Summary of Coyote Scat Analysis for Bird Consumption Summer 2011

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HYPOTHESIS:

It was hypothesized that coyotes were indeed consuming birds on the refuge, and of the samples that would be collected and analyzed, 20% would contain bird remains.

After analysis of 265 samples, it was found that coyotes are eating birds, and of the samples collected, 34.71% contain bird remains.

STUDY AREA:

Study Area Coordinates	
Toploader	
113°23'42.522"W 39°52'56.784"N	Start
113°23'24.263"W 39°52'56.001"N	End 1
113°23'19.829"W 39°52'55.74"N	End 2
Goospu	
113°20'49.325"W 39°51'48.183"N	Start
113°21'3.932"W 39°51'51.052"N	End 1
113°21'10.974"W 39°51'52.356"N	End 2
Winding Road	
113°22'11.75"W 39°51'9.579"N	Start
113°21'59.49"W 39°51'5.145"N	End 1
113°22'11.75"W 39°51'9.579"N	End 2
Mallard	
113°23'3.135"W 39°50'57.32"N	Start
113°23'24.785"W 39°51'0.189"N	End

METHODS:

I Creating Study Areas

1 Select a segment of road on the refuge approximately 600 yards (548.64 meters) in length

2 Walk the length of the road at a slow pace, scanning the area from the middle of the road (to the left) to the shoulder of the road (to the right). All areas that are graveled, up to the first line of dense vegetation, should be scanned

3 Using the shovel, remove all bits of coyote scat, throwing it off the road so that it will not be confused with new scat. If there is confusion over whether or not scat on the road is coyote scat, remove the scat.

4 If clearing the road without aid, walk the length of the segment observing only one half of the road (from the middle of the road to the shoulder on the right). Once the length of the sample area has been cleared, turn and walk back toward the starting point of the sample area, scanning the other half of the road (middle of the road to the shoulder on the right). Thus both sides of the road will be cleared and attention will be equally divided between both halves of the road.

II Collecting Samples

1 Three weeks after clearing the study areas of all coyote scat, return to the study areas and begin collection

2 Walk the length of the road at a slow pace, scanning the area from the middle of the road (to the left) to the shoulder of the road (to the right). All areas that are graveled, up to the first line of vegetation, should be scanned.

3 Using the shovel, pick up all coyote scat and place each new pile of scat in a fresh plastic sandwich bag. Wrapping the scat in tinfoil is also acceptable.

4 Place the plastic bag (or foil-wrapped scat) in a large plastic bag set aside for each study area.

5 When storing the samples, label each study area bag with the name of the study area the samples were collected from, the date they were collected, and “General”.

III Analyzing Samples

1 At the lab, remove a sample from one of the study area plastic bags.

2 Empty the contents of the foil or plastic bag into an examination tray

3 Using plastic gloves, a face mask, and protective eyewear to minimize exposure to the feces, pick apart the sample, searching for scales, feathers, fur, insect exoskeletons, and plant remains.

- Do not mark a sample for bird remains unless at least one feather is found within the scat
- Do not mark a sample for mammal remains unless at least one hair is found within the scat
- Do not mark a sample for reptiles/amphibians unless at least one scale is found
- Do not mark a sample for “other” unless one seed, insect exoskeleton or plant part is found

4 After picking apart the sample so that the inside of the scat has been thoroughly searched, mark on a data sheet all the categories of remains (bird, mammal, reptile/amphibian, other) that were observed within the sample.

- If plant, egg, or insect remains were found in the sample, identify what “other” was found within the scat and write it down in the “notes” column

5 Keep a separate data sheet for each sample area.

6 After recording the categories of remains found within the scat, do one of the following:

- If the scat contains bird remains, return as much of the sample as possible to the sandwich bag or foil wrapping that the sample was contained within and place the sample in a large plastic bag labeled with the study area name, the date collected, and "Bird."
- If the scat doesn't contain bird remains, dump the examination tray into a large plastic bag labeled with the study area name, the date collected, and "Other"

7 Keep separate post-analysis large plastic bags for each study area

IV Analyzing Data

1 In a Microsoft Excel document, record the categories found within each sample by placing a "1" within each category identified within the sample.

2 Calculate the total number of times each category was found within the samples by study area

3 To get the percentage of samples containing bird remains, divide the total number of times bird remains were observed in a study area by the total number of samples collected in that study area.

RESULTS:

FIGURE 1

Coyote Scat Analysis Summary (by sample area and total)						
Sample Area	Bird	Mammal	Rept/Amp	Other	# of Samples	% Bird
Goospu	22	30	4	17	50	44
Toploader	17	42	3	4	47	36.17021
Mallard	32	113	27	20	124	25.80645
Winding Road	21	36	5	14	44	47.72727
TOTALS	92	221	39	55	265	34.71698

FIGURE 1: This table display s the number of times each category of remains was found within analyzed samples. The percentage of samples containing bird remains are displayed in a separate column.

FIGURE 2

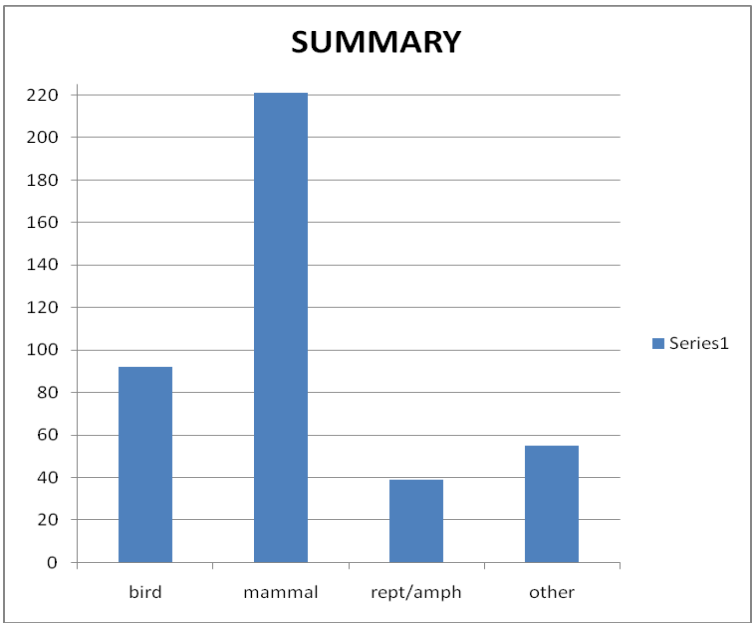
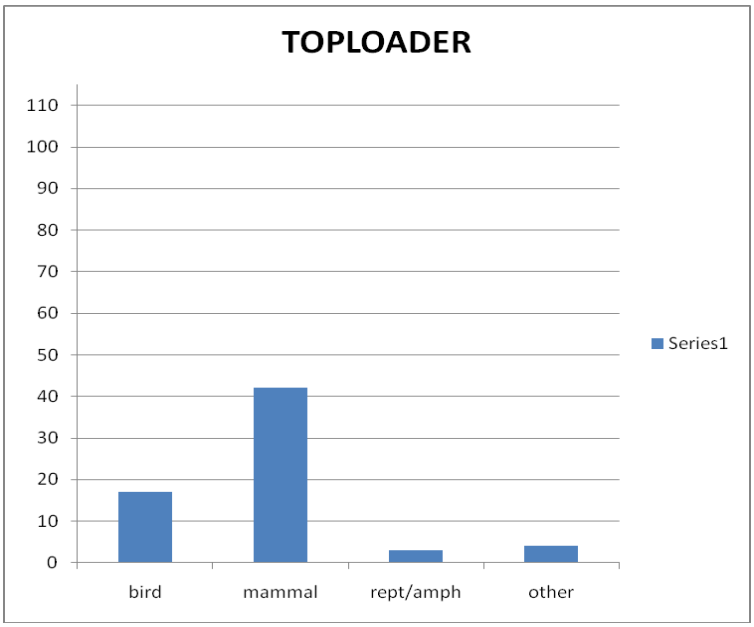


FIGURE 2: This graph displays the total number of times samples contained each category of remains.

FIGURE 3



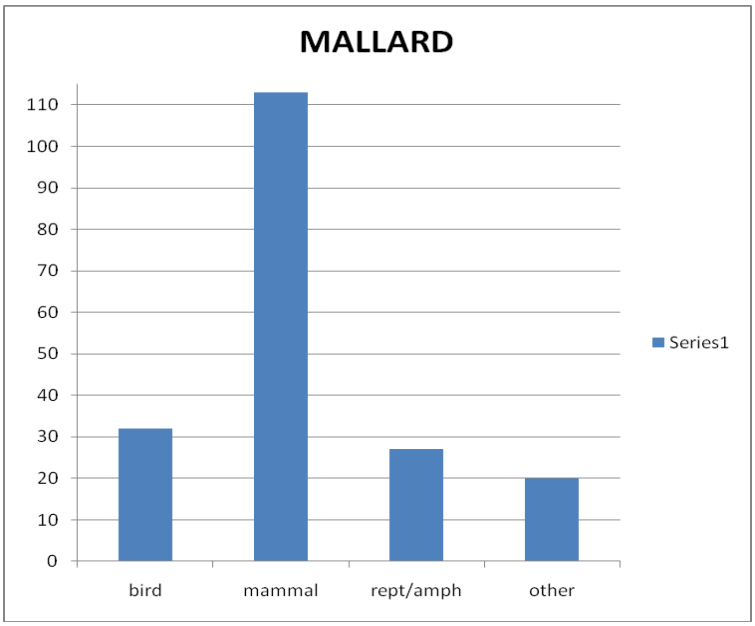
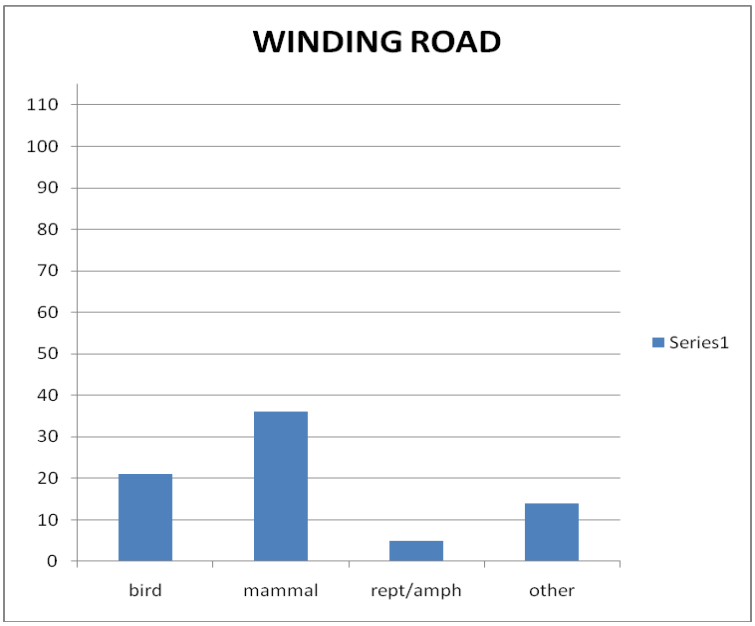
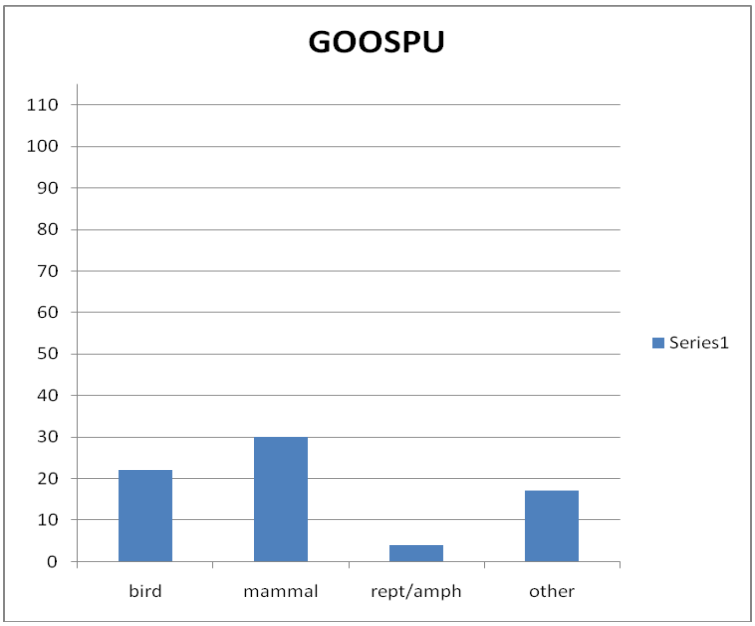


FIGURE 3: These graphs display the number of times each category of remains was found within analyzed samples.





SOURCES OF ERROR:

As a preliminary study, there are several sources of error, due to the fact that the procedure has been previously untried on the refuge and the subject has not been pursued in this manner in the past. Sources of error within this study include:

- Misidentification of digested material: data may have been skewed due to the difficulty in distinguishing digested bird down from digested fur, and digested reptile scales from digested insect skeletons.

- Failure to observe remains while sorting through scat: due to the fact that a single hair or feather, scale or insect exoskeleton determined whether or not a sample was recorded as one containing mammal, bird, reptile or insect, these small pieces of evidence could have been overlooked just by failing to break apart every piece of the scat and thus changed results.

- Inconsistencies in sorting through scat samples: breaking apart and picking through one piece of scat more than another might reveal evidence that wasn't observed in another sample due solely to a less thorough inspection of the scat.

- Failure to remove all previous scat from sample areas: When preparing the road before the scat sampling period, some scat may have been left from months prior to the study, potentially skewing the data in a way that doesn't necessarily reflect coyote diet during the nesting season. This source of error isn't believed to be a major contributor to errors in this study.

- Remains within the scat were not actually ingested: Although considered a less likely source of error, it is possible that items collected within the scat were on the road where the scat was dropped, and were thusly mistaken as part of the scat.

- One sample mistaken for two, or two samples mistaken for one: Scat piles may have been separated by movement of the defecating animal, traffic on the road, or weather conditions, causing samples that were near one another, that were in fact two separate piles of scat, to be mistaken for one sample, or samples that were farther apart, that were in fact parts of the same sample, to be mistaken for two samples.

SUGGESTIONS FOR FUTURE RESEARCH:

If this study was to be repeated in the future, these suggestions might be taken into consideration to improve the study and remove some of the bias inherent in human actions.

- Mark the limits of the study area: While "scanning the road to the first line of dense vegetation" often provided a clear edge to a study area, there were occasions where there was confusion concerning the edge of a study area. The first line of dense vegetation was occasionally dead and fallen, due to chemical spraying or heat, and then it was unclear whether the sample area

should expand to the first living vegetation or remain along the line of the dead vegetation. In the future, marking the edges of the sample area with a washable spray paint may prove useful.

- Create a distance for samples to be separated to be considered separate samples: A standardized distance should be established to identify samples as parts of one scat pile or two different, closely placed scat piles. If two pieces of scat are farther apart than this standardized space, they should be considered two separate samples. Unless they are clearly two different samples (one is entirely composed of insect carapaces, and the other is almost completely composed of fur), all samples lying within that distance should be considered one sample. While this won't entirely eliminate the error of one sample being mistaken for two or vice versa, this can help remove some human bias associated with sample collection.

DISCUSSION:

The original motivation for this study was to gain information that would ultimately allow a decision to be made regarding whether or not there was reason to begin coyote population control on the refuge. While this preliminary study did provide a rough picture of what portion of the coyote diet may include birds, along with information to support the position that coyotes are preying upon birds during the nesting season, this study did not provide the information necessary to make a decision regarding coyote population control. To gain a sense of the significance of this study's findings, it would be beneficial to compare the dietary ratio of the coyotes on the refuge to coyotes elsewhere. Only comparison could contribute to an understanding of whether or not the coyotes' bird predation is above what is to be expected in the coyote diet. However, comparison would not reveal whether or not the coyotes of the Fish Springs National Wildlife Refuge (FSNWR) are preferentially seeking nests during the nesting season. On a refuge with a population of ground nesting birds, it is to be expected that birds would make up some portion of the coyote diet. It may even be expected that, in comparison to similar refuges, coyotes found on FSNWR may have a higher proportion of bird in their diet if nests and nesting birds make up a higher proportion of the potential prey base at this refuge compared to similar refuges.

To provide evidence to support the theory that coyotes are preferentially preying upon nests and nesting birds would require a different approach to assessing the FSNWR coyote diet. In wildlife behavior, preference is indicated by an animal using one resource at a rate disproportionate to its availability[1]. For example, if nests and nesting birds made up 20% of the potential prey base for coyotes on the refuge, and bird appeared in the coyote diet 50% of the time, assuming equal availability of all prey, coyotes would be preying upon birds at a rate disproportionate to the availability of the nests and nesting individuals. With data such as this, one could begin to support the theory that coyotes are preferentially preying upon nests and nesting birds. To begin such a study, one might begin nest surveys and pitfall trap surveys to get

a clearer sense of the potential prey base available on the refuge, and couple these findings with coyote dietary analysis, perhaps similar to that seen in this 2011 coyote scat survey.

While evidence to support the position that FSNWR coyotes are preferentially preying upon nests and nesting birds would be useful, one would still lack the necessary evidence to make a decision regarding coyote population control. Without a sense of the impact coyote predation is having on the bird populations of FSNWR, one couldn't support the position that coyote predation needs to be controlled. The coyote population on the refuge may consume a hundred birds in a nesting season, but if the bird populations of the refuge are robust enough, coyote predation may not be significantly affecting overall bird population dynamics. Therefore, one might begin a study to see what proportion of the bird populations on the refuge are affected by coyote predation. In the past, studies were conducted on the refuge to get a sense of which predators were leading to nest destruction. Similar studies could be implemented in the future to assess the proportion of nests being destroyed by coyote predation. A clearer picture of bird population dynamics (which is being somewhat addressed at this time through bird count surveys conducted each month) on the refuge would also be essential in understanding the impact of coyote predation on nests and nesting birds on the refuge and making a decision regarding coyote population control.

[1] Diego-Rasilla, Fransisco Javier, and Valentin Perez-Mellado. "Home range and habitat selection by Podarcis hispanica (Squamata,." *Folia Zool* 52.1 (2003): 87-98. Web. 1 Aug 2011. <http://www.ivb.cz/folia/52/1/87-98.pdf>.