



Iowa - The Rivers
of Her Valleys 4.0



Title - Iowa's Glaciers, Rivers and Life

Audience - High school to University, Formal to Informal Education, Teachers to Naturalists, students and their families, Iowa citizens

Lesson Description - *Big Ideas / Big Questions* - Iowa Core, NGSS and Earth Science Literacy <http://www.earthscienceliteracy.org/document.html>

1. Earth scientists use repeatable observations and testable ideas to understand and explain our planet.
2. Earth is a complex system of interacting rock, water, air, and life. - How Do geologic environments affect the types of water and life present?
3. Earth is continuously changing - How can we learn about Iowa's geologic history?
4. The Earth is a water Planet - How has water shaped Iowa's surface? Glaciers vs Rivers...

Time Needed to Complete - Approximately 3 to 4 - 50min class sessions

Iowa Science Standards -

HS-ESS_2-1 Develop a model to illustrate how Earth's internal & surficial processes operate at different spatial & temporal scales from continental to ocean floor features.

HS-ESS_2-2 Analyze geoscience data to make the claim that one change to the Earth's surface can create feedbacks that cause changes to other Earth Systems

HS-ESS_2-4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result in climate changes

HS-ESS_2-5 Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

HS-ESS_2-7 Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

HS-ESS_3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

HS-ESS_3-3 Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

HS-ESS_3-6 Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Science & Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.

Disciplinary Core Ideas

ESS2.C: The Roles of Water in Earth's Surface Processes

The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks.

Crosscutting Concepts

Structure and Function

The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.

Environmental Sustainability

Implications & Practices

Sustainability is the intersection of the Earth's natural and anthropogenic systems working in

Students will...

Construct and apply

1. Paleogeologic and paleoecologic models to interpret change in climatic, geologic and life systems.
2. a new model for potential geologic and ecologic changes under modern climate change processes.

Students will

Observe

1. Different water properties are the result of variable feedbacks, internal and external energy resources.
2. Frozen vs free flowing water leads to different geologic processes and products.
3. Variable energy levels, geologic processes and products influence the Earth's ecosystems.

Students will

Identify

1. Landscape and ecologic changes from data, maps and papers.

Students will

Apply knowledge to create sustainable practices

1. Changing energy levels, feedbacks and geology, are the basis for sustainable life on Earth.
2. Humanity is capable of impacting the Earth's natural systems.
3. Understanding changes in the Earth's natural systems is vital to sustainable development planning.

Student Objectives I-can statements

I can obtain, apply and learn from scientific data.

I can use geologic maps to address questions.

I can use geologic/environmental data to model and interpret differing fish populations

I understand energy and processes affect the Earth's complex systems over variable time scales creating surficial changes and products.

Resources :-) **IMPORTANT LINK -** [Unit directions and questions document](#) **IMPORTANT DOCUMENT :-)**

Unit 1 - Bedrock to Surficial Geology of Iowa

Colored pencils, [Bedrock Activity Map](#) and [SurficialActivity Map](#)

Iowa Geological Survey - [2010 Bedrock Map](#) , [2010 Bedrock Map Descriptions](#)

IGEIN - Landform Videos - <https://www.exploreiowageology.org/iowaSurficialGeology2020.php>

Iowa Geological Survey - Landforms Map - <https://www.iihr.uiowa.edu/igs/publications/map/landscapes.html>

Google Earth - Downloadable .kmz files https://www.exploreiowageology.org/GoogleEarth_IAGeology.php

Challenge data

Iowa Geological Survey

GeoSam Data - <https://www.iihr.uiowa.edu/igs/geosam/home>

GeoCore Data - <https://www.iihr.uiowa.edu/igs/geocore/map>

Need a jump start on how to use these resources, start here :-)

<https://uni.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=4eb561e2-3686-4e30-94f5-ac770119f6da>

Unit 2 - Energy and Change on Iowa's surface

Neotoma Paleoecology Database <https://www.neotomadb.org/>

Neotoma Explorer - <https://apps.neotomadb.org/explorer/>

Google Earth - Downloadable .kmz files https://www.exploreiowageology.org/GoogleEarth_IAGeology.php Or try here Black Hawk Co. [Slopes](#) and [Rivers](#)

Unit 3 - Geology's Role in Iowa's Ecosystem Distribution

Iowa DNR BioNet - A. Ecoregions, <https://programs.iowadnr.gov/bionet/Docs/Ecoregions> , B. Bionet, <https://programs.iowadnr.gov/bionet/> , C. Search, <https://programs.iowadnr.gov/bionet/Sites/Search>

Neotoma Paleoecology Database <https://www.neotomadb.org/>

USDA - Climate Change Atlas - <https://www.fs.fed.us/nrs/atlas/>

Unit 4 - Climate, Natural Hazards and Anthropogenic amplifications in Iowa

Climate data - <https://prism.oregonstate.edu/>

Nasa Climate Machine - https://climate.nasa.gov/climate_resources/25/interactive-climate-time-machine/

Dams and failures - <https://damfailures.org/case-study/lake-delhi-dam-iowa-2010/>

Hydro Review - <https://www.hydroreview.com/2011/09/01/dam-safety-what-happened-to-lake-delhi-dam/#gref>

Iowa DNR report - <https://pdfs.semanticscholar.org/dc09/00d9bab944e854055e774ce0fc4a7cce1483.pdf>

USGS Report - <https://pubs.usgs.gov/of/2011/1301/pdf/of2011-1301.pdf>

Iowa DNR BioNet - <https://programs.iowadnr.gov/bionet/>

Unit 5 - Sustainability in Iowa

United Nations Sustainable Development Goals (SDGs) - <https://sdgs.un.org/goals>

Iowa's Coldwater Conservation Conservancy - <https://iowacoldwater.org/>

Iowa Environmental Council - <https://www.iaenvironment.org/>

Iowa Naturalists Association - <https://www.iowanaturalists.org/>

5-E Format

Engagement/ Excitement	<p>Gallery Walk - General method - https://www.exploreiowageology.org/gallerywalking.php</p> <p>Iowa Geology to Ecology Gallery Walk</p> <p>Gallery Walk Questions -</p> <ol style="list-style-type: none">1. What are Iowa's landscape characteristics?2. How do Iowa's different landscapes impact wildlife?3. What are your favorite Iowa outdoor experiences/memories?4. How do Iowa's landscapes influence your experiences?5. How have Iowans changed the landscape to facilitate their experiences and needs?6. What effects might a changing climate have on Iowa's landscapes, wildlife and people? <p>Hold a class discussion using answers to these questions while introducing the activity's 'Big Ideas'.</p>
Exploration	<p style="text-align: center;"><u>Exploration directions</u></p> <p>Unit 1 - addresses HS-ESS_2-1</p> <ol style="list-style-type: none">1. Make a bedrock map of Iowa. Bedrock Activity Map. Use the Iowa Bedrock map to learn about deep time, processes and products2. Make a surficial map of Iowa. SurficialActivity Map. Use the Iowa Surficial Maps3. Introduce relative dating, the rock cycle and relevant geologic concepts then have the student address questions. <p>Unit 2 - Decreased energy? led to LGM, phase changes, DSM lobe subsequent land changes HS-ESS_2-2, 2-4, 2-5</p> <ol style="list-style-type: none">1. Graph LGM data? energy vs products2. Compare and contrast Iowa Maps during and post glacial.3. Model the effects of glacial activity and processes in Iowa <p>Unit 3 - Role of geology contributing to ecologic distributions and patterns Addresses HS-ES_2-6</p> <ol style="list-style-type: none">1. Apply knowledge from unit 12. Combine and analyse data from bionet3. Use as a predictive tool model to predict fish populations in Iowa. <p>Unit 4 - Lake Delhi Collapse (HS-ESS_2-1, HS-ESS 3-1, HS-ESS3-3 and 3-6)</p> <ol style="list-style-type: none">1. maps, papers, data <p>Unit 5 - Climate change and sustainability in Iowa (HS-ESS 3-1, HS-ESS3-3 and 3-6)</p> <ol style="list-style-type: none">1. Previous unit findings2. United Nations SDGs
Explanation	<p>Please use Iowa's Glaciers, Rivers and Life, Directions and Questions attachment. This document provides the instructions and suggested questions for each unit activity :-)</p>

