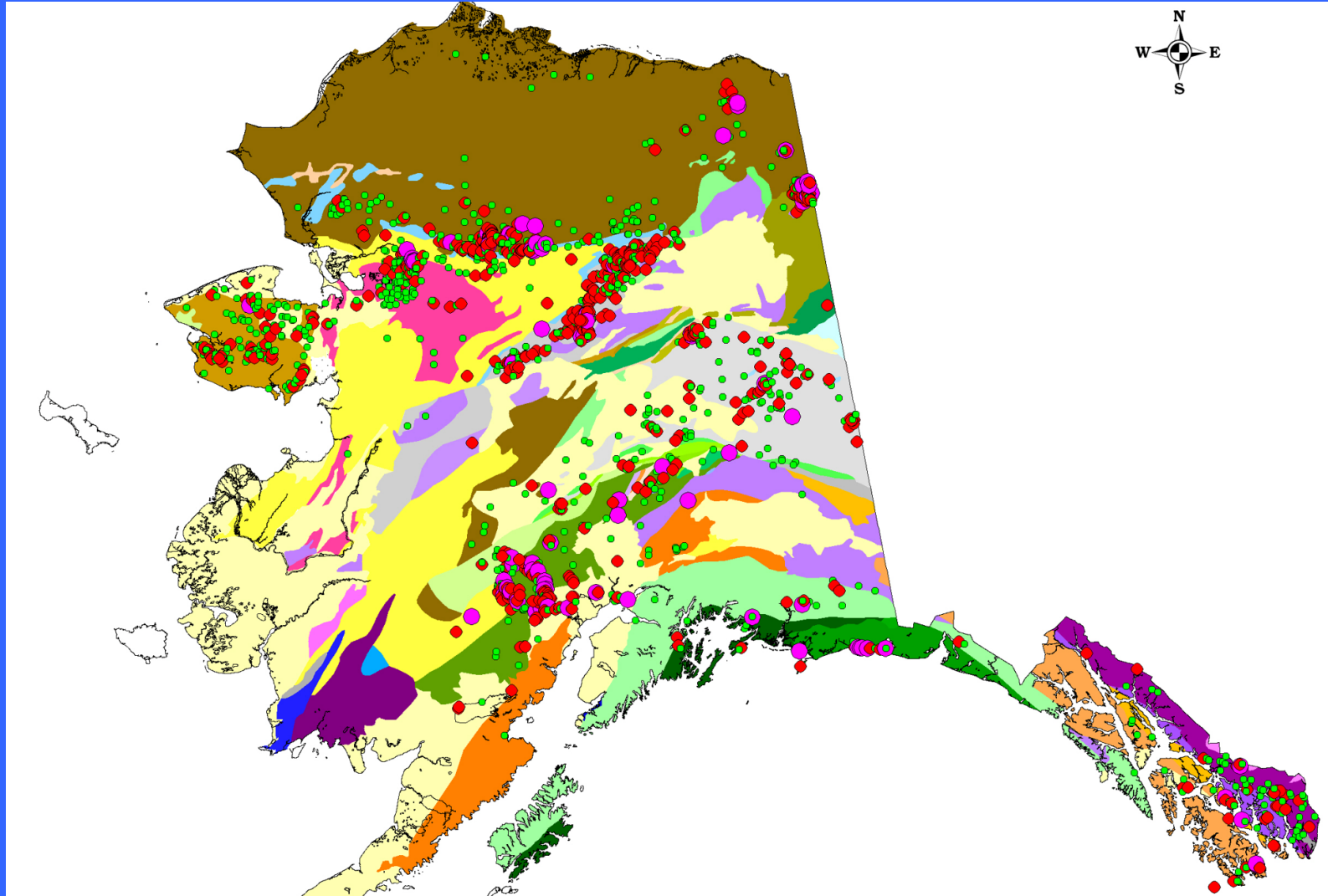


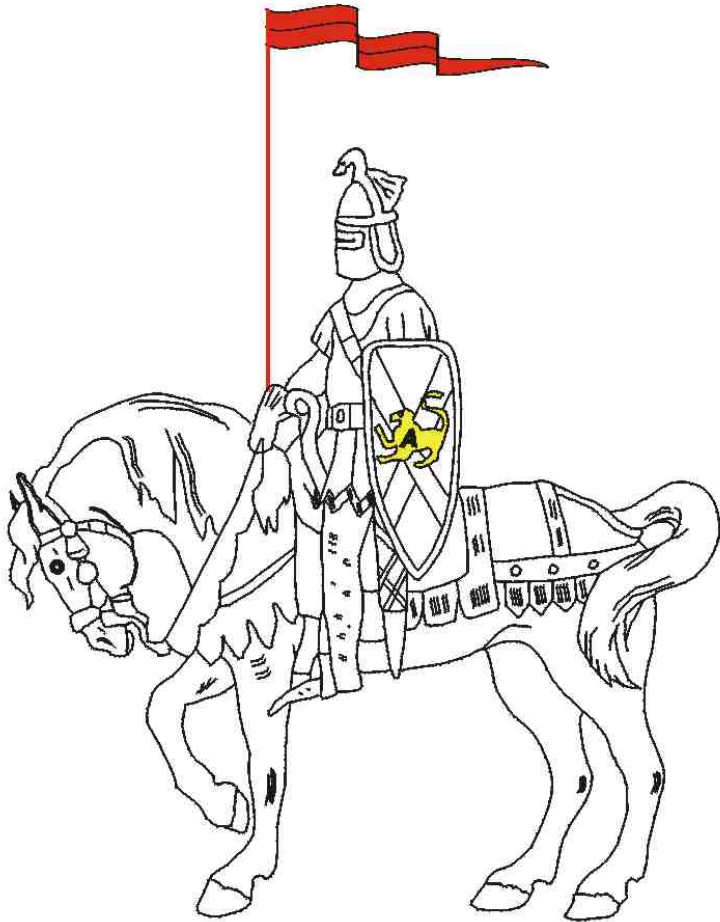
STRATEGIC AND CRITICAL METALS IN ALASKA



A MINING INDUSTRY PERSPECTIVE

Curt Freeman, Avalon Development Corp.

AVALON



DEVELOPMENT
CORPORATION

ACKNOWLEDGMENTS

My personal thanks to
my staff and to all of
the web sites
and publications from
which I shamelessly
boosted information
for this presentation

THE MAIN THING

IS TO KEEP

THE MAIN THING

THE MAIN THING

Steven Covey



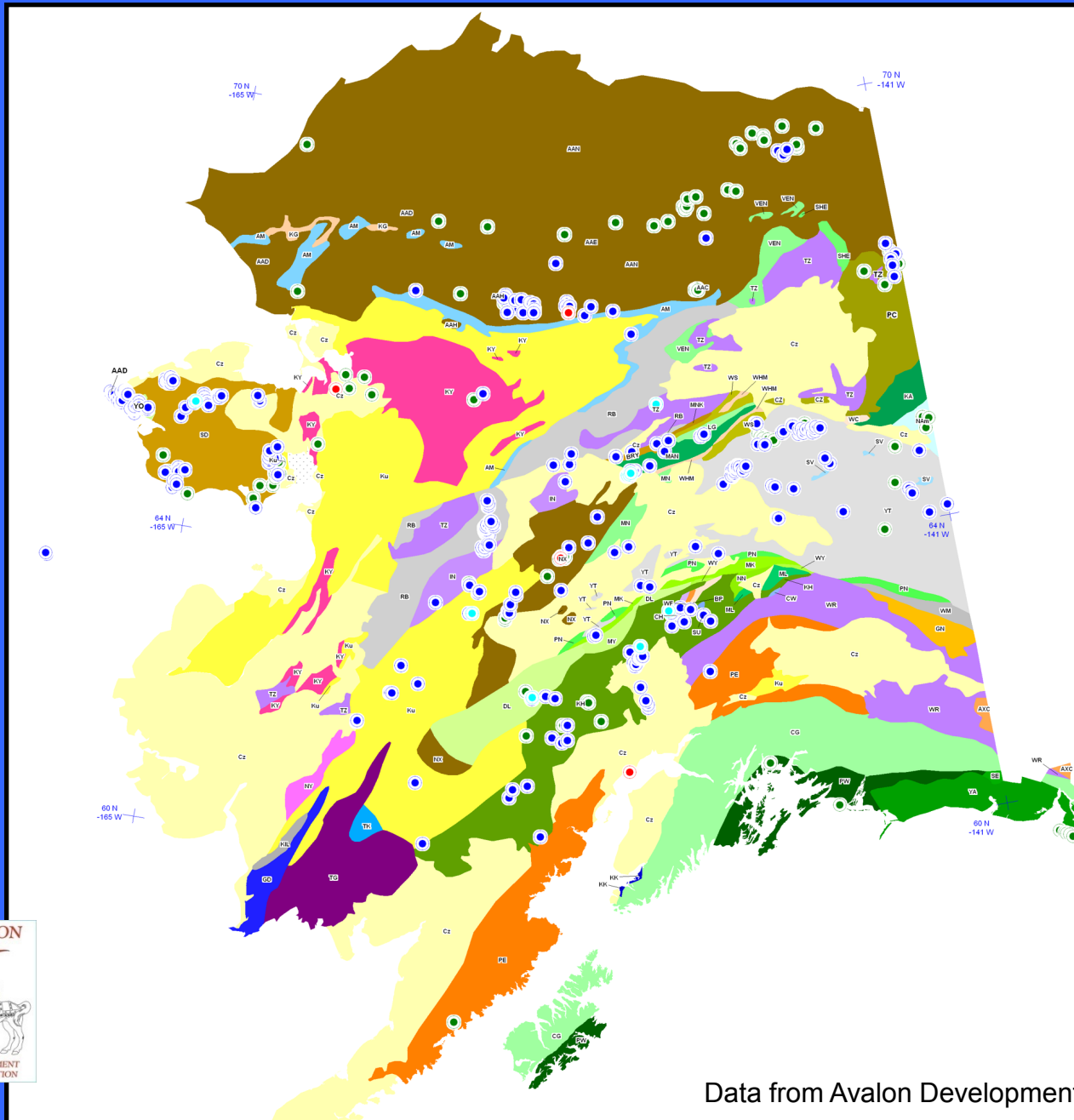
WHAT IS A STRATEGIC MINERAL?

A strategic mineral is a mineral that would be needed to supply the military, industrial, and essential civilian needs of the United States during a national emergency. Furthermore, strategic minerals are not found or produced in the United States in sufficient quantities to meet this need.

WHAT IS A CRITICAL MINERAL?

A critical mineral can be regarded as critical only if it performs an essential function for which few or no satisfactory substitutes exist. Examples include Rare Earths, Lithium, Platinum group elements, High purity quartz, Antimony, Rhenium, Beryllium, Tantalum, Cobalt, Tellurium, Niobium, Tungsten, Gallium, Yttrium, Germanium.

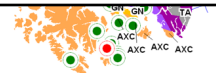
ALASKA IS GEOLOGICALLY PROSPECTIVE



Element	# of Prospects
Gold	4,568
Tungsten	531
Molybdenum	499
Mercury	347
Sn-Ta-Nb	332
Chromium	264
Bismuth	198
REE	156
U-Th	155
Cobalt	142
Thallium	111
Beryllium	55
Vanadium	39
Tellurium	29
Indium	2
Scandium	2



Data from Avalon Development, 2012





ALASKA PLAYERS

- **REEs: Ucore Rare Metals at Bokan and Ray Mountains project; Contango ORE at Salmon Bay and Stone Rock Bay**
- **PGEs: Pure Nickel at MAN and Salt Chuck; Pacific North West at Tonsina**
- **Graphite: Graphite One at Graphite Creek**
- **Other: Arrowstar at Snettisham (Ti); Teck at Red Dog (In); NovaCopper at Bornite (Co); Ucore at Ray Mts. (Sn)**

***YOU CAN AVOID REALITY
BUT YOU CAN'T AVOID THE
CONSEQUENCES OF
AVOIDING REALITY***

AYN RAND

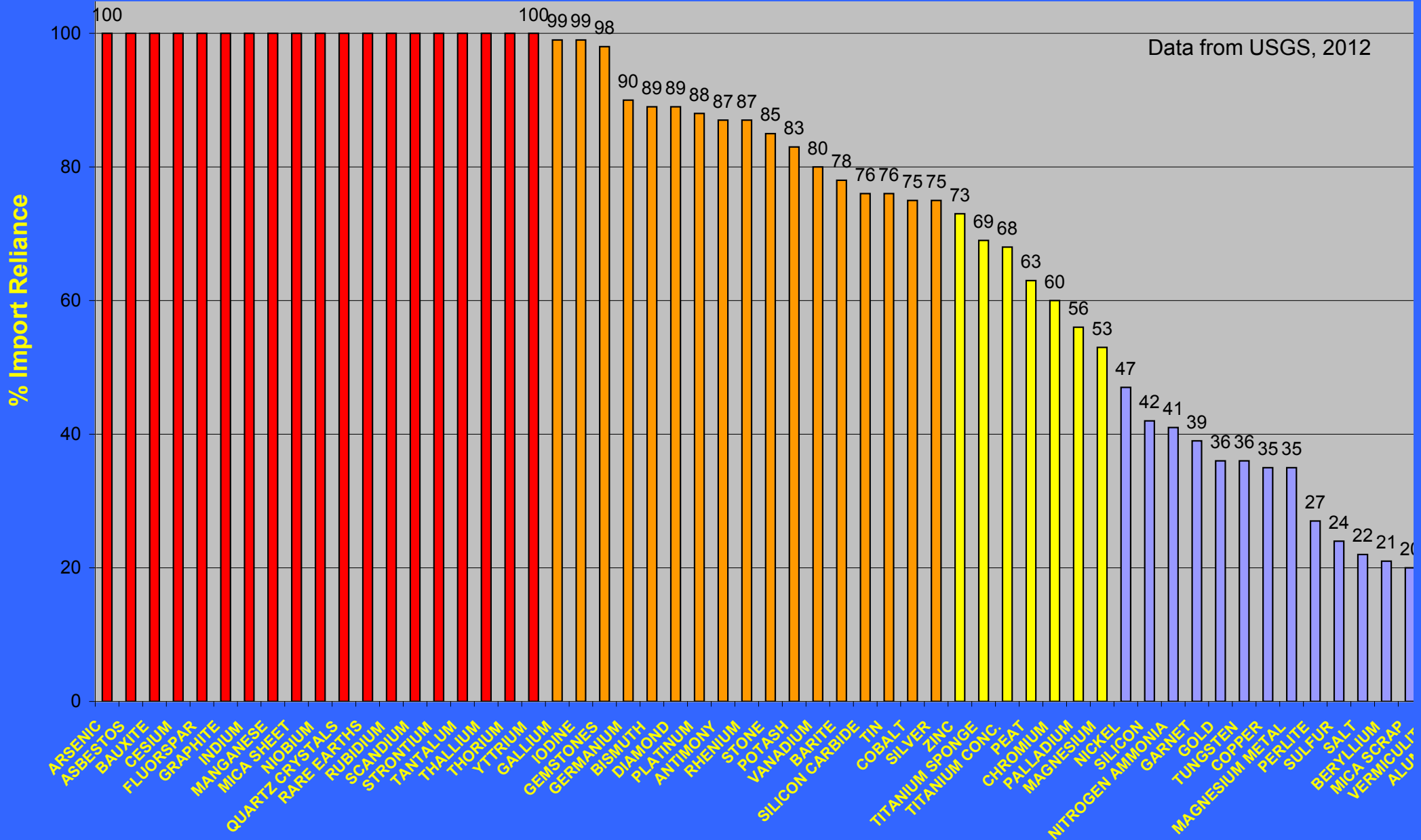


GLOBAL ECONOMIC CHALLENGES

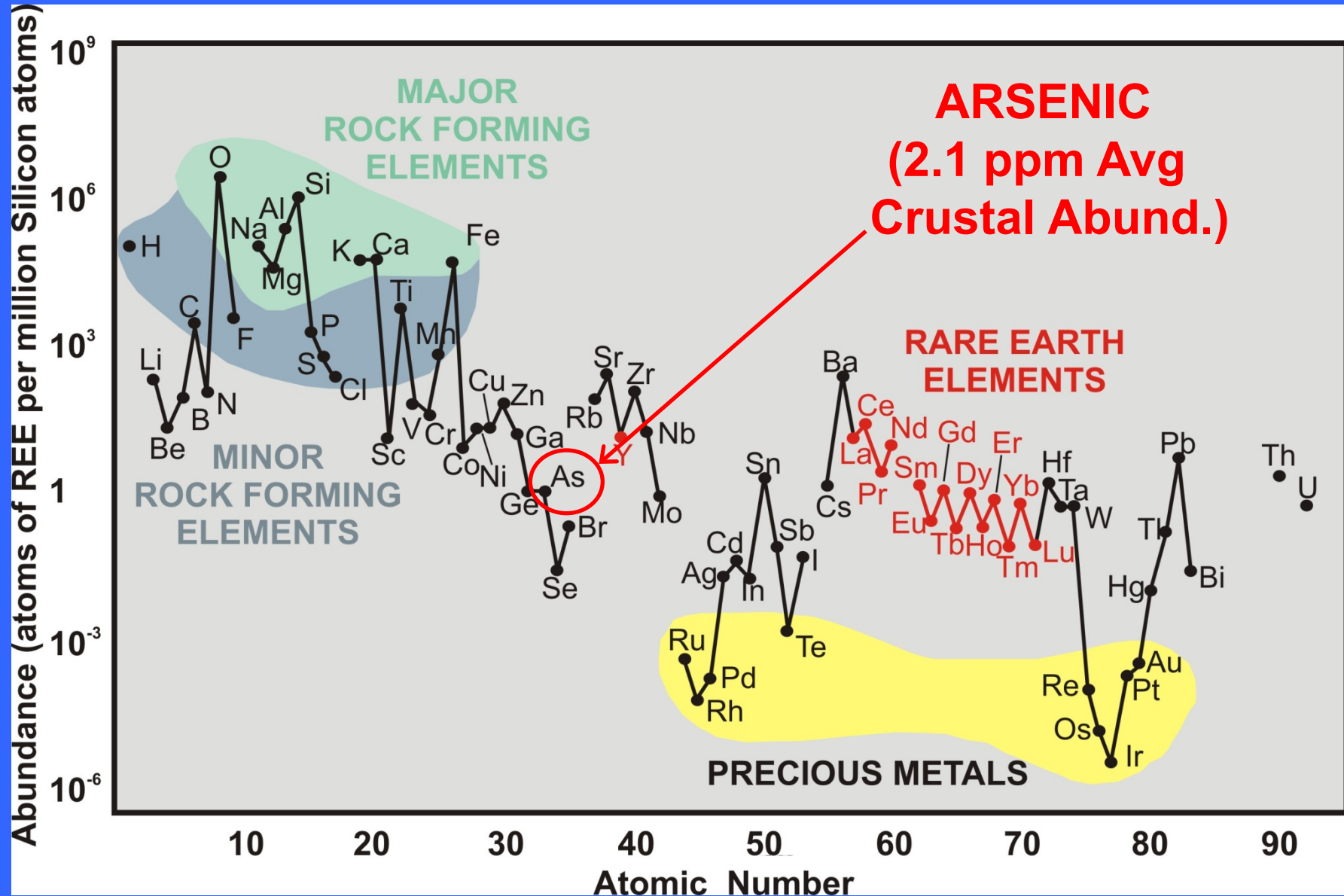
- **The small volumes of strategic/critical minerals utilized make them extremely price sensitive**
- **New producers need to “steal” a reliable, long-term buyer from existing producers**
- **Long-term buyers require fixed price schedules, but operating costs are variable**
- **Monopolies/oligopolies often drive out marginal producers by over-supplying the market until competition is eliminated**

U.S. IMPORT RELIANCE – 2011

Data from USGS, 2012



THE CASE FOR ARSENIC



WHO WANTS TO PRODUCE?

- **The U.S. imports 100% of the arsenic it uses for domestic purposes (~4,000 tpy)**
- **Arsenic is not rare from a crustal abundance standpoint, nor does it have a high unit value in the market place (\$1.75/kg)**
- **Arsenic is a common waste by-product in a number of ore deposit types mined in the U.S.**
- **The cost:benefit ratio of recovering arsenic from an arsenic-rich deposit is too high in the U.S. (and many other countries)**

ALASKA-CENTRIC CHALLENGES

- **Alaska's limited access, infrastructure and energy systems require higher unit value ore to make projects cost competitive**
- **Alaska's higher environmental standards will increase costs and the time it takes to move from discovery to production**
- **Much of the most prospective geology for strategic and critical minerals in Alaska is closed to mineral entry**

ROY CREEK GEOCHEM

		Elemental Avg, PPM	Oxide Equivalent	Conversion	PPM Oxide	% REO + Y ₂ O ₃
L I G H T	La	46,800	La ₂ O ₃	.85	55,000	24.7
	Ce	79,600	CeO ₃	.90	89,450	39.6
	Pr	5,800	Pr ₆ O ₁₁	.83	10,600	4.8
	Nd	27,700	Nd ₂ O ₃	.86	32,210	14.4
	Sm	4,500	Sm ₂ O ₃	.86	5,230	2.3
	Eu	1,080	Eu ₂ O ₃	.86	1,260	0.6
H E A V Y	Gd	4,580	Gd ₂ O ₃	.87	5,260	2.3
	Tb	524	Tb ₄ O ₇	.85	616	0.3
	Dy	2,490	Dy ₂ O ₃	.87	2,860	1.3
	Ho	450	Ho ₂ O ₃	.87	517	0.2
	Er	1,100	Er ₂ O ₃	.84	1,310	0.6
	Tm	129	Tm ₂ O ₃	.88	150	0.1
	Yb	440	Yb ₂ O ₃	.88	500	0.2
	Lu	50	Lu ₂ O ₃	.88	60	Tr
	Y	15,000	Y ₂ O ₃	.79	18,987	8.5
Total REE+Y		193,251		Total	223,076	99.9



STRAT-CRIT CONCLUSIONS

- **Alaska's geology is highly prospective for a wide variety of strategic and critical minerals**
- **Prospects with high unit value rock will be preferentially targeted by industry**
- **Prospective districts with good access, infrastructure and energy systems will be preferentially targeted by industry**

IT WASN'T RAINING

WHEN NOAH BUILT

THE ARK

HOWARD RUFF



QUESTIONS?



Photo by Avalon Development Corp.