Date _____

AIM: What are significant mineral resources and how are they extracted?

MINERAL RESOURCES

Identified - known location and quantity

Reserves - identified resources that can be extracted

Undiscovered -

potential supplies assumed to exist

MAIN TYPES OF RESOURCES

Energy Resources

1. coal
2. oil (petroleum)
3. natural gas
4. uranium (also considered a mineral resource)

Non-Metallic Resources

1. **building stone** granite, limestone, marble, slate	4. **salt** road deicer, food additive
2. **sand and gravel** construction	5. **gypsum** plaster, wallboard (sheetrock) fertilizer
3. **clay** cement, bricks, pottery	6. **phosphates** fertilizers

Metallic Resources

ore - a rock from which a metal (or valuable mineral) can be profitably extracted.

1. **copper** (chalcopyrite) construction electronics	2. **iron** (magnetite, hematite) steel production	3. **aluminum** (bauxite) transportation construction food and beverage packaging

TYPES OF MINES

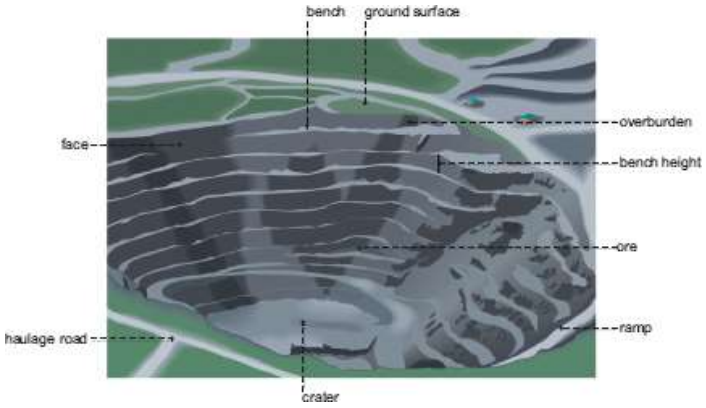
SUBSURFACE MINING drilling of underground shafts and tunnels

SURFACE MINING top layers of soil & rock **(overburden)** are removed to access minerals

- **spoils** - waste material removed from area being mined

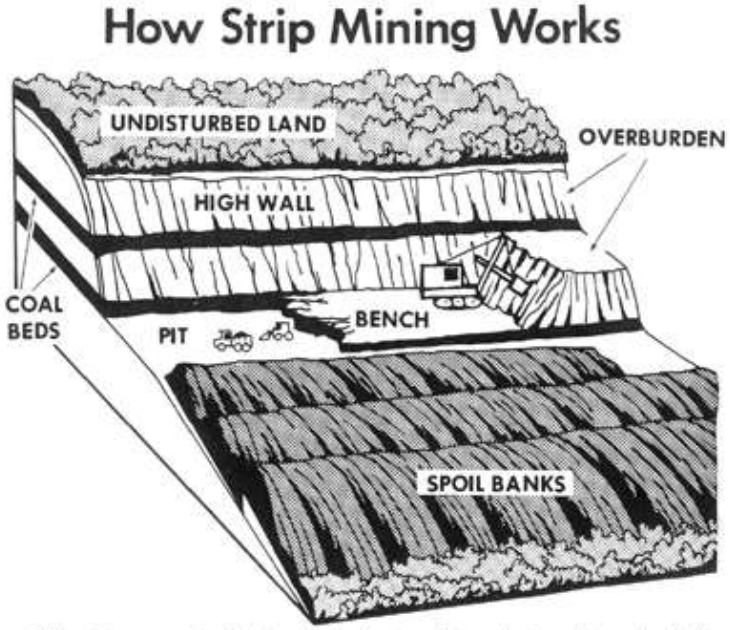
a. open-pit mining

- large hole is dug to extract minerals
- ex. copper and iron



b. strip mining

- overburden and minerals removed in strips or sections
- ex. coal and phosphates



Strip mining operations begin with the clearing of trees, brush and topsoil, called the "overburden," by bulldozers or power shovels. Explosive charges loosen the coal deposits, and power shovels or auger drills remove the mineral and load it into trucks in the stripping pit. Strip mining exposes cross-sections of the earth's crust, called "highwalls," and the discarded overburden is piled in long rows called "spoil banks." There are two basic kinds of strip mining: "area" stripping, which is conducted on flat or rolling terrain, and "contour" stripping, done in hilly or mountainous areas.

c. mountaintop removal

- removal of mountaintop or ridgeline using explosives and heavy machinery

NEGATIVE EFFECTS OF MINING

1. disrupts great amounts of surface ecosystems (trees, vegetation, and soils are all removed)

2. increased soil erosion (loose soil from spoils can be picked up by wind and water)

3. altered stream drainage → flooding (landform shapes change, dumping of spoils change landscape)

4. machinery energy use → air pollution (burning of fossil fuels and other particulate matter)

5. – **tailings** - leftover material after ore has been processed
   surface and groundwater pollution rainwater contacts mine waste
   (from runoff and percolating water – toxins leach downward)

6. **acid mine drainage** – subsurface rocks exposed to air and water → sulfuric acid

7. post-extraction processing of ore

   smelting produces sulfur dioxide which combines with water to form sulfuric acid rain

   heap-leach extraction
   – chemical process to separate metal from rock → cyanide water contamination

8. subsurface – dangerous conditions
   - chronic health effects
   CWP - coal-workers pneumoconiosis (black lung)
   COPD - chronic obstructive pulmonary disease
   hypertension
   kidney disease

MINING LAWS AND REGULATIONS

1. **National Environmental Policy Act of 1970 (NEPA)**
   - Environmental Impact Statement (EIS) must be created before mining is approved

2. **Surface Mining Control and Reclamation Act of 1977**
   - regulate active mines
   - mine reclamation - restoration of mined land to a natural state
   - established OSM (Office of Surface Mining)

3. **Environmental Performance Bonds & Pollution Prevention Bonds** (upfront insurance payments)
   hold mining companies legally and financially responsible for environmental clean-up / restoration