IST 652 - FINAL PROJECT

CENTRAL PARK SQUIRREL CENSUS

NEW YORK CITY

PRESENTED BY

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SANDY SPICER

THE CENSUS

11 DAYS

Non-consecutive days from October 6 - 20, 2018

323 SIGHTERS

Volunteers who took shifts surveying

350 HECTARES

Each equal to 10,000 meters^2 or 2.47 acres

3,023 SQUIRRELS

Sighted throughout Central Park

THE DATA

NYC OpenData

SQUIRRELS

ROWS
3,023

COLUMNS
31

EACH ROW IS A
SQUIRREL

HECTARES

ROWS
700

COLUMNS
13

EACH ROW IS A
HECTARE SHIFT (AM/PM)

PROGRAM SUMMARY

1 READ & CLEAN SQUIRREL DATA

Removes unnecessary columns
Replaces NAs
Converts data types to appropriate forms

2 READ & CLEAN HECTARE DATA

Removes unnecessary columns
Converts data types to appropriate forms
Transforms columns:

- Weather (70º F, Sunny) to Temp (70) & Weather Condition (Sunny)
- Simplify Weather Condition to only Sunny, Rainy, Cloudy, Other
- Converts Celsius entries to Fahrenheit
- Separate Animal Sighting (humans, dogs, birds, blue jays) to four boolean columns for Humans, Dogs, Birds, Rodents

3 RUN ANALYSIS

Sighter Observed Weather Data
77º F, Mostly sunny (humid) but lovely
65º F, drizzly
18º C, Cloudy
61º F, Sunny. Sun starting to go down

Other Animal Sightings
Humans
Humans, Dogs, Birds, Song birds and Crows
Humans, Dogs, Pigeons, Rat
Humans
Humans, Dogs

SQUIRRELS

	X	Y	Unique Squirrel ID	Hectare	Shift	Date	Hectare Squirrel Number	Age	Primary Fur Color	Highlight Fur Color	...	Kuks	Quaas	Moans	Tail flags	Tail twitches	Approaches	Indifferent	Runs from	Other Interactions	Lat/Long
0	-73.956134	40.794082	37F-PM-1014-03	37F	PM	10142018	3	NaN	NaN	NaN	...	False	False	False	False	False	False	False	False	NaN	POINT (-73.9561344937861 40.7940823884086)
1	-73.968857	40.783783	21B-AM-1019-04	21B	AM	10192018	4	NaN	NaN	NaN	...	False	False	False	False	False	False	False	False	NaN	POINT (-73.9688574691102 40.7837825208444)
2	-73.974281	40.775534	11B-PM-1014-08	11B	PM	10142018	8	NaN	Gray	NaN	...	False	False	False	False	False	False	False	False	NaN	POINT (-73.97428114848522 40.775533619083)
3	-73.959641	40.790313	32E-PM-1017-14	32E	PM	10172018	14	Adult	Gray	NaN	...	False	False	False	False	False	False	False	True	NaN	POINT (-73.9596413903948 40.7903128889029)
4	-73.970268	40.776213	13E-AM-1017-05	13E	AM	10172018	5	Adult	Gray	Cinnamon	...	False	False	False	False	False	False	False	False	NaN	POINT (-73.9702676472613 40.7762126854894)

RAW

Primary Fur Color	Highlight Fur Color
NaN	NaN

→

CLEANED

Primary Fur Color	Highlight Fur Color
Unknown	None

HECTARES

	Hectare	Shift	Date	Sighter Observed Weather Data	Other Animal Sightings	Number of sighters	Number of Squirrels
0	01A	AM	10072018	70° F, Foggy	Humans, Pigeons	1	4
1	01A	PM	10142018	54° F, overcast	Humans, Pigeons	1	7
2	01B	AM	10122018	60° F, sunny	Humans, Dogs, Pigeons, Horses	1	17
3	01B	PM	10192018	59.8° F, Sun, Cool	Humans, Dogs, Pigeons, Sparrow, Blue jay	1	10
4	01C	PM	10132018	55° F, Partly Cloudy	Humans, Dogs, Pigeons, Birds	1	10

RAW

Sighter Observed Weather Data
55° F, Partly Cloudy

Other Animal Sightings
Humans, Dogs, Birds

CLEANED

temperature °F	weather_condition
55.0	cloudy

human_flag	bird_flag	dog_flag	rodent_flag
1	1	1	0

ANALYSIS QUESTIONS

SQUIRRELS

What are the primary visual characteristics of the squirrels? What color combinations were most popular? Were squirrels of similar markings found in a particular area of the park?

What verbal noises were most popular? Were the noises correlated with the presence of any other animals in the area? How does this correlate with their tail movements?

HECTARES

Is there a section of the park that tends to have more squirrels? How busy were those areas? Were other animals present?

Is there a relationship between the number of squirrels seen and the time of day? Does the weather at the time have any influence?

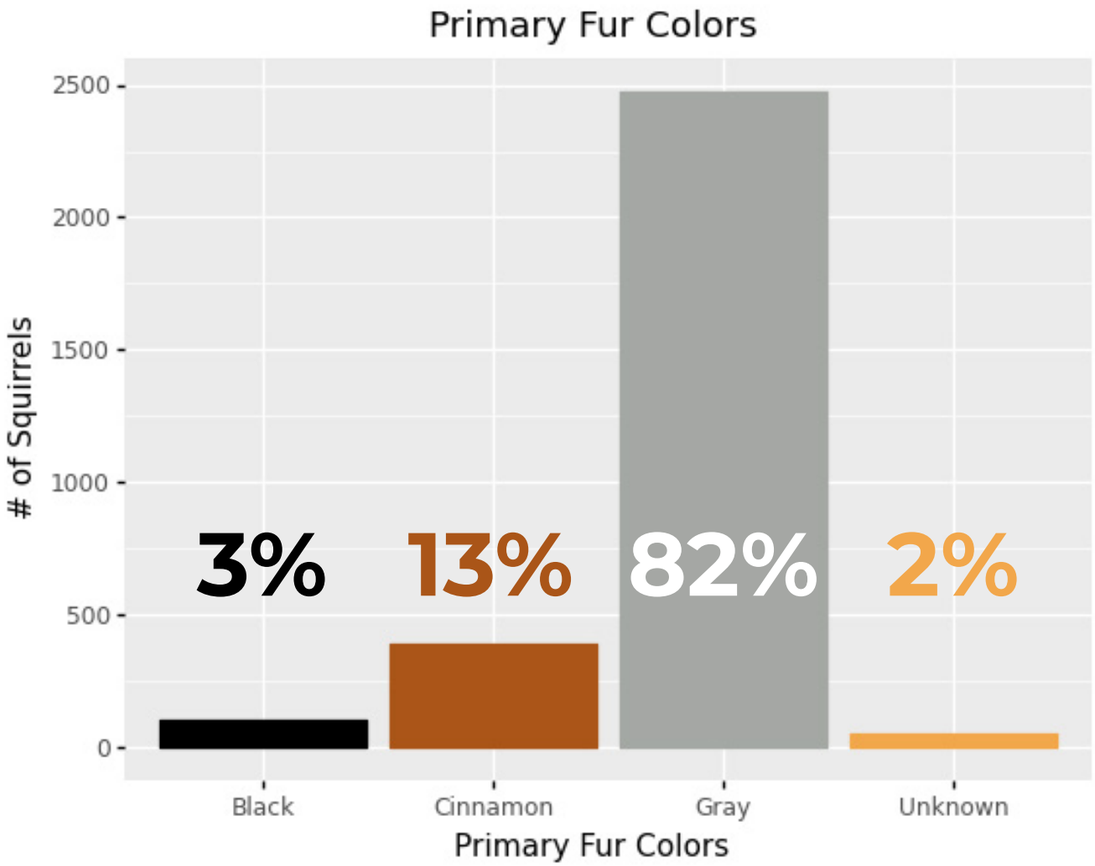
Q1

Part 1

What are the primary visual characteristics of the squirrels?
What color combinations were most popular?

3 PRIMARY COLORS

Primary Fur Color	counts	percent
Black	103	0.03
Cinnamon	392	0.13
Gray	2473	0.82
Unknown	55	0.02



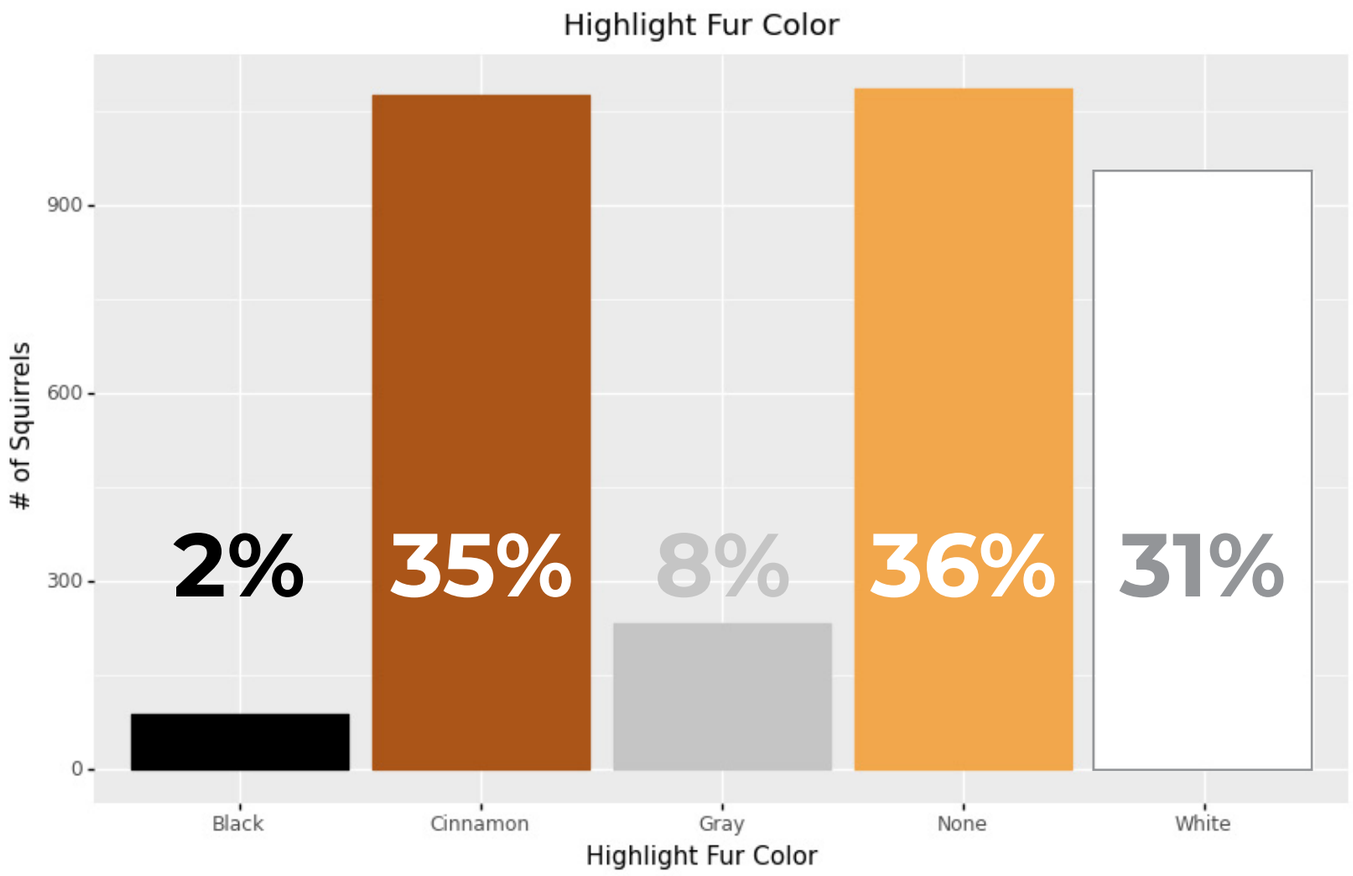
Q1

Part 1

What are the primary visual characteristics of the squirrels?
What color combinations were most popular?

4 HIGHLIGHT COLORS

	highlight_fur_color	counts	percent
0	Black	88.0	0.02
1	White	954.0	0.31
2	Gray	232.0	0.08
3	Cinnamon	1076.0	0.35
4	None	1086.0	0.36

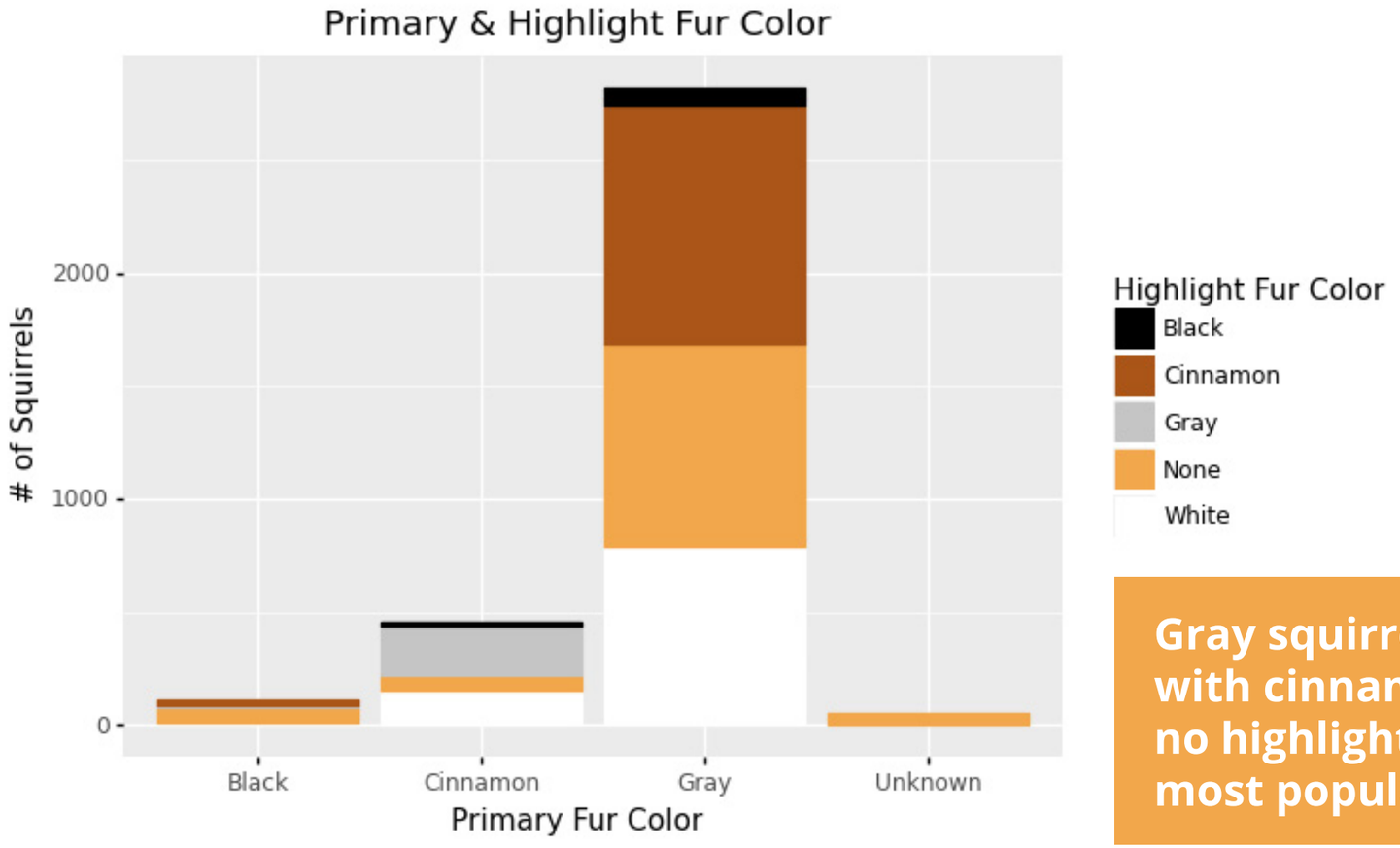


Q1

Part 1

What are the primary visual characteristics of the squirrels? What color combinations were most popular?

	Primary Fur Color	Highlight Fur Color	counts	percent
0	Black	Cinnamon	15	0.005
1	Black	Cinnamon, White	3	0.001
2	Black	Gray	8	0.003
3	Black	Gray, White	1	0.000
4	Black	None	74	0.024
5	Black	White	2	0.001
6	Cinnamon	Black	10	0.003
7	Cinnamon	Black, White	3	0.001
8	Cinnamon	Gray	162	0.054
9	Cinnamon	Gray, Black	3	0.001
10	Cinnamon	Gray, White	58	0.019
11	Cinnamon	None	62	0.021
12	Cinnamon	White	94	0.031
13	Gray	Black	24	0.008
14	Gray	Black, Cinnamon	9	0.003
15	Gray	Black, Cinnamon, White	32	0.011
16	Gray	Black, White	7	0.002
17	Gray	Cinnamon	752	0.249
18	Gray	Cinnamon, White	265	0.088
19	Gray	None	895	0.296
20	Gray	White	489	0.162
21	Unknown	None	55	0.018

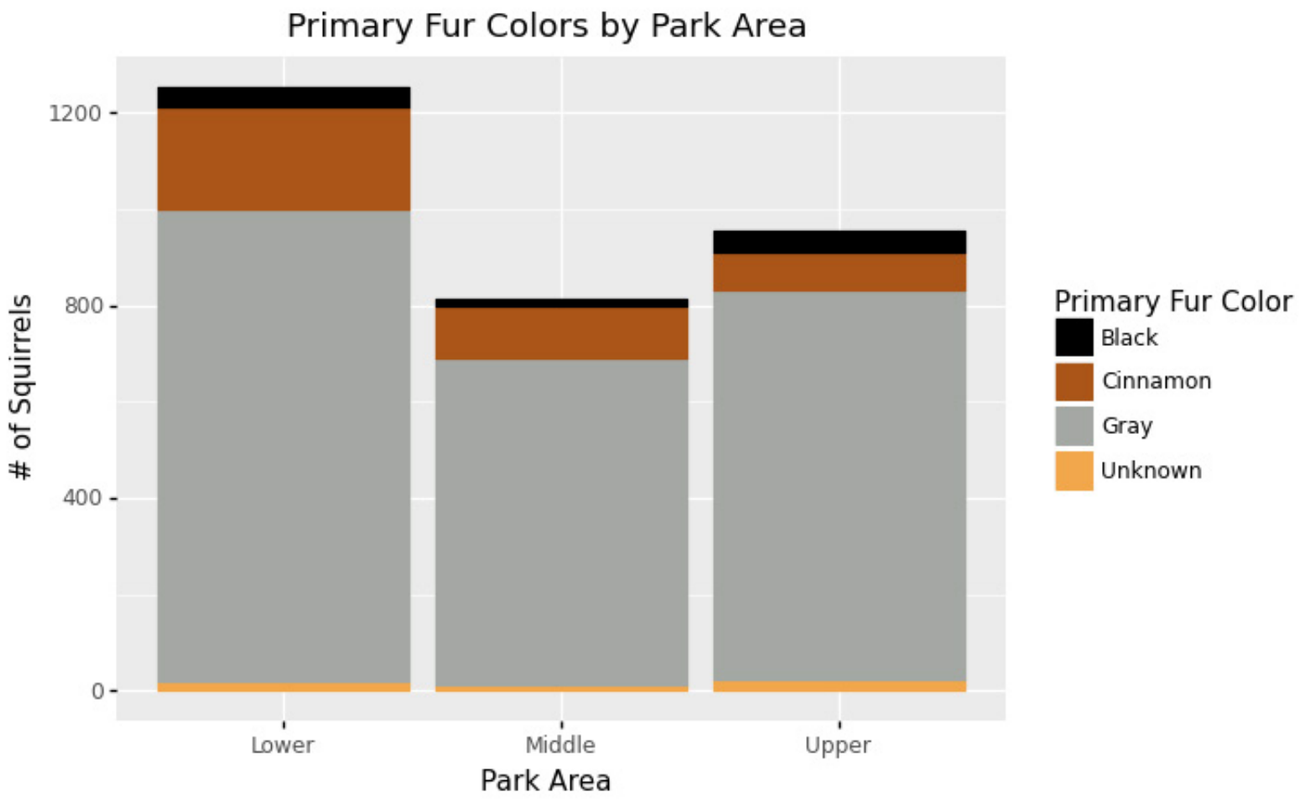


Gray squirrels with cinnamon or no highlights were most popular

Q1 Part 2

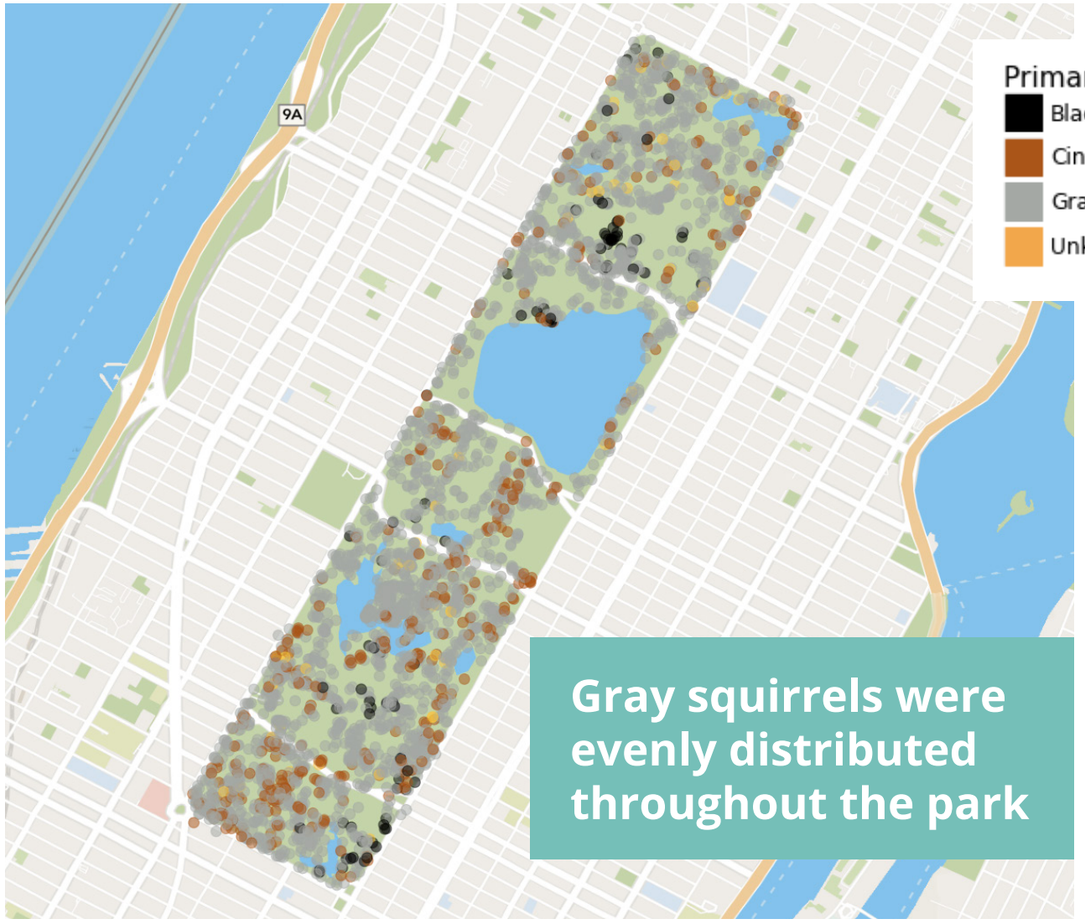
Were squirrels of similar markings found in a particular area of the park?

	Park Area	Primary Fur Color	counts	percent
0	Lower	Black	42	0.014
1	Lower	Cinnamon	209	0.069
2	Lower	Gray	982	0.325
3	Lower	Unknown	20	0.007
4	Middle	Black	16	0.005
5	Middle	Cinnamon	106	0.035
6	Middle	Gray	681	0.225
7	Middle	Unknown	11	0.004
8	Upper	Black	45	0.015
9	Upper	Cinnamon	77	0.025
10	Upper	Gray	810	0.268
11	Upper	Unknown	24	0.008

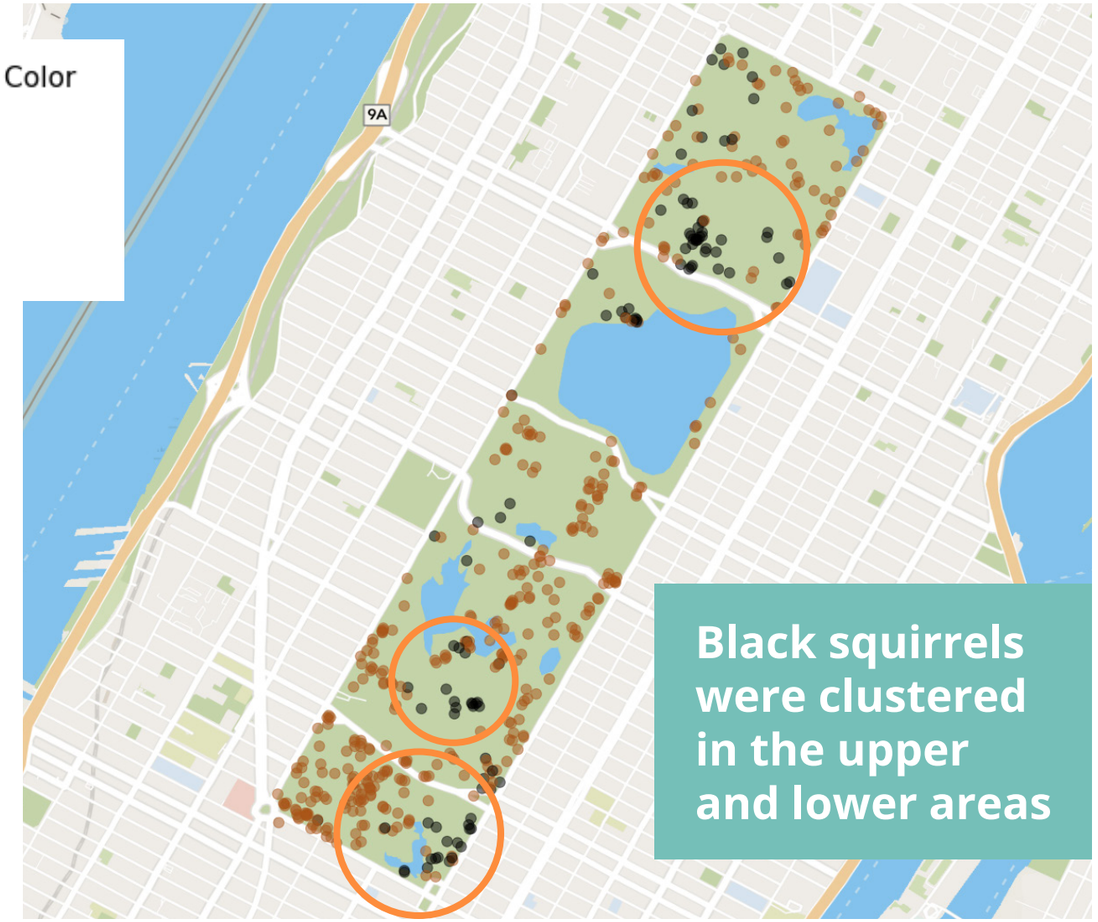


Q1 Part 2

Were squirrels of similar markings found in a particular area of the park?



Gray squirrels were evenly distributed throughout the park



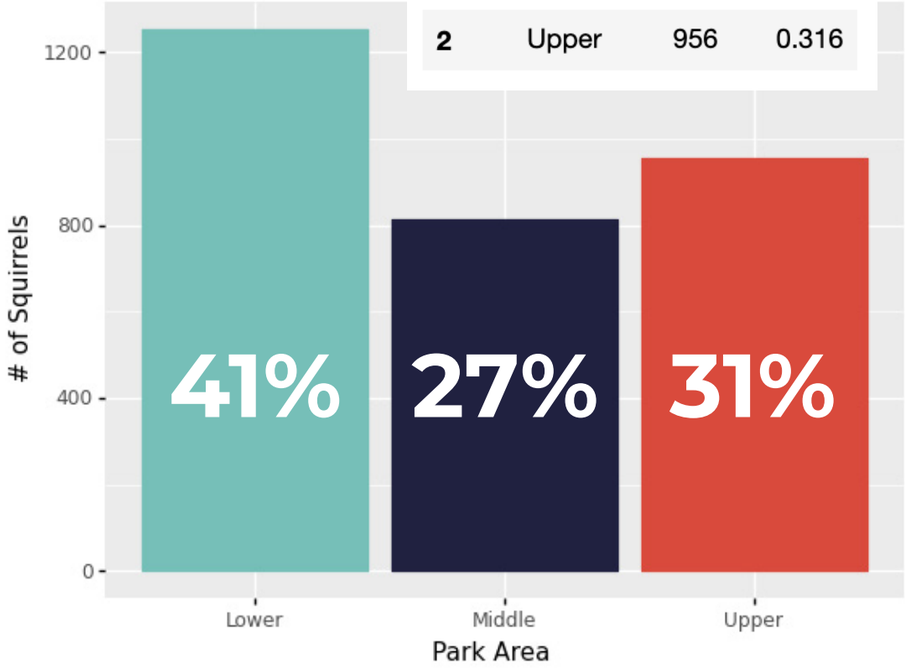
Black squirrels were clustered in the upper and lower areas

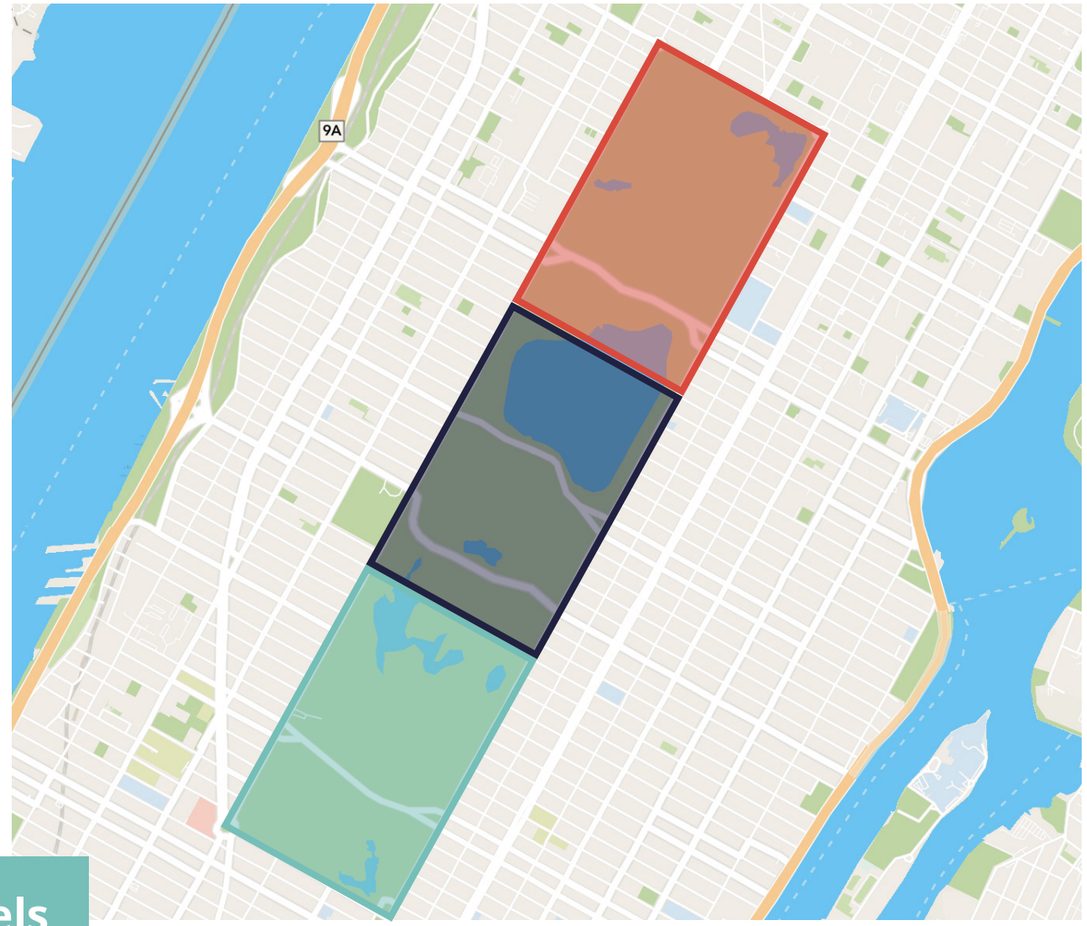
Q2

Part 1

Is there a section of the park that tends to have more squirrels?

	park area	counts	percent
0	Lower	1253	0.414
1	Middle	814	0.269
2	Upper	956	0.316



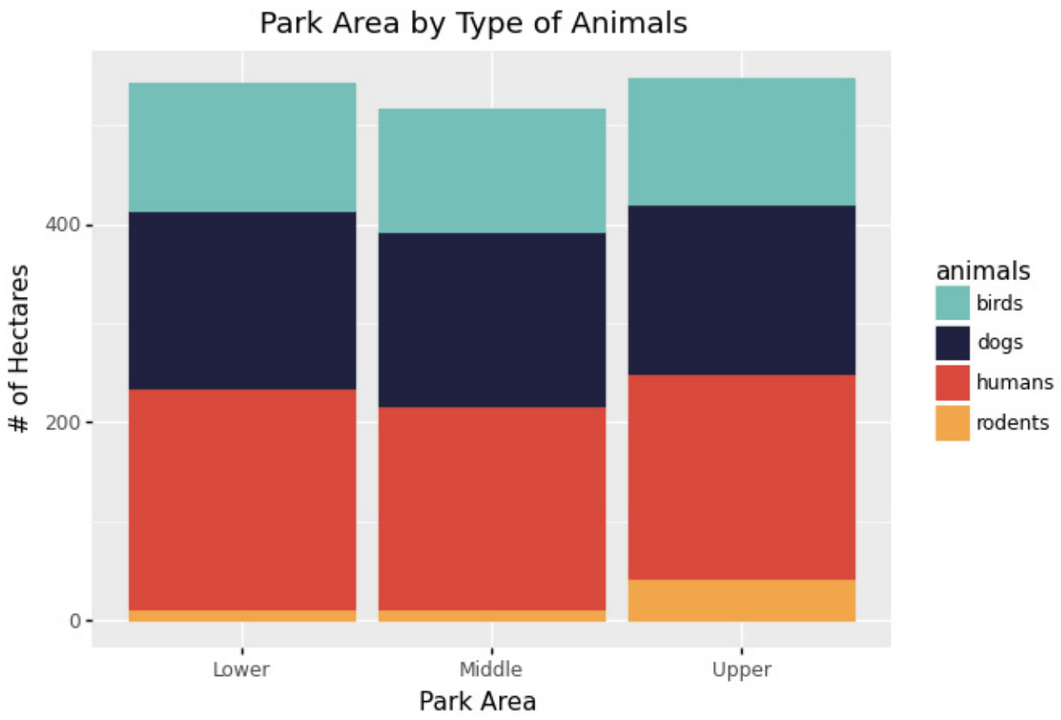


The lower area of the park had the most squirrels

Q2

Part 2

Were other animals present?



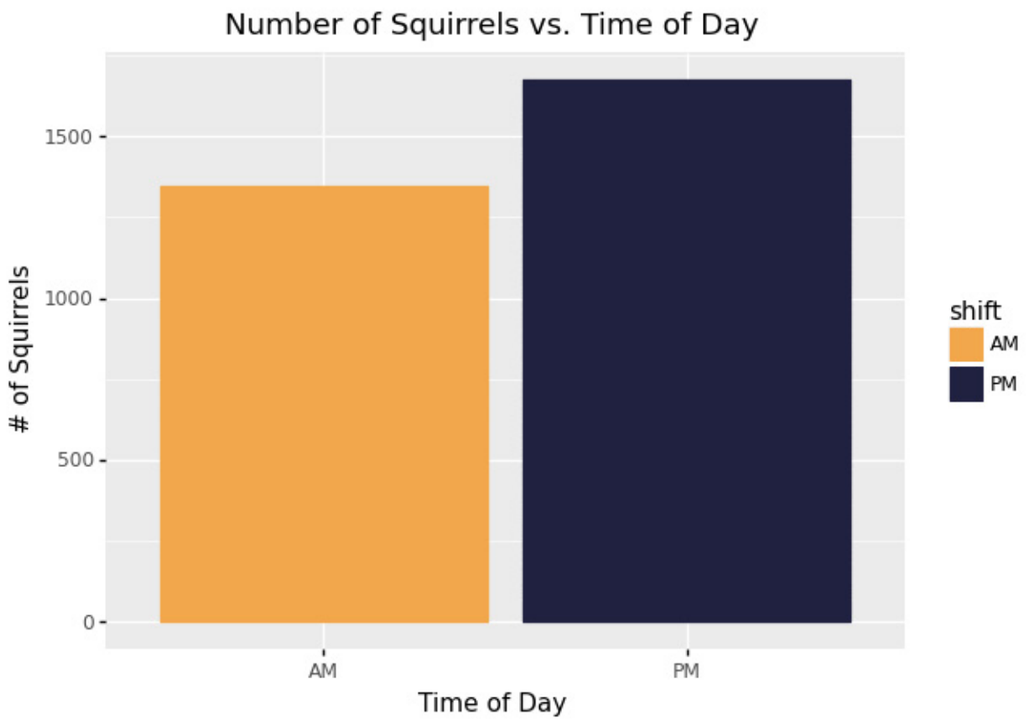
	park_area	hectare_counts	num_squirrels	animals	value
0	Lower	234	1252	humans	223
3	Lower	234	1252	birds	128
6	Lower	234	1252	dogs	179
9	Lower	234	1252	rodents	12
1	Middle	232	814	humans	206
4	Middle	232	814	birds	125
7	Middle	232	814	dogs	175
10	Middle	232	814	rodents	11
2	Upper	234	956	humans	207
5	Upper	234	956	birds	126
8	Upper	234	956	dogs	171
11	Upper	234	956	rodents	43

Animal sightings were evenly distributed around the park

Q3

Part 1

Is there a relationship between the number of squirrels seen and the time of day?



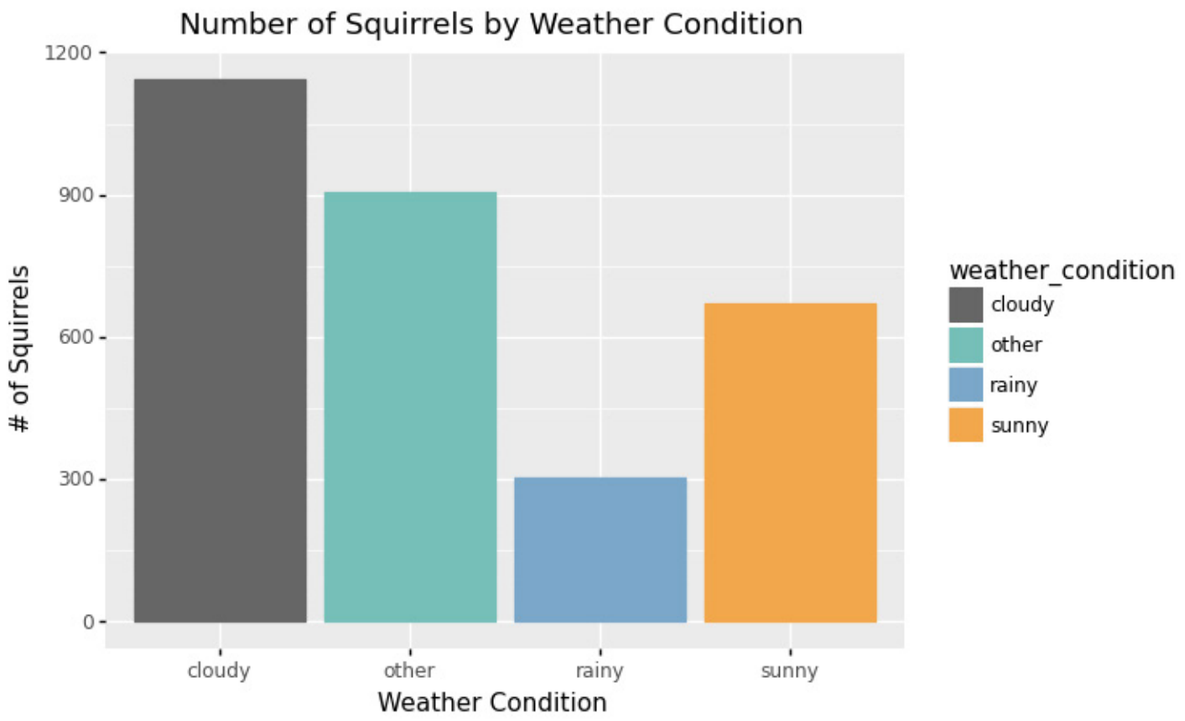
	shift	num_squirrels
0	AM	1347
1	PM	1675

Most squirrels were observed in the PM.

Q3

Part 2

Does the weather condition affect squirrel sightings?



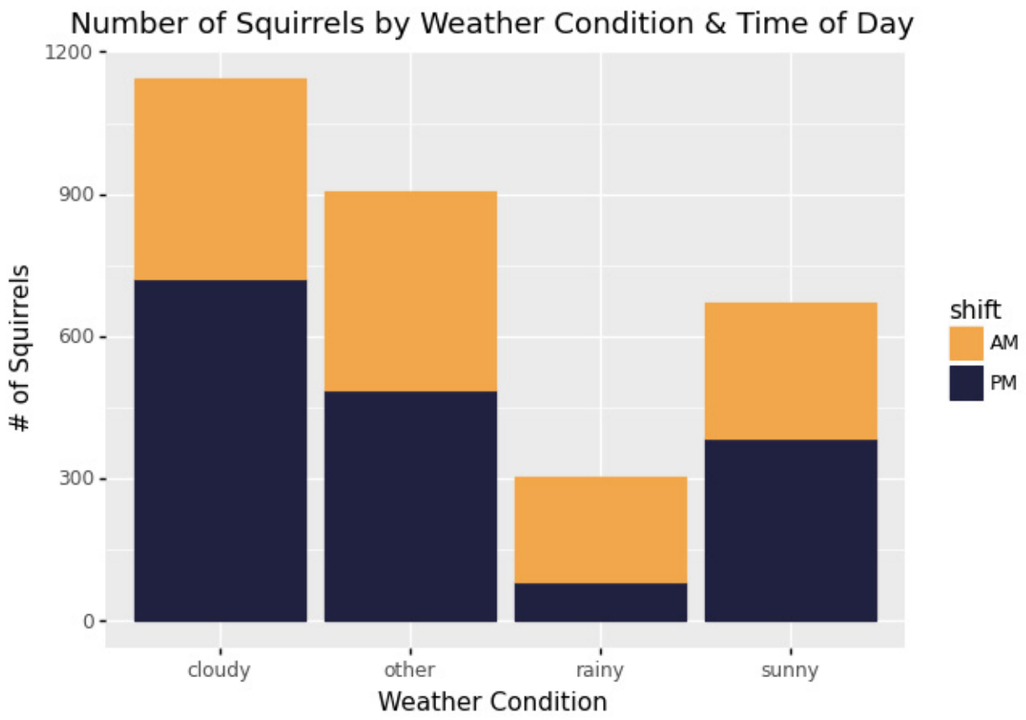
	weather_condition	num_squirrels
0	cloudy	1143
1	other	904
2	rainy	304
3	sunny	671

Most squirrels were observed in cloudy weather and were rarely observed in the rain.

Q3

Part 2

Does the weather condition affect squirrel sightings?



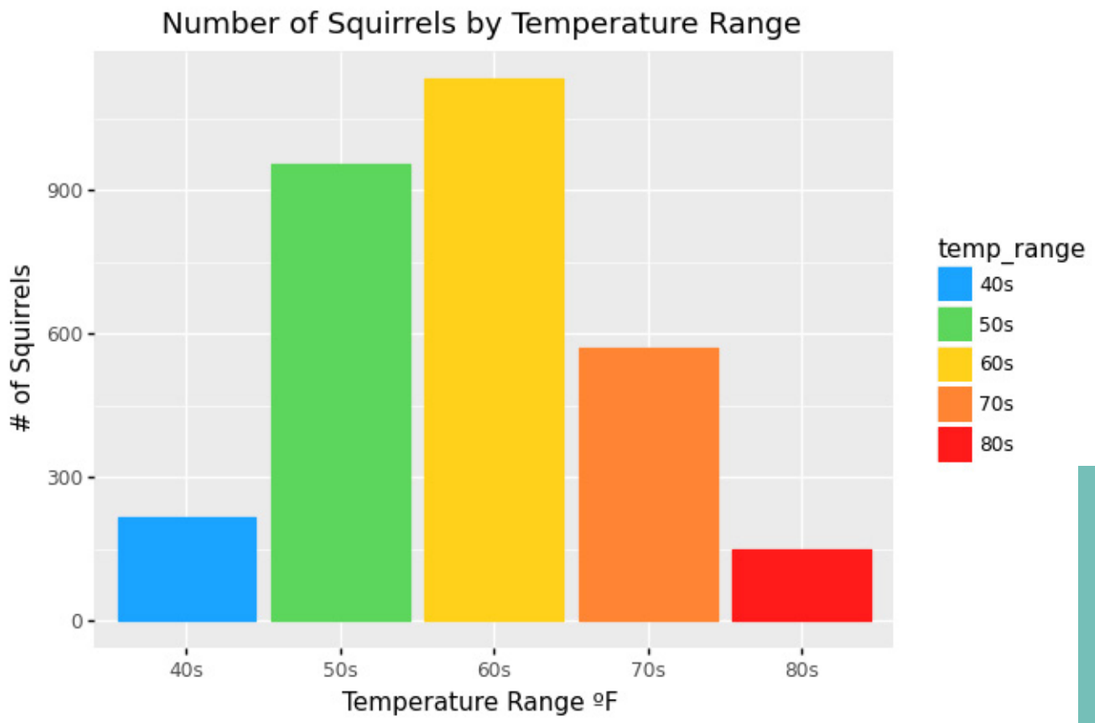
	weather_condition	shift	num_squirrels
0	cloudy	AM	420
1	cloudy	PM	723
2	other	AM	418
3	other	PM	486
4	rainy	AM	222
5	rainy	PM	82
6	sunny	AM	287
7	sunny	PM	384

Most squirrels were observed in the PM across all weather conditions except in the rain.

Q3

Part 3

Does the temperature affect squirrel sightings?



	temp_range	num_squirrels
0	40s	217
1	50s	953
2	60s	1132
3	70s	570
4	80s	150

Most squirrels were observed in temperature that ranged in the 50s and 60s. There were less observations on colder and hotter days.

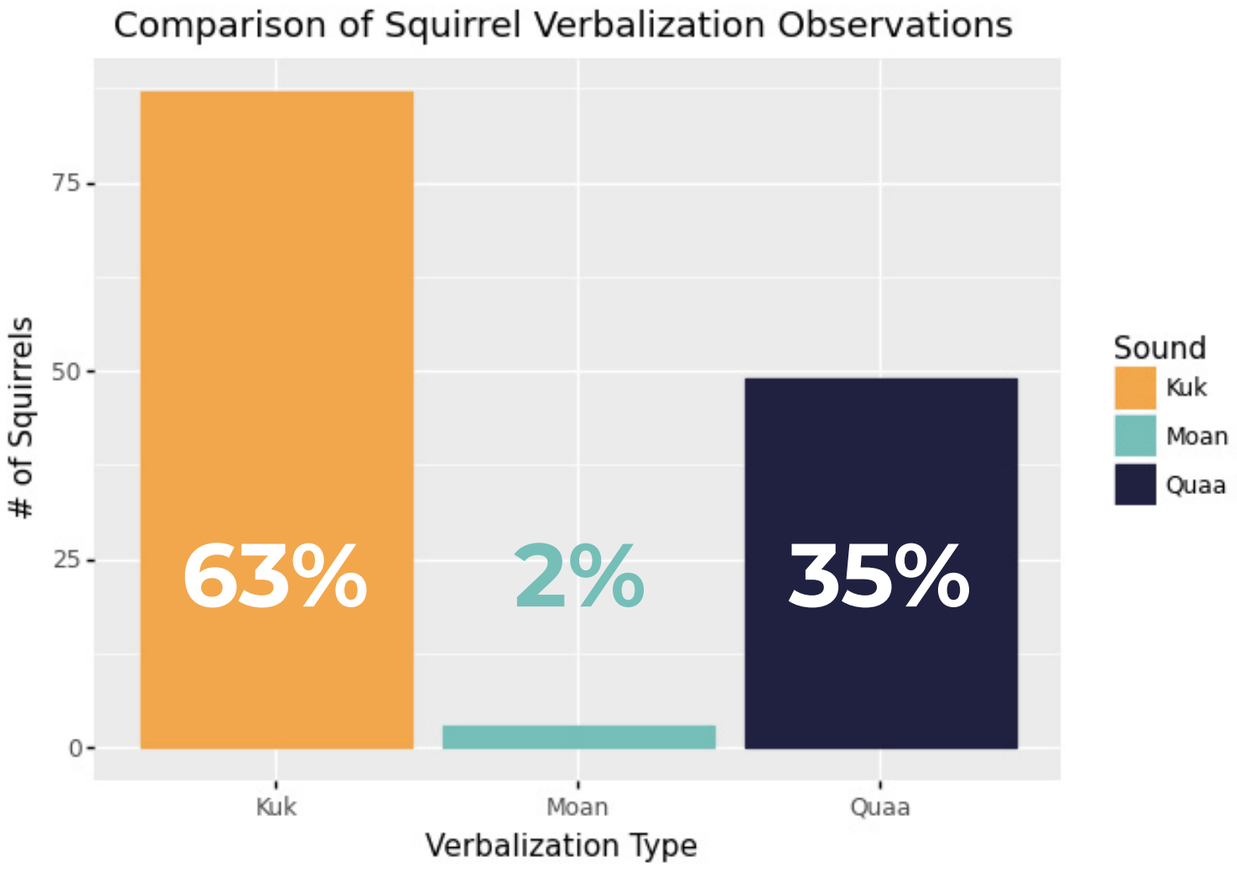
Q4

Part 1

What verbal noises were most popular?

	Sound	counts	percent
0	Kuk	87	0.63
1	Moan	3	0.02
2	Quaa	49	0.35

Most verbal squirrels were observed kuking



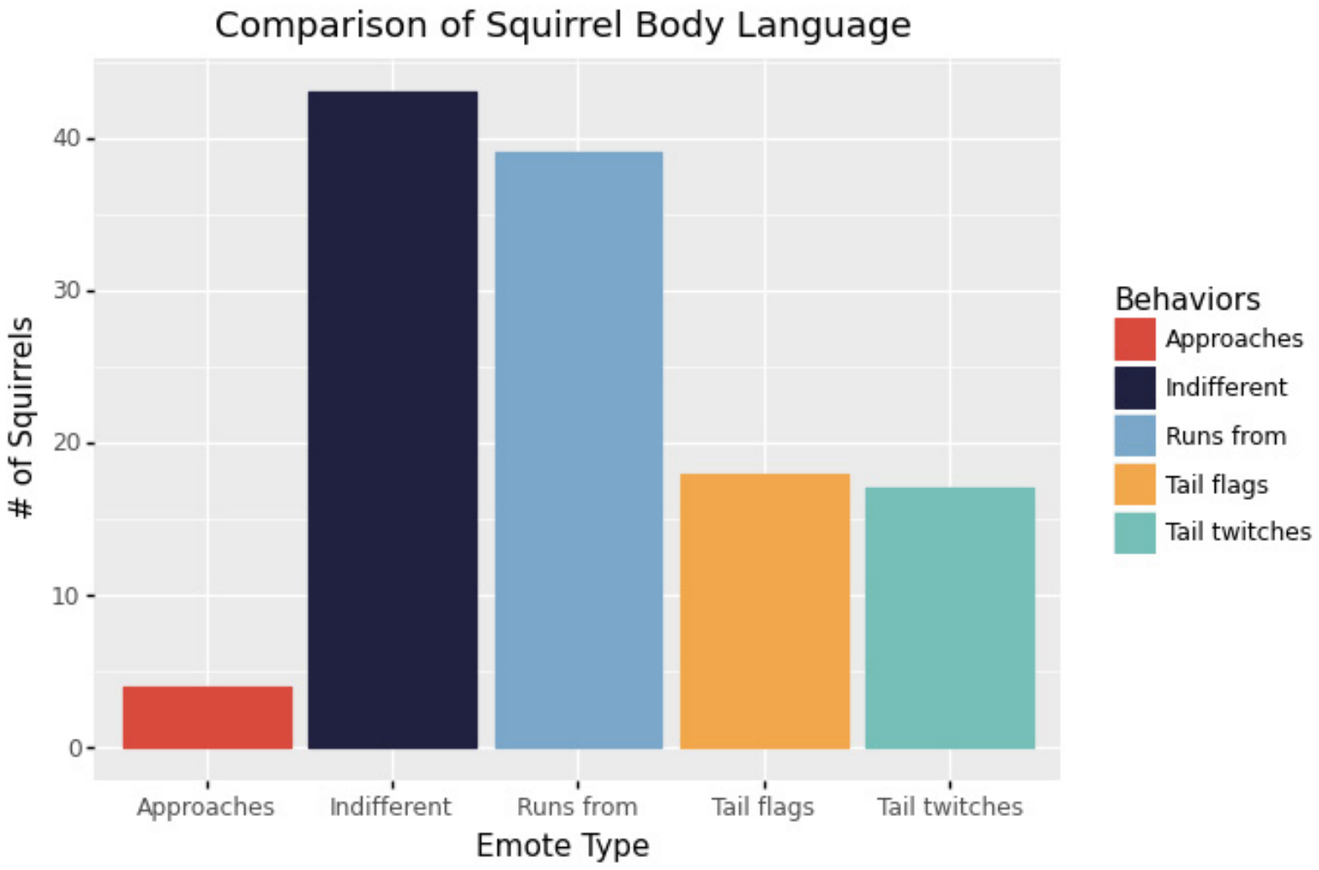
Q4

Part 2

What behaviors are most common?

	Behaviors	Counts
0	Tail flags	18
1	Tail twitches	17
2	Approaches	4
3	Indifferent	43
4	Runs from	39

Most squirrels were indifferent or ran from humans



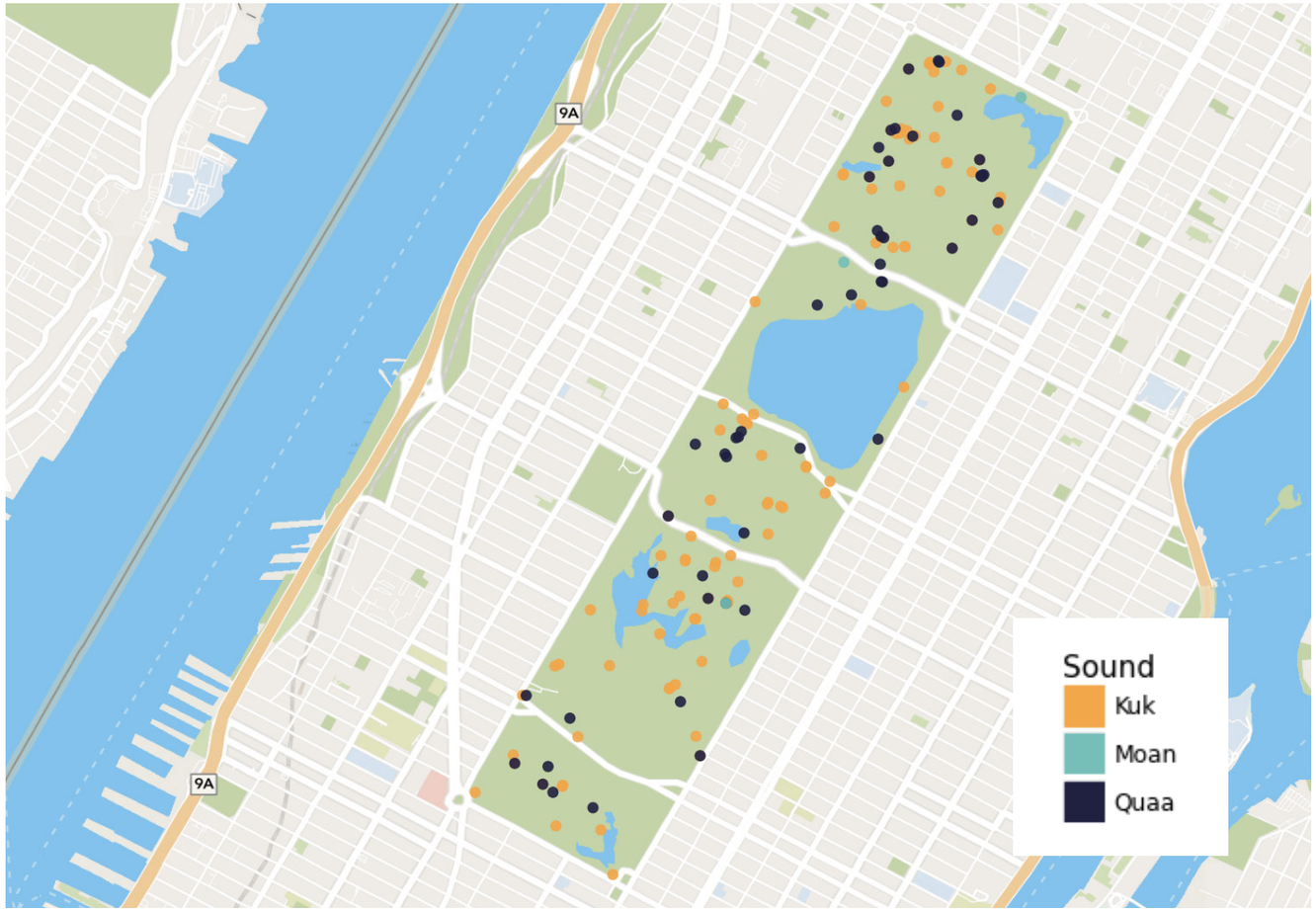
Q4

Part 2

How do these distribute around the park?

	Sound	counts	percent
0	Kuk	87	0.63
1	Moan	3	0.02
2	Quaa	49	0.35

Verbal squirrels were evenly distributed around the park



SQUIRREL SUMMARY

PRIMARY FUR COLOR

GRAY

FUR COLOR COMBINATIONS

GRAY WITH NO HIGHLIGHT

GRAY WITH CINNAMON HIGHLIGHT

NOISES

KUKS

HUMAN INTERACTIONS

INDIFFERENT OR RAN FROM

HECTARE SUMMARY

PARK AREA

LOWER

ANIMAL SIGHTINGS

HUMAN

TIME OF DAY

PM SHIFT

WEATHER CONDITIONS

CLOUDY

TEMPERATURE

50 - 60 ºF

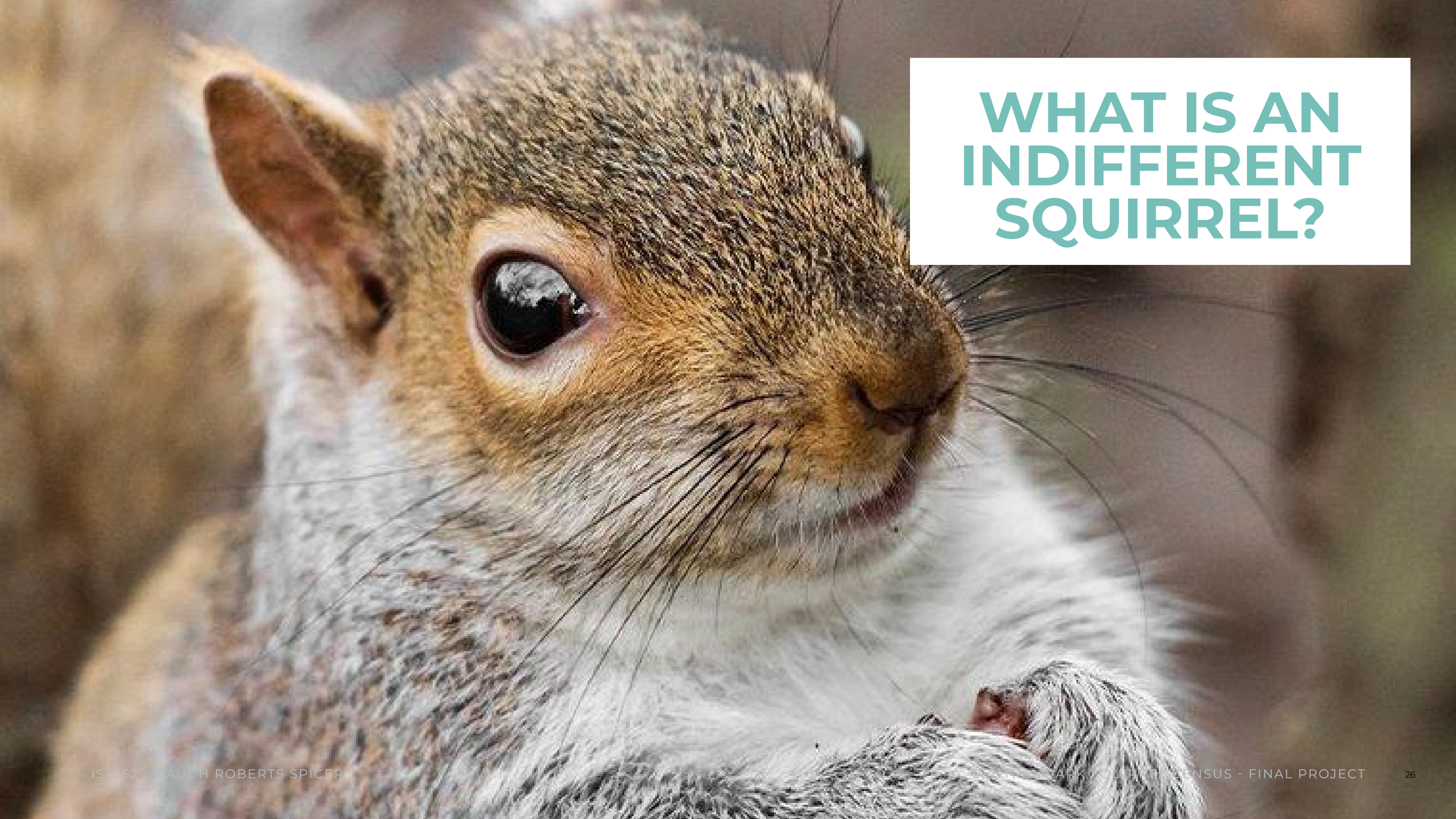
QUESTIONS

HOW LONG DID THE SQUIRREL SIGHTERS OBSERVE THEIR HECTARES FOR?

~20-25 MINUTES

WHAT IS KUK & QUAA?

KUKS & QUASS ARE DISTINCT WARNING CALLS MADE BY EASTERN GRAY SQUIRRELS



WHAT IS AN INDIFFERENT SQUIRREL?

HOW DO WE KNOW THEY WEREN’T COUNTING THE SAME SQUIRREL TWICE?

IT WAS ASSUMED THAT SIGHTERS COUNTED THE SAME SQUIRRELS MORE THAN ONCE, AND THE FLYGER FORMULA WAS USED TO ADJUST FOR THE POSSIBILITY.

WHAT IS THE FLYGER FORMULA?

ESTIMATED SQUIRREL SIGHTINGS

TOTAL OBSERVATION AREA IN METERS^2
1 HECTARE = 10,000 M^2

TOTAL NUMBER OF SQUIRRELS OBSERVED

$$\hat{P} = \frac{AZ}{V\pi Sy^2}$$

THE AVERAGE DISTANCE A SIGHTER IS CAPABLE OF VIEWING AT A GIVEN TIME
(DETERMINED TO BE 50 METERS)

OPTIMAL SQUIRREL VISABILITY FACTOR
(HOW MUCH OF AN AREA CAN TRULY BE OBSERVED)

NUMBER OF OBSERVATION PERIODS