Field Studies Visit: Seasonal Changes in Florida and Human Impact on the Environment

CONCEPT

- Plants and animals, including humans, interact with and depend upon each other and their environment to satisfy their basic needs.
- Both human activities and natural events can have major impacts on the environment.
- Energy flows from the sun through producers to consumers.

OBJECTIVES

- Students will use science instruments to collect and analyze data
- Students will communicate their results and compare/contrast their findings with other teams
- Students will use the scientific process to learn how to collect data and come up with conclusions
- Students will analyze data at other times during the year to see patterns in Florida's upland and wetland habitats

VOCABULARY

region – an extensive part of the Earth's surface
ecosystem – all the living and nonliving things that interact with each other in an environment
biome – a very large area of land with a certain kind of climate and certain kinds of organisms living there
habitat – is it the natural environment in which an organism lives; physical factors of a habitat include soil, moisture, range of temperature, and availability of light
wetlands – is a land area that is saturated with water, either permanently or seasonally
uplands – is a land area that is dry and elevated

SUNSHINE STATE STANDARDS

SC.4.E.6.5
Investigate how technology and tools help to extend the ability of humans to observe very small things and very large things

SC.4.L.17.1
Compare the seasonal changes in Florida plants and animals to those in other regions of the country.

SC.4.N.1.2
Compare the observations made by different groups using multiple tools and seek reasons to explain the differences across groups

SC.4.N.1.5
Compare the methods and results of investigations done by other classmates

SC.4.N.3.1
Explain that models can be three dimensional, two dimensional, an explanation in your mind, or a computer model.

SC.3.N.1.1
Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

SC.3.N.1.2
Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.

SC.3.N.1.3
Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted

SC.3.N.1.4
Recognize the importance of communication among scientists.

SC.3.N.1.5
Recognize that scientists question, discuss, and check each others' evidence and explanations.

SC.4.L.17.In.1:
Compare the seasonal changes in the Florida plants and animals to those in other regions of the country.

SC.4.L.17.Su.1:
Recognize seasonal changes in some Florida plants, such as the presence of flowers and change in leaf color.

SC.4.L.17.Pa.1:
Recognize a seasonal change in the appearance of a common plant

CUMULATIVE MATERIALS AND TEACHER PREPARATION

ALL ACTIVITIES WILL BE DONE ONSITE AT CIRCLE B BAR RESERVE FROM 9:00 AM TO 1:00 PM (times vary based on transportation) FOR YOUR FIELD STUDIES VISIT.

STUDENT SCIENTIST ROLES:

BOTANIST (GREEN): PLANT IDENTIFICATION

- ✓ Field Guide Journal: Botanist
- ✓ PVC squares
- ✓ Plant ID cards

A botanist identifies plants and trees by the leaf shape, tree trunk, etc. Students will use a prepared plant guide. Note that the types of trees change as the ground slopes upward from the wetland area and that the leaves in the upland habitat tend to be narrower and waxy to help retain moisture. Look for flowers, seeds, etc.

Observe a burned area and discuss the role of fire in maintaining upland, pine-flatwood habitats. Observe a "tree cookie" and/or a tree core to estimate the age of the tree, years when the tree burned, years when the tree grew the fastest and slowest, etc.

In this project students will plot square meters during their Field Study visit. Square meters will be placed in an upland area and a wetland area. The students will record the different types of plants they have identified.

HYDROLOGIST: WATER QUALITY

- ✓ Field Guide Journal: Hydrologist
- ✓ Thermometer
- ✓ pH test
- ✓ Dissolved oxygen kit (DO)
- ✓ Dip net supplies and macro invertebrate ID

BACKGROUND

In streams and ponds, the presence or absence of certain organisms, called indicator species, reveals much about water quality. These creatures make up a biotic index (number of living organisms found in an ecosystem). The absence or presence of these organisms is an indicator of water quality.

Water with numerous aquatic species is usually a healthy environment, whereas water with just a few different species usually indicates conditions that are less than healthy. The word healthy is used to indicate an environment supportive of life. Pollution generally reduces the quality of the environment and, in turn, the diversity of life forms. In some cases, the actual biomass will increase because of pollution, but the diversity inevitably goes down.

METEROLOGIST (PURPLE): WEATHER FORECAST

- ✓ Field Guide Journal: Meteorologist
- ✓ Cloud ID sheet
- ✓ Contrail ID sheet
- ✓ Thermometer
- ✓ Rain gauge
- ✓ Weather vane

BACKGROUND

For students to predict the weather they need to know the simple weather patterns. To know the simple weather patterns they need to know the simple instruments used by meteorologists that measure the elements of weather. These simple instruments that 4th graders need to know are the thermometer, weather vane, and rain gauge. When the students have learned the identity of these instruments, they need to know how they work and how to interpret the information they have gathered. In this lesson you will learn how to teach what these instruments are, how they are used, data that can be collected from the use of these instruments, and why we keep records of the data.

Meteorologists gather information each day about the weather using their weather instruments. They have been gathering this information for decades. With all this data they gathered they look for patterns. When they notice a certain pattern for any given day, they can predict the weather. Many years ago before there were satellites, Doppler Radar and specialized weather instruments they would just use a barometer, thermometer, weather vane, anemometer, hygrometer, and rain gauge to predict the weather. When they saw the barometer at a certain pressure, the temperature at a certain level, and the wind blowing at a certain speed and a certain direction they could generally predict what the weather was going to be like the next day. Now with the all their special weather instruments added to these other tools they can predict the weather pretty well.

Just like meteorologists of old, students can take the weather readings using the simple weather instruments and be able to predict the weather. To do this they must take these reading for a month during a season and chart it. With the information, they can graph what is happening with each instrument each day. As storms are coming in and going out, the written data shows certain patterns the storms follow for that particular season. When they graph each instrument each day they can see what happens to each instrument as a storm comes in and when it leaves. It is also fun to compare the graphs of the instruments to each other each day. The more they do it the more they will see the patterns of the storms. It is recommended that students do a month of instrument reading for each season so they can know the patterns of each season

GEOLOGIST/PROJECT MANAGER (BROWN): SOIL

- ✓ Field Guide Journal: Geologist/Project Manager
- ✓ Soil chart
- ✓ Soil profile
- ✓ Rulers
- ✓ Soil probe

BACKGROUND

Students may have dug holes in the ground and noticed variation in soil coloration, but they may not know what causes these colors, or how soil colors are important for keying out soil type. In this activity, students will learn to recognize common wetland soil types and begin to locate wetlands in their communities.

There are many different types of soils, as well as sophisticated classification systems to categorize them. Most soil types are well-drained, nonwetland varieties. Because of the prolonged presence of water, wetland soils are physically different from non-wetland (often called upland) soils.

Wetland (hydric) soils are saturated, flooded, or "ponded" long enough during the growing season to develop anaerobic conditions in upper layers. That is, wetland soil is at times so saturated with water that it cannot hold much, if any, oxygen. The prolonged presence of water, and the resultant lack of oxygen, causes chemical reaction that eventually affect the color of the soil.

The study of a soil sample's color can determine if it is hydric soil even if the sample is not wet at the time of the investigation BY "reading" color characteristics, a soil scientist can tell how long or how frequently an area has been wet. You and your students can learn to recognize some wetland soils in this manner too.

There are two major types of wetland soils: organic and mineral. Organic wetland soils are those that contain a noticeable amount (more than 10 percent) of partially decomposed plants within at least 1.5 feet (0.46 meters) of the ground's surface. In waterlogged spots, organic materials accumulate. The lack of oxygen results in a decrease in bacterial decomposition, and plants do not decompose as they do in aerated situations. Wet organic soils look like black much or black to dark brown peat.

Soils that contain little or no organic material are classified as mineral soils. Mineral soils usually consist of a wide range of materials such as sand, silt, and clay. Mineral wetland soils can be gleyed (pronounced "glade") or mottled. Gleyed soils are usually formed when the soils are saturated all of the time (and thus anaerobic). These soils are usually neutral gray, greenish, or bluish gray.

Mottled soils are formed in areas that have wet (anaerobic) conditions, followed by periods of dry (aerobic) conditions. These conditions alternate continuously, possibly seasonally. The basic (matrix) soil color often includes concentrated splotches of brown, orange, red, or yellow. When the soil is very wet, minerals such as iron and manganese collect in spaces in the soil. When air moves into the soil during dry periods, these mineral concentrations oxidize. The iron rusts, leaving a permanent indicator of this process. Oxidized iron concentrations are various shades of red, orange, and yell. while manganese mottles are black.

When you did a hole to study wetland soil, you may find horizontal banding of colored materials in the soil profile. The soil types you find will depend on the area studied; you may want to contact your county Natural Resources Conservation Service office for expert help in identifying soil types. Wetland scientists use sophisticated tools such as the Munsell Soil Color Charts to identify wetland soils. Each color chip in the Munsell book represents a combination of hue (color), value (lightness or darkness), and chroma (purity) that reflects the degree of wetness in the soil. The color chart developed in Part I of this activity is a simplified version of the Munsell book.

Keep in mind that the soils on many properties have been altered by human activities. Tilling for agriculture, filling for development, and stripping for mining are a few examples of activities that change soils. Try to find a relatively undisturbed site, if possible. If you are looking at soil in a city, a suburban housing community, or near farmland, you may have to dig deeper to find undisturbed soils, including the original hydric soil.

The Project Managers role will be to work with each team member and put all of their data onto the team's data sheet. This is not a passive responsibility. They are still a scientists working with the team to do all of the other activities. I would advise that this person be a great leader and be able to help the group stay organized and focused at each station.

ZOOLOGIST (YELLOW): ANIMAL IDENTIFICATION

- ✓ Field Guide Journal: Zoologist
- ✓ Reptile/amphibian field guide
- ✓ Bird field guide
- ✓ Tracks and scat field guide

BACKGROUND

Wetlands provide critical benefits to plants, animals, humans and the total environment. Most wetlands, with their abundance of food, vegetative cover (shelter), and water, are rich with diverse wildlife species. Marshes (wetlands with very few trees) are important for thousands of migratory birds, as they are used for breeding, resting, and wintering habitats. Other animals such as invertebrates, reptiles, amphibians, fish and shellfish also reproduce and spend part or all of their lives in these wetlands. Many mammals depend on wetlands for food, shelter and water.

Wetland vegetation is highly beneficial. Plants absorb nutrients and help cycle them through the food web. They keep water's nutrient concentrations from reaching toxic levels. Plants produce oxygen through photosynthesis, and they are important food source for other life forms.

Wetlands have a unique ability to purify the environment. They are extremely effective natural filtering systems. For instance, they trap and neutralize sewage waste, allow silt to settle, and promote the decomposition of many toxic substances.

Wetlands mitigate the harmful effects of sudden and seasonal variations in the water supply. When runoff from rain is high wetlands retain excess water, allowing it to drain into streams and rivers and permeate the soil gradually. Healthy wetlands are buffer zones that prevent flooding and erosion. In drier periods, they hold precious moisture long after open bodies of water have disappeared.

As remarkable and resilient as wetlands are, they do have limits. Wetland functions can be compromised when portions are drained and filled for other uses. When a wetland is lost, the effects on wildlife, humans, and overall environmental quality can be significant. Although many wetlands are protected by federal and state laws, there is still a need to create a greater awareness of the importance of wetlands as unique and essential ecosystems.

Uplands provide similar ecological value that is often under appreciated. For instance the uplands play a large role in the water resource value as well.

Uplands are primary areas that serve for aquifer recharge storing and holding water in deep sugar sand soils to recharge into our water table.

Uplands also provide a valuable buffer to wetlands from pollutants and other runoff. Unlike wetlands though, uplands are very sensitive and require additional management of prescribed fire to maintain a healthy balance of plants and animals.

Lastly, uplands provide valuable habitat to many endangered animals and to many common animals as well. From wild turkey to bobcats to gopher tortoise, uplands provide essential elements that are needed by a diversity of animals.

THE 5 E'S

ENGAGE

1. Introduce the types of research scientist the students will become (pg 1-6 of this packet).
2. Brainstorm other science researchers.
3. Brainstorm questions about the natural world that they would like to know in relation to their field study tour to Circle B.

EXPLORE

Visit Circle B Bar Reserve for your Field Study

Teachers should pre-assign research scientist to students and their research teams.

- ✓ **For a class of 25 students → 5 TEAMS WITH 5 STUDENTS PER TEAM**

EXPLAIN

1. Ask students to answer three questions from the data they individually collected during the field tour (questions below).
2. How do seasons affect living things?
3. How do human interactions affect ecosystems?

4. Describe one other interdependence you observed (did you observe a bird eating a fish; did you observe scat in the road; did you see invasive apple snail eggs – have them use their interdependence vocabulary to explain what they observed).

ELABORATE

1. Take a class average for your data on temperature, rain accumulation, dip netting, soil color and soil texture. Create graphs for your data.
2. Compare this to the other classes/schools that have visited Circle B at different times.
3. Answer the following questions using all data collected.
   - How do seasons affect living things?
   - How do human interactions affect ecosystems?
   - Describe one other interdependence you observed.

EVALUATE

1. The students should create a forecast of what their class will encounter the following year, and infer changes during different seasons.
2. Student should answer as many questions on sticky notes from the Engage brainstorm session. This can be done as a class or in their research teams.

EXTEND (ALL OPTIONS)

A. Create shoebox dioramas or a play of the marsh and the upland habitats. Have students interact with their own project and describe how the system will change through seasons, human interaction, invasive species introduction and any other variables the student determines.

B. Create an account on eBird and be able to see citizen science data of bird observations from around the world! In May 2015, participants reported more than 9.5 million bird observations across the world! Explore Data by looking at Circle B Bar Reserve (click on Explore Hotspots).

1. Create a class account and Submit Data of the birds your class observed (optional)
2. Look at Bar Charts for Seasonal patterns
   i. Create inference questions of to how and why some birds stay and some birds migrate
3. Make a daily routine of going out into your school yard and collecting data on the birds you see and documenting them on the website or as a class journal.

C. Complete Project Budburst at your school. Project Budburst participants take careful observations of the seasonal plant events such as the first leafing, first flower, and first fruit ripening for a variety of plant species including trees, shrubs, flowers, grasses, weeds and ornamentals. Data can be put into an important climate change database online, or worksheets are provided for classroom data logging.

1. Book
2. Data log sheets
3. Online data log

D. Create your own class Nature Notebooks.

1. Here is a Ranger Rick template.
2. Have students create their own! This video illustrates how to "weave" together a fully functional "slot & tab: book. The process requires only scissors; no glue, no sewing. Just paper!
3. Observe the natural world around you. Draw what you see; create a poem; make a story about the squirrel always on campus.

E. Create a Nature Telescope. A potato chip can and a paper towel tube become a telescope you can use to keep your eye on wildlife!

F. Create a list of natural items appropriate for the season and location, and see how many your students can find. Complete this Nature Scavenger Hunt or have your students create their own. Also a BINGO game works too!

Field Studies Visit ONSITE: Life Cycles and Food Chains

CONCEPT

- Plants and animals, including humans, interact with and depend upon each other and their environment to satisfy their basic needs.
- Both human activities and natural events can have major impacts on the environment.
- Energy flows from the sun through producers to consumers – linkage that is called a food chain.
- Living things go through different stages in their life cycle; some involve physical changes as they grow and develop.

OBJECTIVES

- Students will use science instruments to collect and analyze data
- Students will communicate their results and compare/contrast their findings with other teams
- Students will use the scientific process to learn how to collect data and come up with conclusions
- Students will investigate the life cycles of Florida plants and animals
- Students will make observations about life cycles by identifying similarities and differences between selected life cycles.

VOCABULARY

region – an extensive part of the Earth's surface
complete metamorphosis – there are four distinct stages (in insects)

1. Egg
2. Larva
3. Pupa
4. Adult

incomplete metamorphosis – life cycle in which an insect hatches from an egg and then goes through several nymph stages. Each nymph stage looks like a smaller version of the adult but getting bigger with age.

1. Egg
2. Nymph
3. Adult

food chain – an arrangement of living things of an ecological community according to the order of energy being transferred from the Sun to producers to consumers.
ecosystem – all the living and nonliving things that interact with each other in an environment

biome – a very large area of land with a certain kind of climate and certain kinds of organisms living there
habitat – is it the natural environment in which an organism lives; physical factors of a habitat include soil, moisture, range of temperature, and availability of light
consumers – get their food from an ecosystem; i.e. herbivores, carnivores and/or omnivores
producers – plants that make their own food, using energy from the Sun, in a process called photosynthesis.

SUNSHINE STATE STANDARDS

SC.4.E.6.5
Investigate how technology and tools help to extend the ability of humans to observe very small things and very large things

SC.4.L. 16.1
Identify processes of sexual reproduction in flowering plants, including pollination, fertilization (seed production), seed dispersal, and germination.

SC.4.L. 16.4
Compare and contrast the major life cycles of Florida plants and animals, such as those that undergo incomplete and complete metamorphosis, and flowering and nonflowering seed-bearing plants.

SC.4.L. 17.2
Explain that animals, including humans, cannot make their own food and that when animals eat plants or other animals, the energy stored in the food source is passed to them.

SC.4.L. 17.3
Trace the flow of energy from the Sun as it is transferred along the food chain through the producers to the consumers.

SC.4.N.1.2
Compare the observations made by different groups using multiple tools and seek reasons to explain the differences across groups

SC.4.N.1.5
Compare the methods and results of investigations done by other classmates

SC.4.N.3.1
Explain that models can be three dimensional, two dimensional, an explanation in your mind, or a computer model.

SC.3.N.1.1
Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

SC.3.N.1.2
Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.

SC.3.N.1.3
Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted

SC.3.N.1.4
Recognize the importance of communication among scientists.

SC.3.N.1.5
Recognize that scientists question, discuss, and check each other's' evidence and explanations.

BACKGROUND

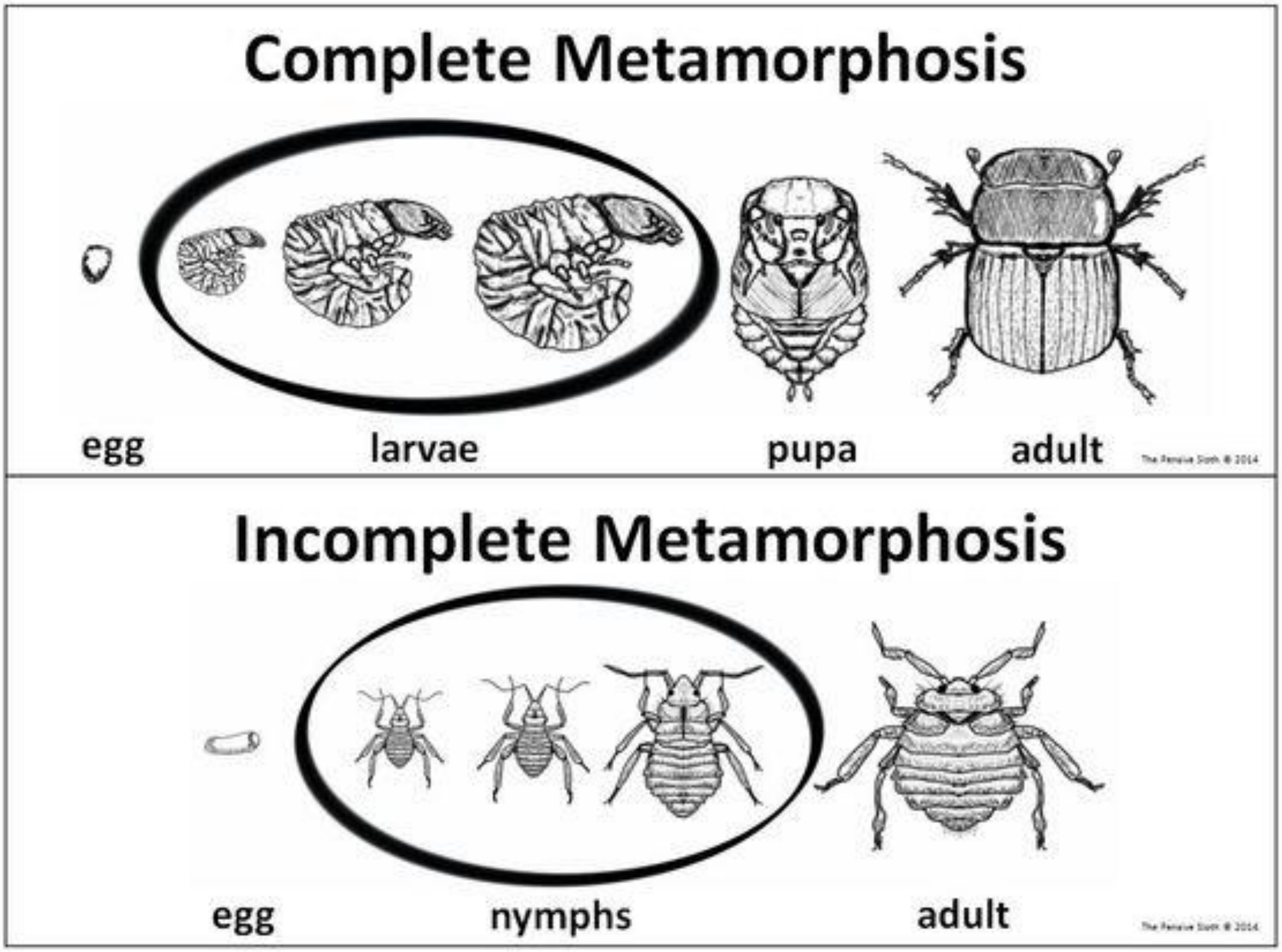
LIFE CYCLES

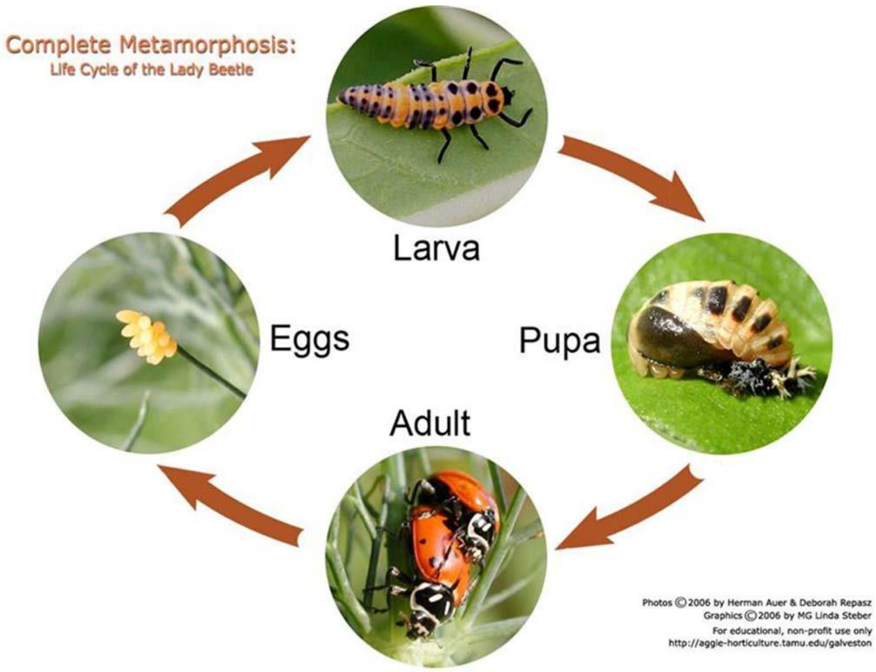
The term life cycle describes the development of an organism (living thing) from its inception through to its death. Is is a process by which a new organism forms and changes through various stages of its life and ensures the continuation of a species as a whole. The stages of a life cycle are characteristic of each group of organisms and may include, in animals and plants, fertilized egg, seed or spore, juvenile and adult. Also characteristics of each group is how you are varied for; rituals surrounding reproductive processes; food required at various stages of the life cycle and how the organism takes it in; and its natural life span.

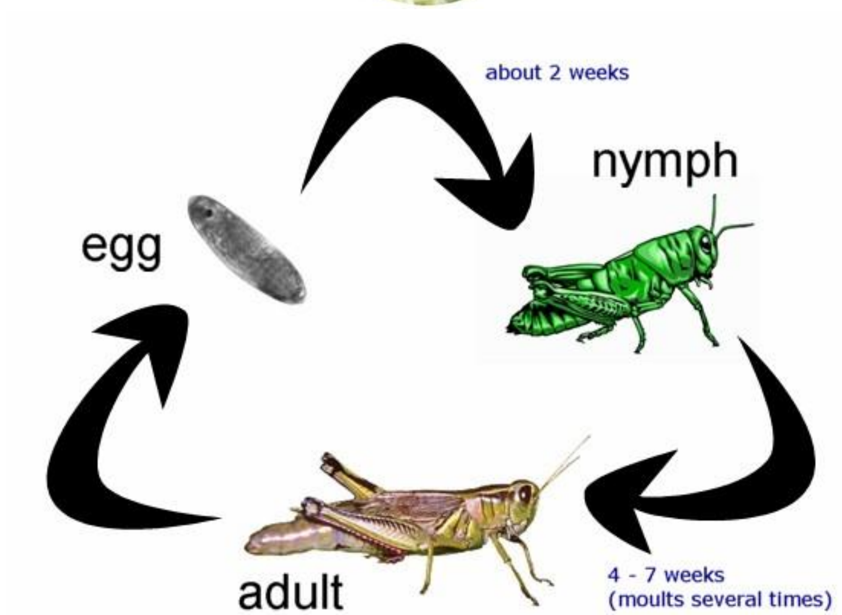
Metamorphosis

Metamorphosis is a process of change in an animal's form as it develops. This change often means that a particular stage of its life cycle the animals will look quite different from how it looked in the previous developmental stage. Each stage of a life cycle is characteristic of that organism and is adapted to its special environment and way of living.

POLK COUNTY ENVIRONMENTAL LANDS PROGRAM







Plant Reproduction

Plants, which include ferns, mosses, cone bearers and flowering plants, similarly exhibit a range of reproductive adaptions and strategies.

Ferns and mosses

Ferns and mosses usually reproduce by means of spores. Ferns produce spores in structures called sori on the underside of their fronds (leaves); mosses produce spires in capsules at the growing point of the plant. Both ferns and mosses have another life cycle stage: the sexual reproduction stage, where genetic mixing occurs.

Cone bearers

Cone-bearing plants include pine trees which have male cones that produce pollen and female cones that produce ovules. Both male and female cones are found on the one plant.

Flowering plants

The reproductive strategies of flowering plants fall into two groups – asexual reproduction and sexual reproduction. Many plants reproduce by asexual means. Strategies employed, and example plants include:

- runners – strawberries
- rhizomes – ginger
- branches that put down roots where they touch the ground – cape gooseberry
- suckers – bananas
- bulbs – onions
- tubers – potatoes

People may propagate plants, such as fire bush or impatiens, from cuttings.

Mechanisms for sexual reproduction vary between plant species. They include self-fertilization, cross-fertilization from the same (or another) plant, separate male and female flowers on the one plant (for example, squash) and male and female flowers on separate plants. With flowering plants of a single sex, such as pawpaws, two plants required to produce fruit, the result of successful fertilization of the ovule in the female plant.

Other living things

Fungi obtain their nutrients by breaking down living or once-living material. Fungi grow quickly. This is particularly noticeable at the time of sexual reproduction when there is a mixing of genetic material – fruiting bodies appear overnight! For example, mushrooms are a fruiting body and each produces thousands of asexual spores on gills. When the spores develop they produce fine, thread-like material called mycelium. The fine threads grow over and through any organic material available, absorbing nutrients and hastening the material's decomposition. Mushrooms form as a result of favorable conditions and are the result of sexual reproduction.

FOOD CHAINS

Every living organism needs energy to sustain life. Organisms within a community depend on one another for food to create energy. The simplest of these feeding relations is referred to as a food chain. A food chain is a linear arrangement of at least three organisms in which each uses the organism below as its food source. Within an ecosystem, there are many interactive food chains which create a food web.

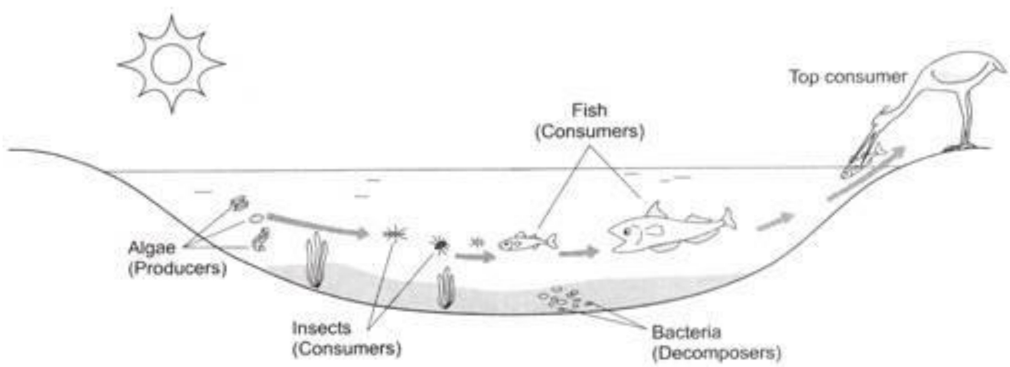
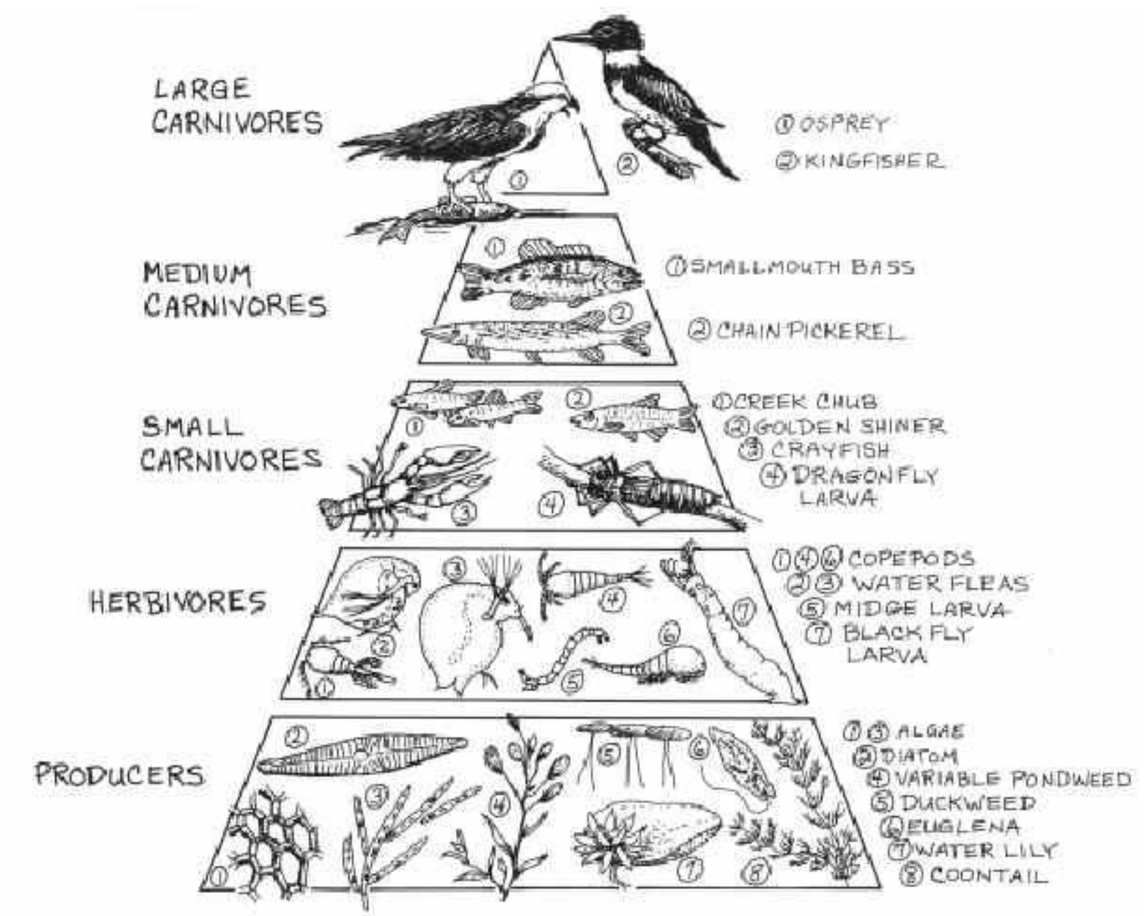


Fig. 8.4 A food chain in a freshwater pond

In every environment threw are different food webs. For example, as a raccoon leaves the hammock to feed on fresh fish from a freshwater marsh habitat, the nutrients of one food web can transfer to another. Although the organisms may be different, the order, producers, primary consumers, secondary consumers and tertiary consumers, is always the same.

At the base of a freshwater food web are producers such as algae, duckweed, and frogbit. Because many freshwater systems are small relative to the nearby terrestrial systems, much of the energy in freshwater systems can come from terrestrial sources, such as leaves falling into the water. Consequently, decomposers are often very important in freshwater systems. Just like on land, aquatic plants undergo photosynthesis and provide aquatic organisms with oxygen. Freshwater primary consumers include zooplankton and invertebrates. Smaller prey fish that consume the invertebrates are secondary consumers. Predators that are the top level include largemouth bass, smallmouth bass, walleye, chain pickerel, and perch. Humans and carnivorous birds (ospreys) are also included in the freshwater food chain.



CUMULATIVE MATERIALS AND TEACHER PREPARATION

ALL ACTIVITIES WILL BE DONE ONSITE AT CIRCLE B BAR RESERVE FROM 9:00 AM TO 1:00 PM (times vary based on transportation) FOR YOUR FIELD STUDIES VISIT.

THE 5 E'S

During the Field Study Program, students will be learning about two different topics: life cycles and energy in the environment (food chains). Therefore both topics might be address in each part of the 5 E process.

ENGAGE

Life cycles - Students on their hikes will be directed towards small, spherical pink things above freshwater levels. What could these pink things be?

Food chains - Students will be shown a square cover board that is placed over top of a grassy area. When the cover board is lifted up, the grass that was once thriving has now died. How can this be? Students discuss.

EXPLORE

Life cycles – students will be dip netting at a freshwater marsh. During this time, students will be able to link the animal that they find to its other life stages.

Food Chains- students will observe wildlife and their eating behaviors. These observations will lead to discussions on energy, what eats what, and what is at the start of all food chains.

EXPLAIN

Life cycles – students will be discussing the physical changes that some organisms go through, called metamorphosis, to alter themselves from infant to adult. Students will be able to show examples of incomplete and complete metamorphosis and identify flowering and nonflowering plant parts, and be able to compare and contrast their reproductive parts.

Food chains – students will participate in a predator-prey activity and be able to demonstrate how birds cycle nutrients and energy through ecosystems. Students will act out the food chain as a living thing; algae, shrimp, fish, or osprey.

EXTEND

Life cycles – Students will be using their logbook to further extend their thinking of life cycles. Students may also look up different living things life cycles and compare and contrast them.

Food chains - students will be using their logbook to further extend their thinking of food chains. Students may also look up some living things in Florida, and what they eat and create a food chain. Students can also create their own living thing and draw where it is in a food chain.

EVALUATE

Life cycles – Students can also create their own living thing and draw its life cycle in their log book.

Food chains – with access to a computer lab, use the website from PBS Learning Media, Make a Mangrove: An Ecosystem Game, and have the students create a food chain. There are variables to keep the ecosystem healthy. Students will also "experiment with how changing the amount of one resource affects the whole ecosystem".

Acknowledgements

Background information was used from NYSDEC Region 1 Freshwater Fisheries I FISH NY Program and Gayle Brown, who attended a module writing workshop organized by the Science Teachers' Association of Queensland and the Queensland School Curriculum Council.