# Kentucky Envirothon Soils Learning Objectives for 2024

The curent topic for the 2024 NCF Envirothon is “*Renewable Energy for a Sustainable Future*”. Energy production and usage are two important topics concerning our future on this planet. From the earliest of times, when humans began using wood for fire to warm and cook, to the discovery and utilization of coal, oil, and natural gas, all have helped bring about the situation we face today, climate change. A rising global temperture has made us aware that to continue with current or increased fossil fuel consumption, negative impacts to our forest, water, and soil resources can become significant enough to severly affect how we live on the earth now and into the future.

Changing to more renewable enegy sources can help slow the effects of climate change and allow our natural resources more time to recover from the damage that has already occured. Noteable renewable energy sources such as solar, hydro, wind, and geo-thermal, were used as far back as 500 BC, 200 BC, 644 AD, and 1700 AD, repectively. Newer noteable sources like tidal and wave, are being developed and utilized to address localized energy needs for coastal areas while biomass can supply raw material for transportation biofuels, synthetic natural gas, fertilizers or other soil amendments to aide in growing food and keeping our soil healty for sustainable use.

Mass transition to these energy sources will take time. Both proponets and opponents of renewable energy realize that human civilization standards of living are correlated to energy consumption. Maintaining or increasing the world’s standard of living while moving away from fossil fuels will not be easy, probably experience setbacks along the way, and will not be able to rely on one single renewable source to replace fossil fuels.

The learning objectives for soils will be similar to previous Kentucky envirothons: recognizing basic soil horizon characteristics, determining soil structure, texture, and color, measuring slope percent, and utilizing a soil survey. Since the current topic is “*Renewable Energy for a Sustainable Future*”, we should look at how soil can provide a natural medium for biomass production utilized as a renewable energy source.

Learning resource groups 1-5 pertain to the usual soil study areas covered each year in Kentucky’s envirothon while group 6 provides links to articles concerning biomass energy. Group 7 provides more information pertaining to Kentucky’s soil and water conservation programs and BMP’s used to protect our water resources.

**1.** **Basic soil science and Educational Resources**

Soil Science

[Soil Science | Natural Resources Conservation Service (usda.gov)](https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soil/soil-science)

Soil Facts – What is Soil & Soil Fomation & Classification

[Soil Facts | Natural Resources Conservation Service (usda.gov)](https://www.nrcs.usda.gov/resources/education-and-teaching-materials/soil-facts)

Soil Science Glossary

[Glossary of Soil Science Terms | Soil Science Society of America](https://www.soils.org/publications/soils-glossary/)

Soil Basics

[Soil Basics: Soil Testing: University of Illinois Extension](https://extension.illinois.edu/soil/soil-basics)

[Intro to Soil lecture - Bing video](https://www.bing.com/videos/search?q=Understanding+basic+Soil+concepts+videos&docid=607998534480955423&mid=490D1FAE9177374229AF490D1FAE9177374229AF&view=detail&FORM=VIRE)

**2. Utilizing a soil survey**

[from-the-surface-down.pdf (usda.gov)](https://www.nrcs.usda.gov/sites/default/files/2022-11/from-the-surface-down.pdf)

[What is a Soil Survey? - Soil Research Guide - Library Guides at Montana State University](https://guides.lib.montana.edu/soilsurveys?p=1302916)

[Soil Survey Manuscripts and Soil Maps - YouTube](https://www.youtube.com/watch?v=oIPKw3ey6ec)

[Soil Surveys by State | Natural Resources Conservation Service (usda.gov)](https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soil/soil-surveys-by-state)

[Web Soil Survey | Natural Resources Conservation Service (usda.gov)](https://www.nrcs.usda.gov/resources/data-and-reports/web-soil-survey)

**3. Describing basic soil physical characteristics**

[Soil Horizons - YouTube](https://www.youtube.com/watch?v=YQhyMsisRD8)

[How To Differentiate and Identify Soil Horizons In The Field - YouTube](https://www.youtube.com/watch?v=ZlyDyQT6_WE)

[Soil Basics: Soil Profiles - YouTube](https://www.youtube.com/watch?v=xoTd7ctj-e0)

[Field Book for Describing and Sampling Soils | Natural Resources Conservation Service (usda.gov)](https://www.nrcs.usda.gov/resources/guides-and-instructions/field-book-for-describing-and-sampling-soils)

[Soil Survey Manual | Natural Resources Conservation Service (usda.gov)](https://www.nrcs.usda.gov/resources/guides-and-instructions/soil-survey-manual)

[SOILS 101 (psu.edu)](https://www.dept.psu.edu/agsciences/agsci/elearning/0course-samples/soils_101_sample/Ln_3/L3_1.htm)

Soil Texture

[Texture By Feel Procedure - Bing video](https://www.bing.com/videos/search?&q=Soil+Texture&view=detail&mid=0A64B445F82AC06A32A40A64B445F82AC06A32A4&FORM=VDRVSR&ru=%2Fvideos%2Fsearch%3Fq%3DSoil%2BTexture%26F&ajaxhist=0)

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[How to read a soil texture triangle - Bing video](https://www.bing.com/videos/search?q=Soil+Texture&ru=%2fvideos%2fsearch%3fq%3dSoil%2bTexture%26FORM%3dVDMHRS&view=detail&mid=8440F44DFEC68D948D2C8440F44DFEC68D948D2C&&FORM=VDRVSR)

Soil Color

[Soil Colors of the United States | Natural Resources Conservation Service (usda.gov)](https://www.nrcs.usda.gov/resources/education-and-teaching-materials/soil-colors-of-the-united-states)

Source for Munsell Color Book

[Munsell Soil Color Book  |  Forestry Suppliers, Inc. (forestry-suppliers.com)](https://www.forestry-suppliers.com/p/77321/73221/munsell-soil-color-book)

[Amazon.com: Pantone M50215B        Soil Color Book : Everything Else](https://www.amazon.com/Munsell-Soil-Book-Color-M50215B/dp/B007E9JERA/ref%3Dsr_1_1_sspa?crid=321LP6FB458II&keywords=munsell%2Bsoil%2Bcolor%2Bbook&qid=1675206721&sprefix=Munsell%2B%2Caps%2C121&sr=8-1-spons&smid=A1VI2TVE6IQZVN&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUExRTNCUUk5Q09GRjBOJmVuY3J5cHRlZElkPUEwNTQ5OTIxMVlEQ0xNNEgxVDc2USZlbmNyeXB0ZWRBZElkPUEwMjQxNzc2MU1RVDhLUFo3QjZTTCZ3aWRnZXROYW1lPXNwX2F0ZiZhY3Rpb249Y2xpY2tSZWRpcmVjdCZkb05vdExvZ0NsaWNrPXRydWU&th=1)

How to use Munsell Color Book

[Soils: Soil Color - YouTube](https://www.youtube.com/watch?v=N6doCSP8T7I)

<https://www.youtube.com/watch?v=JLWT7Gl-9YE>

Hydic Soils

[Hydric Soils | Natural Resources Conservation Service (usda.gov)](https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soil/hydric-soils)

[Field Indicators of Hydric Soils | Natural Resources Conservation Service (usda.gov)](https://www.nrcs.usda.gov/resources/guides-and-instructions/field-indicators-of-hydric-soils)

Measuring Slope with Clinometer

[1.2 Field Technique Tips for Measuring %Slope – Forest Measurements (pressbooks.pub)](https://openoregon.pressbooks.pub/forestmeasurements/chapter/1-2-field-technique-tips-for-measuring-slope/)

**4. Understanding soil health/soil quality**

[Soil Health | Natural Resources Conservation Service (usda.gov)](https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soils/soil-health)

[Soil Health Assessment | Natural Resources Conservation Service (usda.gov)](https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soils/soil-health/soil-health-assessment)

Soil Quality Indicators

[indicator\_sheet\_guide\_sheet.pdf (usda.gov)](https://www.nrcs.usda.gov/sites/default/files/2022-10/indicator_sheet_guide_sheet.pdf)

Cropland

[SH TN 450-06 Cropland In-Field Soil Health Assessment Guide Jan 2021 (usda.gov)](https://www.nrcs.usda.gov/sites/default/files/2022-10/Cropland_InField_Soil_Health_Assessment_Guide.pdf)

Physical Properties

Infiltration

[Soil Quality Physical Indicator Information Sheet Series (usda.gov)](https://www.nrcs.usda.gov/sites/default/files/2022-10/Infiltration.pdf)

Bilogical Properties

[biological\_indicators\_overview.pdf (usda.gov)](https://www.nrcs.usda.gov/sites/default/files/2022-10/biological_indicators_overview.pdf)

[The Science of Soil Health: Going Deeper - YouTube](https://www.youtube.com/watch?v=XzfFFNG5mnQ)

[The Science of Soil Health: Going Deeper, Part 2 - YouTube](https://www.youtube.com/watch?v=Qo6zvBBROL0)

[Soil Biology and Organic Matter - Ray Weil - YouTube](https://www.youtube.com/watch?v=98ZGaT7C6io)

[Living Soil Film - YouTube](https://www.youtube.com/watch?v=ntJouJhLM48)

[Understanding and Managing Soil Biology for Soil Health and Crop Production - YouTube](https://www.youtube.com/watch?v=JGQP--xtGVc)

**5. Comprehension and use of soil mangement principles**

[Soil Health Management | Natural Resources Conservation Service (usda.gov)](https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soils/soil-health/soil-health-management)

Soil Health Literature

[Soil Health Literature | Natural Resources Conservation Service (usda.gov)](https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soils/soil-health/soil-health-literature)

<https://nrcspad.sc.egov.usda.gov/DistributionCenter/product.aspx?ProductID=119>

<https://nrcspad.sc.egov.usda.gov/DistributionCenter/product.aspx?ProductID=131>

<https://nrcspad.sc.egov.usda.gov/DistributionCenter/product.aspx?ProductID=388>

<https://nrcspad.sc.egov.usda.gov/DistributionCenter/pdf.aspx?productID=479>

<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/>

[Understanding Soil Risks and Hazards (usda.gov)](https://nrcspad.sc.egov.usda.gov/DistributionCenter/pdf.aspx?productID=500)

[The Magic of Soil - YouTube](https://www.youtube.com/watch?v=AWILIYSf5ts)

**6. Additional links related to current topic:**

Renewable Energy from Biomass

[Biomass explained - U.S. Energy Information Administration (EIA)](https://www.eia.gov/energyexplained/biomass/)

[The Top Pros And Cons of Biomass Energy | EnergySage](https://www.energysage.com/about-clean-energy/biomass/pros-and-cons-biomass/)

[Biogas Information System (Biogas) | USDA](https://www.wctsservices.usda.gov/Energy/maps/Biogas)

[Biomass Energy (nationalgeographic.org)](https://education.nationalgeographic.org/resource/biomass-energy/)

[Biofuels Basics | NREL](https://www.nrel.gov/research/re-biofuels.html)

**7.** **Divison of Conservation Programs:** The Kentucky Division of Conservation provides assistance to our Commonwealth’s 121 local conservation districts in delivering soil and water consevation measures to landowners through a variety of programs designed to enhance the wise use of soil and water resources. For a list of state soil & water conservation programs administered through local conservation districts go to the Kentucky Division of Conservation’s web page;

[Conservation - Kentucky Energy and Environment Cabinet](https://eec.ky.gov/Natural-Resources/Conservation/Pages/default.aspx)

The Agriculture Water Quality Act explains the Division’s role in protecting Kentucky’s surface and groundwater resources.

[Agriculture Water Quality Act - Kentucky Energy and Environment Cabinet](https://eec.ky.gov/Natural-Resources/Conservation/Pages/Agriculture-Water-Quality-Act.aspx)

The Agiculture Water Quality Authority is responsible for developing and implementing Kentucky’s statewide agricultural water quality plan.

The Kentucky Agricultural Water Quality Plan has BMP’s that address agricultural practices designed to aid in protecting Kentucky’s water resources.

[Best Management Practices - Kentucky Energy and Environment Cabinet](https://eec.ky.gov/Natural-Resources/Conservation/Pages/Best-Management-Practices.aspx)