


August 2022–July 2023

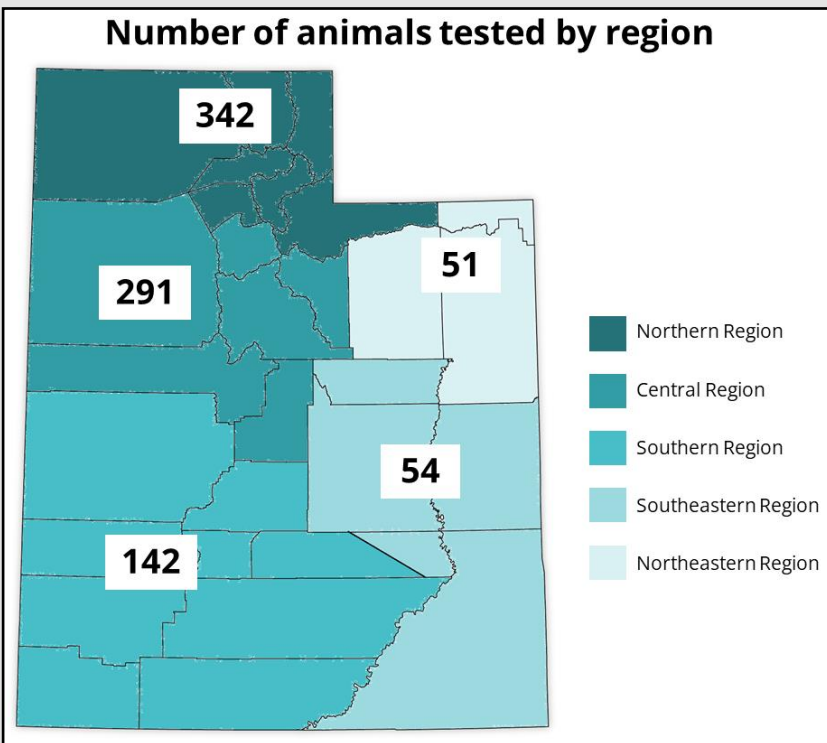
SARS-CoV-2 animal surveillance project summary

Between August 2022 and July 2023, we tested a total of 1,404 samples from 61 different animal species for SARS-CoV-2. A total of 1,069 individual animals were tested. Of these, we collected 329 paired samples, meaning we collected both a nasal swab for PCR testing and blood serum for antibody testing. Paired samples provide a better understanding of the current (PCR) and past (serum) infection history for an animal. Six animals were tested twice on separate dates. Overall, we tested 807 PCR and 597 serology samples. None of the animals tested were PCR positive for SARS-CoV-2; 31 animals (5.2%) were seropositive, meaning their blood serum contained antibodies for the virus. Our results indicate that

none of the animals we sampled were actively infected with SARS-CoV-2 at the time of sample collection. The 31 seropositive results suggest that the animals had, at some point, mounted an immune response to the virus, either through natural infection or through vaccine response. Of the 1,069 animals sampled, 23% were companion/owned animals, 61.6% were free-ranging wildlife, 9.3% were shelter/rescue animals, and 6.1% were captive wildlife (zoo) animals. Approximately 42% of the animals tested were females, 26% were males, and 33% were unknown. Animal samples were collected from all regions across Utah, with the greatest number of samples collected from the Northern Region (Figure 1).



- 1,404 total samples tested**
1,069 individual animals sampled
329 paired samples
- 807 PCR**
597 serology
- 61 species tested**
- No PCR positive samples**
31 seropositive samples (5.2%)



Animal surveillance groups

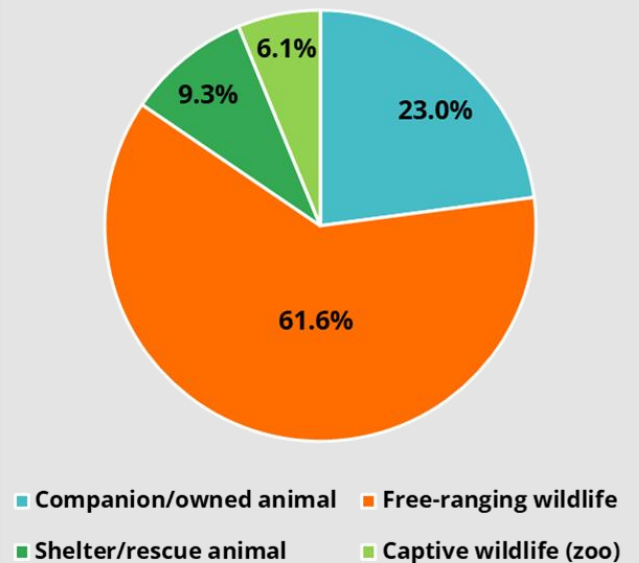


Figure 1. Distribution of individual animals tested for SARS-CoV-2 in Utah. Of the 1,069 animals tested, 189 animals did not have a known sample collection location and were excluded.

August 2022–July 2023 SARS-CoV-2 seropositive animals

Out of the 31 seropositive animals, 21 were free-ranging, wild mule deer, 2 were companion animals (1 dog and 1 cat), and 8 were captive wildlife from Utah's Hogle Zoo (1 gorilla, 1 tiger, 4 Amur leopards, and 2 snow leopards). All seropositive zoo animals were previously vaccinated for SARS-CoV-2.



299 mule deer serum samples collected
→ **21 seropositive**



3 gorilla serum samples collected
→ **1 seropositive***



46 dog serum samples collected
→ **1 seropositive**



13 zoo big cat serum samples collected
→ **1 seropositive tiger***
→ **6 seropositive leopards***



16 cat serum samples collected
→ **1 seropositive**

*Animal previously vaccinated for SARS-CoV-2

August 2022–July 2023 Mule deer

Out of the 21 seropositive mule deer, 18 had a known location of sample collection. Of these, 13 mule deer were from the Central Region, 4 deer were from the Southern Region, and 1 deer was from the Southeastern Region (Figure 2).

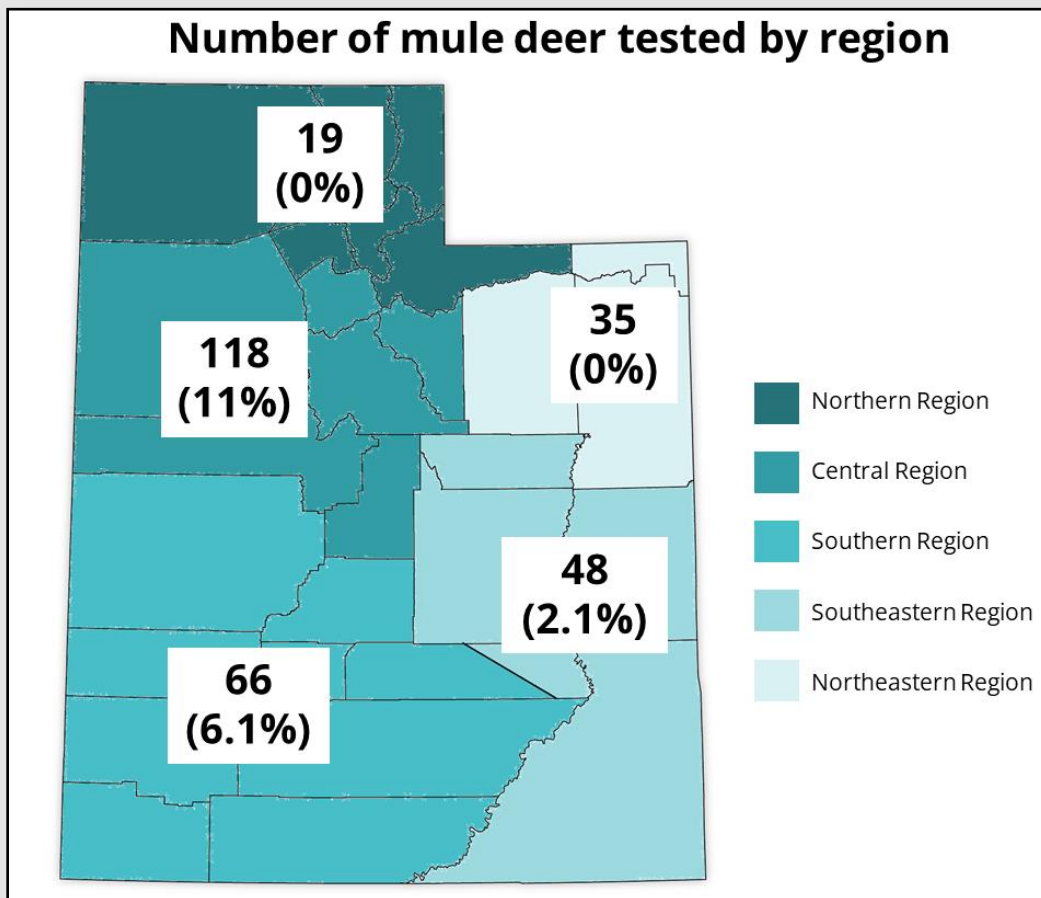


Figure 2. Mule deer serum samples tested by region (top number) and percent seropositivity (%) per region. Out of the 299 samples, the sample collection location was unknown for 13 deer. They were excluded from this figure. Out of the 21 seropositive mule deer, the collection location was unknown for 3 of the deer. They were excluded from this figure.

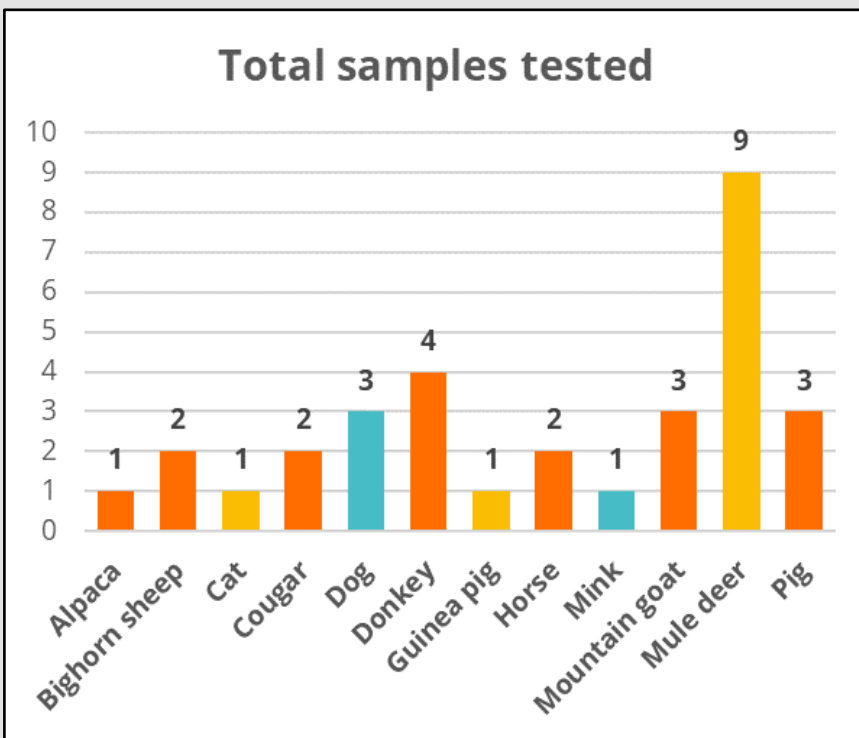
August 2022–July 2023 Project successes

While the results from this project have improved our understanding of the extent of past and present SARS-CoV-2 infections across various animal populations in Utah, we believe the One Health partnerships developed throughout the project period were the most notable successes. Through these partnerships, Utah has established SARS-CoV-2 animal testing capacity (PCR and serology), created a SARS-CoV-2 animal testing database and system for data collection, and built an effective surveillance framework that can be used in the event of future zoonotic and/or emerging disease outbreaks.

August 2022–July 2023 Partner results

The following sections provide a summary of the total number of samples (PCR and serology) collected by each of the project partners. Asterisks denote animal species with at least one positive serology result. The colors of the graph bars correspond to the testing prioritization scoring groups. We created the testing prioritization groups based on (1) how likely the animal was to be susceptible to SARS-CoV-2 based on their genetics ([scientific basis](#)), and (2) whether SARS-CoV-2 infection had already been detected in that species [globally](#), [nationally](#), or in Utah (novel detection). Our goal was to prioritize testing animals that were more likely to be infected, but we also wanted to target animals in which infection had not already been documented.

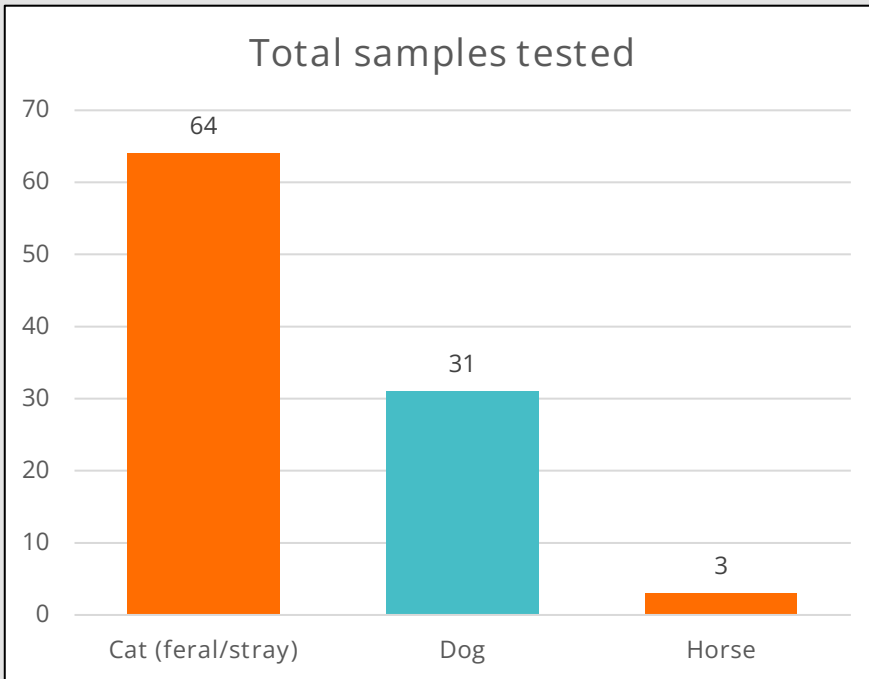
Utah Veterinary Diagnostic Lab



Score	Companion animals	Free-ranging wildlife
Very high testing priority (7-8)		
8		
7	goat	moose, muskrat, elk
High testing priority (5-6)		
6	alpaca, cat (feral), cow, hamster, sheep	bison, bighorn sheep, bobcat, lynx, chipmunk, flying squirrel, marmot, mountain goat, mouse, prairie dog, pronghorn, rabbit/hare, squirrel
5	donkey, horse, pig	black bear, pika, grizzly bear, coyote, fox, cougar, North American porcupine, Ord's kangaroo rat, vole, white-tailed deer
Low testing priority (3-4)		
4	guinea pig	badger, beaver, marten, bat, black-footed ferret, rat, gopher, mule deer, nutria, raccoon, ringtail, shrew, skunk, weasel, wolverine
3	cat (household)	
Very low testing priority (1-2)		
2	dog, ferret	river otter
1		mink

Figure 3. Left: bar chart showing the total samples tested from the Utah Veterinary Diagnostic Lab. The colors of the graph bars correspond to the testing priority groups. Right: testing priority groups for companion animals and free-ranging wildlife.

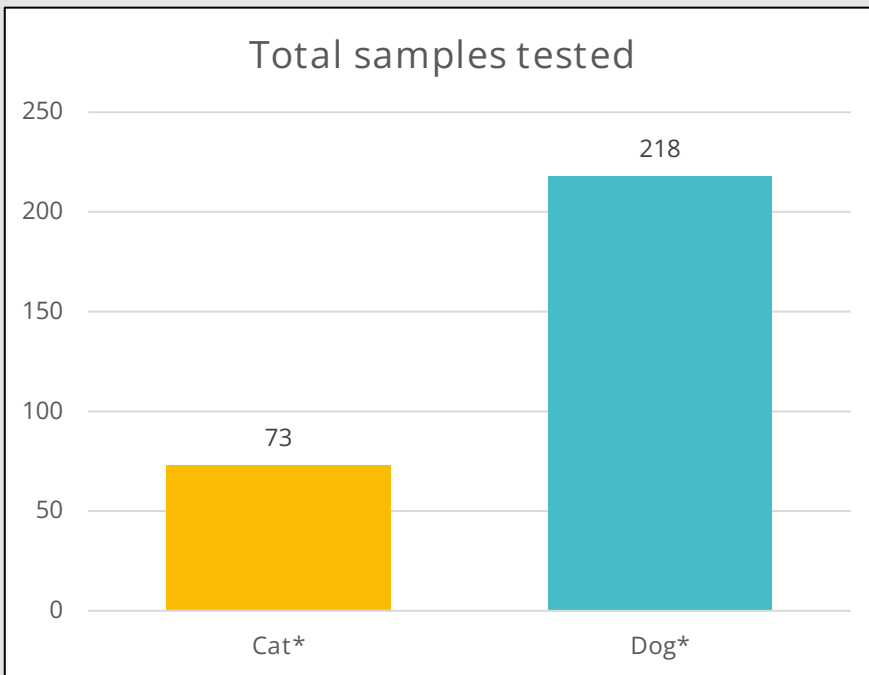
Animal Care of Davis County



Score	Companion animals
Very high testing priority (7-8)	
8	
7	goat
High testing priority (5-6)	
6	alpaca, cat (feral), cow, hamster, sheep
5	donkey, horse, pig
Low testing priority (3-4)	
4	guinea pig
3	cat (household)
Very low testing priority (1-2)	
2	dog, ferret
1	

Figure 4. Left: bar chart showing the total samples tested from Animal Care of Davis County. The colors of the graph bars correspond to the testing priority groups. Right: testing priority groups for companion animals.

Veterinary Clinics

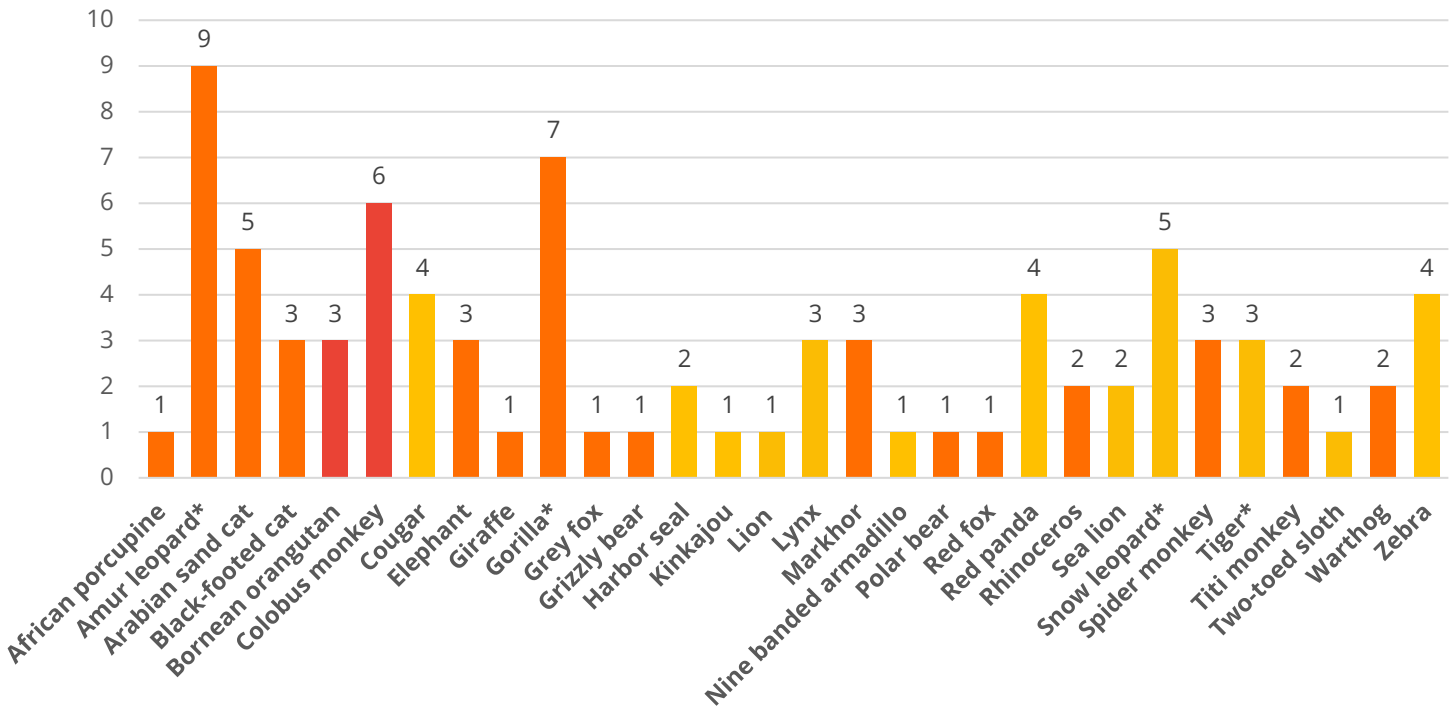


Score	Companion animals
Very high testing priority (7-8)	
8	
7	goat
High testing priority (5-6)	
6	alpaca, cat (feral), cow, hamster, sheep
5	donkey, horse, pig
Low testing priority (3-4)	
4	guinea pig
3	cat (household)
Very low testing priority (1-2)	
2	dog, ferret
1	

Figure 5. Left: bar chart showing the total samples tested from veterinary clinics in Utah. The colors of the graph bars correspond to the testing priority groups. Asterisks indicate a seropositive result. Right: testing priority groups for companion animals.

Utah's Hogle Zoo

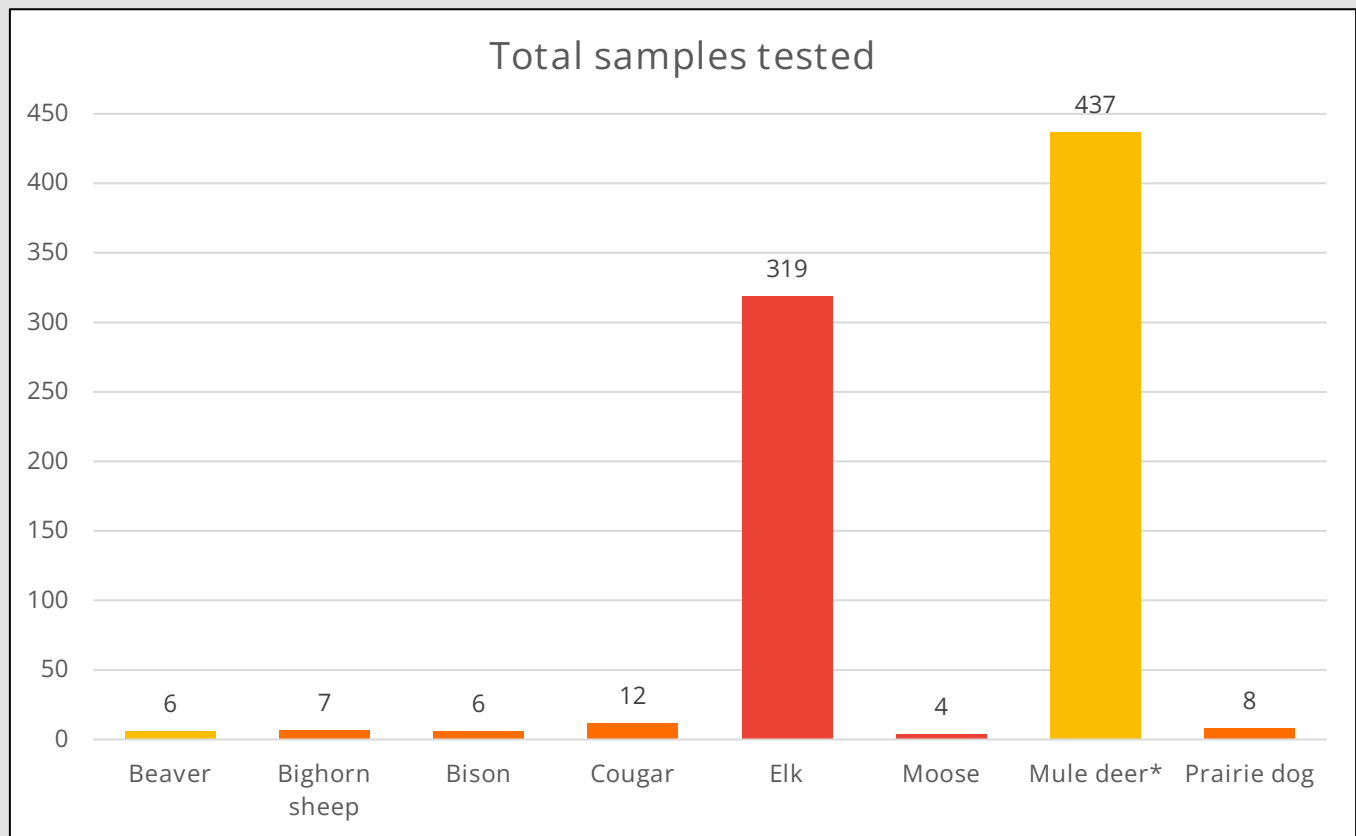
Total samples tested



Score	Captive wildlife			
	Very high testing priority (7-8)	High testing priority (5-6)	Low testing priority (3-4)	Very low testing priority (1-2)
8	orangutan	6 Amur leopard, Arabian sand cat, howler monkey, black-footed cat, bobcat, titi monkey, giraffe, gorilla, Pallas cat, spider monkey, markhor	4 snow leopard, sea lion, cougar, harbor seal, zebra, kinkajou, hedgehog tenrec, two-toed sloth, nine-banded armadillo, red panda, rock hyrax, Siberian lynx, meerkat, armadillo, tiger	2 river otter
7	colobus monkey	5 African porcupine, elephant, fox, grizzly bear, polar bear, warthog, fruit bat, rhinoceros	3 lion	1

Figure 6. Top: bar chart showing the total samples tested from Utah's Hogle Zoo. The colors of the graph bars correspond to the testing priority groups. Asterisks indicate a seropositive result. Bottom: testing priority groups for captive wildlife.

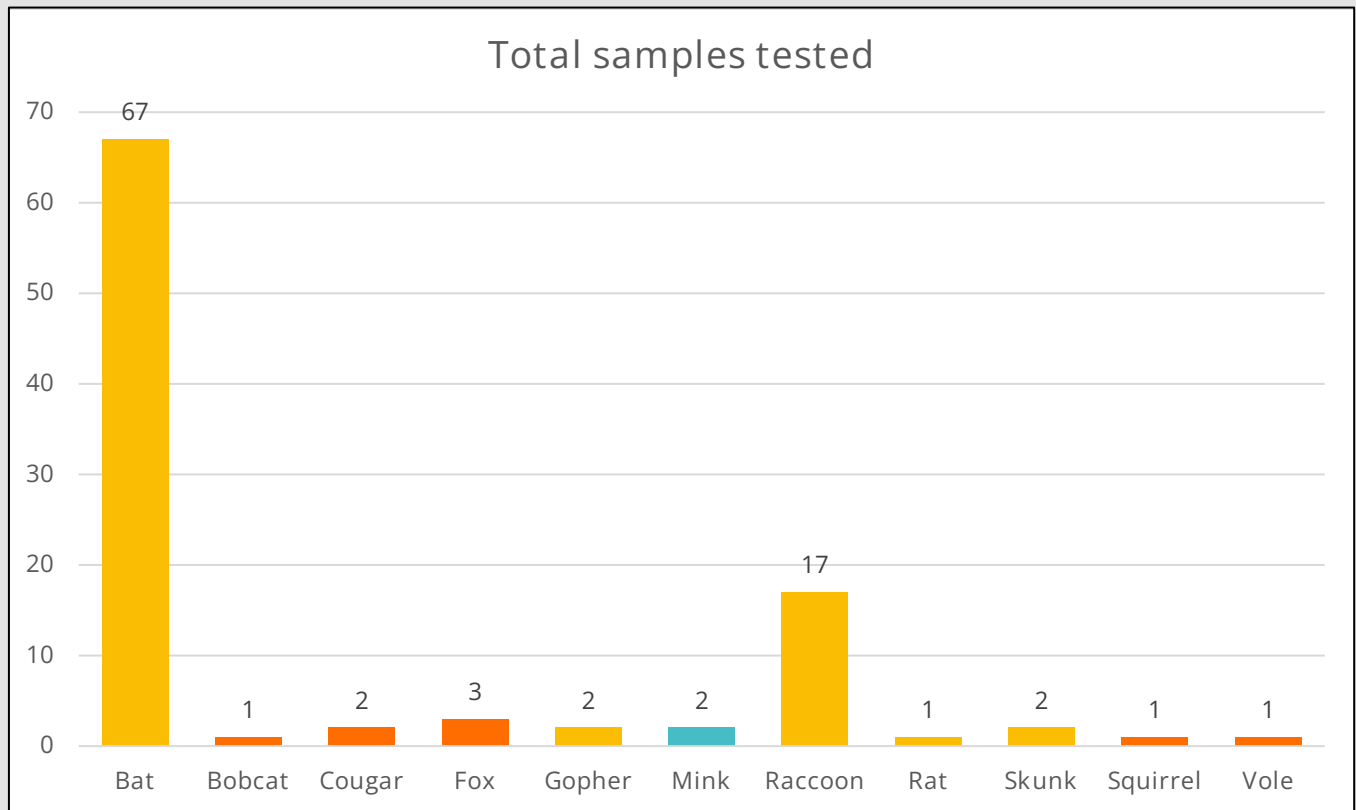
Division of Wildlife Resources



Score	Free-ranging wildlife		
Very high testing priority (7-8)	High testing priority (5-6)	Low testing priority (3-4)	Very low testing priority (1-2)
8	6 bison, bighorn sheep, bobcat, lynx, chipmunk, flying squirrel, marmot, mountain goat, mouse, prairie dog, pronghorn, rabbit/hare, squirrel	4 badger, beaver, marten, bat, black-footed ferret, rat, gopher, mule deer, nutria, raccoon, ringtail, shrew, skunk, weasel, wolverine	2 river otter
7	moose, muskrat, elk	5 black bear, pika, grizzly bear, coyote, fox, cougar, North American porcupine, Ord's kangaroo rat, vole, white-tailed deer	3
			1 mink

Figure 7. Top: bar chart showing the total samples tested from Division of Wildlife Resources. The colors of the graph bars correspond to the testing priority groups. Asterisks indicate a seropositive result. Bottom: testing priority groups for free-ranging wildlife.

Utah Public Health Lab



Score	Free-ranging wildlife			
	Very high testing priority (7-8)	High testing priority (5-6)	Low testing priority (3-4)	Very low testing priority (1-2)
8		6 bison, bighorn sheep, bobcat, lynx, chipmunk, flying squirrel, marmot, mountain goat, mouse, prairie dog, pronghorn, rabbit/hare, squirrel	4 badger, beaver, marten, bat, black-footed ferret, rat, gopher, mule deer, nutria, raccoon, ringtail, shrew, skunk, weasel, wolverine	2 river otter
7	moose, muskrat, elk	5 black bear, pika, grizzly bear, coyote, fox, cougar, North American porcupine, Ord's kangaroo rat, vole, white-tailed deer	3	1 mink

Figure 8. Top: bar chart showing the total samples tested from the Utah Public Health Lab. The colors of the graph bars correspond to the testing priority groups. Bottom: testing priority groups for free-ranging wildlife.