**2017 LATE WINTER CLASSIFICATION OF NORTHERN YELLOWSTONE ELK**

A collaborative survey by the Northern Yellowstone Cooperative Wildlife Working Group

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**Introduction**

Annual classification surveys of northern Yellowstone elk have been conducted on their winter range since 1968. The objective of this survey is to classify a representative sample of the northern Yellowstone elk herd to estimate the overall sex and age structure of the population. These estimates are used to obtain an index of winter calf survival and recruitment as well as adult and yearling bulls in the population. The methods are to classify a sampling of elk across the entire northern Yellowstone elk herd winter range, including winter range within Yellowstone National Park and north of the Park in Montana. The Northern Yellowstone Cooperative Wildlife Working Group (NYCWWG) has conducted these classifications since 1986. This group is comprised of resource managers and biologists from Montana Fish, Wildlife, and Parks (MFWP), National Park Service; Yellowstone National Park (YNP), U.S. Forest Service; Gallatin-Custer National Forest (USFS), and U.S. Geological Survey; Northern Rocky Mountain Science Center (USGS). The purpose of the Working Group is to cooperatively preserve and protect the long-term integrity of the northern Yellowstone winter range for wildlife species by increasing our scientific knowledge of the species and their habitats, promoting prudent land management activities, and encouraging an interagency approach to data collection, answering questions, and solving problems.

**Summary**

The 2017 northern Yellowstone elk classification was conducted by helicopter on March 17. We classified a portion of the elk population with the objective of obtaining a representative sample of the overall population. Sampling was distributed across the winter range to reflect distribution of elk, with 71% sampled in Montana, and 29% within YNP (Figure 1).

A total of 3,420 elk were classified including 2,479 cows, 520 calves, 240 yearling bulls, and 181 brow-tined bulls resulting in ratios of 21.0 calves and 17.0 total bulls per 100 cows, including 9.7 yearling bulls and 7.3 brow-tined bulls per 100 cows (Table 1). Brow-tined bull classifications resulted in 40% with 6 or more antler points, and 6% of the 181 observed mature bulls had shed their antlers (Table 2). In comparison to long-term trends, this year's calf ratios are near average, yearling bull ratios are above average, and brow-tined bull ratios are below average (Table 4)

Survey time was 8.6 hours at a rate of $425 per hour for a total cost of $3,655. Ferry to and from the survey area was covered by the aviation unit of FWP. Bighorn sheep were surveyed as well during this flight; results will be included in a separate report. Survey costs are shared by NYCWWG member agencies.

**Methods**

We traveled in a Jet Ranger helicopter and sampled elk across the entire winter range of the northern Yellowstone elk herd, from 6-mile Creek in the south end of Paradise Valley in Montana to the Soda Butte/Cache Creek area in Yellowstone National Park (Figure 1). The survey began at 7:40am and concluded at 4:50pm. Skies were clear to partly cloudy, winds were mostly calm, there was no precipitation, and temperatures ranged 27° - 61°F across the survey area. Karen Loveless (MFWP) was the primary observer and pilot Neil Cadwell (MFWP) assisted with spotting and classifications. Elk were classified as cow, calf (<1-year-

old), brow-tined bull (mature bull), or yearling bull. Brow-tined bulls were classified as either 5 points and less, or 6 points and greater, and bulls that had shed their antlers were recorded. Shed bulls that were clearly large bodied were considered to have been brow-tined bulls.

Temperatures during the later portion of the survey were warmer than ideal. With warm temperatures bulls tend to bed in forested areas and are less easily observable. This resulted in lower sightability of bull groups during the afternoon, when we were surveying the Montana portion of the range. To address this, we searched again for bulls during a mule deer survey conducted one week following this survey. The additional bulls spotted during the subsequent survey are included in these results.

**Results**

We classified a total of 3,420 elk by age and sex, resulting in 2,479 cows, 520 calves and 421 bulls, including 240 yearling bulls and 181 brow-tined bulls (Table 1). The resulting age and sex ratios were 21.0 calves and 17.0 total bulls per 100 cows. The ratio of 17.0 total bulls included 9.7 yearling bulls, and 7.3 brow-tined bulls per 100 cows. Of the mature bulls observed, 68 (39.2%) were 6-point and greater, 103 (60.2%) were 5-point or fewer, and 10 (5.5%) had shed their antlers (Table 2). Of the 171 brow-tined bulls that had not shed the antlers, 39.7% were 6-point or greater bulls (Table 2). In comparison to recent and long-term trends (Table 4):

- Calf ratios of 21.0 per 100 cows is lower than recent survey results of 23.3 (2016) and 26.5 (2015), but very near the long-term average
- The observed ratio of 9.7 yearling bulls per 100 cows is one of the highest ratios ever observed, and above recent and long-term averages
- The observed ratio of 7.3 brow-tined bulls is slightly higher than the low of 6.5 observed in 2015, and 66% below the long-term average of 21.6 brow-tined bulls per 100 cows.
- As is typical, calf and yearling bull ratios were higher among elk wintering north of YNP, and brow-tined bull ratios were higher in YNP.

Within the Montana portion of the survey:

- calf ratios were slightly lower than recent surveys with 22.1 calves per 100 cows
- yearling bulls were much higher than average at 10.8 per 100 cows
- brow-tined bull ratio of 3.8 per 100 cows is the highest we have observed since 2008, but well below the long-term average of 11.1

Within the YNP portion of the survey:

- calf ratios were 18.2, above the long-term average of 17.3 calves per 100 cows
- Yearling bull ratios were 6.9 per 100 cows, slightly above the long-term average ratio of 5.3
- Brow-tined bull ratios were 16.2, the second highest we've observed since 2009 but well below the long-term average of 30.5 brow-tined bulls per 100 cows.

**Discussion**

The objective of this survey is to determine demographic trends of the northern Yellowstone elk herd. In order to evaluate trends over time, it is critical that surveys are conducted consistently from year to year. Last year's survey (2016) was conducted more intensively than usual to determine whether our sampling methods were accurately representing the overall population in terms of mature bull ratios. This resulted in slightly higher overall brow-tined bull ratios (8.7 BTB:100 cows) in 2016 as compared to the 2015 survey (6.5 BTB:100 cows). The 2016 survey can be considered a more accurate measure of the actual population ratios as

it represented a near census of the population, however since it was not consistent with prior survey methods it is not useful for assessing trends, i.e. whether brow-tined bulls increased or decreased as compared to prior year surveys. Since we did not observe a substantial difference in the brow-tined bull ratios with the intensive 2016 survey, we concluded that the sampling strategy we have been using is representative, and we returned to our typical survey methods in 2017.

Given very high bull harvest in the fall of 2015 (Table 3), it is likely that we would have observed a decline in brow-tined bull ratios during the 2016 survey if it had been flown consistently with previous surveys. A comparison of the 2017 and 2015 survey results indicate that brow-tined bull numbers are slightly higher this year as compared to 2015.

Since 2015 calf ratios have been at or above long-term average. In order to achieve a stable or increasing elk population, production and survival of calves must equal or surpass rates of natural and human caused mortality among the adult population. Calf recruitment was below average during most surveys 2002-2013, and during that time elk numbers declined from 11,969 elk in 2002 to the lowest count of 3,915 elk observed in 2013. The increased calf recruitment observed in recent years is consistent with the recent increases in overall elk numbers and high yearling bull ratios.

The proportion of yearling bulls is an important indicator as it represents future recruitment of mature bulls into the population, and also serves as a rough indicator of the proportion of yearlings surviving to their second year. Yearling bull ratios have been above average since 2015, indicating increased yearling survival as compared to below average yearling bull ratios observed during 2003 – 2013.

**Harvest Management**

In response to declining bull ratios and increasing bull harvest, MFWP instituted an unlimited permit season structure in HD 313 beginning in 2012, and further restricted the structure in 2014 by changing the permits to “first-choice only” for applicants. These changes were not effective; harvest continued to increase and bull ratios continued to decline, and we continued to observe substantial decline in 6-point bulls in the harvest. In response, a season change was adopted for 2016-2017 that limits the last 2 weeks of the hunting season to limited-draw permits only, and establishes an emergency closure area from the Crevice Creek vicinity to Little Trail Creek on the east side of the Yellowstone River where elk migration is concentrated. This closure will be implemented if weather conditions result in early elk migration. The objective of this new season structure is to reduce bull harvest in order to increase brow-tined bull ratios to within 20% of the long-term average and maintain a diverse age structure within the bull population.

The current structure was a compromise geared to address social concerns with loss of opportunity while still reducing bull harvest. It remains to be seen whether the current season structure will reduce harvest sufficiently to allow recovery of brow-tined bull ratios. Modelling of population and harvest trends predicted that it will take at least 5 years with the current season structure in place to achieve the objective of recovering brow-tined bull ratios to within 20% of the long-term average, assuming calf and yearling bull recruitment remain near or above average. When 2016 harvest results are available (late spring) this report will be updated.

Antlerless elk mortality in this population is primarily due to natural causes; antlerless harvest has been below 3% of the observed population since 2005, and since 2012 antlerless harvest has represented less than 1% of the observed population (Table 3). Predation continues to be a significant source of mortality, however in spite of a predator-rich environment we have observed average to above average calf recruitment as well as slightly increasing overall elk numbers since 2015.

Figure 1. Locations and groups types for elk observed during the March 2017 northern Yellowstone elk classification survey, including boundaries of elevation sectors used to distribute classifications: Montana HD 313/Lower Outside Sector, and the three sectors within Yellowstone Park: Lower Inside, Middle and Upper.

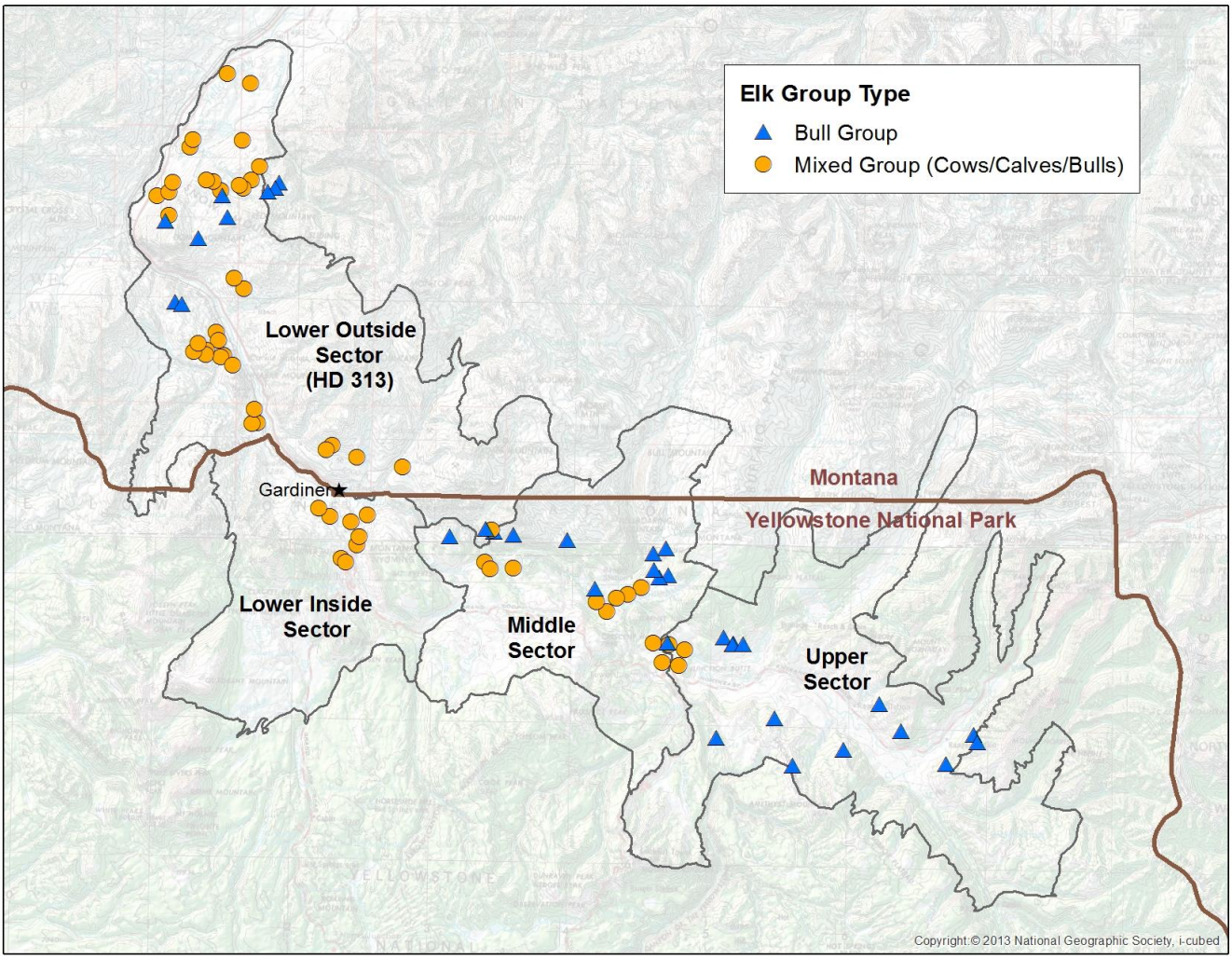

Table 1. Results of northern Yellowstone elk classification survey by elevation sector, March 2017

| Year | Area | | Cows | Calves | Yearling Bulls | BTB | Total Bulls | Total Elk Classified | Calves per 100 Cows | Spikes per 100 cows | BTB per 100 Cows | Total Bulls per 100 Cows |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2017 | Montana (HD313) | | 1780 | 393 | 192 | 68 | 260 | 2433 | 22.1 | 10.8 | 3.8 | 14.6 |
| | Yellowstone Park | Lower | 334 | 66 | 17 | 7 | 24 | 424 | 19.8 | 5.1 | 2.1 | 7.2 |
| | | Middle | 278 | 49 | 29 | 57 | 86 | 413 | 17.6 | 10.4 | 20.5 | 30.9 |
| | | Upper | 87 | 12 | 2 | 49 | 51 | 150 | 13.8 | 2.3 | 56.3 | 58.6 |
| | | Total YNP | 699 | 127 | 48 | 113 | 161 | 987 | 18.2 | 6.9 | 16.2 | 23.0 |
| | Total Northern Range | | 2479 | 520 | 240 | 181 | 421 | 3420 | 21.0 | 9.7 | 7.3 | 17.0 |

*BTB = Brow-tined Bull

Table 2. Bull classification results by elevation sector, March 2017. Bulls were classified as either yearling bulls, brow-tined bulls (BTB) or shed bulls. Brow-tined bulls were further classified as either 5-points or fewer, or as 6-points or greater.

| Year | Area | | Yearling Bulls | BTB 5- | BTB 6+ | Shed Bulls | Total BTB | Total Bulls | % Yearling Bulls | % Shed Bulls | % ≤ 5 points* | % ≥ 6 points* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2017 | Montana (HD313) | | 192 | 56 | 6 | 6 | 68 | 260 | 74% | 9% | 90% | 10% |
| | Yellowstone Park | Lower | 17 | 5 | 2 | 0 | 7 | 24 | 71% | 0% | 71% | 29% |
| | | Middle | 29 | 31 | 24 | 2 | 57 | 86 | 34% | 4% | 56% | 44% |
| | | Upper | 2 | 11 | 36 | 2 | 49 | 51 | 4% | 4% | 23% | 77% |
| | | Total YNP | 48 | 47 | 62 | 4 | 113 | 161 | 30% | 4% | 43% | 57% |
| | Total Northern Range | | 240 | 103 | 68 | 10 | 181 | 421 | 57% | 6% | 60% | 40% |

* Calculated as % of total classified (not shed) brow-tined bulls

Table 3. Estimated elk harvest in hunting district 313, 2004 – 2015
(This report will be updated when 2016 harvest data are available)

| License Year | Total Harvest | Brow-tined Bulls | Antlerless | ≤ 5 Antler Points | ≥ 6 Antler Points | % ≥ 6 Antler Points |
|---|---|---|---|---|---|---|
| 2004 | 521 | 114 | 407 | 13 | 95 | 88% |
| 2005 | 426 | 297 | 129 | 40 | 244 | 86% |
| 2006 | 454 | 405 | 45 | 102 | 303 | 75% |
| 2007 | 144 | 116 | 29 | 54 | 62 | 53% |
| 2008 | 154 | 81 | 73 | 33 | 49 | 60% |
| 2009 | 226 | 123 | 103 | 54 | 63 | 54% |
| 2010 | 393 | 301 | 92 | 94 | 208 | 69% |
| 2011 | 224 | 161 | 63 | 76 | 85 | 53% |
| 2012 | 185 | 167 | 18 | 78 | 89 | 54% |
| 2013 | 187 | 165 | 22 | 78 | 88 | 53% |
| 2014 | 349 | 315 | 34 | 163 | 152 | 48% |
| 2015 | 509 | 472 | 37 | 199 | 274 | 58% |

Table 4. Late winter helicopter classification survey results for northern Yellowstone elk, 1995-2017. The "Total Northern Range" results include elk classified within the Montana and Yellowstone National Park portions of the range; "Montana Only" results include only those elk classified north of Yellowstone National Park in hunting district 313, and "YNP Only" includes elk classified within Yellowstone Park.

| | Total Northern Range | | | | | Montana Only | | | | | YNP Only | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Total Elk Classified | Total Calves: 100 Cows | Total Yearling bulls: 100 cows | Total BTB:100 cows | Total Bulls: 100 cows | MT Elk Classified | MT Calves: 100 Cows | MT Yearling bulls: 100 cows | MT BTB: 100 cows | MT Bulls: 100 Cows | YNP Elk Classified | YNP Calves: 100 Cows | YNP Yearling bulls: 100 cows | YNP BTB: 100 cows | YNP Bulls: 100 Cows |
| 1995 | 3,613 | 33.4 | 10.9 | 28.7 | 39.7 | 983 | 62.1 | 20.0 | 60.1 | 80.0 | 2,630 | 26.5 | 8.7 | 21.2 | 29.9 |
| 1996 | 2,921 | 28.5 | 8.7 | 25.8 | 34.5 | survey restricted to YNP | | | | | 2,921 | 28.5 | 8.7 | 25.8 | 34.5 |
| 1997 | no survey | | | | | no survey | | | | | no survey | | | | |
| 1998 | 2,720 | 22.4 | 4.2 | 60.9 | 65.1 | 387 | 34.7 | 9.0 | 50.8 | 59.8 | 2,333 | 20.4 | 3.4 | 62.5 | 65.9 |
| 1999 | 4,055 | 33.9 | 8.9 | 42.0 | 50.8 | 1,685 | 46.3 | 13.4 | 28.0 | 41.3 | 2,370 | 25.3 | 5.8 | 51.7 | 57.4 |
| 2000 | 3,157 | 22.7 | 6.7 | 16.8 | 23.5 | 1,773 | 26.8 | 6.4 | 1.3 | 7.7 | 1,384 | 16.4 | 7.3 | 41.1 | 48.3 |
| 2001 | 1,869 | 29.0 | 6.5 | 53.6 | 60.1 | 644 | 35.2 | 6.9 | 10.2 | 17.0 | 1,225 | 24.4 | 6.2 | 86.2 | 92.4 |
| 2002 | 4,001 | 13.8 | 7.2 | 35.9 | 43.1 | 1,200 | 11.4 | 9.5 | 13.3 | 22.8 | 2,801 | 15.0 | 6.0 | 48.0 | 54.0 |
| 2003 | 4,200 | 12.4 | 3.7 | 18.1 | 21.8 | 1,315 | 18.0 | 2.6 | 3.9 | 6.4 | 2,885 | 9.5 | 4.3 | 25.3 | 29.6 |
| 2004 | 3,167 | 12.3 | 3.4 | 20.7 | 24.1 | 1,075 | 19.8 | 3.9 | 6.3 | 10.2 | 2,092 | 8.1 | 3.1 | 28.7 | 31.8 |
| 2005 | 3,508 | 13.0 | 4.5 | 15.8 | 20.3 | 1,039 | 17.2 | 7.5 | 1.7 | 9.2 | 2,469 | 11.2 | 3.2 | 22.2 | 25.4 |
| 2006 | 3,649 | 23.8 | 6.0 | 13.9 | 19.9 | 2,116 | 26.6 | 7.1 | 7.3 | 14.5 | 1,533 | 19.7 | 4.3 | 23.5 | 27.8 |
| 2007 | 4,828 | 18.6 | 6.1 | 11.7 | 17.8 | 1,646 | 23.0 | 7.1 | 1.0 | 8.1 | 3,182 | 16.1 | 5.6 | 17.5 | 23.1 |
| 2008 | 3,656 | 11.4 | 2.4 | 14.4 | 16.8 | 2,578 | 14.0 | 2.2 | 9.6 | 11.9 | 1,078 | 4.7 | 2.7 | 26.6 | 29.4 |
| 2009 | 4,269 | 21.5 | 4.0 | 10.7 | 14.7 | 1,793 | 27.2 | 4.7 | 1.9 | 6.6 | 2,476 | 17.2 | 3.5 | 17.2 | 20.7 |
| 2010 | no survey | | | | | no survey | | | | | no survey | | | | |
| 2011 | no survey | | | | | no survey | | | | | no survey | | | | |
| 2012 | 5,146 | 10.8 | 4.2 | 8.1 | 12.3 | 2,065 | 11.1 | 4.3 | 0.8 | 5.1 | 3,081 | 10.6 | 4.1 | 13.5 | 17.6 |
| 2013 | 3,507 | 18.4 | 5.4 | 10.5 | 15.8 | 1,257 | 20.9 | 7.3 | 2.7 | 10.0 | 2,250 | 16.9 | 4.2 | 15.0 | 19.2 |
| 2014 | survey restricted to north of YNP | | | | | 2,772 | 24.1 | 8.7 | 3.1 | 11.8 | survey restricted to north of YNP | | | | |
| 2015 | 3930 | 26.5 | 8.7 | 6.5 | 15.2 | 2,507 | 29.6 | 9.4 | 2.7 | 12.1 | 1,423 | 21.1 | 7.5 | 13.1 | 20.6 |
| 2016 | 6913 | 23.3 | 7.4 | 8.7 | 16.1 | 4,783 | 25.2 | 8.0 | 2.6 | 10.6 | 2,130 | 18.8 | 6.0 | 23.6 | 29.6 |
| 2017 | 3420 | 21.0 | 9.7 | 7.3 | 17.0 | 2,433 | 22.1 | 10.8 | 3.8 | 14.6 | 987 | 18.2 | 6.9 | 16.2 | 23.0 |
| 10-Year Average (2008-2017) | | 19.0 | 6.0 | 10.8 | 15.4 | | 21.8 | 6.9 | 3.4 | 10.3 | | 15.4 | 5.0 | 17.9 | 22.9 |
| Previous 11-Year Ave (1998-2007) | | 20.2 | 5.7 | 28.9 | 34.6 | | 25.9 | 7.3 | 12.4 | 19.7 | | 16.6 | 4.9 | 40.7 | 45.6 |
| 22-Year Average (1995-2017) | | 20.9 | 6.2 | 21.6 | 27.8 | | 26.1 | 7.8 | 11.1 | 18.9 | | 17.3 | 5.3 | 30.5 | 35.8 |