RABIES IN TEXAS

A HISTORICAL PERSPECTIVE

Rabies (ra′bez) n. from Latin *rabere* – to rage

Victims of an animal bite would literally ride for their lives to obtain a wad of partially digested food from the stomach of a cow or deer. These wads of vegetable matter were commonly known as "madstones for rabies." In desperate pursuit, bite victims sought the most coveted madstone, the stomach contents of a white deer. White deer being uncommon, bite victims often had to settle for a less desirable alternative, a run-of-the-mill buckskin. Once a fibrous glob of fodder was obtained, it was moistened in warm water or, preferably, milk and applied to the wound. To be effective, the madstone had to adhere to the wound a very long time in order to draw out the rabies poison. After the madstone had become saturated with poison, it allegedly would no longer adhere to the wound. At that point, it was put into warm or hot milk, which would turn green from the poison. The therapeutic gastric contents were then reapplied to the wound. Madstones were multifunctional. In addition to drawing out the hydrophobia (rabies) contagion virus, madstones were purportedly effective in removing venom from a snakebite. However, victims of snakebite were faced with unforgiving time constraints and usually had to resort to some other remedy; only by the sheerest coincidence would a snakebite occur in the proximity of a madstone. People bitten by a mad dog, hydrophobic skunk, or other animal with rabies had the time and the motivation to ride a long way to find a madstone. And ride they did.

RABIES IN TEXAS
A HISTORICAL PERSPECTIVE

In the beginning, there was no rabies in Texas (or so it appears). The question of when rabies first appeared in Texas is not an easy one. Books published about the area that would later become the Lone Star State make no mention of the disease. Native Indian tribes had dogs (a common rabies vector), but no surviving Indian folklore indicates the presence of rabies. The introduction of European dogs into the Americas began in the early 1490's with Spanish explorers. Rabies was mentioned neither in manuscripts on these early explorations, which were replete with stories of the dogs, nor in books describing the medicinal plants used by Native Americans. Notes documenting the visits to Texas by Cabeza de Vaca in 1542 as well as by Coronado a few years later state that medical men accompanied both explorers; however, neither set of notes reflects that rabies was encountered. The annotations of the French surgeon Liotot, who accompanied La Salle on his 1684 trip to Texas, likewise do not mention rabies. The migration of pioneer settlers introduced several diseases into the newly established settlements as well as the indigenous Indian populations. The town council records from the Austin Colony, established in 1821, refer to outbreaks of yellow fever and smallpox as well as credible efforts to regulate the practice of medicine. Rabies, however, is not mentioned. The symptoms of rabies have been categorized as a specific disease entity since antiquity, leading one to believe the disease would have been mentioned in at least one of the aforementioned sources had it been present.

The first references to rabid animals in Texas appear in anecdotal accounts by cowboys. Many of these stories of the mid-1800s mention sleeping on the ground and being attacked by "hydrophobia cats" or "phoby cats," which was the local vernacular for rabid spotted skunks (*Spilogale* spp.) These stories often reference being bitten on the nose and the difficulty in getting the animal to release the bite.

The following highlights are intended to provide insight into the historical documentation of rabies and its control in Texas.[1] As with many diseases of public health significance, control of rabies consists of legislation; education; surveillance; quarantine and isolation; and direct medical intervention, such as vaccination.

A map showing the location of all counties referenced in this manuscript can be found in Appendix 1.

[1] Individuals who have additional historical documentation on the diagnosis, treatment, and control of rabies in Texas are encouraged to submit it to the Zoonosis Control Division of the Texas Department of Health by emailing The.Vet@tdh.state.tx.us, calling (512) 458-7255, or mailing information to 1100 W. 49th Street, Austin, TX 78756.

RABIES IN TEXAS

A HISTORICAL PERSPECTIVE

1856 The Texas Quarantine Act of 1856 formed the nucleus for public health in Texas and established a state health agency called the Texas Quarantine Department. Following many revisions, this agency eventually became Texas's present-day public health department.

1879 The Texas Legislature created the position of State Health Officer to be selected and appointed by the Governor with the advice of the Senate. Dr. Robert Rutherford was the first State Health Officer.

Dr. Robert Rutherford
First State Health Officer

1884 The French bacteriologist Louis Pasteur developed a preventive vaccine against rabies. Prior to this achievement, the only medically recognized treatment was the application of a red-hot iron to the site of the wound combined with a strong solution of soapy water.

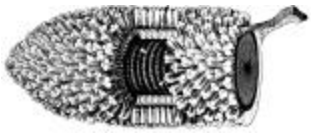
1903 The Texas Legislature changed the name of the Texas Quarantine Department to the Department of Public Health and Vital Statistics.

The Pasteur Institute was opened as a branch of the Austin Lunatic Asylum with one of its public health services being rabies testing. The Institute used a staining test that detected Negri bodies, which are oval or round structures that form in the nerve cells of rabid animals. The Institute also offered postexposure treatment for rabies. Individuals who had been bitten came from all over Texas to take the Pasteur treatment for prevention of hydrophobia. This postexposure treatment vaccine was prepared from the desiccated spinal cords of rabbits that had been infected with rabies virus. The tissue was then treated with formalin, ether, or other substances to kill the virus. The painful and distressing injections of vaccine were given daily up to 25 days, depending on the severity of the rabies exposure. Rabies vaccine wasn't the only biological the state health department produced. At one time or another, the agency also made diphtheria-pertussis-tetanus vaccine, adult tetanus-diphtheria toxoid, tetanus regular vaccine, pertussis vaccine, diphtheria plain toxoid, smallpox vaccine, and typhoid vaccine.

1909 The Texas Legislature abolished the Department of Public Health and Vital Statistics and established in its place the seven-member Texas State Board of Health. The President of the State Board of Health was appointed by the Governor and served as the State Health Officer. The State Health Officer and his administrative organization was collectively called the Texas State Health Department.

1927 Whereas previously the governor appointed the State Health Officer, the Texas Legislature changed the process to allow the Texas State Board of Health to select the state's top public health official.

1928 The Pasteur Institute of the Austin State Hospital, the Food and Drug Laboratory, and the Bacteriological Laboratory were consolidated to become the Bureau of Laboratories of the Texas State Department of Health. The Texas Legislature appropriated $12,500 for a new two-story red brick building and equipment, to be located at the corner of Fifth and Neches in Austin. Dr. J. W. Wilhite, director of the Pasteur Institute for 22 years, was chosen to head the consolidated laboratory but died of pneumonia before the move was made. The new building was dedicated to him even though it was called the State Hygienic Laboratory Building. Dr. S.W. Bohls became the Bureau's first director.



Drawing of rabies virus from
The Natural History of Rabies 2nd Edition
by George M. Baer

1934 The Texas State Department of Health's laboratory discontinued production of Pasteur's postexposure rabies vaccine in favor of a modified phenolyzed version. Unlike the original vaccine that used fresh rabbit spinal cords, the new product was stable, thereby allowing the health department to ship it to local health officials all over the state so that patients could take the treatment near their homes.

1940 The increasing number of local public health units gave testimony to the importance of locally administered public health. Four city health units and 32 county health units rendered service to 1,885,696 people, which represented 32% of the state's total population.

1943 The laboratory at Houston's public health department became the first laboratory in Texas other than the Texas State Department of Health to conduct rabies testing.

1946 Prior to 1945, rabies in foxes was almost nonexistent in Texas. From 1922 through 1944, only 12 rabid foxes[2] were reported from 7 randomly distributed counties. In 1946, gray fox rabies first appeared in Sabine County. The 16 cases that were reported in 6 counties that year signaled the beginning of an epizootic (an epidemic or outbreak in animals). Eventually 74 counties were involved in eastern and central Texas as the epizootic moved in a southwesterly direction through 1955 (Appendix 2). The rapidly expanding rabies epizootic advanced up to 20 miles a month. During the epizootic, livestock losses due to rabies ran as high as $100,000 in some counties and as many as 200 persons in a single county took anti-rabies treatments. A total of 1,095 cases of rabies in gray foxes were reported during that 10-year period. The actual level of rabies

[2] In this document, any citation to the number of rabid animals refers to laboratory-confirmed cases. The number of rabid animals may be much greater than the number of confirmed cases of rabies, particularly in wildlife, in which the majority of rabid animals may go undetected.

infection among wild carnivores was believed to have been much higher than indicated since animals were seldom submitted for examination unless they had invaded premises (usually during daylight hours) and attacked domestic animals and/or people.

The author of a Texas Health Bulletin entitled *Animal Diseases Transmissible to Man* blamed the expanding rabies outbreak on fox hunting associations that perpetuated the notion that killing foxes was illegal. That misperception, in turn, encouraged local governing bodies to protect the animals. Fox hunters also intentionally introduced foxes into areas where the animals had never been able to gain a foothold naturally. The upshot of both of these endeavors was an increase in the population of foxes. The incidence of rabies directly correlates with the population density of a species of rabies vector; therefore, during the late 1940s, rabies spread readily from fox to fox.

The late 1940s was a watershed in the control of rabies when veterinarians in Texas and throughout the US began to actively recommend that dogs be vaccinated against rabies. The remarkable decrease in the number of human rabies cases that occurred during the 1940s and 1950s is a tribute to the effectiveness of widespread rabies vaccination of dogs and cats combined with effective animal control (Appendixes 3 and 4). Once rabies was controlled in dogs, the primary vector of rabies to humans changed from dogs to wildlife.

1948 The Bureau of Laboratories at the Texas State Department of Health reported 847 rabies-positive results out of 3,479 specimens submitted from September 1947 to August 1948. The large number of rabid animals indicated the state was in the midst of an acute rabies outbreak (Appendixes 5, 6, and 7). In response to the outbreak, an Anti-Rabies Campaign was initiated in December by the Austin-Travis-Bastrop Health Units to vaccinate all dogs in the area, a highly unusual and rigorous action during the 1940s. Priority was also given to controlling stray dogs. The two dog wardens impounded 6,000 animals. Of these animals, 35 were found to be rabid, 28 of which had come from within the city limits of Austin. Dr. Kenneth S. Young, a veterinarian with the Texas State Department of Health, expressed his belief that the rabies control laws in the state were inadequate.

1949 At the annual Conference of Veterinarians held January 17-19 in Fort Worth, Dr. Kenneth S. Young (see 1948), a Texas State Department of Health veterinarian, declared the rabies outbreak in Texas had reached emergency proportions.

The Texas State Department of Health published the *Methods and Procedures for Sanitary Dog Pound Construction and Operation* (Appendix 10). The manual provided a model for communities to follow, complete with instructions on how to control flies by spraying with DDT.

1952 In order to control rabies, health authorities advocated a 75% reduction of the affected wildlife species. A grim warning in a Texas State Department of Health rabies morbidity report advised farmers and ranchers in the Red River

Valley region as well as Southwest and Central Texas to begin wholesale killing of skunks before cold weather brought an increase in rabies cases. Focal points of skunk rabies included Harris, Matagorda, Fort Bend, and Lavaca Counties in southeast Texas with a second focus in Comal, Hays, Travis, Bell, Coryell, Lampasas, and McLennan Counties in Central Texas.

Magazine articles in *Colliers* (1947) and *Reader's Digest* (1947) on vampire bats had generated a small furor in Texas newspapers and other magazines. Public concern and questions about rabies spread by vampire bats prompted Dr. R.B. Eads, an entomologist with the Texas State Department of Health Bureau of Laboratories, to review the risk to Texas human and livestock populations. Although vampire bats were not part of Texas' natural fauna, they were not far from the Texas Border. Dr. Eads found vampire bats within 150 miles south of the Rio Grande Valley and 300 miles south of Big Bend. A rabies epizootic in the state of Chihuahua, Mexico, killed between 20% and 50% of the unvaccinated cattle in the immediate area. Dr. Eads described a distinct epidemiologic curve in which the phase of highest mortality usually lasted 1 or 2 months. This peak was typically followed by the disappearance of the disease for 1 or 2 years before the next outbreak occurred. He also described a seasonal distribution of the disease in which most cases occurred between October and April with the peak in January and February. Dr. Eads postulated that the passage of rabies virus through bat populations had somewhat altered its species specificity. The virus appeared to be relatively nonpathogenic to dogs while cattle and horses were highly susceptible and sheep and swine were seldom affected. These observations may have been the early epidemiologic inklings of what would later be understood about rabies variants and the niches they have in wildlife populations.[3] Dr. Eads encouraged public health personnel in states adjacent to Mexico to maintain vigilance.

Vampire Bat
Desmodus rotundus

1953 Thinning of the fox population was a primary method used to curtail the fox rabies epizootic that had begun in 1946. The basis of the thinning concept stemmed from the epidemiology of rabies. For rabies to be transmitted, animals had to be in close contact with one another (i.e., bite one another). Therefore, the lower the density of animals, the less likely the virus was to spread from one animal to another. The depopulation program included 4 methods. First, in areas where the emergency was acute, strychnine-laced bait was used, requiring a permissive vote of the residents before the bait could be distributed. Second,

[3] There are many types of rabies viruses, each of which is called a variant (also known as a strain or ecotype). Each individual variant will perpetrate itself in nature through repeated transmissions only in the mammalian species for which it is adapted. "Spillover cases" are rabies infections that usually occur as single cases in mammalian species other than the species specific to that variant of virus. Therefore, the rabies variant that typically infects gray fox rabies will kill foxes and perpetuate itself when a rabid fox bites another fox. The first fox transmits the virus to the second fox, which then transmits the virus to a third fox, etc. If a rabid gray fox bites a bobcat, a spillover case of gray fox rabies in a bobcat will cause the death of the infected bobcat. However, the gray fox variant will not usually spread to other bobcats. This does not imply that a bobcat with fox rabies would not be infective. A bite from any rabid mammal represents a potentially life-threatening circumstance.

livestock owners and fox hunters were encouraged to intensively hunt and trap the animals. Third, many counties contracted with United States Fish and Wildlife Service trappers. Fourth, County Commissioners in some areas authorized payment of a bounty ($2.00 per animal) to stimulate fox thinning. The intent of these measures was not the indiscriminate slaughter of foxes but rather selective thinning in regions where the disease was most intense or to which rabies could spread quickly.

In all species of animals except bats, rabies was noted to be more prevalent in the fall, winter, and spring months than during the summer (Appendix 11). The number of cases of rabies in foxes in winter was approximately six times the number in summer.

Except for an occasional rabid dog, the western half of the state had no terrestrial rabies, presumably because susceptible wildlife (foxes and skunks, specifically) were not present in a density sufficient to maintain the chain of infection. Just as in 1952, these hypotheses may have been the precursors for what would later be understood as the epidemiology of rabies variants.

Health officials lamented the absence of a statewide law requiring vaccination of dogs. A total of 1,000 dogs and 68 cats were diagnosed as rabid in 1953. Dogs totaled 75% of all positive animals reported by the state laboratory in 1953.

"This is the worst situation I have ever seen…the worst in the country." Dr. Ernest S. Tierkel, a rabies specialist with the federal Communicable Disease Center in Atlanta, Georgia, made this comment to reporters regarding the raging rabies epizootic in Harris County. Laboratory records for Harris County showed 156 rabid animals in 1949, 227 in 1950, 236 in 1951, 369 in 1952, 489 in 1953, and 427 during the first ten months of 1954. A massive educational campaign conducted in Harris County in 1953 included:

- front page articles and editorials in newspapers;
- radio spot announcements and interviews;
- broadcasts on popular afternoon television shows;
- educational outreach of school children, including distribution of pamphlets and posting of color posters;
- pamphlets and posters placed in public buildings and Houston Housing Authority projects;
- announcements at every civic club; and
- messages broadcasted from trucks with sound equipment.

Harris County's rabies control plan stressed a three-point program of control: immunization of all dogs, elimination of stray animals, and public education as to the cause and effect of the dreaded disease. A citizens' advisory committee was formed consisting of medical doctors, veterinarians, teachers, and representatives of civic clubs, the county farm agent's office, and the media. Dramatizing the tense situation were front-page photos of a youngster whose cheek had been ripped open by a pet puppy gone suddenly mad. Daily newspaper stories were printed, speeches were made, panel discussions were

held on television, and literature was distributed in all of the schools. In March, a special session of the Texas Legislature acknowledged the foreboding situation by passing legislation authorizing County Commissioners to require rabies vaccination of all dogs in counties with populations over 600,000 (Bexar, Dallas, and Harris being the only three meeting the population requirement). A massive vaccination drive was initiated in Houston. Fire stations served as convenient sites at which to conduct vaccination clinics and were among the 91 sites selected. The entire vaccination drive was condensed into a four-day period. A make-up clinic had been planned but was not announced until after the campaign had ended. Health officials focused on conveying three pieces of information:

- the clinic locations, dates, and times;
- the minimum age at which dogs could be vaccinated was 2 months; and
- the vaccine was safe.

The total number of animals vaccinated was 44,390, making it the largest mass rabies vaccination project to have been conducted in the history in the US.

The Texas State Department of Health, Livestock Sanitary Commission, Texas A&M University College of Veterinary Medicine, Texas Veterinary Medical Association, Disease Control Branch of the Agriculture Research Service, and United States Public Health Service joined in a cooperative Animal Disease Reporting System. The new bi-weekly reporting system tracked the incidence of domestic animal diseases. This new system absorbed the Texas State Department of Health monthly survey that had been started in 1951 to pinpoint the county of origin and the species of all rabies-positive animal specimens.

Mexican free-tailed bat
Tadarida mexicana

In October, R.B. Eads, George Menzies, and Jack Weisman, entomologists from Texas State Department of Health's Bureau of Laboratories, placed aluminum metal tags in the wings of 5,000 bats, of which 4,514 were Mexican free-tailed bats (*Tadarida mexicana*) and 486 *Myotis* in Bracken Cave near San Antonio. The purpose of the $10,000 project was to review the migration patterns of the bats as part of an effort to understand where the bats were acquiring rabies. These entomologists also examined solitary, tree-frequenting species of bats. Four of the most extensive bat colonies in the United States were found in Texas: Ney Cave near Bandera, Bracken Cave in Comal County, Frio Cave in Uvalde County, and Devil's Sinkhole in Edwards County. Dr. Aurelio Malaga-Alba, a prominent rabies specialist with the Ministry of Health in Mexico, speculated that the Texas bats were being exposed to rabies during their winter migratory stay in Mexico while flying with vampire bats. The Texas bats would then carry the disease back to the Lone Star State in the spring.

1954 Harris County was the focus of rabid animals during the 30 years from 1925 through 1954. During this period, over 100 rabies-positive dogs were reported in Harris County each year, reaching a high of 577 in 1942. In 1954 Harris County accounted for 43% of the total rabies-positive animals reported in the entire state.

1955 Intensive ecological studies focused on the role of bats in transmitting the rabies virus to man and domestic as well as wild animals. The studies focused primarily on the Mexican free-tailed bat.

The Texas State Department of Health announced the formation of the Division of Veterinary Public Health. The new Division was headed by Dr. A.B. Rich, marking the first time in the Department's history a veterinarian held the position of Division Director.

The Texas Legislature passed a rabies control law that gave County Commissioners authority to take emergency action against threatening rabies epidemics in areas of their county lying outside the boundaries of incorporated cities. The law stated that before emergency measures could be enacted, a public hearing was required to determine that a rabies epizootic existed. An epizootic was defined as any increase in the number of diagnosed rabies cases in animals over the median number of cases for the previous five years. The typical rabies control program for counties and cities included stray dog elimination as well as vaccination of dogs by a veterinarian. Some counties and cities also required dogs be registered, although registration at that time was not synonymous with licensing; registration merely meant the animal had received a certificate of vaccination and a vaccination tag. The Texas State Department of Health recognized two types of rabies vaccine: 1) phenolized, which imparted immunity for one year and 2) chicken embryo, which imparted immunity for three years if the dog was vaccinated after the age of six months; dogs vaccinated prior to that age needed to be reimmunized at 12 months of age. A 30-day quarantine was recommended to allow adequate time for immunity to develop in vaccinated dogs in areas with a high incidence of rabies.

The Texas State Department of Health recommended that all dogs bitten by a known rabid animal be immediately destroyed. However, if the owner was unwilling to have the dog euthanized, the following three protocols were available as alternatives.

- If the animal was not currently vaccinated, postexposure treatment could be administered and the animal confined in a kennel for 3 months. Postexposure treatment consisted of the administration of antirabies hyperimmune serum (0.5ml per kg of body weight) not later than 12 hours after exposure, followed by a single dose of chicken-embryo vaccine within the next seven days or a course of nervous-tissue vaccine.
- If the animal had been vaccinated within the previous year with chicken-embryo vaccine, it could be revaccinated and confined for 30 days.
- Regardless of whether the dog was currently vaccinated or not, postexposure treatment could be eliminated all together if the animal was isolated in a kennel for six months.

The recommendation also stated that although no experimental evidence was available, the postexposure treatment described may be applicable to animals other than dogs.

The U.S. Fish and Wildlife Service, Division of Predator and Rodent Control, assisted in wildlife rabies control programs and was lauded for its support.

1956 Studies on bat rabies continued under Texas State Department of Health Laboratory Director, Dr. J.V. Irons. The field research work of George C. Menzies revealed the presence of the rabies virus in the common cave and premise bat, *Tadarida mexicana*. He also noted that these bats utilized human habitations as their daytime retreats. In addition to Mexican free-tailed bats, rabies virus was also isolated from three red bats, *Lasiurus borealis*, a solitary, tree-frequenting species. Educational campaigns advised the public to avoid handling sick bats.

Field investigations involving bat caves proved unexpectedly hazardous when George Menzies died of rabies presumably contracted in the course of conducting research inside a cave (Appendix 12). The portal of entry of the virus was suspected to be an abraded area on Mr. Menzies' neck. As a result, laboratory and field workers were prophylactically inoculated with Lederle's avian-based rabies vaccine. Three intradermal inoculations of 0.2 ml of the vaccine were given at weekly intervals with a fourth inoculation six months later.

Dr. Ernest Tierkel, the U.S. Public Health Service specialist who lead the rabies control program at the Communicable Disease Center in Atlanta, Georgia (the forerunner of the current Centers for Disease Control and Prevention), was quoted as saying "the bite of infected dogs causes 90% of the human cases of rabies in the United States." Of the five persons who died of rabies in Texas in 1956, three children and one adult had received their infection from rabid dogs. The fifth person was George Menzies.

Texas State Department of Health officials encouraged a two-pronged control effort consisting of 1) prevention of rabies in domestic animals through the enforced annual vaccination and registration of all owned dogs and active control of stray dogs and 2) control of rabies in wildlife by thinning affected wildlife species both in areas where rabies was prevalent as well as in rabies-free areas where foxes and skunks were very numerous.

The Texas State Department of Health annually produced more than 5,000 treatments of what was termed "antirabic vaccine" in a tediously exacting process requiring six months to complete. The vaccine was obtained by harvesting virus-laden neural tissue from rabbits in which the disease had been artificially introduced. The vaccine, together with liberal applications of strong soap and warm water, constituted state-of-the-art treatment for exposure to rabies. Some medical practitioners still cauterized wounds with acids, but the Texas State Department of Health did not recommend that procedure. Six batches, or lots, of vaccine were made each spring and each fall; each batch consisted of 450 treatments. Quality control testing was performed by the National Institutes of Health on each lot. On the horizon were vaccines produced from egg-grown rabies virus.

Testing of animal specimens for rabies involved the microscopic examination of sections of brains that had been stained for evidence of the disease. New techniques, such as the fluorescent antibody technique, permitted more accuracy in detecting the rabies virus.

1958 The Texas State Department of Health was relocated to the present site of Texas Department of State Health Services headquarters at 1100 W. 49th Street in Austin. Even at the time of the move to the new building, additional off-site office space had to be rented.

1959 At least 36 counties stretched from east to west across the southern half of Texas were poised at the brink of a full-blown epizootic of fox rabies which could equal or surpass the one that occurred a few years previously in East Texas (see 1946). Prior to 1954, counties along the Mexican border had never known a case of rabies in a fox. Some authorities speculated that, prior to 1954, large species of cats, such as jaguars, were in abundance and kept the number of foxes low due to predation. Subsequent thinning of the large cat population allowed the number of foxes to increase, thereby allowing rabies to spread more easily among foxes. A separate and more widely held theory was that farmers and ranchers had diligently pursued sheep-killing coyotes, which had inadvertently resulted in less predation on foxes. Foxes were not only able to multiply in South Texas beyond their previous numbers but were also able to move into South Texas from rabies regions of Central and East Texas.

More than 80% of the skunks confirmed as rabid were the striped variety (the most common of the 6 species of skunks found in Texas). Skunk merchandising (selling descented offspring for household pets) was a profitable business. In addition to the pet trade, skunks were trapped and raised for their pungent gland secretions, which were sold to perfume manufacturers for $100 a gallon.

Although specimens from raccoons and bobcats were frequently submitted for rabies testing, they were seldom found to be rabid.

According to Dr. James H. Steele of the Veterinary Public Health Epidemiology Branch of CDC in Atlanta, 3,750,000 cases of rabies in humans and animals occurred annually throughout North, Central, and South America.

1960 Doubts surfaced concerning the ability to accurately monitor rabies trends because 71 of Texas' 254 counties did not have a licensed veterinarian in residence. During June, a typical month for reporting diseases to the Division of Veterinary Public Health, no reports were received from 133 Texas counties. Timely information from throughout the state was deemed necessary if epizootic outbreaks were to be accurately detected and characterized.

1961 The geographic distribution of rabies-positive animals showed an interesting redistribution of the disease from 1953 to 1962. In 1953, the major portion of rabies virus activity was in East Texas, with Harris County as the primary focus.

Over the intervening decade, the disease foci steadily shifted westward until the main concentration was in the El Paso area and the Rio Grande Valley. At the same time, the disease's primary host species changed from domestic animals to wild animals, particularly skunks. Skunks rose from 3% of the rabies-positive animals in 1953 to 52% in 1961.

The United States and Mexico, through a signed agreement, established the Border Public Health Association. Initial efforts of the program included a series of special training courses to bring US and Mexican rabies control staff members up-to-date on the newest techniques for controlling rabies in wild as well as domestic animals. A second step was the assignment of four new rabies experts (two from the federal health service of each country) to permanent duty along the Border. A separate but closely related effort in the US was the establishment by the Public Health Service of a National Rabies Surveillance Network, which collected rabies reports on a county-by-county basis.

Texas was noted to be a major contributor to the reported rabies cases in the US between 1951 and 1961. During that 11-year period, Texas averaged 15% of the reported rabies cases in the US each year while occupying 7% of the landmass.

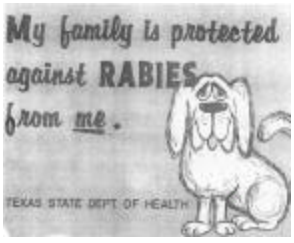
1962 Beginning in March, joint rabies control programs were initiated in adjoining cities along the Mexico-Texas border, starting with Ciudad Juarez and El Paso. Intensive publicity was implemented on both sides of the border using newspapers, radio stations, and television outlets. Approximately 100,000 Texas State Department of Health rabies leaflets, produced in Spanish and English, were distributed through El Paso's schools. In May, the 2 Mexican cities of Ciudad Acuña and Matamoros conducted intensive rabies control programs. A Regional Rabies Council for the lower Rio Grande area was organized to promote rabies control in that area.

Rabies in dogs was diagnosed in 25 counties in 1962. Cameron County in South Texas and El Paso County in West Texas contributed almost three-quarters of the 93 total cases in dogs.

1963 Thirty cases of rabies in foxes occurred during the first quarter of the year, indicating fox rabies was again on the rise. Most of these cases occurred in the Edwards Plateau area of Central Texas (Appendix 13). The principal focus of rabies in dogs remained in various cities along the Texas-Mexico border.

The laboratory at San Antonio's public health department initiated its program for testing animals for rabies.

1964 A massive effort in the Rio Grande Valley addressed la rabia with migratory families. Leaflets were sent home with school children by the tens of thousands. Mobile vaccination clinics offered rabies vaccinations for $3.00 per pet. Local participating veterinarians were given $1.00 of the fee. The program was promoted by the



Texas State Department of Health Rabies Vaccination Promotion

Texas State Department of Health.

Egg-adapted vaccine (the same type of vaccine that had been in continual use for almost a decade) was used in the mass animal immunization program. Challenge studies determined this vaccine protected the immunized animal for at least 3 years and other evidence indicated that the immunity may have persisted for as long as 5 years.

A historical review of fox rabies revealed an interesting change in its geographic distribution (Appendix 2). In 1946, fox rabies cases were reported in only 6 counties in Texas. Five of these counties were located along the eastern edge of the East Texas Timber Belt (Piney Woods) (Appendix 13) with the Sabine River separating them from the state of Louisiana. One county was located in the southwestern area of the Belt. Between 1946 and 1953, fox rabies cases were being reported from the same area of East Texas and as far west as Kerr and Concho Counties. By the end of 1953, fox rabies appears to have expanded from the eastern edge of the East Texas Timber Belt, throughout the Belt, through the central portion of the Blackland Prairies, and into the eastern counties of the Edwards Plateau (Appendix 13). In 1957, rabid foxes were reported as far west as Presidio County in the Trans-Pecos area. During 1960, a declining number of counties reported rabid foxes, but several counties were added in the Trans-Pecos area. In 1963, rabid foxes, almost without exception, were confined to counties of the Edwards Plateau or adjacent counties. Only one case was reported in the Trans-Pecos area and one case was reported in the East Texas Timber Belt. For the next four years, all confirmed cases of rabies in foxes occurred in the Edwards Plateau or adjacent counties, with three exceptions, one in Anderson County in 1964, one in Tarrant County in 1965, and one in Lavaca County in 1966. The total number of rabid foxes decreased from 173 in 1949 to 30 in 1961. Authorities estimated that only about 10% of the total wildlife rabies cases were actually detected in contrast to rabies cases in pets, in which the majority of the cases in dogs and cats were believed to be actually confirmed.

Texas dropped to fifth among US states in the number of reported rabies cases in the US. Of interest among the reported cases were a jackrabbit and 2 mice, species in which rabies was uncommon (Appendix 14). The number of rabies cases in Texas was the second lowest to date (358 cases) in recorded history and remained low for the next 13 years.

1968 In the period 1953-1967, El Paso County averaged 40.5 rabid dogs per year. In response, the City of El Paso established the Department of Veterinary Services under Dr. Lea R. Hutchinson in 1965. In 1968, El Paso surrendered its unofficial title of “Rabies Capital” when no cases were reported in domestic pets. El Paso Health Department personnel obtained training in the laboratory diagnosis of rabies in animals at the Texas State Department of Health laboratory and established rabies diagnostic capabilities for the city itself.

By 1968, the number of local public health units in Texas reached 70.

1969 The Texas State Department of Health laboratory performed a two-tiered testing procedure on the brains of rabies suspects. A screening test was first conducted using the Sellers stain, which was 60% to 70% accurate in detecting samples that were positive (i.e., 30% – 40% of the positive samples falsely tested negative). If the Seller's stain was positive, then a positive report was forwarded to the sender of the specimen. Negative results were withheld pending the results of a second, more sensitive type of test, the fluorescent antibody test.

Corpus Christi applauded its new rabies control operation, stating it had finally given meaning and substance to a 1961 community leash law. Rabies control in pets was improving, according to Dr. Dean J. Alpert, U.S. Public Health Service, who was stationed in El Paso at the National Communicable Disease Center's Rabies Control Activity. In Texas, the main rabies problem was occurring in the lower Rio Grande Valley with 11 rabid dogs in Hidalgo County, 3 in Willacy County, and 35 in Cameron County.

Prior to 1969, the portion of the Texas State Department of Health responsible for rabies control was a subdivision of the Communicable Disease Services Section known as the Leprosy Program and Zoonoses Control. The 61st Texas Legislature added to the Texas State Department of Health's tasks by assigning it responsibility for the inspection and regulation of all meat and poultry produced in the state for interstate commerce to the Texas State Department of Health. The Zoonosis Control Division joined with the Cooperative Meat Inspection Program to form the Bureau of Veterinary Public Health.

1970 The 222 confirmed rabid animals was the lowest reported for any single year and continues to hold the record.

During the first half of the 1970s, the Public Health Region system was established as part of the Texas State Department of Health in order to supply services to people who didn't have organized local public health units (Appendix 15). Personnel considered necessary to provide professional and technical capabilities to the Public Health Regions included public health veterinarians as well as public health physicians, nurses, sanitarians, dentists, and engineers in addition to clerks, secretaries, and administrators.

1971 Effective prevention in humans exposed to rabies now consisted of a series of 14 injections. The principles of rabies vaccines remained the same as they had been during Louis Pasteur's day (that is, ground nervous tissue was injected into the patient along with the killed virus). The successful trial of a vaccine prepared in human tissue culture was reported as a significant advance in rabies control.

1972 One human case of rabies was reported; the exposure was attributed to an aerosol inhalation exposure. A 56-year-old veterinary microbiologist in Temple was working with an experimental lot of rabies vaccine. In the course of conducting his laboratory procedures, he was thought to have used a type of blender known to produce aerosols. The patient was suffering from a chronic

respiratory condition, which may have increased his susceptibility to aerosol infection.

Health authorities gathered information on the vaccination history of rabid dogs. Reports on 178 cases indicated 157 were known either to be unvaccinated or strays. In the remaining 21 cases, 7 appeared to be vaccine failures, 10 involved animals whose vaccinations were no longer current or had been vaccinated after exposure to rabies had occurred, and insufficient information was available in 4 cases to make a determination. The cases of apparent vaccine failure involved 4 types of vaccine: "live" tissue culture origin, "live" chick embryo origin, inactivated tissue culture origin, and inactivated nervous tissue origin.

1973 In September, a rabid dog signaled the beginning of an epizootic of rabies in El Paso, with almost all of the reported cases occurring in the river area. Approximately half of the dogs were owned, and 25% of these owned dogs were currently vaccinated against rabies as defined by the El Paso ordinance requiring annual vaccinations. An estimated 150 El Paso residents received postexposure rabies treatments. The epizootic lasted until 1975 (Appendix 16).

Investigation of bite case reports indicated 31% of the dogs and 4% of the cats were vaccinated against rabies. These percentages remained fairly consistent for the next two decades.

1974 The state health agency briefly assumed the name Texas Department of Health Resources before adopting the name Texas Department of Health.

1975 The Texas Department of Health Regional Public Health Veterinarian in El Paso initiated training for those individuals responsible for domestic animal population control. This training grew and evolved into the present day Texas Animal Control Officer Training Program.

Leading the state in number of rabies cases, El Paso County reported 46 cases of rabies (21 bats, 10 skunks, 13 dogs, and 2 cats).

A skunk rabies epizootic began that peaked in 1979 and lasted until 1985. During these years, a total of 5,070 cases of rabies in skunks occurred predominately in the eastern two-thirds of the state. Rabies in skunks occurs in cycles with each cycle lasting approximately 20 years (Appendix 8).

1976 In 1975, no cases of rabies were reported in Webb County. By the following year, Webb County (Laredo in particular) was in the midst of a rabies epizootic (Appendix 16). The first reported case of rabies occurred in a dog that lived a "sheltered life" in a fenced-in yard. Between November 1, 1976, and the end of 1977, Webb County had 56 cases of rabid dogs, demonstrating how quickly a canine variant of the rabies virus can spread among domestic dogs. Control efforts included an educational rabies awareness program as well as a citywide vaccination campaign aimed at immunizing 50% of the city's dog population (estimated at 20,000). Vaccination fees were dropped to $1.00. Twelve animal

control wardens were hired. Laredo passed a city ordinance for rabies control that included a penalty for non-compliance.

1977 At a big market fair in Canton (Van Zandt County), Texas, between 10 and 12 dealers bought and sold exotic animals as pets, including skunks and raccoons. One of the animals was later diagnosed as rabid. As a result, 18 Texans had to take rabies postexposure treatment. People from 28 states had attended the sale, indicating the potential for widespread disaster when unvaccinated carnivores are congregated together as well as the danger of attempting to turn wild animals into pets.

Postexposure rabies vaccine for humans was derived from duck embryo cells that required a cumbersome protocol of 14 to 21 injections. Some individuals experienced allergic reactions to the foreign animal protein. A new vaccine, known as the human diploid cell vaccine, had very few side effects while at the same time was highly immunogenic. The reduced treatment course consisted of injections on days 0, 3, 7, 14, and 28 along with a single injection of rabies immune globulin. The vaccine was being developed by US and Iranian researchers and was still experimental. By 1980, human diploid cell vaccine had completely replaced the duck embryo vaccine in the US. On the horizon was the next step in the improvement in rabies treatment, the production of immune globulin from human cells to replace the antiserum of animal origin.

1978 In Young County in north-central Texas, 17 persons received postexposure rabies treatment after a pet coyote pup was diagnosed with rabies.

1979 An outbreak of rabies in dogs in El Paso and Eagle Pass (Appendix 16) resulted in intensive public awareness campaigns. Two human deaths occurred. One death was due to an exposure to a rabid dog in Piedras Negras, Mexico. The individual died in a San Antonio hospital. The second death was an eight-year-old from Eagle Pass (Maverick County), whose death also occurred in San Antonio. The Texas State Health Commissioner, Dr. Raymond Moore, called for an all-out effort to control rabies. To help raise the level of pet immunizations, 6 Texas Department of Health veterinarians, a technician, a nurse, and other personnel traveled to Eagle Pass to administer free rabies immunizations to pets in a door-to-door campaign.

The 66th Texas Legislature enacted the Rabies Control Act (Texas Health and Safety Code Chapter 826) (Appendix 17). Whereas rabies vaccination of dogs or cats had not previously been required, the Act mandated all dogs and cats in Texas be vaccinated against rabies by a veterinarian. The Legislature placed the particulars of the vaccination requirement under the purview of the Texas Department of Health, including how often the vaccine should be administered, what vaccines could be used, the age by which an animal must be vaccinated, etc.

1987 An epizootic involving the gray fox rabies variant was identified in West Texas (Appendix 18). Although gray fox was the species primarily affected, spillover cases were also common in raccoons, bobcats, cats, goats, and cattle.

1988 Through advanced molecular laboratory techniques (polymerase chain reaction, commonly known as DNA fingerprinting), the Centers for Disease Control in Atlanta confirmed the urban Mexican dog variant of rabies (later renamed the domestic dog/coyote variant) in a coyote in Starr County in September, marking the beginning of an epizootic in South Texas (Appendixes 9 and 19). The virus quickly spread to unvaccinated domestic dogs in South Texas, giving Texas the notorious distinction of being the only state in the U.S. with a dog variant of the rabies virus.

1989 During the late 1980s, the laboratory at the Texas Department of Health initiated a sophisticated testing procedure using monoclonal antibodies that enabled the various rabies variants to be identified and distinguished from one another. The procedure proved to be indispensable for monitoring the spread of the rabies variants across the state.

Between 1989 and 2003, an average of 41% dogs and 13% cats in Texas were currently vaccinated against rabies (Appendix 20).

1991 The 72nd Texas Legislature altered the boundaries of the Public Health Regional system (Appendix 15).

1994 Governor Ann Richards declared two ongoing rabies epizootics to be a state health emergency (Appendix 21). By 1994, the domestic dog/coyote rabies epizootic had spread northward from the Rio Grande Valley to include a total of 517 laboratory-confirmed cases in 18 counties. The epizootic area would eventually include 21 counties. By the end of 1994, the gray fox rabies epizootic in West Central Texas involved 35 counties and would eventually include 50 counties.

Schematic of bait containing oral rabies vaccine

The Texas Department of Health's monoclonal antibody test was capable of differentiating all the common rabies variants in Texas with one critical exception: the domestic dog/coyote rabies variant was indistinguishable from the gray fox rabies variant. Both variants looked identical on the monoclonal antibody test. Recognizing the importance of being able to distinguish the 2 rabies variants that were causing the 2 Texas epizootics, the Texas Department of Health laboratory begin using DNA fingerprinting in order to further identify rabies variants. The test (known as the polymerase chain reaction or PCR) was a major technological advance that used small segments of the RNA contained in the virus to identify the particular rabies variant. Texas was the second public health laboratory in the United States to use PCR technology for rabies testing, the other laboratory being at the Centers for Disease Control and Prevention in Atlanta. Being able to distinguish between the domestic dog/coyote and the gray fox rabies variants was the first crucial step toward the next phase of rabies control in Texas, the implementation of an oral rabies vaccination program.

The development of an oral rabies vaccination program in Texas took place as a partnership between the Texas Department of Health and numerous state and federal agencies as well as the Ontario (Canada) Ministry of Natural Resources. The immediate purpose of this program was to create a barrier of immune animals to prevent the spread of two on-going rabies epizootics: one caused by the domestic dog/coyote variant in South Texas and one caused by the gray fox variant in West-Central Texas. The ultimate goal was to eliminate those rabies variants from Texas. One of the initial steps was a baiting study on coyotes to determine a suitable bait in which to place the oral rabies vaccine. In conjunction with Texas A&M-Kingsville, the Texas Department of Health conducted research to develop a flavored bait that would be eaten by free-roaming coyotes. Next, a vaccine efficacy study was conducted on the same coyotes to ensure that the oral rabies vaccine effectively produced immunity in the animals.

1995 The first field operations of the Oral Rabies Vaccination Program for coyotes in South Texas were conducted. Thereafter, vaccine-laden baits were distributed on an annual basis every winter at levels appropriate to what funding allowed (Appendix 22). The baiting strategy successfully eliminated the virus from Texas (Appendix 23).

Baiting trials and vaccine-efficacy trials were conducted on gray foxes to develop an oral rabies vaccine program directed at that species in West-Central Texas.

The two on-going rabies epizootics in Texas gained notoriety when wild animals that had been legally shipped from Texas to other states and countries turned out to be rabid. Certain species of animals were commonly trapped in the wild to use as game in enclosed hunting pens that encompass hundreds of acres. Rabid coyotes were shipped to Alabama (1993) and Florida (1995) and rabid gray foxes were shipped to Montana and the Netherlands in 1995. Fortunately, the animals were identified and measures were successfully implemented to prevent the introduction of these rabies variants to new locales. No cases of rabies in humans resulted from these incidents.

In response to the epizootic, the Texas Board of Health administrative rules enacted a statewide rabies quarantine that prohibited the transportation of certain species of animals to, within, or from the state (Appendix 17). After the quarantine underwent several refinements, the species ultimately affected were raccoons, coyotes, and species of foxes indigenous to North America.

1996 The first field operations of the Oral Rabies Vaccination Program for gray foxes in West-Central Texas were conducted. Thereafter, vaccine-laden baits were distributed on an annual basis every winter at levels appropriate to what funding allowed (Appendix 24). The program successfully stopped the expansion of the epizootic (Appendix 25).

Nationwide, bats had become the main culprit in transmitting rabies in humans. Between 1990 and 1996, 15 of the 17 human rabies cases acquired in the US

were due to bat variants of the rabies virus. Interestingly enough, the remaining two cases were acquired in Texas and were due to the domestic dog/coyote variant of the rabies virus. The Centers for Disease Control and Prevention issued the following warning about rabies transmitted by bats.

> In incidents involving bats, postexposure prophylaxis may be appropriate even in the absence of demonstrable bite, scratch, or mucous membrane exposure in situations in which there is reasonable probability that such exposure may have occurred (e.g. sleeping individual awakes to find a bat in the room, adult witnesses a bat in the room with a previously unattended child, mentally challenged person, intoxicated individual, etc).

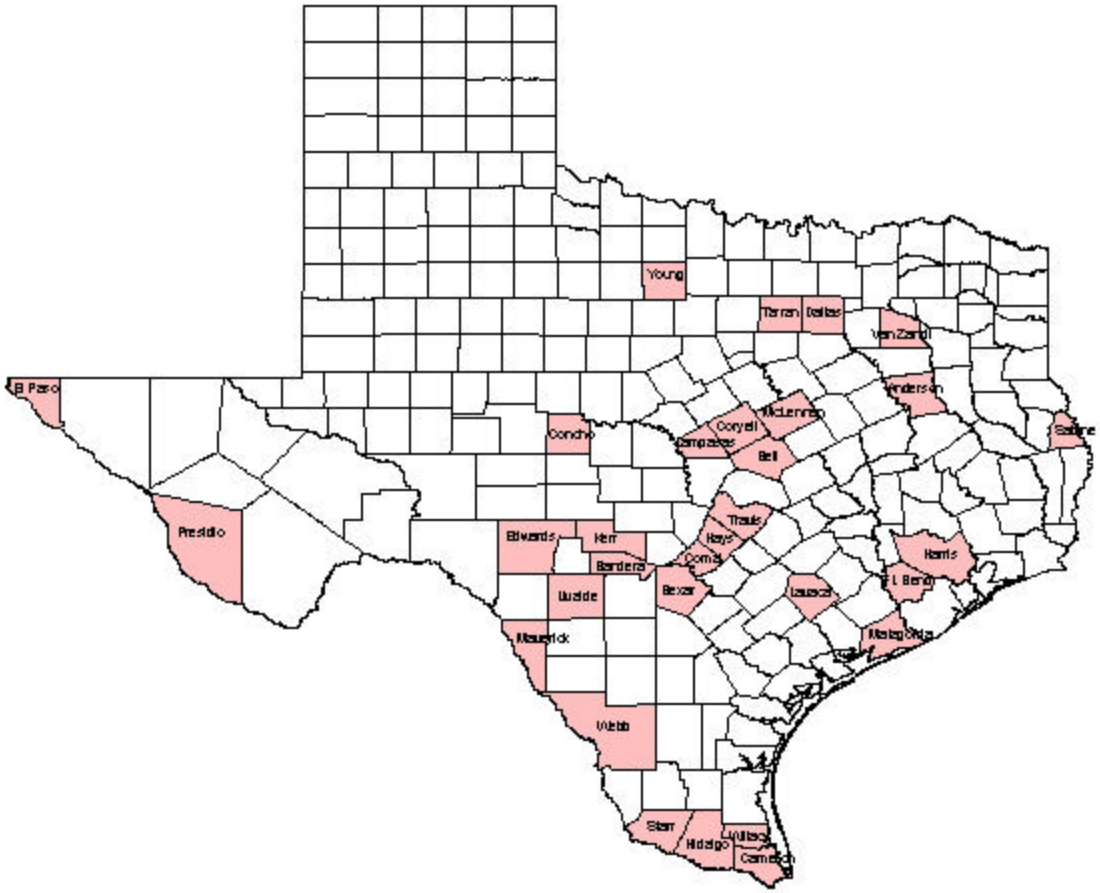
1998 To augment rabies surveillance conducted at the federal level, the Texas Department of Health laboratory was selected by the Centers for Disease Control and Prevention to be a regional reference typing laboratory for surrounding states and the US-Mexico border.

2001 An epizootic of skunk rabies began that focused in eastern, north-central, and central Texas. Although skunk rabies (primarily due to the south-central skunk rabies variant) is endemic in Texas, the number of cases rises and falls in peaks and valleys that occur approximately 2 decades apart (Appendix 8).

2003 The Texas Board of Health modified the Rules for Rabies Control and Eradication from requiring an annual vaccination of dogs and cats to vaccinations at either one-year or three-year intervals, depending on the type of vaccine used by the veterinarian (Appendix 17).

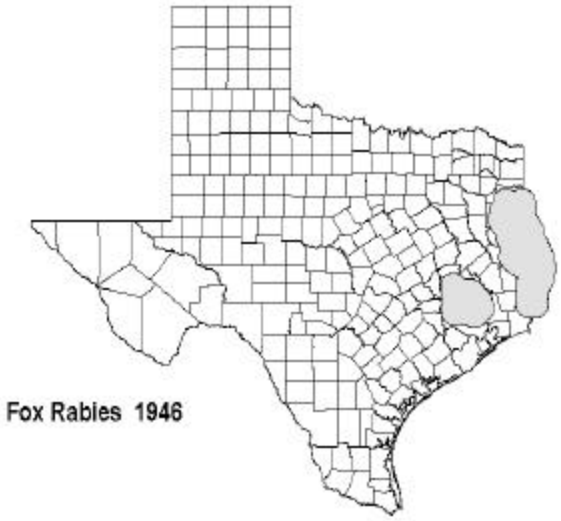
The 78th Legislature changed the name of the Texas Department of Health to the Texas Department of State Health Services.

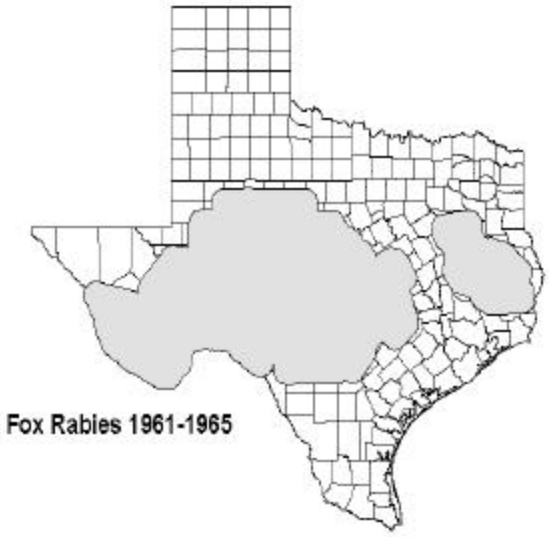
Counties referenced in
Rabies in Texas
A Historical Perspective



Appendix 1

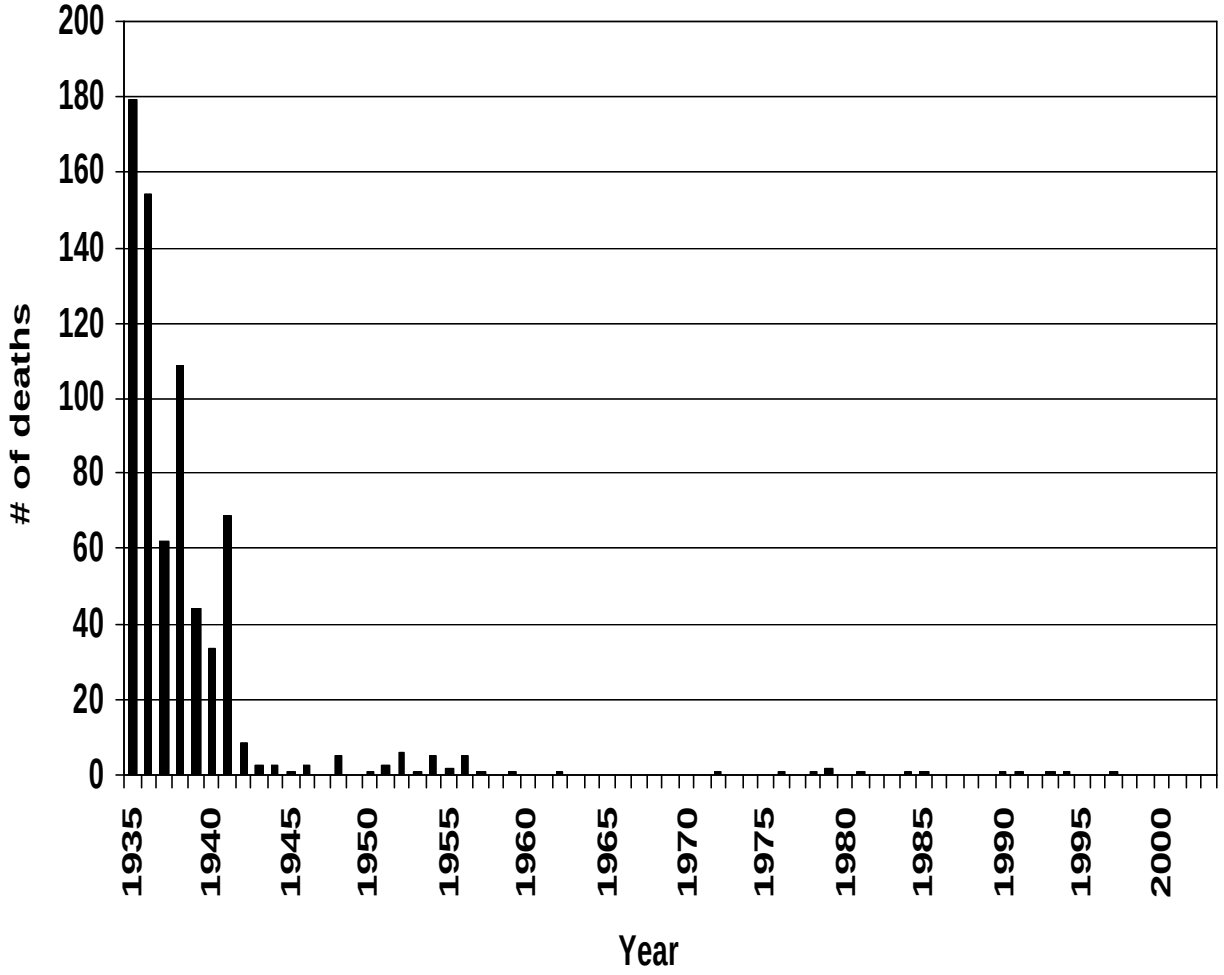
Geographic Distribution of Rabies in Foxes 1946-1986





Appendix 2

Human Rabies Deaths in Texas 1935-2003



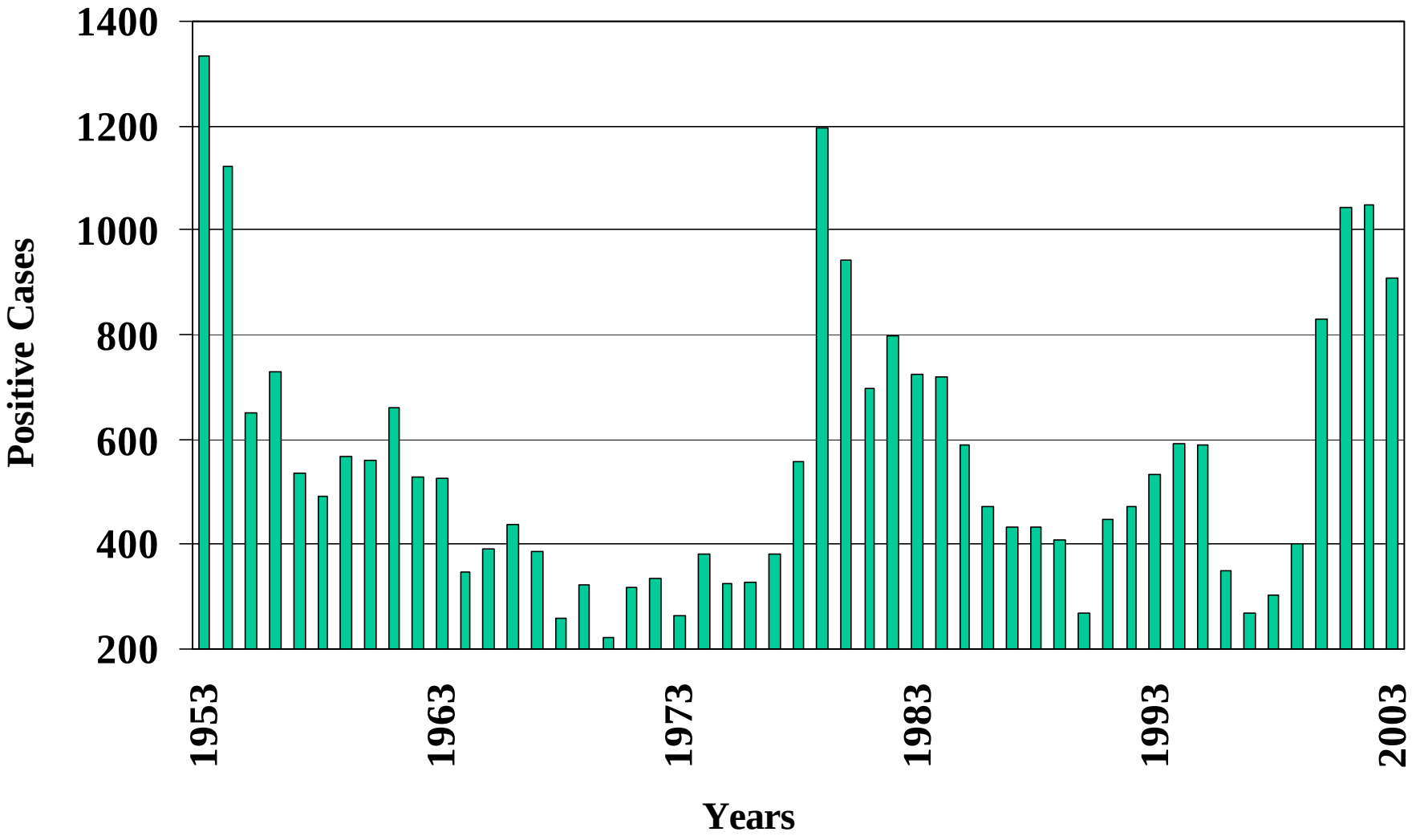
Year	#cases
1935	179
1936	154
1937	62
1938	109
1939	44
1940	34
1941	69
1942	9
1943	3
1944	3
1945	1
1946	3
1947	0
1948	5
1949	0
1950	1
1951	3
1952	6
1953	1
1954	5
1955	2
1956	5
1957	1
1958	0
1959	1
1960	0
1961	0
1962	1
1963	0
1964	0
1965	0
1966	0
1967	0
1968	0
1969	0
1970	0
1971	0
1972	1
1973	0
1974	0
1975	0
1976	1
1977	0
1978	1
1979	2
1980	0
1981	1
1982	0
1983	0
1984	1
1985	1
1986	0
1987	0
1988	0
1989	0
1990	1
1991	1
1992	0
1993	1
1994	1
1995	0
1996	0
1997	1
1998	0
1999	0
2000	0
2001	0
2002	0
2003	0

Appendix 3

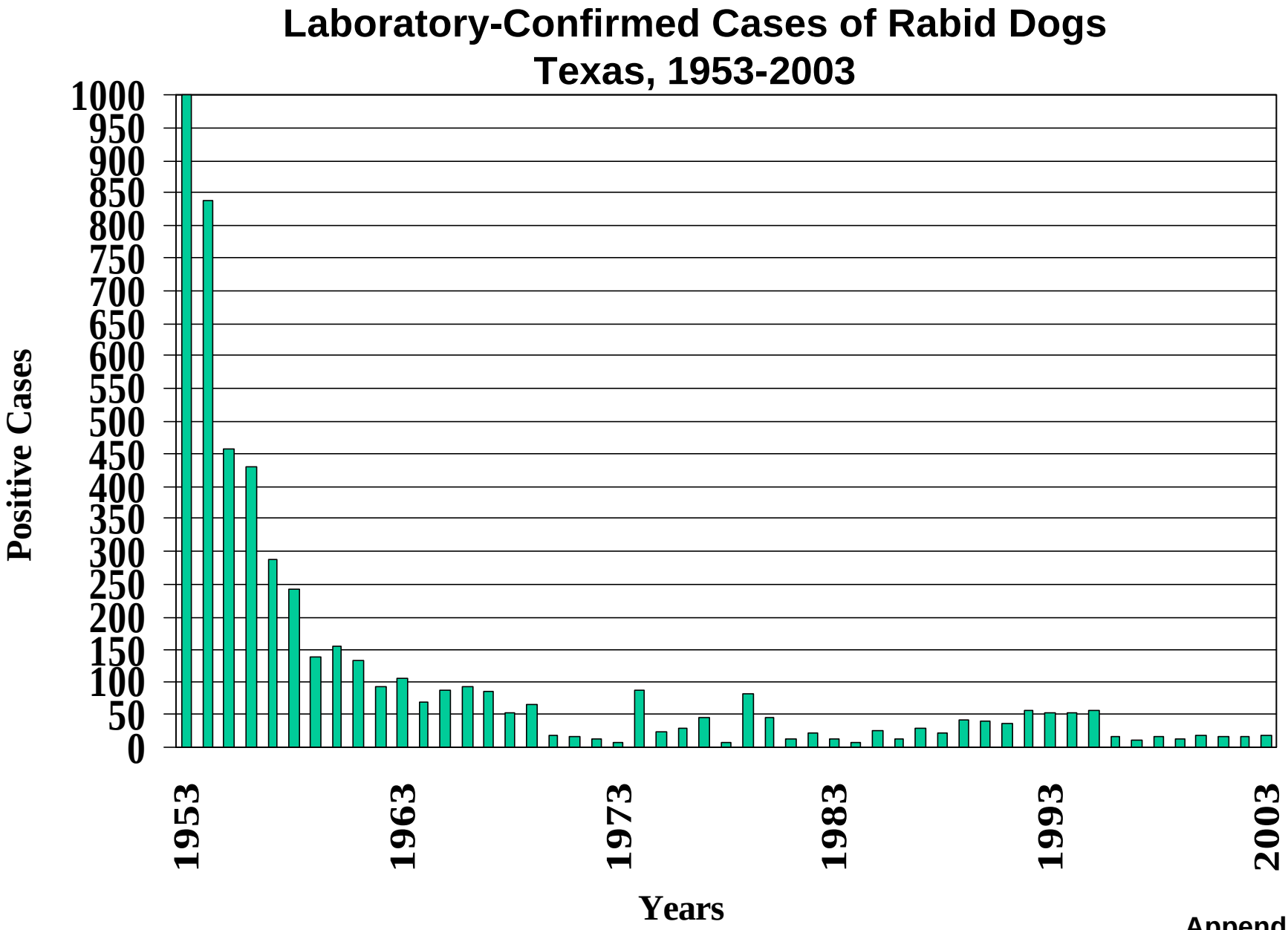
Human Rabies Cases in Texas, 1938 - 2003

COUNTY	1938	1939	1940	1941	1942	1943	1944	1945	1946	1948	1951	1952	1953	1954	1955	1956	1957	1959	1962	1972	1976	1978	1979	1981	1984	1985	1990	1991	1993	1994	1997
Bastrop				1																											
Bell	3		1	1					1											1											
Bexar							1			1		2									1		1								
Bosque				1																											
Bowie			2	2		1																							1		
Brazos			8	21																											
Cameron																			1												
Comanche					1																										
Cass			1		1																										
Coke			1																												
Comal	4																														
Dallas	14											3		2		4															
Denton				5																											
Ellis							1																								
El Paso																	1														
Falls		1																													
Fannin	1																														
Fisher			1	4																											
Floyd	1																														
Fort Bend										1																					
Galveston						2																									
Gregg										1																					
Hardin		1			1																										
Harris	1							1	1	1		1	1	1	2							1			1						1
Hidalgo																											1			1	
Hill					1		1																								
Hopkins	1																														
Hunt					1																										
Jackson											1																				
Jasper	3		2																												
Jefferson		3	7											1																	
Kerr	1																														
Limestone			1																												
Maverick			2	12																			1								
McLennan										1																					
Milam	3	5																													
Navarro		5																													
Orange	11	4																													
Panola			1																												
Robertson			1																												
Rusk	61	19	4	17	2				1																						
San Augustine				1																											
San Saba				1																											
Shelby			2																												
Starr											1																	1			
Stephens		6																													
Swisher				1																											
Taylor					1																					1					
Terry	3																														
Travis																1															
Tyler					1																										
Upton				1																											
Van Zandt	1																														
Wilson	1			1																											
Total:	109	44	34	69	9	3	3	1	3	5	2	6	1	4	2	5	1	0	1	1	1	1	2	0	1	1	1	1	1	1	1

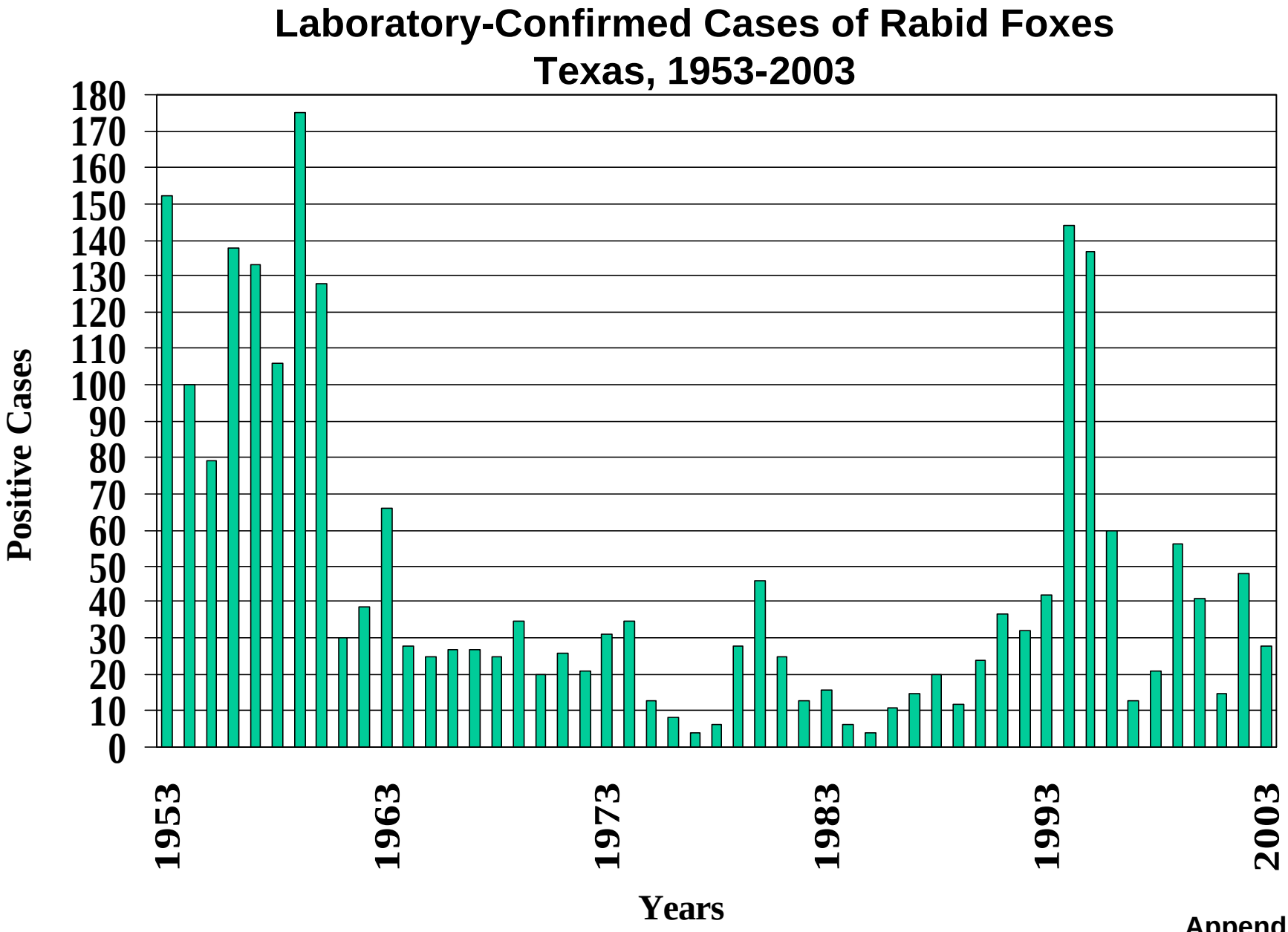
Laboratory-Confirmed Cases of Animal Rabies
Texas, 1953-2003



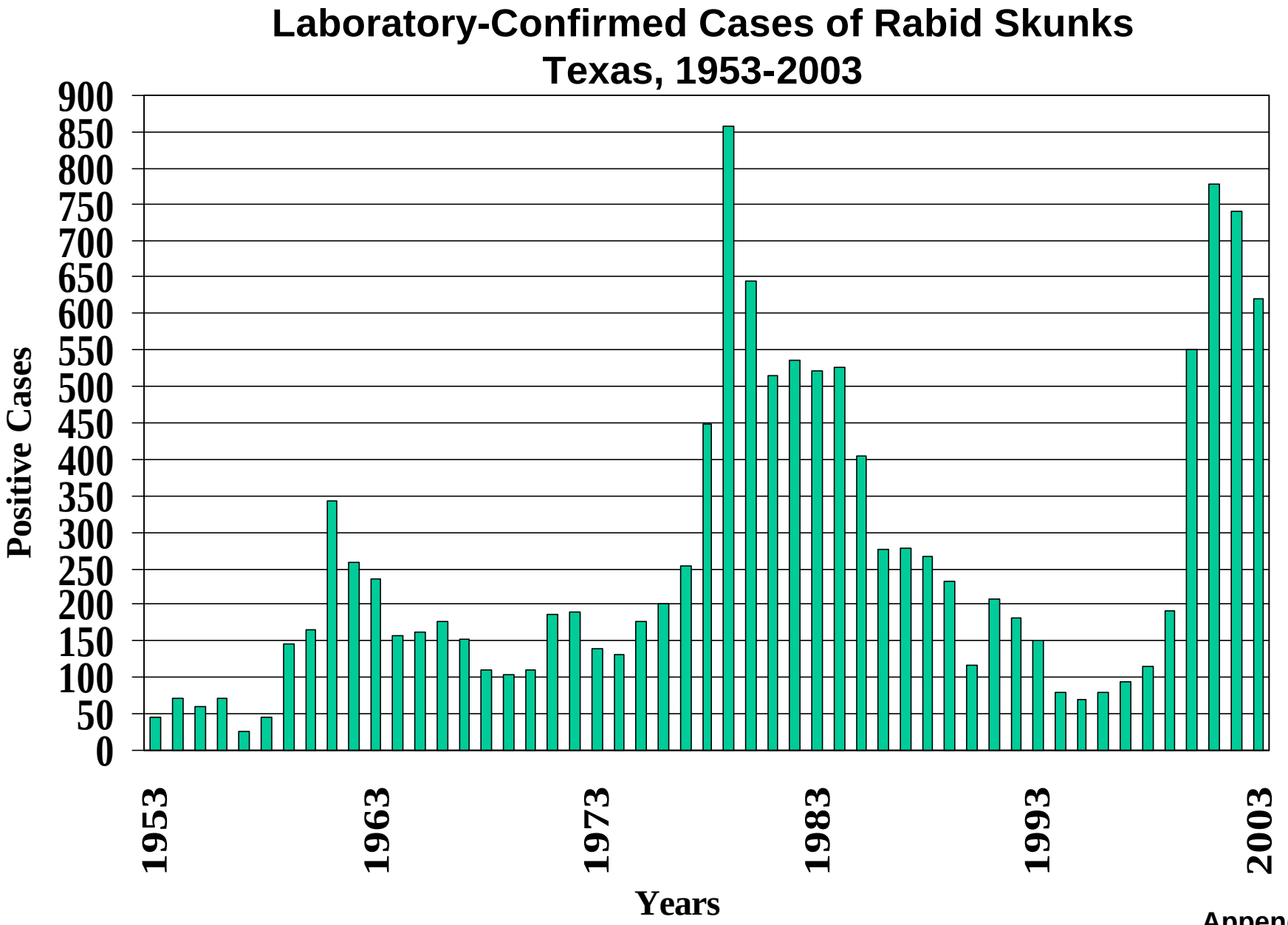
Appendix 5


Laboratory-Confirmed Cases of Rabid Dogs
Texas, 1953-2003
Positive Cases
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
1953
1963
1973
1983
1993
2003
Years

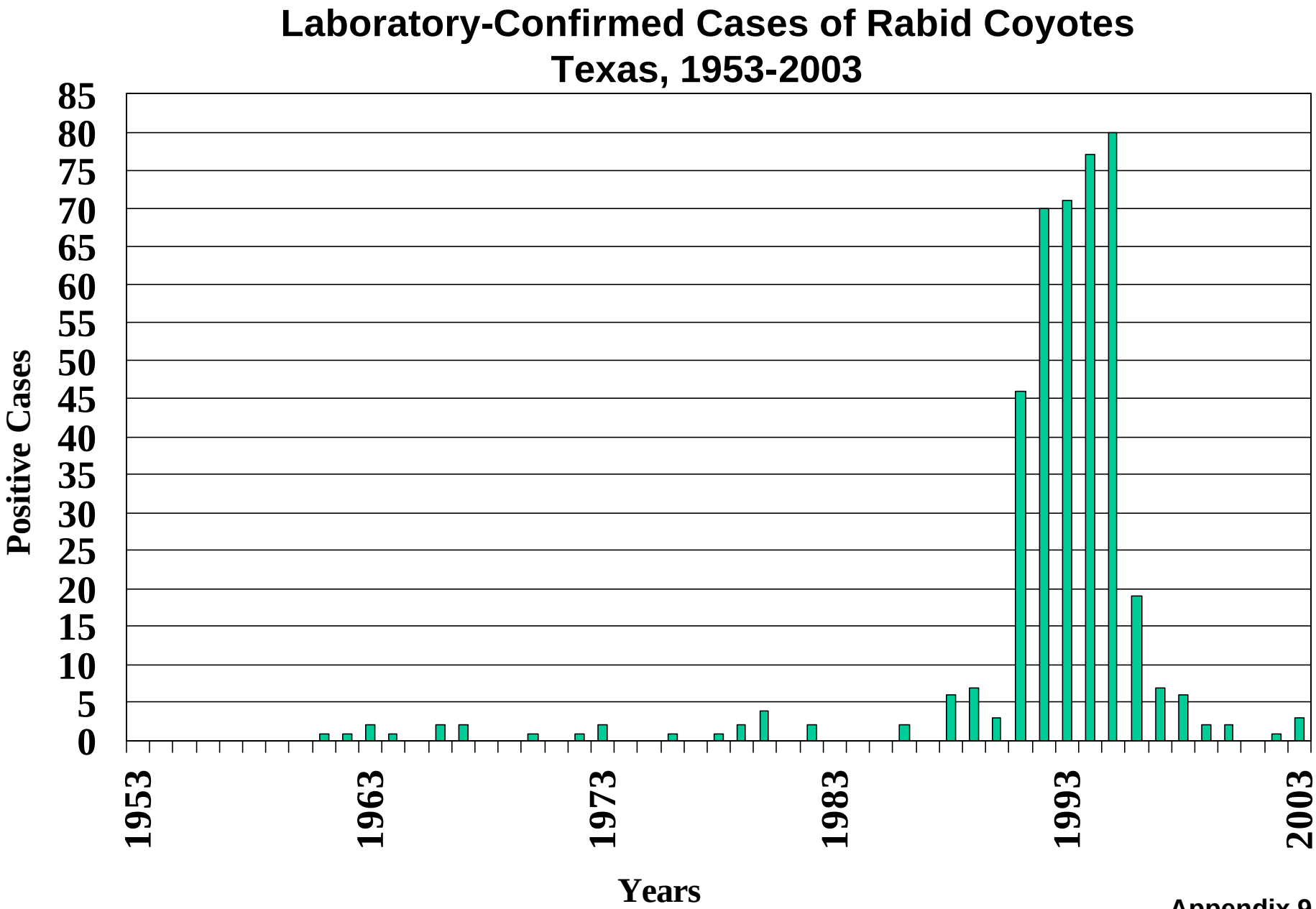
Appendix 6


Laboratory-Confirmed Cases of Rabid Foxes
Texas, 1953-2003
Positive Cases
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1953
1963
1973
1983
1993
2003
Years

Appendix 7


Laboratory-Confirmed Cases of Rabid Skunks
Texas, 1953-2003
Positive Cases
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
1953
1963
1973
1983
1993
2003
Years

Appendix 8


Laboratory-Confirmed Cases of Rabid Coyotes
Texas, 1953-2003
Positive Cases
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1953
1963
1973
1983
1993
2003
Years

Appendix 9

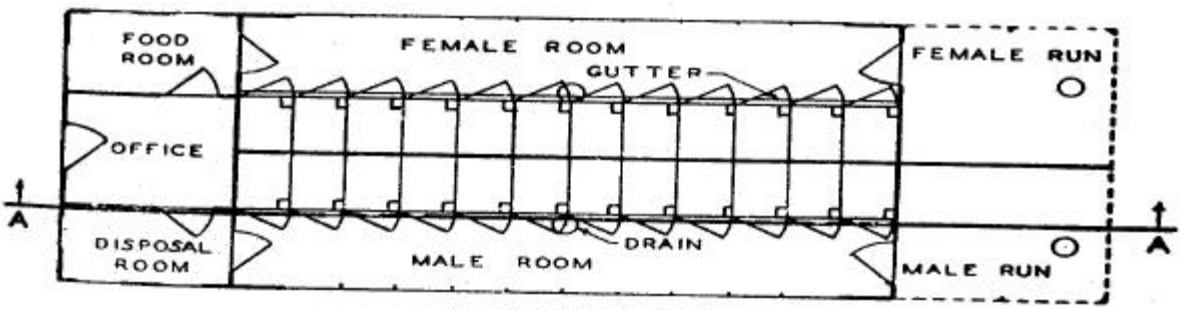
METHODS AND PROCEDURES FOR SANITARY DOG POUND CONSTRUCTION AND OPERATION (1949)

Stray dogs are a menace to any community. It is the duty of city officials to pick up stray dogs, and it is their right to hold the animal until his owner has him vaccinated and takes him home. This is one of the most essential factors in any rabies control program.

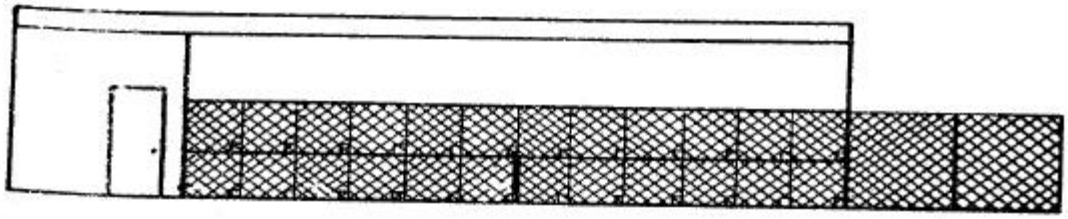
In order to hold the stray dogs in a humane and sanitary manner, and in order that they may be destroyed humanely if unclaimed by the owner, constructing a sanitary and economical dog pound or shelter such as is outlined, will help to solve the city's problem in this respect.

Note that the model shelter includes the following important suggestions for the restraint and care of impounded dogs and general proposed principles of construction.

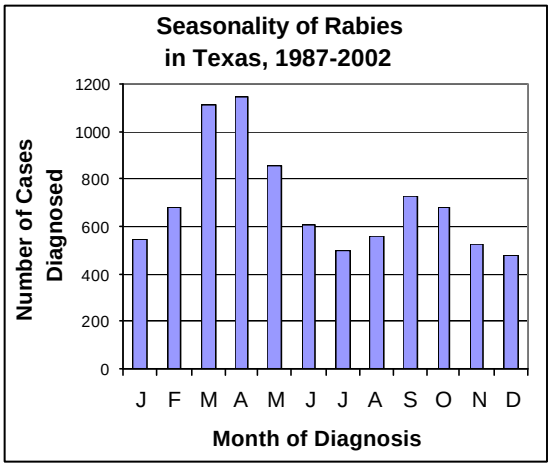
1. Cages should be of steel with heavy wire doors. Drinking cups shall be attached to cage but be removable for purpose of cleaning.
2. Cages shall slope from 1 to 1 ½ inches from back to front and gutters shall slope from 2 ½ to 3 inches to central drain.
3. Hot and cold water shall be provided in order that sanitary floors and cages may be cleaned efficaciously.
4. Site shall be in an area easily accessible to the public on a good street and in a well drained sanitary area where city water and sewage facilities are available.
5. Adequate fly and insect control should be maintained, such as spraying with DDT using sodium fluoride for cock-roaches and all other practicable insect control procedures.
6. The three basic principles involved in the unit plan are the following:
    a. The concrete, or similar sanitary floors, cages and runs, and screened windows, provide a place that will be ratproof and have no odors. As all animals face the outside wall, and do not see each other, there is no reason for barking.
    b. The city or county is protected from lawsuit as dogs are held 72 or more hours to provide time for the owners to claim them. You are not incubating and spreading rabies as each days pickup of dogs or each individual dog, if need be, can be let into the runs separately and valuable bitches have not contact with mongrel males.
    c. The owners are being provided service in that their dogs are being protected and handled humanely. The conscientious owner wants his valuable dog with his family and on his property and not running in marauding packs.
7. Pens should be cleaned at least twice daily.
8. Dogs should be fed once daily, either morning or night.

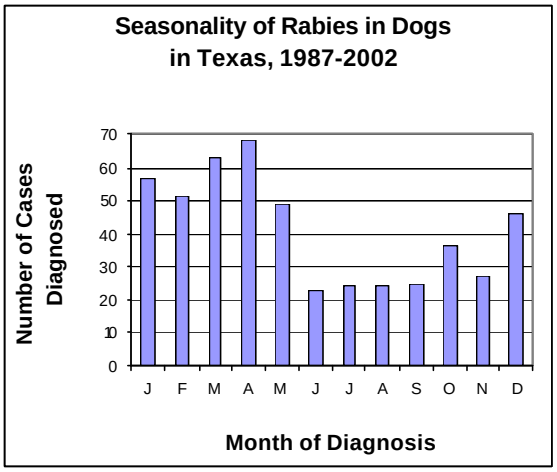


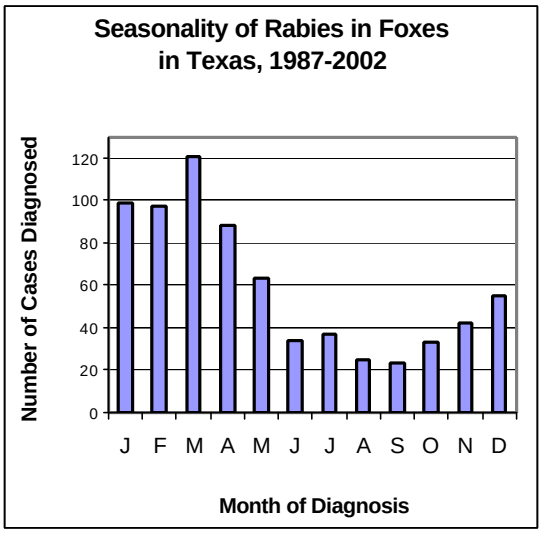
FLOOR PLAN

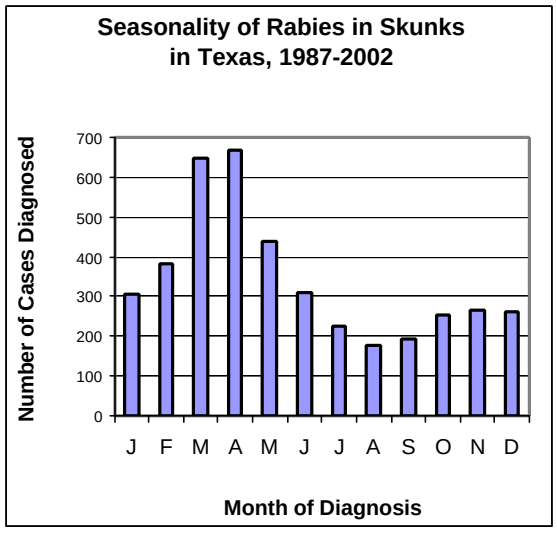

SECTION A – A

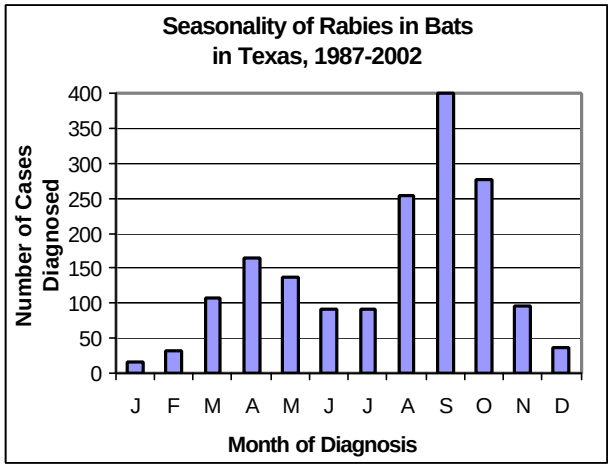
Seasonality of Rabies in Texas











George Menzies
(1914 – 1956)

In 1956, George Menzies, an entomologist and rabies researcher from the Texas State Department of Health, died from what is assumed to have been bat rabies. Mr. Menzies was most likely exposed to an aerosolized rabies virus while working in Frio Cave, Uvalde County, Texas, a favorite roosting area for thousands of Mexican free-tailed bats. Associates of Mr. Menzies at the time of the incident recall that he was suffering from poison ivy as well as a possible skin infection. These conditions (localized around the shoulders and neck) may have facilitated the exposure and/or served as the main portal of entry.

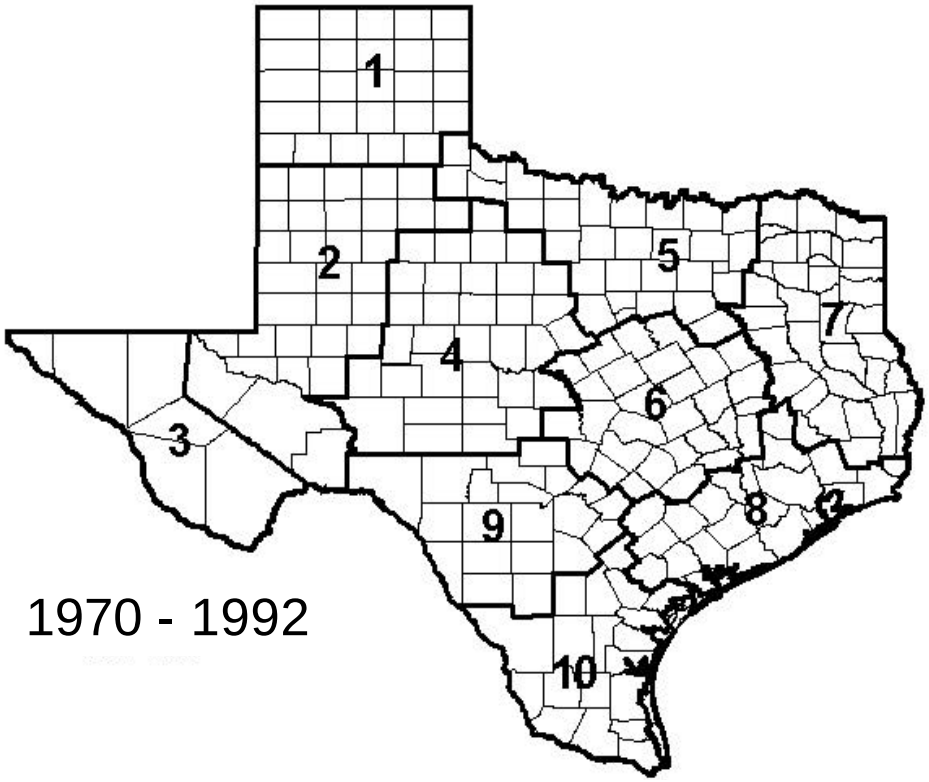
Major Ecological Regions of Texas

Appendix 13

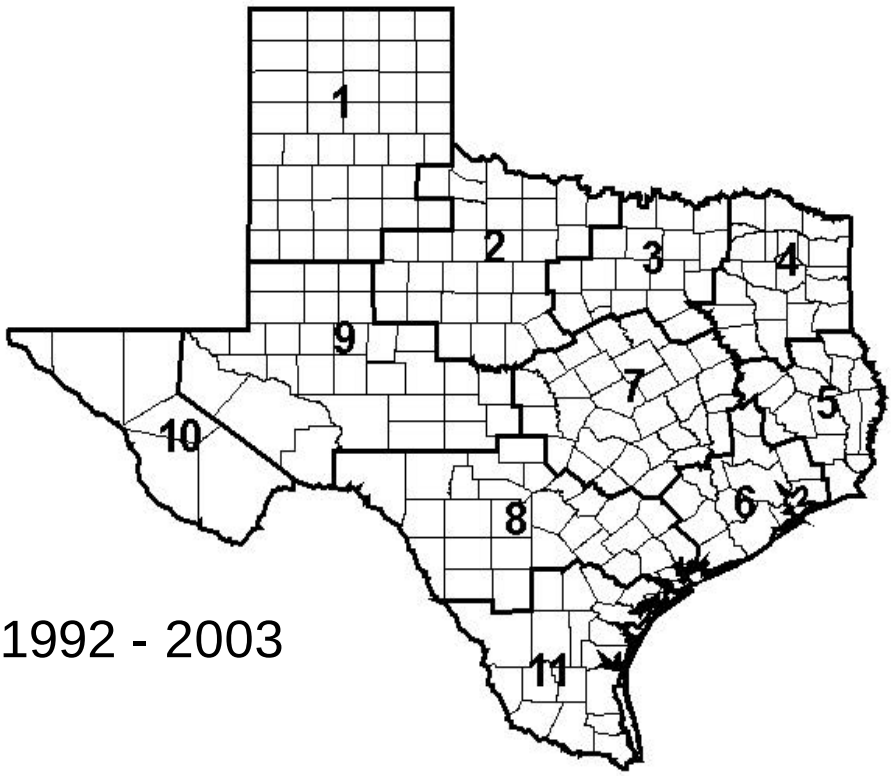
Laboratory-Confirmed Cases of Rabies in Unusual Species
Texas, 1962 – 2003

Year	County	Animal
1962	Val Verde	Guinea Pig
1964	Bexar	Mouse
	Wichita	Mouse
	McLennan	Jack rabbit
1965	Jefferson	Opposum
1974	Val Verde	Opossum
1977	Waller	Opossum
1979	Comanche	Rat
	Collin	Squirrel
1980	Comal	Opossum
	DeWitt	Squirrel
1981	Parmer	Badger
1982	Llano	Zebra
	Nueces	Rat
1983	Brown	Opossum
	Coke	Pig
	Johnson	Deer
1984	Tarrant	Rat
1985	Travis	Mouse
	Uvalde	Rabbit
	Ector	Squirrel
1987	Hill	Armadillo
1988	Randall	Deer
1991	Sutton	Deer
	Schleicher	Porcupine
1992	Sutton	Llama
1994	Tom Green	Rabbit
1996	Uvalde	Deer
2002	Pecos	Javelina

Texas Public Health Regional System

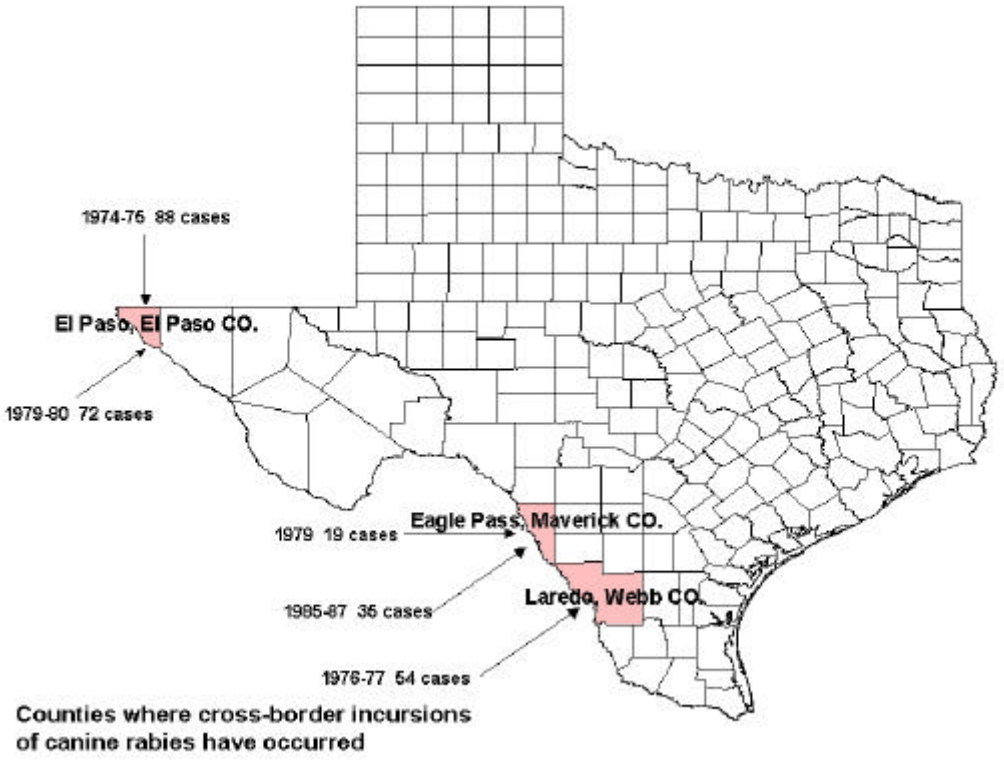


1970 - 1992



1992 - 2003

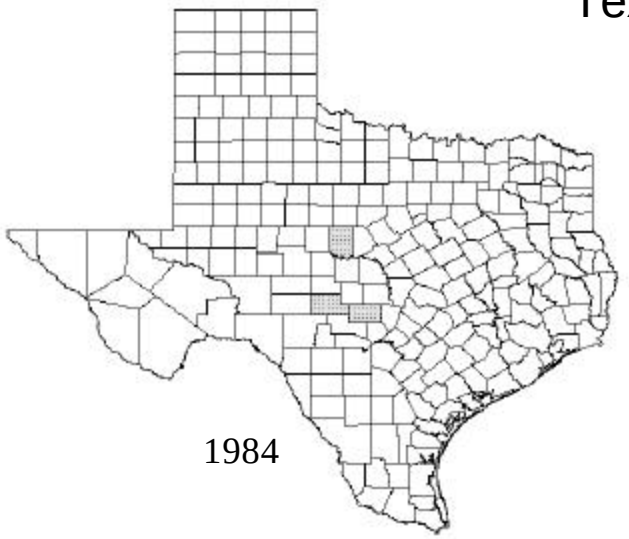
Canine Rabies Incursions in Texas

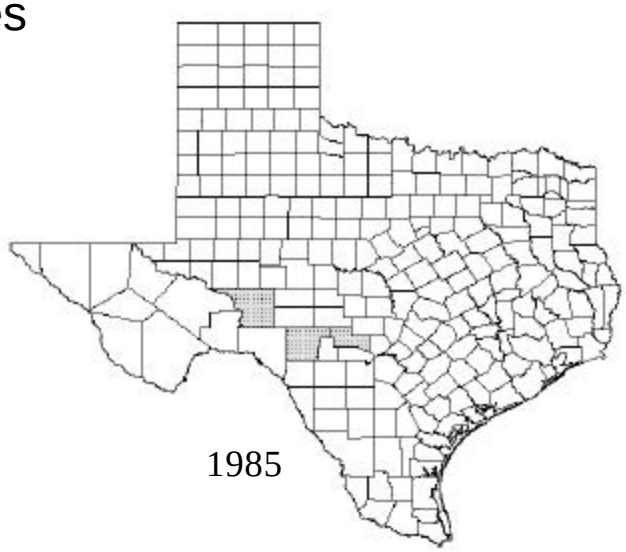


Major State Laws and Rules Affecting Rabies Control in Texas

Date	Law or Regulation	Impact
1979	**Chapter 826 Texas Health and Safety Code Rabies Control Act**	**Established principles for rabies control including required vaccination of all dogs and cats**
1995	**Chapter 826 Texas Health and Safety Code Rule 169.34 Texas Administrative Code Rabies Control and Eradication**	**Established an emergency statewide rabies quarantine**
2003	**Chapter 826 Texas Health and Safety Code Rule 169.29 Texas Administrative Code Rabies Control and Eradication**	**Modified the annual rabies vaccination requirement for dogs and cats to allow for vaccination on either a 1-year or 3-year basis**

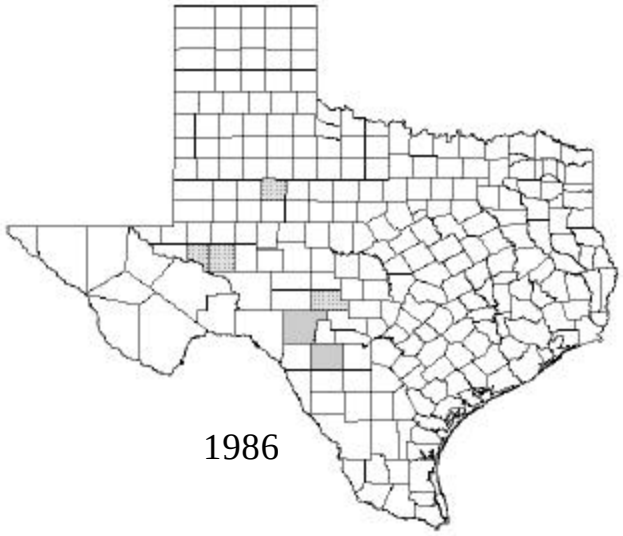
Counties with Laboratory-Confirmed Indigenous Texas Gray Fox (TF) Rabies 1984 - 2003

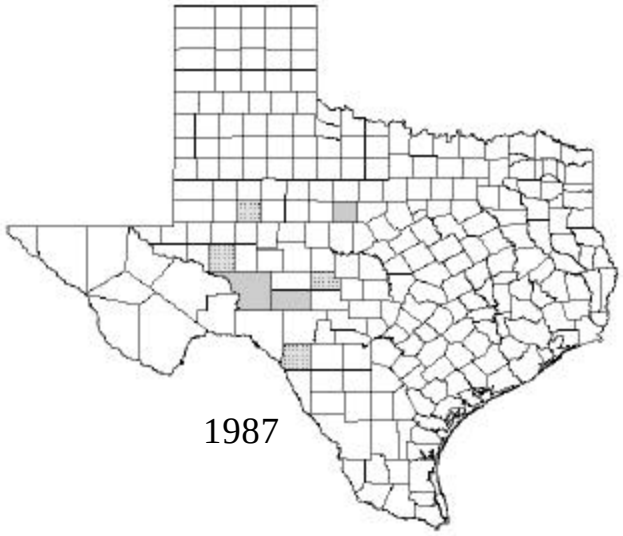




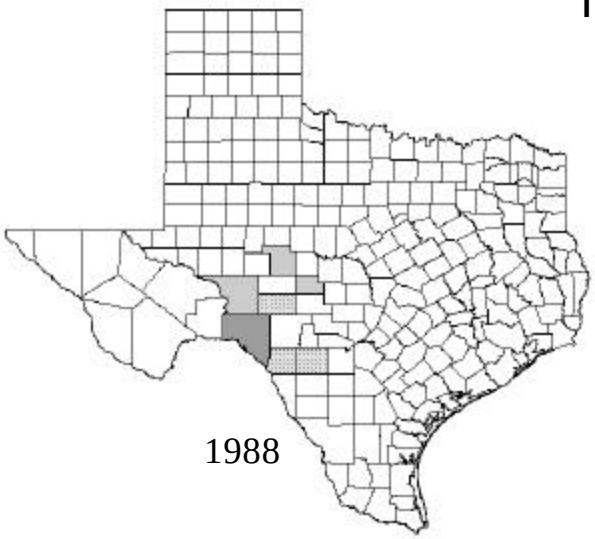
Cases of TF

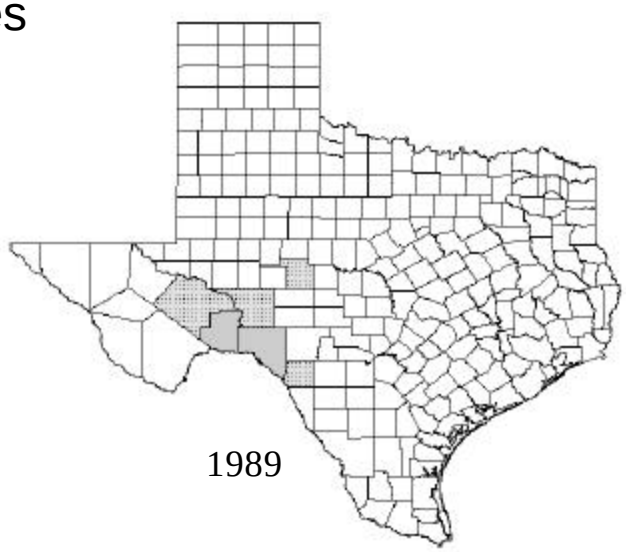
- 1 - 2
- 3 - 5
- 6 - 10
- 11 - 19
- 20 - 40
- 41 - 80





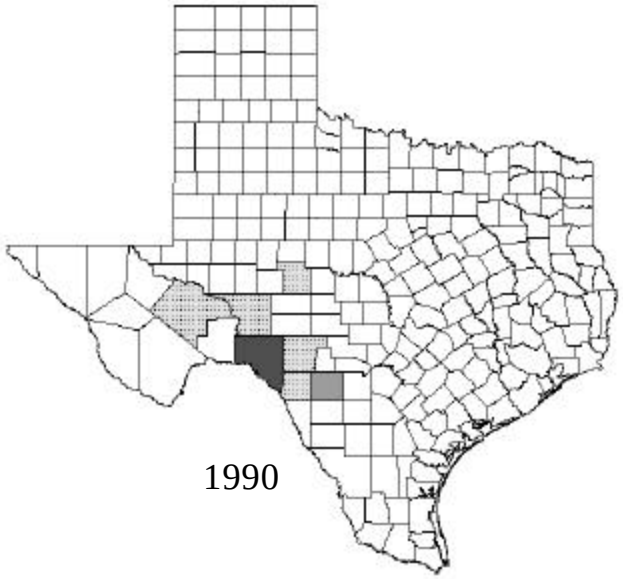
Counties with Laboratory-Confirmed Indigenous Texas Gray Fox (TF) Rabies 1984 - 2003

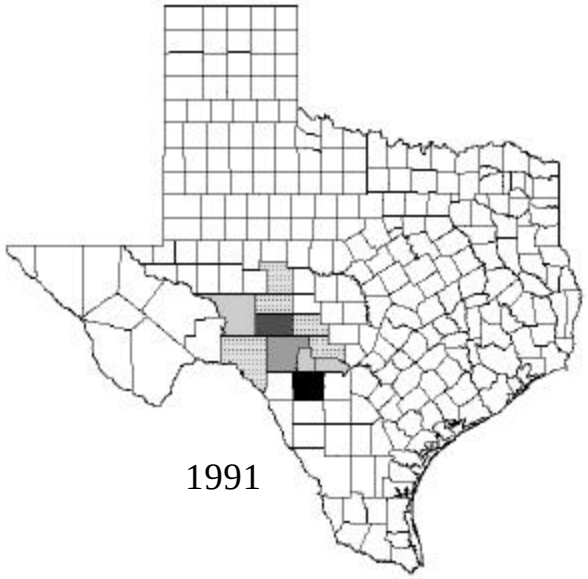




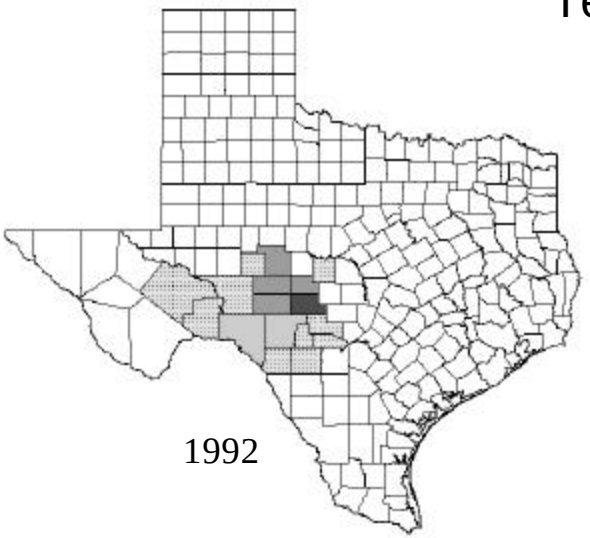
Cases of TF

- 1 - 2
- 3 - 5
- 6 - 10
- 11 - 19
- 20 - 40
- 41 - 80

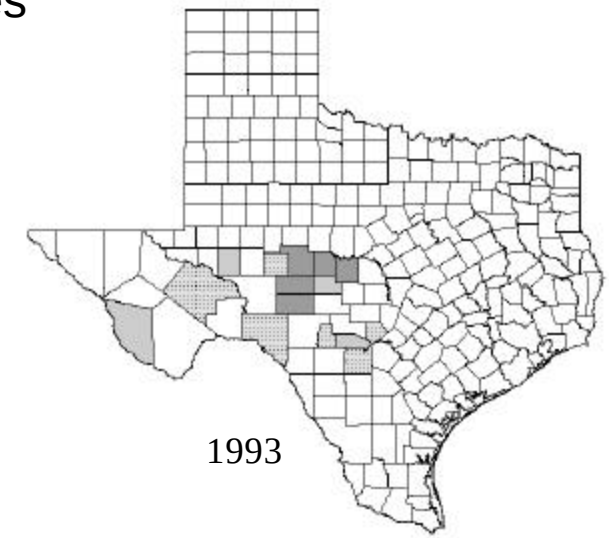




Counties with Laboratory-Confirmed Indigenous Texas Gray Fox (TF) Rabies 1984 - 2003



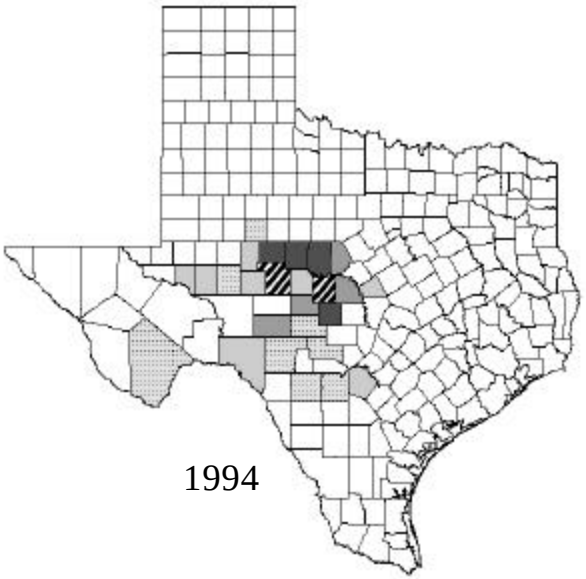
1992



1993

Cases of TF

- 1 - 2
- 3 - 5
- 6 - 10
- 11 - 19
- 20 - 40
- 41 - 80



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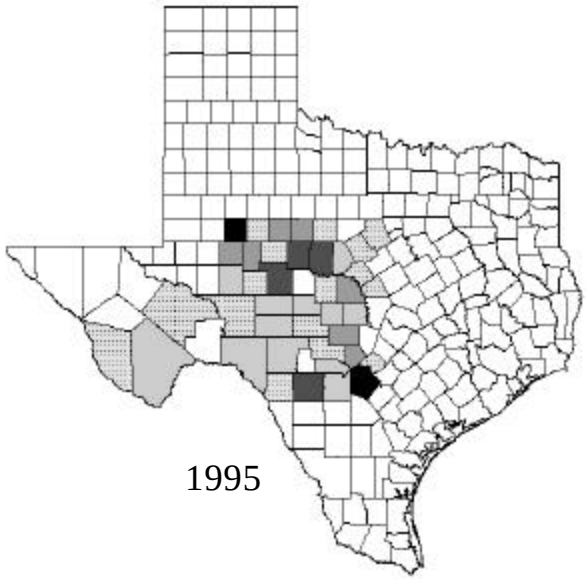
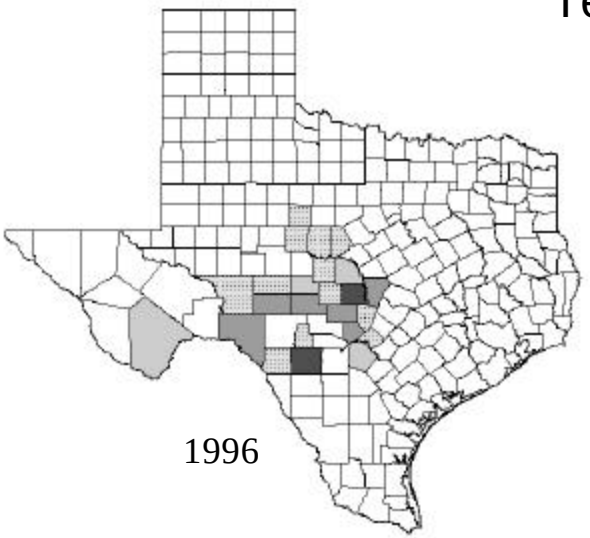


1995

Counties with Laboratory-Confirmed Indigenous Texas Gray Fox (TF) Rabies 1984 - 2003



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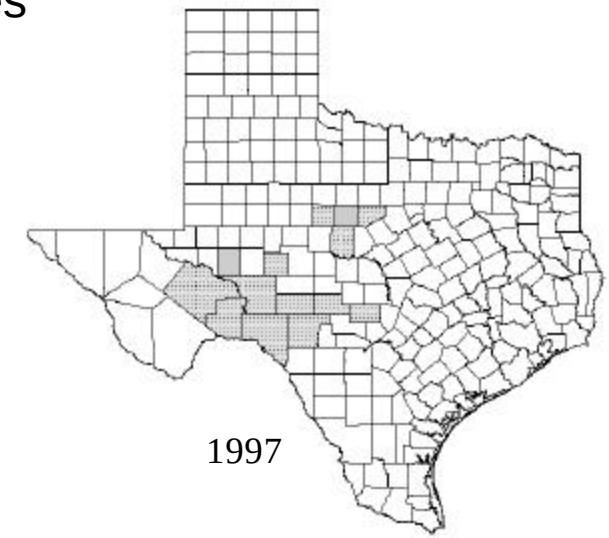
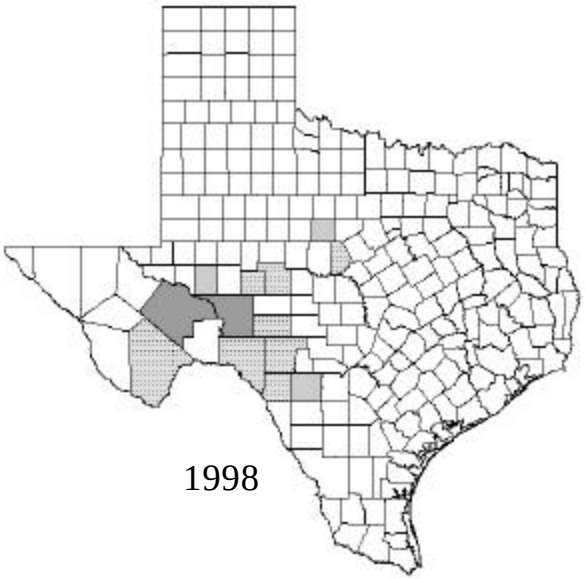


1997

Cases of TF

- 1 - 2
- 3 - 5
- 6 - 10
- 11 - 19
- 20 - 40
- 41 - 80



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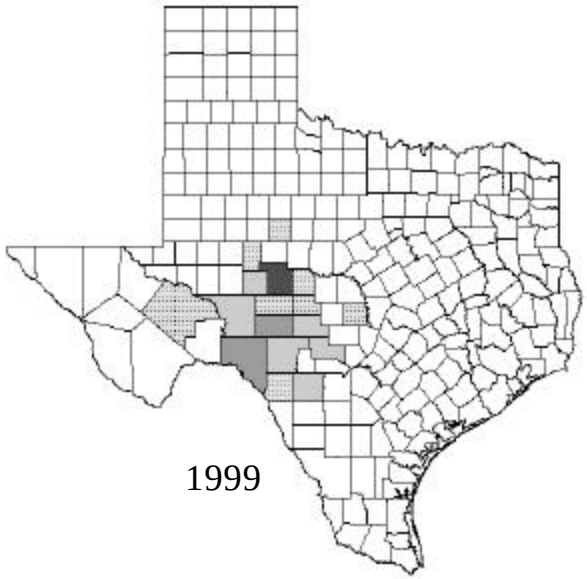
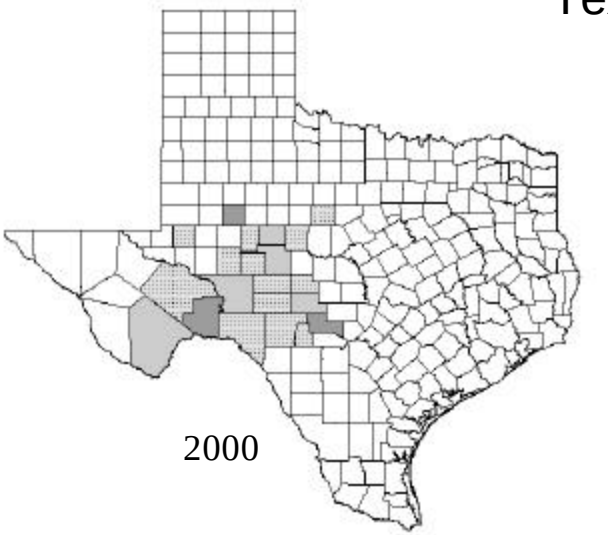


1999

Counties with Laboratory-Confirmed Indigenous Texas Gray Fox (TF) Rabies 1984 - 2003



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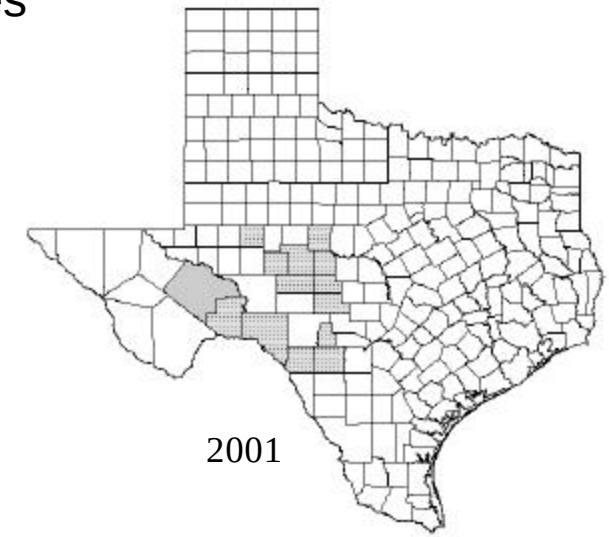
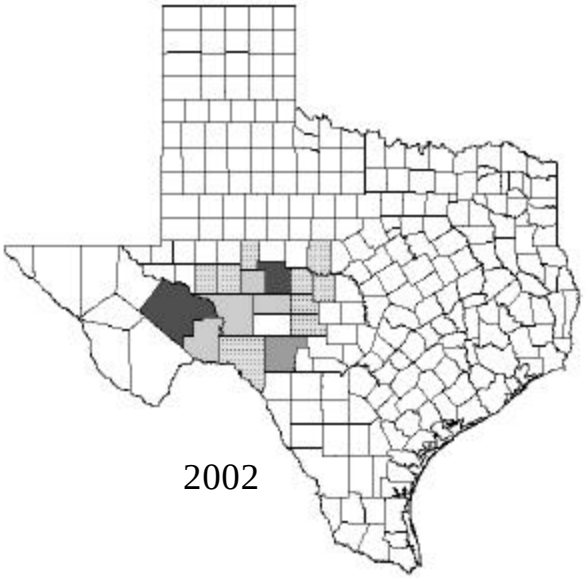


2001

Cases of TF

- 1 - 2
- 3 - 5
- 6 - 10
- 11 - 19
- 20 - 40
- 41 - 80



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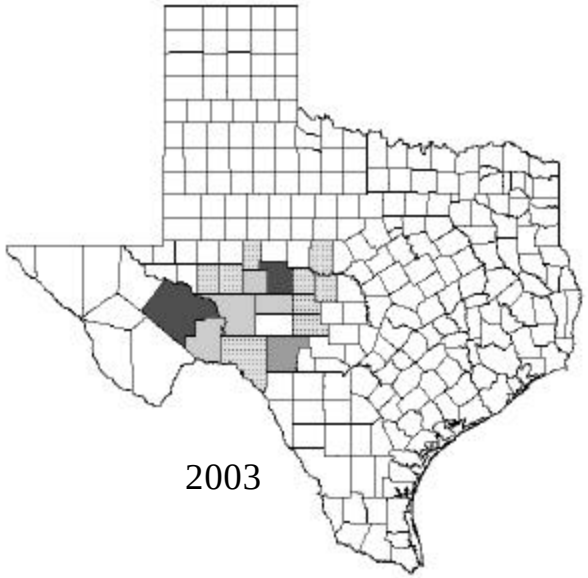
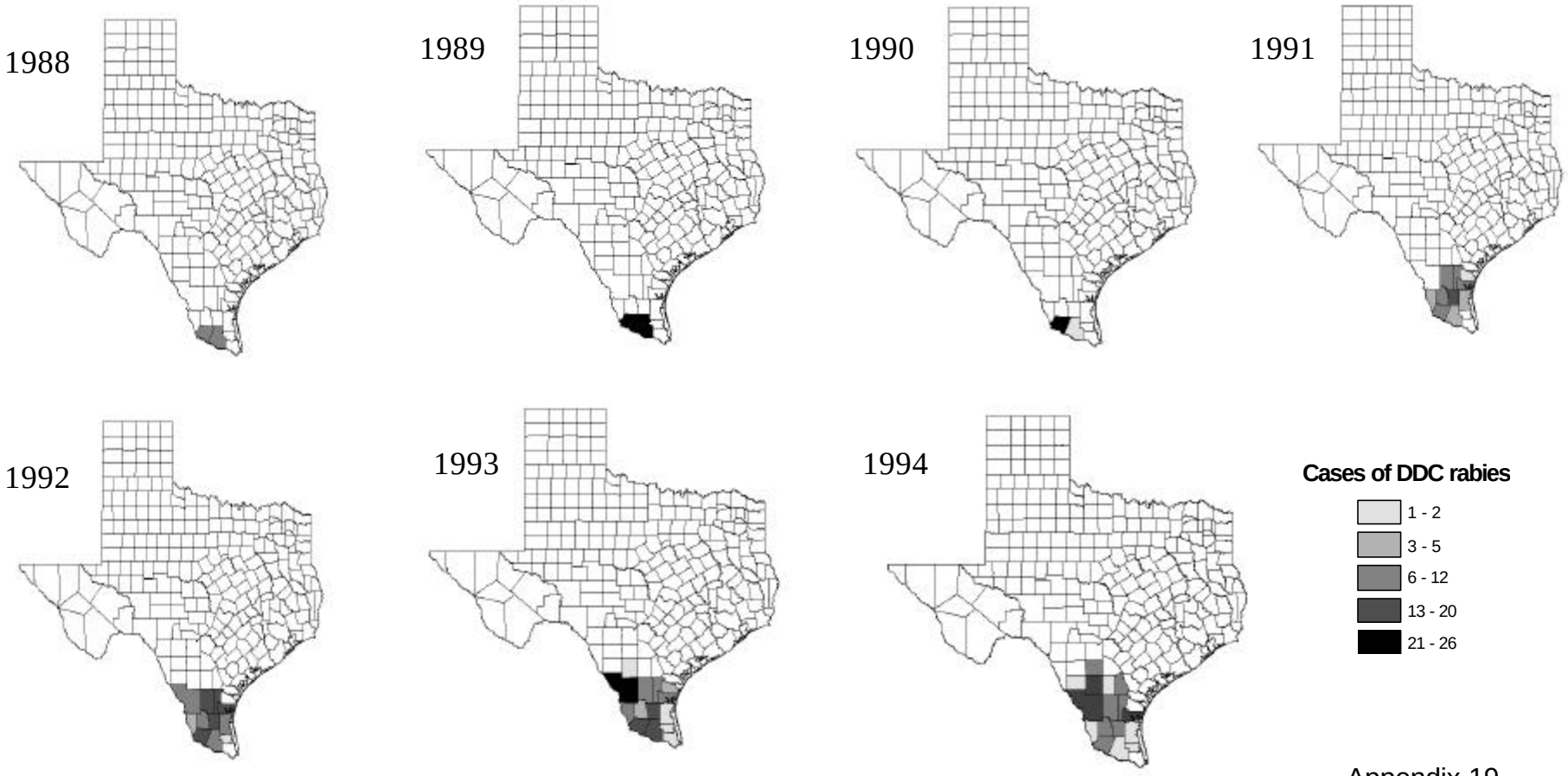


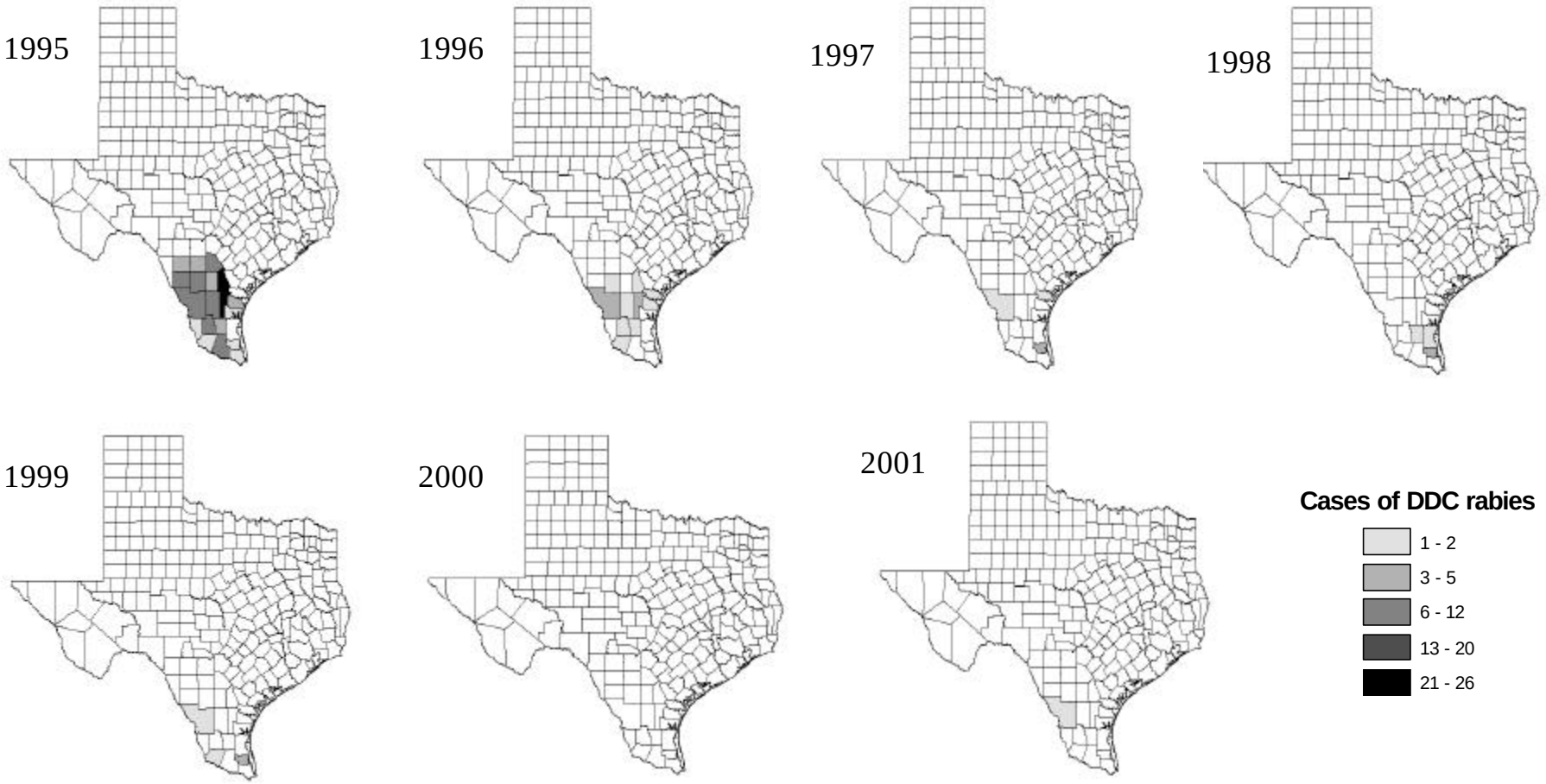
2003

Counties with Laboratory-Confirmed Indigenous Domestic Dog/Coyote (DDC) Rabies 1988 - 2001

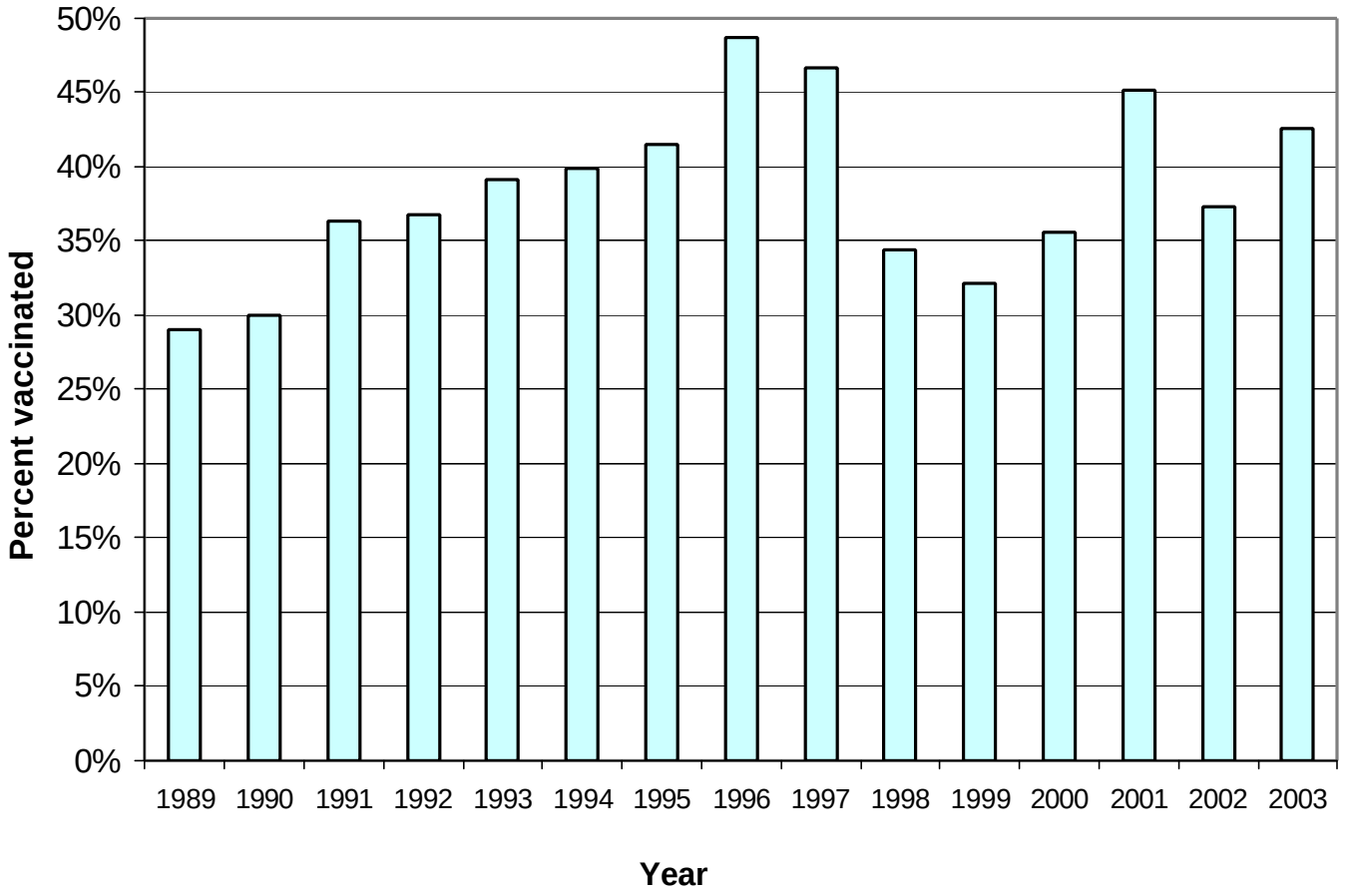


Appendix 19

Counties with Laboratory-Confirmed Indigenous Domestic Dog/Coyote (DDC) Rabies 1988 - 2001



Estimated Rabies Vaccination Rates for Dogs and Cats in Texas, 1989 - 2003



STATE OF TEXAS
OFFICE OF THE GOVERNOR
AUSTIN, TEXAS 78711

July 18, 1994

David R. Smith, M.D.
Commissioner of Health
Texas Department of Health
1100 West 49th Street
Austin, Texas 78756-3199

Dear Dr. Smith:

I am declaring the serious rabies problem in West-Central and South Texas to be a State Health Emergency.

I will convene a meeting this week of representatives of the Texas Department of Health, the Texas Department of Agriculture, the Texas Department of Parks and Wildlife, the Texas Animal Damage Control Service, and the Texas A & M University System. The purpose of the meeting will be to develop and implement a plan of action to reduce the threat of rabies in Texas through both short-term and long-term rabies reduction programs. I will ask the group to consider oral vaccination of coyotes, foxes, and other animals affected by rabies; population reduction of animals likely to transmit rabies; increased rabies vaccination efforts; public education activities; costs and funding sources for the rabies reduction programs; and other solutions they may find to be effective.

We must protect the people and animals of Texas against rabies, and I am committed to taking whatever action is necessary to control the rabies problem.

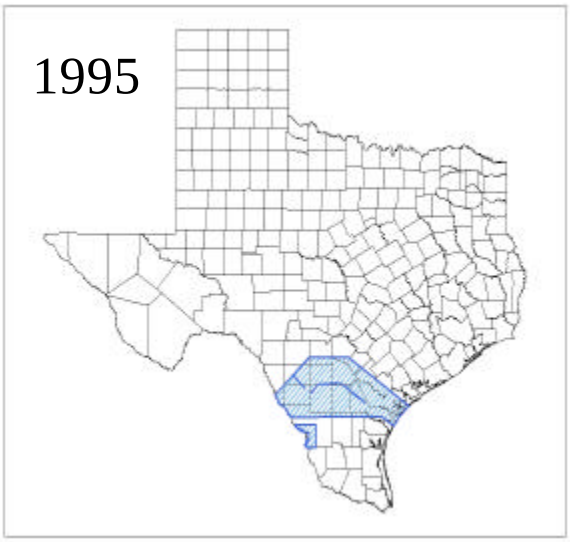
Sincerely,

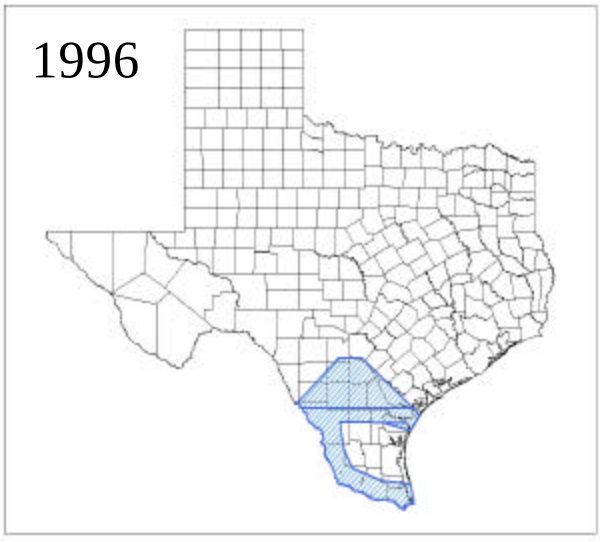
Ann Richards

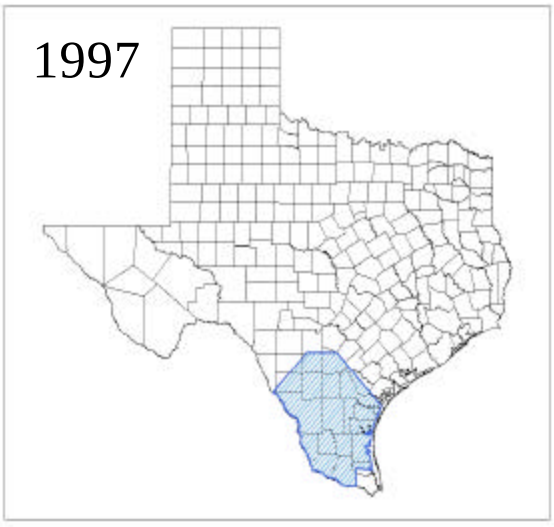
ANN W. RICHARDS
Governor

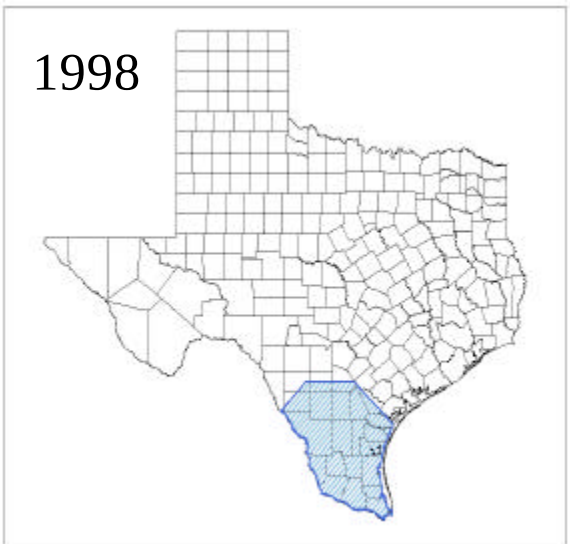
AWR/pc

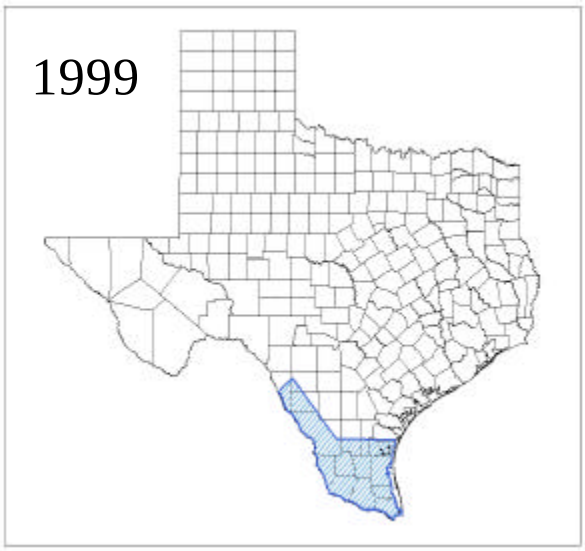
Oral Rabies Vaccination Program
South Texas, 1995 - 2004



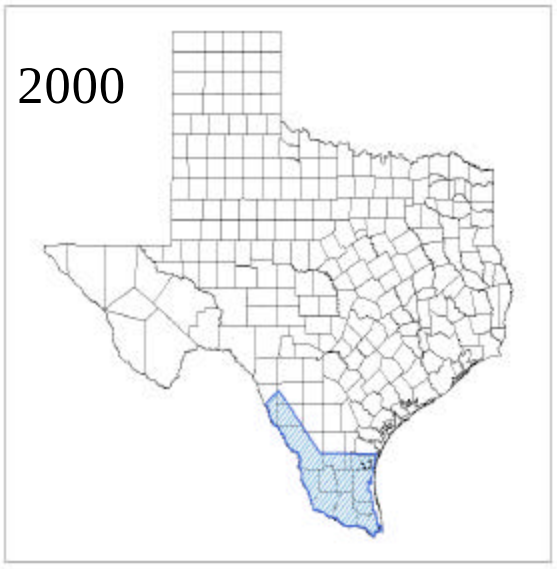


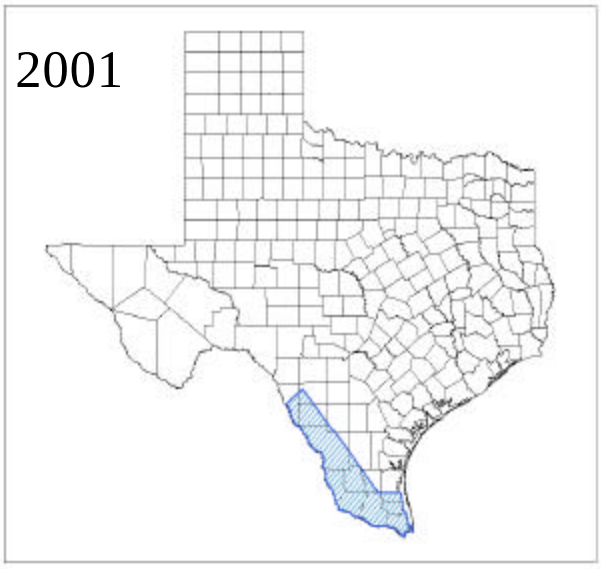


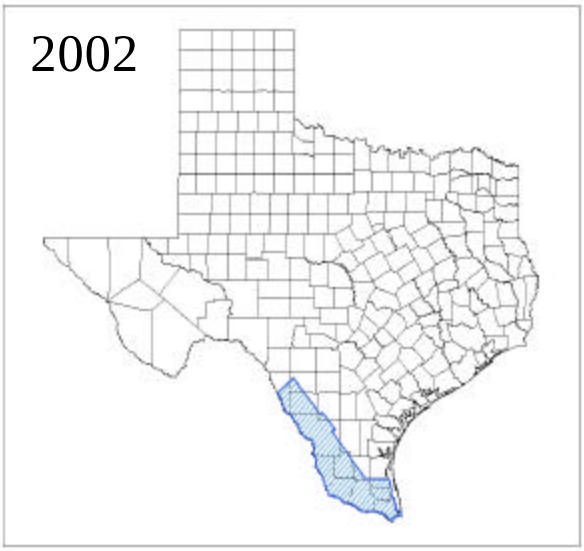


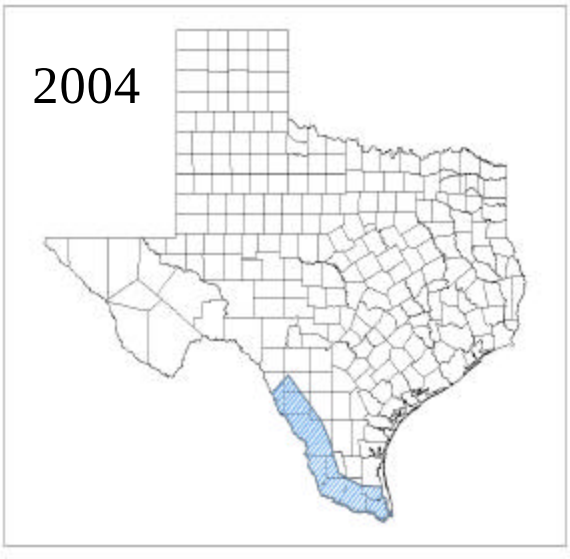


Oral Rabies Vaccination Program
South Texas, 1995 - 2004

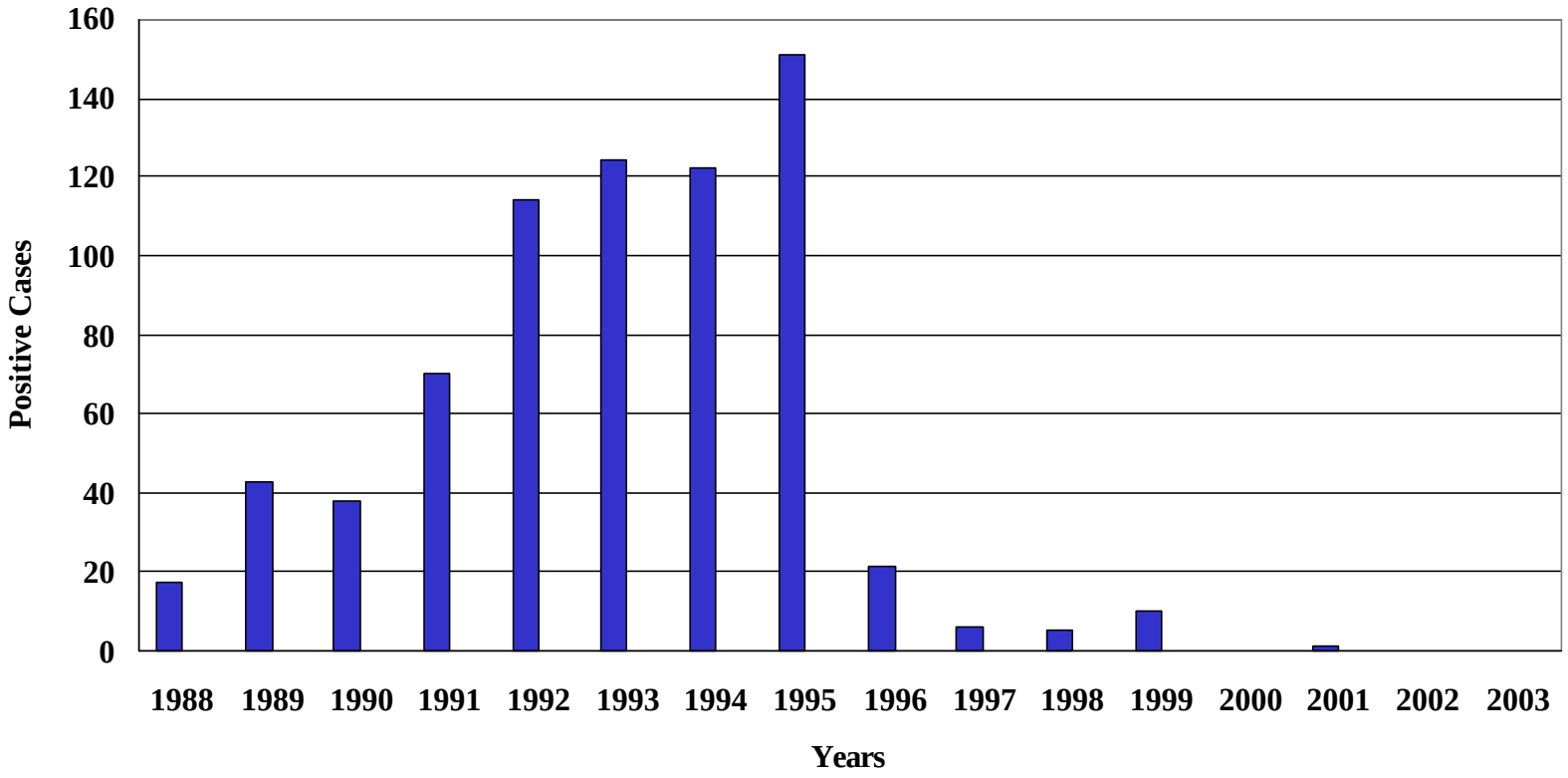




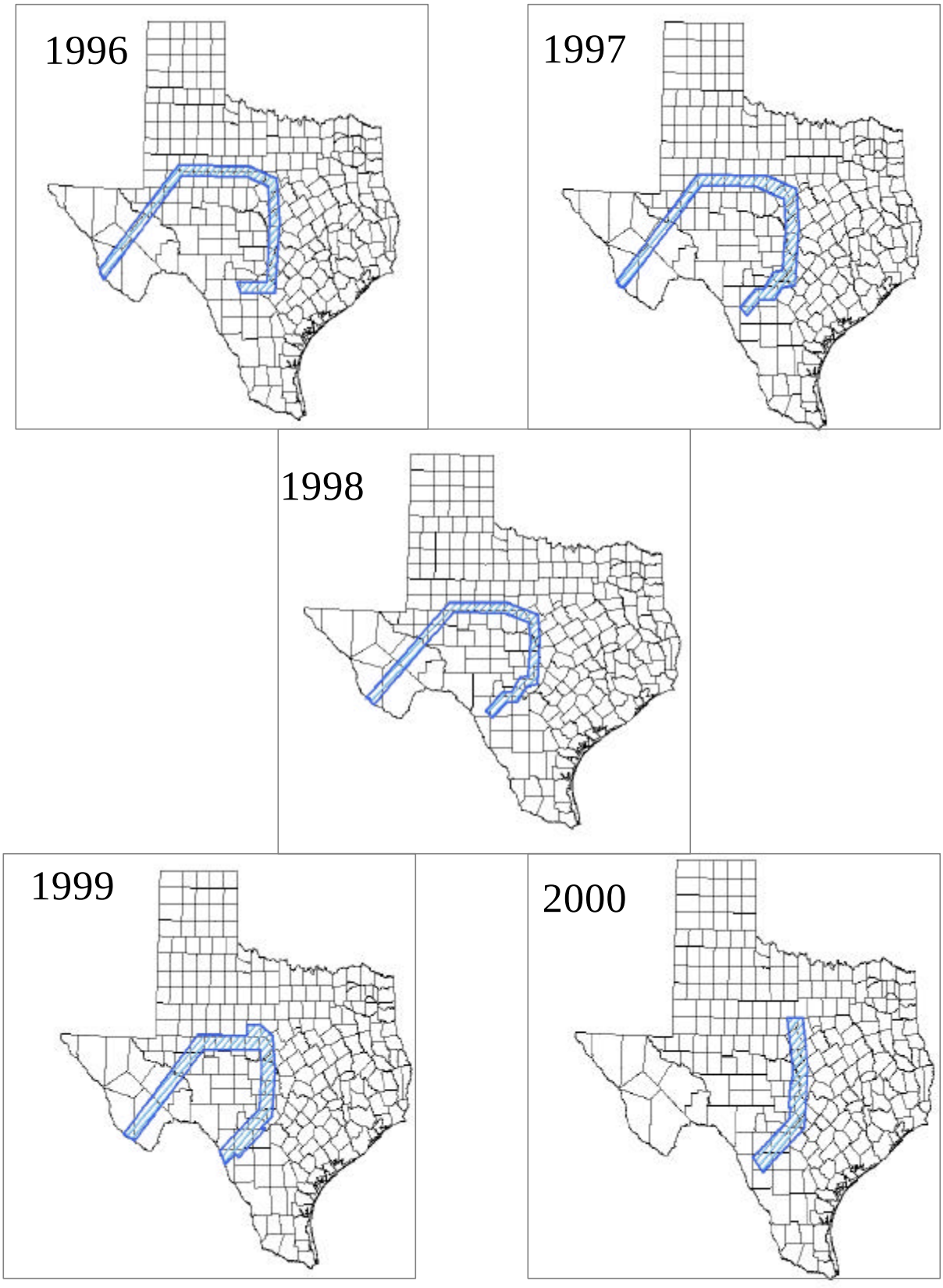




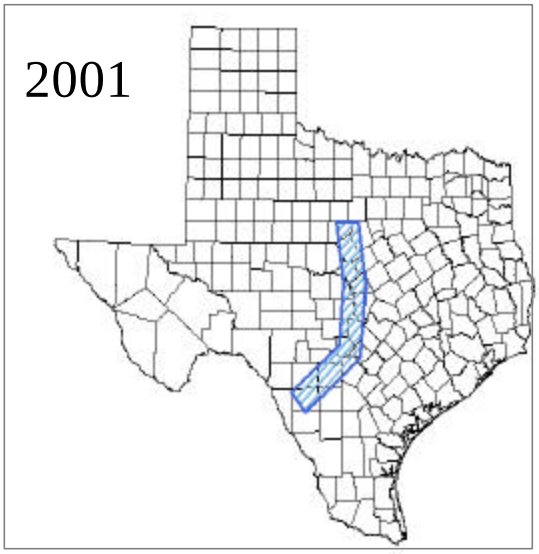
Laboratory-Confirmed Cases of Domestic Dog/Coyote Rabies Texas, 1988-2003

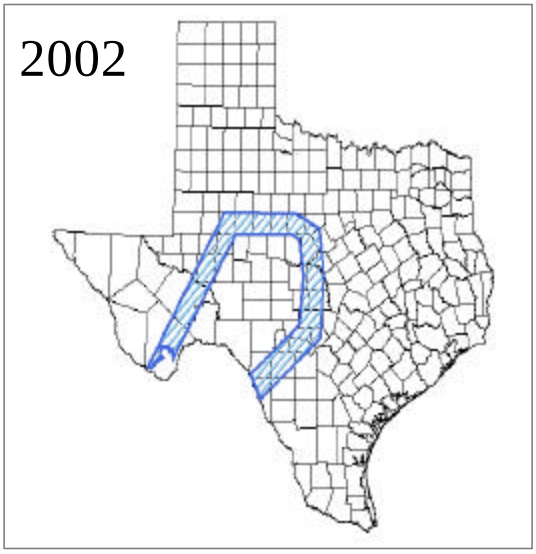


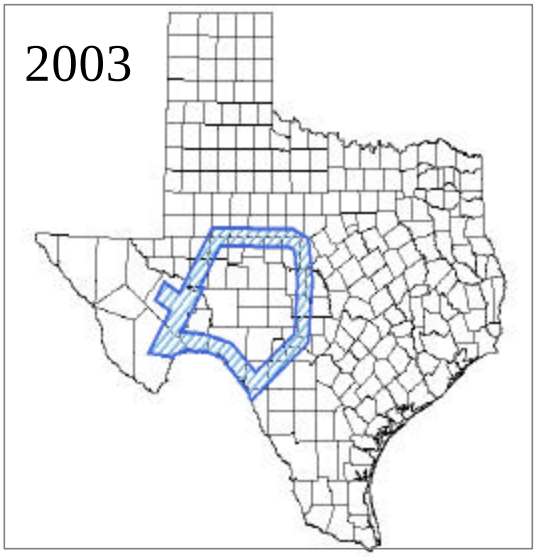
Oral Rabies Vaccination Program
West-Central Texas, 1996 – 2004

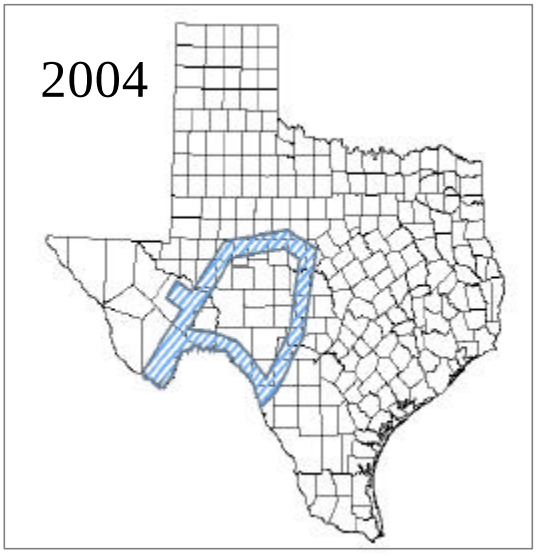


Oral Rabies Vaccination Program
West-Central Texas, 1996 - 2004









Laboratory-Confirmed Cases of Gray Fox Rabies Texas, 1988-2003