

# **Grand Haven Thermal Deer Count Estimate January 2025**

Prepared for  
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# Summary

This deer count includes two levels of confidence based on the January 2025 thermal imagery:

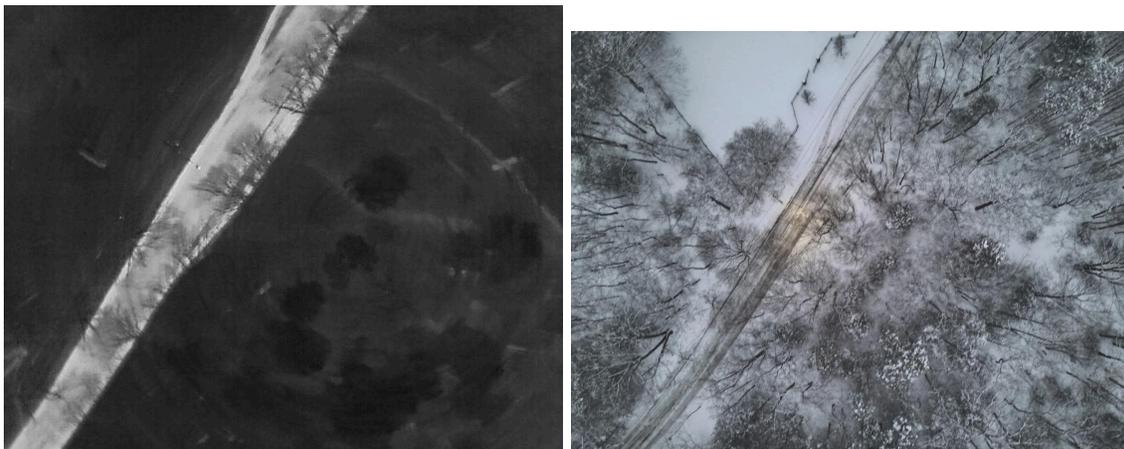
1. **Likely sightings**; with clear visual verification of deer.
2. **Possible sightings**; with thermal signatures suggesting deer, though visual confirmation was inconclusive.

The count recorded 68 highly likely (verifiable) sightings, with an additional 44 possible sightings. Thus, the total deer population within the 200-acre urban forest is estimated to range between 68 and 112.

Location	Likely Sightings	Additional Possible Sightings	Estimated Population
Mulligan's Hollow Area 1	8	6	14
Mulligan's Hollow Area 2	18	13	31
Mulligan's Hollow Area 3	7	5	12
Lake Forest Cemetery	16	9	25
Duncan Woods	19	11	30
Total:	<b>68</b>	<b>44</b>	<b>112</b>

## Background & Methods

Unlike traditional cameras, which assign a specific color to each pixel to construct a visible image, thermal cameras operate by assigning a relative temperature value to each pixel. Therefore, warmer temperatures in a thermal image appear bright while cooler temperatures appear dark. The drone used in this deer count – owned by the City of Grand Haven – is equipped with both a traditional color camera (with a resolution of 1440x1080 pixels) and a thermal camera (with a resolution of 640x512 pixels). Color and thermal images are captured near-simultaneously. In these images, an individual pixel corresponds to a roughly 7 square centimeter area based on an average flight altitude of 175 feet relative to the takeoff point. Due to differing focal lengths and resolutions, color and thermal images do not align exactly, but each thermal image has a roughly corresponding color image (see images below):



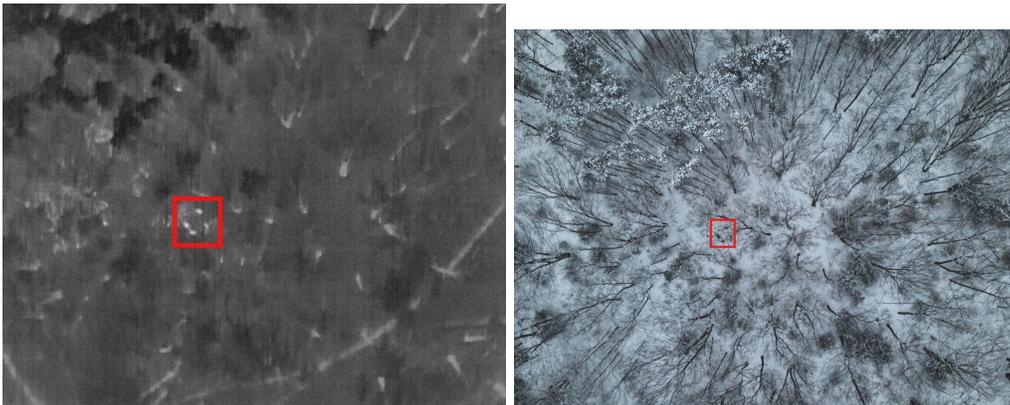
Flights were conducted over Mulligan’s Hollow, Lake Forest Cemetery, and Duncan Woods according to pre-planned routes and flown semi-autonomously. Due to its size and geometric complexity, Mulligan’s Hollow was subdivided into three separate flights. A total of five different flights encompassing all 200 acres took place across three subsequent days – January 9, 10, and 11 – with start times between 8:30AM and 9:30AM. ***It is important to note that these deer count estimates represent single points-in-time on three subsequent days; while every effort is made to provide accurate estimates, exact counts cannot be guaranteed.***

Thermal images are manually reviewed for deer sightings and, wherever possible, potential thermal deer sightings are augmented by review of the accompanying color image. Potential sightings are grouped into three categories:

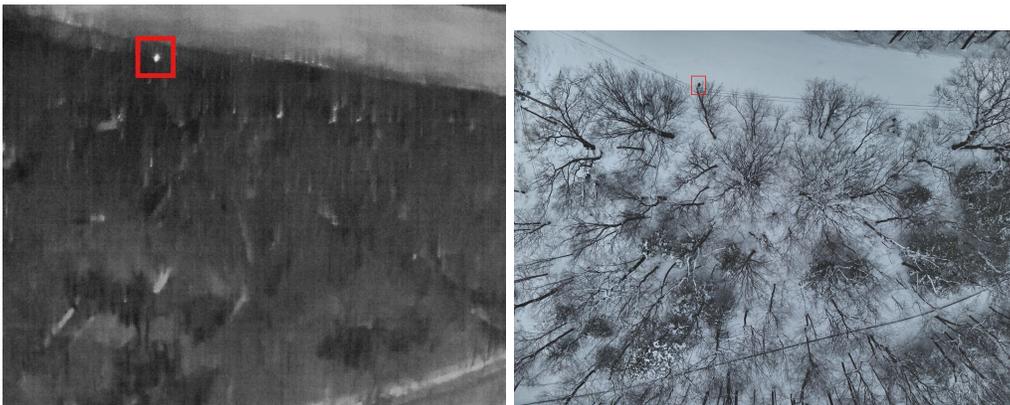
1. **Likely deer sighting**; where an object appears to be a deer, and confirmation based on color imagery supports positive identification (in the images below, what appears to be a group of three deer in the thermal image is visible as a group of three deer in the color image):



2. **Potential deer sighting**; where an object appears to be a deer in the thermal imagery, but confirmation based on color imagery is not possible (in the images below, what appears to be a cluster of deer in the thermal image is inconclusive in the color image):



3. **Erroneous sighting**; where an object resembles a deer in the thermal imagery, but upon further review is not a deer (in the images below, what appears to be a potential deer sighting in the thermal image is visible as a street lamp in the color image):



# Mulligan's Hollow Area 1 Estimate

January 9, 2025; 8:30AM

The composite image below represents the boundary of **Mulligan's Hollow Area 1** and was captured on a prior date:



## Deer Estimates:

- Likely deer spotted: **8**
- Possible deer spotted: **6**

# Mulligan's Hollow Area 2 Estimate

January 9, 2025; 9:10AM

The composite image below represents the boundary of **Mulligan's Hollow Area 2** and was captured on a prior date:



## **Deer Estimates:**

- Likely deer spotted: **18**
- Possible deer spotted: **13**

# Mulligan's Hollow Area 3 Estimate

January 9, 2025; 10:00AM

The composite image below represents the boundary of **Mulligan's Hollow Area 3** and was captured on a prior date:



## **Deer Estimates:**

- Likely deer spotted: **7**
- Possible deer spotted: **5**

# Lake Forest Cemetery Estimate

January 10, 2025; 8:30AM

The composite image below represents the boundary of **Lake Forest Cemetery** and was captured on a prior date:



## **Deer Estimates:**

- Likely deer spotted: **16**
- Possible deer spotted: **9**

# Duncan Woods Estimate

January 11, 2025; 9:30AM

The composite image below represents the boundary of **Duncan Woods** and was captured on a prior date:



## Deer Estimates:

- Likely deer spotted: **19**
- Possible deer spotted: **11**