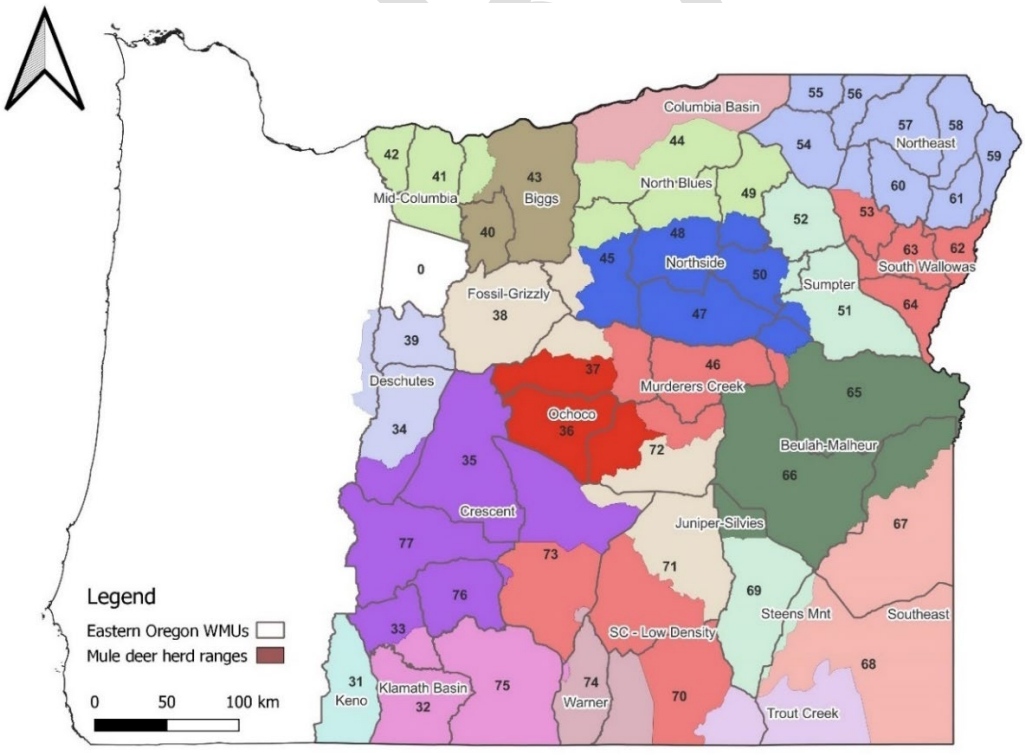
Appendix 1A. Management Objectives

Oregon Department of Fish and Wildlife (ODFW) recently completed efforts identifying 22 herd ranges for mule deer in eastern Oregon (ODFW 2022). Biological data previously collected at the Wildlife Management Unit (WMU) scale often included multiple populations or portions of larger populations and did not synchronize well with other management practices such as allocation of harvest or established management objectives. Consequently, ODFW is re-structuring management objectives (population and buck:doe) to align with these biologically meaningful boundaries (Figure 1).

Population management of mule deer boils down to strategies to increase, decrease, or maintain numbers within biological and social carrying capacity. While social pressures may strive for overly high population objectives, it is important to consider the biological carrying capacity of the habitat along with the spatial and temporal scale over which objectives will be set. Unachievable objectives can erode public support for the agency and local personnel as it may appear the agency is failing to manage mule deer populations properly. Because mule deer population dynamics differ in response to long-term trends in habitat, weather, climate, and local conditions, objectives need to be tailored to the appropriate time frame and spatial scale of specific populations, and should be realistic, measurable, and attainable (Mule Deer Working Group 2018).

Figure 1. Twenty-two herd ranges developed from mule deer collar data overlaid on current Wildlife Management Unit boundaries.



Population objectives

As outlined in Issue #5 of the harvest management section (Chapter 9) of the mule deer plan, ODFW will incorporate population growth rate (lambda) into management objectives at the herd range scale. The goal of the proposed changes is to allow assessment of how management actions are influencing mule deer population performance within a herd range, and to provide guidance on how to prioritize allocation of resources to improve underperforming herd ranges. This new system considers both population size as well as population trajectory (e.g., is a population increasing or decreasing and how fast or slow) when assessing herd range performance.

The proposed management criteria utilizes a tiered approach using both current mule deer population size and % annual change over a 5-year period (i.e., population growth rate) within the herd range (Figure 2a). Both categories used to assess herd range performance (i.e., population size and population growth rate) are comprised of 4 tiers with Tier 1 reflecting herd ranges with the highest level of management concern based on either current population size and/or the rate at which the population is declining. Herd ranges in Tier 4 for population size and/or rate of population growth would have the lowest level of management concern. Herd range population estimates, based on results from an Integrated Population Model (IPM), will be used to score herd ranges from 1 to 4 based on which population tier that estimate falls within. Similarly, average annual herd range population growth rates over the previous 5 years will be used to score herd ranges from 1-4 based on the average annual change during that time frame. A scoring matrix will then be used to assign herd ranges to one of four categories: 1) high concern, 2) medium concern, 3) low concern, or 4) least concern (Figure 2B). A herd range that falls into Tier 1 of the population size or population growth rate may not necessarily have a combined score indicating high concern. For example, a currently small population size (i.e., Tier 1) may be experiencing rapid population increase (i.e., Tier 4) and would indicate current conditions and management actions are contributing to population growth. In contrast, a herd range that may be at Tier 4 of population size, but may be declining rapidly (i.e., Tier 1 population growth), may not have the highest level of management concern because this population may be at carrying capacity or management actions (e.g., doe harvest) may be contributing to population declines. Utilizing the combined score of current population size in conjunction with the population growth rate allows flexibility in determining population performance and prioritization of resources to benefit populations of greatest concern.

Population size tiers are structured to represent benchmarks above the Tier 1 category, with Tier 2 representing populations 1-25% larger than Tier 1, Tier 3 representing populations 26–50% larger than Tier 1, and Tier 4 representing populations >50% above Tier 1. The Tier 4 estimate is not meant to

represent an upper population cap or biological carrying capacity, but rather where a herd would be sufficiently large to have low levels of management concern and represents realistic increases that could occur over the next 20 years based on population growth rates currently observed in Oregon. To be sure, populations may be allowed to become substantially larger than the minimum population required to be in Tier 4 and this should not be viewed as a population cap or maximum population size.

Growth rate tiers reflect average annual change in population size over the previous 5 year and not overall percent change over the previous 5 years. These tiers are structured such that Tier 1 indicates populations experiencing rapid declines, Tier 2 indicates slow declines to stable populations, Tier 3 indicates slowly increasing populations, and Tier 4 indicates populations that are increasing quickly.

This system will provide greater flexibility in assessing management actions by considering both population size and trend when assessing the success of management actions. For example, it is unlikely that herd ranges currently experiencing rapid declines will reach the Tier 4 population benchmark in the short-term, however, short-term goals and management actions may slow population declines and move that herd range growth tier from a Tier 1 (rapid declines) to Tier 3 (modest increases) category. In this case, the reasons for population declines have been addressed and the population is trending in a direction that will allow the population to eventually reach a Tier 4 population size. Additionally, this system facilitates more effective ranking of herds when allocating limited resources and prioritizing management actions. This ranking system was used to score all 22 herd ranges in Oregon based on 2022 population estimates and the past 5-year average population growth rates (Table 1). Currently, all herd ranges in Oregon rank as a Tier 1 or 2 for population size. Herd range population growth tiers range from 1 to 4. No herd ranges in Oregon are currently ranked as least concern, one herd range is of low concern, and all remaining herd ranges are of medium to high concern (Table 1).

Buck management objectives

In addition to population management objectives, ODFW is re-structuring buck management objectives to the herd range scale (Table2). Similar to population objectives, the goal is to help ensure consistency across both the harvest season and other data collection efforts (e.g., fall herd comp). Where possible, ODFW has attempted to maintain similar buck:100 doe objectives previously defined at the Wildlife Management Unit scale. The main difference is removal of the previous 12 bucks:100 does objective and moving to either 15, 20, or 25 bucks:100 doe objective (Table 2). Buck objectives are meant to be targets not floors. Modelled 3-year buck ratios from the IPM will be used to assess how well each herd range is performing relative to target objectives. Modelled ratios are used to reduce the amount of variation that can occur due to weather conditions and sample distribution or effort. The 3-tiered structure

Figure 2. A) Population objective tiers criteria for mule deer in Oregon using current population size and average 5-year change in population size, and B) scoring matrix used to assign herd ranges to one of four categories going from High concern to Least concern. The individual Tier scores for the population size and growth rates are summed and cross-walked to determine the relative herd range management objective (i.e., high concern, medium concern, low concern, least concern).

Management Criteria

A)

	Tier 1	Tier 2	Tier 3	Tier 4
Population	Heightened concern	1-25% above Tier 1	26-50% above Tier 1	>50% above Tier 1
% Annual change over 5 years	≤ -3%	≤ -2% to 0%	.01% to 3%	> 3%

Scoring Matrix

B)

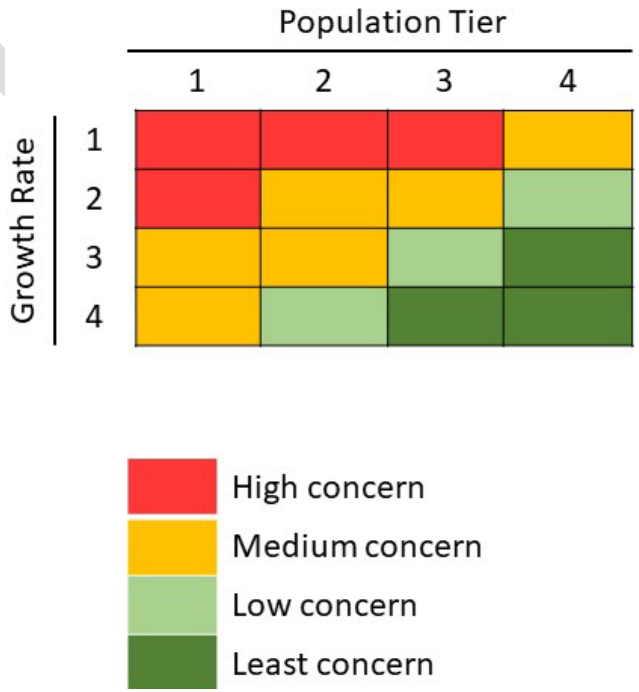


Table 1. Twenty-two mule deer herd ranges across eastern Oregon with 2022 population estimates developed from an Integrated Population Model (IPM), 5-year growth rates, 4 population and growth rate tiers, and overall scores (see management criteria inset above).

Herd Range	2022 Population	Average annual population change over 5-years	Tier 1	Tier 2 1-25%	Tier 3 26-50%	Tier 4 >50%	Pop. Tier	Growth Tier	Herd Range Concern Level
Beulah-Malhuer	11292	-7%	≤ 11333	11334 to 14167	14280 to 17000	>17000	1	1	High
Biggs	10392	1%	≤ 9666	9667 to 12083	12180 to 14500	>14500	2	3	Medium
Columbia Basin	4400	1%	≤ 3999	4000 to 5000	5040 to 6000	>6000	2	3	Medium
Crescent	10542	-10%	≤ 10667	10668 to 13333	13440 to 16000	>16000	1	1	High
Deschutes	6644	4%	≤ 6333	6334 to 7917	7980 to 9500	>9500	2	4	Less
Fossil-Grizzly	8737	2%	≤ 8333	8334 to 10417	10500 to 12500	>12500	2	3	Medium
Juniper-Silvies	3752	3%	≤ 3666	3667 to 4583	4620 to 5500	>5500	2	3	Medium
Keno	2485	-7%	≤ 2333	2334 to 2917	2940 to 3500	>3500	2	1	High
Klamath Basin	7684	-2%	≤ 7333	7334 to 9167	9240 to 11000	>11000	2	2	Medium
Mid-Columbia	10428	0%	≤ 10000	10001 to 12500	12600 to 15000	>15000	2	3	Medium
Murderers Creek	7157	-4%	≤ 7000	7001 to 8750	8820 to 10500	>10500	2	1	High
North Blues	17206	-2%	≤ 16667	16668 to 20833	21000 to 25000	>25000	2	2	Medium
Northeast	17397	0%	≤ 16667	16668 to 20833	21000 to 25000	>25000	2	3	Medium
Northside	18846	-4%	≤ 18001	18002 to 22500	22680 to 27000	>27000	2	1	High
Ochoco	7667	-3%	≤ 7333	7334 to 9167	9240 to 11000	>11000	2	1	High
SC Low Density	353	-3%	≤ 332	333 to 417	420 to 500	>500	2	2	Medium
South Wallowas	13532	1%	≤ 13000	13001 to 16250	16380 to 19500	>19500	2	3	Medium
Southeast	3063	2%	≤ 2999	3000 to 3750	3780 to 4500	>4500	2	3	Medium
Steens Mtn	3691	2%	≤ 2999	3000 to 3750	3780 to 4500	>4500	2	3	Medium
Sumpter	10462	0%	≤ 10000	10001 to 12500	12600 to 15000	>15000	2	2	Medium
Trout Creek	1190	-1%	≤ 1132	1133 to 1417	1428 to 1700	>1700	2	2	Medium
Warner	2683	-9%	≤ 2533	2534 to 3167	3192 to 3800	>3800	2	1	High

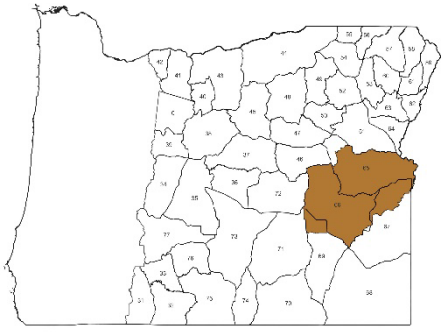
*Note all estimates are preliminary and subject to change.

represents harvest managmenet goals specific to each herd range. For example, herd ranges with 15 bucks:100 are opportunity areas that provide for the maximum number of hunters without compromising biological capabilities of the herd. In contrast, herd ranges with 25 bucks:100 does reflect areas where more mature bucks would be present, but where tag allocation and opportunities would be reduced.

Table 2. Bucks:100 does based on 3-year averages from 2020-2022 along with proposed mule deer buck management objectives for 22 herd ranges in eastern oregon.

Herd Range	3-year average	Buck MO
Beulah-Malhuer	20	15
Biggs	24	15
Columbia Basin	12	15
Crescent	17	15
Deschutes	28	25
Fossil-Grizzly	14	15
Juniper-Silvies	20	15
Keno	13	15
Klamath Basin	19	15
Mid-Columbia	20	20
Murderers Creek	16	15
North Blues	21	15
Northeast	19	20
Northside	14	15
Ochoco	15	15
SC Low Density	29	20
South Wallowas	21	15
Southeast	21	15
Steens Mtn	33	25
Sumpter	14	15
Trout Creek	34	25
Warner	22	20

Appendix 1B. Example Herd Range Detail.

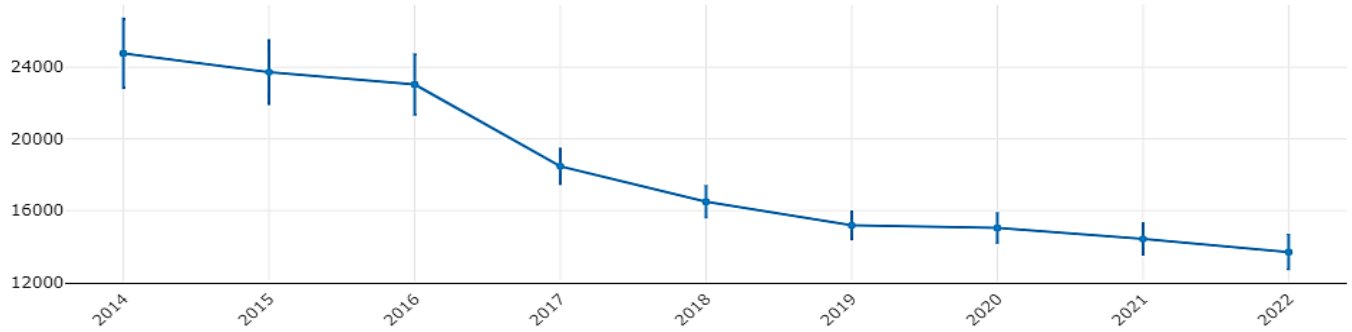


Beulah-Malheur Herd Range

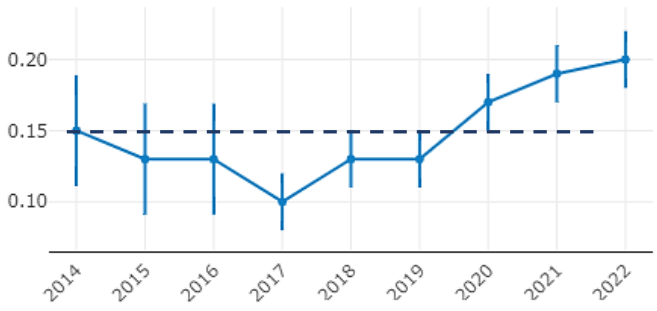
WMUs 65, 66, 67, and 69

The Beulah-Malheur Herd Range encompasses portions of four WMUs extending from the Owyhee River in WMU 67 (Owyhee) in the southeast through units 66 (Malheur River), 69 (Steens Mtn), and 65 (Beulah). Ownership is 58% federal, 38% private, and 4% state owned. Low-elevation winter range on BLM and private lands are dominated by sagebrush-steppe, mountain-shrub communities, juniper woodlands, and cultivated agriculture in the east. High-elevation summer range is dominated by mixed-conifer forests interspersed with sagebrush, and mountain-shrub communities on lands managed by the BLM and Malheur National Forests. Although summer and winter ranges can overlap, mule deer in the Beulah-Malheur Herd Range are generally migratory. Primary winter range in the Malheur River Canyon has experienced multiple large wildfires over the last two decades. This has resulted in a loss of native brush and a medusahead/cheatgrass-dominated understory throughout much of the range.

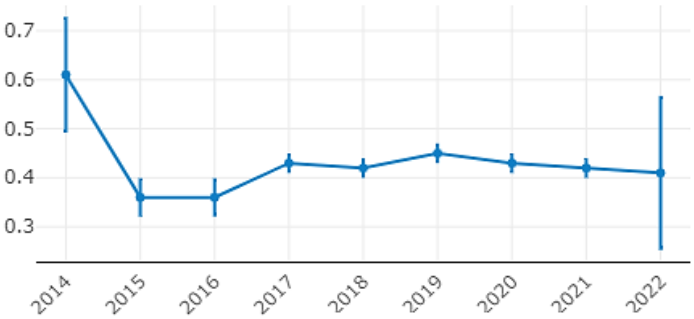
Post-harvest Abundance



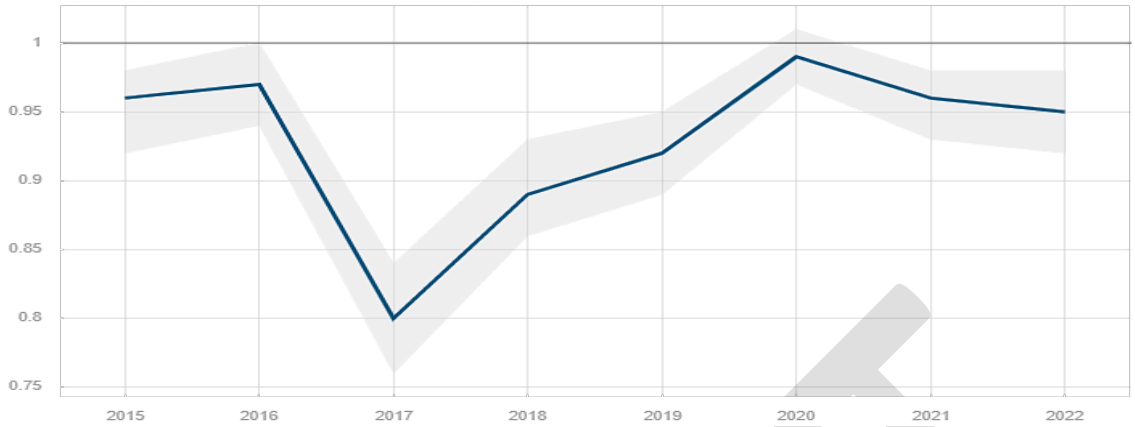
Sex Ratio (Buck MO = 15)

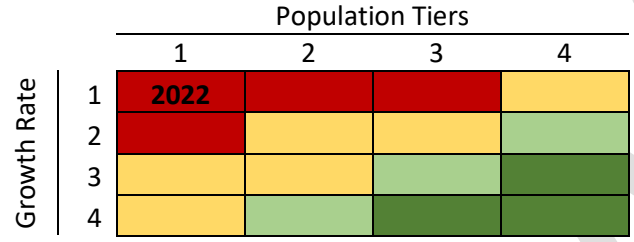


YOY: Female



Growth Rate





5-Year Growth Rate = 0.93 (Tier 1)

2022 Population = 11,292 (Tier 1)

Herd Range Concern Level = High

Management Direction	Action Items
Protect, restore, and improve key winter, summer, and transitional habitats on public and private lands	Implement and support projects that reduce invasive annual grasses and juniper encroachment and promote desirable grasses, forbs, and shrubs. Promote a mosaic of cover types across vegetation communities. For juniper, mitigate encroachment by implementing treatment prescriptions which maintain isolated patches of juniper to promote security and thermal cover. Pursue opportunities to improve mule deer winter range affected by recent wildfires across landownerships. Prioritize native shrub reestablishment in rehabilitation efforts. Pursue opportunities to enhance and protect private land winter ranges. Support BLM in maintaining feral horse Herd Management Areas at recommended population levels. Develop strategies with ODOT, the Burns Paiute Tribe, and other stakeholders to implement projects to minimize deer-vehicle collisions along Highway 20 from Harper to Juntura. Provide technical assistance and seek partnerships with land management agencies to promote early seral forage in timber harvest and fuels reduction projects on public lands. Work at a landscape scale to produce a balance of forest cover types conducive to mule deer and other ungulates. Work with county, state, and private partners on site placement and ensure best management practices are implemented to mitigate impacts from large-scale development such as mineral extraction and renewable energy development. Support riparian area restoration on public and private lands to improve ecological structure and function. Engage partners and landowners to complete projects on rivers, reservoirs, creeks, seeps, springs, and ponds. Cooperatively work to restore connectivity by protecting and enhancing mitigating migration corridors. This includes converting to or constructing wildlife-friendly fencing and removing fences that are dilapidated, no longer used, or prohibitive to ungulate movement.
Continue to implement biological investigations and monitoring to improve population and habitat management capabilities	Monitor existing adult female mule deer collars and collect survival and cause-specific mortality data to identify limiting factors to population performance. As resources are made available, pursue collaring 20-50 additional adult deer in the Northeast portion of the herd range. This would serve to fill a data gap in adult survival, movement, and habitat use in that region. Sample an appropriate number of mule deer for disease surveillance from euthanized, harvested, and roadkill deer.