

**TOYOTA** | georgetown

presents

# THE LOUISVILLE ZOO'S 2006 **BACKYARD ACTION HERO**

## GUIDEBOOK



**Lots of Fun Facts! • Cool Activities!  
Awesome Animals!**



# WELCOME FUTURE HEROES:

**W**e are so glad that you have reported for your Backyard Action Hero Mission. At Toyota Motor Manufacturing, Kentucky, Inc. (TMMK), we believe that protecting the environment is part of our mission to be a Good Neighbor across Kentucky. As we build cars in our plant in Georgetown, we are committed to protecting the environment, obeying the environmental laws, preventing pollution and continuously improving our processes. But the commitment doesn't stop there. It is everyone's responsibility to protect the environment.

Becoming a Backyard Action Hero is the first step in learning about how we all co-exist with the plants and animals that make up our environment. Once you have learned about some of the things in this book, you will be ready to accept your mission to take action in your own backyard. Good luck!

*Sincerely,*

*Your Friends at Toyota Motor Manufacturing, Kentucky, Inc.*

## WHAT IS A BACKYARD ACTION HERO OR BAH?

A BAH is a kid who is really into wildlife and habitats and is ready to take action to protect them. They know that to really make a difference you need to learn, but you also need to act! BAHs care about animals and habitats in their own backyards and also all over the world. The Louisville Zoo is a cool place to learn about all kinds of plants and animals so we'll check out what's going on there.

### DID YOU KNOW...

The Louisville Zoo is one of only 200 zoos that are members of the Association of Zoos and Aquariums (AZA). That's an important group that works to be sure animals get great care and visitors have great experiences at their zoo.

## MEET THE BAH CREW

Four Backyard Action Heroes will lead you through this book as you prepare to become a BAH yourself! Wade knows a lot about water and Skye is an expert on air. Tanya is really into making things grow and Alden is concerned about saving the planet!



Written by Marcelle Gianelloni and Doug McCoy

Edited by Sandy Allen and Debbie Sebree

Design & Art by Moonlight Graphic Works/ Stephen Sebree

Printing by Publishers Printing

Produced by the Louisville Zoo

## HEY, BACKYARD ACTION HEROES

If you read our last BAH publication, you will remember that we focused on the importance of water. You can find a copy of last year's book at [www.louisvillezoo.org/BAH](http://www.louisvillezoo.org/BAH). We looked at how water makes its way around the world, through the atmosphere, through the soil and rocks, and through all living things. We found out that without water, "life" as we know it could not exist. This time, we are going to look a little more closely at what takes place in and around our own backyards. In many ways, a good understanding of our immediate surroundings will help us all understand more about how we are linked to the rest of our planet.

How many of you BAHs know what types of ecosystems can be found here in Kentucky? There are two main types of ecosystems that were once widespread in Kentucky: 1) temperate deciduous forest and 2) tall grass prairie grasslands. Much of this original area has long since been converted to agricultural land. Deciduous forests make up the largest portion of our state. This issue of the BAH publication is going to focus on some of the plants and animals located in these interesting and diverse forests.

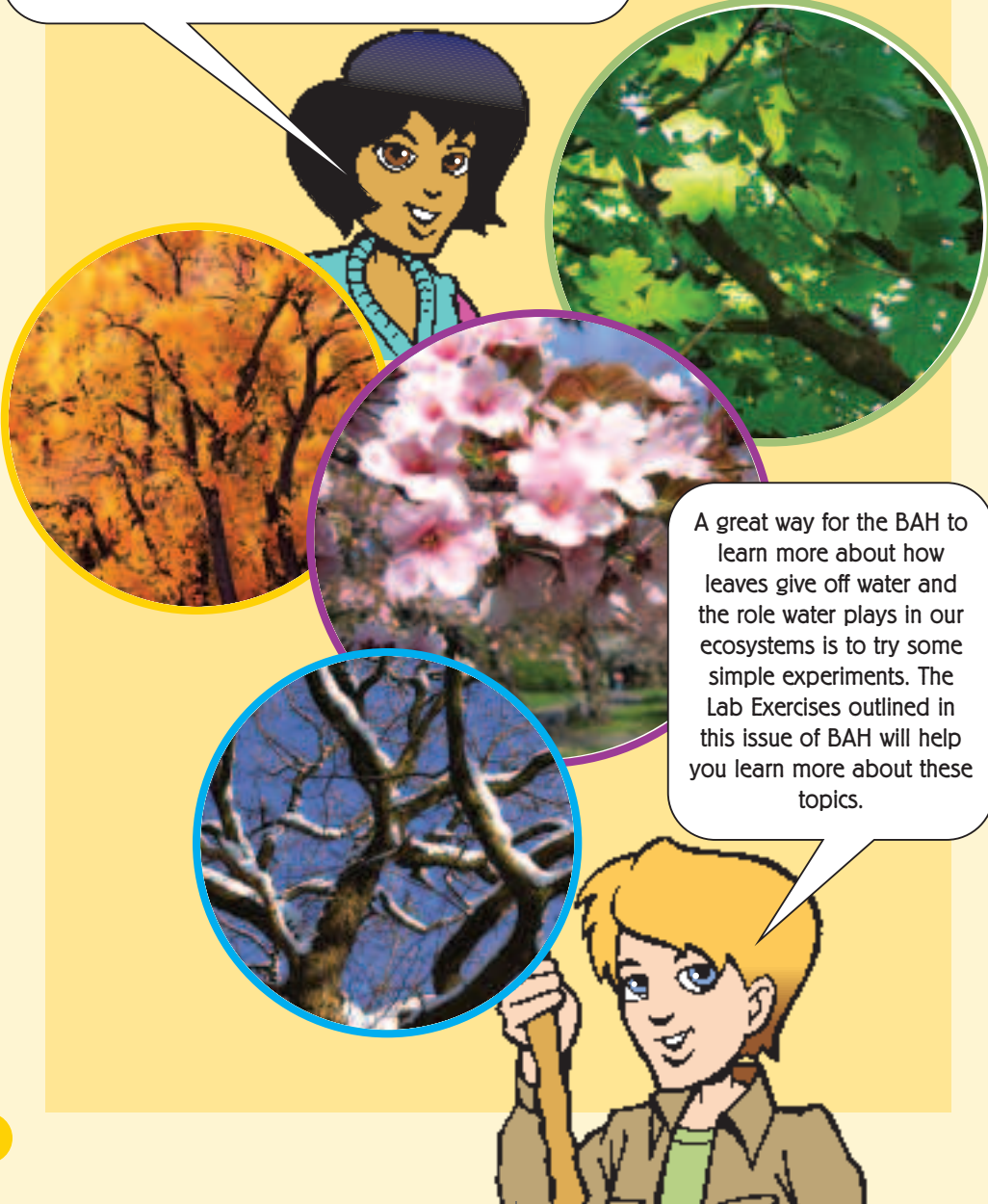




The term **deciduous** refers to those broadleaf trees that lose their leaves completely during the winter. Deciduous forests are usually found in those areas where the climate is considered temperate. Temperate areas experience the four seasons – spring, summer, fall, and winter – in a typical yearly cycle. The loss of leaves by deciduous trees and shrubs is an adaptation to situations where they have to deal with prolonged periods of time when water is not readily available. Winter is actually our driest time of the year, not only because of less precipitation, but also because of the ground being frozen. These conditions make it hard for roots to take in water. By dropping their leaves, deciduous plants go into a state of dormancy, which lessens the need for water during this difficult time.

Broad leaves give off a lot of moisture to the atmosphere through a multitude of small openings called **stomata**. You may have witnessed this phenomenon when you have gotten up on a cool fall morning and noticed fog in the air. Much of the fog is moisture given off by the plants overnight and condensation of that water vapor in the cool atmosphere. By going dormant and losing their leaves for several months, these plants avoid water loss during the time of year when water is precious.

**Coniferous**, or evergreen-type, trees have needle-shaped leaves. Needle-like leaves have much less surface area, thus fewer stomata from which to lose moisture. Coniferous forests can often be found in areas where prolonged winters or dry periods are the rule and going completely dormant for 6 to 8 months is not really an option. Coniferous trees are adapted to different living conditions than are our deciduous trees.



A great way for the BAH to learn more about how leaves give off water and the role water plays in our ecosystems is to try some simple experiments. The Lab Exercises outlined in this issue of BAH will help you learn more about these topics.

# LAB EXERCISE 1

## WHICH LEAVES GIVE OFF MORE MOISTURE?

This simple experiment will help you understand more about adaptations in plants.



You should witness that the broadleaf bag will show considerably more moisture, with droplets forming on the inside of the bag.

What you will have discovered is that the leaves themselves have given off moisture. This process is known as **transpiration**, which is a big part of the water cycle. Deciduous trees give off more moisture due to having more surface area and, therefore, more of the tiny pores that give off moisture in the atmosphere. Perhaps you can now see how having needle-like leaves helps a plant survive in drier regions.

- Collect 5 leaves from deciduous trees from your yard or near your school. They should be actively growing and green. Maples, oaks, beech or any similar broadleaf variety will work. They may all be from the same kind of tree or from different trees.
- You need to also collect 5 needles (leaves) from a coniferous tree. Look for some types of pine or similar evergreen.
- Place the five deciduous leaves in a freezer bag and the 5 needle-like leaves in another bag.
- Seal the bags and place them where they can get several hours of good sunlight.
- Check the bags after 2 or 3 hours and record your observations.



What did you observe?

---



---

From where do you think the moisture came?

---



---

Why do you think there is a difference in the amount of moisture that formed in the two bags?

---



---

## Lab Exercise 2

### HOW MANY DROPS OF WATER CAN A COIN HOLD?



Before you start, guess how many drops you think you can place on the coin before the water spills over the edge. You may be surprised!

Estimate:

Be sure to take your time and keep in mind that the idea is not to be right about your guess but to observe what happens. How close was your initial guess of how many drops could be placed on the coin, relative to your observations?

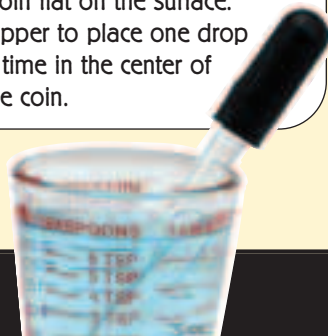
Actual:



This experiment is designed to get you to observe a particular characteristic of water called cohesiveness or surface tension.

- Get a small cup of water, an eyedropper and a coin – any coin.
- Find as level a surface as possible and place the coin flat on the surface.

Use an eyedropper to place one drop of water at a time in the center of the coin.



What you observed has to do with the nature of the water molecules themselves. Water is made up of oxygen and hydrogen ( $H_2O$ ).

Because of the way the hydrogen atoms and oxygen atom bond, water molecules act like little magnets, thus they have one side that is positively charged and the other side that is negatively charged. If you have ever played around with a couple of bar magnets, you know there is a north and a south pole, one positive and one negative.

Opposite charges attract each other and like charges repel each other.

What this means then is that every molecule in a drop of water is like a little magnet. What you observed was the molecules trying to hold on to each other because of these opposite charges. Every drop contains billions and billions of molecules. The reason the water on the coin creates a dome is that the forces holding the water molecules together are greater than those that are trying to pull them apart. It is when the pulling apart forces become greater than those holding them together that the water on the coin begins to spill over.

Can you guess what force is trying to pull the molecule apart? How about gravity?



The simple property that you witnessed in the experiment can explain a lot of things we see in nature. The water strider appears to walk on water because it uses 4 of its 6 legs to spread its weight over as many water molecules as possible on the surface of the water. The water molecules form surface tension and hold together like little magnets. If the strider stands on enough of them, then the force of gravity that would make him fall through the water is not great enough to break those surface molecules apart. The strider uses its other 2 legs to "row" itself across the top of the water.

Similarly, a "belly flopper" into the swimming pool hurts because, by hitting flat, you spread yourself over more of those water molecules that are clinging together. When you hit, they are not able to separate out as fast over such a large area, thus they resist you going through and you end up with a stinging, red belly.



The characteristic that you studied in the experiment also plays a big role in controlling temperature, both within living things and in the ecosystems where they are found. When you read a thermometer, you may not realize it, but that reading is actually a measurement of how fast the molecules are moving. The faster molecules move, the warmer things are.

Because the water molecules hold together like magnets, it takes a lot of energy to get them moving. This is why when a pot of water is put on the stove and the heat is turned on, it doesn't immediately get hot. It takes a while for the water to heat up since the molecules are trying to hold together. Once they get moving, which you witness as the water "boiling", the water retains its heat and stays hot for some time after the heat source is removed.

Water retains heat because once those little magnet-like molecules start bouncing around, positive sides will run into positive sides and negative sides will run into negative sides. You know this from bar magnets, which cause a repulsive force, thus keeping the molecules moving. It won't be until positives and negatives all line up together again that things will start to slow down and, therefore, cool off.



Creatures like us, as well as other mammals, have a lot of water in our cells. A person's weight on a daily basis is made up of 60-90% water. Mammals with more volume relative to their surface area are able to retain more heat. This explains why certain groups of animals, like deer and bears, tend to be bigger (more volume) in colder climates.

Ecosystems have varying amounts of water. **Humidity** is a measurement of the amount of water in the air at a given time. Rainforests maintain about 100% humidity, so they hold on to their heat throughout the night. In the desert where the air is very dry or lacks water, the air molecules do not retain as much heat, so it gets very cool at night. During the day, the lack of water causes it to heat up very fast, thus temperatures in the desert vary a lot from day to night.

# ANIMALS OF THE DECIDUOUS FORESTS

Just as the plants of the deciduous forest have special adaptations for survival, so do the animals living there. As mentioned before, most areas of deciduous forests are in places where there are distinct seasonal changes. Winter tends to be the time of year that is hardest on the living things. Winter means possible periods of frozen ground and water sources, less sunlight, lower temperatures and less precipitation.

The ways that animals in these areas deal with these conditions vary according to the species. Some deciduous forest animals deal with the winter in a way that is similar to how plants deal with



it. Plants go **dormant**. Some animals hibernate. **Hibernation** involves a slowing down of the animal's metabolism. The heart rate, breathing/respiration and digestive system all slow down to almost undetectable levels. The heart may beat once or twice every minute, while breathing may slow to 2 to 3 breaths a minute. The animal appears to be in a deep sleep.



Other animals deal with the changing seasons by **migrating** to warmer areas. Many birds and insects in our area deal with the colder weather this way. While some, like songbirds and hummingbirds, migrate out; other species, like eagles and owls, migrate in. What may be cold to one species may be perfect for another.

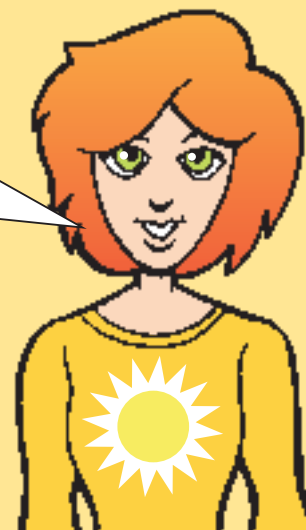
Others, such as cardinals, finches and blue jays, just stick it out by staying active during the winter and foraging on food sources that may be a bit different than those they feed on in warmer times.





The staff at the Louisville Zoo knows a whole lot about all kinds of animals and how they behave. In fact, they are real experts on animal care and wildlife conservation. Several of these animal experts want to share some information with you about the animals they work with and care for every day. They love to share their knowledge with kids who share their passion for wildlife!

Hibernation just happens to be the topic addressed by Steve Wing, the Zoo's General Curator. Steve is also the chairperson of the Association of Zoos and Aquariums (AZA) Bat Advisory Group, which directs breeding programs and *in-situ* (in the animal's natural habitat) conservation efforts for bats worldwide.



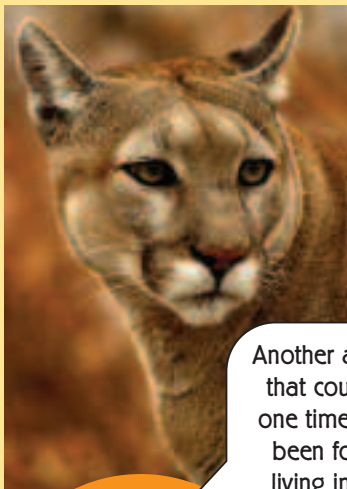
Many animals often associated with hibernation do not actually hibernate. Bears are a good example of an animal that slows down a bit and may go into a state of **torpor**, which is truly a deep sleep, for periods of time, but they do arouse regularly to forage for food. Examples of animals that actually hibernate are ground squirrels, bats, snakes, turtles and frogs. The

## HIBERNATION IN BATS

**B**ats that live in Kentucky and Indiana are exposed to a wide range of seasonal temperatures. Many respond by entering hibernation in winter. Others migrate to warmer climates. The drop in evening temperatures causes a decline in insect activity. The reproductive cycles of many bat species are closely linked to the availability of insects. Bats in our area give birth in the early spring just as insects are becoming abundant.

*Steve Wing*





Another animal that could at one time have been found living in our forests is the favorite topic of Zookeeper Dave Hodge.



### THE CAT OF MANY NAMES

It is a creature of stealth in the forest. It has many names. Mountain lion, screamer, catamount, ghost cat, cougar, and panther are but a few. At the Zoo, we use the name puma. It is a great cat of the Americas. This tan and white

predator can reach a weight of 130 pounds for females to 200 pounds for males. Its range is from the tip of South America to the Yukon. It feeds on animals from deer to birds. In spite of its range, it is rarely viewed in the wild, which earns it yet another name – ghost walker.

*Dave Hodge*

#### READ ABOUT IT, WRITE ABOUT IT!

Do some research on your favorite forest-dwelling animal. Then write a profile of that animal.  
*Follow this format:*

Common Name: \_\_\_\_\_  
Scientific Name: \_\_\_\_\_  
Range: \_\_\_\_\_  
Habitat: \_\_\_\_\_  
Diet: \_\_\_\_\_  
Behavior: \_\_\_\_\_  
Other Points of Interest: \_\_\_\_\_  
Status: \_\_\_\_\_  
Can you see this animal at the Louisville Zoo? ☐ Yes ☐ No  
Why is it your favorite?  
\_\_\_\_\_



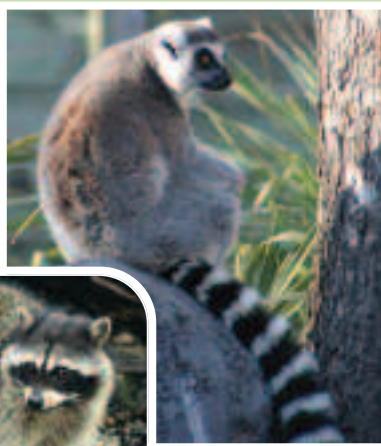
Living things have **adaptations** that have developed throughout their natural history. This is true for our deciduous forest species, too. Some creatures on opposite sides of the world have developed similar features or adaptations to similar environments, even though they are not closely related. Others that are quite closely related may actually appear very different due to having been influenced through time by different environments. This was one of the things that led Charles Darwin and Alfred Wallace to develop their theories on Natural Selection. Candy McMahan, Assistant Curator of Mammals at the Louisville Zoo, talks about this topic in relation to an animal that is common in our deciduous forests.



## LEMUR OR RACCOON?

**K**eepers often hear visitors referring to the ring-tailed lemurs as raccoons. These two species are unrelated and quite different in spite of their superficial resemblance. Raccoons, native to Kentucky, are well adapted to life in a deciduous forest where the weather and food supply change with the seasons. Lemurs would not survive the cold winters when the trees do not provide the fruit and leaves they need. Raccoons not only have different food sources, they store fat to help them through times when food is difficult to find.

*Candy McMahan*





As mentioned earlier, one of the most important **abiotic** (non-living) factors influencing living things is temperature. People visiting the Zoo often ask how certain animals living here but not originally from this climate deal with the changes in temperature. Jane Ann Franklin, our head trainer at the Zoo, addresses this topic with her BAH report:



## SOME LIKE IT HOT!

**W**e deal with temperature variations on a day-to-day basis. During the cooler months, animals like the snow leopards and Siberian (or Amur) tigers are outside a lot but others that are generally found in warmer climates, like the Sumatran tigers and gorillas tend to want to stay inside, or go out for very short periods of time.

We do training with our animals all year, but we actually do more of it in the winter, teaching new behaviors if needed, and keeping the animals engaged and busy. This is important during the time when there are fewer Zoo visitors and, therefore, diminished visitor enrichment for the animals!

Each species has its own temperature parameters (the amount of heat or cold it can stand.) For example, we will allow our Sumatran tigers outside when it is 35-40 degrees and sunny. The tapirs and orangutans need temperatures in excess of 45-50 degrees. And most of the birds prefer that it be warmer still. One of the benefits of all of the training we do is that if the weather is suitable, animals can go outside for a short period of time and get fresh air and sunshine, and then they will come back inside when we call them.

The same theories apply to the very hot summer weather when polar bears prefer the cool water of their pool, while the rhinos, lions, and elephants don't mind the heat at all. Of course, any animals outside during the summer have access to shade and plenty of water.

*Jane Anne Franklin*

## FYI Training and enrichment

activities are very important to the health and well-being of many of the animals at the Zoo along with a healthy diet and appropriate exercise. Training allows zookeepers to get animals to do certain behaviors on command. This is useful in several ways. The animals get some mental exercise and the behaviors they learn help our keepers and veterinarians take better care of them. For example, our gorillas and orangutans will offer their ears so we can take their temperature and their arms so we can check blood pressure. And when one of the tigers was pregnant, training allowed the veterinary staff to perform ultrasounds. Enrichment activities also offer the animals new and different things to do. It might be a new boomer ball for the polar bears, mirrors for the birds or tree branches for the elephants to strip of bark and leaves. What kinds of enrichment activities do you do as part of your daily life?

## Lab Exercise 3

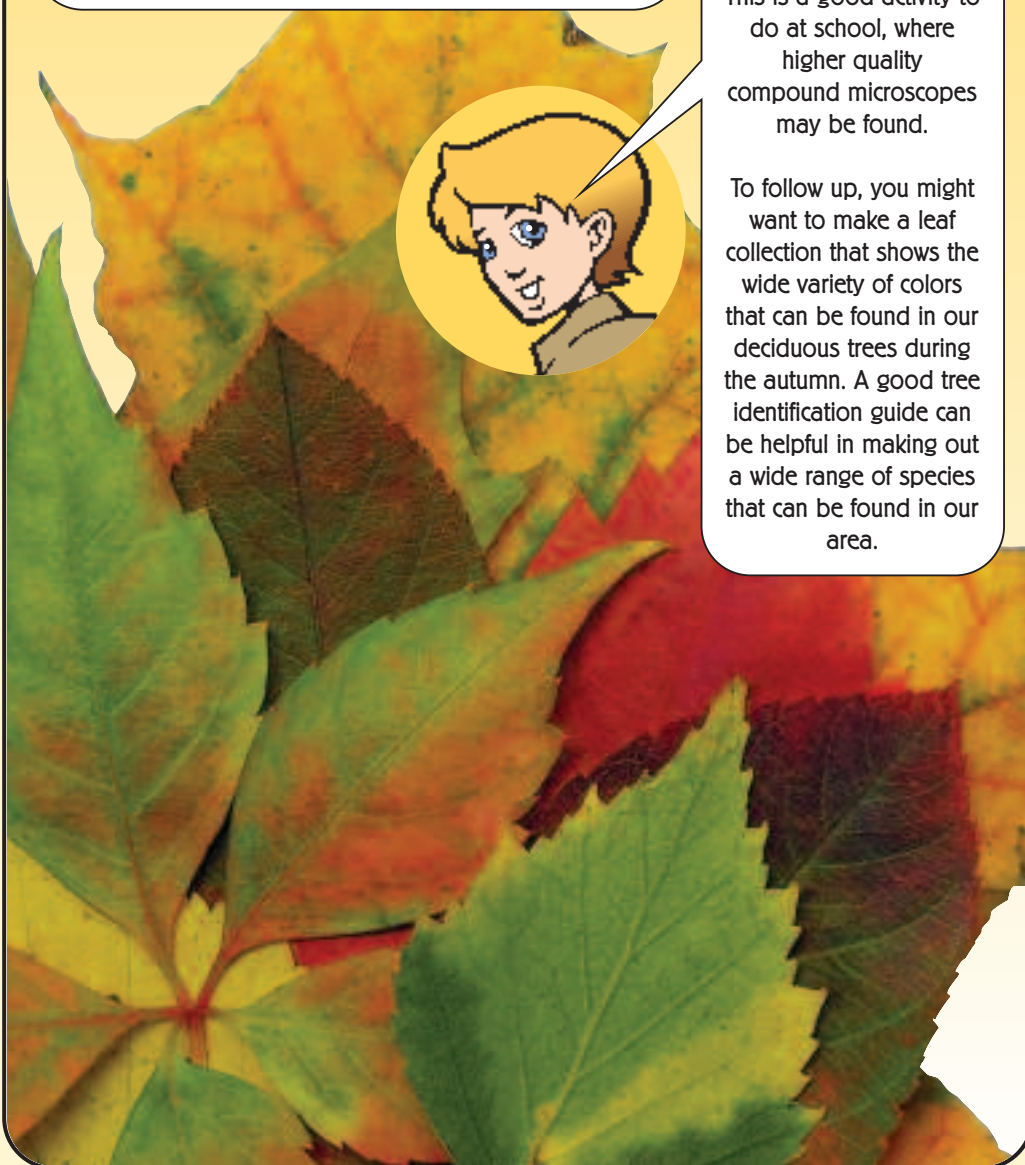
### CAN YOU SEE THE DIFFERENT COLORS?

One of the more interesting aspects of our deciduous forests that most people notice every fall is the changing colors of the leaves. What is not as well known about this phenomenon is that those colors that show up each fall were actually there throughout the year. The green of the leaves is a result of an abundance of the pigment **chlorophyll** that invades those leaves during the process known as photosynthesis. **Photosynthesis** is how plants convert the energy of the sun and non-living materials, such as water and carbon dioxide, into organic matter. When we see the colors changing, we are witnessing the retreat of the chlorophyll from the leaves back into the stems and roots to be used again next spring. This makes it possible for the natural pigments of the leaves to stand out, no longer being overpowered by the green chlorophyll.



The chlorophyll can be seen in the cells of the leaves as flowing little bodies known as **chloroplasts**. You can see the chloroplasts with a decent microscope. This is a good activity to do at school, where higher quality compound microscopes may be found.

To follow up, you might want to make a leaf collection that shows the wide variety of colors that can be found in our deciduous trees during the autumn. A good tree identification guide can be helpful in making out a wide range of species that can be found in our area.



## JOIN THE BAH ECO WATCHERS

**T**his year, we're asking students from all over Kentucky and Indiana to become Eco Watchers.

It's simple and only requires you to be observant and get permission from your teacher or parent to contact the Louisville Zoo through our web site. Here's how it works.

- Log on to the Zoo's web site at [www.louisvillezoo.org/education/BAH-eco](http://www.louisvillezoo.org/education/BAH-eco) and print out your Observation Chart.
  - Choose any or all of the items to observe (things like leaves changing color, sighting the first butterfly in spring or the first snowfall in winter).
  - Record your observations on the chart.
- To share your observations with us, log on to the Zoo's web site at [www.louisvillezoo.org/education/BAH-eco](http://www.louisvillezoo.org/education/BAH-eco)
- Fill in the electronic form and submit it to us. We'll record and post your information on our web site. You can compare your findings with students from other parts of Kentucky and Indiana.

There will also be some questions for you to consider as you view the information.



The diversity of temperate deciduous forest ecosystems goes far beyond the plants and the animals. One of the more defining characteristics of these forests is the yearly build-up of dead organic matter, known as **detritus**. This build-up means that the forest floors generally consist of thick, fertile soils. Within these soils lie many types of detritivores. Bacteria, fungi and insects take the fallen leaves and branches and help break them down into humus, giving the forest floor rich, thick soil. This is one of the reasons that much of deciduous forest ecosystems throughout the world have been converted into agricultural land. It must be noted, though, that once that ecosystem is removed to make way for agriculture, the system that creates the fertile soil goes with it. Many of the species associated with the deciduous forests also disappear.

We can create fertile soil for our own gardening projects through the creation of a compost pile. John Glenn, Horticulturist and Landscape Architect at the Louisville Zoo, addresses this aspect of deciduous forest in his BAH discussion:







## COMPOSTING NATURE'S TINY UNIVERSE ON A FOREST FLOOR

**O**n the forest floor under the leaves of the last leaf drop is an amazing universe. The forest has developed its own fertilizer processing plant using mushrooms, sow bugs, ants, earthworms, centipedes, and millipedes. All those creepy crawly things chew up leaves and other plant parts to make a rich humus soil with lots of fertilizers and chemical elements that, change to turn, feed the trees and shrubs of the forests. As you kick the leaves around, you will discover a rich world of tiny insects, as well as microscopic creatures, all with the intent to eat the fallen leaves of the trees.

A backyard compost pile is a great way for a BAH to help the environment. By composting leaves and grass clippings from the yard, we save on the amount of stuff heading to the landfills. This valuable organic matter may be used to enrich soils in



both flower and vegetable gardens and will help cut down on the need for chemical fertilizers. There are many simple and inexpensive ways to start a compost pile. You may want to do some research and start one in your backyard today!

*John Glenn*



### GET INVOLVED!

There are lots of ways a BAH can get involved in helping us all protect our planet. Helping often starts with learning more about what is going on in our own backyards.

- ☐ Reduce, reuse and recycle.
- ☐ Organize a cleanup and pick up litter day around your school or in a local park.
- ☐ Try to buy products made of recycled materials. Also, choose products with the least amount of packaging.
- ☐ Learn as much as you can about animals and animal habitats and how to help preserve them. The Louisville Zoo is a good place to start.

Let us know what you are doing as a BAH. Contact us through the Louisville Zoo web site at [www.louisvillezoo.org](http://www.louisvillezoo.org).

## HEY, BACKYARD ACTION HEROES!

We'd like to know your opinions about this book so we can plan an even cooler book for next year. Please take a minute to answer these questions. Then bring your completed survey to the Zoo and get FREE admission with the coupon below. If you can't make it to the Zoo, we'd sure appreciate it if you'd mail us your completed survey! Just send it to:

BACKYARD ACTION HERO SURVEY  
Louisville Zoo, PO Box 37250, Louisville, KY 40233

## BAH SURVEY FORM

Did you and your teacher use this Backyard Action Hero Book in your class at school? Yes ☐ No ☐

If so, what parts of it did you and your teacher use? \_\_\_\_\_

Did you use this Backyard Action Hero Book at home? Yes ☐ No ☐

What was your favorite thing in the book?

- ☐ The BAH characters ☐ The activities  
☐ The cool facts and information ☐ Other (please list)

What was your least favorite thing in the book and why? \_\_\_\_\_

List 3 things you learned from this book that you did not know before.

List any other comments and ideas you have that might help us make a better book.

Do you feel smarter about conservation? Yes ☐ No ☐

Do you think that will make you take better care of the environment? Yes ☐ No ☐

## COUPON

Present your completed survey along with the coupon and receive  
**ONE FREE CHILD'S ADMISSION**  
**WITH THE PURCHASE OF ONE REGULAR ADULT ADMISSION**  
at the Louisville Zoo

Valid during regular Zoo hours. Not valid with other offers or discounts. Expires 12/31/06 • #950000705



**theZOO**  
LOUISVILLE



The Louisville Zoo is a 501(c)(3) not-for-profit organization accredited by the Association of Zoos and Aquariums (AZA) and The American Association of Museums (AAM).



Printed in cooperation with the Kentucky Department of Tourism.



Shaping the Future

Presented by **TOYOTA** | georgetown  
www.toyotageorgetown.com