

## Upper Yellowstone Bighorn Sheep Survey 2015

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**Date:** March 9, 10, 22, 2015

**Aircraft:** Jet Ranger Helicopter

**Pilot:** Neil Cadwell

**Observer:** Karen Loveless

**Conditions and Area Covered:** Overall conditions were good to excellent:

**March 9:** Surveyed Point of Rocks and Tom Miner. The survey was conducted in conjunction with an elk classification flight. Conditions were good with mostly clear skies, winds calm, temperatures 26 - 30° F.

**March 10:** Surveyed Yellowstone National Park. The survey was conducted in conjunction with elk classification flight. Conditions were good with partly cloudy skies, calm winds, temperature 26 - 32° F.

**March 22:** Surveyed Gardiner Basin north of Yellowstone National Park. The survey was conducted in conjunction with a mule deer survey. Conditions were partly cloudy, calm winds, temperature 40 - 50° F.

**Total time and cost:** Costs for March 22 survey within Gardiner Basin were included in the Gardiner Basin Mule Deer Survey; these surveys were conducted simultaneously and paid for by United States Geological Survey (USGS). Flight costs for the Tom Miner and Point of Rocks survey on 3/9 were 2.0 hours @ \$425/hour = \$850, paid for by Gallatin National Forest. Flight costs for 3/10 within Yellowstone National Park (YNP) were 2.0 hours @ \$425/hour = \$850, paid for by YNP. Total survey cost was \$1700.

### **Methods**

Bighorn sheep aerial surveys have been conducted as a collaborative survey of the Northern Yellowstone Cooperative Wildlife working Group in the upper Yellowstone area since 1991, with surveys expanding into the Gardiner Basin and Yellowstone National Park (YNP) in 1995. Surveys are conducted by helicopter, allowing for low elevation observations and classification by age and sex. Bighorn sheep observations in the Montana portion of the survey have been separated into herd units as follows: Point of Rocks, Tom Miner Basin, Yankee Jim Canyon to Corwin Springs (east of Yellowstone River), Travertine to Deckard Flats, Beattie Gulch to Cinnabar (West of Yellowstone River). In YNP, sheep observations have historically been separated into 3 areas: Mt. Everts to Mammoth, YNP East (Black Canyon to Barronnette Peak) and YNP West (Mt. Norris to Tower Junction)

### **Results**

During the 2015 survey a total of 329 bighorn sheep were observed, including 166 in Montana and 163 in YNP (Table 1). These results represent a decline of 22% as compared to the 2014 survey results of 421 total sheep observed. In Montana sheep numbers declined by 26% while YNP numbers were 17% lower. (Table 2, Figures 1-3). The lower count this year was due to fewer sheep observed in the Cinnabar (-37%) and Point of Rocks (-38%) winter ranges in Montana, and the YNP West (-40%) winter range. Sheep numbers on the other winter ranges were stable. In comparison to previous surveys, this year's results are slightly lower (5%) than the previous 10-year average of 347 sheep observed during 2005 – 2014, but well above (27%) the 20-year average of 260 sheep observed during 1995-2014.

We were able to classify all sheep by age and sex, resulting in 49 lambs, 186 ewes, and 100 total rams. The resulting ratios were 26 lambs per 100 ewes, and 54 rams per 100 ewes. Among the different wintering areas lamb ratios ranged from 2 – 60 per 100 ewes, and ram ratios ranged 14 – 122 rams per 100 ewes (Table 1). Of the 100 rams observed, 68 (68%) were classified as  $\frac{3}{4}$  curl or greater, while 32 (32%) were classified as immature rams (Table 1).

### **Population trends and management**

The count of 329 bighorn sheep in the upper Yellowstone is the lowest since 2006. Previous to this year the sheep population had been increasing steadily since 2005. This year's decline is related to an all-age pneumonia event which most severely affected sheep on the Cinnabar winter range. Beginning in mid-December we documented pneumonia related mortalities, including 30 sheep at the Cinnabar winter range, 2 at Tom Miner and 1 at Corwin Springs. Most of the mortalities occurred between mid-December and early January, however occasional mortalities and observations of sick sheep continued throughout the winter. We were able to necropsy and collect samples from 19 sheep carcasses. Gross lesions on the lungs consistent with pneumonia were seen in 18 of the bighorn mortalities. One ewe died of causes unrelated to pneumonia. Lung tissue was submitted to the Washington Animal Disease Diagnostic Laboratory for analysis. Of the 18 pneumonia related mortalities sampled, *Mycoplasma ovipneumoniae* was detected in 9, *Mannheimia haemolytica* was detected in 15, *Bibersteinia trehalosi* was detected in 12, *Pasturella multocida* was detected in 6 and Pasteurella leukotoxin (lktA) was detected in all but 1 of the sheep tested. The bacterial species detected among the samples submitted are commonly observed with bighorn sheep pneumonia events. It is important to note that "not detected" is not the same as a confirmed negative test as there are instances when bacteria is present but not detected. The role of each species of bacteria in causing pneumonia events such as this is the subject of intense research and debate. Recently we have begun testing for leukotoxin/lktA which is not a bacteria but rather a virulence factor produced by some bacteria that may contribute to the outcome of infection. For more detailed information on these disease results please contact the FWP Wildlife Health Laboratory in Bozeman.

Subsequent to the aerial survey, 14 dead sheep were identified in the Mt. Everts area within YNP. Fresh samples from six of these sheep were submitted to the state wildlife lab in Bozeman. Also, lung tissue and swabs were sent to the Washington Animal Disease Diagnostic lab in Pullman for further diagnostic testing. Lab reports confirmed the presence of *M. haemolytica* and the associated Pasteurella leukotoxin in four sampled sheep. *M. ovipneumoniae* was identified in three sampled sheep. Please contact YNP wildlife biologist John Treanor for additional information on disease results from sheep within YNP.

In April we detected additional mortalities at the Point of Rocks winter range. This area is entirely private land and due to restricted access the bighorn sheep population is difficult to monitor. A total of 8 sheep carcass were identified. All of the carcasses were partially decomposed and we were unable to collect samples or determine cause or precise timing of the mortalities.

Disease events can occur within bighorn sheep populations for a variety of reasons which are not completely understood, however there is strong evidence of increasing disease risk as population densities increase, and high risk with exposure to domestic sheep and goats. The upper Yellowstone bighorn sheep population is experiencing both of these risk factors. In recent years the population has steadily increased and prior to this year was approaching a similar population level where a pink-eye epidemic resulted in mortalities which significantly reduced the population during the 1980's. Additionally, we are aware of 3 private land parcels that hold domestic sheep for some or all of the year within the population's winter range. Though it is impossible to determine the source of the pneumonia outbreak this winter, research has shown that contact with domestic sheep is a significant risk factor for pneumonia in wild sheep populations. There have been numerous observations of wild sheep coming into contact and/or close proximity with the various domestic sheep in this area. Montana FWP will continue to make efforts to work with domestic sheep producers to reduce risk of commingling among wild and domestic sheep; however FWP has no jurisdiction over private land livestock husbandry and any efforts to maintain separation must occur through the willing cooperation of these landowners.

Due to the decline in numbers of mature rams in the Cinnabar area, hunting district 305 was closed for the 2015 hunting season. Hunting district 304 (which includes the Point of Rocks winter range) was closed in 2013 due to a disease event and remains closed for the 2015 season. Hunting districts 300 (Tom Miner) and 303 (east side of Gardiner Basin) are unlimited permit districts; at this time there are no plans to close these districts for the 2015 season.

Table 1. Number and classification of bighorn sheep observed by area in the Upper Yellowstone during Spring 2015 aerial surveys.

Area	Total	Ewes	Lambs	Ram Curl Class				Lambs:100	Rams:100
				0 - 1/4	1/4 - 1/2	1/2 - 3/4	3/4 +	Ewes	Ewes
Cinnabar	56	43	1	0	2	3	7	2	28
Corwin - Yankee Jim	31	21	7	0	1	2	0	33	14
Point of Rocks	26	14	7	0	1	2	2	50	36
Tom Miner	53	35	9	2	0	1	6	26	26
Deckard-Travertine	0	0	0	0	0	0	0		
<b>Total Montana</b>	<b>166</b>	<b>113</b>	<b>24</b>	<b>2</b>	<b>4</b>	<b>8</b>	<b>15</b>	<b>21</b>	<b>26</b>
Everts-Mammoth	77	32	6	1	2	5	31	19	122
YNP east	39	15	9	0	0	5	10	60	100
YNP West	47	23	8	0	4	0	12	35	70
<b>Total YNP</b>	<b>163</b>	<b>70</b>	<b>23</b>	<b>1</b>	<b>6</b>	<b>10</b>	<b>53</b>	<b>33</b>	<b>100</b>
<b>Total Upper Yellowstone</b>	<b>329</b>	<b>183</b>	<b>47</b>	<b>3</b>	<b>10</b>	<b>18</b>	<b>68</b>	<b>26</b>	<b>54</b>

Table 2. Results of upper Yellowstone bighorn sheep aerial surveys 1995-2015. No surveys were conducted in 1993, 2004 and 2007, and survey conditions in 2010 were poor.

Area	'95	'96	'97	'98	'99	'00	'01	'02	'03	'05	'06	'08	'09	'11	'12	'13	'14	'15
Pt of Rocks	26	22	27	16	14	16	20	12	15	22	34	35	40	47	50	32	42	26
Tom Miner	15	17	21	15	23	27	22	21	24	30	14	31	33	51	75	79	56	53
YJ-Corwin	6	7	5	10	12	11	13	19	16	18	2	36	29	22	19	24	32	31
Trav-Deckard	22	18	21	14	14	5	1	2	3	3				0	4	0	5	0
Beattie-Cinnabar	33	52	30	34	34	28	40	50	48	46	35	71	64	85	77	96	89	56
<b>Total Montana</b>	<b>102</b>	<b>116</b>	<b>104</b>	<b>89</b>	<b>97</b>	<b>87</b>	<b>96</b>	<b>104</b>	<b>106</b>	<b>119</b>	<b>85</b>	<b>173</b>	<b>166</b>	<b>205</b>	<b>225</b>	<b>231</b>	<b>224</b>	<b>166</b>
Everts-Mammoth	50	66	44	36	45	41	41	42	47	79	73	83	110	78	94	75	87	77
YNP East	48	39	38	1	24	12	38	10	11	13	12	46	29	34	29	44	32	39
YNP West	13	8	13	8	15	10	7	16	21	33	38	51	44	70	30	89	78	47
<b>Total YNP</b>	<b>111</b>	<b>113</b>	<b>95</b>	<b>45</b>	<b>84</b>	<b>63</b>	<b>86</b>	<b>68</b>	<b>79</b>	<b>125</b>	<b>123</b>	<b>180</b>	<b>183</b>	<b>182</b>	<b>153</b>	<b>208</b>	<b>197</b>	<b>163</b>
<b>Grand Total</b>	<b>213</b>	<b>229</b>	<b>199</b>	<b>134</b>	<b>181</b>	<b>150</b>	<b>182</b>	<b>172</b>	<b>185</b>	<b>244</b>	<b>208</b>	<b>353</b>	<b>349</b>	<b>387</b>	<b>378</b>	<b>439</b>	<b>421</b>	<b>329</b>

Figure 1. Upper Yellowstone bighorn sheep trends from spring aerial surveys 1995 - 2015, including Yellowstone National Park, Gardiner Basin and Paradise Valley south of Big Creek.

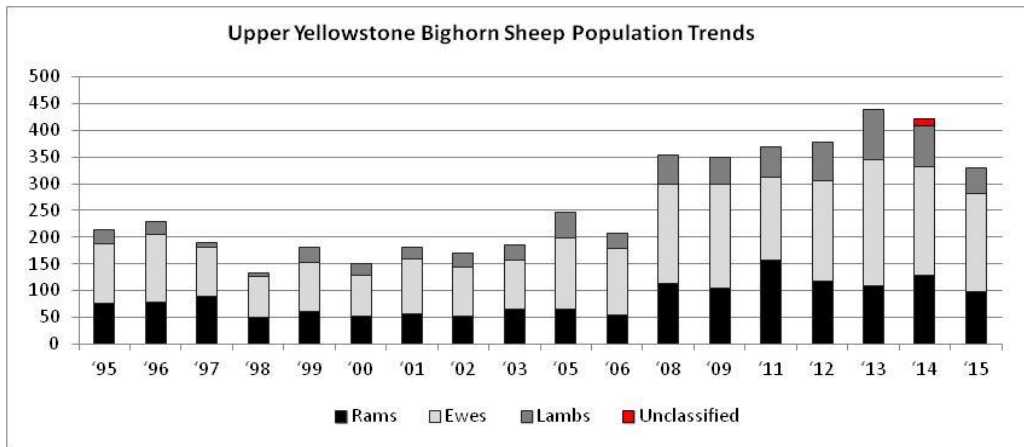


Figure 2. Montana bighorn sheep population trends in the upper Yellowstone region from spring aerial surveys 1992 – 2015, including Gardiner Basin and Paradise Valley south of Big Creek.

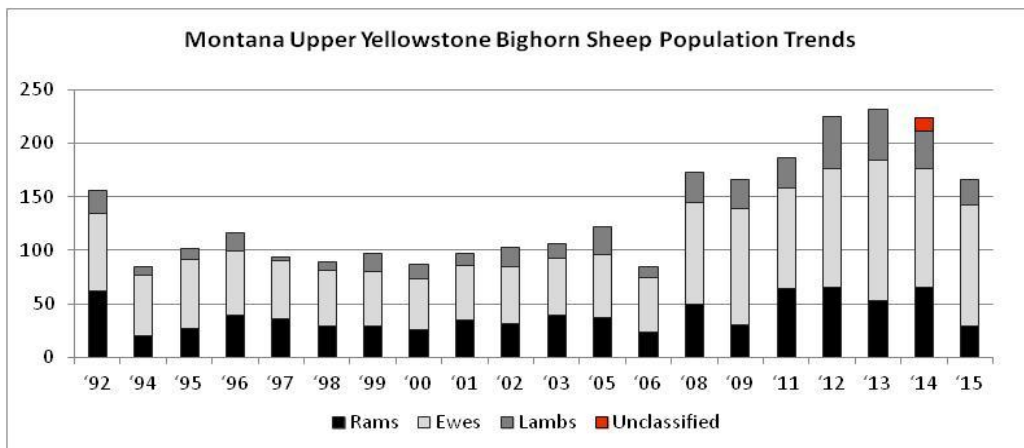


Figure 3. Yellowstone National Park bighorn sheep population trends from spring aerial surveys 1995 - 2015

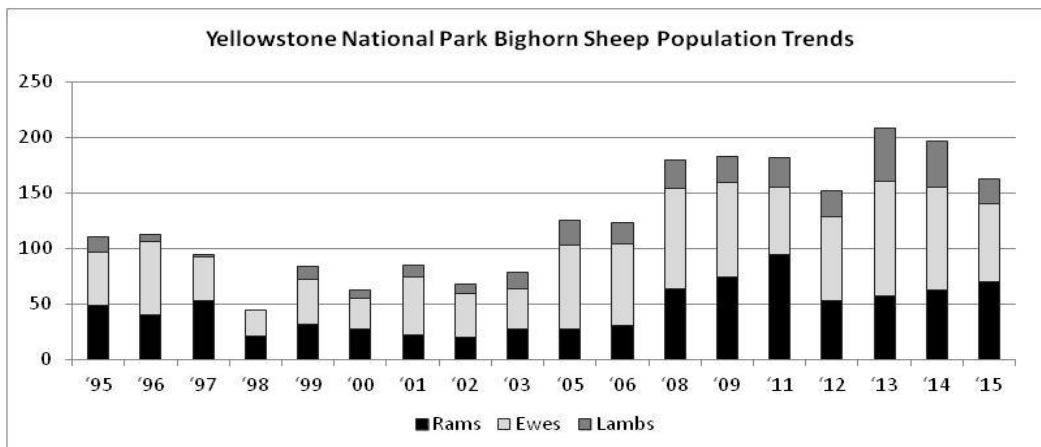


Figure 4. Locations of bighorn sheep observed during 2015 spring aerial surveys. See Table 1 for classification of sheep observed in each area.

