THE HUMANE SOCIETY OF THE UNITED STATES

Government data confirm that cougars have a negligible effect on U.S. cattle & sheep industries

In the United States, data show that cougars (*Puma concolor,* also commonly known as mountain lions) kill few cattle and sheep. Livestock predation data collected by various governmental bodies differ significantly, however. The most recent data published by the U.S. Department of Agriculture-Animal and Plant Health Inspection Service (USDA)[1] indicate losses many times greater than those collected by states. For instance, the USDA's cattle loss data to cougars are at least 69 percent greater than those reported by Colorado Parks and Wildlife. The USDA's methodology involves collecting data from a few mostly unverified sources, which the USDA then extrapolated statewide without calculating standard errors or using models to test relationships among various mortality factors.[2] This contravenes the scientific method and results in exaggerated livestock losses attributed to native carnivores and dogs. Unfortunately, this misinformation informs public policies that harm cougars and other native carnivores.

The Humane Society of the United States analyzed the USDA's embellished predation numbers. Their data show that farmers and ranchers lose nine times more cattle and sheep to health, weather, birthing and theft problems than to all predators combined. In the USDA reports, "predators" include mammalian carnivores (e.g., cougars, wolves and bears), avian carnivores (e.g., eagles and hawks) and domestic dogs. Domestic dogs, according to the USDA's data, kill 35 percent more cattle than cougars, and 65 percent more sheep. According to the USDA, in the states where cougars live, they cause far fewer than one percent of unwanted cattle-calf (hereinafter "cattle") and sheep-lamb (hereinafter "sheep") losses.

We present our analysis of the USDA's data sets on cattle and sheep deaths in cougar-occupied states and cougars' effects on the national cattle and sheep industries. We compare the USDA's data to those of other governmental bodies that also collect this information, which corroborates our findings that while the USDA's predation figures are significantly exaggerated, they are nominal when compared to livestock mortalities from health, weather, theft and birthing problems (we refer to these livestock losses as "maladies"). We describe humane, efficacious and cost-effective non-lethal methods for cattle and sheep protection, and show that only a fraction of cattle and sheep growers in cougar-occupied states use non-lethal methods to protect their herds—even as numerous published scientific studies have found that non-lethal methods to protect non-native cattle and sheep from native carnivores are more efficacious and cost-effective than the constant slaughter of wildlife that is ubiquitously employed.

I. Cougars' legal status varies across their range

Once distributed across the U.S., breeding populations of cougars exist in only a fraction of their historic range in 16 states, including the western U.S., with small populations in the Midwest, and two contested subspecies, one in Florida, the Florida panther (*Puma concolor coryi*), and the other on the eastern seaboard from the U.S. into Canada, the Eastern cougar (*Puma concolor couguar*). Only Florida panthers are federally protected under the Endangered Species Act (ESA); the FWS recently delisted Eastern cougars. California banned trophy hunting of cougars in 1991. Except in Florida and California, cougars are killed by both trophy hunters and predator-control agents.

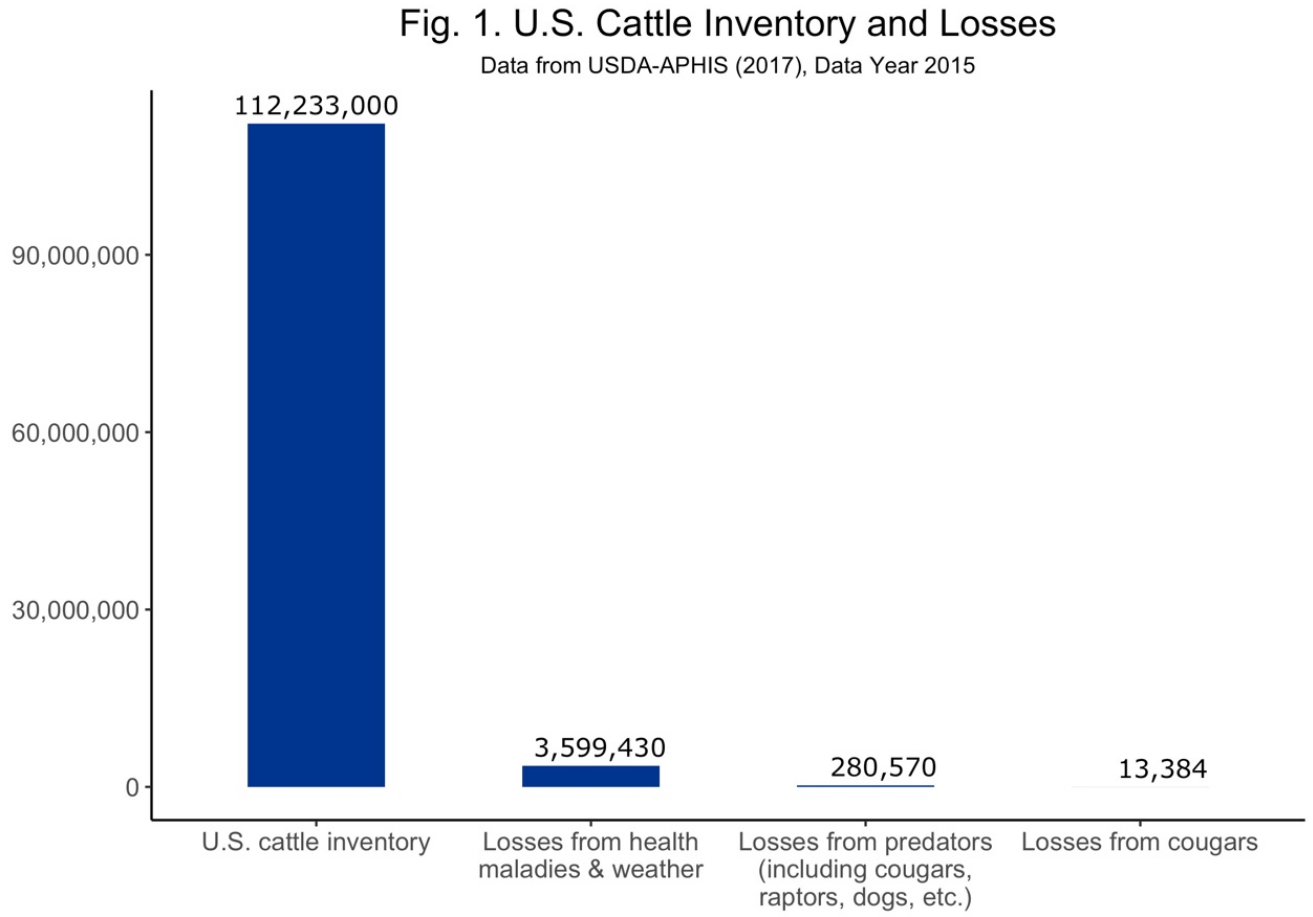
Dated: Feb., 2019

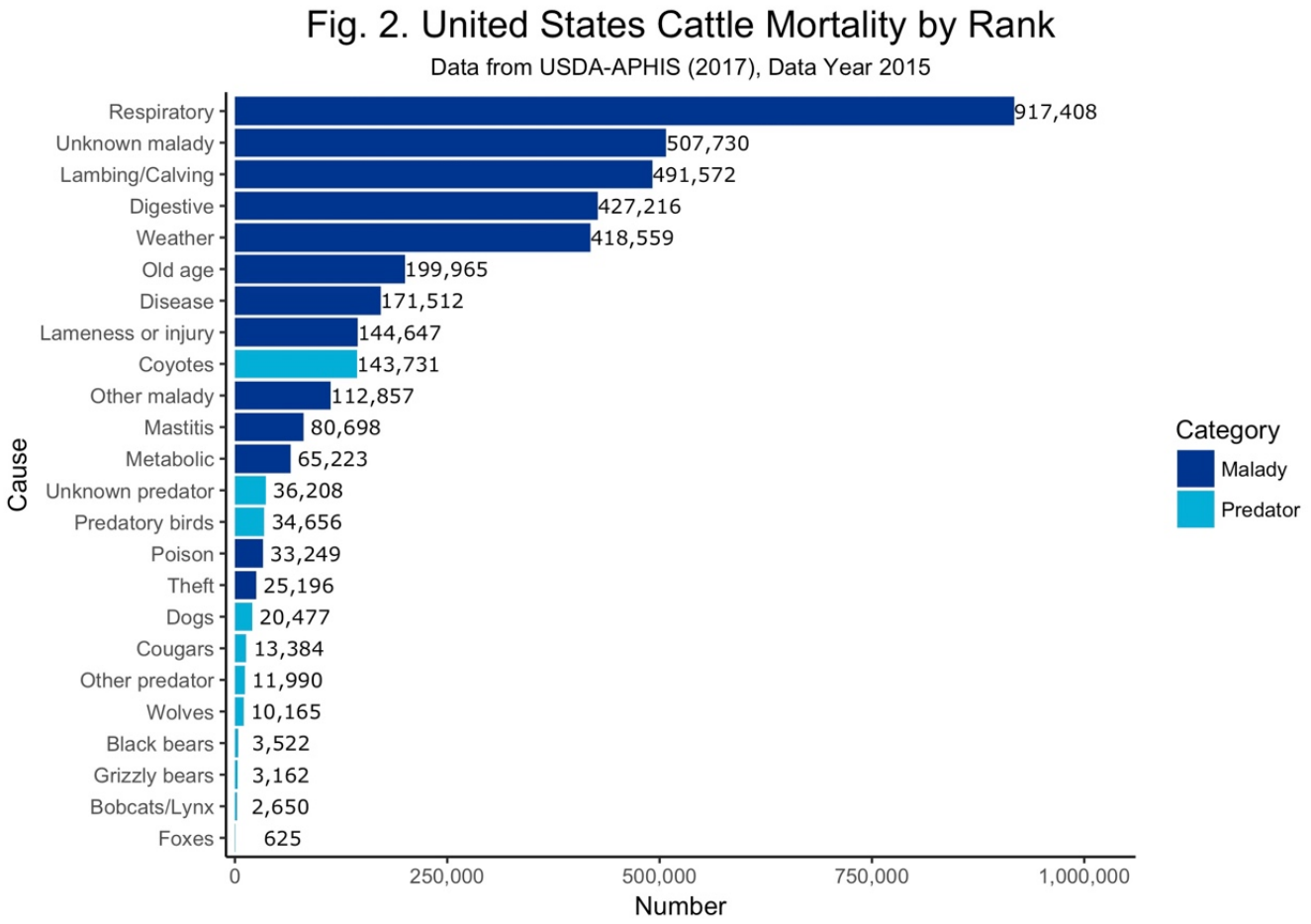
II. USDA data show most cattle and sheep die from health, weather and other maladies

USDA reports show that the primary causes of cattle and sheep losses in the U.S. come from health problems, weather, theft and other maladies, but *not* from wild native carnivores, including cougars.[3] Nationwide, the USDA's data show that *nine times* more cattle and sheep died from maladies such as illnesses, birthing problems, weather, poisoning and theft (3,990,035), than from all mammalian or avian predators together (474,965). Of the 119 million cattle and sheep inventoried in the U.S. in 2014 and 2015, fewer than one percent (0.4 percent) died from mammalian and avian predators combined. Figs. 1 and 3. Of the total unwanted cattle deaths in cougar states, between 83 percent and 97 percent came as a result of maladies. Fig. 5b.

A. Despite being inflated, USDA data show that few cattle die from cougars, other native carnivores or dogs

In 2015, the USDA inventoried 112.2 million cattle in the U.S.[4] Of that number, 4.5 million died from *all* unwanted causes. Most of those deaths, 3.6 million (3.2 percent of U.S. cattle inventory) stemmed from health-related maladies, weather and theft. Mortalities from all predators amounted to 280,570 cattle deaths, representing a mere 0.3 percent of the U.S. cattle inventory—with cougars taking 0.01 percent of the U.S. cattle inventory. Figs. 1 and 2.





B. <u>Despite being inflated, USDA data show that few sheep die from cougars, other native carnivores or dogs</u>

In 2015, the U.S. sheep inventory amounted to 6.8 million individuals. Health, weather, poison, theft and other maladies were responsible for the majority of ranchers' and farmers' losses: 390,605 sheep deaths (5.7 percent of the U.S. sheep inventory). In comparison, native mammalian carnivores, raptors and domestic dogs killed 194,395 sheep or 2.9 percent of the U.S. sheep inventory, with sheep losses from cougars amounting to 0.14 percent of the U.S. sheep inventory.[5] Figs. 3 and 4. Predation of sheep is greater than of cattle, likely because sheep have smaller body size and lack predator-avoidance skills.[6] Despite this, the USDA's data show few sheep growers use non-lethal methods to protect their flocks (*see*: Figs. 39 and 40 below). Fewer than 20 percent of sheep growers in cougar-occupied states used all non-lethal methods available to them to protect their flocks (see: Section V and VI Figs. 38 and 39).

PHOTO BY: JIM ZUCKERMAN

Fig. 3. U.S. Sheep Inventory and Losses

Data from USDA-APHIS (2015), Data Year 2014

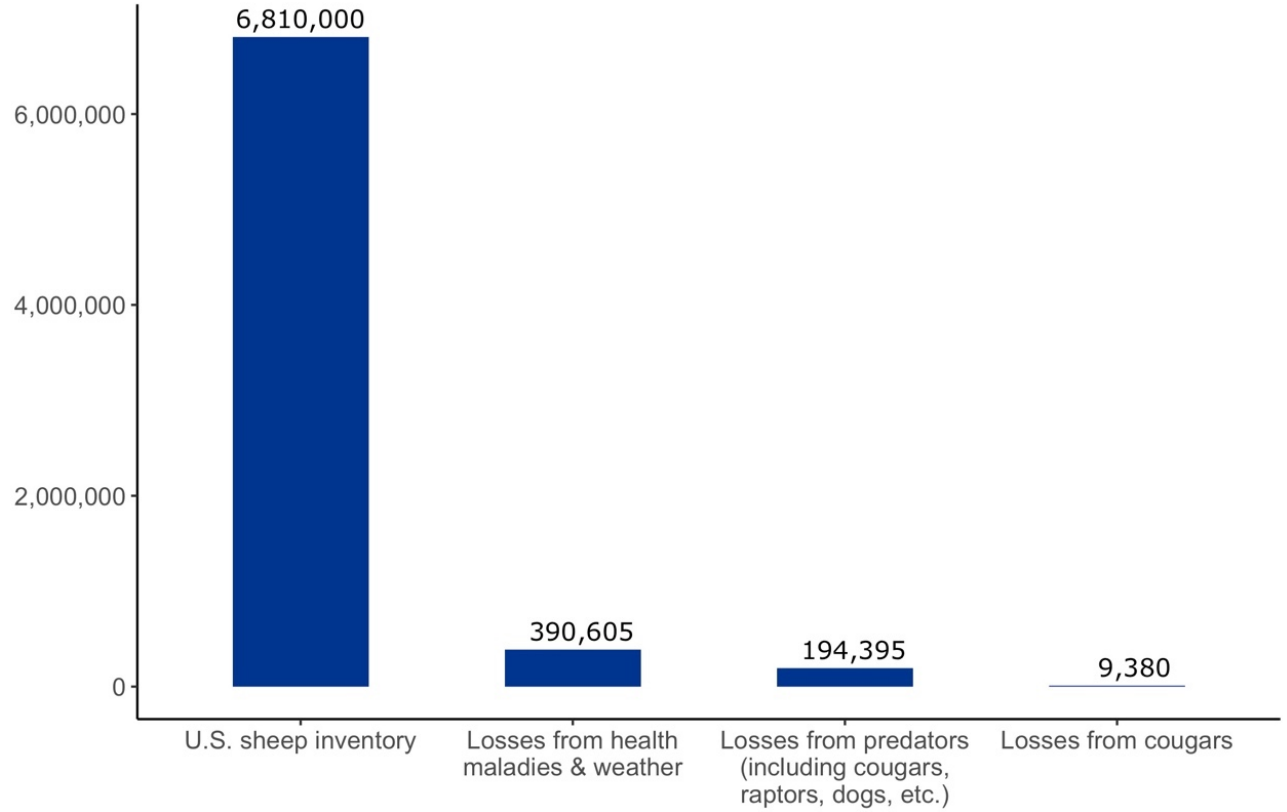
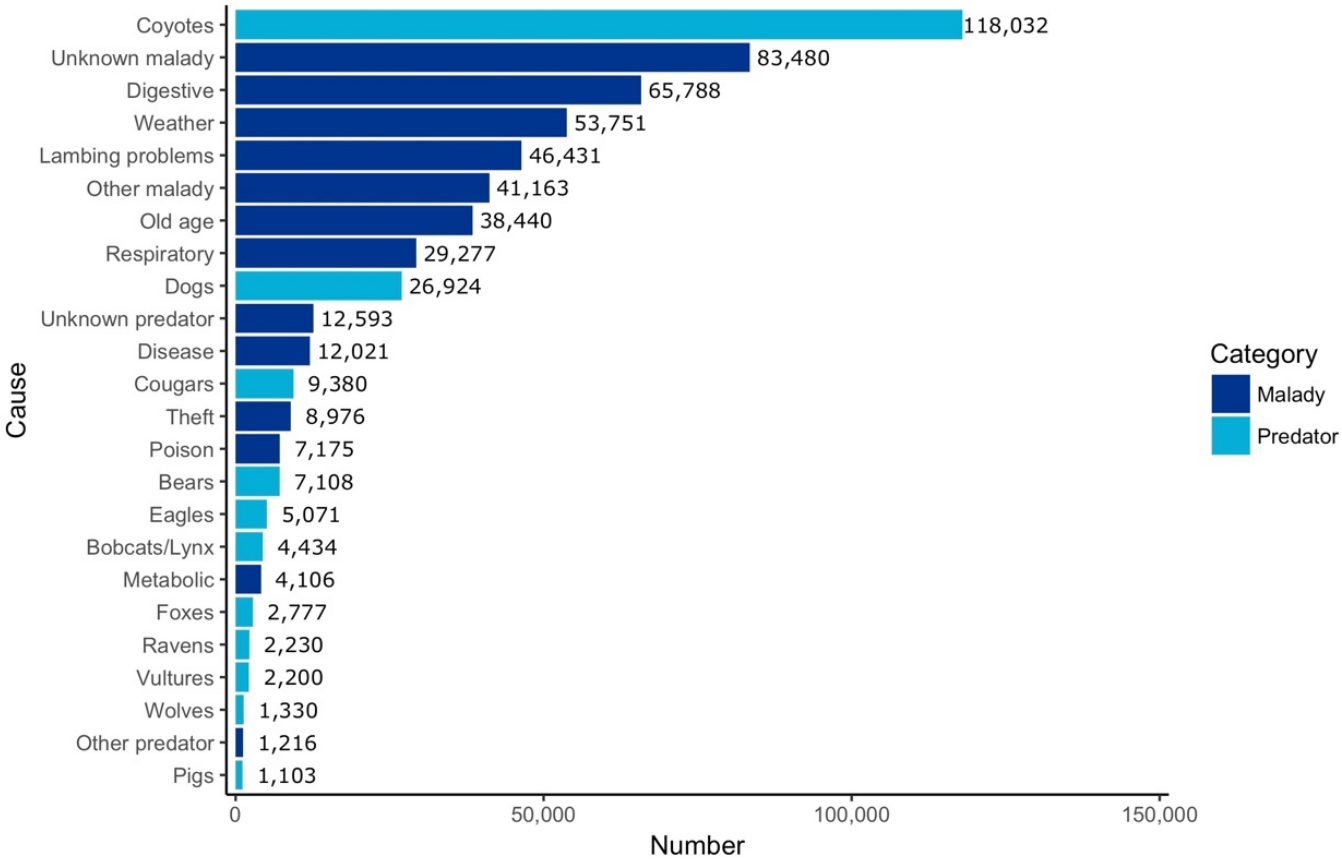


Fig. 4. United States Sheep Mortality by Rank

Data from USDA-APHIS (2015), Data Year 2014



III. Even in cougar-occupied states, USDA's data show nominal losses of cattle and sheep to predators

- Cougars are regularly found in 16 states: Arizona, California, Colorado, Florida, Idaho, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Texas, Utah, Washington and Wyoming. In these states, the USDA found that cougars killed 16,595 cattle (2015) and sheep (2014) from a combined inventory of 62.4 million. In other words, cougars killed 0.03 percent of the cattle and sheep inventories in the states where they are present. Figs. 4 and 5, 7-37. Data from four state wildlife departments, however, show far fewer losses due to cougars than do the USDA's data. *See* Section IV.

- In all cougar-occupied states, these native cats preyed on less than one percent of states' cattle inventories. Fig. 5a. In comparison, deaths from maladies in cougar-occupied states involved an average of 92 percent of all unwanted cattle losses. Fig. 5b.

- In all cougar-occupied states, cougars preyed on less than one percent of states' sheep inventories, except for in Nevada. Fig. 6a. In comparison, deaths from maladies in cougar states involved an average of 57 percent of all unwanted sheep losses. Fig. 6b.

- The USDA failed to use *verified* livestock loss data—that is, they largely relied on livestock growers to tell them how their domestic animals died without confirmation by USDA representatives. Therefore, some cattle or sheep losses that the USDA attributed to cougars, coyotes and bears are likely inflated or misidentified. For example, in its cattle loss report, the USDA reported that growers lost cattle to grizzly bears in six states where grizzly bears are *absent* or never occurred historically (Arkansas, Colorado, Georgia, Nevada, Oregon and Wisconsin).[7] This indicates that the USDA's data are unverified and therefore flawed and unreliable.

Fig. 5a.
U.S. Cattle inventory and losses by state
(Unverified data from the USDA-Animal and Plant Health Inspection Service, 2017 (Data year 2015))

State	Cattle inventory	Cattle losses from maladies (illness, birthing problems etc.)	Percent of cattle inventory losses from maladies	Cattle losses from cougars	Percent of cattle inventory losses from cougars
AZ	1,095,000	37,880	3.46%	764	0.07%
CA	6,110,000	230,720	3.78%	1,907	0.03%
CO	3,350,000	109,920	3.28%	208	0.01%
FL	2,110,000	54,570	2.59%	475	0.02%
ID	3,020,000	89,050	2.95%	108	0.00%
MT	3,995,000	80,730	2.02%	384	0.01%
NE	7,795,000	194,150	2.49%	186	0.00%
NV	578,000	14,370	2.49%	411	0.07%
NM	1,755,000	60,500	3.45%	1,476	0.08%
ND	2,440,000	46,820	1.92%	195	0.01%
OR	1,780,000	53,470	3.00%	901	0.05%
SD	5,340,000	133,840	2.51%	232	0.00%
TX	13,890,000	472,220	3.40%	183	0.00%
UT	1,135,000	18,440	1.62%	241	0.02%
WA	1,423,000	42,730	3.00%	225	0.02%
WY	1,880,000	35,600	1.89%	204	0.01%
Total	57,696,000	1,675,010	2.90%	8,100	0.01%

Fig. 5b. U.S. Unwanted cattle losses by cause and state (Unverified data, USDA-Animal and Plant Health Inspection Service, 2017 (Data year 2015))							
States	Total unwanted cattle losses	Cattle losses from maladies (illness, birthing problems, etc.)		Cattle losses from all predators		Cattle losses from cougars	
		Number	Percent of total unwanted cattle losses	Number	Percent of total unwanted cattle losses	Number	Percent of total unwanted cattle losses
AZ	42,000	37,880	90.19%	4,120	9.81%	764	1.82%
CA	240,000	230,720	96.13%	9,280	3.87%	1,907	0.79%
CO	115,000	109,920	95.58%	5,080	4.42%	208	0.18%
FL	65,000	54,570	83.95%	10,430	16.05%	475	0.73%
ID	93,000	89,050	95.75%	3,950	4.25%	108	0.12%
MT	88,000	80,730	91.74%	7,270	8.26%	384	0.44%
NE	200,000	194,150	97.08%	5,850	2.93%	186	0.09%
NV	16,500	14,370	87.09%	2,130	12.91%	411	2.49%
NM	70,000	60,500	86.43%	9,500	13.57%	1,476	2.11%
ND	52,000	46,820	90.04%	5,180	9.96%	195	0.38%
OR	61,000	53,470	87.66%	7,530	12.34%	901	1.48%
SD	140,010	133,840	95.59%	6,170	4.41%	232	0.17%
TX	530,010	472,220	89.10%	57,790	10.90%	183	0.03%
UT	21,000	18,440	87.81%	2,560	12.19%	241	1.15%
WA	44,010	42,730	97.09%	1,280	2.91%	225	0.51%
WY	39,000	35,600	91.28%	3,400	8.72%	204	0.52%
Total	1,816,530	1,675,010	92.21%	141,520	7.79%	8,100	0.45%

Fig. 6a. U.S. Sheep inventory losses by state (Unverified data from the USDA-Animal and Plant Health Inspection Service, 2015 (Data year 2014))					
State	Sheep inventory	Sheep losses from maladies (illness, birthing problems etc.)	Percent of sheep inventory losses from maladies	Sheep losses from cougars	Percent of sheep inventory losses from cougars
AZ	136,000	5,396	3.97%	0	0.00%
CA	535,000	13,552	2.53%	519	0.10%
CO	395,000	16,346	4.14%	792	0.20%
ID	342,000	11,377	3.33%	49	0.01%
MT	361,000	17,380	4.81%	277	0.08%
NE	132,000	11,713	8.87%	0	0.00%
NV	98,000	2,782	2.84%	2,771	2.83%
NM	109,000	8,187	7.51%	0	0.00%
ND	100,000	6,967	6.97%	0	0.00%
OR	246,000	8,861	3.60%	390	0.16%
SD	384,000	29,433	7.66%	0	0.00%
TX	820,000	41,844	5.10%	1,616	0.20%
UT	467,000	9,700	2.08%	1,600	0.34%
WA	77,000	3,555	4.62%	181	0.24%
WY	461,000	8,600	1.87%	300	0.07%
Total	4,663,000	195,693	4.20%	8,495	0.18%

Fig. 6b. U.S. Sheep Unwanted Losses by Cause and by State (Unverified data, USDA-Animal and Plant Health Inspection Service, 2015 (Data year 2014))							
States	Total unwanted sheep losses	Sheep losses from maladies (illness, birthing problems, etc.)		Sheep losses from all predators		Sheep losses from cougars	
		Number	Percent of total unwanted sheep losses	Number	Percent of total unwanted sheep losses	Number	Percent of total unwanted sheep losses
Arizona	12,000	5,396	44.97%	6,604	55.03%	0	0
California	19,000	13,552	71.33%	5,448	28.67%	519	2.73%
Colorado	29,000	16,346	56.37%	12,654	43.63%	792	2.73%
Idaho	16,000	11,377	71.11%	4,623	28.89%	49	0.31%
Montana	27,850	17,380	62.41%	10,470	37.59%	277	0.99%
Nebraska	12,800	11,713	91.51%	1,087	8.49%	0	0
Nevada	15,000	2,782	18.55%	12,218	81.45%	2,771	18.47%
New Mexico	13,000	8,187	62.98%	4,813	37.02%	0	0
North Dakota	9,500	6,967	73.34%	2,533	26.66%	0	0
Oregon	15,000	8,861	59.07%	6,139	40.93%	390	2.6%
South Dakota	37,000	29,433	79.55%	7,567	20.45%	0	0
Texas	91,000	41,844	45.98%	49,156	54.02%	1,616	1.78%
Utah	27,000	9,700	35.93%	17,300	64.07%	1,600	5.93%
Washington	5,000	3,555	71.10%	1,445	28.90%	181	3.62%
Wyoming	16,000	8,600	53.75%	7,400	46.25%	300	1.88%
Total	345,150	195,693	56.70%	149,457	43.30%	8,495	2.46%

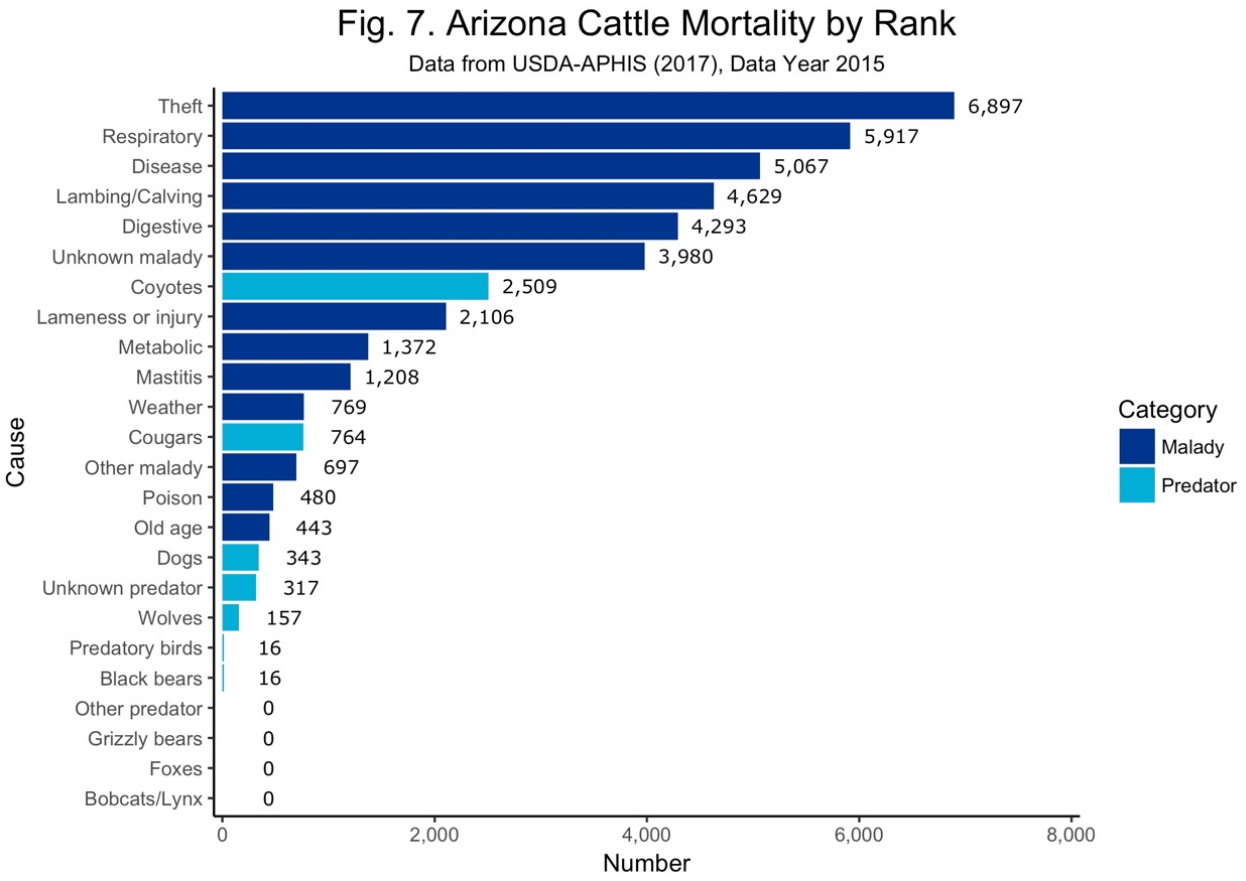
IV. The USDA's *unverified* losses data for cattle and sheep losses ranked by cause

Based on data from other governmental agencies, the USDA exaggerates the cattle and sheep losses it attributes to native carnivores and dogs. Also, the USDA's reports attribute livestock deaths to cougars even in states where none or very few of these native cats exist, as the examples below illustrate. (Cougars occur in low densities in states with arid climates. Because vegetation is scarce in dry habitats such as in Nevada, New Mexico, Oklahoma and Utah, they have few cougars (compared to Idaho or Montana). With less vegetation, ungulates—hoofed herbivorous animals like deer—are rare on the landscape. And prey populations generally set the size of their predators.[8])

- The USDA reported cattle losses from cougars in Alabama (49), Arkansas (885), Kansas (229), Kentucky (59), Louisiana (102), Michigan (1,471), South Carolina (112) and Wisconsin (310). Yet cougars are not present in these states, with the possible exception of a few dispersing animals from time-to-time.
- The USDA claims cattle predation in states were very few cougars exist, such as New Mexico (1,476) and Oklahoma (2,045). These claims are implausibly high.
- The USDA also reported sheep losses from cougars in Kentucky (120), Missouri (834), Tennessee (47) and West Virginia (46)—states where likely no cougars exist.
- In some states, like Nevada (2,771) and Utah (1,600), the sheep loss figures are simply implausible given how few cougars roam these desert states.

The USDA suggests that cougars killed 13,384 cattle (data year 2015) and 9,380 sheep (data year 2014) nationwide. Given that these data are exaggerated, there is value in showing the USDA's cattle and sheep loss numbers in rank order to demystify predator events on cattle and sheep. We show unwanted losses to cattle and sheep in each cougar-occupied state. The data clearly show that health and weather problems are the biggest concerns livestock growers face.

A. State-by-state cattle and sheep losses by rank



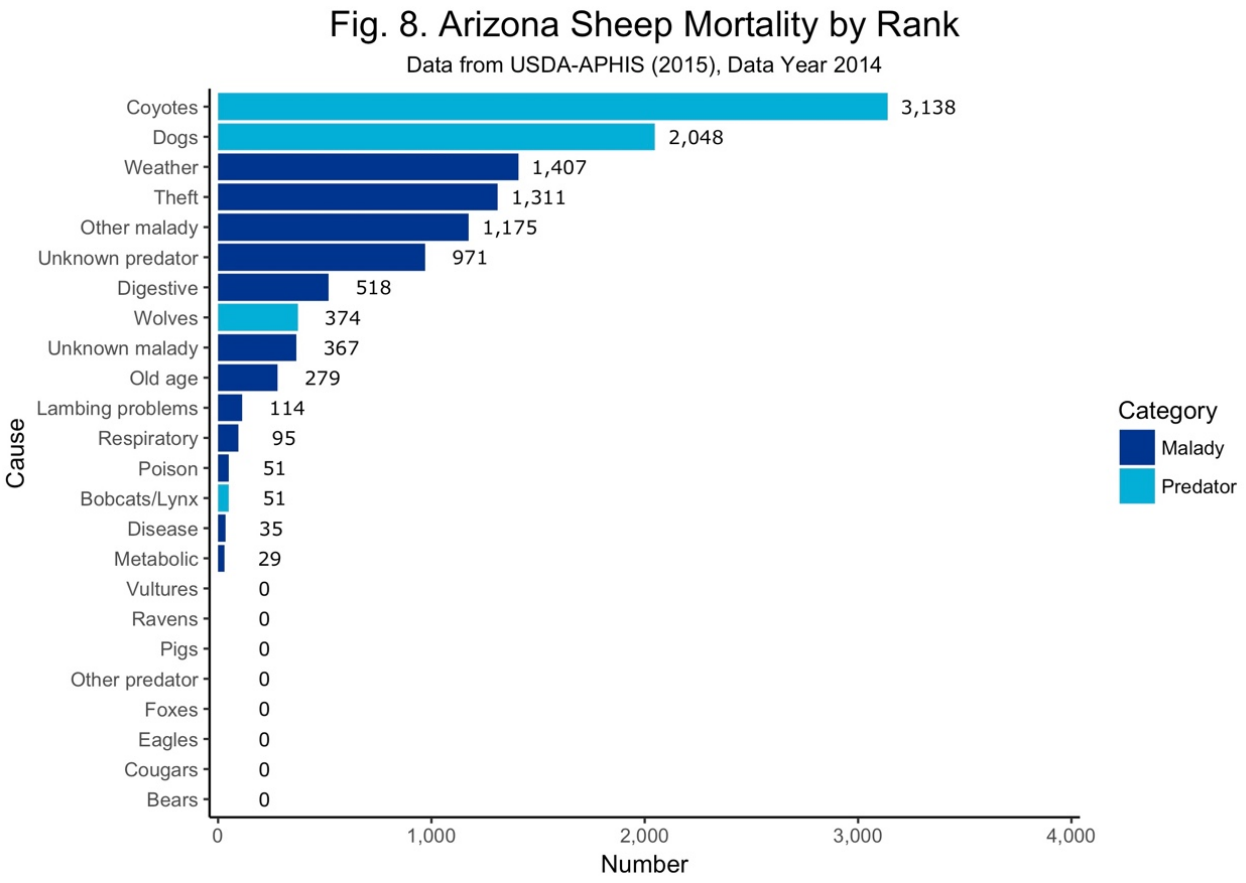


Fig. 9. California Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015

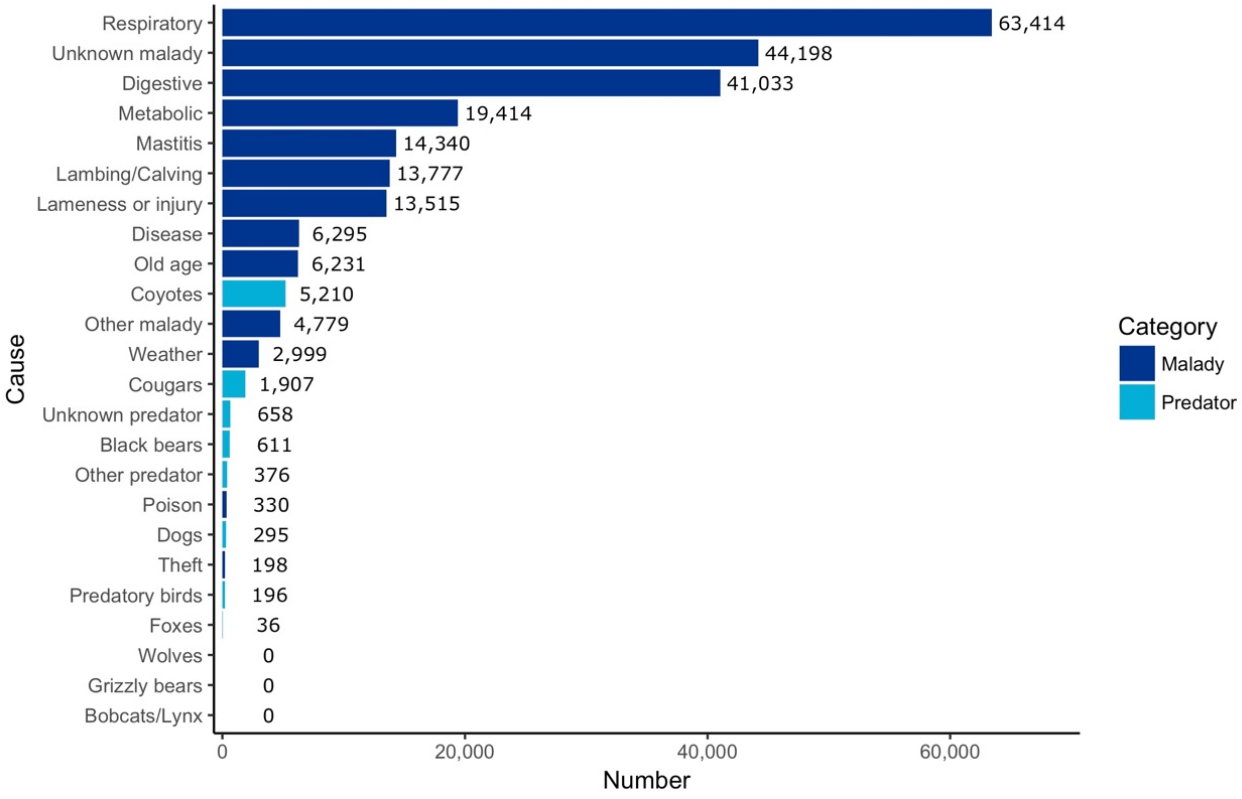


Fig. 10. California Sheep Mortality by Rank

Data from USDA-APHIS (2015), Data Year 2014

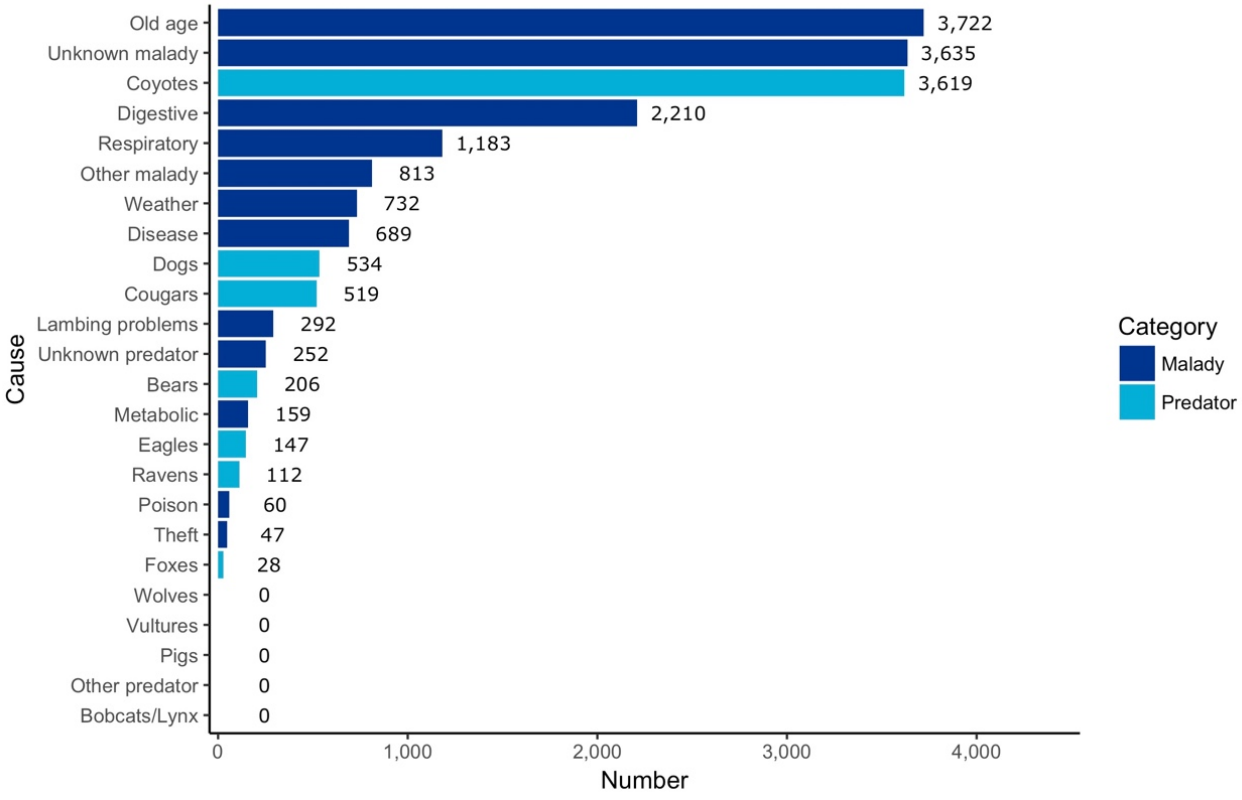


Fig. 11. Colorado Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015

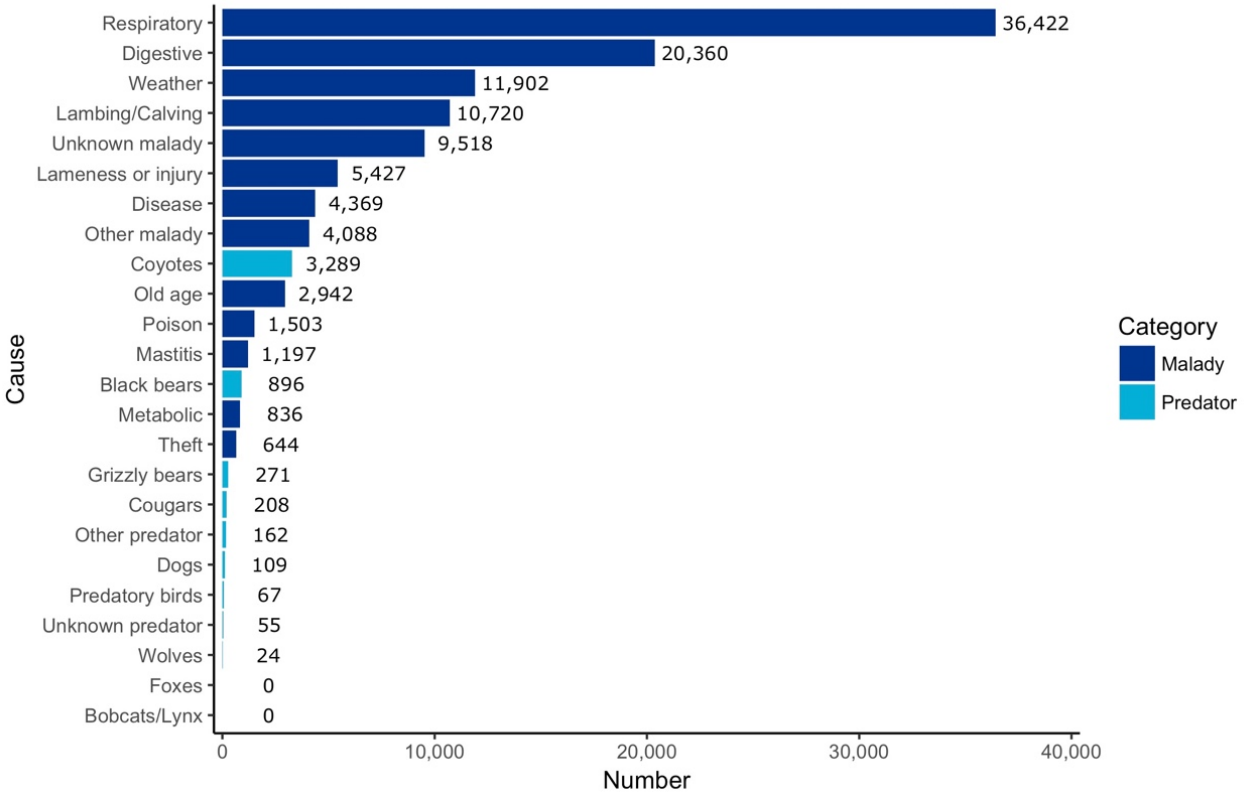


Fig. 12. Colorado Sheep Mortality by Rank

Data from USDA-APHIS (2015), Data Year 2014

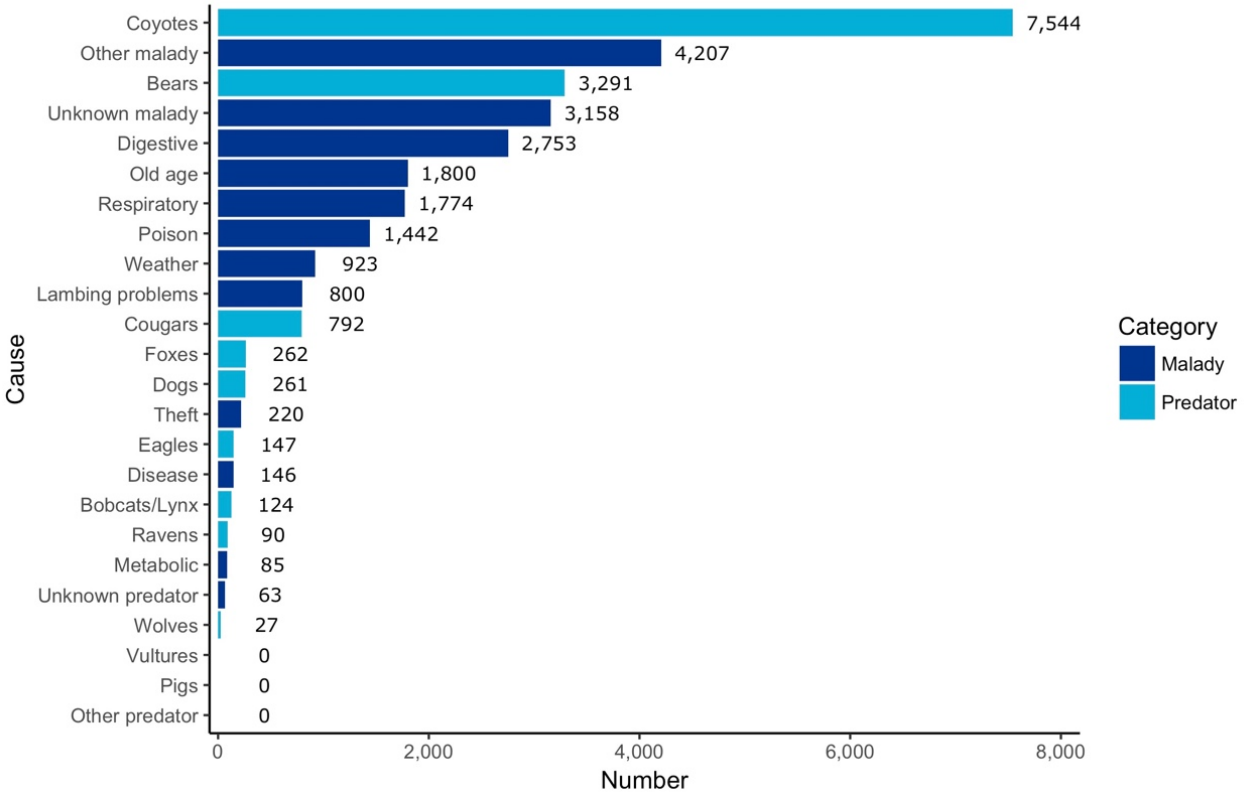
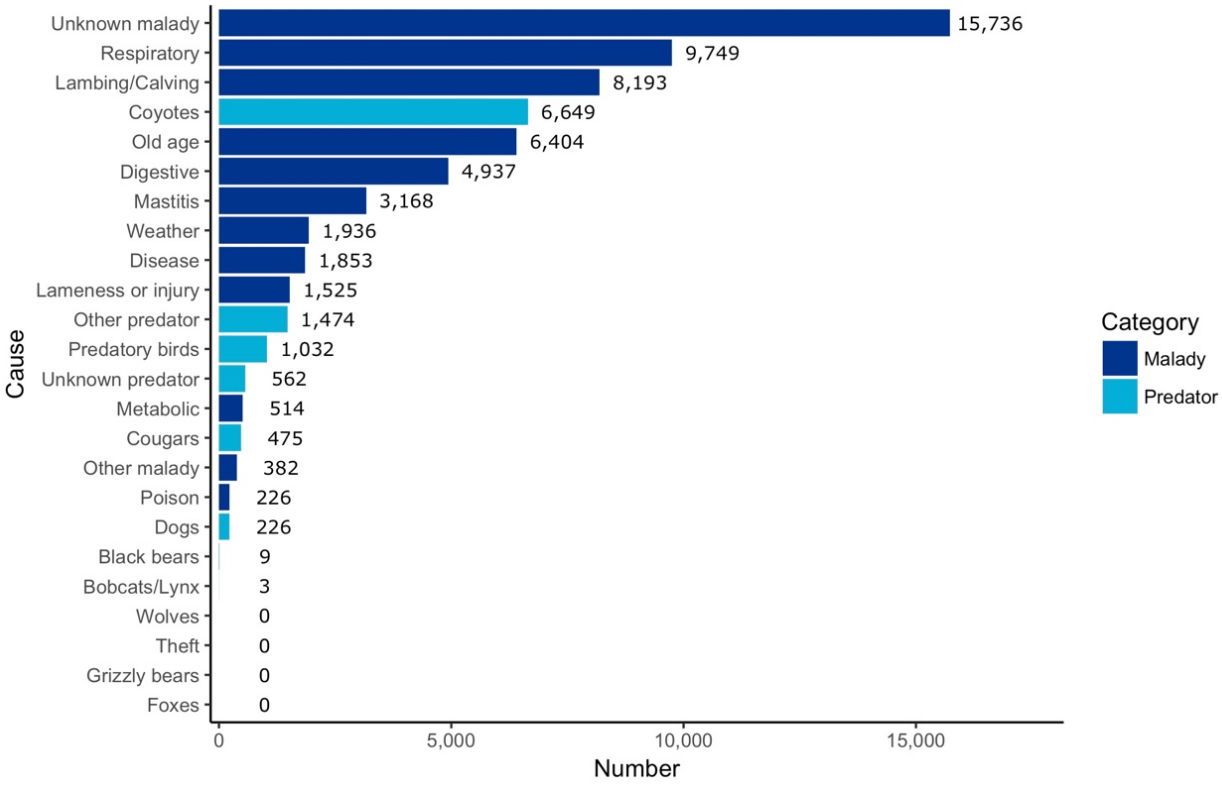


Fig. 13. Florida Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015



[The USDA reports no sheep data for Florida.]

Fig. 14. Idaho Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015

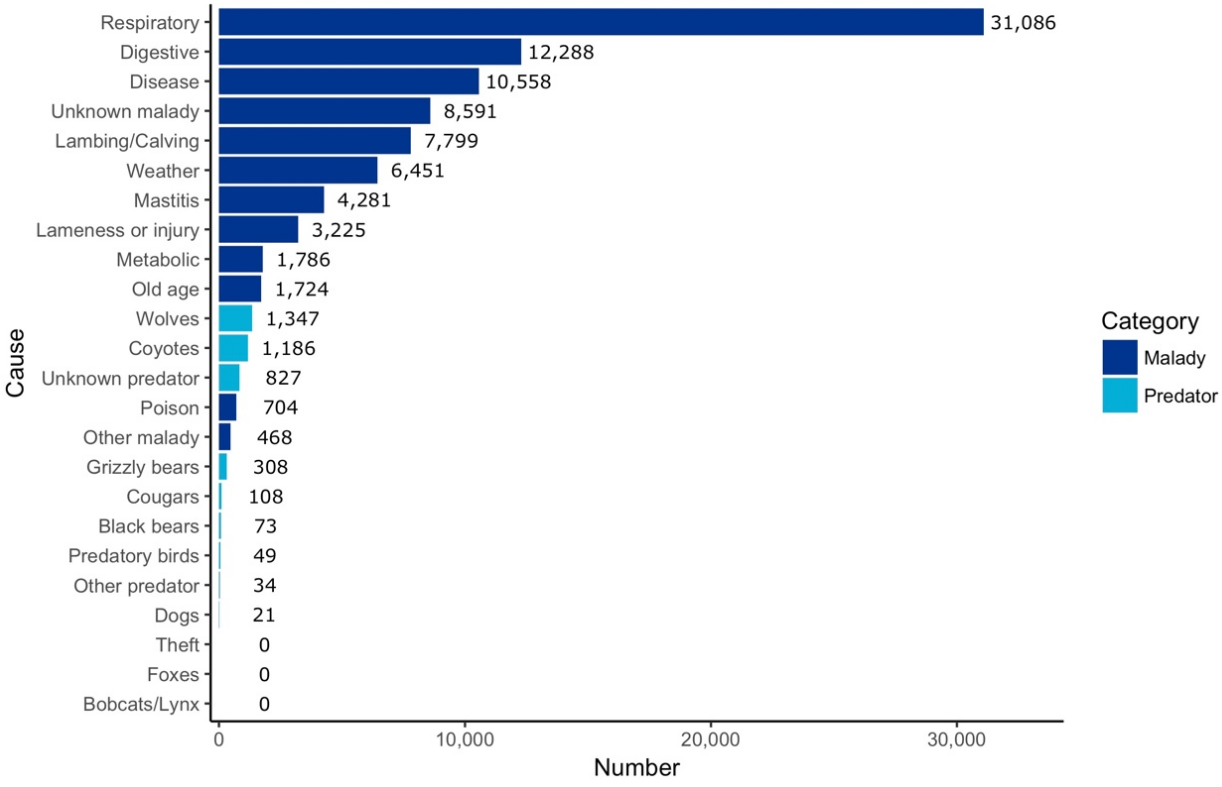


Fig. 15. Idaho Sheep Mortality by Rank

Data from USDA-APHIS (2015), Data Year 2014

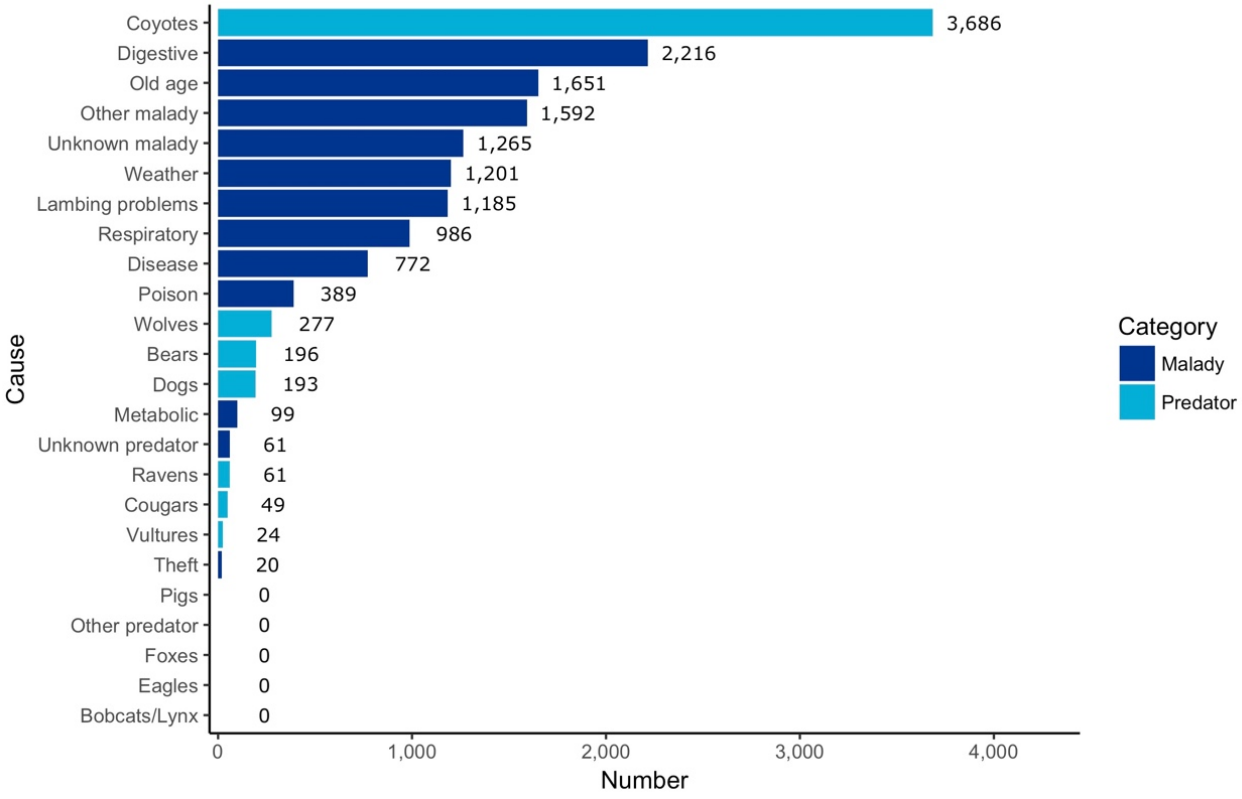


Fig. 16. Montana Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015

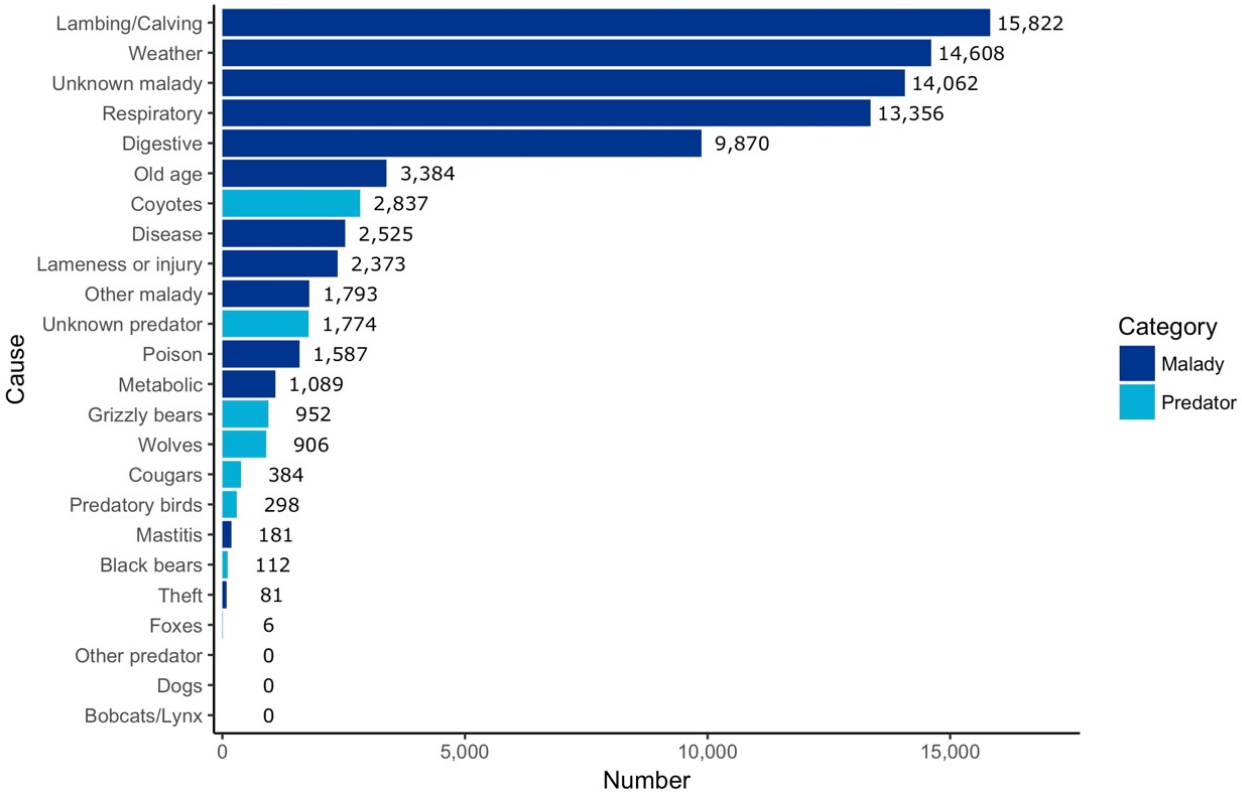


Fig. 17. Montana Sheep Mortality by Rank

Data from USDA-APHIS (2015), Data Year 2014

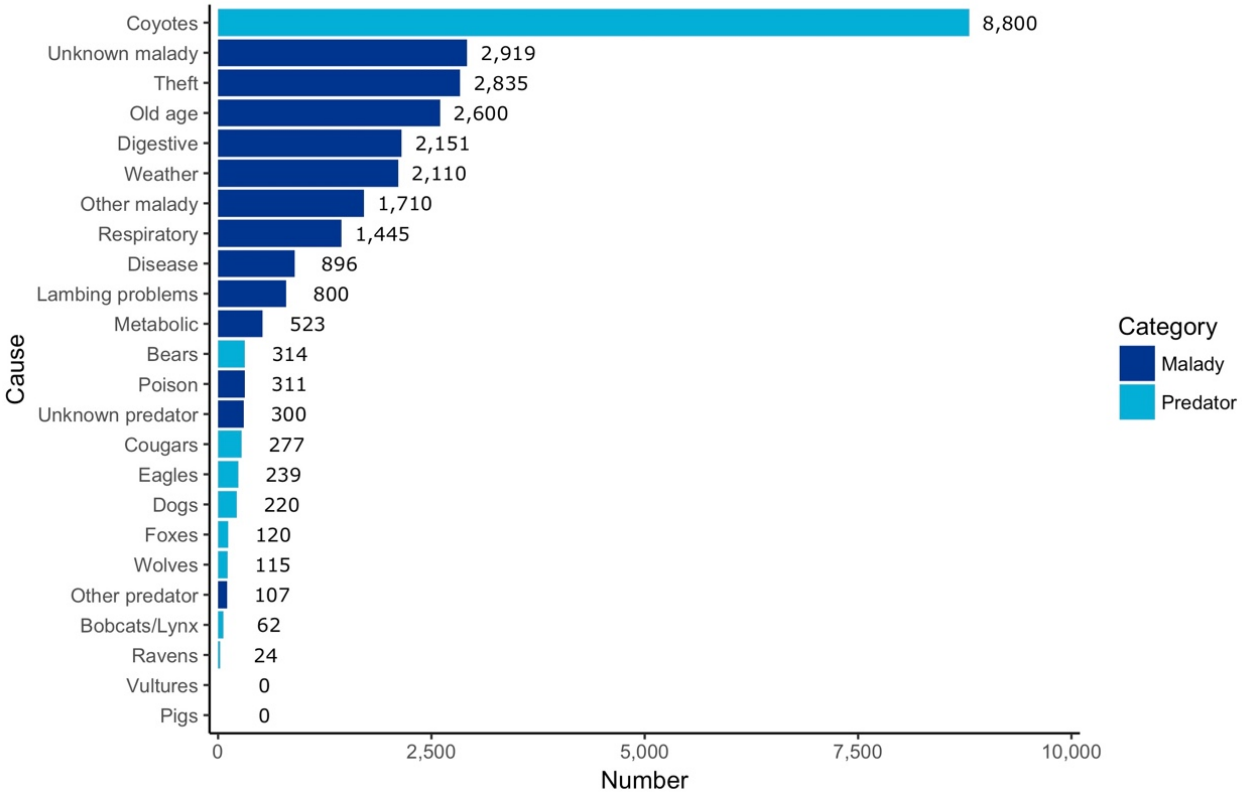


Fig. 18. Nebraska Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015

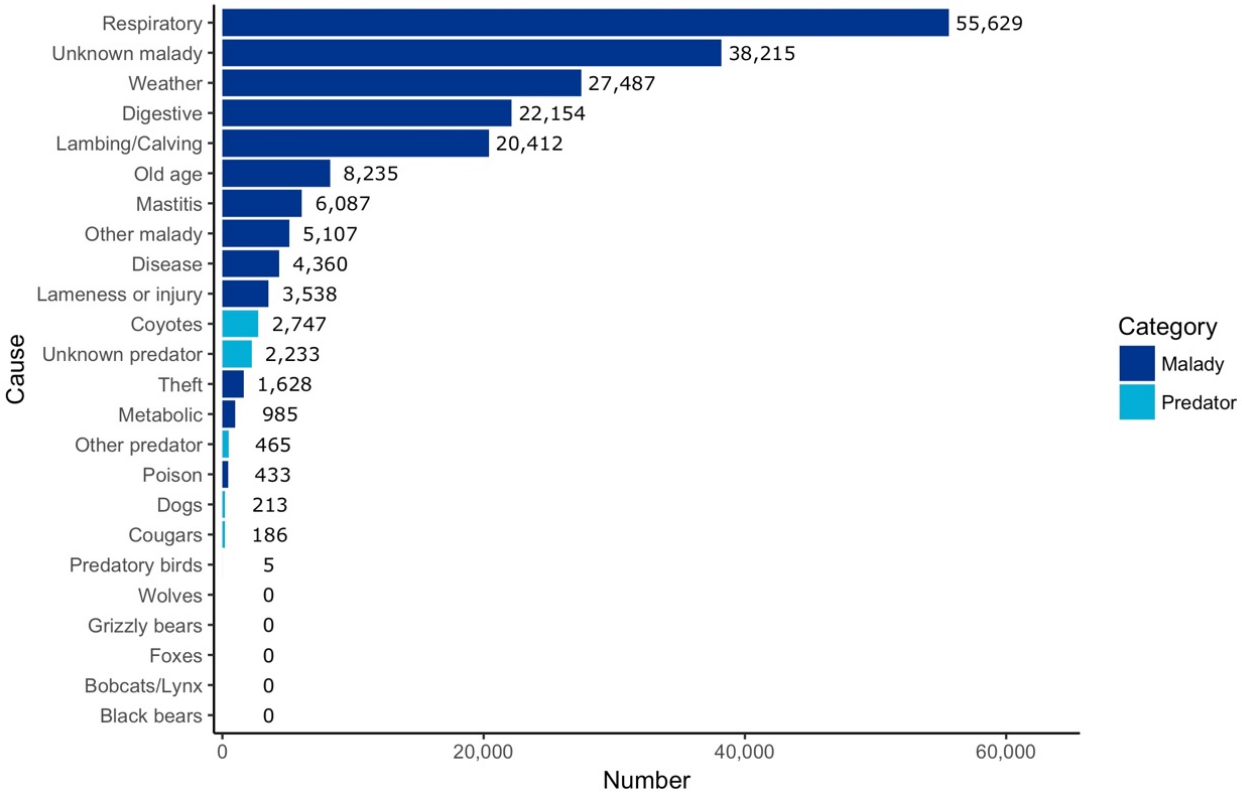


Fig. 19. Nebraska Sheep Mortality by Rank

Data from USDA-APHIS (2015), Data Year 2014

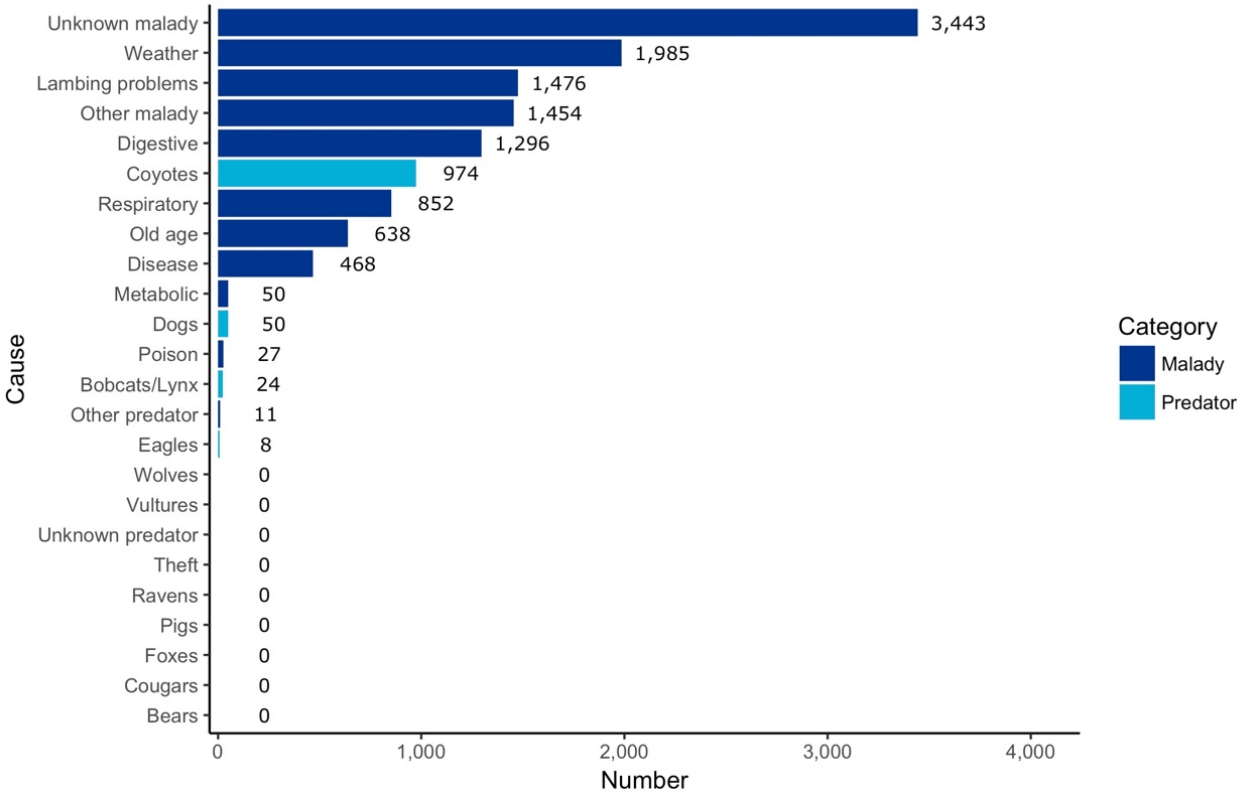


Fig. 20. Nevada Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015

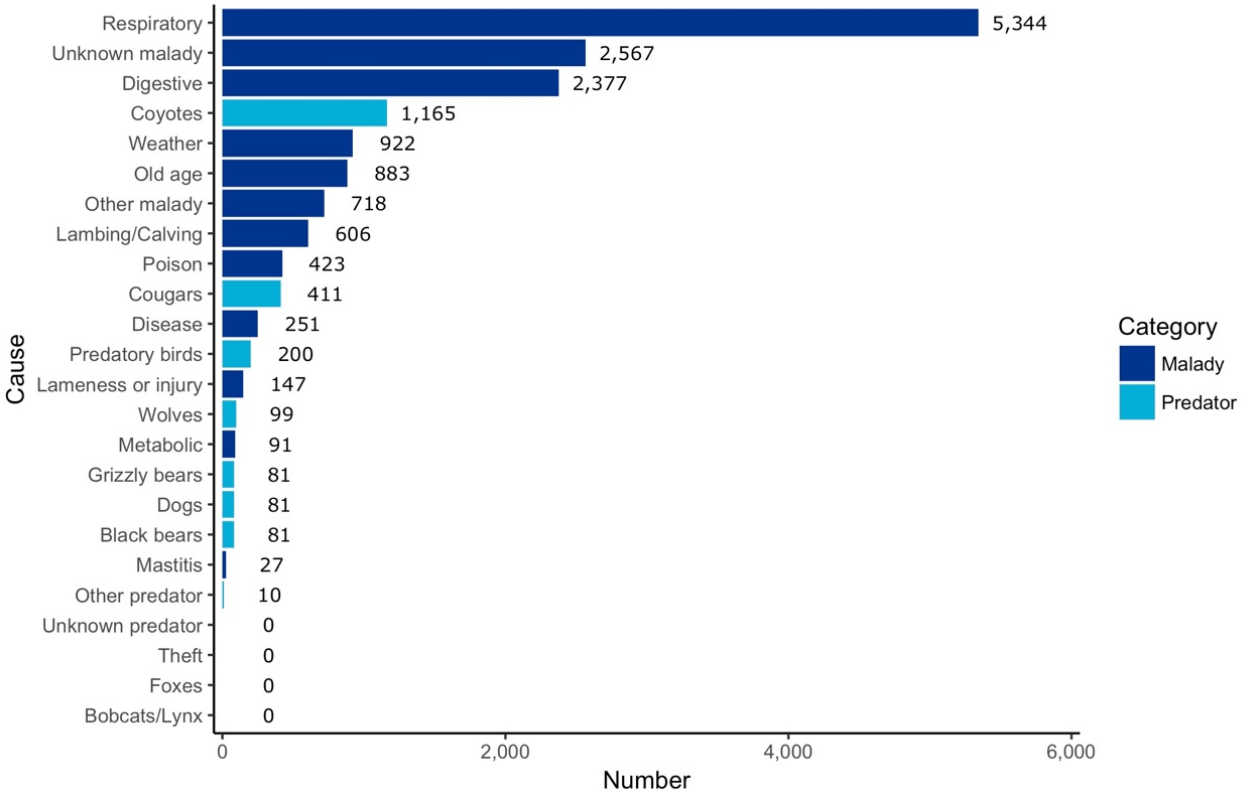


Fig. 21. Nevada Sheep Mortality by Rank

Data from USDA-APHIS (2015), Data Year 2014

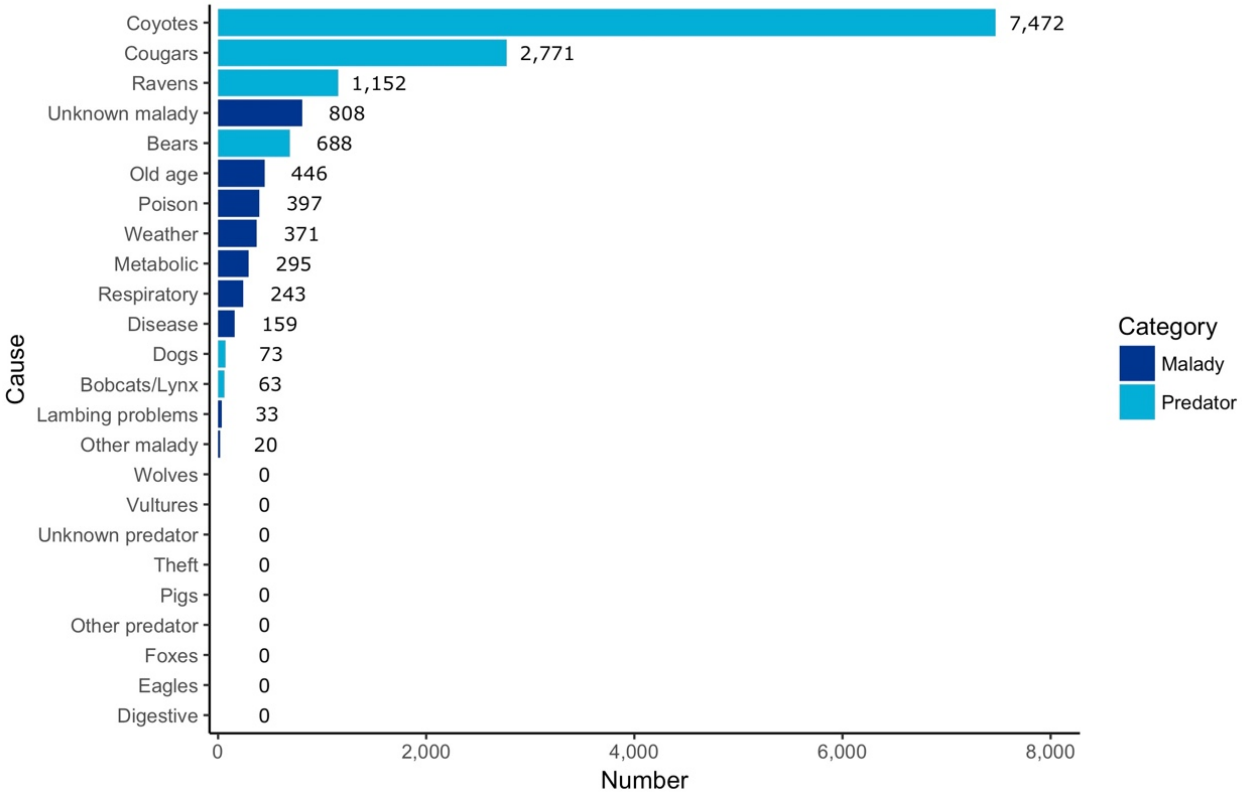


Fig. 22. New Mexico Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015

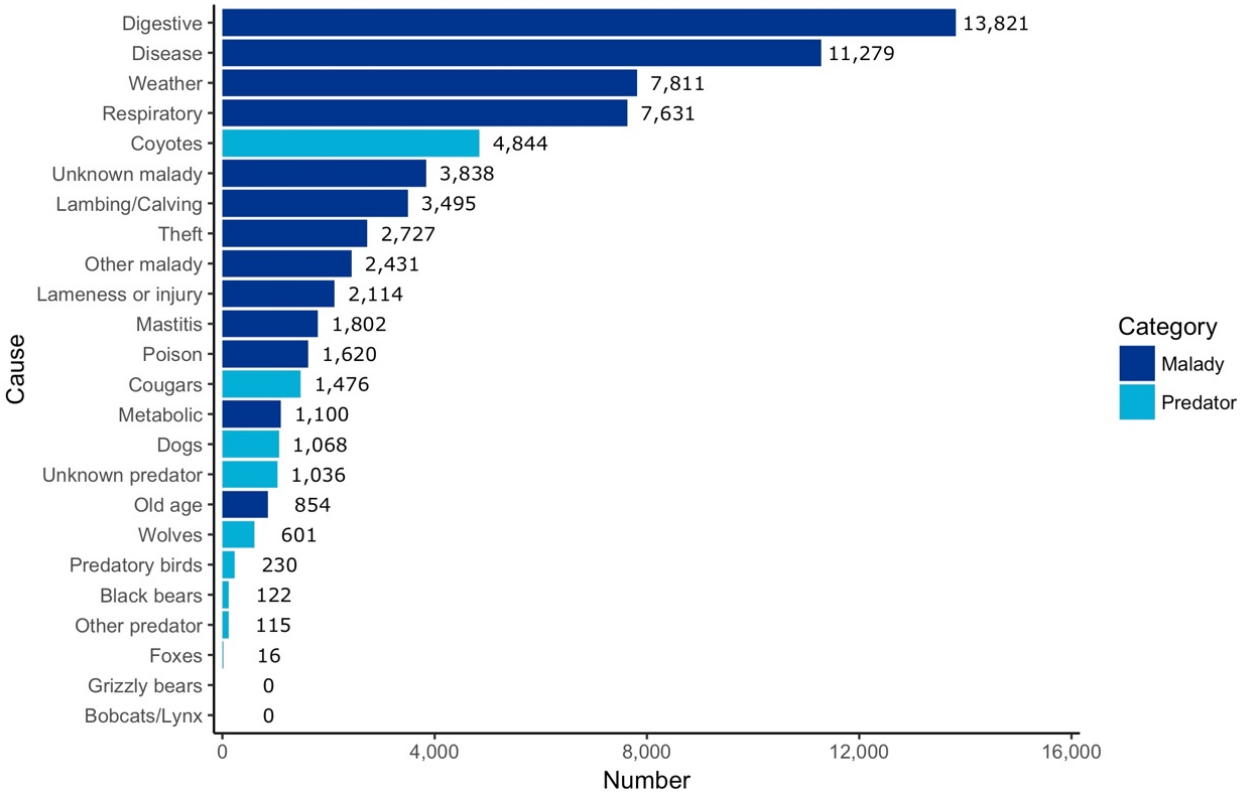


Fig. 23. New Mexico Sheep Mortality by Rank

Data from USDA-APHIS (2015), Data Year 2014

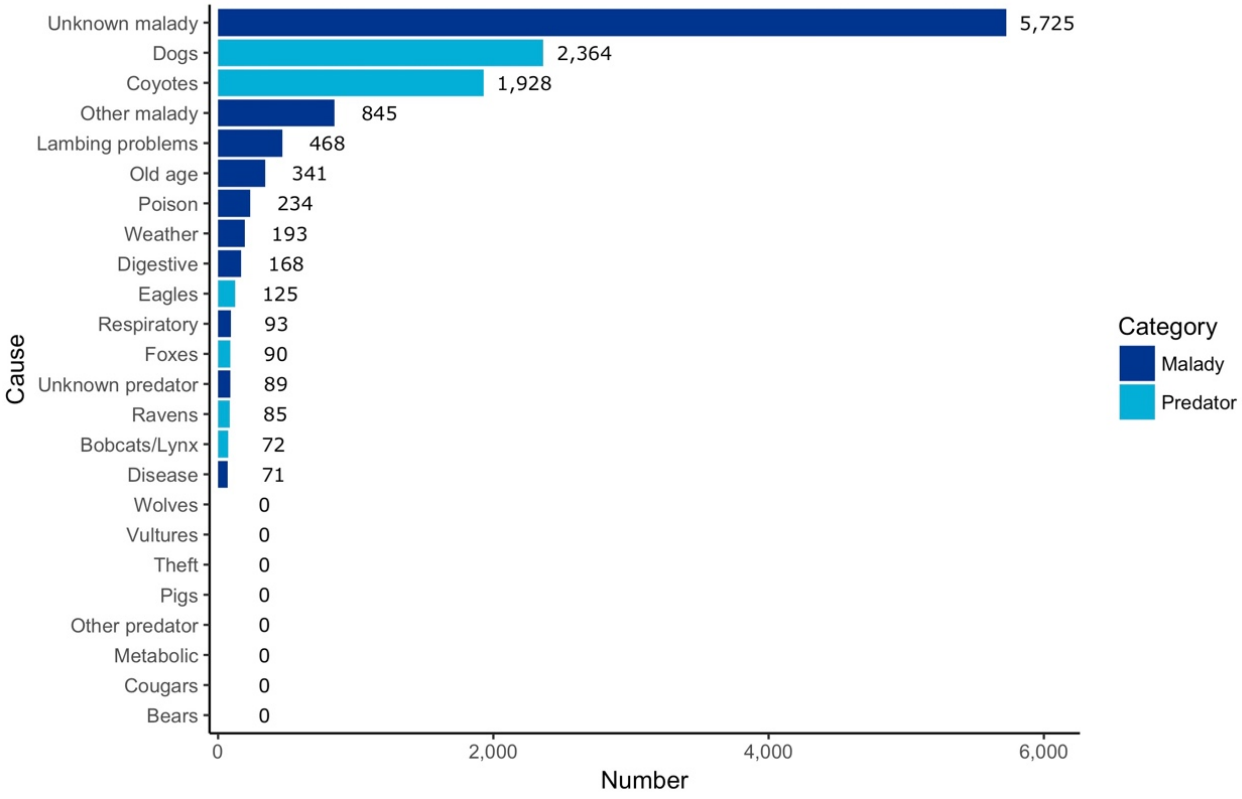


Fig. 24. North Dakota Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015

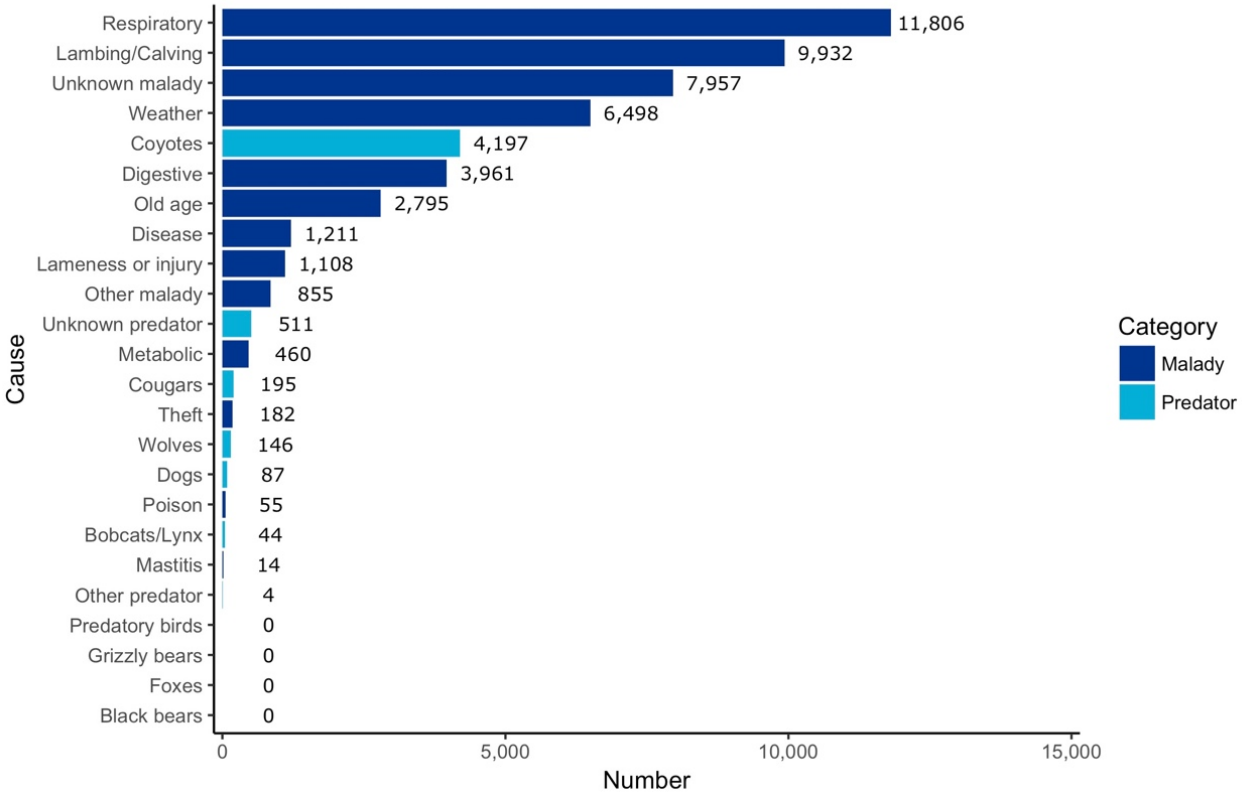


Fig. 25. North Dakota Sheep Mortality by Rank

Data from USDA-APHIS (2015), Data Year 2014

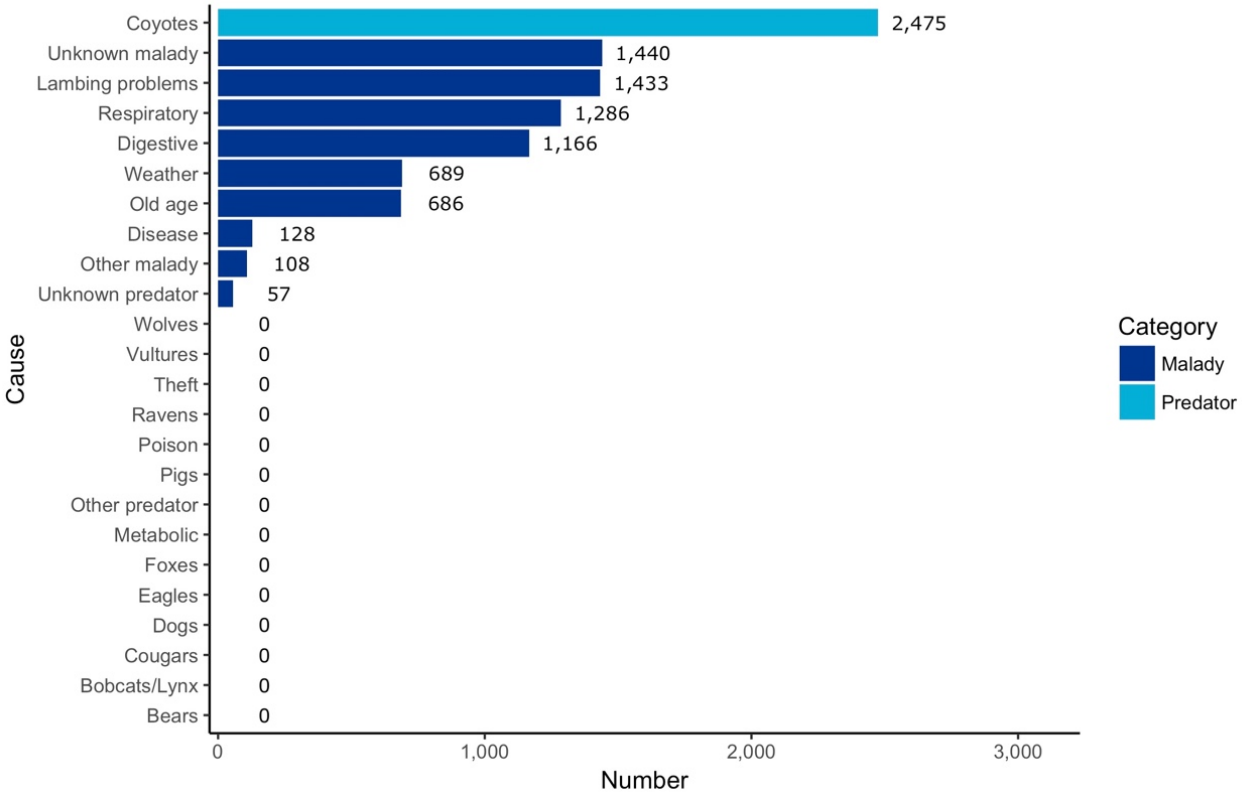


Fig. 26. Oregon Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015

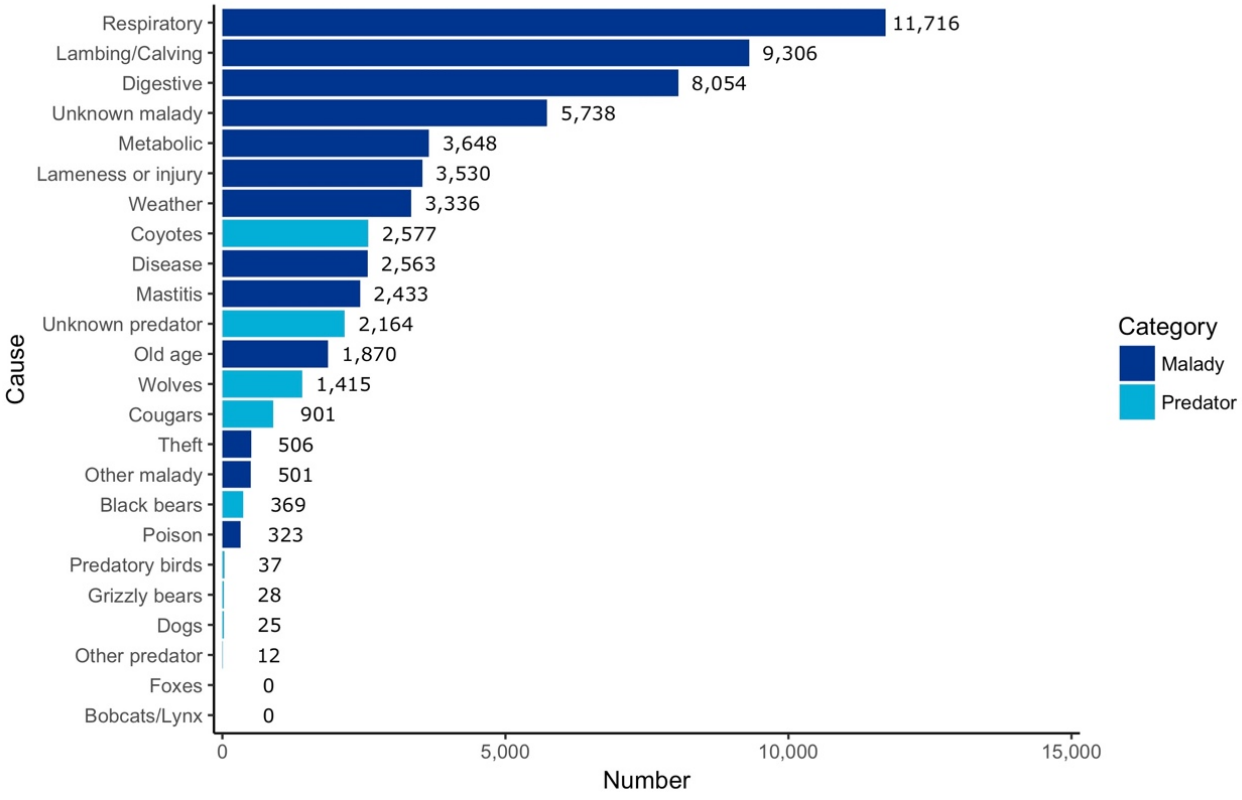


Fig. 27. Oregon Sheep Mortality by Rank

Data from USDA-APHIS (2015), Data Year 2014

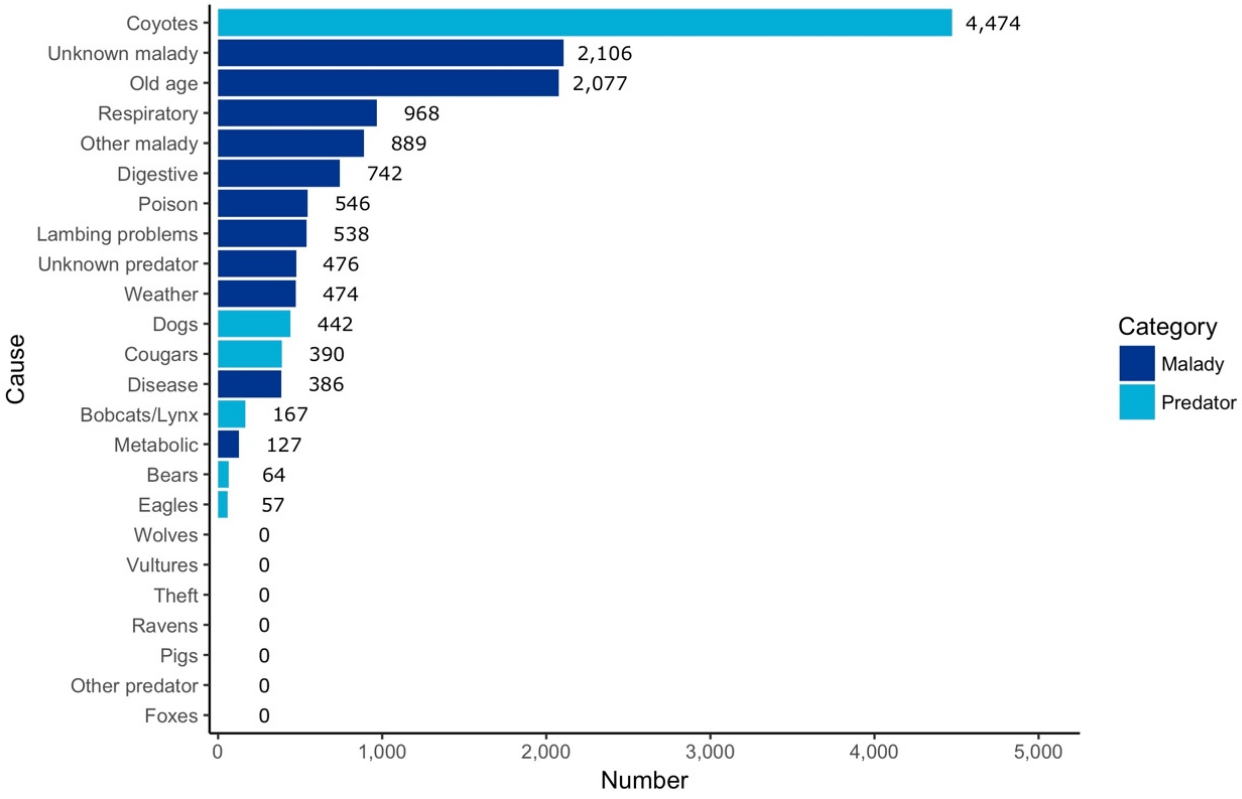


Fig. 28. South Dakota Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015

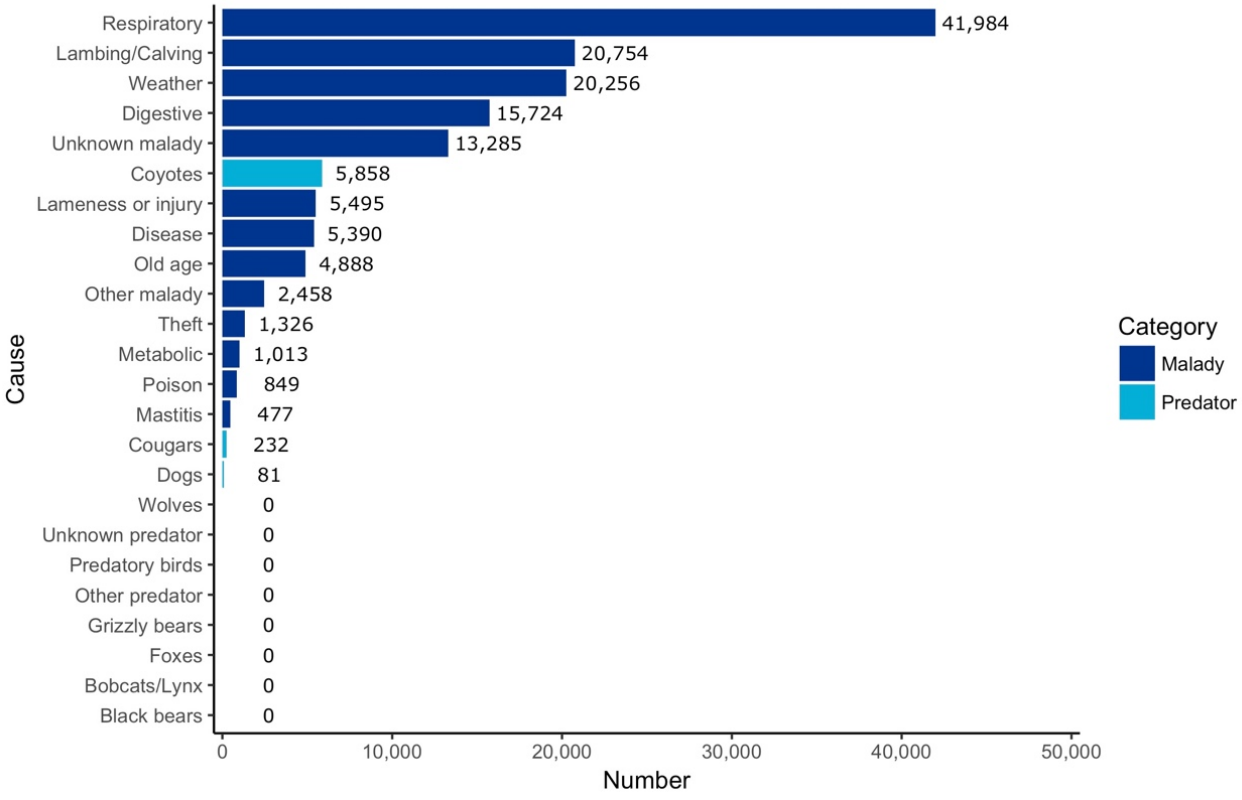


Fig. 29. South Dakota Sheep Mortality by Rank

Data from USDA-APHIS (2015), Data Year 2014

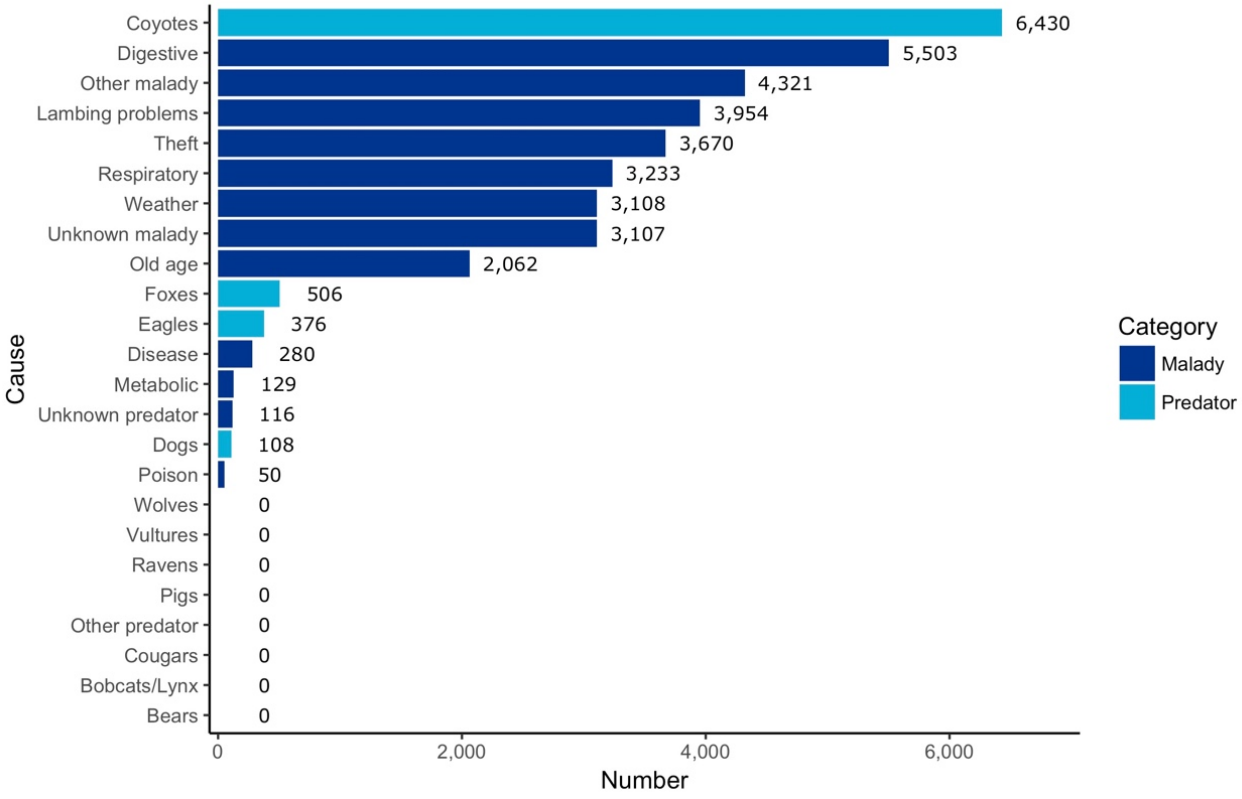


Fig. 30. Texas Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015

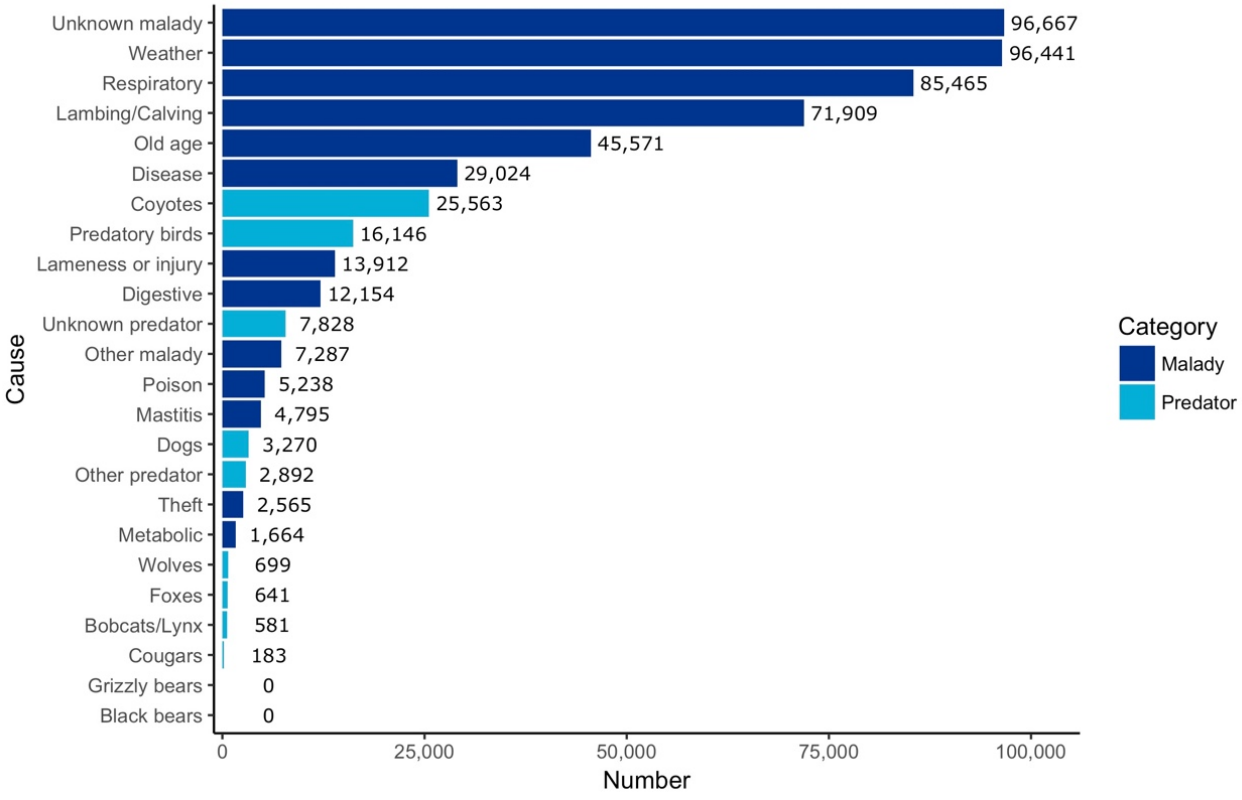


Fig. 31. Texas Sheep Mortality by Rank

Data from USDA-APHIS (2015), Data Year 2014

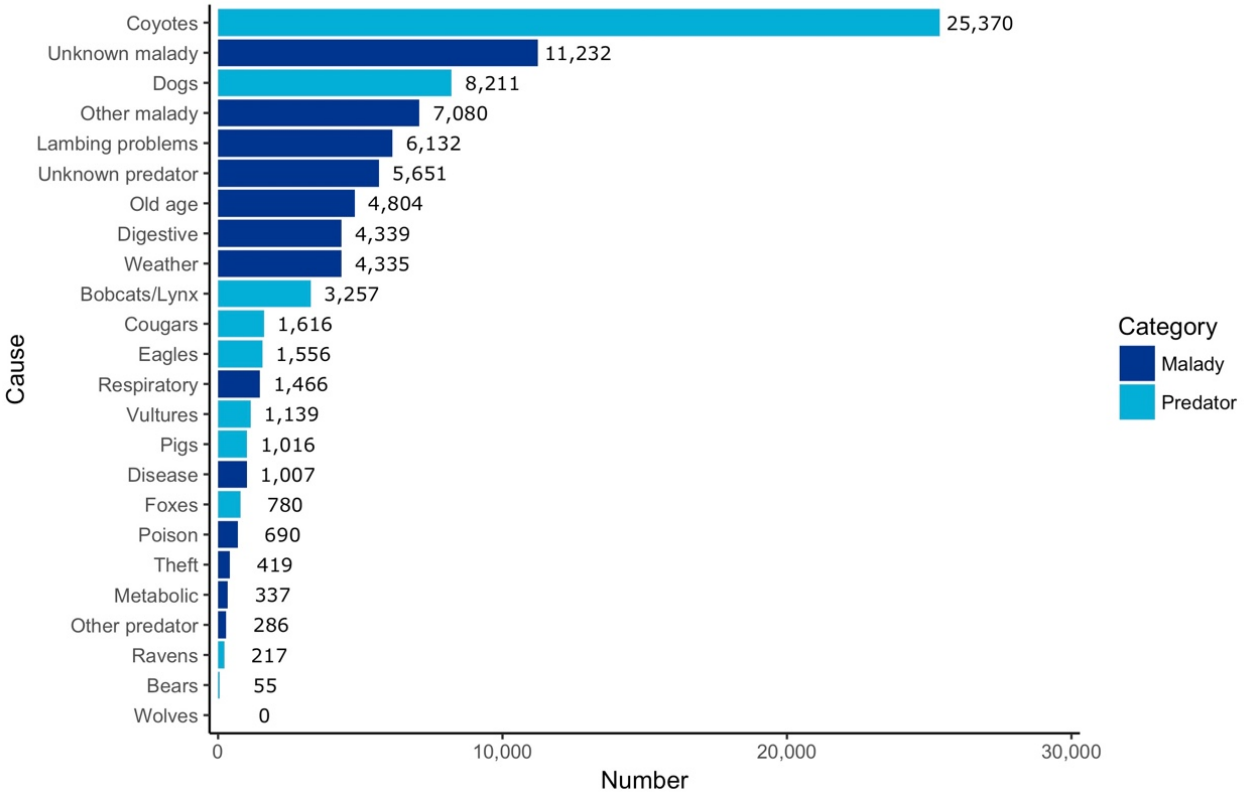


Fig. 32. Utah Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015

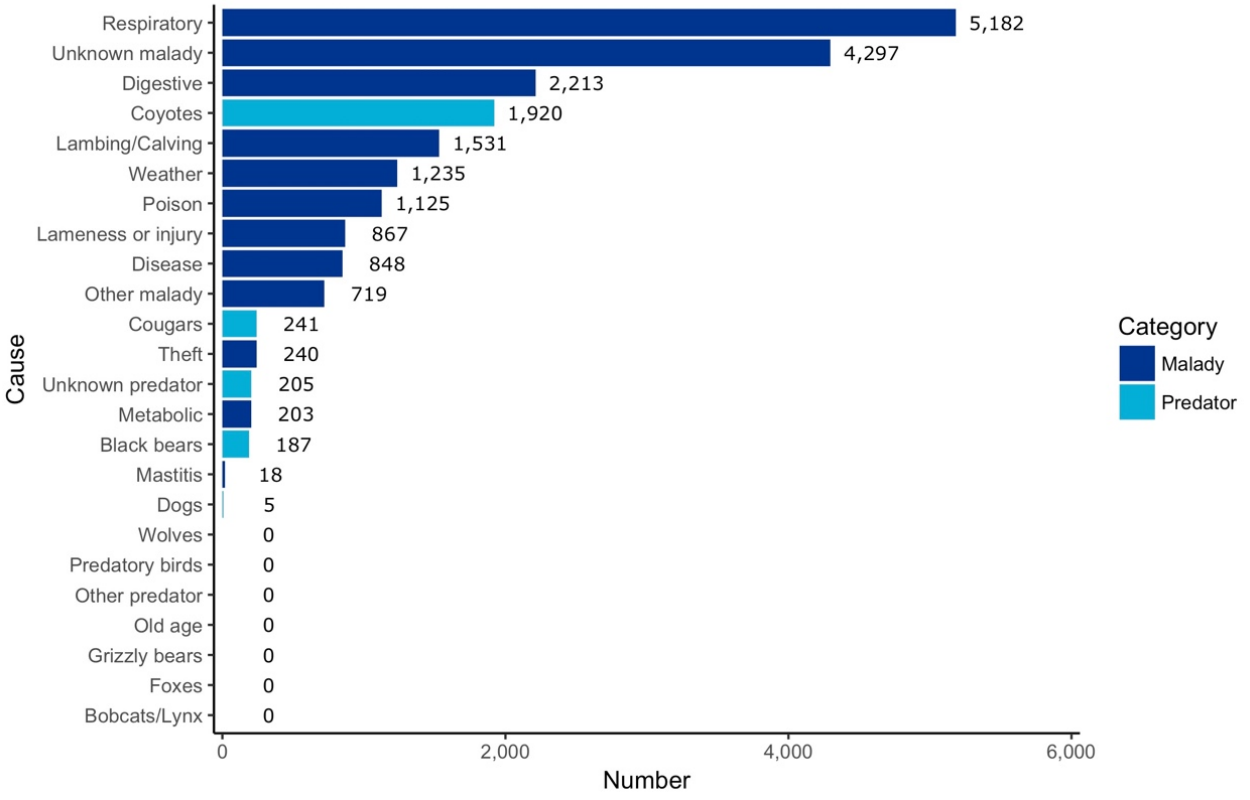


Fig. 33. Utah Sheep Mortality by Rank

Data from USDA-APHIS (2015), Data Year 2014

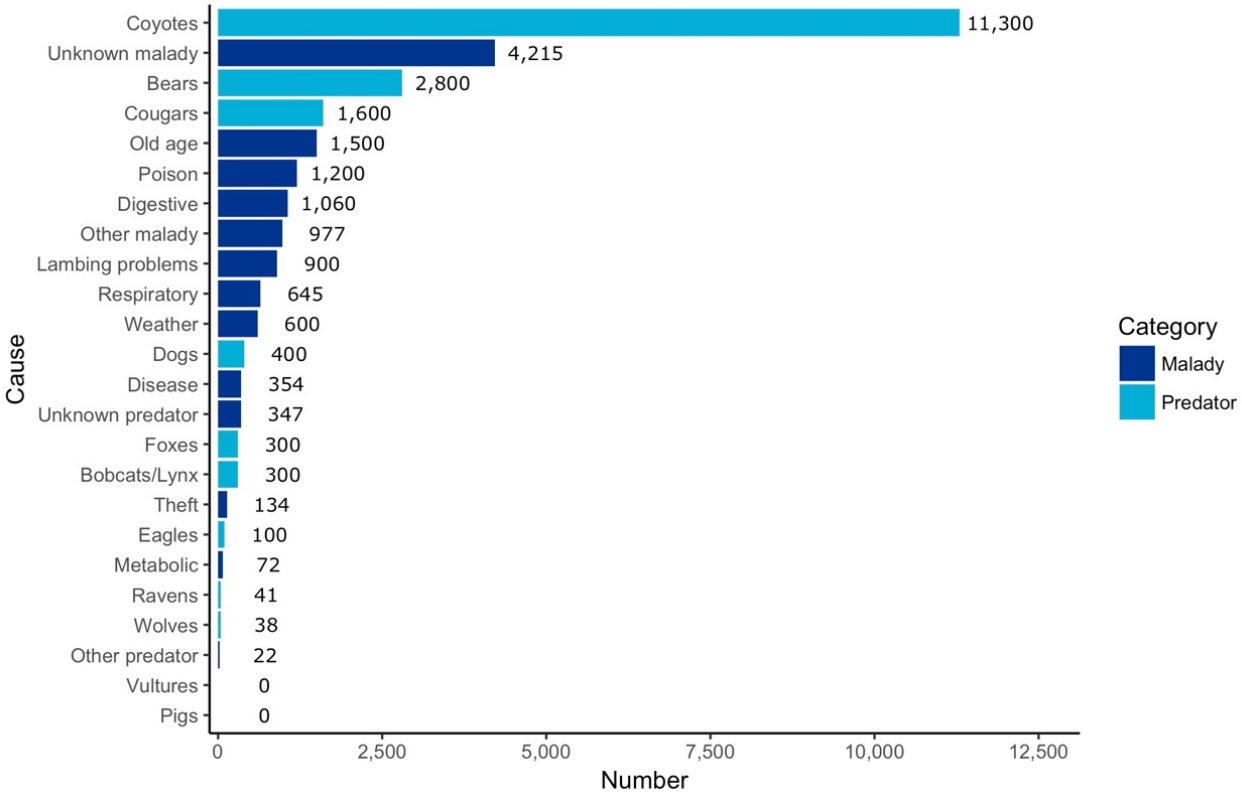


Fig. 34. Washington Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015

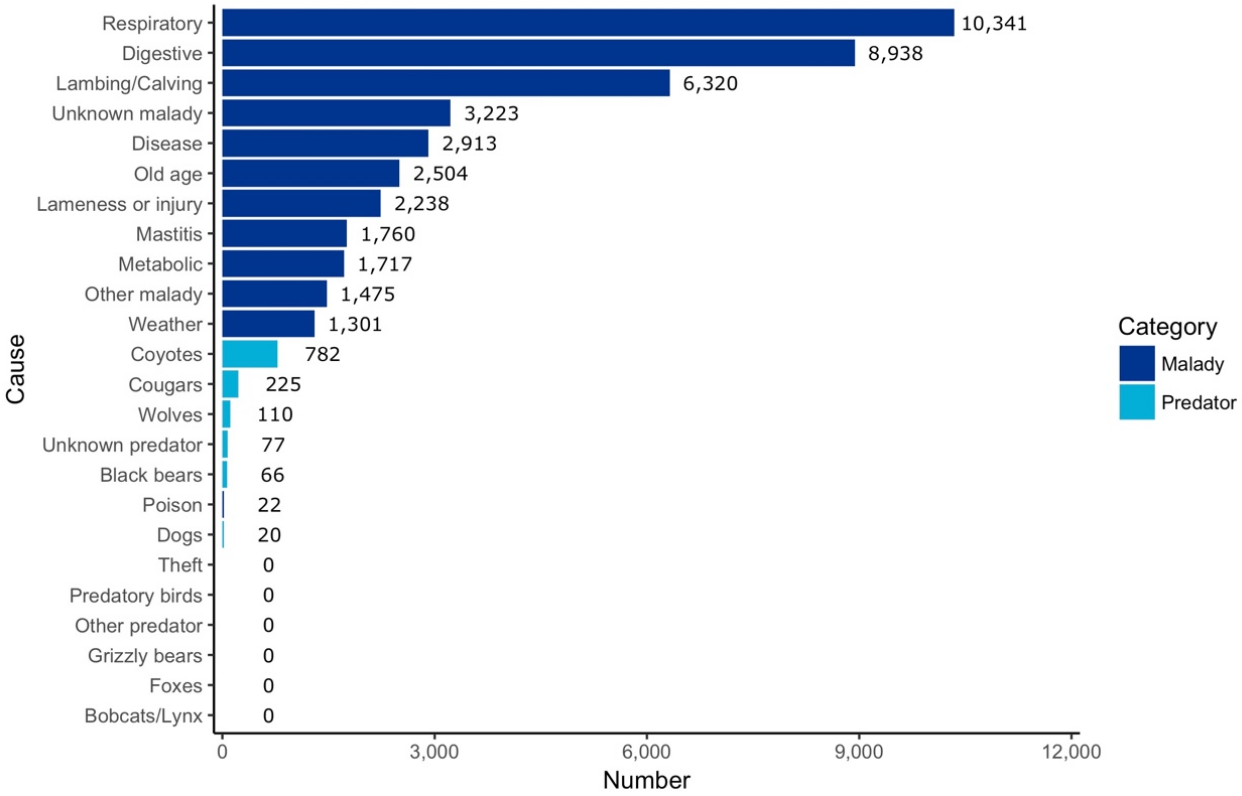


Fig. 35. Washington Sheep Mortality by Rank

Data from USDA-APHIS (2015), Data Year 2014

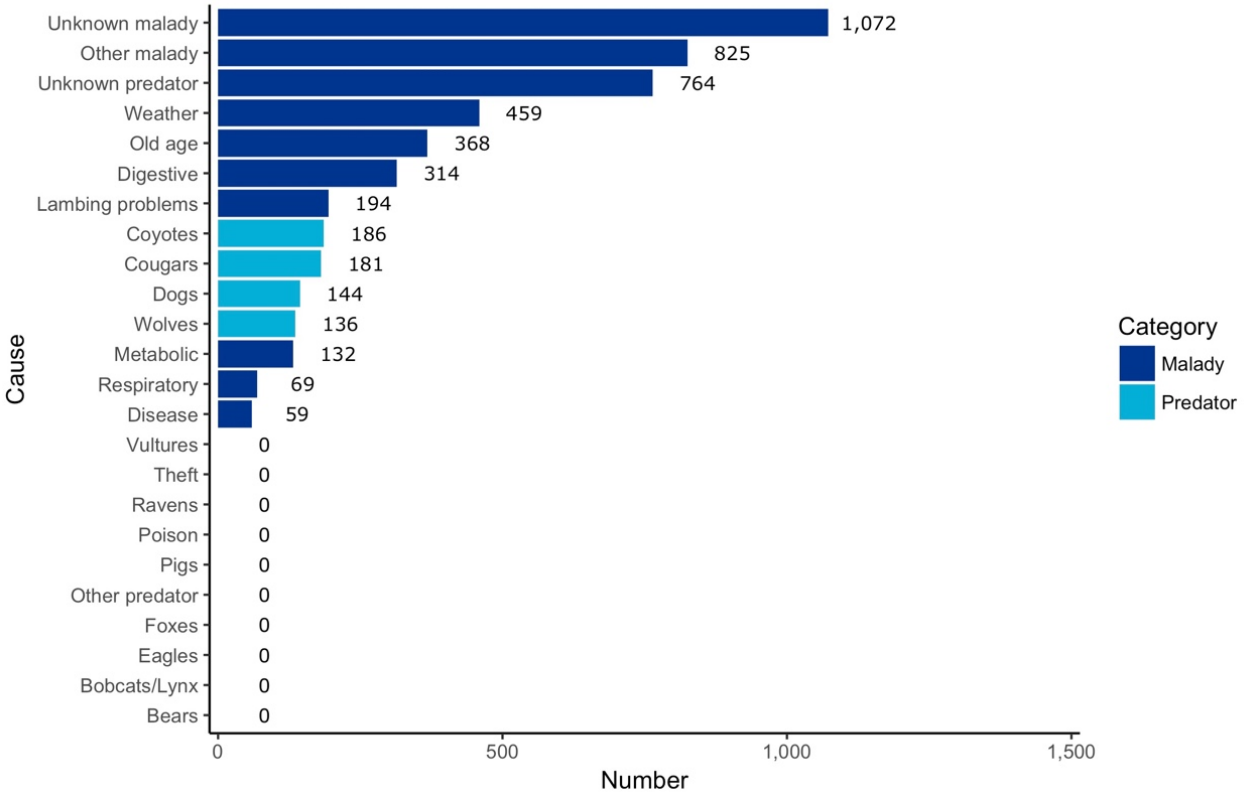
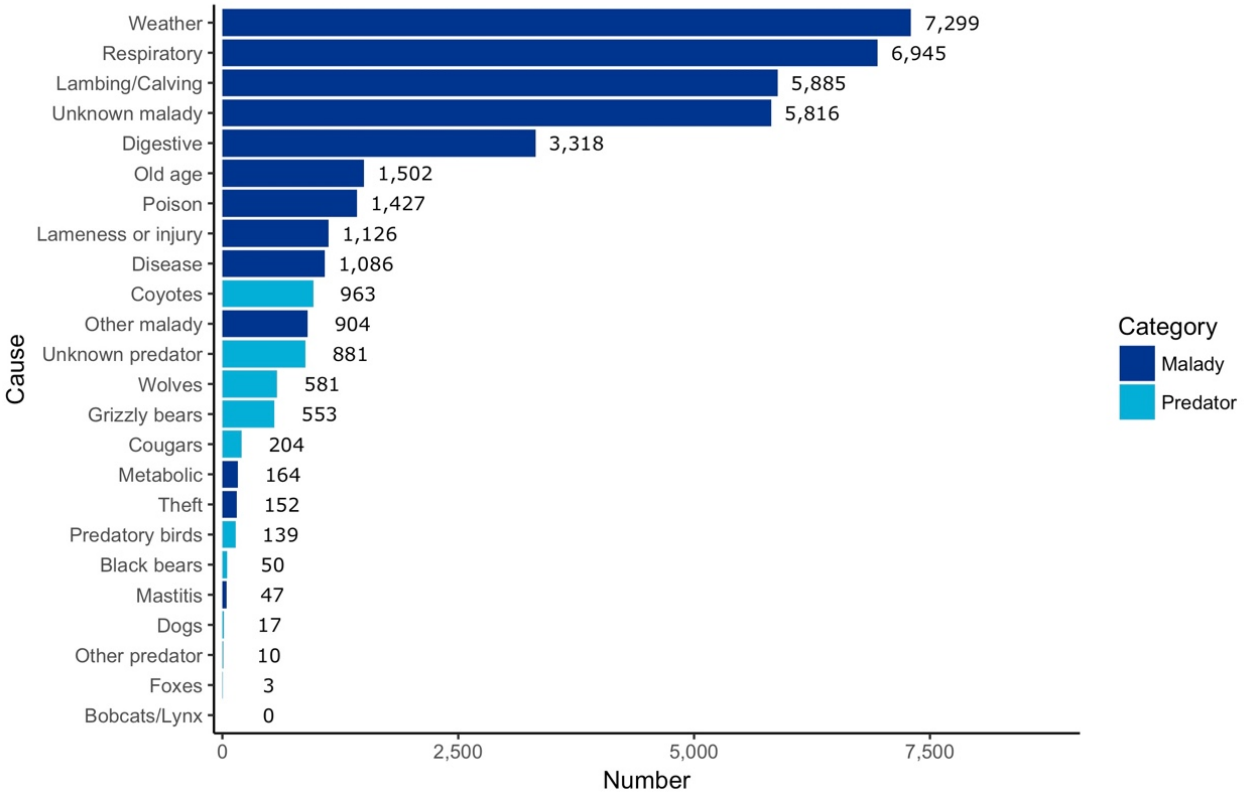
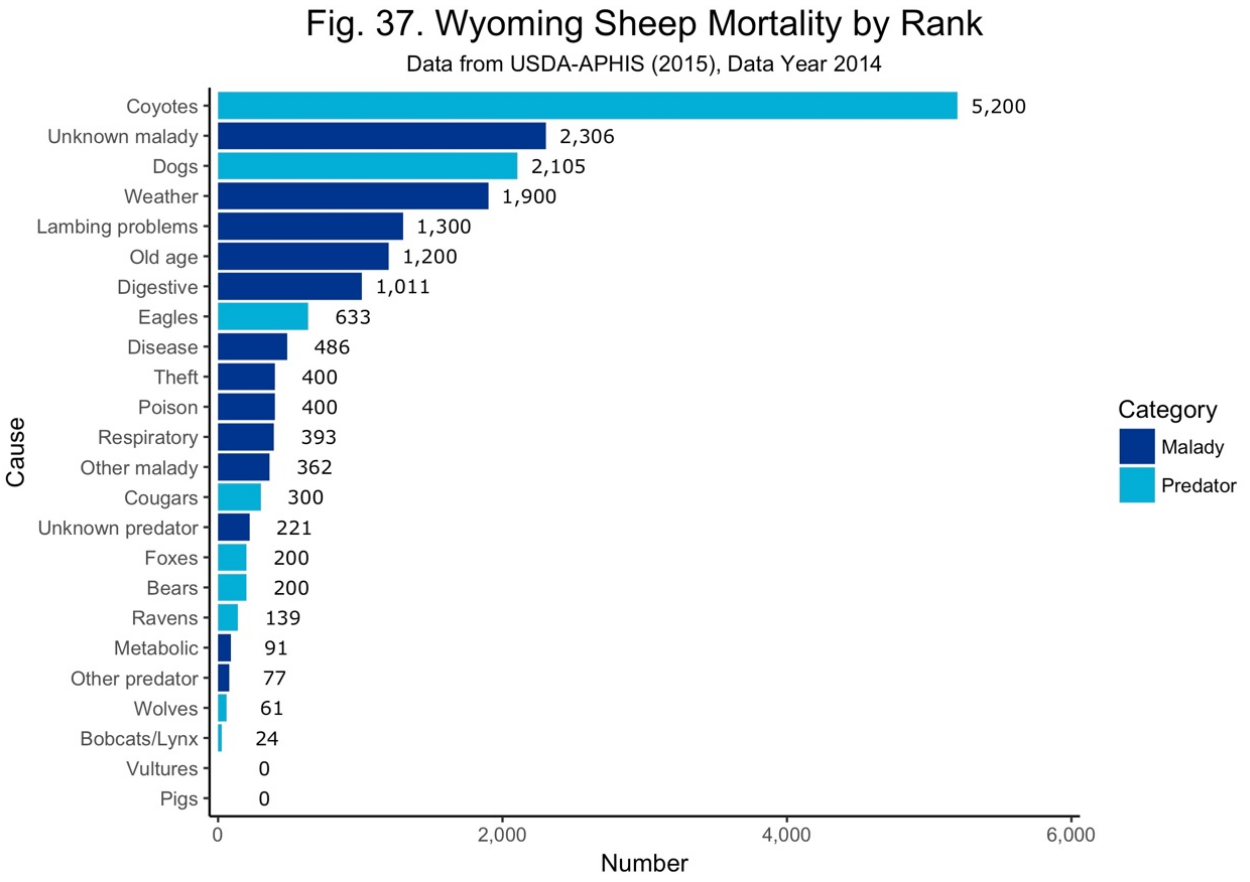


Fig. 36. Wyoming Cattle Mortality by Rank

Data from USDA-APHIS (2017), Data Year 2015





V. Data from three cougar-occupied states demonstrate that USDA livestock losses attributed to cougars is inflated

When other government agencies confirm data on livestock losses, the results show many fewer livestock losses than the USDA's unverified claims. Here, we compare the USDA's data to those from four state agencies.

- The Florida Fish and Wildlife Conservation Commission provides verified data for endangered Florida panthers. In 2015, the state agency's losses were 47 times smaller for cattle than the USDA's numbers: 10 (FFWC) vs. 475 (USDA).
- Ironically, the numbers reported by USDA-Wildlife Services to Montana Fish, Wildlife & Parks for data years 2006 to 2010 for cougars are even more astounding. On average, USDA-Wildlife Services reported cattle losses 48 times lower than USDA-APHIS (WS: 8 vs. APHIS: 384), and three times lower for sheep (WS: 90 vs. APHIS: 277). The Montana Board of Livestock reported no cattle losses from cougars in 2018 and 50 confirmed sheep losses that year.
- The Oregon Department of Fish and Wildlife (ODFW) reported for 2014, 184 complaints for *all* livestock losses to cougars.[10] In comparison, in 2014, the USDA reported 390 deaths just for sheep from cougars in Oregon. Fig. 27. In 2015, the ODFW reported 217 complaints for *all* livestock losses to cougars.[11] In comparison, in 2015, the USDA reported 901 deaths just to cattle from cougars in Oregon. See: Fig. 26 and 27.
- In Colorado in 2015, the Colorado Parks and Wildlife attributed 64 losses to *all* livestock from cougars, while the USDA found 208 losses just to cattle in 2015, a figure 69 percent higher.[12] See: Figs. 11 and 12.

While cattle and sheep mortalities attributed to cougars were nominal, the mortalities experienced by cougars from human causes were remarkable in comparison. In 2014 alone, more than 3,000 cougars were killed by trophy hunters in 13 states with regulated cougar hunting.[13]

VI. American values concerning predator control

According to a 2017 public attitudes study, lethal predator controls such as shooting animals from aircraft (aerial gunning), neck snares, gassing of pups in dens, leg-hold traps and poisons are unpopular with the American public.[14] Predator control is only acceptable to the public if it removes the particular individuals who prey on livestock, damage crops or cause economic losses.[15] Unfortunately, predator control rarely works that way. Predator control agents typically kill random animals instead of the individual animals responsible for livestock losses.

Another recent study indicates that when states or the federal government engage in predator-control activities to alleviate alleged or real livestock losses, then poaching activities increase.[16] This is because community members perceive that native carnivores have little value. Conversely, if no state-sponsored predator control is conducted, fewer people poach native carnivores, the opposite of what some surmise to be true.[17]

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VII. Predator control of cougars likely exacerbates livestock conflicts

Attacks on humans or livestock may actually be exacerbated by trophy hunting and predator control, because when adult cats are removed, subadult animals move into their vacancy at much higher densities and these animals are less skilled at hunting their natural prey.[18] This conclusion has been confirmed by several Washington-based studies that found human complaints (that is, sightings) increased in the year following heavy trophy hunting of cougars[19] and in a corroborating Canadian study.[20]

VIII. Non-lethal methods to protect cattle and sheep are more cost-effective, less cruel and more efficacious

Not only is the public's view of predator control generally negative, but a bevy of studies also contradict the claimed efficacy of lethal predator control programs. Numerous wildlife biologists have declared these programs biologically and fiscally expensive.[21] That is, removing native carnivores through predator control harms wildlife and their ecosystems.[22] Predator control is also expensive to taxpayers—Wildlife Services receives tax money from municipalities, counties, states and federal appropriations.[23] New studies also show that non-lethal measures are the best means for protecting cattle, sheep and other domestic animals. Such methods include sanitary carcass removal, fladry and or turbo fladry, synchronizing birthing seasons with native ungulates, changing livestock types or breeds, spot lights, airhorns, guard animals, range riders, electric fencing and Foxlights™.[24]

Despite the importance of these practices, the USDA's data indicate that less than 17 percent of cattle growers in cougar-occupied states, on average, used non-lethal methods to protect their herds. Fig. 38. On the other hand, 59 percent of sheep growers used fencing to protect their sheep. Only about one-third used sheds for lambing or penned their animals at night. Worse, only 12 percent picked up stillborn lambs or other dead sheep. Fig. 39.

Fig. 38 Percentage of cattle operators who used non-lethal methods (USDA 2017, data year 2015)		
State	Percent of operations with any cattle/calf deaths	Percent of operations that used some non-lethal method to protect cattle
Arizona	13.8%	10.4%
California	12.9%	21.1%
Colorado	10.6%	14.9%
Florida	12.7%	19.7%
Idaho	6.1%	10.1%
Montana	10.6%	14.5%
Nebraska	7.5%	8.7%
Nevada	12.1%	17.1%
New Mexico	15.9%	34.4%
North Dakota	17.9%	11.6%
Oregon	5.9%	23.4%
South Dakota	13.3%	11.2%
Texas	10.6%	19.3%
Utah	9.5%	9.7%
Washington	2.9%	19.9%
Wyoming	10.3%	14%

Fig. 39 Percentage of sheep operators using non-lethal methods (USDA 2015, data year 2014)													
State	Llamas	Donkeys	Fences	Lamb shed	Herding	Night penning	Fright tactics	Remove carrion	Culling	Change bedding	Frequent checks	Altered breeding season	Other
AZ	4.3%	0.0%	17.6%	27.4%	86.7%	72.2%	0.1%	10.6%	19.4%	22.1%	19.7%	7.6%	2.9%
CA	10.2%	8.4%	78.6%	31.9%	9.0%	38.9%	7.6%	12.6%	10.9%	10.9%	19.8%	4.6%	6.3%
CO	14.0%	4.5%	60.9%	43.7%	14.4%	47.2%	5.7%	12.5%	21.6%	9.5%	23.4%	3.6%	2.3%
ID	11.3%	22.3%	52.3%	28.4%	4.1%	25.1%	1.4%	8.0%	23.4%	3.7%	19.1%	1.6%	0.9%
MT	24.0%	9.3%	37.2%	49.0%	7.9%	48.0%	6.5%	24.5%	23.4%	12.2%	34.5%	0.6%	9.3%
NE	14.0%	5.8%	78.5%	17.3%	3.6%	10.1%	1.3%	13.5%	6.9%	10.0%	17.3%	5.1%	7.1%
NV	7.6%	10.6%	64.4%	15.9%	3.0%	11.9%	0.0%	3.4%	4.4%	6.0%	6.3%	0.0%	24.3%
NM	10.8%	22.5%	82.0%	41.7%	11.1%	20.7%	2.2%	30.3%	31.0%	29.8%	15.5%	3.0%	5.1%
ND	2.7%	22.3%	60.0%	27.1%	29.3%	58.7%	2.7%	13.4%	14.8%	9.8%	14.8%	0.0%	2.7%
OR	14.2%	2.9%	55.2%	41.4%	10.2%	42.2%	6.0%	12.9%	19.5%	6.1%	14.2%	7.5%	4.7%
SD	9.2%	15.6%	50.9%	17.5%	4.6%	10.3%	0.0%	12.3%	8.7%	7.3%	13.0%	1.2%	2.1%
TX	9.0%	48.6%	75.4%	78.2%	7.5%	12.1%	2.4%	10.7%	61.0%	54.5%	56.9%	48.9%	15.5%
UT	9.1%	20.9%	60.3%	15.4%	1.8%	22.2%	2.6%	3.7%	8.0%	5.3%	12.4%	0.7%	16.6%
WA	0.9%	22.3%	41.7%	23.5%	5.7%	21.1%	0.6%	3.3%	6.8%	0.8%	9.5%	0.0%	11.0%
WY	2.0%	20.1%	65.1%	26.5%	4.1%	19.7%	1.7%	6.2%	6.3%	6.6%	9.1%	1.7%	6.8%
Avg.	9.6%	15.7%	58.7%	32.3%	13.5%	30.7%	2.7%	11.9%	17.7%	13.0%	19.0%	5.7%	7.8%

Experts recommend several practices to protect cattle and sheep from cougars. These methods must be used in combinations with one another for best results. They include:

- Keep livestock, especially maternity pastures, away from areas where wild cats have access to ambush cover.[25]

- Keep livestock, especially the most vulnerable—young animals, mothers during birthing seasons and hobby-farm animals—behind barriers such as electric fencing and/or in barns or pens or kennels with a top.[26] The type of enclosure needs to be specific for the predator to prevent climbing, digging or jumping.[27]
- Move calves from pastures with chronic predation problems and replace them with older, less vulnerable animals.[28]
- Concentrate calving season (i.e., via artificial insemination) to synchronize births with wild ungulate birth periods.[29]
- In large landscapes, use human herders, range riders and/or guard animals.[30] Guard dogs work better when sheep and lambs are contained in a fenced enclosure rather than on open range lands where they can wander unrestrained.[31]
- Some of the low-cost sound and/or visual equipment that deters wild cats are suspended clothing, LED flashing lights (sold as Foxlights™), and radio alarm boxes set off to make sounds/noises near pastures.[32]

According to biologists, Treves et al. (2016), the published studies that laud the effectiveness of lethal-predator control are concentrated in three or four journals, and the scientific methods involved in these studies were insufficient.[33] A subsequent study by Eklund et al. (2017) located 27,781 articles concerning predator control and of that number, only 562 met authors' criteria for having some scientific merit.[34] And, of those 562 articles, only 21 used scientific methodologies the authors deemed excellent, a number so insufficient that it prevented authors from conducting a meta-analysis of the efficacy of predator control.[35]

Eklund et al. (2017) write that although the loss of livestock to predators has occurred for thousands of years—likely since livestock were first domesticated—the scientific study of successful interventions is rare, and unfortunately our understanding of the efficacy of predator control is "based on narrative review" rather than sound science.[36] In fact, Treves et al. (2016) strongly suggest that all lethal predator controls should be suspended until "gold standard" reviews of the efficacy of some predator-control methods are completed.[37] Eklund et al. (2017) similarly concluded that the science of predator control is vacuous. In yet a third review article concerning predator control, Lennox et al. (2018), also recommended against the expensive, broadscale killing of native carnivores and called upon us all to adapt to and co-exist with carnivores because of their ecological benefits—even in urban areas.[38]

IX. Conclusion

The Humane Society of the United States analyzed two data sets compiled by the USDA as part of its livestock reports. We make these data publicly decipherable, and more importantly unmask the fraction of losses that livestock operators experience from cougars, other native carnivores and domestic dogs. We found, using the USDA's data, that native carnivores and domestic dogs allegedly killed 0.4 percent of the 119 million cattle and sheep inventoried in the U.S. in 2014 and 2015. Furthermore, we found that states' data for cougars from regions across the U.S. indicate that the USDA's attributions of cattle and sheep deaths by cougars and other carnivores are highly exaggerated because of the agency's suspect methodology.

As this report shows, farmers, ranchers and wildlife managers should most fear maladies—especially respiratory and birthing problems—that kill nine times more cattle and sheep than all predators (wild mammalian and avian carnivores and domestic dogs) combined. In the face of this evidence, the anxiety of some in society against native carnivores is misplaced. While wildlife managers and cattle and sheep ranchers are quick to kill wolves, coyotes, bears, cougars and bobcats allegedly for livestock protection reasons, the data show that few livestock growers use non-lethal measures to protect their herds from predation. According to the USDA's own data, less than 17 percent of cattle growers in cougar-occupied states, on average, used some form of non-lethal method.

Wildlife biologists have found that predator-control programs to kill cougars and other native carnivores are unscientific, because most studies advocating predator control do not adhere to the scientific method, including the lack of study control areas for purposes of comparison. Three review articles, published in 2017 and 2018, reviewed

the corpus of predator-control studies. All concluded that the use of non-lethal methods to protect livestock was more efficacious than killing native carnivores. While some in society complain about cougars and other carnivores, the reality is, we humans are an unsustainable "super predator."[39] Because cougars live in a fraction of their historical range, it is time that we stop conducting lethal predator control and trophy hunting practices on them under the guise of livestock protection.

X. Methodology

Methods:
All data wrangling and analyses were conducted inR v. 3.5.0 (R Core Team, 2018). We used the R package tabulizer (Leeper, 2018) to extract tables from the 2017 USDA report ″Death Loss in U.S. Cattle and Calves Due to Predator and Nonpredator Causes, 2015″ (1) and the 2015 USDA report ″Sheep and Lamb Predator and Nonpredator Death Loss in the United States, 2015″ (2). Once extracted, data were combined, summarized, and plotted using R packages dplyr (Wickham et al. 2018), tidyr (Wickham & Henry, 2018), ggplot2 (Wickham, 2016) and extrafont (Chang, 2014).

Data used from each report:
(1) Specifically, from the 2017 USDA cattle report, we used data from the following tables: B.1. Number and percentage of cattle over 500 lbs. on Jan. 1, 2016, and calf crop (2015), by state, A.2.d. Number of cattle over 500 lbs. who died in 2015, by cause and by state, A.2.e. Number of calves who died in 2015, by cause and by State, A.2.h. Percentage of operations with any calf deaths due to nonpredator, predator and all causes, by state, A.2.j. Cattle death loss due to nonpredator, predator and all causes, as a percentage of inventory of cattle 500 lbs. or more on Jan. 1, 2016, by state, A.2.k. Calf death loss due to nonpredator, predator and all causes, as a percentage of calf crop (2015), by state,C.1.g. Percentage of cattle deaths due to nonpredator causes, by cause and by state, C.2.f. Percentage of calf death loss due to nonpredator causes, by cause and by state, D.1.a. For all operations, number and percentage of cattle death loss due to predators, by predator, D.1.c. Percentage of cattle death loss due to predators, by state and by predator, D.2.d. Percentage of calf death loss due to predators, by state and by predator.


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(2) From the 2015 sheep report, we used data from the following tables: B.1. Number of ewes, rams, market sheep and lamb crop, by state, A.2.a. Number of sheep and lambs that died, by state and by cause, A.2.d. Percentage of Jan. 1, 2015, adult-sheep inventory lost in 2014, as a percentage of adult-sheep inventory on Jan. 1, 2015, by cause and by state, B.8. Number of sheep and lambs who died due to enterotoxemia, internal parasites or other digestive problems in 2014, by state, B.9. Number of sheep and lambs who died due to respiratory problems, metabolic problems or other disease problems in 2014, by state, B.10. Number of sheep and lambs who died due to weather-related problems, starvation or lambing problems in 2014, by state, B.11. Number of sheep and lambs who died due to old age, being on back or poisoning in 2014, by state, B.12. Number of sheep and lambs who died due to theft, other nonpredator causes, were found dead or died from unknown nonpredator causes in 2014, by state, C.8. Number of sheep and lambs who died by bears, bobcats or lynx, coyotes or dogs, by state, C.9. Number of sheep and lambs who died by mountain lions (cougars/pumas), wolves or vultures, by state, C.10. Number of sheep and lambs who died by ravens, feral pigs, eagles, other known predator causes or other unknown predator causes, by state.

Endnotes:

[1] USDA-Animal and Plant Health Inspection Service, "Death Loss in U.S. Cattle and Calves Due to Predator and Nonpredator Causes, 2015," *https://www.aphis.usda.gov/animal_health/nahms/general/downloads/cattle_calves_deathloss_2015.pdf* (2017); USDA-Animal and Plant Health Inspection Service, "Sheep and Lamb Predator and Non-Predator Death Loss in the United States," *https://www.aphis.usda.gov/animal_health/nahms/sheep/downloads/sheepdeath/SheepDeathLoss2015.pdf* (2015).

[2] In their cattle report, the USDA explains its methodology as follows: "The numbers provided in this report are based on a sample of operations **and are thus estimates of the true numbers**. There is variability associated with each estimate, although the measures of variability (such as the standard error) are not always shown" (emphasis added). USDA-Animal and Plant Health Inspection Service, "Death Loss in U.S. Cattle and Calves Due to Predator and Nonpredator Causes, 2015," ii.
In their sheep report, the USDA explains its methodology here: "For 2015, death losses by cause were estimated to match NASS' total death losses published in "Sheep and Goats," released January 30, 2015. Estimates were generated with SUDAAN® software (Research Triangle Institute, version 11.0.1). Standard errors, where shown, account for the stratified study design....."The number of operations with sheep in 2014 (table A.2.a) was estimated using the number of operations in the sample, weighted by the expansion weight (the number of operations in the population that each sampled operation represents). Similarly, the total number of deaths are estimated by expanding the number of deaths in the sampled operations. For lamb losses, pre- and postdocking losses are captured separately for CO, MT, UT, and WY, while all other Western States count only postdocking losses. The lamb loss estimates in this report are estimated by expanding the postdocking losses for sampled operations in Western States and all losses for sampled operations in Eastern States." USDA-Animal and Plant Health Inspection Service, "Sheep and Lamb Predator and Non-Predator Death Loss in the United States."

[3] U.S. Department of Agriculture-Animal and Plant Health Inspection Service-Veterinary Services, "Death Loss in U.S. Cattle and Calves Due to Predator and Nonpredator Causes, 2015,"
https://www.aphis.usda.gov/animal_health/nahms/general/downloads/cattle_calves_deathloss_2015.pdf (2017); U.S. Department of Agriculture-Animal and Plant Health Inspection Service, "Sheep and Lamb Predator and Nonpredator Death Loss in the United States," *http://usda.mannlib.cornell.edu/usda/current/sgdl/sgdl-05-27-2010.pdf* (2015).

[4] USDA-Animal and Plant Health Inspection Service, "Death Loss in U.S. Cattle and Calves Due to Predator and Nonpredator Causes, 2015."

[5] USDA-Animal and Plant Health Inspection Service, "Sheep and Lamb Predator and Non-Predator Death Loss in the United States."

[6] F. F. Knowlton, E. M. Gese, and M. M. Jaeger, "Coyote Depredation Control: An Interface between Biology and Management," *Journal of Range Management* 52, no. 5 (Sep 1999), <Go to ISI>://000082837300001; Philip J. Baker et al., "Terrestrial Carnivores and Human Food Production: Impact and Management," *Mammal Review* 38 (2008); S. M. Wilson, E. H. Bradley, and G. A. Neudecker, "Learning to Live with Wolves: Community-Based Conservation in the Blackfoot Valley of Montana," *Human-Wildlife Interactions* 11, no. 3 (Win 2017), <Go to ISI>://WOS:000422844800010; Seth M. Wilson et al., "Natural Landscape Features, Human-Related Attractants, and Conflict Hotspots: A Spatial Analysis of Human–Grizzly Bear Conflicts," *Ursus* 16, no. 1 (2005/04/01 2005), accessed 2017/04/28, http://dx.doi.org/10.2192/1537-6176(2005)016[0117:NLFHAA]2.0.CO;2; Seth M. Wilson, Gregory A. Neudecker, and James J. Jonkel, "Human-Grizzly Bear Coexistence in the Blackfoot River Watershed, Montana: Getting Ahead of the Conflict Curve," in *Large Carnivore Conservation: Integrating Science and Policy in the North American West*, ed. S.G. Clark and M.B. Rutherford (2014).

[7] USDA-Animal and Plant Health Inspection Service, "Death Loss in U.S. Cattle and Calves Due to Predator and Nonpredator Causes, 2015."

[8] Barbara L. Peckarsky et al., "Revisiting the Classics: Considering Nonconsumptive Effects in Textbook Examples of Predator-Prey Reactions," *Ecological Society of America* 89, no. 9 (2008); I. A. Hatton et al., "The Predator-Prey Power Law: Biomass Scaling across Terrestrial and Aquatic Biomes," *Science* 349, no. 6252 (2015).

[9] George Edwards, *Montana Livestock Losses Board, Tables of Losses from 2015-2018* (email: 2018). Mr. Edwards notes that these claims are only the ones where ranchers came forward, Wildlife Services verified the claims and then the ranchers contacted the Montana Livestock Losses Board for reimbursement. As such, the claims may be underrepresented.

[10] Oregon Department of Fish and Wildlife, *Oregon Cougar Management Plan*, by Oregon Department of Fish and Wildlife (Salem, OR, 2017).Table 11.

[11] Ibid.

[12] Colorado Parks and Wildlife, "Fy15 Game Damage Annual Report: Prepared for the Colorado General Assembly Pursuant to C.R.S. 33-3-111,"
https://cpw.state.co.us/Documents/LandWater/PrivateLandPrograms/GameDamage/GameDamageYearlyReport.pdf (undated).

[13] The Humane Society of the United States, *State of the Mountain Lion: A Call to End Trophy Hunting of America's Lion* (Washington, DC: 2017), humanesociety.org/stateofthemountainlion.

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