

Geophysical Mapping in Alaska: Unlocking Alaska's Critical Resources

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Seward Peninsula electromagnetic survey

Earth Mapping Resources Initiative: Earth MRI

- USGS National Cooperative Geologic Mapping Program
- Partnerships with state geological surveys
- Assess critical minerals by 2031
- Mineral systems approach
 - Mappable criteria for mineral systems
 - Many critical minerals are produced as co-products in conventional mineral deposits
- Three main components
 - Geophysical surveys (mag-rad, EM, gravity, hyperspectral)
 - Geologic mapping
 - Geochemical mapping



Earth MRI in Alaska

- Shared priorities and goals
- Funding
 - \$22M EMRI funding since 2019
 - ~25% match from State
- Critical Mineral Exploration
 - State revenue from natural resources
 - Minerals—area for new development and increased revenue
 - Critical minerals present in Alaska
 - Challenges with Alaska mineral exploration

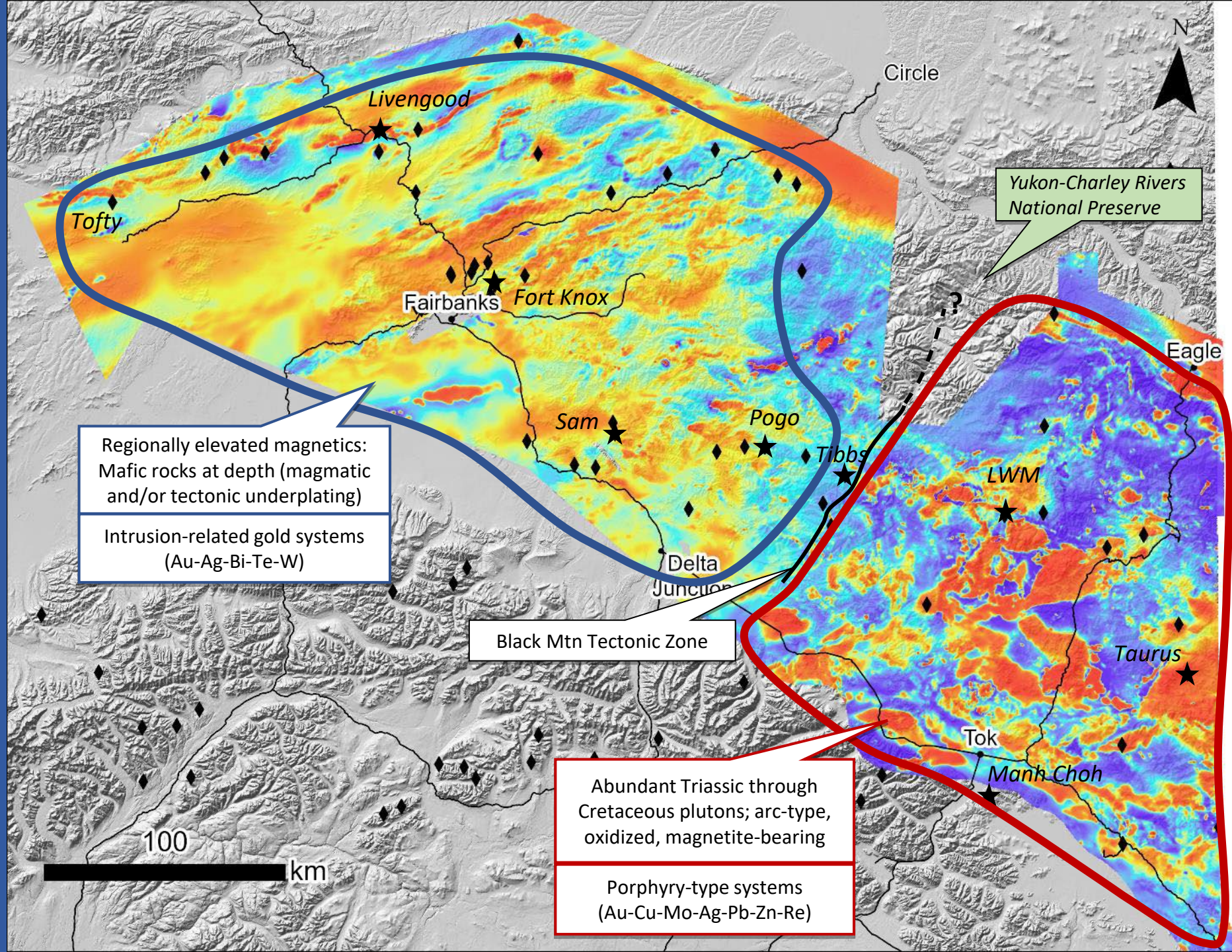
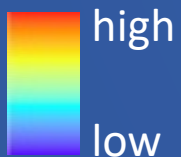


Area south of Pogo gold mine: high exploration interest, minimal exposure

Geophysics Products

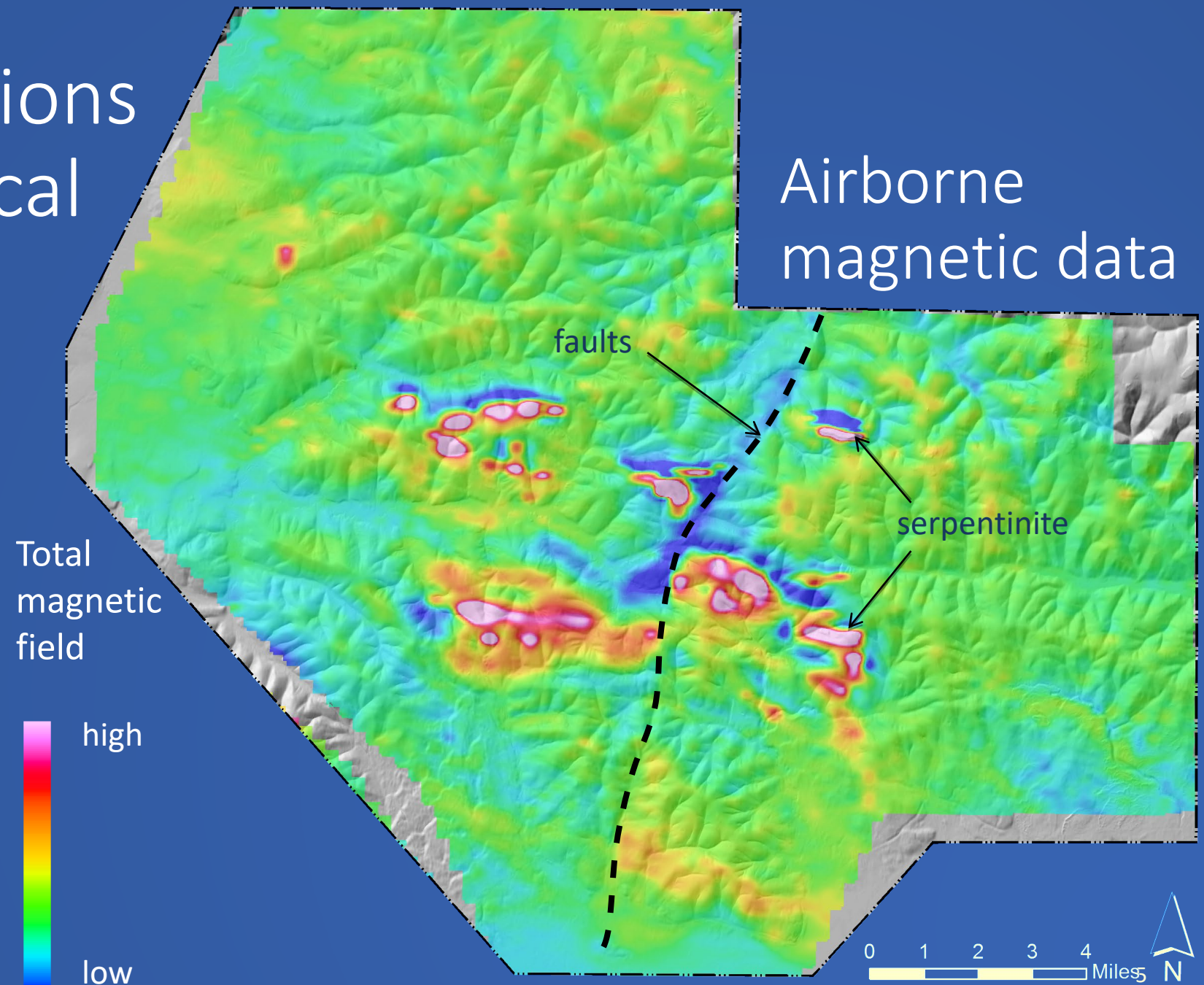
- Maps of geology based on physical properties
 - Magnetic properties
 - Conductivity
 - Radioactivity
 - Density
- May see below the surface
- May directly detect ore
- Detect geology of mineralized systems

Reduced-to-pole
magnetic field:



Other Applications for Geophysical Data

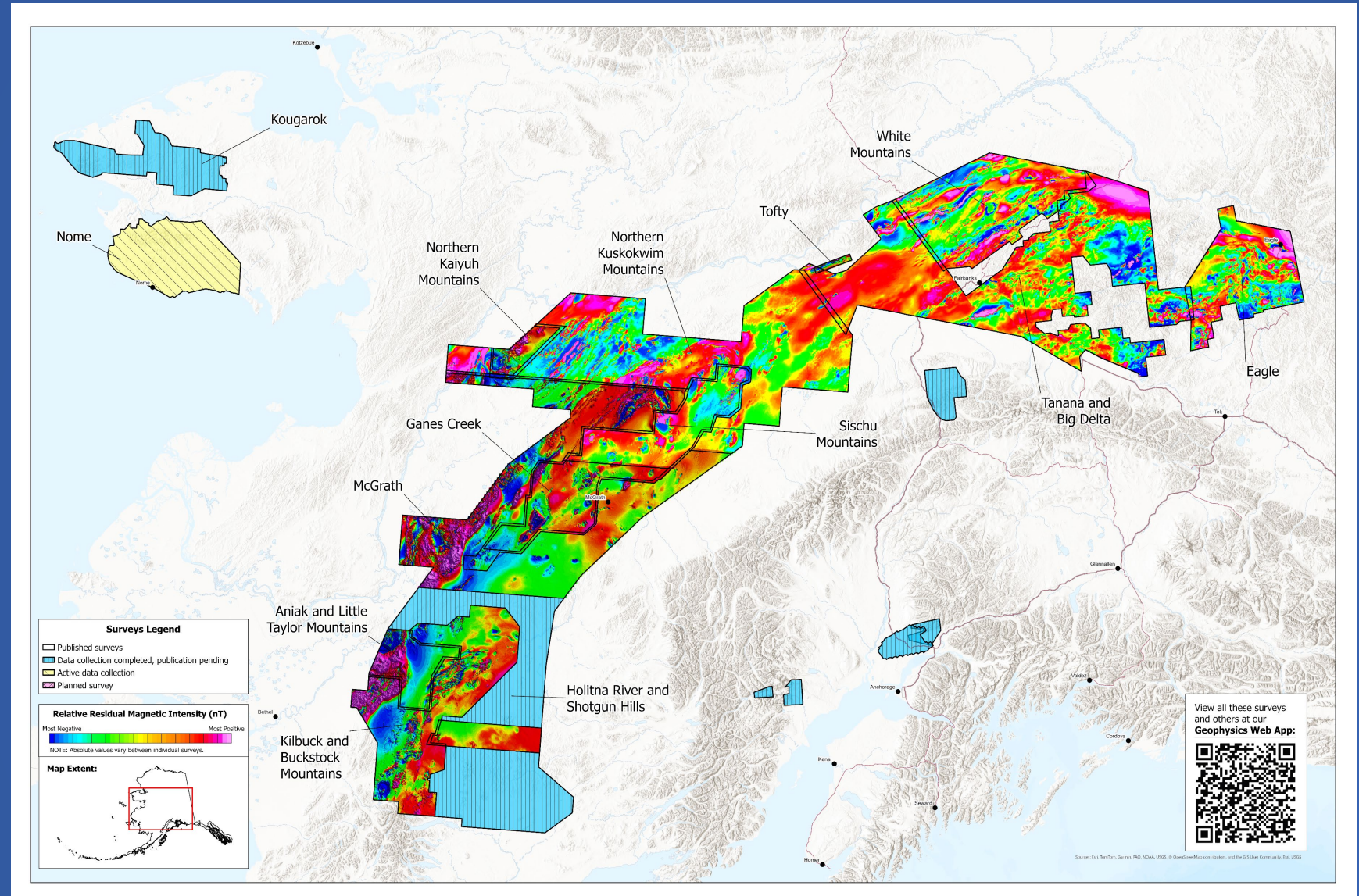
- Geologic hazards
- Geologic hydrogen
- Geothermal energy



East Richardson geophysical survey (Burns and others, 2006)

USGS and DGGS Geophysics Collaboration Results

- 30,000 mi² new geophysical data
- 41% of Alaska's highest potential mineral belts surveyed since 2019
- 96% increase in data coverage
- Gathering data at 6X rate of pre-EMRI



USGS and DGGS Geophysics Collaboration Results

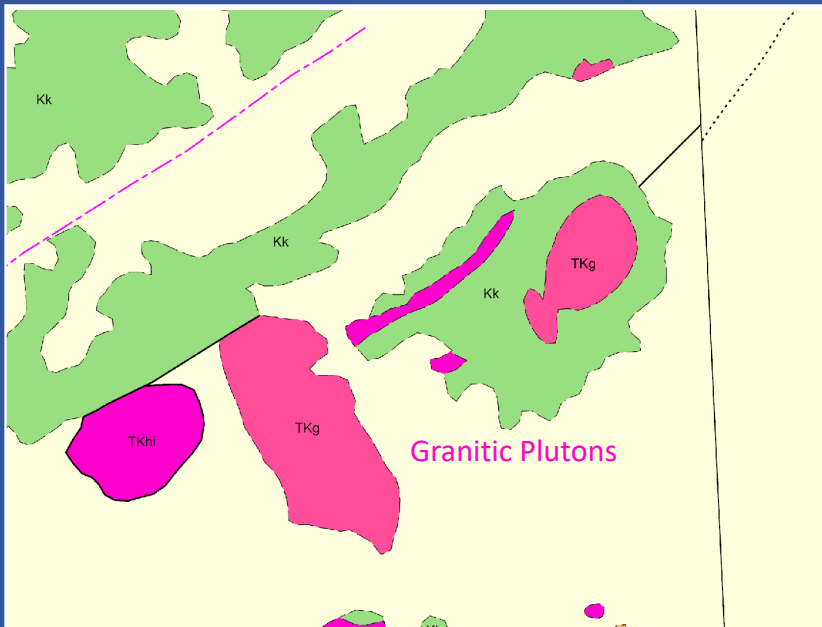
- Significantly higher quality data

Magnetic
Signal



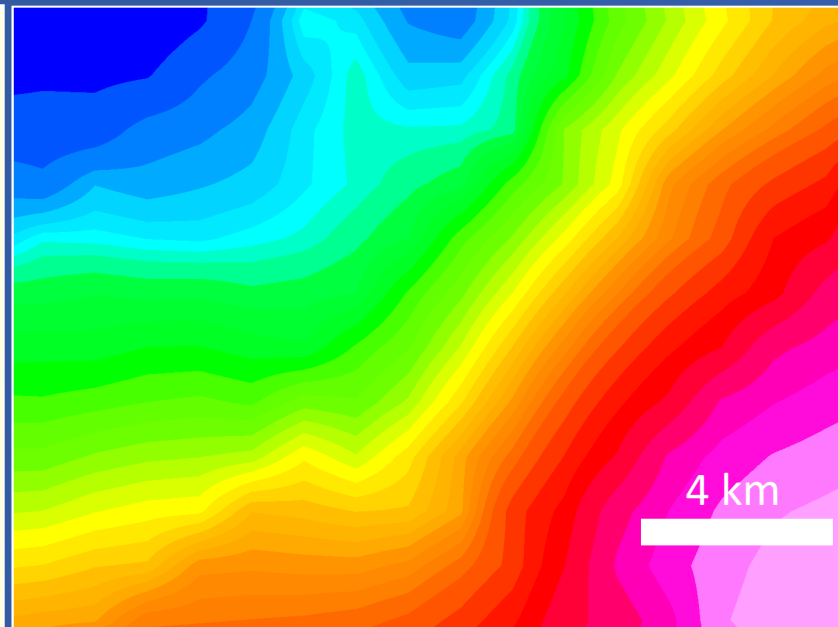
high
low

Geologic Map:



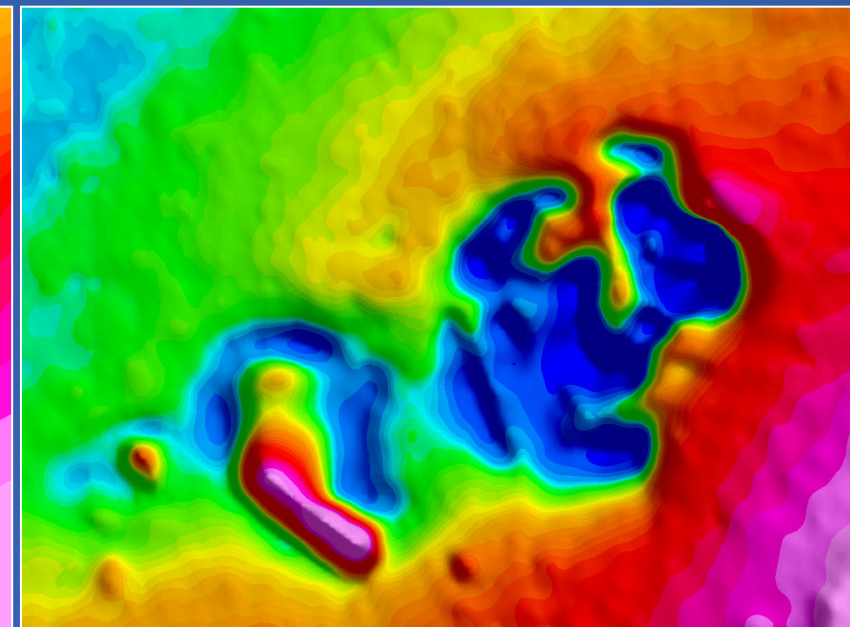
Wilson et al. 2016

Aeromag, Pre-EarthMRI:



Connard et al. 1999 (Compilation/Merge)

Aeromag, EarthMRI (2026):

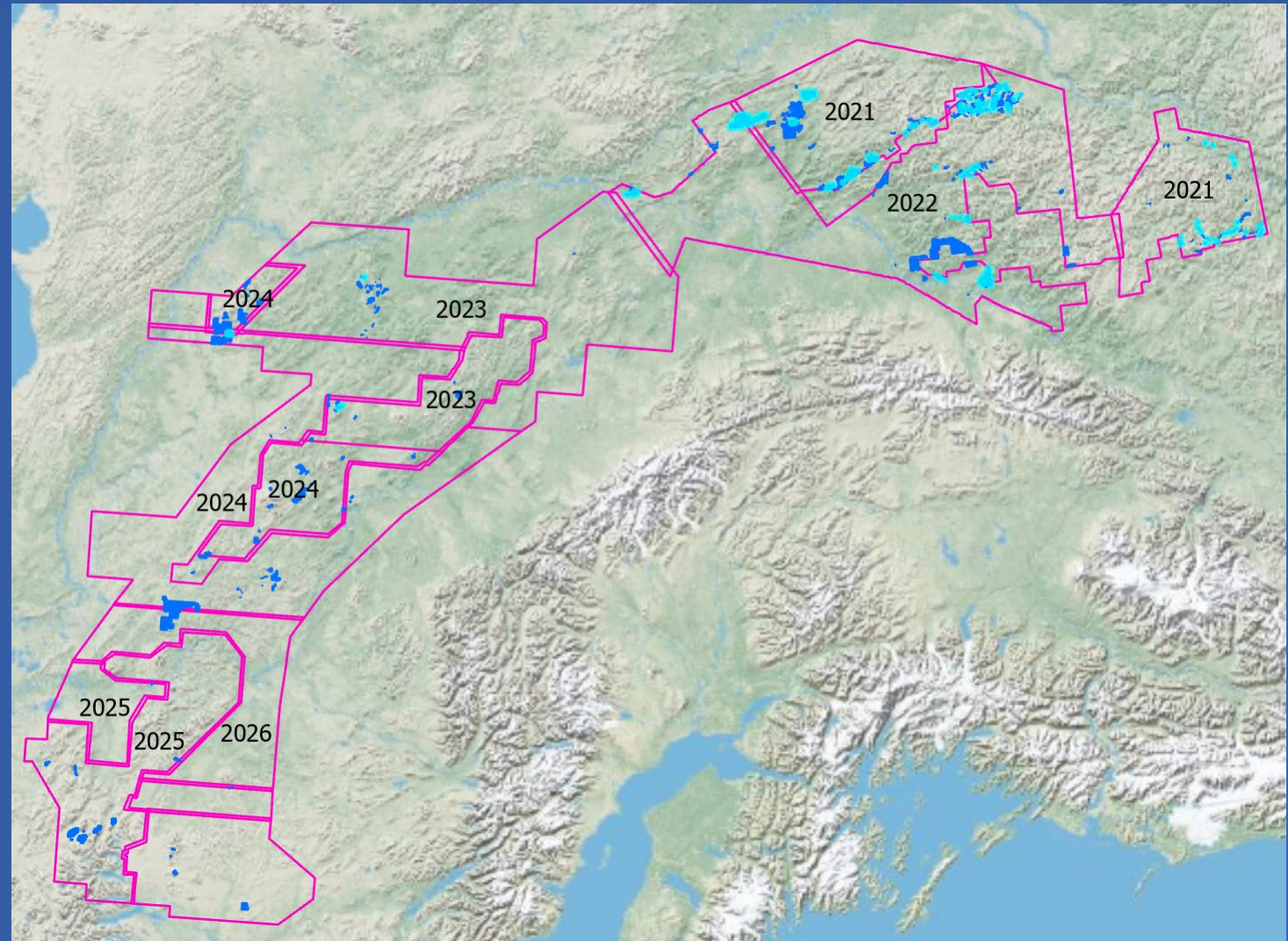


Fusso et al. 2026

State Lands near McGrath, AK

Increasing Mineral Activity in Alaska

- New state mining claims since 2020
 - >2 million acres
 - ~340,000 acres of claims per year
- Hardrock exploration permits increasing
 - 73 state permits in 2020
 - 124 permits expected in 2026
- Alaska still frontier exploration—*prospects at the surface*



Blue boxes: Claims staked after EMRI geophysical surveys

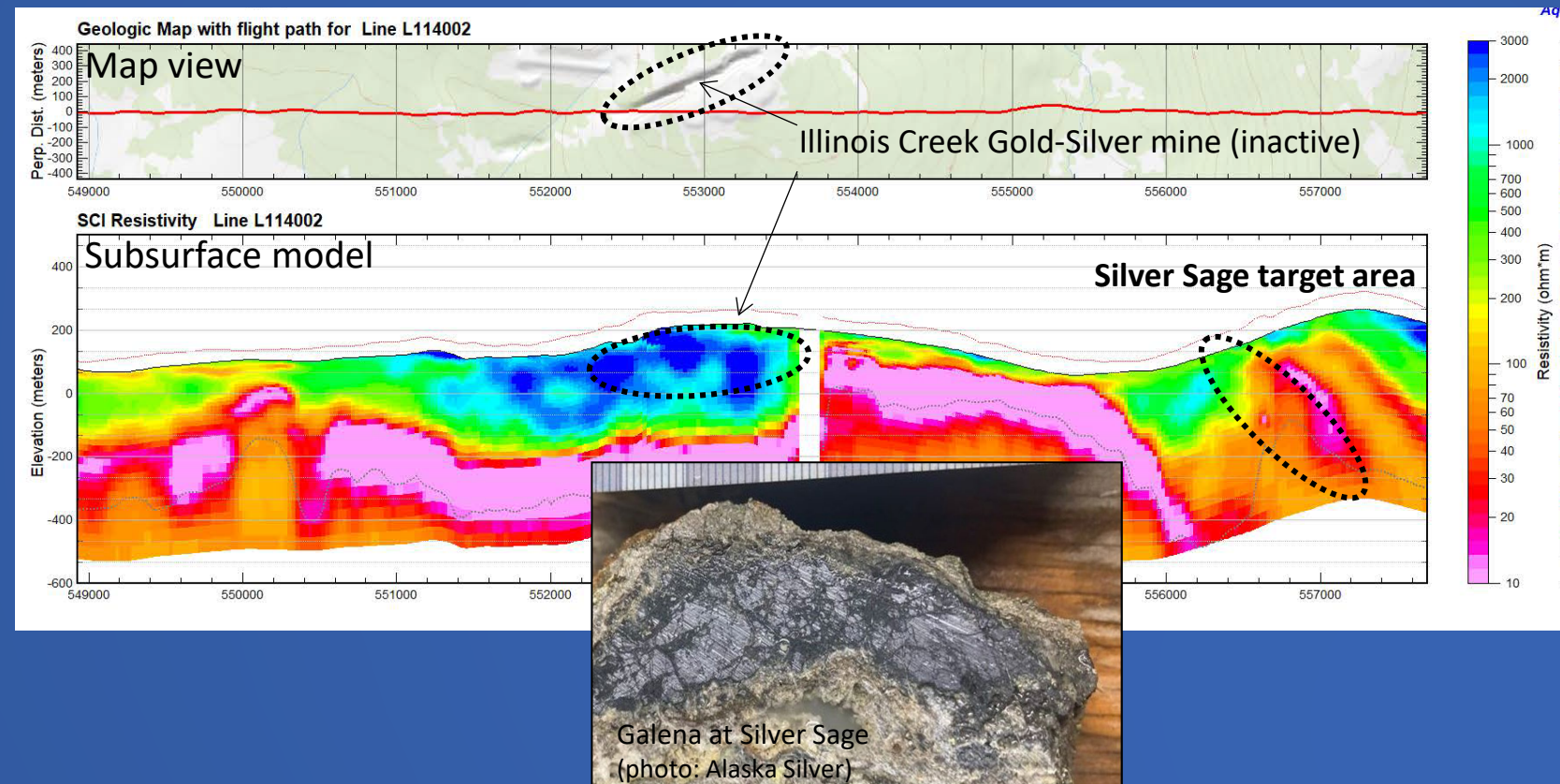
Electromagnetic surveys: Alaska Silver

- Survey partnership: Earth MRI federal (magnetics) and SOA matching (EM)
 - Alaska Silver and Doyon Ltd. as infill partners for high interest areas
- Subsurface data: Time-domain EM inversions can map 200-400m deep
- Adding value to Alaska's lands: Decrease investment risk, increase attractiveness

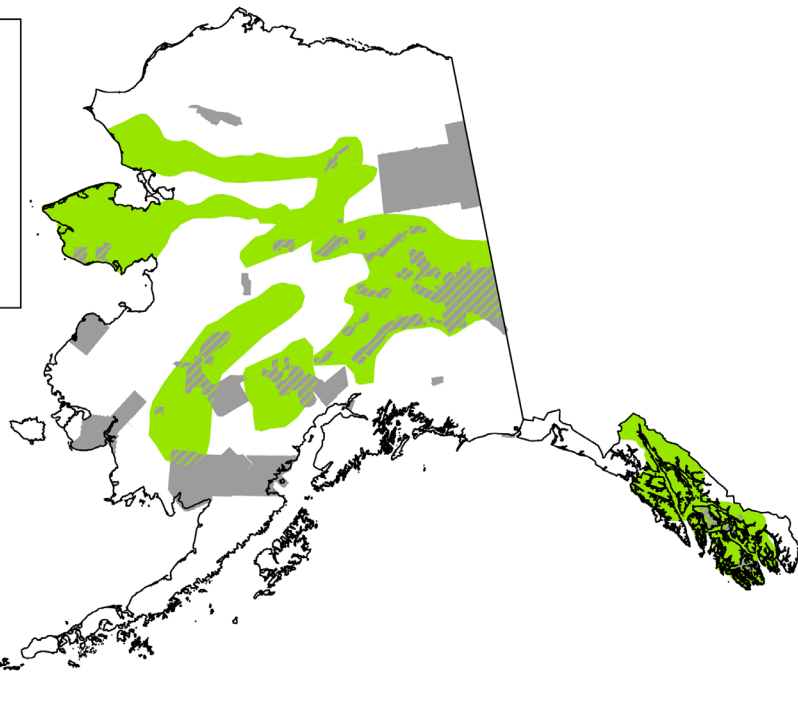
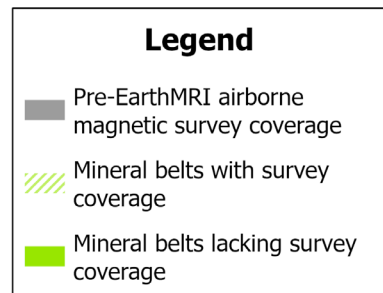
Alaska Silver:

- Actively drilling new discovery at Silver Sage
- Reassessing district geologic controls in light of new data

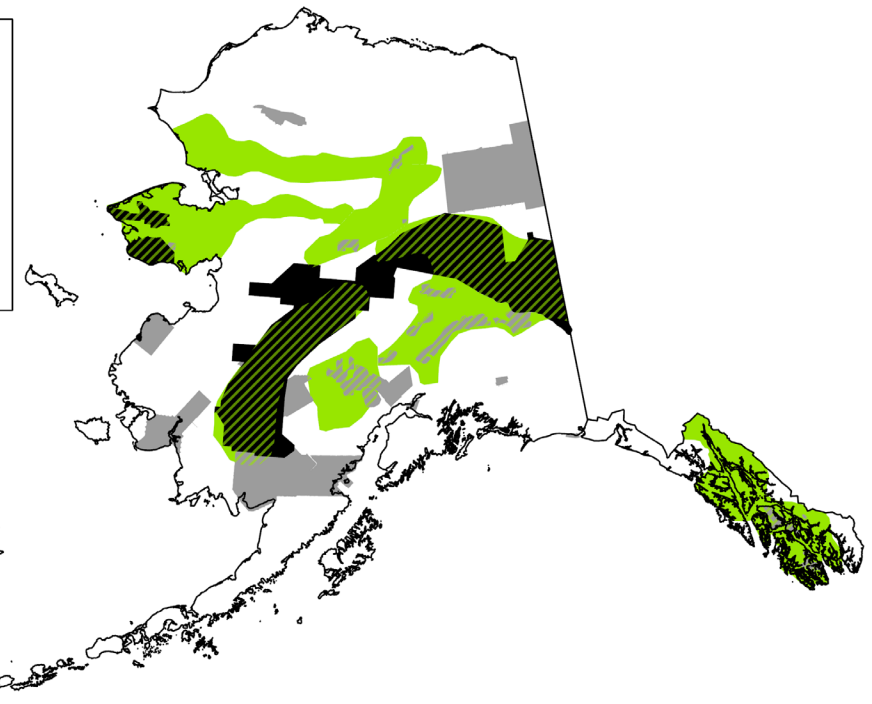
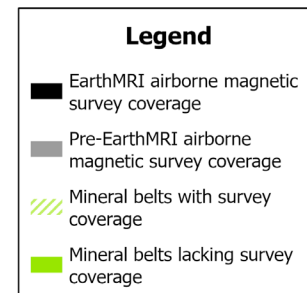
"...this will be our most aggressive summer program in our history" – Kit Marrs, President and CEO of Alaska Silver (news release 3/12/2026)



Geophysical Data Acquisition in Alaska: Plan Forward



Pre-EMRI



Present

“[The] geophysical surveys are the single most important improvement in the last 30 years for Alaskan geology.”

-industry response to DGGs mining survey



Helicopter with airborne magnetometer (large Q-tip)



Magnetometer beneath helicopter on survey in the Kilbuck Mountains.