Species Comparison of Salvage Permits in Washington State

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Abstract

A rule adopted by the Washington Fish and Wildlife Commission in 2016 allows people to legally salvage deer and elk carcasses in the state. Anyone who takes possession of a deer or elk carcass must obtain a free, printable permit from WDFW within 24 hours. This is a way for the state to promote a sustainable, recycle, and reuse climate among its citizens. I found three databases to use for my analysis. A salvage permit dataset, Washington census data, and Department of Fish and Wildlife, wildlife area data. Using PostgreSQL 15 through the pgAdmin 4 graphic user interface (GUI) I performed several SQL functions and queries to analyze the selected data. Starting with pulling out the data that represent totals of animals salvaged sorted by species and sex. This was accomplished using the count expression combined with grouping and ordering. I would have liked to perform Spatial queries such as ST_Distance, ST_Within and ST_DWithin, however, I could not get those functions to work with my data. It is very possible that that was due to the quality of the data. While I did discover trends that were unexpected, I was not able to do all of the research originally desired. Therefore, the success or failure of the Roadkill salvage program in the state of Washington is inconclusive.

Species Comparison of Salvage Permits in Washington State

A rule adopted by the Washington Fish and Wildlife Commission in 2016 allows people to legally salvage deer and elk carcasses in the state. Anyone who takes possession of a deer or elk carcass must obtain a free, printable permit from WDFW within 24 hours. The permittee must then keep a hard copy of the signed and dated salvage permit with the meat until all of the edible parts are consumed (WDFW, 2023). I have always wondered how much these permits are used, and which species and locations are the most prevalent. My questions are: How many animals have been salvaged annually since the rule was adopted? Which counties across the state have the most permit applications? Which species is salvaged most often? How many salvage permits are applied for in close proximity to state wildlife areas? How many salvage permits are applied for under questionable circumstances? As an employee of the Washington Department of Fish and Wildlife Enforcement Program, I am curious how many animals are salvaged in the state and how salvage permits can be a way to promote sustainable and ethical use of animal resources. Many people find it important to make use of animal carcasses found on the road to reduce waste and promote responsible resource use. There are three main species of deer in the State of Washington mule deer, black-tailed deer, and white-tailed deer. The total deer population in Washington is estimated to be around 300,000 animals. There are four subspecies of elk in Washington: Roosevelt, Rocky Mountain, Tule, and Merriam's. The total elk population in Washington is estimated to be around 65,000 animals. However, population numbers can vary greatly depending on the location and habitat. The Washington Department of Fish and Wildlife also conducts research and implements

conservation efforts to manage and protect deer and elk populations. These efforts include habitat restoration, predator management, and population surveys.

Research Context and Background

Research

Literature Review

Empirical Bayes Approach

The study found that the EB approach was effective in estimating the expected number of DVCs and that the method provided accurate estimates of the number of DVCs. The authors also found that the EB approach was effective in identifying high-risk locations for DVCs, which could be useful for developing targeted strategies for mitigating the risk of DVCs. (Gkritza et al., 2014).

Ethical Management of Wildlife

The paper indicates that the ethical management of white-tailed deer populations requires careful consideration of both the effectiveness and the impact of different control methods. While lethal methods such as hunting are often used, nonlethal methods such as contraception and sterilization can be effective alternatives that promote animal welfare and biodiversity. (Gamborg et al., 2020)

Identification of Elk-vehicle incident hotspots

To address this issue, the authors suggest a range of potential solutions, including increased public education about the risks of elk-vehicle collisions, the installation of wildlife crossings, and the implementation of speed limits and other traffic control measures in hotspot areas. The authors also highlight the importance of collaboration

between local agencies and stakeholders, including transportation authorities, wildlife managers, and community groups, to develop and implement effective solutions. (Sevigny et al., 2021)

Background

In the state of Washington, it is legal to salvage the carcasses of deer or elk that are involved in wildlife vs. vehicle collisions. This is a way for the state to promote a sustainable, recycle, and reuse climate among its citizens. The rule has only been in place since 2016 and there is not any published research or analysis that I can find.

Materials and Methods

Selection of Data

After choosing my topic of choice and developing a set of research questions I searched the Washington Geospatial Open Data portal. I found three databases to use for my analysis. A salvage permit dataset, Washington census data, and Department of Fish and Wildlife wildlife area data.

Analysis

Using PostgreSQL 15 through the pgAdmin 4 graphic user interface (GUI) I performed several SQL functions and queries to analyze the selected data. Starting with pulling out the data that represent totals of animals salvaged sorted by species and sex. This was accomplished using the count expression combined with grouping and ordering. The importance of being able to see these data is a key component of conservation efforts. Grouping and ordering are important

concepts in SQL (Structured Query Language) because they allow you to manipulate and analyze data in a more meaningful way.

Grouping in SQL refers to the process of combining rows that share a common value in a particular column or set of columns. This is typically done using the GROUP BY clause in a SQL query. By grouping data, you can perform aggregate calculations on the data, such as calculating the average, minimum, maximum, or sum of a particular column within each group. For example, I have a table of salvage permit data with columns for the person who applied, and the species and animal to be salvaged, I used the GROUP BY clause to group the data by sex and species and calculate the total amount of each species and sex.

Ordering in SQL refers to the process of sorting the data in a particular column or set of columns in ascending or descending order. This is typically done using the ORDER BY clause in a SQL query. By ordering data, you can view the data in a more meaningful way, such as sorting the data by species.

I used ST_Distance to determine which permit are in close proximity to a Wildlife Area. The ST_Distance function in PostgreSQL is a spatial function that can be used to calculate the distance between two geometric objects. This function is beneficial in analyzing Washington salvage permit data in relation to wildlife areas because it allows us to determine the distance between a permit location and the boundary of a wildlife area.

By using the ST_Distance function, we can identify permits that were issued for locations close to wildlife areas but outside their boundaries. This information can be useful for wildlife management and conservation efforts, as it can help identify areas where animal populations may be more vulnerable to vehicle collisions and other threats.

Additionally, we can use the ST_Distance function to perform spatial queries and analyses to determine patterns and trends in salvage permit data. For example, we can use the function to determine the average distance between salvage permit locations and wildlife area boundaries, which can help identify areas where there may be a higher risk of vehicle collisions with wildlife. Overall, the ST_Distance function is a powerful tool that can be used to analyze spatial data in PostgreSQL and is particularly useful in analyzing Washington salvage permit data in relation to wildlife areas.

I used ST_Within to determine which permit locations reside within the boundaries of a Wildlife Area. The ST_Within function in PostgreSQL is a spatial function that can be used to determine if a geometric object is completely within another geometric object. This function is beneficial in analyzing Washington salvage permit data in relation to wildlife areas because it allows us to determine which salvage permits are within the boundaries of wildlife areas.

By using the ST_Within function, we can identify which permits were issued for the purpose of salvaging roadkill or other animal carcasses within the boundaries of wildlife areas. This information can be useful for wildlife management and conservation efforts, as it can help identify areas where animal populations may be more vulnerable to vehicle collisions and other threats.

Additionally, we can use the ST_Within function to perform spatial queries and analyses to determine patterns and trends in salvage permit data. For example, we can use the function to determine which wildlife areas have the highest number of salvage permits issued within their boundaries, which can help prioritize conservation efforts in those areas. Overall, the ST_Within

function is a powerful tool that can be used to analyze spatial data in PostgreSQL and is particularly useful in analyzing Washington salvage permit data in relation to wildlife areas.

I wanted to use spatial joins to analyze the three datasets together in different combinations. Spatial joins in PostgreSQL are beneficial in analyzing Washington salvage permit data in relation to wildlife areas and census data because they allow us to combine and relate two spatial datasets based on their spatial relationship.

For example, we can use a spatial join to combine the Washington salvage permit data with a dataset of wildlife area boundaries in order to identify which permits are within the boundaries of wildlife areas. This can provide valuable insights into the distribution of salvage permits in relation to wildlife areas and help identify areas where there may be a higher risk of vehicle collisions with wildlife.

Additionally, we can use spatial joins to combine the salvage permit data with other spatial datasets, such as datasets of road networks or land use, to further analyze patterns and trends in salvage permit data. For instance, we can use a spatial join to relate the permit data with a dataset of road networks and identify which permits were issued for locations near busy roads, which may be associated with a higher risk of vehicle collisions with wildlife.

Spatial joins can also be used to aggregate or summarize data based on their spatial relationship. For example, we can use a spatial join to calculate the total number of salvage permits issued within each wildlife area, which can help prioritize conservation efforts in areas where animal populations may be more vulnerable to vehicle collisions and other threats.

Overall, spatial joins in PostgreSQL are a powerful tool that can be used to analyze spatial data and help identify patterns and trends in Washington salvage permit data in relation to wildlife areas.

Results

Using Basic queries, I was able to determine the totals of permits applied for by Species and sex I was also able to determine the top 5 reporting cities per species.

Species	Sex	Count
Deer	Female	2012
Deer	Male	2134
Deer	Unknown	122
Elk	Female	451
Elk	Male	246
Elk	Unknown	19

Table 1 Count by Species and Sex

Species	City	Count
Deer	Port Angeles	91
Deer	Olympia	82
Deer	Spokane	81
Deer	Ellensburg	61
Deer	East Wenatchee	57

Table 2 Top 5 Deer by Permit City

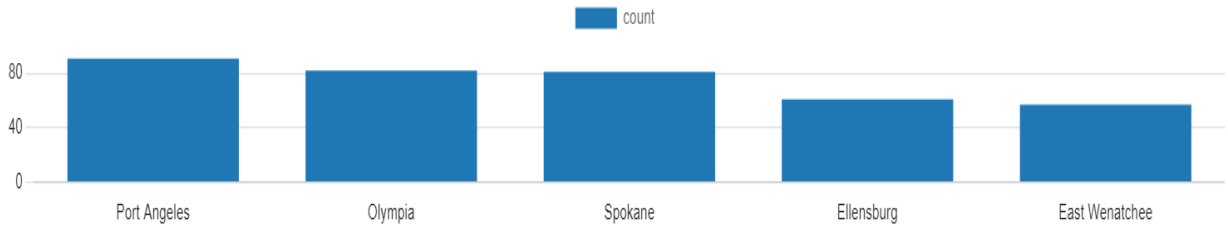

Figure 1 Top 5 Deer by City

Species	City	count
Elk	Graham	21
Elk	Orting	21
Elk	Eatonville	20
Elk	Buckley	19
Elk	Yakima	18

Table 3 Top 5 Deer by Permit City

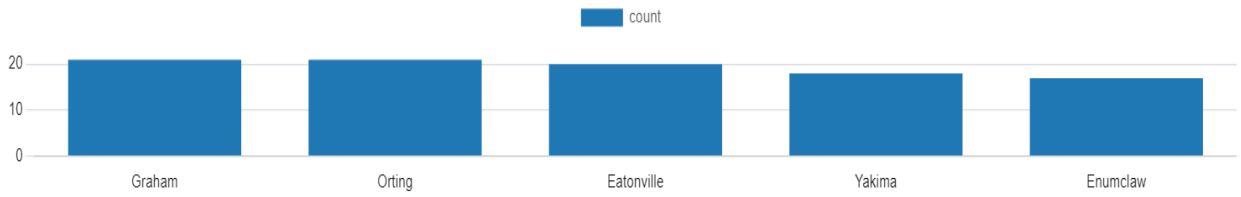

Figure 2 Top 5 Elk by City

I would have liked to perform Spatial queries such as ST_Distance, ST_Within and ST_DWithin, however, I could not get those functions to work with my data. It is very possible that that was due to the quality of the data. The lesson I learned from this is what we have been talking about this semester and that is the Data Life Cycle. Had I developed and followed a plan I would have been able to determine that the data I was using needed to be scrubbed. The other major Pitfall in my analysis is that the datasets chosen were not compatible for joining. Because of this, I was unable to perform many of the functions I desired to derive much more valuable analysis.

Discussion.

Through my analysis I was able to determine that in the State of Washington, there are far more Vehicle/deer collisions than vehicle/elk, it is more common for a cow elk to be invold in a collision with a vehicle than a bull by about 32%. While bucks are only about 3% more likely to be hit by a car. The distribution by species and location is a little shocking to me based on the ratio of animals to people across the state. While there was a rather large number of deer hit in the northwest region of the state, overall, the amount of deer involved in collisions on the more rural east side of the state is larger. This is where joining the census data with the salvage permit data would be beneficial. The same goes for Elk While the top 5 cities for permit applications are fairly rural the elk population is not as high as in other regions of the state.

Conclusion

As mentioned in the introduction of this paper I am interested in the success of the Salvage permit program in Washington state as it relates to conservation. More detailed research is required to determine the value of such a program. Other data sets will need to be acquired and some data sets need to be collected to get a detailed summary. While I did discover trends that were unexpected, I was not able to do all of the research originally desired. Therefore, the success or failure of the Roadkill salvage program in the state of Washington is inconclusive.

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