Lesson 1: GREEN GREEN REVOLUTION
An Introduction to Eco-Schools USA

PURPOSE/QUESTION
To lay the foundation for the Eco-Schools USA program as well as foundational pieces that will tie NASA data to Eco-Schools pathways to sustainability.

GRADE LEVELS
9-12

TIME TO COMPLETE
1. 1- 50 minute time period for overview
2. Energy Audit will depend on several variables. Allow no less than one week with maximum support.
   a. Size of school
   b. Number of students involved in the audit
   c. District employee support
3. Class time or before/after school

STANDARDS
See appendix below-page 7.

PREREQUISITES
- Strong background in renewable and nonrenewable resources
- What are fossil fuels, how are they used, and why are they a problem in today's world?
- Examples of alternative energies, (in depth) uses and importance in today's world. Quick overview

LEARNING OUTCOMES
- Students will understand what the goals and objectives are for the Eco-Schools program, including the 7 step framework and the pathways.
- Students will make a choice to be a participant of the Eco-Action Team.
- Set a meeting time to plan the energy audit portion of the environmental audit.

STUDENT OBJECTIVES
- Identify and review the components of the 7 step framework
- Identify and review the pathways to sustainability
- Perform an Energy Audit

LESSON LINKS
- Schedule a free assembly with ACE.
- Cool School Challenge
- Motivate with Young Voices for the Planet

MATERIALS & TOOLS
Computer with internet access

VOCABULARY
- Environmental literacy
- Environmental audit
- Energy audit
- Energy efficiency
- Climate change
- Retrofit
- Renewable energy
- Nonrenewable energy
- Fossil fuels
- Alternative energy

TEACHER BACKGROUND FOR ECO-SCHOOLS USA
Familiarity with the Eco-Schools website along with specific focus on the following topics is necessary for program implementation.

1. About the Eco-Schools USA program and Eco-Schools 101, create your own **user name** and **password**:
2. Overall benefits of the Eco-Schools USA program
3. STEM benefits
4. Eco-Schools USA 7 step framework
5. Eco-Schools USA pathways to sustainability
6. Eco-Schools in your state

TEACHER BACKGROUND FOR ENERGY AUDIT

1. Please read about performing an environmental audit.
   At this point you will need to focus on the energy audit portion of the environmental audit.
2. The energy audit forms are in the **Lesson 1 folder**.
3. To complete the energy audit in a timely manner, either you or your students need to contact and retain the help of the following building and district employees. This will potentially gain support for the Eco-Schools USA program on your campus. An added benefit… through your connection you may find they want to be a part of the Eco-Action team!
   - Energy Lifestyles-students can complete on own
   - Building Envelope-Director of building and grounds maintenance or the operations manager
   - Lighting-Energy management supervisor or head custodian
   - HVAC-Energy management supervisor or Environmental/Safety coordinator
   - Equipment-School's Technology Facilitator and Librarian

If your district does not have a person assigned to the designated role above, talk to the person in charge of district facilities or talk to your vice principal that frequently has contact with the district's facility managers.

ESSENTIAL QUESTIONS

1. Identify benefits you see for your school using the Eco-Schools USA framework.
2. Having had an overview of the Eco-Schools program explain how the pathways address your understanding of climate change.
3. Thinking of Earth as a system, do the pathways address the biosphere, lithosphere, hydrosphere, and atmosphere? Explain your position.
4. What can you learn about renewable and nonrenewable resources from performing an energy audit?
5. Based on your auditing experience what are the advantages and disadvantages to performing an energy audit at your campus?

PROCEDURE

1. You will want to run through the PowerPoint before doing it with the class. Present and discuss Eco-Schools USA PowerPoint, Knowledge is Power, to students.
2. Identify students who want to be a part of the Eco-Action team and provide students with information for attending the first meeting.
3. Your classes will need to have the Energy Audit complete before beginning lessons 19-21. The information collected in the Energy Audit is critical to understanding both lessons 19 and 20. The Energy Audit can be performed in one of the following ways.
   a. Assign students in each class a section of the Energy Audit, for example,
      Class 1-Energy Lifestyles Audit
      Class 2-Building Envelope
      Class 3-Lighting Audit
      Etc.

Continued on next page

PROCEDURE (CONTINUED)

b. Assign groups of students within one class the sections of the Energy Audit they are responsible for completing, for example
   -Class 1, group 1-Energy Lifestyles Audit
   -Class 1, group 2-Building Envelope
   -Class 1, group 3-Lighting Audit
   -Etc.
   -Repeat with each class.

c. Assign each class the same piece of the Energy Audit to complete, for example all classes would complete the Lighting Audit. Then it would be up to the Eco-Action team to complete the other sections of the energy audit at times before or after school that you and the Eco-Action team come up with. It will also be important to have members of the Eco-Action team report their findings to their class so their peers will be prepared for lessons 19 and 20.

d. Assign groups of students within one class a "region" of the school. They will be responsible for completing the Energy Audit sections that are applicable to their "region".

United High School – Trashin Fashion

TOOLS AND IDEAS FOR ASSESMENT

- Energy Audit completed to the best of student's ability along with group participation expectation met – found in the lesson folder.
- Essay – found on pg.13
- Concept Quiz – found on pg. 10
- Foldables®
- Student Reading Assessment Tool – found in *Rubrics* folder

STUDENT READING RESOURCES

- Teens Lead Effort To Green America's Oldest School
- Costs, Concerns Push Schools to Use Eco-Friendly Elements
- Recycling Comes of Age

WEBSITES FOR FURTHER LEARNING

- Eco-Schools USA Case Studies
- What Eco-Schools in the UK Look Like
- Foundation for Environmental Education (FEE)-Learn about our international connection and about the 5 programs FEE supports around the world.

LESSON 1-APPENDIX

HYPER-LINK WEB ADDRESSES

LESSON LINKS

- **ACE – Alliance for Climate Education**
  http://www.acespace.org/
- **NWF's Cool School Challenge**
  http://www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/Become-an-Eco-School/Cool-School-Challenge.aspx
- **Young Voices for the Planet**
  http://www.youngvoicesonclimatechange.com/climate-change-videos.php

PREREQUISITES

- **Renewable and Nonrenewable Resources**
  http://www.bbc.co.uk/schools/gcsebitesize/geography/energy_resources/energy_rev1.shtml
- **Fossil Fuels and In Depth Alternative Resources**
  http://www.darvill.clara.net/altenerg/fossil.htm
- **Quick Overview – Alternative Resources**
  http://www.alternative-energy-resources.net/

VOCABULARY

- **Environmental literacy**
  https://www.google.com/search?hl=en&rls=com.microsoft:*&defl=en&q=define:environmental+literacy&sa=X&ei=XjgGTcjoG8L58Abut-jPCg&ved=0CBgQkAE#hl=en&rls=com.microsoft:*&sclient=psy-ab&q=define:environmental+literacy&oq=define:environmental+literacy&gs_l=serp.12...0.0.0.473933.0.0.0.0.0.0.0..0.0.les%3B..0.0...1c.5GPACjci5eE&pbx=1&bav=on.2,or.r_gc.r_pw.r_qf.&fp=f3803001d38086d7&biw=1280&bih=939
- **Environmental audit**
  https://www.google.com/search?hl=en&rls=com.microsoft:*&defl=en&q=define:Environmental+audit&sa=X&ei=lTgGTd_RE8KblgeGvKmbBQ&ved=0CBsQkAE
- **Energy audit**
  https://www.google.com/search?hl=en&rls=com.microsoft%3A*&q=define%3AEnergy+audit
- **Energy efficiency**
  https://www.google.com/search?hl=en&rls=com.microsoft:*&sa=X&ei=4DgGTcOCMsSblgfBys2ACA&ved=0CAQQBSgA&q=define%3AEnergy+efficiency&spell=1
- **Climate change**
  http://www.unisdr.org/we/inform/terminology
- **Retrofit**
  https://www.google.com/search?hl=en&rls=com.microsoft:*&defl=en&q=define:retrofit&sa=X&ei=HDoGTa-nL4Sq8Abx5Yy6Dw&ved=0CBYQkAE
- **Renewable energy**
  https://www.google.com/search?hl=en&rls=com.microsoft%3A*&q=define%3Arenewable+energy
- **Nonrenewable energy**
  https://www.google.com/search?hl=en&rls=com.microsoft%3A*&q=define%3A+nonrenewable+energy

- **Fossil fuels**
  https://www.google.com/search?hl=en&rls=com.microsoft%3A*&q=define%3Afossil+fuels
- **Alternative energy**
  https://www.google.com/search?hl=en&rls=com.microsoft%3A*&q=define%3Aalternative+energy

TEACHER BACKGROUND FOR ECO-SCHOOLS

- **About and Benefits**
  http://www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/About-Eco-Schools-USA/Benefits.aspx
- **Eco-Schools 101 – Instructions for course access are found on page 14 of this document.**
  http://wildlifeuniversity.nwf.org/logIn.aspx?ReturnURL=http%3a%2f%2fwildlifeuniversity.nwf.org%2fHSBC.aspx
- **STEM**
  http://www.nwf.org/~/media/PDFs/Eco-schools/NWFANDSTEMFINAL.ashx
- **7 step framework**
  http://www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/Become-an-Eco-School/Steps.aspx
- **Pathways to Sustainability**
  http://www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/Become-an-Eco-School/Pathways.aspx
- **Your State**
  http://www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/Map.aspx

TEACHER BACKGROUND – ENERGY AUDIT

Performing an Environmental Audit

http://www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/Become-an-Eco-School/Steps/Environmental-Audit.aspx

TOOLS AND IDEAS FOR ASSESSMENT

Energy Audit

http://www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/Become-an-Eco-School/Pathways/Energy/Audit.aspx

STUDENT READING RESOURCES

- **Teens Lead Effort to Green Americas Oldest School**
  http://www.smartplanet.com/blog/pure-genius/teens-lead-effort-to-green-americas-oldest-school/4518
- **Costs, Concerns Push Schools to Use Eco-Friendly Elements**
  http://www.usatoday.com/news/education/2008-07-31-green-schools_N.htm
- **Recycling Comes of Age**
  http://www.green-energy-news.com/arch/nrgs2010/20100058.html

WEBSITES FOR FURTHER LEARNING

- **Eco-Schools Case Studies – Learn about what other schools in the U.S are doing through the Eco-Schools program.**
  http://www.nwf.org/Global-Warming/School-Solutions/Eco-Schools-USA/Become-an-Eco-School/Case-Studies.aspx
- **What Eco-Schools Look Like in the UK**
  http://www.keepbritaintidy.org/ecoschools/gettingstarted/casestudies
- **Foundation for Environmental Education, FEE – non-government, non-profit organization promoting sustainable development through environmental education – programs include, Eco-Schools, Blue Flag, Green Key, LEAF, and Young Reporters.**
  http://www.fee-international.org/en

LESSON 1-STANDARDS

National Science Education Standards

Unifying Concepts and Processes

- Systems, Order, and Organization
- Evidence, Models, and Explanations
- Change, Constancy, and Measurement

Standard A – Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

Standard B – Physical Science

- Conservation of energy
- Interactions of energy and matter

Standard C – Life Science

- Matter, energy, and organization in living systems

Standard D – Earth and Space Science

- Energy in the earth system

Standard E – Science and Technology

- Abilities of technological design
- Understandings about science and technology

Standard F – Science in Personal and Social Perspectives

- Personal and community health
- Natural resources
- Environmental quality
- Science and technology in local, national, and global challenges

Standard G – History and Nature of Science

- Science as a human endeavor

National Education Technology Standards

Standard 1: Creativity and Innovation

- Use models and simulations to explore complex systems and issues
- Identify trends and forecast possibilities

Standard 3: Research and Information Fluency

- Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
- Process data and report results

Standard 4: Critical Thinking, Problem Solving, and Decision Making

- Collect and analyze data to identify solutions and/or make informed decisions.

Standard 5: Digital Citizenship

- Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.

Standard 6: Technology Operations and Concepts

- Understand and use technology concepts
- Select and use applications effectively and productively
- Troubleshoot systems and applications
- Transfer current knowledge to learning of new technologies

National Council of Teachers of Mathematics Standards

Measurement

- Understand measurable attributes

Data Analysis and Probability

- Develop and evaluate inferences and predictions that are based on data

Climate Literacy Principles

Principle 1: The sun is the primary source of energy for Earth's climate system.
Principle 2: Climate is regulated by interactions among components of the Earth system.
Principle 5: Our understanding of the climate system is improved through observations, theoretical studies, and modeling.

Energy Literacy Principles

Principle 1: Energy is a measurable quantity that follows physical laws.
Principle 2: Physical Earth processes are the result of energy flow through the earth system.
Principle 3: Biological Earth processes depend on energy flow through the earth system.
Principle 4: Various sources of energy can be used to power human activities, and often this energy must be transferred from source to destination.
Principle 5: Individuals and communities make energy decisions every day.
Principle 6: The amount of energy human society uses depends on many factors and can be reduced in many ways.
Principle 7: The energy choices made by individuals and societies affect quality of life.

LESSON1-ESSENTIAL QUESTIONS ANSWER KEY

Essential Questions

1. Identify benefits you see for your school using the Eco-Schools USA framework.

[Answers will vary, but could include,

- Taking what you have learned locally and applying it on a global level by creating a platform for cultural exchange
- Save our school money-more money for student activity fund
- Reduce our carbon footprint
- Raise awareness at school and in the community]

2. Having had an overview of the Eco-Schools program explain how the pathways address your understanding of climate change. [Answers will vary]

3. Thinking of Earth as a system, do the pathways address the biosphere, lithosphere, hydrosphere, and atmosphere? Explain your position. [Answers will vary, but could include: The pathways address the entire Earth system with hopes of reducing the overall carbon footprint.]

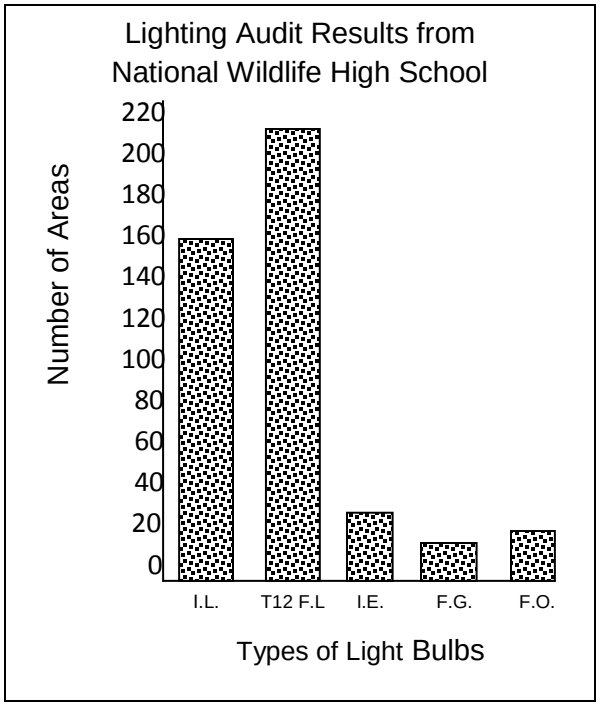
4. What can you learn about renewable and nonrenewable resources from performing an energy audit? [Performing an energy audit allows students to see how heavily we rely on fossil fuels for our daily activities as well as the large amount of energy that is wasted on a monthly and yearly basis. Raising this red flag will motivate students to learn more about renewable energy real potential for use at the campus and outward.]

5. Based on your auditing experience what are the advantages and disadvantages to performing an energy audit at your campus? [Answers will vary.]

Name: _____ Date: _____

Science Concept Quiz

Lesson 1: An Introduction to Eco-Schools USA



What conclusions can be drawn from this graph?

A. NWHS has energy efficient lighting in their exit signs, gyms, and outdoor lighting.
B. NWHS appears to have energy efficient lighting throughout the campus.
C. More data is needed, how many of each kind of lights are there.
D. Based on the evidence, the large number of rooms using incandescent and T12 fluorescent lamps shows NWHS is energy efficient in the area of lighting.

I.L. – incandescent lamps
T12F.L. – T12 fluorescent lights
I.E. – incandescent ***Exit*** lights
F.G. – fluorescent gym lights
F.O. – fluorescent outside lights

_____ points out of 20

I. Answer

A.○ B.○ C.○ D.○

_____ points out of 15

II. What is the main science concept behind this question?

1. Drawing conclusions
2. Making predictions
3. Energy efficiency
4. Energy audits

_____ points out of 25

III. Provide the reasoning behind your answer.

_____points out of 40

IV. Why are the other responses not the best answer chose?

A.

B.

C.

D.

Use the rest of this page if more room is needed to fully communicate your thoughts.

Teacher Answer Key

1. C

2. 1

3. Answers will vary. The directions for the question ask you to draw conclusions based on the information in the graph.

4. Answers will vary
   A) The exit signs use incandescent bulbs which are not energy efficient.

   B) The campus cannot be completely energy efficient in regards to lighting based on the fact that they still use incandescent bulbs in some areas.

   C) This is the correct answer. It is important to note how many fluorescents and incandescent are being used in each school area. This will provide information needed to improve the lighting efficiency.

   D) Even though the campus uses a large number of fluorescent bulbs the campus can still make improvements by moving away from using incandescent bulbs all together.

Student Name
Teacher/Class
Date

Lesson 1: Green Green Revolution!
An Introduction to Eco-Schools USA

Answer and elaborate upon one of the following 4 essential questions.

1. Identify benefits you see for your school using the Eco-Schools USA framework?
2. Having had an overview of the Eco-Schools program explain how the pathways address your understanding of climate change.
3. Thinking of Earth as a system, do the pathways address the biosphere, lithosphere, hydrosphere, and atmosphere? Explain your position.
4. What can you learn about renewable and nonrenewable resources from performing an energy audit?

What Is the Expectation?

Use case studies or student readings to support your position

Visual representations if applicable

Key vocabulary

Evidence of on grade level spelling and grammar usage

Instructions for Logging In To Wildlife University

Wildlife University is an on-line portal that houses the National Wildlife Federation's educational training courses. It provides people with the opportunity to learn about wildlife and wild places and the issues that impact them.

1. If you are not a registered Eco-School please open up another browser window, go to http://www.nwf.org/EcoSchoolsRegister/EcoSchoolRegistration.aspx , and register your school as an Eco-School.

2. Enter http://wildlifeuniversity.nwf.org into your browser

3. Register using a user name and password. If you have already registered please login.

4. Looking at the left navigation choose "Enroll". If you have already enrolled in a class and are coming back to complete a course, look again at the left navigation and choose "Access Your Courses".

5. Here you will find all of our courses for all of our programming. **Scroll down to the Eco-Schools USA section (it is the last section) and click on *Eco-Schools USA Climate Change Connections***

6. Once you "click" on ***Eco-Schools USA Climate Change Connections*** it may seem as though nothing happened, but it did. You will now want to scroll back to the top of the page and again look to the left navigation. Click on "Access Your Courses".

7. Now you are ready to click on "Launch course". This will take you to the two courses we are asking you to complete, **A) An Introduction to Eco-Schools USA and B) Climate Change 101**. They will take about 45 minutes each.

8. You can save your work and come back to it later if you cannot complete the course all at once. You will follow steps 2-7, skipping steps 5 and 6. To get back into your course. You can tell how much of the course is completed by the shading of the sun graphic.