

Jackson Hole Wildlife Foundation's

# Teton County Wildlife-Vehicle Collision Database Summary Report 2016/2017

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## Summary

### 2016-2017 Data Update

Wildlife-vehicle collisions (WVC) are most prevalent during the winter months (December – February), and generally highest during particularly severe winters. In past years, Jackson Hole Wildlife Foundation (JHWF) has produced an annual WVC synthesis report based on the calendar year. However, in order to more accurately capture the increase in WVCs during the winter months, we will now produce an annual report that covers the time period of May 1 – April 30 (e.g. May 1, 2016 – April 30, 2017 = 2016-2017). This will be a better representation of the seasonal trends associated with WVCs in Teton County, WY.

The JHWF WVC database incorporates WVC observations collected by multiple sources, including Wyoming Department of Transportation (WYDOT), Wyoming Game & Fish Department (WGFD), and JHWF Nature Mapping citizen scientists. There were 362 WVCs added to the database with the 2016-2017 update (Table 2). Data for the 2016-2017 update was acquired from the following data sources: Wyoming Department of Transportation - Carcass Data (n=147), Wyoming Department of Transportation – Crash Data (n=88), Wyoming Game & Fish Wildlife Observation System (n=46) and JHWF Nature Mapping Jackson Hole (n=81) for a total of 362 WVC observations. In total, the WVC database (1990-2017) contains 4,916 WVC records, representing 45 species. Mule deer, elk, and moose are the most prominent species involved in WVCs (Table 5).

### Methods

The JHWF WVC database is updated annually using an automated process. This process stores all wildlife-vehicle collisions in a SQL database where they can be accessed in ArcMap, via an SDE connection, and in Program R, via a remote database connection. The SQL database allows all raw data to be stored in one place. Then, with saved queries, the data are formatted and combined into one large database. This database is then run through an iterative loop in R that eliminates duplicates based on distance (<0.25mi) from other observations entered on the same day of the same species. Additional observations are easily added to the SQL database and queried to eliminate duplicates.

WYDOT maintains spatial datasets for all major travel routes in Wyoming. These spatial datasets use linear-referenced system (LRS) geometry that contain route and measure attributes. Before raw WVC data are queried in a SQL database, a field locating each observation to the nearest LRS WYDOT route is added and populated with a value using the “Locate Feature Along Route” tool in ArcMap. This value is used to when identifying duplicates. When duplicates are identified in the R script, optimal observations are selected based on the data source (Table 1).

**Table 1.** Ranking of the data sources included in the JHWF Wildlife-Vehicle Collision Database (observations with a lower source rank are selected over a higher source rank).

<b>Data Source</b>	<b>Source Rank</b>
JHWF_NATURE_MAPPING_2010_2012	1
JHWF_NATURE_MAPPING_2013	1
JHWF_NATURE_MAPPING_2014	1
JHWF_NATURE_MAPPING_2015	1
tbIJHWF_NATURE_MAPPING_2016_2017	1
JHWF_ROADKILLHOTLINE_2012	2
WGFD_WOS_2014	2
WGFD_WOS_2015	2
WGFD_WOS_2016_2017	2
WYDOT_TETON_CRASH_2013	3
WYDOT_TETON_CRASH_1994_2012	3
WYDOT_TETON_CRASH_2014	3
WYDOT_TETON_CRASH_2015	3
WYDOT_TETON_CRASH_2016_2017	3
WYDOT_TETON_CARCASS_2013	4
WYDOT_TETON_CARCASS_2006_2012	4
WYDOT_TETON_CARCASS_1999_2005	4
WYDOT_TETON_CARCASS_2014	4
WYDOT_TETON_CARCASS_2015	4
WYDOT_TETON_CARCASS_2016_2017	4
JHWF_1990_2002	5
JHWF_2003_2009	5
WGFD_WOS_1976_2012	6
WGFD_WOS_2013	6

## Results

### *Wildlife-vehicle collision trends over time*

An additional 362 WVC records were incorporated into the database for the period from May 1, 2016 – April 30, 2017. This brings the total number of recorded WVCs from 1990-2017 to 4,916 (Table 2). The number of WVCs in 2016-2017 was the second highest annual number, after 372 WVCs recorded for 2010-2011. The winters of both 2016-2017 and 2010-2011 were exceptionally severe in regards to snowpack, which likely influenced the number of ungulates (especially mule deer) that were concentrated in the valley in close proximity to roads. From May 1, 2016 – April 30, 2017, 267 mule deer, 48 elk, 18 moose, 4 white-tailed deer, and 4 bighorn sheep WVCs were recorded (Table 5). In

addition, 21 WVCs of other species were recorded, including black bear, coyote, porcupine, raccoon, red fox, and others (Table 5). For some species, the number of WVCs may be large enough to impact populations. For example, over the past 7 years, at least 1,328 mule deer have been killed by WVCs (Table 5). Over the same time period, 123 moose have been killed by WVCs (Table 5). In the case of moose, the Jackson Moose Herd is estimated to number approximately 400 individuals (Alyson Courtemanch, Wyoming Game & Fish Department, *pers. comm.*). Wildlife-vehicle collisions are contributing a relatively high source of mortality for both of these ungulate species in Teton County.

Three-year averages of WVCs from 1990-2017 indicate an increasing trend over time (Figure 1), even though the total number of WVCs can fluctuate from year to year depending on weather conditions and other factors (Figure 2). Most WVCs occur during the winter months from December – March when ungulates are concentrated on low elevation winter ranges close to roads, however, there is also an interesting uptick in WVCs during June and July (Figure 3). The reason for this increase during the summer months is currently unknown, but it is something that JHWF would like to investigate further.

Wildlife-vehicle collisions have increased during the past 5 years on South Highway 89 (Figure 4). Most of these WVCs are mule deer, although elk WVCs have been increasing on this highway as well. The number of WVCs has also steadily increased on Highway 22 (including Teton Pass) from 2009-2017 (Figure 3). Wildlife-vehicle collisions on Broadway/Highway 89 north of town to the GTNP boundary and on Highway 390 have stayed relatively flat from 2009-2017 (Figure 4).

The number of mule deer WVCs was very high in winters 2010-2011 and 2016-2017, and mostly occurred on US Highway 89, and to a relatively lesser extent on Highway 22 (Figure 5). This is likely due to severe winter conditions concentrating mule deer close to roads and subdivisions on their crucial winter ranges. Also, mule deer WVCs were relatively high during other years when winter conditions were milder, indicating other factors driving an overall increase in WVCs besides winter conditions (Figure 5). Moose WVCs have decreased from 2010-2017 on Highway 390, from a high of 12 moose killed in 2010-2011 to 2 moose killed in 2016-2017 (Figure 6). Moose WVCs on Highway 22 (including Teton Pass) have fluctuated quite a bit, but have been from 5 to 8 moose in the last 4 years (Figure 6). Elk WVCs showed a generally decreasing trend from 2010-2015, but have increased over the past 2 years (Figure 7).

### *Hotspot Maps*

Hotspots were identified using the Kernel Density tool in ArcMap 10.3.1 (Figures 8, 9, 10, 11). The colors represent the probability density of WVCs occurring based on the search radius. Two raster layers were created for each analysis (All species, Moose, Deer, Elk). The coarse resolution layer, which appears smoother by generalizing hotspots, identifies searches for WVCs within 300 m of each 50 m pixel (Figures 8-11). The finer resolution layer identifies WVCs with 100 m of each 50 m pixel resulting in a more accurate hotspot depiction.

### **Limitations and Caveats of the Data**

- No records included within GTNP at park's request. The park maintains its own WVC database.
- Mix of data collected in different ways with different accuracies depending on the source.

- Large effort to remove potential duplicates among different sources.
- Date/time usually does not record actual time of death, but rather when the dead animal was observed (often a day or two later).
- Heavily biased by ungulates, especially mule deer. These are the animals that WYDOT picks up and that cause crashes large enough to call police. Also easier to observe by citizen scientists.
- This database is likely a significant underestimate of road kill occurrences in Teton County, even for ungulates. Many road kill events go unreported or animals are hit and die out of sight from roads.
- Probably biased by larger roads (more observers).
- Biased by year; WYDOT has been collecting data since 1990, but other groups started later. WYDOT has also improved their documentation in recent years.
- Road kill numbers are influenced by winter conditions, with high numbers occurring during more severe winters when ungulates are concentrated close to roads.

### **Suggested Citation**

Jackson Hole Wildlife Foundation, Jackson, WY, Wildlife-Vehicle Collision Database, 10/16/2017

### **Acknowledgements**

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**Table 2.** Wildlife-vehicle collisions by year (1990-2017).

<b>Year</b>	<b>Count</b>
1990	29
1990-1991	68
1991-1992	107
1992-1993	77
1993-1994	61
1994-1995	123
1995-1996	65
1996-1997	238
1997-1998	102
1998-1999	131
1999-2000	156
2000-2001	170
2001-2002	168
2002-2003	132
2003-2004	254
2004-2005	146
2005-2006	271
2006-2007	196
2007-2008	220
2008-2009	178
2009-2010	137
2010-2011	372
2011-2012	207
2012-2013	170
2013-2014	213
2014-2015	277
2015-2016	286
2016-2017	362
<b>Total</b>	<b>4916</b>

**Table 3.** Wildlife-vehicle collisions by month.

<b>Month</b>	<b>2016-2017</b>	<b>All Years (1990-2017)</b>
January	47	707
February	32	467
March	32	429
April	24	360
May	21	301
June	40	381
July	32	335
August	23	254
September	23	248
October	25	359
November	22	391
December	41	684
<b>Total</b>	<b>362</b>	<b>4916</b>

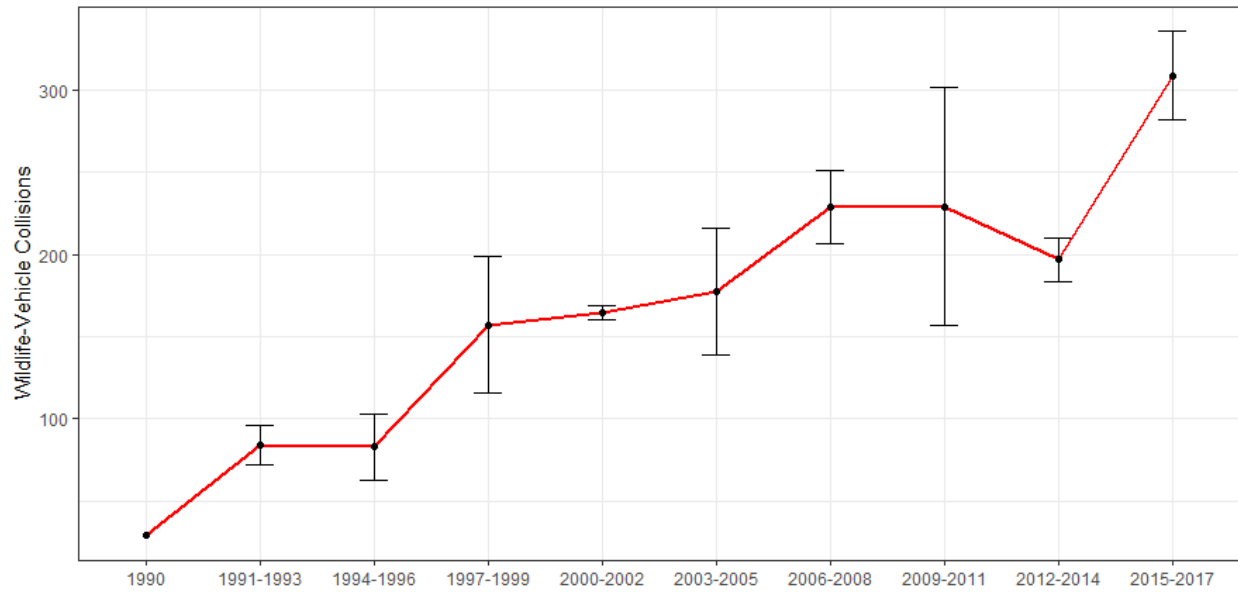
**Table 4.** Wildlife-vehicle collisions for all years by road name (2010-2017).

Road Name	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	Total
BATCH PLANT RD		2		1				3
BOYLES HILL RD	1							1
BUFFALO VALLEY RD						1	2	3
CASHE ST	1							1
DELONEY AVE	1							1
E BROADWAY AVE				1				1
FALL CREEK RD	3	1	2	2	2	1	5	16
FISH CREEK RD	12				1	6		19
GAME CREEK RD						1	1	2
HENRY'S RD		2		1		1		4
HIDDEN RANCH LN	1							1
HIGH SCHOOL RD							1	1
JACKSON AVE					1			1
KELLY AVE					1			1
MALLARD RD	1							1
NATIONAL ELK REFUGE	1						1	2
PARK LOOP RD	6						2	8
PARK RANCH RD SO FORK				1				1
REDMOND ST					1			1
SKI HILL RD			1		2	1		4
SNOW KING AVE		1					1	2
SOUTH PARK LOOP			1		1			2
SPRING GULCH RD	1	1		3	6	2	2	15
UPPER CACHE CREEK DR					1			1
US 189		1						1
US 189/US 191: Hoback Jct SE to county line	28	18	14	16	18	18	27	139
US 189/US 191/US 26/US 89: Hoback Jct to Jackson Y	139	58	38	57	94	94	149	629
US 191/US 26/US 89: Jackson Y to GTNP	55	39	31	27	37	31	33	253
US 26/US 287: GTNP NE boundary E to county line	10	5	7	1	15	17	10	65
US 26/US 89: Hoback Jct SW to county line	40	22	21	34	34	38	42	231
VIRGINIAN LN		1						1
WY 22	54	36	41	48	51	65	70	365
WY 390	18	20	14	21	12	10	16	111
<b>Total</b>	<b>372</b>	<b>207</b>	<b>170</b>	<b>213</b>	<b>277</b>	<b>286</b>	<b>362</b>	<b>1887</b>

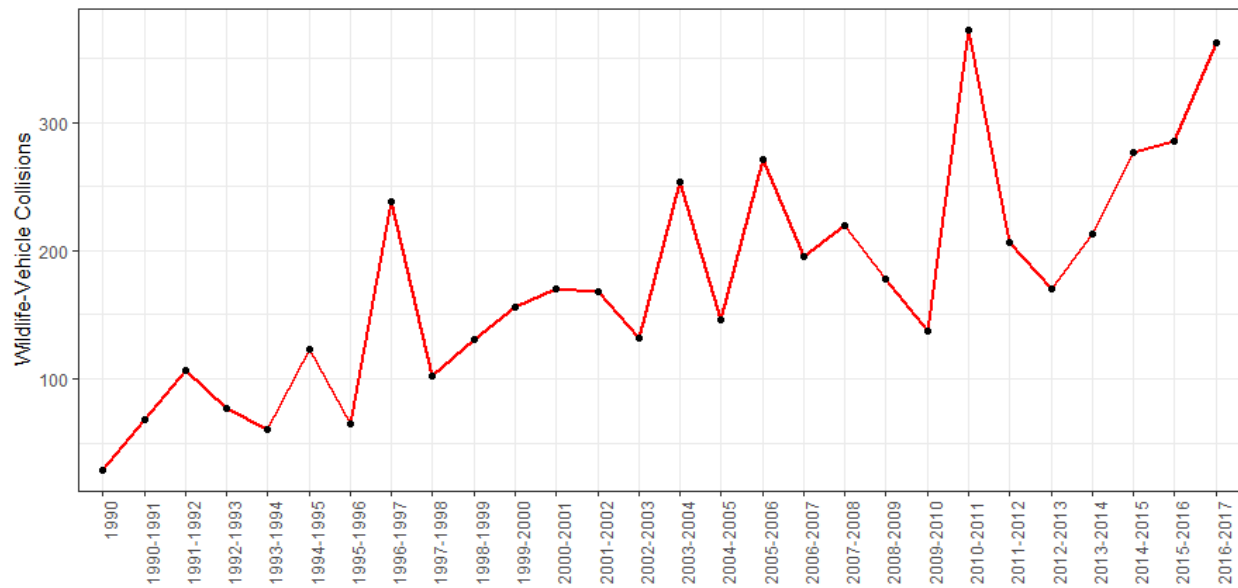
**Table 5.** Species count in the wildlife-vehicle collision database (2010-2017).

<b>Species</b>	<b>2010-2011</b>	<b>2011-2012</b>	<b>2012-2013</b>	<b>2013-2014</b>	<b>2014-2015</b>	<b>2015-2016</b>	<b>2016-2017</b>	<b>Total</b>
American Marten	1	1						2
American Mink		1						1
American Robin	1					1		2
Barrow's Goldeneye	1							1
Bighorn Sheep							4	4
Bison	1							1
Black Bear			1	1		1	2	5
Black Rosy-Finch	1							1
Black-billed Magpie			1	1				2
Boreal Toad							1	1
Brewer's Blackbird	1							1
Common Gartersnake	2							2
Common Raven		1			1			2
Coyote		1	1	1		3	2	8
Deer Mouse	1							1
Elk	59	37	36	46	29	25	48	280
Gray Wolf			1		1			2
Great Horned Owl	1	1		1		4		7
Grizzly Bear						1	1	2
Least Chipmunk						2		2
Long-tailed Weasel							1	1
Moose	33	14	18	15	13	12	18	123
Mountain Bluebird					1			1
Mountain Lion		1						1
Mule Deer	248	138	99	134	217	225	267	1328
North American Porcupine	1	4	5	4	2	4	4	24
Northern Goshawk				1				1
Northern Raccoon	4	5	3	4	6	4	1	27
Pronghorn	1			1				2
Red Fox	2	1	1	1	1		2	8
Red Squirrel	2					1		3
Rough-legged Hawk				1				1
Ruffed Grouse					1			1
Short-tailed Weasel (Ermine)	3							3
Snowshoe Hare			1					1
Striped Skunk			1		4		6	11
Wandering Gartersnake						1		1

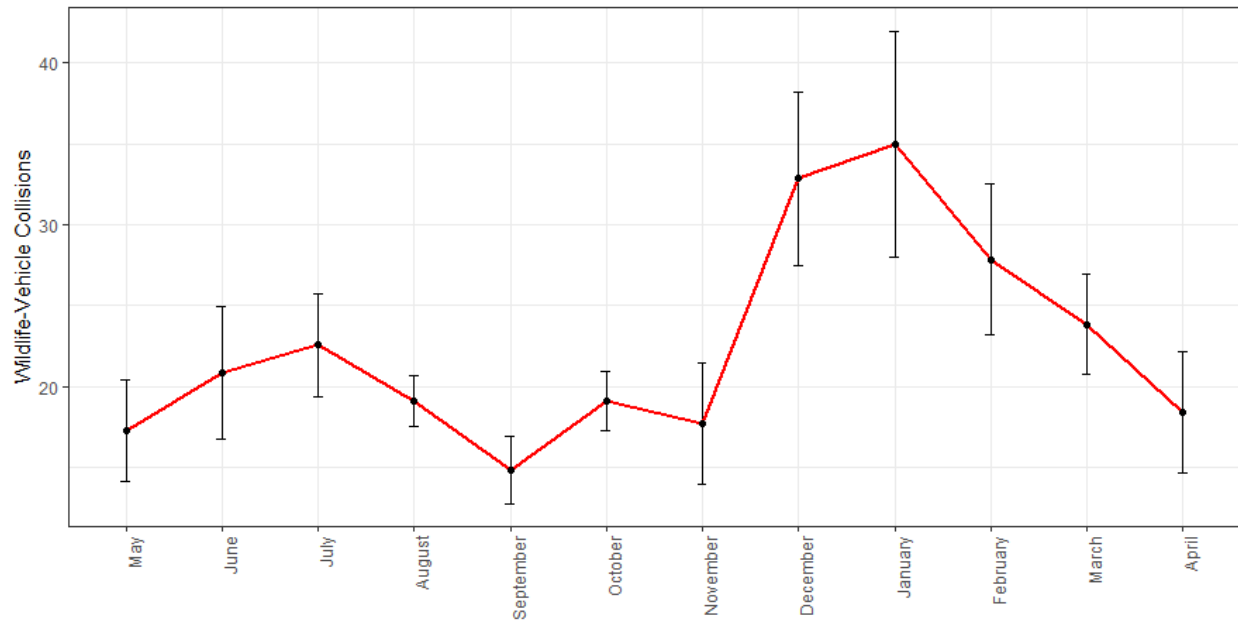
Weasel						1		1
Western Tanager	1							1
White-tailed Deer	5	2	2	2		1	4	16
Wilson's Warbler	1							1
Yellow Warbler	2							2
Yellow-bellied Marmot					1		1	2
<b>Grand Total</b>	<b>372</b>	<b>207</b>	<b>170</b>	<b>213</b>	<b>277</b>	<b>286</b>	<b>362</b>	<b>1887</b>



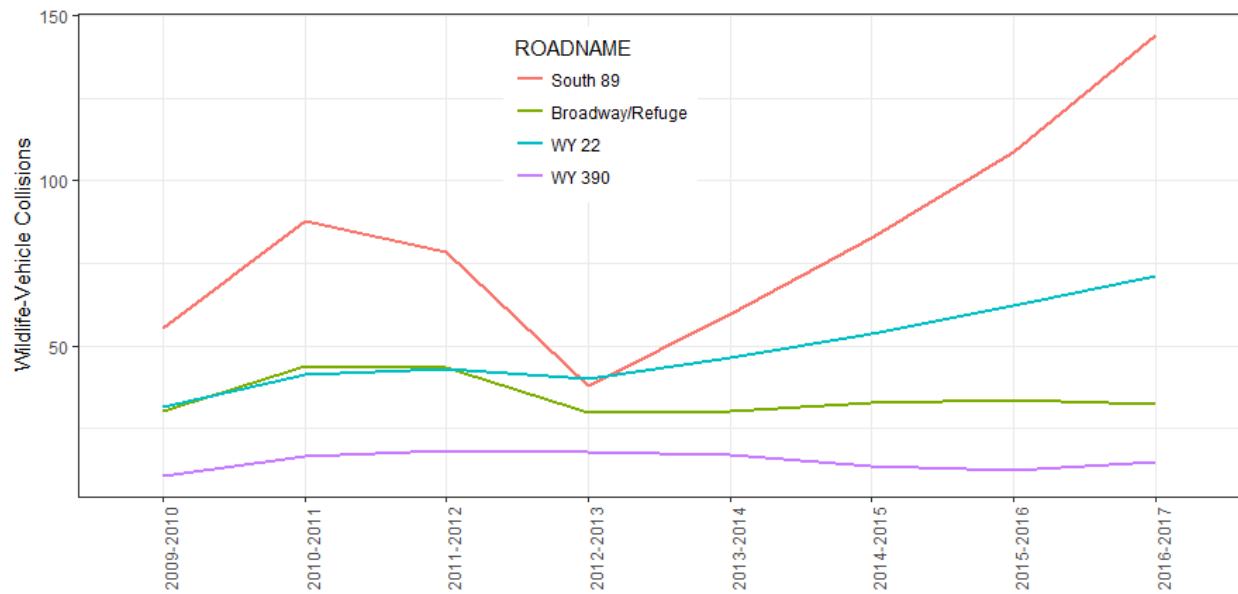
**Figure 1.** Three-year averages and standard errors of wildlife-vehicle collisions in Teton County, WY (1990-2017)



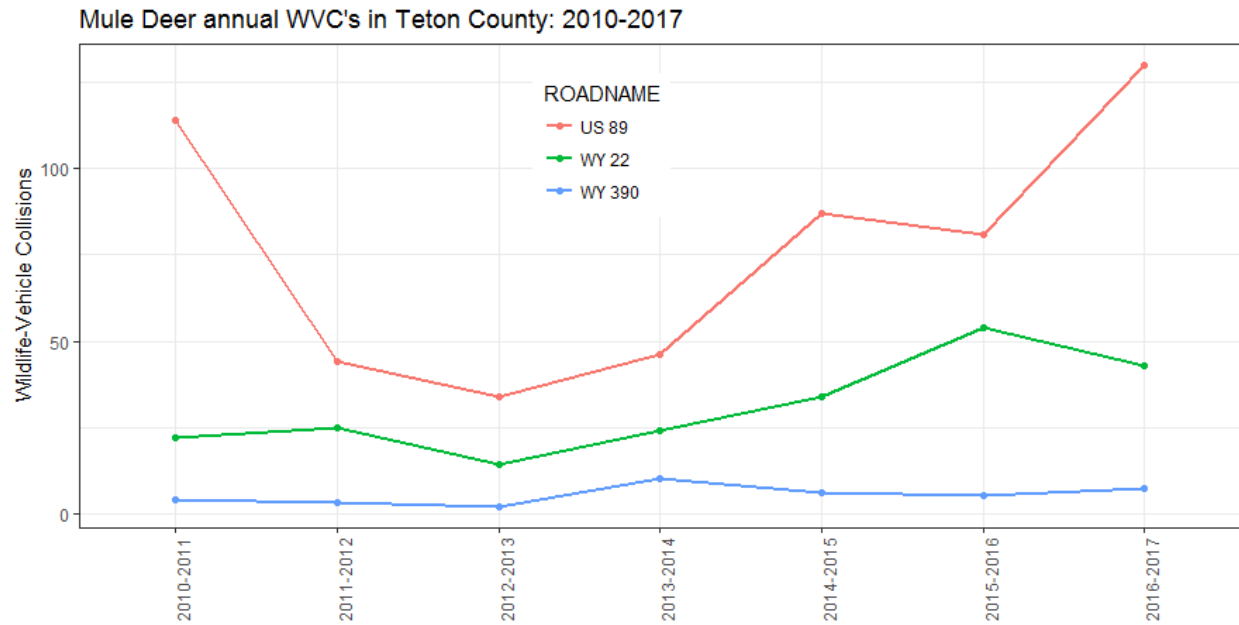
**Figure 2.** Total annual wildlife-vehicle collisions by year in Teton County, WY (annual equals May 1-April 30; 1990-2017).



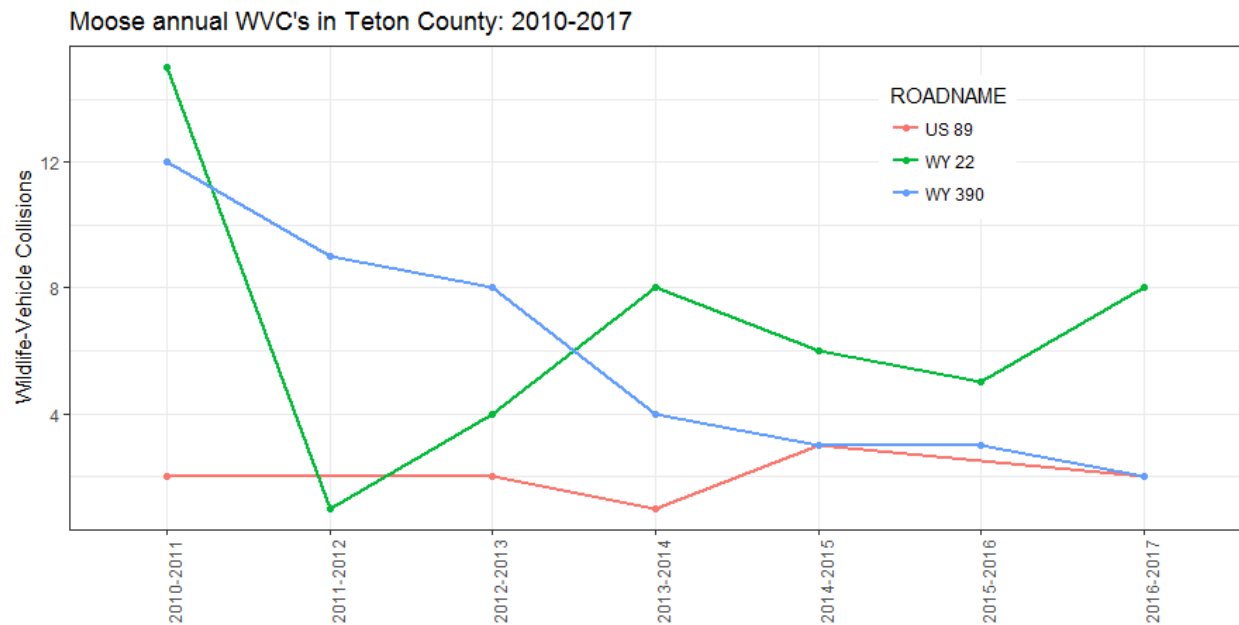
**Figure 3.** Means and standard errors of wildlife-vehicle collisions by month (2010 -2017).



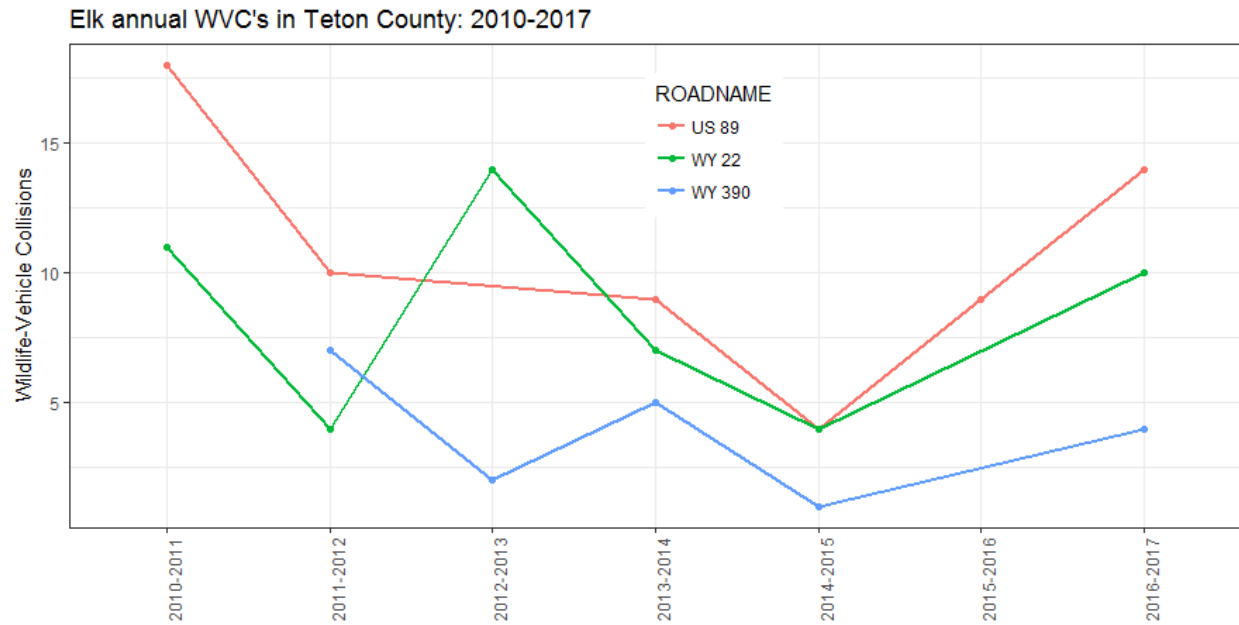
**Figure 4.** Annual wildlife vehicle collisions on South 89, Broadway/North 89, WY 22, and WY 390 (year equals May 1-April 30; 2010-2017).



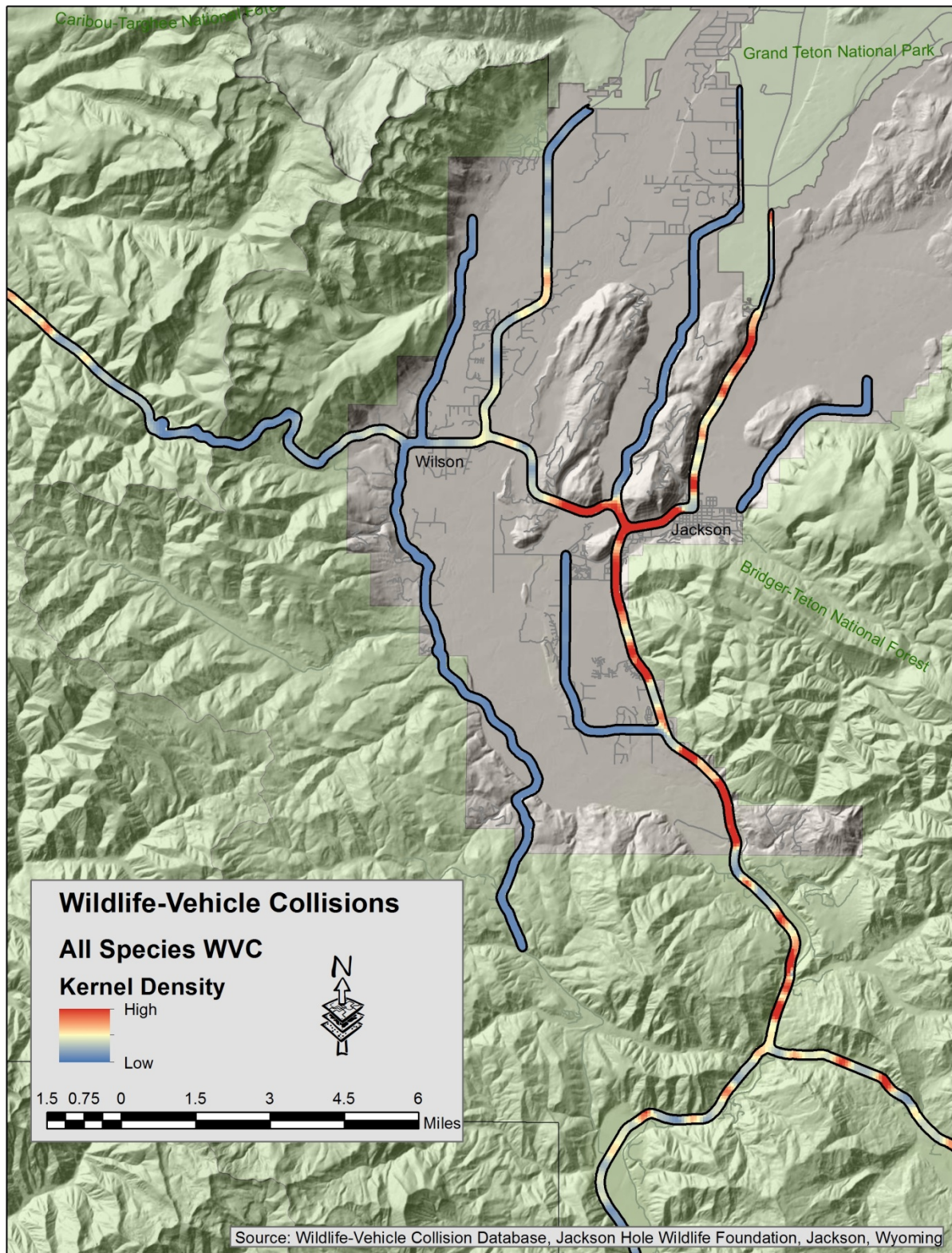
**Figure 5.** Annual mule deer-vehicle collisions on US 89 (north and south), WY 22, and WY 390 (annual equals May 1-April 30; 2010-2017).



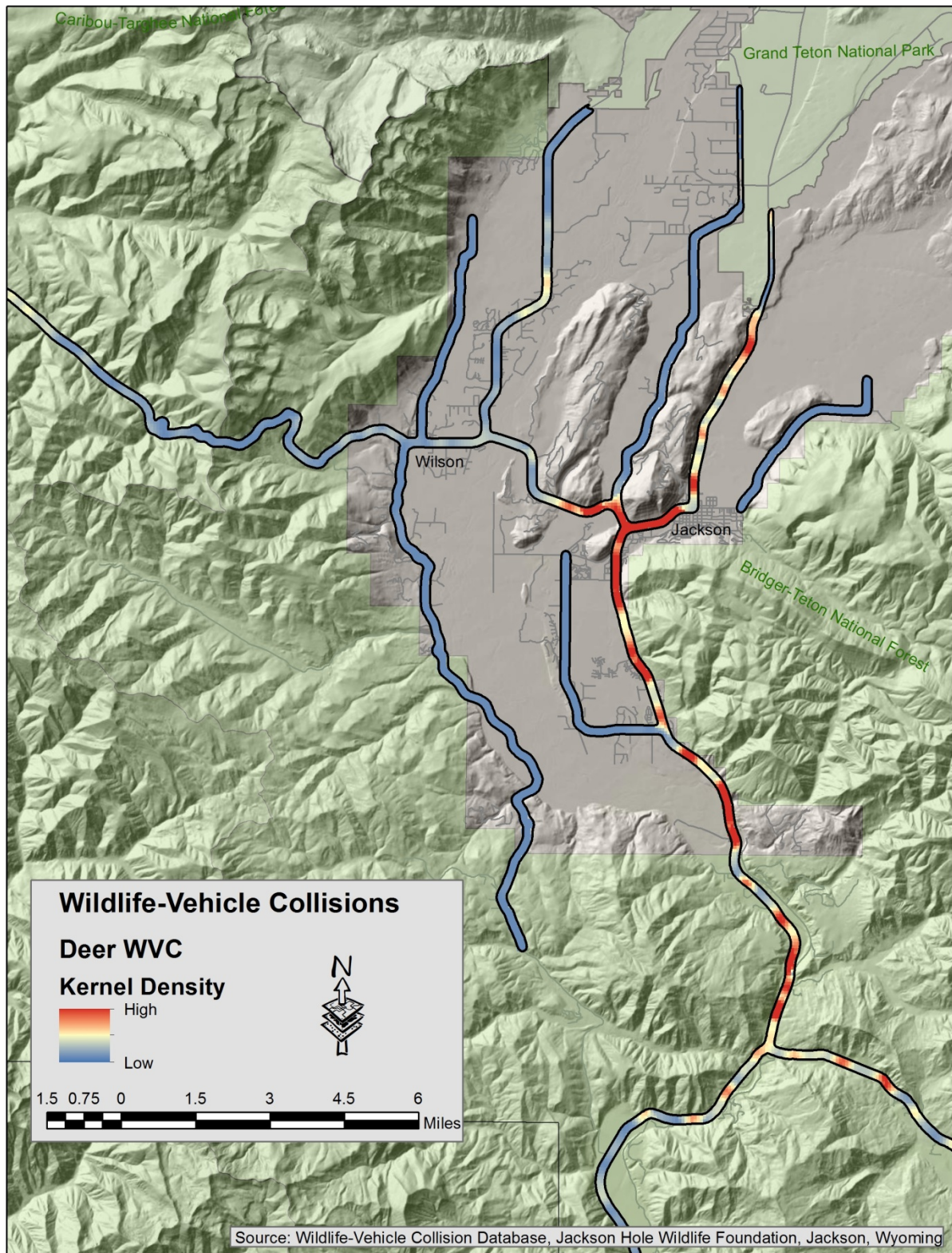
**Figure 6.** Annual moose-vehicle collisions on US 89 (north and south), WY 22, and WY 390 (annual equals May 1-April 30; 2010-2017).



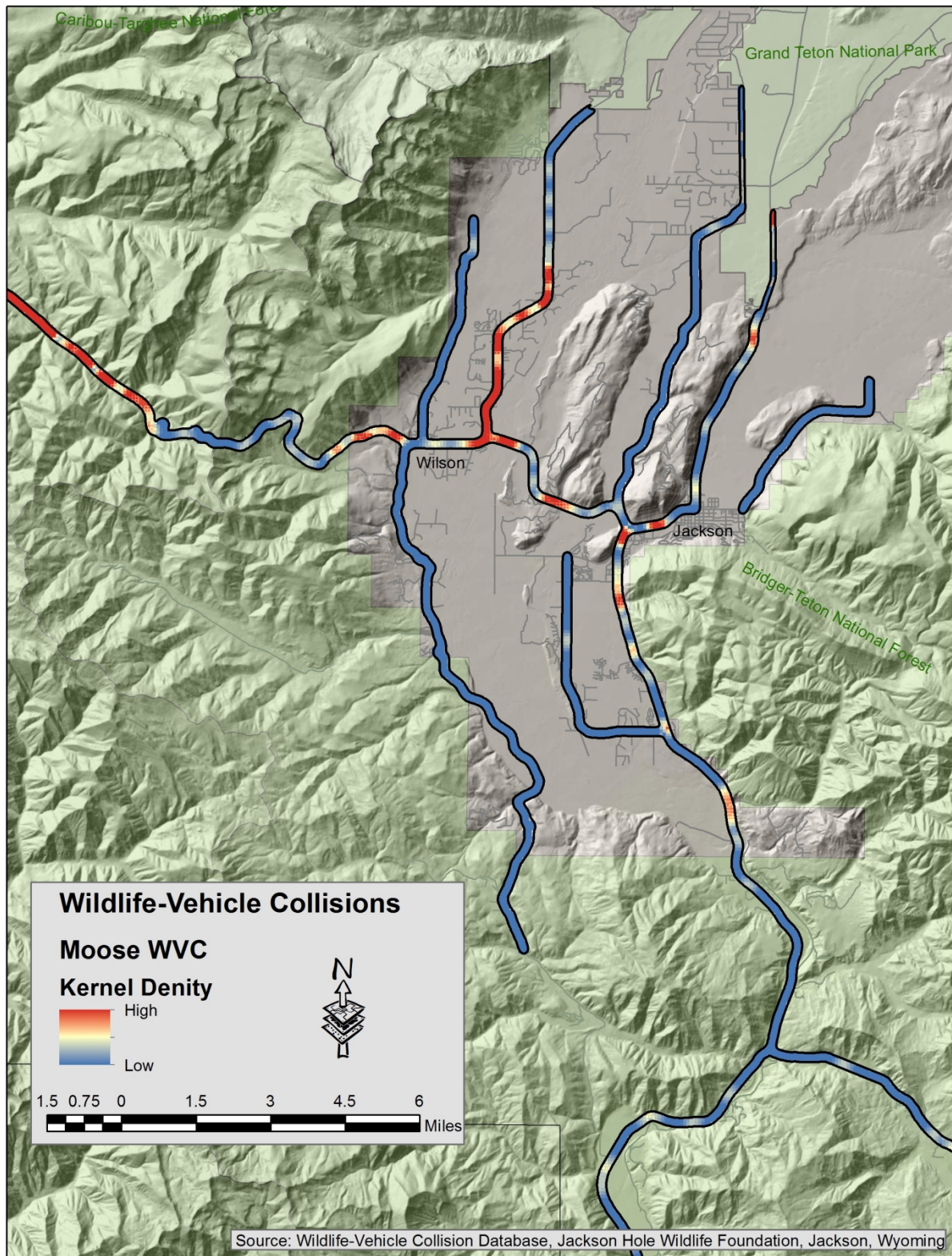
**Figure 7.** Annual elk-vehicle collisions on US 89 (north and south), WY 22, and WY 390 (annual equals May 1-April 30; 2010-2017).



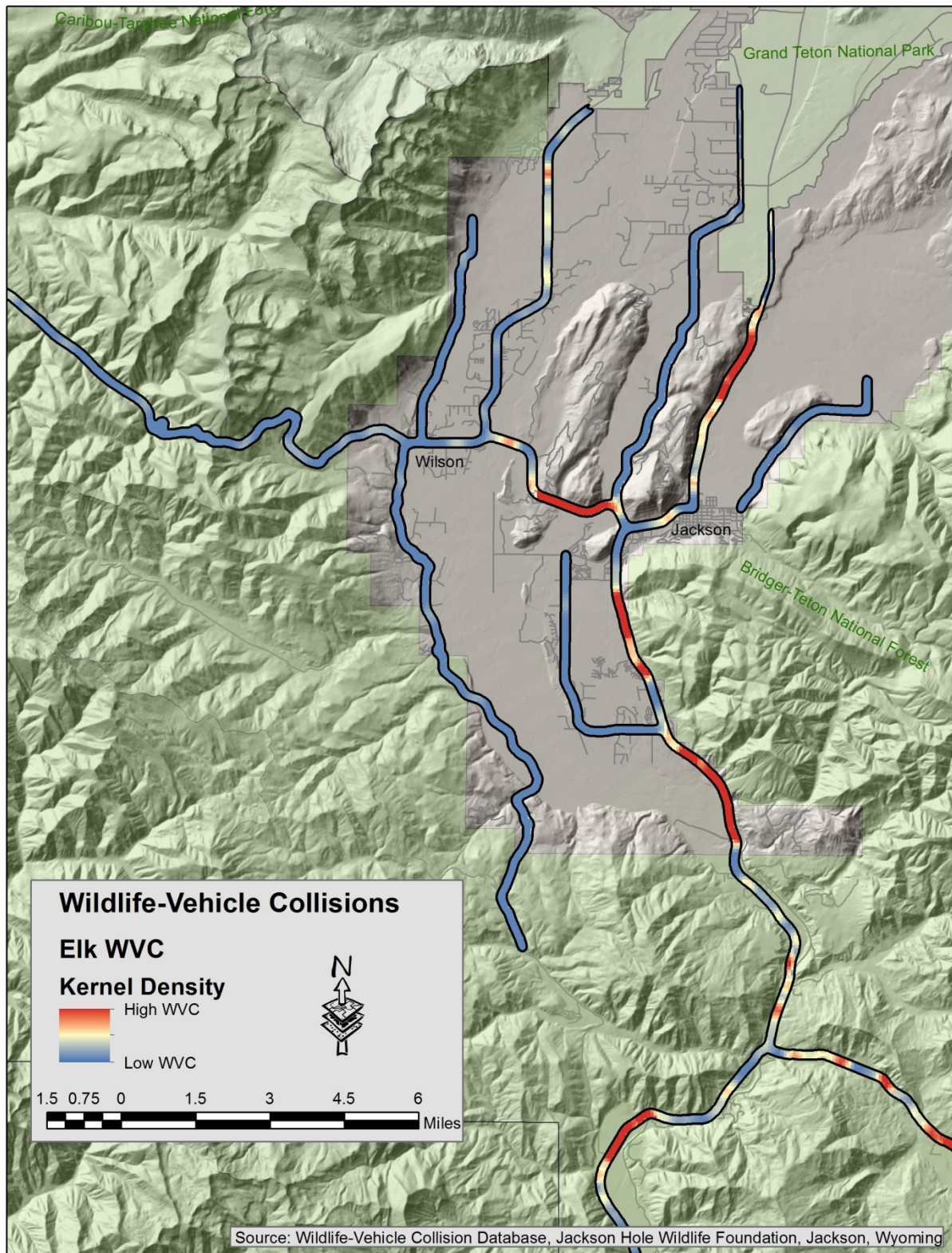
**Figure 8.** Hotspot map showing areas of highest WVCs for all species (red) and lowest (blue) in Teton County, WY.



**Figure 9.** Hotspot map showing areas of highest WVCs for deer (red) and lowest (blue) in Teton County, WY.



**Figure 10.** Hotspot map showing areas of highest WVCs for moose (red) and lowest (blue) in Teton County, WY.



**Figure 11.** Hotspot map showing areas of highest WVCs for elk (red) and lowest (blue) in Teton County, WY.