

Di's Story

1EXTENSION ALERT: ALASKA ECOLOGY CARDS OPTIONAL



Section 4 TUNDRA ACTIVITIES

Grade Level: K - 6

State Standards: RI.K.1,RI.K.3

RI.1.1,RI.2.1,RI.2.3,RL.3.1,RI.3.3

RL.4.1,RI.4.3,RI.5.1,RI.5.3,W.K.3

W.1.3,W.2.3

NGSS: K-LS1-1.,K-ESS2-2.,

K-ESS3-, 1-LS1-2.,2-LS4-1,3-ESS2-2.,4-

LS1-2, MS-LS1-4.,

MS-LS2-1,MS-LS2-2.

Subjects: Language arts,
science, art

Skills: Listening, visualization, art,
identification

Duration: 3-5 classes

Group Size: Individual

Setting: Indoors

Vocabulary: Adaptations, habitat,
hibernate, insulation, lemming, predator,
permafrost, tundra

Objective:

Students will describe the characteristics of a tundra ecosystem and draw its elements.

Teaching Strategy:

Synthesizing what they hear in a story about lowland tundra animals, students draw pictures to illustrate the story and make a book of their illustrations.

Complementary Activity:

“Getting to Know Tundra Wildlife – Tundra Writing Adventure” in this section. Also “Snow Blanket” in Section 1, *Elements that Create Tundra*.

Materials:

Depending on grade, one to several copies of “The Story of *Dicrostonyx torquatus*” (following pages), pencils or pens, drawing paper, yarn, hole punch or staples for binding student books.

OPTIONAL: *Alaska Ecology Cards* or other pictures of tundra animals, photocopies of the class book.

Background:

See *INSIGHTS Section 4, Ecosystems*; also *INSIGHTS Section 1: “Snow Blanket” and “Permafrost”*; *Section 2: “Permafrost”*; and *Section 3, Adaptations*.

Procedure:

1. Explain that you have a story about some Alaska animals. Because it doesn't have any pictures, students will need to use their imaginations to picture the places and animals in the story. Later, they will help to illustrate the story.
2. The story is about a collared lemming scientists have named *Dicrostonyx torquatus*. (Di-KROS-te-nix Tor KWA-tus). *Scientists give all animals two-part names derived from Latin and Greek. Scientists use these names so that people all over the world, no matter what language they speak, can identify each animal.*
3. Ask one student to read the dictionary or field guide definition of a **lemming**. Show the class pictures of lemmings and their habitats. (*Lemming mounts are available in the “Tundra Kit,” on loan from the Alaska Science Center, Alaska Pacific University – see Teacher Resources for Section*



4 in Appendix.) Also show pictures of the other animals in the story (use *Alaska Ecology Cards*).

4. Explain that this story is divided into four chapters, which correspond to the four seasons.

Chapter 1. WINTER. Di's story begins in winter when she is born in a grass nest beneath the snow. Explain that lemmings do not **hibernate** in the winter. What **adaptations** must they make to survive in the winter? Ask the class why they think lemmings live beneath the snow. Students usually easily guess the wind as an answer, but they may have trouble understanding the **insulation** value of snow (see *INSIGHTS Section 1, "Snow Blanket"*).

Chapter 2. SPRING. What happens during breakup as everything melts? How will this affect the lemming's tunnels and nests? Encourage students to think of the surprises above ground – new plants, the return of **tundra** animals, and **predators**.

Chapter 3. SUMMER. The tundra continues changing. Notice the references to the small size of the plants and the permanently frozen soil. Ask students to define **permafrost** (see *INSIGHTS Sections 1 and 2*). Di also finds her partner, her mate, in the summer. Together, they build their nest.

Chapter 4. FALL. Snow arrives in the fall, and Di welcomes its return and the warmth of the snow tunnels and nests. She encounters the weasel – a danger she recalls from last winter. As winter progresses, the story leaves Di raising her own litter of young.

5. Read the story aloud to the class. You may wish to give each student a copy of the story and take turns reading aloud.

6. Pause at the end of each chapter and discuss how the season affected Di – for example, where she lived (her **habitat**) and the dangers she encountered. What are the signs of the seasons? List the clues or settings on four pieces of butcher paper.

7. Divide the class into four cooperative learning groups. Assign each group a chapter (*a season*).

8. Give the group a copy of the chapter, writing and art supplies, and the appropriate piece of butcher paper on which you have listed the setting. Depending on their grade levels, students may rewrite the story in their own words or illustrate the setting and events.

9. Assemble the four chapters, and bind them together as a class book.

VARIATION FOR YOUNGER STUDENTS:

Students make a mural showing the four seasons described in the story and the various plants and animals present in each of the seasons. Divide the responsibilities between work groups. For example, one group may draw the spring background, while another group cuts out spring animals to paste on the mural. Use the mural to discuss the tundra environment and its seasons.

Evaluation:

1. Students list at least three characteristics of tundra ecosystems.

2. Students work individually or in teams of 2 to 4 to write a story similar to Di's story using their own imaginary animal.

EXTENSION:

Create a play. Using Di's story as a base, students create a play and perform for the community or another class. Different students play Di in the different seasons of her life.

Curriculum Connections:

(See appendix for full citations)

Books:

A is for Arctic (Lynch)

Above the Treeline (Cooper)

One Day in the Alpine Tundra (George)

Tundra (Kaplan)

What is a Lemming? (Souza)

Teacher Resources:

(See appendix)



The Story of *Dicrostonyx Torquatus*, The Collared Lemming

by Susan E. Quinlan

CHAPTER 1

WINTER – A WORLD TO DISCOVER

Dicrostonyx torquatus, or Di for short, was a collared lemming. She lived on the tundra in northwestern Alaska. On the day she was born, the temperature was 30 degrees below zero, and the tundra was frozen under a blanket of snow. Icy winds howled through the dark winter air.

Tiny Di and her litter mates (brothers and sisters) were born with their eyes still closed and with no hair. They would have frozen in the cold air. Instead, they were warm inside a nest of grasses that their parents had built beneath the snow.

The tiny lemmings slept and drank milk from their mother. Slowly, they grew soft fur and opened their eyes.

One day *Dicrostonyx* was awakened by a pinch on the back of her neck. She squirmed and twisted only to find that she was hanging from her mother's mouth. A terrible smell filled the air of the nest. That horrible smell and her mother's strange actions made Di feel very afraid. She hung limply as her mother carried her out of the warm nest.

Her mother then ran down a long, dark tunnel. Di's back end and feet felt icy cold when they brushed against the sides of the tunnel. Di sensed that her mother was alarmed.

Her mother hurried through one tunnel, then another. Finally she dropped Di inside a new grassy nest and then left. Di fluffed her fur out and curled into a ball to keep warm.

Di's mother returned in a few minutes. She dropped another litter mate she was carrying, then stopped. She listened carefully and sniffed the air. Di did the same. She heard the wind overhead. Wssshhhhhh, Wshhhhhhhh, it whistled. She smelled the grasses of the new nest, her parents, and her litter mates.

And, very faintly, she smelled that terrible odor that she had noticed in the old nest. Di now knew that the awful smell meant danger. For now, though, she was safe in the new nest with her parents.

Di and her litter mates grew larger over the next few days. Soon there was not enough milk to feed all the growing young. Di felt hungry and the nest felt too crowded. So she left the nest. It was colder outside of the nest, but Di stayed warm because by now she had grown long fur. She slowly walked down the snow tunnel away from the nest.

She looked at, listened to, and smelled all the new things she found. Soon she smelled something that made her remember she was hungry. She dug through the snow without thinking. Two shovel-like claws on her front paws helped Di scrape and dig through the hard snow. She found a small willow plant. Di filled her stomach with the twigs and buds of this plant. Then she began exploring again.

Di scurried from one tunnel to another for the next several weeks. She slept in nests she found along the way. She ate whatever smelled good. Di could not find very much to eat, so she had to move farther and farther away from the place where she was born.

One day she found a tunnel that ended above the snow. Di cautiously peeked out into the open air.

Ice crystals blown by a strong wind blasted into her face. The wind bit the tip of her nose, and her breath turned to white fog. Di was still curious. She poked her head out further and saw a small hill. The hill was only two feet tall but to Di it looked very large. She scampered up it to find out what was on top.

She found a patch of ground without any snow. The frozen soil was bare and brown. Di saw only a few small plants. The dead leaves and stems of these two-inch-tall plants spread over the ground like mats. Di ate a few buds that she found hidden under these dead leaves. Then she looked around.

Flat, snow-covered ground stretched out as far as she could see. There were no trees or mountains to block the view. The sun was just above the southern horizon. It lit the sky with a reddish light.



Just then Di heard a noise. Crunch, crunch! Di dove back into her snow tunnel. Then she turned around and looked out carefully. She saw six giant beasts moving towards her.

The crusty snow squeaked and snapped beneath their feet as they walked. Their short legs were almost hidden by long, woolly fur. Each one had horns that looped down either side of its shaggy face. They stopped to paw the ground as they moved nearer to Di.

They nibbled at some plants, then stopped to chew. They did not seem to notice the bitter cold and wind. But Di suddenly felt cold. She turned and ran back down her tunnel to a warmer spot beneath a large drift of snow.

Di dug her own tunnels to find food during the next few months. She learned that it was warm beneath soft, deep snow and cold under the crusty snow. She also found many new things. One day she found a beetle that was frozen. Another day she found frozen berries. She ate these. She also nibbled on the frozen buds of willow and gnawed on the stems of grasses.

Di soon learned to recognize the sounds of other animals. She knew the sounds that other lemmings made as they gnawed on twigs. She knew the sound of muskoxen crunching through the snow.

She also learned to recognize the sniffing and pat, pat, pat of a hunting arctic fox. Di knew she must fear this sound. Whenever she heard it, she sat very, very still.

Each day in the snow tunnels was just like the last. Di dug tunnels through the snow. She looked for food and found it. She listened to the sounds around her and always hid when she heard a fox. The arctic tundra provided Di with food, shelter, and places to hide from her predators. She could not have had a better home.

CHAPTER 2

SPRING – CHANGES IN THE AIR

Di often dug tunnels to the surface of the snow just to see the world above the snow. Once when she dug a tunnel to the surface she saw another tunnel in the snow just a few feet away. She saw nothing around except white snow, so

she decided to have a closer look at it.

She noticed that the sky was brightly lit out in the open. The wind was still, and the air seemed warmer than ever before. Di began to explore the white world around her. She looked, listened, and sat on her haunches to sniff the cold air.

She did not see the large white bird that sailed quietly over the snow toward her.

Its large black claws stretched out toward her back. Suddenly Di noticed a large shadow moving towards her. She rushed into the nearest tunnel, barely escaping the owl. This time the snowy owl would have to search for some other lemming to eat for its dinner.

Di's tunnels through shallow snow were light almost all of the time now. They had been dark all the time when she had first begun living on her own. Now it was almost too bright to see outside as the snow glistened and flashed in the sunlight.

Di, curious as ever, still regularly visited the snow surface. But after her encounter with the snowy owl, she was much more careful.

One day, as she gnawed on a willow branch, Di heard a new sound. It was a beautiful, melodic whistle. She hurried up to the surface to see what was making the pretty sound. The wind was howling outside the tunnel. It was hard to see through the blowing snow.

When she heard the beautiful sound again, Di spotted the singer. A small bird with striking black and white feathers and a small, cone-shaped bill was perched on top of a small snow bank near the entrance to one of Di's tunnels. A snow bunting.

After that day, Di noticed many changes in her world. The snow changed to ice in some places. Di could not dig through the ice. In other places, the ends of Di's tunnels simply disappeared. The tunnels in deep snow that were once warm, became wet and icy. Some filled up with water. Di got very cold when her fur got wet. She began to avoid the tunnels in the deep snow and started spending more time on top of the snow.



Her fur was now brown, so that she was camouflaged when she hid among the brown leaves of the tundra plants. None of the plants was more than a few inches tall. Di had to be very still when she wanted to hide.

This was a dangerous place and time for a lemming. Di saw, heard, or smelled an arctic fox almost once every week. Twice she smelled the horrid odor that she remembered from her days with her mother. Once she saw an owl carry off a lemming that had been too careless.

These events made Di wary. She sniffed the air often. She always looked carefully before going above the snow. She moved slowly. And she listened, even for faint noises.

Cack, cack, cack, get-back, tobagger, tobagger!

Di jumped nearly three inches off the ground when that loud cackling call exploded behind her. She raced under a tussock of grass and sat with her heart pounding.

Tobagger, tobagger, tobagger!

Di carefully peeked out of her hiding place. She saw a ptarmigan eating willow buds. It had a brown head, a white body, and bright red combs over its eyes.

“Tobagger, Tobagger, Tobagger!” it called.

Di saw a new bird every day. Most were flying to other places. They came, and left in great flocks. Often she heard large flocks of birds flying over. Their wings whistled in the wind. And most of them called out. Honk! Honk! Quack ... quack, quack. Phss, phss, phss.

She heard the sounds during the sunlit day and in the short twilight of night. Perhaps Di did not know it, but spring had arrived with the birds.

CHAPTER 3 SUMMER – A DIFFERENT WORLD

The weather changed often as spring turned into summer. One day was warm and the snow melted. Then snow fell and the winds howled the next day.

Soon, however, Di could not find snow to tunnel through. She had to swim in places where she had once run through snow. She found flattened piles of wet grass in places where she once had built warm nests.

Di, like all the lemmings, was forced to move to high spots on the tundra. Water covered everything else. Di could not find many places to hide, because few plants grew on the dry spots of tundra. Usually she hid under the dry leaves of a grass tussock.

Soon, the song of the snow bunting and outbursts of ptarmigan were hard to hear, because the air was filled with the calls and songs of many kinds of birds.

Lapland longspurs flew high into the air to sing songs that sounded like ice tinkling in a crystal glass. Boom, boom, boom, the drumlike calls of pectoral sandpipers echoed across the tundra.

Dunlin sailed into the air, then dove toward the earth. “Psssssssssssh!” they whistled.

“Ah ha leek, ah ha leek,” called the oldsquaw ducks from every lake and pond. But even these were drowned out by the loud, haunting cries of loons: Hulawhoouo, Hulawhoouo.

The birds began nesting almost as soon as they arrived. Loons, geese, and eiders nested on the tiny islands in the midst of frozen tundra lakes. Sandpipers nested in the bare spots between patches of melting snow.

When another snow storm passed through, the tundra was blanketed with snow. The nests, eggs, and incubating birds were soon covered by wet snow. The birds could do nothing but wait for the snowstorm to stop. If they moved off their nests, their eggs would get too cold.

Di also waited for the snowstorm to end. The snow was too wet to tunnel through, so she hid under a grass tussock. When she felt the ground shaking, she poked her head out to look for a muskox. But she saw something else.

The long-legged animals trotting toward her were thinner than the muskox. They had short fur and thin antlers. They



moved quickly, barely stopping to munch on the grasses and sedges. Di saw 20 caribou come close to her. Nearby, tens of thousands wandered over the tundra.

Di had much on her mind during these days of early summer. She had to dodge the hooves of the caribou. Jaegers, a new kind of bird predator, had appeared with the great hordes of other birds. Di had to be very careful to keep hidden from them and from owls. She listened for foxes and often sniffed the air for the smell of that other, mysterious danger.

Di found many new things to eat. She found green leaves and beautiful flowers on plants that had seemed dead during winter. The tundra was dotted with yellow, white, blue, and purple flowers. As Di feasted on this new variety of food, she grew large.

Many tundra animals, like the birds, were soon busy raising young. Within two weeks after the caribou arrived, almost every cow gave birth to a calf. The muskoxen had their calves in the willows down by the river.

Every day arctic foxes trotted across the tundra to carry lemmings, birds, eggs, and other prey to four young fox pups in their underground den.

Soon Di found a mate and, like the other tundra animals, began raising young. She and her mate dug a tunnel into the dry soil on the edge of a small rise in the tundra. Di discovered that just a few inches underground, the soil was still frozen solid. The frozen earth she found, called permafrost, underlies nearly all of the lowland tundra in Alaska.

Di made her nest soft and cozy with grasses, muskox fur, and ptarmigan feathers. Di and her lemming pups could not have had a warmer home.

As the days grew warmer, many kinds of insects began to appear. Bumblebees in yellow and black fur coats hatched from eggs that had been buried in the soil. They buzzed from one flower to the next. Yellow, blue, orange, white, and even black butterflies and moths came out of the chrysalises and cocoons in which, as larvae, they had slept through winter.

Flies and mosquitoes hatched from the eggs that had survived winter. They soon filled the air with a constant hum: Bzzzzzzz Bzzzzzzzz Bzzzz. Di heard their bzzzz whenever she was out of her burrow. She twitched her nose when one landed on it.

Every warm-blooded creature, from caribou to lemming and goose to longspur, knew the annoying sounds and bites of the mosquito hordes. Caribou often ran wildly across the tundra to try to escape these and other insects.

Di's summer season passed quickly. One day, the caribou herd headed inland on another part of their endless migration.

The eggs in hidden shorebird nests turned into long-legged, downy chicks, taller than Di. Soon after hatching, these chicks hurried after their parents in search of insects to eat.

Broods of ducklings followed their mothers around the edges of the tundra ponds. Meanwhile, flocks of male birds, and female birds whose nests eggs were eaten by predators, headed back south. Di watched long, single-file flocks of eiders fly past in a mirror image of their northward rush just two months earlier.

Areas that were flooded with water early in summer dried as the water slowly evaporated. Soon, white tufts of cotton topped the sedges and blanketed the tundra like patches of snow. Di found plenty to eat as the tundra's other flowers turned to seed pods.

In August, the temperature stayed below freezing for several days. Ice formed on the small tundra ponds, and frost covered the plants. Di listened, and she could hear no hum of insects. Summer had come to its end.

CHAPTER 4

FALL – A MYSTERY SOLVED

Di had to be very careful as summer turned to fall. More predators were looking for lemmings than ever before.

Not only were the adult foxes hunting, but their pups were



out of the den and had begun hunting on their own. The jaegers' chicks were now large and needed more food than before. Both adult jaegers were busy hunting almost 24 hours a day in search of enough food for their demanding young.

The pair of snowy owls had raised five young, and all of them were out of the nest. Di often spotted their yellow eyes peering at her. Di was also careful because she sometimes smelled the terrible scent which she knew meant danger.

Each day the temperatures grew colder. The wind stung as it lashed across the land. Frost covered the tundra plants each morning. Small flurries of white snow swirled across the tundra. Di spent most of her time hiding amidst the cotton grass and eating the sweet berries that the frosts had ripened.

She also spent some time grooming her fur. Her short brown summer coat was falling out and a long white winter fur was growing in. Arctic foxes, tundra hares, and ptarmigan were beginning to turn white just like Di.

Di noticed that a period of darkness occurred and seemed to grow longer with each passing day. The tundra was quieter than it had been earlier. Not only were the insects silent, but the birds were too busy feeding to sing or call.

Each bird needed to put on a layer of fat. The fat would give it the energy needed for the long, long journey south. As each bird gained the needed weight, it lifted off and headed south. Di often heard the honking of a flock of geese that sailed overhead. "Honk, honk, honk!" they called as they left.

One day, Di awoke from a nap and felt that her world was somehow different. She ran to the entrance of her underground tunnel. It was covered by snow.

Di pushed her nose through the soft powder to try to find the outside world. She could tell from the dim reddish light that the short, sunlit part of the day was almost over. All around her the tundra was white. Snow was everywhere. It covered the yellowed leaves of the willows, the brown leaves of the sedges, the red of the bearberry, and even the brown patches of earth.

The wind was blowing again. The wind grew colder. More

snow fell. The tundra lakes froze over. And the sun shone for a shorter and shorter length of time each day.

Di felt at home in this cold world. She tunneled one way and then the other through the snow. This was the world she had known as a young pup. She liked the warmth of the snow blanket and the darkness of her tunnels.

Di started building a warm nest of grasses in a spot she recognized as one she had used last winter. She also dug a tunnel to the surface of the snow so that she could occasionally go and look out.

On one of her visits to the surface, she saw a strange white animal she had never seen before. Its long body, short legs, and long tail tipped in black gave it an odd look. It moved by bringing its hind legs up near its front ones, then moving its front legs out. It looked a little like a very large and very fast caterpillar.

Always cautious, Di watched it carefully and sniffed the air. The animal was downwind of her, so she could not smell it. But she noticed that it was also sniffing the air, and it seemed to be moving right towards her. She backed further into her snow tunnel, but continued watching.

It was coming towards her even more quickly now. Something about its approach reminded Di of a hunting fox, so she decided to run away. She slipped down her snow tunnel away from the animal. Then she took a side tunnel that would lead to a spot downwind of the animal. Perhaps if she could sniff its scent, she would know what it was.

Di stopped and sniffed as she neared the end of the downwind tunnel.

She trembled when she recognized the odor that she had always feared. It was the smell of danger that she remembered from her earliest days in the nest with her mother. And now it was here – coming towards her!

She knew she must hide. But she had not had time to dig many tunnels in the snow. She peeked out the tunnel she was in and saw the tip of the weasel's tail disappearing down the entrance to the tunnel she had just been in. The animal's long narrow shape was just right for traveling in lemming tunnels.



Di suddenly knew that the weasel was hunting her. If she ran back down her tunnel she would run right into it.

Di decided to run over the snow surface instead. Scampering across the snow, she ran one way, then the other. The wind had formed a crust on the snow, so it was easy to run across it.

Di did not look back to see if the weasel was following. She just kept running as fast as she could.

The winds had blown the snow into drifts. Di had to run up and down, up and down over these. In her rush, Di did not see the drop-off near the edge of a frozen lake. She tumbled head over heels down the drop-off.

Down, down, down she went. When she finally landed in a snow bank, she lay stunned for an instant. Then she dove into the snow bank.

She dug as fast as she could and kicked snow to fill the tunnel behind her. At last she was too tired to dig further, so she stopped. Her heart was racing so fast she could hardly hear. But she listened carefully and sniffed the air. She heard nothing and could not smell anything.

Still she lay quietly. She did not want to make any noise that would help the weasel find her. She soon fell asleep.

Di jumped when she awoke. She calmed down only after sniffing the air. It smelled fresh and clean. Di had escaped the weasel. Now it was time to find food.

Di dug tunnels through the snow of this new area. When she finally had time to peek above ground, she felt the icy blast of winter winds and the freezing chill of below-zero temperatures. She could see only darkness. The wind howled. The ice groaned. Sometimes the sound of Di's teeth gnawing on willow twigs echoed through her tunnels; otherwise, winter was a silent season.

Di lived in her snow tunnels during these months of wind, snow, and darkness. The northern lights lit the dark sky over the tundra in February. Di cared for another litter of young under the snow. They would begin their lives as she had, in the darkness of a warm grass nest beneath a blanket of snow.

