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Ecology, Environment, & the Anthropocene
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Term Project Summary

The white-tailed deer is notable for being one of North America's most widespread species. Their population, however, may be too dense for the ecosystem to handle. How does one species population affect the biodiversity within an ecological community? With research, I will give an explanation on how the overpopulation of the white-tailed deer greatly affect the biodiversity within a community, especially the plant species. Along with this research, I have collected basic facts about the white-tailed deer and their social and adaptive behaviors in order to gain a better understanding of how they are so widely spread within the North American terrain. I also included reasonable solutions that may help in maintenance of the deer overpopulation; one being the introduction of predators within the deer populated area, and the other being proposals that can contribute to the management of the population. All this information is of great use for this term project.

The forest can only give so much for the deer population to consume, thus results the number native plant species to decrease. As the white-tailed deer take in those native species, the abundance of exotic, invasive plant species will grow in abundance [8]. Nancy G. Tilghman observed how the deer population makes an impact on the population of seedlings, shrubs, and other herbaceous plants. She concludes that the group with the highest deer density reduced the diversity of herbaceous plants. They have also stunt the growth of many tree seedlings, causing only the regeneration of ferns [4]. This is due to their eating habits as they tend rip away vegetation rather than snipping because of their lack of upper incisors, causing great difficulty for plants to regenerate [2]. This is a great indication of how the deer population affecting forest compositions. The white-tailed deer can play the role of a seed-dispersal agents as seeds are "planted" onto their bodies until they eventually fall off. Though it may sound beneficial for the ecosystem, it can also distribute seeds of invasive species. Because of these exotic plants, the ecosystem will go through some changes in order to sustain its life. Such factor would be the change in soil pH, as invasive species can elevate the nitrate uptake [3], affecting the native plants as they are not accustomed to suit such altercations. White-tailed deer are known to roam through forest terrain, yet they somehow manage to set foot on farmlands, causing great concern for the human community. The deer do not limit themselves to only forest vegetation as they may have also devour various crops from various farmlands. Such loss infuriates may farmers as it equates to the lost of money [5].

Before the population became an issue, excessive amount of deer hunting has occurred, causing wildlife managers to enforce rules to prevent the endangerment of the white-tailed deer population. Some of these rules include shortening hunting seasons, or limiting the hunting to

bucks in order to aid the herds' recovery. When the hunters game, they mostly targeted bucks as they are the one to have antlers, which is viewed as a prize to the gamers [7]. This, however, results to the deer population to have a great amount of does who have to ability to birth 2-3 fawns later on, resulting to a sudden grown in population. An introduction of predators within an ecosystem is also a possible solution to help manage a certain species's population by consumption of said species, this being the white-tailed deer. One of the deer's predators is the coyote. In 2015, the coyote population slowly reached into the eastern region of North America, causing a depletion of the white-tailed deer population [6]. Coyotes tend to prey on the fawns rather than adults since they are much more vulnerable.

Using illustrations, I convey all the collected scientific research that I have collected in order to depict these raising issues through a children's book called "Where Did My Blueberries Go?" The story revolves around a baby deer who is having trouble finding her favorite snack, blueberries. Her situation reflects the fact that there have been altercations within the forest ecosystem due to the deer overfeeding on native plant species. I conveyed that issue by making all the bushes bare in comparison to the flashback to the elder deer's younger days as every bush is filled with blues and reds to represent the berries that the baby deer cannot find. I also drew very bright, purple plants to show the growth of exotic, foreign plants within their area. I used such a bright color for a plant as it stands out from the rest of the ecosystem because it's initially not suppose to be a part of it. Since it is a children's book, the narration focuses on the story of the deer rather than providing information. However, it does hint the familiarity of the research that I have collected. Each page depicts a scene which displays the different problems that arise because of the white-tailed deer population as well as the solutions that have taken initiative to solve the overpopulation issue. Along with these scenes, I also used the background to narrate the issue as it is a discreet way to communicate my research such as showing silhouettes (hunter, farmer, predators) and the absence of native plant species. I decide to not make they stand out since they are supposed to emit the ominous aura that can pose danger to the deer characters. Also, because this story is suppose to be for children, I wouldn't want to make the dangers too clear as they are rather innocent.

Although this project is considered to be that of a children's book, I believe that anyone of any age would be suited to read it as the narrative is very simple and easily understood. I hope the project gives an impact on the audience as it is addressing an issue on the white-tailed deer overpopulation, yet takes form of a children book. Some people may not be interested in scientific articles as they may consume too much of their time, or they have difficulty taking in all that scientific information, which is why I chose the format of a short illustrated book. I can inform the audience in a simple fashion, and also gain their attention with illustrations since it can grab more of their attention. I want to inform my audience the problems that arise due to an overpopulation of a species and how it can greatly affect the ecosystem and other living organisms as well (including the human community).

Annotated Bibliography:

1. Peterson, Roger Tory, editor. 1988. *A Field Guide to Ecology of Eastern Forests North America*. First Edition. Boston (MA). Houghton Mifflin Harcourt Publishing Company

This book source is a guide that provides information on all the eastern forests of North America. It gives an enormous amount of information on animals and plants which inhabit those areas, that including the white-tailed deer. They inform on animal behavior, animal diet, population, and so forth.

2. Brown, Lauren. 1985. *National Audubon Society Regional Guide to Grasslands (Audubon Society Nature Guides)*. First Edition. New York: Knopf

This guidebook includes illustrations and photographs of various plants, mammals, and other living organisms. Each organisms is accompanied with information relating to where they inhabit, their behaviors, and appearance. One of these organisms mentioned is the white-tailed deer. The guidebook provided information on the area range which the inhabitat, appearance, breeding, and the author's comments on the species which are interesting facts about the animal's behavior.

3. Shen, Xiaolin, Bourg Norman A., McShea William J., Turner, Benjamin L. 2016. *Long-Term Effects of White-Tailed Deer Exclusion on the Invasion of Exotic Plants: A Case Study in a Mid-Atlantic Temperate Forest: A Case Study in a Mid-Atlantic Temperate Forest*. PLOS ONE 11(3): e0151825. <https://doi.org/10.1371/journal.pone.0151825>

This source focuses on the role the white-tailed deer plays on exotic invasive plant species. They chose to use four different exotic species in a temperate forest ecosystem in Virginia and applied it within a 4-ha deer exclusion site and a 4-ha reference site. The results indicate the significant role the deer density has on the abundance of exotic invasive plant species. They infer that in order to limit the number of these invasive species, there must be a limitation on the deer population.

4. Tilghman, N. (1989). Impacts of White-Tailed Deer on Forest Regeneration in Northwestern Pennsylvania. *The Journal of Wildlife Management*, 53(3), 524-532. doi:10.2307/3809172 www.jstor.org/stable/3809172

This journal article covers the effects of white-tailed deer overpopulation in Allegheny hardwoods forests located in Northwestern Pennsylvania. Tilghman observes 3 silvicultural treatments with different amounts of deer density. Such observations have concluded information of how deer overpopulation can greatly affect forest regeneration and biodiversity. The deers caused a stunt growth for many tree seedlings, even consuming some of these seedlings, which can cause an issue regarding forest composition.

5. Waller, D., & Alverson, W. (1997). The White-Tailed Deer: A Keystone Herbivore. *Wildlife Society Bulletin*, 25(2), 217-226. www.jstor.org/stable/3783435

This article, like the rest of the articles, touches upon the problematic white-tailed deer overpopulation. However, it also proposes different approaches to tackle this issue. In order to do so, biological research on the ecosystem is needed in order for managers to have a better understanding as to what contributes to the growth of deer population. There is also an option of hunting, though it is found to be unfavorable for those who do not understand the issue of the abundance of deer roaming within the ecosystem.

6. Chitwood MC, Lashley MA, Kilgo JC, Pollock KH, Moorman CE, et al. (2015) *Do Biological and Bedsite Characteristics Influence Survival of Neonatal White-Tailed Deer?*. PLOS ONE 10(3): e0119070. <https://doi.org/10.1371/journal.pone.0119070>

This source discusses the survival of neonatal white-tailed deer and their survival of predation of the coyote. This source explores the rate of survival for deer offspring and the amount of predation amongst them which may come in handy for explaining the deer overpopulation or maybe a solution to the deer overpopulation. It also explores the role of bedsites and how they can help in a neonate's survival. However, the survival of the neonates was not due to the visual obstruction of the bedsite, though it had slight relations to the diversity of plant species near the bedsites.

7. Hirth, D. (1977). Social Behavior of White-Tailed Deer in Relation to Habitat. *Wildlife Monographs*, (53), 3-55. Retrieved from <http://www.jstor.org/stable/3830446>

This article discusses the social behavior of white-tailed deer and how much reproduction that may occur within. Data such as the amount of doe in comparison to buck is provided. It also provides the behavior of fawns and the amount of time which it takes for them to adapt to their surroundings and follow their parent's footsteps. Such information can be beneficial as it has data regarding the rate of birth of the white-tailed deer as well as their behavior within a social group in different habitats.

8. Frerker K, Sabo A, Waller D (2014) Long-Term Regional Shifts in Plant Community Composition Are Largely Explained by Local Deer Impact Experiments. *PLOS ONE* 9(12): e115843. <https://doi.org/10.1371/journal.pone.0115843>

Like many sources, this source also touches on the effects of deer overpopulation on the plant community composition. It explores the long term effects on the communities and plant reproduction within the Midwest area of North America. The results show how deer consumption can lead to a decrease in abundance of various plant species, such as shrubs, and an increase in exotic plants and ferns. Their consumption can also cause future difficulty in plant regeneration.

9. Conover, Michael R., William C. Pitt, Kimberly K. Kessler, Tami J. DuBow, and Wendy A. Sanborn. "Review of Human Injuries, Illnesses, and Economic Losses Caused by Wildlife in the United States." *Wildlife Society Bulletin (1973-2006)* 23, no. 3 (1995): 407-14. http://www.jstor.org/stable/3782947?seq=1#page_scan_tab_contents

This source is about the occurring problems between wildlife and the human population. It also includes reports of economic losses that were caused by these wildlife problems, one being deer-vehicle collision. This source provides information as to how many collisions occurred during the 1990s and how much it costs for repairment of these collisions. This information can help further explain how the deer overpopulation can cause a negative impact to

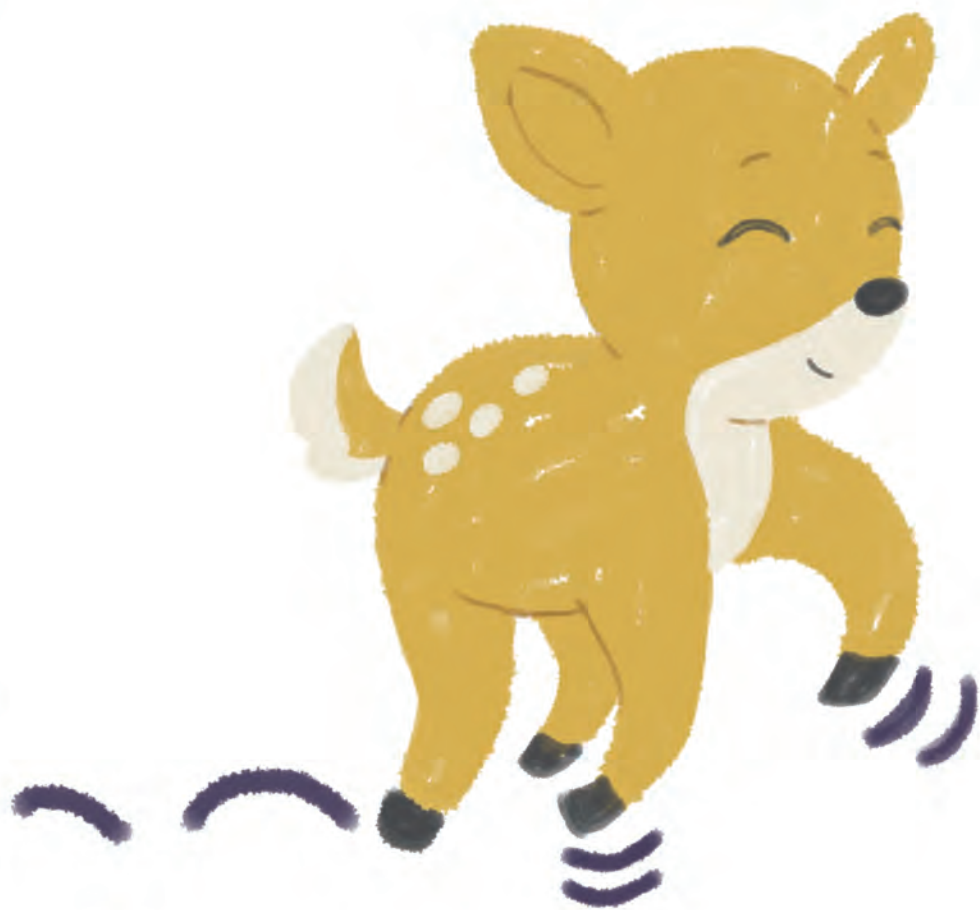
human society. These accidents are very dangerous for both the deer and the people in their vehicles.

Where Did My Blueberries Go?



By: Peggie Liew

***Baby deer is really excited to
eat her favorite snack,
blueberries!***





***But baby deer couldn't find
her favorite blueberries.***

**Baby deer is really sad.
“What’s wrong deerie?”
Asks Granny Deer.**

**“I can’t find any
blueberries. Where did
they go?” Baby deer**





***“Oh, deerie, when Granny was
your age, berries used to filled
the forest, and Granny’s
tummy!”***

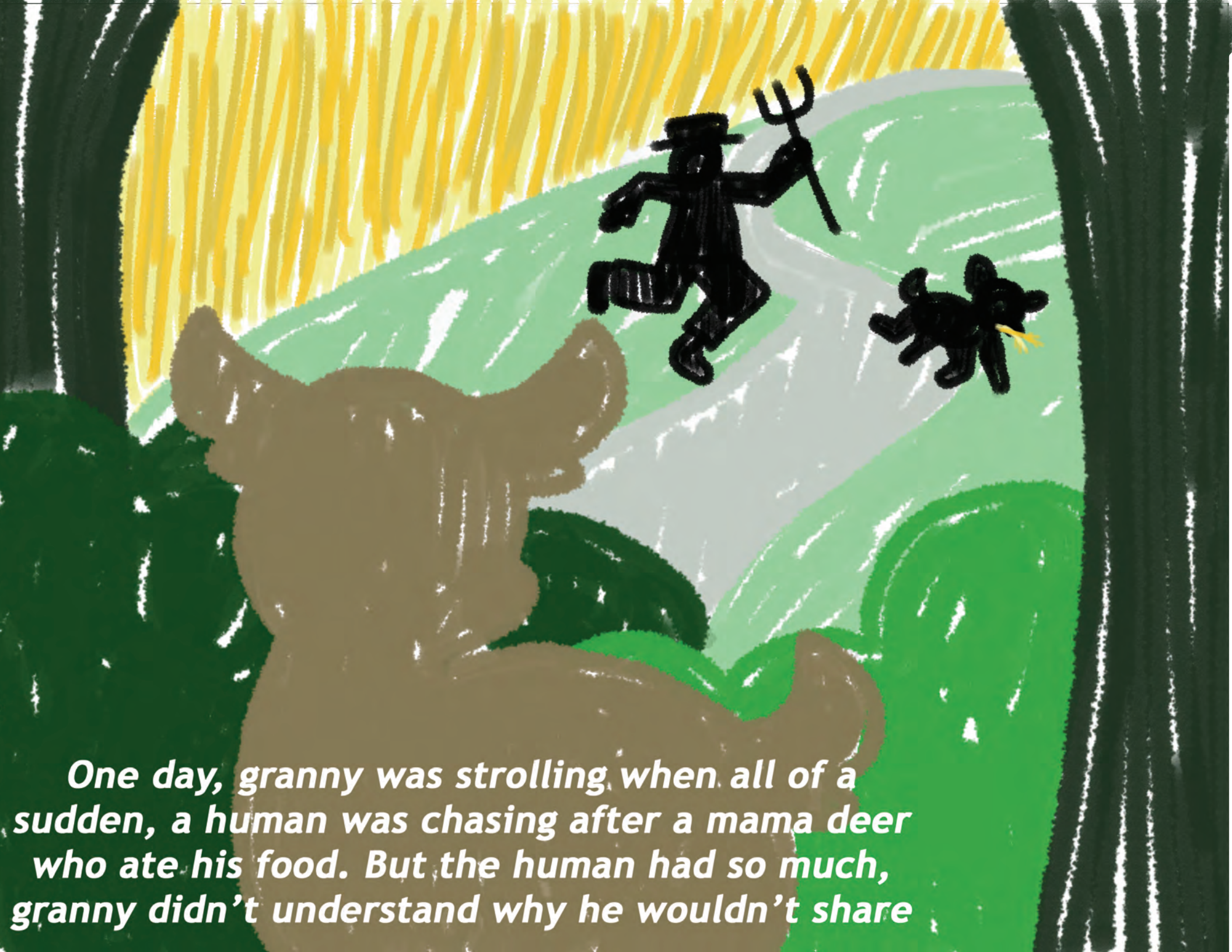
***Granny deer used to spend lots of
time with all the mama deers and
baby deers. All the daddy deers
went off...***



***but they never came
back...***



*There were
also a lot of
weird looking
plants that
grew nearby.
Granny never
tried them*



One day, granny was strolling when all of a sudden, a human was chasing after a mama deer who ate his food. But the human had so much, granny didn't understand why he wouldn't share

“Wow Granny deer! A lot has happened during your day!” Baby deer said.

“Lately, a lot of weird stuff has also happened. Some baby deers went went off, but never came back!”



“Oh dear, that’s horrible!” Granny gasps. “Promise to be careful deerie.”

“I will!” Baby deer responds.

the end.

