

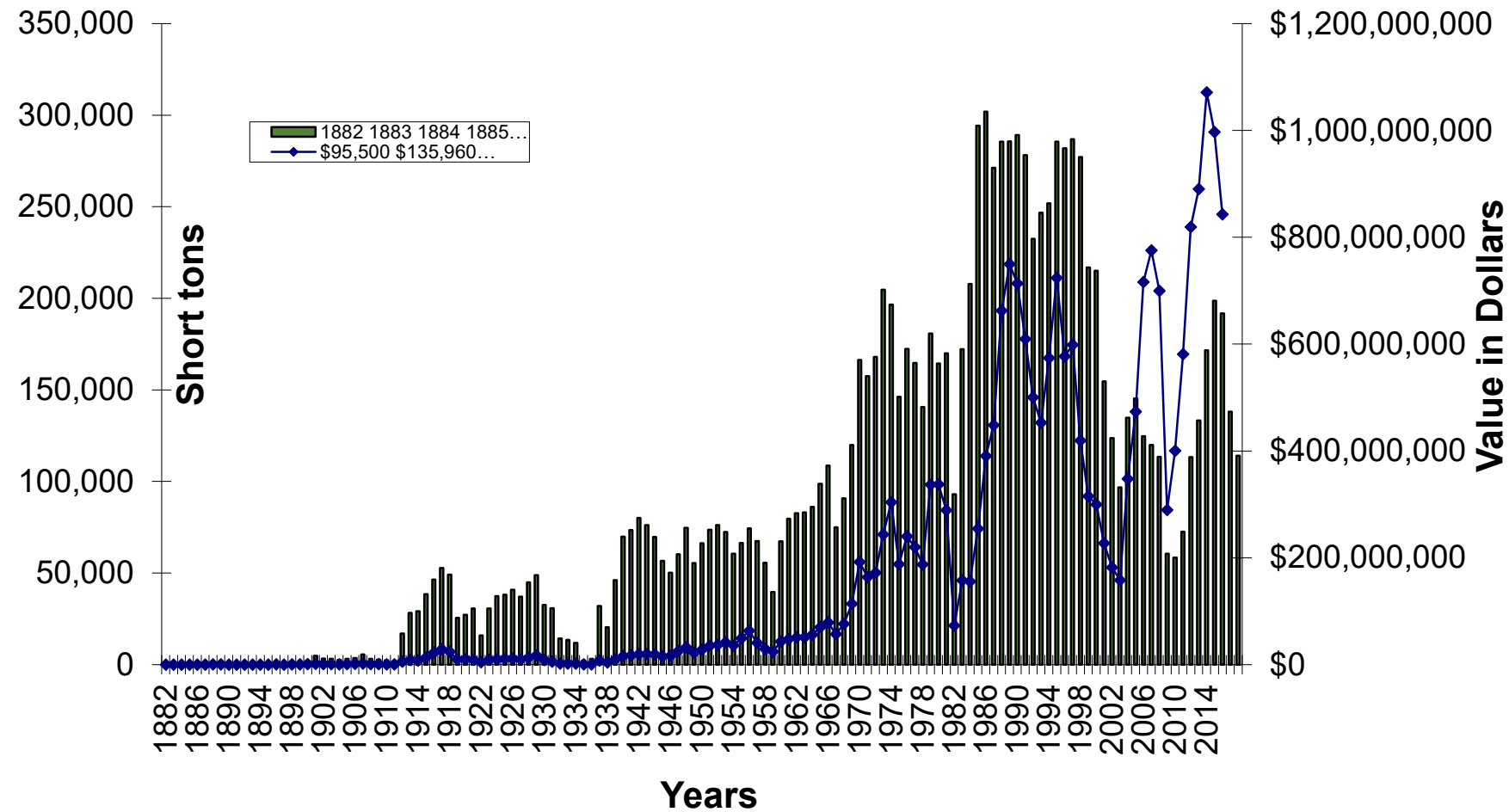
Mining Activities

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Mining production in New Mexico

- Excel file with yearly production of metals in New Mexico or US
 - US data found <https://www.usgs.gov/centers/nmic/commodity-statistics-and-information>
 - NM data found <https://geoinfo.nmt.edu/staff/mclemore/home.html>
- Have students plot each metal by year
- Have students explain why there are highs and lows in production

Copper Production 1882-2018



Cookie mining

- Lesson plan in book
- Supplies sent to you
- Simulates copper mining (Chino, Tyrone, Copper Flat)

- Be sure to make accurate drawings of the original cookie. Trace the outline of the intact cookie on the graph paper and then eyeball the cookie from the side in order to draw the original topography. After mining is completed, the “EPA Inspector” will use both of these drawings in order to assess fines.
- Choose the proper tools for your mining operation. You can choose any two tools out of a choice of three. Tools are rented, not purchased. Damaged or broken tools must be replaced at double the initial cost.
- Make good decisions concerning the removal of ore from your cookie as this is your only source of income. You will sell the ore at a set market price.
- Select cookie and tools. You can only purchase one cookie.
- Record the type of cookie and its cost on the Cookie Mining Worksheet.

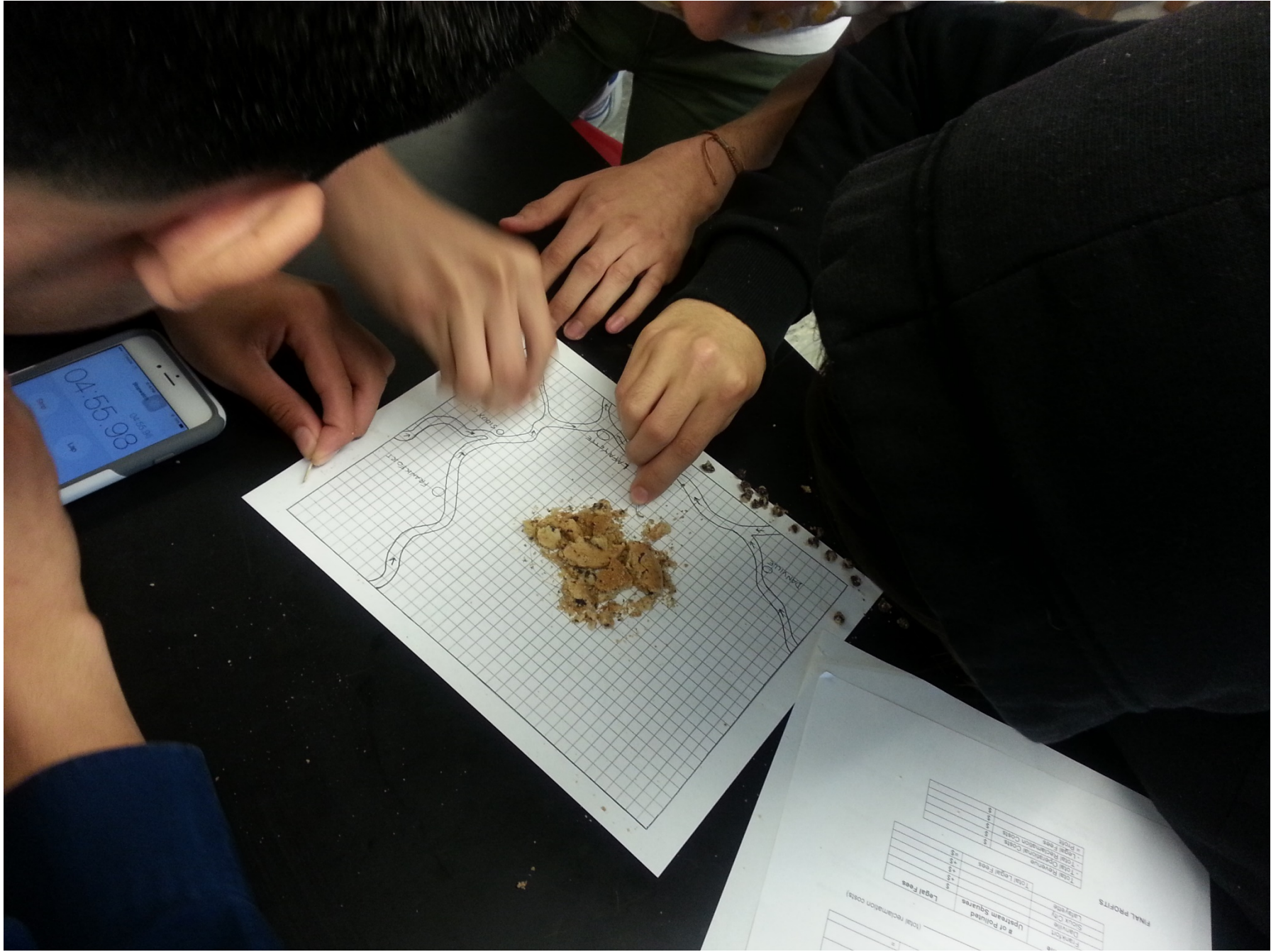
- Determine which mining tools your corporation would like to use for the mining activity. You may only rent two of the three available tools: a flat toothpick, a round toothpick, or an unfolded paper clip. They have different rental prices. Broken tools are replaced at double the rental price.
- Calculate and record the cost of the tools on the Cookie Mining Worksheet.
- Determine cookie size and topography. Trace an accurate outline of your cookie on a piece of graph paper. Determine the size (area) of the cookie by counting the graph paper squares within the outline.
- Record the area of your cookie on the Cookie Mining Worksheet.
- Look at the cookie from the side and carefully draw an accurate representation of its topography. Be sure to capture the natural peaks and valleys in the cookie.

ofit if

Full quires
8 half square
73 squares
(total)



- Mine cookie. Start timing with the stopwatch as you begin to mine the desired ores from your cookie.
- Excavate the ore using only the rented tools. You may not use your fingers! Be careful not to break or damage the tools.
- Collect as much of the ore as you think is best. Whole chips are most desirable, but pieces of chips may be combined to form complete chips.
- Reclaim mined cookie. Initiate reclamation of your cookie after mining is complete. The stopwatch should still be running.
- Use only your mining tools to perform reclamation. You may not use your fingers! Try to reclaim your cookie so that it matches its original size and topography.



FINAL PROPOS

Project	
Location	
Scale 1:100	
Upstream Squares	
Downstream Squares	
Total (Legal Fees)	
Legal Fees	
Total (reclamation costs)	

Project	
Location	
Scale 1:100	
Upstream Squares	
Downstream Squares	
Total (Legal Fees)	
Legal Fees	
Total (reclamation costs)	

- Stop timing when reclamation of your cookie is complete. Record the length of time for mining and reclamation operations on the Cookie Mining Worksheet.
- Calculate the operational (mining and reclamation) cost on the Cookie Mining Worksheet.
- Ask the “EPA Inspector” to check your cookie reclamation. Your teacher or another student may act as the inspector. Ideally, the cookie should match its original space and topography. Fines are given for discrepancies from the original shape and topography.
- Record any fines on the Cookie Mining Worksheet.
- Calculate profit or loss. Determine how many chips you removed. Small pieces of chips may be combined to form a complete chip.
- Calculate and record the value of the ore collected.
- Calculate a final profit or loss for your mining venture.

Cookie Mining Worksheet
Profit & Loss Statement

Mining Expenses

Land Cost & Area

Cost of cookie = \$1,200 _____

Initial size of cookie (in squares x \$100) = \$ _____

Mining Equipment Costs

Paperclip _____ x \$500 = \$ _____

Round toothpick _____ x \$300 = \$ _____

Flat toothpick _____ x \$100 = \$ _____

Total mining equipment costs = \$ _____

Labor Cost (Time)

Minutes spent mining _____ x \$50 = \$ _____

Unexpected costs

Landslide = \$ _____ COVID-19 expenses = \$ _____ Other = \$ _____

Subtotal: Cost of Mining Operations

Cost of land/cookie + mining equipment costs + labor/time cost + Unexpected = \$ _____

Reclamation Cost (land impacted by mining)

Final area taken up by cookie = _____ squares x \$30 = \$ _____

Minutes spent reclaiming _____ x \$10 = \$ _____

Total reclamation = area + labor = _____

Mining Revenue (from sale of chocolate ore)

Number of whole chips removed = _____ x \$3000 = \$ _____

Number of "dirty" chips removed = _____ x \$2000 = \$ _____

Number of grouped partial chips* removed = _____ x \$2000 = \$ _____

* To sell partial chips, amass the partial chips into groupings that contain at least the amount of chocolate as an intact whole chip.

Subtotal: Total Mining Revenue

Income from whole chips + dirty chips + grouped partial chips = \$ _____

PROFIT (Net Revenue)

Mining revenue – cost of mining operations – reclamation cost = \$ _____

Gold panning

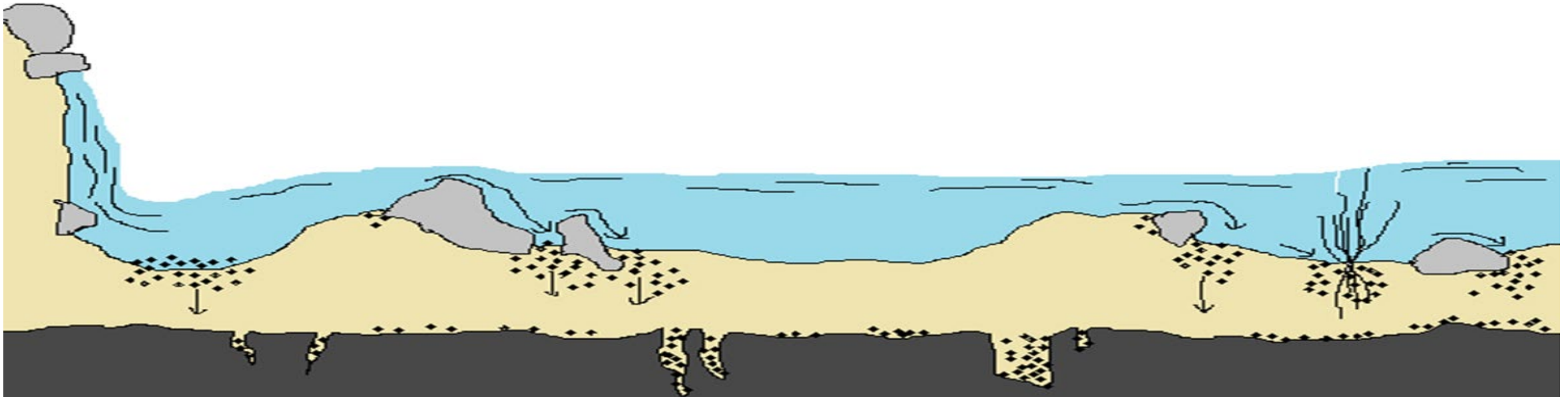
- Lesson plan in book
 - Can use pie plate
- Supplies sent to you
- Use dirt in back yard and add lead pellets and/or gold bag
 - Pan to see how much black sand is in the dirt
- Video



15811 - Gold, San Lazurus Gulch, San Pedro

Placer Gold

Gold that has been weathered from the host rock where it was formed and been re-deposited either on a hillside, stream bed, or alluvial fan—typically by the action of gravity and water



Placer deposits

- Placer is from Spanish meaning alluvial sand
- Any natural accumulation or concentration of a material in unconsolidated sediments of a stream, beach, or residual deposit
- Gravity controls the deposition of gold, because the gold is heavier than the other minerals, especially when saturated in water
- Four conditions must occur
 - Source terrain must crop out
 - Source must be weathered
 - Gold is eroded, transported and concentrated
 - Deposit must be preserved from erosion

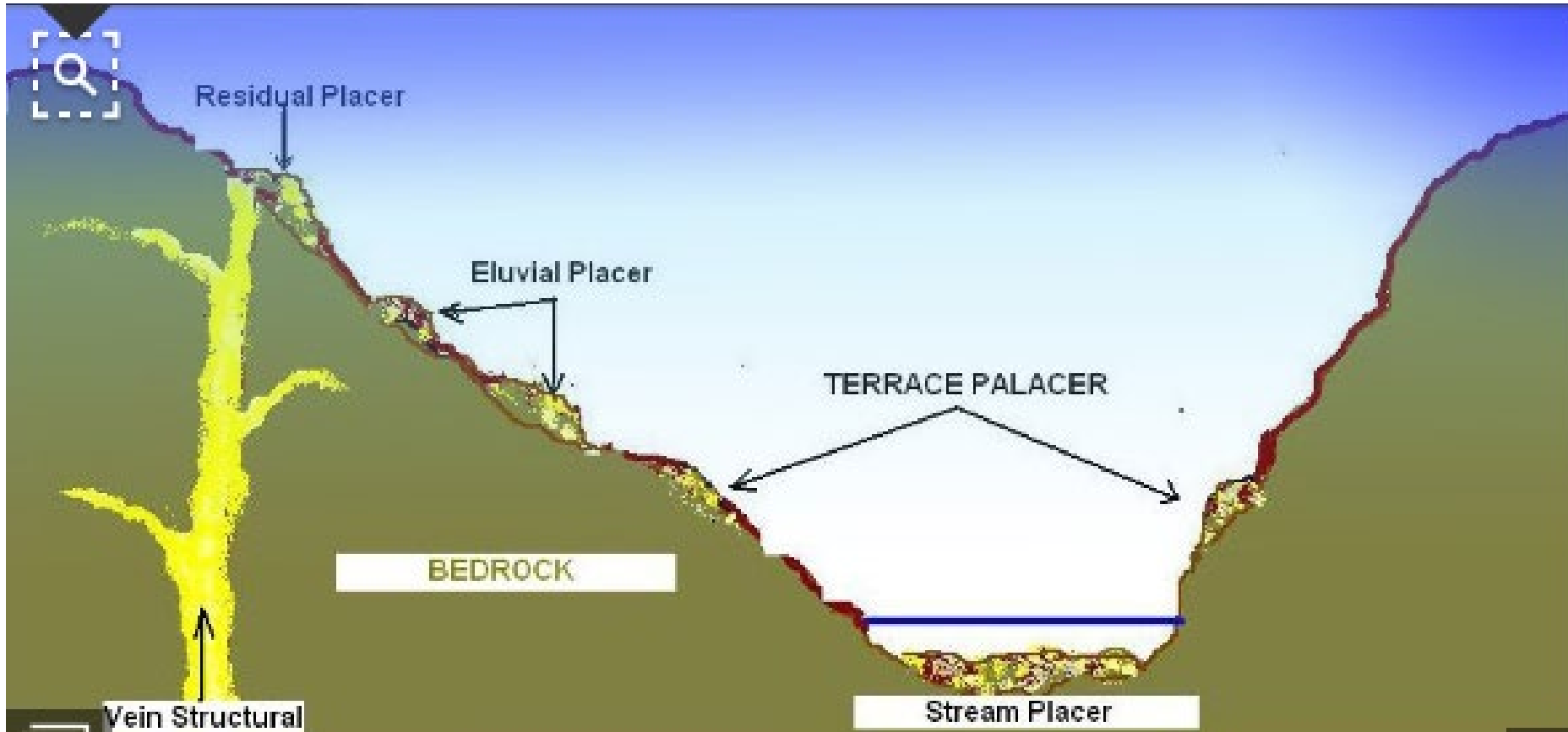


Types of placer deposits

- Alluvial
 - the sands and gravels of streams, rivers, beaches and deltas
- Aeolian
 - windblown sand deposits and are relatively minor
- Eluvial (hill-slope) or residual
 - weathered detritus directly over or near the outcrops of the lode deposits



Placer mining with rockers and longtoms in mouth of Baxter Gulch near Baxter Mountain near White Oaks, New Mexico, ca 1900 (NMBGMR #p-01658)



https://www.bing.com/images/search?view=detailV2&ccid=gaBBdoA%2b&id=2C4F3AE3F979478731489D420C2DDA6ABA3B131A&thid=OIP.gaBBdoA-wDK4T72_euNcMQEsCa&q=placer+gold+deposits&simid=607986213416406559&selectedIndex=0&ajaxhist=0

Gold Placer Deposits in New Mexico

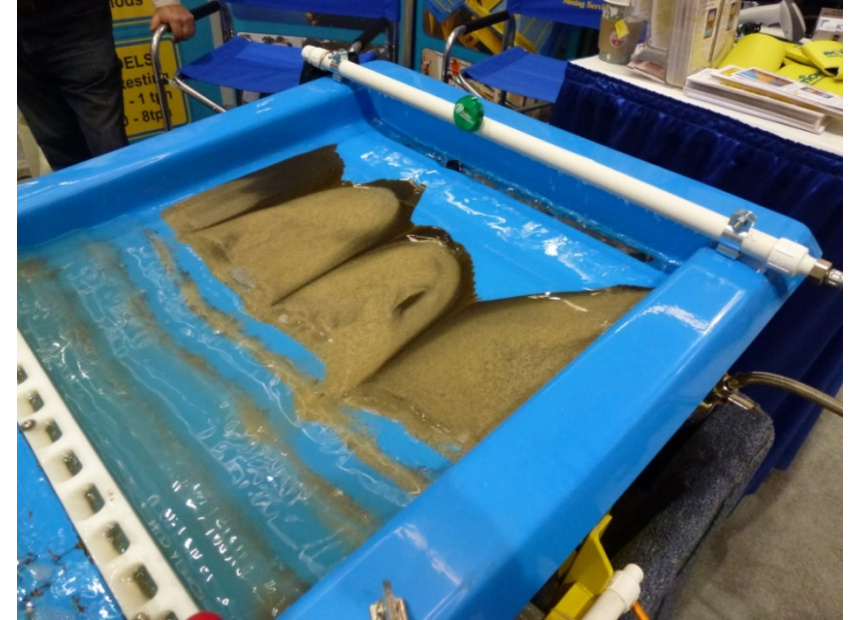
- Important source of gold in NM prior to 1902
- Placer production in NM after 1902 has been minor
- Most placer gold deposits discovered in NM by 1900
- ~662,000 oz of gold produced 1828 to 1991
- No recorded placer production since 1991

Sluice box

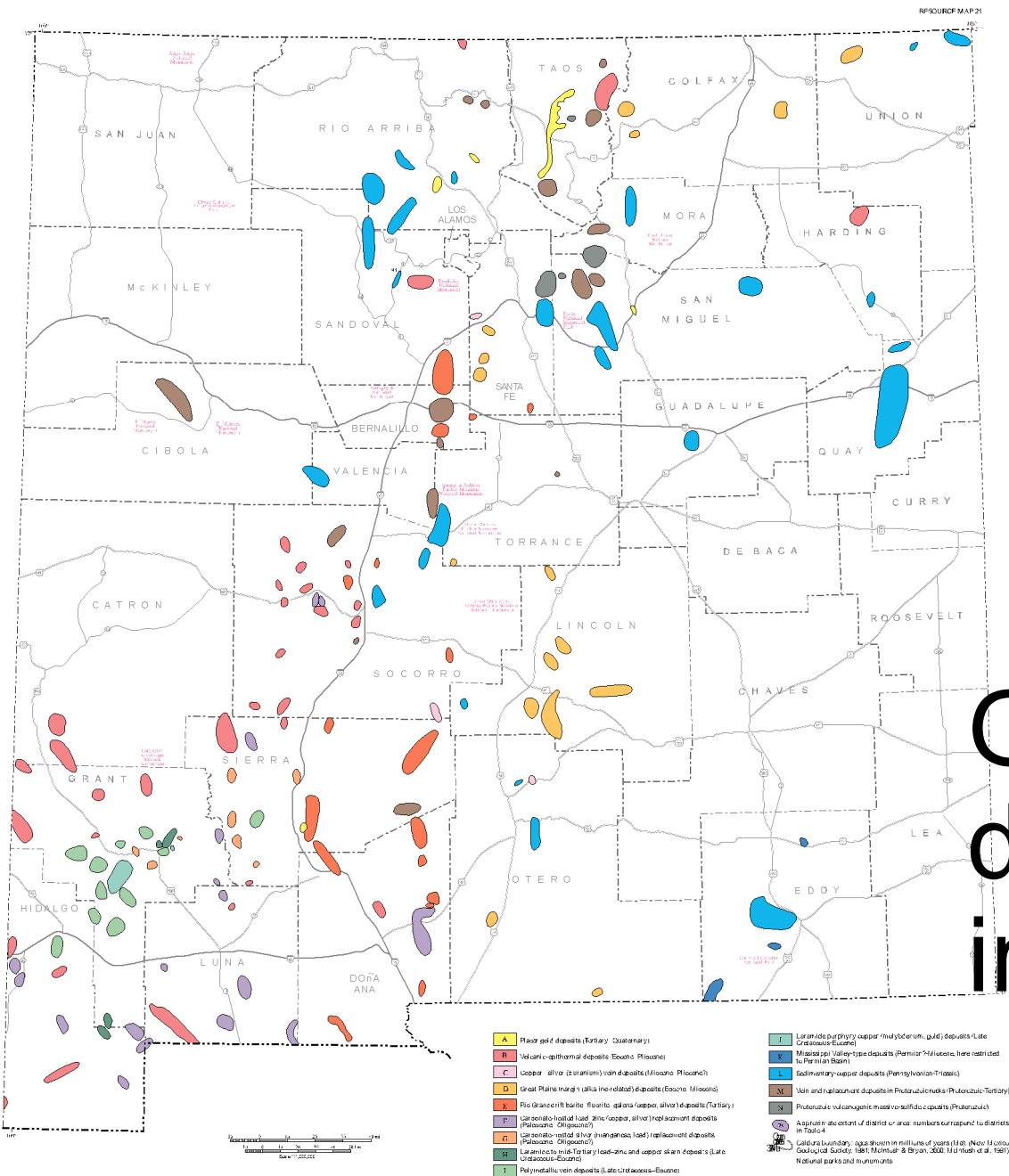


Major placer gold deposits in NM

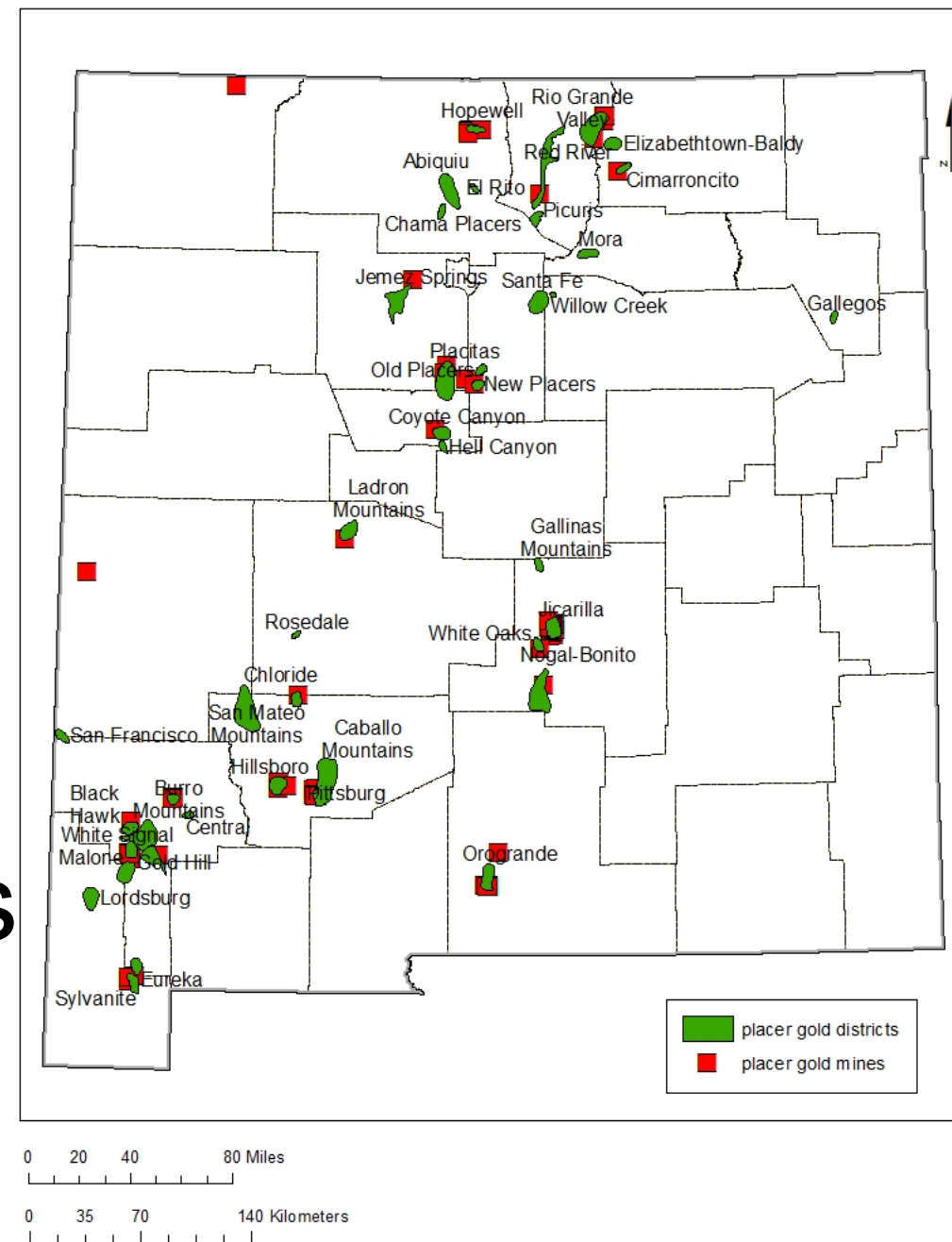
- >100,000 oz gold
 - Elizabethtown/Baldy
 - Hillsboro
 - Old Placers
 - New Placers
- Generally occur in alluvial fan deposits, bench or terrace gravel deposits, river-bars, and stream deposits or as residual placers formed directly on top of lode deposits



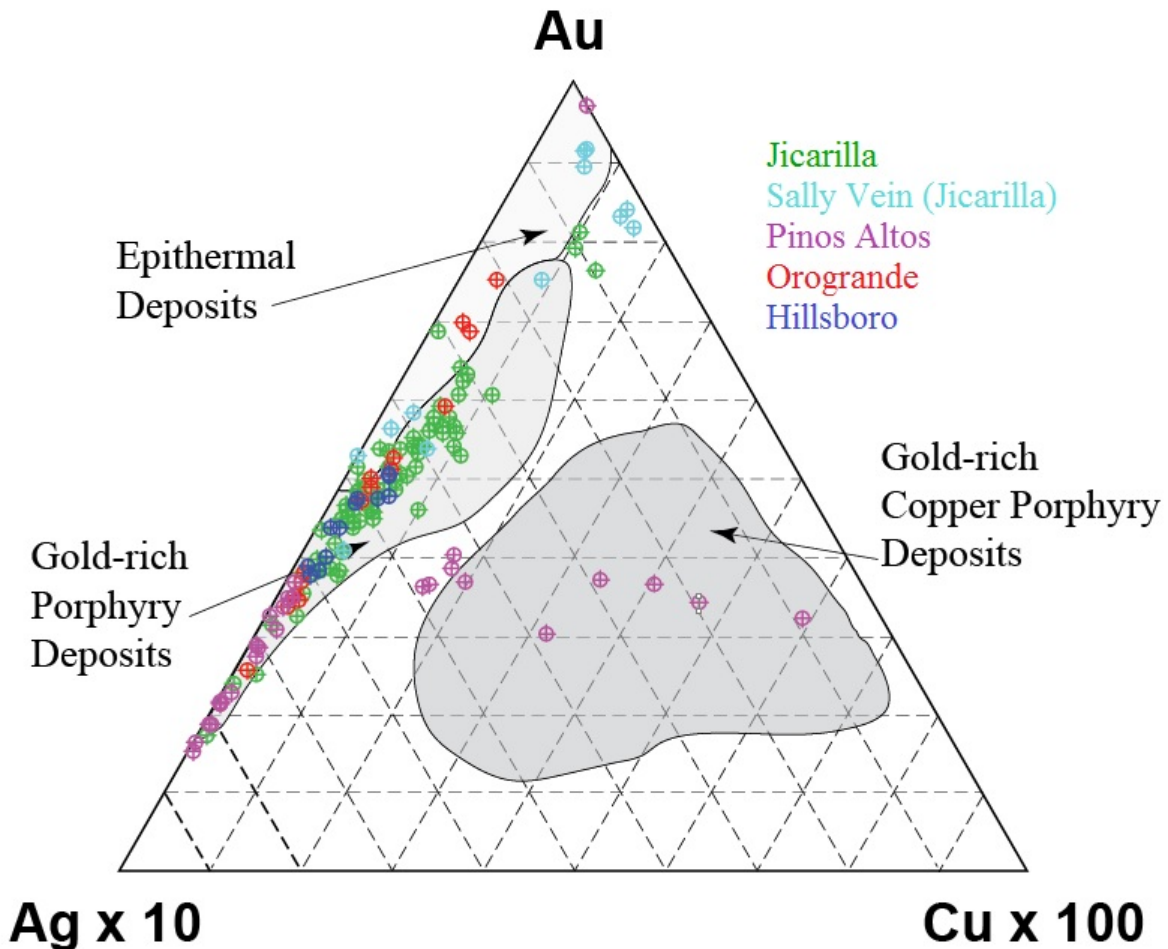
Shaking table



Gold districts in NM



Using Trace Element Analysis of Placer Gold to Determine Source and type of original deposit



- New Mexico's placer gold didn't travel far from source
- Chemical compositions of placer gold samples can be correlated with specific lode deposits

Variations

- Measure the amount of soil/dirt you start with and then measure the amount of black sand remaining (volume or weight)
- Add other metals (copper) or glass beads to the dirt
- Describe the soil/dirt and the black sand (particle size, mineralogy)