

Implementation of a Feral Cat Management Program on a University Campus

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In August 1998, Texas A&M University implemented on campus a trap-test-vaccinate-alter-return-monitor (TTVARM) program to manage the feral cat population. TTVARM is an internationally recognized term for trapping and neutering programs aimed at management of feral cat populations. In this article we summarize results of the program for the period August 1998 to July 2000. In surgery laboratories, senior veterinary students examined cats that were humanely trapped once a month and tested them for feline leukemia and feline immunodeficiency virus infections, vaccinated, and surgically neutered them. They euthanized cats testing positive for either infectious disease. Volunteers provided food and observed the cats that were returned to their capture sites on campus and maintained in managed colonies. The program placed kittens and tame cats for adoption; cats totaled 158. Of the majority of 158 captured cats, there were less kittens caught in Year 2 than in Year 1. The proportion of tame cats trapped was significantly greater in Year 2 than in Year 1. The prevalence found for feline leukemia and feline immunodeficiency virus ELISA test positives was 5.8% and 6.5%, respectively. Following surgery, 101 cats returned to campus. The project recaptured, retested, and revaccinated more than one-fourth of the cats due for their annual vaccinations. The program placed 32 kittens, juveniles, and tame adults for adoption. The number of cat complaints received by the university's pest control service decreased from Year 1 to Year 2.

Feral cats are a concern in the United States and around the world. Concerns center around issues of public health, cat welfare, impacts on wildlife, and meth-

ods for controlling these populations (Mahlow & Slater, 1996; Patronek, 1998). The term *feral* is used to denote a spectrum of behavior in cats, representing varying levels of socialization dependent on the cat's history and experiences (Patronek, 1998). Although some of these cats previously may have been animal companions, in general they are too unsocialized to be placed as pets. Thus, there is controversy over how to control these populations.

A population of cats has existed on the Texas A&M University campus for many years. The campus is in a community of approximately 100,000 and has an enrollment of more than 44,000 students (Texas A&M University, 2001). The campus is near the edge of town, adjacent to pastures as well as residential areas; thus, the campus cat population is contiguous with the cat population in the community. The campus group is thought to have developed from pet cats abandoned or lost by students and neighbors. Thus, the population consists of cats born feral from nonneutered former pets as well as cats who have been lost or abandoned more recently.

Because of concerns associated with these cats, the university has attempted to control this population and historically has done so through traditional pest control measures: trapping and euthanasia. In response to concerns from some faculty and staff that these methods were not effective and that other more effective and humane methods existed, an alternative approach was proposed and implemented. This alternative method was aimed at management of the population rather than pest control and was implemented in the summer of 1998. The method, known as trap-test-vaccinate-alter-return-monitor (TTVARM), strives to control population growth through neutering and maintaining the cats at their original site in managed colonies where food is provided and the cats are observed (Patronek, 1998). Proponents of this method believe that maintaining the cats at the original location will keep the environmental niche filled and help prevent immigration of new cats (Universities Federation for Animal Welfare [UFAW], 1995).

In contrast, when trapping and euthanasia are employed, a few cats often escape capture and will repopulate the area—as long as food and shelter are available (Mahlow & Slater, 1996; UFAW, 1995). A few studies of the implementation of this type of program on small populations of feral cats have been carried out and have found the populations to remain relatively stable with no new kittens being produced (Neville & Remfry, 1984; Zaunbrecher & Smith, 1993). Although reducing reproduction in the population, TTVARM programs, it is believed, improve the health of feral cats and reduce the public health risks and risks to free-roaming pet cats because the ferals are vaccinated for rabies and feline infectious diseases at the time of neutering. Neutering also alters certain behaviors, making cats less likely to roam, spray, and fight (Mahlow & Slater, 1996), further lessening the risk of spreading disease as well as decreasing nuisance complaints. Thus, the campus program's goal was to manage the population more humanely

through nonlethal measures by reducing growth through neutering while reducing complaints associated with these cats.

METHODS

Trapping

A TTVARM program began on the university campus in August 1998. Trapping was carried out approximately every 4 to 6 weeks from August 1998 through July 2000, except in December. The December 1998 trapping session was conducted 2 weeks after the November period, and the December 1999 session was cancelled because of the senior veterinary students' taking their national board exams.

Typically, trapping occurred for 4 to 6 nights (range 2 to 8). Humane live traps (Raccoon-Opossum Transfer Trap and XL Raccoon Transfer Trap, Tomahawk Live Trap Co., Tomahawk, WI) were used to trap the cats. Generally, 10 to 20 traps per night were set (range 3 to 25). The minimum number set in any trapping period was approximately 30 traps, as the minimum number of traps per night and the minimum number of nights per trapping period never occurred in combination. Trap numbers were reduced toward the end of a period or if it was raining, as cats were unlikely to be caught under these conditions. Increased numbers were set during the winter and spring breaks because the campus was less active at these times. Traps were set in areas known or suspected to have cats and were placed in less conspicuous sites, so as to be less visible to passers-by.

Various baits and trapping methods were used in an attempt to maximize trapping success. Canned cat food, tuna, and dry cat food were used most often, but other foods such as hot dogs and sardines were also tried. Covering traps with tarps or plastic garbage bags was also done periodically, either for protection from rain or in an attempt to alter the trap's appearance to encourage trap-shy cats to enter. Other variations in trapping methods included covering the wire mesh floor of the trap with newspaper and using a wooden box trap. Feeding out of a trap, without setting the trap, was also tried. This feeding method was carried out for a few days to a few weeks before the trap was set. Traps were placed in the evening and, to reduce interaction between people and trapped cats, typically were checked early in the morning. Cats caught were transferred to a holding area in the Small Animal Clinic of the Veterinary Teaching Hospital.

The cats were kept in specially modified cages, which allowed for feeding and cleaning the cats without handling them. The floors of the cages were slotted to allow waste to drop through into a tray that could be removed for cleaning. The doors of the cages, although able to open in a standard manner, also had a guillotine door. This feature allowed caretakers to maneuver bowls and litter trays into

and out of the cages while reducing the risk of escape. The cages also contained a squeeze feature.

Data Collection and Analysis

At the time of initial capture, each cat was assigned an identification number. An individual record was made for each cat, using data sheets developed for recording the cat's identification and health information. Breed and estimated age were recorded at this time, along with weight, coat color, and a physical description. Age estimates were based on size, body weight, and dentition, with one veterinarian making the majority of the estimates. Gender was determined after the cat had been anesthetized for the surgery lab. Information regarding feline leukemia (FeLV)/feline immunodeficiency virus (FIV) status, vaccination information, and microchip number was recorded on each cat's data sheet. Occasionally, tame cats were trapped or found, in which case gender was determined during routine physical examination. To provide an age distribution of the population, age categories were defined as follows: kitten (< 3 months); juvenile (3 months to 1 year); young adult (1 year to 5 years); adult (5 to 10 years); geriatric (> 10 years). Cats then were placed into categories based on their estimated ages.

Blood samples were taken from each cat either when anesthetized for the surgery laboratory or during physical examination if the cat was tame. Using a commercial ELISA test (Snap® FeLV Antigen and FIV Antibody Combo Test, IDEXX Laboratories, Inc., Westbrook, ME), samples were tested for FeLV and FIV. The prevalence found in Year 1 and Year 2 was compared by Fisher's exact test, as was the prevalence found in ferals and tame cats.

The number of cats caught in Year 1 of the program was computed and compared to the number caught in Year 2. The proportion of males and females caught in each year was analyzed by chi-square. The difference in proportion of kittens caught in each year also was analyzed. In addition, the number of kittens caught in the first year was divided by season and analyzed by chi-square. The number of tame cats caught in each year that were estimated to be at least 6 months old, was totaled and analyzed using Fisher's exact test. The number of cats returned to campus and later recaptured for annual vaccination was compared to the total number returned and due for vaccination. The weights of those cats recaptured for annual vaccination that were estimated to be at least 1 year of age at the time of neutering, were compared to their weights at neutering, using the Wilcoxon signed rank test.

Initially, any cat involved in a bite incident was euthanized and submitted for rabies testing. The decision to euthanize these cats, rather than quarantine them, was made because of concerns of the college's Hospital Research Review Committee, which oversees research programs on nonuniversity owned animals. The policy was amended in the latter part of Year 2 to allow for quarantine on a case-by-case basis.

The number of complaints received by the university's pest control service for cats was tabulated for the period January 1999 through July 2000. Approximate totals for costs of surgeries and traps were tabulated. Number of person hours was estimated for time spent feeding, monitoring, trapping, and conducting surgeries.

Surgery Laboratories

On the Friday at the end of each trapping session, surgery laboratories were conducted. In the laboratories, the cats were anesthetized; given physical examinations; tested for FeLV and FIV; and, if negative, vaccinated for rabies, feline panleukopenia, feline rhinotracheitis, calicivirus, and, occasionally, leukemia—depending on which combination vaccine was used (Imrab™ 3, Merial, Inc., Athens, GA; Eclipse™ 3+ FeLV/R, Fort Dodge Laboratories, Inc., Fort Dodge, IA; Trivalent Intranasal and Intraocular Vaccine, Boehringer Ingelheim Animal Health, Inc., St. Joseph, MO). Microchips were implanted (FriendChip™, AVID™, Norco, CA) and cats were surgically neutered, using accepted techniques (Fossum et al., 1997). Kittens were neutered if they were estimated to be at least 8 weeks old, based on a minimum body weight of 0.9 kg (Howe, 1997; Theran, 1993). After the cats were neutered, they were ear-tipped for identification as neutered feral cats (Cuffe, Eachus, Jackson, Neville, & Remfry, 1983). The ear-tipping procedure consisted of removing approximately 1 cm from the tip of the pinna by a straight cut after crushing with a hemostat. Styptic sticks were used if needed to control bleeding (Stypt-Stix, Vetus Animal Health, Burns Veterinary Supply, Rockville Centre, NY). The left ear tip was removed in females and in males, the right. Cats that tested positive for FeLV or FIV were euthanized. These cats were submitted for necropsy beginning in the fourth month of the program. Blood samples were collected from FIV+ cats for potential testing of viral status postmortem, through viral isolation, as part of another study.

Senior veterinary students, as part of their clinical rotations, performed the laboratory procedures. To prepare the students, handouts describing the protocol were provided prior to the laboratory. A veterinary technician supervised the students in drawing blood, placing intravenous catheters and endotracheal tubes, and clipping and preparing the cats for surgery. A veterinary surgeon supervised the surgical and ear-tipping procedures. Cats were returned to their site of capture approximately 2 days following surgery.

Management

Tame cats and kittens young enough to be socialized were placed for adoption. An estimated age of 3 months was generally the maximum age at which socialization of kittens was attempted. Tame cats were held for 3 days and, in an attempt to locate the owner, were listed with the local animal shelter, in the lost

and found section of the local paper, and with the front desk of the Small Animal Clinic. Like the ferals, unclaimed cats were tested, vaccinated, microchipped, and neutered. They then were placed for adoption. Previously feral cats that later became socialized also were placed for adoption.

A volunteer organization, limited to faculty, staff, and students, acted as caretakers of the managed colonies. Returned cats were fed at feeding stations set up around campus that, subject to the availability of volunteers, were replenished daily. Volunteers also observed for the presence of new or ill cats.

Periodically, cats were caught between scheduled trapping, in which case the cat was worked into the general surgery service's schedule and was tested, vaccinated, microchipped, neutered, and ear-tipped as during the laboratories.

RESULTS

From August 1998 through July 2000, a total of 158 cats were caught on campus. Most of these were caught in traps, but some, such as kittens and tame cats, were occasionally caught by hand. The number of cats caught in Year 1 was summarized for comparison to the number captured in Year 2 (Table 1). Although a greater proportion of males was caught in Year 2 than in Year 1, there was no association between gender and year, $\chi^2(1, N = 158) = 1.47, p = .22$. Although 20 kittens were caught in Year 1, only 3 kittens were caught in Year 2. The proportion of kittens caught in Year 2 was less than the proportion of kittens caught in Year 1 but was not statistically significant ($p_1 - p_2 = .08, p = .39$). It was thought unlikely that the 3 kittens in Year 2 were born on campus, as they were found in unusual locations and found as single kittens with no littermates.

Excluding these kittens from the analysis, the proportion of kittens captured in Year 2 was significantly less than the proportion in Year 1 ($p_1 - p_2 = .16, p = .02$). In Year 1, a significantly greater proportion of kittens was captured in the fall than in any other season, $\chi^2(3, N = 123) = 10.06, p = .02$. The prevalence of cats testing positive for FeLV and FIV was calculated (Table 1). This calculation was based on the testing of 155 cats. Three cats were not tested for the following reasons: One was euthanized for rabies testing as the result of a bite incident, one was a kitten found dead, and the third was a tame cat found bearing identification and was returned to the owner. The kitten found dead was not captured in a trap but was found in the mud next to a drainpipe and was presumed to have drowned. Although the prevalence of both FIV and FeLV decreased in Year 2, this was not statistically significant ($p_{\text{FIV}} > .99; p_{\text{FeLV}} = .46$). Two of the FIV+ cats had their viral status tested postmortem and both were confirmed positive. Of the 20 cats testing positive for FeLV or FIV, there was 1 FIV+ tame cat, but the difference in prevalence between ferals and tame cats was not statistically significant ($p_{\text{FeLV}} = .38; p_{\text{FIV}} > .99$). The majority of FeLV+ cats were estimated to be kittens or juveniles (67%),

TABLE 1
Comparison of Population Demographics and Outcomes for Years 1 and 2

	<i>Year</i>					
	<i>1</i>		<i>2</i>		<i>Total</i>	
	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>
Total caught	123		35		158	
Males	56	46	20	57	76	48
Females	67	54	15	43	82	52
Ages						
Kitten ^a	20	16	3	9	23	15
Juvenile ^b	16	13	9	26	25	16
Young adult ^c	76	62	20	57	96	61
Adult ^d	10	9	3	9	13	8
Geriatric ^e	1	1	0	0	1	1
Outcomes						
Returned to campus	85	69	16	46	101	64
Died (after returned)	1		5		6	
Returned to owner	1	1	0	0	1	1
Adopted	16	13	16	46	32	20
Found dead (not caught)	1	1	0	0	1	1
Euthanized	20	16	3	9	23	15
Total tested	120		35		155	
FIV+	8	6.7	2	5.7	10	6.5
FeLV+	8	6.7	1	2.9	9	5.8
FeLV+/FIV+	1	0.8	0	0	1	0.6
Bite incidents	3		0		3	
Quarantined	0		1		1	

^aLess than 3 months old. ^b3 months to 1 year. ^c1 year to 5 years. ^d5 years to 10 years. ^eMore than 10 years.

while the majority of FIV+ cats were young adults (70%). The one cat testing positive for both FeLV and FIV was a young adult. Three feral cats were involved in bite incidents and were euthanized. All tested negative for rabies. A fourth bite incident occurred involving a socialized kitten. The kitten was quarantined and released from quarantine at the end of 10 days.

The majority of the FeLV+ and FIV+ cats were clinically normal on physical exam. One FeLV+ cat was clinically ill. This was a kitten with flea anemia. Another FeLV+ cat had a small mass on the lip but otherwise was clinically normal. Three of the FIV+ cats had abnormal physical exam findings. One cat had facial dermatitis, one had ocular discharge and a swelling ventral to the eye, and the third cat had diarrhea and an upper respiratory infection. Necropsy results were available on 12 of these cats, as 6 were euthanized before necropsies were begun and re-

ports were not found for 2 cats submitted for necropsy. Two of the FIV+ cats and one FeLV+ cat had no significant lesions at necropsy. One FIV+ cat had diarrhea clinically and only intestinal parasites found at necropsy. It was speculated that the diarrhea may have been associated with the FIV+ status. Among the FIV+ cats, one cat was diagnosed at necropsy with chronic fibrosing pancreatitis and one with pulmonary edema. In the cat with pancreatitis, other findings were intestinal parasites, chronic enteritis, hepatitis and nephritis, alveolar edema, cystic rete ovarii, and thrombus of the uterine vein.

Although these other findings were mild and not considered clinically significant, it was thought that the presence of such a variety of lesions may have been associated with FIV. In the cat diagnosed with pulmonary edema, other findings that were not considered clinically significant were intestinal parasites, mild hepatocellular lipidosis and hydropic degeneration, mild focal portal hepatitis, mild to moderate villus blunting of the small intestine, focal nephritis and lymphoid hyperplasia, and follicular lymphoid depletion. Another FIV+ cat had a fibrotic lesion on the splenic capsule, possibly due to a previous trauma, intestinal parasites, and a healing skin abrasion. Of the FeLV+ cats, one had hydrothorax and atelectasis, but these were not considered clinically significant and no other lesions were found. At necropsy, one FeLV+ cat had intestinal lymphoid hyperplasia, associated with parasitism, and cystic rete ovarii; another had diffuse mild lymphoid depletion of the white pulp in the spleen, mild enteritis, and intestinal parasites. The lymphoid depletion was speculated to be related to the FeLV+ status. One FeLV+ cat was diagnosed with hypertrophic cardiomyopathy at necropsy, whereas another was diagnosed at necropsy with severe infestation of intestinal parasites, a hepatic hematoma, and myelo-erythroid hyperplasia of the bone marrow, which may have been related to the FeLV+ status. The one cat who was FeLV+ and FIV+ had lymphadenopathy and lymphoid hyperplasia, which was thought to be associated with the FIV+ status as well as focal hepatocyte necrosis and telangiectasia.

The total number of cats and kittens caught for Years 1 and 2 is summarized on a month by month basis (Figure 1). The proportion of new tame cats caught in Year 2 (10:35) was significantly greater than the proportion caught in Year 1 (8:123; $p = .001$). Two cats, that were known and had been fed for a long period by employees, were excluded from all the tame cat analyses. Rather than being placed for adoption, these cats were maintained at their sites, where employees continued to feed them.

The number of cats recaptured that were due as of July 2000 for annual vaccination was compared to the total number of cats returned to campus and due for vaccinations as of that date. A total of 23 cats (29%) out of 80 that were due for annual vaccinations, were recaptured and given their annual vaccinations. All but 3 of these cats were within 3 months of when they were due for vaccinations. Two of the 3 cats were 6 months past due and the third cat was 8 months past due for vaccination. All cats recaptured for their annual vaccinations were retested for FeLV

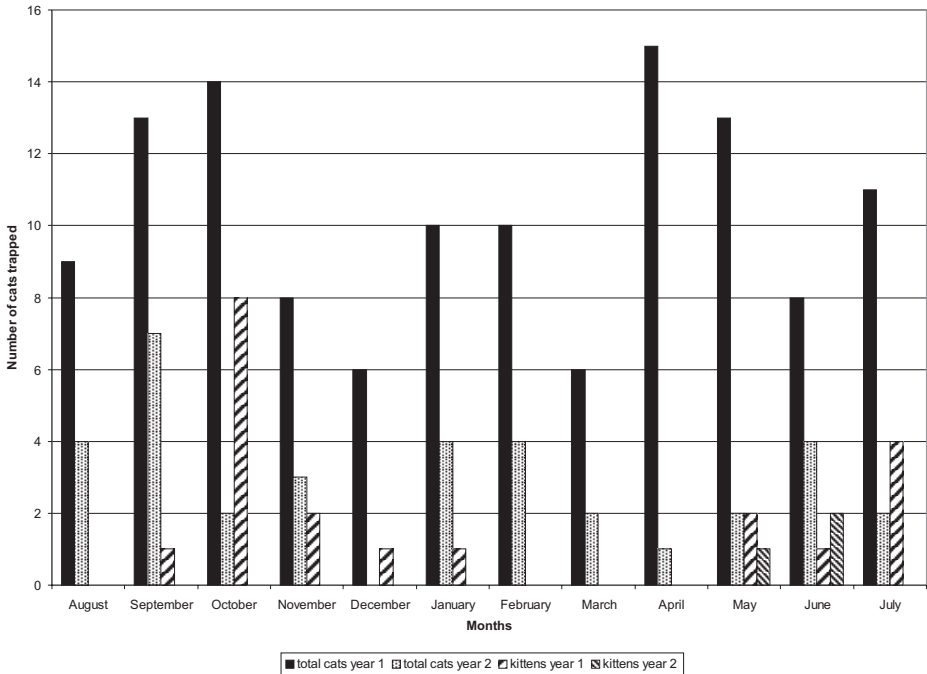


FIGURE 1 Monthly captures Year 1 versus Year 2.

and FIV, and all were negative. Weights at the time of annual vaccination were compared to the weights at neutering for the 17 adult recaptures, with a difference ranging from -0.4 kg to 1.8 kg and a median difference of 0.3 kg. The weights at recapture were significantly greater than the weights at neutering ($p = .01$). Of the 4 cats who lost weight during this time, 1 cat was in late pregnancy at neutering, 1 had been previously spayed, and 1 was a female heavily lactating. The fourth cat was a male who lost 0.4 kg. On physical exam, he was found to have some scars and skin lesions on his head, broken nails, and a broken tooth. Some firm hard masses, presumed to be feces, were palpated in the abdomen, although the possibility of an intestinal foreign body was also considered. No further diagnostics, other than retesting for FeLV and FIV, were performed. As he appeared generally healthy, he was returned to his capture site 2 days following revaccination and has been observed in the area since his return. He was originally captured for neutering in January and recaptured in October.

There was one cardiac arrest during the laboratories. A juvenile arrested while under anesthesia and was resuscitated but was blind following recovery. The cause for the arrest was not identified. As a result of handling for nursing care, he became socialized. He later regained partial vision and was placed for adoption.

A total of 17 kittens and juveniles, plus 15 tame adults were placed for adoption. Of the tame cats caught, only 1 was reunited with the owner. This was the only cat found bearing identification. One case of attempted socialization, which failed, involved a 4–5 month old juvenile who initially seemed amenable to socialization. Over a period of approximately 6 weeks, the cat became gradually less social and was returned to the site of capture.

Of the 158 cats caught, 101 initially were returned to their site of capture a few days following the surgery laboratories. Since their initial return, 9 cats became socialized and were adopted into homes, in addition to the 32 other cats placed for adoption. Six cats were known to have died. Four died as the result of trauma; 1 from disease; and the sixth from unknown cause. Necropsies were performed on 5 of these cats. The body of the 1 whose cause of death was unknown was not recovered. For the 4 cats that died from trauma, necropsy results were consistent with trauma and included broken bones, hemorrhage, fractured liver, brain herniation, and perforation of the thoracic cavity. One of the cats who died from trauma also had concentric hypertrophy of the heart. The cat that died from disease was diagnosed at necropsy with acute encephalitis, enteritis presumed due to panleukopenia infection, and pyelonephritis. Other findings were mild cystitis, oral ulcers, postsurgical focal chronic peritonitis, vacuolar degeneration, sinus plasmacytosis and mild plasmacytic pericholangitis bile stasis of the liver, and plasmacytosis and mild hemosiderosis of the spleen.

For the period from January through July 1999, the university's pest control service reported five instances in which either a complaint about a cat was received or a cat was caught while responding to another complaint. Only three such instances were reported for the period August 1999 through July 2000 (personal communication, Pest Control Supervisor P. Maxwell, August 10, 2001). Reports from 1998 were not available.

The surgical costs of the program were approximately \$9,800. The cost to the program was half this amount, based on a 50 % rate reduction charged by the Veterinary Teaching Hospital. The cost for traps was approximately \$900. Other traps were borrowed from the university's Department of Wildlife and Fisheries Sciences. Food, FeLV and FIV test kits, vaccines, and microchips were donated. Time spent in person-hours per week was approximately 15 for feeding and monitoring, 25 to 35 for trapping, and 35 for conducting surgeries.

DISCUSSION

The campus program generally has been viewed as a success by the veterinary faculty and the university's pest control service. The numbers of cats and kittens caught on campus have decreased between the first and second years of the program. The three kittens found in Year 2 were unlikely to have been born on

campus, as no littermates or nursing females were seen. Furthermore, each was found in open areas, such as parking lots and dog runs, and was easily picked up rather than being trapped, suggesting that these socialized kittens were either lost or abandoned. Although some of the kittens in Year 1 were caught by hand, most were caught in areas where littermates or nursing females were also caught. As to the variation in captures by season, the month of October—in which a litter of three kittens was captured—may account for the greater proportion of fall captures. All other kittens were found singly or in pairs. No other explanation was found for the increased proportion in fall. Although there was variation in the number of traps set each month, the number of cats caught did not correspond necessarily to the number of traps set. Very few cats were caught in some months, despite a large number of traps being set. Thus, despite the variation in trapping effort, the number of cats caught by month can be compared to see the decreasing trend in the number of new cats captured. The number of traps set was not a rate-limiting step.

Ideally, a population estimate, using the mark-recapture method, would have been performed prior to the program's implementation. However, a critical assumption of this method is that marked and unmarked animals are equally catchable, an assumption that often does not hold true in natural populations (Krebs, 1989). Another method, relying on visual identification of individuals, was not feasible as many of the cats often were seen fleetingly and under conditions—such as at night or from a distance—making exact identification difficult. Given this limitation and the potential difficulty in recapturing cats, and because the program's goal was to neuter as many cats as possible, an initial population estimate was not performed. It cannot be stated definitively that the total number of cats on campus has decreased because the study was not designed to determine this. However, more than one-third of the cats were removed, and the results indicate—based on the decrease in the number of complaints—that those who remain are less of a nuisance than previously they were. The decline in complaints has continued as only one was reported from August 2000 through July 2001 (personal communication, Pest Control Supervisor P. Maxwell, Aug 10, 2001). Although complaint records were not available for the period prior to 1999, it is known that in the year before the program's start, at least nine kittens either were caught by pest control, as they were brought to the veterinary college for euthanasia, or found by university personnel (personal communication, D. Fradkin, AFCAT founder, August 27, 2001). Typically, complaints associated with cats occurred every year.

Although nearly two-thirds of the cats caught in Year 2 were male, the overall population of cats captured on the campus had approximately a 1:1 male to female ratio. The majority of cats were young adults, followed by juveniles and kittens, while only a low percentage were adult or geriatric cats.

The increase in the proportion of tame cats caught during Year 2 may be the result of the same number of tame cats coming in each year or may be the result of

cats from the surrounding neighborhoods replacing cats that were removed from campus as a result of euthanasia and adoption. Such findings have been seen at other sites where similar programs have been implemented. Neville and Remfry (1984) carried out a trap-neuter-return program on a population consisting of two small colonies in Regents Park in London. They found that the population remained relatively stable following neutering, although two males disappeared. Several months following the disappearance of these cats, two other males joined the colony. These cats were subsequently trapped and neutered. The colony was monitored for approximately 6 months after the arrival of these cats; in that time, no other cats immigrated into the group, and there were no new litters of kittens. Another possible source of tame cats could be people abandoning cats on campus. To promote responsible pet ownership, the program provided education on campus through presentations and distribution of brochures.

There is variation among TTVARM programs with regard to the details of implementation, most notably in the decision to test feral cats for FeLV and FIV. Because testing is expensive, many programs opt not to test, preferring to focus their limited resources on neutering as many cats as possible. Another concern over testing, besides cost, is the interpretation of results, particularly if cats testing positive will be euthanized. For this program, the decision to test all cats for FeLV and FIV and to euthanize those testing positive was made for several reasons. First, cost was not a consideration as tests were donated to the program. Second, as this program had an interest in research on feral cats' health, as well as management of the population, testing was desired to estimate the prevalence of these diseases. Furthermore, given that it was not feasible to hold these cats to retest positives at a later time to see if they remained positive or to do further confirmatory testing, it was decided to euthanize all positives. Finally, as this program was being incorporated into the curriculum of a veterinary school, it was important to expose the students to the complete implementation of TTVARM programs so that once they were in practice they could make more informed decisions regarding feral cat health and management.

The three bite incidents involving ferals were the result of human error. One occurred when a university employee, not associated with the program, found a kitten on campus and attempted to pick up the kitten. The second incident occurred when a student reached for a cat who had awakened—an anesthetic hose having come off—just as surgery was starting. In the third incident, a cat recovering from surgery knocked open the cage door; got loose; and, as picked up, bit the person, despite the person's heavy gloves being worn for protection. It was presumed that the cage door had not been latched properly. All three incidents occurred during the first 6 months of the program. Attention to detail was increased in an effort to avoid further incidents. A fourth incident also was due to human error. It occurred late in Year 2 and involved a veterinary student playing with a socialized kitten.

The bite occurred when the kitten became frightened by a dog that got loose. Following quarantine, the kitten was placed for adoption.

Although the initial costs of starting up TTVARM programs can be substantial in terms of money and time, these tend to decrease with time as fewer new cats are caught. Often, people, providing free labor, are willing to donate their time to assist with feeding and trapping. In addition, some of the financial costs can be defrayed through donations. Although the affiliation with a veterinary college aided this program in acquiring donations, other programs can obtain 501(c) 3 nonprofit status (Internal Revenue Service, 2001), which can be beneficial when seeking donations.

At reduced frequency because fewer new cats are being captured, the colonies on campus will continue to be managed through periodic trapping—with feeding and observation continuing as before.

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