Watershed Sustainability Research Project

The Effect of Mild versus Extreme Weather Conditions on the Population Size of Geese and Their Distribution throughout Vilas Park during the Fall Migratory Season

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Lab/Research Report

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Abstract:

Overpopulations of the Giant Canada Goose (*Branta canadensis maximus*) have created conflicts with humans in urban areas, especially as a result of the large quantities of feces left by geese in parks. The purpose of our study was to determine how the goose population and distribution changes in response to weather throughout various areas of Vilas Park, Madison, Wisconsin. We hypothesized that under "extreme" weather conditions, there would be fewer geese present in the park and they would be concentrated in a smaller area; and there would be more geese that are more widely distributed under "mild" weather conditions. We took waterfowl counts during the fall migratory season, selecting 20 days that fit specific criteria for "mild" (10 days) and "extreme" (10 days) weather conditions. We examined relationships between these weather conditions and goose distribution and population throughout the park. Results generally supported our hypothesis: there was an average of 247.8 geese present on "mild" days and 65.0 geese present on "extreme" days. We consider implications of our results for management of geese and make recommendations for future studies.

Introduction:

Giant Canada Geese are a subspecies called *Branta canadensis maxima* (Clayton). This subspecies of geese are often found in flocks or family groups. The flocks fly high in a V formation and they tend to migrate short distances. The Giant Canada Geese will stay in one location until the ice freezes and then they fly only far enough to find open water and food. This pattern of migration is different from past geese migration habits. The voice of these geese is often considered to be a "Hronk." They create their nests on the ground in grass or marshy areas (Sibley p. 70). This type of goose is often considered to be an "eating-excreting machine" because an adult Canada Goose leaves one pound of feces per day (Adams p.292).

As early as 40 years ago, these geese were thought to be nearly extinct due to unrestricted hunting, harvesting of eggs and draining of their wetland habitat (Adams p.289). In 1969, they were rediscovered in Minnesota where breeding efforts began and were successful. The population of Giant Canada Geese increased in urban areas of North America. In the year 2006, their population was estimated to be over 30 million (Adams). Geese are more often found in urban areas for many different reasons. One reason is that the urban areas create a safe environment for the geese away from hunters. They will congregate anywhere around water and food but also look for areas with a low abundance of natural predators. Due to safer conditions, the geese tend to live longer in the city and are able to find more food resources in shrubs, garden plants and supplemental feed. Better living conditions for the geese also produce a higher production and survival rate of their offspring.

The Lake Wingra and Vilas park area in Madison, WI is considered to be historically rich in bird species. There are different waterfowl species in and around the lake such as ducks and geese (WRM p.26). The characteristics of the Giant Canadian Geese are evident in Vilas Park where there are water and food resources for the geese to use. This is also an area that is considered to be safe from hunters

and other predators. The geese also leave behind a large quantity of feces which contaminates the areas in and around Lake Wingra and Vilas Park. The feces of this non-native species contaminate the water that flows into Lake Wingra which threatens the well being of fish, wildlife, and invertebrates. Their feces can be found on lawns, playgrounds, beach areas, and playing fields. When the feces is on the playing fields it causes damage to the turf and an increase in the amount of erosion (Lorman 2003). An increase in nutrient runoff results in lake eutrophication. Eutrophication is the process of an increasing amount of nutrients in a water body. As the body of water ages, the amount of nutrients increase and the body of water will become more like a marsh due to the large amount of nutrients. The feces of the Giant Canadian Geese contribute to the eutrophication in an unnatural way and effects Lake Wingra and Vilas Park. The feces also contribute to the transmission of diseases to other animals including humans.

Vilas Park is a recreational area used for many different reasons. There are tennis courts, soccer fields, basketball courts, a playground as well as paved areas throughout the park for visitors. Vilas Park has been separated into 9 zones. (See figure 1)

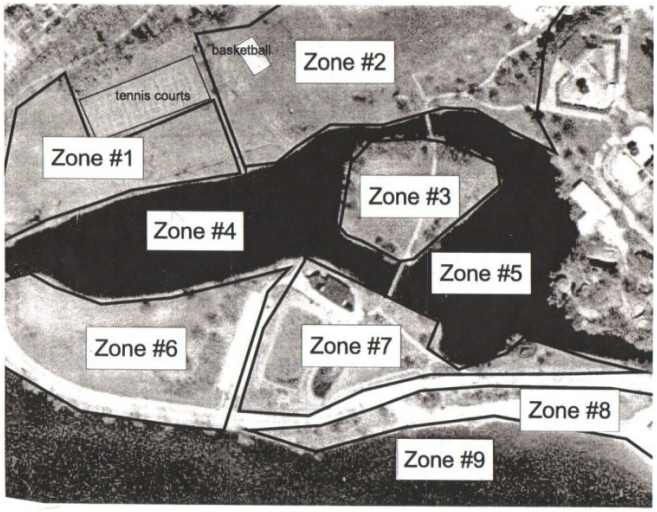

Figure 1. Map of Vilas Park and zone separations.

The zone separation was created to examine the possible trends that occur to the landscape around the lake due to human presence. A vegetation buffer was planted along the shoreline of zones 1 and 4 and is maintained by the Friends of Lake Wingra and the City of Madison Parks. The vegetation buffer was planted to see if it would decrease the goose population in zone 2 where humans prefer to congregate.

Due to the management problems with Giant Canadian Geese in Vilas Park, the geese tend to overpopulate the zones. The possibility of other factors such as weather conditions and time of year could contribute to possible reasons the geese are over populated. By looking at the effect of mild versus extreme weather conditions on the population size of geese and their distribution throughout Vilas Park during the fall migratory season may give new evidence as to why the geese tend to over populate areas at certain times we defined “extreme” conditions as less than 35 degrees Fahrenheit in general or less than 40 degrees Fahrenheit if another condition such as snow, rain, wind, or clouds is occurring. If the wind is greater than 15mph sustained or gusts over 20mph then it will be considered extreme. Any rain, thunder, lightning, snow, humidity, muggy or bad fog will also contribute to extreme conditions. We considered “mild” conditions as days with sun or mostly sun and anything that is not

considered extreme and above 35 degrees Fahrenheit. From the research, our prediction is that in extreme weather conditions there will be a smaller population of geese in Vilas Park. Also, in extreme weather conditions the geese will not be as evenly distributed throughout Vilas Park. We also predict that they will be found in clusters and areas sheltered by buildings, trees, and banks to help protect themselves from the weather conditions.

Methods:

To complete our study on the population size and distribution of geese throughout Vilas Park during the Fall Migratory Season, based on the weather conditions, we observed the geese at the park. During our observations we recorded the number of geese that were present in each predefined zone and made additional observations on how they were spread out within each zone. We recorded the time, date, temperature, and other additional weather conditions that were present. We gathered about twenty observations between the months of September through December.

Our next step was to look through all of the observations and classify them based on weather conditions. We put all the "mild" days together and all of the "extreme" days together. Extreme conditions include less than 35 degrees Fahrenheit in general or less than 40 degrees Fahrenheit if another condition such as snow, rain, wind, or clouds is occurring. If the wind is greater than 15mph sustained or gusts over 20mph then it will be considered extreme. Any rain, thunder, lightning, snow, humidity, muggy or bad fog will also contribute to extreme conditions. Mild conditions include anything that is not considered extreme and is an overall 'nice' day. When the weather is sunny to mostly sunny and above 35 degrees Fahrenheit, the weather is considered to be under mild conditions. To accuretly test the hypothesis and avoid confusion, we eliminated days that did not fit our criteria for "mild" or "extreme" weather conditions. After separating the observations and "weeding" the in-between days out, we looked for any patterns between the different types of days and the geese population and distributions within each zone. After weeding the extreme days and mild days out, we ended with 10 extreme days and 10 mild days.

Using the same criteria for "extreme" or "mild" conditions we looked into past data from 2001 to 2007. We collected ten "extreme" and ten "mild" waterfowl counts from the six year period. We compared this data to findings from 2008 and found that the results were similar to those expected.

Results:

After eliminating the "in between days," we separated the waterfowl counts into the ten most "extreme" days, and the ten most "mild" days. There was one day that does not meet the criteria for "extreme," but had interesting results that we felt necessary to include in our report.

We always found over ninety geese on mild days. The temperature between the ten "mild" days we chose ranged from 52 degrees Fahrenheit to 75 degrees Fahrenheit. Most of these days had some to almost full sun coverage, and the fowl counts were taken at various times throughout the day. We also found in our "mild" results that the geese were often spread throughout Vilas Park, as well as

spread throughout the nine zones. Most of the geese on “mild” days were found near the water zones which include zones four, five, and nine.

The population of geese on “extreme” days decreased from the “mild” days. The temperature between the ten “extreme” days we chose ranged from 2 degrees Fahrenheit to 41 degrees Fahrenheit. On the “extreme” days there was usually another condition occurring such as wind or snow. When observing the geese in Vilas Park on “extreme”days we noticed that the geese were confined to fewer zones and were not so spread out as much as they were on “mild” days. We also observed that the geese seemed to be more huddled together in groups to stay warm, as well as behind banks to block themselves from the wind. In general on most “extreme” days we found that there were typically less than 100 geese in Vilas Park. However, there were two days that did not meet our criteria. There were two “extreme” days that were very cold and windy however we found that there were still a lot of geese in Vilas Park. We also found one day that did not meet our criteria for “extreme” but we thought that there were interesting results that we should include. It did not meet our “extreme” criteria because the temperature was 58 degrees Fahrenheit. However, the wind was approximately 18mph so we decided to include this day in our results. On this day we found that there were a lot of geese near the water in zone four trying to hide behind the bank to protect themselves from the wind.

Figure 2*;* the average population of geese in Vilas Park on “mild” days was 247.8 geese; on “extreme” days the average population of geese in Vilas Park was 65 geese. We also looked at the total populations of geese in each of the nine zones for both “mild” and “extreme” days. We found that on”mild” days most of the geese were found in zone two, where on “extreme” days most of the geese were found in zone eight.

Along with looking at the waterfowl counts we collected, we also looked at past data to help support our results. We found that the majority of the results supported our hypothesis with the idea that there were fewer geese in Vilas Park on days with “extreme” weather conditions. Looking at data from 2001-2007 (*Appendix 1*), we were able to see the differences in the geese population on days with “mild” or “extreme” weather conditions. As seen in *Figure 3,* the average total population of geese in Vilas Park on “mild” days was 424.8 geese; on “extreme” days the average population of geese in Vilas Park was 26.5 geese(figure three). These averages were based on waterfowl counts collected from 2001-2007

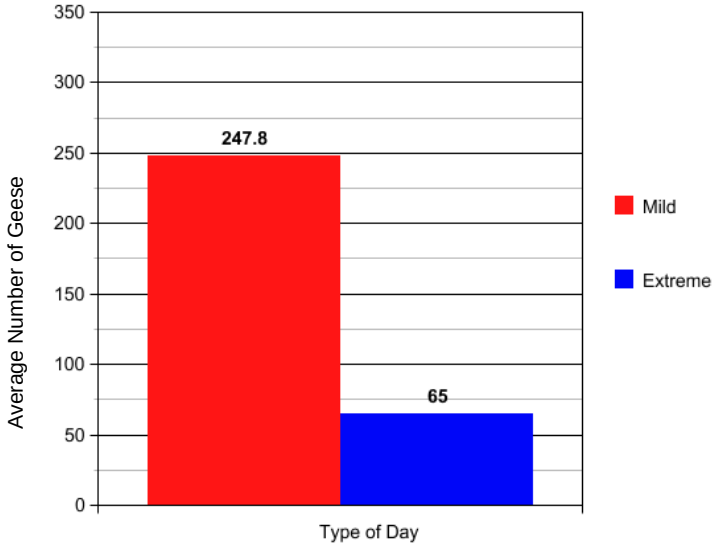

Figure 2. Average number of geese in Vilas Park for both "mild" and "extreme" days during the 2008 fall migratory season. The mild days show to have a higher average total population

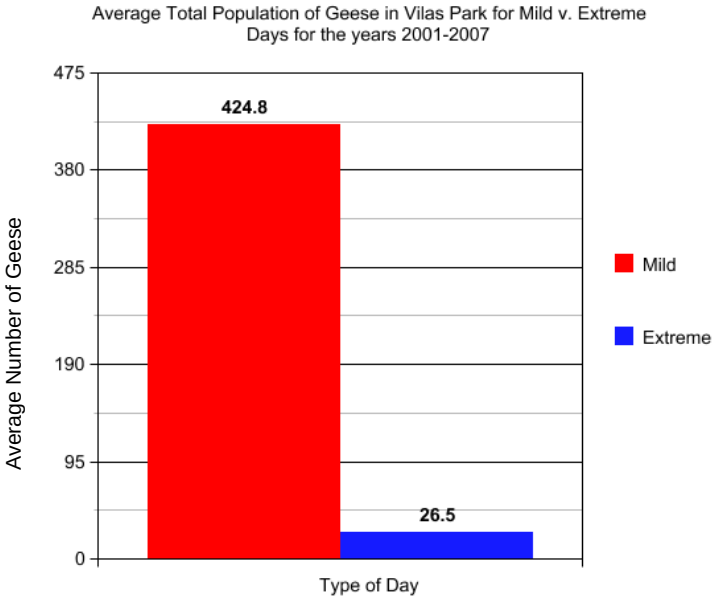

Figure 3. Average number of geese in Vilas Park for both "mild" and "extreme" days throughout the years of 2001-2007 fall migratory seasons. This graph supports our findings by the "mild" days still showing a higher population than "extreme" days.

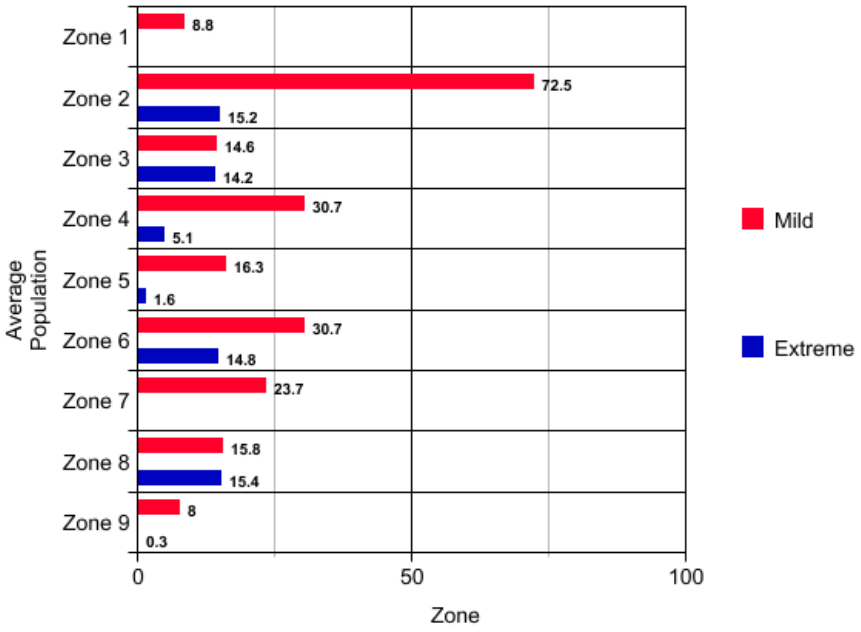

Figure 4. Average number of geese present in each of the 9 zones throughout Vilas Park for "mild" and "extreme" days September through December 2008.

Discussion:

We hypothesized that during "extreme" days there would be fewer geese and that if there were geese they would be together in a few zones. We also thought that on the "mild" days the geese would distribute themselves more throughout the park and there would be a larger population. To an extent, our hypothesis was accurate, but a few days altered our results. For most "extreme" days we found the population to decrease, the geese were generally in only three or less zones, and when the geese were in a specific zone they were all close by one another or huddled together. When they were huddled together we figured it was a way for them to protect themselves against the "extreme" temperatures and weather conditions. On most "mild" days the geese were spread out throughout the park and there was an increase in the population size. There was one day that did not fit into either the "mild" or "extreme" criteria and because of this, it questioned our hypothesis due to the fact that we were unable to classify it into one of our specific weather categories. On October 19 it was extremely windy, but the temperature was 58 degrees. Because our criteria for an "extreme" day was that the temperature had to be below 35 degrees Fahrenheit in general or less than 40 degrees Fahrenheit if another condition such as snow, rain, wind, or clouds is occurring, October 19 would fall into a "mild" day because the temperature was so high. Although we left this day out of our final results, we realized that we should have taken more into consideration regarding other weather conditions occurring on a "mild" day, temperature wise. Also, the distribution on this day would fit into what we thought would occur on an "extreme" day. Although the population was higher than we thought, the geese were only spread out throughout four of the nine zones, and majority of the geese (231) were found in zone 4. Also, on

November 17 it was an “extreme” day, but we found a large population of geese. There were 382 geese that day which were distributed throughout four of the nine zones. This alters our results because based on the temperature (32 degrees Fahrenheit) and the weather conditions (windy and cold) this day would fall into an “extreme” day, but the population and distribution was significant on this day.

Although our hypothesis was not completely supported, there were possible sources of error in our results. One implication of our results could be global Climate change because most geese leave when the lake or lagoon in the park has frozen over, but with global climate change it can cause one day to be very “mild”, while the next to be extreme. This rapid change in weather can confuse the geese and cause them to stay during the “extreme” days, thinking it will become “mild” again, or leave on an “extreme” day with anticipation that it will not get warmer again. Because in a good scientific experiment it is important to have only one variable we had to ignore things, like time of day. If we looked at both the time of day and temperature it would create problems when looking into our results. Because we left time of day out of our study, it may have affected our results because geese may be more prominent in Vilas Park during certain times of the day. Also, throughout the day, temperatures generally rise, so there may have been an increase in the number of geese as the day went on. Another issue we faced while doing this study was the ability to count the geese. Sometimes it is difficult to get a perfect count of geese because on some days they were huddled together or there were large populations within the park. Because we are relying on our own ability to count, we always need to include human error into our results. On our first day of class we discussed that it is important to round to the nearest 5-10, if there were more than 100 geese, based on one’s own judgment. This also includes the counter’s own confidence in counting. Our group generally had a good idea of how many geese were at the park and we usually rounded like we were taught in class. Although we did round up to make sure to account for human error, we do not believe that the amount that we rounded up could create a significant change in our results.

Another important factor is the seasonal time change. In the beginning of the fall migratory season, through the months of September and October, we found more “mild” days than “extreme” days. As the fall migratory season progressed, we found more “extreme” days because winter was approaching, and the temperatures were decreasing. Further studies would need to be completed to elucidate this seasonal weather pattern changes, and its affect on the geese population in Vilas Park.

There are many possible ways to help manage the growing population of the Giant Canadian Geese. One of these ways is to educate community members including information about not feeding the geese. Another possible solution is landscape modification particularly the creation of shoreline vegetation buffers. Also by letting vegetation grow tall along the shoreline will decrease usable habitat for the geese (Lorman 2003). Using other animals such as dogs, noisemakers, or scare devices are methods that could be used to scare the geese into leaving or migrating to another location. These are examples of using hazing as a method to control the geese population. By coating the geese eggs with mineral oil during their incubation period causes the egg to not hatch resulting in fewer offspring (Clayton). Another possible way to lower the offspring count would be to sterilize the adult geese to prevent reproduction. By trapping the geese during molting would be beneficial as well because the

geese will not be able to fly away and therefore can be trapped and relocated. After trapping the birds, the juveniles can be relocated and adults can be killed to produce bird meat (Lorman 2003).

After completing this study we were also able to consider any recommendations for further studies. One thing would be to count the geese during an exact time of day, although this can also present the challenge of geese moving around throughout the zones while counting. We also thought that it would be important to try and be as specific as possible when creating weather conditions. We tried to base our "extreme" days off of what a person would say or believe to be uncomfortable conditions to be in, but it is difficult to know if geese would find these days to be similar or different from our own judgment. So, it would be important to get as specific as possible when creating criteria. For a further study, depending on time, it would be a good idea to take this study out through a longer period of time. Because we focused on the fall migratory season, it was challenging to come up with "mild" days. If the study would have began earlier in the summer into the fall we could have looked more into "mild" days. Finally, with any study, it is important to test and retest. If we would have had more days to gather waterfowl counts, we would have had more to choose from and weed out, leaving us with a more precise and accurate finding of days.

After collecting our data and analyzing it, we were able to find that certain weather conditions will not always affect the geese population and distribution throughout Vilas Park. More detailed research could be conducted to give a more thorough and complete analysis of the geese population and distribution related to weather conditions in Vilas Park. We realize that when studying something like weather we need to be more specific and consider other outlying factors that can create conflict in our results.

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Appendix 1

Observation #	Date	Temperature in Fahrenheit	Weather Conditions	Mild or Extreme	Total Population
1A	12/2/2001	36 degrees		Extreme	3
2A	12/3/2001	48 degrees	Cloudy	Mild	710
3A	11/6/2002	54 degrees	Sunny	Mild	312
4A	11/19/2002	50 degrees	Sunny	Mild	299
5A	11/21/2002	0 degrees	Cloudy	Extreme	29
6A	11/20/2003	62 degrees	Sunny	Mild	449
7A	12/1/2003	35 degrees	Sunny and windy	Extreme	84
8A	12/4/2003	38 degrees	Cloudy	Extreme	0
9A	10/6/2004	62 degrees	Sunny	Mild	634
10A	11/7/2004	50 degrees	Sunny and windy	Mild	343
11A	12/2/2004	22 degrees	Partly cloudy	Extreme	0
12A	10/11/2005	60 degrees	Mostly cloudy	Mild	219
13A	10/25/2005	48 degrees	Sunny	Mild	440
14A	10/6/2006	50 degrees	Sunny	Mild	379
15A	12/6/2006	32 degrees		Extreme	0
16A	11/7/2007	45 degrees	Cloudy	Mild	463
17A	11/15/2007	40 degrees	Cloudy and windy	Extreme	149
18A	12/3/2007	10 degrees	Sunny	Extreme	0
19A	12/6/2007	10 degrees	Sunny and Windy	Extreme	0

This table is a list of all the waterfowl counts we used for our research. All this data was found between the 2001-2007 fall migratory seasons.

Appendix 2

Observation Number	Date	Temperature in Fahrenheit	Weather Conditions	Mild or Extreme	Total Population
1	9-9	73 degrees	Sunny	Mild	93
2	9-16	67 degrees	Sunny	Mild	119
3	9-22	63 degrees	Foggy and cloudy	Mild	203
4	9-23	75 degrees	Sunny	Mild	247
5	9-39	63 degrees	Mostly Sunny, Windy	Mild	258
6	10-7	58 degrees	Mostly Cloudy	Mild	184
7	10-20	58 degrees	Sunny	Mild	361
8	10-28	46 degrees	Mostly Sunny	Mild	700
9	11-3	52 degrees	Mostly Sunny	Mild	124
10	11-3	60 degrees	Mostly Sunny	Mild	189
11	11-7	41 degrees	Rain/Snow Mix	Extreme	106
12	11-11	28 degrees	Thin Ice on Lake	Extreme	9
13	11-17	32 degrees	Very Cold and Windy	Extreme	382
14	11-19	31 degrees	Sunny and Windy	Extreme	34
15	11-20	32 degrees	Mostly Cloudy, Windy	Extreme	0
16	11-21	25 degrees	Windy and Very Cold	Extreme	92
17	11-25	35 degrees	Sunny	Extreme	0
18	12-2	27 degrees	Cold and Windy	Extreme	27
19	12-12	18 degrees	Light Breeze	Extreme	0
20	12-16	2 degrees	Mostly Sunny	Extreme	0

This table is a list of all the waterfowl counts we used for our research. All this data was found during the 2008 fall migratory season.