative methods.
- FFY2022 – Re-analyze 2,500 additional stream-sediment samples in Yukon-Tanana Upland
- FFY2023-2026 – Re-analyze samples in Southwest Alaska and Seward Peninsula regions
- Goal is to complete geochemical re-analyses of all stream-sediment samples within Alaska's critical mineral belts (red outlines) – 10 yrs



Planned Earth MRI Geologic Mapping - FFY2022-26

- FFY2022 – Continue geologic mapping in the Yukon-Tanana Upland
- Map ~8,000 square km in Y-T Upland – Summer 2022 (done!)
- Double DGGS' Mineral Resources geologic mapping team to two teams by FFY2023 (*pending funds*)
- Complete geologic mapping in the Yukon-Tanana Upland by FFY2026, publish geol. map and data, write report summarizing geology and critical-mineral potential
- Extended goal is to move to the Seward Peninsula and Southwest Alaska to start the next phases of geologic mapping



Products & Publications

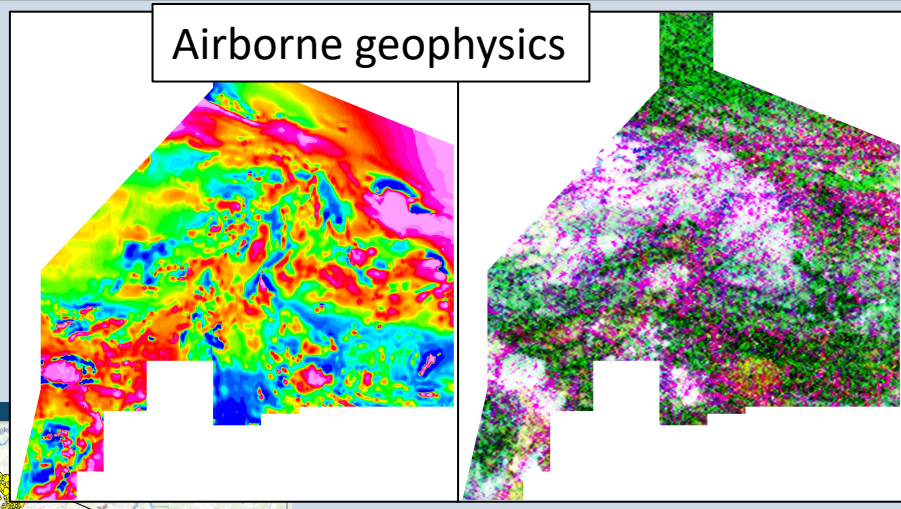
-All data served out via DGGS website: https://dggs.alaska.gov/

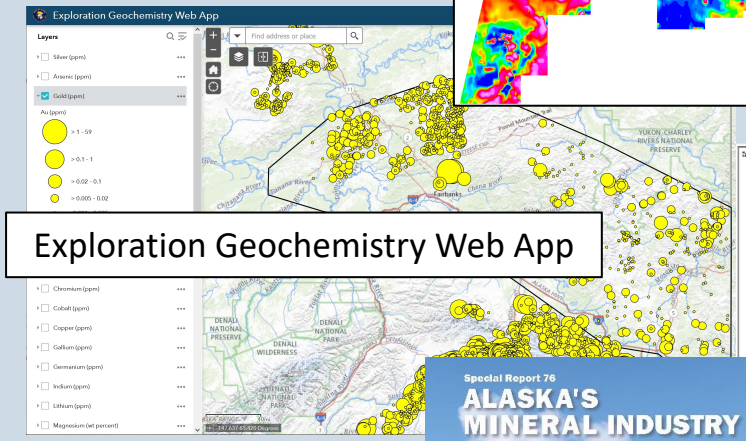
-Alaska Mineral Industry report & database

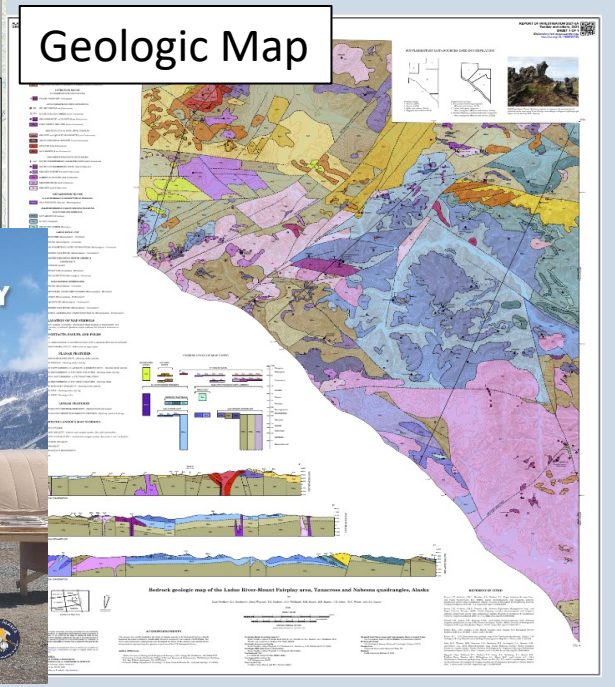
-Geophysical surveys (published in variety of industry-standard formats)

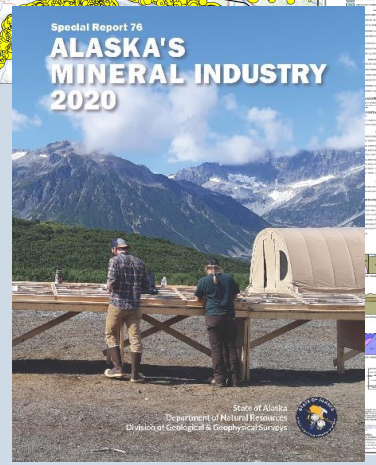
-Geochemical reports and databases
-Geochronological reports and databases
-Field-station + magnetic susceptibility databases

-Geologic maps:
  -Bedrock + surficial maps
  -Bedrock-only maps (interpret under cover using geophysics)
  -Associated topical interpretive reports (mineral-resource potential, structural history, metamorphism, igneous suites, geochronology, etc.)









Thank you!

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