Examining Human Impact on Western Washington's Canada Geese

by

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Abstract
Effective management of the Canada Goose has resulted in abundant local populations that sometimes interact with people. In some cases these interactions are negative. One outcome of negative interactions is the submission of Canada Geese to wildlife rehabilitation centers. By looking at the individuals who come into a prevalent wildlife rehabilitation facility in Washington State this study sought to gain knowledge about what elements of the environment are negatively affecting Canada Geese. An analysis of the demographics and primary reasons that Canada Geese come into rehabilitation is an important step in understanding potential threats to the species. The findings of this data, that humans are the primary cause for animals to be admitted to rehabilitative care, are not surprising but they are important to the future of conservation. More specifically, the data concluded that the Canada Goose is most at risk due to the potential of being hit by a vehicle and oil contamination while in the age range of adult. While the Canada Goose is a prevalent species, this data could serve to assist future campaigns for conservation of less prevalent species.

Introduction

In the mid 1900's Canada Goose populations were on the decline, with some subspecies crashing into the hundreds. In the 1930s, Canada Geese were released by the government in order to restore their populations (Leonard 2013). Due to the conservation of resident geese and their adaptability to urban park landscapes, their populations have since rebounded and now Canada Geese are one of the most numerous waterfowl species that inhabit Washington State (Ankney 1996). Large populations of Canada Geese coupled with the vast human expansion we are experiencing right now will inevitably lead to more frequent interactions between the two species. These interactions need to be examined to determine if there is a way to limit conflicting interactions between humans and wildlife.

Public opinion of a species is an important element of conservation. Canada Geese are often seen as a nuisance species due to their feces and noises (Powell, 2015; Johnsgard, 1965). Canada Geese also possess a serrated beak, specialized to pick grasses, which can make the animal looks much more intimidating (Sibley 2001). Examining public opinion on wildlife is

important for a broader understanding of the future of conservation. In a 2018 study on public opinions regarding common wildlife species researchers found that internet users held more negative opinions on coyotes, but more wholistic and positive opinions towards opossums and racoons. It was also noted that scientific opinions were the least common opinions overall (Fidino, 2018). Learning about the public's perspectives on a target species, and creating a plan to make it positive, could allow management and conservation campaigns to not only experience more support socially but also increased financial support. For example, a 2011 study on sharks and rays concluded that the increase of positive perceptions of sharks and rays has increased awareness for the species and increased calls for positive action and conservation (Simpfendorfer, 2011).

The abundance of the Canada Goose, particularly in urban areas where they feed and breed, puts them in high contact with people, leading to conflicts or opportunities to administer aid (Magle 2012). Wildlife rehabilitation centers such as PAWS Wildlife Rehabilitation in Washington State, serve as the public's contact for wildlife related emergencies, and so serve as a liaison between the medical side of wildlife care and the social side of wildlife education (WDFW 2019). Given the abundance of Canada Geese submitted to PAWS they make a good model for understanding human conflicts with urban wildlife. By using data obtained from PAWS, this study sought to examine three separate questions. First, are anthropogenic sources of injury more common than natural ones? Second, what kinds of human conflict account for the great sources of admitted Canada Geese? And finally, how do wildlife rehabilitators perceive public attitudes towards Canada Geese? The answers to these questions could result in a model, where the Canada Goose is used as an example species to represent how birds and wildlife in general are reacting to increasing human populations and development.

Methods

Data for this study was provided by Progressive Animal Welfare Society (PAWS). All the data was obtained from Washington state and begins January 1st 2003 and ends September 18th 2019. This data consists of all N=581 Giant Canada Geese *(B.c. maxima)* that were admitted to PAWS in that time. Each individual chart includes information on: the date of admittance, age, cause of admission, and whether the animal was found near a road. In addition, PAWS has recently implemented a 'suspected' cause of admission for two of their most common causes of admission, hitting windows and being hit by vehicles. Unless the animal was found in a predicament that suggests one of these instances happened (i.e. found on the side of the road, or directly under a window) the cause of admission remains 'unknown'. This helps to assure that the rehabilitation team and veterinary team do not incidentally treat an animal for a hunch that someone has. Each of these elements were taken from the PAWS data system, RaptorMed, and placed into Microsoft Excel.

In an effort to understand how trained rehabilitative staff react to and interact with Canada Geese, I explored the rehabilitation community and its feelings towards goose patients within a survey (Driscoll, 2011). By understanding the mediator and communication point for the public, there may be some greater insight into how people think about wildlife and specifically the Canada Goose. For the purposes of my survey I broke down the rehab process categorically to ensure that I gathered survey data from all processes in rehabilitation: 1) Admission of the Animal 2) Rehabilitation and Initial Examination 3) Veterinary Care (i.e. surgery) 4) Release to Natural Habitat. After establishing these four categories I contacted a single member of each respective team (N=4) at PAWS to complete a survey. Each member was

given the questions on the 24th of September 2019 and instructed to send a completed form by the 31st of October 2019. To ensure participants provide unbiased answers, the questions were administered via a potentially anonymous survey as opposed to an in-person interview (Cicourel 1982). The questions given to each member were as follows:

1. Without looking at RaptorMed, what do you think is the number one reason that Canada geese enter PAWS?
2. What do you think is the greatest impact that humans, specifically, are having on Canada geese (in Washington State, both residential and migratory individuals)?
3. What is the most common physical injury that Canada geese face?
4. What is the most common illness that Canada geese face?
5. What, in your opinion, do you think should be done to protect the Canada goose? Reminder that "nothing" is a valid answer.
6. How do you, personally, view Canada geese?
7. How do you think the general public views Canada geese? Do you think people that find injured/sick/orphaned Canada Geese change their opinion after their experience?
8. Can we change the public's view on Canada geese? Should we change the public's view of Canada geese? Expand on your answer if you feel the need to, but you do not have to.

All of the survey takers were instructed to not look at RaptorMed, and reminded that answers could be of any length and could also be left blank. The full disclaimer reads: "Disclaimer: The purpose of this research study is to examine the reasons that Canada Geese come into rehabilitation. Your participation is voluntary. You may choose not to participate. You may withdraw at any time. You may choose to answer any question with as few or as many words as

you'd like, and you may choose to refrain from answering any question. You may choose to remain anonymous, please indicate below if you would like to do so. Data is stored in a password protected drive. Parts of your answers may be used in a paper and/or presentation to supplement research. If you have any further questions please email Marisa at marisa6@uw.edu" The importance of disclaimers is detailed in Okechuku 1993, and I ultimately determined that any factor that could potentially reduce bias was necessary to implement in my study.

To determine whether or not humans were the primary cause of admission in Canada Geese I ran a Chi Squared test for two population proportions. This test used the total number of known Canada Geese (N=161) and comparing human related admissions (n=138) to natural ones (n=23), at an alpha value of 0.05. All unknown causes of admission were omitted from this test. To determine if there were any trends amongst the specific causes of admission I used a Chi Squared Goodness of Fit test. This included the Yate's correction for continuity. Under the assumption that all causes of admission are equally likely to happen to a Canada Goose, the expected values were equal. I included the top four known causes of admission: 1) Hit By Vehicle (n=38) 2) Oiled (n=36) 3) Illegally Shot (n=16) 4) Entanglement (n=16) against my expected values (n=26.5, or ¼ of the total, per cause), at an alpha value of 0.05. I ran two more Chi Squared Goodness of Fit tests, also including the Yate's correction for continuity, to determine if there was a connection between the general known causes of admission (human or natural) and the age of the goose at intake. This test used the total number of known Canada Geese (N=161), human related admissions (n=138), natural related admissions (n-23) and the number of each age group that were involved. For human related admissions there were: 1) Adults (n=89) 2) Subadults (n=9) 3) Juveniles (n=31) 4) Infants (n=9). For natural related admissions there were: 1) Adults (2) 2) Subadults (1) 3) Juveniles (n=9) 4) Infants (n=11). These

statistical tests was run at equal expected values (n=1/4) and at an alpha value of 0.05. All statistical tests were run on R programming.

Results

Causes of Admittance:

Of the N=581 geese, 138 (24%) were admitted due to a known human event, 23 (4%) were admitted due to known natural events, and 420 (72%) geese had an unknown cause of admission. Looking at a more detailed breakdown of causes of admission, next to unknown the most common reason for admission was general orphans. In these cases, the finder did not know whether or not the parent was coming back and/or the staff member admitting the animal could not tell if the animal was kidnapped.

I found that human causes of admission were more common than natural causes (X_2 =161.44, $p < 0.0001$). See Fig 2. Of N=581 admitted geese, the top four causes of known admission were: 1) Hit By Vehicle(6.5%) 2) Oiled (6.2%) 3) Illegally Shot (0.3%) and 4) Entanglement (0.3%). All other causes of admission and their respective sample sizes and percentages can be found in Fig 1. I found that there is a statistically significant difference in frequencies of causes of admission, with Hit by Vehicle being the most common (X_2 = 16.717, p=0.00081).

When looking at the generalized causes of admission in comparison to age categories (adult, subadult, juvenile, infant). Of N=581 geese, adults made up 42%, subadults made up 7%, juveniles made up 25% and infants made up the last 26%. In relation to known causes of admission, adults were the greatest proportion of human related incidents (65%) and infants were the greatest proportion of natural incidences (48%). There was a significant difference in the

number of geese of different age categories that come in due to human related incidences (X_2 = 124.14, $p < 0.001$). Additionally, there was a significant difference in the number of geese of different age categories that come in due to natural related incidences ($X_2 = 12$, $p = 0.00464$).

Sociological Survey

The survey given to four members of the PAWS Wildlife Staff were consistent with my results. All staff members mentioned that Canada Geese are often hit by vehicles. Staff also agreed that there is a divided opinion on the species when it comes to the general public. Some people are afraid of them while others see them as beautiful. Each staff member recognized that the goose population in Washington is thriving, and we don't need to do any work to conserve the species. Finally, when asked how we can change public opinion on Canada Geese, the majority of PAWS staff surveyed agreed that educating the public was the best way to go about changing opinion. All of the survey participants' answers are quoted in Figure 4.

Discussion

As humans continue to expand into formally wildland areas, conflicts between humans and wildlife will increase. Understanding sources of conflict and public attitudes will help inform management choices. Abundant species such as the Canada Goose provide an important opportunity to examine human urban wildlife conflicts because they are regularly admitted to wildlife rehabilitation centers.. By examining 16 years of data obtained from PAWS, I found that of N=581 sources of admittance, human related causes, particularly hit by vehicle and oiled, accounted for the greatest number of known Canada Goose injuries or deaths recorded by PAWS. My findings concluded that humans are the primary known cause of admission for

Canada Geese and that these Canada Geese are most often admitted due to being hit by a vehicle. In terms of how old Canada Geese are when they are brought into PAWS it was found that in the case of a human incident they are more likely to be adults, whereas in the case of a natural incident they are more likely to be infants. My survey given to staff members at PAWS reflected that they see Canada Geese as a thriving species whose main threat are humans.

With respect to known causes of admission, I found that the most common was being hit by a vehicle. As humans continue to expand, our roadways reach further into areas traditionally used by wildlife for movement, posing serious risks of collisions with vehicles. Some studies suggest that at least one bird is killed every 10,000 kilometers of roadway (Svensson, 1998). Birds are not the only animals that suffer fatalities from roadways, however (now insert your comments about the study on ungulates). Even the actions humans are taking to make their urban environment more natural are negatively impacting bird populations, resulting in ecological traps. Hedges placed along roadsides have attracted birds to the vegetation, but incidentally have put those birds at risk when flying over or near that Orlowski, 2008). A more modern solution to the continuous conflict of wildlife and roadways are overpasses and underpasses on frequently traversed roadways. These passageways would allow for wildlife to cross fragmented habitat without being at risk of being hit by a vehicle. There is currently a 1-90 Wildlife Bridges Coalition, with the goal of habitat restoration and establishing wildlife corridors to assist wildlife in crossing highways in Washington State (Conservation Northwest, 2018). Another potential solution to bird collisions on urban roadways is to increase the height of vertical barriers to encourage flighted birds to avoid the areas (Pons, 2000). This method works best in areas where it has already been established that birds are more likely than other areas along the road to get hit by vehicles.

The second most common known human cause of admission was oil related incidences. In urban environments waterfowl are exposed to multiple sources of oil pollution, such as water pollution and air pollution. Of course, waterfowl on the coasts are subject to any oil spills that happen in bodies of water they may interact with. For the Canada Goose, the largest scale instance of this would be the Puget Sound; which is surrounded by urban environments here in Washington. Oil contamination is not limited to feather damage or other physical ailments. An oil spill can result in a decline in populations of marine birds and waterfowl. Ingestion of the oil, along with an initial die off, can limit the breeding success of future seasons (Piatt, 1990). A lesser known cause of oil contamination is air-based contamination, from local pollution produced by institutions in the urban environment (Stout, 1976). Due to the influence that pollutants like oil have on marine birds and waterfowl, these species are now being used as bioindicators of environmental contaminants. One study looked into the tissue samples and feather samples of marine birds to determine the degree to which pollutants are in our environment (Burger, 2004). Oil contamination is a clear problem, directly caused by human influence.

My findings based off of the data collected were consistent with the perception of the surveyed rehab workers. Survey participants believed that Canada Geese were at risk of being hit by cars and orphaned. They also agreed that the Canada Goose does not need any direct conservation, because of its current status as a thriving population in Washington State. Participants also agreed that the Canada Goose is both a loved an iconic species, while also being a nuisance and threatening species. This being said, they all recognized the important role that every species plays in the greater ecosystem, and most recommended education in order to help the public understand this.

A large potential source of error was the bias and limited sample size of my survey. I am currently employed at PAWS Wildlife Rehabilitation. Although the surveys were conducted anonymously, it is possible that my colleagues tailored their responses to something they knew I would like to see. While I see this as a very valid concern and potential flaw in my collection of survey data, I can also confirm that some of the answers were very different from my personal opinions. It should also be noted that 2019 was a bit of an abnormal year for Canada Geese at PAWS. We got our first "repeat" goose, who's habituation proved to be a hindrance to its health and wellbeing. For that reason, I believe the results of my survey were skewed towards this experience in particular. While at PAWS we all understand that humans have a large impact on the wildlife around us, habituation and the impact that people's behavior towards animals has been at the forefront of our minds this year.

Looking at previous research into human interactions with wildlife we can see that conflict has the potential to change individuals within a population. In large populations, human conflicts have been shown to change the attitude of animals rather than their overall behavior (Liu, 2011). The changes of attitudes can range from becoming a more reclusive individual to becoming a more aggressive individual. Given that injuries to people by Canada Geese are already an issue (McCoy, 2000), if they become more aggressive conflicts could increase, worsening public opinion and causing greater conflicts. Washington State typically ranks second among the 12 states known as the "Pacific Flyway" for waterfowl harvest and hunter numbers (WDFW, 2019). Reclusive geese may be more difficult to hunt. A booming population of geese due to decline in the hunt is only going to result in further interactions and conflicts, and frustrated hunters.

On a broader scale, human conflicts with the Canada Goose may serve as a model to further understand urban animal conflicts. Conflicts with people are another potential stressor for a species, and for those that are in a more vulnerable position it could be detrimental to the survival of the species as a whole (Gaston, 2008). If wildlife biologists and the like can determine what makes an interaction between wildlife and humans positive versus what makes an interaction negative, that would be a step forward. By understanding more about what makes negative interactions, we can hope to limit those and instead promote positive experiences with wildlife.

Literature Cited

Ankney, C. D. (1996). An embarrassment of riches: too many geese. *The Journal of wildlife management*, 217-223.

Burger, Joanna, & Gochfeld, Michael. (2004). Marine Birds as Sentinels of Environmental Pollution. EcoHealth., 1(3), 263.

Cicourel, A. V. (1982). Interviews, surveys, and the problem of ecological validity. *The American Sociologist*, 11-20.

Conservation Northwest. (2018). I-90 Wildlife Corridor Campaign. Retrieved December 5th, 2019, from https://www.conservationnw.org/our-work/habitat/i-90/

Driscoll, D. L. (2011). Introduction to primary research: Observations, surveys, and interviews. *Writing spaces: Readings on writing*, *2*, 153-174.

Ducks Unlimited. (n.d.). The Ultimate Guide to Hunting Canada Geese. Retrieved December 5, 2019, from https://www.ducks.org/hunting/goose-hunting-tips-tactics/the-ultimate-guide-to-hunting-canada-geese.

Fidino, Mason, Herr, Seth W, & Magle, Seth B. (2018). Assessing online opinions of wildlife through social media. Human Dimensions of Wildlife., 23(5), 482-490.

Forman, R. T. (2012). *Safe passages: highways, wildlife, and habitat connectivity*. Island Press.

Gaston, Kevin J., and Richard A. Fuller. "Commonness, population depletion and conservation biology." Trends in Ecology & Evolution 23.1 (2008): 14-19.

Leafloor, J. O., Ankney, C. D., & Rusch, D. H. (1998). Environmental effects on body size of Canada Geese. *The Auk*, 26-33.

Johnsgard, P. A. (1965). Handbook of waterfowl behavior. *Handbook of Waterfowl Behavior, by Paul Johnsgard*, 7.

Liu, Fang, et al. "Human-wildlife conflicts influence attitudes but not necessarily behaviors: Factors driving the poaching of bears in China." Biological Conservation 144.1 (2011): 538-547.

Magle, Seth B., et al. "Urban wildlife research: past, present, and future." Biological conservation 155 (2012): 23-32.

McCoy, Nicole H. "Economic tools for managing impacts of urban Canada geese." (2000).

Okechuku, C., Frost, M., & Porchuk, M. (1993). The moderating effect of disclaimer importance on the effectiveness of two-sided advertising. *ACR European Advances*.

Orłowski, G. (2008). Roadside hedgerows and trees as factors increasing road mortality of birds: implications for management of roadside vegetation in rural landscapes. *Landscape and urban planning*, *86*(2), 153-161.

Piatt, John F, Lensink, Calvin J, Butler, William, & Nysewander, David R. (1990). Immediate Impact of the 'Exxon Valdez' Oil Spill on Marine Birds. The Auk., 107(2), 387-397.

Pons, P. (2000). Height of the road embankment affects probability of traffic collision by birds. *Bird Study*, *47*(1), 122-125.

Powell, H. (2015, May 19). Where Did All Those Canada Geese in Town Come From? Retrieved December 5, 2019, from https://www.allaboutbirds.org/news/canada-goose-resident-vs-migratory/.

Sibley, D. (2003). *Sibley Field Guide to Birds of Western North America* (p. 1). New York: Alfred A. Knopf.

Simpfendorfer, C. A., Heupel, M. R., White, W. T., & Dulvy, N. K. (2011). The importance of research and public opinion to conservation management of sharks and rays: a synthesis. *Marine and Freshwater Research*, *62*(6), 518-527.

Stout, I. (1976). Nonhunting mortality of fledged North American waterfowl. *The Journal of Wildlife Management*, 681.

Svensson, S. O. R. E. N. (1998). Bird kills on roads: is this mortality factor seriously underestimated?. *Ornis Svecica*, *8*(4), 183-187.

WDFW. (2019). Injured or orphaned wildlife. Retrieved December 2, 2019, from https://wdfw.wa.gov/species-habitats/living/injured-wildlife.

WDFW. (2019). Let's go waterfowl hunting. Retrieved December 2, 2019, from https://wdfw.wa.gov/hunting/requirements/waterfowl.

Appendix

Figure 1:

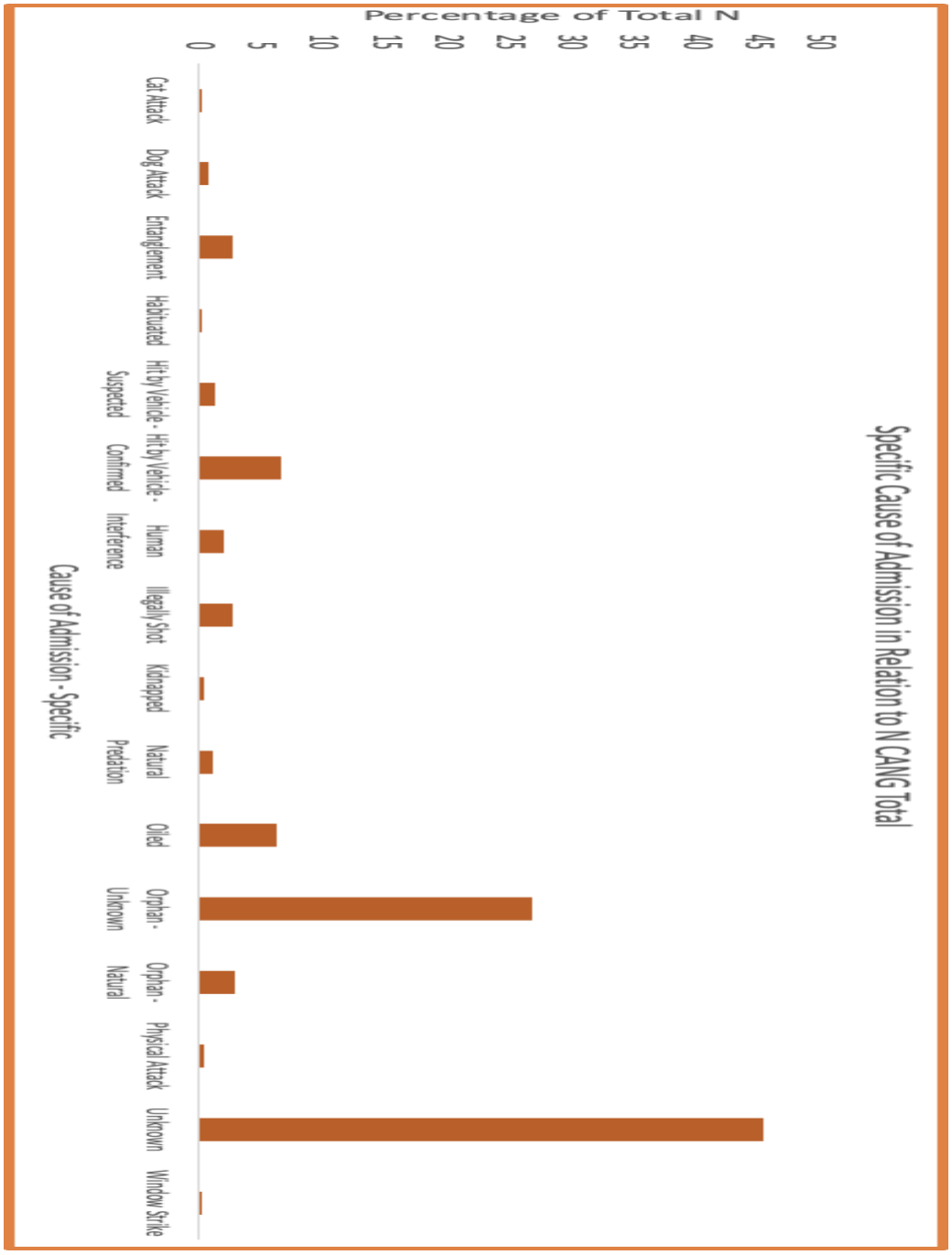

Figure 1 shows the full breakdown of causes of admission compared to what proportion of the total Canada Geese (N=581) they represent.

Figure 2:

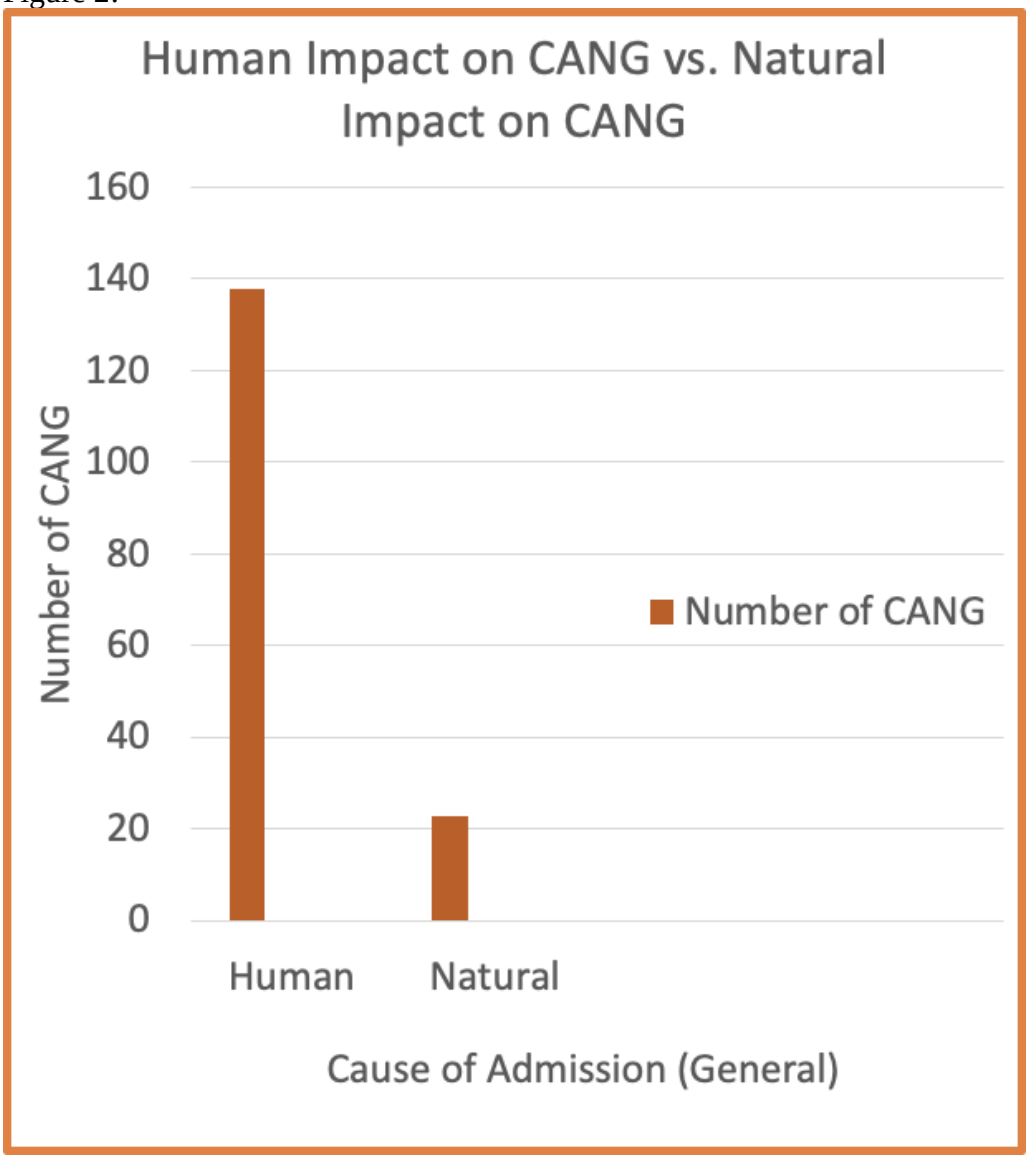

Figure 2 shows the immense difference between human causes of admission and natural ones. This test excluded all unknown data.

Figure 3:

Survey Questions	Majority Answer
1. What is the top reason CANG come into PAWS?	Hit by Vehicle
2. How are humans impacting CANG in WA State?	Habituation & Habitat Modification
3. What's the most common injury CANGs come in to PAWS with?	Fractured Limbs (wings, legs)
4. What's the most common illness?	Lead Toxicity
5. In your opinion, what should be done to protect the CANG?	Public Education
6. How do you view the CANG?	Stable & Thriving Species
7. How does the public view the CANG?	Pretty & Feedable OR Nuisance & Scary
8. Can we change the public opinion on CANG?	All Positive Outlook

Figure 3 gives an abbreviated version of the questions asked next to the most frequent answer to that question.

Figure 4:

Question	Admissions Specialist	Rehabilitator	Wildlife Veterinarian	Naturalist
1	Human related injuries (i.e. HBV, entanglement, pollution-related, shot, etc.)	Suspected or observed hit by vehicle.	Hit by vehicle (or orphan)	Orphan
2	Further habituating their species. Most residential geese live in man-made lakes and ponds nowadays and are constantly surrounded by people. I believe	By feeding Canada geese in parks humans encourage them to congregate in urban areas where they are more likely to encounter vehicles, dogs, windows,	Habitat alteration	Human development/habitat modification

	this is what leads to most of their injuries.	humans with guns, etc, and therefore increase their risk of injury.		
3	In my experience I've noticed mostly leg/wing injuries (luxations/fractures).	Gun shot.	Blunt force trauma secondary to HBV	Fx Wing
4	Not sure if it counts cause it's such a broad answer and can be caused by many things, but I'd say respiratory distress.	Metabolic imbalances from improper diet leading to "angel wing".	Lead toxicosis	Lead Poisoning
5	A lot, but they're all things that protect other animals too. Illegal/accidental dumping/spills of contaminants into water sources needs to stop, plastics need to be produced and used in much smaller quantities, road signs should be put up to warn if an area is heavily trafficked by a particular type of wildlife. That kind of thing	Educate the public about the negative effects of providing unnatural food sources to wild animals	I don't think Canada geese are in need of active protection; however, I think maintaining natural habitats would benefit them and all other native Washington wildlife.	Reduce Habitat Modification

6	Honestly, they're wonderfully silly birds, they just are. But that's my personal POV. Scientifically I view them as pivotal to their ecosystems because, just like every other working element, their ecosystem services cannot be replaced in their absence.	As a stable population with low risk of problematic decreases in number in the near future. As a species that rarely becomes a nuisance outside of when humans habituate them, provide unnatural food sources, or encroach upon their habitats. And lastly, as a species with as much right to thrive in their natural environment as any other.	I think they are a very adaptive and often charismatic species that has figured out to not only coexist but thrive with humans, and they receive a largely negative opinion because of this ability.	As a species that is part of the natural ecosystem but also as a species that is well suited for urban ecosystems.
7	I think it boils down to a top three; 1) Nuisance wildlife 2) Scary 3) A fun animal to feed at the park like ducks and crows.	As unpredictable and aggressive birds with a painful bite.	I think most of the public view them as a nuisance for the above mentioned reason. I also think many people who have to interact with them on any kind of regular basis are afraid of them!	Some view them as beautiful wildlife others as pests
8	Oh absolutely. I think we can change the public's view of any animal with proper education and outreach.	Absolutely. It would require a wide-spread educational campaign to improve the public's	I'm not sure. We continue to provide unnatural but amazing habitat (e.g. golf courses, condo	Not sure. That is not within my realm of expertise. My guess is that education can always improve

		understanding of how to tailor interactions to be positive for both people and Canada geese.	green space/ponds) that people do not want them on, so until this practice stops and we maintain more natural habitats, I think the species will continue to thrive and people will continue to be irritated with their presence.	the public's view if it is incorrect. However, how to educate the public is something I don't understand and therefore why I am unsure if it would be possible.

Figure 4 gives a full breakdown of what each staff member expressed in their response, all are direct quotations.

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