

Reclaiming the Future:

Reforestation in Appalachia

TEACHERS GUIDE



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General Introduction

Students in Kentucky are bombarded with information regarding the impacts of coal mining on the environment. As educators, we have a responsibility to present as much relevant and accurate information from as many different perspectives as we can. This DVD presents the research of the Reforestation of Surface Mined Lands Initiative efforts. It will show students that there are ways to mitigate the impacts of coal mining on forested areas and the recommended approach needed for that protection. This Teachers' Guide presents some Research and Discussion Questions, Activities and Lesson Plan Resources, Literature Connections, Helpful Organizations and Links, and Video Recordings under different topic areas that may be used to help students gain an understanding of the complex issue of coal mining reclamation in Kentucky.



Content Background

Since the implementation of the Surface Mining Control and Reclamation Act of 1977 (Public Law 95-87), many opportunities have been lost for the reforestation of surface mines in the Eastern United States. Excessive compaction of spoil materials in the backfilling and grading process is the biggest impediment to the establishment of productive forests as a post-mining land use. As the result of reforestation research, a five step Forestry Reclamation Approach is being recommended for successfully establishing productive forests on reclaimed surface mines.

This DVD highlights the Forestry Reclamation Approach, but in addition, it can give insight on the importance of reclaimed lands, how reclamation should occur, the legal restrictions, and how the University of Kentucky, state and federal agencies conducted research to find solutions to wide-spread reclamation issues.



TARGETED STANDARDS

Social Studies

Core Content for Assessment 4.1



Economics

SS-HS-3.1.1—Students will give examples of and explain how scarcity of resources necessitates choices at both the personal and societal levels in the modern world (1500 A.D. to present) and the United States (Reconstruction to present) and explain the impact of those choices. DOK 2



SS-HS-3.3.1—Students will explain and give examples of how numerous factors influence the supply and demand of products (e.g., supply—technology, cost of inputs, number of sellers; demand—income, utility, price of similar products, consumers' preferences). DOK 2



SS-HS-3.4.3—Students will explain and give examples of how interdependence of personal, national, and international economic activities often results in international issues and concerns (e.g., natural resource dependencies, economic sanctions, environmental and humanitarian issues) in the modern world (1500 A.D. to present) and the United States (Reconstruction to present). DOK 2



Geography

SS-HS-4.4.2—Students will explain how human modifications to the physical environment (e.g., deforestation, mining), perspectives on the use of natural resources (e.g., oil, water, land), and natural disasters (e.g., earthquakes, tsunamis, floods) may have possible global effects (e.g., global warming, destruction of the rainforest, acid rain) in the modern world (1500 A.D. to present) and United States (Reconstruction to present). DOK 2



Social Studies

Program of Studies

Economics

Students will demonstrate an understanding of the nature of limited resources and scarcity in the modern world (1500 A.D. to present) and the United States (Reconstruction to present):

- explain how scarcity of resources necessitates choices at both the personal and societal levels, and explain the impact of those choices.

Students will describe relationships between and among markets (e.g., local, national, global) and exchange of goods and services:

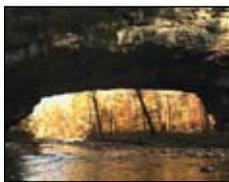
- explain factors that influence the supply and demand of products (e.g., supply—technology, cost of inputs, number of sellers; demand—income, utility, price of similar products, consumers’ preferences).

Students will explain results and issues related to interdependence of personal, national and international economic activities (e.g., natural resource dependencies, economic sanctions, environmental and humanitarian issues) in the modern world (1500 A.D. to present) and the United States (Reconstruction to present).

Geography

Students will understand that human actions modify the physical environment and, in turn, the physical environment limits or promotes human activities.





TARGETED STANDARDS

Science

Core Content for Assessment 4.1

Energy Transformations

SC-HS-4.6.7—Students will explain real world applications of energy using information/data.

Interdependence

SC-HS-4.7.1—Students will predict the effects on other organisms of changes to one or more components of the ecosystem.

SC-HS-4.7.2—Students will evaluate proposed solutions from multiple perspectives to environmental problems caused by human interaction; justify positions using evidence/data.

SC-HS-4.7.3—Students will predict the consequences of changes to any component (atmosphere, solid Earth, oceans, living things) of the Earth System; propose justifiable solutions to global problems.

Science

Program of Studies

Energy Transformations

- Analyze a variety of energy sources, their potential uses and their relative costs/benefits

Interdependence

- Explore ways to eradicate or lessen environmental problems caused by human interaction (e.g., examine programs for habitat restoration or wildlife protection, automotive/industrial emissions standards).
- Investigate changes in ecosystems and propose potential solutions to problems by documenting and communicating solutions to others through multi-media presentations.
- Analyze and describe the effects of events (e.g., fires, hurricanes, deforestation, mining, population growth and municipal development) on environments from a variety of perspectives. Use data to propose ways of lessening impacts perceived as negative.





Research and Discussion Questions

1. Research the state and federal legislation that has been passed to regulate coal mining in the past 50 years. Discuss how each piece of legislation has affected the economy, landscape, and community development in different geographic regions of Kentucky.
2. Investigate the structure of regulatory agencies that monitor coal mining in Kentucky. Interview agency personnel at different positions and those who have been at the agencies for different lengths of time. Discuss their views on the changes that have occurred in the industry.
3. Investigate the ups and downs in the prices of oil over the past 25 years. Explore reasons for the increases and decreases in prices. Compare those prices to the prices of coal. Discuss how those price fluctuations impacted communities in different regions of Kentucky.
4. The University of Kentucky, Department of Forestry has been charged not with just growing trees but with growing a forest. Compare the structures and functions of a tree with the structures and functions of a forest. Discuss the difficulties of re-establishing each on reclaimed coal mines.
5. Investigate complaints or lawsuits that community members have filed against coal companies. Discuss ways the coal companies could build better community relations. Take the role of a marketing director and develop a community relations plan for your “client” Ace Coal Company.

6. Investigate the benefits coal mining has brought to Kentucky. Include economic benefits such as our low energy rates and community benefits such as jobs. Make sure students look at all perspectives including the increase in technology that tends to lead to a decrease in jobs. In addition, investigate the adverse affects of coal mining, including pollutants released to the water and land. Debate the benefits and adverse affects of coal mining in Kentucky. Analyze other energy sources to see if converting to another source would add benefits of alleviate adverse affects.
7. Investigate the coal fields of western Kentucky. Compare the geology, geomorphology, forestry, wildlife, land use patterns, hydrology, and sociology to the same features in eastern Kentucky. How do the different features of these two geographic areas impact reclamation?
8. Mining is not the only industry that impacts the topography of the Commonwealth. Discuss other industries that impact Kentucky's topography. Research the state and federal legislation that regulates highway and commercial developments. How do these regulations compare with those regulating the mining industry?
9. After reviewing the reclamation research, design an experiment that might be used to test how or where an herbaceous plant or tree might grow best on a reclaimed coal mine. Include a hypothesis, independent and dependent variables, constants, controls, and number of repeated trials.



RESOURCES

Coal

Activities and Lesson Plan Resources



[WWW.COALEDCATION.ORG](http://www.coaleducation.org)—This web site is funded by the Kentucky Foundation and has lesson plans organized by primary, middle and secondary schools. Its purpose is to present factual, useful information about coal in a fun and productive way.

[WWW.ENVIROLITERACY.ORG](http://www.enviroliteracy.org)—This web site is sponsored by the Environmental Literacy Council and contains background information recommended resources, data and maps, and resources for the classroom. The purpose for the web site is to provide up to date information for teachers and educate the next generation of decision makers, scientists, and business leaders.

[HTTP://STORE.CHANNING-BETE.COM](http://store.channing-bete.com)—Through this web site, teachers can obtain Let's Learn about Coal: Coloring & Activities Book for younger students.

[WWW.TEACHCOAL.ORG](http://www.teachcoal.org)—This web site is funded by the American Coal Foundation and gives information about coal, lesson plans, and many resources including organizations, governmental, and university resources. The lesson plans are listed by subject and grade level. The teacher store offers posters.

[HTTP://WWW.EXPLOREPAHISTORY.COM/SHOW_RESULTS.PHP?SHOW=40](http://www.explorepahistory.com/show_results.php?show=40)—This web site is sponsored by a number of educational and historical groups in Pennsylvania. Three lesson plans on coal mining are included.

[WWW.HISTORYTOGO.UTAH.GOV](http://www.historytogo.utah.gov)—Games of the coal camp children can be found on this web site.

[WWW.FOSSIL.ENERGY.GOV](http://www.fossil.energy.gov)—This web site is sponsored by the US Department of Energy and contains lessons and study guides related to coal, oil, and natural gas.

[HTTP://WWW.EIA.DOE.GOV/KIDS/ENERGYFACTS/SOURCES/NON-RENEWABLE/COAL.HTML](http://www.eia.doe.gov/kids/energyfacts/sources/non-renewable/coal.html)—This is the web site for the kids' page of the Energy Information Administration.

[HTTP://WWW.NEED.ORG/ENERGYINFOBOOKS.PHP](http://www.need.org/energyinfobooks.php)—This is the web site for Project NEED, where Energy Infobooks may be obtained.

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JONES, G. C. (1985)—Growing up hard in Harlan County. Lexington, KY: University Press of Kentucky.

Video Recordings

KET. (1995)—Electronic field trip to a coal mine. <http://www.ket.org/trips/coal/>

Helpful Organizations and Links

WWW.TEACHCOAL.ORG—This web site provides information and educational resources on coal topics for teachers and students and is sponsored by the American Coal Foundation.

WWW.CEEDNET.ORG/CEED/—This web site is sponsored by the Center for Energy and Economic Development (CEED), a non-profit association that focuses on issues related to coal-based electricity in the U.S.

WWW.LEARNABOUTCOAL.ORG—This web site is sponsored by Americans for Balanced Energy Choices, provides in-depth information on coal-based electricity issues on its web site.

[HTTP://WWW.EIA.DOE.GOV/FUELCOAL.HTML](http://WWW.EIA.DOE.GOV/FUELCOAL.HTML)—This web site is sponsored by Energy Information Administration (EIA) and contains official energy statistics from the US government.

RESOURCES

Forestry

Activities and Lesson Plan Resources

[HTTP://WWW.FS.FED.US](http://www.fs.fed.us)—This is a comprehensive web site sponsored by the US Department of Agriculture that includes information and education materials.

[HTTP://WWW.COF.ORST.EDU/OFEP/TEACHERSCORNER.SHTML](http://www.cof.orst.edu/ofep/teacherscorner.shtml)—This web site is sponsored by Oregon State University and links to the Teacher's Corner.

[HTTP://WWW.DNR.STATE.WI.US/EDUCATION/](http://www.dnr.state.wi.us/education/)—This site is sponsored by the Wisconsin Department of Natural Resources and contains many educational materials and publications.

[HTTP://WWW.FORESTRY.IASTATE.EDU/EXT/EP.HTML](http://www.forestry.iastate.edu/ext/ep.html)—This site is sponsored by the Iowa State University Extension Service and contains many forestry related activities and links.

[HTTP://WWW.FS.FED.US/R6/NR/WILDLIFE/ANIMALINN/TEACH.HTM](http://www.fs.fed.us/r6/nr/wildlife/animalinn/teach.htm)—This site is sponsored by the US Forest Service and outlines activities related to dead trees as habitat.

[HTTP://WWW.DOF.VIRGINIA.GOV/EDU/INDEX.SHTML](http://www.dof.virginia.gov/edu/index.shtml)—This site is sponsored by the Virginia Department of Forestry and is full of information for students of all ages. This page links to information for kids, students, adults, and teachers.

[HTTP://WWW.UWSP.EDU/CNR/LEAF/COURSES/740/](http://www.uwsp.edu/cnr/leaf/courses/740/)—This site outlines Learning Experiences and Activities in Forestry, LEAF!

[HTTP://WWW.UKY.EDU/KGS/FOSSILS/INDEX.HTM](http://www.uky.edu/KGS/fossils/index.htm)—This site is sponsored by the Kentucky Geologic Survey and may be used to identify fossils used in Kentucky.

[HTTP://WWW.UKY.EDU/KGS/EDUCATION/POPPUBS.HTM](http://www.uky.edu/KGS/education/poppubs.htm)—This site is sponsored by the Kentucky Geological Survey and may be used to obtain useful publications.

[HTTP://WWW.UKY.EDU/KGS/EDUCATION/INDEX.HTM](http://www.uky.edu/KGS/education/index.htm)—This site is sponsored by the Kentucky Geological Survey and may be used to find useful educational resources.



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Video Recordings

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Helpful Organizations and Links

[HTTP://WWW.FAO.ORG/FORESTRY/INDEX.JSP](http://www.fao.org/forestry/index.jsp)—This is the web site of the Food and Agricultural Organization of the United Nation and takes an integrated approach to information gathering on natural resources.

[HTTP://WWW.CA.UKY.EDU/FORESTRY](http://www.ca.uky.edu/forestry)—This is the web site of the University of Kentucky, Department of Forestry and contains information about Kentucky forests.

[HTTP://WWW.ESF.EDU/OUTREACH/KI2/RES.HTM](http://www.esf.edu/outreach/ki2/res.htm)—This is the web site of the State University of New York, College of Environmental Science and Forestry and contains supplemental curriculum materials developed or sponsored by the College.

[HTTP://WWW.ARRI.OSMRE.GOV](http://www.arri.osmre.gov)—This is the web site of the U.S. Office of Surface Mining Reclamation and Enforcement, and contains information on the latest research and reclamation methods.



Reclaiming the Future: Reforestation in Appalachia

Since the implementation of the Surface Mining Control and Reclamation Act, many opportunities have been lost for the reforestation of surface mines in the eastern United States. Excessive compaction of spoil material in the backfilling and grading process is the biggest impediment to the establishment of productive forests as a post-mining land use. As the result of reforestation research, a five step Forestry Reclamation Approach is being recommended for successfully establishing productive forests on reclaimed surface mines.

Don Graves, Professor at University of Kentucky Forestry Department explains that "Planting a tree and re-establishing a forest are two different things. We are not just putting trees back on the mine site, but trying to re-establish the function of the forest, which includes enhancing wildlife habitat, improving water quality and stream systems, reduction of erosion and sedimentation, less flooding and cleaner air."

The five steps of the Forestry Reclamation Approach for properly reclaiming surface mined land into a forest are explained in a 30-minute DVD.

For more information please contact Dr. Chris Barton: barton@uky.edu or visit www.bae.uky.edu/UKReclamation.

<http://www.arri.osmre.gov>

COOPERATIVE
EXTENSION

UK



UNIVERSITY OF KENTUCKY
College of Agriculture

KENTUCKY STATE UNIVERSITY