



Peary Caribou

Northern Soils Inspiration

The Peary Caribou is the smallest of all caribou sub-species and our most northern. They live in the high Arctic islands. Peary caribou rely on the plants that grow on the tundra. Freezing rain can cause problems for the Caribou as it covers their food supply with a layer of ice, which makes it very difficult for them to feed in the depths of the winter. [Committee on the Status of Endangered Wildlife in Canada](#) (COSEWIC) listed the Peary caribou as endangered. The Peary caribou, called tuktu in [Inuinnaqtun/Inuktitut](#), and written as ᑦᑦᑦᑦᑦᑦᑦᑦ in [Inuktitut syllabics](#),^[2] is a major food source for the [Inuit](#) and was named after [Robert Peary](#). (Source: [COSEWIC](#)).



SMART Board / Promixa Ready



Northern Resources

Gr.3 Soils Alive

NORTHERN SOILS AND PLANTS

OBJECTIVE Students will learn about the unique characteristics of northern soils through a variety of hands-on activities.

Nunavut covers 1, 900 000 km². Within this territory there is a limited variety of soil types. All of the communities exist above the treeline, with shallow organic soil layers. The most common soils are mainly calcareous on the Canadian Shield bedrock. The effect of the last ice age scraped away much of the organic soils, exposing the Canadian Shield. As the glaciers melted, they left behind large deposits of glacial gravel - called moraines. The soils are topped with a very thin surface layer that thaws in the short summer (June - August) and below this is a zone of permanently frozen ground (permafrost). The soil in all Nunavut communities is only able to support plants adapted to harsh conditions. Therefore, exploring a variety of soil types can be a challenge for northern teachers.

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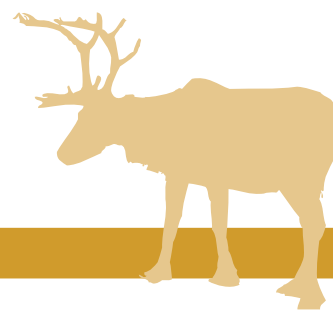
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CURRICULUM Links



The activities and resources in this document are intended to tie in with Grade 3 science curriculum *Earth and Space Systems: Soils in the Environment*, as well as the *Inuuqatigiit* curriculum relating to the land. In addition to the Pan Canadian Protocol for Collaboration on School Curriculum, you can find specific learning outcomes for each of these by following the links below. If you're not already familiar with Inuuqatigiit curriculum it's a good idea to take a look because it contains a lot of useful advice about bringing northern culture, language and traditional knowledge into the classroom. Here are some examples of where the lessons in this resource connect with these different curricula. Some suggestions for making connections have been included in the lesson plans too.

Grade 3 Science

General Learning Outcome

Students will demonstrate an understanding of the similarities and differences between various soils and the effects of moving water on soils.

Specific Learning Outcomes

Students will describe, using their observations, the differences between sand, humus and other soil components (e.g. texture, smell, malleability) and compare and describe soil samples from different locations (e.g. school yard, forest, riverbank).

Connected Lessons

Lesson 1 - What is Soil?

This lesson focuses on comparing the composition of soils from different areas.

Lesson 2 - Northern Soils

This lesson introduces students to some of the factors that shaped the creation of northern soils.

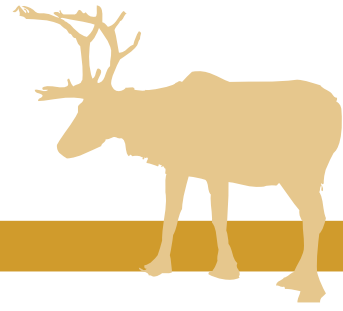


© Patrice Halley

Children exploring in Nunavut

3

JOURNALS

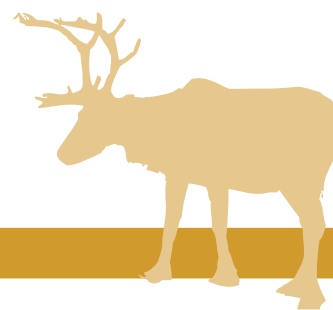


Soil and Plant Field Journal

Students can design their own journals for recording observations and questions as they explore the soil types and plants around them. Keeping a field journal helps develop scientific inquiry and research skills. Journals can be simple homemade books with lined pages or sections for note taking and plain sections for sketching. It's also a good idea to reinforce some or all of the pages with card so that they'll be strong enough to have things like twigs, leaves or even little plastic bags containing soil samples stuck to them. Greatstems.com has an excellent step-by-step guide to making nature journals. You can find the link in the **Teacher's Resources** section below.

Journals can be used as assessment tools for almost all of the lesson ideas in this resource. Some suggestions for how to use them have been included too. For students who need help writing their ideas, consider pairing them with a student who can scribe for them, or allow them to complete their work on the classroom computer or create a video blog.

TEACHER'S Resources



Books



Proud to be Inuvialuit

James Pokiak & Mindy Willett
Illustrated by Tessa Macintosh
The Land Is Our Storybook series
Fitzhenry & Whiteside, 2009
ISBN 978-1897252598
Language Focus Inuvialuktun
(French edition available)



The Caribou Feed our Soul

PeteENZOE & Mindy Willett
Illustrated by Tessa Macintosh
The Land Is Our Storybook series
Fitzhenry & Whiteside, 2008
ISBN 978-1897252673
Language Focus Chipewyan
(French edition available)



No Borders

Darla Evyagotailak & Mindy Willett
Illustrated by Tessa Macintosh
The Land Is Our Storybook series
Fitzhenry & Whiteside, 2009
ISBN 978-1927083079
Language focus Inuinnaqtun

Compost: a family guide to making soil from scraps

Ben Raskin
Roost Books 2014.
ISBN 978-1611801279

Dirty Science

Shar Levine & Leslie Johnstone
Illustrated by Lorenzo Del Bianco
Scholastic Canada, 2013
ISBN 978-1443113540
(French edition available)

Planet Arctic:

Life at the Top of the World

Wayne Lynch
Firefly Books, 2012
ISBN 978-1554076321

Yucky Worms

Vivian French
Illustrated by Jessica Ahlberg
Candlewick, 2012
ISBN 978-0763658175

North: The Amazing Story of Arctic Migration

Nick Dowson
Candlewick 2011.
ISBN 978-0-7636-5271-5

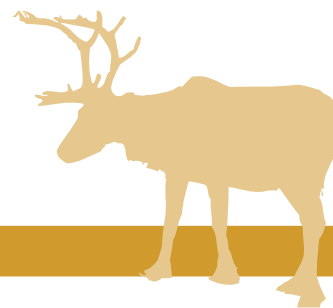
Counting in the garden

Emily Hruby
Ammo books LLC 2011
ISBN: 978-162326005-7

Rocks and Fossils.

Struan Reid
Usborne Publishing LTD, 2009
ISBN: 978-0-7460-9633-8

TEACHER'S Resources



Printable Materials



Agriculture in the Classroom

www.farmnwt.com

Teaching Guide and Resource written by the Territorial Farmers Association - Hay River, NT, 2014. This is an excellent resource all about growing food in the North! TFA will guide any Nunavut teacher who seeks support. You can contact the Territorial Farmers Association for advice at (867) 874-4706.



Elders in Schools Handbook

www.ece.gov.nt.ca/files/publications/elders_in_schools_handbook_en_web.pdf

This resource provides valuable information about inviting Elders to contribute to lessons and related activities. Interview templates are included as well as practical advice about compensation.

Videos

Bill Nye the Science Guy (24:00)

Full episode on rocks and soil
www.vimeo.com/117845069



Soil Brownies (3:00)

This video shows the collection of a soil sample ("soil brownie") on the tundra.

www.youtube.com/watch?v=AmDVFKYlqEU

"Worm poop" song (2:00)

By Birdsong and Ecowonders to get your students giggling!

www.youtube.com/watch?v=9Xs5cdIT9Ec

Composting for Kids (5:00)

An animated video that explains composting and the reasons for doing it.

www.youtube.com/watch?v=dRXNo7Ieky8

Hunting for Methane with Katey Walter Anthony (2:00)

This video, produced by the University of Alaska Fairbanks, shows how methane released from permafrost gets trapped in frozen lakes. Very entertaining to watch!

www.youtube.com/watch?v=YegdEOSQotE

Websites

Soils 4 Teachers

www.soils4teachers.org/glossary

Great Stems

www.greatstems.com/2013/05/wildlife-projects-for-kids-making-a-nature-journal.html

Grow the Planet

www.growtheplanet.com/en/blog/learn/article/289/soil-composition-an-easy-garden-experiment-for-children

Science of Everyday Life Discovery Education

www.scienceofeverydaylife.discoveryeducation.com/teachers/videos.cfm?grade=gradesk2

Missouri Botanical Gardens: Biomes of the World

www.mbgnet.net/sets/tundra/index.htm

Atlas of Canada

Free, downloadable maps.
<http://www.nrcan.gc.ca>

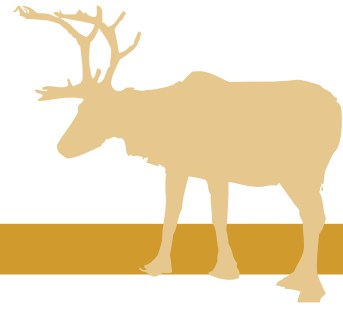
Naturetrail Rocks & Fossils

www.usborne.com/quicklinks/eng/catalogue/catalogue.aspx?cat=1&loc=uk&id=4935

Peary Caribou Fact Sheet

www.gov.nu.ca/sites/default/files/Peary%20Caribou_o.pdf

LESSON Plans



Introductory Lesson

1 class period. No formal assessment.

Assess the students' knowledge about the land. Ask the students what they can tell you about the land around their community and what it provides. They may discuss going out on the land, hunting, and having fun. Ask: *What is the land made of and what do plants need to grow?* They should mention soil, water and sunlight. Check the school library for a video of **Bill Nye The Science Guy - Rocks and Soil** (24 minutes).

Extension

Alternatively, or if you have more than one class period available, you could use this introductory lesson to make soil journals.



Lesson 1: What is Soil?

2 class periods. Including schoolyard soil sampling and assessment activity.

Project the text "What is Soil" on page 8 on a smart board, or Proxima projector. It may benefit some students to follow along on a printed copy. Read the text as a class.

▶ Soil Brownies (3:00)

Video on taking a soil sample on the tundra which highlights the presence of permafrost.

Provide your students with the tools and materials needed to gather a soil sample from the schoolyard. Depending on the soil/plants in the yard, spoons and labeled plastic bags might be sufficient.



© Peter Ewins / WWF-Canada

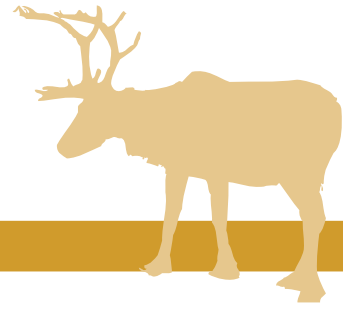
Flowering lousewort on the Tundra. Location: North Baffin Island

Take the samples back into the classroom so students can reflect on what they saw and write about the different properties of the soil they found, as well as any questions they have, in their soil journals. Reviewing their journal observations provides an assessment opportunity.

Extension

In order to meet the curriculum requirements, soil samples need to be collected from a variety of locations. Ask your students to collect one additional soil sample from a location of their choosing (river bank, home yard, shoreline, tundra, etc.). Once you have a selection of soil samples have the students compare the soils and discuss their differences.

WHAT is Soil?



None of the living things on Earth, even creatures that live in the sea, could survive without soil. Plants need soil to grow. Animals need plants to eat. Even the air we breathe would be different without soil. Over millions of years, the relationship between soil, plants, and animals has created the environment that makes all existing life possible.

Have you ever wondered how soil is made? Some soils are very old and some are very young. Some are thick and others are thin. Soils have **parent rocks**, which give some of their characteristics to the young soil. Over time, wind, snow, ice and rain will break off small pieces of the parent rock. This process is called **erosion**. Plants also play an important role in the creation of soil. Hardy plants like **lichens** can grow on the little pieces of rock. Lichens look different on the landscape, depending on the season. They make up the tundra soil so that other plants can also grow.

As more lichen grows, it attracts animals that eat the lichen and other plants will start growing on the young soil. This is good news because it means that more animals will start eating and pooping in that area. For soil **decomposers** this means more food! Soil decomposers are tiny organisms that eat and recycle dead plant and animal remains to create something called humus. **Humus** is the good-smelling part of soil that nourishes plants. Without humus, we would have no taiga forest and no tundra plants as they would have none of the nutrients they need to live.

Soil takes a long time to form but I hope you agree that it's worth the wait. With your class you will learn all about soil. Maybe one day you'll be a soil scientist!



© Frank Miller / WWF-Canada

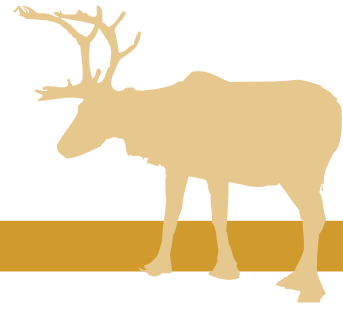
Peary caribou
(*Rangifer tarandus pearyi*), Canada



© Jeff Hollet

Lichen species

LESSON Plans



Lesson 2: Northern Soils

1 class period. Includes preparing for Elder visit.

Review the glossary terms from the **What is Soil?** student text and record terms on the whiteboard or chart paper. Project the **Northern Soils** text on the next page and ask students to follow along while you read out loud.

Assessment Opportunity

Have your students copy the key terms from the text into their soil journals and write a short definition for each one. You could also introduce the concept of diagrams and have students draw diagrams showing layers of permafrost and active soil over parent rock.

Teacher Note

The Grade 4 NWT resource in the Schools for a Living Planet series, *Extreme Weather*, also discusses flooding and the effects of soil erosion and includes a soil erosion experiment. This would tie in well especially if you have a mixed class of Grade 3 and Grade 4 students.

Innuqatigiit Connection

Explain to the students that you are inviting an Elder to visit the class to talk about land and soil changes over time and reasons for these changes. Review the points listed in the **Elders in Schools Handbook** that pertain to preparing the class. As a class, brainstorm questions to ask the Elder. Here are some suggestions:

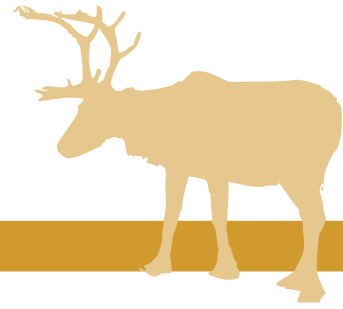
- Ask about areas of nutrient rich and nutrient poor soil in the region. *Which animals and plants are found in these areas? Are there special names for these areas?* For example – a pile of gravel left behind by a glacier is called an esker (bank swallows nest in this type of formation).
- As a class discuss with the Elder/parent/community member about what to do to keep the land clean. Encourage the class to think of ways to get involved.
- *Does your community have an icehouse?* If it does, Elders may be good at explaining why it works and if it has changed/warmed over the years.



© Peter Ewins / WWF-Canada

Children from the Inuit community of Pond Inlet (also known as Mittimatalik) standing in front of men with cargo canoes, Baffin Island, Nunavut, Canada.

NORTHERN Soils

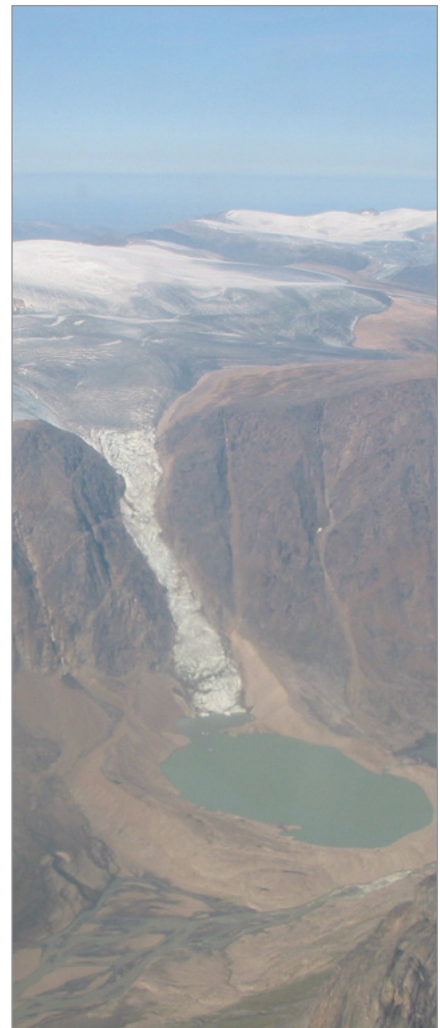


Northern soils are some of the youngest soils in the world. When the glaciers receded at the end of the ice age, they scraped away the soil and exposed the **parent rock**. The soils had to form all over again. In many parts of Nunavut you can still see a lot of bare rock. Years from now that rock may be covered with soil.

As it is so cold for most of the year in Nunavut, the soil is often frozen. Part of the soil remains frozen all the time, even in summer. When summer comes, the surface of the frozen ground warms and thaws allowing small plants to grow. This very top layer is called the active layer. The layer beneath is called **permafrost**. Permafrost is difficult for roots to push through, so plants cannot grow very tall. That is why trees in the **taiga** are shorter than trees in southern Canada.

Northern soils are created very slowly because there is not very much plant or animal residue on the ground and it is too cold in the winter for bacteria to decompose what residue there is. Northern soil is often very thin.

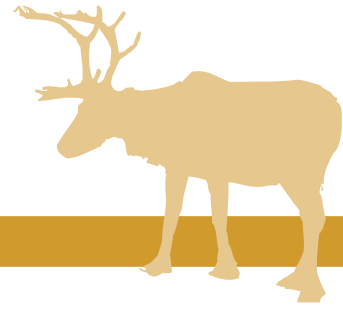
One place where the soil is thicker is beside big rivers like the Back, Burnside or Ellice Rivers. The rushing water carries lots of plant and animal nutrients. These are left on the riverbanks after spring flooding. This helps create healthy soil. But rivers can also destroy soil. When rivers flood, erosion happens. This means the water drags away some of the soil. Erosion can create problems for people, plants and animals.



© Peter Ewins / WWF-Canada

North Baffin Island

LESSON Plans



Lesson 3: Soil Actions in the North

2 class periods. Includes a permafrost experiment.

You'll need: two bread pans, some water, some soil and gravel, toothpicks, play dough or clay, pipe cleaners and some seeds.

Note: This activity requires enough prep time for a pan of water to freeze.

Assessment Opportunity

This is another great opportunity for students to add diagrams to their soil journals. Alternatively you could have students take pictures of the two pans of soil and stick these in their journals, with descriptions of the differences.

Extension

Permafrost also holds lots of methane, a gas that is 20 times more destructive to the atmosphere than carbon dioxide. If permafrost starts melting more frequently, methane is liberated (released) in the atmosphere and contributes to global warming.

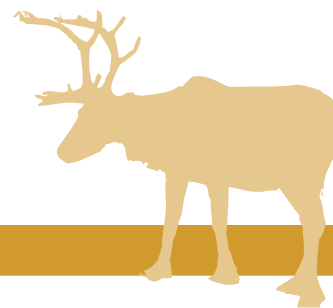
Hunting for methane with Katey Walter Anthony (2:00)

This video shows how methane gas released from permafrost gets trapped in frozen lakes. Includes engaging footage of lighting the methane on fire!

Steps

1. Mix 3 parts soil and 1 part water in each bread pan.
2. With play dough or clay, make two model houses. Prop the houses into the soil using toothpicks. Leave some of the toothpick visible. There should be one house per pan of soil.
3. Put one pan outside (if winter) or in the freezer until it is frozen solid. Keep second pan inside classroom.
4. When the pan of soil is completely frozen, bring it into the classroom. Have students compare the soils in the two pans and record their observations in their soil journals.
5. Pretend pipe cleaners are plant roots. *Which soil is easiest to penetrate?* Try planting a seed in both soils. *Which soil is easiest to plant in?* Pour a little bit of water on the surface of both soils. *Which one absorbs the water? What happens if the soil doesn't absorb water?*
6. Have students observe the changes to the soil after 10 minutes, 20 minutes, 30 minutes, 40 minutes and record observations in their soil journals. *Does the frozen soil change? In what ways does it change?*
7. Extend your observations to consider what happens to the houses and roads built on permafrost when the frozen soil melts.
8. Finish the activity with a discussion about permafrost. It affects plant roots and growth, as well as buildings. When permafrost melts, the ground becomes unstable. Students can also share stories about their own experience with permafrost.

LESSON Plans



Lesson 4: Decomposers

15 minutes with opportunities to record observations throughout a week.

This activity helps students to think about the role decomposers play in breaking down plant waste.

You'll need: an apple, a coring knife and four plates

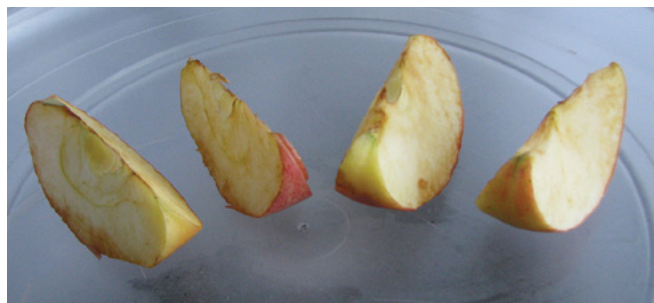
Steps

1. Cut the apple into 4 pieces.
2. Put a piece of apple onto each plate.
3. Put one of the pieces in the school fridge, one outside in an area where it will not be disturbed, one on the windowsill in the classroom and one in a cupboard.
4. Have the class observe the changes in the apple after a few hours, a few days, a week. *Which sample has changed the most? Which one has changed the least?*



© Mike Linksvayer

An example of a vermicomposting bin.



© Rose-Marie Jackson / Ecology North

Apple slices

Assessment Opportunity

Soil Journal

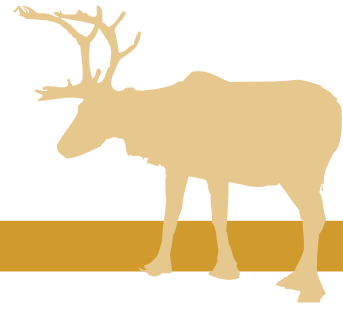
Students can record their observations.

This activity gives us information about decomposers. As a class, discuss which conditions were the best for decomposing the piece of apple. *Which conditions led to little or no decomposition?* Explain that decomposers do not multiply as fast in a cold environment, so they are slower to work when the temperature is chilly or freezing. This is one reason why northern soils build up so slowly. As a class, discuss how people can improve the nutrients in their soil. Suggestions should include adding soil amendments such as bone meal, blood meal, manure and composted organics (if available). Discuss how people can create their own low-cost supply by composting food waste or using worms (indoors) to create vermicompost.

▶ Composting for Kids (6:00)

This animated video explains how composting works and why we should compost. It describes 'centralized composting' where municipalities have large programs that can accept meat and dairy. Iqaluit has a small composting program run by one person. The compost generated is used in the Iqaluit greenhouse.

WILD Ideas



© Crossroads School

Create a class vermicomposter

Special worms can be ordered online, or contact Ecology North in Yellowknife (867 873-6019).

Get growing

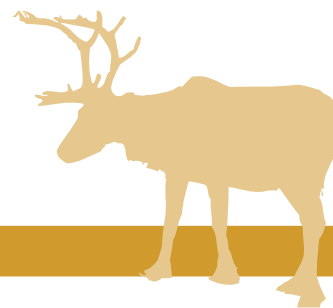
Contact the Northern Farm Training Institute as they have exciting gardening-related resources.

[The Territorial Farmers Association \(TFA\)](#) (867) 874-4706.

Soil sorter

Create an experiment to sort soil into different components using a sieve or a sedimentation jar [Grow the Planet](#) has a nice example.

Glossary



Nunavut has two official languages: Inuktitut and Inuinnaqtun. Inuvialuktun is used in some parts of western Nunavut. Languages develop over thousands of years and they tell us a lot about the people who speak them and the environment that they live in. You've probably heard that Inuit have many different words for snow. This is because there are many different types of snow in the Arctic and knowing the difference between them and what they can be used for at one point in time would have meant the difference between life and death. We asked speakers of some of these languages to

translate some of the key words in these resources and provide literal back translations. You'll see that some words translate easily while some require very long explanations. The same is true when trying to translate from Aboriginal languages into English and French. There are many words that have no translation. Try using these translations to have a conversation with your students about the differences between languages and how they reflect different ways of life and ways of thinking. This would be a great opportunity to invite a native language speaker into the classroom too.

Bank Swallow

A small song bird with a white belly and brown wings and back.

Inuktitut **Qupanuaq** / The little bird that comes up north to Nunavut each spring for the summer.

Inuinnaqtun **Kupanuanaq** / Small bird

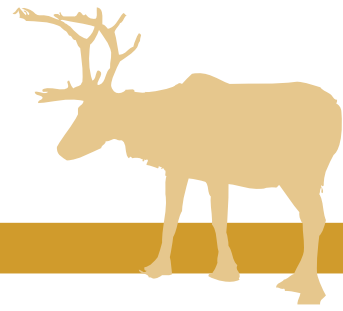
Soil

Living layer on the surface of the earth.

Inuktitut **Ibjuq (pronounced ibyuq)** / Soil where plants can grow that is softer than sand or gravel.

Inuinnaqtun **Nuna**

Glossary



Parent Rock

Original rock on which soil sits.

Inuinnaqtun

Uyaraq / Rock

Decompose

To break material into small pieces and release nutrients.

Inuktitut

Siqalisimajut (pronounced as siqalisimayut) mikijuutitut pirurutiksait /

Broken up materials for addition on land to make plants/others grow

Inuinnaqtun

Hunavaluk ahiruuyaqhuni mikhipluni anitiriyuq niriyuminaqtunik /

Anything that breaks up into a small matter and is eatable

Decomposer

Small creature that breaks down material into small pieces to free nutrients.

Inuinnaqtun

Mikiyunuaq umayuq hunavalungnik ahiruiyuq niriyuminaqtun aulaqublugit

Permafrost

Soil mixed with ice that remains frozen all year.

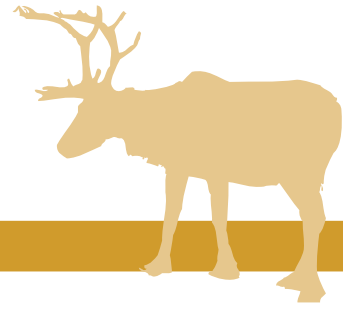
Inuktitut

Nunaup iluani quanguinarniq / The permanently frozen parts inside the lands.

Inuinnaqtun

Nunap puvitquumanga / The land, swollen

Glossary



Mineral

A naturally made solid that has never been alive

Inuktitut Ujaranniagaksauqataq (pronounced Uyaranniagaksauqataq) /
A substance that can be mined out of the land (among others)

Inuinnaqtun Naptuyuq nauniq uumangittuq / Hard surface that grows, that is not alive.

Humus

The part of the soil that is completely decomposed.

Inuinnaqtun Nuna auhimayuq / Rotten land

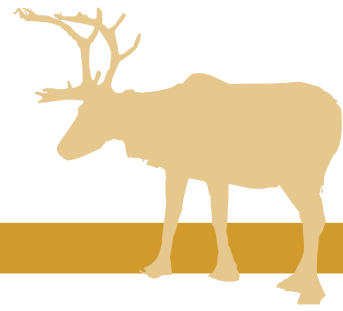
Lichen

A type of plant made of algae and fungi growing together in what scientists call a symbiotic relationship. This means that each organism depends on the other to survive.

Inuktitut 1. Tuktuut niqingi / Caribou fodder / 2. Tingiujait (most common term) / More accurately explains the appearance in that it is similar to pubic hair that grows on land or rocks

Inuinnaqtun 1. Qavviqut / Lichen on a rock 2. Tuktup niqautaa / Lichen on the ground

Glossary



Erosion

When soil or rock gets carried away by water or wind.

Inuinnaqtun Akharangniq / Part that has rolled down or off

Compost

A mixture of rotted plants that people use to grow gardens.

Inuktitut Igunaqsiarijausuut pirurutiksait / Items purposely rotted to use for growing growable things.

Inuinnaqtun Nauttiat auhimayut akuttimayuq nautianut Atuqpaktait nauniqaqublugit

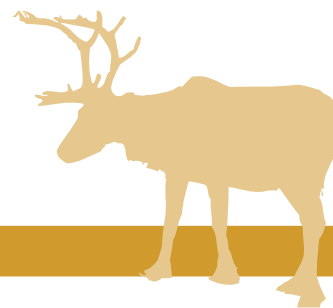
Surface

The top layer of soil

Inuktitut Nunaup qaanga / The top of the land

Inuinnaqtun Qanga

URLs



Some hyperlinks have been embedded throughout the **Soils Alive** resource. If a link appears to be broken, try visiting the homepage or keying in the URL as it's written below.

Grade 3 science curriculum

<http://www.ece.gov.nt.ca/files/Early-Childhood/K-6%20Science%20%26%20Technology%20CurriculumFINAL%20.pdf>

Inuuqatigiit curriculum

<https://www.ece.gov.nt.ca/early-childhood-and-school-services/school-services/curriculum-k-12/aboriginal-languages>

Agriculture in the Classroom

<http://www.farmnwt.com>

Elders in Schools handbook

http://www.ece.gov.nt.ca/files/publications/elders_in_schools_handbook_en_web.pdf

Soil Brownies

<https://www.youtube.com/watch?v=AmDVFYlqEU>

Worm Poop song

<https://www.youtube.com/watch?v=9Xs5cdIT9Ec>

Composting for Kids

<http://www.youtube.com/watch?v=dRXNo7Ieky8>

Soil sorter example

<http://www.growtheplanet.com/en/blog/learn/article/289/soil-composition-an-easy-garden-experiment-for-children>

Hunting for Methane with

Katey Walter

www.youtube.com/watch?v=YegdEOSQotE



WWF is working to build a future where people live in harmony with nature. The Schools for a Living Planet program empowers educators and students of all ages with the tools they need to lead us into a sustainable future. Schools for a Living Planet is grounded in the principles that make WWF a global success - including strong science and a focus on solutions.

Ecology North is a charitable, non-profit organization that has engaged Northerners in hands-on learning opportunities in the Northwest Territories since 1971. Our mission is to bring people and knowledge together for a healthy Northern environment. Education, public engagement and youth involvement are integral to all of our program streams that include climate change adaptation, watershed protection planning, waste reduction, food sustainability and alternative energy promotion.

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