FIREPAW

THE FOUNDATION FOR INTERDISCIPLINARY RESEARCH AND EDUCATION PROMOTING ANIMAL WELFARE

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THE DYNAMICS OF SPAY/NEUTER

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There can be little doubt that increasing spay/neuter rates helps to reduce companion animal overpopulation. However, despite millions of dollars invested in spay/neuter programs, there is little understanding of the dynamics of its effects.

Little effort has been put into formally modeling the dynamics of companion animal sterilization programs, however there have been attempts made to study the effects of other sterilization programs. Most of these models have come from "pest eradication" efforts that examine sterilization as a more humane alternative to killing animals (such as deer in some areas). Some studies find that sterilization may be even more effective than killing at reducing pest populations.

In general, most attempts to model sterilization efforts assume that there is some degree of "density dependence". That is, natural forces regulate population size to decrease it when it is very high or to increase it when it is very low. In a stable environment, animal populations are kept in check and balanced naturally.

If an outside force acts to change the birth rate or death rate (such as by sterilizing animals) the balance point will shift. In other words, using most common population growth models, an increase in the sterilization rate, even a small one, will lead to a reduction in the stable population level. However, there are certain scenarios where moderate levels of sterilization will be ineffective. In these scenarios, the sterilization level required to start decreasing the population would depend on a number of environment-specific factors; there is no single universal level of sterilization that needs to be achieved that can be applied across all species and environmental conditions.

The time scale required to see significant population declines from sterilization may be larger than many people who work with companion animal spay/neuter programs would assume. For example, one study of deer found that a 5-10 year horizon is necessary to see a significant decline, while another study of a possum population found that it takes about 20 years for the population to come close to stabilizing at a new lower level.

Understanding the timeline

Companion animal dynamics can differ from wild animal dynamics for a number of reasons. But after studying the dynamics of the dog population, FIREPAW also found the same long delay exists before spay/neuter programs show their full effect[1]. Figure 1 shows the time pattern for a spay/neuter program that results in a 50 percent reduction in euthanasia. As the chart indicates, it takes about 8 years to get half of the benefit of a one-time shift in the spay/neuter rate, and as much as sixty years for the euthanasia rate to stabilize at a new lower rate. This chart assumes an instantaneous shift in the spay/neuter rate. If implementing the change takes time, this will delay the effects even further. When accounting for the long adjustment period for a spay/neuter program to take full effect, it is important to understand that the benefits multiply over time by preventing the birth of successive future generations.

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[1] Full published results of the study are forthcoming in *HUMAN ECOLOGY: An Interdisciplinary Journal* under the title "A Interactive Model of Human and Companion Animal Dynamics: The Ecology and Economics of Dog Overpopulation and the Human Costs of Addressing the Problem".

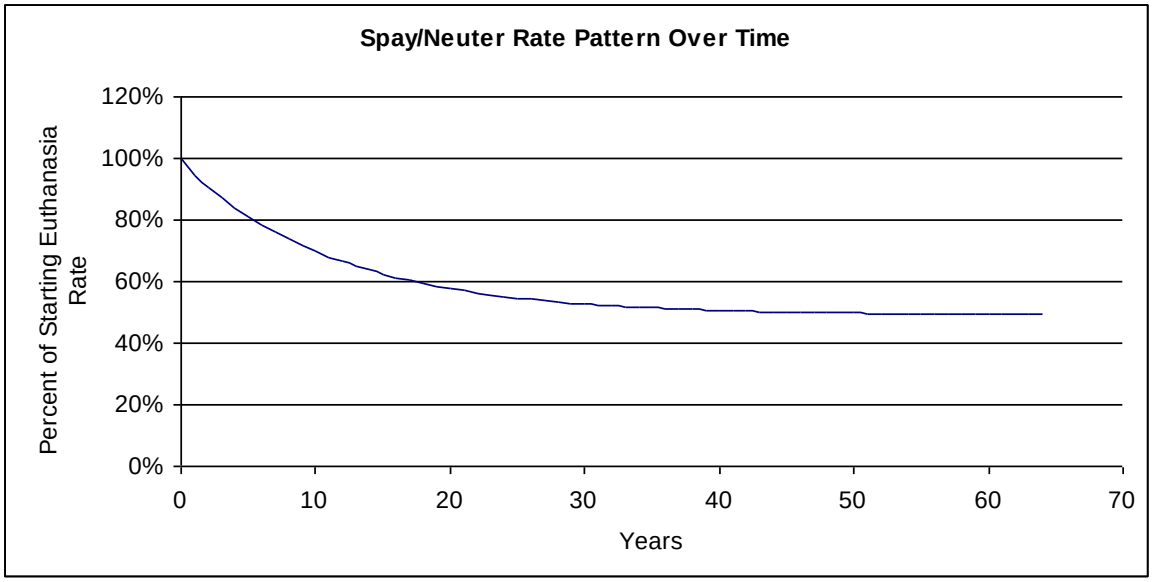

Figure 1

The time-scale issue is important to recognize; most attempts to evaluate spay/neuter programs probably greatly underestimate their impact since the evaluation takes place only a few years (at most) after the program starts. The problem with such an approach is that if a spay/neuter program's impact is evaluated a year after it is implemented, it will have only had about 10 percent of its full effect. Even after two years, the program will have reached less than 20 percent of its full effect. This is important information to keep in mind next time a city official, for example, argues that the spay/neuter program they authorized a year ago "has not worked".

A little can go a long way

The surprisingly long adjustment period for a spay/neuter program is not necessarily a bad thing since it is due to the program's great power and ability to multiply its impact over time. In fact, the same FIREPAW study found that spay/neuter programs were the most cost-effective method of reducing euthanasia. Spay/neuter programs can still be powerful even if most people already spay/neuter their animal because a small number of unfixed animals can have a large impact on the total population. Figure 2 below gives a better idea of just how powerful a spay/neuter program can be. According to the FIREPAW study, using numbers for one particular community in upstate New York, if a little less than half of the people who do not spay/neuter their dog would change their behavior, all euthanasia of dogs could be eliminated[2]. The exact numbers will vary, but this community is typical of many mid-sized American cities.

In some ways, dog and cat dynamics are similar. The biggest difference for cats is a viable reproducing feral population. In many cities, this feral cat population can be 30-50 percent of the total cat population, and without an aggressive sterilization (TNR)

[2] This deals only with euthanasia due to "surplus" animals; it excludes euthanasia that was due to medical or behavioral conditions that could not easily be treated.

program, these feral cats can overwhelm any successes in controlling the growth of the "owned" population.

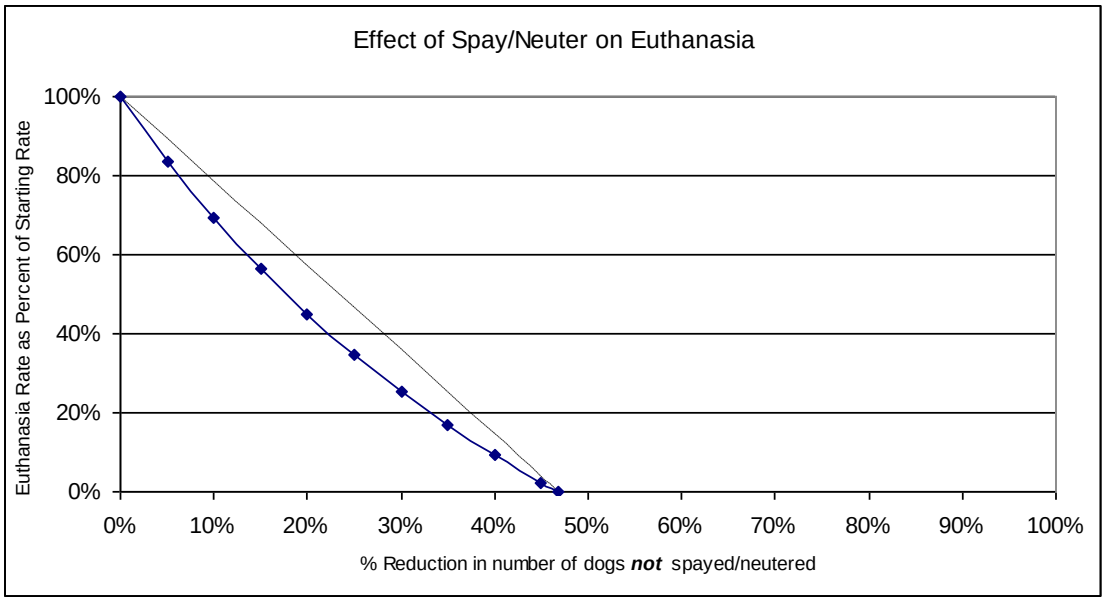

Figure 2

The feral cat population is the companion animal group most similar to the wild populations where the impact of sterilization has been studied by biologists. In general, the studies on sterilization of wildlife tell us that the impact of sterilization on feral cat populations depends on many variables. It is possible that the population will decline as a linear function of sterilization, as an increasing (nonlinear) function of sterilization, or it is also possible that the sterilization effort may also need to reach a "critical mass" in a short period of time to be effective. However, if there is a critical mass it will not be a single universal number but will vary regionally depending on a number of factors. For example, in regions with harsh winters the lifespan of a feral cat is much different than in Florida or California, and this will have a big impact on what level of sterilization is needed to reduce the population. The most likely result is probably a "nonlinear" function, meaning that spay/neutering 30 percent of the feral cats in a region may have some effect, but it will only reduce the population by less than 30 percent. If you double your efforts and spay/neuter 60 percent of the cats, most likely the impact on the population size will more than double.

Probably the most important fact we know about spay/neuter programs is that they can be very powerful—probably the most powerful tool we have available to fight overpopulation. But it is important to recognize that it may take a long time for a program to have its full impact. It is also important to recognize that the impact of spay/neuter efforts may be non-linear, particularly when dealing with a population with natural stabilizing forces such as feral cats. Therefore, it may be more effective to concentrate a large amount of effort in a small area rather than spreading that same effort across a larger area.