

Mineral Resources Program

Industrial Minerals Activities

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Acknowledgments

This presentation includes major contributions from the following USGS scientists:

- **Nora Foley Ayuso**
- **William Langer**
- **James Bliss**

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Mineral Resources Program

Industrial Minerals Projects

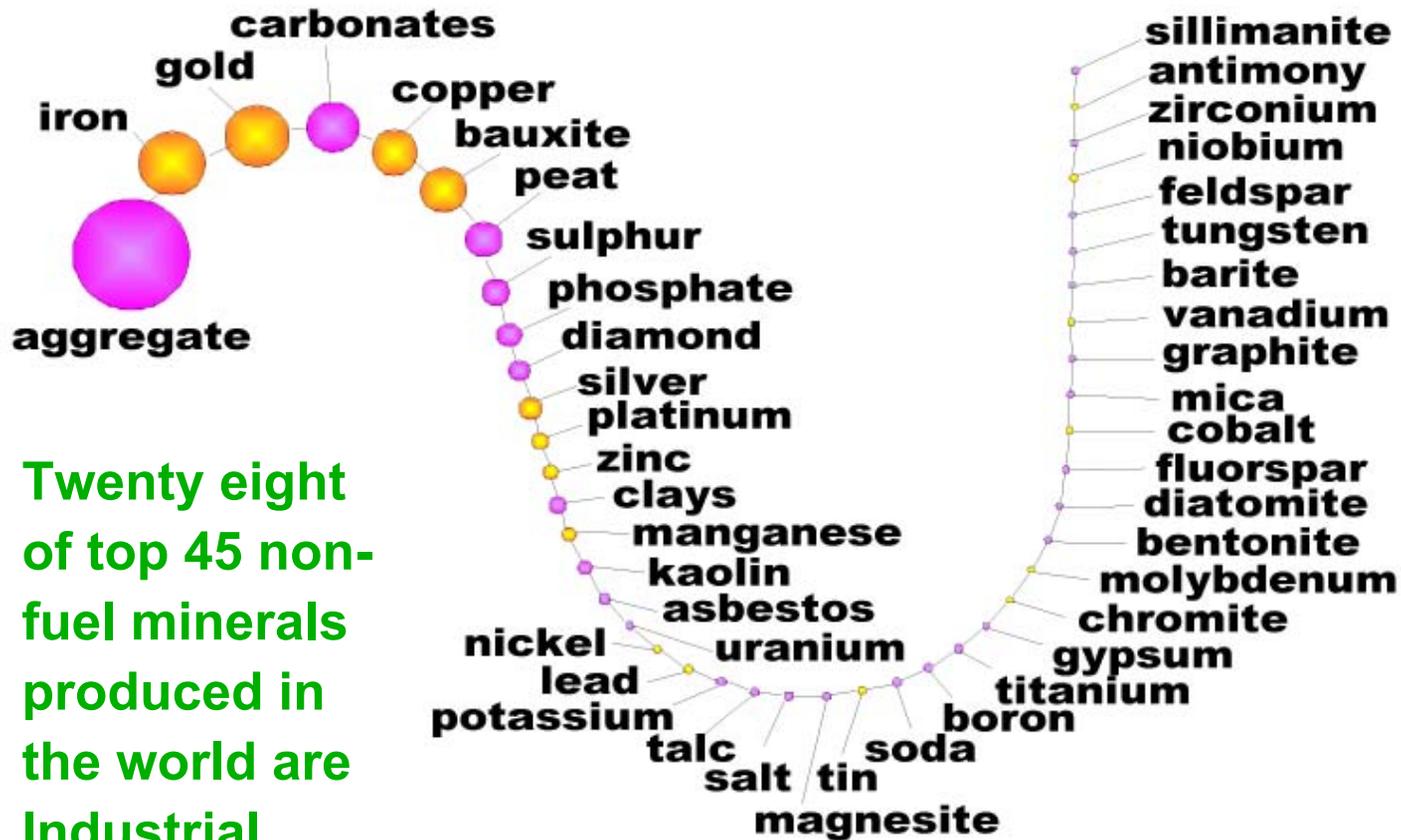
■ Research Activities

- National Industrial Minerals Project
- Eastern, Central, & Western Regions of U.S.

■ Minerals Information Activities

- Information on production, consumption, reserves
- Trends in industry – markets, supply and demand

Industrial Minerals - Background



Twenty eight of top 45 non-fuel minerals produced in the world are Industrial Minerals.

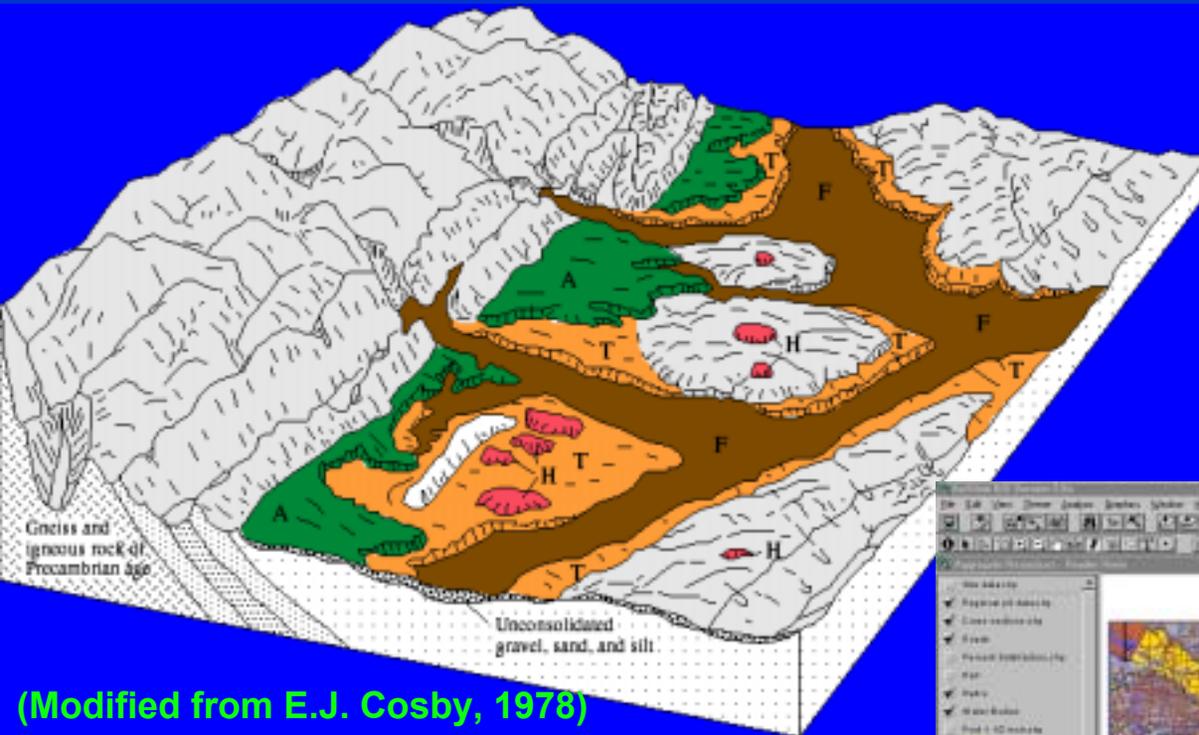
National Industrial Minerals Projects

Objectives:

- **Develop new and emerging approaches, methods, and modeling applications in industrial minerals.**
- **Conduct research on a variety of science research topics.**
- **Provide a National perspective for scientific activities in industrial minerals.**
- **Utilize a readily available outlet for industrial minerals information.**



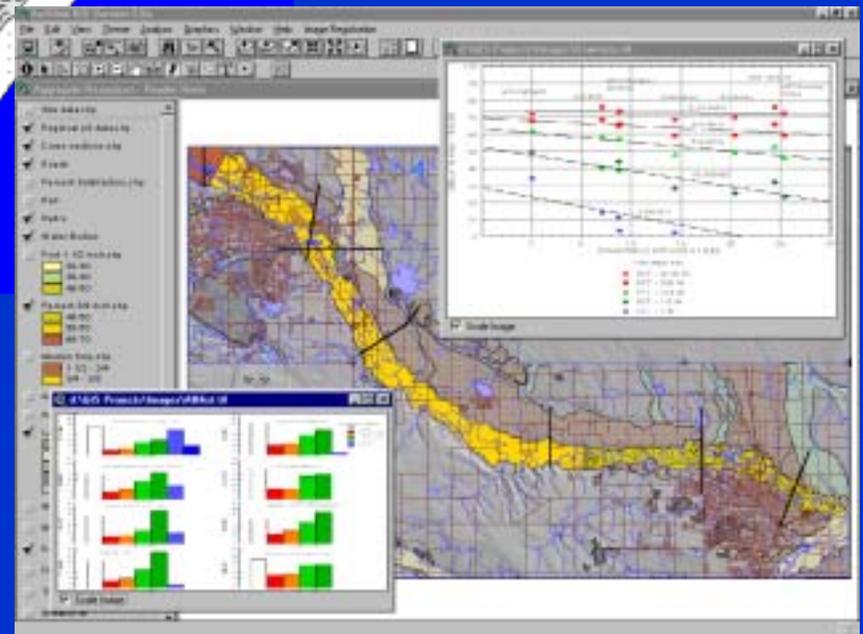
Infrastructure Resources Project Sand and Gravel Models



- Physical and mineralogical properties as a function of location along stream.
- Physical and mineralogical properties as a function of source area.

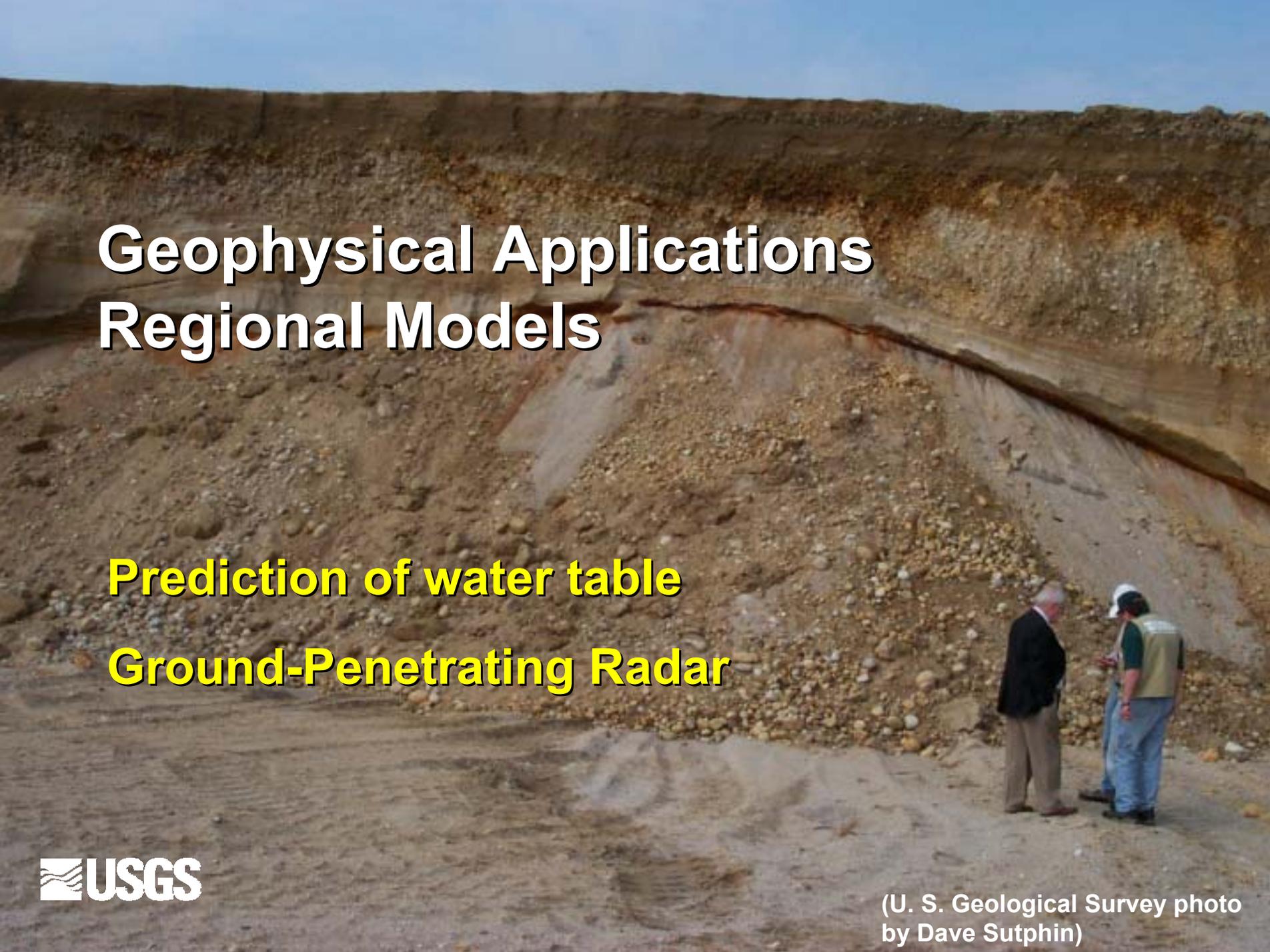
(Modified from E.J. Cosby, 1978)

- More efficient resource assessments
- Objective decision-making support.



Research Topics Include:

- **Processes that form industrial minerals**
 - **Environmental consequences of extracting industrial minerals**
 - **Identification of mineralogical and geochemical characteristics that may have an impact of health of humans or other biota**
 - **Geosocietal factors of industrial minerals development and reclamation**
-



Geophysical Applications Regional Models

Prediction of water table
Ground-Penetrating Radar

Clay Studies

- **Pb, As, Se, REE**
- **Behavior during formation of clay deposits and mobility during mining**
- **HAPs Elements associated with clays in brick-making (Fluorine)**



Kaolinite Studies - Gallium

- Content in clays/residual environments
- No domestic sources - imported from France, Kazakhstan, and Russia

Uses:

- Semiconductors
- Solid-state devices
- Conversion of electricity to coherent light
- Mirrors
- Solar neutrinos
- Alloying

Ultramafic Minerals – Rainbow Mine, Vermont

**Minor asbestos,
Trace arsenic**



(U. S. Geological Survey
photo by Nora Foley
Ayuso)

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Research Topics – FY 2003:

- **Aggregates**
- **Clays**
- **Ultramafic minerals**
- **Geophysical applications**
- **Megaquarries**
- **Manufactured sand**
- **Carbonate rocks**
- **Diatomite**
- **Gallium**
- **Barite**
- **Diamonds**
- **Garnets**

Industrial Minerals in Lacustrine Systems

- Regional to local controls on **diatomite** formation
- Controls on basin development: climate, tectonism, volcanism on metal and diatomite deposits
- Other minerals: **gypsum, halite, sodium carbonate, zeolites, magnesite, lithium, clays**



(Photo from Bureau of Land Management, Wyoming)

Barite

- **Weighting agent in drilling fluids**
- **87% barite imported (mostly from China)**
- **No government stockpile of barite**

Garnet

- **Preferred mineralogy, size, angularity**
- **Abrasives, filtration, gemstones**
- **Objective – Determine controls in development of major garnet placer deposits**

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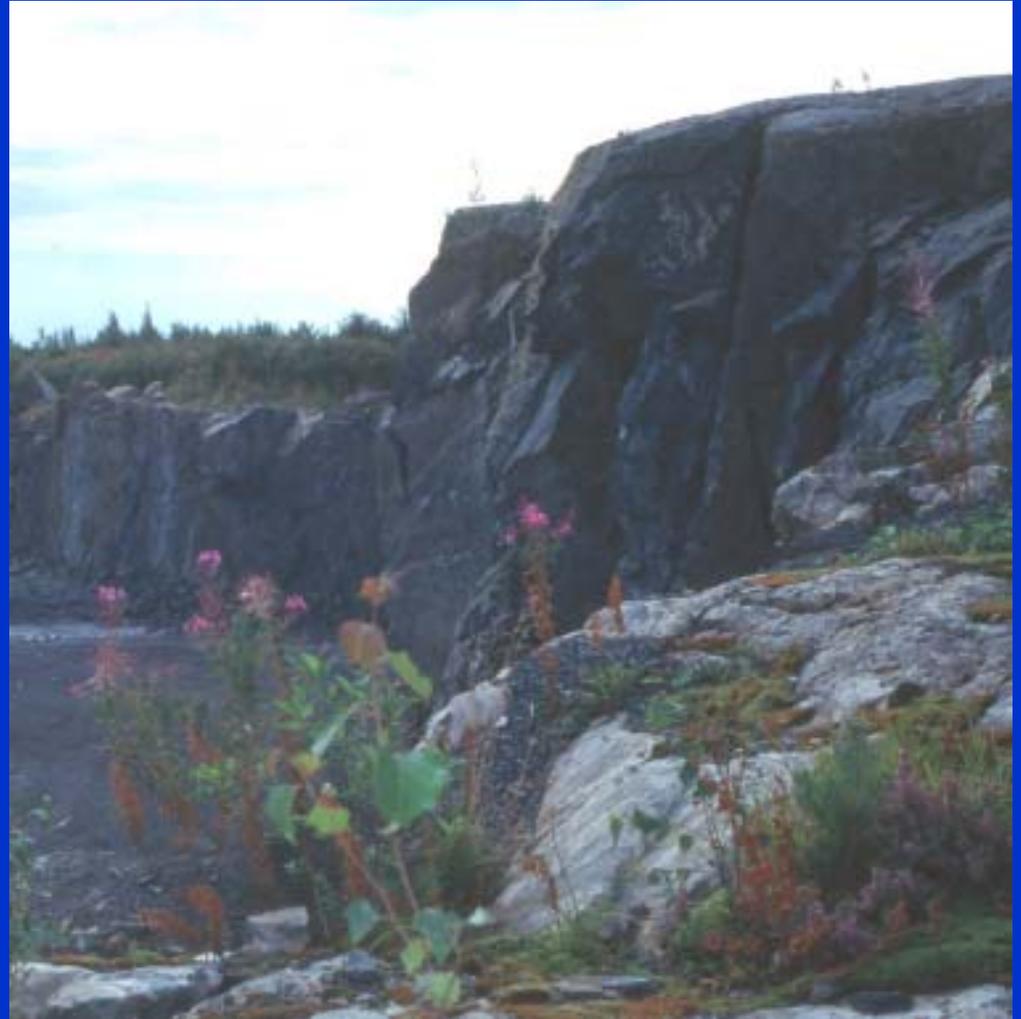
Development of Industrial Minerals – Emerging Issues

Geosocietal Issues of Industrial Minerals Development:

- Visualization methods
- Sustainable mineral resource management

Visual Resource Management for the Mining Industry

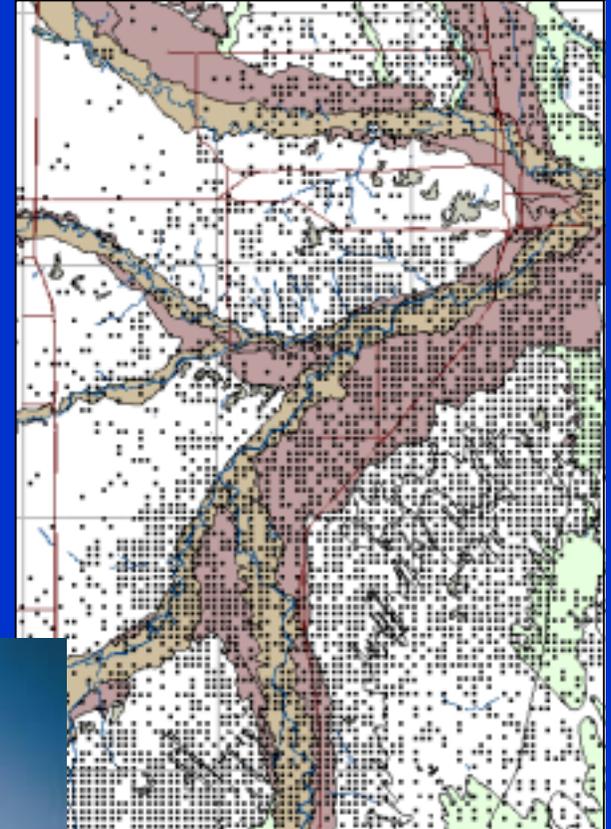
Beauty, whether it is man-made or natural, can never be accurately measured. There is no reason, however, why it should not be modeled. By defining the variables associated with an object and a subject's perception of it, a reasonable understanding of aestheticism may be attained. (Coomber and Biswas)



Infrastructure Resources Project

Resource Conflicts

- Pump jacks, tanks, pipelines, pads, and access necessary for energy development.
- Surface rights versus mineral rights.
- Collaborative planning.



Objective
decision-making
support

Outside expertise



(U. S. Geological Survey photo by Neil Fishman)

(Photo courtesy Michael Power,
Construction Aggregates Ltd.)

Megaquarries



- Low-cost ocean or rail transport
- Societal resistance

- Challenges for Land-management & reclamation
- Geologic, geographic, and economic settings

Megaquarries -- Topics of Study

- **Economic factors**
- **Production trends**
- **Cost trends**

Megaquarries - Goals

- **Geologic modeling**
 - **Characteristics of deposits**
 - **Areas permissive/not permissive for development**
 - **Distribution models, points of consumption, use**
 - **Hypothetical development and economic scenarios**
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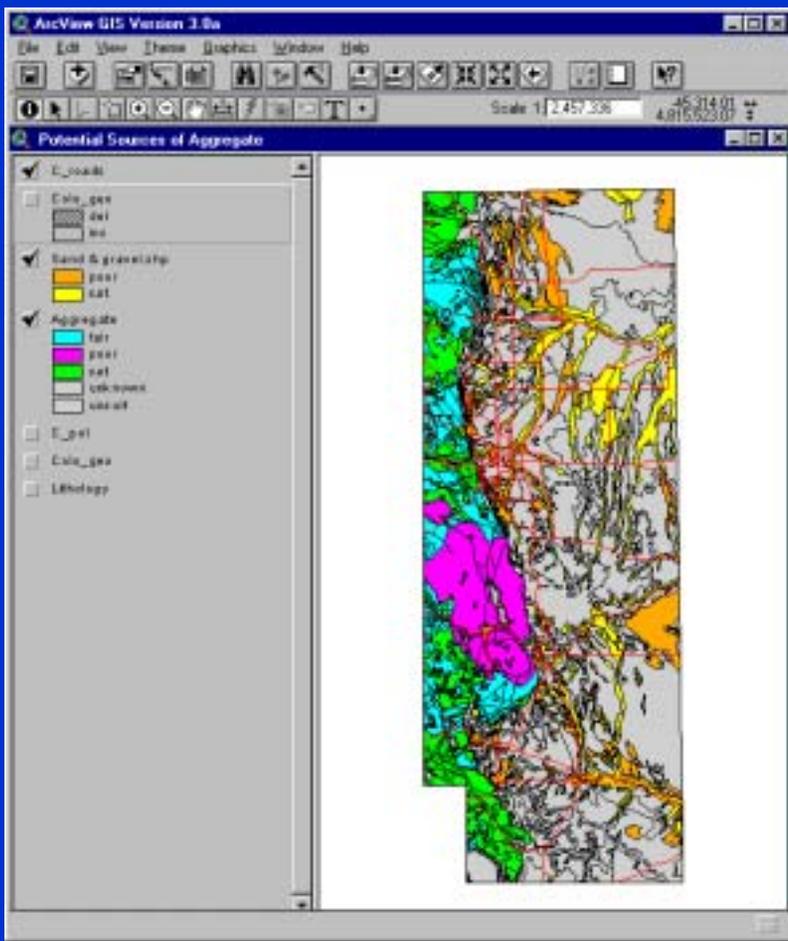
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Digital Aggregate Resource Maps



■ Aggregate Resources of FRIRP

■ Colorado Geological Survey “Atlas of sand, gravel and quarry aggregate resources”

■ Objective decision-making support

■ Collect, analyze, disseminate data

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