Science & Environmental Education
Community Connections, Impacts & Actions

A comprehensive K-12 science and environmental education curriculum developed collaboratively between Waukesha County, School District of Waukesha, and Carroll University.

www.WaukeshaCounty.gov/EnvironmentalEd
Waukesha County, School District of Waukesha, and Carroll University have collaborated to create a comprehensive, interdisciplinary K-12 science and environmental education curriculum fully integrated with NGSS Science and Literacy standards.

The goal of this curriculum is to create more scientifically and environmentally literate citizens with the ability to understand and critically assess current scientific and environmental issues, along with a desire and ability to engage in these issues.

This project focuses on improving efficiencies through program coordination among partners as well as building comprehensive approaches.
This curriculum is organized by K-5, 6-8, and 9-12 grade bands. All grade bands are aligned directly to the Next Generation Science Standards (NGSS) and the Wisconsin Standards for Environmental Literacy and Sustainability (WSELS). The 6-8 and 9-12 curriculums serve as a way to infuse the WSELS into the secondary science classroom without sacrificing time or content. The K-5 curriculum is written as two-week integrated units designed for teachers and students to engage in an interdisciplinary study of science and the environment through literacy and math lessons. The lessons and activities are not meant to be done in isolation, but in support of and during literacy and math time.

All lessons have a structure with room for teachers to infuse more interactive play, academic discussions, or videos as well as adjust pacing as makes sense for their class. The assessments are designed to assess the NGSS, with several formative checks along the way for Common Core State Standards (CCSS) and WSELS, used as the teacher sees fit. The purpose of this curriculum is to serve as a support to help schools, teachers, and the community better educate our students on key issues at a local and global scale. The curriculum can be viewed and downloaded in PDF or iBook form at https://www.waukeshacounty.gov/envedu/schools/curriculum.

All programs within this Community Connections, Impacts & Actions Collaborative Curriculum can be requested online at www.waukeshacounty.gov/envedu and are noted with an asterisk within each grade level listed under “Schools.”

Environmental education is a lifelong learning process that leads to an informed and involved citizenry, having the creative problem-solving skills, scientific and social literacy, ethical awareness and sensitivity for the relationship between humans and the environment, and commitment to engage in responsible individual and cooperative actions.

By these actions, environmentally literate citizens will help ensure an ecologically and economically sustainable environment.
The E. B. Shurts building, located in the Fox River Sanctuary, is home to the environmental education program of the School District of Waukesha. The building is operated through a cooperative agreement between the School District of Waukesha and the City of Waukesha.

School Group Fees: (For all non-district, K-12 recognized institutions.)
Base Fee .................................................$50.00

Base fee starts at $50 and rates vary based on class size, length of program, and whether visiting teachers and/or volunteers would like to have teaching responsibilities during the program for a reduced rate. Please contact E.B. Shurts for specific program fees and to learn about additional education offerings not listed in this guide.

Carroll University’s Prairie Springs Environmental Education Center and Greene Field Station are located in the Town of Genesee, about 10 miles from the University’s main campus in Waukesha. The site includes a new facility for teaching and research-- as well as 75 acres of natural springs, wetlands, woodlands, and grasslands along Genesee Creek.

School Group Fees: (For all K-12 groups from recognized institutions.)
1-hour ...... $1.00 per student, $50.00 minimum charge.

One chaperone required per 10 students, no charge to chaperones.

Pricing for multiple visits per year can be arranged and determined on a case-by-case basis.

Prairie Springs Environmental Education Center Cancellation Policy:
A program may be cancelled if the contract with payment agreement is not received at least 10 business days before the schedule date. A $50 cancellation fee may be charged for any cancellations made within 10 business days of the scheduled program date. An additional materials fee may be charged if specialized materials/equipment was purchased for the program. In case of inclement weather, the center will try to reschedule the program when given advance notice.

Retzer Nature Center & Horwitz-DeRemer Planetarium Cancellation Policy:
If payment is not received at least 21 days in advance, the program will be cancelled. If a program is cancelled within 21 days of the program date, the program fee may be forfeited or a credit issued instead of a refund. Credit must be redeemed within the same calendar year unless otherwise noted. All programs are held rain or shine. An indoor program may replace hikes in inclement weather.
KINDERCARTEN

This unit connects to the specific literacy theme of “Community.” Connections are made between people serve as community helpers through their jobs and how students serve the community through their actions as environmental stewards.

STEM CONNECTIONS
Students will work as a class to reduce waste in their school. They will sort, count, and chart the total class waste and engineer a solution for their building based on the data they collect.

- Students develop and connect with their sense of place and well-being through observation, exploration and questioning.
- Students evaluate relationships and structures of natural and cultural systems and analyze their interdependence.
- Students analyze the interactions and outcomes of cycles and flows in natural and cultural systems.
- Students analyze the dynamic balance between natural and cultural systems.
- Students engage in experiences to develop stewardship for the sustainability of natural and cultural systems.

This integrated unit uses NGSS and CCSS as the backbone to planning and infusing environmental education standards into the curriculum.

NGSS PERFORMANCE EXPECTATION

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<td>KL-ESS3 Communicate solutions that will reduce the impact on humans on the land, water, air, and/or other living things in the local environment.</td>
<td>Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things.</td>
<td>Events have causes that generate observable patterns.</td>
<td>CCSS.MATH.CONTENT.1.MD.C.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.</td>
<td>CCSS.MATH.CONTENT.K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference</td>
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How Can We Reduce Our Negative Impact On Our Community?

Reduce, Reuse, Recycle
Retzer Environmental Learning Center
Also available at your school as an all-school assembly for K-5.
1 hour
Students will:
- Learn about the three Rs, what to recycle, and what recyclables become.
- Close the loop at our new Retzer Nature Center interactive exhibit area!
- Visit the eco-house, load the recycling truck, operate the mini-recycling facility and deliver recyclables to remanufacturers to become new products ready for the store shelves.
- Learn how your actions matter!

*Bus funding may be available, e-mail: recycling@waukeshacounty.gov.

Community Helpers
E.B. Shurts Environmental Education Center
2 hours
Students will:
- Participate in hands-on activities to learn about what it means to be a community helper.
- Meet live animals, investigate a picnic scene, take a nature walk and create a turtle craft.
Activities will take place indoors and outdoors.
This unit connects to the specific literacy theme of “Investigation.” Students will be studying biomimicry, which is the investigation of how we can use animals and plants as models for human technologies.

**STEM CONNECTIONS**

Students will work collaboratively to engineer a habitat to help their animal survive in a variety of scenarios. Students will ask, imagine, plan, create, and improve their creation as a team.

- Students develop and connect with their sense of place and well-being through observation, exploration and questioning.
- Students investigate and analyze how change and adaptation impact natural and cultural systems.

This integrated unit uses NGSS and CCSS as the backbone to planning and infusing environmental education standards into the curriculum.

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<td>1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.</td>
<td>Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs.</td>
<td>Use materials to design a device that solves a specific problem or a solution to a specific problem. Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.</td>
<td>CCSS.ELA-LITERACY.RI.1.8 Identify the reasons an author gives to support points in a text. CCSS.ELA-LITERACY.RI.1.9 Identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures). CCSS.ELA-LITERACY.RI.1.10 With prompting and support, read informational texts appropriately complex for grade 1. CCSS.ELA-LITERACY.W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.</td>
<td>CCSS.MATH.CONTENT.1.MD.C.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.</td>
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**How Do Animals Use Their Adaptations to Survive in Their Environment?**

**Animal Adaptations**

Retzer Environmental Learning Center
Also available at your school.
1 hour to 1.5 hours
Students will:
- Enjoy a visit from the Retzer teaching animals!
- See how an animal’s physical and behavioral traits can help it to survive as we explore the concepts of habitat and adaptation.
- For an extended program, add on a craft where students will create a critter with unique traits to illustrate how their critter will function and survive in its habitat. (Additional fees apply.)

**Animal Adaptations**

E.B. Shurts Environmental Education Center
1.5 hours
Students will:
- Visit the live animal and habitat rooms to explore and observe a variety of animals and their adaptations, including snakes, turtles, salamanders and more.
What Can We Learn About Our Negative Impact On Pollinators?

Plants and Pollinators
Retzer Environmental Learning Center
1.5 hours
Students will:
• Investigate the relationship between plants and the animals that contribute to the process of pollination.
• Act out these pollinators’ “jobs” to understand this natural but complicated and very necessary procedure.
• Hike the trails looking for what is in bloom to observe the pollinators in action.
• Possible activity of recording which species were spotted (bees, wasps, bumble bees, butterflies, moths, flies, hummingbirds, etc.) then collaborate as a class and turn those observations into a chart or graph summarizing their findings.

Insect Investigation
Retzer Environmental Learning Center
1.5 hours
Students will:
• Join the naturalists and use sweep nets in the prairie, roll logs in the forest, and flip over rocks in search of insects.
• Investigate pollinators’ many adaptations that help support their survival, growth, behavior and reproduction.
• Learn about insects’ important roles in the environment, such as pollination.

The Importance of Pollinators
E.B. Shurts Environmental Education Center
2.25 hours
Students will:
• Learn about pollination while visiting the native gardens in the Fox River Sanctuary.
• Discover how native pollinators support humans through indoor and outdoor activities.
This unit connects to the specific literacy theme of "Power." This will be culmination of the larger unit around weather and climate. Students will focus on understanding how severe weather impacts life, health, property, and environment.

**STEM CONNECTIONS**

Students will design a solution that reduces the impacts of a flood-related hazards on the Fox River. They will focus on the impacts made before, during, and/or after a flood making sure to note the effects on life, health, environment, and property.

- Students develop and connect with their sense of place and well-being through observation, exploration and questioning.
- Students analyze the interactions and outcomes of cycles and flows in natural and cultural systems.
- Students investigate and analyze how change and adaptation impact natural and cultural systems.

This integrated unit uses NGSS and CCSS as the backbone to planning and infusing environmental education standards into the curriculum.

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<td>3-ESS3-1 Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.</td>
<td>A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.</td>
<td>Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.</td>
<td>Cause and effect relationships are routinely identified, tested, and used to explain change.</td>
<td>CCSS.ELA-LITERACY.RI.3.3 Describe the relationship between a series of historic events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.</td>
<td>CCSS.MATH.CONTENT.3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).</td>
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This unit connects to the specific literacy theme of “Relationships.” This mini-unit is part of a larger Earth and Human Activity Unit where students will learn about how human activity has impacted the Earth by exploring the essential question: What relationship do individual communities have with protecting the Earth’s resources and environment?

**STEM CONNECTIONS**

Students will work in groups to identify causes of erosion and describe what methods should be implemented to prevent erosion. They will design an action plan on how best to mitigate the amount of erosion occurring locally.

- Students develop and connect with their sense of place and well-being through observation, exploration and questioning.
- Students assess how diversity influences health and resilience of natural and cultural systems.
- Students analyze the interactions and outcomes of cycles and flows in natural and cultural systems.
- Students analyze the dynamic balance between natural and cultural systems.

This integrated unit uses NGSS and CCSS as the backbone to planning and infusing environmental education standards into the curriculum.

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<td>4-ESS2-1 Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind or vegetation.</td>
<td>Rainfall helps to shape the land and affects the types of living things found in the region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.</td>
<td>Make observations and/or measurements to produce data to serve as a basis for evidence for an explanation of a phenomenon.</td>
<td>Cause and effect relationships are routinely identified, tested, and used to explain change.</td>
<td>CSS.ELA-LITERACY RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on web pages) and explain how the information contributes to an understanding of the text in which it appears.</td>
<td>CCSS.MATH.CONTENT.4.MD.A.1 Know the relative sizes of measurement units within one system of units including km, cm, kg, g, lb, oz., l, ml, hr, min, sec. Within a single system of measurement, express measurements in larger unit in terms of smaller unit. Record measurement equivalents in a two-column table.</td>
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**Healthy Soils through Composting**

Retzer Environmental Learning Center
Also available at your school.
0.5 hours
Students will:
- View a real soil profile, understand how soil is formed, and discover the importance of organic matter.
- Conduct and erosion experiment and observe live compost microorganisms.
- Learn how to put food waste to use through the simple act of composting and improve soil health.

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**What Changes the Land**

E.B. Shurts Environmental Education Center
Lapham Peak
5.5 hours
Students will:
- Visit Lapham Peak to study weathering and erosion of landforms in Waukesha County.
- Cycle through activities such as a nature hike, soil investigation, glacier experiments, and more.
- Climbing to the top of the Lapham Peak observation tower is always a highlight of the day!
This unit connects to the specific literacy theme of “Relationships.” This mini unit is part of a larger Ecosystems Unit where students will learn about how the relationships amongst living things with each other and their environments have impacted the Earth by exploring the essential question: What relationship do individual communities have with protecting the Earth’s resources and environment?

**STEM CONNECTIONS**

- Students develop and connect with their sense of place and well-being through observation, exploration and questioning.
- Students evaluate relationships and structures of natural and cultural systems and analyze their interdependence.
- Students assess how diversity influences health and resilience of natural and cultural systems.
- Students analyze the interactions and outcomes of cycles and flows in natural and cultural systems.
- Students investigate and analyze how change and adaptation impact natural and cultural systems.
- Students engage in experiences to develop stewardship for the sustainability of natural and cultural systems.

This integrated unit uses NGSS and CCSS as the backbone to planning and infusing environmental education standards into the curriculum.

**NGSS PERFORMANCE EXPECTATION**

**DISCIPLINARY CORE IDEAS**

- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth’s resources and environments.

**SCIENCE AND ENGINEERING PRACTICES**

- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design solution.

**CROSS CUTTING CONCEPTS**

- A system can be described in terms of its components and their interactions.

**COMMON CORE ELA**

- CCSS.ELA-LITERACY. RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

**COMMON CORE ELA**

- CCSS.ELA-LITERACY.W.5.7 Conduct short research projects that can use several sources to build knowledge through investigation of different aspects of a topic.

- CCSS.MATH.CONTENT.5.MD.8.2 Make a line plot to display a data set of measurement in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in plots.

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**Water Resources**
Retzer Environmental Learning Center
*Also available at your school.*

1 hour

Students will:
- Discover the many aspects of water in the interactive power point program.
- Learn where drinking water comes from and where it goes after we are done with it.
- Students will learn what actions they can take to preserve and protect our water resources.

**Healthy Watersheds**
E.B. Shurts Environmental Education Center
5.5 hours

Students will:
- Engage in active learning as they explore our local water resources.
- Study local watersheds as well as test the quality of our local water resources using both chemical and biological tests.

This is a full day field trip with rotations between several different stations and laboratory investigations.
NGSS PERFORMANCE EXPECTATION: MS-PS-1
Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

Plant & Animal Communication
E.B. Shurts Environmental Education Center
5.5 hours
“How do plants and animals use scent to communicate?”
Students will:
• Rotate through three stations where they explore different ways plants and animals use scent to communicate. Activities include predator-prey games, setting up a long-term research project, and investigating how to increase distance scent travels.
This field experience is designed to last a full day with a lunch break included.

The Big Melt
E.B. Shurts Environmental Education Center
6 hours
“How can we utilize environmentally-friendly materials in our winter sporting and daily activities?”
Students will:
• Have the opportunity to build awareness and appreciation of the local environment in the winter.
• Investigate how we can be aware of our environment while solving a common winter issue: ice.
This field experience is designed to last a full day with a lunch break included.

Amazing Renewable Energy
Retzer Environmental Learning Center
2.5 hours
“How can we minimize negative environmental impact using alternative forms of energy?”
Students will:
• Participate in programs with Retzer (1 hr.), Recycling (30 min.) and the Planetarium (1 hr.).
• Discover how energy from the earth can be used to help heat & cool our homes & buildings. A brief tour of Retzer’s geothermal building. (Geothermal System at Retzer)
• Learn about energy sources and compare fossil fuel energy and renewable energy in an interactive Power Point program.
• Observe the Eco-house solar panel in our exhibit space to learn how sun is captured to create energy. Make a solar print. (Solar Energy)
• Learn how recycling and consumer choices save energy. Try our energy bike to demonstrate the difference in energy use by types of different light bulbs. (Recycling Saves Energy)
• See the Planetarium show Dynamic Earth. The show explores the inner workings of Earth’s climate system, narrated by Liam Neeson. With visualizations based on satellite monitoring data and advanced supercomputer simulations, this cutting-edge production follows a trail of energy that flows from the Sun into the interlocking systems that shape our climate: the atmosphere, oceans, and the biosphere.

Colors In Nature
Retzer Environmental Learning Center
2.5 hours
“What creates colors in nature and why are they important?”
Students will:
• Participate in programs with Retzer (1.5 hrs.) and the Planetarium (1 hr.).
• In one rotation, students will participate in a Color Scavenger Hunt related to pollinators/bees and other important colors in nature related to survival.
• In the other rotation, students will see the show Cosmic Colors: An Adventure Along the Spectrum.
NGSS PERFORMANCE EXPECTATION: MS-LS-1
Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

- Students will use credible research methods to investigate environmental questions, revise their personal understanding to accommodate new knowledge and perspectives, and be able to communicate this understanding to others.

**Water Comparisons**
E.B. Shurts Environmental Education Center and Prairie Springs Environmental Education Center
6 hours
“What environmental factors have affected the growth of macroinvertebrates in the Fox River and Genesee Creek?”
Students will:
- Have the opportunity to test the biological, physical and chemical environments of the Fox River (E.B. Shurts) and Genesee Creek (Prairie Springs) and make inferences as to how those environmental factors affect the macroinvertebrates.

This field experience is designed to last a full day with a lunch break included, but can be adjusted.

**Aquatic Survival**
E.B. Shurts Environmental Education Center
3 hours
“What specialized structures do aquatic macroinvertebrates have that help them survive and reproduce?”
Students will:
- Actively investigate how the plants and animals of the Fox River respond to different conditions and how they are specifically adapted for survival.

This field experience is designed to last a half day.

NGSS PERFORMANCE EXPECTATION: MS-LS-2
Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

- Students will demonstrate an understanding of the natural environment and the inter-relationships among natural systems.

**Invasive Species Study**
Prairie Springs Environmental Education Center or E.B. Shurts Environmental Education Center
5.5 hours
“How have invasive species influenced native plant and animal populations?”
Students will:
- Participate in an Invasive Species Pull to help battle invasive species in our community.
- Test water quality to see how biotic and abiotic factors can be affected by invasive species.

This field experience is designed to last a full day with a lunch break included.

**Survival in the Prairie**
Retzer Environmental Learning Center
2 hours
“How do adaptations help organisms survive in the prairie?”
Students will:
- Have the opportunity to observe the differences between four distinct ecosystems (prairie, field, pine plantation, forest) and make connections to the adaptations that have taken place over time.
- Diagram the prairie and forest life cycles, explore tree bark thickness and compare biomass diagrams of different ecosystems.
NGSS PERFORMANCE EXPECTATION: MS-ES-2
Construct an explanation based on evidence for how geoscience processes have changed Earth’s surface at varying time and spatial scales.

- Students will demonstrate an understanding of the natural environment and the interrelationships among natural systems.

How is the Forest Changing?
E.B. Shurts Environmental Education Learning Center
5.5 hours
“How have natural and human influences caused the forests of Wisconsin to change over time?”
Students will:
- Spend half of the day studying tree identification and creating a tree map of a section of the Fox River Sanctuary. During the other half of the day, students will explore how forests change from natural and human influences.
This field experience is designed to last a full day with a lunch break included.

Weather and the River
E.B. Shurts Environmental Education Learning Center
5.5 hours
“How does weather affect the water in the Fox River?”
Students will:
- Rotate through three rotations where they will actively investigate the effects of weather (specifically precipitation) on the local portion of the Fox River as well as make predictions using stream models.
This field experience is designed to last a full day with a lunch break included.

MRF Tour
Waukesha County Recycling
City of Milwaukee/Waukesha County Materials Recycling Facility
1401 W Mount Vernon Ave., Milwaukee
1 hour
“How can we reduce the impact of our consumer waste on the environment?”
Students will:
- Tour the Milwaukee Materials Recycling Facility (MRF) and observe the fascinating combination of physics, technology and people sorting and baling mixed recyclables before heading to market.
- Learn what can be recycled, why some things cannot be recycled, and what recyclables become.
Can be combined with other programming/field trip destinations for large groups.

NGSS PERFORMANCE EXPECTATION: MS-ES-2
Develop a model to describe the cycling of Earth’s materials and the flow of energy that drives this process.

- Students will investigate and analyze how change and adaptation impact natural and cultural systems.
NGSS PERFORMANCE EXPECTATION: HS-LS1-3
Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

• Students will demonstrate an understanding of the natural environment and the interrelationships among natural systems.

Homeostasis & Feedback Mechanism
Retzer Environmental Learning Center
3 hours
“How can homeostasis/feedback mechanisms become disrupted? Why does it matter if they are disrupted?”
Students will:
• Participate in programs with the Retzer (1.5 hrs.) and Water Resources (1.5 hrs.)
• Explore the interconnection of species and how they maintain homeostasis in their environment and what happens if those feedback mechanisms get disrupted.
• Visit a prairie habitat and make connections of the role fire regulation has on ecosystem biodiversity.
• Role play water run-off, look at the different types of road salt and how that impacts water systems, then explore how plants maintain homeostasis.

NGSS PERFORMANCE EXPECTATIONS: HS-LS2-1; HS-LS2-6
HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-6. Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

• Students will demonstrate an understanding of the natural environment and the interrelationships among natural systems.

Population Dynamics
Prairie Springs Environmental Education Center
6 hours
“Why is biodiversity important for a healthy ecosystem?”
Students will:
• Build evidence for the claim that “biodiversity is important for maintaining healthy ecosystems.”
• Explore how invasive species affect biodiversity in an ecosystem and how differences in biodiversity affect the food webs in an ecosystem.

This field experience is designed to last a full day with a lunch break included. Half-day experiences can be arranged upon request.

NGSS PERFORMANCE EXPECTATIONS: HS-PS1-4; HS-PS3-4
HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics.)

• Students will use credible research methods to investigate environmental questions, revise their personal understanding to accommodate new knowledge and perspectives, and be able to communicate this understanding to others.

The Chemistry of Climate Change
Prairie Springs Environmental Education Center
6 hours
“How do greenhouse gases in the environment affect climate change?”
Students will:
• Participate in activities that discuss and demonstrate the causes of the greenhouse effect through chemistry and how that relates to climate change.

This field experience is designed to last a full day with a lunch break included. Half-day experiences can be arranged upon request.

NGSS PERFORMANCE EXPECTATION: HS-PS1-5
Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature of concentration of the reacting particles on the rate at which a reaction occurs.

• Students will demonstrate an understanding of the natural environment and the interrelationships among natural systems.

Water Quality Testing
Prairie Springs Environmental Education Center
6 hours
“How do chemicals in water affect organisms?”
Students will:
• Explore the biological, physical, and chemical properties that affect water quality.
• Have an opportunity to investigate how humans can impact water systems to make both positive and negative changes.

This field experience is designed to last a full day with a lunch break included, but can be adjusted upon request.
NGSS PERFORMANCE EXPECTATIONS: HS-ESS3-1; HS-ESS3-5

HS-ESS3-1. 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-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth’s systems.

Students will be able to identify, investigate, and evaluate environmental problems and issues.

Hidden Threats
Retzer Environmental Learning Center and Horwitz-DeRemer Planetarium
3 hours

“What are some of the hidden threats to the environment and what is their impact? How can these threats be mitigated?”

Students will:
• Participate in programs with Retzer (1 hr.), Water Resources (1 hr.) and the Planetarium (1 hr.)
• Explore local threats to the land and water, their impacts and how these threats may be mitigated.
• Investigate invasive species threatening the ecosystems of Southern Wisconsin and specifically the challenges these species present at Retzer Nature Center.
• Use a watershed model to see what threats to water quality are affecting our waters and how they get there.
• See the planetarium show Dynamic Earth that explores the inner workings of Earth’s climate system.

This option is designed to be a full-day experience with a lunch break. The three, 1-hour rotations at three stations include: Invasive Species in our Ecosystem, Hidden Threats to our Watershed and the planetarium show Dynamic Earth.

Another option is designed to be a half-day experience with just the planetarium show and completing the Global Threats Activities at school.

• Participate in either Light/Sound Pollution or Green House Effect/Ocean Acidification in class.
• See the Planetarium show Dynamic Earth

NGSS PERFORMANCE EXPECTATIONS: HS-ESS2-4; HS-ESS3-1; HS-ESS3-4; HS-ESS3-5

HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate.

HS-ESS3-1. 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-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth’s systems.

Students will be able to analyze the interactions and outcomes of cycles and flows in natural and cultural systems.

Engineering Alternative Energy for a Changing Climate
Retzer Environmental Learning Center and Horwitz-DeRemer Planetarium
2.5 hours

“Can alternative energy replace the use of fossil fuels?”

Students will:
• Participate in programs with Retzer (1.5 hrs.) and the Planetarium (1 hr.)
• Explore how energy from the earth can passively heat and cool buildings through geothermal systems, discover how solar energy is captured to create energy, and experience how the earth’s interconnected systems shape our climate.
• See the planetarium show Dynamic Earth that explores the inner workings of Earth’s climate system.

NGSS PERFORMANCE EXPECTATIONS: HS-ESS3-2; HS-ESS3-3; HS-ESS3-4; HS-ETS1-3

HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Students will analyze the interactions and outcomes of cycles and flows in natural and cultural systems.

The Engineering of Recycling
Waukesha County Recycling
City of Milwaukee/Waukesha County Materials Recycling Facility, 1401 W Mount Vernon Ave., Milwaukee and one other location of your choice. Time varies based on options selected.

“What happens to residential waste once it leaves your home?”

Students will:
• Compare and contrast different aspects of waste management.
• Tour the MRF recycling facility and one other industrial site to compare and contrast waste management techniques. Other site options include: MMSD, the largest wastewater treatment plant in Wisconsin, a local landfill, or a plant nursery and yard waste processing site.