# Game Cameras as a Biosecurity Tool around Turkey Farms

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## Introduction

The focus areas for Salmonella risk reduction usually involve several farm biosecurity measures such as rodent control, especially on breeder farms, and controlling entry of people or equipment in an attempt to limit transmission of infection between houses and between the inside of houses and the environment (1). Visual observations of wild birds and other fauna on the premises by workers and managers are limited to their time spent on farm. Furthermore, there are likely periods of changing exposure dynamics for turkey farms depending on the type of farm and the time of year. In particular, during the fall and spring seasons, there is an increased frequency of wild bird movements.

Camera traps, or trail cameras, are well known for animal and bird detection for private use (i.e. hunting and trapping). The research community has also made significant use of camera traps, for example, to quantify the availability of vertebrate hosts to ticks (2), monitoring scavenger visits as a disease transmission risk (3), and habitat occupancy (4). In order to evaluate the source of avian influenza infection into poultry facilities, researchers in the Netherlands used cameras that were strategically placed during one visit and set to record images for a full year with little interruption to the farm operation (5). Although camera image review is time-consuming and generally a fixed position view, the data captured can be used to identify types of pathogens potentially transmissible from wildlife to poultry based on the types of wildlife seen (6).

The objective of this presentation is to present quantitative and qualitative summaries of camera trap image data from six turkey farms in Minnesota and discuss findings relative to visitor logs and rodent trap records. Our long-term goal is to use this data to help poultry farmers refine biosecurity measures to reduce the risk of Salmonella spp. and other pathogen introduction from interactions with wild species or increased traffic on the farm.

## Method

There were camera traps at six poultry farms in MN during three migration seasons (Fall 2018, Spring 2019, Fall 2019). Three of the farms were breeder farms and three were commercial grow-out farms. The cameras were Bushell B-12 12 MP Trail Cameras. The cameras were set in motion-sensor mode, taking a picture when motion was detected and every 5 minutes thereafter if the movement continued. The camera position and view angle were stable within a season for each barn, but did change between seasons on some farms. The number of images was limited by the view angle for each farm and was not wholly indicative of all movement on the farms. Each image was 12 megapixels with date, time, and temperature stamps. The memory cards were emptied every 2 weeks and photos stored for subsequent review. A team of reviewers sorted the images based on traffic type (Mammals, Birds, Humans, Vehicles and No Traffic) and documented the number, type (as best possible), and location (i.e. on ground, perched on barn ridge, flying

overhead, etc.) of traffic in each image in a spreadsheet. Birds included wild and domestic avians (i.e. escapees). All reviewers signed a confidentiality agreement.

The farm veterinarians provided visitor logs and rodent trap records for the camera-monitored periods at the three breeder farms. The farm veterinarians reviewed the summary of images and engaged in discussion about what the camera and image quantification did and did not tell us.

Results and Discussion

Across the six barns and three seasons, the cameras captured over 9,000 images. Following review, approximately 5,500 images contained at least one form of "Traffic". Snow, blowing vegetation, or other non-traffic movement triggered photos that were ultimately removed from the dataset, but still consumed time and energy during the review process.

The number of images differed between sites and seasons (Table 1). There were 73 total images of mammals on all farms in the view angles, and 79% of the instances occurred outside of typical working hours. On Farm 2, the mammals tended to be housecats, raccoons, coyotes, or other small animals during Fall 2018 and Spring 2019; there were frequent instances of white-tailed deer in Fall 2019. The greatest frequencies of birds were in the Spring 2019 season on all but Farm 4. The majority of bird images occurred during working hours. Farms 3 and 5 view angles' included a service road, resulting in higher frequencies of human and vehicle traffic images.

**Table 1. The number of images with traffic types for six turkey barns in Minnesota during three migration seasons. The number of images are limited by the view angle for each farm, and are not wholly indicative of all movement on the farms**.

| | | Number of Images | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Breeder | | | Grow-out | | | |
| | | Farm 1 | Farm 2 | Farm 3 | Farm 4 | Farm 5 | Farm 6 | Total |
| Mammals | Fall 2018 | 4 | 22 | 0 | 6 | 1 | 1 | 34 |
| | Spring 2019 | 7 | 10 | 0 | 0 | 5 | 0 | 22 |
| | Fall 2019 | 0 | 16 | 0 | 1 | 0 | 0 | 17 |
| Birds | Fall 2018 | 1 | 0 | 32 | 12 | 137 | 40 | 222 |
| | Spring 2019 | 16 | 9 | 393 | 28 | 208 | 584 | 1238 |
| | Fall 2019 | 0 | 1 | 63 | 87 | 101 | 53 | 305 |
| Humans | Fall 2018 | 27 | 18 | 59 | 13 | 373 | 23 | 513 |
| | Spring 2019 | 48 | 81 | 52 | 16 | 489 | 79 | 765 |
| | Fall 2019 | 24 | 23 | 557 | 44 | 129 | 83 | 860 |
| Vehicles | Fall 2018 | 41 | 17 | 248 | 10 | 382 | 29 | 727 |
| | Spring 2019 | 60 | 78 | 188 | 22 | 700 | 122 | 1170 |
| | Fall 2019 | 21 | 31 | 1013 | 58 | 413 | 114 | 1650 |
| Fall 2018 Total | | 73 | 57 | 339 | 41 | 893 | 93 | 1496 |
| Spring 2019 Total | | 131 | 178 | 633 | 66 | 1402 | 785 | 3195 |
| Fall 2019 Total | | 45 | 71 | 1633 | 190 | 643 | 250 | 2832 |
| Total | | 249 | 306 | 2605 | 297 | 2938 | 1128 | 7523 |

Visitor and rodent/pest logs are recommended biosecurity measures for any farm. These logs were available for the breeder farms only. The format of and the entries in the rodent logs varied over time. All rodent/pest logs suggested regular maintenance of and checking of rodent traps and/or bird nests. Periodically, there were notations of mice trapped and bird nests. At

some of the farms, based on view angle, we expected to see more human traffic corresponding to rodent trap maintenance along the exterior of barn walls. There was no significant agreement between the images and the logs for many reasons, particularly view angles. This suggests the two record types may serve more in complementary roles rather than as validation measures.

Recommendations

Camera traps were easy to install, but the time for image review was considerable. Each image took approximately 60 s to review and code in this project. Camera trap technology is evolving, and video may prove more useful for some situations than still images. Recording image types is not necessary, but recommended for pattern detection and comparison to management records. View angle is critical for several reasons. If view angles change periodically and randomly, the ability to detect patterns is lost. Additionally, when placing cameras, it is obviously necessary to avoid structures that block the view of the camera but of equal importance is placement of the camera to avoid detecting "non-traffic" motion, e.g., swaying tree branches and fan baffles opening and closing. Finally, when placing the cameras, the goal of camera trap use should ultimately guide camera placement. If the goal is to detect wild mammals, for example, place cameras to capture motion near points of entry to the feed or compost piles. However, if the goal is to monitor entry and exit of people and equipment on the farm, placement of cameras to detect motion at the line of separation will likely yield useful images. Regardless of camera angle and placement, if the images are to be used to determine pathways of pathogen introduction into a turkey barn, regular and timely review of the images is highly recommended, not only to decrease the backlog of images to review but to also provide more immediate feedback to the farm managers who can then make corrections to biosecurity protocols as needed.


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