Nonrenewable Resources

Concept
Natural resources are limited.

Objective
Students will compare estimated life expectancies of some nonrenewable natural resources and will understand the role recycling and careful use play in meeting the demand for the extending availability of these resources.

Method
Students will complete worksheets and discuss.

Material
Attached charts and worksheets.

Subjects
Environmental Science, Social Studies, Language Arts

Skills
Applying ideas to solve problems, explaining, interpreting data, predicting outcomes

Time
One class period

Vocabulary
Nonrenewable resources, static use, life expectancy, reserve base

Resources
Donella and Dennis Meadows, Limits to Growth; Cynthia Pollack, “Mining Urban Wastes: The Potential For Recycling,” Worldwatch Paper 76

3R’s of the Common Core
Parallel Activities
K-3, Machine
4-6, What Kind of Waste Am I?
7-8, School Trash Analysis
Information
The Solid Waste Stream
Resources
General

How Does Waste Affect Our Natural Resources?

Background
Despite occasional drops in the market, the global demand for and consumption of most major nonfuel mineral commodities continues to rise. There is a limit to how long an increasing population can continue to make increasing demands on our finite resources. Concentrated, easily mined reserves of nonrenewable resources are being depleted. The availability of these resources can be extended by careful use and recycling.

Leading Question
How long will our natural resources last?

Procedure
1. Distribute copies of the chart Selected Nonrenewable Natural Resources: Their Life Expectancies and Prime Consumers. Have students complete the worksheet and/or discuss the questions in class.
2. Discuss Alternate Depletion Patterns For a Nonrenewable Resource.
   - How can we determine how long a given resource might last?
   - Any projections are based on two major set of assumptions: We must estimate the potentially available supply at existing (or future) acceptable prices and with existing (or improved) technology and we must estimate the annual rate at which the resource may be used.

Evaluation
What could be some effects of population growth, natural disasters, disease, and advanced technology systems on resource availability? What are some advantages and disadvantages of using renewable resources in place of nonrenewable resources?
Common Core Alignments

GRADE 9-10

CC.L.9-10.6
Language:
Vocabulary Acquisition & Usage

CC.RST.9-10.7
Reading in Science & Technical Subjects:
Integration of Knowledge & Ideas

CC.SL.9-10.2
Speaking & Listening:
Comprehension & Collaboration

CC.W.9-10.4
Writing:
Production & Distribution of Writing

GRADE 11-12

CC.L.11-12.6
Language:
Vocabulary Acquisition & Usage

CC.RST.11-12.8
Reading in Science & Technical Subjects:
Integration of Knowledge & Ideas

CC.SL.11-12.2
Speaking & Listening:
Comprehension & Collaboration

CC.W.11-12.4
Writing:
Production & Distribution of Writing
## Selected Nonrenewable Natural Resources: Life Expectancies & Prime Consumers (2007)

<table>
<thead>
<tr>
<th>Resource</th>
<th>*Reserve Base</th>
<th>Countries with highest reserve base</th>
<th>Countries with largest production</th>
<th>Largest consumer</th>
<th>**Life expectancy at current rate</th>
<th>Life expectancy at US consumption rate</th>
<th>recycling rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bauxite</td>
<td>32,000,000</td>
<td>Guinea, Australia, Jamaica, Brazil</td>
<td>Australia, China, Brazil</td>
<td>China</td>
<td>1027</td>
<td>510</td>
<td>49%</td>
</tr>
<tr>
<td>Copper</td>
<td>940,000</td>
<td>Chile, United States, China</td>
<td>Chile, Peru, United States</td>
<td>China</td>
<td>61</td>
<td>38</td>
<td>31%</td>
</tr>
<tr>
<td>Gold</td>
<td>90,000</td>
<td>South Africa, Australia, Peru, China</td>
<td>Australia, South Africa, China</td>
<td>India, China</td>
<td>45</td>
<td>36</td>
<td>43%</td>
</tr>
<tr>
<td>Iron Ore</td>
<td>340,000</td>
<td>Ukraine, Russia, China</td>
<td>China, Brazil, Australia</td>
<td>China</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Lead</td>
<td>170,000</td>
<td>Australia, China, United States</td>
<td>China, Australia, United States</td>
<td>China</td>
<td>42</td>
<td>8</td>
<td>72%</td>
</tr>
<tr>
<td>Silver</td>
<td>570,000</td>
<td>Poland, China, United States</td>
<td>Mexico, Peru, China</td>
<td>United States, India, China, Russia</td>
<td>29</td>
<td>9</td>
<td>16%</td>
</tr>
<tr>
<td>Tin</td>
<td>11,000,000</td>
<td>China, Brazil, Malaysia</td>
<td>China, Malaysia, Indonesia</td>
<td>China</td>
<td>40</td>
<td>17</td>
<td>26%</td>
</tr>
<tr>
<td>Chromium</td>
<td>N/A - exceeds 12 billion tons</td>
<td>Kazakhstan, South Africa</td>
<td>South Africa, Kazakhstan, India</td>
<td>China</td>
<td>143</td>
<td>40</td>
<td>25%</td>
</tr>
<tr>
<td>Platinum</td>
<td>80,000,000</td>
<td>South Africa, Russia, United States</td>
<td>South Africa, Russia, Canada</td>
<td>EU</td>
<td>360</td>
<td>42</td>
<td>0%</td>
</tr>
</tbody>
</table>

*All weight is in dry metric tons
**Life Expectancy is very subjective and cannot be accurately determined due to constant fluctuations in the markets, changing technologies and political climates.
Alternate Depletion Patterns for a Nonrenewable Resource

A. Mine, use and throw away
B. Recycle, improve mining technology to damage the environment less and use less concentrated mineral deposits
C. Recycle

SOURCE: Modified after Hubbert and Cloud.

“There is no danger whatever of humanity ‘running out’ of non-fuel mineral resources and I have not said there is. Humanity is not destroying them. What will run out, however, is the capacity of the environment to absorb the punishment associated with mining ever-lower grades of ore or reconcentrating what is already dispersed. Secondarily, the ability to do the job at an attractive cost will also ‘run out.’”

– Paul Erlich
Examine the chart Selected Nonrenewable Natural Resources: Their Life Expectancy and Prime Consumers. Then answer the following questions.

1. Which Life Expectancy in Years, current global rate or US rate, do you think is more accurate in estimating the length of time our nonrenewable natural resources will last?

2. What are some factors leading to the accelerated use of resources?

3. Examine the column under the heading Life Expectancy in Years. Which nonrenewable natural resource will be used up first?

4. Which countries have the highest reserves of the resource from question 3? Locate these countries on a world map.

5. Why does the United States need to be concerned with the depletion of this resource?

6. Which nonrenewable resource will last the longest according to the table?

7. Which countries have the highest reserves of this resource?

8. Which countries will the United States need to cooperate with in order to get the amount of this resource it needs?

9. List the resources that will probably be used up within the next 40 years given global usage rates.

10. What role do recycling and careful use play in extending the availability of these resources?