First things first. The term "Third World" is in no way defamatory, since many of the greatest places on Earth are in what used to be termed "the Third World" and is now more commonly referred to as the “Developing World” These places frequently have the warmest, friendliest people, and in many cases want the best for their animals but are limited financially. Additionally, every country, whether ultra-rich or exceedingly poor, has areas where Third World conditions exist. In the United States, the Native American reservations (the "rez", as the term is used by locals and will be used here) meet these criteria, and this document is an attempt to address the veterinary concerns of the small animals that live in these areas. The principles apply equally anywhere in the world where animals frequently free roam, have limited to no regular veterinary care, and where overpopulation creates a myriad of problems ranging from starvation to infectious disease.

Many simply want to blame the state of animal affairs on the reservations as a consequence of poverty alone. However, not only is this patronizing, it ignores cultural differences. On the Navajo Nation, the average household has 4 dogs. This is an average, and it is not unusual to see a pickup pull into a clinic with 8 or more dogs in the back. Going to someone's house, you might find 20 dogs (1). By some estimates, there are close to half a million dogs on the Navajo Nation alone, with more than half of those feral or neglected (2). Despite these numbers, there are cultural differences as to what the dogs mean to the people. Like anywhere on Earth, there are people there for whom their pets are family, sharing the bed at night. There are others that want nothing to do with dogs and would just as soon shoot one if it came near their home. But, in comparison with their non-Native counterparts, dogs are often simply a means of security in remote areas or areas with higher crime. Animal welfare is also not a high priority for tribal governments, and in fact tribal governments frequently even charge fees to groups performing free veterinary services.

This is not a primer on emergency procedures in the field, or how to capture and restrain feral or wild animals, since many books exist and

discuss those procedures. This is a manual on basic principles of veterinary medicine on free-roaming domestic animals, with emphasis on field settings and with the aim of improving quality of life for animals that otherwise might have a very hard life, and an even harder death. These dogs and cats range from truly feral and dependent on garbage dumps and wildlife for food, to community animals that generally stay within an area and are fed by locals, to owned but otherwise free-roaming animals that come and go from a household, and finally to owned animals that never leave a household or fenced yard. Some animals belong to owners who have the financial ability to pay for veterinary care, but many do not, and only receive medical attention with free or low cost MASH style field clinics.

In the United States, this is the case for the millions of dogs and cats living on Native American reservations, and for whom this manual applies. However, this also applies to the vast majority of dogs and cats worldwide, who live in a similar fashion throughout the developing world. Mainstream USA and European veterinary medicine is an ivory tower institution far beyond what 99% of the animals worldwide will ever have the luxury of receiving, and the principles of this manual are for the dogs and cats being left behind in an era of escalating veterinary costs. The first and foremost principle is “the greatest good for the greatest number of individuals” and is at the core of everything that follows.

In the ideal world of universities and high end emergency veterinary clinics, every patient gets a CBC, chemistry panel, urinalysis, fecal tests, and 3 view radiographs as a standard baseline. These institutions are chock full of specialists with the newest equipment, and clients with money to spend. At the current time of this writing (2022), this standard baseline could easily cost $1000 or more. But, if “the greatest good for the greatest number” is our goal in the field setting, how much disease could that $1000 treat? How much could it prevent? How much morbidity (suffering) and mortality (death) could be spared with $1000? Alternatively, everyone who works and volunteers on the “rez” has seen GoFundMe accounts set up for a stray dog (or more commonly a fully owned one who was once a stray) that needs a $5000 surgery and the donations flood in. But, in

these same areas, countless animals are dying from parvo every day. How many parvo cases could be prevented with that same $5000? At the current rate of about $3.50 per vaccine (directly from the manufacturers), that is 1429 doses of vaccine. Every dog or cat is an individual, and there wouldn't be a small animal veterinary profession if people did not feel a sense of attachment and empathy for animals. But, money for Native American reservation work is always in short supply, and donors have to ask themselves where their $10, $100, $1000 might be best spent. The concept of the "greatest good for the greatest number" suggests that buying 1429 doses of vaccines might just be the better way to spend that money.

This document is an attempt to merge things learned working in veterinary medicine, veterinary epidemiology, and wildlife ecology. Viewing our domesticated dogs and cats outside of the lens of a closed household is extremely important since dogs and cats compete with each other for resources in the same way that every species does. This understanding becomes critical when looking at owned dogs and cats that are allowed to free roam and thereby become part of the population at large, competing for food, mates, etc.

The principles of wildlife ecology and epidemiology explain why conventional spay / neuter, the dogmatic answer typically given to the problem of overpopulation, has not worked and is in fact incapable of working given the billion dogs and incalculable cats that exist on this planet, at least 75% of which are feral. The idea that spay / neuter is ineffective when dealing with large populations is counter to what vets have been taught except in institutions with large epidemiology divisions, and this idea is counter to the multi-billion dollar animal welfare industry in the United States. It is counter to the current state of shelter medicine programs, which are in fact funded directly by organizations whose stated purpose is to promote spay and neuter. But then, what could be more opposite of existence in a shelter than being free-roaming and part of a much larger dynamic population?

Outside of large animal herd health programs, most veterinary colleges in the United States teach individual small animal medicine intended for owned animals. Spaying makes conceptual sense for

population control within the household, and is also presented as in the best interest for the health of the individual (despite early spay / neuter also being known to increase the risk of cruciate ligament tears and certain cancers).

When it comes to large populations of small animals, however, vets receive little to no training since veterinary colleges have no epidemiology departments. In recent times, a few shelter medicine master's programs have started and have promoted spay / neuter as the panacea to cure all ills.

But, in life, the easiest way to figure out why something is promoted is to simply follow the money. Is there money being made? Is there a potential profit motive? This might seem irrelevant to a document on dealing with the problems that animals face in poorer areas, but it is inherent to understanding why the current state of affairs has not solved the current problems on reservations in the United States despite decades of work, and why it can never solve the problems of the estimated up to 100 million feral cats in the United States alone (3) and at least 1.5 billion feral dogs and cats worldwide (4,5).

Follow the money. Shelter medicine programs are funded directly by donor driven advocacy groups promoting spay / neuter. Animal welfare groups with individual budgets in the hundreds of millions of dollars also promote spay / neuter as the answer to population control, and use their very limited spay / neuter publicity campaigns on Native American reservations in order to garner more donations..

One might suggest that getting donations is the life blood of any charity, and that good work requires financial support. Fair enough, except that the major animal welfare groups as a whole have assets approaching one billion US dollars, and have boards whose members either individually or collectively make millions of dollars (6,7,8,9,10). Nonprofit foundation status is only a “charity” tax designation and for which nonprofit status can still be obtained even if only 5 pennies of every dollar donated actually are used for programs and the other 95 cents used for “administrative” salaries. As such, the major animal welfare organizations not surprisingly often do not meet the most basic financial accountability standards set by watchdog groups such

as Charity Navigator, Charity Watch, and the Better Business Bureau Wise Giving Alliance (11,12). By some estimates, nonprofit animal focused organizations earn over $12B annually and have assets of $29B (13).

Further, public shelter veterinary medicine programs that promote spay/neuter as the answer are funded directly by private donor driven animal welfare charities that have an agenda, even going as far as naming the public university master's program for the private advocacy group (14). Nothing wrong with having an agenda, of course, unless science is skewed for the sake of money. The large animal welfare organizations with annual donations over a billion dollars every year are the same organizations that have killed countless dogs by causing repeatable and easily avoidable distemper outbreaks after natural disasters (15), by simply ignoring fundamental principles of epidemiology as well previous examples of infectious disease outbreaks following natural disasters (16). The same organizations that took in millions of dollars in donations after Hurricane Katrina by taking animals off the streets and moving them across the country (with plenty of publicity), and in doing so took heartworm disease from New Orleans and seeded it throughout Western states that had no previous heartworm disease (17, 18). Instead of finding homes locally for a few hundred dogs, one of the most fundamental epidemiologic principles regarding movement of infectious disease was ignored and thereby made heartworm endemic throughout the West, and it's here to stay. Forever. They created a monster that has infected and will kill hundreds of thousands of dogs and cats alone, as well as many wildlife species such as coyotes, foxes, raccoons, bears, and wolves, potentially compromising a decades-long federal program attempting to reintroduce endangered Mexican grey wolves. With millions of owned animals whose owners remain unaware of heartworm disease or choose to not give monthly preventatives, and no treatment nor prophylaxis possible for wildlife species, this will account for millions of deaths of dogs, cats, and wildlife in the long run. Millions of animals will slowly suffocate in backyards and wild areas, in exchange for a few hundred dogs moved out of New Orleans despite the fact that a dog left behind after a

natural disaster on the Gulf Coast is virtually guaranteed to carry heartworms. The road to hell is paved with good intentions.

So, if very basic scientific principles are ignored by the groups promoting shelter medicine and spay / neuter, maybe it's time to question the methodology and start looking at the big picture. Anybody reading this document cares about the state of animals, but if you want the best for them, take a step back and look at the science.

If you are reading this, the chances are that you already work or volunteer in field veterinary medicine, animal rescue, or some related field and are intimately familiar with the problems animals face on the reservation, in Latin America, Asia, Africa, the Middle East, or even just in your local urban neighborhood. As such, a detailed description of the numerous problems is not provided, but an approach to dealing with the fundamental issues follows. This document is hopefully short enough to encourage people to read it (few want to read a 200+ page book), with expanded emphasis on why limited human and financial resources should be shifted away from conventional spay / neuter and towards finding a cheap, effective, and safe means of nonsurgical reduction of female fertility in dogs and cats. This has been presented both in lay terms as well as a chapter of "hard science" concerning spay / neuter of free-roaming populations, with studies cited for the reader to research if they want more information.

Finally, there is a shorter, more direct section on basic rural field veterinary clinics, with pointers on how to do the best medicine possible in a short amount of time and with limited resources.

There are 5 key concepts that are fundamental to the text, 4 that are ignored or not understood when someone promotes the incorrect black and white idea that spaying and neutering is the answer to the world's growing feral dog and cat overpopulation problem, and the flawed premise that surgically altering even just one breeding pair ultimately saves the world a million future offspring due to exponential growth.

5 Key concepts:

A) Carrying capacity (the maximum number that resources will support) exists for every free-roaming species

B) The number of offspring produced by one female increases (fecundity) when competition for resources is reduced by other females being spayed

C) Neutering males makes no difference at all if any intact males remain in a free-roaming population

D) For effective population management, at least 70% of the intact females in a population must be sterilized annually (19), and the percentage reported in multiple studies is actually higher (up to 94%) (20, 21, 22, 23)

E) Total current population may be less important than population turnover, if our ultimate goal is to improve life for feral animals.

These 5 fundamentals explain why a better approach to the world's overpopulation is needed, not just in the undeveloped parts of the western world but for the likely 2 billion feral dogs and cats for whom there never will be enough financial resources if current methods are continued. This is important, since not only has there been no progress made in the past 5 decades of spay / neuter, but the numbers of feral animals are increasing in the Third World with the increasing concentration of humanity in urban centers.

Lastly, in the end, on a worldwide level, there are simply too many dogs and cats and not enough resources to provide ivory tower, first world care to everybody. As such, the most fundamental principle of

epidemiology applies, which is "the greatest good for the greatest number". I.e. If you are going to give an hour of your time, or a dollar from your pocket, try and make sure that it is used as efficiently and practically as possible.