



# Deer Ecology

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## Program Purpose

Through a small discussion and hands on activities students will learn how white-tailed deer live and how they are a keystone species

**Length of Program:** 1 hour

**Age:** Grades 3rd-12th

**Maximum Number of Participants:** 100, depends on room size and naturalist availability

## NGS Standards:

**MS-LS2-1:** Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem

**MS-LS2-2:** Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems

**MS-LS2-4:** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations

## Relevant Disciplinary Core Ideas:

**LS2.A:** Interdependent Relationships in Ecosystems

**LS2.C:** Ecosystem Dynamics, Functioning, and Resilience

## Preparations:

Before the class arrives:

- Locate program box in NC

- Set up touch tables (for all ages)
- Review and set up powerpoint (for older kids)
- Determine hike route and where to play Oh deer
- If group is large coordinate with other naturalists so two groups aren't doing activities at the same time

## Materials:

Preserved ankles/ hooves  
Rubber hoof and scat molds  
Antler sheds  
Jawbones  
Skulls  
Bones with chewmarks  
Deer headbands (optional)  
Ziploc bags for deer food  
Oh deer laminated cards (all ages)  
Oh deer tracking/graphing sheets (older kids)  
Ingredients for fake scat (younger kids)

## Outline:

- I. General Deer Biology
- II. Introduction & discussion
- III. Herbivore hike
- IV. Search for food
- V. Oh Deer!
- VI. Conclusion
- VII. Additional information

## General Deer Biology:

White-tailed deer are medium-sized deer native to the Americas and their range extends from Canada to Peru. This range encompasses about 38 subspecies of white-tailed deer. In addition to

being mammals, they are also ungulates (large hooved mammals) and cervidae (deer). These highly adaptable mammals typically live in temperate regions which experience all four seasons. Their yearly routine depends very much on all four seasons. They are herbivores and their diet changes with the seasons. They are also ruminants, so they have a four chambered stomach which uses a special microbiome to break down cellulose, similar to cows.

Male whitetails are referred to as bucks and can be easily distinguished by their antlers which are visible for most of the year. Female whitetails are called does and their offspring are called fawns which can be identified by their white spots. Some behaviors associated with bucks are rubbing their antlers/forehead against trees to mark territory and leave their scent. Scent glands are essential to whitetail communication especially during their mating season, the rut, which takes place at the end of fall. All deer use their scent glands to communicate. There are eight different scent glands, the most important of which is the tarsal gland located on the ankle joint. These glands take advantage of the white-tailed deer's incredible sense of smell which surpasses that of even the famed bloodhound. Hearing is also an important sense for deer and some of the noises they make include bleating, grunting, snorting, and wheezing. Their vision is one of their weaker senses and they have more rods than cones. They have good night vision but do not see as well during the day and do not distinguish colors easily. Due to this phenomena they are crepuscular, which means they are most active near dawn and dusk. If a deer feels threatened enough to move away it will likely have its iconic white tail up to communicate potential danger to other deer.

In addition to being known for their white tail, buck antlers are one of their defining features.

Like all cervids, these antlers are shed and regrow yearly. Whitetails will start growing their antlers in spring and rapid growth occurs in early summer. This growth can be up to one inch every two days, which makes it the fastest growing tissue on earth. These antlers will grow with rounded tines and covered in velvet. As days get shorter, testosterone levels go up and antlers become calcified and harden while the velvet is shed. Bucks will also become more aggressive when this change occurs. Fresh rubs are another sign of antler hardening. Antler calcification coincides with the beginning of the rut. Once the rut is finished (normally after the solstice) antlers will start being shed in the months of January to March. After shedding antlers, growth of a new pair will take place in about three weeks and the cycle continues.

#### *Digestion in ruminants*

Ruminants will typically only chew their food enough to swallow it and a foraging deer can fill its stomach (rumen) in only an hour or two. After the first chewing, the rumen is used as a storage chamber in the four-chambered stomach of ruminants. The food stored in the rumen will then be regurgitated and chewed again. This can be called chewing cud or ruminating. In the second chamber, the reticulum, there are microorganisms which break down plant material called cellulose which ruminants couldn't break down otherwise. This symbiotic relationship is critical to ruminant digestion. Chewed cud will be sent to the reticulum and those microorganisms will use a chemical process called fermentation which breaks down cellulose into simpler substances to be absorbed by deer and the microorganisms. This also makes methane gas which causes the deer to burp regularly. The chewed cud is now mixed with the microorganisms which provide nutrition to the deer. This third chewing will travel to the third chamber called the omasum which will

absorb water. The fourth chamber, the abomasum, contains gastric juices which chemically digest the cud and send it to the intestines. Most nutrient absorption occurs in the intestines and deer intestines are about 28 feet long.

**Introduction:**

Introduce yourself to the class and explain that we will be talking about white-tailed deer. Ask the students what they already know about whitetails. Use this and the first slide of the presentation as an opportunity to gauge pre-existing knowledge for older kids. Use fun facts on the younger kids and the powerpoint if you would like. Otherwise you can have touch tables set up and spend a couple minutes talking about each of the items in lieu of the powerpoint. Make sure to mention this is a challenge by choice and if they don't want to touch something that is perfectly fine.

If you do decide to use the powerpoint feel free to pass around touch items (hooves, rubber molds, antlers, jawbones, skulls, chewed bones) as they come up. You might want to have an adult return them to the front of the room to not disrupt the presentation. **Try to avoid mentioning the deer exclosures** during the presentation, and instead have kids guess what it is during the hike.

Once the discussion is over you should make sure the kids know deer are a keystone species and what a keystone species is. Mention we are going on a hike to a special place soon thereafter and split up into groups of ~20 to prepare for the hike. Make sure to bring enough Ziploc bags with you so kids can collect "deer food" after you've explained the significance of the exclosure. Younger kids might want deer-ear headbands while they do this so bring those too.

**Herbivore Hike:**

Once you have your group ready, make sure you have ziplocs and headbands if needed. Try to time this hike around dusk for optimal deer activity (not essential). Tell the kids we are going to hike to an important area here at Upham Woods. Hike in the direction of one of the deer exclosures. Make sure to point out any deer hoofprints, scat, rubs or nipped plants and tell the kids to look out for these things too. If you do find any of these, engage in I notice, I wonder, it reminds me of at this point, otherwise do it at the exclosure.

When you are near the exclosure have kids guess what it is. If they don't get it right away, tell them and have them guess what they think the word exclosure means and why we would want to keep deer out of a certain area. At this point go into further detail about deer browsing impact at Upham and the significance of the exclosures. Deer have the potential to significantly alter the composition of a forest. They have favorite foods just like us. Left uncontrolled they can eliminate certain plant species from that section of the forest. This plant preference can allow invasives to flourish, and oftentimes affects certain bird populations. This is what makes them a keystone species. Make sure kids understand what a keystone species is by this point if they don't already. Talk about the lack of predators in the Dells area and ask why that might be the case. If you're working with older kids, highlight trophic cascades and the importance of predator-prey relationships in the context of deer overbrowsing at Upham. Ask the kids what whitetails eat and if they don't know, explain that they're herbivores and point out a few examples nearby of something a deer might eat (acorns, leaves, woody stems, ends of woody shrubs). At this point talk about poison ivy (which deer can eat) and how we can be safe when looking for deer food.

**Search for food:**

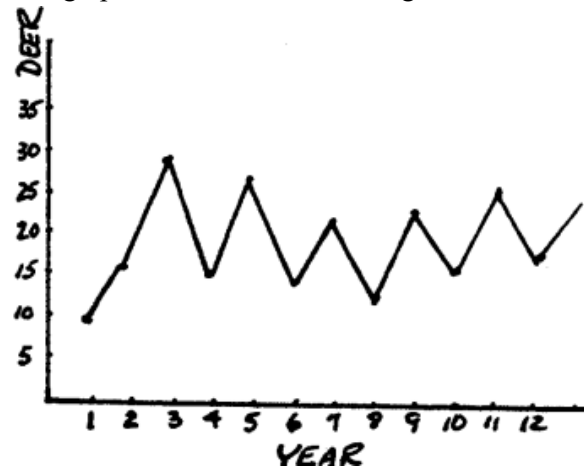
Tell kids to split into groups or count them off into small groups (3-5) and give one of them a ziploc bag. Tell them we are going to spread out a little bit and set up boundaries so you can supervise everyone. Talk about what size plant pieces deer would be able to eat (no bigger than the kids' pinky finger). Once we have some rules established, say that the ziploc bag is a deer rumen and that we want to fill it up with good quality deer food. Make sure they know to watch for poison ivy and have them search for deer food. They should gather this from off the ground so they're not damaging nearby plants. After about 10 minutes (can be shorter if you need more time for Oh Deer!) get the kids back together and go through each bag and talk about the contents. If you are with older kids, talk about how deer are ruminants and how they would digest something completely.

**Oh Deer!:**

Oh Deer! is a game which should get kids thinking about concepts like carrying capacity, limiting factors, and population abundance. This game will require a large area for kids to run and can be played indoors or outdoors. The facilitator should have more than 15 kids in their group for this game. Count off students in fours and assign one group as the deer. Separate the deer from the others by ~25 ft and have them face their backs to the other students. You can use bandanas on the arm or the laminated cards to label kids as deer. The other kids will be food, shelter or water which are the potential limiting factors in this simulation. These three can generally be referred to as habitat for the sake of the simulation. Let them choose their factor but discourage them from all choosing the same thing. The deer in this simulation will pick one essential factor and **cannot change their mind during that round** once chosen. When the deer have chosen either food, shelter, or water, have

the remaining kids do an act-out or use the laminated cards to signify whatever factor was chosen. Make sure the deer still have their backs to the other kids. Do the same with the big group. Once everyone has picked their chosen factor you are ready to begin. Make sure to record how many deer you start with and record this as year 1. Count to three and have everyone turn around to face each other. Let the deer find their factor and bring them back to the deer side. These kids are now new deer. The population should go up at this point. Any deer who did not find their chosen factor die and become habitat (have them pick a factor). Make sure to record the new number of deer after each round so you can discuss at the end. After two or three rounds (years) the deer population will crash, but shouldn't go to zero. After 10-15 rounds you can wrap up and discuss. If time allows, have the kids help you make a graph of the results, or if they are older kids have them work in small groups to make their own graphs.

The graphs should look something like this:



Have a wrap-up discussion and ask questions like what do animals need to survive, what are some limiting factors, do animal populations change or stay the same, how does the graph tell us whether they change or stay the same? If working with older kids, talk about how predator-prey relationships would look on the same graph and how food webs can interact to

determine population abundance i.e. a lack of wolves results in lots of deer.

**Conclusion:**

Wrap up the class and ask the kids what new things they now know about white-tailed deer. Talk about how this new information can help them look for signs of deer activity in the wild. Ask them what their favorite part of the class was and tell them they should continue learning more about deer. If time allows, discuss the impact deer overbrowsing has on BHI and how this information makes sense in the context of Oh Deer!. High levels of deer browsing can completely remove shrubs and tree seedlings from a forest. Native wildflowers are also a preferred food of deer. These plants can have their abundance reduced or eliminated which reduces the biodiversity of the forest.

**Additional Information:**

*Fake Deer Scat activity*

If you finish the main lesson plan with 15 or more minutes left with younger kids you can start making fake deer scat which involves using some modeling clay, green food coloring and flax seed to make realistic looking fake deer scat.

*Socio-economic impact*

While deer biology and their role in the ecosystem are more relevant to the teaching of this class, their socio-economic impact is also significant. Some suburban settings have seen deer populations skyrocket. With a lack of predators and abundance of food these deer can flourish uninhibited. In suburban Cayuga Heights, NY there are estimated to be 125 deer per square mile, which results in many garden plants being destroyed and a sharp increase in deer-vehicle collisions. We know they are a keystone species and can impact biodiversity,

but they also cause about 1.5 million car accidents nationwide a year which result in about one billion dollars in damages. In addition to this, hunting is a major industry in Wisconsin and other states. 2.5 billion dollars are spent in Wisconsin annually on hunting related items and 88% of hunters pursue deer.

*Hunting*

Deer and deer hunting hold significant importance to the culture of the Ojibwa or Chippewa people. In the 1800's tribal leaders reserved special hunting and gathering rights for the Ojibwa in a region called the Ceded territories. This region covers about a third of the state, mostly in the northern portion. A consensus on deer management policies was determined in the 1980s between six Wisconsin Ojibwe tribes and the State of Wisconsin. The Ojibwe tribes are legally entitled to a portion of the harvestable surplus in the Ceded Territories and harvest about 4,000 deer each year.

In 1851, the first closed deer season was held in Wisconsin with very few regulations. Throughout the rest of the 19th century regulations were put in place, like prohibiting use of dogs for hunting in 1876 and prohibiting hunting at night in 1887. Bag limits were introduced in 1897 and license sales began at \$1 for residents. In the early 1900s white tailed deer populations in most states began to plummet due to overhunting. Many states including Wisconsin suspended their seasons during the interwar period to allow these populations to recover. There was no deer hunting season in Wisconsin from 1919 to 1950. Additional regulations were put in place during the 20th century such as required registration in 1953 and requiring blaze orange clothing in 1980. Some more recent changes to hunting have been in the context of CWD, a neurological disease affecting cervids. Three deer shot in 2001 in

Dane County tested positive for CWD. In 2002 there was a 10 percent drop in licensed hunters with much of the decrease attributed to concerns surrounding CWD.

Hunting is now a multi-billion dollar industry here in Wisconsin, as is the case in many other states. The hunting season can help control population and the DNR will determine license numbers based on previous population estimates. Bow hunters have longer seasons, but the majority of deer harvesting occurs during the nine day gun deer season in late November.

#### *CWD*

Chronic Wasting Disease (CWD) is a transmissible spongiform encephalopathy (TSE) affecting deer. It is also known as the Zombie Deer Disease. TSEs are caused by misfolded proteins called prions which also cause a disease in cattle known as BSE or mad cow disease. These diseases have neurodegenerative effects and result in severe weight loss and abnormal behavior. CWD has also been called the zombie deer disease. CWD specifically affects members of the deer family. While transmission from deer to humans isn't proven the science on this is still fairly inconclusive. Discovered in the US in the 60s and correctly identified as a TSE in 1978, the disease has now been confirmed in 30 US states and four Canadian provinces. The Wisconsin DNR began testing for CWD in 1999 and got its first positive test in 2002. Since then, hunters have been encouraged to get their deer tested for CWD, and most of the positive cases have been in the southwestern portion of the state. In addition to suggesting hunters get their deer tested, the DNR published a report in 2014, which was revised in 2019. This report gives tons of recommendations to the public about how they can reduce the spread of CWD. Avoiding unnatural concentrations of deer is of the utmost importance to reduce spreading

CWD. Artificial water structures such as a trough or guzzler which are not properly cleaned and maintained have been shown to drastically increase the ability of CWD to spread in a local deer population. Urine based scents (UBS) also have the ability to increase spread of CWD depending on the source of the UBS. The Wisconsin DNR highly recommends using alternatives to UBS. Hunter harvested deer carcasses are often moved across geographic barriers, and this human assisted movement can spread CWD to areas which naturally would not contain CWD. Staying informed and up to date on regulations and knowing areas affected by CWD is extremely important, especially if you are a hunter. The damaging effects of CWD spread such as decreased herd size and lack of herd structure can be slow to progress, making it difficult to monitor management success, however continuing efforts to control the spread are currently our best option.

#### **References:**

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- Project WILD Activity "Oh Deer!"*. <https://idrange.org/wp-content/uploads/2020/07/Oh-Deer.pdf>.
- Recommendations for Reducing the Spread of Chronic Wasting Disease*. Wisconsin DNR, <https://p.widencdn.net/g5zxn3/transmission>.