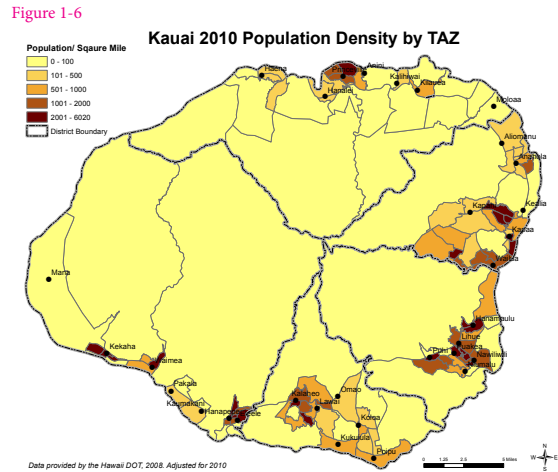


Kauai’s Feral Cats: Scope of the Problem

Submitted by Basil Scott

Based on a detailed analysis, Kauai’s feral cat population is estimated at 15,500 ± 4,000 cats. Understanding where the cats are – how they are geographically and demographically distributed across the island – is vital to understanding how to address the problem of too many homeless cats.

To a first approximation, cats are where people are. Therefore, the population density map¹ at the right is a starting point for understanding how cats are distributed across Kauai. But, since there is special concern about cats located in “sensitive” areas, it’s important to address specifically how many cats are located near the coast and in interior areas that may be habitat for endangered birds. It’s also important to address this demographically: how many cats on private residential property, on business properties, on hotel premises, and so forth.



The detailed analysis described in the attachment shows the following distribution for types of areas and locations where cats are found. “Coastal” means within one mile of the ocean in the table below. “Interior wilderness” means greater than one mile from the Ocean, as well as outside of residential areas that extend beyond one mile from the Ocean.

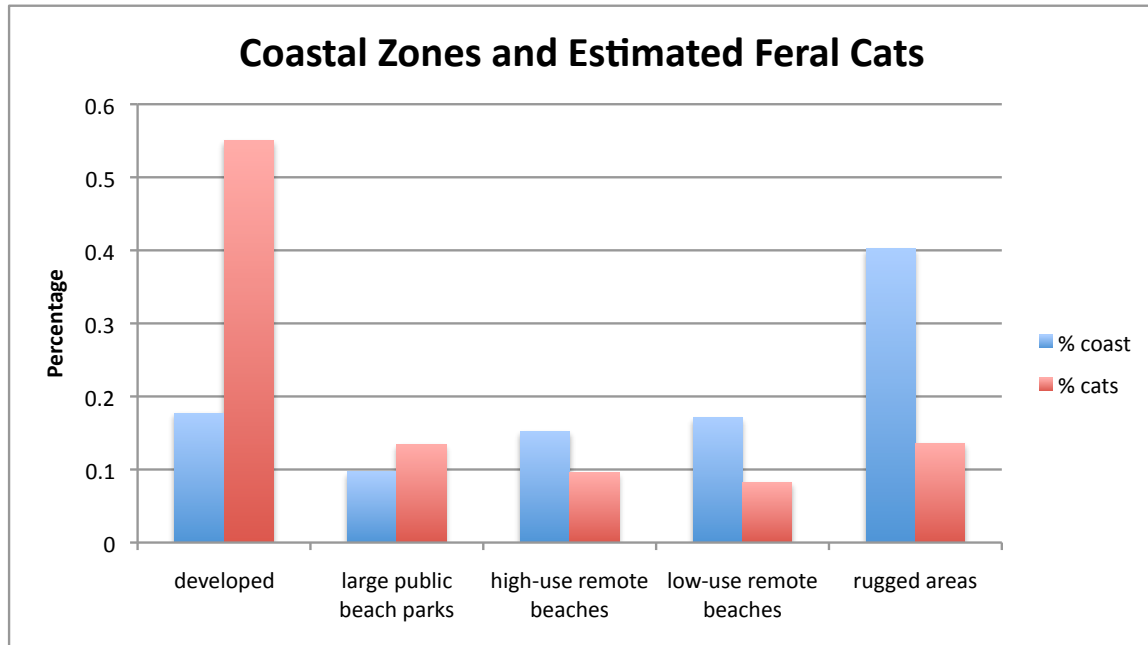
Type of Location	Percentage of Cats		
	Coastal	Interior	Total
Business areas	11%	18%	29%
Residential neighborhoods	8%	18%	26%
Beaches and rugged coastal areas	20%	0%	20%
Interior wilderness	0%	19%	19%
Hotels	6%	0%	6%
Total	45%	55%	100%

Because the interior of Kauai is so large, it contains a surprisingly large number of cats. This result is consistent with research from multiple authors (details are presented in the attachment). 19% of 15,500 is over 3000 cats, and this may seem

¹ Kauai Transportation Data Book, May 2012, Chapter 1: Population and Demographics

remarkable. However, based on a wilderness area of 450 square miles, this is only 6 cats (6.5 for the purist) per square mile, which is only one cat for every 100 acres.

For the 45% of cats located within the coastal zone, the chart below shows the distribution of types of coastal zone areas and how feral cats are distributed across these.



The chart highlights the fact that development near the shoreline is the number one cause of large numbers of feral cats living in coastal areas. Public beaches are the largest contributors on a per square mile basis, but in sheer numbers, the more remote areas contribute more. These areas are closer to bird habitat than the large public beaches.

Approximately 10% of the total number of cats on Kauai are located within the coastal zone between Hanalei and Anahola.

The details of the estimation analysis are presented in the following pages.

Attachment 1 Estimating Kauai's Homeless Cat Population

This analysis applied multiple methods to determine cat populations on Kauai:

1. Using published formulas or ratios that have proven accurate in previous studies
2. By taking census in specific areas and determining cat density (cats / Km²) for selected areas representing types of environments
3. Extending method 2 based on Liberg's² regression analysis for spatial density in various environments
4. A "bottom up" (BU) estimate using demographic data for Kauai³ to develop specific population counts for different areas or zones within Kauai.

Four published estimation formulas were computed and compared with the BU estimate to determine a range of values. The four estimation formulas were:

1. Pro-rata scaling based on population ratios and estimates of total feral cats across the United States.⁴
2. Pro-rata scaling based on population ratios and census of feral cats in Honolulu⁵
3. Based on Dr J. Levy's formula: number of households x 17%⁶
4. Based on a formula relating intake and euthanasia of cats and total cat households given by Boks.⁷

These four and the BU estimate give the following results:

Estimation Type	Value	Comments
Pro-Rata US data	16,800	Relates human population to cats (see note)
Pro-rata Honolulu data	19,800	Similar to above, but specific to Hawaii
Levy	14,600	Based on human population (see note)
Boks formula	11,700	Not widely publicized (see note)
Bottom up	14,800	Specific details described below

(Note: the indicated formulas will tend to undercount because they do not account for tourists, which make up 30% of Kauai's total population on average)

The average value is 15,500. Information from the BU study was used to determine percentages of cats within certain area, e.g. the numbers of cats within the Hanalei to Anahola coastal zone.

² O. Liberg et al., Density, Spatial Organisation and Reproductive Tactics in the Domestic Cat and Other Felids, The Domestic Cat, Second Edition, Cambridge Press, 2000

³ Kauai Transportation Data Book, May 2012, Chapter 1: Population and Demographics

⁴ American Bird Conservancy, average value between 60 million and 100 million

⁵ Communication with P. Burns, D/Hawaiian Humane Society

⁶ An Overview of Caring for Free-Roaming Cats, Humane Society of the United States

⁷ Ed Boks, Analysis of Feral/Stray Cat Solutions

The BU study enumerates cats by breaking the problem down into categories. Data for each category is developed using demographic information for Kauai combined with cat population information. The BU categories, estimated numbers of cats, and defined areas are as follows:

Category	Total Cats
Business areas	4300
Residential neighborhoods	3900
Beaches and rugged coastal areas	2900
Interior wilderness	2800
Hotels	900
TOTAL	14,800

The methods used for each category are described below.

Business Areas

Business areas include commercial business centers, industrial parks, schools, hospitals, shopping malls, trash dumps, a small number of hotels, and public buildings.

Total feral cat populations are calculated from estimated cat densities, from actual counts, and from location estimates (e.g. for dump areas). Cat density data is as follows:

Source	Measured Density, Per sq. Km, Per sq. mi.	Comments
Kauai Census	1420, 3675	From Lihue area
Liberg	1600, 4150	Average value from studies in 5 cities
Kauai census	400, 1050	Shopping mall
Kauai census	300, 790	Mixed shopping

For high-density business areas (in town), Kauai data (3600 cats/square mile) is used. For industrial parks a value of 1200 is used, based on permitted personnel densities for warehouse buildings (about 1/3 as many workers are allowed). Shopping malls use the 1050 density and hotels or mixed areas use the 790 density.

Based on these densities, it is estimated that Kauai's business areas support a population of 4300 cats. 2700 of these are located outside the one mile coastal zone, and 1600 are within the coastal zone. This high density is supported by the observations of cat caregivers in these areas.

Residential Neighborhoods

Dabritz⁸ develops a formula of .167 feral cats per household in a target residential area. Demographic data from Kauai⁹ (23,200 households) results in an estimate of 3900 feral/homeless cats in Kauai neighborhoods. 30%, or 1200, of these are estimated to be within the one-mile coastal area.

Coastal Zones

Cat population was estimated for Kauia's 90 miles of shoreline using the methods described below. Within this area there are 50 listed beaches, a large number of hotels, 2 golf course areas, about 2 miles of farming area, and a large amount of undeveloped/wilderness area.

Seven sub-categories are defined to account for these various areas. For each sub-category, different cat densities and other methodologies are used as described below:

- Type 1, High-density beach is one with a large number of users 7 days a week. Examples include Hanalei, Kealia, Lydgate, Nawiliwili, Poipu, and Salt Pond. Cat density is 1500/square mile based on cat census.
- Type 2, Medium-density beach is for an out-of-the-way location that is nonetheless used extensively by surfers and potential illegal campers. Beaches with nearby households are rated as medium density. Estimated cat density is 500/square mile, based on cat census.
- Type 3, Low-density beaches are remote and used lightly with zero to low illegal camping and no nearby human habitation. Estimated cat density is 250/square mile, based on cat census.
- Note that for all three types, the average beach area is assumed to extend for 0.05 miles inland (about 80 yards). However, for some larger beaches, this inland area may extend up to 0.2 miles, and for some areas it may be less than 0.05.
- Note also that not all ocean interface areas are beaches. 40% of the ocean interface on Kauai is rugged terrain.
- Type 4 is rugged terrain, which is undeveloped and/or unpopulated land with no direct human activity. Cat density, per Liberg is 50/square mile.
- Type 5 is wilderness. This is completely undeveloped and isolated land. Cat density per Liberg is 6/square mile.
- Type 6 is farmland. This is property with active farming. Cat density based on Liberg's data is 140 cats/square mile. Farmland may back up beach areas or rugged/wilderness areas.
- Type 7 is developed land area. These include hotels, marinas and an estimated 40% of the population. Marina cat population is estimated using a

⁸ Dabritz, H.A. et al. (2007) Detection of *Toxoplasma gondii*-like oocysts in cat feces and estimates of the environmental oocyst burden. *J. Am. Vet. Med. Assoc.* 231, 1676–1684

⁹ Census data from Zillow website

cat density of 2600/square mile. This is based on a cat census conducted on Kauai, and is a lower value than reported by Liberg.

Wild Inland Areas

Liberg's density data¹⁰ for wilderness areas cites 8 studies with a mean density of 6.1 cats per square mile. This figure is used with an estimated total wild area of 450 square miles. It should be noted that this density is over 500 times less than cat densities in populated areas. Sightings of these animals would be very rare.

Hotels

Hotel cats are estimated using the formula: hotel capacity (rooms) x 0.09, which is based on considerable colony caregiver experience at hotels of various sizes.

¹⁰ Liberg, Density...Domestic Cat