

# Impact of Speed Limit, Weather, and Adjacent Habitat on the Mortality of Animals due to Road Traffic

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# Impacts of Urbanization

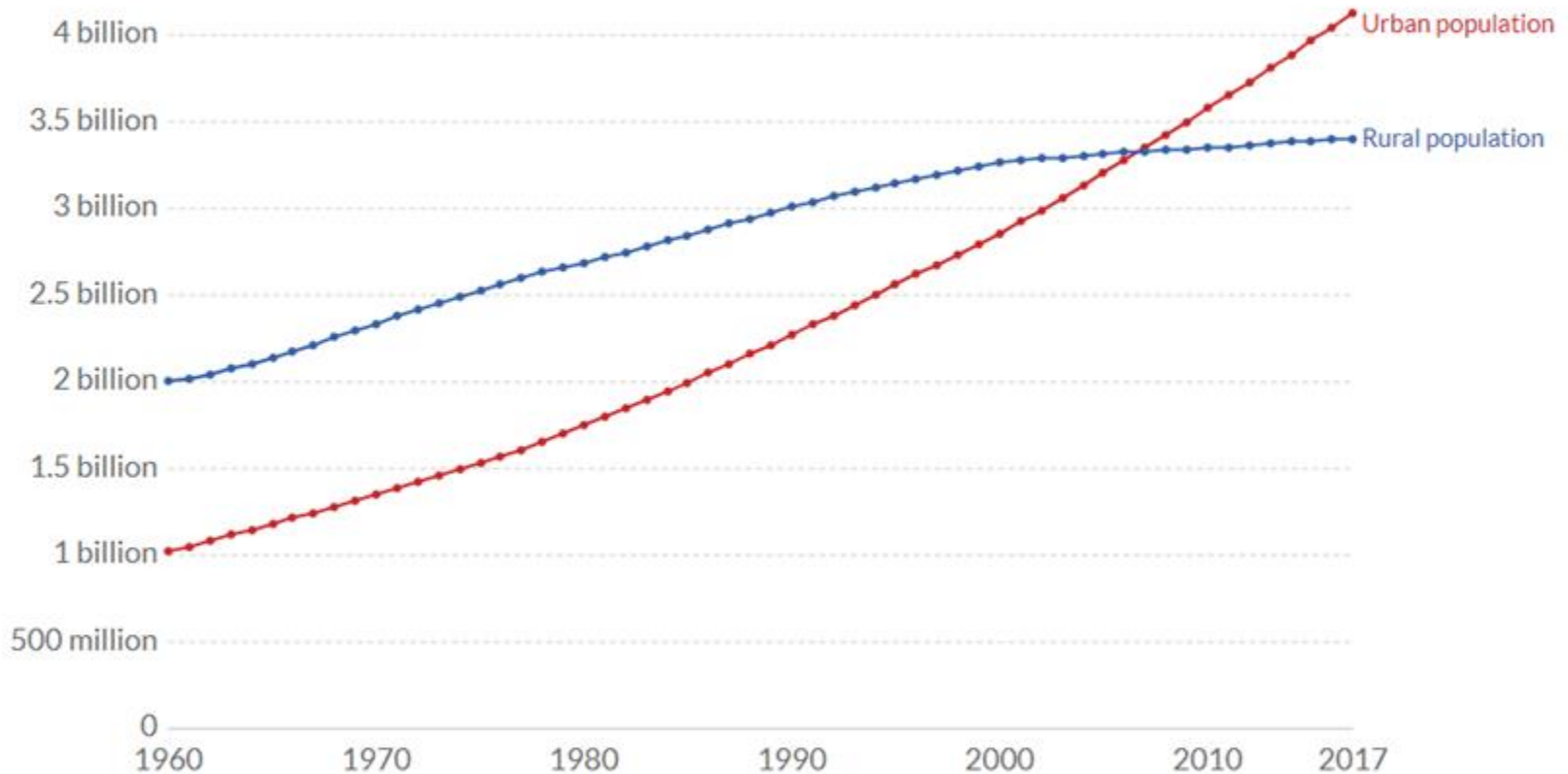
- Urban areas around the world contain more than half of the world's population
- Urbanization is a new phenomenon in world and human history

(Ritchie & Roser 2018)



# Urban and rural population, World

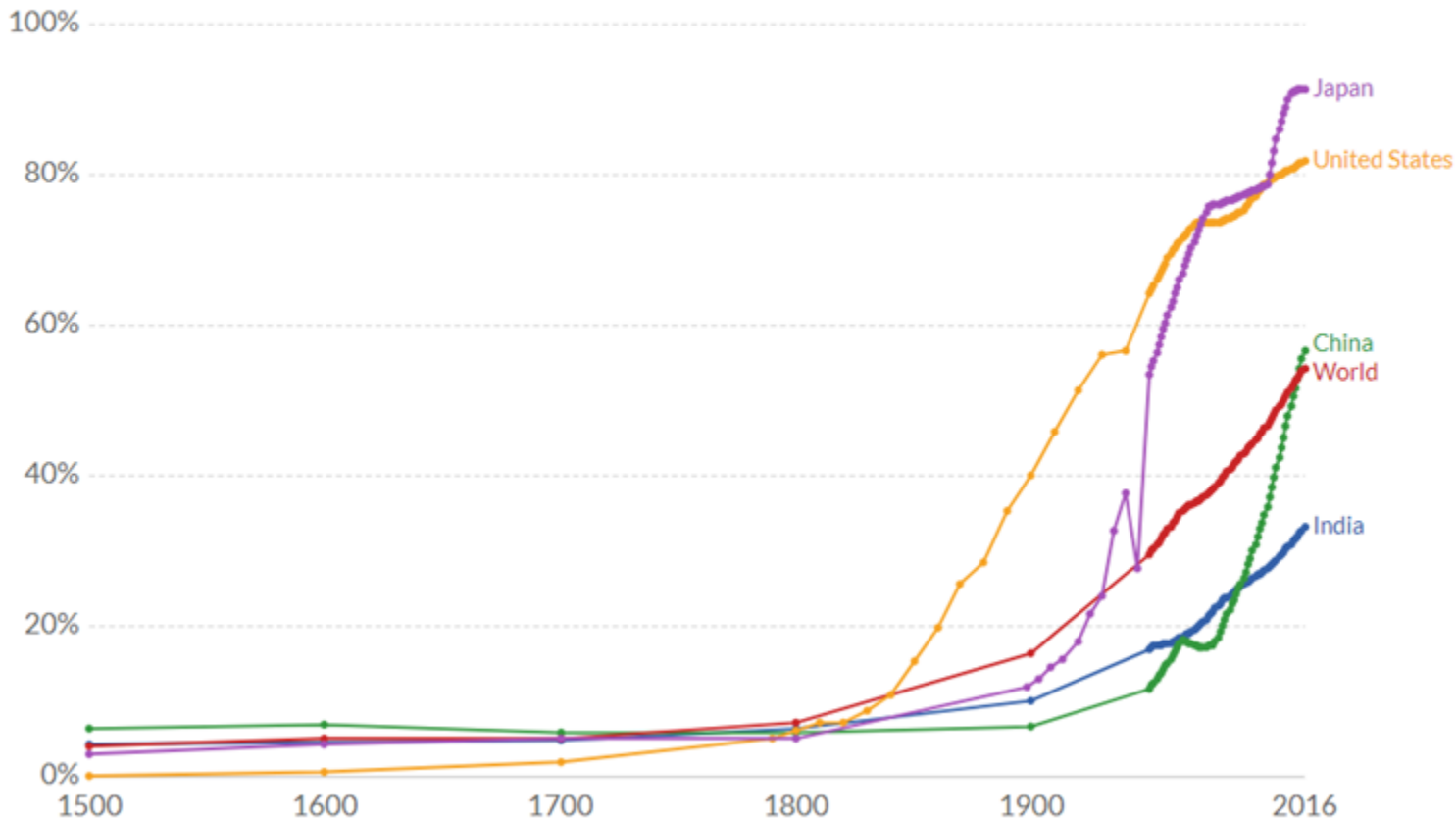
The total number of people living in urban or rural areas. Urban populations are defined based on the definition of urban areas by national statistical offices.



Source: World Bank, based on UN estimates

# Urbanization over the past 500 years

Share of the total population living in urban areas. Urban areas are based on national definitions and may vary by country.



# Ecological Impacts of Roads

- Roads cause fragmentation
  - Destroys habitats
  - Alters animal behavior
- Change soil density/soil water content
- De-icing agents (e.g. road salt)
- Increase impervious surfaces
- Dust and sand
- Artificial light and noise
- Mortality due to collisions



(Spellerberg 1998)

# General Background



## What is Roadkill?

- The remains of an any type of animal that has been killed on a road by a motor vehicle (Merriam-Webster).
- With an increase in roads there is an increase of possible wildlife vehicular collisions (Sáenz-De-Santa-María, 2015).

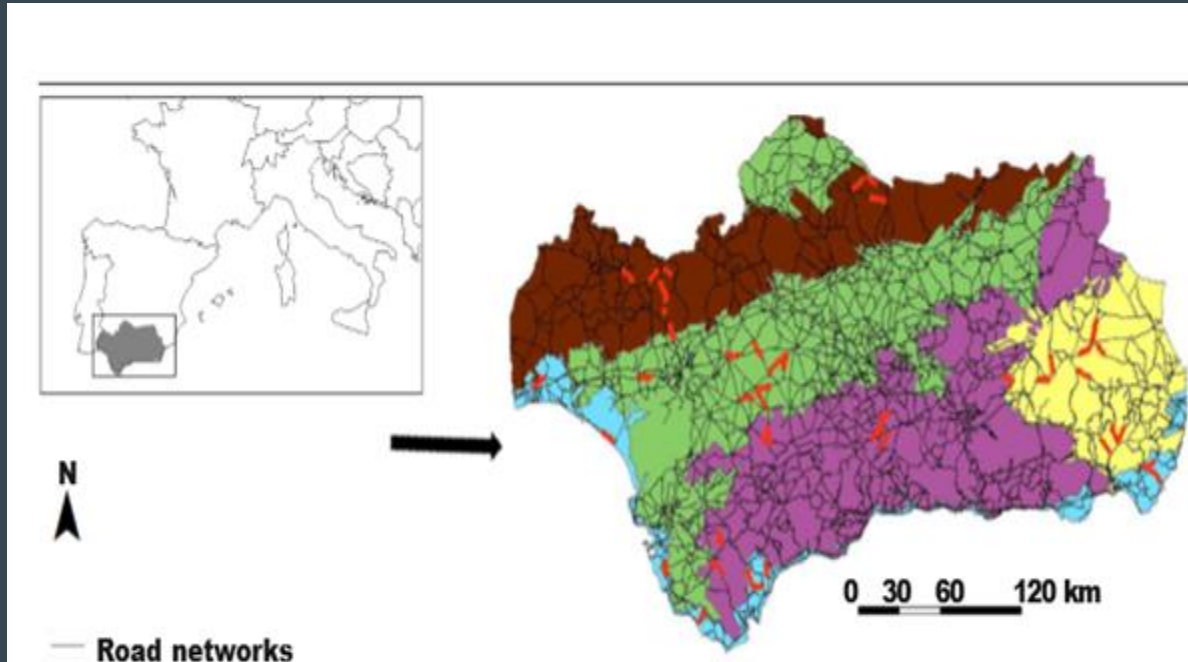
# Impacts of Collisions with Wildlife

- Direct Mortality
  - Population declines
  - Population fragmentation
- Impacts on Scavengers
  - Population increase of vultures
- Hazards on humans

(Taylor & Goldingay, 2010)



# Previous Studies



Different amounts of roadways causes different amounts of roadkill

-More roadways = more roadkill

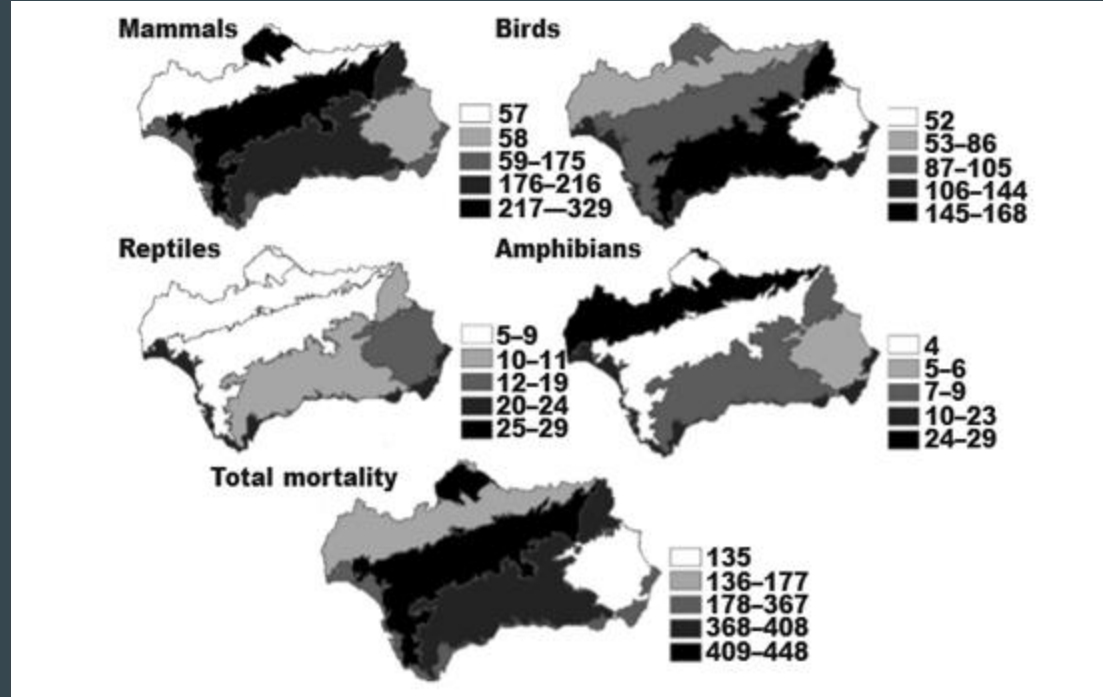
(Canal 2018)



# Previous Studies

- The impacts are variable on Different animal groups
- More bird kills in south
- More amphibian kills in north

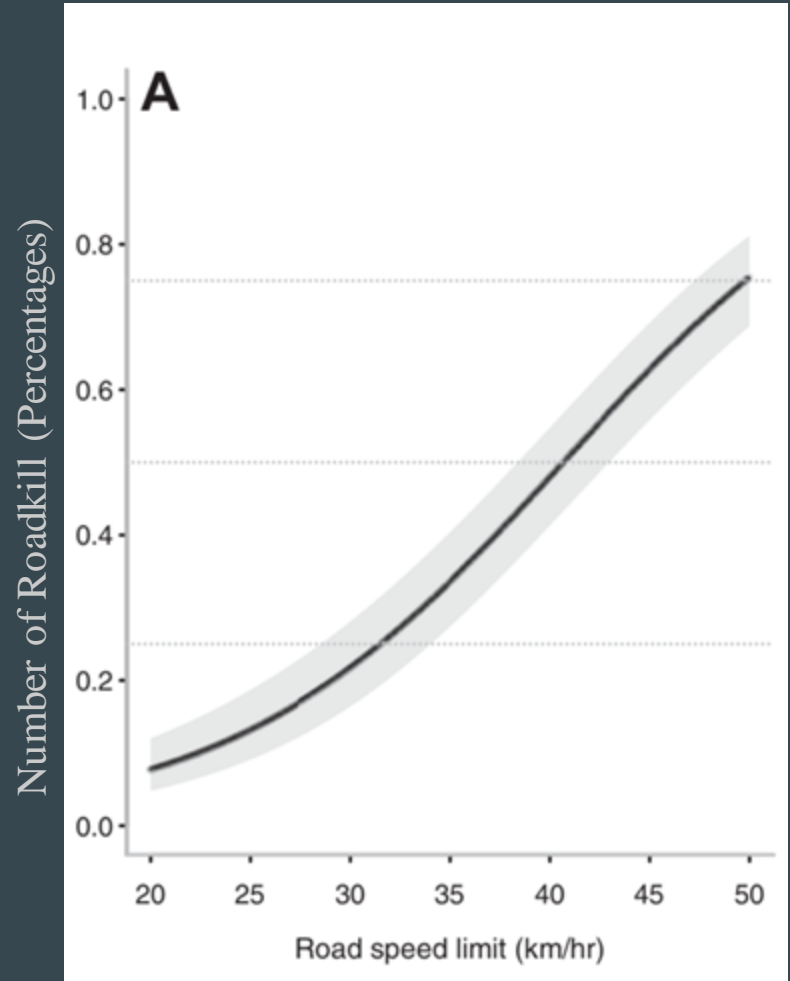
(Canal, 2018)



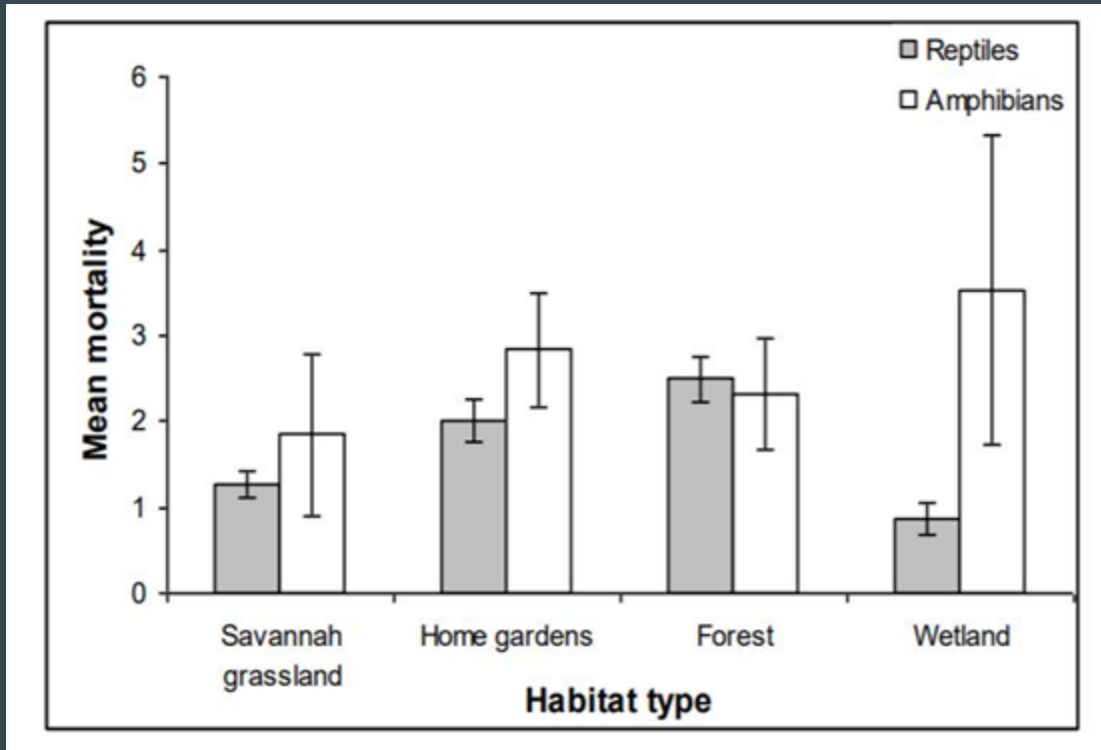
## Previous Studies

- Varying speed limit determines the amount of roadkill on the road
  - Increased speed limit = more roadkill

(Farmer & Brooks, 2012)



# Previous Studies



- Adjacent habitat had an effect on the number of roadkill found

# Question & Hypothesis



## Question:

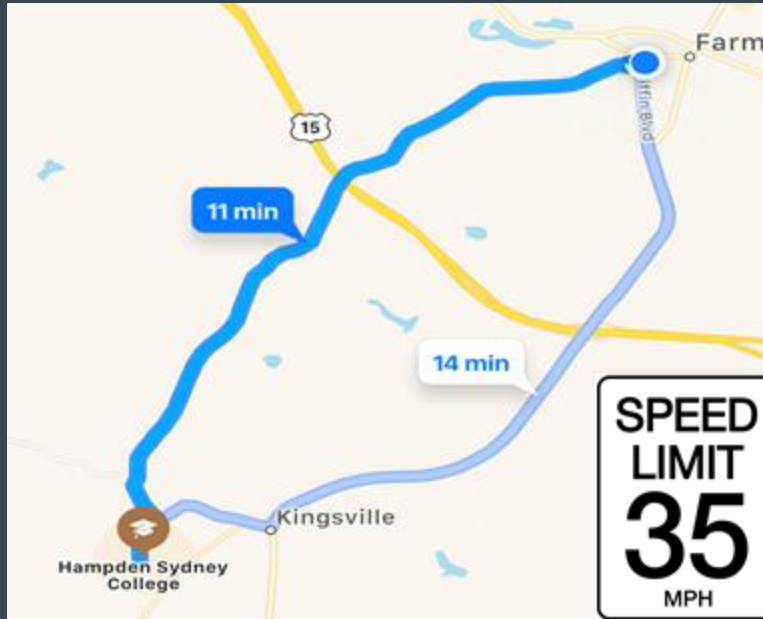
What is the impact of speed limit and adjacent habitat on mortality of animals due to road traffic?

## Hypothesis(es):

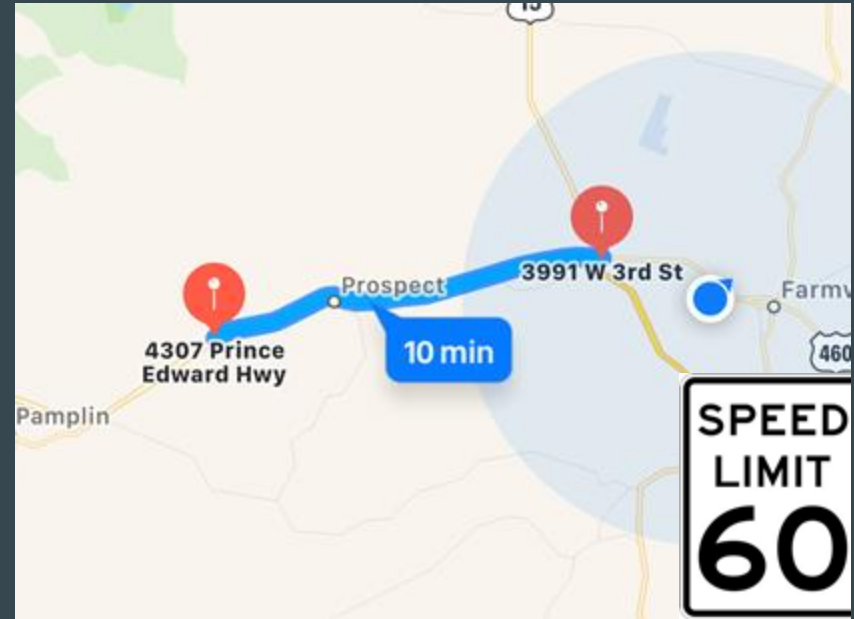
- Mortality rates of animals will increase due to an increasing speed limit
- More roadkill will appear on the two lane road with a 35 MPH speed limit compared to the one lane road with a 60 MPH speed limit

# Study Area

Back Hampden Sydney (9.8 km)



Route 460 West (9.8 km)



# Methods

- We collected data weekly for six weeks.
  - Driving (in pairs) 10 Kilometers on two different roads:

Route 460 and Back Hampden Sydney Road

- Recorded:

How many roadkills in 1 kilometer increments

- Species
- Abundance

- Weather conditions:

- Temperature
- Humidity
- Cloud Cover
- Wind Speed

**Speed Limit and Adjacent Habitat Impact on Roadkills**

Date: \_\_\_\_\_ Time: \_\_\_\_\_ Speed Limit: \_\_\_\_\_ Recorders: \_\_\_\_\_

Weather Conditions:  
Air Temp (C): \_\_\_\_\_  
Precipitation (Last 24 hours): \_\_\_\_\_  
Humidity (%): \_\_\_\_\_  
Cloud Cover (%): \_\_\_\_\_  
Wind Speed (km/hr): \_\_\_\_\_

Segment	Species	Number	Remarks (Unknown)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

# Methods

## Variables:

- Predictor Variable:
  - Speed Limit
- Response Variable:
  - Abundance
  - Species
  - Overall Diversity

## Statistical Test:

- Shannon Weiner Formula

Shannon-Weiner Index:

$$H = -\sum_{i=1}^s p_i \ln p_i$$

# Results



Gray Squirrel



Unknown



Turkey Vulture



White Tail Deer



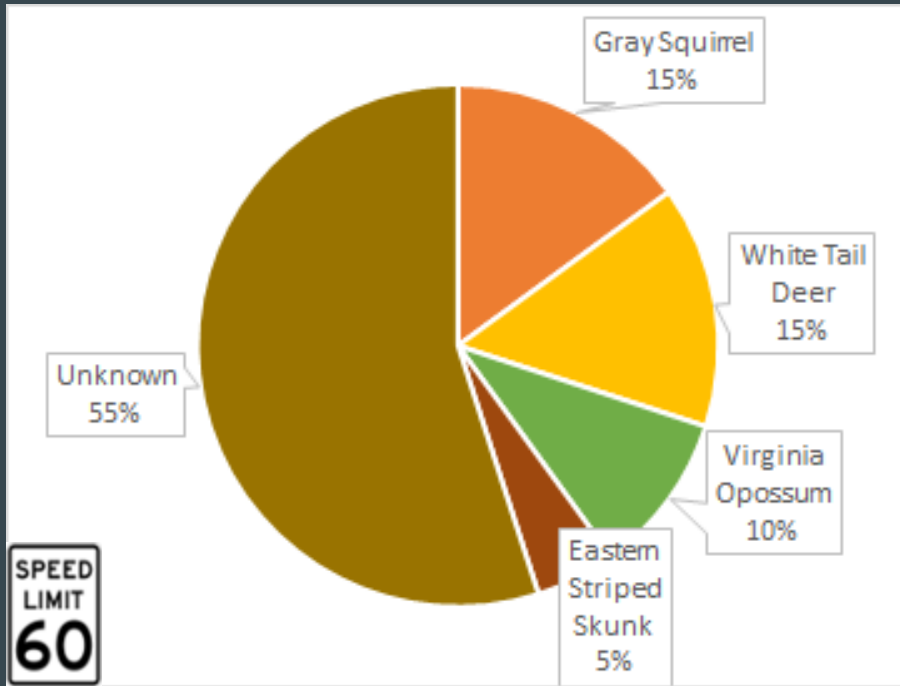
Virginia Possum



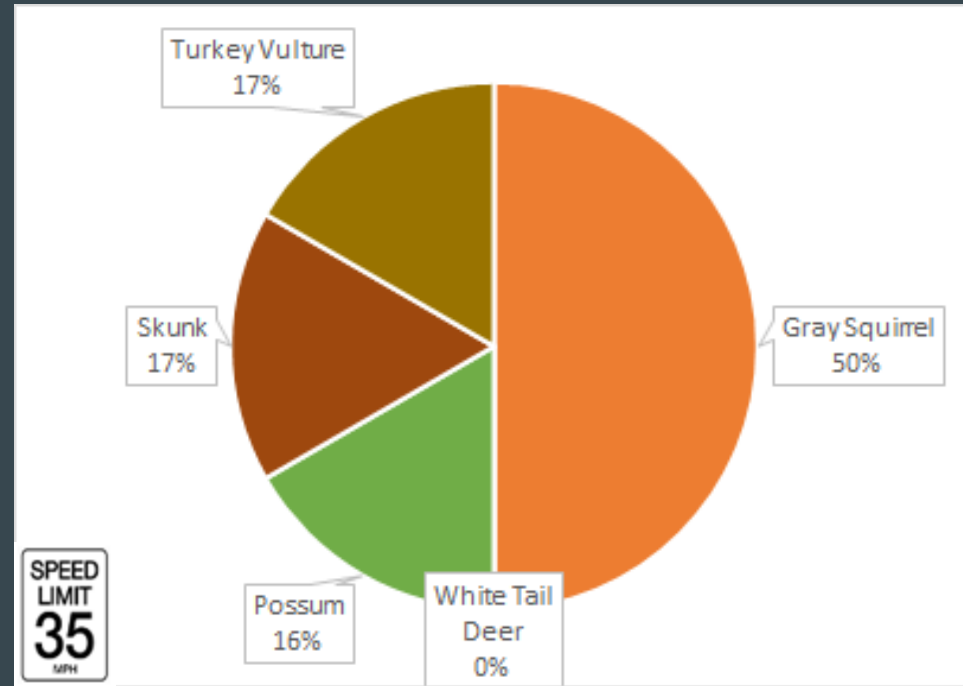
Eastern-Striped Skunk



# Roadkill Abundance



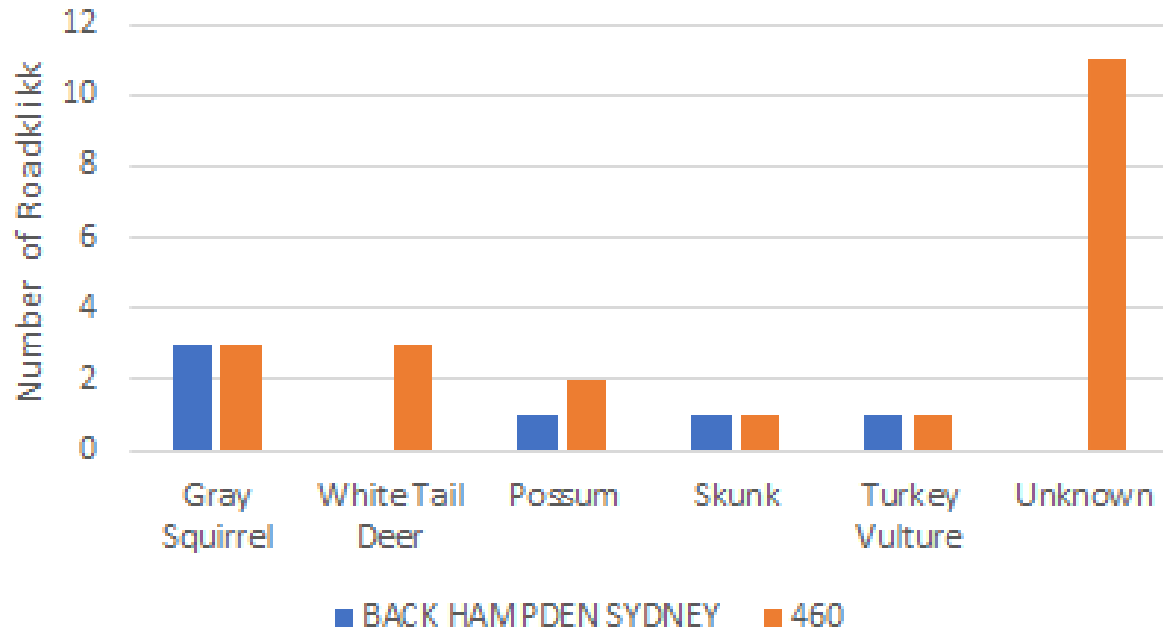
Route 460 West



Back Hampden-Sydney Road

# Total Number of Kills

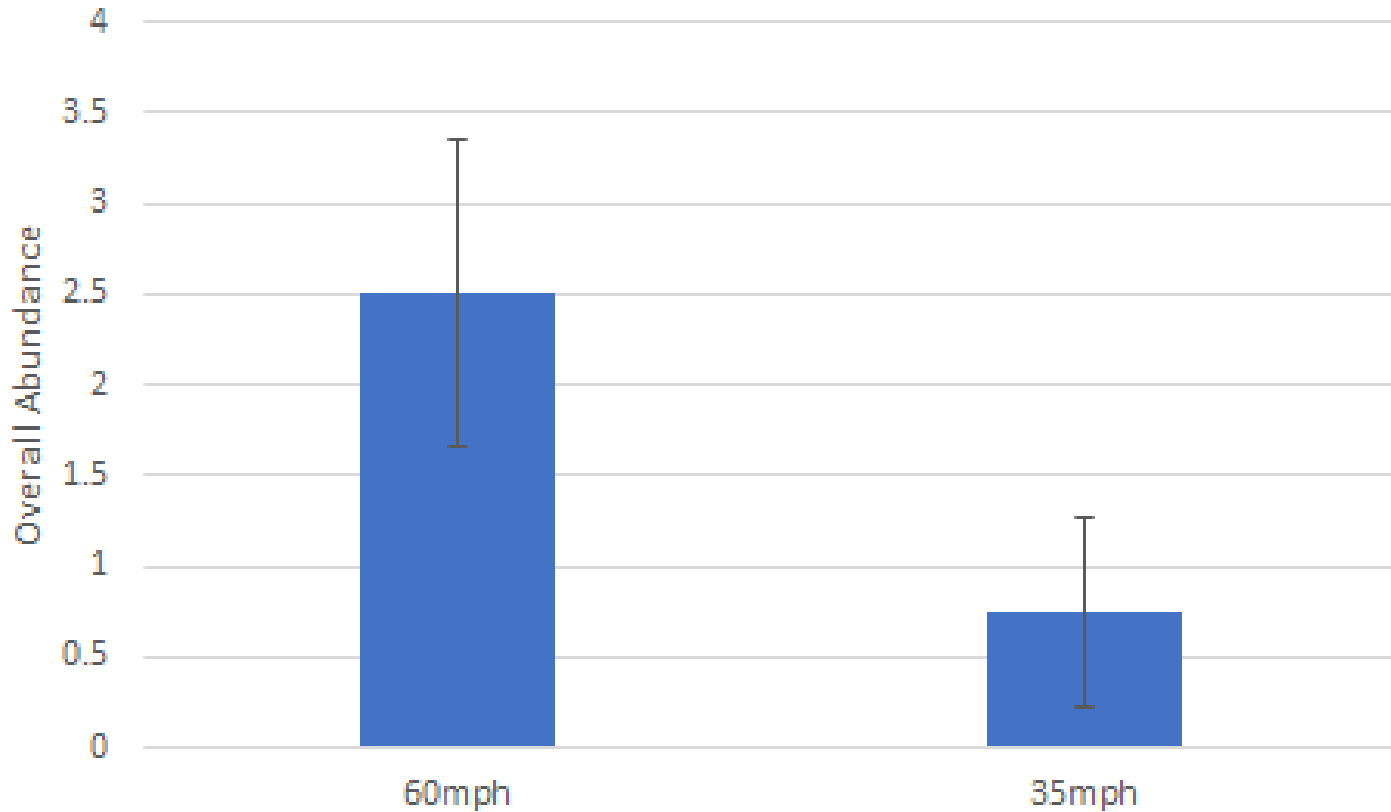
Comparison of Species Killed on Different Roads



T-Test=  
1.5554

P-value=  
0.1722

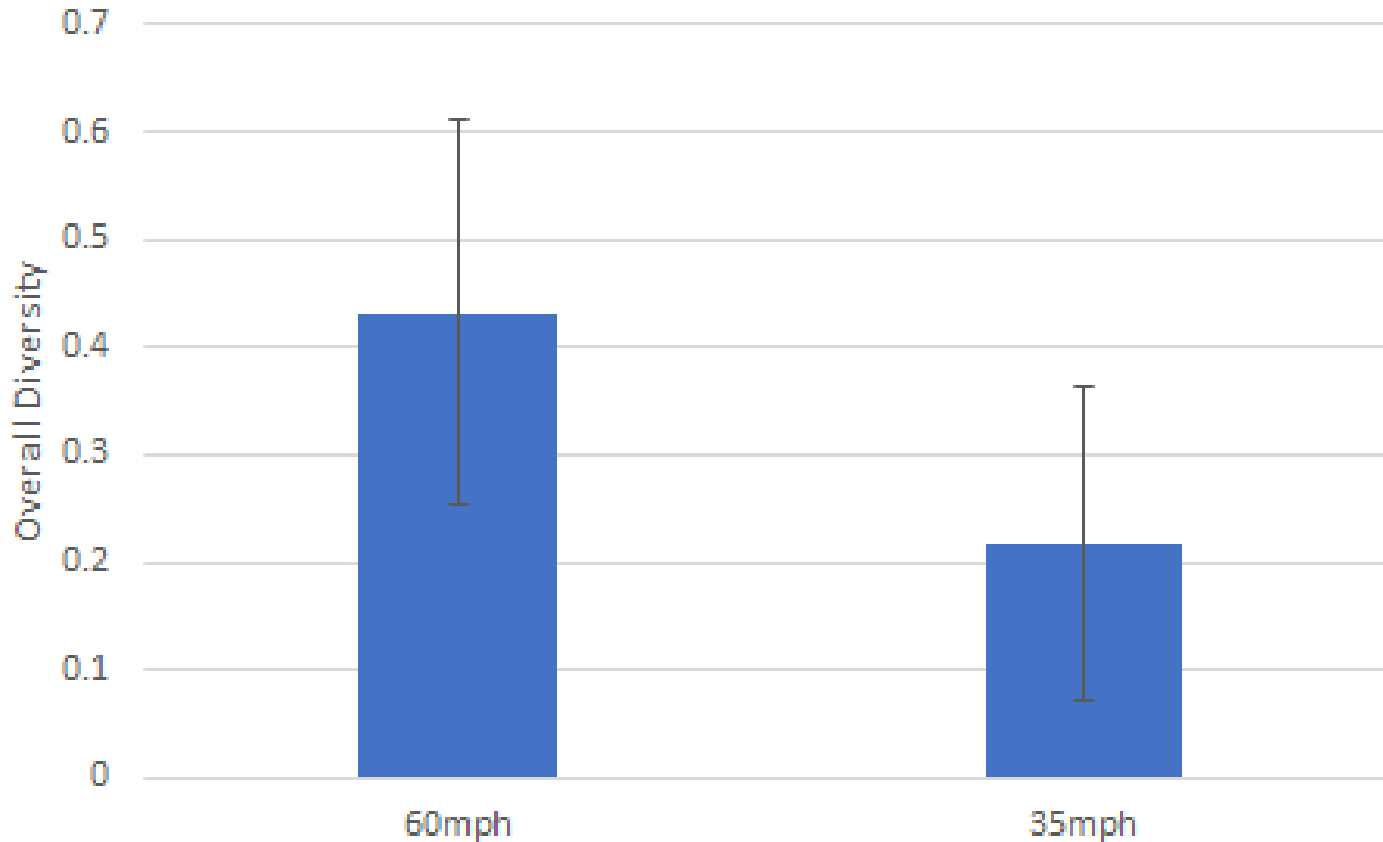
# Overall Abundance per Kilometer



t-value:  
-1.7579

P-value =  
0.1048

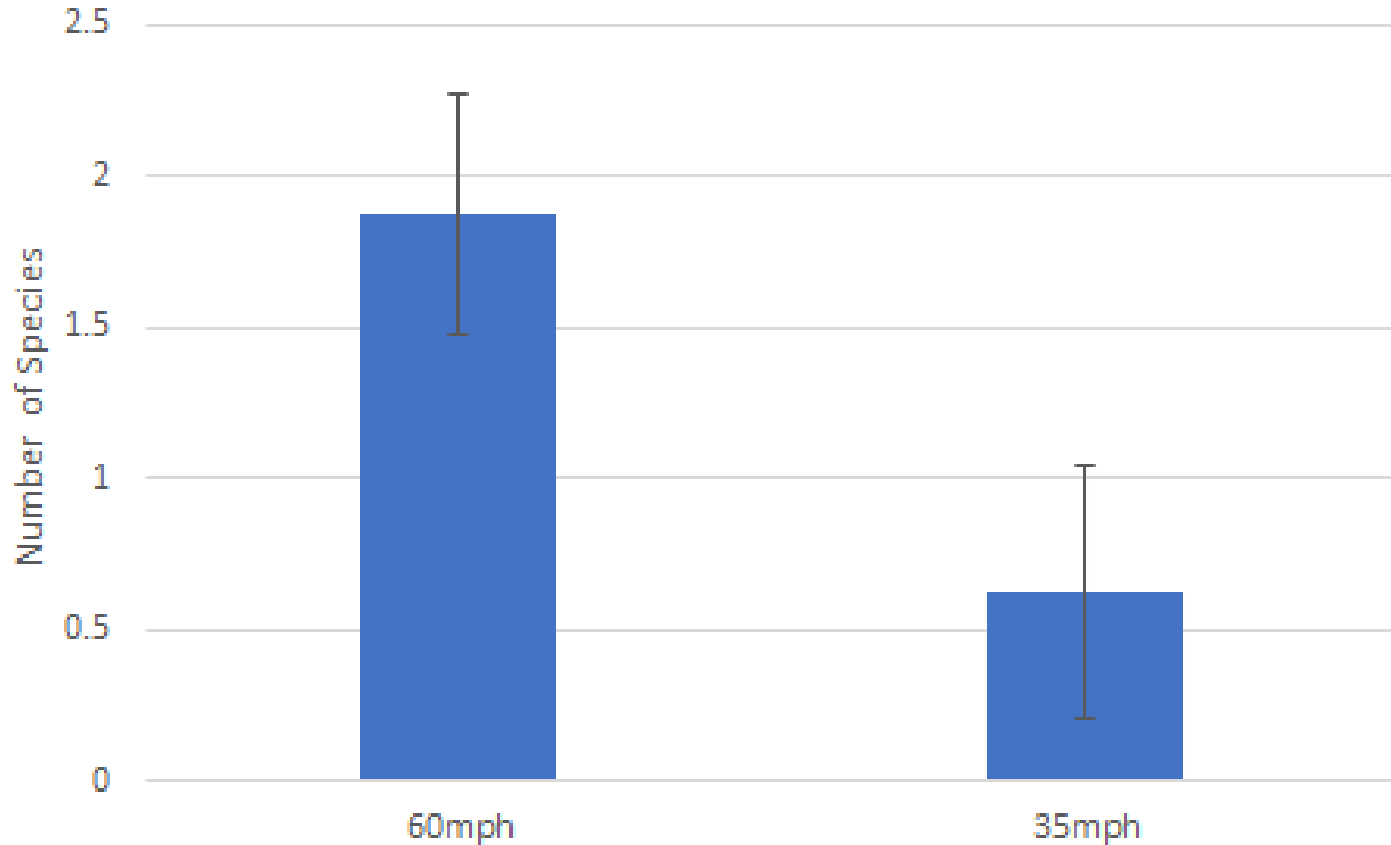
# Overall Diversity per Kilometer



t-value=  
-0.93397

P-value =  
0.3668

# Number of Species per Kilometer



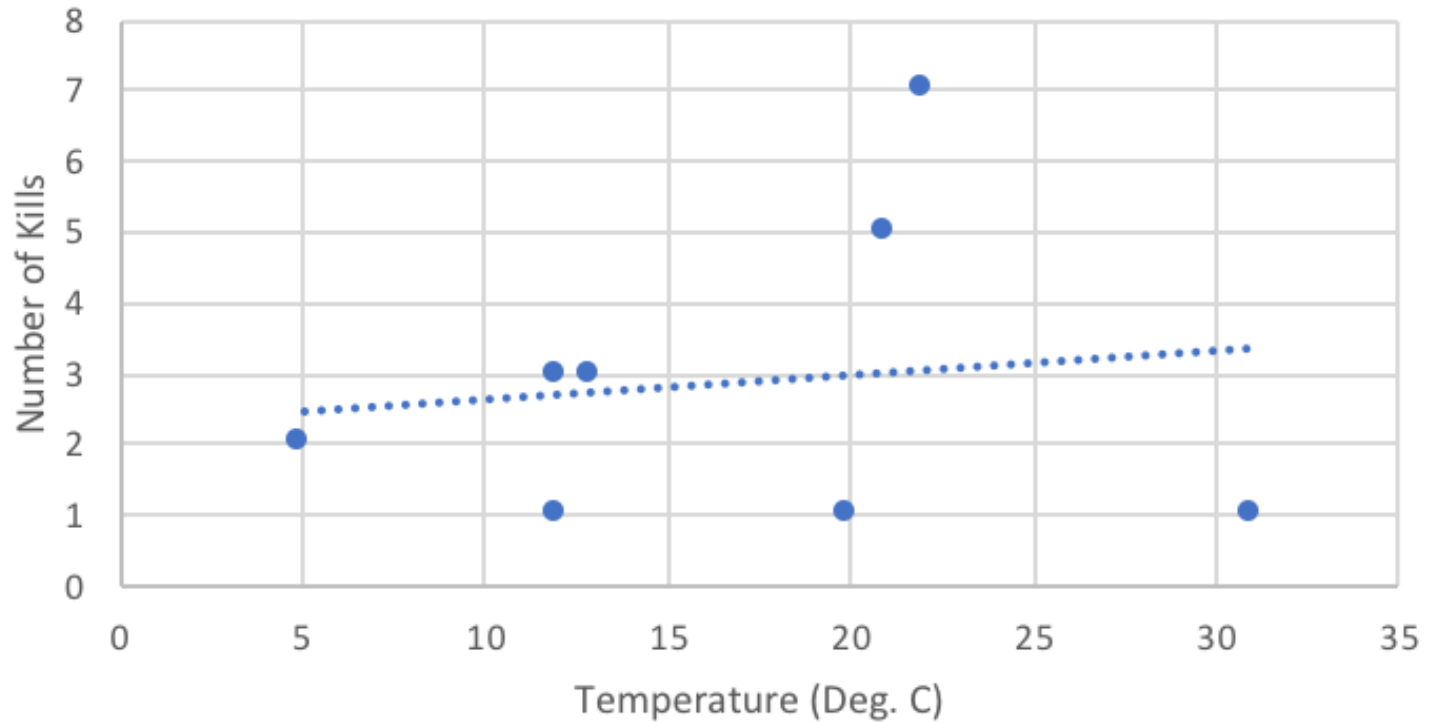
t-value=

-2.1602

P-value=

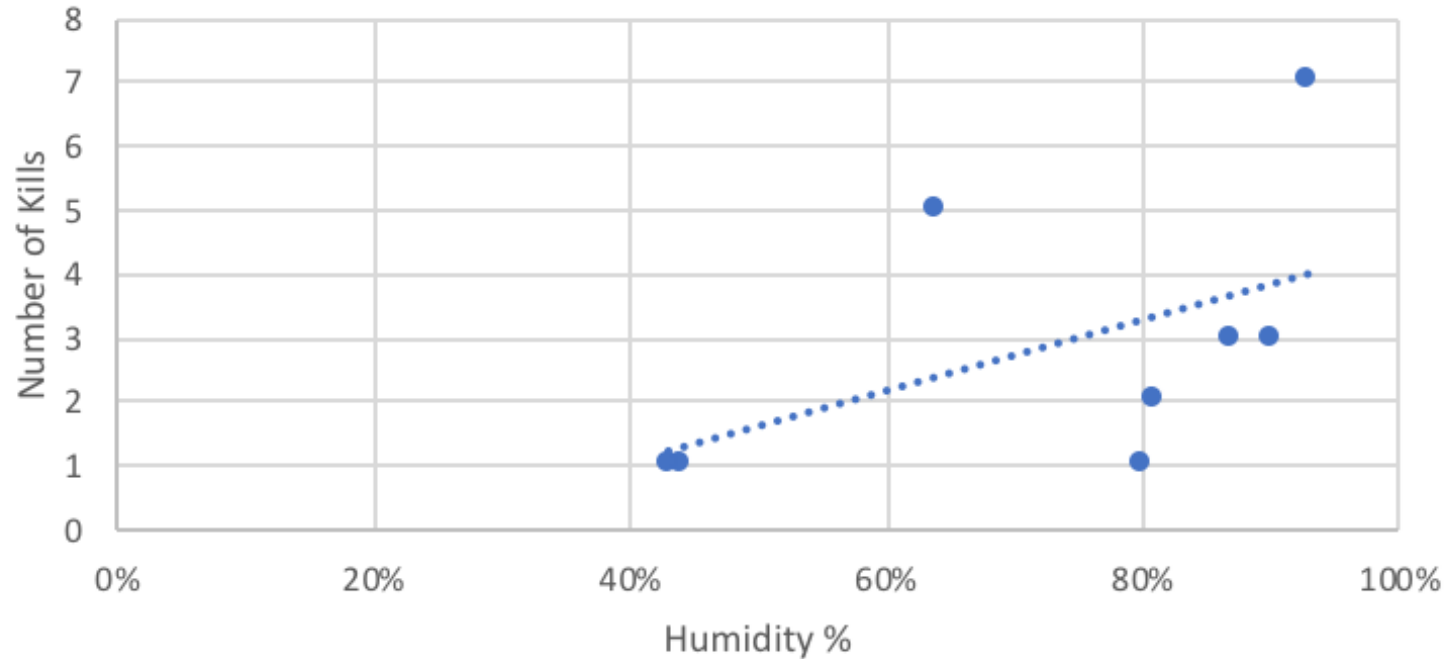
0.04863

## Total Number of Kills Dependent on Temperature



$R^2 = 0.01708$     $P = 0.001388$

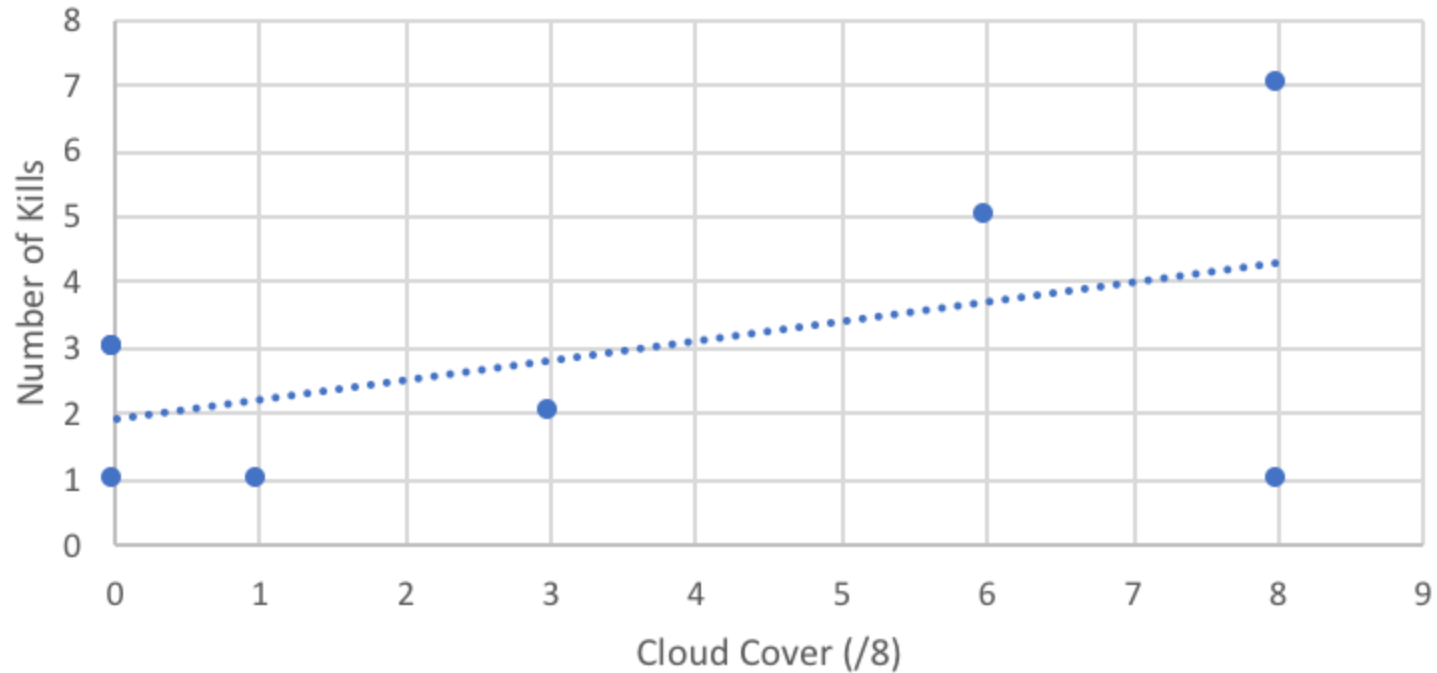
## Total Number of Kills Compared to the Level of Humidity



$R^2 = 0.2685$

$P = 0.0002112$

## Total Number of Kills Dependent on the Amount of Cloud Cover

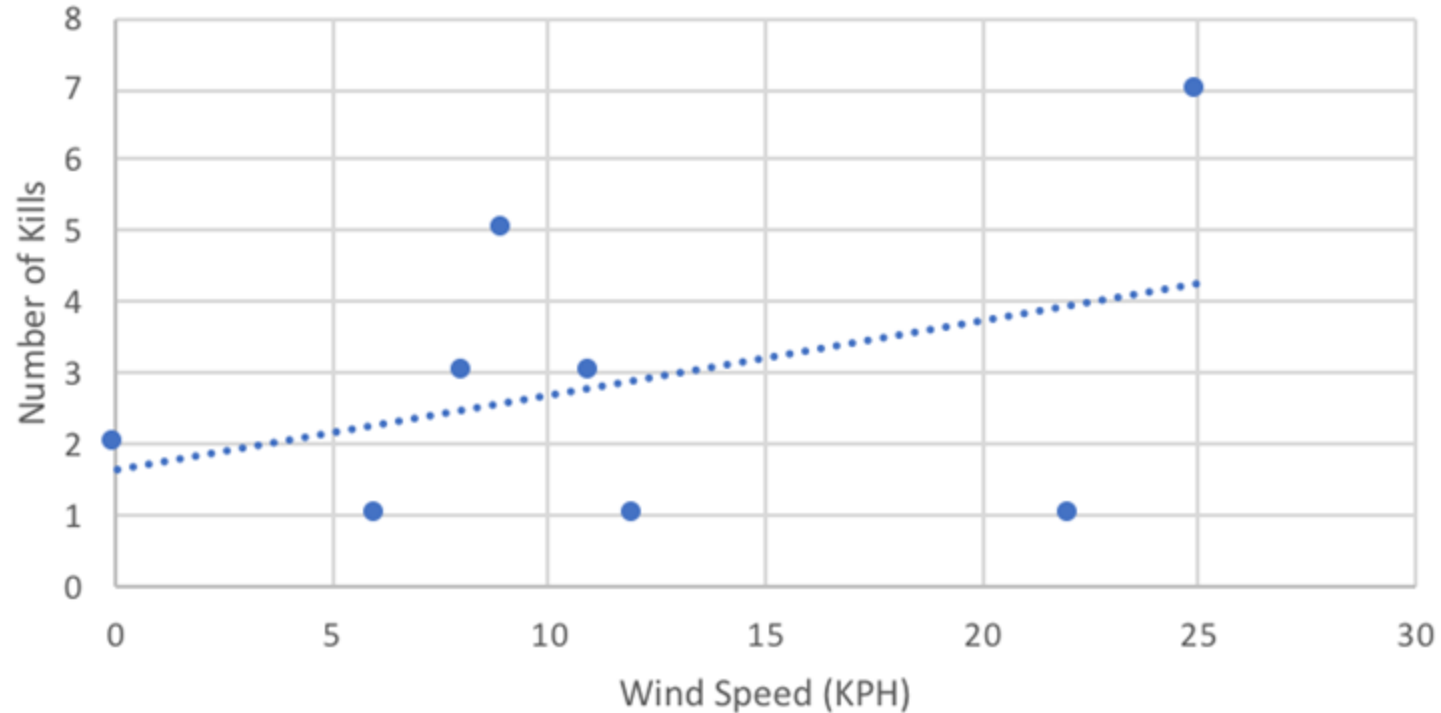


$R^2 = 0.2342$

$P = 0.8042$



## Total Number of Kills Compared to Wind Speed



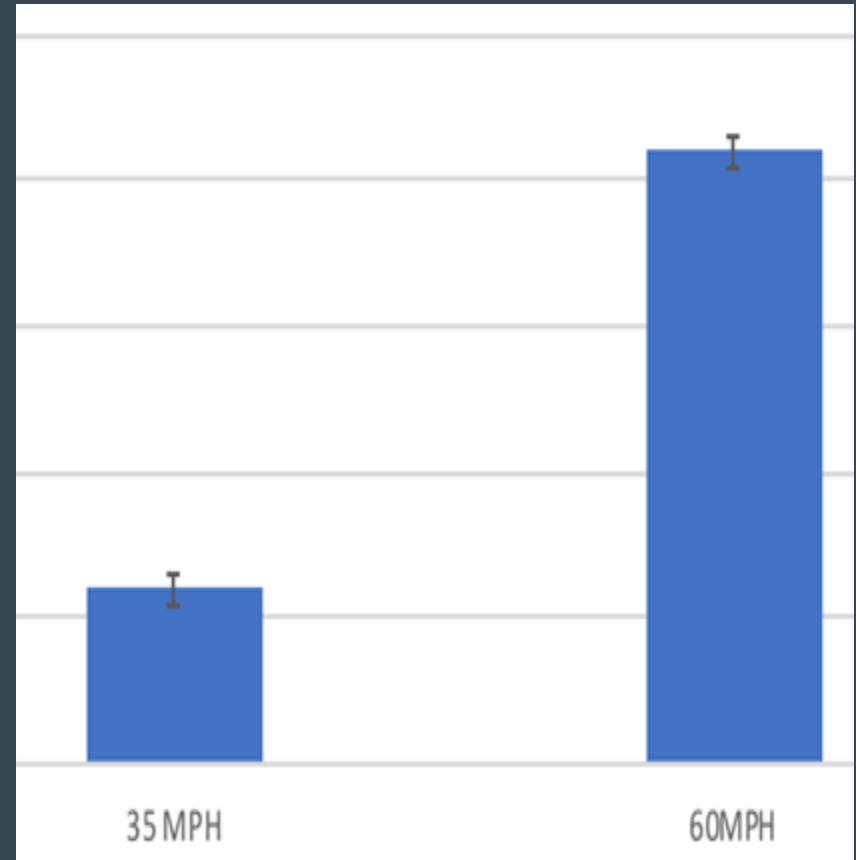
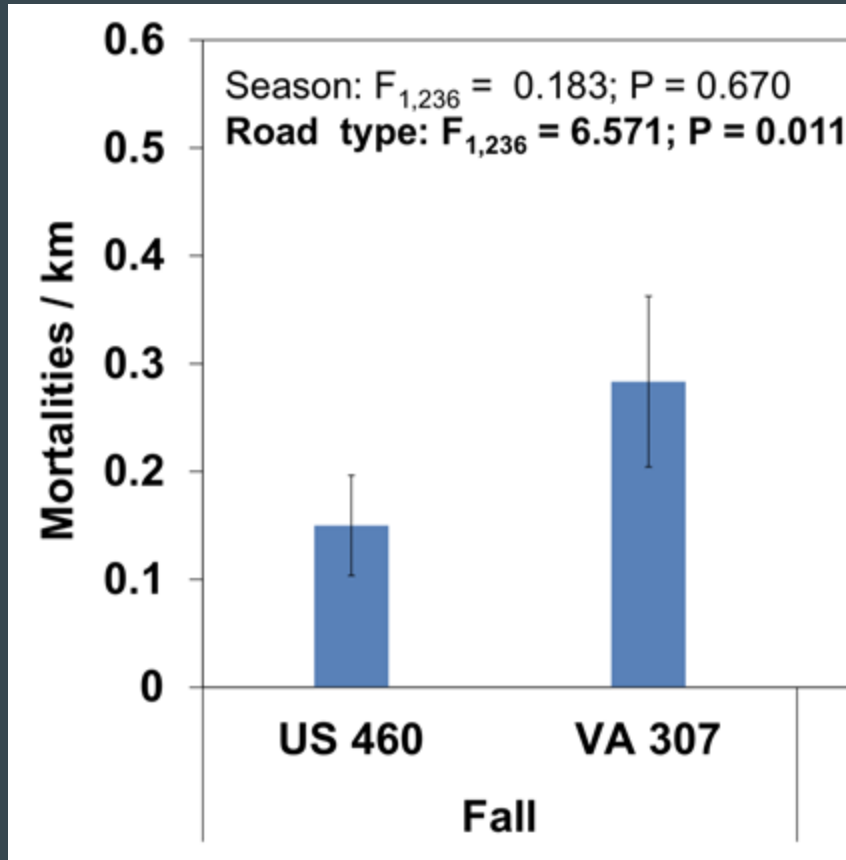
$R^2 = 0.1581$        $P = 0.01971$

# Major Findings

- 60mph road had more roadkills than 35 mph road.
- Temperature, humidity and wind speed had significant impacts on the number of roadkills (positive correlations)



# Discussion



# Final Thoughts

- Human interaction causes more road which leads to more roadkill abundance
- Humans are put at risk for danger because animals are crossing roads
- This is important because
  - Animals are affected tremendously
  - Humans are killing habitats and causing species to go extinct because of roads separating populations



# Acknowledgement

- Special thanks for to Dr. Henk for supporting and helping us with our experiment.
- Special thanks to the Longwood University for allowing us to have this opportunity.



# Sources

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**I'M HIT!**



**OTTER DOWN!**

Thank You for  
Coming!

Any Questions?