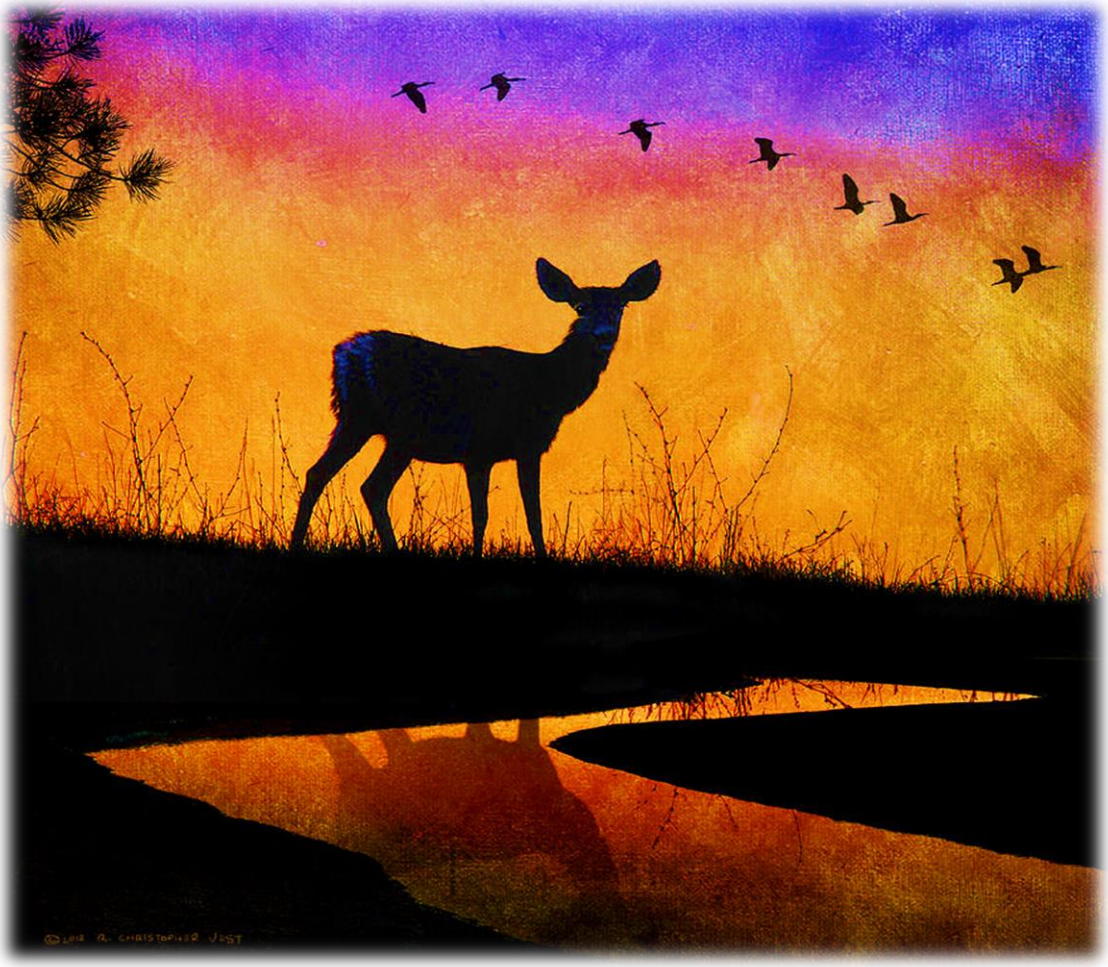
Connecting to Nature:

An Educator's Guide to the Clarks River National Wildlife Refuge



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Introduction

Introduction

First, we want to thank you! Thank you for taking the time to get your students outside and thank you for choosing Clarks River National Wildlife Refuge!

Refuge staff and members of The Friends of Clarks River National Wildlife Refuge want to encourage positive outdoor experiences for visitors of all ages to promote life-long appreciation of all wildlife and plant species, outdoor recreation, and National Wildlife Refuges.

We hope this guide will provide the assistance needed to make your trip planning easy so both you and your entire group will have a great trip that is filled with smiles, laughs, dirty hands, and lots of good memories!

Who is the U.S. Fish and Wildlife Service?

The U.S. Fish and Wildlife Service (Service) is the premier government agency dedicated to the conservation, protection, and enhancement of fish, wildlife and plants, and their habitats. We are the only agency in the federal government whose primary responsibility is the conservation and management of these important natural resources for you, the American public.

The Service's origins date back to 1871 when Congress established the U.S. Fish Commission to study the decrease in the nation’s food fishes and recommend ways to reverse that decline. Fast forward to 1903. President Theodore Roosevelt established nation's first wildlife refuge on March 14th at Pelican Island National Bird Reservation in Florida. American Ornithologist's Union agrees to pay warden, Paul Kroegel to manage the refuge. This made him the first manager of a National Wildlife Refuge.

A short list of the responsibilities of the Service includes: enforcing federal wildlife laws; protecting endangered species; managing migratory birds; restoring nationally significant fisheries; conserving and restoring wildlife habitat, such as wetlands; helping foreign governments with their international conservation efforts; and distributing money to state fish and wildlife agencies through the Wildlife Sport Fish and Restoration Program.

Here is a list of some sub-units of the Service:

- National Wildlife Refuge System—Over 565 National Wildlife Refuges and thousands of small wetlands and other special management areas covering millions of acres
- Division of Migratory Bird Management
- Federal Duck Stamp
- National Fish Hatchery System—70 National Fish Hatcheries and 65 Fish and Wildlife Conservation Offices
- Endangered Species program—86 Ecological Services Field Stations
- Wildlife & Sport Fish Restoration Program
- International Affairs Program
- USFWS Office of Law Enforcement

To learn more about the U.S. Fish and Wildlife Service, please visit www.fws.gov.

Our mission is to work with others to conserve, protect and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people.

More about the National Wildlife Refuge System

The mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

The Refuge System protects some of the country's most iconic ecosystems and the fish and wildlife that rely on them. The Refuge System also conserves waterways that give life to all of them — critical ecosystems along rivers, streams, wetlands, coasts and marine areas.

What Makes the Refuge System Special? The National Wildlife Refuge System lands and waters serve a purpose distinct from that of other U.S. public lands, that is wildlife conservation drives everything on national wildlife refuges, from the purposes for which each refuge was established, to the recreational activities offered, to the resource management tools used.

Each refuge is established to serve a statutory purpose that targets the conservation of native species dependent on its lands and waters. All activities on those acres are reviewed for compatibility with this statutory purpose. For example, Clarks River National Wildlife Refuge was established to protect bottomland hardwood forest, provide habitat for migratory birds, and provide habitat for nesting wood ducks.

To learn more about the National Wildlife Refuge System visit: www.fws.gov/refuges/

History of National Wildlife Refuges in Kentucky

Kentucky Woodlands National Wildlife Refuge was established in 1938. The refuge consisted of 37,000 acres. At one time, this refuge served as the only place in the state of Kentucky that was home to native white-tailed deer and wild turkey (Believe it or not, these two species' populations dropped to dangerously low levels and were in danger of extinction!).

In 1963, Tennessee Valley Authority (TVA) bought Kentucky Woodland National Wildlife Refuge and surrounding land during the creation of Lake Barkley. In 1999, TVA transferred this land to the U.S. Forest Service. You may actually be familiar with this area – Land Between the Lakes National Recreation Area. With the selling of Kentucky Woodlands National Wildlife Refuge, Kentucky did not have a National Wildlife Refuge managed in the state until the late 90s with the establishment of a new Refuge.

A New Beginning

The Service, as part of its bottomland hardwood conservation program, evaluated the Clarks River as a candidate site for protection in 1975, because it was the only major river in western Kentucky that had not been dammed or dredged and because it was comprised of one of the largest remaining bottomland hardwood forests in the region. The final list of candidate sites published in 1978 excluded Clarks River, because it lay outside the Mississippi Alluvial Valley primary focus area.

Serious discussion about the need for a national wildlife refuge in western Kentucky began again in 1987. The refuge could support the mission of the Refuge System, the goals and objectives of the North American Waterfowl Management Plan and help the Commonwealth of Kentucky achieve its conservation goals. In 1989, three potential sites were identified with assistance from KY Department of Fish and Wildlife Resources. Two additional sites were added in 1991, including the site located on the East Fork of the Clarks River first evaluated in 1975.

In 1997, Clarks River National Wildlife Refuge was authorized, and it currently has an acquisition area of approximately 53,000 acres. The first track of land was purchased in 1998, making it the 549th National Wildlife Refuge in the country. The goal is to assemble approximately 20-25,000 acres of land through donation and acquisition from willing sellers to create the refuge.

Currently the refuge consists of approximately 9,500 acres and is comprised of one of the largest remaining bottomland hardwood forest in the region.

Bottomland hardwood forests are one of the most biologically productive ecosystems on land, and the rich moist soils from seasonal flooding nourish an explosion of wildlife diversity. Freshwater mussels, amphibians, fish, and mammals are all found in abundance here, and migratory songbirds and waterfowl take advantage of this rich habitat on their long flights from nesting to wintering grounds. This diversity and abundance of wildlife provides ample hunting, fishing, and other recreational opportunities. Clarks River National Wildlife Refuge protects, manages, and enhances this ecosystem and healthy and viable populations of wildlife found here through habitat and wildlife management, environmental education, and cooperative partnerships with conservation agencies and landowners.

Clarks River National Wildlife Refuge remained the only refuge fully located and managed in the state of Kentucky, until 2019 when Green River National Wildlife Refuge was established in Henderson, KY.

Everyone Needs a Friend

Soon after the refuge was established, volunteers from the community started helping work towards the management goals of the refuge. Then, in 1999, the Friends of Clarks River National Wildlife Refuge was officially established.

The Friends of Clarks River National Wildlife Refuge is a Federal 501(c)(3) public charity group. They assist with various activities such as the establishment and restoration of wildlife habitat, environmental education and interpretation programs, special events, and increasing wildlife recreation opportunities. In addition, the Friends manage grants to help support and fund these various activities, as well as reach out to and visit Representatives and Senators to speak in support of the Clarks River National Wildlife Refuge.

Other Resources

There are many other online resources that you can use for you and your group's benefit.

Clarks River National Wildlife Refuge Website: information about the refuge and wildlife found on the refuge.	www.fws.gov/refuge/clarks-river/
Clarks River National Wildlife Refuge Facebook Page: Lots of information and pictures about the refuge, wildlife, and we even have a collection of educational videos.	www.facebook.com/clarks.river
U.S. Fish and Wildlife Service YouTube Channel: videos from across the Country about what we do, wildlife, careers, and much more!	www.youtube.com/usfws
U.S. Fish and Wildlife Service Facebook Page: see great photos and keep up with the latest information from across the U.S..	https://www.facebook.com/USFWS
Junior Duck Stamp Website: all the information you need to start participating in the contest including curriculum guides, contest rules, and examples of past winners.	www.fws.gov/program/junior-duck-stamp/junior-duck-stamp-conservation-education-curriculum
iNaturalist: this citizens science program allows you to identify and catalog what you see while visiting the refuge. It's also a big help to the refuge because our small staff can't be everywhere all the time to know what uses the land.	www.inaturalist.org/

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Visit Preparation

Planning

We want you to enjoy the refuge to its fullest and come back to visit over and over, so we are dedicated to helping you have a positive experience. Staff are available to talk with teachers and/or group leaders to help facilitate and plan field trips. We are happy to recommend activities to help you achieve your learning objectives. If available, staff and/or volunteers maybe able to help lead an activity or speak to your group.

If you are a pro at outdoor experiences and do not require any assistance, but might want to utilize some of our facilities, you are encouraged to contact the refuge. Our facilities are first-come-first-serve, but we strive to reduce conflict between groups.

To start the planning process, please contact Education Specialists, Stacey Hayden via phone 270-205-5087 or email Stacey_hayden@fws.gov.

Facilities

Environmental Education and Recreation Area (EERA)

The Environmental Education and Recreation Area (EERA) is one of the most popular locations on the refuge for environmental education, walking/hiking, wildlife viewing, and fishing. The EERA is open during daylight hours. The EERA is a great choice to bring your group if you are looking to complete a lot of various activities and are on a tight schedule, or if you wish to visit during a hunting season as this area is closed to all hunting. The EERA includes the following amenities: educational pavilion (first come first serve, please contact the refuge), restroom, paved/gravel/earth trails, universally accessible fishing pond, and observation decks.

The physical address to the EERA:
1010 Eggner Ferry Road
Benton KY 42025

Directions: From I-69/Purchase Parkway, Exit 43- Benton/Symsonia Exit towards Benton; right on Hwy US 641 south (3rd stoplight); left on Hwy 408 east (second stoplight); Environmental Education and Recreation Area is ~ 1 mile on the right.

GPS Coordinates: 36.857111, -88.337127

Refuge Headquarters

Headquarters is open Monday – Friday from 7 am until 4:00 pm. Closed on all Federal Holidays. This facility is not set-up to host large groups, but it does offer a Conservation Garden complete with Animal Olympics for our younger visitors, and an interpretative timeline on the history of the refuge. Inside the headquarters we do have public restrooms and some interpretative displays. This is also the best location to gather information such as maps, brochures, and get answers to any questions.

The physical address to Refuge Headquarters:
91 US Hwy 641 North
Benton KY 42025

Directions to Refuge Headquarters: From I-69/Purchase Parkway south; to Exit 43-Benton/Symsonia towards Benton; left on Hwy US 641 North (3rd stoplight); Clarks River NWR is ~1 mile on left on Hwy 641.

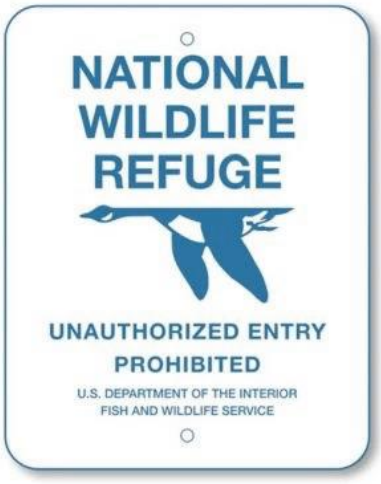
GPS Coordinates: 36.879829, -88.344359

The locations described above have developed amenities and are the most popular locations for groups to visit. However, feel free to utilize the included map to choose another refuge destination for your group, if you so desire. We would like to remind you the refuge is open to public and quota hunting and ask that you educate yourself on any potential hunting seasons occurring during the time of your visit. The refuge also has a few seasonally closed areas that provide sanctuary for wildlife. Please respect these areas.

Know the Signs

Millions of people visit national wildlife refuges each year. The impact of human activity, if not regulated, can degrade these wild lands. Signs help control recreational activities and respect private property while protecting natural resources on the refuge.

This sign and yellow paint marks all refuge property. While not required, adjacent landowners are encouraged to use blue paint to mark their property. It is your responsibility to know where the property lines are and remain within the boundaries.



This area is closed to all entry. No entering, hunting or sightseeing is permitted. No roads or trails beyond this sign are open to the public. Some of these signs may have dates indicating the length of time the area is closed.

What to bring

- Sunscreen – We hope you enjoy a sunny day on the refuge, but we don't want you to leave in pain from a sunburn.

- Bug spray – You will be in nature and this is home to all kinds of critters, even bugs. This doesn't mean they have to be on you and bug spray can help with that.

- Water/snacks/lunch – Generally we live lives that have us indoors and sitting for the majority of the day. We often see on field trips students are hungry earlier in the day and much thirstier than normal. Even the most athletic one in your group can feel lightheaded if they get dehydrated or too hungry.

- Dress for the weather – A reminder for a jacket, if it will be cool or rainy. Also ask students to wear clothes they won't mind getting dirty- this is not a field trip to show off your newest outfit! While shorts and tank tops seem reasonable for hot weather, in the outdoors long pants and lightweight long-sleeved shirts provide better protection from the elements.

- Blankets/beach towel – The refuge does offer picnic tables at some locations, but with larger groups or just for fun, leaders will allow the group to experience a picnic lunch in a grassy area.

- Hand sanitizer – Running water is not available at all the refuge locations, so hand sanitizer is helpful before lunch.

- Binoculars – Not a requirement but can be handy if looking at wildlife from a distance.

- Camera – Another item that is not a requirement but can be useful for capturing memories.

- Activity supplies – Don't forget the supplies you will need to conduct your activities.

Ways to Protect Your Refuge and Things to Remember

Certain rules are necessary to help protect the wildlife that call the refuge home and keep facilities nice for future visitors. The list below are reminders for you and things you can go over with your students prior to your visit so they understand the area they will be visiting is different from a park or playground.

- Take only memories – The refuge is here for wildlife first; this is their home. Plants, animals, artifacts, even the rocks and fallen leaves need to stay on the refuge.

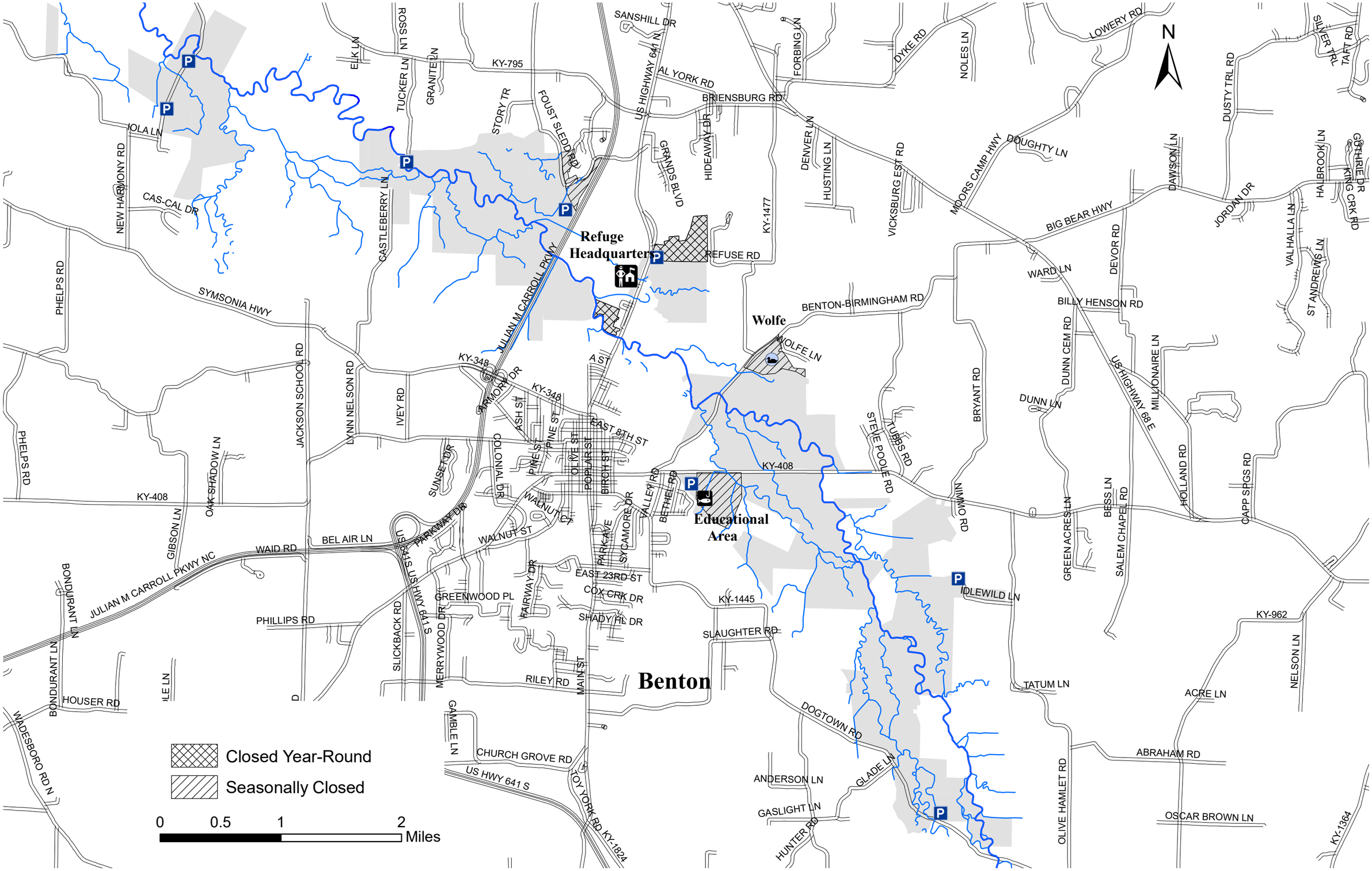
- Don't rearrange the wildlife's furniture – We encourage exploring! So, pick up rocks or sticks to look under them, but put them back where they were. This is also very important if you will be doing any water exploring – if it comes out of the water, it needs to go back in. There could be aquatic organisms living on those items and they need to be in the water.

- Quiet Mouse – Loud noises and fast movements generally scare wildlife. The quieter you are and the gentler you walk, the more wildlife you are likely to see.

- Be aware of trash – It's so easy for something to fall out of our pockets or blow away out of our lunchbox in the breeze. Be mindful of not littering to help protect wildlife and their habitat.

- No Fires – Fires, including grills, are not permitted on the refuge without a Special Use Permit (SUP). Please contact the refuge headquarters to start the process of obtaining a SUP.

- They aren't hungry – Feeding wildlife isn't permitted on the refuge for many reasons. People food can often be toxic to wildlife. Animals who are raised relying on humans for food struggle to survive. Feeding also teaches animals that people are friendly and animals who approach people for food are sometimes mistaken as rabid, or aggressive.


Refuge Headquarters
Wolfe
Educational Area
Benton
Closed Year-Round
Seasonally Closed
0
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1
2
Miles
N
SANSHILL DR
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LOWERY RD
DYKE RD
NOLES LN
FORBING LN
DENVER LN
HUSTING LN
VICKSBURG EST RD
MOORS CAMP HWY
DOUGHTY LN
DUSTY TRL RD
SILVER TRL
TART RD
DAWSON LN
HALBROOK LN
GUTHRIE DR
KING CRK RD
JORDAN DR
BIG BEAR HWY
VALHALLA LN
ST ANDREWS LN
DEVOR RD
WARD LN
BILLY HENSON RD
BENTON-BIRMINGHAM RD
DUNN CEM RD
DUNN LN
US HIGHWAY 68 E
MILLIONAIRE LN
HOLLAND RD
CAPP SPGS RD
BESS LN
SALEM CHAPEL RD
GREEN ACRES LN
INMAN RD
BRYANT RD
STEVE POOLE RD
TUBBS RD
WOLFE LN
REFUSE RD
KY-1477
GRANDS BLVD
HIDEAWAY DR
STORY TR
FOUST SLEDD RD
TUCKER LN
ROSS LN
ELK LN
GRANITE LN
CASTLEBERRY LN
JULIAN M CARROLL PKWY
NEW HARMONY RD
CAS-CAL DR
OLA LN
PHELPS RD
SYMSONIA HWY
JACKSON SCHOOL RD
LYNN NELSON RD
IVEY RD
OAK SHADOW LN
GIBSON LN
KY-408
KY-348
HAMMOND DR
A ST
ASH ST
PINE ST
OLIVE ST
POPLAR ST
BIRCH ST
EAST 8TH ST
SUNSET DR
COLONIAL DR
WALNUT CT
WALNUT ST
PARKWAY DR
PARK AVE
SYCAMORE DR
VALLEY RD
BETHEL RD
EAST 23RD ST
COX CRK DR
SHADY HL DR
GREENWOOD PL
FAIRWAY DR
MERRYWOOD DR
SLICKBACK RD
US HWY 641 S
MAIN ST
RILEY RD
PHILLIPS RD
BEL AIR LN
WAID RD
PARKWAY DR
JULIAN M CARROLL PKWY NC
BONDURANT LN
HOUSER RD
WADESBORO RD N
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KY-1445
SLAUGHTER RD
IDLEWILD LN
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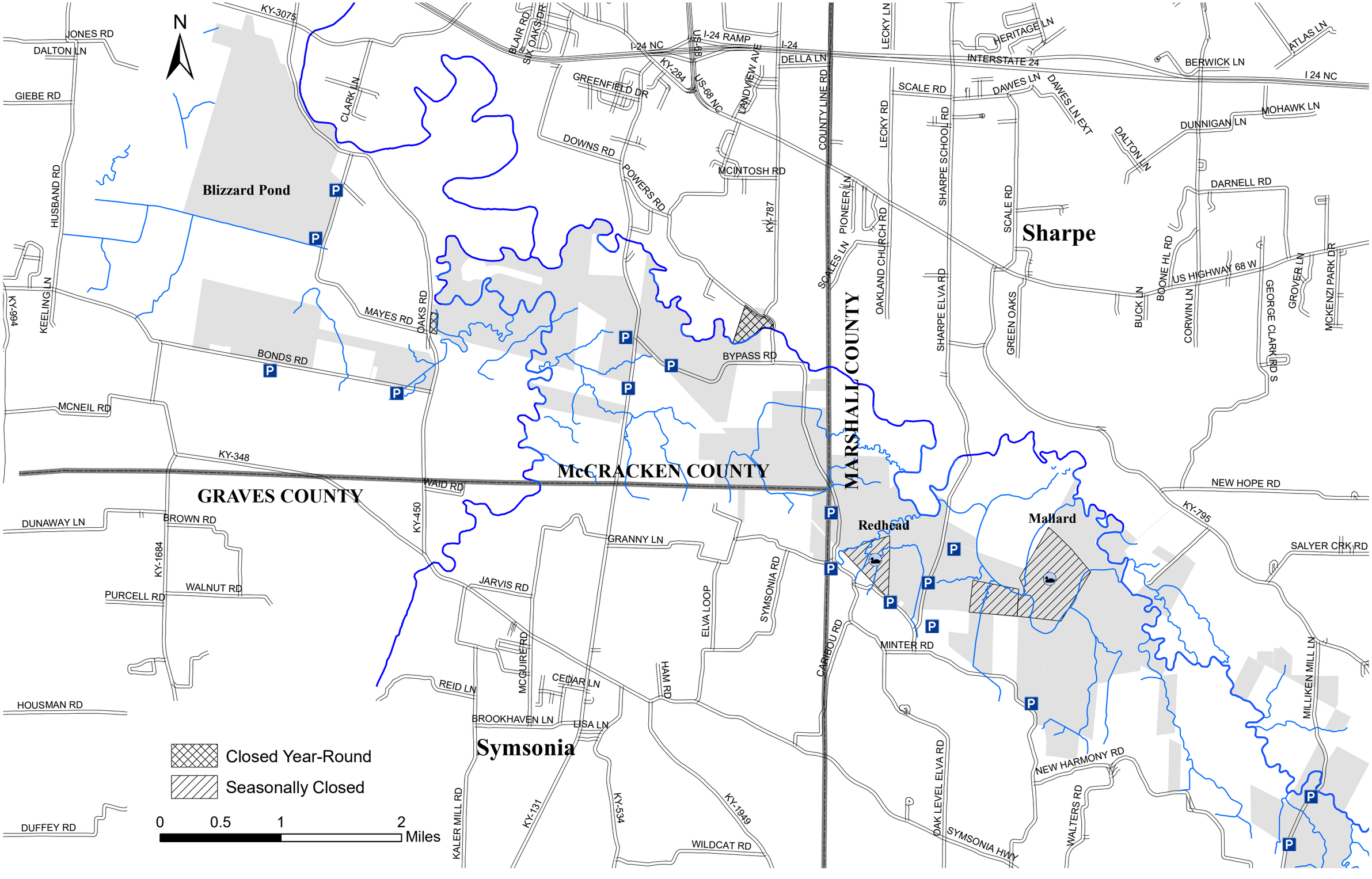
TATUM LN
ACRE LN
NELSON LN
DOGTOWN RD
ANDERSON LN
GLADE LN
GASLIGHT LN
HUNTER RD
ABRAHAM RD
OLIVE HAMLET RD
OSCAR BROWN LN
KY-1364


N
KY-3075
JONES RD
DALTON LN
GIEBE RD
HUSBAND RD
KEELING LN
KY-994
CLARK LN
BLAIR RD
SIX OAKS DR
I-24 NC
I-24 RAMP
I-24
KY-284
US-68 NC
GREENFIELD DR
LANDVIEW AVE
DELLA LN
COUNTY LINE RD
LECKY LN
HERITAGE LN
INTERSTATE 24
BERWICK LN
ATLAS LN
I 24 NC
SCALE RD
DAWES LN
DAWES LN EXT
LECKY RD
SHARPE SCHOOL RD
DALTON LN
DUNNIGAN LN
MOHAWK LN
DOWNS RD
POWERS RD
MCINTOSH RD
KY-787
PIONEER LN
SCALES LN
OAKLAND CHURCH RD
SCALE RD
DARNELL RD
Sharpe
BOONE HL RD
US HIGHWAY 68 W
BUCK LN
CORWIN LN
GEORGE CLARK RD S
GROVER LN
MCKENZI PARK DR
SHARPE ELVA RD
GREEN OAKS
Blizzard Pond
MAYES RD
OAKS RD
BONDS RD
BYPASS RD
MCNEIL RD
KY-348
McCRACKEN COUNTY
MARSHALL COUNTY
GRAVES COUNTY
WAID RD
KY-450
DUNAWAY LN
BROWN RD
KY-1684
PURCELL RD
WALNUT RD
GRANNY LN
JARVIS RD
MCGUIRE RD
ELVA LOOP
SYMSONIA RD
HAM RD
REID LN
CEDAR LN
BROOKHAVEN LN
LISA LN
HOUSMAN RD
DUFFEY RD
KALER MILL RD
KY-131
KY-534
KY-1949
WILDCAT RD
Symsonia
Redhead
Mallard
CARIBOU RD
MINTER RD
NEW HOPE RD
KY-795
SALYER CRK RD
MILLIKEN MILL LN
OAK LEVEL ELVA RD
NEW HARMONY RD
WALTERS RD
SYMSONIA HWY
Closed Year-Round
Seasonally Closed
0
0.5
1
2
Miles

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Activities

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  Walking in natural places can be relaxing, and it can be a great opportunity to see things you've never seen before. These activities can help make hikes/walks more interesting for you and your students.

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Activities

Active

Crazy 8s Animal Workout

Summary/Objectives

Do your students need to move around and act a little silly? This activity will allow them to do just that while you can still tie in a science lesson. The activity instructs the students to act like 8 different animals, but in a very dramatic or silly way.

Materials

- Copy of the Crazy 8s Animal Workout
- Space for movement

Background

Animals are very active. Animals get up every day having to move (run, fly, jump, swim, etc.) to find their basic needs for survival – food, water, and shelter. As serious as survival is, it's also fun to see videos on the internet of animals being silly. The examples in this activity are a combination of both these realities.

Butterflies fly to find mates and female butterflies fly to find plants that their caterpillars can feed on. They also fly to avoid being eaten by predators, such as birds. Flying takes energy, so they also fly from flower to flower to get more "fuel" to power their flight.

Quail live out their lives in grasslands. As temperatures plummet in the winter and snow falls, quail use tall grasses as shelter. Brood rearing cover is another important part of grasslands. Broad leaf plants attract insects critical for chick survival. Plants like alfalfa, sweet clover, and wildflowers make for great quail habitat.

Woodpeckers peck into trees in search of food or to create a nesting site. They also "drum," or peck in a rapid rhythmic succession to establish their territory and attract mates.

The Roadrunner is native to the Southwestern desert and gained its name from its habit of running on the road towards cars. Roadrunners max out at running speeds of around 20 mph.

Ground hogs live underground in burrows. Typically, they have a burrow in the woods for the winter and a burrow in grassy areas for the warmer months. These underground homes can have two to a dozen entrances. Groundhogs keep their burrows tidy by changing out the nesting materials from time to time.

Bird bodies are made to fly. They have light bones, strong legs, and specially shaped wings. Flying helps birds get away from animals that want to eat them, and makes them better hunters, too. Flying also helps them travel from cold places to warm places, called migration.

Herons are very tall birds with long legs. Often you see herons standing so still and so silently that they don't seem to move at all. Sometimes they stand just on one leg. This is so they can stay warmer while in cold water.

Long-legged frogs use quick, powerful jumps to escape from predators. A jumping frog can leap away from danger in an instant and hide safely in the water. Frogs with shorter legs are said to hop instead of jump.

Procedure

Go over the background information with the group. Then, explain they will be acting like these animals but in a silly way. Use the workout on the following page to go through the “crazy” animal actions. There are 8 animals with an action to do 8 times, and the entire workout is designed to be repeated 8 times through. Allow for modifications as needed for time and endurance/abilities of the group.

Crazy 8s Animal Workout

8 dramatic butterflies (jumping jacks)

8 quail peaking over the grass (squats)

8 hungry woodpeckers (wall pushups)

8 theatrical roadrunners (high knees)

8 groundhog days (sit-ups)

8 confused birds (arm circles)

8 hopping herons (hop on one foot, do both sides)

8 overzealous frogs (jump squats)

Repeat 8 times

Migrating Animals

Summary/Objectives

Lots of different wildlife migrate for various reasons. Allow you students to “migrate” like animals with this activity.

Materials

- Copy of Migrating Animals
- Space for movement
- Cones, tape, chalk (optional to use, if needed, as a marker for distance)

Background

Most people think of migration as the seasonal movement of birds between their breeding and non-breeding sites. However, there are many other forms of animal migration, including journeys between east and west, complex trips involving land and water, journeys up and down mountains, and movements through the water columns of oceans and lakes.

The monarch is the only butterfly known to make a two-way migration as birds do. Unlike other butterflies that can overwinter as larvae, pupae, or even as adults in some species, monarchs cannot survive cold winters. Monarchs use air currents to help them travel the long distances -- some as far as 3,000 miles. Monarchs in Eastern North America travel each year to the Sierra Madre Mountains of Mexico; however, monarchs in Western North America overwinter in California.

Some polar bears make extensive north-south migrations in response to the ice packs receding in the spring and advancing in the fall. In October and November, males head out onto the packed ice where they spend the winter. Pregnant females seek locations on land to dig dens in the snow, where they give birth.

The northern crawfish frog is a large frog with a light ground color and numerous, closely set dark spots. The head is disproportionately large. Their call is a deep, loud, snoring “gwwaaa.” A group of calling males has been said to sounds like pigs at feeding time. They spend most of the year in a crayfish burrow and they never stray far from their burrow which serves as an important retreat from predators.

The crawfish frog breeds following mild, rainy weather in mid-March. During this time, males travel to ephemeral ponds and wetlands that lack fish and begin calling. The call may carry over a mile, drawing females in from the surrounding area. Under the right conditions, these frogs can migrate over 500 yards in one night, and in total may travel close to 1 mile from their burrow to the breeding pond (equivalent of a human walking 10 miles). Then after about 2 weeks, they travel back to the same crawfish burrow they came from.

Atlantic salmon begin their life in freshwater and stay there 2-3 years. Then they migrate to the ocean, which takes 1-3 years, to feed and grow and return to freshwater to spawn. They have been known to travel over 6,000 miles before coming back home to spawn. They sometimes swim 200 miles up a river to find their preferred places to spawn.

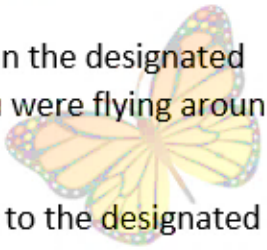
Christmas Island's mass red crab migration sounds like a made-up story, but it's true. Every year, millions of large crabs emerge from the forest and make their way to the ocean to breed, swarming across roads, streams, rocks and beaches. The migration starts with the first rainfall of the wet season (usually in October or November). The exact timing and speed of the migration is determined by the phase of the moon. Red crabs always spawn before dawn on a receding high-tide during the last quarter of the moon. Incredibly, they know exactly when to leave their burrows to make this lunar date.

Ducks fly long distances to find the resources they need to survive harsh winter weather. Leaving in the fall, some birds from far northern Canada, they need to make the flight to the southern United States and sometimes central America. It is not known for certain how ducks navigate during their long migration, but biologists believe the birds take cues from the position of the sun, moon, and stars in the sky, and utilize geographic landmarks like rivers, mountains, and even man-made roadways. *Note: Since people can't fly, in this activity we will be waddling like a duck instead of flying to mimic their migration.

Procedure

Explain to students they will be migrating like real animals. The option to go through each animal one at a time and explain the background, or completing the activity as a whole after discuccing the information gives flexibility for time alotment. Allow for modifications as needed for time and endurance/abilities of the group.

Migrating Animals

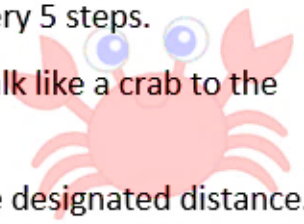


Flight of the Monarch – Flap your butterfly wings as you run the designated distance, but every 4 steps you have to run in a circle as if you were flying around a flower.

Bear Crawl – Crawl like a polar bear on your hands and toes to the designated distance marker.

Frog Jumps – Squat down and jump like a frog to your designated location marker.

Salmon Run – Place your hands by your side and run to the designated marker but jump like a salmon jumping up a waterfall every 5 steps.



Crab Walks – Sit down then use your hands and feet to walk like a crab to the designated marker.

Duck Waddle – Squat down and fold your wings. Waddle the designated distance.

Wetland Yoga

Summary/Objectives

Yoga is a non-competitive activity and can incorporate meditation, which adds to its power to relieve stress. Many wild and restless students have been calmed by this activity. In this activity participants will complete traditional yoga poses, that have been renamed after wetland plants and animals, allowing for discussion of adaptations.

Materials

- Copy of the activity
- Room for movement of the students (about as much space as a yoga mat or a beach towel)

Background

Adaptations are learned behaviors or inherited traits that help living things survive. Camouflage is an adaptation that helps an organism blend in with its surroundings. Blending in helps the animal avoid predators and therefore increases its ability to survive.

Wetlands are areas where the land does not drain well. The ground in a wetland is saturated, or full of water for at least part of the year. Wetlands are usually classified as swamps, marshes, or bogs. Bottomland hardwood forest, like the habitat on the Clarks River National Wildlife Refuge, is an example of a seasonal wetland. Typically, in the winter and spring, this habitat is wet or flooded, but summer and fall it looks like a “normal” forest. These forests provide important habitat to a variety of wildlife including migratory songbirds and waterfowl. Here, in bottomland hardwood forest, these birds can feed, rest, and raise their young. The acorns from the abundant oak trees are an important source of food for squirrels, deer, and many other animals. Locations of standing water such as backwater sloughs and small vernal pools are important breeding grounds for animals such as frogs and crayfish.

Procedure

This activity can follow a discussion on adaptations, or it can be the introduction to the lesson on adaptations. If students have shoes on, you can allow them to take the shoes off if the environment and time allows. If students have on a skirt, a cast, or have scrapes or bruises they don’t have to do the pose completely. All the poses can be modified to how the student is

comfortable. Remind students the important part of this activity is to try your best and not worry with how silly you might look in a pose because every animal in the wild looks just a little different even when they are doing the same thing.

Time of the activity can be modified by the number of poses completed and the amount of time given to each pose. For a more formal yoga session, a suggested order of animals is as follows:

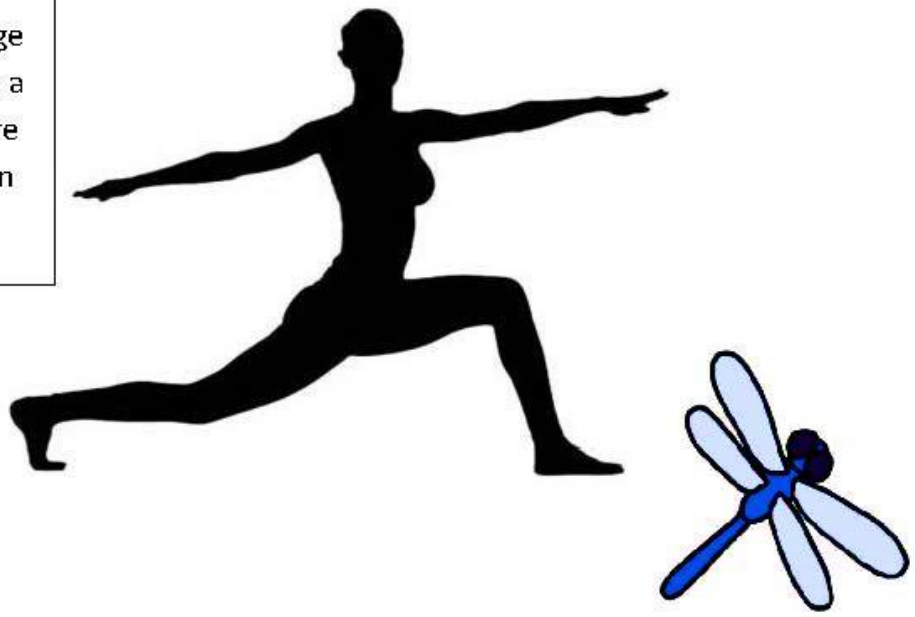
1. Crayfish (easy pose)
2. Bald cypress tree (mountain pose)
3. Heron (tree pose)
4. Beaver (triangle pose)
5. Bat (standing forward fold)
6. Eagle
7. Dragonfly (warrior 2)
8. Fox (warrior 3)
9. Damselfly (warrior 1)
10. Snake (upward facing dog)
11. Mussel (bow)
12. Poison ivy (seated spinal twist)
13. River otter (seated forward fold)
14. Bull Frog (squat)
15. Owl (thunderbolt pose)
16. Bobcat (cat)
17. Turtle (child's pose)
18. Opossum (savasana)

Option: Can print off the poses and post them around the classroom, gym, or outdoor area for participants to read and conduct each pose on their own. Can be a good option for filler while other students are finishing another project or test.

Wetland Yoga

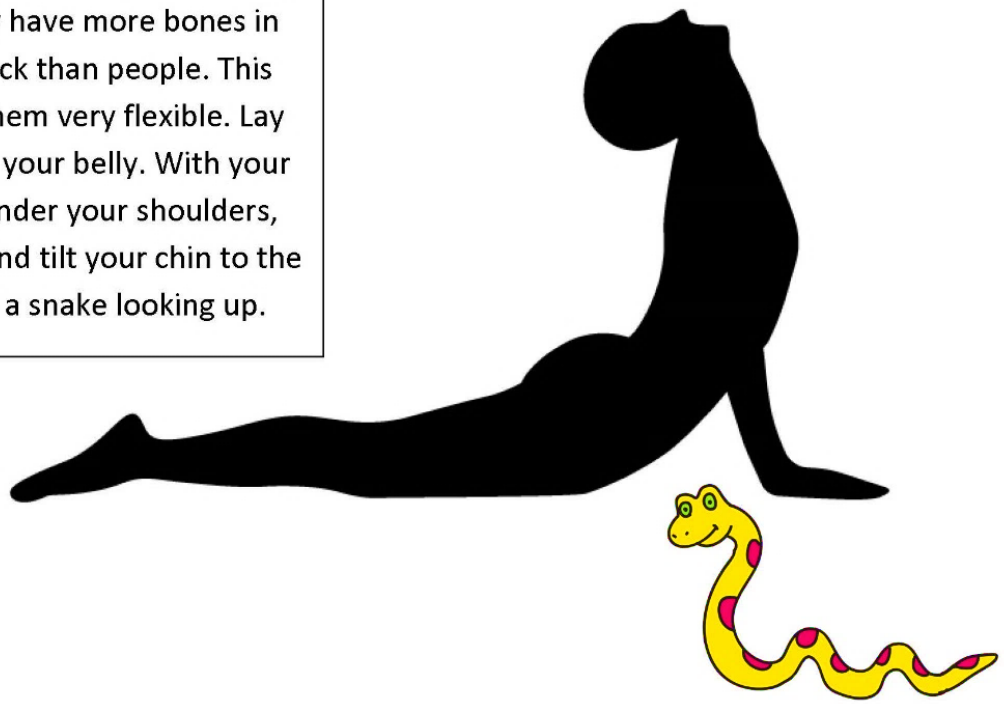
Dragonfly

Dragonflies spread their wings and fly over wetlands catching misquotes for dinner. Step back in a lunge and spread your arms like a dragonfly. Imagine you are soaring over a pond. Then switch sides.



Snake

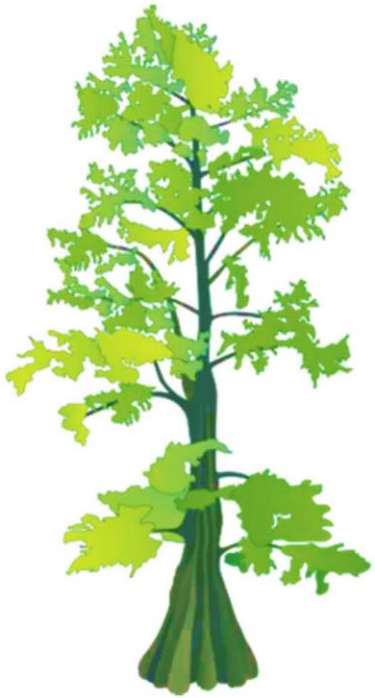
Snakes have bones just like you, but they have more bones in their back than people. This makes them very flexible. Lay down on your belly. With your hands under your shoulders, push up and tilt your chin to the sky like a snake looking up.



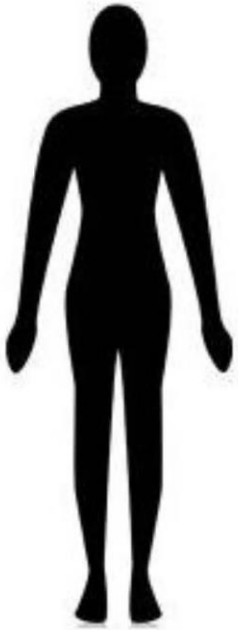
Heron

Herons stand on one leg while in the water to help stay warm. Be like a heron and bring one foot up to the opposite leg. Balance on one foot while bringing your hands above your head. Then, try the pose on the opposite leg.

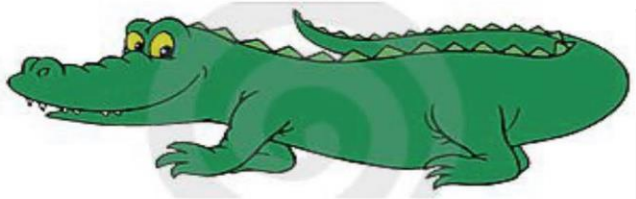
Bald Cypress Tree



Unlike most other trees, bald cypress trees can stand tall and strong in the middle of water. Stand with your feet hip-width apart and your hands by your side with the palms facing forward. Keep your back straight and tall like a cypress tree.



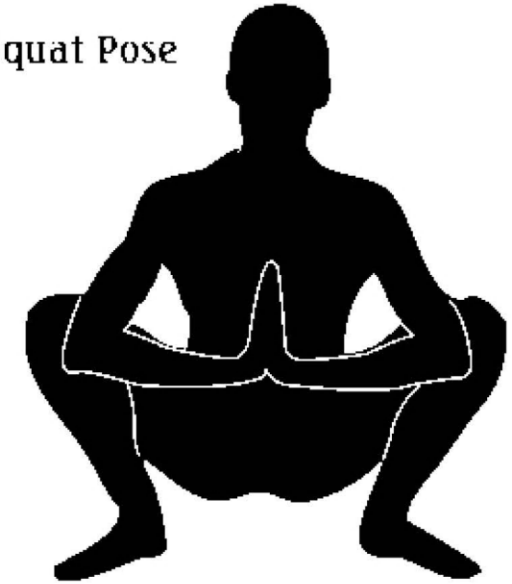
Alligator



Alligators have short legs and walk low to the ground. Take alligator pose by getting into a push-up like position. You can stay there, or you can lower your forearms to the ground. Try to keep your back very straight, just like an alligator would.

Bull Frog

Squat Pose



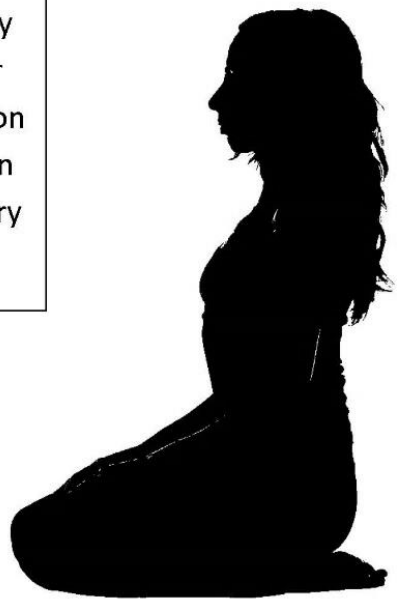
Frogs have long back legs that are strong and help them jump really far. Squat down like a frog, trying to keep your heels on the ground if you can. Bring your hands together in front of your chest.

Coyote

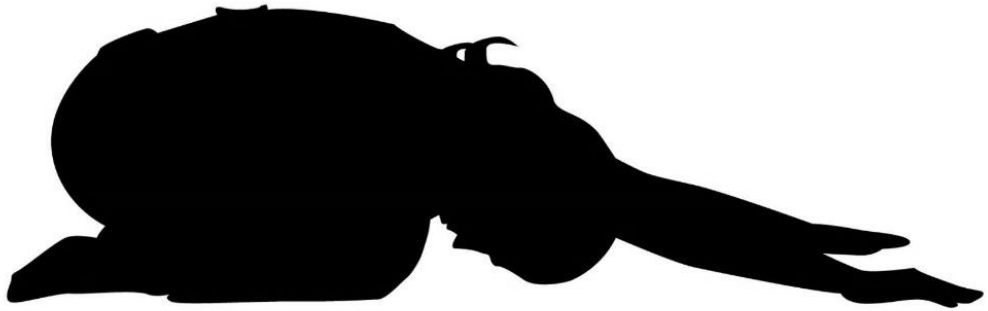
Coyotes stretch after waking up to get their body ready to run. See if you can stretch like a coyote. Put your hands and feet on the ground and walk your hands forward so you are making an upside down V. Push your chest towards your toes in between your arms.

Owl

Owls are well camouflaged. This makes easy for them to it very still and not be seen. Sit your knees, and if you can sit back on your feet. Place your hands on the top of your legs and sit very still and quiet like an owl.



Turtle



Turtle's shells protect them from harm. Pretend to be a turtle in its shell. Start on your hands and knees, then sit on your heels and try to touch your forehead to the ground while reaching your hands forward.

Eagle

Eagles can sit very still while in a tree. Wrap one leg around the other while wrapping one arm around the other. While standing on one leg, concentrate on something in front of you to help your balance. Then, try it on the other leg.

Bobcat

Bobcats arch their backs to look bigger. Get on your hands and knees and arch your back high to the clouds like a bobcat would.

Lotus

Lotus flowers grow in standing water like ponds. When they bloom it looks like the flower is floating on the water. Sit cross-legged and put your hands together over your head. Close your eyes and pretend you are floating on water.

Bat

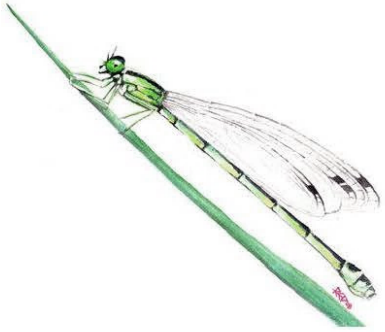
Bats sleep upside down using their feet to hang on to tree branches. Bend over and reach for your toes. Look between your legs and see the world upside down like a bat would.

River Otter

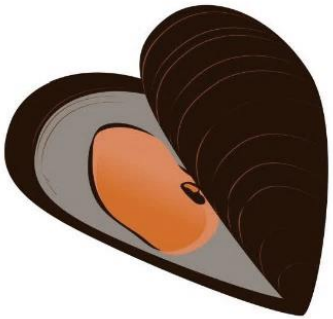
Otters are very streamline so they can swim fast through the water. Sit down and fold forward towards your toes. See how straight you can get your back.

Damselfly

Damselflies are similar to dragonflies, except when they land they close their wings. Step back in a lunge and reach your arms up above your head together like a damselfly resting on a leaf. Then switch the leg that is in a lunge.



Mussel



Mussel shells have two halves, this allows them to close-up like a door and protect their body. Lie on your belly and reach for your feet or ankles. See if you can "close yourself in half" like a mussel.

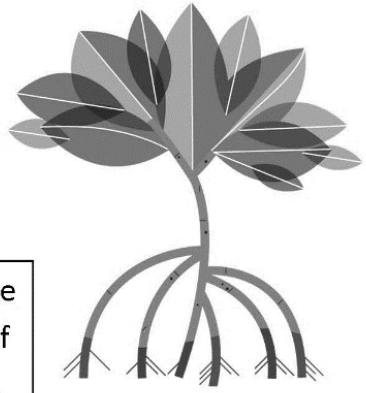
Salamander

Salamanders walk with a wiggle as their body moves in an "S" like movement. Stand with your legs and arms together with your arms pointed towards the air and then bend at the knees and push your chest forward to give you the "S" shape like the Salamander.

Poison Ivy

Poison ivy is a plant that can grow like a vine up a tree, twisting around the trunk. Don't touch this plant though it can make you itch! Instead, sit with your legs crossed in front of you (if you wish take your right ankle in front of your left knee). Place your left elbow on the outside of your right knee and twist to the right like a vine twisting around a tree. But remember, you're growing up the tree so keep your head tall! Repeat this twist on the other side.

Mangrove Tree



Mangrove trees have stilt-like roots to raise them up out of the water and get more air. Kneel down and use your hands like mangrove roots. Reach back for your feet and look to the sky.

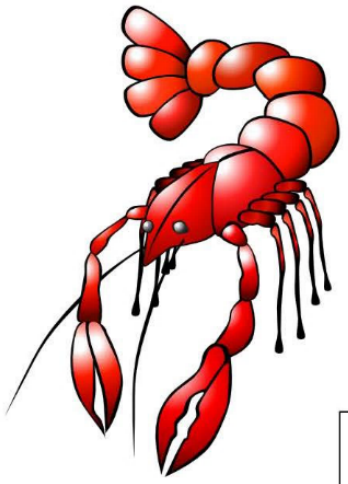
Beaver

Beavers use their tail to slap water to warn when there is danger and to startle predators. With your legs spread apart, lean to one side and with one hand touch your toes and the other raise high above your head like you're going to slap it down like a beaver's tail

Mosquito

Mosquitos use their long proboscis “nose” to pierce skin so they can suck up blood. With one foot stretched out in front of you, put your hands behind your back in a prayer style and then lean down like you’re going to use your nose like a mosquito.

Crayfish



Crayfish use their pincers to grab and hold their prey. Sit down and put your feet on top of your lap then put your pointer finger and thumb together like you are closing up your pincers.

Opossum

Opossums have an involuntary reaction to play dead when they are threatened. Lay down with your legs spread apart and your arms laid with palms up away from your side.

Dancing Animals

Summary/Objective

It's fun to think of animals participating in human-like activities and that's what Dancing Animals is all about. This is also a great way to introduce the term anthropomorphism and what it means in writing.

Materials

- Copy of the activity
- Room for participants to move

Background

Anthropomorphism (an-thro-poh-more-fizz-um) is the attribution of human traits to non-human beings. An example of this is thinking a dog is smiling because it is showing his teeth. Another example is in Shel Silverstein's The Giving Tree, a tree cares for a boy over the course of its life in the same way a human would—it feels human emotions. In this activity we are imagining animals dancing, which is also a type of anthropomorphism because animals don't dance.

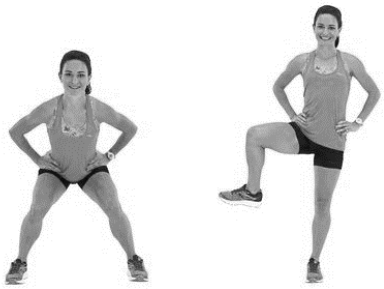
Some studies suggest anthropomorphism may be beneficial to the welfare of animals because it causes people to be more willing to care for or about animals. Understanding anthropomorphism will help improve use of figurative language and help improve creative writing.

Procedure

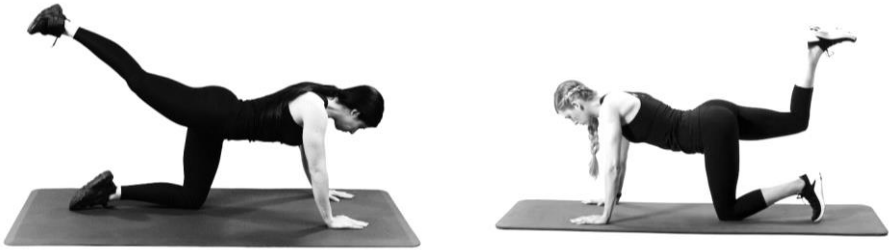
Follow the exercises in the Dancing Animal workout. Repeat the exercises as many times as you prefer, have time for, and keeping in mind the abilities of your group. Any exercise can be modified for abilities or limitations that your group has (example: if students must remain seated, have them only complete arm movements.) As a bonus, you can ask the students to pick a different animal of their choosing and teach the group the dance move of that animal.

Images of each exercise being completed by a person has also been included for your benefit on the following pages.

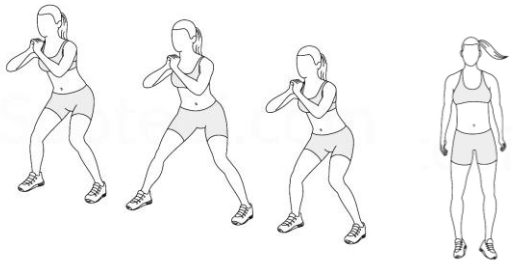
Dancing Frog



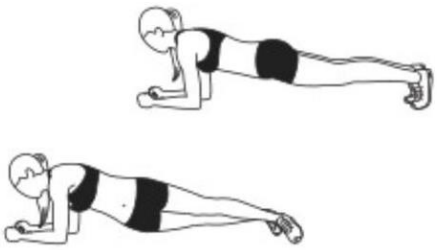
Dancing Dragonfly



Dancing Rabit



Dancing Lizard



Dancing Worm

Dancing Animals Workout

Complete each exercise 10 times and repeat the set as many or as few times as you want!

Dancing Frog (squat and raise knee to elbow)

Dancing Dragonfly (straight leg raise and donkey kick)

Dancing Rabbit (2 squats to the side with a hop)

Dancing Lizard (plank with a hip dip)

Dancing Worm (Inchworm)

Connecting to Nature:

An Educator's Guide to the

Clarks River National Wildlife Refuge

Activities

Art/Journaling

Chalk Art Ideas

Summary/Objective

Everyone loves a chance to be creative but how do you do that outside without paper and pencil? Sidewalk Chalk for the win! Not only is it inexpensive, but it's great for all ages and has unlimited potential. There are plenty of paved areas on the refuge that are frequently used for chalk pallets during special events. We've pulled together our favorite sidewalk chalk ideas into a list of learning activities that will keep your chalk repertoire fresh.

Materials

- Sidewalk chalk
- Area of pavement or blacktop
- Some activities may require pencil and paper or dry erase boards and markers

Background

Chalk art has always had a purpose beyond beautifying the streets and sidewalks. While the earliest form of chalk art dates back to the Stone Age on cave walls, the street art tradition originated in 16th-century Italy. Drifting artists, known as the Madonnari, made a living traveling and recreating pictures of the Madonna on the pavement. The practice continued for centuries. Around the mid-1880s, a street art movement emerged in Victorian England, artists, this time called "screevers," graced the pavement with their ephemeral art. Unlike the art of the Madonnari, the works of screevers were often accompanied by poems and proverbs with a moral or political slant. Today there are around 100 chalk art festivals in the U.S. alone.

Procedure

Really the possibilities of chalk are endless, it doesn't even have to stop with art. Poems, math problems, list of observations, etc. Below is a list of ideas for ways to incorporate this easy, yet effective tool into your trip.

- Take a hike, then draw something you remember from the hike. Then you can classify each piece of art (living/nonliving, plant/animal, bird/mammal/reptile/amphibian, tree/bush/flower, etc.)
- Write out the alphabet, then list something in nature that starts with each letter.
- Complete math problems.

- Write various math equations on each sidewalk square – have them walk along and write the answers on a piece of paper or dry erase boards and then return to the start for you to check their work. If they have an answer incorrect, send them back to the beginning to go through the problems again until they find their mistake.

- After listening/reading a book or story, draw the story elements for the story (characters, setting, events, conflict, resolution).

- Learning voice and audience in writing, doesn't have to be complicated. Have students chose a friend, family member, mentor, etc. to write a greeting card message to that person. Then lead a discussion on how the messages are different and sound different depending on who they are written for.

Junior Duck Stamp Art and Writing Contest

A great way to get kids interested in the outdoors is through the Junior Duck Stamp Art and Writing Contest. The Junior Duck Stamp contest teaches students about wetlands, migration, conservation, waterfowl, National Wildlife Refuges, and land stewardship.

This program has been used in not just art and science classes, but writing, history, geography, and gifted classes, as well clubs and scouts. It is a great learning experience for beginners and the more experienced artist as well.

With funding for the visual arts decreasing in many school budgets, bring science and art together!

How the Contest Works

Begin anytime studying waterfowl, wetlands, migration, and/or National Wildlife Refuges. Some prefer to start in the fall and avoid any snow days that might come, others feel like the kids won't be able to focus until after winter break. We have some students that start practicing their art in later spring!

Once the learning is done, the students should show what they learned by creating an entry for the Junior Duck Stamp Contest and submitting it for the judging process. Optional is to create a conservation message (1-2 sentence creative statement).

At the state level we award 12 students with 1st place, 12 for 2nd place, 12 for 3rd place, and 65 Honorable Mention. Beyond that, and thanks to sponsors, we are able to award several hundred Special Recognition awards to help encourage as many young artists as we can while keeping a sense of competition.

State recognition is given to winners in many forms including cash, ribbons, certificates, etc. The Best of Show selected in Kentucky will go on to the National Contest where they will compete again.

Why Try Junior Duck Stamp?

The program encourages students to explore their natural world, invites them to investigate biology and wildlife management principles and challenges them to express and share what they have learned with others.

The winning artwork from a national art contest serves as the design for the Junior Duck Stamp, which the U.S. Fish and Wildlife Service produces annually. This $5 stamp has become a much sought after collector's item. One hundred percent of the revenue from the sale of Junior Duck stamps goes to support recognition and environmental education activities for students who participate in the program.

"Nature is our history, conservation is our future."

- Sam Lambert (McCracken County) 2013 Kentucky Conservation Message winner and National Conservation Message winner

General Information for Mailing Art:

- Art may be dropped off at the refuge office, during regular office hours, if that is preferred over mailing.
- Entries being mailed should have a postmark date no later than March 15th.
- When sending art in a soft envelope, please remember to include stiff cardboard in the envelope with your art and write "DO NOT BEND" on the outside.

If mailing by USPS send to: P.O. Box 89, Benton, KY 42025

If sending by FedEx or UPS send to: 91 US Hwy 641 North, Benton, KY 42025

Susan Harp, Kentucky Best of Show 2021

Junior Duck Stamp Curriculum and Resources:

There are several different curriculum guides to choose from: Youth Guide, Educator Guide, Homeschool, and Nonformal Education
https://www.fws.gov/birds/education/junior-duck-stamp-conservation-program/conservation-education-curriculum.php

You can also contact the refuge at any time that you have questions or need assistance through the process of the Junior Duck Stamp Contest.

Find us on Facebook @KentuckyJDS – We post information about waterfowl, reminders on the contest deadline, art and journaling tips, habitat and waterfowl photos, and it's a good way to connect with others participating in the contest.

Teresa Kruger, Kentucky Honorable Mention 2021

Addy Schilling, Kentucky Third Place 2021

While the curriculum guides are a great resource, here are a few quick ideas just to get you started:

- Have students write a story about migration from the perspective of a waterfowl species. Some waterfowl migrate at different times and prefer different habitats, so students will need to do a little research before they start their writing.
- Simply observe waterfowl to better understand behaviors, adaptations, and notice the various iridescent colors. Sketching and/or nature journaling would be appropriate for this activity.
- If you don't have the option to observe live waterfowl, use waterfowl decoys in a tub of water and change the lighting to see how it effects the reflections and shadows.
- Daily weather observation and journaling can help make predictions on migration of waterfowl.
- Measuring plants/objects in a wetland or near a pond. This can help with proportions when drawing.
- Take advantage of migration forecasts and flyways to learn geography.
- Utilize National Wildlife Refuge waterfowl population counts to complete math assignments. Using real data can be an encouraging factor for students so they see how it relates to everyday situations.
- Many teachers borrow waterfowl mounts from parents and use them throughout the art creation process.

Journaling Prompts

Summary/Objective

Nature journaling is the practice of drawing or writing in response to nature. This fun and relaxing practice helps to connect more closely with nature, and results in the creation of a unique nature journal that can be kept and referenced for years. This allows for connection to science curriculum, writing curriculum, and even creative writing.

Materials

Notebook or journal (really anything to write/draw on will work)
Pencil/pen
Outdoor space (preferred), but if not able bring some of the outdoors inside

Background

Nature Journaling whether done daily, weekly, or seasonally allows one to look deeper at the world around them and notice changes or even details they didn't see at first glance. However, we live in a world with so many distractions and technology that has continually shortened our attention span. This makes it hard to quiet the mind focus on the little things right in front of us. Using prompts can help focus observation, encourage imagination, and inspire critical thinking.

"If I have ever made any valuable discoveries, it has been owing more to patient attention, than to any other talent."
~Issac Newton

Procedure

To begin ask participants to observe one thing or observe a specific area of an outdoor space. This could be a tree, stick, leaf, animal, pond, the sky, or the area around [fill in the blank].

Instruct students to take a deep breath while focusing on what they are observing. Then, tell them one of the prompts or give them the option of choosing one or all of the prompts.

- I wonder
- I notice
- This reminds me of
- It makes me feel
- Why does
- If I could change it
- This seems different than last time because

The important thing about journaling is there is no right answer, so encourage students to write or draw whatever comes to mind.

Another option is instead of looking at an object, depend on your ears only. This could be a focus on only one sound, or all the sounds that one can hear.

Feel can also be used. The sun on your face versus a cloudy day. Wind on your skin. The feel of grass on your hands or feet.

What makes these observations more powerful is rereading them and observing the same object or space on a different day. Students may feel awkward one the first attempt, or they may feel like they can't possibly observe anything different than what they previously did. Encouraging them to continue the process of being curious in their observations should open them up to come up with questions of their own they want to write/sketch about.

If connecting writing with science, consider questions asked when journaling as possible testable hypothesis for the entire class or small groups to test through the scientific process.

Color Filter

Summary/Objective

With so much to observe in the world, why not narrow down the focus. It can be done in many different ways, but what about by color? Looking at all the things that are a certain color can be a fun way to experience the outdoors. It can also be a great way to help students recognize and understand tints and shades of a color.

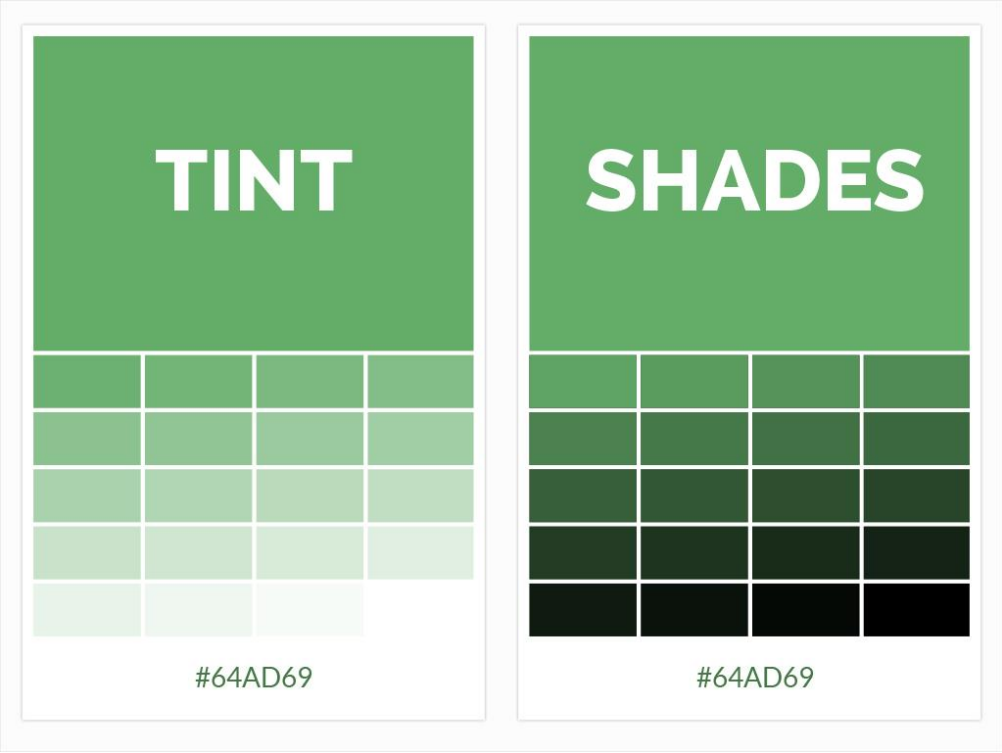
Materials

- Piece of paper
- Crayons, colored pencils, or markers (each student will need one color)
- Pencil

Background

We face hundreds of choices everyday — from what to wear to what to eat for lunch to more complicated decisions that involve our emotional and physical well-being. Regardless of how strong you are, your ability to make the best choices can eventually run out and you get decision fatigue. That's the official term for that feeling when you're overly stressed by the endless number of decisions you've had to make throughout the day. Avoiding this fatigue is a strategy that even the most successful people have adopted, some opting to wear the exact same thing every day. One color shirt and one color of pants is all you'll find in their closet.

Finding other ways to reduce decisions and choices can be freeing, even if only in your art. It also expands the way we look at color and can strengthen the way we view shading and tint. It's called monochromatic. Monochromatic doesn't always mean black and white. The one color chosen can be any color. The details, shadows, and depth can be achieved by using tints and shades. Tints are achieved by adding white. Shades are achieved by adding black.



Procedure

Without revealing the whole process, ask students to pick one color. They should use a crayon/marker/colored pencil to color the top of a blank piece of paper. This is to remind them of their color and so they can't change their color once they get outside.

Then, take them outside to explore. The goal is to fine as many different things as possible that are the one color they chose. They should create a list of these items on their sheet of paper. Natural things are the preference, but if a few man-made things sneak in that's ok too. The color does not have to be an exact match to their chosen color because we are looing for tints and shades as well.

Most students will be surprised at the number of things that match their if they have selected something other than green or brown. So, encourage them to look closely at everything - edges of leaves, flower blooms, etc.

Back in the classroom, use their list to have a discussion on tint and shade and how they are made when creating art. This can also lead to examples from Picasso's Blue Period.

Dive deeper by having the students crate a monochromatic work of art using the color they chose and the knowledge they gained from their exploration outdoors. This doesn't have to be a complex drawing or painting. It can be an abstract design as long as it includes tints and shades of their color.

Credit: Pinterest

Back to the Basics

Summary/Objective

Everyone knows, practice makes perfect, but how to incorporate a daily practice on anything can be difficult. Encouraging students to draw, especially with older students when self-consciousness has set in, can be difficult. One way to accomplish it is to keep it simple and get back to the basics.

Materials

- sketch book or loose paper
- pencil or another sketching tool(s)
- ruler

Background

To become a skilled artist or simply to improve the skills you already have, you need to put in the work every day. The best way to improve is with daily practice. So how do you set yourself up with that type of daily schedule? How can you think of something to sketch every. Single. Day.

Set aside time to sketch, even if it's only 10 minutes. To make it even more enjoyable go to a place without distractions such as TV, internet, and phones. Allowing yourself to get lost in the creative mindset will destress you, open your mind up to more creativity, and make the practice more enjoyable.

Next, you need to be prepared with a prompt, so there is no wasted time on what you should draw. There are many different ways to come up with a prompt, but one of the most basic is the alphabet.

Procedure

Students will need to use the ruler and pencil to divide their paper into equal sections. The sections can be 4 or 6 squares on the paper. The idea is to make the spaces big enough to capture the subject but not so big it feels overwhelming.

Each square should then be filled in with one letter from the alphabet.

Take the students outside and tell them to find a natural object they want to draw/sketch and do so in the proper square for the alphabet, e.g. A – acorn, B – buttercup, C – cattail.

This can be done everyday as students will be challenged to find a different object each time to complete the alphabet. You can require they go in order, or you can allow them to complete it in an order they chose.

When letters get harder encourage more exploration into nature and support creative thinking.

This could also serve as an option for journaling prompts by writing on the items instead of drawing.

Connecting to Nature:

An Educator's Guide to the

Clarks River National Wildlife Refuge

Activities

Wildlife

Fishing

Summary/Objective

Fishing is a highly valued heritage activity. It's an activity that any age can participate in and can serve as a gateway to outdoor enthusiasm.

Materials

- Fishing poles (students do very well when working in partners for fishing). Poles can be borrowed from the refuge. They are cane poles so no reels to detangle.
- Worms or other bait such as hotdogs. Night crawlers bought at a store can be cut up into 3-4 pieces to make them last longer and stay on the hook better.
- Gloves can help adults handle fish if they don't like the slimy fish feeling.
- Pliers can help remove hooks.
- Camera. Many students will be catching their first fish and they will want to show their family.
- The fishing pond at the refuge does not have many mature trees around it yet, so sunscreen is necessary.

Background

Fishing is a prehistoric practice dating back at least 40,000 years. Since the 16th century, fishing vessels have been able to cross oceans in pursuit of fish, and since the 19th century it has been possible to use larger vessels and even process the fish on board. Fishing also has deep heritage roots in Kentucky and is still going strong today as a relaxing outdoor activity suitable for all ages.

In 2020, it is estimated there were over 554,000 licensed fishermen in Kentucky, and it had a $1.2 billion effect on the state's economy. That's a lot of money and jobs for people in our state!

Procedure

Making sure you have enough adults to help with younger groups is extremely helpful for fishing outages. Often you will find too there are some students in your group that will be very skilled (at baiting and taking fish off the hook) and become a great helper.

No matter what style poles you are using (casting or cane) you will probably have to give students a how-to talk. Cane poles have more of a learning curve for students only

familiar with casting poles because they want to sling and jerk the pole, which is not needed or necessary with a cane pole. This leads us to the safety talk.

Remind students that poles have a hook, and they are not toys, swards, lightsabers, or a baton. Once the fishing line is tangled, they have to wait until it gets untangled before they can go fishing again.

Tips from refuge staff and volunteers:
It is best if younger students are given a location to fish and asked to not move unless given permission or escorted with an adult. This will prevent tangling of poles as students try to move to the first spot that a fish has been caught and they drag their line behind them.

If more bait is needed, ask the students to stay in place and raise their hand and/or holler out to get someone's attention instead of moving to ask. This too prevents tangling.

The most hectic time of fishing is getting the group started. Getting everyone set-up and baited takes a few minutes. So, remind students ahead of time to be patient. For this reason, we recommend a minimum time allotment of 45 minutes for fishing.

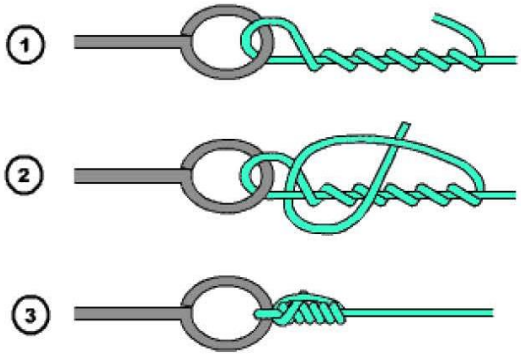
When a fish is caught and someone is taking the fish off the hook, ask students to hold the pole like a wizard with a staff. This prevents the pole from moving and jerking the fish out of the adult's hands.

How to incorporate fishing into other classes:

- Measure the length of the fish or weigh them to use the data in math.
- Write a story of the day from the perspective of the fish.
- Research the fish species caught and find out the basic needs for the species create a poster/PowerPoint/paper to present to the class.
- Write a poem about the fish or time spent fishing.
- Research how Native Americans used all parts of the fish they caught, and how they caught them.

Tying knots

One of the best knots overall is known as the "clinch knot". The following diagram illustrates how to tie this basic knot (which can be used to tie hooks to leaders, swivels to lines, etc.):



Palomar Knot

The Palomar Knot is a general-purpose connection used in joining fishing line to swivels, snaps, hooks and artificial lures. The double wrap of line through the eyelet provides a protective cushion for added knot strength.

1. Double the line and form a loop three to four inches long. Pass the end of the loop through hook's eye.

2. Holding standing line between thumb and finger, grasp loop with free hand and form a simple overhand knot.

3. Pass hook through loop and draw line while guiding loop over top of eyelet.

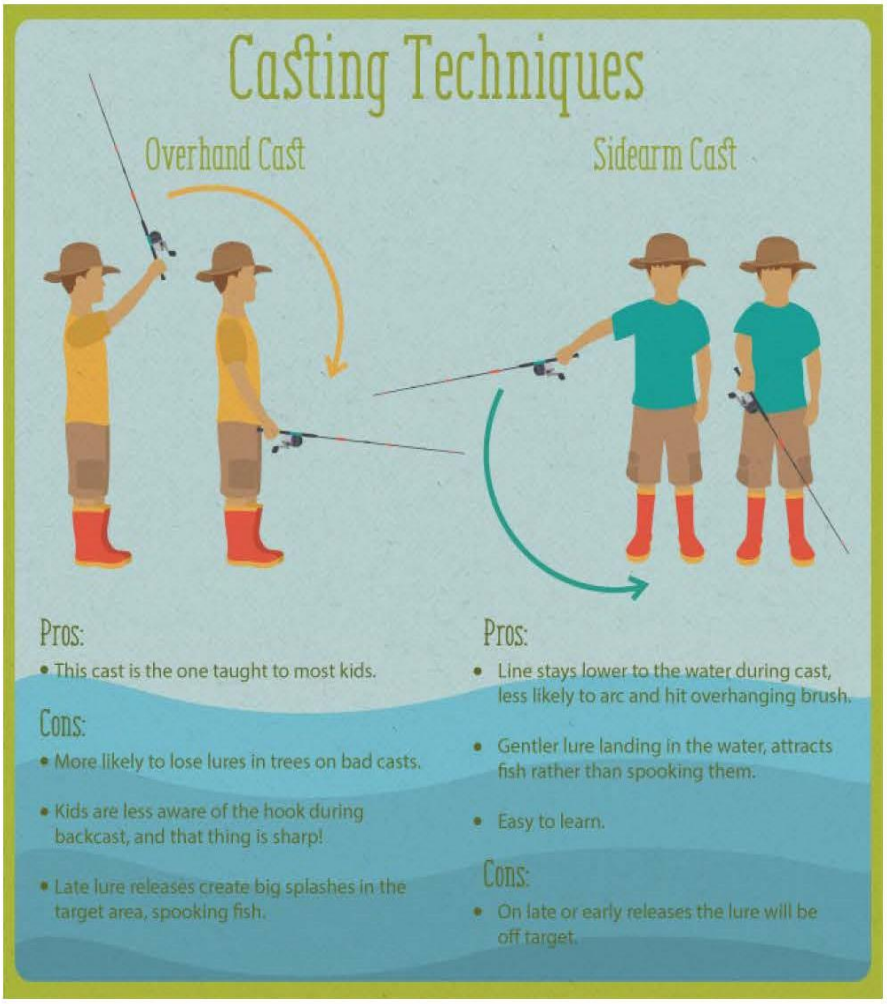
4. Pull tag end of line to tighten knot snugly and trim tag end to about 1/4".

Baiting the Hook

Worms are a common type of bait used. If the worms are very long, you can cut them into smaller sections. This gives you more bait to use and makes it easier to put on the hook.

Using the "threading" method is a good way to ensure the worm won't come off while casting. Thread the hooks point through the center of the worm all the way up to the "eye" or the top of the hook. Leave a ¼ to ½ inch of worm hanging past the barb on the hooks point.

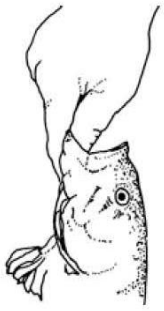
Casting



How to Handle a Fish

There is more than one way to safely handle a fish after it's been caught. It all depends on what you are comfortable with. Aa glove or a towel can be helpful. Pliers are helpful when removing hooks.

1. Grip the lip of the fish firmly with your thumb and pointer finger. This is best used on small fish only.
2. Grab the fish on the back, holding the dorsal fin down with your palm.



Bird Walk

Summary/Objective

Birds are a great way to connect with life outdoors. And, anyone can see a bird, just go outside and look around. In the sky, in trees, on the ground, in water. No matter where you are you should see birds. Bird watchers have developed some techniques that make it possible to find, and get good looks at, more birds we'll explore some of those to improve your chances of seeing birds.

Materials

All these materials are optional, but they can make birding a lot more fun.

- Binoculars – Will help get a better look at smaller birds or ones far away)
- Bird Identification Guide – They do make kid friendly guides, but the point is to get a guide that is easy for you and your students to use to understand what you see.
- Bird Identification App – If you are wanting to connect technology into the lesson, apps are a great way to do just that. These apps will not only include pictures but they will also include the call or song of birds. There are also apps that can record just a bird song and help you identify it.
- Bird check list – The refuge is a great place to go birding, after all that's one of the reasons the refuge was established, and we have a bird list you might find helpful: https://www.fws.gov/media/clarks-river-nwr-bird-brochurepdf

Background

A lot of kids gravitate toward birds. And why wouldn't they? Birds come in all colors and all shapes and sizes, they make a variety of sounds, and like fairies and planes, they fly! It's important to encourage curiosities with wildlife and the outdoors, such as birds, because an interest in birds can be a child's first step to falling in love with biology and the other sciences.

Procedure

Birding can be conducted any time of day and any season; however, different times of day and different seasons are usually a little better than others. There is a reason behind the phrase “Early Bird,” birds are usually more active in the morning hours. This is especially true as the temperatures are warm. They like to beat the heat then rest when the temperatures are high. Migration seasons, spring and fall, are also good times to see birds that are just passing though on their way back up to Canada or on their way down to Central and South America. Winter can be good if you are looking for larger birds such as ducks, geese, cranes, and eagles.

Here are some other tips to keep in mind when you head out:

1. Be quiet. Birds are easily startled by loud noises and will flee to safety. It is almost impossible to sneak up on a bird, because birds hear much better than human beings do. By minimizing noise, you can get much closer to a bird.

2. Avoid sudden movements. Just as loud noises startle birds so does sudden movement. Sudden, jerky movement, even when swinging your binoculars up to your eyes, can make a bird nervous enough to fly away. The closer you are to a bird, the more slowly and quietly you should move.

4. Know the habitat. Each bird is specially adapted to a particular habitat. Meadowlarks prefer large open fields, woodpeckers need trees, waterfowl prefer ponds or bodies of water. What you see will depend in large part on where you look.

5. Be patient. A bird hopping around in a bush will eventually move into a spot where you can get a good look. Bird watching is often about being patient and waiting for the birds to show themselves.

6. Get the sun at your back. It is not always possible but moving around so that the sun is behind you will make it much easier to see and identify birds.

7. Try *pishing*. This can be fun for students to try! Bird watchers use a technique called *pishing*. Pishing involves making small, squeaky noises by kissing the back of your hand or making a low whistled *pish* by blowing air through your closed teeth. Small birds are attracted to such sounds and will often pop into view to investigate. Here's how to pish: Clench your teeth, open your lips and whisper the word *pish.* It's usually done in a series of 5-6 calls at a time and can take a few minutes to get the birds close.

8. Look around. Don't get stuck looking at one habitat and forget to look at the other habitats around you. The more eyes you have looking around, the less likely you will miss anything, so encourage your students to have an eagle eye.

Know-it-OWL

Summary/Objective

Everyone should learn about owls and experience the fun of dissecting owl pellets! Pellets are a record of what owls have eaten, and scientists can study them to learn more about the owl and the ecosystems in which they live. When kids dissect owl pellets, they can see and identify the tiny bones from that owl's meal, learn about the owl's diet, and the owl's place in the food chain.

Material

- Owl Pellets – Can be ordered online, collected from a location where an owl roost is known (remember to not collect them when you won't be disturbing the owl, and have permission from the land owner), or the refuge has an owl and will be happy to collect pellets for you (please know we will need plenty of notice, she only produces 6 pellets a week and her diet will not have a lot of variety)
- Tweezers – These are helpful when extracting small bones
- Blunt Probes – Toothpicks can be another option
- Copies of the bone chart
- Ruler

Background

A variety of owls can be found in Kentucky. Below is a little info about them:

Barred Owl – Named for the bars on their chest, the most common owl that is both seen and heard on Clarks River National Wildlife Refuge. The phrase associated with their call is "Who cooks for you? Who cooks for you allll?", but they can also be heard saying just portions of that phrase and are sometimes described as sounding like monkeys. This owl is a lot of fluff! They seem very large by sight, but if you were to weigh them, they would only come in around 1 pound. For dinner they prefer mice, birds, reptiles, fish, insects, and crawfish.

Great Horned Owl – The largest owl is easily recognized by the large feather ear tuffs, and their large yellow eyes. They are powerful hunters and have even been known to take over an Eagle nest. Their diet includes insects, birds (song birds all the way to herons), squirrels, and skunks (their favorite). They are not as vocal as other owls, but when they do speak, they say, "Who's awake? Me too." In a low tone. They begin nesting by February, but do not build their own nest, as previously said they take over other nest.

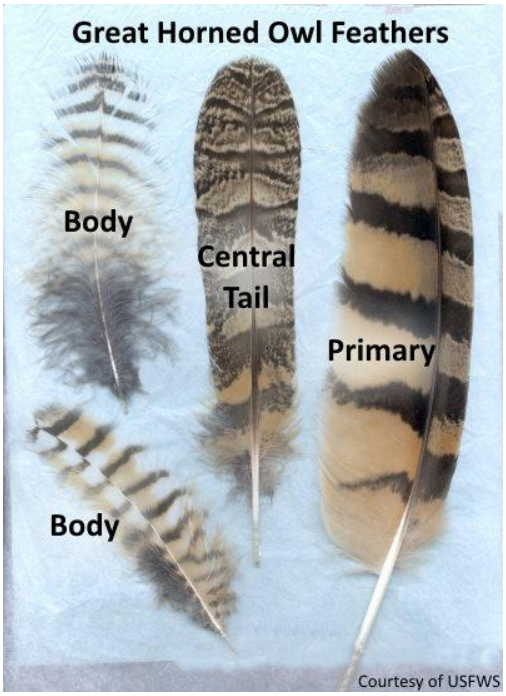
Eastern Screech Owl – The smallest owl that can be seen in Kentucky weighing in at about ¼ of a pound. So, about as much as a hamburger. But don't be fooled by the small size, they can be great hunters too. They consume insects, small birds, small mammals, amphibians, and reptiles. They have been known to eat close to roadways and puts them in danger of car strikes. Contrary to their name, they do not screech, but rather make a whiney cry and they can begin their calling as early as later January. When nesting, they prefer a cavity, such as a hollowed tree, but will use nesting boxes when provided.

Barn Owls – This owl is an uncommon one to see or hear. They prefer open habitats where it preys primarily on rodents and other small mammals. True to their name, they are often found roosting in barns or other structures. However, Kentucky Department of Fish and Wildlife Resources have made efforts to install nest boxes in suitable habitat to help the Barn owl population. During nesting, they do not bring any vegetation to the nest. They simply lay their eggs on the floor of the structure or on their pellets. The barn owl does not hoot, but rather screams. Yup, an owl that doesn't hoot. The harsh scream is made most often by the male in flight.

Adaptations are learned of inherited traits that help the animal survive. Owls have some special adaptations that make them great for nocturnal, or nighttime, survival.

Eyes – The large eyes of owls are forward facing, an adaptation of predators. The average owl can see an mouse move from 100 feet away. The size of the eyes allows as much light in as possible, very important when starlight is your only light. Owl eyes can

take up as much as ½ of their head, but these eyes are fixed in place. This means the only ways to see around is to move their head, which they can certainly do. They can move their head approximately 270 degrees in either direction.



Feathers – At night everything gets a little quieter, so if you are going to hunt you must be quiet too. Owls' feathers are adapted to be almost silent. The feathers are soft and have fringed edges on the front of the feathers. This fringe helps muffle sound by creating micro-turbulences instead of a gush of air over the wing. There is a trade-off to this though. The silent feathers are not waterproof like other bird feathers.

Ears/Face Shape – Most owl species have asymmetrical ear openings. Meaning one ear (or hole in their head), is higher than the other. This helps the owl know if a sound is coming from the left or right, and if it's above or below. While they lack cartage surrounding their ears, like humans, they do have pronounced facial disc and heart shaped face. These features help funnel sound to the ears.

Digestion – Lacking hands to cut up their food with a fork and knife, owls have specialized digestive systems. They swallow their food whole. The food travels to the first part of the digestive process where the digestive enzymes and acids break it down. From here, the food travels to the gizzard where strong muscles with grind and filter the food. The parts that cannot be passed on to the intestines such as hair, bones, and nails, forma pellet. This pellet will then be regurgitated several hours later, and the owl cannot eat again until the pellet is expelled.

Procedure

After covering the background information on owls, pass out the owl pellets and dissecting equipment to students along with the bone chart. Have the students conduct the following steps:

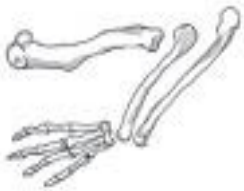
1. Measure the length and width of the owl pellet and record it.

2. Carefully examine the exterior of the pellet, looking for any signs of fur or feathers. Record your observations.

3. Carefully use a toothpick/tweezers to break apart the owl pellet and observe what is within. Use your tools to expose all bones for identification. Use the bone chart to help you identify your bones. Record what you think this owl ate.

If you wish to expand the activity, they students can use glue to reconstruct the bones they find in their pellet. If they can't reconstruct the whole animal, they can draw and/or identify the missing parts.

Owl Pellet Bone Chart

	Bird	Mouse	Shrew	Mole
Skull				
Jaw				
Shoulder Blade				
Front Leg or wing				
Hip				
Back Leg				
Rib				
Back Bone (Vertebrae)				

Super Teacher Worksheets - www.superteacherworksheets.com

Covered in Fur

Summary/Objective

It's one thing to see pictures of animals and get excited. It's a whole different level getting to see animals in the wild, but is there a happy medium? There is! The refuge has a collection of furs and animal parts. Some can be borrowed for you to teach about them, and others require refuge staff be present at all times with them.

Materials

If you would like students to take notes, a pencil and notebook and if not sitting at a desk a clipboard could be handy.

Background

Mammals are a group of vertebrates, characterized by the presence of mammary glands which in females produce milk for feeding (nursing) their young, a neocortex (a region of the brain), three middle ear bones, and what they are most famous for is having fur or hair.

Mammals have a variety of strategies for helping them survive. Adaptations are what we call this.

Adaptations = physical traits or learned behaviors that allow animals to better survive.

Some of the animal furs have a yellow or white tag on them *These must not be removed*. This is a Convention on the International Trade of Endangered Species or CITES (pronounced "sight-ease") tag. This is an international agreement between governments. Its aim is to ensure that trade in specimens of wild animals and plants does not threaten their survival. Many wildlife species in trade are not endangered, but the existence of an agreement to ensure the sustainability of the trade is important in order to safeguard these resources for the future. You can look on the tag to see where the animal was harvested.

Procedure

The animals listed below are mammals that can be found in Kentucky, and these furs are ones that can be borrowed from the refuge. The fur collection is not a complete collection of all mammals in Kentucky, but a good representation. The information

provided is to assist you in your program or to use as follow up info after a refuge program.

You can also find more information on the Murray State University website: http://campus.murraystate.edu/academic/faculty/hwhiteman/field/mammals/mammallink.html

Bobcat

- Bobcats are large spotted cats named after their short or "bobbed" tail.
- Have white spots on the back of their ears, known as false eyes.
- Known to have a very "scary" or "eerie" scream.
- Are carnivores, feeding on insects, reptiles, birds, mammals (cottontails are a favorite).
- Tend to be more solitary except during breeding.
- Gives birth to 1-6 spotted kittens.
- Oftentimes, a bobcat can be mistaken for a mountain lion (remember why they are called a "bob"cat, always look at the tail length).
- Able to jump as high as 12 feet.
- Top speed is ≈34 mph.

White-tailed Deer

- Named after the underside of their tail.
- Almost went extinct in KY in the early 1900s.
- Males have antlers, not horns, (Antlers fall off and regrow each year. Horns continuously grow). Antler growth is related to diet and nutrition. For this reason, antlers are not a good indicator of age.
- Biologists and hunters use the bottom jaw to determine age. This is done by looking at the wear of the teeth.
- Buck = Male, Doe = Female, Fawn = young or baby

- Fawns born with spots to help them hide. The mother will hide them for periods during the day while she goes off to feed.
- Their number one predator was the Red Wolf, an animal that no longer lives in Kentucky due to humans' fear and overharvest. Today, larger mammals such as coyote, bear (in eastern KY), and bobcat are predators of young deer.
- Deer are browsers, meaning they eat leaves, fruits, fresh shoots, bark, and shrubs. They will also eat young sunflowers, corn, soybeans, and other ag crops.

River Otter

- Built for swimming - streamlined body, short legs with webbed feet, dense fur that keeps them warm, a tapered tail, and small ears.

- Their nostrils can close, great for being underwater.
- Carnivorous (fish, crustaceans, amphibians, snakes, water insects, snails, worms, small mammals, birds, eggs, frogs, turtles, and any aquatic invertebrates).
- Can hold their breath for up to 8 minutes while under water.
- Baby otters are called pups.
- Very vocal. Communicate with whistles, yelps, growls, and screams.

Beaver

- Well-known for their appetite of wood. Because of this diet, their front two teeth are orange/yellow from the thick enamel, and they continuously grow.
- They also eat leaves, roots, and aquatic plants.
- Their large, flat tail not only helps them swim faster, but can also be used to make a loud alarm call when slapped against water. In addition, the large tail helps the beaver balance when carrying a heavy log or tree trunk.

- Well-known for their ability to build dams. They are one of two few animals that can completely change an ecosystem (the other is humans). Their dams block rivers and streams with trees and mud, creating new lakes, ponds, and flooded land.
- Beavers can stay underwater for 15 minutes without coming to the surface.
- They have transparent eyelids that act as goggles so they can see as they swim.

Racoon

- Sometimes called the “masked bandit” because of their face markings and their habit of stealing trash and birdseed.
- The black fur works just like the black stickers athletes wear under their eyes: The dark color absorbs incoming light, reducing glare that would otherwise bounce into their eyes and obstruct their vision. At night, when raccoons are most active, less peripheral light makes it easier for them to perceive contrast in the objects of their focus, which is essential for seeing in the dark.
- The English word raccoon comes from the Powhatan word aroughcun, which means "animal that scratches with its hands."
- Rebecca, the raccoon lived with Calvin Coolidge for part of his presidency.
- One of the most omnivorous animals in the world.
- Very adaptable, so they live in a wide range of climates and habitats. They typically make homes, called dens, in trees or caves, though they will also make homes in barns, abandoned vehicles and other man-made locations.
- Like to feel their food before eating and often dip it in water to help them feel. Water softens the callouses on their hands so they can feel better.

Opossum

- Prehensile tail, but do not use it to sleep upside down. They use it more for balance when climbing or for carrying leaves to make a den.

- One of the most common habits of opossums is “playing dead” or, as it is frequently called, “playing possum.” An opossum, when confronted with a threat, will often hiss or bare its teeth. Or more likely, run. But if it is surprised by a predator, it will enter a catatonic state. It basically faints and is in a state of unconsciousness. The opossum has no control over this; it’s involuntary.
- Born hairless and sightless and are about the size of a honeybee. They crawl to the pouch of the mother to feed and continue to develop.
- Omnivorous. Have a large variety in their diet, they even eat ticks.
- Resistant to snake venom. They have a protein that binds to the toxin and neutralizes it.
- Their tails (and ears) are hairless, making them particularly susceptible to frostbite.
- Have very bad eyesight.

Red Fox

- Rusty red in color, but most important is the white tipped tail.
- Like open areas in woodlands, rural and suburban neighborhoods, wetlands, and brushy fields.
- Prefer rodents and rabbits, but they will also eat birds (quail), amphibians, and fruit.
- Approximately 12 pups per litter.
- Have excellent hearing. They can hear low-frequency sounds and rodents digging underground.
- Males = Tods, Females = Vixens

Coyote

- About as big as medium-size dogs. They are 32 to 37 inches long from head to rump, plus another 16 inches for their tails.
- Originally only found in the prairies and deserts of central and western North America. Humans helped facilitate their expansion in the 1800s both by creating more open habitats through logging and agricultural development, and also hunting out red wolves and cougars, which are natural coyote competitors.

- Hunt and eat small prey, such as rodents, rabbits and squirrels, as well as insects and fruit, depending on what is available to them.
- Live in small family groups, not large packs like wolves.
- Most active at dawn and dusk, can also be nocturnal.
- Communicate using vocal sounds, including yips, barks and howls. They also use scent and body language.
- Females have typically 6 pups.
- Both the males and females participate in taking care of the pups

Gray Fox

- Mixture of gray, black and reddish fur. They have ah black tipped tail that helps differentiate them from the red fox.
- Shorter legs and stockier size than the red fox.
- One of two canine species that can climb trees. The other is the Asian raccoon dog. Usually done to either to search for prey, sleep, or to escape from predators.
- Normally nocturnal but will hunt during the day if necessary.
- Like to stay in deciduous forests or brushy woodlands.
- Communicate with scent or vocal sounds such as barking or growling.

- A large part of its diet is made up of small mammals like mice, voles and eastern cottontail rabbits. It also eats birds, insects, and plants such as corn, apples, nuts, berries and even grass.

Gray Squirrel

- When acorns and other nuts are plentiful, numerous squirrels will survive the winter and females will produce larger litters. But when food is in short supply, squirrels that survive the winter often produce fewer young.
- Construct nests made of leaves or use tree cavities to escape predators and weather.
- Very vocal (harsh squalls, warning barks, chucks, mews, purrs, and tooth chattering)
- Nuts and acorns are a staple, but they also feed on seeds, fruits, mushrooms, tree buds, and blooms. They occasionally consume insects.
- Have 22 teeth.

- Acorns buried in the ground then are not needed or forgotten, will grow.
- While they are usually gray, they can be more white or more black. This is a result of genetics.

Fox Squirrel

- Larger than the gray squirrel.
- Name is from the reddish fur that resembles a fox.
- Squirrels' tails are used for a variety of purposes. They can be wrapped around their face to keep them warm, used as an aid in balancing when they run along tree limbs or powerlines, or spread and used as a parachute if the squirrel should fall. They also communicate with their tail. Quick jerks of the tail signal that they are nervous or upset.
- Have 20 teeth.
- Predators: cats, hawks, coyotes, foxes, and bobcats.

Eastern Striped Skunk

- The size of a house cat.

- Number one predator is a great horned owl. (they can't smell)
- Considered habitat generalists and can be found in an assortment of habitats (woodlands, open fields, neighborhoods, campgrounds)
- Omnivores: insects, small mammals, earthworms, snails, grains, nuts, fruits, vegetables, reptiles, vegetation, amphibians, birds, eggs, bird seed, carrion and garbage.
- When threatened, striped skunks will first try to run away or will stomp their front feet as a warning. However, if those tactics do not work, then the skunk will do a handstand and spray. But this is a last resort because once they have sprayed it takes a week or two for their body to produce more of the scent.
- The spray comes from glands under their tail. Dogs have the same glands.
- The spray can cause blurry vision, nausea, and disorientation. This is to allow the skunk time to get away.
- They can spray accurately up to 15 feet.

- The spray is an oil that will attach to hair or fur and it is also attracted to oil (our bodies are covered in oil and oil glands). Dishwashing soap will cut through this oil and hydrogen peroxide will help dissipate the scent.
- Skunks don't get the spray on themselves, but they always retain a musky scent.
- In the Musteloidea family, the same as red pandas, weasels, otters, and racoons.

Wooly Worm Survival

Summary/Objective

Talking about adaptations, survival and natural selection is one thing, but put it into action and it's completely different. This experiment introduces the process of natural selection by scavenging for wooly worms. Your students, now birds, will "forage" for worms, uncooked pasta. Students will be able to observe how the variation in the color of the wooly worms makes a difference in how many they can collect.

Materials

- 5 marked off feeding areas (or whatever is needed for the size of the group)
- Stopwatch
- Rotini pasta of mixed colors
- Cups or bags for each group
- Attached worksheet

Background

Charles Darwin and Alfred Russel Wallace first introduced the term natural selection. Natural selection is the change in a species over time, resulting in preservation of favorable adaptations. These adaptations can be behavioral, or physiological (learned or inherited traits) that will enhance the survival and reproduction of that species in their environment.

So, two things must be present for natural selection to take place. One, there must be variations in the population (different beak size in birds or different length in giraffe necks). Two, these variations must change the survival rate of the organism (birds with big beaks can break more nuts; giraffes with the longest necks can reach more food).

Both predator and prey have adaptations to survive. Predators must be able to capture their prey. At the same time, prey must have methods to avoid being eaten.

Woolly bear caterpillars—also called woolly worms—have a reputation for being able to forecast the coming winter weather. If their rusty band is wide, then it will be a mild winter. The more black there is, the more severe the winter.

It is actually the larva of the Isabella tiger moth (Pyrrharctia isabella). Even though it is widely believed that the woolly bear caterpillar can predict the upcoming winter's severity, the truth is that this caterpillar can't predict what Old Man Winter has in store for us. The woolly bear caterpillar's coloring is based on how long caterpillar has been feeding, its age, and species. The better the growing season is, the bigger it will grow. This results in narrower red-orange bands in its middle. Thus, the width of the banding is an indicator of the current or past season's growth rather than an indicator of the severity of the upcoming winter.

Procedure:

- Set up feeding area. Distribute wooly worms in the feeding areas.
- In teams of 5 (or whatever is determined by group size), students will act as predacious birds on the wooly worms.
- After everyone is stationed and ready. The stop watch is set (2 minutes is usually enough, but can be changed) and the timer yells, “Go!”
- Students feed on the wooly worms until time is up and the timer yells, “Stop!” Then, each group places their worms in a bag to take back to the classroom.
- Once back in the classroom, sort the wooly worms by color and tally the number of each. Share your numbers with other groups and fill in the chart in the data section.

This activity can be expanded by changing the environment, e.g. move from grass to gravel. Generations can also be shown, e.g. only use the “offspring” from the colors that were selected from round one to set up round two.

You can choose a group and strategically place more light or dark pasta to easily show how easy/hard it is to find the worms of certain colors.

Wooly Worm Survival

Name:_____

Data:

Worm Color	**Group 1**	**Group 2**	**Group 3**	**Group 4**	**Group 5**	**Total**
Green						
Orange						
Cream						
Totals						

Follow-up Questions:

What color wooly worm was eaten the most?

What color wooly worm was eaten the least?

Based on your results in this experiment, do worms with different colors have a better or worse chance of surviving? Why?

In your own words, what does camouflage mean?

If you were studying wooly worms in a colder climate with snow, which color worms would you expect to get eaten the most? What about in a hot desert region?

What other things, besides color, would help a wooly worm survive?

Connecting to Nature:

An Educator's Guide to the

Clarks River National Wildlife Refuge

Activities

Water

Macro Sampling

Summary/Objective

Few things are as exciting or as memorable as spending time in a wetland! Learning the health of a stream can lead to all kinds of discussions about pH and chemistry, pollution, stream buffers, rain gardens, and positive ways we can help the environment. This lesson will be fun for students as it is very hands on with water and mud involved.

Materials

- Old clothes that can get wet and/or muddy
- Old shoes/boots
- Dip nets
- Small tubs or containers
- Macroinvertebrate id sheets
- Access to a stream or a pond (large fishing ponds might not provide the best samples, rather you need shallow ponds with vegetation)
- Magnifying lens (optional)

Background

macroinvertebrate (macro = big enough to see with the naked eye, invertebrate = no backbone)

All aquatic macroinvertebrates start life as eggs. Some animals, such as water boatmen (Hemiptera) and leeches, do not change much as they grow – like humans, they get bigger but look basically the same. Some insects, however, change (metamorphose) quite dramatically as they grow. After hatching, the insect may go through several stages before reaching adulthood. Depending on the species, it may go through a larval stage, a nymph stage, or both.

Macroinvertebrates are relatively easy to collect and identify, can reveal acute pollution events because they spend their whole life in the stream, and have known pollution sensitivities (some are more tolerant than others to contamination).

Many macroinvertebrates make their homes in riffles and pools of gravel-bed streams. By turning over stones and examining the underside, you may find aquatic macroinvertebrates. Aquatic macroinvertebrates are often used as an indicator of water quality. The orders of Ephemeroptera (mayflies), Plecoptera (stoneflies), and

Tricoptera (caddisflies) are generally sensitive to pollution. Water Quality Biologists use these three orders to determine the quality of a water body. If we find families from these three orders of invertebrates living in a stream or river the water is most likely not impacted from pollution. However, it is important to remember that the absence of these families does not always mean the quality is poor. There could be other reasons these families are not present.

Procedure

This activity is good for teams of 2-3.

Before beginning, it's always a good idea to remind students of a few ground rules.

- Dip nets are scientific tool, not lightsabers, swords, or toys.
- Anything that comes out of the water MUST go back in the water. There would be microscopic animals on rocks/leaves and decaying plant matter is also a food or home for some wildlife.
- Set your limits with splashing or "playing" in the water.
- If necessary, such as in a river, set boundaries for where the students can sample.
- Crawdads can be aggressive especially if they are large. They can begin to fight each other or eat the other macroinvertebrates. Limit 2 small crawdads per container and 1 large (depending on how large, it might need a container by itself)
- Fish and Frogs/tadpoles are fun to catch and to look at but are not invertebrates. They do not need to be kept in the containers.
- Macroinvertebrates are wildlife, they are not to be thrown or handled aggressively. (Some students will be fearful to touch the invertebrates, but if coached gently one proper handling most usually come around to enjoy it and be as enthusiastic as other students.)

1. Instruct students to fill containers with water from the stream or river. The containers should be placed in the shade if it's a warm sunny day. If left in a shallow pan of water the temperature change could stress or kill the macroinvertebrates.
2. Have students collect macroinvertebrates in nets and by picking up rocks and looking underneath.
3. All macroinvertebrates should be transferred safely into the container of water.

4. After the time limit is up (20-40 minutes is a good range) have the students come together with their containers so what they captured can be identified with the group.
5. After identifying, use the score sheet to determine the health of the stream.

Extension idea: brainstorm what factors might be influencing the health of your stream and what students/the community could do to increase the health of the stream.

MACROINVERTEBRATE DATA SHEET

Please check the box next to the "Site #" ***if this is a new site and please be sure to attach a map.*** (PLEASE PRINT)

☐ Site # _____ Stream _____ County _____

Site Location _____

Date ____/____/____ Time (military time) _____ Rainfall (inches in last 7 days) _____ Water Temp. (°C) _____

Trained Data Submitter (responsible volunteer) _____ Stream Team Number _____

Participants _____

Invertebrate Type	*Net Set #1*	*Net Set #2*	*Net Set #3*	*Score*
Habitat type →				*After entering the **number(#) of organisms collected**, circle the number below for every type of organism collected. Add the numbers circled and record the totals as your Water Quality Rating.*
Net Type *(circle type)* →	*Kick Net* **or** *D-Net*	*Kick Net* **or** *D-Net*	*Kick Net* **or** *D-Net*	
Time Spent Picking (Minutes picking x number of people picking)	min. picking ____ × # people ____ = total min. ____	min. picking ____ × # people ____ = total min. ____	min. picking ____ × # people ____ = total min. ____	
Sensitive	**# of Organisms**	**# of Organisms**	**# of Organisms**	**Circle Types Present**
Caddisfly Larvae				3
Hellgrammites				3
Mayfly Nymphs				3
Gilled Snails (right)				3
Riffle Beetles				3
Stonefly Nymphs				3
Water Penny Larvae				3
Somewhat Tolerant	**# of Organisms**	**# of Organisms**	**# of Organisms**	**Circle Types Present**
Other Beetle Larvae				2
Clams/Mussels				2
Crane Fly Larvae				2
Crayfish				2
Dragonfly Nymphs				2
Damselfly Nymphs				2
Scuds				2
Sowbugs				2
Fishfly Larvae				2
Alderfly Larvae				2
Watersnipe Fly				2
Tolerant	**# of Organisms**	**# of Organisms**	**# of Organisms**	**Circle Types Present**
Aquatic Worms				1
Black Fly Larvae				1
Leeches				1
Midge Larvae				1
Pouch Snails (left)				1
Other Snails (flat)				1
< 12 = Poor	12-17 = Fair	18-23 = Good	>23 = Excellent	**Water Quality Rating** ____

Comments (mention any changes from your usual readings) _____

Fish Present (Please Mark) **Yes**☐ or **No**☐

Volunteer Monitoring - 12/15

Key to Stream Macroinvertebrates

Izaak Walton League
Save Our Streams

Shells

Single

Gilled snail
Spiral, open on right

Lunged snail
Spiral, open on left

Orb Snail
Coiled

Double

Clam
Small, whitish tan or brown

Mussel
Large, dark-colored

No Shells

Legs

No Legs

Leech
Suckers, expands and contracts, soft, slimy body

Midge Fly
Distinct head, whitest to clear or red < ¼"

Aquatic Worm
Small, hair like or looks like earth worm

Black Fly
Black head, shaped like bowling pin, <1/4 "

Crane Fly
Plump, worm-like, often can see guts

10+ legs

3 pairs of legs

3 tails

Crayfish
Lobster-like

Sowbug
Two long antenna flatter top to bottom

Scud
Shrimp-like, swims on side

Water Snipe Fly
Many caterpillar like legs, two fringed tails

Mayfly
3 long tails gills on abdomen

Damselfly
3 oar-like "tails" no gills on abdomen

No Obvious Tails

One or two tails

Riffle Beetle

Larva - Brown, crunchy body, 6 legs, "C" shaped, no gills on belly

Adult - Small, dark crawls on bottom

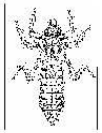
Water Penny
Flat, oval disk

Caddisfly
Green, tan, orange or white, may have gills on body

May be encased in a house of sticks, stone or leaves

Net Spinning Caddisfly
Dark head, tan, gills tufts on belly, 3 armored plates behind head

Dragonfly
Large eyes, stocky body, no tail



Dobsonfly
Large mouth, "spines" on side

Fishfly
8 pairs of spines, no gill tufts between spines

Alderfly
7 pairs of, "spines" on side, long thin tail

Stonefly
2 tails, gill tufts under arms

Mayfly
Two tails, gills on abdomen

Potential Hydrogen

Summary/objective

Why do we need to learn about pH? pH is important because substances such as our stomach acids need to be at a certain pH in order to work properly. pH is also important because it must be at certain levels in order for living organisms to survive in the wild. This activity will have students sampling the pH of a local water source and can lead to discussion on watersheds, pollution, stream health, positive things to do for our water systems.

Materials

- Water source(s) such as pond, stream, river, or creek
- pH testing kits

Background

pH stands for potential hydrogen.

Whether a liquid is acidic, basic, or neutral is measured by a quantity called pH. pH is a measure of how much hydrogen, in an ionic form, is in a solution. pH measurements are put on a scale from 1-14, with 1 being the most acidic and 14 being the most basic. If a solution has a pH of 7 it is said to be neutral.

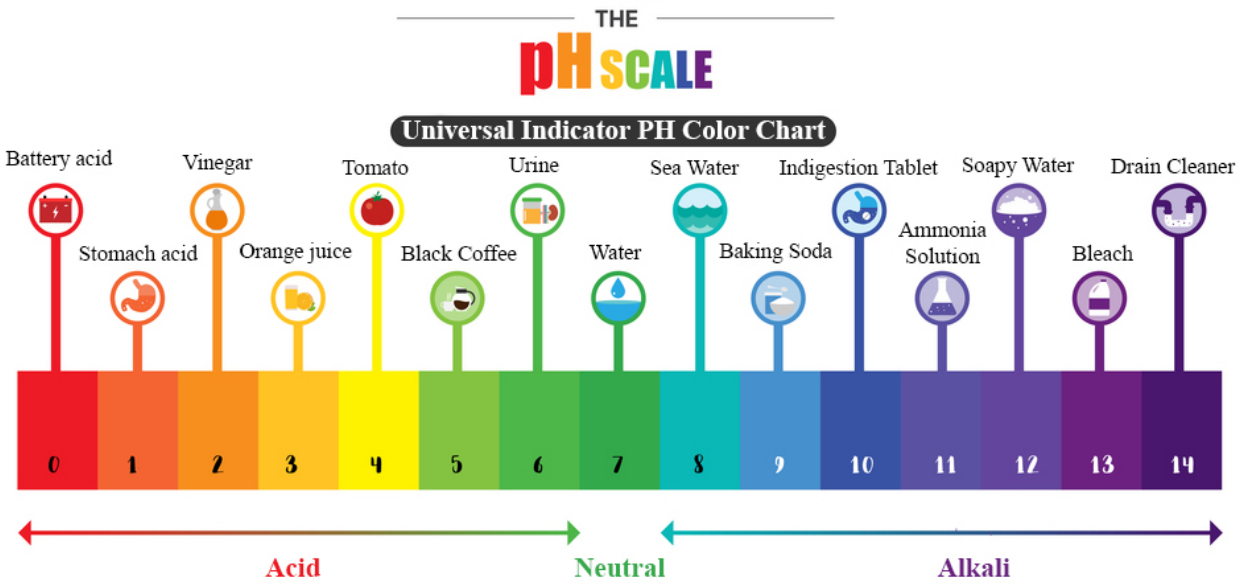
Testing the pH of water sources can help determine the health of that water source for people, plants, and wildlife. At a pH of 4 (very acidic) fish reproduction is disrupted.

Not all acids are bad. Stomach acid is necessary for digestion.

It's also important to note that strong basic chemicals can be just as harmful. Think about bleach, it can burn skin just like an acid.

A pH of 7 does not mean the water is ok to drink. This is just one test to determine the quality.

DETAILED pH GUIDE



Procedure

This activity works well for teams of 2 or 3.

It's important to follow the instructions from the pH kit that you are using.

The kits from the refuge use a plastic test tube with a fill line. Students should add 10 drops of the indicator per tube, then cap the tube and tip it end over end, not shake, 10 times. The tube then slides into a slot on the colored scale, the color it matches the best is the pH.

If you have more than one water source to test divide the class appropriately so a comparison can be made.

****When you are done with the samples they must be collected in a bottle or container that can then be emptied into a sink or toilet. We have added chemicals to the water and it does not need to be put directly into the habitat. It needs to go through a septic tank so the chemicals can be filtered out. ****

Discuss ways that the pH can change for the good and the bad. Examples below:

- Recent rainfall
- Pollution (increase or decrease)
    - Point – can see a specific source (drain from a home or business to the water)
    - Nonpoint – not clear the direct source (runoff from roads, farms, yards, etc.)
- New plants
- Stream buffers
- Rain gardens
- Stream restoration
- Flooding
- Drought

Extension idea: Look for ways around the school the class can improve water quality and have positive effects on the watershed (create a raingarden, clearly marking drains to remind people not to dump chemicals in them)

Connecting to Nature:

An Educator's Guide to the

Clarks River National Wildlife Refuge

Activities

Hikes

Bingo Hike

Summary/Objective

Taking a walk outdoors is extremely beneficial for physical and mental health. Studies suggest it lowers blood pressure, enhances creativity, lowers stress hormones, and boosts test scores. However, taking a walk can also include exploring and encouraging closer observation of everything in the outdoor world. A Bingo Hike is the perfect answer.

Materials

- Copies of the included Bingo Hike (or borrowed from the refuge) – these can be laminated or just pieces of paper
- Pencils or dry erase markers depending on if the papers are laminated or not.

Background

Bingo was popularized in the United States due to the ingenuity of Edwin S. Lowe. In 1929 Lowe, a traveling New York salesman, spotted a carnival as he passed through Georgia. There he noticed a crowded booth where people were playing a game with hand-stamped boards and beans. He learned that the game was called “Beano,” and that the game operator derived the activity from a lotto game that he had played in Europe. Back in New York, Lowe experimented with numerical combinations on the Beano boards and invited his friends to test out the game. As one version of the story goes, one of his guests mistakenly called out “bingo” instead of “beano” after a winning and the new name stuck.

Lowe began manufacturing bingo boards in the early 1930s and hired a mathematician to devise more than 6,000 different numeric combinations for the boards. Eventually, bingo developed wide popularity and churches and fraternal organizations purchased sets to use as fundraisers.

Procedure

The Environmental Education and Recreation Area, just outside of Benton, is a great place to go hiking. It has paved, gravel, and earthen trails. However, any refuge land is a great place to hike and explore if you are looking for something a little more challenging.

Lots of options with this activity:

- This activity can be done in pairs, teams, or each individual student can have their own bingo sheet.

- You also have the option to use one bingo sheet for the entire class and mark it off together. This works well for very young groups.

- The students can be given an area to explore on their own, or a group hike can be taken with stops to id plants and wildlife.

- To get a bingo use general bingo rules (a line, diagonal, four corners, or cover-all).

Bingo Clarks River NWR Style

Wildflower	A seed	Deer Food	Bug eaten leaf	Something the color of your shirt
A twig that looks like the letter "Y"	Hiding place for animals	**A good home for a frog**	Rough Tree Bark	A place for fish to live
Something that smells good	Bird Food		Poison Ivy (don't touch)	A bug
Describe a sound you hear	**Something soft**	A good place for a squirrel to make a nest	**Scat**	A place for animals to hide food
A spider web	**A leaf bigger than your hand**	**Signs that an animals has been here**	**Something put here by people**	Something smooth

Paint Hike

Summary/Objective

When we think of nature, we usually have visions of greens, browns, and blues. Maybe during the fall, reds, oranges, yellows, and golds. However, at a closer look there are purples and red on those blades of grass, white or yellow spots on leaves, and even various colors on bark of trees. This activity is to show students that it can be rewarding to slow down and take a closer look.

Materials

- Paint chip cards (can usually be picked up at any local hardware/paint store)
- If paint cards are not an option, try a large box of crayons or color pencils that has many different shades and colors.
- A location outside to explore or hike

Background

As the season changes from summer to fall, temperatures drop and days get shorter. Trees get less direct sunlight, and the chlorophyll in the leaves breaks down. This lack of chlorophyll reveals other color pigments that were already in the leaves but masked by the chlorophyll.

Darker red leaves are the result of a chemical change: Sugars that can get trapped in the leaves produce new pigments (called anthocyanins) that weren't part of the leaf in the growing season. Some trees, like oaks and dogwoods, are likely to produce red leaves.

It's not commonly thought of, but you don't have to wait for fall to see colors in nature. It might take a closer look to find them, but many flowers, leaves, bark, rocks, and even the sky can take on different shades and different colors.

Procedure

The Environmental Education and Recreation Area, just outside of Benton, is a great place to go hiking. It has paved, gravel, and earthen trails. However, any refuge land is a great place to hike and explore if you are looking for something a little more challenging.

Lots of options with this activity:

- This activity can be done in pairs, teams, or each individual student can have their own color card.

- The students can be given an area to explore on their own, or a group hike can be taken with stops to id plants and wildlife.

A discussion of all the different colors can be the conclusion of the hike.

Option 1: Take another hike after students trade colors.

Option 2: Have students take pictures of what they found and use these later for a discussion in the classroom.

Options 3: Each student/group gets multiple colors and takes pictures of their finds. Back at school, use the pictures to create a PowerPoint that is presented to the classroom.

Five Senses Hike

Summary/Objective

Using all our senses can not only be educating, but it can also bel calming. This is even more true when you incorporate the peacefulness of nature. This scavenger hunt will make for a fun, educational, and calming hike.

Materials

- Copies of the attached 5 senses sheet
- Pencils/markers to mark on sheet
- Sheets can be laminated for reuse (if so you will need dry erase markers)
- A location outside to explore or hike

Background

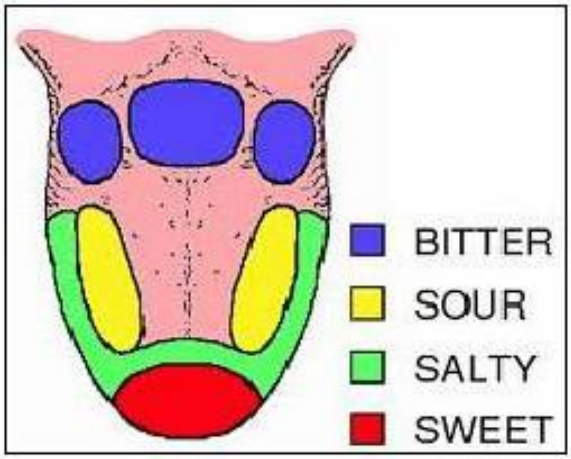
There are five basic human senses: touch, sight, hearing, smell and taste. The sensing organs associated with each sense send information to the brain to help us understand and perceive the world around us. Our five senses can also help keep us safe.

1. Sight: light and color is detected by cells in the retina at the back of the eye called rods and cones. Rods see in black, white, and shades of gray and tell us the form or shape that something has. Rods can't tell the difference between colors, but they are super-sensitive, allowing us to see when it's very dark. Cones sense color, and they need more light than rods to work well.

2. Sound: hair cells in the ear move in response to specific frequencies of sound.

3. Taste: taste buds on the tongue react to salt, sour, bitter, and sweet tastes.

4. Smell: special cells in the nose detect different chemicals in the air that we breathe in. We also detect the flavors in food as air moves from our mouth up into the back of the nasal cavity.



5. Touch: various receptors in our skin can detect different types of touch, including pressure and vibrations.

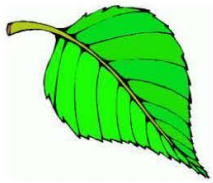
Procedure

The Environmental Education and Recreation Area, just outside of Benton, is a great place to go hiking. It has paved, gravel, and earthen trails. However, any refuge land is a great place to hike and explore if you are looking for something a little more challenging.

This activity can be done in pairs, teams, or each individual student can have their own sheet. For younger groups, one sheet can be used for the whole class.

Students will be more talkative when they are in groups or pairs, this may require the entire class to the sound section together.

For the taste section, it states on the sheet to NOT eat anything but rather find something they think could be eaten. The option of bringing a natural food for students to try at the end of the activity. Examples: blueberries, strawberries, blackberries, grapes, almonds, apples, carrots. This could lead to a discussion on different taste and the parts of the tongue that senses each.



FIVE SENSES NATURE SCAVENGER HUNT

Sight

- ☐ Find something white
- ☐ Find something with a pattern
- ☐ Find animal tracks
- ☐ Fins something heart shaped
- ☐ Find 3 things that look alike
- ☐ Find 3 leaves that are very different

Sound

- ☐ Listen for an animal sound
- ☐ Listen to the wind in the trees
- ☐ Listen for something that crunches
- ☐ Find something you can make music with
- ☐ Find a very quiet noise
- ☐ Find a place where there are no noises

Taste

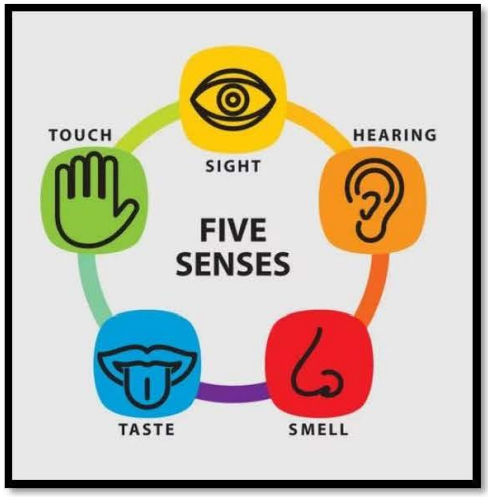
- ☐ Find something people could eat (don't eat it though)
- ☐ Find something you think an animal would eat

Smell

- ☐ Smell a flower
- ☐ Find a smell you like
- ☐ Smell green grass
- ☐ Smell a pine tree
- ☐ Smell dirt
- ☐ Smell fallen leaves

Touch

- ☐ Find something smooth
- ☐ Find something warm
- ☐ Find something soft
- ☐ Find something wet
- ☐ Find something rough
- ☐ Find something bumpy



Tic Tac Toe

Summary/Objective

Adding games to hikes/walks in nature is a great way to keep students engaged and encourage them to explore. If there are timid students afraid of nature, a familiar game, such as tic tac toe, can be a distraction from the thing(s) they are unnecessarily afraid of.

Materials

- Copy of the attached tic tac toe sheet
- Pencils/markers to check off sheet
- Sheets can be laminated for reuse (if so you will need dry erase markers)
- A location outside to explore or hike

Background

Some ascribe the origin of Tic-Tac-Toe to the ancient Egyptians, but the most concrete ancient record we have of the game is from the Romans, and the game they referred to as terni lapilli, or three pebbles at a time.

The game wasn't necessarily identical to how we play today. Rather than writing down markings, it's believed that the Romans would use tokens, pieces, or pebbles, and move them around the unique grid to represent the different moves. All around ancient Roman cities, historians have found terni lapilli grids scrabbled.

The United States officially adopted the name tic tac toe in the 20th century. Historians aren't completely clear about the origin of the game's name, but it could be referring to the noise of repetitive ticking or writing that goes along with the game's play.

Procedure

The Environmental Education and Recreation Area, just outside of Benton, is a great place to go hiking. It has paved, gravel, and earthen trails. However, any refuge land is a great place to hike and explore if you are looking for something a little more challenging.

Lots of options with this activity:

- This activity can be done in pairs, teams, or each individual student can have their own sheet.

- The students can be given an area to explore on their own, or a group hike can be taken with stops to id plants and wildlife.

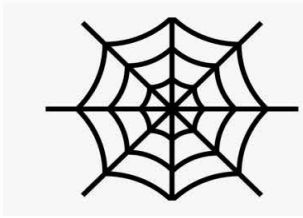
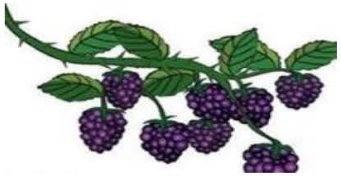
- Option to conduct this activity as a regular scavenger hunt and give prizes for the first three in a row.

- Have your students in pairs play similar to the original game of tic tac toe, making Xs and Os as they take turns finding items needed to make their move.

- Call out which three in a row students must find, e.g., bottom three, top left to bottom right diagonal, etc.

Scavenger Tic Tac Toe

Just like a game of tic tac toe, you must get three in a roll, but you must find the item in your square first.

Animal Track 	Spiderweb 	Crawdad Chimney 
Flat Rock 	Litter 	Leaf Bigger Than Your Hand 
Tree Stump 	Bird Nest 	Plant with Thorns 

Seek and Find

Summary/Objective

Seek and Find is the Where's Waldo of nature! Let students know the environment has all kinds of things to see if only they will seek them. This is great for students that like the idea of treasure hunts or finding hidden things.

Materials

- Copy of the attached Seek and Find sheet
- Pencils/markers to check off sheet
- Sheets can be laminated for reuse (if so, you will need dry erase markers)
- A location outside to explore or hike

Background

Hidden Pictures puzzles provide many developmental and skill-based benefits for children and taking that same activity into nature can provide the same benefits.

1. Promote attention to detail. As kids gain experience in looking for hidden objects, they become better at focusing on details and can look past other visual challenges.

2. Increase vocabulary. Reading the picture name helps children become visually familiar with the names of objects.

3. Instill good work habits. Because searching for hidden items can be very absorbing, children spend more time on the activity, thus increasing their concentration, persistence, and determination. Using the picture clues encourages independence while solving puzzles.

4. Develop self-confidence. Age and physical fitness is not a determiner of success in this activity. This allows the non-athletic students to shine alongside the more athletic ones in the same outdoor activity.

5. Improve visual perception. Looking for hidden objects helps kids develop the ability to recognize figures in a variety of contexts.

6. No screens necessary! Doctors have been saying for years how important it is to give your eyes a rest from screens and focus on objects at varying distances. Searching for objects high and low will do just that.

Procedure

The Environmental Education and Recreation Area, just outside of Benton, is a great place to go hiking. It has paved, gravel, and earthen trails. However, any refuge land is a great place to hike and explore if you are looking for something a little more challenging.

Options with this activity:

- This activity can be done in pairs, teams, or each individual student can have their own sheet.

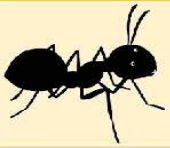
- The students can be given an area to explore on their own, or a group hike can be taken with stops to id plants and wildlife.

- Conduct this activity as a general scavenger hunt, or call out which item(s) the students should be looking for at one time. Calling out specific items can slow down how long this activity takes place, but can also cause running and foot races between competitive students. Ground rules of no running may need to be discussed.

- As the activity sheet suggests, keeping this sheet or keeping a record of how many items were found and taking another hike/exploring in the same area different times of the year or exploring different areas allows for a compare and contrast lesson.

Seek and Find

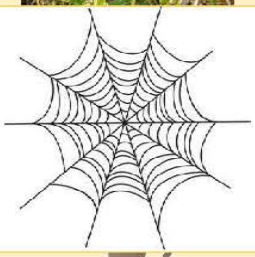
Take a walk outside and see how many items on the list below you can find! Keep the list and try again on your next walk to see if you can find more or less than you did before.

✓	Find	Picture
	Ant	
	Squirrel	
	Puddle of Water	
	Spider	
	Seed	
	Vine	

Seek and Find

	Bird	
	Moss	
	Flower	
	Worm	
	Bee	
	Butterfly	
	Rock	
	Shiny Leaf	

Seek and Find

	Mushroom	
	Animal Track	
	Crawdad Chimney	
	Spiderweb	
	Tree with a Hole	
	Nest	

iNaturalist

We mentioned this resource in the introduction but feel that it is worthy to talk about again in the hiking section! One of the world's most popular nature apps, iNaturalist helps you identify the plants and animals around you in a few easy steps:

1. Download the app, or you can make an account and upload pictures on a computer. (Don't want students to have individual accounts, create one account for the classroom.)
2. Take pictures of plants, animals, animal tracks, bugs, fish…all of the wild things!
3. Load it to the app or online and allow other biologists and naturalists to review and confirm your observations.

There are video tutorials online (https://www.inaturalist.org/pages/video+tutorials) to help you through the process.

The benefits?
First, you and your students learn about what you see while outside.
Second, this information helps land managers, including Clarks River National Wildlife Refuge, better enhance habitat for wildlife. You and your students will actually become citizen scientists.

Go ahead! Get connected with a community of over a million scientists and naturalists who can help you learn more about nature!

https://www.inaturalist.org/