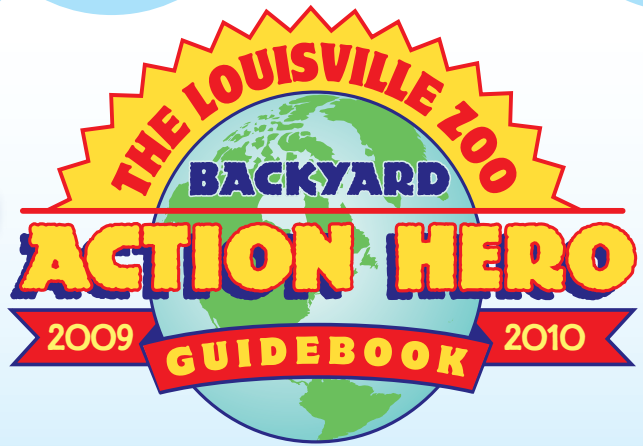


Toyota | georgetown

TOYOTA MOTOR MANUFACTURING, KENTUCKY, INC.



Starring Wade, Alden
Skye & Tanya, the
Backyard
Action Heroes

ADVENTURES IN THE TUNDRA

Featuring Cool Activities!
Fun Facts! & Awesome Animals!

Have you ever wondered what life would be like living on top of the world? Or how about living on top of one of the highest mountains in the world? Well, that is what this edition of the Backyard Action Hero Guidebook is all about. We are going to explore life in some of the harshest regions on the planet, the Tundra!



WELCOME FUTURE HEROES!

We 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 continually 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 coexist 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?

A Backyard Action Hero – or BAH as they are called – is a kid who is really into wildlife and habitats and is ready to take action to protect them. They think being “green” is cool, and they know that to really make a difference you not only need to learn, but you also need to act! BAHs care

about animals and habitats in their own backyards as well as all around the world. Since the Louisville Zoo is a cool place to learn about all kinds of plants and animals, our BAH crew will check out what's going on there and introduce some of the Zoo's real life conservation heroes!



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 all about animals. They all think being green is cool and they're all ready to help you take action to help the planet!

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Printing by Publishers Printing
Produced by the Louisville Zoo

HELLO!

(That's how they say "Hi" in Finland)

Have you ever wanted to just get away from it all? Before you answer, check out this "cool" info about one of the most remote areas on the planet and find out how the Louisville Zoo and Backyard Action Heroes like yourself are making a difference in preserving the "extreme" biome known as the Tundra.

The word "tundra" comes from the Finnish word "tunturia" and the Uralic word "tundâr." Both mean about the same thing - a treeless tract of land.

There are two types of tundra: the Arctic tundra and the Alpine tundra. Either way you slice it, living in the tundra means cold days and nights, frozen ground without much vegetation, and not a lot of people.

Did You Know?

The Louisville Zoo is one of only 218 zoos that are members of the Association of Zoos and Aquariums (AZA). The AZA is an important group that ensures that animals get great care and visitors have great experiences at their zoos.



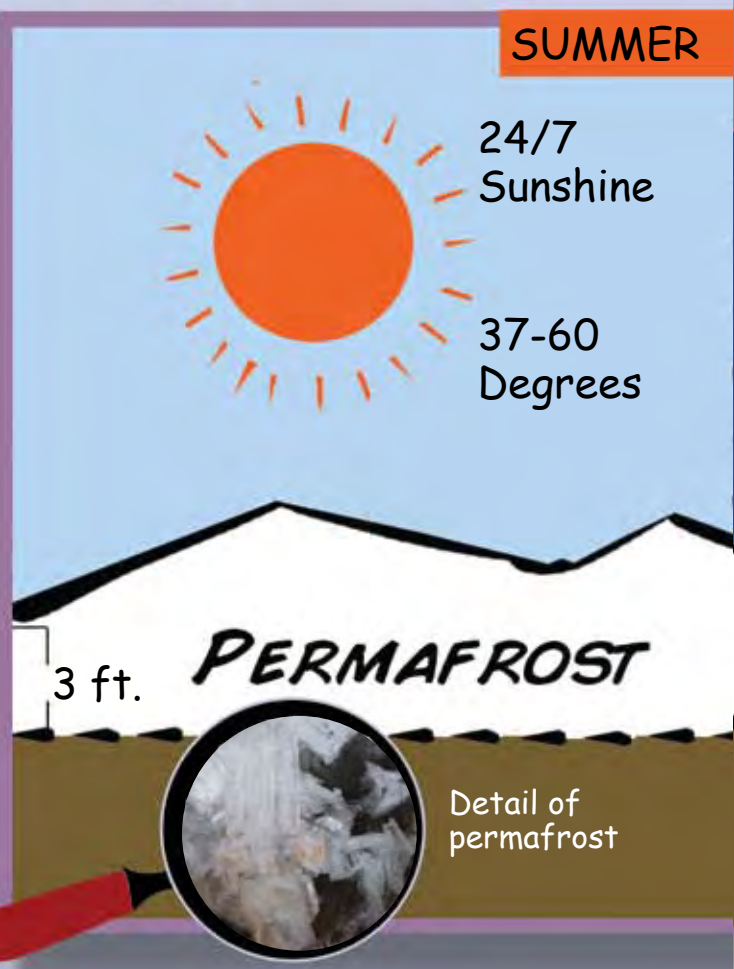
NOW THAT'S HARSH!

Just how cold does it get in the tundra? In the Arctic tundra, which includes areas of northern Finland, Russia and Canada, the average temperature is about 18 degrees below zero Fahrenheit. Compare that to the average low temperature of Louisville in January, which is about 25 degrees *above* zero. The tundra is also a very windy place, with winds typically ranging between 30 and 60 miles per hour.

Now, granted, summertime brings warmer temperatures, with a range from about 37 degrees to 60 degrees above zero. Summer also brings 24/7 sunshine. But don't expect to hang out on an Arctic beach. The ground or soil in the tundra is permanently frozen, with ice as much as three feet deep. Hence the term, *permafrost*. Don't plan on great skiing weather, either. Despite the cold, or rather, because of it, it doesn't snow much in the tundra. The atmosphere is too chilly to contain much water vapor. Even during the warmer season, when the upper layers of the permafrost thaw, the year's snow only adds up to about eight inches of water.



Wolf



Rabbit



These harsh conditions limit the biodiversity of the tundra. There are only about 50 species of mammals found in the tundra. Although this number of species is relatively low, there are some rather large groups of individuals within these species living in the tundra.

Some of the mammals you might come across include rodents, rabbits or hares, shrews, wolves, foxes, bears and deer. It might surprise you to learn there is actually quite a large number of insects in the summer: black flies,

deer flies, small biting midges and especially mosquitoes. Mosquitoes survive the winter under the snow by replacing all the water in their bodies with an antifreeze-like substance called glycerol. Summertime also brings flocks of migratory birds, including geese, ducks, sandpipers and plovers.

Mosquito



Geese



Vole



Fox



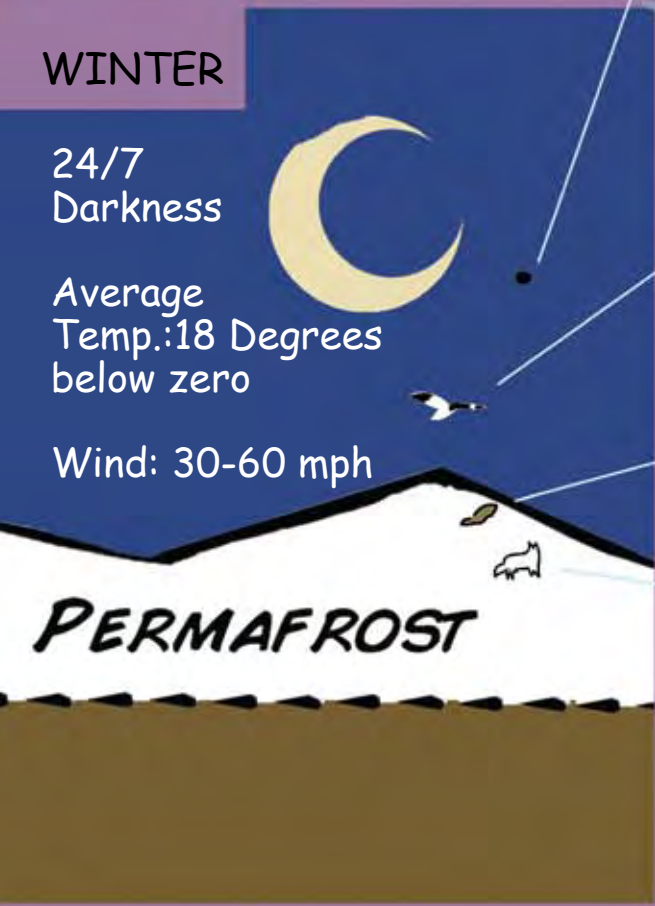
WINTER

24/7
Darkness

Average
Temp.:18 Degrees
below zero

Wind: 30-60 mph

PERMAFROST



CARIBOU TO YOU, TOO!

One of the species of mammal that thrives in the tundra is the caribou. Large herds make their way onto the tundra to feed on the lichens and plants that grow there, and to give birth. What makes the caribou so comfortable in the cold, harsh weather of the tundra? Let's find out from Candy McMahan, Assistant Curator of Mammals for the Louisville Zoo, who has first-hand – or rather, first-hoof – experience caring for caribou.

“Caribou, which are also known as reindeer, are uniquely well-adapted to live in the extreme conditions of the circumpolar region called the tundra. Their hooves are wide and round, which helps them walk easily on the slick surface of the snow and ice, or on the spongy ground in the summer. They have a two-layered coat, which includes a dense undercoat to ward off the cold temperatures. The truth is, I’ve never



Mistletoe/Reindeer

Female caribou grow antlers, just like their male counterparts, which helps them compete for food. This is especially important for females that are getting ready to give birth.

Because of the many ways that reindeer or caribou have adapted to the harsh conditions of the tundra, they are one of the few animals in the arctic that have been domesticated by humans. They are used in the same ways as cattle are used in temperate areas — for milk, meat and hides. But even though the caribou is able to exist and co-exist in this severe wilderness, they are not immune to environmental change. In fact, one subspecies, the Arctic reindeer, once found in Greenland, has been extinct since about 1900.”

Candy McMahan, Assistant Curator of Mammals



Kara Bussabarger

Candy McMahan,
Assistant
Curator of
Mammals

seen a reindeer with a red nose, because their noses are actually covered in fur, too!

Related to the deer, the caribou's extremities are shorter, which helps prevent frostbite. Another characteristic of the caribou is its ability to accumulate fat in the summertime. Storing it helps them survive when food is scarce in the winter.



Did You Know?
caribou are the only deer where
males, females, and calves produce
antlers.

RAISE YOUR ADAPT-ITUDE!

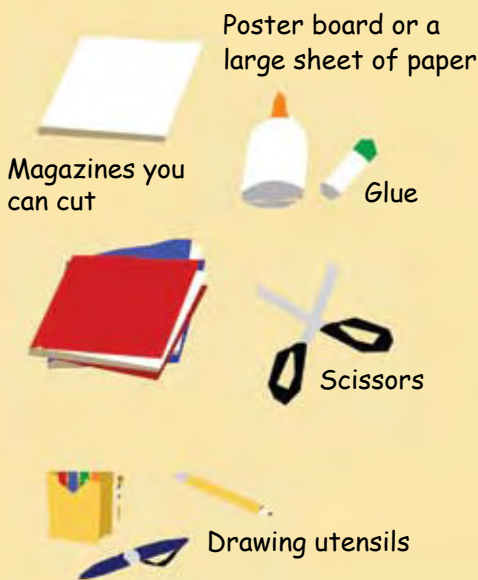
Have you ever wondered how a fox survives in the arctic or why a zebra has stripes?

Animals display a wide and fascinating range of adaptations to help them survive in the environment where they live. These adaptations can be observed in two ways: form and function. The form has to do more with the physical characteristics of specific body parts – fur or skin color, shape, flexibility, etc. Function describes how those specific body parts are used – to pick up objects, to climb trees, to dig for food, to blend in.

What animal adaptations can you observe? What purpose do they serve? How do you make similar adaptations in your day-to-day life?

First, choose an area of the world that interests you – maybe it's a place you've visited, or maybe it's a location you want to learn more about. Think in terms of an ecosystem. You can use the areas of the Louisville Zoo, too, such as the islands of Indonesia, the tropical rainforests or the

For this activity, you will need:



savannahs of Africa, the Australian outback, or, of course, the tundra of Glacier Run.

Using old magazines or the Internet, look for pictures of animals that live in the ecosystem you've chosen. Cut out the pictures and paste them on your poster board. Or, you can draw the animals.

Once you've found several pictures and filled up your poster board, see if you can identify form or function adaptations in the animals you've collected. Here are a few things to look for:

- What color is the animal? How does the animal's color help it survive in its habitat?
- Does it have fur? Why or why not?
- Does the animal have any unique body parts, like a tail or a trunk? What are they used for?
- Does the animal have short or long legs, or no legs at all?
- What does the animal eat? Are there any physical traits that could make finding or catching food easier?
- Can you identify any characteristics that all or most of the animals in one ecosystem share?

If you enjoy this activity, create another poster for a different ecosystem. Then, compare the animals of one ecosystem with the animals in the other. How are they the same? How are they different?

WHERE ARE ALL THE PLANTS?

Not only are there few species of animals living in the tundra, there is also limited plantlife. The dominant vegetation is composed of mosses, lichen, sedges and other low-growing plants. The combination of cold temperatures, rocky ground, and a winter night that lasts for weeks contributes to the types of vegetation that are able to grow in the tundra. The thawing in summer and the subsequent boom in vegetation growth play an important role in the migratory cycles of many species, including the caribou.

The growing season in summer is only 50 to 60 days long. There are only about 1700 species of plants that have been identified in the various tundra areas, about 400 of which are varieties of flowering plants. Although there are very few trees, dense mats of plants grow in areas where root systems have developed over thousands of years.

MOSS



LICHEN



SEDGES



A FEW TREES



CHANGES IN ATTITUDE CHANGES IN ALTITUDE



Alpine tundra

But even if you like the Arctic attitude, let's say you are looking for something with a little more altitude. High atop some of the world's tallest mountains, between the treeline and the snowcapped top, you'll find the Alpine tundra.

The Alpine tundra occurs at an altitude that is too high for trees to grow, but can occur at any latitude on Earth, from the Tibetan Plateau to the Indian Peaks region of Colorado. The vegetation in the Alpine tundra is similar to that found in the arctic, although with more sunshine, no real permafrost develops on top of the soil. Drainage is better in the Alpine tundra, where grasses, dwarf trees and small leaved shrubs can grow.

For several weeks every summer, the Alpine tundra in the U.S. bursts with wildflower growth, providing food for a variety of animals such as mountain goats, elk, sheep, pika, marmots, and other ground squirrels. The major predators tend to be large birds of prey, such as golden eagles.

Golden eagle



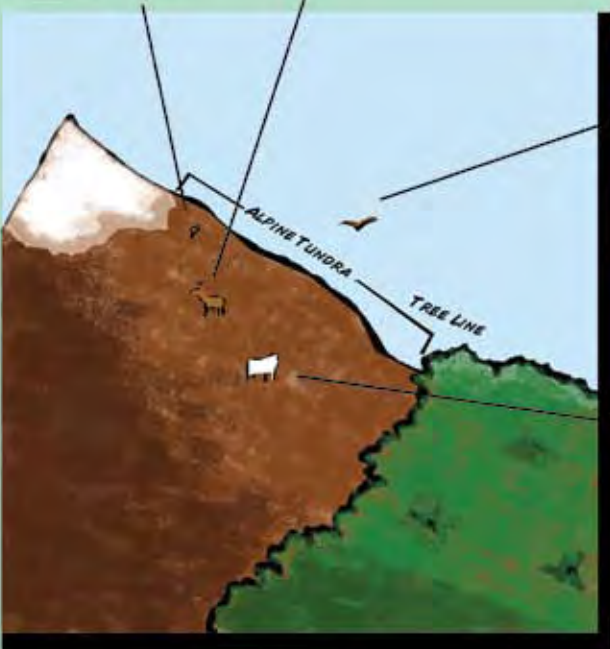
Elk



Marmot



Goat



DUDE, THAT STELLER'S SEA-EAGLE IS STELLAR!

One of the most dramatic predatory birds that enjoys the colder climates is the Steller's Sea-eagle. Weighing in at as much as 20 lbs, it's certainly one of the biggest. The Steller's Sea-eagle keeps its cool in the snowy Eastern regions of Russia, but summers in Japan when the temperature really drops.

Viewing the Steller's Sea-eagle at the Louisville Zoo, where it will soon be a part of the new Glacier Run exhibit, it's hard to believe this powerful, majestic bird is very vulnerable in the wild. Let's find out a little more from Gary Michael, Curator of Birds at the Zoo.

"The Louisville Zoo joined forces with the San Diego Zoo more than a decade ago to conserve the Steller's Sea-eagle (*Haliaeetus pelagicus*). The species is listed as vulnerable to extinction by the International Union for the Conservation of Nature and Natural Resources (IUCN). The population is declining as a result of over-logging and pollution in its primary breeding area of Russia, and over-fishing in Japan where the species often migrates, which limits the food supply for the birds. Today, it's believed that fewer than 5,000 birds live in the wild.

What makes conservation efforts even more challenging is that we know very little about the habits of the species' young, particularly birds less than four or five years old. This lack of information makes it extremely difficult to manage the population in the field. To combat this challenge, the San Diego Zoo, in partnership with international groups, has outfitted ten youngsters with radio transmitters that allow researchers to monitor the birds' activities. As a second approach, a captive population is being



Kara Bussabarger

developed. At present, eight adults and two offspring are housed at five facilities, including Louisville.

Our pair of Steller's Sea-eagles will be housed in a massive aviary at Glacier Run, designed to provide a beautiful, naturalistic habitat and breeding center for these incredible creatures. Along with our colleagues in sister institutions of the Association of Zoos & Aquariums, the Louisville Zoo has made a long-term commitment to conserve this rare flagship species for conservation programs."

Gary Michael,
Curator of Birds



Kara Bussabarger

MAKE YOUR OWN GLACIER!

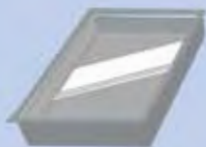
Glacial ice covers about 10% of the earth, including many parts of the ecosystem known as the tundra. The biggest glaciers are found in Greenland and Antarctica, but you can even find small glaciers at higher elevations of mountain ranges.

As you will read in the next part of this Backyard Action Hero magazine, the ice of the Arctic is forming later and melting earlier. While that has an immediate impact on the hunting habits of the Polar bear, it will also have a long-term effect on the entire ecosystem.

Since it's a little hard to observe glaciers these days in Kentucky, here's how you can make your own.

For your block of ice, fill a shallow plastic container with water and let it freeze (this

You will need:



A large pan



A thick book



Sand, or sandy soil



Small stones



A block of ice
(see above for directions)



might take several hours!). If possible, put a handful of small stones into the water before freezing it. Once the water is frozen, dip the bottom of the container in hot water to make it easier to remove the ice from the container. Your ice block should be fairly heavy.

Pack damp sand into the pan, filling it about halfway. Create a mound or "hill" in the center of the pan with extra sand. Place three or four of your smallest stones on the top of the mound, lightly pushing them into the soil.

Rest one end of the pan on top of the book, so that it's slightly tilted. After removing your ice block from the container, set it on top of the mound of sand you created in the center of the pan.

Now, let your glacier melt! Check on it occasionally to see what changes you can observe. Look for areas of erosion caused when the glacier pushes against the stones in the sand. Where do the stones that were frozen in the ice end up?

If time allows, you can try this experiment twice – once indoors, once outdoors (that is, at two different temperatures). What differences do you notice in the soil when the ice melts more quickly or more slowly? Where does the water from the melted ice go?

LORDS OF THE ARCTIC!



So, you have your gear packed. Snowshoes? Check. Chapka (that's a hat)? Check. Five pairs of warm mittens? Check. You're ready for your trek to the tundra, and what is the one animal you really hope to see?

How about the Polar bear? Perhaps the species most associated with the Arctic, the Polar bear, is the largest land carnivore, almost twice as big as the Siberian or Amur tiger. Like the caribou, the Polar bear has many adaptations that make living in this harsh region possible. Its feet are covered in fur to provide traction on the frozen sea ice. Although they appear to be white from a distance, their fur is really transparent. Each hair is a clear,

hollow tube which channels sunlight down to their skin which is actually black. The dark skin allows them to absorb this heat throughout their massive bodies. Speaking of mass, Polar bears have as much as 10 centimeters (almost four inches) of blubber that acts as insulation.

With all these adaptations, and its position at the very top of the food chain, you might think the Polar bear can withstand any threat. But in 2006, the IUCN upgraded the species' status to vulnerable. Here to tell us about some of the detrimental environmental changes affecting the Polar bear is Dave Hodge, one of the main keepers for Louisville Zoo's new Glacier Run Exhibit.

POLAR BEARS: A COLD OUTLOOK

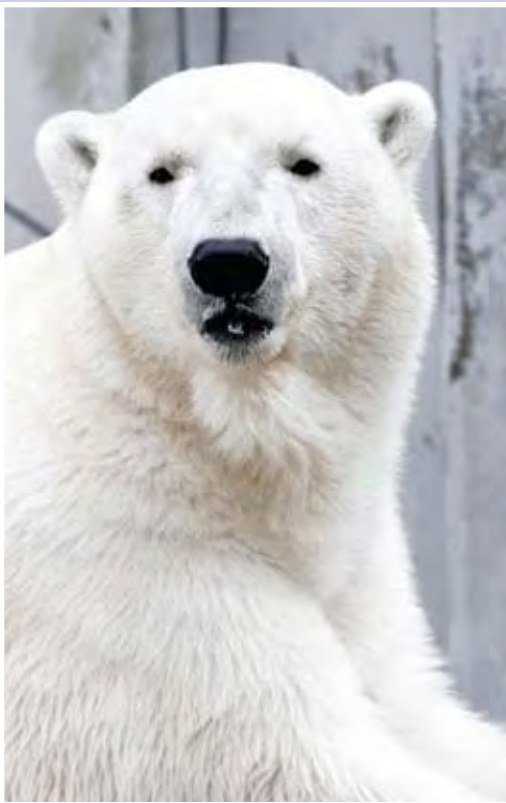
“The biggest threat to the survival of the Polar bear is climate change. Each year, arctic ice steadily erodes, forming later and melting earlier. This decreases the time the bears can hunt their main prey, which is seals. Many bears are now finding they must swim longer and farther just to reach any place where they can find food. Polar bears are so tied to the seasons of the ice that they are classified as marine mammals. But many are now dying either by drowning or because they are too exhausted to hunt once they finally reach solid ground.

Some experts say that if the present conditions continue, Polar bears could become extinct in less than fifty years. Pollution and habitat loss due to gas and oil development are also contributing to the Polar bears’ rapid decline. While



it’s possible that some Polar bears might survive by moving inland, perhaps blending in with their brown bear cousins, it’s become increasingly evident in a short period of time that the ecosystem that supports the Polar bear and a lot of other wildlife is increasingly fragile.”

Dave Hodge, Head Keeper



Kara Bussabarger

The tundra is an important place, both fascinating and mysterious. The home to many unique and beloved animals, it is also a symbol of survival.

INTRODUCING . . . GLACIER RUN!



Artist drawing of Polar bear Exhibit in Glacier Run.

As a Backyard Action Hero, we're counting on you to help us spread the word about the tundra and incredible creatures that inhabit it. You may not be ready to lead an expedition to the Arctic, but we hope you will learn more about the animals that live there by studying them in school and at home. And soon you'll be able to visit and learn about some of them at the Louisville Zoo's new Glacier Run exhibit.

Glacier Run will be an amazing and fun new Zoo exhibit where you'll see seals and sea lions swimming and playing or basking in the sun, and polar bears foraging for food. Arctic foxes and snowy owls may appear on the path through town, accompanied by Zoo staff to greet you as you travel through the village.

The exhibit is designed to look like an old mining town in Churchill Canada—South of the Arctic Circle where humans and animals have created the delicate balance needed to share the same territory. As glaciers melt it becomes more and more difficult for the wildlife in the area to find food. Bears often wander through town in search of something to eat, and people must learn how to live with that.

The Louisville Zoo hopes to teach kids like you about these important endangered animals and their habitats, and help you discover ways that you can make a difference in creating a healthier planet for generations to come.

The new exhibit will include daily interactive presentations with seals, sea lions, and polar bears, where zoo keepers will teach you about what these animals eat, where they come from, how many of them are left in the wild, and why it's important that we care for and about them.

The Seal and Sea Lion Exhibit area in Glacier Run is set to open in the summer of 2010 and the Polar Bear Exhibit will debut in 2011. Be sure to check out the Zoo's website at www.louisvillezoo.org to learn more about the cool experiences that will be available to visitors when this amazing exhibit opens.



Sea lion

Glacier Run is sure to be a cool experience that won't give you frost bite!



HELP BUILD GLACIER RUN!

Your class, club, or entire school can help the Louisville Zoo make Glacier Run possible by making a donation that you can raise with a little creativity and time. Any amount, large or small, will help. By being a part of Glacier Run, you can help bring seals, sea lions, and polar bears back to your Zoo!

Here are some ways that you can raise funds to support your Zoo. Be sure to get permission from your teacher or principal before you start!

Pennies for Polar Bears OR Cents for Sea Lions and Seals.

Each class can bring a container (coffee containers and clean milk jugs are two ideas) and fill them with spare change. You'll be amazed at how quickly that change will add up!

Party for a Polar Bear.

At most birthday parties, the guests you invite bring a birthday gift. For your next birthday, consider asking your friends to make a donation to Glacier Run instead.

Stellar Bake Sale.

Host a bake sale in your school's cafeteria. Arctic-themed baked goods and information about Glacier Run will not only inform your classmates about the Zoo's new exhibit, but who doesn't love a "Sea Lion Snickerdoodle" or "Polar Bear Brownie." Check the Zoo's website for some cool recipes.

Cool Crafts for a Cause.

People love stuff handmade with love. Get your talented friends together in the classroom or at home and make bracelets or tie-dyed t-shirts and sell them to family and friends.

Involve Your Principal.

Enlist the help of your principal to provide a "prize" for the classes that raise money for Glacier Run. Perhaps he or she would give the winning class a "no homework day" or an extra recess. They might even



Artist drawing of the classroom in Glacier Run.

be willing to do something totally zany like dye their hair green!

Recycle for Glacier Run.

Help raise money for Glacier Run and help the environment too! Students and families can collect and recycle aluminum cans, or even just the aluminum tabs off the tops of cans. Proceeds from the recycling can be donated to the Zoo.

These are just some of the ways that you can make a difference and get involved in supporting your Zoo and the new Glacier Run exhibit. You will be receiving more information throughout the school year, including the PRIZES and AWARDS that you'll have a chance to win as a participant. Plus, every school that participates will get its name on a plaque in the exhibit – forever – and your class will be featured on the Louisville Zoo website!

Please visit www.louisvillezoo.org for more information about Glacier Run and more ways to get involved. Please send donations to Louisville Zoo, Development Department, 1100 Trevilian Way, Louisville, KY, 40213.

Thanks for using your Backyard Action Hero "powers" to help the Louisville Zoo.

GET YOUR PARENTS & TEACHERS INVOLVED, TOO!



Marcelle Gianelloni

The Louisville Zoo can be your partner in providing you, your family members & teachers with the knowledge & inspiration to be the future caretakers of nature & wildlife. Visit louisvillezoo.org/education for information about field trips, classes, camps, overnight programs, professional development and so much more.

Kentucky may seem like a long way from the tundra, but your efforts do make a difference. There are lots of ways a BAH and his or her family can get involved in protecting our planet. Here are some more things YOU can do!

REDUCE, REUSE AND RECYCLE

- Organize a cleanup day and pick up litter around your school or in a local park.
- Find ways to conserve around your house. Turn off the water while you brush your teeth. Replace burned out light bulbs with compact fluorescents. Turn your thermostat up or down a couple of degrees (up in the summer, down in the winter).
- Try to buy products made of recycled materials. Also, choose to buy products with the least amount of packaging. That means there's less to throw away.
- Learn as much as you can about animals and their habitats and how to help preserve them. The Louisville Zoo is a good place to start.



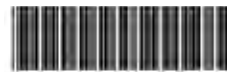
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