



in the Classroom

Curriculum-linked activities that bring students' love of animals to life!



Winter is over and spring has sprung! It's breeding time for Canadian bird populations and students will have to fly their paper airplane birds back home – but will they be able to make it after losing the important habitat that they rely on?

Fly Away Home: Classroom Activity

Birds face a number of challenges as they make their annual trips to and from their wintering grounds, including the continued habitat loss and fragmentation at critical migration stopover sites. The Prairie Pothole Region is one of the most important stopover sites in Canada, encompassing over 400,000 km² and extending across three provinces. This region is home to more than 50 wildlife species at risk, and it also supports over 50% of the North American populations of several different duck species¹. Some of these animals use the region to breed, while others use it as a stopover site to feed and “refuel” on their long migrations, but with almost 100 acres of this habitat disappearing each day, these animals are in trouble².

In this Classroom Activity, students will simulate the effects of habitat loss and fragmentation with paper airplane “birds”. They will try to make it from their wintering grounds to their summer habitat, but the stopover sites they rely on to complete this journey will shrink and split into pieces in subsequent rounds of the game, causing fewer and fewer birds to make it to their final destination. This activity and follow-up discussion, which will broaden students’ understanding of the impacts of habitat loss by featuring additional examples of animal population declines across Canada, should take between 30-45 minutes and must take place in a large playing area, like a gymnasium or a hallway.

✂ Materials

• Access to a gymnasium or hallway • Painter’s tape • Craft supplies: **required:** paper (8.5” x 11” regular printer paper), tape; **optional:** decorative materials (markers/crayons/pencil crayons, stickers, feathers, googly eyes) • Teacher’s Guide (provided) • Paper airplane template (provided in Teacher’s Guide) • Student Worksheet (provided)

📖 Instructions

1. Before beginning the classroom activity, lead a classroom discussion on the key concepts outlined in the Teacher’s Guide (migration, Prairie Pothole Region, habitat loss and fragmentation). Students should understand these basic ideas because they provide the context for the activity below.

Did you know?

Earth Rangers helped protect the breeding habitat of the bobolink, a songbird that spends its summers across Canada but will travel up to 10,000 km to South America when it comes time to migrate each winter!



Activity at a Glance

Grade level: 4

Overall objectives: Explore the impact of habitat loss and fragmentation on bird migration and animal populations

Key concepts: migration, Prairie Pothole Region, habitat loss and fragmentation - see Teacher’s Guide for more information

By participating in the Fly Away Home Classroom Activity, students will meet the following curriculum expectations:

1. Analyse the effects of human activities on habitats and communities
2. Identify reasons for the depletion or extinction of a plant or animal species (e.g., hunting, disease, invasive species, changes in or destruction of its habitat), evaluate the impacts on the rest of the natural community, and propose possible actions for preventing such depletions or extinctions



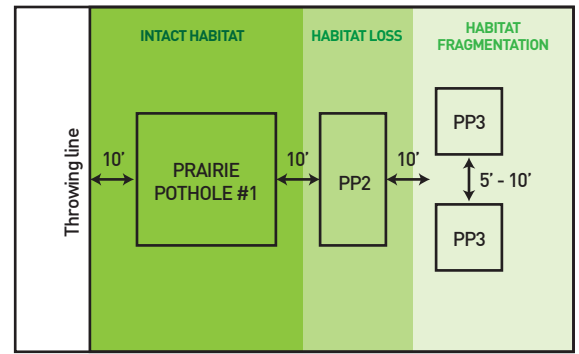
The Prairie Pothole Region touches three provinces and five states, covering over 700,000 km².

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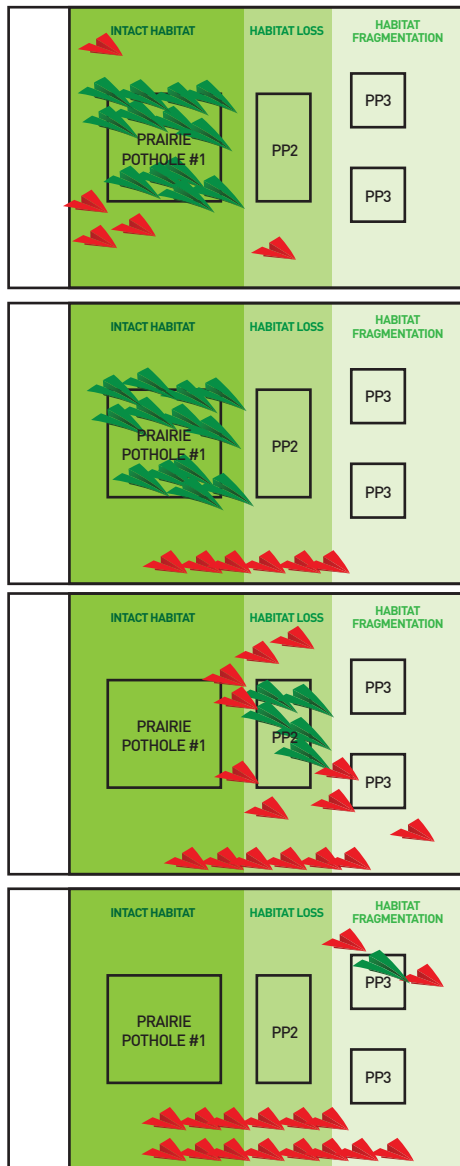
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2. To set up for the activity:
 - a. Use the template provided in the Teacher's Guide to assemble some example airplanes that students can reference while they build their own
 - b. Use painter's tape to tape down the throwing line at one end of the gym
 - c. Mark out Prairie Potholes 1-3:
 - i. Prairie Pothole 1 (approximately 10' x 10'/3 m x 3 m square) should be about 10 feet (3 m) away from the throwing line
 - ii. Prairie Pothole 2 (approximately 10' x 5'/3 m x 1.5 m rectangle) should be taped out about 10 feet (3 m) away from Prairie Pothole 1
 - iii. Prairie Pothole 3 (two 5' x 5'/1.5 m x 1.5 m squares) should be taped out about 10 feet (3 m) away from Prairie Pothole 2, and 5'-10' (1.5 – 3 m) away from each other (depending on available space)



3. Divide students into small groups (3-5 students per group) and distribute the following materials:
 - One sheet of paper per student – if desired, the paper airplane template can be printed for each student
 - One roll of tape per group of students
 - One paper airplane template per group of students – only if they don't receive individual copies
4. Using the template, demonstrate the paper airplane assembly at the front of the class while students follow along and build their own airplanes.

Successful birds **Unsuccessful birds**



Paper Airplane Assembly: The first round of the game should be completed using the standard paper type and airplane design, but if time permits, a second round of the activity can be played in which students decorate their airplanes and express their creative genius! They can make them bright and colourful or might opt to make them more lifelike using feathers and eyes.

5. Have students line up at the throwing line – they're now about to begin their migration! Tell students that they'll have one throw for each leg of their migration journey and will have to land their airplane "birds" in each Prairie Pothole in order to successfully complete their trip home.
6. **Prairie Pothole 1:** For the first phase of their migration journey home, their birds have to stop, eat, and rest at Prairie Pothole #1. Students will throw their paper airplanes towards Prairie Pothole #1 and all planes that land in, slide into, or touch the Pothole represent birds that have successfully completed the first leg of their migration. Students whose planes did not land in Pothole #1 can retrieve their planes and watch the remainder of the game.
7. **Prairie Pothole 2:** For the second leg of the journey, successful students will retrieve their planes and stand at the edge of Prairie Pothole #1. These students must now continue their migration but will find that their second stopover site, Prairie Pothole #2, has been affected by habitat loss and has shrunk. Students will throw their airplanes towards Prairie Pothole #2 and all planes that land in, slide into, or touch the Pothole represent birds that have successfully completed the second leg of their migration. Students whose planes did not land in Pothole #2 can retrieve their planes and watch the remainder of the game.
8. **Prairie Pothole 3:** In the final round of the game, students whose planes reached Pothole #2 will now try to land their planes in either of Pothole #3's fragmented habitat patches. Few (if any) students will make it this far! Tell students that most of the migrating birds were unable to make it to their final destination because the habitat loss and fragmentation at their stopover sites meant they were unable to acquire the resources (food, water, shelter, etc.) they needed to continue their journey. Explain to students that although their airplanes didn't make it, there are a number of habitat conservation and restoration projects currently underway in the Prairie Pothole Region that will help protect this important area for the wildlife that call it home.

*If desired, the game can be repeated to illustrate the effects of habitat conservation and restoration on the Prairie Pothole Region – simply increase the size of Potholes 2 and 3 in the game's second iteration to show how the number of successful migrating birds also increases when these habitats are protected.

Wrap-up and Discussion

Now that students understand the importance of the Prairie Pothole Region and the effects of habitat loss and fragmentation on its animal populations, encourage a broader discussion about other systems in which habitat loss has had a significant impact on wildlife. Ask students to share stories about their own experiences with habitat loss (perhaps they've noticed a new housing development or construction site in the neighbourhood, or have spotted more animals encroaching on the urban environment after being displaced from their native range). Share the examples below but be sure to emphasize the habitat conservation and restoration success stories included – students should feel inspired and hopeful knowing all is not lost!



- Ontario deciduous forests and the Jefferson salamander: The Jefferson salamander was added to the list of endangered species in Canada in 2010. It lives in eastern North America, and in Canada, it exists only in southern Ontario, where it was previously found in just 13 different locations. The salamander lives in deciduous forests that contain ponds that it uses for breeding, but these forests have been largely lost due to agricultural and human developmentⁱⁱⁱ. Thanks to an extensive radio-tracking research program that began in 2004 and continued in 2007 and 2008, we now know a lot more about where the Jefferson salamander lives in Ontario, and because of this information we are now able to protect even more important habitat locations^{iv}.



- Boreal forest and the caribou: The woodland caribou is considered a threatened species in Canada, which means that it is expected to become endangered if the cause of its decline continues to persist^v. The caribou's range extends into most provinces and territories across Canada and it lives in mature coniferous forests, which provide it with an ample source of lichen (the primary component of a caribou's diet). Many of these forests are contained within the boreal ecosystem, Canada's largest forested area – and one that has been subject to the development of pipelines, roads, agriculture, and resource mining that has caused a decline in caribou populations^{vi}. Fortunately several caribou populations live within protected areas, like national parks, and access to these areas has been further regulated to help minimize habitat loss and disturbance^{vii}. Coupled with a proposed captive breeding and reintroduction program, there is hope that caribou populations will rebound^{viii}!



- Canadian prairies and the swift fox: The swift fox is a small, prairie-dwelling fox that is currently listed as threatened in Canada. It was once abundant across the prairies but severe population declines in the early 1900s led to its near extinction, and the current development of prairie grassland for agriculture continues to reduce the amount of habitat available for the swift fox. Thanks to a captive breeding program that began in the 1970s, the swift fox has been reintroduced across much of its native range, and several small populations currently exist in Alberta and Saskatchewan^{ix}. It is estimated that there are about 300 individuals across Canada, a number that will hopefully keep increasing as recovery efforts continue^x!

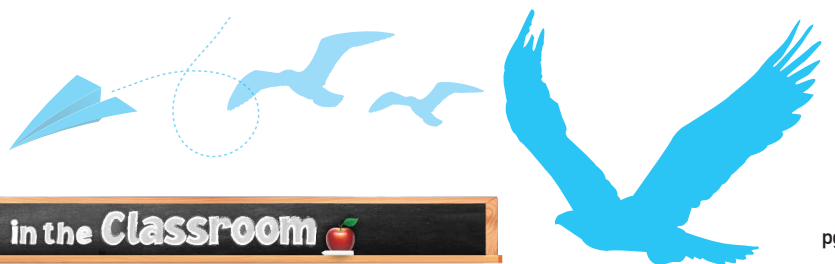
Did you know?

Earth Rangers helped protect the Jefferson salamander, caribou, and swift fox, by researching their habitats so we could better protect them!

Building on these examples, and any additional examples shared during the class discussion, students will now communicate their passion for animals and the environment in a letter to the Minister of the Environment, Catherine McKenna. The Student Worksheet provides a template that students can follow, but they can be as creative as they like! Students can write about a region they feel is important to protect and research the environmental issues faced in that region, or they can simply share their love for animals. Their letter should be positive and inspiring and should contain the following key elements:

- An overview of the issue – what is habitat loss? Why is it a problem?
- An example of an animal affected by habitat loss and why this animal is important
 - Students can use one of the examples discussed or can research their own
 - The importance of the animal can be ecological (eg. its role in the food chain or ecosystem as a whole – will require additional research by the student), or it can simply be an emotional appeal (animals are still important to protect even if only because a student thinks they're cute!)
- A broad call to action (eg. "Please do your part to help protect habitats")

Once completed, students can mail their letters (no stamp required) to The Honourable Catherine McKenna at the House of Commons (Ottawa, Ontario, K1A 0A6).





Take it to the Next Level (optional)

Habitat loss is a big problem, but your class can do their part to help by creating new wildlife habitat – right in your schoolyard! By planting a habitat garden, your students can create new spaces that a number of different animals can call home, from birds to bugs to bees and beyond.

Your garden can be as simple or as creative as you choose as long as it contains the following habitat essentials:

- A place for wildlife to raise their young (eg. birdhouse, dense brush, host plants)
- A food source for the wildlife that will use your garden (eg. plants that produce seeds, berries, or nectar)
- A water source (eg. birdbath, water dish)
- A source of cover (eg. rock pile, birdhouse, dense brush)



Once you've created your garden, you can receive a wildlife certification plaque from the National Wildlife Federation (<http://www.nwf.org/Garden-For-Wildlife/Certify.aspx>) or the Canadian Wildlife Federation (<http://cwf-fcf.org/en/do-something/challenges-projects/get-certified/>) that will designate your new habitat as wildlife friendly. A great way to show off your student's success!

Did you know? The Earth Rangers pollinator garden contains almost 5,000 plants with 53 different species!



Fly Away Home!

Teacher's Activity Guide

Use this guide to facilitate a discussion on the Key Concepts below prior to leading the classroom activity.

Key Concept One: Migration | Key Concept Two: Prairie Pothole Region | Key Concept Three: Habitat Loss and Fragmentation | Paper airplane template and instructions | Student Worksheet

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Key Concept One: Migration

Migration is the long distance movement of animals from one place to another^{xi}. Most animals migrate, and in climates with distinctive seasons (like those that occur in most of North America), this migration is usually based on changes in weather and the amount of daylight available that signal a shift towards resource scarcity. As food becomes harder to find in one area, animals will begin their migration to a location that is less resource-limited.

Birds are likely the most well-known migratory animals, and the scope of their migration is incredible. The Arctic Tern, for example, breeds in the Arctic but spends its winters in Antarctica, travelling nearly 20,000 kilometers to complete just one leg of its trip^{xiii}! Most North American birds will follow a similar pattern, breeding in the north during spring and returning to warmer locations further south in the winter^{xii}.

Migration usually occurs in groups, with flocks of birds travelling together to save energy^{xiv}. When one bird flaps its wings it creates lift for the birds around it and cuts resistance to the birds behind it, just like the drafting technique used by cyclists^{xv}. The typical V-formation used by most migrating birds can save over 10% of an individual's energy costs, but being the leader of the pack is hard work. The bird at the tip of the V does not receive the same energy savings as its fellow birds and in fact exerts more energy flying at the front of the group. To compensate for this birds will alternate positions in the V, taking turns acting as the group's leader and demonstrating a high degree of cooperation to help increase their chances of a successful migration^{xvi}.

Birds typically migrate along a flyway, which is a north-south corridor that provides an efficient route that contains ample stopover sites for feeding and rest – much like the highways and rest stops we use for our own long distance travelling^{xvii}. They tend to be coastal or track an inland body of water, which provides the critical resources including food and shelter that birds rely on. Years of tracking and research has led to the definition of four flyways across North America^{xviii}:

Over 300 bird species navigate these flyways each year, and millions of birds pass through these corridors during their migration.

- 1) Pacific flyway
- 2) Central flyway
- 3) Mississippi flyway
- 4) Atlantic flyway



Did you know?

Peregrine Falcons, like Earth Rangers Animal Ambassador Blue, have one of the longest migrations of North American birds, with some non-urban populations travelling over 25,000 km each year!



The Prairie Pothole Region is used by hundreds of bird species, including the mallard and Canada goose.



Key Concept Two: Prairie Pothole Region

One of the most significant stopover sites in the North American flyway system is the Prairie Pothole Region. In Canada, this 467,000 km² area is spread across three provinces (Alberta, Manitoba, and Saskatchewan) and is primarily grassland habitat. The region gets its name from its large number of scattered wetlands, formed during the last ice age after the numerous glaciers that dotted the landscape melted and left behind millions of shallow pools of water^{xxix}. Today these pools persist as they fill with snow in the winter that melts and replenishes the water supply come spring^{xx}.

The prairie potholes provide critical habitat for over 200 bird species^{xxi} and hundreds of other animal species^{xxii}. Their adjacent grasslands are ideal nesting locations for breeding ducks, and they provide ample resources for migratory bird populations. More than half of North America's duck populations will migrate to the pothole region in the spring to breed, and in some years there are as many as 40 breeding pairs in only one square kilometer – that's over 37 million ducks^{xxiii}!

In addition to its value to wildlife, the Prairie Pothole Region provides numerous benefits associated with wetlands, including:

- Flood control: wetlands act as sponges that can collect excess rainwater
- Water filtration: wetland plants take up excess nutrients in the water (including runoff from agricultural fertilizers), and wetland sediment traps pollutants^{xxiv}

Key Concept Three: Habitat Loss and Fragmentation

Habitat loss

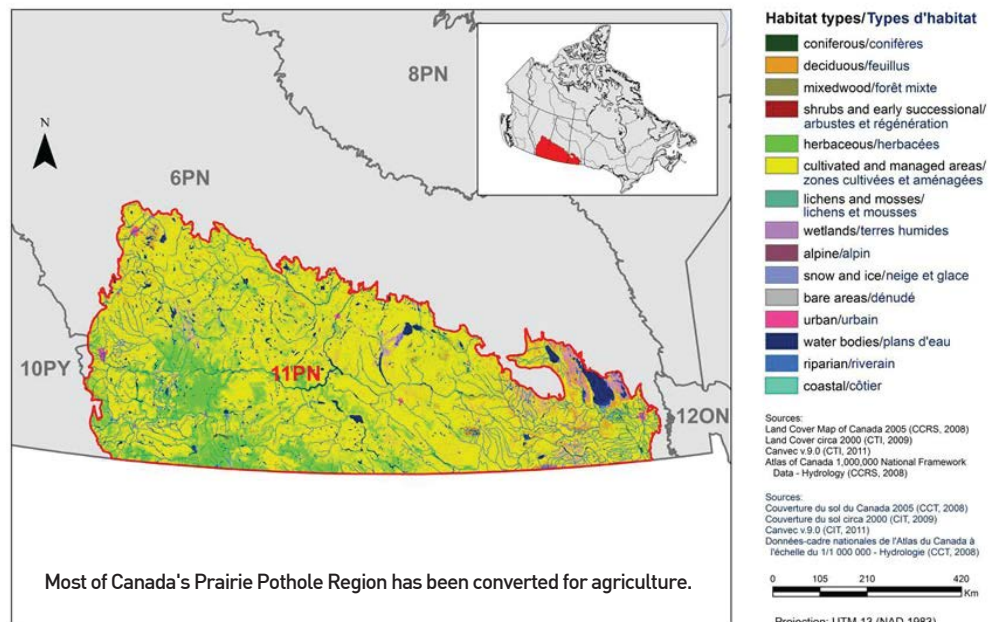
In spite of its significant ecological value, Canada's Prairie Pothole Region is under threat with nearly 30,000 acres of critical habitat disappearing each year^{xxv}. The primary cause of this habitat loss is agricultural development, with cultivated areas now the most prevalent on what was once a natural landscape^{xxvi}. Over 40% of the regions potholes have already been drained, and this habitat loss will likely persist as the rate of development continues to rise^{xxvii}.

The consequences of pothole drainage and habitat loss for the birds that use the Prairie Pothole Region are significant. Almost 35% of these species were recently classified as "priority species", which means their populations are vulnerable to, or are currently experiencing, declines. The number one threat to these species is habitat loss and degradation^{xxviii}.

Habitat fragmentation

When large areas of land are converted for development, the habitat is fragmented into patches. These patches of course cannot support the same capacity of wildlife that they could as one continuous area, and biodiversity has been shown to decrease significantly when habitat fragmentation occurs^{xxix}. This effect is widespread across an ecological community, but the risk of extinction is greater for species higher in the food chain (like ducks, swans, and cranes in the Prairie Pothole Region) because they generally reproduce less frequently, lay fewer eggs, and have smaller populations^{xxx}. A low reproductive rate and small population can lead to extinction by reducing the rate at which a species can recover from a disturbance and the odds of recovery are even further decreased when species exist in isolated populations. In this case movement between patches is limited, which means that as the number of individuals living in one habitat patch decreases there is only a small chance that this decrease will be "cancelled out" by immigration from a nearby population^{xxxi}.

The birds and ducks that rely on the Prairie Pothole Region's grassland habitat to provide protection from nest predators are at an additional disadvantage when fragmentation occurs. Smaller patches of habitat have been shown to be searched by predators more thoroughly, and more often, than larger non-fragmented tracts of land, which makes nests located in habitat patches more vulnerable to predation^{xxxii}.



Paper Airplane: Template and Instructions

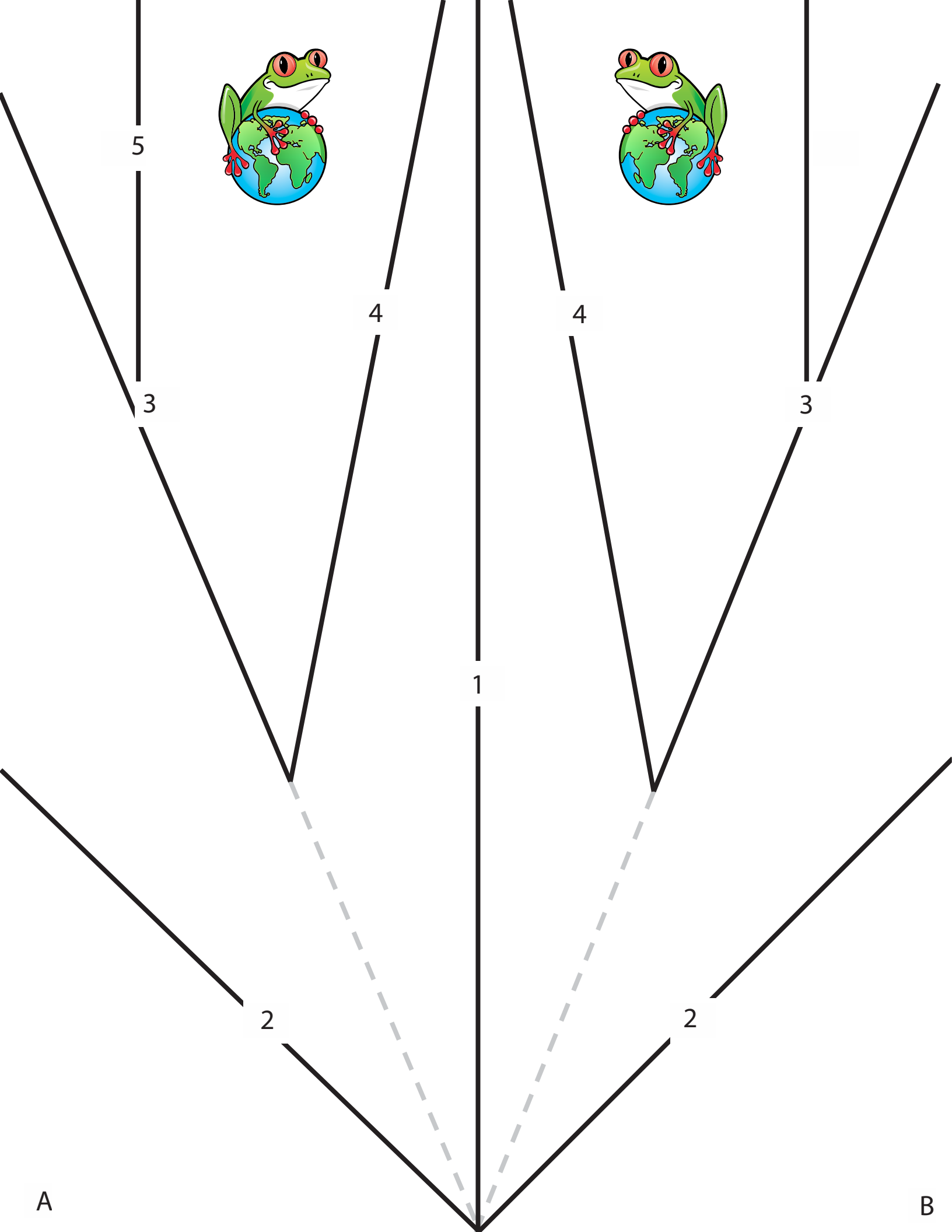
Provide a copy of the paper airplane template on the following page to each group, or if desired print a copy for each student. Students can reference the template as they watch and follow along with the teacher demonstration. You can also distribute or write out the instructions below to provide to students during the exercise.

Begin folding your example airplane with the printed side up and continue as follows:

1. Fold paper in half along Line 1.
2. Unfold paper and fold in corners A and B along Lines 2 – these should meet Line 1 in the middle of the page. Your wings are starting to take shape!
3. Fold the wings in again along Lines 3 so the edges meet Line 1 in the middle of the page – they should now be half as wide as they were in Step 2.
4. Fold entire page in half again along Line 1 (with the printed side facing inwards – it should no longer be visible) and fold the outside corners down and out along Lines 4.
5. Fold Lines 5 up to create a flap on the side of each wing.
6. Place a small piece of tape in the middle of the top of the plane to help keep it together in flight.

If students have trouble making their airplanes fly, share the following tips:

- The plane should be held in the middle of its body when thrown
- Throws should be gentle and planes shouldn't be thrown towards the ground – they'll land there on their own!
- A paperclip can be added to the nose of the airplane to help it fly straighter and further



A

B



Fly Away Home!

Student Worksheet

Use the letter template below to help guide students as they write their letters, but encourage them to be as creative as possible! Students should include an overview of habitat loss and why it's a problem, an example of an animal affected by habitat loss, and a call to action that encourages the government to continue to help protect animals and their habitats.

Student Name
c/o School Name
School Address 1
School Address 2
School City, Province
School Postal Code

The Honourable Catherine McKenna
House of Commons
Ottawa, Ontario
K1A 0A6

Date

To The Honourable Catherine McKenna,

Thank you for reading my letter!

Habitat loss is (explain what it is), and it's a big problem because (explain why it's bad). One animal that I really love is the (animal name), and it was affected by habitat loss in (location where habitat loss occurred). This animal is really important in our ecosystems because (explain its role in the environment), and I hope we can help it survive.

Please help me protect animals and their habitats. I know we can save them together if we try!

Sincerely,

Student Name
School Name

References and additional resources

i <http://www.ducks.ca/places/prairie-pothole-region/#why-it-matters>
ii <http://www.ducks.ca/places/prairie-pothole-region/#why-it-matters>
iii http://files.ontario.ca/environment-and-energy/species-at-risk/stdprod_085070.pdf
iv http://labs.eeb.utoronto.ca/murphy/PDFs/220of20papers/2009_Jeff.pdf
v http://www.cosewic.gc.ca/eng/sct0/rpt/rpt_csar_e.pdf
vi http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=636
vii <http://www.pc.gc.ca/eng/nature/eeep-sar/itm3/eeep-sar3caribou.aspx>
viii <http://www.pc.gc.ca/eng/pn-np/mtn/conservation.aspx>
ix http://www.registrelep-sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=140
x <https://wildlifepreservation.ca/swift-fox/>
xi Migration: The Biology of Life on the Move (Davis Hugh Dingle Professor in the Department of Entomology and Center for Population Biology University of California. Oxford University Press, USA, Jan 18, 1996 - Nature - 480 pages)
xii https://www.allaboutbirds.org/guide/Arctic_Tern/id
xiii <https://books.google.ca/books?id=P28caMMFRqYC&dq=isbn:9780125173674&hl=en&sa=X&ved=0ahUKewivq4j38sXMAhXFND4KHh-dAo8Q6AEIHDA>
xiv <http://birding.about.com/od/birdbehavior/a/Why-Birds-Flock.htm>
xv <https://books.google.ca/books?id=BndbshDWTgC&pg=PA89&lp-g=PA89&dq=energy+savings+of+migrating+in+flocks&source=bl&ots=XJ9P1-GIC0&sig=6-4AW3BAR25DnRPeDaZifEzo8aA&hl=en&sa=X&ved=0ahUKewivq4j38sXMAhXFND4KHh-dAo8Q6AEIHDA>
xvi <http://www.pnas.org/content/112/7/2115.full.pdf>
xvii <http://birding.about.com/od/birdingbasics/ss/North-America-Migration-Flyways.htm>
xviii <https://www.newscientist.com/article/dn25583-north-american-land-birds-migrate-along-three-flyways/>
xix <http://www.ducks.ca/places/prairie-pothole-region/#overview>
xx <https://www.epa.gov/wetlands/prairie-potholes>
xxi <https://www.ec.gc.ca/mbc-com/default.asp?lang=En&n=47D1FA51-1>
xxii <http://www.ducks.ca/places/prairie-pothole-region/#overview>
xxiii <https://ec.gc.ca/mbc-com/default.asp?lang=En&n=41613C45-1>
xxiv http://wwf.panda.org/about_our_earth/about_freshwater/intro/value/

xxv <http://www.ducks.ca/places/prairie-pothole-region/#overview>
xxvi <https://ec.gc.ca/mbc-com/default.asp?lang=En&n=41613C45-1>
xxvii <http://www.ducks.ca/places/prairie-pothole-region/#overview>
xxviii <https://ec.gc.ca/mbc-com/default.asp?lang=En&n=41613C45-1>
xxix <http://advances.sciencemag.org/content/1/2/e1500052.full>
xxx <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2871172/>
xxxi http://www.cosewic.gc.ca/eng/sct2/sct2_6_e.cfm
xxxii http://www.jstor.org/stable/3803066?seq=1#page_scan_tab_contents

Photos courtesy of Canadian Wildlife Federation, United States Fish and Wildlife Service, Alain Carpentier, Joe Ravi, Environment and Climate Change Canada