



Big Woods, Big Rivers

MINNESOTA MASTER NATURALIST PROGRAM

LESSON THREE: EARTHWORMS, TURTLES, AND DEER, OH MY!

Creatures of the Big Woods



Objective: *Understand that wildlife species have specific adaptations to their environment and that they interact with both living and non-living components of their habitat.*



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2

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Use this PowerPoint presentation to review the material in Chapter 3 of the Big Woods, Big Rivers curriculum.

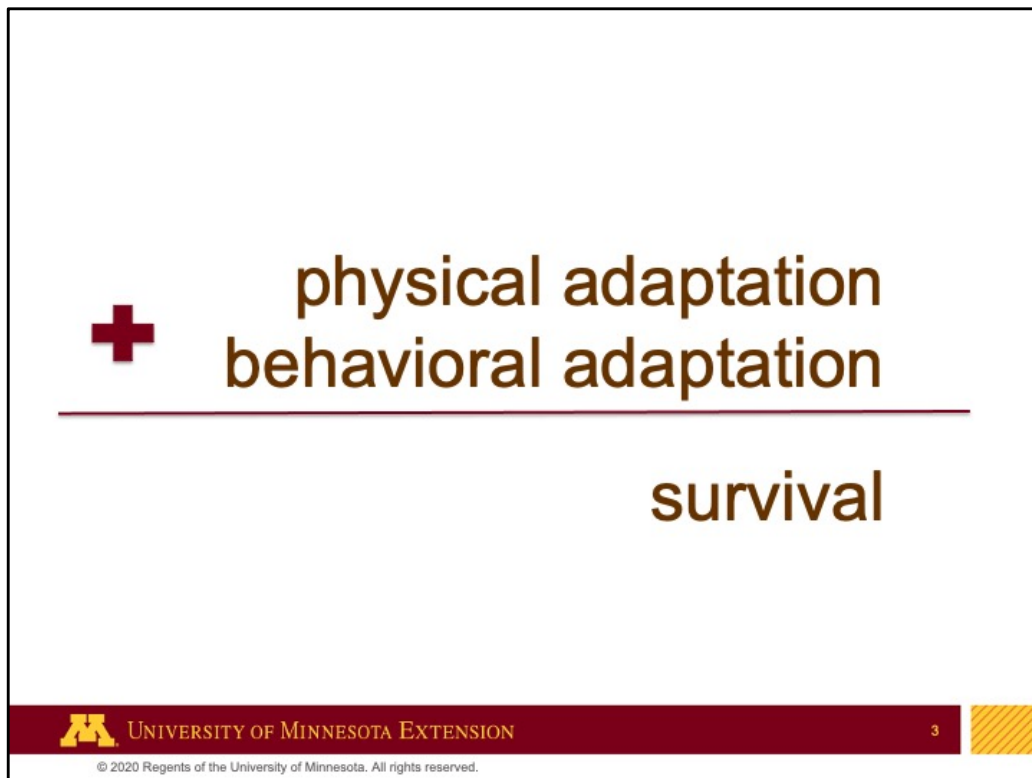
Images: worms, turtles, deer from PPT Clipart

Objective: Understand that wildlife species have specific adaptations to their environment and that they interact with both living and non-living components of their habitat.

Goals:

1. Define adaptation, and provide examples of physical and behavioral **adaptions** in animals.,
2. Describe the difference between **specialists and generalist** wildlife species.,
3. Identify and describe at least one common species of the following wildlife categories that lives in the Big Woods, Big Rivers region: invertebrate, amphibian, reptile, bird, and mammal.,
4. Describe how **management** techniques are used for game, non-game, and species of special concern, such as imperiled and invasive species in the region.

Images:
PPT Clipart



The overall theme of this presentation is that woodland wildlife use specific physical and behavioral adaptations to fit into specific niches and find food, reproduce and survive in the climate and conditions of the Big Woods.

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WHAT IS AN ADAPTATION?(NOUN)

a genetic characteristic of a living organism that improves its chances of surviving and reproducing in its habitat

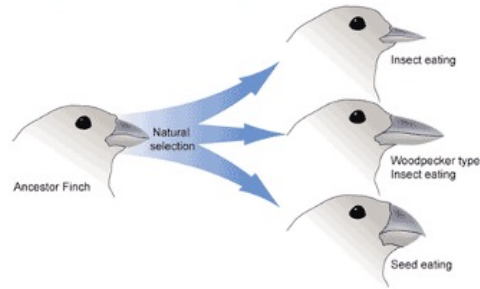


Illustration courtesy of NHGRI by Darryl Leja.



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4

Adaptations are features of an organism that allow it to survive and reproduce. They have a genetic basis and are characteristic of a population. Adaptation does not occur in the lifetime of a single individual e.g. when you acclimate a new fish to your fish tank. Rather, adaptations occur in populations over time.

Image = By Darryl Leja, National Human Genome Research Institute (NHGRI), Public Domain

http://geneed.nlm.nih.gov/topic_subtopic.php?tid=48

<http://www.genome.gov/glossary/index.cfm?id=60>

TO ADAPT (*VERB*)

the process of evolutionary modification which results in improved survival and reproductive efficiency



Adaptation also refers to the evolutionary process that leads to those characteristics that change to increase survival and reproduction.

IMAGE: PPT Clipart

PHYSICAL



American Toad
(poison glands)



North American Porcupine
(quills)



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6

Adaptations can be physical structures. Ask participants if they can name the species and the physical adaptation that they have that helps them to survive. The toad has poison glands and the porcupine has quills that keep predators from eating them.

Images:

American Toad By Jarek Tuszynski, CC BY-SA

https://commons.wikimedia.org/wiki/File:American_Toad_8885.jpg

North American Porcupine By US NPS

https://commons.wikimedia.org/wiki/File:Porcupine_NPS11952.jpg

BEHAVIORAL



Virginia Opossum
(play dead)



Eastern Gray Squirrel
(frantic movement)



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7

Adaptations can also be behavioral. Ask the participants if they can name the species and/or their behavioral adaptation.

An opossum plays 'possum' and squirrels frantically darting back and forth. Occasionally, a trait that increases survival in some situation may be maladaptive in other situations. For example, the unpredictable darting back and forth of squirrels may be a good defense when being attacked by a red-tail hawk but not when being attacked by a marauding automobile.

Images:

North American (aka Virginia) Opossum By Cody Pope CC BY-SA
https://commons.wikimedia.org/wiki/File:Opossum_3.jpg

Eastern Gray Squirrel By Tom Friedel CC BY-SA
[https://commons.wikimedia.org/wiki/File:Eastern_Grey_Squirrel.j
pg](https://commons.wikimedia.org/wiki/File:Eastern_Grey_Squirrel.jpg)

HOW DOES ADAPTATION LEAD TO DIVERSITY?

Adaptations allow organisms to divide up their habitat into distinct niches.

This allows different species to occupy the same area without competing for identical resources.



Adaptations may deter predators, but they can also lead to diversity.

Adaptations allow organisms to divide up their habitat into distinct niches. This allows different species to occupy the same habitat without competing for identical resources.

THE TALE OF THREE SQUIRRELS...



Gray Squirrel



Fox Squirrel



Red Squirrel



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9

The Big Woods of Minnesota host three similar, but different species of squirrels. These differences, or adaptations, allow these species to occupy similar habitats without directly competing for all of their resources.

Images:

Eastern Gray Squirrel in Florida By Tom Friedel @ birdphotos.com (CC BY-SA)

https://commons.wikimedia.org/wiki/File:Eastern_Grey_Squirrel.jpg

Eastern Fox Squirrel near Cleveland, OH By Markus Krotzsch (CC BY-SA)

[https://commons.wikimedia.org/wiki/File:Sciurus_niger_\(on_fence\).jpg](https://commons.wikimedia.org/wiki/File:Sciurus_niger_(on_fence).jpg)

American Red Squirrel By John Plaistow (CC BY-SA)

<https://commons.wikimedia.org/wiki/File:AmericanRedSquirrel.jpg>

EASTERN GRAY SQUIRREL

- Thrives in moist, mature forests.
- Weighs ~ 625 grams (**medium**).
- Eats tree and shrub buds and flowers, elm and pine seeds, berries and nuts (including acorns)
- Forages early morning and late afternoon.
- Dens in live hollow trees but will build leaf nests.



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10

Gray squirrels, oddly, are found in both residential areas and older moister woods. They are our ‘medium’-sized squirrel with a wide-ranging appetite. They tend to forage both early and late in the day and usually take a siesta midday.

Image:

Eastern Gray Squirrel, London, UK By William N. Beckon (CC BY-SA)

https://commons.wikimedia.org/wiki/File:2011.06.19_gray_squirrel,_Kensington_Gardens,_London,_UK_008cc.jpg

Rang map is from p. 64 “The Mammals of Minnesota” by Evan B. Hazzard.

EASTERN FOX SQUIRREL

- Thrives in small isolated woodlots and drier areas.
- Is kicked out of dens in trees by gray squirrels, so live in leaf nests.
- Weighs ~ 755 grams (**large**).
- Forages midday.
- Eats buds and flowers of trees and shrubs, various berries, and corn, but specialize on acorns.



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11

Fox squirrels can be found in fragmented and drier woods. Even though they are our 'hefty'-sized squirrel they can be displaced by the gray squirrel. They are neither early risers nor night owls and prefer to forage midday.

Image:

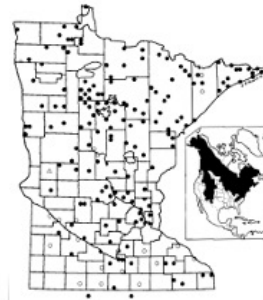
Eastern Fox Squirrel in Berkeley, CA USA By Laura Morland (CC BY-SA)

<https://commons.wikimedia.org/wiki/File:Robert-Jr-pausing-during-nest-building.JPG>

Distribution map from p. 67 "The Mammals of Minnesota" by Evan B. Hazzard,

RED SQUIRREL

- Thrive in mature and continuous forests.
- Weigh ~ 205 grams (**tiny!**).
- Usually eat conifer seeds.
- Cache their seeds instead of burying single acorns.
- Actively defend their caches and territories.



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12

Red squirrels are the tiny, frisky squirrels of our woods. They prefer conifer seeds and, consequently, are typically found on the evergreens in our woods. Since conifer seeds are so tiny, they cache the seeds and defend the caches vigorously. Consequently, they chatter up a storm when you walk by warning you to stay away.

Image:

American Red Squirrel By Franco Folini (CC BY-SA)

https://commons.wikimedia.org/wiki/File:Tamiasciurus_hudsonicus_001.jpg

Range map from p. 69 “The Mammals of Minnesota” by Evan B. Hazzard,

HOW DO THEY COEXIST?

- Different sizes.
- Different foods.
- Different foraging behaviors.
- Different nest sites.
- Prefer slightly different forest types.
- **But can all be found in the same forest. In their own NICHE**



These squirrels may occupy the same forest, but they have a variety of adaptations that allow them to make use of the habitat in different ways.

Images:

Eastern Gray Squirrel in Florida By Tom Friedel @ birdphotos.com (CC BY-SA)
https://commons.wikimedia.org/wiki/File:Eastern_Grey_Squirrel.jpg

Eastern Fox Squirrel near Cleveland, OH By Markus Krotzsch (CC BY-SA)
[https://commons.wikimedia.org/wiki/File:Sciurus_niger_\(on_fence\).jpg](https://commons.wikimedia.org/wiki/File:Sciurus_niger_(on_fence).jpg)

American Red Squirrel By John Plaistow (CC BY-SA)
<https://commons.wikimedia.org/wiki/File:AmericanRedSquirrel.jpg>

NICHE

The unique position occupied by a particular species in an ecosystem, including the actual physical area that it inhabits and the function that it performs within the community.

-- Morris 1992

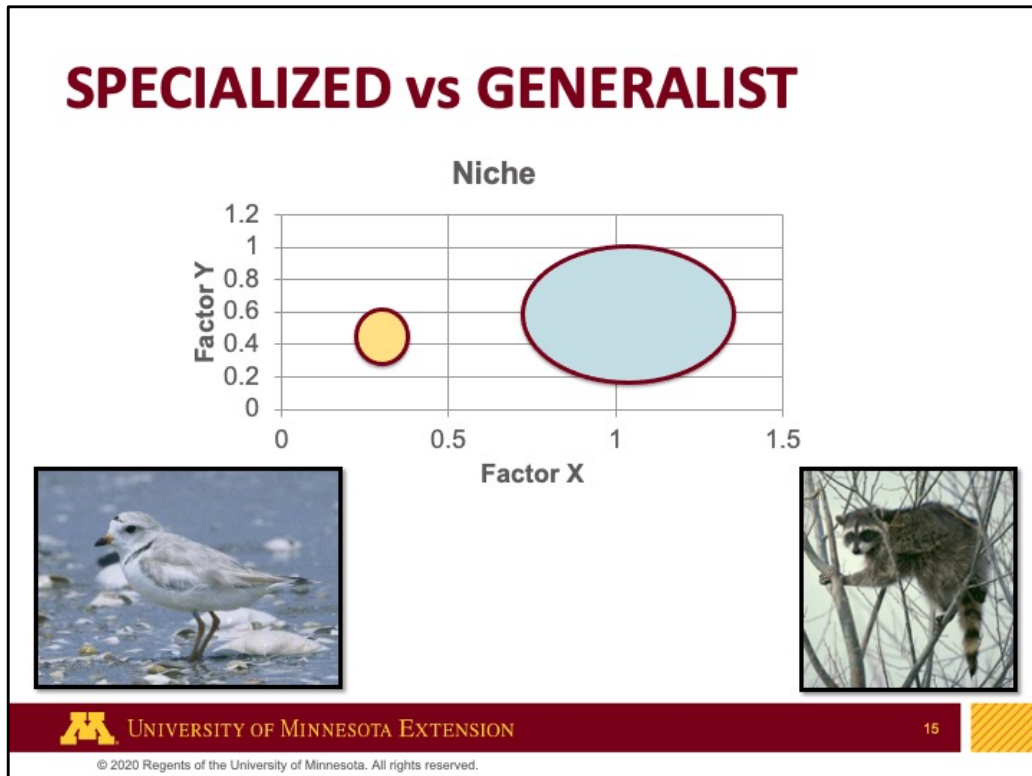


A niche is another way of describing how species coexist by *not* using the same resources. A species' niche includes all of the resources it obtains from its environment as well as how it interacts with all the components (both biotic and abiotic) of the ecosystem. Ecologists often refer to a niche as an “n-dimensional hypervolume.” The n-dimensions are all of the factors that describe an organism's distribution and abundance. The hypervolume refers to the object that would exist if you put all of these factors in a single graph of n-dimensions (not just your typical two-dimensional x-y graph!).

Many plant communities and diversity in resources leads to many different niches!

Morris, Christopher. Academic Press Dictionary of Science and Technology. Academic Press, Inc. San Diego: 1992.

SPECIALIZED vs GENERALIST



Species that can live in many different types of environments, and have a varied diet are usually considered generalists. Specialist species require unique resources and are more likely to suffer from habitat loss and disruption than generalist species because if one factor is destroyed they are more affected than a generalist.

Examples:

Piping plovers use wide, flat, open, sandy beaches with very little grass or other vegetation for their habitat (specifically for nesting). Other example in book is monarch butterfly and its dependency on milkweed. Blanding's turtle prefer specific nesting sites that have been altered or eliminated by humans.

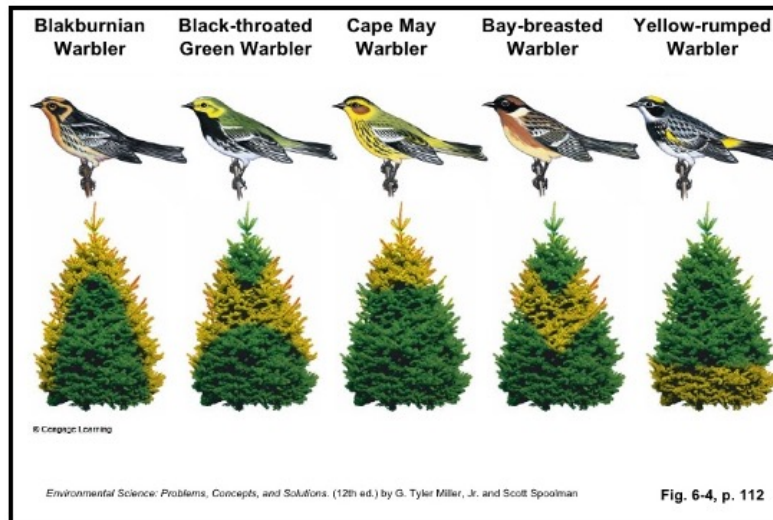
Raccoons are omnivores who can survive and use a variety of habitats. Example in book is white-tailed deer.

What's your niche?



NICHE: FINDING THE RIGHT FIT

The advantage of being different.



This image from *Environmental Science: Problems, Concepts, and Solutions* textbook shows a famous example (MacArthur 1958) of warblers and their niches on conifers. All these warblers eat insects, but they portion these food sources by specializing and foraging on certain parts of the conifer tree.

Niche (as an ecological term) may be a new term for many participants.

Book definition: The role and position of an organism in its environment/habitat and what that organism needs to survive. Ecological niche defines how an organism interacts with resources and competitors in its habitat, how it meets its needs for food and shelter, how it reproduces, how it interacts with all the abiotic and biotic factors in its environment, and simply just how it survives.

Species differences are responsible for their coexistence. Niche differences allow species to divide up the environment, like different products/services cater to consumers with different needs, tastes, and income levels. Occupying a unique niche is advantageous since it reduces the amount of competition for resources.

Fundamental vs Realized Niche: Fundamental is the entire niche the individual fits into (in a perfect world). However, due to competition (and possibly other factors), the organism may not be able to fill the entire fundamental niche. The fundamental niche is adjusted (shrank down) due to the factors like competition and this adjusted niche is known as the realized niche.

Each of us have our own niche. Your niche includes where and how you obtain food and all of the things you do in order to survive.

Optional Videos:

<https://www.youtube.com/watch?v=xIVixvcR4Jc>
<https://youtube/z31y-ZtegZ8?list=PLrLT13AaT96caLi-F49mZTj-kAsYmcRPa>

Warbler Example (classic Bio article):

MacArthur, R.H. "Population Ecology of Some Warblers of Northeastern Coniferous Forests". *Ecology*. Vol. 39, No. 4, Oct 1958. pp 599-619.

http://labs.bio.unc.edu/Peet/courses/Classics-2003/ReadingsPDFs/5_Oct2_Niches/MacArthur1958.pdf
https://web.stanford.edu/group/stanfordbirds/text/essays/MacArthur's_Warblers.html
<https://www.youtube.com/watch?v=LBFnJtKv4c>

Image: *Environmental Science: Problems, Concepts, and Solutions*. (12th ed.) by G. Tyler Miller, Jr. and Scott Spoodman. ISBN-13: 978-0495560173, ISBN-10: 0495560170

HUTCHINSON'S RATIOS

- Species within a size set often differ in size by 1.3:1.
- This is equivalent to a doubling in weight or volume ($1.3 \times 1.3 \times 1.3 = 2.1$)
- This leads to different prey items and, presumably, less competition.



<https://commons.wikimedia.org/w/index.php?curid=227816>



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18

One long-standing hypothesis in ecology is that species are different enough to co-exist when they differ in size by a ratio of 1.3:1. This pattern is seen in hawks, seed-feeding finches, copepods, and the body sizes of owls. The mechanism is most likely a differentiation in prey sizes (Broad-wings eat insects, Red-tails can eat medium-sized mammals). However, the pattern of 1.3:1 may not be the ultimate explanation. This ratio is seen in a variety of items including nested Russian dolls and stringed instruments (think violin, viola, and cello).

Image from Wikipedia (http://en.wikipedia.org/wiki/Image:Russian-Matroska_no_bg.jpg). GNU head (By Original photo: User:FanghongDerivative work: User:Gnomz007 - removed background from File:Russian-Matroska2.jpg, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=227816>) Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.2 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts. A copy of the license is included in the section entitled "GNU Free Documentation License".

HOW DO PREDATORS SEPARATE THEIR NICHES?



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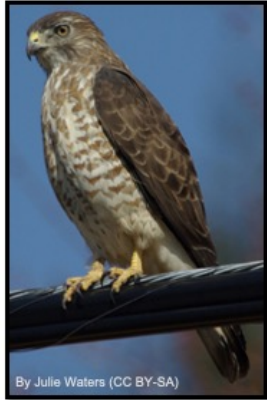
19

One area of inquiry for many ecologists has been the study of “size sets”-- the observation that similar species in an ecosystem come in small, medium, and large sizes. One example is that of woodland woodpeckers: the small Downy, the medium Hairy, and the large Pileated. Another example is woodland hawks.

IMAGE:

A juvenile Red-tailed Hawk, *Buteo jamaicensis*, By Steve Jurvetson (CC BY-SA)
https://commons.wikimedia.org/wiki/File:Hawk_eating_prej.jpg

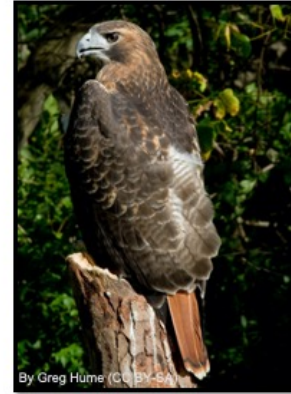
THE TALE OF 3 HAWKS...



Broad-winged



Red-shouldered



Red-tailed



The Big Woods of Minnesota host three similar, but different species of hawks. These differences, or adaptations, allow these species to occupy similar habitats without directly competing for all of their resources.

Images:

Broad Winged Hawk, By Julie Waters (CC BY-SA)

https://commons.wikimedia.org/wiki/File:Julie_Waters_broad_winged_hawk.JPG

Red-shouldered Hawk, By Richard J Kinch (CC BY-SA)

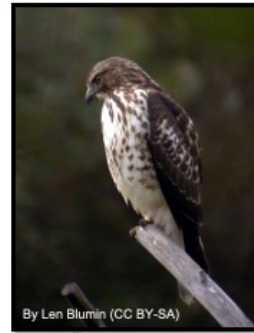
https://commons.wikimedia.org/wiki/File:Rkinch_red-shouldered_hawk.jpg

Red-tailed Hawk, By Greg Hume (CC BY-SA)

<https://commons.wikimedia.org/wiki/File:RedTailDisplay.jpg>

BROAD-WINGED HAWK

- Small (smaller than a crow)
 - Length: 13-17 in.
 - Wingspan: 32-39 in.
 - Weight: 9.35-19.77 oz.
- Eats small mammals, birds, reptiles, amphibians, and large insects.
- Breeds in continuous deciduous or mixed-deciduous forest.



By Len Blumin (CC BY-SA)



● Broad-winged Hawk

Range map courtesy of MN DNR



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21

Broad-winged hawks are our smallest Buteo or buzzard hawk. Buteos are short and chunky with broad wings and rounded tails. They perch in woodlands and wait for prey including mice, frogs, insects, and snakes.

IMAGE:

Broad-winged hawk in CA, USA, By Len Blumin (CC BY-SA)

https://commons.wikimedia.org/wiki/File:Broad-winged_Hawk.jpg

Range map courtesy of MN DNR

<http://www.dnr.state.mn.us/birds/broadwingedhawk.html>

RED-SHOULDERED HAWK

- Medium (size of a crow)
 - Size: 17 - 24 in.
 - Wingspan: 37 - 44 in.
 - Weight: 17 - 27 oz.
- Eats small mammals, birds, reptiles, amphibians, and crayfish.
- Breeds in forests with open understory, especially bottomland hardwoods, riparian areas, and flooded swamps.



Range map courtesy of MN DNR



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22

Red-shouldered Hawks used to be the most common hawk in North America but they are now considered a rare and declining species. They favor woodlands with water and hunt from a perch watching for frogs, small mammals, insects, fish, earthworms, and crayfish. Their decline is attributed to humans clearing and fragmenting contiguous riparian forests

IMAGE:

Red-shouldered Hawk, By Mike Baird (CC BY)

https://commons.wikimedia.org/wiki/File:Red-shouldered-hawk_1.jpg

Range map courtesy of MN DNR

<http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ABNKC19030#>

RED-TAILED HAWK

- Large (larger than a crow)
 - Size: 18 - 26 in.
 - Wingspan: 45 - 52 in.
 - Weight: 24 - 53 oz.
- Eats small and medium-sized mammals, birds, reptiles.
- Found in open areas with scattered elevated perches, including agricultural areas, fields, pasture, parkland, and broken woodland.



Red-tailed Hawk Range

Range map courtesy of MN DNR



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23

Red-tailed Hawks are now our most common species. They are birds of more open country and often perch on utility poles

Image:

Red-tailed hawk with two chicks in nest, By Thomas O'Neil (CC BY)

https://commons.wikimedia.org/wiki/File:RT_hawks.jpg

Range map courtesy of MN DNR

<http://www.dnr.state.mn.us/birds/redtailedhawk.html>



HOW DO THEY COEXIST?

- Different sizes.
- Different foods.
- Different foraging behaviors.
- Different nest sites.
- Prefer slightly different forest types.
- **But can all be found in the same forest.**

In their own NICHES.

By Richard Crossley (CC BY-SA)

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24 

These hawks may occupy the same forest, but they have a variety of adaptations that allow them to make use of the habitat in different ways.

IMAGE:

Broad-winged Hawk from The Crossley ID Guide Raptors By Richard Crossley (CC BY-SA)

https://commons.wikimedia.org/wiki/File:Broad-winged_Hawk_-_flight_From_The_Crossley_ID_Guide_Raptors.jpg

WHAT ABOUT EARTHWORMS?



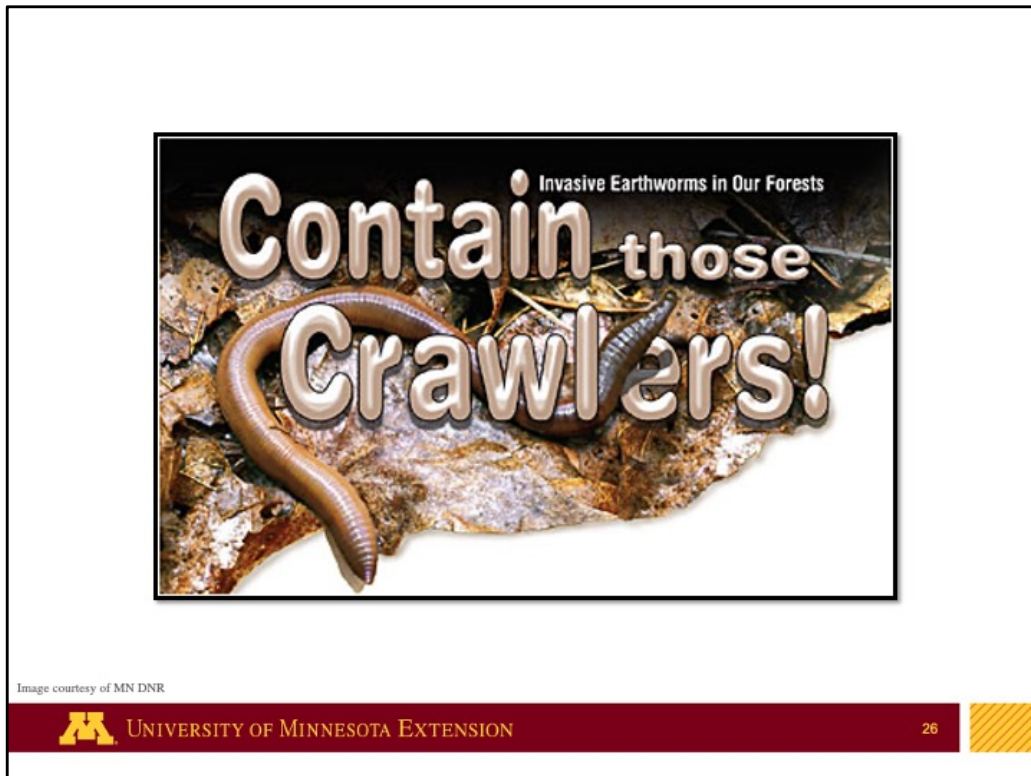
Earthworms are invasive species and they are causing problems in Minnesota forests.

Info:

<http://www.dnr.state.mn.us/invasives/terrestrialanimals/earthworms/index.html>

<http://www.nrri.umn.edu/worms/>

<http://www.extension.umn.edu/garden/insects/find/european-earthworms-in-minnesota/>



“What's the big deal about earthworms in Minnesota?”

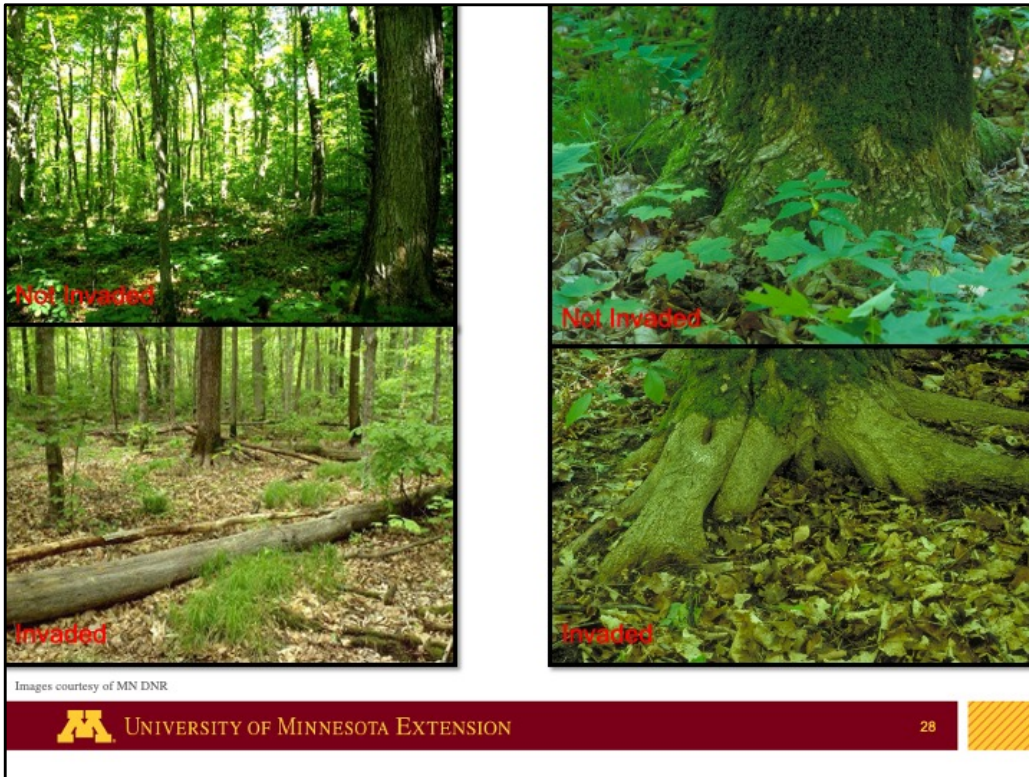
“All of the terrestrial earthworms in Minnesota are non-native, invasive species from Europe and Asia (There is a native aquatic species that woodcock eat). At least fifteen non-native terrestrial species have been introduced so far. Studies conducted by the University of Minnesota and forest managers show that at least seven species are invading our hardwood forests and causing the loss of tree seedlings, wildflowers, and ferns.”

“How did the 15 earthworm species get here?”

“The first earthworms probably arrived with soils and plants brought from Europe. Ships traveling to North America used rocks and soil as ballast which they dumped on shore as they adjusted the ballast weight of the ship. During the late 1800's and early 1900's many European settlers imported European plants that likely had earthworms or earthworm cocoons (egg cases) in their soils. More recently, the widespread use of earthworms as fishing bait has spread them to more remote areas of the state. All common bait worms are non-native species, including those sold as "night crawlers," "Canadian crawlers," "leaf worms," or "angle worms.”

Text and image from DNR

<http://www.dnr.state.mn.us/invasives/terrestrialanimals/earthworms/index.html>



“What are the harmful effects of non-native earthworms?”

“Minnesota's hardwood forests developed in the absence of earthworms. Without worms, fallen leaves decompose slowly, creating a spongy layer of organic "duff." This duff layer is the natural growing environment for native woodland wildflowers. It also provides habitat for ground-dwelling animals and helps prevent soil erosion.

“Invading earthworms eat the leaves that create the duff layer and are capable of eliminating it completely. Big trees survive, but many young seedlings perish, along with many ferns and wildflowers. Some species return after the initial invasion, but others disappear. In areas heavily infested by earthworms, soil erosion and leaching of nutrients may reduce the productivity of forests and ultimately degrade fish habitat.”

Text from DNR

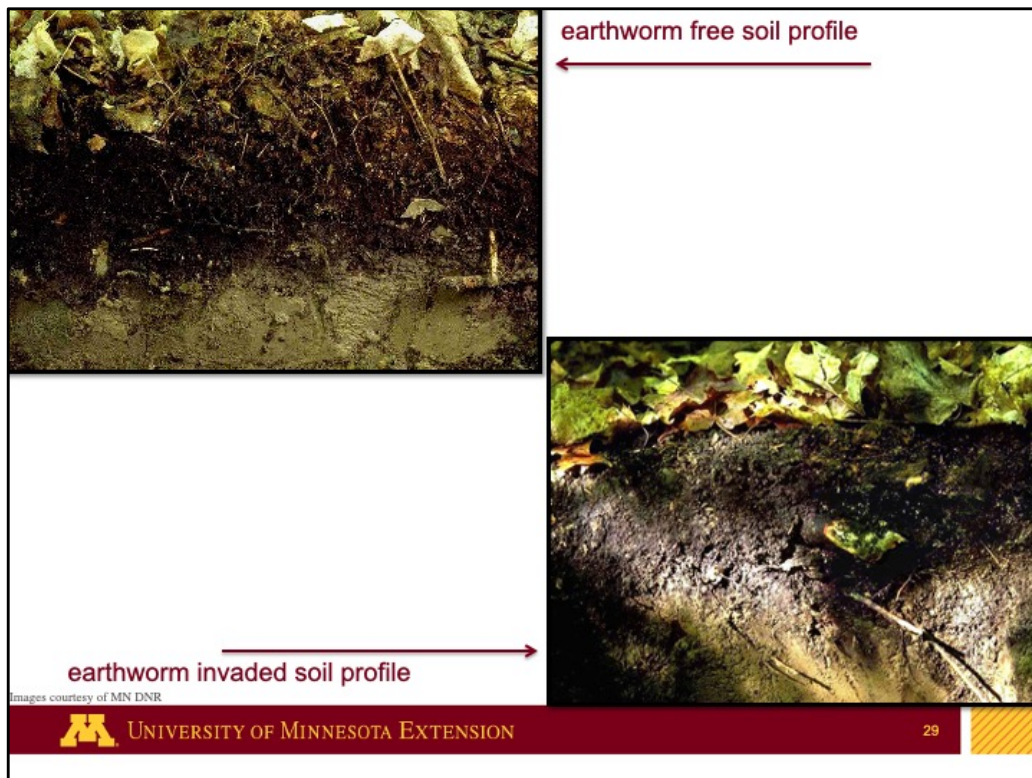
<http://www.dnr.state.mn.us/invasives/terrestrialanimals/earthworms/index.html>

Image:

Courtesy of Kelly Randall, Minnesota Department of Natural Resources.

From Earthworm Poster at

<http://www.dnr.state.mn.us/invasives/terrestrialanimals/earthworms/index.html>



Affect on Soil:

An earthworm free soil profile showing a thick (~3-4 inches) forest floor or “duff” layer with beige mineral soil below. Notice that there is no black top soil layer between the forest floor and the mineral soil

An earthworm invaded soil profile (in the same forest as the previous slide!) showing only fresh leaf litter from the previous fall but no forest floor or “duff” layer. Notice that there is now a very thick (3-5 inches) layer of black soil (earthworm casts) between the surface leaves and the beige mineral soil below.

Image:

Courtesy of Kelly Randall, Minnesota Department of Natural Resources.

From Earthworm Poster at

<http://www.dnr.state.mn.us/invasives/terrestrialanimals/earthworms/index.html>



Trillium By Stan Shebs (CC BY-SA)


Bellwort By Jason Hollinger (CC BY)

Goblin Fern By Stephen

False Solomon's Seal By Walter Siegmund (CC BY-SA)

**Species at risk of
earthworm invasions**

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30 

Goblin ferns and many spring ephemeral wildflowers have disappeared in areas invaded by earthworms.

Goblin ferns are currently state listed as threatened in Michigan and endangered in Wisconsin, and in Minnesota US Forest Service has placed the fern on their sensitive species list.

Images:

Goblin Fern Courtesy of Stephen Mortensen, Great Lakes Worm Watch
<http://www.nrri.umn.edu/worms/>

False Solomon's Seal By Walter Siegmund (CC BY-SA)
https://commons.wikimedia.org/wiki/File:Maianthemum_racemosum_4930.JPG

Trillium By Stan Shebs (CC BY-SA)
https://commons.wikimedia.org/wiki/File:Trillium_ovatum_ssp_ovatum_2.jpg

Bellwort By Jason Hollinger (CC BY)
[https://commons.wikimedia.org/wiki/File:Perfoliate_Bellwort_\(4750636615\).jpg](https://commons.wikimedia.org/wiki/File:Perfoliate_Bellwort_(4750636615).jpg)

NICHES OF INVASIVE EARTHWORMS

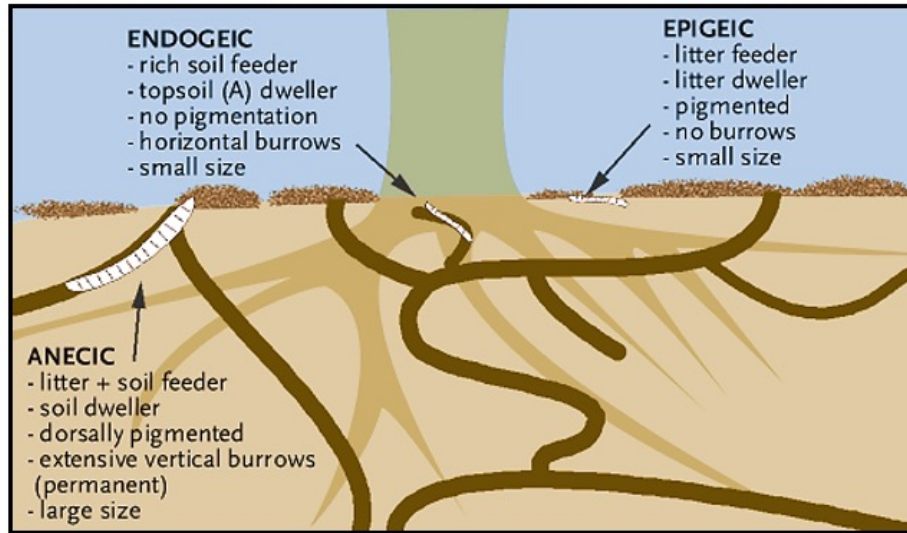


Image courtesy of Great Lakes Worm Watch



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31

Even though earthworms are invasive in Minnesota, they, too, occupy distinct niches in the forest floor.

Epigeic worms dwell and feed in the leaf litter

Endogeics dwell and feed in mineral soil

And anecic species, which include nightcrawlers, live in deep vertical burrows and feeds on soil and leaves which it drags one by one into its midden and burrow.

Illustration courtesy of Andrew Holdsworth (Modified from Brown 1995).

<http://www.nrri.umn.edu/worms/>

HOW DO THEY COEXIST?

- Different sizes.
- Different foods.
- Different foraging behaviors.
- Different burrows.

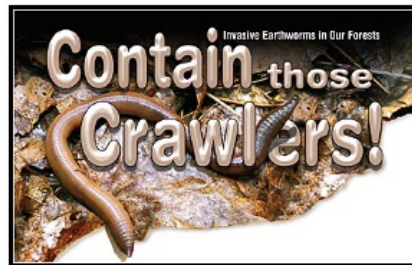


Image courtesy of MN DNR



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32

Just like the squirrels and hawks, different species of earthworms have different niches based on their size, what they eat, and where they live.

Image:



From Earthworm Poster at

<http://www.dnr.state.mn.us/invasives/terrestrialanimals/earthworms/index.html>


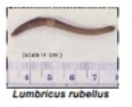
A Rough Guide to the Worms You'll Find in Minnesota:

There are many species of exotic earthworms in Minnesota. They can be divided into three broad groups to make identification easier:

Epigeic (litter dwelling) species



Dendrobaena octeadra Lumbricus rubellus


D. octeadra Lumbricus rubellus

Epigeic species live in the leaf litter, above the mineral soil. They are reddish brown in color and small in size, usually less than 3 inches (7.5 centimeters) long when mature.

Endogeic (soil dwelling) species


Aporrectodea (misc. species) Octolasion tyrtuum




Octolasion tyrtuum

Endogeic species live in the upper layers of the soil. They are easily distinguished from epigeic species by their color: endogeics are a light grey. They are also large in size, usually 3 to 5 inches (7.5 – 12.5 cm) long when mature.

Anecic (deep burrowing) species




Lumbricus terrestris



Lumbricus terrestris

Anecic species burrow deep into the soil. Night crawlers are an example of an anecic species. They are reddish brown in color and generally much larger than either of the other two groups, usually 5 to 8 inches (12.5 – 20 cm) long when mature.

Image courtesy of Great Lakes Worm Watch


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33

These earthworm ecological groups can help you identify the species that you may find. This page is from Great Lakes Worm Watch (<http://www.nrri.umn.edu/worms/>) which is working with students and citizens to identify worm invasions in Minnesota.

Image:

Minnesota Worm Watch, U of MN

<http://www.nrri.umn.edu/worms/>

http://www.nrri.umn.edu/worms/downloads/identification/ecological_groups.pdf

YOU CAN HELP STOP THEM

- Don't dump your worms in the woods. It's illegal to release most exotic species into the wild (Minnesota Statutes 84D.06).
- Dispose of unwanted bait in the trash.
- Tell others "the dirt" on invasive earthworms in Minnesota

<http://www.nrri.umn.edu/worms/>

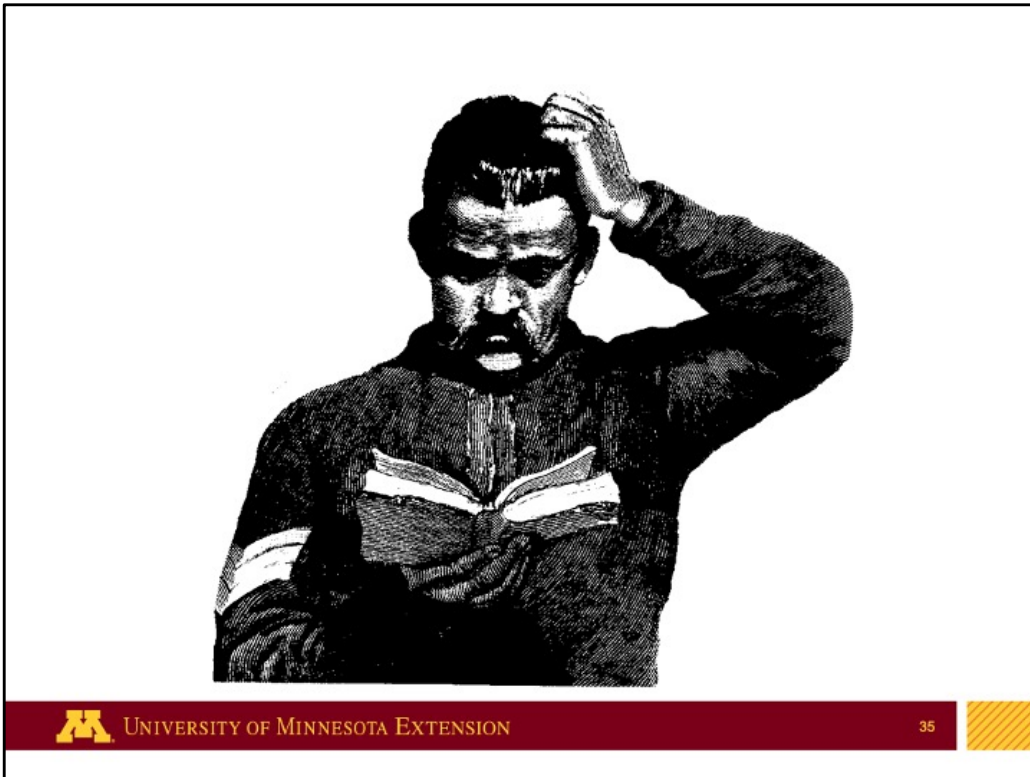


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34

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Currently there is no feasible method to eliminate invasive earthworms from our soils. Prevention is the best form of management, and you can help!



So, what are the important take-home lessons?

Adaptations allow organisms to occupy specific niches. These niches differ, and that allows similar species to coexist.



They should remember that woodland wildlife species have adaptations that allow them to interact with the living and non-living components of their habitat. These adaptations can be morphological, physiological or behavioral, and allow organisms to survive and reproduce.

Also, some invasive species are well adapted to survive in Minnesota like the invasive earthworms. We should do our part to help manage them and stop them from spreading.



Woodland wildlife use specific physical and behavioral adaptations to fit into specific niches and find food, reproduce and survive in the climate and conditions of the Big Woods.

Objective: Understand that wildlife species have specific adaptations to their environment and that they interact with both living and non-living components of their habitat.

Goals:

1. Define adaptation, and provide examples of physical and behavioral **adaptions** in animals.,
2. Describe the difference between **specialists and generalist** wildlife species.,
3. Identify and describe at least one common species of the following wildlife categories that lives in the Big Woods, Big Rivers region: invertebrate, amphibian, reptile, bird, and mammal.,
4. Describe how **management** techniques are used for game, non-game, and species of special concern, such as imperiled and invasive species in the region.

ACKNOWLEDGMENTS

Images used in this presentation were taken from multiple sources and we thank all of the people who gave us permission to use them.

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38

Many organizations have been, and still are, involved in the development of the program.



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