

FAUX FOXES:  
FOX DOMESTICATION AND PET OWNERSHIP

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FAUX FOXES:  
FOX DOMESTICATION AND PET OWNERSHIP

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## **DEDICATION**

This study is dedicated to the memory of the companion foxes that have lost their lives due to the fear, misunderstanding, negligence, and restrictions of humans and the owners whom loved and cared for them. To Anya, Vader, Valo, and Miko, and their owners Kay, Tara and Eric, Chloe, and Anda, may this honor the bonds you shared and the lives you created together.

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## LIST OF ABBREVIATIONS

<b>Abbreviation</b>	<b>Description</b>
ACO	- Animal Control Officer
ACTH	- Adrenocorticotrophic Hormone
AHN	- Adult Hippocampal Neurogenesis
AKC	- American Kennel Club
ASPCA	- American Society for the Prevention of Cruelty to Animals
CDC	- Department of Health and Human Services Centers for Disease Control and Prevention
CIOMS	- Council for International Organizations of Medical Sciences
DGIF	- Virginia Department of Game and Inland Fisheries
DNR	- Michigan Department of Natural Resources
HPA	- Hypothalamic-Pituitary Adrenal
HSUS	- Humane Society of the United States
ICG	- The Institute of Cytology and Genetics of the Russian Academy of Sciences
NASPH	- National Association of State Public Health Veterinarians
ODNR	- Ohio Department of Natural Resources
OLAW	- Office of Laboratory Animal Welfare
PETA	- People for the Ethical Treatment of Animals
USDA	- United States Department of Agriculture
USFW	- United States Fish and Wildlife Service

## ABSTRACT

Since 1959, the Institute of Cytology and Genetics of the Russian Academy of Sciences in Novosibirsk, Russia has attempted to domesticate the red fox, *Vulpes vulpes*, in order to better understand the domestication of the dog, *Canis familiaris*, from the gray wolf, *Canis lupus*. Interest in owning these newly-domesticated animals as pets has increased, adding to the controversy of exotic pet ownership. Pet foxes in the United States have come across negative community attitudes and have been relocated, confiscated, and even exterminated as a result.

This study investigated existing participant attitudes toward pets and pet ownership and analyzed how the manipulation of canine physical attributes by domestication can affect participant perceptions. Anonymous surveys were administered to 97 undergraduate students enrolled in psychology classes at Texas State University. Each participant's attitudes toward dogs and pet-dog ownership were measured alongside their attitudes toward domesticated foxes and pet-domesticated-fox ownership. Additional questions were created to assess participants' legal and ethical attitudes, knowledge of fox domestication, and opinions and experiences in regard to pet ownership. Images were created to isolate physical attributes in canines in order to assess their impact on human perception of undomesticated and domesticated features.

The results of this study showed a preference for pet dogs over pet foxes and provided evidence that a majority of people have participated in the practice of owning pet dogs. A connection was found between attitudes toward pet dogs and foxes. Attitudes

toward dog and fox breeding and laws regarding pet-dog ownership and pet-fox ownership showed a preference for the legal possession of dogs as pets over foxes, but a moderate agreement to both dog and fox breeding. A low percentage of participants were found to have knowledge of the Farm-Fox Experiment and a moderately-high percentage showed interest in owning a domesticated fox as a pet. This study's illustrations found that participants instantly reacted to physical attributes manipulated by domestication, but often preferred the standard wild red-colored fox. Different physical traits were also found to have different perceptions of participants.

This study has shown that while our communities are not yet ready to accept these animals into the home, there is potential. Not only do these animals have the genetic potential to become more domesticated and suited for life with humans, participants were shown to have moderately high favorability scores toward pet domesticated foxes.

## CHAPTER I

### INTRODUCTION

The dog, *Canis familiaris*, has become one of the most popular companion animals since it was domesticated from the gray wolf, *Canis lupus*, its sole progenitor (Wayne et al. 1997). Because of its incredible versatility and variety, the dog can adjust and accommodate to fit the lifestyle of his owner. Young and Bannasch (2006) report that the dog has the greatest diversity recognized within any single species. Dogs vary in body size and type, ear and tail length and carriage, coat patterns and colors, craniofacial features, and even limb formation. Virtually any and all combinations of traits can be manipulated in dogs through selective breeding, creating a variation in morphology, anatomy, physiology, and behavior.

Not only do dogs have great diversity, they also have an unusual ability to communicate with humans in comparison to other animals, such as primates and wolves (Hare et al. 2002, 2005; Sandøe et al. 2008). In the absence of language, communication must heavily rely on signals conveyed by motions, body language, positioning, and even sounds. Dogs can read human intent and analyze the invitation to entertain a physical relationship involving a reserved trust (Hare et al. 2002, 2005). They can use signals through actions such as their distance, location, position, ear carriage, tail activity, and vocalizations to non-verbally communicate with humans. Hilary Bok (2011) explains that dogs are willing to enter into genuinely reciprocal relationships with humans that involve efforts from both parties to accommodate the other. Most animals are not willing to

develop this kind of relationship with humans. “A wolf does not refuse friendship, because for the wolf it isn’t there to be refused in the first place,” writes Vicki Hearne in *Animal Happiness* (1994, p. 225). “The problem with the wolf is that she does not care for your love...Human love and praise are alien to her.” Dogs care about what we think of them and adjust their conduct consistently to coexist with humans (Bok 2011). They have the ability to communicate with and understand humans that allows us to develop a trusting relationship together. We can generally have confidence that a dog will follow our commands and fit in our society and will not act unpredictably or dangerously without reason.

For these reasons, we have welcomed dogs into our homes as companion animals. Is it possible that another species could react positively to the stressors and selective pressures of domestication and happily live in human households and welcome human companionship? Sandøe et al. (2008) suggests that animals of any species can be kept as companion animals. “It is the nature of the relationship, not the species, which identifies an animal as a companion animal” (Sandøe et al. 2008, p. 122).

Since 1959, the Institute of Cytology and Genetics of the Russian Academy of Sciences (ICG) in Novosibirsk, Russia has attempted to domesticate the red fox, *Vulpes vulpes*, in order to better understand the domestication of the dog, from the gray wolf. The foxes from this experiment have demonstrated an eagerness to establish human contact and the desire to please. “They have shown themselves to be good-tempered creatures, as devoted as dogs, but as independent as cat, capable of forming deep-rooted pair bonds with human beings-mutual bonds,” explains Dr. Lyudmila Trut (1999, p. 169), head of the research group at the ICG. Interest in owning these newly-domesticated

animals as pets has increased, adding to the controversy of exotic pet ownership.

Unfortunately, pet foxes in the United States have come across negative community attitudes and have been relocated, confiscated, and even exterminated as a result.

This study investigated existing participant attitudes toward dogs and pet-dog ownership compared to their attitudes toward domesticated foxes and pet-domesticated-fox ownership and analyzed how the manipulation of canine physical attributes by domestication can affect participant perceptions. The purpose of this study was to improve our understanding of attitudes about domesticating wild foxes and selling them as pets. After reviewing the history and progress of fox domestication, scrutinizing personal cases regarding the ownership of foxes as pets, comparing wild, ranched, and domesticated foxes, and understanding attitudes toward dogs and foxes as companion animals, the potential of the fox to become man's new best friend becomes more clear.

The History of Fox Domestication at the Institute of Cytology and Genetics of the Russian Academy of Science Experimental Fox Farm

Since 1959, the Institute of Cytology and Genetics of the Russian Academy of Science in Novosibirsk, Russia has been attempting to domesticate the red fox, *Vulpes vulpes*, on their experimental fox farm, a project now known as the "Farm-Fox Experiment" (Kukekova et al. 2011; Spady and Ostrander 2007; Trut 1999). Currently led by head of the research group, Dr. Lyudmila N. Trut, the experiment was initiated by the late evolutionary geneticist and Director of the Institute of Cytology and Genetics, Dr. Dimitry K. Belyaev. In 1948, a time when Soviet genetics was beginning to recover from the anti-Darwinian ideology of Trofim Lysenko, Belyaev lost his position as Head of the Department of Fur Animal Breeding at the Central Research Laboratory of Fur Breeding in Moscow. His commitment to genetics led him to conduct genetic research under the

guise of studying animal physiology. Under his leadership, the Institute of Cytology and Genetics was founded and became a center of basic and applied research in both classical and modern molecular genetics (Trut 1999). Belyaev mainly worked in genetics and animal breeding and was heavily influenced by the work of Charles Darwin (Belyaev 1979). “Animal domestication was his lifelong project, and fur bearers were his favorite subjects” recalls Dr. Trut (1999, p.162).

Charles Darwin focused much of his research on the domestication and variation of animals and sought to explain why domestic animals are so variable, with variations in body size, pigmentation, relative skeletal proportions, and even reproductive cycles (Belyaev 1979; Price 1984; Trut 1999, 2001; Trut et al. 2009). Domestication has brought about dwarf and giant breeds, wavy and curly coats, and long, Angora type coats and short, Rex type coats. Many domesticated animals are piebald, completely lacking pigmentation in specific body areas (Trut, 1999). “No one doubts that domesticated productions are more variable than organic beings which have never been removed from their natural conditions,” Darwin wrote in 1875 (p. 241). He admitted that the capacity to become more variable under domestication is common to all species and the “tendency to general variability is unlimited” (1875, p. 411).

Darwin also noticed the similarities of changes observed in different domestic animals and even noted features found in domesticated animals that were not found in their wild counterparts. In Chapter XXIV of *The Variation of Animals and Plants Under Domestication*, Darwin noted that there are no wild species with drooping ears and curled tails, although domesticated animals can acquire these traits (Darwin 1875). Many breeds of dogs and pigs carry their tails curled up in a circle or semicircle. Some domesticated

animals even have shorter tails resulting from a decrease in the number of tail vertebrae. (Trut 1999). “This deformity, therefore, appears to be the result of domestication,” Darwin concluded (1875, p.179).

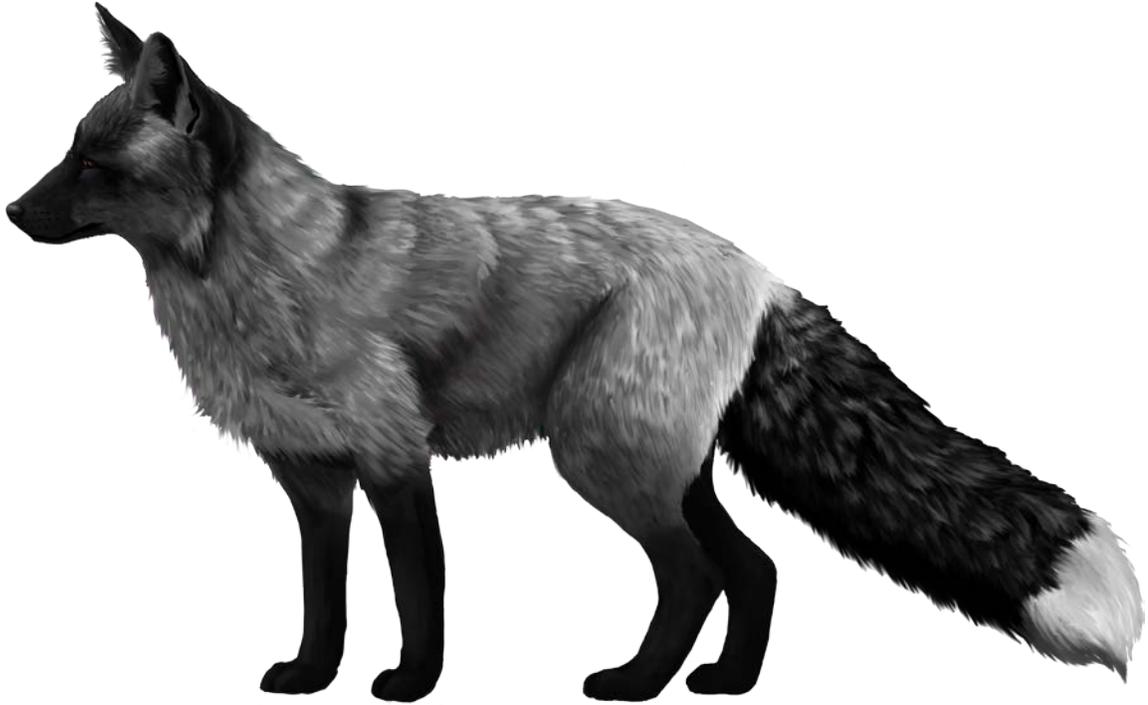
“Different animals, domesticated by different people at different times in different parts of the world, appear to have passed through the same morphological and physiological evolutionary pathways. How can that be?” questioned Trut (1999, p. 166).

Belyaev determined that the main result of domestication has been an enormous increase in the rate and range of variability of the animals. “Domestic animals differ from their wild ancestors, and from each other, much more than do some species and even genera,” he remarked (1979, p. 301). Yet, the most striking feature of changes in separate domesticated species wasn’t how different and varied they were from each other, but the similarities they shared despite these changes. Belyaev believed that the patterns of changes observed in domesticated animals resulted from genetic changes that occurred in the course of selection and that the key factor selected was not a *quantitative* trait, but a *behavioral* one, specifically, tameability, an animal’s amenability to domestication and unique ability to interact with humans in a positive way (Hare 2002, 2005; Price 2002; Trut 1999). Following this hypothesis, different animals would respond in similar ways when subjected to the same kinds of selective pressures and extreme stressors of domestication (Trut 1999). Because mammals from widely different taxonomic groups share similar regulatory mechanisms, Belyaev believed that he could replicate common hormonal and neurochemical changes resulting from domestication in a previously-undomesticated species simply by selecting for an animal’s tameness toward humans (Trut 1999).

Belyaev decided to conduct an experiment attempting to replicate the domestication of the dog through the domestication of the silver fox, a color variant of the red fox, *Vulpes vulpes*. He intended to resolve questions surrounding early domestication and expand understanding of the suite of genes underlying complex behavior and domestication by reconstituting not only the behavioral, but the physiological phenotypic changes associated with domestication by selecting solely for behavior (Spady and Ostrander 2007). In his own words, Belyaev explained the purpose of his Farm-Fox Experiment: “The purpose of the present study was to produce, in the course of systematic selection for behavior, a type of domestic fox in some measure resembling the domesticated dog in its behavior” (Belyaev and Trut 1975/2009, p. 417).

The silver fox is a melanistic variant of the red fox, *Vulpes vulpes*, rarely found in nature, but commonly maintained on fox farms (Johnson et al. 2015; Westwood 1989). In silver foxes, black color replaces the red color of the guard hairs and the white areas of the wild red fox. Silvering, a sprinkling of white guard hairs throughout the colored pelage, is also present. These foxes were originally called black foxes, until the term “silver” was adopted among fur bearers due to the exclusiveness of the silvering characteristic of the fox. The value of fur bearing animals raised in captivity is considerably influenced by color phase, with mutant colors in foxes having been in great demand since 1940 (Cole and Shackelford 1943; Shackelford 1948). In the beginning stages of Belyaev’s experiment, the silver-colored fox yielded the greatest economic return of all fox colors and was bred for fur quality, body size, and litter size. (Gogoleva et al. 2010a; Westwood 1989).

Refer to Figure 1 for an illustration of a silver-colored red fox, *Vulpes vulpes*.



**Figure 1. Silver-Colored Red Fox.** Illustrated by Noelle Brooks.

### Methodology

Belyaev chose the silver variant of the red fox as his experimental model for several reasons. First, the red fox shares a close taxonomic relationship with the dog and is a member of a sister lineage to dogs, representing a temporal phylogenetic separation of 10 million years (Bardeleben et al. 2003; Kukekova et al. 2008a, 2008b; Trut 1999; Trut et al. 2006; Wayne et al. 1997). This could mean that the fox holds the same genetic potential for domestication as the dog. Secondly, the silver fox's elite fur-bearing status and importance in the fur industry benefitted Belyaev and fur farmers. Fur farmers have attempted to breed foxes that were no longer restricted by mono-estrousness, the strict seasonal rhythm of reproduction and that would breed multiple times in a year, but all attempts had failed (Belyaev 1979; Trut 1999). Fur farmers were especially interested in foxes that reached sexual maturity more quickly, mated outside of the strict breeding

season, became less stressed in the confinements of captivity, and were tamer with handlers and easier to handle in general (Faith 2007; Kukekova et al. 2012). Belyaev was able to begin his experiment with foxes that had already been selectively bred to some degree. The earliest steps of domestication: capture, caging, and isolation from other wild animals, had already taken place in foxes bred for their fur. These animals had been bred on fur farms in Russia since the early 20<sup>th</sup> century and were already tamer than their wild relatives as they'd been subjected to rigorous selection for adaption to a new social environment. This helped to reduce the duration of the Farm-Fox Experiment (Statham et al. 2011; Trut 1999; Trut et al. 2009).

Despite captive breeding for over a century, farm-bred foxes still retain characteristic fear-aggressive responses toward humans, such as growling, biting, and avoidance response and have not become domesticated. These behaviors can be defined through the distance between the animal and the human as more fearful foxes will try to increase their distance from an approaching human (Faith 2007; Kukekova et al. 2008a, 2012; Gogoleva et al. 2010a; Trut 1999). Because these foxes were bred for fur quality, body size, and litter size and not for positive attitudes toward people, they have remained fearful of humans and have retained a standard morphological phenotype and seasonal pattern of breeding specific to foxes of natural populations (Faith 2007; Gogoleva et al. 2010a; Kukekova et al. 2008a, 2012; Scientific Committee on Animal Health and Animal Welfare 2001; Statham et al. 2011; Trut et al. 2009). As a result of fur farm keepers not establishing personal relationships with the animals, these foxes can experience short-term and long-term welfare problems in proximity of humans and can display non-vocal behavioral indicators such as: elevated psychological stress, hyperthermia, adrenal

responses, changes in blood parameters (Moe and Bakken 1997), peaks of stress-related hormones, such as cortisol and AKTG, latencies to touch novel objects, inability to move, hesitations to defecate (Gogoleva et al. 2010b), restraining from eating in the presence of humans (Rekilä et al. 1997), erected ears (Moe et al. 2006), extent of abnormal behaviors, such as tail biting and reproductive failure (Braastad 1987), infanticide (Bakken 1998), synchrony of activity of family members, and aggressive acts (Ahola and Mononen 2002). Farmed silver foxes also exhibit high vocal activity toward humans, a sign of negative emotional states and psychological discomfort (Jürgens 2009), producing up to a few calls per minute in response to human approach (Gogoleva et al. 2008). When in the presence of humans, these foxes remain in the back portion of their cages, do not approach breeders, move back when the breeder approaches the cage, and move to the back part of the cage when the doors of their cages are opened (Gogoleva et al. 2010b). Out of fear, these animals will sniff the front portion of the cage, demonstrate rear attacking, and express aggressive sounds (Kukekova et al. 2008b). Captive breeding has also been accompanied by frequent reproduction problems brought about by the breeding system and the physical and social environment (Scientific Committee on Animal Health and Animal Welfare 2001). Due to the stress put on silver foxes by selective breeding for fur quality, fur farmers were interested in the possibility of a tame silver fox that was easy to handle. The lowered stress levels in the fox would reflect in larger litters, better fur quality, and longer lifespans of the foxes.

Belyaev (1979) visited multiple fur farms to identify a subset of commercial foxes that showed less fearful and aggressive responses to humans. Several thousand foxes were tested on the basis of contacts with man, which were graded in time, as an

experimenter approached the animal's cage, tried to open it, and monitored the expression of the response. Foxes were also assessed quantitatively by the acceptance of food from the hand of man and response to fondling, handling, and to call (Belyaev and Trut 1975/2009; Faith 2007). About 30% of the foxes he tested were extremely aggressive towards man, 20% were fearful, 40% were aggressively fearful, and only 10% displayed a quiet exploratory reaction without either fear or aggression (Belyaev, 1979). "Even the nonaggressive foxes could not be handled without special precautions against bites," he writes. "They, too, were virtually wild animals" (Belyaev, 1979, p. 301). From the 10% of curious silver foxes, Belyaev chose 100 vixens, female foxes, and 30 tods, male foxes to foster the new generations of experimentally-bred foxes selected for tameness (Belyaev 1979; Trut 1999; Trut et al. 2009).

Because early exposure to humans can affect the further reactions of foxes to people, the Institute of Cytology and Genetics forbids anyone, including the researchers, to pet or establish personal contacts with any particular fox on the experimental farm outside of time dosage contacts. The institute has maintained a standardized holding regime uniform for all foxes since 1960 and continues to maintain it presently. All foxes experience consistent farm conditions and have similar interactions with people in order to ensure that tameness results from genetic selection. The foxes are not trained and are only allowed brief contact with human beings under uniform conditions. This helps to exclude the influence of new factors on the behavior of the animals and minimizes environmental influences on the fox behavioral phenotypes (Gogoleva et al. 2010a, 2010b; Kukekova et al. 2007, 2008a, 2008b; Trut 1999).

Foxes are bred once per year in January and February and pups are generally born in March-May. Littermates are housed together with their mothers until weaning at the age of 1.5 months, when the mother is removed and the littermates continue to live together without her. At the age of 2-3 months, each fox pup is separated from his littermates and placed into individual, outdoor cages 70 x 85 x 90 cm. with a wire mesh floor. The cages are arranged in batteries of 50 cages per row, with two rows opposite each other and 1.7-meter-wide passageway between them. This close proximity allows the foxes to remain in visual, olfactory, and auditory contact with foxes in neighboring and opposing cages. The cages are covered with a slate roof with two sloping surfaces that provide protection from wind, rain, and sun. The foxes are fed a diet of beef, meat by-products, minced chicken, cereals, vitamins, and minerals twice a day and water is available ad libitum (Gogoleva et al. 2010a, 2010b, 2011; Kukekova et al. 2008b; Trut 1999).

The testing of fox behavior to evaluate fox responses to humans in situations with different levels of interaction between the experimenter and tested animal has also been standardized at the ICG. The early testing process has since been improved upon to create “the standard test.” In the early stages of the experiment, an experimenter would offer food from his hand to a one-month-old pup and try to stroke and handle the pup. The fox cubs were tested twice, once confined in a cage and once allowed to roam freely in an enclosure with other fox pups where the animals could choose to make contact with the experimenter or with another pup. In each test, the reactions of the animal to the experimenter and the fox’s disposition to approach the experimenter were recorded. The test was repeated monthly until the pups were 6-7 months old. At 7-8 months old, when

the foxes reached sexual maturity, they were scored for tameness and assigned to one of three classes. Pups that continued to show aggressive-avoidance responses to humans were discarded from the experimental population. The least domesticated foxes, those that showed fear or aggression, such as fleeing from experimenters or biting when stroked or handled, were assigned to Class III. Even still, these Class III foxes were tamer than wild foxes or even foxes bred at fur farms and could be hand-fed at times. Foxes that allowed themselves to be petted and handled but showed no emotionally friendly response to experimenters were assigned to Class II. Class I was reserved for foxes that were friendly toward experimenters and would show positive reactions to humans such as wagging of the tail or whining for attention. By the 6<sup>th</sup> generation of breeding, the foxes had become so tame that a fourth class was added, Class IE, the domesticated elite. These foxes were eager to establish human contact and would whimper to attract attention and sniff and lick experimenters like dogs (Belyaev 1979; Abumrad 2009; Trut 1999; Trut et al. 2009; Hare et al. 2002, 2005).

As a result of the vigorous selection process, offspring exhibiting aggressive and fear avoidance responses were no longer present in the experimental population by the 3<sup>rd</sup> generation of selective breeding. In the 4<sup>th</sup> generation, some pups began to respond to humans by wagging their tails like dogs. Within the 6<sup>th</sup> generation, fox cubs eagerly sought contact with humans by wagging their tails, whining and whimpering for attention, and licking, thus inspiring the newly-added Class IE. At this time, 1.8% of the foxes were classified in the IE class. By the 10<sup>th</sup> generation, 17.9% of fox pups were classified as domesticated elite, by the 20<sup>th</sup> generation, 35% had achieved the status, and in the 30<sup>th</sup> generation, 49% were in Class IE. By the 35<sup>th</sup> generation, a majority of the

foxes in the experimental population, at 70%-80% were ranked as Class IE, showing no aggression, but submissive behavior toward humans upon first behavioral assessment without any prior training. Today, almost all of the foxes are domesticated elite, making up a new breed of genetically tame foxes (Huang et al. 2015; Trut 1999; Trut et al. 2004, 2009).

The fox behavior test has since been modified to create “the standard test” which can measure quantitative differences between the behaviors of the foxes (Trut 1999, 2001; Trut et al. 2009). During “the standard test,” each fox is tested in his home cage at least twice at 4-6 months of age, when the behavioral reaction toward humans is permanently formed, and a subset of foxes is tested three times. No more than one test is given to any individual animal on the same day and, in most cases, the period between tests is one day. All tests are performed between 10:30am and 5:00pm, but no earlier than 30 minutes after feeding. An interval of at least 30 minutes separates testing of animals in neighboring cages. All tests for a particular animal are conducted by the same experimenter and are videotaped and maintained on permanent record. The test is composed of five steps, each one minute long, except the first step (Gogoleva 2010b; Huang et al. 2015; Kukekova et al. 2008a, 2008b, 2011).

Refer to Table 1 for the complete Standard ICG Fox Behavior Test.

Table 1  
*The Standard ICG Fox Behavior Test Steps*

Step	Name	Description
1	Approach	Observer approaches the fox's cage.
2	Stand	Observer stands calmly near the closed cage but does not deliberately try to attract the animal's attention.
3	Door	Observer opens the cage door, remains nearby but does not initiate any contact with the fox.
4	Touch	Observer attempts to touch the fox.
5	Exit	Observer closes the cage door, then stays calmly near the closed cage.

*Note.* The test was composed of five steps, each one minute long, except the first step. Adopted from Kukekova et al. 2011, 2008a, 2008b.

After being tested, foxes are rated for tameness. Two scoring systems were developed to measure a fox's behavioral phenotype: one for tameness and one for aggressiveness. The major criterion for measuring behavior was the critical distance between the experimenter and the caged animal when the animal first demonstrates a reaction and the intensity of that reaction viewed from the video record using a DVD player or WinDVD software. The Class I, II, III, and IE system was replaced by a quantitative system that rates a fox's response to an experimenter for tameness and aggression on a scale of -0.5 to +4.0. The most aggressive foxes are given a score of -3.5 to -4.0 on the scoring system. These animals show teeth, snarl, and growl at the first sight of a human. When an experimenter is near the fox's closed cage, the fox attacks the experimenter with bared teeth and fixed dilated pupils. Foxes assigned a score of -3.0 are slightly less aggressive. These foxes show teeth, snarl, growl, and attack the experimenter

with bared teeth and fixed dilated pupils when the cage is opened, but not closed. -2.5 foxes growl at an experimenter near their open cages, but do not attack. Foxes assigned the -2.0 score only growl and bite when the experimenter moves an arm towards the fox. The least aggressive, but not tame, foxes are scored a -1.5. These creatures are calm when an experimenter opens the cage, but attempts to touch the fox provoke it to show teeth and snarl. Animals that display neutral behavior, an absence of both actively aggressive and actively tame responses directed toward the observer, are assigned a score of 0. The least tame foxes that do not show aggressive tendencies are assigned a score of +0.5 to +1.0 and show the passive-protection response. These foxes avoid the experimenter and bite if stroked or handled, but draw near if food is offered. Foxes assigned a score of +1.5 to +2.0 let themselves be petted and handled, but show no emotionally friendly response to the experimenter. Foxes given a score between +2.5 to +3.0 show emotionally positive and friendly responses to the experimenter and wag their tails and whine for attention. The tamest foxes score between +3.5 to +4.0 and are eager to establish human contact. These foxes whimper to attract attention and sniff and lick experimenters like dogs (Gulevich et al. 2004; Huang et al. 2015; Kukekvoa et al. 2008b, 2012; Trut 1999, 2001).

A comprehensive set of 50 binary (present/absent or yes/no) objective observations that non-redundantly and accurately measures behaviors is used to clearly distinguish tame foxes from aggressive and wild foxes. Objective observations such as a fox's location in the cage, amount of time spent in a location in the cage, body posture, position of particular parts of the body, willingness and desire to be touched, eagerness to attack and bite, and even the noises and sounds made by the fox were used to measure behavior. Subjective assessments of fox actions were avoided. To evaluate the location of

the fox in the cage while being tested, the space in each cage was partitioned into six different zones, Zones 1-6. Zones 1 and 2 are located at the front of the cage with Zone 2 being closest to the experimenter. Zones 3 and 4 are in the middle of the cage and Zones 5 and 6 are in the back. The systems for measuring behavior yield objective and reproducible behavioral assessments of individuals from the tame and aggressive strains and were used to select the animals exhibiting the tamest and the most aggressive behaviors for breeding the next generations. (Gulevich et al. 2004; Huang et al. 2015; Kukekvoa et al. 2008b, 2011, 2012).

Refer to Table 2 for the 50 traits selected for behavioral assignment in the standard ICG fox behavior test.

Table 2  
*The Standard ICG Fox Behavior Test 50 Behavioral Assignment Traits*

#	Trait	Code	Step Observed	PC1
1	Wagging tail	S7	Step 2 (Stand)	2+
2	Touching cage door with nose	S13	Step 2 (Stand)	4+
3	Sniffing the front door of the cage	S13	Step 2 (Stand)	4+
4	Staying at the front door of the cage	S16	Step 2 (Stand)	4+
5	Sitting in zone 2 looking at observer	S20	Step 2 (Stand)	4+
6	Moving back at least one zone during first 15 seconds	S37	Step 2 (Stand)	2-
7	Spends at least 40 seconds in zones 1-2-3-4	S38	Step 2 (Stand)	3+
8	Spends at least 40 seconds in zones 3-4-5-6	S39	Step 2 (Stand)	3-
9	Comes into zones 1-2	S49	Step 2 (Stand)	4+
10	Fox moved immediately to zone 5 or 3-5	D5	Step 3 (Door)	3-
11	Fox approaches the hand for at least 40 seconds	D7	Step 3 (Door)	4+
12	Fox tries to nip the hand or pokes it with nose	D12	Step 3 (Door)	4+
13	Sniffing floor/air	D17	Step 3 (Door)	2-
14	Sniffing the front wall/door	D18	Step 3 (Door)	4+
15	Wagging tail	D21	Step 3 (Door)	4+
16	Ears horizontal/down for at least 10 seconds	D22	Step 3 (Door)	3+
17	Body shaking	D24	Step 3 (Door)	3+
18	Not on the floor of the zone 2 at all	D27	Step 3 (Door)	4-
19	Comes into zones 1-2	D30	Step 3 (Door)	4+
20	Comes to the hand and sniffing	D32	Step 3 (Door)	4+

#	Trait	Code	Step Observed	PC1
21	Spends at least 40 seconds in zones 1-2-3-4	D39	Step 3 (Door)	4+
22	Spends at least 40 seconds in zones 5-6	D41	Step 3 (Door)	4-
23	Lying down during contact	T9	Step 4 (Touch)	4+
24	Rolling on side or back during contact	T10	Step 4 (Touch)	4+
25	Ears held horizontal/down	T13	Step 4 (Touch)	4+
26	Fox allows the back of its neck to be touched	T14	Step 4 (Touch)	3+
27	Fox allows its back to be touched	T15	Step 4 (Touch)	4+
28	Fox allows its nose to be touched	T16	Step 4 (Touch)	4+
29	Fox allows its head to be touched	T17	Step 4 (Touch)	4+
30	Fox tries to hold the observer's hand in its mouth	T19	Step 4 (Touch)	3+
31	Breathing loudly	T27	Step 4 (Touch)	4+
32	Attack	T37	Step 4 (Touch)	2-
33	Attack alert	T38	Step 4 (Touch)	4-
34	Pinned ears	T40	Step 4 (Touch)	4-
35	Aggressive sounds	T46	Step 4 (Touch)	4-
36	Fox moved to zone 2	T49	Step 4 (Touch)	4+
37	Fox in zone 2 during the first 5 seconds	E4	Step 5 (Exit)	4+
38	Spends at least 30 seconds in zones 1-2	E5	Step 5 (Exit)	4+
39	Staying at the front door	E7	Step 5 (Exit)	4+
40	Touching the front wall with fore feet	E9	Step 5 (Exit)	4+
41	Touching the door with nose	E13	Step 5 (Exit)	4+
42	Running in the cage in a circle	E20	Step 5 (Exit)	2+
43	Sitting in zone 2 looking at observer	E26	Step 5 (Exit)	4+
44	Spends more than 40 seconds in zones 5-6	E30	Step 5 (Exit)	4-
45	Spends more than 40 seconds in zones 1-2-3-4	E32	Step 5 (Exit)	4+
46	Initially spends more than 10 seconds in zones 5-6	E33	Step 5 (Exit)	3-
47	Comes into zones 1-2	E43	Step 5 (Exit)	4+
48	Changed position in cage 5 or more times	E49	Step 5 (Exit)	4+
49	Did not come to the floor of zone 2	E54	Step 5 (Exit)	4-
50	Leaning on right wall in zone 2	E56	Step 5 (Exit)	3+

*Note.* Adopted from Kukekova et al. 2011, 2008a, 2008b.

Belyaev (1979) explained that the criteria for breeding foxes began by selecting foxes that consistently displayed tame behavior with respect to people. As the foxes began to show more tame behavior, the selection was restricted to animals that were

actively willing to contact the experimenter. Finally, the selection became so strict that in recent years, less than 10% of the most tame individuals of every generation, 5% of breeding males and 20% breeding females, were allowed to breed and parent the next generation (Belyaev 1979; Trut 1999, 2001; Trut et al. 2009).

The selected population was maintained by outbreeding in order to minimize homozygosity due to inbreeding. From time to time, foxes selected for behavior from different fur farms and not related to each other were introduced into the experimental breeding pool. Through outbreeding with foxes from commercial fox farms and other standard methods, the inbreeding coefficients of the experimental fox population was kept between 0.02 and 0.07. This means that the probability of acquired traits are inherited through inbreeding is between 2% and 7% (Belyaev 1979; Trut 1999, 2001; Trut et al. 2004). Kukekova et al. (2004) has confirmed this low level of inbreeding in an analysis using microsatellite markers.

The heritability of domesticated traits, as opposed to a significant epigenetic or maternal environmental influence, was established in studies in the early 1960s involving cross-upbringing of domesticated pups by non-domesticated mothers and vice versa; cross breeding of tame, unselected, and highly aggressive animals; and cross-transplantation of blastocysts and embryos followed by behavioral and genetic investigations (Belyaev 1979; Kukekova et al. 2004, 2008b, 2011; Trut 1999, 2001; Trut et al. 2004, 2009). “We did an experiment with cross-fostering where we gave aggressive cubs to tame mothers and vice-versa,” explained Dr. Trut. “We found out that the mother’s behavior does not influence that of the cub” (Child 2011). Whether a fox was raised by a tame mother or an aggressive mother, it was always the birth mother’s nature

and not the foster mother's nurturing that determined the cub's behavior. "We even took the experiment one stage further and transplanted embryos from aggressive mothers into tame mothers but the results were the same," says Trut, explaining the embryo transplantation experiments (Child 2011). Trut (1999) reported that about 35% of the variations in the foxes' defense response to humans were genetically determined. Despite how the kit was raised or nurtured, only genetics could tell if the animal would be a tame or aggressive individual. These experiments confirmed the genetic basis of the domesticated behavior, demonstrating that behavioral differences between tame and aggressive foxes were genetically, not behaviorally, determined.

After establishing a selectively bred tame strain of foxes, the Institute of Cytology and Genetics began to develop varied populations of foxes. Five populations of foxes are currently maintained on the fox farm: the selectively bred tame strain, a selectively bred aggressive strain, an unselectively bred farm-raised strain, an F1 generation, and a backcross population. (Kukekova et al. 2008; Statham et al. 2011).

In the 1970s, the Institute of Cytology and Genetics started a new population of aggressive foxes at the experimental fox farm. This deliberate selection for animals that show aggressive responses to humans would parallel the tame population of foxes and help reveal similarities and differences between the two strains. This comparison was intended to expand our knowledge and understanding of domestication and how it effects animals. Fifty farm-bred silver foxes with the most aggressive responses to humans were selected from several fox farms and used to found the selectively bred aggressive strain (Kukekova, 2008b; Trut et al. 2009). Aggressive foxes are difficult to handle as they hiss and scream in response to people and growl toward conspecifics (Gogoleva et al. 2010b;

Trut 1999, 2001). “It just bit my hand. I didn't even open the cage. I just put my hand out and it managed to bite me through the bars,” remarked Dr. Lyudmila Trut in the documentary *Dogs Decoded* after she had brushed her hand across an aggressive fox’s cage. “This isn't a fox, it's a dragon” (Child 2011).

An unselected population is also kept at the ICG in order to act as a control group. These foxes originate from several commercial fox farms, are unselected for behavior, and are meant to replicate farm-raised foxes bred for their fur (Abumrad 2009; Kukekova et al. 2008; Statham et al. 2011).

All animal experiments conducted at the Institute of Cytology and Genetics follow the international guiding principles for biomedical research involving animals developed by the Council for International Organizations of Medical Sciences (CIOMS) and are in compliance with the laws, regulations, and policies of the “Animal welfare assurance for humane care and use of laboratory animals,” permit number A5761-01, approved by the Office of Laboratory Animal Welfare (OLAW) of the National Institutes of Health, USA (Huang et al. 2015; Statham et al. 2011). The “Guidelines for the treatment of animals in behavioral research and teaching” are also followed (Gogoleva et al. 2011).

## Results

Although the original farm-bred fox population showed a continuous variation in aggressive and fearful behavior, the phenotypes in the newly selected tame and aggressive populations no longer overlap. Belyaev (1979) defined domestication as “the ability of animals to have direct contact with man, not to be afraid of man, to obey him, and to reproduce under the conditions created by him” (p. 301). By this definition, the

Farm-Fox Experiment has succeeded in domesticated the red fox. In the process of domesticating these foxes, profound and complex changes occurred in behavior and in the organismic neuroendocrine state (Belyaev and Trut 1975/2009).

### Behavior

The foxes from the selected population are not afraid of people and display an active positive reaction to human contact as they seek contact with people (Belyaev 1979). These selectively bred foxes differ remarkably from their wild or farmed counterparts in distinct and specific behavioral traits: their positions within their cages when a human approaches; the positions of their tails and ears; the noises that they make; and their willingness and desire to be touched as opposed to their eagerness to attack and bite (Kukekova et al. 2011). Domestic foxes respond when called, answer to nicknames, come up to man, and permit themselves to be petted and picked up. The most domesticated animals wag their tails in greeting (Abumrad 2009; Belyaev 1979; Belyaev and Trut 1975/2009; Faith 2007). Through experimental testing, Gogoleva et al. (2010b) found that tactile contacts, caressing, and handling were most stimulating for tame foxes because of their desire for human attention. These foxes are eager to establish human contact and approach humans willingly; move on half-bent paws; hold their mouths ajar as they pant with excitement; hold ears horizontally or down; sniff and lick; nip or poke with the nose; roll on the side, back, or even belly up during contact; and try to hold a human's hand weakly in the mouth by the teeth, all signs of trustfulness shown by domesticated dogs (Belyaev 1979; Kukekova et al 2008a, 2008b, 2012; Trut 1999; Trut et al. 2009). Play activity, which is normally only seen in infantile, wild foxes is more common among foxes of the tame population and persists into adulthood as they actively

seek attention from conspecifics and humans in a playful, friendly, and communicative manner (Faith 2007; Kukekova et al. 2008a; Spady and Ostrander 2007; Trut 2001).

“They are unusual animals, docile, eager to please, and unmistakably domesticated,” concludes Dr. Trut (1999, p. 163).

These traits have never been observed in the unselected or aggressive populations of foxes. Further, aggressive behaviors, such as attacking, pinned ears, and aggressive sounds are frequently documented in the aggressive population, but have never been observed in the tame population (Kukekova et al 2008a, 2008b). The foxes actively selected for behavior are tame, not as a result of training or taming, but due to prolonged selection for a tame genotype. “There is something moving in the emotions of these foxes,” remarked Belyaev (1979, p. 303). “At the sight of even a strange person, they try actively to attract attention with their whining, wagging of tails, and specific movements.”

### Communication

It has been suggested that domesticated animals are able to receive and discern communicative signals from humans, evolving this ability as an adaptation to the tight coexistence and interaction with people (Trut et al. 2009). Gogoleva et al. (2011) even suggests that domesticated animals can provide humans with information, thus involving in inter-species communication. In the presence of humans and conspecifics, tame foxes show emotionally positive responses and communicate in a positive manner (Gogoleva et al. 2011; Trut 1999). Domesticated foxes show explosive behavioral and vocal responses at the appearance of humans before them, even unfamiliar humans (Trut 1999; Trut et al. 2009). Gogoleva et al. (2011) suggests that this high calling rate in response to human

appearance may act as a behavioral mechanism for attraction of human attention that is directed to prolonging the contact and involvement of animal-human interaction. These domesticated foxes have been observed producing tonal cackles and noisy pants, but never coughs or snorts, two vocalizations commonly created by aggressive and unselected foxes (Gogoleva et al. 2008, 2010b). They breathe loudly with excitement when in contact with humans, panting similarly to domesticated dogs when interacting with people in a positive manner and offering an invitation to play (Cohen and Fox 1976; Kukekova et al 2008a, 2008b). Domesticated foxes also have a habit of emitting typical barks, resembling those made by domesticated dogs, at the sight of man and whimpering and whining for human attention (Abumrad 2009; Belyaev and Trut 1975/2009; Trut 1999). Gogoleva et al. (2011) reported that domesticated foxes will pant upon human interaction and will increase the proportion of whines to pants when contact is refused by the human. This suggests that human appearance before a tame fox provokes high levels of emotional arousal which entices the fox to react with vocal and non-vocal displays that suggest the desire to interact with humans. In contrast, aggressive and unselectively bred silver foxes respond emotionally negatively to all humans, displaying permanent vocal activity for the duration of human interaction (Gogoleva et al. 2008, 2010b, 2011; Trut 1999; Trut et al. 2009).

In 2006, Hare et al. conducted experiments to test the abilities of domesticated fox pups to understand and utilize human pointing gestures. The domesticated silver fox pups were found to perform the task of finding hidden food items with the assistance of human pointing gestures as skillfully as dog puppies while undomesticated silver foxes, not bred for behavior, failed to perform the task. Domesticated dog pups instinctually use human

pointing gestures as guidance as early as 6-9 weeks of age. Interestingly, after weeks of exposure to humans, even the undomesticated control foxes were capable of using human communicative gestures to find the hidden food, yet still not as skillfully as the domesticated foxes with less human exposure (Hare et al. 2006). In comparison, undomesticated timber wolves and chimpanzees are unable to resolve this task without special training (Hare and Tomasello 2005; Hare et al. 2006). These results show that experimentally domesticated foxes with almost no experience with humans and not trained to use human gestures, are as skilled as domestic dogs at using communicative gestures, and are therefore more skilled at understanding human communication than chimpanzees and wolves. Trut et al. (2009) has confirmed the use of human cues for coping with a man-made environment within experimental tests, selection procedures, and even daily routine care in the ICG experimental population of foxes. Domestication in foxes has led to an improved ability to use human communicative gestures and glances and an evolved social cognitive mechanism that more closely resembles social cognitive skills than do those of other animals.

### Development

A close relationship has been found between the nervous system and endocrine system. Selection for behavior can intrinsically change the hormonal status of a breed, thus affecting the ontogenetic development of the animal (Belyaev 1979). Tecumseh Fitch, an evolutionary biologist at the University of St. Andrews in Scotland, hypothesizes that neural crest cells contribute to the development of an embryo. In foxes, the migration from the neural crest contributes to the development of the skin, ear cartilage, jaw, tissues, teeth, tail, nervous system, brain, and adrenal glands. When

selecting animals for positive responses to humans, the migration from the neural crest is slowed in order to produce foxes with adrenal glands that don't mature (Abumrad 2009). Because so many quantitative traits in animals are genetic and tend to be controlled by complex systems of genes and polygenes, anything that tampers with these genes changes a multitude of parts within an animal's genetic makeup (Trut 1999). When a fox's neural crests do not fully migrate to the adrenal glands to produce less aggressive behavior, they also do not fully migrate to other areas, such as the fox's ears, and when a section of the ear does not receive as many cells needed to remain straight and stable, it becomes flopped over (Abumrad 2009).

Delay in the developmental rates of the foxes selected for tame behavior has been observed as early as during embryonic morphogenesis. In these foxes, opening of the eyelids and external auditory canal was accelerated while the onset of the fear response was delayed (Trut et al. 2009). On average, domesticated fox pups respond to sounds two days earlier and open their eyes a day earlier than non-domesticated foxes (Trut 1999). The sensitive period for socialization, in which mammals explore their environments, adapt to social factors, learn about their surroundings, and form attachments through the use of sense and locomotion (Scott 1958), persisted past 60 days of age in domesticated foxes, compared to less than 45 days in unselected foxes (Belyaev et al. 1985; Kukekova et al. 2008a; Trut 1999; Trut and Oskina 2004; Trut et al. 2009). Because the type of defense behavior towards man is formed and preserved as a permanent individual characteristic in most animals during the first few months of life when the neurophysiological substrate of the fear response matures, foxes with extended socialization periods don't show the fear response until later than tame foxes and have

more time to become incorporated into a human social environment. Thus, they are more likely to form positive response behaviors toward humans (Belyaev 1979; Trut 1999; Trut et al. 2009). Belyaev (1979) has found that variability in the defense behavior has a hereditary basis, thus selection is possible and repeatability is very high. Foxes can be selected for positive response behaviors toward humans and pass their positive responses to their offspring.

### Physiology

Hormonal responses suggest that domesticated foxes do not experience stress when in contact with humans, unlike aggressive foxes, foxes unselected for behavior, and even farm-bred foxes (Gogoleva et al. 2011). The domestication of foxes has effected the hypothalamic-pituitary-adrenal (HPA) system, the main hormonal system which plays an important role in the process of adaptation to captivity, a challenging stressing factor upon animals. The responsiveness of the pituitary-adrenal system not only determines the initial level of plasma hormones, but may also influence the reactivity to psychological stress and ACTH, an adrenocorticotrophic hormone. The HPA axis of domesticated foxes has reduced steadily at all levels from the central regulation of the pituitary to peripheral blood levels of glucocorticoids, and the hypothalamo-pituitary-adrenal system is activated to a higher degree (Belyaev 1979; Belyaev and Trut 1975/2009; Gulevich et al. 2004; Trut 1999; Trut et al. 2009). Because the function of this system helps an animal respond to stress, domesticated animals experience a decrease in the stress response (Trut et al. 2009). Tame and unselected foxes differ in the functional state of the adrenal cortex, as well, as the adrenal cortex responds less sharply in domesticated foxes when the foxes are subjected to emotional stress (Belyaev and Trut 1975/2009; Trut 1999).

After 12 generations of selecting foxes for tame behavior in response to handling and blood sampling, it was found that plasma glucocorticoid levels, produced in relation to stress, were significantly lower in tame animals than unselected animals; the higher the domestic behavior of the animal, the lower the plasma glucocorticoid levels (Belyaev and Trut 1975/2009; Gulevich et al. 2004; Trut 1999; Trut et al. 2009). Trut (1999) identified a correlation between the delayed development of the fear response in domesticated foxes and changes in plasma levels of corticosteroids: the more advanced the animal's selection for domesticated behavior was, the later it showed the fear response and the later came the surge in its plasma corticosteroids. Foxes selected for tame behavior also demonstrated lower in vitro glucocorticoid production by the adrenals and plasma ACTH levels in response to handling and blood sampling in comparison to unselected animals and those selected for aggressive behavior (Gulevich et al. 2004). ACTH response was about 2-4 times more intense in domestic females than in wild females, showing that domestic and wild foxes differ in the degree to which they respond to the same dose of ACTH (Belyaev and Trut 1975/2009). Tame foxes also had significantly lowered basal and stress-induced blood plasma cortisol levels in response to ACTH stimulation and stress than aggressive and unselected individuals and experienced 30% lower stress levels (Gulevich et al. 2004; Oskina and Tinnikov 1992; Trut et al. 2009).

Studies of the brain's serotonin system in tame foxes and foxes unselected for behavior have found changes in the neurochemistry of domesticated foxes. Tame foxes possessed lower density of 5-HT<sub>1A</sub> serotonin receptors, in the hypothalamus. Higher levels of serotonin, its main metabolite 5-hydroxyindol acetic acid, and tryptophan hydroxylase, the key enzyme of serotonin synthesis, were found in the midbrain and

hypothalamus (Belyaev 1979; Gulevich et al. 2004; Trut 1999; Trut et al. 2009). The hypothalamus is a biologically important, evolutionary conserved brain structure and modulator of behavioral and neuroendocrine responses to environmental agents (Trut et al. 2009). Serotonin is a neurotransmitter that inhibits aggression and centrally regulates the hypothalamic-hypophyseal-adrenal-sexual system, thus selection for tame behavior is associated with changes in both the central and the peripheral mechanisms of the neuroendocrine control of ontogeny (Belyaev 1979; Popova 2006; Trut 1999).

In all foxes, both absolute and relative adult hippocampal neurogenesis (AHN) have been found to be markedly higher in the temporal hippocampus, associated with odor memory and social behavior (Kesner et al. 2011; Kjelstrup et al. 2002). Behavioral neoteny is regulated differently from physiological neoteny and might be associated with higher AHN in the hippocampus of the fox (Huang et al. 2015).

### Reproduction

The selection for tame behavior in foxes has also resulted in a change in the level of steroid sex hormones, estradiol and progesterone, hormones responsible for implantation and embryonic mortality, thus accounting for higher fertility of domesticated foxes as compared to wild foxes. Female foxes selected for positive responses to humans show increased levels of estradiol and progesterone during the first days of pregnancy than foxes unselected for behavior (Belyaev 1979). Belyaev (1979) identified a phenotypic and a genotypic correlation between the type of defensive behavior of females and the time of onset of their reproductive activity within the breeding season.

Foxes which do not show aggressive and fear responses when coming into contact with man mated earlier during the breeding season, had larger litters, and experienced longer moulting times than foxes with aggressive defense behaviors toward humans. On average, these foxes reached sexual maturity one month earlier than farm-bred foxes, mating anywhere from November to May, rather than the usual fox mating period of late January to late March in Siberia (Belyaev 1979; Oskina 1995; Trut 1999). They also gave birth to litters that were one pup larger than wild fox litters, ranging from two to fourteen pups with an average of five or six (Trut 1999). Some foxes even mated twice in one year. (Belyaev 1979; Trut 1999). These results agreed with Darwin's observation in 1876, "With our domesticated animals, the various races when crossed together are quite fertile" (p. 304). Domestication of the fox, just as domestication of all other species, has increased the duration and success of its reproduction.

In 1962, 6% of the silver foxes subjected to selection showed sexual activation outside the regular seasonal pattern, and in 1969, after only 7 years of selective breeding, 40% of the selectively bred silver foxes experienced extended breeding periods. Unfortunately, the reorganization towards two annual estrus cycles in the foxes was paralleled with a decreased capacity to reproduce during the regular breeding season. 30% of the foxes failed to produce litters as a result of not mating at all, infertile mating, or having litters that succumbed to inhibited lactation or cannibalism (Belyaev 1979; Belyaev and Trut 1975/2009; Trut et al. 2009). Also, Trut (1999) has reported that no offspring of an extra-seasonal mating has survived to adulthood. While there is potential in the selectively-bred foxes to reproduce more than once a year, there hasn't been success yet.

## Anatomy

In some of the tame foxes, new morphological characteristics appeared that are not found in wild animals, but are commonly seen in domesticated animals, such as various breeds of dogs. Several different aberrations appeared simultaneously, such as a peculiar curled position of the tail over the fox's back in a semicircular position; brown spots around the ears, neck, and about the shoulder blades; and drooping ears, characteristic of young animals (Abumrad 2009; Belyaev 1979; Faith 2007; Trut 1999; Trut et al. 2009). After 15-20 generations of selective breeding, changes in the parameters of the skeletal system began to arise. Some foxes were born with shortened legs, tails, snouts, teeth, and upper jaws, thinner bones, and widened skulls (Abumrad 2009; Trut 1999; Trut et al. 2009). Some developed underbites or overbites due to the elongation of the lower jaw or shortening of the upper jaw (Trut 1999; Trut et al. 2009). On average, the foxes are longer and larger in body size than their wild counterparts (Trut 1999). Trut (1999) was especially interested in the growth of the skull. In both genders of foxes from the experiment, the cranial height and width tend to be smaller and snouts tend to be shorter and wider than those from the control group of farmed foxes. The cranial morphology of domesticated adult males also became somewhat "feminized" as the skulls of males became more like females and the sexual dimorphism between the two sexes decreased. Analysis of the cranial allometry concluded that the changes in skull proportions resulted from changes in the timing of their growth rates or the first appearance of particular structures (Trut 1999).

Coat color changes; brown mottling, brown spots around the ears, neck, and about the shoulder blades; and white spotting appeared earlier than other changes, premiering in

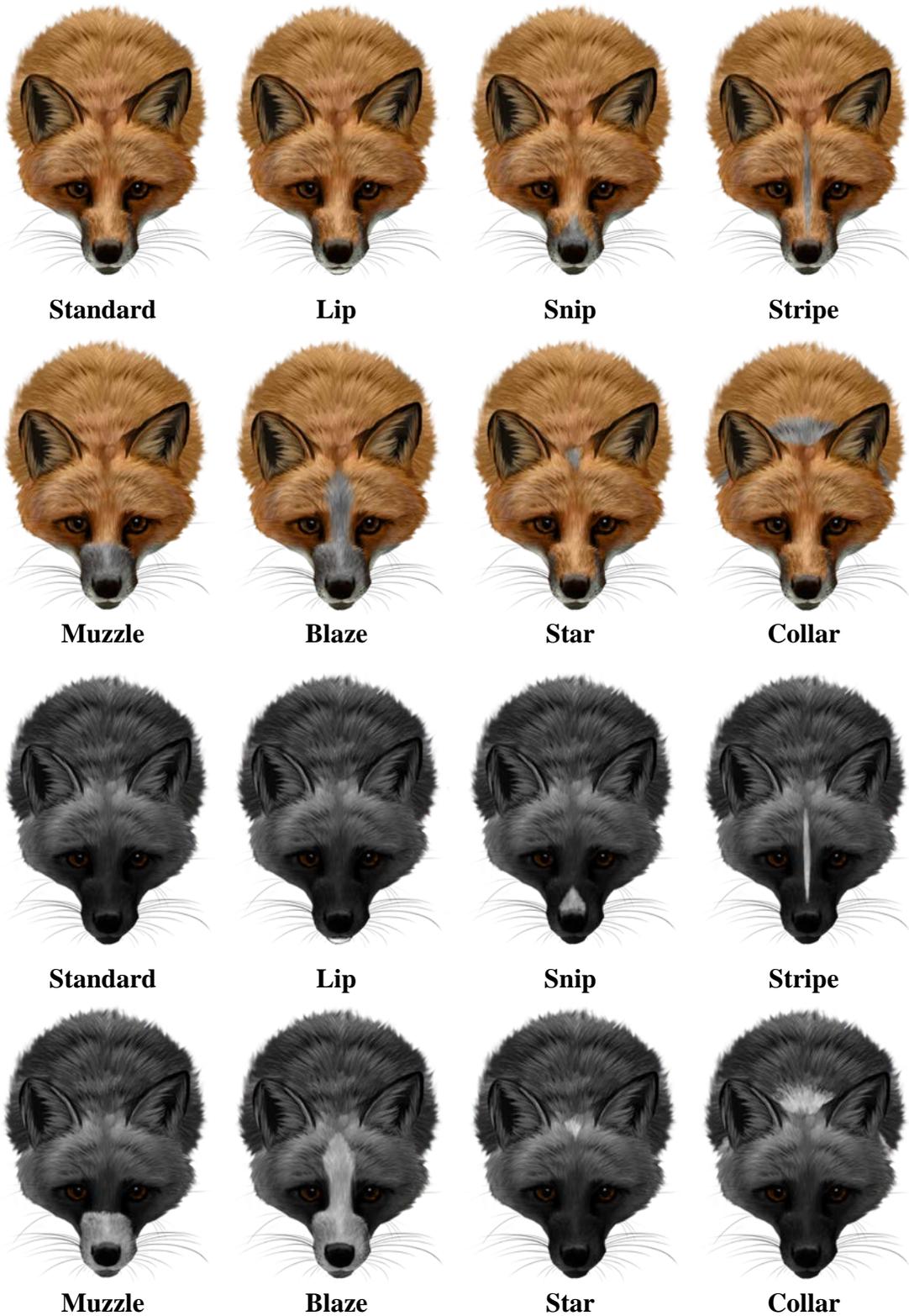
the 8<sup>th</sup> generation of foxes without direct selection for appearance or inbreeding in the tame fox population. White spotting in foxes is referred to as whitemarks and one of the most common marks is a white star-shaped spot on the head. In contrast, when an animal experiences large sections of depigmentation on its body, it is referred to as piebald spotting or piebaldism (Abumrad 2009; Belyaev 1979; Belyaev et al. 1981; Kukekova et al. 2008a; Trut 1999; Trut et al. 2009) Belyaev determined that the star-shaped piebald pattern was governed by a gene that he named *Star*. Foxes homozygous for the *Star* gene developed piebald spotting, while foxes heterozygous for the gene sported smaller depigmentation. (Trut 1999; Trut et al. 2009). The star-shaped whitemark has since been named *Star*. Several other distinctive whitemarks have been named in the fox fur trade that closely resemble the names of markings given to other domesticated animals, such as horses and dogs. A fox can sport a single whitemark or more than one whitemark.

Refer to Table 3 for a summarization of the frequencies of phenotypic changes in farm-bred and domesticated fox populations. Refer to Figure 2 for an illustration and label for each whitemark found on red foxes and silver foxes.

Table 3  
*Frequencies of Phenotypic Changes in Fox Populations*

Physical Characteristic	Farm-Bred (%)	Domesticated (%)
Depigmentation	7.1	12.4
Tail Rolled in a Circle	8.3	9.4
Gray Hairs	1	5
Brown Mottling	0.08	4.5
Floppy Ears	1.7	2.3
Short Tail	0.02	1.4

*Note.* Adopted from Trut 1999; Trut et al. 2009.



**Figure 2. Whitemarks on Red-Colored and Silver-Colored Red Foxes.** These are the common names given to whitemarks in the fox fur trade. Illustrated by Noelle Brooks.

The color change seen in the foxes seemed to result from shifts in the rates of certain ontogenetic processes, or the timing of an embryo's development (Trut 1999). Richard Shackelford (1948), the fur animal specialist at the University of Wisconsin in 1953, explained, "Coat color in mammals is generally attributed to melanins, organic compounds containing nitrogen, usually dark in color, and characterized by chemical inactivity" (p. 311). Dr. Lyudmila Trut and Lyudmila Prasolova found that retardation of the development, proliferation, and migration from the neural crest of the embryonic precursors of melanocytes, or primary melanoblasts, is the mechanism underlying depigmentation. Melanoblasts are the embryonic precursors of the pigment cells, melanocysts, which give an animal's fur its color as they form in the embryonic fox's neural crest and later move to various parts of the embryo's epidermis. In foxes that carry even a single copy of the *Star* gene, melanoblasts pass into the potentially depigmented areas of the epidermis two days later, on average, leading to the death of the tardy melanoblasts and the lack of pigment in the animal's fur (Trut 1999; Trut et al. 2009). When foxes are selected for tame behavior, they are selected for adrenal glands that have not been fully matured by the migration of neural crests (Abumrad 2009). This retardation leads to the absence of melanocytes from specific areas of the coat and, hence, to its depigmentation (Trut et al. 2009). Because fur color is effected by the migration of neural crests, it is also not fully matured, thus the fur color can look incomplete with patches of missing color or piebald spotting. While this has been discovered, the gene control of the brown mottling seen in some domesticated foxes is still unclear. In dogs, this variation is controlled by one of the mutations at the *Agouti* locus (Trut et al. 2009).

## Conclusions

The results of the Farm-Fox Experiment are impressive. Through methodically applied selective breeding, a unique domesticated fox that looks and behaves similarly to the domesticated dog has been born. As a result of selecting for tame behavior, the foxes from the Institute of Cytology and Genetics are more similar to dogs than wild foxes and show more physical variations like many domesticated breeds. Some foxes have white collars and markings upon their faces like border collies, curly tail carriages like Islandsk Farehounds, floppy ears and widened skulls like pugs, long jaws like English bulldogs, and long skulls like Pharaoh hounds (Trut et al. 2009).

Domestication involves changing the behavioral relationship between animals and man and developing mutual trust (Kukekvoa et al. 2011). When subjected to domestication, animals whose evolutionary pathways have not crossed start to evolve in the same direction as they lose the wild, aggressive behavioral response to humans and increase in social tolerance and reduced sensitivity to environmental changes (Price 2002; Trut 1988). Reproductive physiology is changed as sexual maturity is accelerated, fertility is increased, and periods of reproductive seasonality are lost. The activity of the reproductive system becomes relatively uncoupled from the environmental photoperiod, allowing the animal to acquire the ability to breed in any season and sometimes more than once a year (Belyaev 1979; Spady and Ostrander 2007; Trut 1999; Trut et al. 2009). The activity of the hypothalamic-pituitary adrenal axis, the key hormonal regulator of adaptation to stress, becomes weakened. Sexual dimorphism, the sizes of the visceral cranium, and teeth, and thickness of limb bones decrease. Similar morphological changes also appear in domesticated animals such as body size and proportions, coat color, fur

length, and hair texture. White spotting, floppy ears, and curly tails have become markers of domestication (Abumrad 2009; Belyaev 1979; Kukekova et al. 2008a; Morey 1994; Trut 2007; Trut et al. 2009) and a piebald-spotted coat is one of the most striking mutations among domestic animals seen frequently in dogs, pigs, horses, cows, guinea pigs, cats, and other domesticated animals (Trut 1999).

Another common factor amongst domesticated animals is the phenomenon of neoteny and pedomorphosis, the retention of juvenile traits by adults (Morey 1994; Price 2002). The retaining of widened skulls, shortened snouts, floppy ears, curly or truncated tails, and the emotional expression of positive responses such as whining, barking, and submissiveness to humans are juvenile traits that certain domesticated individuals retain to adulthood (Morey 1994; Wayne 1986). “When you’re selecting against aggression, what you’re doing is you’re favoring juvenile traits,” explains evolutionary biologist and dog expert Professor Brian Hare from Duke University (Child 2011). “Juveniles and infants show much less aggression than adults and so what the idea is that basically you’ve frozen the development at a much earlier stage, and so you have an animal as an adult that looks and behaves much like a juvenile.”

All of the features commonly observed in domesticated species have been seen in the ICG’s population of domesticated foxes. These animals are capable of developing a trusting relationship with humans, are less sensitive to environmental differences due to hormonal changes, and can reproduce outside of the restrictive breeding season (Belyaev 1979; Oskina 1995; Trut 1999). Some domesticated foxes experience anatomical changes in their teeth, skulls, bones, body sizes and proportions, fur coloration, ears, and tails (Abumrad 2009; Belyaev 1979; Faith 2007; Trut 1999; Trut et al. 2009). The foxes from

the Farm-Fox Experiment have also been effected by neotenization and appear and behave more like infants in their mature lives. Floppy ears, for instance, are characteristic of newborn fox pups, but may get carried into adulthood in domestic foxes. Play is another characteristic distinctive to infant foxes, but adult domesticated foxes enjoy the activity (Faith 2007; Kukekova et al. 2008a; Spady and Ostrander 2007; Trut 2001). While selecting for positive responses to humans, the Farm-Fox Experiment essentially bred infant-like foxes that never mature, forever looking and acting like a young fox kit, thus demonstrating that by simply selecting for behavior changes in the animal's behavior, developmental, physiological, and anatomical changes would follow.

Because of its ground-breaking results, the Farm-Fox Experiment has contributed greatly to the study of animal domestication and genetics. This study has shown that the amenability of silver foxes to domestication is hereditarily determined and the degree to which offspring are domesticated increases with the number of domestic animals in their pedigree (Belyaev and Trut 1975/2009). "The domestic fox is not a domestic dog, but we believe that it has the genetic potential to become more and more doglike," explains Dr. Trut (1999, p. 169). "We can continue to increase that potential through further breeding, but the foxes will realize it fully only through close contact with human beings." The Farm-Fox Experiment has also demonstrated that neotenic shifts in developmental rate may arise as a correlated consequence of selection for tameability, or social adaptation to humans (Trut et al. 2009). Tamelessness, a behavioral trait that includes less fear and aggression toward humans in captivity, is a necessary prerequisite for domestication (Huang et al. 2015). Domestication for behavior is a profound process of selection that

involves genetically and environmentally inducing developmental adaptation to man and captivity upon animals, and the ICG has achieved this in the red fox species (Price 1984).

The Farm-Fox Experiment has been highly commended by colleagues for its valued contribution to scientific and genetic research. Brian Hare has declared the Farm-Fox Experiment as “one of the most exciting experiments in biology” (Abumrad 2009). Hare, himself, has worked with the experimental fox populations in order to better understand the evolution and domestication taking place there and to explore new possibilities in dog research. Professor Ray Coppinger from Hampshire College in Massachusetts, another dog researcher interested in how dogs have evolved from wolves, told KPBS San Diego, “I really think that the Belyaev experiment was one of the most significant experiments in evolution that took place in the 20<sup>th</sup> century and it effected my life and my thinking in so many ways” (Faith 2007). The ICG’s fox farm experiment has also influenced the study of evolution in humans. “Our present concepts of the human evolution are most greatly influenced by your work on domestication of foxes,” wrote evolutionary anthropologist, R. Wrangham in a letter addressed to Dr. Trut in 2003 (Trut 2007, p. 58). In February 2007, the *US Scientist* praised the Farm-Fox Experiment:

Since Darwin called attention to the mysteries of correlated alterations in domesticated animals, science had been waiting for explanations. The brilliant experiment of Dmitry Belyaev opened the door for resolving this problem. His work is a breakthrough to a new route important for evolutionary anthropology not only as an amendment to unexplained adaptations, but also because the specific behavioral traits influenced by natural selection are related to the human evolution (Trut 2007, p. 59).

Currently, the Institute of Cytology and Genetics maintains five populations of foxes on their fox farm: the selectively bred tame strain, the selectively bred aggressive strain, an unselectively bred farm-raised strain, an F1 generation developed by crossing tame males to aggressive females, and a backcross population produced by reciprocally breeding F1 foxes back to the tame strain (Kukekova et al. 2008; Statham et al. 2011). By 2009, Trut et al. reported that throughout the entire course of the experiment, 10,500 foxes had been bred and 50,000 offspring had been born and tested for their amenability to domestication. In 2011, the tame fox population at the ICG comprised of 300 breeding animals and the aggressive population of foxes was composed of about 130 breeding individuals (Statham et al. 2011).

Unfortunately, these numbers have dwindled since the past. In 1996, the population of the breeding herd was 700 foxes, but when the experiment was jeopardized by the crisis of the Russian economy, shrinking budgets, and changes in the grant-awarding system in Russia, the ICG had to reduce its population to 100 foxes. Without funds to provide food for the foxes and salaries for the staff, the future of the Farm-Fox Experiment was threatened. Still functioning today, the experiment has been funded through a variety of methods (Trut 1999). “Like many other enterprises in our country, we are becoming more entrepreneurial,” expressed Dr. Trut (1999, p. 169). Most expenses are covered by selling the pelts of the foxes culled from the breeding herd. Some foxes have been sold to Scandinavian fur breeders who have been pressured by animal-rights groups to breed from animals that do not suffer stress in captivity. Still dependent on outside funding, however, the ICG began to search for alternative funding. The domesticated foxes from the Farm-Fox Experiment are now offered as house pets.

Trut believes that this commercial venture will lead to interesting, informal experiments, helping the ICG financially and in terms of understanding their creations better (Trut 1999). “If our experiment should continue, and if fox pups could be raised and trained the way dog puppies are now, there is no telling what sort of animal they might one day become,” Trut concludes (Trut 1999, p. 169).

### Pet Fox Cases

While foxes are not popular animals to keep as companions, there are many cases of keeping foxes as pets. From these cases, we can understand the responsibilities involved with owning a fox as a pet and the consequences one must be prepared to handle. Unfortunately, several pet fox cases have tragic endings for the animal due to human fear, misunderstanding, negligence, or restriction. Only a few cases of pet-fox ownership are documented here.

Mikhail and Nikolai, two domesticated foxes from the Institute of Cytology and Genetics’ Farm-Fox Experiment were confiscated by the Texas government when illegally imported into the United States through the Dallas-Fort Worth Airport (Fedewa 2011 December 6). Anya, another domesticated fox from the ICG’s Farm-Fox Experiment was successfully imported into the United States through Florida, but was forced to relocate from her city in Michigan with her owner, Kay Fedewa, when community outrage triggered the enactment of a new law banning the ownership of foxes as pets (Fedewa 2012 May 3). After moving to a new city, Anya was later killed by a feral coyote when inadequately housed in an outdoor enclosure (Fedewa 2014). Vader, a ranched fox bred in Indiana and owned by Tara and Eric Hiatt, was exterminated by the Minot Police Department of North Dakota when he bit an animal control officer (KX

News Minot 2014; Meredith 2014; Minot Police Department 2014; Schramm 2014).

Valo, another ranched fox, was exterminated in the city of Fairborn, Ohio, when found loose and thought to be a wild animal and not the pet of Chloe Kristensen (Crowe 2014; Moore 2014; WHIO Breaking News Staff 2014). Finally, Swiper, another ranched fox, did not meet with a tragic fate. Although he was confiscated by the Fairfax County Police Department, his owner, Alayna Sitterson, was able to repossess him (ABC News 7 2010; Falls Church News-Press 2010; The Washington Post 2010; WSUA9 2010). Swiper's life was later altered, however, when his owner realized that she was no longer able to adequately provide for him and surrendered him to a fox rescue organization.

Currently, there are three different degrees of tameness found in foxes. These degrees of tameness are clearly described by Hemmer (1988):

- (1) Tameness by primary acquisition of confidence as done by hand-rearing,
- (2) Tameness by reduce of distrust, as done in taming adult animals,
- (3) Tameness by naivety as the only type of tameness on a genetic basis. Only this last one is the basic type of tameness as typical for real domestic animals (p. 135).

Many foxes kept as pets in the United States are *behaviorally* tame, not *genetically* tame. As Hemmer explains, these foxes are hand-raised to acquire tameness to humans. Commonly referred to as "ranched foxes," these foxes were born and raised on fox farms that commercially breed foxes. Gogoleva et al. (2010a) reminds that farm foxes are selected mainly for fur, size, and litter sizes, and not for attitudes to people, so they are normally fearful of humans. Ranched foxes have been bred in captivity for years, however, during which they have been inevitably subjected to some selection for

adaptation to captivity or amenability to domestication (Trut et al. 2009). The observation that even unselected farm-raised foxes exhibit some adaptive behavioral changes is supported by observations of free-living foxes with coat colors typical of farm-raised strains, and thus most likely descended from escaped farm-bred foxes, exhibiting reduced avoidance of humans compared to wild foxes (Keeler 1975/2009). While these foxes are tamer than wild foxes, they are arguably not as tame as the domesticated foxes from the Institute of Cytology and Genetics' Farm-Fox Experiment. Even mitochondrial DNA and history records have shown differences within captive farm foxes, or ranched foxes, bred with unconscious selection for behavior and a conscious selection for fur quality for commercial purposes, and domesticated foxes bred under intensive selection for tame behavior at the ICG (Statham et al. 2011).

Despite these differences, ranched foxes are much more common as pets in the United States because they are easier to obtain. Not only are there several fox farms and exotic pet breeders all over the country, these foxes also cost much less than a domesticated fox from the Russian Farm-Fox Experiment. The final purchase price of any domesticated fox imported into the United States from Siberia is about \$8,900.00 (World Wide Exotic Animal Talent Agency, LLC. 2012) while the most expensive color of red fox sold at Tiny Tracks Exotic Animals LLC., one of the most popular exotic pet farms in the United States, sells for \$750, though most of Tiny Tracks' red foxes sell for \$425 (Tiny Tracks Exotic Animals LLC 2015a). Because of these limitations, few have attempted purchasing a domesticated fox from the ICG and many choose to purchase a possibly less tamed, but unarguably cheaper ranched fox from the States.

Typing “pet fox” into *YouTube*’s search engine, at [www.youtube.com](http://www.youtube.com), will bring about several videos of Eric Mason’s pet fox, Ron. Adorably called “RonRon,” this fox has become a YouTube celebrity with over 56,000 subscribers and over 22 million views on his account “foxalbiazul” since his first video was published six years ago (Mason 2015). On every single one of his video’s Mason writes, “Ron is a pet red fox I bought from a licensed exotic animal breeder, in Oklahoma, captive-bred and hand-raised. My state of Arkansas allows pet foxes without any permit needed.” Mason is correct in the fact that Arkansas allows pet red foxes as it is written in *Chapter 9: Captive Wildlife and Hunting Resort Regulations, Section 14: Native Wildlife Pets Restricted* of the *Arkansas State Game and Fish Commission Code of Regulations* of the *Arkansas State Game and Fish Commission Code*:

It is unlawful to possess native wildlife as pets except as follows:

(A) Native wildlife captured from the wild:

(1) No more than six per household of any combination of the following animals may be possessed as pets:

(a) Hand-captured bobcat, coyote, gray fox, red fox, opossum, rabbit, raccoon and squirrel; and

...

(B) Captive born native wildlife: No more than six per household of any commercially obtained, captive born native wildlife may be possessed as personal pets in compliance with the following restrictions:

...

Mason's fox Ron is a captive-born red fox, native to the state of Arkansas and legal to own as a pet in the state. Mason and Ron live harmoniously together and illustrate a successful fox-human bond. In order to form such a fruitful bond, one must be responsible and knowledgeable about pet fox needs, laws regarding the ownership of foxes as pets, and community attitudes toward the animal. On his *YouTube About* page, Mason writes, "A pet fox is not for everybody; it is difficult and a challenging adventure that requires sacrifice on your part (and your stuff!) Always do extensive research before getting a fox or other exotic on a whim" (2015).

Unfortunately, there are numerous cases in which the lack of responsibility of the owner has resulted in negative consequences upon pet foxes. Pet foxes in the United States have come across negative community attitudes and poor ownership and have been confiscated, relocated, and even exterminated as a result.

#### Texas Government Confiscates Mikhail and Nikolai the Domesticated Foxes

In late 2009, a company emerged within the United States under the name SibFox Inc. with the website, *SibFox*, located at [www.sibfox.com](http://www.sibfox.com). On December 12, 2009, the subtitle of *SibFox* read, "SibFox is an official distributor of tame foxes from Siberia," and the front page boasted, "We work directly with the Institute of Cytology and Genetics (Russia) that bred tame foxes for over 50 years" (2009 December b). On its *About Us* page, SibFox Inc. described itself as "a private company [that] operates as a distributor and a point of contact between North America pet lovers and Siberian tame fox breeders. We work with the farm directly and have Russian speakers on our team" (2009 December a). The website claimed that the company's purpose was to "introduce tame foxes as pets

in North America and establish non-consumptive relationships between foxes and people" (2009 December a).

SibFox claimed to be the exclusive, official United States distributor of the Institute of Cytology and Genetics' domesticated foxes and stated on its *About Us* webpage in 2009, "Genuine tame foxes come from Institute of Cytology and Genetics in Novosibirsk, Russia and are exclusively distributed by SibFox Inc." (2009 December a).

The Institute of Cytology and Genetics appeared to back SibFox's claim as it posted in 2010, "To receive the information about purchasing of our domesticated fox pups as pets, please contact us: in USA – to the SibFox Inc." on the *Laboratory of Evolutionary Genetics of Animals* page of its website *Institute of Cytology and Genetics*, [www.bionet.nsc.ru](http://www.bionet.nsc.ru).

On its website in 2009, SibFox posted pictures of fox pups ready for adoption on the *Our Foxes* page and claimed that any fox pup could be purchased for \$5,950 once the buyer submitted a payment in full and completed the *Purchase Contract* that was hyperlinked at the bottom of the page (2009 December c). In early 2011, SibFox included new fox pups ready for adoption on its *Our Foxes* webpage and updated the website's homepage to read:

We do not have farm in USA and only help with ordering and transportation of tame foxes directly from farm in Siberia to your door in USA. This is an additional and expensive service where we assume all transportation risks. We will return 100% of your deposit if we fail to deliver a tame fox (of your choice) to your door within 90 days. HOW TO ORDER FOX IN USA? Download file in JPG format (2011c).

By downloading the listed .jpg image, one could view a step-by-step process on how to purchase a fox through SibFox. This image listed three steps with written directions, screenshot images from SibFox's website, and URLs that linked to various pages on the *SibFox* website. The *How to purchase a fox?* .jpg image can no longer be found on the *SibFox* website.

On June 4, 2011, Kay Fedewa, a fox-lover and freelance artist, posted to the *Sybil's Message Board* forum titled, *SIBFOX SCAM and domestic fox discussion* stating, "I'm getting my baby in mid-August. :)))) SO EXCITED. I think I'm going with the name Viktor." Several members of the exotic pet community suspected that SibFox was not a legitimate company and was trying to set up a scam. Fedewa responded, "What exactly makes you think it's a scam? I have a contract from them saying they will be delivering my fox to me in August or I get my money back." Fedewa was most likely referring to the *SibFox Purchase Contract* found on the *SibFox* website. On June 7, 2011, Fedewa included, "I'm in direct contact with David Garside from SibFox (who the Russian institute themselves refer you to if you inquire about purchasing from the U.S.)"

As the months passed, Fedewa explained that vaccination and documentation complications postponed the arrival of her new fox pup, but the institute and SibFox were keeping her updated with the schedule changes (2011 September). On October 5, 2011, Fedewa posted on the forum that she had obtained Viktor's passports and specimen documentation from the institute. The documents mentioned that Viktor had originally been named, "Antoshka" at the Institute and was born on April 3, 2011, was microchipped on the left side of his neck, and was documented as a "Standard red, with small white tie." In an interview in 2012, Fedewa later explained that the Institute

combines the names of the parents to create names for the offspring which can result in some odd name combinations (Jacobs 2012).

Sadly, on October 30, 2011, Fedewa wrote on the forum, “My heart is broken. The day they were supposed to arrive in the U.S. I receive this in my inbox.” After her statement of sorrow, Fedewa posted a copy of the email that she had received that read:

Kay,

Foxes arrived in US, but unfortunately there were multiple problems with the foxes and [the United States Fish & Wildlife Service] USFW didn't allow them in USA. Problems included issues with transportation (cages used) and health conditions - foxes had high temperature and veterinary inspection showed that due to neutering surgery done poorly, foxes are having health complications. At this time foxes are in quarantine (sp) and USFW ordered their shipment back to Russia with all associated charges (quarantine (sp), veterinary care, transportation to Russia) to be billed to SibFox.

Due to the fact that we are unable to deliver you a fox in a reasonable timeframe - a 100% of your deposit will be returned to you via overnight mail. Please see attached a copy of cashier's check #9438003871 issued to your name, which will be mailed today - a FedEx tracking number is 797680690044.

I would like to sincerely apologize on behalf of SibFox team, but unfortunately there is nothing we can do to change the situation in any way. At this time we are re-considering our business relationship with the Institute as an unreliable business partner.

-David (Fedewa 2011 October 30a)

In the same forum post, Fedewa explained that she responded to David Garside asking him several questions such as where the foxes were located, who was holding them, and how she could get ahold of their captors and pleaded that she was willing and able to provide medical care for the foxes. She then posted the second email that she received from Garside:

Kay,

Due to medical condition foxes were not allowed on a flight, but due to USFW order they can't stay in USA, therefore we used the only remaining option and signed a USFW form 3-2096 transferring foxes to be a government property - we were told they will be transferred to a zoo, but we will not have access to information what zoo or any other details. As of now, the foxes do not belong to us anymore.

We feel your frustration and are also deeply concerned with the situation.

Unfortunately, SibFox experienced a very poor communication and low reliability with the Institute promises and actions, which resulted in this situation, as well as our severe financial loss (the Institute received a full payment for foxes and their transportation to US).

This is all the information we can provide.

-David (Fedewa 2011 October 30a)

According to the USFW *Fish and Wildlife Service Law Enforcement* document, the USFW form 3-2096 that Garside referred to is called a *Fish and Wildlife Abandonment Form*. Stated in *Chapter 1 Wildlife Inspection Policy and Procedures, Part 443 Wildlife Inspection, Section 1.17 What do Service officers do after they refuse*

*clearance of a shipment?*, *Subsection B.3 Seizure of Wildlife with Opportunity to Abandon* in the 2008 USFW policy: “Service officers may allow importers/exporters to abandon property interest in the seized items to the Government” (p. 12). Garside’s comment that the foxes were most likely transferred to a zoo also follows the policy described in *Chapter 1 Wildlife Inspection Policy and Procedures, Part 443 Wildlife Inspection, Section 1.18 How do Service officers care for and handle seized, abandoned, or forfeited wildlife?*, *Subsection A. Caring for seized live wildlife* in the USFW policy: “Service officers working in ports should develop contacts with local accredited zoos and aquaria, nature centers, and educational institutions to assist in the care of seized wildlife” (p. 13).

Fedewa ended her forum post stating that she once again asked Garside to provide information on where the foxes were located only to receive this response:

Dear Kay,

Thank you for your letter. Unfortunately, David is no longer with SibFox team.

We will not be able to provide information you're requesting.

-Alex Smith (Fedewa 2011 October 30a)

In a later post on October 30, 2011, Fedewa posted that she asked Smith why she wasn’t allowed more information on the foxes’ whereabouts only to receive another disappointing email:

Because foxes are not SibFox property anymore and they are not at port of entry anymore. Foxes are government property now and they were transferred to another facility (we do not have any information on what facility, where, etc.).

We were told by USFW that there is no and will be no additional information.

Please understand that we (SibFox) have not even seen the foxes - due to condition they arrived. Now we have to reimburse all customers, but the Institute considers this to be a SUCCESSFUL sale (because they believe that they SOLD foxes to SibFox and as long as foxes arrived to US - that's done deal) and they specifically stated that they will NOT take any responsibility for what happened. -Alex Smith (Fedewa 2011, October 30b).

On November 22, 2011, Fedewa returned to the forums to post a series of emails that she had sent and received in order to find out what had happened with her fox. On October 29, 2011, she had received an email from the Operations Supervisor of the Dallas-Fort Worth Airport located in Texas:

This was rejected by the Texas Department of Wildlife, due to state regulations, Nevada has a similar ruling.

This was not rejected by US Fish and Wildlife. Due to the State regulations we are being directed to send them [the foxes] back to DME. They will be re-exported on BA192/29OCT under new master awb 125-8090 6910. Please advise ok to forward ASAP. The prohibition to ownership of foxes in both Texas and Nevada was a surprise to all but unfortunately there is no possibility of obtaining a waiver and thus the animals MUST be returned (Fedewa November 2011).

The Operations Supervisor referred to the Texas Department of Wildlife's *Parks and Wildlife Code* as prohibiting the ownership of foxes in Texas. Under *Title 5. Wildlife and Plant Conservation, Subtitle C. Fur-Bearing Animals, Chapter 71. Licenses and Regulations, Section 004. Prohibited Acts* the code states:

(a) No person may take, sell, purchase, or possess a fur-bearing animal [wild beaver, otter, mink, ring-tailed cat, badger, skunk, raccoon, muskrat, opossum, fox, or nutria], pelt, or carcass in this state, except as provided by proclamation of the commission.

This law is also stated in the *Texas Administrative Code, Title 31 Natural Resources and Conservation, Part 2 Texas Parks and Wildlife Department, Chapter 65 Wildlife, Subchapter Q Statewide Fur-Bearing Animal Proclamation, Rule 376 Possession of Live Fur-Bearing Animals:*

(a) No person other than the holder of a fur-bearing animal propagation license may possess a live fur-bearing animal [wild beaver, otter, mink, ring-tailed cat, badger, skunk, raccoon, muskrat, opossum, fox, or nutria] at any time, except as otherwise provided in this chapter.

Fedewa also reported in her forum post (2011 November), receiving an email from USFW Office of Law Enforcement Wildlife Inspector, Ricky Brooks, on October 29, 2011:

The state of Texas, where the foxes arrived, and also the state of Nevada, said to be their final destination, both require permits to import foxes and these permits are issued for limited purposes. The importer did not have permits from either state and has been offered the opportunity to return the foxes as violating the state laws would also be a violation of federal law under the Lacey Act (Fedewa 2011 November).

*Title 5. Wildlife and Plant Conservation, Subtitle C. Fur-Bearing Animals,  
Chapter 71. Licenses and Regulations, Section 005. Licenses required of the Texas Parks  
and Wildlife Code states:*

- (c) No person may capture or possess a live fur-bearing animal [wild beaver, otter, mink, ring-tailed cat, badger, skunk, raccoon, muskrat, opossum, fox, or nutria] for any purpose, except as otherwise authorized by this code, unless he has acquired and possesses a fur-bearing animal propagation [person who takes or possesses a living fur-bearing animal and holds it for the purpose of propagation or sale] license.

*Title 31 Natural Resources and Conservation, Part 2 Texas Parks and Wildlife  
Department, Chapter 65 Wildlife, Subchapter Q Statewide Fur-Bearing Animal  
Proclamation, Rule 378 Statewide Fur-Bearing Animal Proclamation of the Texas  
Administrative Code reads:*

- (a) No person may import live fur-bearing animals [wild beaver, otter, mink, ring-tailed cat, badger, skunk, raccoon, muskrat, opossum, fox, or nutria] into this state from another state or country unless:
  - (1) A permit has been issued by the department for such importation and a copy of the completed permit accompanies any live fur-bearing animal being imported or is attached to any container used to import live fur-bearing animals;
  - (2) The imported animals are accompanied by a health certificate signed by a veterinarian accredited in the state of origin; and

(3) If the imported animals are foxes, raccoons, or skunks, a signed letter of authorization issued by the Texas Department of Health.

Because foxes are considered fur-bearing animals in Texas, only those with a Fur-bearing Propagation Permit may possess them. Clearly stated in the Texas Parks & Wildlife's *Guidelines for Propagating Live Fur-Bearing Animals*, "A Fur-bearing Propagation Permit does not authorize individuals to possess live fur-bearing animals as pets. This IS NOT a 'pet permit'" (p. 1).

Lastly, according to *Chapter 503 – Hunting, Fishing and Trapping; Miscellaneous Protective Measures, Section 110. Restrictions on importation, transportation and possession of certain species of the Nevada Administrative Code:*

1. Except as otherwise provided in this section and NAC 504.486 [A person who holds an exhibitor's license issued by the Animal and Plant Health Inspection Service of the United States Department of Agriculture may exhibit in this State wildlife listed in that license, for not more than 90 days, without obtaining any license or permit issued by the Department for the possession, transportation, importation or exportation of that wildlife], the importation, transportation or possession of the following species of live wildlife or hybrids thereof, including viable embryos or gametes, is prohibited:

...

- (9) Foxes: All species in the genera *Vulpes*, *Fennecus*, *Urocyon*, *Alopex*, *Lycalopex* and *Pseudalopex*

USFW Office of Law Enforcement Wildlife Inspector Brooks stated that the foxes were unable to be retrieved because it would be a violation of the Lacey Act. According to the *United States Code Annotated. Title 16. Conservation. Chapter 53. Control of Illegally Taken Fish and Wildlife:*

The Lacey Act provides that it is unlawful for any person to import, export, transport, sell, receive, acquire, or purchase any fish or wildlife or plant taken, possessed, transported, or sold in violation of any law, treaty, or regulation of the United States or in violation of any Indian tribal law whether in interstate or foreign commerce. All plants or animals taken in violation of the Act are subject to forfeiture as well as all vessels, vehicles, aircraft, and other equipment used in the process.

From these emails, it appeared that SibFox Inc. did not have the proper licenses and required documentation to import foxes into the states of Texas or Nevada. When the domesticated foxes from the ICG's Farm-Fox Experiment were imported into Texas from Russia through the Dallas-Fort-Worth Airport, SibFox was required to sign a USFW *Fish and Wildlife Abandonment Form 3-2096* that forfeited the animals to the Texas Government due to a lack of required documentation and proper cages to import foxes. Because of the Lacey Act and Texas' state laws, nothing could be done to regain possession of the foxes.

At the end of her November 22, 2011 forum post, Fedewa posted a final email that she had received on November 1, 2011, this one again from USFW Office of Law Enforcement Wildlife Inspector, Ricky Brooks: "The foxes have been transferred to a zoo. I think the one fox may need further medical care but the zoo is providing." Fedewa

was desperate for more information as she still didn't know the whereabouts of the foxes. She pleaded for help from other members of *Sybil's Message Boards* in order to scout all of the zoos in the state of Texas for any new red fox arrivals. She was worried that she would lose track of her fox and was concerned by the apparent need of medical condition for one of the foxes (Fedewa 2011 November). Fedewa later explained in a 2012 interview that custom-built steel transport cages are required by airline regulations to import foxes in order to ensure the health and safety of the animal (Jacobs 2012). One of the foxes was most likely sick because of SibFox's disregard of using the appropriate transport cage.

Finally, in December 2011, Fedewa found her fox. On December 1, 2011, the Austin Zoo and Animal Sanctuary posted a photograph of two red foxes with a status update on its *Facebook* social media page that read:

Meet our newest arrivals - Russian Red Foxes Mikhail and Nikolai. Mik and Nik were born in early April this year in Russia at a farm that raises foxes and sells them as pets. Mik and Nik were purchased online and shipped by air to Texas. When they arrived at airport customs, they were confiscated by the authorities as it is not legal to have them as pets in Texas. The authorities contacted us to see if we had space to accept Mik and Nik. Here they are lounging in their temporary indoor enclosure while we complete their new outdoor space.

Refer to Figure 3 for a photograph of Mikhail and Nikolai, the two red-colored red foxes from the Institute of Cytology and Genetics' Farm-Fox Experiment in their permanent enclosure at the Austin Zoo and Animal Sanctuary located outside of Austin, Texas taken in June 2014 by Noelle Brooks. This is not the photograph posted by the Austin Zoo and Animal Sanctuary its *Facebook* social media page.



**Figure 3. Mikhail and Nikolai the Red-Colored, Domesticated Red Foxes.** Mik and Nik have become permanent residents at the Austin Zoo and Animal Sanctuary in Austin, Texas. Photographed by Noelle Brooks in June 2014.

Fedewa was thrilled to learn of her fox’s whereabouts and tried all that she could to regain possession of him. On December 6, 2011 after contacting several different agencies about the situation, Fedewa began to lose hope as she posted to the forum, “The problem is that they [the Austin Zoo and Animal Sanctuary] are fully within the law to keep the foxes. I have no legal right to them.” According to the Lacey Act, Fedewa was correct in that the foxes were confiscated government property and could never be repossessed by a private individual.

Later that day, Fedewa changed her focus from reacquiring a fox from the Austin Zoo and Animal Sanctuary with a new forum post. “Its funny timing; today you guys find

Viktor for me, and today the institute sends me a photo of a red female who is all ready for exportation,” she wrote, posting an image of a female red fox afterwards. “My [United States Department of Agriculture] USDA guy and I could fly over there next month and get her if I wanted.” In a final post that day, Fedewa decided to allow Viktor to remain with the Austin Zoo and Animal Sanctuary. “I think I need to resign myself to the idea that Viktor will be there forever...” she wrote. “As long as he is in a good place, which he seems to be, I suppose I can move on...”

To this day, the Austin Zoo and Animal Sanctuary is home to Nikolai and Mikhail, the Russian domesticated red foxes from the Institute of Cytology and Genetic’s Farm-Fox Experiment. Oddly, the zoo has not housed Mik and Nik with the other wild, red and gray foxes on display, but instead built them an entirely separate enclosure in a completely different area of the zoo. Attached to the fence of Mik and Nik’s interactive, permanent enclosure rests a yellow informational sign that reads:

Mikhail and Nikolai were purchased by an individual from a website that sold foxes which were bred to be pets. Upon their arrival to the US from Russia, they were confiscated by customs, as it is not legal to own Red foxes in Texas. A warden from Texas Parks and Wildlife Department contacted us for help to provide these foxes a new home (Brooks 2014).

Refer to Figure 4 to read the entire yellow Austin Zoo and Animal Sanctuary *Russian Red Foxes* Informational Sign.



**Figure 4. Austin Zoo and Animal Sanctuary *Russian Red Foxes* Informational Sign.** Photographed by Noelle Brooks.

In a forum post written on January 8, 2012, Fedewa expressed that “the zoo doesn’t fully understand what they have. They probably had never heard of the experiment prior to this and still might not really know.”

In a 2013 video created by the Austin Zoo and Animal Sanctuary titled *Austin Zoo and Animal Sanctuary on Nationwide Syndicated Animal Rescue*, manager and guest

relations, Toni Alberty expressed one of the most important goals of the zoo: “to educate people as to why they do not want to own any type of exotic animal as a pet. These animals were never meant to live in homes or be pets.” In a 2013 video titled *Austin Zoo - Mik and Nik – Russian Red Foxes*, she directly comments on the Russian domesticated foxes. Although Alberty explains the experiment performed by the Institute of Cytology and Genetics and addresses the purpose of the Farm-Fox Experiment, to selectively breed foxes for positive reactions toward humans in order to domesticate the species, she ends the video with the final statement, “Beautiful animals, but never meant to be a pet.” Unfortunately, these videos have since been removed from the Austin Zoo and Animal Sanctuary’s *YouTube* social media page, but the video focusing on Mik and Nik is still available on its video creator, Tiny Courage’s *YouTube* page.

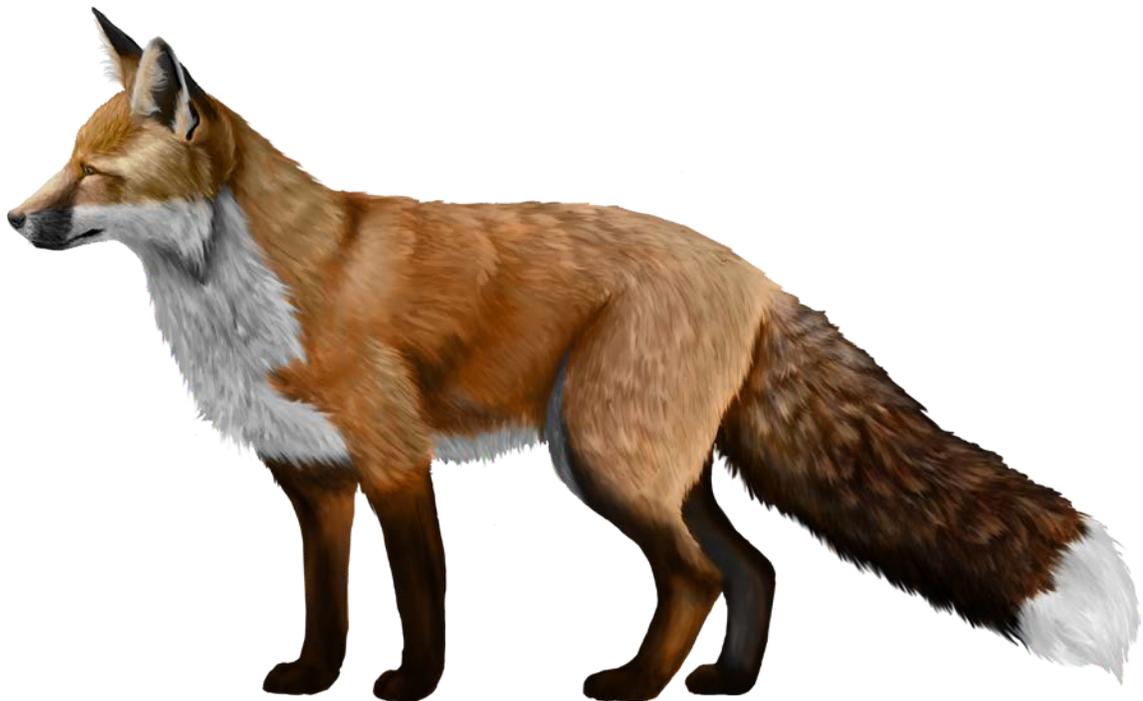
As for SibFox, on February 27, 2012, Fedewa posted to the *Sybil’s Message Board* forum, “I got SibFox to take down their site.” In November 2011, SibFox had removed all content from its website that claimed the company to be an importer of the Russian domesticated foxes and then claimed the company to be an “informational resource,” but by March 2012, the site was completely removed and no longer accessible. SibFox has since ceased all business with the Institute of Cytology and Genetics and no longer has an Internet presence.

Currently, the Institute of Cytology and Genetics’ *Laboratory of Evolutionary Genetics of Animals* page no longer lists SibFox Inc. as the official United States importer of the foxes, and has replaced the previous statement with the following statement: “To receive the information about purchasing of our domesticated fox pups as pets, please contact us: [trut@bionet.nsc.ru](mailto:trut@bionet.nsc.ru), [shpak67@mail.ru](mailto:shpak67@mail.ru).”

### Michigan Community Forces Relocation of Anya the Domesticated Fox

After losing her fox, Viktor, to the Texas government because of state laws on fur-bearing animals, Kay Fedewa began to turn her sights on a new Russian domesticated fox at the Institute of Cytology and Genetics. On December 7, 2011, Fedewa posted to the *Sybil's Message Board* forum titled, *SIBFOX SCAM and domestic fox discussion*, about the new fox, “The female’s name is Anya. She is 8 months old (same age as Viktor) and related to him. Over the summer she was taught tricks like a dog. She is described as being very friendly toward people and incredibly clever.”

Refer to Figure 5 for an illustration of Anya, the red-colored, domesticated red fox.



**Figure 5. Anya the Red-Colored, Domesticated Red Fox.** Illustrated by Noelle Brooks.

On November 12, 2012, The Siberian Times wrote an article about Anya and her summer training. Irina Mukhamedshina, a PhD student at the Institute of Cytology and Genetics with experience training dogs, spent time training Anya, (sometimes called Anna or Nyuta) and Elma, two of the institute's domesticated foxes. "I had seen these foxes daily, wiggling their tails and jumping to get a tiniest bit of human attention, and got really curious about the possibility of working with them the same way as I used to do with dogs," she told the Siberian Times. "My first task was to make them forget about digging the soil and running around, but instead to encourage them to consciously come close to me," she explained. "Then I moved on to the classic commands, such as 'stand up', 'lie down', 'sit down'. It took me about three weeks of daily 15 minutes sessions to teach them do these commands" (The Siberian Times 2012).

In PRI's The World's report on March 20, 2014 (Cleek 2014), Irina Mukhamedshina is noted for training a new fox, Viliya. Irina stresses to The World that even though a fox can be trained to obey commands, it doesn't have the concentration of a dog. She describes Viliya as "disobedient and not totally house-trained" (Cleek 2014).

Fedewa decided to pursue Anya and acquired the help of USDA-certified exotic animal importer, Mitchel Kalmanson and veterinarian, Renee Baker, of the World Wide Exotic Animal Talent Agency, LLC., Certificate No: 58-C-0505, located in Maitland, Florida (USDA, 2015). On December 7, 2011 she posted to the *Sybil's Message Board* forum, "I have decided to try and adopt Anya. I have my USDA friend arranging importation documents as we speak. We plan to fly there, pick her up, and bring her back so that she never leaves our possession." After arrangements were made, Kalmanson traveled to Russia without Fedewa to collect Anya and personally accompanied her

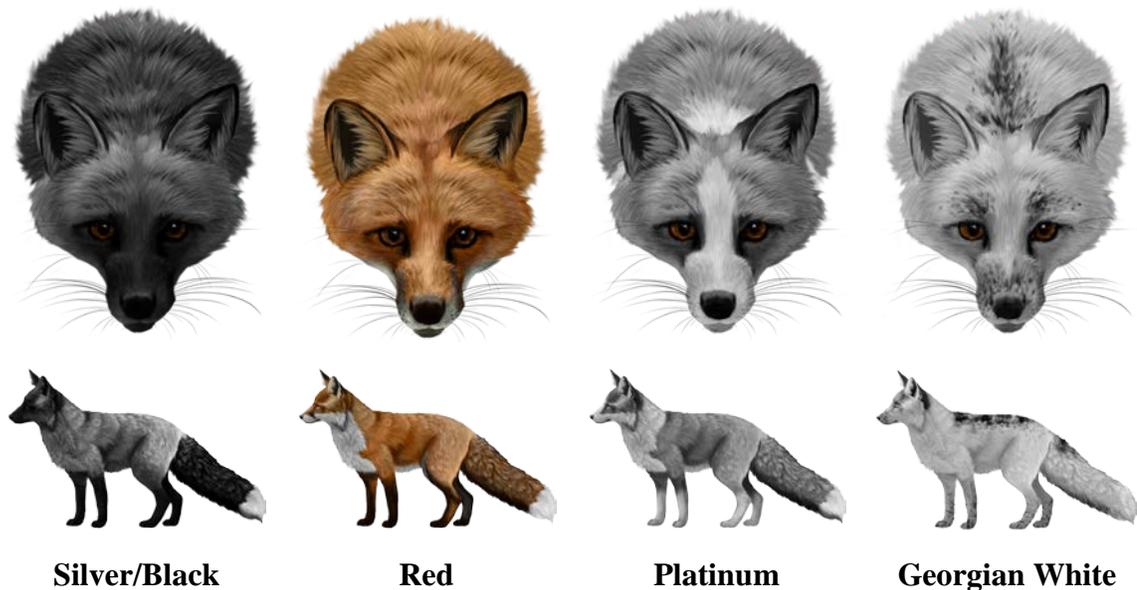
during her flight to the United States. “It’s like a 30 hour each way trip and I’d have to take off too much work so I’m not going,” explained Fedewa in a forum post on February 6, 2012. On February 17, 2011, Anya became the first Russian domesticated fox to be successfully imported into the United States (Fedewa 2012 February 2a).

Shortly after Anya was successfully imported, Fedewa posted a new forum on February 21, 2012 on *Sybil’s Message Board* stating, “Due to our success, the Russian institute would like to have Mitch (my importer) and I take over the operation of distributing domestic foxes to homes all over the world.” She created *The Domestic Fox: Bringing Russian Domestic Foxes to Homes around the World*, a website dedicated to informing people about domesticated foxes and providing answers of how to acquire the animals and began taking orders for future fox purchases (Fedewa 2012 February 2b).

Every year, Mitchel Kalmanson makes annual trips in the fall to the Institute of Cytology and Genetics to personally escort Russian domesticated foxes into the United States as imported exotic pets. On the *Russian-Siberian Domestic Fox* page of his website *Lester Kalmanson Agency Inc.*, located at [www.lkalmanson.com](http://www.lkalmanson.com) (World Wide Exotic Animal Talent Agency, LLC. 2014), one can find information about owning these animals as pets and placing an order. Four color choices are listed: silver/black, red, platinum, and Georgian white, and either sex, male or female, can be purchased. The final purchase price is \$8,900.00, no matter the color or sex chosen. \$3,200.00 is paid to the Institute of Cytology and Genetics for the purchase of the fox, and \$4,800.00 is paid in transportation fees. A non-refundable deposit of \$1,250.00 is required and 50% of the balance must be paid before shipment (World Wide Exotic Animal Talent Agency, LLC. 2012). In a 2012 interview, Fedewa explained that the institute’s fees include vaccination,

sterilization, microchipping, and the cost of the animal, while the transportation fees include transportation of the fox and Kalmanson as he personally escorts the fox, a custom-built steel transport cage for the fox to meet airline regulations, documentation, preparation, fees, and licenses (Jacobs 2012).

Refer to Figure 6 for images of the four red fox colors available for purchase from the Institute of Cytology and Genetics and through World Wild Exotic Animal Talent Agency, LLC.



**Figure 6. Four Red Fox Colors Available for Purchase from the Institute of Cytology and Genetics.** Illustrated by Noelle Brooks.

Kalmanson has successfully imported several foxes into the United States including Anya, Arsi, and Dasha, three red-colored foxes, Pusha and Prada, two platinum-colored foxes, Dante and Elga, two silver-colored foxes, and Dior, a Georgian white-colored fox (Fedewa 2013). “They’re just like any dog. It’s quite fascinating that

we're able to train them to sit, stay; they'll fetch they're balls, they'll play with you," he told ABC News. "You can fall asleep on the couch watching TV with a fox next to you; it won't hurt you" (ABC News 2013).

Although Anya was successfully imported into the United States on February 17, 2011, she was not immediately able to live with Kay Fedewa in her home state of Michigan. "Anya won't be coming to Michigan for a while," Fedewa posted to the *Sybil's Message Board* (2012, March). "My importer has a facility outside of Orlando where Anya will be living until the [Michigan Department of Natural Resources] DNR gets around to issuing my permit." Anya lived with Kalmanson in Florida until Fedewa was able to acquire the proper documentation to own a pet red fox in the state of Michigan (Fedewa, 2012 February 10).

According to *Chapter 324 Natural Resources and Environmental Protection, Act 451 Natural Resources and Environmental Protection Act, Article III Natural Resources Management, Chapter 2 Management of Renewable Resources, Subchapter 1 Wildlife, Division 1 Wildlife Conservation, Part 401 Wildlife Conservation, Section 40106 Game or protected animal; taking, releasing, transporting, selling, buying, or possessing; construction of section.* of the *Michigan Compiled Laws*:

A person shall not take, release, transport, sell, buy, or have in his or her possession game [any species of wildlife designated by the legislature or the natural resources commission as game under section 40110, including fox] or any protected animal, whether living or dead, or parts of any game or protected animal, from this state or from outside of this state, except as provided for in this part or by an order of the department or an interim order of the department.

*Chapter 324 Natural Resources and Environmental Protection, Act 451 Natural Resources and Environmental Protection Act, Article III Natural Resources Management, Chapter 2 Management of Renewable Resources, Subchapter 1 Wildlife, Division 1 Possession, Sale, Regulation of Wildlife, Part 427 Breeders and Dealers, Section 324.42710 Orders; rules.* of the Michigan Compiled Laws gives the Michigan Department of Natural Resources (DNR) the ability to issue orders:

- (1) The department may issue orders considered necessary by the department to protect the public interest and to provide for the proper administration of this part. Orders under this part shall be issued according to the procedure for the issuance of orders provided for in part 401.
- (2) The department may promulgate rules designating certain game that do not require protection under this part and that may be possessed, propagated, purchased, or sold without a license.

Following this law, *The Captive Wild Animal Order* of Michigan states:

Under the authority of section 42710, Act 451 of the Public Acts of 1994, as amended, being section 324.42710 of the Michigan Compiled Laws, the Director of the Department of Natural Resources ordered that effective March 11, 2005, the following regulations shall read as follows:

...

#### 20.3 Permits.

Sec. 20.3. (1) Except as provided by section 20.4, only a person who has submitted an application to the wildlife division permit specialist for a permit to hold wildlife in captivity, being form PR 1350, in accordance

with the instructions on that form, and who possesses a valid permit to hold wildlife in captivity shall be considered, for the purposes of subsection 42709(2) of part 427, breeders and dealers, of the natural resources and environmental protection act, Act No. 451 of the Public Acts of 1994, being subsection 324.42709(2) of the Michigan Compiled Laws, "persons holding permits authorizing the possession of the game" or "licensed game breeders." A person possessing or desiring to possess migratory birds, such as ducks or geese, shall comply with all federal regulations and permit rules in addition to state of Michigan regulations. This includes the physical marking of waterfowl by removal of the hind toe on the right foot of each bird before it reaches the age of 4 weeks or by other federally approved marking methods.

The referenced "form PR 1350" refers to the Michigan DNR's 2014 *Form IC1350-1 Permits to Hold Wildlife in Captivity*. This form further describes details of possessing foxes as pets. "Permits to Hold Wildlife in Captivity authorize the possession of animals reared in captivity only," it states, assuring that the permits "do not authorize the possession of animals taken from the wild" (p. 1). The form continues:

A Permit to Hold Wildlife in Captivity is required to possess, propagate, sell, transport, or make any other commercial or personal use of live animals defined as game or protected in Michigan. In addition, a Permit to Hold Wildlife in Captivity is required for the possession of live animals which closely resemble game or protected species and can reasonably be confused with game or protected species as determined by the Department (DNR 2014, p. 1).

The Michigan DNR's 2014 *Form IC1350-1 Permits to Hold Wildlife in Captivity* also specifically mentions the possession of particular foxes as it states:

A Permit to Hold Wildlife in Captivity is also required for the possession of the species listed within the following groups: ducks (all North American species except properly marked mallards), fox (red, gray, and silver), geese (all North American species), Grouse (ruffed and sharp-tailed), pheasants (ring-necked, Sichuan, and look-a-likes from the genus *Phasianus* per Types of Pheasants Regulated), swans (mute and tundra) (DNR 2014, p. 1).

Unfortunately, a permit wasn't the only obstacle preventing Fedewa from finally possessing her Russian domesticated fox. On January 9, 2012, Fedewa created a new forum on the *Sybil's Message Boards*, titled *Sigh...neighbors*, explaining that she had decided to inform her neighbor that she would be adopting a domestic fox in order to create an open relationship with her neighbor and not surprise her with the appearance of a wild animal being kept on the property. Unfortunately, Fedewa had disappointing news to report. "Now that she knows that's what the enclosure [I'm building] is for, she is interfering with construction, harassing my construction guy, and getting into my business," Fedewa wrote. On January 10, 2012, Fedewa had more to report, stating that her neighbor was continuing to harass her hired construction worker while she was away, proclaiming that Fedewa shouldn't be allowed to have the fox and that it probably wasn't legal to possess.

"There are no county or city ordinances that are contrary to the State laws regarding this animal or any exotic animals," Fedewa wrote (2012 January 9). "Actually in their Ordinance Code Definitions the fox isn't even an exotic animal since the species

is native to Michigan.” Fedewa was referencing the *Farmington, Michigan – Code of Ordinances, Part II – Code of Ordinances, Chapter 35 –Zoning, Article 21. – Definitions, Section 35-252. – Definitions* as of March 19, 2012 which stated:

*Animal, domesticated:* Any animal that is commonly considered capable of being trained or is capable of adapting to living in a human environment and being of use to human beings, and which is not likely to bite without provocation, nor cause death, maiming or illness to human beings, including: birds (caged), fish, turtles, rodents (bred, such as gerbils, rabbits, hamsters or guinea pigs), cats (domesticated), lizards (nonpoisonous) and dogs. Wild, vicious, or exotic animals shall not be considered domesticated.

*Animal, exotic:* Any animal of a species not indigenous to the State of Michigan and not a domesticated animal, including any hybrid animal that is part exotic animal.

On January 11, 2012, Fedewa reported on the *Sybil’s Message Boards* that her neighbor had called the city about Fedewa’s plans to house a wild animal on her property. In response, the city had posted a notice at the construction site ordering construction to cease. After speaking with the head of zoning, Fedewa was given a meeting the following day with the head of zoning and an attorney to discuss the situation. Fedewa wrote that her neighbor had been telling all members of the community about the wild animal, including the neighborhood watch. “I’m going to have to go to the next neighborhood watch meeting to explain to people that my fox is not wild or vicious and is no threat to anyone,” Fedewa lamented on the forum. “I am going to have to do everything you guys suggested to keep security as tight as possible and make sure no one tries to sabotage the

enclosure or hurt Anya. I am amazed what people will do out of ignorance and fear” (Fedewa 2012, January 11).

After receiving a cease and desist order, even Fedewa’s builder began to feel uncomfortable about the fox. On January 22, 2012, Fedewa wrote, “Prior to the building inspector knowing it was for a fox, he had approved the enclosure. Now that he knows what it’s for and that a neighbor complained, he's made me stop building.”

Despite everything, Fedewa was able to work things out and on February 6, 2012, she declared that her enclosure was complete and that she had submitted an application for a state permit. “If my neighbor would not have interfered with construction, I could have had my permit by now,” she commented. She also mentioned that she had an appeal with the Farmington Zoning Board on March 2, 2012 and would be attending a Town Council meeting on February 13, 2012, in which the approval of a ban on the ownership of exotic animals would be discussed. “If a ban passes, I will be looking for a house in a different city,” she concluded (Fedewa 2012 February 6).

Before Anya could live in Michigan, Fedewa needed to acquire the appropriate Michigan Permit to Hold Wildlife in Captivity (DNR 2014). On January 13, 2012 on *Sybil’s Message Boards*, she had posted, “My enclosure is half finished. I can’t get my permit to allow me to bring Anya into the state until I have my enclosure inspected. Then, it will take up to a month or so for the government to approve and prepare and send to me my permit.” On February 27, 2012, Fedewa posted to the *Sybil’s Message Boards* that she was having difficulties obtaining her DNR permit. She explained that a DNR officer had arrived at her home to inspect her fox enclosure in order to approve her permit, but she wasn’t at home and the inspection was not able to take place. “Now they aren’t

returning my calls. Called 10 times today,” she wrote (2012 February 27b). “If I would have been here, he would have done the inspection and I’d have my permit in time to bring her [Any] home this weekend” (2012 February 27a).

In *The Captive Wild Animal Order* of Michigan, having the appropriate enclosure for an exotic pet and receiving inspections from DNR officers is mentioned:

20.5 Enclosures and sanitation; mute swan requirements.

Sec. 20.5. (1) Except as provided by subsection (2), animals held in captivity shall be confined to the licensed premises at all times. Animals shall not be chained or otherwise tethered to stakes, posts, trees, buildings, or other anchorage. Each animal shall be provided with an enclosure which meets the requirements of section 20.6, and shall be provided with rainproof dens, nest boxes, shelters, perches, and bedding as required for the comfort of the species held in captivity and to protect them against inclement weather or extreme heat. Animals in captivity shall be handled in a sanitary and humane manner and kept free as far as practicable from parasites, sickness, or disease. Permittees shall provide an enclosure of such strength and type of construction that it is impossible for the animals to escape, and shall keep all fences and enclosures properly repaired.

...

20.6 Enclosure size and amenities, requirements.

Sec. 20.6. The minimum enclosure size and required amenities for the species designated in this section shall be as follows, except that newborn mammals may remain with their parents until weaned:

Enclosure size; badger, bobcat, fox, and raccoon.

(1) Badger, bobcat, fox, or raccoon:

(a) Single animal: 8 feet long by 6 feet wide by 6 feet high.

(b) For each additional animal, increase horizontal cage size by 24 square feet.

(c) Clawing logs and a den site 2 feet by 2 feet by 2 feet high required for each animal.

(d) A climbing tree with 3 or more 4-inch diameter branches shall be available for each raccoon or bobcat. A 14-inch by 36-inch protected shelf area shall be provided for each animal. Bobcat or raccoon platforms shall be at least 3 feet above the floor; fox and badger platforms shall be 1 foot above the floor.

...

Inspections.

(14) A conservation officer or other representative of the department of natural resources may inspect the premises, pens, animals, records, and facilities of a permittee at any reasonable time.

On February 28, 2012, Fedewa had a new update posted on the *Sybils Message Board*. She explained that she called the DNR office about rescheduling a new inspection and was told that she needed a city permit in order to possess a fox as a pet because the city was in the process of approving a new ordinance banning the possession of exotic or wild animals as pets. Fedewa explained that she was aware of the new ban passing and was moving to a new home in a different city, but had received an exception from the city

until then. “On March 19<sup>th</sup>, I was meant to bring Anya to the City Council and introduce domestic foxes to them and explain why according to their own definitions she would be considered domestic and why she is not dangerous,” she wrote. “The City Council is expecting this and I have the City Manager’s permission to do this. I can’t get Anya into the state to bring her to the council meeting if I don’t have my state permit.” Fedewa was told that the city of Farmington would not approve her permit, so the state was not able to issue it (Fedewa 2012 March 1).

Fedewa was correct that the city of Farmington was working on approving a new ban on the possession exotic animals as pets. As of May 10, 2013, the *Farmington, Michigan – Code of Ordinances, Part II – Code of Ordinances, Chapter 35 –Zoning, Article 21. – Definitions, Section 35-252. – Definitions* had updated the description of an exotic animal from “any animal of a species not indigenous to the State of Michigan and not a domesticated animal, including any hybrid animal that is part exotic animal” (Farmington, Michigan – Code of Ordinances (2012 March 19). §35-252) to include a much greater variety and more in-depth description that included more animals, including foxes:

*Exotic or vicious animal:*

...

- (5) Non-domesticated carnivorous animals, including hybrid crosses of non-domesticated carnivorous, including, but not limited to, raccoons, skunks, and foxes.

“I bought another house in another city but the closing date isn’t for another month or so. At that point I will have to begin construction on another enclosure,”

Fedewa concluded. She would not be able to import Anya into Michigan until after she moved out of Farmington, built a new enclosure, had the enclosure inspected by the DNR, and had her Permit to Hold Wildlife in Captivity approved by the city and state (Fedewa 2012 March 1).

On May 3, 2012, Fedewa had good news to share with the forum. “Next weekend, on the 11th, 12 or 13, Anya will be coming home,” she declared. “I finally have the piece of paper which ‘qualifies’ me to own a fox.” Fedewa explained that she had re-applied for a new Permit to Hold Wildlife in Captivity after moving to a different city and building a new enclosure. An inspection was scheduled, then rescheduled, and the permit was finally approved. On May 15, 2012, Fedewa created a new forum post on *Sybil’s Message Board* announcing the successful acquisition of Anya. “I just wanted to say that Friday, May 11, Anya flew from Florida to Detroit and is now living with me!” she exclaimed.

After researching the Institute of Cytology and Genetics’ fox-farm experiment, Kay Fedewa became determined to own a Russian domesticated red fox. After her first attempt to import a fox into the United States failed and the fox was confiscated, she tried again, this time successfully importing the fox, but facing retaliation from her community, city, and state. After moving to an entirely different city, rebuilding a new enclosure for her fox and meeting all of the requirements to finally earn her Michigan Permit to Hold Wild Animals in Captivity, Fedewa was finally united with her pet (Fedewa 2012 May 15). She has since paved the way of importing Russian domesticated foxes into the United States and several foxes have since been imported (Fedewa 2013).

“After all the money she cost, I have been asked - do I feel like I made the right choice when I could have gotten a wild fox for a fraction of the cost?” Fedewa wrote in a post on May 30, 2012, referencing ranched foxes. “My answer is a definitive yes. I recommend a domestic fox.” Fedewa followed up with comments that Anya has a willingness to please that can be seen in dogs and that she knows her name and can be trained easily. “I’m pretty sure that the love for interaction with people that I see in her, which is one of the things that makes her such a fun pet, is something that will flourish even more if these animals are adopted at younger ages” (Fedewa 2012 May 30).

Unfortunately, Anya’s story does not end well. On September 26, 2014, Fedewa posted a status update on the *Facebook* social media page she had created for Anya. “To all of Anya’s friends, I must tell you now that our beloved and special Anya has passed away. She was mortally wounded by a coyote.” Fedewa explained that Anya’s outdoor enclosure that had been specially built to provide for Anya and had been meticulously crafted. “We took great pains during the construction to be sure nothing larger than a mouse and the occasional mole could get in or our [out] of her habitat. We kept it padlocked to make sure no strangers made off with her, either” (Fedewa 2014 September). Apparently, it was not built well enough.

Continuing in the 2014 *Facebook* post, Fedewa wrote that she had noticed canine bite marks on Anya’s muzzle one morning. “The only way this could have happened was if she stuck her muzzle through the holes of the chain-link and either a coyote or large stray dog on the other side bit her during the night.” Anya was immediately taken to the vet and her wounds were treated and disinfected. To prevent anything from happening again, a layer of chicken wire was stapled to the outside of Anya’s enclosure. “I folded

these sharp ends down with pliers but still felt like Anya could get snagged, or scraped, or her eye put out or something. So it was with that worry that I decided to put the chicken wire on the outside,” Fedewa wrote on *Sybil’s Message Boards* (2014 December). “I thought this would be sufficient. I was wrong. I underestimated the strength, intelligence and will of the animal that wanted to get Anya,” stated Fedewa.

A few months later, the animal returned and successfully killed Anya. Fedewa wrote in the 2014 *Facebook* post that police inspection had determined that a coyote had torn a hole through the chicken wire in order to get to Anya’s enclosure. In response, Anya must have put her front paw through the chain link fence to interact with the animal. The animal then grabbed Anya’s enticing paw and pulled her entire leg through the chain link fence with enough force to completely dismember it from Anya’s body. Anya lay in her enclosure and bled to death throughout the night.

“It’s a very hard thing to have had to come to terms with, and very hard to speak and write about,” Fedewa commented in the *Facebook* status update (2014). “The pain of finding someone you love like this is deep and hard to recover from. I wanted to protect her from all pain and suffering in her life. I couldn’t, and it is utterly heartbreaking.”

“I was always very proud of the design, workmanship and ‘no cut corners’ of my enclosure,” Fedewa wrote on December 20, 2014 on a forum post in *Sybil’s Message Boards*. She then recommended that outdoor fox enclosures be reinforced with 17 and up gauge welded wire on the interior side of the fence with no larger than 1 inch spaces between the wires. The Ohio Department of Natural Resources (ODNR) recommends using good fencing to reduce coyote predation, such as net-wire fencing with horizontal spacing at less than 6 inches (15 cm) and vertical spacing at less than 4 inches (10 cm)

(ODNR 2013). Fedewa has since reinforced the interior of her own outdoor enclosure with heavy gauge that has been proven too strong for coyotes to destroy. “If I had put the chicken wire on the interior, it would have done the job I’m pretty sure. It wouldn’t have been able to have been bitten away like that,” she reflected. “It was a hard, hard lesson I learned here, but hopefully it will be of use to prevent similar things from happening again to others’ beloved foxes.”

Anya’s story is one of challenge, strife, and heartbreak. It shows that in order to successfully own a fox as a pet, one must be incredibly well-researched. One must know and understand the state, city, and local laws and ordinances regarding the ownership of foxes as pets and must be prepared to defend himself and quote these laws when challenged. Even so, laws can change and one must be aware of these changes in order to protect his animals. The government and community are not the only enemies threatening a fox, however, as wild animals can also bring about harm to a restrained target. Fox owners must build enclosures that not only provide enrichment for the animal, but also safety and shelter. Despite everything Kay Fedewa and her pet Russian domesticated red fox Anya, went through, it was a wild coyote that ended their bond.

#### North Dakota Police Exterminate Vader the Ranched Fox

In December of 2012, Eric and Tara Hiatt (2013 August) contacted Tiny Tracks Exotic Animals LLC, a USDA-licensed breeding company, Certificate No: 32-B-0211, located in Auburn, Indiana (USDA 2015) about purchasing a ranch-raised pet fox. During the weekend of May 4<sup>th</sup>-May 5<sup>th</sup>, 2013, Tara Hiatt (2013 August) drove 1,500 miles, one-way, to purchase her new pet, a silver-colored morph of the red fox. Because of her husband’s love of Star Wars and the fox’s dark-colored coat, they decided on the name

“Vader” and started the blog, *May the Fox be With You* at [maythefoxbewithyou.tumblr.com](http://maythefoxbewithyou.tumblr.com). On her blog, Hiatt posted photographs of her exotic pet and answered questions about pet-fox ownership. Unfortunately, her blog may have resulted in the death of her pet.

Refer to Figure 7 for an illustration of Vader, the silver-colored, ranch red fox.



**Figure 7. Vader the Silver-Colored, Ranch Red Fox.** Illustrated by Noelle Brooks.

On February 21, 2014 the Minot Police Department of Minot, North Dakota released a press release announcing Vader’s death. On February 20, 2014, two police officers arrived at the home of Tara and Eric Hiatt to confiscate their silver-colored red fox pet. The police department reported that they had received an anonymous report that the animal was in violation of city ordinance and was a public health concern as it had been reported to have bitten someone who had contact with the animal.

Animal Control Officer (ACO) Tremblay and Senior Officer Clouse arrived on scene and informed the Hiatts that their possession of a fox was in violation of Minot City Ordinance 7-5 and that it would need to be confiscated throughout the entirety of the investigation. According to *Chapter 7 Animals and Fowl, Section 7.5 Keeping of certain animals prohibited; exception. of the Minot, North Dakota Code of Ordinances:*

(a) No person shall keep, maintain or harbor within the corporate limits of the city any of the following animals:

...

(08) Foxes; or hybrid;

...

(21) Any non-hoveled animal for which there is no approved rabies vaccine;

...

(29) Any animal commonly found in a zoo;

The press release (Minot Police Department 2014) reveals that while Animal Control Officer Tremblay attempted to detain the fox, the animal bit through his protective gloves and broke the skin on his hand and wrist. After impounding the canine, contact was made with the State Veterinarian, North Dakota Department of Health, and the Minot Veterinarian Clinic.

Jill Schramm of the *Minot Daily News* (2014) reported that a rabies vaccination certificate for Vader the fox was received by the Minot Police Department from a Rugby veterinarian Clinic, but the vaccination used was intended for ferrets and not guaranteed to prevent rabies in foxes. According to Vader's vaccination record, posted on *Facebook*

by his owner Tara Hiatt (2014) Doctor of Veterinary Medicine Richard Lagasse administered a “Ferret Rabies. X.” vaccine to Vader on August 15, 2013. In the press release (Minot Police Department 2014) the State Veterinarian was said to have stated that the Department of Health and Human Services Centers for Disease Control and Prevention (CDC) does not recognize a preventative rabies vaccine for foxes and declares, “The safety and efficacy of parenteral rabies vaccination of wildlife and hybrids have not been established, and no rabies vaccines are licensed for these animals” (CDC 2011, p. 9).

The CDC (2008) addresses terrestrial carnivore bites seriously and declares, “All bites by such wildlife [raccoons, skunks, and foxes] should be considered possible exposures to rabies virus” (p. 14). Official guidelines suggest that terrestrial carnivores “should be euthanized as soon as possible (without unnecessary damage to the head), and the brain should be submitted for rabies diagnosis” (p. 14).

Written in the press release, the Minot Police Department (2014) followed the CDC’s guidelines and authorized Vader the fox to be euthanized and tested for rabies. Vader was euthanized by the Minot Veterinarian Clinic on February 21, 2014 and was sent to the Department of Health for rabies testing on February 24, 2014.

In the “North Dakota Department of Health 2014 Epidemiology Report”, a total of 731 animals were reportedly tested for rabies in North Dakota. Ward County, containing the city of Minot, submitted 67 animals for rabies testing, including Vader the fox. Four animals tested positive for rabies, two cows, one skunk, and one cat. Although these results were preliminary when printed in December 2014, Vader the fox was tested for rabies in February 2014 and his results were most likely included in this publication.

These results suggest that Vader the fox was not among the animals that tested positive for rabies in the state of North Dakota in the year 2014.

According to the press release (Minot Police Department 2014), Tara Hiatt had contacted ACO Trembaly in July 2013 to inquire about the possession of foxes in city limits and was cited Minot City Ordinance 7-5 as prohibiting pet foxes within city limits. Beginning on July 8, 2013, Hiatt began posting on her blog about Vader's illegal status. She attempted to apply for a USDA exhibitor's license, but on July 18, 2013, she wrote on her blog that the city of Minot would not recognize the state permit in order to exempt her from the city's law.

The Minot Police Department (2014) also took note that a permit required by the State Board of Animal Health to transport animals across state lines was not obtained by Hiatt to allow her fox to be imported into the state. According to *Title 48 State Board of Animal Health, Article 02 Domestic Animal Importation Requirements, Chapter 01 General Importation Requirements, Section 10 All other animals.* of the *North Dakota Administrative Code*:

Importation of all animals not included in the preceding sections, [cattle, bison, sheep, swine, poultry, dogs and cats, horses, and skunks and raccoons] including domesticated wild animals, game animals, game birds and eggs of game birds, shall be accompanied by a permit issued by the North Dakota game and fish department or the board of animal health. The state veterinarian may require for the detection of any disease, tests and inspections upon any such animals and birds and eggs prior to importation and may deny importation if the results of such tests or inspections are other than negative.

The Minot Police Department (2014) cited Tara Hiatt, the primary caretaker of Vader the fox, for “Keeping Prohibited Animal in City Limits.” According to KX News (2014), she was also called to court in March 2014 and served with a small fine. “A citation is nothing,” states Tara Hiatt in The Huffington Post (Meredith 2014) “But the death of my pet has left me devastated...There was no warning. No chance to say goodbye.”

Hiatt fears that Vader’s Internet popularity may have been the cause of conflict (Meredith 2014). On September 13, 2013, Hiatt answered a question on her blog about negativity she receives from her community toward Vader. Neighbors have expressed fear towards Vader being near their children, licking their hands, coming close to their dogs, and walking on a leash in the neighborhood. On June 13, 2013, Hiatt wrote a post on her blog about an incident she had with one woman that resulted in Animal Control reporting to the scene. While walking Vader on a leash in the community park, Hiatt was approached by a woman and told to keep her “wild animal” away from the woman’s children because she feared her children contracting rabies. The woman threatened to call Animal Control and when Hiatt returned to her car in the parking lot, she found an Animal Control unit looking for her. An ACO approached Hiatt and Vader and announced that he had received a report on a “vicious wild animal in the park.” After explaining the situation, Hiatt was left with a warning to be aware of the community’s potential fear of her exotic pet.

Hiatt reported to The Huffington Post (Meredith 2014) receiving hate mail on her blog on many occasions, noting one message that threatened to fake a bite report. “My biggest fear is that someone who was upset about us having Vader called in a false report

simply to have him taken and killed.” The Minot Police Department correctly followed protocol in euthanizing Vader to test for rabies because he had bitten an animal control officer, but the officers would not have had contact with the fox had they not been investigating a bite report.

Captain John Klug of the Minot Police Department informed KX News that his team responded as they should. “It was a city ordinance violation that we were investigating. Whether [the fox] bit somebody or not, that animal is not allowed in the city limits. Our plan was not to go there, take the fox, and euthanize it. Our plan was to go there, take the fox, while we investigated the incident that was reported to us.”

“Had the police simply asked me to remove Vader from the city, I would have gladly done so,” states Hiatt in *The Huffington Post* (Meredith 2014). She feels that the police department had no right to enter her home without a warrant and attempt to confiscate her animal without catch poles or without the assistance of the owners. She believes that Vader’s death resulted from police error and could have been prevented. “There is nothing heavier than the empty collar that sits in my hand,” she lamented (Meredith 2014).

Vader’s case demonstrates the delicate state of owning a fox as a pet. Because the risk for rabies in wild animals is most common in raccoons, skunks, coyotes, foxes, and bats, the importation, distribution, translocation, and private ownership of these animals is highly regulated (USDA 2011). Those who wish to own a pet fox must be familiar with and abide by the exotic pet laws in their area, including state, county, and city laws or risk endangering the lives of their animals. They must realize that their pets are not legal if any laws in their area declare it. Even though a pet fox may be legal in one’s state, it

may not be legal within a city in that state. Fox owners need to realize the fear and misunderstanding that can result from their communities and attempt to protect their animals in the best way that they can. In return, communities should educate themselves on these exotic animals before acting in ignorance and fear.

#### Ohio City Exterminates Valo the Ranched Fox

On September 7<sup>th</sup>, 2014, Chloe Kristensen found her silver-colored fox, Valo, missing from his outdoor enclosure (Crowe 2014). In order to make her community aware of the missing animal, she contacted the Fairborn Police Department, Ohio Department of Natural Resources (ODNR), and the local news station. “I immediately contacted everyone because I know how big of a deal this is. Because a fox is not a dog. People will hurt him,” she told WDTN Channel 2 News (Moore 2014a).

Refer to Figure 8 for an illustration of Valo, the silver-colored, ranched red fox.



**Figure 8. Valo the Silver-Colored, Ranched Red Fox.** Illustrated by Noelle Brooks.

WHIO (2014) reported that on September 10, 2014, Kristensen was contacted by a wildlife officer to inform her that her fox Valo had been euthanized. Valo was found by a neighbor who had accidentally trapped the fox in a rabbit trap and contacted the city of Fairborn. Chris O' Banion, a trapper from Advanced Wildlife Management, Fairbank's contracted nuisance trapping company, sent a photograph of the canine to ODNR for identification and was told the animal was a silver-haired fox, an animal not native to Ohio and "most likely someone's pet" (Crowe 2014).

"When the fox was caught, there was no collar, there was no chip, and the ears weren't tipped," explains Mayor Dan Kirkpatrick in the Fairborn Daily Herald (Crowe 2014). "The city did not know it was a pet, and we acted according to what the Ohio Department of Natural Resources suggested to us."

Written in the ODNR's *Nuisance Wild Animal Control Certification Manual's Disposition of Nuisance Wild Animals* section (2013): "To prevent the issue of moving certain problem animals from one location to another, and due to concerns for the spread of disease, it is unlawful to fail to euthanize, or release on site, any live trapped nuisance: raccoon, skunk, beaver, coyote, fox –red or gray, opossum" (p. 9). Because Valo was not easily identifiable as a pet, he was established a wild animal and was euthanized on September 8, 2014 due to ODNR protocol (Crowe 2014). "Because he didn't have a collar and tags shouldn't have meant he was killed," protested Kristensen in the Fairborn Daily Herald (Crowe 2014). "Dogs are held for three days, why was he not held to the same standard? They didn't even bother to try to look for his owner."

Seeking answers, Kristensen attended a City Council meeting on September 15, 2014 and spoke with Mayor Dan Kirkpatrick (Crowe 2014; WHIO Breaking News Staff

2014). Mayor Kirkpatrick told WHIO News Center 7 (2014) that Kristensen should not have had the pet fox in the first place and that she was violating a city ordinance. “We have an ordinance that was written several years back that says that you cannot have a wild animal in the city of Fairborn and a fox is not considered a domesticated animal,” he explained.

Mayor Kirkpatrick seemed to be referring to *Part Five – General Offenses Code, Chapter 505. Animals and Fowl. Section 17. Keeping wild or exotic animals.* of the *Fairborn Codified Ordinance*, passed in 2006:

...

- (b) No person shall harbor any wild [any non-domesticated animal, including hybrid, which generally lives in its original natural state, and is not normally domesticated, and/or falls under the jurisdiction of the Ohio Department of Natural Resources] or exotic animal [any animal, including hybrid, which is foreign and generally not native by birth to the local community] or animal that is endangered within the municipality.

...

- (e) Animals which may be owned or harbored within the municipality are: pure domestic cats, pure domestic dogs (not hybrid), domestic rabbits, guinea pigs, chinchillas, mice, hamsters, gerbils, parrot-like birds, non-poisonous fish, non-poisonous reptiles, and non-poisonous snakes under five feet in length, and horses owned prior to the effective date of this ordinance.

In the Fairborn Daily Herald (Crowe 2014), Kristensen said that she had an ODNR “Noncommercial Propagating license” that allowed her to keep Valo. Under *Title 15 XV Conservation of Natural Resources, Chapter 1533: Hunting and Fishing, Section 71. License to raise or keep game birds and animals.* of the *Ohio Revised Code*:

(A) Unless otherwise provided in this section or by division rule, any person desiring to engage in the business of raising and selling game birds, game quadrupeds, reptiles, amphibians, or fur-bearing animals [minks, weasels, raccoons, skunks, opossums, muskrats, fox, beavers, badgers, otters, coyotes, and bobcats] in a wholly enclosed preserve of which the person is the owner or lessee, or to have game birds, game quadrupeds, reptiles, amphibians, or fur-bearing animals in captivity, shall submit an application to the division of wildlife for a license to do so. This section does not apply to a person who possesses wild animals under the authority of a license for a wild animal hunting preserve or a commercial bird shooting preserve.

The division, when it appears that the application is made in good faith and the applicant is in compliance with division (B) of this section, if applicable, and upon the payment of the fee for each license, may issue to the applicant any of the following licenses that may be applied for:

...

(2) "Noncommercial propagating license" permitting the licensee to propagate game birds, game quadrupeds except captive white-tailed deer, reptiles, amphibians, or fur-bearing animals and to hold the animals in captivity. Game birds, game quadrupeds except captive

white-tailed deer, reptiles, amphibians, and fur-bearing animals propagated or held in captivity by authority of a noncommercial propagating license are for the licensee's own use and shall not be sold.

The fee for such a license is twenty-five dollars per annum.

Kristensen may not have realized, however, that city ordinances can overrule state laws that allow the ownership of an exotic pet and can deny a license or permit for that animal. “It’s one of those issues where the primary goal of any government is to protect the citizens of that area, and in this case the citizens of Fairborn, and wild animals are an issue that we’ve had problems with in the past,” explains Mayor Kirkpatrick in the Fairborn Daily Herald (Crowe 2014).

Valo’s story, like Vader’s, highlights the importance of knowing and understanding the laws regarding the ownership of exotic pets. Although a fox owner may obtain a permit or license from the state that allows him to own a fox as a pet, the permit or license may not be valid in specific counties or cities within that state. Those who wish to own foxes as pets must check with all governing bodies in their area to ensure that their animals are legal, and thus protected.

Valo’s case also highlights the importance of pet owner responsibility. Because pet foxes are foreign to many communities, measures must be taken to keep the fox on one’s property and symbolize that the canine is a pet and not a wild animal.

Foxes can be difficult to contain as they are skilled at jumping, climbing, and digging, so a pet-fox owner must find a way to safely contain the animal and prevent him from escaping. Outdoor fox enclosures should include secure roofing and flooring in order to prevent the fox from climbing out or digging underneath. The State of Michigan

(DNR 2014) requires that a fox enclosure be eight feet by six feet with six feet in height to enclose a single fox, and the enclosure must be expanded 24 square feet of floor space for each additional animal. Clawing logs, a two feet by two feet by two feet den, and a 14-inch by 36-inch protected shelf area at least one foot above the floor are also required for each fox in the enclosure. One should check his own area's laws for fox enclosure requirements or use the requirements from another area, such as Michigan, as a personal guideline for what should be provided for a pet fox.

Owners must also find ways to identify the fox as a pet, such as having the animal microchipped, tagged, tattooed, or even simply labeled by wearing a collar with tags in case the animal escapes. Having the animal easily identifiable as a pet will improve the chances of having the animal returned and will assure community members that the animal is owned and not wild. "If the fox had a collar or a chip, this might not have happened the way it did," states Mayor Kirkpatrick in regards to Valo's death (Moore 2014b). A pet fox should only be owned if it is legal according to the owner's state, county, city, and zoning laws and can be safely contained and identified. If the fox's owner does not take the responsibility to ensure that his fox is legal, contained, and labeled, he is risking his fox's life and well-being.

#### Virginia Police Confiscate Swiper the Ranched Fox

Thankfully, not all pet foxes meet with a grim fate. When fox owners understand the laws regarding the ownership of foxes as pets and provide for their animals correctly, foxes can be successfully kept as pets, such as with Alayna Sitterson and her pet fox, Swiper.

In the spring of 2010, Alayna Sitterson purchased a seven-week-old silver-cross-colored red fox, a silver-colored fox with some red color in the pelage, from a breeder in the Midwest (Sitterson 2010; The Washington Post 2010). She decided to name the baby fox “Swiper” after the villain fox character from the cartoon show, *Dora the Explorer* (ABC 7 News 2010) and started the blog *My Pet Fox* at [mypetfox.com](http://mypetfox.com) to catalog each day with her new pet. She intended to follow the day-to-day life of her pet fox in order to answer the question, “Can a fox be kept as a pet?” (Sitterson 2011a.)

Refer to Figure 9 for an illustration of Swiper, the silver cross-colored, ranched red fox.



**Figure 9. Swiper the Silver Cross-Colored, Ranched Red Fox.** Illustrated by Noelle Brooks.

ABC 7 News (2010) reported that on Halloween, October 31, 2010, Sitterson dressed Swiper in a dog's skeleton costume and decided to walk him on his leash at the Reston Town Center. Fairfax County Police and Animal Control was called and confiscated Swiper, believing that the proper Virginia Department of Game and Inland Fisheries (DGIF) permits were not in place to own the fox. Sitterson was charged with "Unlawful possession of a wild animal" and Swiper was taken to Fairfax County Animal Shelter. "I started crying. I was very emotional," Sitterson told ABC 7 News (2010).

Sitterson insisted that she understood her area's laws and did not need a DGIF permit to own Swiper because he was "bred for domestication" and not a wild animal (ABC 7 News 2010). "I knew my rights. The law was always on my side," she wrote on her blog (2010).

According to *Title 4. Conservation and Natural Resources, Agency 15. Department of Game and Inland Fisheries, Chapter 30. Definitions and Miscellaneous: Importation, Possession, Sale, Etc., of Animals, Section 4VAC15-30-30. Exclusions of the Virginia Administrative Code:*

This chapter does not prohibit the possession, importation, and sale of native or naturalized albino amphibians, native or naturalized albino reptiles, or those domestic animals as defined in 4VAC15-20-50. [Domesticated races of red fox (Vulpes) where their coat color can be distinguished from wild red fox.]

Falls Church News-Press (2010) confirmed that after consulting with DGIF state wildlife biologists, officials determined that Swiper was a domesticated breed and Sitterson did not require a specific permit to legally own her fox. "Police say the fox is a breed that can be trained and domesticated, so it posed no threat to the public," writes

WUSA9 (2010). Swiper was released back to his owner on November 1, 2010, just one day after being confiscated, and all charges on Sitterson were dropped.

As she left the Fairfax County Animal Shelter with Swiper safely in her arms, Sitterson cautiously warned ABC 7 News (2010), “If you are going to get an animal like this, you need to know the law. You need to be responsible.”

Even though Sitterson and Swiper are legal, they are still met with controversy. “It’s just not a good mix to keep a wild animal as a domestic pet. They’re always going to be wild,” stated Sergeant Mary Zambrano of the Fairfax County Police Department to ABC 7 News (2010). Jay Korff of ABC News 7 (2010) also noted:

Swiper has had all his vaccinations, but according to animal control officials here in Fairfax County, they’re not so convinced that the rabies vaccination is entirely effective on foxes and they say if Swiper would happen to bite anybody in the future, they would have to put Swiper down.

Tara and Eric Hiatt’s pet fox, Vader, demonstrated this situation to be an actuality. Even though Vader had a valid rabies vaccination, he was euthanized after biting an animal control officer (KX News Minot 2014; Meredith 2014; Minot Police Department 2014; Schramm 2014). The same applies to Swiper. Even though Swiper may be a legal pet and has been vaccinated for rabies, he would be determined a wild, rabies-prone animal in the case of a bite and would be euthanized immediately (CDC 2008; DNR 2014; ODNR 2013).

Alayna Sitterson is aware of this dark possibility and warned about the risk of owning a pet fox on her blog in 2011, “I do not recommend a pet fox because of one reason. There is no proof that the current rabies vaccine works on foxes. Even if you find

a vet that will give your fox a rabies shot, if that fox *ever* bites anybody, the law states that it will have to be euthanized” (2011a). She recommends that foxes are not owned as pets or brought into the public until a fox rabies vaccine is approved by the USDA and recognized by government officials in order to prevent the loss of pet foxes due to euthanization.

Sitterson even commented on Vader’s situation in a blog post titled *Regarding Vader* (2014). Sitterson pointed out that while many things may have gone wrong in Vader’s case, such as his owners owning him illegally, the animal control officer catching him inappropriately, and the police investigating a possibly false bite report, there *was* a documented bite from Vader and because he is a red fox, an animal with no proven rabies vaccine, he must be euthanized to test for rabies (CDC 2008; DNR 2014; ODNR 2013). “Without a ‘real’ rabies vaccine in existence, ALL foxes are considered rabies factors whether they’ve had their shots or not,” Sitterson wrote. “This is a risk all fox owners take. The minute that rabies factor enters your home, you are going to struggle to take care of it properly” (Sitterson 2014).

Sitterson made it clear on her blog that she was writing to promote responsible pet ownership. In her 2011 blog post titled *A Final Word on Fox Ownership*, she asserted that one must complete several preparations before considering owning a fox as a pet: one must check the laws and county laws to ensure the fox is legal to own as a pet, find a veterinarian that will treat the fox, and build an enclosure that is fully reinforced and serviced for the animal. “I sincerely suggest that if you cannot provide all of these things, you should reconsider fox ownership,” she concluded (2011b).

Following her own advice, Sitterson posted a somber note on her blog in early 2011. “What I need to tell you is that Swiper does not live with me anymore,” she began after assuring everyone that Swiper was well and alive. Sitterson began by explaining that when she first acquired Swiper, she lived in a five-bedroom house with a spacious backyard. After ending a relationship with her boyfriend, however, she and Swiper were forced to move into a much smaller apartment where Swiper was not given the amount of space and outdoor experiences as Sitterson felt he needed. “It was then I realized that if I really loved Swiper, I would have to do what is best for him, no matter what. Even if it meant letting him go” (Sitterson 2011b).

After deciding that she was no longer able to provide Swiper with the proper care that he needed, Sitterson contacted Fox Wood Wildlife Rescue Inc., a USDA-certified rehabilitation facility, Certificate No: 21-C-0154, located in East Concord, New York (USDA 2015) about admitting Swiper into the sanctuary. Arrangements were made and Sitterson drove Swiper to New York. “The car ride was long and ominous. I wanted to turn around and go home at every intersection, and yes, I cried a lot,” Sitterson wrote on her blog (2011).

On March 9, 2011, a man named Joe posted a photograph of Swiper on his *DeviantART* social media page with the following status update:

So this is Swiper, the fox I'll likely be taking in this Spring or Summer (hopefully Spring!) Here, he's in his temporary pen at Fox Wood until I can get something built here. For now, I can only visit him 2 or 3 times a week, and I really wish I could bring him here sooner so I could get him used to me quicker. He still doesn't trust me, but he's only been there a few days now, and I'm sure it will take

some time. I've been in contact with his previous owner so she knows what's going on, and she's included some of the photos I took of him at her blog about him. What she's done with this fox is just so amazing, and I can't imagine how difficult it must have been for her to give him up. He was definitely loved. I'm looking forward to having him here.

On April 5, 2011, Joe posted a new photograph of Swiper in his newly-built permanent enclosure at his residence with the caption, "On 3/30/11, I was finally able to bring him home!" Now, four years later, Swiper continues to live with his new adopted owner, Joe and enjoys his expansive outdoor enclosure.

Sitterson continues to write on her blog, *My Pet Fox* even without owning Swiper anymore. She posts new pictures and status updates that Joe sends her, old pictures and videos of Swiper when she feels like reminiscing, and celebratory posts for Swiper's birthday and other momentous occasions. She also continues to answer questions her readers ask about owning a pet fox and continues to promote responsible pet-fox ownership. In a blog post written in 2012, Sitterson reflected:

From the moment I laid eyes on him, to the day I said goodbye, I've only wanted two things for Swiper; for him to be happy and healthy. Joe's found a way to accomplish that and take that to the next level. It's because of Joe that both Swiper and I can both sleep peacefully at night.

#### Foxes as Pets

Because the Institute of Cytology and Genetics of the Russian Academy of Sciences in Novosibirsk, Russia has begun selling and commercializing its domesticated foxes as pets (Trut 1999), controversy has arisen. The legislature is unsure of how to

define these animals, whether wild, exotic, or domesticated, as illustrated by the city of Farmington in Anya's case, and some people are still suspicious as to whether or not these animals are *truly* domesticated and should be welcomed into our homes.

According to Hilary Bok, from the Department of Philosophy and Berman Institute of Bioethics at The Johns Hopkins University, a pet is a “nonhuman animal whom we take into our home and accept as a member of our households” (2011, p. 769) and to adopt an animal as a pet is to “undertake to meet her needs, and to accept the responsibility of ensuring that one's relationship with her is good for all concerned” (2011, p. 778). When a person decides to adopt an animal as a pet, that pet's life becomes completely dependent on that person. Whether or not the pet eats depends on his owner remembering to supply him with food, whether or not the pet drinks depends on his owner noticing the empty water dish and refilling it, and whether or not the pet receives exercise depends on if his owner feels like going outside and has the time in his schedule to do so (Bok 2011; Sandøe et al. 2008). By accepting an animal into our homes, we unconsciously imprison him in a foreign world designed for the convenience of humans. However, when humans allow pets to become a part of their families, they cross species boundaries and forge new relationships. By loving and providing for their pets, humans allow both, themselves and their animals, to live harmoniously together and form a mutual and symbiotic bond. When a pet owner fails his pet by mistreating him or neglecting him, though, the pet can become trapped in a world of abuse without any recourse.

Opting to acquire a pet is a life-changing decision that requires a great deal of responsibility of the pet owner. One should consider whether he is willing to accept this

responsibility before acquiring a pet as the time to figure out that you are not a pet person is before you alter the life of an animal, not after the animal has been adopted and brought into your home (Bok 2011). It is the pet owner's responsibility to carefully consider the responsibilities he will be claiming and the life that he will be altering through the adoption of a pet. Pet owners owe it to themselves, to others, and to their pets not to adopt an animal if that animal's life or the life of others will be worsened because of it.

When considering the responsibilities of pet ownership, one must ensure that they can provide adequate diet, space, shelter, medical care, attention, affection, exercise, and other basic needs. Regarding foxes, the domesticated foxes at the Institute of Cytology and Genetics are fed a diet of beef, meat by-products, minced chicken, cereals, vitamins, and minerals twice a day and water is available ad libitum (Gogoleva et al. 2010a, 2010b, 2011; Kukekova et al. 2008b; Trut 1999). Tiny Tracks Exotic Animals LLC (2015b), one of the most popular exotic pet farms in the United States, recommends feeding pet foxes Blue Buffalo Chicken-Based (Wilderness) or Merrick that has chicken or turkey. As for space, *The Captive Wild Animal Order* of the Michigan Department of Natural Resources requires all pet-fox owners in the state of Michigan to supply their foxes with outdoor enclosures and deems the animals not to "be chained or otherwise tethered to stakes, posts, trees, building, and other anchorage" (2014, p. 5). Foxes are required to reside within an eight foot long by six foot wide by six foot high outdoor enclosure fitted with a rainproof den, nest box, shelter, protected shelf perch, clawing log, and bedding in order to provide the animal with comfort and protection from inclement weather and heat (DNR 2014). Foxes, especially, require a great deal more than an average pet dog.

Owners must be knowledgeable about their pets' needs and ensure that they can provide for them, otherwise, they should not be pet owners. Hilary Bok declares, "When we cannot meet such basic needs, we have no business taking these animals as pets" (2011, p. 778).

The American Society for the Prevention of Cruelty to Animals (ASPCA) understands there is no doubt that "pet guardians truly care for their animals," but believes that if those guardians are "unable to provide their pets with an appropriate living environment that ensures both the health and well-being of the animal and the safety of the community," they are abusing their animals (2015). In order to ensure that residents understand the requirements and responsibilities associated with possessing wildlife as pets, the Michigan Department of Natural Resources requires residents whom possess exotic animals to earn a Permit to Hold Wildlife in Captivity. "[Some] acquire young wildlife species because they are cute and cuddly, but are not prepared for the responsibility of caring for the wild animal as it grows older and larger and sometimes becomes dangerous and deadly," writes the DNR (2014, p. 9). In order to properly acquire a Permit to Hold Wildlife in Captivity in Michigan, one must build, purchase, or acquire a cage, pen, or enclosure that meets the minimum enclosure specifications and amenities required by the DNR; pass an inspection of the facilities; complete an application; pay a fee; and continue to send monthly inventory reports and supply order forms to maintain the permit (DNR 2014). These requirements help ensure the DNR that the resident has the appropriate means to care for the animal and provide for its basic needs. When permits like these are not required, it falls upon the pet owner to ensure that he can supply his pet with what he needs to live a secure, enjoyable, and healthy life.

One must also consider how he will be acquiring his new pet. Regarding foxes, one must decide if it would be best for him to purchase a less tamed ranched fox or the genetically tamed, but much more expensive, domesticated fox from Russia (Tiny Tracks Exotic Animals LLC 2015a; World Wide Exotic Animal Talent Agency, LLC. 2012). Kay Fedewa, owner of Anya, a domesticated fox from the Institute of Cytology and Genetics, supports the purchase of foxes from the Farm-Fox Experiment as pets as she believes that it enhances the lives of the foxes and supports the valuable research being conducted at the ICG. “Sales to private individuals support the important and insightful research from the Institute, but more importantly, is saving these surplus foxes from being sold to fur farms and giving them a chance to have the companionship from a loving family that they were bred to desire,” she reasons (Fedewa 2012). Adopting from a shelter is also an option for acquiring pet foxes. Swiper was readopted from Fox Wood Wildlife Rescue Inc., the rehabilitation facility located in East Concord, New York (USDA 2015). If choosing a local breeder, one should research the breeder’s reputation and how the breeder houses, breeds, and raises his animals to ensure they aren’t raised in inhumane conditions.

Even if one can meet the basic needs of an animal, Hilary Bok (2011) writes that no one should adopt wild animals as pets because they are “neither psychologically nor behaviorally suited to life with humans” (p. 778). She believes that taking wild animals as pets often involves a set of problems as wild animals are likely to be unhappy in human households, are more aggressive than their domesticated counterparts, and may act in ways that their human owners find hard to live with.

Bok (2011) explains that wild animals are not adapted to lives in human households or apartments and will become bored and miserable even when allowed to roam freely in their owner's house or yard. Irina Novozhilova, president of the Vita Animal Rights Centre located in Moscow, Russia agrees, "The animals are suffering, the animals have the instincts for living in the wild, but they are limited to small flats, and they develop diseases because of selection" (RT 2009). Even United States legislature raises concern for keeping wild animals as pets. The Michigan Department of Natural Resources requires residents whom possess wild or exotic animals as pets to complete the *IC1350-1 Form Permits to Hold Wildlife in Captivity* in order to receive a Permit to Hold Wildlife in Captivity. A warning has been listed on the form: "Certain species of wild animals should be appreciated in their natural habitat without being owned as pets, and people in the market for a pet should strongly consider a homeless, domestic, dog or cat" (DNR 2014, p. 9). Taking an even stronger stance, the People for the Ethical Treatment of Animals (PETA) organization objects to the institution of *all* pet ownership and believes *no* animals should be confined to lives with humans. "In a perfect world, animals would be free to live their lives to the fullest, raising their young and following their natural instincts in their native environments," PETA states (2015).

Concerning Russian domesticated foxes, Dr. Lyudmila Trut believes that the Farm-Fox Experiment foxes cannot survive in the wild and are limited to lives on fox farms or in human homes. "Over the years several of our domesticated foxes have escaped from the fur farm for days. All of them eventually returned. Probably, they would have been unable to survive in the wild" (Trut 1999, p. 164). Not only does this show that the domesticated foxes enjoy the presence of humans enough to return from the

wild, it may also suggest that the foxes from the ICG are no longer able to survive in the wild. In their natural environment, these animals are faced with extreme weather conditions such as cold and snow, heat, and rain and face starvation, infection, and animal attacks. Even wild foxes find it difficult to survive. The red fox has a potential lifespan of up to 15 years, but few individuals in the wild live more than 3 to 4 years. When raised in captivity, foxes are much more likely to reach their full lifespan potential than in the wild or on fox farms (Mulder 2004). Foxes are also considered nuisance animals in many states and are required to be captured and euthanized when found in urban communities due to their potential risk of attacking humans, attacking livestock, or spreading disease (CDC 2008; DNR 2014; ODNR 2013).

PETA and Bok agree that domesticated animals cannot survive in the wild and are thus the responsibility of humans (Bok 2011; PETA 2015). Because these animals have been domesticated and have lived with humans for thousands of years, they have adapted to life with people. “By now, our homes *are* the ‘native environment’ of cats and dogs, and if we treat them well, they can be much happier in our homes than in the wild,” writes Bok (2011, p. 777).

Regarding the ownership of the domesticated foxes from the Institute of Cytology and Genetics, it appears that the canines would be happier in our homes than in the wild. These animals have been selectively bred for domestication and are genetically engineered to share lives with humans. Not only are these animals receptive to humans, approaching people willingly without fear and interacting with them in actively positive ways, they also thrive on human affection. “As for pets, for tame silver foxes, directionally selected for many generations for tolerance to people, humans represent a

source of positive emotions” writes Gogoleva et al. (2011, p.220). These animals seek contact with people and desire to be touched and petted. They whine and whimper for interaction and will fight cage-mates for the attention of an approaching human (Belyaev 1979; Kukekova et al. 2011). “If foxes were brought up in a domestic environment interacting with other animals and humans, they would make fantastic pets. They are as independent as cats, but at the same time as devoted as any dog can be,” writes Trut reminiscing from her own experiences as a pet-fox owner (Trut 1999, p. 169).

Not only are domesticated foxes interested in humans, they can also communicate with humans as skillfully as dogs (Hare et al. 2005) and can be trained to obey commands (Cleek 2014; The Siberian Times 2012), helping them to better fit in and adjust to life with people. Hilary Bok (2011) explains that in order for animals to make appropriate pets, they must be willing to enter into genuinely reciprocal relationships with humans that involve efforts from both parties to accommodate the other, but most animals are not willing to develop this kind of relationship with humans. These foxes can use human communicative gestures and glances, and can communicate in return through actions such as their distance, location, position, ear carriage, tail activity, and vocalizations (Hare et al. 2005). Domesticated foxes also respond when called and answer to nicknames (Belyaev 1979; Belyaev and Trut 1975/2009). This ability to communicate with and understand humans could allow domesticated foxes and people to develop trusting relationships together.

In order to successfully integrate into a human society, pet foxes not only need to desire the company of humans and communicate with people, they must also be trained to live in a human-centered world. Foxes, like dogs, need to be trained in order to protect

their safety and the safety of others. Just as one would teach his child how to act appropriately and respectfully, one must teach his pet (Bok 2011). Pets must be taught not to attack or bite people, run into traffic, steal food from people, jump on visitors, and chew up valuable items. Without these rules in place, the animal could become a danger to others or behave in ways that may risk his death or injury. These foxes may enjoy living with humans, but they need to be taught how to function in human society. “Well, they’re great pets,” remarks exotic animal importer, Mitchel Kalmanson of the World Wide Exotic Animal Talent Agency, LLC., in reference to the domesticated foxes from the Farm-Fox Experiment. “The animal needs a place to run, the animal needs to be walked, but it needs to be trained. These animals are calm, they’re domesticated, but they don’t know, it’s just natural behaviors... They haven’t been socialized.”

From Irina Mukhamedshina’s work with Anya, we know that foxes can be trained to obey commands such as “stand up,” “sit,” and “lie down,” but they don’t have the same concentration of a dog and can sometimes be disobedient (Cleek 2014; The Siberian Times 2012). Again, any person considering owning a fox as a pet must consider the requirements and evaluate if he has the time, patience, and ability to communicate, work with, and train a fox to abide by the rules of civilization.

Hilary Bok (2011) explains “the most basic function of training is to enable us to tell dogs not to do something when it is very important that they not do it, to teach them to avoid behavior that is dangerous to themselves or to others, and to teach them how to function in human society” (p. 783). Even PETA supports humane, interactive training of pets in order to allow them greater freedom and a better understanding of our world, and to prevent them from being punished and restrained for improper behavior (2015). Pet

owners owe it to their pets to keep them from harm and to keep them from harming others so that they may continue to live their lives happily. Because we have adopted them and taken on their needs, we are responsible for their socialization.

Finally, there is controversy over the Institute of Cytology and Genetics' Farm-Fox Experiment for continually breeding animals unfit to live in the wild and consciously trying to domesticate a new species. PETA argues it is only permissible to own pets because they have adapted to living with humans and would not be able to survive in their natural environments. PETA's stand is that it is not moral to allow a domesticated animal to breed because it "perpetuates a class of animals who are forced to rely on humans to survive" and only increases the numbers of domesticated animals without adopted homes (2015). Bok (2011) agrees that the domestication of animals may or may not have been moral, but now that animals have been domesticated, for better or for worse, it has become the responsibility of pet owners to care for them and introduce them into human society.

The ICG also receives criticisms for its methods, especially the intentions to dispose of foxes to be culled for their fur at fur farms. Between 1996 and 1999, the ICG culled 600 foxes from their experimental population for their fur when no longer able to provide for the animals (Trut 1999). Because of the commercialized-nature of the Farm-Fox Experiment, thousands of foxes have been bred, sold, and culled and have spent their entire lives in solitary within small wired cages to be used for experiments and forced breeding (Gogoleva et al. 2010a, 2010b, 2011; Kukekova et al. 2008b; Trut 1999). "No form of breeding can be considered responsible" remarks PETA. Because 6 to 8 million cats and dogs are entered into shelters each year with only 3 to 4 million expecting to be

adopted and the remaining 2.7 million to be euthanized (HSUS 2013), perhaps it isn't moral to invest in a new breed of domesticated animal, especially when it requires the deaths of so many animals in the process.

Even though the domesticated foxes from the Farm-Fox Experiment at the Institute of Cytology and Genetics appear to be fully domesticated and genetically engineered to share their lives with humans, they are still a fox species, not a dog species (Trut 1999) and will most likely be considered a wild or exotic pet in terms of legislation. Several states in the United States do not recommend or allow the possession of wild or exotic animals as pets, often including foxes within those terms. The Michigan Department of Natural Resources warns, "Wild animals, even when raised for generations in captivity, are still wild animals. As they grow older, they can unpredictably revert back to their wild instincts, sometimes biting and attacking for no apparent reason" (2014, p. 9). Even the ASPCA has a position on the ownership of exotic animals:

Species suitable to be companion animals include dogs, cats, horses, rabbits, ferrets, birds, guinea pigs and select other small mammals, small reptiles and fish. Where they may be kept legally and responsibly, domestic-bred farm animals can also be maintained as companions. The ASPCA is opposed to the keeping of wild animals as well as wild/domestic hybrids (ASPCA 2015).

The Michigan Department of Natural Resources lists four specific reasons why the possession of wildlife species as pets is not recommended in its 2014 *Form IC1350-1 Permits to Hold Wildlife in Captivity*:

- 1) There is no rabies vaccine approved for use for wildlife.

- 2) Wildlife pets can pose a serious threat to human safety.
- 3) The commercial pet trade can encourage the illegal taking of animals from the wild.
- 4) Some people acquire wildlife species as pets for the wrong reasons (DNR 2014, p. 9).

The first reason, “There is no rabies vaccine approved for use for wildlife” (DNR 2014, p. 9) should be seriously considered by anyone who plans to possess a pet fox, whether ranched, tamed, or domesticated. This fact combined with the general fear and misunderstanding of others regarding foxes can be detrimental to a fox’s safety and well-being.

The Department of Health and Human Services Centers for Disease Control and Prevention (CDC) supports the refrainment of handling wild animals because an approved rabies vaccine does not currently exist:

Because of the risk for rabies in wild animals (especially raccoons, skunks, coyotes, foxes, and bats), the American Veterinary Medical Association, the American Public Health Association, the Council of State and Territorial Epidemiologists, the National Association of State Public Health Veterinarians (NASPHV) strongly recommend the enactment and enforcement of state laws prohibiting the importation, distribution, translocation, and private ownership of these animals (CDC 2011, p. 3).

The Michigan Department of Natural Resources (2014) further affirms that current immunizations have not been proven effective on wildlife and may even prolong or mask existing rabies infections in wild animals. While the progress and symptoms of rabies and

the treatment of such a disease is predictable in domestic animals, it is not in wild animals. The DNR states:

When the animal does become infected, it may not show any symptoms of the disease, while still spreading great amounts of virus. There is no ten-day waiting period, as with a dog. By the time the animal becomes ill, a person who has been bitten could be beyond help. Therefore, if a pet wildlife species bites someone, the animal must be euthanized so that the brain can be tested for rabies (2014, p. 9).

This nightmare became a reality for owners Eric and Tara Hiatt. After their silver-colored ranch-raised red fox, Vader, bit an animal control officer and broke the skin on his hand and wrist, he was immediately euthanized to check for rabies (KX News Minot 2014; Meredith 2014; Minot Police Department 2014; Schramm 2014). It did not matter that Vader was a beloved part of the Hiatts' family, or that he was a captive-born fox raised to be a pet, or even that he had been vaccinated for rabies. Vader was a fox and foxes are known to carry rabies without an approved vaccination (CDC 2011). Even Valo, another silver-colored ranch fox owned by Chloe Kristensen, was affected by this fear. Because he was found untagged in the urban environment of Fairborn, Ohio, the Ohio Department of Natural Resources declared that he be exterminated for a possible case of rabies. Although Valo had not bitten anyone, foxes are deemed one of the most common carriers of rabies by the CDC and are, therefore, high-risk nuisance animals that should be euthanized on sight (CDC 2008; Crowe 2014; DNR 2014; Moore 2014; ODNR 2013; WHIO Breaking News Staff 2014). They are not known to be pets and are feared by most for the possible spread of disease or attack upon a person. Thus, they must be

euthanized when found in our communities, especially after having bitten someone (CDC 2008; DNR 2014; ODNR 2013).

Even Alayna Sitterson, the writer and owner of [mypetfox.com](http://mypetfox.com) and original owner of Swiper, was aware of this fact and warned about the risk of owning a pet fox on her blog in 2011, “I do not recommend a pet fox because of one reason. There is no proof that the current rabies vaccine works on foxes. Even if you find a vet that will give your fox a rabies shot, if that fox *ever* bites anybody, the law states that it will have to be euthanized” (2011a). She recommends that foxes are not owned as pets or brought into the public until a fox rabies vaccine is approved by the USDA and CDC and recognized by government officials in order to prevent the loss of pet foxes due to euthanization.

So, should foxes be kept as pets? Really, there is no simple answer. In the United States, each state addresses the matter differently. In some states, all foxes are banned, in others only red foxes cannot be possessed as different colors signify that the animal was bred and therefore tamer than a wild fox, and in some states, there is no regulation on the ownership of foxes as pets at all. If a fox is legal to possess as a pet in one’s state, city, and local zones, the moral dilemma falls upon the pet owner. In any case, a pet-fox owner must fully bear the responsibilities of owning a fox as a companion animal. The owner must understand his state, city, and local laws regarding the ownership of a fox as a pet; provide an adequate diet, which is debatable as not much is known about nutrition requirements for foxes; provide appropriate shelter that allows the fox room to roam and play, yet still protects the animal from escaping and being captured and euthanized or killed by a wild animal, such as a coyote; ensure that the animal is clearly marked as a pet; train the animal to obey commands, communicate with humans, and function in

human society; and ensure that he can provide the love and affection that the animal desires. Owning a fox as a pet is not as easy as owning a dog as a pet. Not only do we know how to care for dogs exponentially more than how to care for foxes, our society is generally accepting of pet dogs and are not quick to force the relocation or extermination of them. If one is willing to assess his lifestyle before acquiring a fox as a pet and conscientiously attempts to understand and meet the animal's needs, including the needs for attention, affection, and training, a fox, especially a domesticated fox from the Institute of Cytology and Genetics' Farm-Fox Experiment, has been shown to become a rewarding companion animal. However, if a pet-fox owner neglects these responsibilities, it will be the fox, not the owner, who pays the greatest price, possibly even his life. In all the cases demonstrated in this study, it was the fox, not the owner, whom was confiscated, killed, euthanized, exterminated, and rehomed. If the owner is responsible, knowledgeable, and willing to sacrifice in order to benefit his companion, owning a fox as a pet could be a rewarding and enjoyable experience for both the owner and the fox.

## CHAPTER II

### RESEARCHER'S INTENTIONS

This study investigated attitudes toward dogs compared to domesticated foxes as pets and ownership of these animals, analyzing how the manipulation of canine physical attributes by domestication can affect participant perceptions. The purpose of this study was to improve our understanding of attitudes about domesticating wild foxes and selling them as pets.

Anonymous surveys were administered to 97 undergraduate students enrolled in psychology classes at Texas State University. Each participant's attitudes toward dogs and pet-dog ownership were measured alongside their attitudes toward domesticated foxes and pet domesticated fox ownership. Additional questions were created to assess participants' legal and ethical attitudes, knowledge of fox domestication, and opinions and experiences in regard to pet ownership. Fox mages were created to isolate physical attributes in canines assessing their impact on human perception of undomesticated and domesticated features.

#### Hypotheses

This study intended to find correlations between participant attitudes toward pet dogs and pet domesticated foxes and participant attitudes toward the ethics of breeding and legalities of pet ownership regarding these animals. This study also attempted to improve understanding of fox domestication and selling foxes as pets by measuring participant responses to images of foxes with physical characteristics changed by domestication. Hypotheses were:

## Hypothesis 1: Pet Dogs Compared to Pet Domesticated Foxes

*a. Attitudes toward dogs and pet-dog ownership (Pet Dog Attitude Score) will be more positive than attitudes toward domesticated foxes and pet domesticated fox ownership (Pet Fox Attitude Score).*

Dogs have become one of the most popular pets worldwide, with 83.3 million dogs finding themselves in about 56.7 million households according to the American Pet Products Association's 2013-2014 National Pet Owners Survey. Thus, participants are expected to favor pet dogs over pet foxes.

*b. Attitudes toward dogs and pet-dog ownership (Pet Dog Attitude Score) will predict attitudes toward domesticated foxes and pet domesticated fox ownership (Pet Fox Attitude Score).*

Jennifer Word found that the type of pet kept and the level of importance attributed to the pet were not correlated (Word 2012). This may show that those who harbor positive attitudes toward pets may continue to display positive attitudes despite the species of pet.

*c. Attitudes toward dogs and pet-dog ownership (Pet Dog Attitude Score) will predict attitudes toward pet-dog breeding ethics and pet-dog ownership laws, but not predict attitudes toward wild fox breeding ethics and pet domesticated fox ownership laws.*

It is assumed that one's attitudes toward dogs in general will affect his attitudes toward dog breeding ethics and pet-dog ownership laws because they involve the care and treatment of dogs. Because foxes are most commonly associated with wild animals,

one's attitudes toward dog breeding and pet-dog ownership laws may not necessarily reflect his attitudes toward fox breeding and pet-fox ownership laws.

*d. Attitudes toward domesticated foxes and pet domesticated fox ownership (Pet Fox Attitude Score) will predict attitudes toward wild fox breeding ethics and pet domesticated fox ownership laws, but not predict attitudes toward pet-dog breeding ethics and pet-dog ownership laws.*

Again, it is assumed that one's attitudes toward foxes in general will affect his attitudes toward fox breeding ethics and pet-fox ownership laws because they involve the care and treatment of foxes. Because foxes are most commonly associated with wild animals, one's attitudes toward fox breeding and pet-fox ownership laws may not necessarily reflect his attitudes toward dog breeding and pet-dog ownership laws.

*e. Participants will rate dogs as a good pet more than domesticated foxes.*

Because dogs are more common as pets than foxes according to the American Pet Products Association's 2013-2014 National Pet Owners Survey, participants are expected to favor pet dogs over pet foxes.

*f. Participants will prefer wanting a dog as a pet more than a domesticated fox.*

Again, because dogs are more common as pets than foxes according to the American Pet Products Association's 2013-2014 National Pet Owners Survey, participants are expected to favor pet dogs over pet foxes.

## Hypothesis 2: Ethical and Legal Attitudes

*a. Participants will be more likely to agree that it is ethical to selectively breed pet dogs, eventually altering them to suit our needs, than it is ethical to selectively breed wild foxes, eventually altering them to suit our needs.*

Dog breeding is much more well-known than fox breeding as demonstrated in the existence of The American Kennel Club (AKC), the largest and second oldest non-profit organization which maintains a registry of purebred dogs in the world and governs the sport of breeding dogs. There is no such organization for fox breeding.

*b. Participants will be more likely to agree that it should be legal in the United States to own a pet dog, than it should be legal in the United States to own a pet domesticated fox.*

Again, dogs have become one of the most popular pets worldwide, with 83.3 million dogs finding themselves in about 56.7 million households according to the American Pet Products Association's 2013-2014 National Pet Owners Survey. Thus, it is expected for participants to be more familiar, comfortable with, and in favor of the legal ownership of pet dogs than the legal ownership of pet foxes.

*c. Attitudes toward pet-dog breeding ethics will predict attitudes toward pet-dog ownership laws, more than attitudes toward wild fox breeding ethics and pet domesticated fox ownership laws.*

It is assumed that one's attitudes toward dog-related topics will more greatly affect his attitudes toward other dog-related topics more so than fox-related topics because they concern the care and treatment of dogs.

*d. Attitudes toward pet-dog ownership laws will not predict attitudes toward wild fox breeding ethics or pet domesticated fox ownership laws.*

Because foxes are most commonly associated with wild animals, one's attitudes toward pet-dog ownership laws may not necessarily reflect his attitudes toward fox breeding and pet-fox ownership laws.

*e. Participant attitudes toward wild fox breeding ethics will predict attitudes toward pet domesticated fox ownership laws.*

Again, it is assumed that one's attitudes toward fox-related topics will greatly affect his attitudes toward other fox-related topics.

### Hypothesis 3: Perceptions of Wild to Domesticated Fox Images

*a. When shown a series of images that represent the transformation of a wild fox into a domesticated fox in images, participants will most frequently perceive the physical transformations of domestication in the earliest transformation images.*

Because domesticated animals are known for demonstrating similar morphological changes such as body size and proportions, coat color, fur length, and hair texture, including white spotting, floppy ears, widened skulls, shortened snouts, and curly tails, all markers of domestication (Abumrad 2009; Belyaev 1979; Kukekova et al. 2008a; Morey 1994; Trut 2007; Trut et al. 2009), it is assumed that participants will recognize these traits even in small amounts and classify that animal as domesticated. Darwin noted that there are no wild species with drooping ears and curled tails, although domesticated animals can acquire these traits, and concluded that the traits must result of domestication (Darwin 1875). Therefore, if a participant is shown a fox without completely erect ears or a low-slung tail, it is anticipated that he will respond to that fox as domesticated.

*b. Fox images with smaller stop angles, more shortened body part lengths, and/or more greatly curled ears and tails will be rated as more domesticated.*

Domesticated animals are known for demonstrating similar morphological changes such as body size and proportions, coat color, fur length, and hair texture. White spotting, floppy ears, and curly tails have become markers of domestication (Abumrad 2009; Belyaev 1979; Kukekova et al. 2008a; Morey 1994; Trut 2007; Trut et al. 2009). Pedomorphosis and neoteny, the retention in adults of juvenile traits, such as widened skulls, shortened snouts, floppy ears, and curly tails, also leads to the appearance of domestication (Morey 1994; Price 2002)

*c. Fox images with selectively-bred coat colors, (piebald, platinum, or Georgian white,) will have higher ratings as more domesticated than foxes with wild coat colors, (red or silver.)*

White spotting has become a marker of domestication (Abumrad 2009; Belyaev 1979; Kukekova et al. 2008a; Morey 1994; Trut 2007; Trut et al. 2009) and a piebald-spotted coat is one of the most striking mutations among domestic animals seen frequently in dogs, pigs, horses, cows, guinea pigs, cats, and other domesticated animals (Trut 1999).

*d. Fox images with smaller stop angles, more shortened body part lengths, and/or more greatly curled ears and tails will be rated as more attractive.*

Brian Hare theorizes that humans enjoy the appearance of pets because of their pedomorphic features, such as widened skulls, shortened snouts, floppy ears, and curly tails (Abumrad 2009; Child 2011; Morey 1994; Price 2002).

*e. Fox images with selectively-bred coat colors, (piebald, platinum, or Georgian white,) will be rated as more attractive than foxes with wild coat colors, (red or silver.)*

Fox fur from foxes with selectively-bred coat colors are exponentially higher in value than fur from wild foxes or selectively-bred foxes with wild colors (Cole and Shackelford 1943; Shackelford 1948). From this, it is expected that attitudes toward selectively-bred fox fur colors are more positive than wild fox fur colors. Also, because white spotting has become a marker of domestication (Abumrad 2009; Belyaev 1979; Kukekova et al. 2008a; Morey 1994; Trut 2007; Trut et al. 2009) and is seen frequently in dogs, pigs, horses, cows, guinea pigs, cats, and other domesticated animals (Trut 1999), participants may associate white fur color with domesticated animals and may be more familiar, comfortable, or nostalgic in regards to white fur.

*f. Participants will most frequently have higher ratings for foxes with smaller stop angles, more shortened body part lengths, and/or more greatly curled ears and tails as a pet.*

Because domesticated animals are known for demonstrating similar morphological changes such as body size and proportions, coat color, fur length, and hair texture, including white spotting, floppy ears, widened skulls, shortened snouts, and curly tails, all markers of domestication (Abumrad 2009; Belyaev 1979; Kukekova et al. 2008a; Morey 1994; Trut 2007; Trut et al. 2009), it is assumed that participants will perceive foxes with these traits as more domesticated and better-suited as pets.

*g. Participants will most frequently have higher ratings for foxes with selectively-bred coat colors, (piebald, platinum, or Georgian white,) than foxes with wild coat colors, (red or silver,) as a pet.*

Because white spotting has become a marker of domestication (Abumrad 2009; Belyaev 1979; Kukekova et al. 2008a; Morey 1994; Trut 2007; Trut et al. 2009) and a

piebald-spotted coat is one of the most striking mutations among domestic animals seen frequently in dogs, pigs, horses, cows, guinea pigs, cats, and other domesticated animals (Trut 1999), it is assumed that participants will perceive selectively-bred coats as a symbol of domestication, thus causing them to perceive foxes with these coats as more domesticated and better-suited as pets.

Hypothesis 4: Knowledge of the Farm-Fox Experiment

*Fewer than 5% of participants will indicate having prior knowledge of the Farm-Fox Experiment conducted by the Institute of Cytology and Genetics of the Russian Academy of Sciences in Novosibirsk, Russia.*

In an unpublished survey conducted by Noelle Brooks in 2010 with a small sample of approximately 20 undergraduate students at Texas State University, it was found that none had prior knowledge of the Farm-Fox Experiment.

## CHAPTER III

### METHODOLOGY

#### Participants

This study utilized a sample of 97 undergraduate students enrolled in introductory psychology classes at Texas State University located in San Marcos, Texas. The students within these classes were given the option to participate in the study for optional extra credit within the class.

#### Demographics

Demographics of the sample were female as 29 students, or 29.9%, were male; 67 students, or 69.07%, were female; and 1 person, or 1.03%, was unidentified. Because the sample utilized undergraduate students, most of the participants were either 20 or 21 years old. 16 students, or 16.49%, were 18 or 19 years old; 50 students, or 51.55%, were 20 or 21 years old; 16 students, or 16.49%, were 22 or 23 years old; 14 students, or 14.43% were 24 years or older; and 1 student, or 1.03% was unidentified. Ethnic distribution of the sample was similar to the university population of 37, 300 (Texas State University Office of Institutional Research 2015). 3 participants, or 3.09%, were Asian or Asian American; 14 participants, or 14.43%, were Black or African American; 26 participants, or 26.80%, were Hispanic or Latino; 47 participants, or 48.45%, were White, non-Hispanic; and 1 participant, or 1.03%, was unidentified.

#### Materials

A printed paper survey was administered that included a participant information page, cover page with instructions, survey sections for attitudes about dogs and

domesticated foxes as pets and a section showing five different sets of fox domestication images for participants to evaluate. Participants reported their responses on a five-choice answer sheet.

#### Participant Information Page

Included with the survey was a separate, detached page that was used for the purposes of assigning extra credit within the class for the students whom participated in the study. This page asked the student to print his or her name, instructor's name, class name, and class time and was removed from the completed answer form. (Appendix A).

#### Cover Page

The cover page contained the Texas State University Institutional Review Board number assigned to this study, the principle investigator's contact information, instructions for completing the survey, and a short description of the study's purpose, giving notice to the participant that the survey was anonymous (Appendix B).

#### Survey

The survey (Appendix B) consisted of eight pages with a total of 61 items divided between four sections, *I-IV*. The final section, *Section IV*, was divided into four smaller subsections: *A-E*. The survey included five sets of five images in *Section IV* dispersed between the five subsections within that section.

#### Section I

*Section I* consisted of six items, *Items 1-6*, contained demographic information, including participant genders, ages, and ethnicities.

This section also asked participants how many dogs they have owned all at one time in the past and how many they currently own.

The last item in this section asked participants if they had any knowledge of the Farm-Fox Experiment conducted by the Institute of Cytology and Genetics of the Russian Academy of Sciences located in Novosibirsk, Russia.

## Section II

*Section II* contained 10 statements, *Items 7-16*, that were intended to determine a participant's current attitudes toward dogs and pet-dog ownership. Participants were asked to indicate how strongly they agreed to the statements on a scale of 1-5. Choosing higher numbers indicated higher agreement to the statement. Statements were grouped into four pods related to "Love and Interaction," "Pet Dogs in the Home," "Investment," and "Ethics and Legalities." Responses to *Items 7-14* were summed to measure a participant's attitudes toward pet dogs by assigning a Pet Dog Attitude Score.

*Item 15* was used to determine a participant's attitudes toward the ethics of dog breeding and *Item 16* was used to measure a participant's attitudes toward laws regarding pet dogs.

6 statements from this section, *Items 7-9*, and *12-14* originated from the Pet Attitude Scale, an 18-item Likert-format survey developed by Donald I. Templer, et al. in 1981. The Pet Attitude Scale is intended to measure the favorableness of attitudes toward pets by assigning participants Pet Attitude Scores.

The original Pet Attitude Scale was modified to create two new scales, a Pet Dog Attitude Scale intended to measure the favorableness of attitudes toward pet dogs by assigning participants Pet Dog Attitude Scores and a Pet Fox Attitude Scale intended to measure the favorableness of attitudes toward pet foxes by assigning participants Pet Fox Attitude Scores.

The Likert-format was changed from a bipolar scale to a continuous, linear scale indicating magnitude of agreement with the items. Selected survey items were more precisely reworded, removing negative sentence structures to prevent the need for inverting participant responses. The items were also reworded to directly associate with pet dogs, rather than all pets.

Refer to Table 4 to identify exactly how the items from *Section II* were modified from the original items within the Pet Attitude Scale created by Donald I. Templer et al. in 1981.

Table 4  
*Survey Section II Compared to the Pet Attitude Scale*

Survey Section II	Pet Attitude Scale
7. I could love a pet dog.	11. I love pets.
8. Pet dogs could add happiness.	5. Housepets add happiness to my life (or would if I had one.)
9. Treat pet dogs with as much respect as a human member of your family.	18. You should treat your housepets with as much respect as you would a human member of your family.
12. If circumstances allowed and money was not an issue, I would like to own a pet dog.	3. I would like a pet in my home.
13. Pet dogs are worth the money to own.	4. Having pets is a waste of money.
14. Pets dogs are worth the trouble to own.	15. Pets are fun but it's not worth the trouble of owning one.

*Note.* The items on the left are from *Section II* of the survey used in this study. The items on the right are the corresponding items from the Pet Attitude Scale from which they originated.

### Section III

*Section III* contained 10 statements, *Items 17-26*, that were intended to determine a participant's current attitudes toward domesticated foxes and pet domesticated fox ownership. A description at the beginning of the section delivered information on the Farm-Fox Experiment conducted by the Institute of Cytology and Genetics of the Russian Academy of Sciences located in Novosibirsk Russia:

A Farm-Fox Experiment in Russia has been selectively breeding foxes in order to domesticate the wild fox. These domesticated foxes are bred to have characteristics and physical features similar to pet dogs. They are bred to wag their tails, whine for attention, and bark when in the presence of humans and can be trained to obey commands and recognize their names. They enjoy being picked up and petted and show similar fear or aggression toward humans as dogs.

However, they are still genetically wild foxes. They are not a dog species; they are a fox species. These animals are now being sold as pets, costing about \$8,900 to own in the United States.

Participants were then asked to indicate how strongly they agreed to the statements on a scale of 1-5. Choosing higher numbers indicated higher agreement to the statement.

Responses to *Items 17-24* were summed to measure a participant's attitudes toward pet foxes by assigning a Pet Fox Attitude Score.

*Item 25* was used to determine a participant's attitudes toward the ethics of fox breeding and *Item 26* was used to measure a participant's attitudes toward laws regarding pet domesticated foxes.

All the items in *Section III* identically resembled the items in *Section II* with a slight rewording of “pet dog” to “pet domesticated fox” in each item. This ensured that any change in participant attitude was strictly due to the change of animal associated with each item.

#### *Section IV*

*Section IV* contained 35 questions, *Items 27-61*, and five separate subsections labeled, *A, B, C, D,* and *E*. Each subsection paired a set of five illustrations of a full-body standing fox seen from the left side with seven questions. In each subsection, participants were asked to compare the five images together and notice their similarities and differences. Participants were warned that although the images may appear unchanged, there were slight differences. The participants were then asked to answer the questions using the images and record their responses on their answer forms.

The five images were labeled *A, B, C, D,* and *E* to correlate with the *A, B, C, D,* and *E* options on the answer form. In each subsection of *Section IV*, the first image, labeled *A*, was a standard wild red fox with common physical attributes, the least domesticated animal pictured. In the following four images, labeled *B, C, D,* and *E*, the standard wild red fox illustration was manipulated to replicate how domestication changes physical attributes. The image labeled *E* was the most manipulated and demonstrated an extreme physical transformation caused by domestication, making it the most domesticated animal pictured.

The only exception to this was in *Section IV D*. In this subsection, the images showed five different coat colors a red fox can have and did not show a range of change with *Figure A* begin the least domesticated animal and *Figure E* being the most

domesticated animal. In this subsection, two coat colors that can be found in the wild were assigned labels *A* and *B*, while the three coat colors that can only be found through selective breeding were randomly assigned *C*, *D*, and *E*.

Four subsections of *Section IV* focused on one manipulated physical attribute. *Section IV A* focused on body part length and stop angle, *Section IV B* highlighted the ear curl, *Section IV C* demonstrated the tail curl angle, and *Section IV D* illustrated fur color. *Section IV E* composited a majority of the physical manipulations together, combining the shortened stop angle, snout, and leg lengths from *Section IV A* with the ear curl from *Section IV B* and the tail curl of *Section IV C*.

#### *Section IV A: Stop Angle and Body Part Length*

*Section IV A* of the survey contained *Items 27-33* and focused on stop angles and body part lengths. This initial image set was used as a practice condition, familiarizing participants with the type of questions and how to rate the images. In this set of images, the fox's stop's angle decreased  $5^\circ$  within each new image, the snout decreased 3.17% in length, the legs decreased 1.29% in length, and the tail decreased 2.63% in length. The stop is the indentation in a canine's forehead just above eye level where the bridge of the nose meets with the forehead.

The first image, labeled *A*, was a standard wild red fox and was the least domesticated animal pictured. The stop was measured at an angle of  $140^\circ$ . The length of the snout from the ear to the tip of the nose was measured in relation to the length of the entire head, coming out to 62% the length of the fox's entire head. Because all of the legs were resized in equal amount to each other, only one leg was measured. The length of the front left leg was measured from the shoulder to the foot in relation to the height of the

fox at the withers. This measurement showed that the fox's legs were 74% of the fox's total height. Lastly, the tail was measured in relation to the length of the fox's body, measuring at 0.79 times the size of the body.

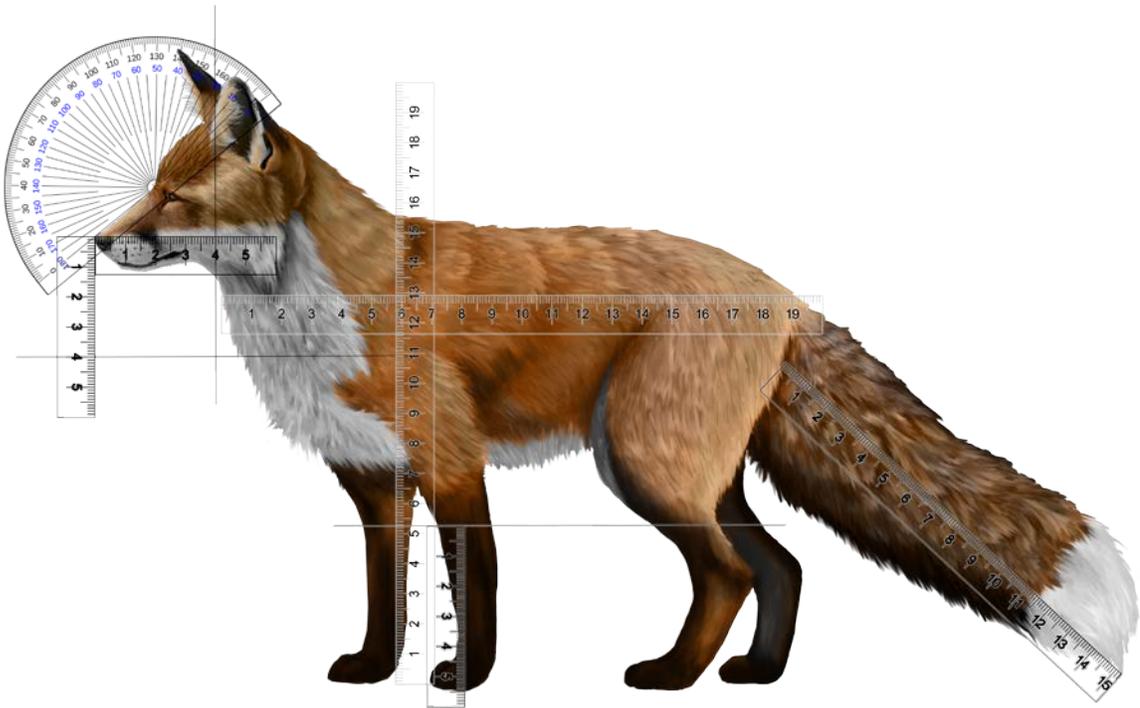
From these measurements, the following images, labeled *B*, *C*, *D*, and *E* were manipulated following set calculations. In *Figure B*, the fox had a stop angle of  $135^\circ$ , a snout length that was 60% the total length of the fox's head, legs that were 73% the total height of the fox, and a tail that was 0.76 times the length of the body. *Figure C* showed a fox with a stop angle of  $130^\circ$ , a snout that was 57% the total length of the fox's head, legs that made up 72% of the fox's total height, and a tail that was 0.73 times the length of the body. In *Figure D* the fox has a stop angle of  $125^\circ$ , a snout that was 54% the total length of the fox's head, legs that made up 70% of the fox's total height, and a tail that was 0.71 times the length of the fox's body. The final image, *Figure E* showed a fox with dramatic physical manipulation resulting from domestication, making it the most domesticated animal pictured. *Figure E* showed a fox with the smallest stop angle of  $120^\circ$ , the shortest snout that was 51% the total length of the fox's head, the shortest legs that were 69% of the fox's total height and the smallest tail that was 0.68 times the length of the body.

Refer to Table 5 for the stop angle and body part length calculations of each figure within *Section IV A* of the survey.

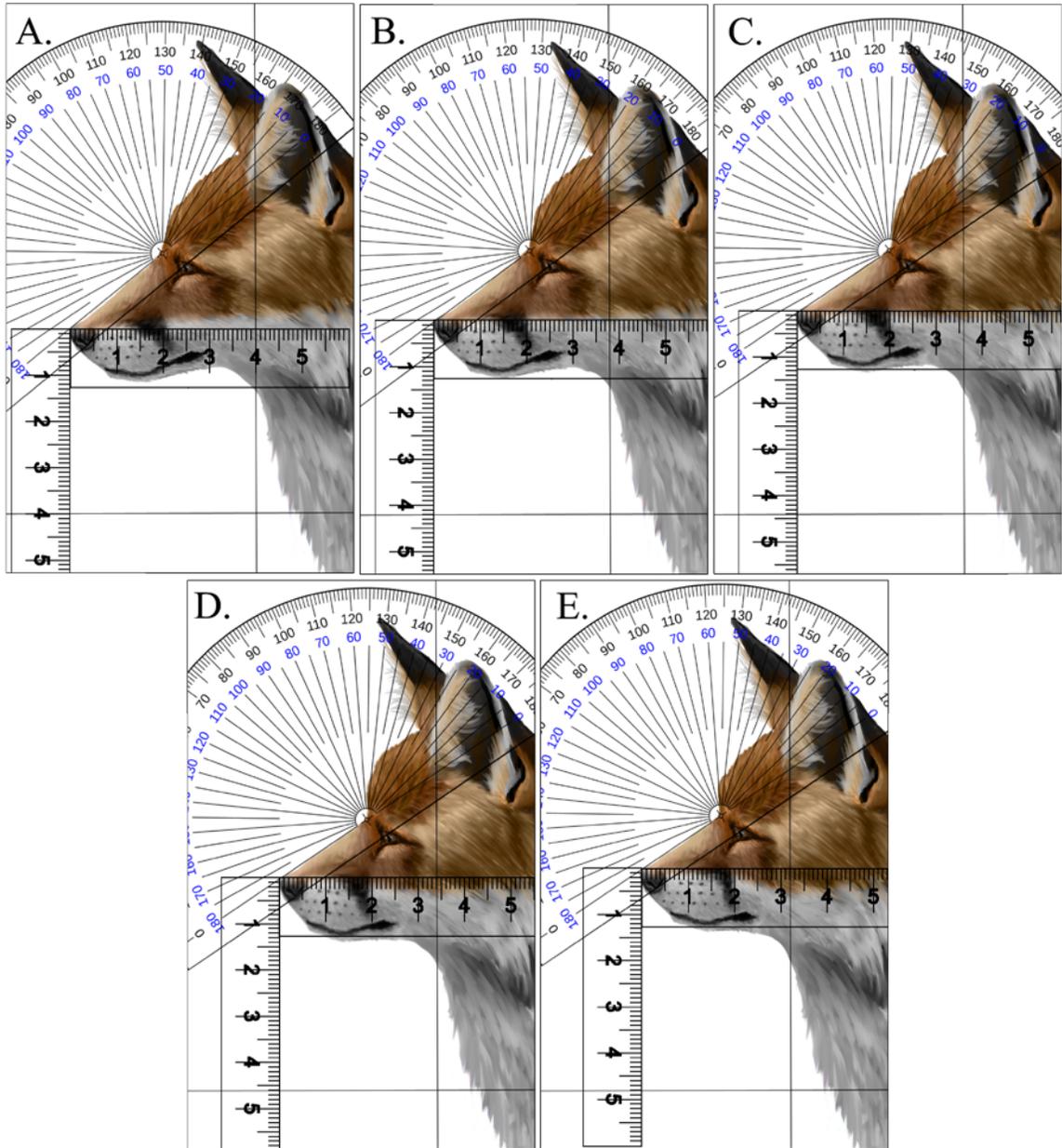
Refer to Figure 10 to verify how the angle of the stop and the lengths of the body parts were measured. Refer to Figures 11, 12, and 13 for close-up views of the face variations, leg lengths, and tail length modifications, respectively, demonstrating their precise calculations.

Table 5  
*Stop Angle and Body Part Length Calculations*

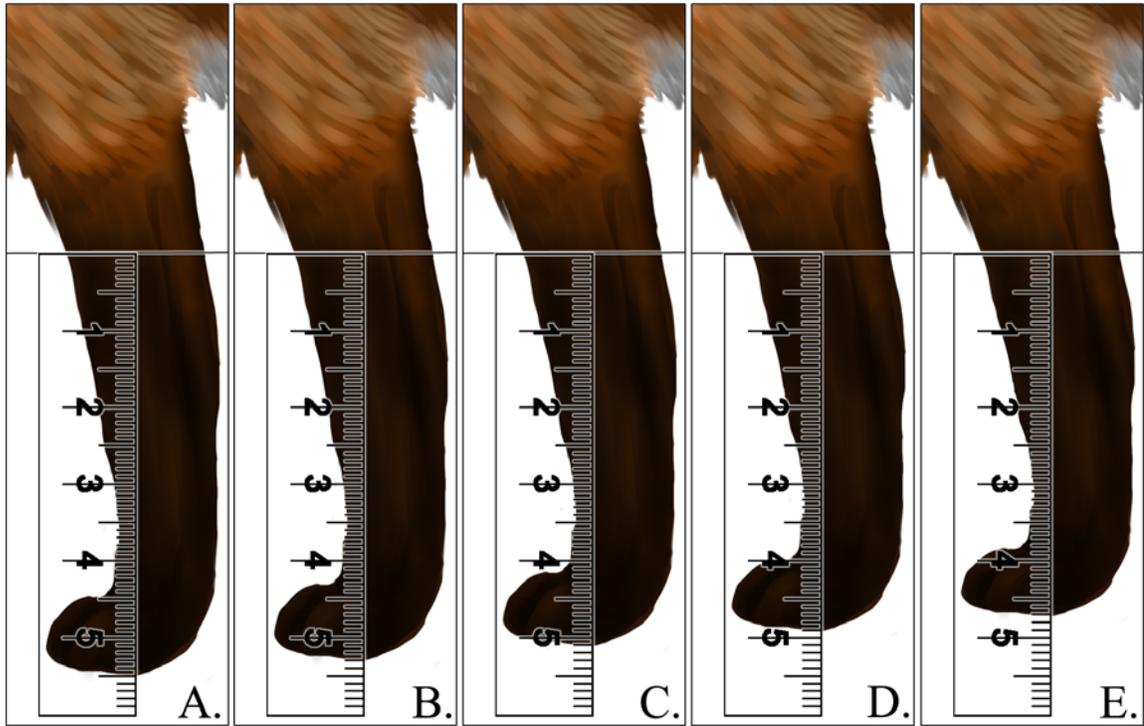
<i>Figure</i>	Stop Angle	Snout Length (% of total head length)	Leg Length (% of total height)	Tail Length (times length of body)
<i>A</i>	140	63	74	0.79
<i>B</i>	135	60	73	0.76
<i>C</i>	130	57	72	0.73
<i>D</i>	125	54	70	0.71
<i>E</i>	120	51	69	0.68



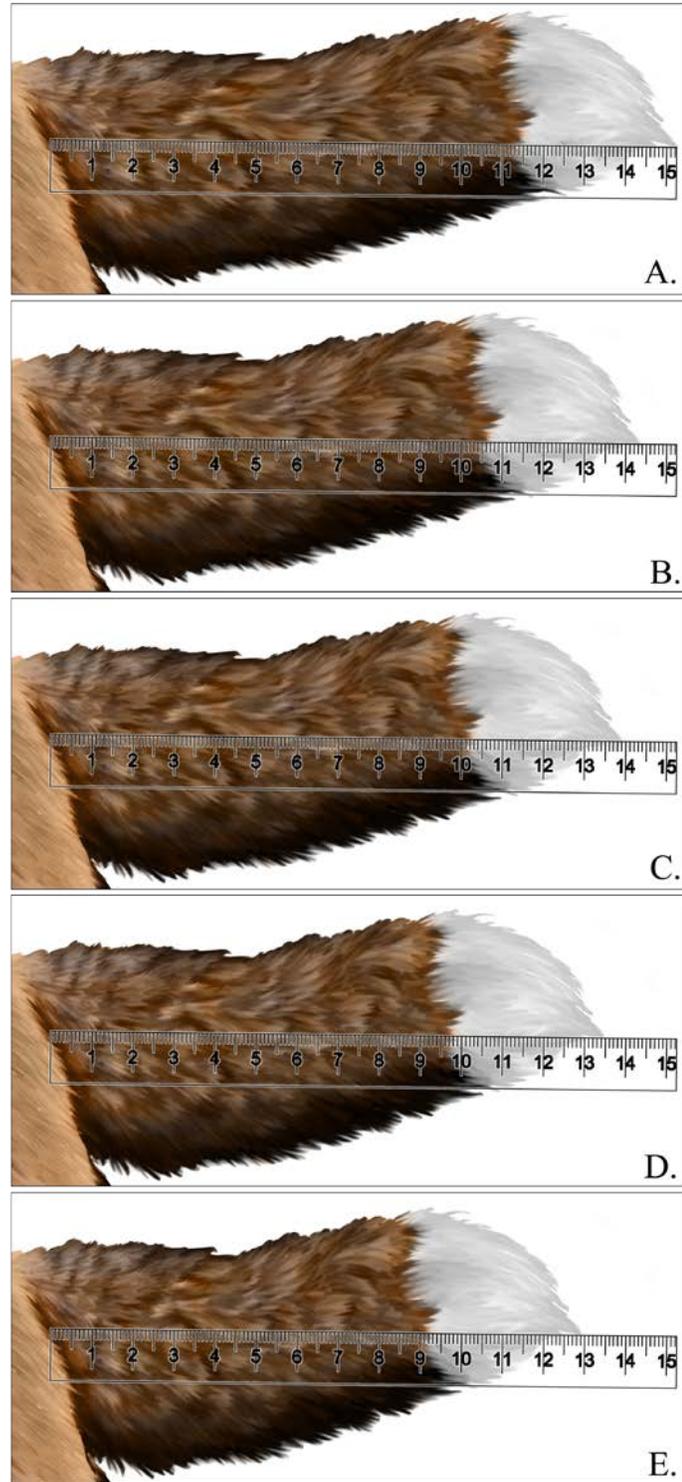
**Figure 10. Wild Red Fox Stop Angle and Body Part Length Calculations.** Illustrated by Noelle Brooks.



**Figure 11. Red Fox Face Variation Calculations.** The fox's stop's angle decreased  $5^\circ$  and the snout decreased 1.29% in length in each new image. *Figure A* depicted a standard wild red fox with a wide stop and long snout, while *Figure E* showed the effects of a domesticated red fox as stop's angle decreased in angle and the snout decreased in length creating a smaller face in general. Illustrated by Noelle Brooks.



**Figure 12. Red Fox Leg Length Calculations.** The fox's legs decreased 1.29% in length in each new image. *Figure A* depicted a standard wild red fox while *Figure E* illustrated the effects of a domesticated red fox as the legs decreased in length in relation to the body. Illustrated by Noelle Brooks.



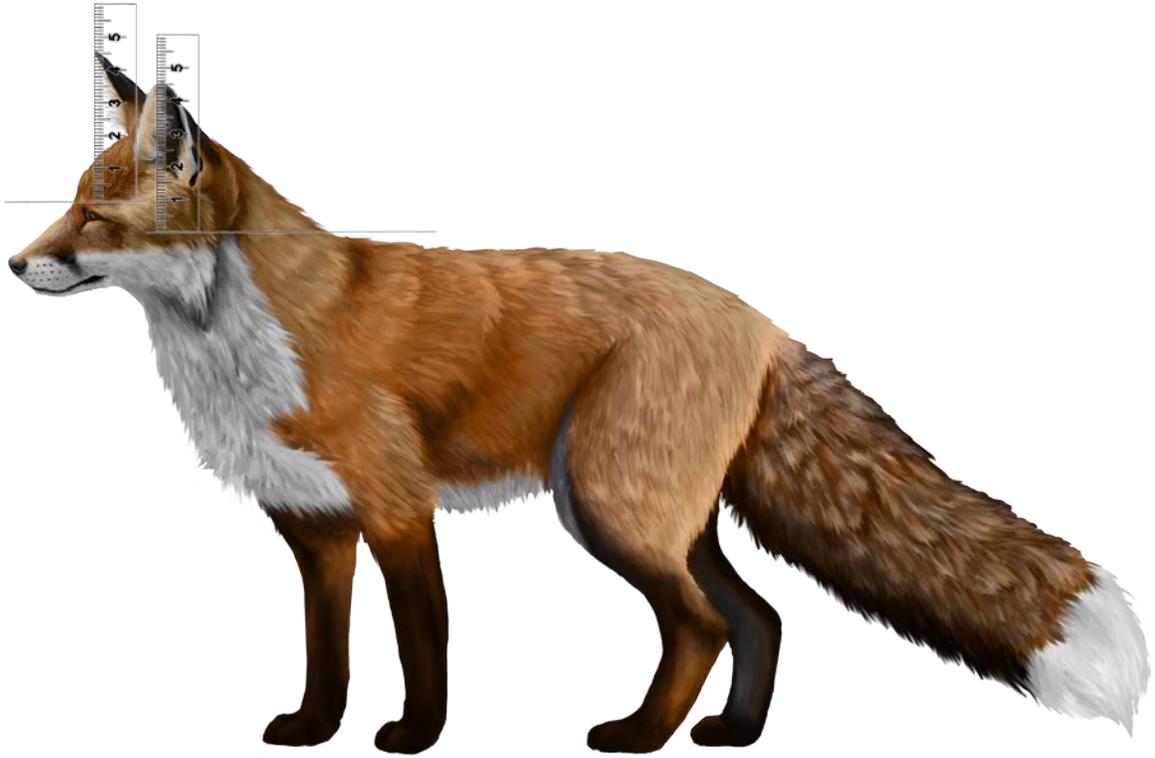
**Figure 13. Red Fox Tail Length Calculations.** The fox's tail decreased 2.63% in length in each new image. *Figure A* depicted a standard wild red fox with a long tail while *Figure E* showed the effects of a domesticated red fox as the tail decreased in length. Illustrated by Noelle Brooks.

#### Section IV B: Ear Curl

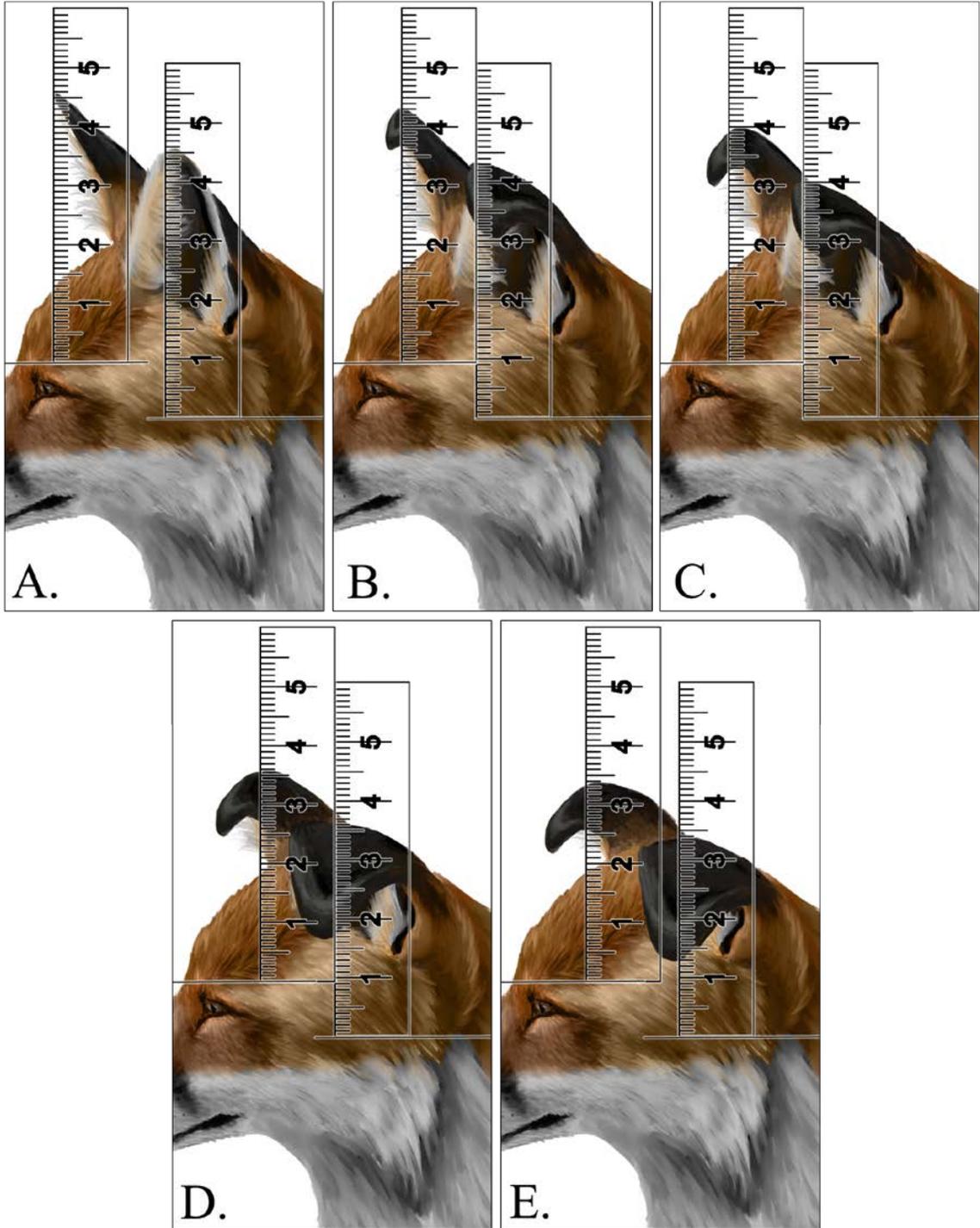
*Section IV B* of the survey contained *Items 34-40* and focused on the curling of the fox's ears. In this set of images, the fox's ears curled downward 6.52% more in each new illustration.

The first image, labeled *A*, was a standard wild red fox with a 0% curl in its ears. In the second image, labeled *B*, the fox's ears were curled over 6.52% in relation to the total height of the fox's ears. With each new image, the ears were curled downward 6.52% more, meaning that in the image labeled *C* they were 13.04% curled, in the image labeled *D* they were 19.57% curled, and in the final and most modified image labeled *E*, they were curled 26.09% of the total height of the ear.

Refer to Figure 14 to verify how the height of the ears was measured. Refer to Figure 15 for close-up views of each image's ears in order to view the precise calculations of each modification.



**Figure 14. Wild Red Fox Ear Curl Calculations.** Illustrated by Noelle Brooks.



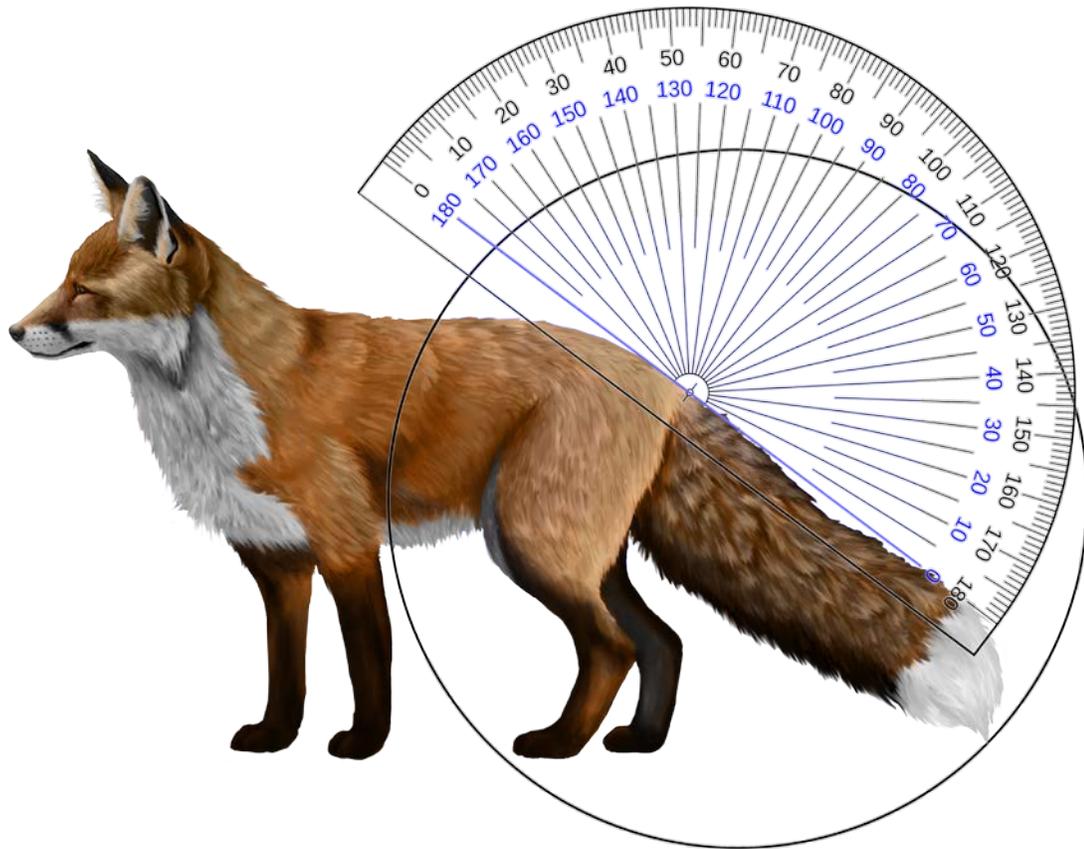
**Figure 15. Red Fox Ear Curl Calculations.** In each new image, the fox’s ears curled downward 6.52% in relation to the ears’ total height. *Figure A* depicted a standard wild red fox with completely straight ears while *Figure E* showed the effects of a domesticated red fox as the ears curled over at 26.09% the total height of the ears. Illustrated by Noelle Brooks.

Section IV C: Tail Curl Angle

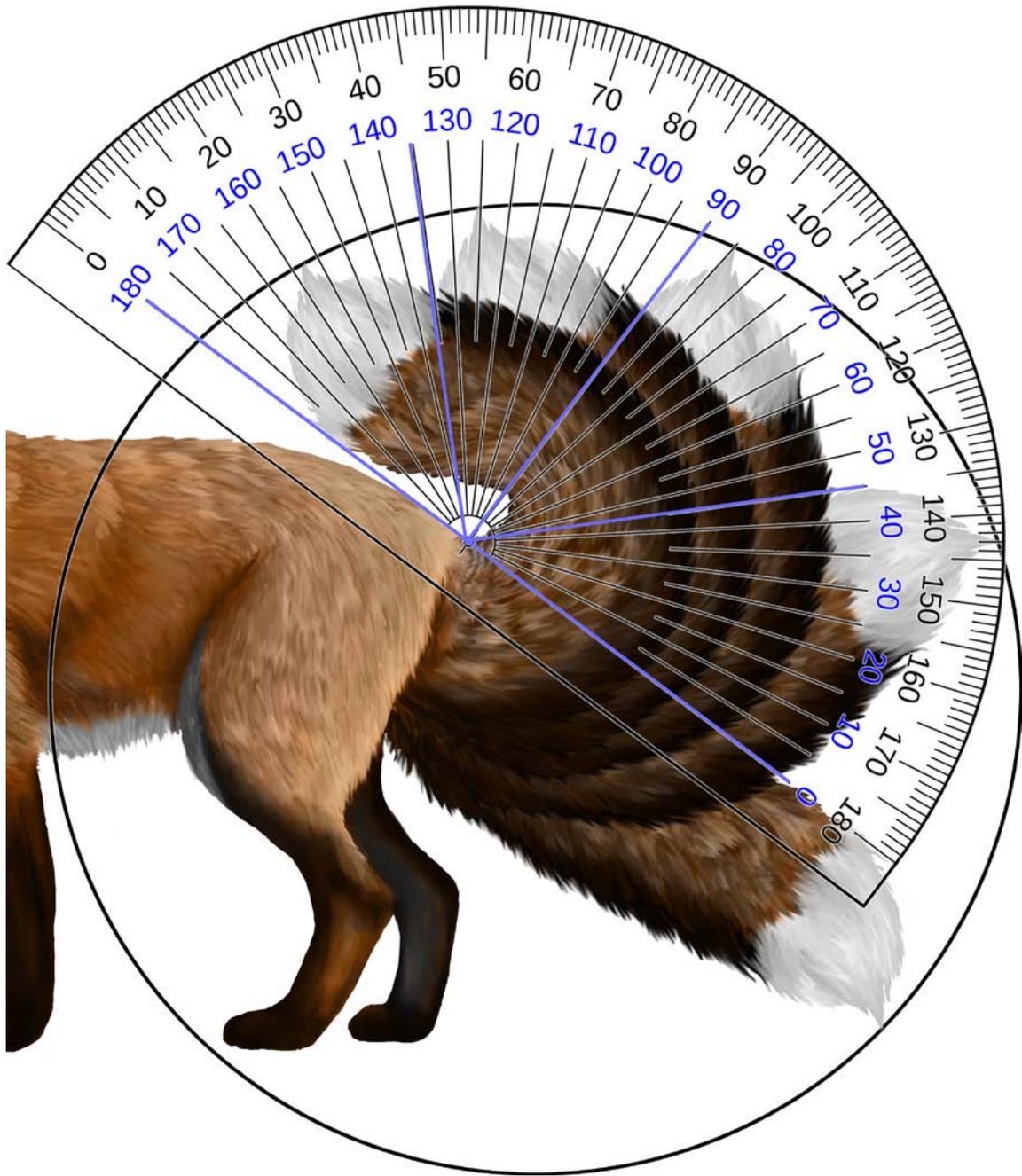
Section IV C of the survey contained *Items 41-47* and focused on the curl of the fox's tail. In this version, the fox's tail curled upward 45° more within each new image.

The first image, labeled *A*, was a standard wild red fox in which the hanging tail was measured at an angle of 0°, matching the sloping hindquarters of the fox. With each new illustration, the tail was curled upward 45° more with tail *B* at 45°, tail *C* at 90°, tail *D* at 135°, and lastly, tail *E* showing the most change at 180°.

Refer to Figure 16 to verify how the tail's curl angle was measured. Refer to Figure 17 for a close-up view of all five of the tail modifications. These tails are all set upon a protractor to help demonstrate how their curl angles were measured.



**Figure 16. Wild Red Fox Tail Curl Angle Calculation.** Illustrated by Noelle Brooks.



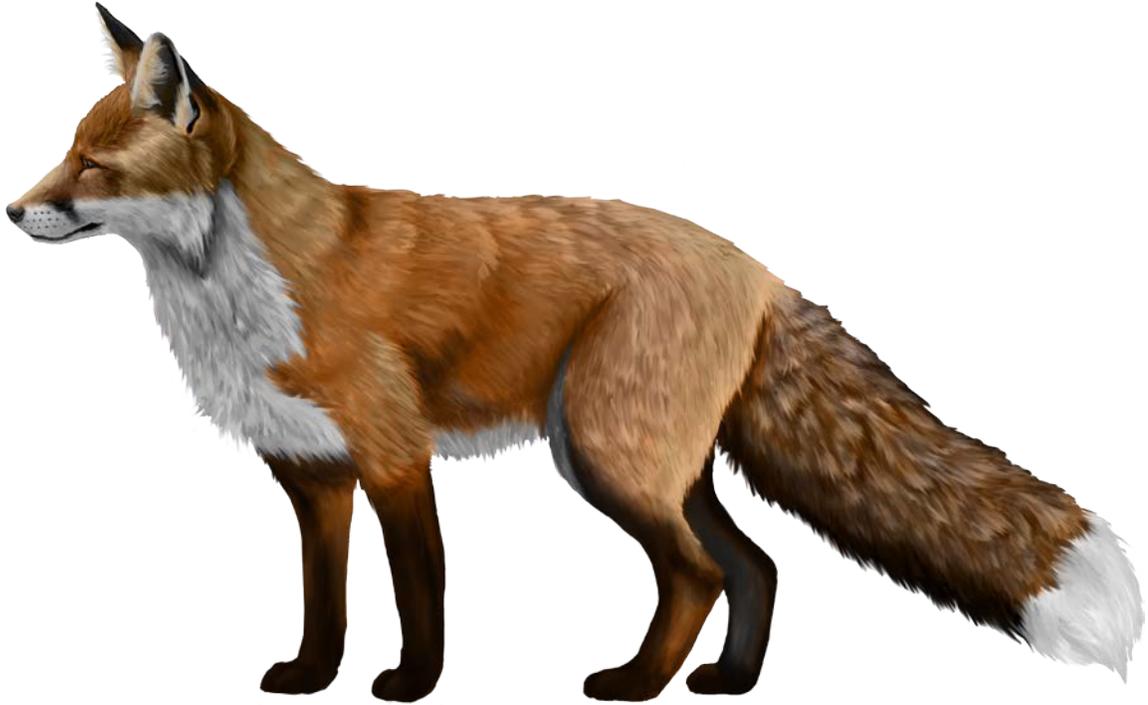
**Figure 17. Red Fox Tail Curl Angle Calculations.** The fox's tail curled upward  $45^\circ$  more in each new image. *Figure A* depicted a standard, wild red fox with a low-slung tail at  $0^\circ$  while *Figure E* illustrated the effects of a domesticated red fox as the tail curled upwards over the back of the fox  $180^\circ$  in a semi-circle motion. Illustrated by Noelle Brooks.

#### Section IV D: Fur Color

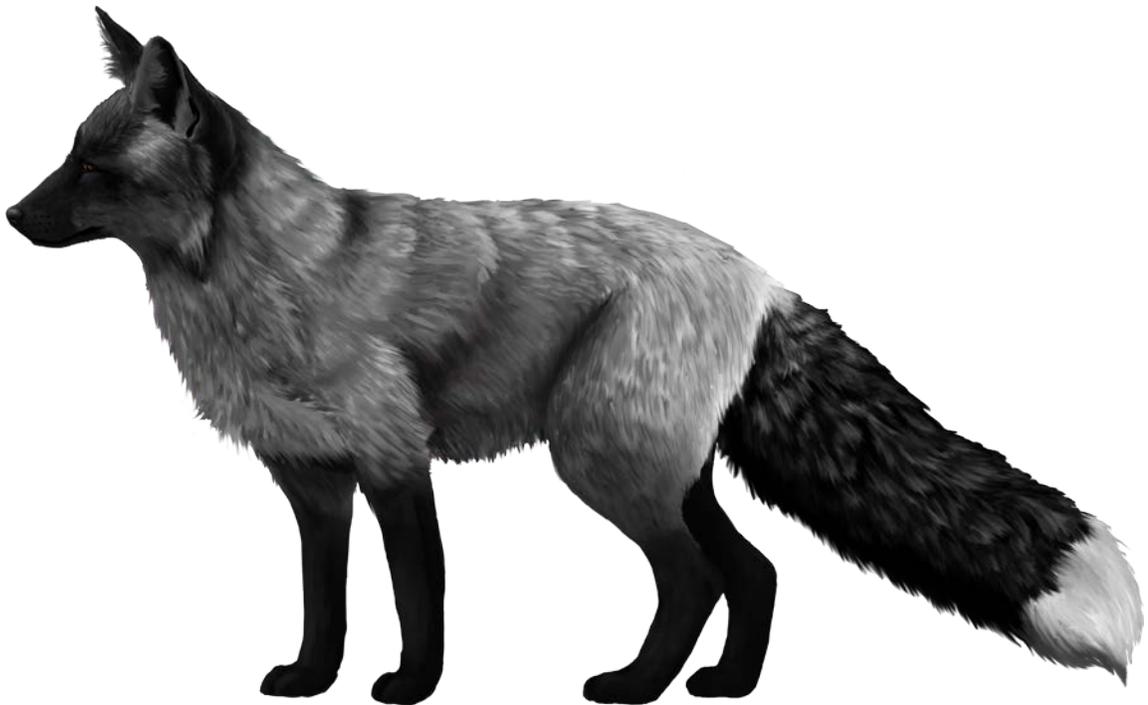
*Section IV D* of the survey contained *Items 48-54* and focused on fur color. Unlike the previous sets of images, in which the first image of the fox presented a standard wild red fox and the images following gradually increased in the amount of manipulation brought on by domestication, these images were unrelated to one another. Instead of showing a gradual progression of manipulation, this series simply showed five different colors that a fox's fur can display, two found in the wild and three only found in selectively bred foxes.

The first image, labeled *A*, was a standard wild red fox with a common red coat. The second image, labeled *B*, showed a silver-colored red fox. While not as well-known as the red-colored red fox, the silver-colored red fox can be commonly found in the wild. The images labeled *C*, *D*, and *E* illustrated fur colors that can only be obtained through selective breeding. *Figure C* demonstrated a piebald-spotted silver-colored red fox, a silver-colored red fox that has large white piebald markings that occur from a reduction in pigment. These foxes are often called "silver whitemarks" or "white mark silvers" in the fox fur community (Canada Fox Breeders' Association 1996). *Figure D* showed a platinum-colored red fox, a grey-colored fox with a great deal of white marks, including a blaze, collar, and stockings. The last image, *Figure E* displayed a Georgian white-colored red fox, an all-white fox with black speckles across its face, back, and legs.

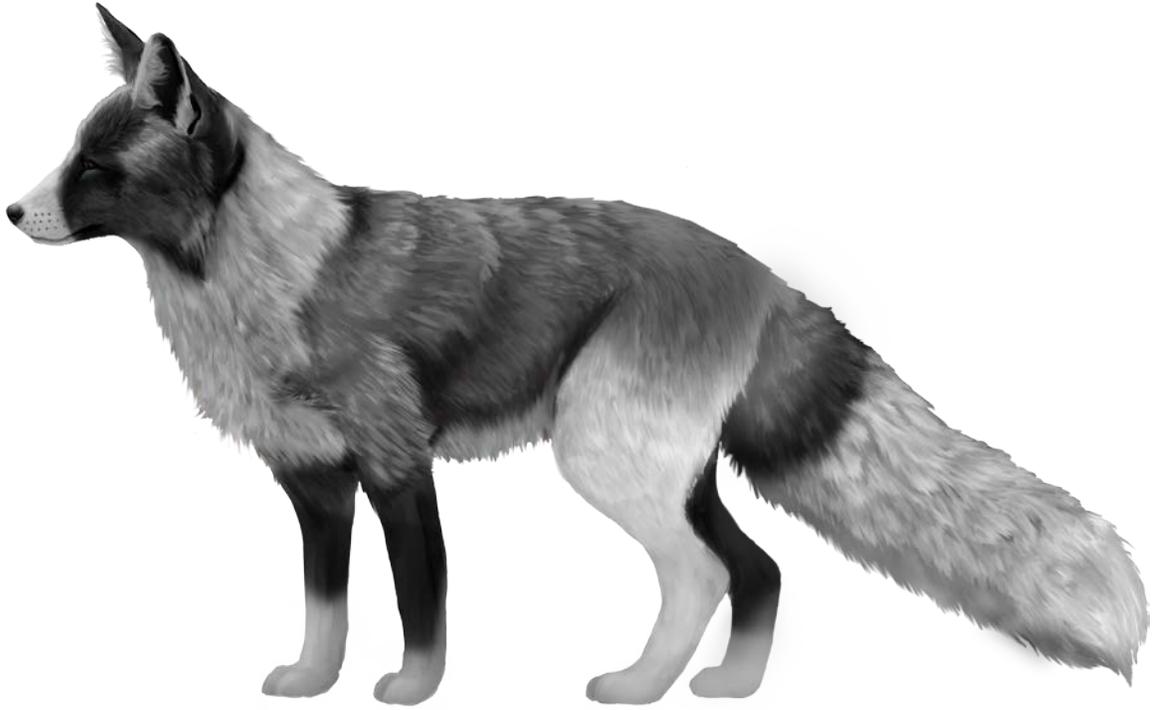
Refer to Figures 18, 19, 20, 21, and 22 to view larger-scaled images of the five different illustrations used in *Section IV D* of the survey. Notice how the physical attributes in each fox remained the same as only the fur color changed.



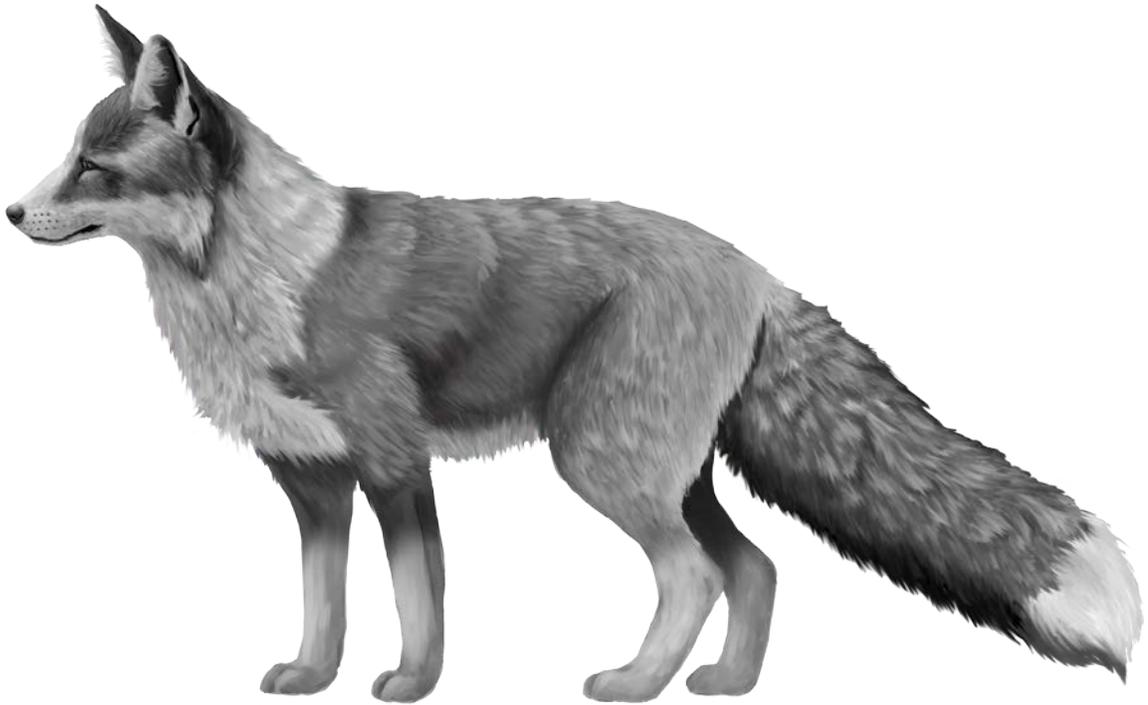
**Figure 18. Red-Colored Red Fox.** Illustrated by Noelle Brooks.



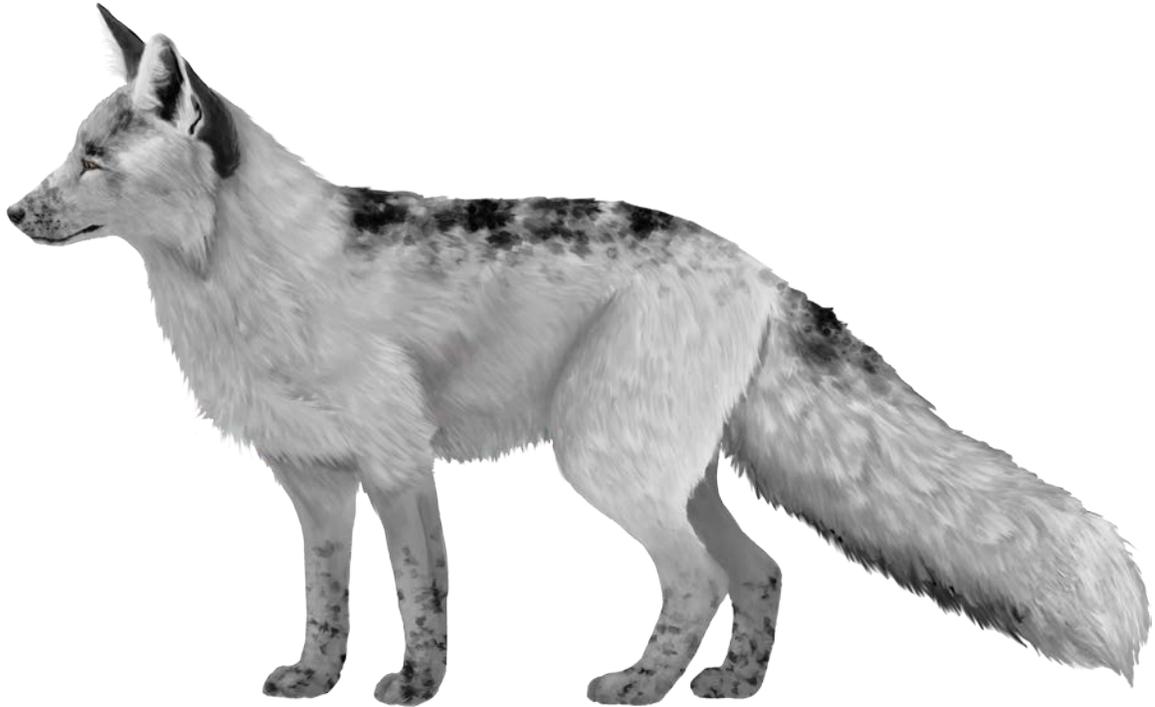
**Figure 19. Silver-Colored Red Fox.** Illustrated by Noelle Brooks.



**Figure 20. Piebald-Spotted, Silver-Colored Red Fox.** Illustrated by Noelle Brooks.



**Figure 21. Platinum-Colored Red Fox.** Illustrated by Noelle Brooks.



**Figure 22. Georgian White-Colored Red Fox.** Illustrated by Noelle Brooks.

Section IV E: Composite

*Section IV E* contained *Items 55-61* and did not focus on manipulating one specific physical attribute. This set of images composited several of the manipulations from three other versions of the survey into one series of images. In this section of the survey, the fox's stop angles, body part lengths, ear curls, and tail curl angles were changed. In each new image, the fox's stop's angle decreased  $5^\circ$ , the snout decreased 3.17% in length, the legs decreased 1.29% in length, the ears curled downward 6.52% more, and the tail curled upward  $45^\circ$  more.

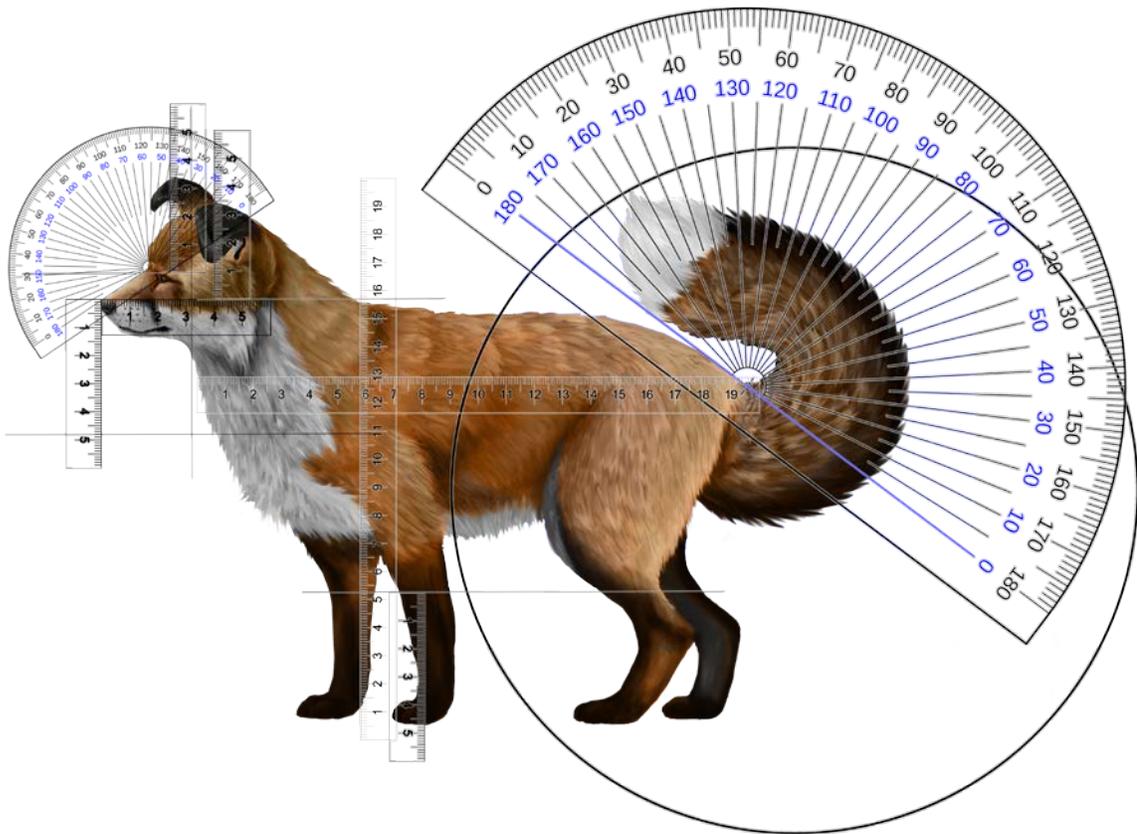
The first image, labeled *A*, was a standard wild red fox showing common physical features, the same as the images labeled *A* in all of the other variations of this survey. Within each new image, the fox was manipulated in several different ways. The image labeled *E* showed the fox with extreme modifications to its physical attributes, combining

the smallest stop angle, shortest snout, shortest legs, most curled ears, and most curled tail from the previous *Figure E*'s to create a composite image demonstrating the great changes domestication can make to an animal's physical appearance.

Refer to Figure 23 to verify how the angle of the stop, length of the body parts, curl of the ears, and the curl of the tail were measured.

Refer to Figures 11, 12, 15, and 17 for close-up views of the leg length, face variation, ear curl, and tail curl angle modifications demonstrating their precise calculations.

Refer to Table 6 for the stop angle, body part length, ear curl, and tail curl angle calculations of each figure within *Section IV E* of the survey.



**Figure 23. Composite Red Fox Calculations.** Illustrated by Noelle Brooks.

Table 6  
*Stop Angle, Body Part Length, Ear Curl, and Tail Curl Angle Composite Calculations*

<i>Figure</i>	Stop Angle	Snout Length (% of total head length)	Leg Length (% of total height)	Ear Curl (% of total ear height)	Tail Curl Angle
<i>A</i>	140	63	74	0	0
<i>B</i>	135	60	73	6.52	45
<i>C</i>	130	57	72	13.04	90
<i>D</i>	125	54	70	19.57	135
<i>E</i>	120	51	69	26.09	180

### Procedures

The survey was administered to 97 undergraduate students in introductory psychology classes at Texas State University. Each student was given the option to anonymously and voluntarily participate in the study in order to earn extra credit in the psychology class. Those who opted to participate, received a participant information page, an answer form, and a paper survey with an attached cover page. After completing the participant information page and using a No. 2 pencil to record their responses to the survey on their answer forms, students were informed to return all of their materials to the survey administrator.

The completed answer forms were sent for scoring at the Testing, Research Support, and Evaluation Center at Texas State University. At the Testing Center, the answer forms were scanned and run through a scoring program which generated three reports: a Microsoft Word, a Microsoft Excel, and an IBM SPSS score report.

For each participant, the sum of *Items 7-14* was calculated to assign a Pet Dog Attitude Score, a sum of the participant's attitudes toward dogs, and the sum of *Items 17-24* was calculated to assign a Pet Fox Attitude Score, a sum of the participant's attitudes toward foxes.

### Statistical Analyses

All statistical analyses were carried out with SPSS Statistics (IBM Corp., Armonk, NY, USA). All tests were one-tailed and differences were considered significant where  $p \leq 0.05$ .

Inter-item reliability was calculated for the Pet Dog Attitude Scale, the Pet Fox Attitude Scale, and the two scales compared together. Pearson correlations were determined for the Pet Dog Attitude Scale and Pet Fox Attitude Scale. A Cronbach's alpha was also conducted to assess the reliability of these items.

Pearson correlations were determined for relations between Pet Dog Attitude Scores and Pet Fox Attitude Scores and the attitudes toward the ethics and legality of breeding and owning these different pets.

Lastly, frequency counts were used to evaluate participant responses to the physical features in the illustrations of the foxes changed by domestication. A contingency coefficient was performed for the correct and incorrect participant estimates of the physical features in the illustrations of the foxes changed by domestication. Estimates of what feature changed in the images were scored correct or incorrect and cast in a 4x2 contingency table.

## CHAPTER IV

### RESULTS

#### Pet Dogs Compared to Pet Domesticated Foxes

Inter-item reliability was calculated for *Items 7-14* of *Section II* measuring participant attitudes toward dogs as pets and *Items 17-24* of *Section III* measuring participant attitudes toward domesticated foxes as pets. Cronbach alphas showed strong inter-item consistency, 0.93 and 0.92, respectively. The combined 16 items had inter-item reliability of 0.93. *Items 7-14* were summed to find a participant's Pet Dog Attitude Score and *Items 17-24* were summed to find a participant's Pet Fox Attitude Score.

As anticipated, dogs were perceived 20% more favorably than domesticated foxes as pets,  $M = 4.48$ ,  $SD = 1.0$  compared with  $M = 3.48$ ,  $SD = 1.45$ , respectively. The total Pet Dog Attitude Scores and Pet Fox Attitude Scores were significantly, positively correlated to each other ( $r = 0.34$ ,  $p \leq .001$ ).

Refer to Table 7 for a summarization of the Pet Dog Attitude Score and Pet Fox Attitude Score correlations. Refer to Table 8 for a summarization of the correlations of the directly-correlated items of *Section II* and *Section III*. Refer to Table 9 for a summarization of the correlations of the items in the Pet Dog Attitude Scale. Refer to Table 10 for a summarization of the correlations of the items in the Pet Fox Attitude Scale. Refer to Table 11 for a summarization of the correlations of the Pet Dog Attitude Scale to the Pet Fox Attitude Scale.

Table 7  
*Pet Dog Attitude Score and Pet Fox Attitude Score Correlations*

Attitude Score	Correlation	Pet Dog Attitude Score	Pet Fox Attitude Score
	Pearson Correlation	1	.344
	Sig. (1-Tailed)		.001
Pet Dog Attitude Score	Sum of Squares and Cross-Products	773.582	384.923
	Covariance	.998	.497
	Pearson Correlation	.344	1
	Sig. (1-Tailed)	.001	
Pet Fox Attitude Score	Sum of Squares and Cross-Products	384.923	1619.479
	Covariance	.497	2.092

*Note.* The Pet Dog Attitude Score was the sum of a participant's responses to the Pet Dog Attitude Scale, *Items 7-14*. The Pet Fox Attitude Score was the sum of a participant's responses to the Pet Fox Attitude Scale, *Items 17-24*.

Table 8  
*Section II and Section III Direct Correlations*

<i>Items</i>	Pearson Correlation	Sig. (1-Tailed)
<i>7, 17</i>	.507	.001
<i>8, 18</i>	.503	.001
<i>9, 19</i>	.614	.001
<i>10, 20</i>	.243	.008
<i>11, 21</i>	.367	.001
<i>12, 22</i>	.344	.001
<i>13, 23</i>	.324	.001
<i>14, 24</i>	.446	.001
<i>15, 25</i>	.616	.001
<i>16, 26</i>	.213	.018

*Note.* All the items in *Section III* identically resembled the items in *Section II* with a slight rewording of "pet dog" to "pet domesticated fox" in each item. This ensured that any change in participant attitude was strictly due to the change of animal associated with each item.

Table 9  
*Pet Dog Attitude Scale Correlations*

<i>Item</i>	<i>Correlation</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>14</i>
<i>7</i>	Pearson Correlation	1	.649	.423	.704	.704	.715	.652	.577
	Sig. (1-Tailed)		.001	.001	.001	.001	.001	.001	.001
<i>8</i>	Pearson Correlation	.649	1	.664	.720	.628	.702	.706	.632
	Sig. (1-Tailed)	.001		.001	.001	.001	.001	.001	.001
<i>9</i>	Pearson Correlation	.423	.664	1	.471	.488	.435	.508	.429
	Sig. (1-Tailed)	.001	.001		.001	.001	.001	.001	.001
<i>10</i>	Pearson Correlation	.704	.720	.471	1	.661	.763	.781	.687
	Sig. (1-Tailed)	.001	.001	.001		.001	.001	.001	.001
<i>11</i>	Pearson Correlation	.704	.628	.488	.661	1	.667	.568	.577
	Sig. (1-Tailed)	.001	.001	.001	.001		.001	.001	.001
<i>12</i>	Pearson Correlation	.715	.702	.435	.763	.667	1	.763	.689
	Sig. (1-Tailed)	.001	.001	.001	.001	.001		.001	.001
<i>13</i>	Pearson Correlation	.652	.706	.508	.781	.568	.763	1	.799
	Sig. (1-Tailed)	.001	.001	.001	.001	.001	.001		.001
<i>14</i>	Pearson Correlation	.577	.632	.429	.687	.577	.689	.799	1
	Sig. (1-Tailed)	.001	.001	.001	.001	.001	.001	.001	

*Note.* The Pet Dog Attitude Scale was composed of *Items 7-14* in *Section II* of the survey.

Table 10  
*Pet Fox Attitude Scale Correlations*

<i>Item</i>		<i>17</i>	<i>18</i>	<i>19</i>	<i>20</i>	<i>21</i>	<i>22</i>	<i>23</i>	<i>24</i>
<i>17</i>	Pearson Correlation	1	.816	.621	.536	.644	.637	.405	.501
	Sig. (1-Tailed)		.001	.001	.001	.001	.001	.001	.001
<i>18</i>	Pearson Correlation	.816	1	.591	.474	.549	.589	.426	.496
	Sig. (1-Tailed)	.001		.001	.001	.001	.001	.001	.001
<i>19</i>	Pearson Correlation	.621	.591	1	.375	.451	.409	.424	.494
	Sig. (1-Tailed)	.001	.001		.001	.001	.001	.001	.001
<i>20</i>	Pearson Correlation	.536	.474	.375	1	.770	.592	.681	.702
	Sig. (1-Tailed)	.001	.001	.001		.001	.001	.001	.001
<i>21</i>	Pearson Correlation	.644	.549	.451	.770	1	.670	.620	.661
	Sig. (1-Tailed)	.001	.001	.001	.001		.001	.001	.001
<i>22</i>	Pearson Correlation	.637	.589	.409	.592	.670	1	.595	.602
	Sig. (1-Tailed)	.001	.001	.001	.001	.001		.001	.001
<i>23</i>	Pearson Correlation	.405	.426	.424	.681	.620	.595	1	.792
	Sig. (1-Tailed)	.001	.001	.001	.001	.001	.001		.001
<i>24</i>	Pearson Correlation	.501	.496	.494	.702	.661	.602	.792	1
	Sig. (1-Tailed)	.001	.001	.001		.001	.001	.001	

*Note:* The Pet Fox Attitude Scale was composed of *Items 17-24* in *Section III* of the survey.

Table 11  
*Pet Fox Attitude Scale and Pet Fox Attitude Scale Correlations*

	<i>Item</i>	<i>17</i>	<i>18</i>	<i>19</i>	<i>20</i>	<i>21</i>	<i>22</i>	<i>23</i>	<i>24</i>
<i>7</i>	Pearson Correlation	.507	.314	.366	.294	.354	.390	.240	.301
	Sig. (1-Tailed)	.001	.001	.001	.002	.001	.001	.009	.001
<i>8</i>	Pearson Correlation	.391	.503	.365	.220	.269	.357	.276	.343
	Sig. (1-Tailed)	.001	.001	.001	.015	.004	.001	.003	.001
<i>9</i>	Pearson Correlation	.310	.346	.614	.138	.166	.215	.228	.306
	Sig. (1-Tailed)	.001	.001	.001	.090	.052	.017	.013	.001
<i>10</i>	Pearson Correlation	.288	.311	.327	.243	.258	.342	.218	.266
	Sig. (1-Tailed)	.002	.001	.001	.008	.005	.001	.016	.004
<i>11</i>	Pearson Correlation	.425	.299	.390	.282	.367	.399	.267	.363
	Sig. (1-Tailed)	.001	.001	.001	.003	.001	.001	.004	.001
<i>12</i>	Pearson Correlation	.299	.354	.271	.241	.251	.344	.283	.372
	Sig. (1-Tailed)	.001	.001	.004	.009	.007	.001	.003	.001
<i>13</i>	Pearson Correlation	.395	.438	.431	.274	.283	.354	.324	.378
	Sig. (1-Tailed)	.001	.001	.001	.003	.003	.001	.001	.001
<i>14</i>	Pearson Correlation	.342	.361	.416	.334	.374	.282	.277	.446
	Sig. (1-Tailed)	.001	.001	.001	.001	.001	.003	.003	.001

*Note:* The Pet Dog Attitude Scale was composed of *Items 7-14* in *Section II* of the survey. The Pet Fox Attitude Scale was composed of *Items 17-24* in *Section III* of the survey.

*Items 30, 37, 44, 51, and 58* asked participants to report how confident they were that one of the foxes shown in the set of five images would make a good pet on a scale of 1-5, with 5 being the most confident. For *Section IV A, B, and C*, participants chose 3 most frequently, but for *Section IV D and E*, 1, least confident, was chosen most frequently. The average responses for *Section IV A, B, C, D, and E* were 2.8, 2.93, 2.98, 2.9, and 2.85 respectively. On average overall, participants responded with a 2.89 on how confident they were that the foxes pictured would make a good pet.

In *Item 20 of Section III* when participants were asked how confident they were that “domesticated foxes make good pets,” the average response was a 2.97. This shows that participants were 1.6% less confident that a fox would make a good pet when looking at an illustration of a fox than not looking at an illustration. When asked how confident they were that “dogs make good pets” in *Item 10 of Section II*, the average response was a 4.6. This shows that participants were 34.2% less confident that a fox would make a good pet compared to a dog making a good pet.

*Items 31, 38, 45, 52, and 59* asked participants if they would like to own any of the foxes from the set of five images as a pet. For every single set of images, participants most frequently responded that they would like to own one of the foxes as a pet. 66.32% wanted a pet from *Section IV A*, 63.74% wanted a pet from *Section IV B*, 64.77% wanted a pet from *Section IV C*, 63.74% wanted a pet from *Section IV D*, and 60.23% wanted a pet from *Section IV E*.

In *Item 22 of Section II*, participants were asked to agree on a scale of 1-5, in which 5 meant most agreement, with the statement, “If circumstances allowed and money was not an issue, I would like to own a pet domesticated fox.” The most frequent

response was a 5 at 36.08% and the average response was 3.38. This shows an average of 67.6% of participants showing an interest in owning a domesticated fox as a pet. In comparison, a similar question in *Section II* regarding dogs. Again, the most frequent response was a 5, however, the frequency was much higher at 75.26% of the participants. The average response was 4.44, showing an average of 88.8% of participants showing confidence in wanting a dog as a pet. This shows that, on average, participants wanted a dog as a pet 21.2% more than a domesticated fox as a pet.

### Ethical and Legal Attitudes

The relation between ethical and legal attitudes comparing pet-dog and pet-fox ownership was also examined.

*Item 15* and *Item 25* asked participants how confidently they agree to the statement: “It is ethical to selectively breed pet dogs/wild foxes, eventually altering them to suit our needs.” The average scores for *Items 15* and *25* were in the low-moderate agreement range for both dogs and foxes,  $M = 2.84$ ,  $SD = 1.28$  and  $M = 2.46$ ,  $SD = 1.34$ , respectively. Participants were 7.6% more in favor for the selective breeding of dogs over foxes. There was a significant, positive relation for *Items 15* and *25*,  $r = 0.62$ ,  $p \leq .001$ .

*Item 16* and *Item 26* asked participants how confidently they agree to the statement: “It should be legal in the United States to own a pet dog/domesticated fox.” These items showed more favorable attitude scores for pet dogs than pet domesticated foxes,  $M = 4.48$ ,  $SD = 1.27$  and  $M = 3.25$ ,  $SD = 1.5$ . Participants were 24.6% more in favor for the legal ownership of dogs over foxes and 40% more in favor for the legal possession of pet dogs than the breeding of pet dogs to suit our needs. Participants

favored owning pet domesticated foxes only 15.8% more than breeding wild foxes. There was also a significant, positive relation for *Items 16* and *26*,  $r = 0.21$ ,  $p = 0.18$ .

Participant attitudes toward dogs, in general, (ethics and legality,) were not correlated ( $r = 0.04$ ,  $p \geq .05$ ), but participant attitudes toward fox ethics and fox legality were significantly correlated with each other ( $r = 0.61$ ,  $p \leq 0.001$ ). Attitudes about pet-dog breeding ethics was significantly, positively correlated with attitudes about pet domesticated fox ownership legality ( $r = 0.31$ ,  $p = .001$ ). However, participant attitudes toward pet-dog ownership laws were not significantly correlated with attitudes toward fox ethics ( $r = 0.1$ ,  $p = .16$ ).

Further, Pearson correlations were determined for relations between Pet Dog Attitude Scores and Pet Fox Attitude Scores and the attitudes toward the ethics and legality of breeding and owning these different pets. Pet Dog Attitude Scores were significantly, positively correlated with attitudes toward dog breeding ethics ( $r = 0.23$ ,  $p = .01$ ), dog ownership legality ( $r = 0.34$ ,  $p < .001$ ), and fox breeding ethics ( $r = 0.17$ ,  $p = .045$ ), but not significantly correlated with attitudes toward fox ownership legality ( $r = 0.13$ ,  $p \geq .05$ ). Pet Fox Attitude Scores were significantly, positively correlated with attitudes toward dog ownership legality ( $r = 0.24$ ,  $p = 0.1$ ), fox breeding ethics ( $r = .33$ ,  $p \leq .001$ ) as well as fox ownership legality ( $r = .39$ ,  $p \leq .001$ ). However, Pet Fox Attitude Scores were not significantly correlated with attitudes toward dog breeding ethics, although it trended toward significance,  $p = .057$ , ( $r = 0.16$ ,  $p \geq .05$ ).

Refer to Table 12 for a summarization of how the Pet Dog Attitude Scores and Pet Fox Attitude Scores; attitudes toward pet-dog breeding ethics; dog ownership laws; wild fox breeding ethics; and domesticated fox ownership laws correlate.

Table 12

*Pet Dog Attitude Score and Pet Fox Attitude Score; Attitude Toward Pet-dog breeding Ethics; Dog Ownership Laws; Wild Fox Breeding Ethics; and Fox Ownership Laws Correlations*

<i>Item</i>	Correlation	<i>Item 15:</i> Dog Ethics	<i>Item 16:</i> Dog Laws	<i>Item 25:</i> Fox Ethics	<i>Item 26:</i> Fox Laws
Pet Dog Attitude Score	Pearson Correlation	.229	.336	.174	.127
	Sig. (1-Tailed)	.012	.001	.045	.108
	Sum of Squares and Cross-Products	26.062	36.443	20.701	16.907
	Covariance	.271	.380	.216	.176
Pet Fox Attitude Score	Pearson Correlation	.162	.236	.333	.393
	Sig. (1-Tailed)	.057	.010	.001	.001
	Sum of Squares and Cross-Products	26	36	56	74
	Covariance	.271	.375	.583	.771
<i>Item</i> <i>15:</i> Dog Ethics	Pearson Correlation	1	.038	.616	.314
	Sig. (1-Tailed)		.354	.001	.001
	Sum of Squares and Cross-Products	157.361	5.753	101.423	57.959
	Covariance	1.639	.060	1.056	.604
<i>Item</i> <i>16:</i> Dog Laws	Pearson Correlation	.038	1	.104	.213
	Sig. (1-Tailed)	.354		.156	.018
	Sum of Squares and Cross-Products	5.753	142.227	16.196	37.371
	Covariance	.060	1.482	.169	.389
<i>Item</i> <i>25:</i> Fox Ethics	Pearson Correlation	.616	.104	1	.606
	Sig. (1-Tailed)	.001	.156		.001
	Sum of Squares and Cross-Products	101.423	16.196	172.124	116.866
	Covariance	1.056	.169	1.793	1.217
<i>Item</i> <i>26:</i> Fox Laws	Pearson Correlation	.314	.213	.606	1
	Sig. (1-Tailed)	.001	.018	.001	
	Sum of Squares and Cross-Products	57.959	37.371	116.866	216.062
	Covariance	.604	.389	1.217	2.251

*Note:* The Pet Dog Attitude Scale was composed of *Items 7-14* in *Section II* of the survey. The Pet Fox Attitude Scale was composed of *Items 17-24* in *Section III* of the survey.

### Perceptions of Wild to Domesticated Fox Images

Response frequencies for *Section IV* of the survey were examined to determine participant responses to manipulations of canine physical attributes by domestication. The results of *Section IV A, B, C, and E* were compared together while the results from *Section IV D* were viewed separately.

*Section IV D* was unlike the other four subsections of *Section IV, A, B, C, and E* in the fact that it did not show a gradual increase in the amount of manipulation brought on by domestication in its set of five images with the top image being the least domesticated and the bottom image being most domesticated. Instead, the five images were unrelated to one another, simply showing five different fur colors a domesticated fox can have, two found in the wild and three only found in selectively bred foxes. For this reason, *Section IV D* must be analyzed separately from *Section IV A, B, C, and E*.

In *Items 33, 40, 47, 54, and 61*, participants were asked to determine which elements of the feral fox to domesticated fox morphs were altered in each of the five sets of five feral to domesticated fox images: ears only, tail only, fur color only, and lastly, multiple changes to the morph. The first subsection, *Section IV A*, included changes in the stop angle and body part lengths and was considered a practice trial as the results of *Item 33* were not included in the data analysis. Participant frequencies of accurate responses and percent correct for feature changes were: ears, 80/18 (82% correct); tail, 83/13 (86% correct), fur color, 72/23 (76% correct) and multiple changes, 76/22 (78% correct). A 4 x 2 contingency coefficient showed there were no significant differences in correct and incorrect estimates of the four domesticated features: ears, tail, color, and multiple changes ( $\chi^2 = 4.11(3)$ ,  $p > .05$ ).

## Domestication

When physical attributes that were changed gradually by domestication were viewed separately from each other in *Items 27, 34, and 41*, the most frequent participant responses determined a fox domesticated when its stop angle reached  $130^\circ$  or less, snout length was 57% or less the total length of the fox's head, the legs were 72% or less the total height of the fox, the tail was .73 times or less the length of the body, the ears curled downward 6.52% or more, and the tail curled upward  $45^\circ$  or more. Average participant responses determined that the fox appeared domesticated when the stop angle reached an angle of  $129.5^\circ$  or less; the snout length was 56.7% or less of the total length of the fox's head; the legs were 71.8% or less the total height of the fox; the tail was 0.73 or less times the length of the body ( $M = 3.10$ ); the ears curled downwards at least 11.87% in relation to the total height of the fox's ear ( $M = 2.82$ ); and the tail curled upwards at least  $84.6^\circ$  ( $M = 2.88$ ).

When multiple traits were changed simultaneously in *Item 55*, the fox was considered domesticated by the participants, on average, when the stop angle reached an angle of  $131.6^\circ$  or less; the snout length was 57.96% or less the total length of the fox's head; the legs were 72.32% or less the total height of the fox; the ears curled downward at least 10.95%; and the tail curled at an angle of  $75.6^\circ$  or more ( $M = 2.68$ ). Participants labeled a fox domesticated 10.5% sooner based on the fox's stop angle and snout length snout length, 10.4% sooner based on leg length, 3.5% sooner based on ear curl, and 5% sooner based on tail curl. On average, participants determined the fox to appear more domesticated 7.98% faster when viewing images in which multiple traits were transformed all at once over images in which only one trait was manipulated.

Refer to Table 13 for a summarization of when participants determined the fox to appear domesticated when viewing individual traits as compared to viewing composite traits based on average participant response.

Table 13  
*Determining Point of Fox Domestication Based on Average Participant Response to Individual Traits Compared to Composite Traits*

Trait	Individual Traits	Composite Traits	Difference (%)
Stop Angle	129.5	131.6	10.5
Snout Length (% of total head length)	56.7	57.96	10.5
Leg Length (% of total height)	71.8	72.32	10.4
Ear Curl (% of total ear height)	11.87	10.95	3.5
Tail Curl Angle	84.6	75.6	5

*Items 28, 35, 42, and 56* asked participants to identify the image in which the fox appeared most domesticated. In all instances, the most frequent response was *Figure E*, the image designed to contain the strongest manipulations of physical attributes by domestication. The average participant responses show a slightly different result, however. On a scale of 1-5, with 1 representing a wild fox and 5 representing a domesticated fox, participant mean responses for *Section IV A, B, C, and E* were: 3.51, 4.32, 4.25, and 3.68 respectively. In this case, *Figure D* represents the average response instead of *Figure E*.

In *Item 49 of Section IV D*, participants most frequently chose the Georgian white-colored fox, at 37.50%, as the one that appeared the most domesticated compared to the silver-, red-, piebald-, and platinum-colored fox. The silver-colored fox was chosen the least often at 6.25% followed by the red-colored fox at 11.46%. This shows that domesticated coat colors were perceived as more domesticated, 82.3% of the time.

## Attraction

In *Items 29, 36, 43, and 57* participants were asked to choose the fox that appeared the most attractive. In all instances, participants most frequently chose *Figure A*, the image intended to depict a standard, wild red fox unaffected by physical changes brought on by domestication. In this image, the fox's stop angle was  $140^\circ$ , the snout length was 63% the total length of the fox's head, the legs made up 74% of the fox's total height, the tail was 0.79 times the length of the body and curled upwards  $0^\circ$ , and the ears curled downward 0%. On average, however, participants preferred a fox with a stop angle of  $132.35^\circ$ , a snout length 58.41% the total length of the fox's face, legs that made up 72.47% the fox's total height, a tail 0.74 times the length of the body ( $M = 2.53$ ), ears curled downward 4.89% ( $M = 1.75$ ), and the tail curled upward  $76.5^\circ$  ( $M = 2.70$ ) when viewing each physical attribute separately.

When viewing images in which the stop angle, snout length, and leg length decreased and the ear curl and tail curl increased all at once in *Item 57*, participants chose, on average, foxes with a stop angle of  $134.05^\circ$ , a snout length 59.43% the total length of the fox's head, legs 72.81% the total height of the fox, ears that curled downward 7.76%, and a tail that curled upwards  $53.55^\circ$  ( $M = 2.19$ ). This means that participants preferred fox stop angles and snouts that were 8.5% more wild-looking, legs that were 6.8% more wild-looking, tails that were 12.75% more wild-looking, and ears that were 11% less wild-looking than when looking at this physical traits individually.

Refer to Table 14 for a summarization of when participants determined the fox to appear the most attractive when viewing individual traits as compared to viewing composite traits based on average participant response.

Table 14

*Most Attractive Foxes Based on Average Participant Response to Individual Traits Compared to Composite Traits*

Trait	Individual Traits	Composite Traits	Difference (%)
Stop Angle	132.35	134.05	8.5
Snout Length (% of total head length)	58.41	59.43	8.5
Leg Length (% of total height)	72.47	72.81	6.8
Ear Curl (% of total ear height)	4.89	7.76	-11
Tail Curl Angle	76.5	53.55	12.75

In *Item 50 of Section IV D* when looking at images of foxes sporting different colored fur, participants most frequently chose the standard, wild, red-colored fox as the most attractive of them all at 35.42%. The platinum was the second most frequently chosen at 19.79%, followed by the Georgian White at 18.75%, the piebald at 15.63%, and the silver chosen the least at 10.42%. Domesticated fur colors, (piebald, platinum, and Georgian White,) were chosen as the most attractive fur color 54.17% of the time.

Ownership Desirability

Participants also gave responses to which pictured red fox they would most like to own as a pet in *Items 32, 39, 46, and 60*. The most frequent participant responses picked a fox with a stop angle of 120°, a snout length 51% the total length of the fox’s head, legs 69% the total height of the fox, a tail .68 times the length of the body, ears that had a downward curl of 0°, and a tail with a 180° curl. The average participant responses found that the most-wanted pet fox that showed a stop angle of 128.8°, a snout length 56.28% the total length of the fox’s head, a leg length that totaled 71.52% the fox’s height, a tail that was 0.73 times the length of the fox’s body (M = 3.24), ears that curled over 10.95% (M = 2.68), and a curl in the tail at 107.55° (M = 3.39).

Refer to Figure 24 for an illustration displaying the most desired pet fox based on the most frequent participant responses.



**Figure 24. Most Desired Pet Fox Based on Most Frequent Participant Response to Individual Traits.** The most frequent participant responses demonstrated a fox is most attractive with a stop angle of  $120^\circ$ , a snout length 51% the total length of the fox's head, legs 69% the total height of the fox, a tail .68 times the length of the body, ears that had a downward curl of  $0^\circ$ , and a tail with a  $180^\circ$  curl. Illustrated by Noelle Brooks.

When viewing images in which the stop angle, snout length, and leg length decreased and the ear curl and tail curl increased all at once in *Item 60*, participants chose, on average, foxes with a stop angle of  $131.35^\circ$ , a snout length 57.81% the total length of the fox's head, legs 72.27% the total height of the fox, ears that curled

downward 11.28%, and a tail that curled upwards 77.85° (M = 2.73). This means that participants preferred fox stop angles and snouts that were 12.75% more wild-looking, legs that were 15% more wild-looking, tails that were 16.5% more wild-looking, and oddly, ears that were 1.25% less wild-looking than when looking at this physical traits individually.

Refer to Table 15 for a summarization of the most desired pet fox based on the most frequent participant responses to individual traits compared to composite traits.

Table 15  
*Most Desired Pet Fox Based on Most Frequent Participant Response to Individual Traits Compared to Composite Traits*

Trait	Individual Traits	Composite Traits	Difference (%)
Stop Angle	128.8	131.35	12.75
Snout Length (% of total head length)	56.28	57.81	12.75
Leg Length (% of total height)	71.52	72.27	15
Ear Curl (% of total ear height)	10.95	11.28	-1.25
Tail Curl Angle	107.55	77.85	16.5

When participants were asked to choose the fox that they would most like to own as a pet in *Item 53* of *Section IV D* when looking at foxes with five different coat colors, participants chose the red-colored fox the most frequently at 26.04%, followed by the piebald-colored fox at 23.69%, the Georgian White at 22.92%, the platinum at 18.75%, and the silver-colored fox chosen the least frequently at 8.33%. Participants preferred foxes with domesticated fur colors 65.63% of the time.

Refer to Table 16 for a summarization of *Section IV*'s response frequencies. Refer to Table 17 for a summarization of *Section IV*'s means and standard deviations. Refer to Table 18 for *Section IV D*'s response frequencies.

Table 16  
*Section IV Most Frequent Responses*

<i>Items</i> Item Text	<i>Section IV A:</i> Stop Angle & Body Part Length	<i>Section IV B:</i> Ear Curl	<i>Section IV C:</i> Tail Curl Angle	<i>Section IV E:</i> Composite
	<i>Figure</i> Frequency (%)	<i>Figure</i> Frequency (%)	<i>Figure</i> Frequency (%)	<i>Figure</i> Frequency (%)
27, 34, 41, 55 In which image does the animal begin resembling a domestic animal rather than a wild animal?	C 25.77	B 46.39	B 47.92	B 47.83
28, 35, 42, 56 Which animal appears the most domesticated?	E 50.52	E 73.20	E 72.92	E 56.84
29, 36, 43, 57 Which animal do you think is the most attractive?	A 46.39	A 68.75	A 38.54	A 52.13
32, 39, 46, 60 Which animal would you most like to own as a pet?	E 34.02	A 35.05	E 46.88	A 34.74

*Note:* This table shows the most frequent responses chosen by participants in *Section IV* followed by the percentage of participants whom chose that response.

In each subsection of *Section IV*, the first image, *Figure A*, was a standard wild red fox with common physical attributes, the least domesticated animal pictured. The following four images *Figures B, C, D*, and *E*. were gradually manipulated to replicate how domestication changes physical attributes. *Figure E* was the most manipulated and demonstrated an extreme physical transformation caused by domestication, making it the most domesticated animal pictured.

Table 17  
*Section IV Means and Standard Deviations*

<i>Items</i> Item Text	<i>Section IV A:</i> Stop Angle & Body Part Length	<i>Section IV B:</i> Ear Curl	<i>Section IV C:</i> Tail Curl Angle	<i>Section IV E:</i> Composite
	Mean, Standard Deviation	Mean, Standard Deviation	Mean, Standard Deviation	Mean, Standard Deviation
<i>27, 34, 41, 55</i> In which image does the animal begin resembling a domestic animal rather than a wild animal?	3.10 1.295	2.82 1.099	2.88 1.163	2.68 1.058
<i>28, 35, 42, 56</i> Which animal appears the most domesticated?	3.51 1.763	4.32 1.271	4.25 1.376	3.86 1.527
<i>29, 36, 43, 57</i> Which animal do you think is the most attractive?	2.53 1.614	1.75 1.290	2.70 1.668	2.19 1.498
<i>30, 37, 44, 58</i> How confident are you, on a scale of 1-5, with 5 being the most confident, that one of these animals would make a good pet?	2.80 1.359	2.93 1.379	2.98 1.392	2.85 1.391
<i>32, 39, 46, 60</i> Which animal would you most like to own as a pet?	3.24 1.644	2.68 1.630	3.39 1.719	2.73 1.601

*Note:* In each subsection of *Section IV*, the first image, 1, was a standard wild red fox with common physical attributes, the least domesticated animal pictured. The following four images 2, 3, 4, and 5 were gradually manipulated to replicate how domestication changes physical attributes. 5 was the most manipulated and demonstrated an extreme physical transformation caused by domestication, making it the most domesticated animal pictured.

Table 18  
*Section IV D Response Frequencies*

Item					
	Red	Silver	Piebald	Platinum	Georgian White
48. In which image does the animal begin resembling a domestic animal rather than a wild animal?	10.42	33.33	<u>40.63</u>	10.42	5.21
49. Which animal appears the most domesticated?	11.46	6.25	29.17	15.63	<u>37.50</u>
50. Which animal do you think is the most attractive?	<u>35.42</u>	10.42	15.63	19.79	18.75
53. Which animal would you most like to own as a pet?	<u>26.04</u>	8.33	23.96	18.75	22.92

*Note:* This table shows the most frequent responses chosen by participants in *Section IV D* with the percentage of participants whom chose that response. Underlined responses were the most frequent responses chosen for each Item.

In *Section IV D*, unlike the other subsections of *Section IV*, in which the first image of the fox presented a standard wild red fox and the images following gradually increased in the amount of manipulation brought on by domestication, these images were unrelated to one another. Instead of showing a gradual progression of manipulation, this series simply showed five different colors that a fox’s fur can display, two found in the wild and three only found in selectively bred foxes.

### Knowledge of the Farm-Fox Experiment

This study intended to assess participants' knowledge of the Farm-Fox Experiment conducted by the Institute of Cytology and Genetics of the Russian Academy of Sciences in Novosibirsk, Russia by asking participants the question, "Do you have knowledge of the Farm-Fox Experiment conducted by the Institute of Cytology and Genetics of the Russian Academy of Sciences in Novosibirsk, Russia?" in *Item 6*. Out of the 97 participants who responded to this question, only 4 (4.12%) responded that they had knowledge of the experiment.

### Test of Hypotheses

#### Hypothesis 1: Pet Dogs Compared to Pet Domesticated Foxes

*a. Attitudes toward dogs and pet-dog ownership (Pet Dog Attitude Score) will be more positive than attitudes toward domesticated foxes and pet domesticated fox ownership (Pet Fox Attitude Score).*

Attitudes toward dogs and pet-dog ownership (Pet Dog Attitude Score,) ( $M = 4.48$ ,  $SD = 1.0$ .) were more positive than attitudes toward domesticated foxes and pet domesticated fox ownership (Pet Fox Attitude Score,) ( $M = 3.48$ ,  $SD = 1.45$ ).

*b. Attitudes toward dogs and pet-dog ownership (Pet Dog Attitude Score) will predict attitudes toward domesticated foxes and pet domesticated fox ownership (Pet Fox Attitude Score).*

Attitudes toward dogs and pet-dog ownership (Pet Dog Attitude Score) and attitudes toward domesticated foxes and pet domesticated fox ownership (Pet Fox Attitude Score) were significantly, positively correlated to each other ( $r = 0.34$ ,  $p \leq .001$ ).

*c. Attitudes toward dogs and pet-dog ownership (Pet Dog Attitude Score) will predict attitudes toward pet-dog breeding ethics and pet-dog ownership laws, but not predict attitudes toward wild fox breeding ethics and pet domesticated fox ownership laws.*

Attitudes toward dogs and pet-dog ownership (Pet Dog Attitude Score) were significantly, positively correlated with attitudes toward pet-dog breeding ethics ( $r = 0.23, p = .01$ ), pet-dog ownership laws ( $r = 0.34, p < .001$ ), and wild fox breeding ( $r = 0.17, p = .045$ ), but not significantly correlated with pet domesticated fox ownership laws ( $r = 0.13, p \geq .05$ ).

*d. Attitudes toward domesticated foxes and pet domesticated fox ownership (Pet Fox Attitude Score) will predict attitudes toward wild fox breeding ethics and pet domesticated fox ownership laws, but not predict attitudes toward pet-dog breeding ethics and pet-dog ownership laws.*

Attitudes toward domesticated foxes and pet domesticated fox ownership (Pet Fox Attitude Score) were significantly, positively correlated with attitudes toward pet-dog ownership laws ( $r = 0.24, p = 0.1$ ), wild fox breeding ethics ( $r = .33, p \leq .001$ ), and pet domesticated fox ownership laws ( $r = .39, p \leq .001$ ), but not significantly correlated with attitudes toward pet-dog breeding ethics ( $r = 0.16, p \geq .05$ ).

*e. Participants will rate dogs as a good pet more than domesticated foxes.*

Participants rated dogs as a good pet 34.2% more than domesticated foxes ( $M = 2.97, M = 4.6$ , respectively).

*f. Participants will prefer wanting a dog as a pet more than a domesticated fox.*

Participants preferred wanting a dog as a pet 21.2% more than a domesticated fox ( $M = 4.44$ ,  $M = 3.38$ , respectively).

#### Hypothesis 2: Ethical and Legal Attitudes

*a. Participants will be more likely to agree that it is ethical to selectively breed pet dogs, eventually altering them to suit our needs, than it is ethical to selectively breed wild foxes, eventually altering them to suit our needs.*

Participants were 7.6% more likely to agree that it is ethical to selectively breed pet dogs, eventually altering them to suit our needs, than it is ethical to selectively breed wild foxes, eventually altering them to suit our needs ( $M = 2.84$ ,  $M = 2.46$ , respectively).

*b. Participants will be more likely to agree that it should be legal in the United States to own a pet dog, than it should be legal in the United States to own a pet domesticated fox.*

Participants were 24.6% more likely to agree that it should be legal in the United States to own a pet dog, than it should be legal in the United States to own a pet domesticated fox ( $M = 4.48$ ,  $M = 3.25$ , respectively).

*c. Attitudes toward pet-dog breeding ethics will predict attitudes toward pet-dog ownership laws, more than attitudes toward wild fox breeding ethics and pet domesticated fox ownership laws.*

Attitudes toward pet-dog breeding ethics were not correlated with attitudes toward pet-dog ownership laws ( $r = 0.04$ ,  $p \geq .05$ ), making less of a correlation than attitudes toward wild fox breeding ethics ( $r = 0.62$ ,  $p \leq .001$ ) and pet domesticated fox ownership laws ( $r = 0.31$ ,  $p = .001$ ) in which there was a significant, positive relation.

*d. Attitudes toward pet-dog ownership laws will not predict attitudes toward wild fox breeding ethics or pet domesticated fox ownership laws.*

Attitudes toward pet-dog ownership laws were significantly, positively correlated with attitudes toward pet domesticated fox ownership laws ( $r = 0.21, p = 0.18$ ), but not wild fox breeding ethics ( $r = 0.1, p = .16$ ).

*e. Participant attitudes toward wild fox breeding ethics will predict attitudes toward pet domesticated fox ownership laws.*

Participant attitudes toward wild fox breeding ethics were significantly correlated with attitudes toward pet domesticated fox ownership laws ( $r = 0.61, p \leq 0.001$ ).

### Hypothesis 3: Perceptions of Wild to Domesticated Fox Images

*a. When shown a series of images that represent the transformation of a wild fox into a domesticated fox in images, participants will most frequently perceive the physical transformations of domestication in the earliest transformation images.*

When shown a series of images that represent the transformation of a wild fox into a domesticated fox in images, participants most frequently perceived the physical transformations of domestication in the earliest transformation images. The most frequent response to *Items 27, 34, 41, and 55 in Section IV A* was *Figure C*, and in *Section IV B, C, and E* was *Figure B*.

*b. Fox images with smaller stop angles, more shortened body part lengths, and/or more greatly curled ears and tails will be rated as more domesticated.*

Fox images with smaller stop angles, more shortened body part lengths, and/or more greatly curled ears and tails were rated as more domesticated. The most frequent response to *Items 28, 35, 42, and 56* was *Figure E*.

*c. Fox images with selectively-bred coat colors, (piebald, platinum, or Georgian white,) will have higher ratings as more domesticated than foxes with wild coat colors, (red or silver.)*

Fox images with selectively-bred coat colors, (piebald, platinum, or Georgian white,) had higher ratings as more domesticated than foxes with wild coat colors, (red or silver) 82.3% of the time.

*d. Fox images with smaller stop angles, more shortened body part lengths, and/or more greatly curled ears and tails will be rated as more attractive.*

Foxes images with smaller stop angles, more shortened body part lengths, and/or more greatly curled ears and tails were rated as less attractive. The most frequent response to *Items 29, 36, 43, and 57* was *Figure A*.

*e. Fox images with selectively-bred coat colors, (piebald, platinum, or Georgian white,) will be rated as more attractive than foxes with wild coat colors, (red or silver.)*

Fox images with selectively-bred coat colors, (piebald, platinum, or Georgian white,) were rated as more attractive than foxes with wild coat colors, (red or silver) 54.17% of the time.

*f. Participants will most frequently have higher ratings for foxes with smaller stop angles, more shortened body part lengths, and/or more greatly curled ears and tails as a pet.*

Participants most frequently had higher ratings for foxes with smaller stop angles, more shortened body part lengths, and/or more greatly curled ears and tails as a pet (M = 3.24, M = 2.68, M = 3.39, respectively).

*g. Participants will most frequently have higher ratings for foxes with selectively-bred coat colors, (piebald, platinum, or Georgian white,) than foxes with wild coat colors, (red or silver,) as a pet.*

Participants most frequently had higher ratings for foxes with selectively-bred coat colors, (piebald, platinum, or Georgian white,) than foxes with wild coat colors, (red or silver,) as a pet. Participants preferred foxes with domesticated fur colors 65.63% of the time.

#### Hypothesis 4: Knowledge of the Farm-Fox Experiment

*Fewer than 5% of participants will indicate having prior knowledge of the Farm-Fox Experiment conducted by the Institute of Cytology and Genetics of the Russian Academy of Sciences in Novosibirsk, Russia.*

4.12% of participants indicated having prior knowledge of the Farm-Fox Experiment conducted by the Institute of Cytology and Genetics of the Russian Academy of Sciences in Novosibirsk, Russia.

## CHAPTER V

### DISCUSSION

The results of this study revealed participant attitudes toward dogs and domesticated foxes in regards to pet ownership, breeding ethics, and ownership legality.

#### Pet Dogs Compared to Pet Domesticated Foxes

As anticipated, participant attitudes toward dogs were more favorable than their attitudes toward foxes. This is understandable as dogs have become one of the most popular pets worldwide, with 83.3 million dogs finding themselves in about 56.7 million households according to the American Pet Products Association's 2013-2014 National Pet Owners Survey. In fact, 54 of the 97 participants of this study (55.67%) reported currently owning a dog and 87 out of 97 (89.69%) reported owning a dog at some point in the past. Dogs are much more familiar to people as pets than foxes, and foxes are often considered vermin, pests, or nuisance animals. In *Title [15] XV Conservation of Natural Resources, Chapter 1531: Division of Wildlife, Section 1531.40 Nuisance wild animal removal or control services*; license of the *Ohio Revised Code*, and the Ohio Department of Natural Resources Division of Wildlife's "Nuisance Wild Animal Control Certification Manual," the red fox is declared a nuisance animal, "a wild animal that interferes with the use or enjoyment of property, is causing a threat to public safety, or may cause damage or harm to a structure, property, or person" (Ohio Revised Code §1531.40; ODNR 2013, p. 3).

It was found that a participant's attitudes toward pet dogs and pet-dog ownership directly related with his attitudes toward pet domesticated foxes and pet domesticated fox

ownership. This showed that the more people favored dogs as pets, the more they favored foxes as pets. This shows potential for foxes to be as favored as dogs in time.

### Ethical and Legal Attitudes

Participants demonstrated low-moderate agreement to selectively breeding both, pet dogs and wild foxes, altering them to suit our needs. Again, participants were slightly more in favor for the selective breeding of dogs over foxes. This may stem from the fact that dog breeding is much more well-known than fox breeding. The American Kennel Club (AKC) is the largest and second oldest non-profit organization which maintains a registry of purebred dogs in the world and governs the sport of breeding dog. This organization has more than 5,000 licensed and member clubs and affiliated organizations and holds more than 22,000 events annually, including the AKC/Eukanuba National Championship (AKC 2011) with more than 3 million purebred dogs entering all-breed dog shows each year (AKC 2014). The AKC recognizes 178 different dog breeds and registers thousands of dogs monthly, totaling more than one million dogs registered each year (AKC 2015a, 2015b). In comparison, there is no internationally or nationally recognized organization in support of fox breeding for sport. The Canada Fox Breeder's Association, organized in 1920, currently has 57 members with 520, 920 foxes registered (Canada Fox Breeders' Association 2014) and recognizes seven different colors of foxes: silver, white mark silver, platinum, pearl platinum, white marked pearl platinum, Alaskan, and brown (Canada Fox Breeders' Association 1996). However, fox breeding associations, like this one, are generally associated with breeding foxes for their fur, rather than as pets or show animals. These facts show general favor for dog breeding over

fox breeding, but the results of this study show the potential for fox breeding to become almost as popular as dog breeding.

Participants' attitudes toward pet-dog breeding influenced his attitudes about wild fox breeding, thus those who were more in favor of selectively breeding pet dogs were also more in favor of breeding wild foxes. It appears that participant attitudes about dog and fox breeding depended more on their attitudes toward animal breeding in general, and less on the actual animal species being bred. This also shows potential for the fox to be favored as much as dogs with time.

Regarding United States laws concerning the ownership of pet dogs and pet domesticated foxes, participants showed high agreement for the legal possession of pet dogs and moderate-high agreement for the legal possession of pet domesticated foxes. Participants favored the legal ownership of dogs more than the legal ownership of foxes. These attitudes also showed correlation as whether or not a participant agreed with the legal possession of pet dogs influenced whether or not he agreed with the legal possession of pet domesticated foxes. Just as those who favored dogs also favored foxes, those who are more in favor of owning pet dogs are more in favor of owning pet domesticated foxes. With both of these results, it appears that foxes have the potential of becoming a well-liked animal companion amongst those who currently enjoy the companionship of dogs.

Participant attitudes toward dog breeding were not correlated with attitudes toward laws regarding pet-dog ownership, but participant attitudes toward fox breeding and the legal ownership of pet domesticated foxes were. Participants were more in favor for the legal possession of pet dogs than the breeding of pet dogs to suit our needs. This

supports current literature that ownership of dogs is generally more accepted than the breeding of dogs (Allan 2010; Harrison 2008). Some dog owners do not support pedigree dog breeding because of several criticisms such as breeders putting emphasis on a dog's appearance rather than the dog's welfare. Because the breeding pool was originally limited for many pedigree dog breeds, several genetic deformities and issues lie hidden within these dogs causing several medical conditions and poor health of some purebred dogs. (Harrison 2008). Carrie Allan (2010), a writer for the Humane Society of the United States (HSUS), exposes several of these concerns, such as the fact that Cavalier King Charles spaniels' skulls are commonly too small for their brains, causing them to develop syringomyelia, a neurological disorder in which painful fluid-filled cavities occur within the spinal cord near the brain (Allan 2010; Rusbridge 2007), Basenjis often suffer from hemolytic anemia or a kidney disease called Fanconi syndrome, 45% of Scottish terriers die from cancer while, and bulldogs must be born through cesarean section in order to avoid their large statures from becoming lodged within the mother's birth canal (Allan 2010). English bulldogs also often suffer serious respiratory problems, including sleep apnea, due to their shortened snouts and tightened throats (Hendricks et al. 1987). Because of these concerns and several more, some pet-dog owners do not think it is morally ethical to selectively breed dogs, eventually altering them to suit our needs. While still agreeing with the legal possession of dogs as pets, these owners still own dogs, but may acquire them through different means than pedigree breeders. It is interesting that the same is not true for foxes.

Similar to dogs, favor for owning pet foxes was higher than favor for breeding pet foxes, but unlike dogs, the attitudes were not as drastically different. Participants favored

owning pet domesticated foxes slightly more than breeding wild foxes. Again, this may be a direct result of the lack of knowledge about foxes versus the amount of knowledge in regards to dogs. Because fox breeding is not as common as dog breeding, there haven't been as many concerns uncovered about breeding foxes as have been uncovered about breeding pedigree dogs.

Participants' attitudes about pet-dog breeding were correlated with attitudes toward the legal ownership of pet domesticated foxes, but attitudes toward the legal possession of pet dogs were not related with attitudes toward wild fox breeding.

Further, attitudes toward pet dogs, in general, were related with one's attitudes about breeding pet dogs and whether the ownership of pet dogs should be legal. Attitudes toward pet foxes, in general, were also associated with attitudes toward the ethics of fox breeding and the legality of owning a pet fox. This is completely understandable, as how one feels about an animal will surely affect how he feels about selectively breeding the animal and creating laws regarding the ownership of such an animal. Attitudes toward pet dogs, in general, were also found to affect a participant's attitudes toward wild fox breeding, but were not correlated with whether or not one felt that foxes should be legal to own as pets. Strangely, attitudes about pet foxes, in general, correlated with attitudes toward the legality of owning a dog, but not with the ethics of breeding dogs.

### Perceptions of Wild to Domesticated Fox Images

#### Domestication

When the stop angle, snout length, and leg length decreased as the ear curl and tail curl increased all at once, participants labeled the foxes as domesticated sooner than when the physical attributes changed individually. These results demonstrate the effects

of physical traits on the appearance of domestication. When an animal displayed a single physical trait that was manipulated by the effects of domestication, participants were quick to label the animal domesticated, with the trait only having to change slightly, but when an animal displayed more than one physical traits being manipulated by the effects of domestication, participants responded to the changes even faster, labeling the animal domesticated when the traits had changed even less than when viewed individually. This means that as the foxes from the Farm-Fox Experiment at the Institute of Cytology and Genetics continue to change physiologically, they will continue to look increasingly more domesticated which could help their potential for becoming well-accepted pets in the United States.

When participants selected *Figure E* the most frequently for the image that most resembled a domesticated fox, this identified which physical traits people most commonly associate with domesticated animals. In this case, participants chose the foxes displaying narrowed stop angles, shortened snout lengths, shortened leg lengths, increased ear curls, and increased tail curls or decreased tail lengths as the most domesticated animal pictured. Participants did not choose most often, *Figure A*, the image intended to best represent a standard wild red fox, or *Figures B, C, and D*, in which the fox was changed gradually by the effects of domestication, but not to the extent that *Figure E* was manipulated. This is in compliance with available literature indicating that pedomorphosis and neoteny, the retention in adults of juvenile traits, such as widened skulls, shortened snouts, floppy ears, and curly tails, leads to the appearance of domestication (Morey 1994; Price 2002) Domesticated animals are also known for demonstrating similar morphological changes such as body size and proportions, coat

color, fur length, and hair texture. White spotting, floppy ears, and curly tails, have become distinctive markers of domestication (Abumrad 2009; Belyaev 1979; Kukekova et al. 2008a; Morey 1994; Trut 2007; Trut et al. 2009).

Not surprisingly, participants most frequently chose the Georgian white-colored fox as the one that appeared the most domesticated compared to a silver-colored, red-colored, piebald-colored, and platinum-colored fox. Because melanin and adrenaline have been found to share a genetic connection, animals selected for tameness tend to sport white coloring in their coats (Trut 1999; Trut et al. 2009). White spotting and a lack of pigmentation have become markers of domestication, common in domesticated animals such as dogs, pigs, horses, cows, guinea pigs, and cats, among others (Belyaev 1979; Kukekova et al. 2008a; Trut 1999; Trut et al. 2009). Thus, white coloring in animals as become associated with tameness, possibly fueling participants to choose the completely white fox as the most domesticated.

Interestingly, several states include laws that prohibit the ownership of red-colored wild-looking foxes, whether they are domesticated or ranched, because of the close appearance to a wild fox. While red-colored foxes may be restricted or even banned in these states, foxes sporting a different coat color other than red are allowed or less restricted. Michigan, in particular, declares silver-colored foxes to be a clear sign of a domesticated fox. Although silver foxes can be found in the wild, the silver-colored red fox is not native to the state of Michigan, thus if one is found in the state, it must be an imported or bred pet and not a captured wild animal. This reasoning is reflected in *Chapter 324 Natural Resources and Environmental Protection, Act 451 of 1994: Natural Resources and Environmental Protection Act, Article III Natural Resources*

*Management, Chapter 2 Management of Renewable Resources, Subchapter 1 Wildlife, Possession, Sale, Regulation of Wildlife, Part 431 Foxes in Captivity, Section 01 Foxes in captivity as domestic animals; protection; construction of part of the Michigan Compiled*

*Laws:*

Silver, silver-black, black, and cross foxes, which of their nature, in the absence of efforts for their domestication, were known as wild, which are brought into or born in captivity upon a farm or ranch for the purpose of cultivating or pelting their furs, together with their offspring and increase, are domestic animals for the purpose of any statute or law relating generally to domestic animals, other than dogs and cats or other pets, or relating to farming or to animal husbandry or to the encouragement of agriculture, unless any such statute or law is impossible to apply to such fur-bearing animals. Such fur-bearing animals, together with their offspring and increase, are the subjects of ownership, lien, and all other property rights, in the same manner as purely domestic animals, in whatever situation, location, or condition the fur-bearing animals may be, and regardless of whether they remain in or escape from captivity. Such fur-bearing animals shall receive the same protection of law as, and in the same way and to the same extent are the subject of trespass or larceny as, other personal property. This part shall not be construed to include silver, silver-black, black, and cross foxes within the definition of livestock, or give any person any right to recovery for damage or destruction of the animal under the dog law of 1919, Act No. 339 of the Public Acts of 1919, being sections 287.261 to 287.290 of the Michigan Compiled Laws.

Shannon J. Hanna, a policy and regulations unit manager of the Michigan Department of Natural Resources Wildlife Division, has commented further in a private email sent to a silver-colored fox owner in Michigan:

If the fox looks like a native fox then it needs a permit. If it is a species that could be closely confused with a native species, then it needs a permit.

Silver fox is a naturally occurring color phase of the native red fox. Laws were enacted to prevent people from taking wildlife out of the wild to keep them in private ownership for varying reasons. Over time selective breeding has created, “designer foxes.” Many of these new phases do not look like native foxes. What we are attempting to do now is to make practical sense out of this changing situation. Therefore, we are handling privately-owned foxes that look like their wild counterparts in accordance with the original intent of the law. Fox phases that do not look like wild foxes are not treated the same as phases that look wild because they do not occur naturally in the wild (P.J. 2014).

Despite all of this, participant response chose the silver-colored fox the least often at when asked, “Which animal appears the most domesticated?” Even the standard, wild red-colored fox was chosen more often than the silver. This shows that participants viewed the silver-colored fox to appear the least domesticated of the colors: red, silver, piebald, platinum, and Georgian white and that the silver-colored coat of a fox does not automatically show that fox to be domesticated to the general public. This is further supported by Valo’s story, in which he was exterminated when found loose in the Ohio city of Fairborn because he was thought to be a wild nuisance, rather than a domesticated

pet. Even though he sported a silver-colored coat, his captors suspected he may be wild and euthanized him (Crowe 2014; Moore 2014; WHIO Breaking News Staff 2014).

Government legislation may want to reconsider how coat colors actually effect community perception and possibly change these laws to better reflect community attitudes. Perhaps no coat color should be given special permissions or exceptions simply because they are colors that can only be obtained through breeding and domestication. Because fox breeding and domestication are not widely known, this fact may not be understood by a member of the community and if such a fox were to come across such a member, he might be treated as a wild animal, regardless of the law. Also, since silver-colored foxes can be found in the wild, these animals should not be automatically considered domesticated, thus not needing the permit to possess that red-colored pet foxes require in Michigan. It is most likely in the best interest of the foxes kept as pets to ensure that the animal was appropriately acquired and cared for, despite fur color.

### Attraction

Participants were asked to choose the fox that appeared the most attractive to them and most frequently chose *Figure A*, the image intended to depict a standard, wild red fox unaffected by physical changes brought on by domestication. Again, when viewing the foxes in which the stop angle, snout length, and leg length decreased and the ear curl and tail curl increased all at once, participant response was different from viewing the attributes changing individually. When viewing these images, participants preferred fox stop angles, snouts, legs, and tails that were more wild-looking and ears that were less wild-looking than when looking at this physical traits individually.

Surprisingly, when looking at images of foxes sporting different colored coats: red, silver, piebald, platinum, and Georgian white, participants most frequently chose the standard, wild, red-colored fox as the most attractive of them all. While the red-colored fox was chosen the most frequently, the remaining four colors were chosen within similar frequencies of each other. Again, community perceptions of the silver-colored red fox were not as positive as the four other color options.

Participants did not respond in compliance with available literature (Child 2011; Morey 1994). Evolutionary biologist of Duke University, Brian Hare, has worked with the Farm-Fox Experiment and commented on the physiological changes of the foxes, “Floppy ears, curly tails... All these other things that are really cute to talk about... You get a lot of stuff for free when you select against aggression” (Child 2011). A large appeal of animal owning is based upon how the animal looks. Many people find animals, especially domesticated ones like cats and dogs, to appear cute and a desire to own such animals is developed. If these facts are true and infantile traits are generally more desired in domesticated animals, then why did participants prefer the more wild-looking physical traits in the foxes? Perhaps the participants were choosing what was most familiar to them, recognizing the wild fox’s distinct traits and feeling more comfortable and happy with them than the unfamiliar domesticated traits not commonly found on foxes.

#### Ownership Desirability

Participants also gave responses to which pictured red fox they would most like to own as a pet. Like before, when viewing the foxes in which the stop angle, snout length, and leg length decreased and the ear curl and tail curl increased all at once, participant response was different from viewing the attributes changing individually. When viewing

these images, participants preferred fox stop angles, snouts, legs, and tails that were more wild-looking and ears that were less wild-looking than when looking at this physical traits individually.

When participants were asked to choose the fox that they would most like to own as a pet when looking at foxes with five different coat colors: red, silver, piebald, platinum, and Georgian White, participant responses were similarly frequent for all choices except the silver-colored fox. Again, the red-colored standard, wild fox was responded to the most positively while the silver-colored fox was given the least amount of positive response. Oddly enough, these responses were not entirely the same as the responses given when asked to choose the fox that looked the most attractive. While participants did choose the red-colored fox the most frequently as the most attractive and the most desirable as a pet, the platinum fox that was chosen the second most frequently to show the most attractive appearance was chosen as the third most desirable as a pet in these responses. Again, it was demonstrated that what participants choose as the most attractive looking fox may not be the fox they would most like to own as a pet, and again, the silver-colored fox is the least frequently chosen.

The physical traits of the foxes that participants thought were most attractive varied from the traits of the foxes that participants most wanted to own as pets. Why would participants not want to own the pet that looked the most attractive to them? Did the physical traits suggest behavioral traits to the participants causing them to choose a fox with different physical traits that may have seemed to contain more desired behavioral traits? Or perhaps, did the more infantile traits not appear more attractive to the participants, but simply enticed the participants to want to own the animal? Morten

Kringelbach believes that infantile traits found in dogs fuel a need to nurture in humans and increases the desire to care for them, “There's something about the way that the facial features are organized that makes us want to care for them, and it's about having a large forehead, it's about having large eyes, big ears. And there's something about that that almost unconsciously we cannot help ourselves but actually like” (Child 2011). Brain scans have confirmed that emotional responses are similar in people viewing baby faces and dog faces, but not when looking at adult faces. (Child 2011). These results suggest that the infantile features found in domesticated animals brought on by neoteny and pedomorphosis (Morey 1994; Price 2002) stir a parental instinct within humans and create the desire to own and care for the animal. Perhaps the physical features that look the most attractive to a person are not as strong an indicator of whether the person will want to keep the animal as a pet as how cute the animal appears to the person.

#### Knowledge of the Farm-Fox Experiment

This study intended to assess participants' knowledge of the Farm-Fox Experiment conducted by the Institute of Cytology and Genetics of the Russian Academy of Sciences in Novosibirsk, Russia by asking participants the question, “Do you have knowledge of the Farm-Fox Experiment conducted by the Institute of Cytology and Genetics of the Russian Academy of Sciences in Novosibirsk, Russia?” in *Item 6*. Out of the 97 participants who responded to this question, only 4 (4.12%) responded that they had knowledge of the experiment. This demonstrates the low levels of public knowledge regarding the Farm-Fox Experiment at the Institute of Cytology and Genetics and shows that, even at a university, knowledge of fox domestication at the ICG is not wide-spread.

## Foxes as Pets

The purpose of this study was to improve our understanding of attitudes about domesticating wild foxes and selling them as pets. Several questions were designed to assess participant attitudes toward foxes to assess the possibilities of the red fox to become a widely-accepted domesticated animal and newfound animal companion in the home.

Even though knowledge of fox domestication isn't commonplace, participants were given a description of the foxes resulting from the ICG's Farm-Fox Experiment and asked to rate how confident they were that these animals would make good pets. Surprisingly, the responses participants gave differed depending on how the fox appeared. Participants were more confident that a fox would make a good pet when the fox's tail curled upward, thus a fox's tail curl angle may have the biggest effect on making the animal appear as if it could make a good pet. However, when a curled tail was combined with multiple features of domestication, the effect was decreased in effectiveness. The fox's stop angle and body parts decreasing were the least successful of the physical features to make the animal appear to make a good pet.

Participants were less confident that a fox would make a good pet when looking at an illustration of a fox than not looking at an illustration and were less confident that a fox would make a good pet compared to a dog making a good pet.

When participants were asked if they would like to own any of the foxes from the set of five images as a pet, responses were again different based on the appearances of the foxes. For every single set of images, though, participants most frequently responded that they would like to own one of the foxes as a pet. Participants most wanted a fox from

*Section IV A*, the section highlighting changes in the fox's stop angle and body part lengths, and least wanted a pet fox from *Section IV E*, the section showing changes in multiple physical traits of the fox. Regarding dogs, on average, participants wanted a dog as a pet more than a domesticated fox as a pet.

#### Contributions

The results of this study revealed participant attitudes toward pets and pet ownership, particularly participant attitudes toward dogs as pets and domesticated foxes as pets. It showed a preference for pet dogs over pet foxes and provided evidence that a majority of people have participated in the practice of owning pet dogs. A connection was found between attitudes toward pet dogs and attitudes toward pet foxes. Attitudes toward dog and fox breeding and laws regarding pet-dog ownership and pet-fox ownership were also revealed, showing a preference for the legal possession of dogs as pets over foxes, but a similar moderate agreement to dog and fox breeding.

Attitudes toward foxes as pets were also addressed as participants responded to how well they thought particular foxes would be as pets based on physical appearance, as well as how worth the money and trouble foxes are worth to keep as pets compared to keeping dogs as pets. About 65 percent of participants responded having an interest in owning a domesticated fox as a pet compared to 88.8 percent wanting a dog as a pet.

This study also revealed the low percentage of people who have knowledge of the fox farm experiment conducted by the Institute of Cytology and Genetics of the Russian Academy of Sciences in Novosibirsk, Russia, suggesting that the domestication of the red fox is not widespread.

Lastly, the illustrations used in this survey helped analyze participant attitudes toward the physical appearances of foxes. From these results, it is better known what physical traits are most important to causing a fox to look domesticated, attractive, or desirable as a pet and to what extent these physical features need to be altered to achieve such results. Precise measurements were given in order to exactly measure perceptions and transformations.

These results can be utilized by those desiring to better understand attitudes about domesticating wild foxes and selling them as pets. Legislation can find use in this research in order to analyze common perceptions of foxes and how best to regulate the ownership of pet foxes to protect the animals and the communities in which they live. Fox breeders may find use in these results as they determine which physical traits to emphasize or manipulate when breeding foxes and to what extent the manipulation should be affected. Fox importers, such as Mitchel Kalmanson, can use this information as they prepare for each year's supply and demand of foxes and figure out what the pet fox community wants in their foxes. Even the researchers at the Institute of Cytology and Genetics can benefit from the results of this study as they caters their foxes as pets and learn how these animals are being received by the outside world.

#### Limitations

There are several limitations of this study. A major limitation of this study relates to its sample population. Because all of the participants were undergraduate students enrolled in psychology classes at Texas State University, the sample may not properly represent other populations. The sample was 69.07% female and 51.55% of the

participants were 20 or 21 years old. The sample size was also fairly small at 97 participants.

This study intended to find a stronger correlation between pet-dog owners' attitudes toward pet dogs and pet domesticated foxes compared to non-pet-dog owners' attitudes toward pet dogs and pet domesticated foxes. Unfortunately, the number of participants who declared never having owned a pet dog was too small to allow inclusion of this correlation in the analysis.

This study also intended to find a correlation between participants' knowledge of the Farm-Fox Experiment conducted by the Institute of Cytology and Genetics of the Russian Academy of Sciences in Novosibirsk, Russia and their attitudes toward pet dogs and pet domesticated foxes, but the number of participants' who responded having knowledge of the experiment was too small to allow inclusion of this correlation in the analysis.

Another limitation was the measurement of the participants' attitudes toward breeding pet dog ethics, owning pet dog laws, breeding wild fox ethics, and owning pet domesticated fox laws. Only one question was asked to assess each of these ideals.

Further, the original Pet Attitude Scale developed by Donald I. Templer et al. in 1981 had to be modified to specifically measure attitudes toward pet dogs and pet-dog ownership and pet domesticated foxes and pet domesticated fox ownership. The original selected survey items from the Pet Attitude Scale were more precisely reworded, removing negative sentence structures. The original Pet Attitude Scale was also modified from a bipolar scale to a continuous, linear scale indicating magnitude of agreement with the items.

This study also relied on the use of illustrations to produce images of foxes physically manipulated by the effects of domestication. While illustrations allowed the ability to standardize the images by keeping the animal's pose, stance, and body proportions the same, photographs may have provided alternate results. Participants may have responded differently when seeing these physical changes in actual animals rather than in fictional illustrations. The illustrations may have also inaccurately represented the manipulation of physical traits in red foxes by domestication, thus affecting participant response.

### Recommendations

Several recommendations are suggested for further research and to improve upon this study. In order to better represent a larger, more diverse population, the sample of this study could be more randomly selected to increase the amount of male participants in relation to female participants and increase the amount of participants outside of the 20- and 21-year-old age bracket. This will better allow the results to more broadly apply to the general population. The sample should also be expanded to include more participants in general in order to collect more data and ensure the validity of the survey results.

An increase in the number of participants may allow the inclusion of correlations between pet-dog owners' attitudes toward pet dogs and pet domesticated foxes compared to non-pet-dog owners' attitudes toward pet dogs and pet domesticated foxes if a large enough sample of non-pet-dog owners can be collected.

An increase in the number of participants may also allow the inclusion of a correlation between participants' knowledge of the Farm-Fox Experiment conducted by the Institute of Cytology and Genetics of the Russian Academy of Sciences in

Novosibirsk, Russia and their attitudes toward pet dogs and pet domesticated foxes if a large enough sample who have knowledge of the experiment can be collected.

In order to better measure participants' attitudes toward breeding pet dog ethics, owning pet dog laws, breeding wild fox ethics, and owning pet domesticated fox laws, several more questions should be constructed.

## CHAPTER VI

### CONCLUSIONS

Since 1959, the Institute of Cytology and Genetics of the Russian Academy of Sciences in Novosibirsk, Russia has attempted to domesticate the red fox, *Vulpes vulpes*, in order to better understand the domestication of the dog, *Canis familiaris*, from the gray wolf, *Canis lupus*. The criteria for breeding foxes were those that consistently displayed tame behavior with respect to people. Within just 10 generations of selectively bred foxes, the animals began to show dramatic changes within their behavior, communication, development, physiology, reproduction, and anatomy, demonstrating a genetically domesticated breed of fox. The ICG has since commercialized the Farm-Fox Experiment and offers domesticated foxes for sale as pets (Trut 1999).

Pet foxes in the United States have come across negative community attitudes and have been confiscated, relocated, and even exterminated as a result. Mikhail and Nikolai, two domesticated foxes from the Institute of Cytology and Genetics' Farm-Fox Experiment were confiscated by the Texas government when illegally imported into the United States through the Dallas-Fort Worth Airport (Fedewa 2011 December 6). Anya, another domesticated fox from the Institute of Cytology and Genetics' Farm-Fox Experiment was successfully imported into the United States through Florida, but was forced to relocate from her city with her owner, Kay Fedewa, when community outrage triggered the enactment of a new law banning the ownership of foxes as pets (Fedewa 2012 May 3). After moving to a new city, Anya was later killed by a feral coyote when inadequately housed in an outdoor enclosure (Fedewa 2014). Vader, a ranched fox bred

in Indiana owned by Tara and Eric Hiatt, was exterminated by the Minot Police Department of North Dakota when he bit an animal control officer (KX News Minot 2014; Meredith 2014; Minot Police Department 2014; Schramm 2014). Valo, another ranched fox, was exterminated in the city of Fairborn, Ohio, when found loose and thought to be a wild animal and not the pet of Chloe Kristensen (Crowe 2014; Moore 2014; WHIO Breaking News Staff 2014). Finally, Swiper, another ranched fox, did not meet with a tragic fate. Although he was confiscated by the Fairfax County Police Department, his owner, Alayna Sitterson, was able to repossess him (*ABC News 7* 2010; Falls Church News-Press 2010; *The Washington Post* 2010; WSUA9 2010). Swiper's life was altered, however, when his owner realized that she was no longer able to adequately provide for him and surrendered him to a fox rescue organization.

Interest in owning the newly-domesticated foxes from the Farm-Fox Experiment as pets has increased, adding to the controversy of exotic pet ownership. Owning a fox requires a great deal of responsibility and commitment and only those who fully understand these sacrifices should own a fox as a pet. If one is not willing or able to provide for the animal's basic needs including space, shelter, medical care, attention, affection, and exercise, he should not own a pet fox. One should also consider where he will acquire his fox, ranched in the United States or domesticated in Russia. Still, concerns about whether these foxes are truly suited for life with humans, should be allowed to live in the wild, or should have even been bred and domesticated at all remains debatable (Bok 2011; PETA 2015). The domesticated foxes have demonstrated the desire for human interaction, however, and have the ability to communicate with and obey humans (Cleek 2014; Hare et al. 2005; *The Siberian Times* 2012). Most concerning,

though, is the fact that no rabies vaccine approved for use on foxes has been approved in the United States, thus foxes are declared nuisance animals and must be euthanized on sight or after having bitten someone (CDC 2008; DNR 2014; ODNR 2013). For this reason in particular, one must heavily consider the risk of possessing a fox and what is best for the animal.

This study investigated existing participant attitudes toward pets and pet ownership and analyzed how the manipulation of canine physical attributes by domestication can affect participant perceptions. Anonymous surveys were administered to 97 undergraduate students enrolled in psychology classes at Texas State University. Each participant's attitudes toward dogs and pet-dog ownership were measured alongside their attitudes toward domesticated foxes and pet domesticated fox ownership. Additional questions were created to assess participants' legal and ethical attitudes, knowledge of fox domestication, and opinions and experiences in regard to pet ownership. Images were created to isolate physical attributes in canines in order to assess their impact on human perception of undomesticated and domesticated features.

The results of this study showed a preference for pet dogs over pet foxes and provided evidence that a majority of people have participated in the practice of owning pet dogs. A connection was found between attitudes toward pet dogs and foxes. Attitudes toward dog and fox breeding and laws regarding pet-dog ownership and pet-fox ownership showed a preference for the legal possession of dogs as pets over foxes, but a moderate agreement to both dog and fox breeding. A low percentage of participants were found to have knowledge of the Farm-Fox Experiment and a moderately-high percentage showed interest in owning a domesticated fox as a pet. This study's illustrations found

that participants instantly reacted to physical attributes manipulated by domestication, but often prefer the standard wild red-colored fox. Different physical traits were also found to have different perceptions of participants. Comparing modal frequencies for changes in the ears, tails, and multiple changes, (face, extremities, ears, and tails, face,) most participants reported an immediate transition from wild to domestic, noting the second image as when the change from wild to domestic began. The most complete domestication was correctly identified by most participants as the final image. The wild image, *Figure A*, was typically rated as most attractive. The sole difference in modal response frequencies was the image most preferred owning as a pet. Most reported liking the feral image for curled ears and multiple domesticated features, but liked as a pet to own, the animal depicted with the tail most curved upward toward the fox's body.

Returning to the dog, *Canis familiaris*, this animal has become one of the most popular companion animals since it was domesticated from the gray wolf, *Canis lupus* (Wayne et al. 1997). Because of its incredible versatility and variety, the dog can adjust and accommodate to fit the lifestyle of his owner and can communicate with humans better than any other animal (Hare et al. 2002, 2005). Dogs are willing to enter into genuinely reciprocal relationships with humans and will accommodate their behavior in order to function in human society. For these reasons, we have welcomed dogs into our homes as companion animals.

The domesticated foxes from the ICG's Farm-Fox Experiment, like dogs, have demonstrated an eagerness to establish human contact and the desire to please. They can communicate with humans as skillfully as dogs (Hare et al. 2005) and can obey tricks and commands (Cleek 2014; The Siberian Times 2012). They are capable of forming deep-

rooted pair bonds with humans and becoming loyal and loving companions (Trut 1999). “Before our eyes ‘the Beast’ has turned into ‘Beauty,’ as the aggressive behavior of our herd’s wild progenitors entirely disappeared” remarked Dr. Lyudmila Trut, head of the research group at ICG (1999, p. 168). This study has shown that while our communities are not yet ready to accept these animals into the home, there is potential. Not only do these animals have the genetic potential to become more domesticated and suited for life with humans, participants were shown to have moderately high favorability scores toward pet domesticated foxes. No longer should these animals be seen as villains in our fairy tales, vermin in our gardens, and dangerous animals in our homes. No longer do these animals deserve to be relocated, confiscated, and exterminated. No longer do we need to be afraid of these beautiful and unique creatures.

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**APPENDIX SECTION**

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APPENDIX A: FAUX FOXES: FOX DOMESTICATION AND PET OWNERSHIP  
SURVEY PARTICIPANT INFORMATION PAGE

**FAUX FOXES: FOX DOMESTICATION AND PET OWNERSHIP  
SURVEY**

**PARTICIPANT INFORMATION**

Please print the following information for the purposes of assigning extra credit:

**NAME:** \_\_\_\_\_

**INSTRUCTOR:** \_\_\_\_\_

**CLASS NAME:** \_\_\_\_\_

**CLASS TIME:** \_\_\_\_\_

APPENDIX B: FAUX FOXES: FOX DOMESTICATION AND PET OWNERSHIP  
SURVEY

**FAUX FOXES: FOX DOMESTICATION AND PET OWNERSHIP  
SURVEY**

The following survey was approved by the Texas State University Institutional Review Board (IRB). #EXP2015G991044P. Noelle M. Brooks is the Principle Investigator, nb1196@txstate.edu.

All answers and information given will be anonymous. Your name or other identifiers are not linked to the survey answers on the answer key Scantron. Only surveys in which all questions have been answered will be included in the study.

The purpose of this survey is to improve our understanding of attitudes about domesticating wild foxes and selling them as pets.

Use a No. 2 pencil to record your responses on the provided Scantron form.

Read each item carefully and choose the response that best matches your response.

Please answer honestly.

## SECTION I

Answer each question by recording the appropriate response on your Scantron form.

1. What is your gender?

A. Male      B. Female      C. Other

2. What is your age?

A. 17 years or younger      C. 20-21 years      E. 24 years or older  
B. 18-19 years      D. 22-23 years

3. What is your ethnicity?

A. Asian or Asian American      D. White, Non-Hispanic  
B. Black or African American      E. Other  
C. Hispanic or Latino

4. How many dogs have you owned all at one time in the past?

A. 0      B. 1      C. 2      D. 3      E. 4 or more

5. How many dogs do you currently own?

A. 0      B. 1      C. 2      D. 3      E. 4 or more

6. Do you have knowledge of the Farm-Fox Experiment conducted by the Institute of Cytology and Genetics of the Russian Academy of Sciences in Novisibirsk, Russia?

A. Yes      B. No

## SECTION II

Indicate how strongly you agree with the following statements on a scale of 1-5.

Use the following scale to record the correct response on your Scantron form.

Choosing higher letters/numbers indicates higher agreement to the statement.

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

7. I could love a pet dog.
8. Pet dogs could add happiness.
9. Treat pet dogs with as much respect as a human member of your family.
  
10. Dogs make good pets.
11. I would feel comfortable living near a neighbor who owned a pet dog.
12. If circumstances allowed and money was not an issue, I would like to own a pet dog.
  
13. Pet dogs are worth the money to own.
14. Pet dogs are worth the trouble to own.
  
15. It is ethical to selectively breed pet dogs, eventually altering them to suit our needs.
16. It should be legal in the United States to own a pet dog.

### SECTION III

**A Farm-Fox Experiment in Russia has been selectively breeding foxes in order to domesticate the wild fox. These domesticated foxes are bred to have characteristics and physical features similar to pet dogs. They are bred to wag their tails, whine for attention, and bark when in the presence of humans and can be trained to obey commands and recognize their names. They enjoy being picked up and petted and show similar fear or aggression toward humans as dogs. However, they are still genetically wild foxes. They are not a dog species; they are a fox species. These animals are now being sold as pets, costing about \$8,900 to own in the United States.**

**With this information, indicate how strongly you agree with the following statements on a scale of 1-5.**

**Use the following scale to record the correct response on your Scantron form. Choosing higher letters/numbers indicates higher agreement to the statement.**

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

17. I could love a pet domesticated fox.
18. Pet domesticated foxes could add happiness.
19. Treat pet domesticated foxes with as much respect as a human member of your family.
20. Domesticated foxes make good pets.
21. I would feel comfortable living near a neighbor who owned a pet domesticated fox.
22. If circumstances allowed and money was not an issue, I would like to own a pet domesticated fox.
23. Pet domesticated foxes are worth the money to own.
24. Pet domesticated foxes are worth the trouble to own.
25. It is ethical to selectively breed wild foxes, eventually altering them to suit our needs.
26. It should be legal in the United States to own a pet domesticated fox.

SECTION IV A

First, compare Images A-E, noticing similarities and differences. The images may appear unchanged, but there are slight differences.

Then answer each question by recording the appropriate response on your Scantron.

27. In which image does the animal begin resembling a domestic animal rather than a wild animal?

28. Which animal appears the most domesticated?

29. Which animal do you think is the most attractive?

30. How confident are you, on a scale of 1-5, with 5 being the most confident, that one of these animals would make a good pet?

A. 1	B. 2	C. 3	D. 4	E. 5
------	------	------	------	------

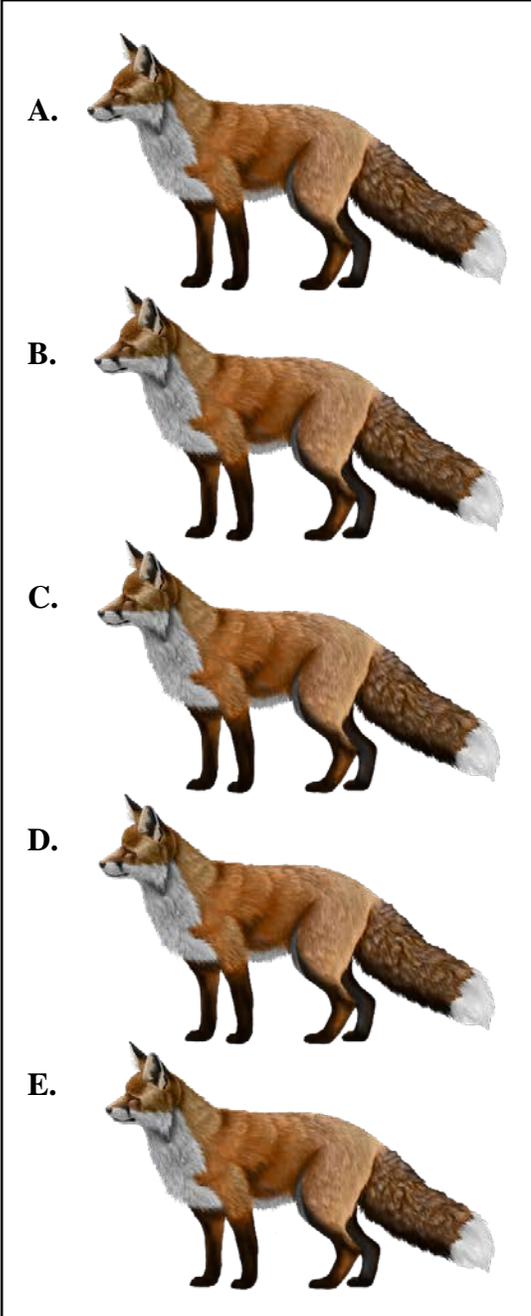
31. Would you like to own any of these animals as a pet?

A. Yes	B. No
--------	-------

32. Which animal, (A, B, C, D, or E,) would you most like to own as a pet?

33. Which feature appeared to be different in these images?

A. Face	D. Fur Color
B. Ears	E. Multiple
C. Tail	Features



SECTION IV B

First, compare Images A-E, noticing similarities and differences. The images may appear unchanged, but there are slight differences.

Then answer each question by recording the appropriate response on your Scantron.

34. In which image does the animal begin resembling a domestic animal rather than a wild animal?

35. Which animal appears the most domesticated?

36. Which animal do you think is the most attractive?

37. How confident are you, on a scale of 1-5, with 5 being the most confident, that one of these animals would make a good pet?

A. 1	B. 2	C. 3	D. 4	E. 5
------	------	------	------	------

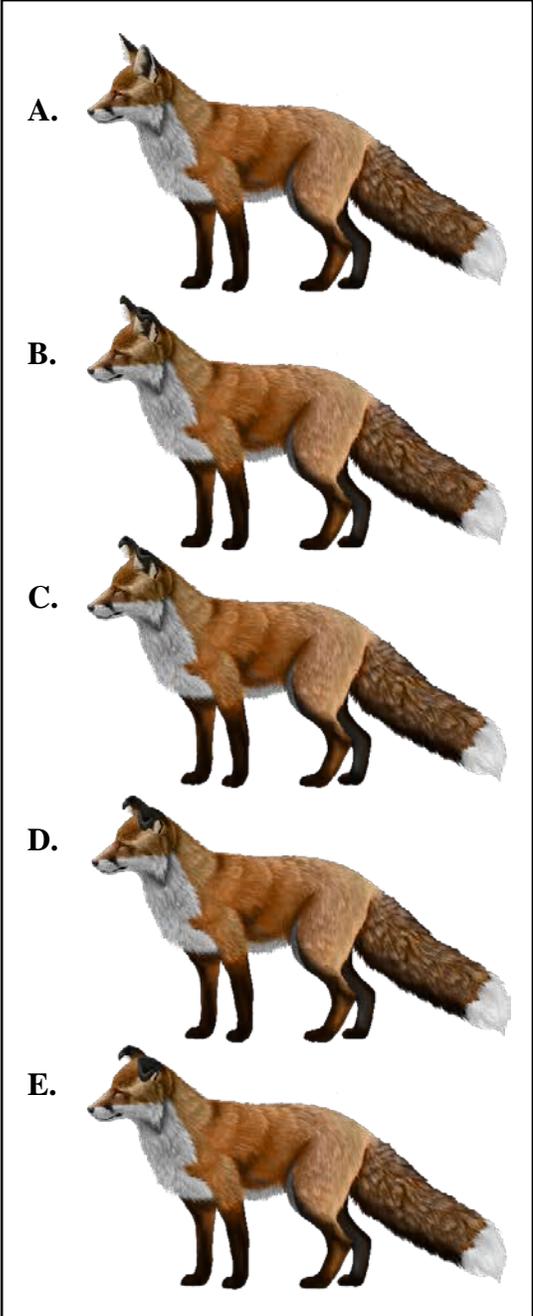
38. Would you like to own any of these animals as a pet?

A. Yes	B. No
--------	-------

39. Which animal, (A, B, C, D, or E,) would you most like to own as a pet?

40. Which feature appeared to be different in these images?

A. Face	D. Fur Color
B. Ears	E. Multiple
C. Tail	Features



SECTION IV C

First, compare Images A-E, noticing similarities and differences. The images may appear unchanged, but there are slight differences.

Then answer each question by recording the appropriate response on your Scantron.

41. In which image does the animal begin resembling a domestic animal rather than a wild animal?

42. Which animal appears the most domesticated?

43. Which animal do you think is the most attractive?

44. How confident are you, on a scale of 1-5, with 5 being the most confident, that one of these animals would make a good pet?

A. 1	B. 2	C. 3	D. 4	E. 5
------	------	------	------	------

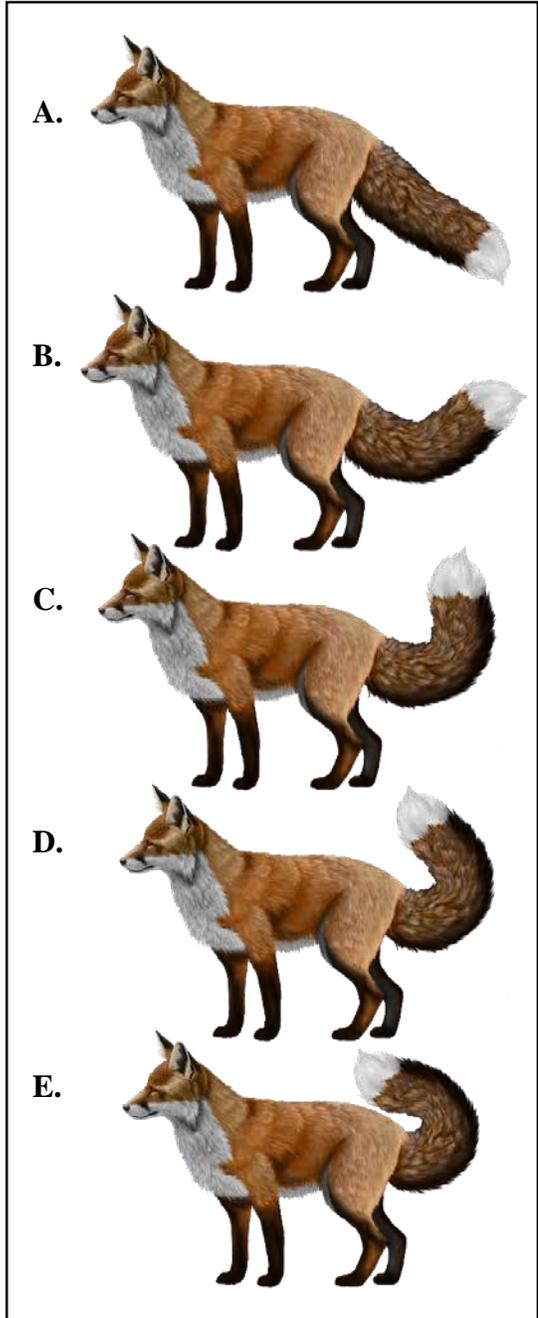
45. Would you like to own any of these animals as a pet?

A. Yes	B. No
--------	-------

46. Which animal, (A, B, C, D, or E,) would you most like to own as a pet?

47. Which feature appeared to be different in these images?

A. Face	D. Fur Color
B. Ears	E. Multiple
C. Tail	Features



SECTION IV D

First, compare Images A-E, noticing similarities and differences. The images may appear unchanged, but there are slight differences.

Then answer each question by recording the appropriate response on your Scantron.

48. In which image does the animal begin resembling a domestic animal rather than a wild animal?

49. Which animal appears the most domesticated?

50. Which animal do you think is the most attractive?

51. How confident are you, on a scale of 1-5, with 5 being the most confident, that one of these animals would make a good pet?

A. 1	B. 2	C. 3	D. 4	E. 5
------	------	------	------	------

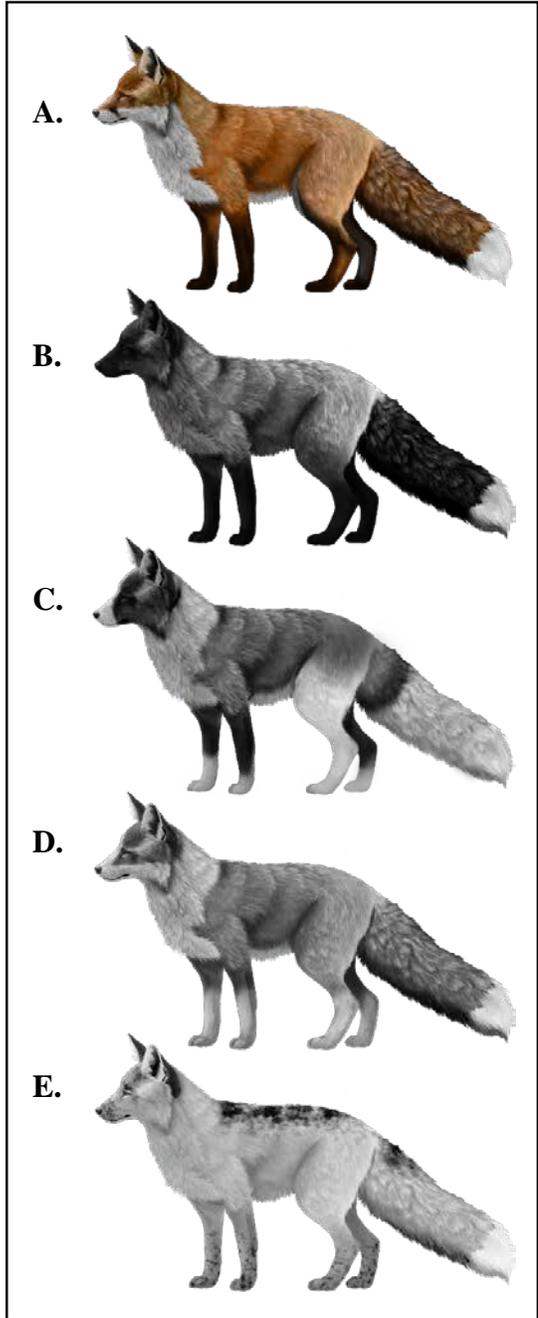
52. Would you like to own any of these animals as a pet?

A. Yes	B. No
--------	-------

53. Which animal, (A, B, C, D, or E,) would you most like to own as a pet?

54. Which feature appeared to be different in these images?

A. Face	D. Fur Color
B. Ears	E. Multiple
C. Tail	Features



SECTION IV E

First, compare Images A-E, noticing similarities and differences. The images may appear unchanged, but there are slight differences.

Then answer each question by recording the appropriate response on your Scantron.

55. In which image does the animal begin resembling a domestic animal rather than a wild animal?

56. Which animal appears the most domesticated?

57. Which animal do you think is the most attractive?

58. How confident are you, on a scale of 1-5, with 5 being the most confident, that one of these animals would make a good pet?

A. 1	B. 2	C. 3	D. 4	E. 5
------	------	------	------	------

59. Would you like to own any of these animals as a pet?

A. Yes	B. No
--------	-------

60. Which animal, (A, B, C, D, or E,) would you most like to own as a pet?

61. Which feature appeared to be different in these images?

A. Face	D. Fur Color
B. Ears	E. Multiple
C. Tail	Features

