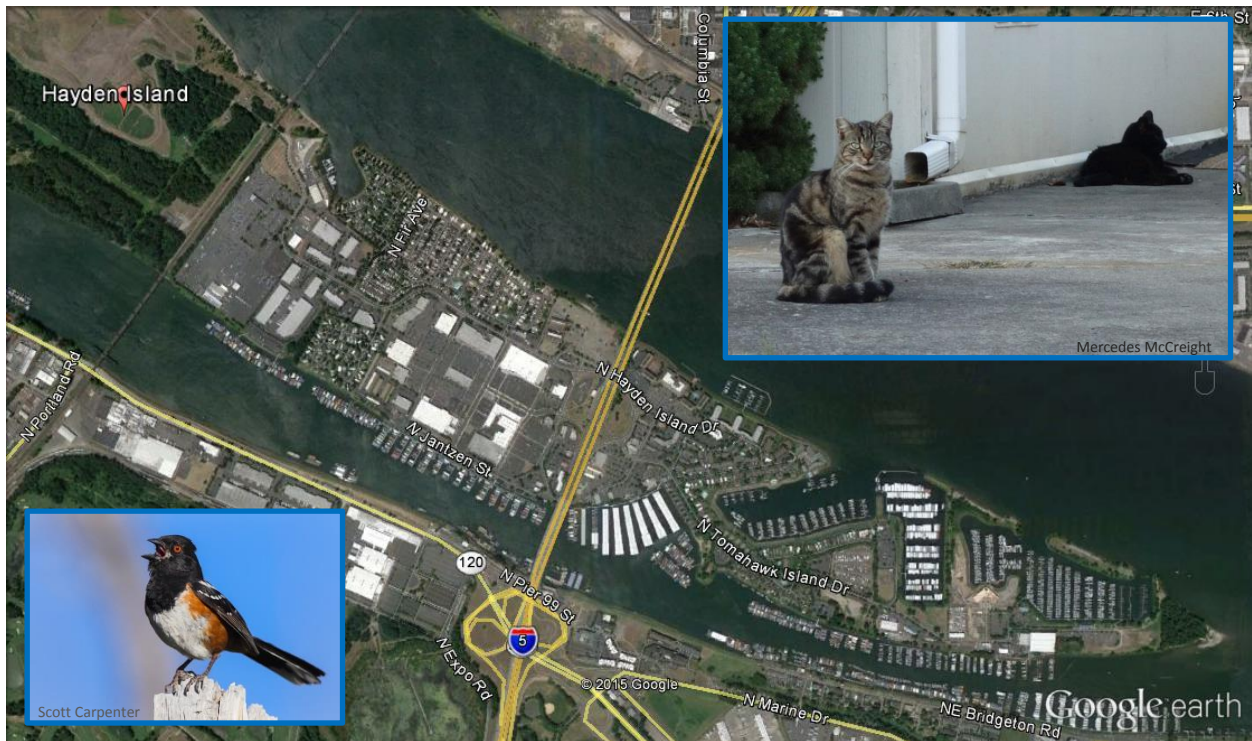


Baseline report on characteristics of the free-roaming cat population, cat ownership, and community perceptions on Hayden Island, Portland, Oregon



Summer 2015

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Hayden Island Cat Project

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Executive Summary

In 2014, the Audubon Society of Portland, the Feral Cat Coalition of Oregon (FCCO) and other partners including residents of Hayden Island, began a multi-year project with the goal of humanely reducing the island's feral/stray cat population using a range of strategies including Trap-neuter-return (TNR), cat adoption, community awareness and cooperation. In this report we highlight the results for the first year of this effort and specifically summarize information from the three main data-gathering components of this project: 1) Cat ownership / attitudes questionnaire survey; 2) Cat caregiver interviews; and 3) Road-based cat count surveys. We also provide preliminary information on tracking of the TNR effort.

Resolving overpopulation of feral/stray cats in communities is of interest to wildlife and cat advocates alike. Cats are the most popular pet in America yet many end up on the street and are subject to an array of hazards including cars, disease, predators, and becoming lost. Birds are an indicator of environmental health and birdwatching is a \$41 billion/year industry¹. The Portland metropolitan region is home to more than 200 bird species, many of which are under significant pressure due to habitat loss. Free-roaming cats, which prey on wildlife, add to this pressure. Central to resolving impacts to both free-roaming cats and wildlife is to understand community perceptions as well as involve local residents in devising solutions.

The impetus for this project was to test the effectiveness of TNR and other methods used in concert to reduce the feral/stray cat population on a 1800 acre island that includes residential, commercial, industrial and natural area uses. TNR was developed as a management approach that could improve the quality of life for outdoor cats while also controlling their numbers without resorting to lethal methods. In the current cat debate, much scrutiny has focused on the effectiveness of TNR in controlling cat numbers. The resulting debate has been confounded by a lack of clarity on the goals of TNR programs and on a paucity of good monitoring data from ongoing TNR programs.

The main objectives of this study are to: 1) Assess cat ownership patterns and solutions the Hayden Island community would like to see considered in helping outdoor cats; 2) Summarize cat caregiver practices on Hayden Island; 3) Objectively assess characteristics of free-roaming cats on the landscape including distribution patterns, sterilization rates, and develop a preliminary population estimate of stray/feral cats as a baseline to monitor the population trend over time.

Hayden Island provides an ideal place to evaluate anthropogenic influences on the local free-roaming cat population as it provides a barrier to natural cat immigration and emigration and previous anecdotal observations suggested that a large free-roaming cat population existed on the island. We delineated a 486 acres portion of the island as our study area covering a range of urban land use types that allowed us to assess how free-roaming cats distribute themselves on the landscape. We did not include the far eastern section of the island because access was difficult and there have been few reports of feral/stray cats on that part of the island.

¹ Based on 2011 U.S. Fish and Wildlife Service data

Cat Ownership / Attitudes Questionnaire Survey

In December 2014 and January 2015 we distributed 1,199 questionnaires to all household units within the study area to document patterns of pet cat ownership on the island and to elucidate solutions the community would like to see considered in helping feral/stray cats. Results from this survey indicated that:

- 38% of households have pet cats.
- Most of the communities on the island have predominately indoor pet cats except for in the manufactured home community (MHC) where indoor/outdoor pet cats predominate.
- Most respondents got their cats from a shelter (30.7%) or friend/relative (25.5%) totaling 56.6% while 22% found a stray or tamed a feral cat. Other sources of cat ownership included: cats purchased from a breeder or pet store, born at home.
- Over half (52.3%) of respondents believe the best way to help outdoor cats is to “fix” them while 25% think they should be removed.

Cat Caregiver Interviews

From August 2014 to May 2015 we interviewed 19 people that provide care for feral/stray cats on Hayden Island. All caregivers live in the manufactured home community except for one that regularly comes from outside of the island. Typically, caregivers began caring for cats shortly after having moved into the manufactured home community when they realize that abandoned cats were on their property or next door and were left behind by former tenants. This suggests many of the cats are strays rather than feral. The average number of cats cared for by caregivers is 7.35 ± 4.1 SD and ranges from 2 to 15 cats. Caregivers report that 75.9% of the cats cared for are sterilized and most of the caregivers have been actively involved in having cats trapped and sterilized.

Road-based Cat Count Surveys

The results from our first season of cat monitoring were promising in terms of providing a quantitative means to estimate the population trend of feral/stray cats on Hayden Island. Through a simple and easily implemented protocol, we were able to employ citizen scientists to conduct intensive road-based cat count surveys in September 2014. Consistency in cat numbers among survey replicates and areas was relatively high indicating we were obtaining reliable information. The main area of concern in data quality was the large difference in sterilization rate estimates between road-based surveys (based on ear-tipping information²) and the cat caregiver information. We recognize the population estimate and detection rates may not reflect reality but we do believe they can serve as an adequate index to monitor changes in population trend over time as long as methodology remains consistent

Key findings include:

- 12 times as many free-roaming cats were detected in the manufactured home community compared to other land-use types.

² Ear-tipping is the universal sign of a neutered feral cat. The procedure involves removing approximately a quarter-inch off the tip of the cat's right ear in a straight line cut. This is done while the cat is anesthetized for spay/neutering and healing is rapid.

- No cats were detected in the natural area plot.
- Significantly more cats were detected in the daytime versus nighttime surveys.
- We estimated a 22% (daytime) and 27% (nighttime) sterilization rate based on ear-tip information.
- We estimated a detection rate during day and night road-based surveys of 49% and 47% respectively based on comparison of road-based counts with caregiver information suggesting that about half the cats were missed by surveyors during the road-based surveys.
- Preliminary population size estimate varied from 139-234 feral/stray cats in the study area (123-204 in the manufactured home community) depending on day or night road-based cat counts.

TNR tracking

Since October 2011, the FCCO has kept records on the spay/neuter effort of feral/stray cats on Hayden Island. During this timeframe a total of 163 cats were received with 152 sterilized, nine were already sterilized, and 1 was euthanized. During the three full years of record keeping (2012-14) the average number of cats sterilized per year was 40.7 cats with a slight declining trend in number of cats fixed over that period.

Next Steps

We will continue the road-based monitoring while also tracking TNR effort for at least the next 3-5 years. With our partners and the Hayden Island community we are working to increase TNR effort, formalize and increase cat adoption, and increase education and outreach to reduce cats in the environment. We will continue our interviews with cat caregivers (follow-up interviews with those previously interviewed as well as new interviews). We will continue to work with local community members to humanely reduce the feral cat population on Hayden Island. Our ongoing research will help determine whether these efforts are effective in establishing significant downward trend in the number of free-roaming cats on the island.

Introduction and background

Reducing the number of free-roaming pet, stray and feral cats in urban and suburban areas across the United States has proven an elusive goal. In recent years debate over management strategies has become highly polarized (Longcore et al. 2009). Many communities have become paralyzed by this debate resulting in limited coordinated resources being applied in implementing and assessing on the ground strategies.

Much of the debate has centered on whether to apply lethal or non-lethal approaches to reducing cat over-population. In many cases, this debate has pitted wildlife advocates who favor immediate removal of free-roaming cats from the environment against cat advocates who favor non-lethal approaches such as trap, neuter and return (TNR). However, paralysis serves neither side of this debate and in the maelstrom, free roaming cats have proliferated in some cities throughout the United States. The controversy surrounding the “cat debate” has overshadowed and inhibited practical approaches to managing outdoor cats. If progress is to be made on this challenge, it will be necessary to develop multipronged approaches that respect the strong value that the public places on both wildlife and cats and to assess and adapt those approaches over time to increase efficacy.

In Portland, Oregon, cat welfare organizations and wildlife advocacy organizations have a long history of working cooperatively with one another. The relationship has been described as a “rare détente” in the cat-bird conflict (Barcott 2007). In particular, the Audubon Society of Portland (Audubon) and the Feral Cat Coalition of Oregon (FCCO) have developed an array of joint projects to promote reduction of free-roaming cats in the Portland Metropolitan Region (<http://audubonportland.org/issues/hazards/cats/cat>).

Hayden Island is an approximately 1,800-acre island located on the Columbia River, immediately north of Portland. In 2014, the Audubon and the FCCO, in cooperation with residents of Hayden Island, began a multi-year project with the goal of humanely reducing the island’s feral/stray cat population using a range of strategies including TNR, cat adoption, and community education, outreach and involvement. The goal of the Hayden Island Cat Project is to test the effectiveness of TNR and other non-lethal strategies used in concert to reduce the feral/stray cat population on the island. Success of this project is defined as establishing a downward trend in the number of free roaming cats on Hayden Island over time. The project includes several distinct components. These include 1) determining the baseline population of free-roaming cats on the island 2) characterizing the communities relationship with the cat population on the island 3) employing non-lethal strategies including TNR to reduce the number of free-roaming cats on the island, and 4) evaluating the effectiveness of these strategies over time.

TNR was developed as a management approach that could improve the quality of life for outdoor cats while also controlling their numbers without resorting to lethal methods. In the current cat debate, much scrutiny has focused on the effectiveness of TNR in controlling cat numbers (Longcore et al 2009). However, some studies have documented a reduction in feral cat populations/productivity in response to TNR programs (Levy et al. 2003, Natoli et al. 2006, Jones and Downs 2011). The resulting debate has been confounded by a lack of clarity on the goals of TNR programs and on a paucity of good monitoring data from ongoing TNR programs. While well-intentioned, many TNR programs are developed opportunistically and are

performed without the collection of suitable baseline and monitoring data, making it difficult to evaluate the efficacy of efforts. The goals of TNR programs are often not clearly outlined and so many assume that TNR programs are guaranteeing population-level results. When these fail to occur, it creates the perception that TNR has proven to be ineffective.

In lieu of the dearth of rigorous evaluations of TNR management, modeling studies provide insight into the potential effectiveness of different management scenarios. These studies tend to suggest that if the majority of cats can be sterilized and if the sterilization rate can be maintained at a high level (>75%) over time, cat abundance will decline (Anderson et al. 2004, Budke and Slater 2009, Miller et al. 2014). Other modeling studies have indicated that lethal removal is more costly with a “higher treatment effort” than TNR but in order for TNR to be effective, immigration must be minimized and sterilization rates must be maintained at a high level (Schmidt et al. 2009).

In this report we provide the results of our first year of outdoor cat monitoring on Hayden Island including information from three sub-projects within the larger effort: 1) Cat ownership/attitudes questionnaire survey; 2) Cat caregiver interviews; and 3) Baseline road-based cat count surveys. Over the next several years we will work with the Hayden Island community and other concerned citizens to continue the population monitoring in concert with an aggressive non-lethal program (including TNR, cat adoption program, education and outreach to residents and building owners) with the goal of demonstrating a downward trend in the number of free-roaming cats on the island.

Report Objectives

1. Better understand the Hayden Island community’s relationship with cats including patterns of ownership, distribution of feral cat caregivers and community values as they pertain to solutions to address free-roaming cat populations.
2. Summarize current cat caregiver practices on Hayden Island.
3. Assess characteristics of free-roaming cats on the landscape including:
 - a. Document patterns of cat distribution and estimate feral/stray cat density relative to land-use areas in the study area.
 - b. Estimate the proportion of outdoor pet cats versus feral/stray cats.
 - c. Estimate feral/stray cat sterilization rates at the study site and compare to sterilization record rates reported by cat caregivers
 - d. Describe spay/neuter effort as tracked by the FCCO.
 - e. Estimate feral/stray cat detection probability by comparing road-based survey data with cat caregiver information.
 - f. Derive preliminary population size estimates for outdoor cats within the study site and in each land-use area.
4. Evaluate road-based survey methodology used in the initial year of this project and provide recommendations for improving the monitoring effort in subsequent years.

Study Area

Hayden Island is located in the Columbia River between Portland, Oregon and Vancouver, Washington and is within Portland city limits. The western portion of the island is largely an undeveloped natural area (826 acres) within the Portland metro urban matrix and contains

important habitat for a range of wildlife. The eastern portion of the island (996 acres) is almost entirely developed and includes light industrial, commercial (shopping mall and big box outlets) and residential zoning. The residential zoning includes large single lot residences, multistory condominiums, a large manufactured home park, RV park and several houseboat communities.

We chose Hayden Island to conduct this project for several reasons. First, the island geography provided a barrier to natural cat immigration and emigration allowing for an effective control to evaluate anthropogenic influences on the local free-roaming cat population. Second, the island provided a range of urban land use types that included natural area, multiple types of residential, commercial and light industrial that would allow for assessment of how free-roaming cats distribute themselves on the landscape. Third, Audubon and the FCCO both had preexisting relationships with the community on Hayden Island that allowed for a baseline of trust necessary to engage with the typically cautious cat caregivers. Finally, anecdotal observation suggested that a large free-roaming cat population existed on the island.

The study area comprises a 485.8 acre section of the island stretching from the isthmus east of Interstate 5 to a section of the undeveloped portion of the island on the west side (Fig. 1). We did not include the far eastern section of the island because this portion of the island is made up almost entirely of gated communities and businesses making access difficult. In addition, there have been few reports of feral/stray cats on that part of the island. For the road-based cat surveys, we included a section of the undeveloped portion of the island (adjacent to the development) to determine if outdoor cats were using this area.



Figure 1. Hayden Island study area including the land-use areas and sampling plot locations.

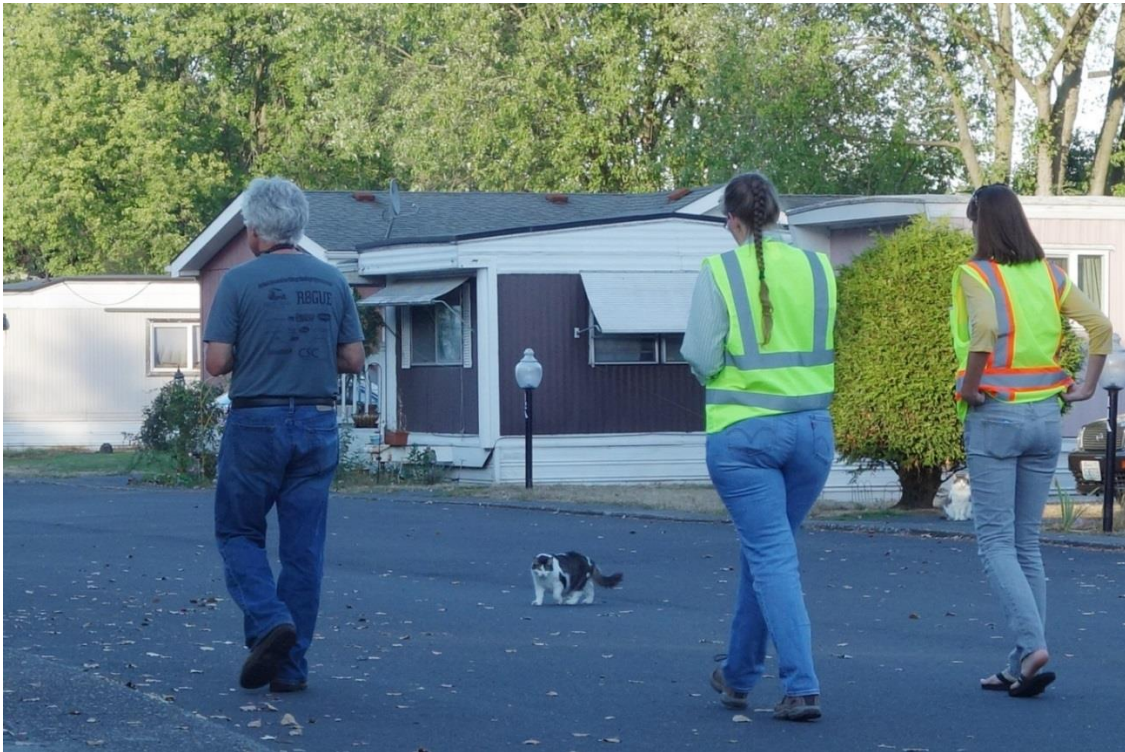
We divided the study area into five land-use types including natural area, residential/commercial, manufactured home community, big box stores, and light industrial (Fig. 1, Table 1). We further subdivided the manufactured home community land-use area into four “plots” and the residential/commercial area into two plots to facilitate efficient sampling of those areas by our team of citizen scientists who used the road / pedestrian path system as transect routes for the road-based cat count surveys (Fig. 1). We were unable to obtain access to a few areas within the study site (shaded red in Fig. 1) making our effective sampling area 421.3 acres. We were able to sample ~64.2% of the developed and ~16.5% of the undeveloped portion of the island.

Table 1. Study area land-use areas, study plots and associated acreages and transect lengths for the road-based cat count surveys.

Land-use area	Number of study plots	Total acreage ¹	total transect length ² (km)
Natural Area	1	94.7	3.0
Light industrial	1	52.9	1.3
Manufactured Home Community	4	84.4	6.3
Big box stores	1	83.8	5.6
Residential/commercial	2	105.5	7.7
TOTAL	9	421.3	23.9

¹not including areas that were not accessible

²We treated the road and pedestrian path network as transects



Citizen scientist volunteers conducting road-based cat survey on Hayden Island, September 2014 (Photo: M. McCreighton).

Land-use type photo examples (Photos: J. Liebezeit)

Natural area



Light Industrial



Manufactured Home Community



RV Park



Box Stores



Residential Commercial



Methodology

Cat “type” definitions

There can be some confusion in how feral, stray, and free-roaming cats are defined, so for clarity, we provide definitions that we used in this project:

Feral cat: An untamed pet cat that was either abandoned and has reverted to a more wild state or the cat was born outdoors to a feral or stray mother and has had little or no human contact. Feral cats are frightened of people and avoid contact whenever possible. Feral kittens can be tamed, but usually adult feral cats are not able to be socialized.

Stray cat: a domestic cat that has strayed from home and become lost, or was abandoned. Stray cats may be friendly or may become wary of people. Their offspring may be feral. Because they have had human contact, they are less frightened of people than feral cats and can usually be socialized and adopted into a home.

Free-roaming cat: is any cat that is not confined in a house or other type of enclosure. This includes pet cats, strays and feral cats.

Cat Ownership / Attitudes Questionnaire Survey

In December 2014 and January 2015 we distributed 1,199 questionnaires to all household units within the study area (Fig. 1). The questionnaire included five questions (**Appendix A**) intended to help document patterns of pet cat ownership on the island and to elucidate solutions the community would like to see considered in helping feral/stray cats. Refer to **Appendix B** for more information on the survey methods used.

Cat Caregiver Interviews

From August 2014 to May 2015, we interviewed 19 cat caregivers, members of the public that provide food, shelter, and other support for feral/stray cats, that either live on island or come there regularly to provide care for the feral/stray cats. We asked the caregivers a standard set of questions that provide information on number of cats they feed, how many do they know have been spay/neutered, how long they have been care giving and why, any overlap in cats cared for by other cat caregivers, etc. See **Appendix C** for the full list of questions.



Joe Liebezeit interviewing a cat caregiver on Hayden Island (Photo: Stefan Karlic)

Road-based Cat Count Surveys

We conducted transect-based surveys for cats using the existing road/ pedestrian path network in each of the land-use areas. After a brief training, volunteer citizen scientists and the project coordinators slowly walked along the road system within their assigned area and counted all outdoor cats seen or heard. Volunteers worked in groups of two or more surveying cats in one or more of the nine plots in the study area (Fig. 1). One observer acted as the primary cat counter while the other observer(s) focused on recording data and acted as the “navigator” (i.e. made sure the team covered all roads/paths within the plot). The navigator also briefly discussed the project and provided brochures to interested members of the public that were encountered while conducting the surveys.

Each team conducted two separate surveys on a given survey day – a daylight and nighttime survey. Both surveys were identical in terms of transects covered and methodology but only differed in time of day. The daylight survey began in the late afternoon and finished 15 minutes before sundown. After a short break, the nighttime survey started at least 15 minutes after sundown. Volunteers used 500 lumen spotlights as well as standard flash lights to search for cats during the nighttime surveys following standard spotlighting methods (Chapman and Willner 1986). We conducted paired day/night surveys because cats are often most active during crepuscular hours and previous studies have documented quite variable cat detectability among day and night surveys (Boone 2014). Three replicates of the day/night surveys were completed on September 14, 21, and 28, 2014. Thirty volunteer citizen scientists participated in these counts contributing more than 350 volunteer hours.

For each cat observed, volunteers recorded if either ear was tipped (upper tip of ear removed indicating the cat was sterilized), location (plotted on a high-resolution aerial imagery map), age, presence/absence of a collar, body condition, sociality, and description of the cat.

For more details on the road-based survey methods see **Appendix D** (or can be downloaded at: <http://audubonportland.org/files/research/cat-protocol>).

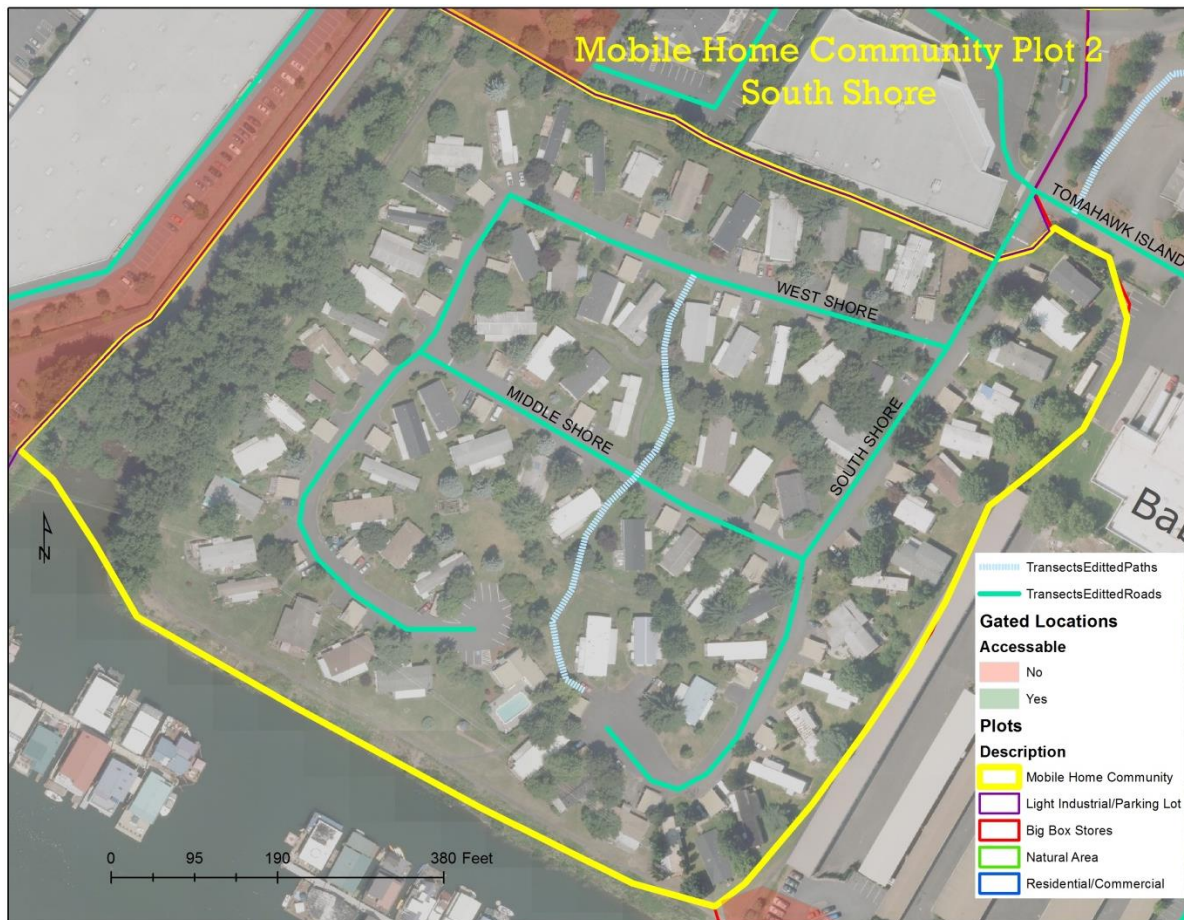


Figure 2. Example of a map provided to volunteers to conduct road-based cat surveys. Roads (in green) and paths (in blue) served as the “transects” the cats were observed from.

Data analysis

All data from the cat ownership/attitudes questionnaire survey, road-based cat counts, and cat caregiver interviews was entered and proofed in Microsoft Excel data tables. Cat ownership/attitudes questionnaire survey data were summarized in Microsoft Excel. For road-based cat counts, we used ArcGIS 10.2 (ESRI 2011) to delineate and tabulate areas/lengths for land-use areas, plot locations, and transects. Locations of individual cats that were plotted on study plot maps were manually digitized into a spatial data layer using ArcGIS 10.2 (ESRI 2011). Associated data for each cat (age, ear marking status, etc.) was appended to the cat location spatial data layer. We used a paired T-test to test for differences in cat detections between day and night surveys using NCSS 8 (2013).

Sterilization rates were calculated from the road-based cat counts by dividing the number of cats with a tipped ear by the total number of cats that we were able to determine the ear marking status. We also calculated a second sterilization rate estimate using the cat caregiver interview information by dividing the number of cats caregivers reported were spay/neutered

by the total cats the caregivers reported providing care for. We “corrected” road-based survey sterilization estimates by subtracting out the proportion of cats believed to be owned based on cats with collars seen during the road surveys with the assumption being that all cats with collars were owned. After we subtracted out collared cats, we further adjusted the estimate by including the proportion of cats that were sterilized but were not ear-tipped³ (obtained from the cat caregiver interviews). We know that a small number of spay/neutered feral/stray cats were not ear-tipped by the veterinary clinic that performed the operation. We also document the annual spay/neuter effort as tracked by the FCCO.

To estimate the detection rate that characterized the cat surveying method we divided the number of cats that were recorded during each road-based survey (with owned cats removed using methods described above) in the manufactured home community #3 plot (MHC3) by the total number of feral/stray cats the caregivers estimated in MHC3. We only used information from MHC3 because that was the only plot in the manufactured home community where we believe we know all the cat caregivers and were able to interview all but two of them. We estimated both daytime and nighttime detection rate estimates. We realize that this method is only approximate but we will attempt to refine in an iterative way as additional data are collected.

To estimate the feral/stray cat population we divided the number of cats detected on each road-based survey in each plot (with owned cats removed as described above) by the detection rate estimate. We applied the detection rate estimate from MHC3 to the entire study area. We then summed the average of estimated cats for each study plot for an overall estimate.

Results

Cat Ownership / Attitudes Questionnaire Survey

Nearly 25% of the questionnaires distributed to households in the study area were returned. Based on survey results, approximately 38% of households in the study area have pet cats. This is comparable to a national estimate by the American Pet Products Association which documented 37.3% of households owned pet cats⁴. Respondents report nearly all pet cats (98.7% of both indoor and indoor/outdoor) are spay/neutered. More than 75% of the manufactured home community households feed outdoor cats (compared to <15% for all other communities). However, it was not determined whether the cats they feed are outdoor cats they consider their own, or ones they consider not their own. Over half of the respondents think that the best way to help outdoor cats is to “fix” them (52.3%) while 25% think they should be removed. This finding was consistent among community types. For detailed results information, refer to **Appendix B**.

Cat Caregiver Interviews⁵

We identified a total of 22 people that provide care for feral/stray cats in or near the Hayden Island manufactured home community (and RV park). All of these caregivers live in the

³ A small percentage of feral/stray cats in the past were not ear-tipped by the veterinary clinics performing the surgeries.

⁴ <http://media.americanpetproducts.org/press.php?include=144262>

⁵ Caregiver cat # estimate, sterilization rate, and proportion of cats with ears tipped is reported elsewhere in this document and was used to adjust population estimates (see methodology section).

community except for one person that regularly comes from outside the community. We were able to interview 19 of the identified caregivers. On average, caregivers have been caring for feral/strays ever since they've lived in the community which ranged from <1 to >20 years. Typically, caregivers began caring for cats shortly after having moved into the manufactured home community when they realized that abandoned cats were on their property or next door. In most cases, caregivers report that the abandoned cats were left behind by former tenants of a nearby house. All of the caregivers that live in the manufactured home community provide food at their residence with the exception of one person that provides food at her home as well as at a home a few houses down the block (where a previous tenant had recently moved and left behind cats).

The average number of cats cared for by caregivers is 7.35 ± 4.1 SD and ranges from 2 to 15 cats. This estimate only includes cats that are regularly seen on a daily or near-daily basis. Most caregivers also report other cats that occasionally use their feeding station. Nine of 15⁶ caregivers (60%) owned pet cat(s) and of those, three owners had indoor-only cats.

Most caregivers feed cats once or twice a day (n=15) in the morning and/or evening. Two caregivers continually replenish food. The quantity of food provided ranges from <0.5 pounds to >8 pounds to per day and typically is a combination of dry and wet food. Of the 10 caregivers we specifically asked if they feed cat food to raccoons or other wildlife, two responded that they do intentionally, and eight responded that they try not to and will bring food inside at night if there is food remaining in the bowls.

Most caregivers (n=13) report that many of the stray/feral cats they provide for can get quite socialized and they can pet at least some of the cats. At least four of the caregivers say that some of the stray/feral cats have habituated enough with them that they will come into their homes and some will actually sleep in the same bed with the caregivers. Five caregivers reported they cannot touch the cats but the cats will let them get fairly close.

Road-based Cat Count Surveys

Almost all outdoor cats detected in the study area were detected in the manufactured home community with nearly 12 times as many cats than in the next highest land-use area (Fig. 3, Table 2). No outdoor cats were observed in the natural area. Overall, we detected significantly more cats during the daytime surveys compared to nighttime surveys (in the manufactured home community where we had a large enough sample) ($T=1.97$, $df=8$, $P=0.04$ Table 2).

⁶ We initially did not ask caregivers if they owned pet cats during the interview

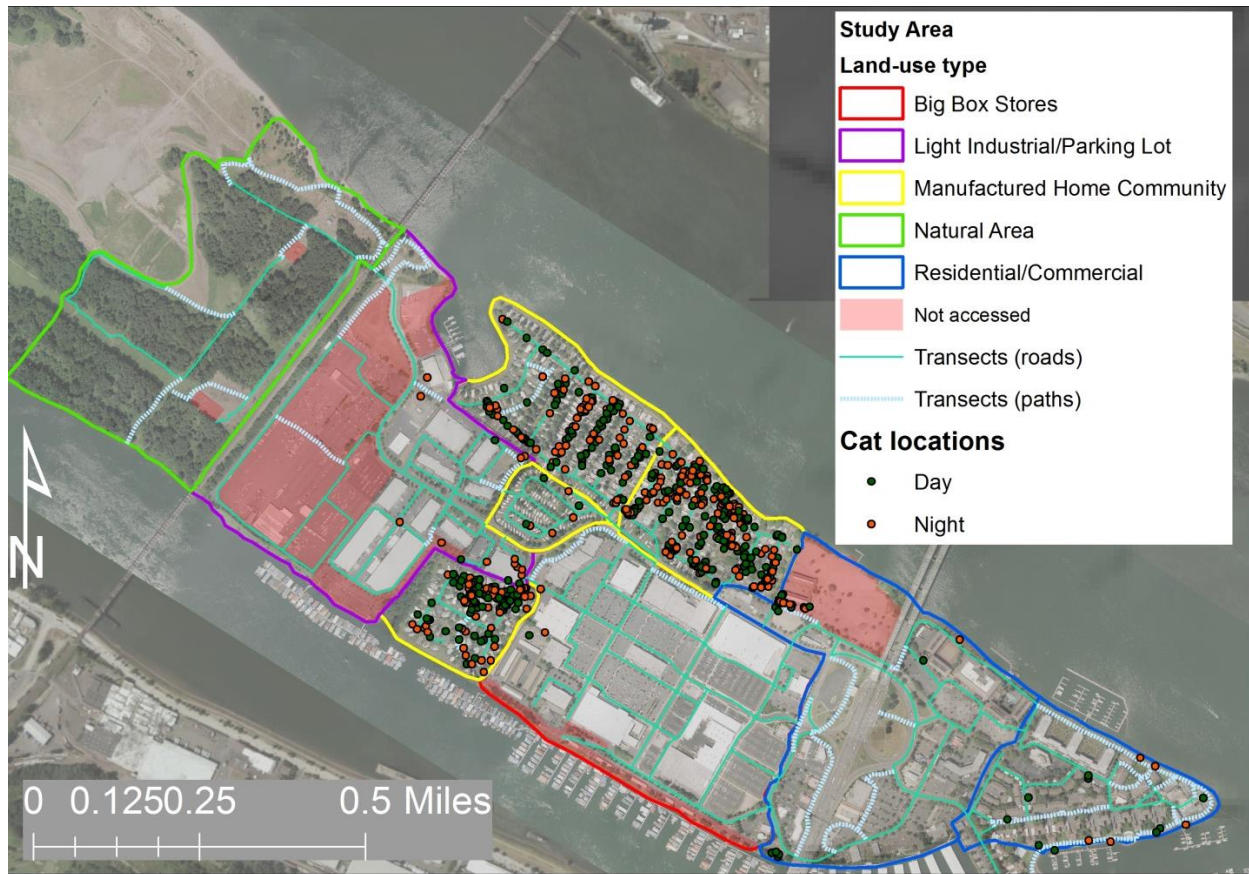


Figure 3. Locations of individual outdoor cats detected in each land-use area. Note: This figure depicts cumulative detections across the 3 surveys and so does not exclude recounted cats.

Table 2. Average number of outdoor cats per land-use area detected during the road-based cat surveys (this estimate is not corrected for owned outdoor cats or for detection rate).

Land-use area	Avg. # cats (\pm SD)	Avg. # cats (\pm SD)	cats/acre	cats/acre
	DAYTIME	NIGHTTIME	DAYTIME	NIGHTTIME
Manufac. Home	102.33 \pm 8.62	85.0 \pm 21.07	1.21	1.01
ResComm	8.67 \pm 3.51	5.0 \pm 1.73	0.08	0.05
LightIndustArea	0.67 \pm 1.15	4.0 \pm 1.0	0.01	0.08
BigBoxStores	0.33 \pm 0.58	0.67 \pm 1.15	0.00	0.01
NaturalArea	0	0	0.00	0.00

Sterilization rate

Based on the road-based count, we estimated sterilization rate of 27% during the daytime surveys and 22% during the nighttime surveys when compensating for owned cats and sterilized cats without a tipped ear (Fig. 4).

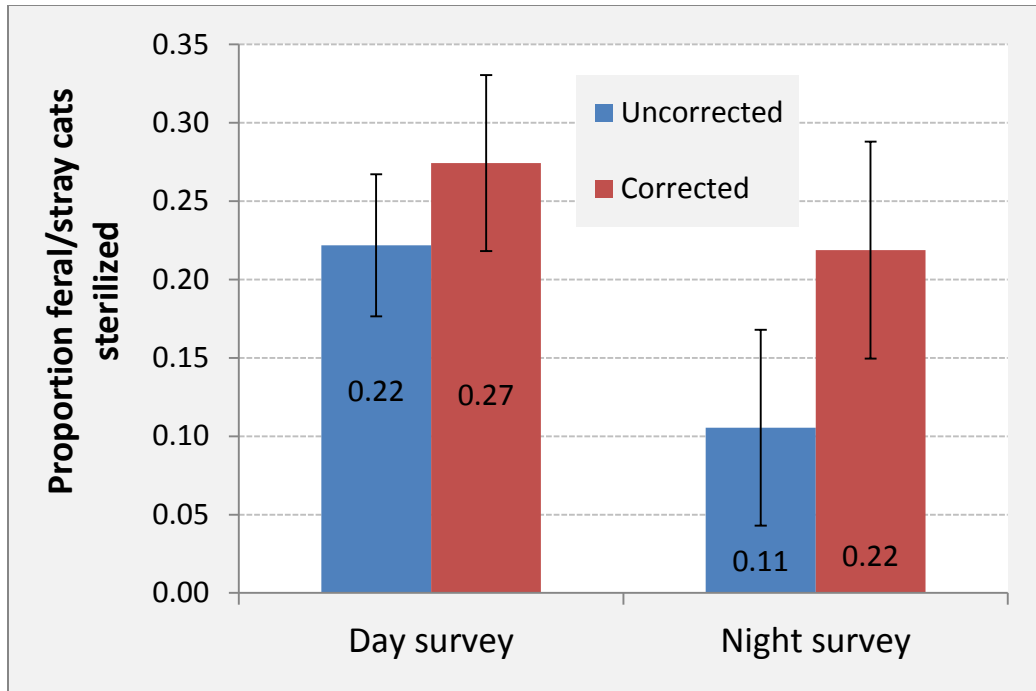


Figure 4. Estimated sterilization rate of outdoor cats on Hayden Island estimated during road-based surveys, September 2014. Corrected estimates exclude owned cats and include sterilized cats without a tipped ear.

In contrast, the cat caregivers that we interviewed estimated a sterilization rate of 75.9% (105 of the 139 cats reported). This large difference in sterilization rate estimates between the road-based count and the cat caregiver interviews is striking and could be the result of a number of issues. One significant factor could be that road surveyors may have mistakenly classified ear-tipped cats as not ear-tipped.

TNR effort

The FCCO has kept records on the spay/neuter effort of feral/stray cats on Hayden Island since October 2011. A total of 163 cats were received during this timeframe with 152 sterilized, nine were already sterilized, and 1 was euthanized. During the three full years of record keeping (2012-14) the average number of cats sterilized per year was 40.7 cats with a slight declining trend in number of cats fixed over that period (Fig. 5). All of these cats were from the manufactured home community. While we believe these records capture the bulk of the TNR effort on the island, we are working with Multnomah County Animal Services and a veterinary clinic to include their data in this estimate. We know they have spay/neutered a small number of Hayden Island feral/stray cats in recent years.

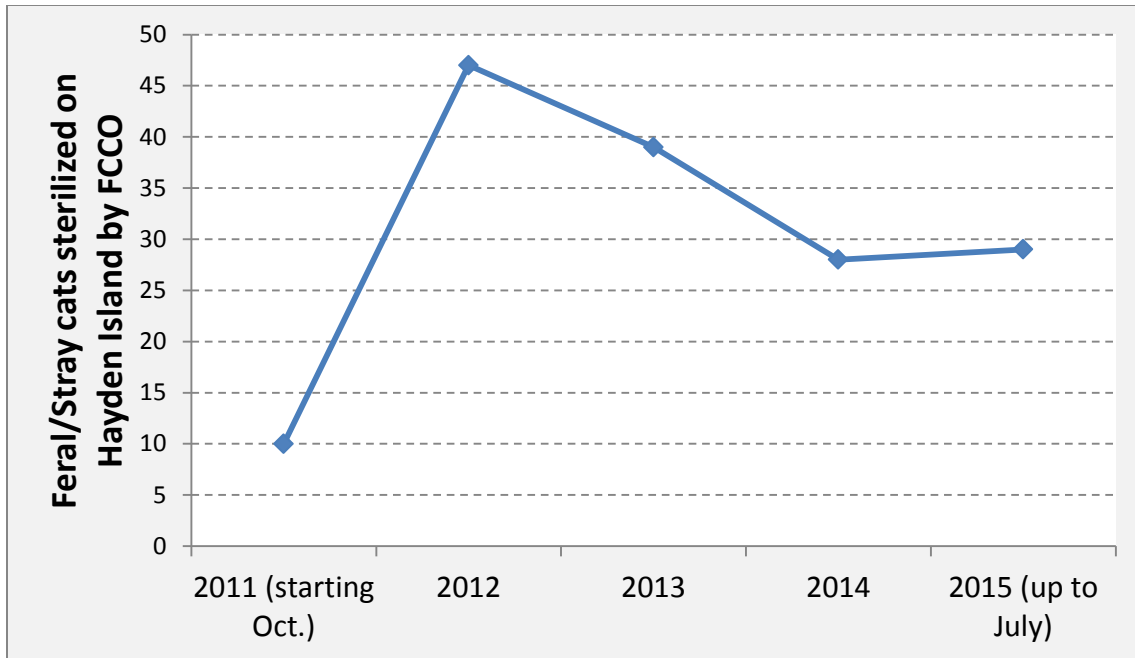


Figure 5. Number of feral/stray cats fixed by the Feral Cat Coalition of Oregon (FCCO) between Oct. 2011 and July 2015 within the study area on Hayden Island. Data provided courtesy of the FCCO.

Detection rate

We estimated detection rate probability for road-based surveys by dividing the road-based count data for the MHC3 plot divided by the number of feral/stray cats cat caregivers in MHC3 reported. We relegated this to the MHC3 plot since that is where we had the most comprehensive information on cat #'s from the caregivers. Our analysis indicated there were about twice as many stray/feral cats reported by caregivers compared to the number of outdoor cats detected during the road-based counts suggesting that about half the cat were missed by surveyors during the road-based surveys (Table 3).

Table 3. Detection rate estimate calculated road-based survey count data for the MHC3 plot (with suspected owned cats removed) divided by the number of feral/stray cats cat caregivers reported they care for.

Plot	survey	Day count	Night Count	Day Count (owned cats removed)	Night Count (owned cats removed)	Caregiver estimate	Day detectability	Nighttime detectability
MHC 3	1	36	24	30.4	20.3	86 ¹	0.485	0.472
MHC 3	2	51	64	46.0	57.7			
MHC 3	3	58	52	48.7	43.7			
Mean		48.3	46.7	41.7	40.6			

¹ For the 2 caregivers we did not interview, we used the average number of cats cared for by caregivers in MHC3.

Preliminary population estimate

Population size estimates varied from 171-234 feral/stray cats depending on day or night road-based cat counts (Table 4). There are many assumptions associated with these estimates so they should be interpreted cautiously. In the Discussion section we elaborate on the potential caveats associated with these estimates.

Table 4. Population size estimate for feral/stray cats within the study area and manufactured home community for fall 2014.

Location	Population estimate (\pm SD)	
	DAY	NIGHT
Study area	201.7 \pm 31.8	170.6 \pm 31.5
Manuf. home community ¹	182.0 \pm 22.1	152.3 \pm 29.0

¹Includes RV park

Discussion

The results of our questionnaire survey indicate that most residents on Hayden Island (within the study area) support non-lethal approaches as a way to manage feral and stray cats. This sentiment is shared among the different residential communities and not just in the manufactured home community where most of the feral/stray cats occur. The finding that most households in the manufactured home community feed outdoor cats points to a “culture” of cat caregiving in the area that is pervasive and perhaps has a long history. In order to develop effective solutions to cat overpopulation, it is clear the manufactured home community must be closely involved in the process. Toward this end, through this project’s activities and events, we are working with the Hayden Island residents to develop a community work group that will focus on resolving cat management issues.

Our cat count findings indicate that almost all outdoor cats in the study area are concentrated within the manufactured home community at a rate twelve-fold or higher than surrounding areas. This result is not surprising. Inflated feral cat numbers in this area is well acknowledged by many in the local community. Our repeated surveys suggest that, at least during the monitoring period, the cats remained largely within the manufactured home/RV community suggesting the cats tend to stay sedentary and do not disperse to adjacent areas. Our finding matches another study that documented stationary feeding sources reduced free-roaming cat’s ranges (Schmidt et al. 2007) although a similar study found no difference in home range size between feral cats experimentally provided food and those that were not (Haspell and Calhoun 1988). There appeared to be a slightly higher concentration of outdoor cat detections in MHC3 and in the northern portion of MHC2 compared to the rest of the manufactured home community (Fig. 3). This pattern overlies the areas with most of the known cat caregivers and could reflect cats staying near provided food sources.

Importantly, we did not detect any outdoor cats in the natural area study plot that borders the developed area. The natural area plot border is approximately 350m from the closest portion of the manufactured home community. Guitilla and Stapp (2010) documented wide-ranging movements of TNR cats on Catalina Island, California (up to 10km from TNR colonies) into natural areas. It is unclear from Guitilla and Stapp (2010) if the feral cats that were radio-tracked were provided a regular, fixed food source. Goltz et al (2008) found similarly large

home range sizes for feral cats in Hawaii. Both Catalina Island and Hawaii do not support wildlife that would prey on feral cats⁷. In contrast, it is possible that feral, stray and free roaming pet cats that do enter the Hayden Island natural area are suppressed by predators. Coyotes are common in the natural area and research by Gehrt et al (2013) has shown that cats in Chicago natural areas are quickly eliminated by coyotes.

The lack of cats in the natural area is notable since one of the concerns commonly raised about free roaming urban cat populations pertains to their impact on wildlife habitat. While there is certainly wildlife in the manufactured home community and other developed portions of the island, including resident and migrant birds and small and medium-sized mammals, the adjacent natural area that contained significant quality and acres of wildlife habitat was found to be devoid of cats. This reflects anecdotal data collected by Audubon Society of Portland that suggests that most complaints regarding feral, stray and free roaming pet cats are concentrated in neighborhoods and very rarely originate from natural areas.

It is possible our daytime surveys produced higher numbers of cats because of the darkness hindering the ability to visually detect cats. There is also the possibility that some cats (including stray and/or habituated feral cats) were let indoors at night (see cat caregiver interview results). This result contrasts with a study in Maui that found five times as many cats at night compared to daytime transect counts (Boone 2014). Boone (2014) suspected this difference in day and night counts in Hawaii could be attributable to differences in cat attendance influenced by feeding schedules (typically at dusk) and variability in physical obstructions (buildings, vegetation) limiting consistently good detection ability.

The disparity in sterilization rate estimates between the road survey and the cat caregiver estimates is striking with the road-survey based estimate one third of what the caregivers reported. Possible explanations include 1) road surveyor error: a significant number of cats may have been incorrectly categorized by road-based surveyors as “not ear tipped” when in actuality their ears were tipped. Although we stressed to only count cats as “ear-tipped” or “not ear-tipped” if they had a very good view (and classify all others as “unknown”), the reality is that it can be very difficult (particularly without optical equipment) to determine whether a cat is ear-tipped from close range in some instances – when a cat has only had a small amount of ear removed and/or long-haired cat. We did document a slightly lower sterilization rate at night indicating visual difficulties; 2) A significant number of free-roaming owned cats did not have collars so the procedure we used for subtracting out roaming owned cats (i.e. cats with collars) provided a biased estimate; 3) cat caregiver error: caregivers may have overestimated the number of cats they feed as fixed or not but the error with this is less likely because most cats were ear-tipped and cat caregivers typically can get very close to these cats. Also, in many cases, cat caregivers either helped trap cats for sterilization or had someone do it for them so they have direct knowledge specific cats were fixed; 4) The caregiver estimates reflect the cats that they are feeding specifically but we are counting a much broader sample in the road-based surveys; and 5) Also possible some combination of the points above led to the large difference in estimates. We did attempt to take photos of as many cats as possible during the road-based surveys. However, the ability to determine ear-mark status is difficult on many of the photos.

⁷ The only canid (other than domestic dogs) that occur on Catalina Island is the diminutive Santa Catalina Island fox (*Urocyon littoralis catalinae*) that mostly consumes deer mice (Cypher et al. 2014).

Efforts to sterilize feral/stray cats on Hayden Island have been consistent since at least 2012 according to records kept by the FCCO. The slight decline in the number of cats sterilized in the study area during this time frame is not believed to be related to a lack of effort. Rather, this trend likely indicates that remaining unfixed cats on the island are less numerous and so more effort is required to trap and fix remaining unfixed cats.

While we present a preliminary population estimate we want to be clear that this estimate (and the detection rate estimate) should be interpreted with caution as there were a number of potential sources of estimation error including the points mentioned in the previous paragraph plus: 1) recounting of the same individual cats on a given survey (although we believe we controlled for this adequately in our study design) and 2) differences in detectability among land-use types (e.g. thick understory in parts of the natural area, buildings and other human structures in developed areas). Despite these potential biases, it is acceptable to use raw standardized counts over time for analyzing trends. If data is collected using the same techniques under the same conditions year after year, reliable population trend information can be obtained. The population size estimate provides useful insight for other purposes, including the projection of timelines for population declines and other factors.

Specific ways we will improve data quality on the road-based surveys include:

- More rigorously train volunteers to more accurately determine ear-mark status. This would entail, increased effort to get good looks at ear tips using binoculars (be sure at least 2 volunteers / survey party is proficient using binoculars), or approaching cats more closely if possible.
- Eliminate night surveys: our first year effort indicated fewer cats detected during the night surveys. This will eliminate any problem due to diminished visibility.
- Use a double-sampling method during road-based surveys to determine a classification error rate in correctly identifying ear-tipped cats and use this to estimate a more accurate sterilization rate.
- Explore other methods for estimating feral cat detection rate and population size. Bengsen et al. (2011) found that use of remote cameras can provide robust feral cat population estimates. However such an investment would require additional funding, personnel time and the danger of theft or vandalism of deployed cameras is likely high.

Next Steps

Over the next five years we will continue to monitor free-roaming cat populations on Hayden Island on an annual basis using the road-based monitoring technique. We will use the results of the 2014 road surveys as a baseline with which to compare changes in free-roaming cat populations over time. We will also continue to periodically conduct interviews with cat caregivers (follow-up interviews with those previously interviewed as well as new interviews) and conduct surveys of the residents of the island regarding cat ownership patterns and attitudes regarding cat management on the island.

During this same time period we will work with partners including the FCCO, Multnomah County Animal Services and the local community to expand existing non-lethal strategies and add new non-lethal strategies to reduce the number of free-roaming cats on the island. Strategies will include TNR, cat adoption programs, education and outreach. Once we refine our sterilization estimate we will aim to set sterilization rate benchmarks to help guide TNR effort

on an annual basis. The ultimate goal of this effort is to demonstrate a decline in free-roaming cat populations on the island over time.

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Appendix A. Hayden Island Cat Survey Questionnaire

The purpose of this survey is to help determine the number of cats living on Hayden Island. You are being asked to participate because you live on the island. Even if you do not care for or own any cats, your responses are important as they will help inform the efforts of the **Audubon Society of Portland and the Feral Cat Coalition of Oregon** in monitoring free-roaming cats. (For more information about the project, please visit <http://www.feralcats.com/haydenisland.html>) Information collected will only be used for this project and will not be shared with other organizations. Please call 971-222-6111 if you have any questions or need assistance completing the survey (M-F 9am-5pm). Your help completing this survey is greatly appreciated.



As a bonus, all completed surveys will be entered into a drawing to **win a \$100 Visa Cash Card**. Return your survey in the postage-paid envelope by January 31, 2015 to be included.

1. Pet Cats

Number of cats that are your pets (not counting outdoor cats you feed) _____

Number of these cats that are spayed/neutered _____

Number of these cats that are indoor-only _____

Number of these cats who are indoor/outdoor _____

Number of cats who are less than 6 months of age _____



2. Outdoor-only Cats

Number of outdoor cats you feed _____

Number of these cats you know are spayed/neutered _____

Number that are less than 6 months of age _____

Number of cats you consider feral or untamed _____

3. Where did you get your cat(s). Circle all that apply:

a. Found as stray b. Born at my home c. Given by friend/relative d. From a shelter e. From a pet store

f. From a breeder g. Tamed a feral cat h. Other: _____

4. Do you see cats outside in your neighborhood? Y or N

If yes, what cat related behavior have you personally experienced? (Circle all that apply)

- a. Smelled cat urine b. Saw kittens in the wild c. Heard noise from cats fighting d. Saw cats crossing streets
- e. Saw cats hunting wildlife f. None g. Other _____

5. What do you think should be done to help outdoor cats? (Circle all that apply)

- a. Have them "fixed" b. Have them removed c. Nothing d. Other _____

If you want to be in the drawing for the \$100 Visa Cash Card please complete the following:

Name: _____

Phone: _____ Email: _____

I want to receive email updates about the Hayden Island Cat Project

Your personal contact information will not be shared with any other organization.



Feralcats.com



Audubonportland.com

Thank you!

**Appendix B. Hayden Island Cat Ownership / Attitudes
Questionnaire Survey - Summary Findings Report**

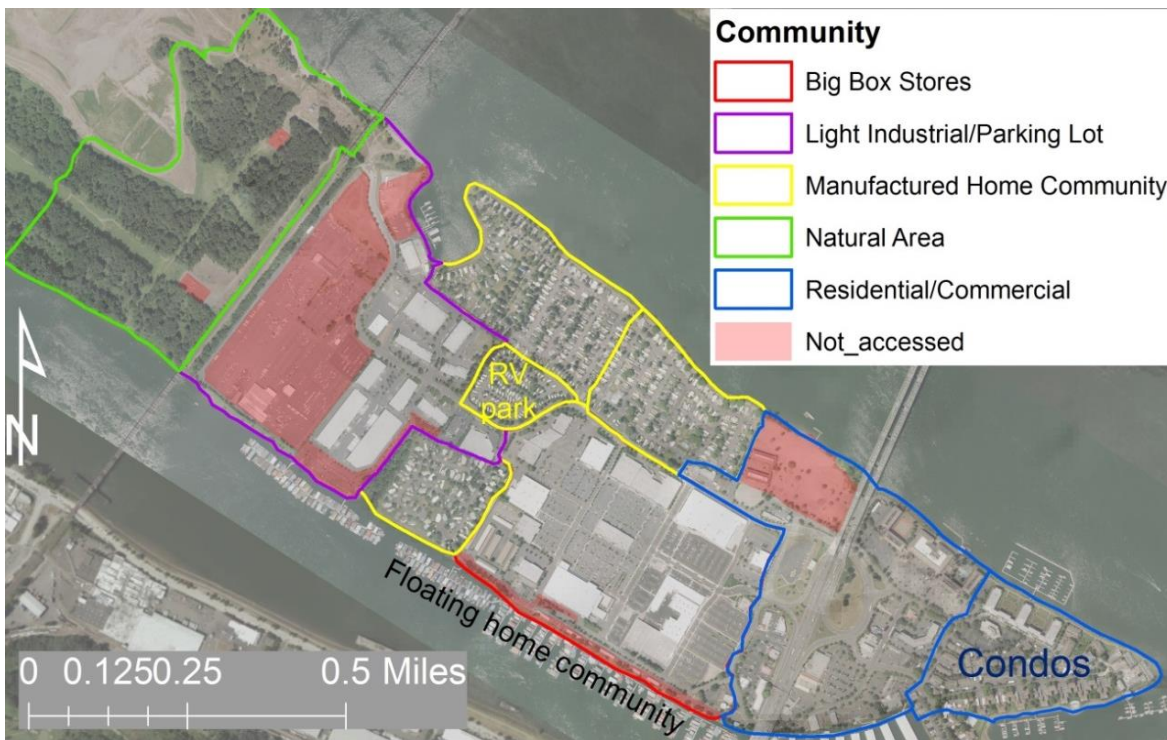


Hayden Island Cat Ownership / Attitudes
Questionnaire Survey
Summary Findings Report
March 2015

Background: The Audubon Society of Portland and the Feral Cat Coalition of Oregon are working with the Hayden Island community to humanely reduce the feral/stray cat population on the island. As part of this project (the “Hayden Island Cat Project”⁸) we developed a survey to better understand cat ownership and solutions the community would like to see considered in helping outdoor cats. The survey was distributed between 19 Dec. 2014 and 10 Jan. 2015. Results of the survey are reported here.

Methodology:

- We provided surveys to all household units within the portion of the island where we focus Hayden Island Cat Project activities (see map below).
- Approximately 1,199 surveys were distributed using four methods:
 - left on doorknob (n=930).
 - distributed by condo representative (Hayden Bay Condos) (n=18).
 - Included in packet and mailed to residents (floating home community) (n=177).
 - On-line survey (Waterside Condos) (n=74).
- Paper surveys were color-coded per community type (Condos, Floating home community, Manufactured Home Community, and RV Park).
- This report contains both a summary of results, as well as results segmented by the community type.



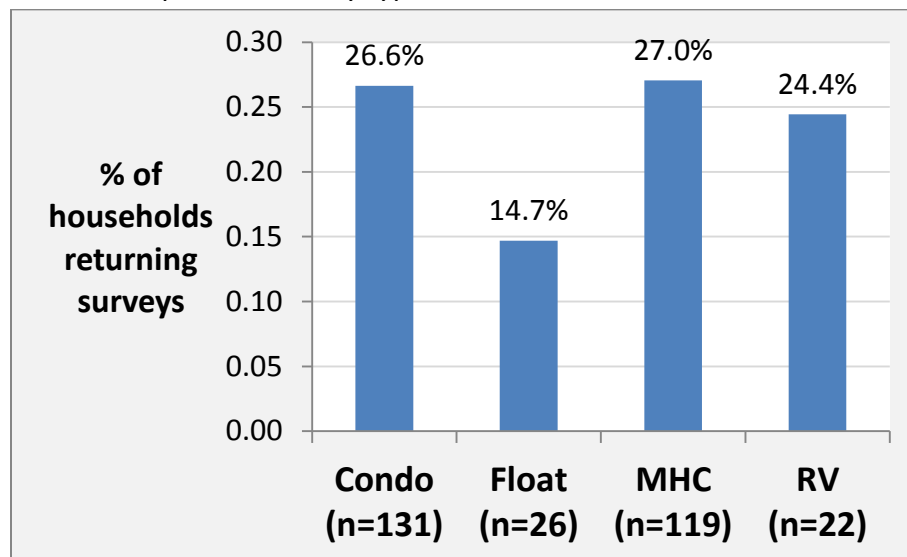
Study site map

⁸ For full project description visit <http://audubonportland.org/issues/hazards/cats/hayden>

Survey response:

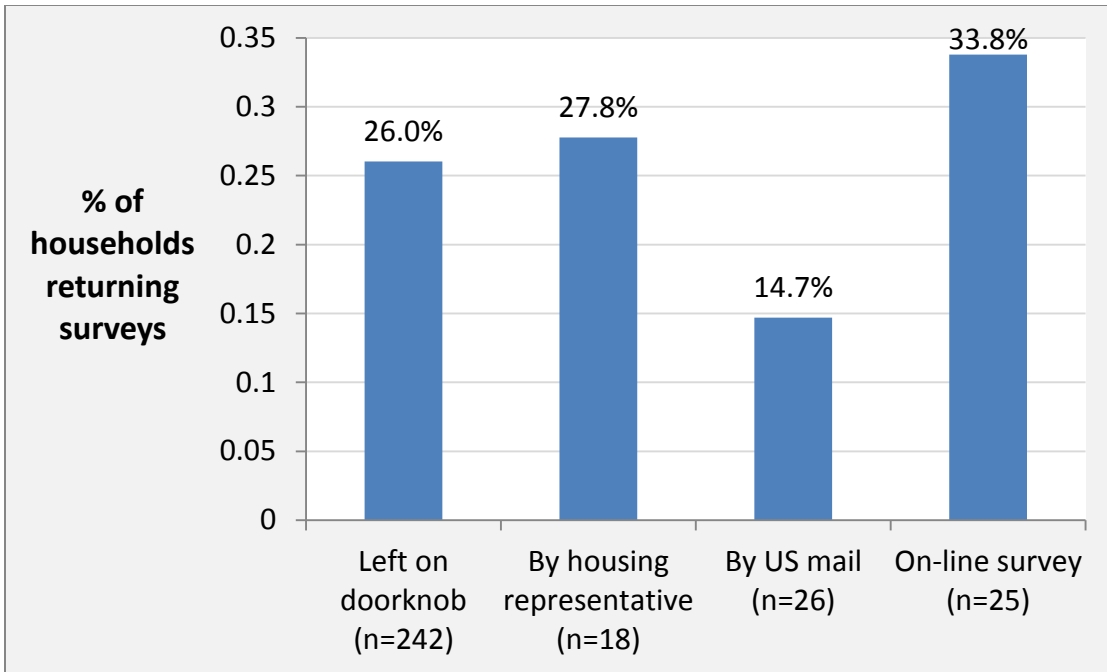
We received a total of 298 completed surveys (out of 1199) ~ a **24.9% return rate**. The return rate for this survey was above average - typical survey response rate falls between depending on distribution method 10-20%. (Dillman 2007⁹).

Return rate per community type:



Return rate per survey distribution method:

⁹ Dillman, D. 2007. *Mail and Internet Surveys: The Tailored Design Method, second edition*, [Eds.] John Wiley & Sons, Inc. Hoboken, NJ.

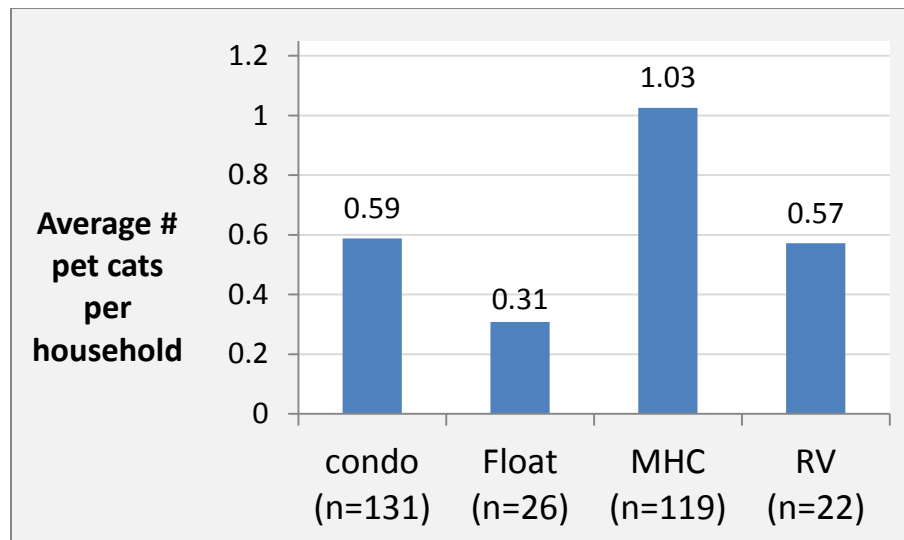
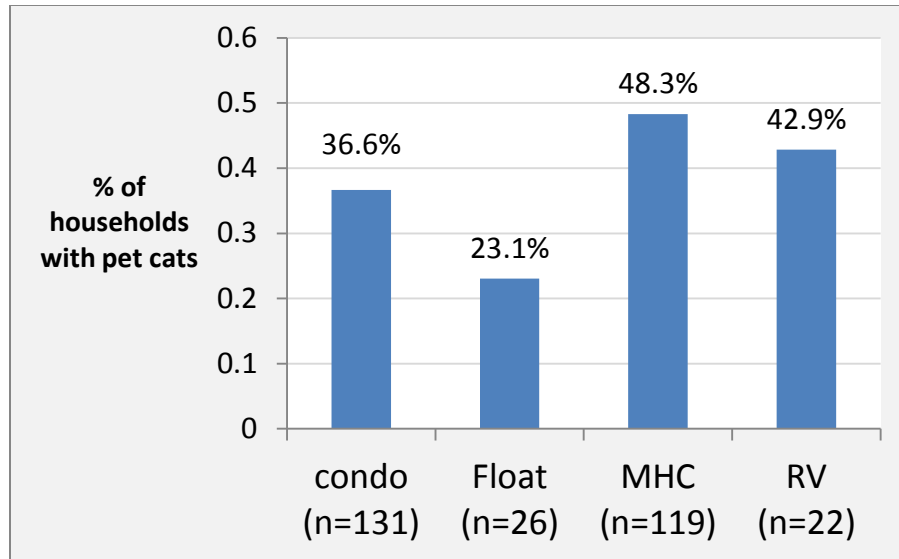


Questions 1a through 1e pertain to “owned” pet cats

Question 1a. Number of cats that are your pets (not counting outdoor cats you feed)

Raw data summary: Community type vs. number of pet cats per household

Community	0 cats	1 cat	2 cats	3-5 cats	>5 cats	TOTAL
Condo	83	25	19	4	0	131
Float	20	4	2	0	0	26
MHC	61	26	17	10	5	119
RV	12	7	3	0	0	22
TOTAL	176	62	41	14	5	298



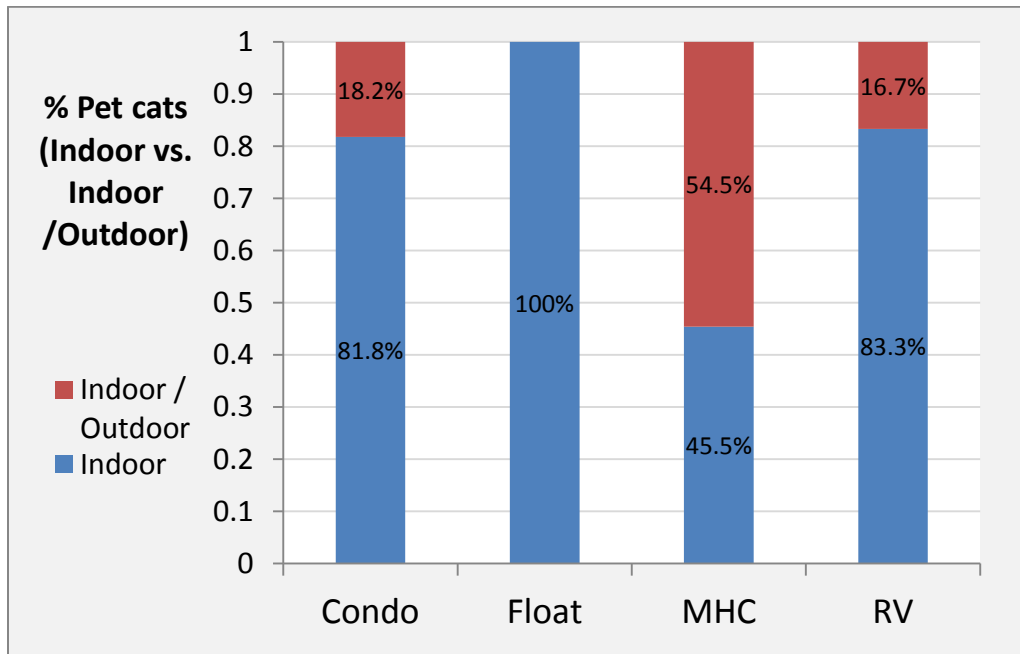
Question 1b. Number of these cats that are spay/neutered

- Respondents reported an average of **98.7%** spay/neuter rate for pet cats

Pet spay/neuter rate per community type:

Community	Total # of pet cats	# of pet cats NOT spay/neutered	% spay/neuter
Condo	77	2	97.4
Float	8	0	100.0
MHC	121	3	97.5
RV	12	0	100.0

Question 1c & 1d. Number of these cats that are indoor-only & Number of these cats who are indoor/outdoor

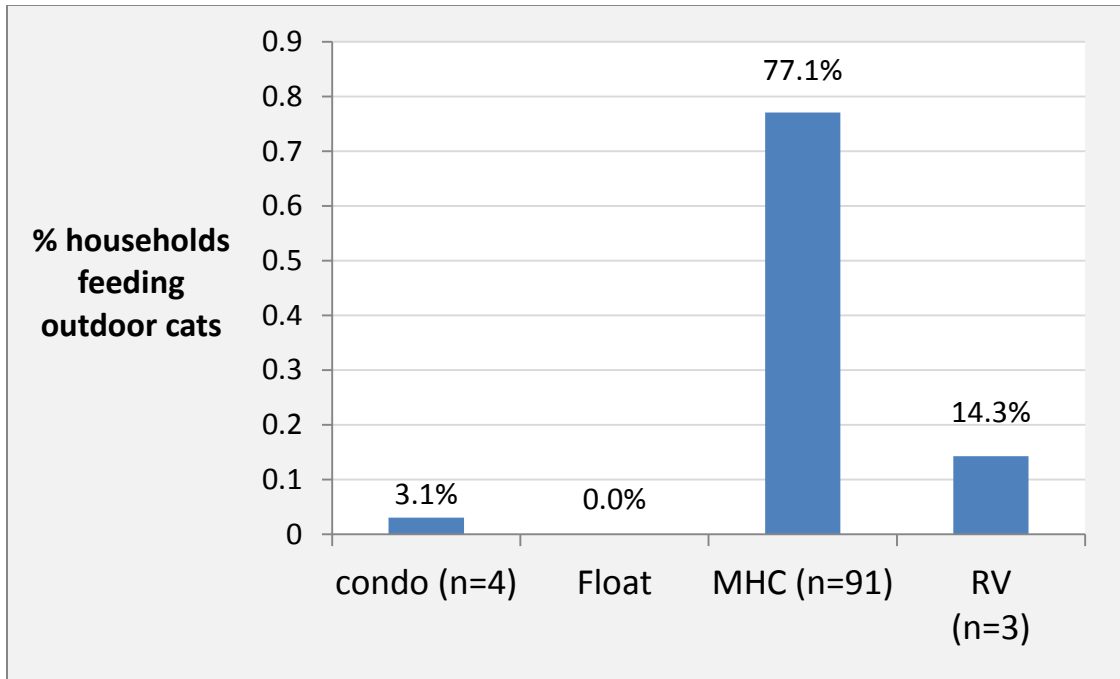


Question 1e. Number of pet cats who are less than 6 months of age

Community	Total # of pet cats	Total # kittens	% kittens
Condo	77	2	2.6
Float	8	0	0.0
MHC	121	2	1.7
RV	12	0	0.0

Questions 2a through 2d pertain to outdoor cats only

Question 2a. Number of outdoor cats you feed



Question 2b. Number of these cats you know are spayed/neutered

- Respondents reported an average of **49%** spay/neuter rate for outdoor cats they feed.

Outdoor cat spay/neuter rate per community type:

Community	Total # of outdoor cats	Total # of outdoor cats NOT fixed	% cat fixed
condo	4	4	0
Float	0	0	n/a
MHC	91	44	51.6
RV	3	2	33.3

* Eight respondents (8.1%) indicated they did not know if the cats were fixed.

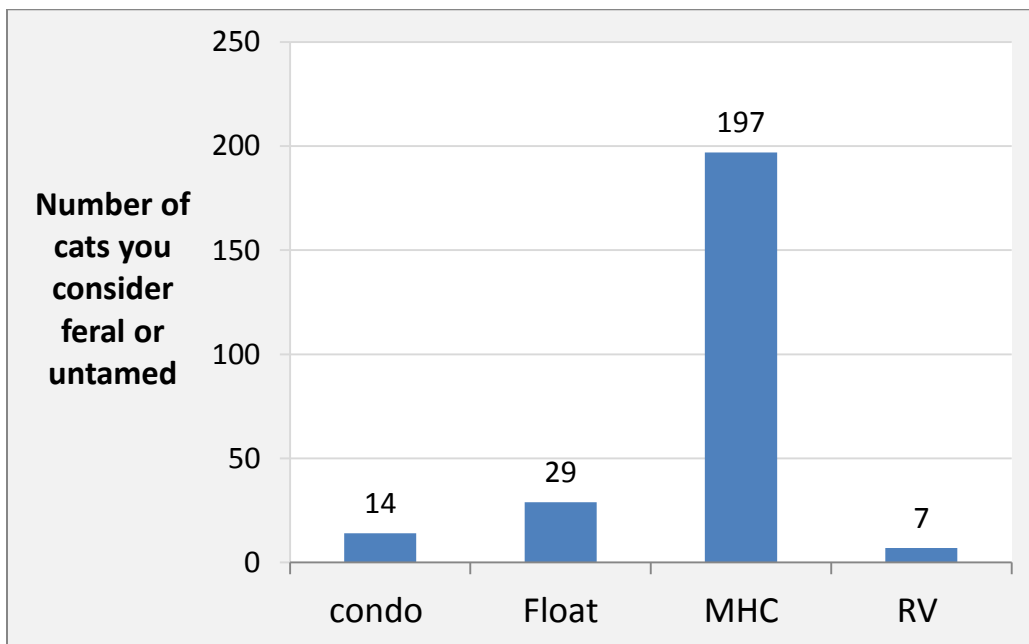
Question 2c. Number of outdoor cats less than 6 months in age

Community	Total # of outdoor cats	Total # of kittens	% kittens
Condo	4	0	0.0

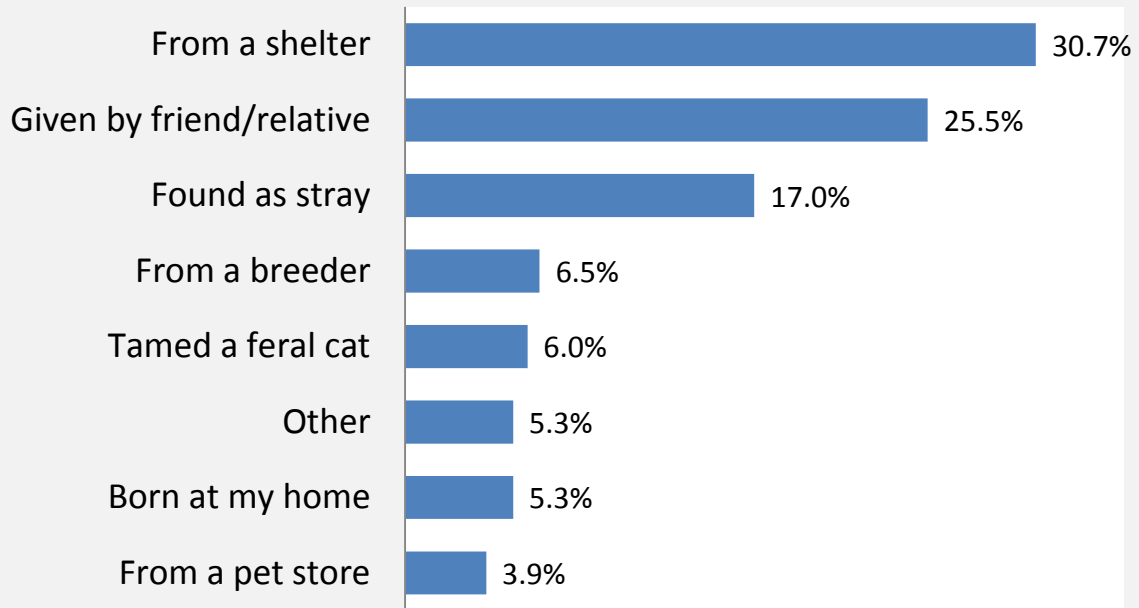
Float	0	0	n/a
MHC	91	5	5.5
RV	3	0	0.0

* Four respondents (4.1%) indicated they did not know age of the cats.

Question 2d. Number of cats you consider feral or untamed



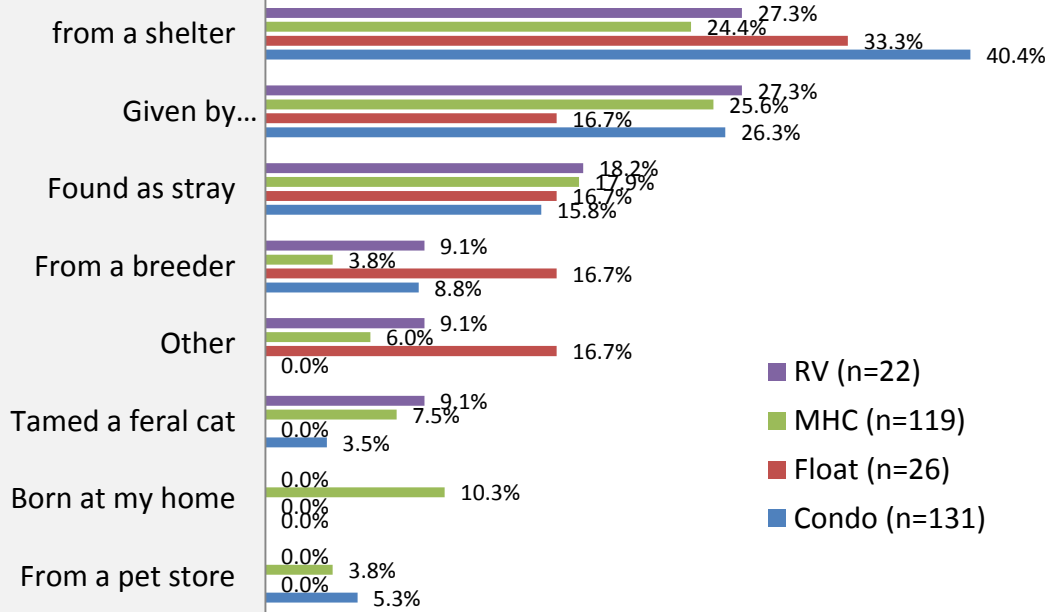
Question 3: Where did you get your cat?



Note: respondents could select more than 1 response. This graph pools all responses together.

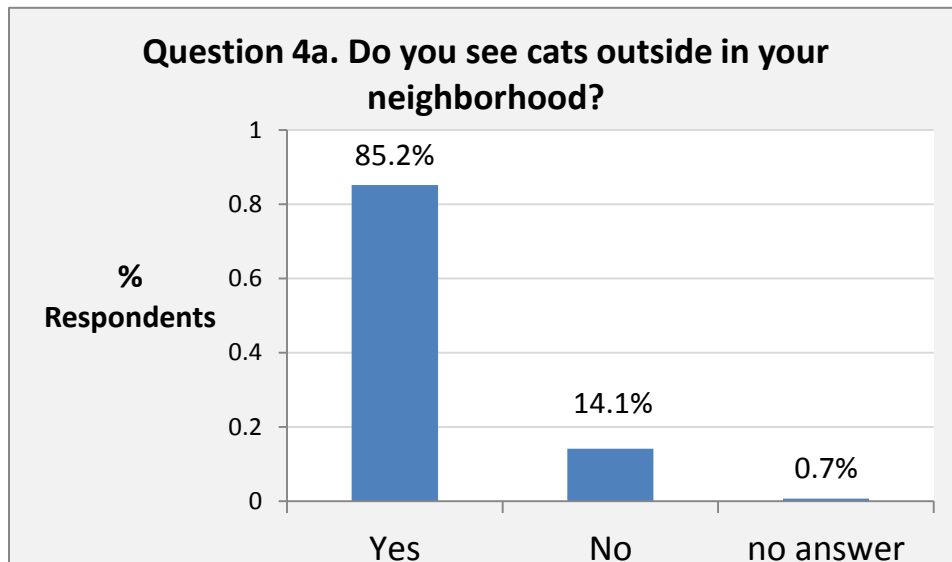
“Other” category included: craigslist (n=3), left by neighbor (n=1), rescued from bad home/situation (n=3), from a vet (n=1), street given a box of kittens (n=1).

Segmented data:



Question 3: Where did you get your cat? (continued) – raw data summary

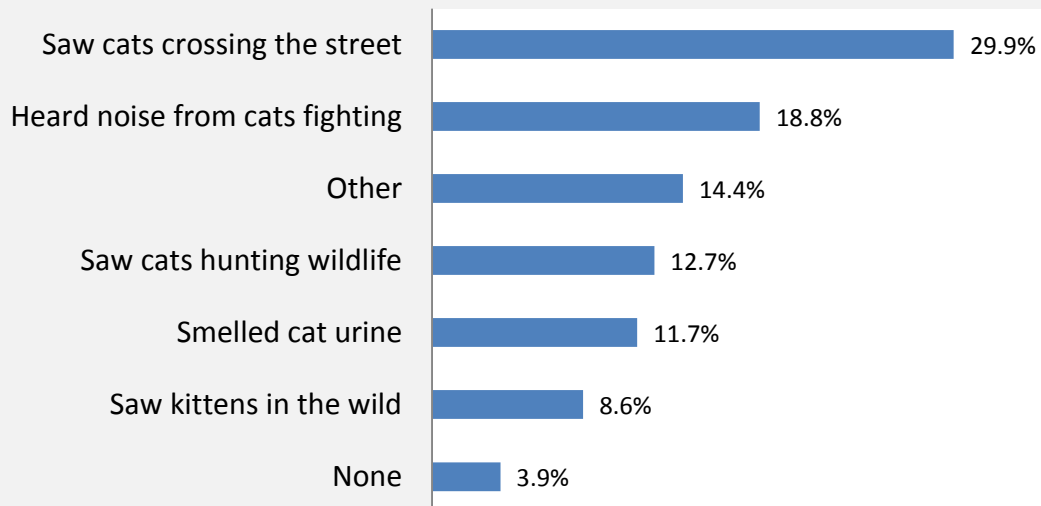
	Condo	Float	MHC	RV	TOTAL
From a shelter	23	2	19	3	47
Given by friend/relative	15	1	20	3	39
Found as stray	9	1	14	2	26
From a breeder	5	1	3	1	10
Tamed a feral cat	2	0	6	1	9
Born at my home	0	0	8	0	8
Other	0	1	5	1	7
From a pet store	3	0	3	0	6
TOTAL	19	3	39	5	66



Raw data summary

Community	Yes	No
Condo	91	39
Float	24	1
MHC	118	0
RV	20	1

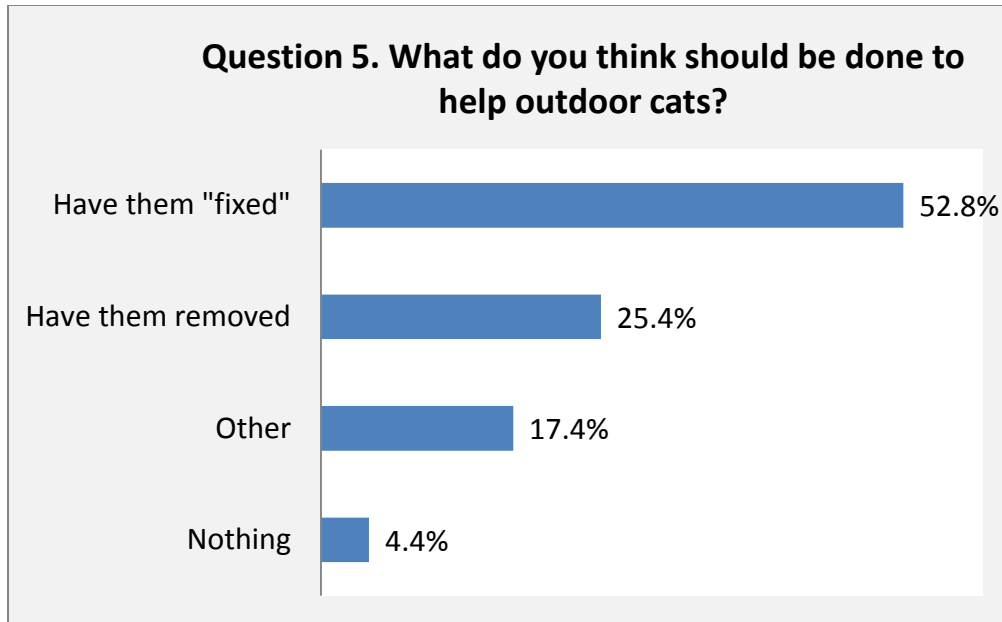
Question 4b: If yes, what cat related behavior have you personally experienced?



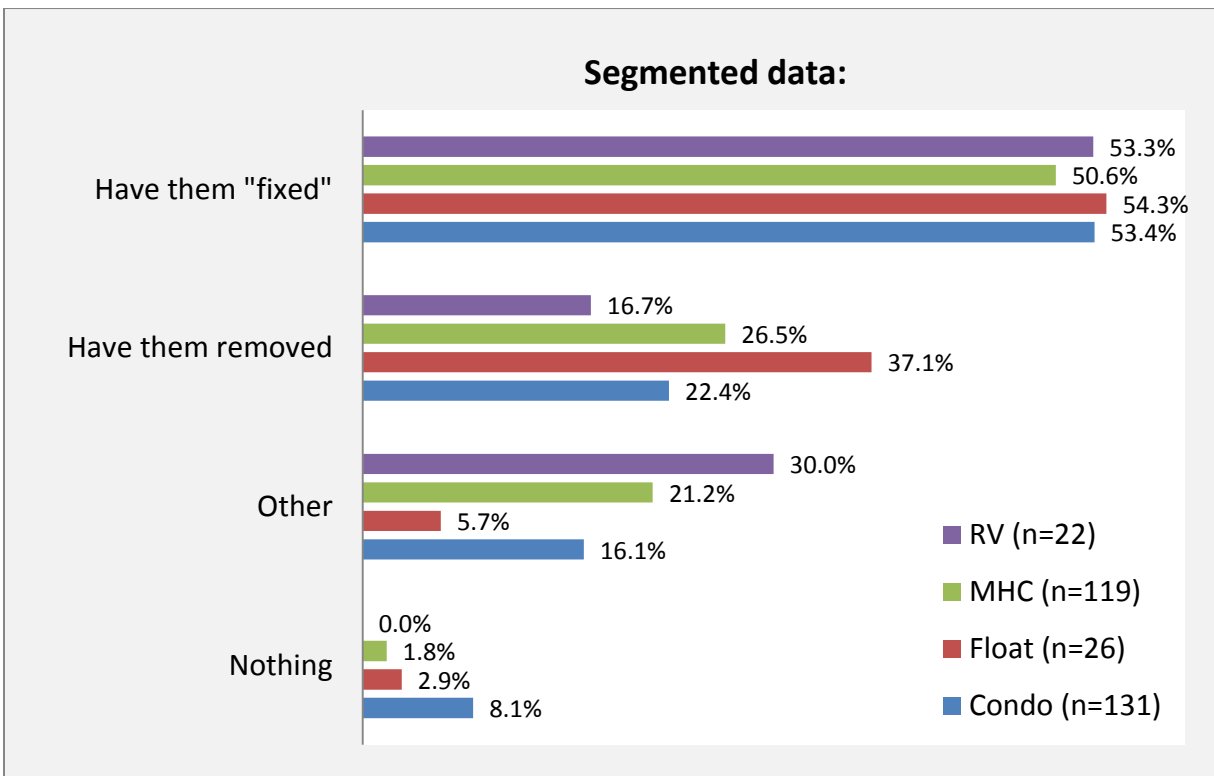
Note: respondents could select more than 1 response. This graph pools all responses together. **“Other” category included:** cat seen resting or walking outside (but not in street) (n=26), Evidence of cat poop/digging/spraying/scratching on property (n=23), neighbors cats outside (n=15), Hear cats crying/meowing (n=4), seen being fed (n=5), seldom see cats (n=3), mother with kittens (n=2), saw squirrel chasing cat (n=1), cat eating at dumpster (n=1), feral colony across street (n=1), saw cat hit by car (n=1), saw dead squirrels/birds under unit (n=1), playing with squirrels (n=1), sick cat in street (n=1), cat knocked over bird feeder (n=1)

Raw data summary

	Condo	Float	MHC	RV	TOTAL
Saw cats crossing the street	45	12	109	17	183
Heard noise from cats fighting	22	8	76	9	115
Other	34	5	42	7	88
Saw cats hunting wildlife	17	12	40	9	78
Smelled cat urine	5	8	54	5	72
Saw kittens in the wild	1	10	42	0	53
None	18	3	3	0	24
TOTAL	24	21	99	5	149



Note: respondents could select more than 1 response. This graph pools all responses together. **"Other" category included:** Rescue/adopt/find homes (n=26), Fix but provide food, shelter, and/or medical attention (n=10), take to shelter (n=6), set up regulations (e.g. fine people who leave cats) (n=5), should be inside (n=4), euthanize (n=4), provide free spay/medical attn. (n=3), remove but do not euthanize (n=2), didn't know it was a problem (n=1), don't know what to do (n=1), people need to be more responsible (n=1), landowners need to be cooperative (n=1), educate residents (n=1)



Conclusions:

- Approximately 38% of households have pet cats
- Respondents report nearly all pet cats (98.7% of both indoor and indoor/ outdoor) are spay/neutered
- Of the four communities, most have indoor cats except for the manufactured home community where indoor/outdoor cats make up the majority of pet cats
- Percentage of kittens (both pets and outdoor cats) reported by respondents was low (<6%)
- More than 75% of the manufactured home community households feed outdoor cats (compared to <15% for all other communities)
- Respondents' reported 49% of the outdoor cats they feed are spay/neutered.
- Most respondents got their cats from a shelter or friend/relative (56.6%) while 22% found a stray or tamed a feral cat.
- The most common cat behaviors witnessed by respondents included cats being seen in the street and noise from fighting cats (48.7%)
- Over half of the respondents think that the best way to help outdoor cats is to "fix" them (52.3%) while 25% think they should be removed. This finding was consistent among community types.
- Of the 54 respondents that chose "have cats fixed" **AND** "removed", 7 of 10 people commented that the cats should be rehomed or sent to a shelter, 2 others recommended euthanizing, and 1 said they must be kept indoors after being fixed.

Potential sources of bias

- This survey represents information and opinions of the 25% of the study area population that were solicited and completed the survey. It does not take into consideration those who did not respond.
- Sampling error in this survey was kept at a minimum since all households in the study area were provided with a survey.
- There was the potential of non-response error in this survey which is the result of people who respond to a survey being different from sampled individuals who did not respond. In this case, likelihood of someone completing a survey may be related to those who care and don't care for cats due to perceived survey content. However, most people that completed the survey did not own pet cats suggesting that this source of bias may have been low.
- Measurement error, the degree to which a survey statistic differs from its "true" value (e.g. poor question wording), was a definite possibility in this survey for a few questions.

Acknowledgments

We thank Jill Mosteller, PhD and cat/dog researcher John Boone, PhD for their input into the development of the survey and for reviewing an earlier draft of this report. We thank the Audubon Society of Portland and Feral Cat Coalition of Oregon volunteers that helped distribute the door hanger surveys as well as Stefan Karlic of Feral Cat Resources. We thank Audubon volunteer Daisy Franzini for entering and proofing the data.

Appendix C. Cat caregiver interview questions

Name:

Date:

Address (including house #):

1. For how long have you been feeding cats on Hayden Island & why did you start doing it?
2. Where do you provide food (at your residence?, somewhere else?)?
3. Currently, how many feral cats do you feed?
 - a. Do you feed cats in more than 1 location? If so, how many cats per location?
 - b. Are the cats clumped in a “colony” or more widely dispersed?
 - c. Can you describe each cat individually (color, age, name)?
4. When/how often do you feed them (# times /day: ___; morn, afternoon, night)
5. How much food do you provide?
6. How many are spay/neutered & who provided the service?
7. Are the sterilized cats ear tipped? Which ear?
8. How socialized are the cats (i.e. how close can you approach, can you pet them)?
9. Do any of the feral cats you provide care for have collars? If so, how many?
10. Do you feed other wildlife? If so, what else?
11. Do you know anyone else that feeds feral/stray cats? Can you tell us who they are?

Appendix D. Hayden Island free-roaming cat survey protocol



Cat with tipped right ear. Photo courtesy of FCCO

Purpose: To develop a baseline estimate of the feral cat population on Hayden Island and to monitor the population trend annually as “Trap-Neuter-Return” and other humane methods are used to reduce the population.

Survey objectives:

5. Estimate the proportion of outdoor pet cats versus feral cats based on presence/absence of ear tip, body condition, sociality, and presence of collar.
6. Estimate feral cat sterilization rates at the study site and compare to sterilization record rates reported by cat colony caretakers
7. Estimate feral cat detection probability by comparing survey data with cat colony caretaker information.
8. Examine patterns of cat distribution relative to established feeding areas
9. Derive preliminary population size estimates for outdoor cats within the study site and in each land-use area.

Study Area: The developed portion of Hayden Island (except for far eastern section of island) as well as adjacent undeveloped area. For the purposes of this project we have divided Hayden

Island into five land-use areas: **1) Natural Area, 2) Light Industrial; 3) Manufactured Home Community; 4) Box Store; and 5) Residential/Commercial.** Two of the land-use areas (Manufactured Home Community & Residential/Commercial) have been further subdivided into “plots” to facilitate sampling logistics. **In 2015 we will survey in all eight land-use areas/plots** (See **Attachment 1** for overall site map).

What to bring (everything below will be provided by the Project unless noted):

- Yellow vest - all volunteers must wear these when conducting surveys
- Clipboard
- Binoculars (if you don't have your own, Audubon may be able to lend you one)
- Smart phone or camera (your own)
- Data form and plot maps
- Pen or pencil (your own)
- Colored medium tip marker
- Cat Safe at Home & Hayden Island Cat Project Brochures
- GPS (optional) – if you have a GPS, you can use it to record cat locations otherwise just marking cat locations on the provided map is fine

Frequency & timing of surveys:

- Conduct surveys on all transects (i.e. roads/paths) within each of the eight land-use areas / plots **three times** during the month of September. See **Attachment 2** for sample schedule.
- Each survey should begin in the late afternoon (approximately 5pm) and finish before it starts to get dark. Surveys typically take between 1-3 hours depending on the plot and cat activity.

Field methods:

- We will **work in groups of 2 or more** for each survey. One observer will be the primary cat counter while the other observers will focus on recording data, navigate (i.e. make sure the team covers all roads/paths within the plot), outreach / provide brochures if a member of the public is encountered, and take photos of cats. It's OK to take turns in each of these roles during a given survey.
- Complete the top section of the data form before starting. This information includes:
 - **Plot name** (e.g. Manufactured Home Comm. #1)
 - **Date**
 - **Visit #: 1, 2, or 3**
 - **First & last name of each observer**
 - **Start time**
- To conduct the survey, start at one corner of your assigned plot and walk at a slow pace along the road (use sidewalk – either side of road is fine) or foot path, slowly working your way through all the roads in the plot. Try to minimize back-tracking on sections of the road/path you already covered, but inevitably you'll have to do some back-tracking.

Do not count cats when you are back-tracking. Resume counting when get back to a portion of the road/path that has not been surveyed.

- As you go along, use a colored marker to periodically draw over the portion of the road network on the map that you've already covered
- When you encounter a cat, mark its location on the provided plot map as accurately as possible (or in GPS) and on the data sheet record the following information:
 - **Cat #** (number sequentially; e.g. the first cat you see will be "1")
 - **On map?:** write an "X" to confirm you've recorded the cat location on the map.
 - **Mark/ear:** record **T**=tipped, **I**=intact, **U**=unknown; and which ear is tipped: **L**=left ear, **R**=right ear (should be right ear as that is the standard for vets)
 - **Collar?:** **Y, N, or U** (unknown)
 - **Age:** **A**=adult (>6 months); **J**=juvenile (betw. 2-6 months); **K**=kitten (<6 months); **U**=unknown
 - **Pregnant?:** **Y, N, or U** (unknown)
 - **Social?:** **Y**=if cat exhibited behavior indicating it was tame/friendly; **N**=cat ran way, avoided you, **U**=unable to determine
 - **Body Condition:** **H** = healthy, **U**=unhealthy, **N**=not determined
 - "Unhealthy" cats will show signs of 1 or more of the following traits: loss of fur, notable wounds, visibly malnourished, etc.
 - **Cat description:** color, fur length, distinguishing marks
 - **Photo taken? Y or N**
- Most cats will be detected visually but you can also count cats you hear if you believe they are ones you haven't counted yet.
- If you have any doubt in recording any of the information on the data form, **please leave blank** – better to be conservative than to make guesses)
- See **Attachment #3** for example data recorded onto a data form and plot map
- **Do not record the same cat twice** during a given survey
- **Use binoculars** to help collect data - particularly helpful for ear tip
- After the survey, remember to **record the stop time** of the survey on the data form.

Submitting data forms/maps:

- Please provide the completed data forms and corresponding marked plot maps for each survey to Joe Liebezeit. If you don't get the chance to hand the forms to Joe in person, you can scan and send to his email (jliebezeit@audubonportland.org). You can also mail to Joe at 5151 NW Cornell Road, Portland, OR 97210.
- For any photos taken of cats, please label the photos as follows: "**Cat#_PlotID_Date**". For example Cat#3, detected on mobile home comm. plot#1, on Sept 27 would be labelled: "**Cat3_MHC1_9.27**".
- Please feel free to call Joe with any questions about the protocol, survey logistics, at his office phone: **971-222-6121** or cell phone **503-329-6026**.

Communication with the public:

While conducting surveys you will likely encounter home owners, business owners, and other members of the public. They will probably be wondering what you are doing. Please be cordial and briefly describe the project and hand them a brochure if they want one. Here is an example script:

“Hi, my name is _____. I’m a volunteer conducting cat surveys on Hayden Island as part of a project with the Audubon Society of Portland and the Feral Cat Coalition of Oregon. The information we are collecting will be used to figure out how many feral cats are on the island. The project goal is to reduce the feral cat population using humane methods like “spay/neuter”. We are working with the local community on this effort.”

Try to get back to doing your survey as soon as you can. Just say, ***“We really need to get back to doing the survey, we’ve got a lot of ground to cover. Thanks for your interest.”***

If folks are really persistent, give them a brochure and point out Joe Liebezeit’s contact info and tell them you can contact him for more info.



Eyeshine from a cat during a nighttime spotlight survey (Photo: J. Boone)

CAT AGE PROGRESSION CHART (Courtesy FCCO)

KITTEN

(2 MONTHS AND YOUNGER)

- Weighs under 2 pounds
- May still be under mother's care
- May be wobbly, not have full coordination



JUVENILE

(2 MONTHS – 6 MONTHS)

- Independent, no longer under mother's care
- Eats solid food



ADULT

(6 MONTHS AND OLDER)



CAT COLORS CHART (courtesy FCCO)

(You do not need to record colors to this level of detail on the data form)

SOLID



BLACK



GREY



WHITE



BLACK & WHITE

TABBY



GREY TABBY



BROWN & WHITE
TABBY



ORANGE TABBY



BUFF TABBY



ORANGE & WHITE

CALICO/TORTI



CALICO
(3 colors in patches)



TORTI
(Orange/black)



DILUTE TORTI
(gray/buff)



TORBY
(Torti with stripes, can
be Torby and white too)

POINT



SEAL POINT



FLAME POINT



BLUE POINT

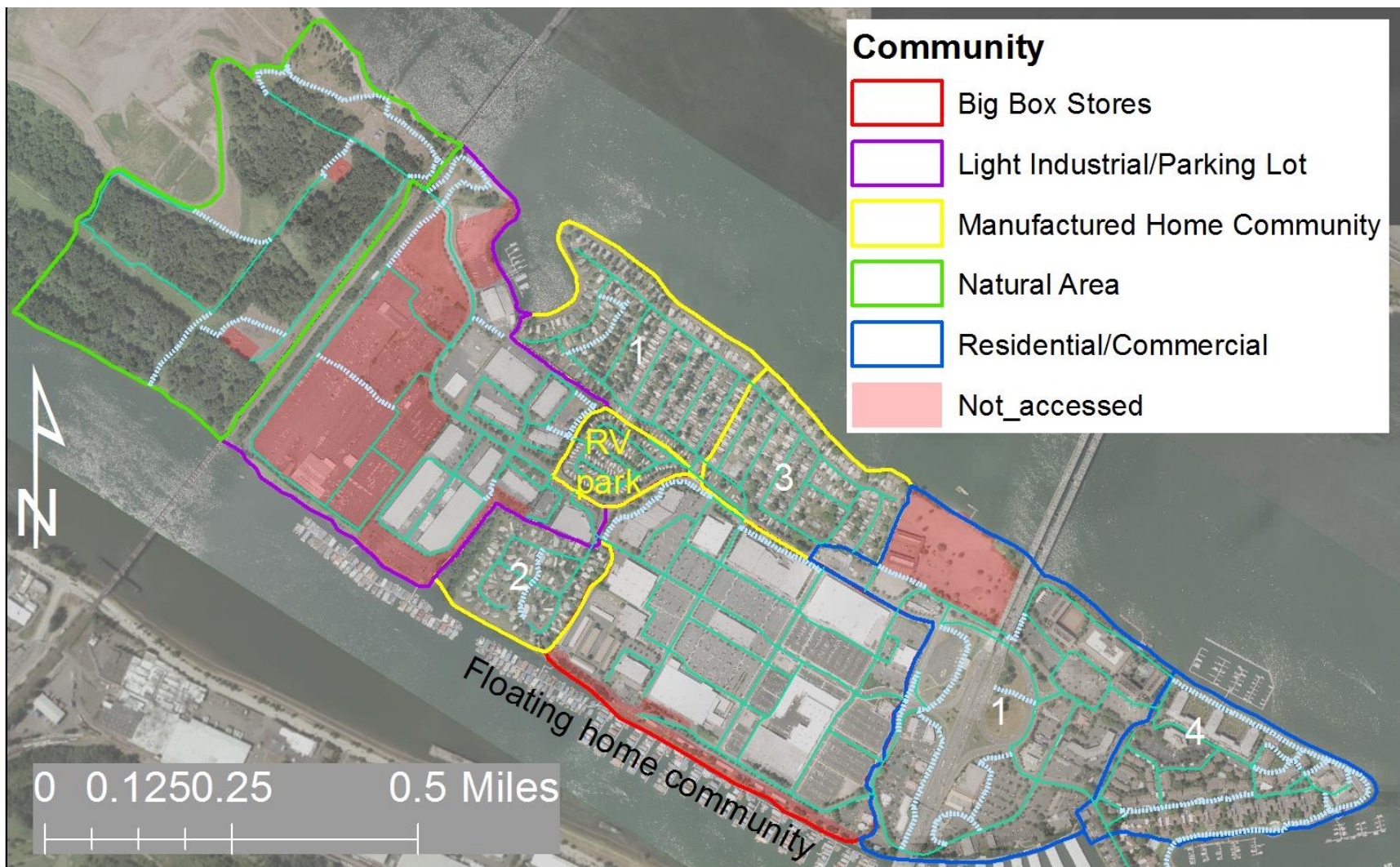


TORTI POINT



LYNX POINT

Attachment 1: Study site map (white numbers = plot #)



Attachment 2: Tentative 2015 survey schedule

Date	Event	Comment
Last week of August	Volunteer training	Meet at Hayden Island – go over protocol & conduct a practice survey
September – week 1 or 2	Survey #1 – all sites	Monitor all 8 plots during the same day. Ideally, total of 16 observers needed at a minimum: OBS 1 & 2: NATURAL AREA OBS 3 & 4: LIGHT INDUST. OBS 5 & 6: MANUF. HOME COMM. PLOT 1 OBS 7 & 8: MANUF. HOME COMM. PLOT 2 & RV PARK OBS 9 & 10: MANUF. HOME COMM. PLOT 3 OBS 11 & 12: BOX STORE OBS 13 & 14: RESIDENTIAL/COMMERCIAL PLOT 1 OBS 15 & 16: RESIDENTIAL/COMMERCIAL PLOT 4
September – week 2 or 3	Survey #2	Same procedure as Survey #1
September week 3 or 4	Survey #3	Same procedure as previous surveys

Attachment 3: Data form and example data (in red text)

DATA FORM – HAYDEN ISLAND CAT PROJECT

Plot name & #: Mobile home comm. #1 Date: 9/27/14 Visit # (1, 2, or 3): 2

Observers: Joe Liebezeit & Karen Kraus

Start Time: 5:42pm Stop Time: 7:04pm Page 1 of 1

Cat #	On map?	Mark /ear	Collar? (Y or N)	Age	Pregn ant?	Social?	Body Condition	Cat description	Photo taken?
1	X	T, R	N	A	N	U	H	Medium size tabby, short hair	Y
2	X	U	N	J	N	Y	H	Large orange cat with green eyes, long hair	N
3	X	I	N	A	N	N	U	Skinny, can see ribs through skin, all black, short hair, no tail, limping	Y

Additional notes: We encountered 4 people that came up to us and asked about the project We provided them brochures. (include additional notes on another sheet of paper if necessary)

Mark: T=tipped, I=Intact, U =unknown (R= right ear, L=left ear)

Age: A=Adult, J=Juvenile (~ 2 – 6 mo), K=Kitten, U=Unknown

Cat description: color, fur length, distinguishing marks

Body Condition: H=healthy, U=unhealthy

N=not determined

Attachment 3 (continued): Cat location map. Locations of cats 1, 2, and 3 recorded on the data form are recorded on this map.

