2024 Status and Trend Report

Washington Department of Fish and Wildlife

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Author

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Deer

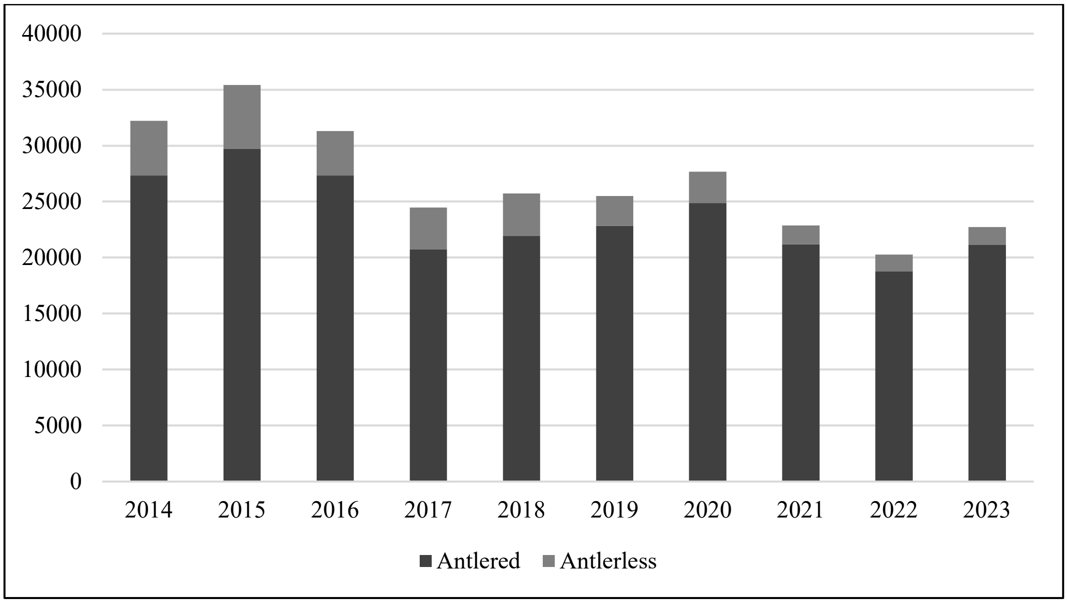
Deer Statewide Status and Trend Summary

The Department manages white-tailed deer, mule deer, and black-tailed deer populations by management zone throughout the state. The Department uses harvest statistics to monitor the status and trend of all deer populations. Some populations are also surveyed to estimate population characteristics (e.g., age and sex composition; abundance). Available funds, forest canopy cover, and habitat selection of deer dictate survey methods and frequency (e.g., aerial vs. ground surveys). Surveys are typically conducted in late summer (i.e., “pre-hunt”) to index productivity and the availability of bucks for upcoming seasons or after hunting seasons have ended (i.e., “post-hunt”) to assess buck escapement.

Statewide general season deer harvest remains lower than levels prior to 2017 (Figure 1), a year with extreme summer drought and subsequent winter conditions that depressed most ungulate populations. In 2021, hemorrhagic disease (i.e., epizootic hemorrhagic disease, bluetongue, and adenovirus hemorrhagic disease) caused significant deer mortality, notably in northeast Washington. Hemorrhagic disease outbreaks decreased abundance among all white-tailed deer zones and were a primary factor contributing to the 10-year low harvest level in 2022. Deer harvest in mule deer management zones was also lower relative to past years during this period, which is attributed to population impacts from summer drought, severe winters, and hemorrhagic disease. Further, many zones experienced unusually warm and dry autumn weather, which typically reduces hunter success. Harvest among black-tailed deer management zones is generally stable but recent declines in some zones are attributed to a hemorrhagic disease outbreak (adenovirus), reduced habitat availability or quality, and hunter access limitations. Statewide harvest in 2023 increased from the preceding year (22,724 vs. 20,281, respectively; Figure 1), which suggests growth in overall abundance and population recovery from the stressors in recent years. See the following pages for detailed zone-specific survey data, population status and trends, and discussion of management concerns.

The Department has taken proactive measures to promote population growth or stability in many management zones by reducing antlerless harvest and completing habitat enhancements on WDFW managed lands. The Department detected the first known case of chronic wasting disease in Washington from samples taken from a white-tailed deer in Spokane County in July 2024. For more information, visit the Department’s CWD website: https://wdfw.wa.gov/species-habitats/diseases/chronic-wasting.

Figure 1. Statewide general season deer harvest, 2014-2023. Washington, USA.



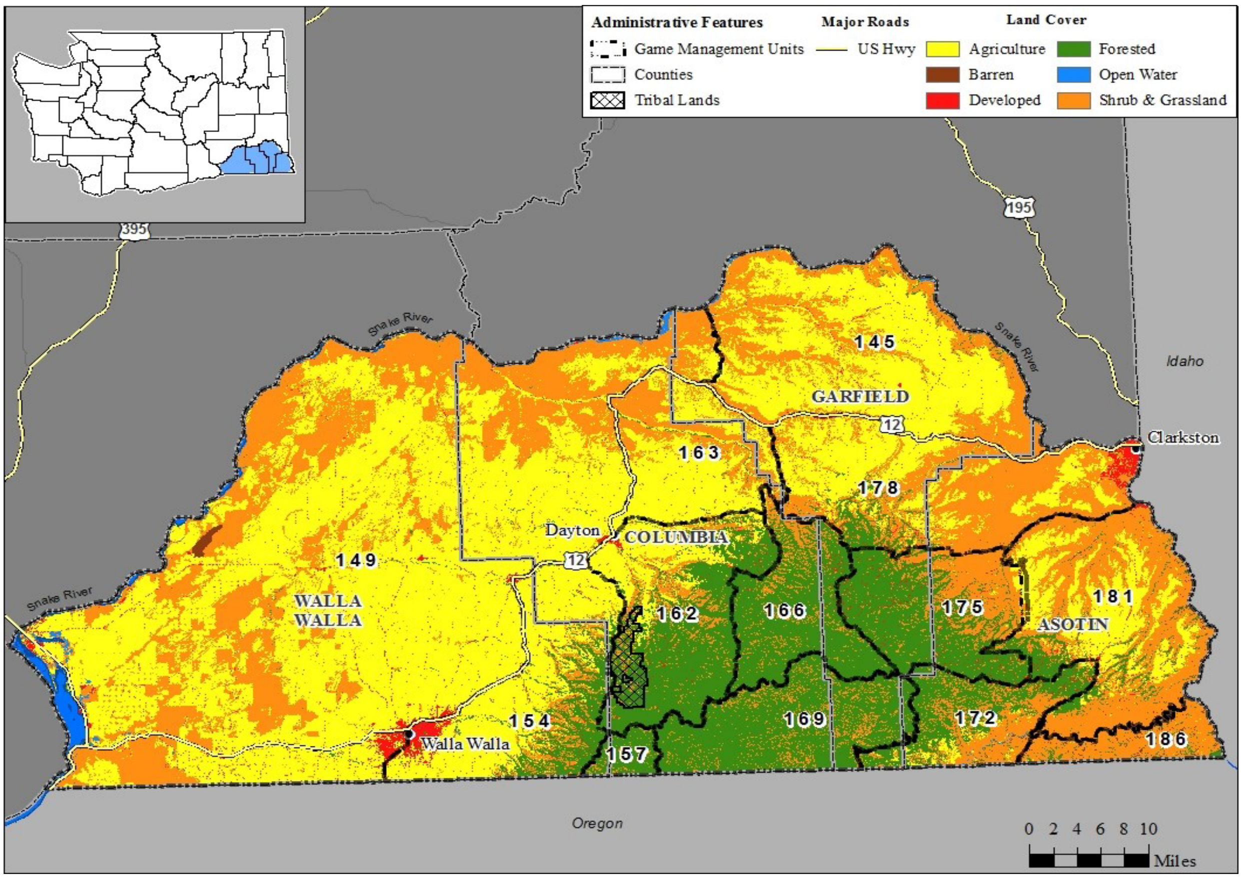
Blue Mountains Mule Deer Management Zone

Mark Vekasy, Wildlife Biologist

Introduction

The Blue Mountains Mule Deer Management Zone (MDMZ) is located in southeast Washington and consists of 13 Game Management Units GMUs (145, 149, 154, 157, 162, 163, 166, 169, 172, 175, 178, 181, and 186; Figure 1). GMU 157 is closed to human entry with no mule deer harvest opportunity.

Figure 1. Blue Mountains Mule Deer Management Zone (MDMZ).



GMUs and generalized land cover types within the Blue Mountains MDMZ.

Management guidelines and objectives

The Department's objective within this MDMZ is to maintain a stable population based on abundance and harvest estimates. Additional management objectives include managing for a post-hunt population with a sex ratio of 15-19 bucks:100 does in predominantly agricultural areas, and 20-24 bucks:100 does in predominantly public land units.

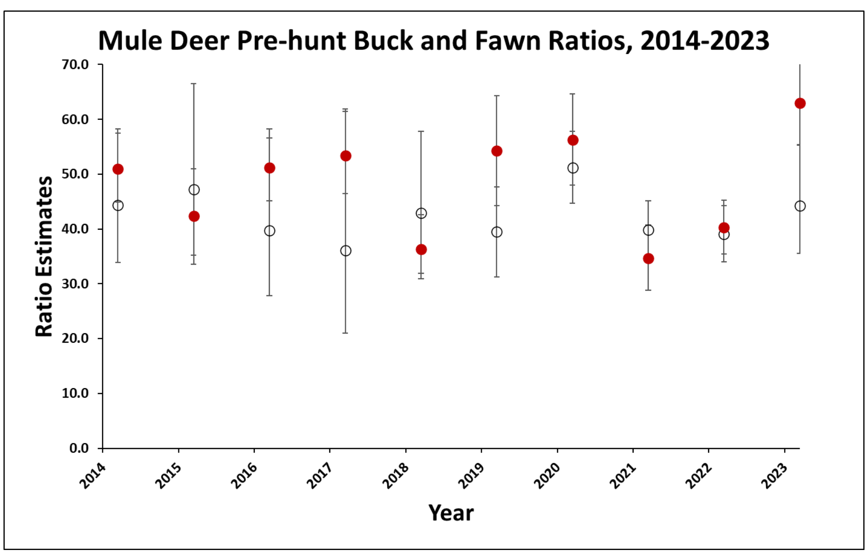
Population surveys

WDFW conducted the last two population surveys in 2017 and 2018 using sightability protocols (a procedure to estimate the population in the survey area statistically) in the area with the greatest winter mule deer concentrations. This area is generally north of State Hwy 12, from Alpowa Creek on the east side of District 3 across to Wallula Junction. These were the first surveys in the District designed to obtain a population estimate for the defined area. Although flown to sightability protocols, previous aerial surveys were not designed to obtain a population estimate and were only used to classify group composition to obtain age and sex ratios. Population estimates between 2017 and 2018 were consistent between years, equaling 18,368 deer in 2017 and 18,415 in 2018. WDFW will likely conduct future survey efforts on a 5-7-year rotation in conjunction with using integrated population models (IPM) to obtain population estimates. The use of an IPM and the types and frequency of data input required for a model is still under investigation.

Population survey details

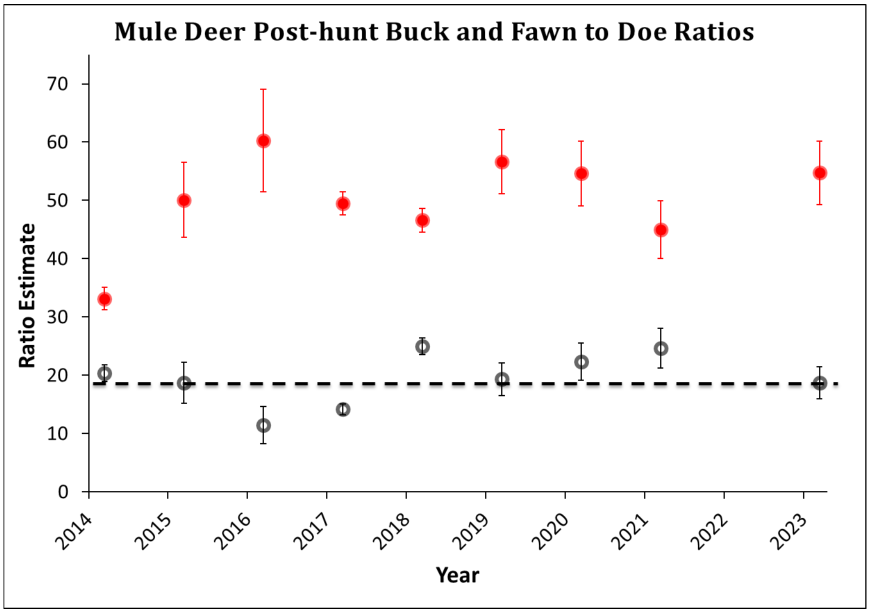
In addition to periodic population surveys, WDFW collects annual pre- and post-hunt herd composition data to monitor buck:doe ratios and fawn:doe ratios. Biologists conduct surveys for buck:doe ratios in August and Nov-Dec for pre- and post-hunt estimates, while fawn:doe surveys are conducted in September and Nov-Dec (Figures 2 and 3). Low fawn ratios observed in 2021 support the mortality of deer due to hemorrhagic disease that year, as young deer are especially vulnerable compared to some adults that may have immunity. Pre-hunt fawn ratios in 2022 were still below what WDFW biologists would like to observe but were sufficient to maintain at least a stable population, assuming good survival through the winter. 2023 pre- and post-hunt ratios returned to long-term averages, with 63 fawns: 100 does pre-hunt and 55 fawns: 100 does post-hunt.

Figure 2. Pre-hunt buck and fawn to doe ratios.



Estimates of buck (black) and fawn (red) ratios per 100 does for pre-hunt (ground-based) surveys in the Blue Mountains MDMZ, 2014–2023.

Figure 3. Post-hunt buck and fawn to doe ratios.



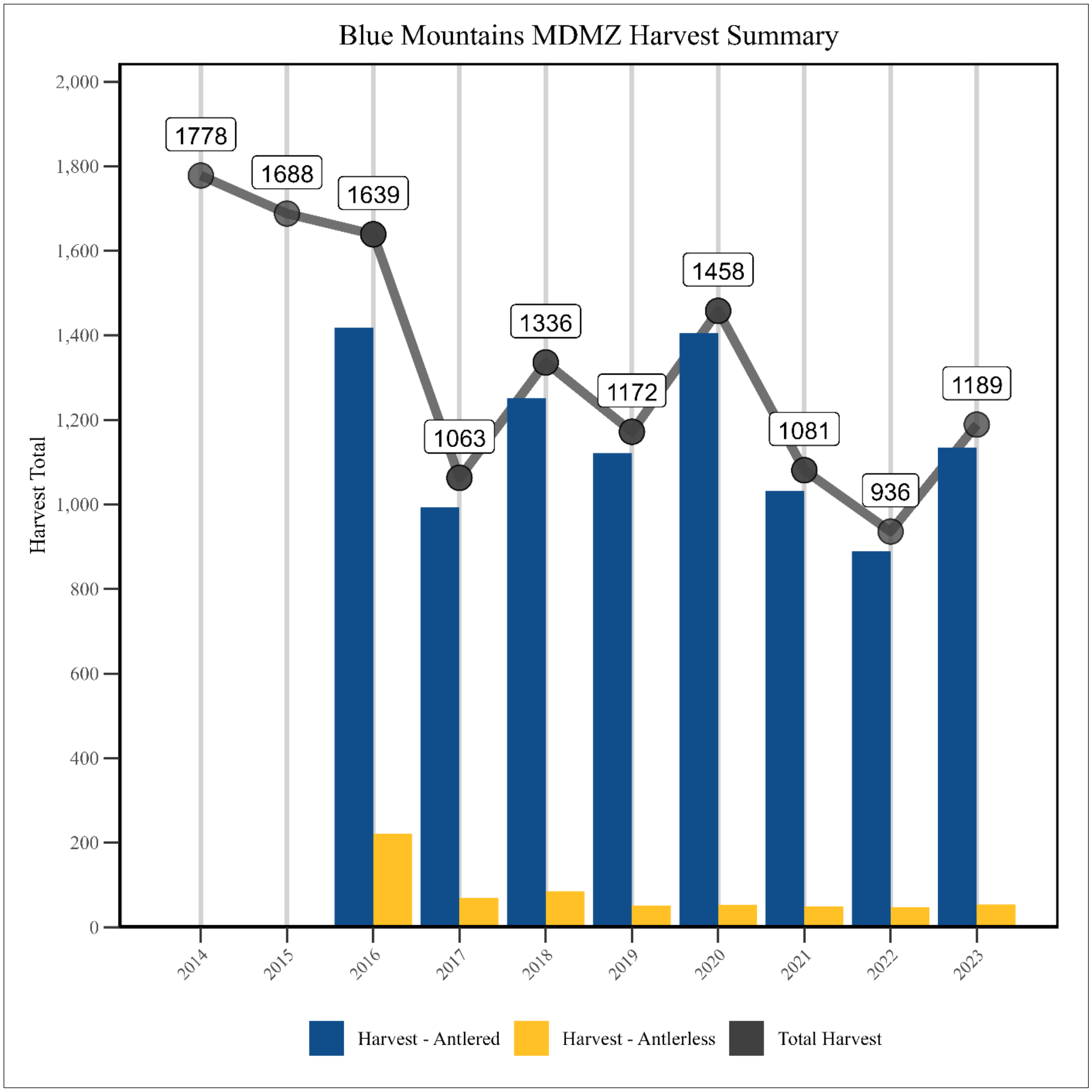
Estimates of buck (black) and fawn (red) ratios per 100 does for post-hunt (ground and aerial) surveys (no data for 2022) in the Blue Mountains MDMZ, 2014–2023. Dashed line is the upper target for post-hunt buck ratios.

Hunting seasons and recreational harvest

Harvest estimates from the 2014-2023 general seasons (Figures 4 & 5) are showing a general decline over that 10-year time frame, with only the 2020 harvest interrupting that trend. At first glance, this declining trend is alarming, but the severe decline in 2017 can be attributed to poor over-winter survival from the 2016-2017 winter season. Biologists were seeing some recovery of harvest to the mean through the 2020 season, and the low 2021 estimate can be correlated with impacts to harvest from both hemorrhagic disease in 2021 affecting deer availability and public land fire closures affecting hunter effort. The 2022 poor harvest is likely related to the deer population still recovering from the effects of hemorrhagic disease. WDFW expected very few legal-size bucks would be available for harvest following this significant disease event where nearly 15% of our radio-collared collared mule deer does died. Some effects could be related to increased mule deer antlerless permits being offered in GMUs 145 and 149, GMUs that account for the highest percentage of harvest, putting pressure on the female segment of the population. However, available antlerless permits have decreased yearly since 2017, which appears to have improved the general season harvest up until the last two years.

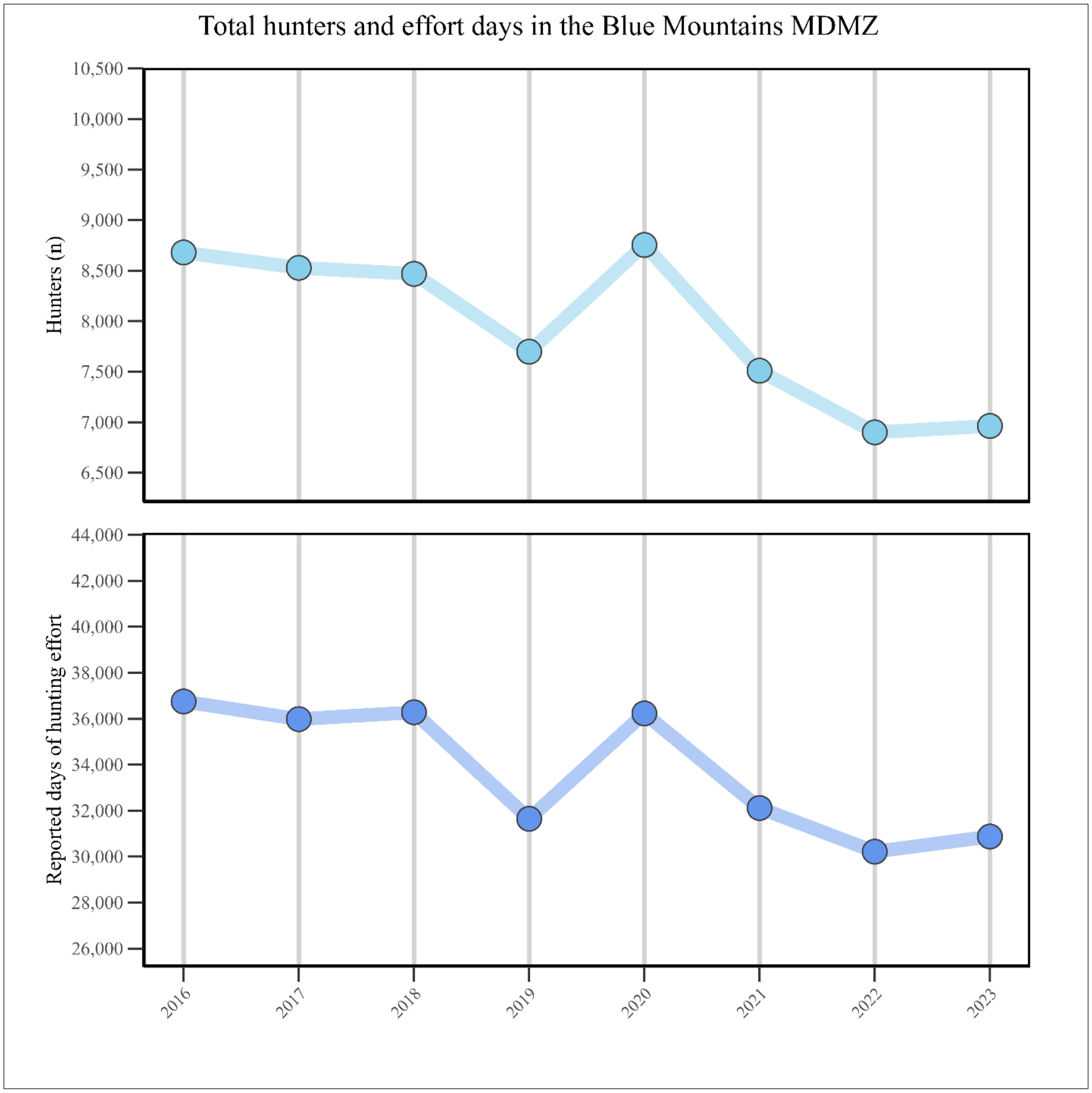
GMU 149, on average, accounts for 33% of the total District mule deer harvests, and changes in this GMU have the greatest impact on the overall trends across the District. Harvest in 2021 and 2022 showed a steep decline in both hunter success and HPUE. This GMU is almost entirely private land and was not subject to fire closures, indicating that the harvest decline can be directly correlated with the incidence of hemorrhagic disease. Mortality detections in radio-collared mule deer indicate mortality rates as high as 15%. Harvest in 2023 saw improvements in both total harvest and hunter effort, although both were still below long-term averages.

Figure 4. Mule deer harvest estimates for the Blue Mountains MDMZ.



Harvest estimates for general season buck (blue), antlerless (yellow), and total harvest (black dots) in the Blue Mountains MDMZ, 2014-2023.

Figure 5. Total hunters and effort days in the Blue Mountains MDMZ.



General season estimates for number of hunters (pale blue) and cumulative number of hunter days (blue) in the Blue Mountains MDMZ, 2016-2023. WDFW cannot generate species-specific estimates for number of hunters, days, success, etc. In most eastside GMUs, both mule deer and white-tailed deer can be hunted.

Survival and mortality

No estimates of pregnancy or survival rates have been available for mule deer herds in the Blue Mountains MDMZ. However, since 2019, biologists have been maintaining approximately 50 radio-collared does across the recent population survey area, which will yield some survival rate information, although small sample sizes may limit the usefulness of these survival estimates. The original purpose of collar deployment was to determine mule deer ranges and migratory movements across the District, not measures of survival or fecundity. Most of those collars have reached the end of their battery lifespan and have automatically dropped off. During the summer of 2021, eight collars were re-deployed after being retrieved from mortalities, but with collars dropping off, there are currently only 4 working collars on mule deer across District 3. The graduate student working with some of the mule deer telemetry data has completed their thesis, the focus of which was to analyze location data to identify migrant deer, characterize habitat associations in winter and summer ranges, and determine fawning status from a subsample of radio-collared does and characterize habitat associations with fawning locations. Overall, annual survival was 84%, the same as mule deer survival from Utah (Smedley et al., 2023) and Colorado, Idaho, and Montana (Unsworth et al., 1999). The thesis characterized 30% of the collared deer sample to be migratory, and for migrants and residents alike, grasslands and shrublands together, whether in the Conservation Reserve Program or not, were the most highly selected habitats across seasons and scales (Hellesto, 2023). Disease was the most common source of mortality, and cougars were the most common predator among predation mortalities.

In addition to hunter harvest, other potential sources of mule deer mortality include predators such as cougars, coyotes, wolves, and black bears, and to a lesser extent, bobcats, golden eagles, and domestic dogs. Collisions with vehicles, over-winter starvation, disease, and poaching can also be significant causes of mortality. While these mortality sources may influence population abundance, habitat conditions and availability likely have the greatest impacts on mule deer populations, particularly here in the Blue Mountains MDMZ, where most of the deer population is concentrated at lower elevations and is likely to be summer range limited. Summer range habitat conditions will influence population dynamics by affecting doe body condition, which will influence fawning rates and survival.

Habitat

Limited habitat is the major impediment to increasing deer numbers and hunting opportunities within the Blue Mountains MDMZ. The Blue Mountains MDMZ has been altered by landscape changes, including conversion to croplands, wildfire suppression and burning (positive and negative), road construction, invasion of noxious weeds, extensive wind power development, and urban-suburban development. Solar development is another emerging threat to habitat, with over 3,000 acres proposed for development in Garfield and Asotin Counties. Although no single factor has had a direct, large-scale effect on mule deer populations in the Blue Mountains, the cumulative impact of such alterations has likely been detrimental to mule deer habitat and populations over time.

Human-wildlife interaction

The agricultural damage prevention program managed by WDFW changed approximately ten years ago, with responsibilities being shifted from the Enforcement Program to the Wildlife Program. 2014 saw the institution of “damage tags,” which must be purchased through the licensing program. Qualifying landowners are allowed two free kill permits, with the requirement of reporting directly to the Conflict Specialist, and are the predominant tags issued in damage situations. Any additional permits are issued as damage permits requiring the landowner, leaseholder, or their designee to purchase a damage tag and report their harvest through the licensing system. Conflict biologists reported six hunters successfully filling kill permits between July 2022 and March 2023, including five mule deer does; the remaining hunter harvested a white-tailed deer doe. Four hunters reported hunting their damage tags: one unsuccessful, and three harvesting mule deer does. Most hunts occurred in GMUs 149 and 154 in areas with minimal hunting opportunities, such as in the winery and orchard areas around Walla Walla and Burbank.

Management concerns

Although recent harvest trends show a decline, population survey results in 2017 and 2018 indicated a robust population of over 18,000 mule deer in the agricultural and rangeland areas of the District, and recent harvest estimates are still higher than the lows seen during the early 2000s. While the declining trend is cause for some concern, the Department expects to see recovery in the coming years from the hemorrhagic disease outbreak if weather conditions are favorable. The biggest management concerns remain habitat alteration and the effects of extreme climatic events (i.e., drought and winter conditions). The Conservation Reserve Program (CRP) acres across the zone have probably played the largest role in sustaining the mule deer population in this agriculture-dominated landscape. Still, CRP acreages have been declining, and incidental information indicates significant acreages will be removed from the program to be farmed in the next few years. Winter range along the breaks of the Snake and Grande Ronde Rivers is probably secure in the short term. However, the expansion of wind and solar energy development, expansion of orchards and other agriculture on the south side of the Snake River, and gradual development of estates along both river valleys indicate that this range faces threats in the long term. With the majority of mule deer habitats being in private ownership, the challenges for WDFW in protecting the long-term security of mule deer in SE Washington are difficult.

Supporting the CRP program in the Farm Bill and pursuing other conservation opportunities, such as conservation easements and habitat restoration, are a few actions WDFW can undertake to maintain habitat for mule deer across the District. A portion of the mule deer reside in the mountain units, where long-term harvest trends show a generally declining population. Some of this is likely due to habitat changes brought about by fire suppression, but recent wildfire activity, controlled burns by the USFS, and forest thinning projects on State and Federal lands may help improve habitat conditions. However, population response to these habitat alterations has not been observed following large-scale fires during the past 20 years. WDFW is continuing to monitor the population's mountain segment through harvest metrics.

Management conclusions

Mule deer populations in the Blue Mountains MDMZ are currently at management objective based on the 10-year mean for post-hunt buck:doe ratio within the objective range (15-19 bucks/100 does post-hunt). Fawn:doe ratios, while highly variable throughout the different habitats of the District, remain within the range that supports a stable to increasing population (40-60 fawns/100 does), assuming good over-winter fawn survival from the time of surveys in December until spring green-up and average adult doe survival within the population. General season antlerless opportunity is very limited, and since population abundance is most sensitive to doe survival, managing antlerless permits is one of the few tools available to influence population changes. Available population survey and harvest data indicate stable populations where habitat availability and quality allow, and recent declines in harvest trends can be largely attributed to negative effects of severe weather events (reduced over-winter survival and drought-facilitated disease).

Literature cited

Hellesto, R.A., 2023. Wheat Vs. Wild: Habitat Selection, Migration, and Parturition of Mule Deer in an Agricultural Landscape. Washington State University.

Smedley DC, McMillan BR, Hersey KR, Shannon JM and Larsen RT (2023) Outcomes associated with translocation of mule deer (Odocoileus hemionus): Influence of age, release timing, and year on survival. Front. Ecol. Evol. 11:1087058. doi: 10.3389/fevo.2023.1087058

Unsworth, J.W., Pac, D.F., White, G.C. and Bartmann, R.M., 1999. Mule deer survival in Colorado, Idaho, and Montana. The Journal of Wildlife Management, pp.315-326.

Columbia Plateau Mule Deer Management Zone

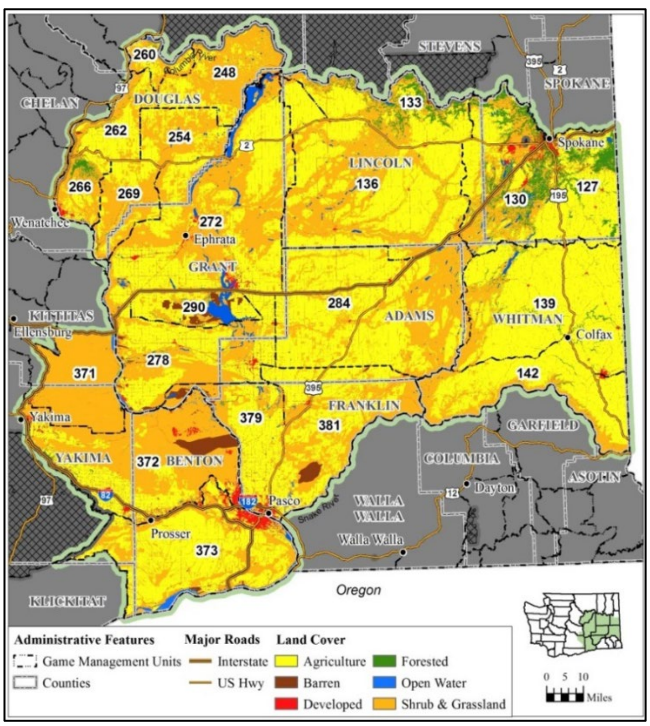
Matt Brinkman, Wildlife Biologist
Sean Q. Dougherty, Wildlife Biologist
Jason Fidora, Wildlife Biologist
Emily Jefferys, Wildlife Biologist
Johnna Eilers, Wildlife Biologist
Paula Clemens, Wildlife Biologist
Carrie Lowe, Wildlife Biologist

Introduction

The Columbia Plateau MDMZ is in central-eastern Washington and consists of 21 Game Management Units GMUs (127, 130, 133, 136, 139, 142, 248, 254, 260, 262, 266, 269, 272, 278, 284, 290, 371, 372, 373, 379, and 381;Figure 1).

This MDMZ is dominated by a mix of uncultivated shrubs, grassland, and agriculture. Crops consist of a mixture of dryland and irrigated farming. Dryland crops are predominantly wheat, while irrigated crops are much more diverse, including crops commonly foraged by mule deer such as orchards, wheat, alfalfa, and corn. This MDMZ encompasses about 16,500 square miles, and approximately 3,000 (18%) are in state and federal ownership, much of which is open to public hunting.

Figure 1. Columbia Plateau Mule Deer Management Zone (MDMZ).



GMUs and generalized land cover types within the Columbia Basin MDMZ.

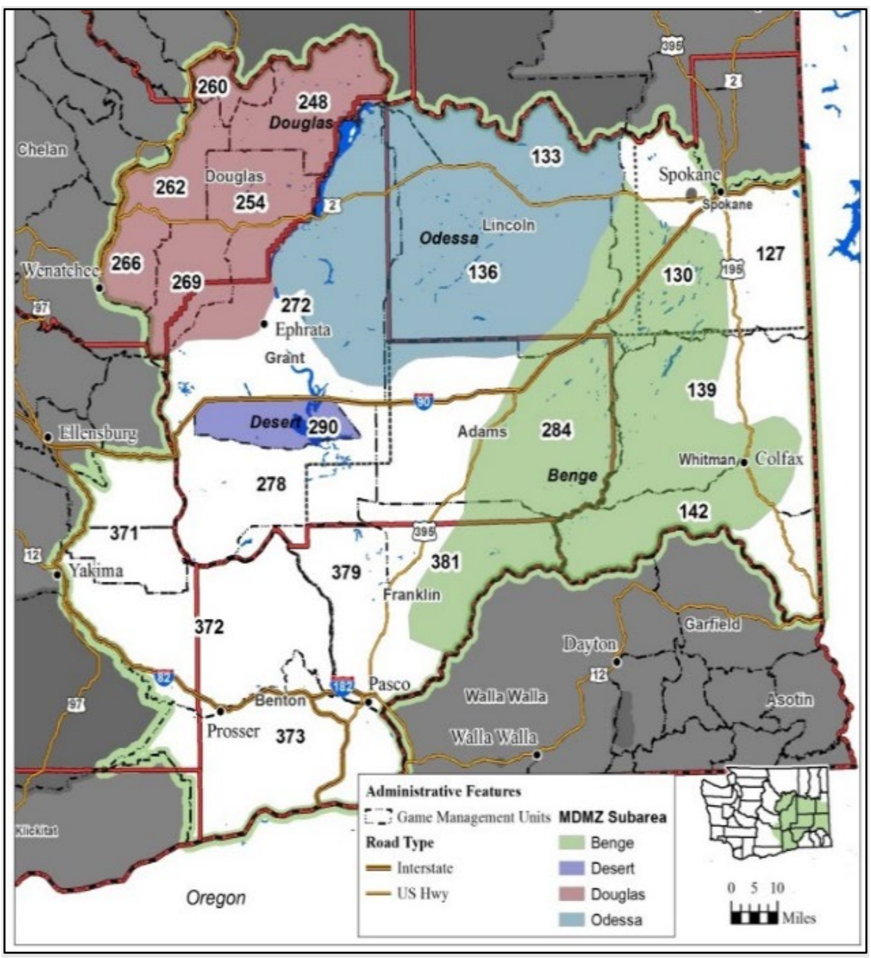
Management guidelines and objectives

The Department's objective within this MDMZ is to maintain a stable population. Population status is evaluated using abundance surveys and harvest trend data. Additional management objectives include managing for a post-hunt population with a sex ratio of 15-19 bucks per 100 does. Quality Deer hunts in the Desert Subarea (GMU 290) are the exception. Post-hunt population management objectives are for a sex ratio of 30 bucks per 100 does, which is maintained via limited-entry drawing permit opportunities.

Population surveys

Mule deer are at varying densities throughout most of the Columbia Plateau MDMZ. The highest densities are seasonally associated with irrigated cropland with adjacent shrub-steppe or riparian habitat, and the lowest densities are associated with large monotypic blocks of either dryland agricultural crops or uncultivated ground. While no estimates of mule deer abundance exist for the entire zone, estimates are available for portions of this MDMZ where higher densities occur (Figure 2). These subherds loosely represent expected population segments within this MDMZ.

Figure 2. Sub-herd areas for Columbia Plateau MDMZ.

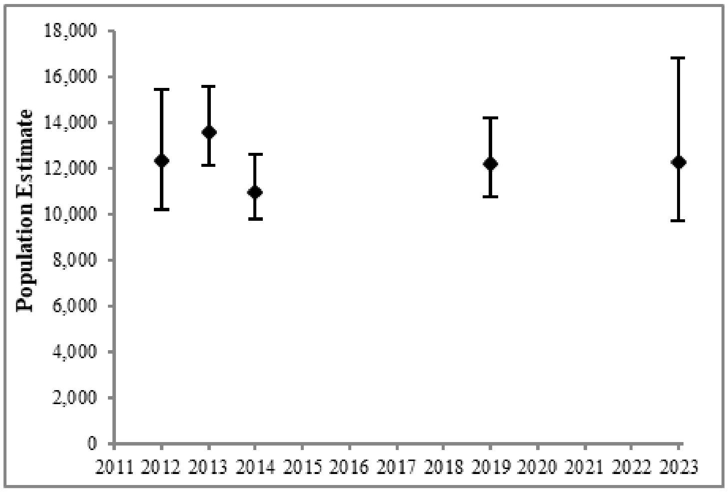


Subherd area boundaries for post-hunt aerial mule deer population surveys in the Columbia Plateau MDMZ.

Odessa subherd

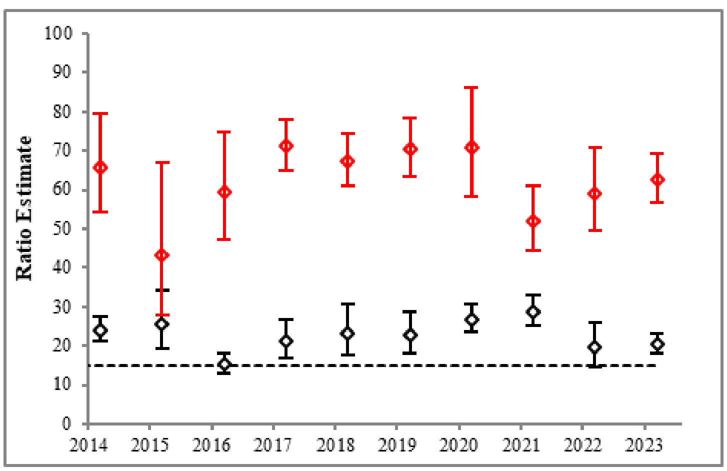
Odessa Subherd population estimates from aerial sightability surveys conducted from 2012-2014, 2019, and 2023 resulted in population estimates ranging from 10,980 to 13,582 deer (Figure 3). Buck-to-doe ratios based on annual ground surveys have been at or above management objectives every year for the past ten years, except 2016, but most bucks observed are yearlings (Figure 4). The decline in buck-to-doe ratios observed in 2016 is likely due to the low recruitment of fawns from 2015, which was associated with drought conditions. The post-season buck population is highly dependent on yearlings. Fawn-to-doe ratios based on ground surveys have been ≥60 fawns per 100 does, except in 2015 and 2021 (Figure 4). The low fawn-to-doe ratio in both years was likely due to severe drought, which reduced fawn survival.

Figure 3. Aerial mule deer surveys of the Odessa Subherd.



Abundance estimates and 90% confidence intervals from aerial mule deer surveys of the Odessa Subherd in the Columbia Plateau MDMZ, 2012-2023.

Figure 4. Ground-based surveys of the Odessa Subherd.

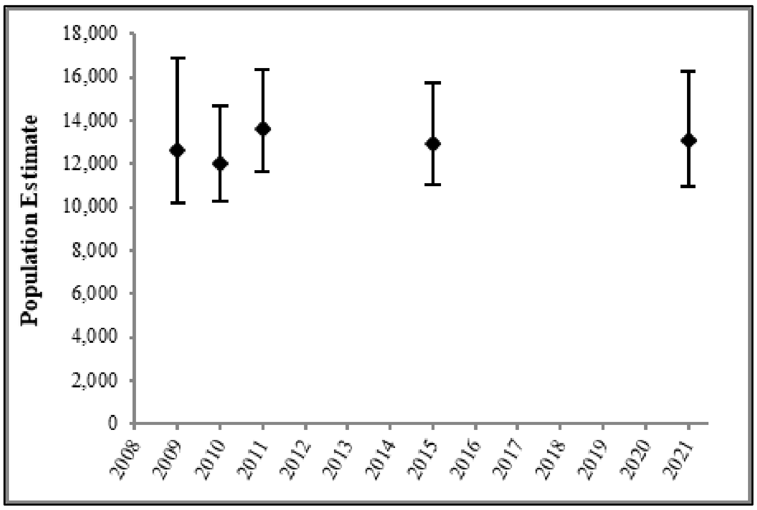


Fawn:doe (red) and buck:doe (black) ratio estimates and 90% confidence intervals from ground-based surveys of the Odessa Subherd in the Columbia Plateau MDMZ, 2014-2023.

Benge subherd

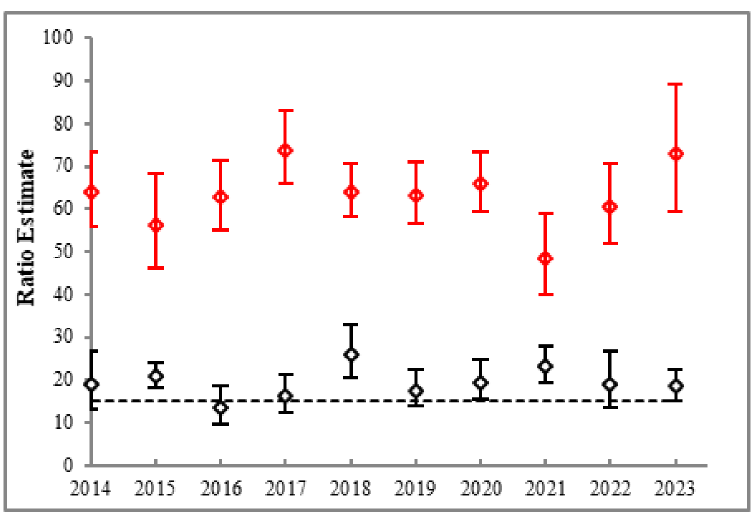
Benge Subherd population appears to be relatively stable; estimates from aerial sightability surveys conducted from 2009-2011, 2015, and 2021 have ranged from 11,990 to 13,589 (Figure 5). Estimates of buck-to-doe ratios based on ground surveys have been at or above management objectives every year except in 2016 (Figure 6). However, like the Odessa Subherd, most bucks observed were yearlings. Fawn-to-doe ratio estimates based on ground surveys have remained relatively stable, with a 10-year average of 63 fawns per 100 does (range = 48–74; Figure 6). The low points of 2015 and 2021 are likely due to reduced fawn survival caused by severe drought conditions.

Figure 5. Aerial mule deer surveys of the Benge Subherd.



Abundance estimates and 90% confidence intervals from aerial mule deer surveys of the Benge Subherd in the Columbia Plateau MDMZ, 2009-2021.

Figure 6. Ground-based surveys of the Benge Subherd.

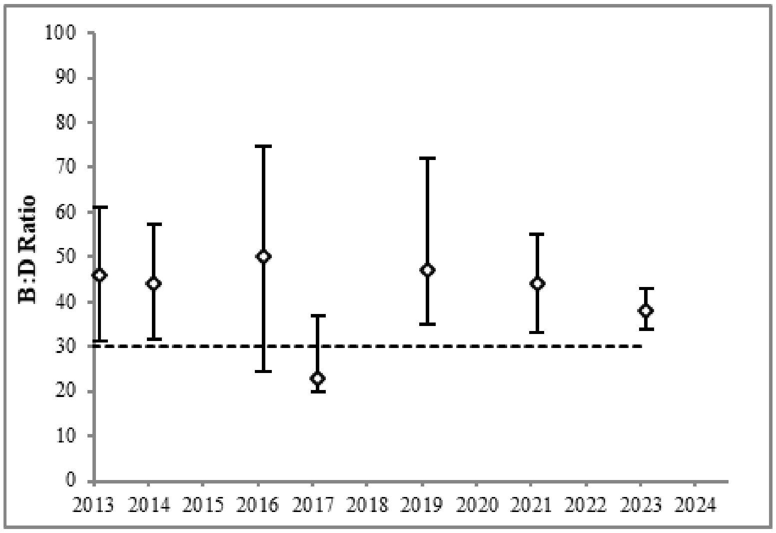


Fawn:doe (red) and buck:doe (black) ratio estimates and 90% confidence intervals from ground-based surveys of the Benge Subherd in the Columbia Plateau MDMZ, 2014-2023.

Desert Unit (GMU 290)

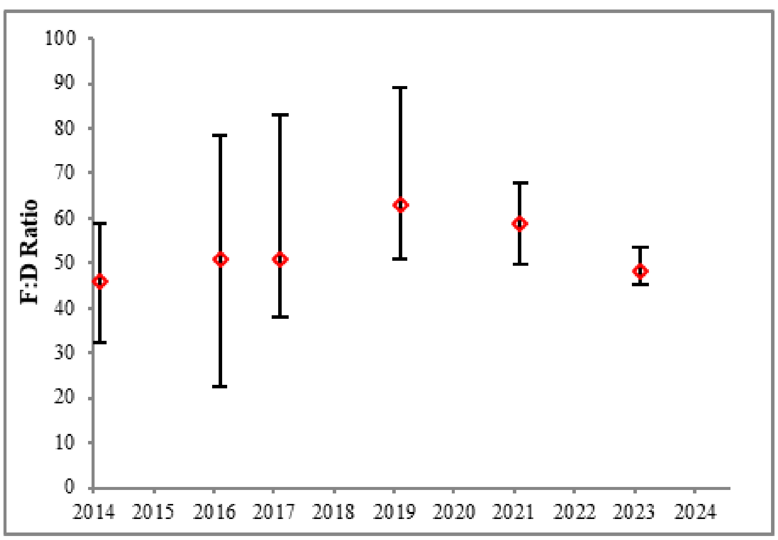
Desert Unit (GMU 290) buck-to-doe ratio estimates have been at or above management objectives since 2006 (range = 30 - 55 bucks per 100 does; Figure 7), except in 2017 when the estimate decreased to 24. Fawn-to-doe ratios have been low relative to other populations within the zone (range = 29 - 58 fawns per 100 does; Figure 8). Aerial surveys were conducted in 2023, and estimates were consistent with previous survey results. Aerial surveys were transitioned from an annual effort to every other year beginning in 2017.

Figure 7. Aerial mule deer surveys of the Desert Unit in the Columbia Plateau.



Buck:doe ratio estimates and 90% confidence intervals from aerial mule deer surveys of the Desert Unit in the Columbia Plateau MDMZ, 2013-2023.

Figure 8. Aerial mule deer surveys of the Desert Unit in the Columbia Plateau.



Fawn:doe ratio estimates and 90% confidence intervals from aerial mule deer surveys of the Desert Unit in the Columbia Plateau MDMZ, 2014-2023.

Douglas subherd

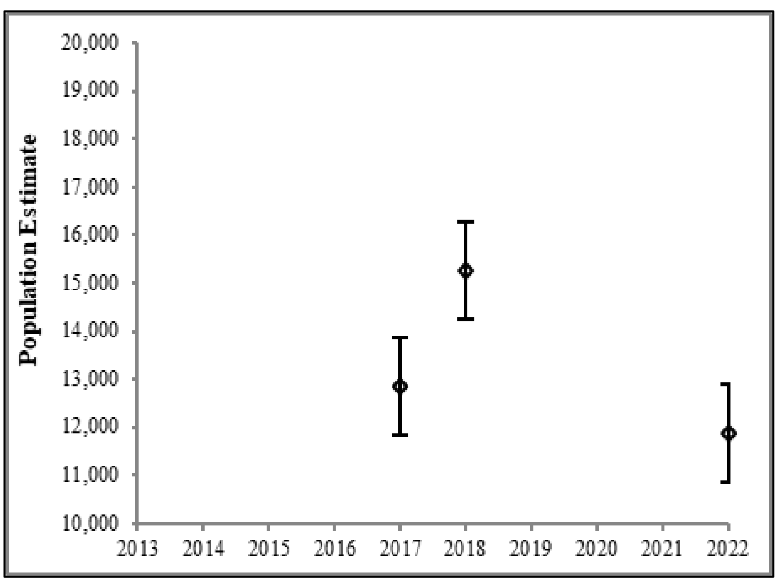
The first comprehensive post-hunt aerial sightability survey of mule deer in the Douglas Subherd was conducted in 2017 and resulted in a population estimate of 12,860 mule deer (90% CI = 10,299–16,735). The second year of aerial abundance surveys estimated 15,254 deer in 2018 (90% CI = 12,145–19,975). In December 2022, a third aerial survey was conducted, resulting in a population estimate of 11,873 (90% CI = 8,783–17,375; Figure 9).

Post-hunt ratios are estimated from annual ground-based composition surveys conducted along established routes within the subherd. Douglas Subherd's buck-to-doe ratio estimates have been at or above management objectives for over ten years (Figure 10). The ten-year average buck:doe ratio calculated from ground surveys from 2013-2022 was 22:100 for the Douglas Subherd. The buck-to-doe ratio of 18:100 derived from 2023 surveys represents a reduction from the 10-year average, but is still well within the management objective of 15-19 bucks per 100 does. Most bucks classified during these surveys are in the juvenile age class because most legal bucks are harvested each year due to open cover and high road densities. In areas where landowners restrict access to large expanses of habitat, numbers of older age-class bucks are more abundant.

Fawn-to-doe ratio estimates have also been stable for over a decade in the Douglas Subherd (Figure 10). However, the 2023 survey fawn:doe ratio was estimated at 48:100, considerably lower than the preceding ten-year average of 63:100 and a modest decrease from last year's fawn:doe ratio of 52:100.

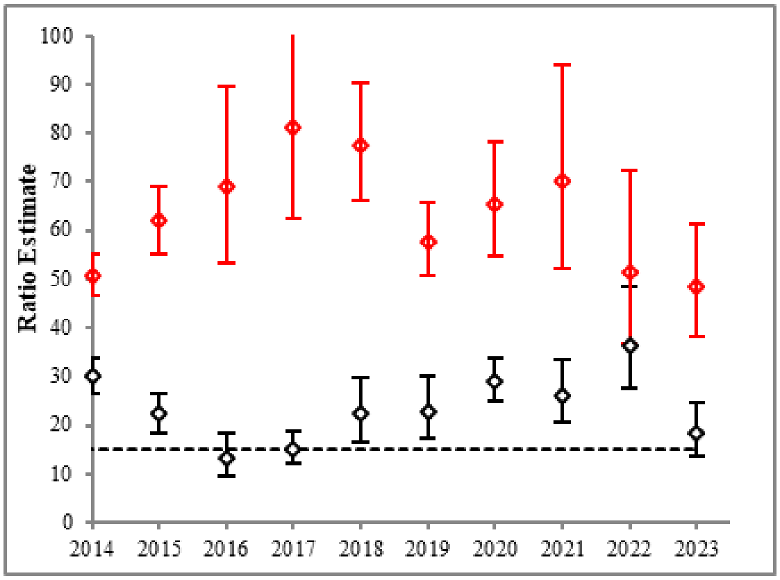
Ground surveys will continue to generate annual post-hunt estimates for buck-to-doe and fawn-to-doe ratios, with aerial surveys for abundance estimates planned to occur at 3-5-year intervals.

Figure 9. Population estimates generated from aerial sightability surveys of the Douglas Subherd in the Columbia Plateau.



Abundance estimates and 90% confidence intervals from aerial mule deer surveys of the Douglas Subherd in the Columbia Plateau MDMZ, 2013-2022.

Figure 10. Sex and age ratios generated from ground-based surveys of the Douglas Subherd in the Columbia Plateau.



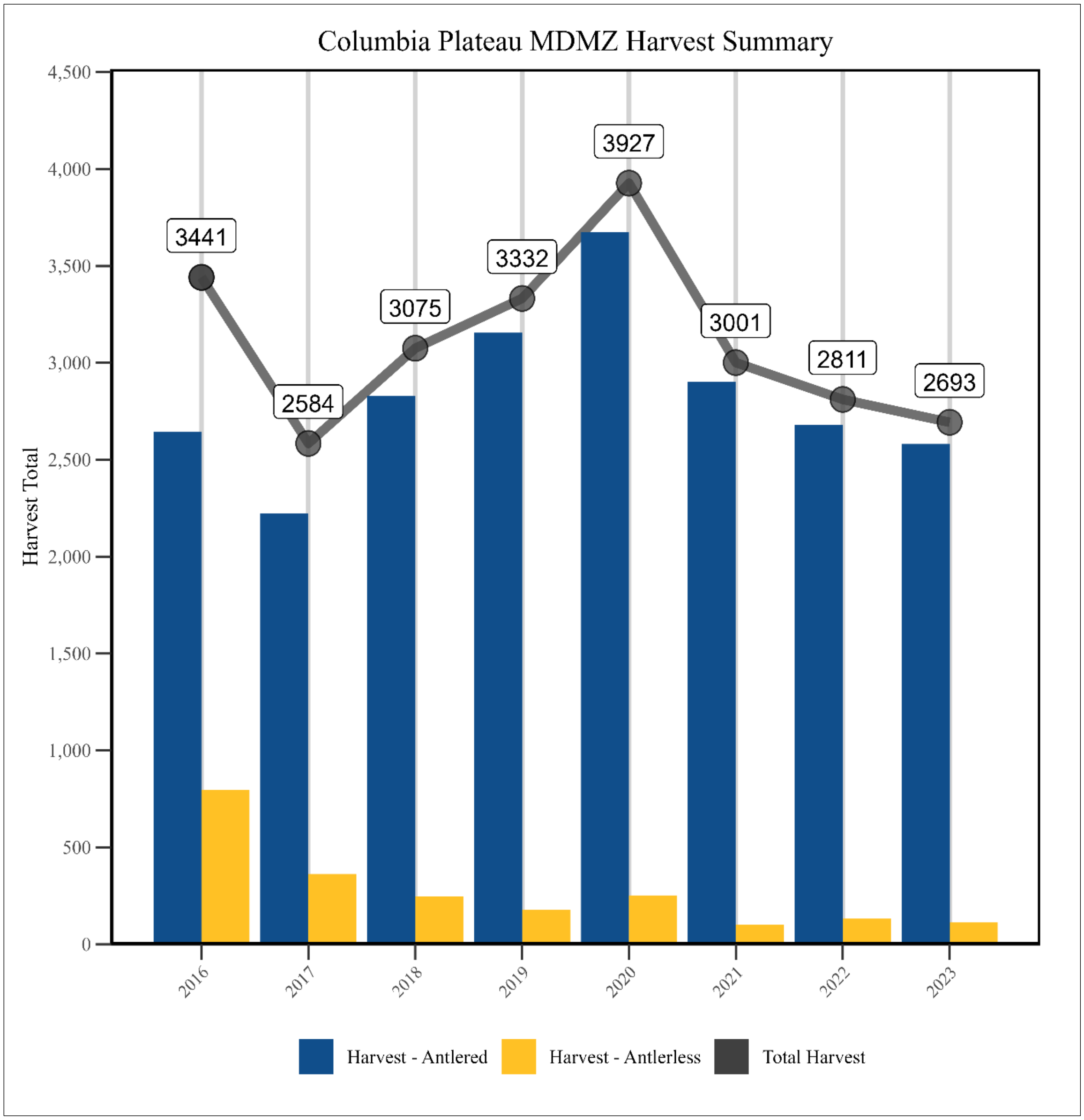
Fawn:doe (red) and buck:doe (black) ratio estimates and 90% confidence intervals from ground-based surveys of the Douglas Subherd in the Columbia Plateau MDMZ, 2014-2023.

Hunting seasons and recreational harvest

More mule deer are harvested in the Columbia Plateau MDMZ than in any other zone, and prior to 2021, harvest has been relatively stable outside of the dip in 2016-2018 (Figure 11). The decline in the 2016 harvest was likely due to poor fawn recruitment in 2015 associated with drought conditions. However, there were also fewer hunters, which may have resulted in fewer deer being harvested. The low harvest in 2017 was likely due to the hard winter of 2016/17. The drop beginning in 2021 is likely tied to the severe drought and hemorrhagic disease outbreak (both epizootic hemorrhagic disease and bluetongue), neither of which is believed to have significantly impacted the adult mule deer population. However, it did severely impact the white-tailed deer population, and the perception that it might have done the same to the mule deer likely kept many hunters home and may have led private landowners, the predominant land ownership type, to limit access.

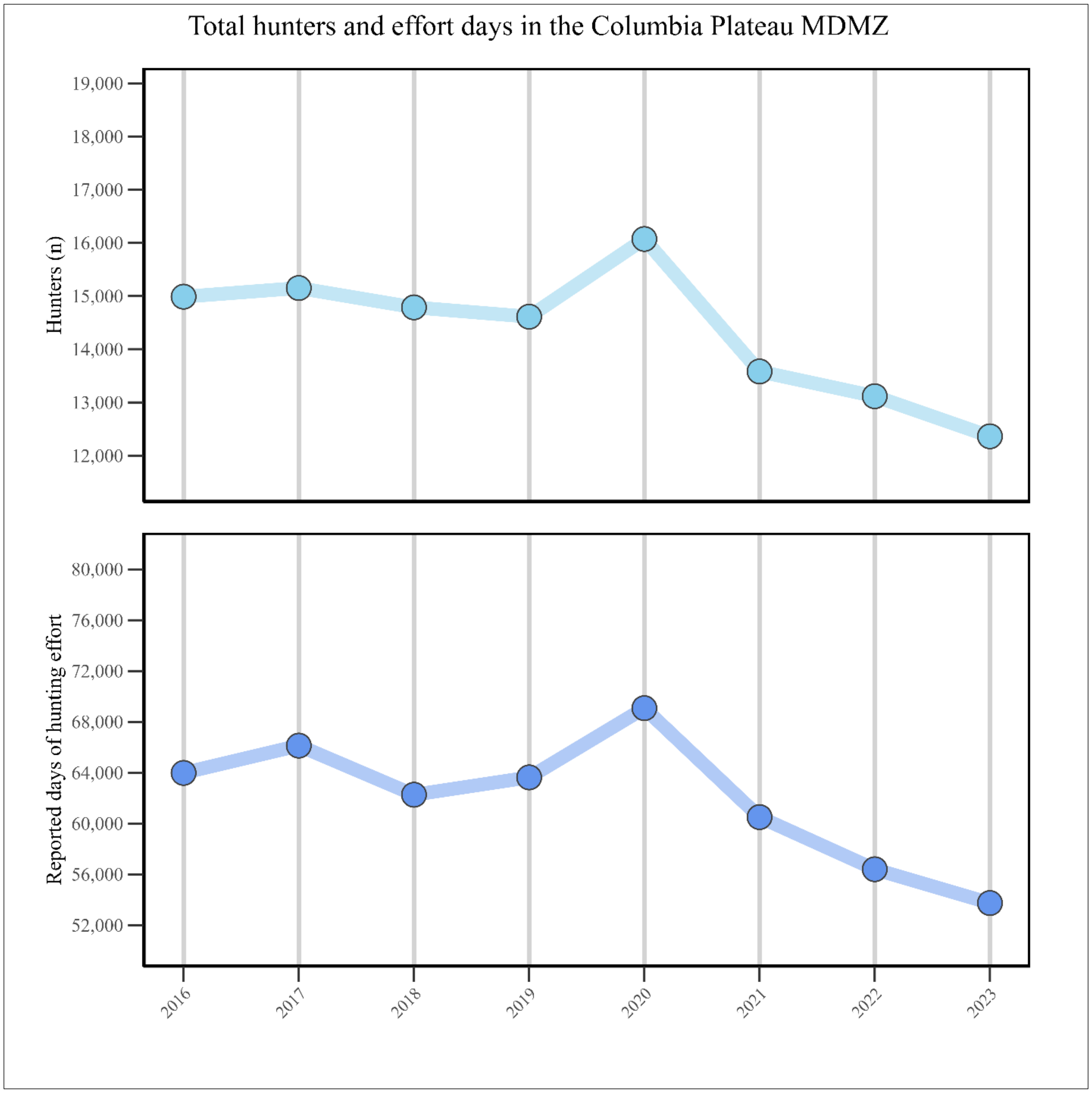
Measures of hunter effort in the zone have generally been stable during the past ten years (Figure 12). Estimates of hunter effort (i.e., hunter days; Figure 12) in this zone are not mule deer specific and include days spent hunting white-tailed deer. Because harvest data are specific to mule deer, kills/day estimates are consequently biased low.

Figure 11. Mule Deer Harvest Estimates for the Columbia Plateau MDMZ.



Harvest estimates for general season buck (blue), antlerless (yellow), and total harvest (black dots) in the Columbia Plateau MDMZ, 2016-2023.

Figure 12. Total Hunters and Effort Days in the Columbia Plateau MDMZ.



General season estimates for number of hunters (pale blue) and cumulative number of hunter days (blue) in the East Columbia Gorge MDMZ, 2016-2023. WDFW cannot generate species-specific estimates for number of hunters, days, success, etc. in most eastside GMUs, because both mule deer and white-tailed deer can be hunted.

Survival and mortality

Field studies conducted in the eastern portion of this zone between 2000 and 2008 indicated annual survival ($\hat{s} = 0.92$, 95% CI = 0.91 – 0.93), pregnancy ($\hat{p} = 0.96$, 90% CI = 0.91-1.0), and fetal rates ($\hat{f} = 1.44$, 90% CI = 1.20-1.68) of adult female mule deer were sufficient to maintain stable populations (WDFW, 2016). Cause-specific mortality for radio-marked juvenile mule deer (30 marked as neonates, 35 marked at six months of age) indicated legal hunting and coyotes were the most frequent sources of mortality (*n* = 28). Juvenile survival rates during the first summer ($\hat{s} = 0.52$) and the first winter (fawns transitioning into the yearling age class; $\hat{s}$ = .90) were sufficient to maintain stable populations (Johnstone-Yellin et al., 2009; WDFW, 2016).

While not observed during the field studies, other sources of mule deer mortality likely include predation, collisions with vehicles, perishing in irrigation canals, and poaching. Predator species living within this zone include cougars, bobcats, black bears, coyotes, golden eagles, and domestic dogs.

The availability of suitable habitats, disease events, and other factors will influence survival, pregnancy, and fetal rates. Therefore, results from former studies do not necessarily indicate the current population's status.

Habitat

Loss of important habitat, particularly shrub-steppe, riparian, and wet meadow habitats, is the most critical issue facing wildlife managers in the Columbia Plateau MDMZ. Land conversion is the most obvious source of habitat loss, but wildfires have become more frequent and intense in recent years. They can often result in a rapid invasion of exotic plant species, such as cheatgrass, which perpetuates more fire. In 2020, two of the largest wildfires in the state's history occurred in this management zone: the Pearl Hill (223,730-ac) and Whitney Rd (127,430-ac) fires. Restoration of native vegetation requires an intensive, expensive, long-term effort to be successful.

In some areas of the zone where crop fields have been enrolled in the Conservation Reserve Program (CRP), the increase in associated cover and introduction of beneficial plant species may partially mitigate shrub steppe losses, especially important during the fawning season.

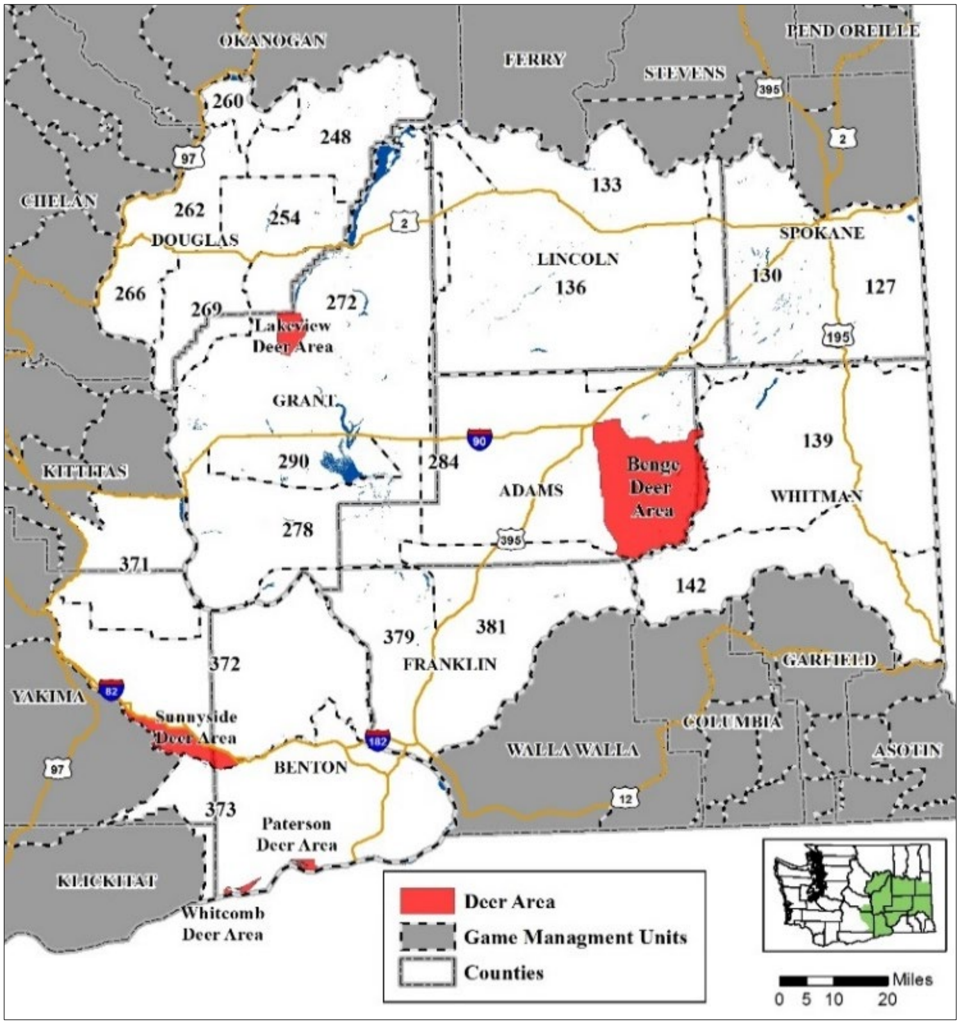
Human-wildlife interaction

Mule deer in the Columbia Plateau MDMZ are largely migratory and often stage in large numbers on the way to and at the wintering grounds along the Snake River breaks and the Wilson Creek area. These large congregations are cause for concern for wheat farmers. However, research suggests crop depredation by large ungulates does not influence grain yield, provided it occurs before the joint stage when plants begin to invest in their reproductive phase (Austin & Urness, 1995; Dunphy et al., 1982). However, grazing on alfalfa and hay fields does have the potential to reduce crop production (Austin et al., 1998).

Five Deer Areas with additional permit opportunities exist within this zone to address impacts associated with these congregations (Figure 13).

Nuisance damage in suburban areas can also be a problem, and WDFW provides additional antlerless hunting opportunities to address this issue. The WDFW Wildlife Conflict staff works with producers to provide technical assistance in lethal and non-lethal deer control on agricultural lands, including orchards and vineyards with high-value crops favored by deer.

Figure 13. Deer Areas within the Columbia Plateau MDMZ.



Management concerns

As previously discussed, habitat loss and habitat degradation are management concerns in this area. While the expansion of agricultural crops is currently low relative to historical rates throughout much of this zone, habitat conversion through urban sprawl and small ranch development is slowly taking a toll. Loss of lands enrolled in CRP programs due to Federal budgets and county caps could drastically reduce available habitat in this zone. Recent changes to the Federal Farm Bill may allow for cattle grazing and hay harvest of CRP lands. Those changes could negatively affect wildlife by reducing forage and cover and having other impacts from associated infrastructure developments. Wildfires have caused increasingly large losses of deer habitat in the Columbia Basin that may take years or decades to recover.

Short-term impacts may include reduced habitat suitability, which is particularly damaging during the summer fawning season. When precipitation fails to initiate a fall green-up, animals are unable to increase the nutritional reserves needed to meet the demands of a harsh winter. Areas with older shrub-steppe habitats and good species diversity are limited and declining annually due to fires and development. High-value shrub-steppe habitats can take over 50 years to develop. Combating encroachment by invasive species is a complex and expensive battle once intact habitat burns.

Solar power generation is a relatively new threat to mule deer habitat in this zone. These installations range from just a few hundred acres to upwards of 10,000 acres. They are often sited in rangelands (shrub-steppe habitat) and adjacent dryland agriculture. Most of the vegetation is either permanently removed, especially larger shrubs, or regularly mowed to a short height to keep it from interfering with solar exposure of the panels. Additionally, the perimeter fencing installed at these sites tends to be wildlife unfriendly (e.g., six-foot-high chain link fence), effectively keeping mule deer out of the site that, at large installations, can impact broader movement across the landscape.

Management conclusions

Mule deer populations in the Columbia Plateau MDMZ are currently at management objectives based on buck-to-doe ratio estimates. Demographic and survey data indicate largely stable populations between years. However, the 22% decrease in the estimated abundance of the Douglas Subherd observed between 2018 and 2022 and reports from hunters seeing fewer deer in recent years may indicate a declining population in this portion of the MDMZ. There are many possible factors behind this decline, including drought, disease, habitat loss due to land conversion and fire, and potential emigration to other parts of the Columbia Plateau MDMZ, and antlerless harvest opportunity has been reduced in Douglas County beginning in the 2024 season to assist population growth of the Douglas Subherd. Zone-wide harvest appeared to be recovering from the decline observed in 2016 and 2017 but dropped again in 2021 and 2022, likely tied to drought in recent years and continued loss of habitat post-fire.

Though there was no decline observed in the adult population during flights in the Benge Subherd in 2021, there was a decline in fawns. This decline was further supported by reduced fawn-to-doe ratios observed in ground surveys in the Benge and Odessa subherds as well as in the 2022 ground survey of the Douglas Subherd. The decline in fawns will likely lead to a lower-than-average harvest in the coming year or two, as the harvest is highly dependent on yearling buck recruitment. This potential impact on the future harvest underscores the importance of addressing the factors contributing to the decline in fawns. But assuming a return to more normal fawn survival in the coming years, this should be a relatively short downturn.

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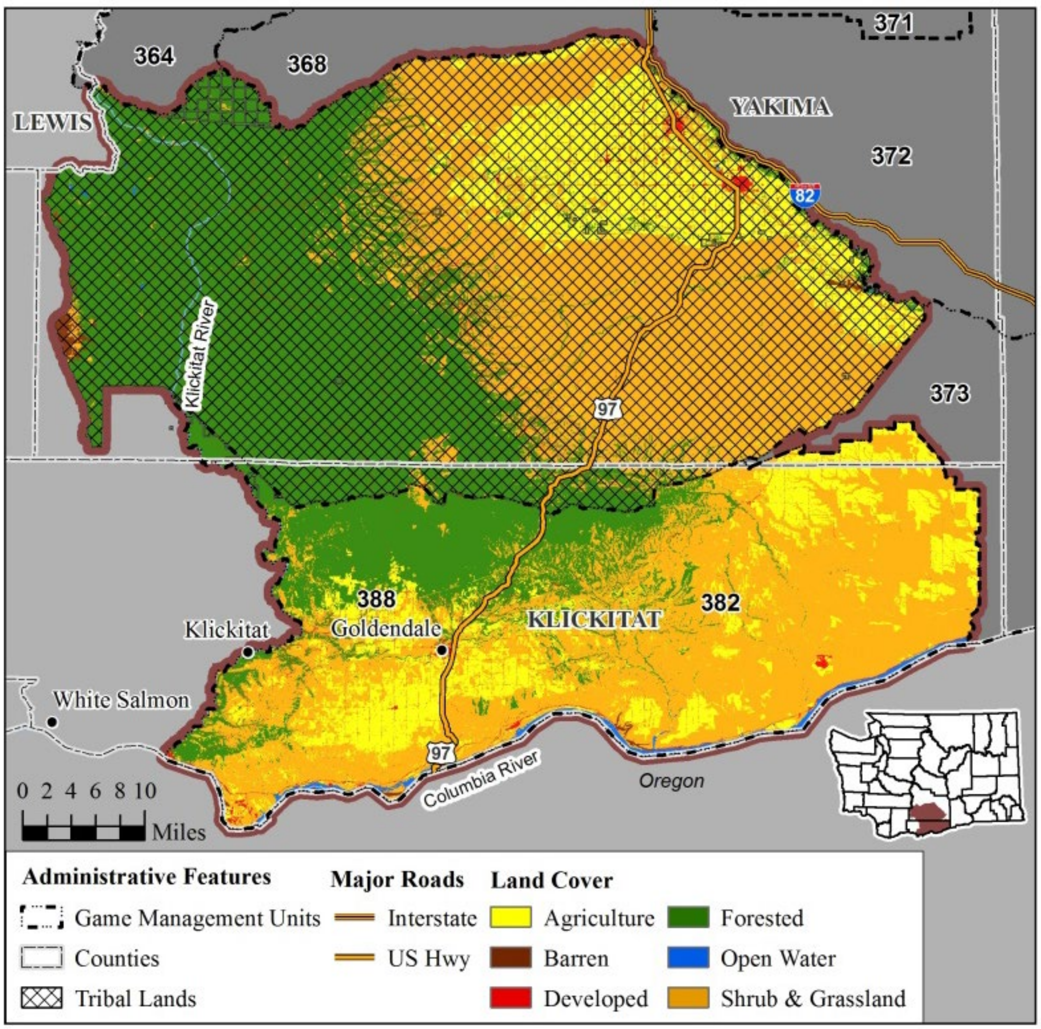
East Columbia Gorge Mule Deer Management Zone

Carly Wickhem, Wildlife Biologist
Stefanie Bergh, Wildlife Biologist

Introduction

The East Columbia Gorge Mule Deer Management Zone (MDMZ), located in south-central Washington, is the smallest of the seven mule deer management zones and consists of two Game Management Units GMUs (382 and 388; Figure 1).

Figure 1. East Columbia Gorge Mule Deer Management Zone (MDMZ).



GMUs and generalized land cover types within the East Columbia Gorge MDMZ.

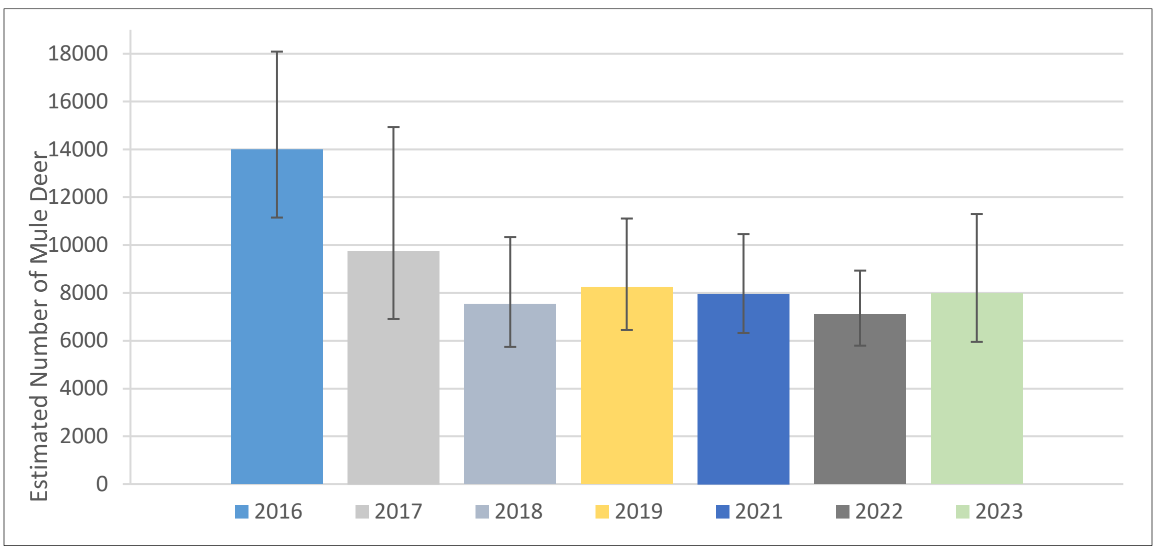
Management guidelines and objectives

The Department's objective within this MDMZ is to maintain a stable population based on field surveys and harvest estimates. Additional management objectives include managing for a post-hunt population with a sex ratio of 15-19 bucks:100 does (WDFW, 2014).

Population surveys

Mule deer are present throughout the East Columbia Gorge MDMZ, with the highest densities observed from January through April throughout the low-elevation winter ranges. Post-hunt aerial surveys conducted in December of 2023 resulted in a population estimate of 7,978 (95% CI = 5,956-11,300; *n* = 1,479), which is similar to the estimates from 2018-2022 (Figure 2). The buck:doe estimate from the same survey was 23:100 (95% CI = 14-33, *n* = 1,479), which is above the management objective. The post-hunt fawn:doe estimate for 2023 was 56:100 (95% CI = 41–71, *n* = 1,479), which is an increase from 2022 (49:100; 95% CI = 40–58, *n* = 7,096) and similar to 2019 (58:100; 95% CI = 45–71, *n* = 8,248), and 2021 (56:100; 95% CI = 45–67, *n* = 7,959) estimates. Washington Department of Fish & Wildlife (WDFW) biologists did not conduct population surveys in 2020 because of COVID-19 restrictions.

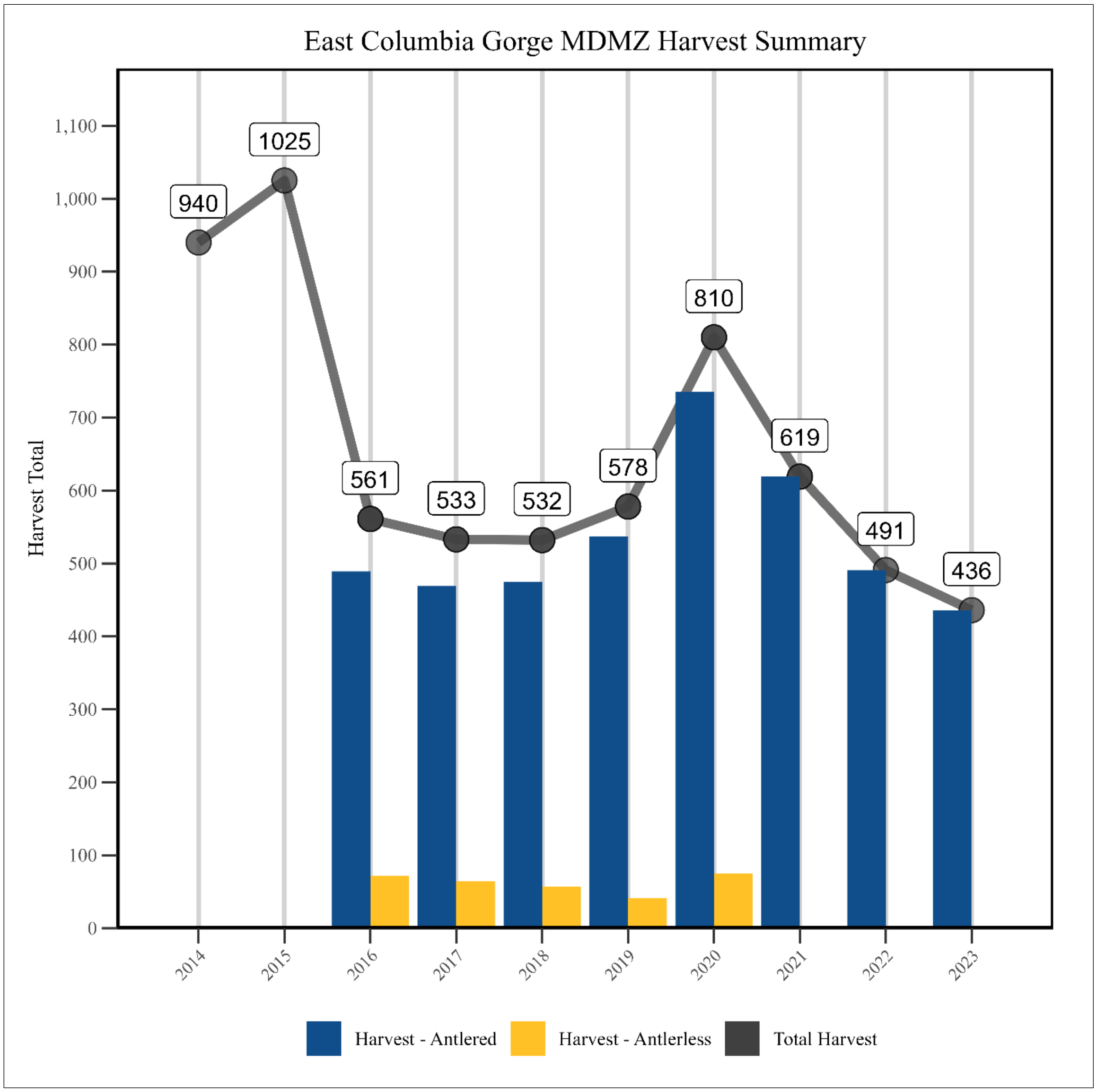
Figure 2. Population estimates and associated 95% confidence intervals for post-hunt aerial mule deer surveys in the East Columbia Gorge MDMZ, WA, 2016-2019 and 2021-2023.



Hunting seasons and recreational harvest

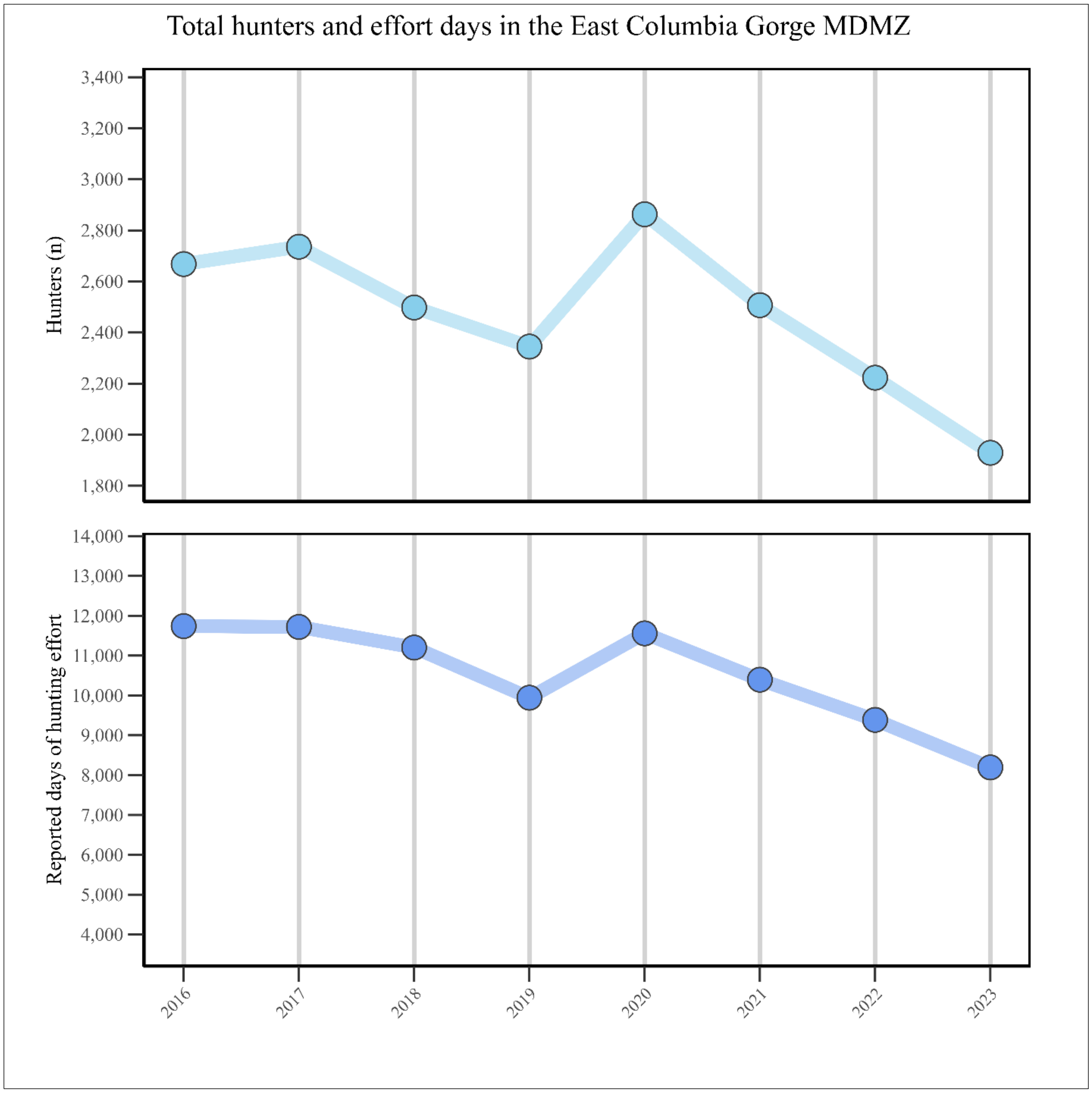
After three years of decline, harvest in the East Columbia Gorge MDMZ increased in 2019 and 2020. However, after meeting the 10-year average in 2020, the 2021, 2022, and 2023 harvest estimates declined again. Estimates from 2016-2018 indicated a decline in harvest (Figure 3) that likely reflected, in part, decreased hunter participation and effort (Figure 4), fewer antlerless permits offered, and population declines within the zone. After a peak in annual harvest and harvests/day in 2020, there has been a decline in annual harvest and hunter effort for the third year in a row (Figure 4). The 2020 increase in harvest was likely bolstered by a surge in hunter participation and effort during the COVID-19 pandemic. The 2021-2023 general season harvest estimates dropped from 2020 and eventually fell below pre-pandemic levels. Since the population estimates have remained relatively stable during those years, the reduced general season harvest is likely due to several causes: the removal of the archery antlerless general season opportunity beginning in 2021, a reduction in hunter effort (Figure 4), and a large private landowner removing public hunting access in GMU 388 beginning in fall 2023.

Figure 3. Mule Deer Harvest Estimates for the East Columbia Gorge MDMZ.



Harvest estimates for general season buck (blue), antlerless (yellow), and total harvest (black dots) in the East Columbia Gorge MDMZ, 2014-2023.

Figure 4. Total Hunters and Effort Days in the East Columbia Gorge MDMZ.



General season estimates for number of hunters (pale blue) and cumulative number of hunter days (blue) in the East Columbia Gorge MDMZ, 2016-2023. WDFW cannot generate species-specific estimates for number of hunters, days, success, etc. in most eastside GMUs, because both mule deer and white-tailed deer can be hunted.

Survival and mortality

Kaplan-Meier estimates of annual survival (April-March) for adult female mule deer in the East Columbia Gorge MDMZ were recently calculated using the GPS-collared does that are part of a mule deer migration study. In 2021-22, survival was estimated to be 0.71 (*n*=81), in 2022-23, survival was estimated to be 0.84 (n=81) and in 2023-2024, survival was estimated to be 0.81 (*n*=94). Results from a telemetry study in this MDMZ during 1989-1994 reported a Kaplan-Meier estimate of annual survival for adult females of 0.82 (McCorquodale, 1996).

In addition to legal hunting, common mortality sources include disease, predation, and deer-vehicle collisions. Lice infestations and hair loss syndrome have been documented in mule deer (Bernatowicz et al., 2011) and likely contribute to declines in mule deer numbers. Common predator species include cougar, bobcat, black bear, and coyote.

In the summer of 2017, an outbreak of AHD was confirmed in the area just east of Goldendale in both GMUs 382 and 388. High rates of fawn mortality were observed, which is typical of this disease. An AHD outbreak was again confirmed near Goldendale in July 2022 through testing of two deer. Throughout the summer of 2022, dead deer displaying AHD symptoms were reported from White Salmon to Bickleton. In the fall of 2022, WDFW also received several reports of bucks with antlers still in velvet and undescended testicles, which can occur in male deer that survive hemorrhagic diseases (Roug et al., 2021). This type of AHD is specific to deer and has occurred in other parts of Washington and in other states, including Oregon and California. Given the relative commonness of AHD, the disease has probably been present in Washington before but was not detected. Staff will continue to field calls from the public regarding sick or dead deer and take samples when appropriate to track future AHD outbreaks as they occur.

The winter of 2016-17 was very severe, with persistent snow down to Columbia River level (lowest elevations of the MDMZ) from December through February, making forage unavailable in key wintering habitats. As a result, population and harvest estimates dropped in 2017 and 2018. The six following winters were mild to average, except for the late winters/early springs of 2019 and 2022, which had several large snowfall events and persistent cold temperatures into April. During spring 2024 productivity surveys, 251 deer were classified, which resulted in a fawn:adult estimate of 54:100, which is above the 10-year average of 50:100. The 2024 estimate was a sizeable increase over the 31:100 recorded in 2023 which may have been due to an outbreak of Adenovirus hemorrhagic disease (AHD) in summer 2022 followed by a lack of fall green-up and a winter that was above average in severity. The annual post-hunt aerial surveys scheduled for December 2024 will continue to monitor the population as it hopefully recovers from the severe winter of 2016-17 and successive droughts as well as disease outbreaks.

Habitat

The East Columbia Gorge MDMZ has experienced extensive alternative energy development and agricultural land conversion in recent years. Electricity generated by wind power is one of the fastest-growing alternative energy sources in the region, with large wind power sites already in operation along the Columbia River. Despite being thought of as a “green” energy source, wind farms reduce and fragment critical habitats (Hebblewhite, 2008; Fargione et al., 2012), especially in the winter range of mule deer in the East Columbia Gorge MDMZ. In addition, construction on the first industrial-scale solar farm in this MDMZ was completed in 2022, and several other solar farm proposals in the area are in various stages of permitting. These operations typically include tall fencing and removal of native vegetation, resulting in complete habitat loss (Lutz et al., 2011). More direct effects on the population have occurred in the form of habitat loss from agricultural conversion, associated roadways necessary to access such development, and increased mortality from vehicle collisions.

In July 2023, the Newell Road fire burned in prime mule deer winter range in eastern Klickitat County. The fire burned 60,551 acres between Rock Creek and Wood Gulch (see the Incident Map), two major drainages where large numbers of deer are typically observed during December aerial surveys. In July 2024, the Bighorn Fire burned 51,569 acres, encompassing a significant amount of mule deer in winter range in the Pine Creek, Alder Creek and Sixprong Creek drainages (see the Incident Map). This portion of the county is primarily grass and sagebrush steppe. The severity of the burn is currently being assessed, which will help guide restoration efforts.

Human-wildlife interaction

Agricultural damage to crops such as hay, alfalfa, wheat, berries, and grapes occurs at low levels in the East Columbia Gorge MDMZ. Wildlife Conflict Specialists work closely with producers by developing Damage Prevention Cooperative Agreements (DPCAs), which identify a plan to reduce damage to agricultural crops using non-lethal and lethal methods.

Wildlife Conflict Specialists and landowners use a variety of non-lethal means to discourage deer, including electrified fladry fencing, noisemakers (e.g., bird bangers, critter-gitters, and propane cannons), hazing and herding, scarecrow-like electronic devices, and odor-based repellents such as Plantskyyd. In 2023-2024, two DPCAs were issued relating to mule deer in the East Columbia Gorge MDMZ. All were issued to address damage to hay. No deer were harvested as a result of these permits. In many circumstances, the Department addresses damage complaints by working with landowners to increase access to their property during hunting seasons so that hunters can help resolve the damage.

Research

In January 2021, a 4-year study was initiated to investigate mule deer movement and migration patterns in the East Columbia Gorge MDMZ. Eighty-one adult female mule deer were captured and fitted with GPS collars. The primary focus of this study is to identify mule deer migration routes and winter ranges within the MDMZ and preserve and enhance habitat in these areas. When possible, biologists are also attempting to determine the cause of death when a collared animal dies and will calculate vital rates like annual survival. Biologists will redeploy collars each winter with a goal of maintaining approximately 80 collars in the MDMZ throughout the 4-year period. Preliminary results have shown that some of the deer are migratory while others are not. Attempting to determine the cause of death has proven difficult due to how quickly scavengers find the carcasses. Nearly half of the mortalities have an unknown cause of death due to a lack of carcass or evidence. Most mortalities with an assigned cause of death are from predation, mainly by cougars, coyotes, and bears. This study will be concluded in early 2025.

Management concerns

Deer hair loss syndrome was observed in Klickitat County for the first time in 2000 and was first documented in GMU 382 in the spring of 2006. Only ten (4%) out of the 262 deer observed during spring 2024 road-based surveys conducted in and around the Klickitat Wildlife Area had noticeable signs of the syndrome, which is low compared to the 16-year average of 7%. Late 1990s declines in hunter harvest, increases in buck mortality rates, and reduced fawn recruitment all roughly coincide with the onset of the hair loss syndrome. WDFW will continue to monitor for this disease during spring surveys.

Habitat loss is the greatest concern for mule deer in the East Columbia Gorge MDMZ. Increased land conversion, especially to vineyards and wind and solar farms, has the potential to negatively affect this herd. Not only do developments reduce the amount of available habitat, but their associated roads and fencing increase the risk of deer-vehicle collisions and inhibit movement across the landscape. Many of the deer in this zone are thought to be migratory and spend the winter in lower elevations, typically preferring habitats with a strong oak (*Quercus garryana*) component (McCorquodale, 1996). Increased human activity and habitat conversion in lower-elevation wintering areas can cause these deer to unnecessarily expend energy during the winter months when resources are limited, resulting in lower survival and reproduction rates. In addition to habitat loss, habitat conditions have been poor in recent years due to persistent drought. Lower forage quality and abundance are likely contributing to poor body condition of deer in the MDMZ.

Management conclusions

Since December 2019, mule deer populations in the East Columbia Gorge MDMZ have been within the buck:doe management objectives. Abundance and harvest estimates were low in 2017 and 2018 when compared to previous seasons, indicating a decrease in the population. After the 2017 and 2018 hunting seasons, managers removed most antlerless special permits, reduced the number of remaining antlerless permits, and reduced the number of quality and buck special permits to allow the population to recover. Before the fall 2021 hunting season, managers also removed the antlerless opportunity from archery general seasons in GMUs 382 and 388. The 2020 harvest estimates showed an increase from recent years, but estimates declined again in 2021, so managers will plan to keep the current special permit and general season changes until the deer numbers improve. Annual survey efforts and the data collected from hunter reporting will allow managers to continue monitoring the population and determine future management needs.

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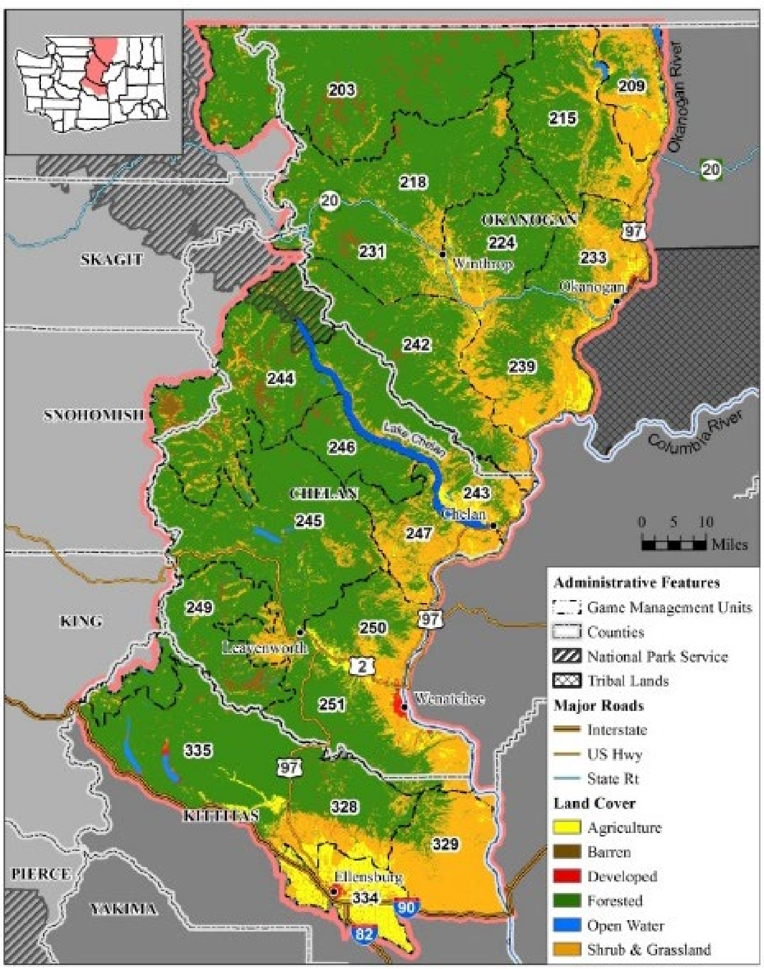
East Slope Cascades Mule Deer Management Zone

Scott Fitkin, Wildlife Biologist
Emily Jefferys, Wildlife Biologist
Erin Wampole, Wildlife Biologist

Introduction

The East Slope Cascades MDMZ, home to Washington's major migratory mule deer populations, spans three wildlife districts (Districts 6, 7, and the northern portion of 8) in north-central Washington and is comprised of 22 Game Management Units GMUs (203, 209, 215, 218, 224, 231, 233, 239, 242, 243, 244, 245, 246, 247, 249, 250, 251, 328, 329, 330, 334, and 335; Figure 1).

Figure 1. East Slope Cascades Mule Deer Management Zone (MDMZ).



GMUs and generalized land cover types within the East Slope Cascades MDMZ.

Management guidelines and objectives

The Department’s objective within this MDMZ is to maintain stable populations based on field surveys and harvest estimates and manage for a post-hunt buck:doe ratio of 15-19 bucks:100 does in the southern and northern portions, and a minimum of 25 bucks:100 does in the central portion. The generally conservative antlerless mule deer harvest in this zone is typically designed to maintain population stability while providing some recreational opportunities. Infrequently, the increased harvest of antlerless mule deer is used to limit herd growth, reduce deer numbers in damaged areas, or respond to dramatic changes in carrying capacity, such as those associated with large winter range wildfires. Conversely, antlerless harvest is occasionally reduced to minimum levels or suspended to promote herd growth following periods of above-average mortality created by natural events such as harsh winters, droughts, large summer range fires, or disease outbreaks. These occurrences have become more common in the last decade, and additional restrictions on antlerless harvest are being proposed.

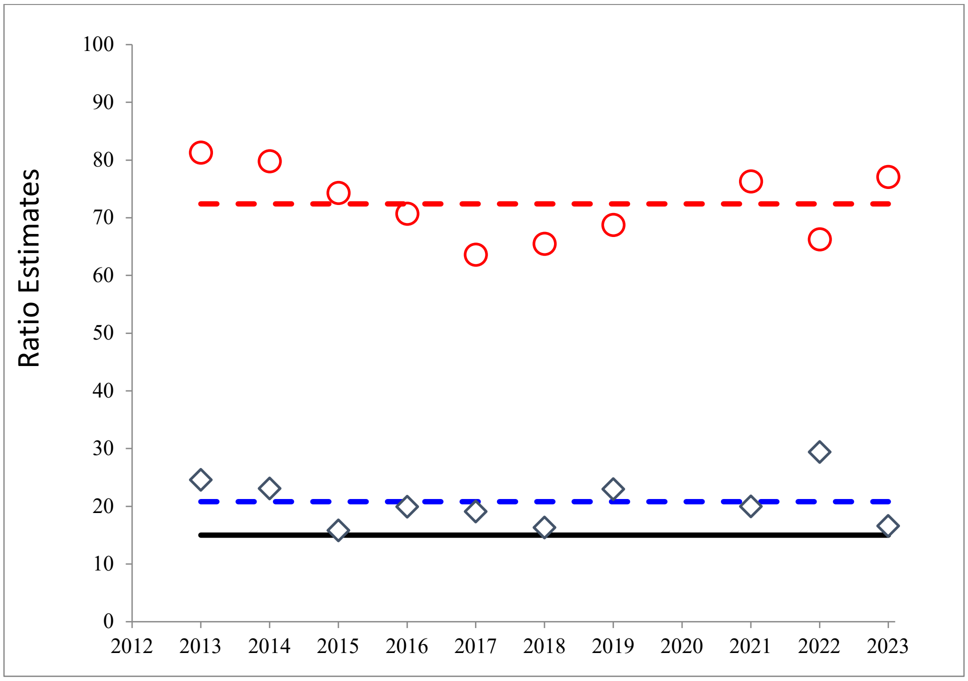
Population surveys

Mule deer are present throughout the East Slope Cascades MDMZ, with the highest densities observed from January through March on traditional winter ranges of low elevation. Populations within the zone are comprised of three general sub-herds. From north to south, these are the Okanogan (western Okanogan County), Chelan (Chelan County), and Kittitas (Kittitas County north of I-90) sub-herds. No zone-wide post-hunt aerial sightability surveys have been conducted in the last decade. Harvest data suggests the overall population has remained relatively stable to slightly declining over this period, with some variation between sub-herds.

Okanogan subherd

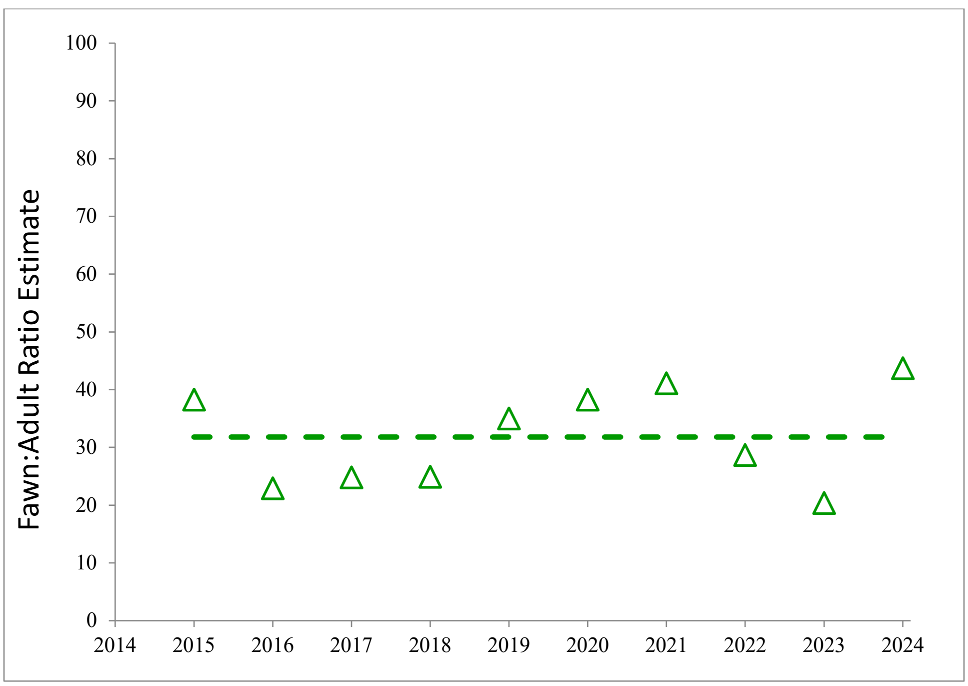
Over 2,400 mule deer were classified during the post-hunt aerial surveys for the northern sub-herd in District 6 (Okanogan County) in 2023. This effort produced observed buck:doe and fawn:doe ratios of 17:100 and 77:100, respectively (Figure 2). The buck:doe ratio fell below the 10-year average but remains above the management minimum. Conversely, the fawn:doe ratio rebounded to the long-term average and climbed above the 10-year average, indicating an improvement in productivity. The 2024 spring ground surveys tallied 1,522 animals, yielding a fawn:adult ratio (Figure 3) of 44:100, noticeably above the 10-year average and the highest since 2014. This improvement in recruitment came on the heels of a particularly mild winter.

Figure 2. Post-hunt buck:doe ratio and fawn:doe ratio population estimates.



Post-hunt buck:doe ratio estimates (black) and fawn:doe ratio estimates (red) with 10-year means 2013-2023* (dashed lines), and minimum ratio management objective (solid black line) for mule deer in the northern sub-herd of the East Slope Cascades MDMZ. *No survey data in fall 2021 due to COVID restrictions.

Figure 3. Spring fawn:adult ratio estimates with 10-year mean 2015-2024.



Spring fawn:adult ratio estimates with 10-year mean 2015-2024 (dashed line); for mule deer in the northern sub-herd of the East Slope Cascades MDMZ. **No survey data in fall 2021 due to COVID restrictions.*

Buck:doe ratios for the northern sub-herd have consistently met or exceeded the management objective of 15:100 (Figure 2a). A combination of rugged topography and limited road access in many GMUs facilitates higher buck escapement, which results in a higher proportion of older age class bucks in the population. Fawn recruitment varies from year to year, largely fluctuating in response to winter conditions. A high-quality summer range has traditionally led to high fawn production. Lately, however, fall fawn:doe ratios have fluctuated more in the wake of intense fires and droughts over the last decade (Figure 2b).

Chelan and Wenatchee mountains subherds

Chelan County (and the East Slope Cascades MDMZ as a whole) of a four-year mule deer movement and migration study in association with Secretarial Order 3362 ([Improving Habitat Quality in Western Big-Game Winter Range and Migration Corridors]) from 2020-2023. The study included aerial capture and Global Positioning System (GPS) collaring of mule deer does on winter range to learn more about timing of migration, migration corridors, important stopover points, and potential barriers to movement, all to improve deer management.

One of the key findings of this study is the significant role of Highway 2 as a barrier to deer movement. The data suggests that deer on either side of the highway exhibit distinct space use and migration patterns. This means that what has always been categorized as the Chelan Subherd is functionally comprised of two separate populations: one consisting of deer that winter in the Wenatchee Foothills region of Chelan and Kittitas counties, and one consisting of deer that winter north of Hwy 2 and south of Lake Chelan. All surveys to date have considered deer within Chelan County as a single population. However, our new understanding of how deer use this landscape may necessitate a revised mule deer monitoring and management approach.

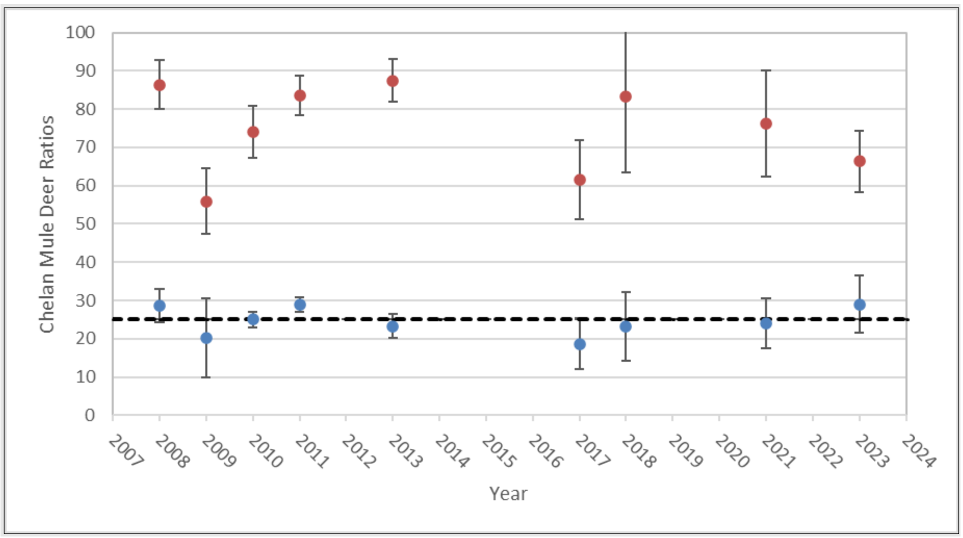
A post-hunt aerial sightability survey was performed in Chelan County mule deer winter range in December 2023. The 2023 survey yielded a population estimate of 7,111 (90% CI = 6,025 - 8,667) for the Chelan County subherd of the ESC MDMZ. This number is consistent with the estimate of 7,147 (90% CI = 5,717 - 9,396) derived from the 2021 aerial sightability survey and with the 2018 post-hunt estimate of 6,820 (90% CI = 5,323 - 9,216). This similarity in population estimates suggests that herd numbers in Chelan County have remained largely stable over the past five years. While these population estimates suggest the herd has neither increased nor decreased significantly in this timeframe, recent estimates are notably lower than those from surveys conducted before 2018. Variations in survey area, timing, methodology, and analysis prevent direct comparison of pre-2018 data with more recent estimates.

In December 2023, a total of 2,137 deer were classified on the Chelan County winter range, resulting in a buck:doe ratio of 29:100 and a fawn:doe ratio of 66:100 for both the Wenatchee Mountains and Chelan subherds combined (Figure 4). The previous post-hunt survey of the Chelan County mule deer winter range, conducted in December 2021, yielded an estimated buck:doe ratio of 24:100 and an estimated fawn:doe ratio of 76:100 from nearly 1,800 classified mule deer. Management of the Chelan subherd is conservative, with a post-hunt buck ratio objective of 25+ bucks per 100 does. Since

2009,estimates of post-hunt buck:doe ratios have largely been sustained at this objective, and 2023 was no exception. While the buck:doe ratio in 2023 represents an increase from 2021 and 2018, the 2023 fawn:doe ratio is considerably lower than estimates from these two most recent prior aerial surveys.

Analyzing the Chelan County portion of the ESCMDMZ as two generally distinct subherds, Wenatchee Mountains and Chelan, reveals a virtually identical estimated fawn:doe ratio across subherds (66.46:100 in Wenatchee Mountains vs. 66.49:100 in Chelan). However, there was a sizable difference in buck:doe ratios between the two subherds. Approximately 24 bucks per 100 does are estimated for the Wenatchee Mountains subherd compared to approximately 33 bucks per 100 does in Chelan. In 2023, a total of 1,216 mule deer were classified in the Wenatchee Mountains subherd and 976 in Chelan.

Figure 4. Estimate of post-hunt buck:doe and fawn:doe ratios for the Chelan sub-herd in the East Slope Cascades MDMZ.



Estimate of post-hunt buck:doe (red) and fawn:doe (blue) ratios with 90% confidence intervals for the combined Chelan and Wenatchee Mountains subherds in the East Slope Cascades MDMZ between 2008 and 2023. Dashed line represents buck:doe management objective.

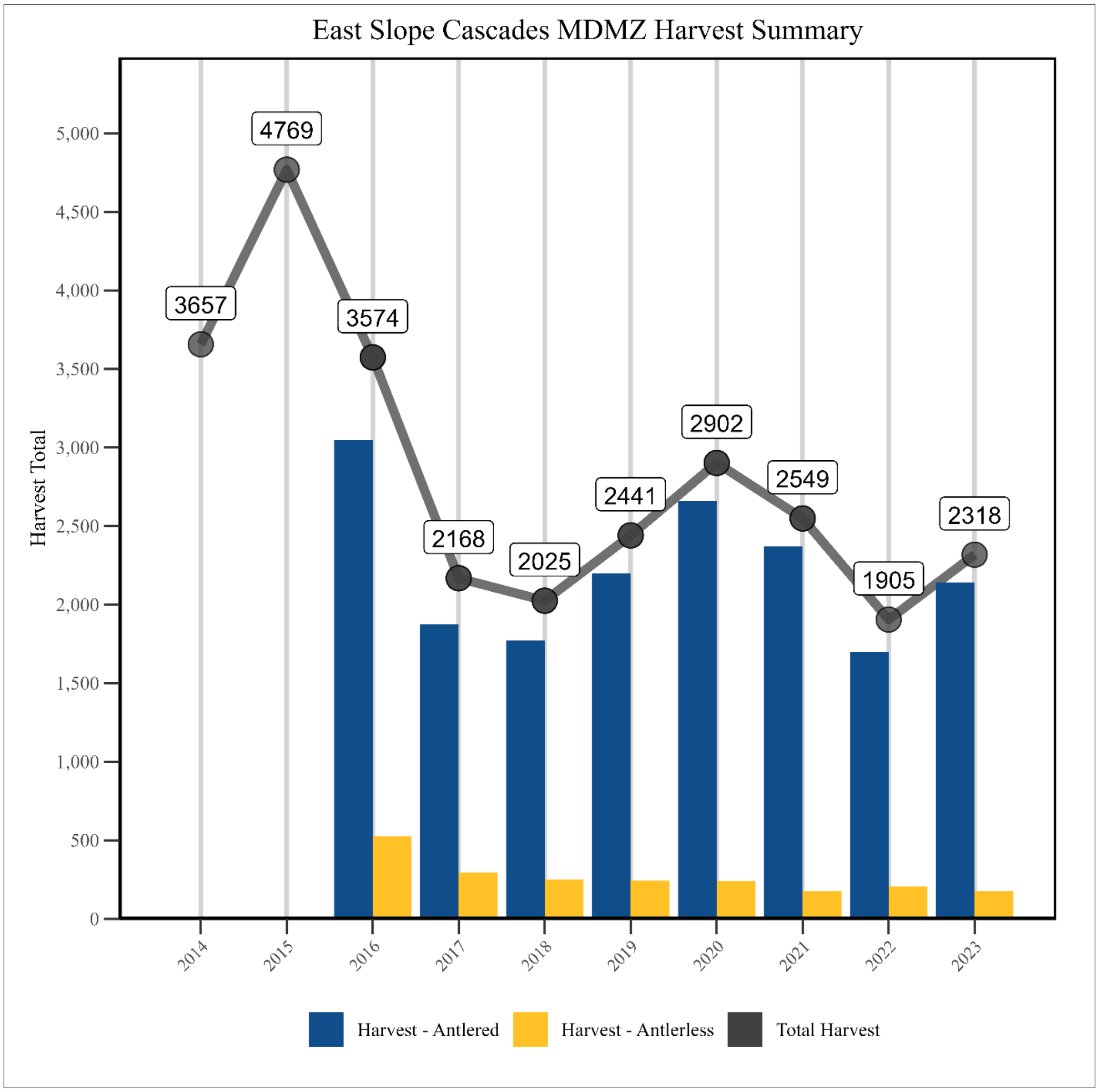
Kittitas subherd

No survey has been conducted for the Kittitas subherd since 2016. The last population survey was conducted in spring 2016 in the southern portion of the zone. The estimated abundance was 3,718 deer (90% CI = 3,307-4,494). The southern population was down 40% from 2003 and 10% from the last survey in 2013. Future survey work is planned for winter 2024-2025.

Hunting seasons and recreational harvest

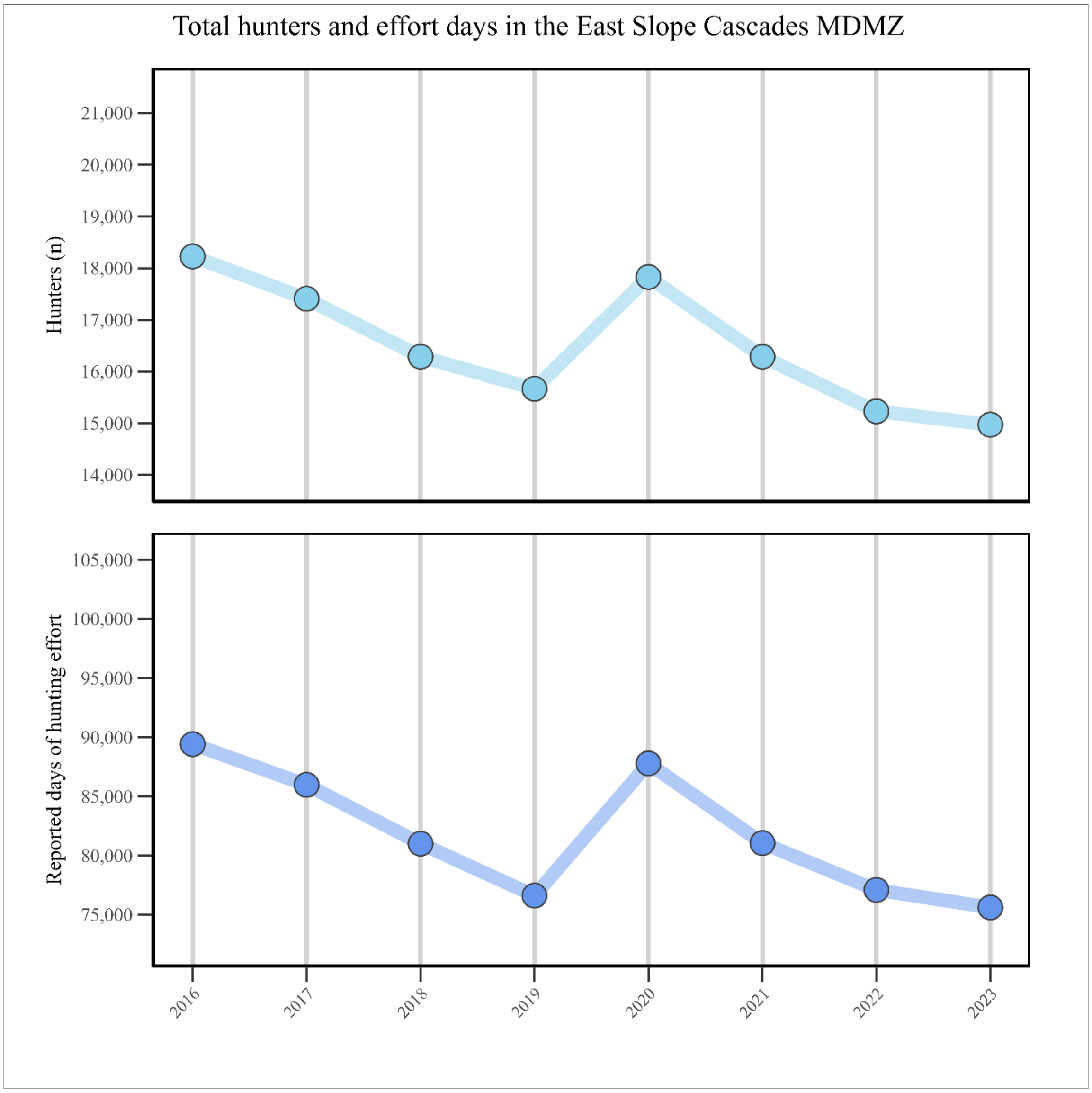
The East Slope Cascades MDMZ yielded a modest increase in mule deer harvest in 2023; however, overall harvest has been relatively stable in the East Slope Cascades MDMZ during the last several years (Figure 5). Hunter effort has generally exhibited a slight downward trend since 2016, except for a notable uptick in 2020 during the COVID pandemic (Figure 6).

Figure 5. Mule Deer harvest estimates for the East Slope Cascades MDMZ.



Harvest estimates for total harvest (gray), antlered harvest (blue), and antlerless harvest (yellow) in the East Slope Cascades MDMZ, 2014-2023.

Figure 6. Total hunters and effort days in the East Slope Cascades MDMZ.



General season estimates for number of hunters (pale blue) and cumulative number of hunter days (blue) in the East Slope Cascades MDMZ, 2016-2023. WDFW cannot generate species-specific estimates for number of hunters, days, success, etc. in most eastside GMUs, because both mule deer and white-tailed deer can be hunted.

Survival and mortality

Data from past research in the central portion of the East Slope Cascades MDMZ on pregnancy ($\hat{p} = 0.95$) and fetal rates ($\hat{f} = 1.66$), coupled with a high annual adult doe survival rate ($\hat{s} = 0.92$, $n = 50$) indicate sufficient recruitment to support a stable to increasing population in this portion of the zone (WDFW, 2016). Preliminary analysis of data for the average annual survival of adult mule deer does ($\hat{s} = 0.85$, $n = 367$) in the Methow sub-herd is similar to the west-wide average for this metric and suggests a roughly stable population for this portion of the herd in most years.

Habitat

This zone's productive, high mountain habitats make the East Slope Cascades MDMZ extremely important to mule deer. Optimal habitat conditions provide nutritious forage for lactating does and contribute to high fawn survival and recruitment. These habitats are not limited, face little threat of direct human alteration, and are at present self-sustaining.

In recent years, drought conditions have arisen more frequently and become more intense, negatively impacting summer forage in the second half of the growing season and fostering large, intense wildfires. Many models predict these warmer and drier conditions will become more common as climate change progresses.

On winter ranges, mule deer move to a small portion of the overall landscape to avoid deep snow and find forage and thermal cover. This lower elevation habitat is under greater threat of alteration and disturbance; however, 30+ years of securing conservation status for critical areas has improved the long-term outlook.

Habitat-related considerations in this zone include continued development and fragmentation of low-elevation habitats, growing use and distribution of off-road vehicles, and increasing disturbance on winter ranges. This is compounded by recent landscape-level fires at low elevations and the increasing spread of invasive weeds, which reduce shrub vegetation communities.

Human-wildlife interaction

Most deer conflict is restricted to the lower elevation irrigated agriculture lands throughout the zone. Specific Deer Areas have been established in the northern portion of this zone, and antlerless permit hunt seasons have been designed to target and reduce deer damage. Permit numbers within each Deer Area fluctuate with the level of reported damage incidents and are currently at minimal levels. The program is operating smoothly and appears to help reduce deer damage complaints.

Damage Prevention Cooperative Agreements (DPCA) and Kill permits are also conservatively issued to reduce deer damage throughout the zone. In 2023, WDFW Conflict Specialists issued 15 deer (Mule or White-tailed deer) permits to address deer damage throughout the East Slope Cascades Mule Deer Management Zone.

Significant roadkill occurs in the northern portion of this zone along State Highways 20 and 153 in the Methow Valley and along a 12.5-mile segment of State Highway 97 in the Okanogan Valley. Telemetry data from deer collared near the highway suggests that the majority of animals in this area are resident deer, indicating vulnerability to road mortality is high year-round and not just during migratory seasons. A collaboration of agencies and NGOs is pursuing major grant funding to significantly expand the installation of crossing structures along this stretch of roadway. State Highways 97 and 97A are the major contributors to deer-vehicle collisions in the central portion of the zone.

Research

In a partnered effort between WDFW and the University of Washington, a large-scale predator-prey study with a mule deer component wrapped up in the northern portion of the East Slope Cascades MDMZ in 2022. This collaboration utilized 75-100 radio-collared mule deer for 4+ years and collected data on cause-specific sources of mortality for adult females as well as movement and migratory information. Annual adult doe survivorship averaged about 85% throughout the study, right in line with the west-wide average. Roughly 75% of the radioed animals were migratory, and seasonal movements of over 60 miles were documented. Publications produced as part of this research effort can be found at: Products - WASHINGTON PREDATOR-PREY PROJECT (weebly.com). More details on the migratory behavior of the Methow Sub-herd are available at Ungulate Migrations of the Western United States.

In 2019, funding was provided by the US Department of Interior for a four-year study to determine migratory routes, stopover areas, and seasonal ranges of mule deer in the East Slope Cascades MDMZ. In January 2020, 98 adult female mule deer were captured across Chelan (n = 40) and Kittitas (n = 58) counties and fitted with global positioning system (GPS) collars expected to last four years. In January 2021, biologists redeployed collars retrieved from mortalities that occurred over the previous year to maintain a sample size of approximately 100 animals. In January 2022, an additional 25 does were collared in Chelan County with refurbished collars. In January 2023, this effort expanded to include 50 collar deployments in the Okanogan Watershed and 17 collars in the Methow Watershed.

Analysis of three years of movement data (2020-2022) has revealed that does collared north of Hwy 2 in Chelan County are 63% migratory and 37% resident. However, the small sample size of only 19 does make it difficult to draw any conclusions from these data to apply to the Chelan subherd at large. In the Wenatchee Mountains subherd, in which a total of 121 does were collared between 2020 and 2022, deer collared in Kittitas County showed remarkably different migratory behavior than those collared in the Wenatchee Foothills of Chelan County. In the Chelan County portion of the Wenatchee Mountains sub-herd, 85% of does are migratory compared to a resident population of only 15%, while in Kittitas County, only 37% of collared does migrated while the remaining 63% were resident.

Adult survival proportions during the first year were 83% for the collared does in Chelan and 69% in Kittitas. Thus far, survival has continued to be significantly higher for the largely migratory does in Chelan County than for the primarily resident deer in Kittitas County. Although cause-specific mortality is not a focus of this study, biologists investigated mortalities to determine the proximate cause if sufficient evidence was present. In 2020, all mortalities in Chelan County were classified as “unknown” causes as snow conditions or private land access typically precluded biologists from reaching carcasses in time to determine the cause of death. In Kittitas, 35% of mortalities were attributed to cougars, 12% were vehicle collisions, and 47% were classified as “unknown” causes. Analyses of movement behavior and survival are ongoing, as is identifying of important migration routes and stopover points for mule deer in the East Slope Cascades MDMZ. More information on the migratory behavior of the Chelan Subherd and Wenatchee Mountains Subherd is available at USGS Ungulate Migrations of the Western United States.

Management concerns

Extensive loss of winter range shrub forage due to wildfire and development is currently a major management concern in the northern three-fourths of the zone. Although shrub forage has recovered significantly in several portions of areas burned in Okanogan County in 2014 and 2015, more recent fires have burned additional large tracts of winter range in both Okanogan and Chelan counties. The issue of winter range shrub loss is compounded by the post-fire conversion of these communities toward invasive weeds, decreasing the capability of the landscape to support deer. These effects are most prominent where conditions limit restoration success, such as on steep aspects with shallow, dry soil. Mule deer access to winter forage is also threatened by ongoing human population expansion in areas such as Wenatchee and Chelan. In these places and others throughout the East Slope Cascades MDMZ, new housing developments continue to encroach upon the already limited winter range available to deer in the foothills and lowlands.

During the winter of 2023-24, managers implemented a complete public access closure on roughly two-thirds of the Methow Wildlife Area between December 15 and March 31. This effort is in response to burgeoning recreational pressure and is designed to minimize disturbance on deer during the winter months when energetic stress is greatest.

Management conclusions

As of December 2023, mule deer populations in the East Slope Cascades MDMZ were meeting the minimum management objective in the north (15-19 bucks:100 does) and the central portion (25 bucks:100 does), and slightly lower than the objective in the south, suggesting current buck harvest strategies are generally sustainable. Past surveys indicated a decline in the overall population in the zone immediately following the 2014-15 fires, followed by slow growth for a few years at the end of the last decade. More recently, the population as a whole appears to be in decline again following a couple of harsher-than-average winters and the extreme summer conditions of 2021. Several years of declining fawn:doe ratios, decreased harvest, ongoing environmental impacts to mule deer such as drought, and numerous anecdotal reports of fewer mule deer on the landscape have all contributed to the decision to reduce antlerless hunting pressure in Chelan and Okanogan Counties. To conserve does in this portion of the East Slope Cascades, harvest in the early archery season is now restricted to 3 pt minimum bucks. Chelan County, special permits previously in the antlerless category are now reduced in number but liberalized to allow the harvest of any deer. In Okanogan County, special permits that included antlerless mule deer opportunities are now limited to any buck.

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Washington Department of Fish and Wildlife. 2016. Washington State Mule Deer Management Plan, Wildlife Program, Washington Department of Fish and Wildlife, Olympia, WA, USA. 144 p. 2016 WA State Mule Deer Management Plan.

Naches Mule Deer Management Zone

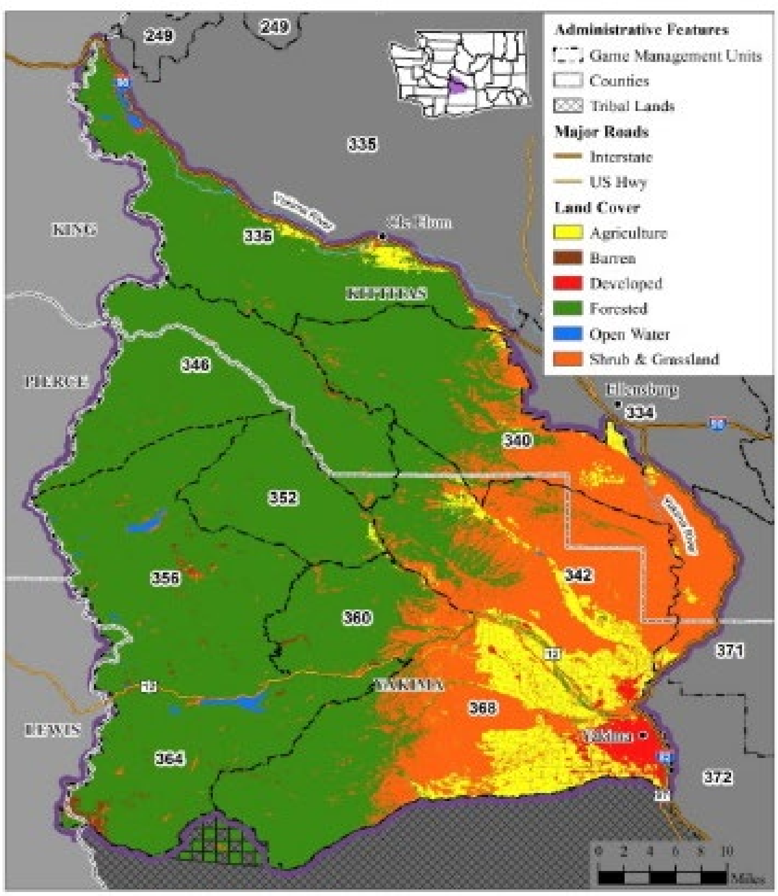
Erin M. Wampole, Wildlife Biologist
Callie B. Moore, Assistant Wildlife Biologist

Introduction

The Naches Mule deer management zone (MDMZ) is located in central Washington and includes Game Management Units GMUs (336, 340, 342, 346, 352, 356, 360, 364, and 368; Figure 1). It is largely comprised of forested, shrub/grassland, and agricultural habitats. Mule deer in this region are an important state and tribal resource, with Yakama and Muckleshoot peoples harvesting within its bounds. Mule deer are present throughout the Naches MDMZ.

The zone encompasses mostly public land (72.5%), including Okanogan Wenatchee National Forests, Washington State Department of Natural Resources Trust lands, Washington State Parks lands, and the Department's Oak Creek, Wenas, and L. T. Murray Wildlife Areas. Portions of private land are found typically along the foothills and valley bottomlands.

Figure 1. The Naches Mule Deer Management Zone (MDMZ) and generalized land cover types within the Naches MDMZ.



Management guidelines and objectives

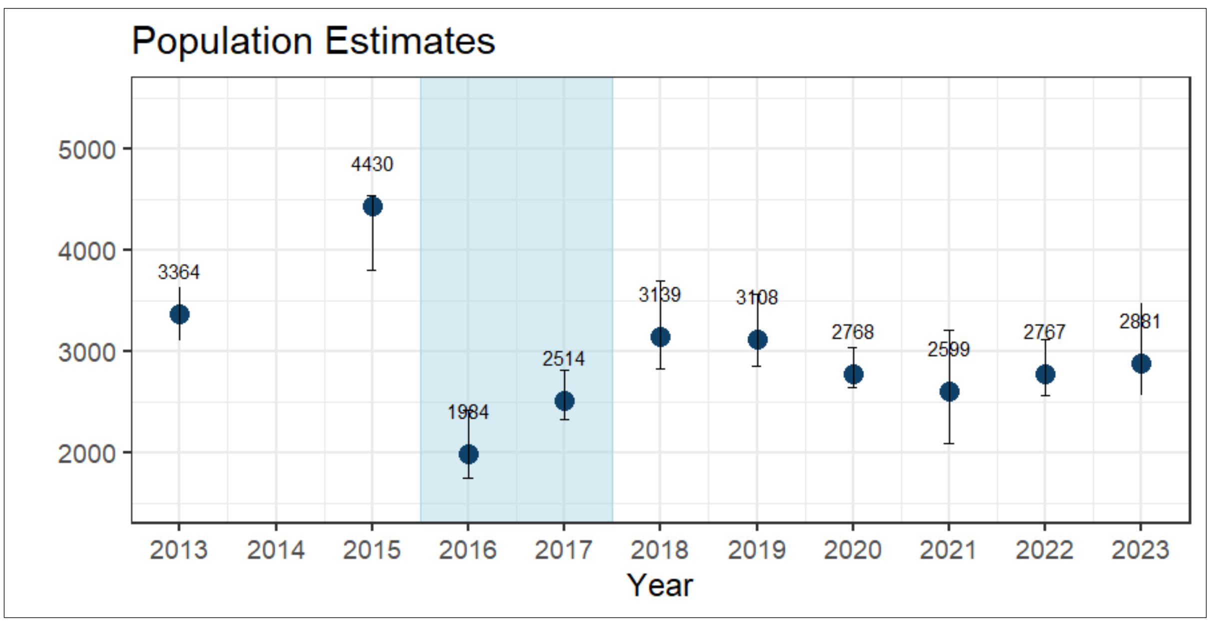
The Department's objective within this MDMZ is to maintain a stable population while managing for a post-hunt population ratio of 15-19 buck:100 doe (WDFW, 2015).

Population surveys

Population surveys in Naches MDMZ have occurred in the late winter-early spring since 2017 within PMU 33, encompassing portions of GMU 340 and 342 (Figure 2). Surveys are conducted by rotor-wing aircraft. The Unit is divided into subunits and searched in transects. Observed groups are counted and individuals are recorded as either fawn or adult. Estimated abundance and fawn:adult ratio is derived from aerial count data corrected for sightability (Unsworth et al., 1999).

The most recent population survey estimates were 2881 mule deer, 90% CI [2566-3475] in Spring 2023. Population estimates indicate a relatively stable trend since 2020, with overlapping confidence intervals (CI). The fawn-adult ratio was estimated at 39 fawns:100 adults, 90% CI [35-42], down from the Spring 2022 estimate of 47 fawns: 100 adults [43-51].

Figure 1. Population estimates of surveyed portions of the Naches MDMZ from 2013-2023. The blue area represents a period of severe winter conditions (2015-2017) in Yakima and Kittitas counties.



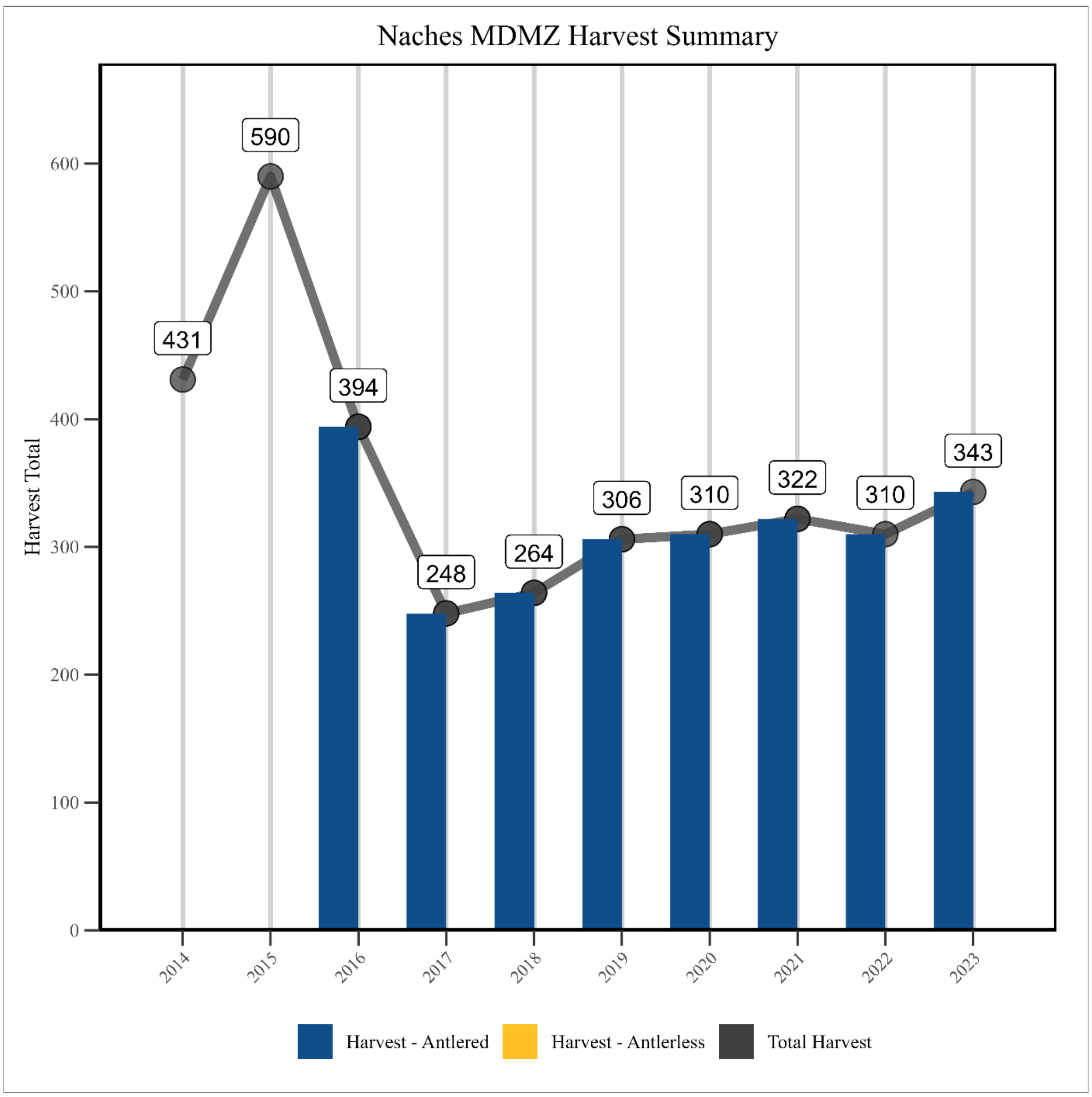
Plots represent surveys on PMU 33.

Hunting seasons and recreational harvest

WDFW permits a general season 3-point minimum hunt and quality buck hunt within the bounds of the Naches MDMZ. There has been no state-issued antlerless harvest in this MDMZ since 2006. The Yakama Nation has off-reservation hunting rights in the MDMZ. They restrict antlerless take to September through December, while bucks can be harvested year-round. The Muckleshoot Indian Tribe also hunts in the Naches MDMZ, does not allow any antlerless harvest, and restricts their buck-only harvest season to the fall. Neither tribe reports an official estimated harvest to WDFW.

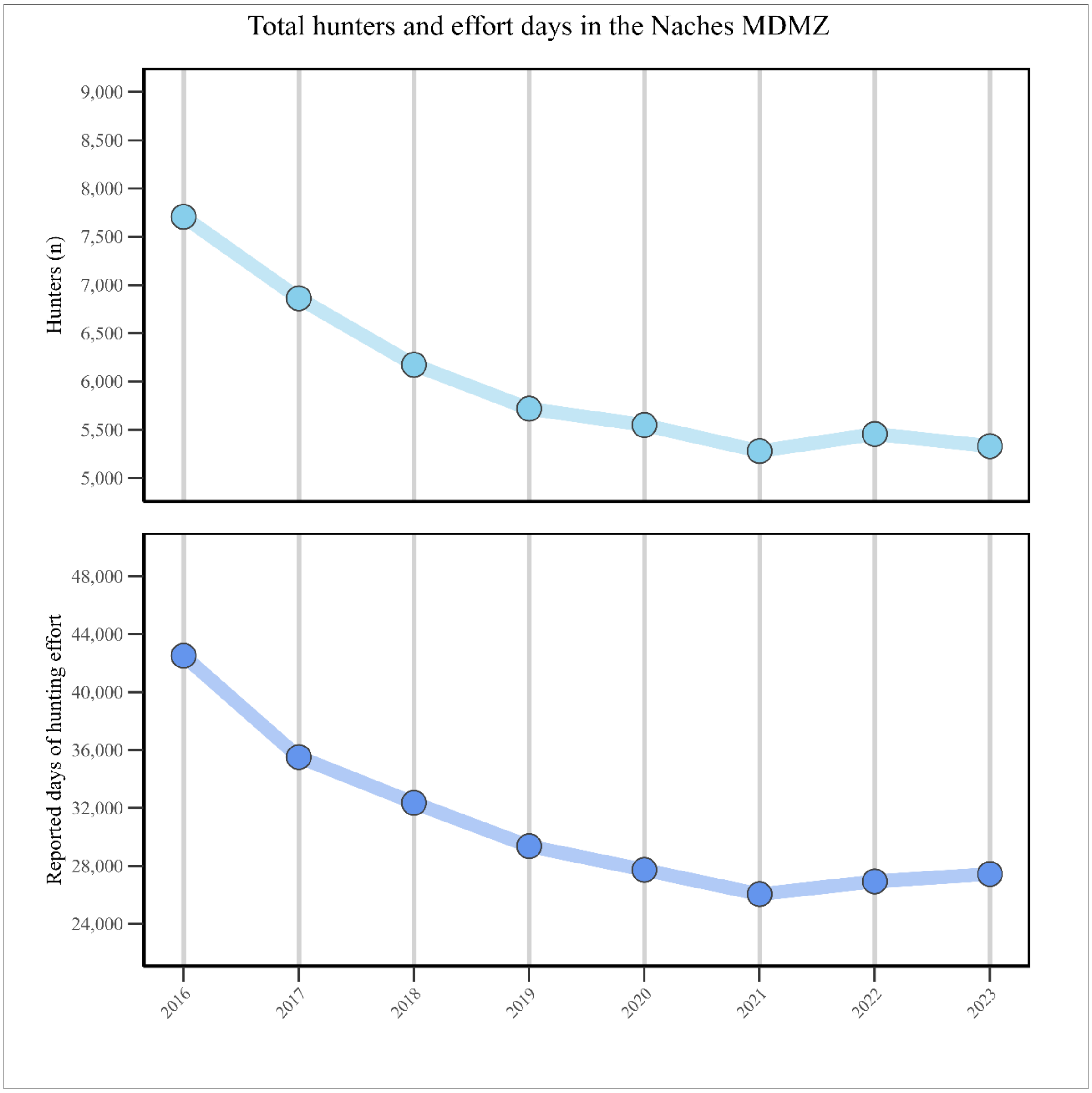
State harvest trends for the past ten years have varied annually (Figure 2). Since 2019, harvest has stabilized around 300 deer. Drought and severe winters in 2015-2017 led to a significant decrease in the population (Figure 1), which is reflected in the harvest estimates for 2016 and 2017. Since then, harvest has rebounded slightly and leveled off just below the 10-year average.

Figure 2. Mule deer harvest estimates for the Nachez MDMZ.



Harvest estimates for general season buck (blue), antlerless (yellow), and total harvest (black dots) in the Naches MDMZ, 2014-2023.

Figure 3. Total hunters and effort days in the Nachez MDMZ.



General season estimates for number of hunters (pale blue) and cumulative number of hunter days (blue) in the Nachez MDMZ, 2016-2023. WDFW cannot generate species-specific estimates for number of hunters, days, success, etc. in most eastside GMUs, because both mule deer and white-tailed deer can be hunted.

Survival and mortality

Estimates of annual survival rates for adult female mule deer monitored in Naches MDMZ average 80%. Survival rates during 2015-2016 were 67% and 77% and peaked in 2017 at 89% (MIT, 2019). Predation by cougars has accounted for the highest proportion of the radio-marked deer mortalities in this MDMZ (≈40%). The second and third highest proportions of total mortality were attributed to malnutrition and human-caused mortality, at 23% and 20% of total mortalities, respectively.

Survival estimates are consistent with adult female survival documented in other mule deer populations throughout the West (Bleich & Taylor, 1998; Unsworth et al., 1999; Bishop et al., 2005; Hurley et al., 2011; Monteith et al., 2014). However, estimates are lower than observed in the WDFW's research conducted in the Columbia Plateau, East Slope Cascades, and Okanogan Highlands MDMZs (WDFW, 2016).

Habitat

A number of habitat improvement projects specifically designed to enhance mule deer habitats have been ongoing within the Naches MDMZ. Projects on Department lands have involved prescribed burning, forest thinning, noxious weed control, and planting native shrubs to improve winter ranges. Habitat improvement projects conducted on national forest lands include forest thinning and other timber harvest, and prescribed burning. There are currently no measures of habitat quality for this deer zone. Fire suppression, post-fire recovery, and thinning/control burns to reduce fuel have likely influenced deer habitat over the last decade. Radio collar data indicate that deer disperse through much of the MDMZ, but densities are highest in GMUs 340 and 342. Harvest data match the distribution of radio-marked deer. Fire and human alteration have generally increased browse production in GMUs 340 and 342. However, the habitat quality of the more arid portions of GMU 342 has declined with the presence of fires, resulting in the loss of shrub-steppe habitat by removing sagebrush, affecting other shrub cover, and subsequently creating a more grassland ecosystem. Thinning and burning in GMU 352 has transformed many areas into ponderosa pine forested grasslands. Radio-marked deer made limited use of these areas during the study. In 2021, the area burned in a major fire, further altering the area and decreasing forage.

Human-wildlife interaction

Deer conflicts with agriculture in the Naches MDMZ are low. Approximately 20 landowner kill permits were issued in the 2023-24 season, and no harvests were reported.

Research

The Muckleshoot Indian Tribe (MIT) has been conducting a long-term mule deer population study since 2012 in cooperation with WDFW. The study aims to understand the drivers of population dynamics, including the effects of climate, habitat, predation, and disease on mule deer. Since 2012, MIT has maintained monitoring of approximately 100 adult does annually. MIT is currently analyzing data from the last decade. The research is set to continue indefinitely.

Management concerns

Mule deer in the Naches MDMZ hit a historic low in 2016. Population monitoring in portions of the zone indicate the populations have seen slow recovery. Climate, habitat disturbance, disease, competition, and predation are the principal concerns for limiting recovery.

Climate: Summer droughts followed by moderate or harsh winters can result in significant population declines.

Habitat Disturbance: In the shrubsteppe, fires have converted the range to grass and are becoming increasingly frequent. Restoration in arid environments is very challenging, and it is hindered by repeated burns. Wildfires, thinning, and controlled burns are increasing in forests and may increase browse production in more moist forest zones. However, several severe stand-replacing fires have occurred in the zone, with slow recovery.

Disease: The deer population faces risks from numerous diseases, including Hair Loss Syndrome (HLS), Adenovirus hemorrhagic disease (AHD), and Chronic Wasting Disease (CWD). Since 2004, some deer in this zone have been affected by Hair Loss Syndrome, a condition caused by an exotic louse. In the mid-2000s, this syndrome and other contributing factors substantially declined the mule deer population in this MDMZ (Bernatowicz et al., 2011). Adenovirus hemorrhagic disease is another suspected but unconfirmed factor that may have influenced historic declines. Chronic Wasting Disease has not been detected in the region but remains a management concern.

Competition: Naches MDMZ overlaps with the Yakima Elk herd range, which includes over 10,5000 elk in 2023. Elk have been documented to exclude deer (Johnson et al., 2000) but at present WDFW lacks information to inform elk-deer management. During periods of limited resources on the landscape, pressure from elk may have significant negative effects on deer.

Predation: Cougars are a principal cause of mortality for deer in this zone, but it is unknown if habitat or nutrition are also factors. Cougar predation is not likely the cause of the deer declines but may affect the pace and scale of population recovery.

Management conclusions

Mule deer populations in the Naches MDMZ are low compared to historic levels. Recent data suggest the population may not recover to historic levels without other management and habitat restoration actions. The difficulty of recovery has been amplified by the increasing frequency of hotter and drier summers. The buck populations were historically within the minimum management objective of 15-19 bucks per 100 does, however current survey methods do not provide buck:doe estimates. Survey approaches in this MDMZ are still being refined. Emphasis on assessing and improving habitat should be made since mule deer densities depend largely on habitat quality (Kie et al., 2002).

Predation may also play an important regulatory role in limiting population recovery or growth during periods of environmental stress. Research findings for the MIT will greatly improve our understanding of mule deer population dynamics and potential limitations to growth and recovery. Analysis is underway, and additional survey efforts are planned in the coming years to better guide management.

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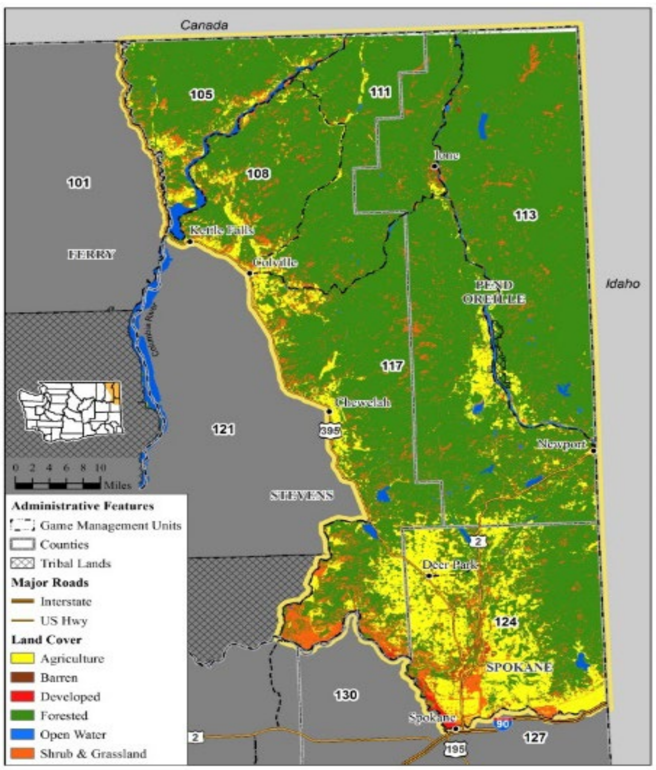
Northern Rocky Mountains Mule Deer Management Zone

Annemarie Prince, Wildlife Biologist
Carrie Lowe, Wildlife Biologist
Matt Brinkman, Wildlife Biologist

Introduction

The Northern Rocky Mountains MDMZ is in northeast Washington and consists of six Game Management Units GMUs (105, 108, 111, 113, 117, and 124; Figure 1).

Figure 1. The Northern Rocky Mountains Mule Deer Management Zone (MDMZ).



GMUs and generalized land cover types within the Northern Rocky Mountains MDMZ.

Management guidelines and objectives

The Department's objective within this MDMZ is to maintain a stable population based on harvest estimates and other best-available information. Additional management objectives include managing for a post-hunt population with a sex ratio of 15-19 bucks:100 does. While mule deer are present at low numbers, the habitat in better suited to white-tailed deer, which are the primary focus of management in this zone.

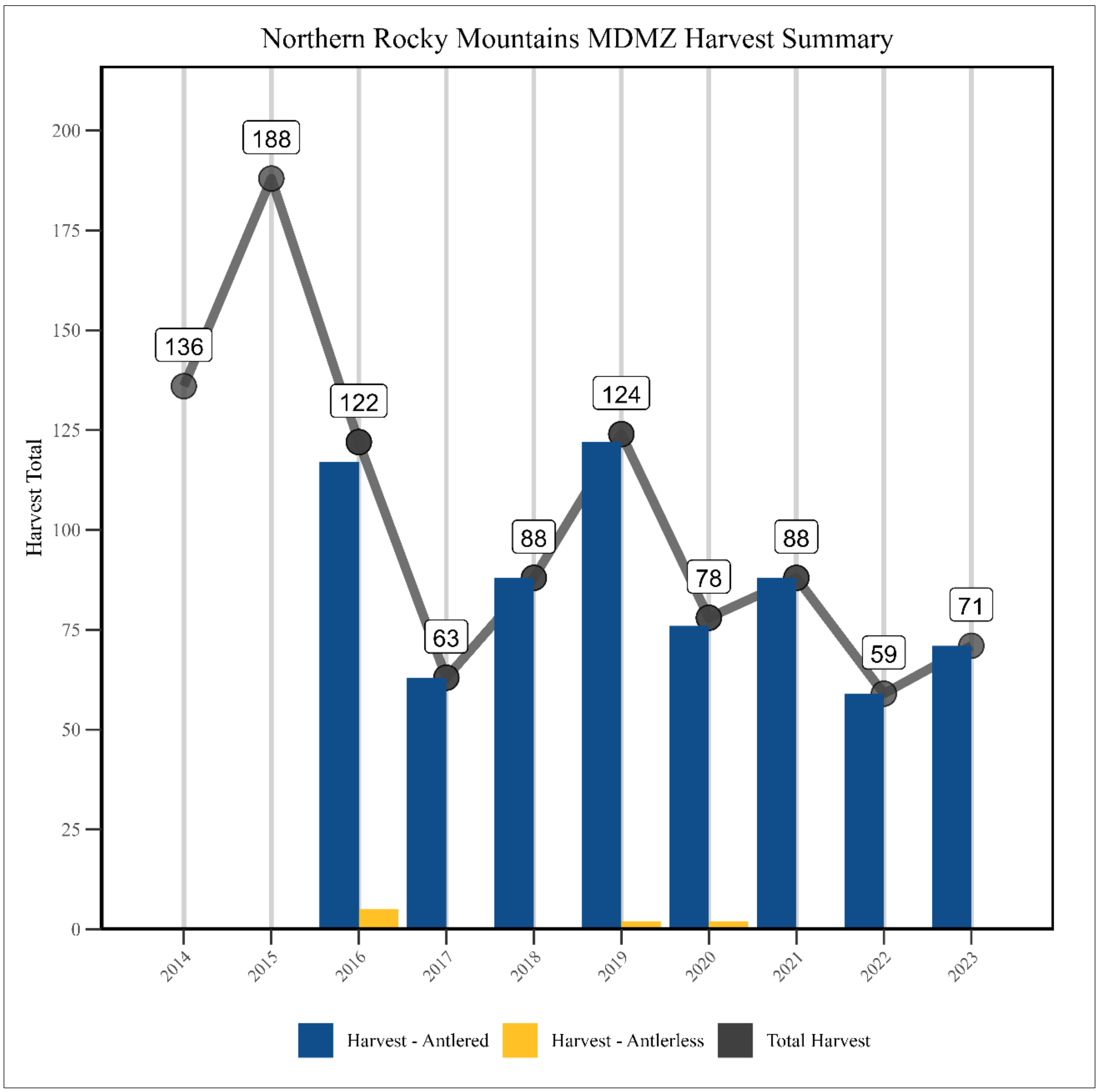
Population surveys

No estimates of mule deer abundance are available for populations within this zone. Still, the overall mule deer numbers are low, given the limited high-quality mule deer habitat in the zone.

Hunting seasons and recreational harvest

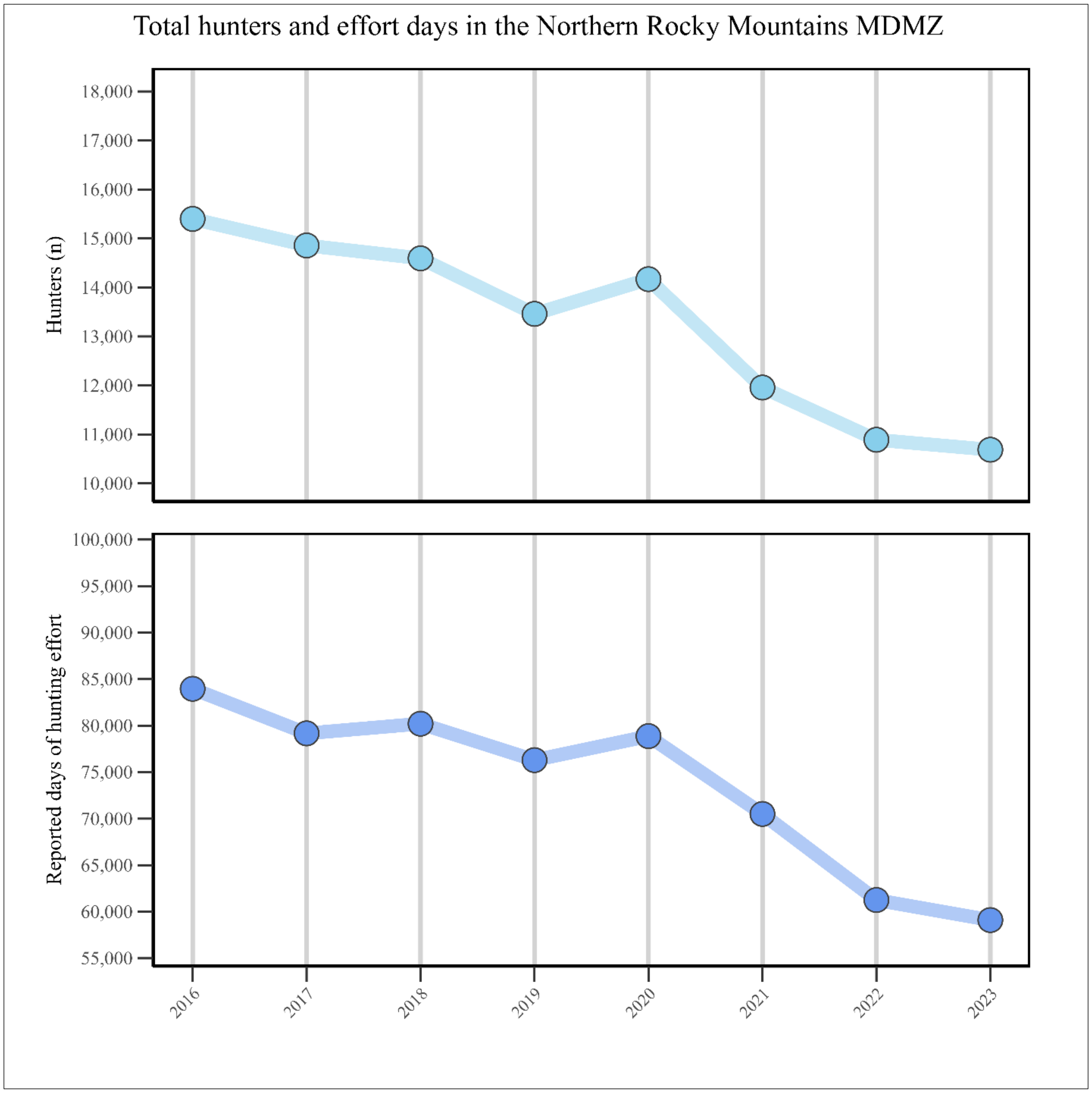
Harvest estimates fluctuate year to year, reflective of the lack of availability of preferred habitat for mule deer in this zone (Figure 2). Measures of total hunters and effort days (Figure 3) for mule deer in this zone are consequently skewed because this zone is predominantly hunted for white-tailed deer and WDFW cannot generate species-specific estimates for number of hunters, days, success, etc.

Figure 2. Mule deer harvest estimates for the Northern Rocky Mountains MDMZ.



Harvest estimates for general season buck (blue), antlerless (yellow), and total harvest (black dots) in the Northern Rocky Mountains MDMZ, 2014-2023.

Figure 3. Total hunters and effort days in the Northern Rocky Mountains MDMZ.



General season estimates for number of hunters (pale blue) and cumulative number of hunter days (blue) in the Northern Rocky Mountains MDMZ, 2016-2023. WDFW cannot generate species-specific estimates for number of hunters, days, success, etc. in most eastside GMUs, because both mule deer and white-tailed deer can be hunted.

Survival and mortality

No pregnancy, fetal, or survival rate estimates are available for mule deer herds in the Northern Rocky Mountains MDMZ. Cougars, black bears, grizzly bears, gray wolves, bobcats, and coyotes occur within this MDMZ, and predation's effects on this mule deer population are unknown.

Habitat

Habitat within the Northern Rocky Mountains MDMZ is predominantly conifer forest, comprising over 70 % of the total land cover within the zone. Forest types include dry forests at low elevations, mainly composed of ponderosa pine and Douglas fir, and high-elevation forests composed of subalpine fir, western larch, Engelmann spruce, whitebark pine, and lodgepole pine. More mesic sites at any elevation contain western red cedar, western hemlock, and grand fir. Outside the winter season, mule deer tend to be found at high-elevation ridges and basins, except in GMU 124, where they are found year-round along the Spokane River and associated tributaries. Most of these high-elevation summer ranges are on public land managed for multiple uses, including wildlife conservation. Lands under private ownership are typically managed for long-term timber production. Hence, there appears to be little threat of habitat conversion on mule deer summer ranges within the Northern Rocky Mountains MDMZ. The one exception to this is GMU 124, where residential development along the Spokane River and tributaries is resulting in the loss of traditional habitat. Mule deer, however, are adapting to this development and are often reported as nuisance or damage issues in the towns along the river.

Human-wildlife interaction

Most mule deer observed within the Northern Rocky Mountains MDMZ are in places where the deer are generally appreciated. Hence, no conflicts have been reported specific to mule deer outside the Spokane area. All Damage Prevention Cooperative Agreements in this zone have been specific to conflicts with white-tailed deer in low-elevation farmlands. Within the Spokane area, conflicts with mule deer have typically involved damage to landscaping and human safety issues, predominantly vehicle-deer collisions along Hwy 291 and Northwest Blvd.

Management concerns

The primary management concerns for mule deer in the Northern Rocky Mountains MDMZ are that numbers appear to be low and restricted in range by suitable habitat.

Management conclusions

Mule deer populations in the Northern Rocky Mountains MDMZ are not considered at risk based on hunter-harvest metrics.

Literature cited

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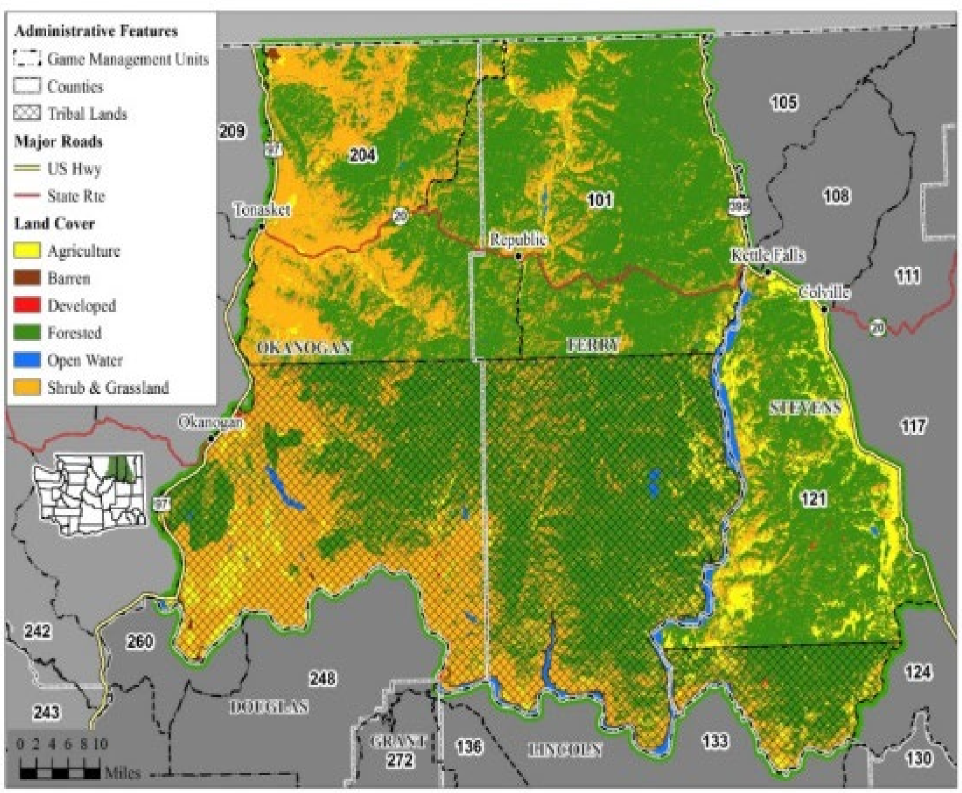
Okanogan Highlands Mule Deer Management Zone

Annemarie Prince, Wildlife Biologist
Jeff Heinlen, Wildlife Biologist
Scott Fitkin, Wildlife Biologist

Introduction

The Okanogan Highlands MDMZ is in north-central Washington and includes Game Management Units GMUs (101, 121, and 204; Figure 1).

Figure 1. The Okanogan Highlands Mule Deer Management Zone (MDMZ).



GMUs and generalized land cover types within the Okanogan Highlands MDMZ.

Management guidelines and objectives

The Department's objective within this MDMZ is to maintain a stable population based on field surveys and harvest estimates. Additional management objectives include managing for a post-hunt population with a sex ratio of 15-19 bucks:100 does. However, post-hunt surveys are not feasible in this zone. Therefore, managers rely solely on harvest estimates for management decisions.

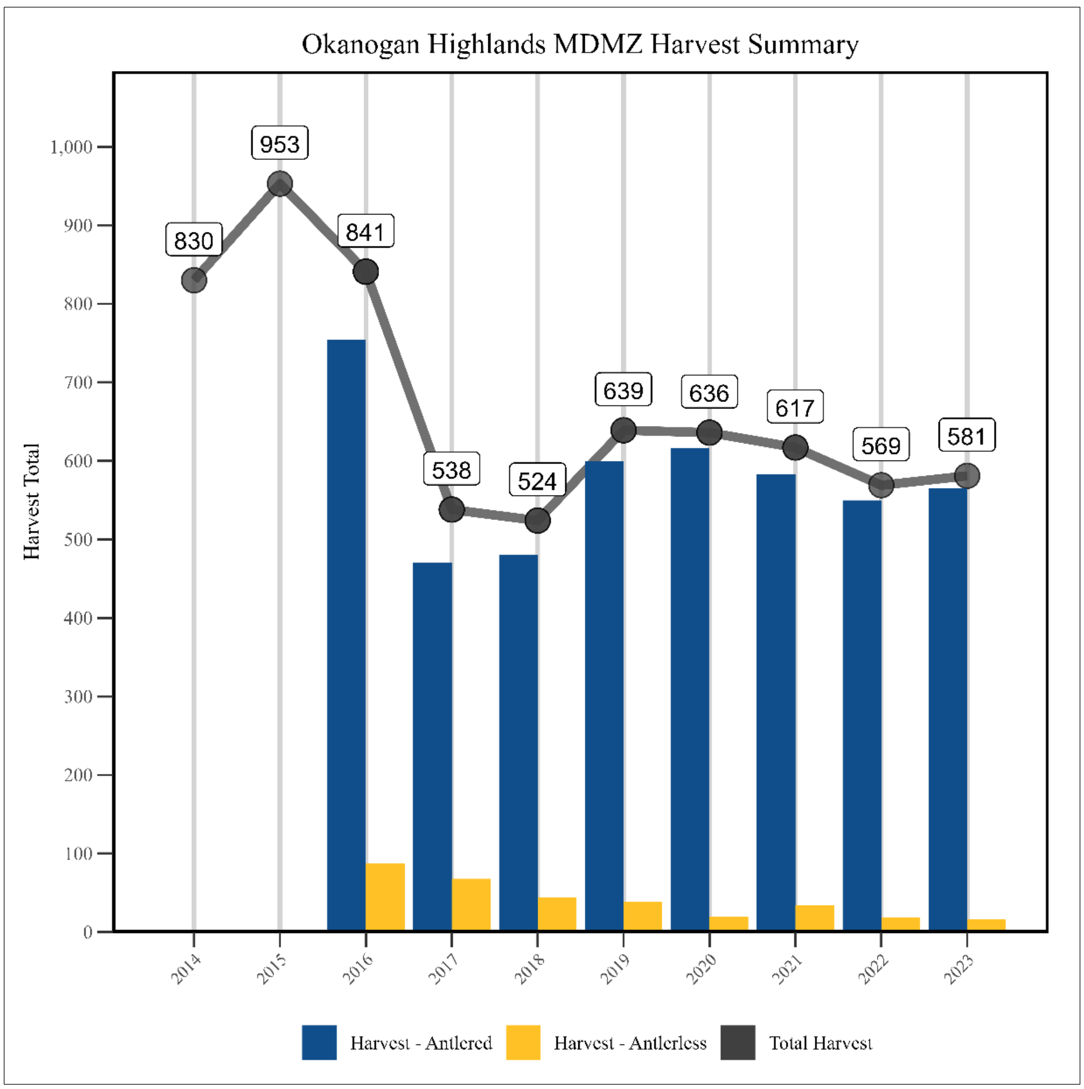
Population surveys

Mule deer are present throughout the Okanogan Highlands MDMZ but are more common in the western portion. Pre-hunt road surveys are conducted for white-tailed deer in the eastern portion of the zone, but sample sizes are insufficient to provide useful information for mule deer. No post-hunt surveys are conducted.

Hunting seasons and recreational harvest

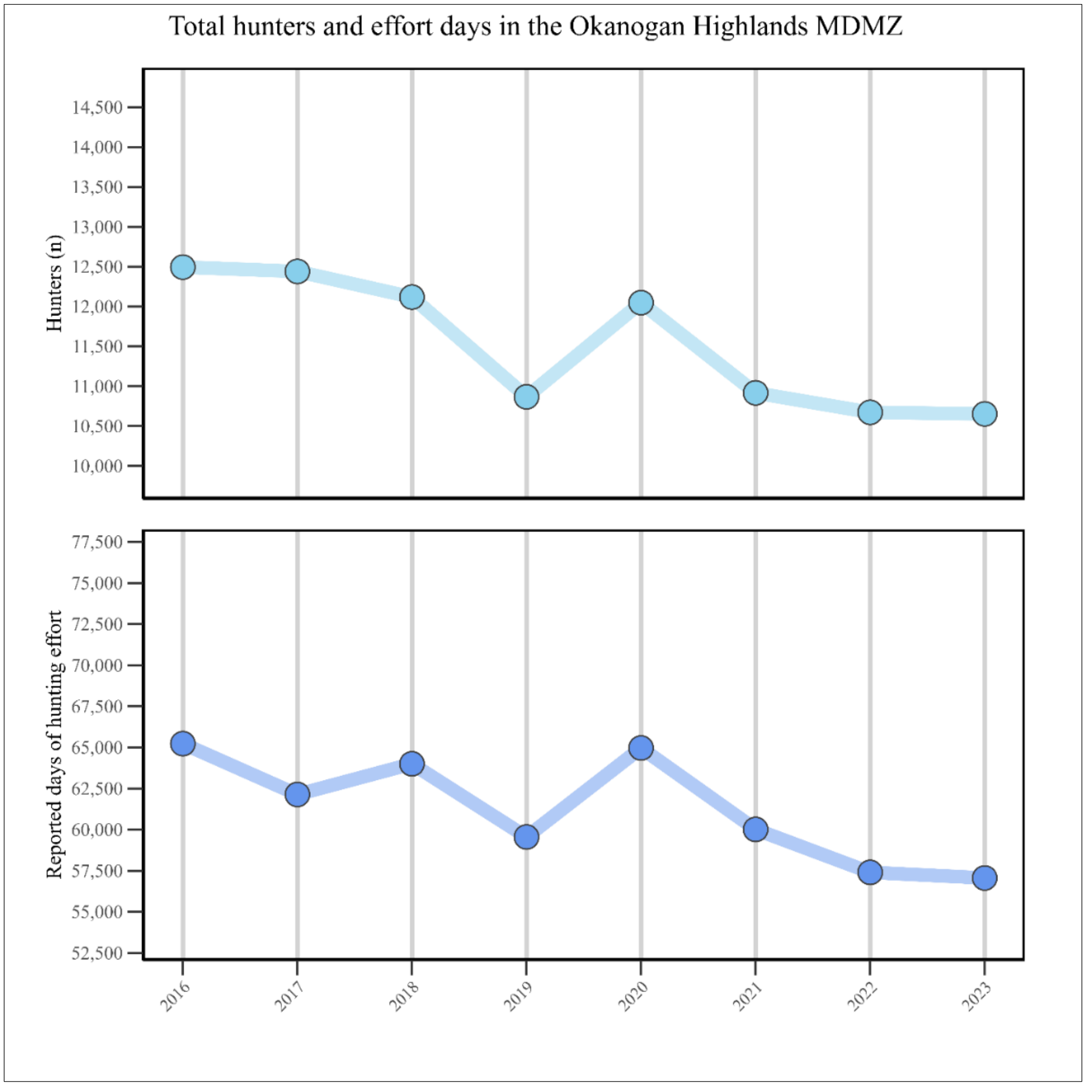
Annual harvest for the past ten years has fluctuated modestly. Harvest in 2023 was slightly up from 2022 but was still below the 10-year average (Figure 2). Hunter days have fluctuated in recent years and could be due to shortened season length, and hunter effort have remained stable (Figure 3).

Figure 2. Mule deer harvest estimates for the Okanogan Highlands MDMZ.



Harvest estimates for general season buck (blue), antlerless (yellow), and total harvest (black dots) in the Okanogan Highlands MDMZ, 2014-2023.

Figure 3. Total hunters and effort days in the Okanogan Highlands MDMZ.



General season estimates for number of hunters (pale blue) and cumulative number of hunter days (blue) in the Okanogan Highlands MDMZ, 2016-2023. WDFW cannot generate species-specific estimates for number of hunters, days, success, etc. in most eastside GMUs, because both mule deer and white-tailed deer can be hunted.

Survival and mortality

A study involving adult female mule deer in the zone, conducted between 2000 and 2007, indicated survival ($\hat{s}$ = 0.89, 95% CI = 0.87 – 0.91), pregnancy rates ($\hat{p}$ = 0.93, 90%CI = 0.81 – 1.00), and fetal rates ($\hat{f}$ = 1.44, 90% CI = 1.03 – 1.85) in the Okanogan Highlands MDMZ were sufficient to support stable populations (WDFW, 2016). The study also found that cougars and deer-vehicle collisions were the most common sources of mortality (WDFW, 2016). A study by Delinger et al. (2018) estimated white-tail and mule deer combined annual survival to be 0.69± 0.04 between 2013 and 2016 within the Okanogan

Highlands Mule Deer Management Zone. Unfortunately, sample sizes were not large enough to produce species-specific survival estimates. Predators in the Okanogan Highlands MDMZ include black bears, bobcats, coyotes, cougars, golden eagles, and gray wolves.

Habitat

Habitat within the Okanogan Highlands MDMZ is predominantly conifer forest, contributing approximately 61% of the total land cover within the zone. Shrublands, upland grass and herbaceous, and agricultural lands make up the next highest level in land cover classes, altogether comprising approximately 33% of the Okanogan Highlands MDMZ area. The Okanogan Highlands MDMZ can also be broken down to about 28% public land and 27% private lands, with the remaining 45% comprised of the Colville and Spokane Indian Reservations (WDFW, 2016).

Threats to habitat quality within the Okanogan Highlands MDMZ include continued development and fragmentation of low-elevation habitats, increasing use and distribution of off-road vehicles, and increasing prevalence of invasive weeds. Wildfire also alters habitat throughout this zone. Large landscape-scale wildfires are becoming more frequent within this zone. Wildfires can create an immediate loss of habitat but typically improve forage quality in the years following. Loss of forage on the winter range and reduced concealment cover take longer to recover after wildfires. In 2021, approximately 70,000 acres burned from wildfires within this zone. No large wildfires occurred within this zone in 2023.

Human-wildlife interaction

Most deer conflict is restricted to the lower elevation irrigated agriculture lands throughout the Zone. Specific deer areas have been established on the western edge of this zone, and antlerless permit hunt seasons have been designed to target and reduce deer damage. Permit numbers within each Deer Area fluctuate with the level of reported damage incidents. The program is operating smoothly and appears to help reduce deer damage complaints. Damage Prevention Cooperative Agreements (DPCA) and kill permits are also conservatively issued to reduce deer damage throughout the Zone. In 2023, WDFW Conflict Specialists issued 4 (any deer species) of these permits to address deer damage throughout Okanogan Highlands MDMZ.

Republic, Washington, has a resident, in-town mule deer population that causes property damage and occasionally poses a safety threat. Historically, the town of Republic was issued kill permits annually so the local police department could address acute deer issues. In 2023, no permits were issued.

Significant roadkill occurs in the western edge of this zone along a 12.5-mile segment of State Highway 97 between Riverside and Tonasket, Washington. In 2020, one mile of deer fencing on either side of State Highway 97 (with associated gates and cattle guards at access roads) was completed, with Janis Bridge serving as the wildlife under-crossing. A collaboration of agencies and NGOs is pursuing funding to complete the 12.5 miles of crossing structures.

Research

No research being conducted on mule deer in the Okanogan Highlands MDMZ.

Management concerns

Approximately 28% of the Okanogan Highlands MDMZ's land base is in public ownership. Thus, maximizing hunting opportunities largely depends on securing access to private lands. Other than hunting, significant sources of deer mortality in this zone include predation by native carnivores and vehicle collisions. Severe winter conditions periodically result in a decline in the over-winter survival of mule deer in this zone, generally affecting fawns more so than adults. In addition, summer heat and drought are becoming more frequent, which can foster conditions for severe outbreaks of hemorrhagic disease, reduce available forage deer need to accrue adequate fat stores for winter, and reduce fawn recruitment. The influence of these factors can complicate how best to balance deer hunting opportunities with herd sustainability.

Management conclusions

Mule deer populations in the Okanogan Highlands MDMZ are considered stable based on harvest data trends but remain below the 10-year average.

Literature cited

Dellinger, J.A., C.R. Shores, M. Marsh, M.R. Heithaus, W.J. Ripple, and A.J. Wirsing. 2018. Impacts of recolonizing gray wolves (*Canis lupus*) on survival and mortality in two sympatric ungulates. Can. J. Zool. 96: 760–768.

Washington Department of Fish and Wildlife. 2016. Washington State Mule Deer Management Plan, Wildlife Program, Washington Department of Fish and Wildlife, Olympia, WA, USA. 144 p. 2016 WA State Mule Deer Management Plan.

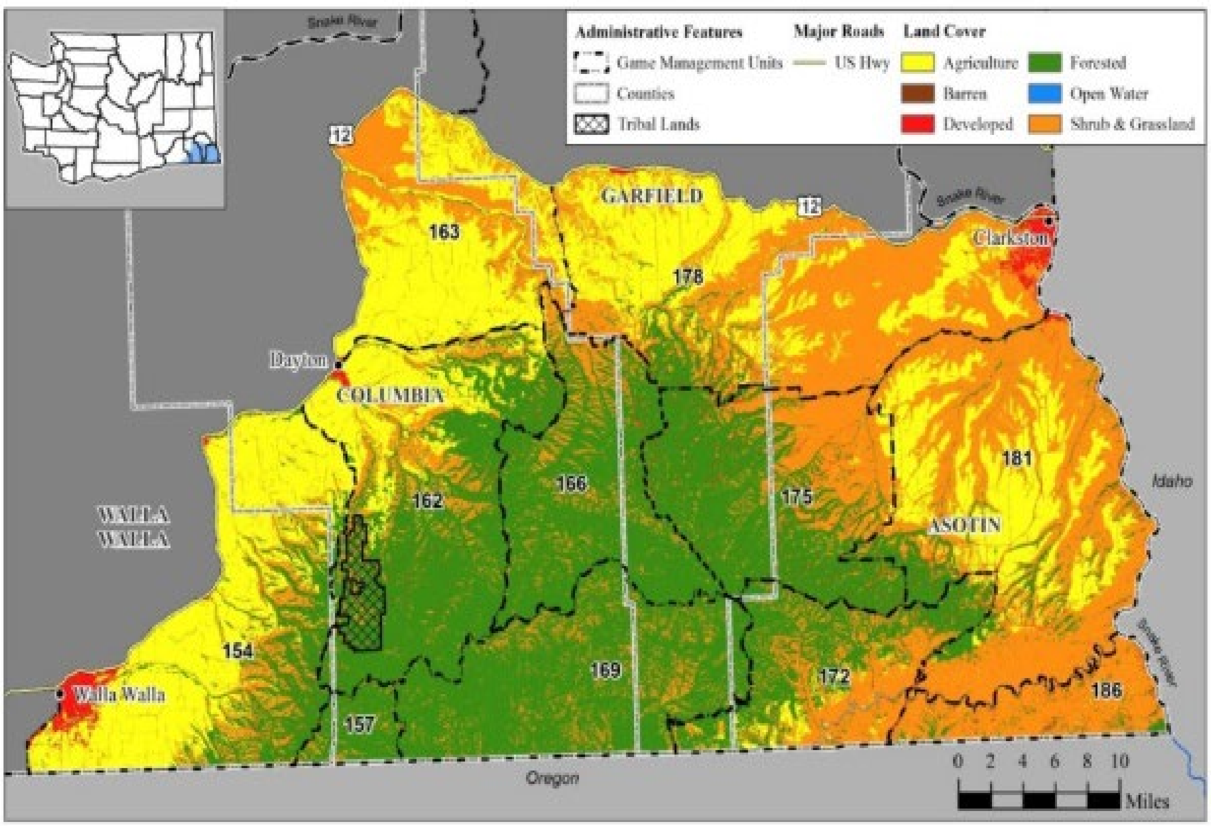
Blue Mountains White-tailed Deer Management Zone

Mark Vekasy, Wildlife Biologist

Introduction

The Blue Mountains White-tailed Deer Management Zone (WDMZ) is in southeast Washington and consists of 11 Game Management Units GMUs (154, 157, 162, 163, 166, 169, 172, 175, 178, 181, and 186; Figure 1). GMU 157 is closed to all entry except by permit, and no white-tailed deer hunting is currently permitted. GMUs 145 and 149 are included in the Palouse WDMZ.

Figure 1. The Blue Mountains White-tailed Deer Management Zone (WDMZ).



GMUs and generalized land cover types within the Blue Mountains WDMZ.

Management guidelines and objectives

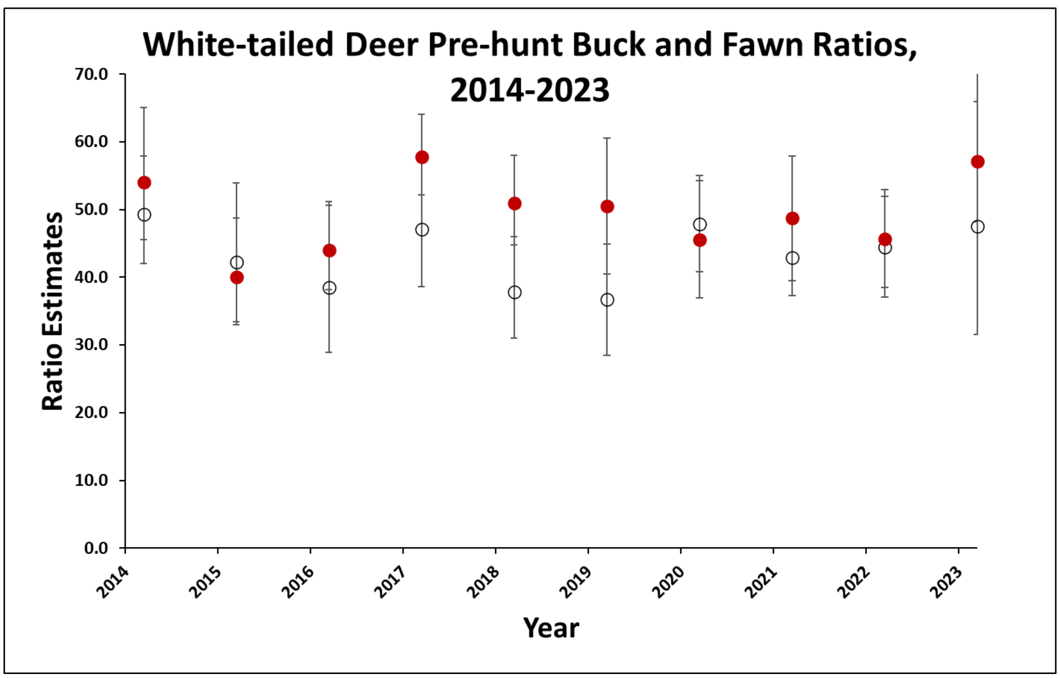
The Department's objective within this WDMZ is to maintain a stable population based on available survey data and harvest estimates. Additional management objectives include managing for a post-hunt population with a sex ratio of 15-19 bucks:100 does (WDFW, 2010).

Population surveys

White-tailed deer occur throughout the zone, but densities are generally greater in the foothills, riparian corridors, and higher-elevation agricultural areas. Pre-hunt ground surveys are conducted each year to estimate sex and age ratios for both mule deer and white-tailed deer in portions of the zone. Some information is recorded for white-tailed deer during post-hunt aerial mule deer surveys and road-based composition surveys.

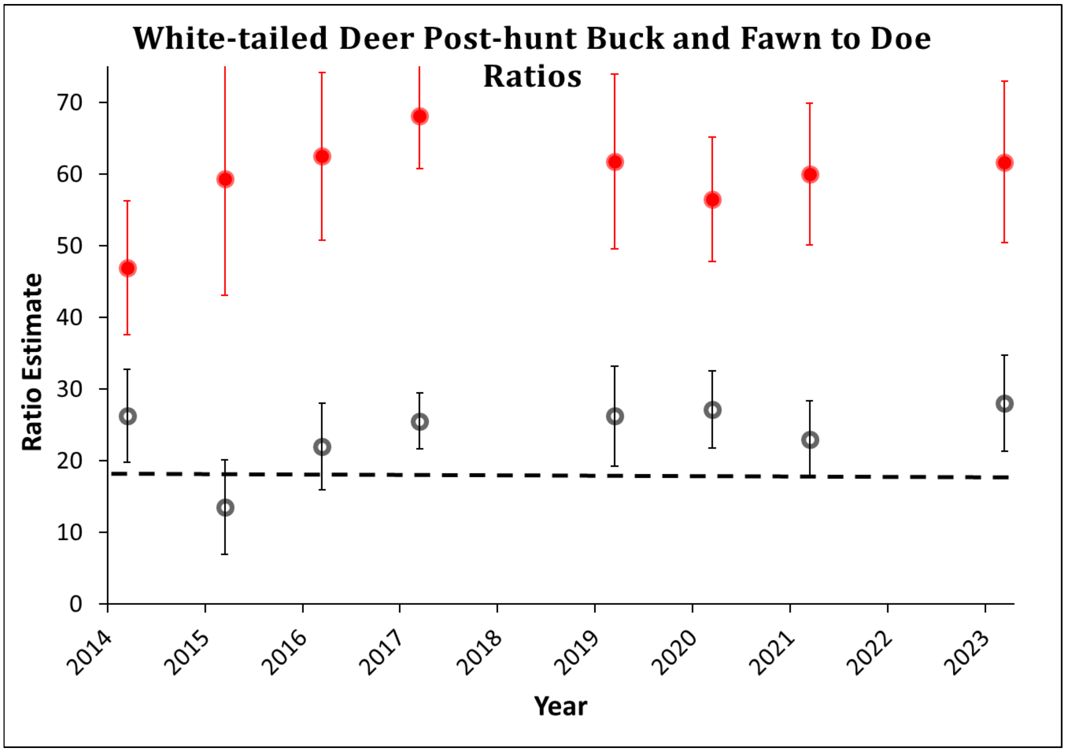
Estimates vary widely from year to year, with a 10-year pre-hunt mean of 42.4 bucks:100 does and 49.0 fawns:100 does. WDFW 2023 monitoring efforts resulted in slightly higher values for bucks and fawns compared to the means, with 47.5 bucks:100 does and 57.1 fawns:100 doe ratios (Figures 2 & 3). Road surveys for ratio estimates are not adequate to obtain a population estimate but are helpful in determining population and recruitment trends. Post-hunt ratios for bucks or fawns in 2023 were improved over the long-term averages of 23.5 for bucks and 57.1 for fawns, with an estimate of 28 bucks/100 does and 61.7 fawns/100 does from post-hunt surveys.

Figure 2. Pre-hunt, ground-based estimates of buck and fawn ratios.



Estimates of buck (black) and fawn (red) ratios per 100 does from pre-hunt (ground-based) surveys in the Blue Mountains WDMZ, 2014–2023. Years where ground counts were below 100 deer have been excluded.

Figure 3. Post-hunt, aerial, and ground composition surveys.



Estimates of buck (black) and fawn (red) ratios per 100 does and post-hunt buck objectives (dashed lines) from post-hunt (aerial and ground) composition surveys in the Blue Mountains WDMZ, 2014–2023. Years where ground counts were below 100 deer have been excluded.

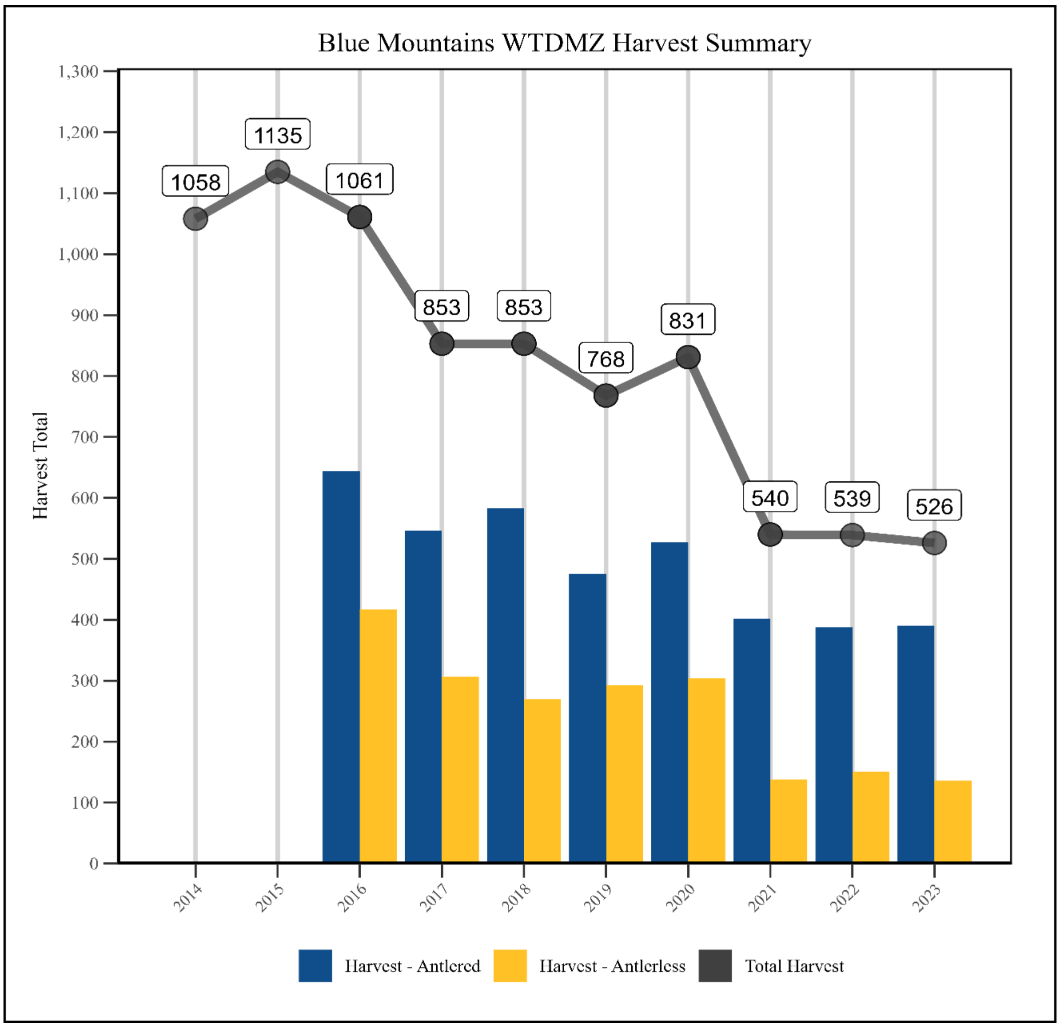
Hunting seasons and recreational harvest

Total harvest estimates for the past ten years (Figures 4 & 5) showed a 4-year declining trend starting in 2016, consistent with the decline in the number of hunter days, resulting in stable values for harvest per unit effort (HPUE, Figure 4). The trend halted in 2020 with a return near the 10-year average. However, harvests declined again in 2021 and have remained lower for the past two hunting seasons coincidental with a hemorrhagic disease outbreak and have shown slow to little recovery since that event. The average general season hunter harvest is 844 white-tailed deer per season, with a harvest of less than 600 estimated for the 2023 season and only a small harvest increase over the 2022 season. Harvest trends across GMUs were not uniform this past season, with many units being stable, a few showing improvements, and GMUs 162, 163, and 172 in particular unexpectedly showing further declines. While it is generally easy to attribute uniform trends across GMUs to a specific cause, the variation seen in 2023 harvest results among GMUs is difficult to explain. With the continued trend of lower white-tailed deer harvest, WDFW has restricted general season antlerless opportunity by eliminating antlerless harvest for youth, seniors, and disabled hunters during the most recent 3-year season setting process. These restrictions will remain in place until biologists re-evaluate harvest trends during the next 3-year season-setting period.

The number of permits issued varies by year, particularly for antlerless deer, depending on factors affecting the population (disease occurrence and severity, winter severity, drought, etc.) and levels of agricultural damage; therefore, the trend in permit harvest is not a good indicator of overall population condition.

A recent permit change was the addition of muzzleloader antlerless permits in GMUs without general season muzzleloader opportunities. In general, there was no net increase in permits, as the Department decreased second deer antlerless permits (or any species antlerless permits) for modern firearm hunters to avoid overharvesting of antlerless mule deer. Despite adding muzzleloader antlerless permits in 2019, total antlerless permits dropped from a 10-year high of 941 in 2017 to 820 in 2018, down to 775 in 2019 and 2020, with a further reduction to 625 antlerless permits in 2021 and reduced again to 265 in 2022. Some of the reduction was the result of switching antlerless permits to “any deer” permits for youth hunters.

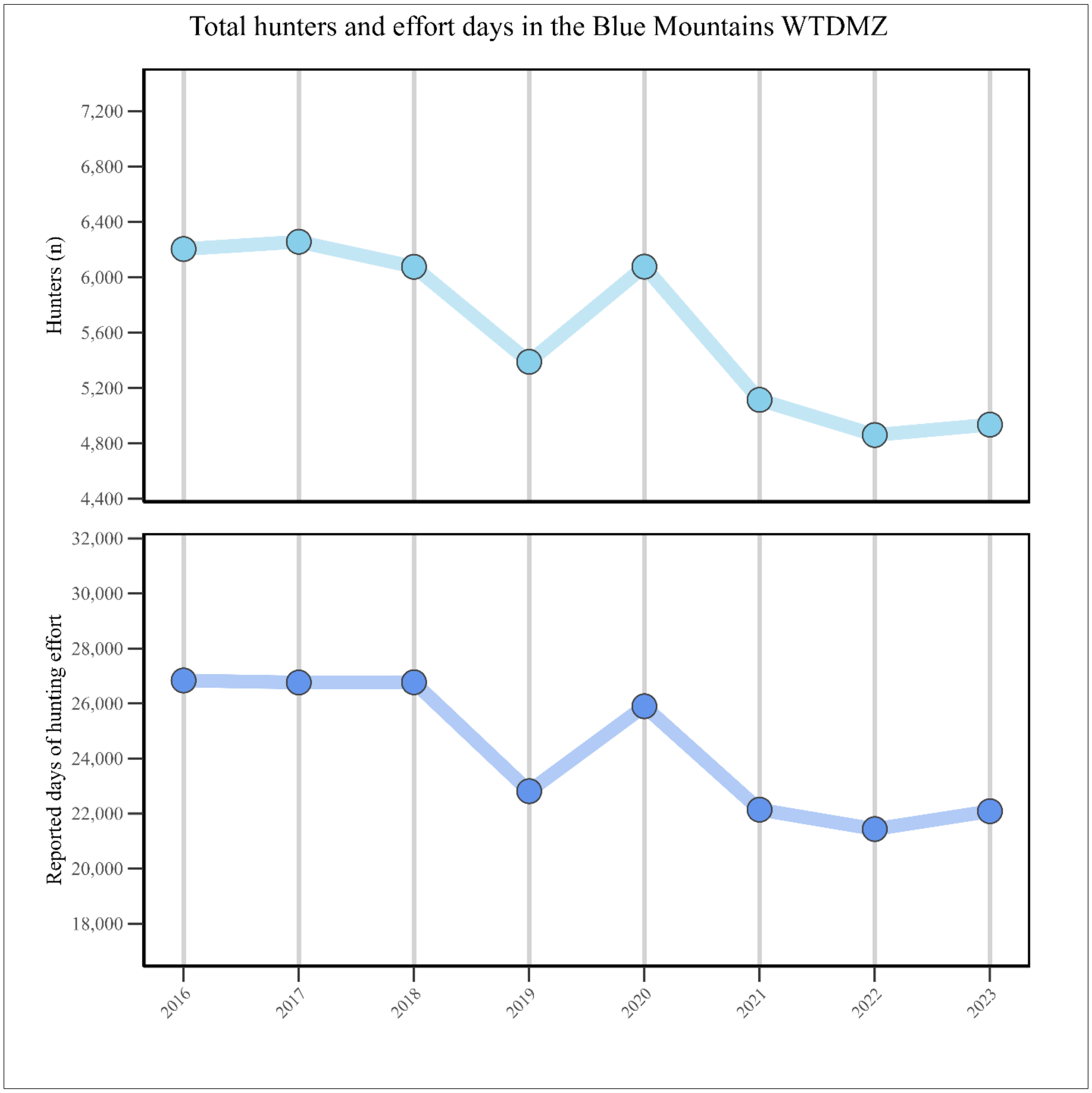
Figure 4. White-tail deer harvest estimates for the Blue Mountains WDMZ.



Harvest estimates for general season buck (blue), antlerless (yellow), and total harvest (black dots) in the Blue Mountains WDMZ, 2014-2023.

Following the severe hemorrhagic disease outbreak in 2021, antlerless permits were reduced to 265. WDFW has tried to maintain as many youth opportunities as possible, and as a percentage of total permits issued, youth permits currently comprise 22%, up from a 5-year mean of 16% and nearly double the mean of 8% before 2016. WDFW also incorporated the use of "any deer" permits for youth starting in 2017, which now includes permit hunts available in five GMUs in addition to youth antlerless permits in the Blue Mountains East and West hunt areas.

Figure 5. Total hunters and effort days in Blue Mountains WDMZ.



General season estimates for number of hunters (pale blue) and cumulative number of hunter days (blue) in the Blue Mountains WDMZ, 2016-2023. WDFW cannot generate species-specific estimates for the number of hunters, days, success, etc., in most eastside GMUs because both mule deer and white-tailed deer can be hunted.

Survival and mortality

No estimates of pregnancy or survival rates are available for white-tailed deer herds in the Blue Mountains WDMZ. In addition to legal hunter harvest, other potential sources of white-tailed deer mortality include predation, collisions with vehicles, disease (EHD and Bluetongue), and poaching. This zone's predators include cougars, wolves, bobcats, black bears, coyotes, golden eagles, and domestic dogs.

Habitat

Similar to mule deer in this area, white-tailed deer populations are generally habitat-limited. Habitat limitations include conversion to croplands from CRP, grazing by domestic livestock, wildfire suppression, invasion of noxious weeds, extensive wind power development, and urban-suburban development that has been detrimental to available habitat in this zone, with the added habitat threat of solar field development coming to the District. Dry conditions that develop during the summer growing season, particularly on the east side of the Blue Mountains, are likely a limiting factor to productivity for white-tailed deer. More white-tailed deer are observed on the District's west side, as evidenced by GMUs 154 and 162 having the highest annual white-tailed deer harvest and accounting for roughly 65% of the white-tailed harvest in this zone.

Human-wildlife interaction

The agricultural damage prevention program is managed by the WDFW Wildlife Program to minimize crop damage through multiple actions, such as the issuance of permits in designated Deer Areas, non-lethal deterrents, and Damage Prevention Cooperative Agreement (DPCA) permits. Qualifying landowners are initially allowed two free kill permits under the DPCA contract, requiring reporting harvest directly to the Conflict Specialist. Kill Permits make up the majority of damage tags given to landowners. Any additional permits are issued as damage permits that require the landowner, lessee, or their designee to purchase a damage tag and report any harvest through the licensing system. Most of the harvest occurred where there would have been very little hunting opportunity otherwise, such as in the winery and orchard areas around Walla Walla.

From July 2023 through March 2024, landowners or their agents reported harvesting six white-tailed deer does on kill permits and one white-tailed deer buck on a damage permit in the Blue Mountain GMUs.

Management concerns

Over the past decade, one of the biggest management concerns for white-tailed deer in the District has been epizootic hemorrhagic disease (EHD) or Bluetongue (BT) outbreaks. The diseases are very similar and are spread by a biting midge (*Culicoides* spp.). Outbreaks generally occur during drought years when there is limited open water and ample mud for midge breeding habitat, and deer are concentrated near water sources. WDFW’s only management option is to gauge the outbreak's severity and adjust antlerless permits as appropriate. Habitat conversion is an ongoing issue that has mainly resulted in increasing white-tailed deer damage conflicts. Expansion of residential areas and conversion of crop acreage to wineries and orchards has brought deer into conflict with landowners by eating ornamental shrubs, fruit trees, and vines. Harvest trends in GMU 166 are of specific concern; the 2020 harvest declined over the improved harvest estimate in 2019, but some of this can be attributed to removing all antlerless opportunities from the GMU; however, harvest declined even further in 2021 and only increased by one in 2022. Biologists will continue to monitor management actions in that unit closely.

Management conclusions

Total white-tailed deer composition metrics in the Blue Mountains WDMZ are currently at management objective for the post-hunt buck:doe ratios. However, white-tailed deer numbers in GMU 166 remain a management concern. Despite the recent drop in total harvest, hunter success and HPUE values indicate that the population is stable where habitat availability and quality allow.

Literature cited

Washington Department of Fish and Wildlife. 2010. Washington State Deer Management Plan: White-tailed Deer. Wildlife Program, Washington Department of Fish and Wildlife, Olympia. 124 pp. [2010 WA State White-tailed Deer Management Plan.]

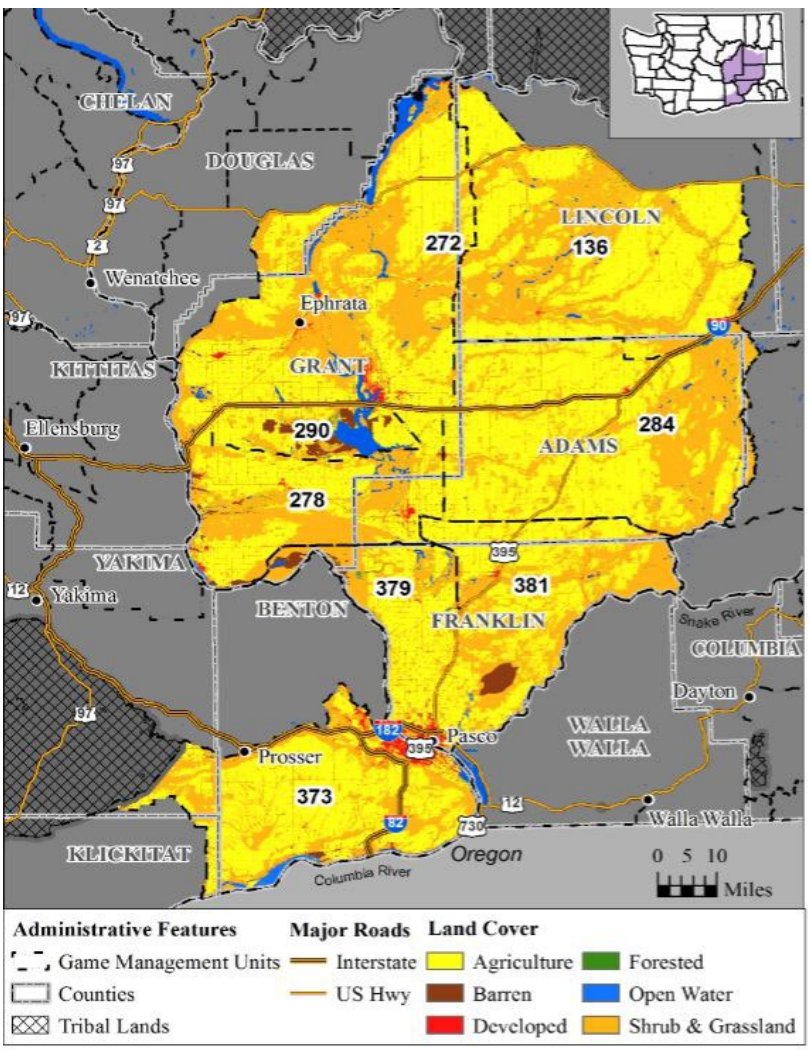
Columbia Basin White-tailed Deer Management Zone

Matt Brinkman, Wildlife Biologist
Carrie Lowe, Wildlife Biologist
Sean Dougherty, Wildlife Biologist
Jason Fidora, Wildlife Biologist

Introduction

The Columbia Basin White-tailed Deer Management Zone (WDMZ) is in east-central Washington and consists of eight Game Management Units GMUs (136, 272, 278, 284, 290, 373, 379, and 381; Figure 1).

Figure 1. The Columbia Basin White-tailed Deer Management Zone (WDMZ).



GMUs and generalized land cover types within the Columbia Basin WDMZ.

Management guidelines and objectives

The Department's objective within this WDMZ is to maintain a stable population based on harvest trends. The Columbia Basin is not optimal white-tailed deer habitat, and there is no management objective to change the distribution or numbers of the few white-tailed deer that reside there (WDFW, 2010).

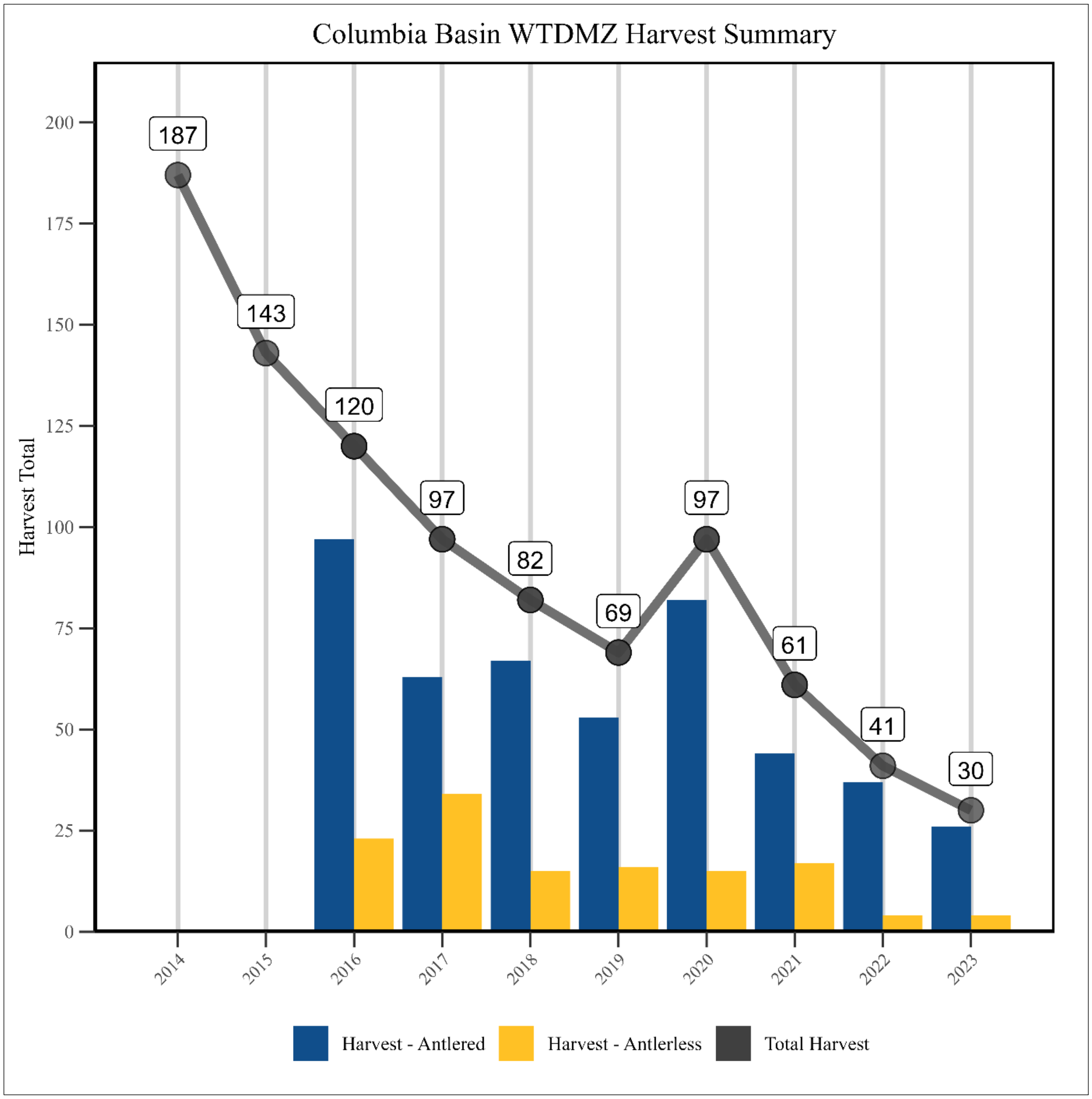
Population surveys

GMUs within this zone are primarily managed for mule deer, but white-tailed deer are present at low densities throughout the Columbia Basin WDMZ. No survey work specific to white-tailed deer is being conducted in this WDMZ at this time.

Hunting seasons and recreational harvest

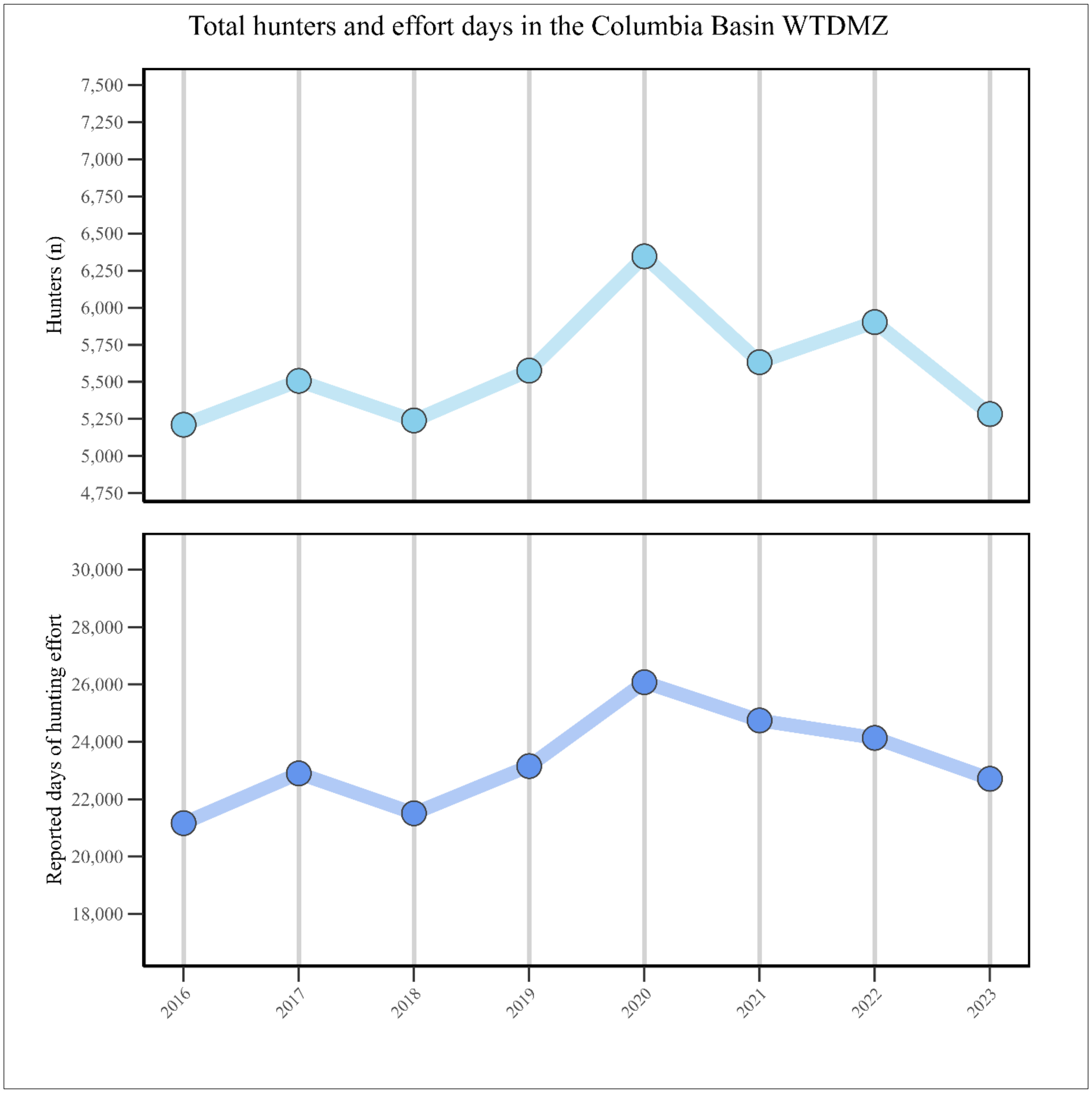
This zone's estimated harvest is low overall, reflecting the availability of preferred habitat for white-tailed deer. However, similar to neighboring zones, there has been a negative trend in harvest over the past ten years, with the lowest harvest observed to date in 2023 (Figure 2). Measures of total hunters and effort days (Figure 3) have remained relatively stable over the past ten years, though hunter days include both mule deer and white-tailed deer. Therefore, these metrics are less useful as indicators of species-specific population trends. The decline in the harvest in 2015 is due to the drought and associated bluetongue (BT) outbreak that year, resulting in reduced white-tailed deer numbers and recruitment. The continued negative trend in harvest since then is likely due to the hard winters of 2016/17 and 2018/19, as well as outbreaks of Epizootic hemorrhagic disease (EHD) in 2018, 2019, and 2021 in GMU 136, where a significant amount of white-tail harvest for this zone traditionally occurs. Hunter success and effort in this zone are correlated to access to private land (86% of the zone is private land); if private landowners are not opening their land to hunters due to perceived low white-tailed deer numbers, this can have a marked effect on harvest.

Figure 2. White-tailed deer harvest estimates for the Columbia Basin WDMZ.



Harvest estimates for general season buck (blue), antlerless (yellow), and total harvest (black dots) in the Columbia Basin WDMZ, 2014-2023.

Figure 3. Total hunters and effort days in the Columbia Basin WDMZ.



General season estimates for number of hunters (pale blue) and cumulative number of hunter days (blue) in the Columbia Basin WDMZ, 2016-2023. WDFW cannot generate species-specific estimates for the number of hunters, days, success, etc., in most eastside GMUs because both mule deer and white-tailed deer can be hunted.

Survival and mortality

No pregnancy, fetal, or survival rate estimates are available for white-tailed deer in the Columbia Basin WDMZ. Like mule deer, other sources of mortality in this zone likely include collisions with vehicles, drowning in irrigation canals, poaching, and predation. Predator species living within this zone include cougars, bobcats, black bears, gray wolves (transients have been observed, but there are no known packs confirmed within this WDMZ at the time of this writing), coyotes, golden eagles, and domestic dogs. Black bears are not common in open shrub-steppe landscapes but occur at low levels in some parts of the Columbia Basin. Cougars are comparatively more common.

Habitat

The Columbia Basin zone represents the periphery of white-tailed deer distribution in central Washington, and habitats are generally more suitable for mule deer. The overall numbers of white-tailed deer are low in all GMUs within the zone; typically, white-tailed deer are found mainly in the eastern portion of the zone and are associated with habitats of very limited extent, such as riparian areas along creeks and streams, CRP grasslands, and non-intensive agricultural tracts. White-tailed deer use in the extensive tracts of the shrub-steppe within the zone is not common. In 2020, significant wildfires occurred in this management zone, and habitat restoration will require intensive, expensive, long-term effort to be successful.

Human-wildlife interaction

Given the relatively small number of white-tailed deer in this zone, no significant white-tailed deer-specific issues exist.

Management concerns

Drought and loss of riparian habitat are the most important issues facing white-tailed deer in the Columbia Basin WDMZ. Disease is also a significant concern in this zone, which regularly has white-tailed deer mortalities due to BT and EHD. These mortality events are typically small in number and isolated; however, in drought years, the number of mortalities can be high and widespread. The western and southern portions of the WDMZ have had a low level of occurrence of these pathogens but also have lower numbers of white-tailed deer.

Management conclusions

White-tailed deer populations in the Columbia Basin WDMZ are below the management objective based on harvest data that indicate a declining population. To quicken the pace of recovery, WDFW removed all general season antlerless opportunities in GMU 136 in 2021. The only exception is for youth hunters who can still harvest an antlerless white-tailed deer, but only during the last weekend of the general modern firearm season.

Literature cited

Washington Department of Fish and Wildlife. 2010. Washington State Deer Management Plan: White-tailed Deer. Wildlife Program, Washington Department of Fish and Wildlife, Olympia. 124 pp. [2010 WA State White-tailed Deer Management Plan.]

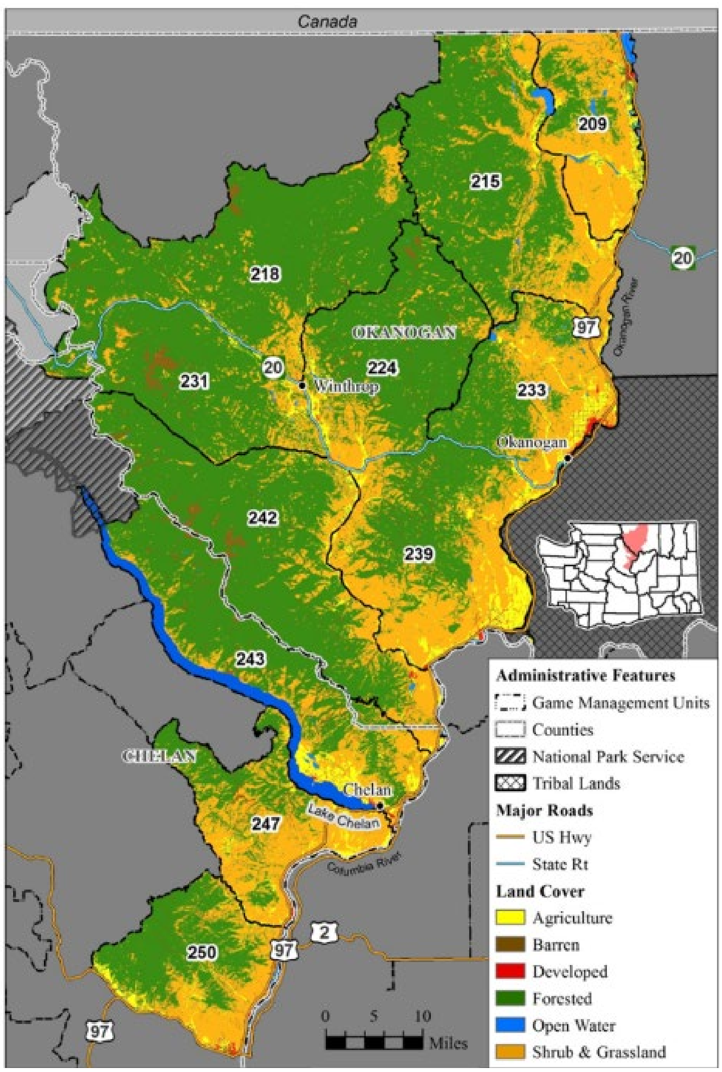
North Cascade Mountains White-tailed Deer Management Zone

Scott Fitkin, Wildlife Biologist
Jeff Heinlen, Wildlife Biologist

Introduction

The North Cascade Mountains White-tailed Deer Management Zone (WDMZ) is in north-central Washington and consists of 11 Game Management Units GMUs (209, 215, 218, 224, 231, 233, 239, 242, 243, 247, and 250; Figure 1).

Figure 1. The North Cascade Mountains White-tailed Deer Management Zone (WDMZ).



GMUs and generalized land cover types within the North Cascade Mountains WDMZ.

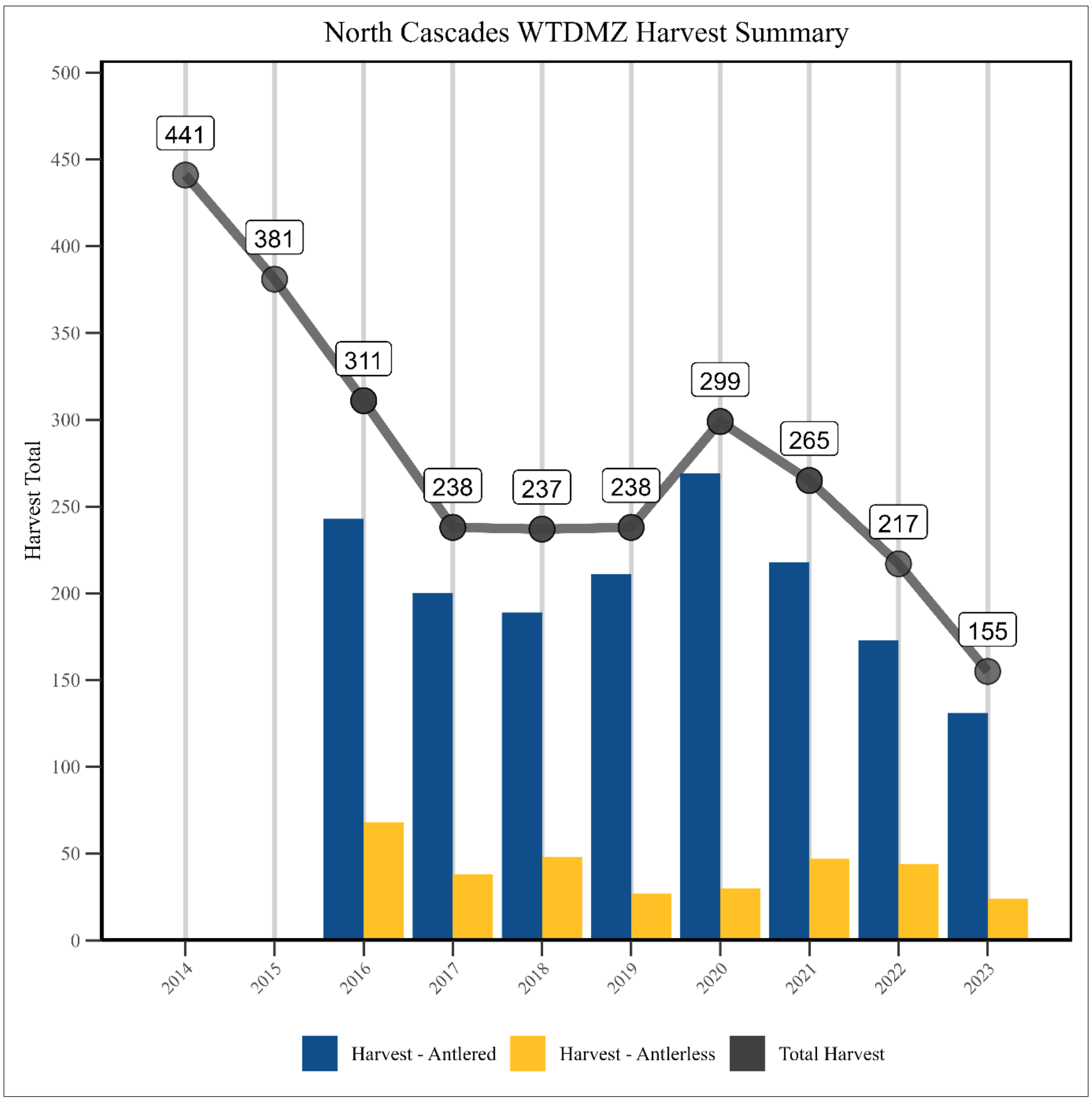
Management guidelines and objectives

The Department's objective within this WDMZ is to maintain stable populations based on harvest estimates (WDFW, 2010).

Population surveys

GMUs within the North Cascade Mountains WDMZ are primarily managed for mule deer, but white-tailed deer are present at variable densities throughout the zone. No formal surveys uniquely designed for white-tailed deer are conducted in this WDMZ.

Figure 2. White-tailed deer harvest estimates for the North Cascades WDMZ.

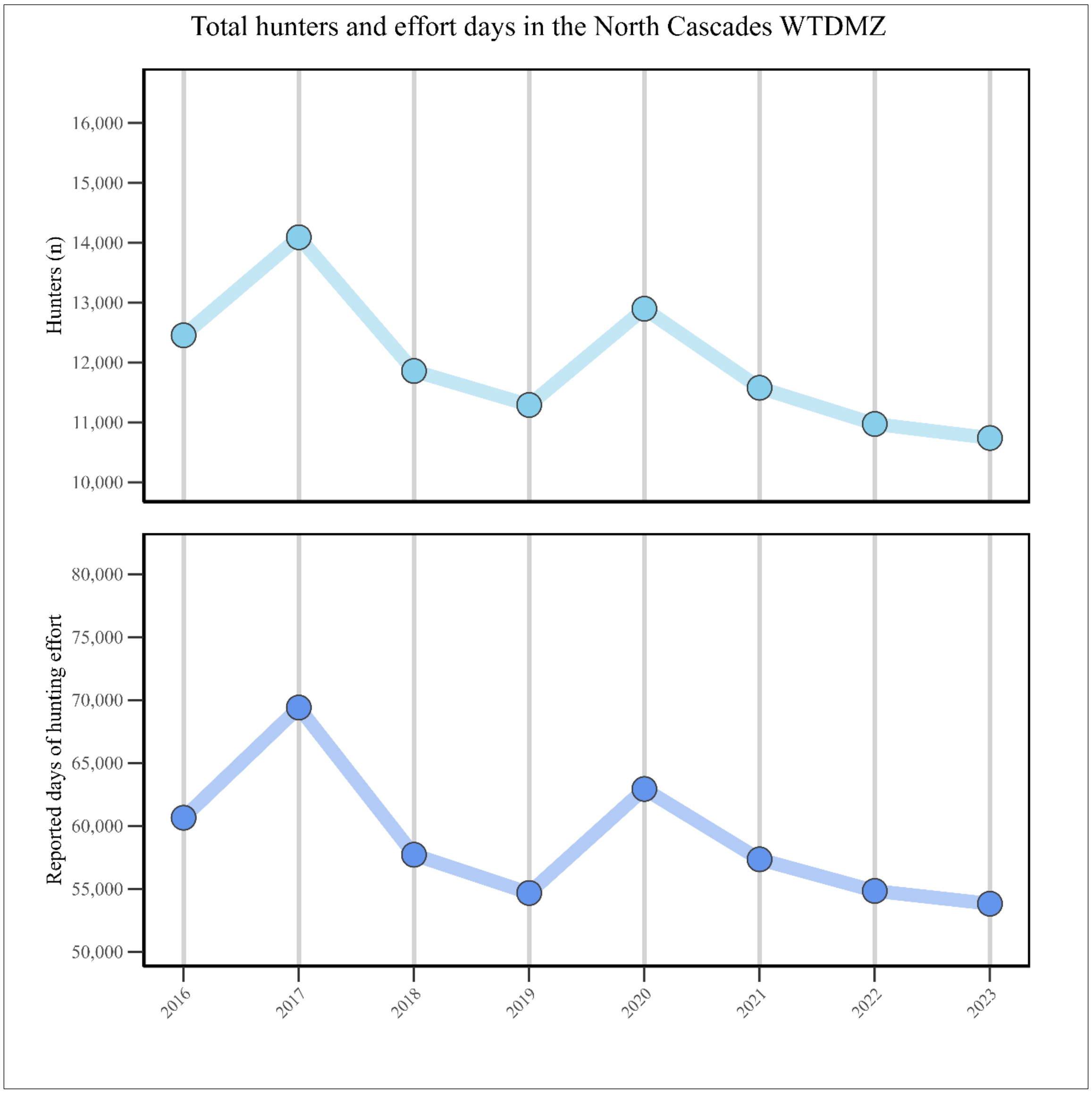


Harvest estimates for general season buck (blue), antlerless (yellow), and total harvest (black dots) in the North Cascade Mountains WDMZ, 2014-2023.

Hunting seasons and recreational harvest

Harvest estimates for the last ten years have been low compared with mule deer harvest and have been declining the last three seasons (Figure 2). A widespread outbreak of hemorrhagic diseases may partially explain this decline. Estimates of hunter effort (which include mule deer hunters) generally track the trends seen with mule deer since many hunters will harvest either species opportunistically during the general seasons (Figure 3). Hunter effort has generally exhibited a slight downward trend since 2016, except for a notable uptick in 2020 during the COVID pandemic.

Figure 3. Total hunters and effort days in the North Cascades WDMZ.



General season estimates for hunter days (top) and hunter days (bottom) in the North Cascade Mountains WDMZ, 2016-2023. WDFW cannot generate species-specific estimates for the number of hunters, days, success, etc., in most eastside GMUs because both mule deer and white-tailed deer can be hunted.

Survival and mortality

No pregnancy, fetal, or survival rate estimates are available for white-tailed deer in the North Cascade Mountains WDMZ. Mortality sources in this zone include legal hunting, vehicle collisions, domestic dogs, poaching, and predation. Predators within the North Cascade Mountains WDMZ include black bears, bobcats, cougars, coyotes, golden eagles, and gray wolves. The effects of predation on white-tailed deer in this WDMZ are unknown but not considered population-limiting.

An outbreak of bluetongue and epizootic hemorrhagic disease occurred in late summer 2021. It is unknown how many white-tailed deer died from this outbreak, but mortalities were confirmed in several locations, particularly in the northern half of the zone. Subsequent harvest figures suggest the overall effect on the population was modest.

Habitat

Habitat-related considerations in this North Cascade Mountains WDMZ include continued development and fragmentation of low-elevation habitats, increasing use and distribution of off-road vehicles, increasing recreational pressure, and the prevalence of invasive weeds.

Large, landscape-scale wildfires are becoming more frequent within this WDMZ. Wildfires can create an immediate loss of habitat but typically improve summer forage quality in the years following. Loss of forage on the winter range and reduced concealment cover take longer to recover after wildfires and may increase winter fawn mortality for several years post-fire. Also becoming more frequent are summer heat and droughts that can reduce the quality and quantity of available deer forage, which can affect the ability of animals to accrue adequate fat stores for winter and can result in reduced fawn production/ recruitment; however, this is being mitigated somewhat by milder winters on average.

Human-wildlife interaction

Most deer conflict is restricted to the lower elevation irrigated agriculture lands throughout the zone. Specific deer areas have been established in the northern portion of this North Cascade Mountains WDMZ, and antlerless permit hunt seasons have been designed to target and reduce deer damage. Permit numbers within each Deer Area fluctuate with the reported damage incidents. The program is operating smoothly and appears to help reduce deer damage complaints. Damage Prevention Cooperative Agreements (DPCA) and Kill permits are also conservatively issued to reduce deer damage. In 2023, WDFW Conflict Specialists issued 15 deer (Mule or White-tailed deer) permits to address deer damage throughout the North Cascade Mountains WDMZ.

Significant roadkill occurs in the northern portion of this zone along State Highways 20 and 153 in the Methow Valley and along a 12.5-mile segment of State Highway 97 in the Okanogan Valley. A collaboration of agencies and NGOs is pursuing funding to significantly expand the installation of crossing structures along this stretch of roadway.

Management concerns

Chronic loss of habitat to development, increasing recreational pressure, and recurring loss of winter-range shrub forage to wildfires are primary management concerns in the northern three-fourths of the North Cascade Mountains WDMZ. The degradation of summer range habitat due to a warming climate and increasing drought frequency and intensity are also issues. In addition, more frequent and severe outbreaks of adenovirus and hemorrhagic diseases potentially related to climate change are also growing concerns.

Management conclusions

White-tailed deer populations in the North Cascade Mountains WDMZ are currently healthy, though harvest estimates suggest a slightly declining population over the last few years.

Literature cited

Washington Department of Fish and Wildlife. 2010. Washington State Deer Management Plan: White-tailed Deer. Wildlife Program, Washington Department of Fish and Wildlife, Olympia. 124 pp. 2010 WA State White-tailed Deer Management Plan.

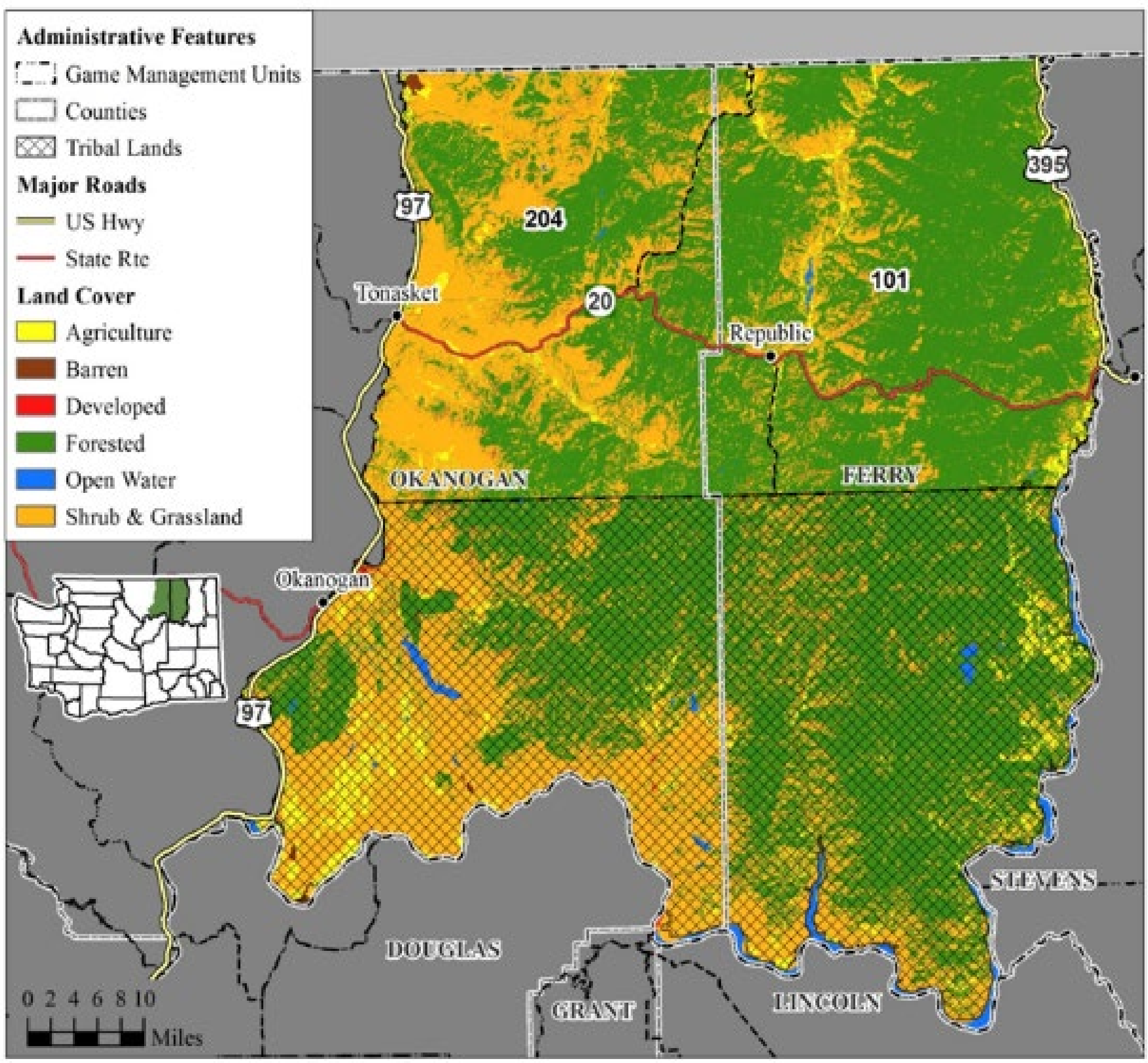
Okanogan Highlands White-tailed Deer Management Zone

Jeff Heinlen, Wildlife Biologist
Annemarie Prince, Wildlife Biologist

Introduction

The Okanogan Highlands White-tailed Deer Management Zone is in north-central Washington and includes Game Management Units GMUs (101 and 204; Figure 1).

Figure 1. The Okanogan Highlands White-tailed Deer Management Zone (WDMZ).



GMUs and generalized land cover types within the Okanogan Highlands WDMZ.

Management guidelines and objectives

The Department's objective within this WDMZ is to maintain stable populations based on field surveys and harvest estimates. Additional management objectives include managing for a post-hunt population with a sex ratio of 15-19 bucks:100 does (WDFW, 2010).

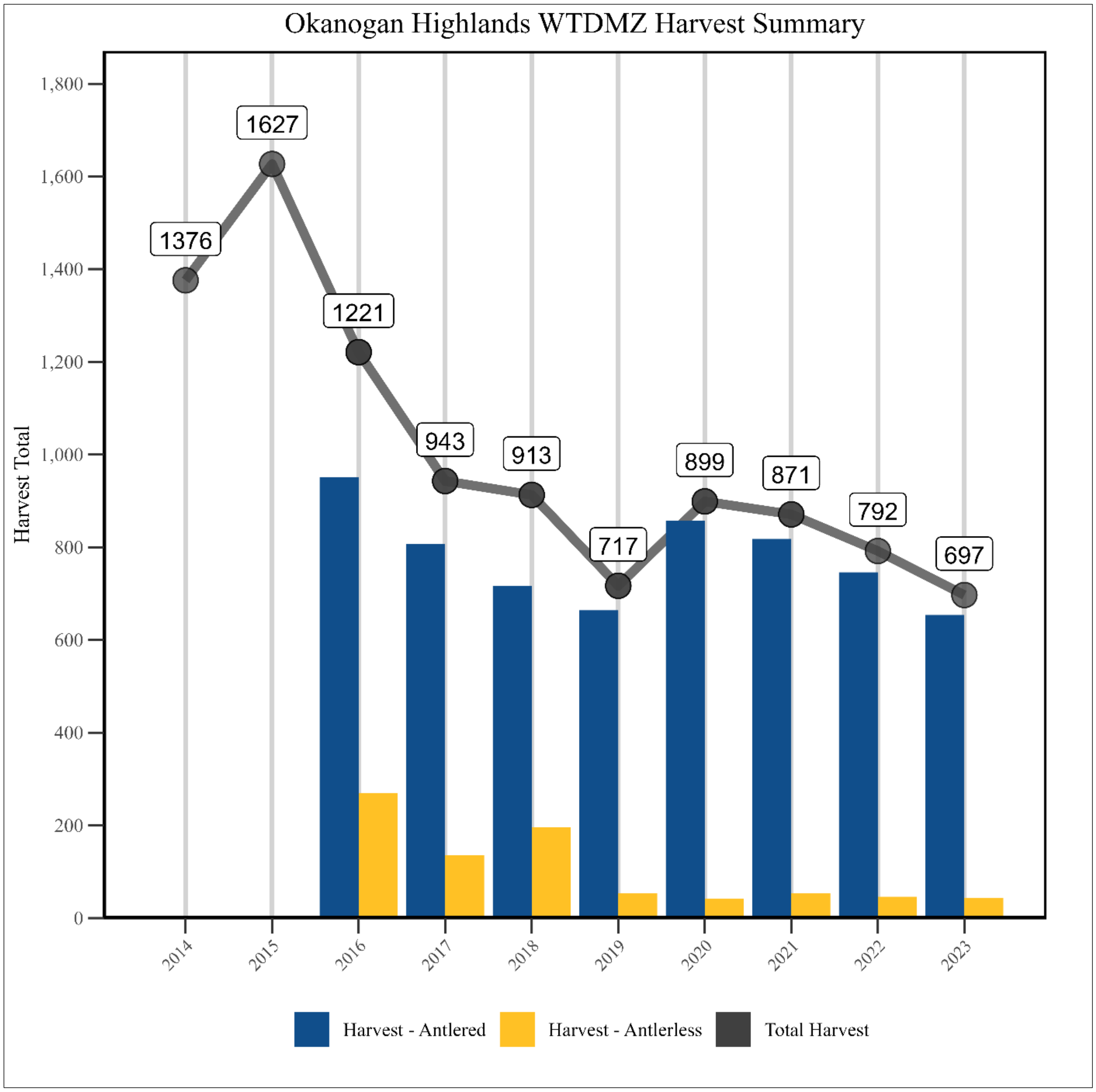
Population surveys

White-tailed deer are present throughout the Okanogan Highlands WDMZ but are more common in the eastern portion. Because estimates of total white-tailed deer abundance in this zone are not practical, pre-hunt ground surveys were conducted in the past in the east half of the zone to estimate buck:doe ratios (a rough annual measure of the effect of harvest on the population) over time. In 2023, WDFW conducted no pre-hunt surveys within this zone. However, the forested landscape and limited visibility experienced during road surveys in this zone generally result in low sample sizes, which prevent the calculation of confidence intervals and limit any conclusions that biologists can make about the status of the population in the Okanogan Highlands. Until resources allow for a wide-scale survey with a sufficient sample size, no pre-hunt surveys will be conducted within this management zone. Due to low detection, no post-hunt surveys are conducted.

Hunting seasons and recreational harvest

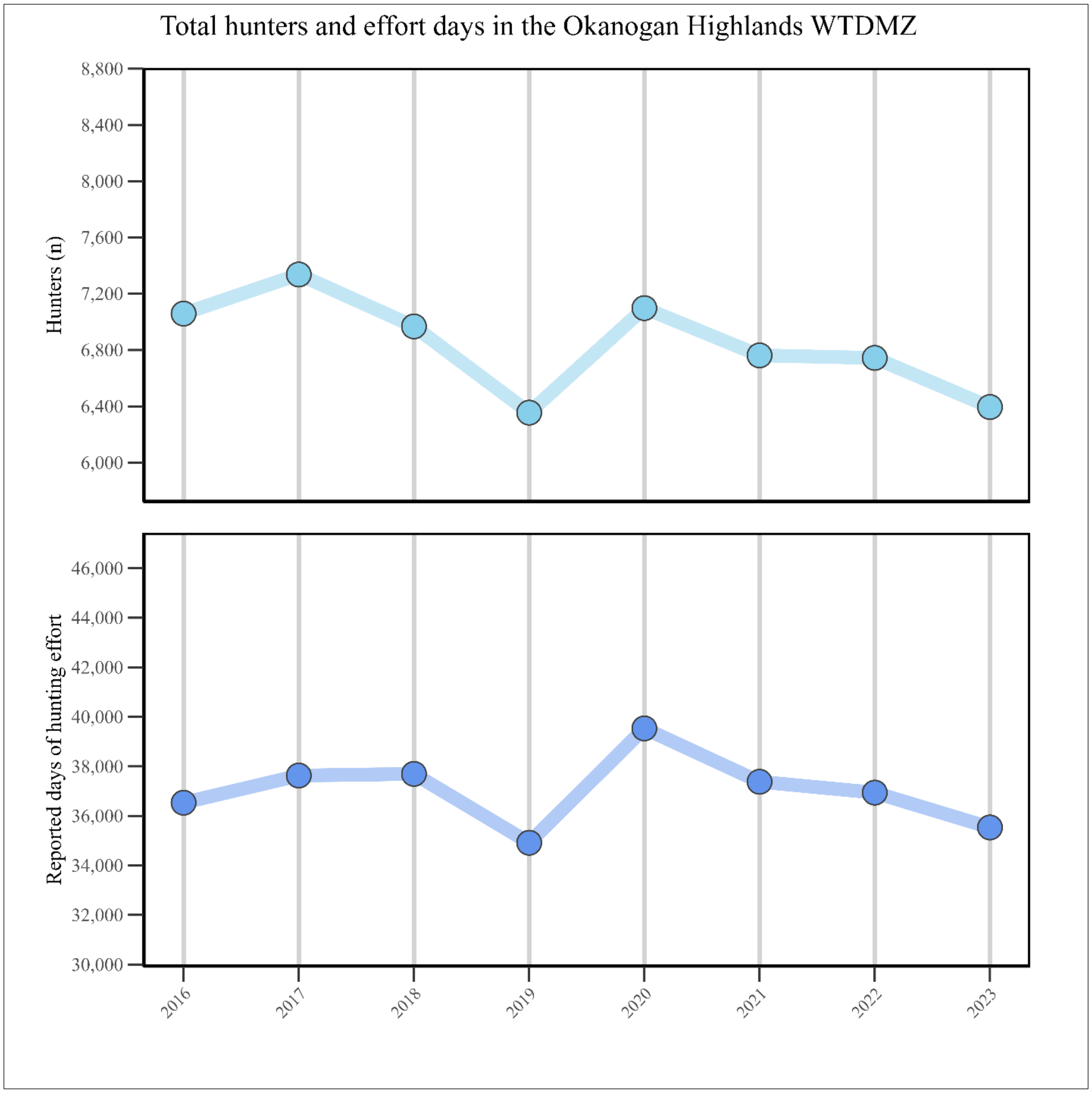
The reported annual harvest for the past ten years has declined almost every year since 2015, including in 2023 (Figure 2). Total hunters and effort days have fluctuated over the past 8 years but have declined every year since 2020 (Figure 3).

Figure 2. White-tailed deer harvest estimates for the Okanogan Highlands WDMZ.



Harvest estimates for general season buck (blue), antlerless (yellow), and total harvest (black dots) in the Okanogan Highlands WDMZ, 2014-2023.

Figure 3. Total hunters and effort days in the Okanogan Highlands WDMZ.



General season estimates for number of hunters (pale blue) and cumulative number of hunter days (blue) in the Okanogan Highlands WDMZ, 2016-2023. WDFW cannot generate species-specific estimates for the number of hunters, days, success, etc., in most eastside GMUs because both mule deer and white-tailed deer can be hunted.

Survival and mortality

No pregnancy, fetal, or survival rate estimates are available for white-tailed deer in the Okanogan Highlands WDMZ. In addition to legal hunter harvest, other potential sources of white-tailed deer mortality include disease, poaching, collisions with vehicles, and predation. This zone's predators include cougars, bobcats, black bears, gray wolves, coyotes, golden eagles, and domestic dogs.

Habitat

Habitat within the Okanogan Highlands WDMZ is predominantly conifer forest, contributing approximately 55% of the total land cover within the zone. Shrub land combined with grassland, pasture, and cultivated crops makes up the next highest level in land cover classes, comprising approximately 41% of the Okanogan Highlands WDMZ area. Combined cover classes produce the highest densities of white-tailed deer, particularly in the valley bottoms where deer have both forage and cover resources in close proximity. Although cultivated crops alone account for only 0.7% of the aforementioned land cover, their influence on the support of the white-tailed deer population cannot be overstated. The Okanogan Highlands WDMZ can also be broken down to about 31% public land and 19% private land, with the remaining 50% comprised of the Colville Indian Reservation (WDFW, 2010).

Threats to habitat quality within the Okanogan Highlands WDMZ include continued development and fragmentation of low-elevation habitats, increasing use and distribution of off-road vehicles, and increasing prevalence of invasive weeds. Large landscape-scale wildfires are becoming more frequent within this zone. Wildfires can create an immediate loss of habitat but typically improve forage quality in the years following. Loss of forage on the winter range and reduced concealment cover take longer to recover.

Human-wildlife interaction

Most deer conflict is restricted to the lower elevation irrigated agriculture lands throughout the zone. Specific deer areas have been established on the western edge of this zone, and antlerless permit hunt seasons have been designed to target and reduce deer damage. Permit numbers within each Deer Area fluctuate with the reported damage incidents. The program is operating smoothly and appears to help reduce deer damage complaints. Damage Prevention Cooperative Agreements (DPCA) and kill permits are also conservatively issued to reduce deer damage throughout the zone.

For example, in 2023, WDFW Conflict Specialists issued no permits to address deer damage within GMU 204 of the Okanogan Highlands WDMZ. Within GMU 101, Conflict Specialists issued 11 white-tailed deer and four Any Deer damage prevention permits to address the damage.

Research

There is no ongoing research on white-tailed deer in the Okanogan Highlands WDMZ.

Management concerns

Less than half the Okanogan Highlands WDMZ land base is in public ownership (31%), so maximizing hunting opportunities largely depends on securing access to private lands. The availability of cultivated cropland cover, particularly cereal grain and alfalfa hay, is closely coupled with this concern for the deer. Cultivated crops are a major driver of white-tailed deer density and productivity in northeastern Washington and beyond. Besides hunting, the other major sources of mortality to deer in this zone include predation by native carnivores, domestic dogs, and road kills from vehicle collisions. Periodically, but unpredictably, a severe winter will cause significant deer loss. Also, unpredictable but becoming more frequent are summer heat and droughts that can foster conditions for severe outbreaks of hemorrhagic disease, reduce available forage deer need to accrue adequate fat stores for winter, and can also result in reduced fawn recruitment. The influence of these diverse factors can greatly complicate how best to balance deer hunting opportunities with herd sustainability. The winter of 2023 was mild. In late summer of 2021, there was a large-scale outbreak of bluetongue and epizootic hemorrhagic disease. It is unknown how many white-tailed deer died from the outbreak, but it may have been up to 30% of the population in some areas. The hard winter of 2022-2023 impacted deer populations to an unknown extent within the zone. However, the 2023-2024 winter was mild.

Significant roadkill occurs in the western edge of this zone along a 12.5-mile segment of State Highway 97 between the towns of Riverside and Tonasket, Washington. In 2020, one mile of deer fencing on either side of State Highway 97 (with associated gates and cattle guards at access roads) was completed, with Janis Bridge serving as the wildlife undercrossing. Currently, a collaboration of agencies and NGOs is pursuing funding to complete the full 12.5 miles of crossing structures.

Management conclusions

Since 2020, the reported harvest has closely mirrored the hunter effort. The reduction in harvest may be due to a slightly declining population (affected by disease and negative winter conditions) in combination with a reduction in hunter effort and days hunted in the zone. White-tailed deer in this management zone are challenged by habitat modifications, disease, and extreme weather.

Literature cited

Washington Department of Fish and Wildlife. 2010. Washington State Deer Management Plan: White-tailed Deer. Wildlife Program, Washington Department of Fish and Wildlife, Olympia. 124 pp. 2010 WA State White-tailed Deer Management Plan.

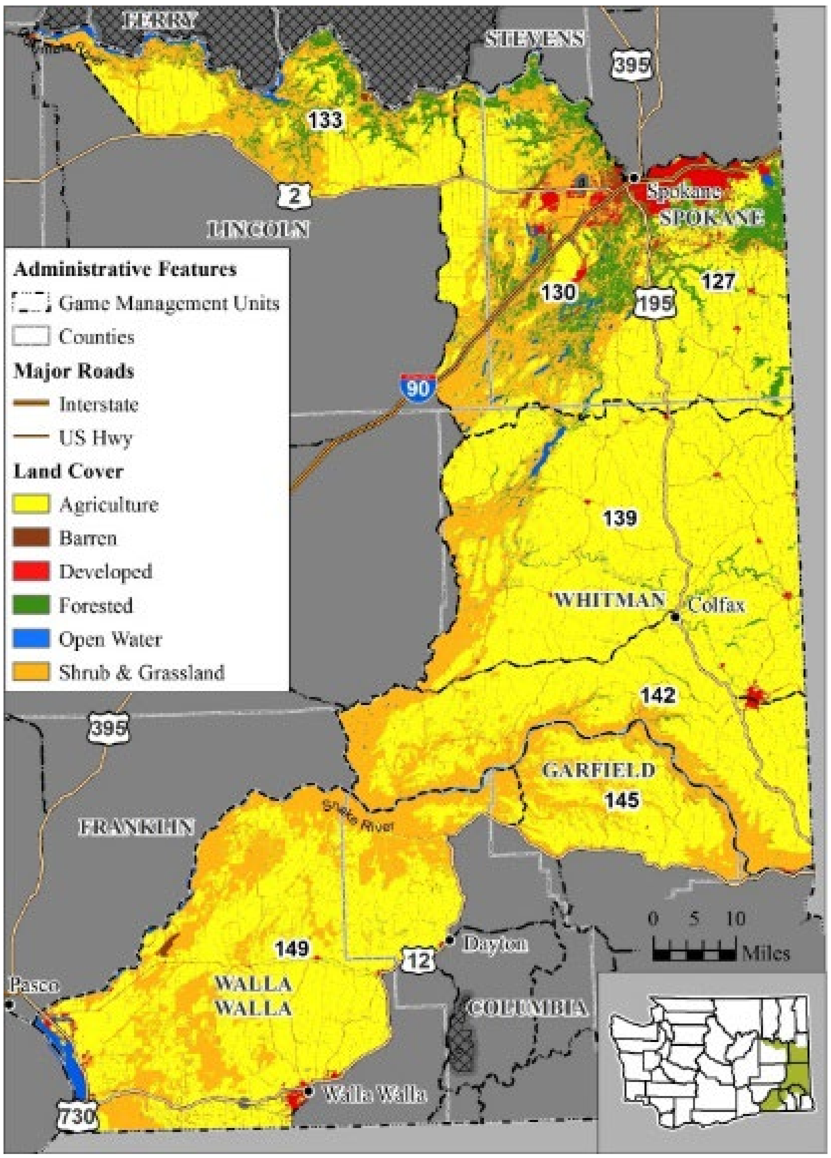
Palouse White-tailed Deer Management Zone

Matt Brinkman, Wildlife Biologist
Mark Vekasy, Wildlife Biologist
Carrie Lowe, Wildlife Biologist

Introduction

The Palouse White-tailed Deer Management Zone is in east-central Washington and consists of seven Game Management Units GMUs in Districts 2 and 3 (127, 130, 133, 139, 142, 145, and 149; Figure 1).

Figure 1. The Palouse White-tailed Deer Management Zone (WDMZ).



GMUs and generalized land cover types within the Palouse WDMZ.

Management guidelines and objectives

The Department's objective within this WDMZ is to maintain a stable population based on available survey data and harvest trends. Additional management objectives include managing for a post-hunt population with a sex ratio of 15-19 bucks per 100 does (WDFW, 2010).

Population surveys

White-tailed deer are present at moderate to high densities throughout the Palouse WDMZ. The Palouse WDMZ is split into two areas for management purposes; the North Palouse comprised of those GMUs north of the Snake River (GMUs 127 – 142; District 2), and the South Palouse comprised of two GMUs south of the Snake River (GMUs 145 and 149; District 3).

South Palouse

White-tailed deer are not a management focus in the South Palouse; the area historically supported less than 15% of the total Palouse Zone white-tailed deer harvest. Most of the management is directed towards mule deer, and any population information for white-tailed deer is incidental to that collected for mule deer. Pre-hunt ground surveys are conducted throughout the two GMUs, but sample sizes for white-tailed deer from ground composition surveys are too small and variable to be robust indicators of population trends.

For a baseline reference, biologists conducted an aerial survey in December 2017, sampling portions of GMUs 145 and 149 and obtaining a raw count of 669 white-tailed deer. They flew surveys following sightability model protocols, but the model was not designed nor validated for white-tailed deer, so WDFW did not calculate survey area population estimates. The post-hunt buck:doe ratio was 31.8 (90% CI = 22.9-44.3), and the fawn:doe ratio was 65.6 (90% CI = 57.9-74.3).

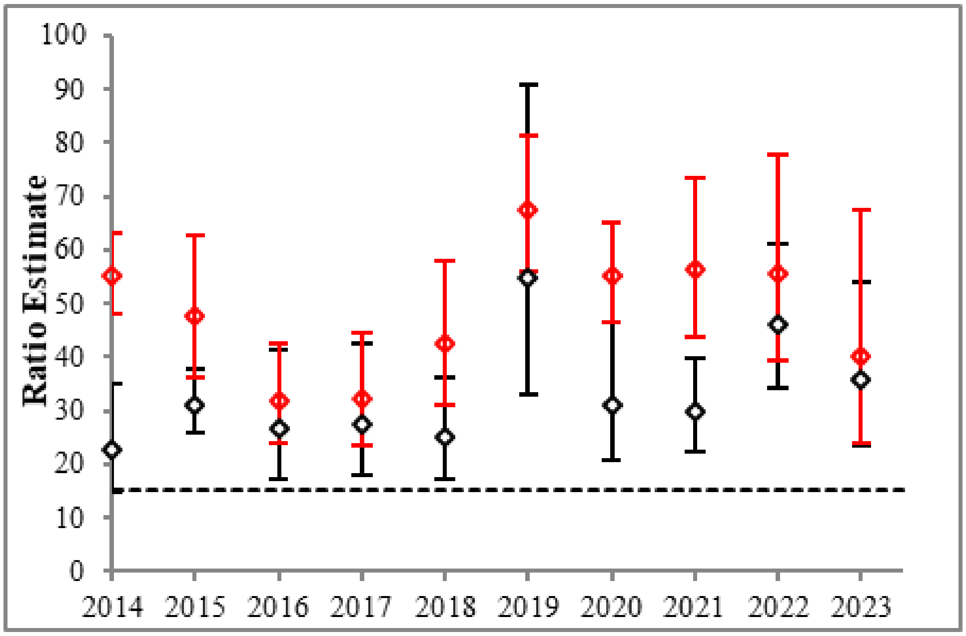
Biologists conducted a survey in the same area but in different subunits in 2018 and eliminated counts of white-tailed deer in some subunits due to poor weather conditions, placing time constraints on the survey; therefore, those counts are not adequate for ratio estimates. During 2023 pre-hunt road surveys, biologists counted 67 white-tailed deer in August for a ratio of 49 bucks per 100 does, and 59 deer in September for a ratio of 55 fawns per 100 does. Only 38 white-tailed deer were counted during post-hunt surveys in the two GMUs, making any ratio estimated to have limited value, but the count resulted in 14 bucks/100 does and 67 fawns/100 does.

North Palouse

Pre-hunt ground surveys are conducted throughout the North Palouse. These surveys aim to estimate deer herd composition, not population size; therefore, routes are altered annually, as needed, to reflect changes in habitat and agricultural crops. Routes are run twice each year: once in August for buck-to-doe ratios to estimate buck recruitment and once in September for fawn-to-doe ratios to estimate fawn production. The ratio data indicates stable buck recruitment outside the peak in 2019 (Figure 2).

Very few white-tailed deer were observed during the 2022 and 2023 surveys, likely due to the widespread EHD outbreak in the North Palouse in 2021. Production of fawns dipped between 2016 and 2018, and was low again in 2023 (Figure 2). However, this low ratio observed in 2023 may have resulted from a low sample size.

Figure 2. Estimated pre-hunt fawn:doe and buck:doe ratios in North Palouse WDMZ.



Estimated pre-hunt fawn:doe (◊) and buck:doe (◊) ratios and associated 90% confidence intervals in North Palouse WDMZ (GMUs 127 – 142), 2014-2023.

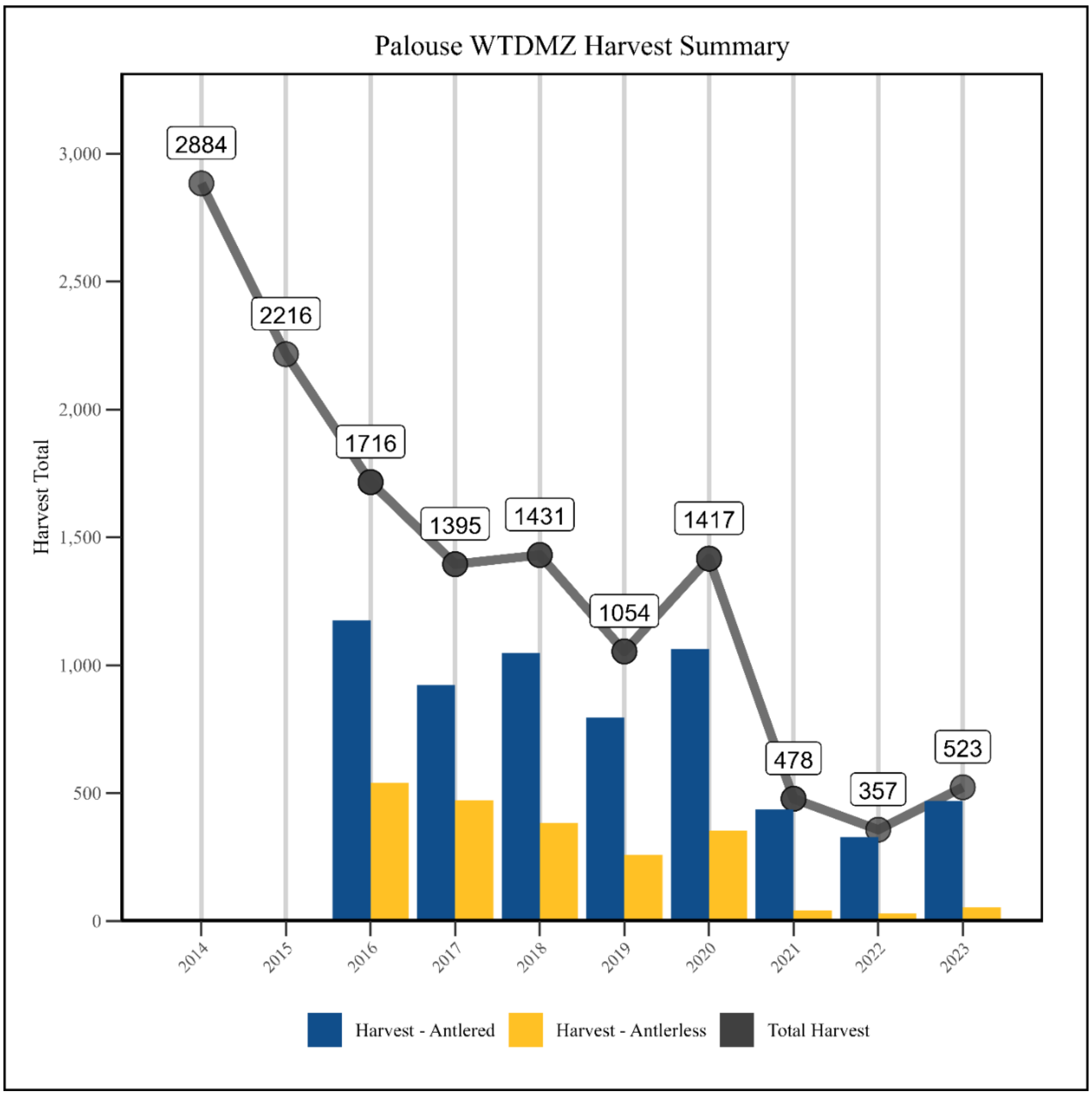
Drought conditions that extended well into October and the associated Bluetongue (BT) outbreak in 2015 were likely the driving factors in the decrease in production seen in 2016. The hard winter in 2016-17 likely contributed to low fawn production in 2017, and a small Epizootic hemorrhagic disease (EHD) outbreak in the northwest of this zone in 2018 likely contributed to the lower production that year. The high ratio estimates in 2019 indicated good recruitment and production, though the counts that produced these estimates were the lowest in the past ten years. As noted above, routes are not designed to estimate abundance; however, the low counts indicate that the 2018/19 winter extending into April impacted the overwinter survival. Ratios from 2020 and 2021 align with the long-term averages; however, the number of deer observed was still well below the previous 10-year average. Fawn ratios are at the lower end of desirable levels but should still support a stable population. Given a relatively mild winter and favorable spring conditions in 2022 and 2023, which can promote good body condition in does and fawns, WDFW Biologists expect to see growth in this population over the coming years.

Ratio estimates should not be interpreted as an index to population abundance; they are a relative annual measure of reproduction and recruitment in the deer population and provide a general indication of whether a population is stable, increasing, or decreasing. These measures are used to inform management decisions each year in conjunction with harvest estimates.

Hunting seasons and recreational harvest

Harvest in 2023 increased slightly (Figure 3), which can be attributed to some recovery from the impacts of severe drought and hemorrhagic disease outbreak in 2021, which affected adult and juvenile survival. Controlling doe harvest is WDFW's most effective tool in supporting the recovery of deer populations, and most antlerless opportunities have been removed from this hunting area. Given the trends in harvest data and pre-season ratios, all general season antlerless opportunity was removed from GMUs 127 through 142 in 2021 and removed from GMUs 145 and 149 for the 2024 hunting season. The only exception was for youth hunters who can still harvest an antlerless white-tailed deer, but only during the last weekend of the general season. These reductions and limitations will be maintained or increased until the population has recovered.

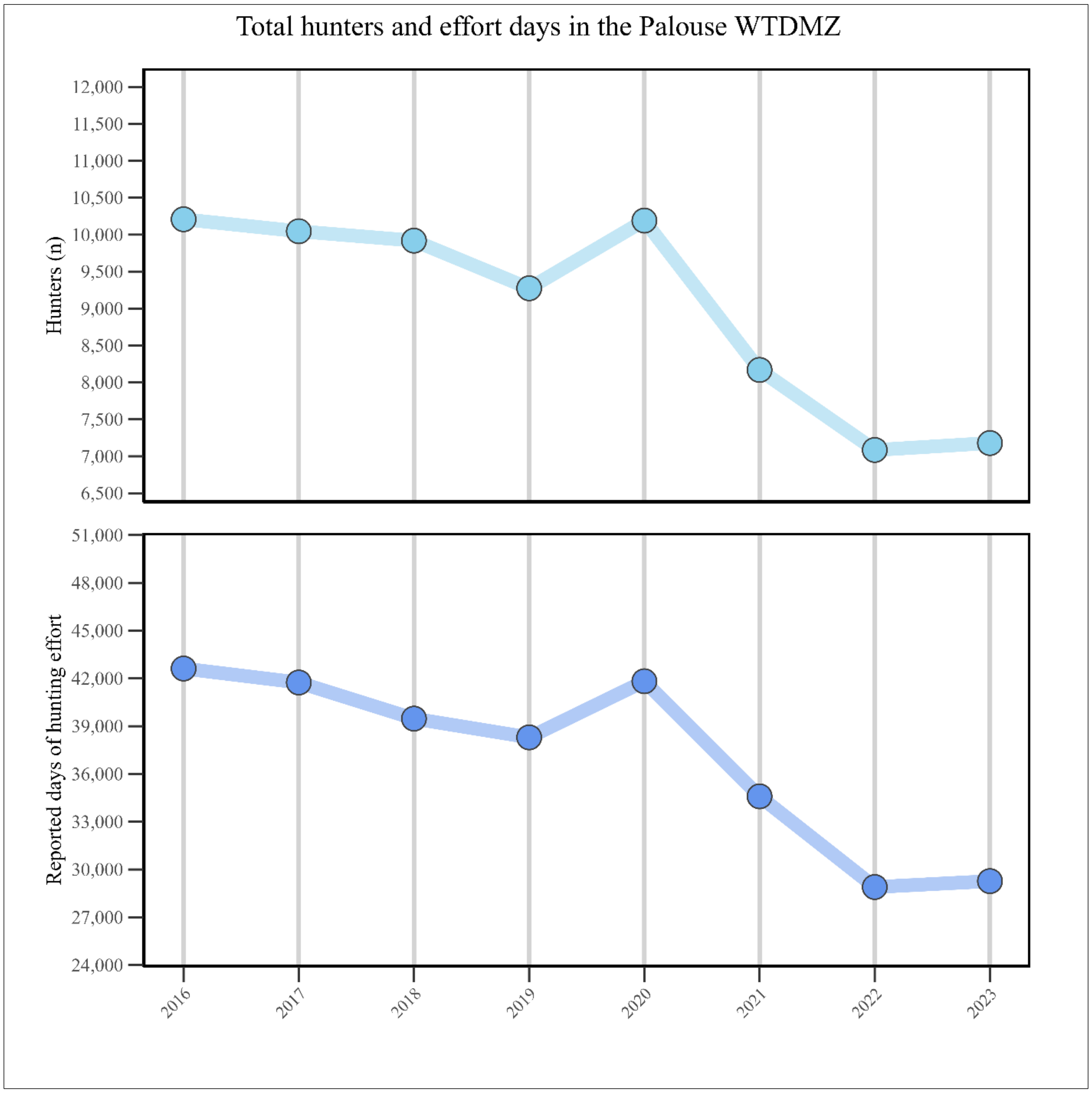
Figure 3. White-tailed Deer Harvest Estimates for the Palouse WDMZ.



Harvest estimates for general season buck (blue), antlerless (yellow), and total harvest (black dots) in the Palouse WDMZ, 2014-2023.

Estimates of hunter effort have also declined to their lowest point in the last decade (Figure 4). Hunter effort (i.e., hunter days) includes days spent hunting mule deer, whereas harvest data are specific to white-tailed deer. The resulting metrics of effort (i.e., days, harvest per day; Figure 4) are therefore likely biased low, though overall harvest trends clearly indicate a decline in deer availability for harvest.

Figure 4. Total hunters and effort days in the Palouse WDMZ.



General season estimates for number of hunters (pale blue) and cumulative number of hunter days (blue) in the Palouse WDMZ, 2016-2023. WDFW cannot generate species-specific estimates for the number of hunters, days, success, etc., in most eastside GMUs because both mule deer and white-tailed deer can be hunted.

The South Palouse historically comprised <15% of the total Palouse harvest but currently comprises roughly 25%. Most of the current decline in harvest can be attributed to declines in the North Palouse. Still, it is not surprising that these areas divided by the Snake River reservoirs would have different factors influencing the Palouse white-tailed deer herd. Although individual GMUs can show very different harvest trends, GMUs 145 and 149 showed significant white-tailed deer harvest declines in 2021, well below the previous 5-year averages and coincidental with hemorrhagic disease outbreaks across much of eastern Washington. This decline follows a promising increase in harvest trends after a good 2020 harvest. WDFW Biologists did not expect the population to recover before the 2023 harvest, and unsurprisingly, both GMUs were at new lows in harvest in 2022. The 2023 harvest showed marginal improvement but was still 40% below the historical averages for both GMUs. WDFW decreased permit numbers in 2018 due to harvest declines and has put further reductions in place to recover the white-tailed deer herd. Most of the current antlerless harvest can be attributed to Youth/Senior/Disabled general seasons and early and late general archery season opportunities. WDFW eliminated all of these antlerless opportunities during the most recent 3-year season-setting process, and these restrictions will likely remain in place until the next 3-year season review.

Survival and mortality

No pregnancy, fetal, or survival rate estimates are available for white-tailed deer in the Palouse WDMZ. Like mule deer, this zone's mortality sources include harvest, collisions with vehicles, poaching, disease, and predation. Predator species in this zone include cougars, bobcats, black bears, coyotes, golden eagles, and domestic dogs.

Habitat

The Palouse WDMZ includes five broad habitat types: active agricultural fields, Conservation Reserve Program (CRP) fields (primarily grasslands), a native grass/shrub complex (primarily along the breaks of the Snake River), coniferous forest, and riparian. Locations obtained during aerial and ground surveys have shown a relationship between white-tailed deer and riparian corridors, primarily the Palouse, Spokane, Little Spokane, Touchet, Tucannon, and Walla Walla rivers and some creeks and hollows, such as Rock, Union Flat, Meadow, and Deadman creeks. Surveyors observe fewer white-tailed deer than mule deer along the Snake River breaks and unbroken CRP fields, and more white-tailed deer associated with shrubby draws are intermixed with active agricultural fields. Coniferous forest habitat exists primarily in the north of this WDMZ and is intensively used by white-tailed deer, especially when associated with agricultural fields. White-tailed deer have also taken advantage of larger acreage (10-20-acre) semi-rural development where forage and cover are present and reduced predation risk (human and non-human).

Human-wildlife interaction

High numbers of vehicle collisions with white-tailed and mule deer are a problem along State Highways 195, 26, and 2, and Interstate 90 in the North Palouse WDMZ. WDFW works with the Washington State Department of Transportation to troubleshoot hot spots. Additionally, crop damage is reported annually in some portions of all GMUs in the North Palouse. It will likely increase as farmers switch to higher-value crops like garbanzo beans. Antlerless harvest is the primary tool used to address crop damage. In the South Palouse, WDFW applies an antlerless harvest strategy at a broad (GMU-wide) scale through general season antlerless opportunity for archery, muzzleloader, youth, senior, disabled, and antlerless-only permits, as well as at the individual landowner scale through damage and kill permits. In both Palouse zones, WDFW has removed most general and permit season white-tailed deer antlerless opportunities due to declines in the population; the primary tool for addressing damage will be at the individual landowner scale until this population recovers.

Deer crop damage complaints in the South Palouse WDMZ, as measured by damage permits issued, account for approximately 44% of the permits issued across District 3, but the majority of complaints are related to mule deer. There are isolated damage issues with white-tailed deer along the boundary of GMU 149 with GMU 154 near Walla Walla, where some orchard, vineyard, and strawberry damage is attributable to white-tailed deer. From July 2023 to March 2024, only one white-tailed deer doe was harvested on a landowner-issued kill permit, and two white-tailed deer does were reportedly harvested on damage permits.

Management concerns

Mass conversion of natural habitats to agriculture occurred over the past century but represents relatively minor changes today. Gains have been made in deer habitat with the enrollment of agricultural acres into the Conservation Reserve Program (CRP). However, with current wheat, lentil, garbanzo bean, and hay prices, several landowners have re-enrolled in CRP only after their contracts expire. In addition, there has been a recent reduction in funding available for CRP, and many expiring contracts are not eligible for renewal.

Habitat loss due to development is of concern in GMUs 127 and 130, with the redistribution of Spokane's urban populations outward into rural settings. High-density development (>1 house per acre) removes less habitat than low-density development (<1 house per 10 acres) but tends to displace deer permanently. While low-density development incorporates more habitat, the direct disturbance is less and more habitat is usable by deer post-construction. However, these deer tend to become damage/nuisance deer. Currently, the District promotes high-density clustered development with larger open space areas, hoping to maintain larger tracts of habitat that supply some connectivity.

Bluetongue (BT) and Epizootic Hemorrhagic Disease (EHD) occur in this zone and likely cause a small number of isolated mortalities every year. These disease events can be more severe during droughts and affect white-tailed deer herds across multiple Management Zones. Drought occurred in 2015 and 2021 when white-tailed deer deaths related to EHD and BT were reported in the Palouse, Columbia Basin, and Selkirk WDMZs. Given climate change and the trend toward warmer, dryer summers, more cases of BT and EHD outbreaks are likely in the future.

Management conclusions

Based on harvest metrics and survey data, white-tailed deer populations in the Palouse WDMZ have declined. Harvest has declined by more than 80% over the last 10 years, as well as a sharp decline in hunter numbers and effort. Due to their naturally high reproductive potential, white-tailed deer populations generally rebound quickly from weather and disease-related events (McCullough, 1987).

However, due to the number of negative events in near back-to-back succession and more permanent changes to habitat in the zone, WDFW efforts to support faster recovery are unlikely to result in returns to the historic population level and harvest metrics. WDFW has reduced antlerless harvest opportunities to support an increase in doe survival and will continue at this reduced level until the population begins to show signs of recovery.

Literature cited

McCullough, D. R. 1987. The theory and management of Odocoileus populations. Pages 535-549 in C. M. Wemmer, ed. Biology and Management of the Cervidae. Smithsonian Institution Press, Washington, D.C.

Washington Department of Fish and Wildlife. 2010. Washington State Deer Management Plan: White-tailed Deer. Wildlife Program, Washington Department of Fish and Wildlife, Olympia. 124 pp. 2010 WA State White-tailed Deer Management Plan.

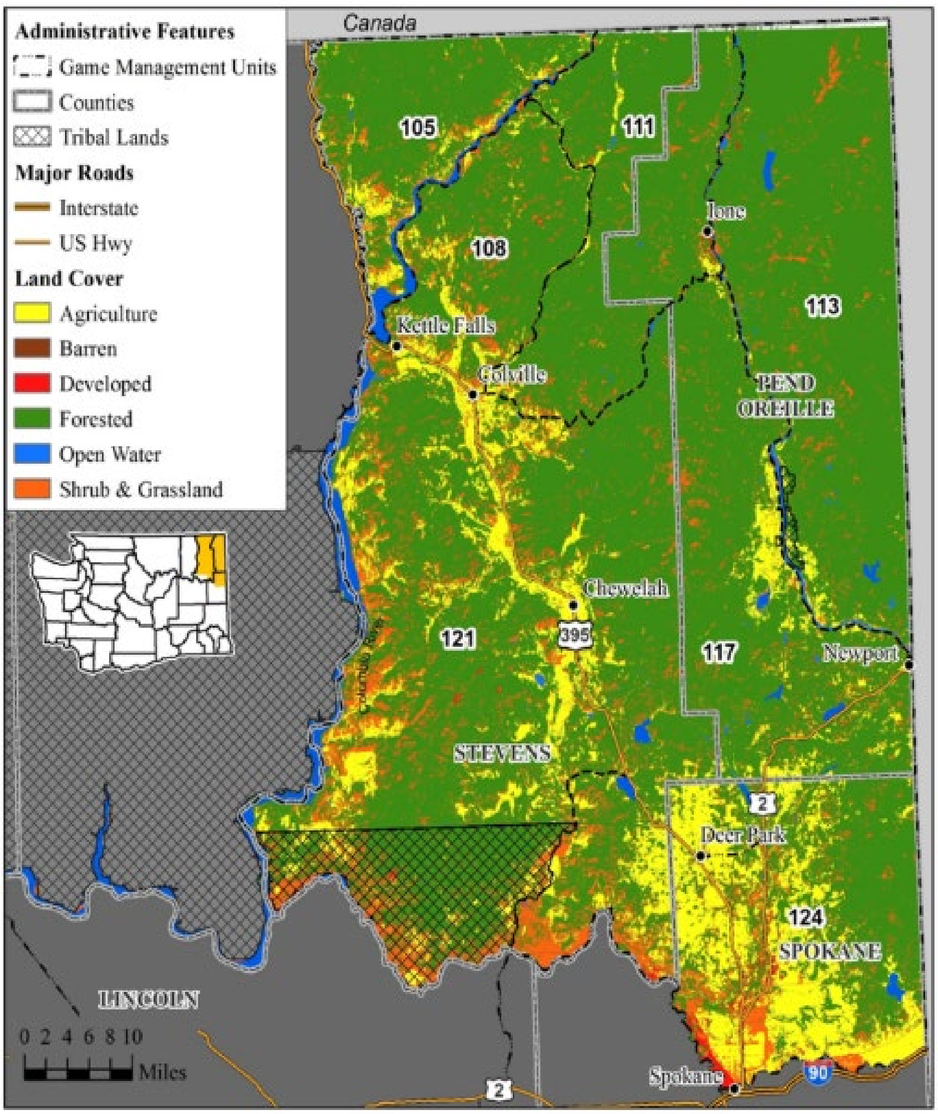
Selkirk White-tailed Deer Management Zone

Annemarie Prince, Wildlife Biologist
Carrie Lowe, Wildlife Biologist
Matt Brinkman, Wildlife Biologist

Introduction

The Selkirk WDMZ is in northeast Washington and consists of seven Game Management Units GMUs (105, 108, 111, 113, 117, 121, and 124; Figure 1).

Figure 1. The Selkirk White-tailed Deer Management Zone WDMZ.



GMUs and generalized land cover types within the Selkirk WDMZ.

Management guidelines and objectives

The Department's objective within this WDMZ is to maintain a stable population based on harvest estimates and available survey data. Additional management objectives include managing for a post-hunt population with a sex ratio of 15-19 bucks:100 does (WDFW, 2010).

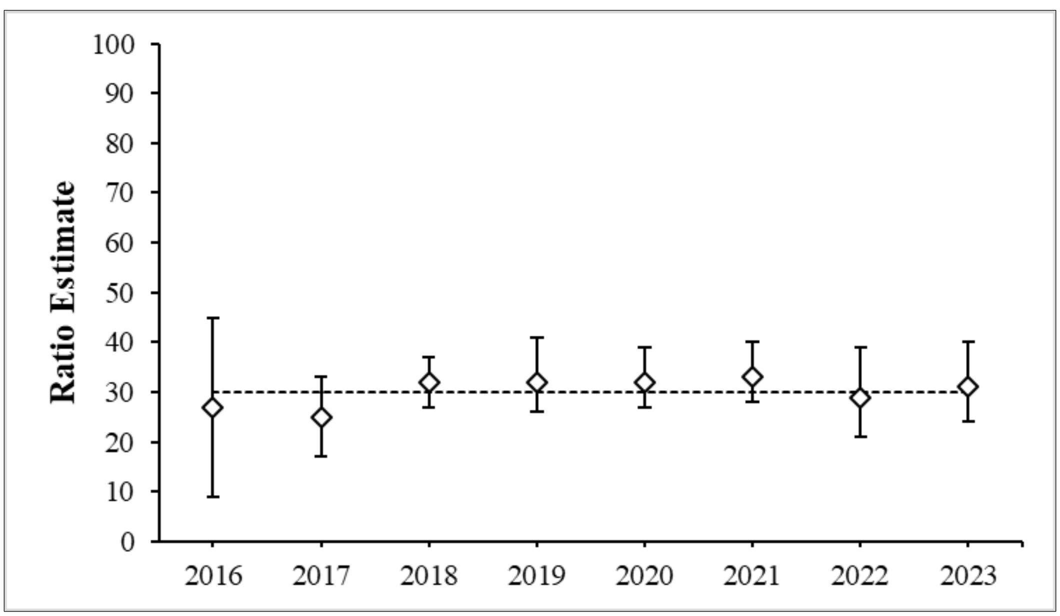
GMUs 105 through 121 have similar rural characteristics, climatic traits, land ownership patterns, and cover types; hence, management prescriptions and white-tailed deer hunting regulations are uniform throughout these six GMUs.

GMU 124, however, is dominated by the metropolitan area of Spokane in the south of the unit and extensive small agricultural properties in the north valleys interspersed with conifer forests in the foothills and mountains. Many small, private property owners do not allow hunting, thus functioning as quasi-sanctuaries; this, combined with the generally milder winters in GMU 124, results in greater deer abundance than in the northern GMUs. Consequently, hunting regulations are formulated to be more liberal as a mechanism to help keep the white-tailed deer population within local landowner tolerance.

Population surveys

A reliable estimate of deer population size for this zone has yet to be attainable due to forest cover, deer behavior, staff availability, and funding limitations. As a result, pre-hunt ground surveys are conducted in the Selkirk zone to estimate age and sex ratios, which provide managers with a relative measure of the effect of harvest (bucks:100 does) and reproduction (fawns:100 does) on deer population status within the zone.

Figure 2. Estimated pre-hunt buck:doe ratios and 10-year average in the Selkirk WDMZ.

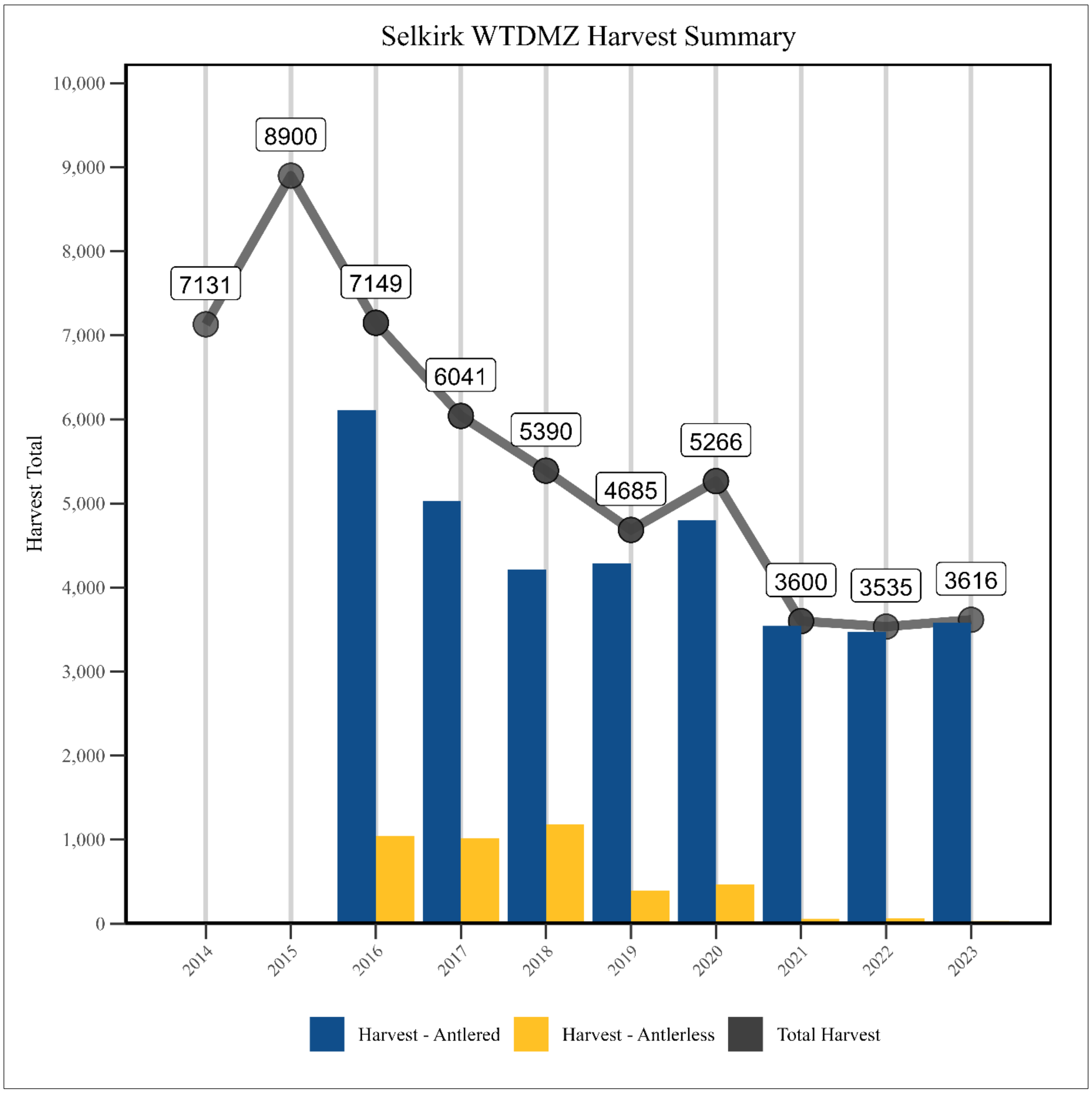


Estimated pre-hunt buck:doe ratios, 90% CIs, and 10-year average (dotted line) for GMUs 105-121 in the Selkirk WDMZ, 2016-2023.

The pre-hunt buck:doe ratio estimates from surveys conducted in GMUs 105-121 during the last ten years (Figure 2) indicate no significant change since 2013. The 2023 fawn:doe ratio for GMUs 105-121 was 55:100 (90% CI = 41-70, *n* = 385). This estimate is an increase from the 2022 estimate and higher than the previous 10-year average.

In GMU 124, the pre-hunt buck:doe ratio estimate was 31:100 (90% CI = 19-50, *n* = 232) in 2023, which is similar to the previous 10-year average of 30:100 but down from the ratio observed in 2022 of 54:100. The fawn:doe ratio estimate was 49:100 (90% CI = 43-56, *n* = 263) in 2023, slightly below the previous 10-year average of 56:100.

Figure 3. White-tailed deer harvest estimates for the Selkirk WDMZ.

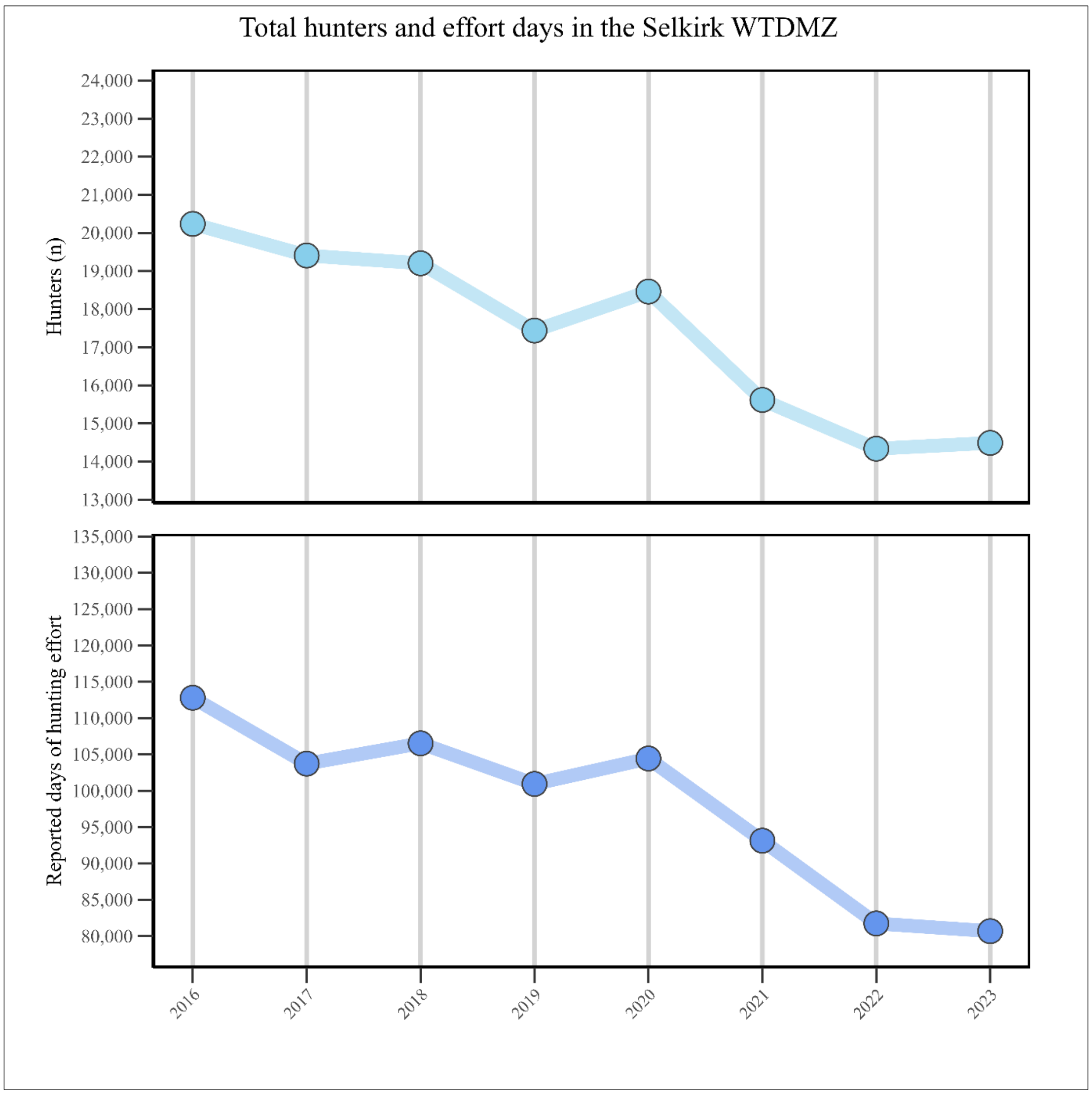


Harvest estimates for general season buck (blue), antlerless (yellow), and total harvest (black dots) in the Selkirk WDMZ, 2014-2023.

Hunting seasons and recreational harvest

Estimates of white-tailed deer harvest in this zone declined from 2015 to 2019, likely due to a widespread 2015 bluetongue outbreak, followed by severe winters in 2016/17 and 2018/19. Declines in estimated harvest well below the 10-year average in 2021, 2022, and 2023 are also attributed to the direct and lingering impacts of hemorrhagic disease outbreak in the summer of 2021. Due to their naturally high reproductive potential, white-tailed deer populations generally rebound quickly from such temporary weather and disease-related events (McCullough, 1987). However, due to the number of events in a short period and to support faster recovery, WDFW reduced antlerless harvest opportunity. Estimates of harvest and kills/day (Figure 3) indicate populations are still below the pre-2015 level.

Figure 4. Total hunters and effort days in the Selkirk WDMZ.



General season estimates for number of hunters (pale blue) and cumulative number of hunter days (blue) in the Selkirk WDMZ, 2016-2023. WDFW cannot generate species-specific estimates for number of the hunters, days, success, etc., in most eastside GMUs because both mule deer and white-tailed deer can be hunted.

Survival and mortality

Between 2016 and 2021, white-tailed deer within this zone, specifically GMUs 117 and 121, exhibited a population growth rate of 0.97 (95% CI = 0.88 - 1.05, Ganz et al., 2024), indicating a stable to slightly declining population. The most recent estimates of survival for adult does in the zone were 0.73 (95% CI = 0.67 - 0.80; Ganz et al., 2024), with predation (n = 45) and vehicle collisions (n = 21) as the primary confirmed causes of mortality for radio-collared deer; 50 mortalities were due to unknown causes. They also estimated juvenile survival to be 0.36 (95% CI = 0.28 - 0.46; Ganz et al., 2024). Most predations on adult deer were by cougars, while juveniles were predated by both cougars and coyotes (Ganz et al., 2024). Other predators in this zone include black bears, grizzly bears, bobcats, gray wolves, and golden eagles.

Regarding recent disease concerns in the zone, white-tailed deer populations throughout the country can be affected, to varying degrees, each fall by different hemorrhagic diseases, most often Epizootic Hemorrhagic Disease (EHD) and Bluetongue Disease. Bluetongue and EHD both naturally occur in this zone and typically cause a relatively small number of mortalities every year. During severe droughts, as happened in late summer 2015 and 2021, these disease events can be more pronounced and affect white-tailed deer herds in multiple Management Zones. Because regional weather patterns can substantially affect the scale and locality of an outbreak, incidences are neither predictable nor preventable. Though intense outbreaks, like those experienced in the Selkirk WDMZ in 2015 and 2021, can be alarming, white-tailed deer appear well-adapted to survive such ecological challenges due to high reproductive potential (McCullough, 1987).

Habitat

Habitat within the Selkirk WDMZ is predominantly conifer forest, contributing approximately 68% of the total land cover within the zone. Shrubland combined with grassland, pasture, and cultivated crops make up the next highest level in land cover classes, comprising nearly 21% of the Selkirk WDMZ area. These cover classes combined produce the highest densities of white-tailed deer, particularly within the farm and forest mosaic, where deer have both forage and cover resources in close proximity. Although cultivated crops alone account for only 2.4% of the aforementioned land cover, their influence on the support of the white-tailed deer population cannot be overstated. The Selkirk WDMZ can also be broken down to about 37% public land and 57% private lands, with the remaining 6% in other categories (WDFW, 2010).

Human-wildlife interaction

The Selkirk WDMZ is home to the largest populations of white-tailed deer in the state. Areas with large concentrations of agricultural and suburban land uses tend to attract and perpetuate greater densities of white-tailed deer than would normally occur in the wild. This interaction often leads to increased human-wildlife conflict and deer mortality due to vehicle collisions. For example, a study on collision rates in Washington indicates that deer-vehicle collisions in this zone are consistently among the highest in the state (Myers et al., 2008). In 2023, 35 white-tailed deer damage prevention permits or kill permits were issued to landowners experiencing issues with deer damaging their crops. An additional 14 permits were issued for any deer species to address damage issues.

Research

Ganz et al., (2024) examined how predator exposure, white-tailed deer use of human-modified landscapes, and winter severity influenced survival and then used those relationships to evaluate impacts on the growth rate of the white-tailed deer population. Results of this study indicated that predators had a negative effect on the population growth rate, while timber harvest and agricultural areas had a positive effect, meaning the white-tailed deer population in the Selkirk WDMZ is limited by top-down and bottom-up factors. Previous research on white-tailed deer within the Selkirk WDMZ examined migratory patterns and concluded that partial migration may occur within this population in response to competition for high-quality habitat (Henderson, 2014).

Management concerns

As less than half the Selkirk WDMZ's land base is in public ownership (37%), maximizing hunting opportunities largely depends on securing access to private lands. The availability of cultivated cropland cover, particularly cereal grain and alfalfa hay, is closely coupled with this concern for the deer. Cultivated crops are a major driver of white-tailed deer density and productivity in northeastern Washington and beyond. Besides hunting, the other significant sources of mortality to deer in this zone include predation by native carnivores and domestic dogs, and road kills from collisions with automobiles on public roadways. Periodically but unpredictably, severe winters will cause major deer loss. Summer heat and drought are also unpredictable, which foster conditions for severe hemorrhagic disease outbreaks. The influence of these diverse factors can greatly complicate how best to balance deer hunting opportunities with herd sustainability.

Management conclusions

White-tailed deer populations in this zone have declined in recent years but remain within management objectives based on harvest, survey, and survival data available.

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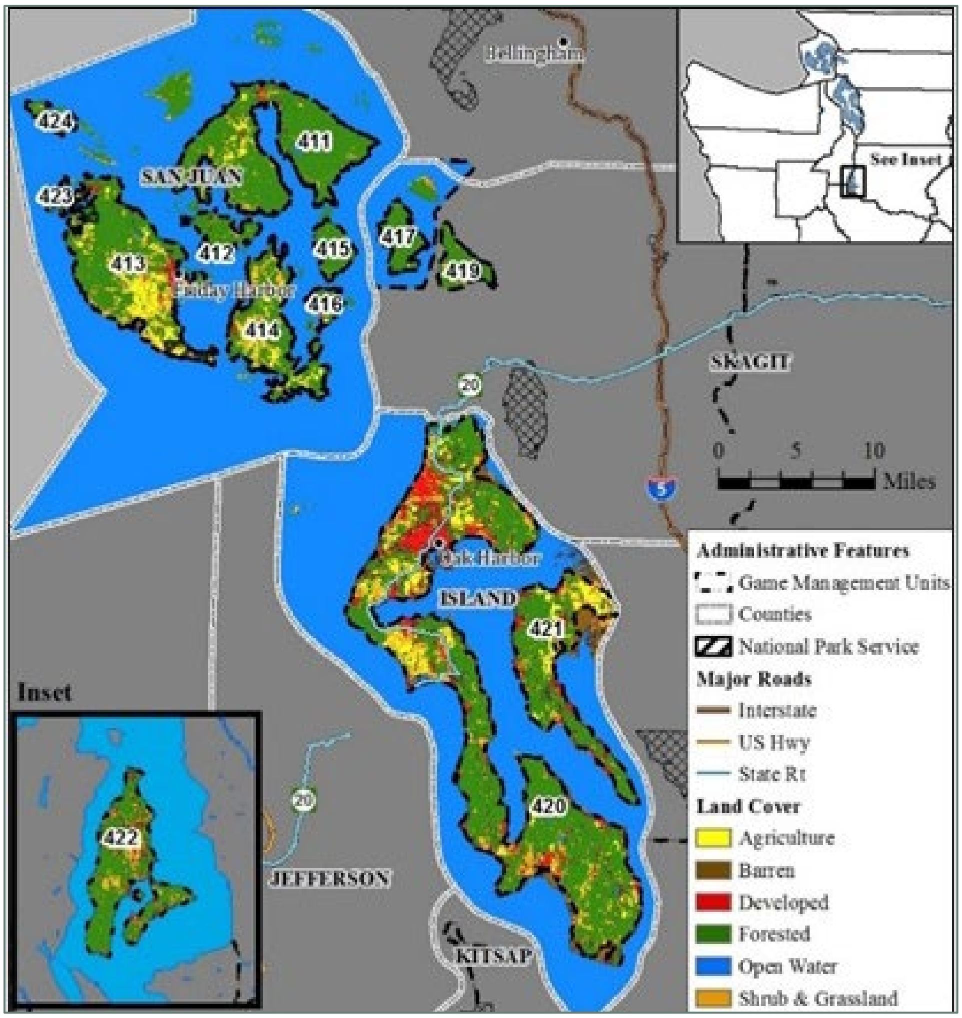
Islands Black-tailed Deer Management Zone

Kurt License, Wildlife Biologist
Mike Smith, Wildlife Biologist

Introduction

The Islands Black-tailed Deer Management Zone (BDMZ) is located in the Puget Sound in northwest Washington and consists of 14 Game Management Units GMUs 410-417 and 419-424; Figure 1).

Figure 1. Islands Black-tailed Deer Management Zone.



GMUs and generalized land cover types within the Islands BDMZ.

Management guidelines and objectives

The Department's current objective within this BDMZ is to manage the population for a liberal deer harvest with the intent of maintaining or reducing deer abundance.

Population surveys

WDFW is conducting no population surveys in the Islands BDMZ at this time. Before spring 2021, annual harvest estimates and anecdotal reports from island residents suggested a stable-to-increasing population. However, Adenovirus Hemorrhagic Disease (AHD) was detected on San Juan and Orcas Islands in May 2021 and Whidbey Island in September 2021. Public reports also indicate that AHD may have impacted other islands in the San Juan Archipelago (e.g., Lopez, Henry, Shaw, Center, Stuart, and Blakely). Deer abundance in AHD-affected areas remains lower than in previous years based on recent harvest statistics. AHD has not been detected in 2024 as of the writing of this report.

Researchers with Seattle Pacific University on Blakely Island recently published deer density trends between 2007-2021 using line-transect distance sampling (Long et al., 2024). In 2007–2008, deer densities were the greatest observed (~44/km2), but a historic snowstorm reduced deer density by 39%. From 2010–2021, as forests continued to mature, deer density decreased 4.0%/year, declining to 20 deer/km2. Extrapolating the most recent density of 20 deer/km2 across the entirety of Blakely Island (17.3 km2) results in a population estimate of approximately 346 black-tailed deer in 2021.

Hunting seasons and recreational harvest

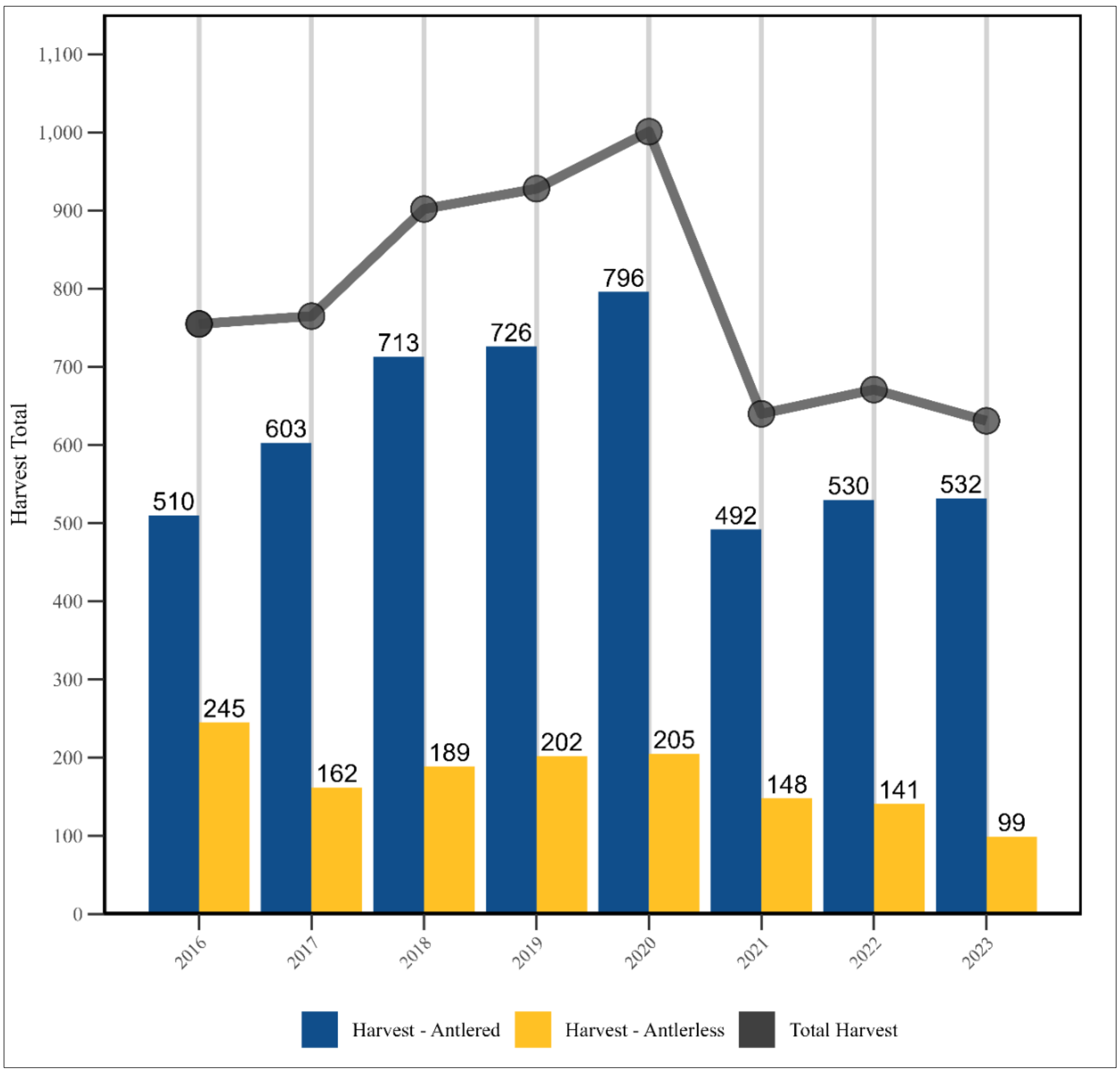
Island BDMZ GMUs are managed for a liberal deer harvest with the intent of maintaining or reducing deer abundance. Participating hunters may harvest one animal of either sex during long general seasons. In 2020, the Island BDMZ general season harvest (Figure 2) was the highest that it had been in the previous decade. However, relative hunter effort-to-harvest (hunter days per kill) has been relatively stable since 2017 (Figure 3). The above-average general season harvest and kills/day likely indicated a stable-to-increasing population before the 2021 AHD outbreak. In 2021, harvest estimates and hunter participation dropped well below the 10-year average.

A total of 631 deer were harvested from the Island BDMZ during the 2023 general seasons; the majority (84%) were antlered bucks. Modern Firearm hunters experienced the highest success rate (46%) and were most likely to harvest an antlered buck. Archery and Muzzleloader hunters experienced moderate to low success rates at 27% and 16%, respectively. Most of the islands in the BDMZ offer antlerless-only second-tag special permits to reduce deer densities and increase hunting opportunities. In 2023, the number of available special permits in the BDMZ was 1,210. Of the 1,210 special permits available, 883 were awarded and claimed by applicants. A total of 101 antlerless deer were harvested in the BDMZ by special permit during the 2023 season.

Publicly owned land is extremely limited in the Islands BDMZ. Public landowners that allow hunting on some properties include the Washington Department of Natural Resources, Bureau of Land Management, San Juan County Land Bank, Washington Department of Fish and Wildlife, King County Parks Island Center Forest, and Island County Public Works Department. WDFW is currently negotiating deer hunting access to some private properties in San Juan and Island counties. Contact information for these agencies and information regarding private land hunting opportunities in the Islands BDMZ can be found in the 2024 District 12 and 13 Hunting Prospects, available on the WDFW website.

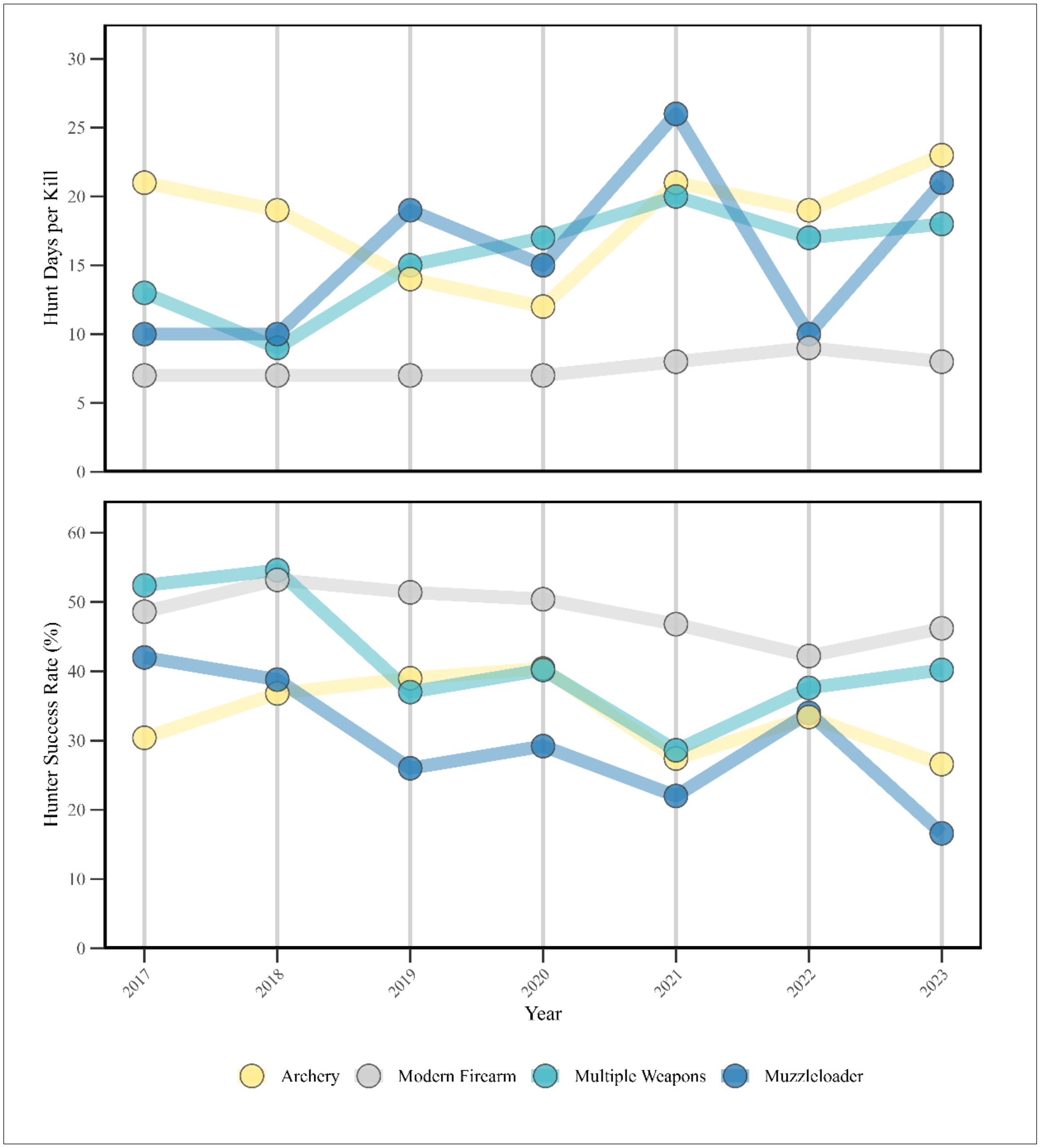
The season dates and weapon type regulations for antlerless-only second tag special permits were recently restructured for several GMUs, including GMU 411 (Orcas), GMU 412 (Shaw), GMU 413 (San Juan), GMU 414 (Lopez), GMU 415 (Blakely), GMU 420 (Whidbey), and GMU 422 (Vashon-Maury). The new regulations allow permit holders to hunt as early as August 1st - December 31st using any legal weapon (archery, muzzleloader, modern firearm—firearm type restricted). Some GMUs have delayed hunt start dates to September to avoid busy tourist seasons in August. Centerfire rifles are not permitted for use because all the affected GMUs are in firearm-restricted areas. All deer hunters in these GMUs must wear hunter orange or hunter pink during the general season and the extended second deer permit season because modern firearm hunters may be afield during the entire duration of the seasons.

Figure 2. Estimated annual, antlered, and antlerless black-tailed deer harvest in the Islands BDMZ.



Harvest estimates for the total (gray line), antlered (blue bars), and antlerless harvest (yellow bars) in the Islands BDMZ, 2016-2023.

Figure 3. Hunter days per kill and success rate.



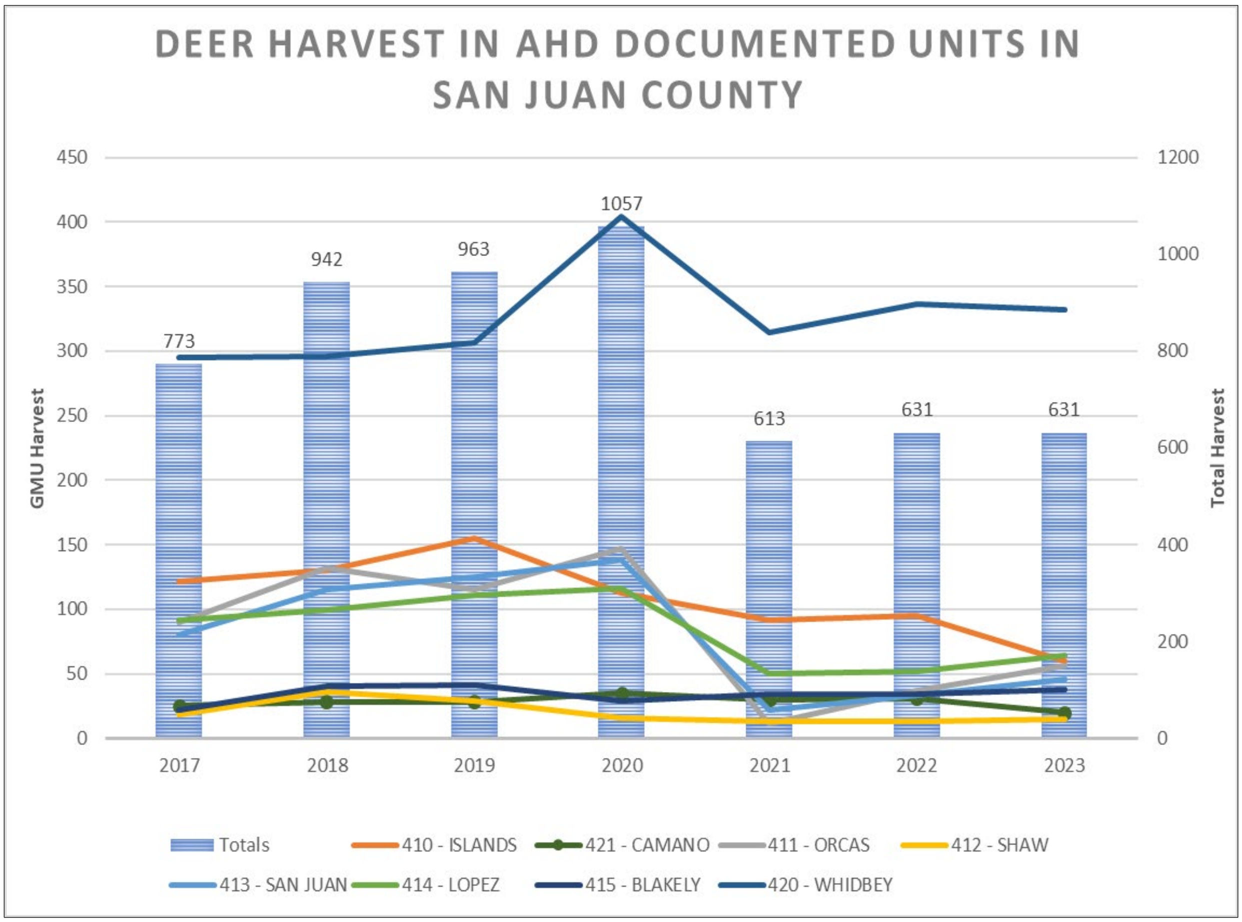
General season estimates of hunter days per kill and harvest success rate in the Islands BDMZ, 2017-2023, by weapon type.

Survival and mortality

No information regarding vital rates is available for black-tailed deer in the Islands BDMZ. In addition to legal hunter harvest, other potential sources of mortality include collisions with vehicles, disease, poaching, and predation by coyotes (the sole large predator in this zone, but absent in the San Juan Archipelago) on Whidbey, Camano, Cypress, Guemes, and Vashon Islands.

Adenovirus Hemorrhagic Disease (AHD) substantially increased the number of deer mortalities in the San Juan Archipelago during the late spring and summer of 2021. Orcas and San Juan Islands appear to have been impacted the most, with roughly 210 reported AHD-related mortalities on Orcas Island and 115 on San Juan Island. These figures are an underestimate of the actual number of AHD-related mortalities. AHD appears to have also impacted deer on Lopez, Shaw, Henry, and Blakely Islands to different degrees. For example, deer harvest success on San Juan and Orcas Islands dropped significantly (84% and 93%, respectively) between 2020 and 2021, while harvest on Blakely Island increased slightly (Figure 4). In 2023, total harvest was generally stable for all GMUs previously documented to have AHD. Specifically, slight decreases in harvest were documented for GMUs 410, 420, and 421, while harvest increased in GMUs 411, 412, 413, 414, and 415.

Figure 4. Deer harvest in AHD documented GMU's in District 13.



Deer harvest in adenovirus hemorrhagic disease (AHD) impacted GMUs in District 13, 2017-2023.

Habitat

Black-tailed deer habitat in the Islands BDMZ generally consists of a mosaic of alder, big-leaf maple, or second-growth Douglas fir forests intermixed with openings created by small regenerating clear-cuts, agricultural fields, hobby farms, and horticultural plantings associated with homes and gardens.

Although small towns exist on most of the larger islands serviced by the Washington Department of Transportation (WSDOT) ferries, most of the islands retain a highly rural character that provides abundant habitat for black-tailed deer.

Human development affects the amount of habitat available for deer in the Island GMUs, particularly on the larger islands where local deer populations are very robust. Robust deer populations may be supported by expanded edge habitats and inadvertent forage enhancements such as gardens and ornamental plantings, which provide abundant food in safe environments where hunting is controlled.

Human-wildlife interaction

Vehicle collisions are common on all the larger islands in this BDMZ. Deer may be encountered during the day or night, and residents frequently complain about deer on roadways. Tolerance for high deer populations varies among island residents. Some are anti-hunting and often feed the deer, while others favor aggressive reductions in the current populations.

Damage complaints regarding deer depredation on farm crops, ornamental plantings, and conifer seedlings occur sporadically throughout the Islands BDMZ. No damage or kill permits were issued during the previous year. Deer depredation has altered the understory habitat conditions and reduced the diversity of avian species on many islands (Martin et al., 2013).

Deer predation has also been identified as a key factor hindering the recovery of the Island Marble Butterfly (*Euchloe ausonides insulanus*) on San Juan Island, where deer browse flowering plants containing butterfly eggs and larvae (Lambert, 2014). Similarly, deer herbivory of young trees impeded Garry oak (*Quercus garryana*) and oak prairie habitat restoration efforts, which may reduce suitable habitat of obligate species like Propertius duskywing (*Erynnis propertius*). Deer also browse the flowers of Golden Paint Brush (*Castilleja levisecta*) on Whidbey Island, prohibiting the plants from setting seeds needed for restoration projects.

Management concerns

In 2013, most of the islands in the BDMZ were split into individual GMUs to better understand hunter access and harvest trends on each island where deer occur. Previously, all the islands were combined into one or two large GMUs. Despite outreach efforts to educate hunters of the change, hunters continue to report their harvest using the previously assigned GMU number, thus hindering WDFW's ability to assess deer management on an island-by-island basis. Although accurate reporting improves each year, erroneous GMU reporting continues, complicating harvest assessments for individual islands. The immediate and long-term impacts of the 2021 Adenovirus Hemorrhagic Disease outbreak are not well known. Deer abundance on impacted islands in the San Juan Archipelago appears substantially lower. As suspected, deer harvest on these islands remained lower during the 2023 season than during previous years, but populations and associated harvests are expected to rebound in the coming seasons.

Management conclusions

Based on harvest data, black-tailed deer populations in the Islands BDMZ were at or above the management objective with an increasing trend. However, deer populations on Adenovirus Hemorrhagic Disease impacted islands may have substantially decreased during the spring and summer of 2021. Regardless of the current abundance of deer on AHD-impacted islands, the long-term objective of wildlife managers has been to reduce and maintain a lower deer abundance in the Islands BDMZ. Consequently, hunters can anticipate liberal hunting seasons in future years with the goal of stabilizing and decreasing deer abundance within the Islands BDMZ.

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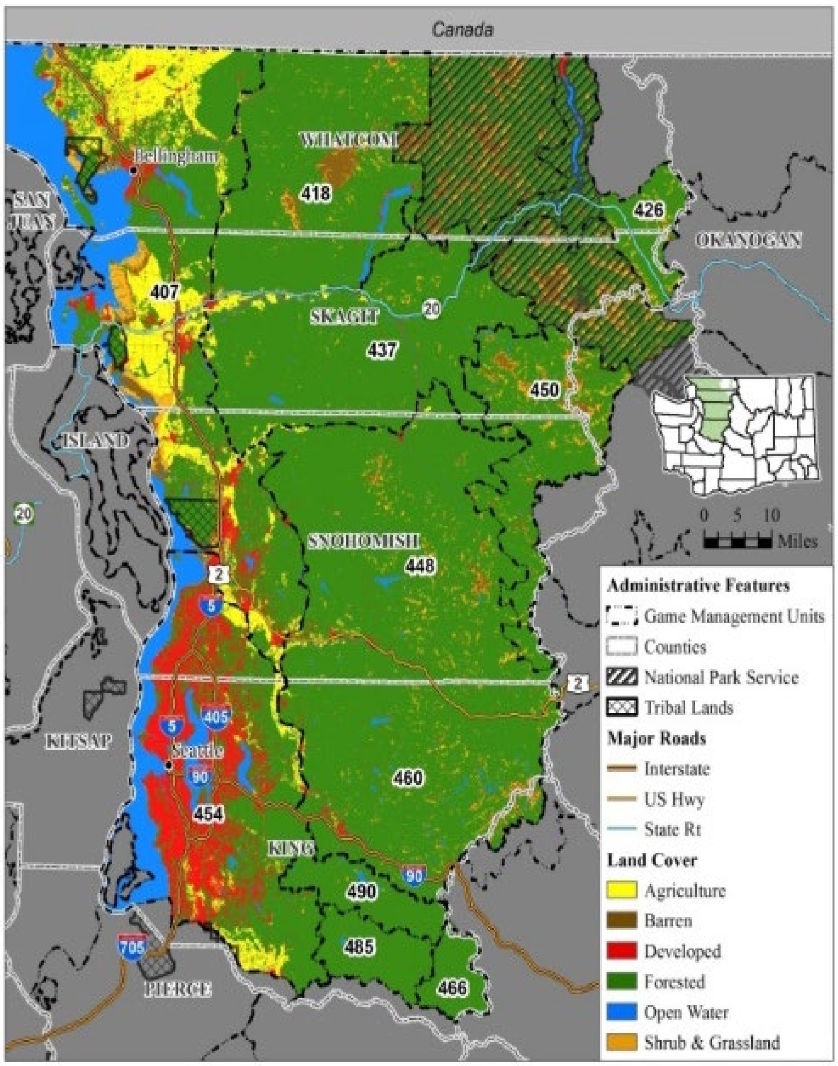
North Cascade Mountains Black-tailed Deer Management Zone

Robert Waddell, Wildlife Biologist
Mike Smith, Wildlife Biologist

Introduction

The North Cascade Mountains Black-tailed Deer Management Zone (BDMZ) is in northwest Washington and consists of 11 Game Management Units GMUs(407, 418, 426, 437, 448, 450, 454, 460, 466, 485, and 490; Figure 1).

Figure 1. The North Cascade Mountains Black-tailed Deer Management Zone.



GMUs and generalized land cover types within the North Cascade Mountains BDMZ.

Management guidelines and objectives

The Department’s objective within this BDMZ is to maintain a stable population based on harvest estimates and other best available information. Other management objectives include managing for a post-hunt population with a sex ratio of approximately 15–19 bucks:100 does (WDFW, 2014).

Population surveys

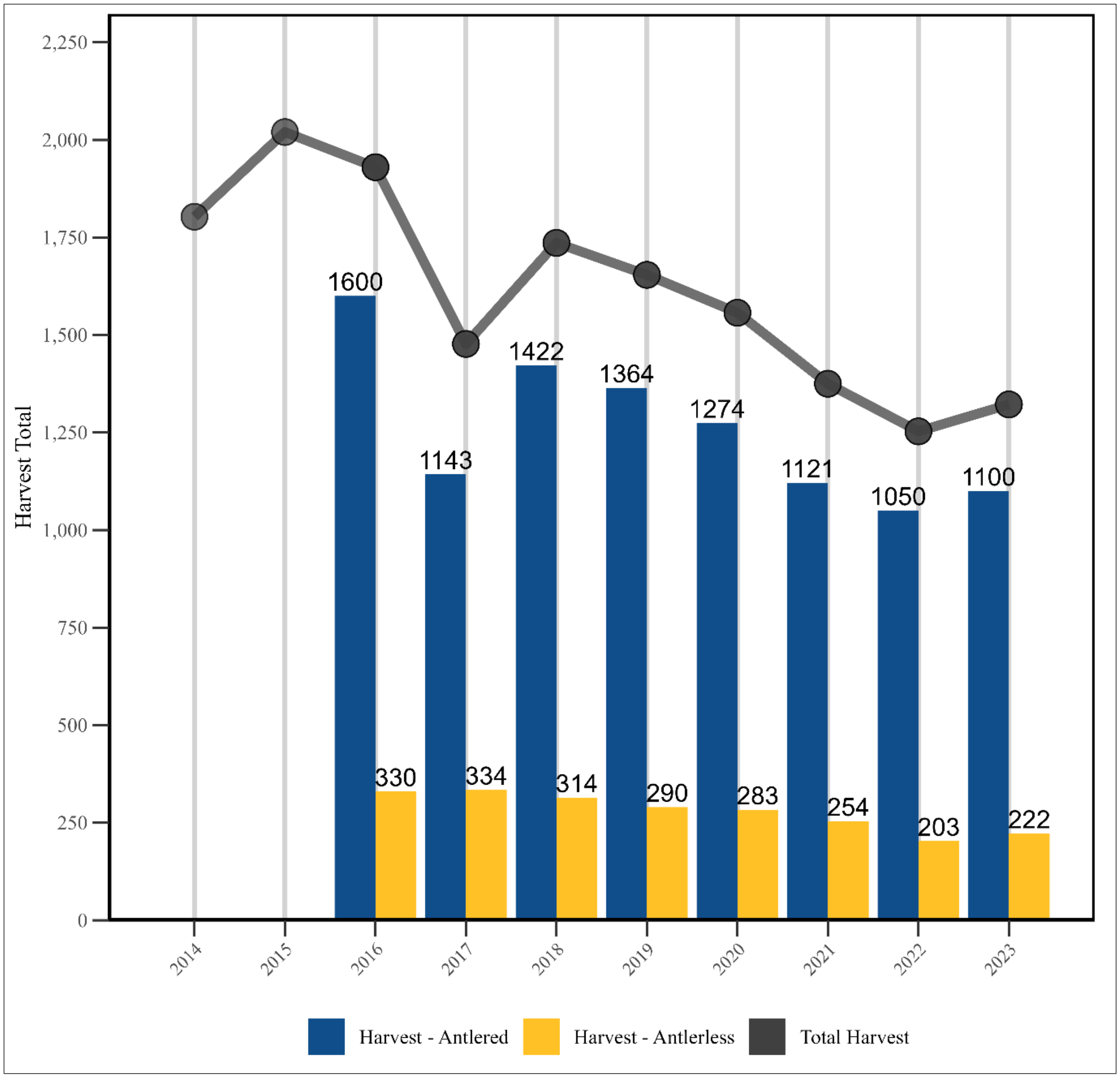
Due to the difficulties of surveying black-tailed deer in their dense habitats, no formal estimates of abundance are available in this zone. However, annual harvest estimates indicate that this population is generally stable.

In May 2021, WDFW detected Adenovirus Hemorrhagic Disease (AHD) in the adjacent Islands BDMZ. It quickly spread to other areas within that zone and was eventually confirmed in a populated municipality of western Skagit County (GMU 407 of the North Cascade Mountain BDMZ) in June 2021. The full impact of the outbreak in GMU 407 is unknown, with most mortalities likely occurring in northern urban and suburban areas of the GMU. The absence of deer mortality reports from the public and no confirmed cases within the area since 2021 indicate that the population-level impacts of the outbreak in this BDMZ likely are minimal. This is likely due to the natural segregation and lower densities of black-tailed deer in the upland forests within this zone. As of August, no cases of AHD have been confirmed in 2024.

Hunting seasons and recreational harvest

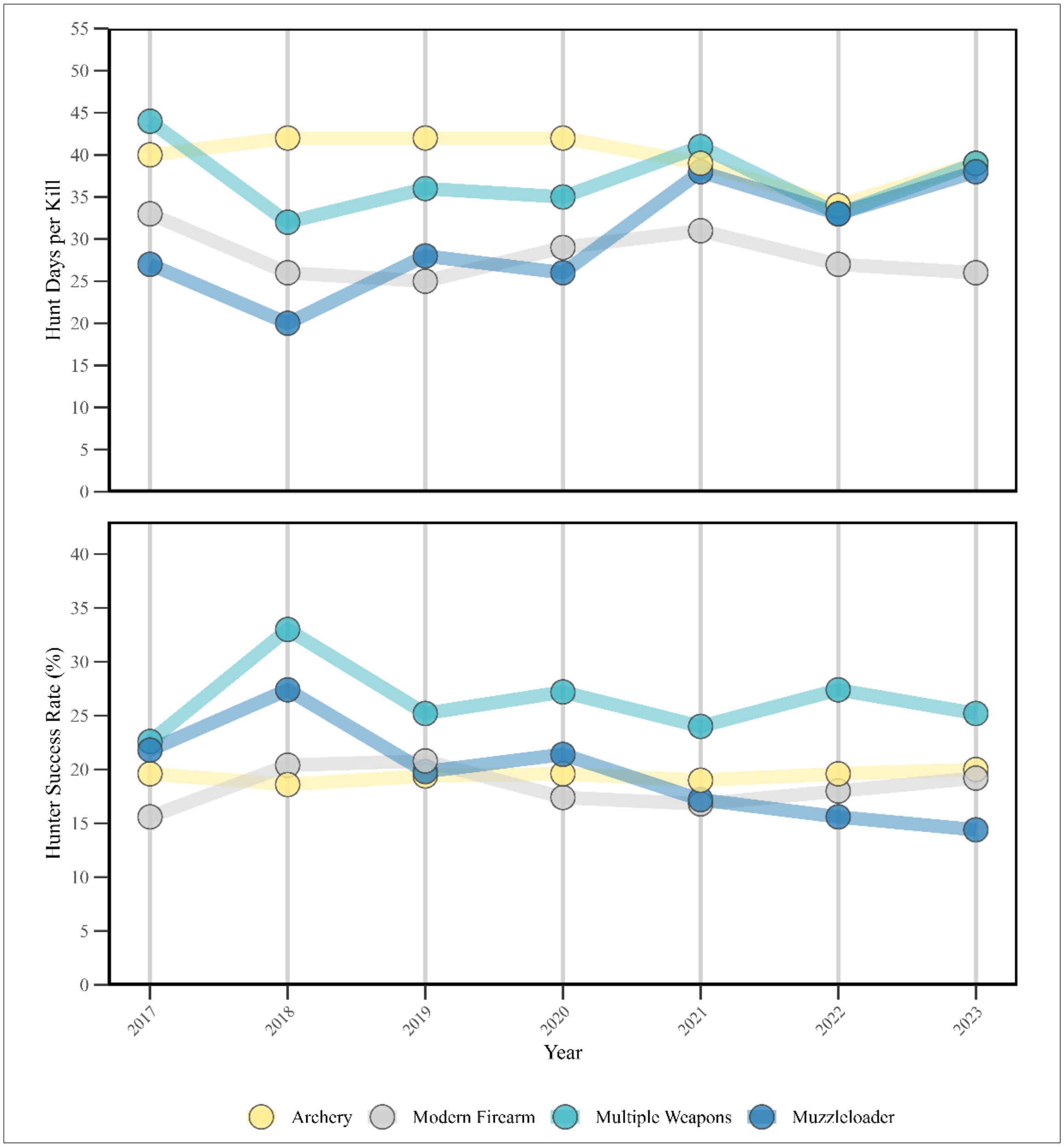
Harvest estimates for the past ten years generally indicate steady to declining harvest trends (Figures 2 and 3). The 2023 harvest estimate, including general season and special permits, was similar to the previous two seasons (Figure 2). Since 2017, the number of hunter-days-per-kill and hunter success rates for most weapon types have remained steady, though muzzleloader hunters have experienced a slight upward trend in hunt days per kill and a slight downward trend in hunt success rate (Figure 3). Overall, this zone's consistent long-term harvest rates (days/kill) indicate a stable population.

Figure 2. Estimated annual, antlered, and antlerless black-tailed deer harvest in the North Cascade Mountains BDMZ.



Harvest estimates for the total (gray line), antlered (blue bars), and antlerless harvest (yellow bars) in the North Cascade Mountains BDMZ, 2016-2023. Years 2014 and 2015 do not show sex-specific harvest estimates because they are not comparable to other years due to improved statistical methods that began in 2016.

Figure 3. Hunter effort-per-kill and success rate for black-tailed deer in the North Cascades BDMZ.



General season estimates of hunter days per kill and success rate in the North Cascade Mountains BDMZ, 2017-2023, by weapon type.

Survival and mortality

No estimates of survival or mortality rates are available for black-tailed deer herds specific to the North Cascade Mountains BDMZ. However, harvest trends reveal no concerns about the vital rates for adult females. In general, estimates of the annual survival of black-tailed bucks in Washington State have averaged 50 percent of the total population in forested landscapes, with hunting identified as the primary source of mortality (Bender et al., 2004).

Cougars, black bears, bobcats, wolves, and coyotes occur within this BDMZ. Although the effects of predation on this population of black-tailed deer are unknown, deer harvest metrics have remained stable.

Habitat

Three primary landownership types comprise most of the huntable habitat within the North Cascade Mountains BDMZ: U.S. Forest Service, private timberlands, and state-managed forests (Department of Natural Resources). Throughout Washington, changes in land-use practices have been the primary driver of declines in black-tailed deer populations (Nelson et al., 2008). Human encroachment, reductions in timber harvest, changes in timber management practices, and the natural progression of aging timber stands have contributed to a decrease in the amount and quality of local black-tailed deer habitat.

Closures of private timberland roads can buffer the influences of increased human disturbance throughout deer ranges in Skagit and Whatcom counties. However, continued use of herbicides on these private timberlands decreases the diversity and quantity of forage plants in early seral stage habitats that are important for black-tailed deer and can adversely affect the population. Although this management practice has declined in state and federally-owned lands during the previous ten years and is of minimal concern compared to historical herbicide use levels, it is still a factor to consider when managing local deer populations and habitat quality.

In general, the long-term trend in GMU 454 deer habitat is for a continued decline. The decline is consistent with the rise in housing and commercial development of the habitat currently used by deer. However, deer in GMU 454 and elsewhere in the North Cascade Mountains BDMZ are taking advantage of 1–10-acre tracts cleared for homes. These tracts still provide and may improve deer forage availability, particularly during winter, improving overall body condition, which usually translates to higher productivity and increased survival. Further, limited hunting access may reduce mortality on private lands closed to the public, subsequently increasing deer densities in those areas and prompting deer dispersal to surrounding habitats more accessible to hunters in GMU 454.

A significant majority of GMU 460 is managed for timber production. Annual timber harvests create a mosaic of seral stages that can benefit deer. Forest clearings of 1–10 acres and riparian corridors protected by the Washington Forest and Fish Law exist and provide a good forage base for wildlife. The forest stands in these corridors provide older age classes that diversify habitat and help intercept snow during harsh winters. These sites may also provide deer access to forage, serve as travel corridors, and provide added winter shelter.

In 2004, King County announced the purchase of development rights on the King County portion of the Snoqualmie Forest (approx. 90,000 acres). This action will ensure the conservation of this large area of commercial forest as open space and de facto deer habitat. The Snoqualmie Indian Tribe recently purchased roughly 12,000 acres in the NE corner of the forest. Additional research is needed on the relationship between current landscape conditions, herbicide application, deer populations, and habitat quality.

Deer habitat trends in GMU 466 and 485 depend on timber management and subsequent seral stage development because it determines forage availability. Several thousand acres of timberlands are managed primarily for wood fiber production, with considerations for recreational opportunities, fish, and wildlife.

Human-wildlife interaction

Deer-related damage to private property has remained a problem throughout the mainland portions of northern Region 4. However, WDFW made no (deer-related) crop damage compensation payments in this BDMZ in 2023. Department Conflict Specialists issued 12 damage permits to commercial producers in Skagit and Whatcom Counties in 2023. One female deer was harvested with a landowner permit. No landowner permits were issued in Snohomish County, and one permit was issued in King County, resulting in one antlerless harvest. These permits were issued for lands involved in the production of nursery and vegetable crops.

Deer Area 4541 was created in GMU 454 in 2018 to offer additional harvest opportunities and to address damage complaints in the most densely populated portion of the unit. In this area, a special permit application offered 30 antlerless permits (10 each for Second Deer, Hunters 65 and over, and Hunters with Disabilities). Of the 30 permits issued, only six recipients reported spending at least one day afield, which resulted in no permits being successfully filled.

Management concerns

Safety concerns associated with increased human development and changing attitudes towards hunting have resulted in fewer areas open to hunters in this BDMZ. In addition, public hunting sites are limited in many of the North Cascade GMUs. As a result, the agency continues to look for opportunities to partner with private landowners to open more opportunities for hunters.

Management conclusions

Limited information is available for black-tailed deer populations in the North Cascade Mountains BDMZ, but based on harvest metrics, populations are considered stable.

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Nelson, J., D. Cottam, E. W. Holman, D. J. Lancaster, S. McCorquodale, D. K. Person. 2008. Habitat guidelines for black-tailed deer: coastal rainforest ecoregion. Mule Deer Working Group, Western Association of Fish and Wildlife Agencies.

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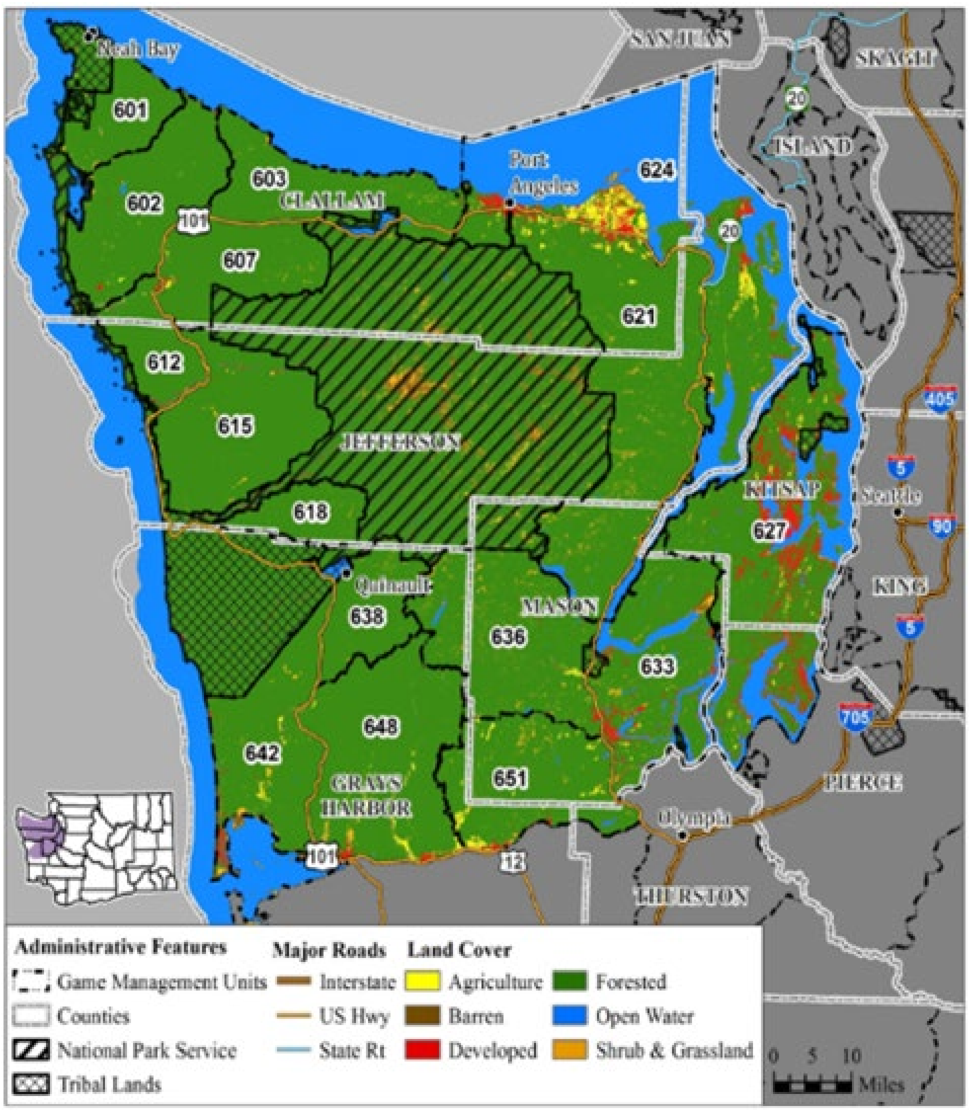
Olympic Peninsula Black-tailed Deer Management Zone

Bryan Murphie, Wildlife Biologist

Introduction

The Olympic Peninsula Black-tailed Deer Management Zone (BDMZ) is in northwest Washington and consists of 16 Game Management Units GMUs (601, 602, 603, 607, 612, 615, 618, 621, 624, 627, 633, 636, 638, 642, 648, and 651; Figure 1).

Figure 1. Olympic Peninsula Black-tailed Deer Management Zone (BDMZ).



GMUs and generalized land cover types within the Olympic Peninsula BDMZ.

Management guidelines and objectives

Black-tailed deer (*Odocoileus hemionus columbianus*) in this zone are managed to maintain productive populations while providing for multiple uses, including recreational, educational, aesthetic, and a sustainable annual harvest (WDFW, 2014). WDFW attempts to achieve these objectives largely through manipulating hunting seasons. Hunting regulations for Olympic BDMZ Game Management Units (GMUs) generally provide liberal buck hunting and a conservative antlerless harvest.

Population surveys

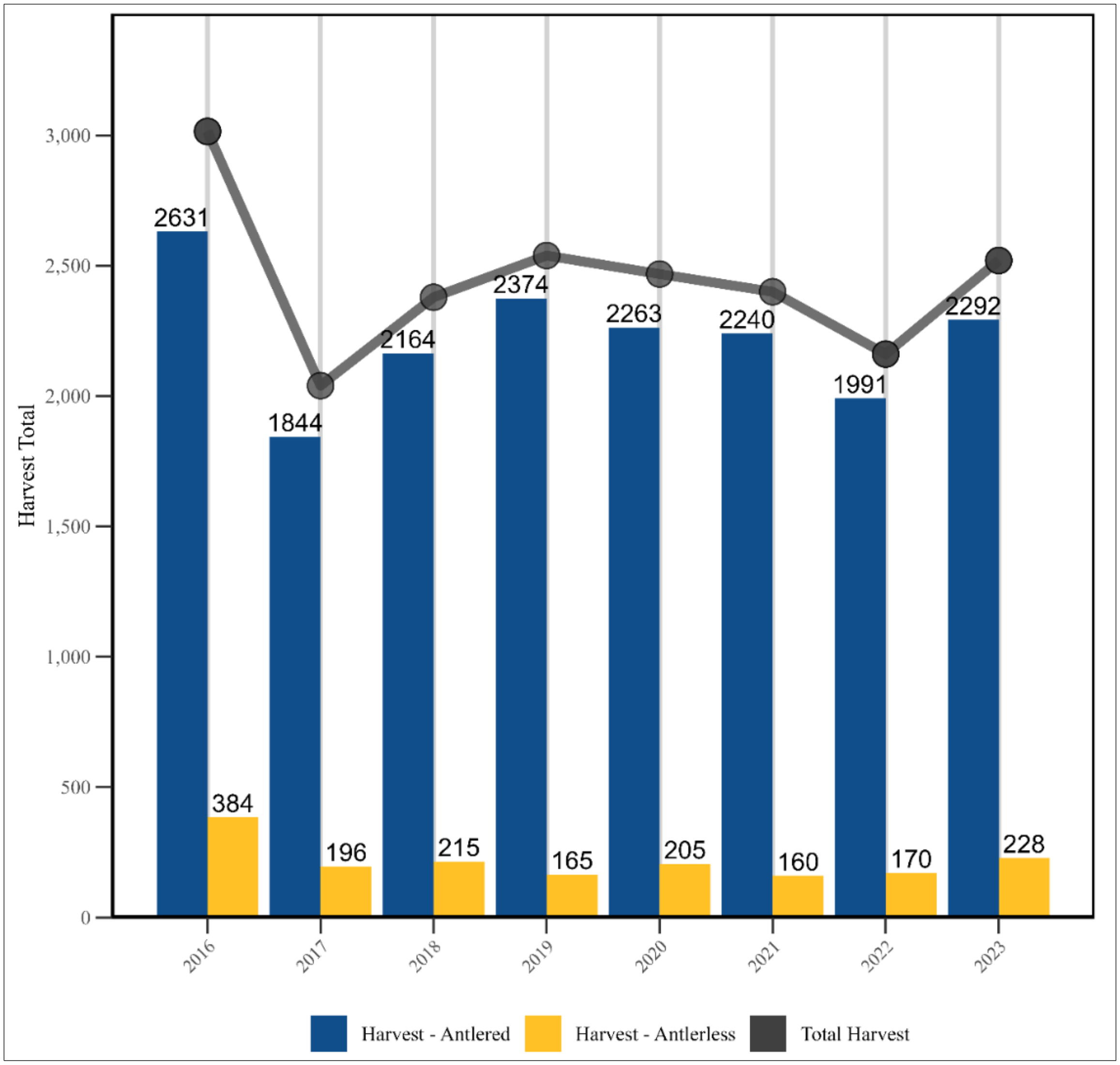
Monitoring is primarily achieved via mandatory hunter reporting. When funding is available, WDFW conducts more targeted projects related to specific GMUs or study areas. Tribal research and monitoring, conducted independently and in cooperation with WDFW, also provide valuable information on black-tailed deer in this BDMZ.

Hunting seasons and recreational harvest

The 2023 deer hunting season regulations were like those in previous years in the Olympic BDMZ. Most general season hunting opportunities were for any buck, while antlerless harvest was limited to certain weapon types or special permits. Deer Area 6020 was open to the harvest of any deer during the general season for all weapon types. The Olympic BDMZ provided additional hunting opportunities during the 2023 season, with 656 permits offered through the Department's special permit system; of these, 291 hunters reported harvesting 83 deer in 2023. Tribal hunter harvest comprises about 8% of the total deer harvest in the Olympic BDMZ and averaged 204 deer in the last 10 years (NWIFC Game Harvest Reports).

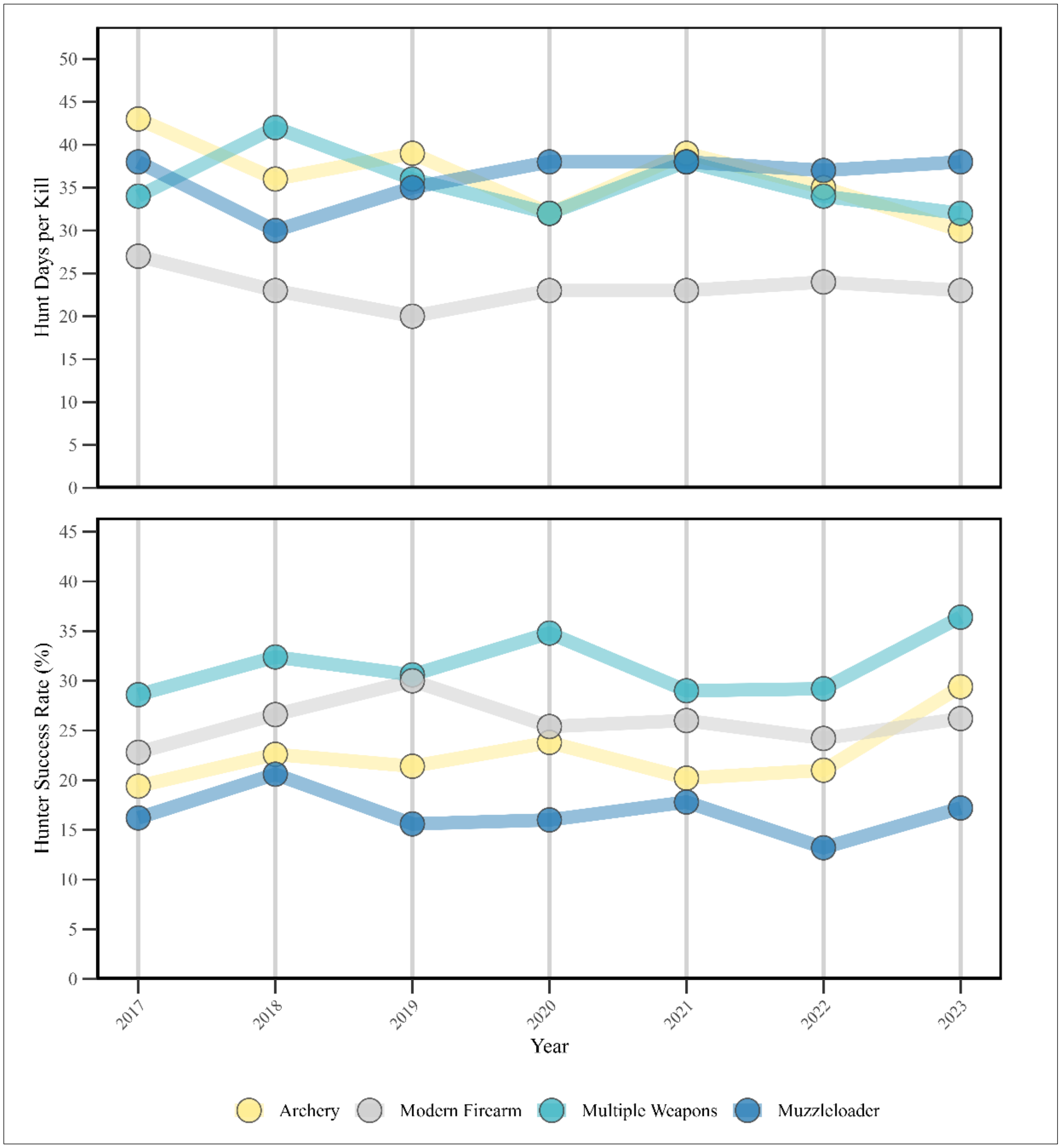
Estimates from harvest reports indicate State deer harvest (Figure 2) has been trending up in recent years, while days-per-kill and hunter success (Figure 3) were similar from 2017 to 2023.

Figure 2. Estimated annual, antlered, and antlerless black-tailed deer harvest in the Olympic Peninsula BDMZ.



Harvest estimates for the total (gray line), antlered (blue bars), and antlerless harvest (yellow bars) in the Olympic Peninsula BDMZ, 2016-2023.

Figure 3. Hunter effort-per-kill and success.



General season estimates of hunter days per kill and success rate in the Olympic Peninsula BDMZ, 2017-2023, by weapon type.

Survival and mortality

Survival and mortality have been studied in some GMUs, and inferences can be made from these data regarding black-tailed deer in the Olympic BDMZ. Doe survival is generally higher than 75% (Rice, 2018; McCoy et al., 2014). Buck survival has been documented to be around 50% (Bender et al., 2014). Fawn survival varies the most annually and is generally below 40% (Rice, 2018; McCoy et al., 2014; Murphie S., 2010).

Causes of mortality among black-tailed deer include malnutrition, predation, legal harvest, poaching, and various other natural and human-related causes (vehicle collisions, for example). Malnutrition and predation are the most common factors associated with the mortality of does and fawns (Rice, 2018; McCoy et al., 2014; Murphie S., 2010). Hair-loss syndrome (Bildfell et al., 2004) is also an important factor influencing black-tailed deer survival (McCoy et al., 2014; Murphie S., 2010). Hunter harvest is the most common cause of mortality among bucks (Bender et al., 2014).

Habitat

Black-tailed deer in the Olympic BDMZ have access to a wide range of habitat types, from alpine meadows in the Olympic Mountains to coastal marine estuaries along the outer coast and inland marine waters. Black-tailed deer have a selective foraging strategy, preferring to consume the most nutritious plants (Nelson et al., 2008). They consume a variety of browse, including woody shrubs, forbs, lichens, and some grasses. Woody shrubs and forbs are typically more abundant in younger, more recently disturbed sites (<20 years old) with less canopy cover than sites in mid to late-seral stages created predominately through active logging. Units heavily logged years ago with vast areas of single-aged stands in the mid to late-seral stage of forest succession are the least productive for ungulate forage. Active timber harvest in some GMUs continues to create early seral habitats with diverse stand-ages, benefiting black-tailed deer. Some common plants present in black-tailed deer diets include vine maple (*Acer circinatum*), red alder (*Alnus rubra*), cascara (*Rhamnus purshiana*), Himalayan blackberry (*Rubus discolor*), evergreen blackberry (*Rubus laciniatus*), salmonberry (*Rubus spectabilis*), trailing blackberry (*Rubus ursinus*), elderberry (*Sambucus spp.*), red huckleberry (*Vaccinium parvifolium*), fireweed (*Epilobium angustifolium*), willowherb (*Epilobium watsonii*), hairy cat's ear (*Hypocharis radicata*), big deervetch (*Lotus crassifolius*), oxalis (*Oxalis oregana*), and violets (*viola spp.*) (Nelson et al., 2008; Ulapa, 2015).

Human-wildlife interaction

In the Olympic BDMZ, most deer conflict issues occur in urban areas where natural mortality is considered low. Management actions generally revolve around liberalizing hunting seasons or adding second deer permits to increase harvest levels. These efforts often have limited value due to local shooting ordinances that reduce deer hunting activity despite the liberalized seasons. Landowners can work with WDFW through Damage Prevention Cooperative Agreements (DPCAs), which are plans designed to proactively prevent, minimize, or correct damage caused by wildlife to crops or livestock, which may include both lethal and nonlethal measures. Wildlife Conflict specialists may issue landowners damage prevention/harvest permits, remove deer under an agency action, or deploy Master Hunters to remove deer or conduct non-lethal activities, such as hazing.

In response to chronic damage/conflict issues, liberal deer hunting seasons have been established in GMUs 624, 627, and 633. Forty 2nd-deer permits were available in the portion of GMU 624 designated as Deer Area 6020, but participation and success were relatively low, with only two does harvested out of nine hunters in 2023. General season antlerless hunting is also provided during the general season for all three weapon types in Deer Area 6020. Although general season harvest is not reported at the Deer

Area level, the combined general and permit season antlerless harvest in GMU 624 was reported to be 49 in 2023, and the 10-year average is 56. The Department issued fifteen damage prevention/harvest permits within the Olympic BDMZ; two deer were harvested.

Management concerns

The primary objective for black-tailed deer management in the Olympic Black-tailed Deer Management Zone is to maintain productive populations while providing for multiple uses. Currently, WDFW does not use formal estimates or indices of population size to monitor black-tail deer populations. Instead, trends in harvest, hunter success, and catch per unit effort are used as surrogates. These statistics can reasonably indicate population trends if harvest and participation are robust. However, deer harvest can be influenced by factors other than deer abundance. For example, weather conditions during the hunting season, changes to hunting regulations, and reduced access to private timberlands can make comparing harvest estimates across years difficult. WDFW is currently evaluating new approaches to monitor black-tailed deer populations that are independent of harvest data.

Management conclusions

Based on harvest data, black-tailed deer populations in the Olympic Peninsula BDMZ are likely within management objectives, with stable populations where habitat allows.

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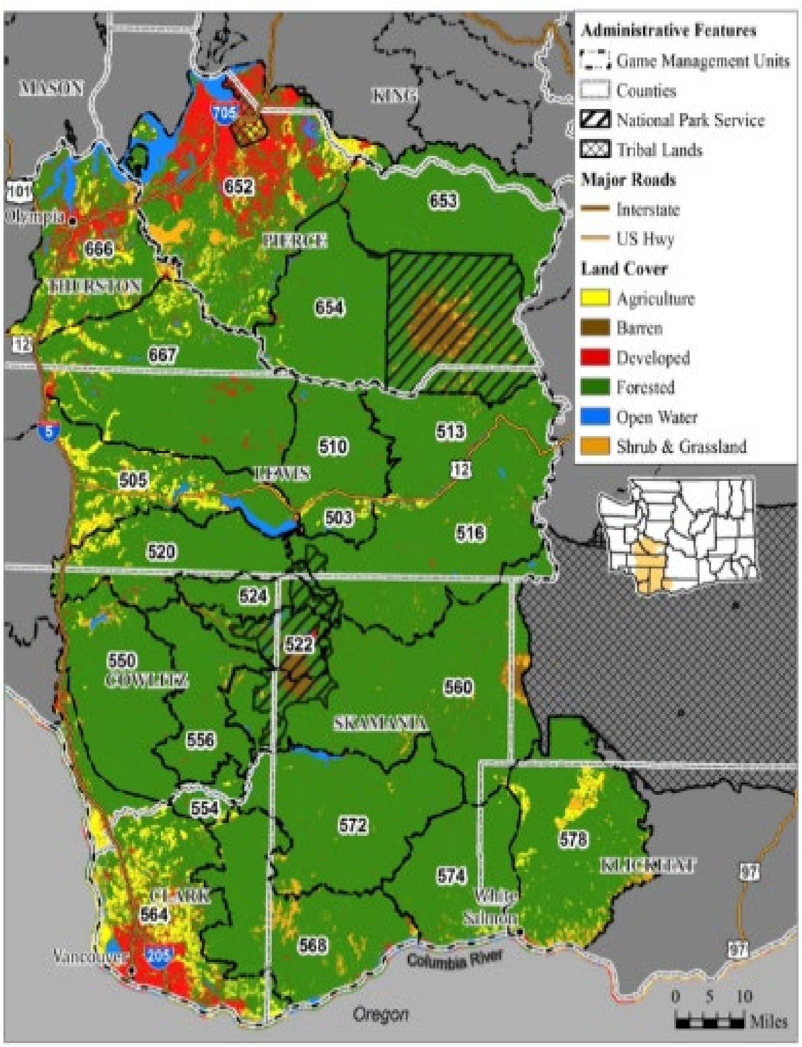
South Cascade Mountains Black-tailed Deer Management Zone

Nicholle Stephens, Wildlife Biologist
Eric Holman, Wildlife Biologist

Introduction

The South Cascade Mountains Black-tailed Deer Management Zone (BDMZ) is located in the southwest portion of the Cascade Mountains and consists of 22 Game Management Units GMUs (503, 505, 510, 513, 516, 520, 522, 524, 550, 554, 556, 560, 564, 568, 572, 574, 578, 652, 653, 654, 666, and 667; Figure 1).

Figure 1. South Cascade Mountains Black-tailed Deer Management Zone (BDMZ).



GMUs and generalized land cover types within the South Cascade Mountains BDMZ.

Management guidelines and objectives

The Department's objective within this BDMZ is to maintain a stable population based on field surveys, harvest estimates, and a post-hunt population with a sex ratio of approximately 15-19 bucks:100 does (WDFW, 2014).

Population surveys

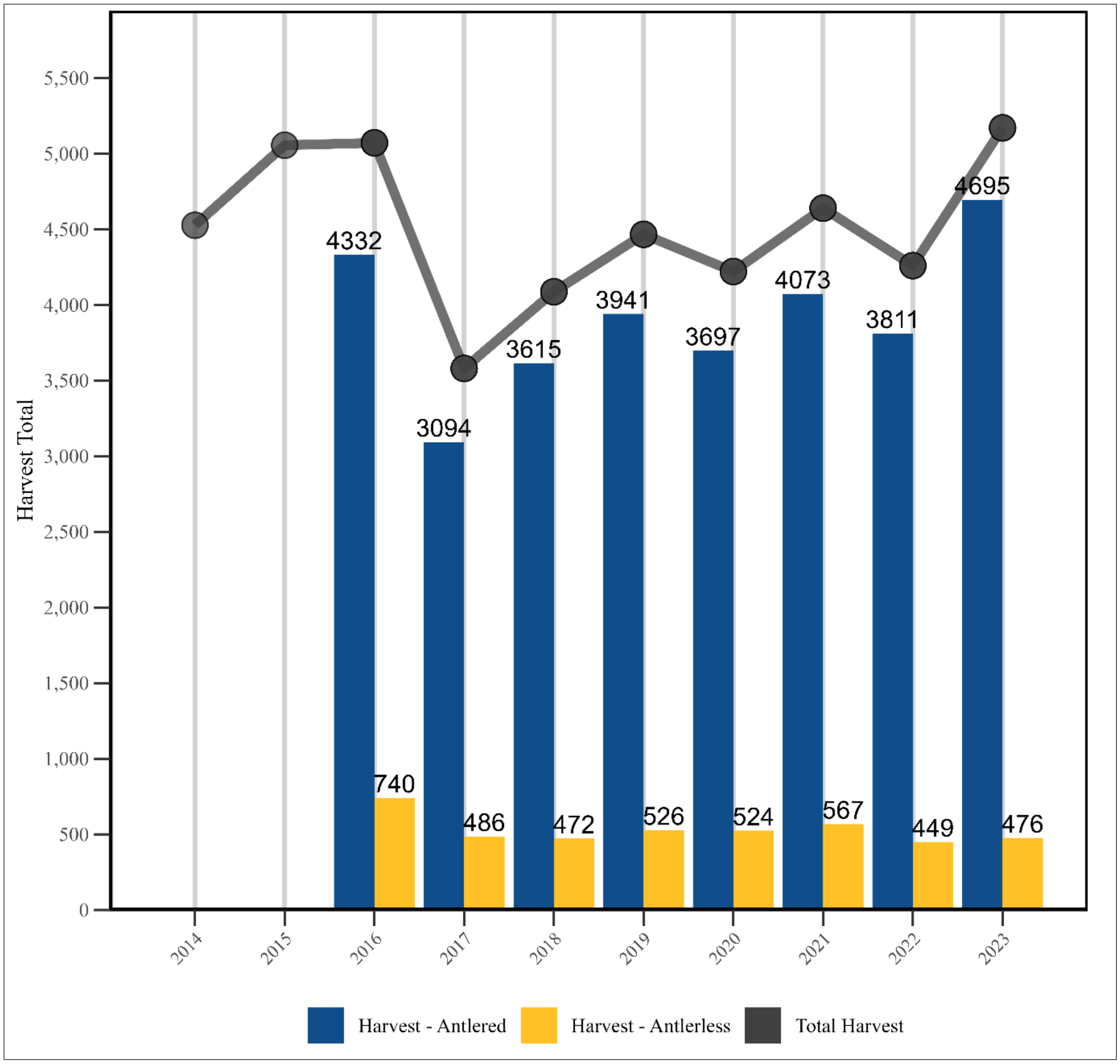
Population estimates of black-tailed deer abundance and post-season ratios are unavailable for the South Cascade Mountains BDMZ. However, deer are generally more abundant at lower elevations in the zone.

Hunting seasons and recreational harvest

Hunting seasons in the South Cascade Mountains BDMZ vary by GMU. Most hunting is structured to focus harvest on bucks, and hunting is allowed on a general season basis with no antler restrictions in place. GMU 578 is an exception, managed with a 3-point minimum antler restriction. In many GMUs, archers may harvest antlerless deer during general seasons. Certain GMUs targeted for deer population control also allow antlerless opportunities for modern firearm hunting under special permit drawings. While harvest estimates have remained relatively stable over the past 10 years, the severe winter of 2016-17 likely caused a population decline, which resulted in reduced harvests in the subsequent seasons. By 2023, harvest estimates exceeded those from before the severe winter event in 2016-17 (Figure 2), possibly indicating that the population had recovered.

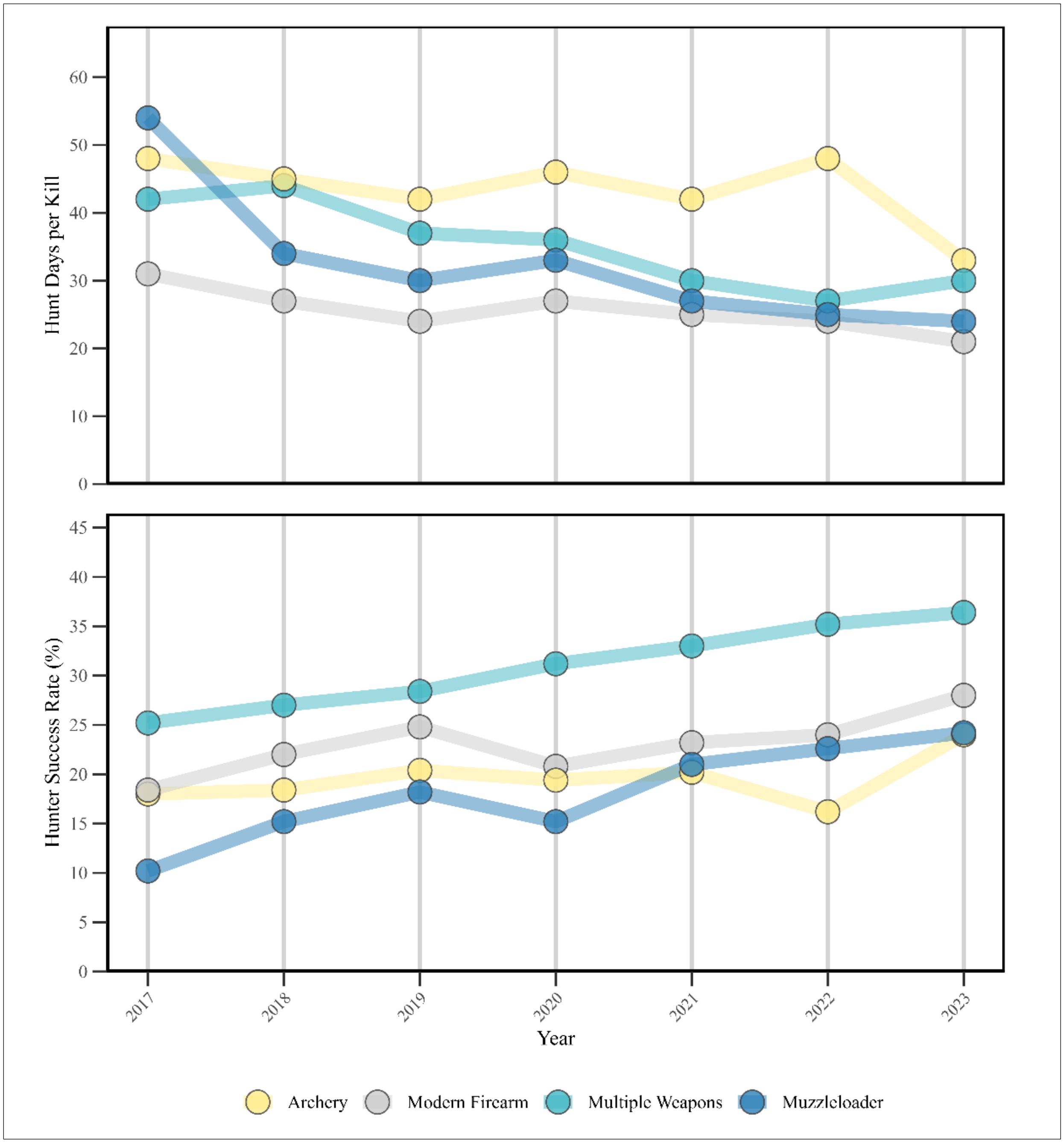
Hunter's success rates have been stable since 2017, with a slight increase for all user groups in 2023. Additionally, the hunter-days-per-kill decreased slightly in 2023, indicating a higher catch-per-unit effort than in previous years.

Figure 2. Estimated annual, antlered, and antlerless black-tailed deer harvest in the South Cascades Mountains BDMZ.



Harvest estimate summary for total deer harvested (gray line) and antlered and antlerless harvest in the South Cascade Mountains BDMZ, 2016-2023. Years 2014 and 2015 do not have sex-specific harvest estimates because they are not comparable to other years due to improved statistical methods that began in 2016.

Figure 3. Hunter effort-per-kill and success rate.



General season estimates of hunter days per kill and success rate in the South Cascade Mountains BDMZ, 2017-2023, by weapon type.

Survival and mortality

Common predator species in the South Cascade Mountains BDMZ include cougar, bobcat, black bear, and coyote. Currently, no documented gray wolf packs are in the herd area (WDFW et al., 2024).

Previous estimates of annual survival rates for black-tailed deer bucks in Washington have indicated a mean of 0.50 in forested landscapes, with mortalities primarily due to legal harvest (McCorquodale, 1999; Bender et al., 2004). In more urbanized habitats, the annual buck survival rate is closer to 0.86, and mortalities are generally not the result of harvest (Bender et al., 2004).

In a sample of 38 GPS-collared black-tailed bucks from 2017-2021, the estimated annual survival was 0.42 (WDFW, unpublished data). Rice (2018, unpublished report) estimated the annual survival of 188 does to be 0.77 on State Department of Natural Resources land and 0.75 on private industrial timber lands in a study area encompassing the South Cascades, Willapa Hills, and the Olympic Peninsula. McCorquodale (1999a) estimated typical doe annual survival as 0.82 in the Klickitat basin, and Gilbert et al. (2007) estimated doe survival as 0.75 in commercial forests on the western slope of the Cascade Range in west-central Washington. McNay and Voller (1995) found adult doe survival on Vancouver Island to be lower for resident does (0.77) than migratory does (0.90).

Habitat

The South Cascade Mountains BDMZ is roughly divided into three primary ownership types: U.S. Forest Service-managed lands in the higher elevations to the east; private industrial timberlands and State (DNR) managed forestlands; and urban, suburban, rural, and agricultural lands found in the valleys and lower elevations. Increasing urbanization in the lower elevation portions of the South Cascade Mountains BDMZ has resulted in the loss of quality habitat for black-tailed deer. This situation is most acute in the urbanized areas of Pierce, Thurston, and Clark counties.

The industrial forestlands consist of a mosaic of clear-cuts, relatively open young regeneration stands, dense second-growth stands of timber, and stream buffers lined with second-growth forests. Industrial timber management practices benefit deer by increasing the quantity of early seral habitats and forage species preferred by black-tailed deer, including trailing blackberry, fireweed, salmonberry, red huckleberry, and vine maple. While beneficial to deer, management practices are not conducted to increase or improve habitat purposefully. Additionally, intensive forest management practices, including planting dense stands of fast-growing conifer seedlings and applying herbicides during the re-establishment of timber stands, may also be affecting overall productivity due to reduced forage quality and availability. These effects work in tandem by reducing the amount of favorable plants available as forage in the early term and completion of forest canopy closure around 14-20 years (Ulappa, 2020), far earlier than would occur in a naturally regenerated stand.

The magnitude of these effects is influenced by site-specific types of post-timber harvest treatments, plant compositions, weather, and the number of years since timber harvest. A commonality among these varying factors is that the best quality and most quantity of favorable forage occurs approximately 3 to 14 years after timber harvest, whether herbicide treatments are applied or not. However, the differences between available, favorable forage for treated and untreated stands can still be substantial in that period. The nuances of how forage availability is influenced by forest stand age and the application of herbicides are complex, and in-depth research on the subject can be found by reviewing Ulappa (2015 & 2020) and Geary et al. (2012).

In contrast, very limited timber harvest on federal forests in the last three decades has led to more even-aged, closed canopy forests than were historically found in the Pacific Northwest. As a result, these forests have a lower abundance of forage species important to deer. Generally, they support fewer deer than the early-seral forests found on private industrial and state-managed timberlands.

Human-wildlife interaction

Deer damage reports occur at relatively low levels in the South Cascade Mountains BDMZ. However, complaints of damage to home gardens and ornamental plants have increased in the South Cascades Mountains BDMZ with higher human populations. WDFW Wildlife Conflict Specialists work closely with agricultural producers by developing Damage Prevention Cooperative Agreements (DPCAs), which identify a plan to reduce the amount of damage incurred to agricultural crops using non-lethal and lethal methods (Table 1).

Conflict Specialists and landowners use a variety of non-lethal means to discourage deer, including temporary electrified fladry fencing, permanent fencing, noisemakers ("bird-bangers", "critter-gitters", and propane cannons), hazing and herding, scarecrow-like electronic devices, and odor-based repellents such as Plantskyyd. Damage to commercial agriculture production over the past year has occurred in organic produce farms, wine grapes, hay, grains, and ornamental flower nurseries.

In many circumstances, the Department addresses damage complaints by working with landowners to increase access to their property during hunting seasons so that hunters can help resolve the damage. In some circumstances, Master Hunters are deployed to hunt outside established hunting seasons to address damage issues directly.

Table 1. Number of DPCAs, permits issued, and resulting black-tailed deer removed during 2023-24.

GMU	DPCA	Permits Issued	Antlered Harvest	Antlerless Harvest	Total Harvested
501	2	4	0	1	1
564	2	0	0	0	0
574	2	0	0	0	0
652	1	3	0	0	0
667	1	5	2	1	3
Total	8	12	2	2	4

Research

From 2009-2017, the Department conducted a study of the effects of forest management practices on black-tailed deer ecology. For this study, adult female deer were captured and fitted with GPS collars to determine their habitat use, and their fawns were captured and monitored for survival. This project had study sites in eight locations in western Washington: four on private commercial timberlands and four on land managed by the Washington Department of Natural Resources. Throughout the project, 212 does and 235 fawns were captured for monitoring. Of those, 82 does and 88 fawns were captured in GMUs 550, 568, and 667, within the South Cascade Mountains Black-tailed Deer Management Zone.

WDFW has been exploring new ways to generate estimates of black-tailed deer abundance or population trends. In May 2017, biologists began deploying GPS collars on a sample of bucks distributed across western Washington. Monitoring these bucks provides information on buck survival, causes of mortality, vulnerability to harvest, and a detailed account of the area used by these collared bucks. This project has been discontinued because it was found to be too costly and time-consuming to capture an adequate number of bucks. The WDFW Ungulate Section is designing a monitoring framework for westside black-tailed deer with a projected start date of January 2025.

Management concerns

Habitat conditions on federally managed lands

Habitat conditions on federally managed lands within the South Cascades Zone are of concern. Large-scale fire, timber harvest, disease, or other succession re-setting events are largely absent from the federal lands. The resulting landscape is dominated by closed-canopy forest, much of which was harvested from roughly 1950-1990 and subsequently replanted with dense Douglas fir trees. These stands provide little ungulate forage and lack older or younger forests' diversity and forage resources. In recent years, the United States Forest Service (USFS) has conducted limited forest thinning and created forest openings to provide more robust forage resources for deer and elk. While beneficial, the scale of these efforts is minimal compared to the size of the landscape. Therefore, WDFW will continue to work with USFS to encourage more of this proactive management.

Fee-only hunting access restrictions

Since 2013, the largest industrial forestland owner within the South Cascades Zone has implemented a fee-only access system for hunting and other recreation on their lands. This system limits the number of individuals allowed access to these lands, primarily in GMUs 520, 524, 550, 556, 568, and 667. The ramifications of this limited access to deer hunting opportunities are difficult to quantify as the landowners do not own entire Game Management Units. Some hunters elect to pay the access fee, some individuals elect to hunt in another area, and some may decide to quit hunting. Up to this point, the total deer harvest remains similar in these GMUs before and after the change in recreational access opportunities. However, the number of hunters in these GMUs has decreased by approximately one-third across the six GMUs mentioned above.

Hair Loss Syndrome

“Hair loss syndrome” (HLS) in black-tailed deer was first described in Washington in 1995. In 1996, initial reports in the South Cascades Mountains BDMZ came from GMUs 501, 504, 506, and 530. The condition is caused by a heavy infestation of an Eurasian louse of poorly defined taxonomic status in the genus *Damalinia* (*Cervicola*). The regular hosts of this louse are Eurasian deer and antelope, which are not seriously affected by the lice.

When black-tailed deer become infested with this foreign louse, they tend to develop a hypersensitivity (severe allergic) reaction to the lice. The reaction causes irritation of the skin and excessive grooming by the deer. Eventually, this excessive grooming leads to the loss of guard hairs, leaving yellow or white patches along the sides. Infestations are heaviest during late winter and early spring, and many affected deer, especially fawns, die during this time. The geographical distribution of HLS has steadily expanded since its first appearance and now affects black-tailed deer throughout their range in western Washington.

Over a three-year period, Bender and Hall (2004) reported "hair-slip syndrome" rates in fawns as 46-74% from 1999-2001. They concluded that HLS was not significant in increasing fawn winter mortality and called for future research to better determine HLS's effects on black-tailed deer populations. HLS may increase predation risk due to poor overall body condition. Poor body condition is attributed to a combination of potential factors, including poor forage, low birth weight, and timing of birth, as well as afflictions, including, but not limited to, HLS.

Many HLS-affected individuals rebound in condition and health if they survive the winter. Ultimately, HLS is likely only one of several regular annual mortality factors acting synergistically in given local populations.

WDFW provides more information regarding hair loss syndrome at its Wildlife Diseases website: Hair-loss syndrome in deer.

In addition to reports of HLS, WDFW annually receives reports of animals with hoof abnormalities (e.g., laminitis), deer warts, and lethargy/unknown illness. While these afflictions can affect the behavior and survival of individual deer, they do not pose a population concern.

Management conclusions

Harvest data indicate a stable population of black-tailed deer in the South Cascade Mountains BDMZ. However, habitat-related concerns remain a concern, such as the lack of early seral forests on federally managed lands and direct habitat loss to urbanization. The progression towards limited, fee-based hunting access programs and HLS also complicates deer management in the zone. Monitoring black-tailed deer populations is a perennial challenge due to the dense understory favored by deer in these landscapes. Still, the Department continues to investigate new methods that might provide additional information about population status in the future.

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Willapa Hills Black-tailed Deer Management Zone

Anthony Novack, Wildlife Biologist
Eric Holman, Wildlife Biologist

Introduction

The Willapa Hills Black-tailed Deer Management Zone (BDMZ) is located in the southwest corner of Washington and includes the southern coast of Washington. The total area comprises 12 Game Management Units GMUs (501, 504, 506, 530, 658, 660, 663, 672, 673, 681, 684, and 699; Figure 1).

Figure 1. Willapa Hills Black-tailed Deer Management Zone (BDMZ).

GMU boundaries with county lines and public lands within the Willapa Hills BDMZ.

Management guidelines and objectives

The Department's objective within this BDMZ is to maintain stable populations based on field surveys and harvest estimates. Additional management objectives include a post-hunt sex ratio of approximately 15-19 bucks to 100 does (WDFW, 2014).

Population surveys

Due to the dense forest structure in this zone, conventional surveys are not possible. Populations are monitored using harvest data obtained from mandatory hunter reporting by licensed state hunters and tribal harvest reports. The Northwest Indian Fisheries Commission compiles and publishes tribal game harvest reports annually at Big Game Harvest Reports.

Hunting seasons and recreational harvest

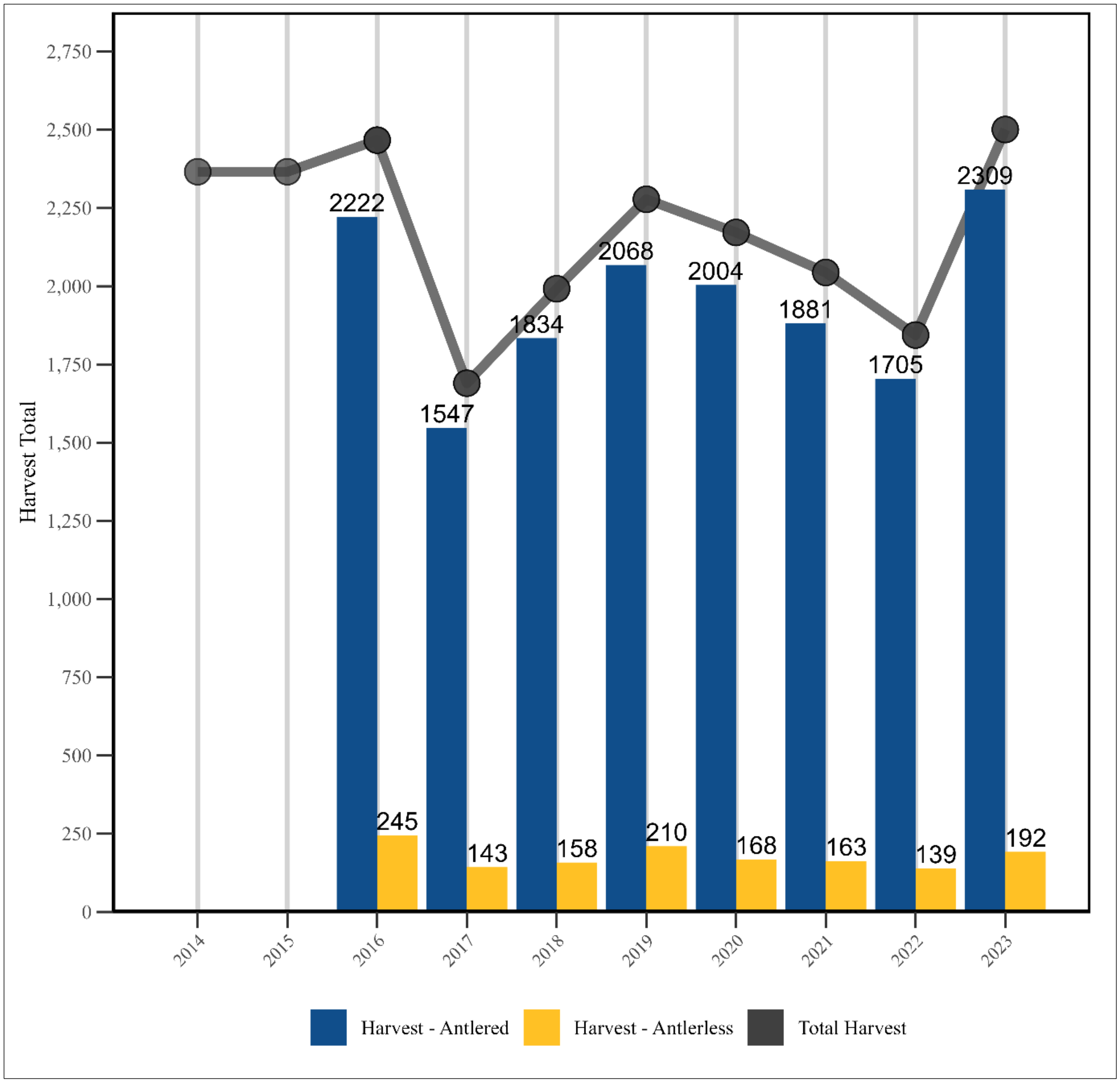
Estimates from harvest reports for the past decade indicate the harvest has generally been stable. In the period from 2014 to 2023, 2017 had the lowest estimated harvest (Figure 2). Hunter harvest dramatically increased from 2022 to 2023, with 2023 having the highest harvest estimate for the past 10 years.

The deer hunter success rate increased across all weapon types for the Willapa Hills BDMZ, while the average number of days to harvest decreased (Figure 3). These trends in hunter success match those expected from the increase in overall deer harvest.

The majority of deer harvested in the Willapa Hills BDMZ are bucks. Any buck seasons are in effect for all GMUs that are open during the modern firearm seasons. Limited permit opportunities are available for both antlerless deer and bucks throughout the Willapa Hills BDMZ.

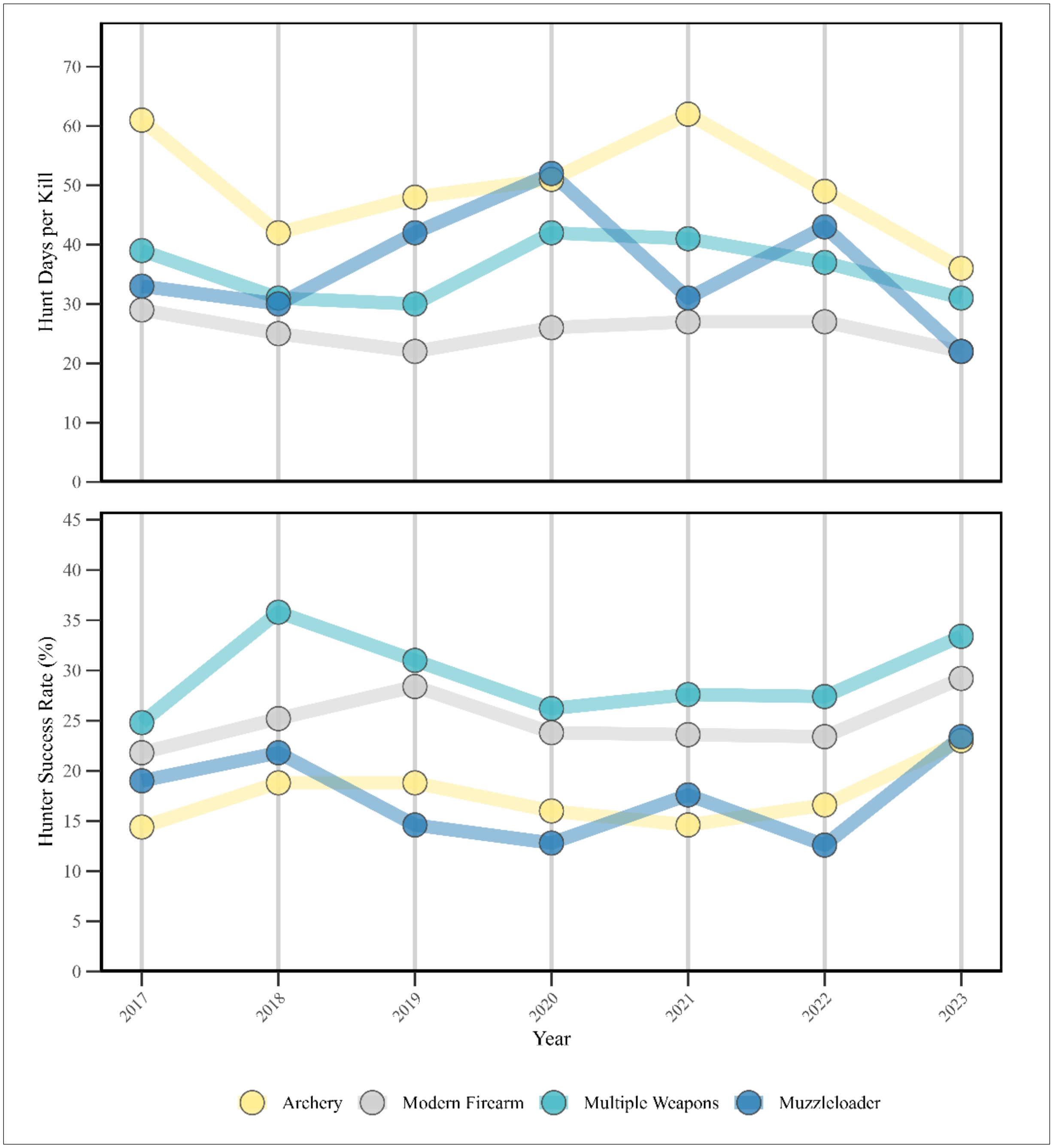
Most units are open for any deer during archery seasons, except GMUs 506, 681, and 699, which are limited to any buck during archery seasons. Unit 684 is the only unit where antlerless deer can be taken by muzzleloaders during their general season.

Figure 2. Estimated annual, antlered, and antlerless black-tailed deer harvest in the Willapa Hills BDMZ.



Harvest estimates for the total (gray line), antlered (blue bars), and antlerless harvest (yellow bars) in the Willapa Hills BDMZ, 2016-2023. Years 2014 and 2015 do not show sex-specific harvest estimates because they are not comparable to other years due to improved statistical methods that began in 2016.

Figure 3. Hunter effort-per-kill and success rate.



General season estimates of hunter-days-per-kill and success rate in the Willapa Hills BDMZ, 2017-2023, by weapon type.

Survival and mortality

There are no estimates of pregnancy, fetal, or survival rates currently available for black-tailed deer in the Willapa Hills BDMZ. Sources of mortality for deer in this BDMZ include hunting, disease, malnutrition, poaching, deer-vehicle collisions, and predation. Common predator species in the Willapa

Hills BDMZ include cougar, bobcat, black bear, and coyote. Previous estimates of the annual survival rate for black-tailed deer bucks in western Washington revealed a mean survival rate of 0.50 in forested landscapes, with mortalities primarily due to legal harvest (McCorquodale, 1999; Bender et al., 2004).

Habitat

Most of the forestland in the Willapa BDMZ is managed to maximize revenue from timber production. The privately-owned industrial forestlands and large portions of the publicly owned lands consist of a mosaic of seral stages. This mosaic consists of clear cuts, relatively open young regeneration stands, dense second-growth timber stands, and stream buffers lined with second-growth forests. The mosaic changes yearly due to ongoing timber-cutting operations. Although timber harvesting is generally beneficial to deer, timber management practices are not intended to improve deer habitats.

The timber management practices implemented within the Willapa Hills BDMZ broadly benefit deer by increasing the quantity of early seral habitats and improving the forage base. Standard forest management practices include planting dense stands of fast-growing conifer seedlings and applying herbicides to reduce competitive plant growth during re-establishment. Ulappa (2015 & 2020) found that herbicide use decreased the amount of understory biomass useable for foraging deer and decreased their daily digestible energy intake, especially in the first three years of stand establishment. Despite the widespread use of herbicide, the early seral habitats will still provide more forage and higher daily energy intake for deer than closed-canopy stands.

Canopy closure for intensely managed forests typically occurs at around 14-20 years post-planting, which is far earlier than in most naturally regenerated stands. Once canopy closure occurs, forage availability decreases significantly. More naturally regenerated stands can continue to produce improved levels of forage through the first 30 years of growth. Pre-commercial and commercial thinning of second-growth stands can greatly improve the available deer forage until canopy closure reoccurs.

Human-wildlife interaction

Deer conflicts with commercial agricultural activities occur at low levels in the Willapa Hills BDMZ. WDFW Wildlife Conflict specialists work closely with producers by developing Damage Prevention Cooperative Agreements (DPCAs), which identify a plan to reduce damage to agricultural crops using non-lethal and lethal methods. These conflict specialists and landowners use a variety of non-lethal means to discourage deer, including electrified fladry fencing, noisemakers, hazing and herding, scarecrow-like electronic devices, and odor-based repellents such as Plantskyyd. The total number of DPCAs relating to deer in the Willapa Hills BDMZ for 2022-2023 was 18, with 14 deer harvested from 70 permits issued (Table 1). Deer within this zone primarily cause damage to commercially produced cranberries, wine grapes, blueberries, orchards, and non-commercial garden and ornamental plants.

In many circumstances, WDFW addresses damage complaints by working with landowners to increase access to their property during hunting seasons so that hunters can help resolve the damage. In addition, certified Master Hunters may be deployed to harvest animals outside of the regularly established hunting seasons.

Table 1. Sum of Deer related Damage Prevention and Control Agreements with resulting deer permits issued and total harvest by GMU in the Willapa Hills BDMZ, 2023-24.

Game Management Unit	DPCA's	Permits Issued	Deer Removed
501	0	0	0
506	0	0	0
530	1	3	2
642	0	0	0
658	11	36	6
660	0	0	0
663	1	3	2
672	1	3	2
673	0	0	0
681	0	0	0
684	4	25	2
Total	**18**	**70**	**14**

Research

From 2009-2017, the Department studied black-tailed deer throughout western Washington to determine black-tailed deer fawn production and survival under various forest management scenarios and conditions. Does were captured in eight different clusters across western Washington, with half of those clusters predominately located on private industrial timberland, while the other half were located on Washington Department of Natural Resources (DNR) lands. Black-tailed deer does were captured in late winter or spring and fitted with GPS tracking collars, and their fawns were subsequently collared shortly after birth for survival monitoring. A single cluster of does was located within the Willapa Hills BDMZ on state-owned lands within Capitol Forest (GMU 663). Data from this study are still being analyzed, and final results are pending.

The Department initiated a new project in 2017 to generate estimates of black-tailed deer abundance or population trends at the GMU level. The field component of this effort began in May 2017 and was expected to last at least five years. GPS collars were deployed on a sample of bucks distributed across western Washington with the objective of maintaining a sample of up to 50 bucks during each year of the 5-year study. Monitoring of these bucks was expected to provide information on buck survival, causes of mortality, and vulnerability to harvest. Additionally, these collars would automatically record a position fix every thirteen hours, providing a fairly detailed account of the area used by these collared bucks. Only two collared bucks were located within the Willapa Hills BDMZ. Those two animals were specifically located inside the Fall River GMU (672) and harvested during the 2019 hunting season. This project was suspended in 2020.

WDFW initiated an effort in 2019 to collect the teeth of black-tailed deer from successful hunters in western Washington. WDFW collected hundreds of tooth samples from successful black-tailed deer hunters during the 2019 and 2020 seasons. Hunters also reported the number of their buck's antler points with each tooth, and samples were sent to a laboratory for cementum annuli analysis to determine age. Generally, the number of antler points increases with age; however, a 3-year-old buck may still be a spike, and an 11-year-old buck could be a 2-point, while a yearling could have 4 points. On average, spikes were a year old, while a 2-point buck was three years of age and a 3-point buck was four years of age. Four-point bucks were four years old on average, and 5-point bucks were five years old.

Management concerns

Hunter access

WDFW actively works with timber companies to maintain hunting access. Most lands that provide deer hunting opportunities in the Willapa Hills BDMZ are privately owned industrial timberlands. Timber companies are increasingly restricting public access or requiring an access permit to hunt or recreate on their lands. The changing ownerships between a multitude of landowners and rules regarding public access create confusion and uncertainty among hunters trying to get afield.

Implementation of fee access programs appears to have reduced hunter participation in the Willapa Hills BDMZ. In some instances, the number of access permits issued is lower than previous hunter participation rates. For other areas, the cost of the permit is considered too much of an added financial burden for hunters. Although the addition of access permits has caused the number of hunters to decline in some GMUs, hunter success has sometimes increased as fewer hunters are afield. Access can sometimes be restricted due to the risk of fire, which predominately affects early-season archery and muzzleloader hunters.

Hair loss syndrome

"Hair loss syndrome" (HLS) of black-tailed deer was first described in Washington in 1995, and reports came from GMU's 501, 504, 506, and 530 in 1996. The condition is caused by a heavy infestation with a Eurasian louse of poorly defined taxonomic status in the genus *Damalinia* (*Cervicola*) sp. The normal hosts of this louse are non-native deer and antelope, which are not seriously affected by the lice.

When black-tailed deer become infested with this foreign louse, they tend to develop a hypersensitivity (severe allergic) reaction to the lice. The reaction causes irritation of the skin and excessive grooming by the deer. Eventually, this excessive grooming leads to the loss of the guard hairs, leaving yellow or white patches along the sides. Infestations are heaviest during late winter and early spring, and many affected deer, especially fawns, die during this time. The geographical distribution of HLS has steadily expanded since its first appearance and now affects black-tailed deer throughout their range in western Washington.

Over a three-year period, Bender and Hall (2004) reported rates of “hair-slip syndrome”(HLS) in fawns as 46-74% from 1999-2001. They concluded that HLS was insignificant in increasing fawn winter mortality and called for future research to determine better the effects HLS has on black-tailed deer populations. HLS may result in additive winter mortality or increased predation risk due to poor overall body condition. Poor body condition is attributed to a combination of potential factors, including poor forage, low birth weight, the timing of birth, and afflictions, including HLS.

Many HLS-affected individuals tend to rebound in condition and health if they survive the winter. Ultimately, HLS is very likely only a portion of the regular annual mortality factors acting synergistically in given local populations. Many HLS-affected individuals tend to rebound in condition and health if they survive the winter. Ultimately, HLS is very likely only a portion of the regular annual mortality factors acting synergistically in given local populations. WDFW provides more information regarding hair loss syndrome at the WDFW Wildlife Diseases website: Hair-loss syndrome in deer.

In addition to reports of HLS, WDFW regularly receives reports of animals with hoof abnormalities (e.g., laminitis), deer warts, lethargy, and other unknown illnesses. While these afflictions can affect the behavior and survival of individual deer, they do not pose a population concern.

Management conclusions

Black-tailed deer populations in the Willapa Hills BDMZ appear to be within the management objectives based on a harvest trend that indicates a stable population. Habitat conditions are expected to support a stable to increasing trend into the near future.

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Elk

Elk Statewide Status and Trend Summary

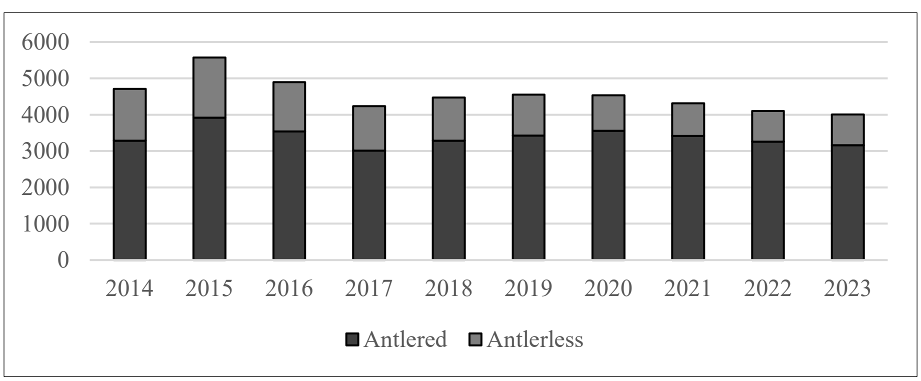
The Department monitors 10 distinct elk populations throughout Washington using a combination of harvest statistics and aerial surveys. Management objectives are defined in the Game Management Plan, and specific herd plans guide monitoring efforts for each herd. The Department uses harvest statistics to monitor the status and trend of all elk populations, and most populations are also monitored using aerial surveys to estimate whole-herd or partial-herd abundance and/or population composition. Surveys are contingent on available funds, monitoring needs relative to population objectives, and landscape characteristics (e.g., dense canopy cover can preclude aerial surveys). Surveys are typically conducted in mid-to-late winter to assess bull escapement (i.e., bull-to-cow ratio) and recruitment of calves (i.e., calf-to-cow ratio).

Current monitoring indicates that 8 of 10 elk populations statewide are generally stable and within management objectives. The Mount St. Helens and Blue Mountains elk populations are not currently at management objectives. Elk in the core units of Mount St. Helens, where aerial surveys occur, are limited by treponeme-associated hoof disease and habitat conditions. The Blue Mountains elk population is limited by poor recruitment of calves. The Department has reduced or eliminated antlerless harvest and implemented habitat enhancements to promote the population growth of these herds. The Colockum population, bolstered by strong calf recruitment in 2023, is now within the abundance objective criteria.

Large-scale management concerns for elk in Washington include habitat loss or conversion on both summer and winter ranges (e.g., via human encroachment), hoof disease (for western herds), and drought on the summer range. Local concerns include agricultural damage, reduced hunter access, depressed recruitment, and disturbance from human recreation. See the following pages for detailed population-specific survey data, status and trends, and a discussion of management concerns.

Statewide elk harvest has slowly declined over the last five years, though antlered male harvest has remained relatively stable over the previous ten years (Figure 1). Total harvest remains lower than before 2017 (Figure 1), when severe summer drought and subsequent winter conditions combined to depress ungulate populations statewide.

Figure 1. Statewide general season elk harvest, 2014-2023. Washington, USA.



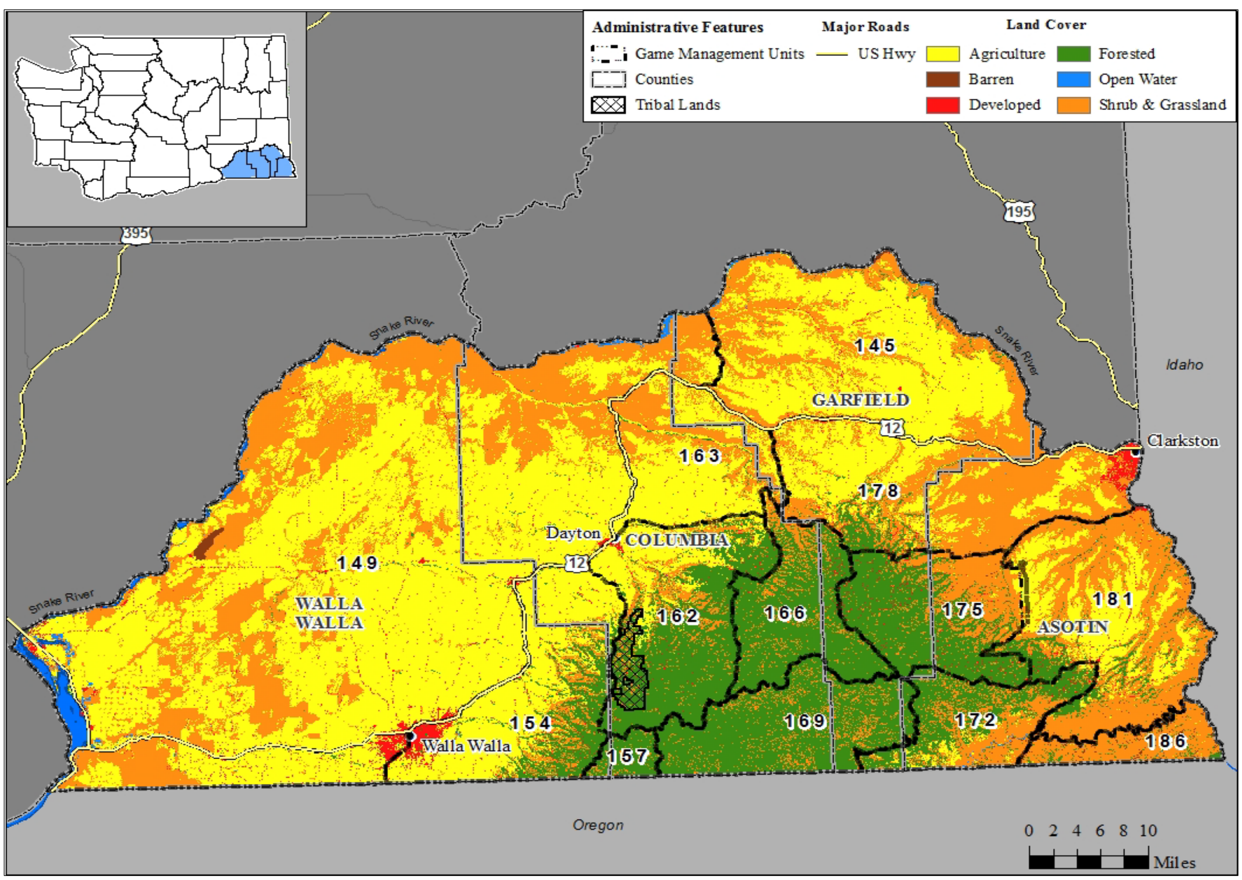
Blue Mountains Elk Herd

Mark Vekasy, Wildlife Biologist

Introduction

The Blue Mountains elk herd area is in southeast Washington and consists of 13 GMUs, including 145 (Mayview), 149 (Prescott), 154 (Blue Creek), 157 (Mill Creek Watershed), 162 (Dayton), 163 (Marengo), 166 (Tucannon), 169 (Wenaha), 172 (Mountain View), 175 (Lick Creek), 178 (Peola), 181 (Couse), and 186 (Grande Ronde); (Figure 1). The landscape is dominated by agricultural land in the prairie and foothill regions, with interspersed grassland areas and brushy draws. The most common habitat in the Blue Mountains is characterized by second-growth forests consisting primarily of Ponderosa pine, Douglas fir, grand fir, and subalpine fir. The Blue Mountains have been characterized as a high plateau dissected by deep draws and canyons carved by numerous creeks and rivers.

Figure 1. The Blue Mountains elk herd area.



Dominant land use cover types within the 13 game management units that comprise the Blue Mountains elk herd area.

Management guidelines and objectives

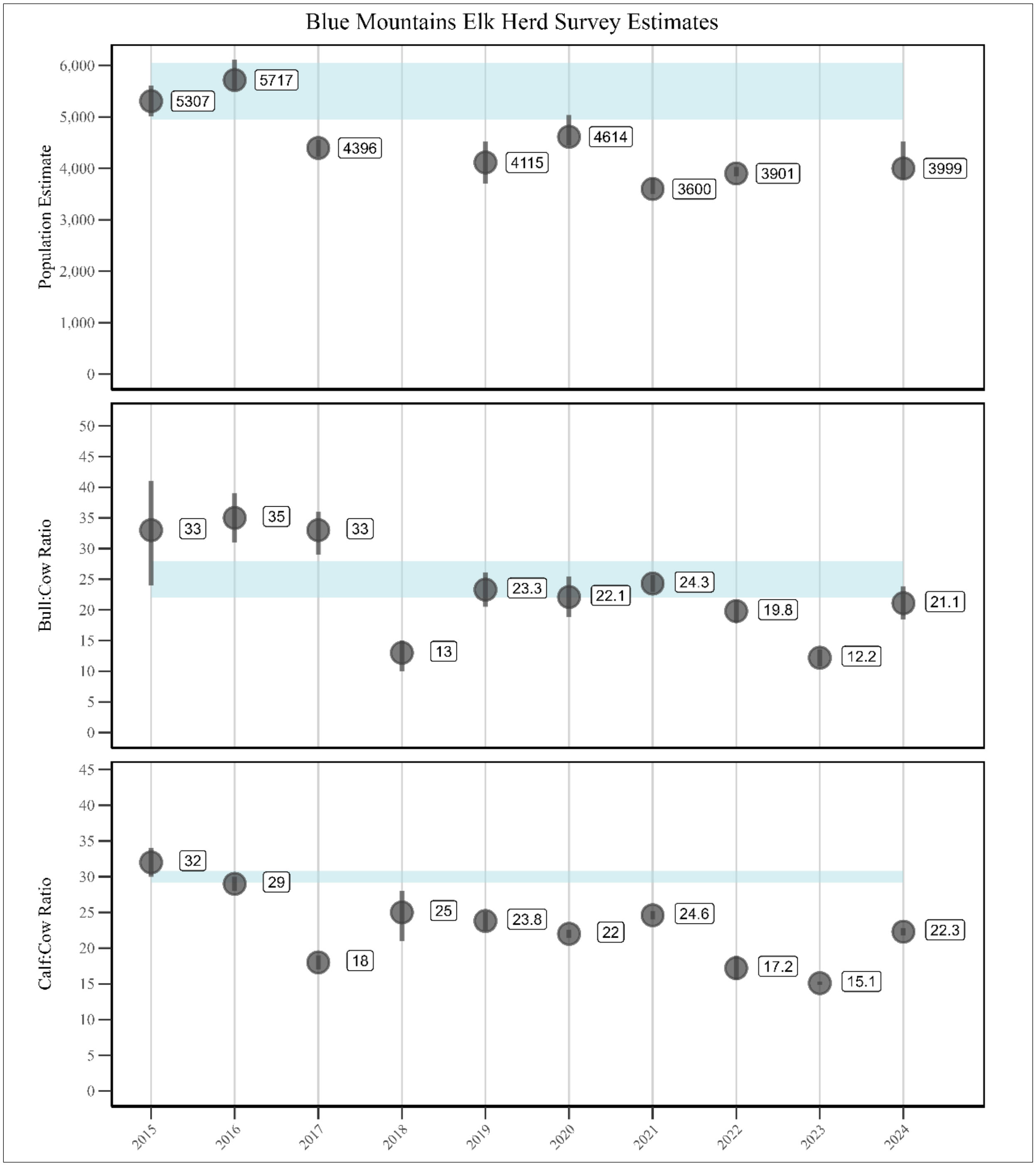
The Department finalized the Blue Mountains Elk Herd Plan in 2020, including a population objective of maintaining a herd size of 4,950 and 6,050 elk. This objective was determined by evaluating past and recent population size and social tolerance (i.e., agricultural damage). Additional objectives include maintaining a post-hunt population with a bull:cow ratio of 22–28 bulls:100 cows and maintaining an annual survival rate of 0.50 for bulls when bull mortality is monitored (WDFW, 2019).

Population surveys

The Department monitors population status by conducting aerial surveys at the end of winter and uses a sightability model developed for elk in Idaho (Unsworth et al., 1999) to generate estimates of elk abundance, age ratios, and sex ratios. In late winter 2023, the Department conducted a partial survey due to spending restrictions. Due to an unavoidable late change in aircraft vendors, spending limitations were in effect for using a non-contract vendor. This necessitated limiting surveys to high-priority GMUs (162, 166, and 175) consistent with the area of an ongoing elk calf mortality study. This partial survey did not generate an estimate of elk abundance as four main GMUs were not surveyed. WDFW returned to a regular survey effort in late winter 2024, and the Department will continue routine whole-herd survey efforts in the future.

Abundance estimates indicate the Blue Mountains elk herd was within objective from 2009 through 2017, when a severe winter occurred two years after a severe drought, triggering the decline (Figure 2). Data from 2023 in the three northern GMUs (162, 166, 175) estimated a bull:cow ratio of 12.2 bulls:100 cows, which is below the management objective of 22–28 bulls:100 cows (Figure 2). The estimated calf:cow ratio in 2023 was 15.1 calves:100 cows, the lowest estimate since 1996. Previously, estimated calf:cow ratios were consistently near 30 calves:100 cows (2006–2016), dropped in 2017, and have not shown signs of rebounding (Figure 2). WDFW conducted no aerial surveys in the Spring of 2018. The Department did conduct a complete survey in late winter of 2024, estimating the population at 3,999 from a direct count of 3,328 elk, excluding approximately 500 elk on the WA/OR Stateline southeast of Walla Walla. The calf:cow ratio was somewhat improved to 22.3 calves/100 cows, and the bull:cow ratio rebounded to near the objective at 21.1 bulls:100 cows.

Figure 2. Survey estimates in the Blue Mountains elk herd area.

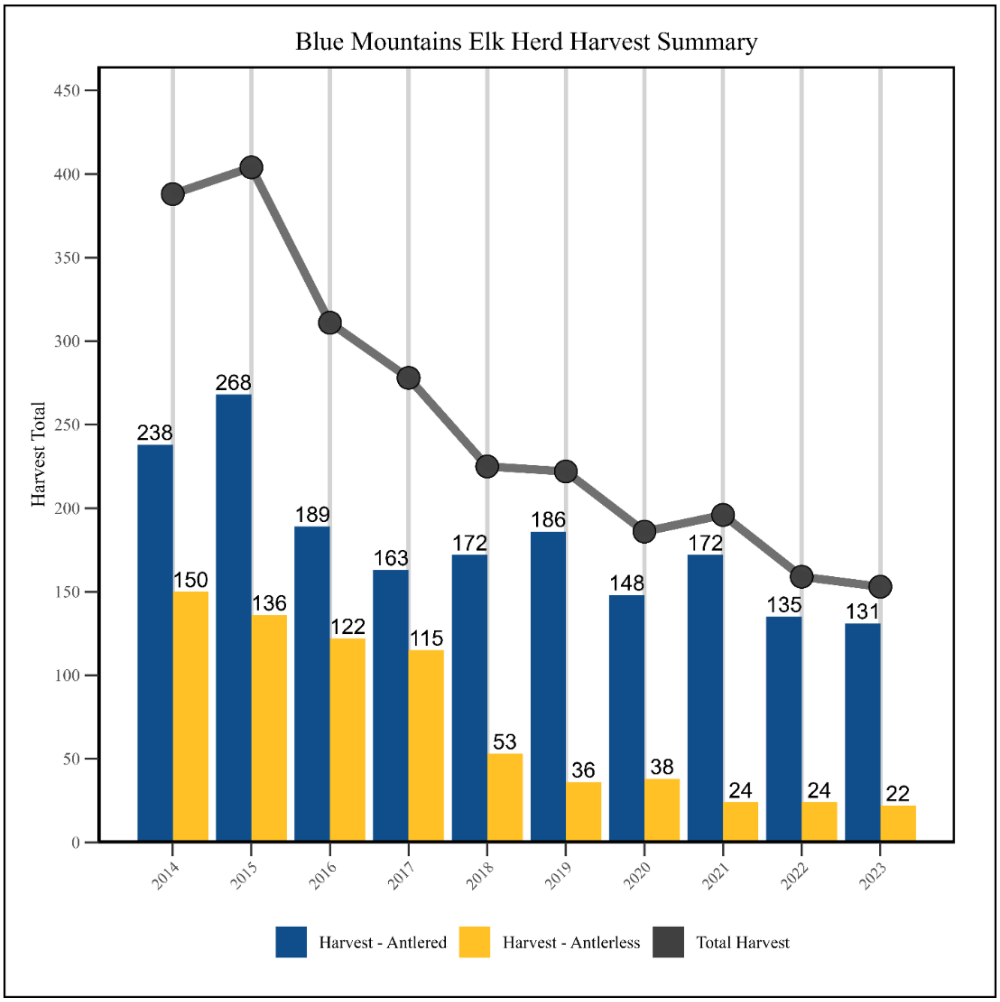


Estimates and associated 90% confidence intervals in the Blue Mountains elk herd area, 2015-2024 for population size, bull:cow ratio, and calf:cow ratio. Population estimate is sightability corrected; no population estimate was obtained during 2023. The bull:cow estimate from 2018 was generated through ground-based sampling, whereas all other years were calculated from aerial surveys. Shaded blue boxes represent WDFW's management objectives that should promote herd stability or growth.

Hunting seasons and recreational harvest

Estimates of total harvest have averaged 406 elk from 2011–2015, before declines began with the 2016 harvest (Figure 3). Estimates since 2016 have averaged 221 total elk. Direct comparisons can be somewhat misleading because fewer permits were offered, which lowered the opportunity to harvest an elk. Still, the same decline is apparent from the general season harvest, with an average of 150 elk harvested during 2011-2015, dropping to 90 elk from 2016 through the 2023 season. The 2023 total harvest showed a slight increase but was still the second lowest recorded in the past 25 years. The general season harvest has improved since 2016. For the period from 2016-2019, hunters only averaged 74 spikes taken during the general season, which has improved somewhat to an average of 106 during the 2020-2023 seasons. The Department restricts general season bull harvest to spikes and offers opportunities to harvest branch-antlered bulls under special permits in all GMUs.

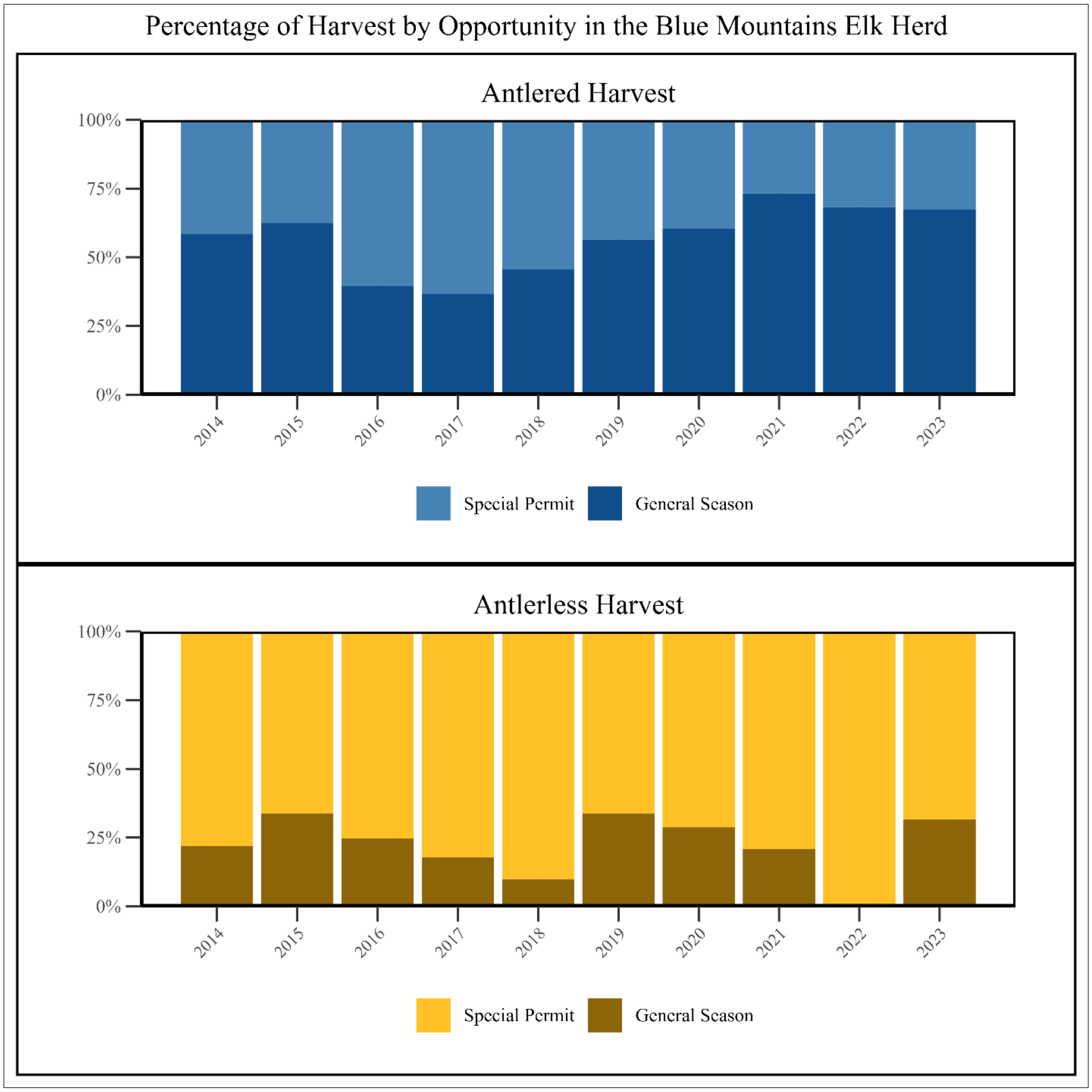
Figure 3. Elk harvested in the Blue Mountains elk herd.



Estimated elk harvest numbers (antlered and antlerless) in the Blue Mountains elk herd area from 2014 to 2023 during recreational hunting seasons are provided. These estimates exclude elk harvested under damage permits (see Human-wildlife interaction below) or during Tribal seasons, as that data is not collected.

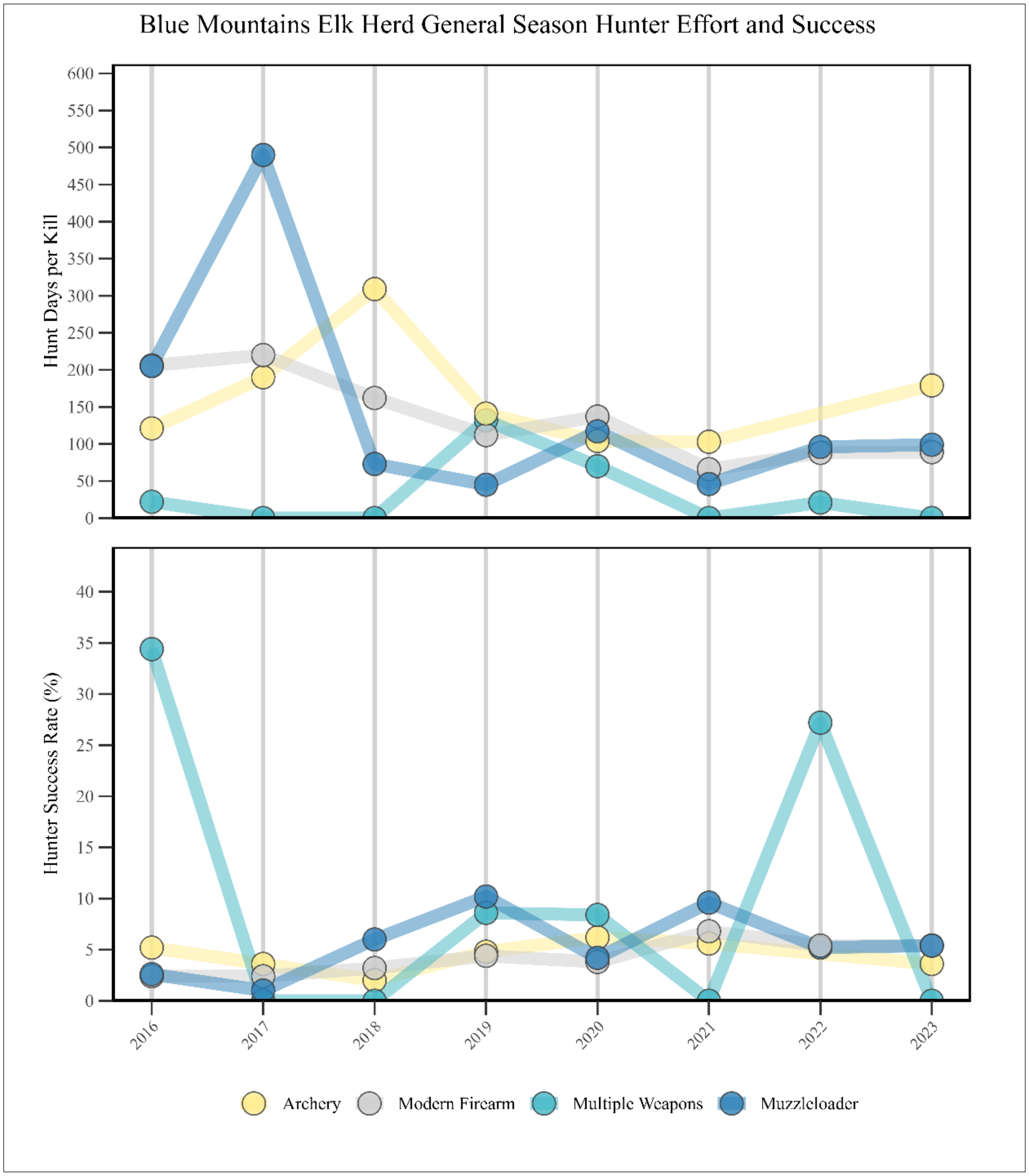
Consequently, most antlered harvests consist of spikes taken during general seasons (Figure 4). The Department generally focuses most opportunities to harvest antlerless elk in areas associated with private land to help alleviate agricultural damage, and most of those opportunities occur during special permit seasons (Figure 4). Estimates of hunter effort during general seasons have declined since 2017 (Figure 5), while estimates of Catch Per Unit Effort (CPUE) have varied (Figure 5).

Figure 4. Percentage of antlered and antlerless harvests.



Estimated percentage of recreational antlered harvest (top) and antlerless harvest (bottom) in the Blue Mountains elk herd area that occurred during general and permit seasons, 2014-2023.

Figure 5. Hunter effort and success rates in the Blue Mountains elk herd.



Estimated number of days hunters spent pursuing elk per kill and hunter success rate in the Blue Mountains during recreational seasons that provided general over-the-counter opportunities, 2016-2023, by weapon type.

Survival and mortality

Common predators of elk in the Blue Mountains include black bears, cougars, and gray wolves, with coyotes and bobcats also being predators of young calves. All are now relatively common throughout the elk distribution area in the Blue Mountains. At the time of this writing, at least six wolf packs are within the Blue Mountains elk herd area.

Extreme weather events affecting elk's survival in the Blue Mountains elk herd area are typically rare, but severe winter weather did occur during 2016-2017 and early in 2019. Summer droughts are more common, with severe events occurring in 2015 and 2021. The effect of these climatic events on pregnancy rates, juvenile survival, and adult survival are likely variable, but when occurring near each other, they are compounded.

Human-wildlife interaction

While actual elk damage claims have historically been low, complaints from farmers are common, and elk damage continues to be a problem in some units. WDFW addresses damage by issuing landowner depredation permits and implementing non-lethal control measures. The most significant damage issues occur in GMU 154 Blue Creek, GMU 162 Dayton, GMU 178 Peola, and GMU 181 Couse. Damage tags are typically valid from July 1 – March 31, with restrictions limiting harvest to antlerless elk.

Damage issues in GMU 181 have remained high in the Cloverland area. Periodically, large numbers of elk move into the western portion of the GMU (Couse), with this trend continuing over the past five years. During the reporting period, 25 antlerless elk were reported as harvested by Damage Prevention Cooperative Agreement (DPCA) or Kill permit holders in the Blue Mountains, 17 of which were killed south of Mill Creek in GMU 154, where elk frequently move between Oregon and Washington. Seven antlerless elk were killed in GMUs 172 and 181 in response to damage complaints. This approach to reducing elk-caused damage to private lands is currently accomplishing its goal in most of the herd range, resulting in more targeted hunts that alter elk distribution at a smaller scale.

Research

In May 2021, an elk calf monitoring project began in the Blue Mountains. One hundred twenty-five neonate calves were captured and fitted with satellite/GPS expandable collars in 2021, 102 in 2022, and 115 in 2023. This effort aims to estimate calf survival and determine causes of mortality, with poor calf recruitment likely being a limiting factor in recovering this elk population to management objectives. The fieldwork associated with this project ended in May 2024, and a final report on this project is anticipated in late 2024.

Management concerns

The number of elk estimated to be within the Blue Mountains herd area in 2022 was 22% below the lower range of the population objective of 4,950 elk and 29% below the point objective of 5,500 elk. Calf ratio estimates obtained in the spring of 2023 (15 calves per 100 cows) indicated that this population could not have grown since that 2022 estimate was calculated and likely declined by at least 5%. The 2024 estimate of 3,999 elk was still 27% below the point objective, and accounting for the estimate's uncertainty, it has remained unchanged since 2022. With an improved calf ratio in 2024, WDFW anticipates some recovery beginning in this herd.

This population has declined over the past eight years, likely due to severe winter conditions, summer drought, and poor recruitment. When the calf monitoring effort identified a problem, WDFW considered several management actions for implementation but implemented only one in the summer of 2022. A second cougar tag was made available for hunters in the Blue Mountains, but the Harvest Guideline remained unchanged, resulting in little to no change in the cougar harvest. The second tag option has been removed, and a lower harvest cap is now in effect for the 2024 season and beyond. It is unclear how the restrictions on cougar harvest will impact elk recruitment in the future, and predation, particularly on elk calves, remains a concern for the recovery of this herd.

Road densities in some portions of the Blue Mountains elk herd area are above the recommended levels. They can potentially reduce the use of important summer ranges because of human disturbance. The United States Forest Service (USFS) has closed several old roads and reduced overall road densities, but more work is needed to address elk habitat and security needs. In addition, anecdotal evidence suggests elk habitat use in early spring has changed in some portions of the Blue Mountains elk herd area due to disturbance caused by people looking for shed antlers.

Shed antler hunting and other activities on traditional winter ranges in the Blue Mountains remain a concern, as they stress elk during this critical time of year. Shed antler hunting activity in GMUs 154, 162, 166, 169, 172, and 175 can be extremely intense during March and April, and disturbance associated with these activities has changed elk use patterns in these areas. Bull groups are broken and scattered into the upper elevation timber and snow, while cow/calf groups can be redistributed onto agricultural lands. Closures to human use were implemented in late winter 2018/2019 on WDFW lands to protect elk during severe conditions. Similar closures may be discussed as needed in the future.

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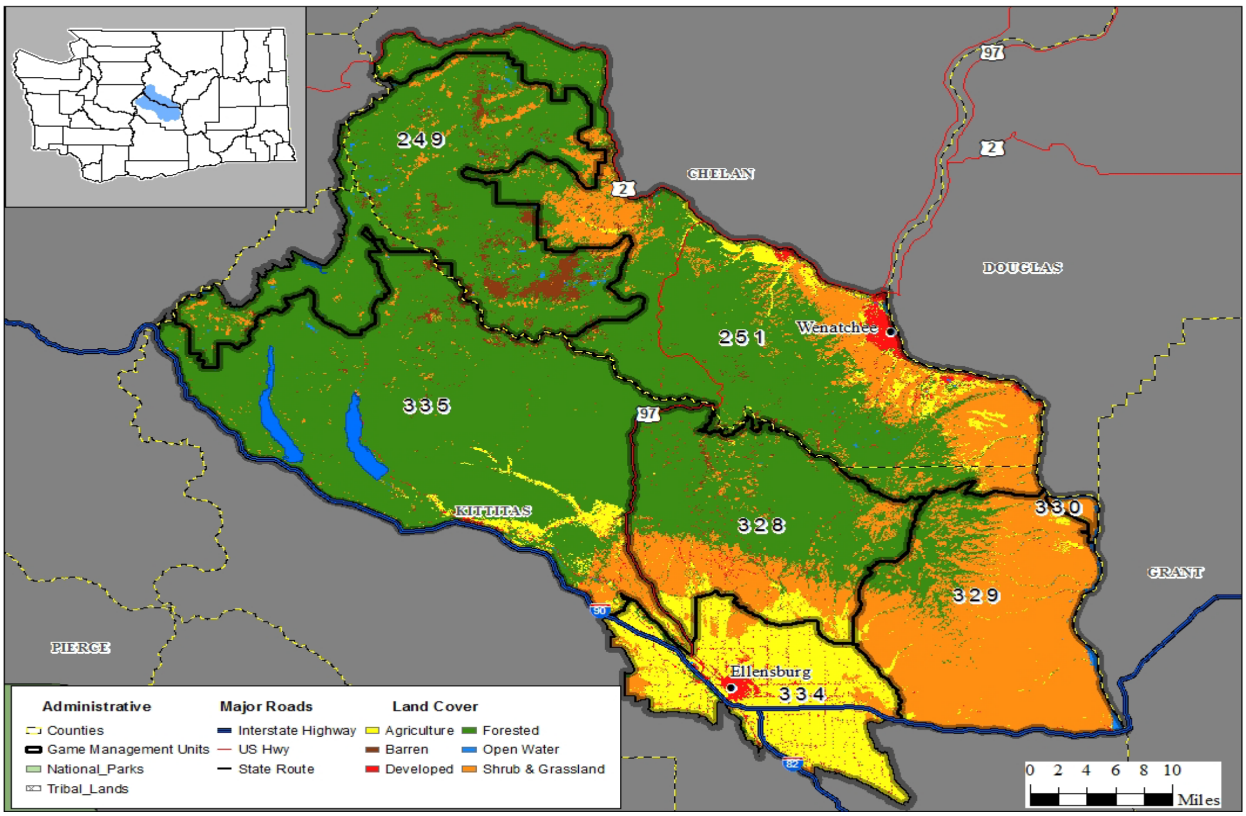
Colockum Elk Herd

Erin M. Wampole, Wildlife Biologist

Introduction

The Colockum elk herd area is located in central Washington along the eastern foothills of the Cascades and consists of six GMUs: 249 (Alpine), 251 (Mission), 328 (Naneum), 329 (Quilomene), 330 (West Bar), 334 (Ellensburg), and 335 (Teanaway; Figure 1).

Figure 1. The Colockum elk herd area.



The dominant land use cover types within the six game management units comprise the Colockum elk herd area.

Management guidelines and objectives

The Department's current objective is to maintain elk abundance in the surveyed winter range post-winter at 4,050-4,950 elk (i.e., 4,500 ± 10%; WDFW, 2014). Additional objectives for the herd include maintaining a post-hunt population with a bull:cow ratio of 12–20 bulls:100 cows and maintaining an annual survival rate of ≥0.50 for bulls when sex-specific mortality is monitored (WDFW, 2014).

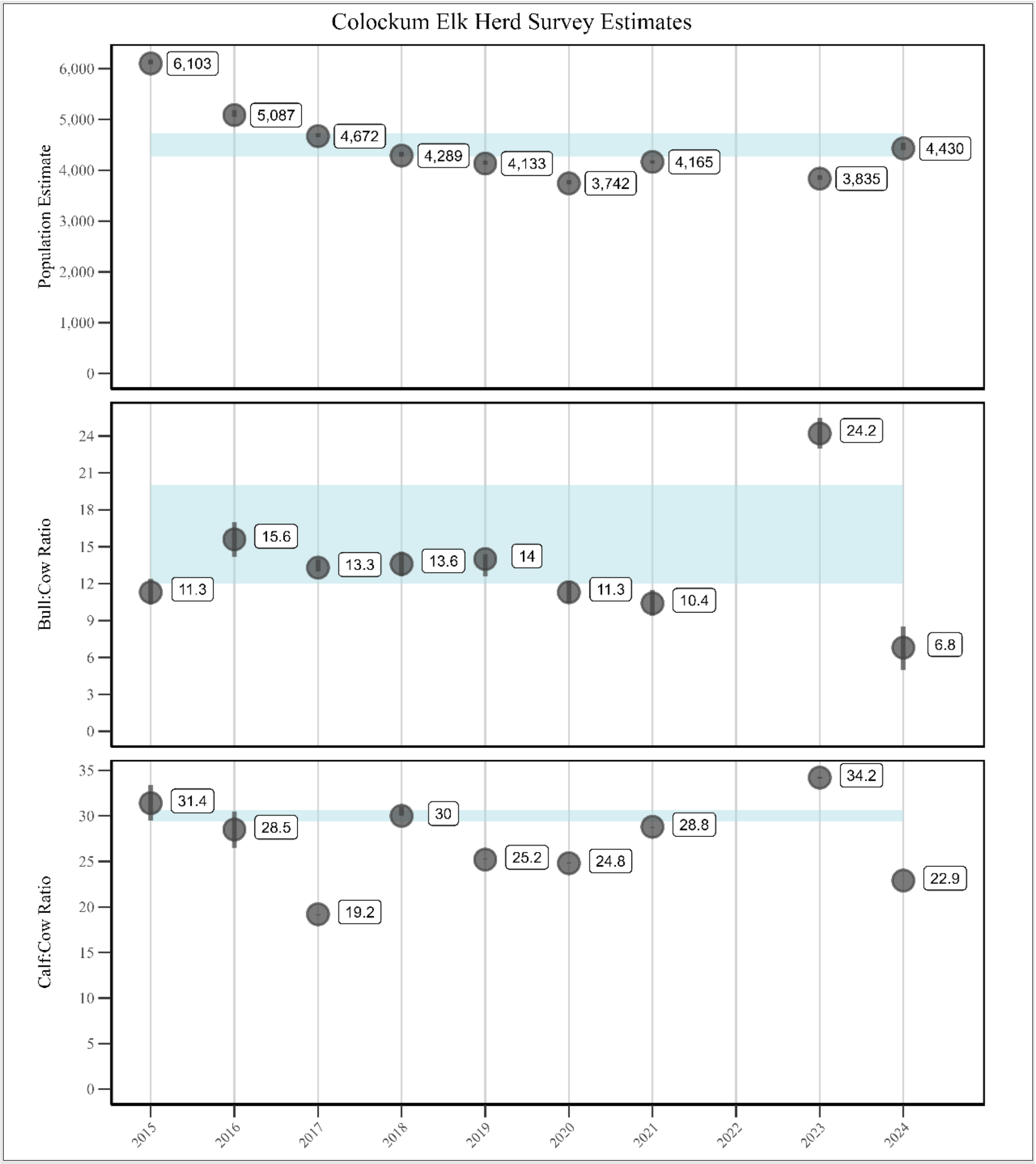
Population surveys

The Department monitors the Colockum elk herd by conducting post-winter aerial composition surveys using a sight ability correction model developed for elk in Idaho (Unsworth et al., 1999). This methodology estimates elk abundance, age ratios, and sex ratios (e.g., herd composition) for the herd's core winter range. Importantly, this modeling approach accounts for the impact of vegetation cover, snow cover, and group size on the surveyor's ability to detect and count elk across a large and complex landscape and provides the Department with a more realistic estimate of the elk herd composition within the surveyed area by using the sight-ability correction model than without. Estimates are reported as a mean with a 90% confidence interval (90% CI). The 90% CI represents the estimated range (low-high) to 90% confidence that the actual population would be within that range if the survey were conducted again.

The most recent 2024 winter survey estimated mean elk abundance in the core winter range at 4,430 elk (90% CI = 4393-4546), above 2023 estimates. The 2024 abundance estimate is within the objective population range, and the estimated post-hunt ratios were 7:100 bull:cow (Figure 2). Estimated bull ratios in the Colockum can exhibit high variability, and the ratio estimate for 2023 of 24 bulls: 100 cows is an extreme example of this variability. Issues with bull estimation under the current survey design are discussed in more detail in Management Concerns below.

Calf:cow estimated ratios were 23:100, down from the 2023 estimate of 34 calves:100 cows (Figure 2). Calves observed during the 2024 survey were, on average, larger than previous years. In addition, winter conditions were mild, and green-up occurred early and remained throughout the spring. Estimates in 2024 are expected to be low compared to actual ratios. Future surveys will better inform trends, whereas continued population increase would indicate higher than reported calf ratios.

Figure 2. Survey estimates in the Colockum elk herd area.

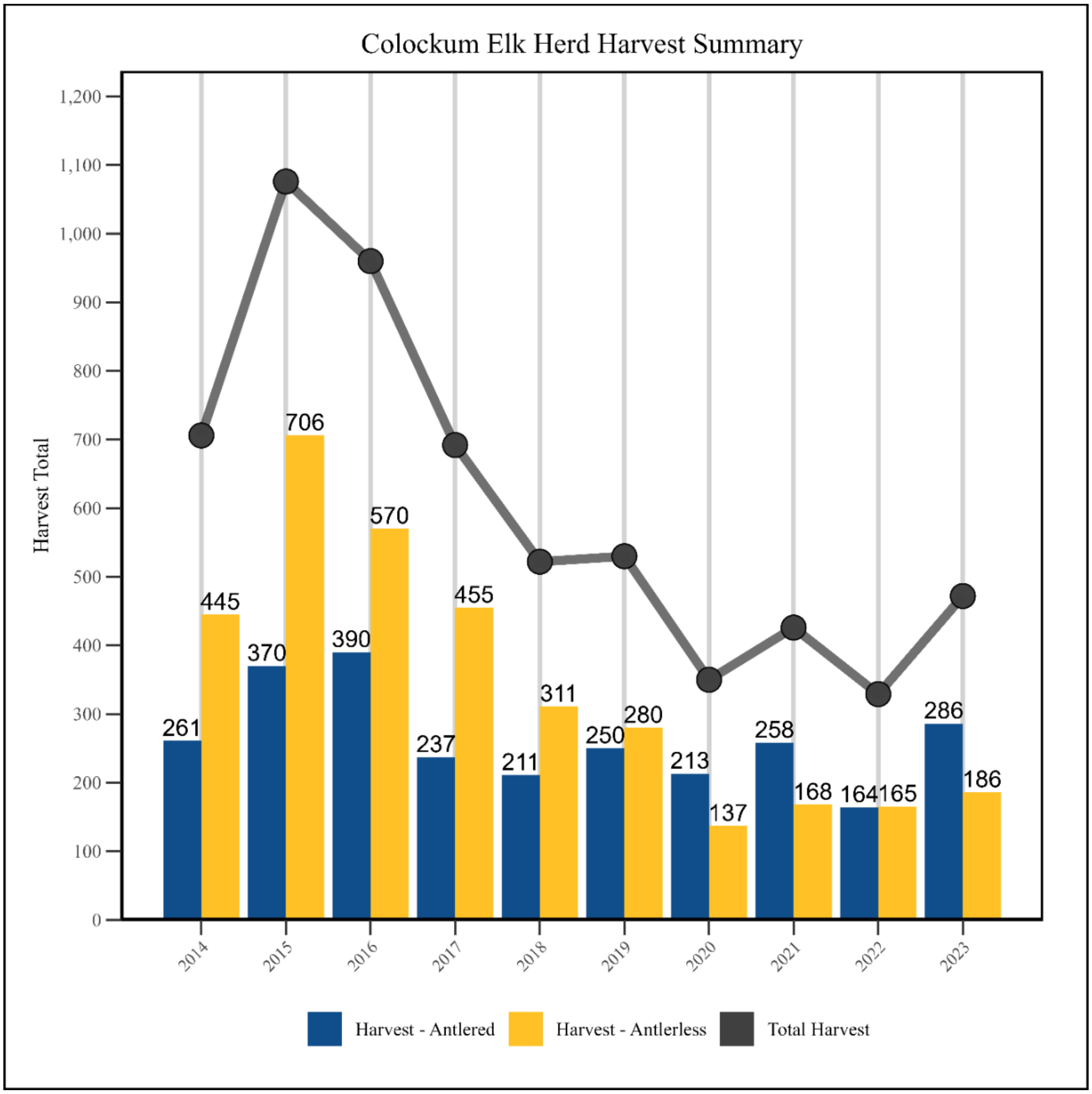


Estimates and associated 90% confidence intervals in the Colockum elk herd area, 2015-2024 for population size, bull:cow ratio, and calf:cow ratio. Population estimate is sightability corrected; no survey was conducted in 2022. Shaded blue boxes represent WDFW's population, bull management objectives, and calf ratio, which should promote herd stability or growth.

Hunting seasons and recreational harvest

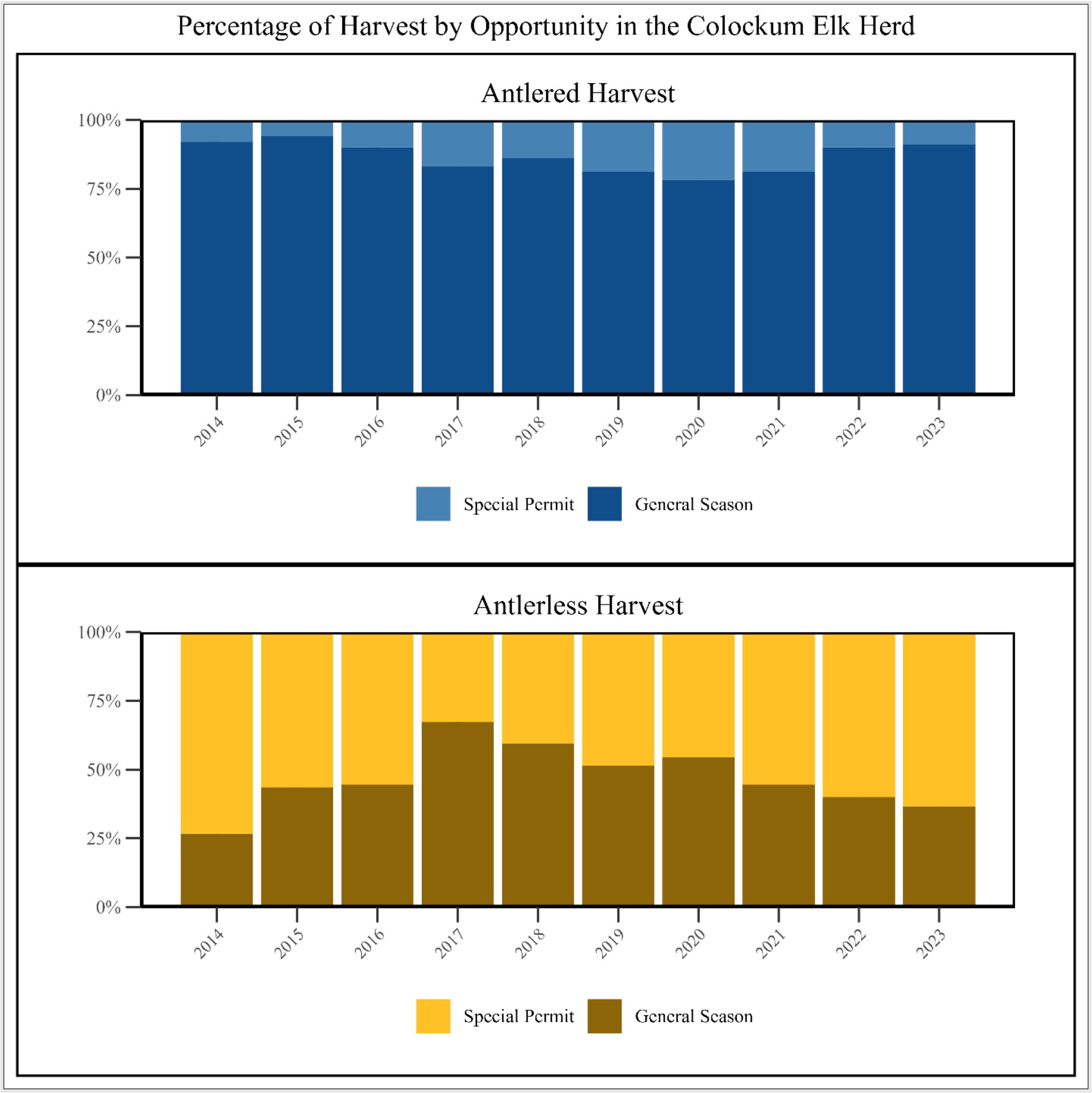
The Department restricts general season bull harvest to true-spike bulls (1×1 bulls) in the Colockum and offers branch-antlered bulls and antlerless special permit opportunity. Antlerless permit opportunity is dependent on population status in accordance with meeting management objectives. Antlerless harvest steadily increased before peaking in 2015 and has stabilized in recent years (Figure 3). Proportions of antlered and antlerless harvest during general and special permit seasons are shown in Figure 4. Total hunter effort has declined in the past 5 years (Figure 5) in unison with hunter success (Figure 5).

Figure 3. Elk harvested in the Colockum elk herd area.



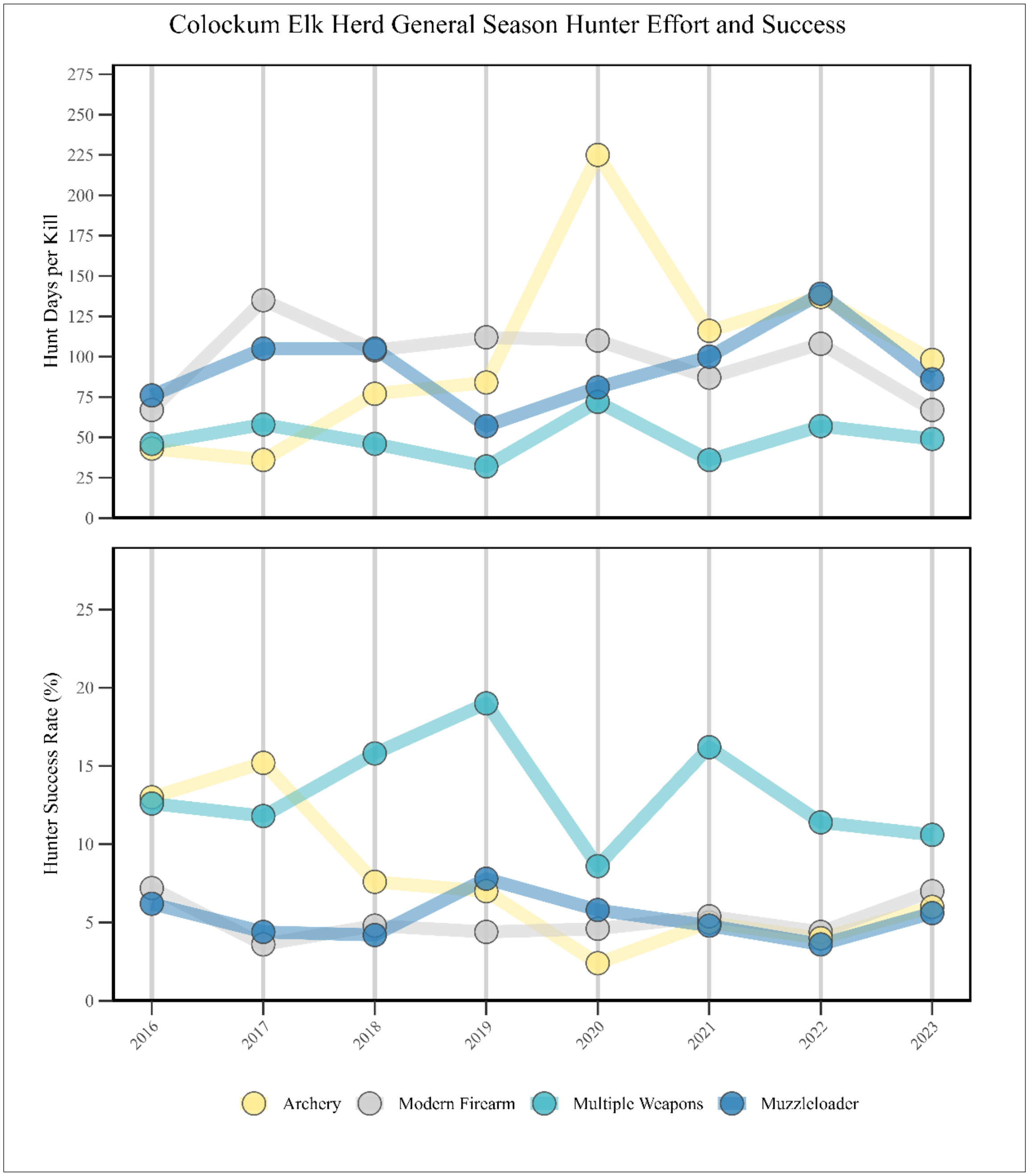
Estimated number of antlered and antlerless elk harvested in the Colockum elk herd during recreational hunting seasons (general and permit opportunities combined) established by the Department, 2014-2023. Estimates do not include elk harvested in association with damage permits (see Human-Wildlife Interaction below). Estimates also do not include harvest that occurred during Tribal seasons because those data are currently not provided.

Figure 4. Percentage of recreational antlered and antlerless harvest.



Estimated percentage of recreational antlered harvest (top) and antlerless harvest (bottom) in the Colockum elk herd that occurred during general and permit seasons, 2014-2023.

Figure 5. Hunter effort and success rate.



Estimated number of days hunters spent pursuing elk per kill and hunter success rate in the Colockum elk herd during recreational seasons that provided general over-the-counter opportunities, 2016-2023, by weapon type.

Survival and mortality

The Department monitored the survival of adult cows from 2008-2012 and branched bulls from 2013 – 2017 on the core winter range. Annual survival rates of adult cows were estimated to be 0.92 (95% CI = 0.87–0.96). Of the 105 monitored adult cows, 73% of mortalities were attributed to hunter-harvest (S. McCorquodale, WDFW, unpublished data). Annual survival rate of branch-antlered bulls was estimated to be 0.81 (95% CI = 0.61–0.94) for subadult bulls and 0.63 (95% CI = 0.49–0.76) for mature bulls. Of the 55 monitored bulls, 25 mortalities were documented, of which 21 (84%) were attributed to hunter-harvest (S. McCorquodale, WDFW, unpublished data).

Outside of harvest, other sources of mortality for Colockum elk include natural mortality caused by nutritional limitations and predation or human-caused mortality from vehicle collisions. A substantial population decline (>1000 elk) was recorded in 2016. The severe drought in 2015 and the following harsh winters (2015-2016) likely impacted the body fat reserves of many adult and juvenile elk, resulting in increased overwinter mortality. During the annual surveys, biologists observed an uncommon abundance of elk carcasses. Overwinter survival rates were found to be reduced across all ages and sex classes, with record low calf recruitment during that time. Adult elk and calves also make up principal prey for a variety of predators. Common elk predators within the Colockum elk herd area include black bears, cougars, and gray wolves. Black bears and cougars occur throughout the herd area, but black bears are more abundant in forested habitats. At the time of this writing, no confirmed wolf packs are within the Colockum elk herd area (WDFW et al., 2023). Lastly, the I-90 highway sees semi-frequent movement of elk moving from the Whiskey Dick Unit of the L.T. Murray Wildlife Area to the Yakima Training Center. At times, elk have experienced additional mortality from vehicle collisions in this area (see below Human-Wildlife Interaction).

Habitat

The Colockum elk herd inhabits two distinct habitats: forest and shrubsteppe. Fire regimes have had significant impacts within each. Forests historically managed under fire suppression strategies are overstocked and dense, while other areas have experienced severe burns or contemporary management focused on thinning and reducing fuel loads. The shrubsteppe habitat of the L.T. Murray and Colockum Wildlife Areas has had multiple fires in recent years, reshaping vegetation communities. Several large-scale fires have occurred in both the summer and winter ranges. Over 80,000 acres of summer range have burned in two major fires, the 36,000-acre 2017 Jolly Mountain fire and the 42,000+ acre 2012 Table Mountain fire. Over 110,000 acres of winter range have burned in the 30,000-acre 2022 Vantage Highway Fire and the 80,000-acre 2013 Colockum Tarps Fire. Smaller fires have also occurred almost annually. In the summer range, fires increase forage quantity and quality but reduce security in a heavily roaded landscape. Fires typically convert vegetation to grass on arid portions of the winter range (cheatgrass on south slopes and disturbed areas). This likely has a negative impact on elk because of reduced plant diversity and the poor forage quality of invasive plants. WDFW and other landowners are making efforts to control invasive weeds and restore habitat impacted by wildfires.

Human-wildlife interaction

The Colockum herd is not fenced from private lands, and damage is managed by hunting, damage permits, and hazing. The boundaries of these hunts are adjusted frequently, depending on where damage occurs. In 2004, the Department extended the damage permit season to August 1st – February 28th. In recent years, the general damage season closed on January 20th. Additional problem-elk are managed through hazing, Damage Prevention Cooperative Agreements (DPCAs), and Master Hunter Permits. The goal is to displace elk that have developed a habit of foraging on agricultural lands.

During the winter, elk cross Interstate 90, presumably searching for suitable forage immediately adjacent to the highway, in the median, or to access the Yakima Training Center. Elk/vehicle collisions occur infrequently but are a significant danger to drivers and their passengers. In 2016, the Washington Department of Transportation documented an unprecedented 70 elk/vehicle collisions. Subsequent winters have returned to historic levels, but the issue is still of great concern. Currently, there are no barriers or engineered wildlife crossings to keep elk off the highway. WDFW manages elk presence along I-90 by hazing them away from the roadway and installing warning signs to alert drivers. However, the effectiveness of these approaches is limited. WDFW is working closely with the Department of Transportation to identify long-term solutions. Over the last five winters, elk-vehicle conflicts were consistent with historic levels.

Research

The previous research projects on Colockum elk have concluded.

Management concerns

Bull estimates

Winter survey units are limited to spatial areas encompassing the herd's core winter range. During periods of low snowpack, bulls may occupy some of the higher-elevation timbered sites not included in the defined core winter range. Under these circumstances, bulls using the non-core winter range could be missed during the survey, providing a lower estimate than the true population. This past winter, there was a lower-than-usual snowpack during the survey period, historically resulting in a low proportion of bulls being detected. This results in an apparent rapid decrease in bulls, which does not represent the biological reality.

Large variations in estimated bull:cow ratios, such as the decrease observed this past survey year, introduce uncertainty for managers interpreting trends and setting harvest limits. Changes in estimates can be the result of true population-level shifts in mortality or recruitment or portions of the mature bull subpopulation wintering outside the surveyed portion of the winter range, independently or in combination. This challenge requires more robust techniques and methods to improve the total bull subpopulation estimates.

Elk-human conflict

Elk-human conflict constitutes a major management concern for the Colockum herd. Agricultural damage and vehicle collisions comprise most of the conflict calls for WDFW staff, with few effective mitigation tools available. Human disturbance is one major factor contributing to elk movement onto private lands and other areas where conflict occurs. Human disturbance can be high on public lands, especially during late winter. Cultivated lands and irrigated pastures are attractive foraging areas for elk and offer safety from disturbance. The primary tool used to manage damage has been to issue damage permits and maintain long Master Hunter seasons. However, harvesting elk is less desirable than preventing elk from entering fields. Elk conflict has been mitigated by reducing disturbance on public lands and instituting physical barriers to movement. A seasonal vehicle closure was instituted to reduce disturbance to wintering elk occupying the Whiskey Dick unit of the L.T. Murray Wildlife Area. However, this closure has not prevented elk from being disturbed by other recreational uses, and further evaluation is needed. Fencing is an effective tool but requires significant funding and multi-stakeholder agreement. Some funding for cooperative fencing recently became available. WDFW is working with Kittitas Reclamation District to develop a fence along an irrigation canal as part of an upgrade to the canal. WDFW continues to explore strategies to reduce elk disturbance and prevent movement onto agricultural lands and highways while addressing multiple stakeholder interests.

Management conclusions

The Colockum herd is within the objective population range. Bull:cow and calf:cow estimated ratios were lower in 2024 than in 2023; however, they were likely confounded by mild winter conditions during the survey period. Adjustment or augmentation of the current survey structure is needed to estimate better the full complement of adult bulls in the population. Elk-human interactions challenge the public and WDFW and require continued efforts to mitigate conflict while ensuring herd health. The Colockum elk herd management would benefit from improved monitoring strategies to inform management objectives and address contemporary challenges.

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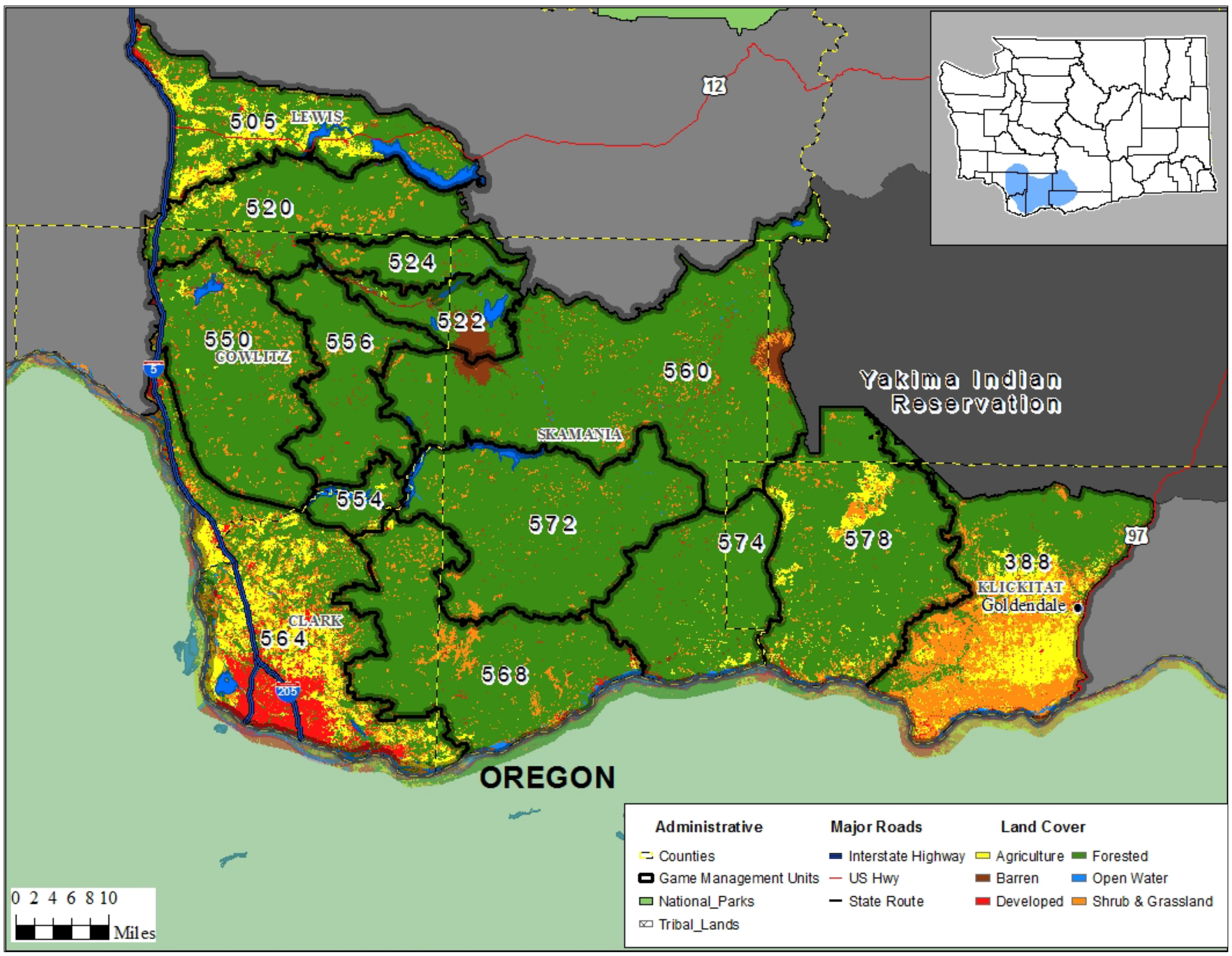
Mount St. Helens Elk Herd

Eric Holman, Wildlife Biologist

Introduction

The Mount St. Helens elk herd is located in southwest Washington and is comprised of 14 GMUs: 505 (Mossyrock), 520 (Winston), 522 (Loo-Wit), 524 (Margaret), 550 (Coweeman), 554 (Yale), 556 (Toutle), 560 (Lewis River), 564 (Battle Ground), 568 (Washougal), 572 (Siouxon), 574 (Wind River), 578 (West Klickitat), and 388 (Grayback) (Figure 1).

Figure 1. Mount St. Helens elk herd area.



The Mount St. Helens elk herd area showing dominant land use cover types within the 14 game management units.

Management guidelines and objectives

In response to the frequency and magnitude of winter mortality events in the 2000s, the Department began liberalizing opportunities to harvest antlerless elk in 2007 to reduce the Mount St. Helens elk herd by 35% (WDFW, 2006). The Department's current objective is to promote population stability as indexed by estimates of total elk abundance in spring. Additional herd objectives include maintaining a post-hunt population with a bull:cow of 12-20 bulls:100 cows and maintaining an annual survival rate of 0.50 for bulls when bull mortality is monitored (WDFW, 2014). The Mount St. Helens Elk Herd Management Plan (WDFW, 2006) also outlines objectives to continue efforts that monitor and improve winter habitat and wintering elk populations in the Toutle River valley. In addition, the herd management plan objectives address minimizing damage conflicts, increasing public appreciation of elk, and using the best available scientific methods to monitor the herd.

Population surveys

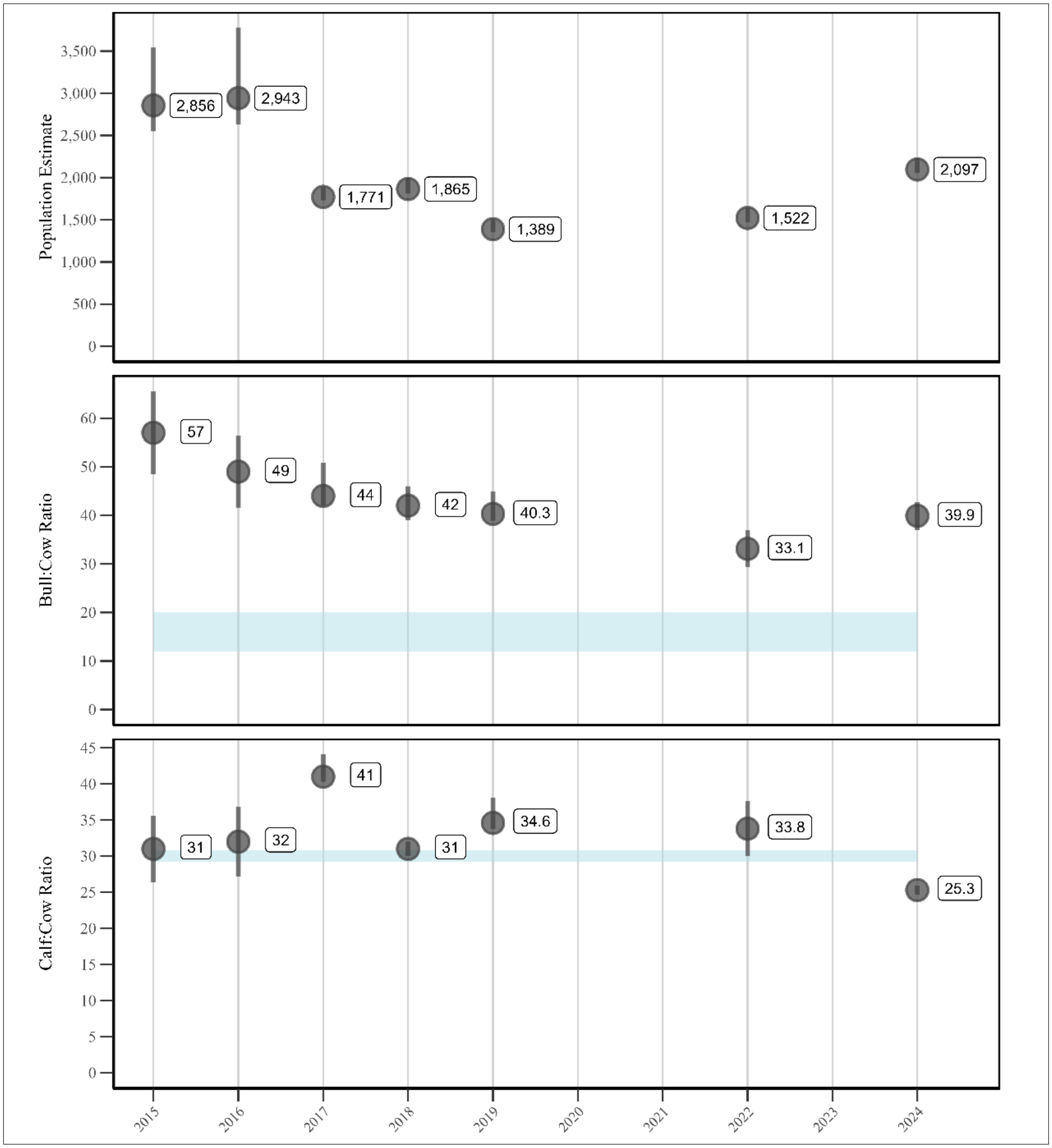
The Department began monitoring population trends in 2009 by indexing total elk abundance within the core herd area (GMUs 520, 522, 524, 550, 556) using a sightability model developed specifically for the Mount St. Helens elk herd (McCorquodale et al., 2014). The COVID-19 pandemic and associated restrictions on work activities did not allow the survey to occur in 2020 or 2021. In subsequent years, restrictions were relaxed, and biologists completed the survey in March 2022 and 2024. During 2024, the Department estimated total elk abundance within the core herd area to be 2,097 elk (95% CI = 2,053-2,232). Estimates of total elk abundance declined following the severe winter of 2016-17 (Figure 2) but showed an increase of roughly 33% in the 2024 estimate. In March 2024, the Department estimated the ratios of post-hunt bull:cow and calf:cow to be 40:100 and 25:100, respectively. Bull:cow ratios have increased since 2010 during purposeful herd reduction and are well above management objective (Figure 2). Calf:cow ratios have ranged from 25-41:100 over the past ten years (Figure 2).

Outside of the core herd area, population monitoring has not regularly occurred due to a combination of factors including the large spatial scale, domination of closed-canopy forest, no suitable method to monitor elk populations in this habitat type, and insufficient funding. Despite these challenges, as a part of the 2024 surveys, portions of GMUs 554, 560, 568, and 572 were surveyed on an exploratory basis. A total of 318 elk were observed during this effort (Table 1).

Table 1. Elk population data for GMUs 554, 560, 568, and 572 in 2024.

GMU	Total Elk Observed	Cows	Calves	Bulls	Unclassified	Calf:Cow:Bull
554	47	25	11	8	3	44:100:32
560	192	131	36	25	0	27:100:19
568	16	12	3	1	0	25:100:8
572	63	49	13	1	0	27:100:2
Total	318	217	63	35	3	29:100:16

Figure 2. Survey of the core area of Mount St Helens Elk Herd.



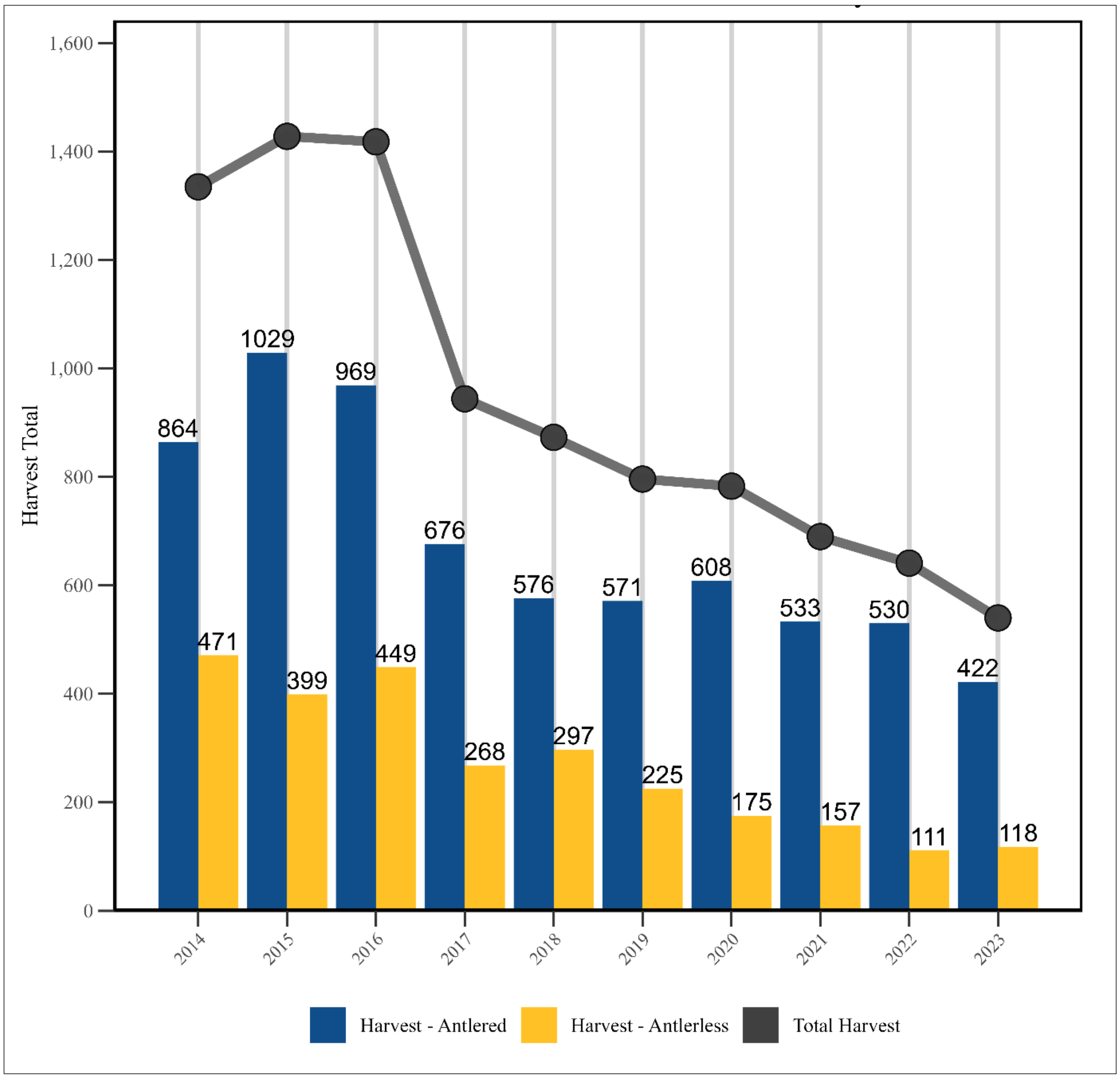
Survey estimates and associated 90% confidence intervals in the core of the Mount St. Helens elk herd area (GMUs 520, 522, 524, 550, 556), spring 2015-2024 for population size, bull:cow ratio, and calf:cow ratio. The population estimate is sightability corrected and only covers the core herd area; WDFW did not conduct population surveys in the spring of 2020, 2021, or 2023. Shaded blue boxes represent WDFW's management objectives, which are to promote herd stability or growth.

Hunting seasons and recreational harvest

The Department manages harvest opportunities in the Mount St. Helens elk herd with a combination of general season and special permit hunts. The Department has restricted all elk harvest in GMUs 522 and 556 to permit-only for several decades. In addition, the Department restricted elk harvest in GMU 524 to special permits only from 1983 through 2014, then changed management strategies by allowing general season opportunities for branch-antlered bulls starting in 2015.

Estimates of harvest during general and special permit seasons averaged 949 elk during 2014-2023 and have steadily declined during these ten years (Figure 3).

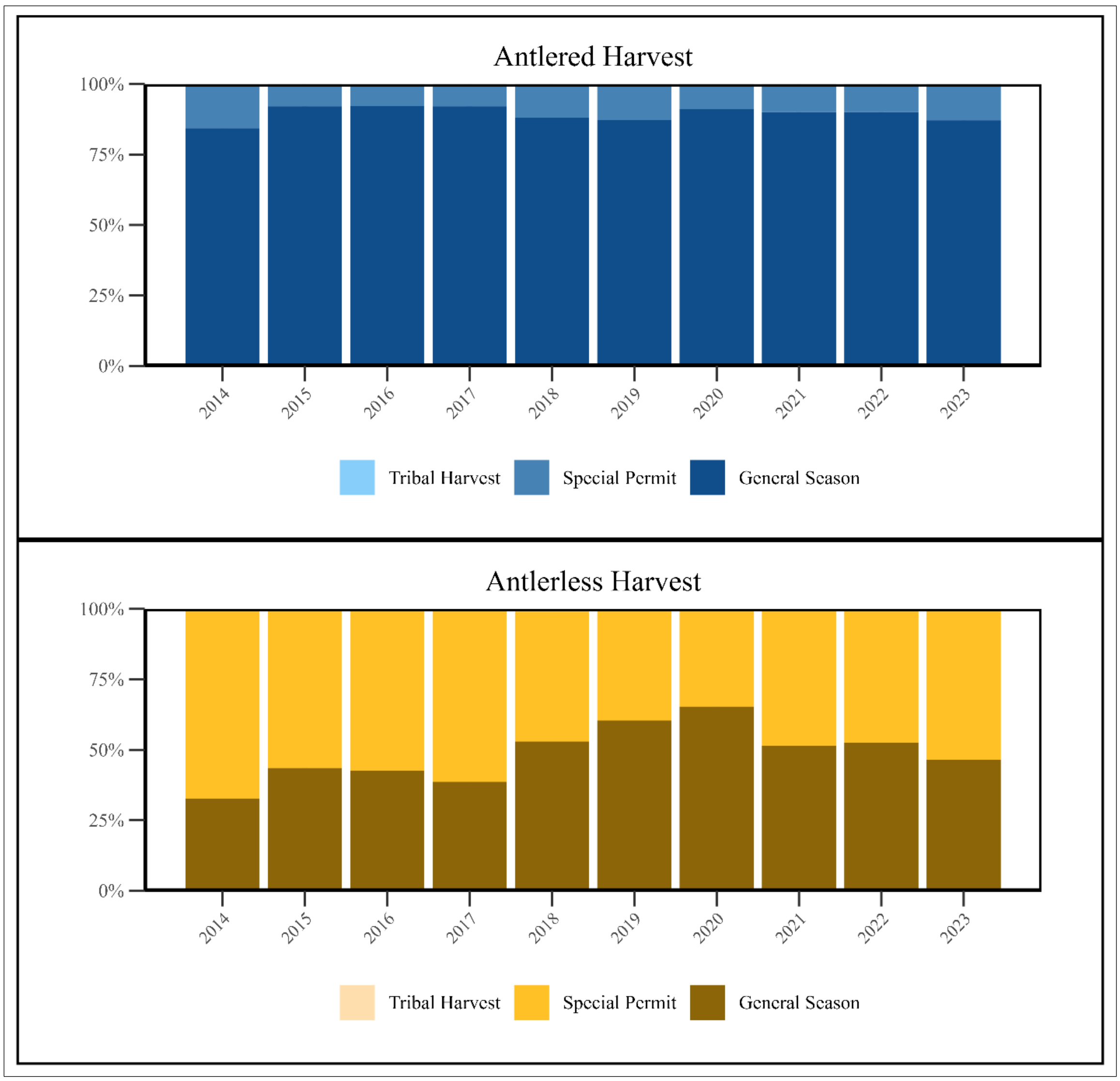
Figure 3. Mount St. Helens harvest estimates.



Estimated elk harvested in the Mount St. Helens area during recreational hunting (2014-2023), including tribal harvest, based on reports by the Northwest Indian Fisheries Commission. Damage permit harvests are excluded.

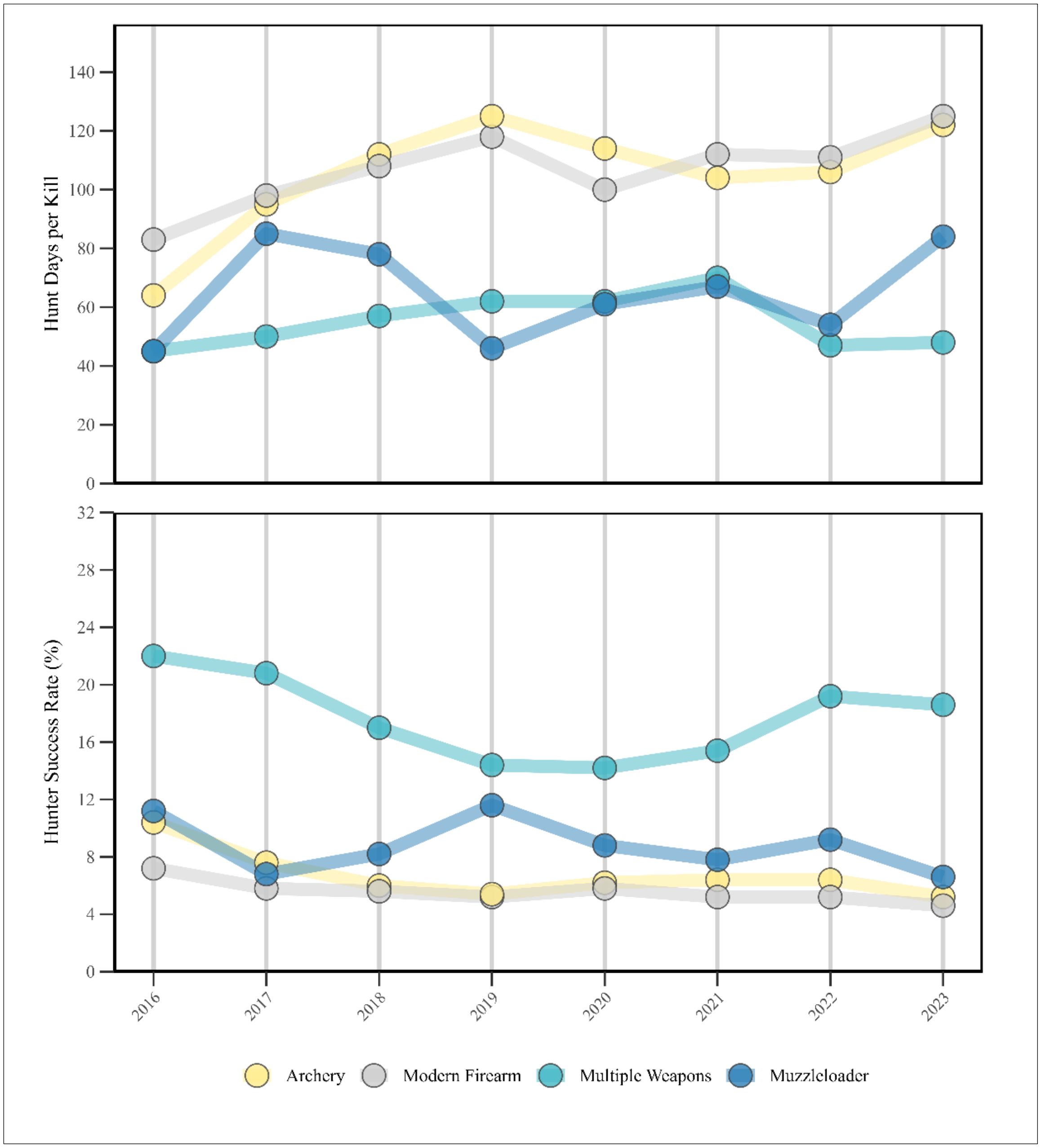
Harvest of antlered elk in the Mount St. Helens herd area occurs primarily during the general season, and most hunts are managed with a 3-point or greater antler-point restriction (Figure 4). Antlerless elk harvest occurs during a mix of general and permit-only seasons. Opportunities to harvest antlerless elk during the general season occur primarily in areas where the Department aims to maintain low numbers of elk or where the population is robust enough to sustain a general season harvest of females (Figure 4). Elk harvest within reported tribal hunting seasons is minimal in the Mount St. Helens herd area, totaling just seven antlered and one antlerless elk during 2014-2023. Hunter's success within the Mount St. Helens herd area has slowly declined over the past ten years (Figure 5). Catch per unit effort (CPUE) has declined as well (Figure 5).

Figure 4. Percentage of antlered and antlerless harvest by opportunity type in the Mount St. Helens elk herd.



Estimated percentages of antlered and antlerless elk harvest in the Mount St. Helens area during general and permit seasons (2014-2023). Tribal seasons accounted for less than 1% of the total harvest.

Figure 5. Hunter days per kill and success in the Mount St. Helens herd.



Estimated number of days per kill and hunter success rate in the Mount St. Helens elk herd area during recreational seasons that provided general over-the-counter opportunities, 2016-2023, by weapon type.

Survival and mortality

Common predators throughout the Mount St. Helens elk herd area include black bears and cougars. A single gray wolf pack comprised of one male and one female was documented within the eastern area of the Mount St. Helens elk herd in 2022, but by the end of 2023, there was only one wolf in the area, which no longer meets the definition of a pack. (WDFW et al., 2024).

Although elk are typically robust to winter weather, some areas of the Mount St. Helens elk herd area have experienced overwinter mortality events when severe winter and dry summer-fall conditions persist (McCorquodale et al., 2014). From 1999 to 2019, the Department conducted an annual winter elk mortality survey on the Mount St. Helens Wildlife Area and documented an average of 36 elk carcasses per year, which was above the 21-year average on seven separate occasions, most recently in 2014.

The Department recently completed monitoring the survival and movements of adult cow elk in GMUs 520, 522, 524, 550, and 556. The study of elk in this portion of the Mount St. Helens elk herd area is an effort to determine the effects of treponeme-associated hoof disease (TAHD) on elk survival and reproduction. The project spanned February 2015 through May 2019 and involved capturing, collaring, and monitoring 178 individual elk. The Department is in the process of analyzing this information.

The Department (McCorquodale et al., 2014) monitored the survival of branch-antlered bulls and adult female elk from 2009–2013. However, it did not attempt to account for elk mortalities by a cause beyond distinguishing between hunting-related and natural causes (e.g., predation, disease, winter mortality, etc. combined). The estimated annual survival of adult female elk in GMUs 520, 522, 524, and 556 was 0.85 (95% CI 0.78–0.91) from 2009–2011 and 0.52 (95% CI 0.38–0.65) in 2012. Estimated annual survival rates of adult female elk in GMU 550 from 2009–2011 were 0.64 (95% CI 0.48–0.78) and 0.52 (95% CI 0.38–0.65) in 2012. The estimated branch-antlered bull survival was 0.56 (95% CI 0.43–0.67) across years and GMUs. Most mortality events were associated with harvest-related causes in 2009–2011, while the reduced survival in 2012 was attributed to increased winter mortality.

Habitat

Most of the landscape comprising the Mount St. Helens elk herd area is a roughly even split of private industrial forestlands and U.S. Forest Service (USFS) managed lands. Smaller portions of the herd area are comprised of State Department of Natural Resources (DNR) managed forestlands, agricultural areas, urban/suburban lands, small forestland ownerships, and WDFW-managed lands.

The industrial forestlands consist of a mosaic of clear-cuts, relatively open young regeneration stands, dense second-growth stands of timber, and stream buffers lined with second-growth forests. Industrial timber management practices benefit elk by increasing the quantity of early seral habitats and providing forage for ungulates. Although beneficial to elk, these management practices are not conducted to purposefully increase or improve elk habitat. Additionally, intensive forest management practices, including planting dense stands of fast-growing conifer seedlings and applying herbicides during the re-establishment of the timber stand, may also be affecting overall productivity due to reduced forage quality and availability. These effects work in tandem by reducing the number of favorable plants available as forage in the early term and completing forest canopy closure (typically approximately age 12) far earlier than would occur in a naturally regenerated stand. Site-specific types of post-timber harvest treatments, plant compositions, and the number of years since timber harvest influence the magnitude of those effects. A commonality among these varying factors is that the best quality and most quantity of favorable forage occurs approximately three to 14 years after timber harvest, whether herbicide treatments are applied or not. However, the differences between available, favorable forage in that time for treated and untreated stands can still be substantial. A full discussion of the complexity of these habitat interactions is beyond this report's scope. Please see Ulappa (2015) and Geary et al. (2012) for a more comprehensive understanding of this research.

In contrast, very limited timber harvest on federal forests in the last three decades has led to a general decline in the quality of elk habitat.

The Department continues to take steps to enhance forage quality in the North Fork Toutle River Basin on the Mudflow Unit of the Mount St. Helens Wildlife Area within GMU 522. Forage enhancement efforts have included planting and fertilizing forage plots; mowing pasture; controlling Scotch broom, yellow and mouse-ear hawkweed, and non-native invasive blackberries; and planting trees and shrubs in upland areas and along the banks of the North Fork Toutle River to reduce bank erosion and re-establish tree cover.

The Department recently completed habitat enhancement activities on the Hoffstadt Unit of the Mt. St. Helens Wildlife Area. This work included conducting thinning of dense conifer stands, creating openings within forested stands, treating invasive plants, establishing forage including grasses, clover, and peas on abandoned roadways and landings, and re-establishing diverse forest stands. These enhancements were conducted in portions of GMUs 522, 524, and 556.

In addition, activities on approximately 16,000 acres of mitigation lands managed by PacifiCorp include forest canopy removal, fertilization, establishment of forage plots, treatment of invasive plants, maintenance of farmlands and meadows for elk habitat, and creation of meadows and openings within the forested landscape. These enhanced habitats provide high-quality foraging opportunities for elk.

Human-wildlife interaction

Conflicts with the production of agricultural crops occur throughout the lower-elevation portions of the Mount St. Helens Elk Herd area. Elk damage complaints have decreased in recent years, reflecting the reduced elk population. Many crops are impacted by elk damage, but most damage occurs in fields used for hay production.

Wildlife Conflict Specialists work closely with producers by developing Damage Prevention Cooperative Agreements (DPCAs), which identify a plan to reduce the amount of damage incurred to agricultural crops using non-lethal and lethal methods. Non-lethal methods of discouraging elk use are an important component to reducing elk damage and are generally attempted prior to the use of lethal response. Conflict Specialists and landowners use a variety of non-lethal means, including electrified fladry fencing, noisemakers (bird bangers, critter gitters, propane cannons), hazing and herding on foot, with a vehicle or with a dog, scarecrow-like electronic devices, and odor-based repellents such as Plantskydd.

Lethal methods of deterring elk are also used. These efforts include special late and early-season damage hunts within specified elk areas, a region-wide pool of Master Hunters, Youth Hunters, and Hunters with Disabilities for immediate response to damage issues, as well as landowner damage permits. These authorizations to lethally remove elk usually require the landowner to allow public hunting on their property. In addition, Wildlife Conflict Specialists negotiate the amount of lethal elk removal and public access on a case-by-case basis with each landowner. Collectively, these hunts are designed to decrease the number of elk causing damage and to haze elk from the area.

In recent years, the most acute situation of elk damage to agricultural crops has been associated with the mid-elevation valleys of Trout Lake and portions of the Glenwood and Gilmer valleys within GMU 578. These valleys provide year-round habitat and are considered a historic winter range for elk occupying the southern Cascade mountains. The aggressive use of landowner kill permits, and some non-lethal deterrents have failed to reduce this conflict. To help with this conflict, the Department implemented a liberalized late muzzleloader season in GMU 578 starting in 2018. This general season opportunity resulted in more harvest than anticipated, so it was replaced with a limited permit opportunity for antlerless elk starting in the 2021 hunting season.

Legislative funding during the 2021-23 biennium provided WDFW with cost-share funds for deer/elk fencing to protect agricultural crops. This funding allowed WDFW Conflict Specialists to work with two different producers in GMU 574, one producer in GMU 578, and three producers in GMU 564 to successfully construct fence projects in 2022 on their respective properties. As a condition of their individual cost-share agreements, producers who enter into these agreements are ineligible to file crop damage claims in the future. Thus, none of the producers who received cost-share funding were enrolled in DPCAs in 2022-2023. Furthermore, the fencing projects eliminated elk and deer damage to crops on these farms.

Table 2 shows a summary of permits issued to landowners allowing the take of elk causing agricultural damage in the Mount St. Helens Elk Herd during 2023-24. Collectively, these hunts are designed to decrease the number of elk causing damage and to haze elk from the area.

Table 2. Elk harvest numbers for the Mount St. Helens elk herd, 2023-24.

GMU	DPCAs	Public Permits Issued	Elk Removed
505	7	0	5
520	4	0	4
568	2	0	0
574	2	0	1
578	6	2	22
Total	**21**	**2**	**32**

Number of DPCA (Damage Prevention Cooperative Agreements), number of permits issued to Master/Youth/Disabled hunters to lethally remove elk causing damage to agricultural crops, and resulting number of elk removed from DPCAs or public permits, Mt. St. Helens elk herd, 2023-24.

Research

The research associated with TAHD (discussed below) is scheduled for continued data analysis in 2024. It is anticipated that this effort will shed light on the impacts of TAHD on the survival and reproductive fitness of adult female elk. Additional information will include survival rates and reproductive fitness of elk not afflicted with TAHD, habitat use, cause-specific mortality among study animals, and other variables.

Management concerns

Treponeme-associated hoof disease

Treponeme-associated hoof disease (TAHD) of elk results in abnormal hoof growth, cavitating sole ulcers, and, in severe cases, eventual sloughing of the hoof capsule. Elk severely affected by TAHD often have reduced mobility and body condition. Consequently, it seems reasonable to assume elk would have a reduced probability of survival or reproductive potential. However, it is unknown how TAHD affects the population dynamics of herds where TAHD occurs. This is the focus of ongoing research. The Department is also conducting research to better estimate the distribution and prevalence of TAHD. To learn more about the Department's efforts associated with investigating TAHD, please visit the Department's hoof disease webpage: https://wdfw.wa.gov/species-habitats/diseases/elk-hoof.

Habitat conditions on Federal Lands

Habitat conditions on federally managed lands within the Mount St. Helens elk herd area are of concern. Large-scale fire, timber harvest, disease, or other succession re-setting events are largely absent from the federal lands. The resulting landscape is dominated by closed-canopy forest, much of which was harvested from roughly 1950-1990 and subsequently replanted with dense Douglas fir trees. These stands provide little in the way of elk forage and lack the diversity and forage resources of either older or younger forests. While recent and ongoing forest thinning projects by the USFS do provide more robust forage resources, at least temporarily, elk forage and, therefore, elk populations will continue to be suppressed in GMUs 560, 572, and 574.

Fee-only hunting access restrictions

In 2014, the largest industrial forestland owner within the Mount St. Helens elk herd area implemented a fee-only access system for hunting and other recreation on their lands. This system limits the number of individuals allowed access to these lands. The effects of this limited access to elk hunting opportunities are difficult to quantify as the landowners do not own entire Game Management Units. Some hunters elect to pay the access fee, some elect to hunt in another area, and some may decide to quit hunting. It is probable that the reduction in participation over the years (Figure 8) partially reflects this reduction in free, unlimited hunting access within a large portion of the Mount St. Helens elk herd area. Ramifications of reduced hunter access and participation are twofold as they impact the Department's goals to maximize recreational access to wildlife and likely reduce hunter participation and recruitment, undermining the capacity to manage elk and other wildlife.

Management conclusions

Population monitoring indicates that the surveyed portion of the Mount St. Helens elk herd has declined over the past 15 years. While the Department's objective within the Mount St. Helens Elk Herd Plan did call for a reduction of approximately one-third, the population is now significantly below that target. Accordingly, opportunities to harvest antlerless elk have been significantly reduced in recent years. Additionally, estimates of calf:cow ratios during this period suggest calf recruitment rates are at a level that should promote population growth or stability. While the population remains well below historic levels, the 2024 monitoring effort indicated strong growth over the previous estimate.

The overall population level, treponeme-associated hoof disease, habitat condition on federal lands, the nutritional condition of the animals, and fee-access systems remain concerns for the Mount St. Helens elk herd. The Department will propose strategies for addressing these issues in an update to the existing elk herd plan.

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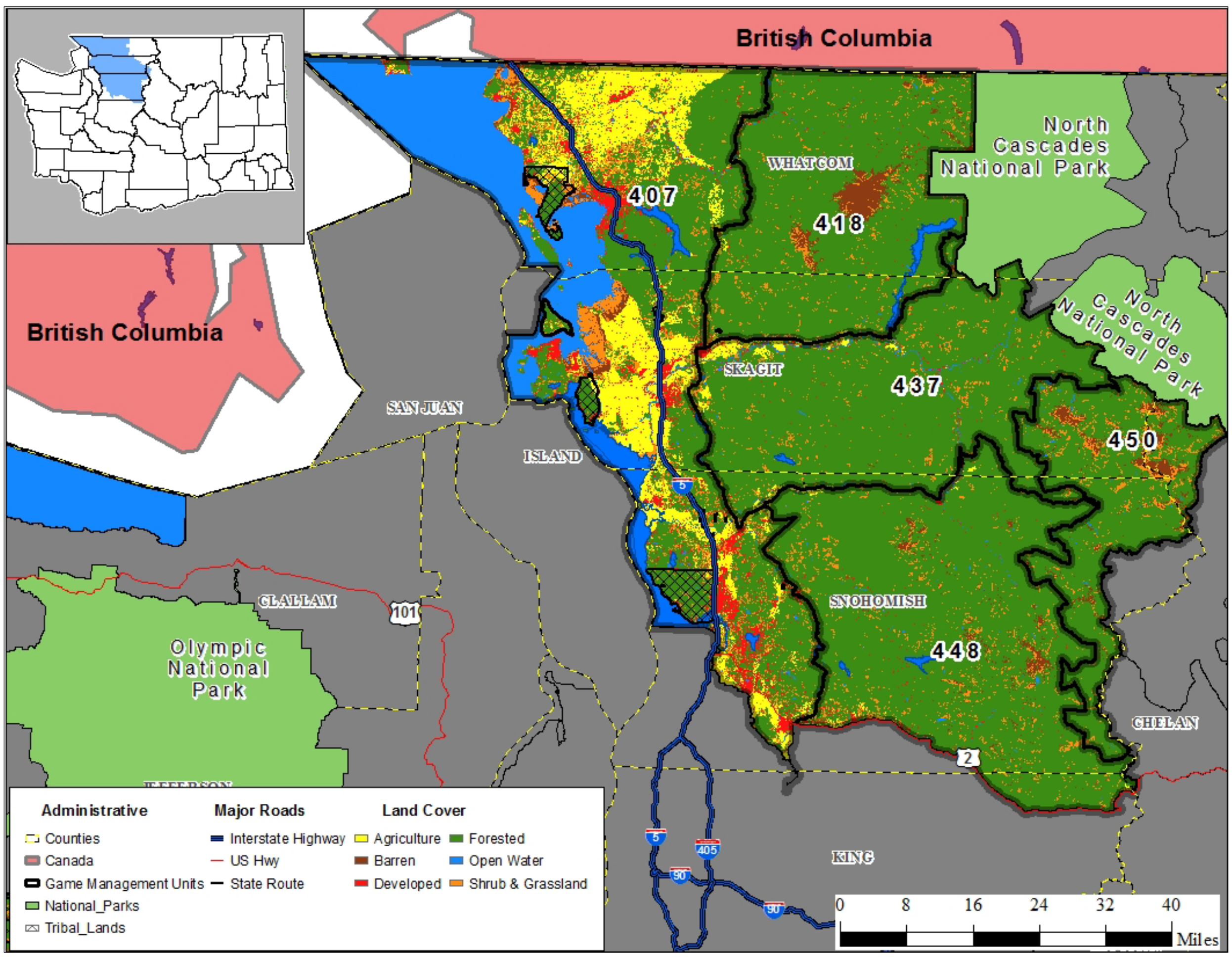
North Cascade Elk Herd

Robert Waddell, Wildlife Biologist
Katie Soltysiak, Wildlife Biologist

Introduction

The North Cascade Elk Herd (NCEH) is the smallest of 10 herds formally managed by WDFW. The herd area is in northwest Washington and consists of five Game Management Units (GMU; Figure 1), which include 407 (North Sound), 418 (Nooksack), 437 (Sauk), 448 (Stillaguamish), and 450 (Cascade).

Figure 1. Game management units within the range of the North Cascade elk herd.



Dominant land use cover types within the five game management units that comprise the North Cascade elk herd area.

Management guidelines and objectives

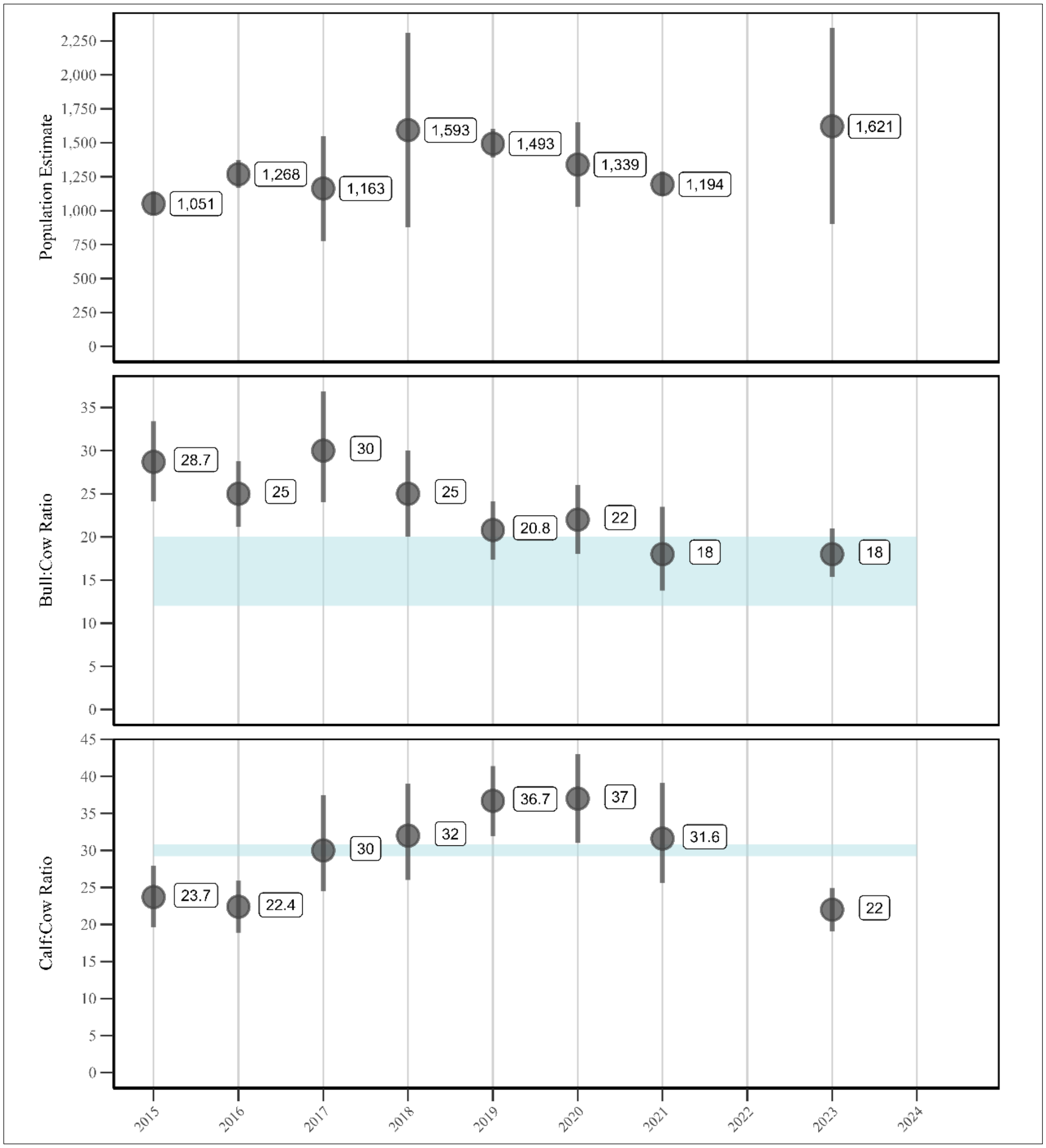
The Department completed the most recent NCEH Plan in 2018 (WDFW, 2018). Current objectives include maintaining a post-hunt population with a bull:cow ratio of 12–20 bulls:100 cows and maintaining an annual survival rate greater than 0.50 for bulls when bull mortality is actively monitored (WDFW, 2014).

Population surveys

In cooperation with the Point Elliott Treaty Tribes, the Department conducts an aerial population survey during spring in the core herd area (GMUs 407, 418, and 437). Survey data is analyzed using a variant of mark-resight known as the logit-normal mixed effects model. This method estimates the total abundance and the cow subpopulation within the survey area (McCorquodale et al., 2011, 2013). However, this estimator is only used when replicate flights during a survey period are performed. In years when a single aerial survey is conducted (e.g., 2017, 2018, 2020, and 2023), commonly due to weather, cost, or other factors, only a total elk abundance estimate is calculated using the Lincoln-Petersen (L-P) method.

The Department and Point Elliott Treaty Tribes conducted the most recent survey in the spring of 2023. That survey estimated total elk abundance within the core herd area to be 1,621 (95% CI = 903–2,345) elk (Figure 2). Estimates of bull:cow and calf:cow ratios derived from uncorrected observation data were 18 bulls:100 cows (Figure 2) and 22 calves:100 cows (Figure 2), respectively. The bull:cow ratio is within the post-hunt management objective of 12–20 bulls:100 cows (Figure 2). The calf:cow ratio is low compared to previous estimates (Figure 2). The lack of statistical precision in the 2023 abundance estimate stems from challenges associated with weather and the pilot's inexperience with surveying elk.

Figure 2. Survey estimates in the North Cascade elk herd area.



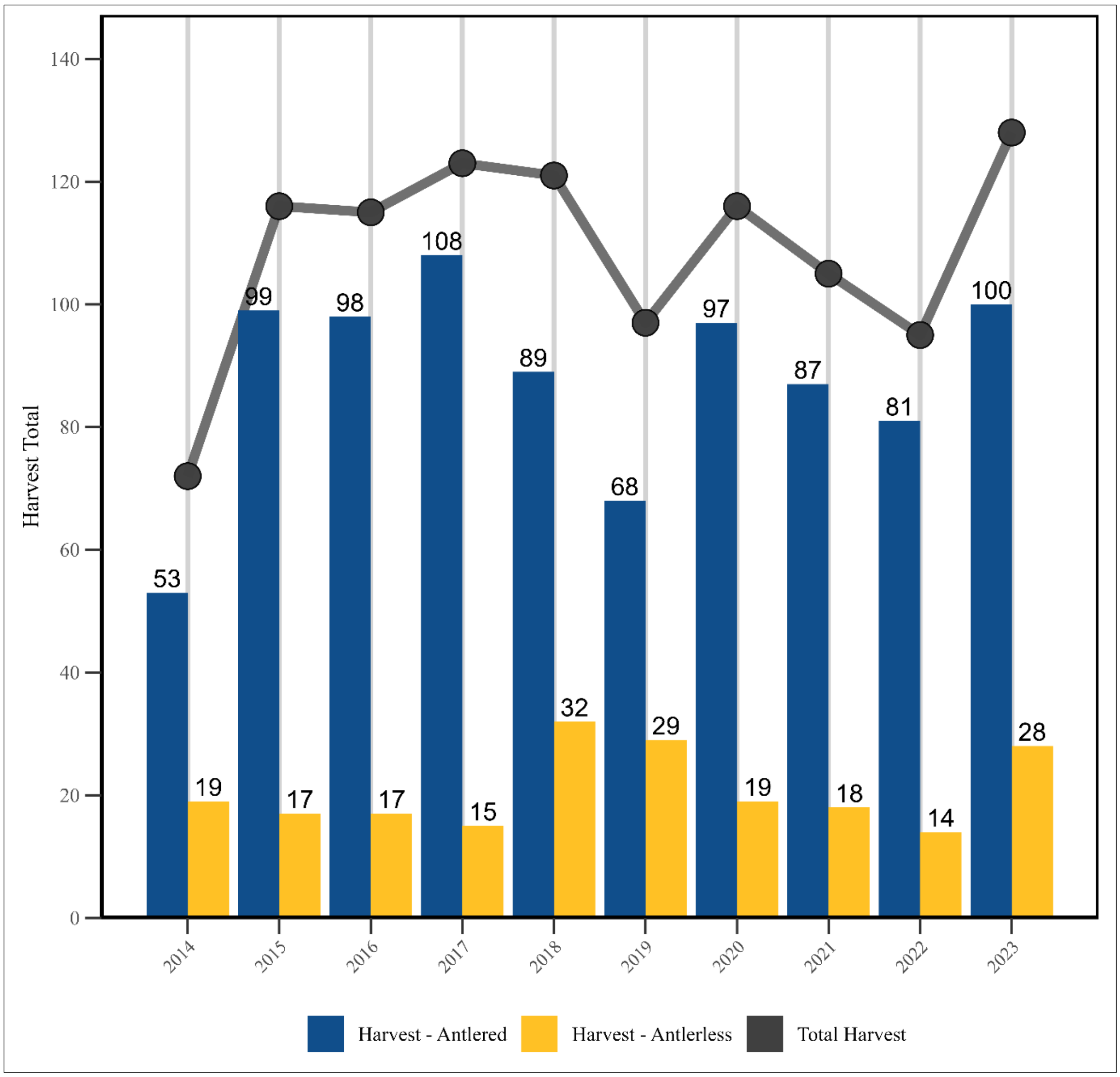
Estimates and associated 90% confidence intervals in the core range of the North Cascade elk herd area (GMUs 407, 418, and 437) for population size (top plot), bull:cow ratio (middle plot), and calf:cow ratio (bottom plot), spring 2015-2024. The population estimate is derived from a mark-resight method. No survey occurred in 2022 or 2024. Shaded blue boxes represent WDFW's management objectives to promote herd stability or growth.

Hunting seasons and recreational harvest

The Department and Point Elliott Treaty Tribes implemented a harvest moratorium throughout most of the herd area during 1997–2006 because managers estimated that the herd had declined to as few as 300 elk. Since then, general season opportunities have been limited. However, special permit opportunities increased as the population grew and stabilized. Similarly, antlerless harvest has expanded over the past few years and is primarily limited to agricultural areas where damage to commercial crops may be high.

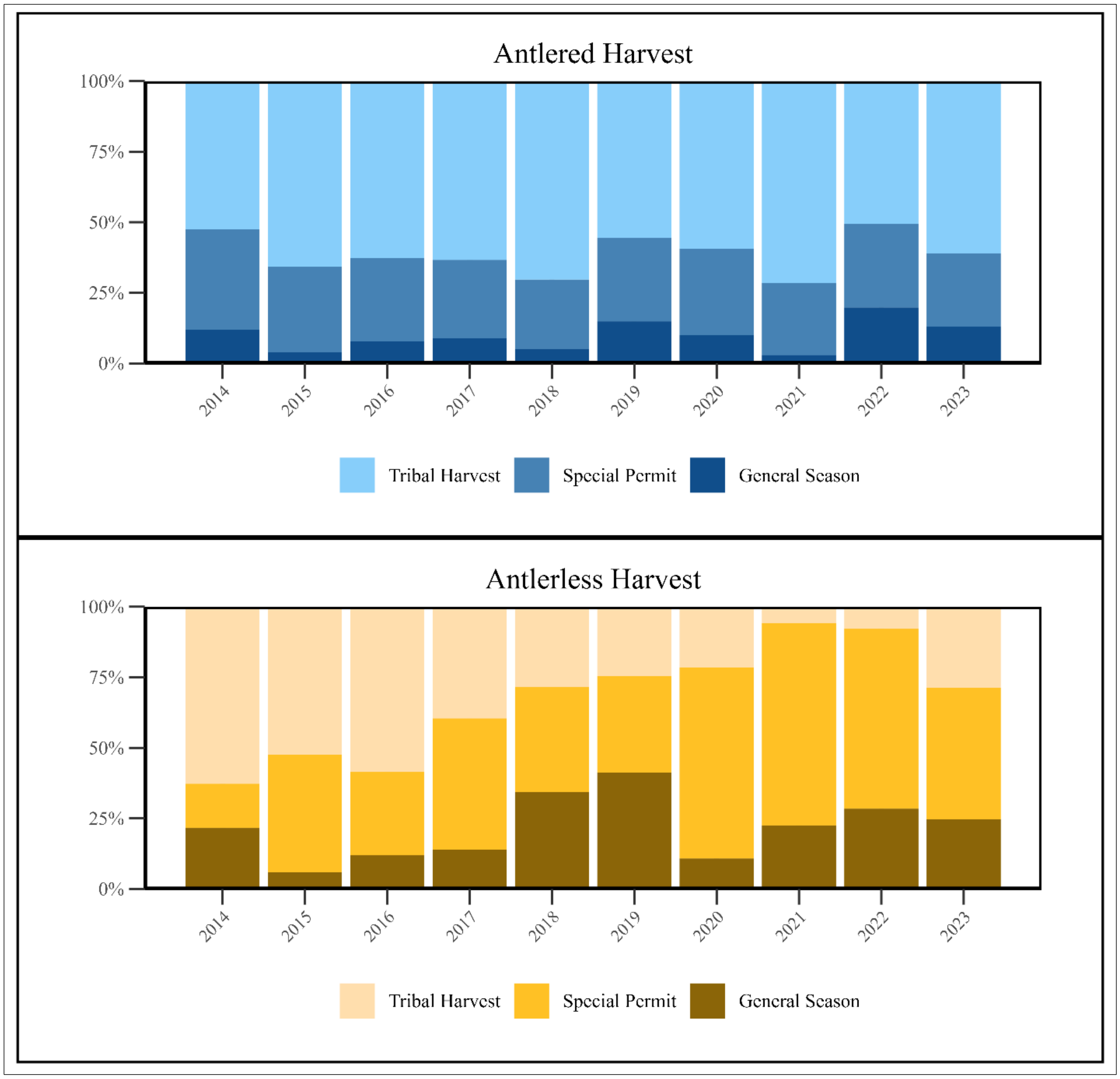
Estimates of antlered harvest since 2014 were around 110 to 120 animals; however, in 2023, they were higher (Figures 3 and 4). This is likely attributed to increases in estimated elk abundance, increases in special permit opportunities and bull:cow ratios (Figure 2), and a need to address crop damage concerns. Estimates of antlerless harvest have remained steady in recent years (Figures 3 and 4) and occur primarily during WDFW special permit seasons (Figure 4).

Figure 3. Estimated number of elk harvested in the North Cascade elk herd area.



The text outlines the estimated number of antlered and antlerless elk harvested in the North Cascade elk herd from 2014 to 2023 during recreational hunting seasons and Tribal seasons, including data from the Northwest Indian Fisheries Commission. It excludes elk harvested under WDFW damage permits.

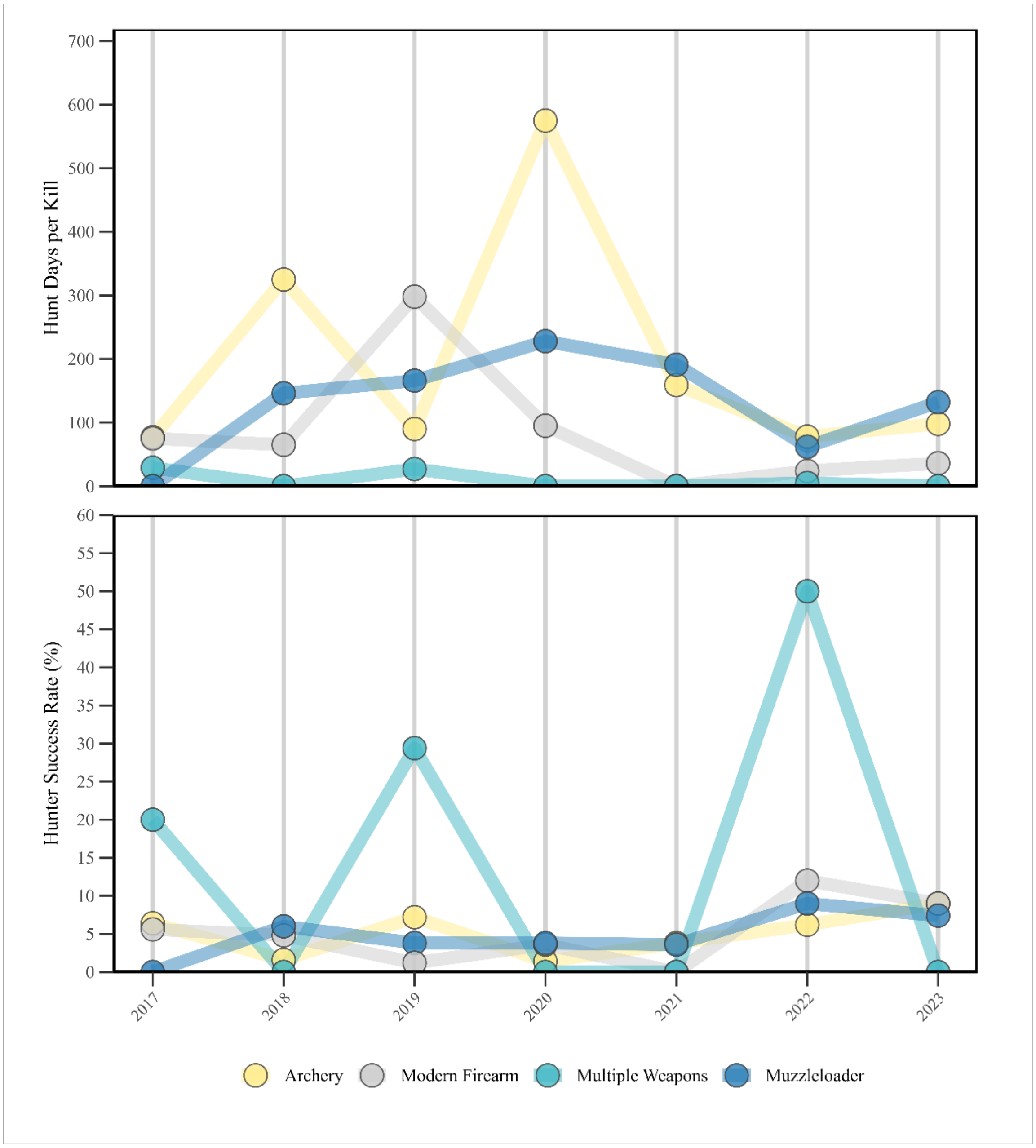
Figure 4. Percentage of antlered and antlerless elk harvest in the North Cascade elk herd.



Estimated percentage of antlered elk harvest (top) and antlerless harvest (bottom) in the North Cascades elk herd during recreational (General and Permit) and Tribal seasons, 2014–2023. Estimates of Tribal harvest are from annual harvest reports compiled by the Northwest Indian Fisheries Commission.

The estimated number of days hunters spent pursuing elk within the NCEH area during general recreational seasons, where over-the-counter license opportunities are available, remained steady from 2015–2017 (Figure 5). The number of hunters seeking general season opportunities grew from 2018 to 2020 but has decreased in recent seasons, likely due to changes in the structure and length of the late archery and muzzleloader hunting seasons (Figure 5).

Figure 5. Hunter effort and success rate, North Cascades elk herd.



Estimated number of days hunters spent pursuing elk per kill and hunter success rate in the North Cascade elk herd area during recreational seasons that provided general, over-the-counter opportunities, 2017-2023, by weapon type.

Survival and mortality

Common elk predators in the NCEH area include black bears and cougars. Though state and federally listed, the Department has documented the presence of gray wolves in the upper Skagit River system near the U.S./Canada border since the early 1990s. In 2017, a single wolf in Skagit County was captured and collared by biologists. The following year, location data from the collared wolf allowed biologists to confirm that an unknown wolf had paired with the collared wolf. This was the first documented wolf pack in western Washington since they were extirpated in the early 1930s. The pair was named the Diobsud Creek pack (WDFW et al., 2021). Surveys of the area from 2020–2022 detected only a single wolf maintaining the territory. Thus, the Diobsud Creek pack was removed from the Department's list of designated packs.

Although biologists have not documented a substantial effect of winter weather on elk survival in this herd, the weather does influence their distribution. When severe winter conditions persist, elk become concentrated in low-elevation areas, including the Skagit River and Acme Valleys. The potential for human-wildlife conflict, especially with agricultural producers, is high when this occurs.

The Department monitored the survival of adult female elk and branch-antlered bulls in the NCEH area from 2005–2006 and estimated annual survival rates to be >0.90 for both sex classes before reinstating harvest opportunities in 2007 (McCorquodale et al., 2011). Following the resumption of bull harvests only, the survival of branch-antlered bulls was estimated to be 0.68 (95% CI = 0.50–0.82). Of the 270 mortality events documented during 2005–2011, biologists attributed 77% (207 elk) to harvest-related causes, 14% (38 elk) to elk-vehicle collisions, and 4% (11 elk) to natural causes (e.g., predation, disease, accidents, etc., combined).

Habitat

Forest management practices on private industrial and state forestlands generally benefit the NCEH by creating a mosaic of habitat types. Specifically, clear-cuts and young regenerating stands provide a forage base that is commonly absent in mature forests, though the size, location, and topography of clear-cuts, as well as the intensive use of herbicides, can impact the value of these early seral-stage forest openings for elk. In contrast to state and commercial forestlands, that portion of the NCEH area under federal ownership is dominated by mature timber that provides little benefit to elk.

Human-wildlife interaction

The damage removal period for elk ran from July 1, 2023, through March 31, 2024. During that period, WDFW received 67 elk-related complaints, an increase from the 60 complaints received during the 2022–23 season. Most complaints came from individuals not engaged in commercial agriculture or livestock production who mostly experienced damage to fencing, ornamental and fruit trees, gardens, and landscaping. The remainder involved damage to fences, pastures, and crops owned or operated by commercial producers.

Seventy-one landowner permits and 13 Master Hunter permits were issued during 2023–2024 to address elk damage in GMUs 407, 418, and 437. Most of the damage permits were focused on the Skagit Valley portion of GMU 437 during the state-authorized removal period, with 42 elk (3 bulls, 39 cows) harvested.

Research

The Department continues to monitor three of nine cow elk captured in GMU 437 from February to March 2021. Each elk was fitted with a GPS collar to track movements and aid in population monitoring. Six elk have died, two to hunter harvest and four to unknown causes.

Management concerns

Treponeme-associated hoof disease

The Department confirmed the presence of Treponeme-associated hoof disease (TAHD) in the NCEH area in 2016, with one confirmed case in the Skagit River Valley and another occurring near the town of Acme. TAHD in elk results in abnormal hoof growth, cavitating sole ulcers, and, in severe cases, eventual sloughing of the hoof capsule. Elk with severe cases of TAHD have reduced mobility, body condition, and survival. The Department is currently investigating individual and population-level effects of TAHD on elk in the Mount St. Helens elk herd area, which will inform WDFW's understanding of how the disease might impact the NCEH. To learn more about the Department's efforts in investigating TAHD, please visit the Department's hoof disease webpage: https://wdfw.wa.gov/species-habitats/diseases/elk-hoof.

Management conclusions

Estimates of elk abundance and calf:cow ratios within the core herd area indicate the NCEH has steadily increased since 2007, and calf recruitment rates have been at levels that would promote population growth or stability in most years. In addition, estimated bull:cow ratios and the most recent estimates of bull survival indicate the Department is within its objective of maintaining 12-20 bulls:100 cows and an annual survival rate of 0.50 for bulls. Consequently, in the absence of abnormal weather conditions or exceedingly high harvest rates for adult female elk, the Department expects the NCEH population to continue to increase.

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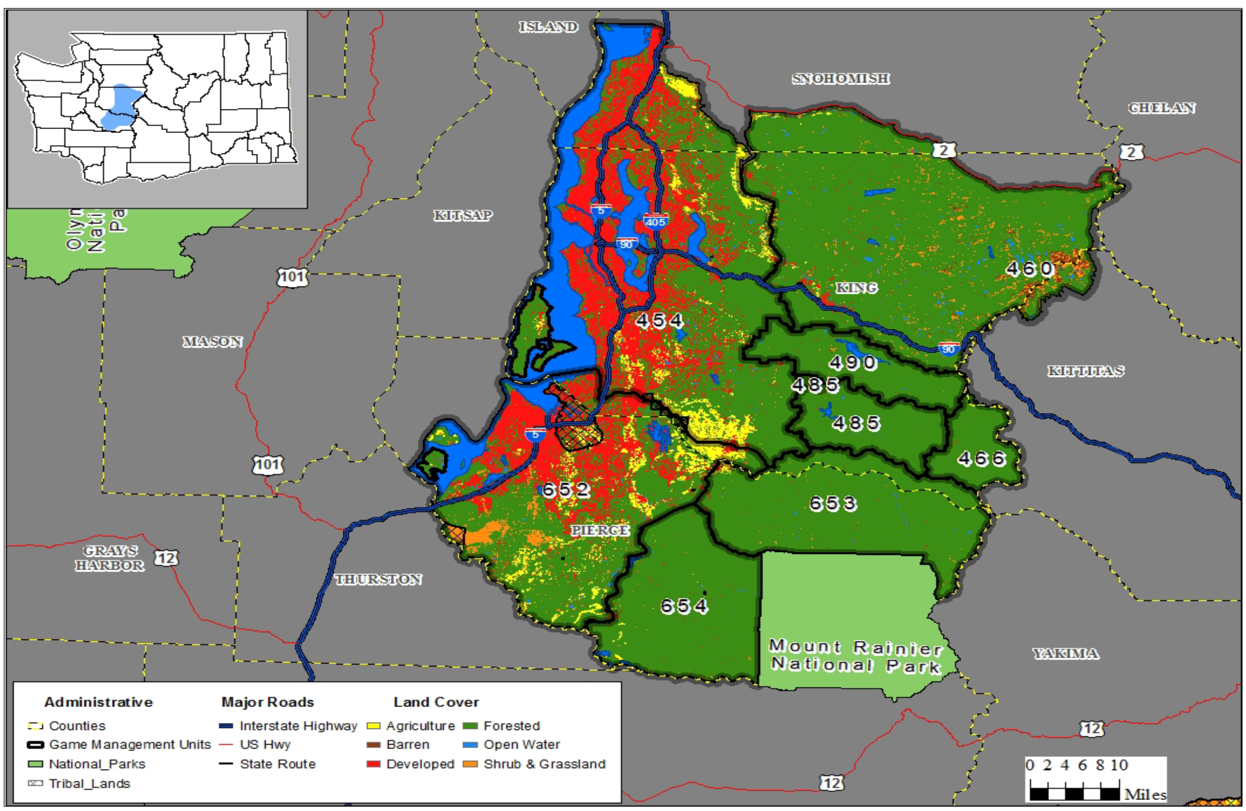
North Rainier Elk Herd

Michelle Tirhi, Wildlife Biologist
Mike Smith, Wildlife Biologist

Introduction

The North Rainier elk herd area is located in west-central Washington. It consists of eight Game Management Units (GMUs), which include 454 (Issaquah), 460 (Snoqualmie), 466 (Stampede), 485 (Green River), 490 (Cedar River), 652 (Puyallup), 653 (White River), and 654 (Mashel) (Figure 1). Elk are primarily found only in the eastern halves of GMUs 454 and 652. The primary land use of the North Rainier herd area is forest, accounting for nearly 50% of the total area. These lands occur in the eastern portion of the herd area and dominate the landscape in GMUs 460, 466, 485, 490, 653, and 654. Developed lands make up more than 25% of the herd area. Undeveloped lands, which include designated open space, exceed 10% but are largely intermingled with developed land. A relatively small amount of agricultural land is scattered in the eastern parts of GMUs 454 and 652.

Figure 1. The North Rainier elk herd area.



Dominant land use cover types within the 8 game management units that comprise the North Rainier elk herd area.

Management guidelines and objectives

The Department updated the North Rainier Elk Herd Plan (WDFW, 2020), including population objectives for each of the herd's subunits and the herd overall. Management objectives include developing a survey protocol(s) for the herd by 2025; maintaining a population of 4,850 elk; maintaining a post-hunt population with a bull:cow ratio of 12-20 bulls:100 cows; reducing elk-caused damage complaints on private lands; reducing elk vehicle collisions; increasing opportunities to view elk; and continuing to partner with tribes in managing the herd. Calf:cow ratios are also monitored to indicate herd dynamics, and a ratio of 30:100 indicates a potentially stable herd. In contrast, anything above that indicates a herd that is potentially increasing.

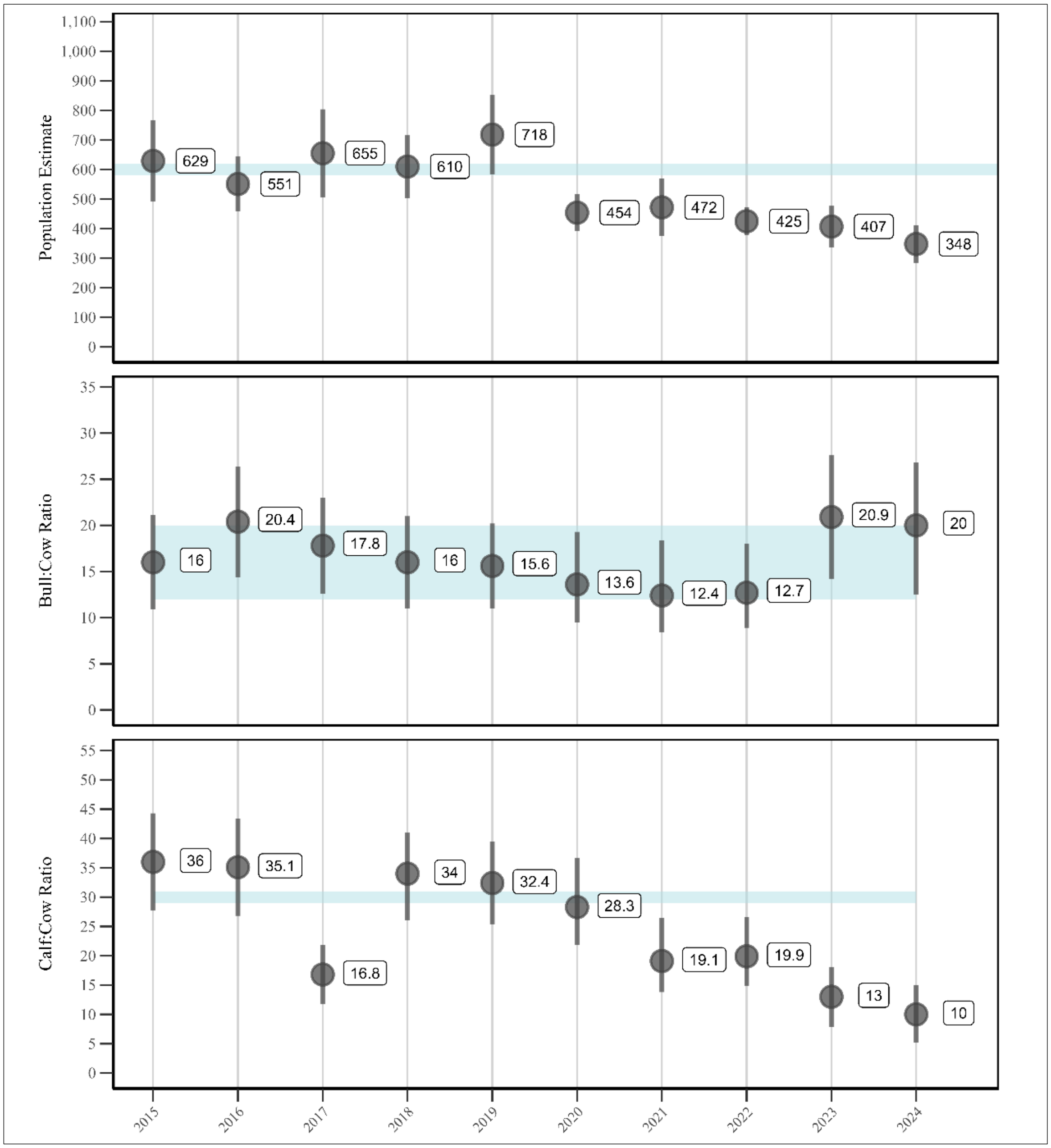
Population surveys

Surveys of various GMUs in the North Rainier elk herd area have been conducted since the 1990s. Separate surveys were conducted in 2024 by WDFW and the Muckleshoot Indian Tribe (MIT). GMU 653 (White River) contains most of the elk in the herd and is surveyed routinely by MIT and occasionally by WDFW and partners. Based on historical data from collared elk in the 1980s (WDFW, unpublished data), about 15% of the White River elk did not migrate to higher elevations in the late spring, while the remaining 85% migrated to high-elevation areas in Mount Rainier National Park (MRNP). More recently, studies conducted by MIT in 1998 indicated about half of the White River elk migrate to MRNP while the remainder remain outside the park, with some being non-migratory and some making short local movements to nearby ridges.

MIT conducts annual aerial composition surveys in GMU 653 and estimates elk abundance using a mark-resight statistical method, in addition to estimating post-hunt sex and age ratios. Surveys typically only occur in the eastern half of the GMU, so estimates of abundance are not reflective of the entire GMU. However, the western half of the GMU was also surveyed by MIT in 2012, MIT and WDFW in 2015, and MIT/WDFW/Hancock (now Manulife) in 2017, with < 100 elk observed in each survey. This supports the conclusion that eastern GMU 653 contains most of the elk in the unit (MIT and WDFW, unpubl. data). WDFW does not have access to MIT data for GMU 653 after 2017.

MIT also conducts annual aerial composition surveys using funds provided by Tacoma Water and uses mark-resight to estimate elk abundance in GMU 485. They estimated elk abundance to be 348 (95% CI = 284-412) elk in 2023. These estimates are derived from a post-2023 hunt survey effort in spring 2024 (Figure 2). GMU 485 population estimates over the past five springs (2020-2024) declined as compared to the previous six years and continues to decline. Survey conditions, the number of marked animals found during the survey, habitat changes, potential emigration, or other area occupancy pattern changes, among other factors, can all influence annual estimates. Estimates of post-hunt bull:cow and calf:cow ratios were 20:100 (95% CI = 12-27) and 10:100 (95% CI = 5-15), respectively (Figure 2). Estimates of post-hunt bull:cow ratios have varied but have consistently been within the objective and were at the upper bound in 2024. While this occurrence suggests that the population could withstand additional harvest, estimates of post-hunt calf:cow ratios have been below the desired threshold (30), which warrants additional monitoring. GMU 466 is not surveyed at this time. Therefore, no GMU 466 population estimates are available for use in reference to the herd population objective. The North Rainier elk herd plan sets the population objective for GMU 466 and 485 combined at 600 elk (WDFW, 2020).

Figure 2. Survey estimates for GMU 485 in the North Rainier elk herd area.



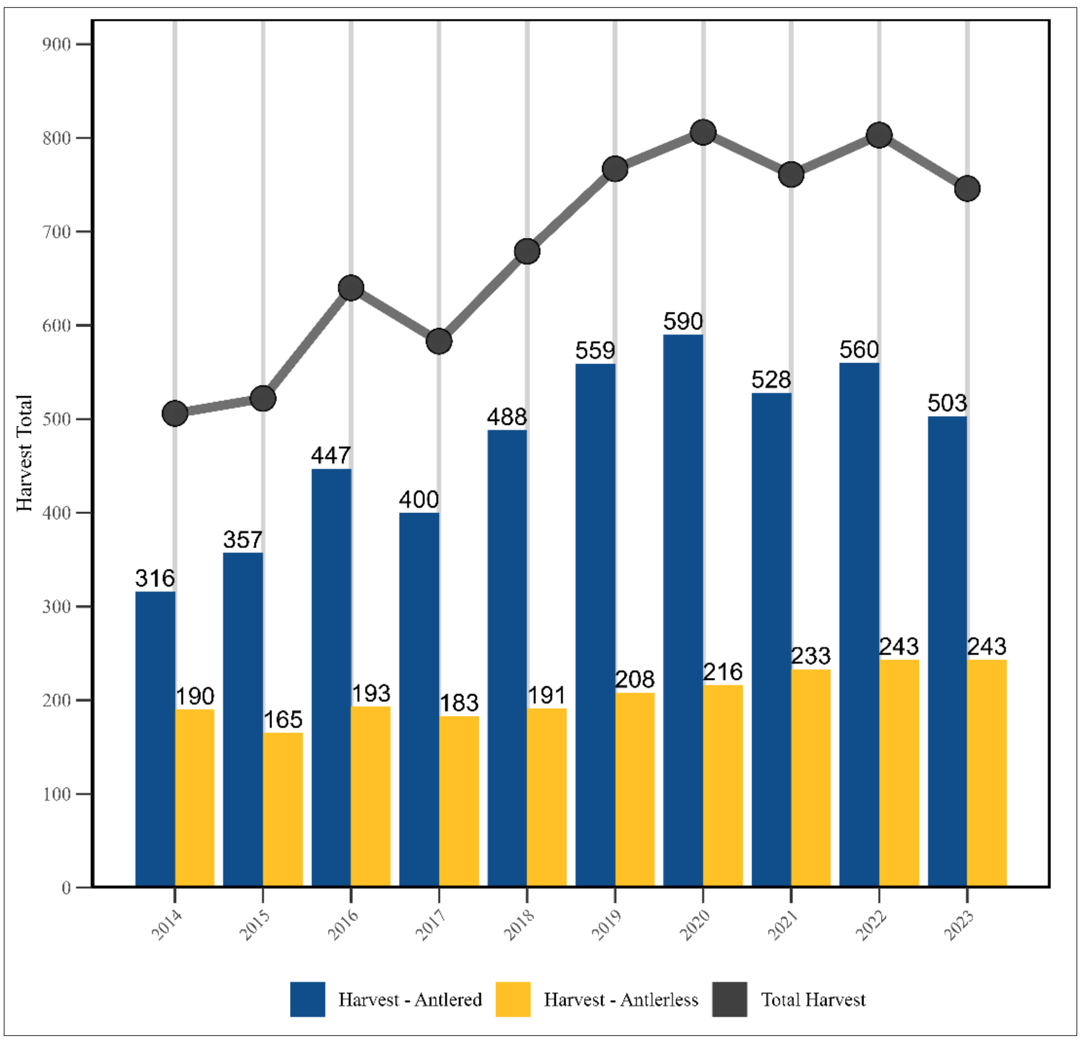
Estimates and 90% confidence intervals for GMU 485 in the North Rainier elk herd area from 2015 to 2024 (MIT unpubl. data) for abundance, bull-to-cow ratio, and calf-to-cow ratio. The population estimate is based on a mark-resight model, with shaded blue boxes indicating the WDFW management objectives aimed at promoting herd stability or growth.

Hunting seasons and recreational harvest

The Department limits most general season harvest opportunities in the North Rainier elk herd area to branch-antlered bulls. It offers most opportunities to harvest antlerless elk through their special permit system. However, limited opportunities to harvest antlerless elk during general seasons occur during general archery and muzzleloader seasons and in areas where the Department's objective is to maintain low elk numbers. The Department restricts all GMUs 485 and 653 elk harvest to special permit-only opportunities.

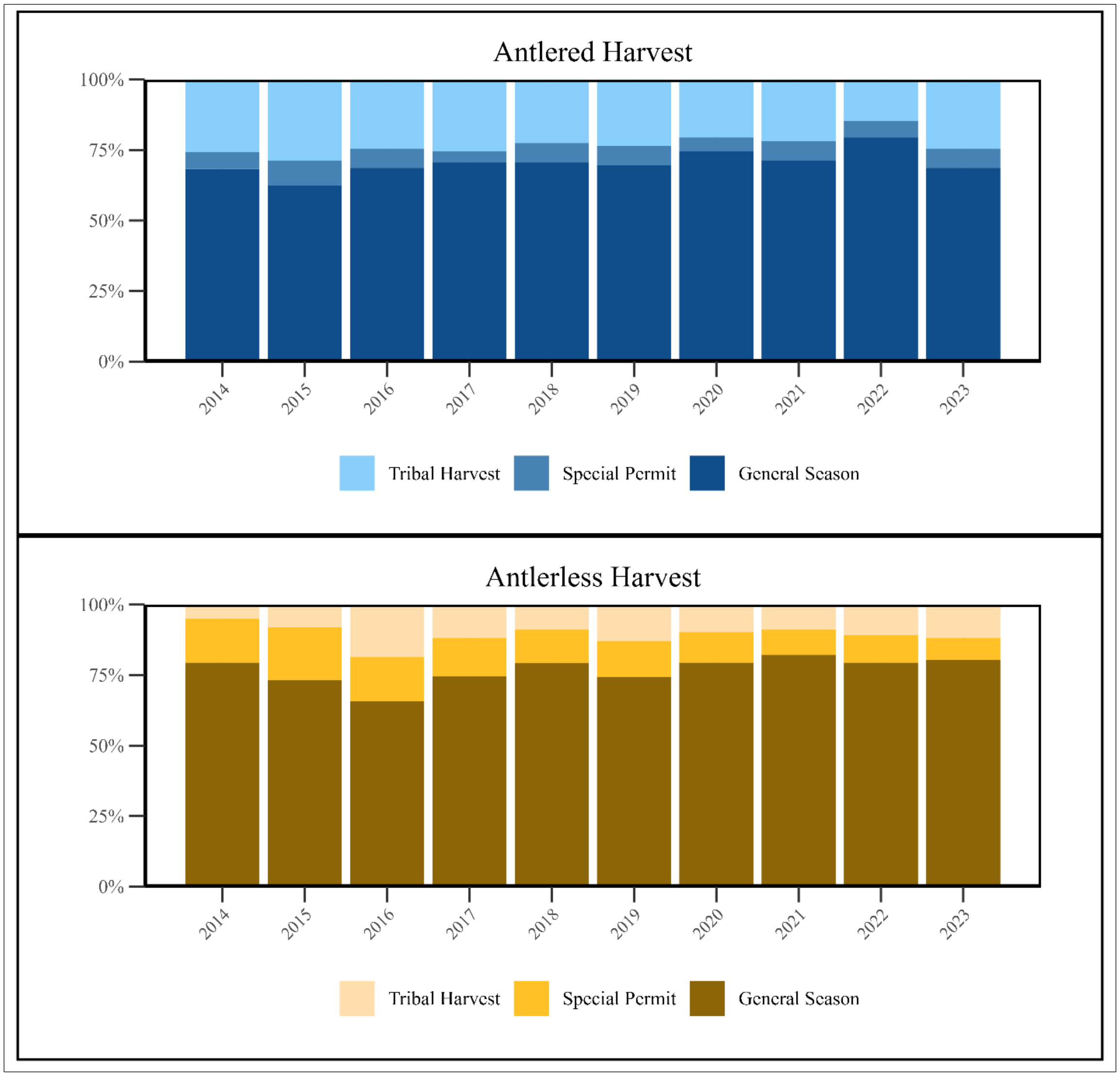
The total harvest within the herd area has been steadily increasing and averaged 642 elk per year from 2014-2023 (Figure 3). The total harvest from state hunters was 627 elk, and the total tribal harvest was 150 in 2023. Most antlered and antlerless elk harvest occurs during general seasons (Figure 4). Hunter effort (Figure 5) has declined slightly, while harvest per unit effort (Figure 5) increased since 2016.

Figure 3. North Rainier Elk Herd harvest estimates.



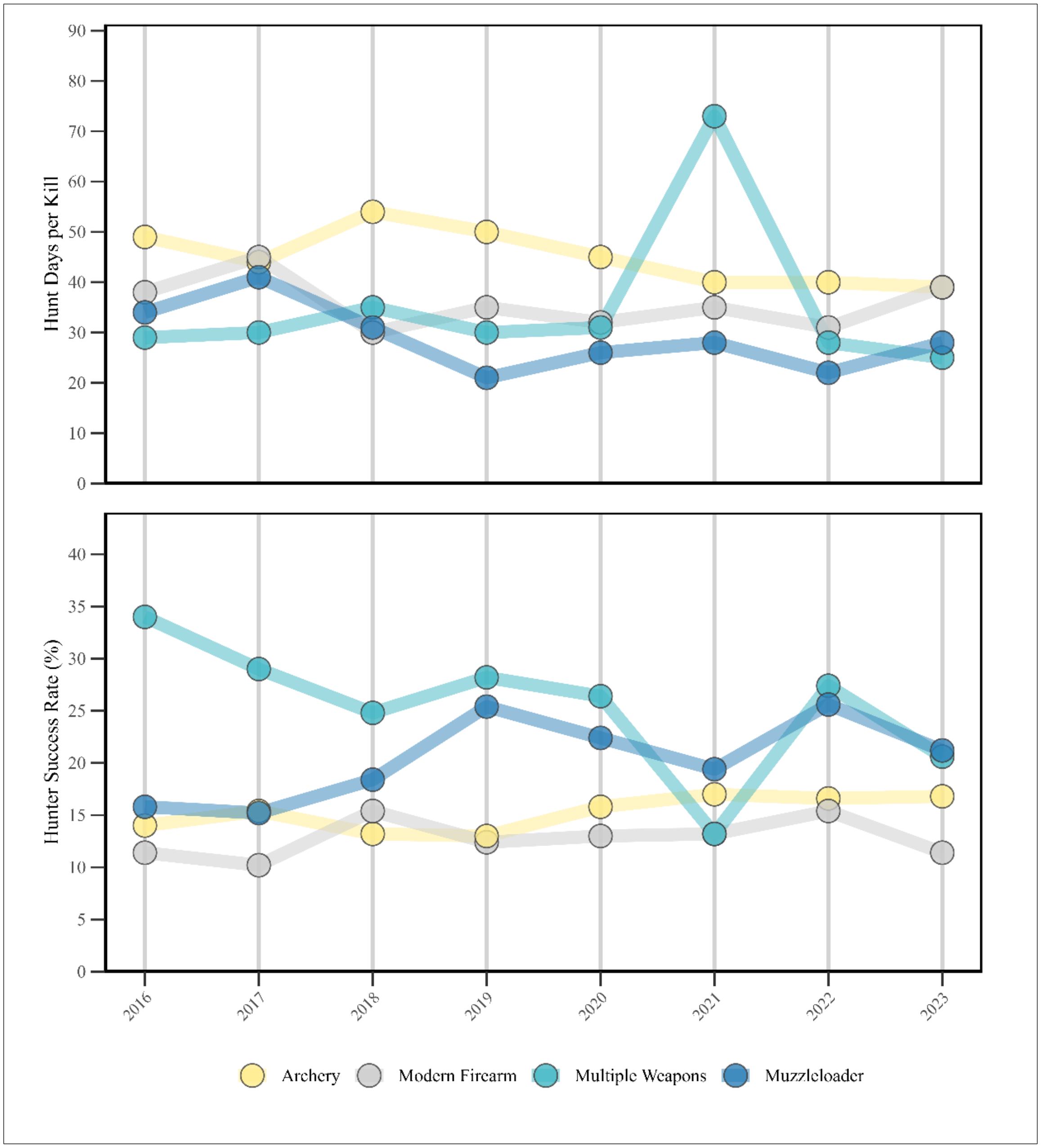
Estimated elk harvest (antlered and antlerless) in the North Rainier herd during recreational and tribal hunting seasons from 2014 to 2023.

Figure 4. Percentage of antlered and antlerless elk harvested in the North Rainier Elk herd area.



Estimated percentage of recreational antlered harvest in the North Rainier elk herd area that occurred during general and permit seasons and the percentage of harvest that occurred during established tribal seasons, 2014-2023.

Figure 5. Hunter effort and success rate in the North Rainier elk herd area.



Estimated number of days hunters spent pursuing elk per kill and hunter success rate in the North Rainier elk herd area during recreational seasons that provided general over-the-counter opportunities, 2016-2023, by weapon type.

Survival and mortality

Common predators of elk that occur throughout the North Rainier elk herd area include black bears and cougars. At the time of this writing, there were no documented wolf packs within the herd area (WDFW et al., 2019), although WDFW staff are monitoring in response to various public reports (M. Tirhi, personal communication).

Severe winter conditions are rare in the North Rainier elk herd area and are unlikely to influence the population dynamics of this herd. However, extreme drought conditions that persist through summer and fall have the potential to reduce the availability of high-quality forages that elk need to accrue adequate fat stores for winter.

MIT has monitored the survival of adult female elk and calves in GMUs 485, 490, and 653, 1998-present (MIT, unpubl. data). During that same period, they estimated annual adult female survival rates that were as low as 0.70-0.75 in some years but typically ranged between 0.80-0.90. Cougars accounted for 63% and 33% of all adult cow mortalities in GMUs 485 and 653, respectively, prior to MIT implementing a cougar reduction program (see below) and 33% and 25%, respectively, following cougar removals.

Estimates of calf survival were quite variable and ranged from a low of 0.09 in 1999 to a high of 0.82 in 2006. Cougars accounted for 43-88% of all calf mortalities; bears only accounted for 6-11% of calf mortalities. Calf annual mortality rates due to cougars ranged from 0.20-0.71. The MIT research's lowest estimates of cow and calf survival occurred in the late 1990s and early 2000s. They indicated that cougars were the leading cause of mortality for adult females and calves.

In response to these findings, MIT implemented a cougar reduction program from 2001 through 2007 to improve elk survival to the degree necessary for promoting population growth. Estimates of annual survival rates for cows and calves, and subsequently estimates of elk abundance, increased during that same period, which suggests cougar predation was a primary factor negatively affecting elk survival in these GMUs. Although the cougar reduction program seemingly benefited local elk numbers, it also co-occurred with implementing more conservative hunting seasons and various habitat improvement projects, likely benefiting elk. By 2018, female and calf survival was still occurring at levels promoting elk population growth and stability (D. Vales, MIT, personal communication).

Habitat

A large portion of the North Rainier elk herd area consists of lands administered by the USFS. The Huckleberry Land Exchange transferred over 9,000 acres of commercial timberland in the White River drainage to the USFS to be managed mostly as a late-successional reserve with minimal timber harvest. Restricting timber harvest reduces the amount of forest openings and can, in turn, reduce forage availability to elk and the number of animals a landscape can support. In response, the USFS created 400-500 acres of permanent openings under the Greenwater Elk Forage Management Project to increase forage production for elk and deer in this area (USFS, 2008). In general, the North Rainier elk herd benefits most from forest management practices on private and state industrial forestlands, where frequent harvesting of mature timber creates a mosaic of early seral habitats that provide an important forage base for this herd. USFS, in collaboration with WDFW, MIT, the Tulalip Tribes, Conservation Northwest, Ruffed Grouse Society, and Northwest Youth Corps, submitted a grant to the Rocky Mountain Elk Foundation in 2022 for a second elk forage enhancement project in the Greenwater Project area (the first occurred in 2020). The project was completed by Dec 2023 and resulted in 101 acres treated to improve elk forage including burning, noxious weed treatment, brush control, and signage (USFS 2023 report).

Pierce County Planning and Land Services have adopted the elk winter range as a Habitat of Local Importance within Title 18E.40. (Regulated Fish and Wildlife Species and Habitat Conservation Areas). The county regulates land use development permits within mapped elk winter range under four management goals: 1) minimize human activity that would disturb elk, 2) maximize retention of undisturbed vegetation – particularly forest cover, 3) avoid activities that serve to exclude elk, and 4) protecting private property.

Human-wildlife interaction

Elk damage to ornamental shrubs, gardens, crops, and pastures is a problem in all GMUs to some degree, and complaints are received every year. Wildlife Conflict specialists work closely with agricultural producers by developing Damage Prevention Cooperative Agreements (DPCAs), which identify a plan to reduce damage incurred to crops using non-lethal and lethal methods. Non-lethal methods of discouraging elk use are a very important component of reducing elk damage and are generally attempted prior to lethal measures. WDFW Conflict Specialists and landowners use various non-lethal methods, including electrified fladry fencing, noisemakers (bird-bangers, critter gitters, propane cannons), hazing and herding on foot, with a vehicle or dog, scarecrow-like electronic devices, and odor-based repellents such as Plantskydd. WDFW also makes payments to landowners that qualify under the DPCA program. In 2022, the Orting Valley within the Herd area was the most expensive area for wildlife damage payments collectively in the DPCA program (M. Blankenship, personal communication).

Lethal methods of deterring elk are also used to reduce damage to crops. These efforts include hunts within specified elk areas, pools of Master Hunters and Youth Hunters, and landowner damage permits. See Table 1 for a summary of active DPCA agreements, permits issued to landowners and hunters allowing the taking of elk causing agricultural damage, and the number of elk killed in the North Rainier Elk Herd during the 2023-24 season. Collectively, these hunts are designed to decrease the number of elk causing damage and to haze elk from the area.

Table 1. Damage Prevention Cooperative Agreements Permits for lethal removal of elk damaging crops, North Rainier Elk Herd, April 2023 - July 2024.

GMU	DPCA	Permits Issued	Master Hunter Removals	Youth Hunter Removals	Antlered Harvest	Antlerless Harvest	Total Harvested
454	8	19	7	0	0	10	17
460	3	4	0	0	0	0	0
466	0	0	0	0	0	0	0
485	0	0	0	0	0	0	0
490	0	0	0	0	0	0	0
652	20	93	3	0	9	25	37
654	3	10	1	0	9	9	19
TOTAL	**34**	**126**	**11**	**0**	**18**	**44**	**73**

In GMU 460, elk damage is a notable problem for some golf courses, Christmas tree farms, nurseries, blueberry farms, and other agricultural crops. Vehicle-elk collisions have increased as well. The Upper Snoqualmie Valley Elk Management Group was formed in 2008 in response to damage complaints within the city limits of North Bend and Snoqualmie, and elk-vehicle collisions on I-90. The group is made up of citizens, WDFW wildlife and enforcement personnel, and city and county staff. The primary role of the group is to address concerns related to elk-human interactions. Further, the Washington Department of Transportation has initiated monitoring and collaborative academic studies to examine vehicle-elk collisions along I-90.

Additional elk hunting opportunities aimed at reducing private property damage were initiated in 2014 within Elk Area 4601 and in 2015 in Elk Area 6014. Antlerless elk harvest was added to general season hunts aimed at reducing the herd in these localized areas. Regional master hunter permit holders were also used to harvest elk on specific properties specified by the Wildlife Conflict Specialists in 6014 to curtail damage further.

Elk in GMUs 485, 466, and 653 have largely not been a problem to private property owners, with few nuisance complaints received. However, continued monitoring of herd growth and opportunities to track any emigration from these GMUs will be valuable as surrounding communities continue to expand and develop adjacent to core herd use areas.

In addition to retaining permit opportunities in Elk Area 6054, the Department is considering additional opportunities to harvest antlerless elk in GMU 654 to assist with mitigating elk damage complaints.

Research

WDFW is a member of the White River Elk Herd Technical Committee, which is made up of state, federal, and tribal biologists and researchers who comprise the White River Elk group. There is no collective partnership for the entire herd area. Members of the Committee collaborated on a Hybrid Double-observer Sightability Model for Aerial Survey research project from 2008-2017 (Griffin et al., 2013). WDFW is not currently engaged in research in the North Rainier herd planning area. PTI has arranged a meeting with WDFW and Joint Base Lewis McChord for Sept 2024 to discuss elk surveys, management, and research for the southwestern portion of the NREH.

Management concerns

Currently, management decisions are based largely on hunter harvest and effort within the herd area. WDFW is contemplating a strategy to better understand herd size, population demographics, distribution, and trends, but implementation will depend on funding. The work of MIT and PTI biologists and others has been helpful in this regard, but a more comprehensive assessment is needed. Elk conflicts with commercial agricultural production and other areas remain a concern in portions of the herd area.

Treponeme-associated hoof disease

Treponeme-associated hoof disease (TAHD or “elk hoof disease”) in elk results in abnormal hoof growth, cavitating sole ulcers, and, in severe cases, eventual sloughing of the hoof capsule. Elk with severe infections of TAHD often have a limping gait and reduced body condition. Although the exact timing and location of when elk hoof disease began affecting elk is not well understood, reports of infected elk began increasing around 2008. Reports of elk hoof disease are concentrated in southwest Washington, and hunters regularly see and sometimes harvest elk with the disease. At times, observers have reported many individuals in a group limping and showing signs of hoof disease, which has been noted in all age and sex classes. In the NREH, TAHD has been lab-confirmed from samples collected in all GMUs except GMU 490, although this area has reports of limping elk. Washington State University and The Department are collaborating to better understand what factors contribute to the transmission and spread of the disease. To learn more about the Department’s efforts associated with investigating TAHD, please visit the Department’s hoof disease webpage at https://wdfw.wa.gov/species-habitats/diseases/elk-hoof.

Management conclusions

Available data indicates the North Rainier elk herd is stable or increasing in most areas and meets the Department’s management objective for bull escapement throughout the herd area. The Department will continue efforts to limit the expansion of this herd in areas with high potential for conflict (e.g., agricultural areas, urban interface, etc.) and promote population growth in areas that provide hunting and recreational viewing opportunities. In addition, limited-entry permit hunts offered in GMUs 485 and 653 are some of Washington’s most popular because of the opportunity to harvest and view mature bulls coupled with high success rates. As such, the Department will continue to manage harvest opportunities in these GMUs through special permits. The Department will also explore opportunities for additional harvest in GMU 652 outside the Orting Valley to reduce high damage occurring within the valley.

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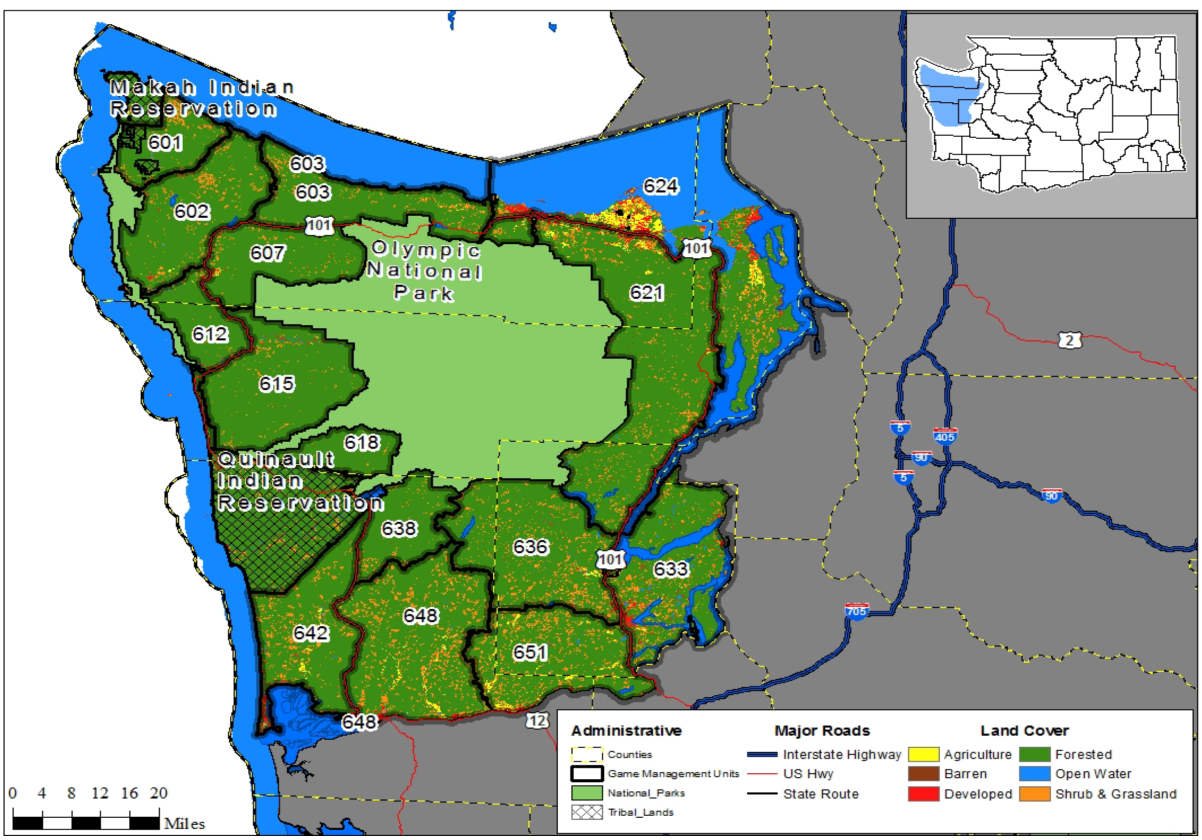
Olympic Elk Herd

Bryan Murphie, Wildlife Biologist

Introduction

The Olympic elk herd area is located on the Olympic Peninsula, which consists of 14 GMUs: 601 (Hoko), 602 (Dickey), 603 (Pysht), 607 (Sol Duc), 612 (Goodman), 615 (Clearwater), 618 (Matheny), 621 (Olympic), 624 (Coyle), 633 (Mason), 636 (Skokomish), 638 (Quinault Ridge), 642 (Copalis), 648 (Wynoochee), and 651 (Satsop) (Figure 1). Much of the land utilized by elk in this area is in public ownership. Federal lands include over 922,000 acres in the Olympic National Park (ONP), consisting of the core of the Olympic Mountains proper, and portions of coastal areas along the Pacific coast. Olympic National Forest (ONF) lands adjacent to ONP include an additional 643,000 acres. The State of Washington Department of Natural Resources (DNR) manages 368,000 acres of forest lands in the herd area, of which the 168,000-acre Clearwater Block is the largest. Tribal Reservation lands encompass over 255,000 acres, the largest being 208,000 acres in the Quinault Indian Nation Reservation. The remainder of the land is in private residential, agriculture, or industrial timber company lands. Most elk hunting occurs on ONF, DNR, and private industrial timber company lands.

Figure 1. The Olympic elk herd area.



Dominant land use cover types within the 14 game management units that comprise the Olympic elk herd area.

Management guidelines and objectives

The Olympic Elk Herd Plan identifies a population objective of 11,350 elk outside Olympic National Park (WDFW, 2004). However, that objective is likely to change when the plan is updated. The Department of Fish and Wildlife (WDFW) has not identified a formalized monitoring strategy to estimate elk abundance or composition throughout the herd area. Consequently, WDFW generally manages for stable to increasing elk populations while providing for multiple uses, including recreational, educational, and aesthetic, as well as a sustainable annual harvest. Additional objectives include managing for a pre-season population of 15-35 bulls:100 cows and a post-hunt population of 12-20 bulls:100 cows (WDFW, 2014).

While WDFW has defined objectives relating to herd abundance and acceptable ranges for bull:cow ratios, there are no established objectives for calf:cow ratios because most factors that affect calf survival can rarely be addressed through short-term management activities. In addition, WDFW primarily collects age-class (e.g., juvenile and adult) ratios to assess the likelihood for a herd to grow, remain stable, or decline. However, whether an estimated recruitment rate would result in a change in abundance also depends on the survival rate of adult female elk. This makes it difficult to identify the minimum calf:cow ratio needed to prevent population declines (Caughley, 1974; Skalski et al., 2005). Nonetheless, survival of adult female elk in managed populations is typically > 0.85 and is often relatively constant (Raithel et al., 2007; Brodie et al., 2013), which means elk abundance usually has the potential to increase if calf:cow ratios in spring are ≥ 30 calves:100 cows. Thus, even though the Department does not establish management objectives for calf:cow ratios, WDFW prefers to see post-hunt ratios that are ≥ 30 calves:100 cows and becomes concerned when they are below 25 calves:100 cows in consecutive years.

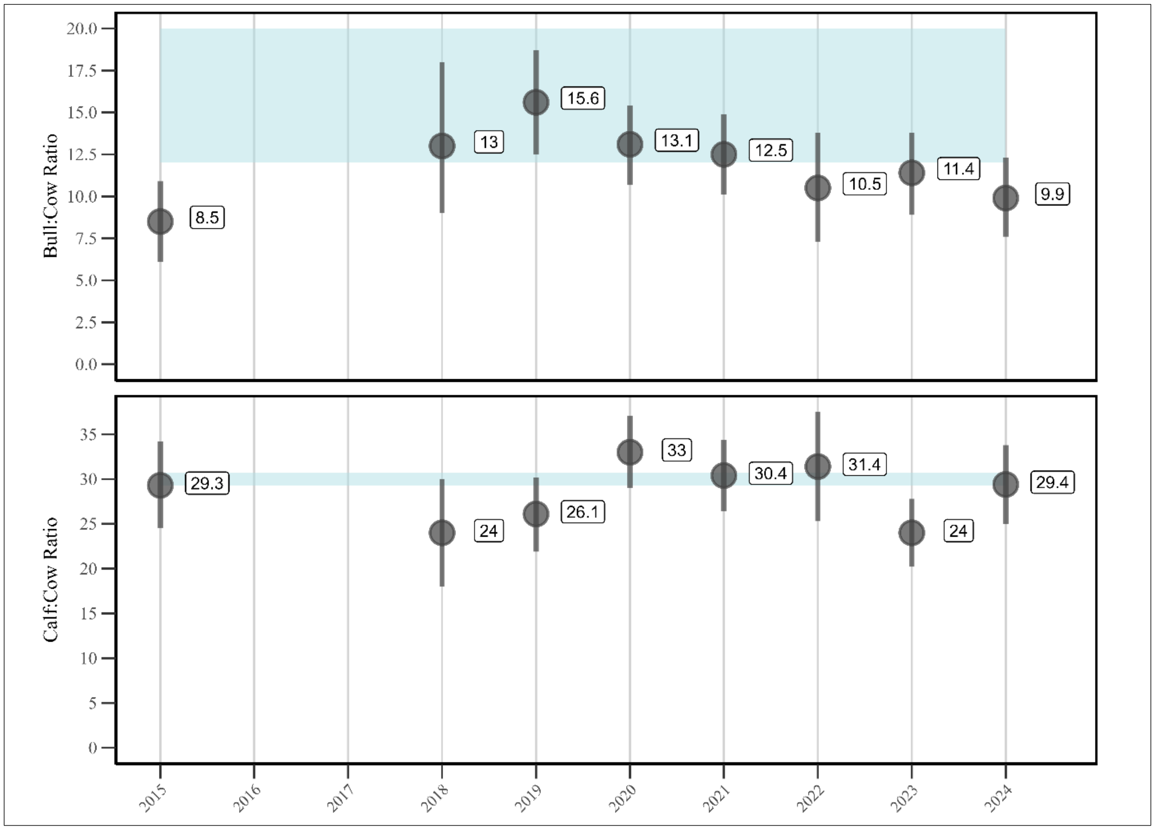
WDFW primarily manages for a stable to increasing elk population through hunting regulations, and thus, retains a relatively conservative state elk harvest strategy in the Olympic elk herd area through a 3-point minimum bull restriction and limited cow harvest. Most, but not all, antlerless hunting opportunities are related to reducing human-elk conflict.

Population surveys

WDFW and several Treaty Tribes that have hunting rights on the Olympic Peninsula periodically conduct aerial or ground-based composition surveys in the Olympic elk herd area. Formalized estimators (e.g., sightability models, mark-resight, distance sampling, etc.) to correct observed data for detection probabilities that vary among age and sex classes are generally not applied. Even though those data are likely biased, and managers must make conservative inferences, it still provides some insight into the current composition of this herd.

Estimates of pre-hunt bull:cow ratios have not been collected in recent years. Instead, WDFW surveys during the post-hunt period of March and April. Estimates of post-hunt bull:cow ratios were within management objectives from 2018-2023 but were lower than objectives in 2022-2024 (Figure 2). Although often reported as below the management objective of 12-20 bulls:100 cows, these ratios are thought to be biased low, as post-hunt surveys are conducted in late winter with effort focused on the main cow and calf groups. This is also a period when most mature bulls travel independently or in small bachelor groups, making them less detectable during survey flights. Estimates of post-hunt calf:cow ratios range from 24 to 33 per 100 cows (Figure 2).

Figure 2. Survey estimates in the Olympic elk herd area.



Estimates and 95% confidence intervals of post-hunt bull:cow and calf:cow ratios in the Olympic elk herd from spring 2015 to 2024, excluding 2016-2017 due to limited surveys. Shaded blue boxes indicate WDFW's target of 12-20 bulls per 100 cows for herd stability or growth.

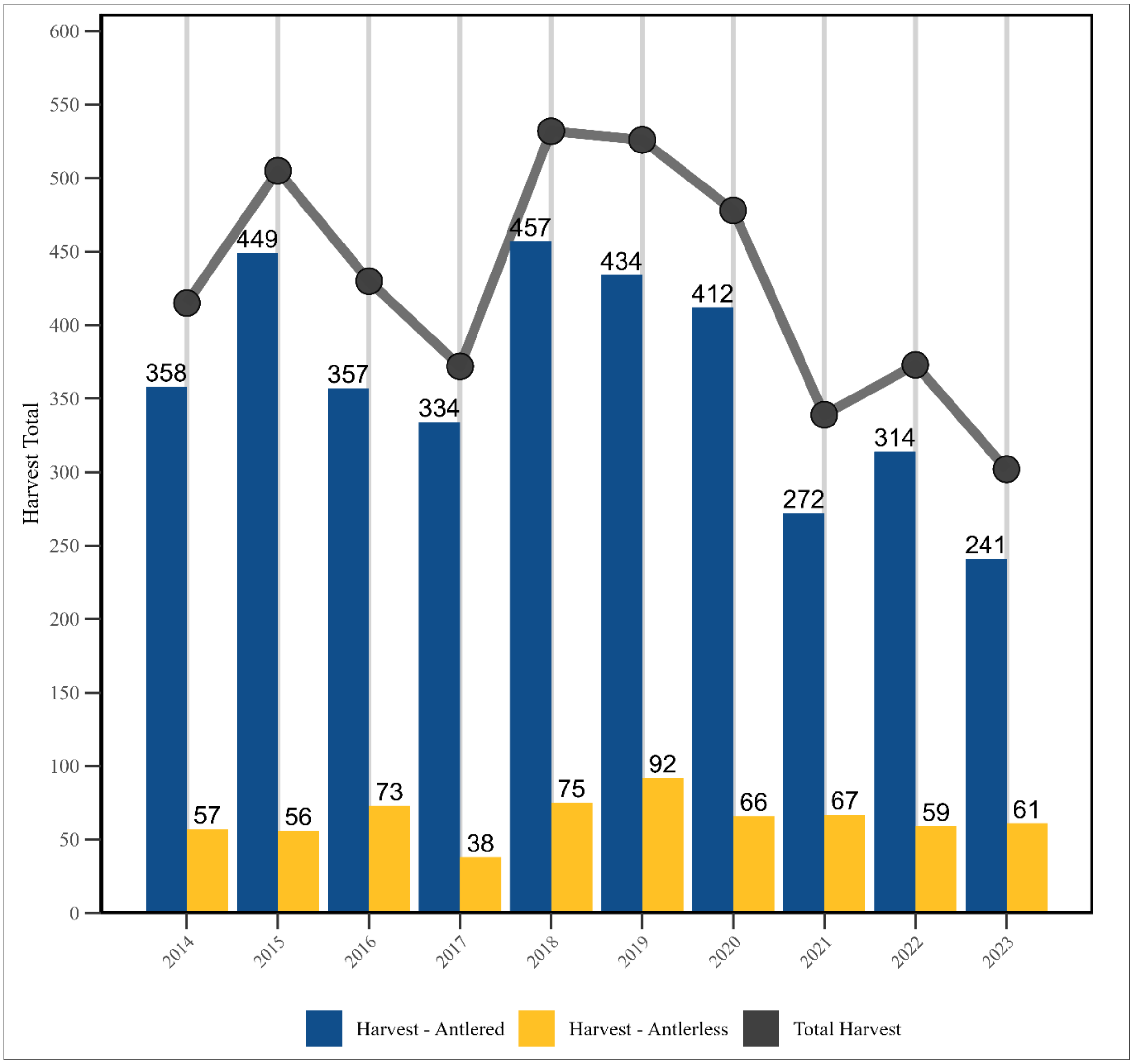
Hunting seasons and recreational harvest

The legal elk for most general season hunts in the Olympic elk herd area are 3-point minimum, branch-antlered bulls. Harvest opportunities for antlerless elk are offered during some general season archery hunts and through a special permit system. Antlerless harvest is usually targeted at areas where the Department's objective is to maintain low elk numbers.

Estimates of harvest during general seasons and total State harvest have averaged 247 and 285 elk per year, respectively, 2014-2023, while estimates of harvest, including tribal harvest, have averaged 424 elk per year, 2014-2023. Elk harvest has been declining in recent years (Figure 3). State hunting typically accounts for a greater percentage of the bull harvest in the Olympic elk herd area (Figure 4). In comparison, Tribal hunting usually accounts for a greater percentage of the cow harvest (Figure 4).

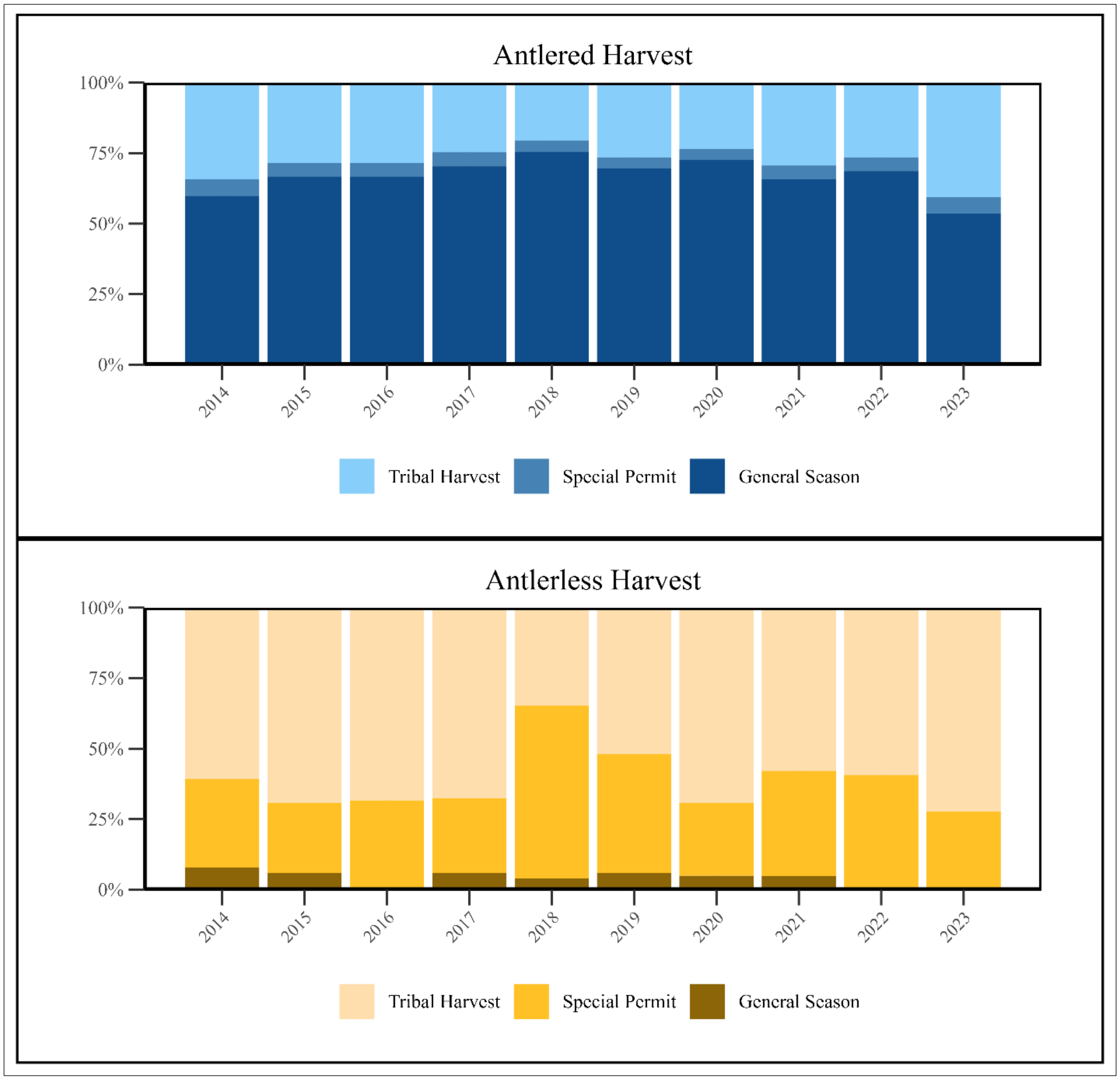
Hunter effort, reported as hunter days per kill, and hunter success is shown in Figure 5. Elk harvest in Figure 3 includes reported Tribal game harvest data, which are compiled and published annually by the Northwest Indian Fisheries Commission (for data referred to in this document, see the NWIFC Big Game Harvest Reports for Western Washington Treaty Tribes; 2014-2023/24).

Figure 3. Elk harvest estimates in the Olympic elk herd area.



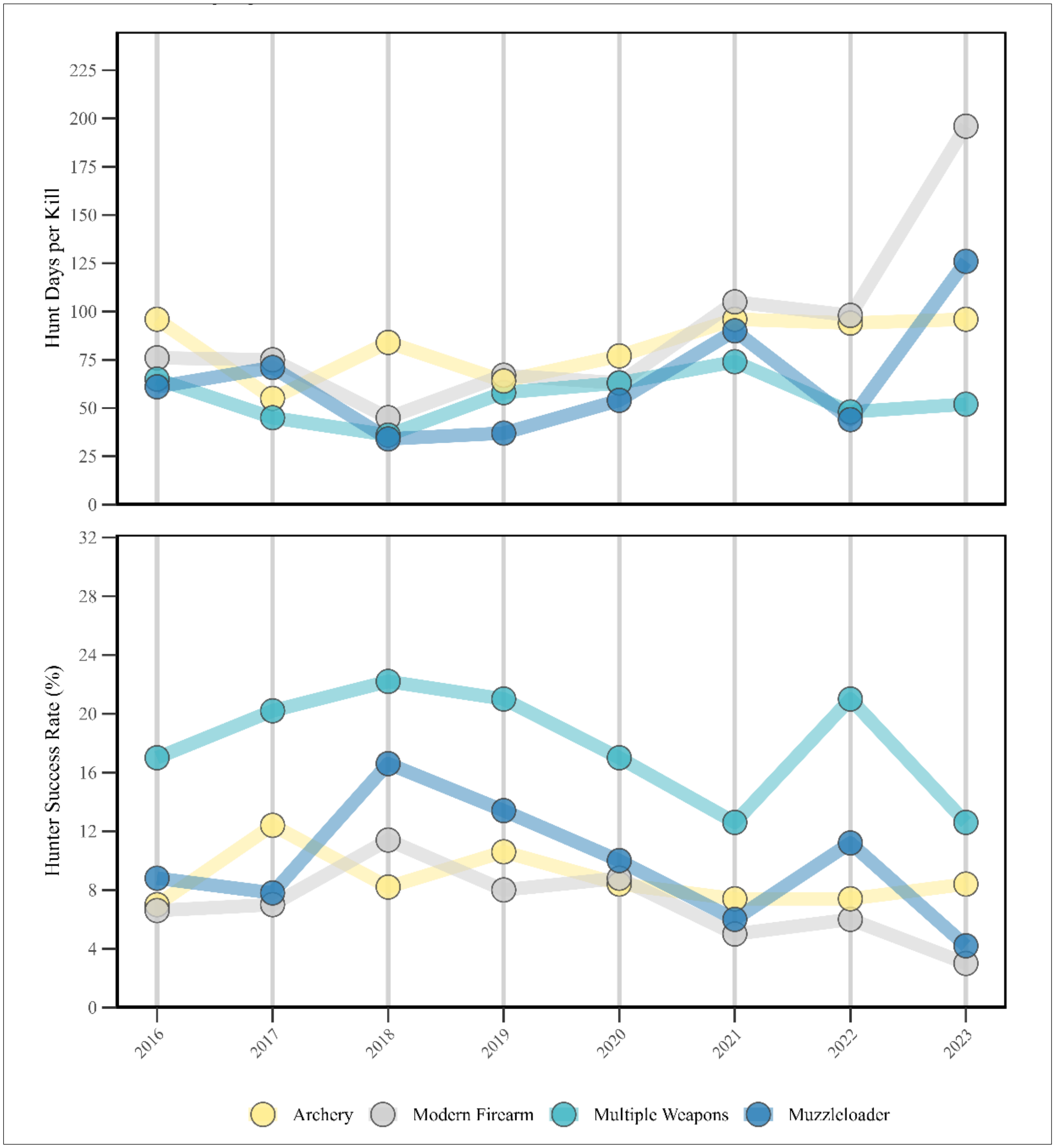
Estimated number of antlered and antlerless elk harvested in the Olympic elk herd area during recreational hunting seasons (general and permit opportunities combined) established by the Department and during established tribal seasons, 2014-2023. Harvest total includes tribal harvest, where applicable, as reported by the Northwest Indian Fisheries Commission (NWIFC). Harvest estimates do not include elk harvested from damage permits (see *Human-Wildlife Interaction* section).

Figure 4. Antlered and antlerless harvest in the Olympic elk herd area.



Estimated percentage of recreational antlered harvest (top) and antlerless harvest (bottom) in the Olympic elk herd area that occurred during general and permit seasons, as well as tribal seasons from 2014 to 2023.

Figure 5. Hunter effort-per-kill and success rate.



Estimated number hunter days spent pursuing elk per kill and hunter success rate in the Olympic elk herd area during recreational seasons that provided general over-the-counter opportunities, 2016-2023, by weapon type.

Survival and mortality

There have been no comprehensive studies to estimate the survival of elk throughout the Olympic elk herd area during a specific period; however, the Department and several Treaty Tribes have conducted numerous projects in specific GMUs. Cow survival is generally higher than 80% (Smith et al., 1994;

WDFW, unpublished data; R. McCoy, Makah Tribe, unpublished data). Bull survival is 23% (Smith et al., 1994) and 29% (R. McCoy, Makah Tribe, unpublished data). Calf survival ranged from 27-40% in studies conducted in GMUs 601 and 602 by the Makah Tribe (S. Murphie, unpublished data).

Causes of mortality among Olympic elk include nutritional stress, predation, legal harvest, poaching, and a variety of other natural and human-related causes (vehicle collision, for example). Malnutrition and predation are the most common factors associated with the mortality of cows and calves (Smith et al., 1994; WDFW, unpublished data; S. Murphie, Makah Tribe, unpublished data). Hunter harvest is the most common cause of mortality among bulls (Smith et al., 1994; R. McCoy, Makah Tribe, unpublished data). In addition, in one study, poaching-related mortality accounted for 2.5% among bulls and cows in the Olympic herd (Smith et al., 1994).

Treponeme-associated hoof disease (TAHD) is present in the Olympic elk herd area, primarily in the southern portion of the herd area. Although not specifically studied in this area, survival of elk in the Saint Helen’s herd was lower among elk with TAHD than those not similarly afflicted (WDFW unpublished data). This is likely the case for Olympic elk, as well.

Habitat

Harrington and Dyrness (1973 and 1988) provide a thorough description of the natural characteristics of the diverse array of habitats found in the OEH range, which extends from the coastal and inland marine ecosystems at sea level through a series of forested zones culminating at elevations well above 7,000 feet in the Olympic Mountains. At the higher elevations within ONP and USFS designated wilderness areas, elk have access to abundant, largely undisturbed habitat, including old-growth forests, river valleys, and alpine meadows (Franklin and Dyrness, 1973 and 1988; Henderson et al., 1989). Following robust timber harvest in the 1970s, management of USFS lands at mid-elevations within the herd area promoted the creation of late-seral forests. As a result, much of the USFS land on the Olympic Peninsula, once highly productive for elk, entered a phase of declining elk forage value, which contributed to a reduction in elk numbers on the Olympic Peninsula following their peak in the 1980s (WDFW, 2004). Today, the application of variable-density forest thinning on USFS land opens closed-canopy forests and improves understory plant productivity, which is important to elk in many areas (Harrington et al., 2005; Mazza, 2009). Since 2005, Olympic National Forest has conducted commercial and pre-commercial thinning of more than 20,000 acres and nine projects specific to deer and elk forage, including invasive weed treatments, native plant seeding and planting, meadow restoration, and slash piling (B. Howell and K. Holtrop, personal communications).

Commercial timber harvest has substantially changed elk habitat at lower elevations, resulting in a patchwork of stand types and ages, each with varying degrees of value for elk (WDFW, 2004). Early seral stands, riparian zones, mature conifer, mixed forests, and remnant stands of old-growth provide the most value to elk, while stands with dense canopy cover, usually 20-40 years old, provide the least (Lopez-Perez, 2004). Burning, a once common practice that created improved forage conditions for elk following clear-cutting, has largely been replaced with herbicide spraying, which can delay or reduce plant growth for the first three years after clear-cutting (Ullapa, 2015). As such, the amount and condition of elk habitat are subject to change due to the timing and extent of forest management activities, at times entering a phase when conditions are favorable to elk and at other times conditions less favorable. Private pastureland, planted for other agricultural purposes, can also be an important component of elk habitat in many GMUs.

Forage quality and quantity affect the nutritional condition of elk (Cook, 2002) and have been identified as limiting factors affecting elk populations (Trainer, 1971; Starkey et al., 1982; Leslie et al., 1984). Inadequate forage, resulting in a lower nutritional condition, affects elk through poor body condition, repressing adult and calf survival, pregnancy rates, recruitment rates, and ultimately the ability of a population to grow (Trainer, 1971; Thorne, 1976; Cook, 2002; Cook et al., 2004). Inadequate nutrition can be limiting during any season; however, if good nutritional conditions exist during alternate seasons, animals may be able to compensate for periods of lower conditions (Cook et al., 2004). In western Washington and particularly on the Olympic Peninsula, poor forage quality or quantity may have contributed to declines in some areas (WDFW, 2004) and may be limiting productivity overall (Schwartz & Mitchell, 1945; Starkey et al., 1982; Jenkins & Starkey, 1991; Schroer et al., 1993; Jenkins & Starkey, 1996; Peek et al., 2001; Cook et al., 2014). In a comparison of elk nutritional condition and productivity, Cook et al. (2014) found that when compared to Roosevelt and Rocky Mountain elk elsewhere, coastal populations of Roosevelt elk, including the Olympic Peninsula, were subject to summer range conditions inadequate to support moderate to high body fat levels in the fall, resulting in lower pregnancy rates and calf recruitment.

Management objectives for WDFW lands in the OEH area are described in the Olympic (WDFW, 2006), North Olympic (WDFW, 2010), and South Puget Sound (WDFW, *2022*) Wildlife Area Management plans. About 2,034 acres of the Olympic Wildlife Area are managed to provide habitat for elk (WDFW, 2006). The Wynoochee Mitigation Unit of the Olympic Wildlife Area is owned by Tacoma Power but is managed by WDFW. It provides 1,030 acres of habitat to mitigate the inundation of the winter range following the construction of the Wynoochee Dam in 1976. This includes 250 acres of pasture planted to provide elk winter forage. To help reduce agricultural crop damage on adjacent private land and provide elk winter forage, the Olympic Wildlife Area also includes the 963-acre Olympic Unit and the 41-acre Anderson Homestead. Pastures on these wildlife area units are tilled, seeded, and fertilized routinely to provide forage for locally important elk groups. Although elk use occurs on Department lands elsewhere in the OEH range, management does not include specific activities associated with elk.

Climate

The Olympic Mountains and the Pacific Ocean strongly influence the climate of the herd area. Although drought-like conditions can occur during the summer, weather conditions over much of the Olympic elk herd area tend to be mild, wet, and temperate, with most precipitation falling as rain. The highest amounts of precipitation fall to the west of the Olympic Mountains, while the lowest amounts fall to the east. As points of reference, the average annual precipitation in Forks is 120 inches per year; in Sequim, it is 16 inches; and in Montesano, it is 80 inches (US Climate Center data). Persistent snow accumulations greater than 18 inches are enough to hinder elk movement and can reduce access to available forage (Parker et al., 1984; Poole & Mowat, 2005). Snow accumulations can be considerable at higher elevations in the Olympic Mountain range, often enough to trigger seasonal migrations to lower elevations (Houston et al., 1990; Schroer, 1986; WDFW, unpublished data). Snow accumulations are generally low and of short duration at lower elevations, averaging less than ten inches yearly (US Climate Center data). The weather conditions in summer and fall on the Olympic Peninsula have been warmer and drier than long-term normal conditions in recent years (US Climate Center data).

Human-wildlife interaction

Elk conflict in the Olympic elk herd area generally falls into two categories: public safety and property/crop damage. Public safety concerns occur where elk and urban development overlap and where elk routinely cross roadways or highways. Occasionally, both damage and public safety concerns overlap. Two of the most notable areas with overlapping concerns involve elk near the towns of Sequim and Forks. The Department employs Wildlife Conflict Specialists to work directly with landowners and communities to address human-elk conflicts using lethal and non-lethal activities, often through formal agreements termed Damage Prevention Cooperative Agreements (DPCAs). These activities intend to reduce damage, increase landowner tolerance of elk, or reduce risk to human safety by reducing the number of elk and the amount of time elk spend on these lands. Non-lethal activities involve hazing and fencing but may also include deploying traffic signs that warn drivers traveling through areas where elk routinely cross roadways. Lethal removals are conducted through permits issued to landowners, special permit hunts, or during general season hunts within a designated Elk Area. Master Hunter permits are used in areas and times designated by the Department to address elk damage. Similarly, a youth permit hunt was created in 2018, and Wildlife Conflict Specialists may also remove elk under an agency kill authority permit.

Management actions to address human-elk conflicts around Sequim began in the 1990s, as expanding urban development replaced historical or traditional elk ranges. At the same time, the Sequim elk group was growing. These actions included the use of electronic traffic warning signs triggered by radio collars worn by elk; habitat enhancement work to provide alternative range; a capture and relocation of 17 elk in 1995 (Nickelson et al., 2003); numerous hazing activities; landowner compensation for crop damage or loss; and the removal of elk. Many of these activities are still utilized today.

Similar situations are emerging in Forks and Joyce, WA. In 2018, an Elk Area was created around the town of Forks (Elk Area 6612, Forks). Forty antlerless elk permits were issued each year from 2018 to 2023, and 96 hunters reported hunting during this permit hunt, resulting in a harvest of 59 elk. In 2021, an elk area was created around the town of Joyce, and five antlerless permits were available in 2021, 2022, and 2023. Ten hunters reported hunting and harvesting a total of six elk.

The more common human-elk conflict situation in the Olympic elk herd area is related to damage to private agricultural lands and pastures, which can create significant costs for the landowner and WDFW. In 2023/24, 70 permits were issued to remove elk, and 33 elk were harvested. All were antlerless except four bulls were taken from GMU 624 near Sequim, WA (Table 1).

Table 1. The number of permits issued associated with conflict reduction activities and elk removed in 2023/24 for Game Management Units (GMU) in the Olympic elk herd area; all but 4 bulls taken from GMU 624 were antlerless elk.

GMU	Permits	Elk Removed
603	14	14
607	15	1
615	2	1
624	13	11
642	1	0
648	23	6
651	2	0
Total	**70**	**33**

Management concerns

The Olympic Elk Herd Plan (WDFW, 2004), which provides management objectives and guidance for monitoring, is currently being updated. A formalized monitoring strategy is under development as the herd plan is updated. Hunting harvest data and herd composition surveys, including information collected by the Olympic Peninsula Treaty Tribes, provide the basis for management decisions related to the Olympic elk herd. Monitoring during this interim period has increased to include additional GMUs, but better coverage is desired. Calf-to-cow ratios frequently at or below desired levels needed to increase the elk population remain a concern and support a conservative harvest strategy, particularly among antlerless elk. Treponeme-associated hoof disease (TAHD) spreading to new places in the Olympic elk herd area may present additional challenges related to managing this herd.

Management conclusions

Post-season (Spring) bull-to-cow ratio objectives are usually met. Calf-to-cow ratios are frequently at or below the desired levels needed to increase the elk population. Thus, conservative harvest strategies remain essential for managing this herd, although some areas with human-elk conflict may need a different approach.

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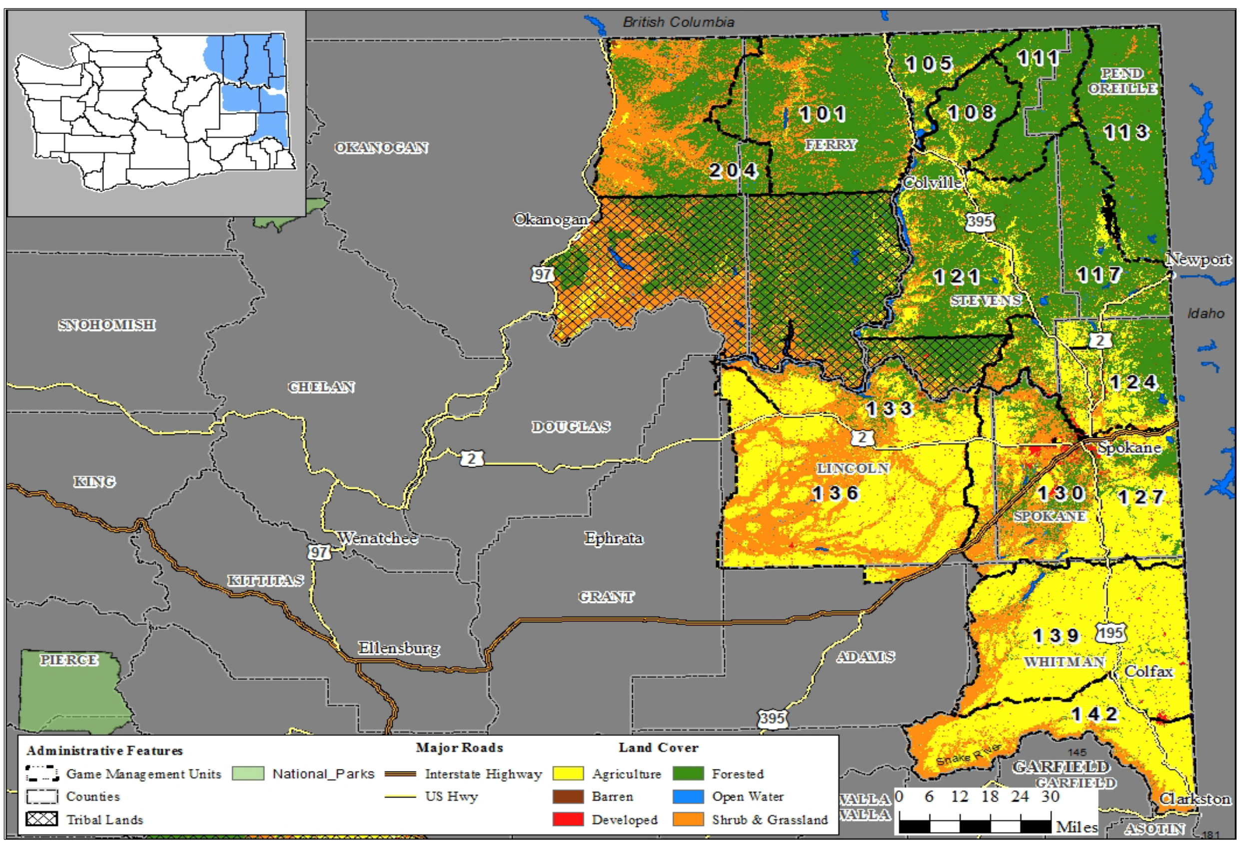
Selkirk Elk Herd

Carrie Lowe, Wildlife Biologist
Jeff Heinlen, Wildlife Biologist
Ben Turnock, Wildlife Biologist
Matt Brinkman, Wildlife Biologist
Healani Johnson, Wildlife Biologist

Introduction

The Selkirk elk herd is located in northeast Washington and includes the Pend Oreille and Spokane subherds. The Pend Oreille subherd consists of nine GMUs, including 101 (Sherman), 105 (Kelly Hill), 108 (Douglas), 111 (Aladdin), 113 (Selkirk), 117 (49 Degrees North), 121 (Huckleberry), 124 (Mount Spokane), and 204 (Okanogan East) (Figure 1). The Spokane subherd consists of six GMUs, including GMUs 127 (Mica Peak), 130 (Cheney), 133 (Roosevelt), 136 (Harrington), 139 (Steptoe), and 142 (Almota) (Figure 1).

Figure 1. The Selkirk elk herd area.



Dominant land use cover types within the 15 game management units that comprise the Selkirk elk herd area.

Management guidelines and objectives

The Department's objective is to increase elk abundance in the Pend Oreille subherd area to 1,500-2,500 elk and to maintain 1,000-1,500 elk in the Spokane subherd area (WDFW, 2014a). Additional objectives include maintaining populations with a pre-hunt bull:cow ratio of 15-35 bulls:100 cows or post-hunt bull:cow ratio of 12-20 bulls:100 cows (WDFW, 2014a) and maintaining an annual survival rate of 0.50 for bulls when bull mortality is monitored (WDFW, 2014b).

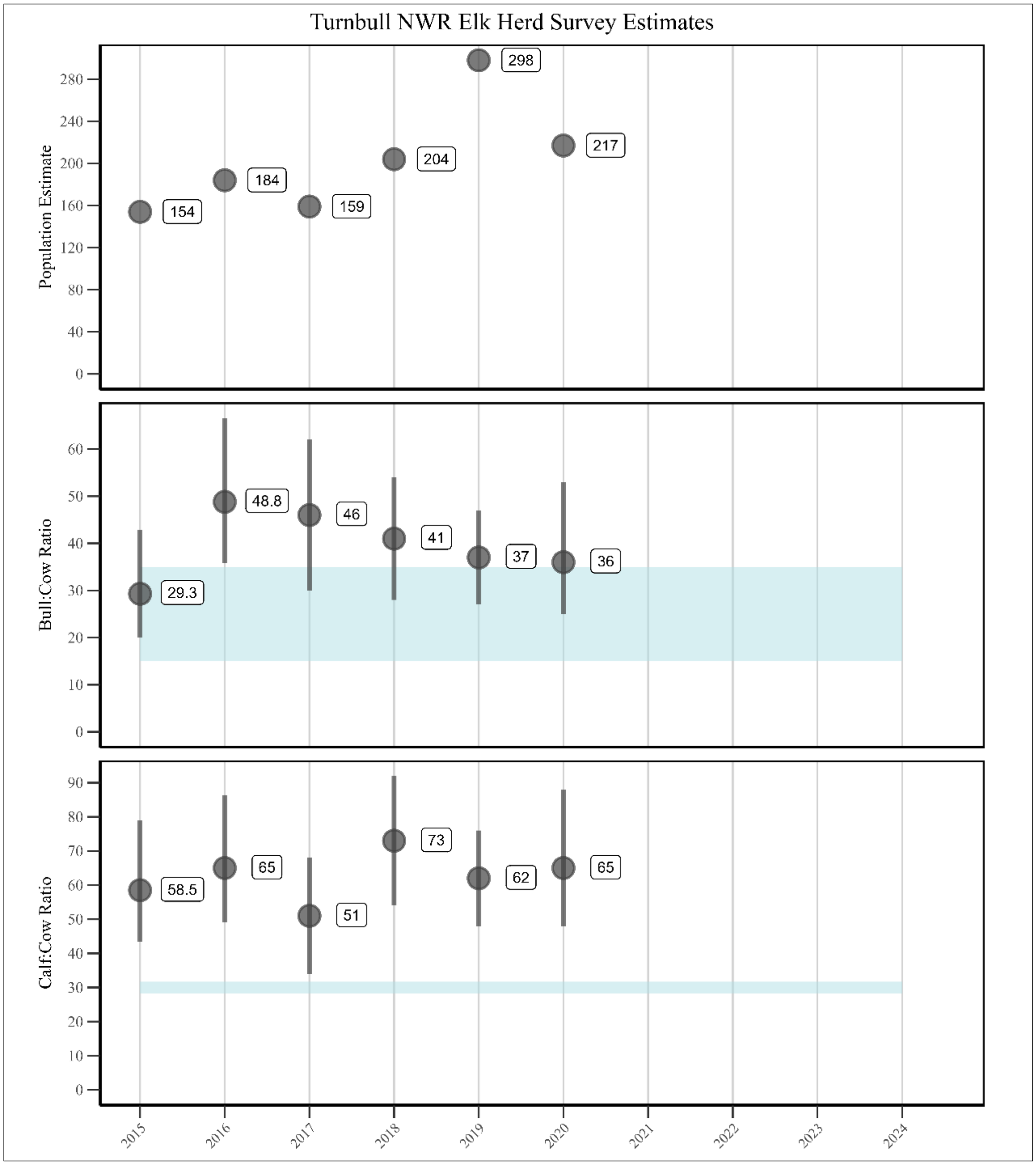
Population surveys

Habitat and terrain within the Pend Oreille subherd area present a sampling environment that is not conducive for typical aerial composition surveys because the dense and largely unbroken forests impede the ability of observers to detect elk. Consequently, the Department does not currently conduct widespread surveys to monitor the Pend Oreille subherd.

Since the winter of 2017/18, the Department has used radio collars deployed on cow elk within GMUs 117 and 121 to conduct helicopter surveys of groups with collared elk and record calf-to-cow ratios. Biologists counted 414 elk in 2018, resulting in an observed calf:cow ratio of 30 calves per 100 cows. During the second year of flights, WDFW biologists counted 419 elk and an observed calf:cow ratio of 22 calves per 100 cows. WDFW conducted no aerial surveys in 2020 because of COVID-19. In 2021, the Spokane Tribe conducted an aerial survey in March and counted 642 elk with a calf:cow ratio of 19 calves per 100 cows. In 2022, WDFW conducted a final survey of GPS-collared cow elk as part of this study and counted 385 total elk with an observed calf:cow ratio of 37 calves per 100 cows. After this effort, too few collars were reliably transmitting to be worth the aerial survey effort; therefore, no elk surveys were conducted in 2023 in the Pend Oreille subherd.

The Department collaborates with the U.S. Fish and Wildlife Service (USFWS) to conduct pre-hunt aerial composition surveys on the Turnbull National Wildlife Refuge (TNWR), located in the Spokane subherd area. However, these surveys only include a small portion of the Spokane subherd and, therefore, only represent part of this subherd. The number of elk observed during these surveys since 2006 has ranged from 154 to 460 elk and varies annually (Figure 2). After 2020, surveys were switched from annual to once every three to five years. The decline observed in this population from 2010 to 2018 results from a concerted effort by WDFW and TNWR to reduce the local population due to elk suppression of aspen regeneration on the refuge. This reduction was accomplished through limited-entry antlerless hunts on TNWR that resulted in direct mortalities and moving animals out of the survey area. The increase observed in the past three years is likely a result of elk figuring out the locations on and off TNWR where hunting is not allowed. Estimated calf:cow ratios have been relatively stable to increasing (Figure 2), while estimated bull:cow ratios have shown more variability but have been consistently within or above the management objective of 15-35 bulls:100 cows (Figure 2).

Figure 2. Survey estimates for elk on the Turnbull National Wildlife Refuge.

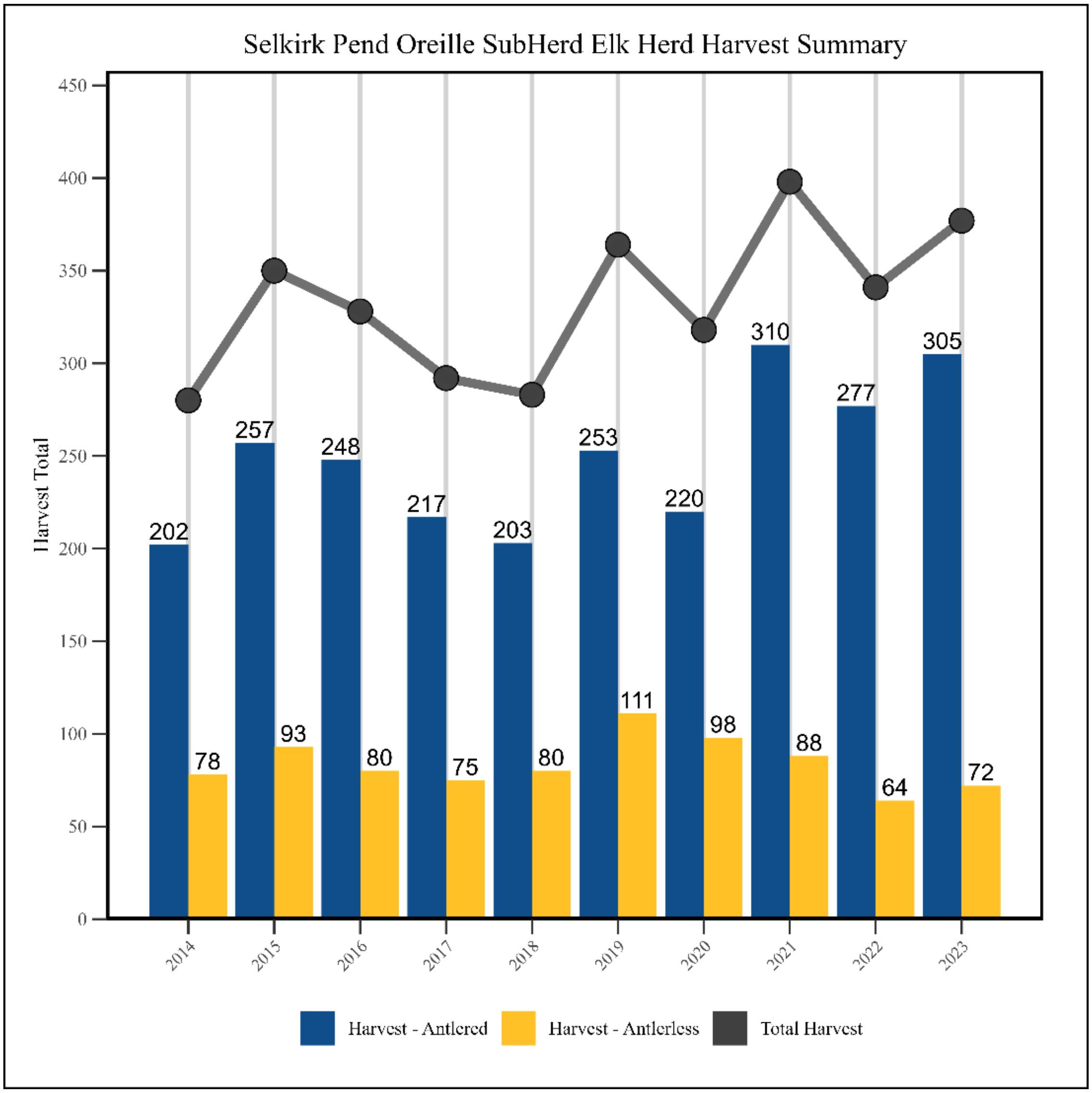


Estimates and associated 90% confidence intervals for the number of elk observed during aerial composition surveys in autumn on the Turnbull National Wildlife Refuge, autumn 2015-2024. No surveys were conducted in 2021, 2022, or 2023. The population estimate is the number of elk observed; No surveys were conducted in 2021, 2022 or 2023. Shaded blue boxes represent WDFW's management objectives which are to promote herd stability or growth.

Hunting seasons and recreational harvest

Most general season harvest opportunities in the Pend-Oreille subherd area are for any bull. Most opportunities to harvest antlerless elk are limited, special permit opportunities. However, opportunities to harvest antlerless elk occur throughout the subherd area during general archery seasons and for all weapon types in GMU 124, where the Department's objective is to maintain elk numbers within landowner tolerance.

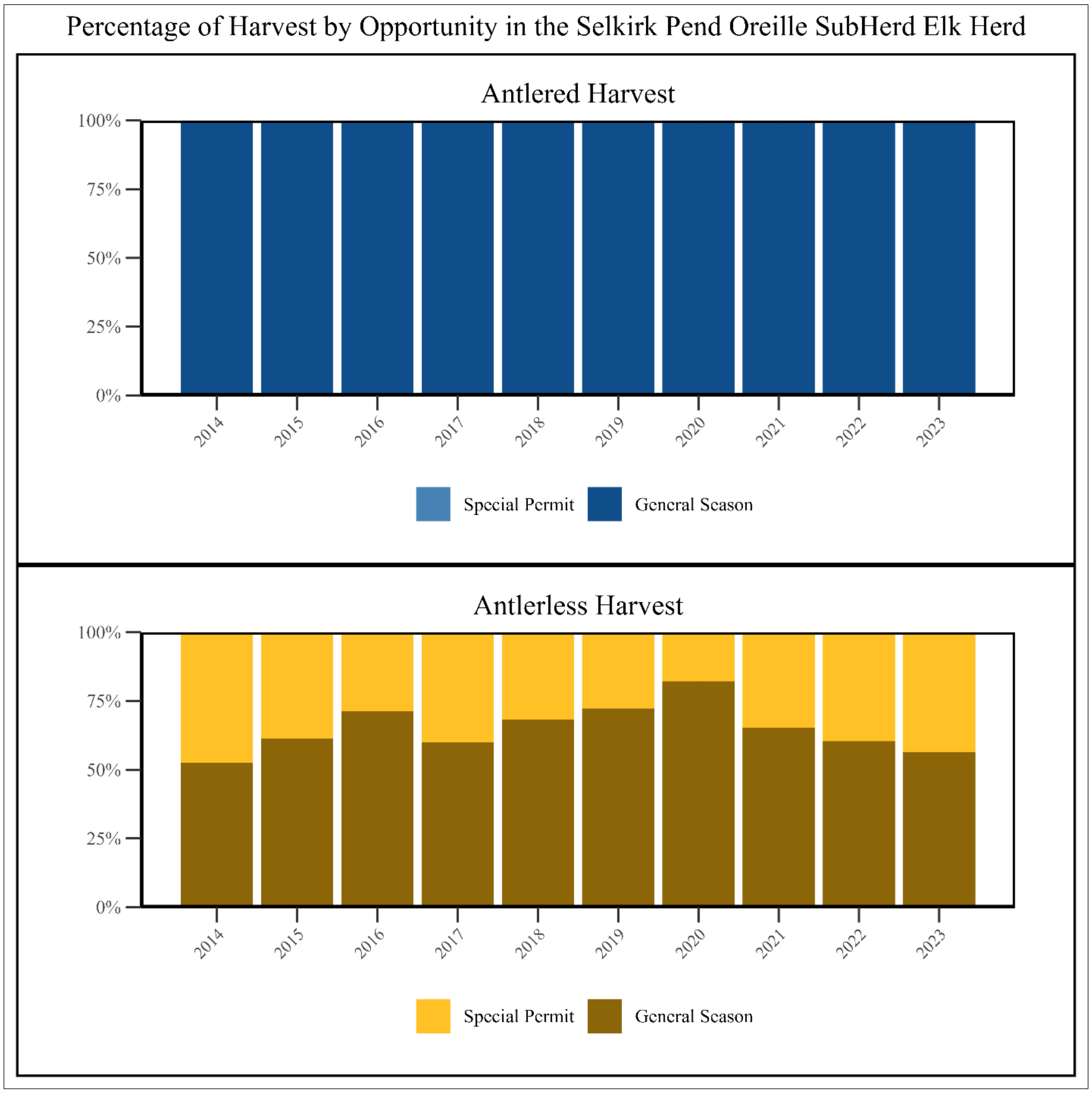
Figure 3. Elk harvested in the Pend-Oreille subherd area.



Estimated number of antlered and antlerless elk harvested in the Pend-Oreille subherd area during recreational hunting seasons (general and permit opportunities combined) established by the Department, 2014-2023. Estimates do not include elk harvested in association with damage permits (see Human-Wildlife Interaction below) or harvest that occurred during established Tribal seasons because that data is currently not available.

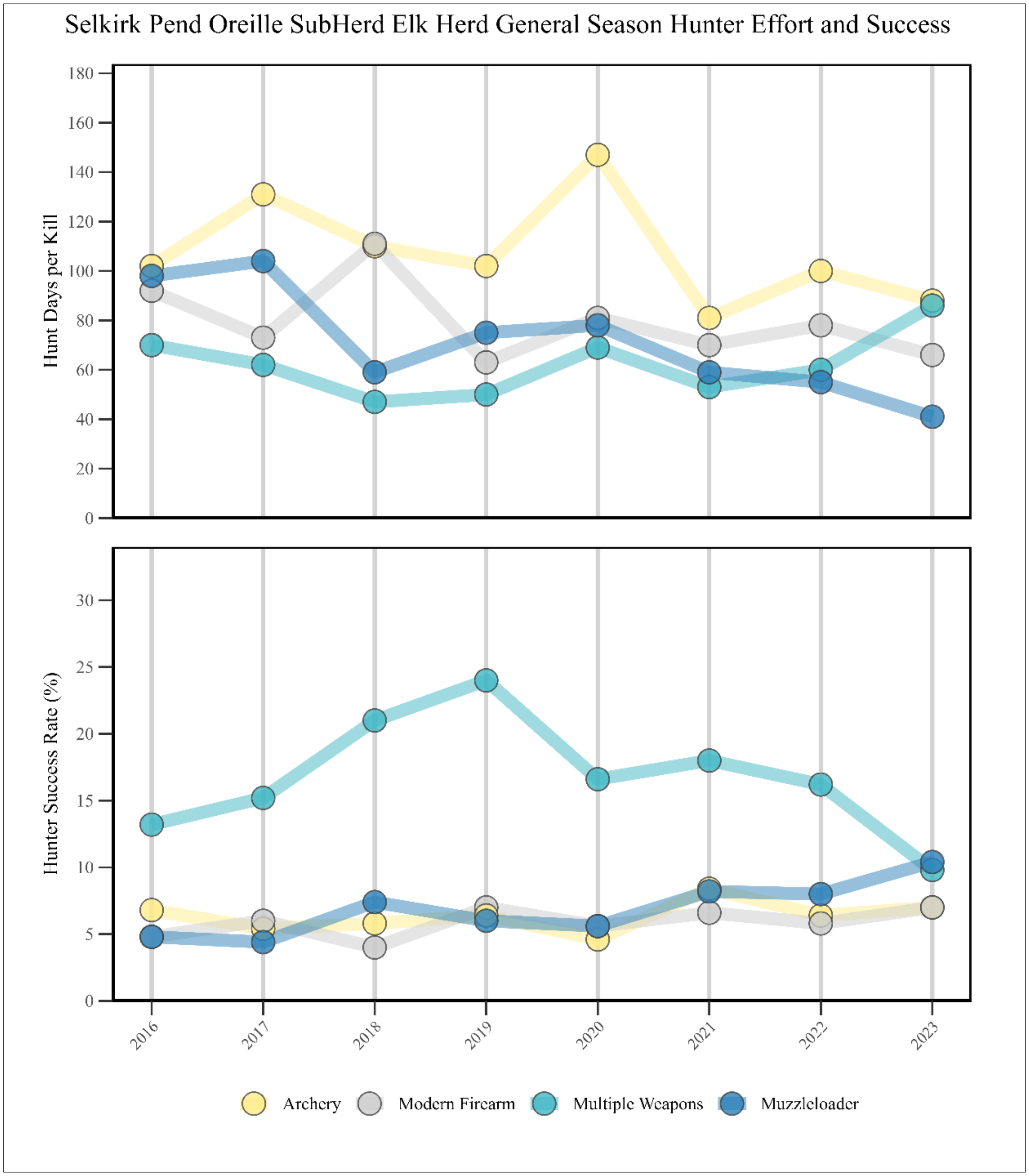
Estimates of total harvest (general and permit opportunities combined) within the Pend Oreille subherd have averaged 325 elk between 2014-2023 (Figure 3). All bull harvests and most antlerless harvests occur during general seasons (Figure 4). Hunter's effort and success have varied annually within the subherd since 2014 (Figure 5).

Figure 4. Percentage of antlered harvest and antlerless harvest.



Estimated percentage of recreational antlered harvest (top) and antlerless harvest (bottom) in the Pend-Oreille subherd area that occurred during general and permit seasons, 2014-2023.

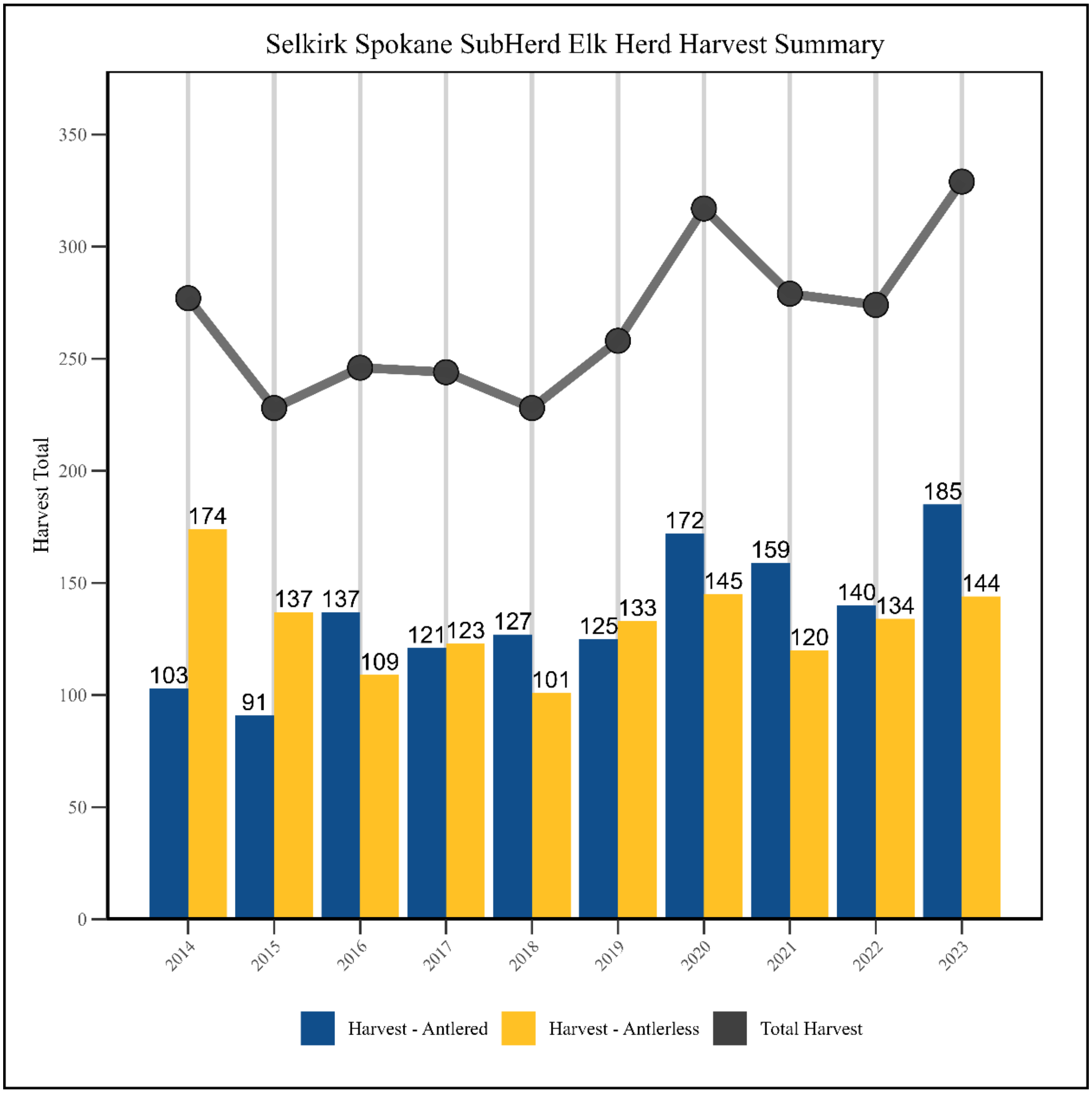
Figure 5. Hunter effort and success rate in the Selkirk Pend Oreille subherd.



Estimated number of days hunters spent pursuing elk per kill and hunter success rate in the Pend-Oreille subherd area during recreational seasons that provided general over-the-counter opportunities, 2016-2023.

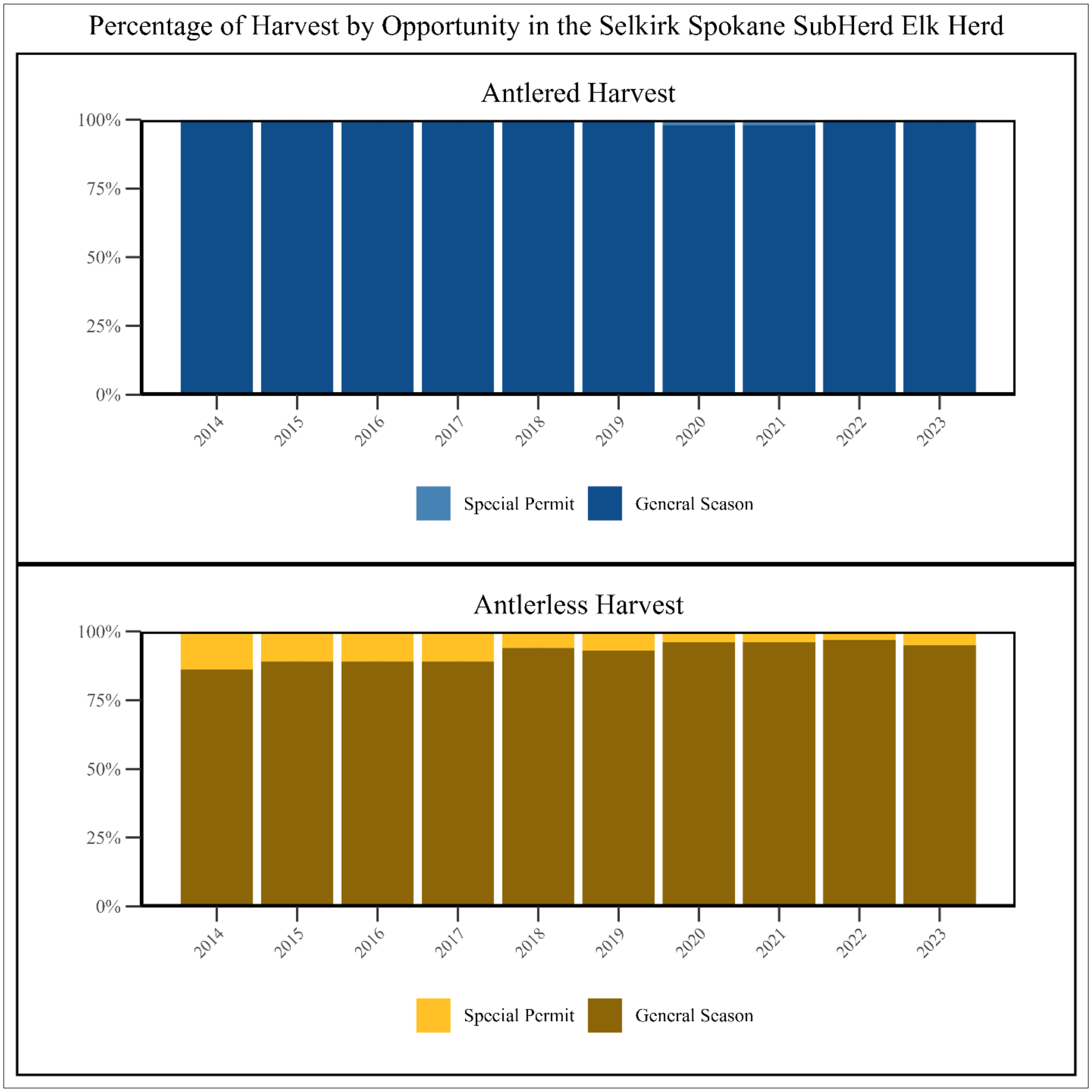
The Department allows the harvest of any elk during all general seasons in the Spokane subherd area and collaborates with the USFWS to implement special permit harvest opportunities on TNWR. Harvest during general seasons and total harvest in the Spokane subherd area averaged 259 and 268 elk, respectively, over the past ten years (Figure 6). In the Spokane subherd, most elk are harvested during general seasons (Figure 7). Harvest estimates (Figure 6), hunter effort (Figure 8), and CPUE (Figure 8) vary annually in this subherd. Much of this variation reflects access to private lands and the patchy distribution of elk rather than true variation in the elk population.

Figure 6. Elk harvested in the Selkirk Spokane subherd area.



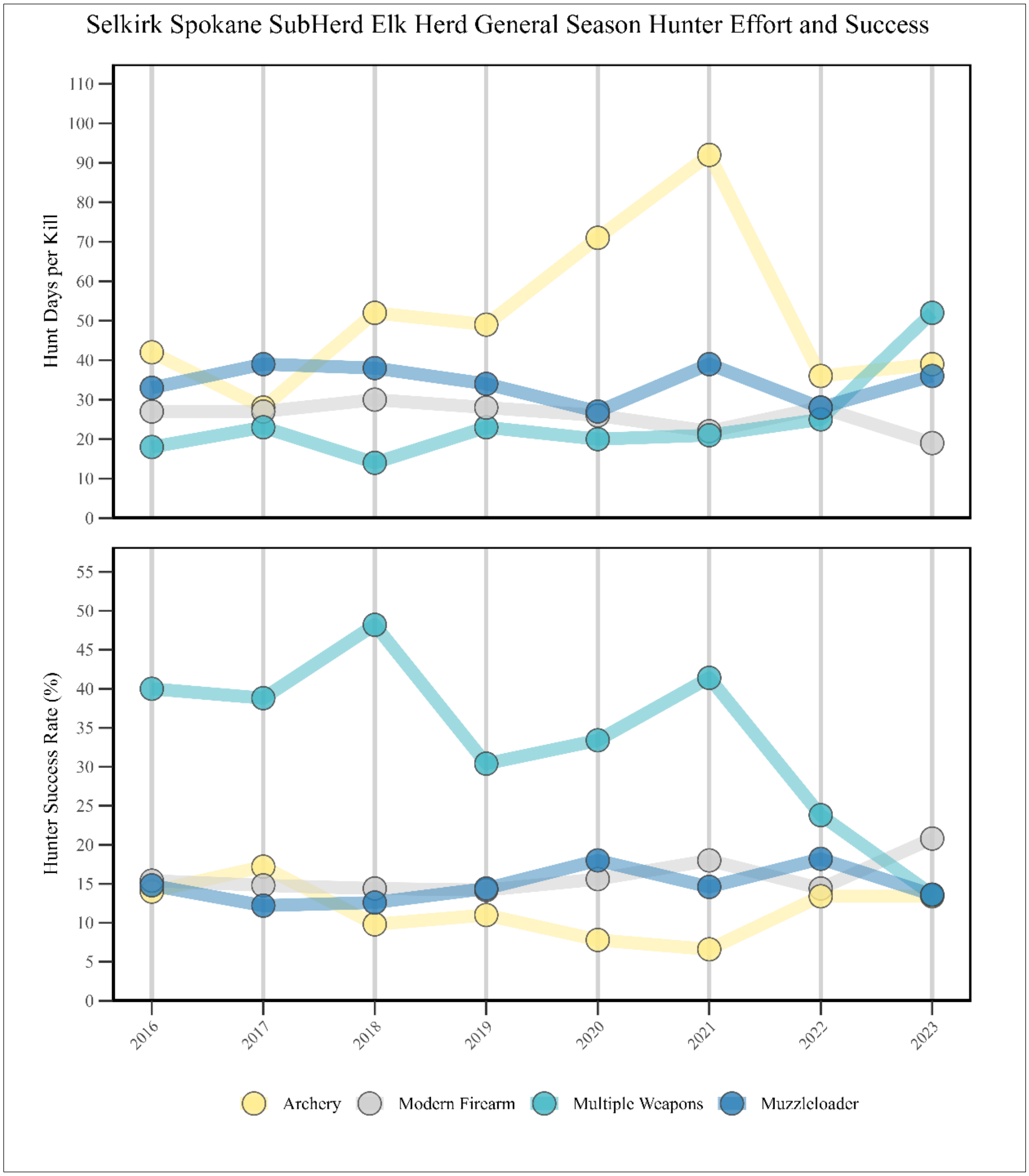
Estimated number of antlered and antlerless elk harvested in the Spokane subherd area during recreational hunting seasons (general and permit opportunities combined) established by the Department, 2014-2023. Estimates do not include elk harvested in association with damage permits (see Human-Wildlife Interaction below) or harvest that occurred during established Tribal seasons because that data is currently not available.

Figure 7. Percentage of antlered and antlerless harvest.



Estimated percentage of recreational antlered harvest (top) and antlerless harvest (bottom) in the Spokane subherd area that occurred during general and permit seasons, 2014-2023.

Figure 8. Hunter effort and success rate.



Estimated number of days hunters spent pursuing elk per kill and hunter success rate in the Spokane subherd area during recreational seasons that provided general over-the-counter opportunities, 2016-2023, by weapon type.

Survival and mortality

Common predators throughout the Pend Oreille subherd area include black bears, cougars, and gray wolves. Initial results from a Department research project (WDFW/UW Predator-Prey Project) indicate human-caused mortality is the leading cause of mortality for cow elk within the Pend Oreille subherd.

Black bears and cougars also occur throughout the Spokane subherd area. Habitat conditions and hunter harvest suggest that bear and cougar numbers are likely higher north of the Spokane River in the Pend Oreille subherd area than in the Spokane subherd area (WDFW, 2014a). Most cougar and black bear populations are managed to maintain a stable population. At the time of this writing, there were no documented gray wolf packs in the Spokane subherd area (WDFW et al., 2023).

Although the Department has never documented any increased mortality events, severe winter events do occur within the Pend Oreille and Spokane subherd areas and likely have the potential to reduce the overwinter survival of elk. In addition, extreme drought conditions that can persist through summer and fall are becoming more frequent, potentially reducing the availability of high-quality forages that elk rely on to accrue adequate fat stores for winter. Extreme conditions can affect adult survival directly but are more likely to have a population impact via reduced calf recruitment.

Obtaining elk survival estimates and causes of mortality for the Pend Oreille subherd was one of the goals of the predator-prey project. Please refer to the Research section of this report for results. There have been no comprehensive efforts to monitor the survival of elk in the Spokane subherd area.

Habitat

Timber harvest is common on state forest lands and even more intensive on private lands. Timber harvest is limited in federal forests. Logging potentially benefits the Pend Oreille subherd by increasing the amount of early seral habitats. In addition, the Colville National Forest, with grant money from the Rocky Mountain Elk Foundation (RMEF), has implemented habitat enhancement projects on approximately 58,000 acres to benefit elk. Most of the projects involved prescribed burning to enhance winter forage production, but there were also projects to restore aspen stands and reclaim roadbeds for improved habitat. The RMEF also funded a prescribed burn on 390 acres of elk habitat in the WDFW Chesaw Wildlife Area within the Pend Oreille subherd area. Large wildfires continue to occur within the Pend Oreille subherd area. These burns will likely benefit elk in the long term by increasing early seral habitats.

The conversion of native Palouse Prairie and shrub-steppe habitats in the Spokane subherd area to agricultural lands has and continues to reduce the amount of native elk habitat. However, irrigated alfalfa, hay fields, and legume crops can supply critical forage for elk during dry summers, when rancher's haystacks are common targets for elk during harder winters. In addition, the expansion of urban populations associated with the main Spokane metropolitan area continues to result in habitat degradation or loss in GMUs 127 and 130. Consequently, social tolerance within agricultural and suburban areas will likely limit the growth and expansion of the Spokane subherd.

Human-wildlife interaction

Most elk conflict is restricted to the lower-elevation agriculture lands in the Pend Oreille subherd. In 2023, 81 damage prevention and kill permits were issued to landowners experiencing agricultural damage within GMUs 101, 108, 113, 117, 121, and 204. The reported harvest was 38, and all permits issued were for antlerless elk only. WDFW modified hunting regulations for GMU 204 in 2016 to allow Early Archery while Late Muzzleloader season was switched to Early Muzzleloader to match the rest of the subherd area and to have hunting seasons during the time of year when most damage occurs.

Complaints of agricultural damage caused by elk in GMUs 124-142 have increased over the last several years; much of the damage has been associated with land converted to legume crops (e.g., garbanzo beans, peas, and lentils). WDFW Conflict Specialists work with landowners to address current damage and develop plans to avoid future damage. Hunters are one tool used to help address damage issues. Fifty-seven damage permits and 17 kill permits were issued to private landowners enrolled in the Damage Prevention Cooperative Agreement (DPCA) Program for elk in GMUs 124-142 in 2023—the reported harvest on those permits was 33 for damage permits and seven for kill permits. Occasionally, Master Hunter Damage Permits are also utilized to address damage outside of the general hunting season for landowners not enrolled in the DPCA Program. Harassment is another common tool used to reduce damage; elk are hazed by staff, Master Hunters, and local sportsman's groups. Additionally, WDFW loans landowners propane cannons to harass elk during critical times, and as budgets allow, WDFW has assisted in fencing projects.

Research

The Predator-Prey Project began in the winter of 2016/17 and seeks to quantify the effects of recolonizing wolf populations on co-occurring ungulate species and another top predator, the cougar. The two primary objectives of this project are to 1) examine the effects of wolf predation on ungulate demography and population growth and 2) investigate the impacts of recolonizing wolves on cougar population dynamics, space use, and foraging behavior. This project consists of two study areas: one in northeast Washington encompassing the majority of Stevens and Pend Oreille counties, where the wolf population is larger and more widely distributed, and the other in Okanogan County in north-central Washington, where the wolf population is smaller, and portions of suitable habitat remain unoccupied. There is increasing understanding that a multi-species approach to predator-prey studies is relevant to account for the various interactions among apex predators and their prey.

To implement a system-based approach, the Department and University of Washington project personnel attempted to capture and radio-collar at least 50 elk and 65 white-tailed deer in NE Washington, 100 mule deer in the Okanogan, and ten cougars in each study area. The project will also attempt to maintain at least two active GPS collars on wolves in each project study pack.

Ungulate capture efforts began in late January 2017 and continued during the winters of 2018 and 2019. Throughout the capture efforts, 63 elk were collared. During March 2018, 2019, and 2022, WDFW biologists conducted aerial composition surveys by locating cows collared as part of the project. See the survey section for these results.

"WDFW collared 63 adult female elk and 30 neonatal calves (16 female, 14 male). Deaths were investigated within 1–16 days (median = 2 days, SD = 5). Fourteen adult female elk died over the 53 months of the study (staggered entry Kaplan–Meier annual survival estimate of females 1–10 years old =

0.93, SE = 0.02; annual survival of females ≥10 years old = 0.88, SE = 0.06; Ganz, 2023). Adult female elk primarily (79%; 11/14) died from human causes (six legally harvested, three vehicle collisions, and two harvest wounding losses). Two adult female elk died from an unknown disease, and one adult female elk died of an unknown cause. Fifteen of 30 elk calves were confirmed to survive to 1 year old (annual survival = 0.63, SE = 0.09; Ganz, 2022); 11 died, and four had unknown outcomes due to dropped collars. Bear (n = 2) and cougar (n = 3) predation accounted for nearly half the confirmed calf mortalities. One calf died from entanglement in a fence, and five calves died of unknown causes. Of the five unknown causes of death, scientists suspected black bears were potentially responsible for three of the unclassified mortalities and coyotes may have caused one unclassified mortality. There were no confirmed cases of wolves killing collared elk during the study." Excerpt from Ganz et al. 2024.

Management concerns

Federal, state, and private land managers have implemented numerous road closures in recent years that have likely benefited this herd by reducing human disturbance in areas that provide quality elk habitat.

WDFW created the special permit hunt on TNWR to address habitat damage by elk on the Turnbull Refuge. Elk counts from annual aerial surveys in the Turnbull area have shown a considerable decline since the high observed in 2010. However, reported sightings and complaints of damage to agricultural crops in the area suggest this may be partially due to elk movement outside the Refuge in response to drought and hunting pressure rather than a true population decline. Counts increased in 2018 and 2019, as spotters found groups of elk in areas where they are infrequently observed in the survey area. In response to frequent reports of a large elk herd a few miles south of the survey area, new survey units were added there in 2020, and 141 additional elk were observed (not included in Figure 2 totals for 2020). It is unknown if or how elk from this group use TNWR, and the Department will continue to work with TNWR to assess the hunt and if it is accomplishing its objectives.

Management conclusions

According to harvest estimates and public perception, elk numbers seem stable or slightly increasing within the Pend Oreille subherd area. However, recent wildfires will likely improve habitat conditions for elk in the area, which may result in a population increase within this subherd.

According to harvest estimates and landowner perceptions, elk numbers seem to be increasing within the Spokane subherd area. Therefore, the Department will continue to allow harvest of any elk during the general season for all weapon types in the Spokane subherd range, as well as GMU 124 in the Pend Oreille subherd range, to help balance these elk populations with landowner tolerance.

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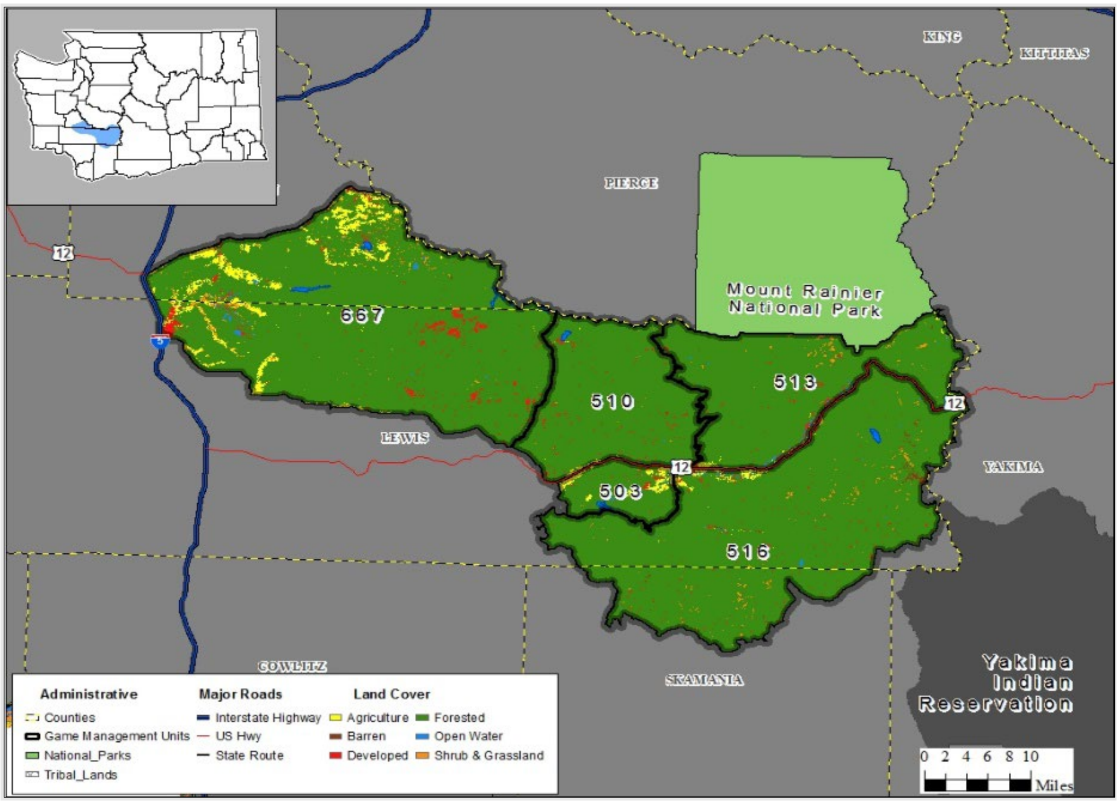
South Rainier Elk Herd

Eric Holman, Wildlife Biologist

Introduction

The South Rainier elk herd is in west-central Washington and consists of five GMUs: 503 (Randle), 510 (Stormking), 513 (South Rainier), 516 (Packwood), and 667 (Skookumchuck) (Figure 1).

Figure 1. The South Rainier elk herd area.



Dominant land use cover types within the five game management units that comprise the South Rainier elk herd area.

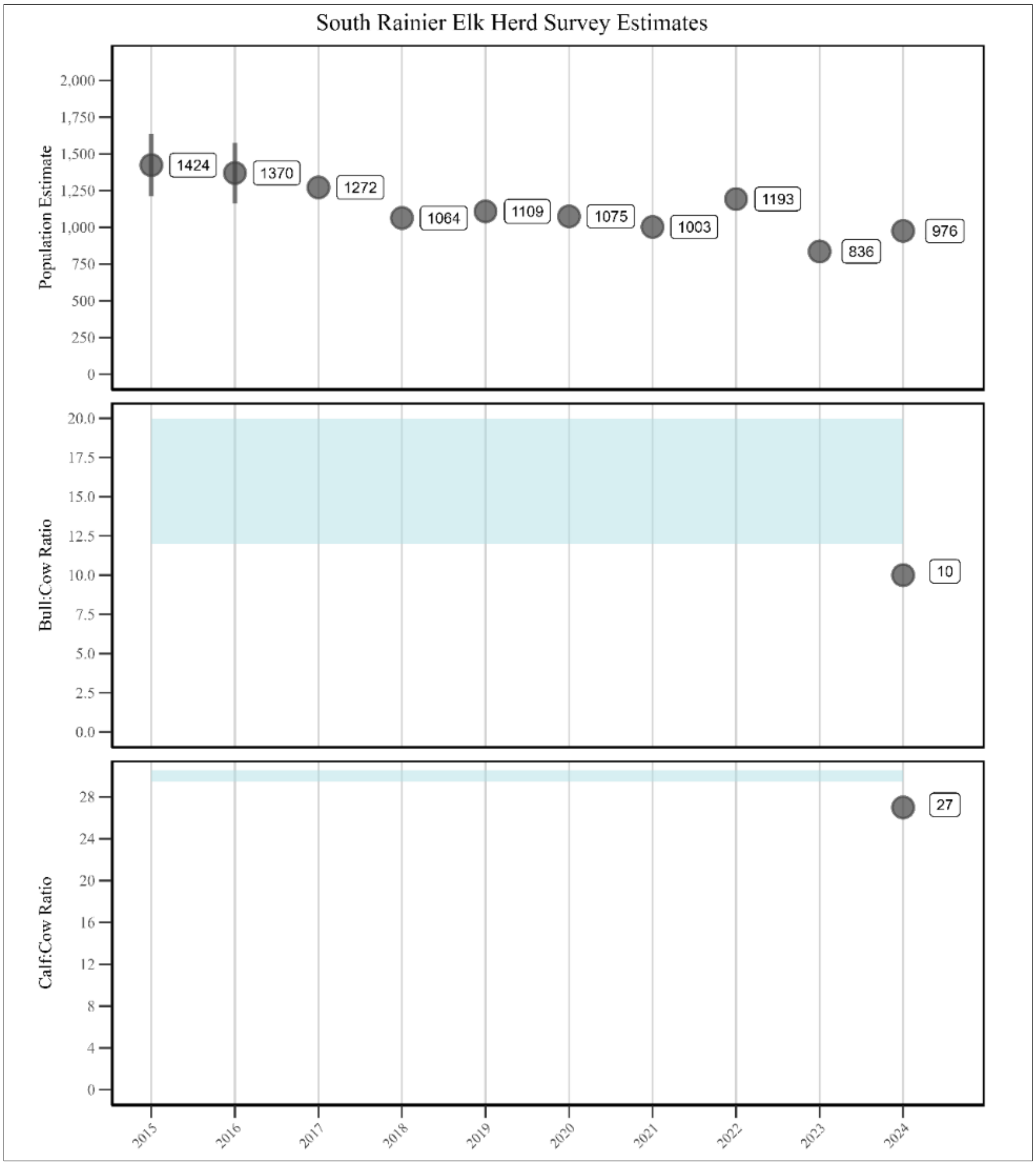
Management Guidelines and Objectives

Washington Department of Fish and Wildlife (WDFW) identified a management objective of 3,000 elk in the South Rainier Elk Herd Plan (WDFW, 2002); however, the plan is overdue for revision, and management objectives may need to be updated. In addition, the Department still needs to identify a formalized monitoring strategy to estimate elk abundance and herd composition in the South Rainier elk herd area. Because the Department has yet to identify a comprehensive monitoring strategy representative of the entire herd, biologists primarily depend on harvest data to make inferences about population trends.

Population surveys

The Puyallup Tribe of Indians conducts aerial composition surveys and estimates elk abundance in the upper Cowlitz River basin using a sightability model they developed specifically for that area (Gilbert & Moeller, 2008). The surveys in early spring include portions of GMUs 503, 510, 513, and 516. The results of these surveys are illustrated in Figure 2 (Moeller, 2024).

Figure 2. Survey estimates in the Cowlitz River Basin elk herd area.



Sightability corrected estimates of total elk abundance, bull:cow ratio, and calf:cow ratio in the Cowlitz River Basin (portions of GMUs 503, 510, 513, and 516), spring 2015-2024. Data are collected and provided by the Puyallup Tribe of Indians. Bull and cow ratio data are not available prior to 2024.

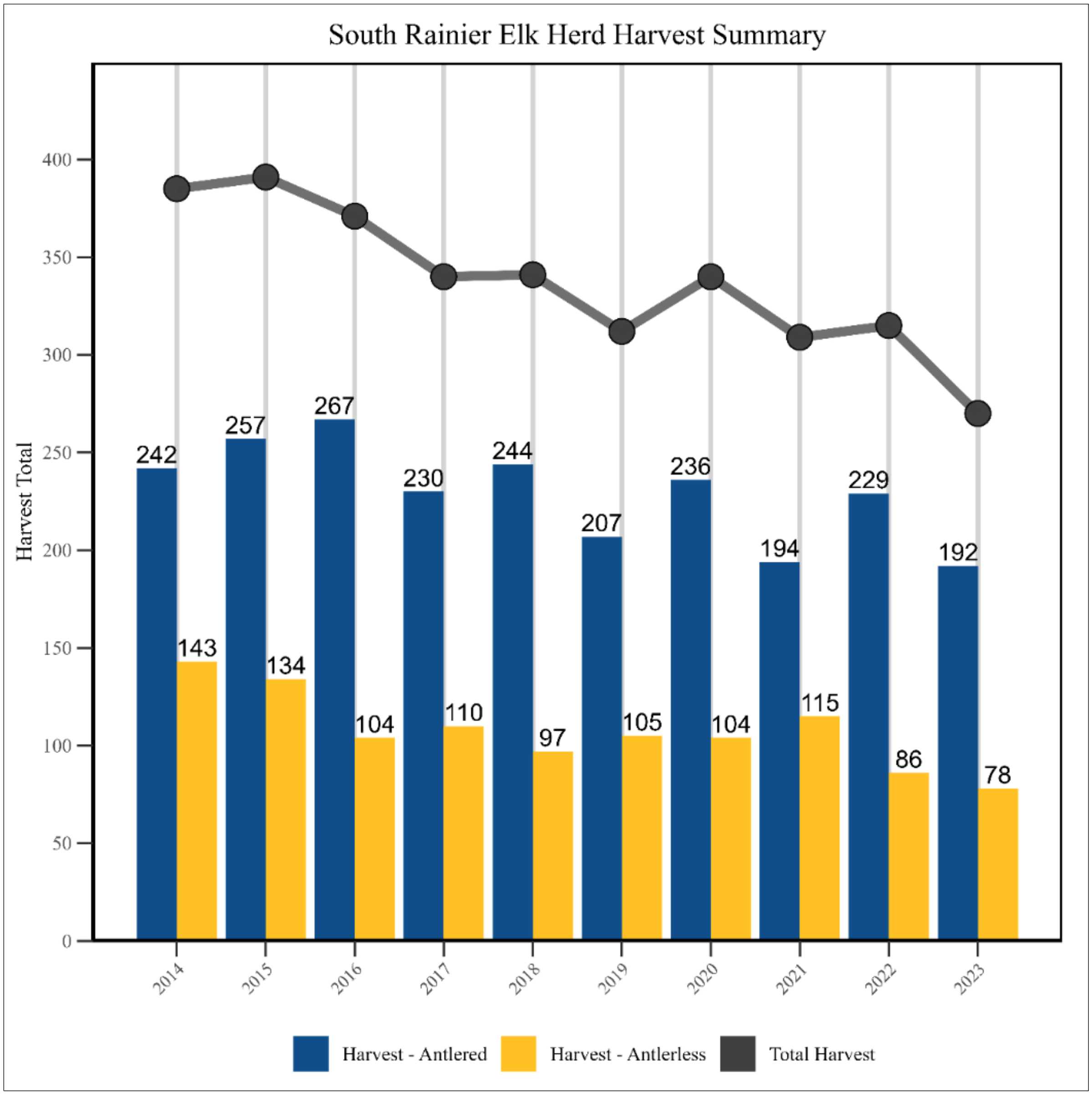
WDFW has also collaborated with the Muckleshoot Indian Tribe, the U.S. Geological Survey, the National Park Service, and the Puyallup Tribe of Indians to estimate elk abundance in the high alpine meadows of Mount Rainier National Park (MRNP) (Griffin et al., 2013). However, those surveys only include a small portion of the South Rainier elk herd (<550 elk). Additionally, it is unknown what proportion of those elk move outside MRNP, what portion may join the Yakima or North Rainier elk herds, or what portion could be included in the spring survey conducted by the Puyallup Tribe.

Elk surveys are conducted on the Centralia Mine portion of GMU 667. These surveys began in 2010 and are attempted annually based on funds available. They are paid for and done in cooperation with Transalta, who owns the mine. TransAlta surveyed in August 2024. The effort resulted in observations of 361 elk with a bull:cow ratio of 32:100 and a calf:cow ratio of 24:100.

Hunting seasons and recreational harvest

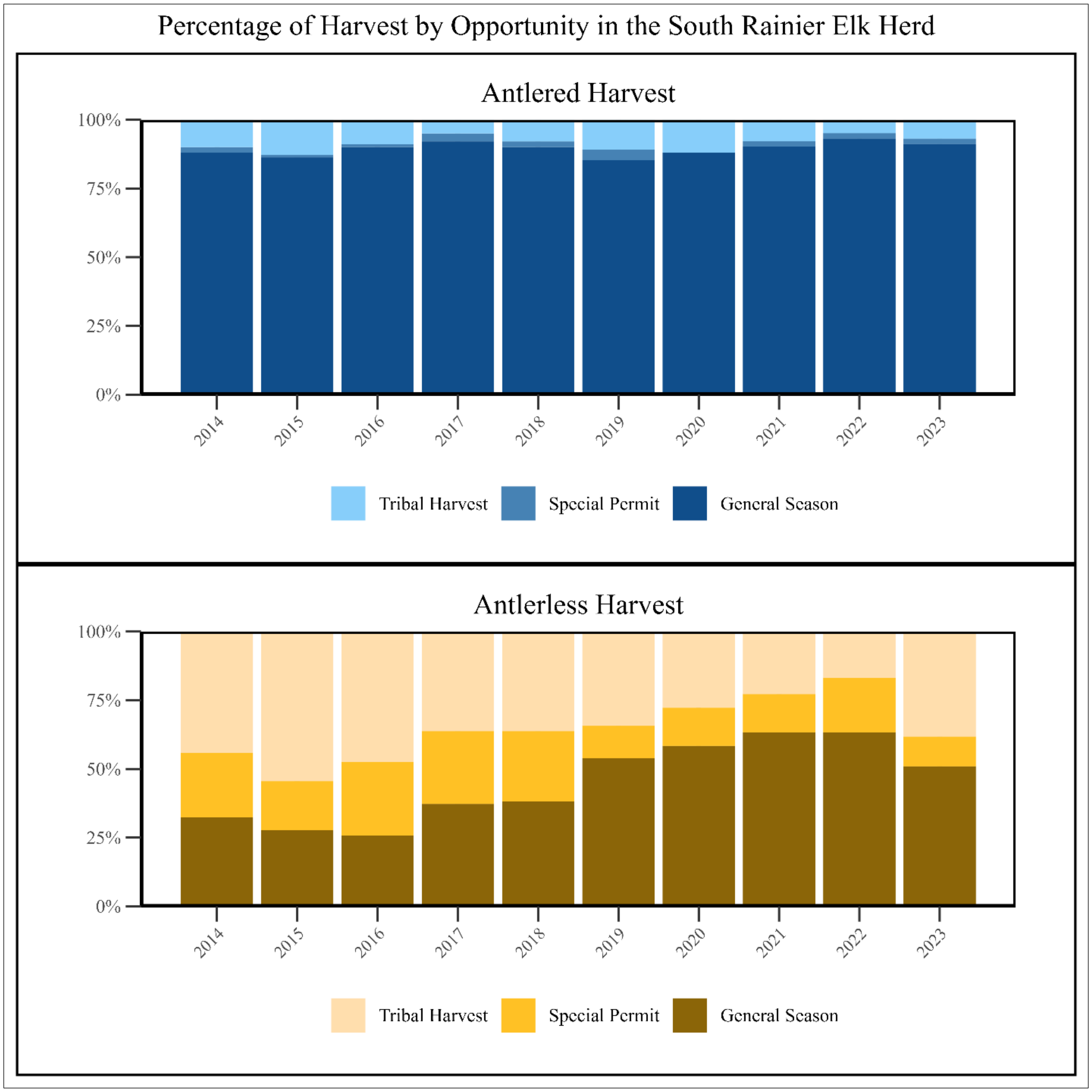
The Department limits most general season harvest opportunities in the South Rainier elk herd area to branch-antlered bulls. Opportunities to harvest antlerless elk occur during general archery and muzzleloader seasons within GMUs 503 and 667 and by permit in areas where the Department's objective is to maintain low elk numbers. Estimates of total annual harvest during State and Tribal seasons have averaged 327 elk during 2014-2023. Harvest estimates have slowly declined over this 10-year period (Figure 3). Estimates of hunter success expressed both as the portion of hunters successfully harvesting an elk, as well as catch per unit effort (CPUE), have been stable during the period spanning 2016 to 2023 (Figure 5).

Figure 3. Estimates of harvested elk in the South Rainier elk herd area.



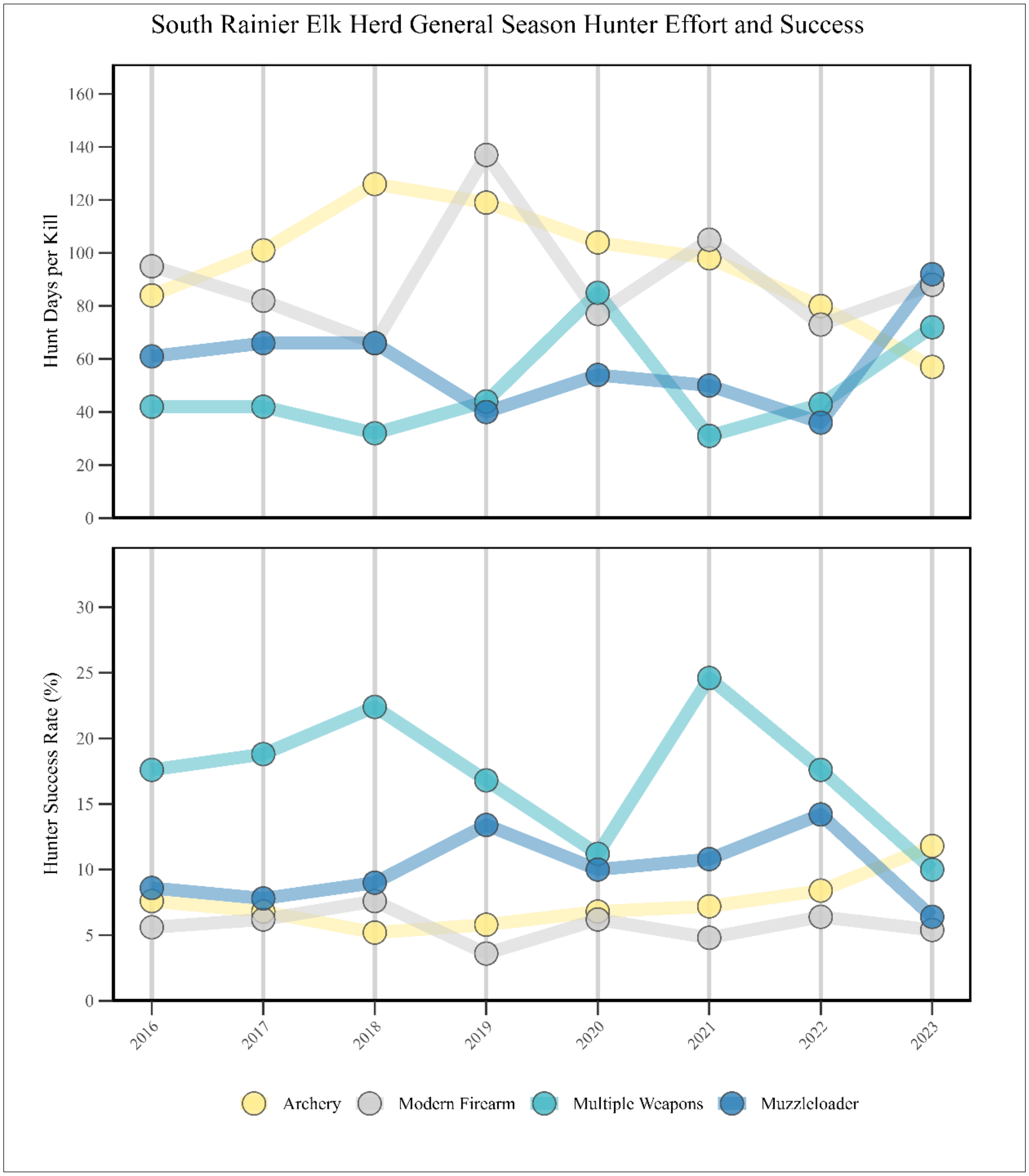
Estimated number of antlered and antlerless elk harvested in the South Rainier elk herd area during recreational hunting seasons (general and permit opportunities combined) established by the Department and during established Tribal seasons, 2014-2023. Estimates include tribal harvest where applicable, as reported by the Northwest Indian Fisheries Commission (NWIFC). Estimates from agricultural damage harvest permits are not included (see *Human-Wildlife Interaction* section).

Figure 4. Antlered and antlerless harvest by opportunity in the South Rainier elk herd area.



Estimated percentage of recreational antlered harvest (top) and recreational antlerless harvest (bottom) in the South Rainier elk herd area that occurred during general and permit seasons and the percentage of harvest that occurred during established tribal seasons, 2014-2023.

Figure 5. Hunter effort and success rate.



Estimated hunter days per kill and hunter success rate in the South Rainier elk herd area during recreational seasons that provided general over-the-counter opportunities, 2016-2023, by weapon type.

Survival and mortality

Common predators of elk that occur throughout the South Rainier elk herd area include black bears and cougars. At the time of this writing, there were no documented wolf packs within the herd area (WDFW et al., 2024), although wolf sightings are being investigated (M. Tirhi, pers. comm.). Severe winter events rarely impact the South Rainier elk herd. However, extreme drought conditions that persist through summer and fall can potentially reduce the availability of high-quality forage that elk rely on to accrue adequate fat stores for winter. There have been no recent studies to monitor the survival of elk in the South Rainier elk herd area.

Habitat

Most of the South Rainier elk herd area consists of lands administered by the U.S. Forest Service (USFS). The remainder of the herd area is comprised of private industrial forestland, State Department of Natural Resources (DNR) forestland, national parkland, agricultural areas, WDFW Wildlife Area, and suburban/rural residential land use. The herd continues to benefit from creating early seral habitats on private industrial and DNR forests.

The industrial forestlands consist of a mosaic of clear-cuts, relatively open young regeneration stands, dense second-growth stands of timber, and stream buffers lined with second-growth forests. Industrial timber management practices benefit elk by increasing the quantity of early seral habitats and the subsequent forage base. While beneficial to elk, management practices are not purposefully conducted to increase or improve elk habitat. Additionally, intensive forest management practices, including planting dense stands of fast-growing conifer seedlings and applying herbicides during the re-establishment of the timber stand, may also be affecting overall productivity due to reduced forage quality and availability. These effects work in tandem by reducing the amount of favorable plants available as forage in the early term and completion of forest canopy closure (typically approximately age 12), far earlier than would occur in a naturally regenerated stand. The magnitude of those effects is influenced by site-specific types of post-timber harvest treatments and plant compositions and the number of years since timber harvest. A commonality among these varying factors is that the best quality and most quantity of favorable forage occurs approximately 3 to 14 years after timber harvest, whether herbicide treatments are applied or not. However, the differences between available, favorable forage for treated and untreated stands can still be substantial. A discussion on the complexity of these habitat interactions is beyond the scope of this report, and WDFW refers the reader to Ulappa (2015) and Geary et al. (2012) for a more comprehensive understanding of this research.

In contrast, very limited timber harvest on federal forests in the last three decades has led to a generally declining trend in habitat quality for elk. Forest thinning projects have partially offset the losses of quality habitat on USFS lands. These projects have been cooperative efforts among the Puyallup Tribe, the Rocky Mountain Elk Foundation, and USFS. Additional thinning is planned for this area.

Many elk in the South Rainier elk herd area concentrate on the valley floor in the Upper Cowlitz River Basin during winter. However, the continued development of this area for agricultural, recreational, and housing purposes continues to result in a loss of critical winter habitat. Currently, elk numbers in the Upper Cowlitz River Basin are higher than some segments of the public would prefer.

Human-wildlife interaction

Complaints of damage to agricultural crops occur within the range of the South Rainier elk herd. The most severe conflicts are concentrated in the upper Cowlitz River valley and the Hanaford area. In the upper Cowlitz River, a narrow band of low-elevation privately owned land is surrounded by mountainous and forested public and industrial forestland. The upper Cowlitz Valley is winter range for elk, and their presence is most common in winter and early spring but persists year-round. Elk damage complaints in this area have persisted for many years and are unlikely to be abated given the juxtaposition of attractive food sources and a large amount of forestland. A variety of crops are impacted by elk damage, but most of the damage is to hay fields.

In the Hanaford Area of Lewis County, elk also cause damage to agricultural crops. Elk populations that move between the Centralia Mine and the Skookumchuck Wildlife Area have increased. Access to the Centralia Mine is restricted by federal regulations, which reduces the number of elk that may be harvested there. However, the landowner has worked with WDFW to allow senior and disabled special draw permit hunts to help control this elk population. Additionally, permit-only elk seasons, designed to address agricultural damage, have been implemented in the Hanaford elk area (Elk Area 6069).

Wildlife Conflict Specialists work closely with agricultural producers by developing Damage Prevention Cooperative Agreements (DPCAs), which identify a plan to reduce the amount of damage incurred to crops using non-lethal and lethal methods. Non-lethal methods of discouraging elk use are a very important component to reducing elk damage and are generally attempted prior to the use of lethal response. Conflict Specialists and landowners use a variety of non-lethal methods, including electrified fladry fencing; noisemakers (bird bangers, critter gitters, propane cannons); hazing and herding on foot, with a vehicle or dog; scarecrow-like electronic devices; and odor-based repellents such as Plantskyyd.

Table 1. Number of DPCA'S (Damage Prevention Cooperative Agreements).

GMU	DPCAs	Landowner Permits Issued	Master/Youth/Disabled/ Tribal Permits Issued	Total Permits Issued	Total Elk Removed
503	0	1	0	1*	1
513	2	3	0	3	2
516	5	9	1	10*	4
667	6	25	2	27	9
TOTAL	13	38	3	41	16

Permits to lethally remove elk causing damage to agricultural crops and resulting number of elk removed, South Rainier elk herd, 2023-2024. Includes damage permits provided to landowners, master hunters, youth hunters, disabled hunters, those removed by WDFW personnel, and those by tribal hunters as part of tribal hunting co-management agreements to help assist with agricultural damage. Two additional Master Hunter permits were deployed to hunt in either 503 or 516. No additional elk were removed under these permits.

Lethal methods of deterring elk are also used to reduce damage to crops. These efforts include hunts within specified elk areas, pools of Master Hunters, Youth, and Hunters with Disabilities for immediate response to damage issues, landowner damage permits, as well as those removed by WDFW personnel, and those removed by tribal hunters as part of tribal hunting co-management agreements to help assist with agricultural damage. See Table 1 for a summary of permits issued to landowners allowing the take of elk causing agricultural damage in the South Rainier elk herd area during 2022-23. Note: These removals are in addition to the elk harvests discussed in Hunting Seasons and Recreational Harvests above. Collectively, these hunts are designed to decrease the number of elk causing damage and to haze elk from the area.

In addition to conflicts with agriculture, elk in the Upper Cowlitz River Valley are regularly near people. This situation is most acute in the town of Packwood, where elk are abundant within the city limits, presenting a challenging scenario where many residents enjoy the presence of the animals, but others do not. A County ordinance does not allow the use of firearms in town, so these animals are largely not hunted, which has created a refugia effect, allowing the elk to feed and loaf in town without fear of humans. Because the elk are somewhat habituated to people, direct interaction between elk and people is not uncommon. Additionally, the elk commonly present a hazard along State Highway 12.

Management concerns

Treponeme-associated hoof disease

Treponeme-associated hoof disease (TAHD) of elk results in abnormal hoof growth, cavitating sole ulcers, and, in severe cases, eventual sloughing of the hoof capsule. Elk severely affected by TAHD often have reduced mobility and condition. Consequently, it seems reasonable to assume they would have reduced survival or reproductive potential probability. However, it is unknown how TAHD affects the population dynamics of herds where TAHD occurs; this is the focus of ongoing research. The Department is also researching to estimate the distribution and prevalence of TAHD better. To learn more about the Department's efforts associated with investigating TAHD, please visit the Department's hoof disease webpage at: https://wdfw.wa.gov/species-habitats/diseases/elk-hoof.

Habitat conditions on Federal Lands

Habitat conditions on federally managed lands within the South Rainier Elk herd area are of concern. Large-scale fire, timber harvest, disease, or other succession resetting events are largely absent from federal lands. The resulting landscape is dominated by closed-canopy forest, much of which was harvested from roughly 1950-1990 and subsequently replanted with dense Douglas fir trees. These stands provide little in the way of elk forage and lack the diversity and forage resources of either older or younger forests. While some forest thinning projects have been completed and do provide more robust forage resources, at least temporarily, elk forage and likely elk populations will continue to be suppressed in GMUs 513 and 516.

Fee-only hunting access restrictions

The largest industrial forestland owner within the South Rainier elk herd area implemented a fee-only access system for hunting and other recreation on their lands several years ago. The fee-based system restricts access to these lands and has continued in the years that have followed. The ramifications of this limited access to elk hunting opportunities are difficult to quantify as the landowners do not own entire Game Management Units, some individuals elect to pay the access fee, some elect to hunt in another area, and some may decide to quit hunting. The effects of reduced hunter access and participation are twofold in that they impact the department's goals to maximize recreational access to wildlife. It likely reduces hunter participation and recruitment, undermining the capacity to manage elk and other wildlife.

Conflict with agricultural land uses in the Upper Cowlitz River Valley

The conflict between agricultural land uses and elk in the Upper Cowlitz River Valley is likely to continue in the near term. The proximity of relatively abundant elk on forestlands surrounding the valley with attractive food resources within the valley likely guarantees that these conflicts will continue. Furthermore, large-scale habitat changes such as forest fires or extensive timber harvest on federal lands, which could generate improved habitat conditions and draw elk away from the valley floor, are unlikely to occur in the near future. However, the forest industry, including the USFS, has begun to reconsider fuel loading and fire management practices in the face of the megafires of the 21st century (Natl. Acad. Sci., Eng., Med. 2017). Large amounts of funding that would be needed for extensive fencing of agricultural areas are not available. Moreover, even if funding were available, installing large-scale fencing would restrict wildlife movement, require maintenance, and be aesthetically unappealing.

Management conclusions

Harvest data, spring surveys conducted by the Puyallup Tribe of Indians, and surveys of alpine habitats on the south side of Mt. Rainier National Park indicate a slow decline in the elk population. While none of these methods provides a comprehensive index of elk abundance in the South Rainier herd area, they serve as an index of the population. Nonetheless, the development and implementation of a method to monitor the entirety of the South Rainier elk herd, including demographic characteristics (i.e., bull and calf-to-cow ratios), is a management need.

Conflicts with agricultural producers, especially in the Upper Cowlitz River Valley and the Hanaford area, are ongoing and will require continuing attention from Wildlife Conflict staff. Additionally, the development of Treponeme-associated hoof disease in southwest Washington elk could impact elk in the South Rainier herd area. Currently, only GMUs 516 and 667 have lab-confirmed detections of TAHD from harvested elk. The impact of the disease on the South Rainier herd at the population scale is unknown. The prevalence of TAHD is highest in the state in both the Mount St. Helens herd area and Willapa Hills herd areas, which border the South Rainier herd area to the south and west, respectively.

An updated herd plan is needed for the South Rainier herd. The existing plan is 20 years old and does not reflect current conditions. Specifically, the plan was written before the presence of hoof disease in southwest Washington elk and prior to the organizational change of hiring wildlife management staff to address wildlife-human conflicts specifically. Finally, the existing plan prescribes an elk population goal of 3,000, but no method is currently available to monitor the entire population.

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Willapa Hills Elk Herd

Anthony Novack, Wildlife Biologist
Eric Holman, Wildlife Biologist

Introduction

The Willapa Hills elk herd is located in southwest Washington. It consists of 12 GMUs (Figure 1), including 501 (Lincoln), 504 (Stella), 506 (Willapa Hills), 530 (Ryderwood), 658 (North River), 660 (Minot Peak), 663 (Capitol Peak), 672 (Fall River), 673 (Williams Creek), 681 (Bear River), 684 (Long Beach), and 699 (Long Island). The herd area covers more than 1.7 million acres, of which approximately 22% is in public ownership and 78% is in private ownership. Most of the herd area is industrial forestland, which is owned by a variety of private corporations. Small private timber holdings and small farms occur along the major drainages.

Figure 1. The Willapa Hills elk herd area.

GMU boundaries with county lines and public lands within the Willapa Hills Elk Herd Area.

Management guidelines and objectives

The Department completed the Willapa Hills Elk Herd Plan in 2014 and identified a population objective of managing this herd for a stable to increasing population (WDFW, 2014a). Additional objectives include managing for a pre-hunt population of 15-35 bulls:100 cows or a post-hunt population of 12-20 bulls:100 cows and maintaining an annual survival rate of 0.50 for bulls when bull mortality is monitored (WDFW, 2014b).

Population surveys

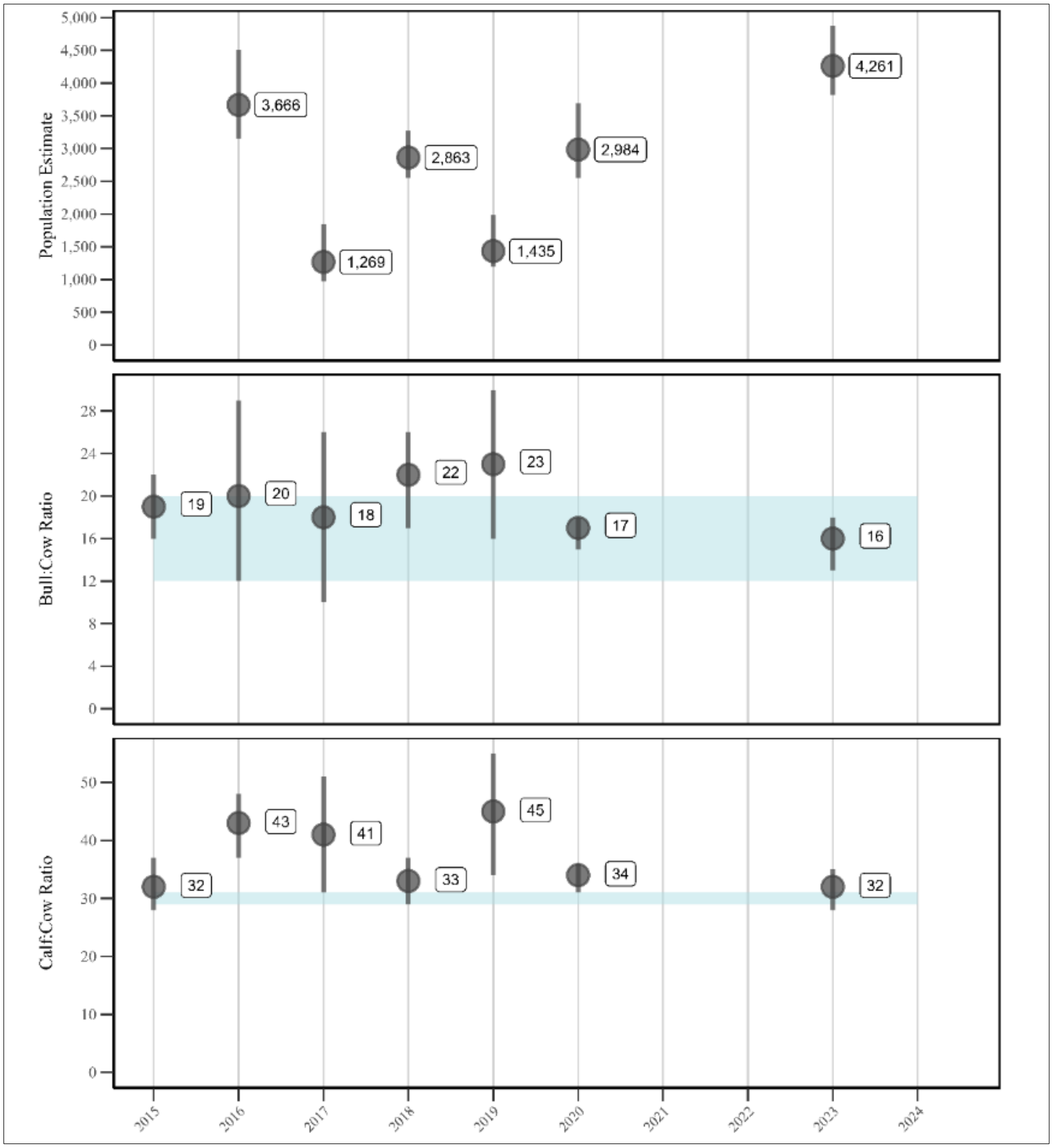
Historically, the Department conducted pre-hunt (August-September) or post-hunt (March-April) aerial composition surveys to assess trends in age and sex ratios. However, surveys needed a more formalized sampling design to account for biases commonly associated with observing elk in densely vegetated habitats (Samuel et al., 1987). Consequently, estimated ratios did not reflect the entire herd and were likely biased (WDFW, 2014a). In 2014, the Department initiated a formalized sampling design to index total elk abundance across the entire herd area using a sightability model developed for elk in the Mount St. Helens elk herd area (McCorquodale et al., 2014). This design contains two distinct survey areas separated by the Willapa River Valley that are typically surveyed biannually, although in 2023, the Department surveyed both areas simultaneously (Figure 2). No survey was conducted in 2024.

Due to budget constraints, the Washington Department of Fish and Wildlife (WDFW) did not conduct elk survey flights in the spring of 2024. The most recent surveys took place in March 2023, covering both the northern and southern portions of the Willapa Hills elk herd area. The Game Management Units (GMUs) surveyed in the southern region included 506, 530, 673, 681, and 684, while the northern region included GMUs 658, 660, and 672. Researchers observed a total of 2,259 elk during this survey. The estimated elk population for the entire herd area was 4,261, with a 95% confidence interval of 3,820 to 4,870.

These estimates are based on data collected from the South Willapa survey area (GMUs 506, 530, 673, and 681) in 2014, 2016, 2018, and 2020, and from the North Willapa survey area (GMUs 501, 658, 660, and 672) in 2015, 2017, and 2019. The 2023 estimate includes data from both the North and South Willapa survey areas. No surveys were conducted in 2021, 2022, or 2024.

The observed bull-to-cow ratio averaged 16 bulls per 100 cows, which is well above the minimum management objective of 12 bulls per 100 cows. However, mature bulls with five or more antler points were uncommon. The calf-to-cow ratio for the entire herd area was 32 calves per 100 cows, indicating good calf recruitment.

Figure 2. Survey estimates of the Willapa elk herd area.

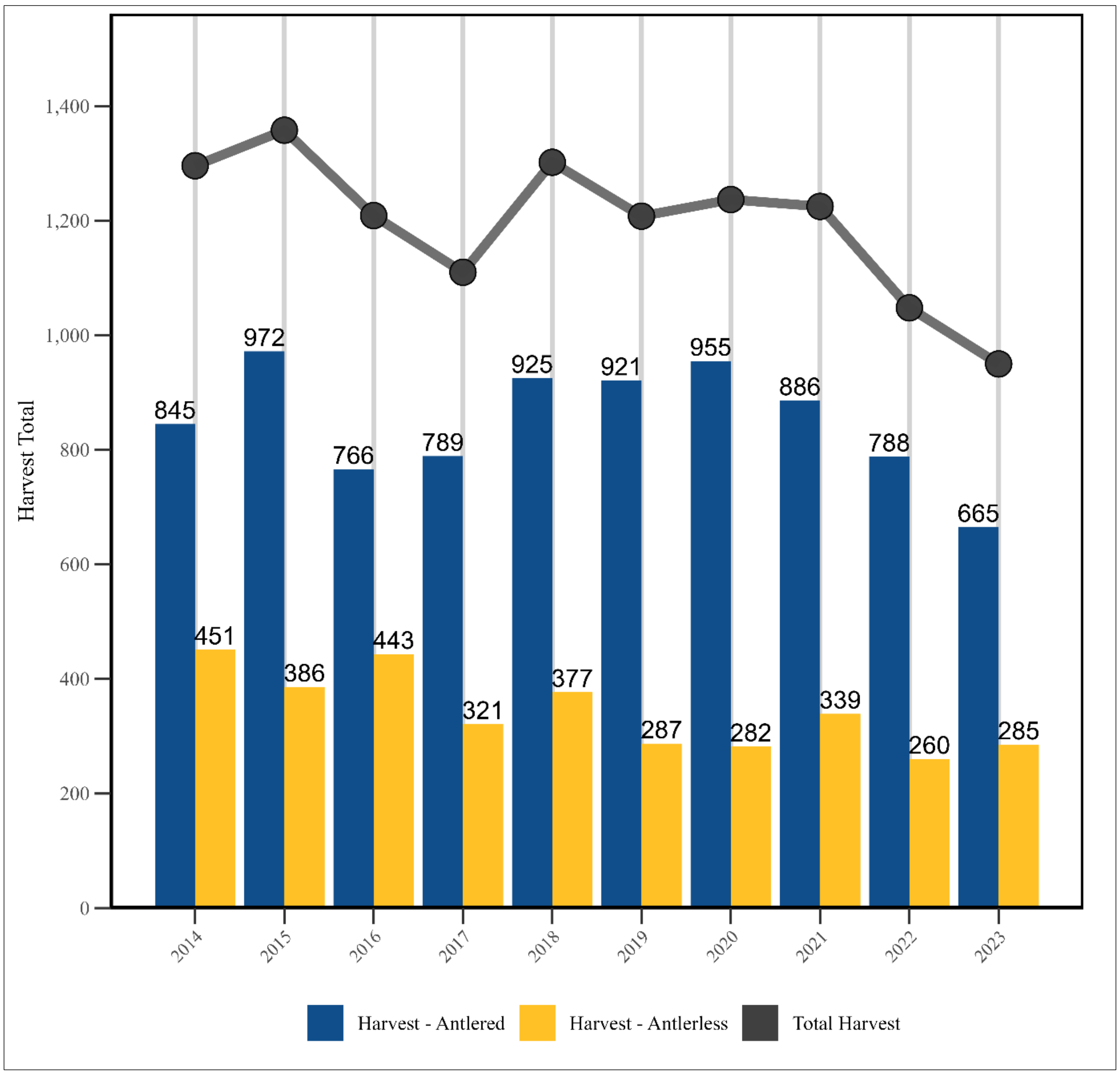


Estimates and associated 95% confidence intervals for the Willapa Hills elk population size, bull:cow ratio, and calf:cow ratio for elk of post-hunt bull:cow and calf:cow ratios in spring 2015-2024.

Hunting seasons and recreational harvest

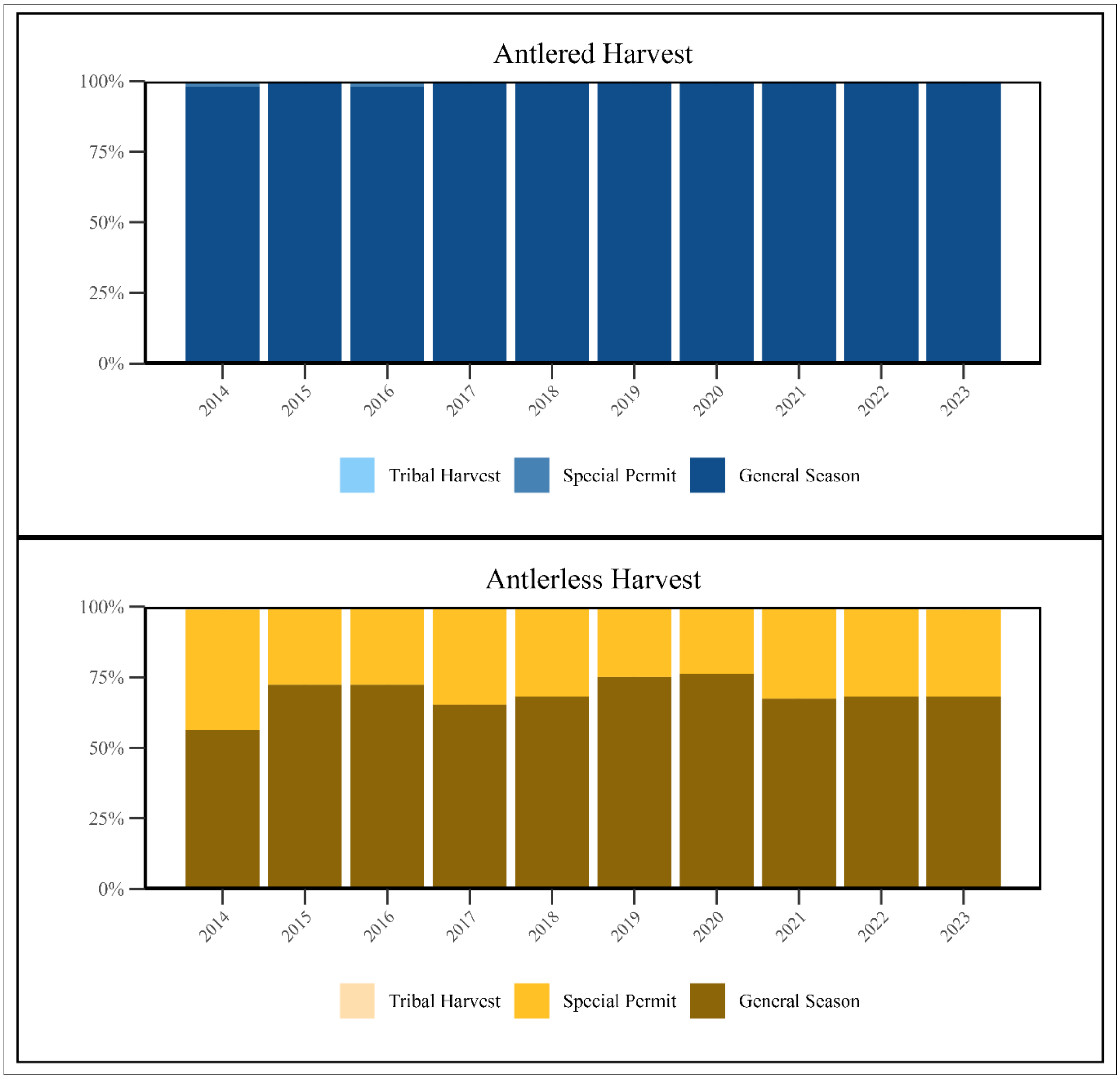
The Department limits most general season harvest opportunities in the Willapa Hills elk herd area to branch-antlered bulls. It offers most opportunities to harvest antlerless elk through WDFW's permit system. Limited opportunities to harvest antlerless elk occur during general archery seasons or in areas where the Department's objective is to maintain low elk numbers. The total bull elk harvest, including special permits, has been generally stable since 2014 (Figure 3); however, there have been recent indications of a downward trend in bull harvest since 2021. Antlerless elk harvest has remained fairly stable since 2017 (Figure 3), with roughly two-thirds of antlerless elk harvested during the general season (Figure 4). No tribal harvest estimates were reported for 2023, and historically, tribal harvest has averaged less than 1% of the overall elk harvest for the past ten years. Nearly all harvests of antlered elk occur during general seasons. General season hunters took a majority of the antlerless harvest in 2023. Elk hunter effort and percentage success rates are found in Figure 5. Since 2019, the Willapa Herd area has required more effort from hunters to harvest an elk. Muzzleloading hunters showed the least effort before harvesting an elk in 2023, and modern firearm hunters had the lowest percentage of success relative to other weapon types.

Figure 3. Elk harvest estimates in the Willapa Hills elk herd area.



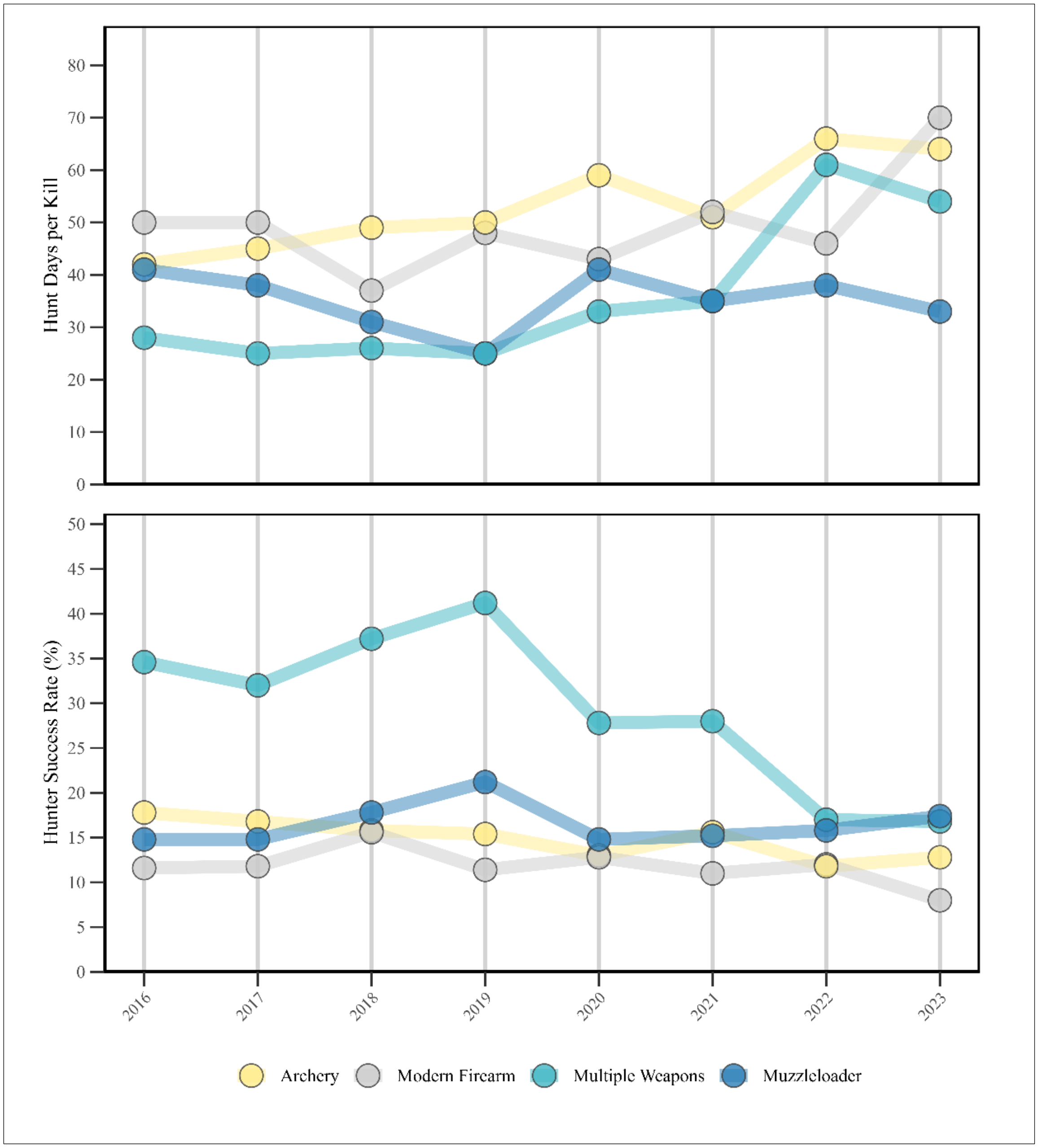
Estimates of antlered and antlerless elk harvested in the Willapa Hills elk herd area during WDFW recreational hunting seasons and established tribal seasons from 2014 to 2023. Data includes tribal harvest data reported by the Northwest Indian Fisheries Commission (NWIFC), but excludes agricultural damage harvest permits (see *Human-Wildlife Interaction* section).

Figure 4. Antlered and antlerless harvest in the Willapa Hills elk herd area.



Estimated percentage of recreational antlered harvest (top) and antlerless harvest (bottom) in the Willapa Hills elk herd area that occurred during general and permit seasons, 2014-2023. Zero tribal harvest was reported and is not represented in the figure.

Figure 5. Hunter effort-per-kill and success rate in the Willapa Hills elk herd area.



Estimated number of hunter days spent pursuing elk per kill and hunter success rate in the Willapa Hills elk herd area during recreational seasons that provided general over-the-counter opportunities, 2016-2023, by weapon type.

Survival and mortality

Common predators throughout the Willapa Hills elk herd area include black bears and cougars. At the time of this writing, there were no documented gray wolf packs in the herd area (WDFW et al., 2023).

In June of 2021, the Willapa Hills area encountered record-breaking heat (multiple days over 100 degrees Fahrenheit), potentially negatively impacting adult and calf elk survival the following winter. Severe drought conditions that persist through summer and fall can reduce the availability of high-quality forage that elk rely on to accrue adequate fat stores for winter. However, severe winter conditions rarely occur that affect the overwinter survival of elk in the Willapa Hills elk herd area.

The greatest source of mortality for bulls in the Willapa Hills elk herd is likely recreational harvest. There have yet to be comprehensive studies to estimate elk survival in the Willapa Hills elk herd area. However, the Department monitored bull survival for 78 adult bulls in GMU 673 in 2005-2009 and estimated annual survival to be 0.37 (95% CI = 0.27–0.48), attributing 93% of all mortalities to legal harvest (W. Michaelis, WDFW, unpublished data). Poaching, wounding loss, predation, and malnutrition combined accounted for <6% of adult bull mortality. Because this study only occurred in GMU 673 and the western third of GMU 506, estimated cause-specific mortality and survival rates may not represent the entire Willapa Hills elk herd.

No studies have occurred in the Willapa Hills elk herd area with the specific goal of estimating the annual survival rates of cow elk. However, 22 female elk in GMUs 506 and 672 were monitored in 2001 and 2002 as part of a larger study evaluating the relationship between nutritional condition and survival of adult female elk in the Pacific Northwest. During that study, Bender et al. (2008) reported a mean annual adult female elk survival rate of 0.92 (95% C.I.= 0.82-0.99).

Habitat

The majority of forestland in the Willapa Hills herd area is managed to maximize revenue from timber production. The privately owned industrial forestlands and a large portion of the publicly-owned lands consist of a mosaic of variable-aged stands dominated by a single tree species. This mosaic consists of clear-cuts, relatively open young regeneration stands, dense second-growth timber, and stream buffers lined with second-growth forests. The mosaic changes yearly due to ongoing timber-cutting operations. Forest management practices on private, industrial, and state forestlands have benefited the Willapa Hills elk herd by creating openings in the tree canopy that increase the forage base for this herd.

Industrial timber management practices have also resulted in a high-density road system that has increased human access to remote areas. As a result, several large industrial timber company landowners have restricted access to their lands. These restrictions can include land leasing and fee permit requirements, which may limit the total number of hunters that can access those areas.

Recently, there have been no major changes in the status of elk habitat in the Willapa Hills herd area. At a more localized scale (e.g., GMU), habitat trends are directly related to the proportion of timber stands in early seral stages. Logging, especially on private timberlands, county land, and state DNR lands, has increased foraging habitats within many GMUs.

Human-wildlife interaction

Elk damage complaints continue to be a substantial management concern in the Willapa Hills elk herd. Chronic damage persists in several GMUs across the entire elk herd area. Management responding to elk conflicts generally increases hunting activity at the focal damage zones. These damage zones can cover an entire GMU or be organized into a special Elk Area. Some focal GMUs include 506 (Willapa Hills), GMU 660 (Chehalis River Valley), GMUs 672 (Fall River), 673 (Willapa River Valley), and GMU 684 (Long Beach). Within these GMUs, some localized elk areas that target crop-depredating elk have been created. These elk areas include 5056 (Grays River Valley) and 6010 (Mallis).

Elk damage occurs on Christmas tree farms, hay and silage fields, cranberries, corn, peas, and commercial seed crops such as carrot, Swiss chard, bok choy, and other agricultural crops. Elk also damage agriculture infrastructures such as fences or irrigation systems.

Wildlife Conflict Specialists work closely with producers by developing Damage Prevention Cooperative Agreements (DPCAs). These agreements involve nonlethal and lethal measures to prevent elk damage and increase hunter access to modify elk behavior and control group size. Nonlethal measures include herding and hazing by Master Hunters, producers, and WDFW staff; pyrotechnics; and electric fladry fencing. All DPCAs include a public hunting component to increase pressure on groups of elk causing damage. For 2022-23, Wildlife Conflict Specialists managed at least 36 active DPCAs and worked with many additional landowners without a DPCA. A minimum of 108 elk permits were issued directly to landowners with a DPCA, resulting in 45 animals being harvested (Table 1).

Table 1: Sum of elk-related Damage Prevention Cooperative Agreements with associated total of elk permits issued and resulting harvest by GMU in the Willapa Hills elk herd area, 2023-24.

Game Management Unit	DPCAs	Permits Issued	Elk Removed
506	11	36	21
530	3	6	3
658	5	22	5
660	1	5	1
663	0	0	0
672	4	6	1
673	4	18	10
681	3	5	3
684	6	10	1
Total	**36**	**108**	**45**

In addition to using DPCAs and issuing elk permits to landowners, general season regulations may be liberalized to address elk conflicts within an area. Furthermore, special permit seasons can be a tool to address elk conflicts within Elk Areas or GMUs. Finally, the Department maintains regional pools of permit hunters that can be deployed to a property incurring agricultural damage. The regional pools of permit hunters are primarily those hunters who have achieved certification as master hunters. Master hunters who draw these permits are deployed directly by WDFW staff to address localized conflicts. Few elk were harvested within the Willapa Hills elk herd area by the entire pool of permittees. Many of the elk harvested under these special permits are unavailable to the general licensed hunter due to the mosaic of land ownership and safety concerns about removing animals from areas near human habitation.

Research

No ongoing elk research is being conducted within the Willapa Hills herd area at this time.

Management concerns

Treponeme-associated hoof disease

Treponeme-associated hoof disease (TAHD) of elk results in abnormal hoof growth, cavitating sole ulcers, and, in severe cases, eventual sloughing of the hoof capsule. TAHD-afflicted elk are found throughout the majority of the Willapa Hills herd area. Elk severely affected by TAHD often have reduced mobility and condition. Consequently, they would have a reduced probability of survival or reproductive potential. However, the population-level effects of TAHD on herds throughout western Washington are unknown. Ongoing research in the Mount St Helens herd area will attempt to identify the specific population-level impacts of TAHD on elk.

The Department has used a combination of citizen science and harvest reporting to estimate the distribution and prevalence of TAHD. In 2014, a citizen science effort incorporated volunteers to conduct road surveys to locate elk and identify the number of animals affected and the geographic distribution of the disease. Researchers at WSU analyzed the data and determined that citizen science efforts were effective in confirming the presence of TAHD on the landscape (Winter et al., 2023). To learn more about the Department's efforts to investigate TAHD, please visit the Department's hoof disease webpage: [Elk Hoof Disease in WA State](#).

Starting in 2021 and continuing through 2024, a unique antlerless elk permit was issued to 15 hunters under the Master Hunter category to focus removal efforts on hoof-diseased animals in the Willapa Hills.

Private land access

Private timber companies own >70% of the Willapa Hills elk herd land base. Consequently, the recreational harvest of the Willapa Hills elk herd has largely depended on these companies' willingness to allow hunters access. Recreational hunting will decline if these companies choose to preclude hunter access or charge increased fees. Since 2011, those GMUs with large quantities of private lands transferred into fee-access programs have seen large declines in hunter participation, although overall harvest has remained stable.

Management conclusions

Harvest data indicate that the Willapa Hills elk herd was relatively stable from 2014 to 2021; however, during the most recent two years (2022-23), bull harvest has trended downward. Prior year's survey data indicated that the Department was meeting or exceeding its management objective of maintaining populations with a post-hunt bull:cow ratio of 12-20 bulls:100 cows. However, the number of mature bulls (5 pt. or better) observed during surveys is generally low. Calf recruitment rates in recent years have been at levels that should promote population stability or growth. While these herd metrics generally indicate a robust and stable elk population, hoof disease and fee-access systems remain concerns for the Willapa Hills elk herd.

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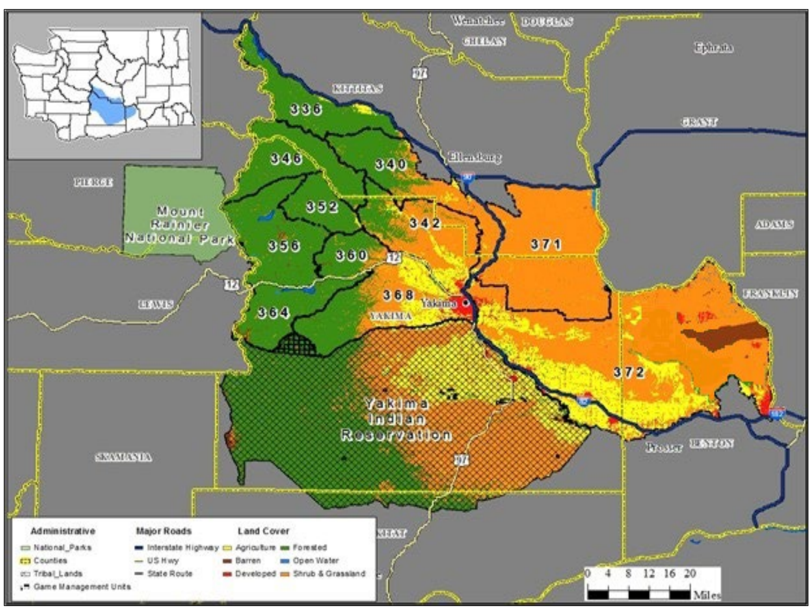
Yakima Elk Herd

Jason C. Fidorra, Wildlife Biologist
Erin M. Wampole, Wildlife Biologist
Callie B. Moore, Assistant Wildlife Biologist

Introduction

The Yakima elk herd area is in central Washington and consists of 11 GMUs: 336 (Taneum), 340 (Manastash), 342 (Umtanum), 346 (Little Naches), 352 (Nile), 356 (Bumping), 360 (Bethel), 364 (Rimrock), 368 (Cowiche), 371 (Alkali), and 372 (Rattlesnake Hills) (Figure 1). The Yakima elk herd includes the Rattlesnake Hills sub-herd located on the Arid Lands Ecology Reserve (ALE) and surrounding lands in GMU 372. The Yakima elk herd is the only herd in the state where the Department maintains an annual winter feeding program for elk. Elk winter feeding is used to mitigate conflict from elk movement onto private agricultural lands.

Figure 1. The Yakima elk herd area.



Dominant land use cover types within the 11 game management units that comprise the Yakima elk herd area.

Management guidelines and objectives

The Department's current management objective is for a post-winter population of approximately 9,000-10,000 elk in the core Yakima elk herd area (GMU's 336-368), <350 elk in the Rattlesnake Hills subherd area, and minimal populations of elk on the Yakima Training Center (WDFW, 2002). Additional objectives include managing for a post-hunt sex ratio of 12-20 bulls:100 cows and maintaining an annual survival rate of ≥0.50 for bulls if bull mortality is monitored (WDFW, 2002; WDFW, 2014).

Population Surveys

A population survey of the Yakima herd was conducted in February 2023. The Department estimates elk abundance for the Yakima herd during spring from ground count data collected at WDFW-established feeding sites and aerial count surveys. The Rattlesnake Hill sub-herd is surveyed separately from the main Yakima Herd using winter aerial surveys conducted in February 2024. Population data in this report for the Yakima herd excludes the Rattlesnake subherd unless specified.

Biologists estimate abundance and ratios from aerial counts using a sight-ability model developed for elk in Idaho (Unsworth et al., 1999). This methodology provides an estimate of elk abundance, age ratios, and sex ratios (e.g., herd composition) for the herd's core winter range. Importantly, this modeling approach accounts for the impact of vegetation cover, snow cover, and group size on the surveyor's ability to detect and count elk across a large and complex landscape. This provides the department with a more realistic estimate of the elk herd composition within the surveyed area by using the sight-ability correction model than without. Estimates are reported as a mean with a 90% confidence interval (90% CI). The confidence interval represents the uncertainty of an estimate (i.e., a smaller relative interval indicates more certainty in an estimate).

The Department does not conduct aerial surveys when mild winter conditions fail to concentrate elk at lower elevations (2014, 2015, 2018, 2020, 2021). Nevertheless, annual ground surveys at feed sites provide data to estimate calf ratios. For example, calf ratios in 2021 were derived from a sample of 4,964 elk counted during the survey on the feeding sites. Estimates of bull ratios are not conducted at feeding sites. Feeding sites do not provide unbiased estimates of bull:cow ratios since bulls often concentrate outside sites.

Elk estimated abundance during 2023 for the Yakima herd was 10,565 (10,355 –11258, 90% CI) and within a consistent range of 2022 estimated 11,324 elk (Figure 2). Bull:cow ratios were maintained at 13:100 (Figure 2). Elk abundance has exceeded the objective for the past two years, with bull:cow ratios also within the target objective range, though the estimated calf:cow ratio was lower than in 2022 (i.e., 27:100; Figure 2).

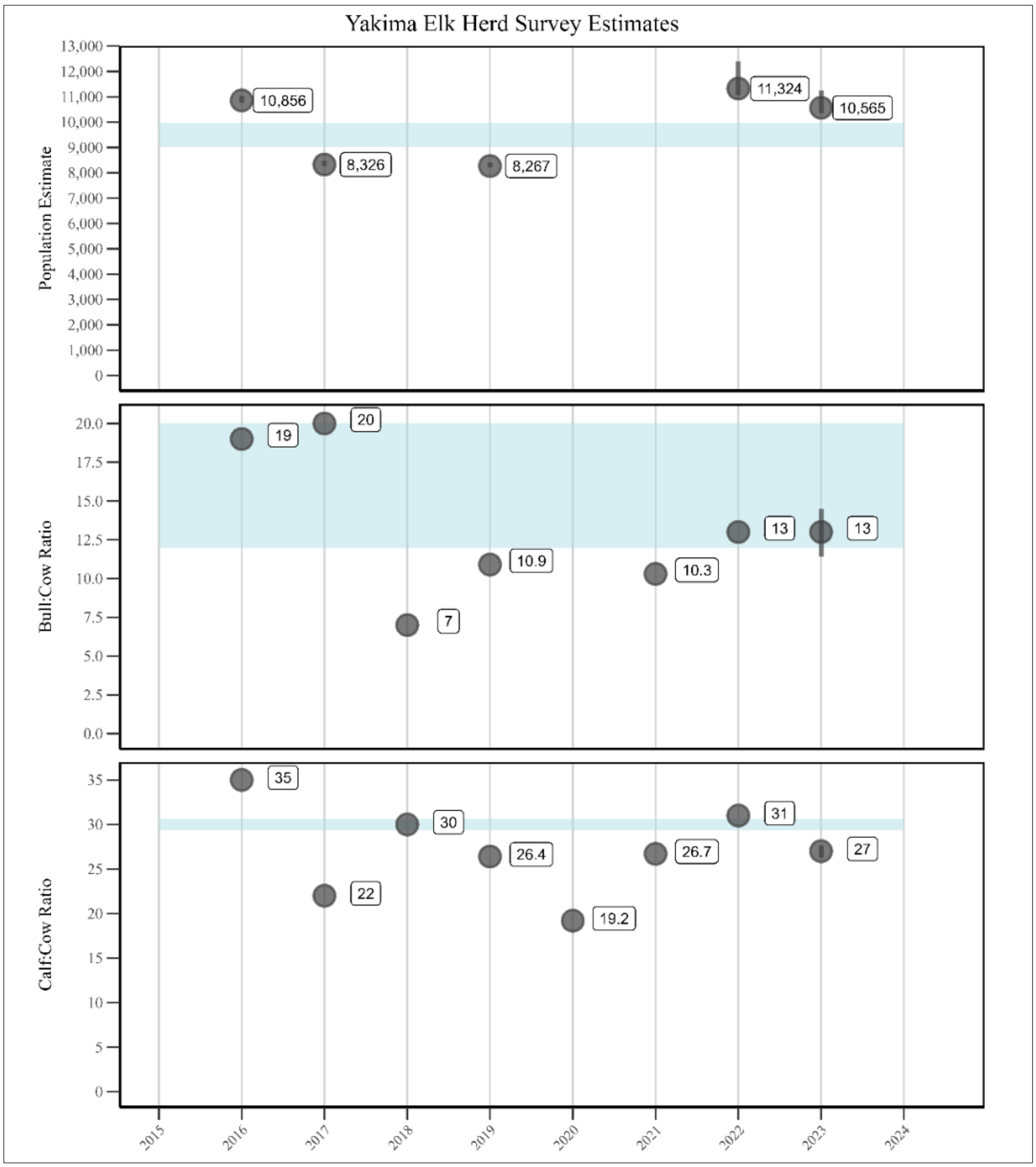
The Department collaborates with the U.S. Fish and Wildlife Service (USFWS) to estimate elk abundance in the Rattlesnake Hills sub-herd. The most recent survey was conducted in February 2024. Elk abundance was estimated to be 2,497 elk, which far exceeds the management objective of 350 elk (Figure 3). Bull:cow and calf:cow ratio estimates for the sub-herd are exceptionally high, the former due to the lack of hunting in this population (Figure 3).

Hunting Seasons and Recreational Harvest

The Department restricts most general season opportunities to harvest elk in most Yakima herd GMUs to spike bulls and offers opportunities to harvest branch-antlered bulls under special permits. Archers previously had general season opportunities to harvest antlerless elk, whereas modern and muzzleloader hunters were restricted to permit only. Master Hunters can harvest antlerless elk below the elk fence in Elk Area 3912 and from GMU 371.

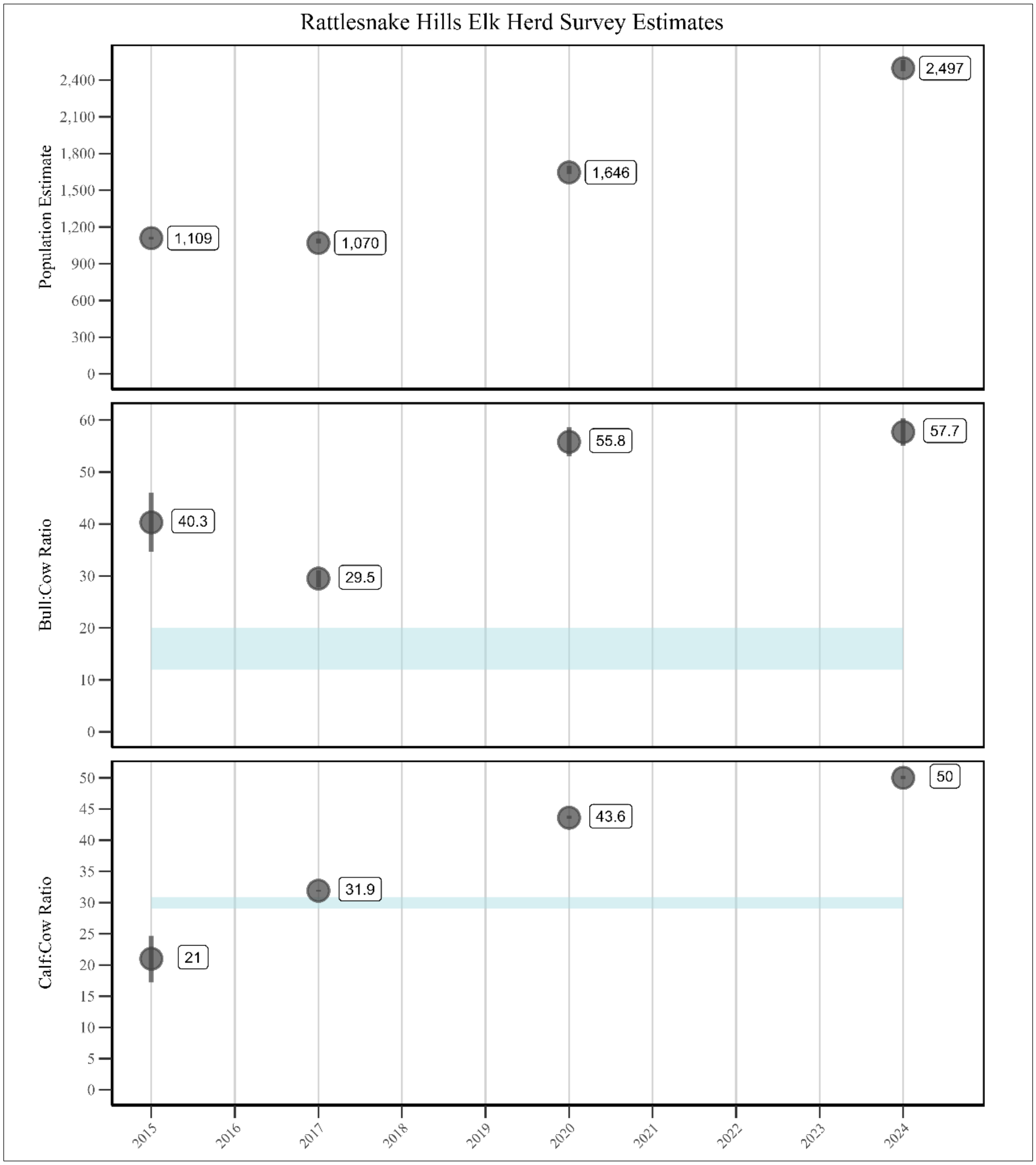
Harvest declined by 60% between 2015 and 2017 following a population decline; harvest has since stabilized with an increase in 2022 (Figure 8). Harvest does not include damage/kill permits or corrections for any permit non-report. It does include GMU 371, which has no direct connection to the surveyed population. Proportions of antlered and antlerless elk harvest that occurred during general and permit seasons are shown in Figures 9 and 10. Trends in hunter numbers and kills per 100 days of effort are shown in Figures 11 and 12.

Figure 2. Survey estimates in the Yakima elk herd area.



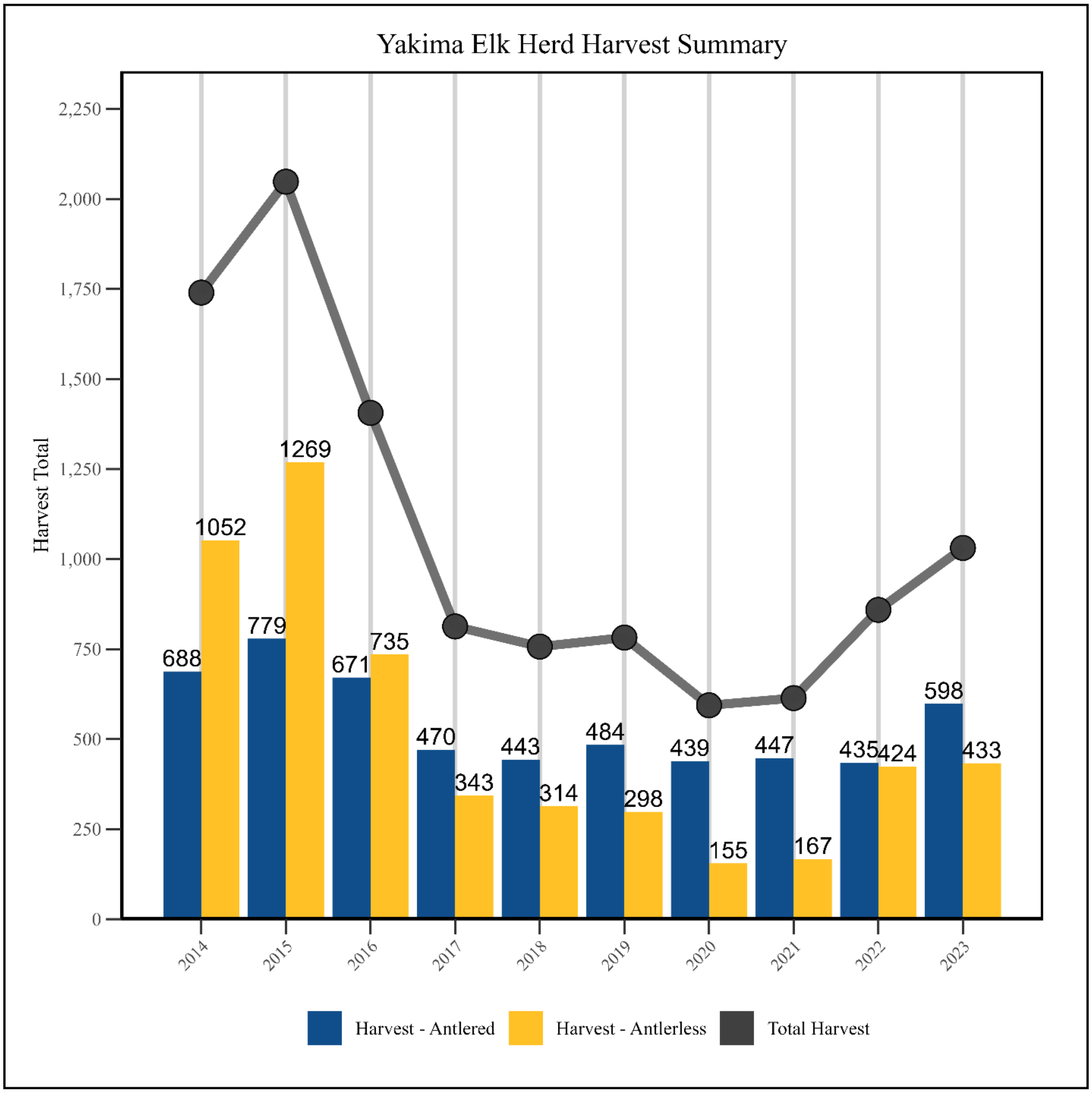
Sightability corrected estimates of total elk abundance with associated 90% confidence intervals, bull:cow ratio, and calf:cow ratio in the Yakima elk herd area, spring 2015-2024. No survey was done in 2024. Shaded blue boxes represent WDFW's management objectives, which are to promote herd stability or growth.

Figure 3. Survey estimates in the Rattlesnake Hills elk subherd area.



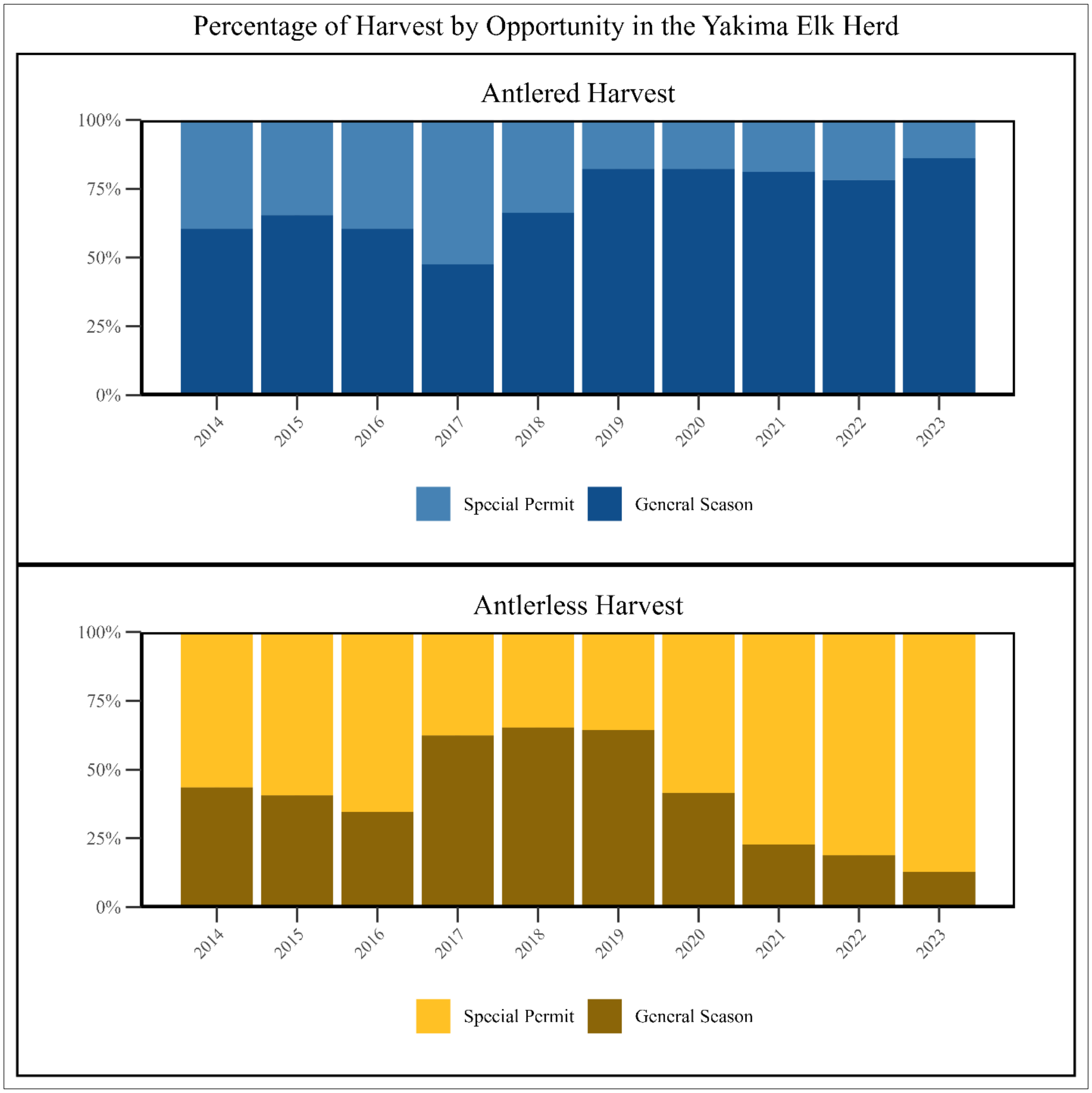
Sightability corrected estimates of total elk abundance with associated 90% confidence intervals, bull:cow ratio, and calf:cow ratio in the Rattlesnake Hills subherd area for population size, bull:cow ratio, and calf:cow ratio, spring 2015-2024. Shaded blue boxes represent WDFW's management objectives, which are to promote herd stability or growth.

Figure 4. Elk harvested in the Yakima elk herd area.



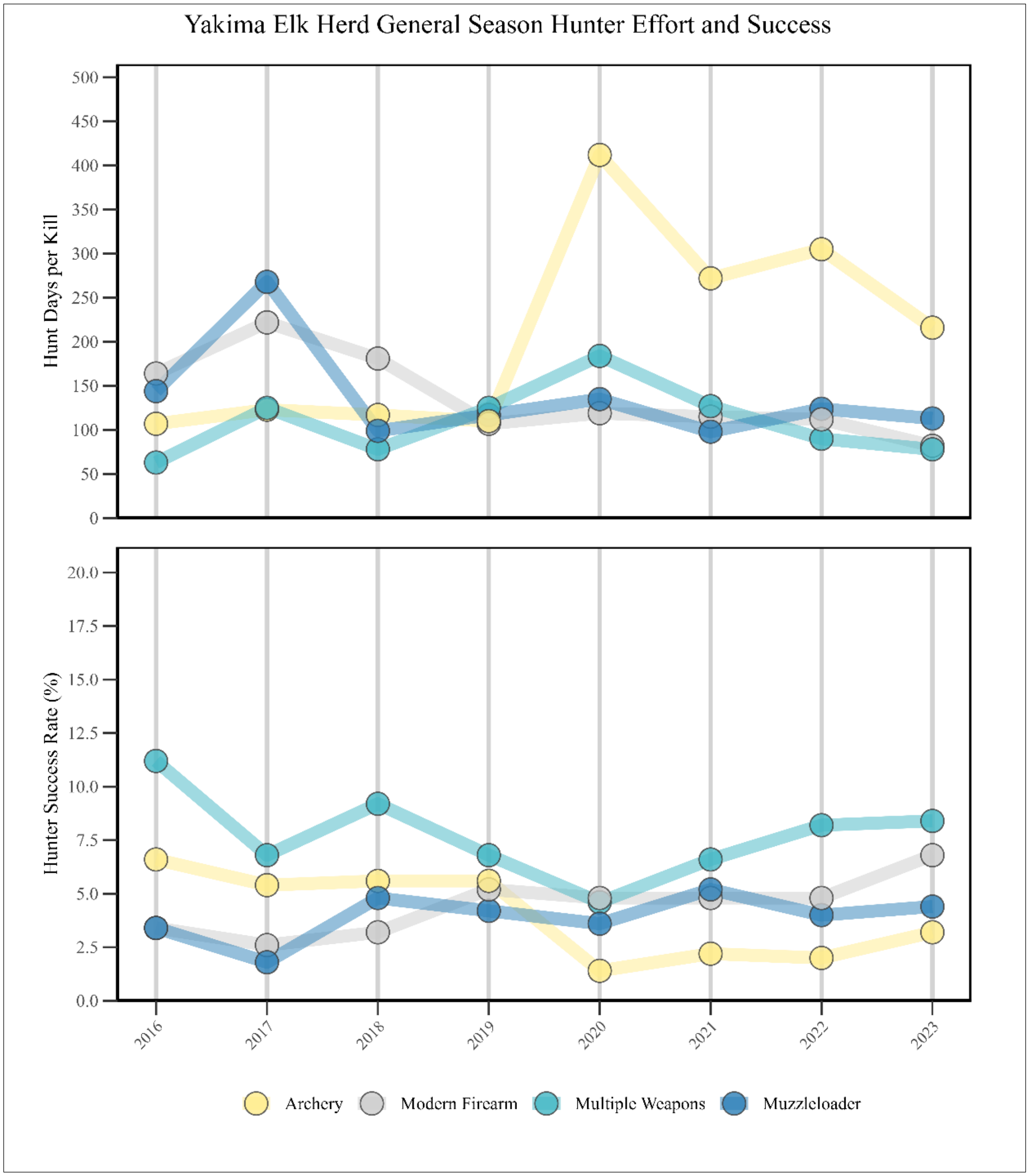
Estimated number of antlered and antlerless elk harvested in the Yakima elk herd area during recreational hunting seasons (general and permit opportunities combined) established by the Department, 2014-2023. Estimates do not include elk harvested associated with damage permits (see Human-Wildlife Interaction below). Estimates also do not include harvest that occurred during established Tribal seasons because those data are currently not available.

Figure 5. Antlered harvest and antlerless harvest in the Yakima elk herd area.



Estimated percentage of recreational antlered harvest in the Yakima elk herd area that occurred during general and permit seasons, 2014-2023.

Figure 6. Hunter effort and success rate.



Estimated number of days hunters spent pursuing elk per kill and hunter success rate in the Yakima elk herd area during recreational seasons that provided general over-the-counter opportunities, 2016-2023, by weapon type.

Survival and mortality

The Department monitored the survival of adult female elk and branch-antlered bulls in the Yakima elk herd area from 2003 to 2006 and estimated bull survival to be 0.63 (95% CI = 0.52–0.73). Estimated cow survival was 0.58 (95% CI = 0.39–0.75) in GMUs 336, 340, 342, and 346 in 2005 and 0.83 (95% CI = 0.73–0.90) during 2003, 2004, and 2006 (WDFW, unpublished data). Estimated cow survival across other portions of the herd area and all study years was 0.88 (95% CI = 0.84–0.92). WDFW documented causes of mortality for 69 elk during that study and attributed 88% of all mortalities to human causes; one (<2%) mortality was attributed to predation.

Adult elk and calves also make up principal prey for a variety of predators. Common elk predators within the Yakima elk herd area include black bears, cougars, and gray wolves. Black bears and cougars occur throughout the herd area, but black bears are more abundant in forested habitats. At the time of this writing, no confirmed wolf packs are within the Yakima elk herd area (WDFW et al., 2023).

In GMU 372, occupied by the Rattlesnake Hills subherd, crop damage is a constant concern amongst producers near the Arid Lands Ecology Reserve, which provides refuge for most of the subherd year-round. The elk also damage sensitive shrubsteppe and natural spring sites in the arid landscape, and traffic collisions are becoming a concern. There are no elk feeding sites near the Rattlesnake Hills. Damage control permit seasons run from May 15 through March 31 each year. Permits issued to landowners in the Rattlesnake Hills subherd area result in an average annual harvest of 62 elk (range 53-73). In addition to these permits, non-lethal deterrents and public hunting have reduced conflict over the past decade despite an increasing elk population.

Management concerns

Population trends

The Yakima elk herd is above its population objective and within objective criteria for bull:cow ratios, providing for significant recreational harvest opportunity, including antlerless harvest. The estimated calf recruitment ratio declined from 31 calves per 100 cows in 2022 to 27 in 2023. However, calf survival is inherently variable, and year-to-year variability is expected. The Rattlesnake Hills subherd continues to grow beyond the population objective. Discussions between the Department, federal land managers, private landowners, and tribes continue as the Department searches for workable solutions to increase harvest.

Winter range disturbance

The Yakima elk herd is the only herd in Washington with winter feeding. Winter feeding in conjunction with the elk fencing is driven by the need to control elk conflict by reducing movement onto lower elevation private property areas; elk are not fed to prevent starvation. The movement of elk onto private lands may be an issue of disturbance on the winter range. WDFW initially obtained lands for elk and deer winter range, but these areas have become very popular for recreation. Areas around the elk feed sites have been closed to all public access during the winter and early spring to reduce disturbance. In addition, the Department of Natural Resources has closed roads seasonally on some of their lands to reduce road damage. This provides elk with some additional protections from disturbance. Elk seek security from human disturbance and would likely concentrate on closed areas, reducing conflict without the enticement of feeding. Closing additional access to the winter range can be controversial.

For the foreseeable future, a large portion of the Yakima elk herd will be fed when winter dictates the need.

Landscape disturbance

Several large-scale wildfires in the Yakima herd area over the past decade have likely impacted elk distribution. In addition, land managers are focused on reducing wildfire risk by returning forests to more historic conditions may lead to more open stands with reduced security for elk. Fire management is expected to result in a change in elk distribution. When elk enter high-road density areas with minimal cover during hunting seasons, their vulnerability to harvest may be increased. Therefore, managing a specific harvest to meet population objectives could become more complex.

Elk-human conflict

The Rattlesnake Hills sub-herd population remains well above the management objective. The Department's ability to manage this population is limited because most elk seek refuge on large federal properties closed to hunting and public access. Discussions with federal land managers have yet to identify workable elk management options for traffic safety, ecological damage, and crop depredations.

During the winter, GMU 371 contains an unknown proportion of resident elk and wintering Colockum and Yakima elk on Yakima Training Center lands. Some elk cross I-90 from the Colockum and are hit by vehicles, causing concern for human safety. Consistent harvest in GMU 371 is difficult. The area is a military installation open to hunting, but training dictates what areas are open. A large impact area is off-limits to all access, limiting harvest opportunities. When hunting pressure is applied, elk retreat to the impact area. During a March 2021 survey, only 25 elk (all bulls) were observed outside the impact area. Limited harvest opportunities and a population well exceeding objective cause concern for ecological damage. GMU 371 elk population is also causing concern for local farmers. The crop damage is mainly during the summer, but conflict can also occur during the spring as elk move out of the area. Some high-value orchards have been fenced, but elk skirt the end into hay fields. More fencing is needed in this area to reduce elk conflict.

Management conclusions

Elk abundance in the core Yakima herd was above objective in the 2022-2023 surveys. Calf:cow ratios were lower in 2023 than in 2022, declining from 31 to 27. The bull to cow ratio (13:100) was again within objective, albeit on the lower end of the objective range (i.e., 12-20 bull to 100 cows). Large-scale access closures associated with wildfires in 2021 facilitated an increased spike in escapement (i.e., survival), which increased subsequent bull-to-cow ratios. However, the number of adult bulls remains lower than desired. The Rattlesnake Hills sub-herd remains above objective because hunting is currently restricted on the federal lands that make up the core of this subherd's range, which limits the Department's ability to manage this sub-herd. The increase in elk numbers and GMU 371 is a concern. While hunting is allowed in GMU 371, entry into the impact area is not allowed, which limits the ability to manage elk at the Yakima Training Center.

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Mountain Goat

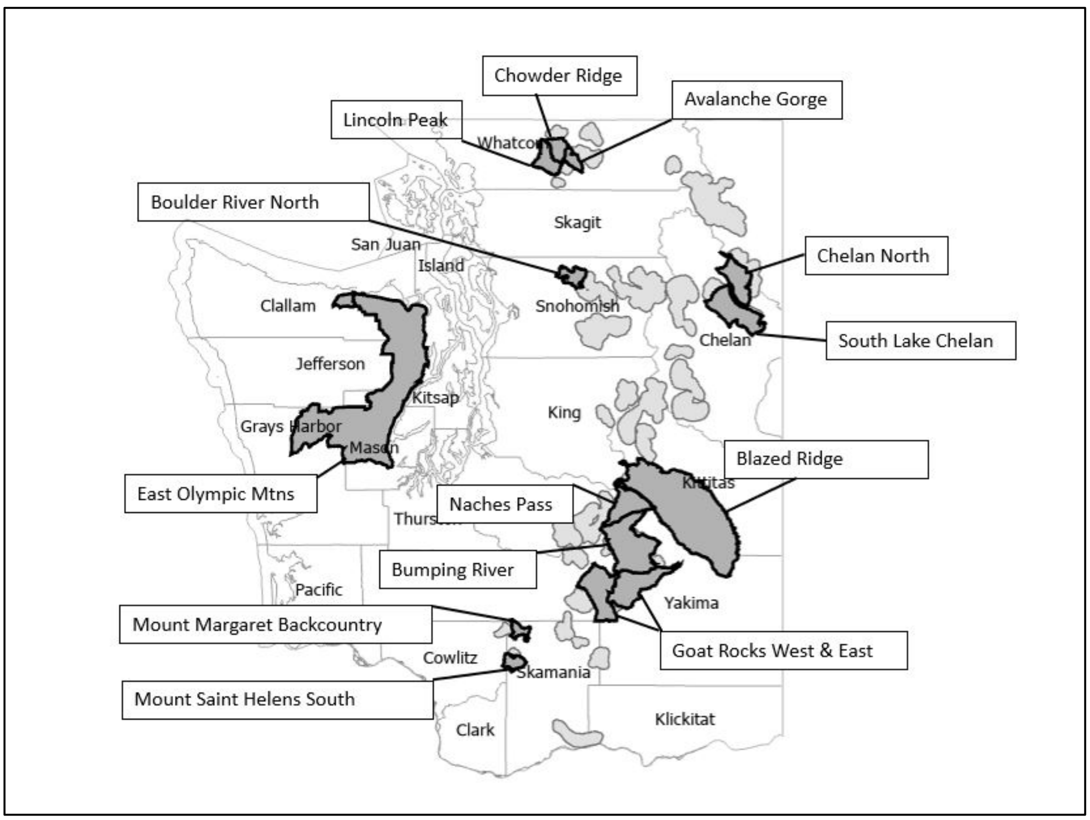
Mountain Goat Statewide Status and Trend Report

Statewide

Introduction

The Washington Department of Fish and Wildlife (*hereafter,* the Department) monitors 10 mountain goat (*Oreamnos americanus*) populations and currently manages seven herds for hunting, divided into 13 hunt areas (Figure 1). The last statewide estimate of mountain goats was 2,800 animals (Rice, 2012). Since then, the Department has focused survey efforts on only a small portion of available habitat (i.e., hunted populations) outside of areas managed by the National Park Service (i.e., Mount Rainier, Olympic, and North Cascades National Parks). While no contemporary statewide estimates are available, the Department expanded its monitoring efforts in 2024. Overall, statewide mountain goat abundance has likely declined commensurate with declines observed in individually monitored herds (Figure 2).

Figure 1. Mountain goat distribution.

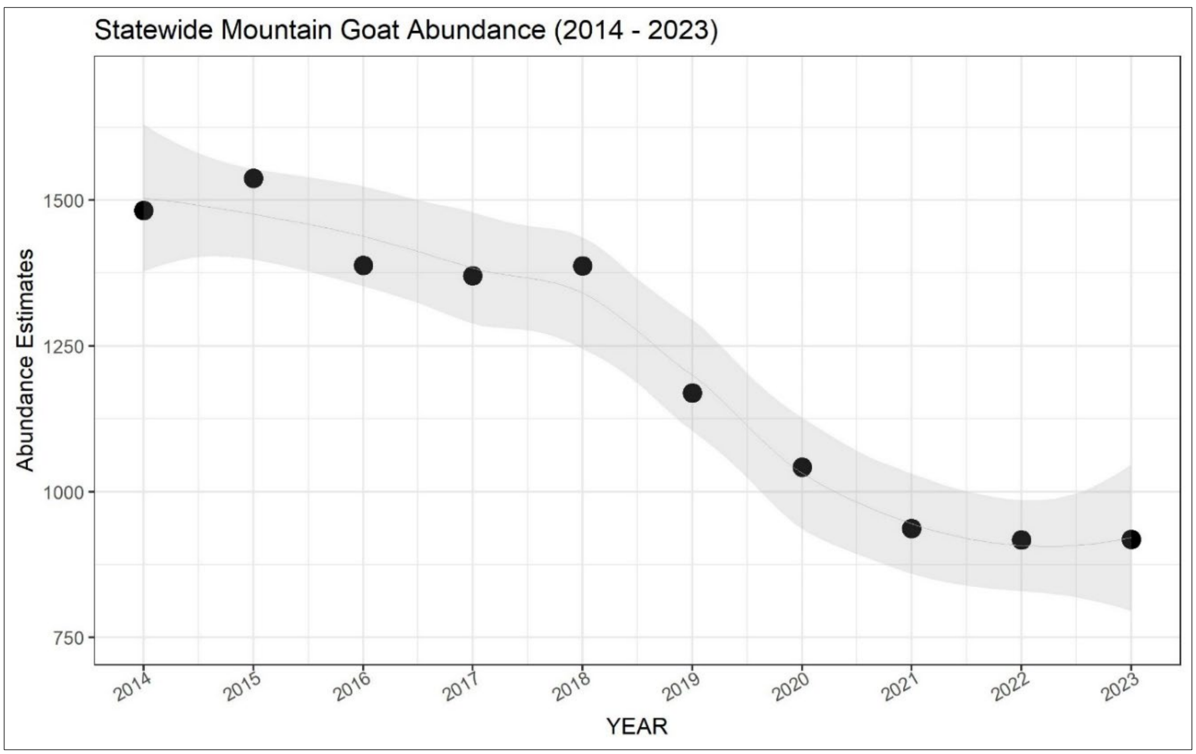


Mountain goat distribution, excluding populations within National Parks, Washington, USA. Dark gray polygons, outlined in Black and labeled, represent the Department's 2023 hunt units. Light gray polygons represent areas of known non-hunted mountain goat populations.

Surveys

The Department monitors population abundance biennially in areas where harvest is permitted and increases frequency (annually) when populations exhibit declining trends. Additionally, locations recently closed to hunting or non-hunted populations are surveyed when funds are available. Monitoring efforts are intended to inform managers of abundance variation within four years, allowing for permit adjustments. Most surveys use aerial methods (i.e., helicopter) during summer and correct for detection bias by applying sightability models (Rice et al., 2009). The only exceptions are those populations associated with the Lake Chelan basin, where boat and aerial methods are applied during winter. Abundance of monitored populations peaked in 2015 (est. = 1537). Severe drought conditions in 2015-2016, followed by a severe winter in 2017, preceded observed declines in abundance beginning in 2016 (Figure 2). The total abundance of monitored populations has stabilized with three years of similar observations and was estimated at 918 animals in 2023 (Figure 2).

Figure 2. Statewide Mountain goat abundance.



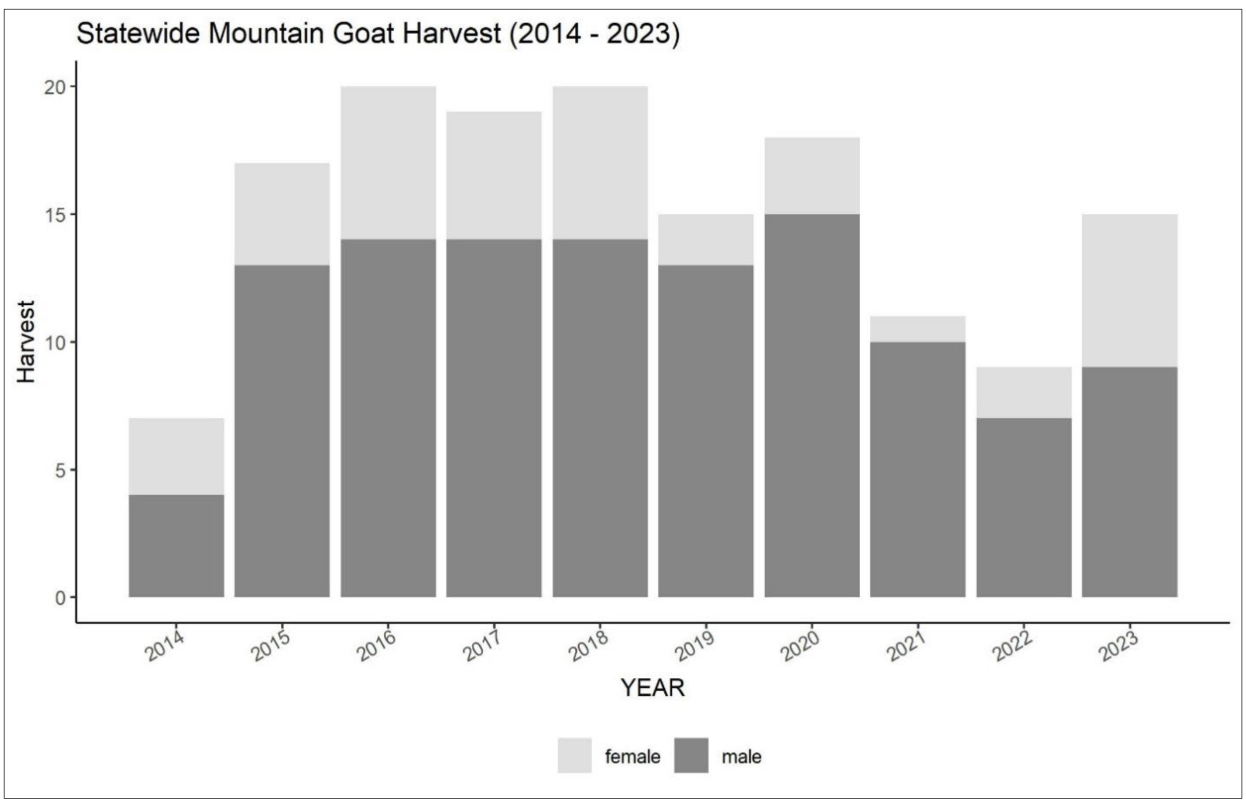
Statewide Mountain goat abundance for herds consistently monitored for hunting with LOESS* smoothing derived from aerial and boat surveys. East Olympic Mountains estimates are excluded, given population reduction management is being implemented (Discussed in Mountain Goat Status and Trend Report: Region 6).

* Locally estimated scatterplot smoothing (LOESS) is a common technique applied when fitting a curve to data. This technique will generate a curve and confidence interval which best fits the given data. A demonstration of this technique can be viewed at: https://www.youtube.com/watch?v=Vf7oJ6z2LCc.

Hunting Season and Harvest

The Department manages mountain goat harvest conservatively to ensure population viability while also providing a high-quality hunting opportunity. The Department offers hunting through once-in-a-lifetime permits, raffle, and auction opportunities. Mountain goats have low relative reproductive potential (e.g., extended parental care, low juvenile survival, relatively low fecundity, and relatively old age of sexual maturity; Hamel et al., 2006; Festa-Bianchet & Côté, 2008). The Department is careful when setting permit levels to avoid overharvest. Populations must have an abundance of > 100 individuals to initiate harvest, and annual allocation will be limited to 4% or less of the population over one year of age. Moreover, the harvest of females is discouraged due to their importance in population stability and growth, and all harvests must be inspected by Department staff to determine age and sex and to allow for the collection of biological samples. Populations with numerous permits are divided into multiple "hunt areas" to reduce excessive harvest in any geographic location (e.g., Mount Baker's population consists of three hunt units: Lincoln Peak, Chowder Ridge, and Avalanche Gorge). Harvest increased as populations grew during the early to mid-2010s, but as declines were observed, the Department has closed specific hunt units (e.g., South Lake Chelan, Chelan North, Boulder River North, Blazed Ridge, and Bumping River) and reduced permit levels (e.g., Goat Rocks West and East) accordingly (Figures 1-3).

Figure 3. Statewide mountain goat harvest.



Statewide mountain goat harvest from 2014 – 2023. Female harvest is illustrated in light gray (above), and male is illustrated in dark gray (below).

Management Concerns

The Department has documented declining population trends in multiple herds throughout the state, with only a few remaining stable (e.g., Naches Pass) or increasing (e.g., Mount Margaret Backcountry and Mount Saint Helens South). Population decreases resulting from the combination of drought and severe winter (2015-2017) were expected, but continual reductions from 2018 to the present do not have a clear explanation. Hypotheses regarding the causes of these declines include disease (discussed in detail under Mountain Goat Status and Trend Report: Region 5, Management Concerns), reduced survival resulting from unfavorable climate conditions (*see* Harris et al., 2023), or predation, emigration to areas outside the Department's surveys geographic extent, increased recreation throughout their range, or potentially alternative habitat use during the survey window (e.g., use of more forested habitats resulting in lower detection rates). Unfortunately, mountain goats are among North America's least studied large mammals, and contemporary local research is limited. In response to these knowledge limitations, the Department, relevant tribes, and federal land managers are working together to coordinate statewide survey and research efforts to improve understanding of population trends and limiting factors. This information will be essential to the Department's future management of this species.

Research

The Department collaborated with Dr. Richard Harris (retired WDFW Special Species Section Manager) to evaluate Washington survival of mountain goats from 2002 to 2022. This effort combined research from multiple agencies (National Park Service, Washington Department of Fish and Wildlife, Stillaguamish, Muckleshoot, and Sauk-Suiattle Tribes) to develop a dataset comprised of 324 adult mountain goats (107 resident and 214 translocated (translocation update: Capture and translocation of mountain goats to the northern Cascade mountains) to evaluate survival over the last two decades. After accounting for fundamental survival differences (e.g., age, sex, season, study area, and translocation status), findings suggest climatic conditions from 2015 to 2022 were not favorable for mountain goat populations stability or growth by demonstrating a negative relationship between survival and winter snow depth, the previous year's drought, and increased May temperatures (Harris et al., 2023; White et al., 2011). Additional research is necessary to better understand the limiting factors of the current mountain goat population.

Management Conclusions

Washington mountain goat populations have declined rapidly over the last decade with substantial variation observed between geographic area and timing (e.g., North and South Lake Chelan, Goat Rocks, and Mount Baker exhibiting reductions in 2014, 2019, and 2021, respectively). Harris et al. (2023) suggest climatic variation is linked to mountain goat survival statewide. Given climate change is expected to increase drought and alter precipitation patterns, more fine-scaled research is necessary. Focused efforts on understanding if disease is a current limiting factor, when climatic conditions have reached a point where survival may be compromised, and how other factors such as recreation may be contributing will inform managers of how best to mitigate these impacts.

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Mountain Goat Status and Trend Report: Region 2 – Chelan County

Emily Jefferies, District Wildlife Biologist
Johanna Eilers, Assistant District Wildlife Biologist

Management guidelines and objectives

The statewide management goals for mountain goats are to perpetuate productive populations and ensure long-term genetic connectivity, to provide opportunities for a wide range of non-consumptive uses, and to enhance populations to provide sustained recreational hunting opportunities.

WDFW manages two mountain goat populations within the Lake Chelan Basin, the South Shore and North Shore herds. These herds correspond with the designated mountain goat hunt areas, South Lake Chelan and Chelan North. Limited harvest of the Lake Chelan mountain goat populations began in 2001 for the North Shore herd and in 2012 for the South Shore herd (WDFW, 2014). These hunt units are closed to mountain goat harvest due to the consistent declines observed in both herds for over a decade (Table 1, Figures 1 & 2).

Population surveys

Mountain goats are inherently challenging to survey because of the landscapes and terrain they inhabit. Lake Chelan populations are surveyed using aerial, boat, and ground surveys depending on funding, capacity, and environmental conditions. Surveys typically occur from November to February and, for decades, were predominantly conducted by the Chelan Public Utility District (PUD) via boat, which has cooperatively monitored mountain goats at Lake Chelan with WDFW staff since 1982. Mountain goats are extremely difficult to survey from a boat due to the terrain and vegetation inhibiting detection. During years with high snow accumulation mountain goats may concentrate in higher densities along the lake to winter. Because of these constraints on observing mountain goats, annual counts can vary widely, especially due to environmental conditions.

WDFW biologists conducted a helicopter-based survey in February 2015 using sightability correction to estimate goat numbers in a subsection of habitat on the North Shore of Lake Chelan to evaluate boat-based survey methods. Although this survey was not exhaustive, results showed that large numbers of mountain goats occupying the habitat in the survey units were not available for observation from a boat-based survey platform. The aerial sightability survey returned an estimate of 93 mountain goats (90% CI = 74-108). The maximum count from boat-based surveys conducted the next day totaled 15 mountain goats (Pope & Cordell-Stein, 2015).

Due to the potential for biased counts resulting from boat surveys, especially as low snowpack years become more common, the 2018-2022 Lake Chelan Wildlife Habitat Plan (LCWHP) included a provision allocating funds to aerially survey mountain goats, among other big game species, in the Lake Chelan

Basin, and this provision remains in the 2023-2027 LCWHP (Chelan PUD, 2018; Chelan PUD, 2023). WDFW conducted aerial mountain goat population surveys in 2019 (summer and winter), 2020 (winter), 2021 (summer), 2022 (winter), and 2024 (winter), in addition to independent boat surveys conducted by Chelan PUD 2020-2022. No aerial or boat surveys were performed for mountain goats in 2023 as staff time and funding went to an aerial capture and collaring effort (*see* Research).

Aerial surveys from 2019-2024 have yielded few mountain goat detections in both subherds. The North Shore herd's population was estimated to number only 30 individuals in 2022 following a winter aerial survey and 55 in 2024. The North Shore herd's estimated kid:adult ratio was remarkably similar for both years, around 35 in 2022 and 2024. Aerial surveys of the South Shore herd in 2020, 2022, and 2024 yielded sightability-corrected population estimates of 33, 25, and 34 goats, respectively. Kid:adult ratios averaged 28:100 over those three years (Figures 1 & 2).

In partnership with the Rocky Mountain Goat Alliance (RMGA) and the Washington chapter of Backcountry Hunters and Anglers (BHA), biologists in District 7 initiated the first-ever hiking surveys of mountain goat habitat in the Lake Chelan Basin in July 2023 and again in July 2024. On both occasions, ten volunteers spent two to four days in and adjacent to the Lake Chelan Basin searching for mountain goats. They collectively covered approximately 90 miles of trail, ranging in elevation from lake level to 8,200 feet (Figure 3). These volunteers observed no mountain goats in 2023; only five goats were observed in a single group in the Ice Lakes area in 2024. No routes were surveyed on the North Shore in 2024 as the vast majority of mountain goat habitat in that unit was within the active burn area or closure area of the Pioneer Fire, which remains ongoing. The Pioneer Fire started on June 8, 2024, and reached 38,730 acres as of August 19, 2024.

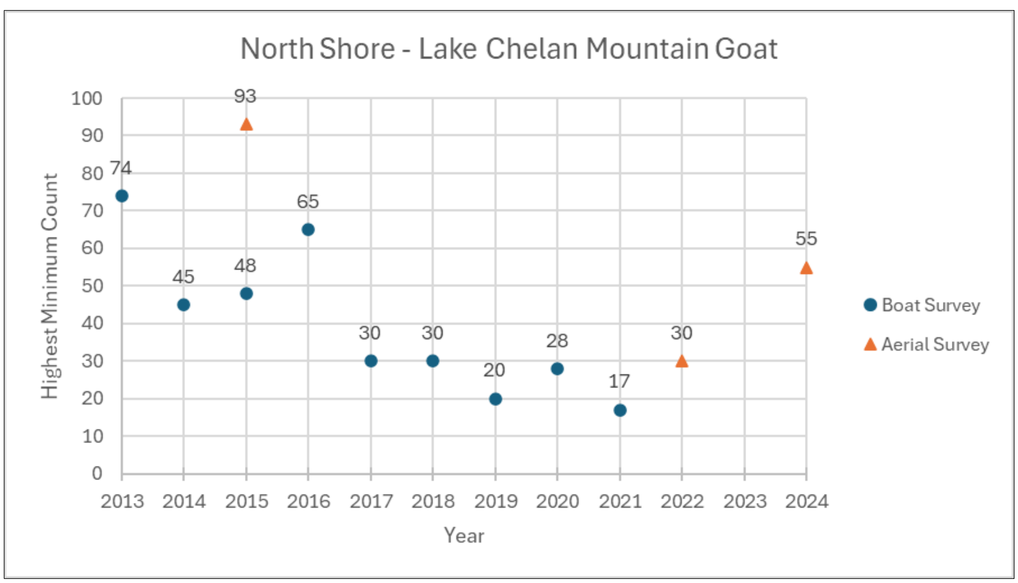
Recent data on mountain goat populations in other areas of Chelan County is lacking. Winter mountain goat counts conducted between 2010 and 2015 along driven survey routes in the Chiwawa and East Stevens Pass areas returned higher numbers over time, which suggests these populations were increasing over this period. Still, surveys have not been performed in these areas in recent years. Additionally, volunteer-led survey efforts conducted along hiking routes in 2008-2015 sought to determine the presence of mountain goats in portions of the Alpine Lakes Wilderness for which no data had previously been available. Surveys averaged a high count of 65 mountain goats per year, comparable to previously compiled estimates of 50-75 animals in the Alpine Lakes Wilderness (Rice, 2012). In 2018, WDFW biologists conducted aerial surveys of mountain goats in the Alpine Lakes Wilderness area, including the Enchantments, Icicle Ridge, and the Wenatchee Mountains. Using a sightability-corrected survey, biologists estimated 71 mountain goats with a 90% C.I. of 60-83. The kid to adult ratio was estimated at 22 kids:100 adults (90% C.I. 18-25). WDFW staff plan to conduct surveys in the Alpine Lakes Wilderness portion of the North Wenatchee Mountains in fall 2024 in an effort to obtain a population estimate and kid:adult ratio for this mountain goat herd.

Table 1. Compiled maximum counts from ground and boat-based surveys in Chelan County, 2009-2022.

Winter	North Lake Chelan*	North Lake Chelan Kid:Adult*	South Lake Chelan*	South Lake Chelan Kid:Adult*	Stehekin	Chiwawa	North Wenatchee Mtns.	East Stevens Pass
2009-10	81	16	128	31		9	69	22
2010-11	78	27	94	53		8	38	10
2011-12	43	30	116	28	1		71	12
2012-13	74	32	103	26			56	
2013-14	45	23	50	10			78	
2014-15	48	30	45	29			117**	
2015-16	65	30	50	22				
2016-17	30	25	40	18				
2017-18	30	38	32	6			71	
2018-19	20	20	43	14				
2019-20	20	36	17	41				
2020-21	17	55	51	59				
2021-22	22							

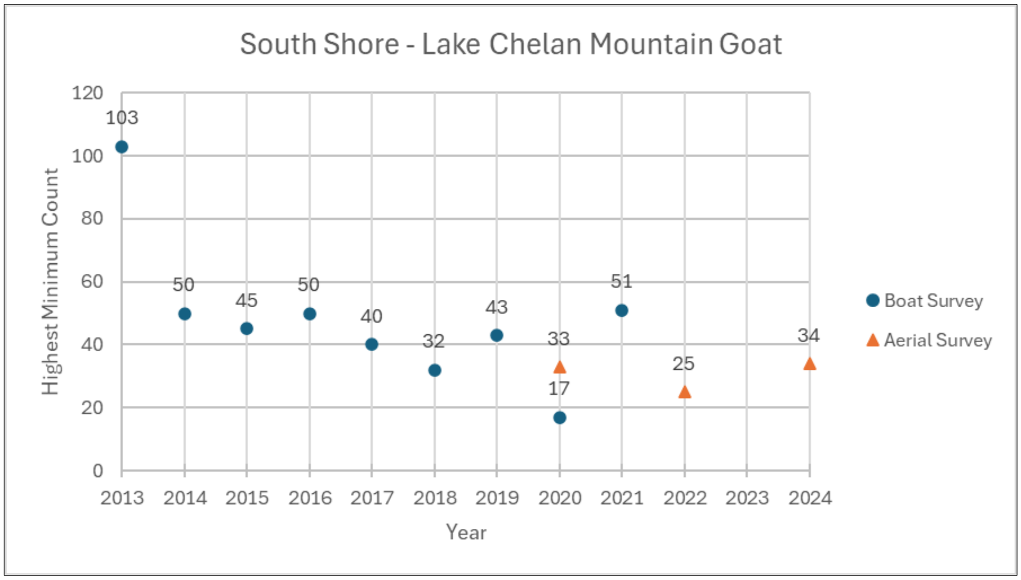
* Data from Chelan PUD Winter Boat Surveys.
** Increase is largely attributed to an increased in volunteer survey efforts.
Kid:Adult ratios calculated from total positively identified animals only.

Figure 1. North Shore mountain goat subherd survey results.



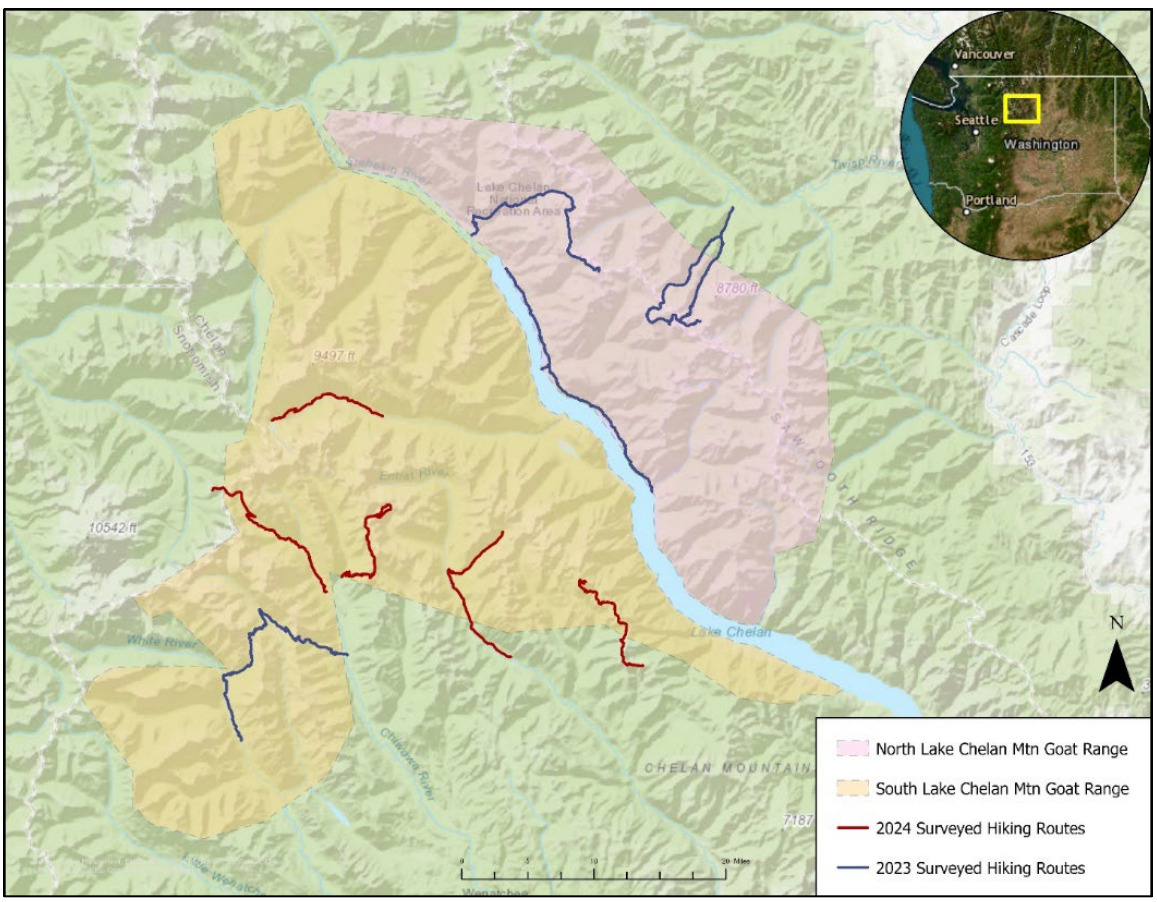
Boat survey values (blue circles) represent minimum population counts, and aerial survey values (orange triangles) are population estimates calculated using the Rice et al., 2009 sightability model.

Figure 2. South Shore mountain goat subherd survey results.



Boat survey values (blue circles) represent minimum population counts, and aerial survey values (orange triangles) are population estimates calculated using the Rice et al., 2009 sightability model.

Figure 3. Completed survey routes in the pilot (2023) and second year (2024) of Lake Chelan mountain goat backcountry hiking surveys.



Hunting seasons and recreational harvest

In 2001, two permits were authorized for Chelan North, the first in two decades, and two male mountain goats were harvested. Only one permit was issued each year from 2002-2008, with permits increasing to two in 2009. Hunter success has varied from year to year but has been high, with hunters in the Chelan North unit enjoying an 86% success rate since 2009 and a 64% success rate for the South Lake Chelan unit over the eleven seasons it was open to hunting (Tables 2 & 3). Rugged terrain and remote wilderness with restricted access can limit hunter success and make finding adult males difficult. In Chelan North, 30% of mountain goats harvested between 2009 and 2022 were nannies. In the eleven years the South Lake Chelan unit was open to hunting, zero females were harvested.

In 2021, special permit levels for both Lake Chelan herds remained the same (two permits for the North Shore and one for the South Shore), but both sub-herds were removed from the raffle hunt areas due to consistent declines in both sub-herds. In 2022, North Shore permits were reduced from two to one in response to low population counts at each shore during the February 2022 aerial surveys. No permits were offered in 2023, and mountain goat hunting in the Lake Chelan Basin will remain closed until these populations recover and meet the minimum threshold to sustain harvest.

Mountain goat populations within the East-Central Cascades (Chiwawa, East Stevens Pass, North Wenatchee Mountains, and Stehekin) are not surveyed intensively enough to confidently estimate size, and they are currently closed to hunting. In 2018, aerial surveys conducted in the North Wenatchee Mountains Unit indicated that this population is still below the minimum threshold (i.e., 100 individuals) to initiate a permitted hunt.

Table 2. Summary of Mountain Goat Harvest for North Lake Chelan, 2014-2023.

Year	Permits	Hunters	Harvest	Male	Female	Success	Days Hunted
2014	2	1	1	1	0	100	5
2015	2	1	0	0	0	0	0
2016	2	2	2	1	1	100	27
2017	2	1	1	0	1	100	5
2018	2	2	2	1	1	100	15
2019*	2	2	2	2	0	100	11
2020	2	2	2	2	0	100	12
2021	2	1	1	1	0	100	3
2022	1	1	1	1	0	100	19
2023	**0**						
Total	**27**	**23**	**20**	**14**	**6**	**86%**	**145**

* For 2012, 2013, and 2019, additional harvest of one mountain goat from raffle/auction hunts not included.

Table 3. Summary of Mountain Goat Harvest for South Lake Chelan, 2014-2023.

Year	Permits	Hunters	Harvest	Male	Female	Success	Days Hunted
2014	1	1	0	0	0	0	0
2015	1	1	1	1	0	100	6
2016	1	1	1	1	0	100	10
2017	1	1	0	0	0	0	13
2018*	1	1	1	1	0	100	17
2019*	1	1	1	1	0	100	10
2020	1	1	1	1	0	100	25
2021	1	1	1	1	0	100	8
2022	1	1	0	0	0	0	20
2023	**0**						
Total	**11**	**10**	**7**	**7**	**0**	**64%****	**115**

* Additional harvest of 2 mountain goats from raffle/auction hunts in 2018 and 1 mountain goat in 2019 not included.
** Success calculation does not include 2012, in which a permit was issued, but no hunt took place.

Habitat

During the last 100+ years, fire suppression and resulting conifer encroachment into meadows has decreased the quality of summer range habitat available to mountain goats in Chelan County. The Lake Chelan Basin offers an abundance of escape terrain and montane conifer habitat, but the alpine and subalpine meadow needed for summer forage is notably lacking. Historically, high-elevation forests in the Lake Chelan Basin and throughout Chelan County consisted of a mosaic of vegetation types and stages due to periodic patchy, mixed-severity wildfires caused by lightning and Indigenous peoples looking to optimize hunting and foraging opportunities. Today, with the absence of strategically placed fire in the subalpine zone and the frequent suppression of lightning strike fires since the 1940s, forests in the North Central Cascades are much more homogenous in stand age and composition. This homogeneity of environment not only offers lower-quality habitat for mountain goats but also sets the stage for large-scale fires of unprecedented scale and frequency, which in turn lead to the regrowth of large tracts of uniform stand age, continuing a cycle that is further exacerbated by hotter, drier climatic conditions.

Over the last 25 years, several major fires on both shores of Lake Chelan and in the North Wenatchee Mountains (Icicle and Tumwater Canyons) have burned substantial mountain goat habitat. The subsequent increase in early seral-stage vegetation and forage may have contributed to a short-term increase in mountain goat counts during the same time, both in terms of increased production and visibility. In 2015, the 65,000-acre Wolverine Fire burned across mountain goat habitat on South Lake

Chelan. The fire burned over areas recovering from the 2007 Domke Lake fire, the 2004 Deep Harbor fire, and the 2014 Duncan fire. Currently, the ongoing 38,730-acre Pioneer Fire on the North Shore of Lake Chelan is burning areas recovering from the 2001 Rex Creek Fire, the 2006 Flick Creek Fire, and the 2017 Uno Peak and Ferry Point fires, impacting the majority of the North Shore herd's known range. Overall, little is known about the long-term effects of fire on mountain goat populations. Without collars on goats, researchers cannot gain important insights into how the Pioneer Fire is impacting North Shore goats (the single-collared nanny on the North Shore is just out of range of the fire, at least as of this writing on August 19, 2024). Additional research on the long-term effects of fire on mountain goat populations is needed to understand and possibly address the observed declines on both shores of Lake Chelan.

Attempting habitat restoration for mountain goats is a challenging prospect due to the rugged, inaccessible nature of mountain goat range and the fact that the vast majority of mountain goat habitat in Chelan County occurs on designated wilderness lands managed by USFS and NPS. However, interagency habitat enhancement efforts may become imperative with the substantial and ongoing impacts to mountain goat habitat from climate change (e.g., rising temperatures and drought conditions), wildfire, and other factors.

Research

In 2002, a statewide mountain goat research project was initiated to determine habitat use, seasonal range, population status, methods of survey, and population limiting factors. In 2004, three adult nannies were fitted with GPS collars in District 7. One was collared on Nason Ridge, and one on each the North and South Lake Chelan Units. In 2005-2006, all mountain goats were found to concentrate their activity in 4-5 mi^2 areas near their capture locations.

Researchers gained insight into gene flow and interactions between populations. This was highlighted by two nannies collared on Gamma Ridge on Glacier Peak that each traveled 10-12 miles east to the south shore of Lake Chelan. Three mountain goats were collared on Gamma Ridge in the fall of 2006 and traveled into the Chiwawa region of Chelan County, highlighting movement and interchange between populations. Upcoming collaring efforts have the potential to greatly enhance WDFW's limited knowledge of the Lake Chelan mountain goats' movements and possible interactions with other populations. Ideally, having collars out in both herds will help biologists get a better idea of population size and trends by enabling the use of mark-recapture methodology.

In January 2023, biologists initiated an aerial capture and collaring project for both mountain goat herds in the Lake Chelan Basin. The goal was to outfit ten adult mountain goats from the South Shore herd and ten adult mountain goats from the North Shore herd with GPS collars, each with a different neckband color allowing for easy visual identification during future aerial or boat surveys. Biological samples, including blood, nasal swabs, and fecal pellets, were collected from each captured goat to be analyzed for diseases, parasites, and nutrient levels. This project aimed to collect data for the Lake Chelan mountain goat populations that would guide the efforts of WDFW biologists to stabilize both herds and enhance the conditions these animals need to increase in number and thrive in perpetuity.

To that end, researchers will use the data collected to estimate the herds' home ranges and movements, improve survey design, and analyze adult survival as a function of climactic variables (e.g., average daily temperature in summer, average monthly snow depth in winter, etc.), assess emigration, and to investigate disease and nutrition influences on these populations.

During the initial capture effort in January 2023, only one nanny on the South Shore and one nanny on the North Shore were captured before the project had to be called off due to hazardous ice conditions. This collaring effort was further postponed in early 2024 due to vendor availability, and biologists will attempt to continue this collaring effort in December 2024 or early 2025. However, due to permitting constraints, operations will only take place on the South Shore of Lake Chelan in areas outside of designated wilderness. Collaring efforts for goats on the North Shore are postponed indefinitely as the vast majority of that herd's range falls within US Forest Service and National Park Service designated wilderness.

Management conclusions

Most mountain goat populations in Chelan County are below historical levels and are not hunted. Population trends in District 7 outside the Lake Chelan area can only be effectively monitored with additional survey resources. Based on Chelan PUD and WDFW survey data, annual counts of the Lake Chelan North Shore and South Shore herds have been declining in recent years, and there is every indication that both herds are too small to allow for the continuation of harvest. As such, 2022 was the last season in which hunting was permitted in either Lake Chelan goat hunt unit for the foreseeable future. South Lake Chelan and Chelan North were closed to hunting beginning in 2023, and permits will not be reinstated in either unit these herds are definitively observed to meet the minimum threshold for harvest.

There continue to be large gaps in WDFW's understanding of mountain goat distribution, movement, and interchange with neighboring populations, post-fire habitat utilization, abundance, recruitment, and survivorship in District 7. To address these knowledge gaps and inform future management actions, biologists will continue to pursue the GPS collaring of adult mountain goats in the Lake Chelan Basin in December 2024 or early 2025. Additionally, emphasis should be placed on new surveys in other sections of District 7's mountain goat habitat to better understand trends in mountain goat populations and their distribution.

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Mountain Goat Status and Trend Report: Region 2 - Methow

Scott Fitkin, Wildlife Biologist
Jeff Heinlen, Wildlife Biologist

Management guidelines and objectives

The Methow unit (Goat Unit 2-2) is currently being managed for population growth and increased distribution. WDFW encourages the public to take advantage of watchable wildlife opportunities at the salt lick along Hart's Pass Road and on Grandview Mountain northwest of Palmer Lake.

Population surveys

The Department conducts biennial surveys within huntable populations, and as resources allow additional surveys to assess other known but unhunted populations. These surveys implement monitoring techniques that correct for group detection bias and generate herd abundance estimates. These data are used to generate hunting permit allocations in accordance with statewide management guidelines. The Methow Unit was recently surveyed in June of 2023, but despite good conditions and timing, only 37 goats were observed (Table 1).

Table 1. Population composition counts from the Methow Unit.

Year	Kids	Yearling	Adults	Minimum Population	Kids:100 Adults
2013	6	5	15	26	40
2014	--	--	--	--	--
2015	--	--	--	--	--
2016	10	2	26	38	38
2017	--	--	--	--	--
2018	--	--	--	--	--
2019	--	--	--	--	--
2020	--	--	--	--	--
2021	--	--	--	--	--
2022					
2023	5	4	28	37	18

Hunting seasons and recreational harvest

Statewide mountain goat management guidelines recommend considering harvest permits only for management units with a population size of at least 100 goats. The two most recent surveys in the Methow Unit suggest the population is well below that threshold. As a result, the population size and trend of these animals are unknown.

Survival and mortality

Limited survey data suggests the population in the Methow Unit has been relatively stable at a low number over the last 15 years, and the kid-to-adult ratio of the herd has been variable. Incidental observations outside of the hunting unit verify that small populations of goats persist in pockets scattered throughout adjacent suitable habitats in the Okanogan District, so the potential for immigration exists. Due to a lack of resources, little survey work has been done in these areas. As a result, population size and trend are unknown for these animals.

Additionally, 49 mountain goats removed from the Olympic Mountains were translocated to the Methow Unit over three summers beginning in 2018. These releases sought to augment the existing population, boost genetic diversity, and improve connectivity with goat bands outside the unit. Mortality rates of translocated animals were high, and although survivors mostly integrated with existing bands, the effort did not appear to boost the overall population significantly.

Habitat

Goat habitat is almost entirely within areas secured by USFS wilderness designation, and habitat availability remains stable. Habitat quality varies noticeably throughout the goat range in the Okanogan District due to past wildfires of varying ages. Overall, the unit is currently characterized by a mosaic of successional stages. As a result, changes in habitat quality will occur primarily through natural, unpredictable events such as wildfires and avalanches rather than human intervention. Fire exclusion may have reduced the quantity or quality of summer forage resources for goats in some alpine terrain; however, goats in areas that have burned in the last 20 years appear to be doing well. A wildfire burned a significant part of the southern portion of the unit during the summer of 2021 and is expected to improve forage quantity and quality for several years to come.

Management conclusions

Management objectives should continue to focus on population growth and distribution expansion. Resources are needed to allow for a consistent and methodical annual survey to better determine population size and trends. It appears that productivity remains low in the southern portion of the unit, and limited data from telemetry and survey flights suggests minimal interchange between the two primary herd segments. In addition, the suitable goat habitat adjacent to this unit is sparsely populated and could likely support more animals than exist currently.

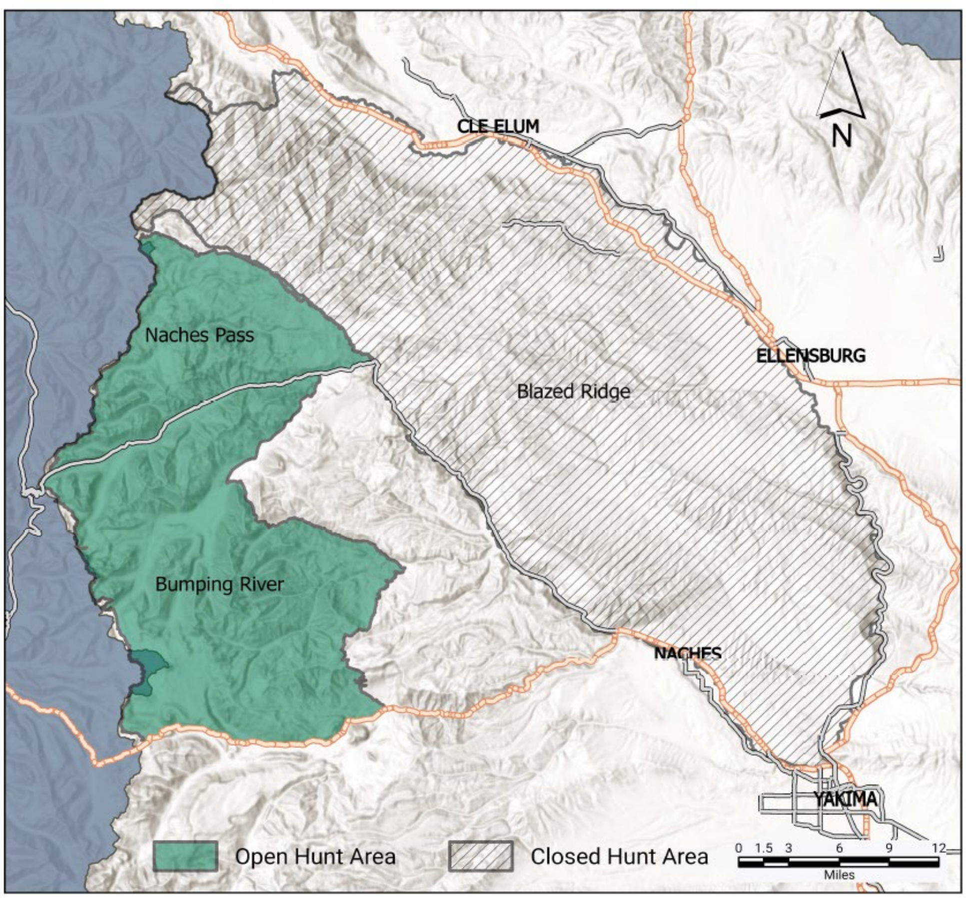
Mountain Goat Status and Trend Report: Region 3 – Blazed Ridge, Bumping River, Naches Pass

Erin Wampole, Wildlife Biologist

Introduction

Mountain goats occupy high-elevation habitats along the Cascade crest throughout Region 3 on lands predominately managed by the Okanogan-Wenatchee National Forest and Yakama Nation. Three mountain goat hunt units are managed within Region 3: Blazed Ridge (3-10), Bumping River (Goat Unit 3-7), and Naches Pass (Goat Unit 3-6) (Figure 1). A fourth unit, Kachess Ridge, north of I-90, was a historically designated hunt unit. The unit was closed in 2006 due to persistent population declines and unsustainable harvest opportunity.

Figure 1. Region 3 designated Goat Units.



Management guidelines and objectives

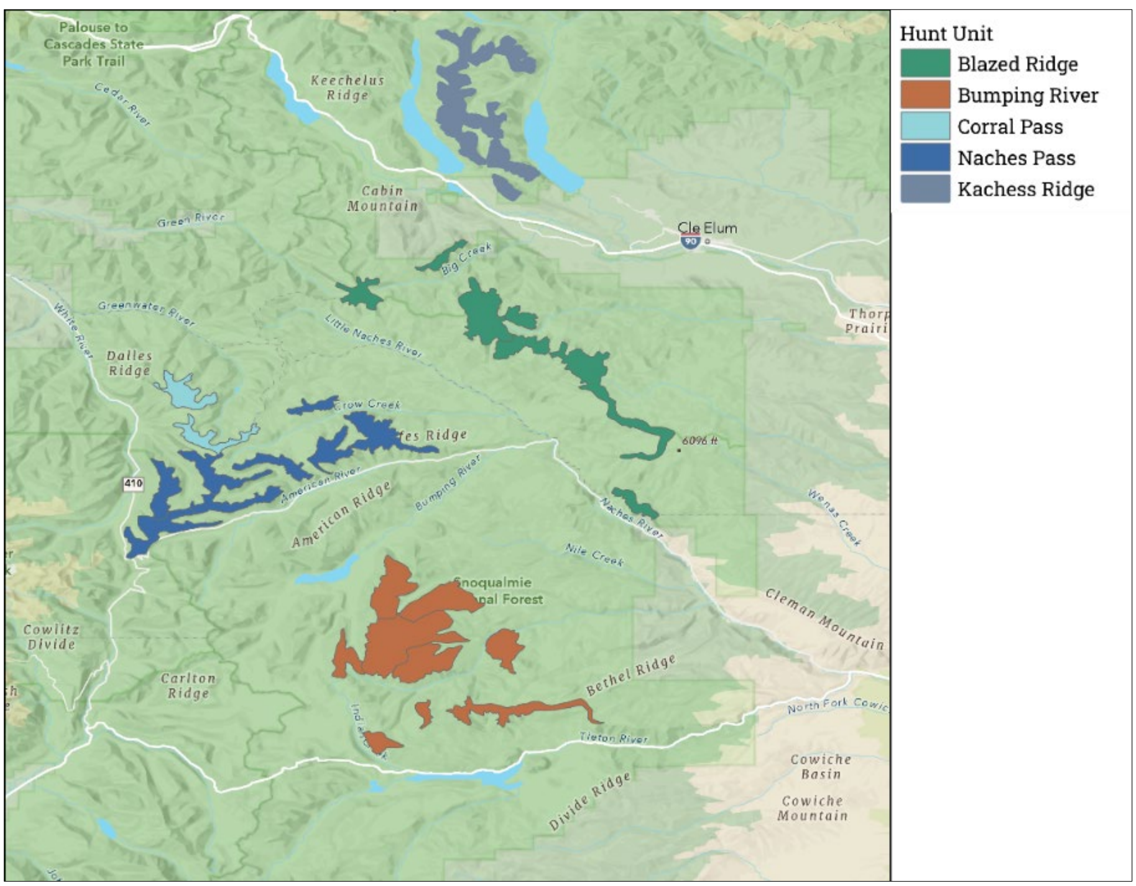
The statewide goals for mountain goats are to preserve, protect, perpetuate, and manage mountain goats and habitats to ensure healthy, productive populations while managing for sustained yield and a variety of recreational, education, and aesthetic purposes (WDFW, 2015).

For a population to sustain yield, a minimum adult (defined as older than a kid) population of 100 goats is required to open a hunt unit. Once open, hunt unit harvest should not exceed approximately 4% of the adult population annually (WDFW, 2015).

Population surveys

Population surveys are conducted to provide estimates of abundance and composition (kid:adult). Surveys occur on alternating years within hunted units and are conducted by aerial rotor-wing aircraft during August-September. Subsections of goat habitat within each hunt unit are searched in transects (Figure 2). Observed goats are identified and counted as either kid, adult, or unknown. Population estimates are derived from aerial count data corrected for sightability for each hunt unit (Rice et. al., 2009). Estimates are then used to evaluate population trends and assess future harvest opportunity, which will not exceed approximately 4% of the adult population annually.

Figure 2. Aerial surveyed areas of mountain goat habitat within each hunt unit.



Additional surveys may be conducted for hunt units where harvest opportunity is approaching management thresholds (i.e., annual surveys) or other management concerns warrant additional surveying. Goat populations no longer within an active hunt unit are surveyed when funding is available.

Surveys of Bumping River and Naches Pass were conducted in August 2024. Blazed Ridge was last surveyed in 2020 prior to closing due to low goat abundance.

Bumping River

In Bumping River, population counts were at 77 observed goats, up from the 2022 survey of 62 goats (Table 1). Populations have shown a declining trend since 2013. The current sightability corrected population estimate is 85 goats, 95% CI [79-130], and 54 adults [50-80]. The 2024 estimates are the first indication of a possible reversing or stabilizing population trend since the 2013 declines (Figure 3a). Kid ratios were at a historic high (Figure 3b), 57 kids:100 adults, 95% CI [53-60].

Table 1. Survey count data for Bumping River (Mountain goat Unit 3-7) 2010 to present.

Year	Kids	Older than kids	Total	K:100
2010				
2011	28	75	103	37
2012	39	103	142	38
2013	43	108	151	39
2014	No	Survey		
2015	44	101	147 [a]	44
2016	No	Survey		
2017	No	Survey		
2018	33	94	127	36
2019	No	Survey		
2020	25	64	89	39
2021	No	Survey		
2022	19	45	62	42
2024	31	54	85	57

[a] Includes unclassified/yearling. Survey Data (for 2009 and later, figures represent points estimates from a sightability-corrected model; Rice et al., 2009.

Figure 3a. Sightability corrected, mean population estimates of goats for the Bumping River with 95% confidence interval reported from 2020-2024.

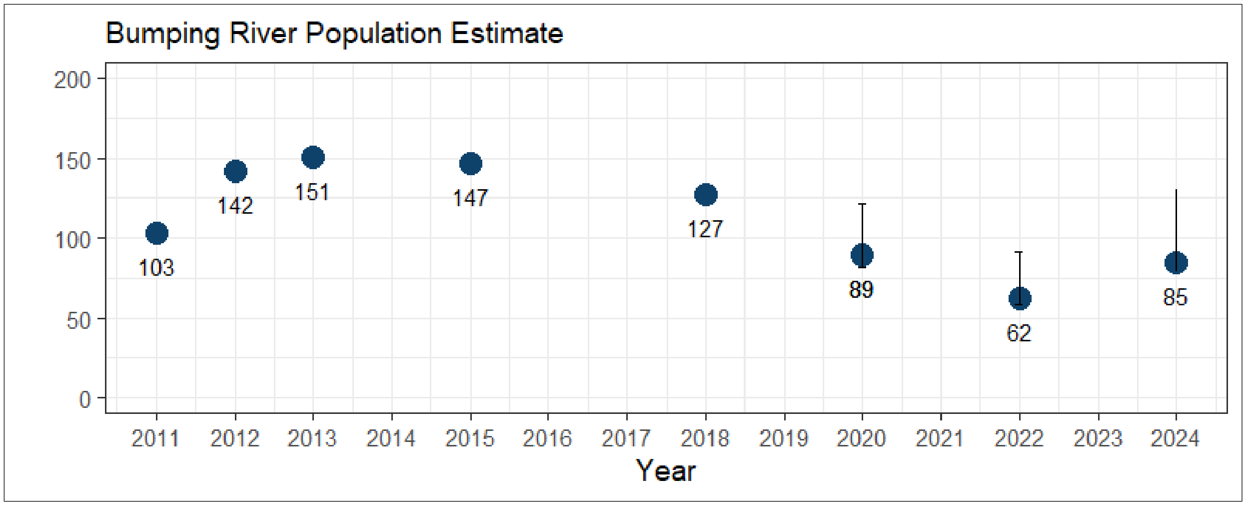
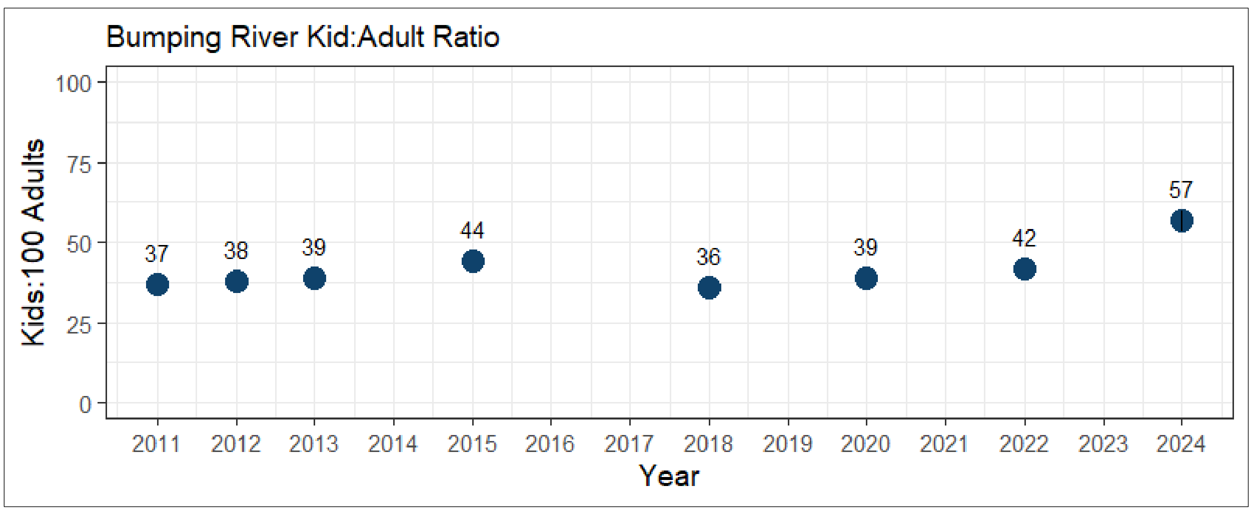


Figure 3b. Estimated number of kids to 100 adult goats in Bumping River goat unit.



Naches Pass

In Naches Pass, 110 goats (95% CI = 102-149) were estimated, down from the 2022 survey of 122 goats (Table 2). The population began to decline in 2015 but has exhibited a stabilizing trend since 2020, with population estimates varying between 110-122 goats and overlapping confidence intervals (Figure 4a). Kid ratios were within the range of historic norms, with an estimated mean of 39 kids:100 adults, 95% CI [27:56] (Figure 4b).

Table 2. Survey count data for Naches Pass (Mountain Goat Unit 3-6 & 4-38) 2010-present.

Year	Kids	Older than kids	Total	K:100
2010	29	74	103	39
2011	37	96	133	38
2012	34	112	147	32
2013	45	104	169[a]	43
2014	No	Survey		
2015	61	125	193 [a]	49
2016	No	Survey		
2017	No	Survey		
2018	17	115	132	15
2019	No	Survey		
2020	38	66	107”	57
2021	26	73	99	36
2022	29	93	122	31
2023	No Survey			
2024	31	79	110	39

[a] Includes unclassified/yearling. Survey Data (for 2009 and later, figures represent points estimates from sightability-corrected model; Rice et al., 2009).

Figure 4a. Sightability corrected, mean population estimates of goats for the Naches Pass with 95% confidence interval reported from 2020-2024.

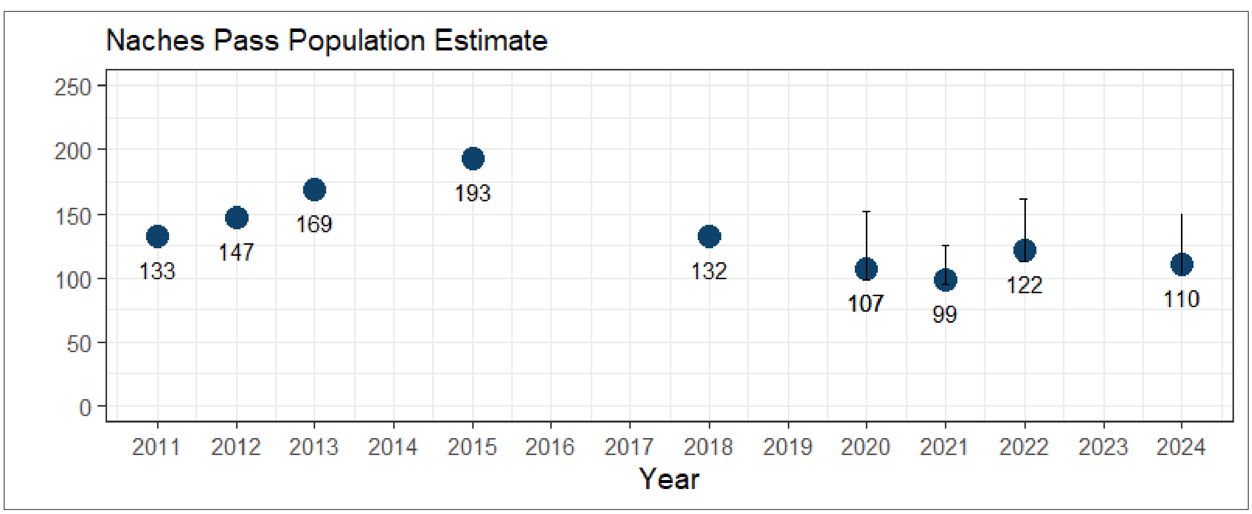
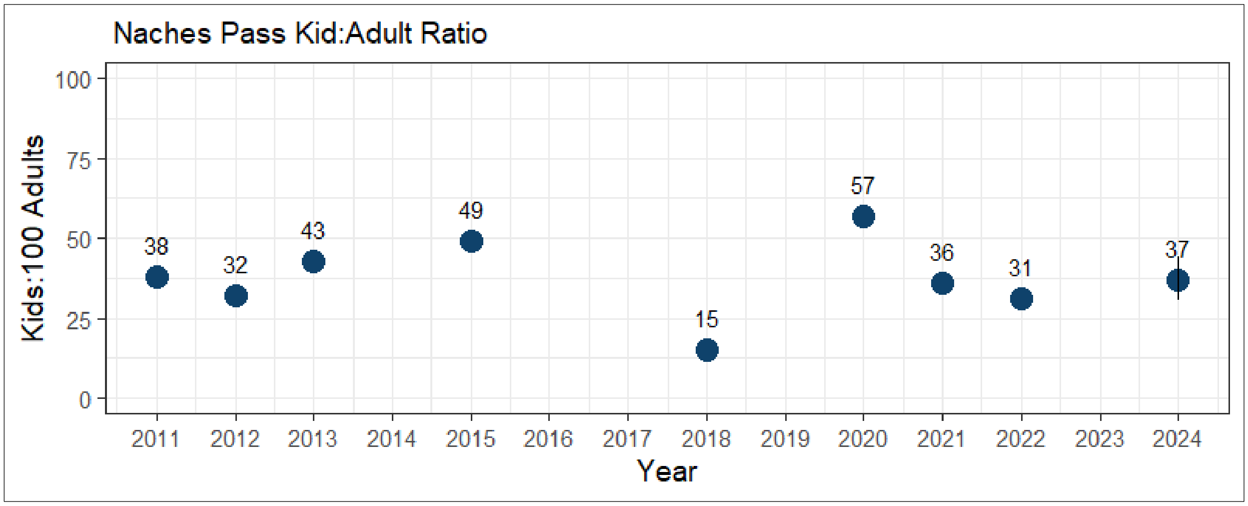


Figure 4b. Estimates of kid:100 adult goats for Naches Pass populations from 2011-2024.



Blazed Ridge

Blazed Ridge was last surveyed in August 2020. The population was estimated at 26 goats, 95% CI [22-50]. Estimated kid: adult ratios were relatively stable over the last decade (Table 3). However, the adult population remained low, with 21 adult goats, 95% CI [18-39] and the harvest was unsustainable.

Table 3. Survey count data for Blazed Ridge (Mountain goat Unit 3-10) 2010-present.

Year	Kids	Older than kids	Total	K:100
2010	-	-	-	-
2011	14	32	46	44
2012	26	78	104	33
2013	14	53	67	27
2014	No	Survey	-	-
2015	19	80	102	24
2016	No	Survey	-	-
2017	22	78	100	28
2018	No	Survey	-	-
2019	No	Survey	-	-
2020	5	21	26	24
2021	No	Survey	-	-
2022	No	Survey	-	-
2023	No	Survey	-	-
2024	No	Survey	-	-

Hunting seasons and recreational harvest

WDFW management calls for the harvest to be, at most, approximately 4% of the adult (older-than-kid) population. Goats were historically managed with more liberal permit numbers and with harvest rates often over 10%. Since 1996, harvest has been more conservative.

Mountain goat seasons are open only to hunters drawing a once-in-a-lifetime special permit or winning a raffle or auction hunt. In 2023, Bumping River and Naches Pass had one permit issued for each. Harvest success was 100%, with a nanny and billy harvested, respectively (Table 4a-b). Blazed Ridge closed in 2015 to special permits, but the unit remained open to a raffle hunt each season. Harvest occurred in 2017, 2020, and 2021; nannies were exclusively harvested (Table 4c).

Table 4a. Harvest Information for Bumping River (Mountain goat Unit 3-7) 2010-present.

Year	Permits	Hunters	Harvest (Females in parentheses)
2010	1	1	1
2011	1	1	1
2012	1	1	1
2013	1	1	1 (0)
2014	2	2	1 (0)
2015	3	3	3 (1)
2016	3	3	3 (0)
2017	3	3	3 (1)
2018	3	3	3 (1)
2019	2	2	3 (1)
2020	2	1	1 (1)
2021	0	0	0
2022	2	2	2 (1)
2023	1	1	1

Table 4b. Harvest Information for Naches/Corral Pass (Mountain goat Unit 3-6 & 4-38) 2010-present.

Year	Permits	Hunters	Harvest (Females in parentheses)
2010	1	1	1
2011	1	1	1
2012	1	1	1
2013	1	1	1 (0)
2014	2	2	1 (0)
2015	3	3	3 (0)
2016	3	4*	4 (3)*
2017	3	0	0
2018	4	3	3 (2)
2019	2	2	1 (1)
2020	2	2	2 (1)
2021	1	1	1
2022	1	1	0
2023	1	1	1

*Includes auction/raffle

Table 4c. Harvest Information for Blazed Ridge (Mountain goat Unit 3-10) 2010-present.

Year	Permits	Hunters	Harvest (Females in parentheses)
2010	1	1	1
2011	1	1	1
2012	1	1	1
2013	1	1	1 (0)
2014	1	1	1 (0)
2015	0	n/a	n/a
2016	0	0	0
2017	0	1*	1
2018	0	0	0
2019	0	0	0
2020	0	1*	1
2021	0	1*	1
2022	0	0	0
2023	0	0	0

* Includes auction/raffle

Survival and mortality

Survival and mortality are not directly measured for regional goat populations. Adult and kid survival is currently unknown. Changes in abundance between survey years indicated gains or losses in the population and are not age-class specific. Kid: adult ratios and changes in population abundance provide an indirect measure of survival and recruitment. Kid ratios do not appear significantly different from historic norms (Figure 3). Declining population trends but sustained kid: adult ratios indicate adult mortality.

Habitat

Mountain goats inhabit alpine habitats, typically near steep rocky, “escape” terrain, but are known to utilize timbered areas for movement and climate refugia. No specific habitat study for mountain goats has occurred in the region. Habitat quality is influenced by climate (i.e., precipitation, temperature), landscape disturbances (fire), and recreational activity.

There are two major watersheds within Region 3, the Upper Yakima and Naches Watersheds. Winter and summer conditions have varied annually in the region. Drought conditions and higher-than-average temperatures have been recorded in eastern Washington in 2023 and 2024 (Department of Ecology, 2024). Large-scale, severe stand-replacing fires occurred in 2017 and 2021. The 52,000-acre Norse Peak Fire occurred in 2017, impacting many Naches Pass goat units. The 101,000-acre Schneider Springs fire in 2021 overlapped with large portions of the Bumping River goat unit. Observations of recovery during population surveys have noted limited and patchy recovery in the fire perimeters. During the 2024 survey, an active fire (Rimrock-Retreat fire) was within the Bumping River Cashe Prairie subunit; impacts on goat habitat are unknown.

Recreation activities in Region 3 include hiking, biking, backcountry skiing and hiking, mountaineering, trail riding, hunting, and motorized use, including ATVs and OHVs. Limitations on recreational use are dependent on area designation. Areas within the wilderness are the most restrictive. Outside the wilderness, road densities are generally high and relatively easy to access via motorized or non-motorized transportation. Recreational activity has increased statewide compared to historical activity; Kittitas and Yakima counties are among the top-visited areas (Datafy, 2023).

Management concerns

Goat populations in Region 3 have seen declines since 2015 (Figure 3a, 4a). Historic harvest, climate, habitat disturbance (i.e., fire), recreation, and disease may influence population trends. Two of three monitored populations in the region have dropped below 100 individuals; the threshold existing harvest guidelines recommend closure (see WDFW, 2015). The frequency of adult female harvest is particularly important, as it accounts for over 35% of harvests in recent years (Tables 4a, 4b). Local overharvest can occur if harvest, particularly of nannies, is concentrated within a small area, even if it is numerically sustainable on a larger geographic scale.

Declining mountain goat population trends are not isolated to Region 3. Mountain goats have naturally low reproductive rates and are susceptible to impacts from changing climatic conditions. In a recent study of Washington populations, reduced survival of adult mountain goats was correlated with changes in snow depth, precipitation, and May temperatures but could not explain the rate of population declines alone (Harris et al., 2023). Over 150,000 acres of Region 3 have burned in severe stand-replacing fires in recent years, and these areas encompass goat core habitat and connecting areas. The severity of the fires has resulted in limited recovery at present but has implications for forage and cover availability. Summer and winter range use, as well as movement between meta-populations, is not well known. Impacts from fires, thus, are not well understood at present in this region. Major highways (e.g., I-90) probably have limited movements among herds over time. Additionally, human activity has increased in the region with unknown impacts but suspected negative effects based on studies elsewhere. No study has directly investigated the impacts of changes in human activity in Washington.

Wild sheep and goats are susceptible to fatal bacterial pneumonia from Mycoplasma ovipneumoniae (*Movi*). Bighorn sheep throughout Region 3 are currently or have historically been *Movi* positive, with infections being documented adjacent to the Bumping River and overlapping the Blazed Ridge mountain goat units. While transmission from direct contact between bighorn and mountain goats is unlikely, domestic goats and sheep are common vectors.

Research

No active research is occurring in this region.

Management conclusions

Mountain goat populations in Region 3 have had trending population declines for nearly a decade. Limited data is available to evaluate factors contributing to observed changes in populations. Studies of mountain goats are limited, and none have occurred in the region to investigate the cause of declines. Negative impacts from harvest, especially nannies (Rice et al., 2009), climate change (rain on snow events, droughts, and harsh winters) (Harris et al., 2024; White et al., 2024), increased recreation, and disease (Blanchong et al., 2018) have been reported. In addition, population viability may be limited in Washington due to freeways, highways, water, agriculture, and urban land cover restricting gene flow between populations (Parks et al., 2015). Impacts on goats from severe fires are unknown but have significantly modified habitat in the region.

No single factor is likely driving population dynamics. Actions to promote population growth in the near term focus on harvest management; however, harvest alone cannot explain population declines. Climatic variability, changing fire regimes, broadscale habitat restoration, and human recreation are likely significant contributing factors to mountain goat population dynamics but are either outside of direct management control or actions are long-term in nature (e.g., habitat enhancement).

The following actions are being implemented to address mountain goat management challenges in this region, but much work is still needed:

1. Reevaluating current harvest guidelines and consider regulation of nannie take.
2. Increasing the number of observers during aerial surveys to improve detection of goats and increase confidence around estimates.
3. Increasing survey efforts and surveying historic hunt units to better assess mountain goat populations throughout the region (Kachess Ridge - scheduled Fall 2024).
4. Working with tribal governments to improve knowledge of mountain goats and initiate collaring studies to inform goat habitat use and survival.
5. Initiate disease testing of all harvested goats.
6. Removing Blaze Ridge unit from the raffle hunt areas.

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Mountain Goat Status and Trend Report: Region 4 – Mt. Baker and Boulder River North

Robert Waddell, Wildlife Biologist
Kurt Licence, Wildlife Biologist

Management guidelines and objectives

The management objective for mountain goats in WDFW Region 4 is to maintain stable populations in all units for public viewing and harvest opportunities. The WDFW 2015–2021 Game Management Plan (2014) lists specific guidelines for managing harvest within sustainable limits. Guidelines restrict harvest to 4% or less of the estimated adult population and only allow harvest in goat populations meeting or exceeding 100 total animals.

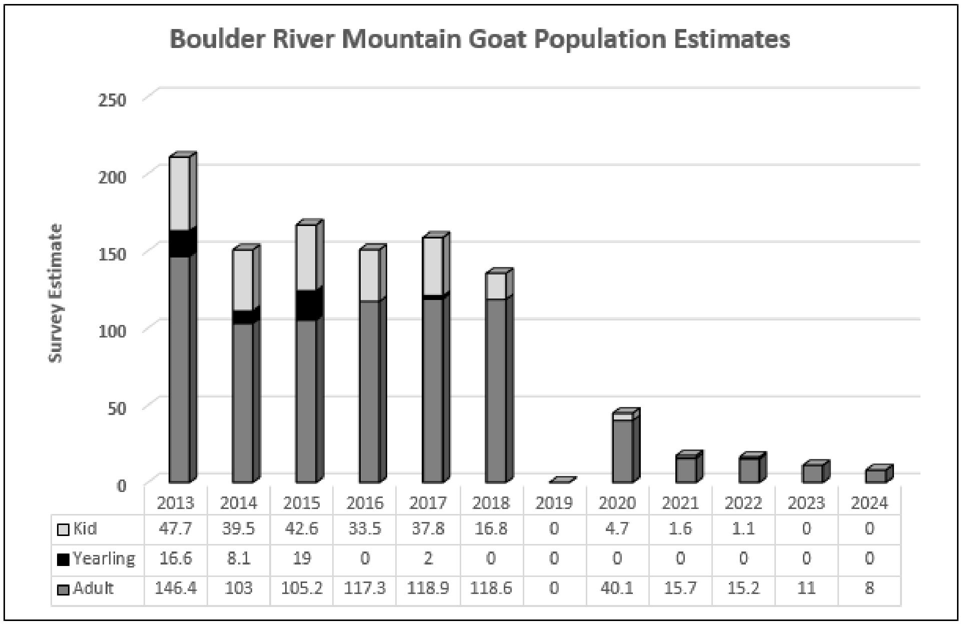
Population surveys

Population surveys were not conducted by WDFW in the Boulder River Wilderness for several years because of low population numbers, and all units within the Darrington Ranger District of the Mount Baker Snoqualmie National Forest were closed to hunting in 1995. WDFW reinitiated surveys in this area in 2012 (Figure 1). Beginning in 2014, WDFW adopted a system of biennial surveys in both Boulder River and the Mt Baker area. In 2018, WDFW began translocating mountain goats from Olympic National Park to the North Cascades. Therefore, WDFW did not survey mountain goats at Boulder River (Figure 1) or Mt. Baker (Figure 2) in 2018 or 2020 because funds were allocated to the mountain goat translocation project. Due to the inconsistent classification of adults and yearlings in previous surveys, individual goats were classified as either adults or kids beginning in 2019.

The Stillaguamish, Tulalip, and Sauk-Suiattle tribes surveyed the Boulder River Unit in 2015, 2017, 2018, 2020, and 2022. The 2021, 2023, and 2024 surveys were conducted by WDFW and the Tulalip, Stillaguamish, and Sauk-Suiattle tribes. Surveys in 2024 generated a total estimate of 8 goats (90% CI = 6–20; Figure 1) for the Whitehorse and Three Fingers blocks only. The 2024 survey represents the fifth year where biologists calculated an estimate of fewer than 100 goats and the second consecutive year of no kid observations.

The Lummi, Swinomish, Upper Skagit, and Nooksack tribes surveyed the Mt. Baker area in 2017, 2019, 2020, and 2022. WDFW and the Upper Skagit, Nooksack, and Lummi Tribes surveyed the area in 2023. WDFW and the Lummi, Swinomish, and Upper Skagit Tribes surveyed the Mt. Baker area in 2024, estimating 154 goats (90% CI = 137–221; Figure 2).

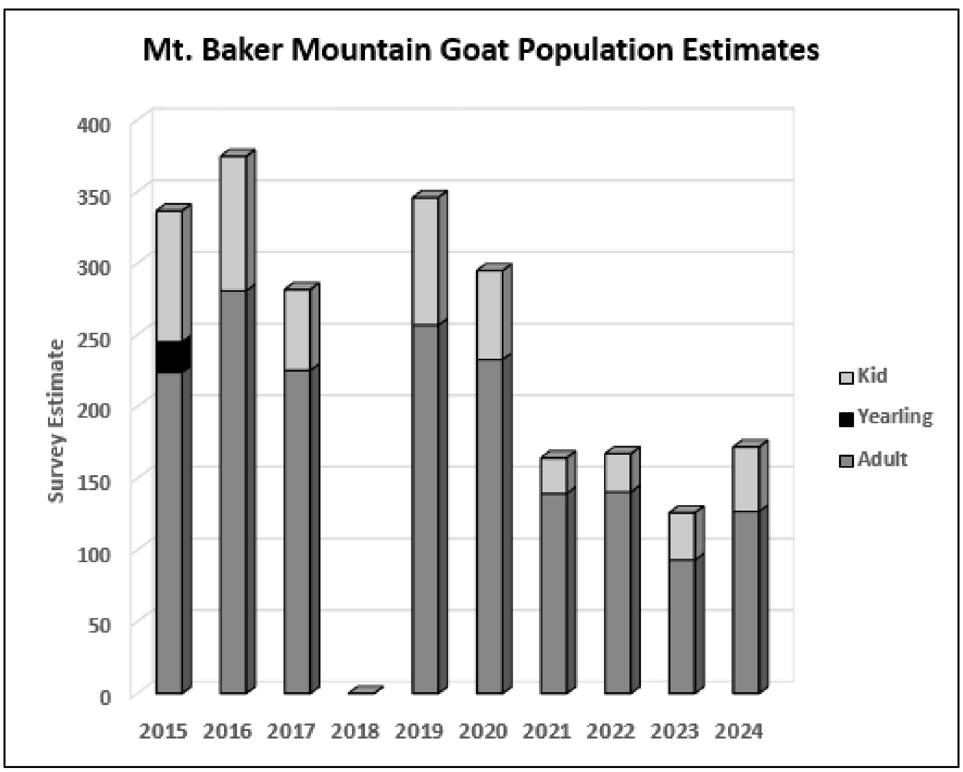
Figure 1. Mountain goat population estimates in the Boulder River North Hunt Unit from 2013-2024.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Kid	47.7	39.5	42.6	33.5	37.8	16.8	0	4.7	1.6	1.1	0	0
Yearling	16.6	8.1	19	0	2	0	0	0	0	0	0	0
Adult	146.4	103	105.2	117.3	118.9	118.6	0	40.1	15.7	15.2	11	8

Beginning in 2019, goats were classified as either an adult or a kid. No survey was conducted in 2019. Estimates are calculated based on numbers derived from the Three Fingers and Whitehorse survey blocks only.

Figure 2. Mountain goat population estimates in the Mt. Baker Area from 2015-2024.



No survey was conducted in 2018. Beginning in 2019, goats were classified as either an adult or a kid. Estimates are calculated based on numbers derived from the Black Butte, Chowder Ridge, Coleman Pinnacle, Heliotrope, Loomis Mtn., Lava Divide North and South, and Sholes Glacier survey blocks only.

Hunting seasons and recreational harvest

After closure for many years, WDFW reopened the Mt. Baker area on a limited basis for mountain goat hunting in 2007. Subsequent surveys in this area suggested an increasing population (see previous Game Status and Trend reports), which permitted a gradual increase in hunting opportunities (Table 1a, 1b, and 1c).

Mountain goat surveys in 2012 within the Boulder River Wilderness Area also suggested greater numbers than in the early 2000s. The number of mountain goats in this area met the minimum requirements to establish a hunting season (Table 1d), as detailed in the 2015–2021 Game Management Plan (WDFW, 2014). Subsequently, a hunting season was initiated in the Boulder River North Goat Hunt Unit beginning in 2015, with a single permit allocated annually to a state hunter. Due to declines in annual mountain goat population estimates (Figure 1), special permits were removed beginning in the 2023 hunt season in the Boulder River North goat hunt area.

Historically, most information regarding goat numbers and distribution was derived from occasional non-standardized aerial surveys, harvest report cards, and questionnaires returned by permitted hunters. The Mt. Baker area originally included goat management units 4-2, 4-3, 4-4, and 4-5 in Whatcom and Skagit Counties. Harvest in these units during 1969–85 totaled 121 animals, with an average of 13 goats harvested per season. From 1986–95, the harvest totaled 26 animals, with an average of six goats harvested per season. By 1996, all the Mt. Baker goat units were closed to hunting due to declines in harvest and low numbers of goats seen during aerial surveys. In 2007, Mt. Baker units 4-3 (Chowder Ridge) and 4-7 (Avalanche Gorge) were reopened with one permit issued per unit. Unit 4-4 (Lincoln Peak) was added later, and the annual number of permits for the Mt. Baker area was increased to its current level of six permits total.

Table 1a. Special permit details for mountain goat hunts in the Chowder Ridge hunt unit of the North Cascade Mountains, 2014–2023.

Year	Permits	Hunters	Harvest	Success (%)	Days hunted	# Females Harvested
2014	2	2	2	100	5	1
2015	1	1	1	100	23	1
2016	1	1	0	0	3	0
2017	1	1	1	100	1	0
2018	1	1	1	100	2	1
2019	1	1	1	100	2	0
2020	1	1	1	100	1	0
2021	1	1	1	100	1	0
2022	1	1	1	100	2	1
2023	1	1	1	100	3	0

Table 1b. Special permit details for mountain goat hunts in the Lincoln Peak hunt unit of the North Cascade Mountains, 2014–2023.

Year	Permits	Hunters	Harvest	Success (%)	Days hunted	# Females Harvested
2014	1	1	1	100	4	0
2015	2	2	2	100	33	0
2016	2	2	1	50	3	1
2017	2	2	2	100	6	0
2018	2	1	1	100	9	0
2019	2	2	1	50	10	0
2020	2	2	0	0	12	0
2021	2	2	1	50	19	0
2022	2	2	1	50	14	0
2023	2	2	2	100	14	1

Table 1c. Special permit details for mountain goat hunts in the Avalanche Gorge hunt unit of the North Cascade Mountains, 2014–2023.

Year	Permits	Hunters	Harvest	Success (%)	Days hunted	# Females Harvested
2014	2	2	2	100	17	1
2015	3	4	3	75	56	1
2016	3	3	2	50	15	1
2017	3	3	2	67	18	0
2018	3	2	2	67	7	2
2019	3	3	0	0	8	0
2020	3	3	3	100	5	0
2021	3	3	1	33	14	1
2022	3	3	0	0	15	0
2023	3	3	3	100	8	2

Table 1d. Special permit details for mountain goat hunts in the Boulder River North hunt unit of the North Cascade Mountains, 2015–2024.

Year	Permits	Hunters	Harvest	Success (%)	Days hunted	# Females Harvested
2015	1	1	1	100	8	0
2016	1	1	1	100	2	0
2017	1	1	1	100	2	0
2018	1	1	1	100	17	0
2019	1	1	1	100	0	0
2020	1	1	1	100	12	1
2021	1	1	0	0	12	0
2022	1	1	0	0	23	0
2023	0	0	0	0	0	0
2024	0	0	0	0	0	0

Habitat

The mountain goat population in the Mt. Baker area has rebounded substantially since the low abundance in the 1980s and 1990s. However, surveyors counted approximately 50% fewer goats during the 2021–2024 survey seasons than were counted each year from 2005–2020. The cause or causes for this change are unknown, though potential factors may include habitat quality issues, climate-caused changes in elevational use patterns (thus reducing sightability during surveys), human recreation impacts, mortalities due to avalanches, and predation. The conservative hunting season, reestablished in 2007, appears to have negligible effects on population size, age/sex structure, and population trend.

Most goats in the Mt. Baker area are within the Mt. Baker Wilderness on the Mt. Baker-Snoqualmie National Forest and the adjacent North Cascades National Park. Federal land management restrictions protect habitat critical for maintaining a robust mountain goat population. However, this area has seen increased recreational uses, including hiking, climbing, backcountry skiing, and snowmobiling. Discussions on goat management between WDFW, Tribes, and federal partners are ongoing and remain a high priority.

The Boulder River North unit lies within the Boulder River Wilderness, managed by the Darrington District of the Mt. Baker/Snoqualmie National Forest. In recent years, this area saw a population rebound like the increases in the Mt. Baker unit, suggesting that habitat quality in this area of the North Cascades was sufficient for mountain goats. Like Mt. Baker, the cause or causes of the low population estimates from 2020–2024 are unknown.

Both the Mt. Baker and Boulder River North survey areas require further investigation. The quantity or quality of summer forage resources for goats in alpine terrain is generally poorly understood in the

North Cascades, though fire exclusion and warming climate conditions may negatively impact alpine habitats. Additional research on these and other potential factors is needed to understand and possibly address the observed declines in both areas.

Management conclusions

From September 2018 to August 2020, WDFW and the National Park Service translocated 325 mountain goats from Olympic National Park to the North Cascades, with an overall survival rate of >50%. Additional analysis of this translocation was published in the Journal of Wildlife Management article "Survival of adult mountain goats in Washington: effects of season, translocation, snow, and precipitation" (Harris et al., 2023). WDFW will continue to monitor the success of recent augmentations to determine whether this effort will increase populations over time. WDFW and Tribal Co-Managers will need to implement research to better understand the declines in population estimates for the Mt. Baker and Darrington areas. WDFW has no immediate plans to increase mountain goat hunting permits in the North Cascades hunt units.

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Mountain Goat Status and Trend Report: Region 5 – Goat Rocks, Smith Creek, Mt. St. Helens

Stefanie Bergh, Wildlife Biologist

Introduction

Region 5 of the Washington Department of Fish and Wildlife (WDFW) contains multiple areas inhabited by mountain goats. Three mountain goat population management units have been monitored aerially in recent years: Smith Creek (Goat Unit 5-3), Goat Rocks West and East (Goat Units 5-4 and 5-5), and the Mt. St. Helens National Volcanic Monument (Goat Units 5-6 and 5-7). The Goat Rocks Units have historically contained one of the largest goat populations of any goat unit in Washington (Rice, 2012). For several years, a cooperative ground-based survey for mountain goats was conducted in the Mt. St. Helens National Volcanic Monument, and the first aerial survey was completed in 2017. Several other areas within Region 5 support mountain goats, including the Dark Divide Roadless Area, Mt. Adams Wilderness, and the Tatoosh Mountains. Individual and small groups of mountain goats are reported throughout the southern Cascades region all the way to the Columbia River.

Management guidelines and objectives

WDFW's mountain goat management objectives are to manage mountain goats and their habitat to maintain or expand current population levels. In addition, mountain goats are managed for recreational, educational, cultural, and aesthetic purposes. Recreational management is to be consistent with a stable or increasing population.

Population surveys

In 2023, the Goat Rocks Units were aerially surveyed once in August. The survey yielded a total of 134 animals observed (Table 1) and a sightability-corrected population estimate of 141 (90% confidence interval: 137-161; Table 2a). The sightability-corrected population estimate of adult mountain goats during the August survey was estimated at 109 (90% confidence interval: 105-125). The Smith Creek Unit was not surveyed in 2023. In 2022, the third-ever aerial survey of the Mt. St. Helens and Mt. Margaret Backcountry was conducted. A total of 292 goats were observed during the flight, which resulted in a sightability-corrected estimate of 335 goats (90% confidence interval: 307-363; Table 2c). The sightability-corrected population of adult mountain goats in that area was estimated at 273 (90% confidence interval: 253-293). All aerial surveys were conducted using the sightability method developed by WDFW (Rice et al., 2009).

Table 1a. Raw Survey Data from Goat Rocks West and East Flights, Region 5 (2005-2023).

Year	Adult	Kid	Unknown	Total	Kid:Adult
2005	235	66	0	303	35:100
2006	217	71	0	290	35:100
2008	201	60	7	268	34:100
2009	203	73	0	276	43:100
2010	195	36	0	231	20:100
2011	222	31	0	253	15:100
2012	168	33	0	231	23:100
2013	236	72	0	308	30:100
2015	224	86	0	310	38:100
2017	204	40	0	244	20:100
2019	162	66	0	228	41:100
2020	136	35	0	171	26:100
2021	105	31	20	156	30:100
8/2022	83	23	0	106	28:100
9/2022	108	22	0	130	20:100
2023	103	29	2	134	28:100

Table 1b. Raw Survey Data from Smith Creek Flights, Region 5 (2005-2020).

Year	Adult	Kid	Unknown	Total	Kid:Adult
2005	21	11	0	32	73:100
2006	22	5	0	27	31:100
2007	28	6	0	34	21:100
2008	11	4	2	17	44:100
2010	34	8	0	42	29:100
2012	36	14	0	50	44:100
2017	10	2	0	12	22:100
2020	13	3	0	16	23:100

Table 1c. Raw Survey Data from Mt. St. Helens/Mt. Margaret Flights, Region 5 (2017-2022).

Year	Adult	Kid	Unknown	Total	Kid:Adult
2017	169	54	0	223	32:100
2020	186	50	0	236	27:100
2022	235	56	0	292	24:100

Table 2a. Sightability-corrected Goat Rocks West and East Survey Results – Region 5 (2005-2023).

Year	Population Estimate (90% CI)
2005	341 (322-359)
2006	308 (291-326)
2008	282 (No CI)
2009	285 (274-297)
2010	224 (213-236)
2011	259 (250-268)
2012	246 (232-261)
2013	232 (307-338)
2015	325 (309-341)
2017	254 (243-264)
2019	239 (226-253)
2020	181 (170-192)
2021	166 (154-172)
8/2022	117 (104-131)
9/2022	143 (136-170)
2023	141 (137-161)

Table 2b. Sightability-corrected Smith Creek Survey Results – Region 5 (2008-2020).

Year	Population Estimate (90% CI)
2008	32 (No CI)
2010	41 (33-49)
2012	64 (48-79)
2017	14 (9-18)
2020	21 (15-27)

Table 2c. Sightability-corrected Mt. St. Helens/Mt. Margaret Survey Results – Region 5 (2017-2022).

Year	Population Estimate (90% CI)
2017	246 (232-260)
2020	254 (235-273)
2022	335 (307-363)

Mountain goats were formally surveyed from the ground on Mt. St. Helens and in the associated Mt. Margaret Backcountry in August of 2014-2020. The effort involved simultaneous surveys and documentation of all goat groups by multiple teams of observers at pre-arranged stations. The surveys demonstrated an increasing goat population. In 2020, the ground survey was conducted two days before the aerial survey, and a minimum of 200 mountain goats were counted, which was lower than the sightability-corrected aerial estimate of 254. Since the aerial surveys have proven effective and WDFW is committed to funding them at regular intervals into the future, the ground count has been suspended. The ground count was a cooperative effort among WDFW, the US Forest Service, the Cowlitz Tribe of Indians, and volunteers associated with the Mt. St. Helens Institute.

No additional mountain goat areas in Region 5 were surveyed from the air during 2023 due to a lack of funding and because hunting permits are not currently offered for these smaller populations. Unsurveyed areas populated with mountain goats in Region 5 include the Tatoosh Mountains and areas between the Indian Heaven Wilderness and Mt. Adams. Finally, individual and small groups of mountain goats are commonly observed throughout the southern Cascades in Region 5 and are also not surveyed.

Sightability-corrected aerial surveys conducted over the past several years show a decline in the Goat Rocks population and a possible decline in the Smith Creek goat population. Aerial surveys of the Mt. St. Helens population show an increasing trend.

Hunting seasons and recreational harvest

Hunting opportunities for mountain goats in Washington are allowed only to those selected in the Special Permit Drawing. Those fortunate enough to draw a mountain goat tag may hunt only within a specified goat unit. The bag limit is one goat of either sex with horns longer than four inches. However, hunters are encouraged to shoot billies (males) rather than nannies (females) because mountain goat populations are sensitive to the removal of adult females. Beginning in 2018, hunters who drew a permit were required to successfully complete online mountain goat gender identification training administered by WDFW. The tag allocation for each unit is conservative in nature, with dual goals of providing a high-quality hunt for those successful in the permit draw and having little or no effect on the goat population.

Mountain goat studies completed by WDFW led to a population guideline for direct harvest management (WDFW, 2014). A goat unit must initially have an estimated population of 100 or more to allow harvest. Furthermore, harvest levels are designed to remove 4% or less of the adult (i.e., older than kids) population (WDFW, 2014). Prior to 2018, only the Goat Rocks West and East Units and the Mt. St. Helens unit within Region 5 consisted of populations large enough to support hunting under this guideline. However, since the 2017 aerial surveys in the Mt. St. Helens and Mt. Margaret Backcountry indicated a goat population much greater than 100 individuals, a proposal for two new goat units (Mt. St. Helens South and Mt. Margaret Backcountry) with one goat tag each was sent to and approved by the WDFW Commission for the 2018 season. After the August 2022 surveys of the Mt. St. Helens and Mt. Margaret Backcountry showed the continued increase of this population, a proposal for an increase to two goat tags in each of these units was sent to and approved by the WDFW Commission for the 2023 season. Surveys of other areas supporting goats will be conducted periodically. Should populations surpass 100 individuals in these areas, hunts could be considered.

The Goat Rocks/Tieton River Hunt Area (5-4/3-9) was split into two separate units in 2018: Goat Rocks West (formerly Goat Rocks) and Goat Rocks East (formerly Tieton River). The purpose of this division was to provide for better spatial distribution of harvest within the Goat Rocks area so that most of the harvest and hunting pressure is not concentrated in one small area. One tag was offered in the Goat Rocks West Hunt Area, and one tag was offered in the Goat Rocks East Hunt Area in 2023. The permit holder in the Goat Rocks West Hunt Area harvested a billy, and the permit holder in the Goat Rocks East Hunt Area harvested a nanny (Table 3a-c). Tribal hunters harvested one billy in 2023 in the Goat Rocks population. The 2023 hunting season was the sixth year for permits in the Mt. St. Helens area. Two permits each were issued for the Mt. St. Helens South and Mt. Margaret Backcountry Hunt Areas. Both the Mt. St. Helens South and one of the Mt. Margaret Backcountry permit holders were successful in harvesting billies (Table 3a-c).

Table 3a. Region 5 Goat Rocks Mountain Goat Hunt Summary 2014-2023.

Year	WDFW Permits Issued	WDFW Permit Harvest	Tribal Harvest[a]	Total Harvest	Total Billies Harvested	Total Nannies Harvested
2014	3	3	1	4	4	0
2015	5	4	1	5	4	1
2016	5	5	3	8	5	3
2017	5	5	2	7	5	2
2018[b]	5	3	3	6	4	2
2019	5	3	4	7	6	1
2020	4	4	1	5	5	0
2021	3	1	0	1	1	0
2022	3	2	2	4	4	0
2023	2	2	1	3	2	1

[a] As reported by the Northwest Indian Fisheries Commission

[b] In 2018, the Goat Rocks Hunt Area was split into two areas: Goat Rocks West and Goat Rocks East

Table 3b. Region 5 Mt. Margaret Backcountry Mountain Goat Hunt Summary 2018-2023.

Year	WDFW Permits Issued	WDFW Permit Harvest	Tribal Harvest[a]	Total Harvest	Total Billies Harvested	Total Nannies Harvested
2018	1	1	N/A	1	1	0
2019	1	1	N/A	1	1	0
2020	1	1	N/A	1	1	0
2021	1	1	N/A	1	1	0
2022	1	1	N/A	1	1	0
2023	2	1	N/A	1	1	0

[a] As reported by the Northwest Indian Fisheries Commission

Table 3c. Region 5 Mt. St. Helens Mountain Goat Hunt Summary 2018-2023.

Year	WDFW Permits Issued	WDFW Permit Harvest	Tribal Harvest[a]	Total Harvest	Total Billies Harvested	Total Nannies Harvested
2018	1	1	N/A	1	1	0
2019	1	1	N/A	1	1	0
2020	1	1	N/A	1	1	0
2021	1	0	N/A	0	0	0
2022	1	1	N/A	1	1	0
2023	2	2	N/A	2	2	0

[a] As reported by the Northwest Indian Fisheries Commission

Habitat

High-elevation openings characteristic of goat habitat are being lost in the Smith Creek Unit due to conifer encroachment. Alpine meadows are critical mountain goat foraging areas. Given the limited extent of suitable goat habitat in the Smith Creek Unit, the loss of habitat represents a threat to the sustained viability of this goat population. Results of the cooperative Cispus Adaptive Management Area (AMA) project indicate that in the four study areas (Stonewall Ridge, South Point Ridge, Smith Ridge, and Castle Butte), a total of 404 acres of alpine meadow were lost in the period spanning 1959-1990 (Kogut, 1996). High alpine meadows are thought to be primarily created through disturbances such as avalanches, disease, wind-throw, and fire (Hemstrom, 1979).

Periodic fire is one of the most important factors in creating and maintaining alpine meadows (Olmsted, 1979). US Forest Service policy currently dictates the suppression of both man-made and naturally occurring fires. This policy has resulted in the loss of alpine meadows, as documented in the above study. In the years since the completion of this study, the loss of alpine meadows has likely continued. Thus, the restoration and preservation of these areas are paramount to continued healthy goat populations. Budgetary, logistical, safety, and other constraints in both the USFS and WDFW make the possibility of a prescribed burn program in the foreseeable future unlikely. However, naturally occurring high-elevation fires have occurred recently. The 2018 Miriam fire burned approximately 5,400 acres in the northeastern portion of the Goat Rocks Wilderness, while the 2022 Goat Rocks fire burned approximately 6,100 acres in the northwestern corner. Additionally, fires in the vicinity of Mt. Adams have occurred over the past several years. Another possible avenue to address conifer encroachment is through girdling and snag creation.

Management concerns

Disease testing on a limited number of samples collected by hunters in 2015 revealed evidence that 1 of 19 mountain goats tested may have been exposed to the bacterium *Mycoplasma ovipneumoniae* (*M. ovi*), associated with pneumonia outbreaks in bighorn sheep. This serological sample was collected from a goat harvested in the Goat Rocks. In 2016, both volunteers and WDFW staff conducted visual observations of goats in the Goat Rocks. The purpose of these surveys was to 1) observe goats for any signs of respiratory disease and 2) count goats, including kids, for evidence of any unusually high levels of early mortality that might be evidence of pneumonia infection. During the surveys, no mountain goat carcasses were found, nor were goats with signs of lethargy, coughing, head shaking, or other indications of respiratory disease observed. Observations made by WDFW staff observed kid-to-nanny ratios of approximately 0.38. Since 2016, all hunter-harvested goats sampled from the Goat Rocks have tested negative for *M. ovi*. Pneumonia due to *M. ovi* is believed to be the cause of a decline in at least one mountain goat population in Nevada. The significance of the positive *M. ovi*-antibody test result from a single mountain goat in Washington is not known currently. WDFW will remain vigilant about reports of sick goats, collect samples when needed, and continue collaborating with Washington State University veterinary researchers to better understand the health of mountain goats in Washington.

Increased recreational disturbance and a decline in habitat due to lack of disturbances and conifer encroachment could also affect the Goat Rocks population. The harvest of seven nannies between 2016 and 2018 possibly contributed to the population decline as mountain goat populations tend to be sensitive to the harvest of adult females (Hamel et al., 2006).

Management conclusions

Mountain goats in Region 5 are valued for both viewing and hunting opportunities. Additionally, the goats are of cultural value to the native American people of southwest Washington. Consequently, harvest quotas are kept at conservative levels to maximize these populations' consumptive and non-consumptive recreational attributes. Management direction dictates that two traditionally hunted units in Region 5 (Smith Creek and Tatoosh) remain closed until populations increase. The increase in the goat population around Mt. St. Helens has benefited viewing opportunities at the popular Mt. St. Helens National Volcanic Monument visitor centers and trails. Now, hunting opportunities are also available with a population larger than currently found in the Goat Rocks.

The recent decline in the Goat Rocks population is concerning and warrants continued surveillance for the disease in hunter-harvested goats and aerial surveys to estimate the population. The repeat aerial survey in September 2022 yielded a slightly higher estimate than the August survey. It showed no drop in the number of kids observed, hopefully indicating a lack of pneumonia outbreaks. Over the past year, work has begun to begin an effort to study the decline in mountain goats across the state, including the Goat Rocks population. Disease testing, body condition analysis, and GPS collaring have the potential to provide more information about the health and vital rates of these declining populations. A multi-partner mountain goat working group was formed in 2023, including all interested tribes, federal land managers, and WDFW. The working group aims to enhance and coordinate monitoring, management, and research for mountain goats in the state.

Consideration of nanny harvest from the previous hunting season(s) may be needed when determining the number of permits allocated during future seasons. A system to account for previous years' nanny harvest was proposed as a strategy in the 2015-2021 Game Management Plan (WDFW, 2014), but it was never implemented. In the proposed update of the Game Management Plan, there are harvest guidelines that take into account the population estimate as well as the gender composition of previous years' harvests, which should help account for years with a large female harvest.

The continuation of aerial surveys is needed to document trends in population and productivity. In most cases, sightability-adjusted aerial surveys provide the least biased and most efficient method of population estimation, particularly considering the large expanse of the area involved.

Based on the cooperative Cispus AMA study results, alpine meadow restoration in the Smith Creek Unit is recommended. Fire management in potential goat habitats will also play an important role in expanding goat populations outside of the Goat Rocks.

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Mountain Goat Status and Trend Report: Region 6 – Olympic Mountains

Bryan Murphie, Wildlife Biologist

Introduction

Mountain goats (*Oreamnos americanus*) are not native to the Olympic Mountains. They were introduced from Alberta and Alaska between 1925 and 1929 (Johnson, 1983). Introductions occurred on the northern part of the Olympic Peninsula in the vicinity of Lake Crescent near Port Angeles and were conducted primarily by the Klahhane Club, a sportsman's group in Port Angeles at the time (Johnson, 1983). The creation of the Olympic National Park (ONP) in 1938 provided complete protection for the introduced mountain goats, and the population thrived. The goat population expanded its distribution to areas outside the ONP boundary. By the 1980s, the mountain goat population had reached an estimated 1,175 goats throughout their suitable range in the Olympics (Houston et al., 1994). Concerns over the negative effects of non-native mountain goats on endemic plant communities and soils in the ONP prompted an effort to reduce the goat population during the 1980s when 407 goats were relocated to mountain ranges outside the Olympics (Jenkins et al., 2012). An estimated 168 goats were harvested by hunters outside ONP from 1980 until 1997, when the hunting season was closed. No additional removals were conducted, and recreational hunting was closed from 1998-2013.

Following a period of relative stability at low numbers for several years, the mountain goat population increased in number and distribution to occupy most areas with suitable habitat in the ONP and on United States Forest Service (USFS) lands outside ONP (Jenkins et al., 2016). Many of these areas are among northwest Washington's most popular hiking destinations. As a result, concerns over human-goat conflicts and the negative effects of non-native mountain goats on endemic plant communities reemerged.

In 2014, after years of planning, the Washington Department of Fish and Wildlife (WDFW), ONP, and USFS began implementing a multi-phased approach to remove mountain goats from the Olympic Peninsula (OP). The primary purpose of this effort was to remove goats from the OP. This effort's secondary purpose was to augment struggling native mountain goat populations in the Cascades. Details of these efforts and rationale are described in the Final Mountain Goat Management Plan/ Environmental Impact Statement (EIS) (ONP, 2018) and in the USFS Record of Decision on the Final ONP Mountain Goat Management Plan Final EIS (USFS, 2018). Removal activities included hunting, aerial capture and relocation, aerial lethal removal, and a ground-based lethal removal effort in ONP (Happe et al., 2023).

Management guidelines and objectives

The mountain goat population on the Olympic Peninsula is not being managed for a stable population or sustainable harvest, which contrasts with management objectives in the Cascades. Rather, the primary objective on the Olympic Peninsula is the removal of mountain goats due to their impact on native habitats.

Population surveys

The last reported estimate of mountain goats on the Olympic Peninsula was 623 (95% CI = 561-741) goats, including ONP and USFS lands (Jenkins et al., 2016). The estimate of goats for those areas surveyed within the WDFW designated permit hunt area was 59 (95% CI = 53-89) (K. Jenkins, personal communication). When the translocation/removal efforts began, it was projected that there would be at least 725 mountain goats in the Olympics. No surveys have been conducted since then. Following the conclusion of removal efforts, which are described in detail below, it is estimated that fewer than 177 goats remain, with most being in the interior of ONP (Happe et al., 2023).

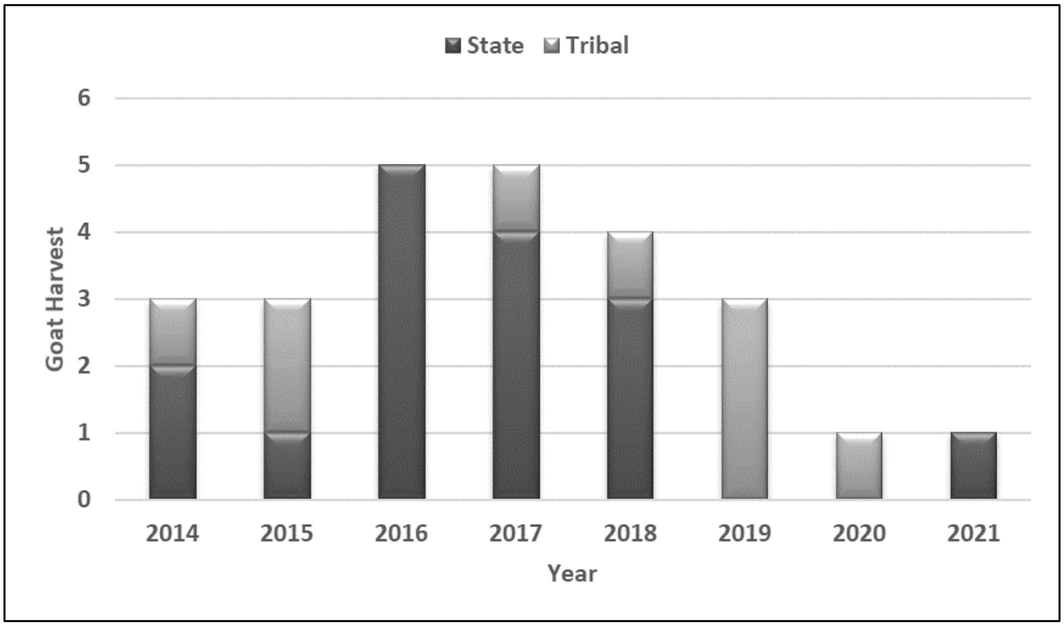
Hunting seasons and recreational harvest

Recreational hunting of mountain goats in Washington State began in 1897 with a bag limit of 2 goats per year with a 3-month season (Johnson, 1983). In 1913, the bag limit was reduced to one goat. Then, in 1917, hunting was restricted to designated areas in the Cascades until goat hunting in Washington was closed entirely in 1925 (Johnson, 1983). Mountain goat hunting resumed in 1948, by permit, in designated hunt units in Washington. Archery-only goat permit hunts were established for three designated permit units in the Olympics in 1980: the Elwha, Quilcene, and Hamma Hamma. An estimated 168 goats were harvested from 1980 until 1997, when the season was closed.

WDFW established a new permit hunt area on USFS lands in the eastern Olympics in 2014. Two permit hunt areas were designated, and three permits were issued per hunt area. In 2015, the two designated permit areas were combined into one large unit, with six permits issued in a split season of three permits each. Hunter success for this hunt averaged 32%. State hunters harvested 15 goats, and Tribal hunters harvested nine goats from 2014-2020 (Figure 1). The WDFW permit hunting season in the Olympics was closed in 2018 due to the removal and relocation efforts, which expanded to include the permit hunt area.

WDFW reopened the eastern Olympic goat permit hunt in 2021 for one season. A total of 25 permits spread across three hunt periods were available. Hunters selected for this hunt could harvest up to two goats and hunt anywhere in GMUs 621, 636, and 638. Also, the once-in-a-lifetime restriction was waived for this hunt. Of the twenty-five permits issued, ten hunters spent fifty-seven days hunting mountain goats in the Olympics and harvested one adult male goat. The hunt was again closed in 2022, as aerial lethal removal efforts occurred in the permit hunt area.

Figure 1. Total State and Tribal mountain goat harvest within the Olympic Mountain Goat Permit Hunt area.



Total State and Tribal mountain goat harvest within the Olympic Mountain Goat Permit Hunt area from 2014 – 2021. There were no State mountain goat hunting opportunities in the Olympics during the 2019 and 2020 seasons, and no reported harvests in 2022.

Survival and mortality

Estimates of survival and causes of mortality are relevant for a specific time, place, and population, and these data are not available for mountain goats on the Olympic Peninsula. Generally, causes of mortality include weather, nutritional stress, predation, parasites and disease, natural hazards (for example, avalanches), hunter harvest, and the confounding effects of many of these. Like other ungulates, survival is often lower among older adults and young-of-the-year than among prime-aged individuals and generally higher among females than males.

Habitat

Mountain goats primarily occupy habitats from just below the timberline to the highest, rocky peaks in the alpine zone. In the Olympics, mountain goats are generally found at elevations above 1400m (Jenkins et al., 2011). They select habitats based on the availability of forage, landscapes that provide high solar loading, and terrain that is rugged, providing an escape from predators (Beus, 2010). Mountain goats exhibit strong site fidelity to seasonal ranges, returning to the same summer and winter ranges year after year (Houston et al., 1994). The transition between seasonal ranges generally occurs in June (summer range) and October or November (winter range), but there is considerable individual variability in seasonal migratory behavior (Rice, 2008; Jenkins et al., 2011). Summer diets consist primarily of graminoids and forbs, while during the winter, they consume more tree and shrub species as part of their diet (Houston et al., 1994).

Human-wildlife interaction

Goats accustomed to humans are often drawn to them for providing salt from food and urine. Encounters can range from mildly annoying to life-threatening. These primarily occur along popular hiking routes that traverse areas occupied by mountain goats in the designated Olympic permit hunt area, most notably along the Mount Ellinor and Lena Lake trails. Although numerous accounts of potentially hazardous encounters between humans and mountain goats have been reported, two occurrences in the Olympic Range illustrate the seriousness of the risk these encounters pose to humans. In 1999, a hiker on Mount Ellinor reported that he was gored in the leg by an aggressive goat and survived. In 2010, a hiker at Hurricane Ridge was also gored in the leg, sustaining a fatal injury to his femoral artery (ONP Mountain Goat Action Plan, 2011).

Olympic Mountain goat removal project

From 2018-2022, WDFW, ONP, and USFS conducted targeted efforts to remove mountain goats from the OP. This effort included recreational hunting, aerial capture and relocation, ground-based culling, and aerial lethal removal activities. Several technical reports have been written stemming from this project. In summary, 341 goats were either relocated to the North Cascades or donated to zoos, 31 were removed by ground-based culling, and 136 by aerial lethal removals (Happe & Harris, 2018; Happe et al., 2020; Happe & Braun, 2021; Happe et al., 2021; Happe & Ryan, 2021; Happe et al., 2023). State and Tribal hunters harvested an additional 25 goats. From this point, the effort moves on to the maintenance phase, where additional mountain goat removals will be conducted on a case-by-case basis as goats are encountered. As of July 2024, no additional goats have been removed (M. Terwilliger, ONP, personal communication).

Management concerns

As a result of an increasing goat population, concerns over human-goat conflicts, and the negative effects of this non-native species on endemic plant communities, an effort to remove mountain goats from the OP was conducted. At its conclusion in 2022, it is thought that fewer than 177 goats remain, with the majority remaining in the interior of the ONP (Happe et al., 2023). The primary concern moving forward will be whether the maintenance strategy based on case-by-case individual removals is enough to maintain a negative trajectory for this population.

Management conclusions

Most of the mountain goats have been removed from the Olympic Peninsula. Maintaining the negative trajectory of this population will rely on consistent, individual removals occurring over the long term. WDFW will consider adding new permit hunt opportunities when or where mountain goats are discovered outside ONP if areas are accessible enough to provide a hunting opportunity. As of July 2024, only three unconfirmed reports have been recorded in the interior of the ONP (M. Terwillger, ONP, personal communication), and none have been noted outside the ONP in hiker trail reports.

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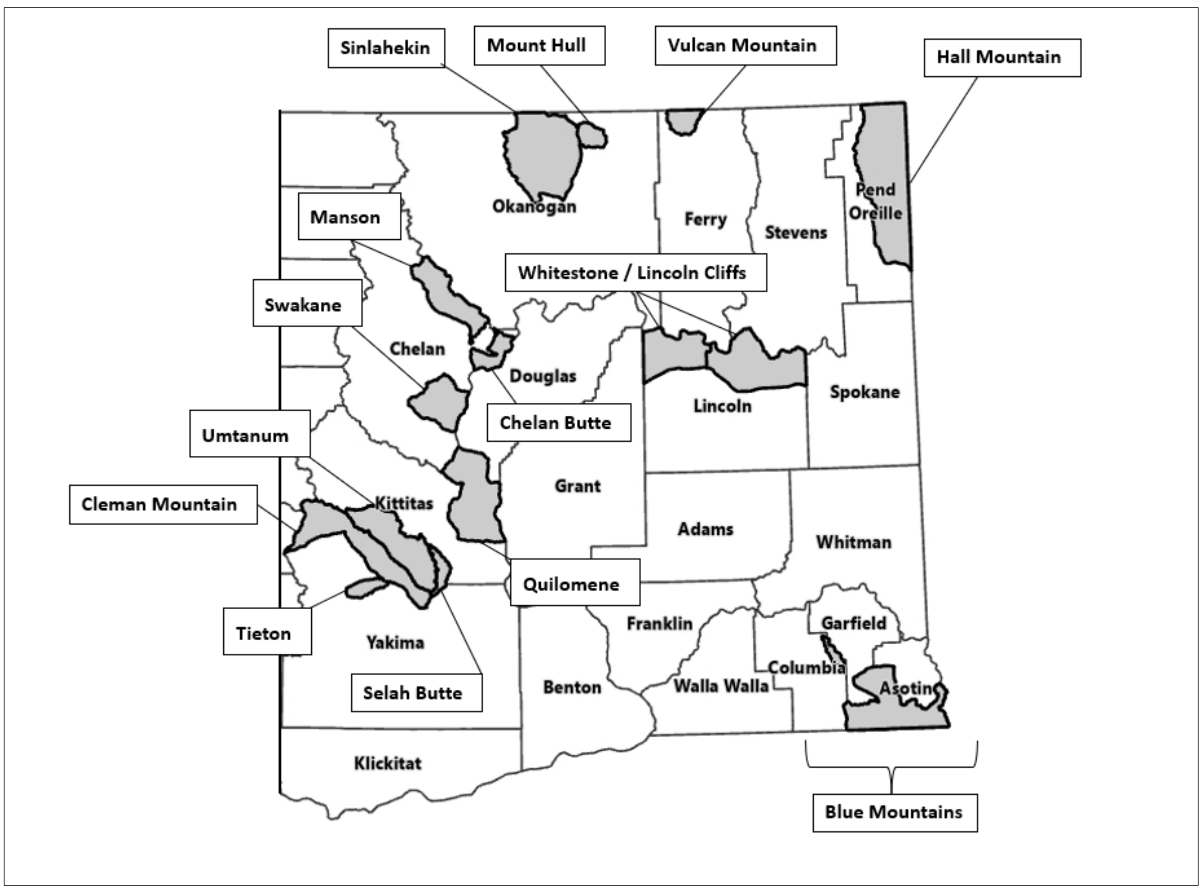
Bighorn Sheep

Bighorn Sheep Statewide Status and Trend Report

Introduction

The Department of Fish and Wildlife (*hereafter,* the Department) manages 17 bighorn sheep herds that occupy a portion of their historic range within the eastern two-thirds of the state. Bighorn sheep were extirpated from Washington by 1935, and these herds are the result of reintroductions, which began in 1957 (Johnson, 1983) and continued until 2004. Herds associated with the eastern foothills of the Cascades and Okanogan Highland are designated as California bighorn (twelve herds), while those in the Blue and Selkirk mountains are considered Rocky Mountain bighorns (five herds). One herd, Tieton, remains under the Department's purview but contracted pneumonia and was depopulated in 2013 to reduce the risk of disease transmission to the adjacent Cleman Mountain herd.

Figure 1. Bighorn sheep distribution across Washington state.

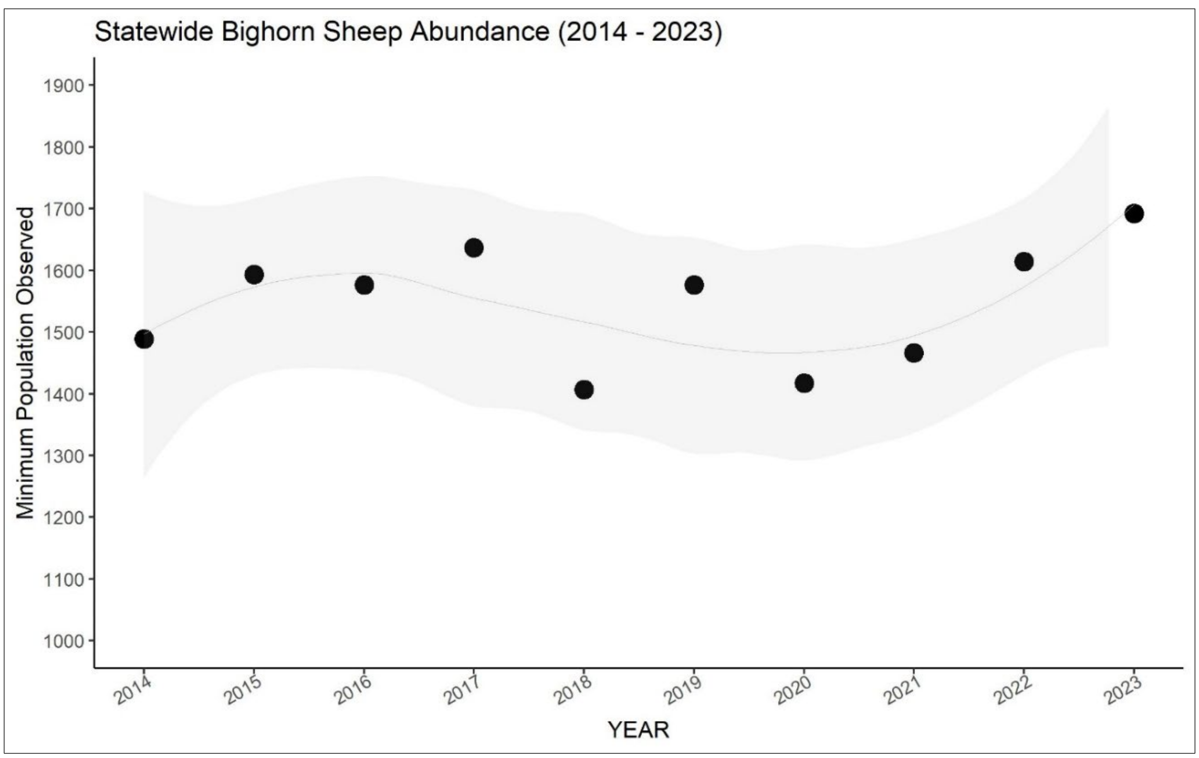


Dark gray labeled polygons represent the Department's 2022 hunt units. Blue Mountains contains four herds, including Asotin Creek, Black Butte, Mountain View/Wenaha, and Tucannon.

Surveys

The Department attempts to survey each herd biennially using aerial or ground approaches, which are not corrected for detection bias; therefore, in most circumstances, results should be considered minimum counts. However, in certain situations, when collars (i.e., marks) are distributed within a given herd, mark-resight methods may be utilized to generate abundance estimates. All aerial and ground surveys are typically conducted between late fall and early spring to estimate population size, lamb recruitment, sex ratio, and proportion of mature rams in the population. The Department estimates that nearly 1,700 bighorn sheep are distributed throughout these herds, slightly less than the lower short-term population bound of 1,995 defined in Washington's 2015-2021 Game Management Plan (WDFW, 2014; Figure 2). Additionally, the Department conducts surveillance of *Mycoplasma ovipneumoniae* (discussed below), the pathogen that initiates bronchopneumonia, in all captured, harvested, and opportunistic situations (e.g., road-killed animals).

Figure 2. Minimum statewide bighorn sheep population counts with LOESS* smoothing derived from aerial and ground surveys.

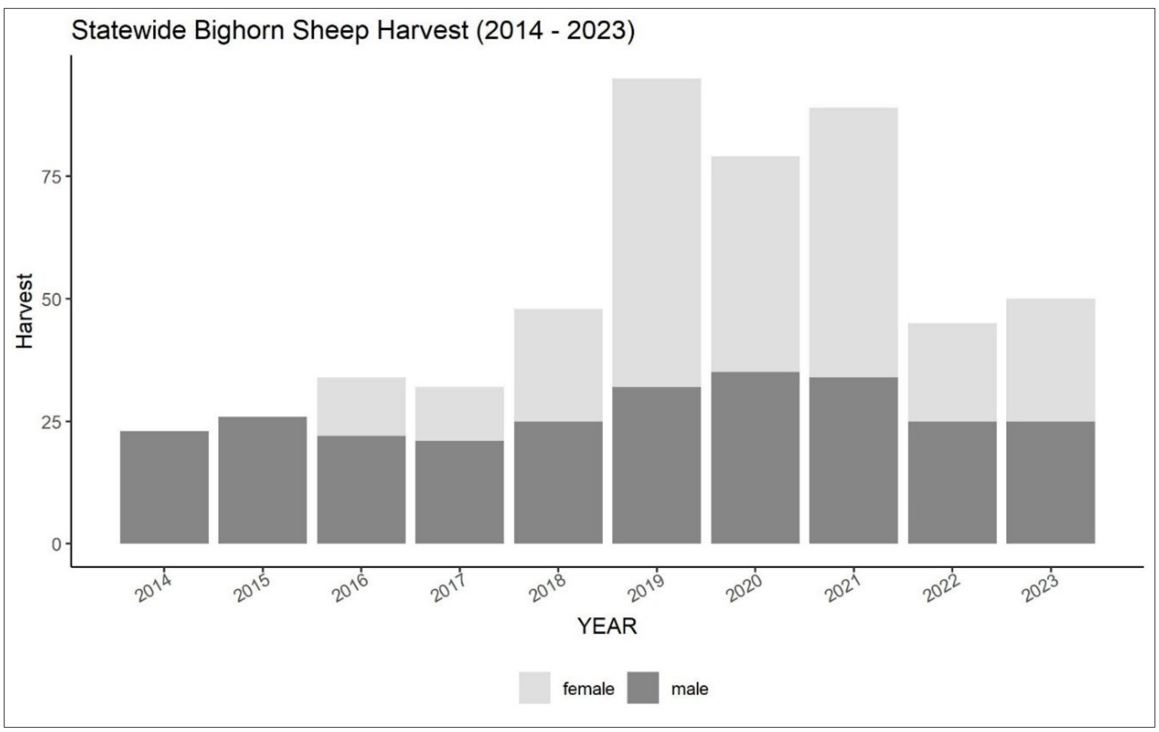


Locally estimated scatterplot smoothing (LOESS) is a common technique applied when fitting a curve to data. This technique will generate a curve and confidence interval that best fits the given data.

Hunting Seasons and Harvest

The Department manages harvest as a high-quality hunting opportunity; therefore, the number of permits is set at a level to maintain long-term herd sustainability, low hunter densities, and long seasons to promote high success rates whether permits are "Any Ram," "Adult Ewe," or "Juvenile Ram." In addition, allocation levels of permits classified as "Any Ram" consider the population size, ram-to-ewe ratio, and the number of older age-class males to ensure a high-quality hunting experience is available when an individual is selected. Permits classified as either "Adult Ewe" or "Juvenile Ram" still maintain a high-quality hunting experience but are intended to reduce herd abundance (e.g., to maintain herd objectives or reduce the risk of contact between wild and domestic sheep), foray probability (decrease overall ram abundance by harvesting juvenile males given their higher probability of foray), or agricultural damage potential. Ram harvest has remained consistent over the last ten years, although overall harvest has fluctuated with the initiation of ewe and juvenile ram permits beginning in 2016, with dramatic increases between 2019-2021 associated with Test and Remove management in the Umtanum and Selah Butte herds (Figure 3).

Figure 3. Statewide bighorn sheep harvest from 2014 – 2023.



Female harvest is illustrated in light gray (above), and male is illustrated in dark gray (below).

Management Concerns

The most significant risk to Washington's bighorn sheep comes from exposure to the bacterium *Mycoplasma ovipneumoniae* (*hereafter*, *M.ovi*), which has been identified as one of the primary factors responsible for causing pneumonia resulting in contemporary population declines and historic extirpations. Transmission may occur when wild bighorn sheep encounter domestic sheep and goats that carry this pathogen but are not clinically affected. Unfortunately, once transferred to bighorn sheep, it results in widespread pneumonia, causing an initial all-age die-off, which may range from mild (e.g., 5%) to severe (e.g., >80%). Survivors will be resistant to the pathogen, but a proportion will remain carriers and infect annual lamb cohorts, reducing juvenile recruitment and resulting in long-term population declines (Besser et al. 2008, 2012; Cassier & Sinclair, 2007; Wehausen et al., 2011; Manlove et al., 2014). The Department has documented *M.ovi* in eight of their 17 bighorn sheep herds, with the most recent transmission being documented in December 2023 in the Black Butte portion of the Blue Mountains Complex. Further transmission within the complex is expected to occur between Black Butte and Mountain View/Wenaha, but hopefully, the Asotin and Tucannon herds will be spared.

Additional population-level concerns come from psoroptes mange being documented in the Sinlahekin and Mount Hall populations, which is caused by a non-burrowing, ectoparasitic mite of the genus *Psoroptes*. This mite will cause "scabby" lesions and alopecia and has been suspected of population decline since its introduction. (Hering et al. 2021). Research suggests parasite transfer results from disease spillover from rabbits, which began in Canada and transitioned to the Sinlahekin herd in 2011. It was documented in the Mount Hall herd during Department captures in January of 2023. More research is needed to quantify the population effects of this introduction.

Finally, the Department documented Bluetongue Disease in multiple populations with severe declines noted within Sinlahekin, Mount Hull, and Vulcan herds, with other herds documenting the disease but without significant decline.

Research

The Department is active with the Bighorn Sheep Restoration committee, which involves multiple State fish and wildlife agencies (e.g., Oregon, Idaho, and Washington), Universities (e.g., Washington State University, Montana State University, Penn State University, Northern Arizona University, and Princeton University) and the Wild Sheep Foundation to coordinate research and funding for bighorn sheep. Research goals focus on building our knowledge base to inform management strategies for populations exposed to *M.ovi*. The Department currently has projects involving the herds associated with the Blue Mountains, Umtanum, Selah Butte, and Cleman Mountain, and is planning for additional effort in Mount Hull.

Management Conclusion

Statewide bighorn sheep populations have maintained stability despite declines associated with disease across multiple herds (Umtanum, Selah Butte, Cleman Mountain, Quilomene, Sinlahekin, and Mount Hull), although with the recent *M.ovi* transmission documented in the Blue Mountains, the Department anticipates population declines in the future. The Department's main objective is to better understand, protect, and manage disease transmission to promote disease-free herds and maintain population stability and growth.

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Bighorn Sheep Status and Trend Report: Region 1 – Blue Mountains

Mark Vekasy, Wildlife Biologist

Introduction

Bighorn sheep (*Ovis canadensis*) were extirpated in Washington by the early 1900s and were first restored in the Blue Mountains on the W.T. Wooten Wildlife Area (Tucannon River). During the early 1960s, bighorn sheep consisting of transplants from the Sinlahekin Wildlife Area, which was the subject of reintroductions in the 1950s, were reintroduced on the Wooten. Since that reintroduction, four additional herds of bighorn sheep have been established in the Blue Mountains, including parts of Oregon: Asotin Creek, Black Butte, Mountain View (formerly known as the Cottonwood herd), and Wenaha. Although bighorn sheep of the California subspecies (*O. canadensis californiana)* were first reintroduced into southeast WA, many of those sheep dispersed and failed to establish viable herds. Subsequent transplants have been of the Rocky Mountain subspecies (*O. canadensis canadensis)* and all herds are considered to consist of Rocky Mountain bighorn sheep.

The Hells Canyon Initiative (HCI) was established in 1996, with representatives from the Washington Department of Fish & Wildlife, the Idaho Department of Fish and Game, the Oregon Department of Fish and Wildlife, the U.S. Forest Service, the Bureau of Land Management, and the Wild Sheep Foundation. HCI coordinates disease research, develops population survey methodology, conducts transplants, coordinates intergovernmental management activities, and implements projects designed to improve bighorn sheep habitat. All five of southeast Washington's bighorn sheep populations are included in the HCI: Black Butte, Mountain View, Wenaha, Tucannon, and Asotin Creek.

Management guidelines and objectives

Population objectives for each herd are based on habitat conditions, habitat availability, and minimizing herd expansion into new habitats that may increase the risk of contact and disease transmission with domestic sheep or goats. In 2015, WDFW recognized the utility of differentiating short-term and long-term objectives. Short-term objectives take 2014 population sizes as a starting point, account for existing constraints to population growth, and account for what can realistically be achieved within the 6-year planning horizon that WDFW uses (WDFW, 2014). Long-term objectives reflect the potential of habitat to support bighorns, assuming that constraints such as disease and landowner tolerance can be resolved. For the Tucannon herd, the short-term objective was identified as being in the range of 40-80, and the long-term potential was estimated to be approximately 160. For the Mountain View and Wenaha herds combined, the short-term objective was bounded by 130-170, with the long-term potential estimated at 375. The short-term objective for the Asotin Creek herd was estimated at 120-130, whereas the area's potential was estimated to be 240 animals. The short-term objective for the Black Butte herd was estimated to be 50-60 animals, and the long-term potential, reflecting the past abundance of this herd, was estimated to be 585. Thus, for the Blue Mountains herds in aggregate, the short-term objective is to have 340-440 animals; biologists estimate that ideally, the area could support approximately 1,360 if disease and landowner tolerance issues were resolved. The above objectives have not been revisited since 2014. Since then, some populations have exceeded the long-term objectives and continue showing rapid growth.

Population surveys

Aerial surveys have not been conducted since 2015 because systematic mark-resight ground counts have proven adequate for estimating population parameters in all but one population. Ground counts were obtained for four of the five herds during March and April of 2024. The remaining herd, Black Butte, was not surveyed, but frequent monitoring for research has provided information to generate an estimate. The population estimate for 2024 (for all herds aggregated) was 467 bighorns. Herd composition consisted of 262 ewes, 96 lambs, and 109 rams, with resulting ratios of 42 rams and 37 lambs (just prior to them becoming yearlings) per 100 ewes (Table 1). A large percentage of bighorns from Mountain View, Wenaha, and Black Butte inhabit Oregon throughout the year. Lamb recruitment during the 2023-2024 biological year declined from the previous year for the herds within the Grande Ronde Watershed (Black Butte, Mountain View, and Wenaha) but may be related to some deficiencies in ground count estimation this year.

Table 1. Bighorn Sheep population trend and herd composition, Blue Mountains, Washington.

Year	Lambs	Ewes	Total Rams	Population Total	Ratio Lambs	Ratio Rams
2015	34	113	57	204	30	50
2016	58	129	69	256	45	53
2017	65	164	77	306	40	46
2018	67	172	92	331	39	53
2019	78	154	94	326	51	61
2020	60	152	95	307	39	62
2021	91	210	124	425	43	59
2022	106	247	131	484	44	52
2023	152	244	246	642	62	103
2024*	94	257	109	460	37	42

*2024 values are minimum counts and not population estimates as compared to other years; therefore, values are likely lower than actual numbers.

Table 2. Herd 10-year survey history, Asotin, Washington.

Year	Lambs	Ewes	Total Rams	Population Total	Ratio Lambs	Ratio Rams
2015	13	25	18	56	52	72
2016	16	32	24	62	53	80
2017	15	40	19	74	37	47
2018	16	47	18	81	34	38
2019	8	28	13	49	28	46
2020	11	33	20	64	33	60
2021	14	32	16	62	43	50
2022	15	25	17	57	60	68
2023	18	22	21	61	82	95
2024	17	44	25	86	39	57

Table 3. Black Butte herd 10-year survey history.

Year	Lambs	Ewes	Total Rams	Population Total	Ratio Lambs	Ratio Rams
2015	3	11	3	17	27	27
2016	5	10	8	23	50	80
2017	10	14	11	35	71	79
2018	5	16	17	38	31	106
2019	11	19	21	51	58	110
2020	5	11	22	38	45	200
2021	4	16	16	36	25	125
2022	12	34	22	68	35	64
2023	19	29	15	63	65	52
2024*	20	44	18	82	45	41

* 2024 totals are minimum counts and not a population estimate as compared to earlier years; therefore, values are likely lower than actual numbers.

Table 4. Mountain View and Wenaha herd 10-year survey history.

Year	Lambs	Ewes	Total Rams	Population Total	Ratio Lambs	Ratio Rams
2015	17	67	27	111	25	40
2016	37	70	38	145	52	54
2017	38	97	39	174	39	40
2018	43	95	53	191	45	56
2019	52	94	55	201	55	59
2020	38	97	50	185	39	52
2021	65	148	89	302	44	60
2022	78	181	86	345	43	48
2023	115	185	206	506	62	111
2024*	55	162	63	280	34	39

Table 5. Tucannon herd 10-year survey history.

Year	Lambs	Ewes	Total Rams	Population Total	Ratio Lambs	Ratio Rams
2015	1	10	9	20	10	90
2016	0	17	9	26	0	53
2017	2	13	8	23	15	62
2018	3	14	4	21	21	29
2019	7	13	5	25	54	38
2020	6	11	3	20	55	27
2021	8	14	3	25	57	21
2022	1	7	6	14	85	14
2023	0	8	4	12	0	50
2024	2	7	3	12	29	43

All values are based on total counts and are not estimated.

Hunting seasons and recreational harvest

The Washington Department of Fish and Wildlife considers bighorn sheep in southeast WA to be of the Rocky Mountain subspecies (*O. canadensis canadensis)* and draw and raffle permits are identified as such. In 2023, recreational hunting opportunities were limited to one raffle permit and one draw permit; both permits were successfully filled. Poor recruitment (past years), disease risk and conflict removals, interstate management, and tribal harvest continue to limit the available recreational opportunity within Washington. Two rams were harvested from the Black Butte and Mountain View herds in 2022.

WDFW strives to work with local tribes with treaty rights to coordinate and agree upon the current harvest opportunity to allow for the recovery of the male segment of the population. The Nez Perce Tribe does not collect or report harvest, but harvest is often surmised from public reports and radio-collar recoveries. WDFW and the Nez Perce Tribe had agreed to a hunting moratorium in the Asotin herd until the herd recovered from a disease outbreak and poor recruitment and survival; however, the NPT closure has expired and is not renewed at the time of writing. The Asotin herd currently has a desirable ram age structure and ratio to adult ewes but remains sensitive to over harvest. WDFW has not offered a permit in this herd since 2014, with disease and tribal harvest limiting the availability of rams for any additional public harvest. WDFW, the Oregon Department of Fish and Wildlife, and the Confederated Tribes of the Umatilla Indian Reservation have collaborated for six years in managing harvest in the Wenaha herd, which covers two states and two treaty tribes' ceded areas.

Survival and mortality

Survival analysis has not yet been completed for the 2023-2024 biological year. The Hells Canyon Restoration Committee will periodically produce a report that captures this information. There is an emerging disease issue in the Hells Canyon herd areas (Redbird, Big Canyon, and Upper Hells Canyon in ID, Imnaha and Lower Hells Canyon in OR, and Black Butte, Mt View, and Wenaha in WA/OR. All these herds have experienced *Mycoplasma ovipneumoniae* (*M.ovi.*)-related mortality beginning in December 2023. Washington herds were not affected by disease until June 2024 but are now experiencing significant mortality. Past experience with pneumonia outbreaks has shown there is little that can be done during the initial phase of an outbreak. Recent experiments with multiple testing and removal of chronic bacterial "shedders" have proved promising for limiting the duration of disease outbreaks that often, without intervention, lead to prolonged periods of nearly zero lamb recruitment.

Habitat

Habitat conditions are moderate to good in most areas. However, the spread of noxious weeds, mostly yellow star-thistle (*Centaurea solstitialis*), thistle (*Cirsium* spp.), and rush skeleton weed (*Chondrilla juncea*) are threatening ranges in the Blue Mountains. Although the School Fire (2005) had immediate negative effects on the Tucannon bighorn sheep population (direct mortality), the range appears to have recovered. Noxious weeds are not dominating the landscape in the core bighorn range, and the grasses and forbs appear healthy. During the summer of 2015, the Grizzly Complex wildfire burned a large portion of the Wenaha herd range. The effect this may have on the habitat within this herd range still needs to be determined. In 2021, a fire burned portions of Joseph Canyon in Oregon and Washington within the Black Butte herd range, and a large fire burned more than 90% of the Asotin herds' home range. A very wet spring occurred in the spring of 2022, which has led to the rapid recovery of grass and shrub communities that were burned the previous summer. This year, the Cougar Creek fire has burned approximately 25,000 acres of the habitat in the Mt View herd area. Between the fire and disease outbreak, we are likely to see immediate and significant reductions in herd numbers.

Human-wildlife interaction

Bronchopneumonia caused by, or facilitated by, the bacteria *M. ovi*, has affected four of the five Blue Mountain bighorn populations in Washington: Asotin, Black Butte, Wenaha, and Mountain View. Bighorn populations in the Hells Canyon area (which includes the Washington Blue Mountain herds, but also nearby herds in Oregon and Idaho) generally have not recovered from bronchopneumonia die-offs as quickly as some herds in other states, possibly because of reinfection from adjacent herds or from domestic sheep and goats that exist within the range of multiple herds. The presence of domestic sheep and goats within and adjacent to the bighorn sheep range presents a constant and substantial risk of another major epizootic. WDFW actively works with landowners near bighorn sheep herds to ensure accurate disease information is available to stock owners and options to minimize contact between domestics and wild sheep are made available.

To facilitate this outreach to owners of domestic sheep and goats, WDFW has partnered with Idaho Fish and Game, Oregon Department of Fish and Wildlife, and state chapters of the Wild Sheep Foundation from Washington, Idaho, and Oregon to fund a full-time position with the Asotin County Conservation District. This person provides education and testing options to owners or potential owners of domestic sheep and goats within the northern Hells Canyon ecosystem. The goal of this position is to reduce or eliminate risk of disease transmission from domestic animals to bighorn sheep populations.

Some land-management agencies have encouraged landowners to use domestic goats for weed control. When used near the range of bighorn sheep, this type of weed control program presents a risk to bighorn sheep populations in southeast Washington. WDFW staff actively work to explain the risk of using domestic Caprinae species within the ranges of bighorn sheep.

Population augmentation

No population augmentations occurred during this reporting period.

Research

As part of the Hells Canyon Restoration committee, WDFW is actively participating in research on *M. ovi*-associated pneumonia in bighorn sheep (e.g., Bernatowicz et al., 2016; Manlove et al., 2014; Cassirer et al., 2017 & 2018). For the past eight years, WDFW and IDFG researchers have been capturing ewes and lambs in the Asotin, Black Butte, Mountain View, Wenaha, and herds in Oregon and Idaho to determine the bacterial shedding status of animals within those populations. Efforts have been made to remove the chronic shedders of *M. ovi* in these herds, which has been successful based on continued negative tests in all herds, along with major improvement in lamb recruitment post-treatment. This management approach has been called the “Test and Remove” action. Although the Asotin herd has been cleaned of *M. ovi*, other stochastic events have decreased survival rates of all age classes, preventing population recovery.

In 2019, a cooperative research project with Idaho Fish and Game, the University of Idaho, and the Washington Department of Fish and Wildlife was initiated within the Asotin herd. The primary aim in Asotin Creek is to uncover links between behavior (e.g., use of the nutritional landscape) and demography (e.g., lamb survival) of sheep occupying arid, low-elevation habitats. In the late summer of 2020, 2021, 2022, and 2023, researchers visited six 100-m vegetation phenology transects to track the availability and succession of plant species across the study areas. Furthermore, they continued collecting fecal pellets and vegetation data to assess diet composition and plant species available throughout the summer. A final report from this study is anticipated in the spring of 2024.

Researchers continued monitoring collared lambs captured in 2020, 2021, 2022, and 2023. Causes of mortality will be evaluated to determine linkages between available nutrition, disease status, dam condition, and movement.

Beginning in the fall of 2023, WDFW began collaring 6-month-old lambs with GPS collars. This first year was a pilot effort to determine the feasibility of ground-capturing this age class of animals. The objectives of this effort were to gain a better understanding of habitat use, exploratory movements, and inter-herd movement. Early results have shown considerable movement outside of adult-defined home ranges.

Management concerns

Disease, predation, and harvest in certain herds remain the biggest challenges for bighorn sheep in the Blue Mountains. A long-term solution to pneumonia spreading within and amongst herds of bighorns has eluded researchers and managers for many years. However, recent developments in identifying chronic carriers of *Movi* have provided opportunities to treat multiple herds using the Test and Remove methodology. *Movi* has been the limiting factor for population growth in the Blue Mountains for more than 30 years. From 2018 until this year, all herds in southeast Washington were thought to be free of *M. ovi*, with growth rates of the Black Butte, Mountain View, and Wenaha herds reflecting this status. The recent outbreak of *Movi* is a major setback to the recovery and conservation of these herds. The Tucannon and Asotin herds are not exhibiting growth due to other reasons. Despite recent efforts to augment the herd and increase genetic diversity, the Tucannon population will likely remain at low abundance due to disease, predation, and other mortality sources (especially those that limit lamb recruitment), the effects of which are exacerbated at low population levels.

Three government entities within the Washington Blue Mountains have harvest rights to the bighorn sheep herds within SE Washington (WDFW, Confederated Tribes of the Umatilla Indian Reservation, and

Nez Perce Tribe). These three entities have begun working toward common population goals and harvest regimes to maintain these goals. It will likely be a multi-year process, but coming to an equitable approach for all entities will be the goal.

Management conclusions

The Blue Mountain bighorn populations have struggled with *M.ovi*-induced bronchopneumonia and continued to do so, with the recent transmission being documented in December of 2023. Management actions, such as test and remove, education, outreach, and risk mitigation for small flocks, coordinated by the Hells Canyon Restoration Committee across multiple states will be critical to limiting the impacts of the current *M.ovi* outbreak. Additionally, increasing our understanding of foray potential and risk of transmission between bighorn sheep herds is necessary.

The multi-state effort to remove chronic shedders of the *Movi* bacteria while monitoring “cleaned” herds will continue in Hells Canyon over the coming years and will likely be critical to limiting the impacts of the current *Movi* outbreak. This will not prevent future contact with infected bighorns from herds outside the HCI focus area or transmission from infected domestic sheep and goats.

Domestic sheep and goats continue to be a major threat to bighorn sheep in the Blue Mountains. Rural landowners continue to use domestic sheep and goats to control weeds, among other uses, posing a severe threat to all herds in Hells Canyon. HCI research has shown that a large amount of inter-herd movement occurs (F. Cassirer, IDFG, pers. comm.). Numerous bighorn sheep have been removed, either lethally or transferred to captive research facilities to minimize the possibility of transmitting diseases. In early 2008, District 3 wildlife management staff authored response guidelines to be implemented when bighorn sheep are located in “high-risk” areas, or domestic sheep or goats are located within the bighorn range. The ability to capture and receive *Movi* test results back in less than 24 hours has improved greatly over the past five years. This has led to an approach that reduces the number of bighorns lethally removed that may have been in contact with domestic Caprinae. The current management approach is to attempt to capture bighorns in high-risk locations, test, hold in a horse trailer, and release into the origin herd with a collar if found negative for *Movi.* This has reduced lethal removals by 90% since 2017.

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Bighorn Sheep Status and Trend Report: Region 1 - Hall Mountain and Vulcan Mountain

Annemarie Prince, Wildlife Biologist
Ben Turnock, Wildlife Biologist
Healiani Johnson, Wildlife Biologist

Introduction

District 1 has two bighorn sheep populations, both resulting from reintroductions. Rocky Mountain bighorn sheep were introduced to Hall Mountain in Pend Oreille County, Washington, from Alberta, Canada, in 1972 (Johnson, 1983). The founder herd included five rams and 13 ewes. In 1981, two additional ewes were translocated to Hall Mountain from Thompson Falls, Montana.

California bighorn sheep were introduced to the Vulcan Mountain area of northern Ferry County, Washington, in 1971. Eight bighorn sheep, consisting of two rams and six ewes, were translocated from the Colockum State Wildlife Area to the US Bureau of Land Management land near Little Vulcan Mountain.

Management guidelines and objectives

An earlier objective for the Hall Mountain herd was to maintain a population of 40-70 Rocky Mountain bighorn sheep (WDFW, 2014). However, WDFW recently revised the population objectives to reflect the updated mapping of suitable habitats. Short-term, early winter herd objectives are between 25-35 animals.

The earlier long-term population goal for the Vulcan Mountain bighorn sheep herd was to maintain 80-110 animals on the available range. However, these population objectives have also recently been revised to reflect updated mapping of suitable habitats. Short-term early winter herd objectives for the Vulcan herd are from 70-90 animals. Long term, biologists estimate that the Vulcan area could support 80-110 animals.

Population surveys

Our most recent surveys of Hall Mountain consist of one ground survey conducted by the Kalispel Tribe in January 2022 and camera trap photos of six rams WDFW received in June 2022. The ground survey and photos yielded a minimum of 14 sheep (eight ewes, no lambs, and six rams). Table 1 summarizes the maximum number of sheep observed during aerial surveys.

The Vulcan herd is surveyed annually using ground-based surveys conducted along an automobile route on county roads and from private and primitive roads. During the survey, biologists attempt to classify every detected bighorn sheep. However, they recognize that the effort likely never results in a complete count, and classification is not possible for animals at extreme distances. In 2023, WDFW conducted several ground-based surveys, and the Confederated Tribes of the Colville conducted one aerial survey. Biologists used the highest count for each classification to observe 38 bighorn sheep (15 ewes, two lambs, and 20 rams; Table 2).

Table 1. Counts of Hall Mountain bighorn sheep, 2004-2023.

Year	Lambs	Ewes	Rams	Total	Lambs: 100 Ewes: Rams
2004	-	-	-	No Data	No Data
2005	7	14	6	27	50: 100: 43
2006	5	7	7	19	71: 100: 100
2007	4	11	7	22	36: 100: 64
2008	9	16	4	29	56: 100: 25
2009	5	14	4	23	36: 100: 29
2010	9	11	0	24	82: 100: 0
2011	5	9	1	15	56 : 100 : 11 *
2012	2	6	4	12	33: 100: 67
2013	0	5	3	8	0: 100: 60
2014	3	7	11	21	43: 100: 157
2015	-	-	-	No Data	No Data
2016	0	5	8	12	0: 100: 160**
2017	0	6	9	15	0: 100: 150
2018	-	-	-	No Data	No Data
2019	0	5	4	9	0: 100: 80
2020	2	5	1	10	40: 100: 20
2021	0	3	4	10	0: 100: 133
2022	0	8	6	14	0: 100: 75
2023	-	-	-	No data	No data

* Total counts in some years include unclassified bighorn sheep. ** Ground-based surveys conducted in spring before translocation of NBR sheep.

Table 2. Annual population composite counts of the Vulcan Mountain bighorn sheep, 2004-2023.

Year	Lambs	Ewes	Yearling	Ram <3/4 curl	Ram >3/4 curl	All Rams	Total*	Lambs:100 Ewes:Rams
2004	9	20	5	7	5	17	46	45 : 100 : 85
2005	21	32	4	11	7	22	75	66 : 100 : 69
2006	10	24	3	6	4	13	47	42 : 100 : 54
2007	21	39	5	4	6	15	75	54 : 100 : 38
2008	19	42	5	8	5	18	79	45 : 100 : 43
2009	15	43	2	14	7	23	81	35 : 100 : 53
2010	9	24	7	8	4	19	52	38 : 100 : 79
2011	7	9	-	-	-	15	31	78 : 100 : 167
2012	4	9	1	3	9	13	26	44 : 100 : 144
2013	6	15	1	2	7	10	31	40 : 100 : 67
2014	7	19	2	5	1	7	36	37 : 100 : 37
2015	13	19	13	6	7	13	45	68 : 100 : 68
2016	11	26	5‡	4	4	13	50	46 : 100 : 54
2017	10	26	1	6	12	19	55	38 : 100 : 73
2018	13	22	5	12	4	16	56	59 : 100 : 72
2019	8	23	0	7	6	13	44	35 : 100 : 57
2020	8	18	3	18	8	26	55	44: 100 : 144
2021	4	17	4	0	0	0	25	24 : 100 : 0
2022	1	11	0	5	1	6	18	09 : 100 : 55
2023	2	15	1	6	14	20	38	13 : 100 : 133

* Total counts some years include unclassified bighorn sheep.
‡ All males.

Hunting seasons and recreational harvest

The Hall Mountain herd is open for the Rocky Mountain raffle permit hunt; however, no bighorn sheep have been harvested there since 2010. Both general public hunters (state) and members of the Colville Confederated Tribes (CCT) hunt bighorn sheep within the Vulcan Mountain Unit. Department and Tribal biologists annually confer prior to developing their respective permit recommendations, with no state permit allocated for 2022 and no rams harvested.

Table 3. Washington State permit holders.

Year	State Permit Holders	State Hunter Harvest
2005	1	1 ram
2006	1	1 ram
2007	2	2 rams
2008	3	1 ram, 2 ewes
2009	4	1 ram, 3 ewes
2010	4	1 ram, 3 ewes
2011	2	1 ram
2012	1	1 ram
2013	1	None
2014	1	1 ram
2015	1	1 ram
2016	1	None
2017	0	None
2018	0	None
2019	1	1 ram
2020	0	None
2021	1	1 ram
2022	0	None
2023	0	None

Summary of State permit numbers and State hunter harvest of bighorn sheep from the Vulcan Mountain Unit, 2005-2023.

Survival and mortality

Predators throughout the Hall Mountain herd area include coyotes, black bears, cougars, and gray wolves. Using a Kaplan-Meier survival estimator for the translocated Bison Range sheep, survival during their first year at Hall Mountain was estimated to be 0.50, and the cause of mortality was known for three sheep. Two of the translocated sheep were dispatched, as a precaution, by WDFW after they left the release site and had the potential to interact with domestic sheep and goats, and the third was attributed to a cougar. After censoring the two dispatched sheep from the analysis, the median survival during the first year at Hall Mountain for the remaining eight was 0.625. Due to the low sample size, these estimates should be viewed with caution, and no conclusions should be drawn about the leading causes of mortality for the sheep at Hall Mountain.

Habitat

Northeastern Washington is densely forested, and the Hall Mountain bighorn sheep depend upon the steep terrain, open grasslands, and other scattered sub-alpine openings for forage and predator avoidance. Non-forested escape terrain is limited and fragmented within the range of the Hall Mountain herd, including Sullivan Mountain, Crowell Ridge, Gypsy Ridge, and Hall Mountain. Sheep migrating between these and other peaks and ridges must travel through valley bottoms and dense forests where vulnerability to predators may increase.

The U.S. Forest Service (USFS) owns most of the land within the range of the Hall Mountain herd. Consequently, there are no immediate threats to habitat quality and quantity. The USFS plans to actively manage portions of the winter range habitat with prescribed burns subject to funding (Suarez, 2001). In July and August of 2017, an approximately 4,000-acre fire burned portions of the Hall Mountain bighorn sheep range. This fire may increase forage quality for this herd in the future; however, most of the trees within the sheep range were unaffected by the fire. Currently, there are no domestic livestock grazing within the national forest area used by the Hall Mountain bighorn sheep.

Several projects to enhance the Vulcan Mountain Bighorn Sheep habitat have been carried out in recent years. These include broad-range weed control, selective logging, forage plant seeding, water source development, and temporary fencing at Moran Meadow to enhance controlled cattle grazing. Partners accomplishing these projects included several local private landowners, the Wild Sheep Foundation (WSF, formerly Foundation for North America Wild Sheep, FNAWS), Safari Club International (SCI), Inland Northwest Wildlife Council (INWC), USFS, Bureau of Land Management (BLM), and WDFW. One large-scale project was completing a BLM timber sale within the core sheep range in 2004. This helicopter-logging project was partially designed to improve predator avoidance for bighorn sheep by enhancing sight distances within their range's most densely forested portions and increasing forage production (K. Doloughan, personal communication, 2004). In addition, a forest health/thinning project occurred on DNR property above Moran Meadows. There are no domestic sheep grazing allotments within the Vulcan herd range.

Human-wildlife interaction

A winter feeding station was maintained for the Hall Mountain bighorn sheep for many years until it began attracting cougars, posing a risk to humans and an unnatural vulnerability for the sheep. Consequently, winter feeding was discontinued in 2003. More recently, there is concern about bighorn sheep straying beyond their traditional range and increasing the risk of contact with domestic sheep that could harbor *M. ovipneumoniae* (M. ovi). This bacterium causes pneumonia in bighorn sheep.

Population augmentation

In March 2016, ten short-yearling (born in spring 2015) bighorn sheep (eight ewes and two rams) were translocated from the National Bison Range in Montana to Hall Mountain. All sheep were fitted with GPS radio collars, tested negative for *Mycoplasma ovipneumoniae* on nasal swabs and serology, and released at the historic USFS Noisy Creek campground feeding station. Unfortunately, two of these translocated ewes moved into residential areas and had to be euthanized because of potential interaction with and transmission of pathogens from domestic sheep and/or goats. There is one collar still functioning and present on Hall Mountain at the time of this writing. Cooperators in this project included the US Fish and Wildlife Service, the Kalispel Tribe, Pend Oreille Sportsman's Club, the Montana Department of Fish, Wildlife, and Parks, the Confederated Salish and Kootenai Tribes, and Global Wildlife Resources.

In January 2017, eight sheep were translocated from the Cleman Mountain herd to the Vulcan herd area. All were fitted with GPS radio collars and released at Vulcan Mountain. As of this writing, four of the sheep are still alive and spend the majority of their time on Vulcan Mountain.

Research

In 2016, the Kalispel Tribe, WDFW, the US Forest Service, and the Pend Oreille Sportsman's Club began a collaborative research project at Hall Mountain. Objectives and corresponding updates of the study are as follows:

1. Estimate ewe and lamb abundance with the assistance of VHF telemetry during multiple helicopter flights.
    a. Unfortunately, the helicopter vendor that is used (closest to Hall Mountain, affordable) has not outfitted their helicopters for aerial telemetry. Without this capability during surveys, observers were not able to locate sheep in real-time, and therefore, the collars did not help biologists find additional sheep. Last collar locations were used to navigate to and survey for additional sheep, but in the heavily timbered environment, this proved moderately successful. As of this writing, no functioning collars remain in the Hall Mountain herd.
2. Determine adult and lamb (up to one year) survival rates and, when possible, cause-specific mortality of radio-collared adult sheep.
    a. Adult survival could not be calculated because no resident sheep were captured on Hall Mountain.
    b. Annual survival (first year after translocation) was calculated using a Kaplan-Meier survival estimator (see results in the Survival section above).
3. Determine habitat use and movement patterns of Hall Mountain bighorn sheep using GPS locations of radio-collared individuals. Compare GPS locations from radio-collared sheep to the USFS habitat suitability model; determine the proportion of GPS locations that fall within the USFS model. Evaluate bighorn sheep movement and timing of movement between Hall Mountain (US Selkirk Mountains) and the BC Selkirk Mountains.
    a. The USFS bighorn sheep habitat prediction model seems to be accurate for the Hall Mountain population's range and is consistent with how sheep are using the landscape. Of the summer GPS collar locations for the NBR sheep, 326 of 444 (73%) fall within 200 m of the USFS predicted summer habitat. The BC ram that crossed into the US multiple times since 2018 was documented as far south as Gypsy Peak, but these visits to the US never lasted longer than a few days. Radio-collared sheep indicate that some Hall

Mountain sheep move into the Gypsy Peak area/Salmo Priest wilderness in the summer while others remain on Hall Mountain. All collared sheep spend the winter on Hall Mountain.

4. Use DNA collected at bait/capture sites in Washington and British Columbia to understand the genetic relatedness and diversity within the Hall Mountain sheep population. If genetic diversity is low, investigate the possibility of releasing Rocky Mountain bighorns from another herd to increase genetic diversity.
    a. This has not been completed. Biologists suspect that genetic diversity is not an issue since the influx of 10 new sheep from the NBR (2M and 8F).
5. Assess the general health of Hall Mountain and BC bighorn sheep. Conduct disease testing and pregnancy tests, check for external parasites, and determine body condition (via ultrasound).
    a. Sheep at Hall Mountain never acclimated to the baiting site, and no captures were attempted. All NBR sheep and those collared in BC tested negative for *Movi.*

In February 2016, WDFW, with assistance from Leading Edge Aviation, captured seven adult bighorn ewes at Vulcan Mountain. Six sheep were fitted with GPS radio collars, and all the sheep were screened for pathogens and diseases of interest. In addition, eight radio-collared sheep were added to the Vulcan herd from the Cleman Mountain herd in 2017. Radio-collared ewes were used to locate lambs and assess recruitment into the population. In addition, the collars aided biologists in finding sheep during helicopter surveys. The collars have all failed, and none are sending GPS locations or VHF signals.

Management concerns

The growth of the Hall Mountain bighorn sheep herd is limited, and habitat is likely the cause. The Hall Mountain bighorn herd is considered a clean herd by WDFW, meaning there are no documented cases of *M. ovipneumoniae*. However, recent collar data indicates this herd may wander farther than previously thought, and interactions with domestic sheep and goat herds are a concern. Winter surveys indicate that this herd is very small, and the future of the herd is uncertain.

The Vulcan bighorn sheep population declined dramatically in the late 1990s due to complications from exceptionally high internal parasite loads. Domestic goats were known to share part of the Vulcan bighorn sheep range. The parasite *Muellerius capillaris,* using slugs and snails as intermediate hosts, could jump from domestic goats to bighorn sheep. Native bighorn sheep, having less natural resistance to *Muellerius capillaris* than domestic goats, likely succumbed to pneumonia that this parasite brings about (Hall, 2002). After 2001, the Vulcan herd appeared healthy and began producing lambs annually, suggesting that the herd's overall health was acceptable. Nevertheless, biologists know of at least two small flocks of domestic sheep and goats near the periphery of the Vulcan range and are concerned about the potential for pathogen transmission from domestic sheep and goats to the Vulcan herd. These flocks have been tested for *M. ovipneumoniae* and are currently clean; however, if new animals enter the flocks, that status could change. In 2021, Bluetongue was the cause of mortality for bighorn sheep in Okanogan County. The much lower population numbers of this herd since 2021 indicate that Bluetongue may have impacted them, though verifying the cause without GPS collars is challenging.

Management conclusions

More intensive research could help the Department better understand the dynamics of the Hall Mountain herd and determine the future potential of sustaining and increasing this herd.

The decline observed in the Vulcan herd 2009-2012 was of considerable concern, but there is evidence (survey numbers) that the population was increasing. The minimum observed population dipped in 2021 and 2022 but experienced an uptick in numbers for 2023. WDFW is unlikely to be able to use GPS-collared animals for monitoring, and an increase in aerial and ground surveys will be necessary to monitor the status of this population.

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Bighorn Sheep Status and Trend Report: Region 1 - Lincoln Cliffs

Carrie Lowe, Wildlife Biologist
Matt Brinkman, Wildlife Biologist

Introduction

Bighorn sheep were reintroduced into the Lincoln Cliffs area in 1990. Sheep distribution was historically centered on the original 1990 release site, a parcel owned by the Bureau of Land Management (BLM), just south of Lincoln, WA - an area jointly selected by WDFW and BLM as suitable habitat. The sheep now regularly occupy two main areas throughout the year: 1) the residential community of Lincoln and the cliffs above it, and 2) the cliffs around Whitestone Rock (about seven miles downriver from Lincoln). Bighorn sheep have also been observed frequently using the cliffs above Sterling Valley, the area between Lincoln and Whitestone. Agricultural fields above cliffs and in valley bottoms are also used regularly by the bighorns. Incidental observations of bighorn sheep have been reported as far east as Porcupine Bay on the Spokane Arm of Lake Roosevelt and as far west as Banks Lake in Grant County.

Management guidelines and objectives

The objective for the Lincoln Cliffs herd is to manage bighorn sheep numbers for a self-sustaining population capable of supporting consumptive and non-consumptive recreation, while remaining within the local landowners' tolerance. The objective for the Lincoln Cliffs herd is to maintain a population size of 100-120, which is the largest feasible herd size due to increasing landowner concerns and habitat constraints.

Population surveys

Aerial surveys have been the preferred method for surveying this herd due to the cliff habitat and lack of road access. Before 2002, aerial surveys were inconsistent due to limitations of funding and personnel. From 2002-2013, a concerted effort was made to conduct two aerial surveys per year, one in the spring to assess lamb production and one in late fall to assess ram numbers. A review of those data showed that the fall flight produced greater ram and ewe counts 90% of the time and greater lamb counts 50% of the time. Consequently, only fall aerial surveys have been conducted since 2014 for staff safety and budgetary reasons (Table 1).

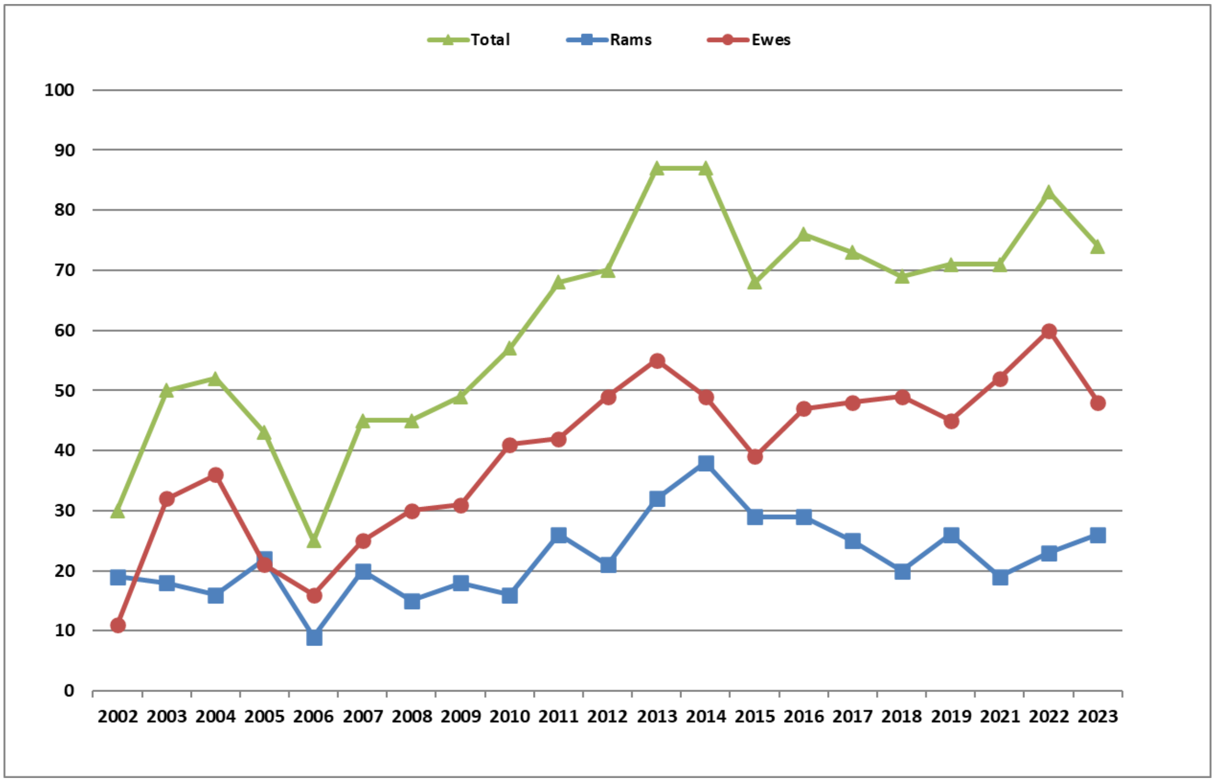
Table 1. Lincoln cliffs herd lamb and ram to ewe ratios, 2014-2023.

Year	Ewes	Lambs	Lambs :100 Ewes	Lower 90% CI	Upper 90% CI	Rams	Rams: 100 Ewes	Lower 90% CI	Upper 90% CI
2014	49	7	14	5	23	38	78	50	106
2015	39	24	62	36	88	29	74	44	104
2016	47	31	66	41	91	29	62	38	86
2017	48	22	46	27	65	25	52	31	73
2018	49	19	39	22	56	20	41	23	59
2019	45	23	51	29	73	26	58	35	81
2021	52	25	48	29	67	19	37	21	53
2022	60	26	43	26	60	23	38	23	53
2023	48	33	69	43	95	26	54	32	76

Bighorn sheep counts and ratios from fall aerial surveys over the past 10 years in the Lincoln Cliffs herd. No aerial survey was conducted in 2020 due to COVID-19.

Minimum population estimates are based on the highest count of rams and ewes from all helicopter surveys in a given year (Figure 1). These surveys indicate the Lincoln Cliffs population experienced a period of steady growth from 2007 to 2014, after which it stabilized (Figure 1). There was a decline in ewes in 2005, followed by a decline in rams in 2006. The decline in rams also followed three consecutive years of removal of two rams due to the auction and raffle permit holders selecting the Lincoln herd to hunt. The ram population rebounded immediately after 2006 and had, until 2013, remained fairly stable at around 20 animals. In 2014, 38 rams were observed during aerial surveys - the largest number since regular surveys began in 2002. In particular, the number of younger (¼- and ½-curl) age classes showed a considerable increase. Since the high in 2014, ram numbers slowly declined and appear to have leveled off. The total number of bighorns observed on the 2023 flight, including lambs, was 107 (26 rams, 48 ewes, and 33 lambs).

Figure 1. Lincoln Cliffs minimum population estimate by sex from 2002-2023.



Shown are the maximum count from all helicopter surveys conducted each year, beginning in 2002, the year regular helicopter surveys were initiated. No aerial survey was conducted in 2020.

Herd composition results from the aerial surveys have varied from 37 to 78 rams per 100 ewes over the last ten years (Table 1). The number of lambs per 100 ewes has remained relatively stable except in 2014, when only seven lambs – all in the Whitestone area – were seen during the fall aerial survey (Table 1). Public reports from the adjacent Lincoln area suggested similarly low lamb numbers. The cause for this one-off year is unknown; testing during the 2015 capture (see research section below) indicates that *Mycoplasma ovipneumoniae* was absent in this population.

Ground counts are conducted whenever possible to supplement the aerial surveys; however, these are often very limited due to terrain and restricted access to private property. Ground counts for ewes and lambs have been relatively easy to obtain in the Lincoln group but less so for the Whitestone group. Ram counts in both areas have proven largely unsuccessful from the ground. Ground counts were conducted regularly during the spring and summer of 2015 and occasionally in 2016-2019 to monitor lamb production and survival. Lamb counts have indicated the recruitment failure of the Lincoln sub-herd in 2014 was a singular event. Residents in Lincoln have also been very helpful in reporting counts and other observations of this group.

Hunting seasons and recreational harvest

WDFW offered one ram permit for this herd annually from 1997-2013. In addition to the annual permit, the statewide 2003 and 2005 auction winners and the 2004 raffle winner all selected Lincoln Cliffs to harvest their rams. Lincoln Cliffs herd was closed to the raffle and auction winners from 2006-2014. It was reopened from 2015 to 2017, though none of the winners chose to hunt in this herd. In 2014, general draw ram permits were increased to two based on ram numbers and population size. Ewe hunts were introduced in 2018, with one permit available for the Lincoln sub-herd and one for the Whitestone sub-herd. These opportunities were reduced to one ewe permit for the Whitestone sub-herd in 2020.

Ram permittees have spent an average of six days hunting per kill; however, days hunted vary widely from one to 14 days. The area is almost entirely composed of private property, and days/kill often reflects how much time was spent prior to the hunt gathering permission to access the local properties. Hunter success has been 100% for this hunt, which had 3,246 applicants in 2023. The two 2023 ram permittees reported a combined seven days of hunting. The ewe permittee was also successful, reporting two days of hunting.

Survival and mortality

Since 1997, 68 known sheep mortalities (49 rams, 19 ewes) have been documented in this herd: 43 from hunting, two from vehicle collisions, eight from cougar predation, one from illness, and 14 from unknown causes. WDFW suspects that the 2014 lamb failure in the Lincoln sub-herd was caused by cougar predation, though the last reported non-hunting mortality occurred in May 2017, when residents witnessed two cougars chase a ewe off a cliff in Sterling Valley. One non-hunting mortality, a ewe suspected to have fallen, was reported in May 2020. Frequent cougar activity was reported in Lincoln during the spring and summer of 2018, spring of 2019, and fall of 2020. It is unknown if lamb and adult survival were affected. Two non-hunting mortalities were reported in 2023; a ewe that died of severe enteritis, and a ewe that was killed by a cougar.

Habitat

Habitat within the Lincoln Cliffs bighorn sheep range is primarily private land. Where intact, it includes sparse ponderosa pine, bunchgrasses, forbs, shrubs, and rock outcrops. The cliffs along the bank of Lake Roosevelt provide escape terrain and lambing areas. The flats above the cliffs are mainly dry land agricultural fields such as wheat and barley. Fields used by the sheep adjacent to roads in valley bottoms contain irrigated alfalfa and other crops. Much of the area has been broken into small parcels and developed, and the sheep frequent landscaped residential areas.

Human-wildlife interaction

Damage complaints related to bighorns occur in both the Lincoln and Whitestone areas. With the growth of this herd, agricultural activities adjacent to escape terrain, and recent drought conditions, some local producers experience significant seasonal damage to crops such as winter wheat and alfalfa. WDFW staff and Master Hunters were used periodically in 2014 to haze sheep from fields with little success. Ewe permits were also issued for the first time in 2018 to help address the growing concern.

Growth in the local human population and the associated construction of new housing continue to be a concern in Lincoln. The Lincoln group of sheep spends substantial amounts of time near residences, so this may become an issue in the future if landowner tolerance changes. At the request of some residents, WDFW worked with the Wild Sheep Foundation to investigate the feasibility of installing sheep crossing signs in Lincoln, where roads are driven frequently by visitors and the risk of collision is significant. This action did not move forward due to liability concerns by the county.

Population augmentation

The Lincoln Cliffs population was started with an introduction of 11 'California' bighorns from Northwest Trek in December 1990. Three additional sheep from Vulcan Mountain were released in March 1991, and five from Kamloops, British Columbia, in 1996. The population steadily increased over the following years and reportedly peaked at around 100 animals in June 1998 (J. Hickman, personal communication). As a result of such growth, the herd was used to augment other populations in the state from 1999-2001. Sixteen ewes and one ram lamb were translocated to Lake Chelan, and 11 ewes were captured and released on Cleman Mountain. Aerial and ground surveys in 2002 indicated that the population was not recovering from the removal of ewes. As a result, 15 sheep were translocated from Nevada to the Lincoln Cliffs and Whitestone areas in January 2003 (12 ewes, one ram, and two lambs). There have been no augmentations to this population since 2003.

Research

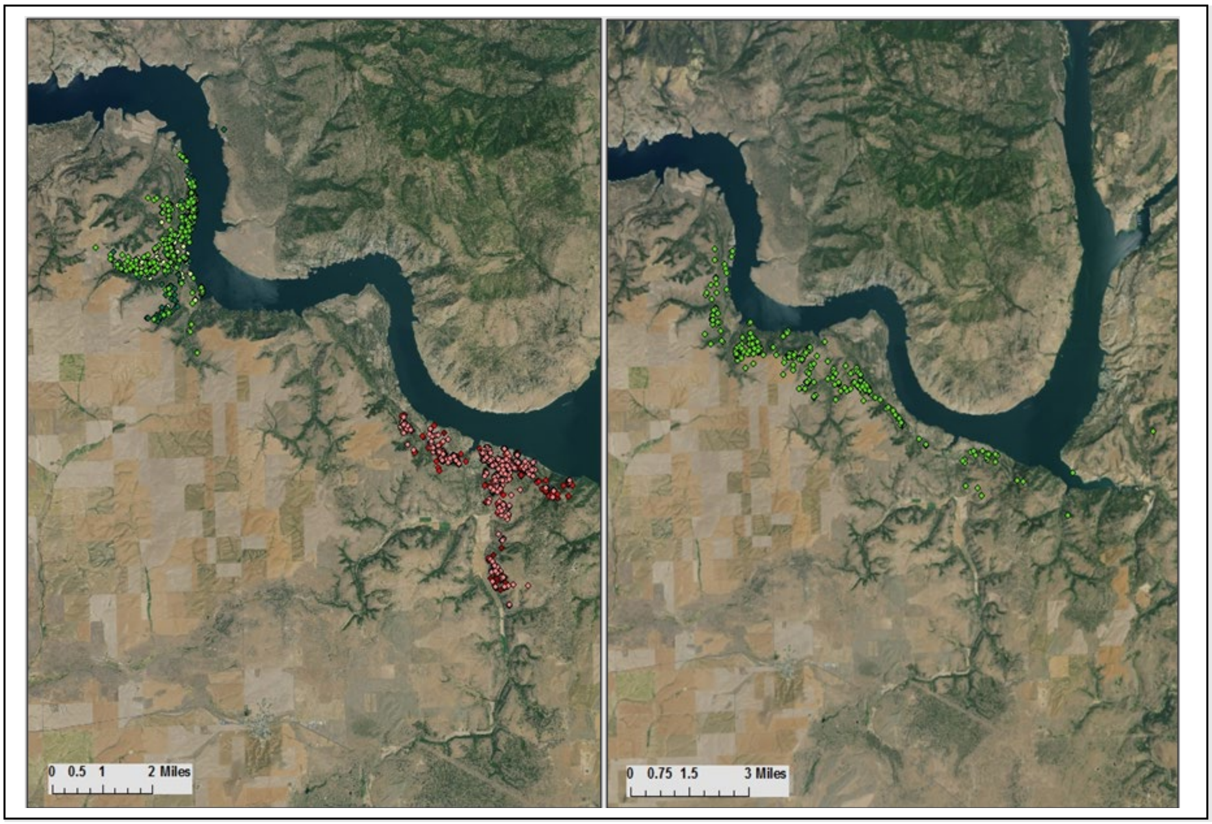
In February 2015, ten sheep (eight ewes and two rams) were captured and fitted with GPS-enabled radio collars. Animals captured in 2015 were in overall good condition, with moderate-to-good body fat levels, low parasite loads, and no scabies infestations. With concern over poor lamb recruitment in 2014, all animals were also tested for *Mycoplasma ovipneumoniae (M. ovi.)* exposure and active infection. *M. ovi*, a respiratory pathogen predisposing wild sheep to pneumonia, is associated with domestic sheep or goat contact. An outbreak can cause high lamb mortality and persist in populations for decades. All bighorns captured in 2015 tested negative for *Movi* Radio collars in this capture aided the sheep's location during lamb monitoring and aerial surveys. In addition, the GPS data collected from the collars provided insight into the movements and habitat use of the ewes and rams in the Lincoln and Whitestone groups. There appears to be little interaction between ewes in the Lincoln and Whitestone groups, although the rams showed regular movement between the two areas (Figure 2). None of the collared sheep went on large forays out of the known use area during their collar lifetime.

Two known mortalities have occurred for the ten radio-collared sheep in the February 2015 capture. A cougar killed one ewe in September 2015, though later testing indicated she had contracted the bluetongue virus and was in poor condition. The second was a cougar kill found in January 2024. One ewe's collar battery failed before the end of May 2015; an older collar was redeployed on this capture.

Though the collar's GPS and VHF (very high frequency radio waves) are no longer functioning, the ewe has been seen on subsequent survey flights. One ewe marked only with an ear tag was also seen on the 2015 and 2016 flights.

Additionally, one ram collar stopped its GPS transmittal in March 2016; the fate of that ram is unknown as it was not seen, or the VHF heard, on any subsequent aerial or ground surveys. All remaining collars in this herd have now stopped transmitting; the remaining ewe collars failed during the fall of 2017, and the ram collar failed in August 2018. Two collared ewes were spotted in Lincoln on the 2023 flight, and one collared ram was not seen on the flight but has been recently reported in Lincoln.

Figure 2. Radio locations for ewes and rams in Whitestone.



Left-hand panel: Radio locations for six Lincoln Cliffs bighorn ewes August 2016-July 2017. Whitestone ewes (3) are in green; Lincoln ewes (3) are in red. Right-hand panel: Radio locations for Whitestone rams August 2016-July 2017 in green.

Management concerns

Though the Lincoln Cliffs herd is considered "clean" (i.e., no documented cases of *Movi*), disease remains a concern, given the proximity to rural private lands. Should it ever be considered a source population to augment failing herds in Washington, this is important. In addition, over 200 bighorn sheep are on the Hellgate Game Reserve, located across Lake Roosevelt within the Colville Reservation boundaries. In 2015, an ear-tagged ewe from the Hellgate population was observed in Lincoln. In 2019, the remains of an ear-tagged ewe translocated from Tieton to Hellgate in 2010 was found in the Lincoln Cliffs, indicating that movement between the two populations occurs at least occasionally. Thus, a pneumonia outbreak in either could affect both populations.

There are no known large domestic sheep or goat operations in the range of the Lincoln Cliffs bighorns at this time. With increased residential development in the area, there is potential for contact with domestic sheep or goats via 4-H and small-scale hobby farms. However, none of these were identified during this reporting period. In past years, WDFW has provided information regarding the potential of disease interactions between domestic sheep and goats with bighorns to the local 4-H extension for inclusion in the newsletter. Outreach to small farm operations, new residents, and local organizations should continue to minimize the risk of an outbreak. GPS collar data has allowed WDFW to delineate better the herd’s home range and movements and, thus, where to target education and outreach efforts regarding these threats.

Management conclusions

The Lincoln Cliffs herd is estimated to be near the stated goal of 100-120 animals for this population if lambs are included. Lincoln Cliff's sheep live primarily on private land, both in the residential area of Lincoln and the agricultural fields above Whitestone. As Lincoln continues to be split into smaller parcels and developed, and the sheep consume agricultural crops, there is an increasing need to explore tools to address the damage.

In early 2016, WDFW staff held a public meeting in Lincoln to update residents on current management and listen to concerns and ideas regarding the future management of this herd. Outreach to residents and local producers should continue as management decisions are considered. The addition of a limited ewe hunt was proposed to the public as part of the 2018-2020 hunting season-setting process. The proposal was supported, and two ewe permits were issued for the first time for the 2018 season, one in the Lincoln sub-herd and one in the Whitestone sub-herd. Two ewe permits were issued again for the 2019 season, and in 2020, this was reduced to one permit in the Whitestone sub-herd.

Bighorn Sheep Status and Trend Report: Region 2 - Mt. Hull and Sinlahekin

Scott Fitkin, Wildlife Biologist
Jeff Heinlen, Wildlife Biologist

Management guidelines and objectives

Mt. Hull herd

The overall objective for the Mt. Hull herd is to achieve and maintain a population of 80-100 animals that can support both hunting and wildlife viewing opportunities, while remaining within the capability of the limited land base to support it. The short-term management priority is to monitor the current *M. ovi* pneumonia and psoroptes mange outbreak and their effects on herd demographics. Efforts to minimize contact with domestic sheep and goats and reduce agricultural damage and associated roadkill continue. The Mt Hull herd is co-managed with the Confederated Tribes of the Colville Reservation (CTCR).

Sinlahekin herd

The overall objective for the Sinlahekin herd is to increase bighorn sheep numbers to 100-150 animals capable of supporting both hunting and wildlife viewing opportunities. A current management priority is improving the monitoring of herd demographics and assessing the effects of the ectoparasitic mite *Psoroptes ovis* on the herd.

Population surveys

Population surveys are generally conducted annually to determine the composition and trend of both the Mt. Hull and Sinlahekin herds (Tables 1 & 2). The surveys are conducted in late fall or winter and consist of helicopter and/or ground count efforts. An attempt is made to classify all sheep in each herd. Although a complete count is generally not achieved, the result represents a minimum count from which a population estimate is generated. To aid with survey efforts, in 2023, the Department captured and deployed GPS collars on 9 (3R/6E) and 7 (2R/5E) bighorn sheep within the Mt Hull and Sinlahekin herds, respectively, to better inform survey efforts as well as to provide survival and foray data. Moreover, CTCR also conducts population surveys of the Mt Hull herd.

Mt. Hull herd

Biologists from the Confederated Tribes of the Colville Reservation conducted an aerial survey of the Mt. Hull Unit in February 2024, classifying 44 sheep (5 lambs, 29 ewes, and 10 rams), which yielded a lamb:ewe:ram ratio of 17:100:34 (Table 1).

Table 1. Population composition counts from the Mt Hull area.

Year	Lambs	Ewes	Rams <3/4	Rams >3/4	Total Rams	Unknown	Minimum Count	L:100:R
2003	20	39	9	12	21	0	80	51:100:54
2004	9	32	7	10	17	0	58	28:100:53
2005	16	48	16	10	16	0	90	60:100:33
2006	8	40	25	5	30	0	77	20:100:75
2007	13	54	17	6	23	0	90	24:100:43
2008	18	52	20	13	33	0	103	35:100:63
2009	17	58	11	10	21	0	96	36:100:29
2010	19	43	6	3	9	0	71	44:100:21
2011	8	38	13	18	31	0	77	21:100:82
2012	8	38	26	17	43	0	89	21:100:113
2013	12	50	17	8	25	3	90	24:100:50
2014	28	52	27	12	39	9	128	54:100:75
2015	--	--	--	--	--	--	--	--
2016	--	--	--	--	--	--	--	--
2017	13	48	5	2	7	4	72	27:100:15
2018	6	26	8	6	14	0	46	23:100:54
2019	11	42	15	2	17	0	70	26:100:40
2020*	5	50	22	9	37	0	92	10:100:74
2021	4	20	24	4	28	0	52	20:100:140
2022*	3	26	8	13	21	0	50	12:100:81
2023	8	34	6	4	10	0	52	24:100:29

* CTCR Survey. <3/4 = less than 3/4 curl rams, >3/4 = greater than 3/4 curl rams, and L:100:R is lambs (L) and rams (R) per 100 ewes (100).

Sinlahekin herd

WDFW biologists attempted ground surveys but were unsuccessful due to unseasonably warm winter temperatures, which allowed the herd to remain dispersed across its range and was difficult to detect (Table 2).

Table 2. Population composition counts from the Sinlahekin area.

Year	Lambs	Ewes	Rams <3/4	Rams >3/4	Total Rams	Unknown	Minimum Count	L:100:R
2003	--	--	--	--	--	--	--	--
2004	--	--	--	--	--	--	--	--
2005	2	13	3	2	5	0	20	15:100:38
2006	3	24	2	3	5	0	32	12:100:21
2007	2	37	5	7	12	0	51	15:100:32
2008	7	21	2	3	5	0	33	33:100:24
2009	15	48	14	9	23	0	86	31:100:48
2010	15	31	9	5	14	7	67	48:100:45
2011	4	55	18	5	23	0	82	7:100:42
2012	2	15	2	0	9	0	26	13:100:60
2013	4	29	3	2	5	0	38	14:100:17
2014	7	16	2	2	4	0	27	44:100:25
2015	11	41	8	3	11	0	63	27:100:27
2016	--	--	--	--	--	--	--	--
2017	3	7	6	1	7	5	22	21:100:50
2018	--	--	--	--	--	--	--	--
2019	--	--	--	--	--	--	--	--
2020	5	11	4	4	8	0	24	45:100:73
2021	1	13	4	1	5	0	19	8:100:38
2022	2	11	14	1	15	0	28	18:100:136
2023	--	--	--	--	--	--	--	--

<3/4 = less than 3/4 curl rams, >3/4 = greater than 3/4 curl rams, and L:100:R is lambs (L) and rams (R) per 100 ewes (100).

Hunting seasons and recreational harvest

Mt. Hull herd

Permits are split annually between the WDFW and the CTCR. Table 3 shows permit levels and harvest success during 2010-2018. Since 2019, WDFW and the CTCR have not issued any harvest permits due to the discovery of pneumonia and psoroptes in the herd and the associated unknown long-term population effects.

Table 3. Summary of harvest information for bighorn sheep in the Mt. Hull Unit.

Year	WFDW Permits	WDFW Harvest	CTCR Permits	CTCR Harvest
2010	1 ram 2 ewe	1 ram 2 ewe	1 any 2 ewe	0 ram 2 ewe
2011	1 ram 2 ewe	1 ram 1 ewe	1 any 2 ewe	1 ram 1 ewe
2012	1 ram 2 ewe	1 ram 2 ewe	1 any 2 ewe	0 ram * ewe
2013	2 ram 2 ewe	2 ram 1 ewe	2 any 2 ewe	0 ram 1 ewe
2014	5 ram 2 ewe	5 ram 2 ewe	2 any 2 ewe	2 ram * ewe
2015	1 ram 2 ewe	1 ram 1 ewe	4 any 2 ewe	3 ram 0 ewe
2016	1 ram 2 ewe	0 ram 1 ewe	1 any 2 ewe	1 ram *ewe
2017	1 ram 2 ewe	1 ram 2 ewe	1 any 2 ewe	1 ram * ewe
2018	1 ram 2 ewe	0 ram 1 ewe	1 any 2 ewe	* ram * ewe
2019 to present	No permits issued	No harvests	No permits issued	No harvests

*not reported

Sinlahekin herd

From 2010 through 2012, this herd supported two total ram permits annually, and hunters successfully filled all permits. Since then, herd demographics have not met management guidelines for harvest. If herd demographics improve and meet management guidelines, opportunities for harvest will again be considered.

Survival and mortality

Mt. Hull herd

Observational data suggest that the Mt. Hull herd grew steadily following initial reintroduction in 1970 until the herd size reached around 100 animals by the 1990s. Since then, the population has fluctuated in response to fires, weather, and other factors but generally remained around 100 sheep. In 2001, WDFW augmented the herd with eight ewes and three rams from the Cleman Mountain herd. Additional augmentation occurred in 2003 with five animals from John Day, Oregon. Augmentation efforts are primarily designed to maintain genetic diversity. Population growth is achieved largely through natural production.

When herd size surpassed 100 animals in the mid-2000s, roadkill became an issue as sheep regularly began crossing State Highway 97 to forage on irrigated agriculture. In response, WDFW and the CTCR established ewe permits and translocated sheep from Mt Hull to the Hell’s Gate herd on the Colville Reservation to stabilize the Mt Hull herd size. These actions and some private land management changes have significantly reduced roadkill occurrence.

In February 2019, *Mycoplasma ovipneumoniae* (*M. ovi.*) was discovered in a dead ram within the Mt. Hull herd. *M. ovi* is the bacterium that triggers pneumonia outbreaks in wild sheep. The herd was monitored, and there was no extensive die-off due to *M. ovi* infection at the time. However, low lamb survival (likely due to M. ovi) has been documented for most years since 2019, contributing to the herd's downward trend. The *M. ovi* outbreak continues in the Mt. Hull herd and connected herds to the north in Canada.

An outbreak of bluetongue disease in late summer 2021 caused an unknown amount of mortality within the Mt Hull herd. This bluetongue disease outbreak likely significantly impacted the population decline observed from 2020 and 2021.

In January 2023, psoroptic mange was discovered in the Mt Hull herd. Psoroptes mites are non-burrowing ectoparasites that generally cause localized ear lesions, but heavily infested animals can exhibit generalized mange throughout the body. Continued monitoring will be important to determine what effects this may have on the herd.

Sinlahekin herd

Initially, the herd grew rapidly following reintroduction in 1957. High productivity and continued expansion allowed for the translocation of sheep to other ranges in Washington. During the 1990s, the population declined, incurring particularly heavy losses during the winter of 1992-93. In 2003, WDFW augmented the Sinlahekin herd with ten animals to improve genetic diversity and bolster production. Post-augmentation, the herd expanded its range and grew steadily through 2011.

During a 2011 capture effort, psoroptic mange was discovered in the Sinlahekin herd, and a similar psoroptic outbreak was documented to the north in adjacent Canadian herds. In 2012, surveys detected poor lamb production and a dramatic decrease in the population, with psoroptic mange likely a significant contributing factor in the decline. Similar trends were documented in the connected Canadian population. Since 2012, herd size has fluctuated up and down but has not returned to pre-psoroptes levels. Other potential mortality factors, such as *M. ovi* or heavy predation, have not been detected in the Sinlahekin. However, the heavy psoropte infestation is still widespread in the herd and remains the leading candidate for explaining the stagnated herd demographics.

An outbreak of bluetongue disease in late summer 2021 caused an unknown amount of mortality within the Sinlahekin herd. This bluetongue disease outbreak likely played a role in the 21% population decline surveys observed from 2020 and 2021.

Habitat

Mt. Hull herd

The Mt. Hull range has generally remained in good shape. The Rocky Hull fire in 2000 rejuvenated a large portion of the area, but noxious weeds and conifer encroachment remain a concern. In 2020, the US Forest Service Tonasket Ranger District began aggressively addressing these issues by thinning 704 acres and broadcast burning 1,000 – 3,500 acres of conifer forest within the Mt Hull range. Historic and contemporary GPS collar data indicates that the current landscape supports functional connectivity between the Mt. Hull herd and the bighorn sheep herd at Omak Lake to the south and the Vaseux Lake herd in British Columbia, Canada, to the north. DNA testing of the Omak Lake herd indicated that all but one of the animals tested is genetically linked to the Sinlahekin herd. The one remaining individual was genetically linked to the Mt. Hull herd. This connectivity may increase genetic mixing but may also increase the chances of disease transmission between these herds, which the Department continues to monitor by maintaining GPS collars throughout the herd.

Sinlahekin herd

In the second half of the twentieth century, fire suppression and associated conifer encroachment reduced the quality and quantity of bighorn sheep habitat, and sheep moved their occupied range in response. In this century, both prescribed burning and wildfires, in combination with aggressive weed control efforts, have reversed this trend and are improving habitat conditions, particularly on WDFW-managed lands. However, much of the sheep foraging habitat for the Sinlahekin herd is not under WDFW control. The Washington Department of Natural Resources and US Bureau of Land Management maintain extensive cattle grazing in bighorn sheep range, and most of the adjacent private land is intensively grazed. These pressures are likely to continue.

An additional threat to both the Mt. Hull and Sinlahekin herds is the presence of domestic sheep and goats within and adjacent to their range. Wild sheep are often near these domestic herds. This interaction may lead to disease transfer into these bighorn sheep herds, especially *Movi* WDFW biologists work to encourage holders of small herds of sheep and goats to minimize risk to bighorns whenever possible.

Management conclusions

Mt. Hull herd

Reducing the risk of contact between domestics and bighorns, monitoring the effects of *M. ovi* and psoroptic mange, improving range conditions, and reducing agricultural damage and road kills are all needed for the viability and health of the Mt Hull herd. Domestic sheep and goats are near the Mt. Hull bighorns and may have led to the current *M. ovi* outbreak. Effective separation between wild and domestic sheep and goat herds would reduce the risk of further disease transmission. Monitoring herd demographics to understand the effects of the *M. ovi* and Psoroptic mange outbreaks is a management priority. Additional range improvements on all public lands within the herd's range would help reinvigorate range quality. WDFW supports these efforts and continues to work on improving habitat and reducing the factors associated with vehicle collisions and agricultural damage.

Sinlahekin herd

Even with extensive habitat improvements within the Sinlahekin Wildlife Area and the rejuvenating effects of the Okanogan Complex Fire, the herd has not seemed to recover from the declines since 2012. The current management priorities are improved survey accuracy, documenting contemporary range use, maintaining separation between bighorn sheep and domestic sheep and goats, and understanding the effects of the psoroptes mites.

Bighorn Sheep Status and Trend Report: Region 2 - Swakane, Chelan Butte, Manson

Emily Jefferys, District Wildlife Biologist
Johnna Eilers, Assistant District Wildlife Biologist

Management guidelines and objectives

Three populations of California bighorn sheep reside in Chelan County: the Swakane, Manson, and Chelan Butte herds. The Swakane herd was established in 1969 by translocating nine bighorn sheep from the Colockum herd (descendants of animals brought from near Williams Lake, British Columbia). Between 1999 and 2001, 47 sheep from multiple Washington herds and 21 from British Columbia were reintroduced to the north shore of Lake Chelan to establish the Manson herd. Most recently, in 2004, 35 bighorn sheep from the Cleman herd were reintroduced to establish the Chelan Butte herd. In addition, bighorn sheep from the Quilomene herd use areas in Chelan County by Tarpiscan Creek and along Jumpoff Ridge.

Management objectives for the Wenatchee District are to increase the size of existing populations where feasible, minimize the risk of disease transmission from domestic sheep to bighorn (e.g., reduce commingling risk, provide outreach and education), and provide recreational opportunities.

The short-term objective for the Swakane herd is to maintain a population size of 130-170 animals; in the long term, WDFW estimates the habitat can support 150-180 animals (WDFW, 2014). The short-term objective for the Manson herd is 100-120 sheep, while the long-term objective estimates that the available habitat could support up to 200 sheep. The Chelan Butte herd has expanded from an original release of 35 in 2004 to a high count of 218 sheep in 2017 and a current estimate of over 114 bighorns. Although habitat analysis (Musser & Dauer, 2003) suggests sufficient habitat exists for a population of 195-390 sheep in the area currently occupied by the Chelan Butte herd, concerns regarding the possible movement of animals out of their core range into areas where they may encounter domestic sheep or goats have led WDFW to propose an objective of 150-170 bighorns (WDFW, 2014).

Population surveys

GPS Collars

In March 2009, 24 sheep were outfitted with telemetry collars in the Swakane and Manson herds (18 ewes and six rams). VHF (very high frequency radio waves) collars were placed on 12 ewes and four rams in Swakane, and GPS collars were placed on six ewes and two rams in Manson. These collars improved our ability to locate sheep during ground and aerial surveys, improving survey data, population estimates, and knowledge of the home range and habitat use. In 2014, an additional 13 bighorn were outfitted with GPS telemetry collars in the Manson herd to continue monitoring efforts. In winter 2019, ten bighorn sheep from the Chelan Butte herd were outfitted with GPS-enabled collars and released onsite. Eight adult ewes and two juvenile rams received collars. Although these collars are no longer active, GPS data gathered from these sheep showed high site fidelity with little seasonal movement.

In January 2022, an aerial capture was performed in the Manson herd, and seven bighorn sheep were outfitted with GPS-enabled collars and released onsite. Six ewes and one juvenile ram were collared. While the objective was to place 11 collars in the Manson herd in 2022, inclement flying weather cut the operation short. One collared ewe died a few months later in the spring, and her collar was retrieved and refurbished for deployment the following winter. In January 2023, five more sheep (three rams and two ewes) were collared in the Manson herd.

Several mortalities have occurred since this time, with the deaths of at least two ewes appearing to have been the result of cougar predation. The other dead sheep either could not be reached in time to investigate the cause of death or could not be reached at all due to access issues, given the remote and rugged terrain in which the mortality occurred. As of the writing of this document in August 2024, seven GPS collars (two rams and five ewes) remain active in the Manson herd. The spatial data generated from these collars has not yet been analyzed. However, from preliminary review it appears that all collared sheep have remained almost exclusively within the known range of the Manson herd, and none have undertaken long-distance forays. Having collared individuals in the herd makes finding bighorn easier during aerial surveys and will potentially allow for mark-recapture methodology to be used to estimate population size in future years as more collars are deployed.

Minimum count surveys

Prior to 2009, herd population data was collected primarily from incidental reports from WDFW personnel, permit hunters, public sightings, and occasionally aerial and ground surveys during the spring and rut periods. All three herds were surveyed in 2009, and uncorrected minimum counts were produced. Between 2010 and 2018, the Swakane and Chelan Butte herds were typically surveyed annually during fall ground counts (Table 1). Ground counts for these herds follow vehicle-accessible routes along public highways, county roads, and unimproved roads. However, ground counts typically underestimate herd sizes due to topographic relief and the limits of optics. Ground counts for bighorns exhibit significant variability because of the inherent detection bias and accurately classifying animals. Year-to-year variation in the distribution of bighorn and survey efforts can cause uncertainty in the minimum counts and population estimates. Therefore, management decisions are based on population trends rather than a single-point estimate.

In November 2018, the Manson herd was surveyed by helicopter by WDFW personnel, and the Chelan PUD conducted seven additional Manson surveys by boat over the 2018/19 winter (Pope & Cordell, 2019). In the fall of 2019, WDFW conducted aerial surveys of the Swakane and Chelan Butte herds. Due to COVID-19 limitations, only fall ground surveys were conducted for all three herds in 2020. Inclement weather limited aerial surveys in the fall of 2021; therefore, aerial surveys were performed again for Chelan Butte, Swakane, and Manson in March 2022. Ground surveys were also performed for Chelan Butte and Swakane in October 2022 to obtain lamb:ewe ratios, and again in October 2023. Additionally, Chelan Butte was surveyed aerially in November 2023. Manson was surveyed aerially again in March 2024, and biologists anticipate conducting fall ground surveys of Chelan Butte and Swakane in October 2024 (Table 1). Aerial surveys for all three herds are anticipated to occur between November 2024 and March 2025.

Table 1. Population counts of the Swakane, Manson, and Chelan Butte Bighorn sheep from 2013 to August 2024. Dashes indicate years with no survey or incomplete survey data.

Year	Swakane Count[a]	L:E	R:E	Manson Count[a]	L:E	R:E	Chelan Butte Count[a]	L:E	R:E
2013	131	43	65	100	28	26	129	26	42
2014	116	51	96	90	12	24	182	35	54
*2015	156	50	74	91	50	48	191	46	62
2016	-	-	-	-	-	-	-	-	-
2017	150	7	118	77	21	125	218	34	50
2018	110	106	109	72	26	60	116	34	37
2019	220	26	48	-	-	-	150	48	94
2020	163	43	89	-	-	-	77	64	110
2021	109	38	104	-	-	-	88	61	106
**2022	195	48	84	71	-	37	114	44	104
2023	186	24	95	-	-	-	93	11	100
2024	-	-	-	69	-	60	-	-	-

[a] The maximum number of unique individuals observed, alternatively called the minimum known count.
* The 2015 Swakane survey was incomplete.
** All 2022 minimum counts and R:E ratios come from aerial surveys performed in March. At this time of year, it is difficult to distinguish between lambs and yearlings. Thus, no L:E ratios were calculated in the spring. Swakane and Chelan Butte L:E ratios were obtained from 2022 fall surveys.

Hunting seasons and recreational harvest

In 1999, the first ram permit was offered for the Swakane herd, followed by one permit per year from 2000-2015, increasing to two in 2016. An additional harvest of one ram in the Swakane occurs in some years as it is a popular option for auction tag holders (Table 2). In 2018, the Yakama Nation offered two ram tags for the Swakane herd. No bighorn permit was offered in the Swakane in 2009 due to the high number of vehicle collision mortalities along Highway 97A in 2008. Highway mortalities were significantly reduced with the construction of a wildlife fence along Highway 97A. A drawing permit for the harvest of one bighorn ram was reinstated for the 2010 hunting season, and hunters have harvested mature rams (>¾ curl) from the Swakane herd every year since. The bighorn season in the Swakane runs from September 15 - October 10, and two special permits for rams in the Swakane herd will be offered in 2024. For the first time, two adult ewe permits will be offered for the Swakane herd in 2024, and the season will run concurrently with the Chelan Butte adult ewe season (October 11th- 31st).

Two ram permits per year have been offered in the Manson unit since the hunt began in 2005. The Manson season runs November 9th-30th, later than the Chelan Butte and Swakane any ram seasons. This is to reflect the timing of the rut in the Manson herd, which has been observed to occur later than in the Chelan Butte and Swakane herds and most herds across the state. Two any ram special permits will again be offered for the Manson herd along the north shore of Lake Chelan for 2024, and the Manson herd remains an option for both auction and raffle tag holders.

The Chelan Butte herd was hunted for the first time in 2010, with hunters harvesting mature rams each year since (Table 2). As aerial and ground surveys of the area confirmed an increasing herd, a second drawing permit for hunters with disabilities was first offered in 2015. WDFW is offering four any ram tags in 2024 and one adult ewe tag in the Youth category. Hunters with disabilities can also draw for four permits: two for bighorn ewes and two for juvenile rams. Raffle tag winners often harvest additional rams from Chelan Butte.

Table 2. 10-year summary of permits issued and harvest.

Year	Swakane Permits	Swakane Harvest	Manson Permits	Manson Harvest	Chelan Butte Ram Permits	Chelan Butte Ewe Permits	Chelan Butte Harvest Ram;Ewe
2014	1	1	2	2	1	1	1;1
2015	1	1	2	2	2	2	4[a];0
2016	2	3[a]	2	2	2	2	3[a];2
2017	2	3[a]	2	2	4	2	3;2
2018	2	2	2	3[a]	6	7	7[a];7
2019	2	3[a]	2	2	6	7	8[a];5
2020	2	2	2	2	6	7	6[a];4
2021	2	3[a]	2	2[a]	6	7	5;7
2022	2	3[a]	2	2	6	7	8[a];5
2023	2	3[a]	2	3[a]	6	7	7[a] ;7
Total	18	24	20	22	45	49	52;40

[a] Includes additional auction and/or raffle permit harvest.

Survival and mortality

Swakane herd

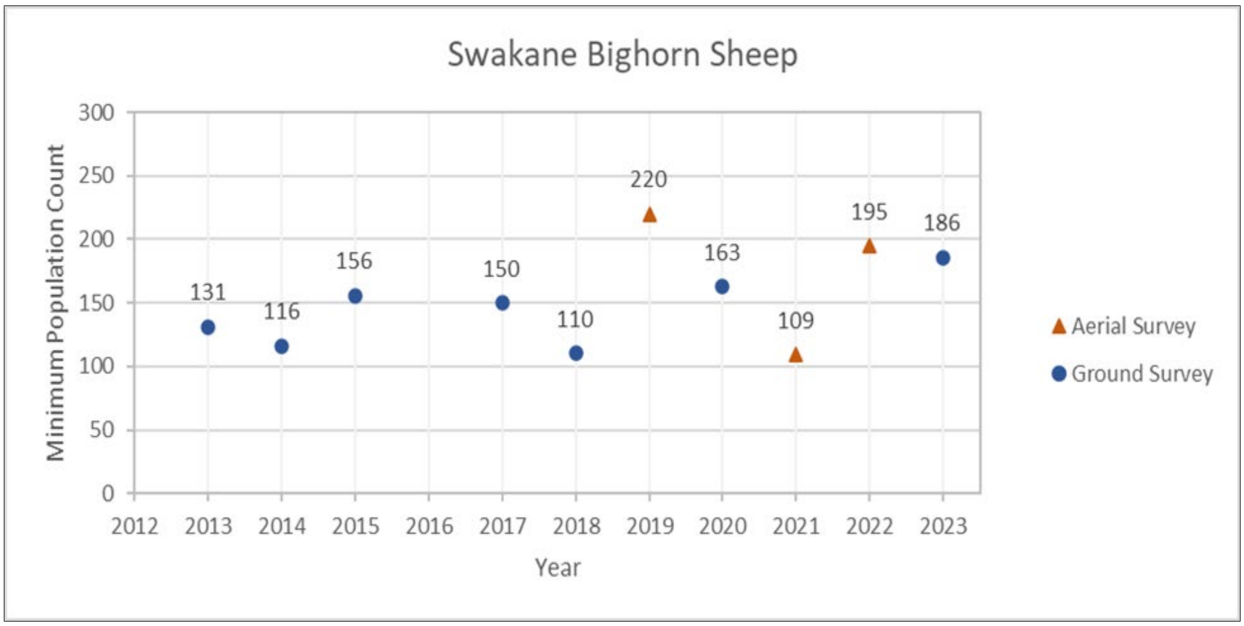
From 1996 to 2000, the Swakane bighorn population increased slowly. In 2001, the population was estimated to be 51 sheep, representing a 46% increase from the 1992-2000 average. The increased count in 2001 resulted after Swakane bands intensified the use of the cliffs and breaks along the Columbia River and Highway 97A, allowing for better monitoring. The proliferation of residential developments and their associated ornamental plantings along the west shore of the Rocky Reach pool may have enticed bighorns to cross Highway 97A with increasing frequency. For over 30 years, no bighorn mortalities had been attributed to vehicle collisions. However, in 2002, the number of bighorn sheep killed by vehicles rose steadily, with numerous sheep-vehicle collisions on Highway 97A. In response to these events, multiple agencies and conservation groups, including the Washington Department of Transportation (WSDOT), State Patrol, WDFW, and the Wenatchee Sportsmen's Association convened a working group to address deer and bighorn sheep vehicle collisions on Highway 97A. They developed plans for a wildlife fence to reduce wildlife-vehicle collisions. This wildlife fence spans nine miles, starting at milepost 203 and extending to milepost 212.

Repair and fence maintenance are expensive and increasing in cost. In 2021, WDFW secured matching fund commitments from the Wenatchee Sportsman's Association, Washington Wild Sheep Foundation, and Backcountry Hunters & Anglers to complete delinquent repairs. Prior to being fenced, this stretch of highway was identified as having some of the highest vehicle strikes in the state. Collision rates for bighorn sheep along this stretch dropped significantly since the fence's completion in 2009 until an unusually large number of vehicle-caused mortalities occurred in 2021. That year, at least twenty bighorn sheep were struck by vehicles and killed on Highway 97A. Most of these sheep mortalities came from the Swakane herd, with only two occurring in the territory of the Chelan Butte herd. Ewes were disproportionately affected, accounting for 18 of 20 known deaths. While concerning, biologists believe this spike in vehicle strikes on 97A represents an anomaly. In 2022, four bighorn sheep roadkill mortalities were reported on 97A- one from the Chelan Butte herd and three from the Swakane herd.

In 2023, the number of bighorn sheep to die from vehicle collisions on 97A rose again. Four mature rams (3/4 curl or greater), one juvenile ram, and five ewes from the Swakane herd were struck and killed in 2023, for a total of 10 road mortalities from the Swakane herd. This relatively high number of sheep mortalities can be at least partly attributed to the large sections of downed fence that remained passable by sheep for most of that year, damaged by rockslides following the spring thaw. A lack of contractor availability impeded efforts made to repair these sections in a timely manner. The needed repairs have since been made, and so far, sheep mortalities along 97A have been fewer in occurrence, with three sheep known to have been killed via vehicle collision as of August 2024.

Data collected during focused ground surveys has increased minimum counts in the Swakane herd. From 2011 through 2019, Swakane herd counts generally increased (Table 1, Figure 1). An aerial survey was attempted in the fall of 2021 but due to poor weather that limited visibility the survey was incomplete, which was likely a major contributing factor to the low count returned that year. Aerial surveys were performed again in March 2022 and resulted in a minimum population estimate of 195 sheep. During the October 2022 ground survey, 115 sheep were observed and 186 were seen during the October 2023 ground survey. Despite year-to-year variation in minimum count surveys, which is to be expected of surveys performed only once or twice a year in such steep, rugged terrain, there is every indication that the Swakane herd is thriving. Minimum count data demonstrates that the Swakane herd has exceeded WDFW's maximum population objective for at least five years. Observed ram:ewe ratios have been high during this same time frame, with a five-year average of 84 rams to 100 ewes (range = 48 to 104) between 2019-2023. The five-year average lamb:ewe ratio for this time frame is approximately 36 lambs per 100 ewes (range = 24 to 48).

Figure 1. The minimum population count for Swakane bighorn sheep subherd, from 2013-2023.



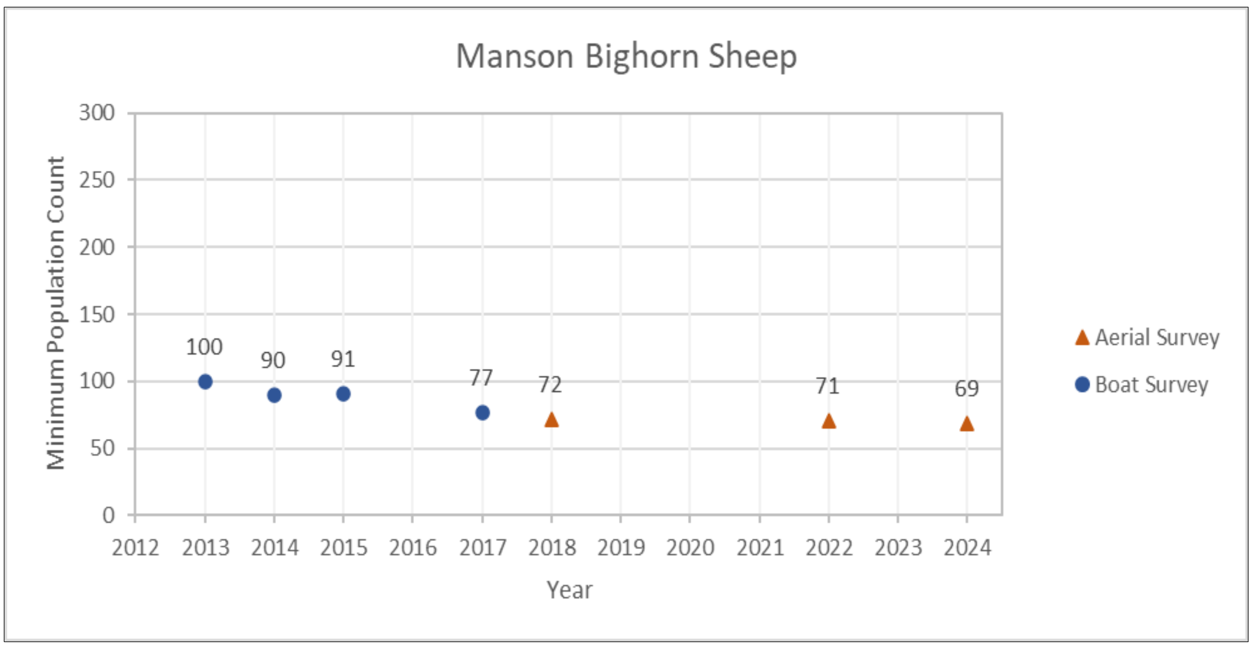
Blue circles represent values collected from ground surveys, and orange triangles represent values collected from aerial helicopter surveys.

Manson herd

Immediately upon its establishment, the Manson herd on Lake Chelan exhibited rapid population growth typical of a founder population in excellent quality, unoccupied habitat. In June of 2004, survey data were used to calculate 2002-2004 population trends, indicating a three-year average annual population growth rate of roughly 38%. Locations from telemetry data showed that several bands had centralized their core use area westward up the lake into steeper, rockier habitat. Due to its remote location and the complex topography of the Manson herd's core range, it is difficult to conduct an accurate census of this herd. For many years now, the Manson herd has shown consistently lower lamb production than the other two herds in this District, but this finding is complicated by minimum population counts that are typically low.

Boat and aerial surveys performed by WDFW biologists have yielded minimum population counts well below the minimum objective for this herd since 2017, with individuals observed consistently numbering in the 70s (Table 1, Figure 2). The same is true of surveys performed by Chelan PUD biologists, except for a single boat survey in the winter of 2017 in which 96 bighorn sheep were counted. Even from this high count, the lamb:ewe ratio observed amounted to only 15:100 (Pope & Cordell, 2018). In 2018, fall aerial surveys conducted by WDFW returned a count of 72 sheep with a lamb:ewe ratio of 26:100. These counts were like those for 2019 and 2020, but the lamb:ewe ratio of 44:100 recorded in 2020 was higher than any reported in the previous 10 years of surveys. March 2022 aerial surveys gave a minimum population count of 71 sheep, but lamb:ewe ratios could not be calculated due to the late season survey, at which time lambs are difficult to distinguish from young adults. The Manson herd was not surveyed in 2023, but a March 2024 aerial survey returned a minimum count of 69 sheep, with an approximate ram:ewe ratio of 60:100. Overall, survey data suggest that the Manson herd size has remained stable for at least the past seven years, neither increasing nor decreasing, but at a level far lower than WDFW's population objective of up to 200 sheep.

Figure 2. The minimum population count for the Manson bighorn sheep herd from 2013-2023.



Blue circles represent values obtained from boat surveys on Lake Chelan, and orange triangles represent values obtained from aerial helicopter surveys.

In the spring of 2020, a vehicle collision mortality of a bighorn ewe was found on Highway 153, which is in the Lower Methow Valley. This suggests that animals, possibly from the Manson herd, may be expanding their range and survey efforts need to be expanded to detect possible changes in the core range. To that end, aerial captures were performed in January 2022 and again in January 2023 to fit Manson sheep with GPS collars. See Population Surveys, GPS Collars for more information on this collaring effort.

The Chelan Butte herd grew rapidly between the introduction of 35 sheep in 2004 and a count of 218 bighorn in fall 2017 (Table 1, Figure 3). While the majority of this herd still occupies the Chelan Wildlife Area, the herd has also expanded north to the Deer Mountain area, south to Knapp Coulee, and even Navarre Coulee. The connectivity of the Chelan Butte herd to the other two herds is not understood, though it is apparent this herd is expanding both north and south of its core range. Multiple sightings of bighorn sheep at low elevations in the Entiat Valley have occurred, though it cannot be determined with certainty from which herd these animals may have originated. In recent years, sheep from the Swakane herd have been detected as far north as the mouth of the Entiat River.

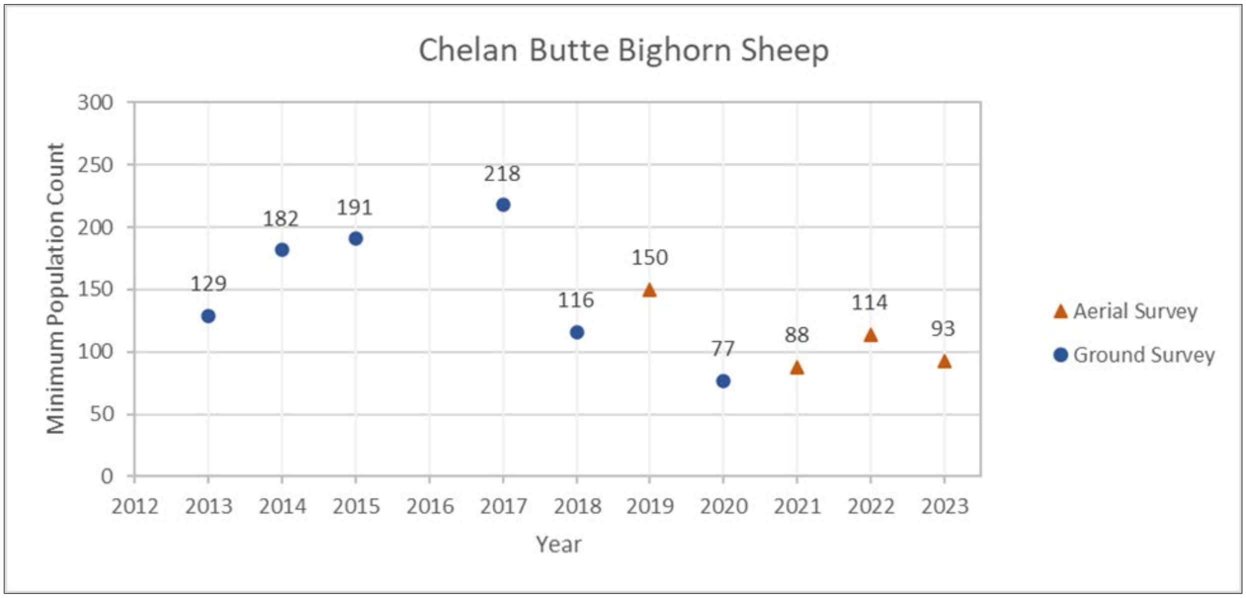
In winter 2019, ten bighorn sheep from the Chelan Butte herd were outfitted with GPS-enabled collars and released onsite. Eight adult ewes and two juvenile rams received collars. To date, at least three of the collared ewes are known to have died: one ewe was predated by a cougar, a hunter-harvested another in the fall of 2020, and the third was found lodged in the debris filter of Rocky Reach Dam on the Columbia River in the spring of 2022, cause of death unknown. Both collared rams either slipped their collars or died. Five collared adult ewes remained alive when the collars eventually expired (no longer transmitting GPS data), and throughout the duration of the monitoring effort, all five showed very high local fidelity with little seasonal movement.

Since the high count of 218 sheep in 2017, annual minimum count surveys have indicated a population decline in the Chelan Butte herd (Figure 3). A 2019 aerial survey found only 150 sheep, and the last three years of aerial surveys have yielded counts far lower than that, ranging from 88 to 114 sheep. Ram:ewe ratios have been very high for this herd, with a five-year average of approximately 103 rams for every 100 ewes between 2019 and 2023 (range = 94 to 110). It is unclear why this apparent population decline is occurring, as observed lamb:ewe ratios were actually significantly higher between 2018-2022 (range = 44:100 to 64:100) than in 2013-2017 (range = 26:100 to 46:100). The 2023 fall ground survey of Chelan Butte yielded a lamb:ewe ratio of only 11:100, but it is difficult to say how accurate this value might be given that only 44 animals were detected during this survey, which is fewer than half the number of sheep observed during the March 2023 aerial survey.

Several years of low minimum counts are cause for concern, and biologists have reduced the number of ewe permits offered for this herd accordingly. One ewe permit will be offered in Chelan Butte in the youth category, and two ewe permits will be offered in the hunters with disabilities category, beginning in 2024. This is a reduction from the seven ewe permits offered annually between 2018-2023, and ewe permits may need to be reduced further or eliminated for the Chelan Butte herd if future surveys continue to indicate a population decline.

Although to a much lesser extent than the Swakane herd, the Chelan Butte herd is also subject to vehicle collision mortalities on Highway 97A. Between the fall of 2020 and the present (August 2024), at least five sheep from the Chelan Butte herd have been struck and killed by motorists on 97A.

Figure 3. The minimum population count for Chelan Butte bighorn sheep subherd, from 2013-2023.



Blue circles represent values collected from ground surveys, and orange triangles represent values collected from aerial helicopter surveys.

Habitat

The Chelan Butte and Swakane herds occupy low-elevation sites characterized primarily by Columbia Basin grasslands and shrub-steppe habitats. These areas are dominated by bluebunch wheatgrass and big sagebrush, transitioning to arid ponderosa pine and Douglas fir forests at higher elevations. Historic land uses drive habitat conditions for these two herds, as does the current fire regime and the success of active habitat restoration. WDFW manages both the Chelan Butte and Swakane Units of the Chelan Butte Wildlife Area and has implemented active restoration projects to restore previously farmed dryland agricultural fields back to native perennial grass and shrub communities. Over the past ten years, the Department has been successful in transforming over thirty fields on Chelan Butte into native habitat with grasses, forbs, and shrubs, which has provided visible benefits to Chelan Butte's bighorn sheep herd.

Fires can be beneficial to bighorn sheep by reducing conifer encroachment and increasing the forage quality of perennial grasses and forbs. Depending on the pre-fire vegetation conditions, fire severity, and post-fire precipitation regimes, these burn scars have the potential for passive recovery and provide more palatable forage during the early seral stage of vegetation recovery. Bighorns have been observed utilizing fall "green-up" within burned areas immediately following a fire. Lower elevation arid grasslands and shrub-steppe communities are most at-risk as the fire return interval has shortened and human-caused fires are increasing. This has been the scenario in the range of the Swakane herd, with successive human-caused fires in 2007, 2009, 2010, 2014, and 2021, which cumulatively burned more than 60,000 acres. As a result, vegetation communities are being altered by the reduction of the shrub component and increased invasive annual grasses and weeds. In 2015, the Chelan Complex fire burned through steep canyon habitats within the northern range of the Chelan Butte herd, including an area known for holding bighorn sheep groups. The Red Apple and Swakane fires of 2021 burned part of the Swakane herd's range, and 1,200 acres of the Chelan Butte herd's range burned in the 2022 Stayman Flats fire.

The Manson herd on the north shore of Lake Chelan occupies different habitat, spanning a range of ecotypes from cool-season grasslands and shrub-steppe to ponderosa and lodgepole pine forests mixed with true firs. Habitat conditions here are generally excellent, with wildfires providing disturbance to maintain high-quality herbaceous forage. During the summer of 2001, the Rex Creek fire on the north shore of Lake Chelan burned over 53,000 acres. However, only a small portion of this burn was known to be occupied bighorn habitat. During summer 2002, the Deer Point fire on the north shore of Lake Chelan, and down-lake from the Rex Creek fire, burned over 43,000 acres, including most of the occupied bighorn habitat characterized by grass, bitterbrush, mixed shrubs, ponderosa, and lodgepole pine. In 2013, the 2,100-acre 25 Mile Creek fire reburned a section of the Deer Point Fire. The 2017 Uno Peak Fire burned approximately 9,000 acres of higher-elevation timbered habitats at the north end of the Manson herd's range. Survey efforts have not included this area post-fire, so it is unknown if sheep have responded to habitat changes by utilizing new areas within the recovery zone, but collar data from January 2022 to present (August 2024) has not revealed any individuals spending time in this area. As of August 19, 2024, the ongoing 38,730-acre Pioneer Fire on the North Shore of Lake Chelan has not crossed Lone Fir Creek, so very little of the Manson herd's range has been impacted as of yet but this may change as fire season continues for another couple of months.

The Manson herd occurs almost entirely on land managed by USFS, with a few private lakefront properties at the southeastern end of its range. The herd's occupied terrain is extremely rugged and remote, with few roads. Unlike the Chelan Butte and Swakane herds, the Manson herd is not realistically threatened by development and land use conversion. However, the continued development of the community of Manson and the development of desirable parcels in the unincorporated areas north and east of the City of Chelan may present connectivity barriers for exchange between the Manson and Chelan Butte herds.

Several springs were developed or improved for bighorn sheep within the Swakane herd range along the Columbia River breaks. Prior to the fence construction, ewe bands regularly moved to the river to access native riparian and ornamental forage. The completion of the Highway 97A fence excluded sheep from a small amount of habitat, as they always spent most of their time in habitats west of the highway. While sheep likely use developed springs, their presence is not thought to be critical to the herd. Telemetry data indicate that sheep did not alter their patterns of seasonal habitat use in response to the construction of the wildlife fence.

Maintaining habitat connectivity at lower elevations is a priority for managing Chelan County's bighorn sheep herds. Chelan County is growing rapidly, with a population increase of over 10% since 2010. Most development occurs below 2,000 ft on slopes less than 20%, but newly constructed homes continue to encroach on the Swakane and Chelan Butte herds' ranges. From 2017 to 2037, the unincorporated population of Chelan County is expected to grow by 3,751 people, requiring an additional 1,405 residences (Chelan County, 2017).

Human-wildlife interaction

Reports have been received in recent years from orchardists adjacent to the Swakane and Chelan Butte units about the presence of bighorns in their orchards. They have expressed concerns of damage to young trees, but no claims for damage have yet been filed. Observations indicate that the sheep are feeding mainly on grass within the irrigated orchards, but occasional browse on new plantings may cause damage. Some orchardists take proactive measures to exclude bighorn sheep by erecting deer fences, and old fences on the Chelan Butte Wildlife Area have been upgraded.

The public lands on which these bighorn sheep herds range are increasingly attracting new types and previously unanticipated levels of recreation that may have a negative impact on bighorn sheep. This is especially true for the Chelan Butte and Swakane herds, which occupy land adjacent to a highly traveled interstate highway and contains numerous maintained and unmaintained roads and trails. Mountain biking and cross-country hiking are popular activities in the Swakane Canyon and Chelan Butte areas. Research conducted in other parts of the US and Canada indicate that sheep exhibit a stress response to approaching humans, especially those with dogs (MacArthur et al., 1982), and can be displaced by, or alter feeding habits in response to, non-motorized recreation (Lowrey & Longshore, 2017; Wiedmann & Bleich, 2014). The creation and use of unauthorized trails on public lands further cause wildlife disturbances, soil erosion, and vectors for noxious weeds.

Due to their high visibility, both the Swakane and Chelan Butte sheep herds offer excellent wildlife viewing opportunities. These herds do not make long-distance seasonal migrations, and it is possible to view rams, ewes, and lambs throughout the year. The famous horn-clashing battles of bighorn rams are on display each fall. With persistent searching, it is reasonable to expect to see 50 to 100 bighorns during the peak of the breeding season. The lack of safe pullouts along Highway 97A near the fall sheep congregation can sometimes create traffic hazards.

In 2019, WSDOT expressed concern over bighorn sheep use of cliff faces above Highway 97A to the south of Knapp Tunnel. Knapp Tunnel is a bored tunnel with a natural rock and vegetation surface allowing sheep to cross over the highway. It was reported that bighorn sheep were causing dangerous rock falls onto the highway, though the extent of rock falls caused by sheep versus natural cleaving was unknown. Small groups of bighorns were detected just south of Knapp Tunnel during 2019 fall aerial surveys of the Chelan Butte herd. In January 2020, WSDOT submitted a proposal to conduct a slope study of the area using drones. This was approved, with conditions to avoid wildlife disturbance. However, due to significant rock fall events in the spring of 2020, WSDOT applied for an emergency permit to conduct hillside stabilization and install netting as a barrier to falling rock, and this project has since been completed.

Population augmentation

There have been no bighorn sheep population augmentations in Chelan County since 2004, and there are no plans to translocate bighorns in the immediate future. In winter 2019, WDFW captured 30 bighorn sheep from the Chelan Butte herd. All animals were tested for pathogens, including *Mycoplasma ovipneumoniae*, for which they tested negative. Twenty animals were translocated to the Stansbury Mountains in Utah to augment a newly re-established herd.

Research

No formal research is currently being conducted on any bighorn sheep herds in Chelan County.

Management conclusions

The risk of disease transmission from domestic sheep is substantial for both the Swakane and Chelan Butte herds (Lyons et al., 2016). Domestic sheep were documented six times within the core habitat of Swakane bighorns from 2000-2007. Domestic sheep were euthanized by WDFW (with permission from owners) in 2003 and 2007. In 2021, WDFW lethally removed a young ram from the Chelan Butte herd in the Apple Acres area after the ram had been observed grazing in a domestic sheep pasture.

Bighorn rams were documented in domestic sheep grazing allotments twice during 2000. WDFW and the Okanogan-Wenatchee National Forest have reduced the risk to bighorns from domestic sheep on Forest Service lands; no final solutions have been developed. Bighorns in Swakane are at the greatest risk for disease transmission from domestic animals. In both 2013 and 2014, four bighorn ewes were seen multiple times near and within occupied domestic grazing allotments in the Entiat Valley. Efforts to locate and remove the bighorn sheep were unsuccessful. In spring 2019, USFS personnel and local citizens reported sighting up to five bighorn ewes crossing the Entiat River at Ardenvoir towards occupied sheep grazing allotments. USFS and the producer responded immediately by Moving domestic sheep off pastures earlier than planned. WDFW continues to work closely with the USFS to minimize encounters between bighorn and domestic sheep. USFS is preparing an Environmental Impact Statement (EIS) for domestic sheep grazing within the bighorn sheep range. In the interim, however, as the population of the Swakane herd grows, management actions will need to be taken to minimize the risk of contact with domestic sheep through ewe harvest and translocation.

Also of concern are small, unregistered hobby farms where domestic goats or sheep may be raised in pastures adjacent to bighorn sheep ranges. To the extent possible, local WDFW staff works to identify and educate local landowners about the risks of disease transmission from domestic livestock to bighorn sheep. In 2021, WDFW initiated a cooperative agreement with a private landowner in the range of the Swakane herd to extend a section of the Highway 97A fence to exclude bighorn sheep from entering pasture containing domestic goats. These domestic goats were tested for *M. ovipneumoniae* in 2014 and again in 2021; both times results were negative. WDFW intends to continue disease surveillance in this flock in cooperation with the landowners. In 2022, WDFW, in cooperation with WSF, completed the construction of a fence around a domestic goat operation in Oklahoma Gulch to reduce the risk of disease transmission to the Chelan Butte herd.

More bighorn have been harvested from the Chelan Butte herd in the past ten years than from the other two District 7 herds combined. As the Chelan Butte herd appears to be declining for over five years, adjustments have been made to the number of permits offered for harvest in this herd (see Survival and Mortality, Chelan Butte Herd). Biologists will continue to monitor this herd with the aim of restoring its numbers to the 150 – 170 animal population objective.

The minimum population objective for the Manson herd on the north shore of Lake Chelan is conservative, based on the low potential for conflicts, USFS management emphasis on bighorn sheep habitat, and the increase in habitat resulting from wildfires. Surveys of the Manson herd continue to yield lower minimum counts than expected, given the vast expanse of habitat available to this herd. These low counts may be due to changes in habitat use by Manson bighorn sheep, poor detectability in rugged terrain, or from a yet undiscovered source of additional mortality. By collaring several sheep in 2022 and 2023 and continuing survey and monitoring efforts in the coming years, WDFW aims to learn more about the movements of the Manson herd and identify factors that may be contributing to the lack of growth in this population.

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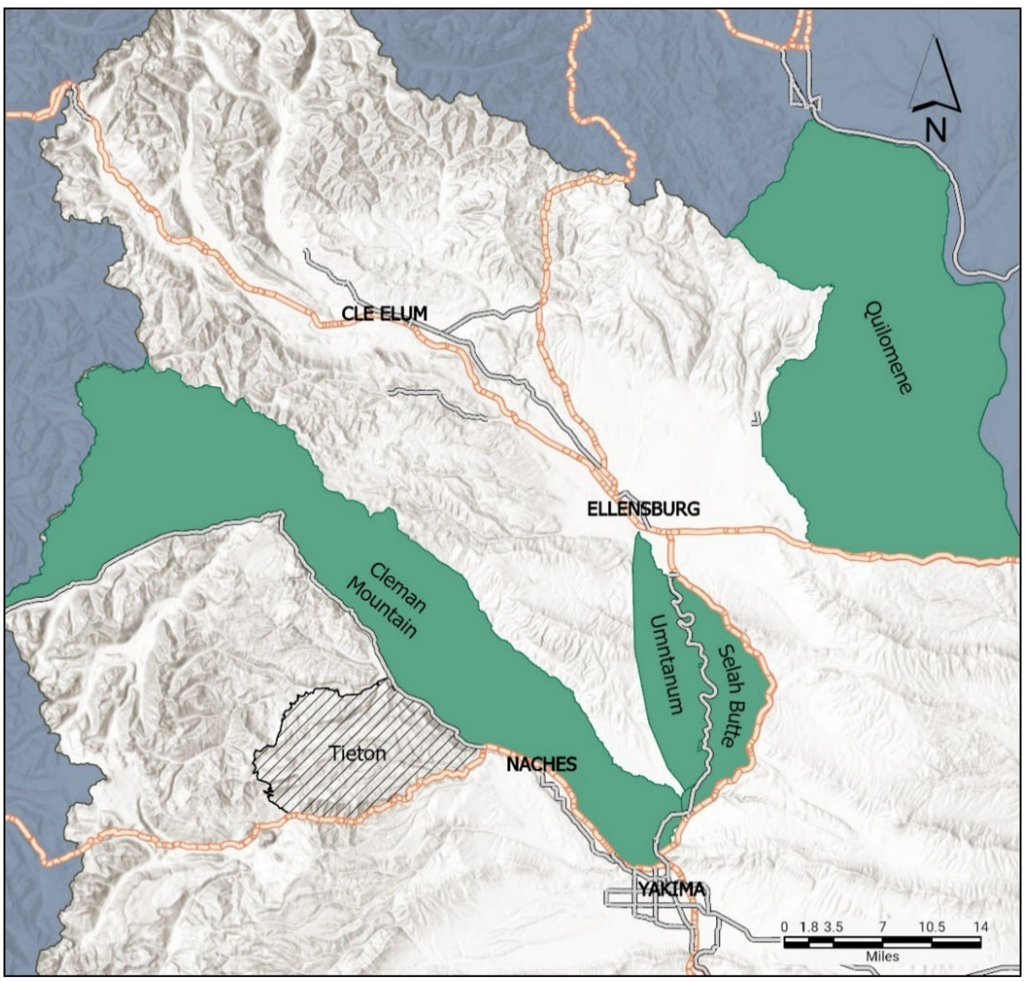
Bighorn Sheep Status and Trend Report: Region 3 - Quilomene, Cleman Mountain, Umtanum/Selah Butte, and Tieton

Erin Wampole, Wildlife Biologist

Introduction

Four herds of California Bighorn sheep are designated within Region 3: Quilomene, Cleman Mountain, Umtanum/Selah Butte, and Tieton populations. The Quilomene herd is found along the peripheries of the Quilomene and Colockum Wildlife areas abutting the Columbia River. The Cleman Mountain sheep occupy the Oak Creek Wildlife Area east of HWY 410 northward to Rock Creek Rd. The Umtanum/Selah Butte population is found within the Yakima Canyon and is comprised of 5 relatively distinct social groups. The Tieton herd occupied areas along HWY 12 west of the Oak Creek Wildlife Area visitor center.

Figure 1. Location of bighorn sheep herds in Region 3.



Management guidelines and objectives

The Game Management Plan (WDFW, 2015) established independent population objectives for each herd, considering historical abundance, habitat availability, and disease management. The Quilomene herd population objective is 150-170 sheep. The Cleman Mountain herd objective is 170-220 sheep. The Umtanum/Selah Butte herd's short-term population objective is 100, with a long-term objective of 300-350 sheep. The Tieton herd was extirpated in 2013; management aims to reintroduce the Tieton population to an objective of 250-300 sheep.

All four herds have tested positive for the bacteria *Mycoplasma ovipneumoniae* (*M. ovi.*), which causes pneumonia, resulting in initial all-aged die-offs, followed by continual poor recruitment, and long-term population declines. Near-term management goals aim at continued population monitoring or implementing test and remove management to either eradicate or limit *Movi* prevalence throughout these populations. Cleman Mountain and Umtanum/Selah Butte populations are currently being managed under the Test and Remove Study protocols and are described in detail in the *Research* section below.

Ultimately, regional management aims to decrease the prevalence of *Movi*, reduce the risk of further disease transmission from domestic livestock to wild sheep, recover existing populations to within objective ranges, and re-establish the Tieton herd.

Population surveys

Annual or biennial surveys of each herd are conducted to monitor herd status and trends in population demographics. Up until 2022, all herds were surveyed by aerial rotor-wing aircraft. Aerial surveys provided a minimum count of *individuals* and an estimated age and sex ratio with no correction for detection bias.

In 2023, the "Test and Remove" study initiated GPS collaring of the Umtanum/Selah Butte and Cleman Mountain herds. Sheep were captured and fitted with visually distinct GPS collars and ear-tag identification. Protocols associated with the study shifted the population survey methodology for these herds. Umtanum/Selah Butte and Cleman Mountain are now surveyed from the ground in the fall and spring of each year. Population surveys in the fall focus on estimating lamb production of marked-GPS ewes -surveys in the spring aim to estimate recruitment and abundance by mark-recapture methodology, which accounts for imperfect detection. The herd-specific sections below provide trends in measured population demographics (counts, rams:ewe, lamb:ewe).

Quilomene herd

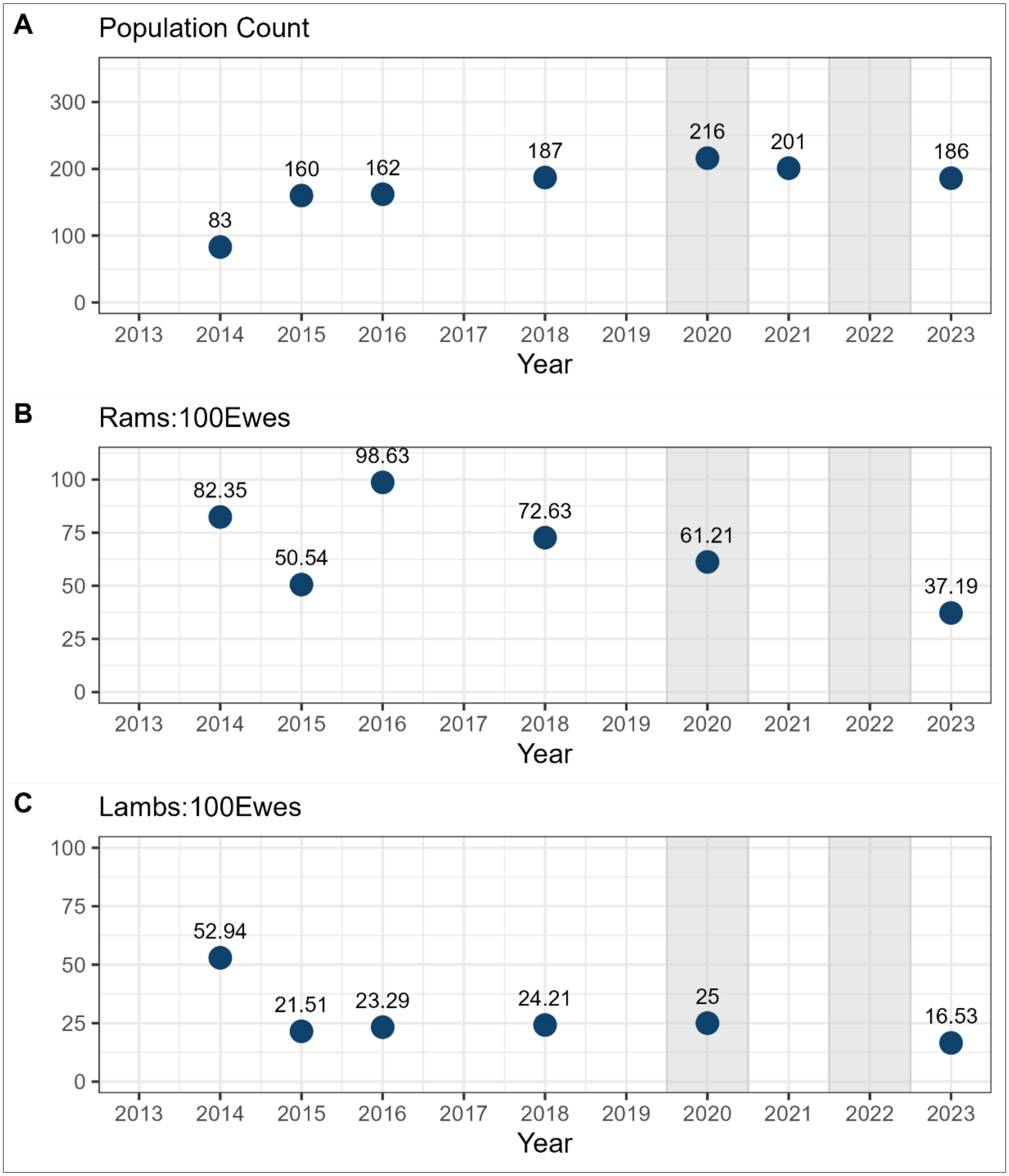
The Quilomene herd was last surveyed in February 2023, producing a minimum population count of 186 sheep. The herd remains within the target population objective range of 150-170 sheep. However, demographic metrics have observed declining trends (Figure 1). Lamb recruitment has remained low since 2015 and declined further in 2023 (Figure 1c). Although widespread disease die-offs have not been reported, *Movi* was detected in a deceased lamb in 2022.

Table 1. Quilomene minimum population count and composition.

Year	Lambs	Ewes	Adult Rams	All Rams	Total
2010	25	57	14	20	102
2011	11	48	15	15	74
2012	41	65	37	43	149
2013	-	-	-	-	-
2014	18	34	20	28	83
2015	20	93	44	47	160
2016	17	73	54	72	162
2018	23	95	58	69	187
2019	-	-	-	-	-
2020	29	116	36	71	216
2021	-	-	-	-	201[1]
2022	-	-	-	-	-
2023	20	121	37	45	186

[1] No composition available

Figure 1: Quilomene herd minimum population count and composition from 2013-2023.



Gray shaded areas indicate confirmed positive Movi event.

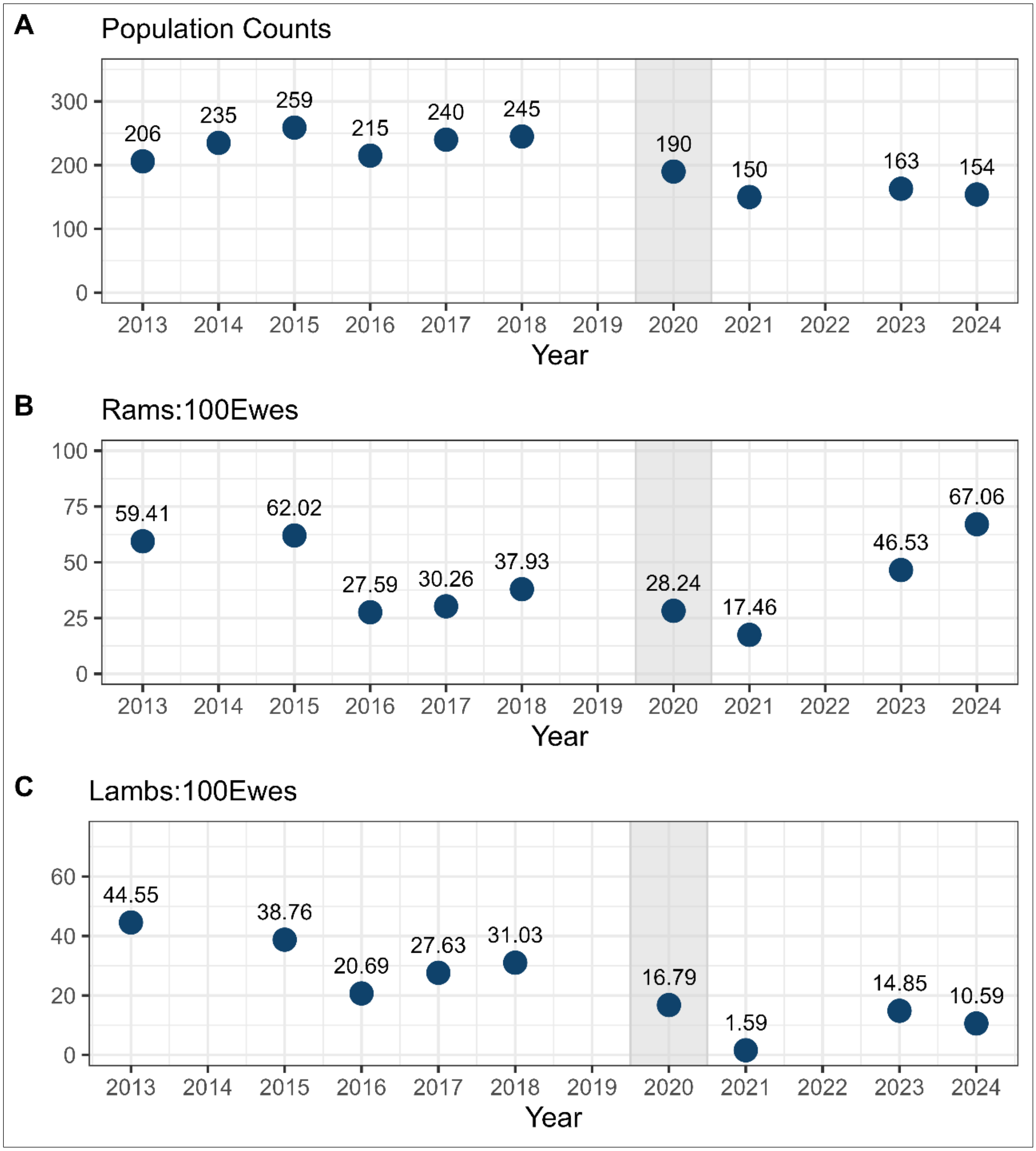
Cleman Mountain

Cleman Mountain was surveyed by ground in May 2024. The population has shown a declining trend with reduced abundance and recruitment (Table 2 and Figure 2). Lamb recruitment is currently low, with observed reductions following detections of *Movi* in the herd (Figure 2c). Pregnancy rates were nearly 100% in captured adult ewes in 2024 (n=48).

Table 2. Cleman Mountain population composition.

Year	Lambs	Ewes	Adult Rams	All Rams	Total
2011	34	83	65	88	205
2012	30	78	59	59	167
2013	45	101	50	60	206
2014	-	-	-	-	-
2015	50	129	60	80	259
2016	30	145	30	40	215
2017	42	152	35	46	240
2018	45	145	40	55	245
2019	-	-	-	-	-
2020	22	131	12	37	190
2021	2	126	n/a	22	150
2022	-	-	-	-	-
2023	15	101	41	47	163
2024	9	85	54	57	154

Figure 2: Cleman Mountain herd minimum population count and composition from 2013-2024.



Gray shaded areas indicate confirmed positive *Movi* event.

Umtanum/Selah Butte

The Umtanum/Selah Butte herd population objective was adjusted in 2020 to a short-term goal of 100 sheep following a severe *Movi* outbreak. In an effort to control *Movi,* permits were increased from 2018 to 2020 (Table 5c-Harvest and Recreation), and culling efforts were undertaken. Population trends mirror the impacts of severe pneumonia outbreaks and management efforts to reduce abundance (Figure 3a). Ram and lamb ratios have been variable, with observable trends in *Movi* outbreaks reducing ram abundance and lamb recruitment followed by periods of recovery and disease relapse (Figure 3b-c).

Table 3. Umtanum/Selah Butte minimum population count.

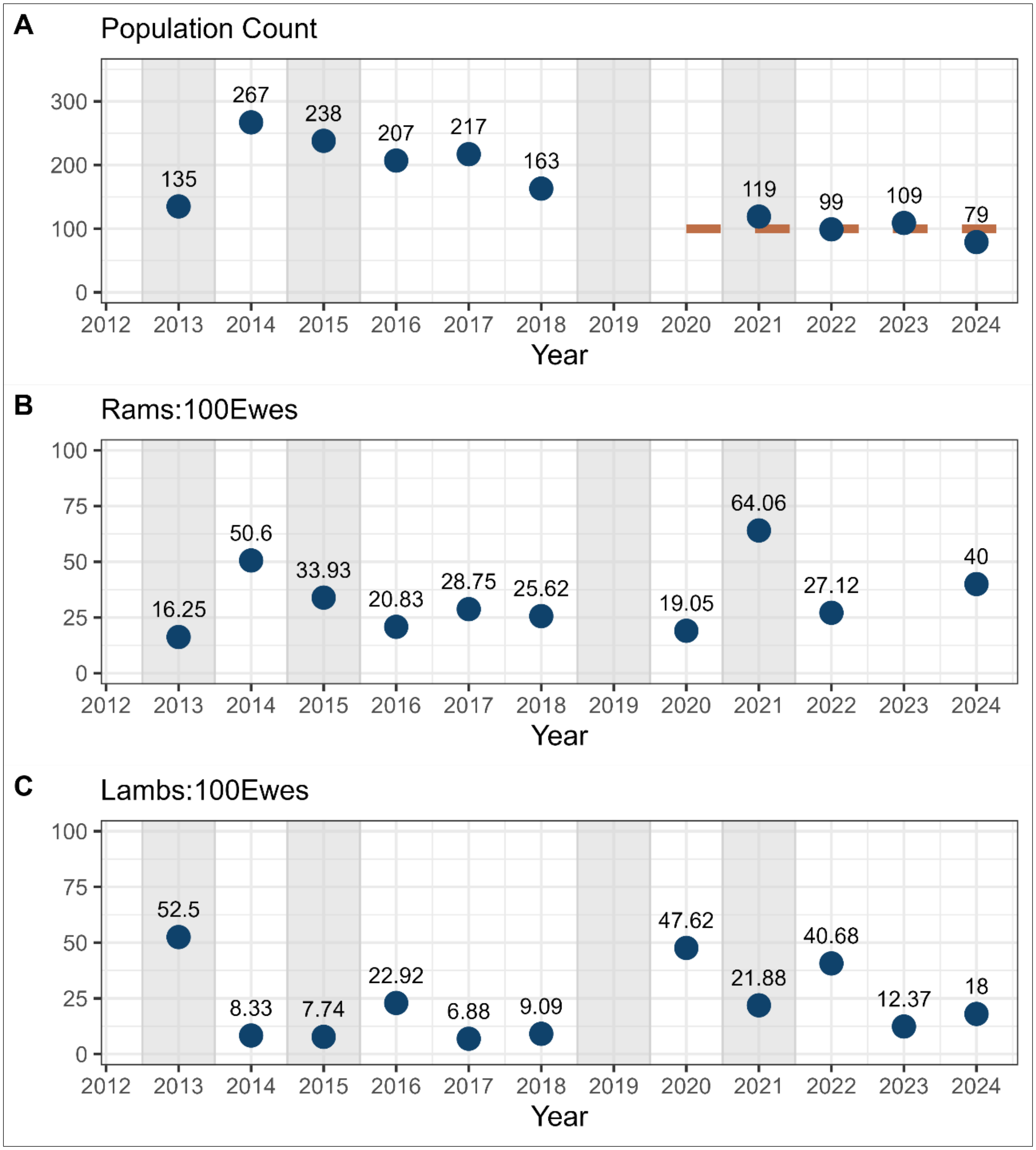
Year	Lambs	Ewes	Adult Rams	All Rams	Total
2010	23	90	60	63	176
2011	33	109	50	53	195
2012	65	155	57	68	288[1]
2013	42	80	-	13	135
2014	14	168	58	85	267
2015	13	168	49	57	238
2016	33	144	26	30	233
2017	11	160	40	46	217
2018	11	121	26	31	152
2019	14	94	23	26	134
2020	14	64	32	41	119
2021	21	75	21	33	129
2022	24	59	7	16	99
2023	12	97	-	-	109[2]
2024	9	50	19	20	79[3]

[1] Probable double count of ewes and lambs

[2] Mark-resight estimate, no rams included

[3] Ground based survey targeting collared ewes for lamb recruitment, excludes rams.

Figure 3a-c. Umtanum/Selah Butte population count and composition from 2013-2024.



Gray shaded areas indicate confirmed positive Movi event. The dashed orange line indicates the implementation of a short-term abundance objective of 100 sheep. The 2023 population count excludes rams.

Tieton *(Extirpated)*

Hunter harvests removed 49 animals between 2009-2012 to keep the population near population objectives. In March 2013, a pneumonia outbreak was confirmed. Mortality appeared to be high, and the remaining 57 animals were euthanized to prevent disease-spread to the nearby healthy Cleman Mountain herd. Pneumonia and *Movi* were confirmed in all samples. The strain of *Movi* in the Tieton herd was different from that found in the Yakima River Canyon sheep. The current Game Management Plan calls for re-establishing the Tieton Herd if the risk from nearby domestic grazing allotments can be eliminated.

Table 4. Tieton maximum June population.

Year	Lambs	Ewes	Adult Rams	All Rams	Total
2000	11	24		11	46
2001	13	35		19	67
2002	10	30	8	8	48
2003	10	40	11	20	70
2004	19	33		5	57
2005	20	88	3	4	112
2006	35	55	37	40	130
2007	23	63	0	7	93
2008	54	81	16	32	167
2009	-	-	-	-	-
2010	40	72	48	89	
2012	33	66	16	24	125
2013	Herd	Extirpated			

Population augmentation

All four herds were reintroduced into the region, and multiple augmentations occurred across time. The Quilomene reintroduction was the first in the region (early 1960s). The population was estimated at over 100 animals by the late 1960s. The population then crashed in the early 1970s. The cause of the decline was unknown, but the population had reportedly died out by 1990. Reintroduction occurred again in 1993, and augmentations continued until 1996, with a total of 41 bighorns released in the area. In January 2017, an additional eight ewes, seven lambs, and six rams obtained from the Cleman Mountain herd were released to further augment the population.

The Cleman Mountain population was established in 1967 with the release of eight animals. The herd remained relatively stable for over 20 years. Augmentation included 27 animals during 1989-1996. Production increased after 1996, and the population exceeded 150 animals by 2000. Almost 200 animals have been relocated from Cleman to establish/augment numerous herds within Washington since 2001.

The Umtanum herd was established in 1970 with the release of eight bighorns west of the Yakima River. Within 15 years, the population grew to an estimated 200 animals and some sheep crossed the Yakima River, colonizing Selah Butte. Prior to 2002, 52 sheep were recorded as translocated from the Umtanum/Selah Butte herd to augment other populations. In 2001, 11 sheep were released at the south end of Selah Butte near Roza Dam.

The Tieton herd was established with the release of 54 sheep during 1998-2002. Subsequent radio-telemetry indicated relatively low mortality and high lamb recruitment. An aerial survey in 2008 confirmed the population was over its population objective. From 2009-2012, 65 animals were removed for translocation. Translocated animals were disease free with the last capture occurring in March 2012, before the severe outbreak of *Movi*.

Hunting seasons and recreational harvest

The Quilomene and Cleman Mountain units are currently permitted for ram harvest. Cleman Mountain ewe permits are closed for 2024 but were available from 2016-2023. Umtanum/Selah Butte was closed in 2023 due to low adult ram abundance. The number of WDFW permits and reported harvest are given in Tables 5a-c. The Yakama Nation (YN) typically matches WDFW permits one-to-one for all sheep herds. The Muckleshoot Indian Tribe also issues permits for the Cleman Mountain and Umtanum/Selah Butte herds. Tribal hunters are not required to report harvest to WDFW, though some harvests may be reported to WDFW through tribal partnerships. When YN harvest is available to WDFW, it is included in Table 1. WDFW continues to work to improve tribal partnerships to better understand harvests.

During the 2023 season, WDFW issued 7 herd-specific ram permits and 20 ewe permits. A total of 7 adult rams and 13 ewes were reported as harvested (Table 5a-c). No tribal harvest was reported to WDFW in 2023.

Table 5a. Summary of Quilomene bighorn sheep ram harvest in Region 3 since 2011.

Area	Year	State Permits	Harvest	Comments
Quilomene	2011	4	5	Harvest includes raffle hunter
	2012	3	4	Harvest includes tribal
	2013	3	4	Harvest includes tribal
	2014	3	3	
	2015	2	2	
	2016	2	2	
	2017	2	3	Harvest includes tribal
	2018	2	3	Harvest includes raffle hunter
	2019	5	5	
	2020	6	5	Harvest includes tribal
	2021	5	5	
	2022	3	3	
	2023	3	3	

Table 5b. Summary of Cleman Mountain bighorn sheep harvest in Region 3 since 2011.

Area	Year	State Permits	Harvest	Comments
Cleman Mountain	2011	6	13	Harvest includes raffle hunter, tribal
	2012	12	24	Harvest includes raffle hunter, tribal
	2013	10	18	Harvest includes raffle hunter, tribal
	2014	8	11	Harvest includes raffle hunter, tribal
	2015	6	6	Harvest includes tribal
	2016	6 ram, 10 ewe	8 ram, 11 ewe	Harvest includes tribal
	2017	3 ram, 10 ewe	5 ram, 7 ewe	Harvest includes tribal
	2018	3 ram, 20 ewe	3 ram, 13 ewe	
	2019	4 ram, 20 ewe	9 ram, 15 ewe	Harvest includes raffle hunter, tribal
	2020	10 ram, 21 ewe	15 ram, 21 ewe	Harvest includes raffle hunter, tribal
	2021	3 ram, 19 ewe	3 ram, 15 ewe	
	2022	3 ram, 20 ewe	3 ram, 14 ewe	
	2023	4 ram, 20 ewe	4 ram, 13 ewe	

Table 5c. Summary of Umtanum/Selah Butte bighorn sheep harvest in Region 3 since 2011.

Area	Year	State Permits	Harvest	Comments
Umtanum/Selah Butte	2011	8	12	Harvest includes tribal
	2012	5	11	Harvest includes tribal
	2013	5	9	Harvest includes tribal
	2014	6	8	Harvest includes tribal
	2015	5	8	Harvest includes raffle hunter, tribal
	2016	4	8	Harvest includes raffle hunter, tribal
	2017	4	8	Harvest includes raffle hunter, tribal
	2018	4	5	Harvest includes tribal
	2019	8 ram, 46 juv. ram/ewe	39 ram, 14 ewe	Harvest includes tribal
	2020	6 ad ram, 8 juv. ram, 30 ewe	13 ram, 21 ewe	Harvest includes raffle hunter, tribal
	2021	8 ram, 44 juv. ram/ewe	8 ad. rams, 36 ewe/juv. ram	
	2022	4 ram	4 ram	
	2023	0	0	Unit closed in 2023

Habitat

Bighorn sheep in the region occupy arid, shrub-step habitat. In the past decade, fires have occurred across the bighorn sheep range in Region 3. The impact of that fire is unclear. Fire regimes throughout Washington are becoming increasingly frequent, and fires within the Yakima Canyon and Wenas wildlife area have occurred annually, varying in intensity and scale in recent years. In 2013, a significant portion of the north Quilomene range burned, and in 2022, portions of the southern range burned in the 30,000-acre Vantage Highway fire. In 2020, the Evans Canyon fire burned over 75,000 acres, including portions of the Yakima Canyon and Clemans Mountain units. In 2023, the Roza Creek fire (~750 acres) burned portions of the southern Umtanum unit.

No habitat enhancement projects have been directly funded for bighorn sheep in the region. Post-fire restoration has occurred in some areas with varying success. Natural recovery occurs when fire intensity is low. Unfortunately, most fires have been high intensity and facilitated invasive grasses (i.e., cheatgrass) within bighorn sheep habitat. Invasive grasses are a concern, typically reducing forage quality and contributing to repeated burn events. Repeat fire events have occurred in the now cheatgrass-dominated range of the Umtanum/Selah Butte herd. Habitat remains disturbed for the Quilomene herd, which is occupying fire areas of the Colockum and Quilomene Wildlife areas. Here, a recent high-intensity fire has contributed to little native grass return. Riparian areas have seen willow recovery, but native bunch grass returns have been limited (WDFW, 2024). Ultimately, forage resources vary annually with climatic conditions. In 2023, a summer drought occurred, followed by mild winter conditions and below-average snowpack. Early green-up occurred throughout the region's bighorn sheep range and extended into early summer.

Human-wildlife interactions

Vehicle strikes account for a large proportion of adult sheep non-hunting mortality. Cleman Mountain and Umtanum/Selah Butte populations experience the greatest threat from vehicle strikes along HWY 410 and HWY 821. Sheep are at greater risk during winter when they are attracted to salt along the road. During the summer, sheep can also be found foraging along greener areas along the Yakima and Naches Rivers and are susceptible to collisions near blind corners. Conversely along HWY 821, vehicles have been struck by rocks dislodged from sheep Moving above the roadside in Yakima Canyon.

A bighorn sheep feed site is located at the Oak Creek Wildlife Area at the base of Cleman Mountain. Sheep are irregularly fed during the winter for periodic trapping efforts. Feeding for public wildlife viewing does not occur annually.

Management concerns

The principal management challenge to bighorn sheep in the region is *Movi,* which causes bacterial pneumonia. Domestic sheep and goats contact with bighorn sheep has introduced *Movi* into herds. Herd exposure has proven persistently problematic in this region (Table 6). Lamb recruitment has faltered from bacterial pneumonia. Large adult die-offs occurred in severe cases in Tieton, Cleman Mountain, and Umtanum/Selah Butte herds.

In the winter of 2020-2021, a new management strategy was implemented to eradicate *Movi* from the Umtanum/Selah Butte population through partial depopulation, followed by a single test-cull event. Harvest was increased that season to reduce the population to a short-term population objective of 100 sheep (Figure 3a). In February 2021, the first phase of “test-remove” was implemented. Eighty bighorn sheep were captured and tested for *Movi*; any sheep that tested positive was lethally removed from the population that year. Eight tested positive for *Movi*, and seven were lethally removed. Of the seven animals removed, six were re-tested for *Movi*. Only one was still positive, and two were indeterminate. Testing of roughly 180 animals to date indicates that about 10% might be “shedders” on any given day. The one animal not removed was a juvenile ram that was incidentally caught and culled during a targeted capture of adults in February 2022. In July 2021, low lamb recruitment was recorded, and in September, coughing rams were observed. Subsequent sampling was conducted, and a new strain of *Movi* was confirmed to have entered the population but was mitigated by targeted harvest and never resulted in an all-age die-off throughout the population.

Disease outbreaks are expected because domestic sheep and goats are present in proximity to bighorns in every herd in the Region. The most beneficial projects to bighorn populations are to reduce/eliminate contact risk with domestic sheep/goats. Efforts are needed to reduce the risk and develop viable management options once *Movi* enters a population.

Research

In 2022, WDFW, Idaho Fish and Game, and Oregon Fish and Wildlife began a 3-year collaborative research project to identify the least invasive, most efficient approaches to clearing *Movi* from free-ranging bighorn sheep populations. This research builds on and improves previous test-and-remove *Movi* clearance efforts (Garwood, 2020).

Management conclusions

Movi remains the greatest challenge to regional bighorn sheep management meeting statewide goals 1) to preserve, protect, perpetuate, and manage bighorn sheep to ensure healthy, productive populations and 2) enhance bighorn sheep populations and manage for sustained yield (WDFW, 2015). Populations have declined, as a result of chronic low lamb recruitment. Harvest opportunity was initially increased as a management tool but was reduced or closed in 2023-2024. Sustainable harvest of rams was no longer viable in the Umtanum/Selah Butte following intensive reductions and culling of positive rams from 2019-2022. The hunt unit was closed in 2023. Harvest of ewes is closed in Cleman Mountain starting in the 2024 hunt season, following protocols of Test and Remove research.

Regional goals aim to address the impacts of *Movi* on herds and work to ensure healthy and sustainable hunted populations. The following actions have been undertaken to meet this challenge:

1. Removing infected sheep through “test and remove” disease management.
2. Initiation of multi-state partnerships to “clean” herd of *Movi* and improve management strategies through the ‘Test and Remove” research project.
3. Securing WDFW bighorn sheep habitat to reduce the risk of domestic/bighorn interactions.
4. Engaging with USFS to re-evaluate domestic sheep grazing allotment near bighorn sheep habitat and convert to cattle grazing where risk of contact is high.
5. Expanding *Movi* testing to all harvest bighorn sheep and mountain goats.
6. Strengthening tribal partnerships to expand reporting and testing of tribal harvest bighorn sheep.
7. Engaging with the scientific community to ensure the best available science is informing local *Movi* management actions.
8. Creating a new bighorn sheep health initiative to provide education, outreach, and testing to local goat and sheep livestock owners within proximity to bighorn sheep herds (statewide).

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Moose

Moose Statewide Status and Trend Report

Annemarie Prince, Wildlife Biologist
Matt Brinkman, Wildlife Biologist
Carrie Lowe, Wildlife Biologist

Introduction

Moose (*Alces alces*) migrated on their own accord into eastern Pend Oreille County, Washington, in the 1950s. The first official state documentation of moose in Washington occurred in 1954 (Poelker, 1972). However, the literature reports a bull moose that was taken by hunting on the Colville Indian Reservation in 1929 (Scheffer & Dalquest, 1944). In the decades since, moose have increased both in numbers and distribution. They are now common in northeastern Washington and can be found in smaller populations in the Okanogan and Blue Mountains. A few scattered individuals have colonized the east slopes of the Cascades. Moose have been documented to wander into many other places throughout the state, including the high desert country of the Columbia Basin (WDFW, 2014) and, more recently, in the central Cascades (Flatt, 2022).

Management guidelines and objectives

The statewide goals for moose (WDFW, 2014) are to:

1. Preserve, protect, perpetuate, and manage moose and their habitats to ensure healthy, productive populations.
2. Manage moose for a variety of recreational, educational, and aesthetic purposes including hunting, scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing, and photography.
3. Manage statewide moose populations for a sustained yield.
4. Manage moose populations with a rigorous, data-based system.

Population surveys

Prior to 2013, helicopter surveys were conducted at the District level annually and generally occurred between December and February. These surveys assisted district biologists in crafting permit-level recommendations and generally supported information from hunts indicating a continued positive trend in the moose population in northeastern Washington (Harris et al., 2015). However, population estimates based on these surveys produced highly variable estimates with large confidence intervals.

A more rigorous aerial survey protocol that covered the entire northeastern Washington moose population was initiated in winter 2013/14 and continued through winter 2015/16. This survey was intended to provide a baseline population estimate from which future trends will be assessed. A full report appears as (Oyster et al., 2018).

District-level surveys for composition were reinitiated in the winter of 2018/19, and three days of flights in District 2 resulted in the observation of 101 moose (45 cows, 39 bulls, and 17 calves). No surveys were completed in 2019/20 because mild conditions persisted throughout the winter, resulting in inadequate survey conditions (i.e., lack of snow cover). Aerial surveys did not occur in 2020/21 due to poor survey conditions and COVID-19 restrictions. One flight was completed in District 1 in 2021/22, but overall survey conditions were poor again this winter.

Hunting seasons and recreational harvest

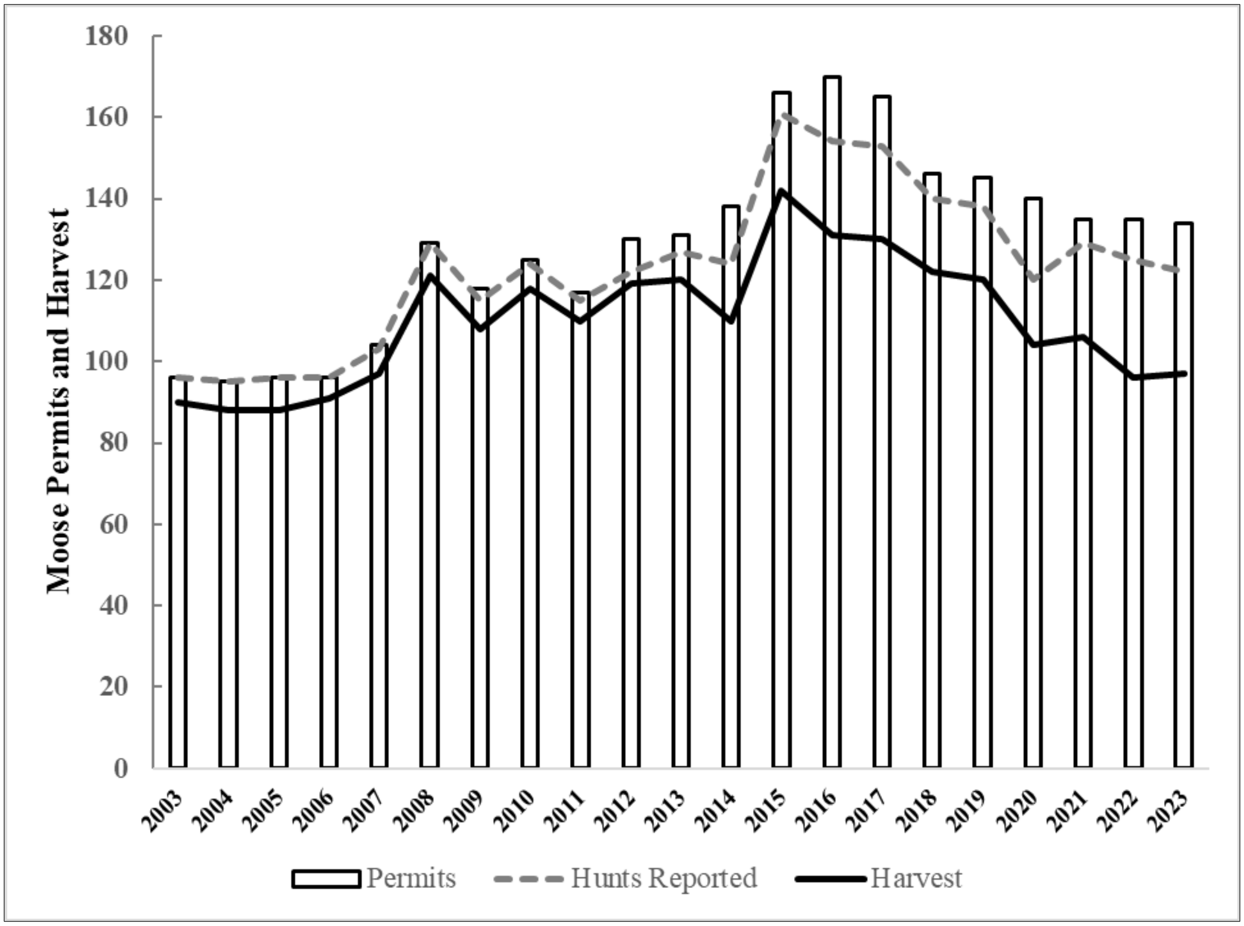
Moose hunting opportunities in Washington are by special permit only. Most moose hunting seasons were October 1-31, November 1-30, or both; auction and raffle hunts begin September 1st. The “any moose” permit category was changed into an “antlered bull moose only” permit category in 2018. Hunters having successfully taken a moose under an “antlered bull moose” permit or the old “any moose” permit are prohibited from applying for another “antlered bull moose” permit. Permit availability (and therefore hunter opportunity) has steadily increased since the late 1990s (Fig. 1), peaking in 2016. Since then, antlerless permit numbers have been reduced due to concerns about population declines.

In 2023, a total of 135 moose permits were issued. Of these, 122 permit holders reported hunting, with 97 moose reported harvested. The following were permit types available in 2023, followed in parentheses by the number offered / minimum number harvested; this is minimum harvest because not all permittees report. “Antlered bull” moose (105/79), antlerless-only (24/13), youth antlerless (1/1), 65-and-over antlerless (3/2), and disabled antlerless (2/2). In addition to moose permits issued through the special permit drawing, hunters could harvest moose with permits obtained through the statewide raffle (1/1), Northeast Washington multi-species raffle (1/1), and statewide auction (1/1). Of the 100 moose reported harvested, 82 were male, and 18 were female. For information on hunting moose in Washington (e.g., number of permits, success rates, hunt units, access, etc.), please see the Hunting Prospects for Districts 1 and 2 (Hunting Prospects).

Habitat

Moose prefer 10-20-year-old clearcut forests, burned areas, or thinned stands on mesic sites. Forested cover is important during summer heat and deep winter snow (Costain, 1989). As timber harvest has declined on public lands, private industrial timberlands have come to provide a large portion of moose range in Washington. Forest regeneration tends to produce dense stands of willow, serviceberry, ceanothus, and other shrubs that are preferred browse. However, private industrial forests have recently begun using herbicides to control shrubs to reduce competition for regenerating coniferous trees. Moose can be found at any elevation in Washington but are most likely found in the 3,000-to-5,000-foot elevation band and are commonly drawn to north slopes or east-flowing drainages, which are cool and moist.

Figure 1. Moose permits and harvest numbers.



Moose permit numbers (open bars, not including Master Hunter and Hunter Educator Incentive moose permits), hunts reported (dashed line), and harvest reported (solid line) for moose in Washington, 2003-2023.

Human-wildlife interaction

Individual moose can create human safety or nuisance concerns, especially within the metropolitan area of Spokane. The procedure for addressing moose within the urban/suburban area is outlined in the WDFW Dangerous Wildlife Policy. WDFW's Enforcement Program takes the lead on moose incident reports in and near the city. Incidents range from single moose sightings in semi-rural areas resulting in the dissemination of literature and discussion on living with wildlife, to moose in dangerous situations requiring immobilization and translocation or euthanasia. The number of moose incidents per year has been as high as 87 in 2001 and as low as 16 in 2009.

Research

Starting in 2013, WDFW and partner researchers at the University of Montana (UM) initiated an investigation of factors controlling the demographic parameters of moose in two study areas north of Spokane. Seventy-four cow moose were fitted with radio collars in December 2013, 2014, and 2016.

Results from the study were published in two articles in Alces in 2021 (Harris et al., 2021; Cook et al., 2021). In general, the moose populations in both study areas were found to be declining due to both the top-down effects of predation and the bottom-up effects of nutrition.

In 2023, WDFW initiated a new research project in northeast Washington to provide population information to improve moose management in this area. This ongoing project will estimate moose vital rates (e.g., survival) and investigate if winter tick load impacts adult survival, calf recruitment, and the cause of moose mortality. This project will occur in northeast Washington.

Management concerns

Fire suppression, reduced timber harvest, herbicide treatment of broadleaf shrubs in regenerating forests, and human development continue to degrade moose foraging habitat. Moose are adapted to colonize forested areas post-disturbance. They can persist at low densities in Washington's forested areas without disturbance. However, biologists expect to see a tempering of the population unless early seral habitats (e.g., shrub fields) can be sustained in a mosaic with mature forest (as needed for cover).

Climate change may pose challenges for moose populations in the future. The direct energetic effects include when temperatures exceed their thermo-neutral tolerances (moose are adapted to cold climates and become heat stressed, both in summer and winter) and indirect effects (if parasites typically harbored by moose become excessively numerous).

From 2014 through 2017, WDFW also monitored for the presence and prevalence of the arterial worm *Eleaophora schneideri*, whose typical host is mule deer but has been documented in moose elsewhere in the lower United States. A total of 126 carcasses were inspected, and WDFW was able to determine the presence or absence of *E. schneideri* in 80. *E. schneideri* was detected in the arteries of 3 of these 80 moose; however, none of these moose showed outward signs of infection. Histology performed at the Washington Disease Diagnostic Laboratory at Washington State University detected additional damage to the carotid artery in a number of moose, but whether or not these animals were infected with *E. schneideri* remains unclear. Moose are susceptible to morbidity and mortality from the brain worm *Parelaphostrongylus tenuis*, whose normal host is the white-tailed deer. *P. tenuis* has not yet been documented in or west of the Rocky Mountains.

Management conclusions

In contrast to many areas along the southern extent of their North American distribution, moose have done well in Washington over the past few decades (WDFW, 2015; Base et al., 2006; Nadeau et al., 2017). Hunter demand continues to far exceed supply; thus, even if permit levels are increased, moose hunting will be a rare (and generally once-per-lifetime) experience for Washingtonians. Although the new aerial survey protocol shows promise, recent surveys have been limited (i.e., poor survey conditions, COVID-19 restrictions), and tracking moose population trends long-term over large areas will likely always be approximate and prone to time lags. Moose abundance in their core in northeastern Washington has declined, possibly due to moose populations exceeding the capacity of available forage and as other natural factors (e.g., predators, parasites, climate change) respond to their abundance. Moose may continue to increase outside of their base in northeastern Washington, and it is possible that hunting opportunities can be developed in other parts of the state in the future.

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Cougar

Cougar Statewide Status and Trend Report

Richard A. Beausoleil, Carnivore Section, Statewide Bear & Cougar Specialist
Lindsay S. Welfelt, Carnivore Section, Statewide Furbearer & Bear Specialist

Introduction

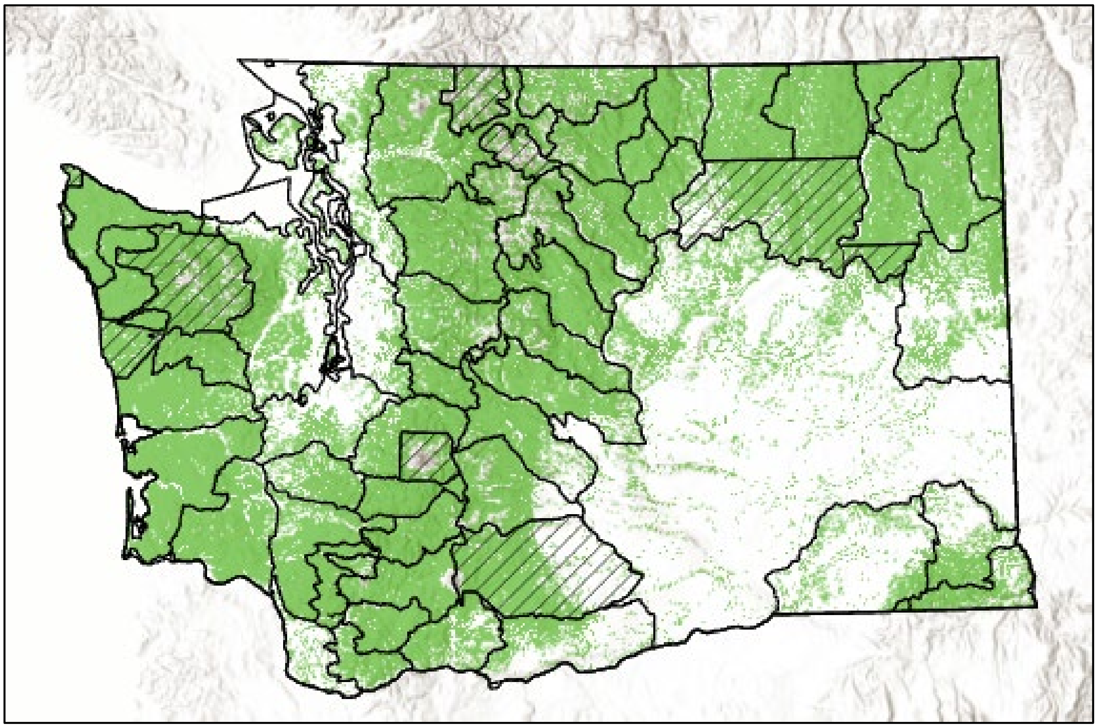
The cougar (*Puma concolor*), also called mountain lion, panther, or puma, is the second largest member of the cat family in the western hemisphere and the fourth largest cat species in the world. Generally solitary by nature, cougars typically only come together to mate, when males challenge each other for territory, or when they are in family groups (females with dependent young). Cougars are a density-dependent species, meaning the number of resident cougars on the landscape is limited by the amount of available space and prey, as males are highly territorial. As one of Washington's apex carnivores, cougars help to maintain ecosystem health and diversity. Their diet contributes to healthy ecosystems by providing food for other scavenging mammalian and avian species, including insects, which deposit nutrients and enrich soils for future plant growth. Cougars are predominantly active at dawn and dusk, but it is not uncommon for them to travel through the natural landscape at all times of the day.

Management guidelines and objectives

The state is divided into fifty population management units (PMUs; Figure 1) for management purposes. Like many other wildlife agencies in western North America, Washington's hunt structure includes harvest guidelines that are applied to specific areas with identifiable boundaries. Harvest guidelines were generated by calculating 12-16% of the estimated population of each PMU (Beausoleil et al., 2013; Beausoleil et al., 2021; WDFW, 2015). Most PMUs are approximately 1,750 km2 in size, except for the PMU that encompasses the Columbia Basin, which is 5,675 km2. Forty-five of the 50 PMUs have harvest guidelines, as five are not considered sustainable breeding habitat. The benefits of this cougar management structure include:

- Providing ample recreational harvest opportunity.
- Distributing harvest equitably across the landscape.
- Maintaining the integrity of cougar social structure and ecosystem function by ensuring older-aged animals on the landscape.
- Improving hunter opportunity and a better-quality hunt via smaller PMUs which reduce large area closures.
- Keeping implementation at a level that is relatively inexpensive.
- Ensuring it is a scientific, transparent, and defensible process.
- Satisfying agency as well as multi-stakeholder interests.

Figure 1. Fifty cougar population management unit boundaries in Washington, 2024[a].



[a] Green indicates cougar habitat.

Hunting seasons and license sales

The cougar hunting season for 2023-2024 was 242 days (September 1 – April 30) and occurred statewide in all 50 PMUs with limited exceptions in areas where access was restricted. Washington implemented an early and a late general cougar season structure. During the early season (September 1 – December 31), harvest guidelines did not apply. Harvest guidelines applied in the late season (January 1 – April 30), with all hunter harvest counting towards that guideline. Harvest guidelines apply in 45 of the 50 PMUs, and PMUs with guidelines close once the harvest guideline has been reached for that PMU. The agency provides hunters with updates on the status of open and closed PMUs via a toll-free hotline and the agency's website. Over the past five years, on average, more than 75% of PMUs have remained open to hunters through the end of the late season. In 2020, the Washington Fish and Wildlife Commission voted to modify the harvest guidelines and hunting structure. The modified harvest guidelines were intended to avoid closures in certain areas by increasing harvest guidelines and increasing the age classes that count towards PMU closure to adult cougars (>24 months old).

Washington has a mandatory inspection, sealing, and reporting program for cougar hunters. Hunters are required to report their cougar harvest to the Department within 72 hours of harvest and must present the hide and skull to agency staff for sealing within five days of notification (WAC 220-400-050). All harvest and biological data are recorded by staff using an electronic platform, ArcGIS Survey123, so harvest information is immediately known and accounted for. Data collected from mortalities includes hunter information, weapon type, hunter effort, GMU, kill location within a GMU, sex, age class, a tooth pulled for aging, and DNA collected for genetic analysis.

License sales have gradually increased over the last ten years, with the highest ever cougar license sales occurring in the 2021-22 season (Table 1). Tribal entities have their own hunting seasons and do not fall under WDFW management authority; thus, on-reservation and off-reservation harvest by hunters licensed under Tribal governments in WDFW-managed GMUs is unknown, with limited exceptions (e.g., Northwest Indian Fisheries Commission).

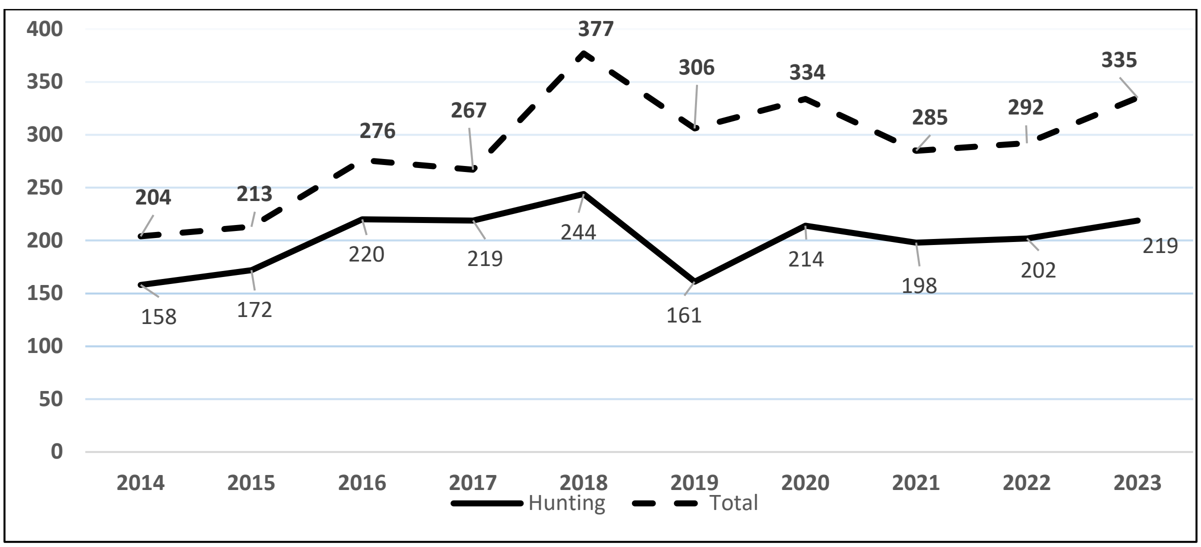
Table 1. Cougar hunting licenses sold annually, 2014-15 through 2023-24 seasons.

2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
50,874	53,196	54,636	55,636	56,785	57,421	46,391	69,632	66,437	66,591

Recreational harvest and other mortality

Hunter harvest has averaged 199 cougars annually, while all mortality has averaged 310 cougars annually over the past five seasons (2019-20 through 2023-24), a decrease of 2% and an increase of 16% from the previous 5-year averages, respectively (Figure 2). Hunting harvest has averaged 64% of the total known cougar mortality annually over the most recent 5-years, compared to 77% for the previous 5-year average (Figure 2; Table 2; Table 3). Over the past ten years (2014-15 through 2023-24), hunter harvest has averaged 201 annually while all mortality has averaged 289 animals annually.

Figure 2. Cougar hunter harvest and total mortality from the 2014-15 through the 2023-24 seasons[a].



[a] Tribal harvest and natural mortality are unknown and not included.

Table 2. Annual harvest mortality[a] of cougars by region and statewide in Washington, 2014-15 through 2023-24.

Season	Statewide	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6
2023-24	219	83	34	23	15	38	26
2022-23	202	81	40	14	16	25	26
2021-22	198	87	27	16	17	26	25
2020-21	214	88	38	22	13	31	22
2019-20	161	71	29	17	11	18	15
2018-19	244	96	50	26	9	32	31
2017-18	219	92	35	28	13	24	27
2016-17	220	99	46	29	3	16	27
2015-16	172	63	32	23	16	24	14
2014-15	158	68	22	21	5	20	22

[a] Does not include non-harvest mortality or tribal harvest.

The percentage of females in the harvest has currently averaged approximately 54% annually over the past five years statewide and varies annually within and amongst WDFW regions. Martorello and Beausoleil (2003) first described this change with an analysis demonstrating that female harvest went from an average of 42% (1990-91 through 1995-96 seasons) to 59% (1996-97 through 2000-01 seasons) following Washington voter Initiative 655. Female harvest is an important metric to monitor, as female survival is the most important metric for population stability.

Ages of cougar mortalities are derived by collecting a tooth from hunter kills during mandatory inspection and sealing, and similarly for other known mortalities. After cataloging the associated field data and assigning a unique identifier to each tooth, teeth are sent to an independent laboratory where each tooth is sectioned, stained, and examined under a microscope. Cementum is deposited as layers on the roots of teeth each year, and the ages are determined by simply counting annual layers on each sectioned tooth, much like counting the “rings” on a cut tree. The median ages of hunter-harvested cougars are important, but like median ages for bears, they are of limited value by themselves as median ages are not sensitive to detect changes in the population trajectory. However, ages can be useful in population reconstruction and integrated population models.

Table 3. Annual known non-harvest mortality[a] of cougars by conflict-related (C)[b] and other (O)[c] causes, statewide and by region in Washington, 2014-15 through 2023-24.

Year	Statewide		Region 1		Region 2		Region 3		Region 4		Region 5		Region 6	
	C	O	C	O	C	O	C	O	C	O	C	O	C	O
2023-24	89	24	53	5	8	4	1	2	3	2	12	10	12	1
2022-23	72	15	27	8	12	4	1	0	5	1	10	2	17	0
2021-22	72	14	34	5	10	3	1	2	3	0	10	2	14	2
2020-21	101	15	60	5	14	2	5	0	3	4	16	3	3	1
2019-20	132	19	71	10	13	3	1	1	13	2	27	2	7	1
2018-19	100	24	46	8	17	8	5	1	5	3	15	2	12	2
2017-18	34	7	10	0	3	2	5	5	0	0	8	0	8	0
2016-17	45	8	23	2	9	4	1	0	0	1	6	0	6	1
2015-16	30	9	10	4	7	2	1	1	2	2	5	0	5	0
2014-15	31	7	10	3	9	0	5	3	0	1	6	0	1	0

[a] Tribal-related mortality not included.

[b] Conflict includes depredations and agency and landowner kills.

[c] Other includes vehicle collision, natural mortality, starvation, disease, poached, electrocution, and unknown cause of death.

Population monitoring

Cougars are among the most challenging species for obtaining population estimates. However, Washington is fortunate in that WDFW has funded decades of long-term cougar research (1998-2020) in collaboration with universities. This research has resulted in 38 annual density estimates from nine research areas within Washington (Beausoleil et al., 2021; Beausoleil et al., 2016; Lambert et al., 2006; Table 4). Tribal entities reported similar densities on analogous research conducted on the Olympic Peninsula and south Cascades.

Cougar density estimates are primarily derived using one of three estimation techniques: 1) capture-collar using GPS data to define proportional contribution to density within a defined study area, 2) spatially explicit capture-recapture, and 3) population abundance divided by a generalized study area. Estimates in Washington have been derived using all three of these techniques (Table 4). Most of this research has been conducted in the state's northeastern Washington but also includes the southeast, central, and western portions. Research estimates were focused on independent-aged animals (≥ 18 months) to calculate densities and subsequently develop harvest guidelines. Kittens have lower survival rates than older cougars and are not included in independent-aged density estimates or harvest guidelines because, if incorporated into estimates, they may mask an inflated harvest rate on independent-aged cougars and increase management risk.

All density variations observed throughout Washington were used to estimate the distribution of likely population sizes and the probability of achieving management objectives in each PMU given various harvest levels (Beausoleil et al., 2021). Importantly, this work was strengthened by (Murphy et al., 2022), who, using a different estimation technique, demonstrated that model-generated capture-recapture densities, when corrected for biases such as not accounting for the spatial distribution of cougars, were consistent throughout the species' range, from British Columbia, Canada to the southern tip of Patagonia. Therefore, density estimates derived in Washington can be defensibly used in the foreseeable future. Currently, the independent-aged statewide cougar population is estimated at 2,445 cougars calculated using the median density of 2.34 cougars per 100 km^2 (1.94-2.85 IQR) over 104,500 km^2 of available cougar habitat (Figure 1). An "independent aged" cougar is one that is old enough to be living on its own, including sub-adult and adult animals, typically 18 months old or older.

Table 4. Independent-aged (≥18 months) cougar density estimates from 6 counties in Washington. Washington Department of Fish and Wildlife, 2021.

Study Area County	Years Conducted	Average Independent-Aged Density /100km^2 (≥18 months)	Source
Okanogan	2003-2013	1.55	Beausoleil et al., 2021
Columbia	2009-2013	2.79	Beausoleil et al., 2021
King	2008-2016	2.34	Beausoleil et al., 2021
Ferry	2003-2011	1.79	Beausoleil et al., 2016[a]
Kittitas	2002-2006	2.37	Cooley et al., 2009[b]
Stevens	2002-2006	1.96	Cooley et al., 2009[b]

[a] Estimate standardized to ≥18 months of age for consistency

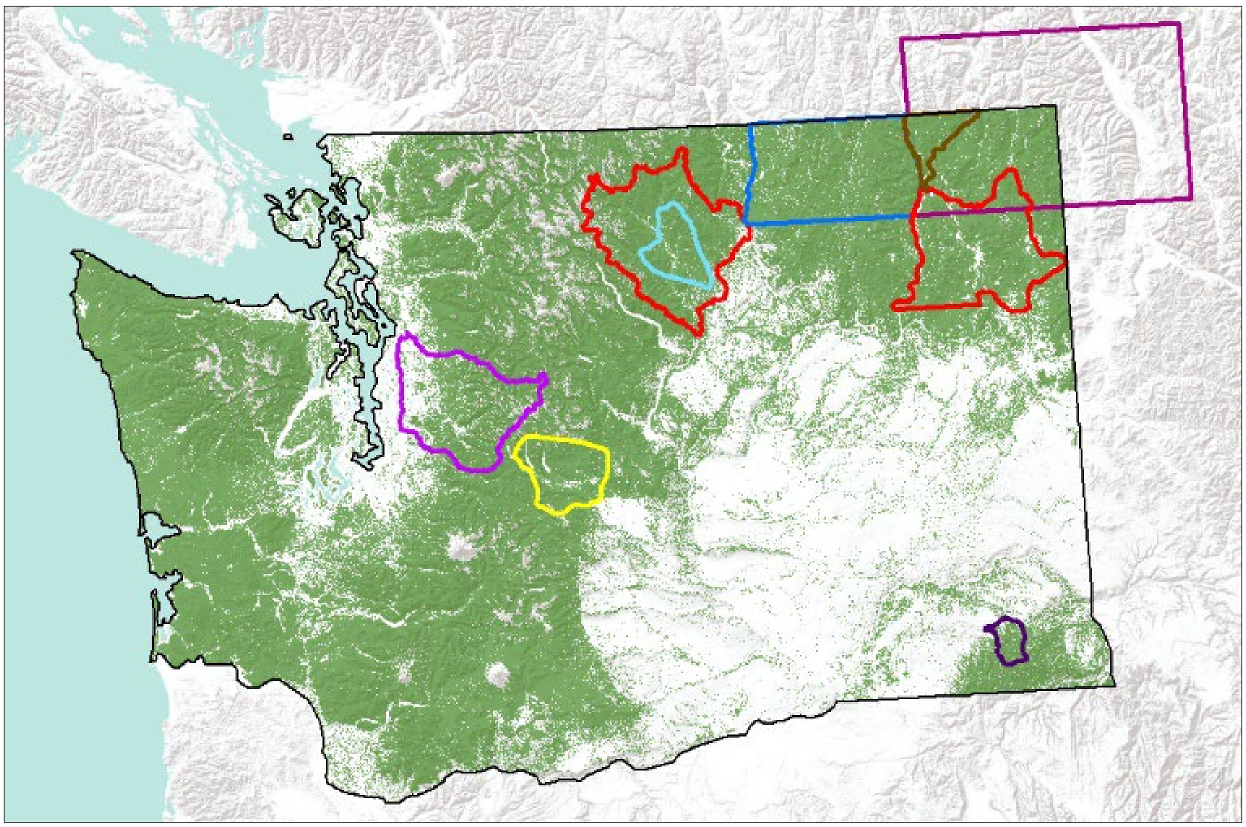
[b] Estimate standardized in Beausoleil et al., (2021) to ≥18 months of age for consistency

Habitat

Washington is the smallest of the western states and has the least cougar habitat, yet it has the second highest human population of the western states at 7.5 million. Just over 50% of these lands are under state or federal ownership, while approximately 33% are owned by industrial private timber companies and 17% are privately owned. Cougar habitat was reassessed in 2018 using research data on habitat use, and cougar habitat was estimated at 104,500 km^2 throughout Washington (Figure 3), 91,000 km^2 of which WDFW manages for hunting opportunity. The National Parks and tribal lands were included in this assessment but do not fall under WDFW's management authority. While independent-aged density is comparable to other state jurisdictions, there is 99% more cougar habitat in Idaho, 84% more in Montana, and 61% in Oregon; this increased habitat is the primary reason these jurisdictions have a higher cougar abundance.

In Washington, forested corridors facilitate cougar movements, maintain landscape connectivity, and preserve gene flow (Warren et al., 2016; Zeller et al., 2022; Wultsch et al., 2023). As human populations expand, preserving connective corridors may be an essential management need in the future, and tools to identify and prioritize these areas have been created specifically for use in Washington (Maletzke et al., 2017; Wultsch et al., 2023), which can aid in that endeavor.

Figure 3. Cougar research areas in Washington where 38 density estimates were derived, 1998-2021[a].



[a] Green indicates cougar habitat.

A recent publication on cougar connectivity using genetic samples obtained from Washington (Zeller et al., 2022) demonstrated that resistance to gene flow increased with increasing values of agriculture, building density, and road density for both sexes. Not surprisingly, resistance was high across the Columbia Basin; however, the Olympic Peninsula also showed high resistance to these habitat features. Connectivity was low for male cougars in and around the Olympic Peninsula, and they showed low genetic variation due to few immigrants finding their way into the population.

Males and females responded to different habitat features and at different scales when it came to dispersal events. Females were more impacted by smaller-scale features than males, likely due to their smaller movements. (Wultsch et al., 2023) built on that analysis and found that cougars in the Olympic, Cascade, Kettle, Selkirk, and Blue Mountains ecosystems are genetically differentiated into two clusters with varying degrees of admixture, indicating moderate levels of gene flow across the area, except for in the Olympic Peninsula where cougars have a mean inbreeding coefficient above F = 0.10 (Ralls et al., 2018). This means that cougars in the Olympic Peninsula are at a potentially higher risk of being negatively impacted by inbreeding depression in the future. For example, an inbreeding coefficient of 0.10 means that any locus has a probability of 10% to be homozygous, which increases the risk of a population being predisposed to genetic disorders. It is likely that the completion of Interstate 5, which vertically bisects Washington from Oregon to the Canadian border, and the concurrent completion of Highway 12 south of the Olympic Peninsula, both of which have led to further development of the Chehalis River valley, may have increased the geographic isolation of Olympic Peninsula cougars in recent decades. That reduced genetic connectivity to and from mainland cougars likely influenced the reported inbreeding and genetic diversity levels.

In summary, symptoms of inbreeding depression have not yet been observed in northwestern cougars, but current findings for Olympic Peninsula cougars highlight the importance of enhancing the genetic connectivity of Peninsula cougars with those of the mainland via the construction of wildlife under- or overpasses.

Human-wildlife interactions

Minimizing human-wildlife conflict is a management priority for WDFW. Washington's human population is estimated at almost 8 million people and increasing, double what it was in the 1970s. With more people comes more recreationists in cougar habitat, more small livestock farms around residences, and more intentional and unintentional feeding of wildlife around homes. Therefore, WDFW must use a comprehensive outreach and information program to reduce negative human-wildlife interactions. Overwhelmingly, the common causes of interactions identified by staff include feeding deer and turkey, which brings cougars closer to human development, and incompatible husbandry practices of small livestock and domestic animals. Understanding how to reduce ungulate attractants and installing affordable electric fencing for goats, sheep, and fowl is the best approach to avoiding or minimizing potential interactions. Information and outreach materials are mandatory components of staff response to potential conflict events. Current outreach materials include a cougar brochure and signage for trailheads, and in 2021, WDFW collaborated with external organizations on a manual to help small livestock owners minimize conflict (Figure 4). These items are available at WDFW regional offices and on the WDFW website. Staff also produced videos providing information on (a) cougar territoriality, (b) tips for cougar encounters, and (c) hiking in Washington cougar country. Agency staff have also reported on interaction rates and ways to reduce human-cougar interactions (Kertson et al., 2011; Kertson et al., 2013; Maletzke et al., 2017; Kertson & Keren, 2021). It is expected that the pre-emptive recommendations outlined in the materials referenced in this section, including improving husbandry practices of small livestock and eliminating ungulate feeding activities, will help reduce human-wildlife conflict.

Population augmentation

No population augmentation takes place for cougars in Washington.

Research

Over the past 25 years, 1998-2023, WDFW has funded or co-funded numerous long-term cougar research projects, resulting in almost 35 peer-reviewed manuscripts published in top-tier journals. Research topics include density and abundance, population demographics, social organization, growth rate, habitat and space use, resource selection, genetic structure, prey use, effects of hunting, harvest rates, and using DNA to evaluate agency and hunter ability to determine sex ID. The most recently concluded project involving cougars is a predator-prey research project, which started in 2016 and recently ended in 2020; analysis is underway. The goal of the research is to assess how hunting and predation may affect Washington's ungulate population dynamics, as well as to document wolf-cougar interactions and assess survival and causes of mortality for each species.

Figure 4. Recently developed education/outreach materials including an education brochure on cougars in Washington (left), a guide for avoiding conflict with wildlife when raising small backyard livestock (right), and a trail/kiosk sign informing outdoor users that they are entering wildlife habitat (center). Washington Department of Fish and Wildlife.

In 2022 and 2023, two genetic research projects were published using DNA from all known cougar mortality in Washington. The first was an account of sex-specific differences in gene flow and functional connectivity for cougars (Zeller et al., 2022), and the second was about genetic diversity and source-sink dynamics of cougars in the Pacific Northwest (Wultsch et al., 2023). Also, in 2022, staff collaborated on a review of model-generated cougar density estimates, which revealed sources of bias and variation in those estimates and the need for standardization (Murphy et al., 2022). That study demonstrated that range-wide density estimates of cougars are not as variable as once presumed.

Management conclusions

WDFW is currently revising the cougar chapter of the Game Management Plan (GMP), which is expected to be adopted by the Washington Fish & Wildlife Commission in 2025. In the summer of 2023, the Game Division partnered with the Science Division and Regional staff to evaluate current cougar research and management practices. The group aims to utilize the best available science to construct a harvest framework to improve the Department's ability to manage cougar hunting while also considering the impacts of female mortality, which currently averages 54% statewide. With these results, the group will also review ways to simplify the hunting season and reduce hunter confusion. Based on the findings presented in (Zeller et al., 2022; Wultsch et al., 2023), wildlife managers should collaborate with other land managers to explore possible wildlife crossing structures to aid dispersal and the exchange of genetic material on the Olympic Peninsula. Finally, beginning to work with the Landowner Services Division to further develop a cougar outreach and information program focused on pre-emptive techniques is crucial to decreasing human-cougar interactions.

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Black bear

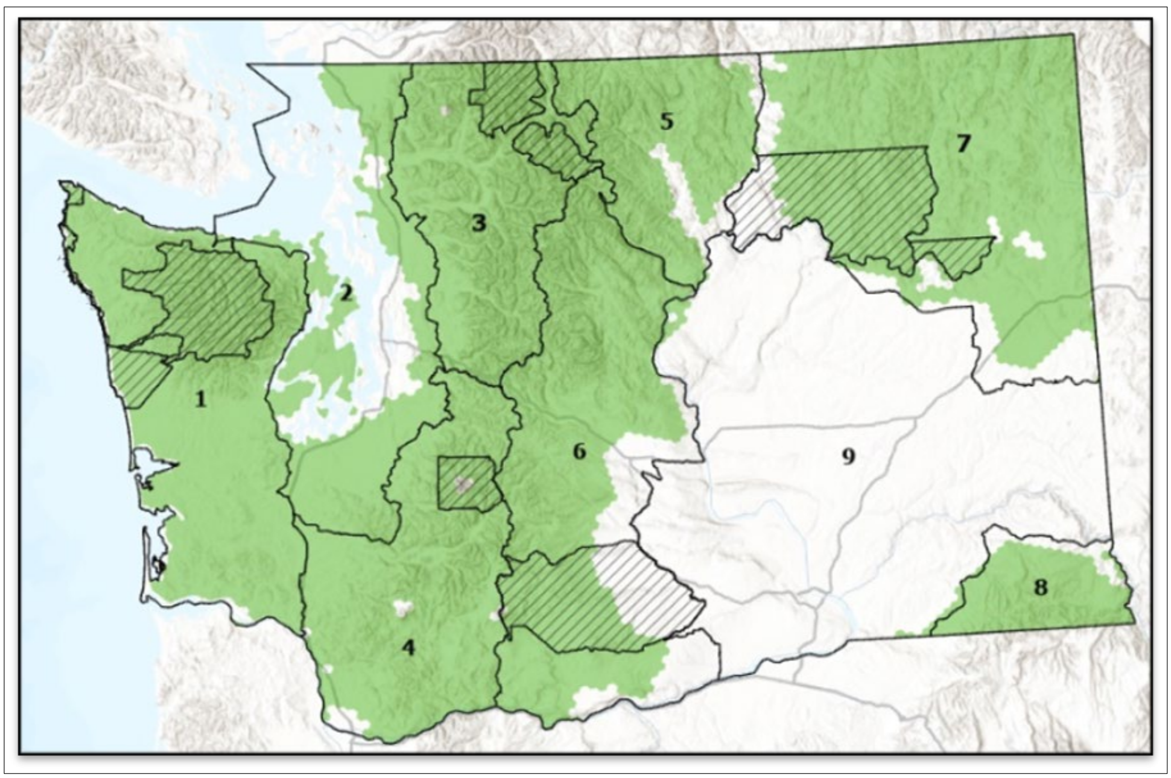
Black Bear Statewide Status and Trend Report

Rich Beausoleil, Statewide Bear & Cougar Specialist
Lindsay S. Welfelt, Statewide Furbearer & Bear Specialist

Introduction

The American black bear (*Ursus americanus*) is a native species in Washington and occupies the forested areas throughout the state (Figure 1). Only the northern island counties within the Puget Sound archipelago and the shrub-steppe habitat of the Columbia Basin do not support resident black bear populations. Grizzly bears also occur in Washington, but populations are estimated to be low (10-15 individuals) and are currently limited to the Selkirk and Kettle ranges of northeast Washington.

Figure 1. Black bear habitat in Washington (in green) and the current 9 Black Bear Management Units (BBMUs)[a].



[a] Hashed areas represent National Parks and Tribal land outside WDFW jurisdiction.

The ecological importance of bears is significant as they are crucial seed dispersers and play a vital role in plant distribution. Black bears are omnivores and predominantly consume vegetation for food (~85%), with the remaining composed of animal matter, including insects, mammals, and fish. Their diet contributes to healthy ecosystems by providing food for other mammals, birds, and insects, which deposit nutrients and enrich soils for future plant growth. Bears are also scavengers of dead animals, which adds to those benefits. Black bears are active at all times of the day, so it is not uncommon for humans to see bears moving through the landscape. Black bears are generally solitary by nature, except females with young, and only come together to mate or feed at abundant seasonal food sources.

Black bears occupy dens in winter and may den for up to six months. Their body temperature drops only slightly, which allows them to be semi-alert to dangers and disturbance. Pregnant females give birth to cubs (two on average) during the denning cycle, and bears in Washington use a variety of structures depending on location. Cubs remain with the adult female for up to 18 months. On average, it takes about five years before an adult female reproduces and has her first litter in Washington (WDFW, unpublished data), similar to other reports from western North American jurisdictions (Beston, 2011).

Management guidelines and objectives

Black bears are an important game species in Washington, and agency objectives include managing for a variety of recreational, educational, and aesthetic purposes (WDFW, 2015). Management to preserve, protect, and perpetuate black bears and their habitats to ensure healthy, productive populations while minimizing conflict with people are goals outlined in WDFW's Game Management Plan (WDFW, 2015). WDFW has made acquiring a better understanding of bear abundance, density, and growth rate a priority to improve harvest management (Welfelt et al., 2019; WDFW 2023). Long-term research collected 2013-2022 in the North Cascade Mountains is currently being analyzed to develop new management guidelines.

For management purposes, the state is currently divided into nine Black Bear Management Units (BBMUs) consisting of the Olympic Peninsula/Coastal Unit (1), Puget Sound (2), North Cascades (3), South Cascades (4), Okanogan (5), East Cascades (6), Northeast (7), Blue Mountains (8) and Columbia Basin (9) units (Figure 1). These BBMUs are generally based on ecoregions utilizing conglomerates of WDFW game management units (WDFW, 1997). It is likely that these BBMUs will be updated as part of the new Game Management Plan (GMP) process.

For harvest management, WDFW currently monitors median ages of harvest and sex ratios to infer population trends (Table 1) within the nine BBMUs throughout the state (WDFW, 2015). Median ages of bears are calculated annually using only the percentage of teeth submitted by hunters (Table 2). Percent females in the harvest is also monitored (Table 3). It is recognized that median ages and percent female metrics are not sensitive to changes in population trajectory since the same statistics could be observed for both increasing and decreasing trajectories (Beston & Mace, 2012; McLellan et al., 2017). Also, black bear density is not uniform across the landscape; it can vary based on various factors, including habitat quantity and quality, human development, and levels of mortality (Welfelt et al., 2019). Therefore, the department is currently revising management objectives and harvest guidelines in the new GMP, incorporating empirically derived black bear density estimates (WDFW, 2023) and research findings including reproduction, growth rate, and survival by sex and age classes. Utilizing this new information

Table 1. Current black bear management harvest guidelines in Washington which are applied to each Black Bear Management Unit (BBMU), 2023.

Parameter	Liberalize	Acceptable	Restrict
% Female in the harvest	< 35%	35-39%	> 39%
Median age of harvested females	>6 years	5-6 years	< 5 years
Median ages of harvested males	>4 years	2-4 years	<2 years

Table 2. Median ages of 4,857 black bear mortalities (approximately 25% of the total) by sex and year in each Black Bear Management Unit (BBMU), submitted by hunters in Washington, 2014-2023[a].

BBMU	2014		2015		2016		2017		2018		2019		2020		2021		2022		2023	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1	4	4	4	5	4	5	4	6	3.5	5	4	5	4	4	4	6	4	5	4	3.5
2	2.5	2	2	4	2	4	3	4	3	2	3	6.5	3	5	3	6	3	5	3	4.5
3	4	8	5	9	4	6.5	3	5	3	4	3	4	4.5	6	4	3	5	6	6	7.5
4	3	5	3	7	4	5.5	3	4	4	4	4	4	4	4	3	7.5	3	6	4	7.5
5	3	3	1	4	3	1	3	6	2.5	2.5	4	2.5	3.5	4	5	2	8	8	2.5	5
6	2	7	3	5	4	4	4	4.5	3	5	3	5	4	5	4	3.5	3	4	4	4
7	2	3.5	3	5.5	4	7	3	5	3	6.5	3	5	3	5	4	6	3	3	3.5	4.5
8	5	7	3	3.5	2.5	4	5	3	3	3.5	3	4	4	5	3	3.5	3	6	5	4
9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

[a] Dark gray areas show where the median age management guideline was exceeded.

Table 3. Percent female black bear mortality by year and Black Bear Management Unit (BBMU) in Washington, 2014-2023[a].

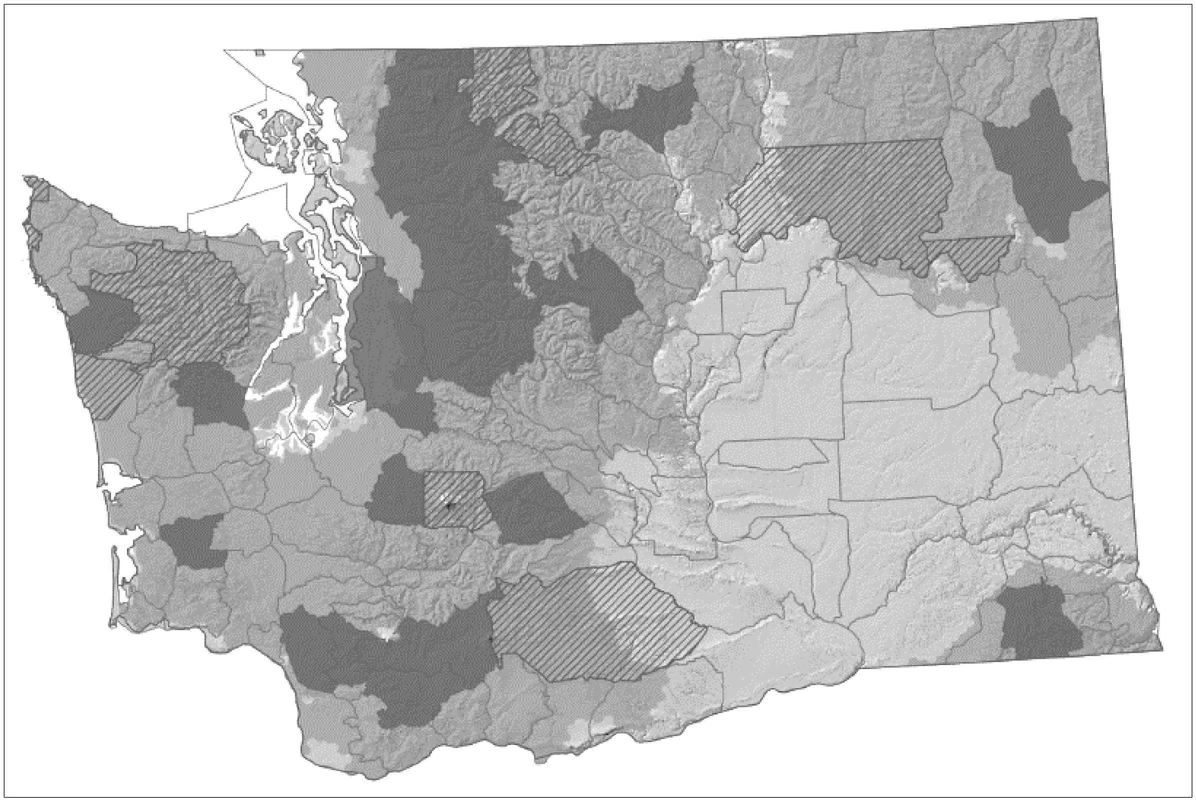
BBMU	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
1	28	27	29	35	36	31	36	28	26	30
2	39	34	43	35	33	26	24	23	44	33
3	38	31	42	26	40	27	29	30	29	24
4	44	24	37	35	40	27	33	28	34	31
5	32	27	32	36	38	31	36	32	44	32
6	34	34	35	31	34	27	34	26	39	34
7	33	34	32	37	33	27	31	34	31	29
8	29	38	37	29	43	42	29	38	39	31
9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

[a] Dark gray areas show where the female harvest guideline was exceeded.

Population surveys

Department staff have been gathering density estimates throughout the state since 2013 so that new population estimates can be derived (Welfelt et al., 2019; WDFW, 2023). Results from (Welfelt et al., 2019) in the North Cascade Mountains showed that while annual density averaged 20 bears/100 km^2 on the western slope and 19 bears/100 km^2 on the eastern slope, density varied within each study area based on human development and habitat productivity, respectively. Because these results showed that density varies widely by habitat types within study areas, it was recommended that density not be extrapolated statewide or even region-wide due to the variability of habitats that occur in Washington. Using research results, WDFW biologists performed simulations to establish a sampling design and protocol that could be applied at a broader scale to obtain black bear density estimates throughout the state while minimizing staff time, materials, and expense to the agency using non-invasive hair snares and DNA analysis to identify individual bears. WDFW staff have completed field work for black bear density monitoring projects in 15 Districts throughout the state where black bears occur (WDFW 2022; Figure 2) using consistent methodology. In collaboration with WDFW, the Stillaguamish and Sauk-Suiattle Tribes used similar methods in 2021, 2022, and 2024 to estimate density in two separate areas of NW Washington, and their efforts provided significant coverage to Skagit and Snohomish counties. This statewide effort has empirical density estimates from 15 of the 18 black bear research areas surveyed thus far, which will help inform variations in density across habitats in Washington. The three additional studies from summer 2024 are pending as DNA samples are currently being analyzed in a lab; this includes the northern Olympic Peninsula in collaboration with the Lower Elwha Klallam Tribes, the northwest Cascades in collaboration with the Stillaguamish Tribe, and Snoqualmie Pass in collaboration with Washington Department of Transportation.

Figure 2. The state of Washington with black bear habitat (gray) and Game Management Units (GMUs) shown, WDFW 2024[a,b].



[a] Tribal areas and National Parks depicted with hash marks.

[b] Darkened GMUs show where black bear density research was completed by WDFW and Tribal co-managers through 2023.

Since 2013, about 18,000 hair samples have been retrieved from non-invasive barbed wire hair stations statewide and subsampled, and approximately 10,000 samples have been submitted for independent lab analysis (Table 4). This monitoring project is anticipated to be continued in additional areas across the state in the foreseeable future. This initial work was conducted in high and medium-quality bear habitats and will likely be expanded to include lower-quality habitats. With multiple density estimates in various habitats, WDFW can examine what habitat and human factors are associated with black bear density across Washington. Continued monitoring will also allow for appropriate inferences of trends to be made regarding harvest levels and the effects of management actions on the black bear population.

Hunting seasons and recreational harvest

In 2023, WDFW provided 107 days of recreational hunting opportunity for the fall black bear general season. An average of 73,631 licenses for black bear hunting were sold annually over the past three years (Table 5). Fall general season hunting licenses can be purchased over the counter with no limit to the number of licenses that can be purchased, and hunters can hunt anywhere hunting is legal. Since the 1960s, WDFW has had a bag limit of two bears, where a second bear could be taken on the west side of the state only. In 2019, WDFW increased the bag limit in eastern Washington from one bear to two, bringing the total bag limit to two bears annually statewide, and standardized season length across the state (August 1 - November 15), increasing hunting season length and opportunity in several areas. On average, approximately 1,000 second tags are purchased (Table 5). In 2022, the Fish and Wildlife Commission voted not to continue the spring bear hunting season unless the department identified a specific management need.

Over the past ten years (2014-2023), Washington's average annual black bear mortality was 1,875 (Figure 3). The general fall season harvest increased approximately 40% statewide in 2019 and 2020 from the average of the previous five years (2014-2018; Figure 3). In 2022, the fall harvest reached its highest point in over 20 years (Figure 3). In 2023, the harvest returned to just above the average range (Figure 3).

Table 4. Annual black bear monitoring results using non-invasive DNA collection on 324 km^2 study areas (each with 36-9 km^2 cells) by Game Management Unit (GMU) in Washington, 2013-2023.

Year	Study Area GMU(s)	Samples Collected	Total Detections[a]	Individuals Identified[a]	> 1 Year Old Density /100km^2
2013-2016[b]	245	1,113	164	117 (56M:62F)	15.4
2013-2016[b]	454/460	852	145	93 (49M:44F)	16.1
2019	117	1,260	212	103 (50M:53F)	24.9
2019	672	298	59	28 (16M:12F)	6.2
2020	550/556	181	16	14 (8M:6F)	6.1
2020	654	1,168	158	74 (34M:40F)	13.5
2021	162/166/169	779	156	98 (55M:43F)	27.8
2021	218	1,419	309	100 (65M:35F)	17.3
2021	418	1,323	209	92 (40M:52F)	22.6
2021	437/448[c]	613	169	96 (50M:46F)	20.6
2022	437[c]	279	110	55 (29M:26F)	13.1
2022	560/572	2,263	303	103 (55M:48F)	18.0
2022	615	1,014	166	92 (54M:38F)	25.0
2023	352/356/360	574	62	36 (20M:16F)	7.7
2023	636	755	94	47 (24M:23F)	9.4

[a] Including cubs

[b] Used annual average from the 4-year study (Welfelt et al., 2019) for comparison purposes.

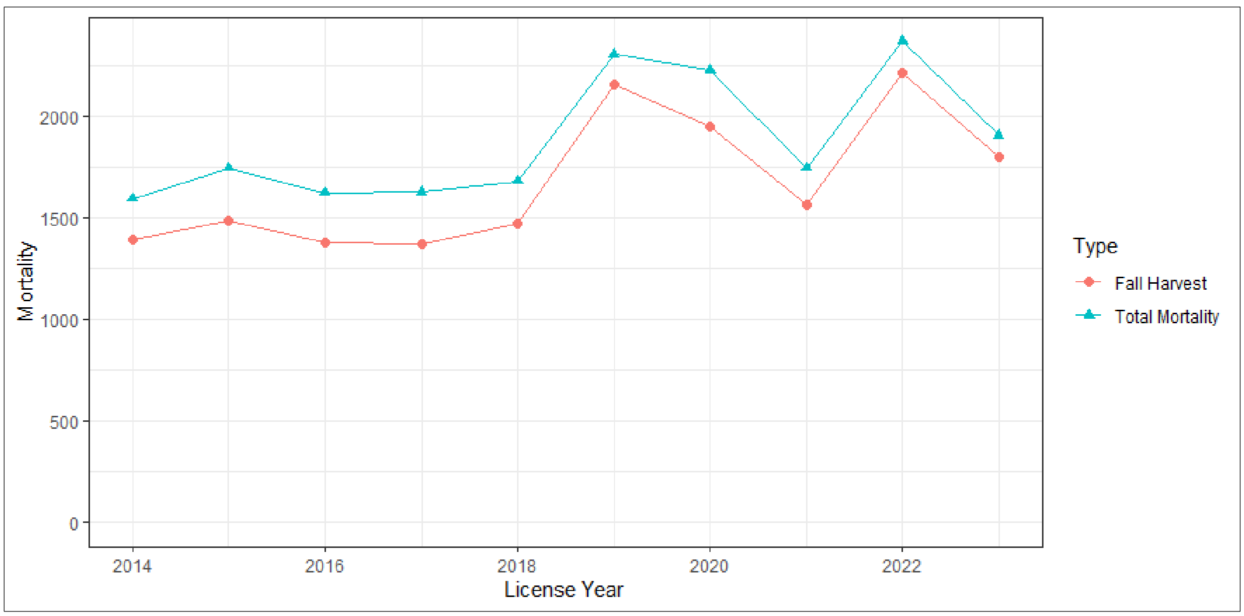
[c] Stillaguamish Tribe project

Table 5. Black bear licenses sold by year in Washington, 2014-2023.

License	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
1st Bear	58,291	60,864	62,032	62,861	63,720	64,743	56,561	77,018	71,977	71,898
2nd Bear[a]	423	497	433	418	415	1,023	785	894	1,253	1,031
Total	58,714	61,361	62,465	63,279	64,135	65,766	57,346	77,912	73,230	72,929

[a] A second bear tag was added statewide (previously only western WA) starting in 2019.

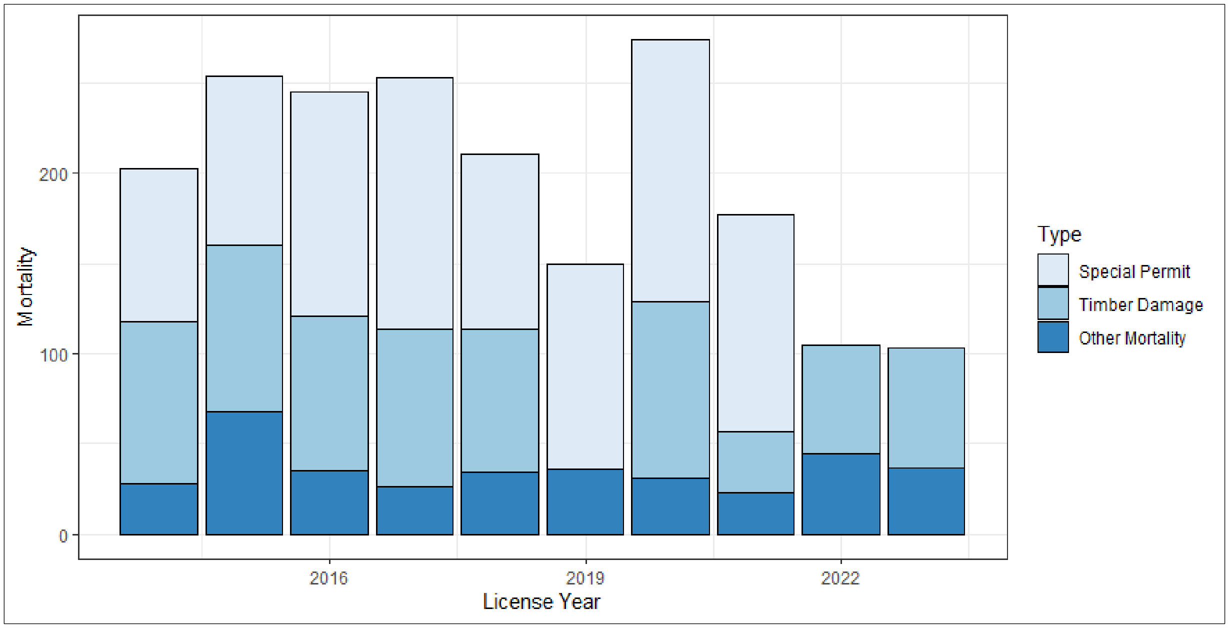
Figure 3. Statewide black bear mortality for fall general hunt season and total mortality by year in Washington, 2014-2023[a,b,c,d].



[a] Does not include tribal harvest.
[b] Total mortality includes all known mortality types.
[c] Timber removals did not occur in 2019.
[d] Data from 2021-2023 include timber damage removals by USDA Wildlife Services and WDFW-authorized removals.

When viewed by mortality type at a statewide level over the past ten years, most black bear mortality occurred in the fall hunting season (89%; Figure 3). Permit hunts that have been conducted over the years, including spring bear hunting, permits issued for timber damage, and other causes of mortality (Figure 4). When viewed by BBMU, harvest increased in all BBMUs following the 2019 change in regulations but was most pronounced in BBMUs 1-6 (Figure 5), and each was followed by a slight decline the following year. Tribal black bear harvest occurs statewide, and reporting varies by tribe; thus, it is not included in this report. For example, in 2023, the Northwest Indian Fisheries Commission reported an additional 17 bear harvests split between BBMUs 1, 2, 3, and 4 (Northwest Indian Fisheries Commission, 2023), but not all member tribes report.

Figure 4. Statewide black bear mortality for spring special permit hunt, timber damage removals, and other causes by year in Washington, 2014-2023[a,b,c,d,e].



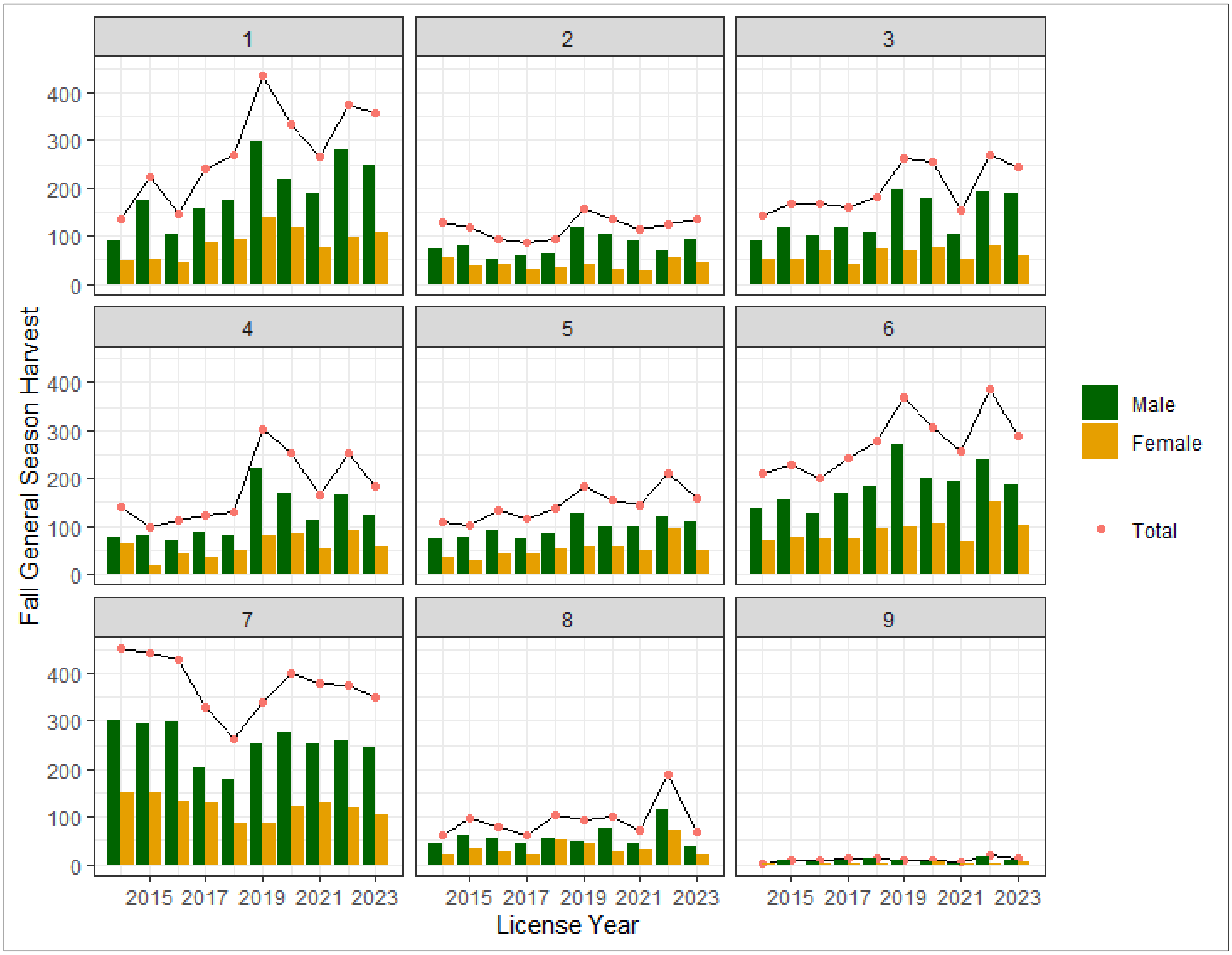
[a] Does not include tribal harvest.
[b] Other mortality includes vehicle collisions and human-bear conflict removals.
[c] Timber permits did not occur in 2019.
[d] Data from 2021-2023 include timber damage removals by USDA Wildlife Services and WDFW authorized removals.
[e] Spring bear hunting ceased in 2022.

Like all big game species, WDFW collects fall hunt statistics via mandatory online reporting. The current reporting rate is about 56%, and a follow-up survey is conducted to correct for non-reporting bias. The Department uses those data to estimate harvest, sex of harvest, number of days hunted and GMUs hunted to calculate hunter success.

To reduce the potential impact of hunters mistakenly shooting a threatened grizzly bear instead of a black bear, which would compromise grizzly bear recovery in Washington, hunters who choose to hunt in GMUs within areas identified as grizzly bear recovery areas must complete an annual online bear identification test and score 80% or higher. Agency staff also created a bear identification video in 2020, which is located on WDFW's website at https://wdfw.wa.gov/hunting/requirements/bear-identification-testing.

Although not currently prohibited by law, WDFW urges hunters not to shoot cubs or a female accompanied by cubs. In 2024, agency staff created a video to aid hunters in identifying the sex of black bears in the field with the goal of reducing cub orphaning and harvest pressure on female bears, which can impact population trajectory.

Figure 5. Fall general season black bear harvest results by Black Bear Management Unit (BBMU) in Washington, 2014-2023.



Survival and mortality

Human-caused mortality is the primary source of mortality in almost all black bear populations throughout North America. Research projects conducted in Washington demonstrate that non-harvest mortality can be an important factor in overall survival rates (e.g., Koehler & Pierce, 2005; Beausoleil et al., 2012). In the North Cascades black bear research project (2013-2023), where 270 individual bears were GPS collared, nearly all documented mortality was human-related. On the west slope of the North Cascades, 52% of mortalities were hunter kills, 19% were conflict removals, 9% were poached, 7% were from wounding loss, 7% were roadkill, and 7% were from natural causes. On the east slope of the North Cascades, 64% were hunter kills, 15% were natural causes, 8% were from wounding loss, 7% were conflict removals, 4% were roadkill, and 2% were poached. Of the bears that died from natural causes, most were yearlings recently separated from their mom that died from starvation, predation (adult male bear or cougar), or other unknown natural causes.

Black bear population dynamics are driven by survival and reproduction rates, immigration (animals coming into the area), and emigration (animals leaving the area). Both natural and human factors can impact all these factors. For example, a berry crop failure can increase human-caused mortality as bears move closer to people in search of food and decrease reproduction rates for adult females through lower body conditions. In the GMP Black Bear Chapter, staff are incorporating these population dynamics to establish sustainable harvest rates and management criteria to maintain stable and viable black bear populations in Washington.

Habitat

Black bears occupy forested areas, which translates to 48% of the land area throughout Washington. The northern island counties within the Puget Sound archipelago, the shrub-steppe habitat of the Columbia Basin, and developed areas do not support resident black bear populations (Figure 1). Washington is the smallest western state with the least potential bear habitat at 108,000 km^2, with 93,000 km^2 within WDFW's management authority (Scheick & McCown, 2014). Approximately 43% of potential bear habitat is under state or federal ownership, while industrial private timber companies with variable land management practices own 32%. Because various habitat and human factors can affect bear numbers, population density varies widely in different habitats throughout the state. While large tracts of forested habitat may provide security for bear populations, areas with timber harvest activities or adjacent to human-populated areas where human access and disturbance are high may have lower black bear densities.

Human-wildlife interaction

Human-bear conflict activity typically reflects the variability of environmental conditions and the availability of human-provided attractants and is, therefore, not a good indicator of population status (Spencer et al., 2007). For example, annual human-bear conflict numbers could rise simply due to a late spring with poor natural forage conditions, followed by a poor late summer or fall berry crop. The human population in Washington is currently estimated at 7.5 million, and most human-bear interactions occur in King County, Washington's most densely human-populated area with 2.2 million people. Nonetheless, human-bear conflict can occur statewide, given the distribution of people and bears in Washington and the prevalence of high-calorie attractants like garbage, bird feeders, and fruit trees. Managers agree that garbage management and removing attractants is the best way to reduce human-bear interactions; intentionally or unintentionally feeding bears is subject to a fine under state law (RCW 77.15.790, RCW 77.15.792).

Additionally, homeowners are advised to practice good animal husbandry, including using roofed enclosures and/or electric fencing for chickens and other small- to medium-sized livestock (e.g., goats and sheep) and keeping enclosures away from forest edges. Once bears know about a non-natural, predictable food source or are intentionally fed by humans, they often return to that place, and many become more willing to take risks to acquire food, so prevention of a conflict is most important. Wildfires and prolonged drought can exacerbate human-bear conflict because there are fewer natural foods to return to on the landscape.

Along with other wildlife agencies nationwide, WDFW has become a member state in the Association of Fish and Wildlife Agencies' sanctioned BearWise© program that creates and distributes educational materials regarding human-bear conflict for agencies and their public. A team of North American bear biologists and communications professionals manage and implement the BearWise program and collect information and input from agency representatives nationwide. The goal is to create consistent and accurate human-bear conflict messaging across the country (Figure 6).

Figure 6. WDFW educational materials created in partnership with BearWise currently being distributed to Washington communities, WDFW 2024[a].

[a] BearWise materials include At-Home BearWise Checklist (top left), a Bear Species ID & Bear Spray Basics card (top middle), educational stickers (top right), and 4 Bulletins including Attract Birds Not Bears, Dogs + Bears = Problems, Electric Fences Keep Bears Out, and an Action Plan for Communities in Bear Country (bottom).

Population augmentation

No population augmentation takes place for black bears in Washington.

Research

Welfelt et al. (2019) is the first in a series of manuscripts that will be compiled from a long-term research project (2013-2023) in the North Cascade Mountains. Future manuscripts will include growth rates (survival and reproduction), home range, black bear denning ecology, and stable isotope analysis to examine the impacts of human foods on black bears and human-bear interactions. The North Cascades bear project focused on estimating black bear density using DNA-based capture techniques coupled with GPS collar data from black bears captured and collared by staff. The results of this work have been used in 17 density monitoring projects statewide, which have been conducted by WDFW staff. This data is summarized in a report titled "Estimating the Statewide Black Bear Population in Washington: A Cross-Region and Interagency Team Approach" (WDFW, 2023).

Management conclusions

WDFW is revising the black bear chapter of the Game Management Plan (GMP), which is expected to be adopted by the Fish and Wildlife Commission in 2025. In early 2024, Game Division staff partnered with Science Division and Regional staff to evaluate current black bear research and management practices. The group aims to utilize the best available science to construct an updated harvest framework to improve the Department's ability to manage black bear hunting while minimizing risks to the population. Using density estimates from ongoing research conducted throughout the state will allow staff to establish and evaluate harvest rates at a localized scale.

Improving response rates for hunter reporting (~56%) and mandatory tooth collection (~25%) remains an issue that WDFW plans to address. Collecting teeth from harvested black bears is one of the least expensive and time-efficient tools managers have available to aid in harvest evaluation, and it fosters a working relationship with the hunting public through engaging partners in management. Data collected from teeth can be used in population reconstruction and Integrated Population Modeling. Coupling this with research data on density monitoring, Washington can substantially improve black bear management in Washington.

Overwhelmingly, human-bear conflicts involve people providing attractants, including garbage, bird feeders, and fruit trees. Partnering with the Landowner Services Division, agency staff hope to work with external entities like city councils and county commissioners to advise on simple contract revisions for garbage management by expanding options for bear-resistant containers and metal-lid dumpsters for residents and businesses. Also, establishing ordinances, bylaws, and disclosures at the local level to address garbage, bird feeders, raising chickens and other backyard livestock, and informing new residents that they live in bear country would greatly reduce human-caused conflict. Staff recently partnered with the city of Leavenworth, WA, to produce BearWise materials and hope to expand that work to other areas with high conflict. Working with homeowners' associations on developing focused ordinances and covenants/bylaws that restrict the use of seed and liquid bird feeders and placement of trash the day of pickup and not the night before is also highly effective in reducing human-bear conflict. Finally, advising orchardists on the disposal of unmarketable fruit is needed as it is a significant and rewarding attraction to bears and often brings bears closer to developed areas.

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Furbearer

Furbearer Statewide Status and Trend Report

Lindsay Welfelt, Carnivore Section, Statewide Furbearer & Bear Specialist

Introduction

Furbearer is a collective term that represents a diverse group of wildlife that perform a variety of roles in the ecosystems of Washington. It includes species from rodents to carnivores, each with unique habitat needs, relationships with other wildlife, and impacts on people. This varied group exhibits a wide range of growth rates, habitat requirements, human tolerance, and historic and current harvest levels. Some of the species have high population growth rates, and human-caused mortality is often considered compensatory mortality, so the risk of over-exploitation is low. However, other species are long-lived, have relatively low reproductive rates, and have specific habitat needs, which places them at higher risk of the impacts of human-caused mortality. The eleven species that are classified as furbearers in Washington state include: American beaver (*Castor canadensis*), American badger (*Taxidea taxus*), bobcat (*Lynx rufus*), ermine (*Mustela erminea*), long-tailed weasel (*Mustela frenata*), marten (*Martes americana*), mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), and river otter (*Lutra canadensis*). Bobcat, raccoon, and red fox are also cross listed as small game species in Washington.

Management guidelines and objectives

Furbearer management is currently administered under the 2015-2021 Game Management Plan (WDFW, 2014). Statewide management goals for all furbearers are to:

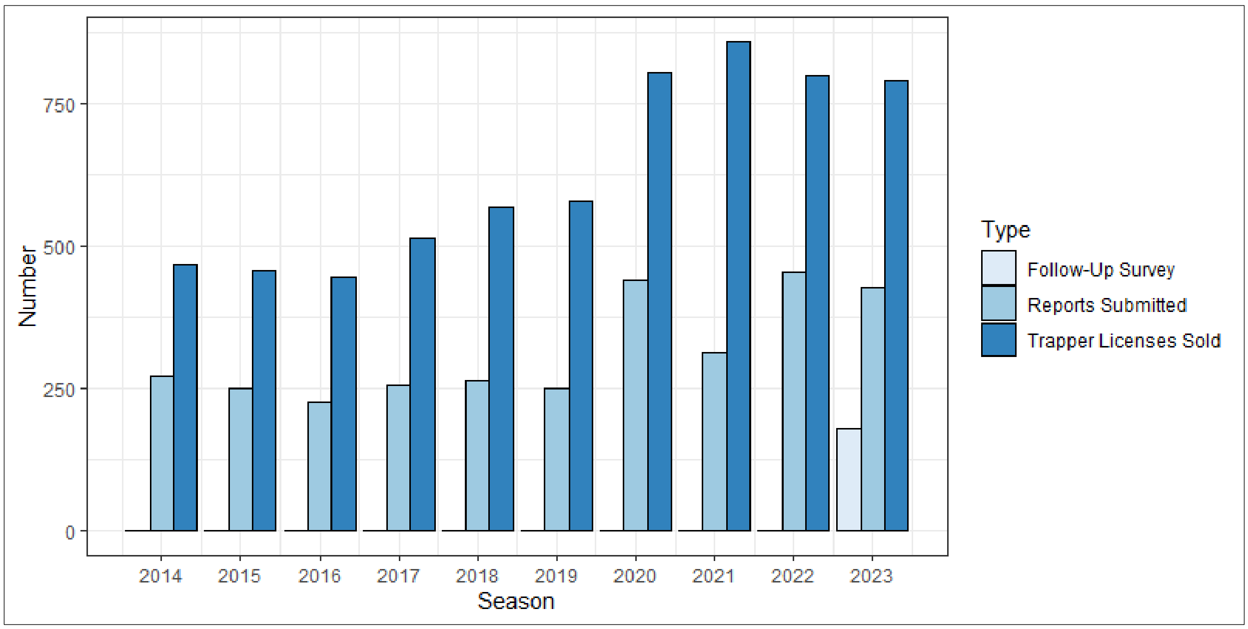
1. Preserve, protect, perpetuate, and manage species and their habitats to ensure healthy, productive populations.
2. Manage wildlife species for a variety of recreational, educational, and aesthetic purposes, including hunting, trapping, scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing, and photography.
3. Manage statewide populations for a sustained yield.

Trapping seasons and recreational harvest

The trapping season for furbearers occurs during the winter months when pelts are in their prime, November 1 – March 31. Trapping occurs statewide, with no restrictions or bag limits, with two exceptions: 1) Marten trapping is closed on the Olympic Peninsula in Clallam, Jefferson, Mason, and Grays Harbor counties to protect low-density coastal Pacific martens (*Martes caurina*); and 2) Red fox trapping is also closed within the Mt. Baker-Snoqualmie, Okanogan-Wenatchee, and Gifford Pinchot National Forests to avoid harvest of Cascade red fox (*Vulpes vulpes cascadensis*), a state-endangered subspecies that occurs only in the montane environments of the Cascade Mountain Range.

For the past ten years, 2014-2023, an average of 629 fur trappers have been licensed in the state annually (Figure 1). A substantial decrease in furbearer harvest correlates with the passing of Initiative-713 in 2000, which banned most body-gripping traps for recreational trapping (Figure 2). In addition to past regulatory changes, current harvest numbers likely fluctuate as a result of several factors, including population levels, pelt prices, trapper numbers, weather, access to trapping areas, and public interest.

Figure 1. Number of trapping licenses sold, reports submitted by trappers, and follow-up survey reports in Washington, 2014-2023[a].

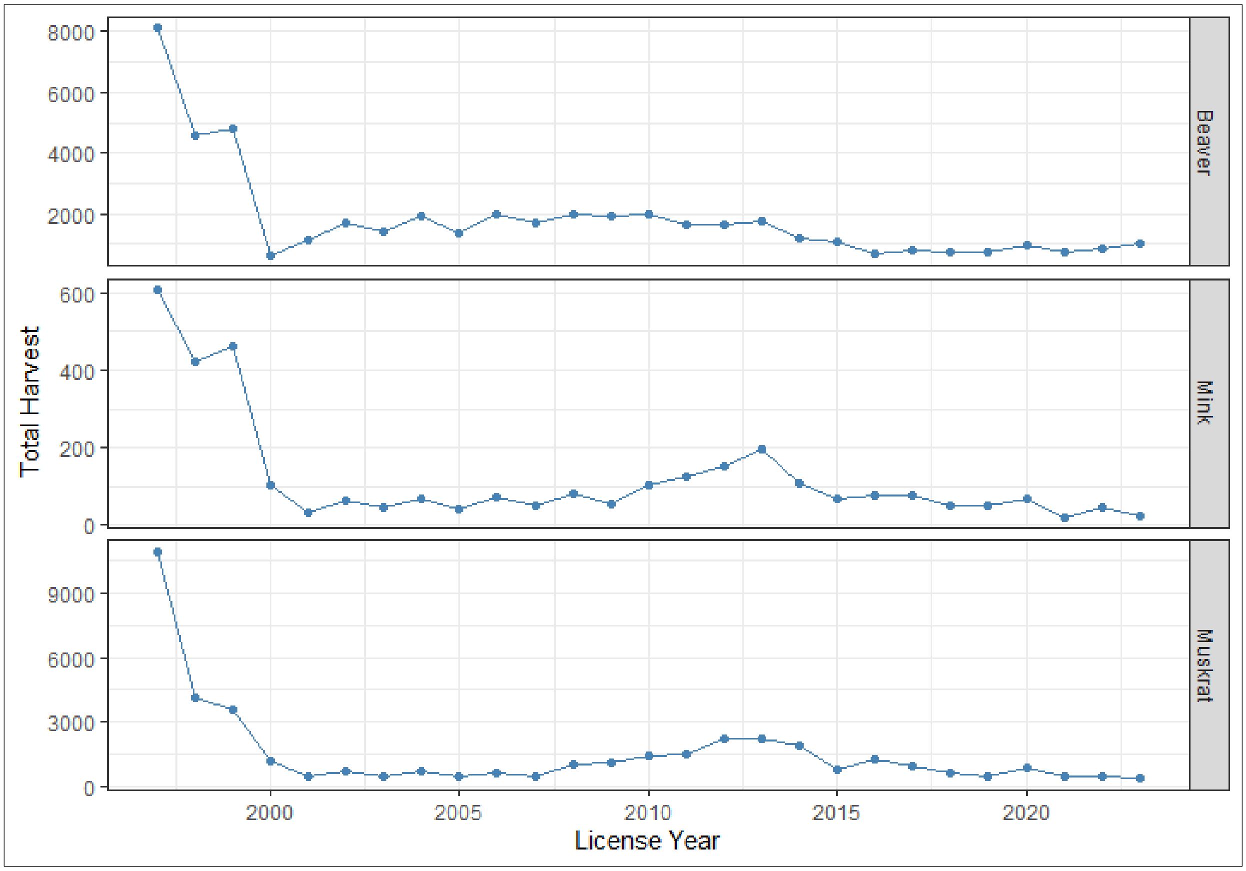


[a] Follow-up surveys were initiated for the 2023 license year.

State law currently restricts the use of body-gripping traps for recreational trapping; cage and box traps, suitcase-type live beaver traps, and common rat and mouse traps are not considered body-gripping traps (RCW 77.15.192). WDFW trapping regulations also require wildlife caught in restraining traps to be removed within 24 hours, and kill traps to be checked and animals removed within 72 hours.

Information on harvest numbers for most furbearers comes from trapping reports, which historically have been mailed or emailed documents describing an individual's trapping activity and outcomes. Unlike many other game species, furbearer trapping reports are summaries of the reported harvest rather than estimates that have been extrapolated from non-compliance surveys. Trapper reporting rates averaged ~49% between 2014-2021 with a decreasing trend over much of that time (Figure 1). Due to this declining trend and the development of the furbearer program in recent years, online electronic trapper reporting in the WDFW WILD licensing system began in the Fall of 2022, similar to all big game species reporting. In 2023, WDFW also began follow-up surveys to gather trapping data from those who had not submitted reports by the April 20 deadline. The combined reporting rate in 2023 increased to 77%. However, because the new licensing system and follow-up surveys reach out to all licensed trappers rather than just self-reported trappers, the new data is not comparable to the previous data. Summaries of furbearer trapping data can be found on the WDFW website at https://wdfw.wa.gov/hunting/management/game-harvest (Figure 2).

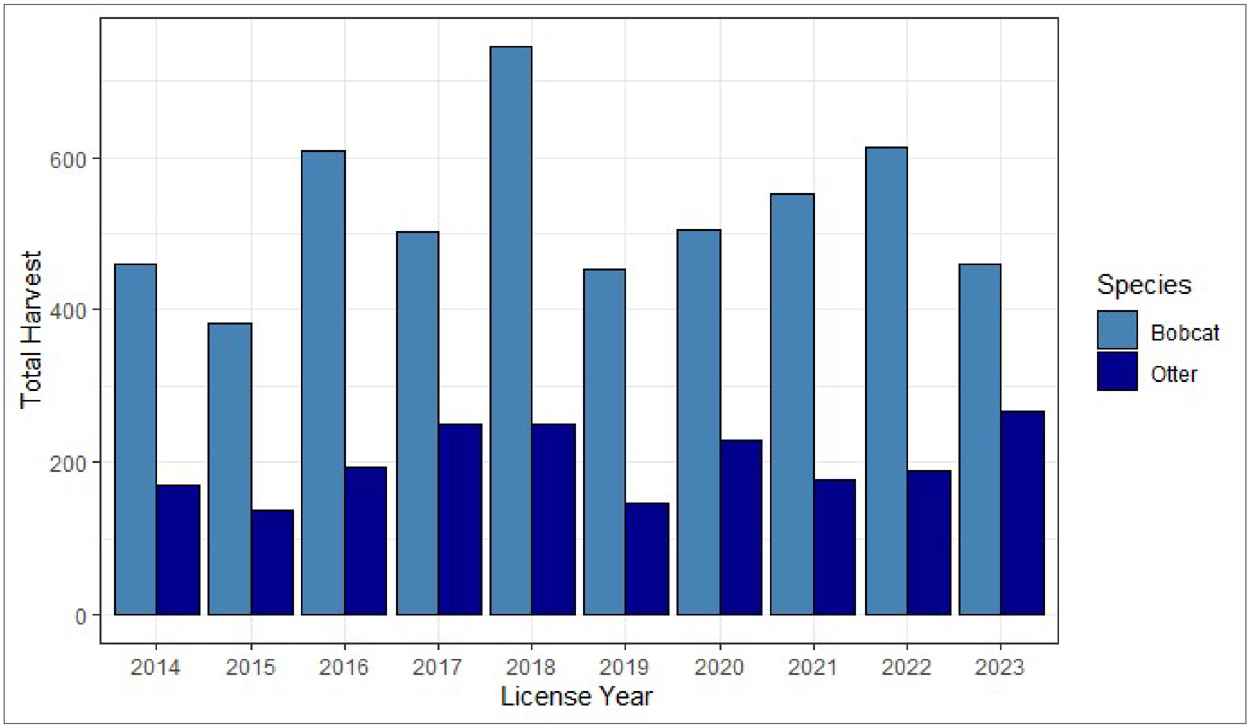
Figure 2. Long-term reported harvest data for commonly targeted furbearer species, 1997-2023[a,b].



[a] Trapping regulations changed in 2000, and harvest for many species declined.
[b] Scale varies between graphs.

All bobcat and river otter pelts must be inspected and sealed by WDFW staff or an authorized individual permitted by the department per federal CITES requirements (Figure 3). Compliance with these requirements is estimated to be high, and bobcat and river otter harvest numbers are some of the most accurate of all game animals. Beginning in the 2024-2025 season, hunters or trappers harvesting a bobcat must now provide a complete lower jaw (both sides), cleaned and dried, before a pelt can be sealed. WDFW staff created several informational handouts and videos to guide hunters and trappers through the new jaw collection requirements, which can be found on the WDFW website at https://wdfw.wa.gov/species-habitats/species/lynx-rufus.

Figure 3. CITES harvest reports for bobcat and river otter in Washington, 2014-2023[a].



[a] The COVID-19 pandemic resulted in incomplete reporting for the 2019-20 season.

Furbearers cross-classified as small game species (bobcat, raccoon, and red fox) can also be hunted during the small game season, September 1 – March 15, in addition to being trapped. Night hunting for bobcat is prohibited in GMUs that fall within the lynx management zones identified by WDFW (GMUs 101, 105, 111, 113, 117, 203, 204, 215, 218, 224, 231, 233, 242–247, 250, 426 and 450) to avoid incidental take of Canada lynx (*Lynx canadensis*). This list also includes GMU 108 beginning in the 2024-2025 season. Hunting of red fox is also closed within the Mt. Baker-Snoqualmie, Okanogan-Wenatchee, and Gifford Pinchot National Forests to avoid the harvest of Cascade red fox.

Population monitoring

There is limited documentation on the current distribution, relative density, and population status of many furbearer species in Washington. Habitat modifications, changes in prey availability, and human-caused mortality have the potential to impact many of these species in positive and/or negative ways. Trends in total harvest and catch-per-unit effort are used as general indicators of population status and trends for some species. Factors such as fur prices and changes in allowed trapping methods, such as the changes that occurred in 2000, should be considered when comparing harvest from different years. Additionally, data since the online reporting system and follow-up surveys began are not comparable to previous years due to a change in reporting methodology.

The 2015-2021 Game Management Plan identified the need to assess furbearer population statuses on a local, regional, and statewide basis via the development of population surveys, research projects, and distribution maps from existing occurrence data. Recent WDFW efforts have aimed to better understand bobcat ecology and population status. In 2023, WDFW began a bobcat research project to look at survival rates and habitat use, among other things, in the western and eastern Cascades. In 2024, WDFW began jaw and DNA collection of harvested bobcats. This sample collection will allow staff to track the age and sex data of harvested bobcats over time to provide insight into population trends.

Collaborative research projects in recent years have been vital to filling data gaps and addressing specific questions about furbearers and small game species. WDFW funded research with Washington State University to assess the use of environmental DNA to detect beaver presence as a potential tool for population or relocation monitoring (Burgher et al., 2024; Duke et al., *in press*). This work also assessed the potential for relocated beavers to transmit invasive aquatic species. WDFW has funded several other studies with Washington State University. One of these seeks to estimate bobcat density and to understand bobcat-Canada lynx habitat overlap using camera detections. Another is researching coyote encroachment and use of higher elevations to better understand implications for alpine species in the face of climate change; in particular, looking at species interactions between coyote, badger, and Cascade red fox. Information from these and additional collaborative projects, such as the population status of marten on the Olympic Peninsula (Moriarty et al., 2019) and the genetic structure of badgers in Washington (Ford et al., 2019), may be used to assist in population monitoring and the development of well-informed management strategies.

The Washington State Department of Transportation (WSDOT) also collects vital information on vehicle collisions, which can be a significant cause of mortality for some furbearer species. For example, between 2015 and 2022, WSDOT documented 372 road-killed badgers, while recreational trappers harvested a total of 20 during that same timeframe (0-7 per year). Not only does this information help WDFW managers more fully understand sources of human-caused mortality, but it can also contribute to species distribution mapping and sample collection (e.g., DNA samples, age distribution, etc.).

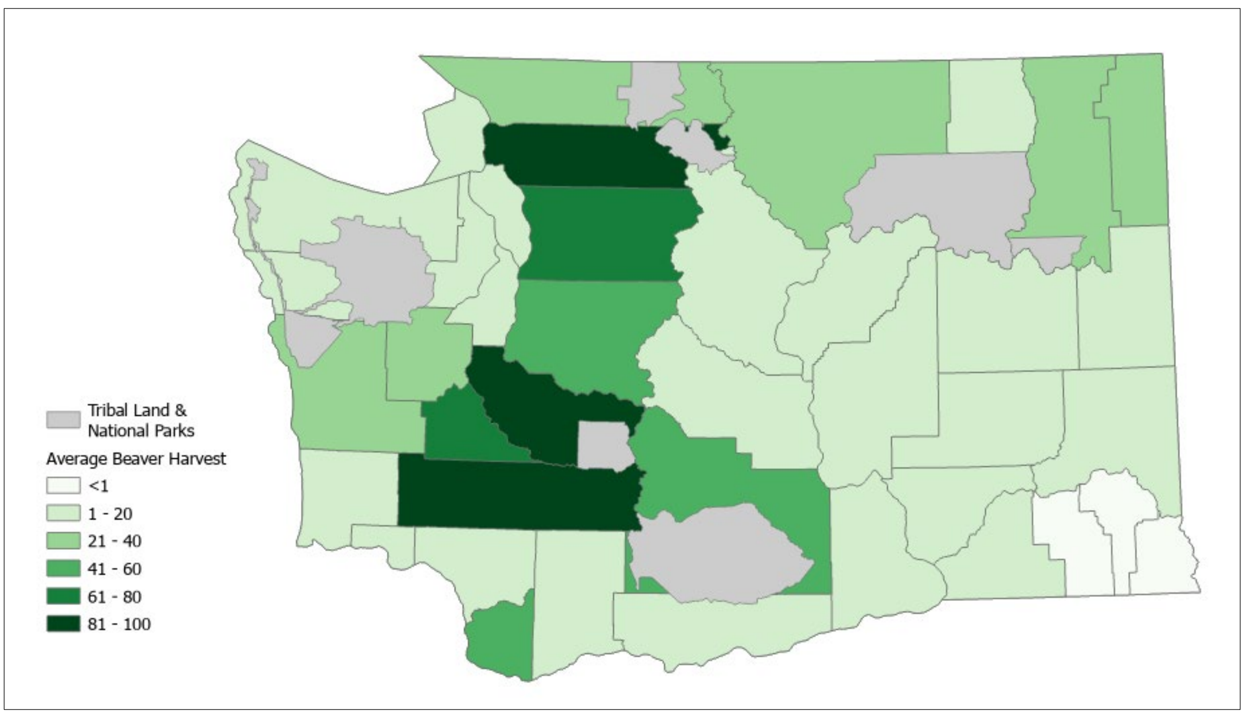
Habitat

Furbearers occupy various habitats throughout the state, ranging from freshwater aquatic ecosystems to montane forests. Below are examples of how a few of these species interact with their environment.

American badgers are considered a ‘Species of Greatest Conservation Need’ in Washington, as identified by WDFW (WDFW, 2015). They are generally found in grassland, shrub-steppe, desert, dry forest, and agricultural areas. They require soils that allow the excavation of den sites and support the fossorial prey species (e.g., ground squirrels) on which they rely. Badger excavation can play an important role in soil physical processes (Eldridge, 2004) and provides nesting, denning, and foraging habitat for a variety of animals, including sensitive species such as burrowing owls and pygmy rabbit (Andersen et al., 2021). Many of the shrub-steppe habitats they occupy have stressors, including energy development, altered fire regimes, agricultural side effects, invasive species, and habitat loss and fragmentation. Actions to improve or secure habitat for badgers and other species that rely on these ecosystems consist of habitat conservation, fire management, invasive species control (particularly cheat grass), grazing and farm management, and private lands incentives (WDFW, 2015). Observations of badgers in mid to high elevations in the eastern Cascades Mountains (King et al., 2021) suggest they may use these habitats more than previously thought, and future work may be aimed at a better understanding of environmental and human factors associated with their current distribution.

The American beaver's role in the environment is expansive. Beaver damming activities have historically played a substantial role in maintaining the health of Washington's watersheds, providing ecological benefits to wildlife, fish, and humans with increased water storage, suspended sediment reduction, and improved wetland habitat (Cooke & Zack, 2008; Dittbrenner et al., 2022). Historically, beavers were trapped out of many habitats in Washington, but beaver populations have recovered with regulated management and are now harvested statewide (Figure 4). However, many of their historic habitats have incurred changes that no longer support beavers (e.g., development, habitat degradation, drought). Beavers may also abandon a colonized site if the landscape no longer provides adequate vegetation or water supply or if it is in areas with high stream power. In human-occupied areas, beavers' destruction of riparian trees and flooding often results in human-wildlife conflict, which can lead to negative attitudes of the public towards beavers (Krueger et al., 2021) and possible lethal removal of beavers from conflict situations. Balancing the ecological benefits of beavers with the undesirable impacts to private property owners, agriculture, and infrastructure remains a WDFW management priority.

Figure 4. Distribution of beaver harvest by licensed trappers in Washington counties, 5-year average, 2019-2023.



Martens are habitat specialists, preferring mature forests at moderate to high elevations (Koehler et al., 1990). They require dense canopy cover, woody structures, and large trees for denning sites and hunting arboreal prey such as squirrels. Martens tend to avoid open areas and, consequently, can be sensitive to forest harvest practices, recreation, and road building (Moriarty et al., 2011). Information on marten occurrence patterns may be valuable for predicting the abundance or occupancy of rare forest carnivores, such as fisher (*Pekania pennanti*), and they are an important focal species for evaluating connectivity among patches of mature forest.

Alternatively, raccoons are habitat generalists and occur throughout much of the state. Their varied feeding habits help to recycle nutrients and disperse seeds throughout the environment. Although they prefer wetlands and damp woods in natural habitats, their ability to thrive on human-supplied foods, such as pet food and unsecured garbage in urban and suburban areas, has made them pervasive in these environments. Consequently, raccoons are among the top species cited in human-wildlife conflict in Washington (Duda et al., 2014), and many are lethally removed due to human-wildlife conflict or killed in vehicle collisions. Understanding raccoons' adaptability and the causes of human-wildlife conflict may help residents minimize future conflicts.

Based on their name, one may expect river otters to occupy freshwater habitats; however, they commonly occupy a variety of freshwater, brackish, and marine environments throughout Washington state and can travel long distances over land. River otters primarily eat fish and crustaceans but opportunistically prey on birds and small mammals. Due to concerns of predation on endangered fish species such as Pacific Salmon (*Oncorhynchus* spp.; Scordino et al., 2016) and rockfish (*Sebastes* spp.; Buzzell et al., 2014), and real or perceived competition with anglers for sport fish, river otter are commonly lethally removed from fish hatcheries and rearing ponds. Salmon consumption by otters and other species, such as black bears and raccoons, greatly benefit ecosystems by transferring rich marine nutrients into terrestrial habitats (Cederholm et al., 2000).

Population augmentation

The only augmentation that takes place for furbearer species in Washington is relocating beavers involved in human-wildlife conflict into unoccupied habitats. WDFW administers the Beaver Relocation Permit Program and permits trained and authorized individuals to relocate beaver to sites that meet specific habitat criteria (see https://wdfw.wa.gov/species-habitats/living/nuisance-wildlife/beaver-relocation).

The Washington State Legislature recognized the potential benefits of beaver relocation. It passed RCW 77.32.585 in 2012, directing WDFW to permit the release of wild beaver to areas of Washington to derive ecosystem benefits such as water storage, suspended sediment reduction, and improved fish habitat. In 2019, WDFW implemented a pilot program to issue permits that authorize beaver relocation (WDFW, 2022), and the program was made permanent in 2024 following public input and WDFW Fish and Wildlife Commission approval. This program resulted from work with tribal co-managers, conservation organizations, and other state and federal agencies in the Washington Beaver Working Group to refine relocation and coexistence methods while establishing criteria for issuing beaver relocation permits and provisions for beaver capture, housing, transport, release site selection, and other aspects of relocating beavers from human-wildlife conflict situations. The permit authorizes beaver relocation situations where beaver damage mitigation efforts have failed or are infeasible, where beavers pose a public health and safety risk, or where other irresolvable factors exist that preclude in-place management or tolerance. Consequently, this relocation program presents an opportunity to use beavers as a wetland restoration tool while offering landowners a non-lethal option for human-beaver conflicts and meeting the legislative requirements and objectives in the 2015-2021 Game Management Plan (WDFW, 2014). Collaborations with Indigenous Tribes, who perform beaver relocations on tribally owned and usual and accustomed lands, have been vital to developing and continuing WDFW's permitting program and beaver-related restoration across North America.

Management conclusions

Though WDFW recognizes the additional effort of pelt sealing and jaw collection by bobcat hunters and trappers, the data will allow WDFW better to manage the state's bobcat populations into the future and provides an opportunity for hunters and trappers to play an important role in conserving bobcats by helping monitor bobcat populations.

Many of the species listed as furbearers can commonly be found in human-occupied environments, and as a result, these species are commonly involved in human-wildlife conflict. Improving awareness and education of human-wildlife mitigation tools and coexistence methods is a management priority in the coming years.

A revision of distribution maps of one or more species is an agency goal identified in the 2015-2021 Game Management Plan (WDFW, 2014). To accomplish this, current occupancy and limiting distribution factors may be gleaned from harvest and trapping data, citizen observations, habitat characteristics and prey distribution, and research and surveys. In addition to the electronic WILD licensing system improvements for trapper reporting that began in 2022, enhanced reporting of non-harvest mortality (e.g., vehicle collisions, landowner kills, etc.) may provide a more comprehensive view of the impacts of all human-caused mortality. Together, these will allow WDFW to understand better population size and distribution, aid communication with the public and stakeholder groups, and provide a strong foundation for land and species management recommendations.

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Rabbit and Hare

Rabbit and Hare Statewide Status and Trend Report

Sarah Garrison, Statewide Small Game Specialist

Introduction

Several species of rabbits and hares, collectively referred to as lagomorphs, occur in Washington. Three of these are classified as game species with regulated annual hunting seasons: eastern cottontail (*Sylvilagus floridanus*), mountain or Nuttall's cottontail (*Sylvilagus nuttallii*), and snowshoe hare (*Lepus americanus*). The eastern cottontail was introduced to Washington and thrives in low-density human development where landscaping and agriculture provide food and cover. Eastern cottontails are particularly abundant in the Puget Sound area, though they occur in parts of eastern Washington as well. The mountain cottontail occurs throughout the Columbia Basin. Both cottontail species will use sagebrush, brushy riparian areas, and low-density human development, while the mountain cottontail also uses rocky outcrops for cover. Snowshoe hare occur statewide in forested areas. They prefer early to mid-successional forest habitats with dense understory cover. Snowshoe hare and cottontail rabbits are important prey species for a variety of avian and mammalian predators.

Management guidelines and objectives

The objectives for lagomorphs in Washington are to maintain healthy, sustainable populations in all suitable habitats within the state and to maximize recreational opportunities, as outlined in the Game Management Plan (WDFW, 2014).

1. Preserve, protect, perpetuate, and manage species and their habitats to ensure healthy, productive populations.
2. Manage wildlife species for a variety of recreational, educational, and aesthetic purposes, including hunting, trapping, scientific study, cultural and ceremonial uses by Native Americans, wildlife viewing, and photography.
3. Manage statewide populations for a sustained yield.

Hunting seasons and recreational harvest

The hunting season for cottontail rabbits (both eastern and mountain) and snowshoe hare opens September 1 and closes March 15 of the following year. The daily bag limit is five rabbits or hares, straight or mixed bag. The possession limit, also straight or mixed bag, is 15. These season dates have been in place since 1988 and limits have been in place since 1997.

For the past two decades, harvest and hunter participation were estimated based on a survey mailed to a stratified random sample of 25,000 license holders. This survey inquired about multiple small game species including game birds and generally targeted game bird hunters. Rabbit and hare hunters make up a very small portion of small game license holders and therefore are difficult to represent adequately in the survey sample. Due to the challenges of estimating from small sample sizes, this survey likely overestimated rabbit and hare harvest statistics. In 2022, WDFW replaced the mailed survey with an online survey of all small game license holders. This updated survey has the advantages of increased sample size and improved stratification. Additionally, a sample of hunters who did not respond to the online survey were called for a follow-up phone survey, which enabled correction for non-response bias. Due to these improvements in the survey and analysis, data from the 2022 season (Sept. 2022 – Mar. 2023) are more accurate but are not directly comparable to previous years.

Participation in cottontail rabbit and snowshoe hare hunting increased between the 2022 and 2023 seasons (Table 1). During the 2023 season, cottontail rabbit hunters increased by 15% and the number of days hunted increased by 74% from the 2022 season. Rabbit harvest increased by 80% in that period. Cottontail rabbit harvest was well distributed across the state in the 2023 season, with 56% of harvests taken in eastern Washington regions and 44% of harvests in western Washington regions (Figure 1). The South Central region provided the most rabbit harvests despite having few hunters relative to other regions. Hunters in this region spent more days hunting than hunters in other regions, which likely contributed to the increased harvests per hunter.

Table 1. Statewide estimates of Washington cottontail rabbit and snowshoe hare hunters, harvests, and hunting days with 95% confidence intervals (CI).

Species	Season	Harvests (95% CI)	Hunters (95% CI)	Days (95% CI)
Cottontail rabbits	2022	907 (728 – 1176)	729 (567 – 931)	4808 (3649 – 6365)
Cottontail rabbits	2023	1631 (1270 – 2123)	837 (678 – 1042)	8386 (6352 – 11033)
Snowshoe hare	2022	143 (103 – 250)	207 (159 – 287)	1125 (866 – 1660)
Snowshoe hare	2023	320 (237 – 496)	260 (209 – 342)	1680 (1335 – 2366)

Snowshoe hare hunters increased by 26% and the number of days hunted increased by 49% from the 2022 to 2023 seasons. Hare harvest more than doubled in that time. The majority of snowshoe hare harvests occurred in eastern Washington, with only 10% of harvests in western Washington (Figure 2). The North Central region provided the most hare harvests of any region, despite more hunting activity occurring in the Eastern region. For a map of WDFW Regions, see wdfw.wa.gov/about/regional-offices.

Figure 1. Estimated proportion of cottontail rabbit harvests, hunters, and number of days hunted in each region of Washington during the 2023 season.

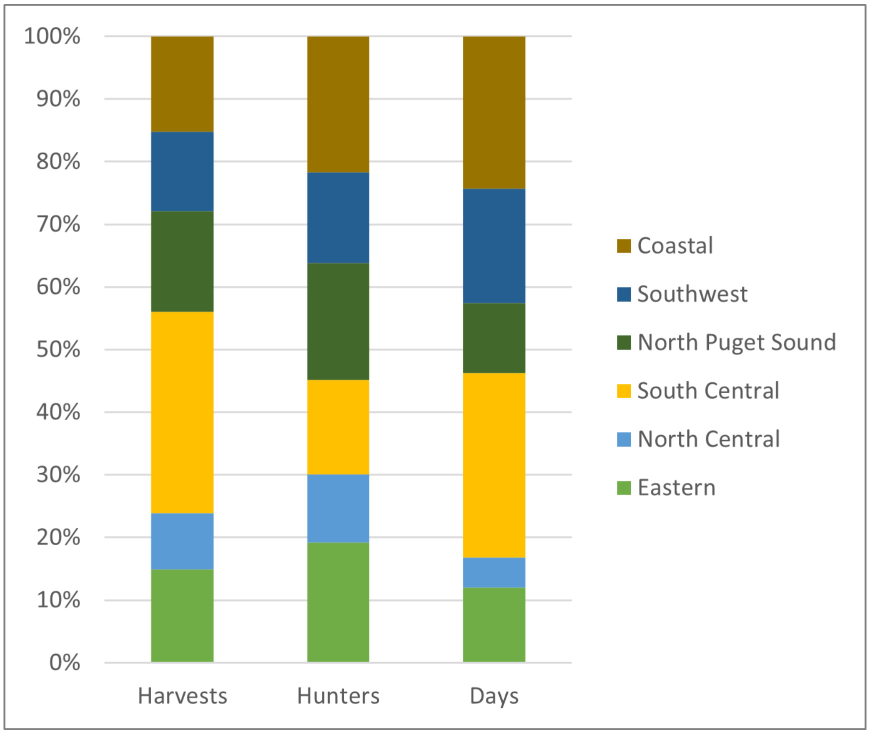
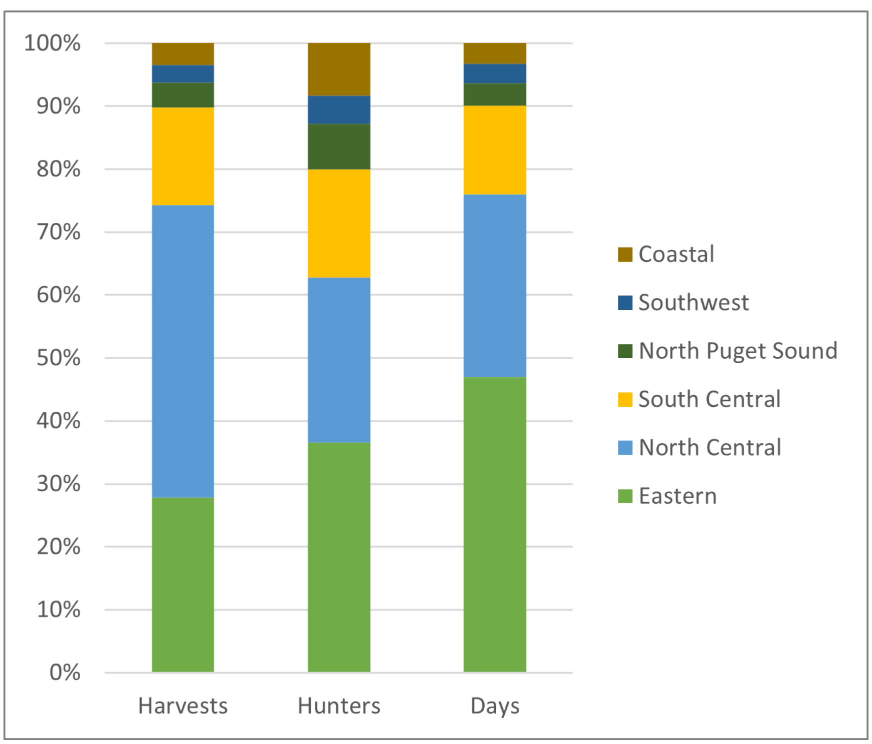


Figure 2. Estimated proportion of snowshoe hare harvests, hunters, and number of days hunted in each region of Washington during the 2023 season.

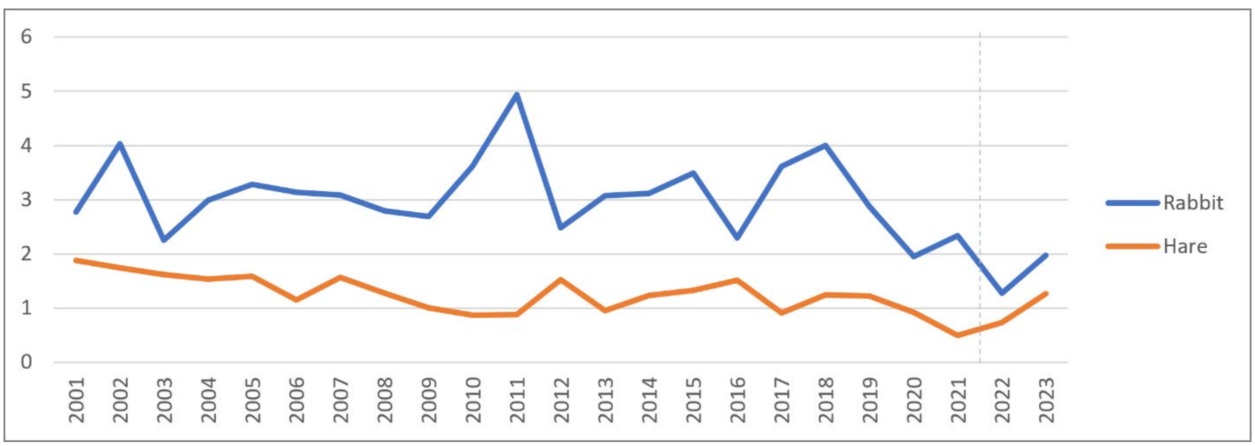


Population monitoring

Harvest and hunter effort data are used as an index to population trends. Standardizing harvest estimates by the amount of hunter effort expended to achieve that level of harvest can provide some indication of whether populations are increasing, decreasing, or stable. With the change in harvest data collection in 2022, results from this year are not directly comparable to data from past years.

The estimated number of cottontail rabbits harvested per hunter ranged between two and four between the 2001 and 2021 seasons, with the exception of 2011 when harvests per hunter were unusually high (Figure 3). The estimated number of snowshoe hare harvested per hunter has remained less than two since 2001, with the average hunter harvesting between one and two hares. An independent review of Washington's harvest data found no significant trend in hunt success for either cottontail rabbits or snowshoe hares between 1988 and 2012 (Brown et al., 2018), indicating populations are stable. The new harvest survey methodology resulted in an estimate of less than two rabbits per hunter for the 2022 season, which increased to about two in the 2023 season. The estimate for snowshoe hare was less than one hare per hunter in 2022, increasing to more than one in 2023.

Figure 3. Estimated number of cottontail rabbits and snowshoe hare harvested per hunter in Washington, 2001-2023[a].



[a] The vertical dashed line denotes change in survey methodology.

Lagomorph populations tend to have high productivity and low survival, leading to high annual variability depending on food availability, weather, predation, and other factors. Unlike snowshoe hares in northern boreal forests that exhibit strong cyclical population fluctuations, snowshoe hare populations appear acyclic in their southern range (Koehler 1990; Hodges et al., 2009; Kumar, 2020). (Kumar et al., 2022) found that warmer winters were associated with increased snowshoe hare density, while warmer summers and shorter snow duration were associated with decreased hare density in Montana. In central Oregon, drought conditions appeared to reduce juvenile production and survival of cottontails (McKay & Verts, 1978). Spring of 2021 was unusually warm and dry in Washington, leading to a record-breaking heat wave in June. This was followed by an extended drought season that likely limited forage throughout the summer and adversely impacted populations. Conversely, the spring of

2022 was unusually wet and cool, which should have benefitted lagomorphs by providing improved forage production throughout the season. In 2023, spring weather was typical and while some areas experienced moderate to severe drought, much of eastern Washington, particularly central Washington east of the Cascades, avoided drought and experienced good forage conditions through the summer.

WDFW funded snowshoe hare research to examine monitoring methods and to estimate hare densities in north-central Washington. Through this project, (Jensen et al., 2022) estimated hare densities between 0.16 and 1.58 hares per hectare based on sampling across both the Loomis State Forest and Colville National Forest, with an average density of 0.54 hares per hectare, which is comparable to other studies in the southern extent of the hare's range (Murray et al., 2002; McCann et al., 2010). Using these results to inform population models at the landscape scale for the Loomis State Forest specifically, (Jensen et al., 2021) estimated densities between 0.02 and 4.86 hares per hectare, with the highest densities in areas with increased horizontal cover and canopy cover in early to mid- successional stands. Based on a survey of Okanogan County small game hunters, Jensen and Thornton (2020 unpublished report) estimated that hunters harvested <1% of hares in Loomis State Forest each year between the 2017 and 2019 seasons.

Rabbit Hemorrhagic Disease Virus type 2 (RHDV2) is a highly contagious, fatal disease for rabbits that is transmitted through direct contact or contact with bodily fluids. RHDV2 has existed in Washington since 2019, primarily in domestic and feral domestic rabbits. The disease was first detected in a wild species in July 2023: an eastern cottontail on Whidbey Island. An abundant population of feral domestic rabbits exists on Whidbey Island and were heavily impacted by RHDV2 that summer. WDFW and the Washington Department of Agriculture are monitoring this disease.

Habitat

Cottontail rabbits use a wide variety of habitat types and can thrive in low-density human development. Particularly in western Washington, cottontail rabbits are abundant in human-dominated areas to the point of becoming a popular media topic (e.g., Kiley 2022). In eastern Washington, advancing agricultural practices such as the use of pivot sprinklers to replace flood irrigation and the reduction of weeds and other brushy cover may have degraded cottontail habitat. A reduction in sagebrush habitat with abundant vegetative cover may also impact the mountain cottontail. Efforts such as the Washington Shrubsteppe Restoration Initiative and the Conservation Reserve Program should benefit this species by protecting and restoring shrubsteppe and grassland habitats throughout Washington.

Snowshoe hare rely on dense understory vegetation in forested areas to provide forage and protection from predators. In north-central Washington, Koehler (1990) found snowshoe hare to be most abundant in 20-year-old lodgepole pine stands, while (Lewis et al., 2011) found that increased sapling density and moist forests were correlated with snowshoe hare pellet density. Results from Hutchen and Hodges (2019) indicate that snowshoe hares seek out post-fire areas with dense sapling regeneration but minimize their time in open post-fire stands. (Wilson et al., 2020) recommended habitat management that creates large patches of early successional habitat with dense vegetation to support snowshoe hare populations and to buffer potential impacts of climate change on hare habitat. Currently, research by Washington State University and the Washington Department of Natural Resources is investigating different types of potential refugia for hare following forest thinning projects.

Management conclusions

Cottontail rabbits and snowshoe hare have high productivity rates that allow their populations to sustain predation by various avian and mammalian predators and to rebound quickly when conditions are favorable. In Washington, populations appear to be stable and hunting pressure is low. Maintaining suitable habitats for these species is important to ensure populations are robust to increasing human development and human activity, changing climate and fire regimes, and novel disease threats. Continued monitoring will be important to detect changes in population trends.

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Band-tailed Pigeon and Mourning Dove

Band-Tailed Pigeon/Mourning Dove Statewide Status and Trend Report

Kyle A. Spragens, Waterfowl Section Manager

Introduction

Pacific Coast band-tailed pigeons and mourning doves are managed cooperatively with the U.S. Fish and Wildlife Service (USFWS) and western states through the Pacific Flyway Council (PFC). The PFC has developed management plans for these populations and, in 1994, established a population objective for band-tailed pigeons in Washington based on the WDFW call-count survey (PFC, 1994). Since that time, PFC has revised the population objective and established closure thresholds based on a new mineral site survey (PFC, 2010). Population objectives for mourning doves are being developed as part of the national mourning dove harvest strategy, but through coordinated banding efforts, estimates of absolute abundance are available since 2003 (USFWS, 2017; Seamans, 2023b). The proposed mourning dove harvest strategy aims to ensure the long-term conservation of mourning dove populations and to minimize the frequency of regulatory changes where Washington is part of the Western Management Unit (USFWS, 2017).

Population Surveys

Methods

Band-tailed Pigeon call-count Survey

The WDFW call-count survey was discontinued after 2003 but is presented in this report for comparison to the mineral site survey.

Band-tailed Pigeon Mineral Site Survey

In 2001, USGS-BRD (then the California Science Center) received a grant from USFWS to design a population index survey for use throughout the range of the Pacific Coast population of band-tailed pigeons. USGS conducted mineral site surveys at eight western Washington locations in 2001-03 (Overton & Casazza, 2004). These included two in Region 4 (Oyster Creek - Pigeon Point and Sumas Springs), one in Region 5 (Cedar Creek), and five in Region 6 (Lilliwaup, McAllister Creek, Mud Bay, Potlatch, and Red Salmon Creek). As part of an earlier grant, USGS-BRD evaluated several population survey techniques and found that an optimally timed mineral site survey offered statistical advantages over other surveys, including the WDFW call-count survey.

A final report on the mineral site survey was completed in 2004, and coastal states adopted the new mineral site survey as the official index for this population. In 2004, WDFW expanded surveys to 15 sites, as specified under protocols developed for the Pacific Flyway (Overton & Casazza, 2004). The 15 sites included the eight locations established in 2001, along with two in Region 4 (Lake Cavenaugh Rd.-Pefley and Warm Beach), four in Region 5 (Altoona, Newaukum River, St. Martin's Hot Springs, and Upper Kalama), and one in Region 6(Willapa Estuary). Since 2004, the site list has been modified due to access restrictions or other changes in status. In 2016, the Naselle River mineral site was added as operational to the index as it met the minimum criteria of a known naturally occurring mineral site and at least two annual counts (Table 2). In 2019, the main perch tree at Warm Beach was cut down, causing birds to scatter in distribution, and the logistics of future counts at this site are uncertain. In 2020 and 2021, WDFW staff initiated marking studies to identify potential mineral sites in regions of no historic records, with the use of transmitters, piloting the effort in the Chehalis River watershed and expanding to Clallam County drainages along the Strait of Juan de Fuca, in consultation with USGS and USFWS.

Mourning Dove call-count Survey

The mourning dove survey was discontinued by USFWS after the 2013 survey (Seamans & Sanders, 2014) and replaced by using annual band harvest recovery data. See the 'Banding and Harvest Recoveries' section below.

Results

Band-tailed Pigeon call-count Survey

Past call-count survey results are presented in Table 1 and Figure 1.

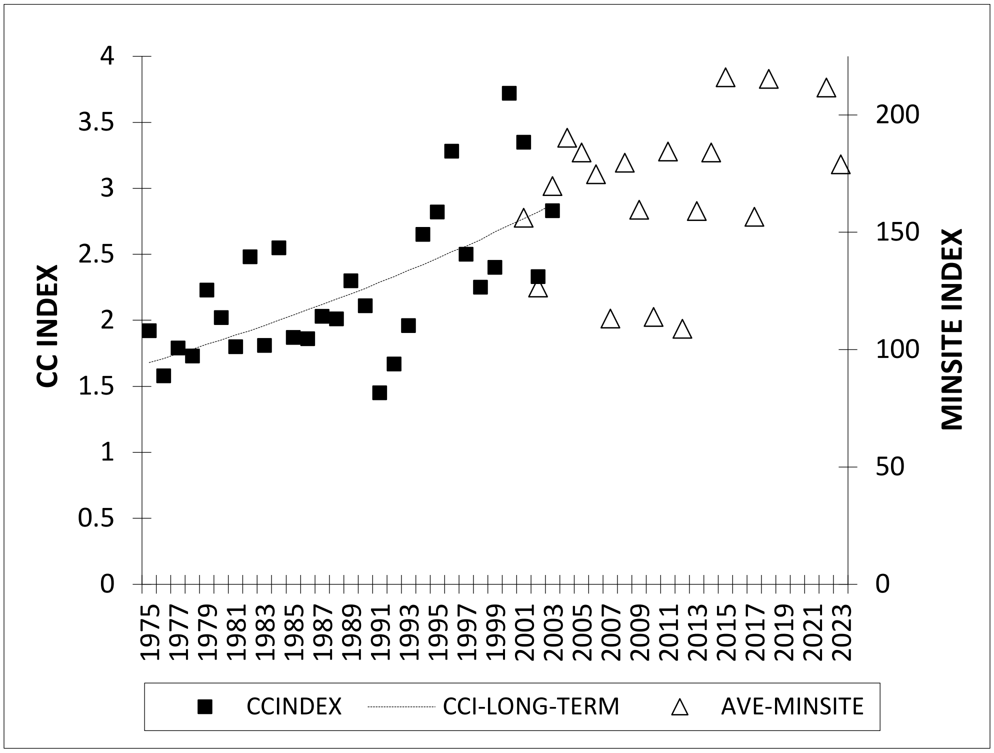
Band-tailed Pigeon Mineral Site Survey

Cooperators from WDFW and USFWS completed surveys at 15 approved sites during the July 10-20, 2023, survey period, with three additional preliminary counts at potential new mineral sites located using marked pigeons. These new sites must be confirmed for mineral concentration and be approved by the USFWS before being considered operational. Mineral site survey raw data summaries are presented in Table 2 and Figure 1. Complete 2023 survey results are available through USFWS (Seamans, 2023a).

Figure 1 and Table 1 show that based on the call-count survey, the band-tailed pigeon population generally increased from 1975-2003. The route regression method was less precise in determining short-term trends than long-term trends, as evidenced by the large confidence intervals for the two-year trends in Table 1. The large spans of these intervals were caused by low sample size due to changing observers from year to year.

The mineral site survey in 2001-2003 exhibited the same general trend as the call-count survey when the two surveys were run concurrently (Figure 1). This rough correlation can be used in the future to develop population objectives for WA consistent with the PFC management plan (PFC, 2010).

Figure 1. Historic comparison of band-tailed pigeon surveys.



Band-tailed pigeon historic call-count results and current time series of mineral site raw data summaries.

Hunting Seasons and Recreational Harvest

The band-tailed pigeon season was closed in Washington from 1991-2001. A limited season was reopened in 2002 and has continued since then, with season dates typically occurring between September 15-23 (9-day season by federal framework) and daily bag/possession limits of 2/6; however, since 2022, the 9-days have been placed to span two weekends starting the Saturday immediately following September 15. The mourning dove season was September 1-15 from 1980 through 2007. Since 2008, season frameworks have allowed for the Western Management Unit to allow up to 60 days, with Washington selecting September 1 – October 30 with a daily bag/possession limit of 15/45.

Methods

Band-tailed Pigeon Harvest Survey

Band-tailed pigeon harvest is estimated annually using mandatory harvest reporting. Written authorization and harvest reports have been required of band-tail hunters in western Washington since the season reopened in 2002. Hunters were required to return a harvest report card by September 30 to avoid a $10 penalty the following year. Reminders were sent out prior to the reporting deadline. Harvest reports returned by the deadline were included in the analysis as the ‘first wave’ of respondents. A special follow-up survey of non-respondents was conducted via a telephone survey through Washington State University. Responses from this survey were included as the ‘second wave,’ and then the harvest estimates were computed, accounting for the non-response bias.

Mourning Dove Harvest Estimation

In previous years, the Mourning dove harvest was estimated as part of the statewide hunter survey conducted by WDFW. In the 2023-2024 season, harvest estimates were derived via a non-mandatory reporting form in the agency's WILD system that was made available to all small game license holders, with a follow-up survey to estimate the response of hunters that failed to report (WDFW, 2023). This change in harvest estimation addressed three concerns compared to the traditional mail-in survey approach, including 1) bias from low participation to the mail-in version, 2) sample size for certain species at the county level was very difficult to attain through mail-in participation, and 3) stratification based on point-of-sale questions to derive the 25,000 annual participants as many hunters belong to multiple strata and some license dealers may not have asked all questions to expedite the transaction. This new framework is encouraging, but comparisons to previous years should be cautioned against in the first few years as more hunters become familiar with the reporting tool. Therefore, single-year values are presented, but not relative change for each respective estimate.

Banding and Harvest Recoveries

Mourning dove season regulations are informed by harvest rates derived from banded birds annually deployed during operational pre-season efforts conducted since 2003 (Seamans, 2023b). WDFW staff have deployed bands on mourning doves at varying levels of effort since 1954, but most consistently since 2003, to assist in harvest management informed by derivation of annual survival and harvest rates for the Western Management Unit (WMU). These efforts are guided by the Mourning Dove National Strategic Harvest Management Plan, with endorsement from all four flyways (USFWS, 2017). Banding quotas for 'known age' mourning dove are distributed within the states by Bird Conservation Regions (BCRs). As part of the Western Management Unit for mourning dove, Washington is tasked with banding in the three BCRs, with the Great Basin (BCR-9) responsible for 82% (229 of 279 known After Hatch Year, and 182 of 221 known Hatch Year) of the statewide expectation (Otis, 2009).

Results

Band-tailed Pigeon Harvest

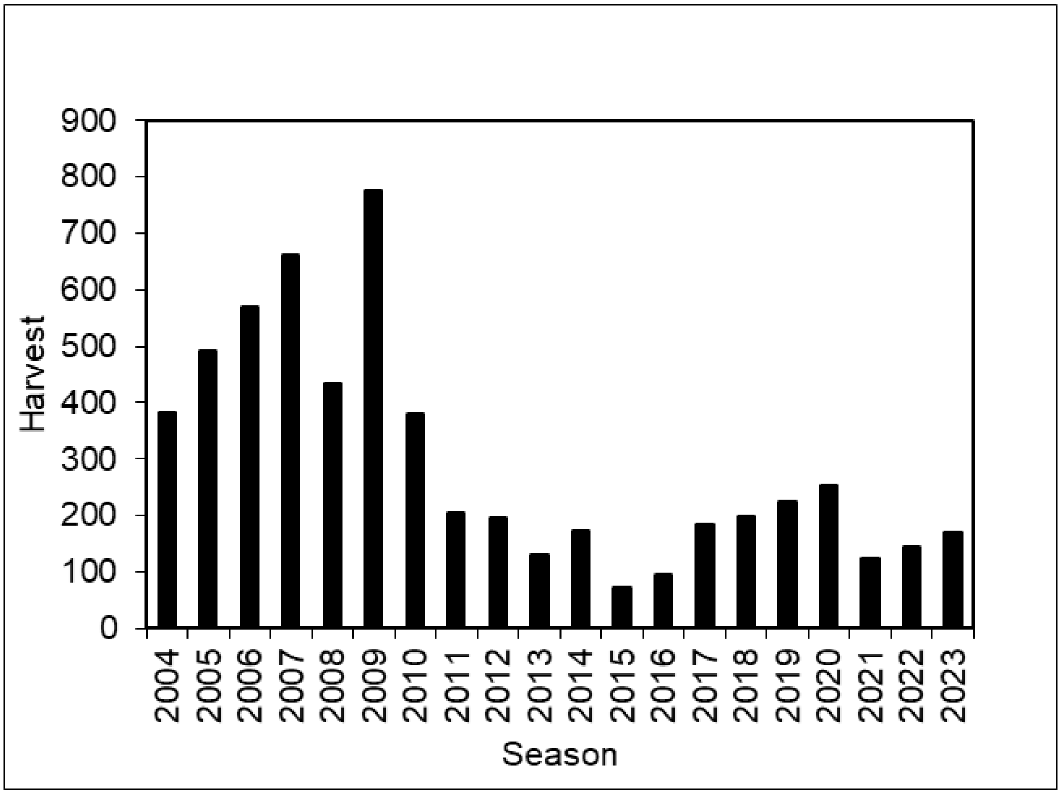
Harvest and hunter activity for the 2002-2023 seasons are summarized in Figures 2 and 3, and Table 3.

Mourning Dove Harvest

As measured by WDFW (2023) small game surveys, harvest in 2023 was estimated at 28,423 doves (Figure 4). Hunter numbers were estimated at 1,960 dove hunters. The number of days hunted was estimated to be 7,110 days afield. When the number of doves harvested per hunter is considered, the 2023 estimate of 14.5 doves per hunter is among the highest dove-per-hunter success rates, ranking third overall, since 1970 (Figure 4). The highest value was recorded in 2022 at 15.5 doves per hunter. This level of harvest per hunter consistently places Washington fourth among Pacific Flyway states with mourning dove harvest, behind California, Arizona, and Idaho (Seamans, 2023b).

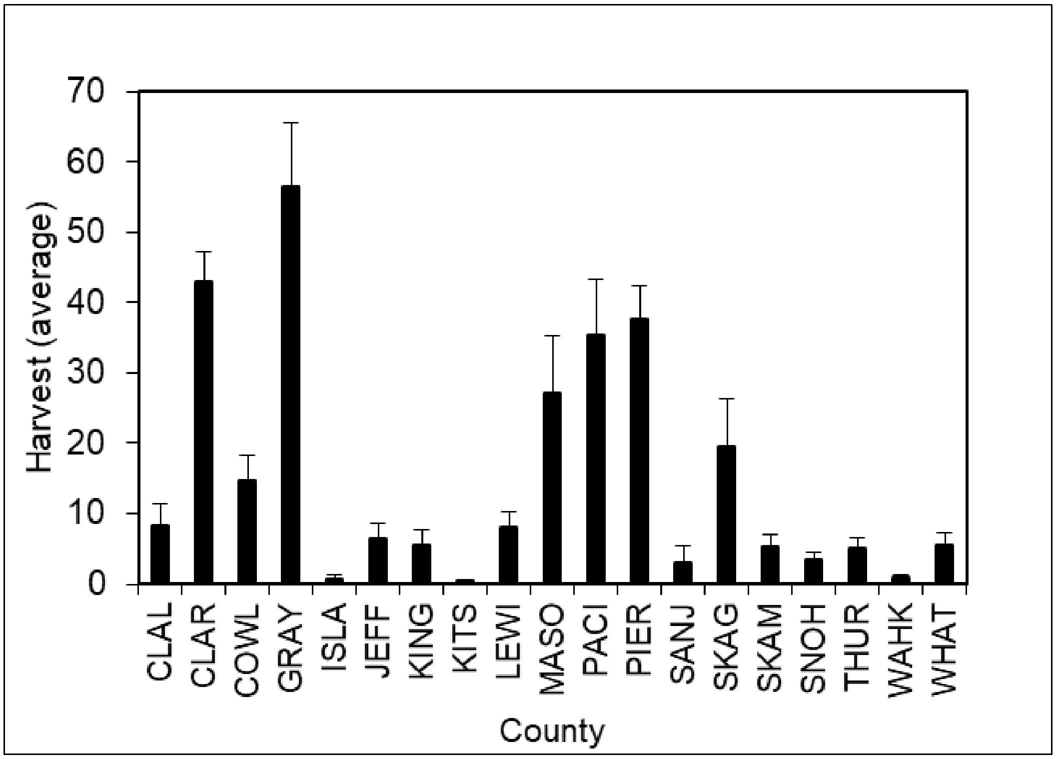
A total of 1,281 mourning doves were banded statewide and used in analyses of survival and harvest rates (Seamans, 2023b *see* Table 4). A total of 47 banded mourning dove recoveries were reported by hunters during the 2023-2024 season. The majority of harvest recoveries were reported from Washington (43), with two harvest recoveries from California and two from Mexico (Figure 5). Within Washington, the majority of harvest recoveries were reported from the Columbia Basin and Yakima Valley, and one harvest recovery was reported from western Washington (Figure 5 inset).

Figure 2. Band-tailed pigeon total harvest.



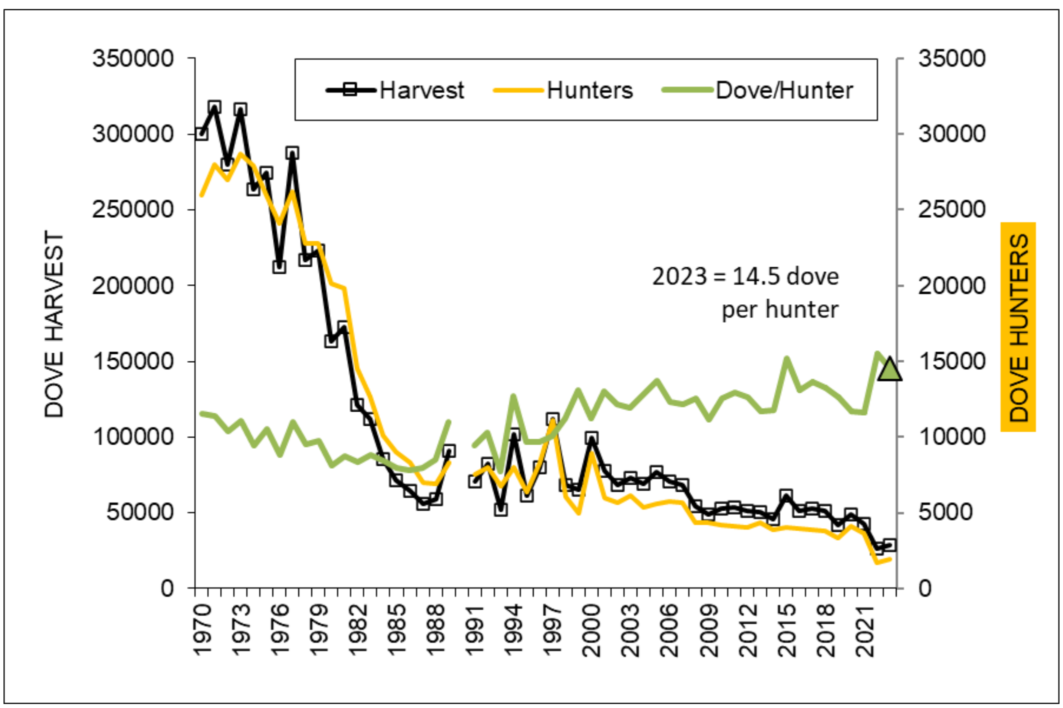
Band-tailed pigeon total harvest since 2004 when a season reopened per Pacific Flyway Management Plan.

Figure 3. Band-tailed pigeon harvest.



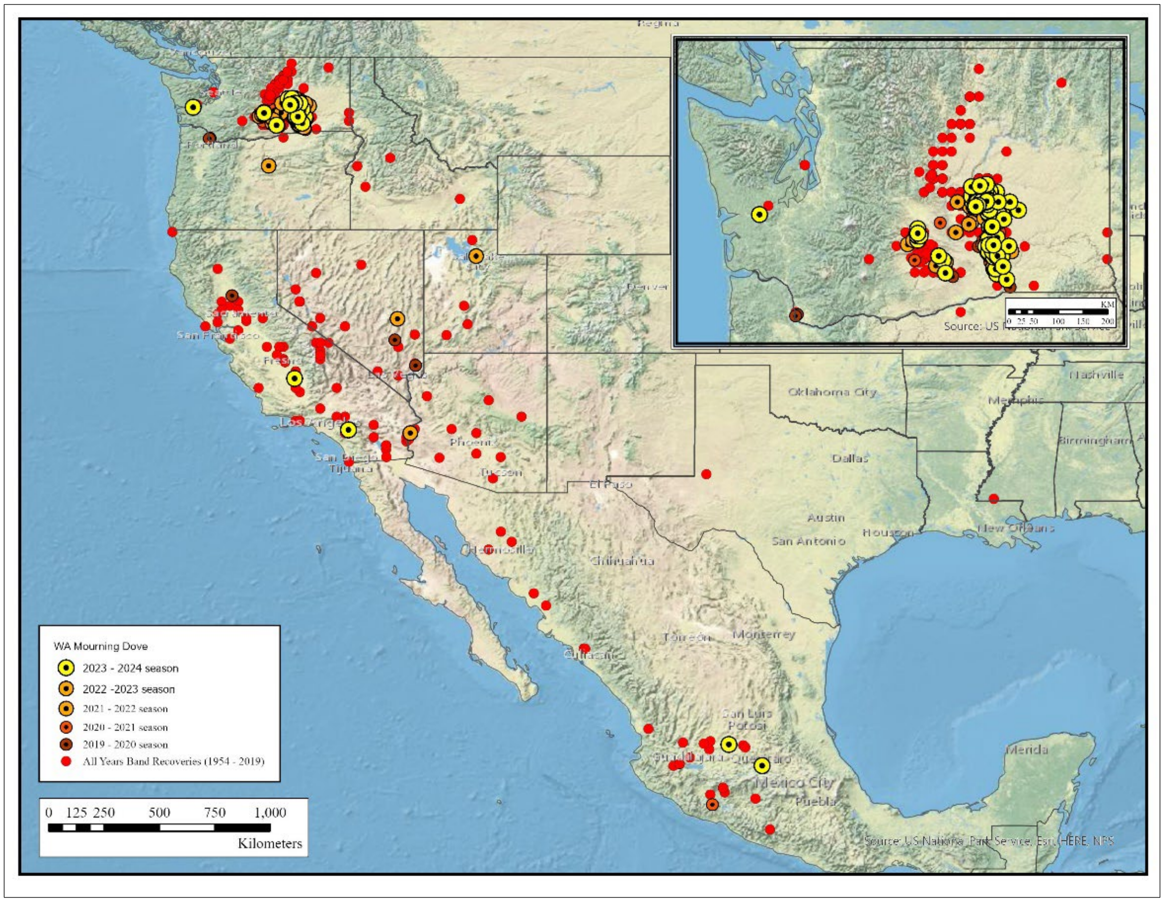
Band-tailed pigeon (2002-2023) average annual harvest by county.

Figure 4. Mourning dove statewide harvest.



Mourning dove statewide harvest and hunter numbers 1970-2023. The dove per hunter average was 14.5 during the 2023 season (green triangle), above the long-term average of 11.1 dove per hunter.

Figure 5. Mourning dove harvest recoveries.



Mourning dove harvest recoveries from birds banded in Washington. Harvest recoveries from the 2023 season (n = 47; yellow dots) in comparison to harvest distribution patterns dating back to 1954.

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Table 1. Band-tail call-count survey results - route regression method.

Start Year	End Year	Change	90% LCI	90% UCI	Routes Used	P Value
1975	1992	-7.8%	-14.0%	-2.0%	63	p<0.05
1991	1992	10.1%	-50.0%	75.0%	11	n.s.
1975	1993	-6.0%	-11.0%	-1.0%	65	p<0.05
1992	1993	44.0%	-49.0%	152.0%	13	n.s.
1975	1994	-3.4%	-8.2%	1.4%	69	n.s.
1993	1994	71.0%	1.4%	141.0%	24	p<0.05
1975	1995	-2.7%	-9.8%	4.5%	70	n.s.
1994	1995	12.1%	-31.3%	55.3%	12	n.s.
1975	1996	-0.8%	-6.5%	4.9%	59	n.s.
1992	1996	24.3%	10.4%	38.2%	30	p<0.01
1995	1996	36.4%	-35.9%	108.7%	18	n.s.
1975	1997	-0.8%	-6.0%	4.3%	62	n.s
1993	1997	8.9%	0.2%	17.6%	32	p<0.10
1996	1997	-14.3%	-35.4%	6.7%	18	n.s.
1975	1998	-1.5%	-5.5%	2.4%	65	n.s.
1994	1998	2.1%	-8.7%	13.0%	34	n.s.
1997	1998	-11.0%	-45.8%	23.9%	11	n.s.
1975	1999	-0.1%	-4.1%	3.8%	67	n.s.
1995	1999	-3.3%	-11.5%	4.9%	38	n.s.
1998	1999	26.7%	-19.7%	73.1%	14	n.s.
1975	2000	-0.3%	-6.2%	5.5%	70	n.s.
1996	2000	5.9%	-2.3%	14.1%	41	n.s.
1999	2000	21.1%	-12.5%	54.8%	24	n.s.
1975	2001	1.7%	-2.3%	5.7%	70	n.s.
1997	2001	15.8%	8.0%	23.6%	44	p<0.01
2000	2001	1.8%	-16.6%	20.2%	36	n.s.
1975	2002	0.7%	-3.7%	5.0%	71	n.s.
1998	2002	9.4%	2.6%	16.2%	45	P<0.05
2001	2002	0.9%	-27.5%	25.8%	32	n.s.
1975	2003	1.8%	-1.7%	5.4%	71	n.s.
1999	2003	0.6%	-4.8%	5.9%	48	n.s.
2002	2003	5.2%	-30.5%	40.8%	25	n.s.

Table 2. Washington band-tailed pigeon mineral site survey raw data 2004-2013.

Location	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Altoona	64	0	5	0						
Cedar Cr.	215	185	231	191	312	163	154		142	181
Cosmopolis*										
L. Cavenaugh - Pefley	108	172	76	71	117	70	89	113	146	156
Lilliwaup	199	143	273	141	89	110	123	167	74	210
McAllister	124	174	87	25	136	46	134	107	102	77
Moclips**										
Morse Creek^										
Mud Bay	134	371	294	95	203	130	70	175	87	214
Oyster Cr. – Pigeon Pt.	474	542	293	157	331	314	190	344	121	51
Naselle River										
Newaukum	634	167	335	309	219					
Potlatch	297	285	306	168	295	480	129	297	288	333
Red Salmon	179	103	64	33	107	41		0	47	5
Soda Springs									58	112
St. Martins	220	128	191	189	141	210	214	439	180	308
Sumas	46		68					78	17	82
U. Kalama	110	225	327	120	350	317	111	368	258	245
Totten -Oyster Bay							119	53	101	192
Warm Beach	48	58	62	83	36	29	29	72	10	60
Willapa	3	24	10	3	0	5	5		2	
Uncorrected Totals	**2855**	**2577**	**2622**	**1585**	**2336**	**1915**	**1367**	**2213**	**1633**	**2226**

* = Cosmopolis (potential); located by 3 marked individual pigeons, site sampled for mineral concentration, count not official.

** = Moclips (potential); located by 2 marked individual pigeons, site sampled for mineral concentration, count not official.

^ = Morse Creek (previously identified); revisited site identified by USGS report, but no pigeons were recorded during the survey attempt in 2021. However, 2023 adjustments to the site's vantage point in relation to marked pigeon locations were successful.

Table 2 *(cont.)*. Washington band-tailed pigeon mineral site survey raw data 2014-2023.

Location	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Altoona										
Cedar Cr.	267	207	306	246	145	308	187	190	117	119
Cosmopolis*								664		179
L. Cavenaugh - Pefley	110	98	149	148	83	67				
Lilliwaup	197	178	251	143	292	390	285	350	374	218
McAllister	78	90	105	111	78	44	96	97	102	29
Moclips**										36
Morse Creek^								0		128
Mud Bay	136	297	208	187	349	594	264	263	239	220
Oyster Cr. – Pigeon Pt.	39	14		6	226	75	188	126	290	98
Naselle River		184	115	37	42	292	107	199	36	22
Newaukum							486	125	255	249
Potlatch	254	506	406	396	556	718	465	474	240	389
Red Salmon		93		43		180	162	291	255	199
Soda Springs		193	259	246	106	101	89	220	125	93
St. Martins	354	435	507	83	279	283	126	313	209	286
Sumas	74	78		96	152	64	101	91	108	138
U. Kalama	187	322	321	243	471	539	476	704	286	289
Totten -Oyster Bay	332	486	388	308	221	443	365	424	328	350
Warm Beach		33	223	57	16					
Willapa										

* = Cosmopolis (potential); located by 3 marked individual pigeons, site sampled for mineral concentration, count not official.

** = Moclips (potential); located by 2 marked individual pigeons, site sampled for mineral concentration, count not official.

^ = Morse Creek (previously identified); revisited site identified by USGS report, but no pigeons were recorded during the survey attempt in 2021. However, 2023 adjustments to the site's vantage point in relation to marked pigeon locations were successful.

Table 3. Washington state band-tailed pigeon harvest report summary.

Year	Permits Issued	Days Afield	Total Harvest	County Ranked First	#	County Ranked Second	#	County Ranked Third	#
2002	522	357	273	Grays	47	Clallam	37	Skagit	33
2003	657	337	574	Skagit	99	Pierce	82	Cowlitz	54
2004	766	209	383	Grays	104	Mason	48	Pacific	37
2005	809	382	492	Skagit	97	Grays	76	Mason/Pierce	62
2006	909	315	569	Pierce	85	Skagit	74	Pacific	73
2007	894	364	661	Grays	145	Mason	84	Pacific	80
2008	917	247	434	Grays	103	Pacific	82	Mason	59
2009	567	548	776	Pacific	136	Grays	129	Mason	126
2010	632	362	381	Grays	83	Pacific	56	Pierce	43
2011	178	151	205	Clark	48	Grays	47	San Juan	45
2012	237	195	196	Grays	55	Pacific	47	Pierce	34
2013	244	85	129	Pierce	42	Pacific	33	Grays Harbor	26
2014	266	191	172	Grays	55	Clark	44	Pierce	36
2015	249	96	72	Pierce	28	Clark	19	Cowlitz	9
2016	253	112	94	Pierce	28	Clark	26	Grays Harbor	18
2017	212	192	183	Clark	57	Pierce	34	Grays Harbor	31
2018	220	222	198	Clark	67	Grays	50	Pierce	34
2019	98	266	226	Clark	55	Grays	20	Pierce	17
2020	206	269	253	Grays	49	Clark	36	Pacific/Pierce	20
2021	734	157	123	Clark	46	Grays	31	Pierce	18
2022	971	213	145	Clark	50	Grays	24	NA	NA
2023	882	230	169	Cowlitz	70	Clark	24	NA	NA

Waterfowl

Waterfowl Statewide Breeding Populations and Production Status and Trend Report

Kyle A. Spragens, Waterfowl Section Manager
Matthew D. Hamer, Assistant Waterfowl Biologist
Joseph R. Evenson, Sea Duck and Survey Specialist
Matthew T. Wilson, Waterfowl Specialist

Introduction

This report summarizes waterfowl productivity data collected during 2023 and 2024 in Washington State, including information on breeding waterfowl populations from aerial surveys and annual banding operations. The Washington Department of Fish and Wildlife (WDFW), with additional support from a network of partners, including the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service (USFWS), Stillaguamish Tribe of Indians, Kalispel Tribe of Indians, Yakama Indian Nation, Colville Confederated Tribes, Washington Waterfowl Association, and Chelan County Public Utility District contributed field logistics and data. Monitoring indices, figures, and tables reflect the most recent information available and have been updated where field logistics allow.

Population surveys

Duck breeding population survey methods

Historical surveys to estimate breeding duck populations in eastern Washington were conducted annually within seven strata in eastern Washington: West Okanogan Potholes, Omak-Douglas Potholes, Far East Potholes, Northeast, and Palouse Streams, Columbia Basin Irrigated, and Yakima Valley Irrigated (Figure 1). Surveys were conducted by ground counts of transects or sections, except helicopter counts, which were used for the 1/4-sections in the Desert Wildlife Area (Frenchman and Winchester Wasteways) within the Columbia Basin Irrigated strata (Figure 1). Samples were multiplied by weighting factors to provide an index to the total number of breeding ducks and coots within the defined areas (Table 1). The proportion of areas within the sampled strata determined weighting factors. Observations were treated as complete counts within sampling units (transects or quadrats) with no corrections for visibility bias.

Due to concerns about the design of past surveys (lack of random sample selection and variance estimates), WDFW began the process of redesigning the eastern Washington waterfowl breeding population survey in 2008, in conjunction with staff from the USFWS Pacific Flyway office formerly in Portland, OR, and the USFWS Branch of Population and Habitat Assessment in Laurel, MD. The updated design consists of randomly selected ¼ mile-wide strip transects flown from helicopters to replace the past survey design. The updated survey aims to provide breeding population indices (with variance estimates) comparable to surveys conducted in other parts of the Pacific Flyway for inclusion in the western mallard management protocols adopted by USFWS in 2008. The new and old survey designs were run concurrently for three years (2009-11), and the old design was discontinued after the 2011 survey. The new survey design (including the Irrigated, Potholes, and Northeast Highlands strata) was modified in 2012 to address continued safety and efficiency concerns for the Northeast Highlands stratum (Figure 2). As a result, transects in this stratum were placed at 10-mile intervals on an east-west orientation across major river valleys. In addition, minor boundary adjustments were made to other stratum boundaries, including eliminating Saddle Mountain from the Irrigated stratum. Overall, observers surveyed approximately 1,688 transect miles in eastern Washington over a 5-day period between May 6-10, 2024.

Beginning in 2010, strip-transect surveys, similar to the updated eastern Washington survey, were developed and flown for the western Washington breeding waterfowl population survey (Figure 3). Observers surveyed approximately 984 transect miles in western Washington over a 4-day period between April 29 and May 2, 2024.

Figure 1. Historic waterfowl breeding survey areas.

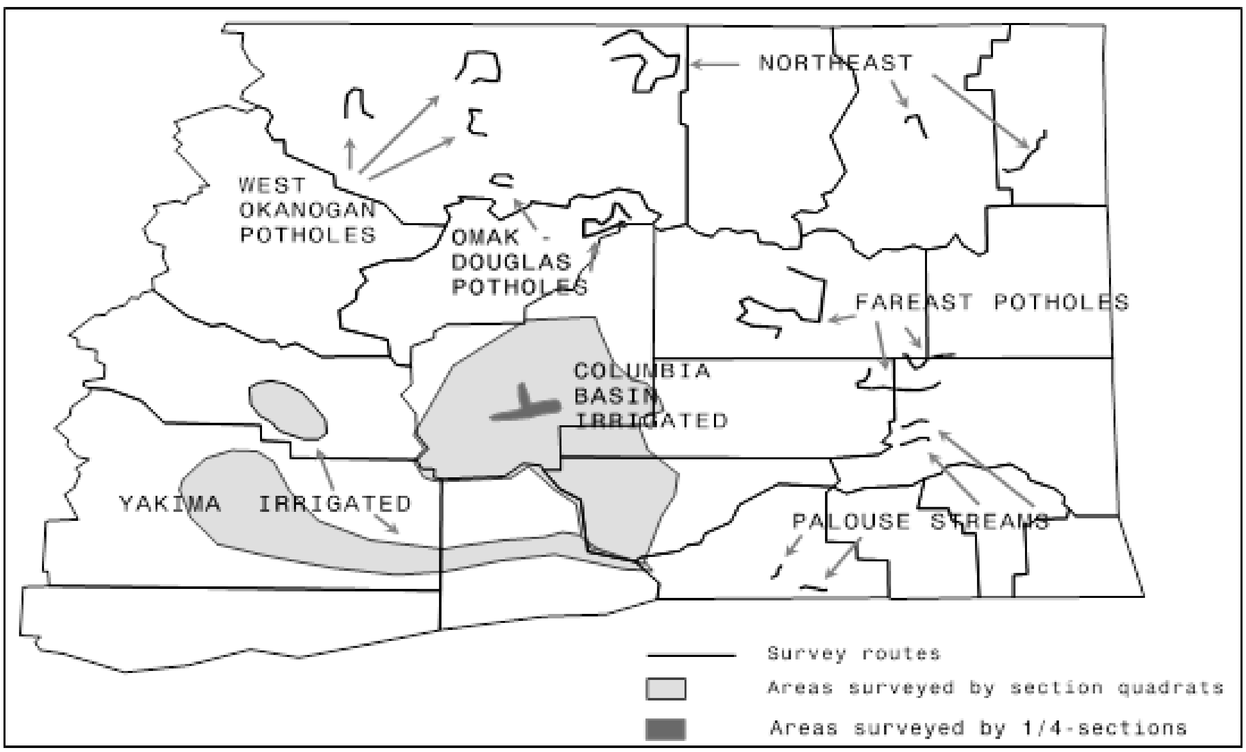


Table 1. Areas and subareas historically surveyed with weighting factors for pond indices and duck and goose breeding surveys.

Area	Subarea	Survey	Weighting factor	% of total area sampled
Potholes	West Okanogan		14.06	7.1
		Methow Valley		
		Salmon Creek		
		Sinlahekin		
	Omak Lake		9.83	10.2
	Douglas County		15.26	6.5
	Far East Potholes		18.69	5.3
		Ewan-Revere		
		Sprague-Lamont		
	Lincoln County		47.59	2.1
Highland	Northeast		25.53	3.9
		Colville		
		Cusick		
		Molson-Sidley		
	Palouse Streams		32.52	3.1
		Union Flat		
		Palouse River		
		Walla Walla River		
		Touchet River		
Irrigated	Columbia Basin	65 sections	37.24	2.7
	Wasteways[a]	19 ¼ sections	10.05	9.9
	Yakima	35 sections	24.49	3.9

[a] Surveyed by helicopter beginning in 1994.

Figure 2. Aerial breeding waterfowl survey transects flown in Eastern Washington.

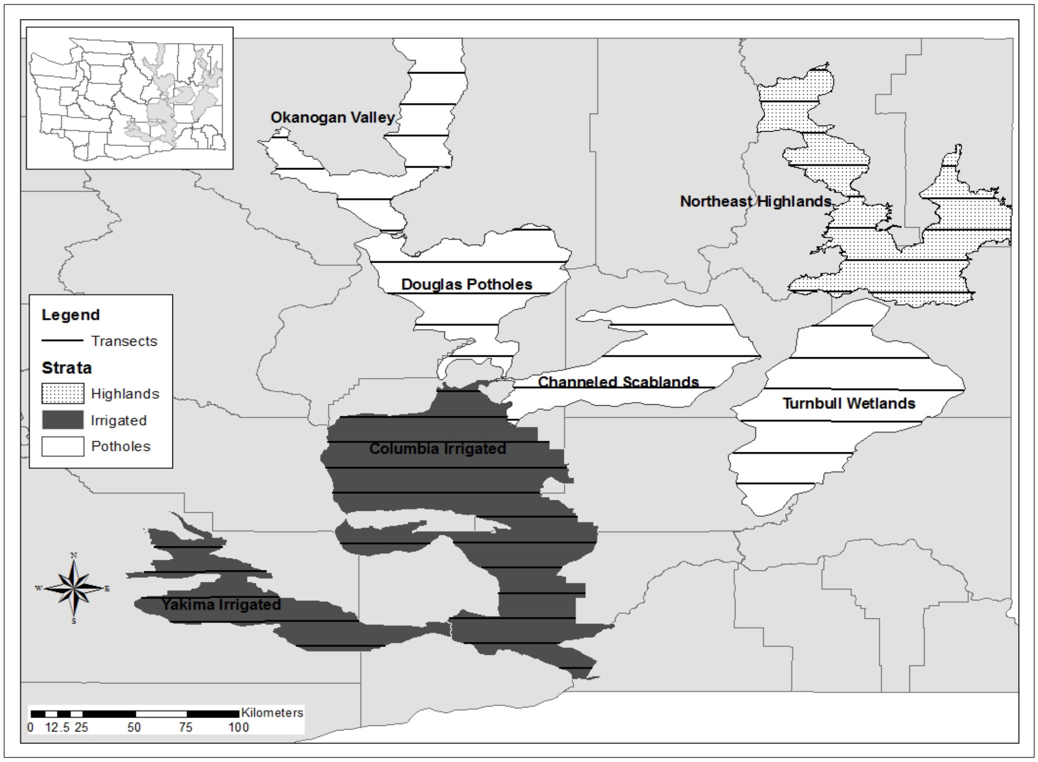
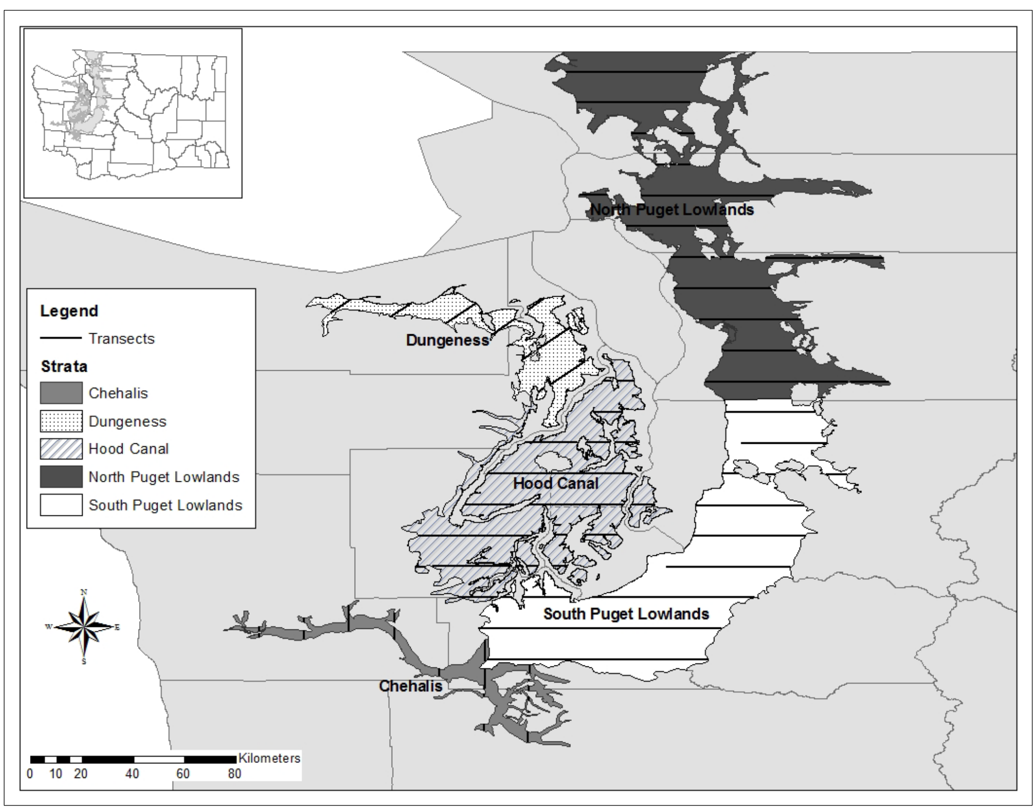


Figure 3. Aerial breeding waterfowl survey transects flown in Western Washington.



The modifications to the survey design and areas during the initial years of the aerial survey created difficulties in comparing results across years. Survey results from 2009-2012 were reevaluated and standardized by matching strata boundaries to the survey boundaries used in 2013 to address this issue. Transects and observations from 2009-2012 that fell outside 2013 strata boundaries were dropped from analyses. Data from the Highlands in 2010 and 2011 were also excluded from analyses due to different survey methods.

Methods for estimating the total number of breeding ducks follow the Standard Operating Procedures of Aerial Waterfowl Breeding Ground Population and Habitat Surveys in North America (USFWS & CWS 1987). Breeding populations are estimated by multiplying the number of pairs, lone drakes, and flocked drakes (<5 male birds) by two and grouped birds (mixed or >5 males) by one. Lone hens are multiplied by one for redhead, scaup, ring-necked duck, and ruddy duck only. These diver species are known to be late nesters, and males significantly outnumber females.

Results

The 2024 statewide total breeding duck estimate was 160,027 (SE 11,906), a decrease of 21.9% compared to 2023 and 18% below the survey's long-term average (Table 2, Figure 4). The 2024 total breeding duck estimate was 90,534 (SE 8,325) across the three eastern Washington strata (Table 3). During the 2024 breeding population survey, observations of mallards show wide distribution with varying densities across all strata. Eastern Washington 2024 total mallards numbered 43,135 (SE 5,494; Table 3, Figure 5). Gadwall was the second most numerous species on the eastern Washington survey (18,600; SE 4,688), followed by redhead (7,801; SE 2,979), northern shoveler (6,647; SE 2,197), scaup (3,139; SE 1,005), green-winged teal (2,031; SE 835), and ruddy duck (1,919; SE 624; Figure 6). The Potholes stratum comprised 46.7% of the eastern Washington total duck count in 2024, followed by the Irrigated stratum (34.1%) and the Highlands stratum (19.2%; Figure 7). Compared to the 2023 survey, the 2024 total breeding duck estimate decreased by 15.5% in eastern Washington.

The 2024 revised survey design for western Washington estimated the total breeding duck population at 69,493 (SE 8,511; Table 2). Estimated mallards numbered 43,225 (SE 7,815), followed by green-winged teal (6,434; SE 2,111), wood duck (5,222; SE 737), northern shoveler (2,910; SE 1,855), and ring-necked duck (2,517; SE 509; Figure 8, Table 3). The North Puget Lowlands stratum held the majority of breeding ducks in 2024 (38.6%), followed by the South Puget Lowlands (33.7%), Chehalis River Valley (12.3%), Dungeness (10.9%), and Hood Canal (4.5%; Figure 9).

Table 2. Summary of the 2024 statewide breeding waterfowl survey in Washington in comparison to Long Term Average of these aerial survey transects (2010-2024).

Species	2024 Statewide	2023 Statewide	Long-Term Average (LTA)	% Change from LTA
Mallard	86,360	102,011	91,622	**-6%**
Gadwall	20,845	14,404	19,005	**10%**
Wigeon	3,178	4,663	7,078	-55%
Green-winged Teal	8,465	16,716	10,889	-22%
Cinnamon/Blue-winged Teal	2,172	6,365	11,034	**-75%**
Northern Shoveler	9,558	9,099	9,853	-3%
Northern Pintail	252	4,875	1,632	-85%
Redhead	7,801	3,086	7,387	6%
Canvasback	0	0	228	
Scaup (combined)	3,139	7,299	4,153	-24%
Ring-necked duck	3,243	6,899	6,196	-48%
Goldeneye	0	82	360	
Bufflehead	3,033	8,814	6,631	-54%
Ruddy duck	1,919	11,019	10,066	-81%
Common merganser	2,811	1,831	2,035	38%
Hooded merganser	1,187	1,329	822	44%
Wood duck	6,066	6,422	5,786	5%
Subtotal	160,027	204,913	194,775	-18%

Table 3. Summary of the 2024 western and eastern subtotals from the statewide breeding waterfowl survey in Washington.

Species	2024 Western WA	2024 Eastern WA	2024 Statewide
Mallard	43,225	43,135	86,360
Gadwall	2,245	18,600	20,845
Wigeon	1,409	1,769	3,178
Green-winged Teal	6,434	2,031	8,465
Cinnamon/Blue-winged Teal	509	1,663	2,172
Northern Shoveler	2,910	6,647	9,558
Northern Pintail	60	192	252
Redhead	0	7,801	7,801
Canvasback	0	0	0
Scaup (combined)	0	3,139	3,139
Ring-necked duck	2,517	726	3,243
Goldeneye	0	0	0
Bufflehead	2,201	831	3,033
Ruddy duck	0	1,919	1,919
Common merganser	1,733	1,078	2,811
Hooded merganser	1,028	158	1,187
Wood duck	5,222	844	6,066
Subtotal	69,493	90,534	160,027

Figure 4. Statewide duck breeding population survey results by species, 2016-2024.

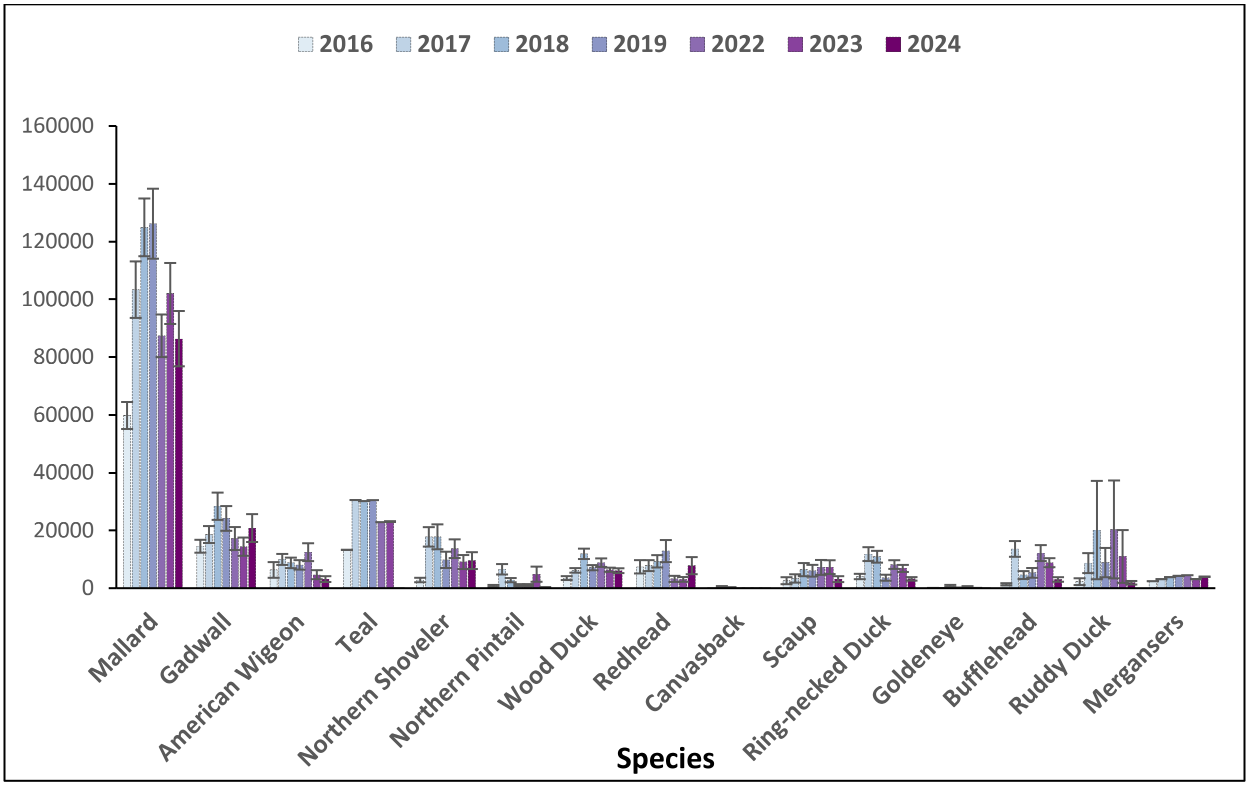


Figure 5. Mallard observation across strata during breeding waterfowl survey in 2024.

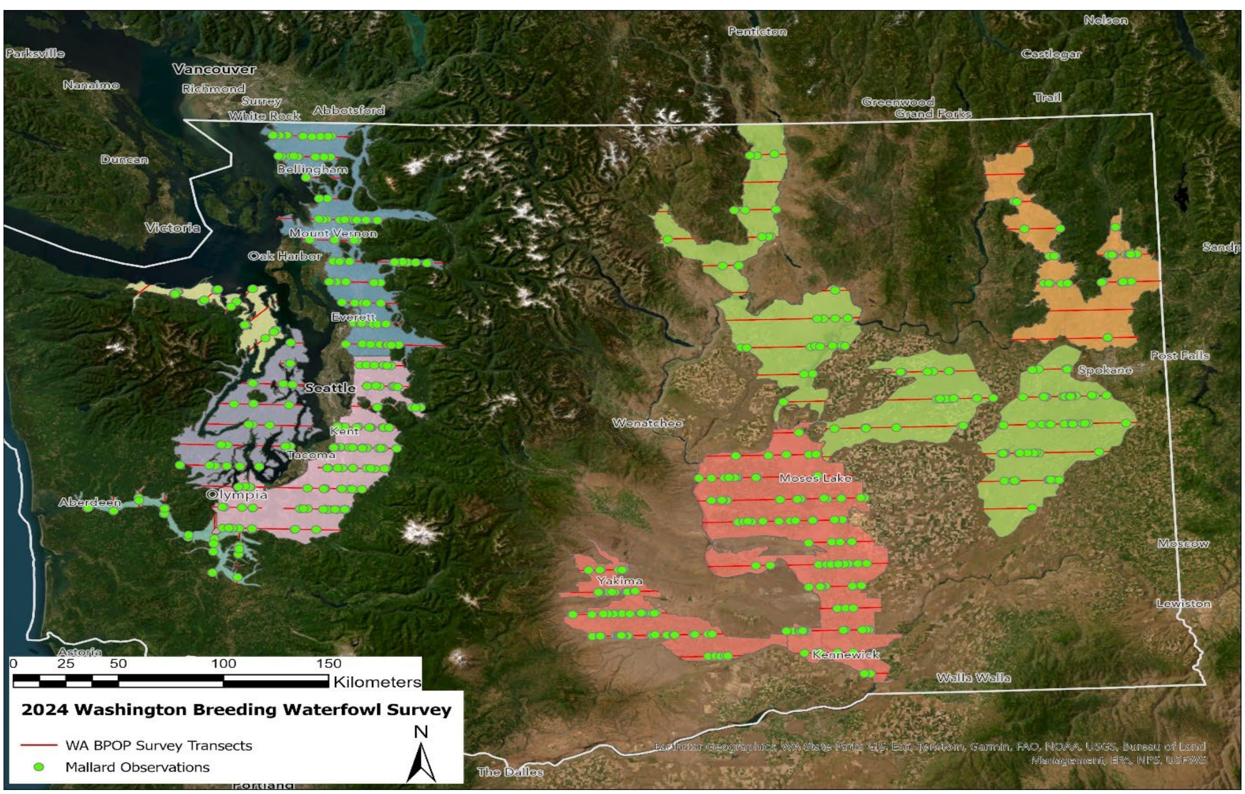


Figure 6. Eastern Washington duck breeding population survey results by species, 2016-2024.

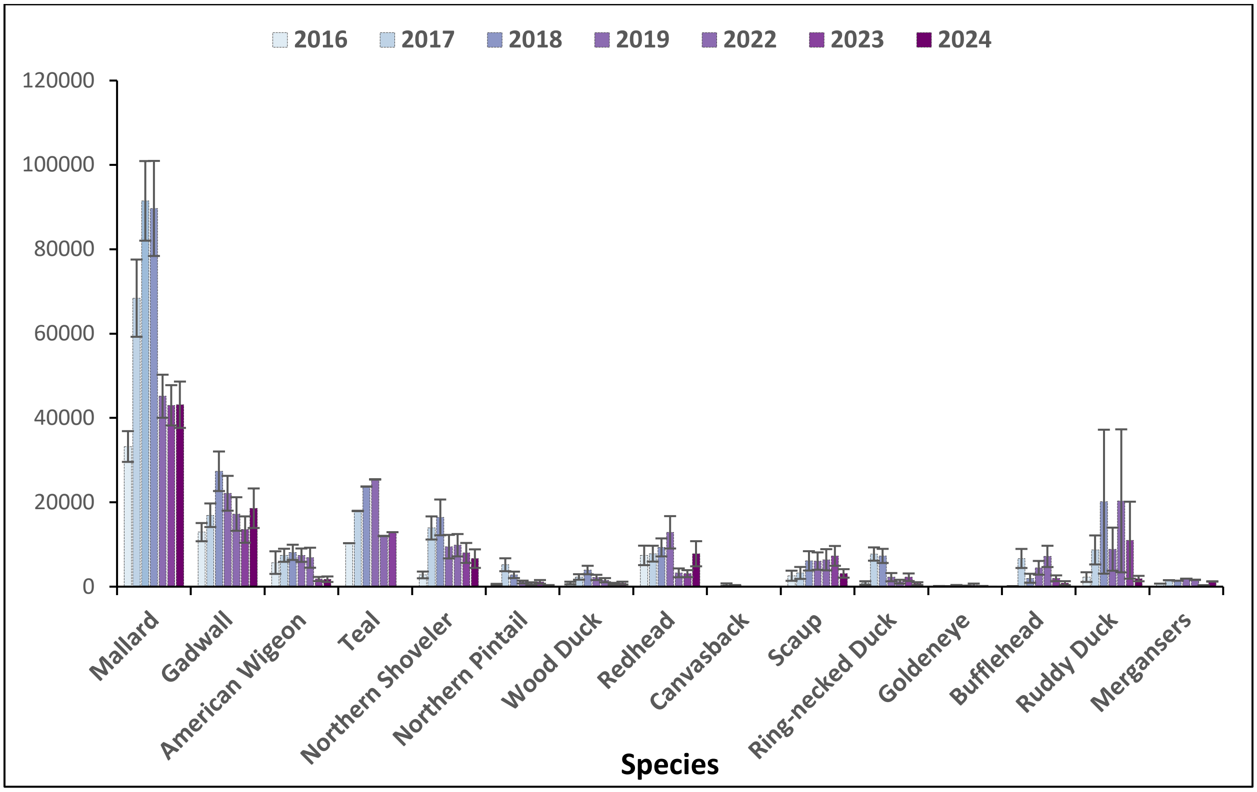


Figure 7. Eastern Washington duck breeding population survey results by species and strata, 2024.

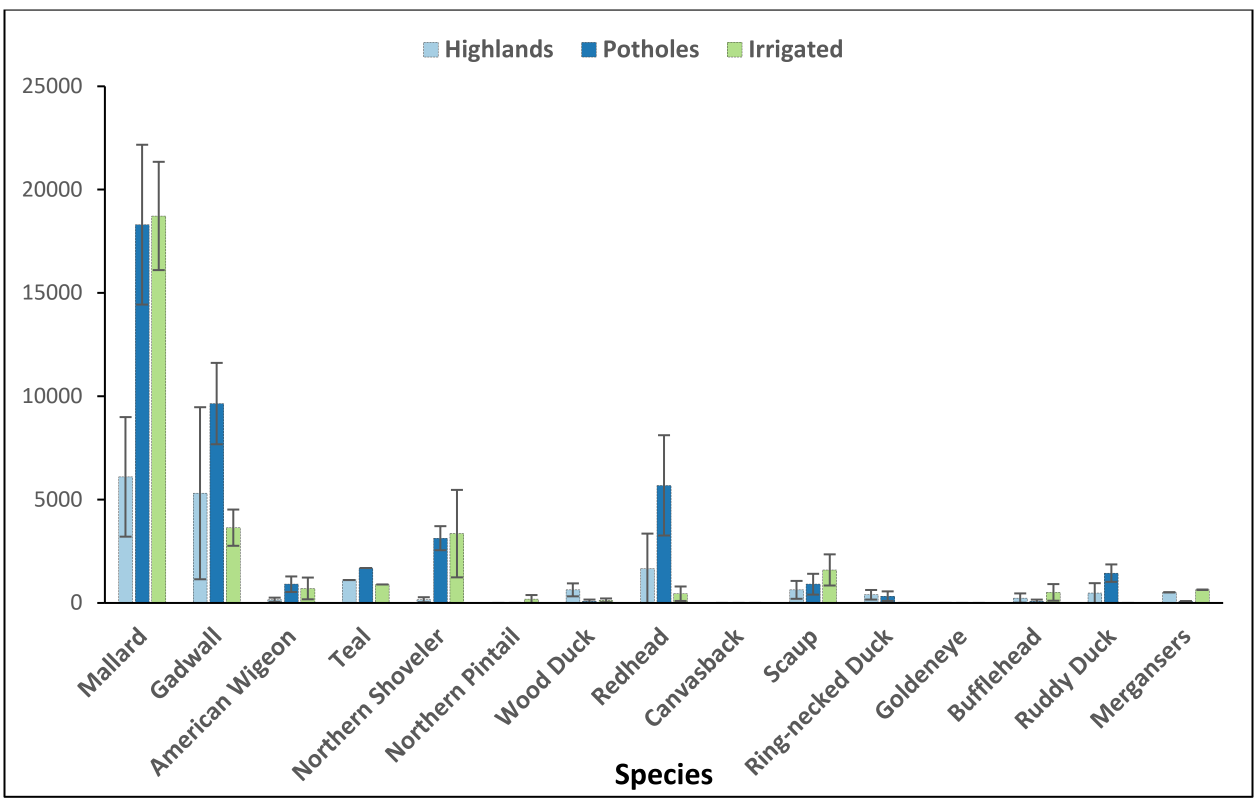


Figure 8. Western Washington duck breeding population survey results by species, 2016-2024.

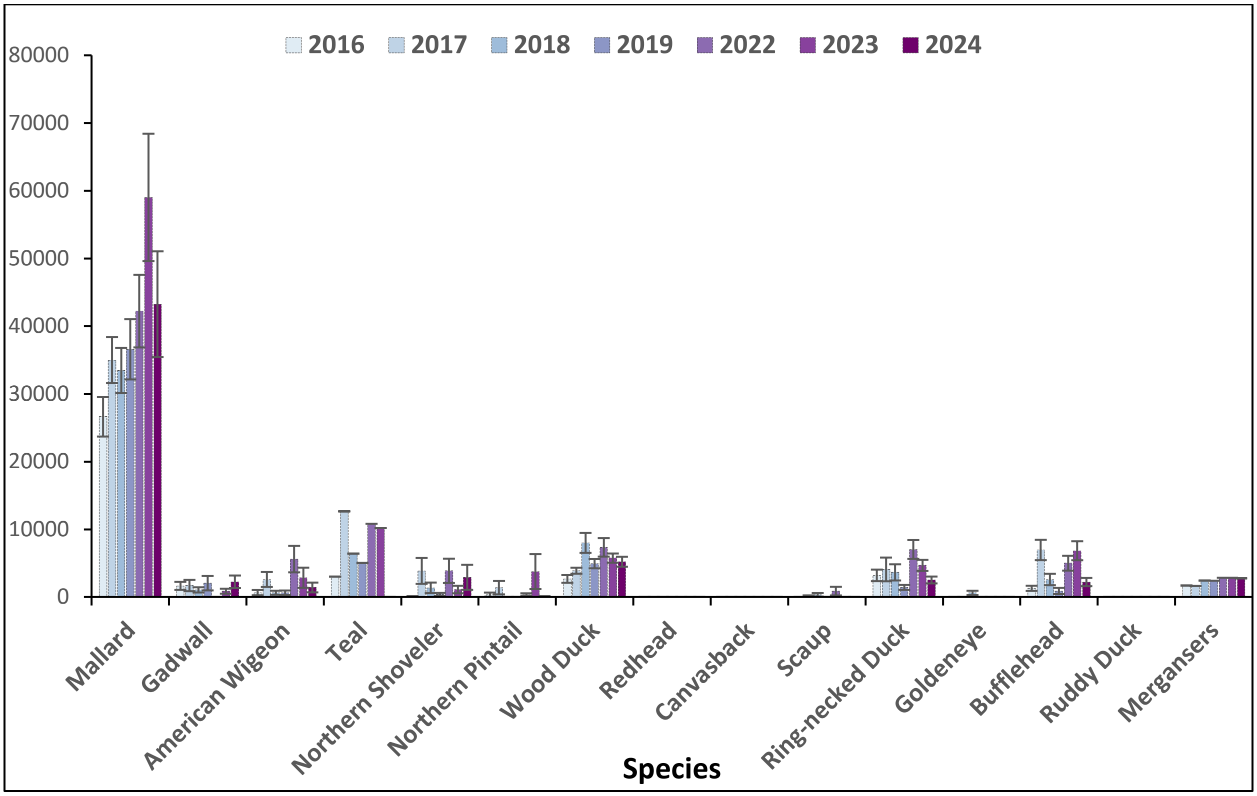
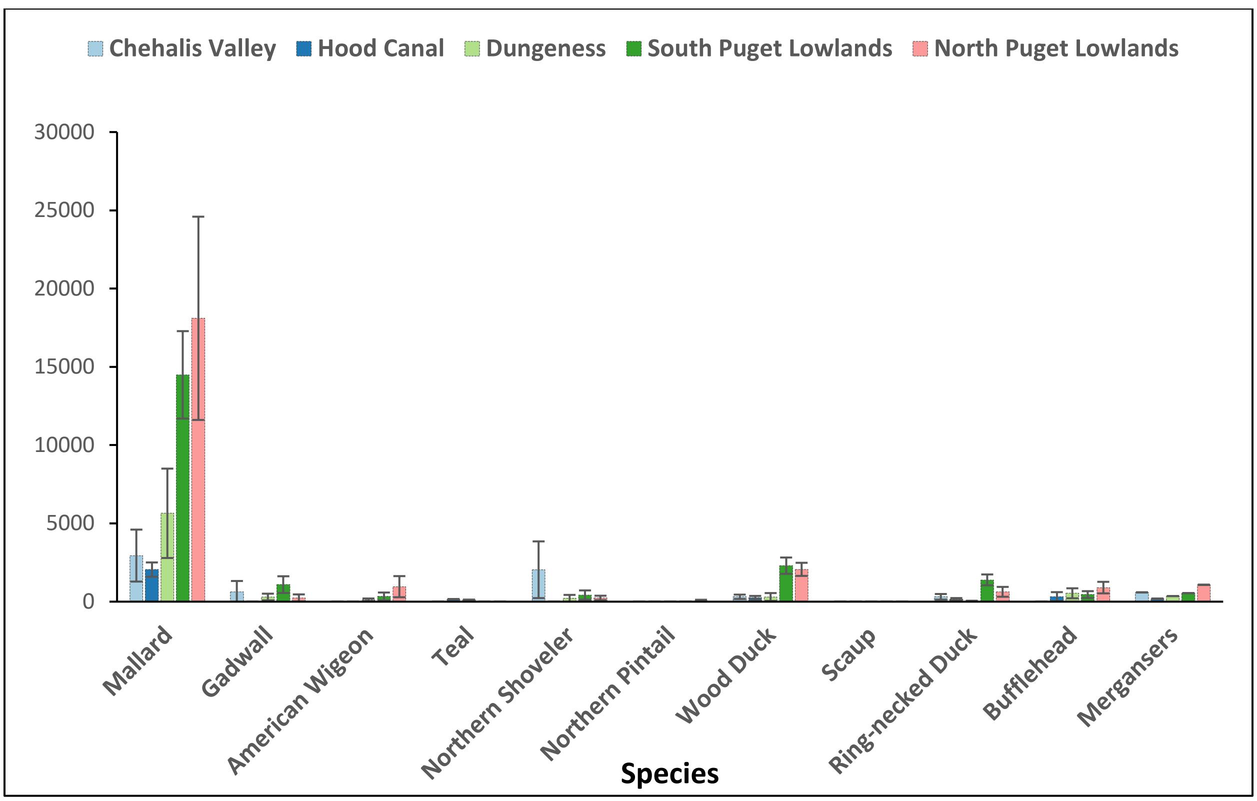


Figure 9. Western Washington duck breeding population survey results by species and strata, 2024.



Duck production survey (Brood survey)

Methods

The same sampling transects used during historic breeding duck surveys are used for brood surveys in the Potholes, Palouse, and Northeast strata (Figure 1). These brood surveys were conducted from late June to early July. All broods observed are recorded by species. The number of broods observed were multiplied by the weighting factors for each stratum to provide an index to duck production. Average brood size is very difficult to estimate. Historic surveys in the Irrigated strata were designed to estimate average brood size. The survey effort varied somewhat over the years. The surveys in the Columbia Basin were redesigned in 1995 by using six sample sites to provide an index to production to provide more consistency. Broods for most species are highly secretive and difficult to observe. The growth of emergent vegetation is more developed than during breeding population surveys in May. Historic brood surveys should be viewed as a rough estimate of production with a greater value for long-term trends than for year-to-year changes.

In 2020, WDFW initiated a survey re-design with three primary objectives: first, to better align brood production data with aerial survey strata statewide; second, to include wetland types (by the seasonality of water) as a component of stratification to account for landscape and environmental changes being documented across Washington; and finally, to design the survey protocol to allow a broader suite of partners and volunteers to participate expanding coverage both spatially and temporally. These redesign efforts are being undertaken in an effort to better describe the status and pressures on waterfowl broods and their wetland habitats in Washington. This new survey protocol will be piloted during the spring of 2025.

Results

The brood survey is being evaluated to determine the feasibility of sampling design, efficiency, and repeatability. No brood observation routes were completed due to staffing shortages and issues with observability in regions of intended coverage. The historic time series of brood counts is presented to reference relative contributions to brood production (Table 4). The most recent brood information was from a small number of sites visited in 2022, with a total of 11 waterfowl species, 68 broods, and 296 ducklings were encountered. Canada goose and mallard were the most common waterfowl, with 25 broods with 99 goslings and 21 broods with 94 ducklings observed, respectively. Other species encountered included (in order): blue-winged teal (4 broods/22 ducklings), cinnamon teal (3/14), green-winged teal (3/18), ruddy duck (3/11), Barrow’s goldeneye (3/14), American wigeon (2/14), hooded merganser (2/5), ring-necked duck (2/3), and scaup (1/2).

Table 4. Weighted duck brood indices by species for the Potholes, Palouse, and Northeast strata, 2004-2020.

Species	Long-term Average (1979-2019)	Percentage of LTA	Production & Distribution Status
Mallard	1639	38%	Expected - Statewide
Blue-winged/Cinnamon teal	582	14%	Expected - EWA
Redhead	395	9%	Expected - EWA
Gadwall	359	8%	Expected - EWA
Wigeon	232	5%	Expected - EWA
Ruddy duck	221	5%	Expected - EWA
Goldeneye	180	4%	Limited - Specialized
Green-winged teal	152	4%	Variable - EWA
Northern shoveler	149	3%	Variable – EWA
Northern pintail	108	3%	Variable – EWA
Merganser	51	1%	Limited – Specialized
Ring-necked duck	47	1%	Variable – EWA
Scaup	46	1%	Uncommon – EWA
Wood duck	45	1%	Expected – Specialized
Canvasback	33	1%	Uncommon – Specialized
Bufflehead	16	<1%	Uncommon - EWA
Scoter	6	<1%	Uncommon
Subtotal	4261		

Canada goose breeding population survey

Methods

Since 2010, the aerial index for breeding geese has been used to monitor breeding geese throughout Washington, consistent with the extent of harvest management strategies considered for this population. Canada goose breeding populations are indexed for 1974-2018 from nest searches conducted within four major geographic areas, mainly along the Snake and Columbia rivers (Table 5).

Table 5. Historic ground-based goose nest survey areas in Washington.

Survey Area	Year Survey Initiated	Agency Conducting Survey	Frequency of Survey
UPPER COLUMBIA			
Hanford	<1974	WDFW	Biennial
Priest Rapids	<1974	WDFW	Biennial
Wanapum	<1974	WDFW	Periodic
Rocky Reach	1975	Chelan Co. PUD	Annual
Rock Island	<1974	Chelan Co. PUD	Annual
Wells	1980	WDFW	Annual
F.D.R.	1981	WDFW	Periodic
Rufus Woods	1981	Army Corps	Annual
Mouth of Yakima	<1974	WDFW	Biennial
SNAKE RIVER			
Snake River	1975	Army Corps	Annual
Snake River Cliff	1979	Army Corps	Discontinued
MID COLUMBIA			
McNary	<1974	USFWS	Discontinued
John Day	<1974	Umatilla NWR	Biennial
Dalles	<1974	Army Corps	Periodic
Bonneville	1982	Army Corps	Periodic
Tri-Cities	1982	WDFW	Biennial
COLUMBIA BASIN			
Moses Lake	1981	WDFW	Biennial
Potholes Res.	1981	WDFW	Biennial
Lenore, Alkali, Park	1981	WDFW	Periodic
LOWER COLUMBIA			
I-5 to Bonneville	1981	Army Corps	Periodic
I-5 to Puget Island	1981	WDFW	Annual, Biennial starting in 2012

Results

The 2024 estimated Canada goose breeding index increased 5.3% statewide, and was 5.7% below the 2010-2023 average when estimates are derived from the aerial Washington breeding population survey. The total eastern Washington index decreased 7.4% compared to 2023, remaining 22.2% below the 2010-2023 average (Table 6). The total western Washington index increased 39.5% compared to 2023 and was 52.2% above the 2010-2023 average (Table 6). The number of geese observed during the breeding waterfowl survey is presented in Figure 10 and Table 6. This index provides information about the expansion of Canada geese into areas of Washington outside of the traditional goose nest index areas and, in general, shows a stable to increasing trend over the complete survey period. Observations of Canada geese (Figure 11) in 2024 demonstrate variable density with lower distribution across strata.

No updated nest indices have been conducted since 2019. Historical time series in the upper, mid, and lower Columbia River stretches are reported (Table 6).

Figure 10. Breeding Canada goose index from breeding duck surveys, 1979-2011 historic, 2010-2024 aerial.

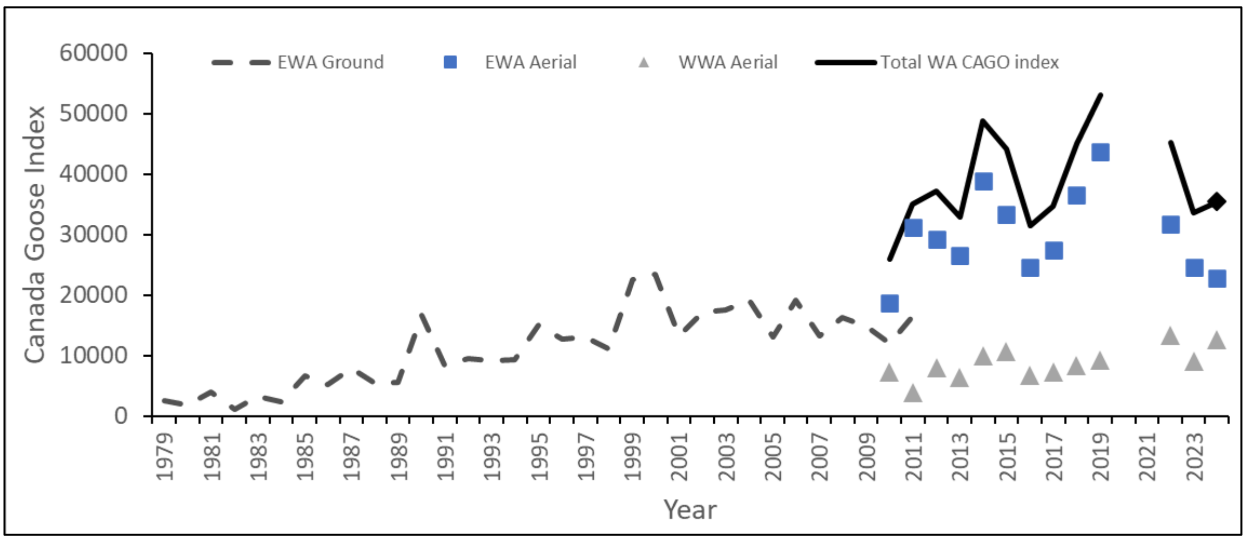


Figure 11. Canada goose observation across strata during breeding waterfowl survey in 2024.

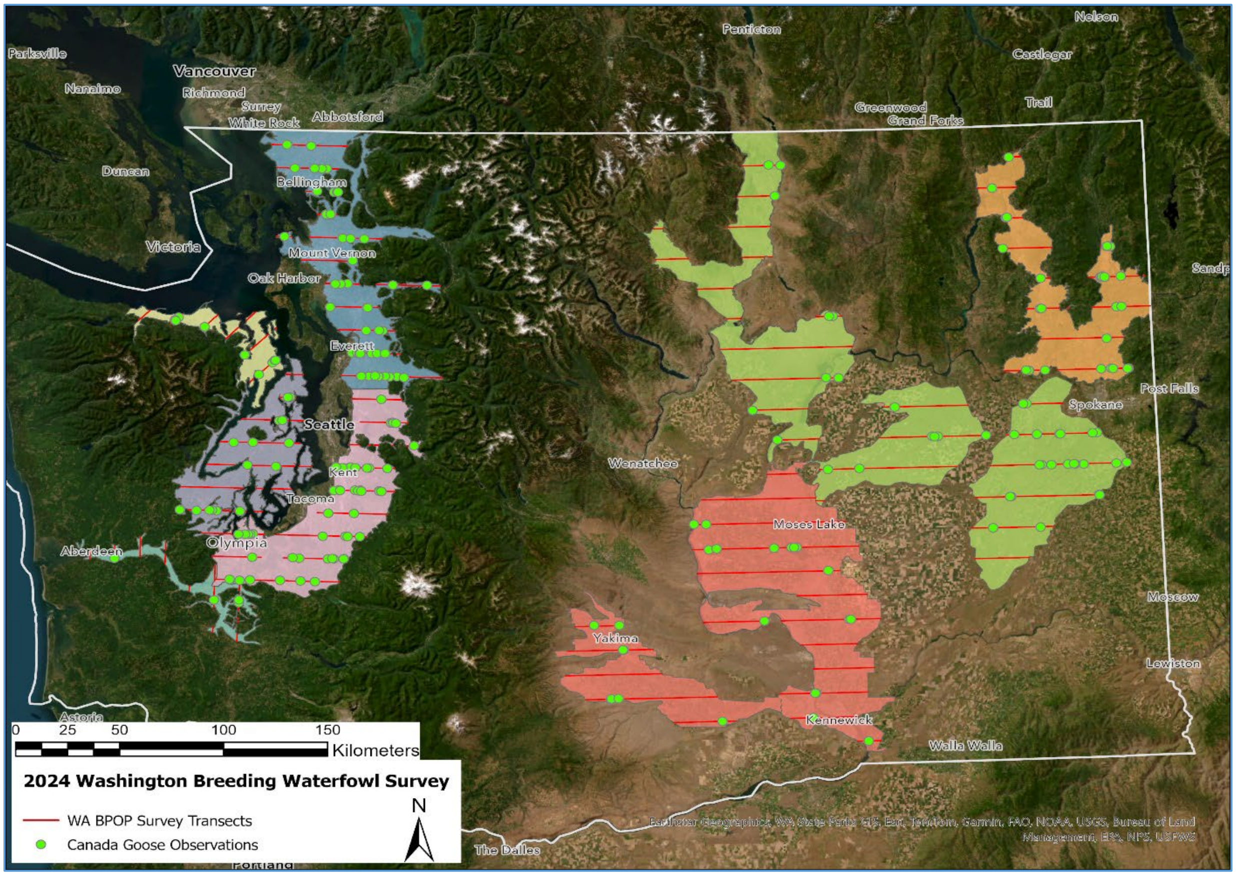


Table 6. Summary of historic Canada goose nest counts by region (1910-2018) and total Canada geese observed during the aerial breeding surveys (2010-2024). The aerial survey data serves as the statewide index.

Year	Total Nests	Eastern WA Aerial Estimate	Western WA Aerial Estimate	Total WA CAGO Index
2010	**2431**	18696	7260	**25956**
2011	**2497**	31176	3969	**35145**
2012	**2485**	29308	7925	**37233**
2013	**2750**	26577	6394	**32971**
2014	**2585**	38832	10041	**48873**
2015	**2885**	33347	10770	**44117**
2016	**2845**	24678	6791	**31469**
2017	**2770**	27461	7272	**34733**
2018	**2756**	36662	8331	**44993**
2019		43749	9310	**53059**
2020		No survey	No survey	No estimate
2021		No survey	No survey	No estimate
2022		31808	13352	**45160**
2023		24570	9090	**33660**
2024		22756	12684	**35440**

Waterfowl banding

Methods

The use of banding as a tool to derive demographic estimates for survival, harvest distribution and derivation, and harvest rate in Washington has been implemented at varying levels of effort since 1946, with emphasis on mallard (1947) and Canada goose (1949). In March 1990, the Pacific Flyway Council endorsed the Pacific Flyway Study Committee's banding project with the objective of conducting sufficient and representative summer banding to obtain adequate band-recovery data as a necessary element for assessing the distribution and derivation of mallard and other waterfowl harvests in the Pacific Flyway (Bartonek & Bales, 1995). In 1995, the USFWS implemented the adaptive harvest management (AHM) program for setting duck hunting regulations in the United States. The AHM approach provides a framework for making objective decisions in the face of incomplete knowledge concerning waterfowl population dynamics and regulatory impacts (USFWS, 2022a). Since 2010, both the Breeding Population Survey and pre-season mallard banding to inform harvest regulations in Washington (USFWS, 2022b).

Capture of Western Canada geese is conducted during June – July when non-breeding birds and family groups typically undertake flightless molt, allowing the use of a corral trap. A crew consisting of WDFW staff and volunteers is used to herd the flock of flightless geese into a capture pen. The capture of dabbling ducks, with emphasis on mallards, is conducted during July-September using one of three typical methods: 1) baited swim-in trap, 2) baited floating trap, or 3) rocket-net. Configuration of the capture site, accounting for constraints in the surrounding landscape, determines the most appropriate capture technique (Batt, 1992). Fall and winter captures of waterfowl are typically conducted for tracking studies, and specialized capture techniques are utilized depending on the focal species. For example, sea ducks are often captured with a floating mist-net setup, whereas swans are captured using rocket nets. At a minimum, each captured individual is assessed for species, age, and sex, then marked with an appropriately sized aluminum butt-end band issued by the Bird Banding Laboratory and released. Following field efforts, banding data was compiled using the new online Bander Portal (BBL: https://www.usgs.gov/labs/bird-banding-laboratory/science/bander-portal).

Results

Pre-season banding efforts were successfully conducted during the summer of 2023 across Washington state to maintain sample sizes and provide harvest rate estimates for mallard and Western Canada geese for the 2023-2024 waterfowl harvest seasons. A total of 944 goose bands were deployed in Washington, with 759 being Western Canada goose bands. Other species banded related to tracking projects included minima cackling geese (81), lesser snow geese (79), and two Aleutian cackling geese. The most recent 3-year statewide average for Western Canada goose is 830 (range: 533-1,199) goose bands deployed by WDFW staff and volunteers. A statewide total of 2,398 ducks were banded between July and early October 2023, with 2,075 being mallard bands. Other species banded during capture efforts included wood ducks (161), northern pintail (74), and all three teal species, including 92 American green-winged teal. The previous 3-year average is 1,809 (range: 1,003-2,543) mallard bands deployed by WDFW staff and volunteers. Finally, 28 trumpeter swans were banded as part of a graduate student project assessing habitat use and migration ecology of swans, part of the Pacific Coast population, and two additional swans were marked as part of rehabilitation and release efforts in the Skagit Valley, Washington. Increased efforts, through hiring a dedicated seasonal technician and facilitating partnerships with collaborators looking to improve their bird capture and handling experience, have greatly improved the reliability of annual banding efforts.

Recommendations

- Develop a visualization tool for breeding survey data available on the WDFW website.
- Develop a standardized operational survey related to productivity, which may be integrated with banding efforts.
- Attempt to distribute band deployment efforts in relation to proportionality of mallard distribution demonstrated by breeding survey data.
- Evaluate ways to combine goose nest and aerial surveys into a more representative goose breeding population index to inform September season harvest strategies.

- Integrate observations from the breeding survey data with wetland evaluation products from Intermountain West Joint Venture in order to prioritize wetland conservation and improvement efforts statewide that benefit nesting, brood rearing, and molt period requirements.

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Waterfowl Statewide Winter Populations and Harvest Status and Trend Report

Kyle A. Spragens, Waterfowl Section Manager
Matthew D. Hamer, Assistant Waterfowl Biologist
Joseph R. Evenson, Sea Duck and Survey Specialist
Matthew T. Wilson, Waterfowl Specialist

Introduction

This report summarizes the 2023-2024 Washington winter waterfowl surveys, hunting regulations, harvest, and hunter trends. This summary compares current data with data collected over more than 35 years in the state as well as in the Pacific Flyway. These data are part of a long-term database archived by the Washington Department of Fish and Wildlife (WDFW) Waterfowl Section. Several of the data sets extend back to the late 1940s.

Population surveys

Methods

Traditionally, the primary assessment to determine the status of wintering waterfowl throughout the Pacific Flyway was the January Midwinter Waterfowl Survey (MWS). This survey was a coordinated, comprehensive survey of the most important waterfowl wintering areas, using a combination of standardized surveys from fixed-winged aircraft and ground observation locations. The MWS combined efforts among several agencies: Oregon Department of Fish and Wildlife (ODFW), California Department of Fish and Wildlife, Yakama Nation, US Fish and Wildlife Service (USFWS), and Canadian Wildlife Service. WDFW continues to conduct those portions of the MWS in Washington that inform population status or harvest strategies under the guidance of Pacific Flyway management plans, specifically for brant, snow geese, and trumpeter swans associated with the Pacific Coast population.

WDFW also conducts a robust winter survey focused on sea ducks during December and January, initially as part of the Puget Sound Ecosystem Monitoring Program (PSEMP). Consistent winter aerial surveys of greater Puget Sound began in 1993-1994 and have been conducted each subsequent year (except for 2006-2007 and 2017-2018, due to funding and staff limitations, and 2020-2021 due to the COVID-19 pandemic). Survey methods have been peer-reviewed by a science panel as part of PSEMP. These surveys use six depth strata to sample the entire marine shoreline and open water areas. The transects annually cover 10% of the inner marine waters of the Washington portion of the Salish Sea, totaling 6,400-7,100 km of transects. Population estimates from these surveys represent minimum estimates as observers are not able to detect all birds present within the transect due to environmental conditions (e.g., glare, waves) and behavioral reactions of some species to aircraft (e.g., diving, flight).

Midwinter waterfowl survey results

As of 2016, the USFWS discontinued the Pacific Flyway MWS for total waterfowl. Changes in operational priorities for USFWS created the need for states to conduct surveys independently, leaving Washington, Oregon, California, and Montana as the only Pacific Flyway states to conduct portions of these original mid-winter surveys.

Table 1. Summary of Washington Department of Fish and Wildlife Midwinter Waterfowl Survey (MWS) from the last 10 years of effort (2009-2018).

Waterfowl Type	Species	MWS average	Species Composition by Waterfowl Type
Duck	Mallard	297,666	46.5%
	Gadwall	3,594	0.6%
	Wigeon (combined)	121,208	18.9%
	Green-winged teal	17,330	2.7%
	Blue-winged/Cinnamon teal	41	0.0%
	Northern shoveler	3,015	0.5%
	Northern pintail	78,679	12.3%
	Wood duck	1,331	0.2%
	Redhead	2,299	0.4%
	Canvasback	2,061	0.3%
	Scaup (combined)	44,452	6.9%
	Ring-necked duck	9,241	1.4%
	Goldeneye (combined)	11,403	1.8%
	Bufflehead	20,461	3.2%
	Ruddy duck	2,169	0.3%
	Eider (combined)	0	0%
	Scoter (combined)	10,571	1.7%
	Long-tailed duck	556	0.1%
	Harlequin duck	735	0.1%
	Merganser (combined)	7,586	1.2%
	Unspeciated ducks	5,535	0.9%
Duck subtotal		639,933	

Table 1 (*cont.*). Summary of Washington Department of Fish and Wildlife Midwinter Waterfowl Survey (MWS) from the last 10 years of effort (2009-2018).

Waterfowl Type	Species	MWS average	Species Composition by Waterfowl Type
Goose	Canada goose (includes Cackling goose)	39,498	33.8%
	Snow goose	60,505	51.8%
	White-fronted goose	50	0.0%
	Brant (combined)	16,808	14.4%
Goose subtotal		116,861	
Swan	Tundra swan	2,414	14.6%
	Trumpeter swan	12,473	75.5%
	Unspeciated swan	1,633	9.9%
Swan subtotal		16,520	
Waterfowl total		773,314	
Rallidae	American coot	72,954	

The values provided represent an uncorrected index and are, therefore, considered minimum estimates. The relative composition of species provides context to the typical presence throughout Washington during winter months.

WDFW suspended the traditional mid-winter surveys after January 2018, but in western Washington, WDFW staff continue to focus efforts on expanded sea duck, snow goose, brant, and swan counts. In eastern Washington, WDFW staff conducted the synchronized roost fly-off survey in coordination with ODFW and USFWS refuges for wintering snow geese in the Columbia Basin. For the relative composition of the various waterfowl species observed during winter in Washington state, the final ten-year (2009-2018) statewide midwinter index averages for waterfowl and coot are summarized (Table 1).

Sea Ducks – Results from the PSEMP aerial winter surveys provide status and trends for the eleven species of sea duck that are regularly recorded during these surveys (Table 2). The most recent three-year average for each species or aggregated group (scoters and goldeneyes) serves as the winter index to track trends in this long-term dataset (Table 2). Notably, the 2023-2024 estimates were the highest for white-winged scoter and red-breasted merganser and were the second highest for Barrow's goldeneye, harlequin duck, and common merganser during the PSEMP time series (1996-2024; n = 26 surveys). The most recent 3-year average for the combined three species of scoters (75,093) remains above the harvest closure threshold and crosses the threshold to offer a "Moderate" harvest regulations option for the first time since 2009.

Table 2. Puget Sound long-term winter survey estimates for sea ducks.

State	Group/Species name	2023-24 (estimate)	Rank	3-year average (winter index)	Long term average
WA	Scoters (not-speciated)	85,905	8th of 26	75,093	80,078.1
WA	Black Scoter	1,044	17th of 26	1,248	1,442.8
WA	Surf Scoter	44,919	11th of 26	40,556	42,961.5
WA	White-winged Scoter	28,567	1st of 26	22,546	16,589.1
WA	Goldeneye (not-speciated)	53,586	4th of 26	50,504	43,089.9
WA	Barrow's Goldeneye	19,127	2nd of 26	13,155	11,913.8
WA	Common Goldeneye	20,726	5th of 26	18,732	16,326.1
WA	Bufflehead	70,776	9th of 26	68,048	66,693.9
WA	Harlequin Duck	5,684	2nd of 26	4,580	4,714.6
WA	Long-tailed Duck	6,377	5th of 26	5,551	5,503.1
WA	Common Merganser	9,075	2nd of 26	6,890	4,698.0
WA	Hooded Merganser	1,768	7th of 26	1,780	1,687.3
WA	Red-breasted Merganser	29,946	1st of 26	24,947	13,298.6

Snow geese – The northernmost flock of lesser snow geese that over-winter across the North Puget Lowland landscape, including Skagit, Snohomish, and Whatcom counties of NW Washington and the Fraser River Delta and Valley British Columbia, Canada nest almost exclusively on Wrangel Island, Russia. Juvenile snow geese comprised a minimum estimate of <10% of the wintering flocks found across the Fraser and Skagit River Deltas when assessed in March 2024; however, this estimate is biased-low as it was after the harvest season concluded. The MWS snow goose aerial photo counts by WDFW were conducted on March 29, 2024, with a total estimate of 66,355 (4,249 SE). However, given this survey was conducted post-season, correcting for harvest estimates in Washington and the Fraser Delta region of British Columbia would result in a flock estimate of 71,237 snow geese. This estimate represents a 27.6% decrease compared to the 2022 estimate of 91,608 counted in March 2023, constituting the third consecutive decreasing winter count recorded for this flock after the high of 133,306 in December 2020.

The most recent 3-year average for adult geese of 83,723, remains above the upper threshold identified by the Pacific Flyway management plan maintaining liberalized hunting regulations (Table 3a, Figure 1). Reports from the Wrangel Island Tundra River colony indicated exceptional, above-average juvenile recruitment and survival in 2019 through 2021. Unfortunately, no further information was made available during the preparation of this report.

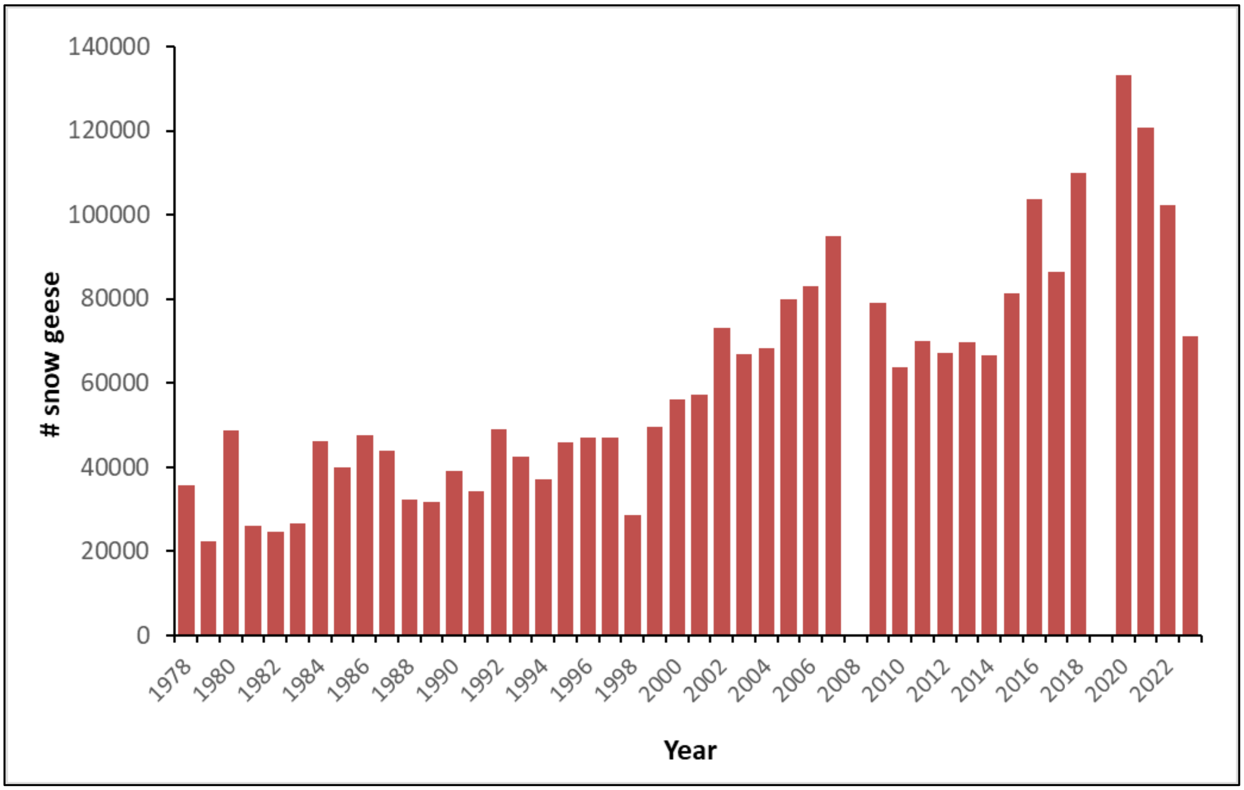
The 2023-2024 season was the seventh year of a coordinated effort to document the growing number of wintering snow geese in the Columbia Basin in Oregon and Washington. The Columbia Basin Snow Goose Fly-off Survey is a synchronized roost fly-off assumed to be a minimum count. This survey was conducted on December 14, 2023, with a minimum count of 162,586 white geese, presumed to be almost exclusively lesser snow geese. The count represents the highest count since coordinating efforts with the Oregon Department of Fish and Wildlife staff, surpassing the previous high count recorded in December 2019 (160,825).

This marks the largest single-year discrepancy between the two wintering flocks and continues the trend of the Columbia Basin "expansion" flock now surpassing the abundance of the Skagit-Fraser "traditional" flock. The winter distribution of lesser snow geese in these regions has undoubtedly been influenced by the rapid increase in the population size from favorable conditions on the breeding grounds of Wrangel Island over a decade (2011-2020), as well as changing land use and crop types, providing expanded available foraging opportunities in these regions. However, all three flock regions (Skagit-Fraser, Columbia Basin, and Lower Columbia River) appear to have past peak counts, suggesting Wrangel Island is no longer experiencing exponential growth or that distributional shifts are causing more snow geese to continue down to the California Central Valley.

Table 3a. 2023-2024 results for snow goose photo and fly-off count surveys.

Snow Goose Counts	Date	Estimate (min. count)	Survey Type	% Young
Skagit-Fraser flock	3/29/2024	66,355 (4,249 SE); 71,237 w/corrections	Aerial – Photo Count	N/A; 10.4 3-year avg.
Columbia Basin flock	12/14/2023	162,586	Ground – Fly-off	N/A

Figure 1. Washington MWS - Snow Geese (Skagit-Fraser winter flock).

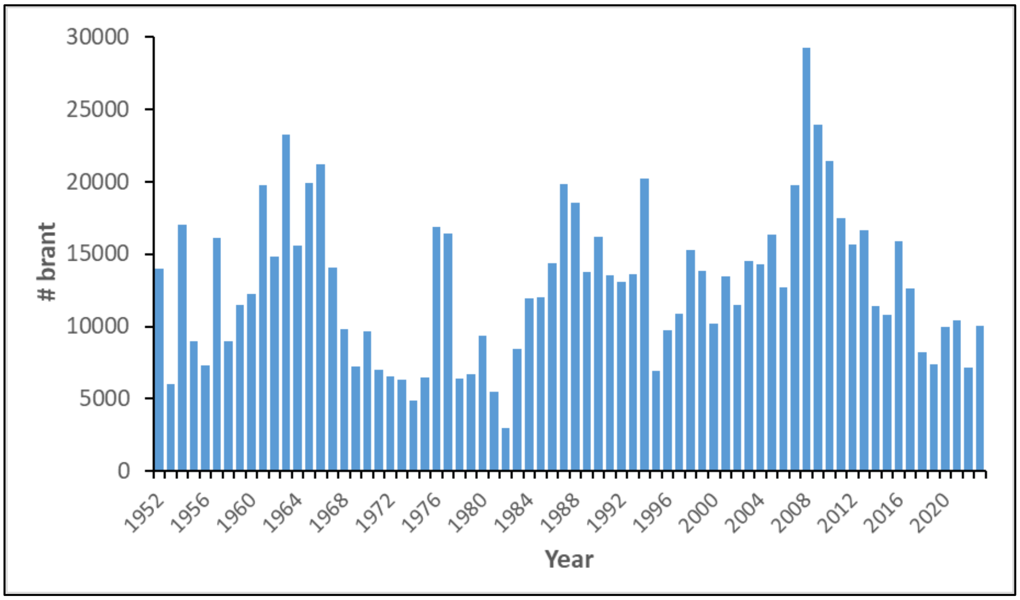


Brant – The preliminary number of brant counted in 2023-2024 during the Washington portion of the Pacific Flyway Winter Brant Survey was 10,042, a 40.4% increase from 2022-2023, but remains 28.1% below the long-term average (13,972; Table 3b, Figure 2). The number of brant counted at Willapa Bay during the ground-based winter survey was 2,999, an increase of 68.2% from 2022-2023. The number of brant counted during the northern Puget Sound component (Skagit County) of the aerial survey on January 6, 2024, was 3,048, 22.9% above the 2022-2023 count. The 2024 survey recorded the first count above 3,000 in the past three years, resulting in a recent 3-year average of 2,760, below the 3,000 brant closure threshold for Skagit County brant harvest. Since 2006, breast feather color measurements taken from brant at Skagit County check stations show an annual gray-bellied (WHA = Mansell 4-8) composition between 21% to 79%, requiring a more restrictive harvest management strategy, as defined by the Pacific Flyway management plan for the population. Since opening in 2018, hunter bag checks in Clallam County have assessed 148 brant, with nine brant classified as WHA (6%), falling below the threshold considered a WHA-site (>25% WHA in harvest). In Whatcom County, WHA status remains difficult to assess; however, in 2020-21, WDFW staff implemented a photo submission request that has generated more than 40 photo submissions of 48 unique individual brant and a preliminary estimate of 35-42% (17-20 of 48) WHA in harvest, well above the 25% threshold. This assessment of WHA status in Whatcom County has required WDFW to evaluate the feasibility of surveying Skagit and Whatcom in the one-survey effort, which will be further tested during the winter of 2024-2025.

Table 3b. 2023-2024 results for brant surveys.

Brant Winter Surveys	Date	Count	Survey Type
Skagit	1/6/2024	3,048	Aerial – Visual
Whatcom	Jan 2024	2,453	Aerial - Visual
Clallam	1/16/2024	1,542	Boat-based – Visual
Willapa	1/15/2024	2,999	Ground – Visual
WA-portion of Pacific Flyway brant index	2024	**10,042**	mixed

Figure 2. Washington MWS – Brant.



Swans – The 2023-2024 northern Puget Sound (Skagit, Whatcom, Snohomish, King, and Island counties) trumpeter swan MWS totaled 7,656 (Table 3c), a 34.3% decrease from the 2022-2023 count of 11,660, attributed to a notable drop in temperatures during the week of the planned survey window. An additional 1,772 swans were observed but could not be speciated due to distance from the swans and are not included in the above minimum counts. Juveniles accounted for 8.9% of the trumpeter swans observed (Table 3c).

The 2023-2024 northern Puget Sound tundra swan midwinter index was 1,118, up 457, down 145% from the 2023-2024 minimum count of 457. Juveniles represented 8.9% (100), similar to the previous 8.8% of the flock observed in 2022-2023 (Table 3c). A total of 1,659 adult and 148 juvenile swans could not be classified to species in these northern Puget Sound counties.

The last expanded winter swan effort conducted through western Washington occurred during 2021-2022, recording a minimum presence of 22,870 total swans, with detection in every western Washington county; however, reliable speciation could not be determined in certain counties due to distance from the observer. Regardless, the minimum winter count for trumpeter swans recorded was 15,696, reaffirming that the primary concentrations are in the northern Puget Sound and Lower Columbia River regions, where species composition is assumed to be a higher mix of tundra and trumpeter swans.

Since 1999, trumpeter swans and, to a lesser degree, tundra swans wintering in northwestern Washington and southwestern British Columbia have experienced documented mortality due to ingestion of lead shot pellets. Of the 2,332 carcasses collected from 2000-2011, the majority of deaths were lead-related (66%). An average of 18 lead and seven steel pellets were recovered per gizzard of lead-exposed swans (n=1,736 gizzards, 43,767 pellets). From 2001-2005, a total of 315 trumpeter and tundra swans were trapped, and blood samples were collected for lead residue analysis. Trumpeter swans were outfitted with VHF radio transmitters (n=243) or satellite transmitters (n=6); 61 tundra swans were fitted with neck collars. Locations of radio-tagged swans were used to identify primary forage and roosting areas. Judson Lake, a major roost site on the Washington/British Columbia border, was identified as a potential source of lead shot ingestion. During the winters of 2006-2009, active hazing activities discouraged swans from using the lake, which coincided with an approximate 70% reduction in lead-caused swan mortalities during the first three winters (an average of 67 lead-related mortalities in 2006-2009) when compared to the average of 227 lead-related mortalities per year over the previous five years (2001-2006).

Starting in 2009, hazing at Judson Lake focused on the area with the highest lead shot concentration. Bamboo poles and fencing prevented swans from landing in the exclusion area, allowing them to use about 50% of the lake. The barrier system successfully excluded swans without an appreciable increase in lead-related swan mortality or any swan injuries due to the barrier system. However, known trumpeter swan mortalities increased to 374 in 2014-2015, with 203 (54%) showing signs of lead poisoning. This increase prompted a revamping of the exclusion area in November 2016. Winter 2020-2021 represented the fourth-year post-revamp of the exclusion area related to monitoring efforts and resulted in 500 encountered mortalities in the long-term monitoring region (including Sumas Prairie, BC; n=480) and other counties (n=20), of which 208 (43%) were confirmed lead poisoning, but with 167 (35%) undetermined-cause mortalities, bringing the total confirmed lead mortality to 2,696 swans. Evaluation of the logistics (longevity, practicality, and alternatives) of the exclusion zone given the past three seasons of elevated encounters have corresponded with lake levels that preclude pre-season access to the site. Given the increased number of responses, in June 2021, WDFW staff completed a complete revamp of Judson Lake with bamboo poles supplied by partners with the Canadian Wildlife Service. Following the complete revamp of the Judson Lake enclosure in June 2021, the winter 2021-2022 efforts suggested a significant reduction in Judson Lake-related mortalities. Winter 2023-2024 efforts resulted in 121 confirmed mortalities, 17 lead poisoning, 54 powerlines, 7 feather piles, 26 non-determination, and 16 suspected of Highly Pathogenic Avian Influenza (HPAI), which was detected most in snow geese and swans during fall 2022, with Whatcom County accounting for only 3 suspected-lead cases representing a third-year of reduced Judson Lake-related mortalities. Monitoring of mortality cause and source of lead exposure in gizzard and liver samples will continue to be documented and spatial extent mapped, pending the presence and prevalence of HPAI.

Table 3c. 2023-2024 results for swan surveys.

Swan age ratios - Species	Sample size	Juveniles	% Young
Trumpeter Swan – N. Puget	7,656	685	8.9%
Tundra Swan	1,118	100	8.9%

Periodic aerial survey results

Without USFWS assistance, it is not logistically feasible to maintain the periodic aerial survey flights for the northern Puget Sound, Willapa Bay, and eastern Washington (Columbia Basin and Yakima Basin). Therefore, these surveys have lost contextual relevance on the landscape. Emphasis was again placed on training observers and focusing efforts on the PSAMP winter sea duck survey flights and species with Pacific Flyway Management Plan monitoring requirements. The WDFW Waterfowl Section will continue to evaluate the potential of periodic aerial surveys when logistics allow and where resource concern influences the prioritization of monitoring efforts.

Hunting season regulations

The 2023-2024 waterfowl harvest was regulated under Washington State regulations following federal framework recommendations (Table 4a-f). The federal framework allowed the maximum number of days (107 days) under the Migratory Bird Treaty Act. Washington's season length was 105 days statewide, with two additional days for the statewide Youth Hunt on September 23 in western Washington and September 30 in eastern Washington, and a statewide Youth, Veteran, and Active Military Hunt held Saturday, February 3, 2023. The daily bag limit was seven ducks, to include not more than two hen mallard, one pintail, two scaup, two canvasback, and two redhead statewide, and to include not more than two scoter, two long-tailed duck, and two goldeneye in western Washington (Table 4a). Harlequin Duck was closed to harvest statewide for the second consecutive season, as the harvest rate had exceeded the 5% threshold identified in the WDFW Sea Duck Harvest Strategy and could no longer be kept below 5% without a limited-user entry mechanism to control the number of hunters pursuing this species of sea duck.

Relatively stable and robust waterfowl populations in the Pacific Flyway over the last 27 years have allowed for a liberal season length of 107 days and bag limits that maximize federal frameworks. The season lengths between 1988-1989 and 1993-1994 were the most restrictive since 1950. Current regulations are among the most liberal ever offered in Washington. Beginning with the 2014-2015 season, hunters could retain three times the daily bag in their possession for most waterfowl.

WDFW instituted a new license format for the 1999-2000 hunting season. A small game license and a big game license replaced a general hunting license. There was little change in total costs for people who hunted a variety of small game species. For people who hunted waterfowl exclusively, the new format increased cost. Before the 2002-2003 hunting season, the cost of a migratory bird validation increased from $6.00 to $10.00 (excluding transaction and dealer fees). A 10% surcharge was added to all WDFW licenses in 2009-2010 and 2010-2011. The physical stamp validation was replaced with a printed migratory bird permit in 2011, and the cost was $15.00 in 2011 before administrative costs were approved to be included in the cost, raising it to $17.00 in 2012 and has remained through the current season. Beginning in 2011-2012, hunters of brant and snow geese in Goose Management Area 1, sea ducks in western Washington, and all geese in SW Washington were required to purchase a special $13.20 migratory bird authorization to obtain harvest record cards for these species (harvest record cards were free before then). The federal migratory bird stamp increased to $25.00 in 2015.

Table 4a. 2023-2024 Washington Duck, Coot and Snipe migratory bird season regulations.

Species	Area	Season dates	Daily bag limit
Duck	Western Washington Youth	Sept. 23[a]	7[b], 7[b]
	Eastern Washington Youth	Sept. 30[a]	7[b], 7[b]
	Youth, Veterans & Active Military (Statewide)	Feb. 3 [a]	7[b], 7[b]
	Statewide	Oct. 14-22 & Oct. 25 – Jan. 28, except Scaup season closed Oct. 14 – Nov. 3	7[b], 21[b]
Coot	Western Washington Youth	Sept. 23 and Feb. 3[a]	25, 25`
	Eastern Washington Youth	Sept. 30 and Feb. 3[a]	25, 25
	Statewide	Oct. 14-22 & Oct. 25 – Jan. 28	25, 25
Snipe	Statewide	Oct. 14-22 & Oct. 25 – Jan. 28	8, 24

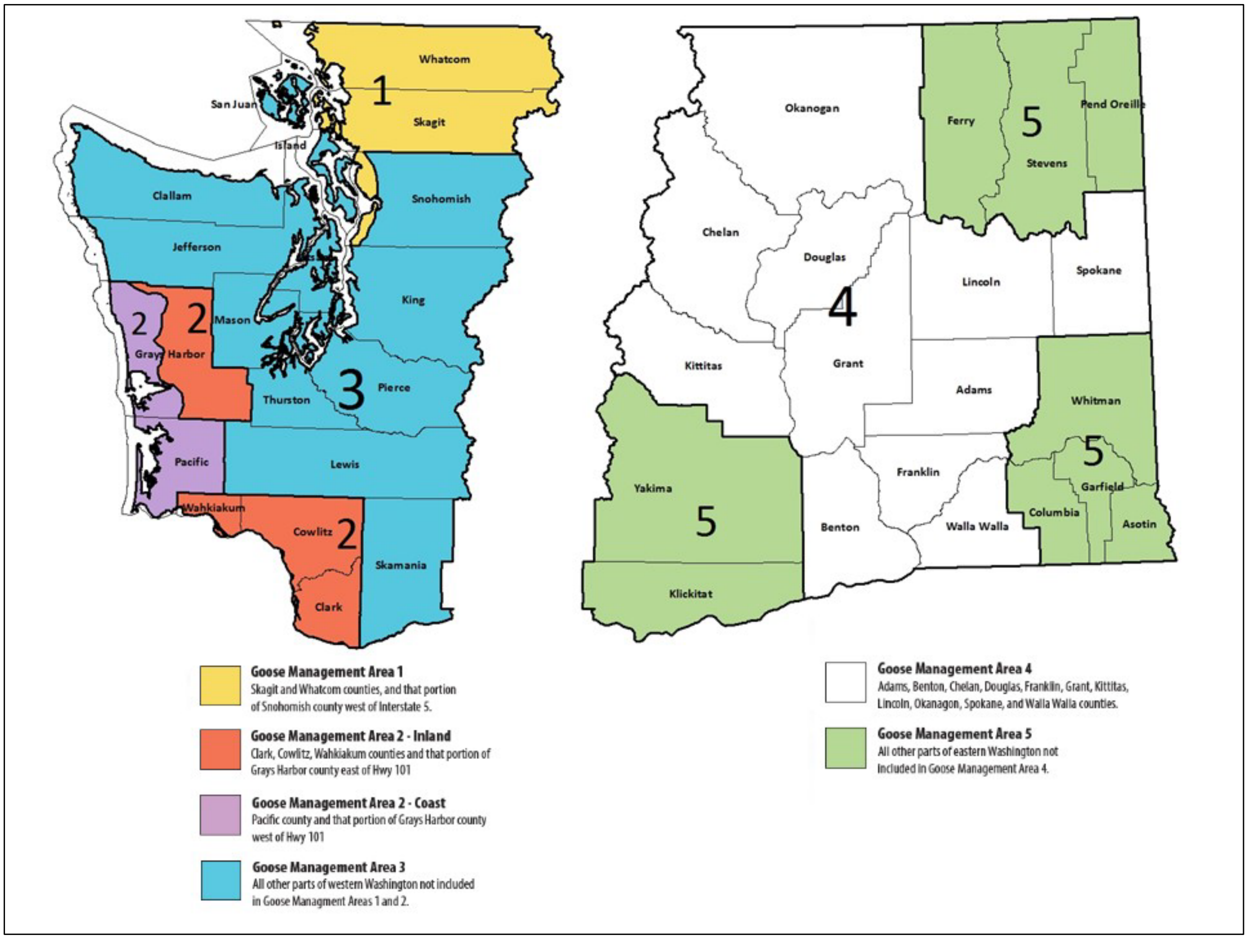
[a] Special youth hunting days are for hunters under 16, accompanied by an adult 18 or older who is not hunting. Veterans must have served honorably in active military, naval, or air service, while active military includes National Guard and Reservists on active duty (not for training). During the hunt, hunters must present one of the following: DD214, Veteran Benefit Card, Retired Active Military I.D., or Active Duty I.D. card.

[b] Daily bag limit: 7 ducks, including up to 2 hen mallard, 1 pintail, 2 scaup, 2 canvasback, and 2 redhead statewide. In western Washington, this includes up to 2 scoter, 2 long-tailed ducks, and 2 goldeneye. For youth and veterans/active military during special dates, the possession limit matches the daily bag limit. During the Regular Season, the possession limit is 21 ducks, with specific limits for each species. **Harlequin Duck closed to harvest statewide.**

Goose hunting regulations are structured to protect declining populations of certain regionally-predictable Canada goose subspecies, increase recreational opportunities on expanding populations of Canada geese, simplify regulations, and address damage or nuisance complaints through the prioritization of regulated harvest. The number of goose management areas became six during 2019-2020. Goose Management Area 2 (GMA2) was divided into Coast and Inland zones to allow for differential season dates to accommodate differences in distribution and opportunity related to the

Cackling goose subspecies. However, GMA2 continues prioritizing Dusky Canada geese conservation (Figure 3). Additionally, this zone adjustment required SW Canada Goose hunters to record the number of geese taken on the mandatory harvest report card to provide a more accurate estimation of harvest in this diverse opportunity goose zone and to emphasize identification and avoidance of Dusky Canada geese most prevalent in this region.

Figure 3. Washington Goose Management Areas.



Before 1984, the goose season length in southwest Washington was 93 days, with bag/possession limits of 3/6. Since then, the season has evolved to 1) conserve the dusky Canada goose subspecies, which has declined in numbers since the 1970s; 2) provide control of agricultural damage resulting from higher numbers of other Canada geese in the area; and 3) provide greater recreational opportunity. Significant changes to the SW goose season in 2015-2016 began with the closure of dusky Canada goose hunting. Check stations were expensive to operate, and it was believed that significant numbers of hunters failed to report to check stations. Other major changes included more season days and longer hunting hours, elimination of harvest recording, hunting hours extended from 30 minutes after official waterfowl hunting hours to 30 minutes before the end of official waterfowl hunting hours, and the inclusion of Clark and Grays Harbor counties in permit zones. A special late season addressing agricultural depredation concerns initiated in 1995-1996 was continued in what was then referred to as Area 2A and initiated in Area 2B during 2015-2016. Beginning in 2016-2017, Area 2A and 2B were combined into

GMA2. Since 2018-2019, Goose Management Area 2 has been divided into Coast (including Pacific County and the portion of Grays Harbor County west of Highway 101) and Inland (including Clark, Cowlitz, and Wahkiakum counties, and the portion of Grays Harbor County east of Highway 101). Season structures and specific dates are summarized in Table 4c.

The daily bag limit for Aleutian geese was eliminated, beginning with the 2015-2016 season, and Aleutians could be hunted as part of the normal Canada goose limit. Previously listed as a federal and state endangered species, Aleutian Canada goose populations have experienced strong population growth in recent years and have caused crop and pasture depredation complaints in coastal agricultural areas, mainly in Oregon and California. Daily bag limits and possession limits during the September goose season are set at 15 and 45, respectively, for the Coast zone to address a localized goose management consideration.

Agricultural depredation by snow geese in Skagit County led to the development of the Snow Goose Quality Hunt Program on Fir Island. Presently, thousands of acres are available through the Private Lands Feel Free to Hunt or Register to Hunt programs. Still, these lands accommodate all waterfowl hunting opportunities and were renamed the Waterfowl Habitat and Access Program prior to the 2021-2022 season. Numerous public safety concern complaints due to unethical snow goose hunting led to special restrictions in Skagit County. Hunters were restricted from discharging a firearm within 100 feet of any paved public road for the purpose of hunting snow geese anywhere in Skagit County. These same restrictions were extended to include Whatcom County, as it was incorporated into the boundary of Goose Management Area 1 during the 2021-2022 season (Figure 3). Violation of these rules, trespass, exceeding the snow goose bag limit, or shooting across a paved road resulted in the invalidation of the hunter's snow goose authorization for the remainder of the current waterfowl season and the subsequent season.

Table 4b. 2023-2024 Washington special hunt season regulations for September Canada Goose, Western Washington Youth, Eastern Washington Youth, and Youth, Veteran and Active Military dates.

Species	Area	Season dates	Daily bag limit
Canada Goose	Goose Management Areas 1 & 3	Sept. 2 - 7	5[c], 15[c]
Canada Goose	Goose Management Area 2 Coast and Inland	Sept. 2-10	5[c,d], 15[c,d]
Canada Goose	Goose Management Areas 4 & 5	Sept. 2-3	5[c], 10[c]
Canada Goose	Western Washington Youth (Goose Mgmt. Areas 1,2, & 3)	Sept. 23 (Canada and White-fronted Goose only)	4, 4
White-fronted Goose	Western Washington Youth (Goose Mgmt. Areas 1,2, & 3)	Sept. 23 (Canada and White-fronted Goose only)	10, 10
Canada Goose	Eastern Washington Youth (Goose Mgmt. Areas 4 & 5)	Sept. 30 (Canada and White-fronted Goose only)	4, 4
White-fronted Goose	Eastern Washington Youth (Goose Mgmt. Areas 4 & 5)	Sept. 30 (Canada and White-fronted Goose only)	10, 10
Canada Goose	Youth, Veterans & Active Military (Statewide)	Feb. 3	4, 4
White-fronted Goose	Youth, Veterans & Active Military (Statewide)	Feb. 3	10, 10
White Goose	Youth, Veterans & Active Military (Statewide)	Feb. 3	10, 10

[c] Daily bag and possession limits: to include Canada geese only.

[d] Daily bag and possession limits in Pacific County are 15/45 during the September Canada goose season.

Table 4c. 2023-2024 Washington Canada Goose season regulations, which includes all subspecies of Canada and cackling geese. Dusky Canada goose season is closed.

Species	Area	Season dates	Daily bag limit
Canada Goose	Goose Mgmt. Area 1[e]	Regular Season: Oct. 14 – Nov. 26 and Dec. 9 – Jan. 28	4, 12
Canada Goose	Goose Mgmt. Area 2 – Coast[f] (includes Pacific County and Grays Harbor County west of Hwy 101)	All areas except Willapa National Wildlife Refuge*: Everyday Oct. 14-29 Saturdays, Sundays, & Wednesdays only Nov. 1 – Dec. 3, Dec. 20 – Jan. 21, and Feb. 10 – 21. During Feb. 10 – 21.	3[g], 9[g]
Canada Goose	Goose Mgmt. Area 2 – Inland[f] (includes Clark, Cowlitz, and Wahkiakum counties; and that portion of Grays Harbor County east of Hwy 101)	All areas except Ridgefield National Wildlife Refuge*: Everyday Oct. 14-29 Saturdays, Sundays, & Wednesdays only Nov. 22 – Jan. 14, and Feb. 10 – Mar. 6. During Feb. 10 – Mar. 6.	3[g], 9[g]
Canada Goose	Goose Mgmt. Area 2 – Inland[f] (includes Clark, Cowlitz, and Wahkiakum counties; and that portion of Grays Harbor County east of Hwy 101)	Ridgefield National Wildlife Refuge: Tuesdays, Thursdays, & Saturdays only Oct. 14-29 and Nov. 22 – Jan. 13.	3[g], 9[g]
Canada Goose	Goose Mgmt. Area 3	Oct. 14-26 & Nov. 4 – Jan. 28	4, 12
Canada Goose	Goose Mgmt. Area 4 (delayed white goose opener)	Canada and White-Fronted Goose Only: Saturdays, Sundays, & Wednesdays only during: Oct. 25 – Nov. 8.	4, 12
Canada Goose	Goose Mgmt. Area 4 (delayed white goose opener)	All goose types: Saturdays, Sundays, & Wednesdays only during: Oct. 14-22, Nov. 11 – Jan. 21; Everyday Jan. 22-28. Additional hunt days include Nov. 10, 23, 24; Dec. 25, 26, 28 - 29; and Jan. 1 and 15.	4, 12
Canada Goose	Goose Mgmt. Areas 5	Oct. 14 – 30 & Nov. 4 – Jan. 28	4, 12

* **National Wildlife Refuges and WDFW Wildlife Areas are closed to goose hunting in this management area.**

[e] In Skagit County and Whatcom County, if a hunter is convicted of trespass, shooting from or across a public highway, discharging a firearm for the purpose of hunting waterfowl or snow geese within 100 feet of a paved public road (on Fir Island or other areas of Skagit or Whatcom counties), or exceeding the daily bag limit for snow geese, their written authorization will be invalidated for the rest of the season and will not be renewed for the subsequent snow goose season.

[f] In Goose Management Area 2, legal hunting hours for geese are 30 minutes after the start of the official waterfowl hunting hours to 30 minutes before the end of the official waterfowl hunting hours.

[g] Dusky Canada goose season closed. A dusky Canada goose is defined as a dark breasted (Munsell 10 YR, 5 or less) Canada goose with a culmen (bill) length of 40-50 mm.

Table 4d. 2023-2024 Washington White-fronted Goose season regulations.

Species	Area	Season dates	Daily bag limit
White-fronted Goose	Goose Mgmt. Area 1[e]	Regular Season: Oct. 14 – Nov. 26 and Dec. 9 – Jan. 28	10, 30
White-fronted Goose	Goose Mgmt. Area 2 – Coast[f] (includes Pacific County and Grays Harbor County west of Hwy 101)	All areas except Willapa National Wildlife Refuge*****: Everyday Oct. 14-29 Saturdays, Sundays, & Wednesdays only Nov. 1 – Dec. 3, Dec. 20 – Jan. 21, and Feb. 10 – 21. During Feb. 10 – 21.	10, 30
White-fronted Goose	Goose Mgmt. Area 2 – Inland[f] (includes Clark, Cowlitz, and Wahkiakum counties; and that portion of Grays Harbor County east of Hwy 101)	All areas except Ridgefield National Wildlife Refuge*: Everyday Oct. 14-29 Saturdays, Sundays, & Wednesdays only Nov. 22 – Jan. 14, and Feb. 10 – Mar. 6. During Feb. 10 – Mar. 6.	10, 30
White-fronted Goose	Goose Mgmt. Area 2 – Inland[f] (includes Clark, Cowlitz, and Wahkiakum counties; and that portion of Grays Harbor County east of Hwy 101)	Ridgefield National Wildlife Refuge: Tuesdays, Thursdays, & Saturdays only Oct. 14-29 and Nov. 22 – Jan. 13.	10, 30
White-fronted Goose	Goose Mgmt. Area 3	Oct. 14-26 & Nov. 4 – Jan. 28	10, 30
White-fronted Goose	Goose Mgmt. Area 4 (delayed white goose opener)	Canada and White-Fronted Goose Only: Sat, Sun, & Wednesdays only during: Oct. 25 – Nov. 8.	10, 30
White-fronted Goose	Goose Mgmt. Area 4 (delayed white goose opener)	All goose types: Saturdays, Sundays, & Wednesdays only during: Oct. 14-22, Nov. 11 – Jan. 21; Everyday Jan. 22-28. Additional hunt days include: Nov. 10, 23, 24; Dec. 25, 26, 28, and 29; and Jan. 1 and 15.	10, 30
White-fronted Goose	Goose Mgmt. Areas 5	Oct. 14 – 30 & Nov. 4 – Jan. 28	10, 30

*** National Wildlife Refuges and WDFW Wildlife Areas are closed to goose hunting in this management area.**

Table 4e. 2023-2024 Washington White Goose season regulations, which includes snow goose, Ross' goose, and blue phase geese.

Species	Area	Season dates	Daily bag limit
White Goose	Goose Mgmt. Area 1[e]	Regular Season: Oct. 14 – Nov. 26 and Dec. 9 – Jan. 28	10, 30
White Goose	Goose Mgmt. Area 1[e]	Late Season (white goose only): Feb. 10 - 20.	20, 60
White Goose	Goose Mgmt. Area 2 – Coast[f] (includes Pacific County and Grays Harbor County west of Hwy 101)	All areas except Willapa National Wildlife Refuge: Everyday Oct. 14-29 Saturdays, Sundays, & Wednesdays only Nov. 1 – Dec. 3, Dec. 20 – Jan. 21, and Feb. 10 – 21. During Feb. 10 – 21, **National Wildlife Refuges and WDFW Wildlife Areas are closed to goose hunting in this mgmt. area.**	10, 30
White Goose	Goose Mgmt. Area 2 – Coast[f] (includes Pacific County and Grays Harbor County west of Hwy 101)	All areas except Ridgefield National Wildlife Refuge: Everyday Oct. 14-29 Saturdays, Sundays, & Wednesdays only Nov. 22 – Jan. 14, and Feb. 10 – Mar. 6. During Feb. 10 – Mar. 6, **National Wildlife Refuges and WDFW Wildlife Areas are closed to goose hunting in this management area.**	10, 30
White Goose	Goose Mgmt. Area 2 – Coast[f] (includes Pacific County and Grays Harbor County west of Hwy 101)	Ridgefield National Wildlife Refuge: Tuesdays, Thursdays, & Saturdays only Oct. 14-29 and Nov. 22 – Jan. 13.	10, 30
White Goose	Goose Mgmt. Area 3	Oct. 14-26 & Nov. 4 – Jan. 28	10, 30
White Goose	Goose Mgmt. Area 4 (delayed white goose opener)	All goose types: Saturdays, Sundays, & Wednesdays only during: Oct. 14-22, Nov. 11 – Jan. 21; Everyday Jan. 22-28. Additional hunt days include Nov. 10, 23, 24; Dec. 25, 26, 28, and 29; and Jan. 1 and 15.	10, 30
White Goose	Goose Mgmt. Area 4	White Goose Only: Feb. 17 – Mar. 3	20, 60
White Goose	Goose Mgmt. Area 5	Oct. 14 – 30 & Nov. 4 – Jan. 28	10, 30

[e] In Skagit County and Whatcom County, if a hunter is convicted of trespass, shooting from or across a public highway, discharging a firearm for the purpose of hunting waterfowl or snow geese within 100 feet of a paved public road (on Fir Island or other areas of Skagit or Whatcom counties), or exceeding the daily bag limit for snow geese, their written authorization will be invalidated for the rest of the season and will not be renewed for the subsequent snow goose season.

The January-only brant season took place in 2024, with 14 hunt days in Pacific County and three days in Clallam and Whatcom Counties (Table 4f). A limited three-day season was allowed in Skagit County after the pre-season count of 3,048 brant was above the threshold required to open a season. The Skagit County brant hunt is dependent on a pre-season count of at least 3,000 brant, allowing a restricted-day season, or more than 6,000 brant, allowing an 8-day season. Piloted during the 2019-20 season in Skagit County, the previous 3-year average was used to determine if a "known" opening weekend was warranted. The results of the aerial survey inform the potential of expanded opportunity.

Table 4f. 2023-2024 Washington Brant season regulations.

Species	Area	Season dates	Daily bag limit
Brant	Skagit County	Starts closed: Additional season dates to be determined by aerial survey results. Season updates will be provided by WDFW news release. (**limited 3-day season approved in 2023 season**)	2, 6
Brant	Clallam & Whatcom	Jan. 20, 24 and 27	2, 6
Brant	Pacific County	Jan. 6, 7, 9, 11, 13, 14, 16, 18, 20, 21, 23, 25, 27 and 28	2, 6
Brant	Youth, Veterans & Active Military (Skagit, Clallam, Whatcom & Pacific)	Feb. 3, Skagit County status will be determined by aerial survey results (**Skagit included**)	2, 2

Harvest surveys

Methods

Harvest estimates were traditionally based on the Small Game Harvest Questionnaire sent to 10% of the hunting license buyers. Hunters were asked to report the number of ducks and geese they harvested by county. Beginning with the 2022-2023 season, harvest estimates were derived via a non-mandatory reporting form in the agency's WILD system that were made available to all small game license holders, with a follow-up survey to estimate the response of hunters that failed to report (WDFW, 2022). This change in harvest estimation addressed three concerns compared to the traditional mail-in survey approach, including 1) bias from low participation to the mail-in version, 2) sample size for certain species at the county level was very difficult to attain through mail-in participation, and 3) stratification based on point-of-sale questions to derive the 25,000 annual participants as many hunters belong to multiple strata and some license dealers may not have asked all questions to expedite the transaction. This new framework is encouraging, but comparisons to previous years should be cautioned against in the first few years as more hunters become familiar with the reporting tool.

Prior to 2017, the species composition of the waterfowl harvest was derived from a Daily Waterfowl Harvest Report Card Survey. In this survey, cards were sent to over 2,500 waterfowl hunters before the start of the season to record the species of the birds they bagged. These data were used to tabulate the species composition of the waterfowl harvest. This survey was discontinued in 2017, and instead, emphasis has been placed on sending a minimum of four biologists (three WDFW staff in February 2023) to participate in the Pacific Flyway Wingbee to assist in species, age, and sex composition information that allows for incorporation into state-specific estimates. This data also provides data at the county level but has the added benefit of providing better training for personnel that participate in operational pre-season duck banding efforts each year.

Because statewide surveys are not accurate enough to measure the harvest of several priority waterfowl species, special surveys have been developed that utilize written hunting authorizations and mandatory reporting. The sea duck (scoters, goldeneyes, long-tailed duck, and harlequin duck – closed to harvest in 2022-2023 and 2023-2024), brant (four open counties), and snow goose (in northwest Washington) harvest are estimated annually using a mandatory harvest report card for each species group. Written authorization and harvest reports have been required of sea duck hunters in all western Washington counties since 2004, brant hunters in all hunt areas since 1990, snow goose hunters in the primary harvest area (Skagit, Island, Snohomish counties) since 1993, and Goose Management Area 2 Coast and Inland (Clark, Cowlitz, Wahkiakum, Pacific, and Grays Harbor counties closed to dusky Canada goose harvest that require an identification test and authorization) since 2018. Hunters must return a harvest report card to be included in the permit mailing the following year. Starting in 2012-2013, hunters failing to turn in their harvest reports were charged a $10 administrative fee to obtain a harvest report card the following year. Harvest reports returned by the deadline are included in the analysis as respondents 'first wave.' Reminder notices are sent out to hunters with email addresses available, reminding them to return reports. Responses received after the reporting deadline are included as the 'second wave,' then, the harvest estimates are computed, accounting for non-response bias. Hunters were required to report harvest by species and county with mandatory harvest report cards by March 20 following each waterfowl season.

The harvest of dusky Canada was closed beginning with the 2015-2016 season in Goose Management Area 2 from October through March (see above) in agreement and coordination with ODFW and USFWS. With the removal of check stations, law enforcement checked hunter bags in Goose Management Area 2 to determine compliance and was assisted by WDFW personnel specifically trained in determining goose species. WDFW uses standardized criteria for classifying duskys, where a dusky was classified as a dark-breasted Canada goose (Munsell ≤5) with a culmen length of 40-50 mm.

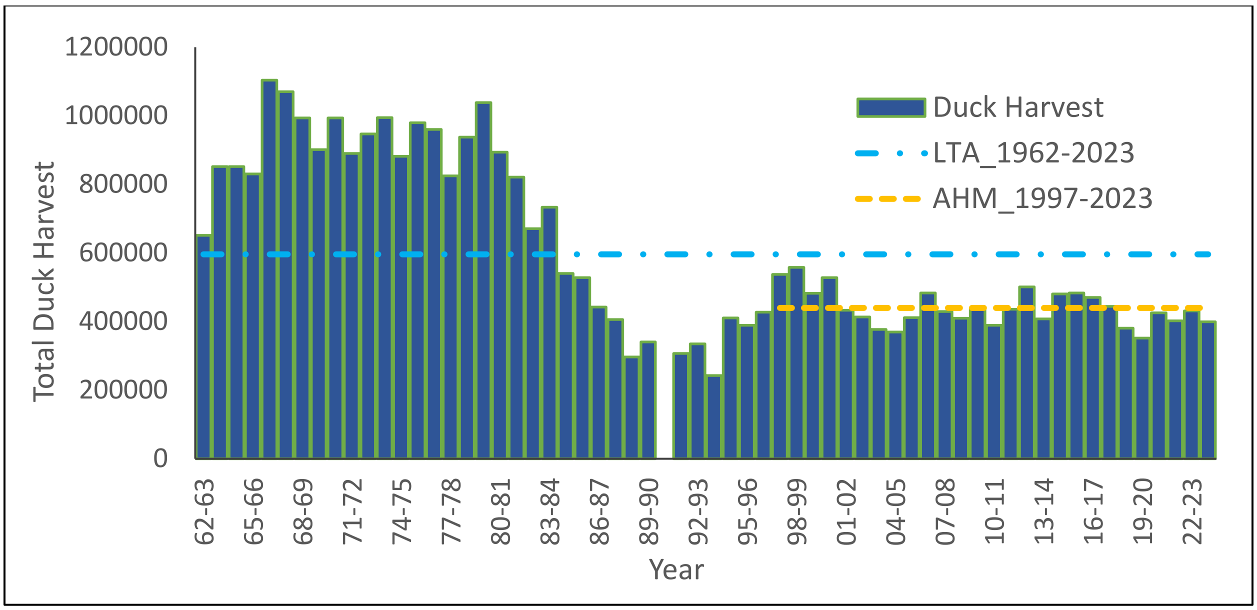
WDFW continued enhanced goose hunter training for people who wish to hunt geese in Goose Management Area 2. The training program was initially developed in 1996 and revised in 1997 in conjunction with ODFW. In this program, hunters study a goose identification workbook and are advised to view a training video. The study materials and video are available from the WDFW website. The workbook is also available through regular mail from WDFW, and the video can be purchased from a vendor. Initially, hunters took a 40-question written test at one of eight testing locations and could choose from several testing dates. In 2007-2008, WDFW provided the opportunity to take tests online and by appointment at WDFW offices. Hunters are required to pass the test with a minimum score of 80%. Hunters who fail the test are required to wait 28 days before retesting. The test was updated in

2015 to reflect the dusky Canada goose season closure. Prior to the 2017-2018 season, the online test was modified to make it easier for hunters to purchase their licenses upon successfully passing the identification test. In the case that a hunter takes a dusky Canada goose or does not comply with field check requirements, their authorization will be invalidated, and the hunter will not be allowed to hunt geese in Goose Management Area 2 Coast or Inland for the remainder of that waterfowl season.

Waterfowl harvest survey results

The 2023-2024 Washington duck harvest of 399,088, a decrease of 7.5% compared to the 2022-2023 harvest of 431,574. The duck harvest in Washington declined steadily from over 1,000,000 in the late 1960s to a low of 242,516 in 1993-1994 (Figure 4). However, duck harvest rates in Washington have stabilized over the past ten years, averaging approximately 426,982 ducks annually.

Figure 4. Washington total duck harvest time-series (1962-2023).



Long-term Average (LTA) indicated by dashed blue line. Long-term Average under Adaptive Harvest Management National Strategy (AHM 1997-2023) indicated by dashed gold line.

Based on 2023-2024 results from the Pacific Flyway Wingbee (Parts Collection Survey; Ratovich et al., 2024), mallards comprised 38.2% of Washington's statewide duck harvest, followed by American wigeon (24.3%), American green-winged teal (12.4%), and northern pintail (5.3%), cumulatively accounting for 80.3% of total duck harvest, with 23 other species of duck constituting the remaining 19.7% of harvest (Table 5).

A total goose harvest (excluding brant) was estimated at 62,891 geese, with a composition of 45,205 (68.7%) Canada and cackling geese, 17,143 (29.4%) white geese (including lesser snow and Ross' geese), and 541 (<1%) greater white-fronted geese. The total Canada goose harvest for 2023-2024 was 42,005 during the regular season, with an additional 3,200 Canada geese taken during the September season. A record-high total goose harvest of 85,534 occurred in 2022-2023. A record-low goose harvest of 26,479 occurred in 2004-2005. During recent years, Washington's breeding segment of Western Canada geese has increased across Washington, which has contributed to an overall increasing trend in harvest (Figure 5), but the total goose harvest increase has been driven by the rapid increase in statewide white goose harvest as bag-limits have become more liberalized in response to an increase in the Wrangel Island population of lesser snow geese. Washington's statewide goose harvest has averaged 69,994 geese annually over the past ten years.

The estimated harvest of cackling geese (formerly, small Canada geese including Taverner's, Aleutian, and "minima or cacklers" subspecies) in 2023-2024 (18,921) is consistent with the most recent long-term average (Figure 5 top panel). The highest recorded harvest of small Canada geese in Washington was 47,270 in 1979-80, while the lowest harvest (8,880) took place in 2003-2004. The reasons for the dynamic small Canada goose harvest are uncertain, but concerns continue related to the complex of lesser Canada goose and Taverner's cackling goose, particularly in the Columbia Basin (Goose Management Area 4).

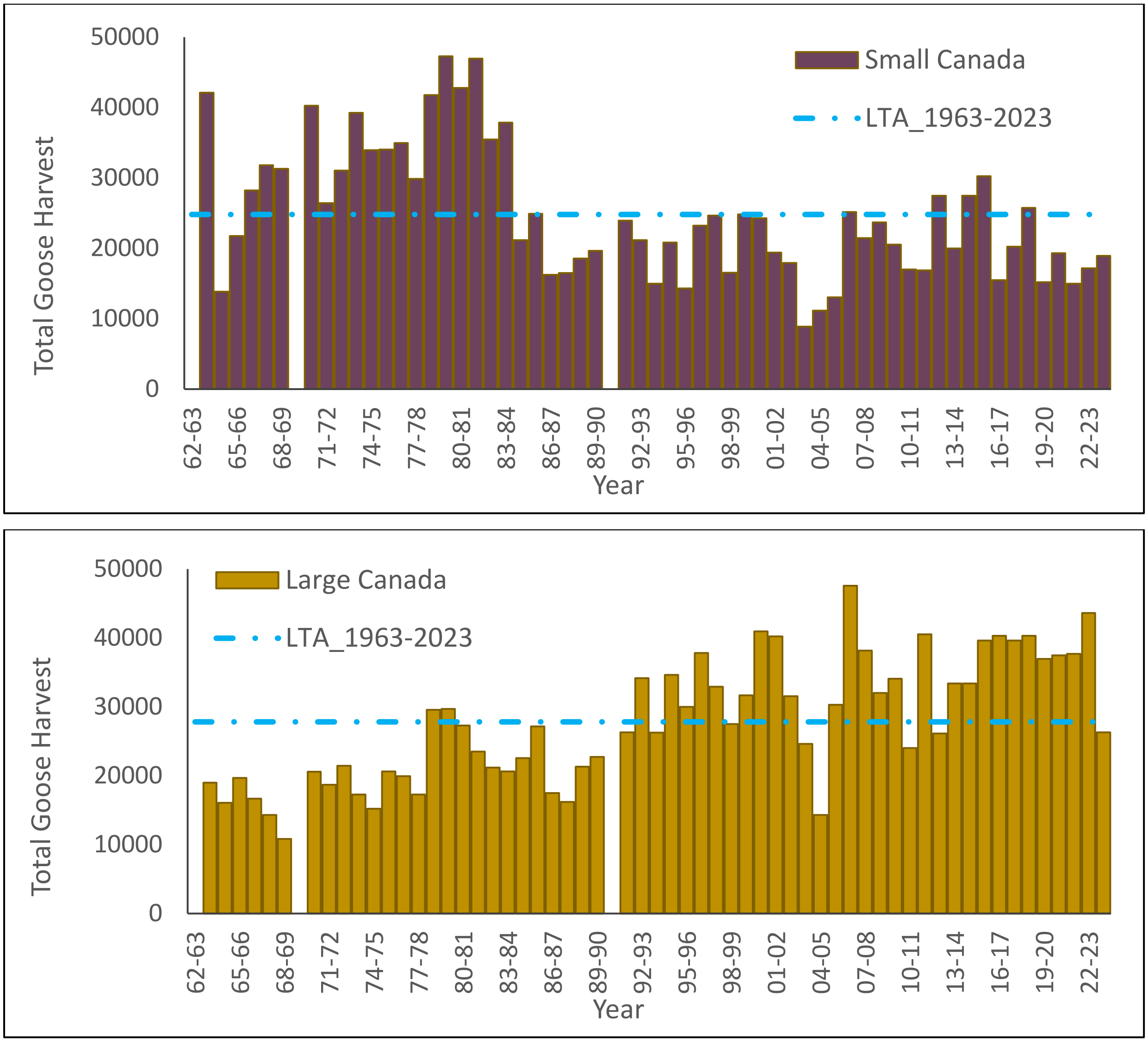
Table 5. Waterfowl harvest by species in Washington during 2023-2024[1].

Species	Harvested	Composition (%)
Mallard	152,642	38.2
Northern pintail	21,233	5.3
American wigeon	96,960	24.3
Green-winged teal	459,593	12.4
Total ducks	**399,088**	
Large Canada (Sept Season[2])	26,284 (3,200)	41.8
Small Canada	18,921	30.1
White goose (Snow + Ross')	17,143	29.4
Total geese	**62,891**	
Total waterfowl	**463,858**	

[1] The number of each species harvested is estimated from the proportions derived from the Pacific Flyway Wingbee parts collection survey. The total number of ducks and geese harvested is estimated from the Small Game Harvest Questionnaire which differentiates September Canada Goose season from the Regular Canada Goose season.

[2] The September season is assumed to be only Large Canada geese and is considered in the composition of Large Canada goose to the total goose harvest statewide but is excluded from deriving small Canada goose.

Figure 5. Small (top panel) and large (bottom panel) Canada goose harvest time-series in Washington (1963-2023).



Long-term Average (LTA) indicated by dashed blue line.

Waterfowl harvest during 2023-2024 is summarized by WDFW administrative regions in Table 6 . During the 2023-2024 season, Region 4 accounted for 25.9% of the total waterfowl harvest (ducks and geese combined), followed by Region 3 (25.0%) and Region 2 (22.3%). The proportion of duck harvest was highest in Region 4 (28.6%), followed by Regions 3 (23.5%) and 2 (20.7%). Region 3 accounted for the highest proportion of goose harvest (35.0%), followed by Region 2 (32.3%) and Region 1 (15.0%); however, Region 1 accounted for the highest proportion of September Canada goose harvest (28.2%).

Table 6. Waterfowl harvest by region during 2023-2024.

Region	Ducks Harvested	% of State Total Ducks Harvested	Geese Harvested[1]	% of State Total Geese Harvested
Region 1	38,638	9.7%	9,495	15.0%
Region 2	82,577	20.7%	20,508	32.3%
Region 3	93,624	23.5%	22,215	35.0%
Region 4	114,304	28.6%	5,626	8.9%
Region 5	28,814	7.2%	2,755	4.3%
Region 6	41,131	10.3%	2,829	4.5%

[1] Goose harvest estimates include September Canada Goose harvest, regular season goose harvest, and mandatory harvest report card estimates from Region 5 and Region 6 (Southwest Washington Canada goose harvest estimate).

Mandatory harvest reporting results

Restrictive bag limits for most sea ducks were maintained for western Washington in 2023-2024. Concerns about low recruitment rates in sea ducks, increasing interest in sea duck hunting, and the unknown impact of reduced sea duck bag limits on compensatory species, particularly Barrow's goldeneyes, led to the measure. The harvest survey indicated a total harvest of 1,062 sea ducks, representing an 18% decrease from the 2022-2023 season, driven by the closure of harlequin duck to harvest during the 2022-2023 and 2023-2024 seasons. Notably, the number of hunter days was estimated at 1,304 days afield, a 2% increase compared to 2022-2023 and significantly below 2021-2022, which was the second-highest estimate (2,329) since mandatory harvest reporting began in the 2004-2005 season. Based on compliant and non-compliant harvest report components, species harvest composition was estimated as 622 scoters, 62 long-tailed ducks, and 370 goldeneyes (Table 7). The reported goldeneye harvest included 54.6% Barrow's goldeneye. Primary sea duck harvest areas included Island (30.3%), Mason (18.7%), and Whatcom (14.4%) counties.

Table 7. Estimated number of sea ducks harvested in 2023-2024.

Season	Permits	Species	Bag Limit	Harvest	Average Annual Harvest Since 2010
2023-24	4,186			1,062	1.763
		Scoter (combined)	2	622	1,038
		Black		66	62
		Surf		450	766
		White-winged		106	209
		Goldeneye (combined)	2		446
		Barrow's		202	230
		Common		168	183
		Long-tailed duck	2	62	141
		Harlequin duck	Closed	0	159

[1] Species composition is derived from mandatory harvest reports.

[2] These estimates are derived from mandatory reports, corrected for non-response bias.

The 2023-2024 pre-season count of brant in Padilla/Samish/Fidalgo Bays was below the threshold of 6,000 but above the 3,000-closure threshold, allowing a limited 3-day brant season in Skagit County. The previous 3-year average of 2,887 was used to start the Skagit County season as closed, but the results of the pre-season survey of 3,048 brant allowed for the limited season opportunity. An estimated 281 brant were harvested from the counties statewide during the 2023-2024 brant season, a 19.1% increase compared to the 2022-2023 brant season. This statewide harvest estimate included the February 3, 2024, Youth, Veterans, and Active Military Personnel (YVMP) special hunt date that included brant as a legal species; harvest in Skagit County was allowable during this hunt. Brant hunting was maintained as a 14-day season in Pacific County, resulting in an estimated harvest of brant of 23, below the 2021-2022 estimate of 62 (Table 8). Additionally, for the seventh consecutive year, harvest was allowed in Whatcom and Clallam counties, resulting in 46 and 43 brant harvested, following record harvest recorded in 2021-2022 for both counties, respectively. These two counties opened in 2017-2018 after winter counts had consistently placed the 3-year average above the 1,000 brant winter population threshold required to consider opening a county to potential harvest, per WDFW Game Management Plan objectives.

Table 8. Brant harvest report summary.

Season	Permits	County	Days	Harvest	Average Annual Harvest
2023-24	3,192			281	466
		Skagit	3	170	220
		Whatcom	3	46	60
		Clallam	3	43	99
		Pacific	14	23	74

Table 9. Snow goose harvest report summary.

Season	Daily Bag Limit	Goose Bag Limit Type	Statewide Harvest Estimate	Goose Management Area 1 Harvest	Percent White Goose Harvest from GMA1
2015-16	4	Aggregate	5,617	3,446	61.3%
2016-17	4	Aggregate	12,008	6,742	56.1%
2017-18	6	Separate	17,524	6,426	36.7%
2018-19	6	Separate	32,842	7,922	24.1%
2019-20	6	Separate	25,146	6,398	25.4%
2020-21	6	Separate	26,230	5,240	20.0%
2021-22	10	Separate	28,218	6,590	23.4%
2022-23	10	Separate	17,802	7,917	44.5%
2023-24	10	Separate	19,914	3,345	16.8%

The 2023-2024 snow goose harvest in Goose Management Area 1 was estimated at 3,345, a 57.7% decrease from the 2022-2023 harvest of 7,917 (corrected for non-compliance). Snow goose harvest in Washington is historically variable (Table 9) depending on several factors, including age and production of the Wrangel Island snow goose flock. In addition, the harvest of snow geese in northern Puget Sound is weather-dependent, with high wind events leading to a greater harvest. This factor, as well as the proportion of juveniles, may be of greater importance to harvest than total abundance because the erratic annual harvest does not follow the number of geese counted in Washington during the MWS. These geese have recently expanded their wintering range in northwestern Washington to portions of Whatcom, Snohomish, and King counties. Additionally, continued reports and coordinated survey efforts suggest that growing numbers of snow geese are being documented in the Lower Columbia River near Vancouver, Washington, and in the mid-Columbia River stretch between Burbank, Washington, Umatilla, and Boardman, Oregon. Recent changes to the bag-limit configurations for goose seasons, including season dates into February-March in Goose Management Areas 1 and 4, have resulted in significant increases in total white geese (lesser snow and Ross' geese) in the statewide harvest, evident by these geese now accounting for 17,143 (29.4%) of the total goose harvest in Washington (Table 5).

In the southwest Washington goose season, hunters who passed the identification test in 1996-2022 and did not take a dusky Canada goose in 2022-2023 were authorized to hunt in 2023-2024. New hunters and those who illegally harvested a dusky in 2022-2023 were required to take a new test to obtain authorization. Goose hunters in Goose Management Area 2 were required to record harvests of Canada and cackling geese to generate a better harvest estimate from these five counties, beginning in the 2019-2020 seasons. A combination of uniformed and undercover officers documented hunter compliance through individual field checks throughout the regular and late seasons. Additionally, biological staff has conducted field checks to determine subspecies composition in the reported harvest, as reliable identification requires measurements and would not be feasible to ask of hunters. An estimated 1,753 Canada and cackling geese were harvested in Goose Management Area 2, by 735 hunters, accounting for 2,522 days afield. Of 282 Canada and cackling goose subspecies classified during bag checks, the overwhelming majority were classified as minima cackling geese (Table 10). One dusky Canada geese was recorded. The number and species of geese brought to check stations from 1969-2015 varied annually, but the presence of "minima" cackling geese is an important component of the composition, typically accounting for greater than 60% of the total harvest composition (Table 10).

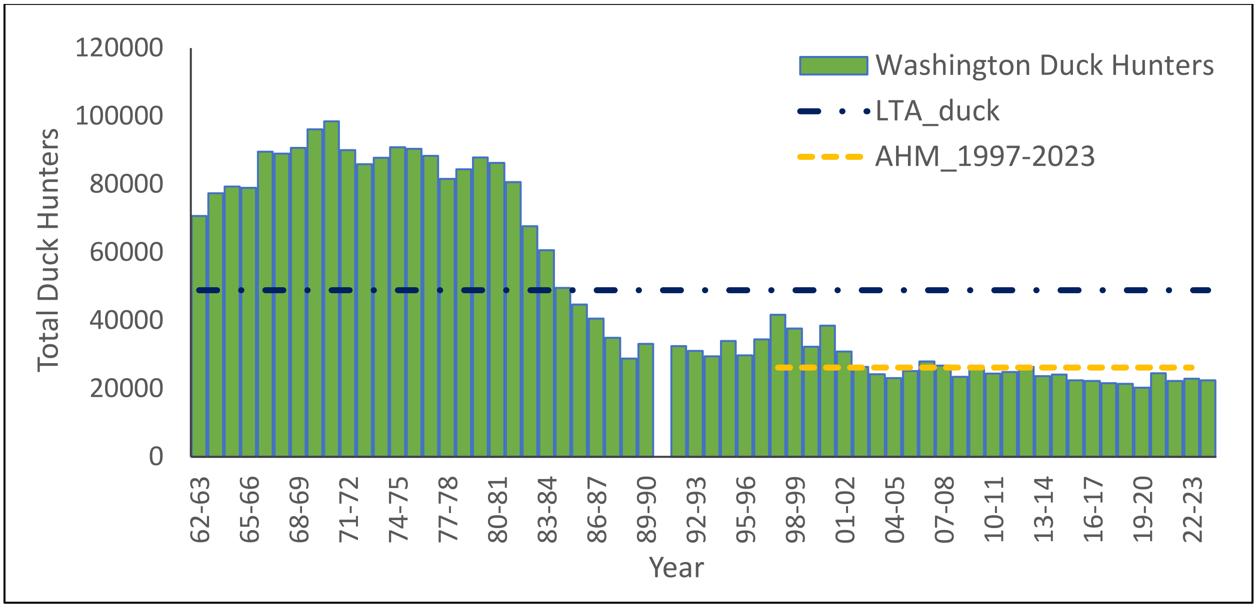
Table 10. Southwest Washington Canada goose harvest summary since 2015, when check stations were removed and Dusky Canada goose was closed to harvest.

Season	Goose Management Area	Goose Bag Limit Type	Daily Bag Limit	Goose Management Area 2 Harvest	Percent Minima Cackling Goose in Harvest
2015-16	GMA 2 – A&B	Aggregate	4	4,853	65.7%
2016-17	GMA 2	Aggregate	4	4,599	46.7%
2017-18	GMA 2	Separate	4	4,844	64.6%
2018-19	GMA 2 – C&I	Separate	4	3,814	65.9%
2019-20	GMA 2 – C&I	Separate	4	3,354	69.5%
2020-21	GMA 2 – C&I	Separate	4	2,297	84.1%
2021-22	GMA 2 – C&I	Separate	4	2,092	83.8%
2022-23	GMA 2 – C&I	Separate	3	1,677	86.2%
2023-24	GMA 2 – C&I	Separate	3	1,753	91.1%

Hunter numbers and success

The Washington small game hunter survey was used to estimate the number of waterfowl hunters in the state. During the 2023-2024 season, an estimated 22,470 duck hunters, down 2.0%, and 7,516 goose hunters, down 12.9%, participated in the Washington waterfowl season (Figure 6), accounting for an estimated 194,327 (down 3.0%) days afield for duck hunting and 53,390 (down 9.2%), with an additional 2,783 (down 40.0%) September goose days afield for goose hunting (WDFW, 2023). The 2020-2021 waterfowl season recorded significant single-season increases largely attributed to increased participation in waterfowl hunting during the COVID-19 pandemic. Following a steep decline in 2002, there had been a stable-to-slightly-decreasing number for approximately fifteen years, although permit (and historically state duck stamp) sales have been stable, if not increasing, since the early 1990s. Prior to that, there was a steady decline in hunters through the 1980s (Figure 6).

Figure 6. Washington active duck hunter time-series (1962-2023).

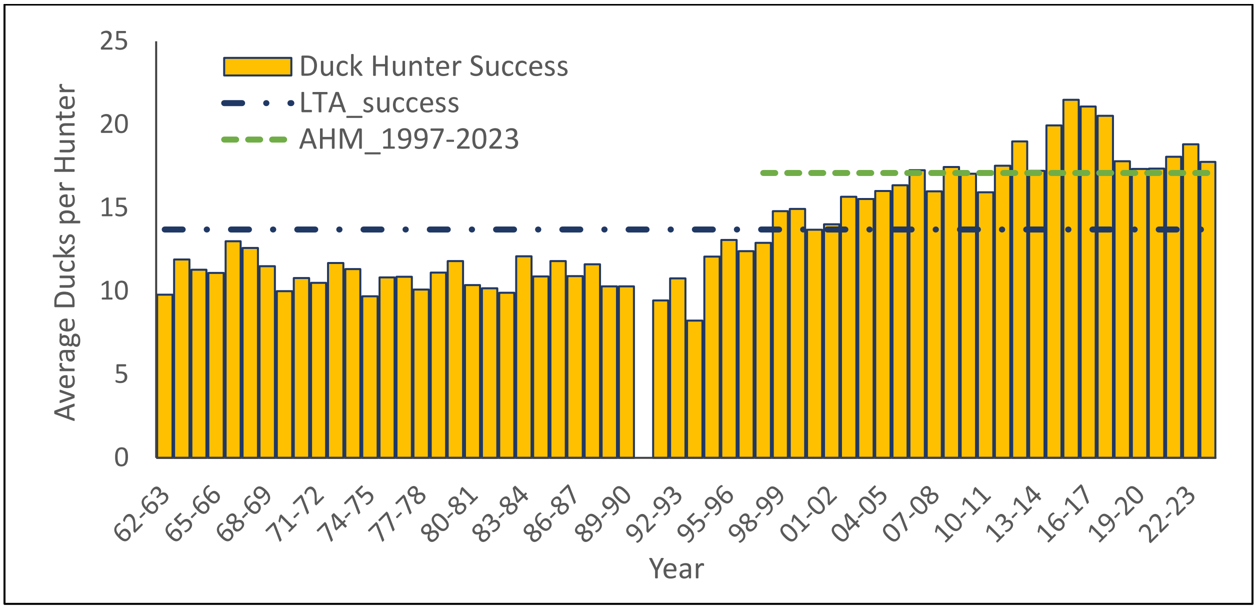


Long-term Average (LTA) indicated by dashed blue line. Long-term Average under Adaptive Harvest Management National Strategy (AHM 1997-2023) indicated by dashed gold line.

The estimated average number of ducks harvested per hunter in 2023-2024 was 17.8, a decrease from the 2022-2023 season of 18.8, but remains above the long-term average of 17.1 ducks per hunter, even with significant decreases in duck harvest, hunters, and days. In contrast to recent depressed hunter numbers, hunter success, when defined as ducks harvested per hunter per year, has been on an upward trend since the mid-1990s (Figure 7). This suggests that the downward trend in total duck harvest (Figure 4) is more related to hunter numbers (Figure 6) than decreased annual hunter success. The high success rate, relative to other states nationwide, may indicate that the state has retained many avid and successful waterfowl hunters but may be struggling to retain hunters that may hunt only a handful of days each season or are failing to recruit new waterfowl hunters due to perceived or real competition inthe field. WDFW continues to evaluate ways of better understanding this discrepancy and finding mechanisms to reduce “churn” rate, flipping between active and did not hunt status, in waterfowl hunters in Washington.

Members of the hunting public often believe the decline in hunter numbers is a result of the restrictive regulations that began in the mid-1980s. Regulations may have contributed to the reduced hunter participation (Figure 6), but the downward trend in hunter numbers began in the early 1980s when there was a 7-duck daily bag limit, no special restrictions on mallards and pintails, and season lengths were 93 days in the west zone and 100 days in the east zone, and have since diverged from waterfowl population status which improved to recorded highs during 2015-2016. The decline in hunter numbers is likely more attributable to a lack of recruitment or retention of new waterfowl hunters and changes in social views on hunting.

Figure 7. Washington duck hunter success time-series (1962-2023).



Long-term Average (LTA) indicated by dashed blue line. Long-term Average under Adaptive Harvest Management National Strategy (AHM 1997-2023) indicated by dashed green line.

The quality of opportunity, when defined by the average harvest per hunter of waterfowl hunting opportunities in Washington, is fair to excellent for the majority of the season and is largely driven by winter weather patterns in relation to water and forage availability (bioenergetic supply) on the landscape, but, certainly the diversity of waterfowl hunting styles (e.g., dabbling ducks, diving ducks, sea ducks, geese, and brant) present challenges in accessibility and educating traditional hunting style traditions (e.g., sea ducks and brant). Decreased hunter numbers result in lower hunter densities in the field, and overall success has remained stable to increasing. In addition, the state holds a large percentage of the Pacific Flyway's ducks. Urban encroachment in traditional hunting areas will be one of the biggest challenges faced by waterfowl hunters and managers, not only from an access and opportunity perspective, but also from the standpoint of meeting energetic requirements of species that depend on different regions of the state during the non-breeding period. Regardless, the value of Washington's waterfowl resources remains high and provides unique and enjoyable hunting recreation for the state's waterfowl hunting population.

WDFW has recognized a decline in "quality" hunting opportunities found in public hunting areas. In response, WDFW has developed initiatives to address public hunting opportunities on public and private lands. In 2018-2019, there were six regulated access areas (RAA) on WDFW lands, including Winchester

Ponds, Frenchman Ponds, and North Potholes in Region 2, and Bailie Youth Ranch, Mesa Lake, and Windmill Ranch in Region 3. In April 2021, the Fish and Wildlife Commission adopted regulations that expanded the number of Waterfowl RAAs to ten. WDFW also continued the private land access program, now called the Waterfowl Habitat and Access Program in Region 4, and maintained and expanded a private lands access program for waterfowl hunting in Region 2, 3, 4, and 6. Some of these programs featured limited access designed to reduce hunter crowding and limit waterfowl disturbance. However, there is continued recognition that habitat enhancements are key to achieving improved hunting experiences and will be emphasized over “quality” in the upcoming seasons. Finally, there is acknowledgment, but not widespread acceptance, that waterfowl hunters define “quality” very differently depending upon which of the five (or six) stages of hunter development one affiliates themselves with as to the characteristics of “quality” that they desire. Understanding these differences would help guide efforts and efficiencies on the ground to target more equitable access to opportunities.

Washington banded waterfowl harvest recoveries

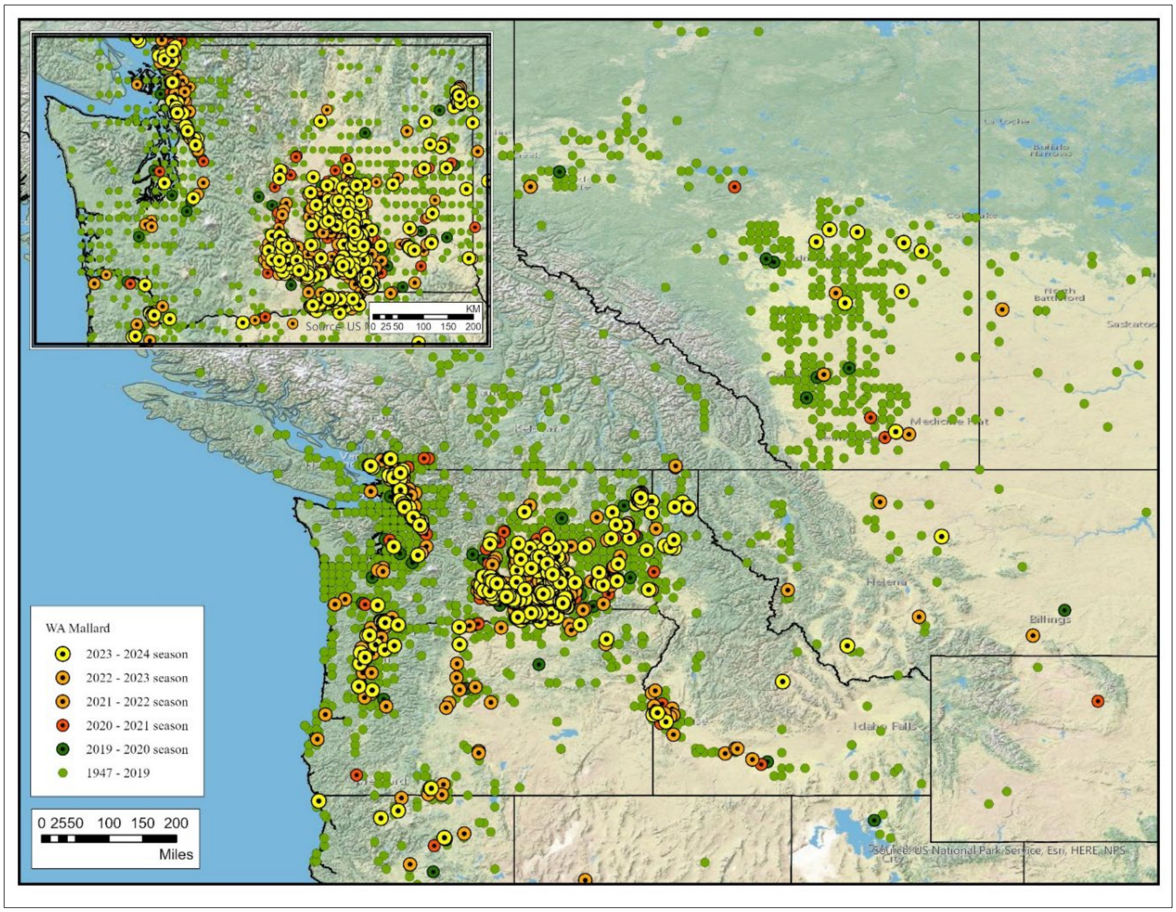
The use of banding as a tool to derive demographic estimates for survival, harvest distribution, derivation, and harvest rate in Washington has been implemented at varying levels of effort since 1946, with emphasis on mallard (since 1947) and Canada goose (since 1949), under a station Federal Bird Banding Permit overseen by the WDFW Waterfowl Section Manager. Operational banding occurs annually for western Canada geese, mallards, and mourning dove. Capture of Western Canada geese is conducted during June – July when non-breeding birds and family groups typically undertake flightless molt, allowing the use of a corral trap. A crew consisting of WDFW staff and volunteers is used to herd the flock of flightless geese into a capture pen. Capture of dabbling ducks, with emphasis on mallards, is conducted during July-September using one of three typical methods: 1) baited swim-in trap, 2) baited floating trap, or 3) rocket-net. Configuration of the capture site, accounting for constraints in the surrounding landscape, determines the most appropriate capture technique (Batt, 1992). Each captured individual is assessed, at a minimum, for species, age, and sex, then marked with an appropriately sized aluminum butt-end band issued by the Bird Banding Laboratory and released. Following field efforts, banding data is compiled and submitted to the US Geological Survey’s (USGS) Bird Banding Laboratory.

Operational pre-season duck banding focused on mallards in Washington results in band harvest, recovery, and reporting to the USGS Bird Banding Laboratory and is transmitted to USFWS and WDFW to derive harvest rates to assess against predictions for the western-mallard model of Adaptive Harvest Management (AHM; USFWS, 2023). Since 2010, both the Breeding Population Survey and pre-season mallard banding have been maintained explicitly to inform harvest regulations in Washington and throughout the Pacific Flyway (USFWS, 2023). Additionally, harvest recoveries from banded birds allow us to better understand the origin of different species, particularly ducks that can have a broad distribution (De Sobrino et al., 2017).

During 2023-2024, a total of 574 harvested band recoveries for mallards banded in Washington, with 489 (85.2%) recovered in Washington state (Figure 8). Reported Washington mallard harvest encounters occurred in October (137; 28.0%), November (136; 27.8%), December (100; 20.4%), and January (105;

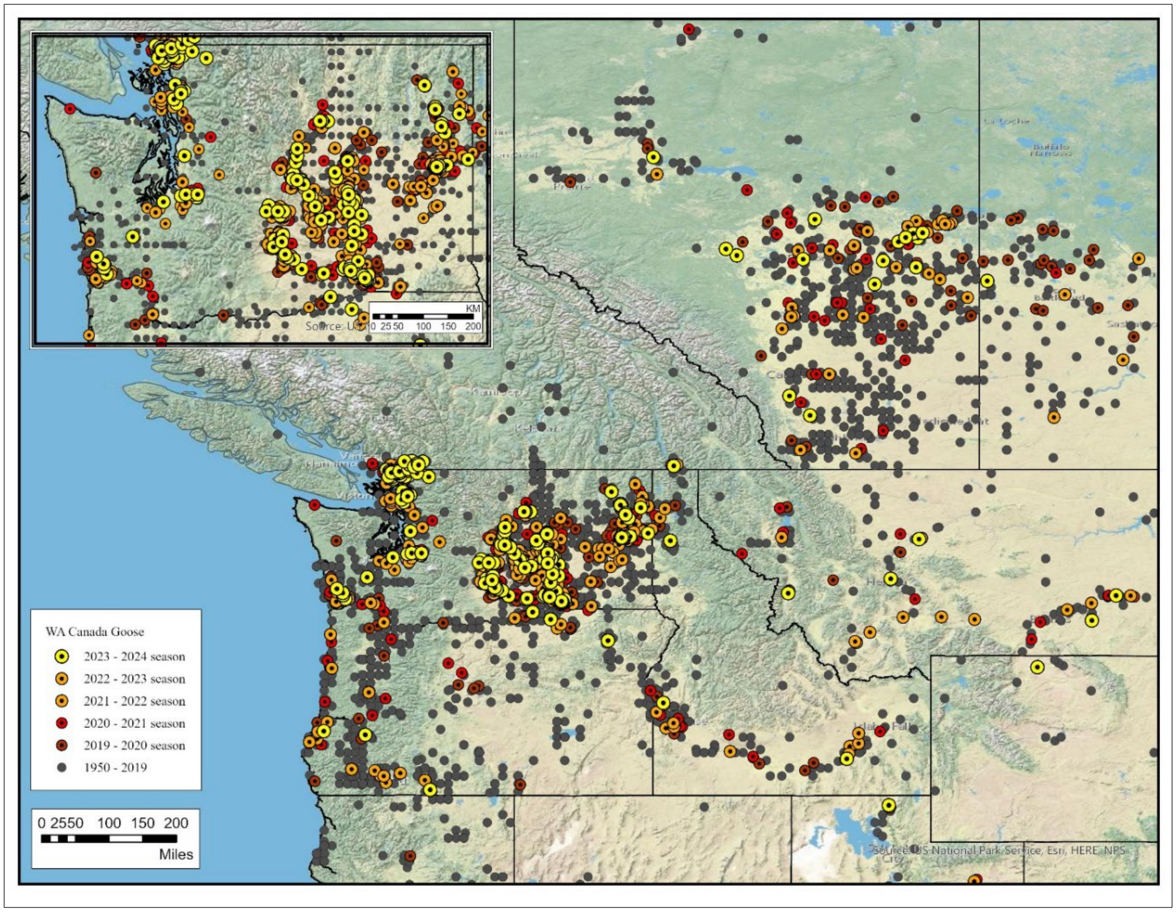
21.5%), with the other 11 harvested during special hunt dates: three during September, and eight during February. During the 2023-2024 goose season, a total of 247 harvested band recoveries were reported for Western Canada geese banded in Washington, with 196 (79.4%) recovered in Washington state (Figure 9). Reported Washington Western Canada harvest encounters occurred in September (68; 34.79%), October (37; 18.9%), November (31; 15.8%), December (18; 9.2%), January (38; 19.4%) and four reported during limited late-season segments in February and March.

Figure 8. Reported harvest recoveries of mallard banded in Washington from deployments occurring between 1947 and the summer of 2023.



Yellow markers indicate reported harvest recoveries during the 2023-2024 duck hunting season.

Figure 9. Reported harvest recoveries of Western Canada geese banded in Washington from deployments occurring between 1950 and the summer of 2023.



Yellow markers indicated reported harvest recoveries during the 2023-2024 goose seasons, including special September season dates.

Recommendations

- Attempt to minimize harvest regulation adjustments during the final year of the three-year period and continue to evaluate harvest opportunities and access limitations.
- Evaluate trends in sea duck harvest, particularly the significant increase in harvest days afield.
- Re-evaluate harvest strategy in both sea ducks and brant in preparation for the update to the waterfowl portion of the WDFW Game Management Plan.
- Transition the ocular Puget Sound Ecosystem Monitoring Program survey to image-based methods to increase crew safety, improve observation detectability, and enhance scientific transparency.
- Generate habitat suitability models for priority marine species for incorporation into spatially explicit population estimates and to assist in the prioritization of habitat conservation efforts.
- Prioritize winter brant survey count of Whatcom and derive estimates from the two previous seasons using available PSAMP data (evaluate years with overlap for comparability).

- Assess the ability to use drones to improve the timing and consistency of the snow goose age-ratio survey for Skagit-Fraser flock.
- Continue the Columbia Basin Snow Goose Fly-off Survey in coordination with ODFW.
- Initiate a collaborative effort to investigate the concerns around the "small Canada goose" complex of Taverner's cackling geese and lesser Canada geese, involving USFWS, ADFG, and Pacific Flyway partners.
- Derive harvest rate estimates for Washington breeding mallards and provide a comparison against expected values derived for the Western Mallard AHM model.
- Provide a more detailed summary of mallard and Canada goose band returns in future reports, including temporal patterns in the harvest.
- Prepare a minimum of one peer-reviewed manuscript from the updated PSAMP sea duck dataset.

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Wild Turkey

Wild Turkey Statewide Status and Trend Report

Sarah Garrison, Statewide Small Game Specialist

Introduction

Wild turkeys (*Meleagris gallopavo*) were first successfully introduced in Washington in the 1960s. Attempts to establish wild turkey populations by releasing pen-raised birds from 1913 to 1959 were largely unsuccessful. The success of later releases is attributed to the ability to capture wild turkeys for translocation to Washington. Population augmentation from 1984 through 2003 expanded turkey distribution and increased hunting and wildlife viewing opportunities (WDFW, 2005). Wild turkey populations had reached a low point in the US around the 1930s, and restoration efforts took decades of dedicated work (Healy & Powell, 1999). Turkey conservationists celebrated the establishment of populations in Washington as an achievement for this iconic North American species.

Three subspecies of wild turkeys occur in Washington. These occur in varied habitats across their native ranges, but commonalities include mature trees for roosting and mast production near open understory for grass and herbaceous forage (Porter, 1992). Turkeys will use open fields and cropland when roost trees are available nearby, while shrubby habitat can also provide important brood cover and forage (Porter, 1992). The Eastern subspecies (*M. g. silvestris*) persists in low densities in southwestern Washington. This subspecies was sourced from Iowa, Pennsylvania, and Missouri, where oak-hickory and other hardwood forests with abundant hard mast are dominant. The Rio Grande subspecies (*M. g. intermedia*) in Washington was sourced from Texas and now occurs throughout southeastern Washington. In its native range, the Rio Grande turkey occupies plains, grasslands, shinnery, prairie, oak-hickory, oak-pine, pinon-juniper, Texas savannah, and shrubsteppe forest from Mexico to Kansas (Beason & Wilson, 1992). The Merriam's subspecies (*M. g. merriami*) is the most abundant in Washington and occurs in the northeastern and central parts of the state. Merriam's turkeys are native to mountainous areas of Colorado, New Mexico, and Arizona, where they are closely associated with Ponderosa Pine but will also use mixed conifer forests (Shaw & Mollohan, 1992). Some hybridization likely occurs between the Rio Grande and Merriam's subspecies where their ranges overlap.

Management guidelines and objectives

In January 2006, the Department adopted a statewide Turkey Management Plan (WDFW, 2005) to supplement the Game Management Plan in response to increasing turkey populations and management topics. Population management strategies from this plan were included and updated in the 2015-2021 Game Management Plan (WDFW, 2014).

The statewide management goals for wild turkeys are to:

1. Preserve, protect, perpetuate, and manage wild turkeys and their habitats to ensure healthy, productive populations.
2. Manage wild turkeys for various recreational, educational, and aesthetic purposes, including hunting, scientific study, wildlife viewing, cultural and ceremonial uses by Native Americans, and photography.
3. Manage statewide wild turkey populations for a sustained harvest.

Hunting seasons and recreational harvest

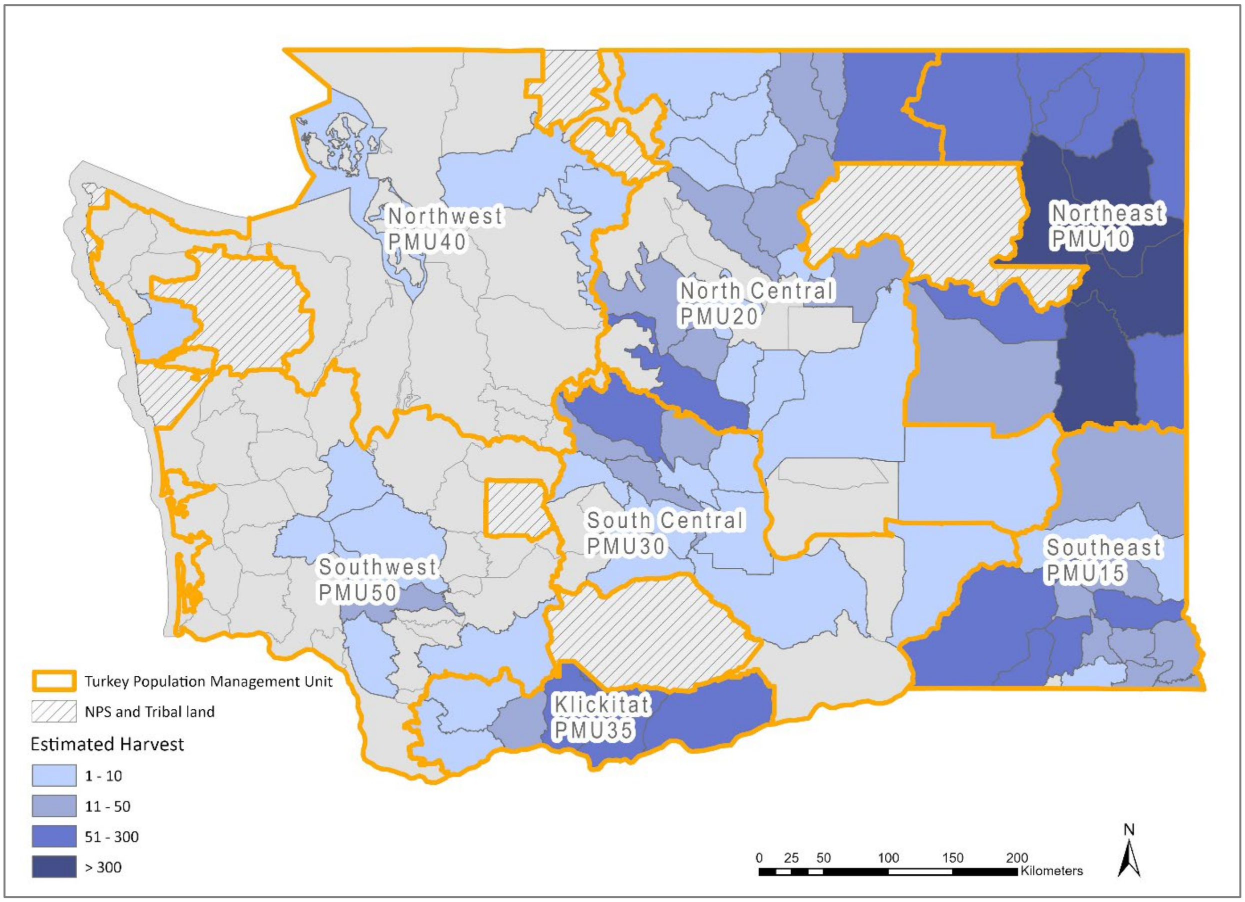
Hunter effort and harvest of wild turkeys are estimated based on the analysis of mandatory hunter reports. Hunters owe reports on all turkey tags, including tags they did not use. Successful hunters are required to submit the date, location, and sex of harvested birds. This mandatory reporting system has allowed for better estimates of harvest and hunter participation than estimates made prior to the reporting requirement.

Within Washington State, Game Management Units (GMUs) have been grouped to define seven turkey Population Management Units (PMUs; Table 1; Figure 1). Changes in harvest have been tracked at the statewide and PMU scales as indicators of population trends. Improvements were made to the turkey harvest data analysis routine in 2011 and 2016, which could account for some variations in estimates and should be considered when comparing data across years.

Table 1. Game Management Units (GMUs) included in each turkey Population Management Unit (PMU).

PMU	PMU Name	GMUs Included
10	Northeast	101-136
15	Southeast	139-186
20	North Central	All 200 GMUs
30	South Central	All 300 GMUs EXCEPT GMU 382 & 388
35	Klickitat	GMUs 382, 388, 568-578
40	Northwest	All 400 GMUs PLUS GMUs 601-627
50	Southwest	All 500 GMUs EXCEPT 568-578 PLUS GMUs 633-699

Figure 1. Estimated spring turkey harvest in each Game Management Unit based on 2023 hunter reports.



The statewide spring general season runs from April 15 to May 31 and has been in place since 2008. Beginning in 2022, the youth season that precedes the general season was lengthened from 2 to 7 days. The spring season is for male turkeys and turkeys with visible beards only. The spring season limit is three birds, with some area restrictions.

Fall opportunities have varied and were generally expanded over the years. In 2018, the fall general season in GMUs 101-154 and 162-186 expanded to run continuously from September 1 to December 31. Also, that year, the permit hunt in Klickitat County changed to a fall general season opportunity. In 2021, the Klickitat hunt lengthened to match the September 1 to December 31 general season, along with the entire North Central unit (PMU 20). This eliminated the Methow fall permit hunt since the area became open to general season hunting. The fall seasons allow harvest of either sex with a bag limit of four birds with some area restrictions as outlined in the WDFW hunting regulations pamphlets.

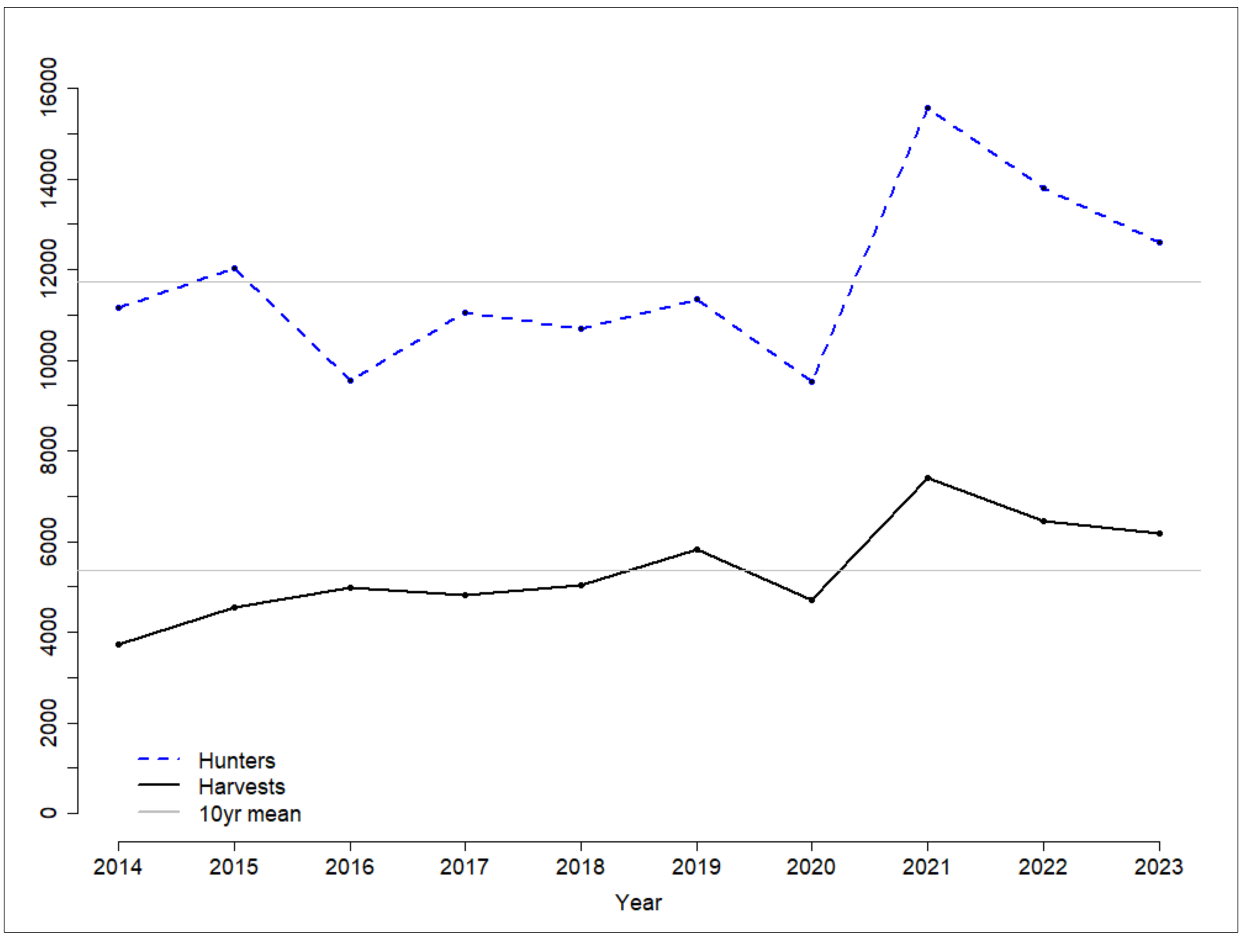
One permit hunt, the Teanaway, was available in fall 2023. This hunt offered 50 permits in Kittitas County, GMU 335, and allowed harvest of either sex with a bag limit of one bird.

Turkey hunting is open to shotgun, archery, and crossbow hunting during the spring and fall seasons. Beginning in 2022, handguns that meet specific requirements may be used for turkey hunting. Handguns must be legal modern handguns designed for hunting, shooting #4 or smaller shot, and not capable of holding more than three shells. Handgun barrel length must be a minimum of 10 inches, inclusive of choke tube. Modern handguns must shoot a minimum three-inch shotshell of .410 caliber or larger.

Similarly, legal muzzleloading handguns may be used if they are designed for hunting and shooting #4 or smaller shot. Muzzleloading handgun barrel length must be a minimum of 10 inches. Muzzleloading handguns must be .45 caliber or larger. Dogs, baiting, electronic decoys, and electronic calls are not legal in Washington; non-electronic decoys are permitted. In 2006, the Fish and Wildlife Commission adopted a regulation permitting falconers to hunt turkeys during the fall and winter.

Current regulations are considered relatively conservative. The spring season timing results in the harvest of gobblers after peak breeding. The season ends before most nests hatch, so disturbance is minimized. Fall seasons have been expanded in certain areas to increase hunting pressure in response to increased complaints regarding turkey damage and human-wildlife conflict.

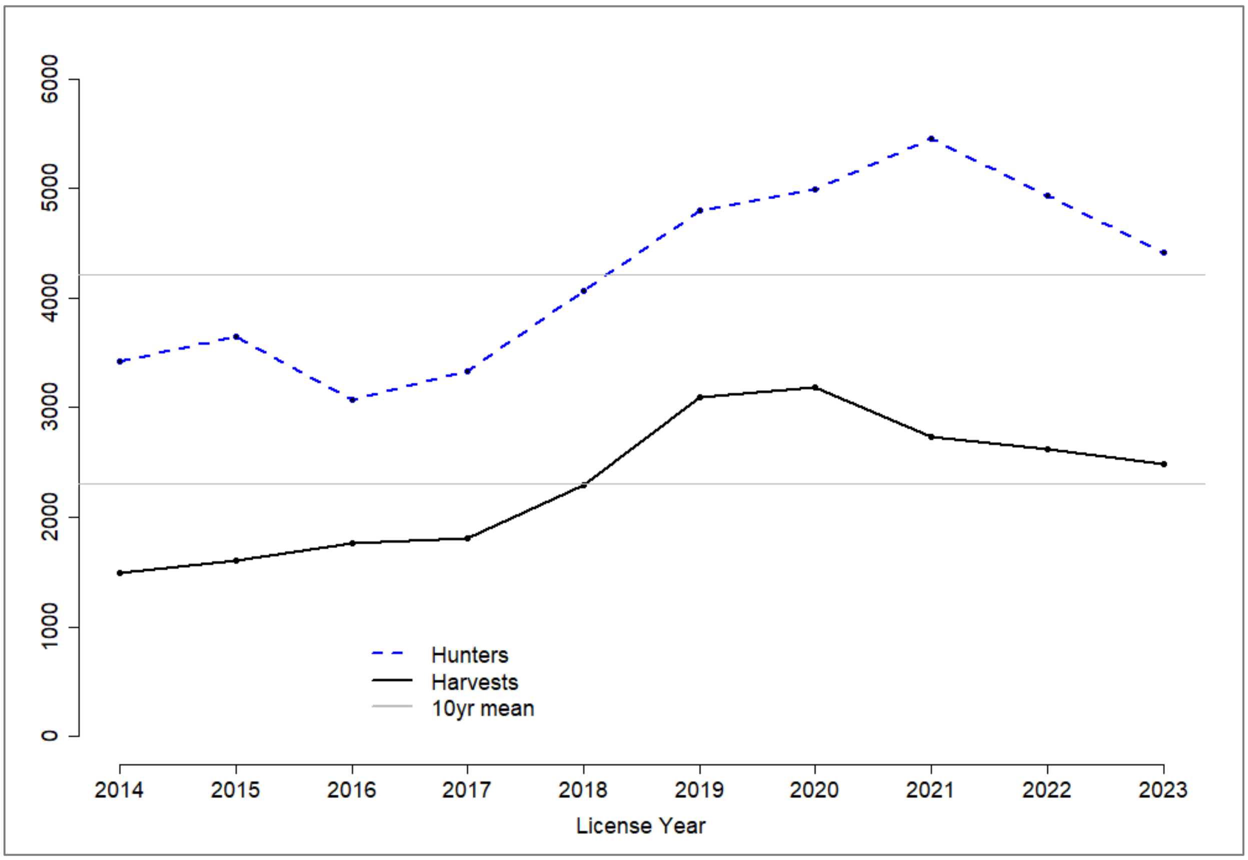
Figure 2. Estimated statewide spring turkey harvest and hunter participation with ten-year means, 2014-2023.



Statewide participation in spring turkey hunting averaged 11,738 hunters over the past ten years (2014-2023; Figure 2). In 2023, participation decreased 9% from 2022 to an estimated 12,613 hunters, which is 8% above the previous 10-year average. Estimated harvest decreased 4% in 2023 to 6,192 birds but remained 15% above the previous 10-year average.

Depredation on agricultural lands caused by turkeys and other conflicts with humans remains a concern in parts of eastern Washington. Liberal fall general seasons are in place there and have recently expanded to help address those issues. This change in season length and extent should be considered when examining trends in fall harvest data. Participation in fall turkey hunting has increased over the past decade (Figure 3). In 2023, an estimated 4,410 hunters pursued turkey in the fall, taking an estimated 2,490 birds. Hunter participation decreased 11% from the previous year but remained 5% above the previous 10-year average of 4,214 hunters. Fall harvest in 2023 decreased by 5% from 2022 and remains 8% above the previous 10-year average of 2,309 birds.

Figure 3. Estimated fall turkey harvest and hunter participation with ten-year means, 2014-2023.

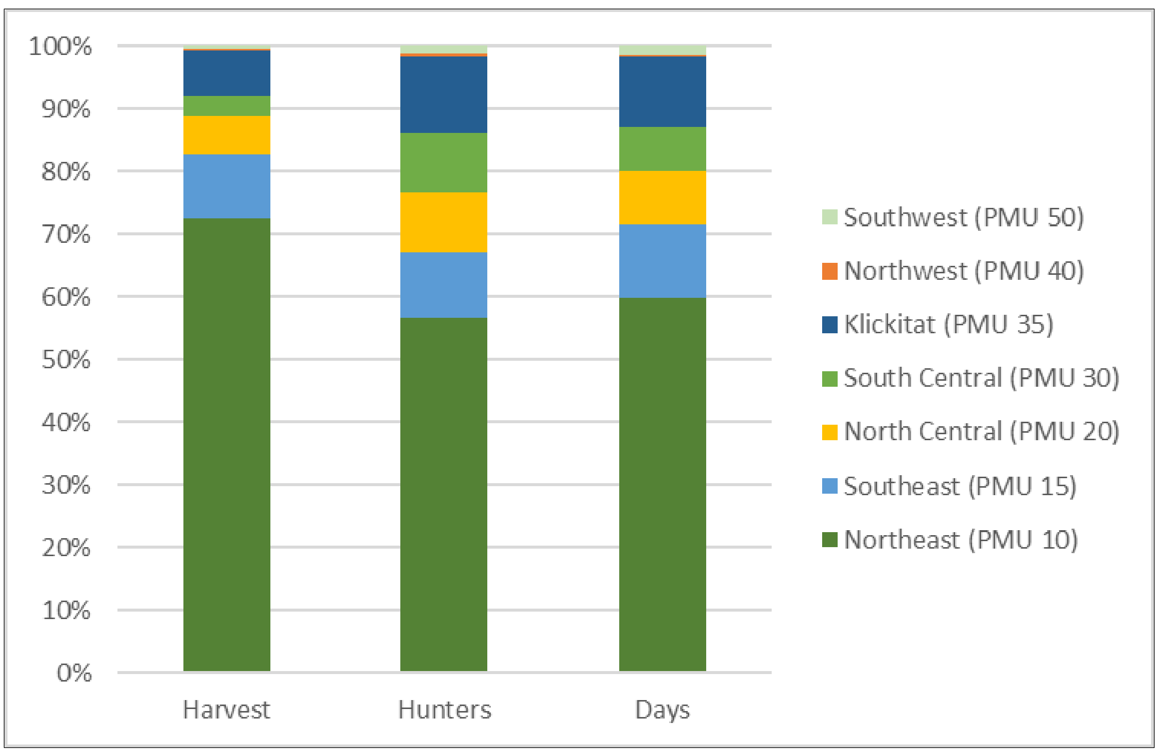


The majority of spring turkey hunting activity occurs in the Northeast unit (PMU 10; Table 2; Figure 4). In 2023, spring harvest in this PMU represented 72% of the total statewide spring harvest. The remaining hunting activity is largely distributed throughout eastern Washington, with little hunting in western Washington (PMU 40 and 50) where turkey populations are less robust.

Table 2. Estimated spring turkey harvest in each turkey Population Management Unit (PMU), 2014-2023.

PMU	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
P10	2,461	3,097	3,421	3,331	3,453	3,847	3,177	5,006	4,540	4,479
P15	500	531	590	499	563	643	461	673	615	645
P20	181	260	270	331	326	480	427	641	448	371
P30	137	157	208	175	172	186	156	305	214	195
P35	436	475	461	417	456	598	461	729	594	462
P40	1	3	2	5	23	12	0	14	13	7
P50	25	38	28	56	25	39	24	51	40	33

Figure 4. Proportion of turkey harvests, hunters, and days hunted in each turkey Population Management Unit (PMU) of Washington during the 2023 spring season.



Population monitoring

Harvest and hunter-effort data serve as an index to population trends. Standardizing harvest estimates by the amount of hunter effort expended to achieve that level of harvest can provide some indication of whether populations are increasing, decreasing, or stable.

Hunter success remains above average for both the spring and fall seasons (Figure 5). In 2023, spring hunter success increased to 49% and fall hunter success increased to 56%. Stable-to-increasing spring success suggests that liberal fall harvest seasons are not adversely impacting the spring hunting experience.

Figure 5. Hunter success rate (harvests per 100 hunters) for the spring and fall turkey hunting seasons with ten-year means, 2014-2023.

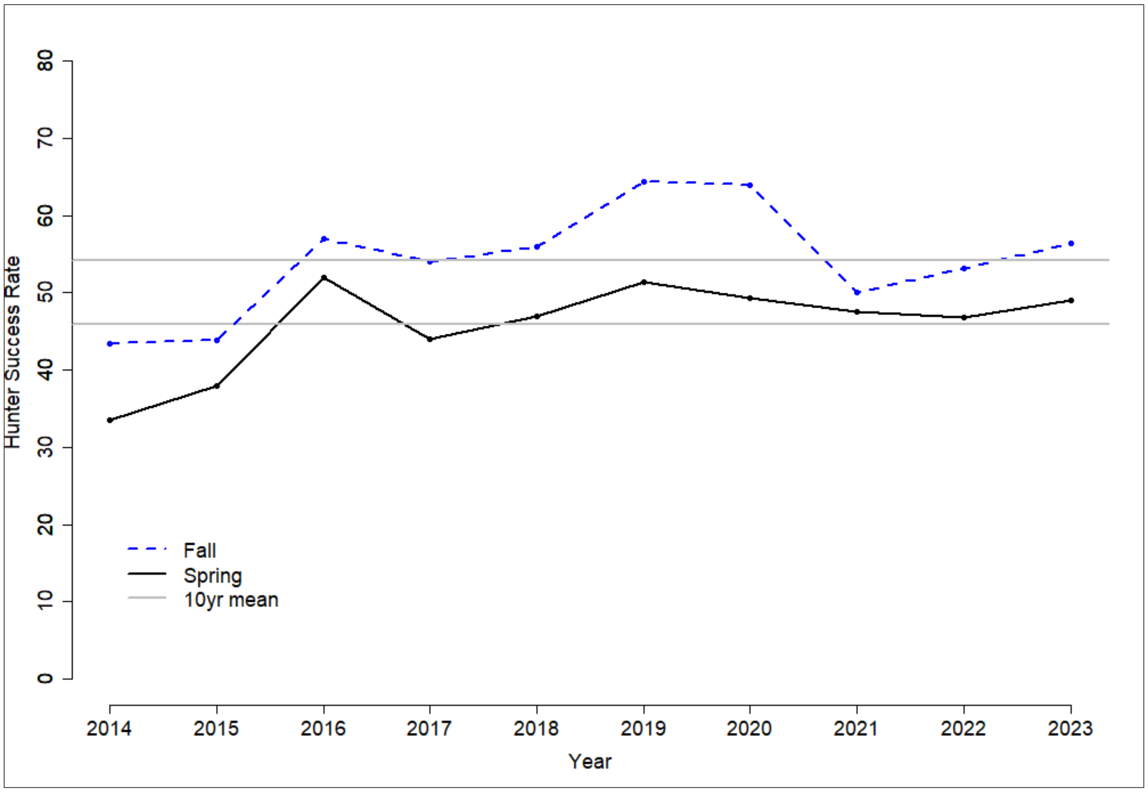
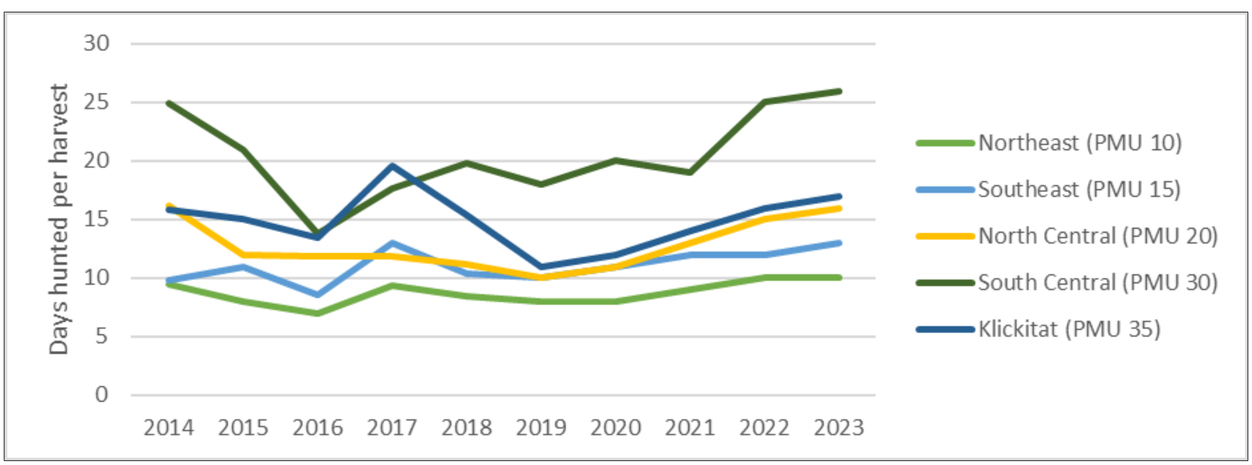


Figure 6. Number of days hunted per successful turkey harvest during the spring season in each turkey Population Management Unit (PMU), 2014-2023[a].



[a] The Northwest (PMU 40) and Southwest (PMU 50) are excluded due to small sample sizes.

The number of days hunted per harvest has shown little to no trend in most turkey PMUs over the past decade (2014 – 2023), though the Northeast (PMU 10) is starting to show an increasing trend (Figure 6). In 2023, days hunted per harvest increased by one in most PMUs and remained unchanged in the Northeast (PMU 10).

In 2022, WDFW initiated public brood surveys (wdfw.wa.gov/hunting/management/game-bird-survey) for wild turkey following a protocol developed by the National Wild Turkey Federation Technical Committee (2019). These data provide an index to turkey population productivity that is independent of harvest data. Good participation levels in 2022 yielded a sufficient sample size (269 observations), but participation dropped in 2023 so only 80 useable observations were available, representing 1112 total turkeys. These observations suggest that productivity increased in 2023, with higher poults per hen, poults per brood, and proportion of hens with a brood relative to 2022. The majority of observations came from the Northeast (PMU 10). Increasing participation in the brood survey will be important to continue this monitoring in future years and to assess population trends for each PMU.

Spring of 2021 was unusually warm and dry, leading to a record-breaking heat wave in June that may have impacted brood survival. An extended drought season followed that likely limited forage throughout the summer. Conversely, the spring of 2022 was unusually wet and cool, which may have been detrimental to hatching poults but led to improved forage production throughout the season. In 2023, spring weather was typical and while some areas experienced moderate to severe drought, much of eastern Washington, particularly central Washington east of the Cascades, avoided drought and experienced good forage conditions through the summer. Despite these variable weather conditions, turkey populations in Washington appear robust and largely unimpacted at the population level.

WDFW is seeking additional cost-effective methods for monitoring turkey and other upland species. In 2023, WDFW contracted a university research project to assess the use of drones for detecting and identifying pheasants and turkeys. Staffing issues impeded the project from completing objectives, but preliminary data indicated that turkeys can be detected with thermal imagery and regular (red-green-blue) imagery under certain conditions. However, the applicability of this method for population monitoring remains uncertain. WDFW has no plans to continue efforts to establish drone monitoring for turkeys at this time.

Habitat

Turkeys are generalist species that can occupy diverse habitats (see Introduction) and utilize a wide variety of food sources. Grasses, including cultivated varieties, and mast, such as acorns, pine seeds, and berries, are especially important (Evans-Peters, 2013). Habitat enhancement priorities are identified in the 2015-2021 Game Management Plan (WDFW, 2014). Projects that increase habitat values for multiple wildlife species, in addition to turkeys, are of special interest. In 2021, WDFW began offering annual habitat funding for turkey habitat enhancement projects in addition to funding already provided through other programs like the Private Lands Access Program (see the Private Lands Access Program chapter in this report for more information). During the 2023-2024 funding cycle, WDFW invested approximately $50,000 in these supplemental habitat projects. WDFW awarded the majority of funding to the Columbia Land Trust to improve habitat on the Bowman Creek Natural Area, which is partially adjacent to the Klickitat Wildlife Area. This project completed non-commercial thinning and slash abatement on approximately 16 acres of overstocked forest, controlled invasive weeds on over ten acres, and made preparations for a 274-acre prescribed burn. Additional funding provided trees and shrub plantings for continued restoration in an area of Whitman County impacted by the Babb Road fire.

Population augmentation

There were no new releases of turkeys in any PMU across the state, and none are planned in the future. Turkeys are present in most areas that would be considered suitable habitat. Concerns related to human-wildlife conflict have precluded introductions in the recent past. WDFW management plans identify trapping and translocation as a potential response to damage and complaints. However, in these cases, turkeys are only being moved to areas where turkey populations of the same subspecies already exist. Few translocation activities have occurred in recent years.

Management conclusions

Turkey populations across the state appear stable to increasing, with the largest concentrations in eastern Washington. Liberal fall hunting seasons do not appear to impact spring hunting success detrimentally. It will be important to continue close monitoring to ensure spring season integrity is maintained. Turkey damage and complaints continue to be reported from eastern Washington, especially Spokane County. Additional hunting opportunities have been created in these areas to help address these complaints. WDFW will continue reviewing ways to focus hunter effort and other management tools in areas with private lands experiencing damage. Management decisions will seek to maintain high hunter success rates in the spring while also addressing human conflict issues. The Wildlife Conflict chapter in this report provides more information.

Determining population trends for wild turkey in western Washington is limited by available data. Wild turkeys are likely reproducing at low levels but maintaining a viable population in PMU 50. Restricted access opportunities may further limit harvest in this area.

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Pheasant

Pheasant Statewide Status and Trend Report

Sarah Garrison, Statewide Small Game Specialist

Introduction

Ring-necked pheasants (*Phasianus colchicus*) were first introduced to Washington from China in 1883. Pheasants thrived in agricultural fields; a habitat generally unsuitable to native galliforms. Agriculture at this time created a patchwork of small fields with diverse cover, slow hay harvest that allowed good nest success, abundant weeds in the crops for brood habitat and winter cover, and abundant waste grain for winter food (National Wild Pheasant Technical Committee [NWPTC], 2021). Pheasant populations peaked around the 1960s, then began to decline as grain production increased in the 1970s, and agricultural intensification reduced habitat quality by removing perennial cover for nesting, brood rearing, and winter cover (NWPTC, 2021). Pheasants have become an important driver for conservation by motivating the creation of wildlife habitat in agricultural ecosystems that benefit a myriad of species, especially grassland birds and pollinators, while controlling soil erosion and improving water quality (NWPTC, 2021).

In Washington, wild pheasant (i.e., not pen-raised) populations occur only in the eastern part of the state due to unsuitable climate and habitat in western Washington. In western Washington, a pheasant release program exists to provide an upland bird hunting opportunity to western Washington hunters. For more information about the pheasant release program, see wdfw.wa.gov/hunting/locations/pheasant-release.

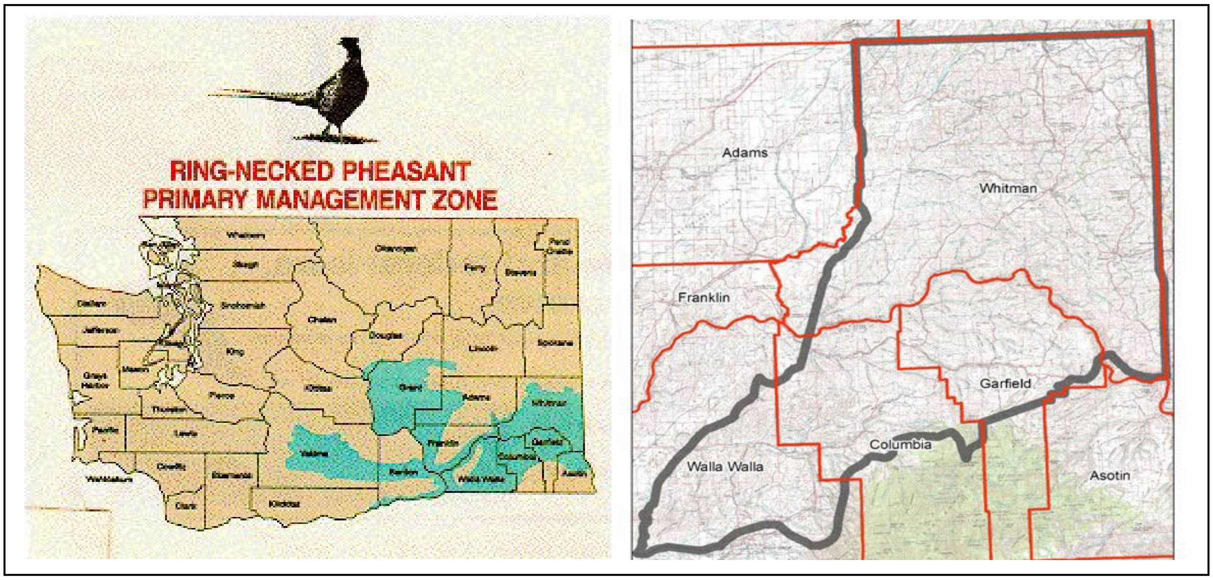
Population guidelines and objectives

Management objectives for upland birds, including pheasant, are outlined in the Washington Department of Fish and Wildlife's (WDFW) Game Management Plan (WDFW, 2014). Goals aim to bolster pheasant numbers through habitat enhancement to ensure healthy, productive populations for recreation and other purposes. Additional strategies are described in the National Wild Pheasant Conservation Plan (NWPTC, 2021), which emphasizes the importance of resources such as the Farm Bill and other habitat conservation opportunities, managing fragmented populations and habitats, understanding drivers of hunter participation, showcasing pheasant-related values, and leveraging partnerships across the pheasant range. Washington-specific strategies are also outlined in the meeting summary from the 2003 Pheasant Workshop (WDFW, 2003).

The legislature established the Eastern Washington Pheasant Enhancement Program (EWPEP, RCW 77.12.790) in 1997 as a dedicated funding source to improve pheasant hunting opportunity through a combination of habitat enhancement and the release of rooster pheasants on lands open to public hunting. More information is available at wdfw.wa.gov/hunting/locations/pheasant-enhancement and an annual program report is available at https://wdfw.wa.gov/publications/02521. Funding allocated to habitat enhancements will help address objectives identified in the 2015-2021 Game Management Plan (WDFW, 2014) to increase the amount of quality pheasant habitat in the pheasant focus area (see below).

A primary pheasant management zone in Washington highlights areas where populations have been historically high. Within this primary zone, WDFW has delineated a southeast Washington pheasant focus area that includes portions of Columbia, Garfield, Walla Walla, and Whitman counties to focus pheasant management efforts where adequate rainfall (i.e., 14 inches and over) is most conducive to supporting desirable plant communities (Figure 1).

Figure 1. Washington state ring-necked pheasant primary management zone (left) and the southeast Washington pheasant focus area (right).



Hunting seasons and recreational harvest

The 2023 pheasant harvest season began in September with a 2-day statewide youth season followed by a 5-day season for hunters 65 and older and hunters with disabilities. The 2023 general pheasant season was open October 21 through January 15 of the following year in eastern Washington and September 23 to the end of November in western Washington, with a 15-day early December extended season in some areas of western Washington.

For the past two decades, harvest and hunter participation have been estimated based on a survey mailed to a stratified random sample of 25,000 hunters. In 2022, WDFW replaced the mailed survey with an online survey of all small game license holders. This updated survey has the advantages of increased sample size and improved stratification. Additionally, a sample of hunters who did not respond to the online survey were called for a follow-up phone survey, which enabled correction for non-response bias. Due to these improvements in the survey and analysis, data from 2022 and later are more accurate but are not directly comparable to previous years.

During the 2023 season, 40,290 pheasants were released at designated sites in western Washington, and 4358 hunters purchased licenses for this opportunity. An estimated 3409 hunters (95% CI = 3322 – 3491) pursued pheasant for 29,340 (95% CI = 28,447 – 30,228) days and harvested 24,462 (95% CI = 23,693 – 25,218) birds in western Washington.

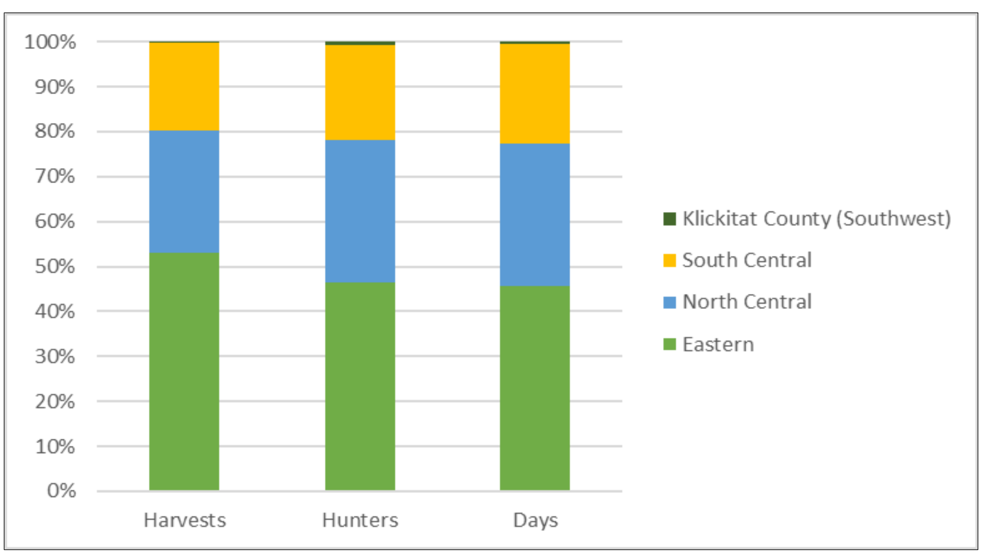
Estimates of harvest and hunter participation for the remainder of this report include the following eastern Washington counties within the Eastern, North Central, South Central, and Southwest regions: Adams, Asotin, Benton, Chelan, Columbia, Douglas, Ferry, Franklin, Garfield, Grant, Kittitas, Klickitat, Lincoln, Okanogan, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman, and Yakima.

Participation in pheasant hunting peaked in the 1950s, while harvest peaked in the 1960s. Changing farming practices have deteriorated pheasant habitat, resulting in long-term population declines along with a decline in hunting participation (WDFW 2023). During the 2023 season, the number of pheasant hunters increased 5% and the number of days hunted decreased 5% relative to the 2022 season (Table 1). The number of harvests increased 21% between 2022 and 2023. Since 1997, rooster pheasants have been released in the fall as part of the state-funded EWPEP. In the 2023 season, WDFW released 10,347 pheasants in eastern Washington. Harvest estimates have included both released and wild birds; therefore, the harvest of wild-grown pheasants is lower than depicted in Table 1.

Table 1. Estimates of eastern Washington pheasant hunters, harvests, and hunting days with 95% confidence intervals (CI).

License Year	Harvests (95% CI)	Hunters (95% CI)	Days (95% CI)
2022	23249 (21362 – 25261)	7914 (7366 – 8492)	42523 (39178 – 45961)
2023	28081 (25814 – 30606)	8276 (7750 – 8848)	40356 (37560 – 43461)

Figure 2: Estimated proportion of pheasant harvests, hunters, and number of days hunted in each region of eastern Washington during the 2023 season[a].



[a] Within the Southwest region, only Klickitat County is considered part of eastern Washington.

The majority of eastern Washington pheasant hunting occurs in the Eastern region (Figure 2), which contains all of the pheasant focus area and the Lincoln County portion of the remaining pheasant management zone (Figure 1). The North Central region's portion of the pheasant management zone includes Douglas, Grant, and Adams counties, while the South Central region's portion includes Yakima, Benton, and Franklin counties. For a map of WDFW Regions, see wdfw.wa.gov/about/regional-offices. During the 2023 season, Grant and Whitman counties produced the most pheasant harvests, while Whitman, Adams, and Garfield counties provided the highest success rates for pheasant hunters.

Population monitoring

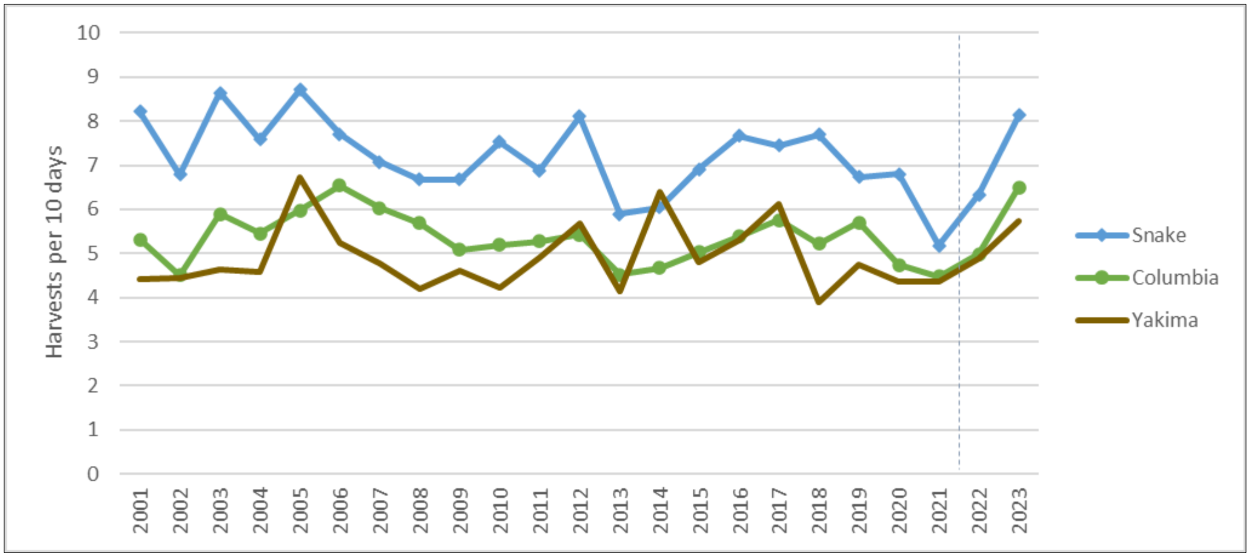
In addition to long-term declines in pheasant harvest, crow counts, and brood counts also indicated declines during surveys in the primary management zone from 1982 through 1998. Though these are coarse measures of population trend, they suggest population declines in the range of 5-10% per year in that zone during that period (Rice, 2003). Rice (2003) found that crow and brood surveys were only likely to detect large population changes in the short term. Therefore, these surveys were not considered cost-effective and were discontinued.

North American Breeding Bird Survey (BBS) data indicate a declining trend of -3.7% (95% CI: -4.98 - 2.45%) in Washington pheasant populations between 1993 and 2022 (Hostetler et al., 2023). In 2022, WDFW initiated public incidental brood surveys to monitor summer productivity for multiple game bird species, including pheasant (wdfw.wa.gov/hunting/management/game-bird-survey). These surveys are modified from a standardized protocol for turkey brood surveys developed by the National Wild Turkey Federation Technical Committee (2019). In 2023, too few pheasant observations were reported to be useful for monitoring. Increased participation in future years will be necessary to use this survey as an effective monitoring tool.

Harvest and hunter-effort data can provide an index to population trends. Standardizing harvest estimates by the amount of hunter effort expended to achieve that level of harvest can offer some indication of whether populations are increasing, decreasing, or stable. Harvest estimates for the Columbia River, Snake River, and Yakima River Basins are used to monitor trends within the primary pheasant management zone. For this report, the "Yakima River Basin" consists of Yakima and Benton counties, the "Snake River Basin" is made up of Asotin, Garfield, Columbia, Walla Walla, and Whitman counties, and the "Columbia River Basin" includes Lincoln, Adams, Franklin, Grant, and Douglas counties.

In all three basins, pheasant harvests for every ten days hunted has remained fairly stable, with a slightly decreasing trend in the Snake River Basin over the past two decades (Figure 3). With some variation among years, ten days of hunting averaged over seven pheasant harvests in the Snake River Basin, between five and six pheasants in the Columbia River Basin, and nearly five pheasants in the Yakima River Basin between the 2001 and 2023 seasons (Figure 3). With the change in harvest data collection methods in 2022, results from the last two years are not directly comparable to data from previous years. Harvests per ten days hunted were above average in 2023, at more than eight pheasants in the Snake River Basin, between six and seven in the Columbia River Basin, and nearly six in the Yakima River Basin.

Figure 3. Estimated number of pheasant harvests per ten days hunted in each of three river basins in eastern Washington, 2001-2023[a].



[a] Dashed vertical line denotes change in survey methodology.

Spring weather conditions can strongly influence upland game bird fall population densities and related harvest. Recently hatched chicks are vulnerable to cold rains before they are sufficiently feathered, yet spring rains are needed to provide early plant growth for nesting cover. Consistent warm early summer rains create insect-rich environments for pheasant chicks. Even with normal temperatures, early spring drought conditions may decrease insect availability. A large portion of pheasant chick diets consist of calorically dense, high-protein insects (Savory, 1989). Spring of 2021 was unusually warm and dry, leading to a record-breaking heat wave in June that was likely detrimental to pheasant nesting and brood-rearing. An extended drought season followed that likely limited forage throughout the summer and adversely impacted populations. Conversely, the spring of 2022 was unusually wet and cool, which may have been detrimental to hatching chicks but led to improved forage production throughout the season. In 2023, spring weather was typical and while Snake River Basin populations experienced moderate to severe summer drought, populations in the Yakima and Columbia River basins avoided drought and experienced good forage conditions through the summer.

WDFW is seeking additional cost-effective methods for monitoring pheasant and other upland species. In 2023, WDFW funded a university research project to assess the use of drones for detecting and identifying pheasants and turkey with both thermal imagery and regular RGB imagery. Researchers were unable to complete the project due to staffing issues; however, preliminary results indicated that pheasants, including chicks and eggs, can be detected in grasslands with thermal imagery under certain conditions. Image resolution was insufficient to reliably distinguish pheasant from other wildlife and pheasants were not reliably detected under shrub cover. WDFW is not pursuing additional efforts to monitor upland birds with drones at this time.

Habitat

Permanent cover is critical to pheasant production, particularly where forest stands consist of a diverse mix of grasses, broadleaf, and flowering plants (i.e., forbs). Diverse vegetation can produce more suitable nesting and brood-rearing habitat (Midwest Pheasant Study Group, 2013). Research in many parts of the United States indicates that habitat loss is the primary factor for declining pheasant populations (Labisky, 1976; Warner et al., 1984; Coates et al., 2017). Nesting and brood-rearing habitat, winter cover, and escape cover are particularly important to elude predators (Warner, 1979). Most of eastern Washington's pheasant habitat is heavily influenced by agriculture, and as a result, the Conservation Reserve Program (CRP) is a critical component of contiguous pheasant habitat.

WDFW leverages multiple programs to improve habitat quality for pheasant and other upland game birds, including the State Acres for Wildlife Enhancement (a CRP program), the Natural Resources Conservation Service's Voluntary Public Access and Habitat Improvement Program, the Environmental Quality Incentive Program, and others. Managing for pheasant on private agricultural lands through these and other programs also extends benefits to the conservation of other species (Stoate, 2002). For example, the benefits of CRP extend to sage-grouse (*Centrocercus* spp.; Schroeder & Vander Haegen, 2011), honeybees (Ricigliano et al., 2019), waterfowl, and grassland passerines (Drum et al., 2015). Private lands biologists provide support to landowners to install and enhance wildlife habitats, including the planting of high-diversity mixes of grasses and forbs, shrub cover plots, and food plots across eastern Washington that benefit upland birds and other wildlife. For more information, see the Private Lands Access chapter of this report.

Evolving farming practices, pesticide and herbicide use, and urban sprawl can contribute to declines in pheasant populations. Herbicide application to wheat stubble and reduced stubble height are considered primary causes of pheasant population decline on the central High Plains (Rodgers, 2002). In some areas of eastern Washington, wheat stubble may be the only cover available to pheasants at certain times of the year. The shorter stubble height increases a predator's ability to see pheasants, thus making pheasants more vulnerable to predation. Pesticide use in early spring reduces early germinating plants, which are important food resources at that time of year (De Snoo & De Leeuw, 1996). Some insecticides and organophosphates can directly affect individual pheasants by sickening and killing them (Blus & Henny, 1997). Neonicotinoid insecticides can impact pheasant survival and breeding reproduction (Sundall, 2020). Herbicide use reduces overall plant diversity, a crucial component of high-quality pheasant habitat. Across all agricultural states, pesticides are used on an increasingly broader scale and have negatively impacted pheasant habitat quality throughout their introduced range. Additionally, houses now occupy many of the areas where pheasants were abundant. This trend is especially apparent within the Columbia Basin and southwest Washington.

Management conclusions

Harvest and historical survey data indicate that eastern Washington pheasant populations and hunter participation have experienced a long-term decline. Recent harvest data indicate that population declines may stabilize, though these data only allow for coarse interpretation, and more rigorous surveys would be beneficial. It is not fully understood whether limitations on hunting access, economic changes, or other factors might be playing a role in declining hunter participation.

Causes for the population declines are not clearly understood, but habitat loss and land use changes are likely primary drivers. Suitable habitats are becoming increasingly fragmented and isolated or have been severely degraded. Monitoring is needed, in combination with increased efforts to improve habitat, especially nesting cover and brood-rearing habitat, to maintain abundant pheasant populations in eastern Washington.

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Chukar and Gray Partridge

Chukar and Gray Partridge Statewide Status and Trend Report

Sarah Garrison, Statewide Small Game Specialist

Introduction

Two species of partridge occur in eastern Washington. The chukar partridge (*Alectoris chukar*), originally from Asia, was first introduced to the state in the 1930s. Chukar use arid, rocky shrublands and steep river canyons where cheatgrass (*Bromus tectorum)*, an invasive annual grass species, can be an important food item. Chukar occupy landscapes that have been changed over time from anthropogenic influences, including the introduction and spread of cheatgrass. Gray partridge (*Perdix perdix*), also known as Hungarian partridge, are native to Europe and were introduced to Washington around 1906. Gray partridge occupy grasslands and agricultural fields of the western United States where they primarily feed on cultivated seeds and insects. In some areas, chukar and gray partridge may overlap in their habitats, though gray partridge use agricultural landscapes more than chukar while chukar prefer steeper, rugged terrain. Chukar and gray partridge are managed as popular game birds throughout western North America, including eastern Washington.

Management guidelines and objectives

Harvest management for chukar partridge and gray partridge is designed to provide maximum recreation opportunity without negatively impacting populations. Management goals and objectives are outlined in the WFDW Game Management Plan (WDFW, 2014). Additional strategies for enhancing chukar and gray partridge populations are outlined in the Western States Chukar and Gray Partridge Management Guidelines (Knetter et al., 2017), which were developed through a collaboration among western states.

Hunting seasons and recreational harvest

Chukar and gray partridge hunting seasons have varied in length over the years and by region, with the first hunting seasons established in 1949 from October 9 to November 6. In the early 1960s and 1970s, Washington's Eastern region (Region 1) had a split early and late season, while the rest of eastern Washington was regulated with one general season. Beginning in 1997, one standardized season started on October 1 and ended the second Sunday in January. The season changed again in 2003, spanning the first Saturday of October through mid-January, which remained in effect through the 2020 season. In 2021, the chukar season was extended to the end of January, while the gray partridge season remains unchanged. Additionally, a 2-day youth season occurs in late September. Daily bag limits are six chukar and six gray partridge, with a possession limit of 18 of each during the general season.

For the first two decades of this century, WDFW estimated harvest and hunter participation based on a survey mailed to a stratified random sample of 25,000 hunters. In 2022, WDFW replaced the mailed survey with an online survey of all small game license holders. This updated survey has the advantages of increased sample size and improved stratification. Additionally, a sample of hunters who did not respond to the online survey were called for a follow-up phone survey, which enabled correction for non-response bias. Due to these improvements in the survey and analysis, data from the 2022 season to the present are more accurate but are not directly comparable to previous years.

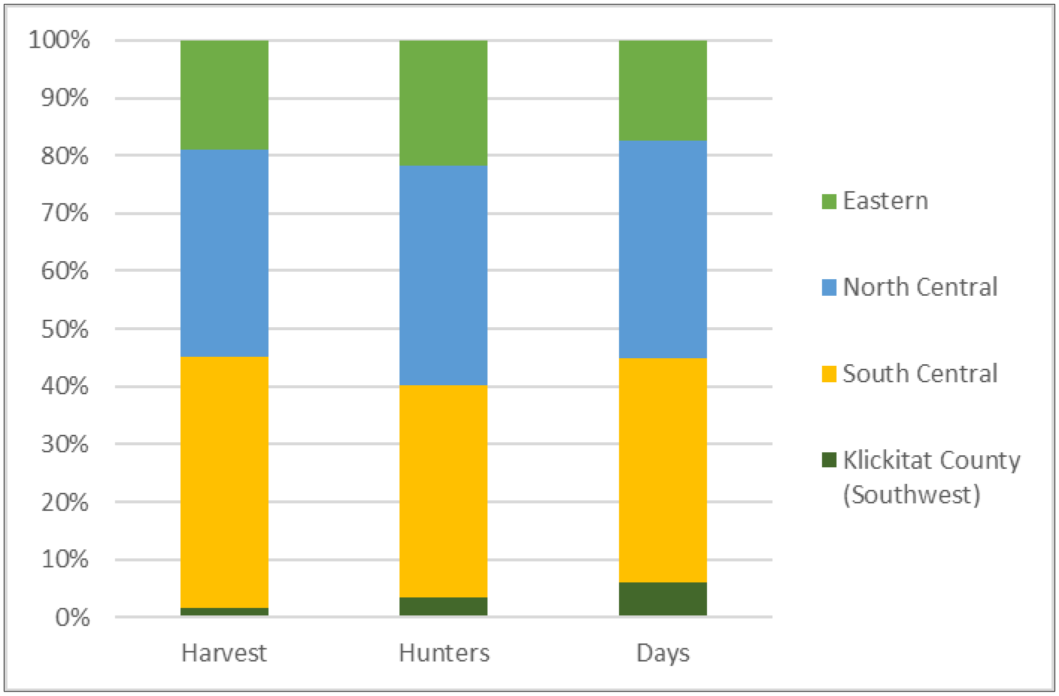
Chukar hunting was a major recreational pursuit in eastern Washington, peaking in the 1970s when the number of hunters averaged almost 40,000 per year. Since that time, hunter participation and harvest declined to an average estimate of 3,092 chukar hunters per season from 2012 to 2021 and 1,879 gray partridge hunters per season over the same period (WDFW, 2023). Despite this long-term decline, participation and harvest increased in 2023 from the previous season (Table 1). Chukar hunters increased 20% from the 2022 season, the number of days hunted increased 39%, and harvests increased 57%. Gray partridge hunters increased 24% from the 2022 season, the number of days hunted increased 63%, and harvests increased 15%.

Table 1. Statewide estimates of Washington chukar and gray partridge hunters, harvests, and hunting days with 95% confidence intervals (CI).

Species	Season	Harvests (95% CI)	Hunters (95% CI)	Days (95% CI)
Chukar	2022	5275 (4293 – 6477)	1237 (1034 – 1477)	5962 (4865 – 7297)
Chukar	2023	8295 (6803 – 10102)	1480 (1277 – 1714)	8287 (6960 – 9855)
Gray Partridge	2022	1296 (899 – 1844)	410 (310 – 535)	2783 (2004 – 3863)
Gray Partridge	2023	1495 (1036 – 2158)	507 (401 – 640)	4545 (3288 – 6215)

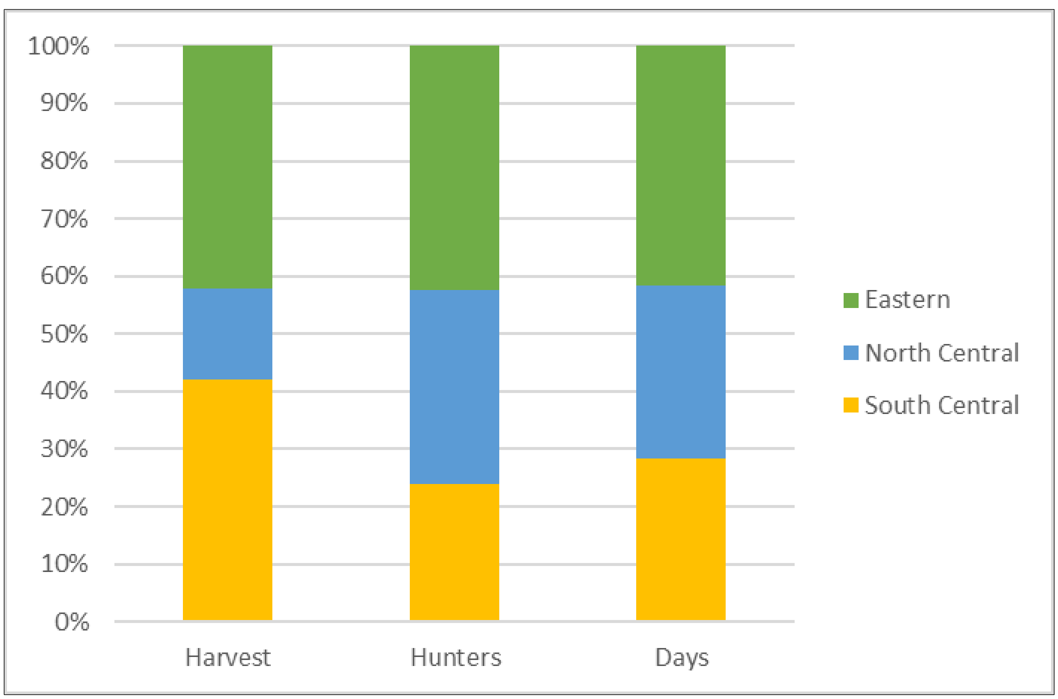
In the 2023 season, chukar and gray partridge hunters had the highest success rates in the South Central region, though slightly more gray partridge were harvested in the Eastern region (Figures 1 and 2; see regional offices). Chukar success rates in Douglas County and gray partridge success rates in Kittitas County were particularly good.

Figure 1. Estimated proportion of chukar partridge harvests, hunters, and number of days hunted in each region of Washington during the 2023 season[a].



[a] Within the Southwest region, chukar may only be harvested in Klickitat County.

Figure 2. Estimated proportion of gray partridge harvests, hunters, and number of days hunted in each region of Washington during the 2023 season[a].



[a] No harvests were reported in Klickitat County (Southwest region) from the 2023 season.

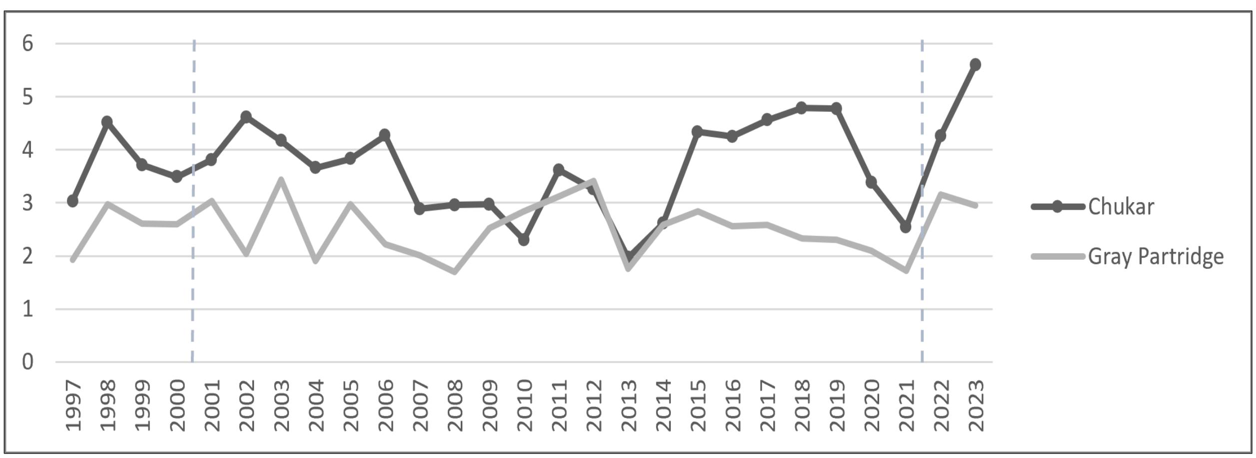
Population monitoring

Chukar populations were surveyed by helicopter from 1987 to 1997, when aerial surveys were terminated due to budget constraints. In 2022, WDFW initiated public incidental brood surveys for multiple game bird species, including chukar and gray partridge (WDFW Game Bird Survey). These surveys are modified from a standardized protocol for turkey brood surveys developed by the National Wild Turkey Federation Technical Committee (2019). In the first two years, participation was limited for chukar and gray partridge, with insufficient observations reported for monitoring. Increased participation in future years will be necessary to use this survey as an effective monitoring tool.

Harvest and hunter effort are used as an index to population trends. Standardizing harvest estimates by the amount of hunter effort expended to achieve that level of harvest can provide some indication of whether populations are increasing, decreasing, or stable. With the change in harvest data collection in 2022, results from this season are not directly comparable to data from past years.

Despite long-term declines in the total number of chukar harvested, the number of chukar harvested per hunter shows no increasing or decreasing trend since 1997 (Figure 3). The long-term average number of chukar harvests per hunter is between three and four birds. Similarly, the number of gray partridge harvested per hunter has been relatively stable since 1997, averaging between two and three birds (Figure 3). In the 2023 season, the estimated number of chukar harvested per hunter was over five, the highest in recent record. Gray partridge harvest per hunter was also above average in 2023, at nearly three, which is slightly lower than the 2022 season.

Figure 3. Estimated number of chukar and gray partridge harvested per hunter statewide in Washington, 1997-2023 seasons[a].



[a] Vertical dashed lines denote changes in survey methodology.

Spring of 2021 was unusually warm and dry, leading to a record-breaking heat wave in June that was likely challenging for brood survival. An extended drought season followed that likely limited forage throughout the summer and adversely impacted populations. Conversely, spring of 2022 was unusually wet and cool, which doesn't appear to have been detrimental to hatching chicks but led to improved forage production through the season. In 2023, spring weather was typical and while Snake River basin populations experienced moderate to severe drought, populations in the Yakima and Columbia River basins avoided drought and experienced good forage conditions through the summer.

The North America Breeding Bird Survey data show slightly positive population trend estimates for both chukar and gray partridge in Washington from 1993-2022, however the confidence intervals for both these trend estimates overlap zero, and the credibility score indicates that these data are deficient (Hostetler et al., 2023).

Habitat

Chukar habitat comprises arid areas with steep slopes, deep valleys, and rocky outcrops. This habitat type can be found where topography, combined with shallow soils, has prevented extensive agriculture and development. Cheatgrass is a staple of the chukar diet during spring and fall, and the availability of cheatgrass can significantly impact chukar populations. Cheatgrass is adapted to wildfires and is highly flammable. It grows sooner after fire than most of the native annual and perennial grasses, leading it to outcompete most native vegetation in the dry, high-elevation shrublands of western North America. Encroachment of invasive plants such as yellow star-thistle (*Centaurea solstitialis*), combined with fires that eliminate shrub habitat, may be contributing to long-term population declines.

Gray partridge habitat can be found along the margins where agricultural fields and native shrub-steppe habitat meet. Their diet consists of cultivated grains, weed seeds such as cheatgrass, and clover (*Trifolium* spp.). Agricultural intensification that creates “clean” farming conditions, such as the removal of shrubby cover along fence lines and draws, decreases suitable habitat. Farm Bill and state habitat programs are important for providing habitat and cover for gray partridge and other upland birds in agricultural areas.

Management conclusions

Chukar and gray partridge populations in Washington have declined from the highs of half a century ago. These long-term declines are likely due to diminishing habitat quality from a combination of changing agricultural practices, wildfire regimes, invasive plants, and drought conditions. The invasion of yellow star-thistle has taken over thousands of acres of quality habitat in southeastern Washington, reducing available food resources for chukars. Habitat quality in some portions of the state may have improved in recent years with the abundance of wildfires that influenced the spread of annual grasses that chukar utilize for forage. However, the concurrent loss of shrub habitat due to fires also removes important cover for nesting and brood-rearing.

Chukar and gray partridge populations can be expected to fluctuate annually in response to weather variability and associated habitat quality. A continued focus on habitat enhancement should benefit these populations into the future.

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Quail

Quail Statewide Status and Trend Report

Sarah Garrison, Statewide Small Game Specialist

Introduction

California quail (*Callipepla californica*), also known as valley quail, is Washington's most abundant quail species. Most California quail occur in eastern Washington, though they can also be found in suitable habitat in the western part of the state. California quail are habitat generalists that rely on protective escape cover, typically brushy habitats but also rocky outcrops, intermixed with open feeding areas and water sources.

Mountain quail (*Oreortyx pictus*) is the only quail species native to Washington. They persist in small populations around the foothills of the Blue Mountains in southeast Washington. Hunting is closed to protect this species in eastern Washington, and researchers are investigating population status and limiting factors. Introduced populations occur in western Washington and can be hunted. These birds prefer very dense, brushy cover. In western Washington, they have been found in stands of Pacific madrone (*Arbutus menziesii*) and invasive scotch broom (*Cytisus scoparius*; Schirato, 2005).

Hunting seasons exist for northern bobwhite (*Colinus virginianus*), primarily to allow the harvest of birds released for dog trials and training. Hunters may find low numbers of bobwhite quail in the wild, remnants from past releases. These are most likely to occur in grasslands and adjacent farm fields.

Management guidelines and objectives

The objectives for quail in Washington are to maintain healthy, sustainable populations in all suitable habitats within the state and to maximize recreational opportunities, as outlined in the Game Management Plan (WDFW, 2014). In the case of mountain quail, the primary objective is to recover populations in the Blue Mountains and potentially other parts of eastern Washington where significant declines have occurred. Additional guidelines are outlined in the Western Quail Management Plan, collaboratively produced through the Association of Fish and Wildlife Agencies.

Hunting seasons and recreational harvest

In eastern Washington, the 2023 general hunting season for California quail and northern bobwhite was open from October 7, 2023, through January 15, 2024. A special youth-only hunting weekend occurred before the general season on September 16 – 17. The general season has a mixed bag limit of 10 per day with a possession limit of 30. In western Washington, the 2023 general season for California quail, bobwhite quail, and mountain quail was open from September 23 through November 30. Bag limits are the same as eastern Washington, except mountain quail have a daily bag limit of two and a possession limit of four. Mountain quail hunting is closed throughout eastern Washington.

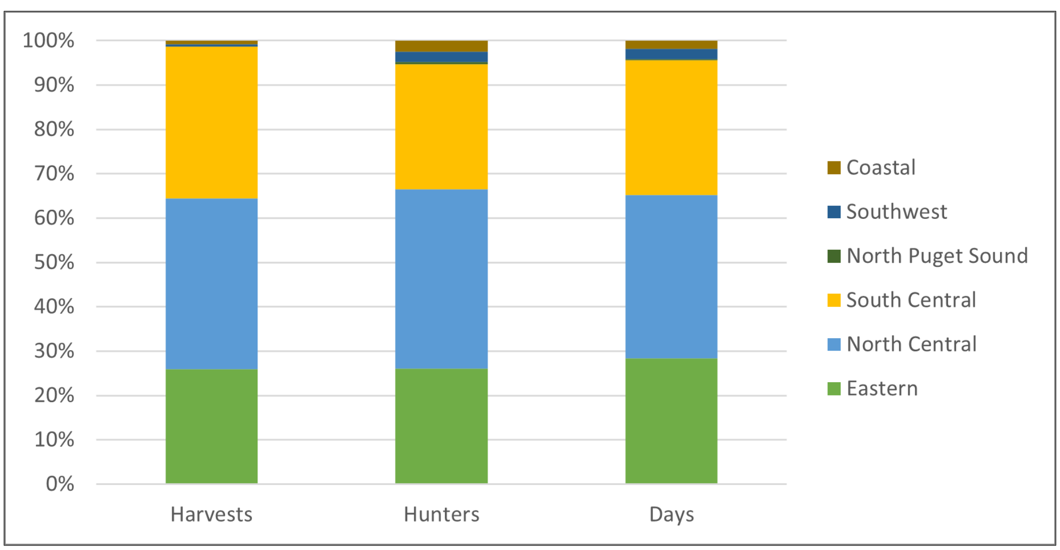
For the past two decades, harvest and hunter participation have been estimated based on a survey mailed to a stratified random sample of 25,000 hunters. In 2022, WDFW replaced the mailed survey with an online survey of all small game license holders. This updated survey has the advantages of increased sample size and improved stratification. Additionally, a sample of hunters who did not respond to the online survey were called for a follow-up phone survey, which enabled correction for non-response bias. Due to these improvements in the survey and analysis, data from the 2022 season and on are more accurate but are not directly comparable to previous years.

Participation in upland bird hunting, including quail, has declined over the long term (WDFW 2023). Between the 2022 and 2023 seasons, the number of quail hunters increased slightly by 2%, while hunters spent 18% more days hunting in the 2023 than 2022 seasons (Table 1). Hunters saw a 7% increase in quail harvest from 2022 to 2023. The vast majority of quail harvested in Washington are California quail. Of the 2023 season statewide total quail harvest, 93% occurred in eastern Washington (Figure 1), which is consistent with past years, though slightly lower. In western Washington, mountain quail occur in the Coastal region. Less than one percent of the statewide quail harvest was mountain quail in 2023. Within the Coastal region, hunters reported just over half of quail harvests as mountain quail. Between 2022 and 2023, mountain quail hunters and days hunted both decreased 22%, while harvests increased 17%. For a map of WDFW Regions, see wdfw.wa.gov/about/regional-offices.

Table 1. Statewide estimates of Washington quail hunters, harvests, and hunting days with 95% confidence intervals (CI).

Season	Harvests (95% CI)	Hunters (95% CI)	Days (95% CI)
2022	25713 (22860 – 28931)	3934 (3548 – 4369)	20396 (18245 – 22784)
2023	27550 (24643 – 30880)	4015 (3644 – 4422)	24122 (21597 – 27019)

Figure 1. Estimated proportion of quail harvests, hunters, and number of days hunted in each region of Washington during the 2023 season.



Population monitoring

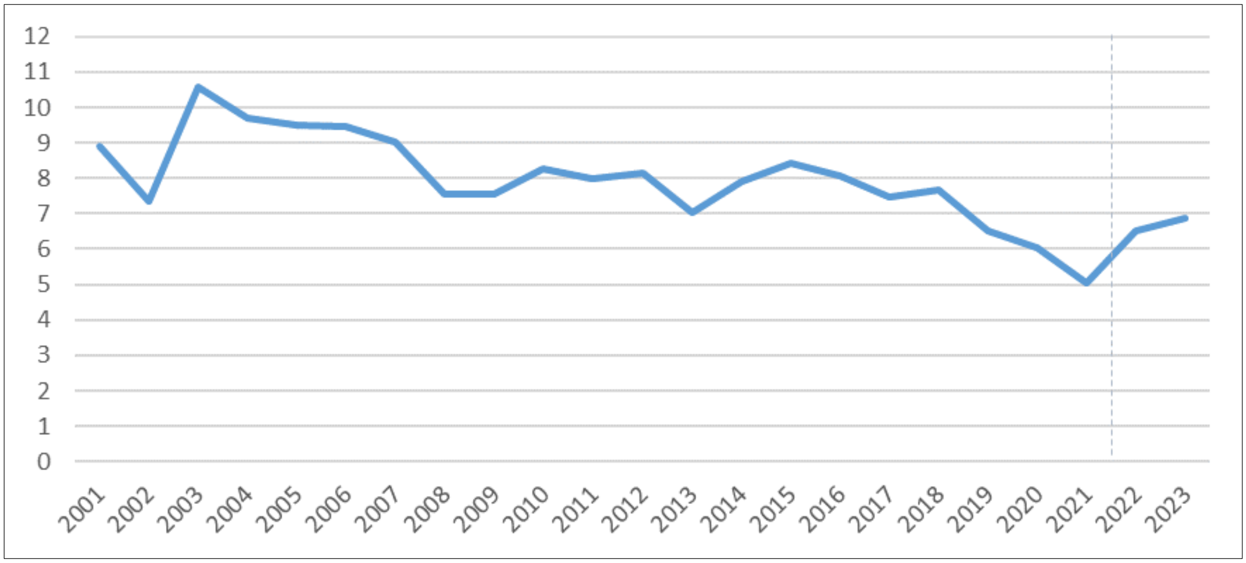
All population and production surveys for quail were discontinued in 1999 due to limited time and funding for district biologists. In 2022, WDFW initiated public incidental brood surveys for multiple game bird species, including quail (wdfw.wa.gov/hunting/management/game-bird-survey). These surveys are modified from a standardized protocol for turkey brood surveys developed by the National Wild Turkey Federation Technical Committee (2019). During the July and August 2023 brood survey, participants reported two observations of mountain quail (one with a brood) and 20 observations of California quail (16 with broods). California quail brood observations averaged 3.6 chicks per adult, however these sample sizes are insufficient for meaningful analysis. Increased participation in future years will be important for this survey to be used as an effective monitoring tool.

Harvest and hunter-effort data are used as an index to population trends. Based on harvest, quail populations in Washington appear much lower than half a century ago when statewide harvest exceeded 200,000 quail. This long-term decline is most likely related to "clean" farming practices introduced in the early 1980s that caused the removal of shrubby cover along fence lines and draws. In addition, the decline in harvest is related to a decline in hunter participation. To account for this, the number of quail harvested per hunter can serve as an index to population trends. Standardizing harvest estimates by the amount of hunter effort expended to achieve that level of harvest can provide some indication of whether populations are increasing, decreasing, or stable. With the change in harvest data collection in 2022, results since then are not directly comparable to data from past years.

The number of quail harvested per hunter declined slightly over the past two decades, from an average of eight to nine quail per hunter in the 2000s to an average of seven to eight quail per hunter in the 2010s, dropping to a low of 5 quail per hunter in the 2021 season (Figure 2). In the 2022 and 2023 seasons, the new harvest survey resulted in an estimated six to seven quail per hunter. The breeding bird survey (BBS, US Geological Survey) information for Washington suggests an increasing trend of 4.75% (95% CI: 3.29 – 6.26%) for California quail populations over the last three decades (1993-2022; Hostetler et al., 2023; Figure 3).

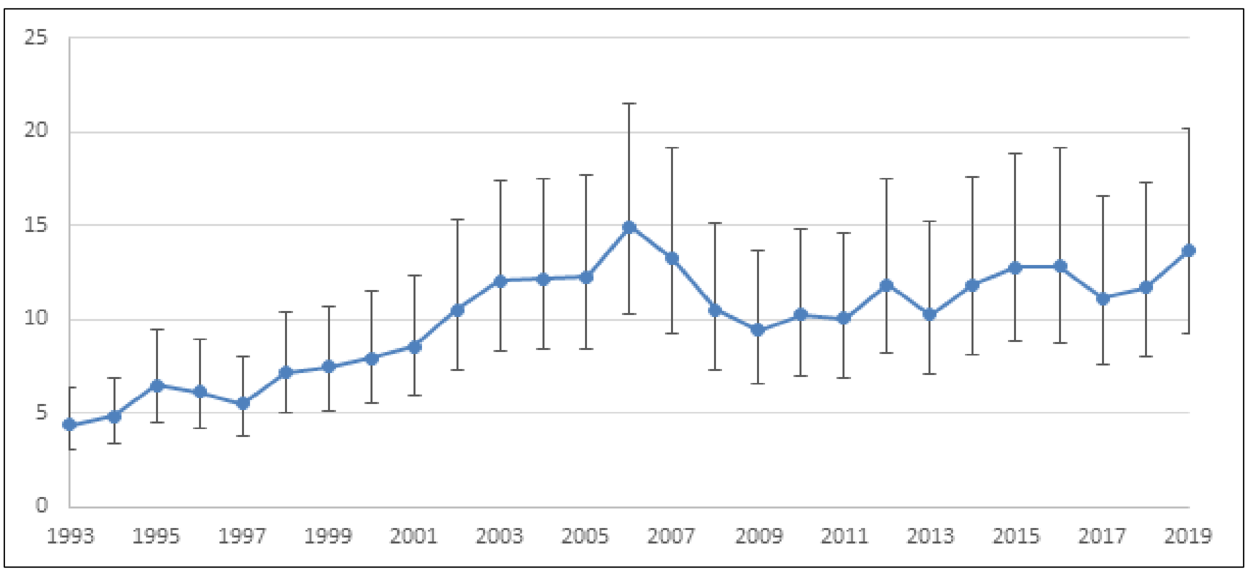
Quail populations are highly dependent on weather, causing high annual variability. Spring of 2021 was unusually warm and dry, leading to a record-breaking heat wave in June that was likely challenging for brood survival. An extended drought season followed that likely limited forage throughout the summer and adversely impacted populations. Conversely, the spring of 2022 was unusually wet and cool, which led to improved forage production throughout the season. In 2023, spring weather was typical and while some areas experienced moderate to severe drought, much of eastern Washington, particularly central Washington east of the Cascades, avoided drought and experienced good forage conditions through the summer.

Figure 2. Estimated number of quail harvested per hunter in Washington for the 2001-2023 seasons[a].



[a] Vertical dashed line denotes change in survey methodology.

Figure 3. North American Breeding Bird Survey annual indices for California quail in Washington, 1993-2019.



Habitat

As with other agriculturally associated wildlife, quail habitat quantity and quality have declined for decades. Breeding habitat (including nesting and brood-rearing habitat), wintering habitat, and habitat that can provide escape cover are important for sustaining quail populations. As a result, land development and "clean" farming practices, such as the removal of shrubby cover along fence lines and draws, have dramatically reduced and fragmented suitable habitats for all upland game birds.

A study on quail's food habits was conducted in southeastern Washington (Anthony, 1970). The study analyzed 157 California quail crops from March through September 1967. The results showed that male and female quail were selective in feeding habits, preferring leafy green plants in the spring and then transitioning to insects and seeds in the summer (Anthony, 1970). The timing of herbicide use in agriculture often corresponds to the "spring green-up" and flushes of undesirable weeds, which can reduce the abundance of those early-season leafy greens that quail rely on, subsequently impacting quail populations.

The Conservation Reserve Program (CRP) has benefited Washington's upland bird species. The program provides financial incentives to producers to establish perennial vegetation. However, dense vegetation, litter accumulation, and decreased species diversity of older CRP fields most likely limit the habitat value for some species (Rodgers, 1999). Recently, CRP programs have been encouraging landowners to diversify their CRP lands through State Acres for Wildlife Enhancement (SAFE), Environmental Quality Incentives Program (EQIP), and simply requiring more diverse plantings to be reenrolled in the general CRP program. Flowering plants benefit upland birds because of the insects they attract. The insects, in turn, serve as an important food resource for newly hatched chicks, allowing for greater brood-rearing success. Continuing these programs is vital for enhancing upland bird habitat in eastern Washington.

Mountain Quail population augmentation

A three-year project to enhance mountain quail populations in southeast Washington was implemented in March 2005. Mountain quail were trapped in southwest Oregon for release in the Asotin Creek watershed. A subset of birds were fitted with transmitters for monitoring. Results are documented in a master's thesis (Stephenson, 2008) and publication (Stephenson et al., 2011). The mountain quail augmentation effort was reinitiated in 2012. A new holding facility was constructed, and 148 birds from western Oregon were released in southeast Washington over two years (2012-2013). Further research is needed to determine current mountain quail population status and limiting factors. In 2021, WDFW initiated a contract with Washington State University (WSU) for a multi-year research project to inform the future management of these mountain quail populations. Results from this research will be available upon project completion.

Management conclusions

Quail are an important upland game bird species and of significant interest to wildlife enthusiasts. Habitat improvements, including the various Farm Bill programs, are vital to WDFW's ongoing efforts to maintain and enhance upland game bird populations across the state.

An evaluation of mountain quail population status and limiting factors in southeastern Washington is needed to determine whether future population augmentation is warranted or whether alternative strategies are needed. Habitat enhancements may be needed in conjunction with future releases or as a next step in the recovery effort. Improved survey methods would be valuable in informing needs and identifying areas of focus. The research contracted through WSU will provide critical information regarding mountain quail status, limiting factors, and habitat use to guide management decisions.

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Grouse

Forest Grouse Statewide Status and Trend Report

Sarah Garrison, Statewide Small Game Specialist

Introduction

Forest grouse in Washington include dusky grouse (*Dendragapus obscurus),* sooty grouse (*Dendragapus fuliginosus)*, ruffed grouse (*Bonasa umbellus*), and spruce grouse (*Falcipennis canadensis*). Dusky and sooty grouse were considered a single species, blue grouse, in the past and are still colloquially referred to as blue grouse today. Spruce grouse are primarily found in lodgepole pine forests of the Okanogan Highlands in northeastern Washington but also occur in spruce-fir forests on the east slope of the Cascades. Cascade populations are believed to be relatively sparse and discontinuous, while populations in the Okanogan Highlands have historically been abundant and continuous. Ruffed, dusky, and sooty grouse are more widespread throughout forested areas of the state. Ruffed grouse are most abundant in lowland forests, both conifer and deciduous. Sooty and dusky grouse can occur at low elevations but are more common in higher-elevation conifer forests. Dusky grouse will use more varied open habitats for nesting. Generally, sooty grouse occur in coastal and western Cascade habitats, while dusky grouse occur in interior habitats east of the Cascades with mixing and hybridization where they co-occur (Schroeder, 2006).

Management guidelines and objectives

Management objectives and strategies for forest grouse are outlined in the WDFW Game Management Plan (WDFW, 2014), which identifies the following goals:

1. Preserve, protect, perpetuate, and manage forest grouse and their habitats to ensure healthy, productive populations.
2. Manage for various recreational, educational, and aesthetic purposes, including hunting, scientific study, wildlife viewing, cultural and ceremonial uses by tribes, and photography.
3. Manage statewide populations for sustained harvest.

Hunting seasons and harvest

The forest grouse hunting season was open from September 1 to December 31 from 1973 through 2020. The grouse season changed to September 15 through January 15, beginning in 2021. Delaying the start of the season by two weeks, without reducing the total season length, is intended to increase grouse abundance and availability to hunters by protecting breeding-aged females (hens) while they are still caring for their broods. Forest grouse broods typically become independent of the hen in mid-September. In the early season, before broods break up, hens appear at higher risk of harvest than breeding-aged males based on hunter-submitted wing and tail samples. Increasing hen survival should lead to an increase in population abundance and hunter opportunity.

A daily bag limit of three of any of the three species (i.e., blue, ruffed, and spruce grouse) was in place from 1952 to 2009, when the bag limit was raised to four. Hunters had been taking approximately 0.4 grouse per day for the past 50 years. Based on this average, management determined that increasing the bag limit would increase opportunity without detrimental impact on populations. The harvest per day has been approximately 0.3 birds per day since the bag limit was increased. The bag limits were changed again in 2015 to address hunter concerns regarding reduced numbers of grouse sightings. The regulation at this time is a daily limit of four forest grouse to include not more than three blue grouse (dusky or sooty), three spruce grouse, and three ruffed grouse.

For the past two decades, harvest and hunter participation have been estimated based on a survey mailed to a stratified random sample of 25,000 hunters. This survey combined data for all forest grouse species. In 2022, WDFW replaced the mailed survey with an online survey of all small or big game license holders (since forest grouse can be hunted with either license). This updated survey has the advantages of increased sample size and improved stratification. Additionally, a sample of hunters who did not respond to the online survey were called for a follow-up phone survey, which enabled correction for non-response bias. Due to these improvements in the survey and analysis, data from 2022 to present are more accurate but are not directly comparable to previous years.

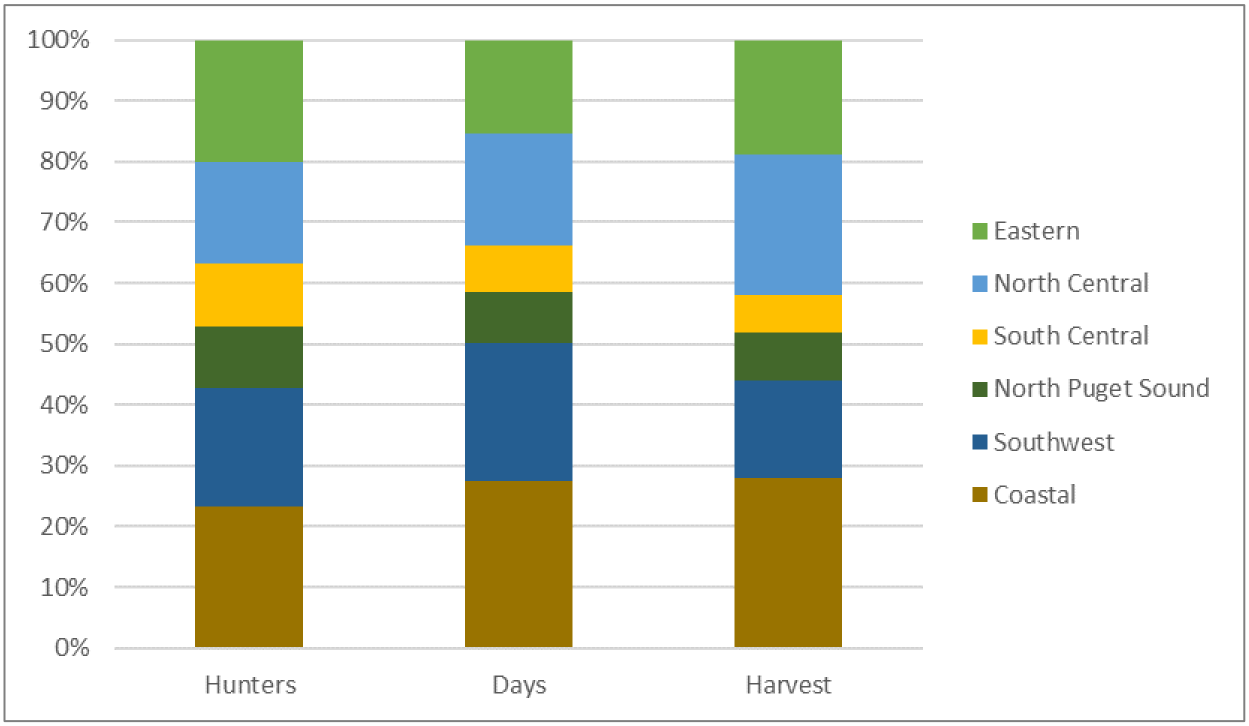
Participation in forest grouse hunting has declined from historic highs in the 1970s when an average of 112,000 hunters pursued grouse each year. From 2012 to 2021, hunter participation and harvest declined to an average estimate of 21,957 grouse hunters per year (WDFW, 2023). The new survey estimates show that hunter participation continued a slight decrease in 2023 (2% fewer hunters and 7% fewer days hunted than in 2022), but harvest increased by 45% compared to 2022 (Table 1).

Table 1. Statewide estimates of Washington forest grouse hunters, harvests, and hunting days with 95% confidence intervals (CI).

License Year	Harvests (95% CI)	Hunters (95% CI)	Days (95% CI)
2022	29860 (27944 – 31962)	18386 (17247 – 19652)	157267 (141571 – 175914)
2023	43180 (39435 – 47607)	18066 (16986 – 19264)	146861 (134564 – 160869)

Grouse hunting activity is well distributed across the state (Figure 1). In 2023, the Coastal region saw the most grouse hunters (23%), hunter days (27%), and harvests (28%). The Southwest and Eastern regions both drew the second most hunters (20% each), while the Southwest region saw the second most days (23%), and the North Central region provided the second most harvests (23%). For a map of WDFW Regions, see wdfw.wa.gov/about/regional-offices.

Figure 1. Distribution of forest grouse hunting activity and harvest by region across Washington State during the 2023 season.



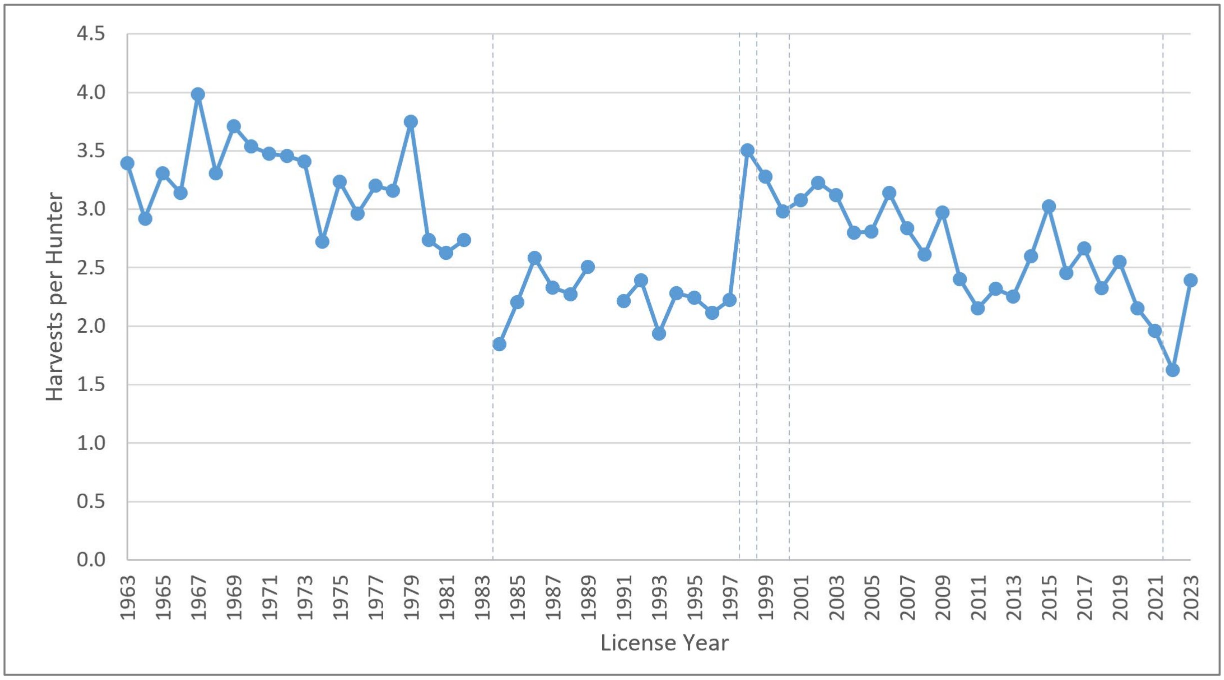
Population monitoring

Hunter surveys

Harvest and hunter-effort data are used as an index to population trends. Standardizing harvest estimates by the amount of hunter effort expended to achieve that level of harvest can provide some indication of whether populations are increasing, decreasing, or stable. With the change in harvest data collection in 2022, results from the past two years are not directly comparable to data from previous years.

Harvests per hunter have declined from historic highs half a century ago, indicating that the decline in total harvests may not solely be due to declining hunter effort (Figure 2). Harvests per day follow a similar slow downward trajectory since 1985. While it is unclear to what extent this downward trend might be cause for concern, it does clarify a need for continued and closer monitoring. In examining these data, it is important to note that changes in bag limits, seasons, and survey methods (1984, 1998-2001, 2022) have impacted the interpretation of long-term trends over the years. In the decade before the harvest survey methodology changed in 2022, harvests per hunter were estimated between two and three birds on average. Harvests per hunter dropped to a low of one to two birds in 2022, then increased back to the previous average of two to three birds in 2023. Continued monitoring under the new survey methodology over the next few years will be necessary to reveal a more accurate population trend.

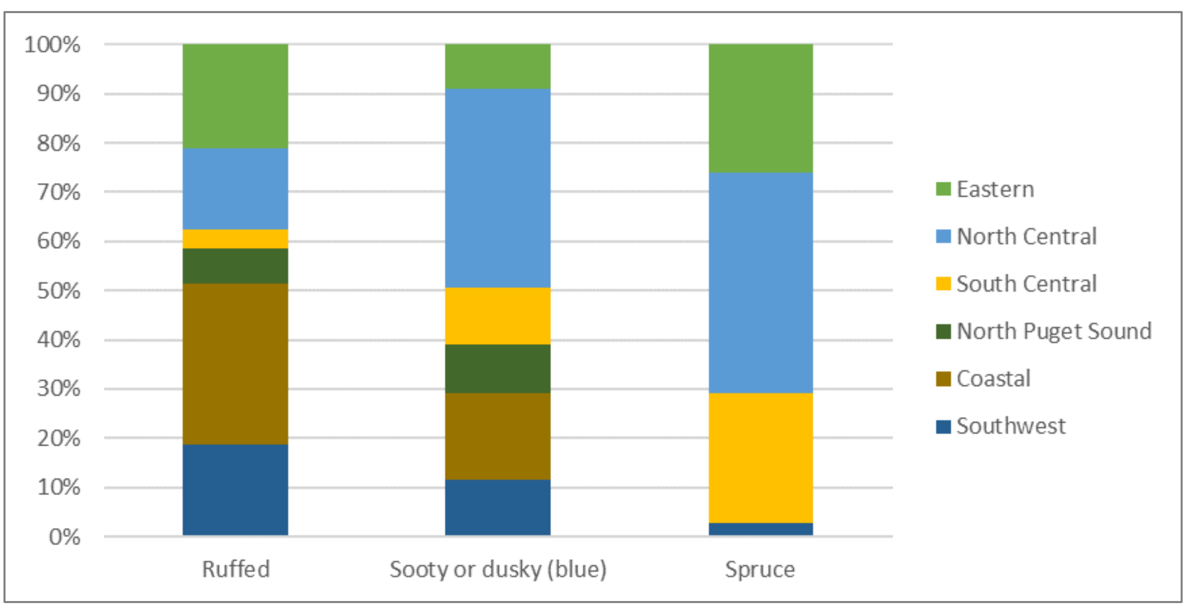
Figure 2. Estimated number of grouse harvested per hunter in Washington, 1963-2023[a].



[a] Vertical dashed lines denote changes in survey methodology in 1984, 1998-2001, and 2022.

Statewide, the majority of estimated grouse harvest in 2023 was ruffed grouse (63%), followed by sooty or dusky grouse (20%), with a small proportion of spruce grouse (2%) based on hunter reports. The remaining 15% of grouse harvests were unidentified. Harvested ruffed grouse came primarily from the Coastal region, while sooty/dusky and spruce grouse came primarily from the North Central region (Figure 3).

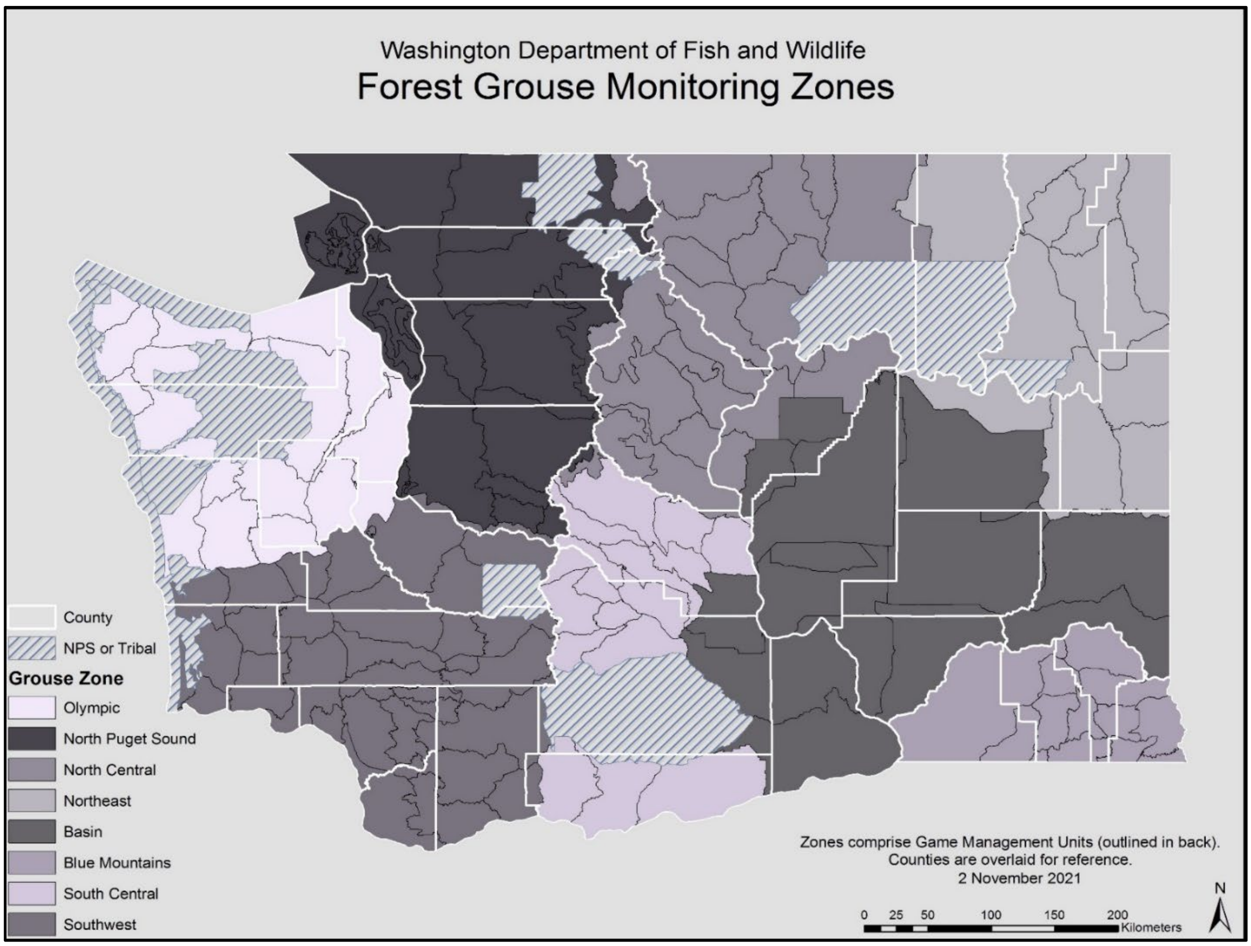
Figure 3. Proportion of each forest grouse species or species group harvested in each region of Washington in 2023.



Wing and tail collections

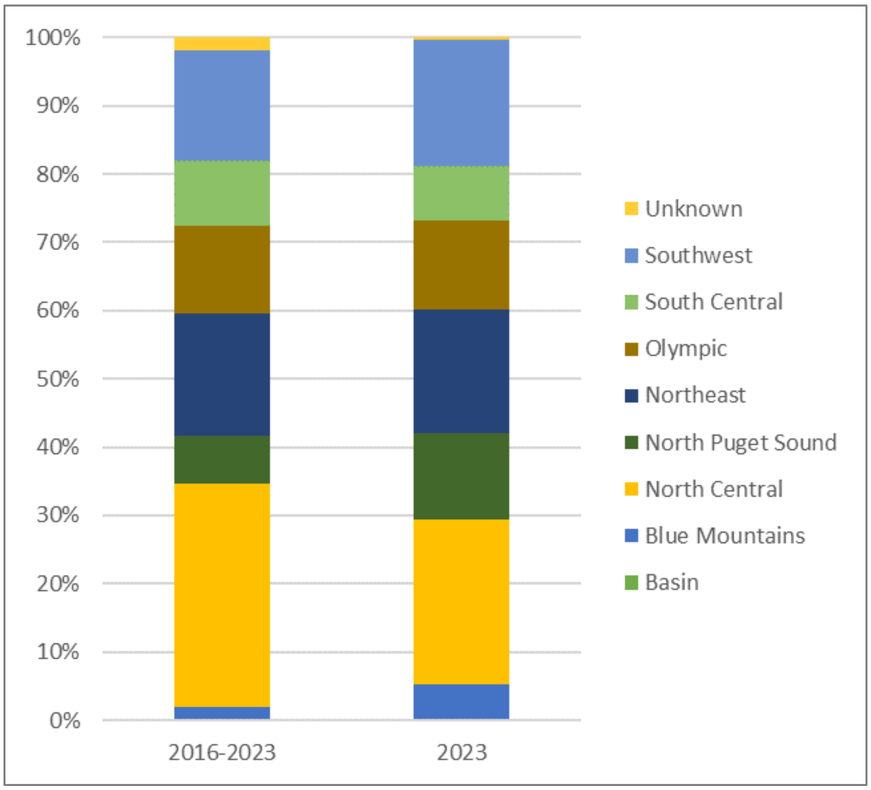
Samples collected from grouse hunters provide an additional metric for monitoring forest grouse population trends. A wing and tail from a harvested grouse can provide the information necessary to identify the species, sex, and age of the bird. For more information about voluntary collections from hunters, see wdfw.wa.gov/hunting/requirements/upland-birds/grouse-wing-tail-collection. Forest grouse wings were collected in north-central Washington between 1993 and 2014 when collections ended due to limited time and resources. WDFW initiated a pilot grouse wing and tail collection effort in eastern Washington in the fall of 2016, which has since expanded into all six WDFW Regions. In 2020, zones were established to guide future sampling efforts and analysis (Figure 4).

Figure 4. Map of forest grouse monitoring zones delineated to guide future sample collection and analysis.



Wing and tail collections can provide insight into species composition among harvested grouse; however, further analysis is needed to account for sampling distribution. Collections have shown that of 7,736 samples from 2016 – 2023, 48% are dusky or sooty grouse, 45% are ruffed grouse, and 7% are spruce grouse. This proportion of ruffed grouse is lower and the proportion of sooty or dusky grouse is higher than estimated by the hunter survey data, likely because of where most wing and tail samples are collected (Figure 5). Only 36% of wing and tail samples were harvested in all of western Washington, whereas 33% of wing and tail samples were harvested in the North Central zone alone. Since most ruffed grouse harvest occurred in the Coastal region of western Washington, wing and tail data underestimate ruffed grouse in the statewide harvest. Likewise, since more samples were collected from the North Central zone than any other zone, and this area is the primary source of sooty or dusky grouse harvest, wing and tail data overestimate the proportion of sooty or dusky grouse in the statewide harvest.

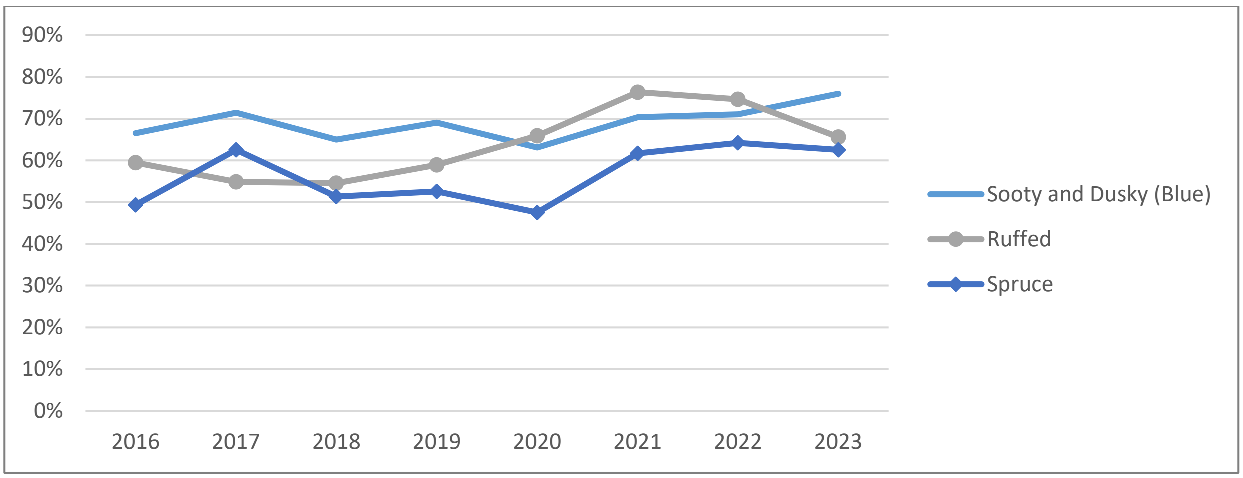
Figure 5. Proportion of harvested grouse wing and tail samples collected in each zone for the entire survey period (2016-2023) and for the most recent year (2023).



Analysis of wing collection data from 1993-2008 showed a significant decline in hunting pressure throughout the first month of the hunting season (Schroeder, 2010). Therefore, current seasons that extend into January probably have minimal impact on grouse populations in the later months. Data from recent collections support this, with 35% of 2016-2020 samples harvested in the first two weeks of September.

Age data obtained from wing samples (proportion of juveniles relative to adults) can serve as an index to monitor trends in the productivity of the forest grouse population. (Hansen et al., 2011) found that age ratios from the first two weeks of the season in early September were the best index to annual reproduction for forest grouse, because ratios of juvenile grouse to adult grouse declined over the season in their study. The 2021 Status and Trend Report (WDFW, 2021) showed the proportion of juveniles in harvested samples from September 1-15, 2016-2020. Because the grouse season opening date moved to September 15 starting in 2021, these data are unavailable for recent years. Unlike (Hansen et al., 2011), Washington's data from 2016 to 2021 did not show consistent declines in juvenile-to-adult ratios through the season. Due to this lack of downward trend and the lack of early September data in the past two years, the proportion of juveniles in the harvest is reported for the full season of each year to serve as a productivity index (Figure 6, Table 2). From 2016 through 2023, 69% of sooty and dusky grouse samples were juvenile, 64% of ruffed grouse were juveniles, and 56% of spruce grouse were juveniles. In 2023, the proportion of juveniles for all species were at or above these averages. Compared to 2022, the proportion of juvenile spruce grouse remained stable, the proportion of juvenile ruffed grouse decreased from 75% to 66%, and the proportion of juvenile sooty and dusky grouse increased from 71 to 76%.

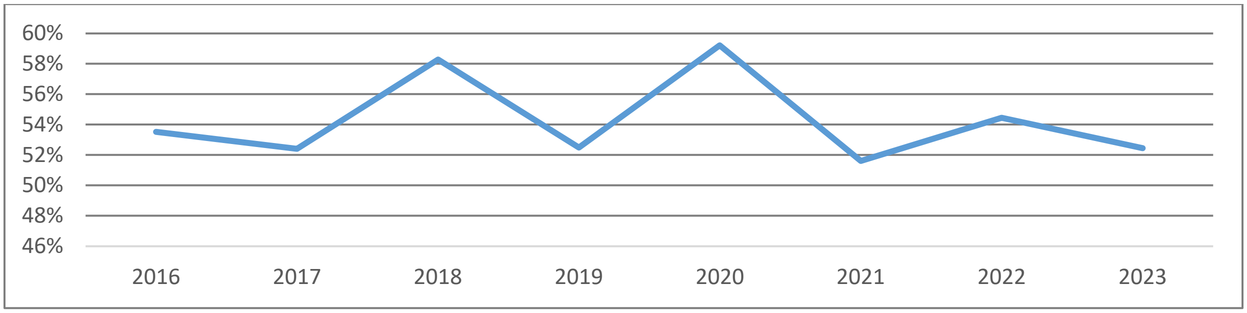
Figure 6. Juvenile proportion of forest grouse in wing and tail samples submitted by hunters, 2016-2023[a].



[a] Data are included from the full season of each year (2016-2020: 1 Sep. to 31 Dec.; 2021-2023: 15 Sep. to 15 Jan.).

Breeding-aged females are an important demographic when monitoring the productivity of a population. For sooty, dusky, and spruce grouse, a wing sample is sufficient for identifying sex; however, for ruffed grouse, both a wing and a tail are required. Due to low submissions of tails from hunters, sex data for ruffed grouse are limited. Sex ratios of dusky and sooty grouse wing and tail samples are consistently skewed towards females. However, 2016-2020 data showed a notable decrease in females from the early part of the season (Sept. 1-15) compared to the full season (WDFW, 2021). Schroeder (2010) found a similar pattern with longer-term data in Okanogan County. Among blue grouse (mostly dusky), the sex ratio was 1.76 females:male during the first half of September and 1.04 females:male during the rest of the season. Among breeding-age spruce grouse, the sex ratio was 2.01 females:male during the first half of September and 0.80 female:male during the rest of the season (Schroeder, 2010). These sex ratios indicate a disproportionate vulnerability of females to harvest during early September before broods have broken up. With the delayed season starting in 2021, the proportion of females in the harvest among dusky and sooty grouse dropped to the lowest value on record (52%), remained relatively low in 2022 at 54%, then dropped back to 52% in 2023 (Figure 7, Table 2).

Figure 7. Female proportion of breeding-aged (adult) dusky and sooty grouse in wing and tail samples submitted by hunters, 2016-2023[a].



[a] Data are included from the full season of each year (2016-2020: 1 Sep. to 31 Dec.; 2021-2023: 15 Sep. to 15 Jan.).

Table 2. Sex and age[a] ratios of harvested forest grouse from wing and tail collections, 2016-2023[b,c].

Year	Species[d,e]	Female (Breeding Age)	Male (Breeding Age)	% Female (Breeding Age)	Juvenile	Adult	% Juvenile	Juvenile: Adult Female
2016	BLUE	53	46	54%	197	99	67%	3.7
2017	BLUE	87	79	52%	415	166	71%	4.8
2018	BLUE	123	88	58%	391	211	65%	3.2
2019	BLUE	84	76	53%	357	160	69%	4.3
2020	BLUE	106	73	59%	306	179	63%	2.9
2021	BLUE	48	45	52%	221	93	70%	4.6
2022	BLUE	55	46	54%	248	101	71%	4.5
2023	BLUE	64	58	52%	392	124	76%	6.1
2016	RUFFED	9	7	NA	148	101	59%	NA
2017	RUFFED	25	11	NA	185	152	55%	NA
2018	RUFFED	12	22	NA	204	170	55%	NA
2019	RUFFED	41	46	NA	313	218	59%	NA
2020	RUFFED	39	70	NA	336	174	66%	NA
2021	RUFFED	36	29	NA	397	123	76%	NA
2022	RUFFED	24	25	NA	333	113	75%	NA
2023	RUFFED	45	56	NA	330	173	66%	NA

[a] Adults are breeding age (yearling or older). Juveniles are young-of-year.
[b] Data are included from the full season of each year (2016-2020: 1 Sep. to 31 Dec.; 2021-2023: 15 Sep. to 15 Jan.).
[c] Where sample size is insufficient (<30), results are not applicable, indicated by NA.
[d] Blue denotes both sooty and dusky grouse.
[e] Ruffed grouse cannot be identified by sex without a tail sample. Since tail submissions are few, sex-based metrics for ruffed grouse are excluded, indicated by NA.

Table 2 (*cont*). Sex and age[a] ratios of harvested forest grouse from wing and tail collections, 2016-2023[b,c].

Year	Species[d,e]	Female (Breeding Age)	Male (Breeding Age)	% Female (Breeding Age)	Juvenile	Adult	% Juvenile	Juvenile : Adult Female
2016	SPRUCE	22	16	58%	37	38	49%	1.7
2017	SPRUCE	18	12	60%	50	30	63%	2.8
2018	SPRUCE	20	15	57%	38	36	51%	1.9
2019	SPRUCE	11	17	NA	31	28	53%	2.8
2020	SPRUCE	31	22	58%	48	53	48%	1.5
2021	SPRUCE	12	6	NA	29	18	62%	2.4
2022	SPRUCE	14	15	NA	52	29	64%	3.7
2023	SPRUCE	6	6	NA	20	12	63%	3.3

[a] Adults are breeding age (yearling or older). Juveniles are young-of-year.

[b] Data are included from the full season of each year (2016-2020: 1 Sep. to 31 Dec.; 2021-2023: 15 Sep. to 15 Jan.).

[c] Where sample size is insufficient (<30), results are not applicable, indicated by NA.

[d] Blue denotes both sooty and dusky grouse.

[e] Ruffed grouse cannot be identified by sex without a tail sample. Since tail submissions are few, sex-based metrics for ruffed grouse are excluded, indicated by NA.

Sooty Grouse surveys

WDFW initiated spring sooty grouse surveys in 2023 to complement harvest-based monitoring with harvest-independent data. The Oregon Department of Fish and Wildlife (ODFW) has been working with Oregon State University (OSU) to develop and refine a survey protocol that can produce a reliable index of sooty grouse populations in western Oregon (Fox et al., 2011; Walton & Cline, 2021). This protocol is based on hooting male sooty grouse detection during the spring breeding season. In April and May of 2023, WDFW adopted this protocol to begin establishing survey routes and to collect data during an initial pilot season. In 2024, biologists surveyed more than 900 listening stops along more than 50 routes across the three western Washington grouse zones (Figure 4). About 30% of listening stops were in the North Puget Sound zone, 32% in the Olympic zone, and 38% in the Southwest zone. Preliminary data from 2024 suggest an encounter rate of 0.22 sooty grouse heard per listening stop, which is higher than the pilot season in 2023 but also represents better sampling distribution across zones. The encounter rate was highest in the Olympic zone and lowest in the Southwest zone in both years. Biologists also deployed acoustic recording units during the spring to assess the timing of peak hooting so the survey period could be established accordingly. Analysis of these audio recording data is pending. These surveys will provide an important harvest-independent monitoring tool to track sooty grouse populations in western Washington, and also at the broader regional scale in tandem with ODFW's ongoing work.

Habitat

Forest management, wildfire, and human development are the most significant factors influencing habitat conditions and habitat losses for forest grouse populations statewide. Historically, timber harvest activities have been considered beneficial for most forest grouse species. Changes to silviculture techniques, such as using herbicide to control broadleaf species, considered essential food resources for grouse, may play a significant role in the degree to which commercial forests provide benefits. Future benefits from timber harvest will depend on how regenerating forests are managed. Regeneration techniques that include extensive broadleaf tree and shrub control, reduced stocking rates and cover density, and replanting with tree species that provide fewer habitat benefits can negatively impact grouse populations. WDFW Habitat Program staff frequently respond to Forest Practice Applications (see https://www.dnr.wa.gov/programs-and-services/forest-practices for more information) with recommendations to mitigate forest management impacts on wildlife. These recommendations commonly include the following: leaving large down logs in timber harvest areas as drumming logs for ruffed grouse; retaining large, “wolf-tree” Douglas-fir trees on ridge tops for blue grouse winter foraging and roosting; and seeding skid roads and log landings with clover and other grouse forage plants.

Wildfires are an important factor influencing grouse habitat in eastern Washington. Several large fires have occurred in forested areas of Region 2 since the early 1990s. Early successional shrub communities resulting from these fires will benefit grouse for several years, but the loss of mature forest stands essential to winter survival may offset this benefit.

The effect of spring weather on chick production and survival is a well-known factor influencing variation in populations across regions and years. During the peak of hatching in the spring, wet and windy weather reduces chick survival due to exposure and reduces insect populations when young grouse need a high-protein diet. For these reasons, the cool, wet spring of 2022 may have been detrimental to grouse populations. Conversely, drought conditions can also reduce forage opportunities. This may have been the case in 2021, when a severe heat wave in June led to an extended drought season over the summer. Spring conditions in 2023 were more typical, but summer conditions led to moderate to severe drought across most of grouse range statewide. Loss or changes in forest habitat may also affect populations and harvest opportunities.

Management conclusions

Many factors influence forest grouse harvest, which historically has been used as the primary population status indicator. A decline in hunter success rates indicates that the decline in harvest may be more than just a result of declining hunter participation. Habitat loss is a likely driver. The collection of grouse wings and tails provides some insights into population structure. Though the proportion of juveniles in the harvest from 2016 – 2020 was within the range documented by Schroeder (2010), hen vulnerability to harvest in early September may have been a factor limiting production, especially in the areas most accessible to hunters. The delayed season start date beginning in 2021 appears to have reduced the proportion of hens in the harvest. Continued monitoring will improve WDFW's understanding of population trends in light of this change. The new sooty grouse surveys will also provide important harvest-independent monitoring and offer improved insight into population trends.

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Private Lands Access

Private Lands Access Statewide Status and Trend Report

Joey McCanna, Private Lands Section Manager

Introduction

The Department's Private Lands Program promotes cooperation with landowners across the state to provide public access to private property while emphasizing hunting, fishing, wildlife viewing, endangered species conservation, and habitat enhancement. One of the top goals is to encourage landowners to provide public access while addressing landowners' concerns about allowing the public to access their property. Depending on the property location, habitat(s), and current property management, various incentives are available to landowners. These incentives include monetary payments, land/habitat improvements, hunter management strategies, and technical assistance. In addition, the Private Lands Biologists assist the landowners through this process by serving as the program specialists for both the Private Lands and other federal programs.

Several funding sources help fund the current private lands program. The work conducted within the private lands program is vast and requires acquiring various funding sources, including state and federal funding. Most of the current funding comes from the following sources: USFWS Pittman Robertson (PR) funds, State General Fund, species-specific funds from hunting license sales, funding from the Natural Resources Conservation Service (NRCS) through the Voluntary Public Access, and the Habitat Incentive Program (VPA-HIP) Grant. The latter provides the most operational funding for the Private Lands Program over three years. The most recent VPA-HIP grant was active from 2020-2023, and a one-year extension was granted to the Department by NRCs to fund the 2023-2024 season. NRCS extended this contract for an additional year due to the lack of a new Farm Bill funding 2024-2025. WDFW leadership is actively pursuing additional funds to maintain full funding for the program. Much of this report will address the specific objectives within the VPA-HIP grant and the program's future direction. It is important to note that the program's success relies on partnerships with private landowners, sportsman's groups, and volunteers. In addition, Washington has several unique challenges regarding public access to privately owned land. The program constantly changes and adapts new ways to serve private landowners and the public.

Management Guidelines and Objectives

Most enrolled landowners have a formal agreement with the Department; however, some industrial timber managers and large land parcel owners often work closely with field staff to facilitate public access for hunters without formal agreements.

The Private Lands Access Program operates and promotes the following five components of hunting access agreements:

- **Feel Free to Hunt (FFTH)** – The FFTH program includes private lands where the Department has a management agreement with the landowner or organization to provide public access for hunting with minimal restrictions. This type of agreement provides the most open and unrestricted access for the public.
- **Register to Hunt (RTH)** – The RTH program includes private lands where the Department has a management agreement with the landowner or organization to regulate hunting access by on-site registration. Hunters must sign in using a registration slip found at the designated parking area. Parking is usually limited for these properties to limit the number of hunters.
- **Hunt by Reservation (HBR)** – The HBR component of the private lands program began in 2013. It attracts many landowners and organizations by allowing access to specific reservation and hunter information via a landowner portal. Management of the Hunt by Reservation program operates through an online registration system where hunters create an account to reserve available properties. The Hunt by Reservation program allows landowners to manage hunting on their lands without direct contact with hunters.
- **Hunt by Written Permission (HBWP)** – The HBWP program includes private lands where a landowner or organization voluntarily opens their land to public hunting on a contact-for-permission basis. Hunt by Written Permission requires the hunter to contact the landowner directly, usually by phone, and meet in person to obtain written permission to hunt that property. Written permission is validated by possessing a written slip provided to the hunter by the landowner. The Department provides these slips to the landowner at the beginning of the hunting season, and the Biologist teams collect them at the end. The Hunt by Written Permission program allows for the greatest flexibility for landowners and is the most widely used access program.
- **Landowner Hunting Permit (LHP)** – The LHP program includes private lands where WDFW negotiates public hunting access to unique opportunities that otherwise would not exist. A formal application process and a 3-year season setting cycle occur every three years. Landowners must apply, qualify, gain acceptance by the program and regional staff, and then be approved by the Wildlife Commission before being considered an LHP Landowner. Once the Commission approves the landowner's application, landowners will work with regional WDFW staff to set customized hunting season opportunities on their property. During the three years, landowners must follow the standard operating procedure for the LHP Program and provide annual reports. These opportunities are also advertised annually in the Big Game Hunting Regulations and are open to the public by special permit.

In early 2018, WDFW determined that the current software system containing the private lands data and information could no longer meet the program's growth and public needs. The Department plans to migrate the current system and the corresponding program data into a new and improved platform maintained through a centralized system. There have been several hurdles that have prevented this new system from being built. The system requirements are extraordinarily intricate and involve numerous divisions within WDFW. This level of detail, combined with the expected cost of production, has presented WDFW with challenges. In 2020, during the latter part of the initial development phase, the total estimated costs of implementing a new system exceeded what funds were available to the Department at that time. In July 2024, WDFW initiated a feasibility study to find a new hunting reservation system. The results of this study will be completed in October 2024. Investigations into new funding sources are happening now. The current system is both beneficial and a source of frustration for users. WDFW continues to work hard to implement a new system and anticipates that the new system will be in production by spring 2026 if funding is secured.

In 2018, the Department introduced an initiative that focused on developing strategies to work with large industrial timber companies to acquire access to hunting and other forms of outdoor recreation. The Department constantly examines existing timber company relationships and analyzes areas with limited private land access. After the 2023 hunting season, the Department maintained more than 849,000 acres of private industrial timber access across the state. WDFW's goal is to preserve its current access agreements and pursue new opportunities for the public regarding access to private industrialized timberland. In Fall 2022, a team of Private Lands Biologists presented a proposal to WDFW leadership that laid out a plan and funding request to increase access to timber properties in the future. The proposal has not moved forward toward a formal request to the legislature. Several private industrial timberland owners have moved towards their own permit access to their properties. WDFW continues to work with these landowners.

In 2020, efforts began to expand the Private Lands Access Program to include access opportunities for fishing and wildlife viewing on privately owned land. In the years leading up to this decision, the Department witnessed a desire from the public to provide opportunities for non-hunting-related recreation on privately owned land. The Department also encountered many landowners who expressed growing concern with the public requesting access to their lands for fishing or other forms of recreation. Fishing and wildlife viewing access are two primary components of the 2020 VPA-HIP grant. In addition, the Private Lands team is actively searching for landowners interested in these opportunities and continuing to expand on current hunting opportunities.

Landlocked public acreage has become a highlighted issue nationwide in the past year. WDFW works with internal and external partners to identify landlocked public lands throughout the state. In many cases, private land landlocks these public lands, which limits access to the public. Local WDFW staff continue to assist in negotiating access to these landlocked areas across the state. Over the next few years, this will be a priority for staff. Interagency cooperation will be crucial as WDFW determines the best ways to access landlocked public lands across the state.

In early 2021, the Private Lands Access Program acquired the ADA Road Access Entry Program management. During the first year, the intent was to maintain the program under the status quo. However, as the Private Lands section manager implemented the program, it was determined that there would be many necessary changes in the upcoming years. One of the biggest concerns was the need for more outreach and communication to the ADA community regarding this program. There were also concerns about incorporating the necessary technological updates while assisting those wanting to participate. In 2022, the WDFW licensing and the WILD system facilitated the permitting and drawing process for the first time. Roughly 300 hunters submitted their applications, and WDFW and their partners granted about 200 hunting permits. In 2023, a marketing plan comprised of social media posts and an email campaign dramatically increased participation, resulting in over 800 hunter applications and around 270 permits granted. In 2024, over 600 hunters submitted applications, with almost 200 permits issued. With a change in section managers, continued improvement in communication is planned for next year in the form of email announcements, website banners, and mailers to encourage hunter involvement and to give instructions on the sign-up process.

Regional Information and Trends

Program objectives and priorities vary by region. The priorities are dependent on available habitat, species emphasis, and hunter access needs.

Conservation Reserve Program (CRP)

The U.S. Department of Agriculture (USDA) Farm Service Agency (FSA) held a general Conservation Reserve Program (CRP) sign-up from February 27 through April 7, 2023. CRP sign-up number 60 saw 160,913 aces enrolled and 1265 offers accepted in Washington. The Grassland CRP sign-up ran from April 17 through May 26, 2023. CRP sign-up number 205 enrolled five offers totaling 2725 acres in Grassland CRP in Washington. SAFE offers were accepted continuously beginning November 1, 2022. Due to a congressional lapse in appropriations, CRP operations have ceased. Software will remain shut down until new funding is appropriated, resulting in unavailable data for the total number of SAFE contracts enrolled in the most recent sign-up.

This year, Washington State NRCS canceled the longstanding State Acres for Wildlife Enhancement (SAFE) agreement with WDFW to provide technical assistance on SAFE contracts. While WDFW staff are no longer providing technical assistance, WDFW continues to work with landowners to benefit species and address habitat concerns. Additionally, WDFW continues to work closely with the Farm Service Agency (FSA) and remains the project sponsor for the three SAFE projects in Washington.

The CRP county-acreage cap continues to impact the producer’s ability to enroll in CRP/SAFE in Douglas County. There is high landowner interest in enrolling in SAFE, but several logistical issues have been barriers to getting those acres enrolled in the SAFE program. The most significant barrier is a National FSA policy on counties close to the CRP cap. In this policy, all the acres in the General CRP enrollment are allocated first. The Grasslands CRP sign-up acres are allocated, followed by SAFE acres, regardless of when the landowner applied. For several years, many interested landowners have submitted applications as soon as possible. Still, they could not enroll in the program because SAFE was last in line for acreage allocation, and few were available. This issue may be addressed in the new Farm Bill, allowing more landowners to enroll in SAFE.

Region 1

Region 1 is one of the most diverse regions due to the latitudinal range of the region. This diversity encompasses many different landscapes, which provide unique hunting opportunities throughout the region. Region 1 remains a popular area for upland bird hunting and big game hunting and possesses the most extensive acreage within the program. Region 1 also holds a significant amount of industrial timberland open to public access. Under the current 2020 VPA grant, this region focuses on big game and upland bird hunting opportunities. Still, new funding is also available to expand opportunities in waterfowl, turkey/dove, fishing, and wildlife viewing.

Region 2

Region 2 is one of the state's most popular areas for waterfowl and upland bird hunters. The Department is constantly exploring other opportunities to expand this region's waterfowl and upland hunting acreage. Under the current 2020 VPA grant, this region's top three priority species are big game, waterfowl, and upland bird hunting. Funding is also available for turkey/dove and wildlife viewing in certain areas of the region. Staff continue implementing upland bird restoration/enhancement projects and seek wildlife viewing opportunities. Funding for these efforts may be available for interested landowners in certain areas.

Region 3

In Region 3, private lands are made available for public hunting through one of WDFW's Private Land Hunting Programs. Many of these acres are enlisted in the Feel Free to Hunt and Hunt by Written Permission programs, especially for deer and upland birds. The Hunt by Reservation program offers several excellent opportunities, including over 10,000 acres on the Puget Sound Energy Wild Horse Wind Facility in Kittitas County, which is popular for elk hunting. Some large properties also exist through the Register to Hunt program for deer, waterfowl, and upland bird hunting. The Landowner Hunting Program provides limited elk permits to youth, disabled, and general season elk hunters for a quality hunt opportunity on private ranches in Benton and Yakima County. Under the current 2020 VPA grant, the top priority species in this region are waterfowl, upland bird hunting, and big game. Additionally, two properties have been made available for Wildlife Viewing, and some funds are available for fishing enhancement throughout the region.

Region 4

The Private Lands Program's efforts in Region 4 focus primarily on waterfowl and industrial timberland hunting access. Staff also work with landowners to improve deer, waterfowl, and elk hunting access to address wildlife damage to agriculture. In the Fall of 2016, the Department extended recreational opportunities by signing agreements with landowners for wildlife viewing, which will continue under the 2020 VPA grant. Most of the acreage enrolled in Region 4 is with timber companies to facilitate deer, elk, and spring bear hunting access. Some of the waterfowl sites in Region 4 are in the Hunt by Reservation Program and are extremely popular and hard to reserve. Hunters wishing to reserve these properties are encouraged to do research early. Some private land contracts in the northern part of the region also help landowners address crop damage problems posed by large numbers of snow geese migrating through the area. However, under the 2020 VPA grant, funding is available to expand big game, fishing, and wildlife viewing opportunities.

Region 5

The program in Region 5 focuses primarily on working with timber companies to maintain open access and enrolling property in areas with a large concentration of private lands. Other agreements provide upland bird hunting opportunities on Private Lands Pheasant Release Sites in Cowlitz and Klickitat Counties. The Private Lands Biologist in Region 5 is actively working to expand the program and increase enrollment. As in regions 4 and 6, there is a good portion of land that private industrial timber companies own. Regional staff have successfully worked with several local companies to negotiate no-fee access for the general public, especially for big game hunting. In the past year, there have been some significant expansions to the industrial timber acreage available to the public in this region. Under the current 2020 VPA grant, the program will have the ability to have a more significant impact on public hunting opportunities in the region. Funds are available to aid expansion in big game, waterfowl, upland bird hunting, turkey/dove, fishing, and wildlife viewing.

Region 6

As in Regions 4 and 5, private land access opportunities in Region 6 are vast. The significant focus for acreage includes waterfowl hunting and industrial timber hunting access. Region 6 also has a few private properties popular for pheasant hunting. WDFW staff devote efforts to working with large industrial timber companies that may not be enrolled in formal contracts. The relationships built between the private land's biologists, private landowners, and industrial timber companies have facilitated public access and assisted the landowners with managing public recreation. WDFW staff work on directing volunteer efforts to monitor use, discourage abuse of private lands, conduct cleanup of illegal dump sites, and maintain signage and gates. Much of the private industrial timberland acreage in Region 6 has landowner fee access requirements or is privately leased. A few of these permit programs offer limited hunter opportunities. This trend is a growing concern for hunters who find it increasingly difficult to locate places to hunt or are unwilling or able to pay fees for access. Under the current 2020 VPA grant, the top priority species for this region is waterfowl. However, funding is also available for big game, fishing, and wildlife viewing opportunities.

The Department’s Private Lands Access Program continues to be an asset to the hunting public and the landowners who choose to participate. Urban development and changing land uses have continued to reduce the amount of land available to hunters. Implementing fee access permits, exclusive leases, or access policies by industrial timberland owners is fast becoming a norm in Washington. As a result of the fee permits, the Department has continued to engage in communication efforts with those large landowners. Implementing the high-cost fee-based permit programs has limited the ability of some hunters to acquire access to huntable timberlands. Presently, the Department does not have the resources to match the income potential of these programs. In some instances, the Department has successfully encouraged landowners to increase the number of low-cost permits to allow additional hunters to access those properties. As a result, hunters unwilling or unable to obtain permits must look elsewhere for hunting access, which increases pressure on other private and public lands.

WDFW is determined to increase public access and hunter opportunities. The Department will continue to pursue funding sources and no-cost agreements to improve recreational access for the public across Washington State.

Landowners or landholders interested in the Private Lands Program should visit WDFW's Private Lands Program webpage. Contact your local Private Lands Biologist by referencing the work areas map. *Access to private land is a privilege, not a right.*

Literature cited

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Table 1. Regional Totals.

Regions	Acreage	Cooperators
Region 1	688,382	252
Region 2	266,138	120
Region 3	77,977	24
Region 4	152,165	35
Region 5	74,373	24
Region 6	273,531	14

Table 2. Timber acreage currently under contract.

County	Acreage	Cooperators
Stevens	360,247	5
Skagit, Whatcom	144,988	1
Vancouver	70,686	2
Montesano	273,531	8

Table 3. Feel free to fish agreements.

County	Acreage/Feet	Cooperators
Montesano	1,604/ac	2
Columbia	1,795/ft	2
Walla Walla	96,755/ft	6

Table 4. Wildlife viewing agreements.

County	Acreage	Cooperators
Montesano	142	1 – Feel Free to View
Yakima	40	1 – Register to View

Table 5. Private Lands enrolled in WDFW hunting access programs by county.

	Feel Free to Hunt		Hunt by Reservation		Register to Hunt		Hunt by Written Permission		Landowner Hunt Permit		County Totals	
County	Cooperators	Acres	Cooperators	Acres	Cooperators	Acres	Cooperators	Acres	Cooperators	Acres	Cooperators	Acres
Adams	6	4,689	1	2,046	0	0	27	94,547	0	0	34	101,282
Asotin	2	3,420	0	0	2	4,218	12	14,792	0	0	16	22,430
Benton	0	0	1	150	1	11,935	2	15,700	1	86,907	5	114,692
Chelan	0	0	0	0	0	0	0	0	0	0	0	0
Clallam	0	0	0	0	0	0	0	0	0	0	0	0
Clark	0	0	0	0	0	0	0	0	0	0	0	0
Columbia	12	33,622	0	0	0	0	7	19,644	0	0	19	53,266
Cowlitz	2	369	0	0	0	0	0	0	0	0	2	369
Douglas	6	13,640	1	2,255	0	0	22	56,044	0	0	29	71,939
Ferry	3	3,912	0	0	0	0	5	1,217	0	0	8	5,129
Franklin	3	1,285	4	3,135	2	3,950	4	7,630	0	0	13	16,000
Garfield	9	8,091	0	0	0	0	7	8,322	0	0	16	16,413
Grant	6	10,140	3	15,890	0	0	30	49,446	1	37,540	40	113,016
Grays Harbor	2	1,849	1	70	1	143	0	0	0	0	4	2,062
Island	5	1,330	0	0	0	0	0	0	0	0	5	1,330
Jefferson	0	0	1	118	0	0	0	0	0	0	1	118
King	1	288	0	0	0	0	0	0	0	0	1	288
Kitsap	0	0	0	0	0	0	0	0	0	0	0	0
Kittitas	0	0	1	9,000	0	0	0	0	0	0	1	9,000
Klickitat	2	43,877	4	1,725	0	0	0	0	0	0	6	45,602
Lewis	1	200	0	0	0	0	0	0	0	0	1	200
Lincoln	5	4,909	0	0	0	0	28	37,249	0	0	33	42,158
Mason	3	688	2	533	0	0	0	0	0	0	5	1,221
Okanogan	0	0	0	0	0	0	0	0	0	0	0	0
Pacific	2	65,392	0	0	0	0	1	68	0	0	3	65,460
Pend Oreille	4	109,081	1	238	0	0	1	1,166	0	0	6	110,485
Pierce	0	0	0	0	0	0	0	0	0	0	0	0
San Juan	0	0	6	166	2	190	0	0	0	0	8	356
Skagit	2	164	4	345	8	1,232	1	86,104	0	0	15	87,845
Skamania	1	5,714	0	0	0	0	0	0	0	0	1	5,714
Snohomish	0	0	1	54	3	196	0	0	0	0	4	250
Spokane	3	11,981	6	6,774	0	0	10	9,028	1	3,800	20	31,583
Stevens	5	333,223	0	0	0	0	11	5,087	0	0	16	338,310
Thurston	0	0	0	0	0	0	0	0	0	0	0	0
Wahkiakum	1	5,714	0	0	2	259	1	97	0	0	4	6,070
Walla Walla	26	66,142	2	7,480	0	0	17	26,802	0	0	45	100,424
Whatcom	0	0	5	15,787	9	2,172	1	43,052	0	0	15	61,011
Whitman	4	3,901	53	56,151	0	0	31	30,711	0	0	88	90,763
Yakima	1	2,600	0	0	1	3,100	2	3,354	1	8,727	5	17,781
Totals	117	736,221	97	121,917	31	27,395	220	510,060	4	136,974	469	1,532,566

* Some landowners have acreage that spans multiple counties. These landowners are represented above in one county where they own property. LHP is the only exception since there are only four landowners, and they are represented in a single county.

Human-Wildlife Interaction

Human-Wildlife Interaction Statewide Status and Trend Report

Jim Brown, Wildlife Conflict Section Manager

Introduction

The Washington Department of Fish and Wildlife (WDFW) renewed its focus on human-wildlife conflict management in recent years. This report is intended to illustrate efforts to meet the Game Management Plan objectives while creating a historical account of human-wildlife conflict management actions. In addition, WDFW has implemented programs to provide opportunities for improved knowledge in developing specific strategies and tools for mitigating negative human-wildlife interactions in Washington for the long-term sustainability of wildlife resources.

Social tolerance can be a limiting factor for species recovery and maintaining sustainable wild animal populations. Negative human-wildlife interactions decrease the social tolerance of wildlife populations using the otherwise available habitat. Through the application of integrated wildlife management techniques designed to prevent or mitigate negative human-wildlife interactions, WDFW can improve the social tolerance of wild animals. By doing so, wildlife managers can increase wildlife populations by increasing the use of existing habitats on heavily human-influenced landscapes.

The convergence of human population expansion, nature-based tourism, and escalating interest in outdoor recreation will likely increase the frequency of negative or unwanted human-wildlife interactions. Maintaining a healthy ecosystem for humans and wildlife will require innovative approaches to minimize these conflicts. These approaches must include science-based decision-making that incorporates public opinion for social context. WDFW is committed to informing and assisting the public to employ proactive measures and to provide a quick and effective response once unwanted interactions and property damage occur (Conover, 2001).

WDFW conducted an opinion survey that identified 29% of the Washington public as having experienced negative situations or problems associated with wildlife (Duda et al., 2014). Deer and raccoons were the most commonly named species causing problems (35% and 25%, respectively), followed by bear (14%), geese (13%), and coyotes (10%; Duda et al., 2014).

WDFW has not always conducted formal assessments of negative human-wildlife interaction complaints. Current trends indicate that human-wildlife conflict resolution in Washington is necessary, and traditional recreational harvest is not always effective in resolving negative interactions.

Management guidelines and objectives

In December 2014, WDFW published the Game Management Plan (WDFW, 2014), which outlined three goals and ten human-wildlife conflict management objectives with strategies designed to create an integrated system of management actions, data collection, and information sharing.

The goals for human-wildlife conflict management in Washington are to:

1. Improve WDFW's understanding and ability to predict human-wildlife conflict issues;
2. Enhance proactive measures to prevent negative human-wildlife interactions and improve agency response to interaction events; and
3. Minimize, mitigate, and manage negative human-wildlife interactions to maintain/increase human tolerance and perpetuate healthy and productive wildlife populations.

Management actions

WDFW management actions are designed to minimize negative human-wildlife interaction and assist landowners with the prevention, mitigation, and, when necessary, compensation for property damage or loss (as provided by law). An effective strategy for managing negative human-wildlife interactions is to allow employees a degree of flexibility to test and implement new techniques while improving existing preventative and mitigation tools. WDFW Wildlife Conflict Specialists assess each scenario and use their professional judgment to determine the best course of action for interaction resolution.

In addition to accounting for negative human-wildlife interaction issues when setting recreational harvest seasons and limits, WDFW deploys other tools when traditional recreational harvest cannot resolve the issue. WDFW has used hunters to assist with deer, elk, and turkey damage issues, and hound handlers, trappers, and hunters to assist with bear and cougar depredation events. In each case, criteria must be met, and restrictions direct the final disposition of the animal harvested.

WDFW continues to use a three-category system to respond to human-wildlife interaction issues: 1) public safety response, 2) non-public safety requiring assistance, and 3) self-help. Self-help involves referring a customer to the WDFW website to obtain an answer to a wildlife-related damage problem, directing the customer to a list of certified Wildlife Control Operators available for hire, or directing the customer to contact the United States Department of Agriculture Wildlife Services for help in solving a conflict situation. Often, the self-help tools are used to assist with damage situations involving small game, furbearers, and unclassified species (e.g., raccoons, beavers, coyotes, etc.). The WDFW Law Enforcement Program is the primary responder for public safety interactions involving bear, cougar, moose, and wolves. Non-public safety wildlife interactions, including depredations involving deer, elk, turkey, black bear timber damage, and wolves, are generally resolved through the WDFW Wildlife Program.

Deer, elk, and turkey damage prevention and kill permits

Depending upon the circumstances, landowners may enter into a Damage Prevention Cooperative Agreement with WDFW to use non-lethal mitigation tools for damage caused by deer, elk, and turkey. If these mitigation tools are ineffective, a Wildlife Conflict Specialist may issue a damage prevention permit (DPP) or a kill permit (KP) to a landowner that allows for the removal of one or more offending animals using licensed hunters or agency kill authority. During the 2023 damage season (April 2022–March 2023), a total of 1,888 permits were issued to remove offending deer, elk, and turkey (Table 1).

Table 1. Total damage prevention and kill permits issued by Washington Department of Fish and Wildlife by region for deer, elk, and turkey, April 2023–March 2024.

Permit	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Total
DPP Deer	125	40	101	2	5	22	**295**
KP Deer	76	14	25	16	4	62	**197**
DPP Elk	98	12	543	15	68	107	**843**
KP Elk	107	38	39	82	39	113	**418**
DPP Turkey	-	-	-	-	-	-	**0**
KP Turkey	119	16	-	-	-	-	**135**
Total	**525**	**120**	**708**	**115**	**116**	**304**	**1,888**

Licensed hunters with a DPP must purchase a damage tag to participate in a deer or elk damage resolution hunt and can retain the deer or elk. Hunters purchased 197 deer damage tags and 598 elk damage tags during the 2023 damage season; of those damage tag holders who reported (461 tag holders reported), 366 deer and elk were harvested for an estimated success rate of 79% statewide (Table 2).

Table 2. Total reported successful harvest by hunters with deer and elk damage tags for each Washington Department of Fish and Wildlife by region, April 2023–March 2024.

Damage Tag Type	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Total
Deer	70	13	26	1	-	6	**116**
Elk	39	2	140	6	17	46	**250**
Total	**109**	**15**	**166**	**7**	**17**	**52**	**366**

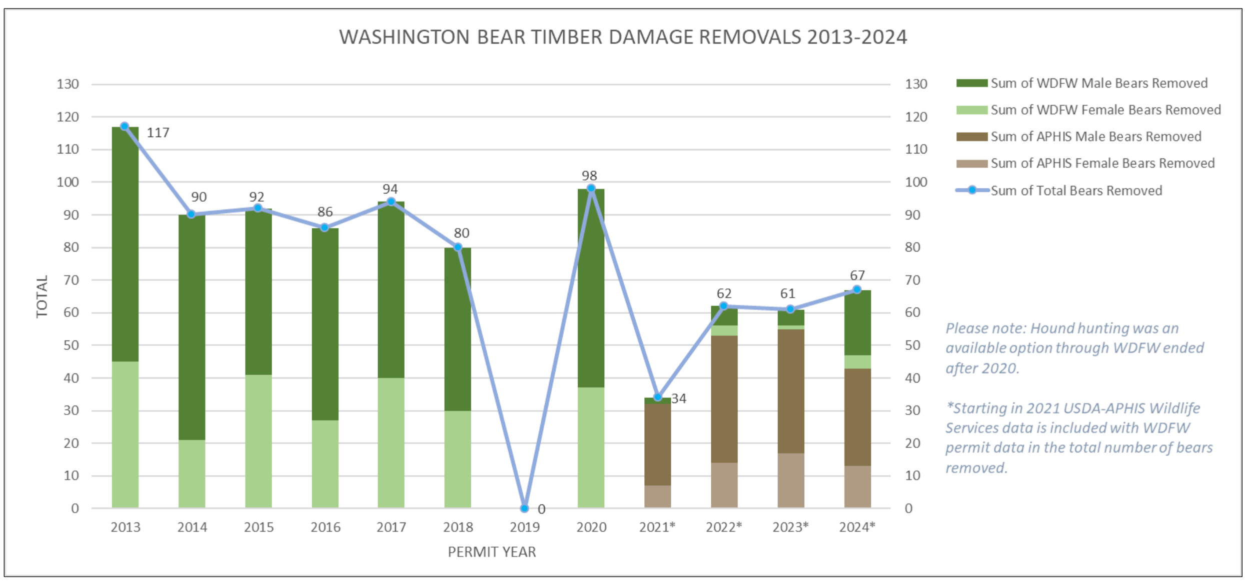
Black bear timber damage

Black bears emerge from winter dens when food sources are relatively scarce and may strip bark off certain species of trees to access the carbohydrate-rich cambium. Bark stripping or "peeling" may hinder the tree's growth or kill it, causing the potential for financial loss to commercial timber growers. The damage period occurs from approximately April through June and ends once other food sources, such as berries, become more abundant.

In early 2024, the Fish and Wildlife Commission adopted a new permit process rule to replace the original Bear Timber Damage Program that was discontinued because the courts had invalidated a portion of Washington Administrative Code (WAC 220-440-210) providing for the issuance and use of the black bear timber damage depredation permits. The new rule provides a process consistent with the prior court ruling and was first used in the spring and early summer of 2024.

Commercial forest landowners and managers experiencing timber damage caused by black bears may now request a kill permit for the timber-damaging black bear. This permit request is initiated by working with the local Wildlife Conflict Specialist, who will evaluate the current damage, discuss the use of any non-lethal measures to address the situation, and ultimately decide if a kill permit is an appropriate option. The number of kill permits issued in response to black bear timber damage (55 permits) and the number of bears harvested for the 2024 damage period (9 black bears) was significantly lower than the depredation permits issued and bears harvested in previous years under the original program. The following information is provided to illustrate historical trends.

Figure 1. Number of black bears removed annually during the bear timber damage period, 2013–2024.



A total of 24 black bears (20 males, 4 females) were removed during the 2024 timber damage period under kill permits issued to commercial forest landowners and managers (Figure 1).

Commercial forest landowners and managers can also work with the Wildlife Services section of the United States Department of Agriculture's Animal and Plant Health Inspection Service (USDA-APHIS Wildlife Services) to mitigate black bear timber damage. During the 2024 timber damage period, USDA-APHIS Wildlife Services reported to the department they removed 43 black bears (30 males, 13 females).

The 2024 recreational black bear season is underway as of this writing, so the 2023 record is used here. In 2023 the Fish and Wildlife Commission discontinued the spring season black bear hunt. In 2023 the black bear harvest total, including the recreational harvest and bear timber damage removals (including USDA-APHIS Wildlife Services), was 1,860 bears statewide. The 61 Black bear timber damage removals represented 3% of the statewide harvest.

Carnivore (black bear, cougar, and wolf) depredation on livestock

Accounts of managing and responding to livestock losses and injury caused by black bears and cougars are described under those sections. Please see the Wildlife Damage Claims section below for details regarding compensation claims during the fiscal year 2024.

Cost-share and prevention measures for livestock losses

WDFW offers cost-sharing with livestock producers for deploying conflict prevention measures to minimize livestock loss to wolves. Producers who sign a Damage Prevention Cooperative Agreement for Livestock (DPCA-L) may receive cost-share funds to assist them with installing and using non-lethal conflict prevention tools. The agreements can last up to one year. They may be signed at any time during a fiscal year and end at the close of the fiscal year. Potential prevention measures that may be included in a DPCA-L include sanitation (fencing bone yards, surrounding carcasses with fladry, or removing carcasses), providing deterrence tools (screamers, range riders, guard dogs, radio-activated guard boxes, fladry, predator fencing, electric fencing, bio fencing), and protecting livestock rearing areas. The most common measures deployed by producers under DPCA-L's are range riding and sanitation. Cost-share amounts can vary depending on the livestock operation, location of the livestock herd in relation to wolves, proactive measures selected, and duration. During fiscal year 2024 (July 1, 2023 – June 30, 2024), there were 32 DPCA-L's written with livestock producers statewide.

In addition to DPCA-Ls, WDFW also contracted range riders to assist ranchers in minimizing livestock losses caused by wolves. Range riders are skilled at herd management and monitor for potential wolf presence within the vicinity of livestock while providing consistent human presence with livestock while on grazing allotments. Range rider duties include, but are not limited to: monitoring the health and behavior of a herd; seeking out signs of wolf or other carnivore activity in the area; implementing tools and techniques that minimize predation risk; deploying non-lethal hazing techniques; trying more intensive livestock management, or any number of other techniques or combination of techniques; and frequent communication with the livestock producer and WDFW staff regarding planned livestock movements and grazing plans. The Washington State Department of Agriculture (WSDA) now has a grant program for range riding in the northeastern four counties to be provided through several non-governmental organizations (NGO). That program has absorbed much of the contracted range rider work formerly provided by WDFW. During the fiscal year 2024, WDFW only had 9 range rider contracts that utilized up to 13 riders throughout the year to fill gaps in coverage in the northeastern counties and for areas outside of the WSDA program area.

Wildlife damage claims

Agriculture

Commercial agriculture producers who meet the definition of “eligible farmer” (Revised Code of Washington 82.08.855), have cooperated with WDFW prior to claim initiation, and experience crop damage from deer and elk may be eligible for compensation from the state. Fund amounts for compensation are set in statute and appropriated through legislation. The payment of a claim is conditional on meeting specific criteria [Washington Administrative Code (WAC) 220-440-140 and 220-440-150] and the availability of specific funding for this purpose. Reimbursement for damage claims is not guaranteed. The total compensation for deer and elk crop damage claims in fiscal year 2024 (July 1, 2023 – June 30, 2024) was $0, for reasons stated below.

The Washington State Legislature passed Second Substitute Senate Bill 5784 during the 2024 legislative session resulting in significant changes to the commercial crop damage compensation program administered by the department. Part of the legislature’s existing responsibility is to appropriate funds for the compensation program each year. These funds appropriated by the legislature are the WDFW’s only funding source to pay claims. Recently, applications for damage compensation have exceeded available appropriations for this purpose. This session, WDFW brought the problem of insufficient funds to the legislature in a request for full funding to cover all unpaid claims. However, in the final bill the legislature only appropriated $184,000 to WDFW to cover any pending claims from prior fiscal years (before fiscal year 2024) in the order they were finalized up to the start of the new fiscal year. This amount was not enough to cover all pending claims in fiscal year 2024 and several claimants were affected by the lack of full funding and had their claims denied as a result. Furthermore, the legislature placed additional language into the bill that states that any existing claims in excess of this supplemental appropriation will not be funded in the future. Future claims exceeding the available funds may be brought before the legislature for them to consider funding in a supplemental appropriation, but only at their discretion.

The total compensation paid for deer and elk crop damage claims filed during fiscal year 2024 (July 1, 2023 – June 30, 2024) was $0.00 because all of those claims in that year were in excess of the funds appropriated and were denied as a result of the language in 2SSB 5784.

Claims reduction through cost-share prevention measures for deer and elk damage

WDFW offers cost-sharing fencing to growers of commercial crops. The legislature appropriates funds within the state capital budget to allow the department to enter into 25-year agreements with growers to erect at their expense, fencing materials built on an approved deer or elk resistant design that are purchased by the department. That fence must be erected and maintained for the life of the agreement and the grower is precluded from filing damage claims on those crops for that time period. In 2023, the department provided $213,373 for cooperative deer and elk damage prevention fencing.

Livestock

Commercial livestock producers who experience livestock loss caused by bear, cougar, or wolf may be eligible for compensation under WAC 220-440-170 and WAC 220-440-180. Similar to the deer and elk claims, payment is conditional upon meeting specific criteria and the availability of specific funding for this purpose. Reimbursement for damage claims is not guaranteed. The total compensation for direct livestock losses (i.e., losses determined by WDFW to be confirmed or probable) caused by wolves in fiscal year 2024 was $27,027. The total compensation for direct livestock losses caused by cougars in fiscal year 2024 was $6,308. The total compensation paid for indirect livestock losses caused by wolves in fiscal year 2024 was $79,548.

Wildlife control operators

Wildlife Control Operators (WCO) are private individuals certified by WDFW to assist landowners in preventing or controlling wildlife-related damage for a fee. A WCO is allowed to harass, control, and trap various small game, furbearer species, unclassified wildlife, and predatory birds. WCOs are not certified to handle nuisance issues involving deer, elk, cougar, bear, moose, wolf, bighorn sheep, mountain goat, turkey, or protected or endangered wildlife.

The WCO program is administered through the statewide Wildlife Conflict Management and Prevention Section at the WDFW office in Olympia. Classes for WCO certification were originally held four times per year, alternating between the Olympia and Spokane WDFW offices. As of August 2020, the training transitioned to a virtual platform in response to COVID-19. With increased capacity for statewide attendance, the virtual training courses have been hosted twice in the last year. All trainings are complete for 2024. Once a person meets all the requirements for becoming a WCO (WAC 220-440-100), completes the WCO training, and passes the qualifying exam, they are presented with a certificate valid for three years that allows the individual to handle specific nuisance wildlife issues year-round and statewide. Thirty-three (33) people completed training and were certified as WCOs in 2024, compared to 51 people in 2023. Currently, there are 280 people serving Washington State with valid WCO certificates.

Special trapping permits

Property owners experiencing wildlife-related damage to their property are allowed to mitigate the problem by capturing and removing the species responsible, with exceptions. In some cases, when nonlethal measures have been deemed ineffective, a property owner may apply for a special trapping permit (STP), valid for 30 days, authorizing the use of one or more body-gripping traps. Body-gripping traps that may be authorized under an STP include a Conibear-type trap in water, a padded-jaw leg-hold trap, and a non-strangling foot snare.

Between January 1st, and December 1st, 2023, 291 STPs (including renewals) were issued statewide, which allowed for the removal of certain wildlife causing damage to public or private property (Figures 2 & 3). The 2023 value is an increase from the 270 permits issued in 2022. The most common authorization requested was for trapping mountain beaver within industrial timberlands.

In 2023, requests for STPs and corresponding wildlife removals were variable by month, but the highest numbers generally occurred from fall through spring. In the last year, WDFW saw a peak in permits issued in January. Special Trapping Permit requests and the number of animals removed using STPs were highest in western Washington counties.

Figure 2. Total number of individual animals reported trapped for the six most common wildlife species removed using Special Trapping Permits in 2023.

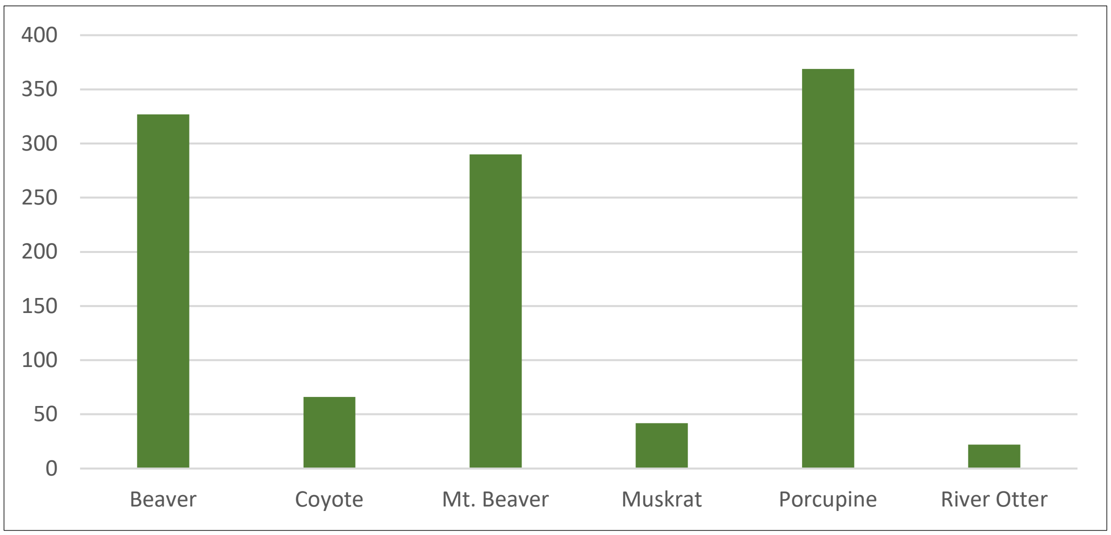
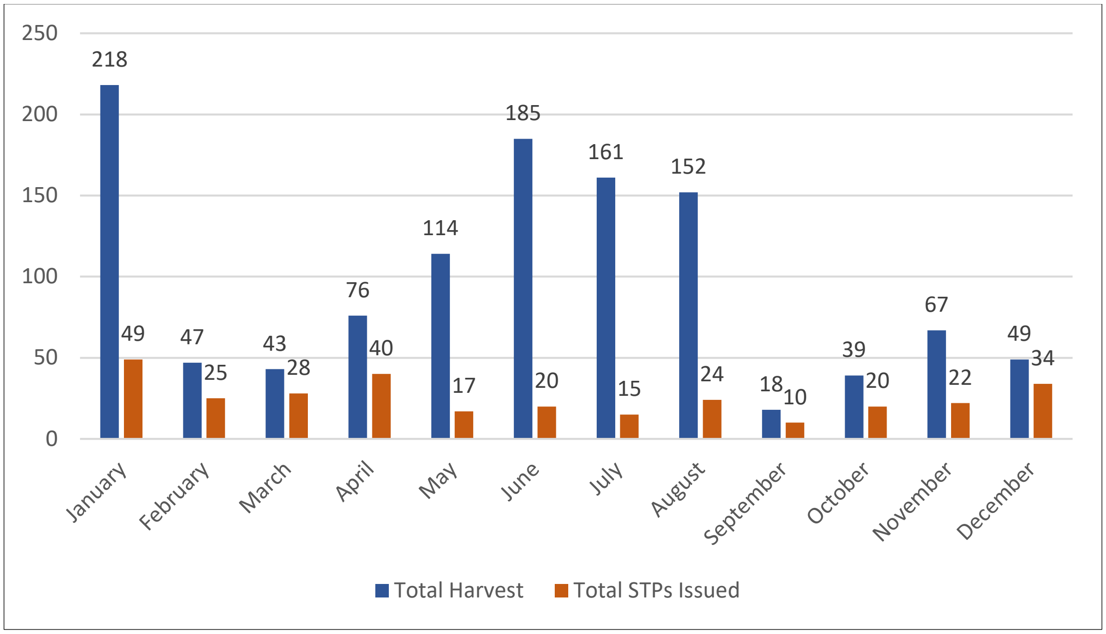


Figure 3. Total number of wild animals reported trapped with Special Trapping Permits (STP) and the total STPs issued each month, 2023. The number of wildlife reported trapped in each month is based on reporting for 30-day permits that ended within a given month.



Management conclusions

Minimizing the potential for negative human-wildlife interaction is a critical key to North American wildlife management in the 21st century. Doing so increases the social tolerance for wildlife living in habitat that might otherwise be unavailable to many species, including big game. Managing and preventing wildlife conflict requires using various adaptable tools and techniques to ensure sustainable wildlife populations without negatively impacting natural resources or the livelihoods of Washington residents. Food resources, such as agricultural crops, livestock, or unnatural attractants in the vicinity of residences, can lead to potential conflict.

From 2020 and to the present, WDFW improved data collection methods, improved call for service tracking and record management through field staff employing the Spillman-Flex record management system, which was formerly only used by WDFW's enforcement program, increased response to conflict issues with staffing increases in limited geographic areas, deployed new methods and techniques for managing conflict, and increased information sharing for mitigating negative encounters. The WDFW Wildlife Conflict Management and Prevention section is committed to continuous improvement in managing negative human-wildlife interactions using a combination of the best science and the best business practices. Some of the remaining challenges for effective human-wildlife conflict management include:

1. Inadequate funding and staffing for the needed response to meet the State's expanding population and human occupation of more wildlife habitat,
2. Improving existing or adding rules that address the primary conflict issues,

3. Developing additional policies and procedures that facilitate a smooth process by which actions can be deployed,
4. Furthering appropriate data collection to direct management activities, and
5. Testing new and evaluating existing wildlife management techniques targeted to mitigate or prevent conflict. An additional challenge and objective for the upcoming years is to improve outreach and information sharing through multimedia approaches (e.g., print, audio, visual, and social media platforms).

Literature cited

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Acknowledging the Indigenous People of the Pacific Northwest

Since time immemorial, Indigenous People have lived in the Pacific Northwest and hunted, fished, and gathered natural resources, traditional foods, and medicinal plants to support their diverse cultures. They were the original occupants and stewards of this land that all Washingtonians enjoy today.

The very survival of the Pacific Northwest Tribes is a testament of resiliency of what they have endured and continue to endure throughout generations on this landscape. Through many historical encounters of massacre, renunciation of religious freedom, systemic racism, cultural assimilation of native children through institutional residential schools, and the fight for their inherent rights and liberties, they have prevailed. Throughout this painful history brought by colonization, abrogated treaties, infringement of civil rights, and the salmon protests of the 1960s, the Northwest Tribes and the Washington Department of Fish and Wildlife (WDFW) have founded a commitment of respect, unity, and alliance informed by the realities of the past.

Today, tribal governments and WDFW work collaboratively to conserve and manage aquatic and terrestrial resources statewide and practice sound science to guide management decisions. The Tribes and WDFW work together to ensure the sustainability of fish, wildlife, ecosystems, and culture for the next seven generations and beyond.