Survival

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Overview: The students will learn how organisms adapt to their environments.

Target Age: 4th Grade

Academic Expectations:

2.2 Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events.
2.3 Students identify and analyze systems and the ways their components work together or affect each other.
2.4 Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.
2.5 Students understand that under certain conditions nature tends to remain the same or move toward a balance.
2.6 Students understand how living and nonliving things change over time and the factors that influence the changes.

Essential Content:

- Structural Adaptations
  - Identify stream organisms' body structures and their functions
- Behavioral Adaptations
-
- Negative co Use tools of measurement
  - Thermometer
  - Yardstick
  - Tape measure
  - Graduated cylinder
- Data collection
- Sample collection
- Scientific Method
- Consequences to pond and forest ecosystems
  - Too much plant growth
  - Distribution of animals
  - Habitat changes

- Oil spills
- Land development

Organizer:
How do organisms adapt to their environment in order to survive?

Essential Questions:
1. Through my observations, how can I determine that organisms have adapted to their environment?
2. Why do organisms in my environment change?
3. What can I learn about ecosystems from studying forests and streams?

Culminating Project

Using the scoring guide for criteria, the students will work in cooperative groups to choose a product or a performance that shows how an organism they create has adapted to its environment. The student must consider the following: soil (plants), space, sunlight, water, temperature, food (animals), shelter (animals), and structural and behavioral characteristics for survival such as camoflauge, movement, claws, teeth and skin covering.

Products	Performance
a poster	a song or rap
a model	a verbal presentation
a written description	a talk show or interview
a PowerPoint presentation	
a brochure	

Enabling Knowledge

- Definition of organism
- Definition of ecosystem
- Components of ecosystem
- Basic needs of organisms
- Lifecycles of organisms
- Awareness of food webs/food chains
  - Producers
  - Consumers

    - Herbivore/carnivore/omnivore
    - Predator/Prey
- Awareness of body structures and their functions
    - Growth
    - Reproduction
    - Survival
- Classifications
    - Vertibrate
    - Invertibrate
        - Macroinvertibrate

Enabling Skills and Processes

- Language skills
- Communication skills
- Organization of information
- Observation skills
- Use of technology
- Research skills
- Cooperation skills
- Basic art and craft skills
- Using art elements
- Using tools of measurement

Instructional Plan 1

Title: Structures of Life

Number of days: 5-7

Academic Expectations:

2.2 Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events.

2.3 Students identify and analyze systems and the ways their components work together or affect each other.

2.4 Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be

observed.

2.5 Students understand that under certain conditions nature tends to remain the same or move toward a balance.

2.6 Students understand how living and nonliving things change over time and the factors that influence the changes.

Essential Content:

- Structural Adaptations
  - Identify stream organisms' body structures and their functions
- Behavioral Adaptations

Essential Question: Through my observations, how can I determine that organisms have adapted to their environment?

Enabling Knowledge:

- Definition of organism
- Basic needs of organisms
- Lifecycles of organisms
- Awareness of food webs/food chains and definitions of the following:
  - Producers
  - Consumers
  - Herbivore/carnivore/omnivore
  - Predator/Prey
- Awareness of some body structures and their functions
  - Growth
  - Reproduction
  - Survival – defense mechanisms

Enabling Skills and Processes:

- Language skills
- Communication skills
- Organization of information
- Observation skills
- Use of technology
- Research skills
- Cooperation skills
- Basic art and craft skills
- Using art elements
- Using tools of measurement

Activity 1

Materials:

- Blindfolds
- Outdoor area with places to safely hide. (A classroom may be used with blankets and desks as the "thicket").

1. Take the group to a thicket.
2. Blindfold one student who will be the predator. The predator slowly counts to twenty while the other students, or "prey", hide. Students who are hiding must be able to see some part of the predator at all times.
3. After counting, the predator removes the blindfold and looks for prey. The predator can turn around, squat, or stand on his/her tiptoes but cannot walk or change location. The predator should see how many students he/she can find. Identify them out loud and describe where they are. When identified the prey students move to the predator's location and wait until the next round to become predators. They can not tell the original predator where anyone is hiding.
4. When the original predator cannot see any more students, a new round starts. All of the predators put on blindfolds and stand in close proximity to each other. Each predator has the same motion restrictions. Again, the original predator counts aloud to twenty. At that point, all of the remaining prey must move at least ten feet closer to the predators. Those remaining prey still try to remain hidden. All predators remove their blindfolds and take turns naming students they can see.
5. Play as many rounds as necessary until only one or two prey students are left. At that time, have the remaining students stand up and identify themselves. It may be surprising how close the prey got to the predators without being detected. The ability to remain undetected and to detect others is an example of successful adaptation. Introduce the term "adaptation".
6. Conduct the activity one or two more times.
7. Discuss what made predators and prey successful. Were they quiet, clever, camouflaged, or good listeners? Ask students to identify animals that were adapted with similar survival characteristics.
8. Ask the students how they could change to be more success predators and prey. Some ideas that may come out are changing color (clothes), wearing clothing that does not stick to plants, being smaller, climbing a tree. Ask the students if animals can make similar kinds of changes.
9. Talk about differences between physical and behavioral changes. Have the students identify which adaptations related to predators and prey are behavioral, which are physical and which involve both.
10. Ask students to summarize what they have learned. Se if students can think of other examples of animal adaptations. Generalize that all animals are adapted to survive.

Activity 2

Materials:

- 4 colored Garden Rotini

1. In a grassy area, toss equal amounts of the four colors of Rotini onto the ground.
2. Break the students into four equal groups and line them up in rows relay-race style.

3. The first student in each row will run to the grassy area, pick up a noodle, run back and tag the next person in line. This will continue until each student has a noodle.
4. Have the students sort the noodles in piles by color.
5. Standing in a circle around the piles, ask the students which color was chosen the most and the least. Encourage the students to make connects between the Rotini colors and structural adaptations (camouflage). Discuss the shape of the mother's beak and the ability to collect the worms. Also the behavioral adaptation of instinct…the mother knows what to feed the babies, and where to go to get food, and the babies know to open their mouths at feeding time. Talk about the connections between worms and mother birds.

Use Windows on Science to show examples of adaptations such as the Snowshoe Rabbit, the walking stick, chameleons, etc…

Activity 3

Materials:

1. Crayfish of all sizes from a local stream, or have students bring them in**.** (Best if each group could have about 4-6 crayfish)
2. Containers with non-chlorine water to put crayfish in.
3. Foss Kit – Structures of Life Lesson

This lesson allows the students to handle crayfish, and examine their body structures. After observation, the students discuss the body structures, and movement of the crayfish as part of its defense mechanism, and the parts of the crayfish…the tail is a vital part of movement and defense.

May use Windows on Science to show examples of social behaviors of animals.

Activity 4

Materials:

- Drag net or leaf bag
- Access to a pond or stream

1. Teacher or student will collect from the pond or stream using the drag net or leaf bag.
2. Students will identify organisms' structures used for survival by looking at specimen and comparing to posters, charts, pictures from the Internet and books, etc. (specific to stream, the students will locate the water penny, caddisfly, mayfly, and stonefly)
3. Students will record information in science learning logs.

Assessment Activity

Birds use their body structure to adapt to their environments. Name two bird adaptations for each of the following body parts, listing their advantages: becks, feet, legs, wings, and color. Describe the importance of each of these adaptations to a bird's survival.

Instructional Plan 2

Title: Environmental Changes

Number of days: 5-7

Academic Expectations:

2.2 Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events.

2.3 Students identify and analyze systems and the ways their components work together or affect each other.

2.4 Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.

2.5 Students understand that under certain conditions nature tends to remain the same or move toward a balance.

2.6 Students understand how living and nonliving things change over time and the factors that influence the changes.

Essential Content:

- Effects of change in an environment (positive or negative)
- Ground water and water sources
    - Streams
    - Ponds
- Contributing factors to changes in ecosystems

- Definitions of terms including in GREEN water quality test kit (turbidity, disolved oxygen, phosphorous, pH, salinity, pollutants).
- Water flow in relation to water quality and environmental effects.

Essential Question: Why do organisms in my environment change?

Enabling Knowledge:

- Use tools of measurement
    - Thermometer
    - Yardstick
    - Tape measure
    - Graduated cylinder
- Data collection
- Sample collection
- Scientific Method

Enabling Skills and Processes:

- Language skills
- Communication skills
- Organization of information
- Observation skills
- Use of technology
- Research skills
- Cooperation skills
- Basic art and craft skills
- Using art elements
- Using tools of measurement

Activity 1

Materials:

- Copy of "The Life and Times of Somewhere Creek" for each child (see attached)
- Copy of "Stream Inhabitants" for each child (see attached)
- GREEN water quality test kit

1. This is a fictitious story about the path of a creek that flows through a city neighborhood. The students learn where the creek begins and all about the ecosystem and organisms surrounding it as it makes its path from the mountains to the city. The students will read and discuss (whole group) the story to develop an awareness of different segments of creeks and the inhabitants along the way.
2. The students will test the water quality using the GREEN kit in small groups.
3. The students will record the findings in their learning logs for class discussion.

*The Life and Times of Somewhere Creek" is from WET in the city/Water Education for Teachers, published by the Council for Environmental Education, 1999, Houston, Texas.

Activity 2

Materials:

- Copies of the pictures of the macroinvertibrates from the Stream Study sheet.
- Bulletin board

1. The students will work in small groups to draw a section of the map of Somewhere Creek (see above).
2. The students will cut out pictures of the macroinvertibrates and attach the aquatic life that is associated with each segment of the stream.
3. Discuss the map and whether the students think the stream is healthy or unhealthy and why.

Activity 3

Materials:

- Access to computer and Internet
- List of organisms to identify (see attached)

1. To prepare the students for a visit to a local stream, have them access the following website: http://www.people.virginia.edu/~sos-iwla/Stream-Study/StreamStudyHomePage/StreamStudy.HTML
2. The students will follow the links to view macroinvertibrates that are sensitive, somewhat sensitive and tolerate to water quality.

Activity 4

Materials:

- Stream Study sheet for each student
- Magnifying glass for each student
- Tweezers or forceps
- White sheets (to place specimen)
- Wading boots
- Buckets
- Thermometers
- Yardstick/measuring tape to measure stream

1. The class will visit a local stream to observe and collect samples of macroinvertibrates.
2. Students will collect samples and sort them onto the white sheet.
3. Using the Stream Study record sheet, the students will tally the number of organisms found in the sample.
4. The students will also measure the depth and width of the stream and record the temperature of the stream.

5. The students will analyze the flow rate of the stream by observing the movement of the water.

Activity 5

Materials:

- Computer

1. The students will visit the following website and play the Watershed game: http://www.proteacher.com/cgi-bin/outsidesite.cgi?external=http://www.uen.org/utahlink/pond/&original=http://www.proteacher.com/110004.shtml&title=ExploA-Pond%20Project

Assessment Activity

You have been hired to determine the water quality of the Acme Stream. It is your job to determine whether the water contains organisms that are sensitive, somewhat sensitive or tolerate so that the mayor will know whether the water is safe or not.

Draw pictures and label at least five organisms you found in your sample. Tell whether or not the organisms are sensitive, somewhat sensitive or tolerate. Then explain to the mayor whether or not you feel the water is safe.

Stream Study

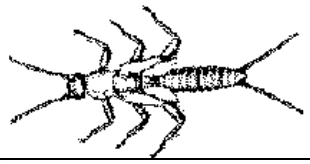
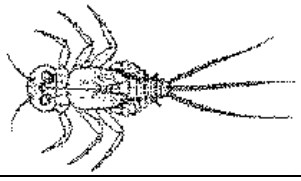
Stream: **Date:**

Depth at Site: **Width at Site:**

Stream Water Temperature: ____F ____C

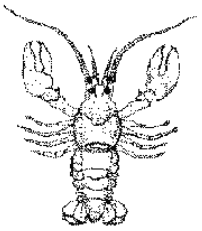
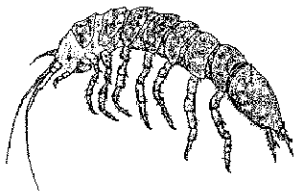
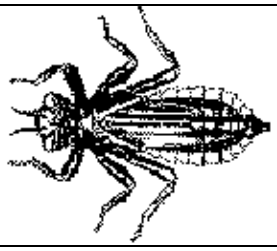
Stream Flow Rate: ____fast ___slow ___still

Stream Appears: ____clear ___cloudy ___muddy

Sensitive:		How Many?
Caddisfly		
Stonefly		
Mayfly		
Water penny		

Gilled snails		

Total of Sensitive:

Somewhat Sensitive:		How Many?
Crayfish		
Sowbugs		
Clams and mussels		
Dragonfly larva		

Total of Somewhat Sensitive:

Tolerant:		How Many?
Aquatic worms		
Lunged snails		

Total of Tolerant:

Instructional Plan 3

Title: Forest and Stream Ecosystems

Number of days: 5-7

Academic Expectations:

2.2 Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events.

2.3 Students identify and analyze systems and the ways their components work together or affect each other.

2.4 Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.

2.5 Students understand that under certain conditions nature tends to remain the same or move toward a balance.

2.6 Students understand how living and nonliving things change over time and the factors that influence the changes.

Essential Content:

- Negative consequences to pond and forest ecosystems
  - Too much plant growth
  - Distribution of animals
  - Habitat changes
  - Oil spills
  - Land development

Essential Question: Why do organisms in my environment change?

Enabling Knowledge:

- Scientific method
- Definition of fertilizer, habitat, ecosystem, environment, successional change, pollutants

Enabling Skills and Processes:

- Language skills
- Communication skills
- Organization of information
- Observation skills
- Use of technology
- Research skills
- Cooperation skills

Activity 1

Pea Soup Ponds (http://www.epa.gov/ORD/WebPubs/fresh/fresh.pdf)
(Adapted from Lacustrine Lessons, 1984)
Overview: Students grow algae with different concentrations of fertilizer to see the effect of nutrients on algal growth.

Objective: To show how algae can become a problem if too much grows in a pond or lake.

Materials:
28 baby food jars; hot tap water that has been aged for one day; 7 eyedroppers; algal culture; commercially packaged plant fertilizer pellets or loose fertilizer (any type of commercial plant food may be substituted); artificial light source- preferably fluorescent; masking tape or wax pencils.
Teaching Time: 45-50 minutes one class period, 5-10 minutes during the next 4-5 class periods.
Note: This activity is planned for 28 students working in 7 groups of 4. It can be easily modified for more or fewer students.
Teacher Instructions
A. Background:
Algae are often called plants because they are green and do photosynthesis, but under most classification schemes, they are neither plants nor animals but are protists. When dissolved nutrients, such as nitrogen and phosphorus found in fertilizers and waste products, are added to a lake, algae can grow very quickly. The lake turns greenish, and the situation is called an algae "bloom." When the algae die in large numbers, which can be noticed by the presence of a strong odor, the real problems begin. As bacteria start to decompose the dead algae, oxygen is used up. This often leads to dangerously low concentrations of oxygen which is needed for the survival of other organisms such as fish. This happens even more rapidly in the winter, when the lake is covered with snow and ice, because the lake water is too dark for algae to produce much oxygen, and it is not in contact with air that could replenish its oxygen. Algal blooms can greatly speed up "eutrophication", the natural aging process of the lake. Algal blooms can be controlled by preventing the release of excess nutrients into surface and groundwater. This can be achieved by pollution control regulations and by efficient sewage treatment facilities.
B. Before the lesson:
1. Order the algal culture ahead of time from a biology supplier (see Sources of Supplies at the end of this document). Make 7 copies of the algae growth chart (Figure 3-4).
2. Purchase fertilizer. It is simplest if all students use varying amounts of the same fertilizer. However, an extension of this lesson is to compare different types of fertilizers, such as liquid versus dry, "organic" versus synthetic, and fertilizers with different concentrations of nitrogen and phosphorus.
3. Prepare culture water by drawing 1 gallon of hot water from the tap and letting it stand for 1 day.
C. With the students With the students:
1. Discuss algal blooms with the students, including common causes, referring to the provided background material. Explain that each group will have 4 identical jars of water and algae, and that their job will be to experiment to find the effect of fertilizer on algae. An important point that students may miss is that 1 of the 4 jars should be a "control," that is, it should be a reference against which the other jars can be compared. The control jar should have a concentration of zero, meaning no fertilizer should be added.

2. Break into groups of 4 students. Each student should have his/her own jar. Number each group.
3. Introduce the fertilizer to be used, and determine how it should be measured (for example, eyedroppers full for liquids, teaspoons for dry fertilizer, or numbers of pellets). Groups should plan their own experiments by selecting 4 different fertilizer concentrations (one being zero). Within the class, there should be a broad range of concentrations.
4. Label the jars with masking tape or wax pencils. Include the group number, student's name, and amount of fertilizer to be added. Have the students add fertilizer first, then fill with aged tap water to within a centimeter of the top.
5. Add one eyedropper full of algae to each sample jar. Leave jars uncovered.
Safety note: Practice good hygiene and have students wash their hands after handling fertilizer or algae.
7. Place all jars in areas with similar light intensities. An artificial light source may be needed. Make sure the source of light is held constant for all jars. Dark at night is fine.
8. Have students observe their jars daily for any visual evidence of algal growth. Keep records on the algae growth charts or in experiment log books. After about three days, algae growth should become obvious as indicated by an increased "greenness" in the jars and possibly odor.
9. At the end of one week, have students fill out the "growth after 1 week" section of the algae growth chart. The members of each group should work together to decide how the algal growth in their control jar compares with their other jars. They may also record any other observations on their growth chart. Discuss ways the data could be presented. One way would be to use water color paints or crayons to color in a square for each fertilizer concentration, showing that each concentration resulted in a different shade of green. There are many other options.
11. Have groups present their results. Did different groups have similar findings?
12. Ask if students observed any dead algae on the bottom of their jars. If yes, what will eventually happen to the algae? Would this be good or bad for animals living in the water?
13. Conclude by discussing with students why this excess of algae can be harmful to our lakes. Are there any practices students have seen that could contribute to this problem? Ideas include fertilizing lawns, fertilizing just before rainstorms, and throwing or sweeping organic matter like leaves or grass clippings in the lake. Are there actions students could take that would improve the situation? Some positive actions would be reducing or eliminating lawn fertilizer, using a different fertilizer (low phosphorus), or composting organic matter.
14. Clean up: The algal cultures should be poured on the ground, especially in areas that could use fertilizer. Avoid adding the cultures to surface water. If you pour them down the drain, they may burden your sewage treatment system.
16. Enrichment activities:
Compare different fertilizers.
Try varying temperature while keeping the nutrient concentration constant.
Visit a lake or pond to look for evidence of algal blooms. Test the oxygen concentration of the water, before and after the algal blooms,
with a water test kit.

Activity 2

Objective
Move Over Rover: Students will list factors that influence that distribution of animals and ecosystems and generalize that each ecosystem has characteristic animals adapted to live there. Students play a game in which the object is to identify characteristic animals found in several ecosystems and to match those animals to the environment in which they live.

See attached from Project Wild (2001), p. 144-151.

Activity 3

Objective
Time Lapse: Students will describe successional changes in an ecosystem and the factors that affect these changes, and relate species diversity to successional habitat changes. Using computer technology if available, students create and analyze a series of sketches depicting changes in the variety and quantity of wildlife as an ecosystem undergoes susccessional changes. Students research the kinds of animals that are found in each stage.

See attached from Project Wild (2001), p. 158-165.

Activity 4

Objective
No Water Off a Duck's Back: Students will (1) identify ways oil spills can adversely affect birds; and (2) describe possible negative consequences to wildlife, people, and the environment from pollutants caused by humans. Students conduct an investigation using water, oil, hard-boiled eggs, detergent, and feathers.

See attached from Project Wild (2001), p. 305-307.

Activity 5

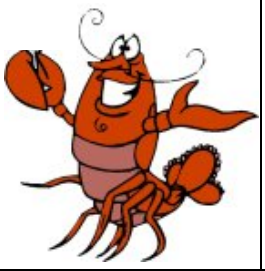
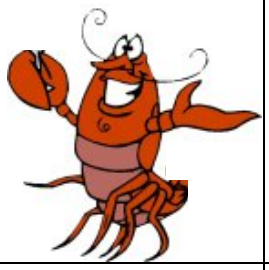
Objective
Shrinking Habitat: Students will describe some effects of human development of land areas on plants and animals living or previously living in the area, evaluate the importance of suitable habitat for wildlife and recognize that lose of habitat is generally considered the most critical problem facing wildlife today. Students simulate a process of land development.

See attached from Project Wild (2001), p. 310-313.

Assessment Activity

Through observing Carter Stream, you have noticed fewer organisms and more plant growth. Write a letter to your conservation officer telling him what you have seen and what you believe to be the cause.

Appendix 1

	Criteria			
Levels		**Content**	**Process**	**Product**
		Demonstrates clear understanding of organisms and their adaptations.	Works cooperatively and contributes to projects.	Presents a product from the list that includes body structure appropriate for surrounding and gives more than three examples supporting their product.
		Demonstrates some understanding of organisms and their adaptations.	Works cooperatively and contributes to projects most of the time.	Presents a product from the list that includes body structure appropriate for surrounding and gives at least three examples supporting their product.
		Demonstrates little understanding of organisms and their adaptations.	Works cooperatively and contributes to projects some of the time.	Presents a product from the list that includes body structure inappropriate for surrounding or gives less than three examples supporting their product.
		Demonstrates no understanding of organisms and their adaptations.	Does not work cooperatively with the group to develop the project.	Project does not show understanding of adaptations.