

Mule Deer Monitoring in the Pinedale Anticline Project Area 2020 Annual Update

Prepared for:

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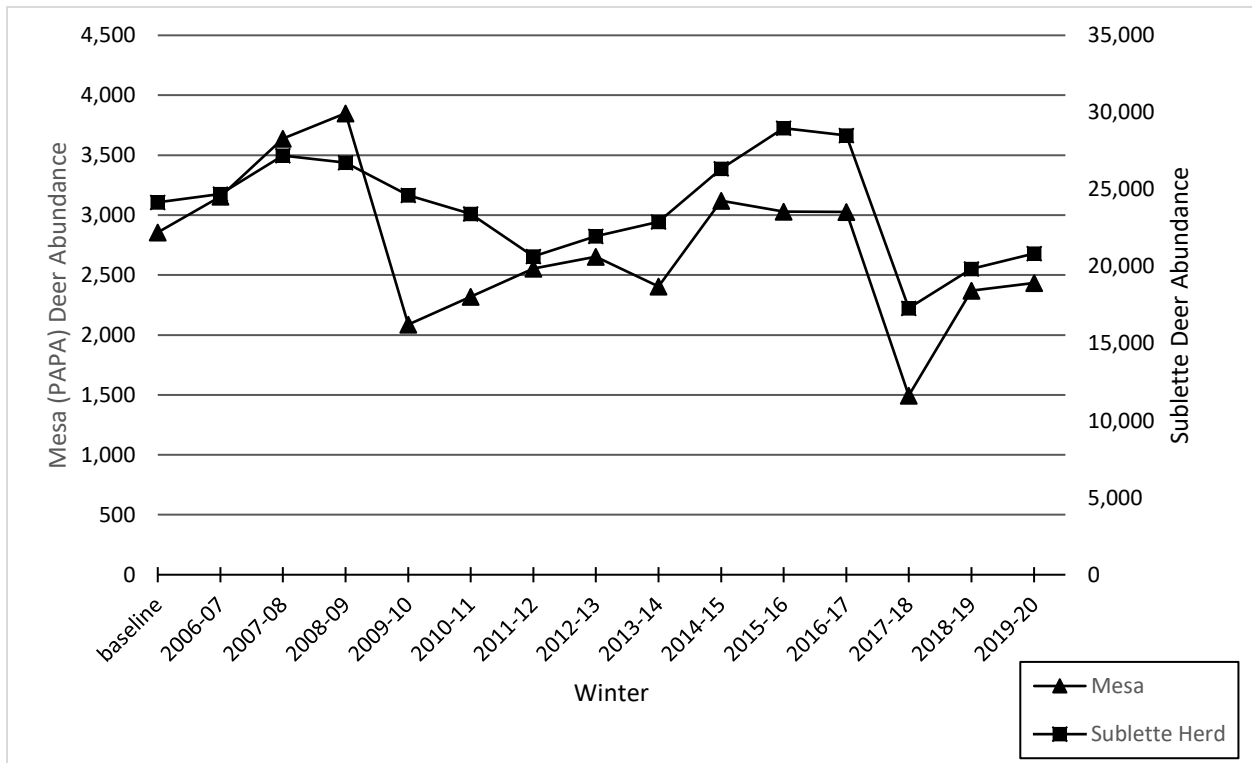


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Section I: Wildlife monitoring and mitigation matrix

Overview

With the 2008 Record of Decision for the natural gas exploration and development in the Pinedale Anticline Project Area (PAPA), the Wildlife Monitoring and Mitigation Matrix (WMMM) was developed to define parameters of PAPA mule deer (*O. hemionus*) abundances to quantitatively monitor for changes throughout development. According to the WMMM, a 15% decline in abundance in any year or cumulatively over all years relative to the Sublette herd unit's baseline average population estimates (from the winters of 2004-05 and 2005-06) would trigger mitigation responses (BLM 2008). What follows is a report on monitoring results for the winter of 2019-20, where population estimates indicate that mule deer abundance has decreased 15% on the Mesa and 14% in the Sublette herd relative to their respective baseline estimates.

Methods

From 2001 to 2017, mule deer abundance was estimated on the Mesa portion of the PAPA using helicopter surveys based on Freddy et al. (2004) in a 68mi² area of core mule deer winter range. From 2001 to 2010, 50% (n=34) of the quadrats were flown, then were increased to 46 quadrats flown identically from 2010 to 2017 to increase precision (Sawyer 2018). Equations from Thompson et. al (1998) were used to calculate abundance and variance estimates. Updated Mesa mule deer estimates were then compared to baseline abundance estimates to determine rate of change. Rate of change for the Sublette reference herd was also calculated for the same periods and compared to Mesa results to determine if the 15% change threshold had been met as defined in the ROD (BLM 2008). Beginning in 2007, 33 quadrats were delineated on the Ryegrass-Soapholes reference area west of the PAPA, and 23 of the 33 quadrats were identically surveyed every year in the same manner as the Mesa quadrats. Surveys continued to be conducted annually according to methods developed by Sawyer in this area because GPS collar data indicated rare intermixing of Ryegrass-Soapholes and Mesa mule deer during the survey periods (2018).

Beginning in 2018, survey methods were changed from helicopter surveys to aerial infrared technology to increase count accuracy, reduce wildlife disturbance, increase safety and decrease costs (Sawyer 2018). 2020 surveys were conducted by Owyhee Air Inc. from February 4 to February 8 by fixed-wing aircraft 2,000 feet above the ground at 100mph between 7-11am and 2:30-6pm when conditions permitted. The aircraft surveyors flew ¼ mile transects over the 45,700 acres of the PAPA Deer Treatment area and the 30,700 acres Ryegrass-Soapholes reference area, recording video, real time counts, and geographical coordinates of mule deer groups they observed (Figure 1). During the survey period, Ryegrass-Soapholes and PAPA mule deer rarely intermix, so there is less risk of counting the same individuals in both places (Sawyer 2018). Updated Mesa and Ryegrass-Soapholes mule deer estimates were then compared to baseline abundance estimates to determine rate of change. Rate of change for the Sublette reference herd was also calculated for the same periods and compared to Mesa results to determine if the 15% change threshold had been met as defined in the ROD (BLM 2008).

Sublette herd abundance estimates were provided by Wyoming Game and Fish Department (WGFD).

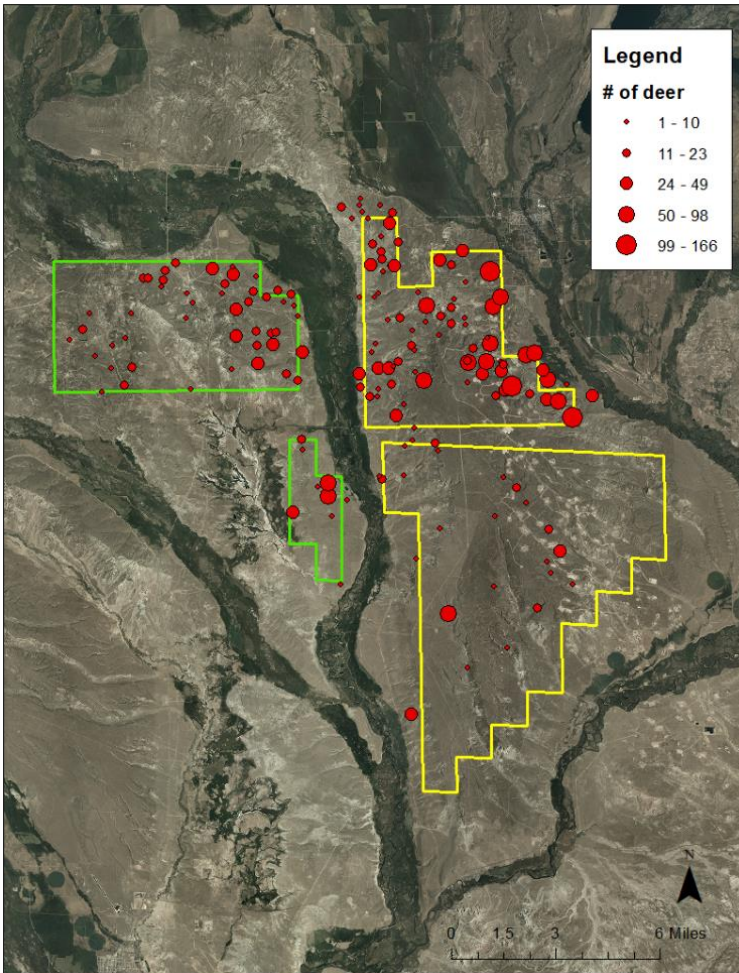


Figure 1. Deer detections in February 2020 survey – Display includes delineations of PAPA and reference survey areas. Groups of deer are depicted by 163 circles that increase in size with the number of deer counted in each group.

Results

Mesa vs Sublette herd

According to the WMMM, the baseline Mesa abundance was 2,856 mule deer, calculated by averaging the estimates of winters 2004-05 (2,818) and 2005-06 (2,894). The baseline abundance for the “reference” Sublette herd originally was 27,254, but, was updated in 2013 after WGFD changed population models, resulting in the Sublette baseline estimate as 24,165 (average of winters 2004-05 and 2005-06).

Infrared flights conducted by Owyhee Air Inc. in early February of 2020 indicated the number of mule deer present in the PAPA was 2,435. This represents a 15% decline over the baseline of 2,856. The 2020 Sublette reference population estimate was 20,846, which represents a 14% decline over the baseline of 24,165 (Table 1). Mesa herd abundance experienced a 3% increase in winter 2019-20 (2,435) from winter

2018-19 (2,369), and the Sublette reference herd abundance increased 5% in the same period (20,846 from 19,838). Therefore, relative to the baseline and to the Sublette estimate, the threshold of a 15% decline cumulatively over all years was not exceeded during this monitoring year for Mesa mule deer. Both herds’ abundances experienced increases from the last monitoring year (2018-19), indicating the 15% decline threshold was not met in the past year.

Winter	Mesa			Sublette Herd Unit			Relative % Change	Threshold Exceeded?
	Estimate	SE	% Change	Estimate	SE	% Change		
baseline ^a	2,856	n/a	baseline	24,165	n/a	baseline	n/a	baseline
2006-07	3,156	470	10%	24,699	n/a	2%	8%	NO
2007-08	3,638	424	27%	27,200	n/a	13%	14%	NO
2008-09	3,850	322	35%	26,732	n/a	11%	24%	NO
2009-10	2,088	325	-27%	24,630	n/a	2%	-25%	YES
2010-11	2,318	212	-19%	23,426	n/a	-3%	-16%	YES
2011-12	2,553	210	-11%	20,652	n/a	-15%	4%	NO
2012-13	2,652	220	-7%	21,969 ^b	n/a	-9%	2%	NO
2013-14	2,405	243	-16%	22,900	n/a	-5%	-11%	NO
2014-15	3,121	325	9%	26,337 ^c	n/a	9%	0%	NO
2015-16	3,030	266	6%	28,976	n/a	17%	-14%	NO
2016-17	3,027	192	6%	28,509	n/a	16%	-10%	NO
2017-18 ^d	1,495	n/a	-48%	17,299	n/a	-28%	-20%	YES
2018-19	2,369	n/a	-17%	19,838	n/a	-18%	1%	NO
2019-20	2,435	n/a	-15%	20,846	n/a	-14%	-1%	NO

Table 1. Mule deer abundance estimates, standard errors (SE), and percent change for Mesa and Sublette herds- baseline winter through winter 2019-20 (baseline to winter 2017-18 table values based on findings by Sawyer (2018)). Mitigation thresholds were met in winters 2009-10, 2010-11, and 2017-18.

a Original ROD used 2,856 as Mesa deer baseline from averaging 2004-05 and 2005-06 winters (BLM 2008)

b WGFD switched from POP2 model to spreadsheet model (Sawyer 2008)

c Sublette herd expanded to include hunt area 131 (Steamboat) by WGFD, population estimation methods unchanged

d PAPA and Reference mule deer surveys changed from helicopter to aerial infrared surveys

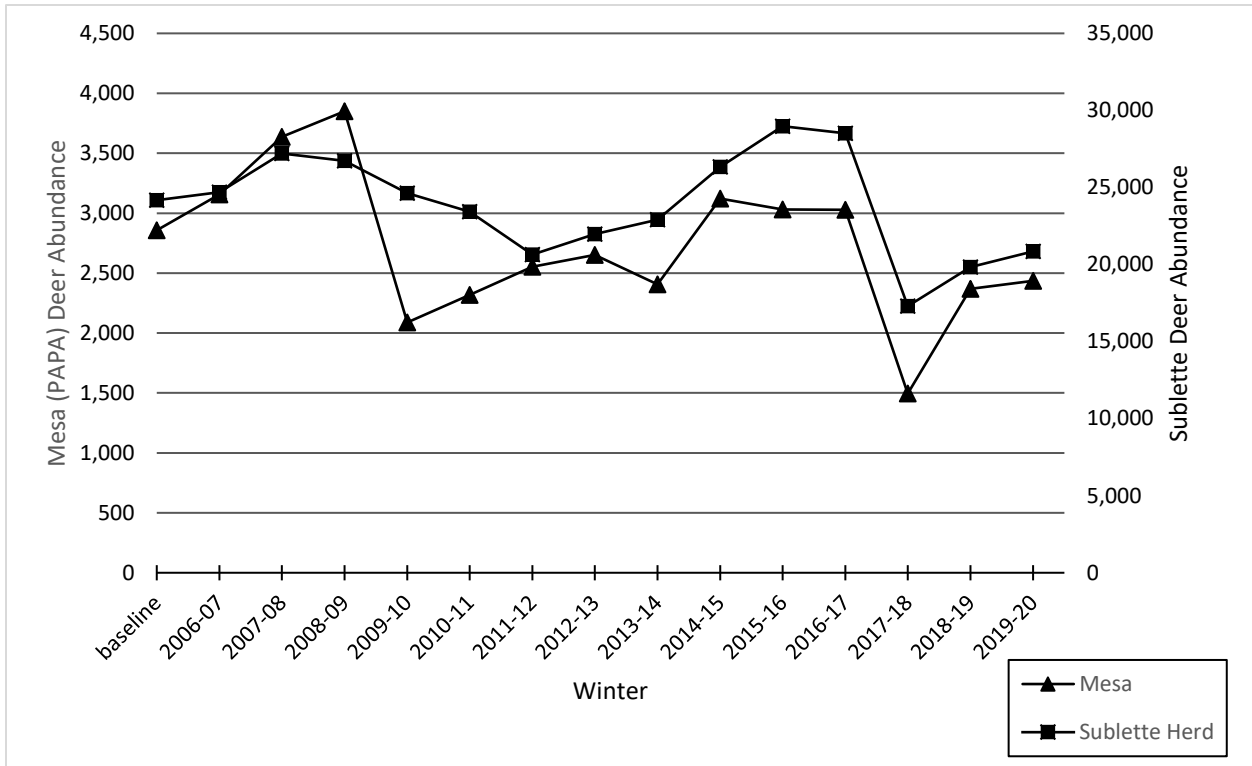


Figure 2. Mule deer abundance estimates for the Mesa herd on the PAPA and the Sublette reference herd. Both herds have generally decreased in abundance over time from the baseline winters to winter 2019-20.

Mesa vs Ryegrass herd

Surveyors counted 859 deer in the Ryegrass-Soapholes reference area in February 2020. This represents an 899% increase in abundance since the 2006-07 surveys began (Table 2). Refer to Sawyer (2018) for descriptions of previous surveys and results for Ryegrass-Soapholes abundance estimations.

Winter	Ryegrass-Soapholes	
	Estimate	SE
2006-07 ^a	86	237
2007-08	1,106	260
2008-09	1,862	249
2009-10	2,223	201
2010-11	1,109	180
2011-12	1,727	165
2012-13	1,210	92
2013-14	1,547	138
2014-15	2,606	339
2015-16	1,573	136
2016-17	890	89
2017-18 ^b	837	197 ^c
2018-19	1,118	n/a
2019-20	859	n/a

Table 2. Ryegrass-Soapholes reference area abundance estimates over time from winter 2006-07 to 2018-19. Abundances have been dynamic but generally been in a positive trend.

a Values from 2006-17 to 2017-18 based on Sawyer (2018)

b Mesa and Ryegrass surveys changed to aerial infrared surveys from helicopter surveys

c Average SE of previous 5 years (Sawyer 2018)

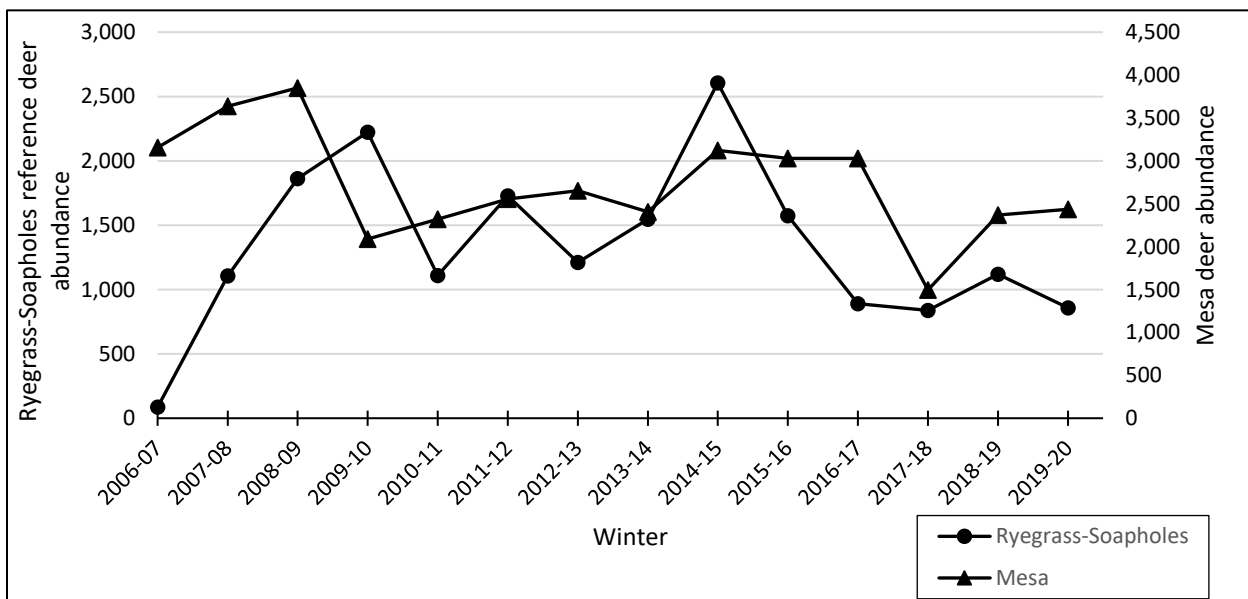


Figure 3. Graph of Ryegrass-Soapholes reference area and Mesa deer abundance estimates over time from winter 2006-07 to 2019-20. Ryegrass-Soapholes abundances have been dynamic but generally been in a neutral trend. Mesa deer abundances have also been dynamic, but trend has generally been negative.

Discussion

The Sublette herd experienced about average fawn mortality during the 2019-20 winter at 37%. Overwinter fawn loss may be returning to a more stable rate after the impacts of the severe winter of 2016-17 (81% fawn mortality). Subsequent winters (2017-18, 2018-19) have seen fawn mortalities have a more dynamic nature (8% and 50%, respectively).

Aerial infrared flight surveys from the winters of 2017-2018 and 2018-19 indicated net changes in PAPA deer numbers relative to the Sublette herd were 20% and 1%, respectively. In the same respective winters, the PAPA deer herd experienced 48% and 17% declines compared to their baseline population estimate. The 2017-18 survey results indicated a WMMM trigger had been met (Table 1), likely a remnant of the severe 2016-17 winter that caused exceptionally high mortality in the Sublette deer population (Sawyer 2018). No mitigation trigger was met in winter 2019-20.

Counting conditions have varied across the winters of 2017-18 to 2019-20. The 2017-18 winter had less snow than 2018-19 and 2019-20, and the 2018-19 winter had more snow than 2019-20 during surveys. Although snow depth was lower in the 2019-20 survey than the 2018-19 survey, observers noted survey temperatures were far lower in February 2020. The population's recovery from the severe 2016-17 winter and milder snow conditions may contribute to the higher numbers of deer and greater number of deer groups in the survey area.

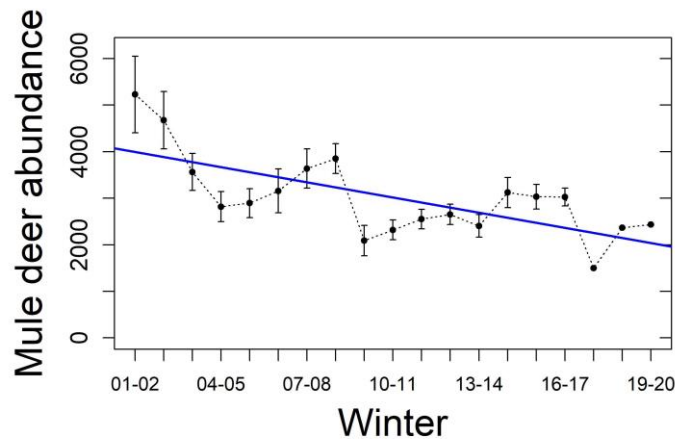


Figure 4. PAPA mule deer abundance estimates (\pm SE) and 19-year trend line (blue; -47% since 2001-02). Note the 17/18, 18/19, 19-20 year abundances have no SE as they are considered censuses.

In general, both the Mesa (PAPA) deer and Sublette reference herd abundances have declined over time since baseline estimates (Figure 2). The Mesa mule deer population has been declining overtime from the winter 2001-02 abundance estimates to most recent estimates in 2020 with a -47% trend (Figure 4). Comparatively, the Ryegrass-Soapholes deer abundances have been dynamic with no distinct trend (Figure 3).

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