

## What is biodiversity?

**B**iodiversity is the variation in all living organisms and it's a key concept in understanding nature and natural processes. Some animals are very different from other animals, and animals are very different than plants. Think about how different a mouse is from a moose, and how different they both are from a maple tree. Even though they are all living organisms, there is incredible diversity between them. Each living thing contributes to biodiversity, even humans.

**I**n general, biodiversity has three levels of organization: *genetic* variation within populations; numbers of *species* (also known as species richness); and the differences in *ecosystems* (e.g. coral reef vs. high mountain tops). Species are also often grouped together based on their relatedness. Larger groups like, birds, mammals, amphibians, and insects are often familiar to us, containing many species. Insects alone account for most of the known species on earth. Smaller groups are less familiar and contain fewer species, but can still contain a huge amount of diversity. 'Coleoptera' is the order name given to beetles and contains about 400 000 species, about half of all insects.



Pond ecosystem surrounded by fields

**U**nfortunately, biodiversity is disappearing from the landscapes where we live. Often, humans threaten the habitats that species need to survive. This makes it harder to find food, water and shelter, the key elements of habitat. Other species avoid humans all together and won't nest or live near our settlements. Even some plants don't interact well with humans and need a lot of undisturbed space to thrive.



Male bobolink with its black and yellow head

**N**ature and biodiversity are amazing at adapting to their surroundings. For instance, birds like bobolinks have adapted to build their nests on the ground in environments where trees are rare. This is a handy adaptation that has made bobolinks successful for thousands of years. However, modern practices of humans have made it difficult for these birds to survive. Tractors and mowers can run over their nests making them unviable. The birds aren't able to adapt fast enough to the rapid changes caused by humans. But... with a little help, these species can thrive in the land shared between humans and nature.

Visit [https://youtu.be/3VnuTFuBj\\_o](https://youtu.be/3VnuTFuBj_o) to see a short clip about a couple of ways to help these birds make use of the farm habitats we share with them.

## ECOSYSTEM INVENTORY (20 MINUTES + WALKING TIME)

Thinking about your farm or property, try to list all the ways in which it is biodiverse. Create lists that answer the questions below. It is a good idea to walk around your property or farm and make notes on the types of ecosystems and species that you see. Also note any unique features of individual animals.

1. Which ecosystem types do you have on your farm or property?
2. How many different groups of species are there? List them.
3. How many species make their home on your farm/property? Which ones are the most common? Which are rare?

### Think about it!

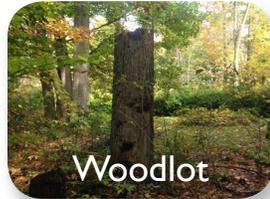
- Do you ever notice that some individuals of a species are slightly different than others? Why might this be?
- What do you think is the most biodiverse area of the farm or property?

## Ecosystem Match! (15 minutes)

Match the species below with the ecosystems they live in. On blank paper, draw a bubble for each ecosystem and write the title at the top, then fill the bubble with all the species that can be found there. What other species live in these ecosystems?

Each ecosystem contains a complex food web. Try to organize the species into a food web based on which species are prey and which species are predators. Which species are missing and where do they fit into the food webs? How do each of the ecosystems offer the key building blocks of habitat; food, water and shelter?

### Ecosystems



### Species



These resources were developed by Simon Greenland-Smith & Kate Sherren of the Biodiversity Landowners' Guide - a collaborative project between the Nova Scotia Department of Natural Resources, Environment Canada, the Nova Scotia Federation of Agriculture and the School for Resource and Environmental Studies at Dalhousie University

NOVA SCOTIA

DALHOUSIE UNIVERSITY

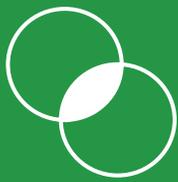
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## Where is biodiversity?

Understanding what constitutes biodiversity is important, but the question remains, “where is it found”? The answer may not be as simple as we think. Biodiversity can be found everywhere, but... it’s not evenly spread out around the world. Countries such as Madagascar and Borneo have a huge number of different species - or species richness - and are known as ‘biodiversity hotspots’. These areas also have high numbers of ‘endemic’ species – species that live in one place and no where else.

Farms are similar in this regard, they have ‘hotspots’ too. Think about which has more biodiversity, a lawn or a wetland? Which one is a hotspot for biodiversity? Biodiversity hotspots are valuable for biodiversity conservation because they contain largest number of plants and animals. Identifying and protecting these areas is a priority. Which should be protected first, a lawn or a wetland? What might influence your decision beside the number of species?

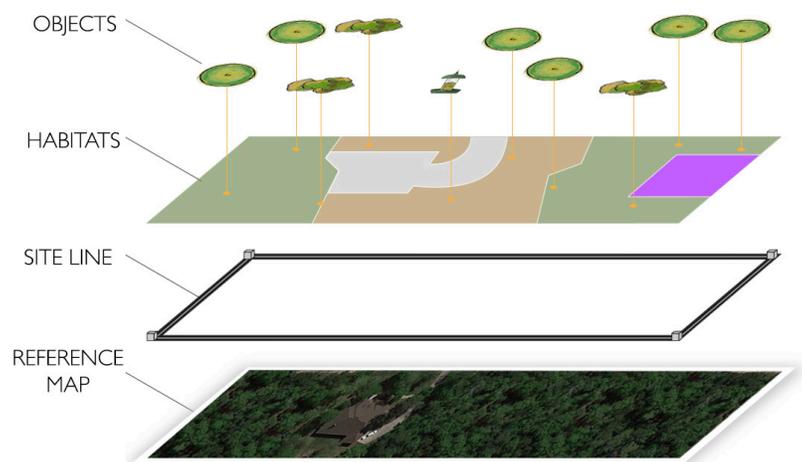
Many property features can contribute to improved conditions for wildlife. For instance, woodland habitats can provide places for birds of prey to nest. Wetlands can provide habitat for interesting amphibians like frogs and salamanders. Ponds create a home for fish and attract ducks on their yearly migrations north and south. Mapping these features will create a starting point for planning activities while still leaving space for nature. Cataloguing the biodiversity resources on your property is not hard to do and there are great online tools to help you out!

Creating a habitat map of your farm or property can help you get more acquainted with the area and appreciate how animals might use it. Yardmap.org is a tool developed at Cornell University to help you catalogue habitat features and share your custom map with researchers. The data from your map will be combined with other maps so researchers can learn more about how habitat types and features affect wildlife.

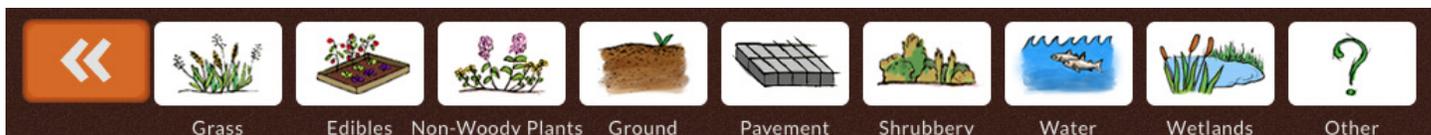
## MAP YOUR YARD!

There are a couple of steps to creating a great ‘yardmap’. Visit <https://youtu.be/ZqshO97yco4> for a video tutorial of how to make a yardmap, or follow the instructions on the back of this page.

1. Visit [yardmap.org](http://yardmap.org) and create a free account.



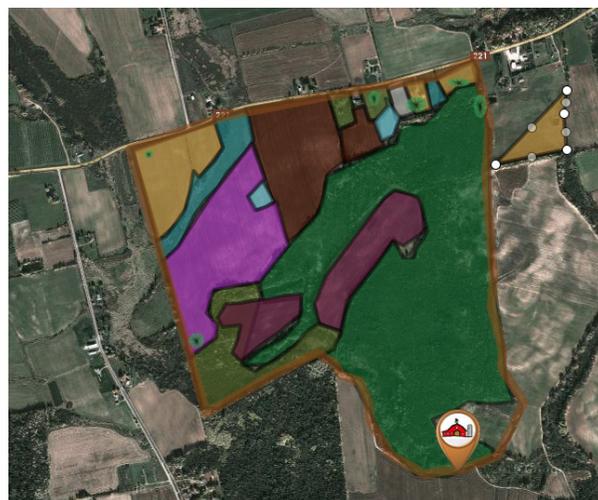
The different parts of a yardmap. (yardmap.org)



Some habitat types available for use at yardmap.org

You will be shown a (huge) map of North America and you need to find your specific property.

2. Type the address of your property into the search bar at the top right of the screen.
3. Once you use the satellite imagery to find your property, you can use the “tool shed” to outline your farm. Be sure to select which kind of property it is (home, school, farm, city park). Then you can click around the border until you get all the way around, completing the perimeter. If you have more than one property, do them one at a time.
4. Next, use the same clicking technique to fill the property with at least five habitat types. there are lots to choose from including forests, grass, wetlands and edible gardens. Try your best to fill the entire property so all areas are covered with a habitat type.
5. Then add objects like trees, shrubs and grasses to your map. These are important features for animal species so try to be detailed. It is a good idea to walk around the property and make notes in a notebook about where trees, shrubs, flowers and other features are.
6. Use plants identification books from the library to identify what kinds of trees you have put on your map. Add 30-50 features including shrubs, trees and flowering plants.
7. Add your map to the BioLOG group. Under the “groups” tab search for BioLOG in the “find a group” menu item. Join the group and add your maps. Once your map is part of the group you can compare it to other ‘yards’.



Your completed 'yardmap' should look like this



Some landscape features available for use at yardmap.org

**Think about it!**

1. What are some important features of habitats that make them good for wildlife?
2. What kinds of habitats work best close to each other? Why?
3. Is it a problem to have habitats that are isolated? Why?
4. How do you think roads and trails affect habitats?
5. What do you think the habitat will be like on your property in 50 years?

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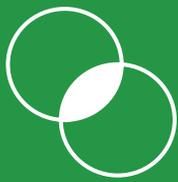


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## **Biodiversity and nature-friendly practices**

**B**iodiversity needs many of the same things that humans do; food to eat, water to drink and a place to call home. Food, water and shelter make up the key elements of habitat. Improving these three elements goes a long way in attracting biodiversity to your farm or property.

**N**ature is excellent at finding a way to exist, but some human activities can make it difficult for plants and animals to meet their needs. Diverse wildlife in healthy ecosystems can also have added benefits for humans in terms of production. Giving plants and animals a helping hand by improving habitat can ensure that wildlife enjoys our farms and properties as much as we do.

**H**abitat creation projects come in all shapes and sizes, from very big projects to little projects that you can do in a day or less. Overall, improvements to the habitat quality of your farm or property will make it more friendly to wildlife. Some species that will be attracted to this new habitat can have positive impacts on production within gardens and farms. These species can also provide services such as pollination, wastes processing, and pest control.

**B**ees are one group of species that are really important. As they feed on nectar from flowers they inadvertently pollinate these flowers by carrying pollen between them. Pollination of this kind boosts the productions of fruits and vegetables like apples, berries and squashes. Commonly, honey bees are used for this purposes. They live communally in hives, but not all bees have this lifestyle. Many species of bees are solitary, meaning they live alone. Attracting solitary bees to your property is easy to do and there are a couple of ways to do it.



Completed pollinator hotel with logs and sticks to create tubular habitats for insects.

## **MAKING A POLLINATOR HOTEL!**

Increasing the number and diversity of pollinators on your property is good for production. Yields of fruits and vegetables like blueberries and squashes improve when pollinators are plentiful. The best way to do this is to welcome your insect guests with high quality habitat including sites for nesting and laying eggs. Try creating a 'pollinator hotel'. There are lots of instructional videos on YouTube but some general guidelines should be followed:

- the insect/pollinator hotel must be dry. Ensure that the hotel has a good roof. Choose a location that is well-drained where no water gathers at any time of year.
- the hotel must face south for increased warmth and should be located in an area with low wind.
- there should be natural material for the insects to live in. Dry logs with holes work great and so do bundles of corrugated cardboard stuffed with hollow stems like bamboo or phragmites grass.
- materials should be all different sizes.

## Things you will need:

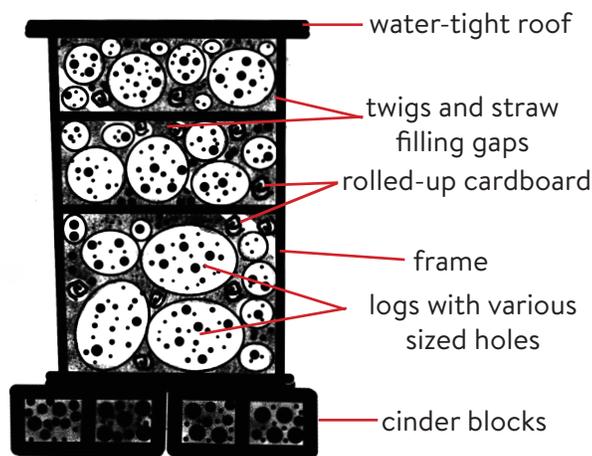
**logs – corrugated cardboard – scrap lumber– a drill – different sized drill bits – straw**



Sample pollinator hotel showing the holes of various sizes and several types of materials. Photo: ABQ Biological Park

## Instructions:

1. Identify a location for your pollinator hotel. Ensure that the 'hotel' is off the ground in a dry area so water does not saturate the materials.
2. Use a drill to create different sized holes in the ends of any pieces of log or wood you can find. Use 1/8" to 1/2" drill bits.
3. Ensure that the holes are at least 4 inches deep, this will provide enough room for the insects and the eggs that they lay in the holes.
4. When creating the frame, choose a design that works with the scrap wood that you have. You can also use crates or wooden boxes as the frame. Check out the schematic below for a generalized design.
5. Fill the frame with logs and other materials, you may need to use some screws or nails to ensure the pieces are secure.
6. Any gaps between the logs can be filled with the rolled up corrugated cardboard. You may need to tie the rolls with baling twine.
7. Fill in the remaining spaces with straw and small dry twigs. This will create lots of little holes for insects to nest in.
8. Ensure that the top of the pollinator hotel is water tight. You will need to have a dependable roof to ensure that insects make use of the hotel. The roof should protect from rain in windy conditions as well, so having a roof that sticks out 4-6 inches is a good idea.
9. Monitor the use of your hotel and track how many different species are making use of it.



Front view of example pollinator hotel showing materials used and general design

Tip! Bees can be territorial, so it is best to situate your pollinator hotel at least 10m from places regularly inhabited by humans.

## **Think about it!**

1. What would the world be like with only half the amount of pollinators? Without any pollinators?
2. Besides pollination, what other benefits might arise from increasing the number of insects on your farm or property?
3. Knowing about what makes good artificial pollinator habitats, what do you think they use when no 'pollination hotels' are available?

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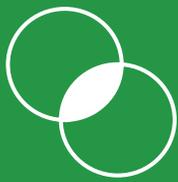


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## How does biodiversity create ecosystem services?

**E**cosystem services are the benefits that humans get from the natural functioning of nature. But to get these benefits, we must maintain the health of the ecosystems that surround us. Diversity helps ecosystems stay healthy in a number of ways. Ecosystems with structural diversity like forests provide more opportunities for different species to thrive. For instance, some species can live in the understory, while others can live in the canopy. Furthermore, a diversity of species will utilize different habitats and forage on different foods to avoid competition between species. This often means they use food sources efficiently and clean up each others' (and our) waste!

**O**nly healthy ecosystems provide the services that we depend on. If ecosystems aren't healthy, services like water purification and storm protection are harder to come by. In this way, biodiversity is a key contributor to the well-being of humans!

**M**any farm processes also rely on diverse ecosystems and their services. Take for example, beef or milk production; cows need grass to grow which comes from a modified prairie ecosystem: a hay field. Functioning hay fields grow lots of grass and can feed more cows, which provides humans with more milk or beef.

**S**ome wasp species are also parasites during their larval stage. These species can target some of our worst pests and help control the problem.

**W**e can take steps to ensure that hayfields and other ecosystems stay healthy to boost the benefits we get from them. One thing is for sure, all ecosystem services rely on functioning ecosystems. For an explanation of some great ecosystem services that humans depend on see the Report: Nature's Services at [farmbiodiversity.ca/REPORTNATURESSERVICES](http://farmbiodiversity.ca/REPORTNATURESSERVICES)

**K**eeping track of ecosystems and where they are is the first step to keeping them healthy and ensuring they provide the benefits that we depend upon.



Pond ecosystem surrounded by fields



Freshwater brook among crop land

A photo is worth 1000 words. Photos are a great way to tell stories and to capture the natural world around us. Photography is also a great way to document ecosystems and their condition. Sometimes there is a lot more happening in a photo than you think. How much of what makes a picture beautiful is because of biodiversity?

## ECOSYSTEM PHOTO SHOOT!

'Photo essay' projects encourage photographers to get out in nature and to experience first hand the ecosystems on their farms, woodlots or other properties; even public spaces close to home. A 'photo essay' project is a series of (5-10) photos, each accompanied by a short explanation of the photo.



Pond, flowery meadow, bog and forest stream. Photos: Simon Greenland-Smith

Things you will need:

### ***access to a camera – some nice days to take outdoor photos***

1. Photograph different ecosystems that can be found on your property. These can be places like woodlands, ponds, wetlands and fields.
2. Choose about 10 photos that accurately portray ecosystems and their services. Compile them into a single document. Provide a short explanation of the ecosystem you have photographed. Include the ecosystem service(s) at work in the photo. You can draw from the listed of ecosystem services in the Nature's Services Report.
3. Relate these services to the function of the farm/property. What would you have to do if nature didn't supply these services?
4. Reflect on how biodiversity contributes to this ecosystem service. Which species are involved?

**CHALLENGE:** Photograph and explain all of the seven services listed below (see "Report: Nature's Services" for explanations of each service):

Habitats - Raw materials - Fuel - Water Purification - Pollination  
Beauty and spiritual value - Health and relaxation - Purification of air

### **Think about it!**

1. Are some ecosystems services harder to take photographs of than others?
2. Why are the ecosystems in your photos important?
3. Do you think the beauty of ecosystems affects the way humans treat them?

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