## Project/Problem Based Learning Template

<table>
<thead>
<tr>
<th>Created By:</th>
<th>Topic: Interactions of Living Things</th>
<th>Grade Level or Subject: 4th Grade</th>
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<tbody>
<tr>
<td>Brittany Gillispie</td>
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<tr>
<td>Stephanie Williams</td>
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### Science Standards:

4.LS2: Ecosystems: Interactions, Energy, and Dynamics

1) Support an argument with evidence that plants get the materials they need for growth and reproduction chiefly through a process in which they use carbon dioxide from the air, water, and energy from the sun to produce sugars, plant materials, and waste (oxygen); and that this process is called photosynthesis.

2) Develop models of terrestrial and aquatic food chains to describe the movement of energy among producers, herbivores, carnivores, omnivores, and decomposers.

3) Using information about the roles of organisms (producers, consumers, decomposers), evaluate how those roles in food chains are interconnected in a food web, and communicate how the organisms are continuously able to meet their needs in a stable food web.

4) Develop and use models to determine the effects of introducing a species to, or removing a species from an ecosystem and how either one can damage the balance of an ecosystem. 38

5) Analyze and interpret data about changes (land characteristics, water distribution, temperature, food, and other organisms) in the environment and describe what mechanisms organisms can use to affect their ability to survive and reproduce.

### Math Standards:

3.MD.B.3 Draw a scaled pictograph and bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled graphs. (supporting standard for 4th grade line plots later in the year)

4.OA.A.1 Interpret a multiplication equation as a comparison (e.g., interpret 35=5x7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5). Represent verbal statements of multiplicative comparisons as multiplication equations.
4.OA.A.2 Multiply or divide to solve contextual problems involving multiplicative comparison, and distinguish multiplicative comparison from additive comparison. For example, school A has 300 students and school B has 600 students: to say that school B has two times as many students is an example of multiplicative comparison to say that school B has 300 more students is an example of an additive comparison.

Throughout the unit, students will need to have an understanding of addition, subtraction, multiplication, and division to solve problems involving changing species populations within ecosystems.

4.NBT.B.4 Fluently add and subtract within 1,000,000 using appropriate strategies and algorithms.

4.NBT.B.5 Multiply a whole number of up to four digits by a one-digit whole number and multiply two-digit numbers, using strategies based on place value and the properties of operations.

**ELA & Other Content Area Standards**

4.RI.KID.1 Refer to details and examples in a text when explaining what the text says explicitly; refer to details and examples in the text when drawing inferences from the text.

4.RI.CS.5 Describe the overall structure of events, ideas, and concepts of information in a text or part of a text.

4.RI.CS.4 Determine the meaning of words and phrases as they are used in a text relevant to a grade 4 topic or subject area, including figurative, connotative, and technical meanings.

4.RI.RRTC.10 Read and comprehend stories and informational texts throughout the grades 4-5 text complexity band proficiently, with scaffolding at the high end as needed.

**Speaking and Listening**

4.SL.CC.1 Prepare for collaborative discussions on 4th grade level topics and texts; engage effectively with varied partners, building on others’ ideas and expressing one’s own ideas clearly.

4.SL.PKI.4 Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

**Writing**

4.W.RBPK.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.
4.W.RBPK.9 Draw evidence from literary or informational texts to support analysis, reflection, and research, applying grade 4 standards for reading.

4.W.TTP.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

| **PBL Summary:** Students will learn about interactions and balance within ecosystems. STEM careers will be highlighted throughout the unit including biomimicry engineer, wildlife conservationists, and environmental scientist. Students will develop and use models to show their understanding of balancing and maintaining ecosystems and the way those systems respond to change. As part of their culminating project, students will research and design a solution to an invasive species problem showing their knowledge through their choice of a wanted poster, Google SlideShow, etc. Students will also write informative/opinion essay. |
| **Multi-Dimensional Question/Driving Question:** Think of a relevant problem with multiple solutions that will drive student learning. |

By the end of the unit, my students will:

| **Master the Following Content:** |
| Ecosystems, Balance within Ecosystems, Invasive Species, Effects of Human and Animals on Ecosystems, |

| **Develop a solution to the following problem:** |
| Invasive species damaging ecosystems in the state of Tennessee |

21st Century Skills Addressed (circle all that apply):

- Creativity
- Collaboration
- Critical Thinking
- Communication

Culminating Event: Students will present their final capstone presentation during a “Showcase” at the end of the unit to the biologists from The United States Army Corps of Engineers biologists who will judge their final projects and provide feedback to students.
### Hook Event:
Show students a picture of The Python Cowboy. Ask students to create a notice and wonder chart and discuss.

TTW show the driving question for the unit to students and direct a conversation about student’s predictions, questions, ideas, and thoughts.

### Community Partners:
List potential business or industry partners that could add to the learning experience for students. Include websites or contact info.

1. United States Army Corps of Engineers Biologists (Nashville Division)
2. Martin County Trapping and Removals
3. City of Gallatin, Engineering Stormwater Section (Creek Critter Program)

What do you need from these partners (i.e. guest speaker, field trip, help facilitate an activity)?

1. Field Trip to Station Camp Creek
2. Help with judging and providing feedback for Invasive Species Showcase
3. Webcast to gain inquiry to unit content
4. Visit to gain content knowledge of balance between organisms within an ecosystem

### Resources/Materials Needed:
Teacher-made research forms
Showcase materials: technology, props, poster, etc.
Super Science magazine
NewsELA article
ReadWorks article
McGraw Hill curriculum materials for Inquiry Activities: Foxes and Rabbits worksheets, Overfishing simulation, What Habitat is Best Activity, Pill Bugs for research and worksheets for organizing findings, A Model Organism activity planning worksheets
Field Notes Cards and Ecosystem Situational Cards

### Lessons

**Essential Question:** How does energy flow in an ecosystem?

**Vocabulary:** biotic factor, abiotic factor, terrestrial, aquatic, producers, consumers, decomposers, food chain, food web

**Activities:**
- Stem Career Connection: Environmental Scientist
- Complete field notes to draw conclusions about the roles of organisms in ecosystems.
- Cumberland River Compact’s Creek Critter Program: Visitors will bring the creek to the classroom to show students connections between amphibians and insects in our local creeks.
- USACE video chat or visit to discuss and view local creek critters within our Station Camp Creek and how their presence or lack of presence helps to evaluate the health of ecosystems near us. (Drake’s Creek evaluation, etc.)
- USACE will visit to discuss important ideas necessary to create a viable Community Action Plan to our Driving Question.
- Foxes and Rabbits Inquiry Activity
  - Students will simulate how predator and prey relationships affect each other.
- To identify balance within an ecosystem between predator and prey, students will develop an ecosystem and create multiplicative comparisons to show that there must be more prey than predators for the ecosystem to remain healthy. For example, students could say There are 15 rabbits and 3 foxes. 15 is 5 times as many as 3. There must be more rabbits than foxes, so the fox have enough food to survive.
- Super Science Article: Vulture Shock
  - Students will identify cause and effect relationships within the article.
  - Condor Comeback: Students will interpret data and patterns found in vulture behaviors.
- Research food chains and food webs within different ecosystems and record findings on ecosystem research form.
- Performance Task: Build a food web

<table>
<thead>
<tr>
<th>Essential Question: How do changes affect ecosystems?</th>
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<tbody>
<tr>
<td>Vocabulary: habitat, niche, limiting factor, competition, symbiosis, mutualism, commensalism, parasitism, invasive species</td>
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<tr>
<td>Activities:</td>
</tr>
<tr>
<td>- Stem Career Connection: Wildlife Conservationist</td>
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<tr>
<td>- Overfishing Simulation Inquiry Activity</td>
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<tr>
<td>- students will use technology to gain an understanding of the needs of organisms in the lake ecosystem and how environmental changes either meet those needs or do not</td>
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<tr>
<td>- Newsela Article: Not in the Nile, not this crocodile! African crocodiles find home in Florida.</td>
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<tr>
<td>- ReadWorks Article: Are the Everglades Forever?</td>
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<tr>
<td>- Students will read the two articles and compare and contrast the different effects invasive species are having on the Everglades ecosystem?</td>
</tr>
<tr>
<td>- Research changes in ecosystems and how those changes affect the species within the environment and record their findings using the Changes in Ecosystems Research Form</td>
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<tr>
<td>- I notice/wonder chart to collect research findings and identify misconceptions.</td>
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<table>
<thead>
<tr>
<th>Essential Question: How do organisms survive changes in their environment?</th>
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<tbody>
<tr>
<td>Vocabulary: structural adaptation, camouflage, mimicry, behavioral adaptation</td>
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</tbody>
</table>
**Activities:**

- Stem Career Connection: Biomimicry Engineer
- What Habitat is Best Inquiry Activity
  - Students will investigate how animals react to different habitats by observing and changing the habitats of pill bugs
- Performance Task: A Model Organism
  - Students will exhibit knowledge of adaptations and behaviors by designing an organism that can survive and meet its needs in a chosen Tennessee environment.
- Capstone Presentation: Students will choose a Tennessee ecosystem to research, i.e. freshwater or forest and begin to research the invasive species affecting those environments using an Invasive Species Research Form.
  - Students will work in groups to choose one of their invasive species and investigate how it is impacting their ecosystem.
  - USACE will visit to judge students Community Action Plans for improving their chosen invasive species problem in Tennessee.

**Technology Integration:** How is technology embedded into this PBL unit?

Students will use technology to complete simulations and research of changes in ecosystems throughout this unit. Students will have the opportunity to use technology in their capstone presentations during the final showcase at the end of this unit.

**Capstone Presentation:** TSW research and investigate an invasive species impacting an ecosystems and will create a wanted poster, Google Slide Presentation, or write an informative/opinion(persuasive) essay that includes a possible solution to the problem of invasive species in Tennessee.

- Students will choose a Tennessee ecosystem to research, i.e. freshwater or forest and begin to research the invasive species affecting those environments using an Invasive Species Research Form.
- Students will work in groups to choose one of their invasive species and investigate how it is impacting their ecosystem.
- Students will create a Community Action Plan to present their findings and provide options for the best way to reduce or remove the invasive species from their chosen ecosystems.
- Students will present these findings at the Culminating Showcase to an authentic audience of presentation judges (United States Army Corp of Engineers).
## Performance Based Rubric

<table>
<thead>
<tr>
<th>Standards</th>
<th>Developing</th>
<th>On-Target</th>
<th>Mastery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>The students demonstrates confusion and misconceptions of how energy flows within an ecosystem.</td>
<td>The student demonstrates a vague understanding of energy flow starting with the sun in an ecosystem.</td>
<td>The student demonstrates a clear understanding of energy flow within an ecosystem.</td>
</tr>
<tr>
<td>Subject</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
</tr>
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<tr>
<td>Ecosystem</td>
<td>The student does not understand that energy comes from the sun. The student does not use vocabulary and is unable to explain the balance of ecosystems. The student does not demonstrate an understanding of invasive species.</td>
<td>The student provides some detail about the balance of ecosystems using some vocabulary. The student vaguely understands the effect of invasive species on an ecosystem.</td>
<td>The student provides details about the balance of their ecosystem using key vocabulary with accuracy. The student is able to explain the effects of invasive species on an ecosystem with detail.</td>
</tr>
<tr>
<td>Math</td>
<td>The student is unable to create multiplicative comparison statements. The student cannot accurately interpret data from a graph using foundational math skills.</td>
<td>The student can sometimes create multiplicative comparison statements to describe relationships between predator and prey. The student can sometimes use the four operations of math to interpret data on a graph.</td>
<td>The student accurately creates multiplicative comparison statements to describe relationships between predator and prey. The student uses multiplication, division, addition, and/or subtraction to accurately interpret graphs.</td>
</tr>
<tr>
<td>ELA</td>
<td>The student is unable to identify the main idea and supporting details within the sources.</td>
<td>The student demonstrates somewhat of an understanding of the main idea and important details of the sources.</td>
<td>The student shows a superior understanding of the main idea and important details of the sources.</td>
</tr>
<tr>
<td>Writing</td>
<td>The writing does not address the topic or align with the given task.</td>
<td>The writing somewhat addresses the topic and aligns with the given task.</td>
<td>The writing clearly addresses the topic and aligns with the given task.</td>
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<tr>
<td></td>
<td>The writing does not refer to the sources used.</td>
<td>The writing does not refer to all sources used.</td>
<td>The writing appropriately refers to sources used.</td>
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<td></td>
<td>The writing demonstrates a minimal understanding of the topic researched.</td>
<td>The writing demonstrates understanding of the topic researched.</td>
<td>The writing demonstrates insight into the topic researched.</td>
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<td></td>
<td>The student does not include module vocabulary words.</td>
<td></td>
<td>The student includes several module vocabulary words.</td>
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The student is unable to identify the text structure and use that to help them better understand the content. Major misconceptions are present.

The student does not understand cause and effect relationships.

The student does not use grade level content specific vocabulary.

The student is somewhat able to identify the text structure of articles read and use that to help understand the information, however some misconceptions are present.

The student demonstrates some misconceptions within cause and effect relationships.

The student demonstrates somewhat of an understanding of some grade level content vocabulary.

The student is able to identify the text structure of articles read and use that to better understand the information.

The student demonstrates a superior understanding of cause and effect relationships.

The student demonstrates a superior understanding of grade level content vocabulary.
| Other Content Areas: Research/Topic Focus | The student includes some module vocabulary words. | The student does not define the focus of the research to a specific Tennessee invasive species. The focus of the student’s research does not align with the given task. | The student somewhat defines the focus of the research to a specific Tennessee invasive species. The focus of the student’s research aligns with the given task, but is confusing or unclear at times. | The student clearly defines the focus of the research to a specific Tennessee invasive species. The focus of the student’s research aligns with the given task. |