EDU-ARCTIC2 LEARNING TOOL-KIT

TAIGA ANIMALS AND CLIMATE CHANGE

The taiga is the deep boreal forests of the north. Where wolves roam, brown bears pick berries and capercaillies sing. The biodiversity is huge, and in the TAIGA ecosystem, all species are wondrously linked to each other.

What happens here as the climate is changing?

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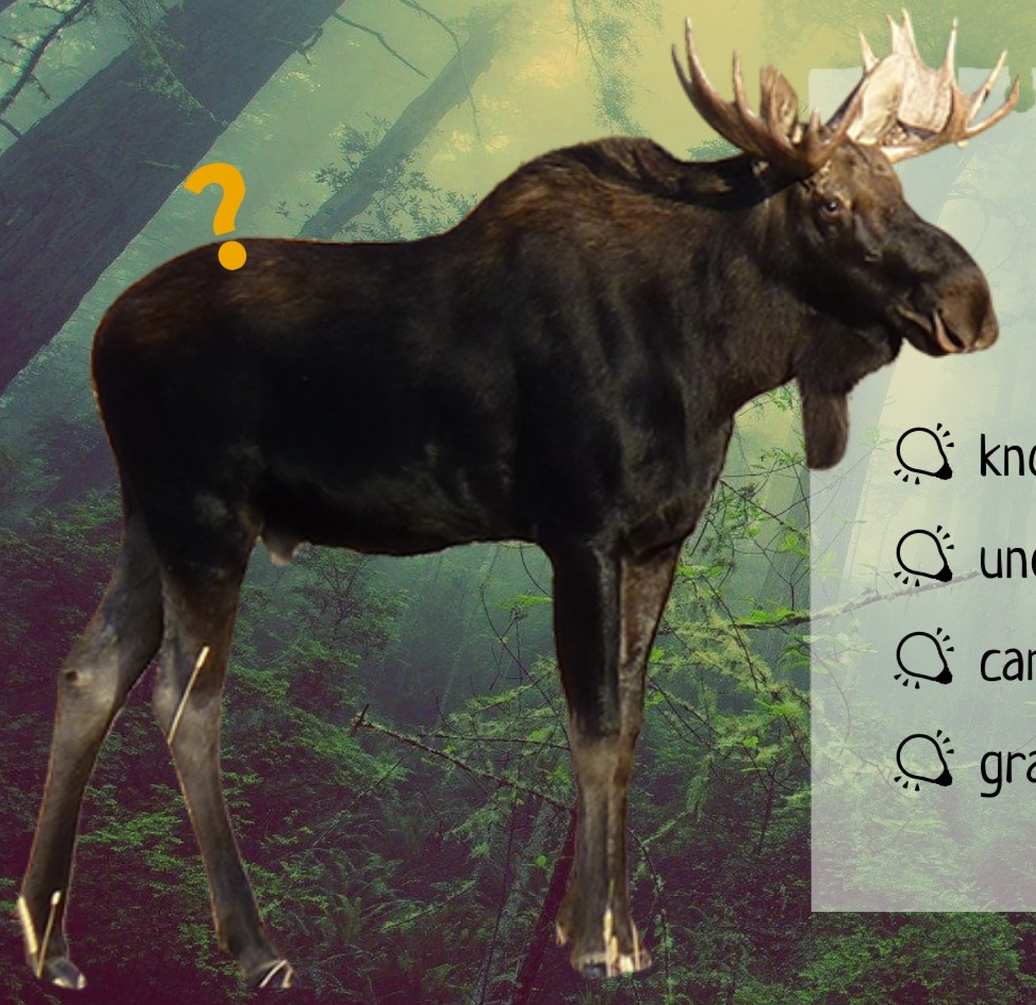
Step 5 Wrap-up

You can always navigate back to this main menu. Look for the menu symbol



Step 1 of 5: Introduction

Taiga animals and climate change

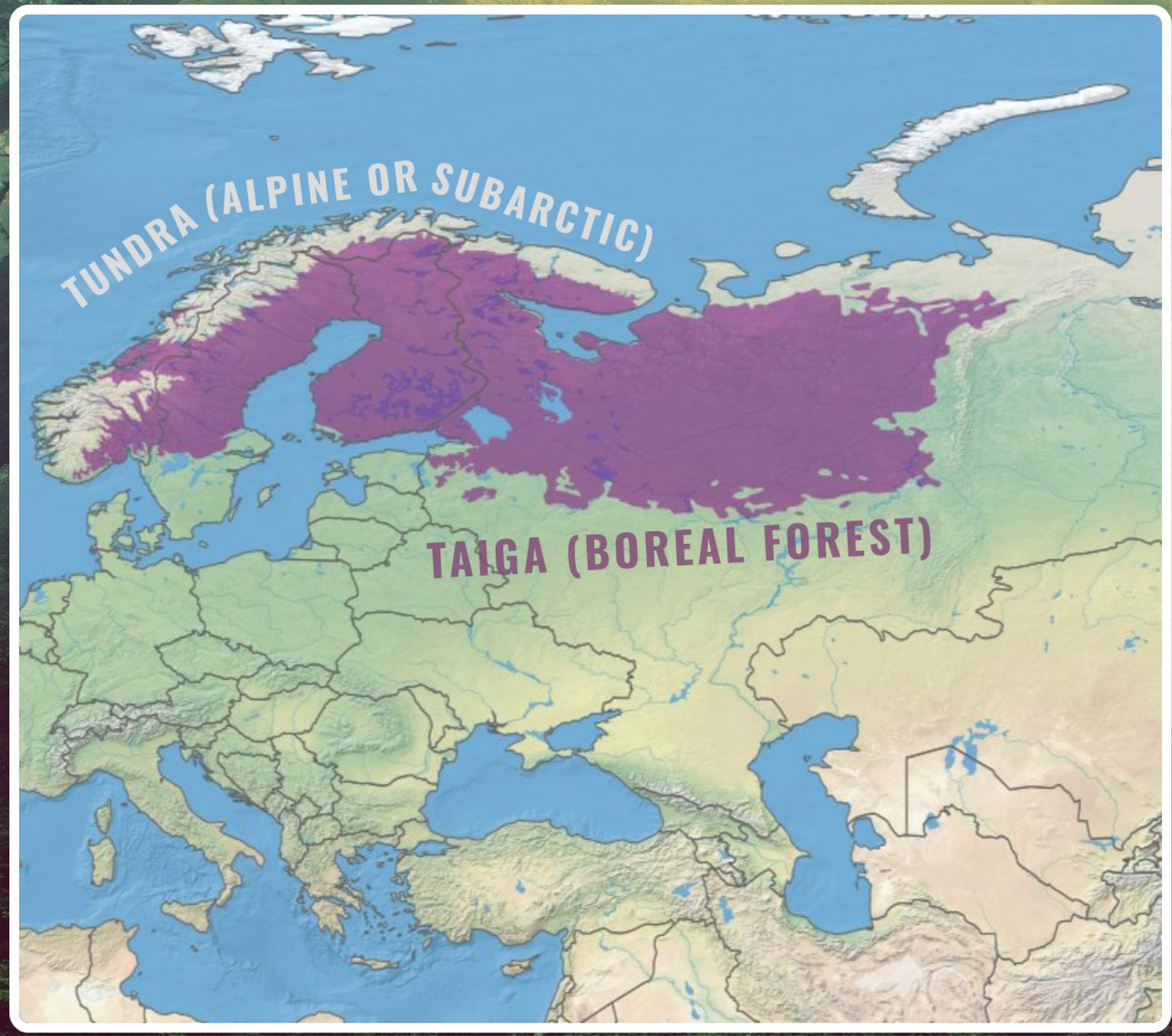


Pst!

LEARNING GOALS

After using this tool-kit, the goal is that the student

- knows what and where is taiga
- understands ongoing climate change in the taiga
- can outline effects of climate change on taiga animals
- grasps how effects on one species cascade on many others



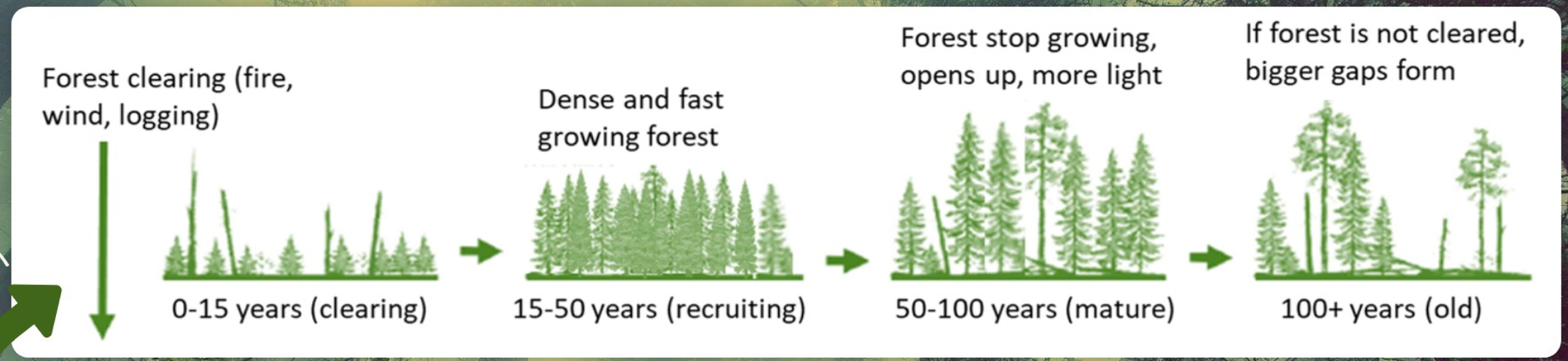
Courtesy of Terpsichores CC-BY-SA 3.0

The taiga stretches around the northern hemisphere from about 60 degrees north up to the arctic circle (about 76 degrees N). To the north it borders the tundra, and to the south it borders the temperate forest.

It is considered the largest of the world's biomes

see the taiga wildlife!

SHORT INTRO TO TOPIC



This is succession

Forest succession is the driving wheel of the TAIGA. Succesion is how a forest develop from young to old age. It takes around 100 years for a taiga forest to grow old. Then only a drastic event can make it young again, like a big fire, a strong storm, or – in most instances in Europe – humans cutting down the trees. The age of the forest determines which animals and plants are the most numerous. Most species are at the mercy of succession caused by humans.

A MAJOR EFFECT OF CLIMATE CHANGE IN THE TAIGA IS THAT IT SPEEDS UP FOREST SUCCESSION.

Terms to learn

Tap the words!

KEY-STONE SPECIES

BOREAL

CANOPY

CASCADE EFFECTS

HEAT STRESS

CONIFER

DECIDUOUS

FIELD LAYER

Click here for printable version

Are you ready to see how much of the taiga terms you remember?

Sure!

Step 2 of 5: Understand

Taiga animals and climate change


Photo shows the lynx,
the most common wild
cat in the north

TYPES OF CLIMATE CHANGE IN THE TAIGA



The temperatures are rising. This is the basis for ALL climate change in the taiga

And it leads to effect

#1

Shorter rotation time of trees.

= GOOD news for some taiga animals, bad news for others

ROTATION TIME = HOW FAST NEW FOREST BECOMES "OLD" AND STOPS GROWING

TYPES OF CLIMATE CHANGE IN THE TAIGA



#2

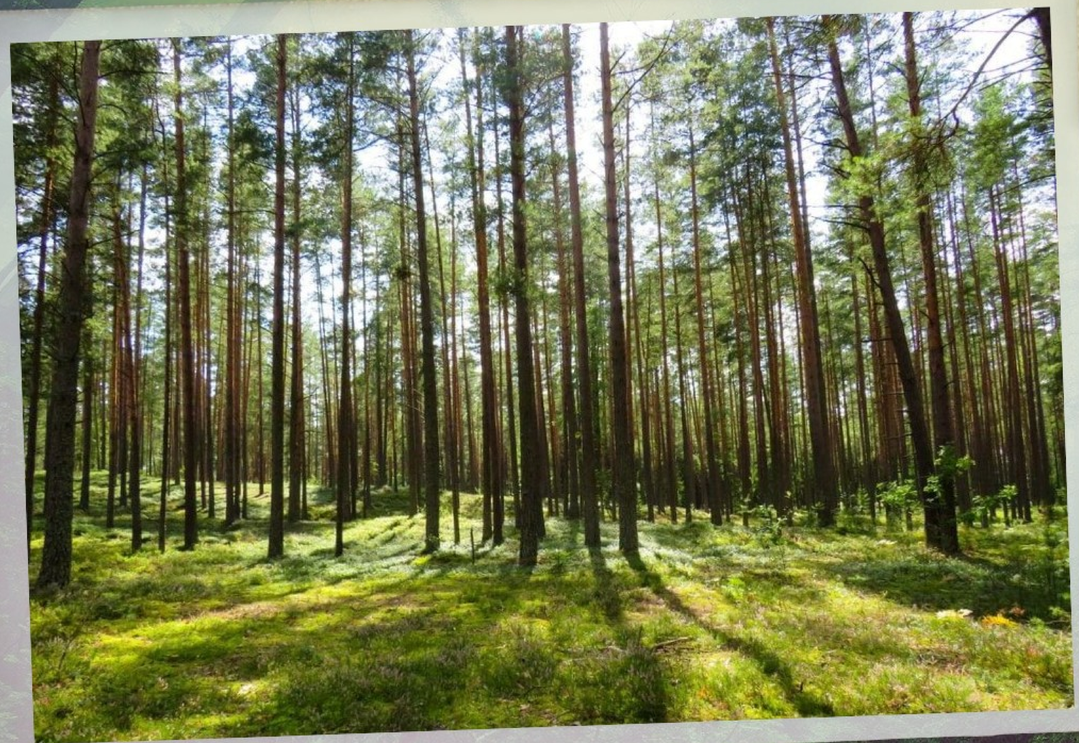
The taiga expands northward and up barren mountain sides (INTO THE TUNDRA) .

There is no biome expected to grow much into the taiga.

So there will be more taiga!

= GOOD news for taiga animals

TYPES OF CLIMATE CHANGE IN THE TAIGA



#3

The temperature rising leads to shorter winters and longer summers.

= both GOOD and BAD news for the taiga animals

STILL NOT REALLY SURE WHAT THE TAIGA IS? WATCH THIS

TYPES OF CLIMATE CHANGE IN THE TAIGA



#4

Precipitation is increasing
this leads to heavier rainfall, and deeper snow in periods.

= BAD news for most taiga animals

PST. CLICK THE QUESTION MARK BEFORE YOU GO TO THE NEXT PAGE

TYPES OF CLIMATE CHANGE IN THE TAIGA



#5

Extreme weather occurs more often, causing storms, wildfires and landslides. This creates openings in the forest, where more light comes in.

= GOOD news for most animals, but it depends on region

TYPES OF EFFECTS ON ANIMALS

- HEAT STRESS IN EARLY SPRING AND ON WARM SUMMERDAYS
- COLD STRESS ON WET SUMMER/AUTUMN DAYS
- EXHAUSTION FROM MOVING THROUGH MORE SNOW
- INCREASED INSECT ATTACKS
- MORE PRONE TO FUNGI/MICROBIC DESEASES
- CHANGES IN FOOD AVAILABILITY
- CHANGES IN COMPETITION BETWEEN SPECIES



WHICH EFFECTS ON WHICH ANIMALS?

HERBIVORES = PLANT EATERS




Moose, deer (several species), in a few areas also reindeer




Beaver, squirrels, hare, small rodents, some birds like grouse (grouse is both carnivore and herbivore)

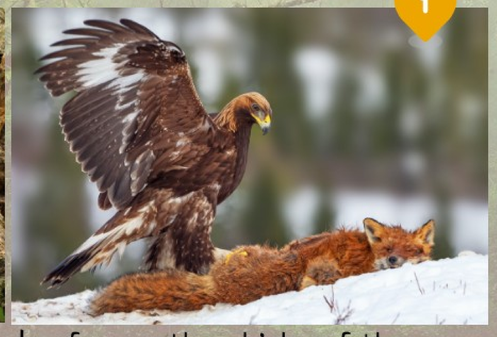
- Heat stress (especially moose, one of the most cold-adapted animals in the taiga).
- Cold stress in heavy rainfall (newly hatched chickens).
- Mismatch of spring (giving birth AFTER plant bud burst, and shedding winter coats after snow has melted).
- Needing more food if they must walk in deeper snow than has been the normal.
- Likely to get better access to (better) food (because of a longer season with fresh plants).
- Snow can affect how vulnerable they are to predators.
- Meets more numerous and new species of insects and microbiota, which bite, suck blood and spread diseases.

WHICH EFFECTS ON WHICH ANIMALS?

CARNIVORES = MEAT EATERS




Wolf, bear, lynx, in some areas also wolverine and golden eagle

Fox, mustelids (weasel, marten), birds of prey, the chicks of the otherwise herbivore grouse birds

- Heat stress (all taiga carnivores have fairly thick summer coats too).
- cold-stress in heavy rainfall (only bird chicks, carnivores easily find shelter).
- Needing more food if they must hunt more often in deeper snow.
- Likely better access to food (if prey becomes more numerous or more vulnerable to be caught in snow).
- Both carnivores and herbivores are likely to be more persecuted by humans if more people move into the taiga, which fragments the landscape and makes animals come into more conflict with humans.

PROGRESS METRE

50%

You have now completed this much of the interactive room

IN ADDITION TO THE DIRECT EFFECTS, COMES THE INDIRECT ONES!

TRULY INTERESTED?
WATCH THIS VIDEO





WANT IT A BIT SIMPLER?
WATCH THIS VIDEO!

THE DOMINO

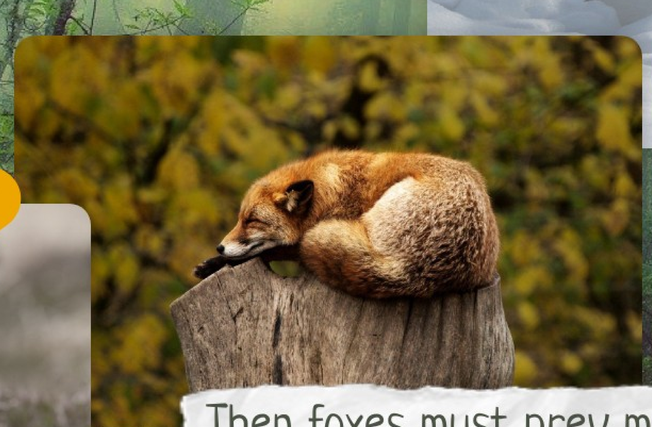
if one species is affected, many others are too



If lynxes have an easier time killing hares



There will be fewer hares



Then foxes must prey more on birds

. . . and then there will be fewer birds too



This is also called cascade effects

(a simplified version, there is a lot more happening than shown here)

showing a bit more of how compicated it is

CASCADE EFFECTS

if one species is affected, many others are too

Each step in this domino affects plant litter, soil properties, decomposers, new plant growth and ULTIMATELY the climate!



Longer summers produce more food for moose



Moose thrive and give birth to many new calves



One such plant is the bilberry, which is food for almost all taiga animals, from small rodents to the big bears.



Certain tree species die out = sprucification





Sprucification = darker forest = less field-layer = less food for many animals



But there is not much extra winter food, and the moose eat intensively on the trees

CONCLUSIONS

> Due to a warmer climate, the area of taiga is increasing. This is good news for new generations of taiga animals.

> However, climate change also gives the animals physiological stress, more insect attacks and diseases, and changed food availability (the latter is for good and bad).

> Also, the taiga is a very complex ecosystem, with lots of species and ecological niches. When one species gets better or worse living conditions, it creates domino effects on other species...most Importantly:

WHO GETS TO EAT WHO?

The sun is setting over the tree tops and your taiga understanding.
Let's wander on to the explorer's lab!

Step 3 of 5: Explore

Taiga animals and climate change

Start by finding the binoculars!

First, there is an exercise to do solo, then it's time for outdoor schooling!

You're teacher will later tell you about the outdoor schooling

(just in case you did not find the binoculars, HERE it is)

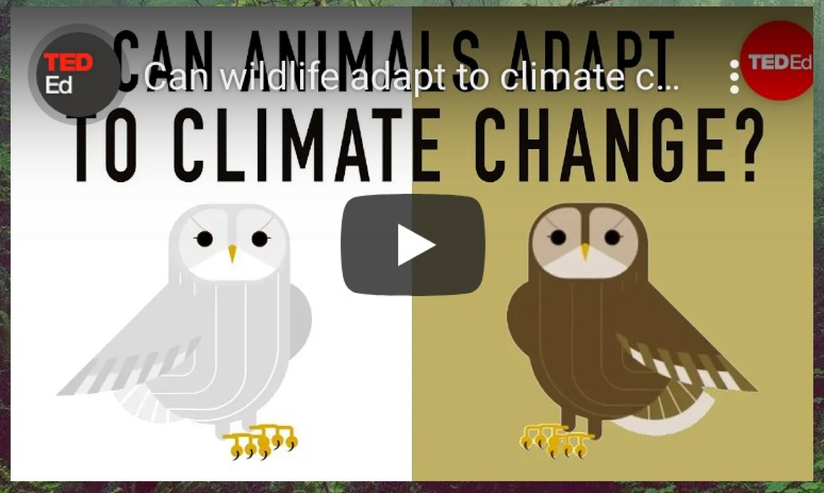


Step 4 of 5: Reflect

Taiga animals and climate change

The most important learning goal of this tool kit is to understand how climate change affects wildlife taiga animals.

Watch these two short videos. The first one is quite optimistic, listing a few species we know have been able to adapt to climate change in the past, and advocating that humans already do much to combat the effects of climate change on wildlife. The other video is not so optimistic.





1) Work in smaller groups and identify scientific claims in each movie. Evaluate how the claim is supported by evidence or not: Is the wording coloured by personal opinion or based on research? How is the use of citations and references to sources?

The teacher later opens for dialogue in class.

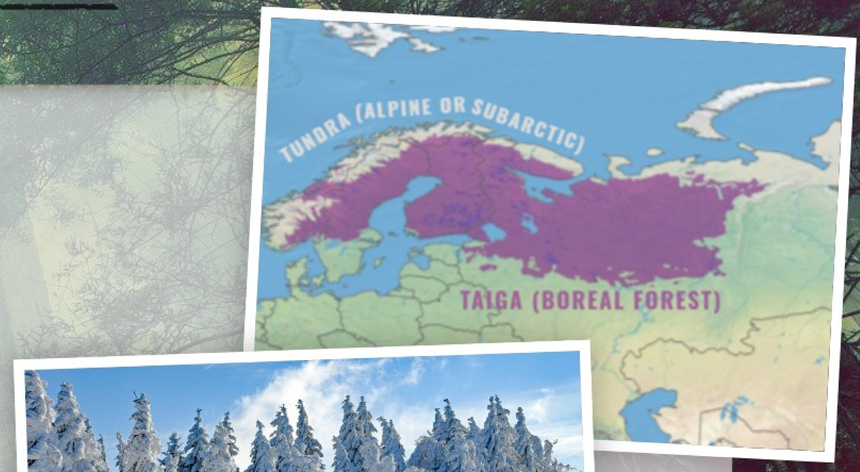
2) Then work individually and write a short essay of at least 200 words or make a creative file (audio, video, drawing etc.) about what YOU think is the long term outcome of climate change on taiga animals, and what we can and should do to stop these outcomes. Be conscientious about how you back up your own message and claims.

Step 5 of 5: Wrap-up

Taiga animals and climate change

KNOWS WHAT AND WHERE IS TAIGA

- The taiga is **only in the northern hemisphere**
- It covers nearly all of Finland, most of Sweden, large parts of Norway, nearly half of Russia and much of North America
- Taiga is **boreal forest**, dominated by conifer trees (= green year-round)
- It has high biodiversity because of its complex structure and many ecological niches
- Taiga is a main supply of wood for human use, and **often intensively cultivated**







UNDERSTANDS ONGOING CLIMATE CHANGE IN THE TAIGA

- The area of taiga is increasing
  = **good news** for new animal generations
- Forest succession goes faster
  = **Good news** for some, **bad** for others
- Temperature is rising
  = both **bad and good news** for the animals
- Rain- and snowfall becomeheavier
  = **bad news** for almost all the animals
- More often Extreme weather, which creates fires, storms and landslides
  = **Good news**, but it depends on region







CAN OUTLINE EFFECTS OF CLIMATE CHANGE ON TAIGA ANIMALS

Some ways climate change affect animals:

- HEAT STRESS, COLD STRESS, EXHAUSTION
- INSECT ATTACKS, DISEASES,
- FOOD AVAILABILITY
- COMPETITION BETWEEN SPECIES

There are more direct effects on herbivores (plant eaters) than carnivores (meat eaters), because a warming climate so intensively affects plants (= the food for herbivores)







GRASPS HOW EFFECTS ON ONE SPECIES CASCADE ON MANY OTHER SPECIES

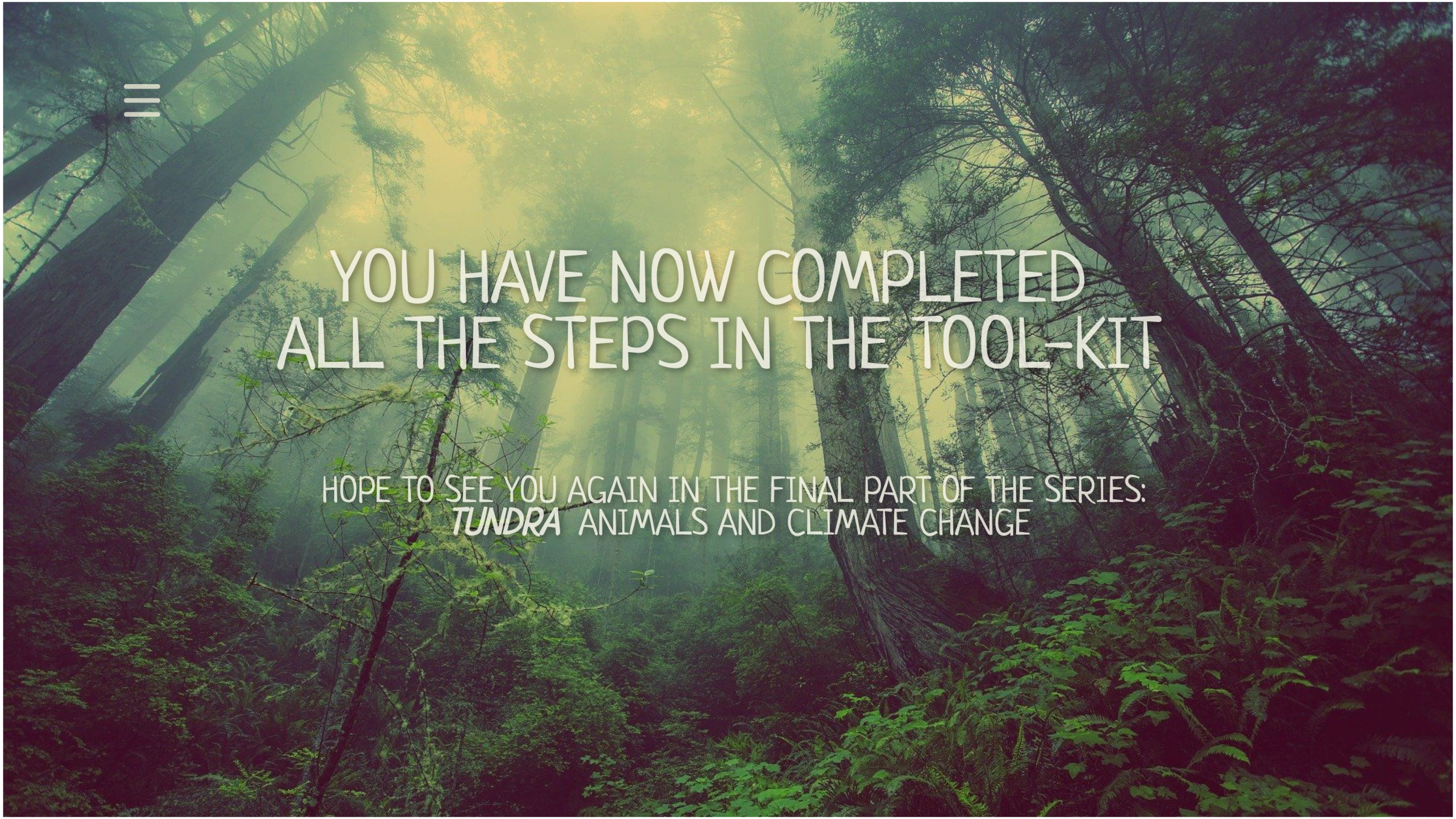
- Carnivores are strongly affected by what happens to herbivores, which are their prey.
- A single effect on a single species ripples out to affect a range of other species, both plants and animals.
- This is called **cascade effects**.
- Outcomes of cascade effects are complex, and we cannot predict what happens.
- Therefore, it may be best that we are **precautious** and do our best to reduce the effects of human-caused climate change










YOU HAVE NOW COMPLETED
ALL THE STEPS IN THE TOOL-KIT
HOPE TO SEE YOU AGAIN IN THE FINAL PART OF THE SERIES:
TUNDRA ANIMALS AND CLIMATE CHANGE