



Educational Resources  
for our Future Footprint

**animal**  
**TRACKS**

with the Pittsburgh Zoo & PPG Aquarium

# POLAR BLAST

Teacher Resource & Lesson Guide



PITTSBURGH ZOO  
& PPG AQUARIUM

# POLAR BLAST LESSON

Through the use of technology this class will provide a platform for students, without regards to their geographic location, to learn about the polar regions of our globe and the animals adapted to surviving in these harsh habitats. Students will have the opportunity to learn about the penguins that live at the Pittsburgh Zoo & PPG Aquarium. In addition to increasing knowledge program goals include fostering a meaningful connection to our penguins and thus encouraging further engagement in the conservation of our polar regions.

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## GUIDE SUMMARY

Students will access videos, journal entries, and participate in activities to learn about our northern and southern polar regions and the animals that live there. The Spotlight Penguin section includes videos about penguins at the Pittsburgh Zoo & PPG Aquarium.

This guide also includes firsthand information from educators who have visited Antarctica. Mr. Michael Penn, a teacher in the Shaler Area School District, went to Antarctica in 2018 as a member of a research team to install and maintain remote automatic

weather stations. Mr. Penn traveled to Antarctica through a program funded by the National Science Foundation called PolarTREC (Teachers and Researchers Exploring and Collaborating). He worked with a team from the University of Wisconsin, Madison on the Automatic Weather Station Project.

Throughout this guide you will find links to videos and journal entries chronicling Mr. Penn's adventures. [Journal entries from Mr. Penn's trip](#)

Each lesson activity contains extension ideas indicated by:



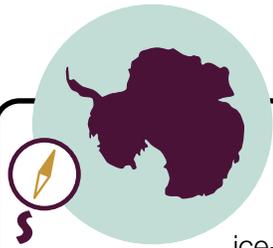
**CHICK** for less difficult extensions



**ADULT** for more advanced extensions

Support provided by Richard King Mellon Foundation

# POLAR FACTS



Antarctica is the region around the South Pole. It is an ice-covered continent surrounded by the Southern Ocean.

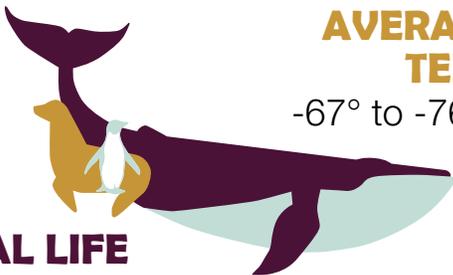
## ANTARCTIC

Continent surrounded by oceans



### PLANT LIFE

Mosses, lichens and two flowering plants grow close to coastal areas.



### AVERAGE TEMP

-67° to -76° F

### ANIMAL LIFE

Antarctica's climate makes it an inhospitable place. Animals live both on land and in the sea in milder coastal areas. Seals, whales, penguins, and many flighted birds can be found here.

### COOL FACTS

Most of Antarctica is covered by a thick sheet of ice. The ice averages more than 1 mile thick.



The largest land animal is the Antarctic Midge, an insect that is 1/4" long.

### HUMAN LIFE

There are no indigenous groups or permanent residents in Antarctica. Most of the people who live on Antarctica are scientists and support staff. In the summer, only 5,000 people live on the continent. Only around 1,000 people remain during the winter.



## ARCTIC

Ocean surrounded by continents

The Arctic is the region around the North Pole. It is made up of the Arctic Ocean, surrounded by land. The arctic circle includes parts of North America, Europe, Asia, many islands, and a huge ice cap over the Arctic Ocean

### AVERAGE TEMP

10° to 20° F



### PLANT LIFE

Small shrubs, mosses, lichens, and flowers can grow in warmer parts of the Arctic.



### ANIMAL LIFE

A number of different types of animals make their home in the arctic, including polar bears, arctic fox, lemmings, caribou, musk ox, walrus, seals, whales, snowy owls and many other birds.

### COOL FACTS

The name 'Arctic' comes from a Greek word meaning 'bear' in reference to the Ursa Major and Ursa Minor constellations.

The nearest land is about 700 miles from the North Pole.

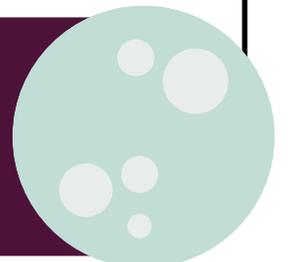
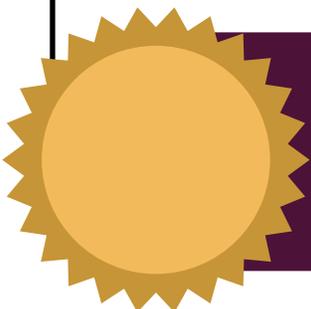


### HUMAN LIFE

People have lived in the Arctic for thousands of years. Indigenous groups include Inuit, Sami, and Yupik.

## MIDNIGHT SUN & POLAR NIGHT

During the summer months the poles experience the "midnight sun". The sun does not set below the horizon during this time which means it is always daylight. The opposite is true in the winter months and is called "polar night".



# JOURNEY TO THE POLES ACTIVITY

Acquaint students with the location of the North and South Poles, describe the climate, and decide what equipment you would take on a polar expedition.

## Materials:

Globe

Internet access

Books:

- Who Lives in the Arctic? by Susan Canizares and Pamela Chanko
- Antarctica by Helen Cowcher

Younger students:

- Scissors
- Glue
- Journey to the Poles student page (*located in the Resources*)



## Step 1:

**Read one or both of the stories.**

Where are these set? In the polar regions! Look at the pictures. What do you think the weather is like? Cold! It is much colder at the poles than it is at home. This is because of where the poles are.

**Use the globe to locate the north and south pole.** Explain that the

earth tips the poles away from the sun for about half the year, and toward the sun for the other half. This means that for half the year it is dark for much of the time, and for half the year it is light much of the time. This gives the poles the nickname “Lands of the Midnight Sun.”

It also means that the polar regions only get heat from the sun for a short time each year. A summer day at the north pole is about 50°F, and only about -5°F at the south pole – that’s below zero!

**Ask the students if they noticed plants/trees in the books.** The Arctic region is above the tree line – that means is too far north for trees to grow. Instead, there are grasses, mosses, lichens, and bushes. In the Antarctic region mosses, lichens and two flowering plants grow close to coastal areas.

**Show the last page of Who Lives in the Arctic?** People live in the arctic. Would it be easy to live there? Why or why not? (hard to find food, shelter, stay warm, etc.) There are no indigenous groups or permanent residents in Antarctica. Most of the people who live on Antarctica are scientists and support staff.

# JOURNEY TO THE POLES **ACTIVITY** *Continued*



## Step 2:



Pass out the student pages. Let's imagine a trip to the polar regions.

### **What sort of things would we need to take with us?**

Give the students three things to consider: it will be cold (even if it is the summer), there are not stores so you have to take everything you'll need, and you cannot leave garbage behind so think of things that can be used your whole time there.

**Have the students cut out the things they would take and glue them in their suitcase.** Have the students share their answers. Why did they choose those things? Is there anything that they did not need to take? Why not? What else would they take? Why?

## Extensions:



People have been interested in finding out what it is like in the polar regions for a long time.

Many people have made trips to explore them.

**Have students research early expeditions to the poles.** Divide the class into two teams. One team should research the first explorers to reach the North Pole; the other team should research the first explorers to reach the South Pole.

**Who was the first to make it to each of the poles?**

**How did they travel there?**

**What were their trips like?**

**What equipment did the explorers use?**

## Step 3:

Below are the links to journal entries and videos of Mr. Penn and Polar-TREC arriving and working at the South Pole.

**How did the team travel to Antarctica?**

**What equipment did the researchers take with them?**

[Journal 28 November 2018 Ice Flight](#)

[Journal 1 December 2018 Ground Transportation and Ivan the Terra-Bus!](#)

[Arriving at South Pole Station](#)

[Geographic South Pole](#)

[Journal & Video 23 December 2018 Servicing an Automatic Weather Station \(AWS\) in Antarctica](#)

# HOW COLD IS COLD? ACTIVITY

Monitor and record temperature and weather conditions here at home and in the polar regions.

## Step 1: Set Up Your Experiment

- Decide which areas you will be comparing: school location to Antarctica, school location to the arctic, or both.
- Decide what data you will be recording-temperature, wind speed, time of day, the feels like temperature, etc.
- How many days will you make observations?
- What time of day will you make observation?
- How will you make your observations?
  - Use an outdoor thermometer or a local weather station to gather data at your school.

- [Antarctic weather conditions](#)

- [Arctic weather conditions](#)

*There are no permanent weather stations located at the geographic north pole (due to the shifting of the ice). Alert, Nunavut, Canada is the northernmost permanently inhabited place in the world. It is located 508 mi from the geographic north pole.*

- Use the data collecting chart provided (located in the Resources section) or have the students create their own based on the data being observed.



## Extensions:



- Check in with the University of [Wisconsin-Madison Automatic Weather Stations](#) in Antarctica:

- AWS Nico is close to the South Pole.

- Review the weather station data prior to class to determine the amount of instruction needed.

The date is in Julian format, time is in a 24-hour format, and all temperatures are in Celsius.

- Compare weather data at various weather stations across Antarctica.

- Nico, Sabrina, and Phoenix. How does elevation effect the readings?



# FUR, FEATHERS, AND FAT ACTIVITY

Animals living in the polar regions must stay warm. Compare the way fur, feathers, and blubber work as insulators.

## Materials:

Quart-sized zip-loc style freezer bags (not the easy-zip type)  
Craft feathers  
Poly-fill  
Shortening  
Stapler  
Duct tape  
Plastic tubs  
Ice cubes or snow, water

## Step 1:

### Make insulator gloves (before students arrive).

Add about 1 cup of shortening to the first bag. DO NOT get shortening on the outside of the bag.

Turn a second bag inside out. Be careful not to tear the sides as you do this. Put it inside the first bag, aligning the male and female sides of the zip-locks. DO NOT get shortening on the inside of the second bag.

Zip the bags together. Reinforce the top with staples, if necessary, ABOVE THE ZIP-LOCK ONLY, smooth side of the staple facing out. Cover the top edge with duct tape, cuff the top, and reinforce again with duct tape.

Distribute the shortening inside the bag, making sure that the bottom and sides are covered.

Repeat for feathers and fur (poly-fill).

Fill your tubs with snow or ice water.

## Step 2:

**Review the climate in the polar regions.** How do animals stay warm? Some, like musk oxen, have warm fur. Some, like snowy owls, have feathers. Some, like whales, have a thick layer of fat called blubber. Some, like penguins and polar bears, use a combination of fur or feathers, fat and blubber. These work as insulators – they help keep the heat inside their bodies.

## Step 3:

**Look at your hand. Do you have fur, feathers or blubber?** Predict: what will happen if you put one hand in snow by itself and one hand in the blubber glove in snow? Try it!

Repeat for the fur and feather gloves.

Predict: what happens if you put blubber and fur together? Try it! Put the blubber glove inside the fur glove, then into the ice water or snow. Is it warmer than just one of the gloves by itself?

Repeat for blubber and feathers.

## Step 4:

**Discuss what they found.** Which was warmer, your hand or the gloves? Which one glove do you think made the best insulator? What about when you put them together? What glove or pair of gloves made the best insulators of them all?

## Extensions:



Have students work together to complete the Arctic or Antarctic Animal Quiz page (*located in the Resources section*)

Assign one or two animals from the sheet to each group and have them research adaptations to stay warm.

# SPOTLIGHT: PENGUINS

## THE BASICS

Penguins are flightless, aquatic birds found throughout the Southern Hemisphere. There are 17 species of penguins, divided into 6 groups. All penguins are found south of the equator. The climate of their habitat varies enormously. Penguins found farther north still have colder waters to swim in. The Humboldt Current flows from the cold waters of the southern seas up the western coast of South America, reaching even the Galápagos Islands. Adélie penguins are considered to be the most numerous, and the Rockhoppers the most widely distributed. *Note: Some scientists divide the Rockhoppers into a northern and southern species making the total number of species 18.*

**HARLEQUIN**, genus *Spheniscus* (little wedge), have a white band around their cheeks and throat, and a black horseshoe-shaped stripe across the chest. They also have a ring of bare pink skin around their eyes to help release excess heat.

They include the:

- 1** Humboldt (Peruvian)
- 2** Galápagos
- 3** Magellanic
- 4** Black-footed (African or Jackass)

### BRUSH-TAILED

genus *Pygoscelis* (rump legged), are characterized by their long, stiff tails. They include the:

- 5** Adélie
- 6** Chinstrap
- 7** Gentoo (Johnny)

**CRESTED**, genus *Eudyptes* (good diver), all have a display of long, wispy yellow feathers on their heads. These include:

- 8** Rockhopper
- 9** Macaroni
- 10** Royal
- 11** Erect-crested
- 12** Fjordland
- 13** Snares Island

**LARGE**, genus *Aptenodytes* (featherless diver), are recognized by their size and the yellow or orange patches on their ears and chest. They include:

- 14** Emperor
- 15** King

Two species do not fit readily into any of these, and so have each been assigned a genera all their own.

**16 YELLOW-EYED**, genus *Megadyptes* (large diver), is unique because of its ochre yellow eye that blends into its eye stripe.

**17 FAIRY (LITTLE BLUE)**, genus *Eudyptula* (good little diver), is nocturnal and has bluish feathers.

*Some consider the White-flipped penguin (distinguished by white band around the edge of the flipper) to be a separate species, but most hold that it is a sub-species of the Fairy penguin.*

## PENGUIN HABITATS





## FEEDING

Penguins feed primarily on fish, squid, and krill, a small, shrimp-like animal that is plentiful in the Antarctic waters. A nictitating membrane, a clear “eyelid,” acts like a pair of goggles, allowing the penguin to see clearly underwater. Most species make shallow dives of less than 1 minute, feeding on krill near the surface. Emperor penguins dive deep after prey. Most dives are between 250 – 400 feet and last less than 8 minutes, but can go down as far as ¼ mile and stay under for as long as 20 minutes!



## COLORATION

Penguins are primarily black on their backs and white on their bellies. This color pattern is known as counter-shading. On land, they are extremely obvious, but in the water, their white bellies make them practically invisible to underwater predators. The black backs also promote heat absorption and can aid in temperature regulation in the frigid waters. The large penguins also have brightly colored ear patches. It is believed that these are used during the breeding season as a courtship display. Each species of penguins has unique markings, usually on the head, which make it easily recognizable.



## LOCOMOTION

Penguins are unable to fly, but are outstanding swimmers. Their torpedo-shaped body, webbed feet and strong, stiff flippers allow them to “fly” gracefully and swiftly through the water. They can be seen porpoising along the surface, allowing them to breathe on the go and possibly confusing predators. On land, their waddling gait is due to their leg placement far back on their bodies,

which aids enormously in swimming. The most efficient way for them to travel on land is tobogganing on their bellies, propelling themselves with their flippers and feet. Penguins are also remarkable jumpers. To escape aquatic predators such as leopard seals, orcas, and sharks, they will jump out of water onto pack ice and ice floes.

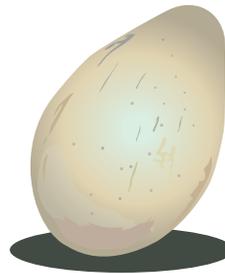
## PENGUIN PARENTS

Parents locate their chick by the sound of their voice. They call to the chicks, and the chicks respond. In just 6 months the chick are nearly as big as their parents.



## ONE EGG

Females lay one egg then pass it to the male.



# EMPEROR PENGUIN LIFECYCLE



## DAD TAKES OVER

Dads incubate their eggs on their feet. A brood patch keeps the egg warm.



## GROWING UP

After a few weeks, chicks have fluffy feathers to protect them from the cold. The chicks wait in large groups while their parents go to sea for food.

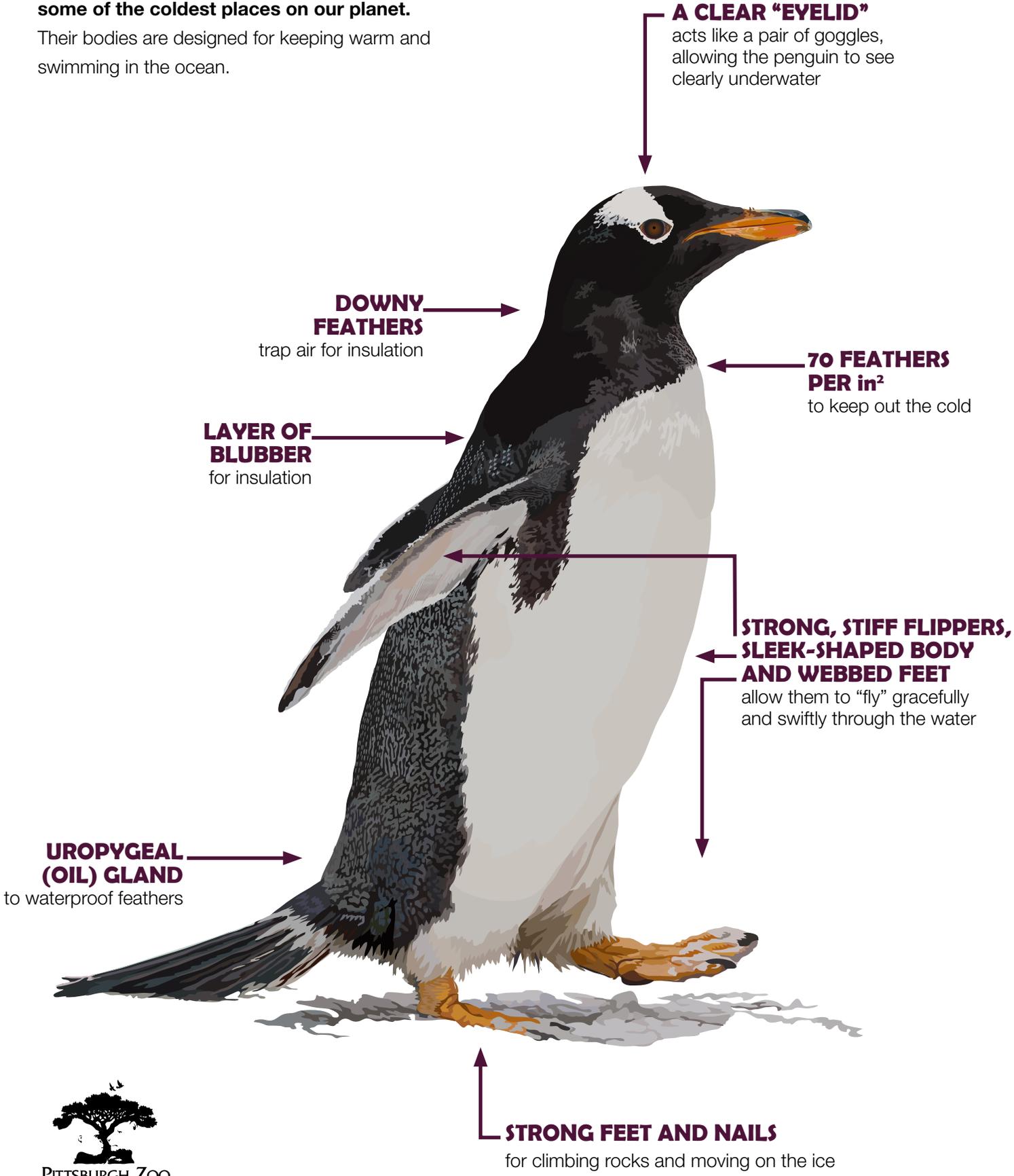


## CHICKS!

During the nine weeks it takes for the egg to hatch the dad are unable to feed.

# SPECIAL ADAPTATIONS

Penguins are well known for surviving in some of the coldest places on our planet. Their bodies are designed for keeping warm and swimming in the ocean.



**Pittsburgh Zoo & PPG Aquarium**

**PENGUINS**

Gentoo and macaroni penguins live here at the zoo. Take a look at the photos below. What similarities and differences do you see?



**MACARONI**

10 lbs.  
20-24in tall  
Orange bill and orange-yellow crest feathers that meet on the forehead  
Spend most of their time at sea. They come ashore for breeding and molting seasons.

**GENTOO**

12lbs  
24-30in tall  
Bright orange bill and white eye patches  
Fastest swimmers  
Spend most of their time close to shore.

# LIVING THE PENGUIN LIFE ACTIVITY

Zookeepers work hard to provide the best care for the penguins, and all of the animals, living at the zoo. A zookeeper's main responsibilities include cleaning animal spaces, providing fresh food and water, observing behavior, and providing enrichment and training.



## Step 1:

Have the students brainstorm what a typical day is like for the penguins and the zookeepers providing their care.

**What might a daily routine for the penguins consist of?**

**What are some daily zookeeper tasks?**

## Step 2:

Play the [A Day in the Life](#) penguin video. This video shows just what a day is like for the penguins and their zookeepers.

**What did you learn about taking care of the penguins at the Zoo?**

**What would your favorite part of the day be?**

## Extensions:



Compare & contrast taking care of penguins at the zoo to taking care of pets at home. Make a chart or draw a picture showing similarities and differences.



Professionals who work in an aquarium are called aquarists. Research the training and skills required to become an aquarist.

## Step 3:

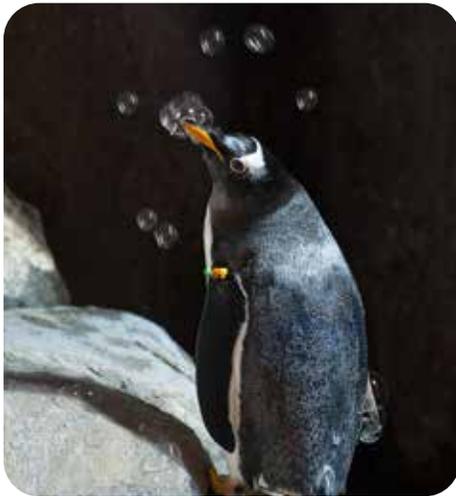
**Can You Spot the Penguin?**

View the live [Pittsburgh Zoo's Penguin Web Cam](#).



# PENGUIN PLAY TIME ACTIVITY

Learn about animal enrichment and its benefits.



## Step 1:

### What does enrichment mean?

Enrichment provides physically and mentally stimulating toys, activities, foods, habitats, and/or sensory items meant to contribute to an animals' overall wellbeing.

**Ask the students what kind of enrichment they think the penguins may enjoy.** Often keepers take an animal's physical adaptations into consideration when choosing enrichment. For example penguins are fast swimmers and enjoy playing in the water so something that involves water would be a good choice. They also have a great eyesight. They enjoy new and interesting things to look at in their habitat.

**Brainstorm how the penguins' behavior may change when enrichment is offered?**

## Step 2:

Watch the [Penguin Enrichment Video](#)

## Step 3:

### Discussion

- How did the penguins' behavior change when enrichment was offered?
- Are they surprised by what they saw?
- How is providing enrichment beneficial?
- Do you think the keepers ever try an enrichment item that the penguins end up not liking? Of course! We can't predict with certainty how an animal will react to enrichment. The keepers will try different types of enrichment and make note of how an animal reacts.

## Extensions:



What kind of enrichment do you give your pets?  
What toys and games do you like to play with for fun?



If you were a zookeeper what new enrichment might you offer the penguins?



# WHAT'S FOR LUNCH ACTIVITY

Learn what is on the menu for our Gentoo and Macaroni penguins and special adaptations that help them catch and eat their food.

## Step 1:

**Review gentoo and macaroni penguin feeding habits.**

Gentoo and macaroni penguins feed on krill, fish, and squid. Their streamlined bodies and strong, paddle like flippers help them to swim and dive quickly to catch their food. Gentoo penguins can swim up to 22mph, faster than any other diving bird! Penguins have very good eyesight under water. They do not have teeth inside their beaks but they do have spines on their tongues that keep food from slipping away. Macaroni penguins' dives are usually shorter than two minutes. Gentoo penguins can hold their breath for seven minutes!

Try it! How long can you hold your breath?

## Step 2:

**Watch the [Penguin Feeding video](#)**

What do the penguins at the zoo eat? How do the zookeepers ensure each of the penguins are getting enough food?



# WHO'S WHO PENGUIN GAMES

## Smallest to Tallest ..... Penguin Matches .....

### Materials

Penguin photo cards  
(located in the Resources)

Penguin Height info sheet  
(located in the Resources)

Tape measure

Tape

Butcher paper

Markers

### How to Play

Arrange the penguins from shortest to tallest.

Hang a piece of butcher paper and use a tape measure to mark the height of each penguin.

Attach each photo with its corresponding height.

- Which penguin is the tallest? The shortest?
- How many penguins are the same size?
- Have each student find where they fit on the chart. How many penguins are taller/shorter than each student?
- Have the students formulate additional questions based on observations such as crest feathers, beak length, feather color surrounding eyes, etc.

### Materials

Two sets of penguin cards

### How to Play

Mix the two sets of penguin cards together.

Arrange the cards in rows, face down.

Player 1 should turn any two cards over. If the cards match, keep them and take a second turn. If they do not match, turn them back over.

The next player chooses two cards and turns them over. If the cards match, keep them and take a second turn. If they do not match, turn them back over.

Play continues until all matches have been made.

## Guess My Penguin .....

### Materials

Two sets of penguin cards.

### How to Play

This game is for two players.

Each player should have a set of penguin cards. Player 1 should arrange all 17 cards into rows. Meanwhile Player 2 should choose a penguin card from his/her set, keeping it secret from Player 1.

Player 1 will ask Player 2 *yes or no questions* to find out who their penguin is. If the answer is "YES" Player 1 will turn over all the penguin cards that DO NOT have what was asked. If the answer is "NO," turn over all the penguin cards that DO have what was asked.

For example: Player 1 asks, "Does your penguin have crest feathers?" If Player 2 says "NO," then turn over all the penguin cards WITH crest feathers. If player 2 says "YES,"

turn over all the penguin cards WITHOUT crest feathers.

Player 1 will continue asking yes or no questions until only one penguin card remains. That will be player 2's card!

Switch positions and play again!

## Extensions



Have students add additional information to the cards such as heights and geographic locations of each species.



# BE A PENGUIN GAMES

Penguin parents work hard to take care of their chicks. Do you think you could stand in the freezing cold for more than two months, without eating, with an egg on your feet? Could you locate your chicks among thousands of identical chicks? Could you waddle long distances to a same nesting area? Let's test your penguin parent skills!

## Protect your Egg!

### Materials

Bean bags

### Try It

Divide the class into two groups and line up on opposite sides of the room.

Give the first person in each line a bean bag (representing an egg).

Have the first students balance their bean bag on their feet.

Students should carefully waddle to the next person in the opposite line while balancing the bean bag on their feet. There will be one student going in each direction.

Be careful to avoid running into each other!

Repeat until all have had a chance.

## Huddle Up!

### Materials

Bean bags *optional*

### Try It

Male Emperor penguins huddle together while brooding eggs to stay warm.

**Have students huddle close.** Note how much warmer it is! Emperors take turns being on the outside – the wind break.

Have the students CAREFULLY shift positions (inner circle to outer circle)

## Extensions



Have the students balance bean bags on their feet while shifting positions. Don't let the eggs (bean bags) fall!

## Find Your Family!

### Materials

Cards with animal names or photos (one pair for every two students), at least 10 players. Choose animals whose sounds are easy to imitate.

### Try It

Penguins use unique calls to find each other. With up to a million birds, colonies are very noisy places! Pass out the slips of papers to the students. They should keep their slip hidden. On go, each student should begin making the sound of the animal on their slip. They should locate the other student making their same sounds. Once pairs have found each other they should stand together and continue making their sound until all matches have been made.

## Extensions



Have players try again with their eyes closed.

# MAKE ONE DEGREE OF CHANGE ACTIVITY

One Degree of Change is a conservation initiative at the Pittsburgh Zoo & PPG Aquarium that aims to educate people about global climate change. The name refers to the overall warming trend we are currently experiencing on our planet. Most importantly, One Degree of Change also means that making small changes in your lifestyle – one degree of change in your daily life - can add up to big results for the planet.

## Is Climate Change Real?

Nobody denies that the Earth is getting hotter. The planet's average surface temperature rose 1.3°F during the twentieth century and is expected to rise even more throughout the next 100 years. A handful of scientists believe that climate change is caused by natural fluctuations in the Earth's atmosphere and that humans have nothing to do with it. The vast majority of experts agree that the changes we're experiencing are hugely influenced by human activity that has helped put more greenhouse gases in the atmosphere than any other time in the last 650,000 years.

If the Earth's temperature increases just 7°F from where it is today, human life will be dramatically different. The oceans will rise, rain patterns will change, deserts will expand, and there will be more instances of extreme weather such as droughts, heat waves, and heavy rainfalls. Some agriculturally rich areas could become barren. Many species of animals are already being pushed to the brink of survival by global warming, and many more will have to adapt or die if it continues unabated.



## Make a Difference

The good news is that people are already making a change and you can too!

### Step 1:

Learn more about what the Pittsburgh Zoo & PPG Aquarium is doing to create [One Degree of Change](#). Listen for actions you are already doing or actions you would like to try.

### Step 2:

Tell us how you're making a difference! If your students choose an extension project we want to hear from you. Email [learn@pittsburghzoo.org](mailto:learn@pittsburghzoo.org) with your project information.

### Extensions:



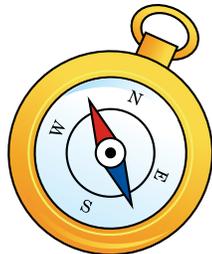
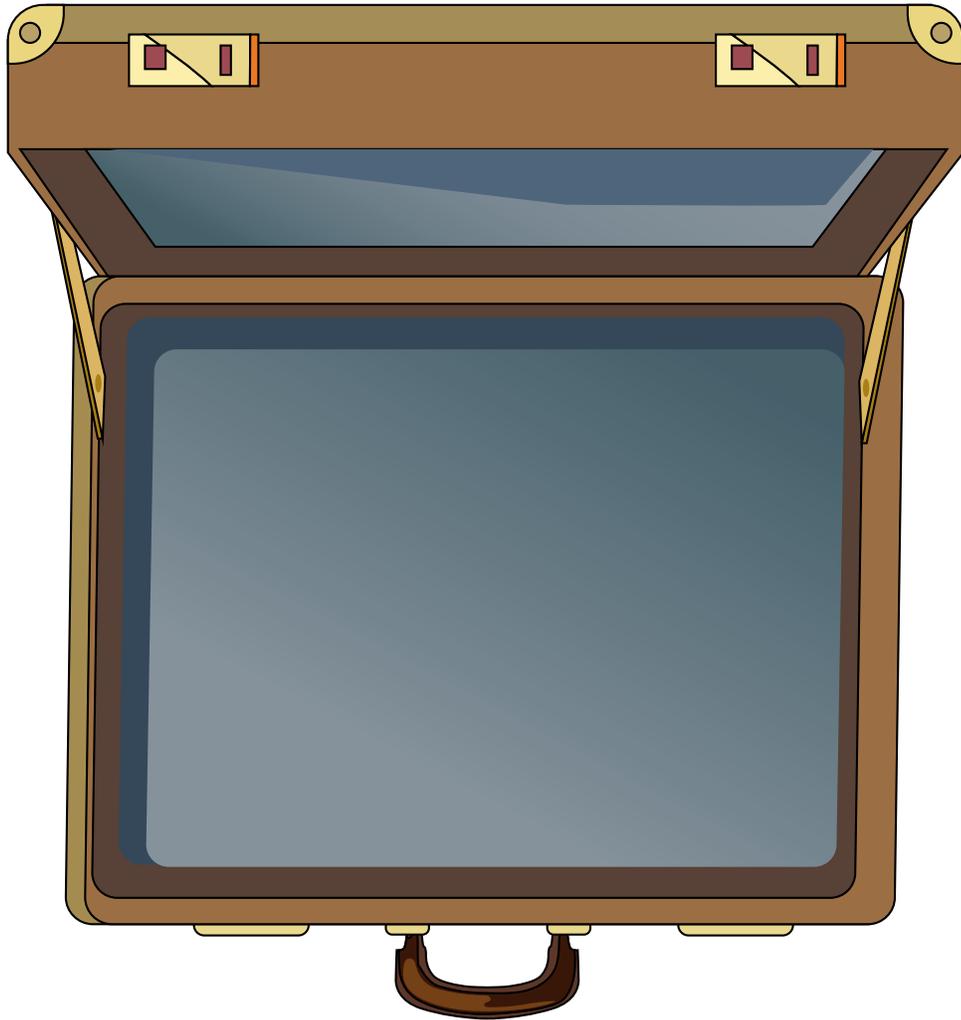
1. Hold a friendly One Degree of Change challenge in your classroom or school (guides for suggested activities can be found in the resource section)
  - Energy Savers Challenge
  - Every Drop Counts Challenge
  - Junk Mail Recycling Challenge

2. The Pittsburgh Zoo & PPG Aquarium is an Arctic Ambassador Center for Polar Bears International. Watch the [video](#) to see how we help.
  - Visit [Polar Bears International](#) to learn more about how climate change is affecting polar bears.
3. [Adopt a Pittsburgh Zoo & PPG Aquarium](#) polar animal through the Adopt-An-Animal program.
4. Fundraise for [new enrichment items for the penguins](#) at the Pittsburgh Zoo & PPG Aquarium.

- adaptation** behavioral or physical feature that improves a plant or animal's chance for survival in its habitat
- aurora** sheets or curtains of dancing, colored lights caused by solar particles reacting with gases in the upper atmosphere; also known as the Northern Lights (*aurora borealis*) or Southern Lights (*aurora australis*).
- blubber** thick, insulating layer of fat under the skin of many polar animals
- camouflage** an organism's ability to hide or blend in with its surroundings using color, pattern or shape.
- conservation** the wise use of natural resources in order to ensure continued availability to future generations
- ecosystem** an ecological community together with its environment, functioning as a unit
- glacier** a huge mass of ice formed from compacted snow that flows over a land mass
- fast ice** sea ice that is attached to land; also called land-fast ice
- habitat** the place an animal lives. It provides the animal with shelter, food, water, and air/space.
- ice floe** chunks of floating sea ice that is less than 6 miles across; sea ice chunks larger than this are called **ice fields**
- insulator** something that acts to keep heat inside the body, such as fur, feathers, or blubber
- katabatic wind** wind that is caused by air flowing down from an elevation; also called a gravity wind
- migration** movement of a population of animals from one area to another in order to secure food, shelter, or breeding grounds; most often tied to seasonal climate change
- pack ice** large masses of floating sea ice
- polar region** areas surrounding the north and south poles, above 66° latitude, that have very cold temperatures, have at least one day where the sun does not set (summer) or rise (winter), and experience auroras
- predator** an animal that kills and eats other animals.
- prey** an animal that is hunted or killed for food.
- sea ice** frozen sea water. Because of the salt content, this happens at 28.8°F.
- tree line** altitude or latitude above which trees do not grow

What do you need to go to the polar regions?

Cut out what you will take and glue them in the suitcase.



**Compass**

There are not roads or signs in the polar regions so a compass is a great tool to help you navigate.

**Sunscreen**

It may seem strange, but sunscreen is a good thing to have at the poles, especially if you are there during the summer. You have 24 hour exposure to the sun's rays. Sunscreen will help to protect your skin.

**Parka and Snow Boots**

You definitely need to bundle up against the cold! Even in the summer, temperatures are still very low, especially in Antarctica!

**Sunglasses**

Like sunscreen, a surprisingly good idea. Continued exposure to the brightly reflected light can result in a condition known as snow blindness. Snow blindness is like a sunburn to the cornea of the eye which, in severe cases, can result in permanent damage and/or loss of vision.

**Camping Gear**

There is little to no shelter available at the poles, so you must bring it with you. Without appropriate gear, you would freeze.

**Camera**

Scientists always want to document their findings! This is one way to make a record of your trip. Early explorers kept journals.

**Bathing Suit**

Sorry, no swimming pools at the poles!

Locations	Temperature	Wind Speed
Date: _____		
_____		
Our school		
<b>Arctic</b> Alert, Nunavut, Canada		
<b>Antarctica</b> South Pole		
Locations	Temperature	Wind Speed
Date: _____		
_____		
Our school		
<b>Arctic</b> Alert, Nunavut, Canada		
<b>Antarctica</b> South Pole		
Locations	Temperature	Wind Speed
Date: _____		
_____		
Our school		
<b>Arctic</b> Alert, Nunavut, Canada		
<b>Antarctica</b> South Pole		
Locations	Temperature	Wind Speed
Date: _____		
_____		
Our school		
<b>Arctic</b> Alert, Nunavut, Canada		
<b>Antarctica</b> South Pole		

The animals listed below are suited to life in the polar regions. **Where does each animal live?**

Look over the list and write:     AR for Arctic  
   AN for Antarctic  
   BOTH

1. \_\_\_\_\_ Polar Bear
2. \_\_\_\_\_ Orca
3. \_\_\_\_\_ Bowhead Whale
4. \_\_\_\_\_ King Penguin
5. \_\_\_\_\_ Musk Oxen
6. \_\_\_\_\_ Harp Seal
7. \_\_\_\_\_ Fur Seal
8. \_\_\_\_\_ Arctic Tern
9. \_\_\_\_\_ Puffin
10. \_\_\_\_\_ Caribou
11. \_\_\_\_\_ Walrus
12. \_\_\_\_\_ Snowy Owl
13. \_\_\_\_\_ Leopard Seal
14. \_\_\_\_\_ Weddell Seal
15. \_\_\_\_\_ Blue Whale
16. \_\_\_\_\_ Northern Elephant Seal
17. \_\_\_\_\_ Southern Elephant Seal
18. \_\_\_\_\_ Macaroni Penguin
19. \_\_\_\_\_ Beluga Whale
20. \_\_\_\_\_ Narwhal



The animals listed below are suited to life in the polar regions. **Where does each animal live?**

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1.   **AR**   Polar Bear
2.   **BOTH**   Orca
3.   **AR**   Bowhead Whale
4.   **AN**   King Penguin
5.   **AR**   Musk Oxen
6.   **AR**   Harp Seal
7.   **AN**   Fur Seal
8.   **BOTH**   Arctic Tern
9.   **AR**   Puffin
10.   **AR**   Caribou
11.   **AR**   Walrus
12.   **AR**   Snowy Owl
13.   **AN**   Leopard Seal
14.   **AN**   Weddell Seal
15.   **BOTH**   Blue Whale
16.   **AR**   Northern Elephant Seal
17.   **AN**   Southern Elephant Seal
18.   **AN**   Macaroni Penguin
19.   **AR**   Beluga Whale
20.   **AR**   Narwhal



# RESOURCES PENGUIN PHOTO CARDS



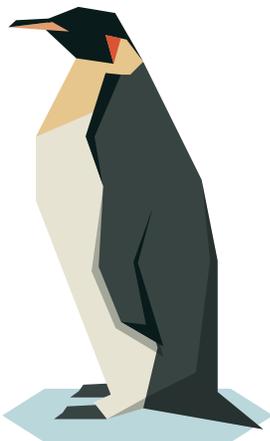
**ADÉLIE**



**AFRICAN**



**CHINSTRAP**



**EMPEROR**



**ERECT-CRESTED**



**LITTLE BLUE**



**FIORDLAND**



**GALÁPAGOS**



**GENTOO**

# RESOURCES PENGUIN PHOTO CARDS



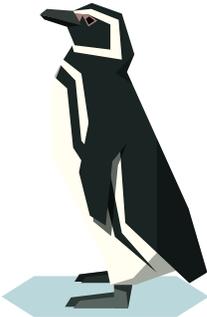
**HUMBOLDT**



**KING**



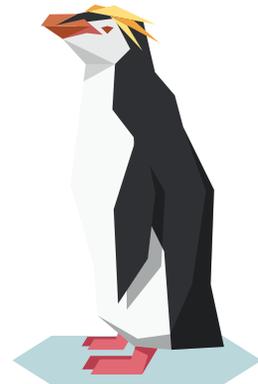
**MACARONI**



**MAGELLANIC**



**ROCKHOPPER**



**ROYAL**



**SNARES ISLAND**



**YELLOW-EYED**

# RESOURCES **PENGUIN HEIGHTS**

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Adélie  
18-28 in

African  
24-28 in

Chinstrap  
27-30 in

Emperor  
43-51 in

Erect-crested  
23-25 in

Little Blue  
10-12 in

Fiordland  
21-23 in

Galápagos  
18-20 in

Gentoo  
20-30 in

Humboldt  
22-28 in

King  
27-39 in

Macaroni  
20-24 in

Magellanic  
24-30 in

Rockhopper  
16-20 in

Royal  
26-30 in

Snares Island  
20-22 in

Yellow-eyed  
23-31 in

## The Problem

We use electricity constantly throughout the day. Most power plants (where electricity is made) use fossil fuels to make electricity. Burning these fossil fuels causes heat trapping gases to build up in our atmosphere. These greenhouse gases are the main cause of the global climate change we're seeing today. Our energy usage is continuing to increase.

## How You Can Help

Has a grown-up ever told you to turn off a light or to close the refrigerator door? Wasting energy is not good for the environment. Make a list of some things you depend on each day that need electricity. Brainstorm ways you can reduce your energy usage. For example:

- Turn off lights, TVs, and computers when you are done using them
- Don't leave the refrigerator door open
- Take a short shower
- Ask a grown up to help you replace an incandescent light bulb with a LED lightbulb
- Turn off the water while you brush your teeth
- Unplug electronic gadgets and chargers when you are not using them
- Recycling your trash
- Use a reusable lunch box and water bottle
- Use reusable shopping bags
- Choose activities that use more human energy and less electricity (nature walks, visiting the playground, riding your bike, playing kickball, playing a board game or cards)

## The Challenge

Your challenge is to use energy wisely.

1. Keep track of your energy saving deeds for two weeks. Use the chart on the following page or use the blank chart to fill in your own deeds. Ask other members of your household to participate too.
2. Make signs to hang near light switches or on the refrigerator door as reminders.
3. That's it! You've just created One Degree of Change! And remember, when your effort is combined with the efforts of others, they add up to big results! Thank you for making a difference!

The image shows two identical 'ENERGY SAVING DEEDS' tracking charts. Each chart is a grid with columns for the days of the week (SUNDAY, MONDAY, TUESDAY, WEDNESDAY, THURSDAY, FRIDAY, SATURDAY) and rows for 'WEEK 1' and 'WEEK 2'. The top chart is partially filled with horizontal lines, while the bottom chart is blank.

**Using energy wisely helps to save electricity, is good for our planet, and will save money too!**

# RESOURCES

## ENERGY SAVERS CHART

Keep track of your energy saving deeds. Place a check in the corresponding box each time you save energy.

ENERGY SAVING DEEDS	SUNDAY		MONDAY		TUESDAY		WEDNESDAY		THURSDAY		FRIDAY		SATURDAY	
	WEEK 1	WEEK 2	WEEK 1	WEEK 2	WEEK 1	WEEK 2	WEEK 1	WEEK 2	WEEK 1	WEEK 2	WEEK 1	WEEK 2	WEEK 1	WEEK 2
1. I turned off the TV when I was finished watching it.														
2. I used both sides of my paper.														
3. I helped recycle paper, cans, glass, and/or plastic.														
4. I didn't leave the water running when I brushed my teeth.														
5. I picked up litter and threw it in the trash can.														
6. I packed my lunch in a reusable lunchbox.														
7. I turned off lights that were not being used.														
8. I chose an electricity-free activity.														



## The Problem

In the United States, we are lucky to have easy access to some of the cleanest water in the world—just by turning on the tap. We wake up in the morning, take a shower, brush our teeth, eat breakfast and head out for the day. Water is an important part of our daily lives and we use it for a wide variety of purposes. The average American family uses more than 300 gallons of water per day at home. Water also plays a big role in our local communities. Think of all the ways water is used in your community.

All living things need water to survive. The Earth might seem like it has an abundant amount of water, but less than 1% is available for human use. The rest is salt water (in the ocean) or is permanently frozen and we can't drink it, wash with it, or use it to water plants. As our population grows, more and more people are sharing this limited resource. The more water we use the less there is for the environment too. It is important that we use water wisely and do not waste it.

## How You Can Help

Has a grown-up ever told you to turn off the water? Wasting water is not good for the environment. Make a list of some ways you use water. Brainstorm ways you can reduce your water usage. For example:

- Remember to turn off the water while brushing your teeth or washing your hands.
- Tell a grown-up if you see a dripping faucet.
- Take a short shower or only fill the bathtub halfway.
- Don't flush trash or dead bugs down the toilet—use a trash can instead to avoid extra flushes.
- Place a pitcher with water in the fridge (so you don't have to wait for the tap to run cold).
- Use leftover drinking water to water plants.
- Turn off the tap while washing dishes.
- Have a grown-up help you check your toilet for a leak by placing a drop of food coloring in the toilet tank. If the color shows up in the bowl without flushing, you have a leak!
- Catch rainwater to water plants
- Only turn the dishwasher on when it is full.
- Tell your friends what you're doing and why and encourage them to save water too.

Write or draw what you did each day to save water.	
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	
Sunday	

## The Challenge

Your challenge is to use water wisely.

1. Keep track of your water saving deeds for one week. Use the chart on the following page to record your deeds. Ask other members of your household to participate too.
2. Make signs to hang near faucets or the shower as reminders to use water wisely.
3. That's it! You've just created One Degree of Change! And remember, when your effort is combined with the efforts of others, they add up to big results! Thank you for making a difference!

**Using water wisely is good for our planet, and will save money too!**

# RESOURCES

## EVERY DROP COUNTS

Write or draw what you did each day to save water.

<b>SUNDAY</b>	
<b>MONDAY</b>	
<b>TUESDAY</b>	
<b>WEDNESDAY</b>	
<b>THURSDAY</b>	
<b>FRIDAY</b>	
<b>SATURDAY</b>	

# RESOURCES **JUNK MAIL RECYCLING**

## The Problem

Junk mail is an ongoing problem for mailboxes all over the world. Almost every household receives unwanted advertisements, magazines, and solicitations that are immediately recycled or thrown out to avoid clutter. It's not only a huge personal inconvenience; junk mail also negatively impacts the planet.

Each year, more than 100 million trees are chopped down to make the paper for junk mail. In the United State alone, nearly 4 million tons of junk mail are produced each year. But that's not all. In addition to contributing to the destruction of trees around the world, junk mail also contributes to greenhouse gas emissions, water usage, and landfill contributions.

## How You Can Help

You can recycle most forms of paper including newspapers, magazines, catalogs, junk mail, envelopes, folders, copy paper, and colored paper. The Pittsburgh Zoo & PPG Aquarium participates in the Abitibi Paper Retriever Recycling Program. This program collects unwanted paper in a giant dumpster. When the dumpster is full, it is taken away for recycling. Each year, the Pittsburgh Zoo & PPG Aquarium collects around 15 tons of paper for recycling. That's 15 tons that never made it to a landfill!

## The Challenge

Your challenge will be to collect all of the unwanted junk mail at home for two weeks and recycle it. Ask family and friends to help you by collecting their junk mail too. You'll be surprised at how much you collect. Place the unwanted junk mail in a cardboard box. After two weeks, add up the number of pieces and see how much it weighs. Fill out the chart below.

The next step will be to recycle your collection of unwanted junk mail. To do this, have a grown-up drive you to the Zoo's main parking lot. Here you will find the Green Abitibi Paper Recycling bin (Hint: It's located on the road closest to the admission gates). Dump all of your junk mail in it! Please do not throw cardboard or phonebooks in – they are unable to be recycled.

That's it! You've just created One Degree of Change! And remember, when your effort is combined with the efforts of others, they add up to big results! Thank you for making a difference!

## FAMILY & FRIENDS JUNK MAIL COLLECTION

TIME FRAME	NUMBER OF PIECES	TOTAL WEIGHT
Two Weeks		
One Month (4weeks)*		
One Year (52 Weeks)*		

\*Estimated