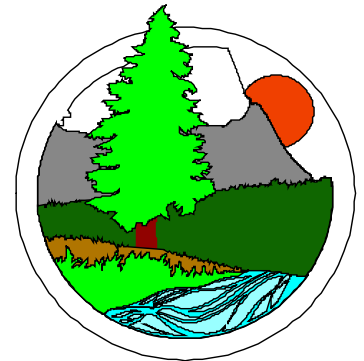
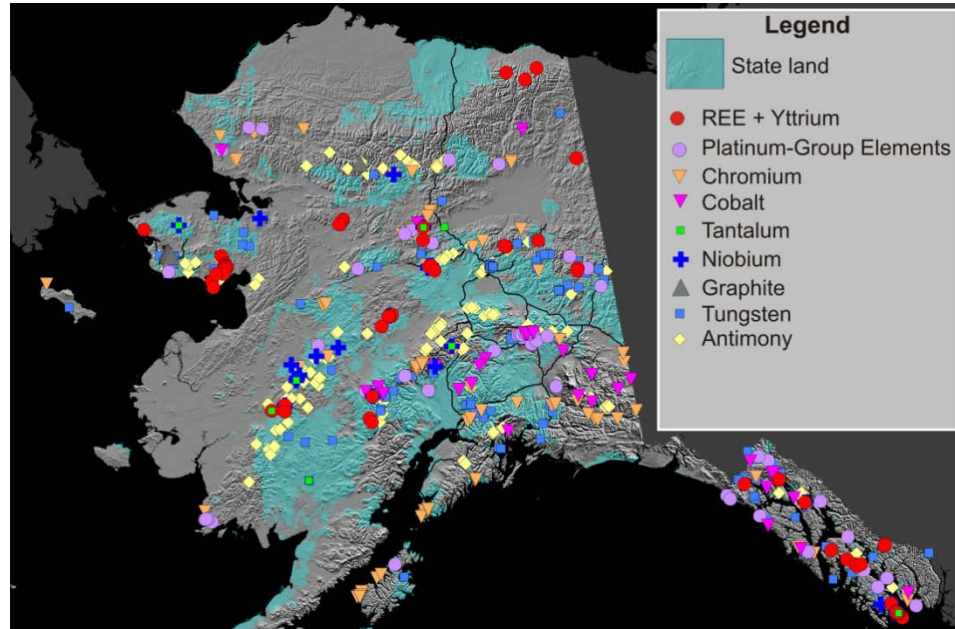


Department of Natural Resources
Division of Geological & Geophysical Surveys
**Alaska Strategic & Critical Minerals Potential and
Assessment**



Bob Swenson

State Geologist & Director
Alaska Division of Geological & Geophysical Surveys

Current USGS List of Strategic & Critical Minerals

USGS (Long 2009; Long and others 2010)

Antimony	Platinum Group Elements (PGE)
Barite	Rare Earth Elements (REE)
Chromite	Rhenium
Cobalt	Tantalum
Fluorite	Titanium
Gallium	Tungsten
Graphite	Yttrium
Indium	Niobium

- **This list will change over time**
- **Merely a subset of Alaska Mineral Potential**

Geologic Terrains in Alaska

Regions of Primary
Mineral Occurrence

Base Metals

- Cu, Pb, Zn, Mo
± Au, Ag,

Precious Metals

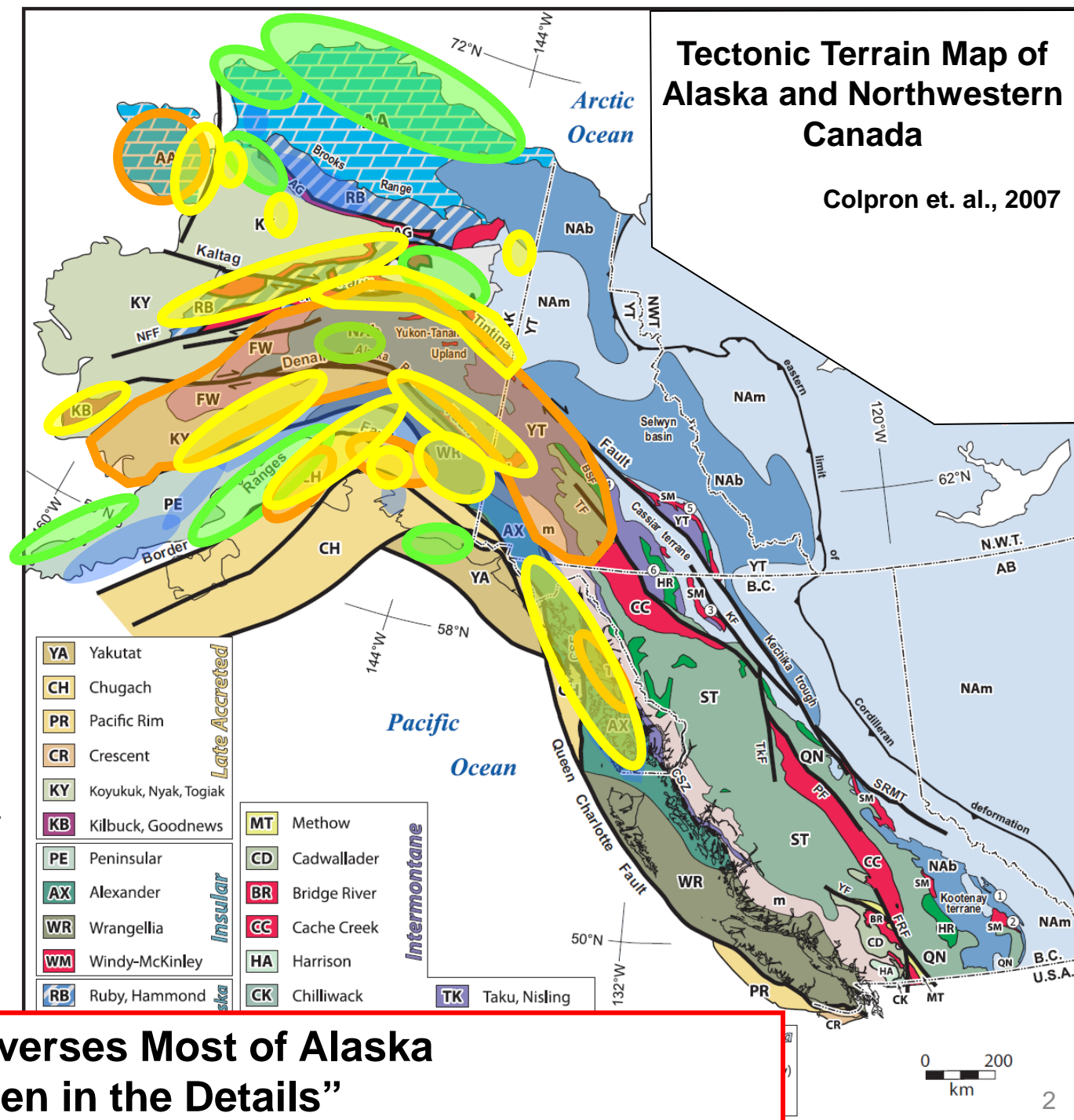
- Au, Ag
± Sb

Strategic Minerals

- PGE, REE, Graphite,
In, Nb, Ta, Ge

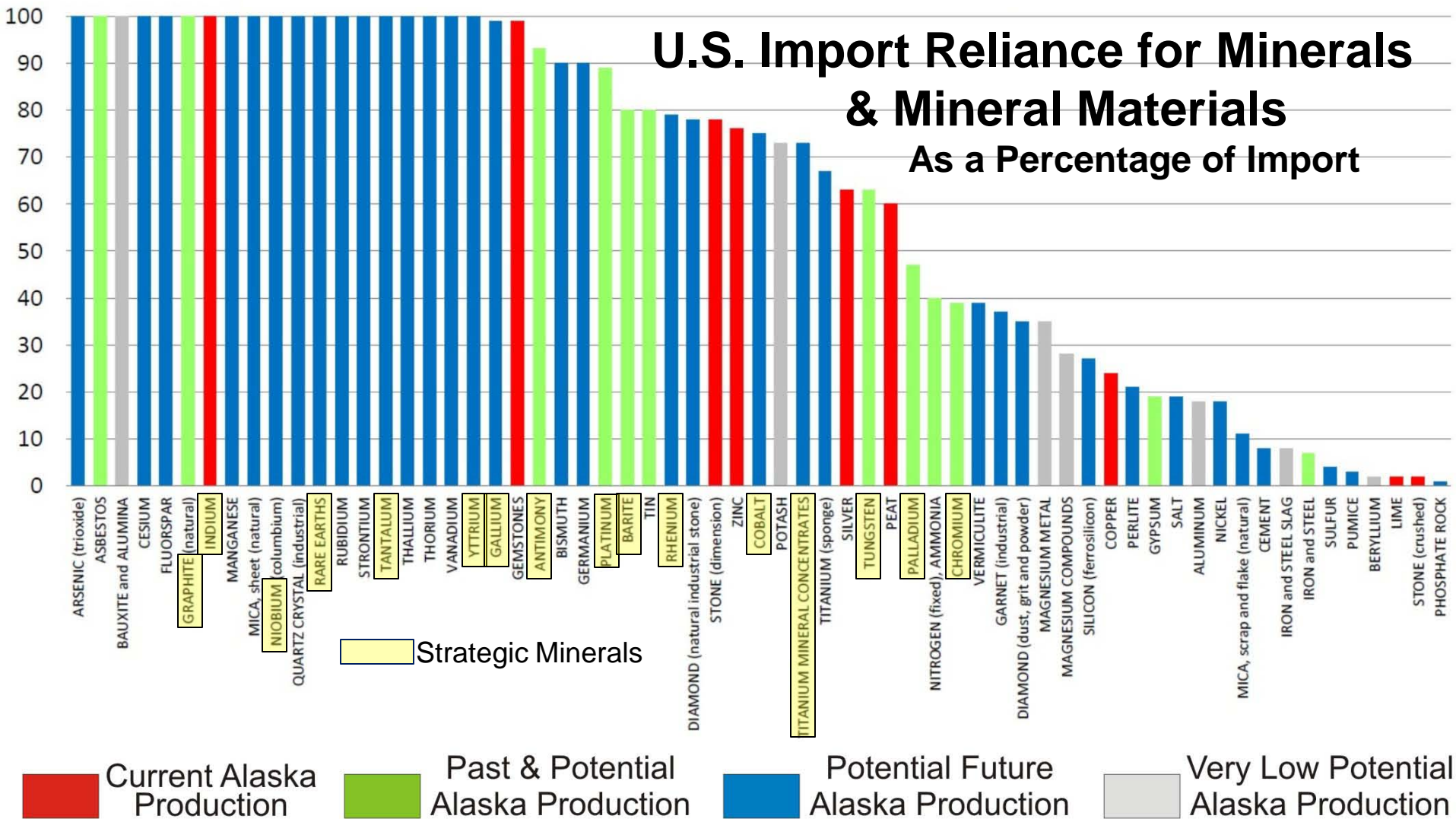
Coal, Oil, and Gas

- Conventional &
Unconventional Energy
Resources

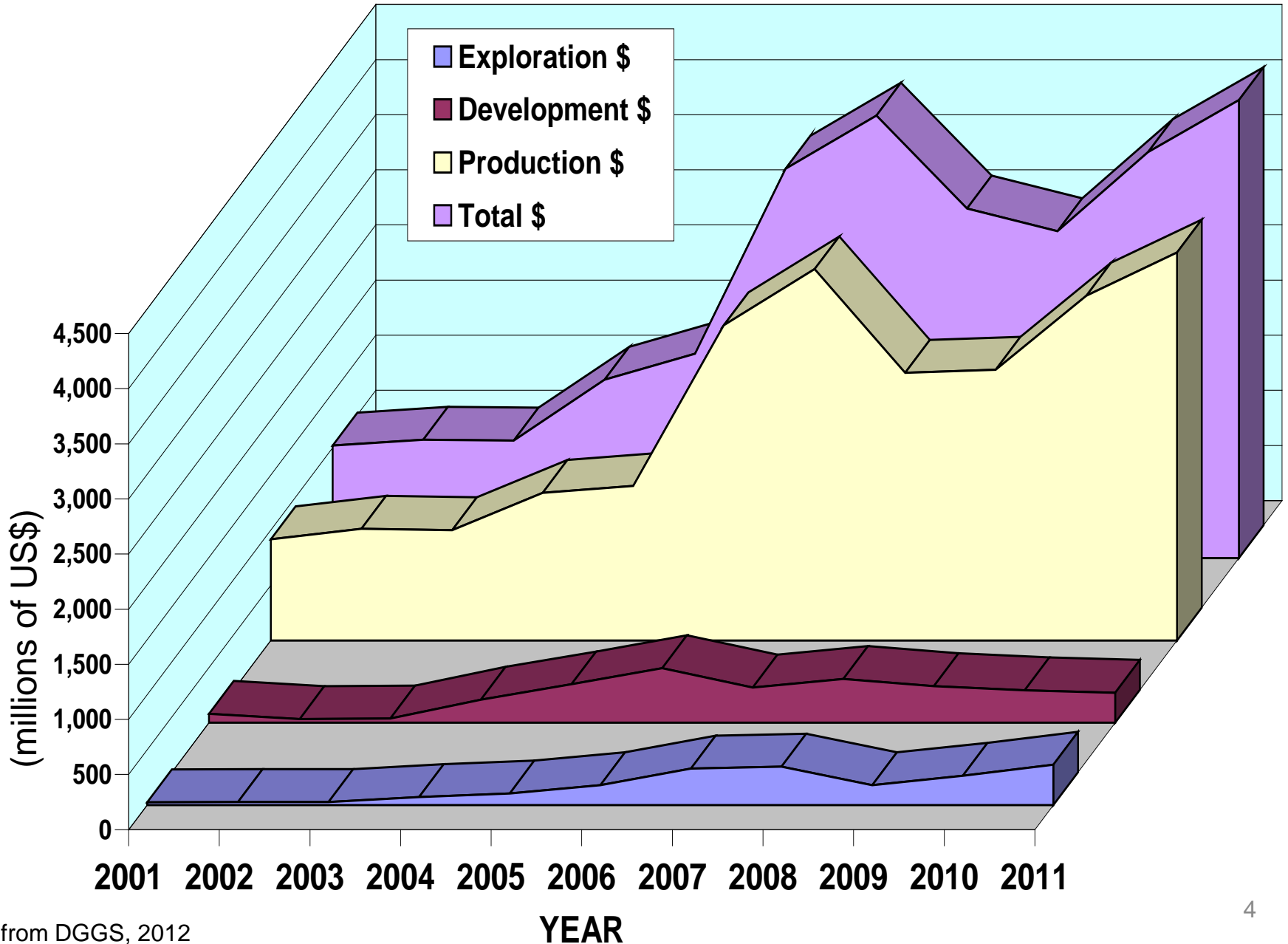


Mineralization Traverses Most of Alaska
The “Prize is Hidden in the Details”

U.S. Import Reliance for Minerals & Mineral Materials As a Percentage of Import



ALASKA MINERAL INDUSTRY VALUE



State of Alaska

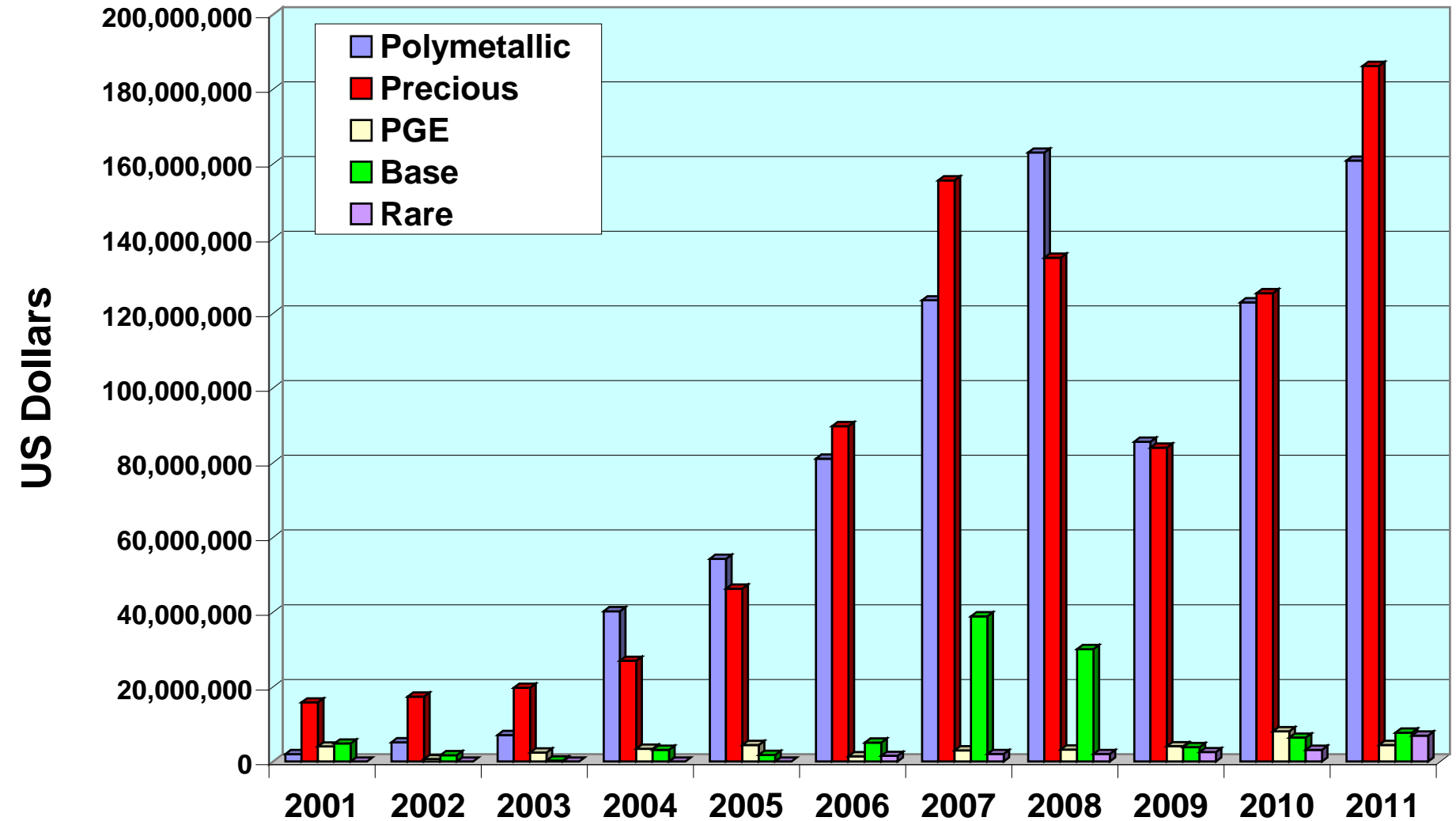
Recent Mining Activity - Exploration



2011 mineral exploration investment in Alaska totaled \$365 million - accounting for about one-third of the total spent on exploration in the U.S. 2012 expenditures are projected to be lower

- Advanced exploration projects:
 - *Pebble*: ~ 80.6 billion pounds of copper, 107.4 million ounces of gold, and 5.6 billion pounds of molybdenum
 - *Donlin*: ~ 45 million ounces of gold
 - *Money Knob*: ~20.6 million ounces of gold
 - *Niblack*: ~ 9.1 million tonnes of polymetallic (copper, gold, silver, and zinc) VMS
 - *Bokan*: 69 million pounds TREO
- 43 exploration projects active in 2012
- Commodities of interest include gold, base metals, PGEs, REEs, graphite, iron and titanium
- Nome offshore exploration renewed in 2012

ALASKAN EXPLORATION BY COMMODITY



Facilitating Mineral Exploration in Alaska

Alaska Geophysical/Geological Mineral Inventory Program

1993-Present:

Goal: Evaluate 40 million acres of State land with high mineral potential

\$14.3 Million - airborne geophysical surveys & geologic mapping

12.8 Million acres of geophysical surveys flown (including FY13)

5.5 Million acres of geologic mapping conducted

Strategic & Critical Minerals Project

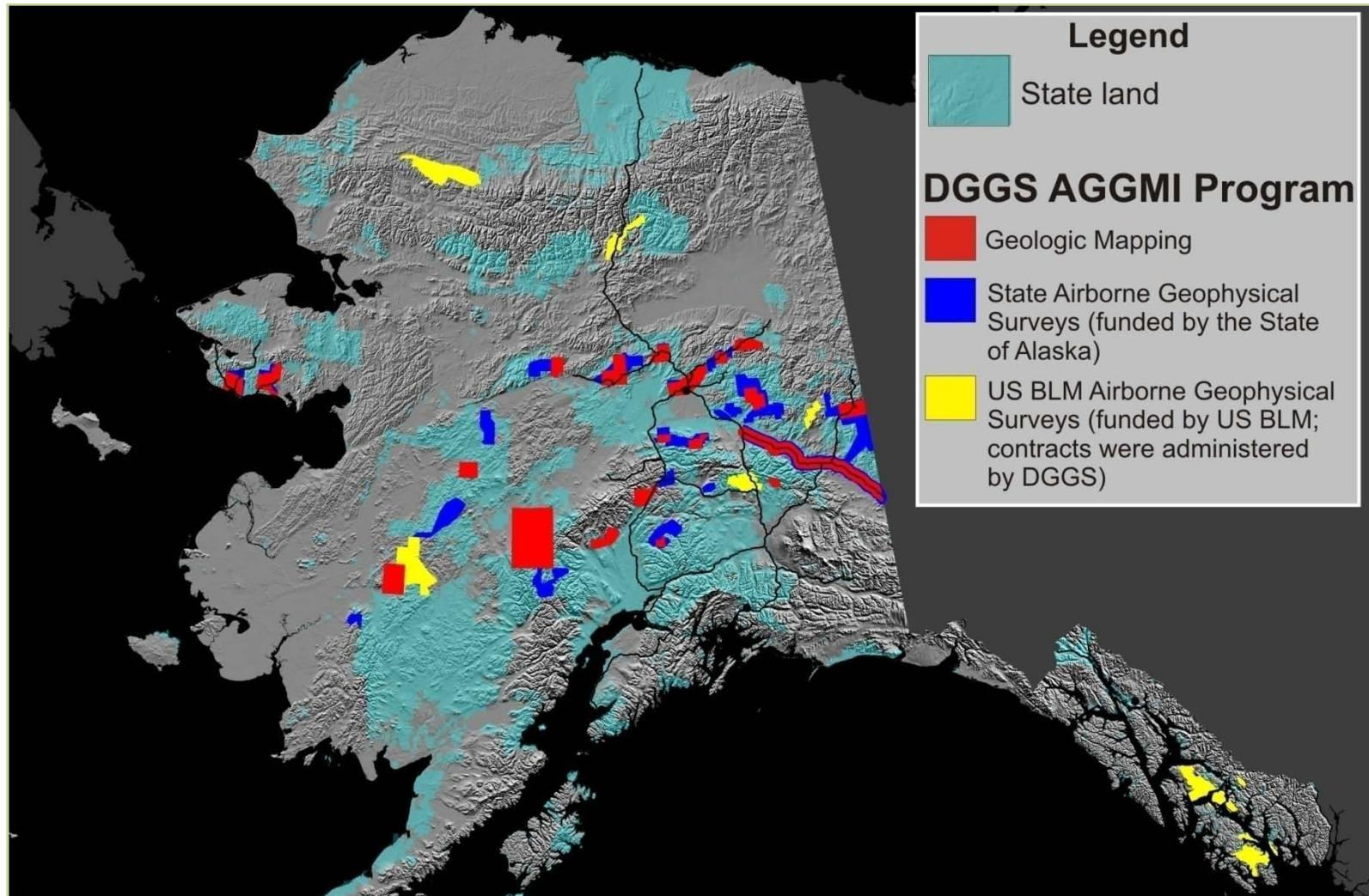
Goal: Assess and document Strategic & Critical Minerals in Alaska

\$498,000 Capital Improvement Project (FY12)

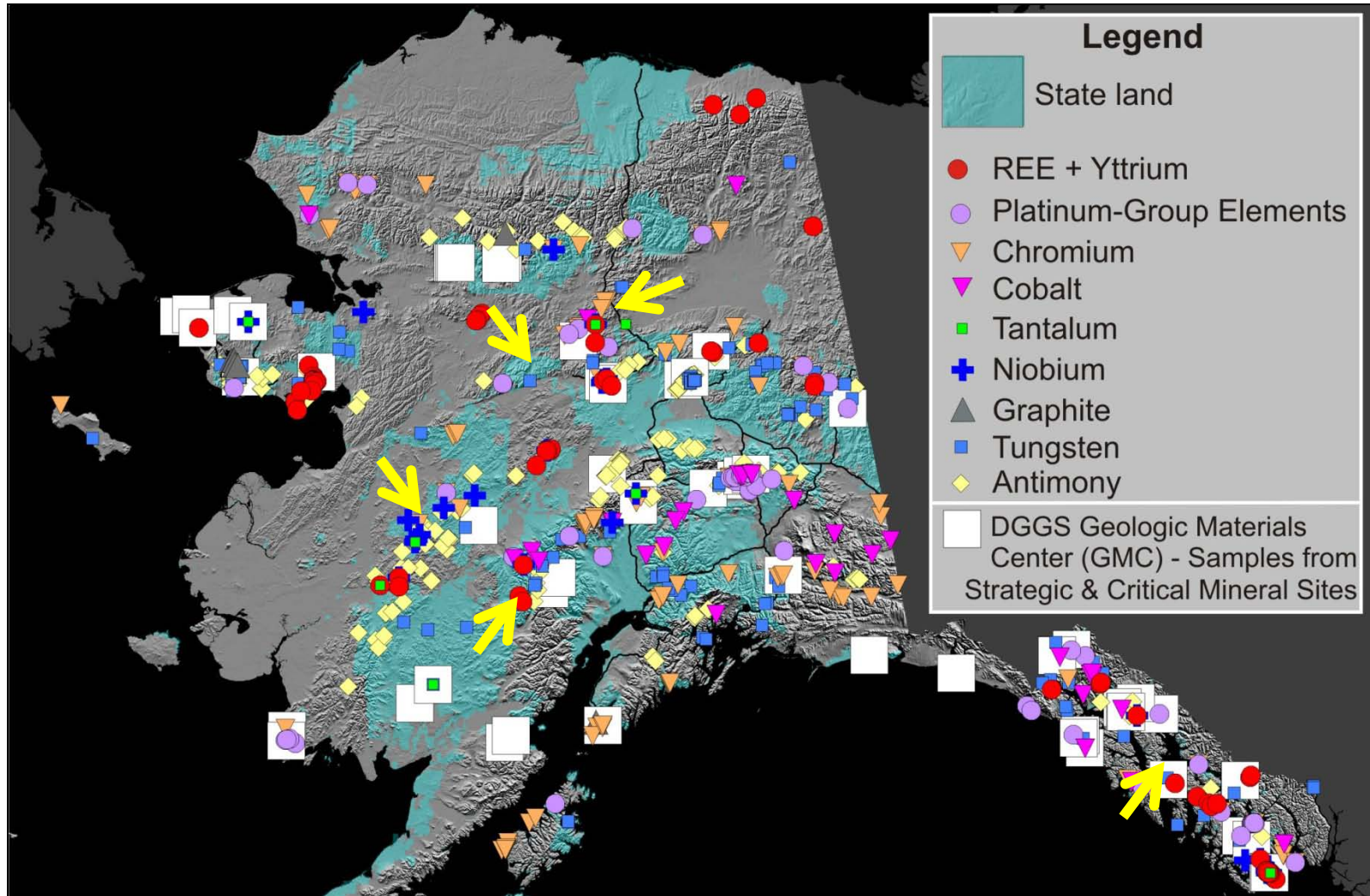
\$2,730,000 Capital Improvement Project (FY13)

\$2,745,000 CIP funds requested in Governor's budget (FY14)

DGGS Airborne Geophysical/Geological Mineral Inventory (AGGMI) Program:



Alaska's Strategic & Critical Minerals Assessment



New DGGS Farewell Geophysical Survey

Rare-Earth Elements

Mafic/Ultramafic-related Cu,
Ni, PGE

Epithermal/Hot Springs

Plutonic-related gold

- Hypabyssal

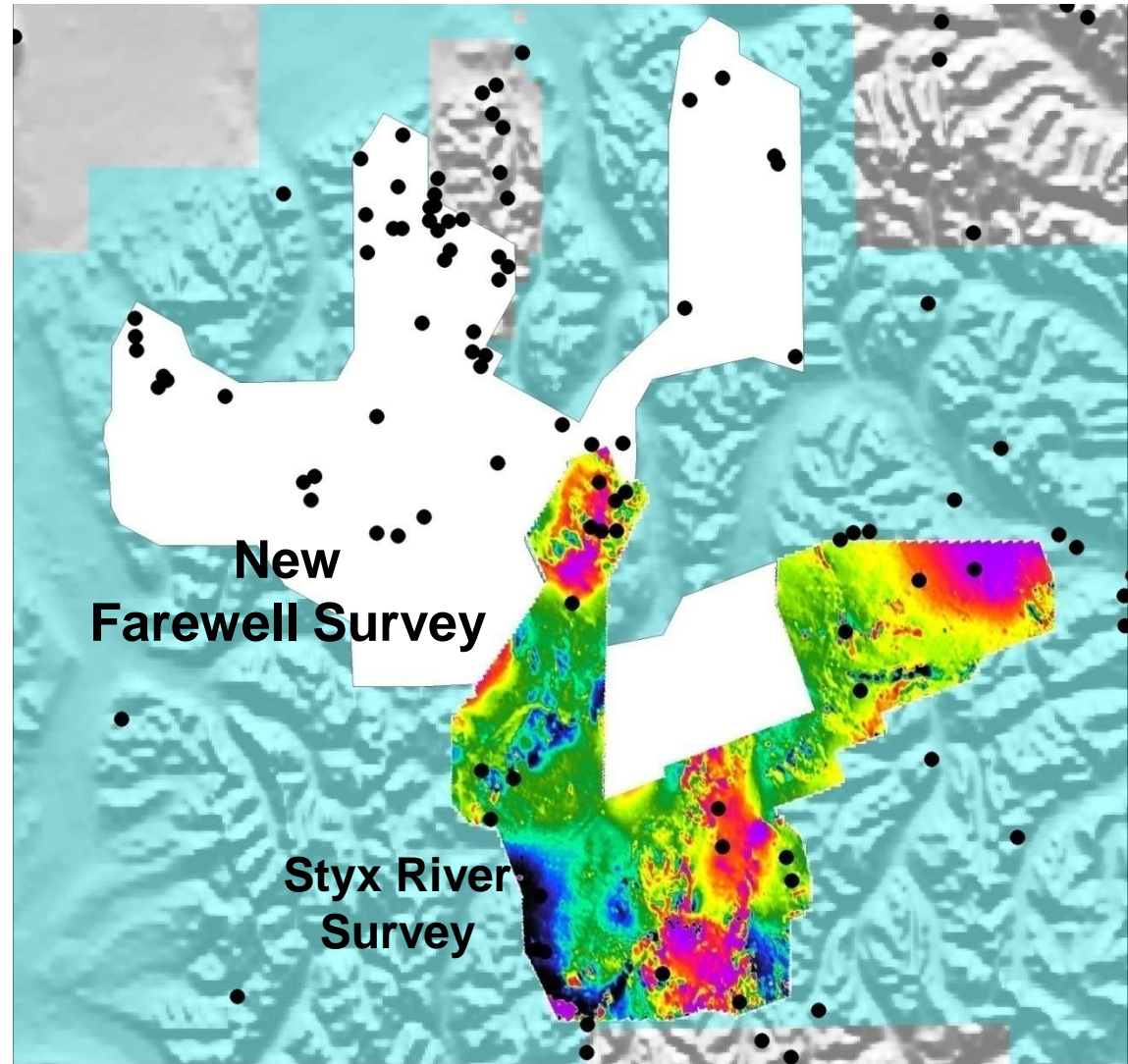
- Porphyry Cu \pm Mo \pm Au

- Skarn

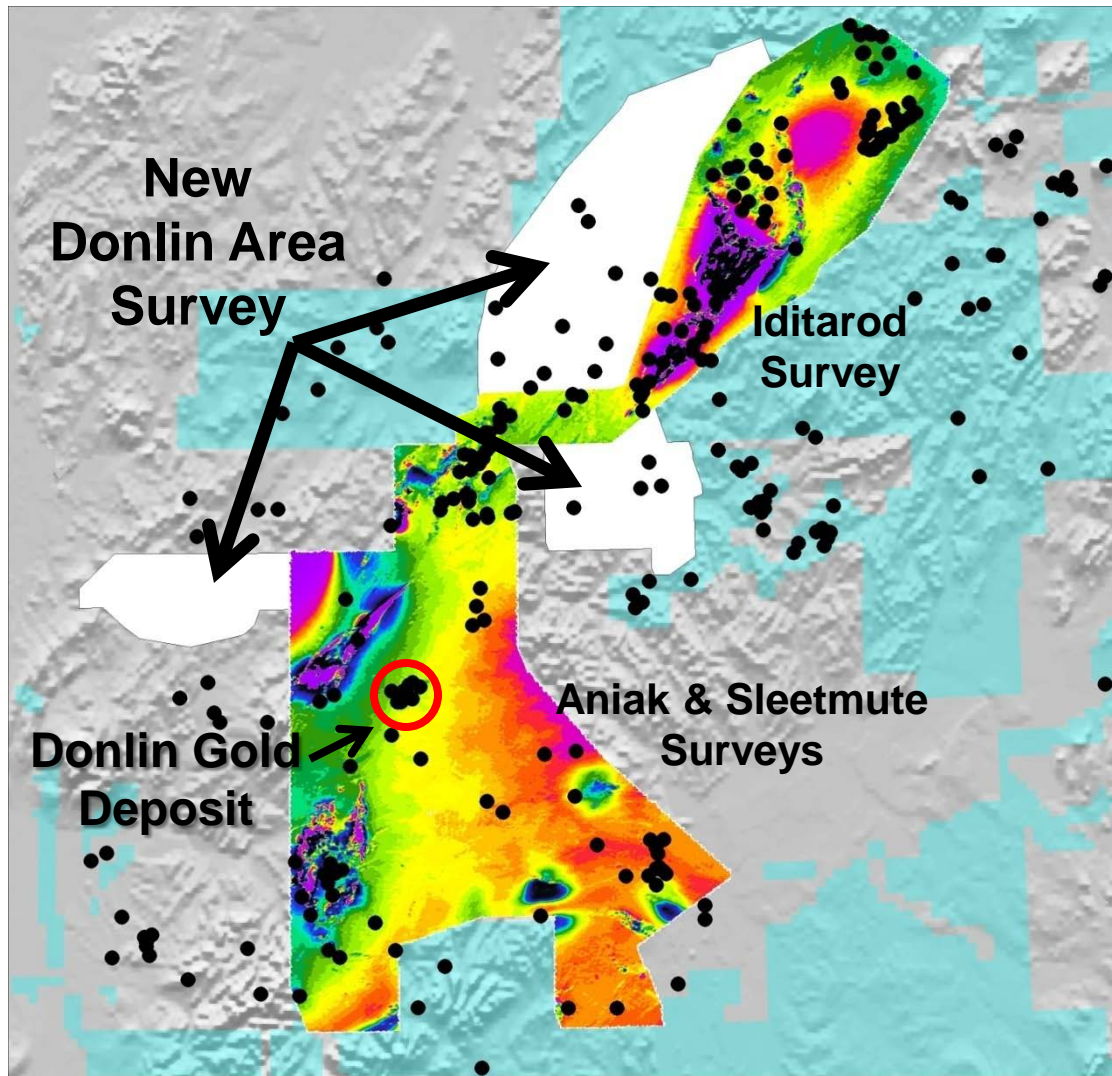
Polymetallic veins of
uncertain origin

Sediment-hosted base metals

Placer gold



New Donlin-Area Geophysical Survey



Epithermal/Hot Springs

Plutonic-related gold

-Hypabyssal

-Plutonic

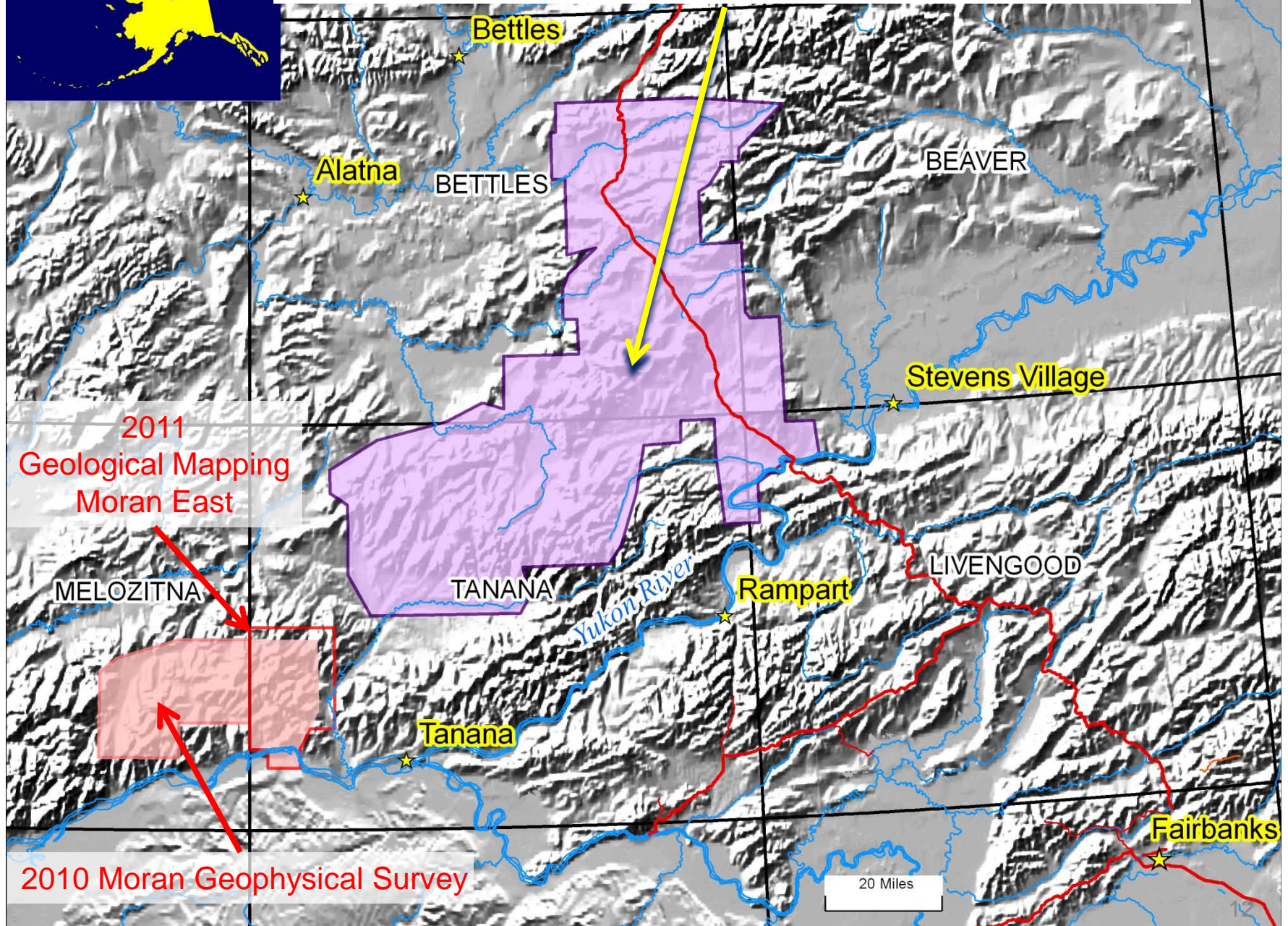
-Hornfels/Skarn

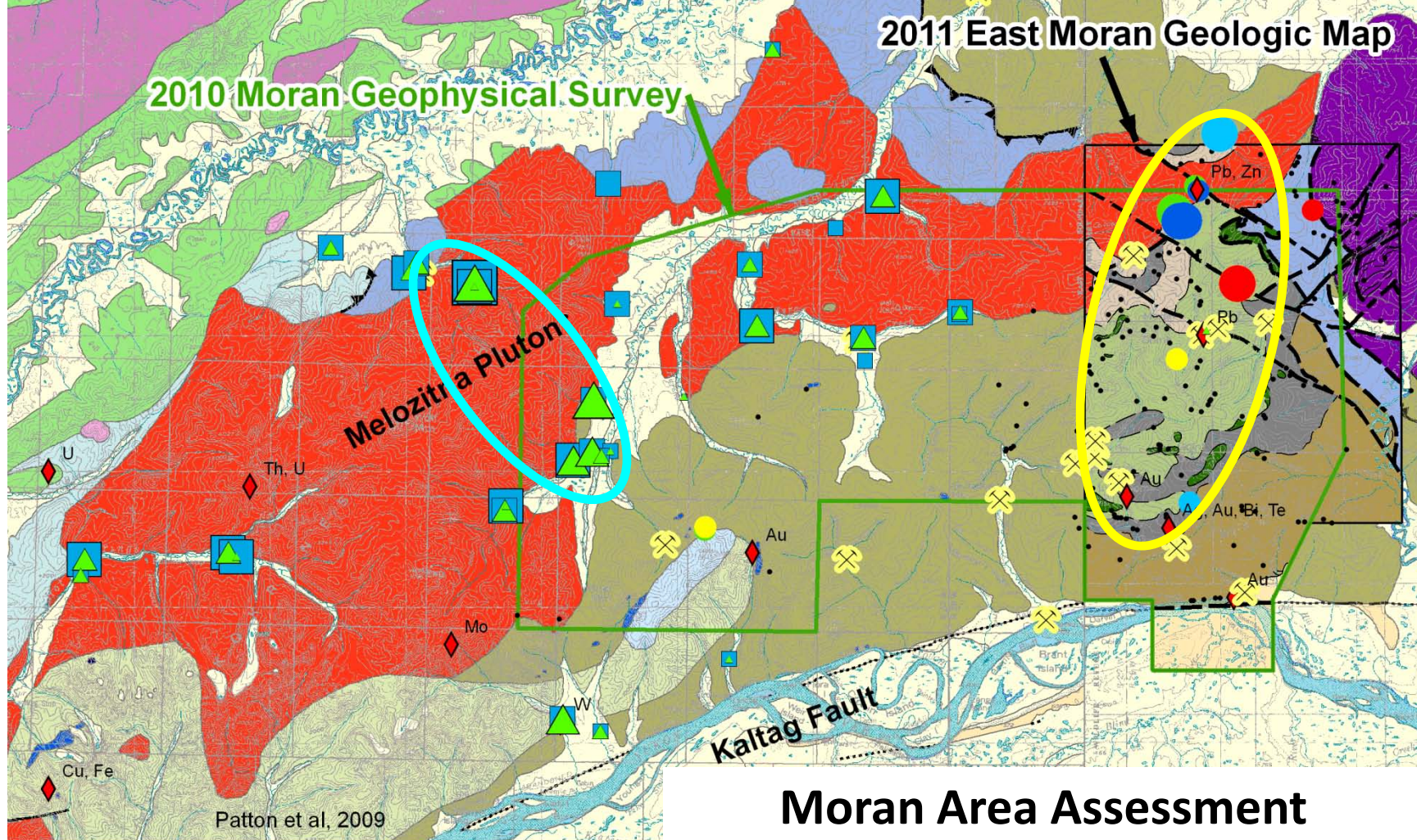
**Polymetallic veins of
uncertain origin**

**Mafic/Ultramafic-related
Cr, Ni**

Placer gold

Ray Mountains Assessment





Moran Area Assessment

ARDF Mineral Localities

◆ Lode Occurrences

⊗ Placer Au ± Sn

5

Miles



2011 West Moran REE Recon DGGs RDF 2012-3

**Total REE (ppm)
Pan Concentrate**

- ▲ < 842
- ▲ 842 - 2422
- ▲ 2422 - 3866
- ▲ 3866 - 7727
- ▲ 7727 - 28850

**Total REE (ppm)
Stream Sediment**

- < 130
- 130 - 367
- 367 - 644
- 644 - 1123
- 1123 - 4141

2011 East Moran Rock Geochemistry DGGs RDF 2011-4

Au (ppm)

- 0.1 - 1.0
- 1.0 - 22.3

As (ppm)

- 1001 - 10000
- 10000 - 18050

Sn (ppm)

- 101 - 500
- 501 - 743

W (ppm)

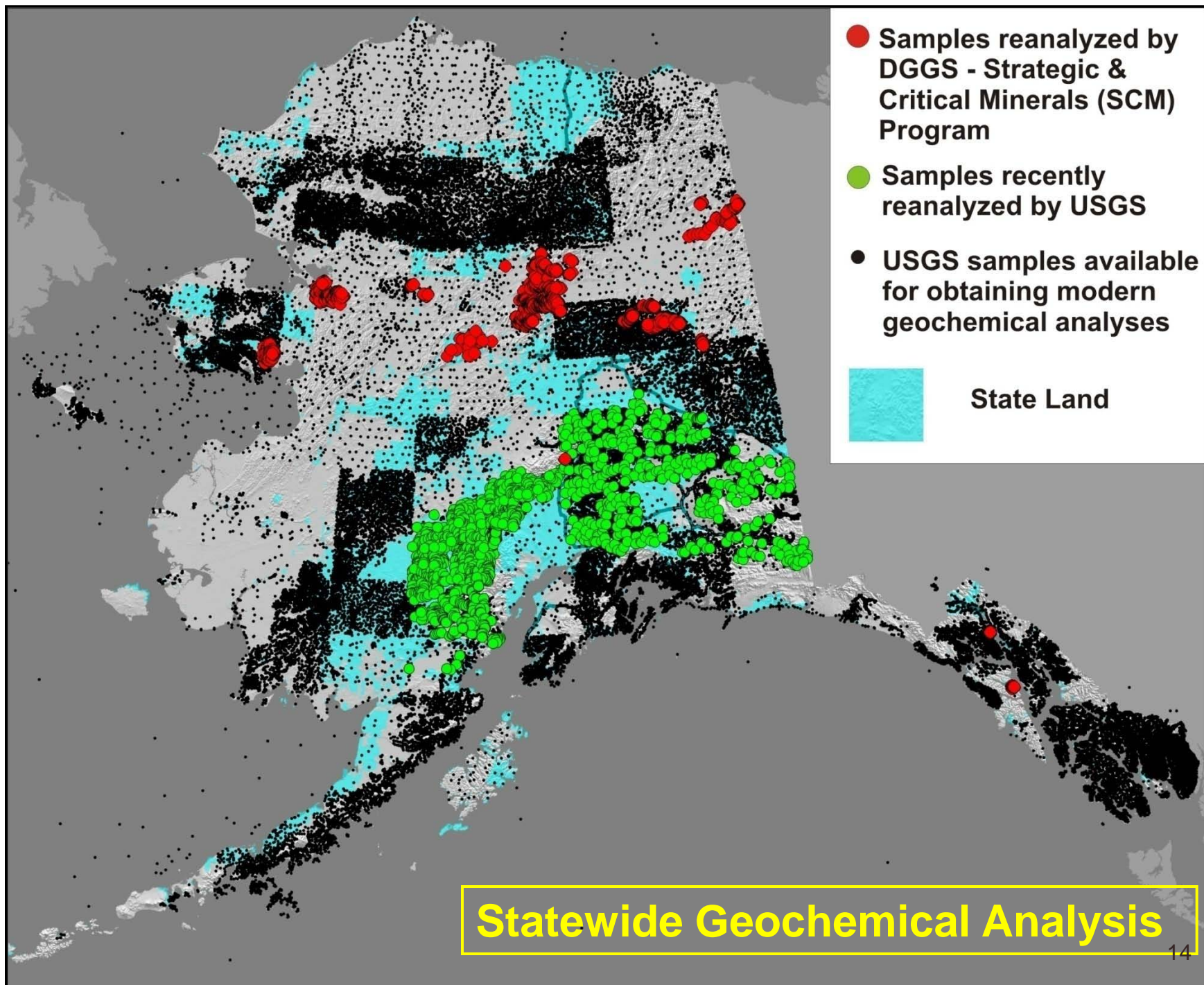
- 281 - 760
- 761 - 8960

Pb (ppm)

- 801 - 2300
- 2301 - 8760

Zn (ppm)

- 1001 - 5000
- 5001 - 49700



Strategic & Critical Minerals (SCM) Assessment

Summary of Assessment Milestones to date:

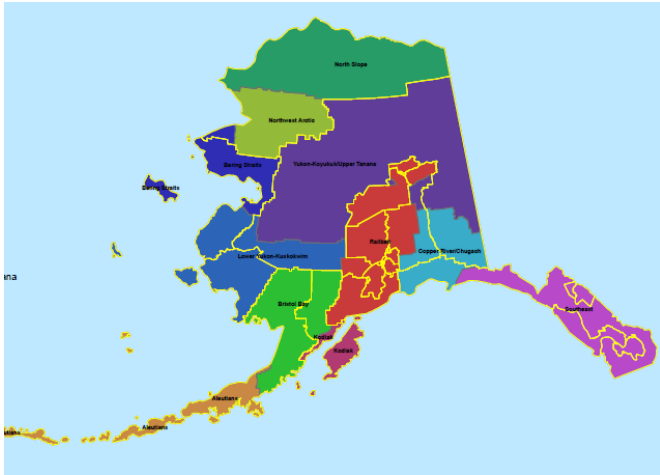
- 3,500-square-mile field project in the Ray Mountains-Dalton Highway
- 2,075-square-mile SCM-related airborne geophysical surveys
- Compiled historic geochemical data for more than 5,387 analyses
- Donations of 2 privately held SCM-related databases
- Modern geochemical analyses for 1,209 historic U.S.B.M samples
- Comprehensive geochemical sampling in the Western Moran area
 - Documented new gold-REE bearing stream drainages
- Discovered new lode gold occurrence near William Henry Bay, SE Alaska
- MOU with USGS for modern chemical analyses of sample databases
- Supporting graduate thesis work at UAF
- Evaluating State-selected land for SCM potential
- Scanning and making historic databases and reports available online

Strategic & Critical Minerals (SCM) Assessment

Future Work Plans:

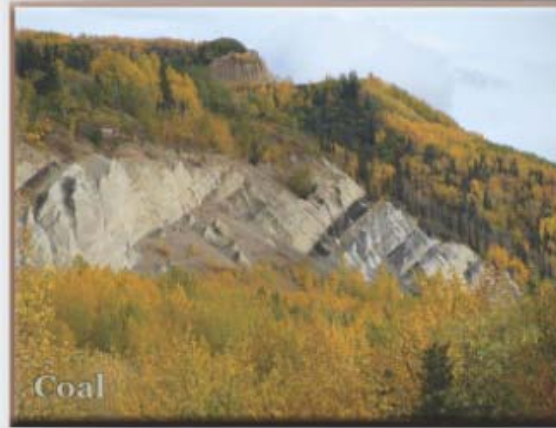
- ✓ Continue focus in areas of mineral entry and highest potential
- ✓ Perform high resolution geologic mapping and geochemical sampling
- ✓ Acquire and distribute high-resolution geophysics
- ✓ Continue compiling digital database of all available information
- ✓ Finalize modern geochemical analyses of archived samples
- ✓ Publish results and make all data available on the web (free access)

Summary of available information on fossil fuel and geothermal energy in Alaska



Available for Download

www.dggs.alaska.gov

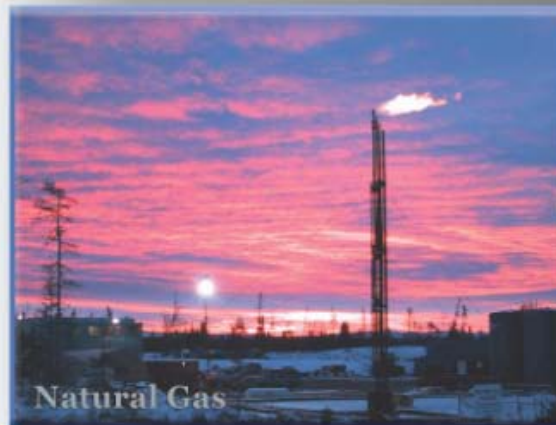


FOSSIL FUEL AND GEOTHERMAL ENERGY SOURCES FOR LOCAL USE IN ALASKA: Summary of Available Information

edited by
Robert F. Swenson
Marwan A. Wartes
David L. LePain
James G. Clough



Special Report 66



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DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

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rock
drill core

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Step 2. Select an Analysis Type:
(press Ctrl and left mouse button to select multiple analysis types)
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rare earth element
major oxide, minor oxide, and trace element

You have selected major oxide, minor oxide, and trace element analysis type

Step 3 (cont'd). Project

Select a Project: Salcha River-Pogo

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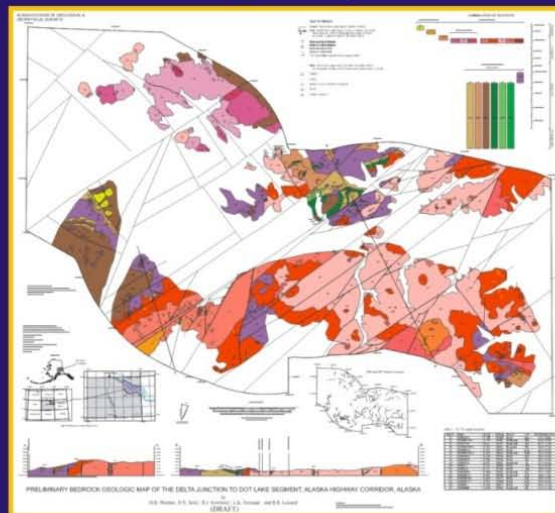
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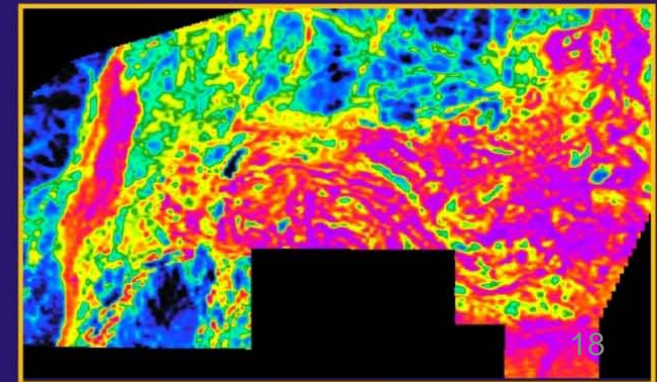
Geologic Maps



Geochemistry

A screenshot of a geochemistry data table. The table has multiple columns, including "Sample ID", "Element", "Concentration", "Unit", "Analysis Type", "Date", "Location", "Project", "Comments", and "Remarks". The table contains data for various samples, including "140-001", "140-002", "140-003", "140-004", "140-005", "140-006", "140-007", "140-008", "140-009", "140-010", "140-011", "140-012", "140-013", "140-014", "140-015", "140-016", "140-017", "140-018", "140-019", "140-020", "140-021", "140-022", "140-023", "140-024", "140-025", "140-026", "140-027", "140-028", "140-029", "140-030", "140-031", "140-032", "140-033", "140-034", "140-035", "140-036", "140-037", "140-038", "140-039", "140-040", "140-041", "140-042", "140-043", "140-044", "140-045", "140-046", "140-047", "140-048", "140-049", "140-050", "140-051", "140-052", "140-053", "140-054", "140-055", "140-056", "140-057", "140-058", "140-059", "140-060", "140-061", "140-062", "140-063", "140-064", "140-065", "140-066", "140-067", "140-068", "140-069", "140-070", "140-071", "140-072", "140-073", "140-074", "140-075", "140-076", "140-077", "140-078", "140-079", "140-080", "140-081", "140-082", "140-083", "140-084", "140-085", "140-086", "140-087", "140-088", "140-089", "140-090", "140-091", "140-092", "140-093", "140-094", "140-095", "140-096", "140-097", "140-098", "140-099", "140-100".

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