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## THE NUMBERS GUY

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### Trying to Herd a Cat Stat

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Can a single female cat and her offspring really produce 420,000 cats over just seven years?

Hundreds of media reports have repeated that startling stat -- in the past month alone, the number has appeared in the Dallas Morning News, the Tulsa World and the Times-Herald of Vallejo, Calif. It also turns up on many Web sites for animal advocacy groups who want to see more aggressive spaying and neutering, and urge people to adopt more cats.

I did some digging, and discovered that no one wanted to claim ownership of this stray stat.

The number is often attributed to the Humane Society of the United States, which lists it on a page of stats on the Humane Society Web site. But the group told me it's not the source of the figure. "That number is flawed," John Snyder, vice president of companion animals for the Humane Society, told me. "We no longer believe it." He added, "I have no idea where that number came from."

Another prominent group, the American Society for the Prevention of Cruelty to Animals (which is unaffiliated with the Humane Society), has used the number in press releases and in a cat rescue program on the group's Web site. Local SPCAs in Ontario, San Francisco and Bakersfield, Calif., also use the number.

An ASPCA spokeswoman told me the group got the stat from the Humane Society.

"I don't necessarily believe it," Stephen Zawistowski, ASPCA's executive vice president, told me about the 420,000 number. He said it may belong in a category of "myths of the field," including one that often turns up around this time of year: that for Halloween, witches adopt black cats from shelters and sacrifice them. ("If a lady with a broom and a black hat comes in, tell her to come back in a week," Dr. Zawistowski advised.)

This is one feline number that has nine lives. Though no one I spoke to could say for sure where it comes from, and no one defended it, the myth of the precociously procreating cat has lived on as an advocacy tool for spaying cats for at least 18 years.

Often the number is preceded by that favorite word of hedgers everywhere: "theoretically." As Gina Spadafori, a writer about animals who suggested this topic, wrote in an email, "With the word 'theoretically' thrown in there, the numbers \*could\* be true, I suppose." But she was seeking a number that is "more likely—and more useful in terms of having real numbers to work with in developing public policy."

Though no one has stood up to take credit for the number, it appears to be derived from assuming that each female cat survives into adulthood, and along the way begins reproducing herself at around six months, then continues creating litters every half year. That means 14 cycles of exponential growth over seven years.

While this, like just about anything, is theoretically possible, it's highly improbable. "What that number does not take into account is that there are deaths—kitten mortality, in particular," John New, professor of veterinary medicine at the University of Tennessee, told me. "Common sense would tell you, if [the stat] were true, we'd be up to our ears in cats." (Just how many cats? I'll get to that in a moment.)

In search of a more reliable number, I found that someone else had looked into the dubious cat stat. The Feral Cat Times, a newsletter of the Feral Cat Spay/Neuter Project in Seattle, published an article debunking the number in February, and instead proposed a number closer to 100. "It becomes overwhelming" to think that one missed cat could produce 420,000 offspring, Julie White, executive director of the project, told me. (Feral cats live in the wild, and can't be domesticated.)

The Feral Cat Times cited research by Michael Stoskopf, professor of aquatic and wildlife medicine at North Carolina State, showing that three quarters of feral cats' kittens in certain North Carolina colonies die before reaching reproductive age. Projected exponentially over 14 cycles of reproduction, that has a big impact on the numbers.

The newsletter called on mathematicians at the University of Washington to check the number. The conservative assumptions were that each female cat produced one litter of six cats each year, with three-quarters of them dying before reaching reproductive age and no more dying after reaching adulthood. The consensus: A real-world cat in the wild would likely be responsible for the creation of 98 other cats.

In an email to me, Jerry Folland—one of the mathematicians consulted by the newsletter—explained how he calculated that total (keep in mind that when you see fractions of cats, he isn't slicing them up King Solomon-style, but instead is calculating what, on average, would happen in this hypothetical scenario):

There had better be a male cat around to help get the process started, and it's easier if I include him in the calculation. So at the beginning there is one female cat and one male cat. In one year they produce six kittens, but three-fourths of them die, leaving 1.5 kittens, of whom half are female -- so, 0.75 female kitten and 0.75 male kitten. At the end of the year they join the pool of adult cats, so at the beginning of the second year we have 1.75 female cats and 1.75 male cats. Each of the female cats produces another 0.75 (live) female kitten and 0.75 (live) male kitten for a total of  $1.75 \times 0.75$  female kittens and  $1.75 \times 0.75$  male kittens. At the end of the year they join the 1.75 adult females and 1.75 adult males, yielding  $1.75 + 1.75 \times 0.75 = 1.75^2$  adult females and likewise  $1.75^2$  adult males. ( $x^y$  means  $x$  to the  $y$  power.) The pattern continues: After seven years there are  $1.75^7$  female cats and  $1.75^7$  male cats. Now,  $1.75^7$  is a bit more than 50, so on rounding off, 50 females and 50 males. If you now remove the original male from the total, since he wasn't explicitly mentioned in the problem, that leaves  $50 + 49 = 99$  cats.

When I told the Humane Society's Mr. Snyder about this calculation, he said, "That seems low to me." (Though he added that he plans to remove the 420,000 number from the group's Web site.) One reason may be the assumption of one litter per year; make it two, and you'd be repeating the cycle 14 times, not seven times.  $1.75^{14}$  is a little over 2,500, so under this assumption, one cat could produce 5,000 cats in seven years—far more than 100, but a far cry from 420,000.

To get to 420,000 would require two litters a year from each cat, every year, and that 1.4 kittens survive each litter to live healthy (and productive) lives. (Dog owners, take note: A similar calculation for canines finds one female dog could, theoretically, produce 67,000 dogs in six years; this stat is also popular among animal advocates.)

The earliest reference I could find to the cat-reproduction figure was a 1988 article in the Atlanta Journal-Constitution (citing the Humane Society). If you take a mythical cat beginning in that year, and let her and her offspring reproduce at the theoretical rate over the 18 years since, you'd have a cat population of nearly 50 trillion. That would mean the U.S. produces far more cats than coal: If each cat weighed, on average, five pounds, this catastrophically huge feline colony would weigh 120 billion tons—or about 100 times the amount of coal produced in the U.S. last year.

By comparison, there were about 70 million household cats in 2001, according to a survey of pet-owning households by the American Veterinary Medical Association. The Humane Society estimates there are 90 million pet cats and 70 million feral cats today.

Prof. New criticized the 420,000 number, but not its use by advocates. "If you can convince someone to spay one more cat, more power to them," he said. Even if the number is wrong? "Well, I think it's exaggerated, and that never happens in marketing," he said, laughing.

The ASPCA's Dr. Zawistowski told me that the number could make the challenge of fighting pet overpopulation seem overly daunting, even as there are indicators of success. In the 1930s, he said, more than 95% of cats and dogs brought into New York shelters were euthanized, compared with about 10% today. Yet "a lot of people say, pet overpopulation is getting worse and worse," he said.

"A more realistic number will certainly be more useful for the animal-control agencies and humane organizations addressing these problems, as they need to assess the potential impacts of different interventions, associated costs, etc.," Felicia B. Nutter, a wildlife veterinarian who studied feral cats under Prof. Stoskopf, told me in an email. "The big question is: What's going to get the message across to the people who create the problem by not spaying and neutering their pets? I don't have the answer to that one, but sure wish I did."