REPORT

Title
The Role of Free-Ranging Wildlife in the Deposition of *Escherichia coli* into a Texas Floodplain

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Abstract
The role of wildlife in the deposition of *Escherichia coli* (*E. coli*) is not well understood. Although water quality studies incorporate wildlife data, the data often lacks a clear connection between wildlife density and *E. coli* deposition. One tool for wildlife management is the adjustment of animal populations. Minimal understanding of species-specific fecal pollution and the role of species density on water quality complicates attempts by natural resource managers to adjust wildlife populations to improve water quality. My goal for this research was to determine the impact of free-ranging mammals (in general and species-specific) on *E. coli* loads in the floodplain. The objectives of this research were to determine the density of important free-ranging wildlife in the study area, research fecal deposition rates, and determine fecal *E. coli* loads for each species. I conducted a comprehensive literature review to determine fecal deposition rates for important mammals. I conducted mark-recapture and mark-resight populations density estimates (2008–2009) for meso- and large mammals in the study areas. I collected fecal samples from study species for *E. coli* analysis at university labs. Finally, I walked transects to determine spatial distribution of fecal material. I found that raccoons (*Procyon lotor*) provided the most *E. coli* into the floodplain followed by feral hogs (*Sus scrofa*), Virginia opossum (*Didelphis virginiana*), and white-tailed deer (*Odocoileus virginianus*) as the next biggest contributors.

Problem and Research Objectives
Although previous *E. coli* research has investigated the role of traditional sources of fecal pollution, little research has investigated the role that free-ranging wildlife plays in water contamination. Further studies are needed to understand the role of free-ranging wildlife populations in the deposition of *E. coli* in order to accurately describe the sources of fecal contamination. Land managers and natural resource decision-makers need to understand the role of wildlife in the deposition of *E. coli* into Texas watersheds in order to successfully manage water supplies in the state and to implement effective pollution control strategies. Furthermore, information concerning the contribution of *E. coli* from free-ranging wildlife populations is needed to improve watershed-level contamination models and reliability of model results.

Our study objectives were to identify, characterize, and quantify *E. coli* deposition from free-ranging wildlife populations into a floodplain of an impaired water body. This project sought to

clarify the spatial distribution of fecal sources, subsequent fecal deposition, and *E. coli* locations. Target species were exclusively mammalian (medium to large; e.g., white-tailed deer [*Odocoileus virginianus*], feral hogs [*Sus scrofa*], raccoons [*Procyon lotor*], etc.). Specific objectives were as follows:

1. Identify and population densities of major wildlife contributors of fecal material in the study floodplain. Focal species were limited to those in direct contact to water course.
2. Evaluate the presence and persistence of *E. coli* levels in fecal samples from identified major wildlife contributors.
3. Estimate the approximate amount of fecal material deposited by major contributors into the watershed on a daily basis.

Materials/Methodology
I used infrared triggered cameras to aid in determining population densities of mid-size to large mammals present within the floodplain. I determined medium-sized mammal population densities by analyzing trapping numbers in live-trap grids. I conducted a literature review to determine the mammal species likely to be found in the study areas and tailor the trap efforts accordingly. I collected fecal material of major contributing species during transects and during medium-sized mammal trapping. In order to identify potential seasonal *E. coli* fluctuations, I collected fecal samples of relevant and dominant identified sources during the winter and summer seasons for 2 consecutive years. I also live-trapped medium-sized mammals in order to collect fresh fecal material. I conducted feral hog and white-tailed deer trapping on one of the cooperating properties to collect fecal samples. I conducted a comprehensive literature review to determine fecal shedding rate for species. Floodplain-scale estimates of the amount of species-specific fecal material were then extrapolated.

Principal Findings
I combined the highest and lowest seasonal density estimates with conservative estimates of fecal deposition rates and found that white-tailed deer, raccoons, and feral hogs deposited the most fecal material into the watershed. Using the fecal samples, my research collaborators at Texas A&M University found that raccoons and Virginia opossums had the highest mean CFU/gram of fecal material of sampled species. Overall, I estimated that raccoons potentially deposited the most *E. coli* per km^2, followed by feral hogs, Virginia opossums, and white-tailed deer.

Significance
Free-ranging mammals in my study area were significant contributors of *E. coli* into floodplains. Raccoons were larger potential contributors than mammals like feral hogs and white-tailed deer. This is exacerbated by the fact that raccoons stay near water and are known to defecate in water sources. Feral hogs are known for a high degree of coprophagy likely further reducing their fecal contribution. White-tailed deer defecated frequently and in relatively large amounts; however, they had relatively low *E. coli* concentration in their fecal material.