

CAMP CLASSEN YMCA

**TRAIL GUIDE**

**LAKE GUY JAMES Trail**



Revised Summer, 2003  
Implemented **Fall, 2004**  
Trail Cards

**Trail Focus: Cycles in Nature**

**Water cycle, carbon-oxygen cycle,  
and nitrogen cycle**

- Cycles in nature and their relationship to plant and animal communities
  - Human impact on nature

**Teaching Stations: Lake Guy James**

Length: Approx. 2 mile

**14 Teaching Stations**

**Color Code: Blue**

## Teaching Stations: Lake Guy James

**Note:** pH testing of water and/or soil can be done anywhere on this trail.  
These testing materials are in the Camp Classes trail backpack.

Station number	Title and focus AND materials supplied by teacher
1	<b>Sewage Lagoon</b> – Trail Introduction and the Water Cycle <b>Apple; knife</b>
2	<b>Artesian Well</b> – The Movement of Water Aquifer model materials: <b>straw baggie, masking tape</b>
3	<b>Gases in Atmosphere</b> – Deer Stand and Grassy Field
4	<b>Decomposition and Nitrogen Cycle</b> – Hardwood Forest <b>Nitrogen cycle graphic; Hand lenses, measuring tapes</b>
5	<b>Russell Homestead</b> – Hydrology and People
6	<b>Fresh Water Ecosystems</b> – The Point <b>Oatmeal; Nutrient cycle chart; perc test data sheets; paper; crayons</b>
7	<b>Watershed</b> – Tributaries and Watersheds

Materials listed for each station on the Trail Cards are provided in the backpack.

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These testing materials are in the Camp Classes trail backpack.

Station number	Title and focus
8	<b>Erosion and Confusion Canyon</b> – Erosion and Canyon ExperiMint materials-one <b>mint per student</b> ; leaf collection- <b>1 baggie per cabin</b>
9	<b>Spillway and Dam</b> – The Small Lake Ecosystem
10	<b>Deer Meadow</b> – Man's Impact and Soil Percolation Perc test
11	<b>Lowland Forest</b> – Competition and Carbon/Oxygen Cycle Keeping Your Balance- <b>sharpie pen</b>
12	<b>Creek Bed Crossing</b> – Erosion and Sedimentation Perc test
13	<b>Oil Platform Field</b> – The True Meaning of Niche check transpiration baggie
14	<b>Lakeview Campsite Area</b> – Review collect paint chips

Materials listed for each station on the Trail Cards are provided in the backpack.

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## **Teaching and Hiking Suggestions**

- Before beginning the trail, explain trail rules and what is expected of each student and counselor
- Backpacks should only contain necessary trail items
- Everyone should check for tied shoelaces
- Position counselors at the end of their cabin group
- Be observant of the surroundings and take advantage of “teachable moments”
- At teaching stations, gather students close so that they can hear, attend, and be involved
- Rotate cabin groups during the hike to give everyone a chance to be at the front

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## **Trail Rules**

- Stay on trails and walk single file. This reduces erosion and helps maintain habitat for animals. Don't shortcut the “switchbacks.”
- Don't litter! Leave no record that you were here, except for footprints. Paper, water bottles, orange peels, piles of rocks, even broken limbs are sad signs of human impact.
- Be prepared. Dress for the weather. Bring water in hot weather. Don't carry so much that you may tire yourself.
- Stay with your group. This keeps people safe, and allows everyone to share in the learning. Keep one person at the end to “bring up the rear.”
- Use study materials. There are other trail guides, field guides, and other materials available to tell you more.
- Be patient and quiet. Getting there is half the fun. Slow down: noise scares away wildlife, and you will miss the things you came to see. Take time to learn and appreciate beauty.

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# Sewage Lagoon

Trail Introduction and the Water Cycle

## Student Activities (approx. 20 minutes)

1. Review trail rules.
2. Discuss the sewage lagoon's history, design, and function.
  - ♣ ALL wastewater from camp drains into this reservoir
  - ♣ Anaerobic bacteria (requires no oxygen) break down the raw sewage (sludge) that settles at the bottom of the Imhoff Digester.
  - ♣ Evaporation returns clean water to the environment.
3. **Apple Activity** (water on earth)
  - Hold apple up to represent all water on earth (fresh and salt water)
  - Use **the knife** to cut out a small wedge (size of an orange section). The large portion of the apple represents the world's oceans. Throw the large section out.
  - Cut the small wedge in half. One part represents the icecaps and glaciers. Throw it away.
  - Cut the remaining piece in half. One part represents groundwater. Throw this part away.
  - Cut the remaining piece in half. One part represents inland seas and salt lakes. Throw this part away.
  - Cut the remaining piece in half. One part represents water in the atmosphere. Throw this part away.
  - The remaining piece represents all rivers.
  - Point out that pollution and contamination reduce the usable water.
4. **Water Cycle Aerobics**

**Water Cycle** includes **evaporation, condensation, precipitation, and transpiration**. Gravity pulls water toward the lowest point in the landscape causing it to accumulate in ponds, lakes, streams, and oceans. What provides the energy for the water to evaporate? Solar energy makes water go upward. Solar energy and gravity do most of the work to move water in its cycle.

- ♣ Gather students in exercise formation in front of you.
- Ask students to name one part of the water cycle.
- Bring student to front of the group and define the part.
- Student demonstrates a physical movement that represents the part of the water cycle.
- Group performs this movement 10-20 times.
- Repeat with different students until the four parts of the water cycle have been demonstrated.

Use the movement that represents the step of the water cycle instead of the word as you go along the trail.

**Traveling Tune:** The Water Cycle Song (Tune: Coming Around the Mountain)

Water travels in a cycle, yes it does. (Repeat)

It goes up as evaporation

It forms clouds as condensation

And it falls as precipitation

*Yes it does!*

**Vocabulary Words:**

**Aerobic:** natural processes in bacteria and algae that use oxygen from the air.

**Anaerobic:** natural processes in special bacteria living in places where there is no oxygen present.

**Condensation:** the act or process of water changing from a gas to a liquid state.

**Evaporation:** the act or process of water changing from a liquid to a gas.

**Habitat:** the particular factors in the natural world, which allow an organism to live and reproduce.

**Precipitation:** water falling as rain, snow, sleet, hail.

**Reservoir:** a natural or artificial pond or lake used for the storage and regulation of water.

**Sewage Lagoon:** a natural wastewater treatment plant.

**Transpiration:** the process which water evaporates from plant tissues.

**Water cycle:** the various “circular” paths of movement of water on a global scale.

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## Artesian Well

### The Movement of Water

One of our most valuable resources is the water under our feet called **groundwater**.

**Student Activities (approx. 10 minutes) Materials: baggie, straw, water, masking tape**

1. Explain what **an artesian well is**, how it is formed, and the history of this well.

- ♣ Gravity pulls water down into the soil where the water travels through tiny spaces around and through the soil and rocks below.
- ♣ Layers and pores of sandstone or limestone trap the water
- ♣ This water-holding formation is called an **aquifer**.
- ♣ An opening in the rock made by nature (**spring**) or man made (**artesian well**) allows the groundwater to be forced upward as pressure is applied to the stored water in the aquifer.

2. **Baggie Well**

- Fill baggie with water, about half full.
- Put straw in baggie, with one end sticking out.
- Seal the baggie. Tape the opening around the straw shut or have students tightly hold the baggie at the straw.
- Squeeze the baggie and watch the water flow up and out of the straw.

3. Discuss the **smell**. Students may taste the water.

- ♣ Sulfur is the main mineral in this water
- ♣ Watercress is the leafy plant that grows in this relatively clean water.

## Vocabulary Words

**Aquifer:** water-bearing rock that transmits water to wells and springs.

**Artesian Well:** a man-made place of lower pressure in the ground where water comes forth from an aquifer.

**Gravity:** the natural force of attraction exerted by a celestial body, such as earth, upon objects at or near its surface, tending to draw them toward lowest point in the terrain.

**Groundwater:** water beneath the earth's surface, often between saturated soil and rock that supplies wells and spring.

**Pressure:** the force applied toward an area of less resistance.

**Sandstone:** a porous rock made of pressed sand deposits held together by a natural cement.

**Seep:** to pass slowly through a small opening or pore around or in a rock or soil ; to ooze or percolate, such as through soil

**Spring:** a place in the ground where water naturally comes forth because of pressure in an aquifer.

Cutaway diagram of artesian well

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## **Gases in the Atmosphere** Deer Stand and Grassy Field

**Nitrogen** makes up 78% of the atmosphere while oxygen supplies 21%. Other significant gases are **carbon dioxide, water vapor, carbon monoxide, and ozone**, which comprise 1% of our atmosphere.

### Student Activities (approx. 15 minutes) **Materials: 25-Ft rope**

1. Students make **Human Bar Graph**
  - Ask students to form a bar graph to represent how much oxygen, nitrogen, and other gases are in the atmosphere.
  - Students stand in three lines parallel to each other. For every 20 students on the trail, the arrangement would be 15 students for nitrogen, 4 for oxygen, and 1 for the other gases.
  - Ask students which line represents oxygen, nitrogen, and the other gases.
  - Continue the discussion of the bar graph by identifying that the longest line represents nitrogen (not oxygen like they may think), the shortest line represents gases including carbon dioxide, water vapor, carbon monoxide, and ozone. The remaining line represents the amount of oxygen in the atmosphere.
2. Ask students where we get the air we need to breath. (Answer: It is the O<sub>2</sub> formed during photosynthesis in producer organisms.)
3. Do **Oxygen for a Day** activity
  - Ask students how much grass (a producer organism) it takes to produce enough oxygen for one person for one day
  - Students form a hypothesis and discuss.
  - Explain that a person requires a minimum of 360 liters of oxygen per day (the volume equal to 180 two-liter soft drink bottles).

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- A 25 square foot plot of grass will produce a person's oxygen need in one day.
- Give a group of students the string.
- Students construct a square with the string by placing 1 person at each of the corners and the rest along the sides
- This square represents a 25-sq. ft. plot of grass, the amount of grass needed to meet an individual's oxygen need for a day.
- Explain that a tree produces enough oxygen each day to support one person while that person exhales enough carbon dioxide to provide the tree with its daily supply needed for photosynthesis.

**Vocabulary Words:**

**Atmosphere:** A mass of gases surrounding the earth

**Nitrogen:** a colorless, tasteless, odorless gas that makes up 78% of the atmosphere and forms a part of all living tissues.

**Oxygen:** a colorless, tasteless, odorless gas that makes up 21% of the atmosphere and is necessary for life.

**Photosynthesis:** The process in which producer organisms use carbon dioxide, water and sunlight to produce their food, glucose, and oxygen for respiration.

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## Decomposition and the Nitrogen Cycle

Hardwood Forest

**Student Activities (approx. 15 minutes)**    **Materials: Popsicle stick for each student**

**3 or 4 Measuring Tapes per cabin**

1. Make observations about what students can look around and see in this area.
2. Discuss purpose of decomposition.( returns nutrients to the soil)
3. Role-play the **Nitrogen Cycle**. (use Nitrogen Cycle graphic to help explain).
  - Select several students to represent nitrogen floating in the air.
  - Select a student to be a legume plant root nodule (bluebonnet or bean plant) and have him/her grab nitrogen out of the air and change it into nitrates.
  - A second student representing a new plant goes over to the legume and receives nitrates to use for growth of new tissues.
  - Select a student to be a herbivore to come along and eat the new plant. (rabbit, deer, etc)
  - The herbivore dies.
  - Select several students to represent decomposers. They should "tear up" the herbivore releasing new nitrogen.
  - Select several students to represent the new nitrogen that is released back into the atmosphere.
4. Do a **Decomposer Hunt**.
  - Hand out a hand lens and Popsicle sticks to each student or pairs of students.
  - Tell students they are to keep one foot on the trail at all times.
  - Look under or into a rotting log. (Teacher turns log and checks for snakes first) Find the decomposers that make their habitat there. Observe their behavior and physical adaptations. (Be sure to return the log to its original position.)
5. Try to find and identify some organisms that promote the decomposition of plants an animal remains (bacteria, mushrooms, shelf fungi, molds, insects and worms).

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6. Pass out measuring tapes. Students will measure the circumference of tree trunks to see if there is uniformity in size
- Discuss students' findings

**Traveling Tune: The Decomposer Song** (*Tune: The Worms Crawl In, The Worms Crawl Out*)

The worms crawl in, the worms crawl out,  
The worms leave droppings all about.  
Bacteria grows, and fungus spreads,  
Mo-o-ld sprouts and insects are fed.  
To decompose, you need to know,  
Nutrients come, and nutrients go!

**Vocabulary Words**

**Decomposer:** an organism that metabolizes dead organic material by eating and digesting it.

**Ecology:** a branch of science that studies the relationship between living things and their environment.

**Forest Ecosystem:** a community in a densely wooded area.

**Herbivore:** a plant-eating animal.

**Nitrogen Cycle:** a continuous series of natural processes by which nitrogen passes from air to soil to the tissues of living things and back to the air by mean of nitrogen fixation, nitrification, decay, and denitrification.

**Nitrates:** nitrogen in a form that is usable by plant and animal cells.

**Nutrients:** an ingredient that provides essential nourishment.

**Recovering Forest:** a wooded area that has only older trees and younger trees, but no middle aged trees.

**Scavenger:** an organism that eats dead organisms.

**Nitrogen Cycle picture**

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Poison ivy in this area! Stay on the trail.

**Russell Homestead**  
Hydrology and People

**Student Activities (Approx. 10 minutes)**

1. The broken down buildings here are the remains of the Russell Family, who lived here until the early 1960s. They had a house and outbuildings for their farming and ranching operations.
  - Mrs. Russell still lives close to the front gate of Camp Classen.
  - The lake was made as a recreational facility in 1968.
  - The diving board is placed on the trail to cross the **spring** that flows over a cliff, making a waterfall to the lake near the cave you can see when boating.
2. Stand along the trail and make observations. Predict what the Russell family's life was like as mid twentieth century homesteaders. Share students' ideas. Relate the story of the Russell family. Discuss places where water is found on the homestead and the impact it had on the Russell family decision to settle here.
  - Availability of water for life (natural spring)
  - A cement **trough** trapped the cold spring water. Part of it could be used as a drinking trough for animals.
  - The Russell family used the cool spring water to keep some of their food cold.
  - There is an abundant source of **groundwater**; in addition it is a quiet and scenic area.

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**3. Hydrosphere:** Hydro is Greek word for water and –ology means ‘the study of’. Hydrology is the study of water on earth (movement of water through the water cycle, where water is found-lakes, streams, ponds, water quality, ability of water to seep into soil, etc) .”

- Lick Creek originates as a spring-fed stream in the ranch land to the west
- It receives water from several other springs before flowing over Classen Falls and eventually into Lake Classen.

#### Vocabulary Words

**Groundwater:** water within the earth that supplies wells and springs.

**Hydro:** Greek; Water.

**-ology:** Greek; logos – symbol, study.

**Hydrosphere:** the surface waters of the earth and the water vapor in the atmosphere.

**Percolate:** water movement (seeping) through the airspaces located between soil and rock particles.

**Spring:** a natural opening in the ground where water flows out of an aquifer.

**Trough:** a low, shallow container for drinking water or feeding domestic animals.

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## Fresh Water Ecosystem

Layers of the Lake; Aquatic Food Chain; First Percolation Test      The Point

**Student Activities:**      **Materials: Soil Auger, Bottled water, Timer (or a watch with a second hand)**

### *Percolation Test Instructions*

1. Dig a hole using a soil auger (soil sampler) approximately 1 inch wide and 1 inch deep.
2. Fill the hole with water from someone’s drinking bottle.
3. Begin timing as soon as the water is poured in. Stop timing when you can see the mud in the bottom, and no water is left pooled at the bottom. Note: if the time goes beyond five minutes record that amount of time and move on.
4. Record the location and the percolation time. Pour the water in a similar manner every time you do this test. Good experiments should only have certain variables. The variables (things that can change) in this experiment are the location, type of soil and the time of percolation. The constants (things that do not change) are the size of the hole, the amount of water and the method of conducting the test.
5. Return the soil to the hole and try to leave no trace.

**Percolation** is the process of water moving through a porous medium. A coffee maker uses this principle when water percolates through the coffee grounds. The test will show how compact the soil is. The more compact the soil, the longer it takes to percolate. Try to find an out-of-the-way place, where few feet have trodden to do the percolation test. (There should be a sandy area near the port-a-potty or the fishing dock.. It should percolate quickly in this area.)

1. While feeding the fish a few flakes of oatmeal, make observations of the lake area and talk about them.
  2. Ask students to predict if this is a healthy lake – why or why not?
  3. Discuss layers of the lake.
- **Littoral Zone** – the area at the bank used for spawning; food production and nesting take place here.
  - **Limnetic Zone** – the top layer; oxygen is produced by phytoplankton during photosynthesis in this layer; it is the layer that ripples.

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- **Profundal Zone** – the middle layer; the warmest layer in the winter and the coolest in the summer (when you stick your legs down as you swim you can feel the difference in temperature); fish live here; good fishing; “a profound fish can be caught in the profundal layer.”
  - **Benthic Zone** – bottom layer; where water animals and plants that die become recycled.
4. Discuss pollution and the affect it has on the health of the lake.
    - If the Littoral Zone is polluted, fish have no place to spawn; animals who come to the lake to feed have less food; the lake gets covered with stinky blue-green algae and begins to smell; the pleasant experience of being around a lake is lost.
    - If the Limnetic Zone becomes polluted, phytoplankton die and the food chain of the lake is disrupted; if dead things stay on top, water gets limited sunlight or oxygen and the lake would smell so badly that no one would use it.
  5. Discuss **aquatic food chain** or nutrient cycle. (see appendix)
  6. Hand out paint chips to for students to use until the end of the trail. They use these to match the colors in nature.
  7. Do bark and leaf rubbings.

### Vocabulary Words

**Benthic Zone** – bottom layer of a lake.

**Eutrophication** – (eu=filled, trophic=food) the process of filling a standing body of water with excess plant nutrients.

**Food chain** – a series of organisms in which each uses the next usually lower member of the series as a food source to get their energy for life.

**Limnetic Zone** – the top layer of the lake that ripples.

**Littoral Zone** – the bank of a lake.

**Profundal Zone** – the middle layer of the lake.

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## Creek Crossing

### Tributaries and Watersheds

Most of the time this creek bed is dry. The source of water of this creek is **rainfall**. After it rains the creek bed we just crossed is full of water. Water from this creek drains into Lake Guy James and then travels down Lick Creek into Lake Classen. We call this kind of stream **intermittent**. Notice that the creek is at the bottom of a valley so water drains in from the hillsides. We call the beginning of a stream its **origin**, and the place where it empties out, the **mouth**. Smaller streams that join bigger streams are called **tributaries**.

*Water flowing from an area of higher elevation to an area of lower elevation becomes a major force which shapes the landscape through erosion. You can tell how much energy a stream usually has by looking at how straight it is, and the size of the rocks in it. **High-energy** (fast) streams have large, exposed rocks in them. **Low energy** (slow) streams have fine sediments in the streambed, and curve (meander) a lot. When a stream hits flat land, it will slow down, and will often break into several channels that weave about. This pattern is called **braiding**. A good example of braiding is the point at which Lick Creek braids around the Chapel at 89er Village.*

### Student Activities

1. Depending on the weather, ask a student to be a volunteer. Have the student put on their poncho or rain jacket. The student will pretend to be a “divide”. Have the other students predict where water will go if poured on the volunteers shoulder.

**Watershed** refers to the particular area of land where water drains to the lowest point in the landscape. The purpose of a raincoat is to “shed water.” Imagine if water were to land on your shoulder. How would you predict which direction the water would drain?

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2. Locate the “divide” for the Lake Guy James watershed.
  - The highest ridge of a watershed is called the **divide**. North America’s *continental divide* is the Rocky Mountains. The divide of your body’s watershed is the top of your head and shoulders
3. Ask the students if they can name any notable North American landscapes that are being shaped by water erosion (Palo Duro Canyon Texas, Red River in Texas and Louisiana, Grand Canyon, Colorado River in Arizona, Royal Gorge).
4. Identify three of the largest rivers of the world (Nile River – North Africa, Amazon – South America, Mississippi River – North America).

### Vocabulary Words

**Braided:** pattern of many overlapping strands of water.

**Dendritic:** tree-like pattern of streams coming together.

**Divide:** the highest ridge of a watershed

**Intermittent:** alternately containing and being empty of water.

**Mouth:** a natural opening, as the part of a stream or river that empties into a larger body of water or the entrance of a harbor, ocean, lake, canyon, valley, or cave.

**Origin:** beginning of a stream.

**Tributary:** a stream that flows into a larger stream, river, or other body of water.

**Watershed:** area of land that drains into a valley.

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## Spillway

### Erosion and Canyon

**The first thing you should do is to hand each student a mint and explain that they are only allowed to suck and may not chew the mint.**

While they are doing that, begin a short discussion on erosion, not only **water erosion** but other factors that contribute to erosion as well. Include **weathering, ice, chemical erosion,** and **root pry** in your discussion.

### Student Activities      **Materials: one starlight mint per student, 1 ziploc bag per cabin**

1. After your discussion of erosion, the mints should have dissolved in the students’ mouths. Begin a short discussion about what happened to the mints. Typical responses include: it dissolved, it went away, it evaporated, and it eroded. If erosion has been discussed previously, they might come up with “it eroded!” Some of the students might still have bits of the mint left, while others have a completely dissolved mint. Talk about how they sucked on their mint. Did they let it just sit in their mouth or did they move it around, crashing it against their teeth? This will help you explain that just as there are different conditions in our mouths causing the mint to dissolve, erode faster or slower, the causes of erosion vary in severity resulting in the different amounts of erosion occurring in nature. Those students who banged the mint around their mouth might mirror a rock that has been through many harsh storms or freezes. Those who just let the mint sit on their tongue mirror the bottom of a creek that has calm, still waters most of the time. Acidic saliva breaks down the sugar of the mint causing chemical erosion of the mint.

Discuss gouge pools and physical weathering and chemical weathering (breaking rocks by mechanical means or by chemicals-acids in the water, etc) , examples of root pry, and discuss how frost wedging would occur.

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**After you view the waterfall head back to the spillway, cross over the pylons and climb up to the top of the dam for the next stop.**

- 2. As you walk toward Confusion Canyon**, look for the **blue star** on a tree. This marks the spot where we are to go off the trail and look at the waterfall, take pictures, and see the awesome **power of water**. **NOTE:** please do not walk beyond this point on the trail, we do not want to disrupt the trail lessons for the Main Camp groups.
- 3.** Each cabin group should pick one green leaf to put in their Ziploc bag. This will be used at station 13.

### Vocabulary

**Canyon** – a deep narrow valley with steep sides and often a stream flowing through it

**Chemical erosion** – chemicals in our environment interacting with each other to dissolve away rocks and soil particles, such as acidic water dissolving the limestone bedrock which is alkaline.

**Erosion**- the carrying away of rocks and soils by the action of water, wind, and ice.

**Frost Wedge Erosion** – when water inside a rock freezes, expands, and breaks the rock

**Gouge Pool** – a hole or a pool made by the force of falling water

**Physical erosion:** changes in rocks that cause them to break along natural weak points causing them to wear away or break into smaller pieces.

**Root Pry erosion** – roots of a plant grow and pry apart rock and soil around it eventually breaking and dissolving rock away.

**Water erosion** – to wear away by the action of water

**Weathering** – the action of ice, drastic temperature changes, wind, and rainfall changing the color, texture, composition, or form of exposed rocks on the earth's surface.

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## **Spillway and Dam** The Small Lake Ecosystem

### Student Activities

- Discuss the history of the lake and the dam (built in 1968)
  - before the dam, it was a forested valley; the trees on the dam cannot be older than \_\_\_\_?)
  - change from a terrestrial ecosystem to an aquatic ecosystem
  - the stream that ran through the forest was impounded-human change
- Discuss the process of making the lake and how the area changed from a terrestrial ecosystem to an aquatic one and the fact that nature is constantly attempting to create new habitat on the spillway through natural selection.
  - time was needed for the aquatic community to stabilize
  - a complete food web needed to establish
  - people stocked the lake with fish
  - Nature is constantly changing and creating new environmental habitats.
  - Nature is constantly changing and creating new environmental habitats.
  - **Natural succession** is the process of different species living in a certain place changing over time.
- A Raindrop's Travel** (trace the path of a raindrop)  
Imagine you are a raindrop that just fell on top of a rocky Arbuckle Mountain. Tell the steps of the journey.
  - Gravity pulls raindrops **down the hillside** toward the **creeks**
  - Water from creeks flow into **Lake Guy James**
  - The lake water flows over the spillway and continues down **Lick Creek** toward **Classen Falls**
  - From Classen Falls the drop flows into **Lake Classen** at Main Camp
  - From Lake Classen the drop moves **further down Lick Creek**

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- Then into the Washita River which is just across I- 35 from here
- The Washita River flows to the Red River
- The Red River flows into the Mississippi River
- From the Mississippi River it flows to the Gulf of Mexico
- From the Gulf of Mexico it flows into the Caribbean Sea
- From the Caribbean it moves into the Atlantic Ocean
- Then into the Pacific Ocean at the tip of South America
- The raindrop evaporates in sunny Hawaii, then condenses to become part of a cloud
- The prevailing winds moving from west to east move the cloud across the USA.
- A thunderstorm takes place at Camp Classen in the Arbuckle Mountains
- Rain falls on the top of a rocky Arbuckle mountain and our raindrop is back where it started
- Now our raindrop percolates through the soil
- Water gets trapped underground and becomes part of the aquifer.
- It becomes part of the groundwater flowing out of the natural springs which feed the creeks flowing through Camp Classen and the trip begins again.

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#### Continuation of #9 Spillway and Dam Small Lake Ecosystem

3. While walking to the far (north) end of the dam, ask the students to guess when they go from the man-made land of the dam to the nature-made land. Ask students to list evidence for their judgment. Evidence may include:

- Soft gravelly soil of the dam versus the bedrock of the natural land surface
- Man made *straight lines* of the dam versus curves and crooked lines of natural land areas
- Younger vegetation versus older vegetation
- Monoculture of dam surface versus greater diversity of the natural land areas

#### Vocabulary

**Aquatic:** referring to water

**Dam:** a barrier limiting the flow of water

**Extinct:** the loss of an entire species from the earth, irreplaceable.

**Impound:** to enclose or confine water flowing in a stream within a limited area using a dam.

**Species:** a category of organisms that can interbreed and generate more of the same organisms.

**Natural succession:** the orderly process of change in the various species living in a certain place resulting in a gradually changing ecosystem. Steps: lake or pond to marsh to grassland to shrubby area to small tree forest to mature climax forest

**Habitat:** the factors necessary for an organism to survive, such as food, water, shelter, and space

**Terrestrial:** referring to land

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**Deer Meadow****Man's Impact and Soil Percolation****Student Activities****Materials: Water, Soil auger (soil sampler)**

1. Discuss **wild hogs'** history, function of the trap, and the impact on this area.

- fenced-in area is the trap, baited with food scraps
- wild hogs are descendents of hogs that were raised by farmers many ears ago
- cause damage to the lake edge and forest
- deer rest in this area; look for grassy areas that have been matted down

2. Discuss **human impact** on the environment. When are parking lots needed? Should we pave everything?

Do you know of an example of a permeable parking lot? Look at this meadow and imagine how the soil would be affected by paving. Based on this, what would you recommend people do when planning for development or parking?

- Parking lot is impermeable(water will not pass through)
- Water will run off causing erosion instead of percolating into the ground

3. Conduct a second **soil percolation test**. Ask students to rub some the soil between their fingers. The soil should feel greasier and less gritty than the previous soil percolation test. (Refer to Teaching Station 6 for specific directions. The soil will not perc as fast as the first test-this soil is less permeable.

4. Point out that the trail moves from a prairie into a forest

### ECOSYSTEM SONG to the tune of “Oh My Darlin’ – Clementine”

Crossing over, crossing over,

From one biome to the next.

From the grasslands and the prairies

To the De- cid- u- ous!

### VOCABULARY

**Erosion:** process of removing and carrying away material from the surface

**Ethics:** relating to issues of good and bad, right and wrong

**Impact:** to have a strong effect on and cause change

**Impermeable:** material that does not let water pass through

**Percolate:** the slow movement of water soaking into the spaces between soil particles or into porous rocks. The faster the water percolates the more porous the soil layer.

**Permeable:** material that lets water pass through

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## **Lowland Forest**

### Competition, Basic Needs, and Carbon/Oxygen Cycle

#### STUDENT ACTIVITIES(approx. 20 minutes)

##### 1. Stand still and be quiet for 30 seconds.

2. Discuss **carbon/oxygen cycle**. Food for all green plants is made during the process of **photosynthesis**. Green plants and algae need **carbon dioxide** for their food-making process, photosynthesis. During this process, **oxygen** is released which plants and animals use to live. During cellular respiration in all living things, **carbon dioxide and water** are given off. Carbon dioxide and oxygen are continually recycled in nature. REMEMBER THE OXYGEN FOR A DAY ACTIVITY AT THE BEGINNING OF THE TRAIL. Why is this cycle so important?

Are you part of this cycle? What are two waste products produced when we breathe? (Answer: water vapor and carbon dioxide)

What is the connection between this cycle and the food chain? (Answer: grass > glucose > plants uses glucose AND an herbivore eats grass > herbivore uses glucose in grass to make their life giving energy > pioneer kills deer for food releasing carbon dioxide and water back into the atmosphere > pioneer uses glucose in deer meat to make his life giving energy, releasing carbon dioxide and water vapor back into the atmosphere.)

3. **Keeping Your Balance** activity (Ask a student if you can mark O<sub>2</sub> and CO<sub>2</sub> on each palm as indicated)

- With each arm extended pretend you are a scale or balance. Open your right palm to indicate the weight on the balance for **carbon**. Open your left palm to indicate the weight on the balance for **oxygen**. When there is an abundance of a material the scale will be weighed down and the hand representing that substance will be lower.
- The teacher will suggest variable situations changing the balance of the carbon cycle/ oxygen in our environment. **Scenarios:**

**A.** If the surrounding trees are cut down to make a shopping mall and a parking lot

**Answer:** the scale tilts with more carbon dioxide and less oxygen in the air due to less photosynthesis

**B.** During an Arbor Day project 3 times as many trees are planted along this ridge. Answer: the scale tilts with more oxygen and equal or less carbon dioxide due to more photosynthesis occurring as a result.

**C.** If your personal plot of grass dries up during a drought. Answer: the scale tilts with more carbon dioxide and less oxygen due to more cellular respiration and less photosynthesis.

**D.** What if a fire destroys millions of acres of plants? Students may offer a variety of answers. Prompt students to answer using their knowledge of the impact of the carbon/oxygen cycle.

**4. North?** Moss tree study: It has been said that moss always grows on the north side of a tree. Does it? Ask students to walk into the forest, each chooses a tree, and stands on the side where the most moss is growing. Make a “best fit judgment” to determine which direction the moss *tends* to grow. As a pattern, moss should grow on the north or northwest side of trees because shadows stay on that side (the sun is in the southern sky for us, who are north of the tropics). **SAFETY**: If there are vines on a tree skip that tree so no one accidentally touches an old poison ivy vine. Use a stick to scatter thick leaves ensuring you have no snake encounters.

**5.** A nearby hickory tree has been damaged by a storm. Look in the hole at the “micro-habitat” for evidence of wildlife. Discuss the injured hickory tree’s recovery (scar around opening) relative to the function of the xylem, cambium, phloem, and bark.

**6.** Appraise the condition of the plants in the shrub layer and speculate concerning why many are bent, dead, and in a dying condition. (Caused by lack of sun and moisture. Vines and the canopy shading; large tree roots rob all the moisture from under story plants.)

- Trees/vines/shrubs are growing toward sunlight
- All vegetation is in competition for sunlight, space, moisture, soil nutrients
- Success of one mature tree could bring problems for other vegetation

continuation (#11, Lowland Forest, Competition, Basic Needs, and Carbon/Oxygen Cycle)

6. Locate some oak and hickory seedlings and speculate concerning the factors that will hinder their progress (browsing animals, shade, vines).
7. Discuss how wildlife and small trees benefit when canopy trees die (Forest is opened up, sunlight penetrates, more water is available and a wider variety of plants grow).

**VOCABULARY** (#11, Lowland Forest, Competition and Carbon/Oxygen Cycle)

**Algae:** a diverse group of primarily aquatic, mostly plantlike organisms that occur in such dissimilar forms as microscopic single cells, loose, filmy conglomerations, matted or branched colonies, or giant seaweed with root-like holdfasts and structures resembling stems and leaves.

**Carbon:** a component of the chemical substance, carbon dioxide.

**Carbon dioxide:** the gas necessary for producers to carry on the process of photosynthesis.

**Competition:** the struggle between all living things for the limited resources in the environment necessary for life such as gases, water, space, food, protective shelter.

**Moss:** along with liverworts the simplest terrestrial plants (in the classification *Bryophyta*) having high moisture and low sunlight requirements. They resemble small carpet patches growing only approximately one-half inch in height.

**Oxygen:** the gas necessary for all organisms to produce their life giving energy from glucose (food).

**Vine:** a plant growth pattern, characterized by long, slender, woody plant stalks that utilize other plants or other structures for support

## Creek bed Crossing

### Erosion and sedimentation

You can look “into the side” of the soil layers as you look at the stream bank. If it is safe to do so, have the group get down into the streambed and look at the exposed soil on the side of the streambed. You are now standing in a **zone of erosion**. Note the **soil profile** where the creek has exposed several alternating layers of soil and cobble (embedded rocks). The rocks and boulders could have been eroded from outcroppings (exposed rocks) upstream or possibly washed down from the adjacent hillside. How deep do the roots of herbs and trees go? Is the soil all the same color?

#### Student Activities (Discussions and perc test)

1. Walk following the creek bed to see stream energy patterns first hand. Examine the streambeds to determine how much energy they carried, by looking for brush piles and at the size of the sediments and rocks. Can you find a tree that will likely fall soon due to stream erosion?
2. What are the factors in a lowland forest that favor soil building? (Low water energy, large amounts of decaying detritus)
3. How can a lowland forest benefit from temporary flooding? (Sediments from the watershed increase soil depth)
4. Discuss which of the two tributaries studied thus far has the highest gradient and the most violent energy potential.
5. Identify and discuss any other evidence of **high water energy** (presence of larger rocks and boulders, brush pile accumulations in and out of the creek beds, debris hanging on limbs of trees and shrubs, and places where the water runs over the rocks forming gouge pools).

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6. Identify and discuss any evidence of **low water energy** (Sedimentation areas, pools of water.)
  - When the stream runs out of energy, it drops its load of sediment
7. How has the forested slope contributed to soil formation in the lowland? (Most of detritus that falls on the slope eventually washes to the low area)
8. How has Lake Guy James interfered with the shaping of downstream landscapes? (The lake is a reservoir that slows the flow of water slowing the amount of erosion that would naturally occur.)
9. **Do your 3<sup>rd</sup> percolation test here.**
10. As you leave this station to go to the next, tell students to collect 1 to 2 leaves off the ground.

#### Vocabulary Words

**High Water Energy:** where water runs the fastest (over rocks, limbs etc.)

**Low Water Energy:** where pools of water settle

**Sedimentation:** process of depositing suspended particles when stream energy slows or stops.

**Soil profile:** cross sectional view of exposed layers of soil

**Zone of erosion:** the place where erosion occurs

**Zone of deposition:** the place where streams drop their load of soil, rock and debris because of low water energy.

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## Oil Platform Field

### The True Meaning of Niche

Two plants are interesting here:

- the trees with peeling greenish bark and shiny white bark splotches are called sycamores. They grow only in habitats where there is plenty of water available. Therefore, the **water table** is very high around here. If you are ever lost in a forest you can look for sycamore trees to find a source of water.
- You may find some low shrubs with round yellow fruit that look like miniature tomatoes. These are nightshade plants. Don't eat them, they're deadly **POISONOUS!** Their close relative is very healthy, though: tomatoes.

Signs of **wildlife** have been noted in this area that indicate raccoon, fox, skunk, opossum, armadillo, deer, coyote, beaver, turkey, mink, and bobcat are among the wildlife inhabiting this area.

**Niche** means "place in the ecosystem," or, simply, "a job in nature." You might describe a niche by answering the "W" questions about it:

**Where** does it live?

**What** does it eat?

**How** does it live? OR **What** does it do to live?

**When** does it do what it does?

**What** does it need to live?

**Why** does it do what it does

### Student Activities **Materials: piece of white paper, crayon per student; bag with leaf**

1. Ask each student to find three different signs of wildlife. Wildlife includes birds, insects, and other "critters!"

- Beaver chewed stumps, tracks, holes from digging armadillos

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2. We know that water is more available in some places, and less available in others. How does the water cycle relate to the concept of niche? For example, let's look at the sycamore tree niche

- Where does it live? Rocky soils, especially those rich in lime, near a water source. Common in old fields and prairies near stream beds and in lowland forests.
- What does it eat? Lime rich nutrients in well-drained, shallow, rocky soils. Tolerates a range of water.
- How does it live? OR What does it do to live? Grows best in sunny areas, with well-drained, shallow, rocky soils. Deciduous hardwoods usually eventually shade them out; can invade meadows, shading out grasses and herbs. Can be an important pioneer species that begins to break up rock layers and bedrock.
- When does it do what it does? Deciduous but fast growing.
- What does it need to live? Rocky, lime-rich well-drained soil, water, lots of sunlight, open space. Birds, such as robins and waxwings eat berries and help spread the seeds (with fertilizer!).
- Why does it do what it does? To gain large amounts of water and sunlight, growth of the individual tree, and survival of the species

4. Name some other herbivorous and carnivorous animals, determining their **niche** through discussion. Ex: **Rattlesnake**

- Where does it live? Forest floor.
- What does it eat? Rodents, mammals, small amphibians, such as voles, mice, frogs
- How does it live? OR What does it do to live? It hunts for its prey, lays eggs, remains hidden as much as possible
- When does it do what it does? Hunts mostly in early morning and late afternoon, suns itself since it is cold-blooded.
- What does it need to live? Needs available food sources, cover for protection and shelter, sunlight/warmth to increase body temperature

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- Why does it do what it does? To grow to maturity and for species survival
5. Discuss the beaver's niche in Lake Classen and list some of its other potential predators.
    - Discuss the influence that fur-bearers had on the settlement of North America.
    - Feel the beaver cuttings and look for other beaver evidence.
  6. Look for **emergent vegetation**.
  7. Look at the green leaves in the baggies for transpiration.

### **Vocabulary**

**Adaptations:** a part of an organism's anatomy, physiology, or behavior which enables it to perform a unique function in its environment

**Niche:** The unique function or "job" of a species within an ecological community.

**Water Table:** the upper portion of ground wholly saturated with water

**Emergent Vegetation:** producer organisms first appearing within an ecosystem.

## Lakeview Campsite Area Review of the Water Cycle

You are at the end of the trail. Find a level, shady spot to do the review. Seat the students so that they may use their student booklets.

- Lake Guy James was impounded in 1968 and created a new lake ecosystem. Eventually sediments from the three creeks that feed the lake will fill it in forming a marsh and succession will continue until a climax forest results.
- Humans have made many decisions that have affected the landscape and ecosystems of this area.
- Identify where water is located (bodies of water, plants, ground, atmosphere, human use).
- Review the stages of the Water Cycle.
- The Carbon/Oxygen Cycle is necessary to support life. Carbon dioxide and oxygen must be recycled so that there is a constant supply for all living things. Review the Carbon/Oxygen Cycle.
- The Nutrient Cycle is the process where plants get nutrients from the soil; herbivores eat the plants, then omnivores and carnivores act as consumers. Decomposers are organisms that eat organic material, break it down through digestion, and leave waste. The waste matter from decomposers returns nutrients to the soil, making them available to plants and animals. Decomposition occurs only when decomposing organisms are present.
- Natural succession is the predictable process that changes ecosystems over time. Abiotic factors change first followed by changes in the biotic factor

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- The Nitrogen Cycle is the process that takes nitrogen from the atmosphere, changes it to a usable form in the root nodules of a legume plant, organisms use these nitrates to make their proteins and decomposers break down proteins of dead organisms releasing free nitrogen back into the atmosphere
- Erosion is the process of moving rocks or soil. Resulting sediments (deposition) are indicators of the amount of energy in a stream. Larger particles indicate more energy, and straight streams indicate faster flow (higher energy).
- Niche is a job in nature. Every living thing has a specific niche in nature.
- Intermittent streams flow only after it rains. Stream systems make a branch-like (dendritic) pattern. Tributaries are streams that flow into another. A geographic drainage pattern is called a watershed.
- Deposition sediments are indicators of the amount of energy in a streambed. The presence of larger particles and gouge pools indicates high energy water flow.

### Student Activities      **Materials: results of 3 perc tests, paint chips (optional)**

1. Compare the time results of the three percolation tests. Identify the level of permeability of each soil type.
2. Review the lake zones (**littoral**—shore line, food production, and spawning; **limnetic**—top layer, oxygen and food production; **profundal**—middle layer, where fish live; **benthic**—bottom layer, recycling layer.)
3. Colors in Nature Conduct a follow-up discussion of the colors they found in nature using the paint chips. Collect the paint chips.

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**Evaporation** step—say, “rise up, rise up.”

**Precipitation** step—say, “pitter patter, pitter patter.”

**Condensation** step—say, “poof, poof.”

**Transpiration** step – sigh and say “ahhhh, ahhhh.”

- Whisper to each student (parents could help with this) his/her specific part of the water cycle and the sound associated with that part.
- Explain that everyone is to keep their eyes closed and the object is to listen and find the other three parts of the water cycle
- Once all four parts are found, hook together to form a “water cycle.”

