

IMDEX Inc.

# Entrepreneurial Exploration: Perspective, Perception and Perseverance

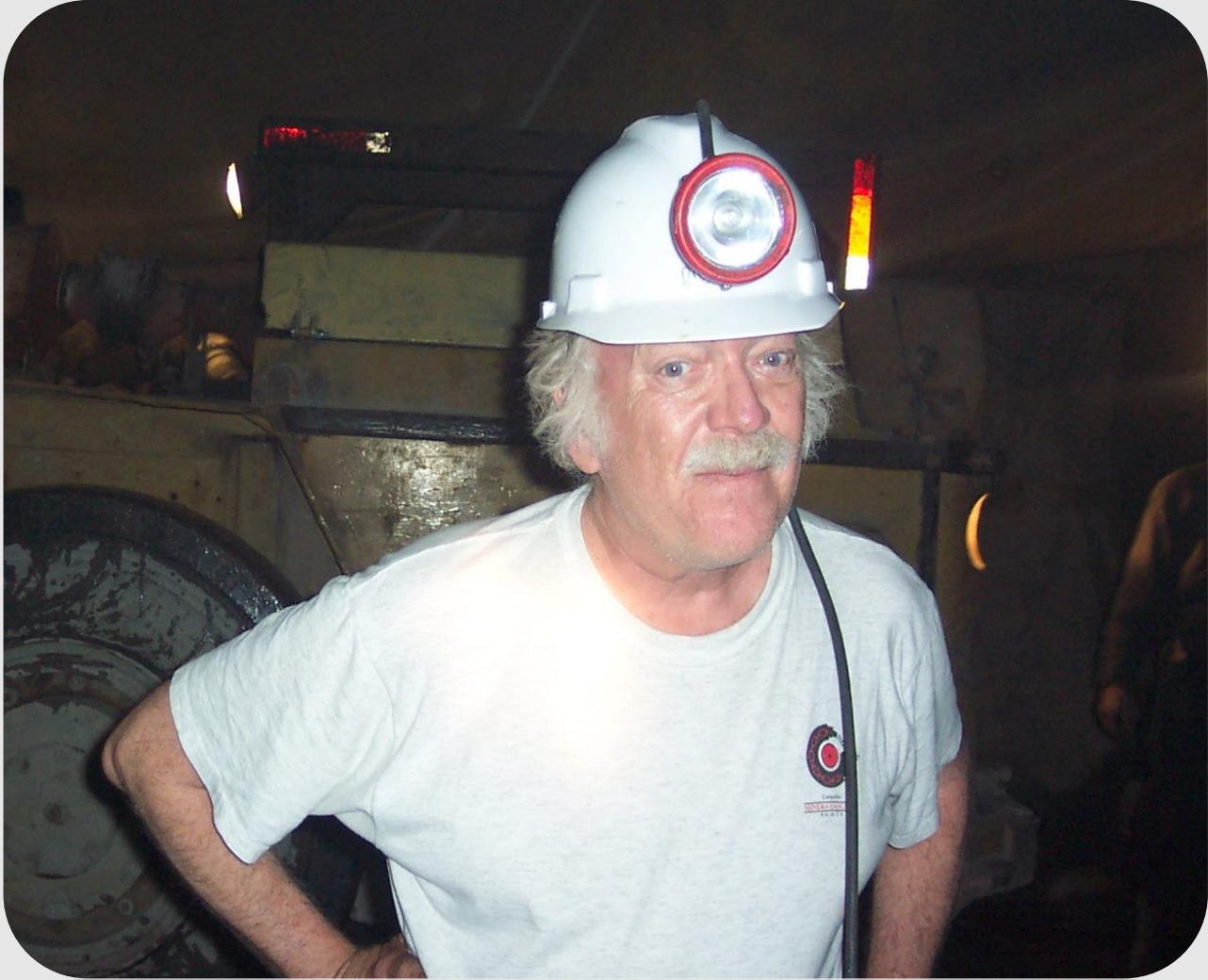


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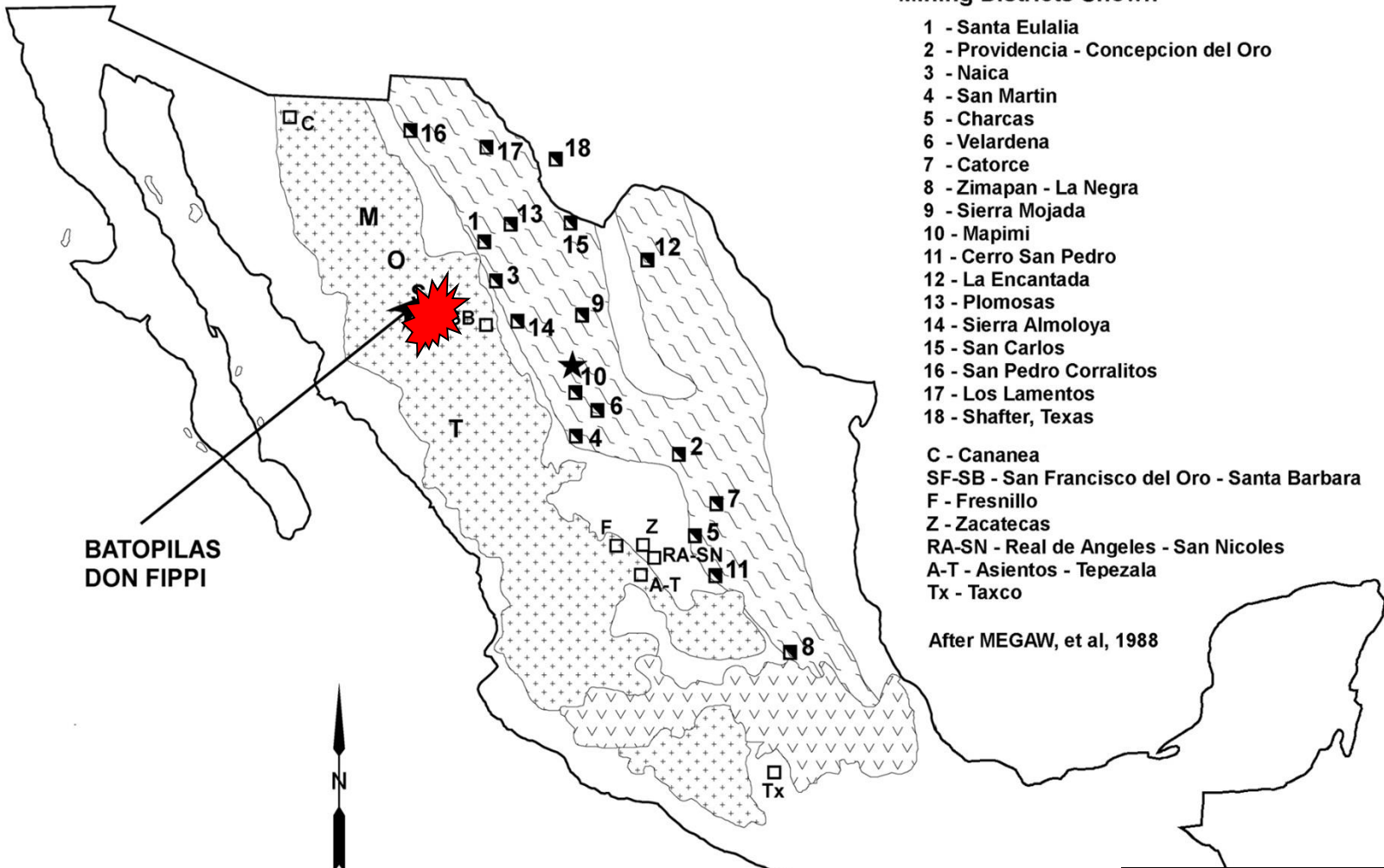
UTEP Entrepreneurial Geology Program  
El Paso, Texas  
October, 2017

**Peter K.M. Megaw**  
IMDEX Inc.  
Minera Cascabel S.A. de C.V.  
MAG Silver

# Dr. Phil Goodell: CEGS Founder



PATIENCE, BELIEF, **FUNDING**, PERSEVERANCE... REPEAT



**Mining Districts Shown**

- 1 - Santa Eulalia
- 2 - Providencia - Concepcion del Oro
- 3 - Naica
- 4 - San Martin
- 5 - Charcas
- 6 - Velardena
- 7 - Catorce
- 8 - Zimapan - La Negra
- 9 - Sierra Mojada
- 10 - Mapimi
- 11 - Cerro San Pedro
- 12 - La Encantada
- 13 - Plomosas
- 14 - Sierra Almoloya
- 15 - San Carlos
- 16 - San Pedro Corralitos
- 17 - Los Lamentos
- 18 - Shafter, Texas

- C - Cananea
- SF-SB - San Francisco del Oro - Santa Barbara
- F - Fresnillo
- Z - Zacatecas
- RA-SN - Real de Angeles - San Nicoles
- A-T - Asientos - Tepezala
- Tx - Taxco

After MEGAW, et al, 1988

**BATOPILAS  
DON FIPPI**

**BATOPILAS  
IN RELATION TO  
MEXICAN ORE  
DEPOSITS**

-  Trans - Mexico Volcanic Belt
-  Mexican Fold - Thrust Belt



# Batopilas Canyon Country 1993

M  
A



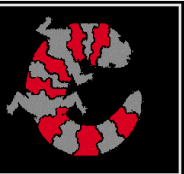
# BATOPILAS 1906:

## One Month's Bullion Shipment

M  
A  
G



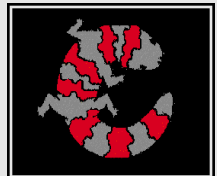
About 300,000 Ounces Fine Silver –  
Each Bar weighing 25 Kilos



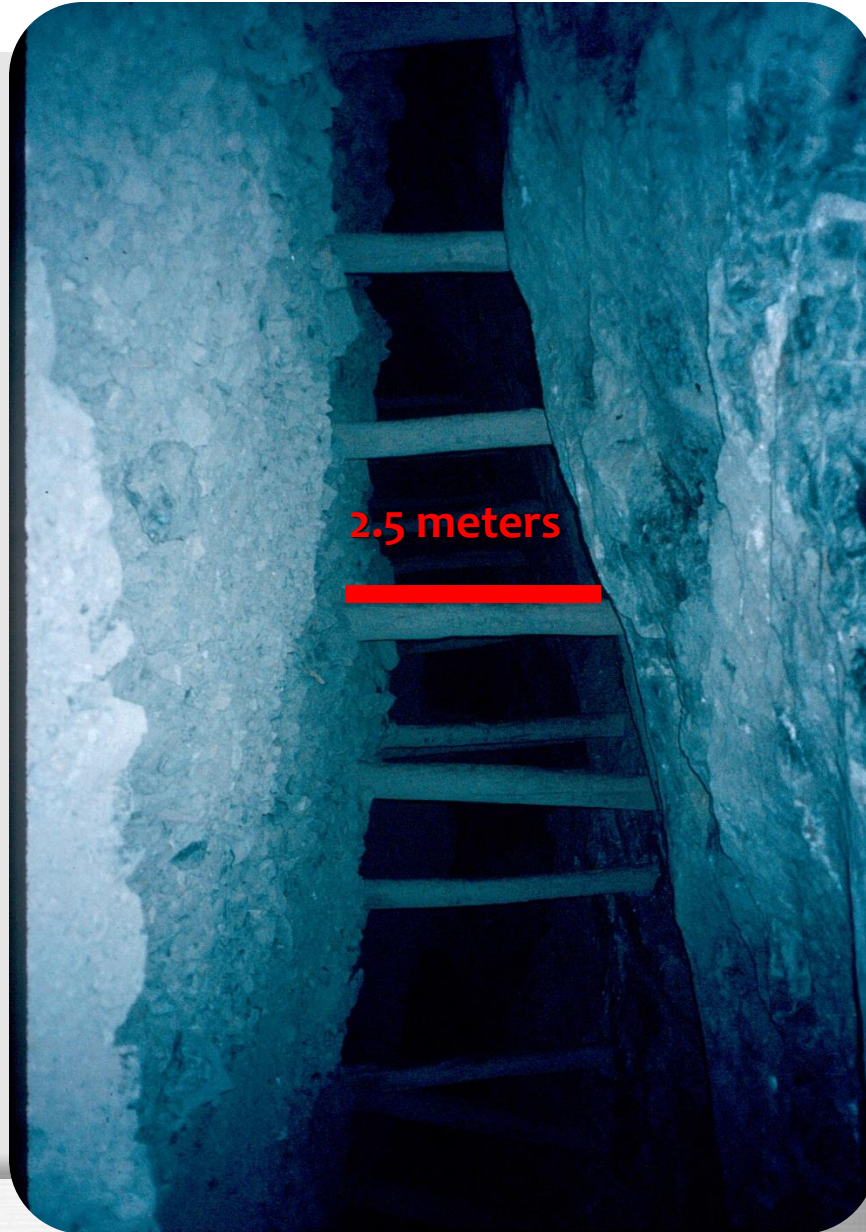
# Batopilas Veins on Surface



# Calcite Veins Underground

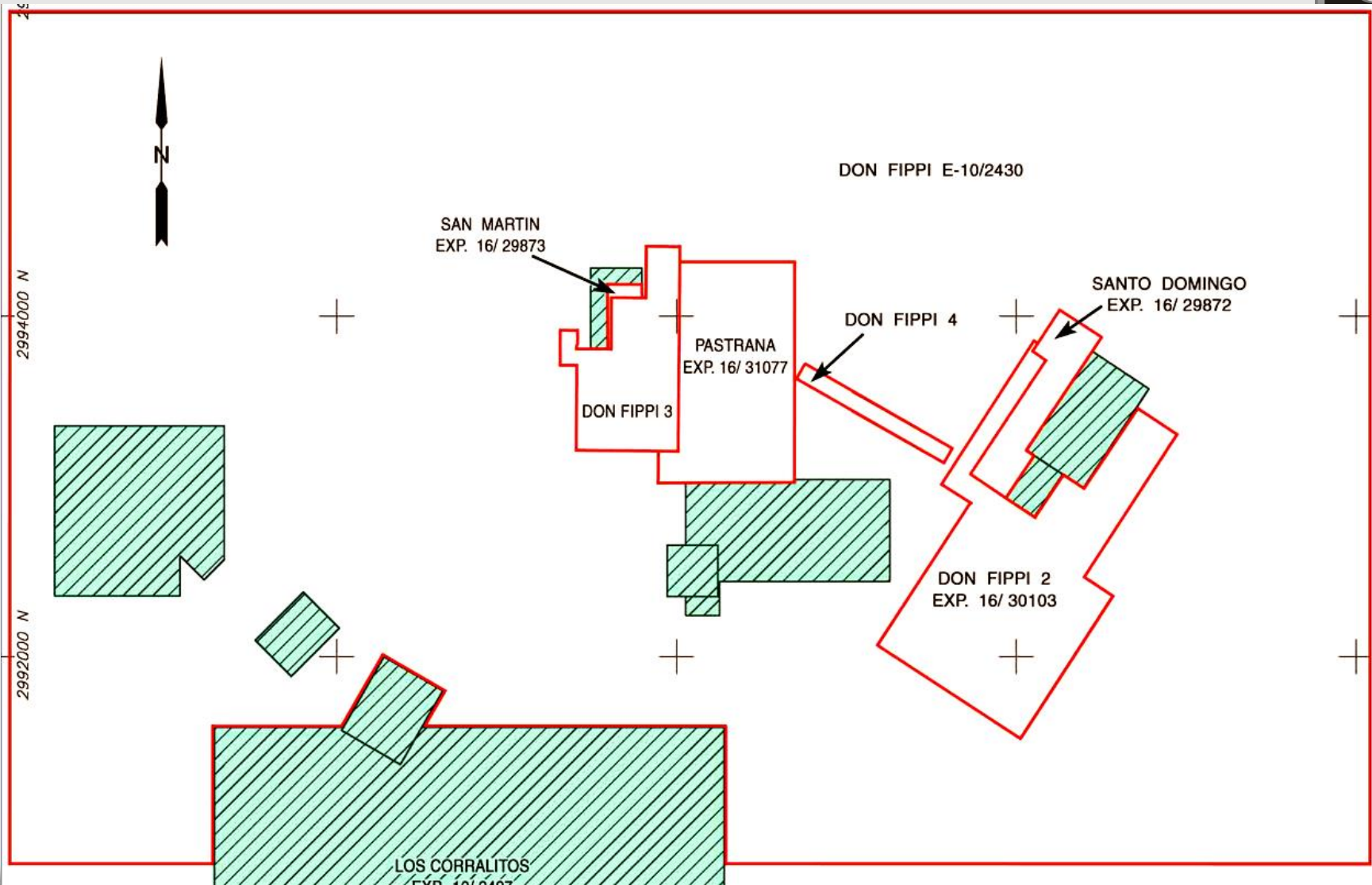


# Old stope in Penasquito Mine





# BATOPILAS



# BATOPILAS EXPLORATION

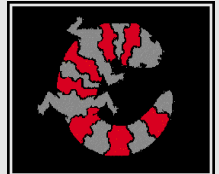
- Historically  
“Stope & Hope”
- Geology Poorly Understood
- Native Silver Probably Strong  
Conductor to NSAMT
- First Time Consolidated Since  
1912



**BATOPILAS hasn't borne fruit yet..  
But other MAG Silver projects have....**



**MAG Silver**



# Career Path of an Entrepreneurial Geologist



# Realities of Being an Entrepreneurial Geologist

## Hating A Bad Job or Bad Boss is not Enough...

M  
A  
G



**Hunger**

**Diligence**

**Patience**

**Willingness to Sacrifice**

**No Benefits**

**Keep the Home Fires Burning**

**Learn to sell your ideas**

**Listen to your critics**

**Be prepared to answer your critics**

**Know when to quit and regroup**

**Know when to quit... period**

# becoming an Entrepreneurial Geologist:

## Opportunity Lies in Challenging Conventional Wisdom

M  
A  
G

**Be Patient... Success takes time**

**Become Technically Adept...**

**Work/Train with a Major**

**Do your Homework**

**Develop Broad Skill Set**

**Get your credentials: Uni & Professional**

**Build and Maintain your Network**

**Become Business Literate**

**Focus your Resources**

**Downturns create opportunities**

**but only if you can survive them...**

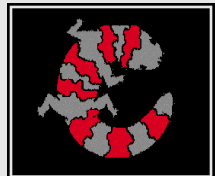
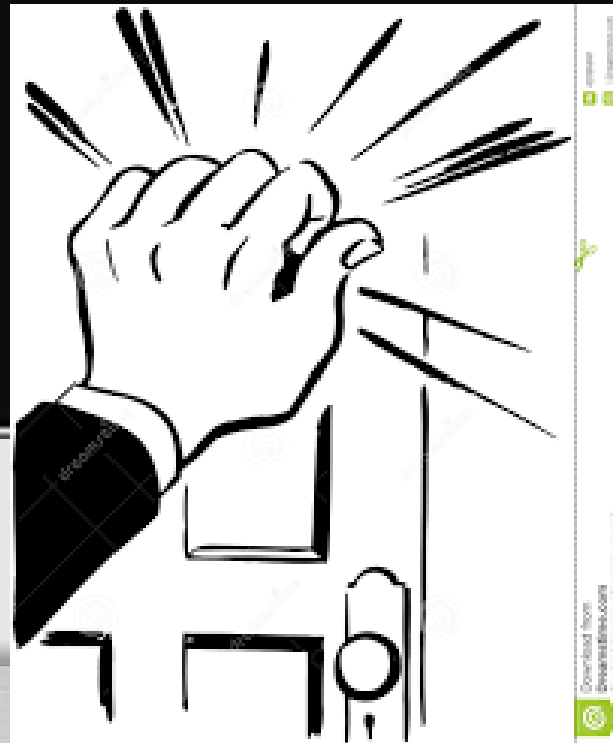


# PERCEPTION: Where does Opportunity Lie... and How do YOU Answer the Door?



*Oscar Wilde*

A pessimist is somebody who  
complains about the noise when  
opportunity knocks.



# EXPLORATION IS NOT DEAD!!!





**PERSPECTIVE:** IF YOU KEEP DOING  
WHAT EXPLORERS BEFORE YOU DID  
YOU'RE NOT GOING TO FIND ANYTHING...  
BECAUSE IF THAT WORKED  
**THEY** WOULD HAVE FOUND IT.



# **PERSPECTIVE:** Right Box for the Job





## **PERSPECTIVE: What Is Valuable?**

**ARCHIE'S RULE: For a Project to be economic long-term you must Recover Twice your all-in Production Costs**

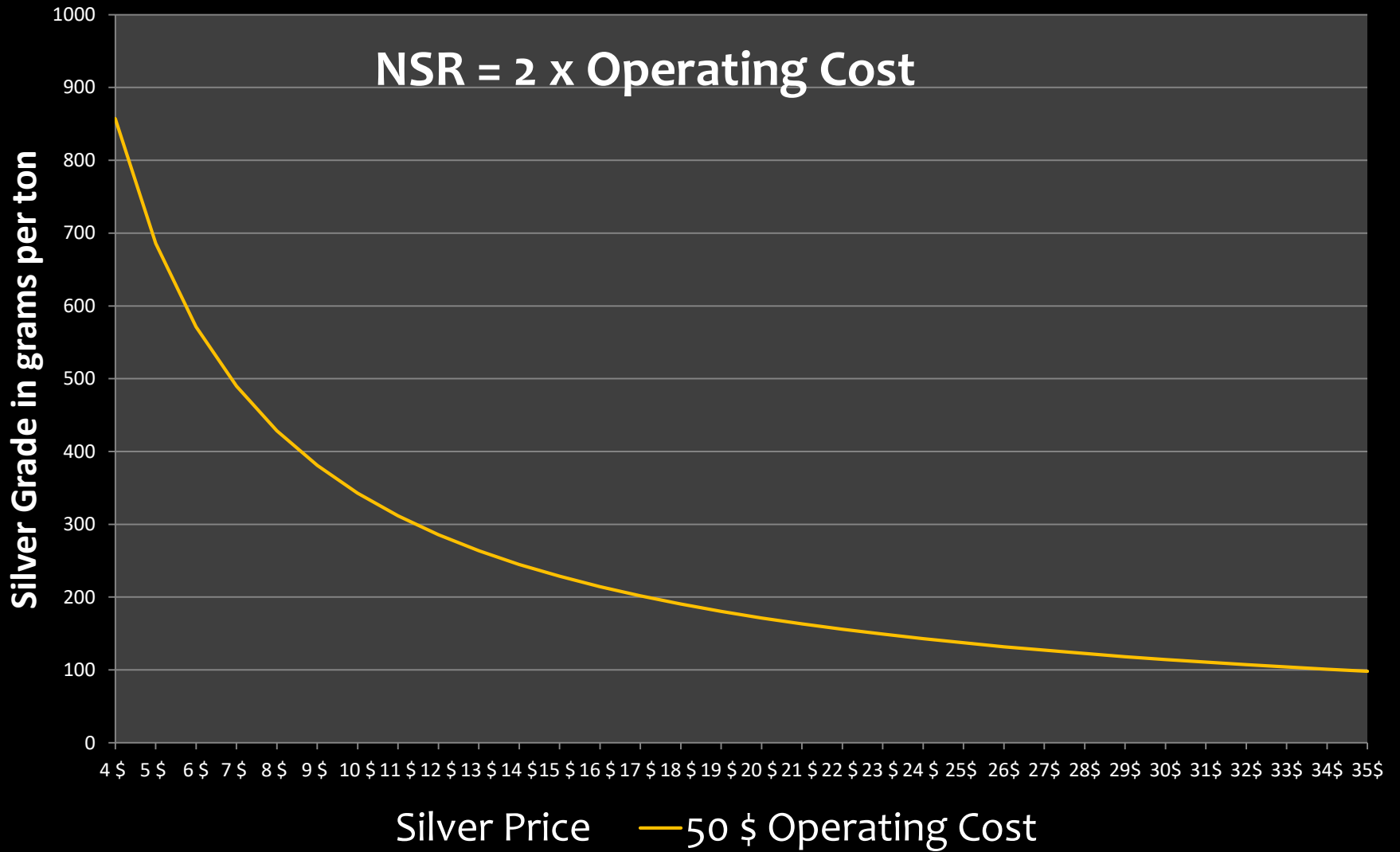
### **This Rule of Thumb Covers**

- 1. Recovery of Capital Expenditures**
- 2. Time value of investment**
- 3. Depletion, Depreciation, Amortization**
- 4. Buffer for metal price fluctuations**
- 5. Increased costs**
- 6. Minimum 15% IRR**
- 7. Plus... A little breathing room**

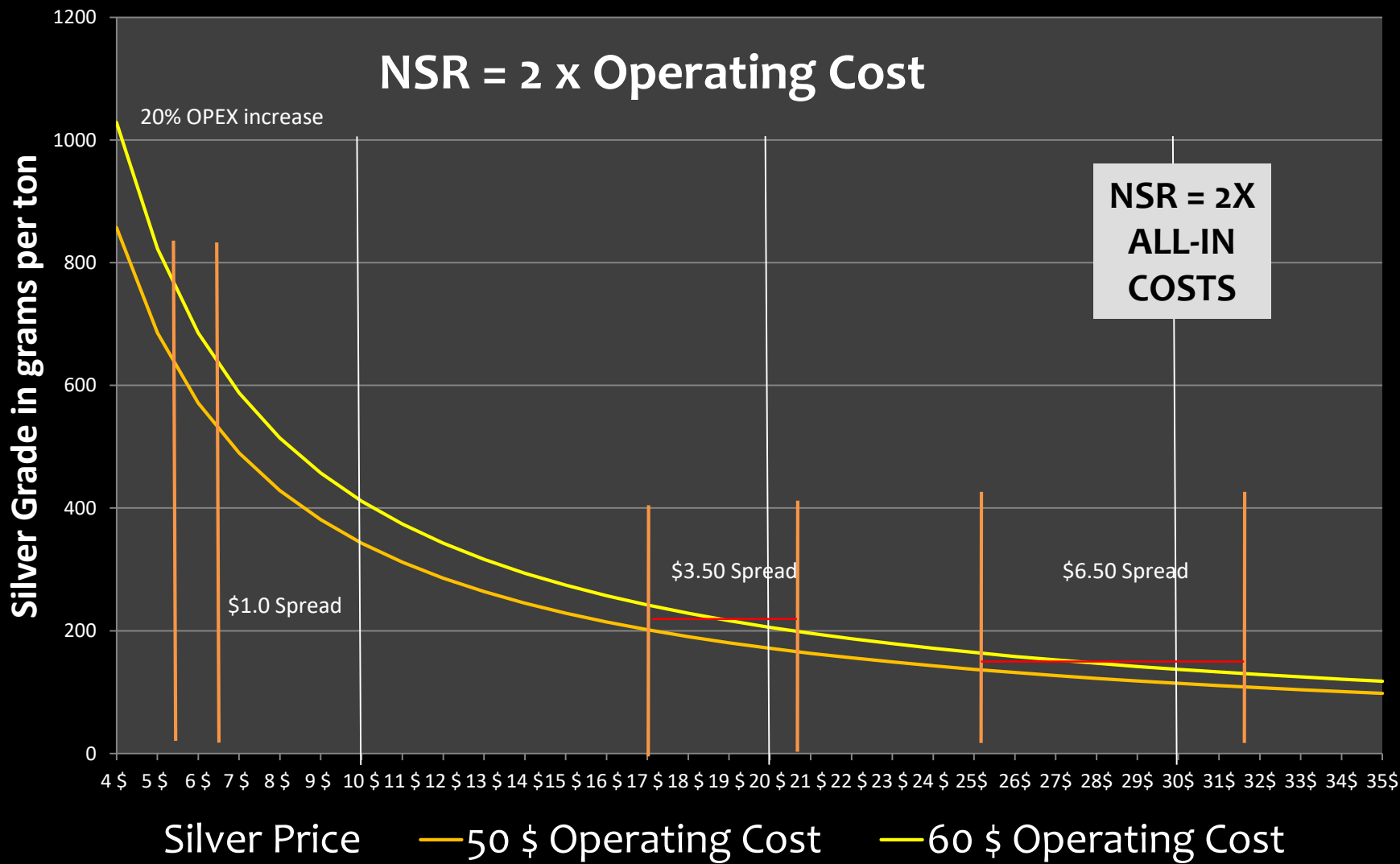
**NSR = 2X  
ALL-IN  
COSTS**



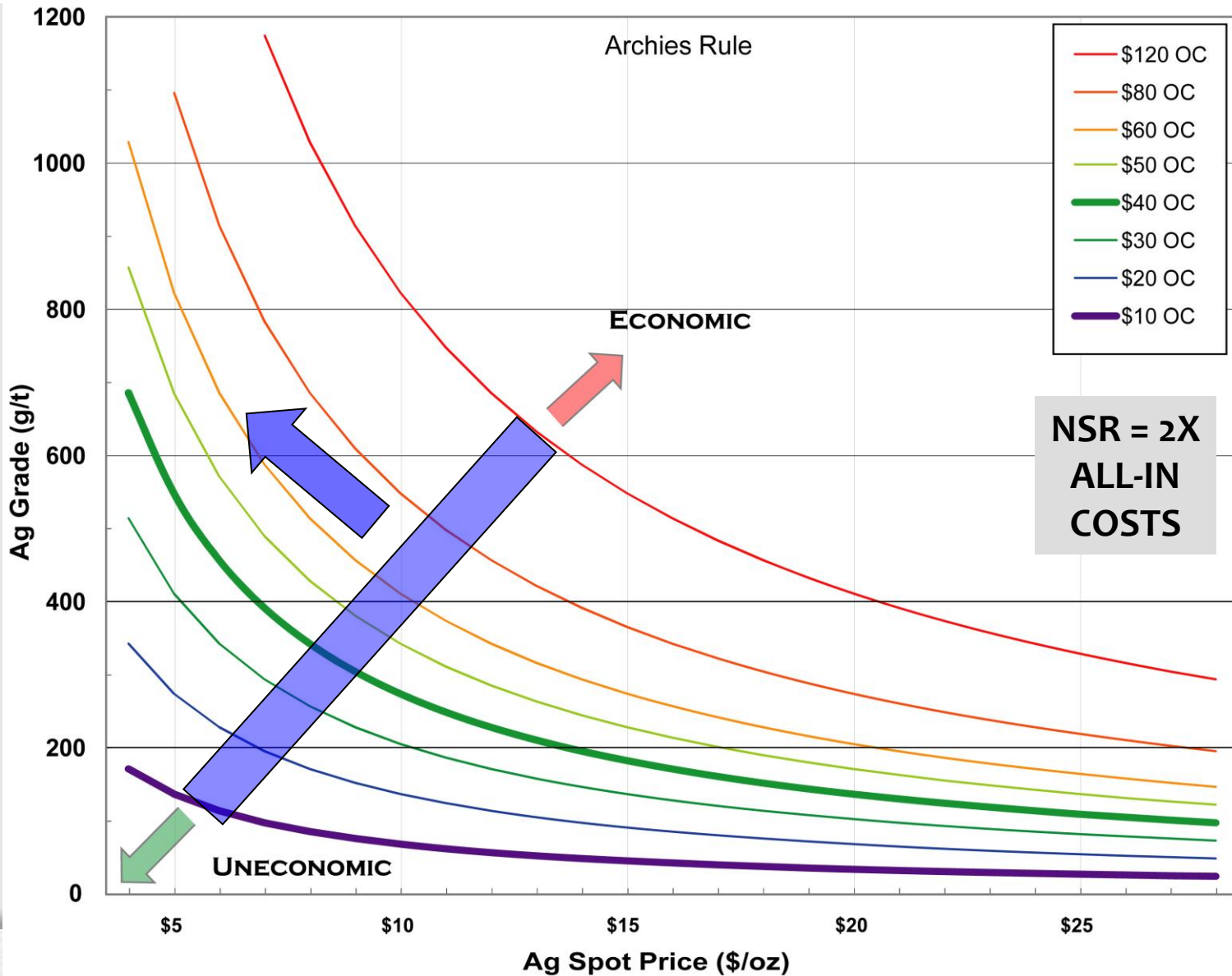
# PERSPECTIVE: Archie's Rule: Profitability



# PERSPECTIVE: Archie's Rule: Change



# PERSPECTIVE: Archie's Rule: Everything

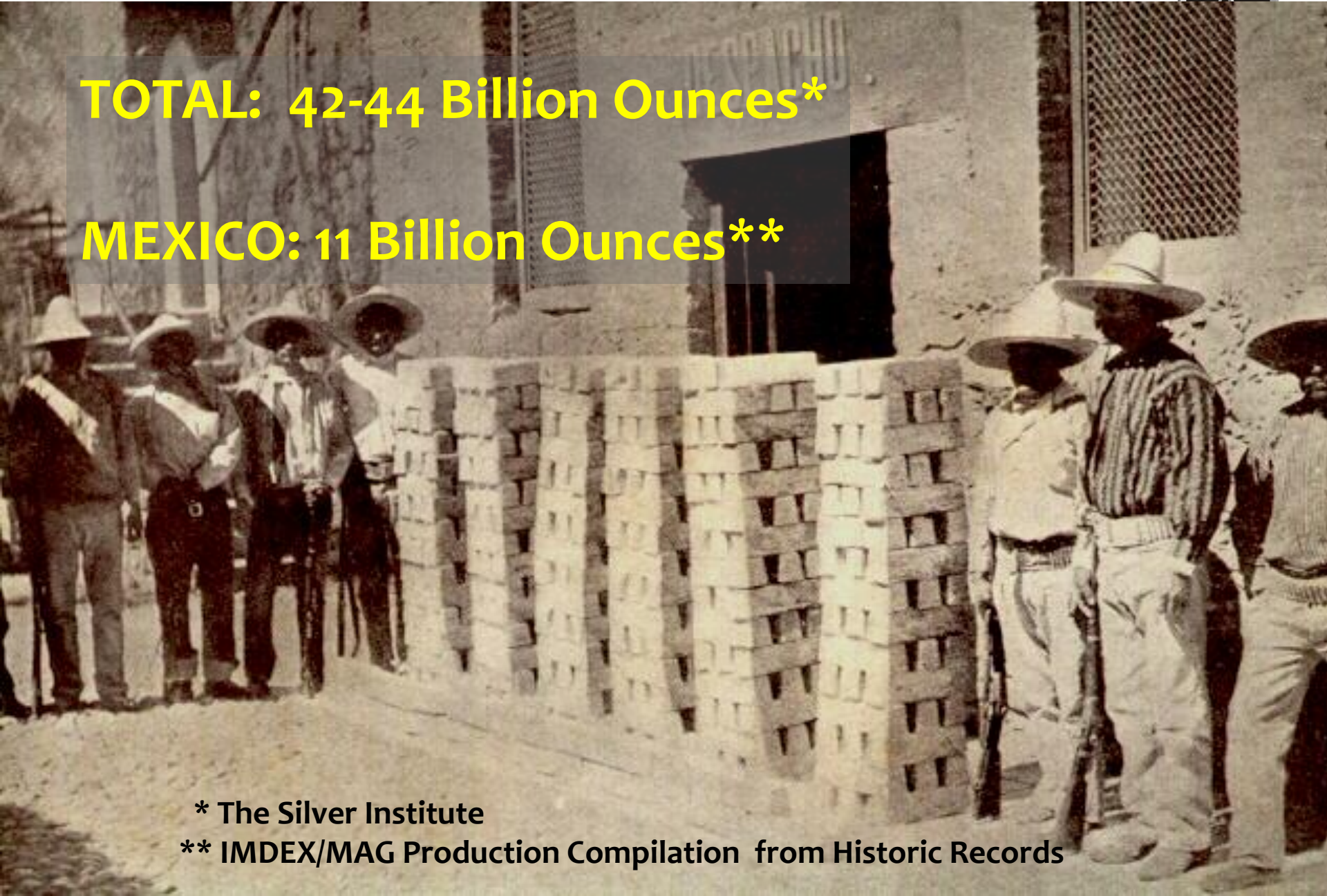




# PERCEPTION: WORLD HISTORIC SILVER PRODUCTION

**TOTAL: 42-44 Billion Ounces\***

**MEXICO: 11 Billion Ounces\*\***



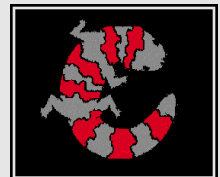
\* The Silver Institute

\*\* IMDEX/MAG Production Compilation from Historic Records

# PERCEPTION: TOP 12 SILVER PRODUCERS 2015



- 1. Mexico 152.8
- 2. Peru 109.8
- 3. China 103.9
- 4. Australia 55.2
- 5. Chile 42.0
- 6. Poland 40.8
- 7. Russia 40.0
- 8. Bolivia 39.0
- 9. USA 36.0
- 10. Argentina 22.6
- 11. Canada 19.1
- 12. Kazakhstan 17.6

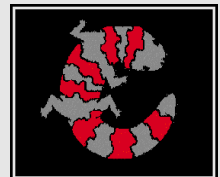
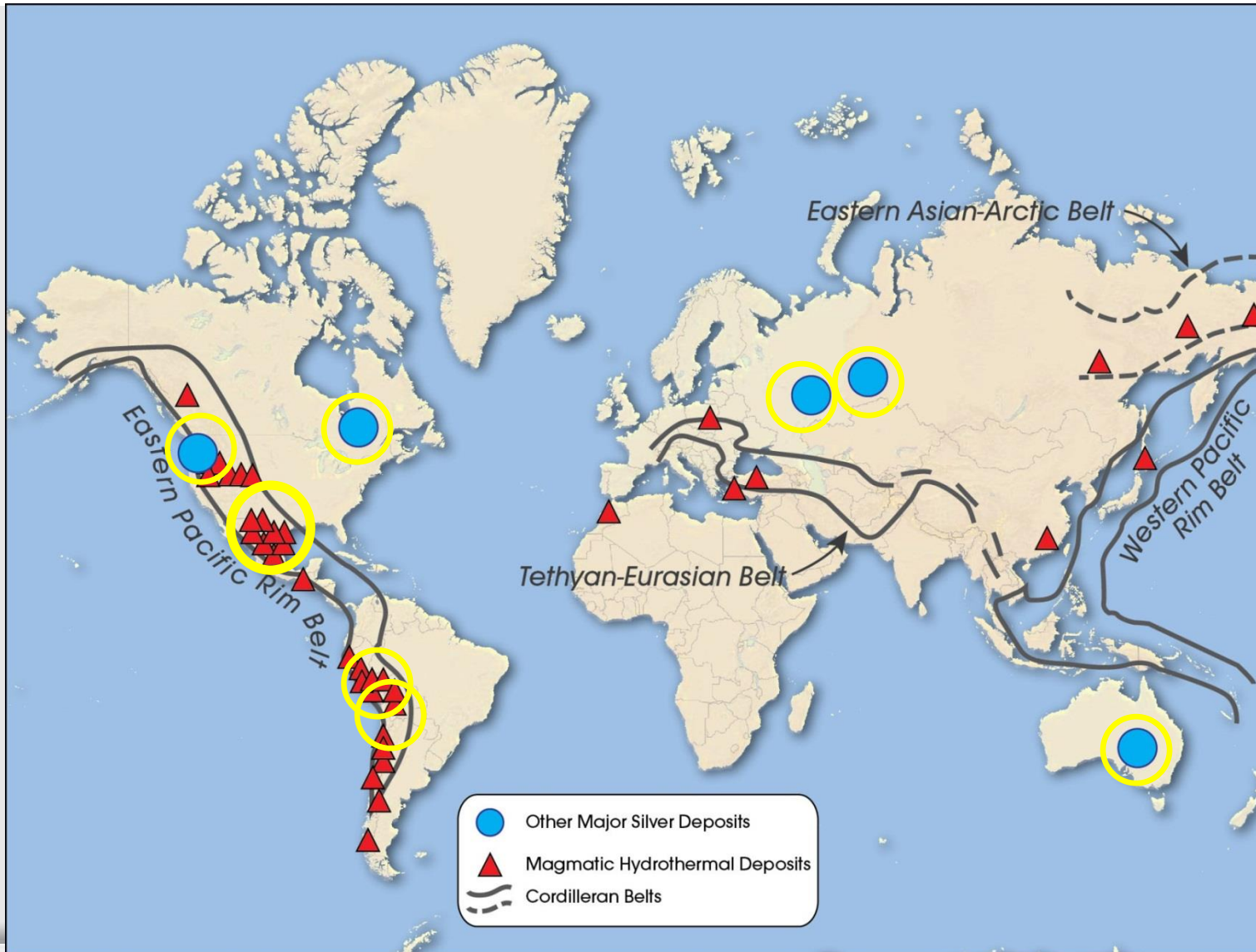




**70% of Modern Silver Production is as By-Product  
So Mexico's 25% of Historic Production is Even More Impressive**



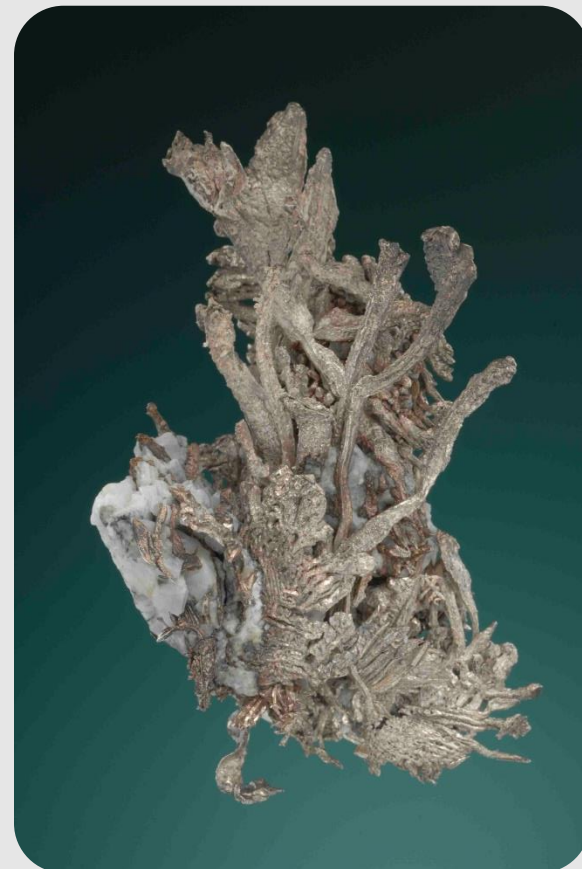
# World's Major Silver Deposits



# World's Billion-Ounce Plus Primary Silver Camps



District	Location	Location	Billion oz
Fresnillo		Mexico	3.2
Cerro Rico	Bolivia		3.0
Cerro de Pasco	Peru		1.7
Pachuca		Mexico	1.5
Guanajuato		Mexico	1.3
Broken Hill	Australia		1.3
Coeur d'Alene	USA		1.1
Dukat	Russia		1.1
Cobalt-Gowganda	Canada		1
Tayoltita		Mexico	1
Sta Barbara-Parral-SFO		Mexico	1
Zacatecas		Mexico	1
Concepcion del Oro		Mexico	1
Sombrerete-San Martin		Mexico	1



# 1 B oz + Primary Silver Deposit Types

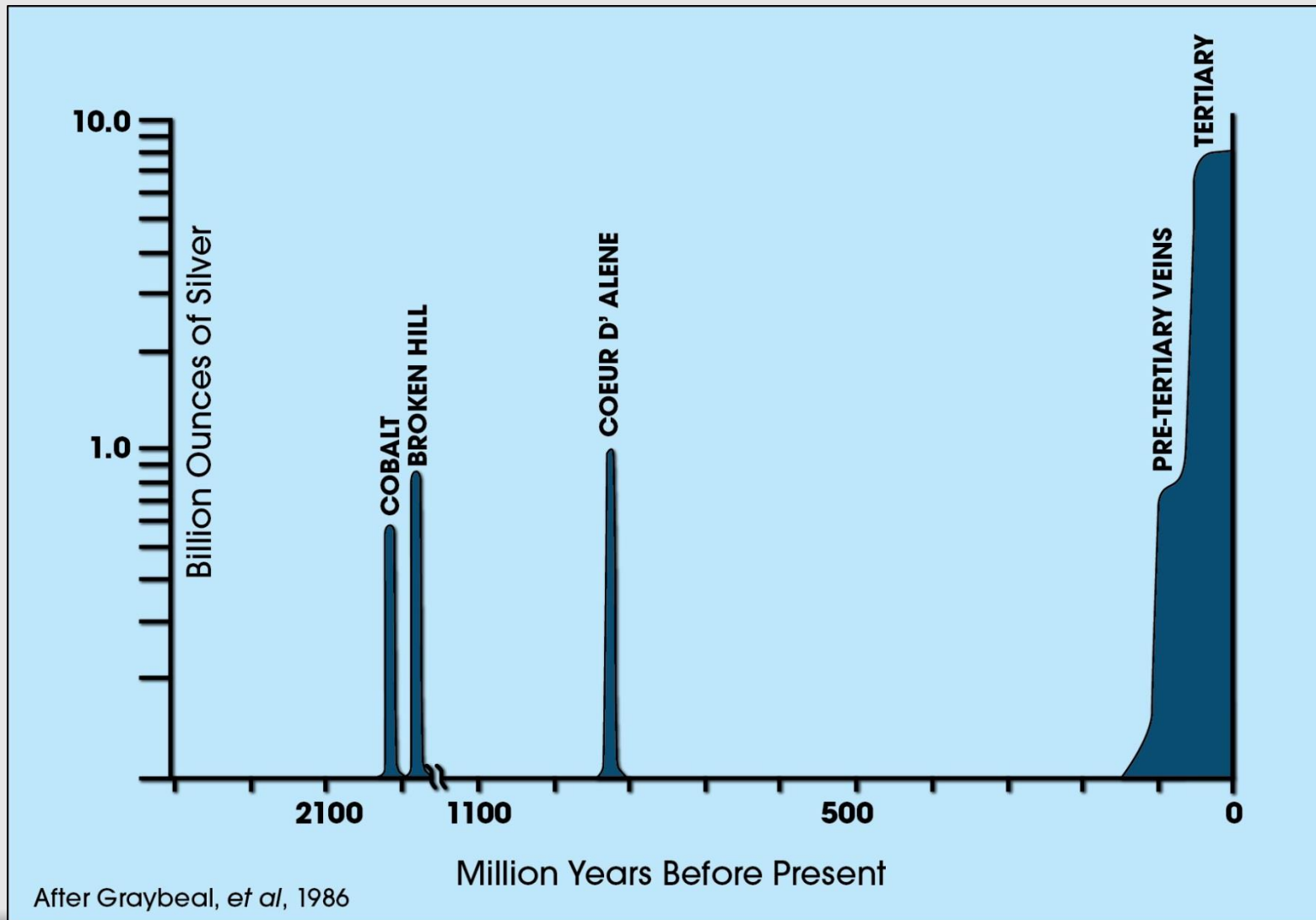


- Epithermal Veins Ag (Au): 6 (5)
- Cordilleran Veins: Pb-Zn-Cu 3 (1)
- CRDs: 2
- Coeur d'Alene type: 1
- Ag-Co-As-Ni: 1
- Clastic-Hosted Pb-Zn (Cu)- Ag: 1

**Mexico Total: 8 of 14**



# Age Distribution of > 1B oz Silver Deposits



# MEXICO: What is so Special?



- **Timing**
- **Source**
- **Processes?**
- **Environment?**



# Western Cordillera Silver Deposits



Timing: Similar

Sources:

Mantle: Inhomogeneity?

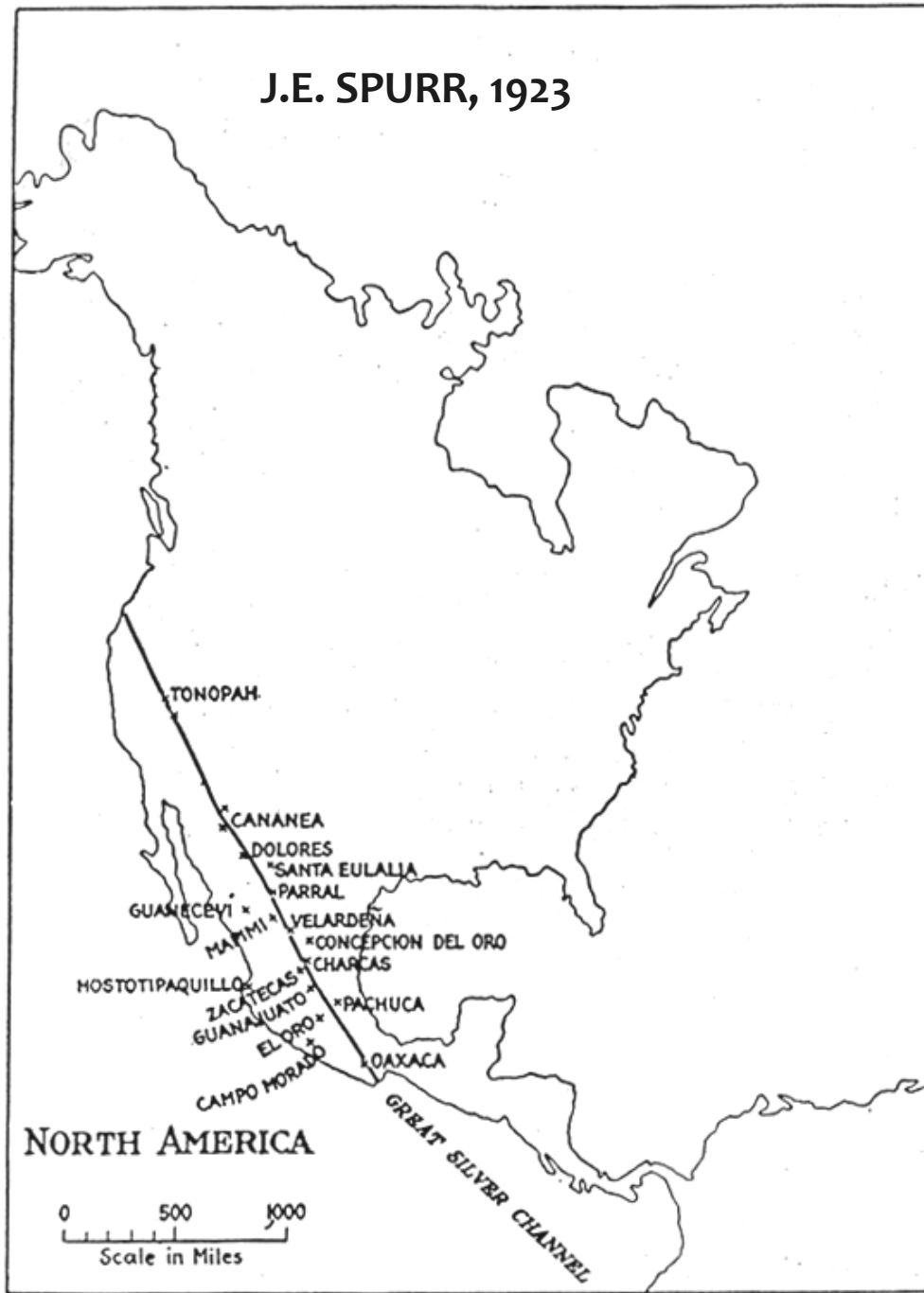
Oceanic Plate: Similar

Crust: Highly variable  
in and out of  
Mexico

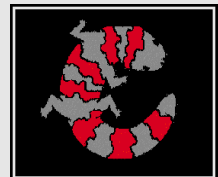
Processes: Similar

**Environment = Geologic History**

J.E. SPURR, 1923

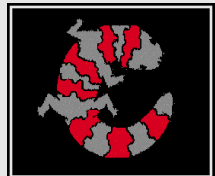
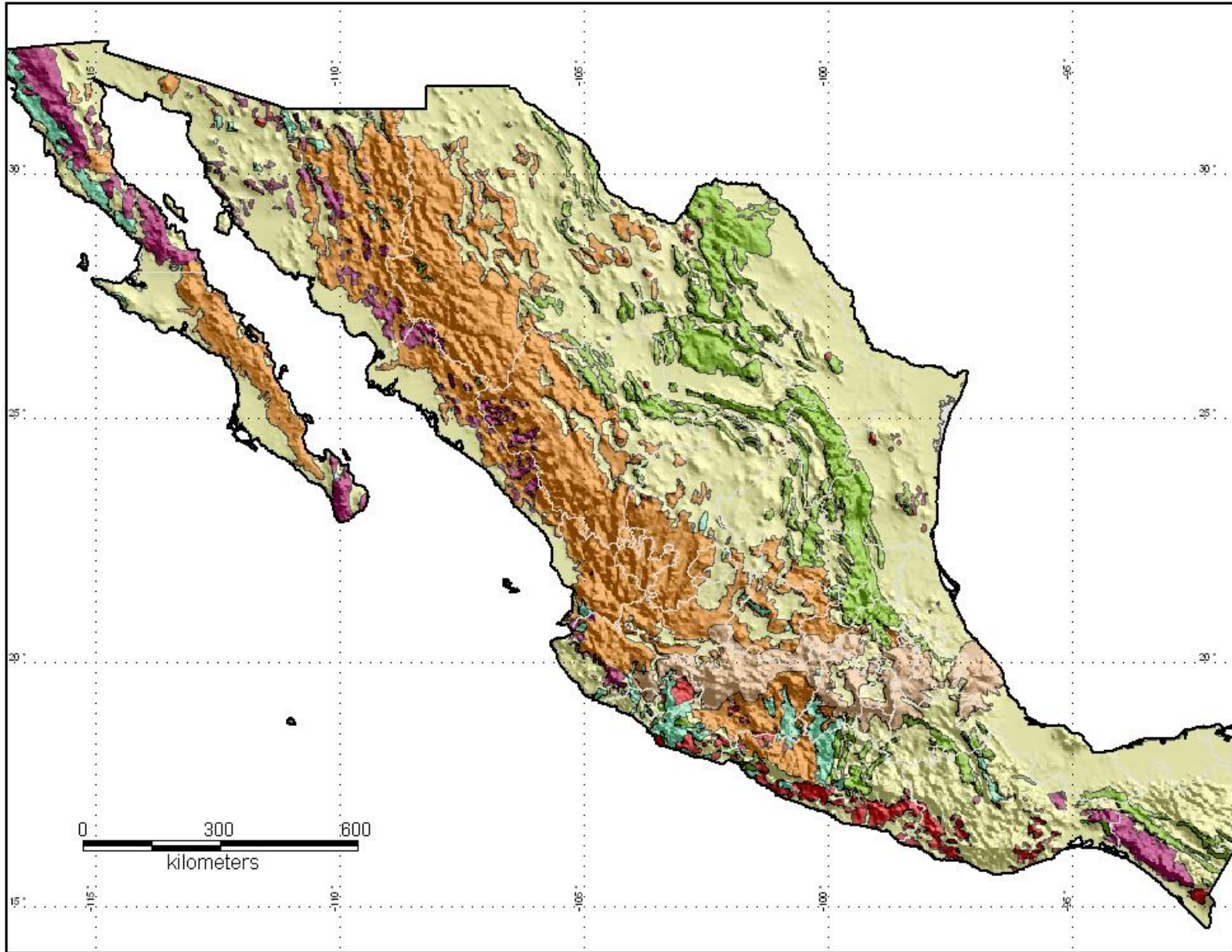


One of many  
Renditions  
of the  
Strong NW-Trend  
of the  
**Mexican Silver Belt**

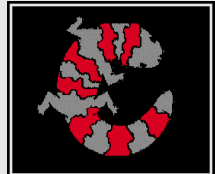
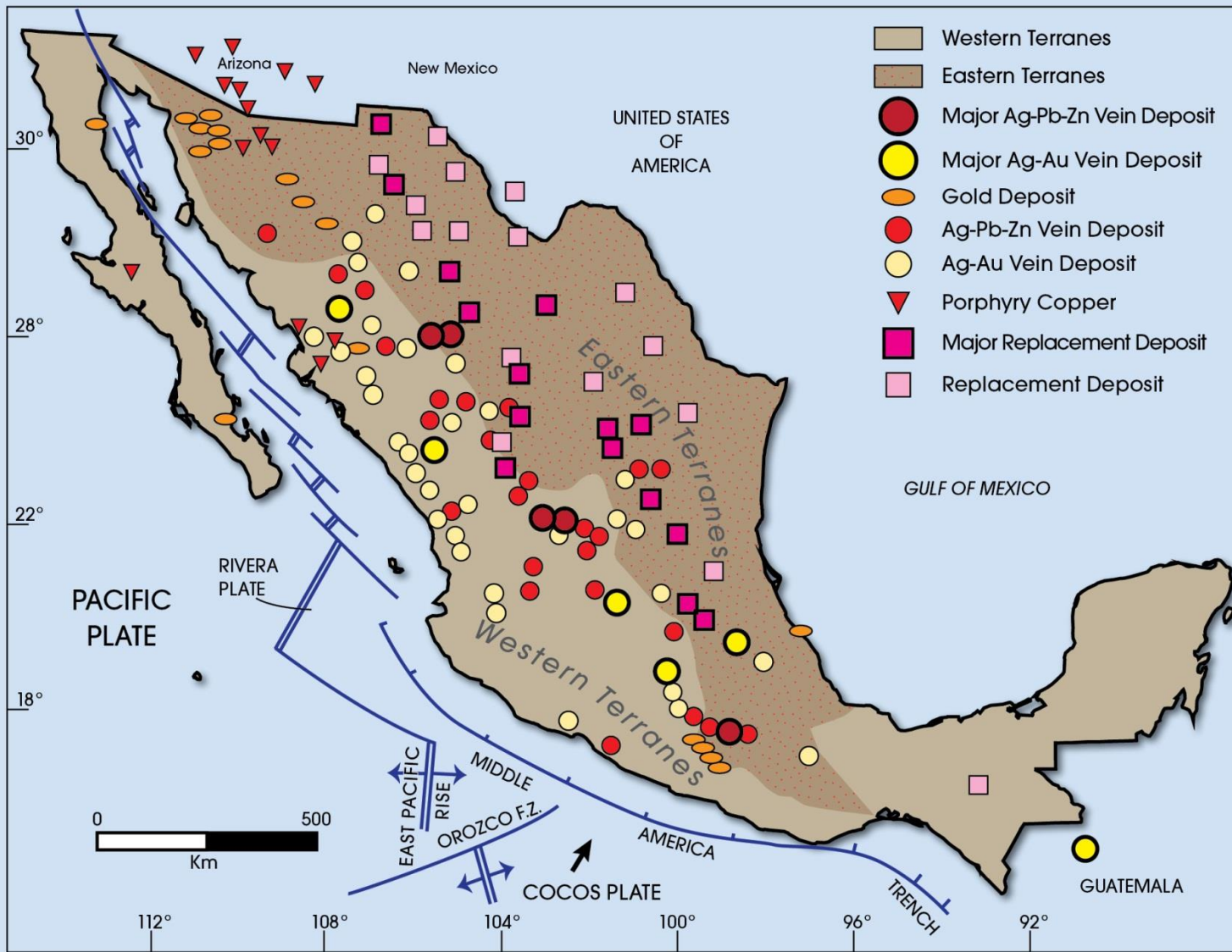




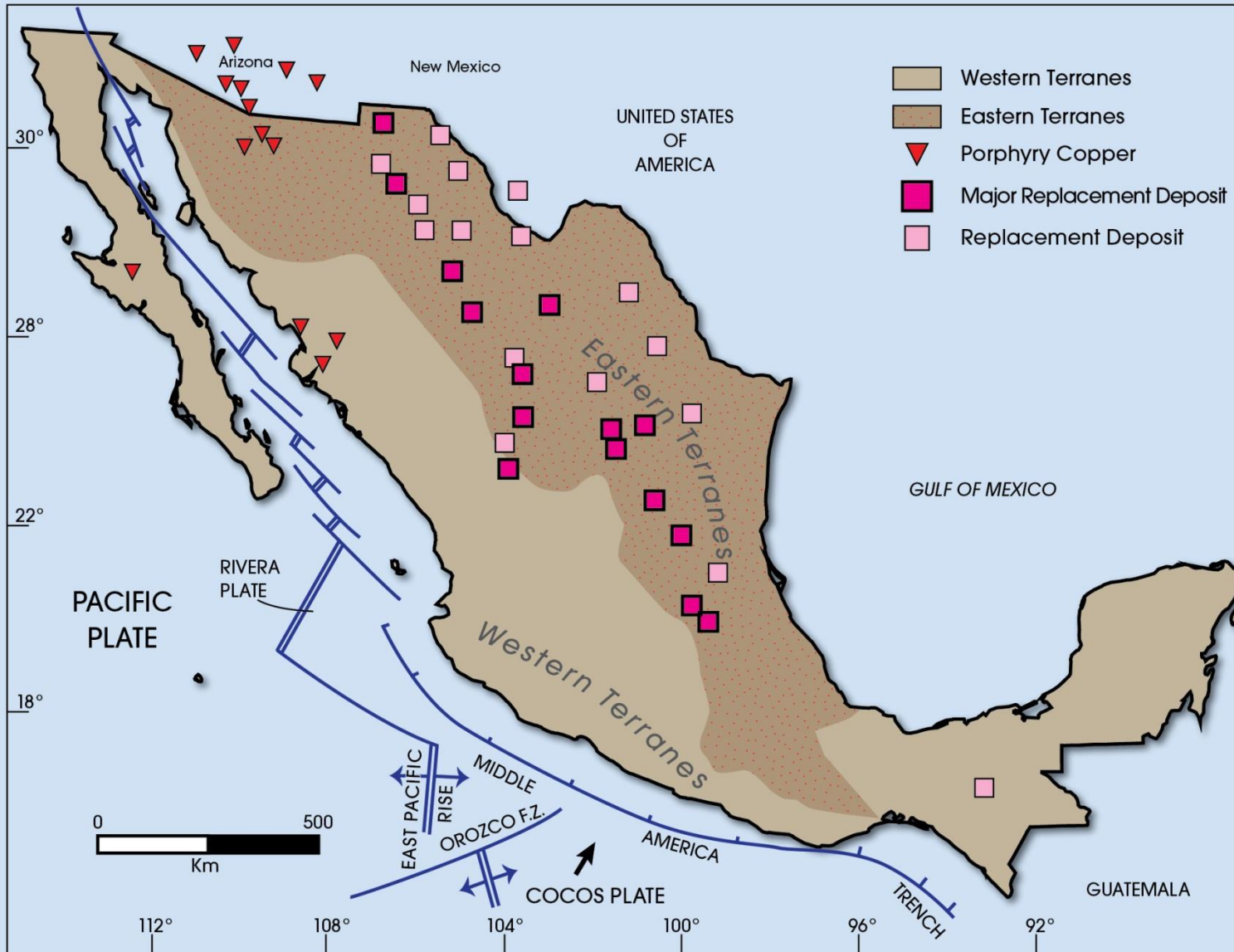
# Mexico Geology



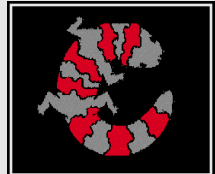
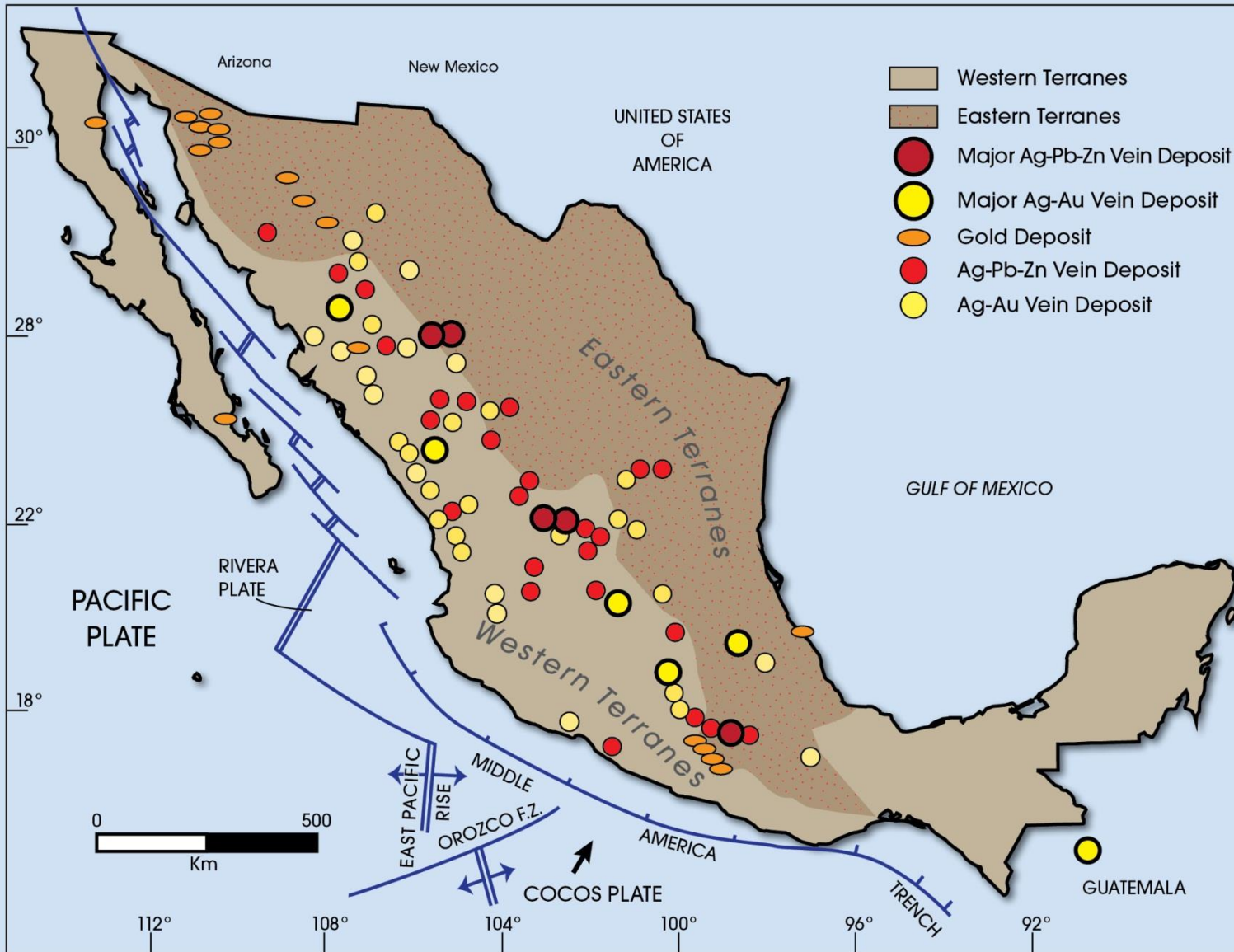
# Mexico: Major Ore Deposits



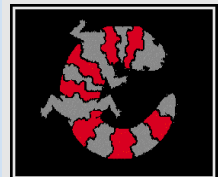
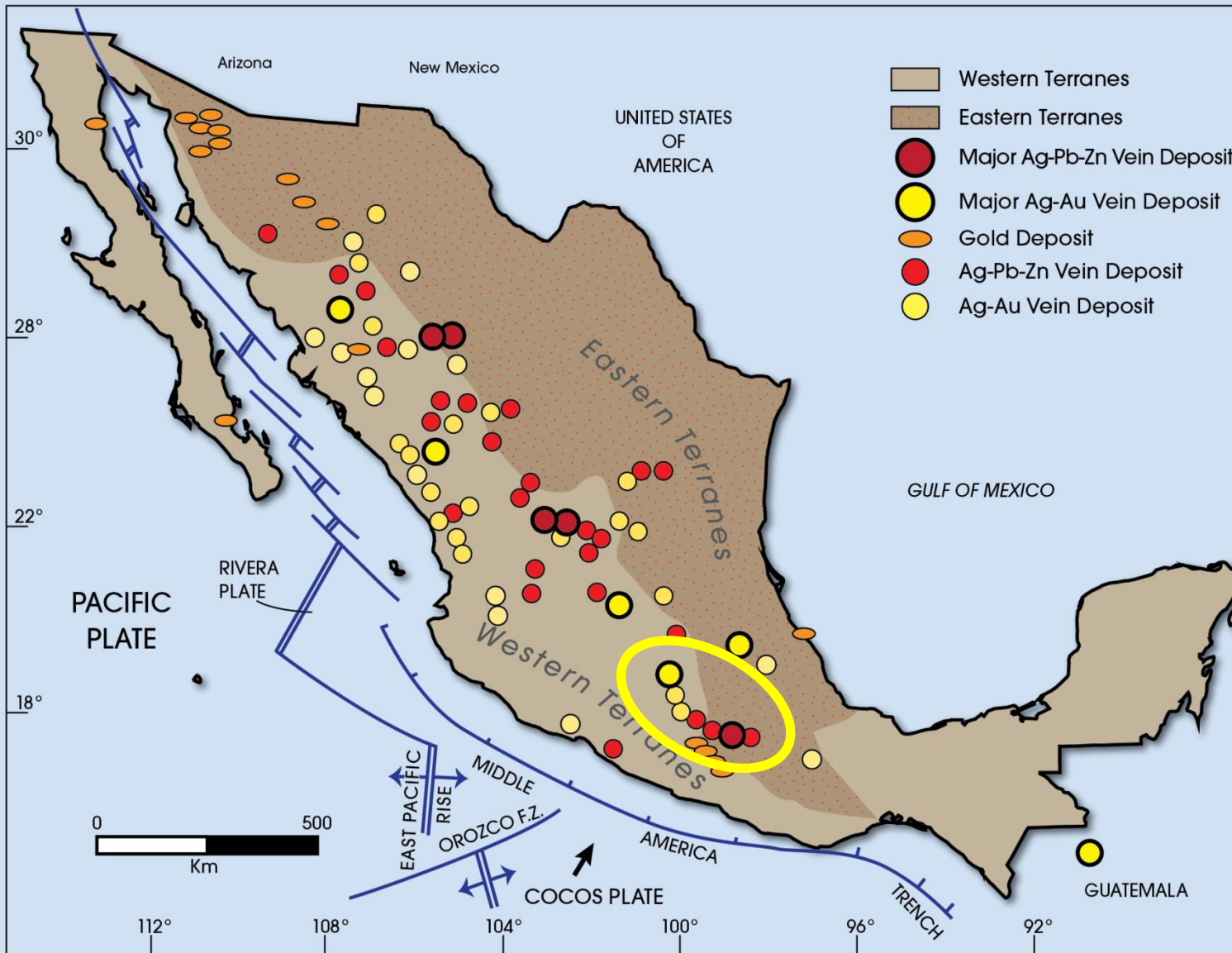
# Mexico: Basement Terranes and CRDs



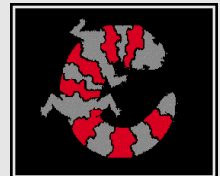
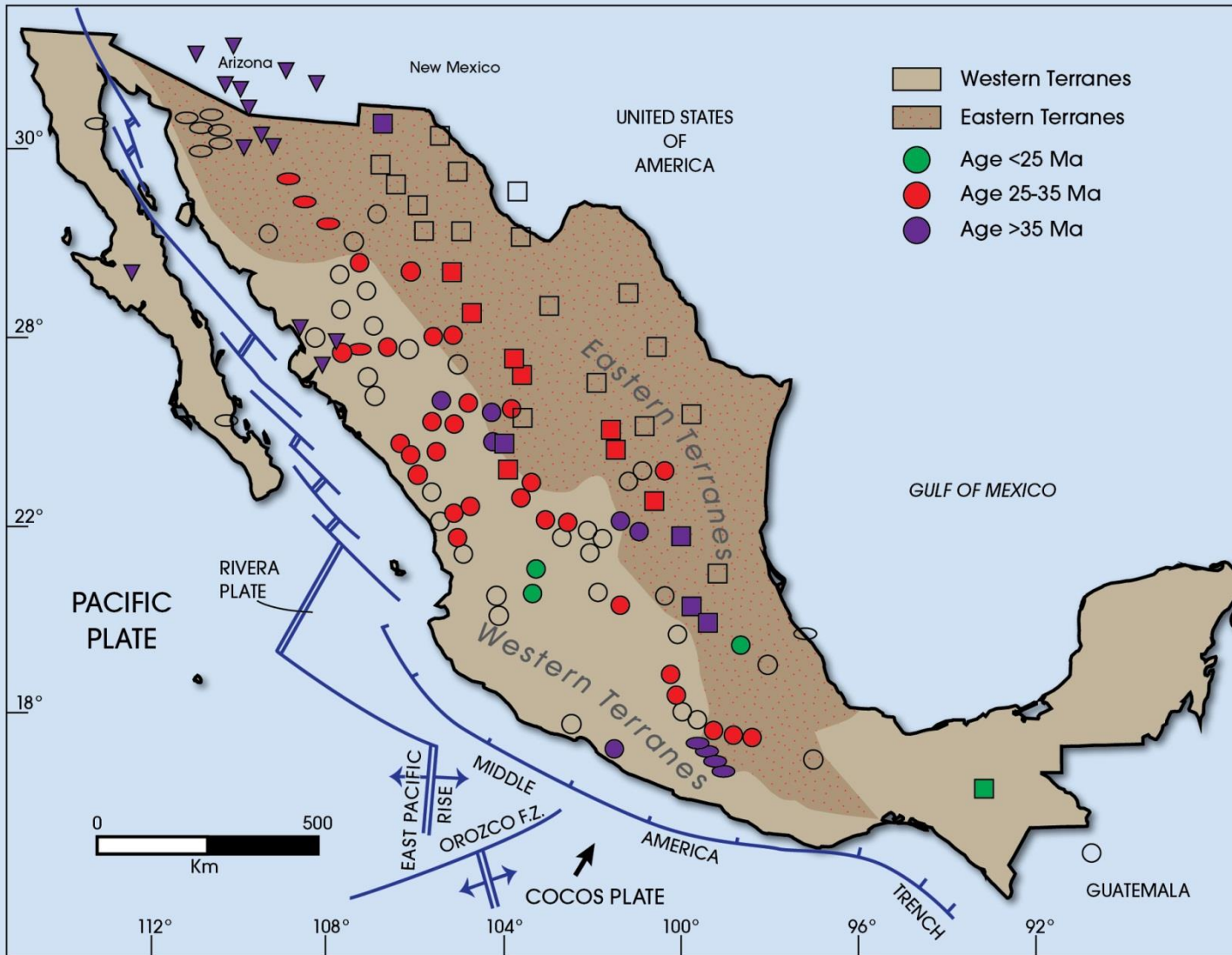
# Mexico: Basement Terranes and Vein Deposits



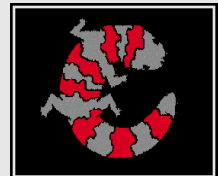
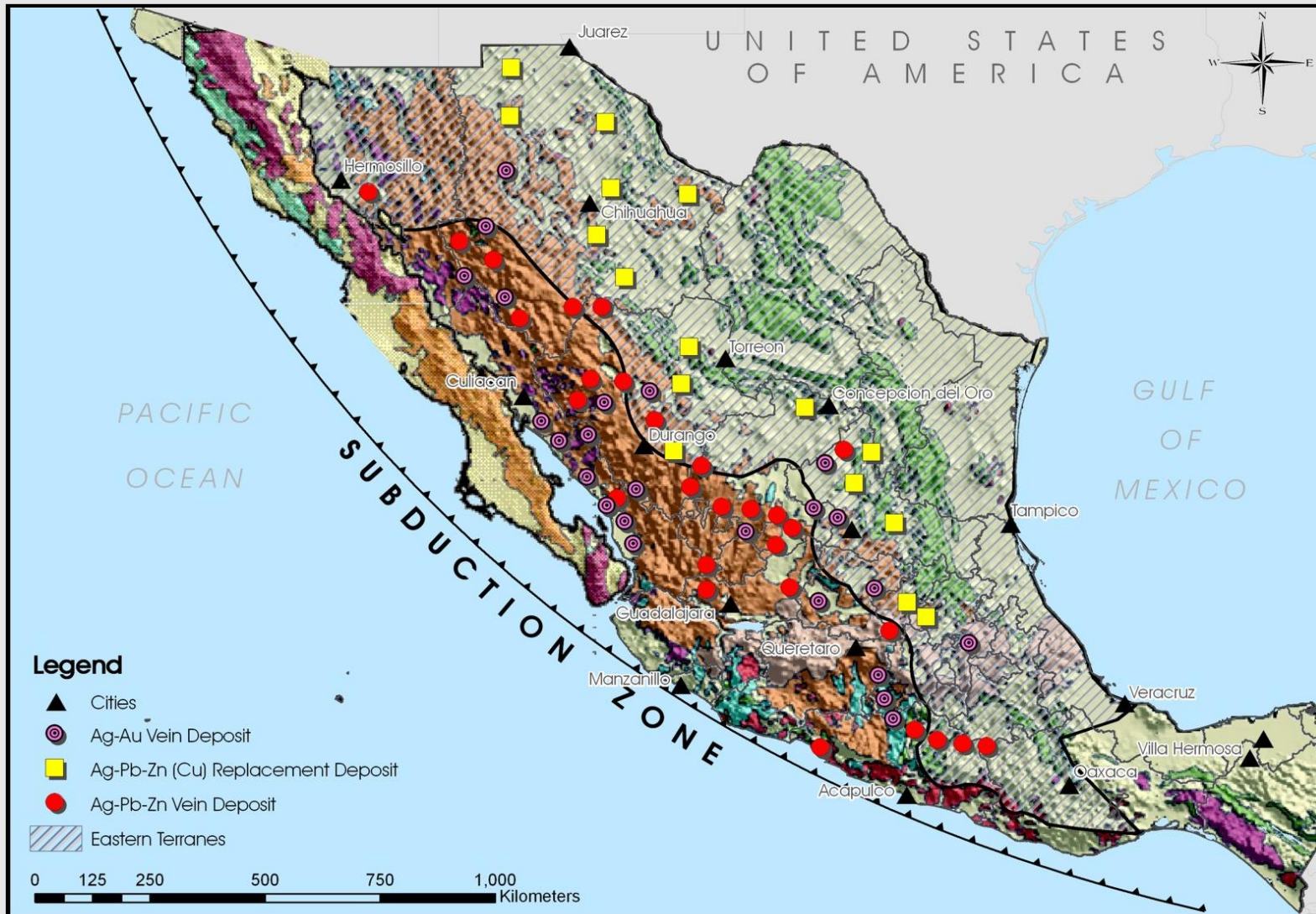
# Mexico: Basement Terranes and Ore Deposits



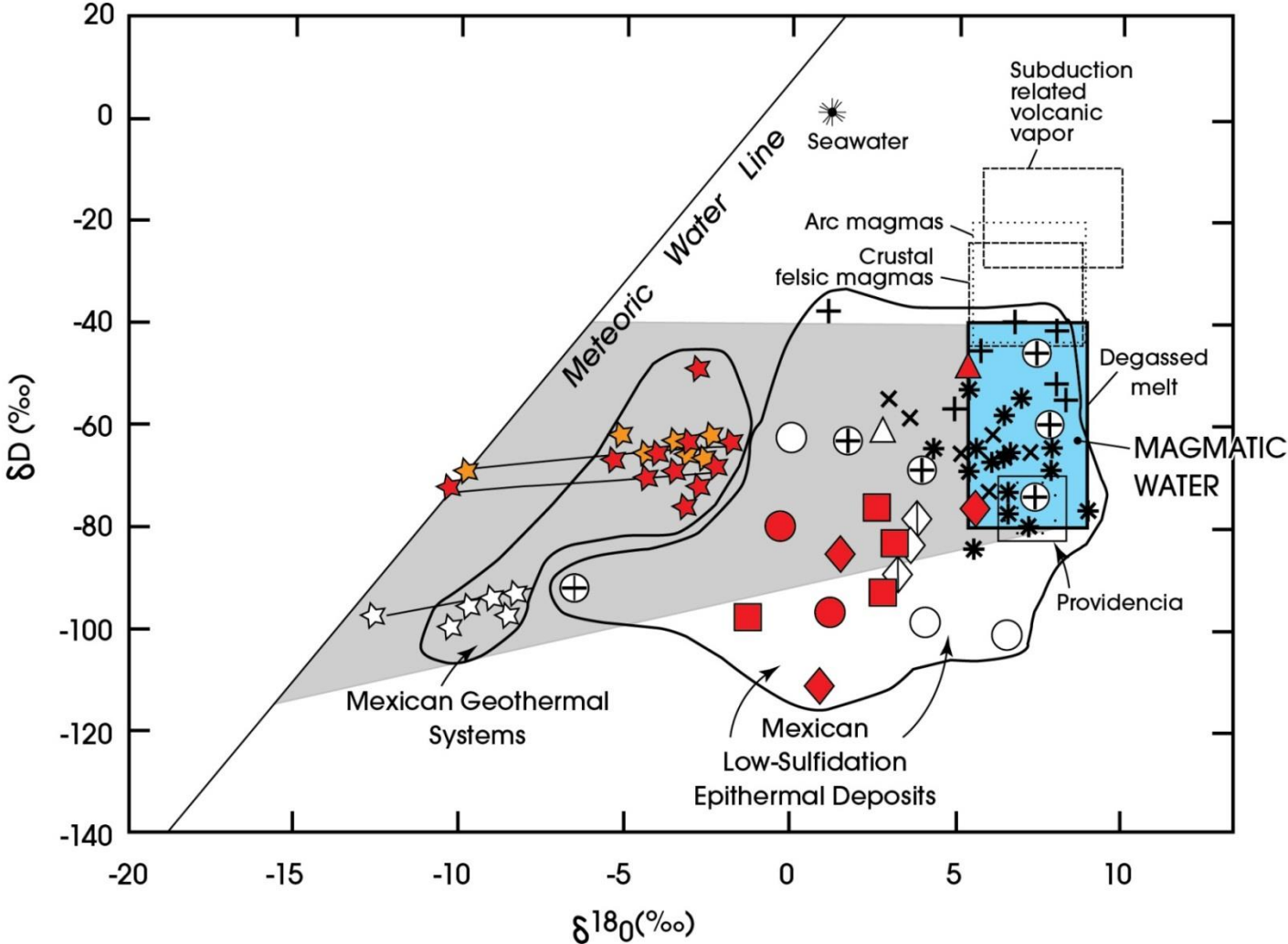
# Mexico: Ore Deposit Ages



# Tertiary Subduction Zone & Ore Deposits



# Origin of Water in Mexican Ore Deposits

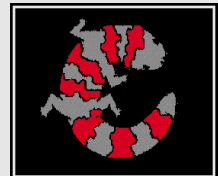




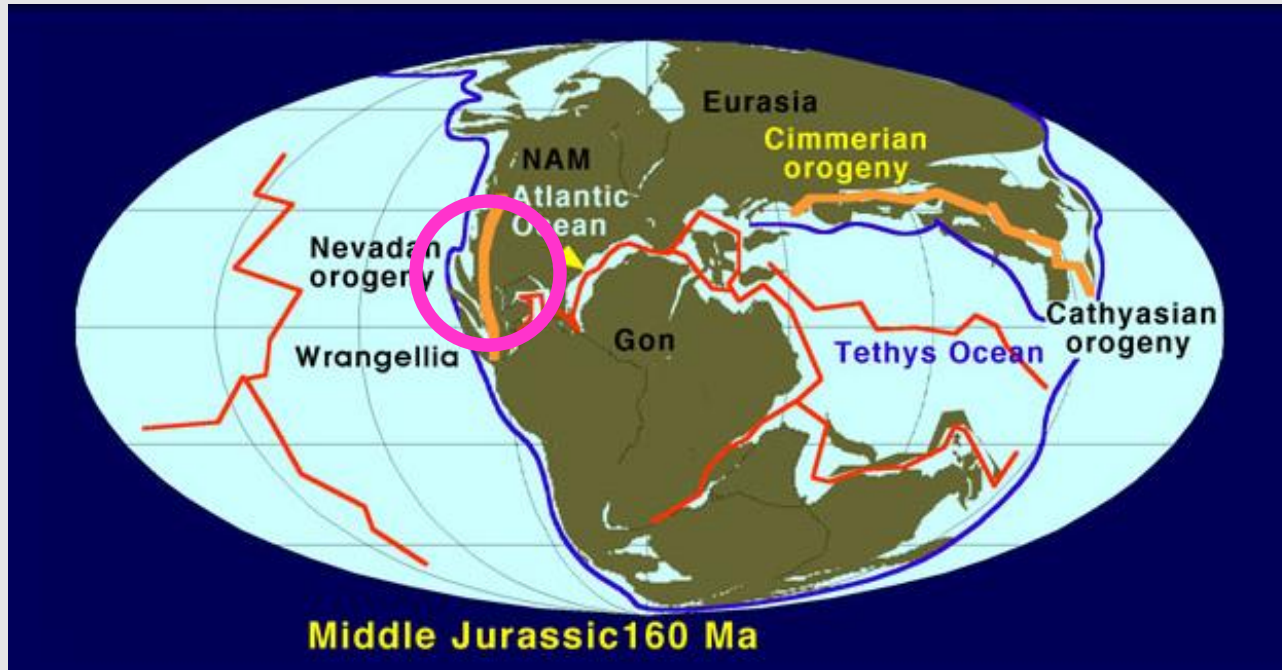
# Mexico Tectonics: Repeated Coaxial Compression



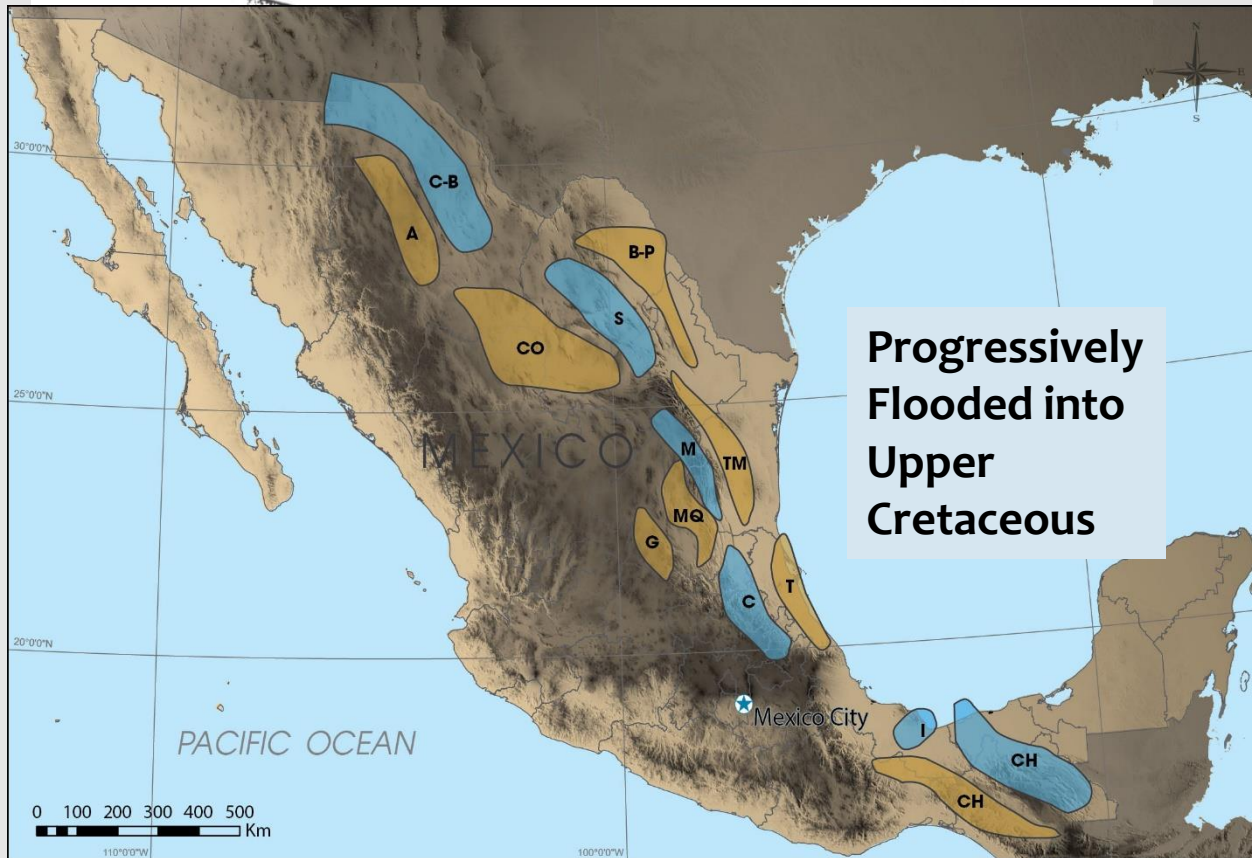
**Flaco Jimenez**



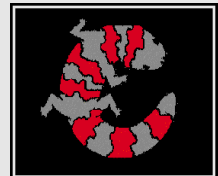
# Mexico: Middle Jurassic Compression



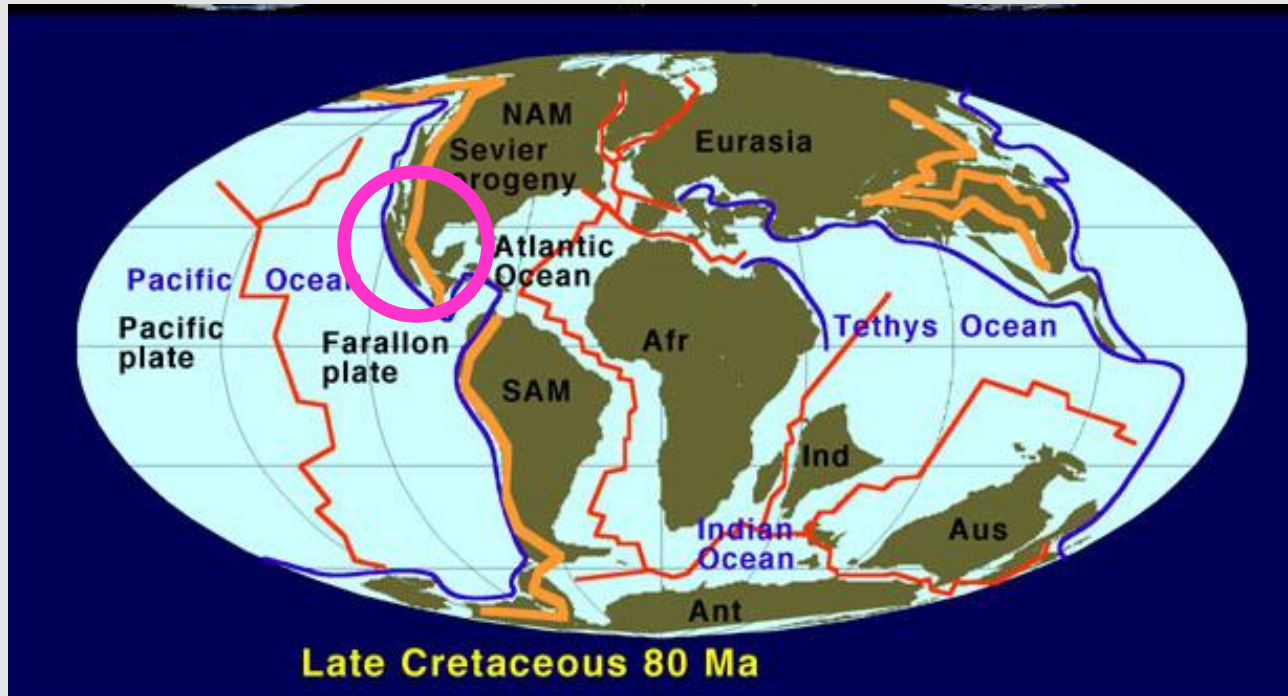
# Mexico: Late Jurassic Extension



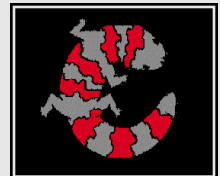
After Sedlock, et al., 1993



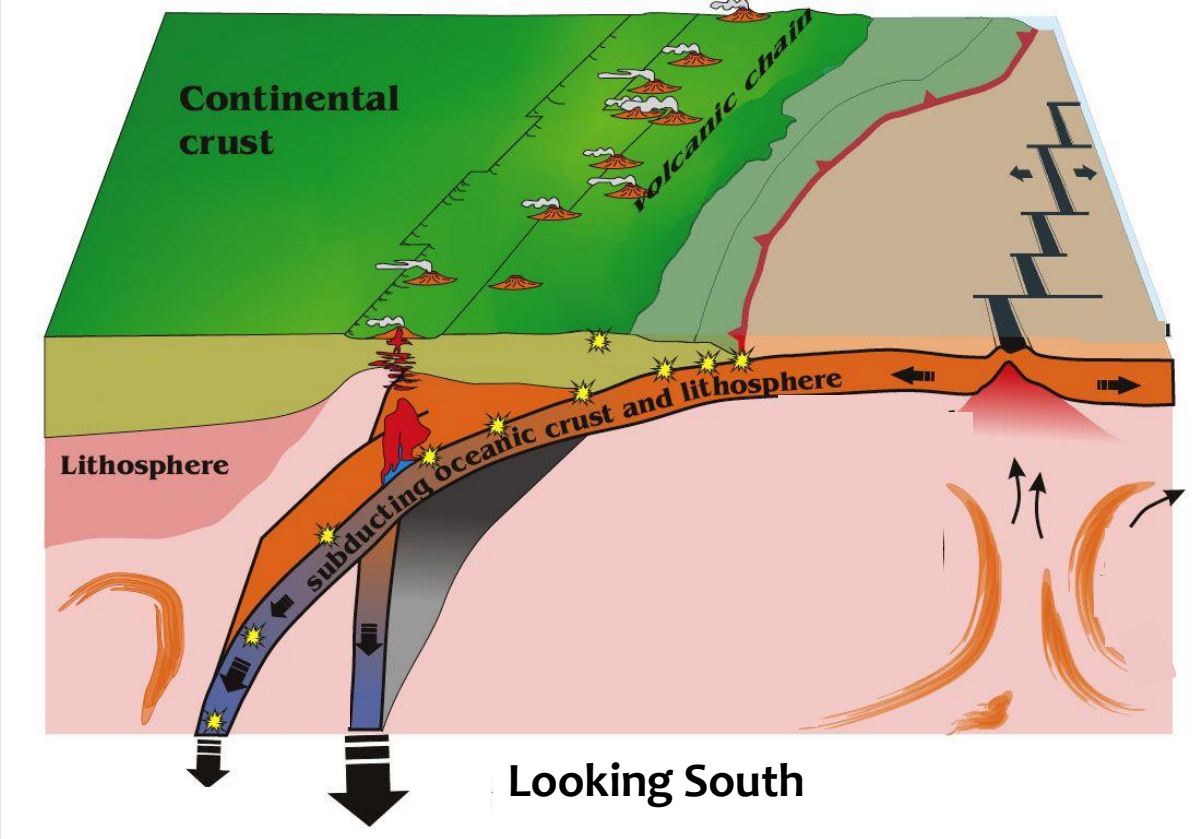
# Mexico: Late Cretaceous Compression Early “Laramide” Orogeny



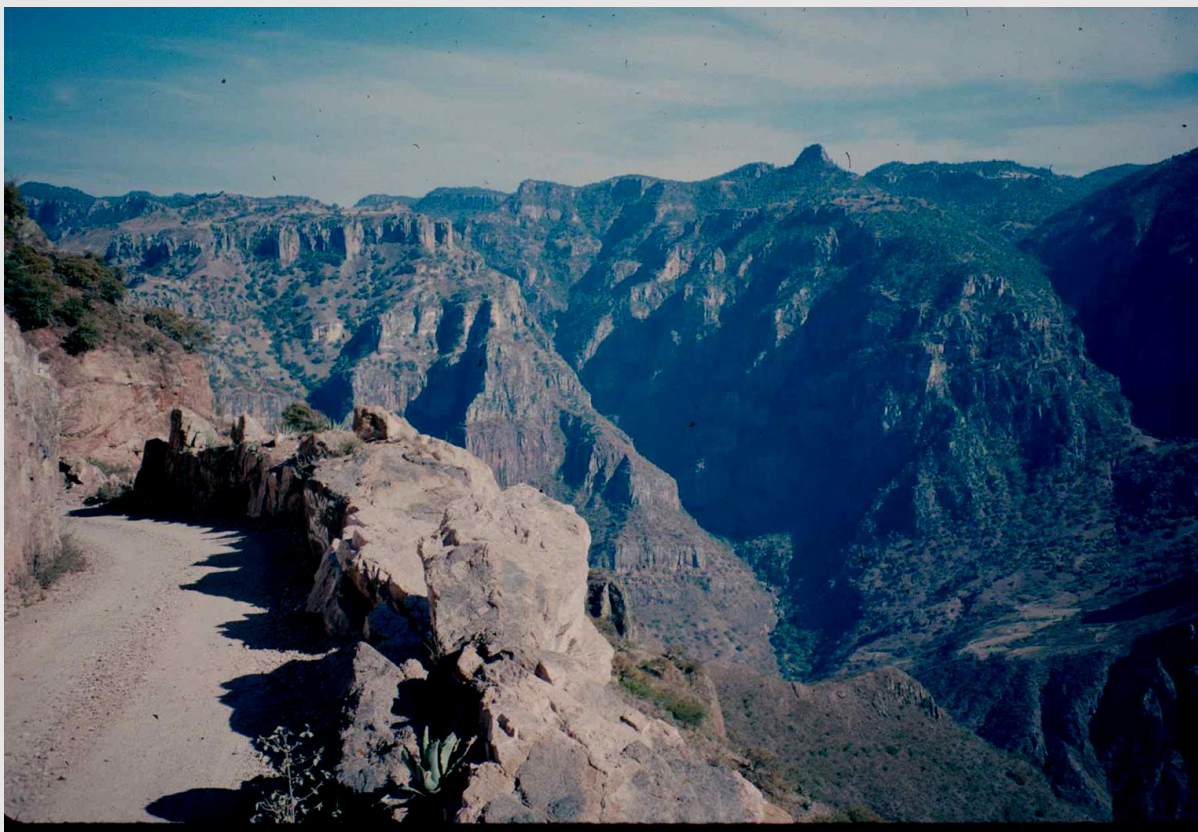
# Mexico: Laramide Fold and Thrust Belt



# Mexico: West Coast Subduction 105-32 Ma



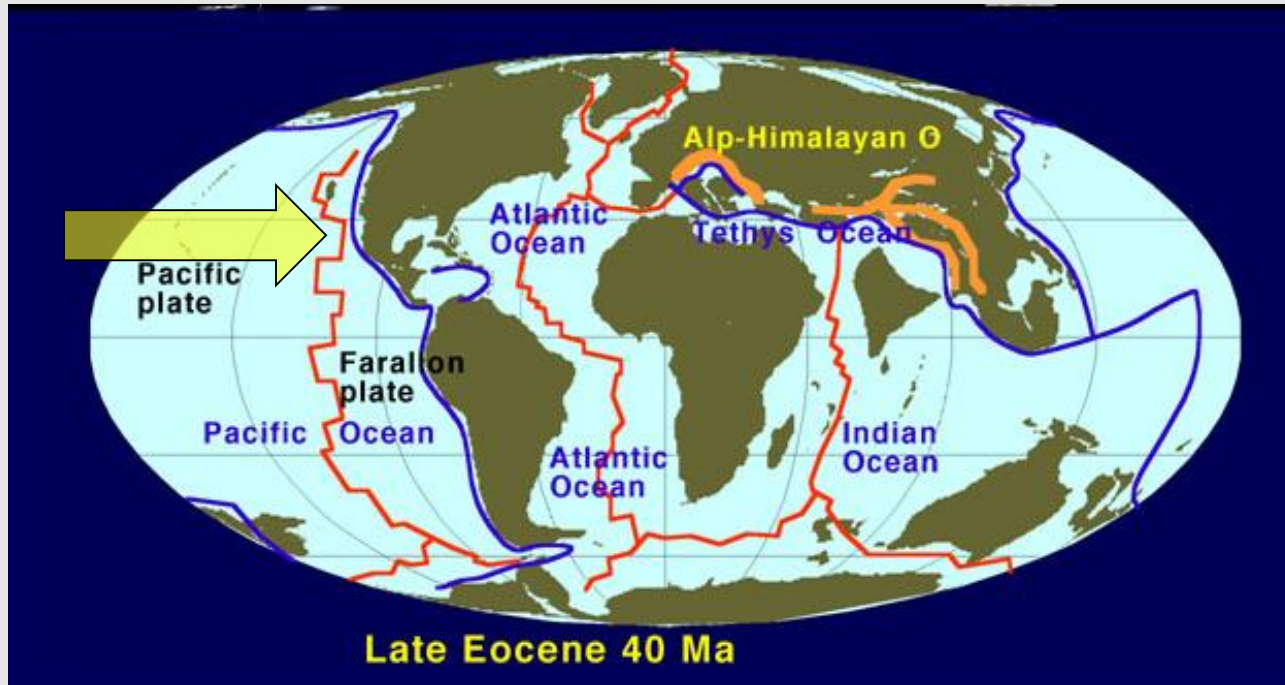
**Mexico: Intermediate Volcanism (105-45 Ma)  
Rhyolitic Volcanism (40-25 Ma)**



**Rhyolites Largely Crustally Derived**

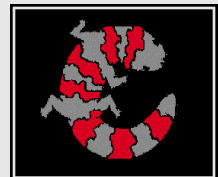
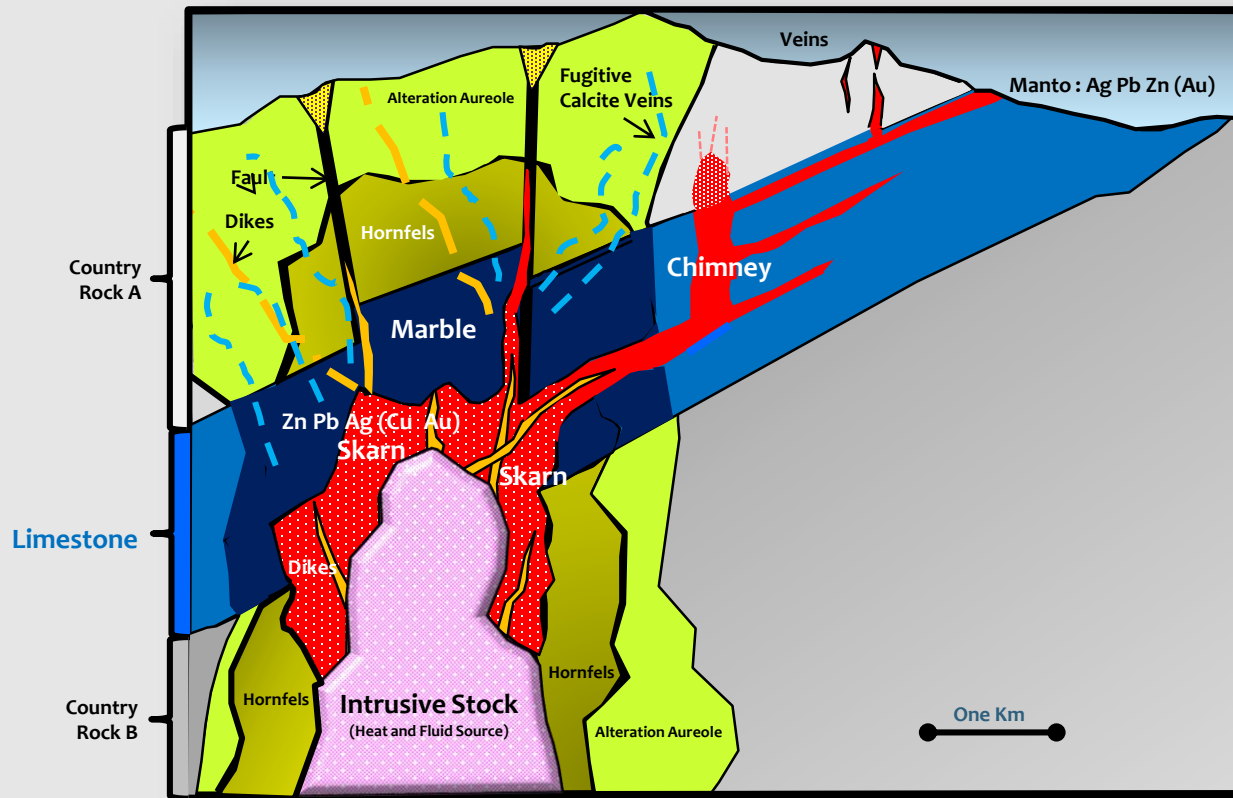


# Mexico: Initial Mid-Tertiary Extension

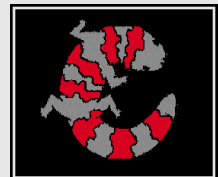
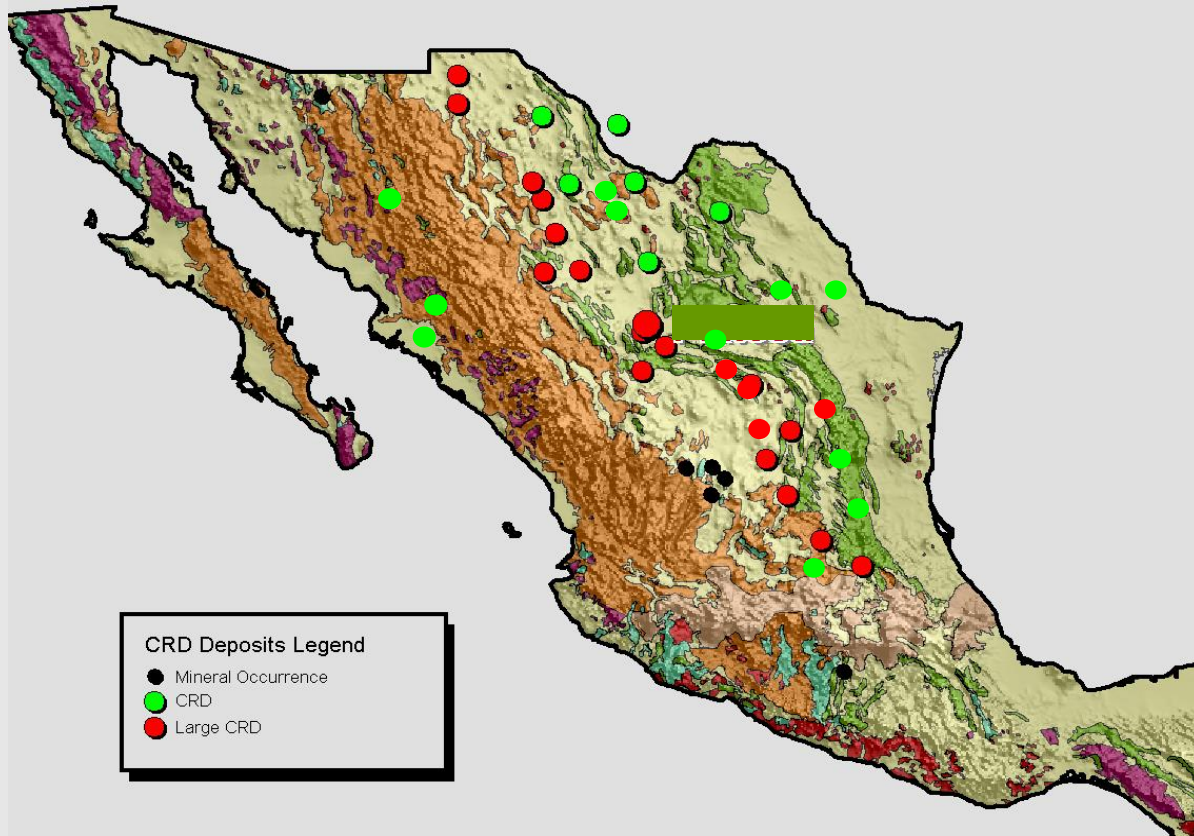




# CRD System – Idealized Geological Model



# Mexico CRD Belt



# Mexican CRD Belt

