Article

Not peer-reviewed version

Keeping Cats Safe at Home (KCSAH): Lessons Learned from a Human Behavior Change Campaign to Reduce the Impacts of Free-Roaming Domestic Cats

Gemma Catherine Ma *, M Carolyn Gates, Katherine E Littlewood, Sarah Zito, Brooke P.A. Kennedy

Posted Date: 6 November 2025

doi: 10.20944/preprints202511.0420.v1

Keywords: Cats;Roaming;Containment;Desexing;Behavior Change;Community Engagement;Social Media;Animal Welfare;Predation

Article

Keeping Cats Safe at Home (KCSAH): Lessons Learned from a Human Behavior Change Campaign to Reduce the Impacts of Free-Roaming Domestic Cats

Gemma C. Ma [1,2,*], M. Carolyn Gates [3], Katherine E. Littlewood [3], Sarah Zito [4] and Brooke P. A. Kennedy [5]

[1] The Royal Society for the Prevention of Cruelty to Animals New South Wales, Yagoona, NSW, Australia
[2] The University of Sydney School of Veterinary Science, NSW, Australia
[3] AkoVet Limited, Palmerston North, New Zealand, 4410
[4] RSPCA Australia, Deakin West, ACT, Australia
[5] University of New England, School of Environmental and Rural Science, Armidale, NSW, Australia
* Correspondence: gma@rspcansw.org.au

Simple Summary

Domestic cats are valued companions for many people, yet their tendency to roam can create challenges for biodiversity, communities, and the cats themselves. Encouraging owners to keep cats contained is increasingly recognized as a priority in Australia but requires strategies that address the practical and behavioral barriers that people face. The Keeping Cats Safe at Home project was a four-year initiative led by the Royal Society for the Prevention of Cruelty to Animals New South Wales (RSPCA NSW) in partnership with 11 councils from 2021 to 2024. The project tested a suite of approaches, including social marketing campaigns, school education, community events, and subsidized desexing and microchipping, to encourage safer and more sustainable ways of caring for cats. These activities achieved a broad reach through digital platforms and direct engagement, and resulted in thousands of cats being desexed and microchipped. Ecological monitoring indicated reductions in roaming cat numbers in several areas, and many participating councils recorded fewer nuisance complaints and impoundments. Owners who encountered campaign messages also reported feeling more able and motivated to keep their cats contained, although measuring actual behavior change proved difficult. The project demonstrates that large-scale behavior change programs can improve outcomes for cats, communities, and wildlife, but highlights the need for sustained investment, stronger veterinary capacity, and consistent monitoring to support long-term success.

Abstract

Domestic cats are valued companions for many people, but when free-roaming, they can pose risks to biodiversity, communities, and their own welfare. Increasing cat containment has become a priority in Australia, yet shifting owner practices requires overcoming behavioral and structural barriers. The Keeping Cats Safe at Home (KCSAH) project was a four-year, AUD $2.5 million initiative delivered by the Royal Society for the Prevention of Cruelty to Animals New South Wales (RSPCA NSW) from 2021 to 2024, trialing human behavior change strategies to reduce the impacts of roaming cats in 11 NSW local government areas. Grounded in social science research, the project combined social marketing campaigns, educational resources, school programs, and community events with subsidized desexing. The project achieved substantial reach, engaging more than 3.5 million people via social media, 42,000 through blogs, 87,000 via the website, and 36,000 through community events. Over 2,700 cats were desexed and 1,700 microchipped. Ecological monitoring showed reductions in free-roaming cat densities in three council areas, with many also recording

 doi:10.20944/preprints202511.0420.v1

declines in nuisance complaints and impoundments. Caregivers exposed to campaign messaging reported greater capability, opportunity, and motivation to contain cats; however, methodological constraints limited the ability to assess actual behavior change. KCSAH demonstrates the opportunities and challenges of large-scale cat management, highlighting the importance of tailored interventions, veterinary desexing capacity, and nationally consistent monitoring frameworks.

Keywords: cats; roaming; containment; desexing; behavior change; community engagement; social media; animal welfare; predation

1. Introduction

Domestic cat management is a complex but increasingly topical area of focus for governments, animal welfare organisations, conservation groups, and communities across Australia [1]. This is because domestic cats are highly valued as companions and integral members of many households; however, they can also negatively impact wildlife, ecosystems, biodiversity, and human communities, particularly when they are allowed to roam freely [2]. Research suggests that domestic cats kill large numbers of native animals each year in Australia, with predation pressures greatest in urban and peri-urban areas where owned cat densities are highest [3]. While several studies have shown that measures such as using collars fitted with anti-predation devices [4–7] or incorporating different feeding programs or structured play into domestic cat care routines [8,9] can help to reduce predation rates, they do not completely eliminate hunting, roaming, and other perceived nuisance behaviors [10,11].

As such, there has been growing interest in promoting cat containment as a practical strategy to mitigate risks to biodiversity, communities, and the cats themselves [1]. Containment encompasses a spectrum of approaches, from dusk-to-dawn curfews through to 24-hour confinement to the owner's property using cat-proof fencing, enclosures, or indoor-only housing [12]. It may also involve cat exclusion zones in sensitive habitats [13], boundary deterrent devices [14], or supervised outdoor access such as leash-walking [15]. Given the known risks and behaviors associated with roaming [16,17], containment should theoretically reduce predation, nuisance behaviors, and unplanned litters in certain settings, while also lowering risks of injury, poisoning, and disease transmission for the cats themselves. Some owners have also reported greater peace of mind and stronger relationships with their animals when cats are safely contained [18]. Contained environments must provide engagement opportunities that support positive affective experiences and a healthy weight; without these, risks of frustration, anxiety, inactivity, undesirable behavior and poor welfare rise [19–21]. Ensuring opportunities for predatory play, exploration, and choice through indoor resources, cat-proof gardens, safe outdoor enclosures, and consistent positive human interaction is critical to making containment effective for both biodiversity and feline welfare [18,22,23].

According to the 2025 *Pets in Australia* report [24], cat ownership in Australia has risen from 27% of households in 2019 to 34% in 2025, equating to an estimated 5.8 million owned cats, or an average of 1.6 cats per cat-owning household. While there has been a noticeable shift toward more contained lifestyles with the proportion of indoor-only cats increasing from 36% in 2019 to 48% in 2025, the uptake of other practices has remained relatively stable or declined, with desexing rates currently sitting at 84%, microchipping at 78%, and vaccination at 66% [24]. These national trends, which highlight potential gaps in how some owners currently care for their cats, are reflected in local situational analyses [25], particularly in communities with high shelter admission rates. Rand et al. [26] found that many owned cats were not desexed, had inadequate containment, or lacked routine veterinary care, increasing both individual welfare risks and the likelihood of contributing to unwanted litters. Similar patterns were reported by Dutton-Regester and Rand [27] in households enrolling cats in a free sterilization program, where cost was a major barrier to desexing, but awareness of optimal feeding, housing, and preventive health was also low. Both studies highlight

 doi:10.20944/preprints202511.0420.v1

the gap between owner intentions and actual management practices, with socio-economic constraints, limited awareness of best-practice care, and cultural norms influencing behavior.

Local councils in Australia are responsible for domestic cat management under state-based legislation. In practice, however, the levels of action vary substantially, with some councils undertaking limited or no cat management activities [28]. While public surveys show strong in-principal support for containment, actual compliance lags behind. In a large Australian survey of 6,808 respondents, Elliott et al. [29] found that 88.6% of cat owners agreed cats should be contained at night, yet only 76.9% reported doing so. Support for 24-hour containment was more divided: 47.3% of owners agreed it should be the norm, which corresponds with the 46.5% who also reported keeping their cats fully contained. Non-owners were significantly more likely than owners to support 24-hour containment, suggesting higher public tolerance for stricter restrictions but also highlighting tensions between community expectations and owner practices. Local government data reinforce this picture: almost a third of councils now mandate curfews, 24-hour containment, or cat exclusion zones, particularly in Victoria, South Australia, and the Australian Capital Territory (ACT). However, compliance monitoring remains limited, and enforcement is inconsistent. Concerns have also been raised that strict legal mandates, if introduced without adequate support, could increase abandonment or surrender rates as well as compromise cat welfare if they are not contained in appropriate environments [30].

As a result, there has been an increasing reliance on the voluntary uptake of cat containment practices; yet, barriers remain, including cost, housing design, and cultural beliefs about roaming as a 'natural' behavior [31–33]. Furthermore, the presence of semi-owned cats (i.e., cats receiving some care from a person or people but without full ownership responsibility) is common, blurring the lines between owned and unowned populations and limiting accountability for care [34–36]. Case studies also show that even when owners express strong intentions to contain their cats, these do not always translate into behavior once practical challenges emerge [37]. Together, these findings suggest that while containment is gaining traction as a management tool, achieving widespread adoption will require carefully designed strategies that bridge the gap between intention and practice, combining community engagement, education, incentives, and support for owners.

To address these challenges, RSPCA NSW secured an AUD $2.5 million grant from the NSW Government through its Environmental Trust to deliver a four-year program exploring the application of different human behavior change strategies to domestic cat management. Implemented across 11 local councils in NSW from 2021 to 2024, the *Keeping Cats Safe at Home (KCSAH)* project aimed to reduce both the size and ecological impacts of free-roaming domestic cat populations by encouraging owners to voluntarily contain their cats. Drawing on behavior change research as well as extensive feedback from consultation with local stakeholders, the KSCAH project developed and implemented a suite of interventions, including marketing campaigns, school-based education, community events, and training resources to support veterinarians, rescue organisations, and local councils in engaging owners in conversations about cat containment. To further reduce barriers to care that enable containment practices, the project also offered free desexing and microchipping targeted at priority populations of cat caregivers.

The objective of this manuscript was to provide a comprehensive overview of the logistics involved in designing, implementing, and evaluating the KCSAH project, offering practical guidance for other jurisdictions considering similar programs.

2. Project Overview

The KCSAH project was delivered in a staged approach (Figure 1). The **project initiation phase** (Jan to Jun 2021) focused on recruiting the governance team, expert advisors, and participating councils. The **stakeholder engagement phase** (Jun to Nov 2021) gathered insights into the current domestic management landscape to inform program design, monitoring, and evaluation. The **campaign development phase** (Jan 2022 to Mar 2023) involved designing messaging and resources, followed by the **campaign implementation phase** (Jul 2022 to Dec 2024), during which project

 doi:10.20944/preprints202511.0420.v1

activities were rolled out across councils. Concurrently, the **evaluation phase** (Jun to Nov 2024) involved collecting and analyzing data to assess the project's impacts.

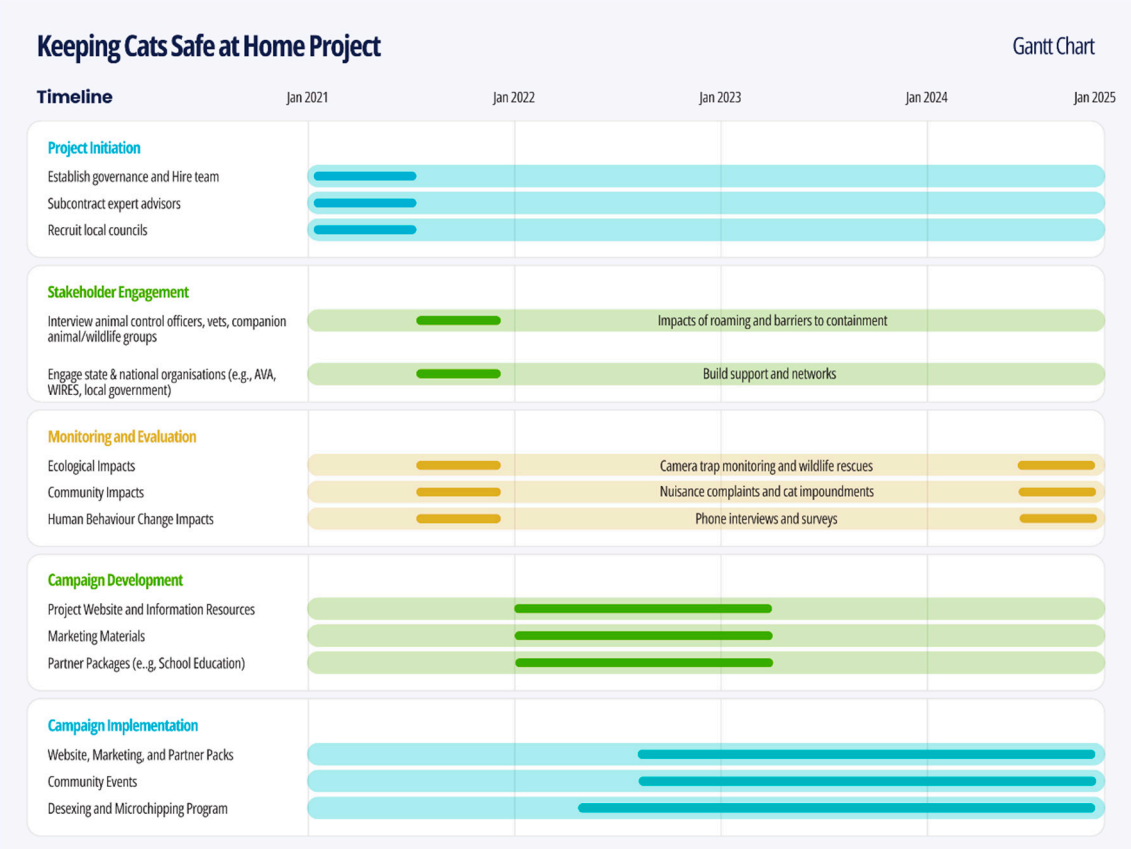

Figure 1. Timeline of the staged implementation of the Keeping Cats Safe at Home (KCSAH) project.

2.1. Project Initiation Phase (Jan to Jun 2021)

The KCSAH project commenced on 1 January 2021 with the establishment of a multi-stakeholder advisory group, recruitment of a project manager, and engagement of expert consultants in behavior change and animal ecology to support the design of project resources and the monitoring and evaluation framework.

A key early activity was the recruitment of local councils to participate as trial regions. Councils were selected because they represent the jurisdictional unit with statutory responsibility for companion animal management under the *Companion Animals Act 1998 (NSW)*. Recruitment aimed to secure a cohort of councils that reflected a diverse demographic and geographic profile, enabling evaluation of project effectiveness across different contexts.

RSPCA NSW, in consultation with the advisory group, established a protocol for inviting expressions of interest (EOIs) and developed criteria for council selection. EOIs were advertised and invited from all 128 councils in NSW between 22/01/2021 and 05/03/2021. A total of 29 EOIs were received, of which 11 councils were selected as project partners. Selection prioritized councils that demonstrated commitment to project objectives, wildlife protection, and humane, evidence-based cat management; proximity to sensitive wildlife habitats; capacity for strong community engagement; and willingness to desex all cats prior to rehoming from council pounds. Additional considerations included the feasibility of project delivery under COVID-19 restrictions and a commitment to provide relevant data for monitoring and evaluation.

Table 1 summarizes the demographic characteristics of the participating councils, and their geographic distribution across New South Wales is shown in Figure 2.

 doi:10.20944/preprints202511.0420.v1

Table 1. Demographic and socioeconomic characteristics of the 11 councils in New South Wales, Australia participating in the KCSAH project.

Council	Population Size (Number)	Land Area (km²)	Population Density (residents per km²)	Unemployment Rate (%)	Median Weekly Household Income (AUD)	Speaks language other than English at home (%)	Socio-Economic Index Rank (1 low, 128 high)
Blue Mountains	77,913	1431	55	2.5	$1,756	6.5	110
Byron	36,510	566	66	2.4	$1,602	9.6	100
Campbelltown	180,365	311	593	4.7	$1,700	35.8	31
Hornsby	151,747	455	339	3.8	$2,417	35.7	120
Kyogle	9,453	3584	3	4.1	$983	3.3	13
Northern Beaches	263,298	254	1,054	2.1	$2,592	15.6	121
Parramatta	260,379	84	3,211	2.3	$2,051	56.4	104
Shoalhaven	109,611	4,567	24	2.1	$1,250	49	65
Tweed	97,969	1308	76	2.3	$1,296	5	78
Walgett	5,516	22,308	<1	9.5	$1,001	5.3	5
Weddin	3,614	3,415	1	1.8	$1,046	1.5	41

[1] Data obtained from the Australian Bureau of Statistics 2021 Census and NSW Office of Local Government.

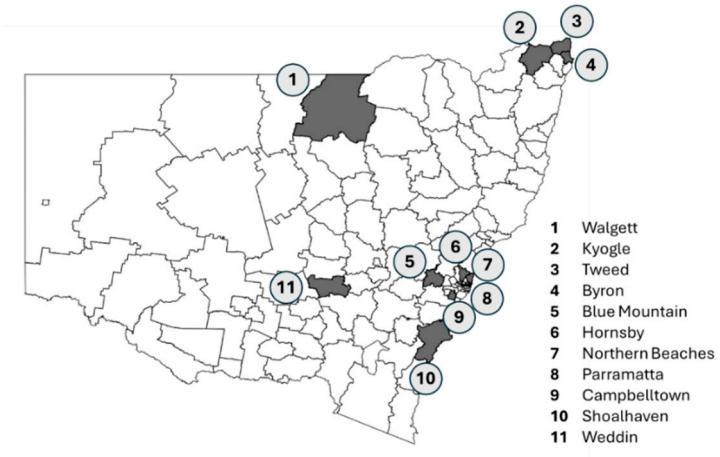

Figure 2. Geographic location of 11 councils in New South Wales, Australia participating in the KCSAH project.

2.2. Stakeholder Engagement Phase (Jun to Nov 2021)

A central component of the KCSAH project was engagement with key stakeholder groups to assess current attitudes, practices, and barriers related to cat containment. Stakeholders included cat owners, semi-owners and caretakers, local councils, veterinarians, animal rescue organisations and shelters, and wildlife organisations. A consultation process was undertaken through structured interviews, workshops, and surveys to ensure that diverse perspectives were incorporated into the campaign design.

The social science research component focused particularly on cat caregivers, with two strands of work published as peer-reviewed manuscripts. One study characterized the practices and motivations of cat semi-owners, who care for cats without formally recognizing ownership [35]. A second study investigated the broader factors influencing containment decisions among cat caregivers using the Capability-Opportunity-Motivation Behavior (COM-B) framework to identify key drivers and barriers [38] and to segment cat owners into six distinct profiles that could be used to target campaign messaging [39]. Profile labels, criteria, and exemplar messages are provided in Supplementary Table S1.

Psychological capability was identified as the most significant barrier across both studies. Caregivers who believed it would be too difficult to prevent roaming, lacked confidence in their ability to restrict their cat's movements, or were unsure how to provide opportunities for their cats to experience positive welfare states in a contained environment were far more likely to allow

 doi:10.20944/preprints202511.0420.v1

roaming. The six profiles underscored the importance of tailoring interventions: Profiles 1–2, who viewed roaming as beneficial and showed little concern about risks, required strategies that increased motivation and directly addressed beliefs about cat welfare; Profiles 3–4, who lacked confidence and understanding of how to contain their cats effectively, needed skills and support to build psychological capability; while Profiles 5–6, who showed strong alignment with COM-B themes and high community motivation, were best supported with tools and reinforcement to consolidate containment intentions.

2.3. Campaign Development Phase (Jan 2022 to Mar 2023) & Implementation Phase (Jul 2022 to Dec 2024)

Insights from the stakeholder engagement guided the design of a portfolio of resources and activities that aimed to build capability, opportunity, and motivation for human behavior change while normalizing containment as part of routine cat care.

2.3.1. Website and Information Resources

A dedicated *Keeping Cats Safe at Home* project landing page was embedded within the RSPCA NSW website and launched in mid-2022, serving as the central platform for campaign messaging and resources. The site was updated regularly throughout the project to ensure its relevance and to address emerging issues identified during stakeholder engagement.

A suite of high-quality information resources was developed in collaboration with veterinarians and clinical behaviorists. These included brochures, fact sheets, and adoption-pack inserts that provided practical guidance on cat behavior and communication, safe housing, and strategies for transitioning roaming cats to an indoor or contained lifestyle. Where appropriate, materials were also translated into languages commonly spoken in the target areas to improve accessibility.

Distribution channels were deliberately chosen to maximize trust and uptake. Information resources were provided directly to veterinary clinics, councils, and rehoming organisations so that they could be offered during routine interactions with cat caregivers, including veterinary consultations and the adoption process.

All education resources were also made freely accessible online via the project landing page and optimized for search engines to capture caregivers seeking information about cat care and management. Materials were designed for flexible use, suitable for reading online, downloading, or printing at home, thereby reducing barriers to access.

2.3.2. Marketing Campaign

The KCSAH marketing campaign aimed to increase the psychological capability and motivation of cat caregivers to contain their cats, using human behavior change techniques such as demonstration of the behavior, social support, goal setting, and action planning [38,40]. Campaign activities were organized around four main delivery streams:

Social media posting

Quarterly themed bursts of content were shared via RSPCA NSW's social media channels (Facebook and Instagram), beginning in June 2022. Content included recovery stories of cats who were injured while roaming and then successfully adapted to containment, competitions, activity and resource tips, and examples of containment systems. Informational posts were interspersed with highly engaging pieces to sustain interest. Partner councils, veterinary practices, and rehoming organisations were encouraged to share or adapt campaign content. The campaign also benefited from strong media interest, with additional radio, television, and print coverage helping to extend the reach of its messaging.

Email newsletter

A triggered twelve-edition email newsletter was developed, delivering monthly content to subscribed cat caregivers over a one-year period. Each edition combined practical cat care advice with embedded messages about the benefits and feasibility of containment. To encourage initial

 doi:10.20944/preprints202511.0420.v1

subscriptions, the newsletter was promoted through a cat grass giveaway, linking an appealing incentive with the campaign's educational content.

Blog articles

A series of blog articles was published through the campaign website, providing accessible, story-driven content for cat caregivers. The 22 articles combined educational pieces on cat care and management with updates on project activities, positioning the campaign website as both an information hub and a narrative record of the project.

Paid advertising campaign

In 2024, KCSAH collaborated with a social marketing agency to develop a paid advertising campaign titled *Not All Cat Videos Are Funny*. Two creative concepts were tested through focus groups with cat caregivers whose cats roam, ensuring message alignment with the target audience. The final campaign combined video storytelling with digital promotion across catch-up television, YouTube, Facebook, and Instagram, aiming to increase awareness and motivation to contain cats among a broader audience than could be reached through organic channels alone.

2.3.3. Partner Packages

To extend the campaign's reach through trusted intermediaries, *Keeping Cats Safe at Home* developed comprehensive partner packages for councils, veterinary practices, and rehoming organisations. These packages included printed brochures, fact sheets, and collateral tailored to support staff in initiating conversations with cat caregivers about the risks of roaming, strategies for containment, and how to provide cats with the necessary care at home. By equipping local professionals with consistent and evidence-based materials, the project sought to embed campaign messages within everyday interactions between caregivers and organisations they already viewed as reliable sources of advice [29].

Partner packages were distributed to all 11 participating councils, over 60 veterinary practices, and more than a dozen rehoming organisations. In addition, the education resources were incorporated into RSPCA NSW adoption packs for cats and kittens across the state and made available through the organization's three veterinary clinics. This integration attempted to ensure that cat caregivers encountered containment messaging at multiple points of contact, including during adoptions, veterinary visits, and routine engagement with councils, normalizing containment as an ownership behavior and reinforcing campaign objectives.

2.3.4. School Education Packages

Recognizing the role of early education in shaping long-term attitudes toward animal care and wildlife protection, KCSAH developed a curriculum-linked education package for primary school students aged 5–12 years. The package included a lesson plan aligned with the NSW syllabus, a supporting PowerPoint presentation with embedded educational videos, and supplementary classroom activities. These materials were designed for delivery by school teachers or trained volunteers, providing age-appropriate lessons on cat care and management, the risks associated with roaming, and the impacts of cat predation on native wildlife.

To reinforce classroom learning, the education package was complemented by a *Keeping Cats Safe at Home* magazine, an illustrated activity booklet, and a take-home poster, encouraging children to continue the conversation about cat care within their households. All resources emphasized the dual message of valuing cats as companions while recognizing their potential impacts on wildlife, thereby normalizing containment behaviors from a young age. All educational resources were also made freely available for download through the project website.

The program also included creative engagement tools. A children's book, *Stay Safe Clancy*, was developed in collaboration with Northern Beaches Council and a local artist. The book was distributed to local libraries, primary schools, and community centers across participating councils,

 doi:10.20944/preprints202511.0420.v1

broadening reach beyond the classroom and embedding campaign messages in family and community settings.

2.3.5. Community Events and Engagement

Direct engagement with the public and professional stakeholders formed a core component of the KCSAH campaign. The project team participated in 34 community and industry events throughout the project's life, reaching diverse audiences, including cat caregivers, veterinarians, and allied animal care professionals.

High-profile events such as the *Cat Lovers Festival* (2023 and 2024) and the *Vet Expo* (2022 and 2024) provided opportunities to interact with large audiences of cat enthusiasts and veterinary professionals. These events enabled the team to showcase containment solutions, distribute resources, and hold face-to-face conversations about cat care and the risks of roaming.

In addition, the KCSAH team collaborated with partner councils to participate in local events across each of the 11 participating local government areas. Agricultural shows, Family Fun Days, and Healthy Pet Days created opportunities to embed campaign messages within community contexts and reach cat caregivers who may not engage through digital or formal education channels.

2.3.6. Targeted Desexing Program

Desexing is critical for reducing cat roaming and overpopulation, yet cost remains a major barrier for many caregivers. To address this, free desexing and microchipping programs were established in each of the 11 KCSAH partner council areas, with more intensive "StrayCare" initiatives implemented in six councils to improve uptake among semi-owned and unowned cat groups that contribute disproportionately to new litters. These programs were delivered in collaboration with 26 local veterinary practices, council animal management teams, and local cat rescue volunteers, creating strong local partnerships. A key focus was on supporting semi-owners to take long-term responsibility for the cats in their care by removing financial and logistical barriers to desexing.

Eligibility for the programs was deliberately broad, limited only by geographic area (whole local government area, postcode, or selected suburbs, depending on population). Within this, targeting was achieved by prioritizing enrolment of caregivers of 'stray' cats and people caring for multiple cats, regardless of whether caregivers considered them owned or unowned. Promotion was intentionally restricted and highly localized, using channels such as direct referrals from council animal management workers and rescue groups, as well as letterbox drops and door-to-door outreach in areas with known unowned cat populations.

2.4. Monitoring and Evaluation Framework

A comprehensive monitoring and evaluation framework was established to track project delivery, measure outcomes, and identify areas for improvement. The framework combined quantitative indicators of reach, ecological change, community impact, and caregiver behavior with qualitative feedback from staff and participants, ensuring both accountability and opportunities for learning.

2.4.1. Project Reach

Project reach was assessed through digital analytics, event participation records, and stakeholder engagement tracking. Metrics included the number of website visits, blog/article views, social media reach, downloads of educational resources, direct participation in subsidized desexing and microchipping programs, attendance at community events, uptake of school education resources, and the level of veterinary and community organisation involvement. These indicators provided a quantitative measure of campaign penetration across participating councils.

 doi:10.20944/preprints202511.0420.v1

2.4.3. Ecological Impacts

Ecological impacts were evaluated using camera traps and distance sampling transect drives across four councils. Distance sampling transects were conducted to estimate the population size of free-roaming cats. At the same time, camera traps were deployed to determine the spatial and temporal movements of free-roaming cats and any overlap with wildlife. Two council areas were in Greater Sydney [41] and two were on the North Coast of NSW (unpublished). Additional ecological insights were drawn from a complementary research project examining cat movement patterns and wildlife interactions at Sydney's North Head [42]. Together, these datasets allowed assessment of changes in roaming cat density and potential shifts in local wildlife activity.

2.4.4. Community Impacts

Community-level impacts were monitored using routinely collected council data. Annual rates of cat-related nuisance complaints and cat impoundments were compared to pre-intervention baselines (four-year averages) to assess whether project activities were associated with reductions in free-roaming cat problems.

2.4.5. Human Behavior Change Impacts

At the start of the project, a statewide online cross-sectional survey was conducted as part of the target audience consultation to collect information from cat owners and semi-owners about their perspectives on free-roaming cats and current cat ownership behaviors, with findings reported in Ma et al. [35] and Ma and McLeod [39]. At the conclusion of the three-year project, a second statewide panel-based survey of cat owners was undertaken in November 2024. The purpose of this follow-up survey was to assess the effectiveness of the KCSAH campaigns by capturing data on current cat ownership behaviors, attitudes towards free-roaming cats, and awareness of campaign messaging.

3. Project Outcomes

3.1. Project Expenditures

The KCSAH project was delivered over four years with a total budget of $2.52 million. Table 2 provides a breakdown of expenditures by financial year and activity area. Salaries and consultancy (38%), the targeted desexing program (32.9%), and the social media marketing campaign (17.3%) accounted for the majority of project costs. It was not possible to determine the precise allocation of full-time equivalent (FTE) effort by project staff across individual behavior change campaign activities, as roles were fluid and responsibilities overlapped. The project also leveraged existing RSPCA infrastructure and in-kind support (e.g., legal, finance, communications, outreach), which enabled delivery at a greater scale than would have been possible within the direct budget allocation.

Table 2. Summary of KCSAH expenditures by activity and financial year over the project lifespan.

Project Activity	Year 1 2020 to 2021	Year 2 2021 to 2022	Year 3 2022 to 2023	Year 4 2023 to 2024	TOTAL	% of Total Budget
Salaries & Consultancy	$76,625	$253,049	$188,597	$438,867	**$957,138**	38.0%
Project Administration	$239	$6,300	$2,000	$12,300	**$20,839**	0.8%
Ecological Monitoring	-	$35,332	$2,446	$7,913	**$45,691**	1.8%
Website & Information Resources	$0	$8,411	$57,198	$55,319	**$120,928**	4.8%
Social Media Marketing Campaign	-	$21,379	$73,885	$340,877	**$436,140**	17.3%
Partner Packages	-	$224	$11,287	$41,355	**$52,865**	2.1%
School Education Package	-	-	$21,844	$7,931	**$29,774**	1.2%
Community Events & Engagement	$483	$2,855	$5,984	$18,879	**$28,201**	1.1%

 doi:10.20944/preprints202511.0420.v1

Targeted Desexing Program	-	$28,412	$335,106	$466,343	**$829,861**	32.9%
TOTAL	**$77,347**	**$355,962**	**$698,345**	**$1,389,783**	**$2,521,437**	**100%**

3.2. Project Reach

The KCSAH project achieved engagement that exceeded initial expectations across digital, community, education, and professional channels (Table 3). The campaign landing page attracted over 87,000 visits, complemented by strong readership of blog articles and downloads of educational resources. Social media activities reached more than 3.5 million people across multiple campaign waves, while direct participation included over 4,000 caregivers in desexing, microchipping, and incentive programs. In-person outreach resulted in more than 36,000 community members engaged at events and over 1,400 students participating in school programs. Veterinary and community partnerships were also extensive, with all local veterinarians involved in some form and 31 additional organisations supporting project delivery.

Table 3. Summary of KCSAH project reach across digital, community, education, and professional channels.

Outcome	Target	Result	Notes
Project webpage views	20,000	44,666	70% of visits from NSW; majority from Greater Sydney.
Blog/article views	—	42,474	Across 22 total blog articles
Resource downloads	5,000	15,920	Includes resources (2,566) and blogs (13,354).
Reach from social media posts (number of likes/impressions)	3,000,000	3,530,352	Across multiple campaign waves from 2022 to 2024.
Cat caregivers directly participating in desexing and microchipping	1,000	4,061	—
Community event attendees	20,000	36,858	Across more than 30 events
Students reached (school incursions)	1,000	1,404	—
Cat caregivers directly receiving digital or printed resources	10,000	14,233	Includes adopters (8,234), desexing participants (1,570), and newsletter subscribers (4,429).
Veterinary practices engaged	10 (subsidized services) / 20 (supporting)	26 / 51	100% of local veterinarians engaged in some form.
Other local organisations engaged	10	31	Includes councils, rehoming groups, community organisations.

3.3. Ecological Outcomes

Distance sampling transect drives indicated reductions in free-roaming cat population density across three participating local government areas, with declines of 51% in the Blue Mountains, 35% in Campbelltown, and 25% in Tweed Shire (Figure 3; Table 4). The small sample size (n=3) precluded further analysis to assess the statistical significance of the change in cat density, but it provides preliminary evidence of cat population reduction between these two time points. Camera traps showed that the cats still roaming were doing so at the same times and locations as before. The cats were also still overlapping with wildlife movements and therefore having the same potential impacts (both disturbance and predation).

 doi:10.20944/preprints202511.0420.v1

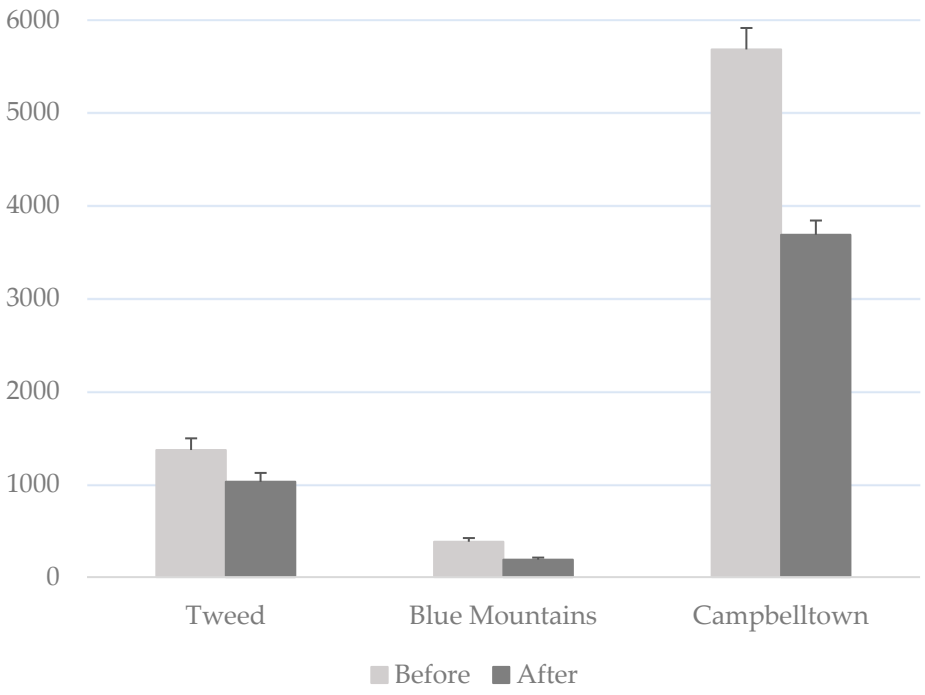

Figure 3. Cat population density estimates before and after the Keeping Cats Safe at Home project in the Tweed, Blue Mountains and Campbelltown local government areas. .

Table 4. Cat abundance estimates for each local government area calculated using line transect distance sampling.

LGA	Density	se	cv	lcl	ucl	df
		Before				
Tweed	0.24	0.02	0.09	0.20	.029	62.41
Blue Mountains	0.24	0.03	0.11	0.19	0.3	16.46
Campbelltown	0.57	0.02	0.04	0.52	0.62	71.82
		After				
Tweed	0.18	0.02	0.09	0.15	0.22	48.89
Blue Mountains	0.12	0.01	0.12	0.09	0.16	6.63
Campbelltown	0.37	0.02	0.04	0.34	0.40	38.13

LGA = Local Government Area, Abundance = estimate number of cats in the LGA, se = standard error, cv = coefficient of variation, lcl = lower 95% confidence interval, ucl = upper 95% confidence interval, df = degrees of freedom.

3.4. Community Outcomes

Community-level indicators showed substantial variation across participating councils (Table 5). Several areas achieved marked reductions in both nuisance complaints and cat impoundments, suggesting positive impacts of project activities on local cat management. In Campbelltown, Parramatta, Hornsby, and the Northern Beaches, nuisance complaints fell by 47–64%. Conversely, complaint volumes rose in some regions, including the Blue Mountains and Byron Shire, reflecting differences in local reporting systems and community engagement.

Trends in impoundments were similarly mixed. Significant decreases were observed in the Blue Mountains (−54%), Campbelltown (−59%), Parramatta (−73%), and Walgett (−100%), while increases occurred in Northern Beaches and Weddin. The rise in Weddin was attributed to improved community engagement and trust in council staff, leading to greater reporting and handover of cats. In contrast, Northern Beaches did not implement targeted desexing programs during the project.

 doi:10.20944/preprints202511.0420.v1

Table 5. Summary of community outcomes from KCSAH monitoring.

Outcome	Target	Result	Notes
Reduction in nuisance cat complaints to councils	20% reduction	Reductions in Campbelltown (−64%), Parramatta (−51%), Hornsby (−47%), Northern Beaches (−61%); increases in Blue Mountains (+78%), Byron (+36%)	Complaint data collection varied between councils.
Reduction in cats impounded	10% reduction	Major reductions in Blue Mountains (−54%), Campbelltown (−59%), Parramatta (−73%), Walgett (−100%); increases in Northern Beaches (+53%), Weddin (+380%)	Increase in Weddin reflects improved community engagement; Northern Beaches had no targeted desexing program.

3.5. Human Behavior Change Outcomes

Overall, human behavior change indicators demonstrated some positive shifts in cat guardianship. The post-intervention survey included 2,039 cat owners from across NSW. Results showed that 46% of respondents reported 24-hour containment, 26% practiced night curfews, and 28% allowed their cats to roam freely. This represented a lower proportion of cats reported as fully contained compared with the baseline survey in 2021, where 65% of owners indicated 24-hour containment, 24% practiced a night curfew, and 11% allowed free roaming (Ma & McLeod, 2023). Owners in the 2024 survey who recalled exposure to KCSAH campaign messaging reported significantly higher levels of capability, opportunity, and motivation to contain their cats than those who had not encountered the campaign. However, the survey response rates from the participating councils were too low to fully evaluate the impacts of the campaign on promoting behavior change.

Other human behavior change outcomes were more directly measurable (Table 6). Over 2,700 cats were desexed through the project, including 877 before the age of six months, substantially exceeding the target for pre-pubertal desexing. More than 17,000 new cats were registered across participating councils, with proportional increases ranging from modest gains in Shoalhaven (+2%) to large rises in Weddin (+75%). Microchipping uptake was also strong, with 1,721 cats microchipped through the project. By contrast, uptake of discounted cat enclosures was low (31 purchases against a target of 300), which may reflect not only caregiver preference for alternative containment approaches such as indoor-only living, modified fencing, or supervised outdoor access, but also ongoing cost and practical barriers - particularly for renters unable to install enclosures or for households concerned about aesthetics or space.

Table 6. Summary of human behavior change outcomes from KCSAH monitoring.

Outcome	Target	Result	Notes
Uptake of containment strategies by cat caregivers	60% (participants) / 40% (LGA population)	Insufficient survey responses (<10%) for direct comparison; panel survey used instead	Cat caregivers exposed to containment messaging reported higher capability, opportunity, and motivation to contain cats.
Cats desexed through the project	1,000	2,731	Includes 877 pre-pubertal desexings (target 300).
New cats registered	1,000	17,464	Proportional increases ranged from +2% (Shoalhaven) to +75% (Weddin).
Cats microchipped	1,000	1,721	—
Cat enclosures purchased with discount codes	300	31	Many owners used alternative containment methods (indoor-only, fencing, supervised access).

 doi:10.20944/preprints202511.0420.v1

3.6. Lessons Learned

The implementation and evaluation of the KCSAH project highlighted several systemic, programmatic, and contextual factors that shaped outcomes and will be critical to consider in future initiatives.

Regulatory context as a limiting factor

The most significant barrier identified was the regulatory framework under the *Companion Animals Act 1998 (NSW)*. Ambiguities in the Act—including the absence of clear definitions for unowned or "stray" cats, lack of clarity around councils' responsibilities, and limited enforcement options for nuisance cats—restricted the effectiveness of both the marketing campaign and the targeted desexing program. Cost barriers, such as registration fees and annual permit fees for undesexed cats, also acted as disincentives for community members to assume ownership of unowned cats they were already caring for.

Segmented audiences and human behavior change capability

The project confirmed that cat caregivers who allow their cats to roam are not a homogeneous group. Their capability, opportunity, and motivation to contain cats vary considerably. Some expressed psychological barriers, believing they could not prevent roaming or that containment would compromise their cat's welfare. Households that acquired cats passively ("adopted by circumstance") were more likely to allow their cats to roam, highlighting the need for targeted support. Rural and semi-rural owners, including those with "working cats," required different messaging and incentives compared with suburban pet owners. These findings reinforce the need for tailored strategies rather than one-size-fits-all messaging.

Programmatic and contextual challenges

External events, including COVID-19 restrictions and severe flooding, disrupted early project activities, delaying community engagement and service delivery. The migration of unowned cats into project areas, particularly in rural councils, undermines containment and desexing gains, emphasizing the importance of sustained, regionally coordinated programs addressing both owned and unowned populations.

Optimizing communication strategies

The social media marketing campaign yielded several lessons for maximizing reach and engagement. Staggered bursts of content helped reduce audience fatigue, while low-cost, do-it-yourself indoor cat activity videos resonated strongly. Storytelling through cautionary tales of cats injured while roaming, followed by successful containment, proved especially engaging. Interactive competitions that invited cat caregivers to share photos, videos, and stories generated high participation, suggesting that peer-to-peer sharing is a powerful motivator for engagement.

Barriers to desexing participation

Uptake of subsidized desexing varied across councils. Target audiences, such as semi-owners and multi-cat caregivers, often faced overlapping barriers, including social isolation, a lack of transportation, difficulties in handling cats, and longstanding mistrust of local government. Program success improved when participation requirements, such as mandatory microchipping, were minimized, and assurances were provided that enforcement would not follow. Flexibility in the number of cats enrolled per caregiver, as well as efforts to build relationships and trust, further boosted engagement.

Veterinary workforce capacity

Persistent veterinary workforce shortages constrained program delivery throughout the project's lifespan. These shortages limited clinic participation and inflated desexing costs (~$300 per surgery performed), reducing program efficiency. This structural challenge has broader implications for the scalability of companion animal management programs in Australia.

 doi:10.20944/preprints202511.0420.v1

4. Discussion

The KCSAH project provides one of the most comprehensive examples to date of a community-driven human behavior change program for domestic cats in Australia. The findings highlight both the opportunities and the challenges of implementing large-scale, multi-channel interventions in this space.

The first key insight was the importance of developing tailored approaches for targeting semi-owners. This group is critical for domestic cat management programs, given that the population of semi-owned and unowned domestic cats in Australia is estimated to be anywhere from 0.7 to 2 million, or approximately 60–100 cats per 1,000 human residents [43–45]. In the KCSAH study sample, 7% of residents reported engaging in some form of semi-ownership [35], which is lower than the 22% of residents who reported feeding stray cats in a Victorian study nearly two decades earlier [34]. This difference may reflect geographic variation, but it is also possible that shifting messaging and interventions around stray cat management have influenced behavior over time.

While many semi-owners also have cats of their own, they are often unwilling or unable to formally adopt additional stray cats. Reported reasons include not wanting another animal, concerns about impacts on resident cats, or restrictions associated with their accommodation [36,46]. Furthermore, many value the perceived independence of cats [34], making full containment an unlikely outcome for this group. However, it is important to note that some of these findings are from a study focused on individuals surrendering stray cats to shelters [46], a subset of semi-owners who have the capacity and willingness to capture and transport cats, which may not accurately represent the broader population of semi-owners. Regardless, management strategies should take a human behavior-change approach and 1) encourage the community to notice and act to ensure unowned cats are actively and appropriately managed, and 2) engage with semi-owners to create a long-term plan for each cat, including designating a caregiver, or 'owner', responsible for their ongoing care.

For semi-owners, the requirement to register cats and pay the associated lifetime fee was a major deterrent to microchipping during the KCSAH targeted desexing campaign, even though the microchipping was free. Some semi-owners also expressed concerns about being held legally responsible if the cat became sick or injured and required costly treatment, or if it was declared a nuisance. Under current NSW law, anyone providing care for a cat can be deemed its legal owner with all the associated responsibilities, regardless of whether the cat is microchipped and registered. In practice, however, the regulations for nuisance cat behavior in NSW are weak; while cats can technically be declared a "nuisance," the threshold for proving an offence is sufficiently high that this almost never occurs. This experience highlighted that financial incentives alone are not enough and that long-term change depends on engaging with semi-owners while also addressing the underlying sources of unowned cat populations. In Australia, the law generally treats anyone providing ongoing care as the legal "owner," even if they do not view themselves that way, which can create reluctance to formalize the relationship. Other countries, such as Italy, Greece, Spain, and Brazil, have adopted colony caretaker models that authorize community members to feed and monitor free-roaming cats without assuming full liability. While such models reduce barriers, they also risk normalizing the presence of unmanaged cat populations in public spaces. This approach is problematic in the Australian context, where it is strongly opposed by conservation groups, could encourage abandonment of owned cats, and may imply that some cats are entitled to a lower standard of care. Instead, efforts are better directed at reducing financial barriers, clarifying the legal meaning of "ownership," and supporting semi-owners to formalize their caregiving role, while also addressing local sources of recruitment to the unowned cat population such as abandonment and migration.

The initial social science research within the KCSAH project identified six unique cat owner profiles amongst those who allowed their cats to roam [39]. These showed close alignment with the typology previously reported by Crowley et al. [47], suggesting consistent behavioral patterns across different contexts. More recently, Chamberlain et al. [48] used latent profile analysis to categorize cat owners into four distinct COM-B segments: *engaged* (6%), *receptive* (17%), *ambivalent* (48%), and *opposed* (30%). Despite methodological differences, these studies converge in highlighting that a large

 doi:10.20944/preprints202511.0420.v1

proportion of cat owners fall into the middle ground of ambivalence or limited capability. At the same time, a smaller subset is either highly motivated to contain cats or strongly resistant to change.

A key limitation of the KCSAH project was the inability to robustly assess the effects of targeted messaging on human behavior change. While the campaign was grounded in strong formative research and designed around owner segments, the primary evaluation relied on pre- and post-intervention surveys that used different methodologies. This limited the capacity to directly attribute changes in containment behavior to the campaign. The post-intervention panel survey revealed that cat owners who recalled exposure to campaign messaging reported higher COM-B scores, indicating improved capability, opportunity, and motivation for containment. However, because this assessment occurred late in the project, it remains unclear how these attitudinal shifts subsequently translated into sustained human behavior change. Importantly, stated attitudes and intentions do not always align with real-world practices, as illustrated in the willingness-to-pay literature, where expressed support for higher-welfare options often exceeds actual purchasing behavior [49,50].

Similar challenges were encountered in assessing the impact and return on investment of the different channels used to raise awareness of the project. For example, the social media marketing campaign, which accounted for 17% of the project budget, achieved the greatest reach with over 3.5 million social media impressions and more than 42,000 blog/article views. By contrast, the school education program represented only 1.2% of the budget and directly reached 1,404 students, while the printed/packaged resources (4.8% of the budget) reached just over 14,000 caregivers. Although these latter channels had a much higher per-person cost and lower reach than mass digital strategies, they may have been more effective in influencing behavior change by fostering deeper engagement and longer-term shifts in norms. Compared to mass communication channels, face-to-face discussions — particularly with trusted advisors such as veterinarians — offer opportunities to address caregiver concerns directly, provide practical and context-specific solutions, and reinforce social norms surrounding cat care [38,51]. However, more robust data are needed on how effectively veterinarians and rescue organisations engaged in these conversations after receiving partner packages, as little is known about whether the materials altered their approach, how frequently they raised the topic with caregivers, or the extent to which their own views shaped the quality and impact of those discussions.

For veterinarians in particular, workforce capacity and lack of training and confidence in desexing unsocialized or prepubertal cats can significantly limit their ability to engage in community cat programs, as evident in the implementation of the KCSAH targeted desexing initiative. A total of 2,731 cats were desexed through 26 private veterinary clinics that participated in the KCSAH project at a program cost of AUD $829,861, equating to an average of approximately AUD $304 per cat. By contrast, Cotterell et al. [52] reported substantially lower costs in a Victorian targeted desexing program, which sterilized 831 cats between 2013 and 2021 for a total cost of AUD $77,490, or about AUD $93 per cat, including microchipping. It should be noted, however, that such low costs are only achievable where private veterinarians heavily subsidize their fees. The higher average cost reported in KCSAH is therefore more likely to reflect the true cost of delivering desexing at scale. Importantly, veterinarians should not be expected to absorb these costs; the real costs of service delivery need to be recognized and built into program planning and funding. As desexing is a critical part of controlling cat populations, veterinary sector capacity building in high-quality, high-volume spay–neuter techniques, anaesthesia and pain management for unsocialized or prepubertal cats would be beneficial, especially by incorporating this into veterinary curricula, and leveraging partnerships with veterinary schools [53–55]. Long-term success will also depend on sustained funding and cross-council coordination, particularly in regions where cat migration between jurisdictions undermines local efforts.

Whether driven by desexing efforts or human behavior change, monitoring data indicated that the KCSAH project contributed to positive ecological and community outcomes in several participating councils, although results were uneven across sites. Ecological surveys suggested reductions in free-roaming cat densities in participating councils, while camera data showed

 doi:10.20944/preprints202511.0420.v1

persistent cat roaming activity in the same areas, indicating that while cat population density decreased, they continued to occupy the same spaces. Community-level indicators were more consistent with many councils experiencing notable declines in nuisance complaints and cat impoundments. In councils that reported increases, this was likely due to either the more limited scope of KCSAH activities or to greater community awareness prompting more proactive reporting of free-roaming cats rather than an actual rise in nuisance activity. Overall, these findings are consistent with international evidence indicating that accessible, community-focused desexing initiatives can lead to measurable reductions in intake, euthanasia, and nuisance complaints when implemented at scale and sustained over time. Examples include Banyule City Council's low-cost desexing program, which delivered a 469% return on investment by reducing animal management expenses [52]; the Rosewood Community Cat Program in rural Australia, which achieved declines of up to 85% in euthanasia and 60% in intake within three years [56]; and U.S. initiatives such as the New Hampshire Animal Population Control Program, which linked subsidized sterilization to long-term reductions in shelter admissions [57]. Together, these examples reinforce that targeted, well-supported desexing programs can underpin ecological and community benefits, particularly when combined with behavior change and broader welfare interventions.

Overall, the KCSAH project underscores the need for more systematic and standardized approaches to evaluating cat management interventions. Readily available metrics such as social media analytics, website traffic, and resource downloads can demonstrate reach and engagement, but they do not directly measure human behavior change. Survey-based social science research provides deeper insights into motivations and barriers, yet it is costly to conduct and is increasingly affected by declining response rates [58–60]. Ecological monitoring methods, such as camera trapping, provide robust evidence of cat activity but are resource-intensive and unlikely to be sustainable for most jurisdictions. Other commonly used metrics, such as the number of registered cats and cat-related nuisance complaints, proved to be of limited value, as both are strongly influenced by reporting effort and compliance processes rather than reflecting actual changes in cat populations or their impacts. More practical, scalable indicators may include shelter and pound intake data. However, these too require cautious interpretation, as increases may reflect improved reporting or changing policies, rather than worsening conditions. Developing a nationally consistent monitoring and reporting framework would greatly strengthen the ability to compare interventions across regions and track progress over time.

Finally, the sustainability of large-scale human behavior change programs is a critical consideration. The KCSAH project was supported by a sizable grant from the NSW Environment Trust; however, actual expenditure was likely underestimated, as the project was able to leverage existing RSPCA infrastructure, staff expertise, and communication platforms. Some costs were one-off investments in resource development, but maintaining engagement over time requires dedicated full-time staff positions. Although ownership of the project was transferred to RSPCA NSW, many initiatives risk losing momentum once initial funding ends, as they are labor-intensive to sustain. Ongoing investment is therefore essential to support staff roles at state or regional levels to coordinate desexing and outreach across multiple councils. Shared or co-funded positions could reduce costs while ensuring continuity, and opportunities exist to centralize and coordinate promotion of low-cost desexing initiatives, an approach already adopted by some organisations in Australia, to minimize duplication and increase reach.

5. Conclusions

The KCSAH project showed that large-scale behavior change programs can engage communities, reduce free-roaming cat impacts, and strengthen cross-sector partnerships. The project reached millions through social marketing and digital resources, while thousands of people engaged directly via community events, school programs, and subsidized desexing. Ecological monitoring revealed reductions in roaming cat densities in several councils, with many areas also experiencing declines in nuisance complaints and impoundments. However, results were uneven, and survey data

 doi:10.20944/preprints202511.0420.v1

could not robustly demonstrate how increased capability, opportunity, and motivation translated into sustained containment behaviors. These limitations underscore the importance of establishing consistent evaluation frameworks and investing in metrics that are practical for councils to collect and interpret.

At the same time, the project exposed structural challenges. Workforce capacity, funding, and practitioner confidence limit the ability of private veterinary practices to deliver high-volume, low-cost desexing. The actual costs of service delivery must be built into program planning, rather than relying on veterinary subsidies. Legal definitions of ownership, registration requirements, and the reluctance of some caregivers to assume full responsibility for semi-owned cats also remain barriers. Addressing these issues will require ongoing policy reform, expanded veterinary training, and resource models that support councils and communities in working together across jurisdictions. By embedding behavior change science within integrated programs that combine education, desexing, and supportive policy, the foundations established by KCSAH can inform future national strategies to improve cat welfare, reduce conflict with communities, and protect Australia's biodiversity.

Supplementary Materials: The following supporting information can be downloaded at the website of this paper posted on Preprints.org. **Table S1.** Summary of caregiver profiles identified through COM-B segmentation and their implications for targeted messaging (adapted from Ma & McLeod, 2023).

Author Contributions: Conceptualization, G.C.M. and B.P.A.K.; methodology, G.C.M. and B.P.A.K.; formal analysis, B.P.A.K.; resources, G.C.M.; data curation, G.C.M. and B.P.A.K.; writing—original draft preparation, M.C.G. and K.E.L.; writing—review and editing, G.C.M., S.Z. and B.P.A.K.; funding acquisition, G.C.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the NSW Government through its Environmental Trust, grant number 2020/PROS/0001.

Institutional Review Board Statement: Human ethics approval for the social science research was obtained from the University of Sydney's Human Research Ethics Committee (Project Number 2021/473). The animal study protocol for the transect drives and camera traps was approved by the Animal Ethics Committee of the University of New England (ARA21-051).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors on request.

Acknowledgments: The authors would like to acknowledge the KCSAH partner councils for their support and commitment to the success of the project.

Conflicts of Interest: GCM was employed by RSPCA NSW as Project Manager on Keeping Cats Safe at Home. M.C.G. and K.E.L. were engaged as paid consultants to help prepare the manuscript.

Abbreviations

The following abbreviations are used in this manuscript:

ACT	Australian Capital Territory
AUD	Australian Dollar
COM-B	Capability-Opportunity-Motivation Behavior
EOI	Expression of Interest
FTE	Full Time Equivalent
KCSAH	Keeping Cats Safe at Home
NSW	New South Wales
RSPCA	Royal Society for the Prevention of Cruelty to Animals

 doi:10.20944/preprints202511.0420.v1

References

1. Cotterell, J., J. Rand, and R. Scotney, *Urban Cat Management in Australia—Evidence-Based Strategies for Success.* Animals, 2025. **15**(8): p. 1083.
2. Wandesforde-Smith, G., et al., *Coping with human-cat interactions beyond the limits of domesticity: moral pluralism in the management of cats and wildlife.* Frontiers in Veterinary Science, 2021. **8**: p. 682582.
3. Legge, S., et al., *We need to worry about Bella and Charlie: the impacts of pet cats on Australian wildlife.* Wildlife Research, 2020. **47**(8): p. 523-539.
4. Gordon, J., C. Matthaei, and Y. Van Heezik, *Belled collars reduce catch of domestic cats in New Zealand by half.* Wildlife Research, 2010. **37**(5): p. 372-378.
5. Calver, M., et al., *Reducing the rate of predation on wildlife by pet cats: The efficacy and practicability of collar-mounted pounce protectors.* Biological Conservation, 2007. **137**(3): p. 341-348.
6. Nelson, S., A. Evans, and R. Bradbury, *The efficacy of collar-mounted devices in reducing the rate of predation of wildlife by domestic cats.* Applied Animal Behaviour Science, 2005. **94**(3-4): p. 273-285.
7. Geiger, M., et al., *Colorful collar-covers and bells reduce wildlife predation by domestic cats in a continental European setting.* Frontiers in Ecology and Evolution, 2022. **10**: p. 850442.
8. Cecchetti, M., et al., *Provision of high meat content food and object play reduce predation of wild animals by domestic cats Felis catus.* Current biology, 2021. **31**(5): p. 1107-1111. e5.
9. Herrera, D., et al., *Prey selection and predation behavior of free-roaming domestic cats (Felis catus) in an urban ecosystem: Implications for urban cat management.* Biological Conservation, 2022. **268**: p. 109503.
10. Hall, C.A., et al., *Do collar-mounted predation deterrents restrict wandering in pet domestic cats?* Vol. 176. 2016.
11. Hall, C.M., et al., *Assessing the effectiveness of the Birdsbesafe® anti-predation collar cover in reducing predation on wildlife by pet cats in Western Australia.* Applied Animal Behaviour Science, 2015. **173**: p. 40-51.
12. McLeod, L.J., D.W. Hine, and A.J. Bengsen, *Born to roam? Surveying cat owners in Tasmania, Australia, to identify the drivers and barriers to cat containment.* Preventive Veterinary Medicine, 2015. **122**(3): p. 339-344.
13. Metsers, E.M., P.J. Seddon, and Y.M. van Heezik, *Cat-exclusion zones in rural and urban-fringe landscapes: how large would they have to be?* Wildlife Research, 2010. **37**(1): p. 47-56.
14. Crawford, H.M., J.B. Fontaine, and M.C. Calver, *Ultrasonic deterrents reduce nuisance cat (Felis catus) activity on suburban properties.* Global Ecology and Conservation, 2018. **15**: p. e00444.
15. Elford, A., A. Cooke, and B. Ventura, *I want them to live their best lives: A qualitative exploration of owner experiences with walking their cats.* Animal Welfare, 2025. **34**: p. e56.
16. Tan, S.M., A.C. Stellato, and L. Niel, *Uncontrolled outdoor access for cats: An assessment of risks and benefits.* Animals, 2020. **10**(2): p. 258.
17. Chalkowski, K., et al., *Who let the cats out? A global meta-analysis on risk of parasitic infection in indoor versus outdoor domestic cats (Felis catus).* Biology letters, 2019. **15**(4): p. 20180840.
18. De Assis, L.S. and D.S. Mills, *Introducing a controlled outdoor environment impacts positively in cat welfare and owner concerns: The use of a new feline welfare assessment tool.* Frontiers in Veterinary Science, 2021. **7**: p. 599284.
19. Vitale, K.R., *The social lives of free-ranging cats.* Animals, 2022. **12**(1): p. 126.
20. Foreman-Worsley, R. and M.J. Farnworth, *A systematic review of social and environmental factors and their implications for indoor cat welfare.* Applied Animal Behaviour Science, 2019. **220**: p. 104841.
21. Wall, M., N.J. Cave, and E. Vallee, *Owner and cat-related risk factors for feline overweight or obesity.* Frontiers in veterinary science, 2019. **6**: p. 266.
22. Taylor, S., et al., *2022 ISFM/AAFP cat friendly veterinary environment guidelines.* Journal of Feline Medicine and Surgery, 2022. **24**(11): p. 1133-1163.
23. Ellis, S.L., et al., *AAFP and ISFM feline environmental needs guidelines.* Journal of feline medicine and surgery, 2013. **15**(3): p. 219-230.
24. Animal Medicines Australia, *Pets in Australia: A national survey of pets and people*. 2025.
25. Lawson, G.T., F.M. Langford, and A.M. Harvey, *The environmental needs of many Australian pet cats are not being met.* Journal of Feline Medicine and Surgery, 2020. **22**(10): p. 898-906.
26. Rand, J., et al., *Situational analysis of cat ownership and cat caring behaviors in a community with high shelter admissions of cats.* Animals: an Open Access Journal from MDPI, 2024. **14**(19): p. 2849.

 doi:10.20944/preprints202511.0420.v1

27. Dutton-Regester, K. and J. Rand, *Cat caring behaviors and ownership status of residents enrolling a cat in a free sterilization program.* Animals, 2024. **14**(20): p. 3022.
28. Nou, T., et al., *The management of cats by local governments of Australia.* NESP Project, 2021. **7**.
29. Elliott, A., et al., *Perceptions of Responsible Cat Ownership Behaviors among a Convenience Sample of Australians.* Animals, 2019. **9**(9): p. 703.
30. Cotterell, J., J. Rand, and R. Scotney, *Rethinking Urban Cat Management—Limitations and Unintended Consequences of Traditional Cat Management.* Animals, 2025. **15**(7): p. 1005.
31. Foreman-Worsley, R., et al., *Indoors or outdoors? An international exploration of owner demographics and decision making associated with lifestyle of pet cats.* Animals, 2021. **11**(2): p. 253.
32. Rand, J., et al., *Attitudes and beliefs of a sample of Australian dog and cat owners towards pet confinement.* Animals, 2023. **13**(6): p. 1067.
33. Toukhsati, S.R., et al., *Wandering cats: attitudes and behaviors towards cat containment in Australia.* Anthrozoös, 2012. **25**(1): p. 61-74.
34. Toukhsati, S.R., P.C. Bennett, and G.J. Coleman, *Behaviors and attitudes towards semi-owned cats.* Anthrozoös, 2007. **20**(2): p. 131-142.
35. Ma, G.C., L.J. McLeod, and S.J. Zito, *Characteristics of cat semi-owners.* Journal of Feline Medicine and Surgery, 2023. **25**(9): p. 1098612X231194225.
36. Zito, S., et al., *Cat ownership perception and caretaking explored in an internet survey of people associated with cats.* PloS one, 2015. **10**(7): p. e0133293.
37. McLeod, L.J., et al., *Understanding the relationship between intention and cat containment behaviour: A case study of kitten and cat adopters from RSPCA Queensland.* Animals, 2020. **10**(7): p. 1214.
38. Michie, S., M.M. Van Stralen, and R. West, *The behaviour change wheel: a new method for characterising and designing behaviour change interventions.* Implementation science, 2011. **6**(1): p. 42.
39. Ma, G.C. and L.J. McLeod, *Understanding the factors influencing cat containment: Identifying opportunities for behaviour change.* Animals, 2023. **13**(10): p. 1630.
40. McLeod, L.J., D.W. Hine, and A.B. Driver, *Change the humans first: Principles for improving the management of free-roaming cats.* Animals, 2019. **9**(8): p. 555.
41. Davey, I.J., et al., *Spatial and Temporal Movements of Free-Roaming Cats and Wildlife in Two Local Government Areas in Greater Sydney, Australia.* Animals, 2023. **13**(10): p. 1711.
42. Kennedy, B.P., A. Clemann, and G.C. Ma, *Feline Encounters Down Under: Investigating the Activity of Cats and Native Wildlife at Sydney's North Head.* Animals, 2024. **14**(17): p. 2485.
43. Tan, K., J. Rand, and J. Morton, *Trap-neuter-return activities in urban stray cat colonies in Australia.* Animals, 2017. **7**(6): p. 46.
44. Legge, S., et al., *Enumerating a continental-scale threat: how many feral cats are in Australia?* Biological Conservation, 2017. **206**: p. 293-303.
45. Kerr, C.A., et al., *Changes associated with improved outcomes for cats entering RSPCA Queensland shelters from 2011 to 2016.* Animals, 2018. **8**(6): p. 95.
46. Zito, S., et al., *Reasons people surrender unowned and owned cats to Australian animal shelters and barriers to assuming ownership of unowned cats.* Journal of Applied Animal Welfare Science, 2016. **19**(3): p. 303-319.
47. Crowley, S.L., M. Cecchetti, and R.A. McDonald, *Diverse perspectives of cat owners indicate barriers to and opportunities for managing cat predation of wildlife.* Frontiers in Ecology and the Environment, 2020. **18**(10): p. 544-549.
48. Chamberlain, S.A., L.J. McLeod, and D.W. Hine, *Audience segmentation of New Zealand cat owners: Understanding the barriers and drivers of cat containment behavior.* Plos one, 2024. **19**(1): p. e0296805.
49. Blumenschein, K., et al., *Eliciting willingness to pay without bias: evidence from a field experiment.* The Economic Journal, 2008. **118**(525): p. 114-137.
50. van Riemsdijk, L., et al., *Can Marketing Increase Willingness to Pay for Welfare-Enhanced Chicken Meat? Evidence from Experimental Auctions.* Animals, 2023. **13**(21): p. 3367.
51. Wanyonyi, K.L., et al., *A systematic review and meta-analysis of face-to-face communication of tailored health messages: implications for practice.* Patient education and counseling, 2011. **85**(3): p. 348-355.

 doi:10.20944/preprints202511.0420.v1

52. Cotterell, J.L., et al., *Impact of a local government funded free cat sterilization program for owned and semi-owned cats.* Animals, 2024. **14**(11): p. 1615.
53. Wolfson, W., B. Unti, and J. Taboada, *LSU–SVM Shelter Medicine Program.* Journal of veterinary medical education, 2015. **42**(4): p. 284-284.
54. Crauer, B., et al., *Future vets helping future pets: shelter medicine at Kansas State University.* Journal of the American Veterinary Medical Association, 2023. **261**(9): p. 1402-1402.
55. Dalrymple, A.M., et al., *Shelter medicine programs support multiple AAVMC competency domains: a survey of shelter medicine programming at AVMA-accredited colleges.* Journal of Veterinary Medical Education, 2025(aop): p. e20240105.
56. Rand, J., et al., *Outcomes of a Community Cat Program Based on Sterilization of Owned, Semi-Owned and Unowned Cats in a Small Rural Town.* Animals: an Open Access Journal from MDPI, 2024. **14**(21): p. 3058.
57. White, S.C., E. Jefferson, and J.K. Levy, *Impact of publicly sponsored neutering programs on animal population dynamics at animal shelters: The New Hampshire and Austin experiences.* Journal of Applied Animal Welfare Science, 2010. **13**(3): p. 191-212.
58. Holtom, B., et al., *Survey response rates: Trends and a validity assessment framework.* Human relations, 2022. **75**(8): p. 1560-1584.
59. Mayer, A., *Reducing respondents' perceptions of bias in survey research.* Methodological Innovations, 2021. **14**(3): p. 20597991211055952.
60. Olson, K., J. Wagner, and R. Anderson, *Survey costs: Where are we and what is the way forward?* Journal of Survey Statistics and Methodology, 2021. **9**(5): p. 921-942.