ELK MANAGEMENT
NEW MEXICO DEPARTMENT OF GAME AND FISH

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ELK HUNTING OVERVIEW

New Mexico offers world class elk hunting throughout the state and is considered a premier hunting destination, known for productive elk herds across diverse landscapes with ample public land access and opportunity. The New Mexico Department of Game and Fish (Department) offers many elk hunting opportunities on both public and private properties with rifle, muzzleloader, or archery hunting options. Between 2020 and 2024, approximately 38,000 licenses were sold to hunters annually, resulting in an average harvest of ~8,550 bulls and ~6,600 cows. Average hunt success across all weapons and license types was 39.4%. Visit our Harvest Report Information page for detailed annual reports.

Within New Mexico there are several elk herd units, defined as contiguous tracts of suitable elk habitat where distinct elk populations inhabit the landscape. Elk herd units are located primarily within the mountainous regions of the state and provide the geographic basis for which biologists monitor and manage populations (Figure 1). Although elk populations persist outside of these regions, the majority of the elk in New Mexico exist within these defined herd units. Many of these herd units span across several GMUs, each containing specific annual harvest regulations and license allotments (Figure 2).

The Department provides elk hunting opportunities on public lands through public draw licenses, and hunting opportunity on privately owned properties through the Elk Private Land Use System (EPLUS). The EPLUS program was created in recognition of the important benefits that private lands contribute to the elk populations and hunting opportunities in New Mexico.

Elk are managed across the state in three categorical zones, each having different management goals. These management zones are Primary, Secondary, and Special (Figure 2), each designated within distinct, non-overlapping, geographic areas. Within Primary Management Zones, the Department actively monitors herd productivity and recommends license adjustments to manage elk herds within a range of sustainable population metrics and harvest strategies. Population sizes and sustainable harvest limits are determined through annual survey efforts and harvest reporting using various statistical models. These monitoring strategies are aimed at maintaining stable elk populations and ensuring appropriate harvest. The total number of elk licenses issued in each Game Management Unit (GMU) are divided between the public draw and the EPLUS system based on the percentage of public vs private land in the Primary Management Zone of each GMU. Licenses issued through the public draw are subject to a quota set by the state's legislature (see below for more information). Public draw licenses are valid on legally accessible public land, and private land (with written permission) in the GMU for which the license is issued.

Secondary Management Zones are areas within the state where elk are present, but are adjacent to, or outside of, core habitat and thus no specific elk management goals are set by the Department. Within these zones, some surface land ownership is private, and hunt access and permission are limited to private properties the hunter has written permission. Landowners willing to allow elk hunting on their property must enroll in the EPLUS system. Elk licenses for enrolled private lands in Secondary Management Zones are issued over-the-counter and are available for purchase with an appropriate ranch code.

Special Management Zones are regions outside both Primary and Secondary Management Zones and elk authorizations are issued to private landowners by the Department on a ranch-by-ranch basis. Private property owners who are qualified participants in the EPLUS program are issued

authorizations for elk hunts to be distributed by the landowner. These private property authorizations can then be converted to licenses by the hunter. Depending on how the landowner enrolled their property in the EPLUS program and where that property is located, authorizations may be valid for the entire GMU, like public draw licenses (Primary Zone, Unit-Wide), or they may be limited to the ranch boundaries where the hunter has written permission (Secondary and Special Zones). For more information on EPLUS licenses, visit the [EPLUS webpage](). The Department monitors elk herds in Primary and some in Special Management Zones using aerial helicopter surveys and hunter harvest information. However, not all elk herds are at densities or in habitat types that are conducive to aerial surveys. In Secondary and some Special Management Zones, elk herds are monitored using data provided through mandatory harvest reporting. As such, harvest reporting is an invaluable tool in assessing elk population performance resulting in informed management recommendations. These metrics, surveys and hunter harvest reports, are used to recommend license adjustments to best manage each herd.

Opportunity vs. Quality Hunt Designations

In Primary Management Zones the Department sets goals for each herd unit and makes management recommendations to the State Game Commission to achieve that goal. The Department manages these herd units under one of two designations; Optimal Opportunity Management (OOM or 'opportunity') or Quality Hunt Management (QHM or 'quality') described below:

> ➢ Optimal Opportunity Management (OOM): Hunts designated as 'opportunity' maximize hunter opportunity without negative impacts to overall population viability. The number of licenses issued for each GMU are designed to stay well within a sustainable harvest limit while allowing ample hunting opportunities. Depending on the GMU, weapon type, and hunt timing, there is the potential for increased hunting pressure. There is also typically an increased chance at drawing a tag. These opportunity areas have a sufficient number of bulls, but fewer older age class males compared to 'quality' hunt areas due to increased hunting pressure.

> ➢ Quality Hunt Management (QHM): Hunts designated as 'quality' offer desirable season structure, lower hunter density, an increased chance for success, and an ability to choose from a wider selection of legal animals due to decreased hunt pressure. These hunts typically have fewer licenses, resulting in a relatively high success rate for hunters. However, demand for these licenses is high and there is a lower chance of drawing a tag.

Opportunity and Quality Hunt designations are listed in the Hunting Rules and Information Booklet under the "Fee Type" for each listed hunt.

Draw System and License Quotas

Unlike many western states, New Mexico does not have a preference point system where applicants gain advantage points for every year they are unsuccessful in the draw. The draw is completely random, meaning that a hunter applying for the public draw for the first time has the same chance as a hunter that has applied for 20 years or more. However, as directed by the New Mexico state legislature, residents of the state are guaranteed the majority of elk licenses available through the public draw; 84% are allocated to residents, 10% to residents and nonresidents applying with a New Mexico registered outfitter, and 6% to nonresidents applying without a registered outfitter. Additionally, all draw licenses for antlerless elk, as well as all hunts on Wildlife Management Areas (WMAs) are issued only to New Mexico residents. Private land authorizations allocated or sold over the counter through the EPLUS system are not subject to the legislative quota.

ELK RULE DEVELOPMENT

The Department's "Elk Rule" outlines season dates and license numbers and opens every 4 years, allowing the Department to make management recommendations based on changes in elk populations and public input. When the elk rule is open for changes, the Department develops management recommendations based on biological metrics, hunter harvest data, and management objectives. Recommendations and harvest objectives are assessed for each herd unit separately and consider both ecological capacity and social desires. The Department solicits public input on these recommendations and adjusts harvest limits and season dates where necessary. The following is a breakdown of how hunting rules are set in New Mexico and ways in which the public can be involved.

1) The Department proposes initial recommendations to the public and Commission based on biological, survey, and harvest data.
2) These initial recommendations are presented at public meetings, typically in each region of the state.
3) The Department solicits and compiles formal written and emailed comments about proposals from all stakeholders.
4) Based on this input, the Department may modify the recommendations if the majority of stakeholders desire a particular change (or no change) if it <u>does not</u> negatively impact a population or management objective.
5) The Department makes final recommendations to the Commission who then votes to adopt the rule based on biological data and public input submitted during the open rule period.

The Elk Rule for the 2023-2026 hunting seasons was open for public comment and passed in October 2022. The next elk rule will open in 2026 and changes to the rule will be available for comment ahead of the 2027-2030 rule cycle. The Department appreciates feedback, and encourages those interested to remain engaged with the Department's rulemaking process and submit official comments when rules are open. For a list of proposals that the Commission may be currently considering, please visit this webpage:
http://www.wildlife.state.nm.us/commission/proposals-under-consideration/

Figure 1) New Mexico Elk Herd Units; defined as contiguous tracts of suitable elk habitat where distinct elk populations occupy the landscape. Population monitoring, estimates, and management considerations are conducted for each herd unit separately.

New Mexico Elk Herd Units
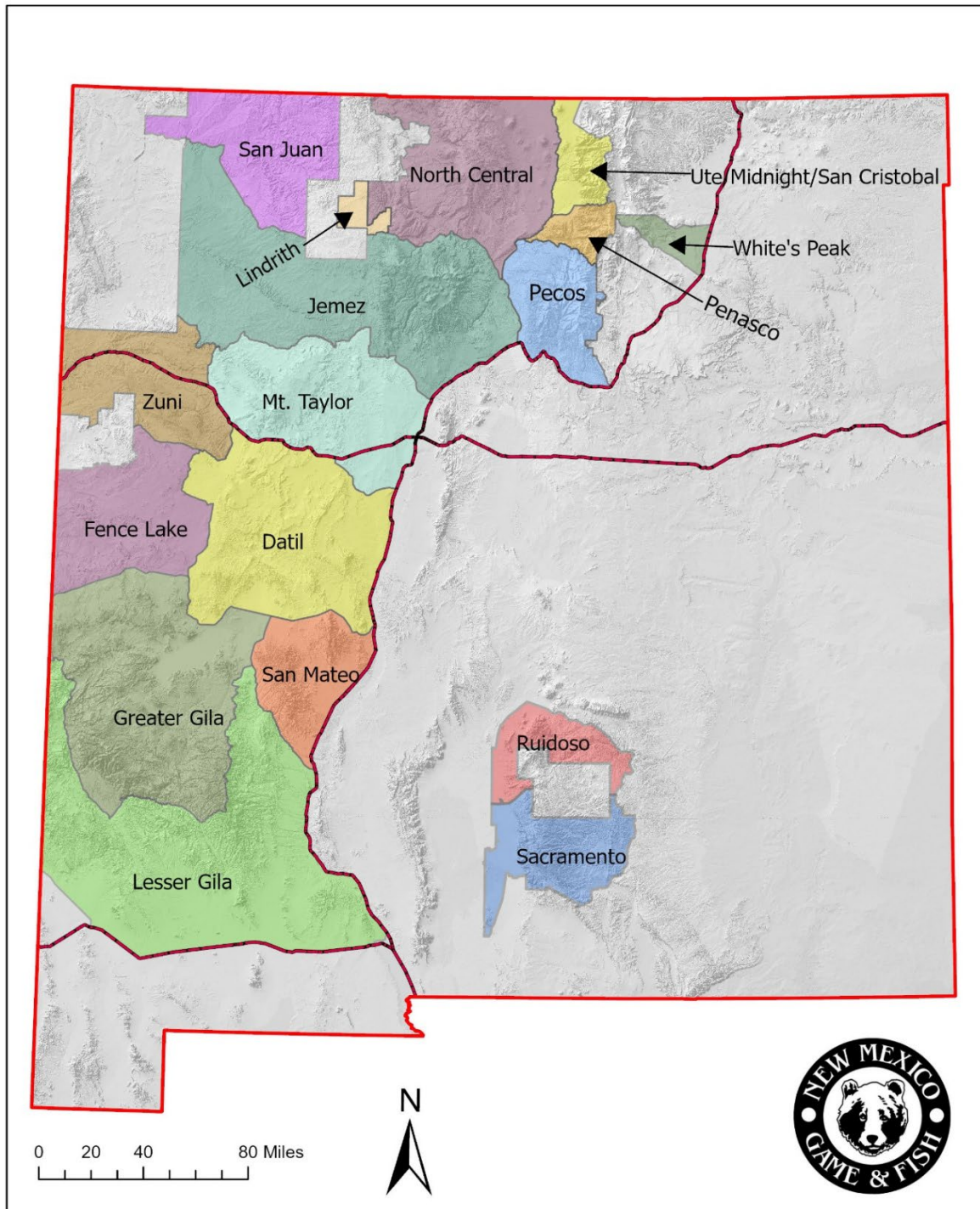
Figure 2) New Mexico Game Management Units (GMU) and Elk Management Zones.

New Mexico
Elk Management Zones
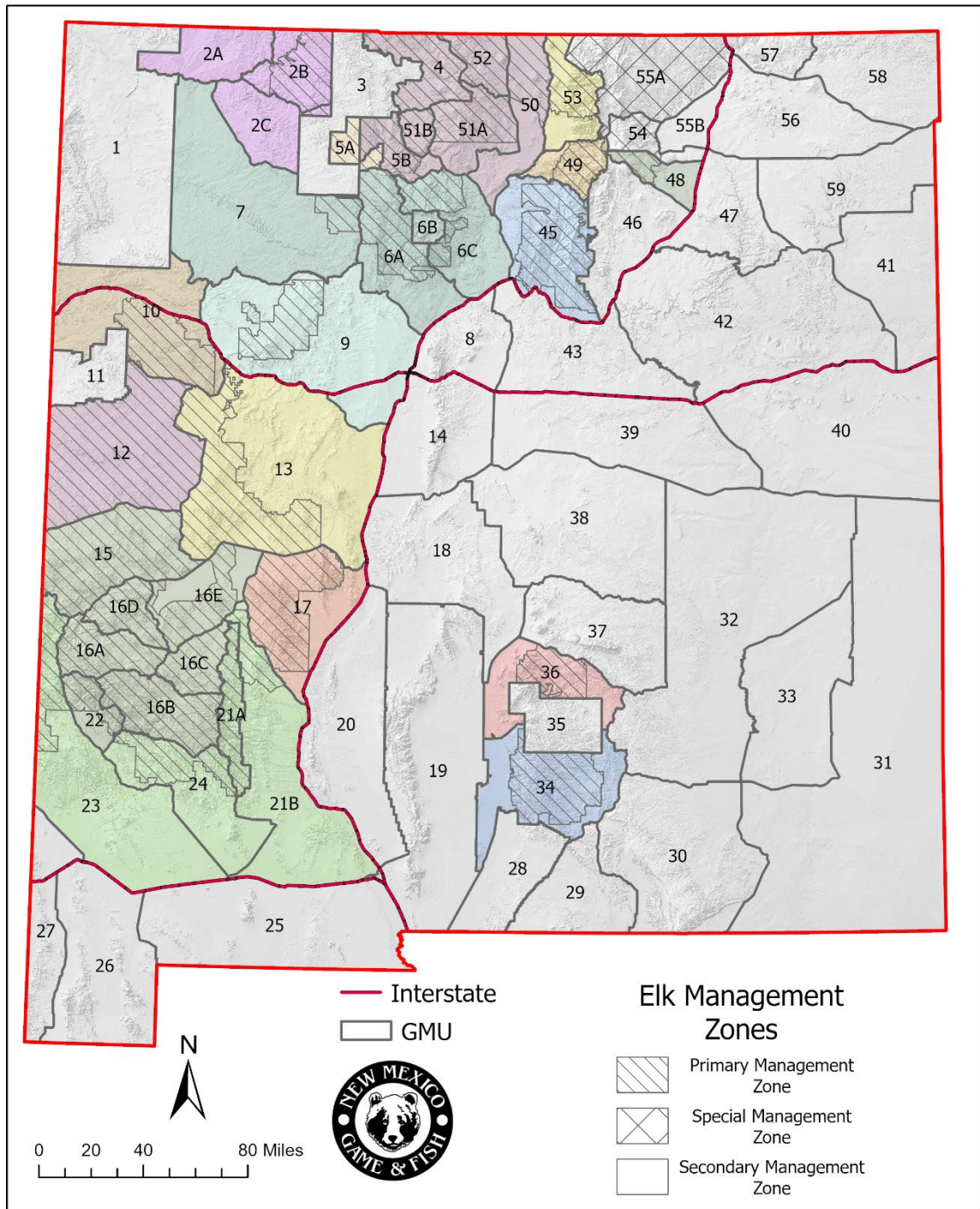
LAND OWNERSHIP

Approximately 11% of the land mass in New Mexico designated as tribal land. The Department does not manage wildlife nor issue hunting licenses valid for hunting on tribal lands. Hunters will need to contact tribal wildlife agencies for opportunities on tribal lands. Of the remaining area, approximately 50% is public land and 50% is privately owned. Public lands available for elk hunting in New Mexico include both state and federally owned and managed properties (Figure 1). Each jurisdiction has different rules for access and recreation.

Additional information about rules for each land ownership type and each GMU can be found on the Department's website.

Information regarding federally owned (public), state, and private properties in New Mexico can be access by following the links at the end of this document.

Figure 3) New Mexico Surface Ownership and Game Management Units

New Mexico Surface Ownership

- Interstate
- 16 C GMU
- Bureau of Land Management
- Bureau of Reclamation
- Dept. of Agriculture
- Department of Defense
- Department of Energy
- Forest Service
- Fish & Wildlife Service
- Tribal
- National Park Service
- Other Federal Agency
- Private
- State
- State Game & Fish
- State Park
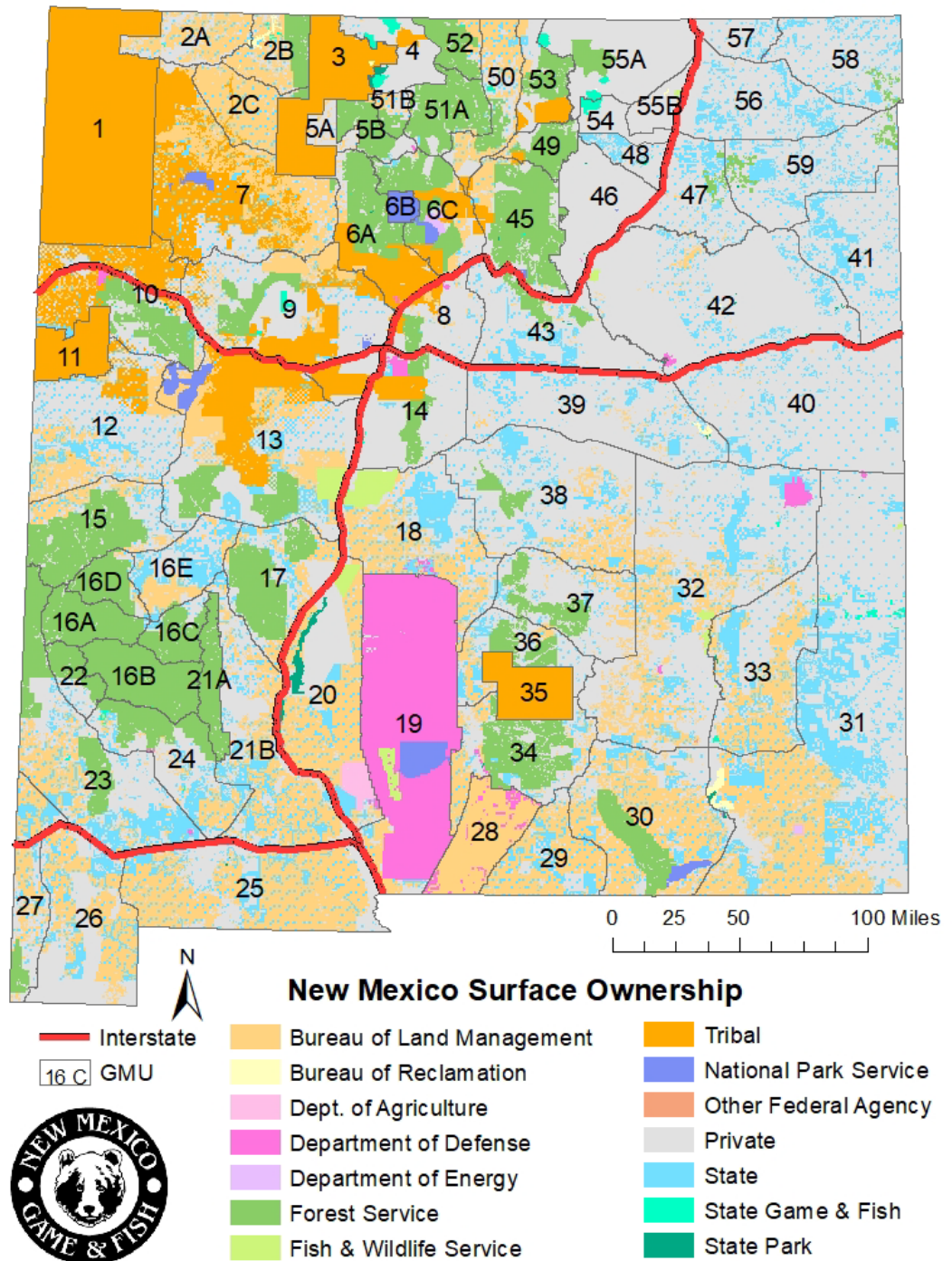
ELK BIOLOGY, SURVEYS, AND POPULATION TRENDS

Elk population sizes fluctuate over time in response to environmental, biological, and anthropogenic (human caused) influences. Population trends are largely driven by survival and mortality rates of adult females and calves. Adult males are certainly important for elk populations, but proportionally fewer males do not reduce the reproductive potential of the population because the same number of females can be bred by the remaining males. Weather, disease, predation, and human-induced mortality impact elk; however, availability of forage and concealment cover can lessen or intensify the effect of these individual factors. It is important for Department biologists to understand the biology and productivity of each elk herd to provide meaningful management recommendations. For this reason, the Department monitors elk herds using a combination of aerial helicopter surveys and hunter harvest reports.

Aerial helicopter surveys are completed annually after the end of archery season and before the first rifle or muzzleloader season begins (end of September through early October). The timing of these surveys is imperative, as they occur during the breeding period (rut) when all age and sex classes of elk are intermixed. Surveying during other times of the year yields biased information and leads to incorrect population estimates. During surveys, elk groups are briefly

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circled by the helicopter for crews to obtain a total count and breakdown of each age and sex class. This information is then used in population models to generate estimates of the total number of elk in each herd which ultimately leads to informed recommendations on how many elk can be harvested sustainably.

Within many Primary Management Zones the Department conducts aerial surveys annually. However, outside of Primary Management Zones, the Department does not regularly conduct aerial surveys and relies primarily on hunter harvest reports to monitor populations. Harvest data informs biologists of the mortality and survival rates for elk in these herds, otherwise estimated with classification surveys. For this reason, the Department can use hunter harvest data as an index to the status and trajectory of an elk population where aerial surveys are not feasible. Separate, harvest-based population models are used for areas where annual survey data is lacking, such as Secondary Management Zones. Both aerial surveys and hunter harvest reporting allow the Department to assess elk population status and productivity. It is critical that the Department obtain reliable aerial survey and hunter harvest data to develop sustainable harvest estimates and management recommendations best suited for each herd. Populations and sustainable harvest are calculated every 4 years using 5 years of demographic and harvest data. This schedule is designed to capture annual variability in population performance and align with the Elk Rule development cycle.

HUNTING PROSPECTS

Throughout much of the state elk populations are stable or slightly increasing in size. Whether hunters are looking for a backcountry experience on foot or by horseback, or prefer to hunt nearer to Forest Service roads and glass from their vehicles, New Mexico's landscape can accommodate every hunting style. Although some hunts are more difficult than others, hunters have an opportunity for success in any unit that offers licenses.

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In addition to accommodating a variety of hunting styles, the Department has designated some units as primitive weapon units. In these units, the Department offers only public muzzleloader and bow hunts. The primitive weapons units are GMUs 9, 13, 15 and 17. Other units provide rifle hunting opportunities in addition to muzzleloader and bow hunts. The Department also offers youth only, mobility impaired, and youth encouragement hunts throughout many of the state's Primary Management Zone hunt units. See the most current hunting rules and information booklet for more information on these and all of the different license types offered for elk hunting.

What to expect for the 2025-2026 season

Wildfires that burned in mosaic patterns with limited high severity, combined with abundant monsoonal rains in 2022 and 2023, have produced an abundance of grasses and forbs in disturbed areas. These benefits will likely persist for many years. Antler growth was considered good during the 2023 and 2024 annual surveys with observations of large mature bulls. Harvest success in many GMUs was slightly higher in 2024, partially due to increased herd sizes as elk congregated around limited water and forage resources. Winter snowpack for the 2024-25 season was low, potentially impacting spring forage production. However, late spring storms across the state have improved spring water availability and forage abundance. Elk antler growth has potential to be good for the 2025-26 season if monsoonal rains are present and persist through the summer. Hunters are advised to track precipitation patterns in hunt areas throughout the summer and fall. Rut behavior tends to be delayed in dryer years as bulls remain on high-elevation summer range longer to maximize intake of forage. Daytime temperatures during dry years also contribute to rut timing with high temperatures delaying initiation of breeding behaviors.

Hunt Description by Region

The following provides a brief description of elk hunting within each geographic region and each herd unit or GMU. Downloadable PDF files for each GMU can be found in the hyperlink below each GMU title. Each GMU hyperlink map contains the names of all appropriate USFS and BLM topographic quad maps to assist hunters in both planning and navigation of their hunts. Hunters may also access our interactive GMU map to see more detailed landowner and topographic information as well as download shapefiles.

Northwest Region – San Juan, Lindrith, Mt. Taylor and Zuni Herds
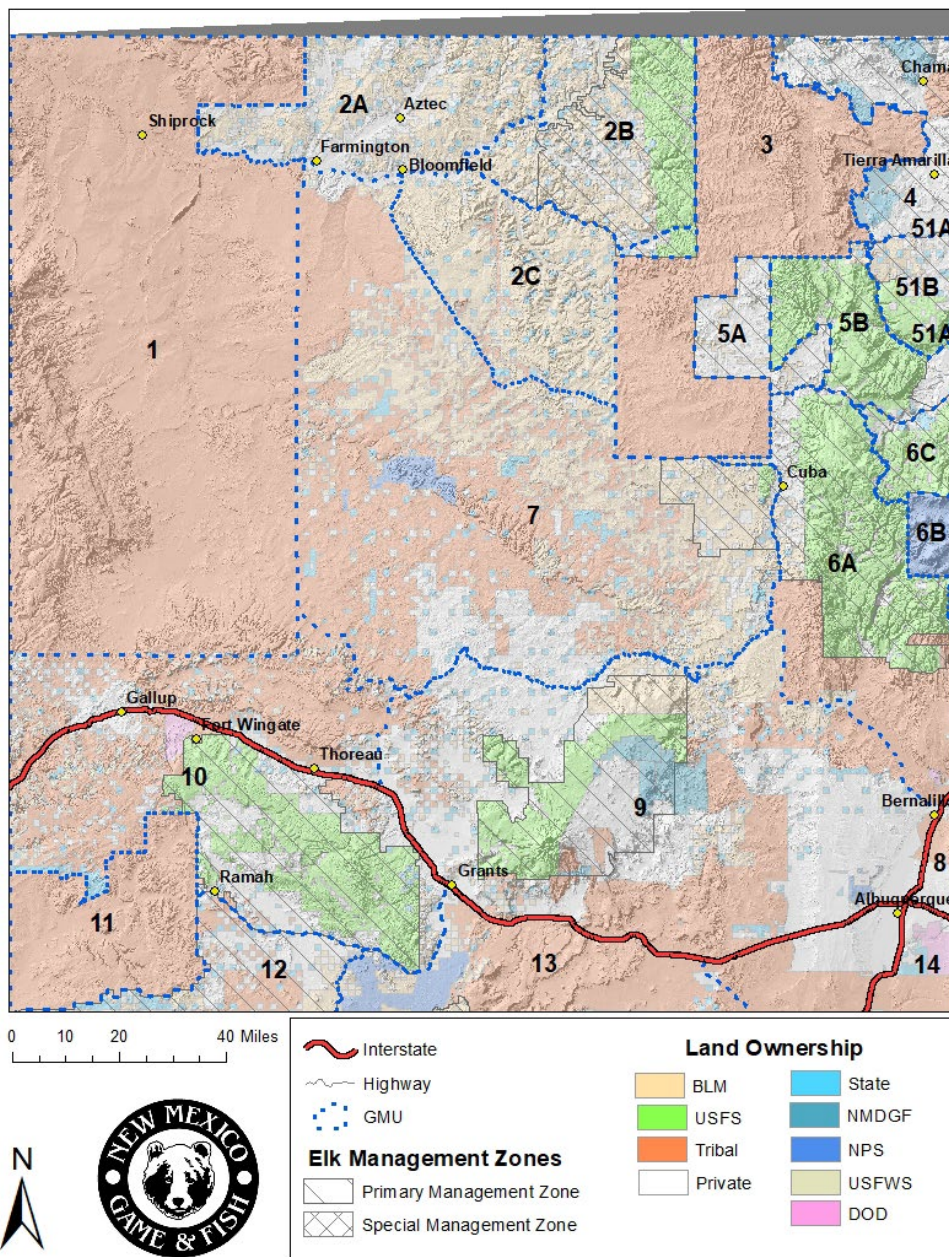
Elk populations in this region are managed under the opportunity framework. The majority of GMUs within this region have steady or slightly increasing herd sizes as well as moderate to high hunter satisfaction. The northwest offers opportunities for all hunters regardless of hunting style, weapon preference, or physical abilities. Rugged back-country hunts are available in some GMUs containing wilderness areas in addition to mobility impaired hunts in the Mt. Taylor (GMU 9) area. Some herds in the mountainous regions of the northwest are migratory due to snowpack at high elevation, having distinct summer and winter ranges. Although not all herds have been sampled, the Mt. Taylor herd has been documented to migrate. See more information in the Mt. Taylor herd unit section below (Fig 4).

San Juan Herd (GMU 2)

Opportunity Management

Unit Maps:
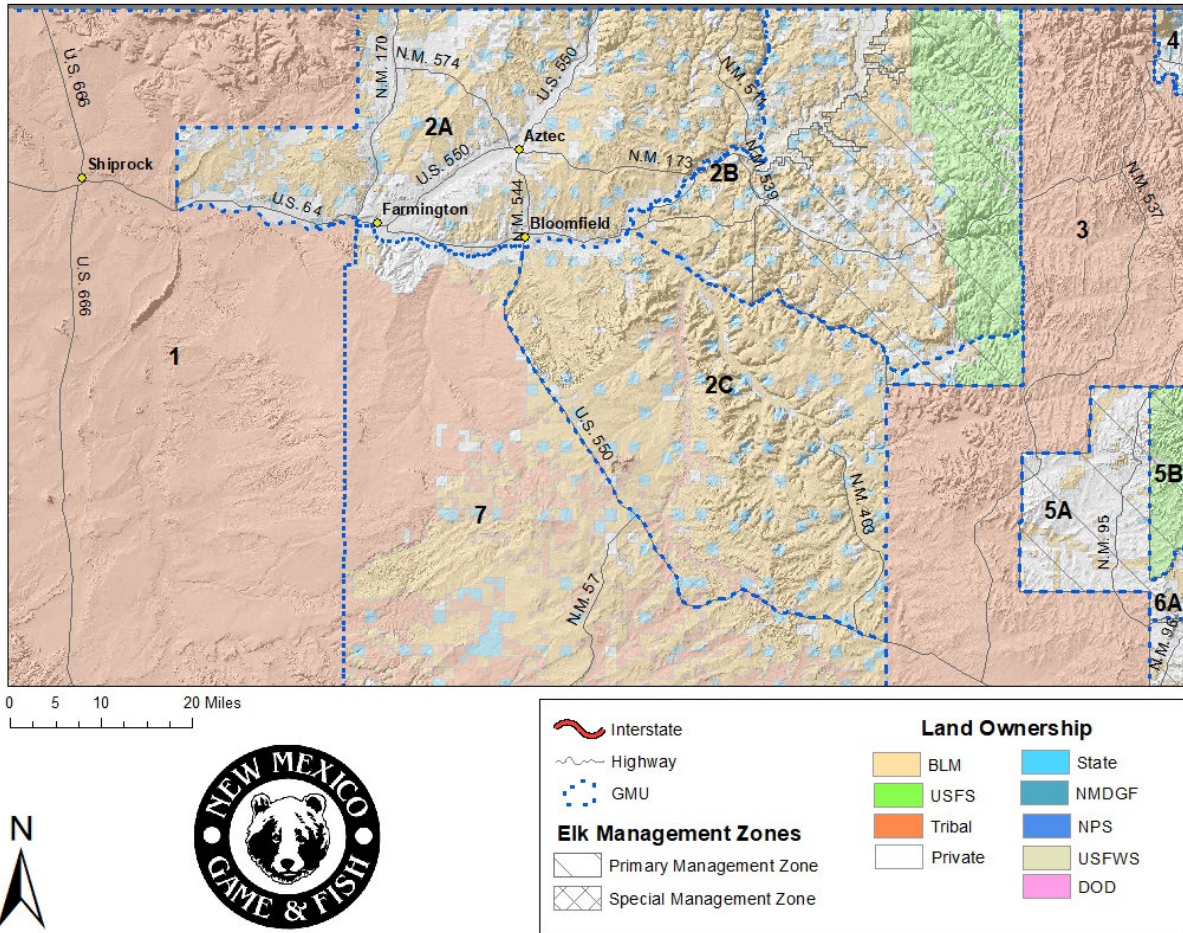
BIOLOGY – GMU 2 is considered a standalone elk herd unit, the San Juan herd. This elk herd is partially migratory with some movements occurring from the Jicarilla Apache Reservation to the east in the spring. It is also likely that some elk move into the area for the winter from the North. Because of the more dispersed nature of the San Juan Herd unit, aerial surveys are not successful and therefore not conducted regularly. Rather, the population is monitored using hunter harvest data. The San Juan herd has been stable to slightly increasing and elk can be found throughout these GMUs.

HUNTING – These units are 78% public land and a network of roads provides for very good access throughout the unit. Habitat is characterized by sagebrush flats, canyons, mesas and rimrock with the eastern side of the unit reaching approximately 7,500 feet and offering some opportunity to hunt in ponderosa pine habitat along the higher ridges. Hunter success and number of elk harvested have been slightly increasing through time.

Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
2,300 - 2,900	35:100:32	140 – 200 Males
Stable to Slightly Increasing		180 – 220 Females

GMU 2 Licenses

No. Licenses Sold/Converted

727, 710, 729, 726, 612, 727, 725, 740, 748, 817, 892, 898, 862, 979, 985

(Years 2010–2024)

GMU 2 Elk Harvest

Harvest

Bull Harvest: 109, 125, 141, 169, 121, 134, 165, 169, 204, 178, 205, 198, 198, 217, 187

Cow Harvest: 101, 124, 107, 137, 129, 111, 125, 136, 130, 155, 186, 165, 165, 192, 185

(Years 2010–2024)
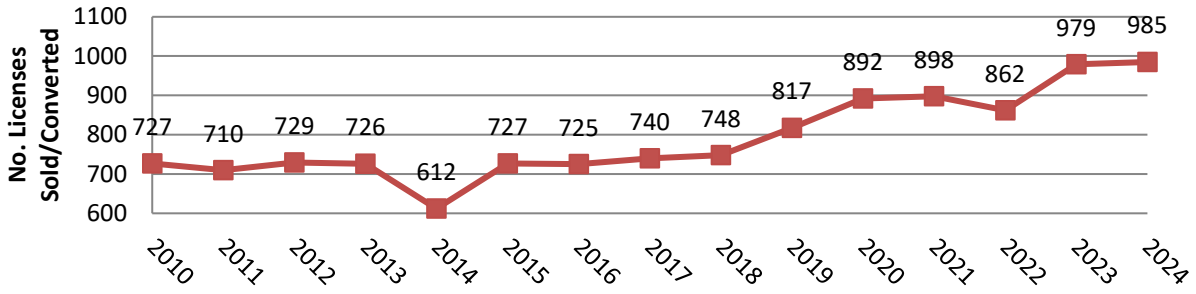
Legend:
- Cow Harvest
- Bull Harvest

GMU 2 Harvest Success

Success Rate

0.26, 0.28, 0.24, 0.34, 0.3, 0.37, 0.36, 0.44, 0.35, 0.34, 0.42, 0.43, 0.47, 0.41, 0.43, 0.48, 0.52, 0.49, 0.45

(Years 2006–2024)
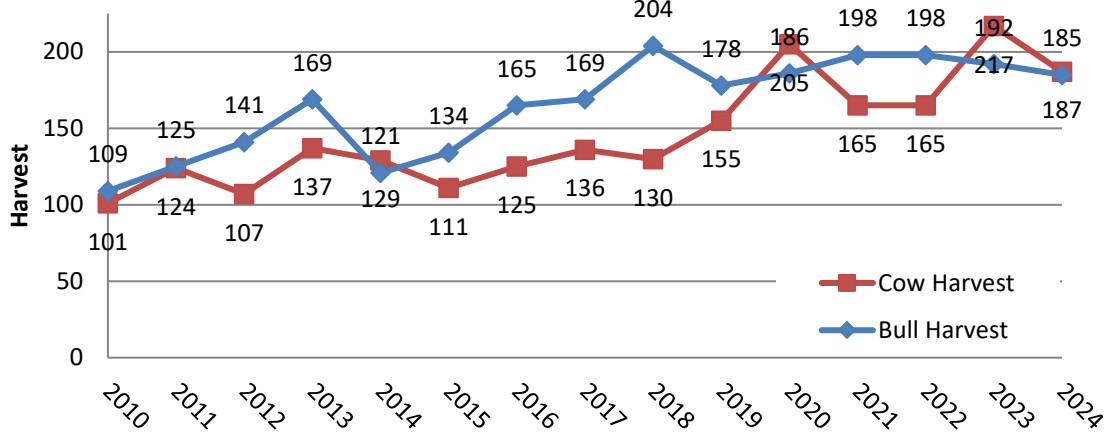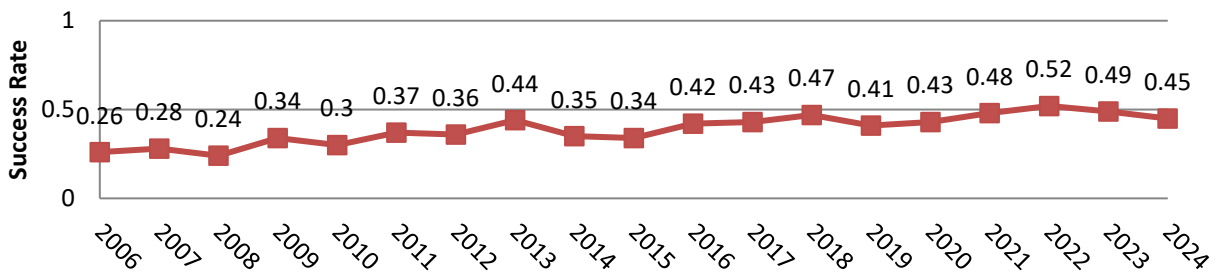
Lindrith Herd (GMU 5A)
Opportunity Management
Unit Map: 5A
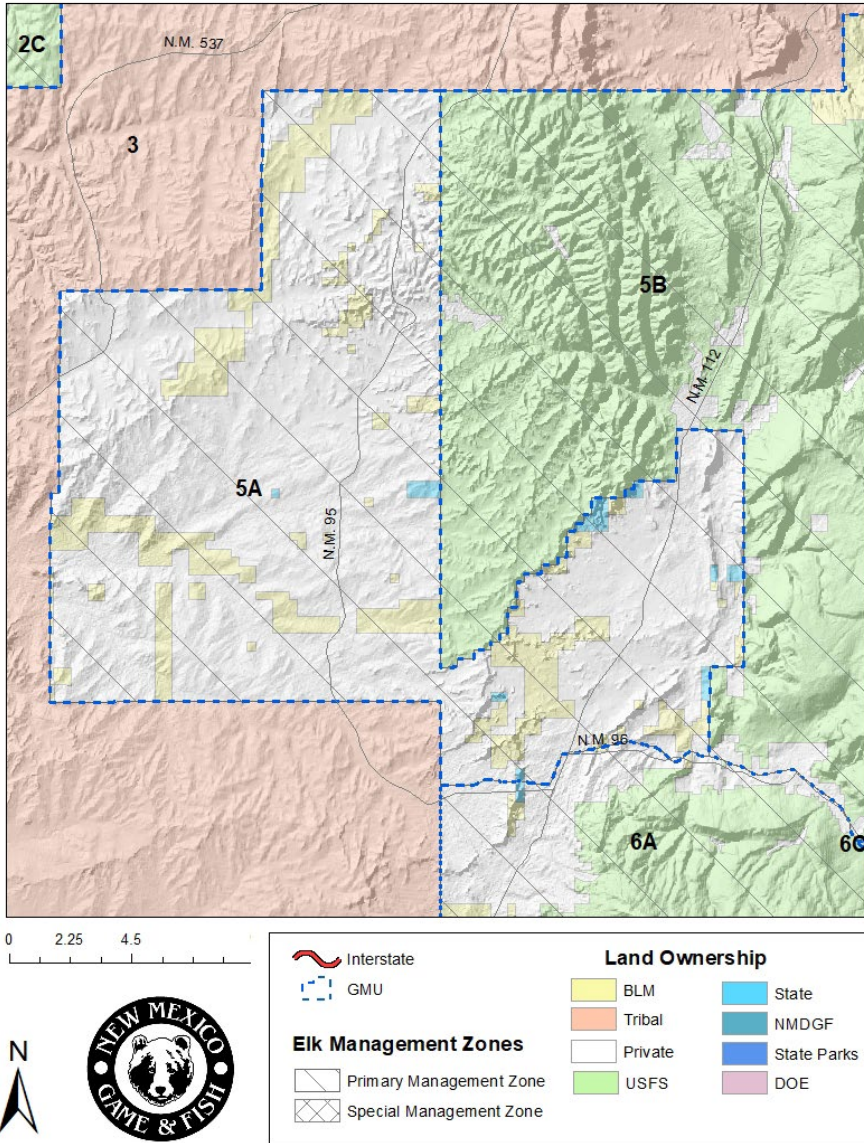
BIOLOGY – GMU 5A is considered a standalone elk herd unit, the Lindrith herd. Elk in the Lindrith herd are a mix of year-round residents and migratory individuals who move seasonally throughout the area. Aerial surveys are not conducted regularly, thus, herd productivity is monitored using hunter harvest data. The Lindrith herd is considered stable.

HUNTING – This unit is 16% public land and draw hunting opportunities are on BLM property. Hunters should be aware that not all public land is legally accessible and the Department recommends acquiring BLM maps prior to hunting to become familiar with access restrictions. Habitat is predominately sagebrush intermixed with pinyon-juniper forests. Hunter success and satisfaction ratings are both typically high for this herd.

Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
2,200 – 2,500	35:100:32	140 – 180 Males
Stable		170 – 200 Females

GMU 5A Licenses

No. Licenses Sold/Converted

516, 543, 560, 589, 550, 549, 532, 503, 533, 577, 577, 587, 584, 564, 541

(2010–2024)

GMU 5A Elk Harvest

Harvest

Cow Harvest: 103, 146, 142, 175, 142, 196, 152, 160, 155, 165, 192, 173, 168, 157, 155

Bull Harvest: 125, 171, 163, 186, 164, 111, 177, 160, 168, 187, 160, 176, 188, 161, 168

(2010–2024)

GMU 5A Harvest Success

Success Rate

0.45, 0.6, 0.52, 0.63, 0.58, 0.58, 0.62, 0.64, 0.6, 0.63, 0.61, 0.62, 0.62, 0.33, 0.31

(2010–2024)
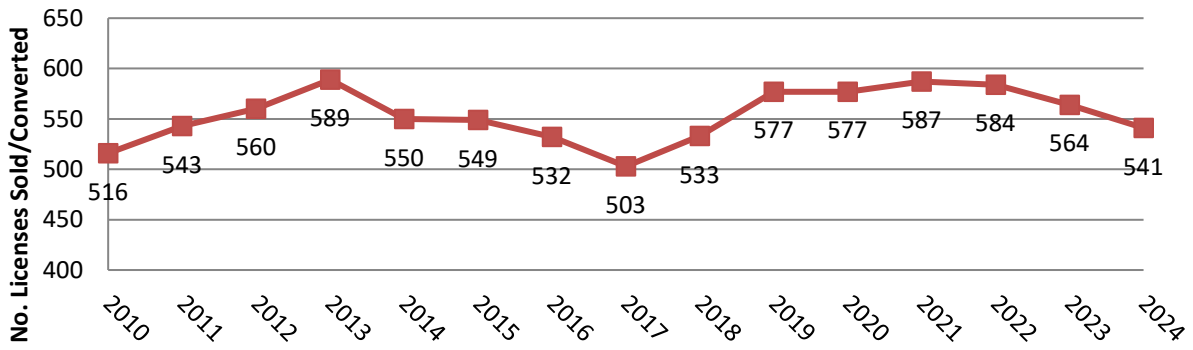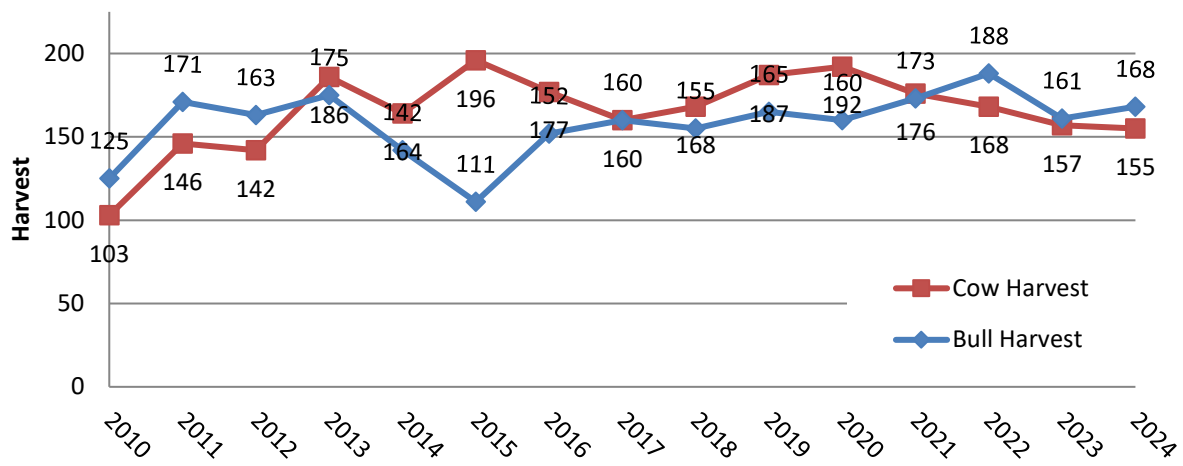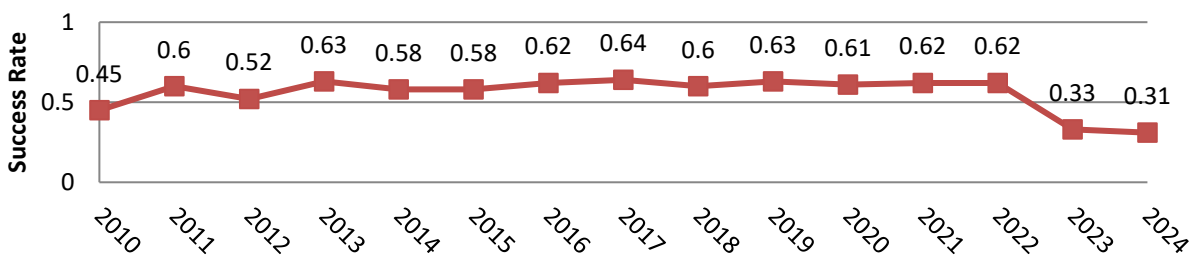
Mt. Taylor Herd (GMU 9)
Opportunity Management
Unit Map: 9
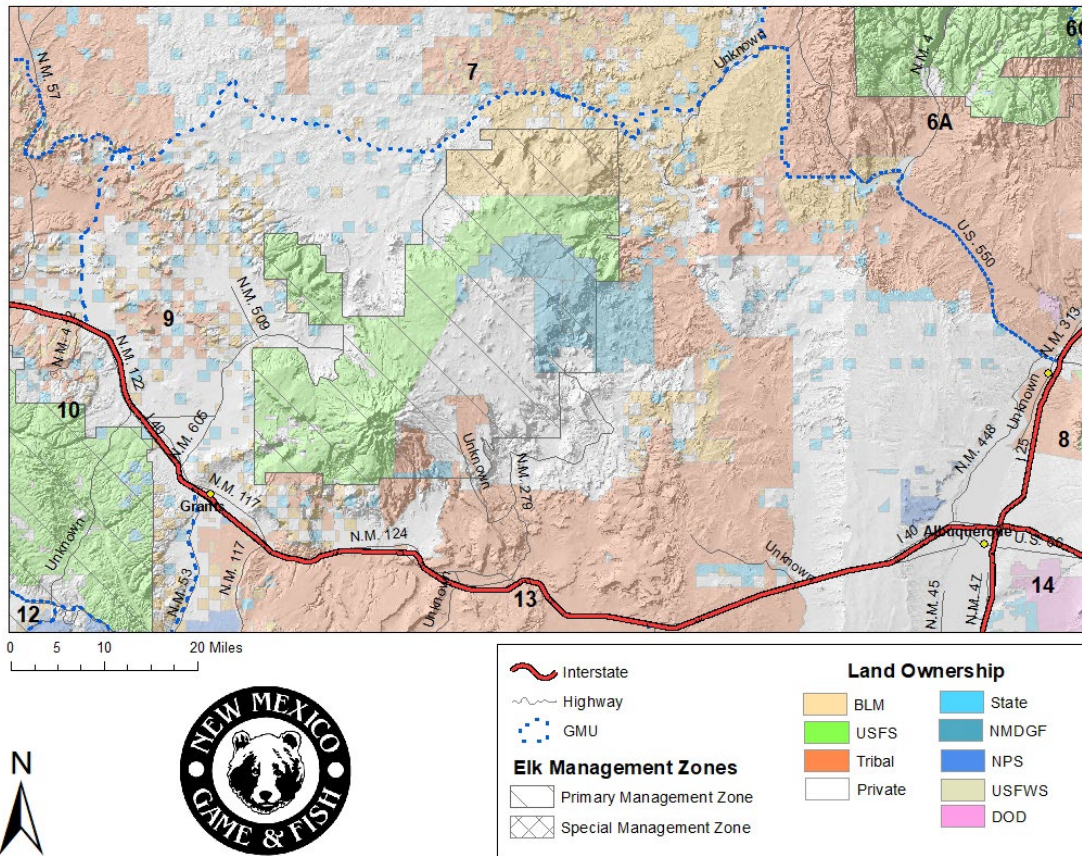
BIOLOGY – GMU 9 is considered a standalone elk herd unit, the Mt. Taylor herd. The Mt. Taylor herd has declined from historic numbers because of sustained low calf survival beginning in 2009. Low calf recruitment has resulted in the Department taking efforts to increase productivity for the Mt. Taylor herd including several habitat improvement projects on critical calving and summer seasonal ranges. Although these management actions have improved calf recruitment since 2018 the herd still remains below objective. The removal of antlerless licenses and limiting hunts to primitive weapon types are intended to buffer this herd from negative harvest effects while populations rebound. The Mt. Taylor herd is monitored annually via aerial surveys.

RESEARCH (MIGRATION) – This herd is known to migrate to lower elevations adjacent to Mt. Taylor in the winter. The Department affixed GPS collars to elk beginning in 2016 as part of a larger project examining reasons for sustained low calf survival. This migratory pathway does not encompass the entirety of the Mt. Taylor herd though, and other elk are likely to migrate along different pathways. This segment of the herd migrates from the northeastern foothills to the northern plateau of Mt. Taylor. While the average migration route was 8.2 miles, most of this travel occurred once individuals were on the northern plateau. The distance from winter to summer range was relatively short with individuals climbing approximately 1,500 to 2,000 feet in just more than 2 miles north of the Santa Rosa Peaks. Most elk spent only a short period, less than 30 days, on the winter range, but a few remained for an extended period of up to 201 days.

The winter range land cover was primarily mixed salt desert scrub and semidesert grassland, while the summer range was dominated by oak (*Quercus* spp.), pinyon-juniper woodland, and ponderosa pine forests with interspersed grassland openings. The Mt. Taylor elk herd likely does not have major landscape challenges interfering with their ability to migrate, because they move across public lands and several large private ranches. For more information on this project, including migration stop and end dates, sample size, and summaries on the corridors see Volume 2 of the Ungulate Migrations of the Western US.

Figure 4. Mt Taylor elk herd unit movement corridors and seasonal ranges. From USGS Ungulate Migrations of the Western United States, Vol. 2 (pg 138).
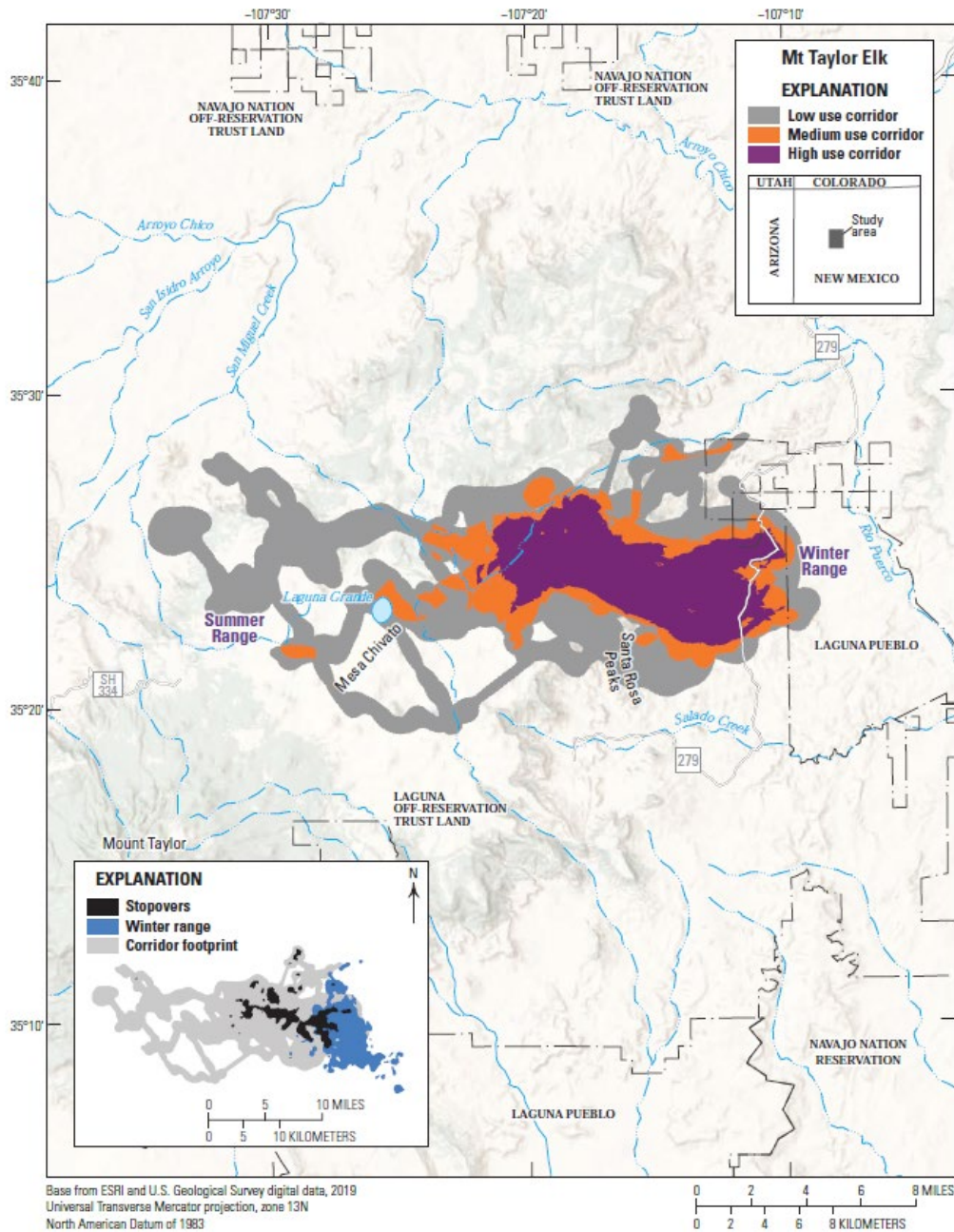
RESEARCH (LOW RECRUITMENT) – Observed herd sized and indices of population performance (i.e. calf:cow ratios) for the Mt. Taylor elk herd suggested a decrease in calf survival and recruitment beginning in 2009. As a result of declining population, the Department began reducing licenses for antlerless elk in 2013 (by 38%), 2016 (additional 20%), and were ultimately eliminated in 2018. Mature bull licenses were also reduced 25% in 2018 to help buffer the population from additional mortality. The NMDGF investigated several potential factors which could have contributed to the declining population beginning in 2014. Harvested elk were tested for infectious diseases, including Bovine Virus Diarrhea, and Bovine Trichomoniasis; however, tests results were negative. Beginning in 2015 the Department deployed VHF tracking devices on newborn calves to determine survival rates and cause of death. Investigations of calf mortality continued through 2019 and determined high levels of calf mortality due to predation and obstacles impeding movement on the landscape (i.e. net-wire livestock fencing in calving habitat). Between 2016 – 2019, a total of 40 adult cow elk were fitted with GPS collars to determine habitat use and track seasonal movements. Body condition and pregnancy status of capture cow elk were measured at this time, informing biologists that pregnancy rates were normal (~90%) and body conditions were sufficient to produce healthy calves (10.4% ingesta-free body fat) indicating that reproduction was not a leading contributor to low calf numbers. Collaring efforts of both calves and adult cows within this herd have highlighted both obstacles to calf survival and important habitats for elk during the calving period (Fig. 5). With this information, the Department has taken steps to improve important calving habitats and summer range including livestock fence removal/modification, forest thinning, predation management, and wildlife water installations.

Figure 5. Mt. Taylor elk calving habitat. Isolated GPS collar data from adult cow elk from 2016-2019 during calving season (May 15 – June 15). Heatmap indicates high (red), moderate, (yellow), and low (green) use areas.
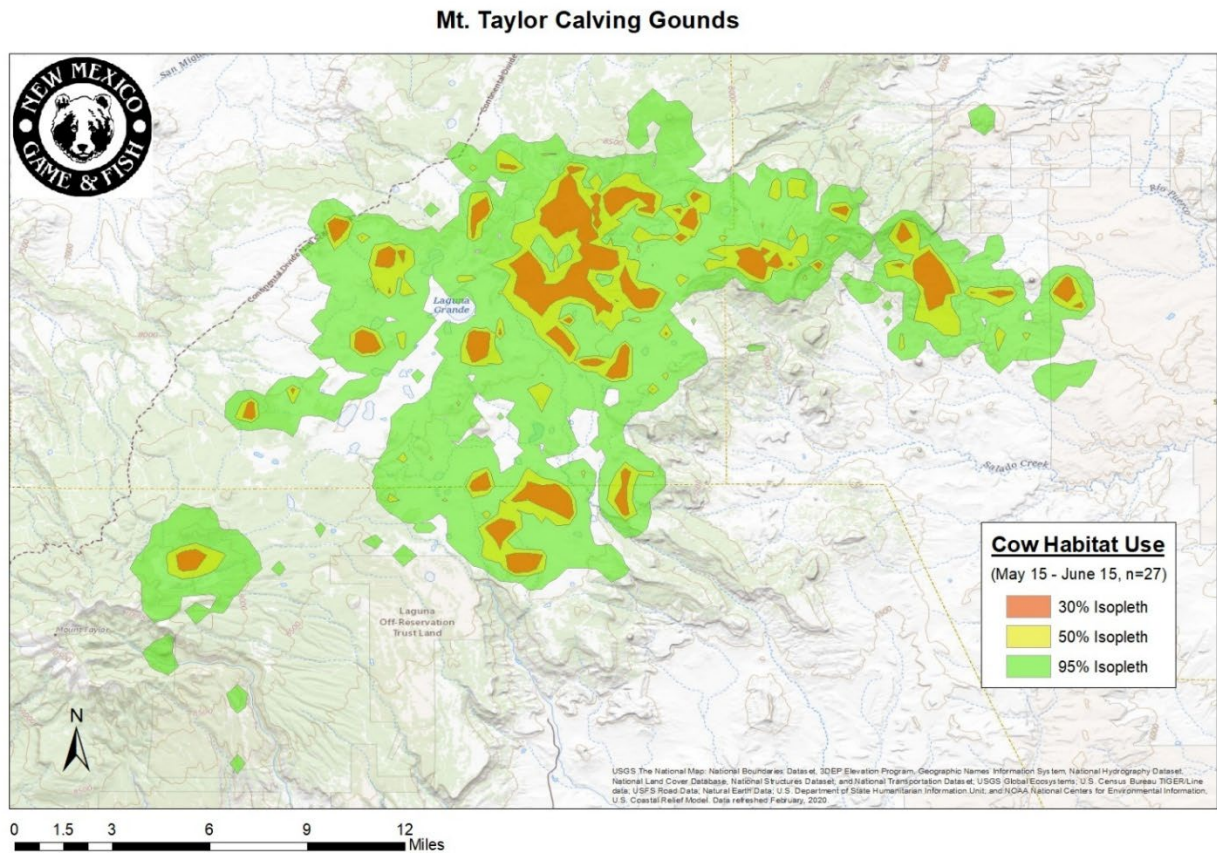
HUNTING – This unit is 27% public land, and a network of Forest Service roads provide several access points for hunters. Arid shrub and grasslands with interspersed pinyon-juniper forests are found in lower elevations and scrub oak and ponderosa pine forests are found at higher elevations. In recent years, success rates have been lower than the statewide average and total license numbers and harvest has also declined since 2011. Sustainable harvest levels should rise as herds rebound, allowing for increased licenses once populations have become more stable.

Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
1,000 – 2,100	26:100:28	40 – 100 Males
Stabilizing		0 Females

GMU 9 Licenses

No. Licenses Sold/Converted

Year	Value
2010	1810
2011	1761
2012	1577
2013	1551
2014	1262
2015	1166
2016	1024
2017	890
2018	856
2019	590
2020	594
2021	600
2022	574
2023	516
2024	518

GMU 9 Elk Harvest

Cow Harvest
Bull Harvest

Harvest

Year	Cow	Bull
2010	329	372
2011	278	271
2012	191	211
2013	189	155
2014	117	157
2015	78	213
2016	71	183
2017	40	163
2018	41	136
2019	13	123
2020	12	134
2021	10	141
2022	4	119
2023	12	136
2024	13	153

GMU 9 Harvest Success

Success Rate

Year	Value
2010	0.39
2011	0.31
2012	0.25
2013	0.23
2014	0.22
2015	0.24
2016	0.24
2017	0.23
2018	0.22
2019	0.22
2020	0.23
2021	0.25
2022	0.22
2023	0.26
2024	0.31

Zuni Herd (GMU 10)

Opportunity Management

Unit Map: 10
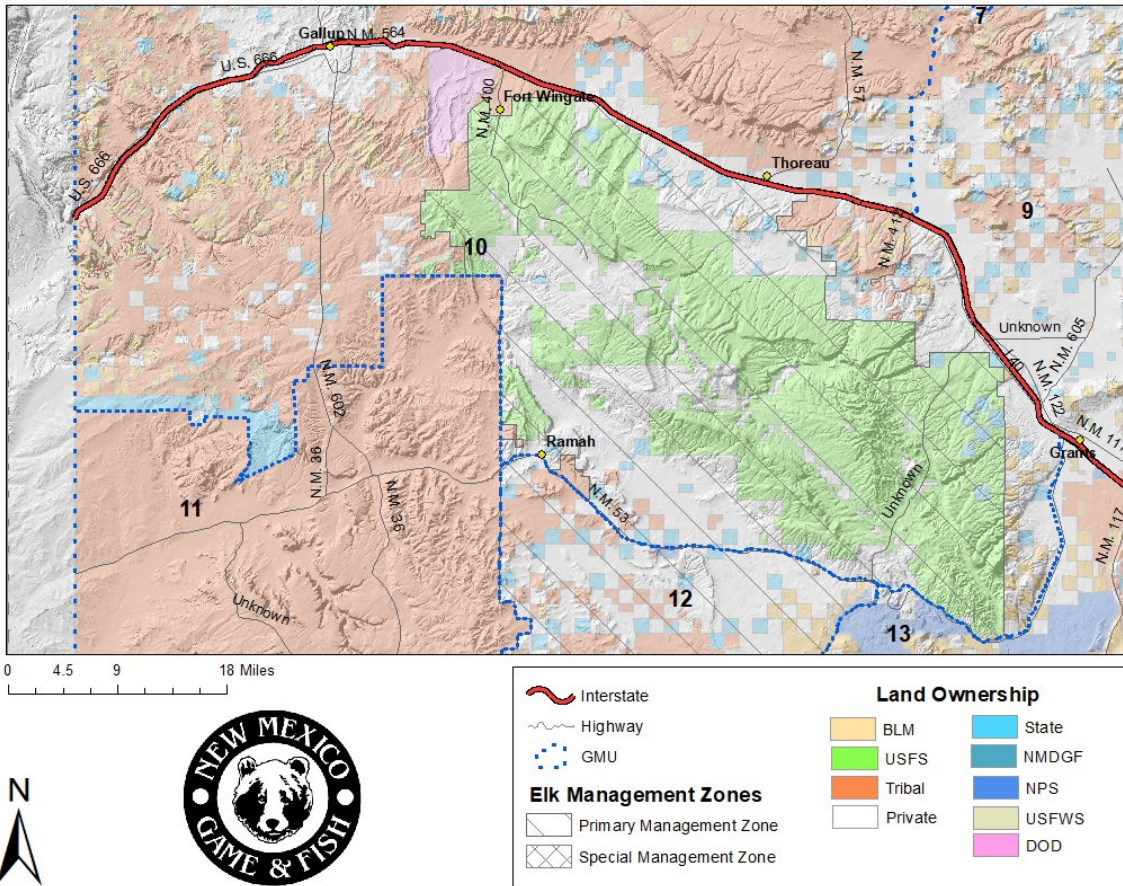
BIOLOGY – GMU 10 is considered a standalone elk herd unit, the Zuni herd. Elk are moderately mobile in this unit with varying movement patterns in search of scattered resources. Precipitation patterns often influence elk landscape use and quality of forage, as well as sources of water for wildlife in this semi-arid landscape. Elk in this herd unit are not surveyed regularly; thus, the herd is monitored using a combination of survey and hunter harvest data.

HUNTING – This unit is 34% public land, and a network of Forest Service roads provide several access points for hunters. Much of the western half of the unit is tribal land and is inaccessible to public hunters. Low elevation basins in this unit are dominated by arid shrub and grasslands with some pinyon-juniper forests found interspersed throughout. Ponderosa forests provide thermal relief to elk at higher elevations in the Zuni mountains during summer months. Elk within this hunt unit tend to inhabit the landscape in clusters where resources are readily available.

Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
1,500 – 1,800	35:100:32	110 – 150 Males
Stable		140 – 160 Females

GMU 10 Licenses

Data by year:
- 2010: 906
- 2011: 915
- 2012: 893
- 2013: 897
- 2014: 906
- 2015: 933
- 2016: 952
- 2017: 924
- 2018: 923
- 2019: 937
- 2020: 940
- 2021: 966
- 2022: 942
- 2023: 942
- 2024: 957

Y-axis: No. Licenses Sold/Converted

GMU 10 Elk Harvest

Cow Harvest (red squares):
- 2010: 55
- 2011: 86
- 2012: 100
- 2013: 88
- 2014: 99
- 2015: 100
- 2016: 104
- 2017: 86
- 2018: 96
- 2019: 93
- 2020: 76
- 2021: 76
- 2022: 74
- 2023: 91
- 2024: 80

Bull Harvest (blue diamonds):
- 2010: 122
- 2011: 95
- 2012: 118
- 2013: 129
- 2014: 107
- 2015: 102
- 2016: 113
- 2017: 148
- 2018: 104
- 2019: 114
- 2020: 105
- 2021: 114
- 2022: 101
- 2023: 121
- 2024: 140

Y-axis: Harvest

GMU 10 Harvest Success

Success Rate by year:
- 2010: 0.2
- 2011: 0.2
- 2012: 0.25
- 2013: 0.25
- 2014: 0.24
- 2015: 0.22
- 2016: 0.24
- 2017: 0.25
- 2018: 0.22
- 2019: 0.24
- 2020: 0.2
- 2021: 0.21
- 2022: 0.19
- 2023: 0.26
- 2024: 0.26

Y-axis: Success Rate
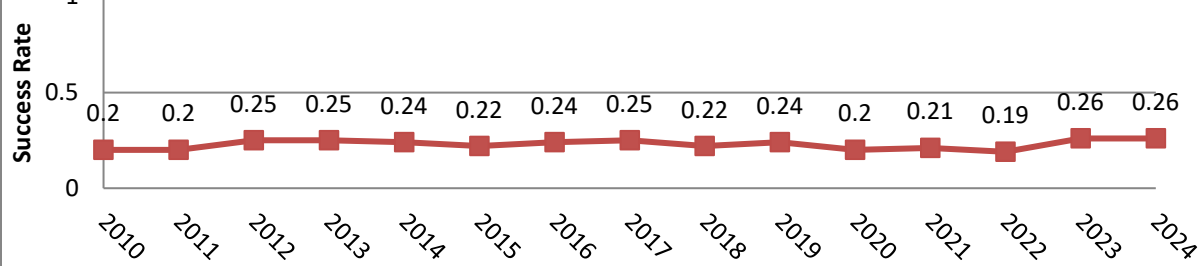
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Northcentral Region – Northcentral Herd (GMUs: 4, 5B, 50, 51, and 52)
Opportunity Management

The Northcentral herd is managed under the optimal opportunity framework, and is mostly within the Primary Management Zone.

The herd is stable. The Northcentral region offers a diverse landscape with quality elk habitat ranging from low elevation grasslands/sagebrush steppe to aspen and mixed conifer in the Carson and Sante Fe National Forests. Portions of this herd are migratory or partially migratory, with many elk moving from high elevation summer range in the San Juan Mountains of southern Colorado and Northern New Mexico to lower elevation winter range near Chama NM, San Antonio Mountain, Taos plateau, and adjacent Wildlife Management Areas (Fig. 6-7). The herd is monitored annually via aerial surveys.
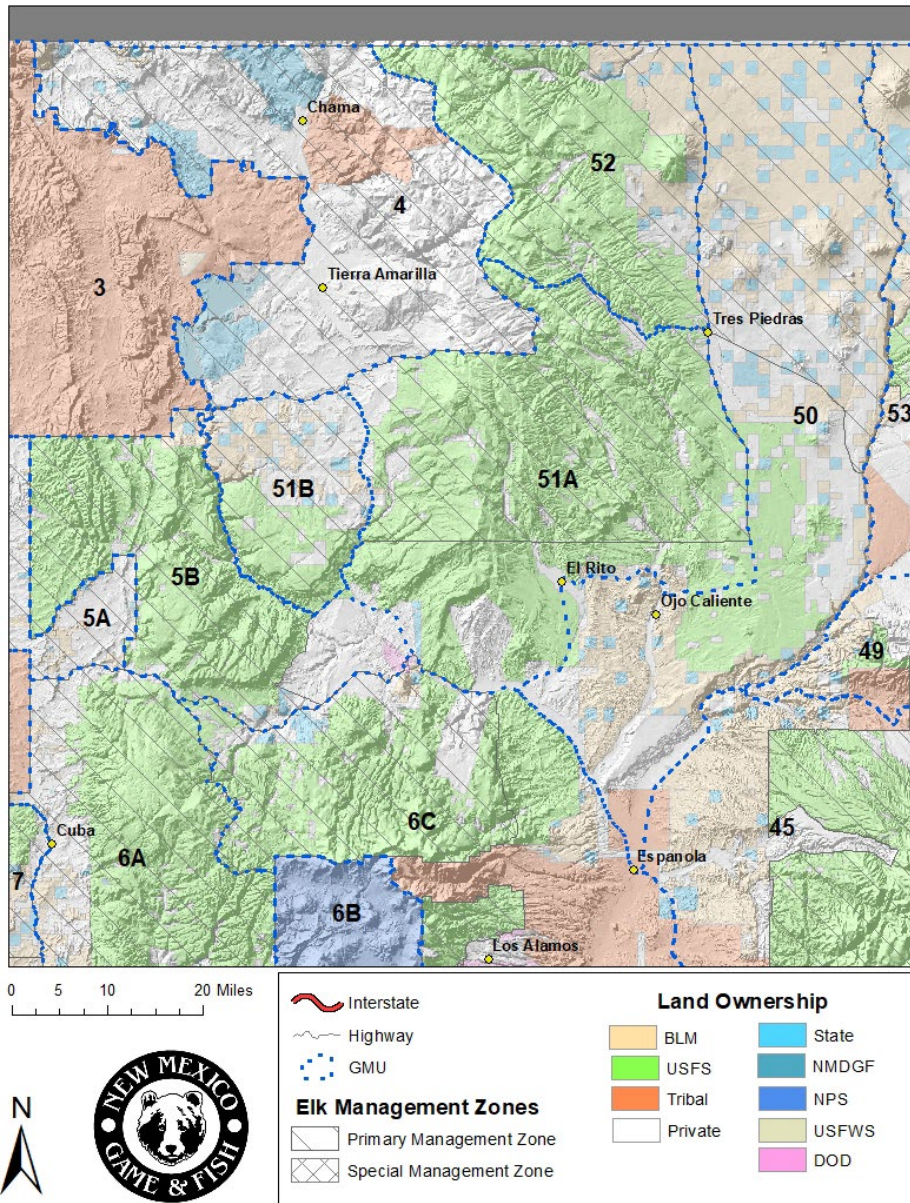
Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
25,300 – 29,000*	38:100:35	1,690 – 2,200 Males
Stable		2,070 – 2,370 Females

*Note: The Northcentral elk herd estimates and metrics are reported at the population level (across GMUs 4, 5B, 50, 51, and 52).

RESEARCH (MIGRATION)– As part of an effort to map seasonal movements for big game in New Mexico, elk in the Northcentral herd were sampled beginning in 2020. Two segments of the herd received GPS collars, one near San Antonio Mountain and another near the Rio Chama WMA.

The San Antonio segment of the Northcentral elk herd migrates from the Rio Grande del Norte National Monument to the southern San Juan Mountains of north-central New Mexico and south-central Colorado (7,000–11,500 ft [2,134–3,505 m] elevation). Managed by the BLM, the Rio Grande del Norte National Monument contains the Taos Plateau and a portion of the Rio Grande. Data collected from the herd in 2020–2021 by GPS collars indicate that elk winter near San Antonio Mountain or east of U.S. Highway 285 on the Taos Plateau, with some elk wintering as far east as the Rio Grande. Other elk herds also winter on the Taos Plateau, including herds from the eastern side of the Rio Grande Gorge that are not featured in this report. Critical winter range consists primarily of sagebrush steppe, with pinyon-juniper dominating the volcanic cones of Cerro de la Olla, Cerro del Aire, Cerro Montoso, and Cerro Chiflo scattered across the monument land. The area north of the volcanic cones is rich in *Ceratoides lanata* (winterfat), providing nutrition high in protein during the harsh winters. Key terrestrial habitats across the herd's ranges include intermountain basins, big sagebrush shrubland, Rocky Mountain alpine montane wet meadow, and Rocky Mountain montane mixed-conifer forest and woodland. Migrations typically begin in early spring, with elk taking extended stopovers in the eastern foothills and slopes of the San Juan Mountains, primarily along the Rio San Antonio. By late spring, many of the elk continue their migration towards the western slopes of the San Juan Mountains or north into Colorado. Some elk travel to lower elevation foothills along the western slopes of the San Juan Mountains before retracing some of their movements to settle on their high-elevation summer range. Summer range habitats are typically mid- to high-elevation mixed conifer and aspen forests with interspersed montane meadows. The crossing of U.S. Highway 285 may create an obstacle to elk migrations. For more information on this project see Volume 3 of the Ungulate Migrations of the Western US report

Figure 6. Seasonal ranges and movement corridors of the San Antonio elk herd. From USGS Ungulate Migrations of the Western United States, Vol 3 (pg 98)
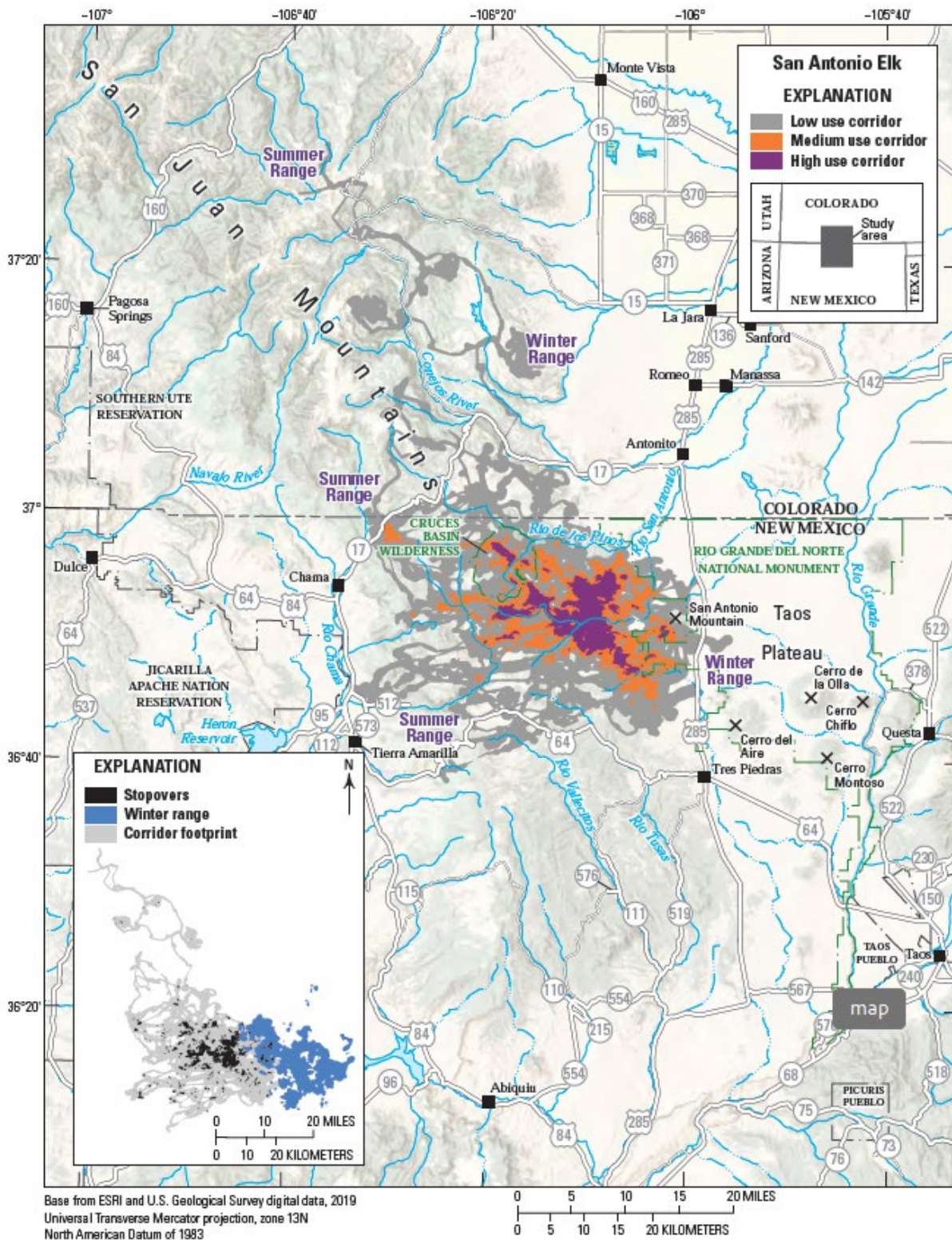
The Rio Chama segment of the Northcentral elk herd inhabits north-central New Mexico, near Tierra Amarilla. This herd's winter range is predominately west of U.S. Highway 84 between the Heron and Abiquiu Reservoirs. The Rio Chama elk herd migrates through a mosaic of private, public, and Jicarilla Apache Nation, New Mexico lands, using three primary migration corridors: the northern and eastern corridors near Heron Reservoir and the northeastern corridor near Abiquiu Reservoir. Elk using the northern corridor near Heron Reservoir follow a variety of routes; some elk only migrate approximately 6 mi (9.7 km) to summer along the Rio Chama and other elk migrate more than 30 mi (48.3 km) to southern Colorado. The eastern migration corridors are approximately 10 mi (16.1 km) and cross U.S. Highways 84 and 64 south of Tierra Amarilla before settling in the western San Juan Mountains. Elk near the Abiquiu Reservoir commonly migrate northeast and cross State Route 84 into the San Juan Mountains to their summer range southeast of Canjilon, New Mexico. The herd faces several challenges, such as crossing State Route 112 and U.S. Highways 84 and 64, increasing density of housing subdivisions in some areas along their migration, and fencing, especially taller fencing that elk cannot jump. For more information see Volume 4 of the Ungulate Migrations of the Western US report.

Figure 7. Seasonal ranges and movement corridors of the Rio Chama elk herd. From USGS Ungulate Migrations of the Western United States, Vol 4 (pg 64).
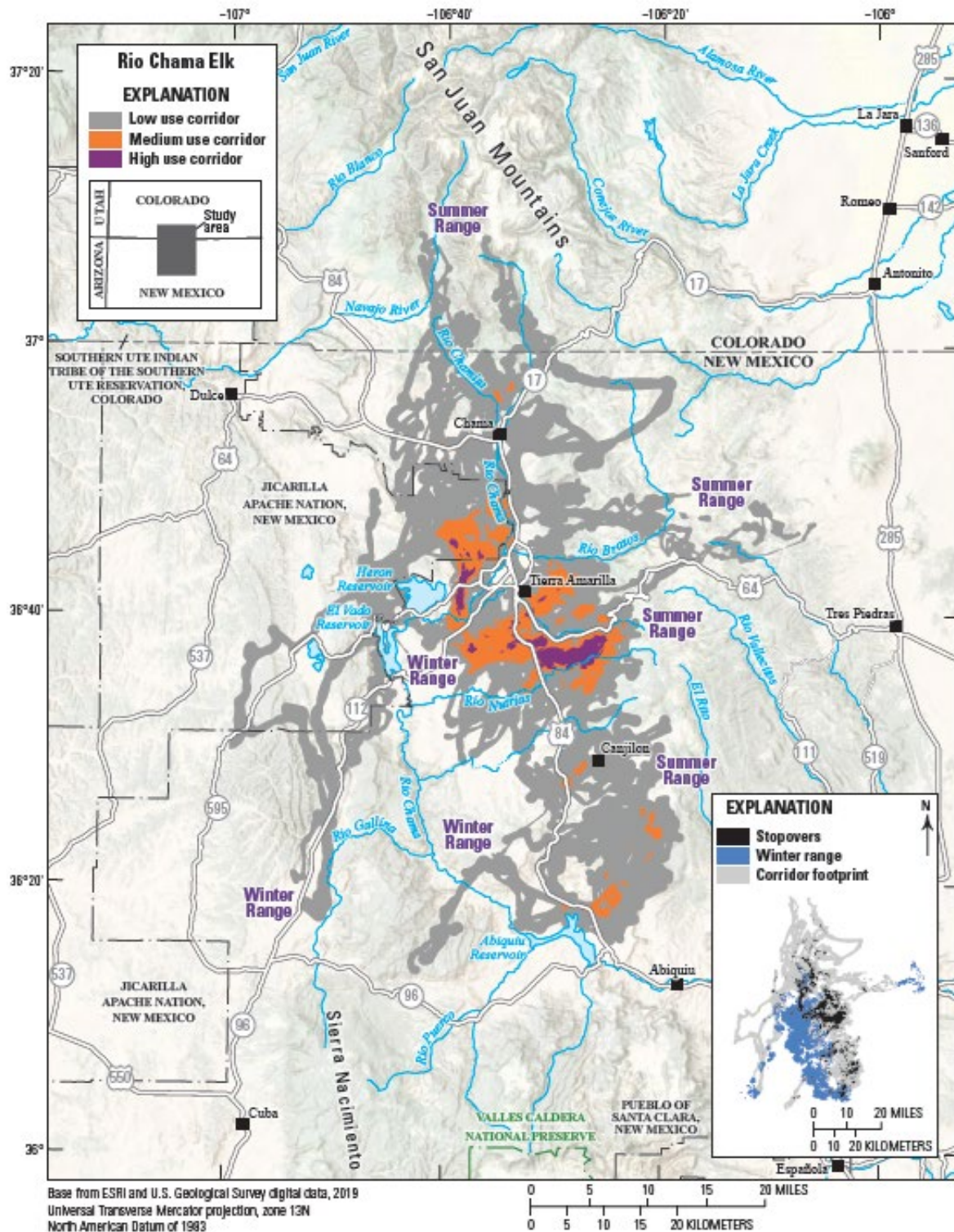
GMU 4 (part of the Northcentral Herd; opportunity management)

Unit Map: 4

BIOLOGY – Elk in GMU 4 are part of the Northcentral herd and population estimates include several GMUs (see regional description). Animals can be found throughout the unit due to its varied topography, persistent water availability, and the accessibility of undeveloped habitat within WMA's. Productive and varied habitats here provide stable resources to support a productive herd. Some seasonal movements occur between this unit and the Jicarilla Apache Reservation to the west as well as movement between seasonal ranges east within Carson National Forest and north into Colorado (see figures above for more information).

HUNTING – This unit consists of 13% public land and all public hunts are restricted to one of 3 Wildlife Management Areas: the Edward Sargent WMA, Humphries WMA, and Rio Chama WMA. All WMA hunts are restricted to New Mexico residents only. Access in WMAs is limited to either foot traffic or travel by horseback. These WMAs offer great elk hunting in scrub oak and mixed conifer habitats. There is ample opportunity for harvesting either bulls or cows. Success and satisfaction ratings for elk hunters in GMU 4 are among the highest in the state. Most licenses sold in this unit are through private land hunts. Non-residents or hunters wishing to hunt private lands in GMU 4 can purchase authorizations issued to landowners through the E-PLUS program (E-PLUS webpage).

GMU 4 Licenses

Data points (No. Licenses Sold/Converted): 2010: 1945, 2011: 2070, 2012: 2197, 2013: 2129, 2014: 2162, 2015: 2049, 2016: 2010, 2017: 2001, 2018: 2095, 2019: 2065, 2020: 2140, 2021: 2145, 2022: 2119, 2023: 1991, 2024: 1981

GMU 4 Elk Harvest

Bull Harvest: 2010: 696, 2011: 780, 2012: 800, 2013: 783, 2014: 749, 2015: 796, 2016: 701, 2017: 737, 2018: 779, 2019: 727, 2020: 794, 2021: 753, 2022: 734, 2023: 743, 2024: 731

Cow Harvest: 2010: 316, 2011: 386, 2012: 400, 2013: 420, 2014: 428, 2015: 446, 2016: 413, 2017: 362, 2018: 499, 2019: 512, 2020: 578, 2021: 549, 2022: 479, 2023: 450, 2024: 469

GMU 4 Harvest Success

Success Rate: 2010: 0.58, 2011: 0.55, 2012: 0.58, 2013: 0.57, 2014: 0.62, 2015: 0.58, 2016: 0.57, 2017: 0.62, 2018: 0.62, 2019: 0.62, 2020: 0.65, 2021: 0.63, 2022: 0.6, 2023: 0.47, 2024: 0.56
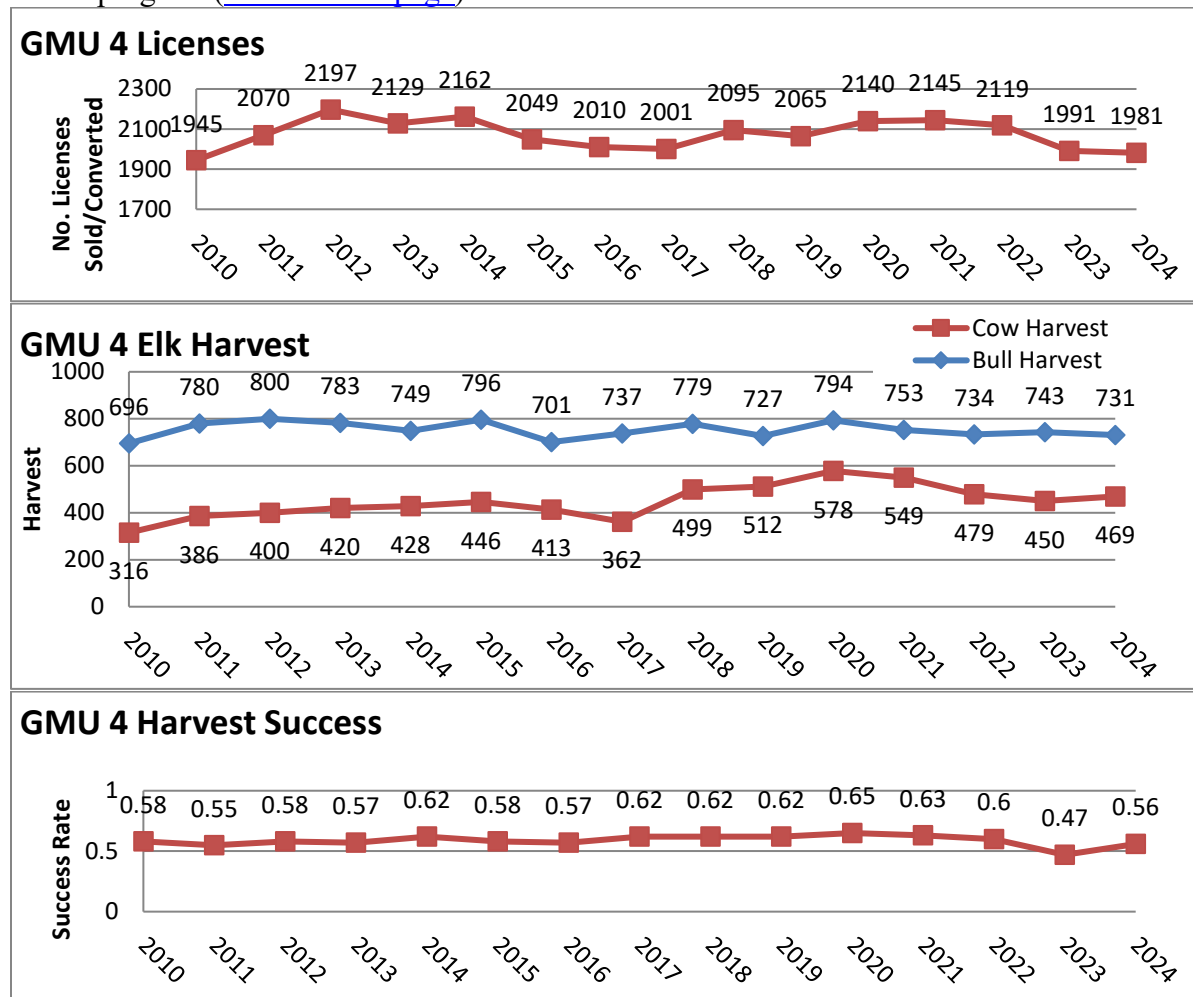
GMU 5B (part of the Northcentral Herd; opportunity management)
Unit Map: 5B

BIOLOGY – Elk in GMU 5B are part of the Northcentral herd and population estimates include several GMUs (see regional description). The habitat types in GMU 5B vary with lower elevation semi-arid grass/scrubland in the east near Abiquiu Reservoir, pinyon-juniper mesas in the foothill regions, and conifer forests on higher elevation ridgelines. Elk densities in this unit are lower than other areas within the Northcentral herd and elk are scattered. Moderate sized herds can be found where conditions are favorable. Movement patterns are largely dependent upon forage and water availability and can vary from year to year with more elk pushed into this unit during more severe winter conditions.

HUNTING – This unit is 81% public land, and a network of Forest Service roads allows for good access throughout. The southern portion of the rugged Chama River Canyon Wilderness is found in this unit for those looking for more challenging pursuit opportunities away from crowds. Hunters have moderate harvest success and high satisfaction ratings.

GMU 5B Licenses

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. Licenses Sold/Converted	754	758	759	757	754	729	729	729	734	732	727	735	732	738	745

GMU 5B Elk Harvest

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cow Harvest	49	53	55	28	53	58	73	48	60	60	56	53	51	62	55
Bull Harvest	76	84	104	78	99	120	123	137	100	124	139	141	143	110	105

GMU 5B Harvest Success

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Success Rate	0.17	0.19	0.22	0.15	0.22	0.26	0.28	0.27	0.24	0.27	0.29	0.28	0.29	0.29	0.3

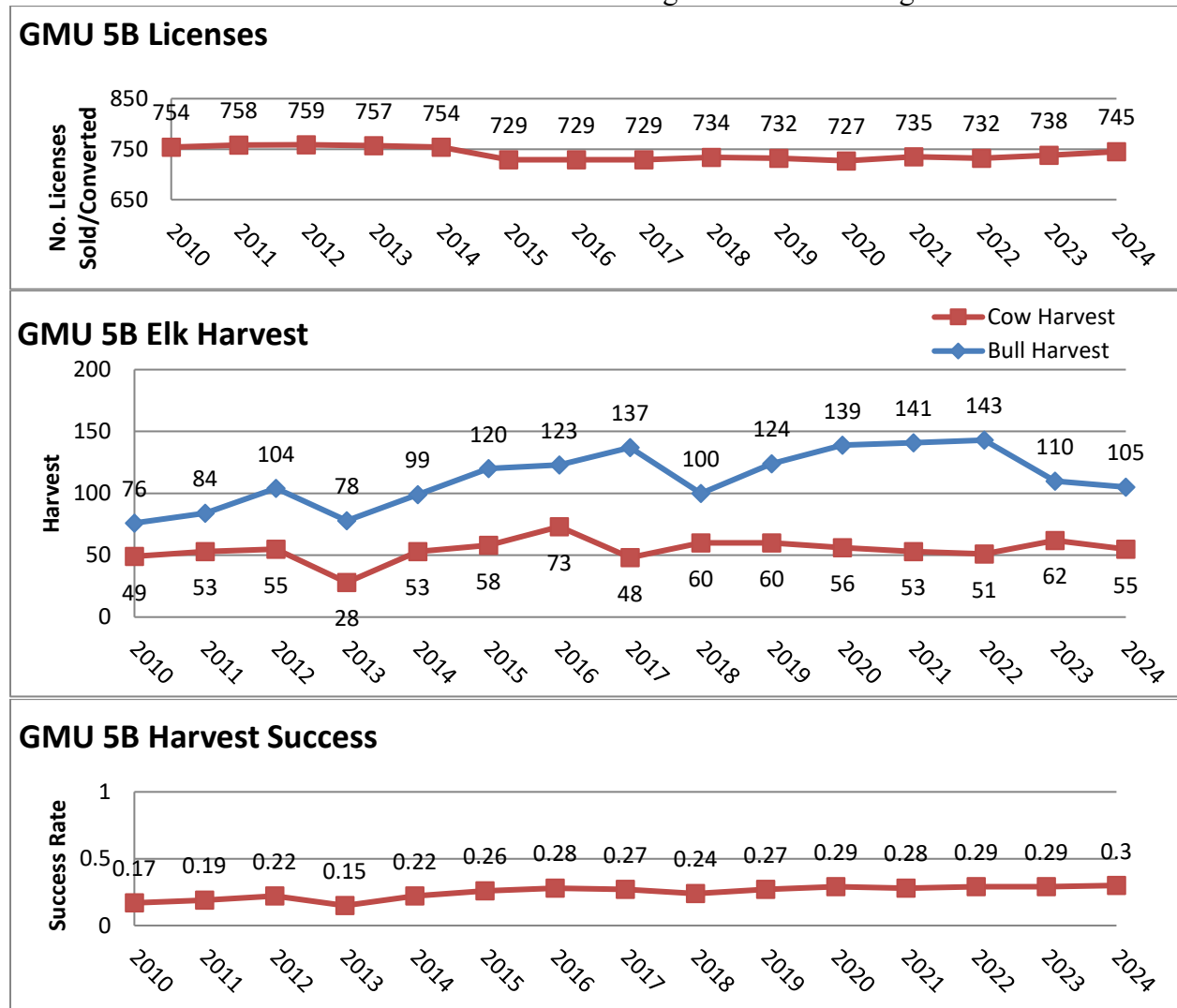Table of Contents

GMU 50 (part of the Northcentral Herd; opportunity management)
Unit Map: 50

BIOLOGY – Elk in GMU 50 are part of the Northcentral herd and population estimates include several GMUs (see regional description). In this unit, the lower elevation semi-arid grasslands and sagebrush flats offer suitable winter habitat with close proximity to escape terrain found on volcanic cones and in pinyon-juniper woodlands. Some elk move out of the adjacent high elevation summer range into lower elevation winter range in this GMU, however there are also resident animals present. See figures above for information on some migratory movements in this GMU.

HUNTING – This unit is 68% public land with excellent road access. Although this unit does not contain a large resident herd, some small pockets of elk can be found here year-round and it serves as winter range for elk that have moved out of the surrounding mountains. Hunter success rates are moderate.
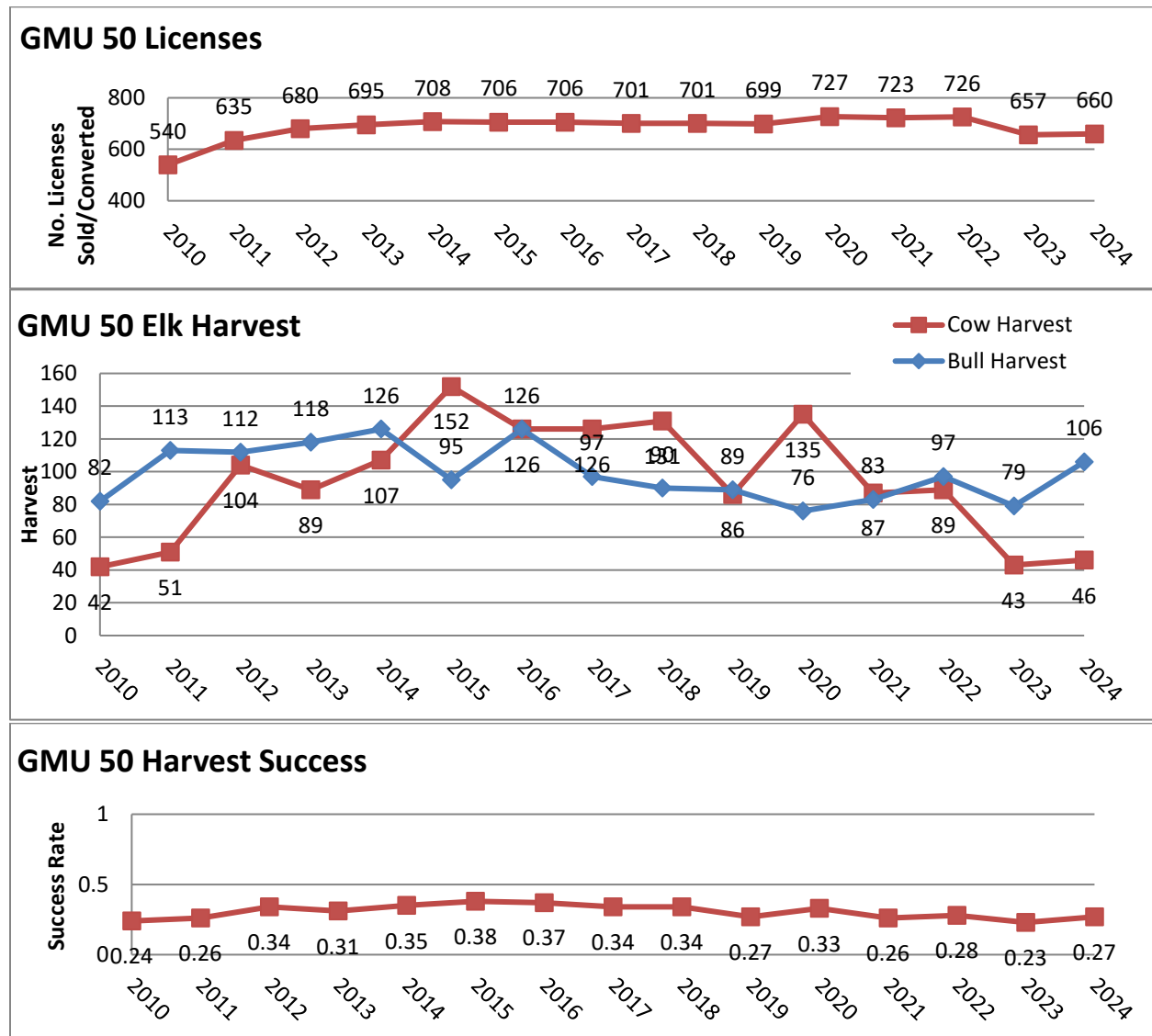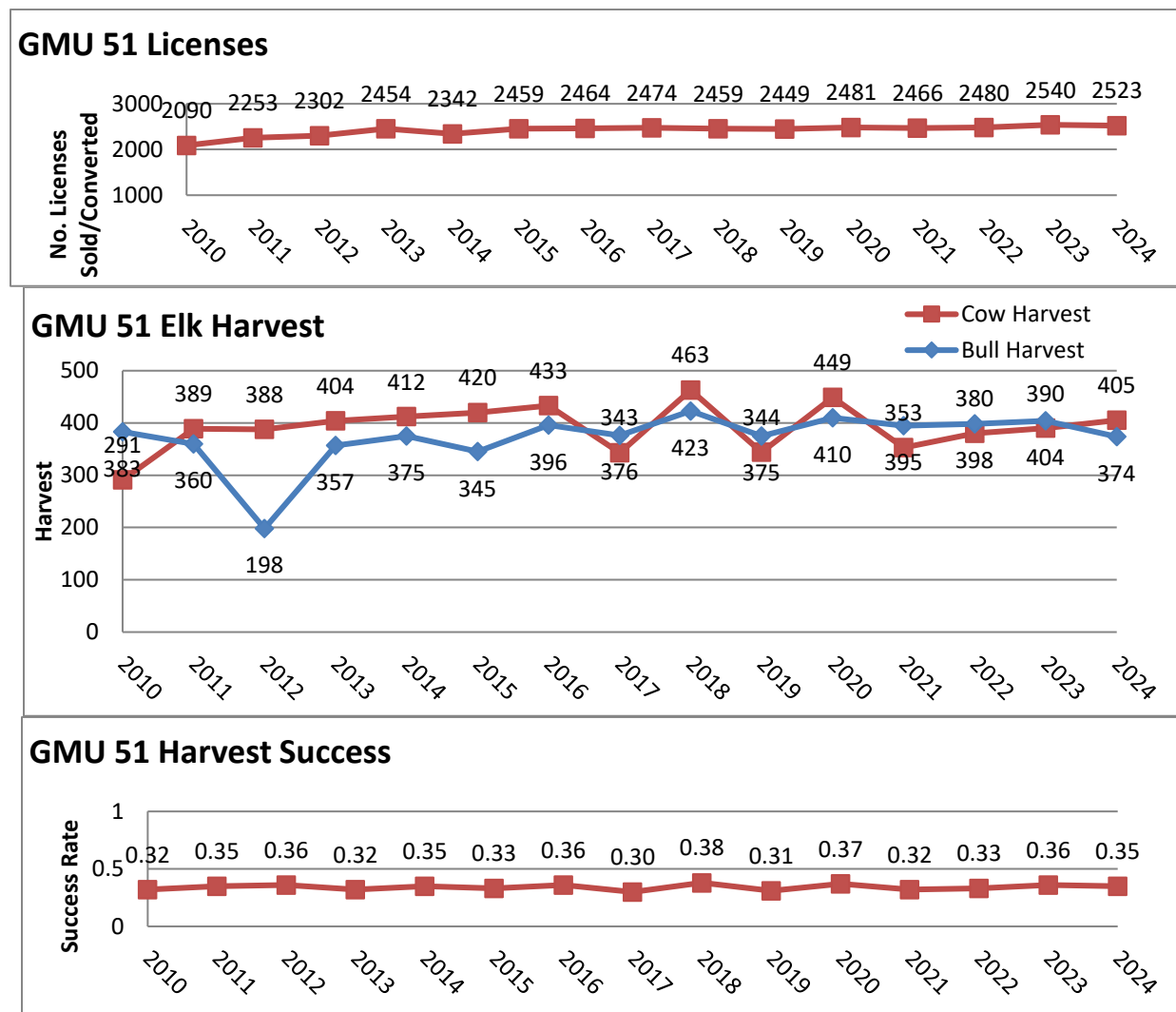
GMU 51 (part of the Northcentral Herd; opportunity management)
Unit Map: 51

BIOLOGY – Elk in GMU 51 are part of the Northcentral herd and population estimates include several GMUs (see regional description). Resident and migratory elk can be found in this unit. Migratory individuals move seasonally between low elevation sagebrush flats and mesa habitats to high elevation mixed conifer and aspen forests. There are some resident elk along riparian corridors and adjacent to irrigated agricultural lands. See figures above for information on some migratory movements in this GMU.

HUNTING – This unit is 82% public land with good road access. Population management hunts may occur occasionally to address winter elk concentrations in the lower elevation winter range of this GMU. Overall success rates are moderate to good and the unit offers ample public and private hunting opportunity. Varied habitat and elevation between seasonal ranges offer good opportunity to find elk throughout early and late season hunts.

GMU 51 Licenses

No. Licenses Sold/Converted

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Licenses	2090	2253	2302	2454	2342	2459	2464	2474	2459	2449	2481	2466	2480	2540	2523

GMU 51 Elk Harvest

Cow Harvest · Bull Harvest

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cow Harvest	291	389	388	404	412	420	433	343	463	344	449	353	380	390	405
Bull Harvest	383	360	198	357	375	345	396	376	423	375	410	395	398	404	374

GMU 51 Harvest Success

Success Rate

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Success Rate	0.32	0.35	0.36	0.32	0.35	0.33	0.36	0.30	0.38	0.31	0.37	0.32	0.33	0.36	0.35

GMU 52 (part of the Northcentral Herd; opportunity management)

Unit Map:

BIOLOGY – Elk in GMU 52 are part of the Northcentral herd and population estimates include several GMUs (see regional description). Variable habitat types between low and high elevation offer suitable year-round elk habitat. Pinyon-juniper woodlands and sagebrush flats are found in some lower elevations with mixed conifer and aspen forests at higher elevations. Elk make migratory movements from high to low elevations when snowpack accumulates. See figures above for information on some migratory movements in this GMU.

HUNTING – This unit is 92% public land with good road access. The Cruces Basin Wilderness Area is found in this unit for those looking for more rugged pursuit opportunities away from roads. Varied habitat and elevation between seasonal ranges offer good opportunity to find elk throughout early and late season hunts.
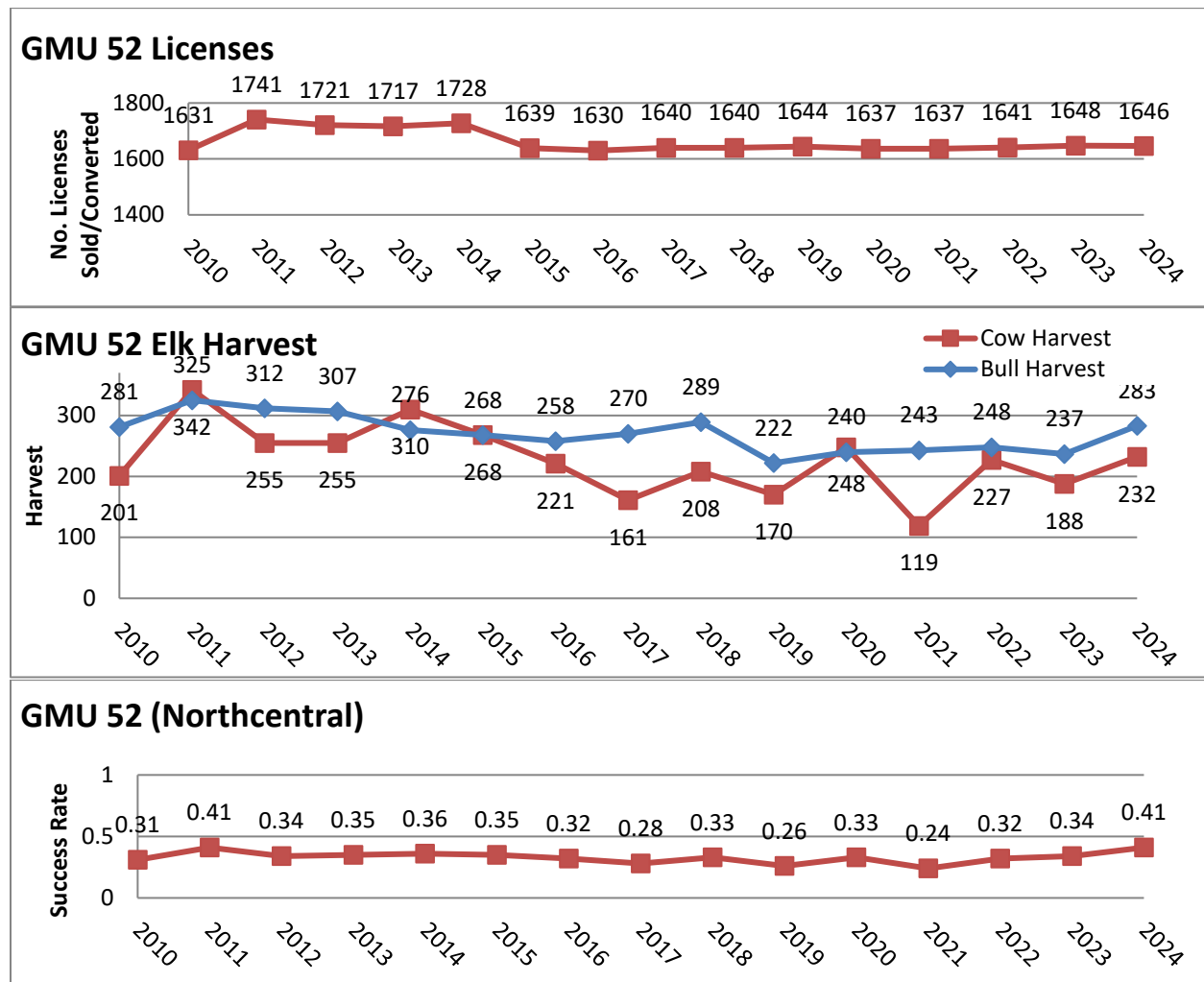
GMU 52 Licenses

Values by year (No. Licenses Sold/Converted):
2010: 1631, 2011: 1741, 2012: 1721, 2013: 1717, 2014: 1728, 2015: 1639, 2016: 1630, 2017: 1640, 2018: 1640, 2019: 1644, 2020: 1637, 2021: 1637, 2022: 1641, 2023: 1648, 2024: 1646

GMU 52 Elk Harvest

Cow Harvest — Bull Harvest

Cow Harvest by year: 2010: 201, 2011: 342, 2012: 255, 2013: 255, 2014: 276, 2015: 268, 2016: 221, 2017: 161, 2018: 208, 2019: 170, 2020: 240, 2021: 119, 2022: 227, 2023: 188, 2024: 232

Bull Harvest by year: 2010: 281, 2011: 325, 2012: 312, 2013: 307, 2014: 310, 2015: 268, 2016: 258, 2017: 270, 2018: 289, 2019: 222, 2020: 248, 2021: 243, 2022: 248, 2023: 237, 2024: 283

GMU 52 (Northcentral)

Success Rate by year: 2010: 0.31, 2011: 0.41, 2012: 0.34, 2013: 0.35, 2014: 0.36, 2015: 0.35, 2016: 0.32, 2017: 0.28, 2018: 0.33, 2019: 0.26, 2020: 0.33, 2021: 0.24, 2022: 0.32, 2023: 0.34, 2024: 0.41

Jemez Region - Jemez Herd (GMUs 6A, 6B, 6C, and 7)
## Combination of Opportunity and Quality Management, depending on GMU
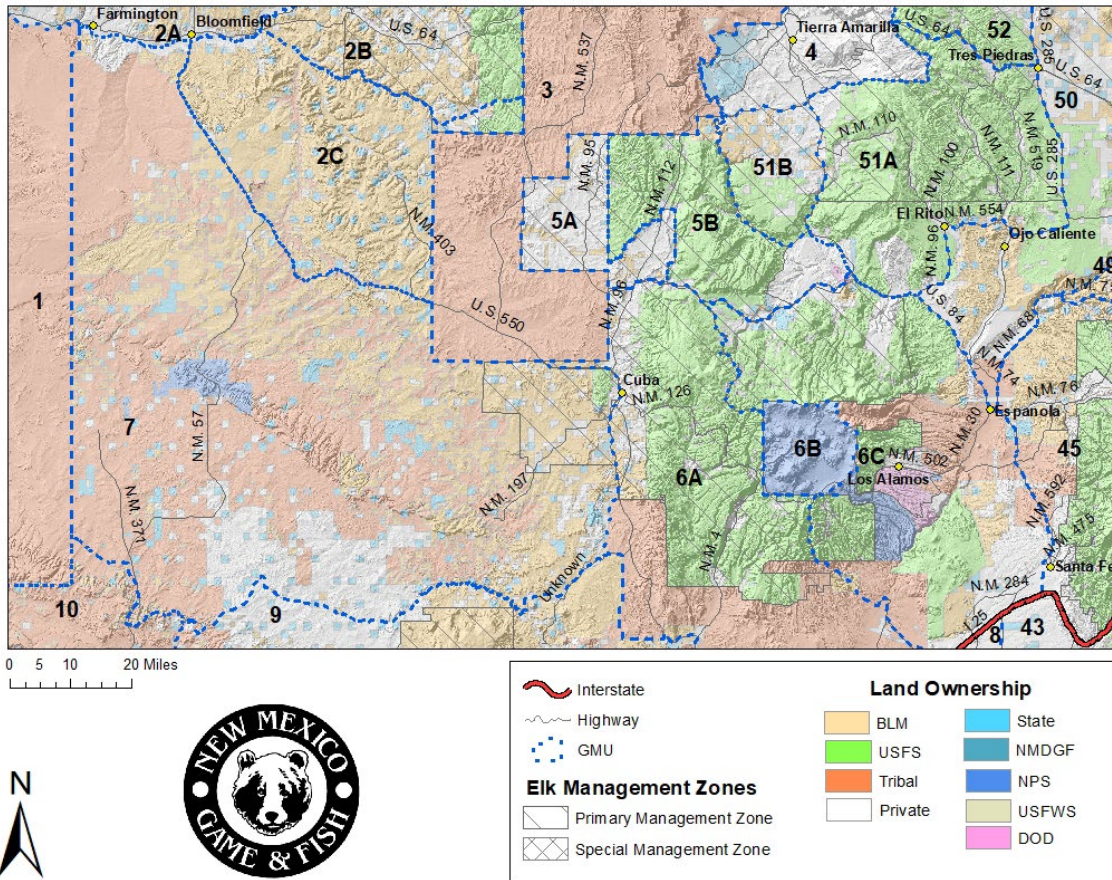
The Valles Caldera and surrounding forests offer premier elk habitat with sprawling montane meadows, vast forests, varied topography, and persistent water sources. Prescribed burning, recent wildfires, and landscape treatment efforts have further enhanced elk habitat in the area. Seasonal movements of elk in the Jemez region are primarily elevational, and dependent upon winter severity, where elk transition to lower mesa tops and surrounding foothills/mountains when winter conditions are more severe (Fig 8). The Jemez herd is considered stable with hunter success and satisfaction ratings moderate to high, depending on the GMU. Recent research has indicated calf survival in this region to be the largest contributor to growth potential, with wide fluctuation of calf survival in areas with limited predator harvest; thus hunter harvest is managed to be conservative in some GMUs to buffer populations from additive mortality (Bernal 2012; APPENDIX A). The Jemez herd is surveyed annually, and the population size is estimated using aerial survey and hunter harvest data.

Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
6,100 – 7,100*	48:100:27	360 - 475 Males
Stable		440 – 510 Females

*Note: Elk populations within the Jemez herd unit are estimated at the regional level and are calculated across GMUs 6A-C and 7.

RESEARCH (MIGRATION)– Elk in the Jemez were fitted with GPS collars beginning in 2015 as part of a large landscape study evaluating the impacts of wildfire and habitat treatments on wildlife use. New Mexico State University and the Cooperative Fish and Wildlife Research Unit partnered with the Valles Caldera National Preserve to oversee the work. Though not the focus of the study, GPS collar information yielded seasonal movement data that was analyzed to identify migratory patterns of a segment of the Jemez herd. The Jemez elk herd primarily resides in the Jemez Mountains in the Valles Caldera National Preserve. The Jemez elk are only partially migratory; some residents remain year-round in the Valles Caldera National Preserve and others exhibit two distinct seasonal movement patterns. The first movement pattern occurs during midwinter (January–February) when numerous elk move to the lower elevation slopes of the Valles Caldera National Preserve, primarily southeast towards Bandelier National Monument. The second movement is more typical of a spring and fall migratory movement; elk migrate north to La Grulla Plateau for the summer and return to the Valles Caldera National Preserve for the winter. The primary challenge for migrants is crossing State Route 4 when traveling to Bandelier National Monument. See Volume 4 of the Ungulate Migrations of the Western United States report.

Figure 8. Seasonal movements and ranges for the Jemez elk herd. From USGS Ungulate Migrations of the Western United States, Vol 4 (pg. 62)
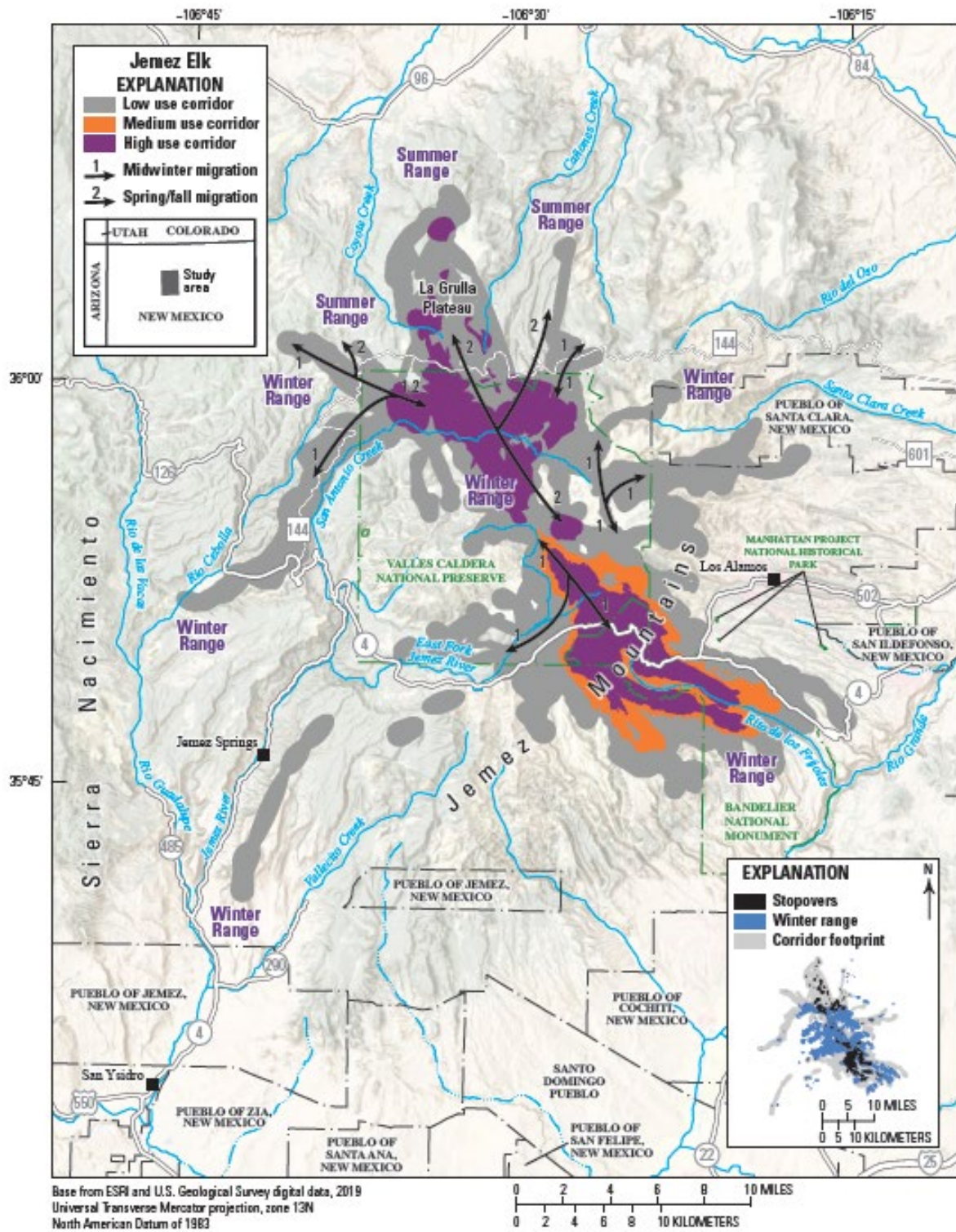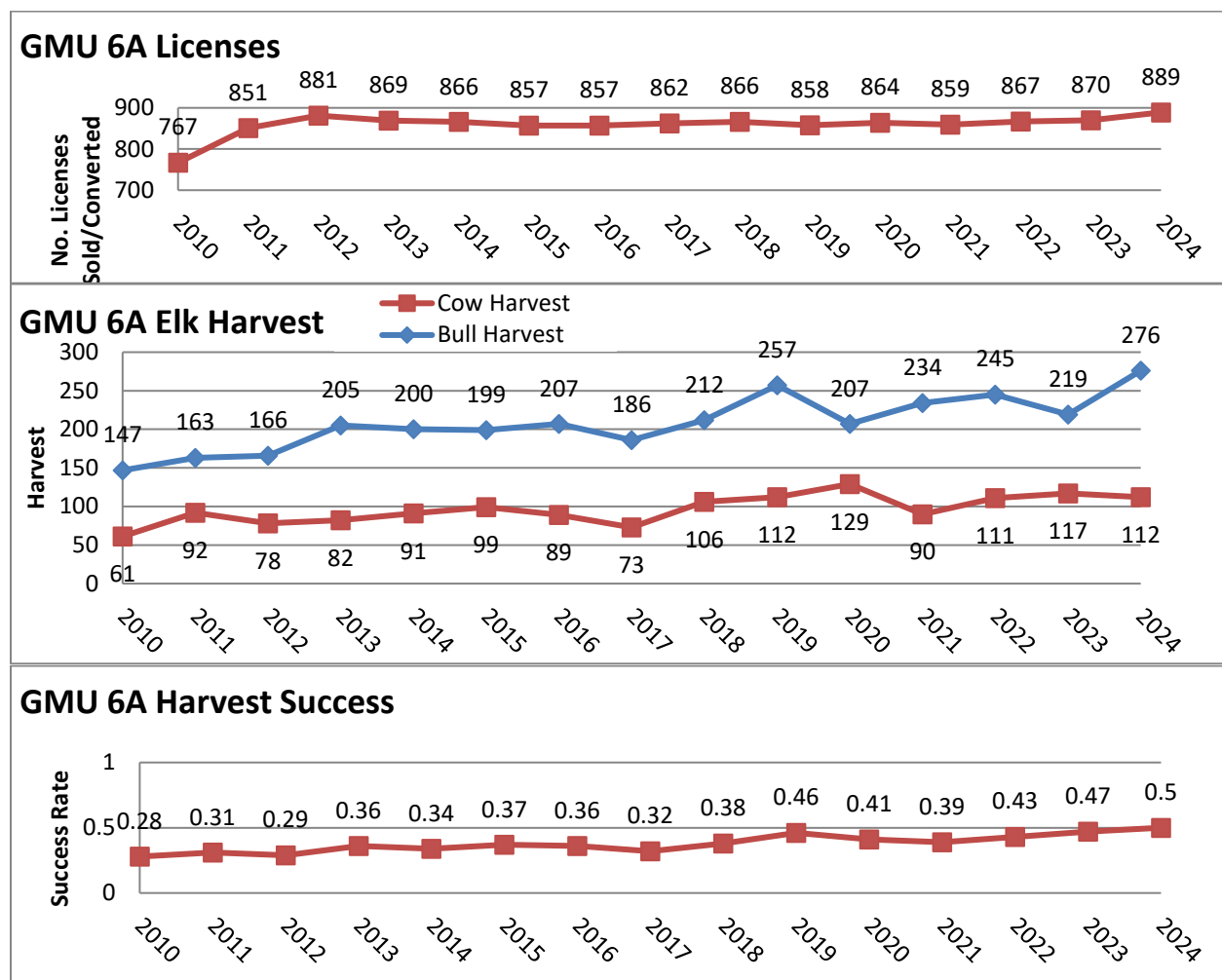
GMU 6A (part of the Jemez Herd; quality management)
Unit Map: 6A

BIOLOGY – Elk in GMU 6A are part of the Jemez herd and population estimates include several GMUs (see regional description). Habitat in this unit ranges from sagebrush, scrub oak and pinyon-juniper forests in the lower elevations to ponderosa pine forests and sub-alpine habitats at the highest elevations. Prescribed burning as well as recent wildfires along the eastern and southern Jemez provide ample elk foraging habitat. Many elk in this unit are found in high elevation open meadows, aspen forests, and mixed conifer during summer months. During winter months, some elk migrate to lower elevations when snowpack accumulates. See above for detailed information on some migratory movements.

HUNTING – This unit is 48% public land, and a network of Forest Service roads allows for good access throughout. The San Pedro Parks Wilderness is found in this unit for those looking for a backcountry experience. Much of the landscape is defined by deep drainages and canyons dividing large, forested mesas. Due to the rugged topography of this GMU, travelling from one region to another is often indirect and can be time consuming; hunters should plan accordingly when deciding which areas to focus.
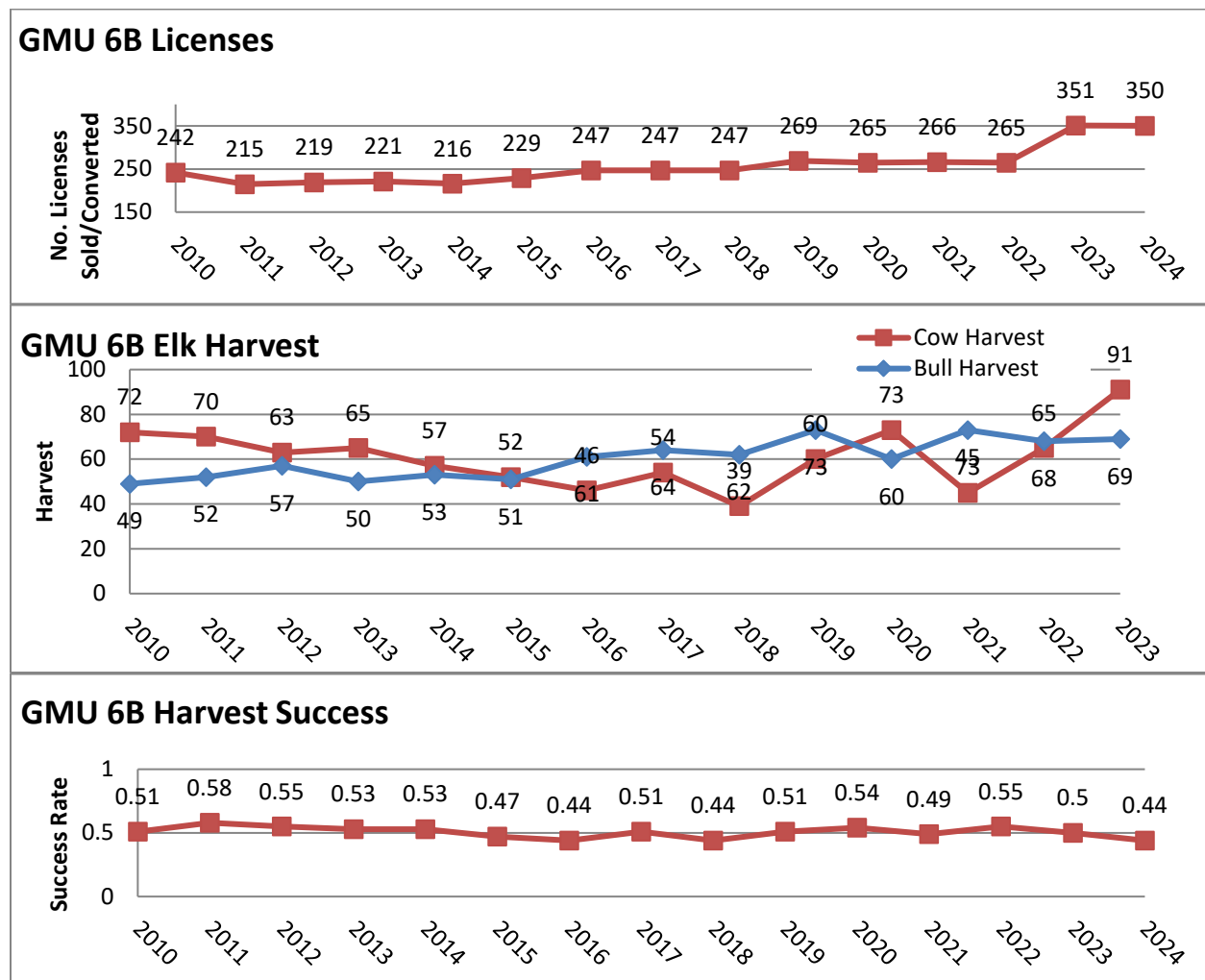
GMU 6A Licenses

Data points: 767 (2010), 851 (2011), 881 (2012), 869 (2013), 866 (2014), 857 (2015), 857 (2016), 862 (2017), 866 (2018), 858 (2019), 864 (2020), 859 (2021), 867 (2022), 870 (2023), 889 (2024)

GMU 6A Elk Harvest

Cow Harvest: 61 (2010), 92 (2011), 78 (2012), 82 (2013), 91 (2014), 99 (2015), 89 (2016), 73 (2017), 106 (2018), 112 (2019), 129 (2020), 90 (2021), 111 (2022), 117 (2023), 112 (2024)

Bull Harvest: 147 (2010), 163 (2011), 166 (2012), 205 (2013), 200 (2014), 199 (2015), 207 (2016), 186 (2017), 212 (2018), 257 (2019), 207 (2020), 234 (2021), 245 (2022), 219 (2023), 276 (2024)

GMU 6A Harvest Success

Success Rate: 0.28 (2010), 0.31 (2011), 0.29 (2012), 0.36 (2013), 0.34 (2014), 0.37 (2015), 0.36 (2016), 0.32 (2017), 0.38 (2018), 0.46 (2019), 0.41 (2020), 0.39 (2021), 0.43 (2022), 0.47 (2023), 0.5 (2024)

GMU 6B (part of the Jemez Herd; quality management)

Unit Map: 6B

BIOLOGY – Elk in GMU 6B are part of the Jemez herd and population estimates include several GMUs (see regional description). The unit is managed as The Valles Caldera National Preserve (VCNP) and is characterized by conifer forests ridges separated by vast grassland valleys. The VCNP is prime elk habitat and is known for its abundant elk. Premier elk habitat in the VCNP, in combination with recent fires and habitat treatments in the area, provides ample opportunity for elk to thrive. Seasonal movements occur between high elevation montane meadows and surrounding forests, to lower elevation mesas and drainages when snowpack accumulates. Although, during milder winters, some elk will remain within the VCNP year-round. See above for detailed information on some migratory movements.

HUNTING – This unit is almost exclusively public land and is administered by the National Park Service as the Valles Caldera National Preserve. As such, hunters must follow some specific regulations and should visit the Valles Caldera National Preserve hunt rules webpage for the most up to date information. The VCNP restricts some vehicular access so hunters should be aware that there are few accessible roads. Hunter success rates and satisfaction are higher than average in this GMU, resulting in these draw tags being highly competitive.

GMU 6B Licenses

Data points (No. Licenses Sold/Converted): 2010: 242, 2011: 215, 2012: 219, 2013: 221, 2014: 216, 2015: 229, 2016: 247, 2017: 247, 2018: 247, 2019: 269, 2020: 265, 2021: 266, 2022: 265, 2023: 351, 2024: 350

GMU 6B Elk Harvest

Cow Harvest: 2010: 72, 2011: 70, 2012: 63, 2013: 65, 2014: 57, 2015: 52, 2016: 61, 2017: 64, 2018: 39/62, 2019: 73, 2020: 73, 2021: 45, 2022: 68, 2023: 91

Bull Harvest: 2010: 49, 2011: 52, 2012: 57, 2013: 50, 2014: 53, 2015: 51, 2016: 46, 2017: 54, 2018: 60, 2019: 60, 2020: 73, 2021: 73, 2022: 65, 2023: 69

GMU 6B Harvest Success

Success Rate: 2010: 0.51, 2011: 0.58, 2012: 0.55, 2013: 0.53, 2014: 0.53, 2015: 0.47, 2016: 0.44, 2017: 0.51, 2018: 0.44, 2019: 0.51, 2020: 0.54, 2021: 0.49, 2022: 0.55, 2023: 0.5, 2024: 0.44

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GMU 6C (part of the Jemez Herd; opportunity management)
Unit Map: 6C

BIOLOGY – Elk in GMU 6C are part of the Jemez herd and population estimates include several GMUs (see regional description). Vegetation communities in this unit range from sagebrush, scrub oak and pinyon-juniper forests in the lower elevations to ponderosa pine forests and sub-alpine habitats at the highest elevations; providing year-round elk habitat. Seasonal movements occur from high to lower elevations as snow accumulation pushes elk off winter range. Recent wildfires have opened up some areas and elk are readily utilizing these burn scars. See above for detailed information on some migratory movements.

HUNTING – This unit is 54% public land, and a network of Forest Service roads allows for good access throughout. The Dome Wilderness is found in this unit for those looking for rugged hunting opportunities. Although the elk population is stable to increasing in this unit, there are generally fewer elk in this unit than are found in GMUs 6A and 6B. However, hunter success and satisfaction have been increasing over the past 10 years.
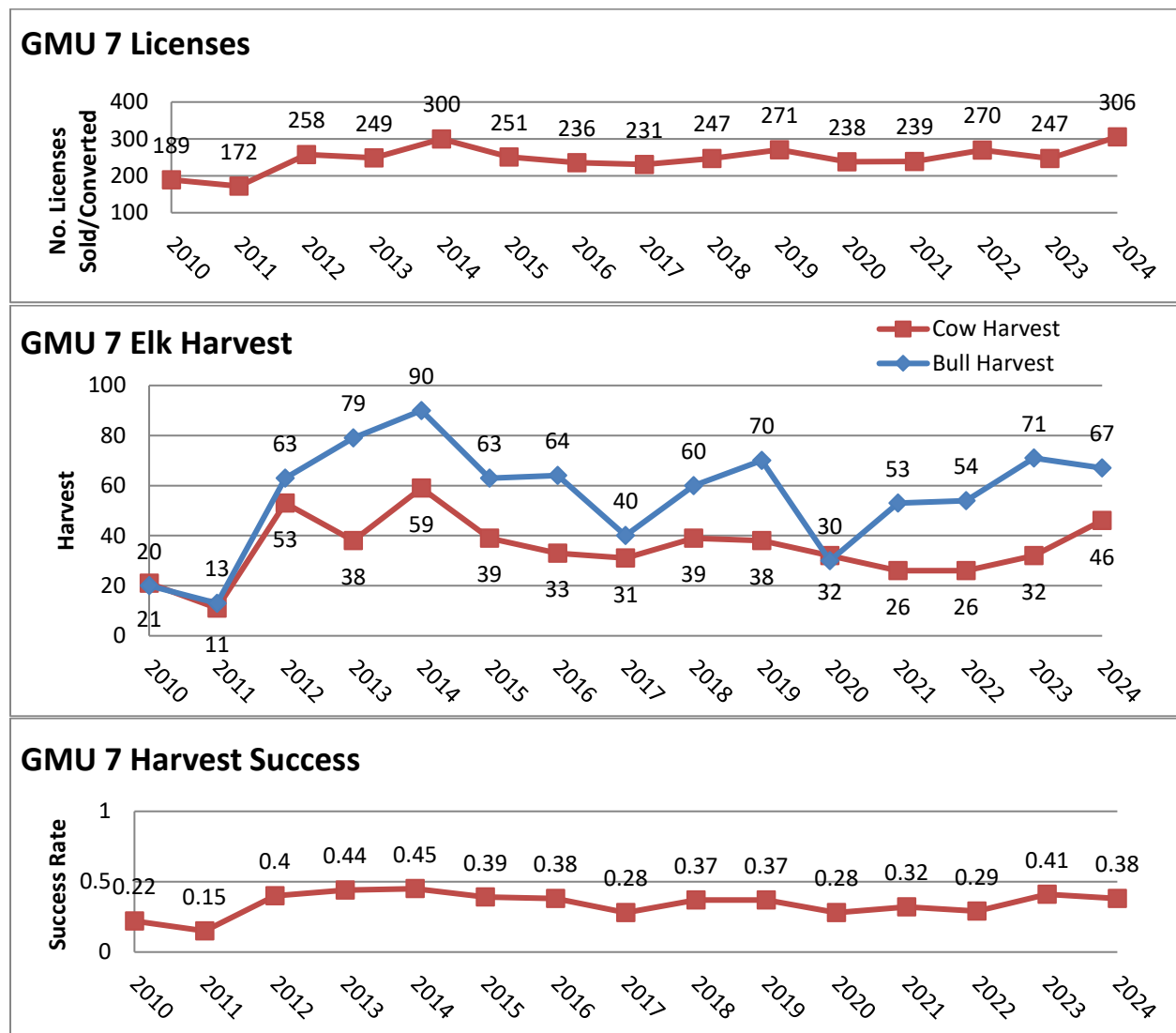

GMU 6C Licenses

GMU 6C Elk Harvest
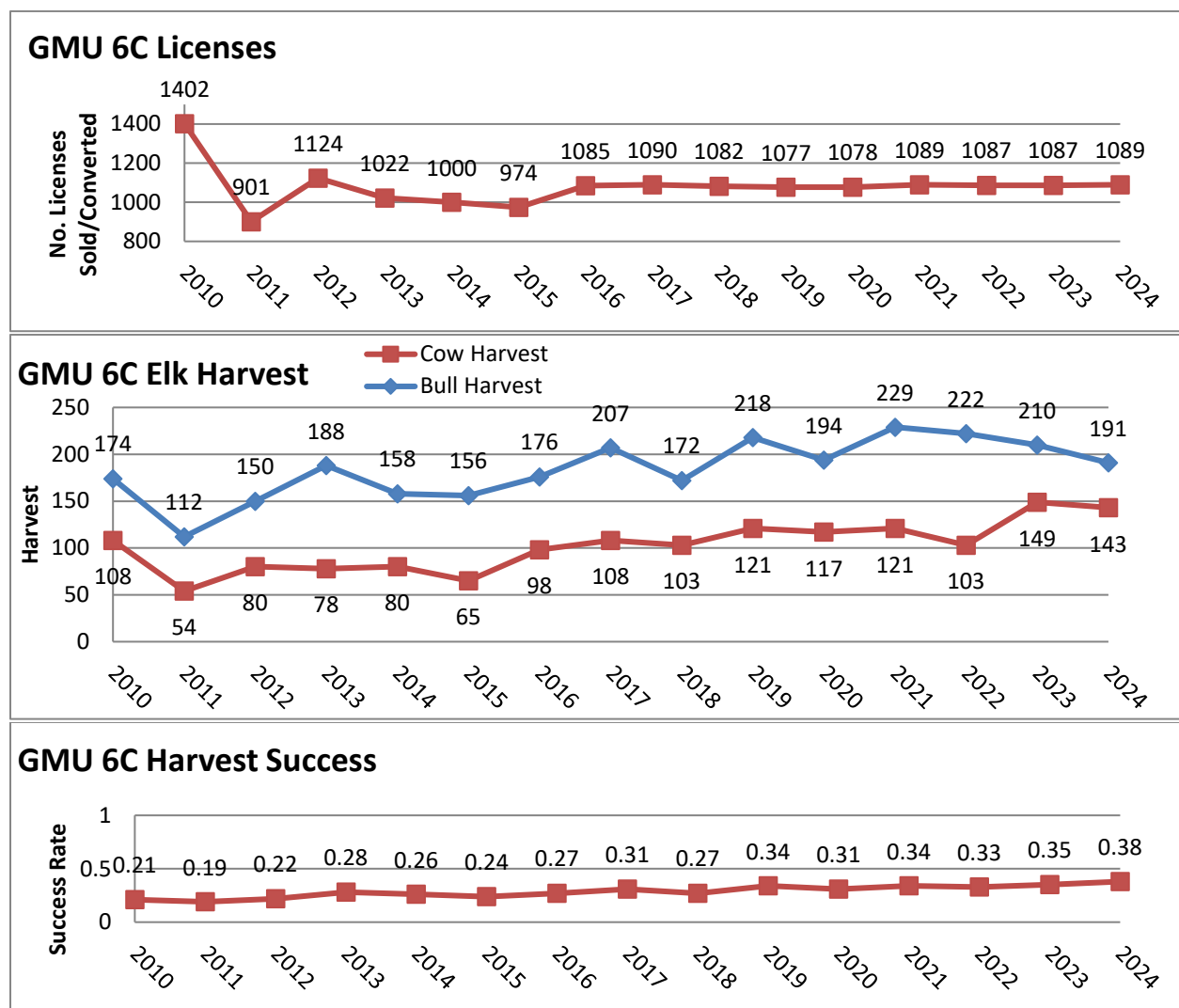
GMU 6C Harvest Success
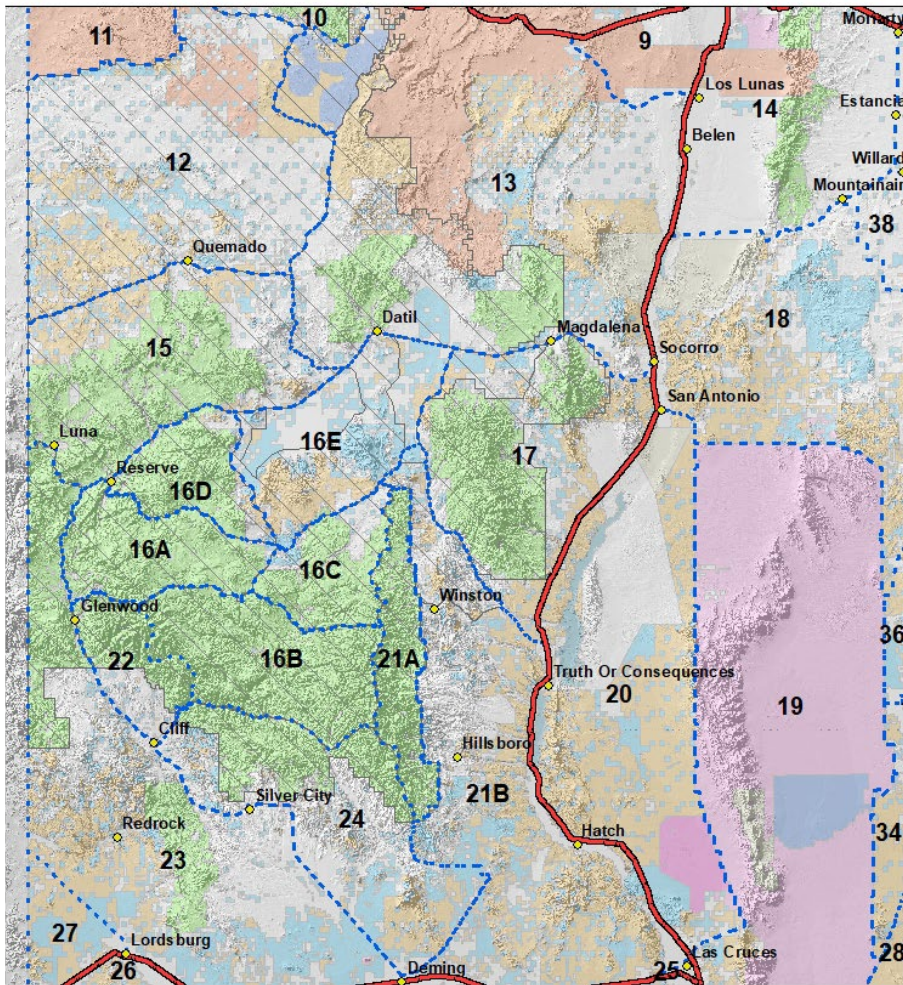
GMU 7 (Jemez Herd; quality management)

Unit Map: 7

BIOLOGY –Elk in GMU 7 are considered part of the Jemez herd and population estimates include several GMUs (see regional description). Habitat type is dominated by lower elevation semi-arid grass/scrubland with interspersed pinyon-juniper woodlands. Elk densities in this unit are low and herds are scattered throughout the unit; however, moderate sized herds can be found where conditions are favorable. Movement patterns here are largely dependent upon forage and water availability and can vary from year to year.

HUNTING – This unit is largely tribal land (48%) intermixed with public land (36%). Public lands within this unit have limited access, thus good maps or the latest GPS technology with land status software is advised. Hunter success and satisfaction within this unit are moderate and have remained stable.

GMU 7 Licenses

GMU 7 Elk Harvest

GMU 7 Harvest Success

Southwest Region – Fence Lake, Datil, Greater Gila, San Mateo/Magdalena, and Lesser Gila Herds


Southwestern New Mexico provides some of the largest expanses of premier elk habitat within the state. Large tracts of undeveloped Forest Service and Wilderness areas, as well as montane forest ecosystems provide for large concentrations of elk. The Department has identified many of the GMUs in the Southwest Area as "Quality" units. Hunters who draw a license in the southwest should do their preseason scouting knowing that the southwest area is primarily dry. Water and forage are limiting factors, which can be useful to keep in mind when assessing where elk might be located. Hunters can acquire maps and find established water sources to determine the best place to scout on the ground. Understanding what areas received monsoon rains the preceding July – September will likewise help guide hunters to areas being used by elk as the animals move into different areas depending on these rain events. As an example, elk in the Wahoo Mountains in the north part of GMU 21A could move to five units within a few miles (21A, 21B, 16C, 16E and 17) depending on moisture events. Typically, elk are more dispersed and in smaller groups during wetter years as resources are more abundant and spatially available.

Fence Lake Herd (GMU 12)

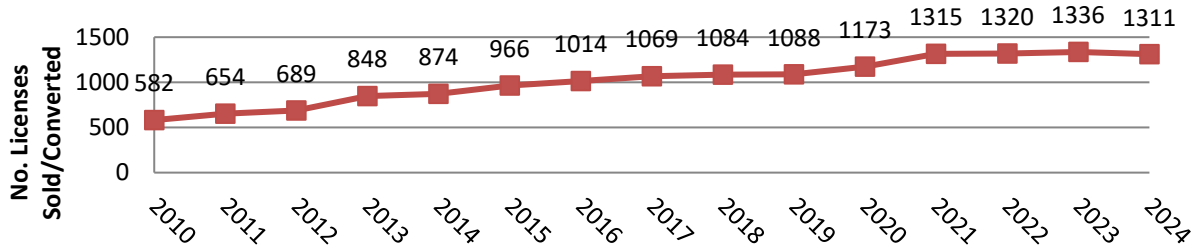**Quality Management**

Unit Map: 12
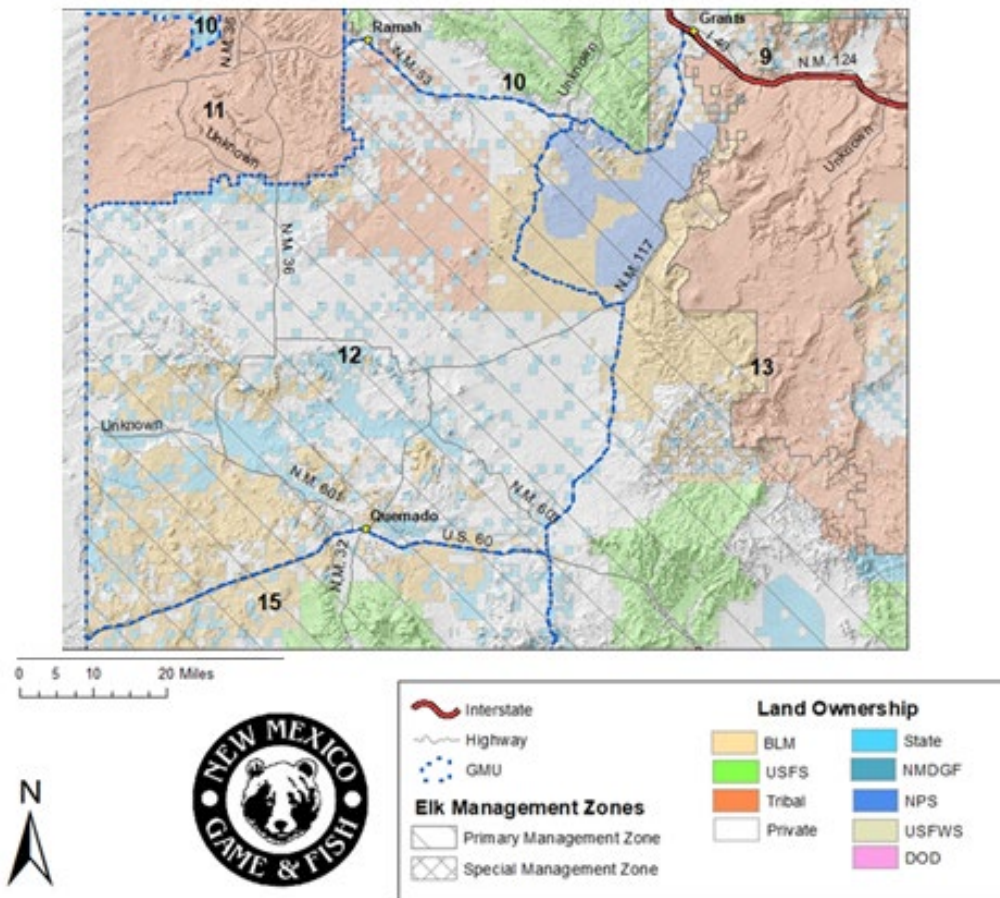
BIOLOGY – GMU 12 is considered a standalone elk herd unit, the Fence Lake herd. It was moved into the Primary Management Zone in 2019 as a result of herd productivity, population size, and increased interest by stakeholders to include this herd in the PMZ. The landscape has large, open drainages with forested mesas interspersed throughout. Habitat in this unit ranges from sagebrush and semi-arid grasslands in low elevations to pinyon-juniper and ponderosa woodlands on mesa tops. Elk are most often found in clusters dispersed across the unit where resources are most readily available, which can vary depending upon precipitation patterns. The Fence Lake herd is monitored annually using a combination of aerial surveys and hunter harvest data.
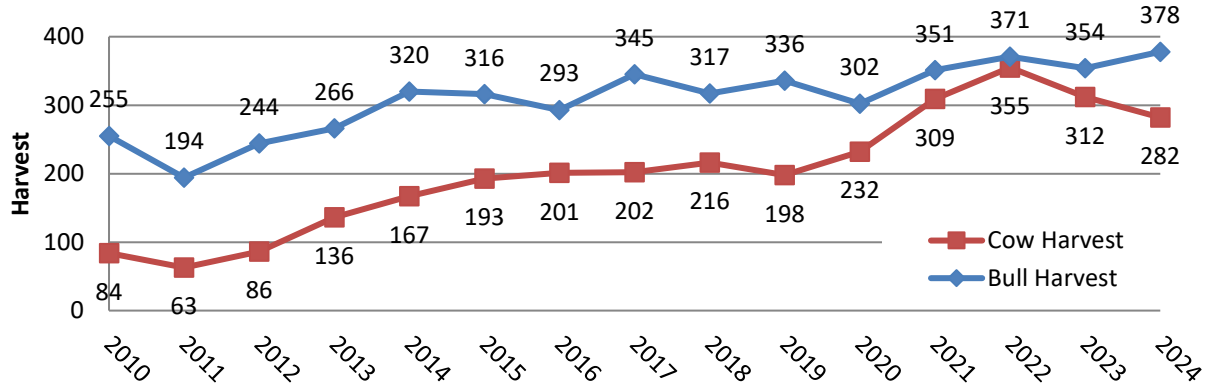
HUNTING – This unit is a checkerboard of private, public, and tribal land with 39% of the unit being public land. Public hunting opportunities can be found on BLM and NM State Trust Land. However, not all public land is legally accessible so public hunters should be prepared with good maps and/or GPS with land status software. Hunter success and satisfaction for this unit are higher than average and have been stable. Elk populations within this unit are stable in size, however, they are dispersed across the landscape in clusters near available resources and are thus more dispersed in years of abundant moisture and forage.

Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
4,000 – 5,900	41:100:46	320 – 550 Males
Stable		400 – 590 Females

GMU 12 Licenses

No. Licenses Sold/Converted

582, 654, 689, 848, 874, 966, 1014, 1069, 1084, 1088, 1173, 1315, 1320, 1336, 1311

2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024

GMU 12 Elk Harvest

Harvest

Bull Harvest: 255, 194, 244, 266, 320, 316, 293, 345, 317, 336, 302, 351, 371, 354, 378

Cow Harvest: 84, 63, 86, 136, 167, 193, 201, 202, 216, 198, 232, 309, 355, 312, 282

— Cow Harvest
— Bull Harvest

2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024

GMU 12 Harvest Success

Success Rate

0.55, 0.4, 0.48, 0.48, 0.55, 0.53, 0.47, 0.52, 0.49, 0.5, 0.45, 0.51, 0.57, 0.42, 0.42

2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024
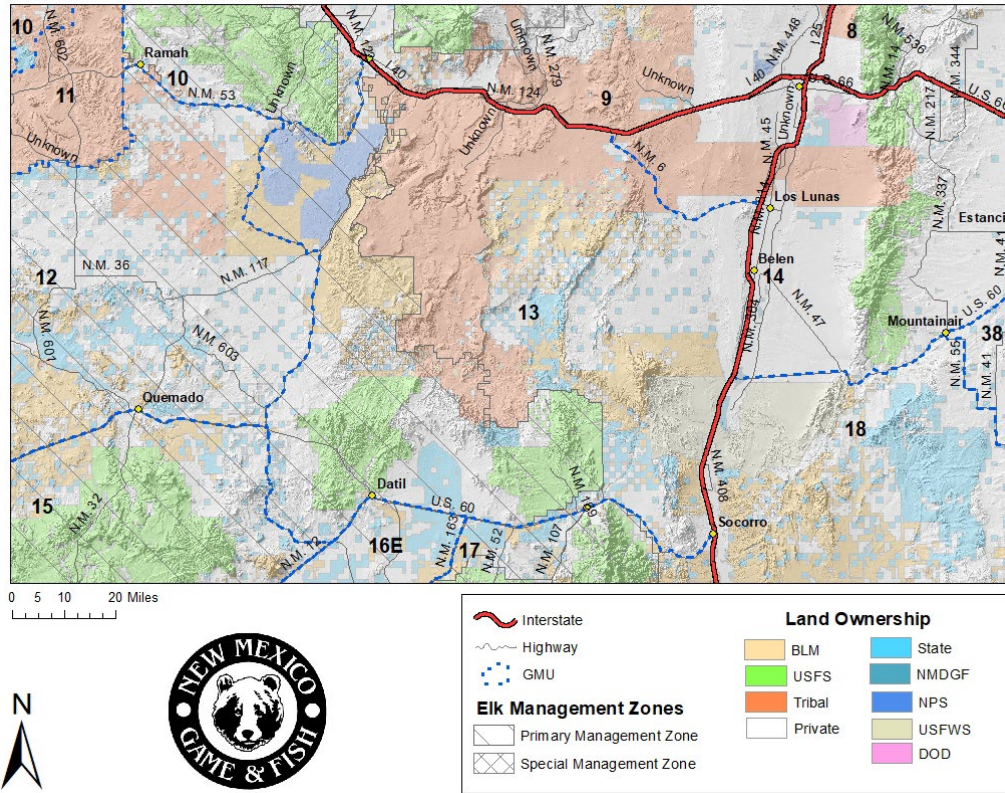
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Datil Herd (GMU 13)
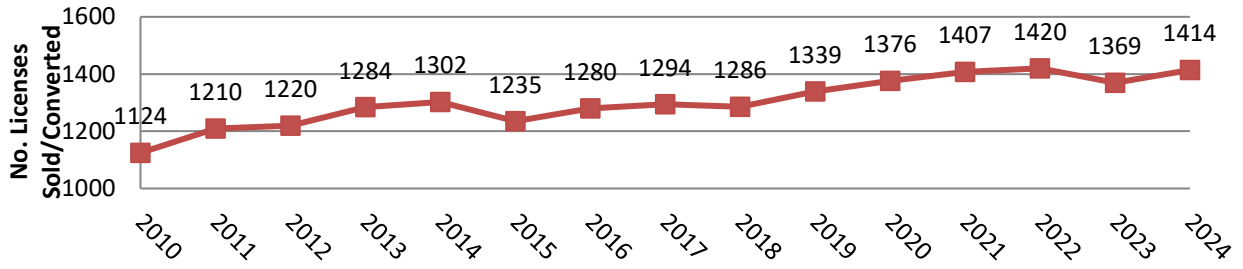
Quality Management

Unit Map:

BIOLOGY – GMU 13 is considered a standalone elk herd unit, the Datil herd. Habitats range across an elevational gradient from plains and grasslands at low elevation to pinyon-juniper woodlands and ponderosa pine forests at higher elevations. Resource availability is the primary driver for elk movements throughout the year, where moderate sized herds can be found in clusters where resources are available. The Datil herd is considered stable, with ample resources to support healthy populations. Elk are monitored annually using a combination of aerial surveys and hunter harvest data.
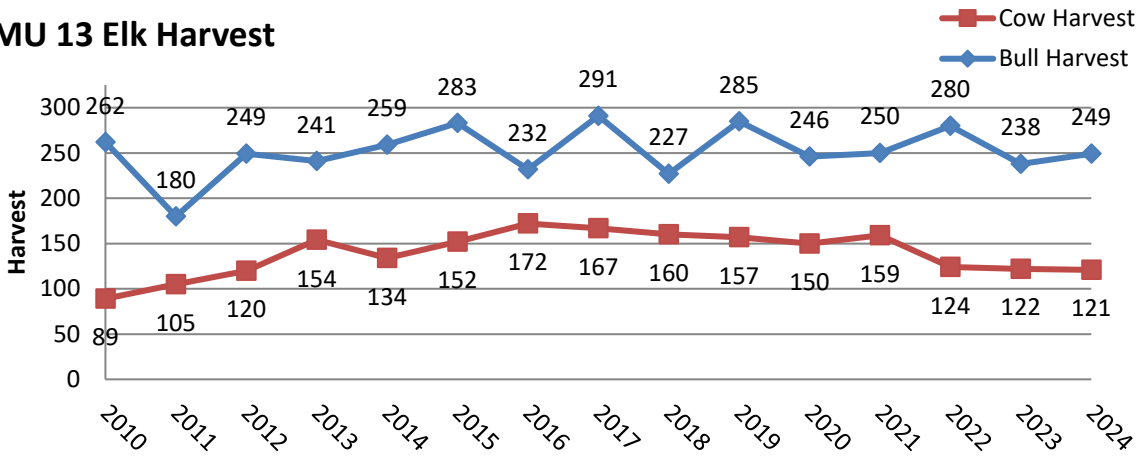
HUNTING – This unit is designated as a primitive weapon unit and hunting opportunities are provided through muzzleloader and bow hunts only. It is comprised of 39% public land with good road access throughout the unit. Although portions of the Cibola National Forest occupy the southern portion of this unit, much of the public land is BLM or state land. Up to date maps or GPS will aid hunters navigating this unit. There are two wilderness areas for those seeking more rugged pursuit opportunities - the West Malpais Wilderness and the Cebolla Wilderness. This is an extremely large unit with localized elk concentrations as well as some more mobile herds following available resources and water sources.

Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
3,000 – 3,900	40:100:37	210 – 310 Males
Stable		250 – 33 Females

GMU 13 Licenses

No. Licenses Sold/Converted

1124, 1210, 1220, 1284, 1302, 1235, 1280, 1294, 1286, 1339, 1376, 1407, 1420, 1369, 1414

(2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024)

GMU 13 Elk Harvest

Harvest

Cow Harvest
Bull Harvest

Bull Harvest: 262, 180, 249, 241, 259, 283, 232, 291, 227, 285, 246, 250, 280, 238, 249

Cow Harvest: 89, 105, 120, 154, 134, 152, 172, 167, 160, 157, 150, 159, 124, 122, 121

(2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024)

GMU 13 Harvest Success

Success Rate

0.3, 0.24, 0.31, 0.33, 0.31, 0.36, 0.32, 0.36, 0.31, 0.35, 0.3, 0.3, 0.3, 0.32, 0.31

2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024

Greater Gila Herd (GMUs 15, 16A, 16B/22, and 16C-E)
Quality Management
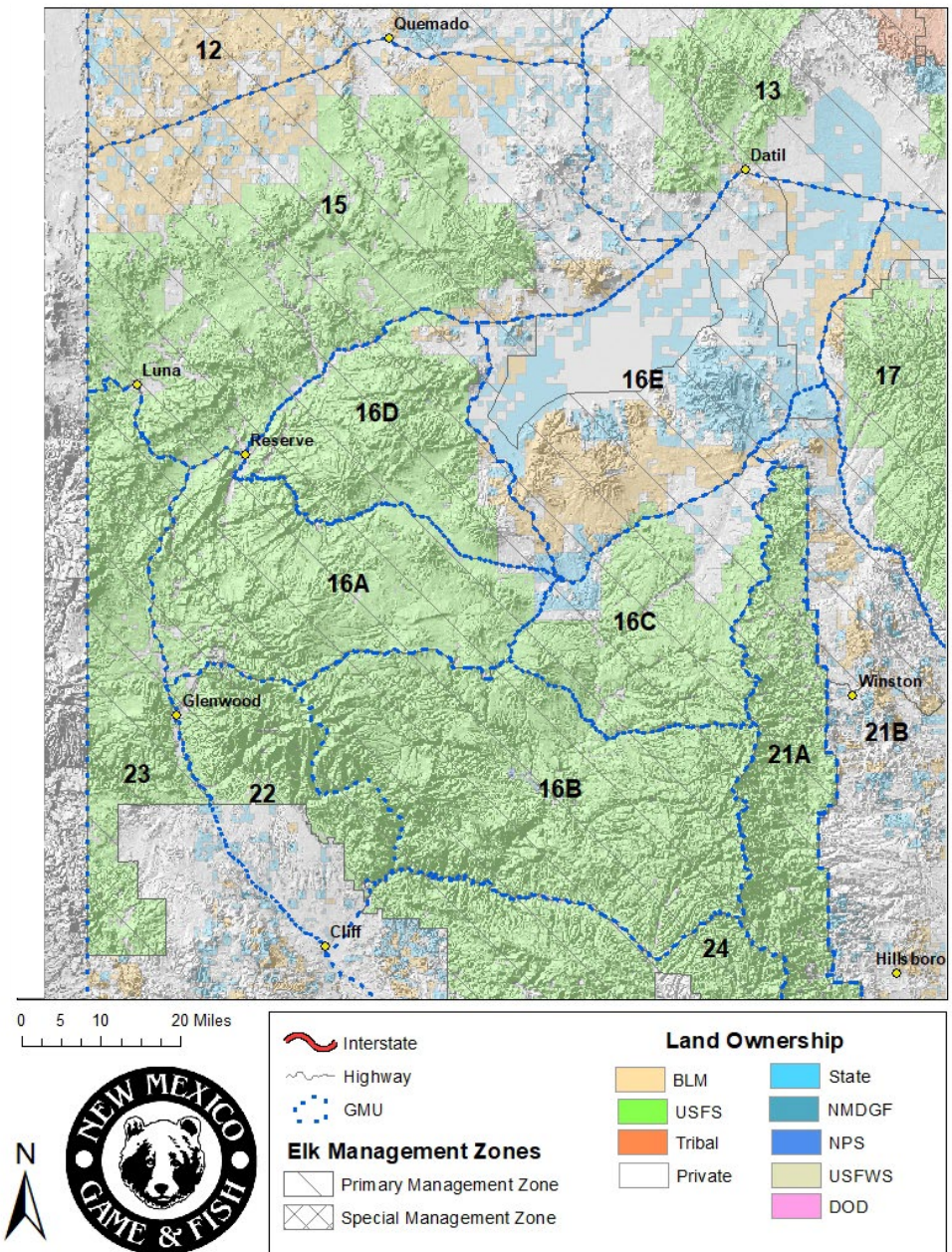
The Greater Gila elk herd unit spans across several GMUs in the Gila National Forest, a large contiguous tract of public land. The majority of this herd is found on public land, with some limited exceptions, and has moderate to good hunter access via a network of forest service roads. Elk utilize a variety of habitats across the greater region and exhibit sporadic movement behaviors in search of available resources (Fig 9) but no migratory behavior has been observed. The Gila Wilderness Area and Aldo Leopold Wilderness Areas provide expansive regions of rugged and remote elk habitat and hunting opportunities. Licenses in these units are highly coveted and draw odds are generally low. Elk population trends are monitored using a combination of aerial surveys as well as hunter harvest information. The Greater Gila herd population size is estimated across GMUs 15, 16A, 16B/22, and 16C-E. The herd is slightly decreasing, and the Department has partnered with NMSU researchers to investigate the various factors which could be contributing to this decline.

RESEARCH – Beginning in 2012 various research projects have occurred throughout the Greater Gila herd unit to determine factors contributing to changes in population productivity, predation rates, behavioral change and adaptation, habitat selection and quality (Tatman et al. 2012, Pitman 2013, Pitman et al. 2014, Farley 2022, Thompson 2022, Martinez 2024, Pitman et al. 2024; APPENDIX A). The various investigations have highlighted the many ecological challenges these elk herds must overcome and give insight to how elk are learning to adapt

through behavioral shifts and resilience. These projects have been partnerships between the NMDGF and Cooperative Fish and Wildlife Research Unit at NMSU and are focused around determining ecological factors influencing populations dynamics of elk to scientifically inform management recommendations.

In addition to projects aimed at elk population demographics, GPS collar technology allowed for the analysis of elk movement information to identify whether this herd migrates. The Gila elk herd consists of multiple sub-herds throughout the Gila and Cibola National Forests. The lower elevations of the Gila National Forest are dominated by various subshrubs, shrubs, and bunch grasses, with the higher elevations consisting primarily of pinyon-juniper woodland, ponderosa pine and mixed conifer forests. The sub-herds are predominantly nonmigratory, with only approximately 3.4% of the 353 collared elk exhibiting migratory behavior, primarily in the Gallo and Mogollon Mountains. Migratory movements may be more common during years of increased snowpack, as the low geographic elevation of the region may mitigate the consequences of remaining at high elevation during winter months in years with low snowpack. Two individuals had longer migrations across the Plains of San Agustin, however their winter and summer ranges were at similar elevations. See Volume 2 of the Ungulate Migrations of the Western US report.

Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
21,200 – 23,300*	33:100:27	1,100 – 1,400 Males
Slightly decreasing		1,300 – 1,400 Females

*Note: Elk populations within the Greater Gila herd unit are estimated at the regional level and population estimates are calculated across GMUs 15, 16A, 16B/22, and 16C-E.

Figure 9. Seasonal movements of elk within the Greater Gila elk herd. From USGS Ungulate Migrations of the Western United States, Vol 2 (pg 134).
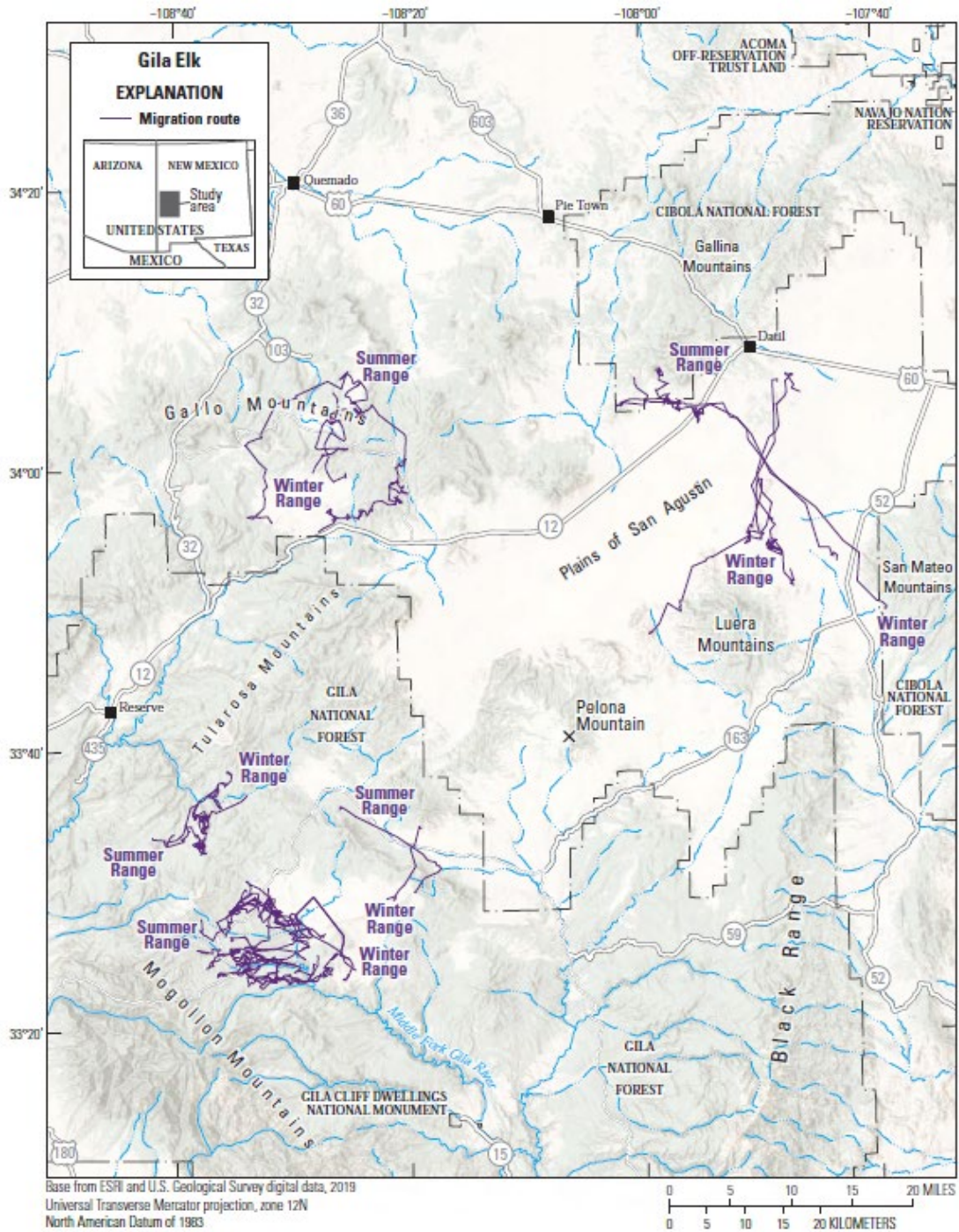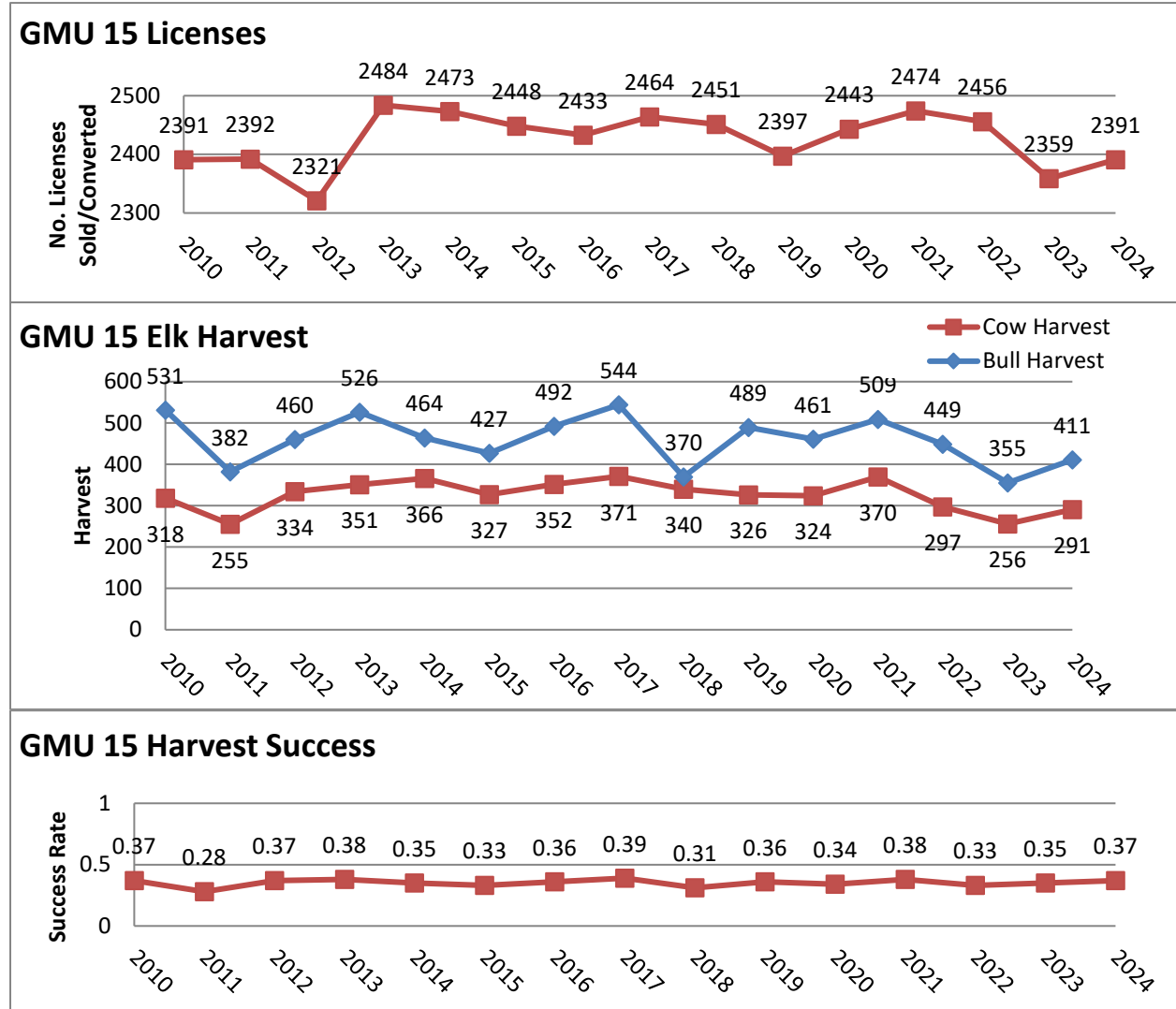
GMU 15 (part of the Greater Gila Herd; quality management)

Unit Map:

BIOLOGY – Elk in GMU 15 are part of the Greater Gila herd and population estimates include several GMUs (see regional description). The landscape offers a variety topography, offering quality year-round elk habitats. Habitats range across an elevational gradient from plains and grasslands at low elevation to pinyon-juniper woodlands and ponderosa pine forests at higher elevations. Seasonal movements are very limited in this herd; likely due to the lack of heavy snow accumulation

HUNTING – This unit is designated as a primitive weapon unit and hunting opportunities are provided through muzzleloader and bow hunts only. This unit is 78% public land with great road access throughout. Success rates and satisfaction ratings are above average. This unit offers quality elk habitat and hunters can find high elk densities throughout. GMU 15 also offers a unique hunting opportunity to pursue mature bulls late in the season. During this time, bulls can be found on extremely rugged terrain while they rest after the rut.
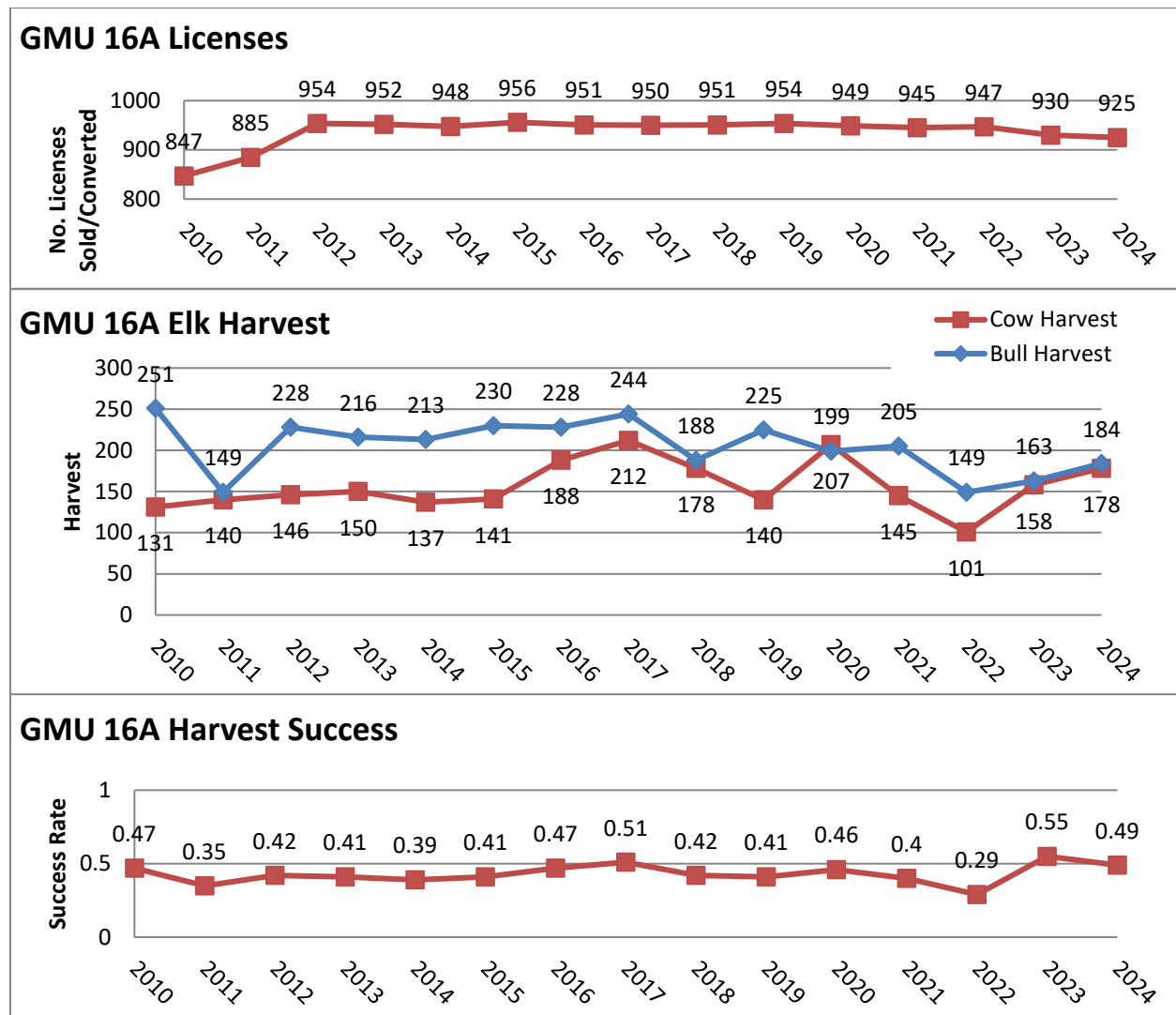

GMU 15 Licenses

Licenses Sold/Converted by year: 2391 (2010), 2392 (2011), 2321 (2012), 2484 (2013), 2473 (2014), 2448 (2015), 2433 (2016), 2464 (2017), 2451 (2018), 2397 (2019), 2443 (2020), 2474 (2021), 2456 (2022), 2359 (2023), 2391 (2024)

GMU 15 Elk Harvest

Cow Harvest: 318 (2010), 255 (2011), 334 (2012), 351 (2013), 366 (2014), 327 (2015), 352 (2016), 371 (2017), 340 (2018), 326 (2019), 324 (2020), 370 (2021), 297 (2022), 256 (2023), 291 (2024)

Bull Harvest: 531 (2010), 382 (2011), 460 (2012), 526 (2013), 464 (2014), 427 (2015), 492 (2016), 544 (2017), 370 (2018), 489 (2019), 461 (2020), 509 (2021), 449 (2022), 355 (2023), 411 (2024)

GMU 15 Harvest Success

Success Rate: 0.37 (2010), 0.28 (2011), 0.37 (2012), 0.38 (2013), 0.35 (2014), 0.33 (2015), 0.36 (2016), 0.39 (2017), 0.31 (2018), 0.36 (2019), 0.34 (2020), 0.38 (2021), 0.33 (2022), 0.35 (2023), 0.37 (2024)

GMU 16A (part of the Greater Gila Herd; quality management)

Unit Map: 16A

BIOLOGY – Elk in GMU 16A are part of the Greater Gila herd and population estimates include several GMUs (see regional description). Lower elevations are characterized by plains and grasslands with ponderosa pine forests at higher elevations. The landscape is predominantly mountainous with large, deep drainages and some lower elevation meadows and foothills. Seasonal movements are very limited in this herd; likely due to the lack of heavy snow accumulation.

HUNTING –This unit is comprised of 97% public land with great road access throughout. Even with a good road network, there are still roadless areas allowing hunters the ability to get away from other people. This is often characterized as one of the best units in the state because of the abundant elk habitat and resources providing healthy herds and potential to harvest an older age class bull.
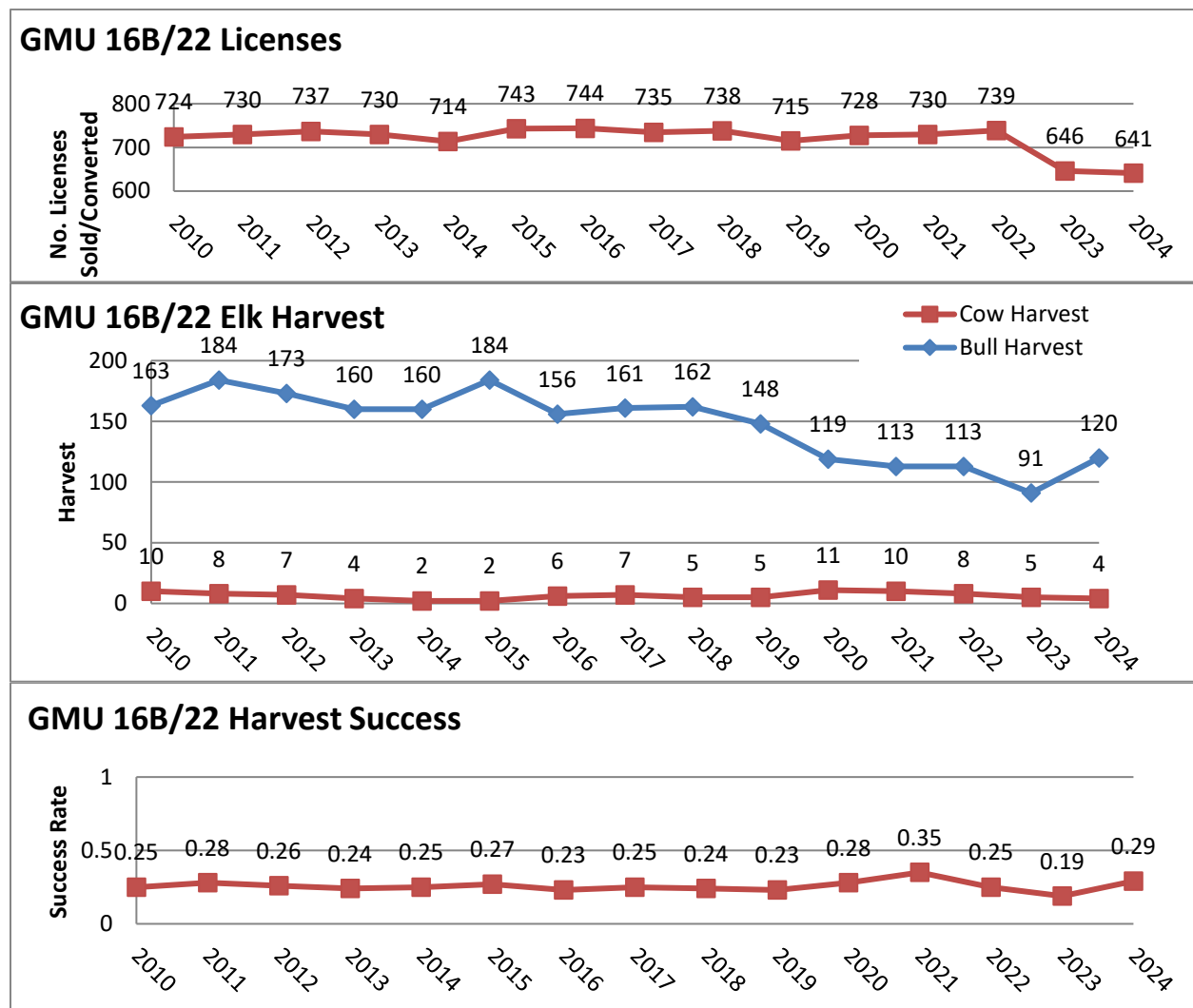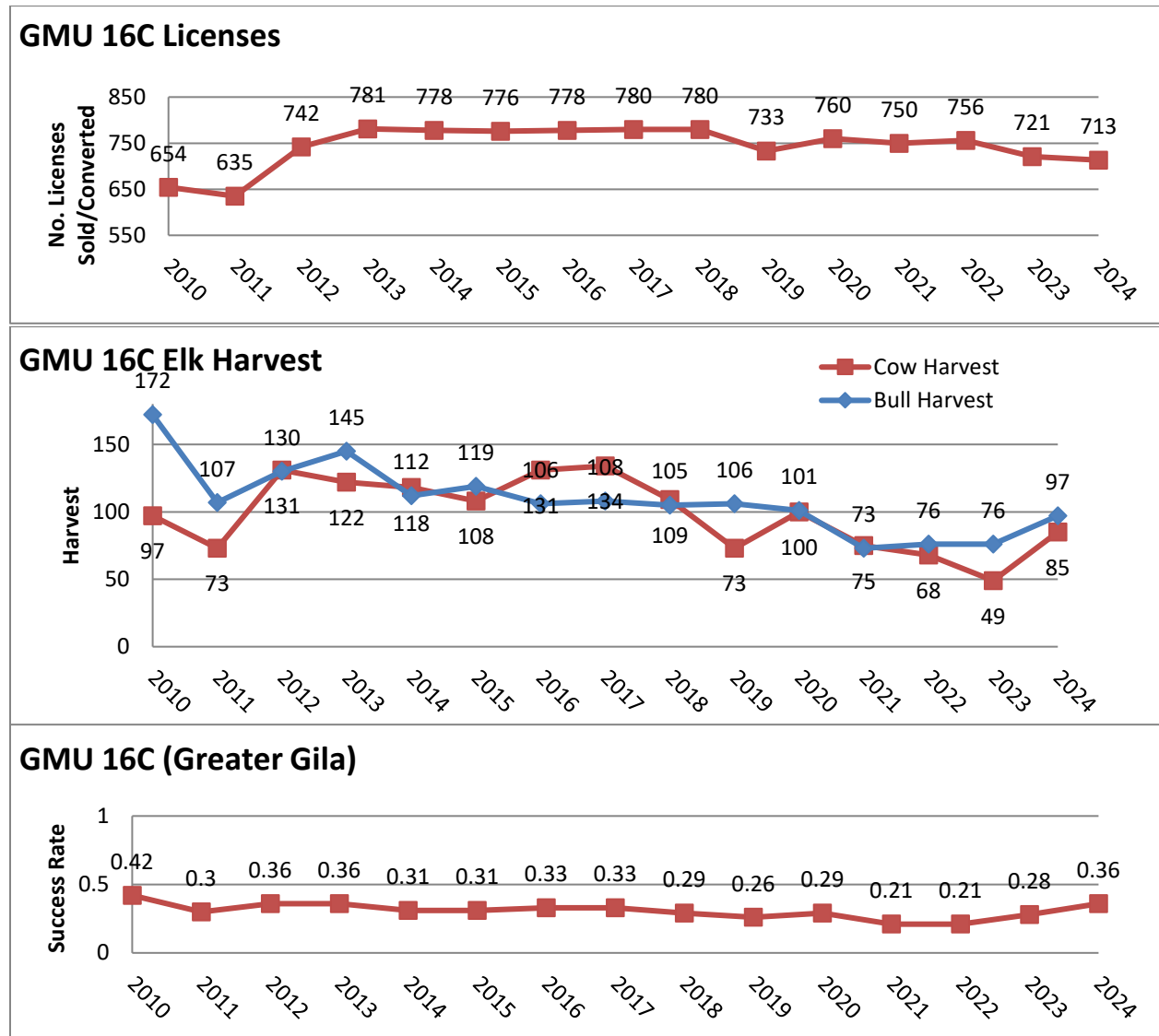
GMU 16A Licenses

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. Licenses Sold/Converted	847	885	954	952	948	956	951	950	951	954	949	945	947	930	925

GMU 16A Elk Harvest

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Bull Harvest	251	149	228	216	213	230	228	244	188	225	199	205	149	163	184
Cow Harvest	131	140	146	150	137	141	188	212	178	140	207	145	101	158	178

GMU 16A Harvest Success

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Success Rate	0.47	0.35	0.42	0.41	0.39	0.41	0.47	0.51	0.42	0.41	0.46	0.4	0.29	0.55	0.49

GMU 16B/22 (part of the Greater Gila Herd Unit; quality management)
Unit Maps: 16B, 22

BIOLOGY – Elk in GMUs 16B and 22 are part of the Greater Gila herd and population estimates include several GMUs (see regional description). The habitat is dominated by ponderosa pine forests with some grasslands interspersed throughout. The landscape is very rugged – especially within wilderness areas. Seasonal movements are very limited in this herd; likely due to the lack of heavy snow accumulation.

HUNTING – These units are 99% public land with much of the area falling in the Gila and Aldo Leopold Wilderness Areas. Road access is limited to nonexistent. Hunters should be prepared to hunt this unit with livestock or on foot. Some hunters choose to venture deep into the backcountry for multi-day excursions in pursuit of elk. These units are ideal for the hunter wishing to experience the solitude of a backcountry elk hunt. Hunter success is slightly below average for the state. The rugged and roadless nature of these units provide ample opportunity for hunters wishing to harvest an older age class bull. Hunter satisfaction remains above average.

GMU 16B/22 Licenses

No. Licenses Sold/Converted — 724, 730, 737, 730, 714, 743, 744, 735, 738, 715, 728, 730, 739, 646, 641 (2010–2024)

GMU 16B/22 Elk Harvest

Cow Harvest / Bull Harvest

Bull Harvest: 163, 184, 173, 160, 160, 184, 156, 161, 162, 148, 119, 113, 113, 91, 120 (2010–2024)

Cow Harvest: 10, 8, 7, 4, 2, 2, 6, 7, 5, 5, 11, 10, 8, 5, 4 (2010–2024)

GMU 16B/22 Harvest Success

Success Rate: 0.25, 0.28, 0.26, 0.24, 0.25, 0.27, 0.23, 0.25, 0.24, 0.23, 0.28, 0.35, 0.25, 0.19, 0.29 (2010–2024)
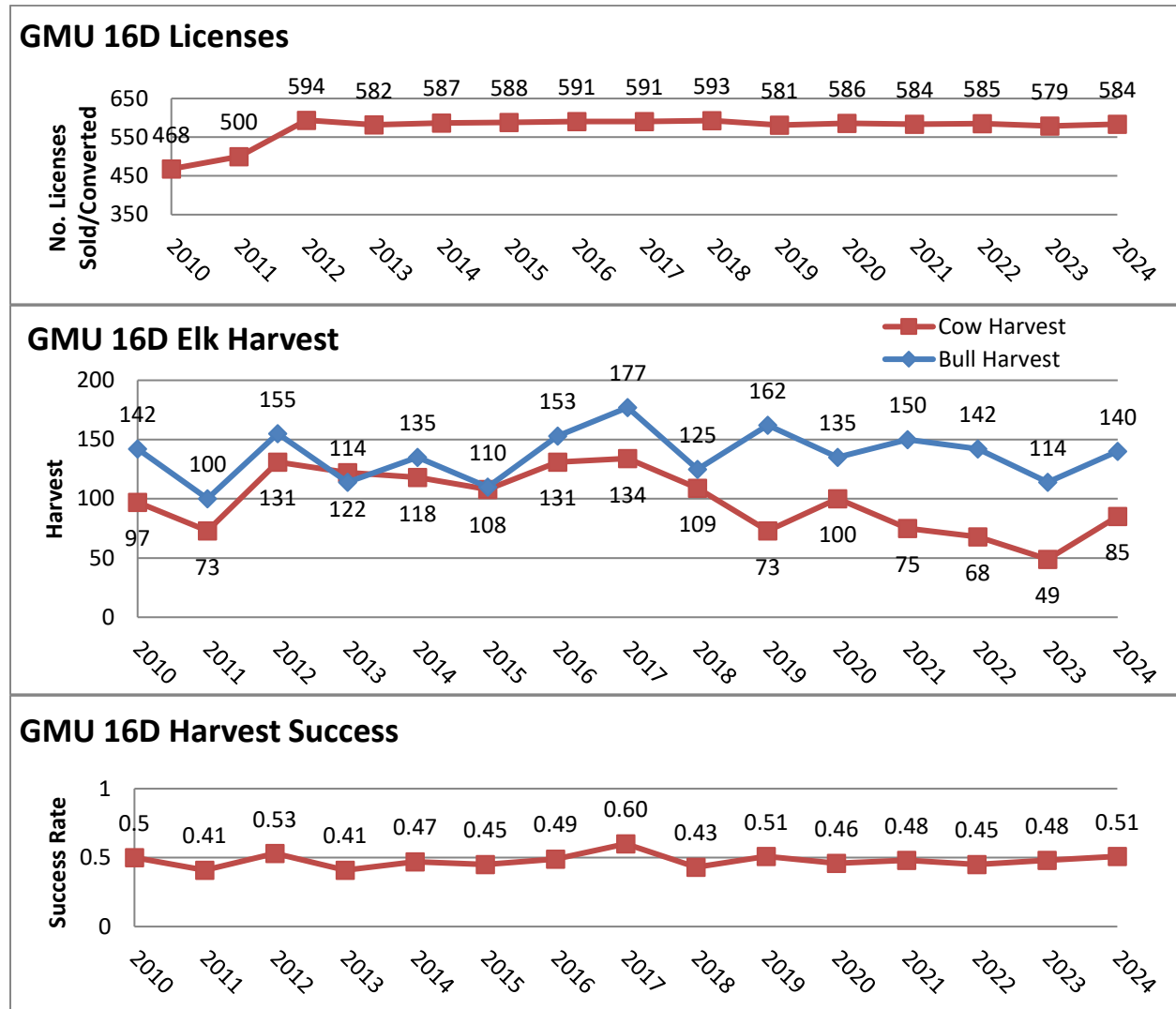
GMU 16C (part of the Greater Gila Herd; quality management)
Unit Map: 16C

BIOLOGY – Elk in GMU 16C are part of the Greater Gila herd where population estimates include several GMUs (see regional description). Like much of the region, the habitats range across an elevational gradient from plains and grasslands at low elevation to pinyon-juniper woodlands and ponderosa pine forests at higher elevations. Resource availability, often driven by precipitation patterns, typically determines movement patterns of elk across this unit during summer and fall seasons. Seasonal movements are very limited in this herd; likely due to the lack of heavy snow accumulation.

HUNTING – This unit is comprised of 83% public land with good road access. Hunters should stay flexible and scout during August and September to determine where moisture events have occurred to determine best places to hunt during the season. Moisture during this time often dictates the availability of resources and often elk.

GMU 16C Licenses

No. Licenses Sold/Converted: 654, 635, 742, 781, 778, 776, 778, 780, 780, 733, 760, 750, 756, 721, 713 (2010–2024)

GMU 16C Elk Harvest

Cow Harvest / Bull Harvest

Bull Harvest: 172, 107, 130, 145, 112, 119, 106, 108, 105, 106, 101, 73, 76, 76, 97

Cow Harvest: 97, 73, 131, 122, 118, 108, 131, 134, 109, 73, 100, 75, 68, 49, 85

GMU 16C (Greater Gila)

Success Rate: 0.42, 0.3, 0.36, 0.36, 0.31, 0.31, 0.33, 0.33, 0.29, 0.26, 0.29, 0.21, 0.21, 0.28, 0.36 (2010–2024)

GMU 16D (part of the Greater Gila Herd; quality management)

Unit Map: 16D

BIOLOGY – Elk in GMU 16D are part of the Greater Gila herd and population estimates include several GMUs (see regional description). Like the rest of the region, habitats range across an elevational gradient from plains and grasslands at low elevation to pinyon-juniper woodlands and ponderosa pine forests at higher elevations. The landscape is predominantly mountainous with extensive foothills and some lower elevation meadows. Seasonal movements are very limited in this herd; likely due to the lack of heavy snow accumulation

HUNTING – This unit is 88% public land with good road access. Topography within the unit offers varied elk habitat from low elevation winter range to high mountain ridgelines, with many drainage and foothills areas to provide escape terrain. This is often characterized as one of the best units in the state because of the abundant elk habitat and resources. This unit has high elk densities and the hunter will be able to not only find elk, but they will have the flexibility to focus on older age class bulls, if desired. Hunter satisfaction and harvest rates are consistently higher than average.

GMU 16E (part of the Greater Gila Herd Unit; quality management)

Unit Map: 16E

BIOLOGY – Elk in GMU 16E are part of the Greater Gila herd and population estimates include several GMUs (see regional description). The unit is dominated by large amounts of open grassland country while Luera and Pelona Mountains offer some topography and timber where elk often find cover. Resource availability can determine elk concentrations and are typically driven by precipitation patterns.

HUNTING – This unit is comprised of 63% public land but has limited road access. State, BLM, and private properties checkerboard the unit; thus, navigation skills or a GPS with land status will benefit hunters. An often-productive technique for hunting this area is to use optics to scan the vast landscape before pursuing target groups. Elk move regularly in this based on moisture events and hunter pressure so hunters should be prepared to relocate if they aren't seeing elk.

GMU 16E Licenses

GMU 16E Elk Harvest
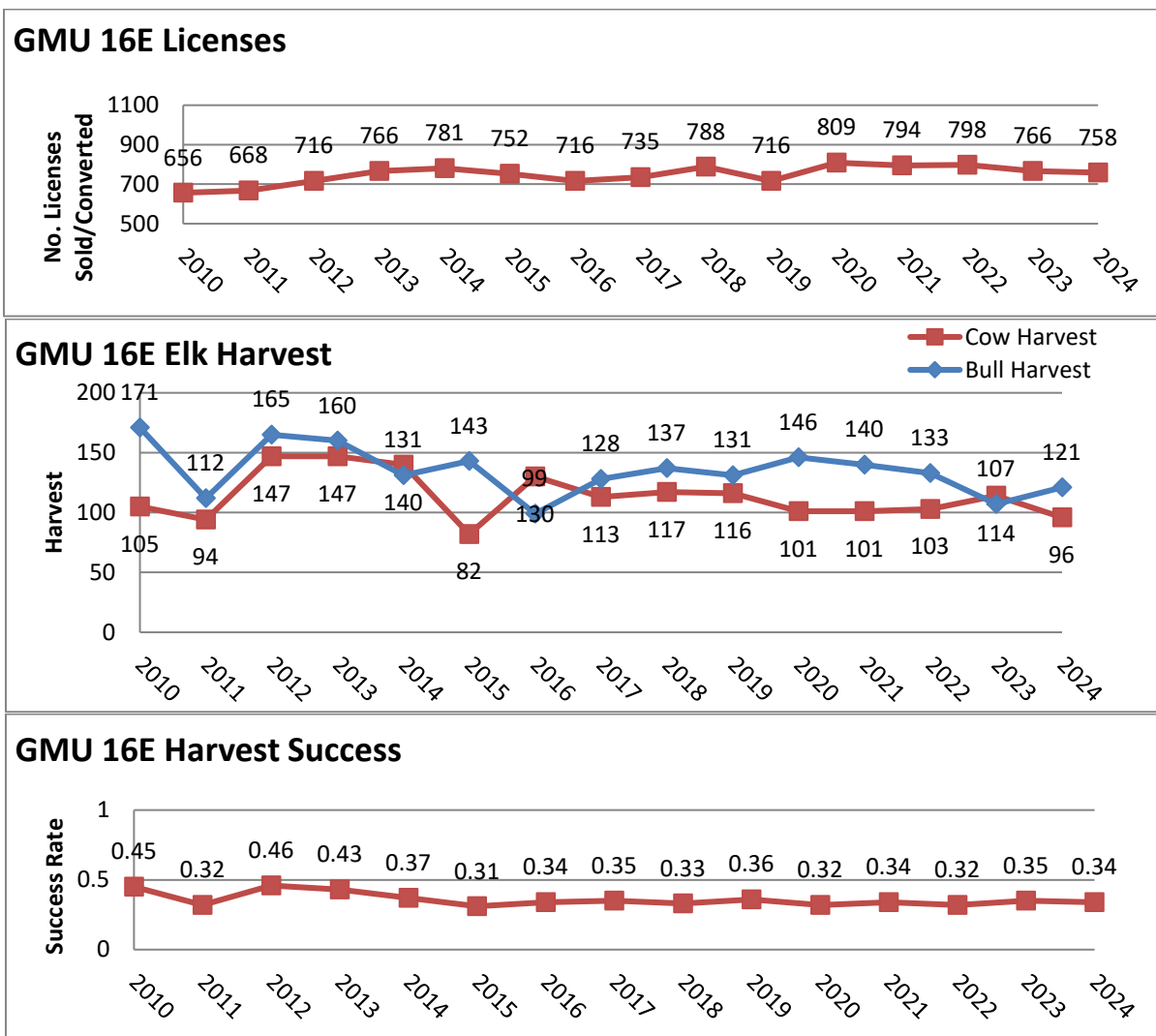
GMU 16E Harvest Success

San Mateo/Magdalena Herd (GMU 17)

Quality Management

Unit Map: 17
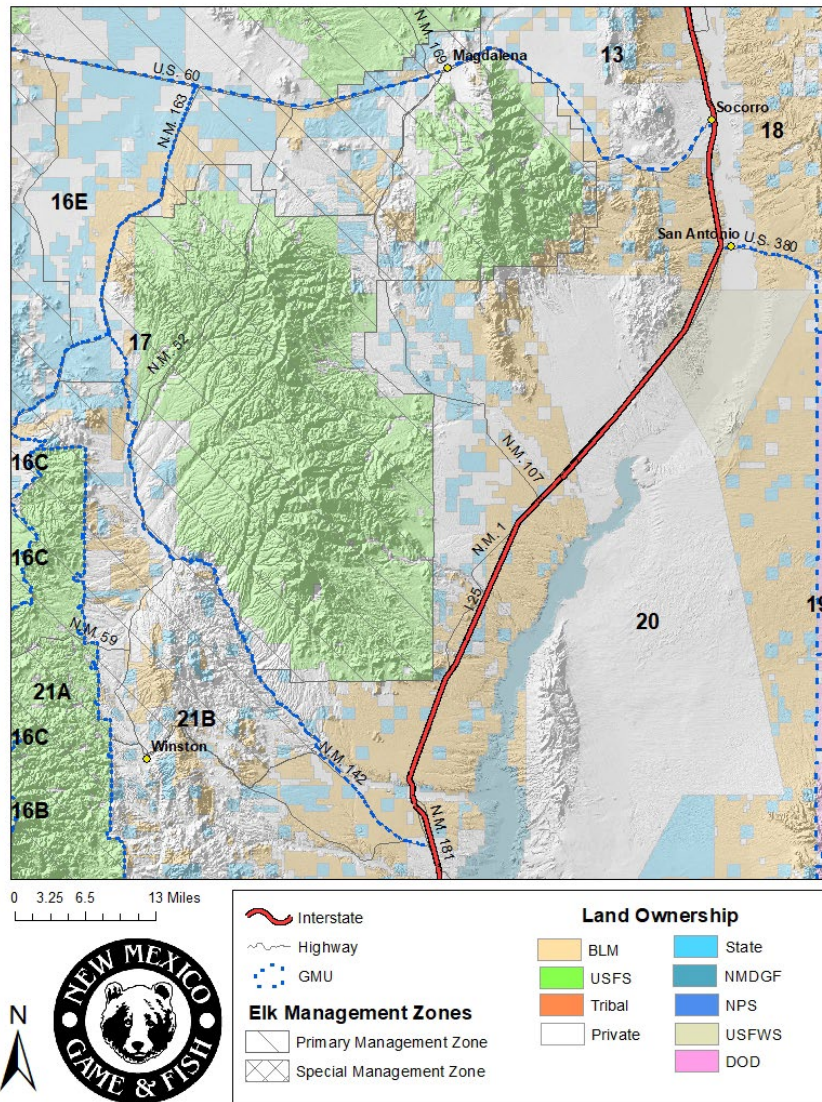
BIOLOGY – GMU 17 is considered a standalone elk herd unit, the San Mateo/Magdalena herd. The habitats range across an elevational gradient from plains and grasslands at low elevation to pinyon-juniper woodlands and ponderosa pine forests at higher elevations. Wildfires along the eastern slopes of Mt. Withington, Blue Mountain, and northern San Mateo mountains provide new growth and forage for elk. The herd is surveyed annually and population sizes are estimated using a combination of annual composition data as well as annual hunter harvest data.

HUNTING – This hunt unit offers hunting opportunities with primitive weapons so hunters will find only muzzleloader and bow hunts. The unit is comprised of 74% public land with a network of Forest Service roads providing good access. This unit has a higher bull to cow ratio allowing the hunter to focus on older age class bulls, if desired. Both the San Mateo and Magdalena Mountains have extremely rugged country including the Apache Kid and Mt. Withington Wilderness Areas. The Department offers a late season bull hunt, and these hunters should focus in the extremely rugged country where bulls congregate during the winter.

Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
1,600 – 2,400	51:100:38	110 – 180 Males
Stable		130 – 200 Females

GMU 17 Licenses

No. Licenses Sold/Converted

760, 819, 835, 850, 829, 834, 835, 850, 845, 861, 863, 907, 910, 850, 854

GMU 17 Elk Harvest

Cow Harvest
Bull Harvest

Harvest

Bull Harvest: 139, 113, 155, 160, 154, 159, 152, 161, 143, 154, 142, 134, 146, 99, 119

Cow Harvest: 60, 49, 66, 70, 71, 55, 81, 58, 56, 60, 80, 73, 94, 54, 49

GMU 17 Harvest Success

Success Rate

0.27, 0.21, 0.28, 0.29, 0.29, 0.27, 0.30, 0.28, 0.26, 0.25, 0.28, 0.24, 0.29, 0.21, 0.25
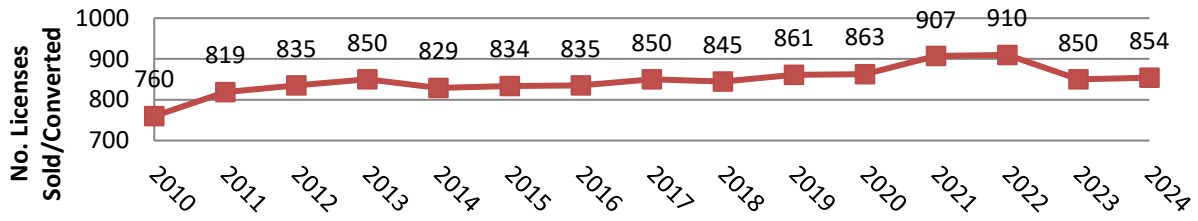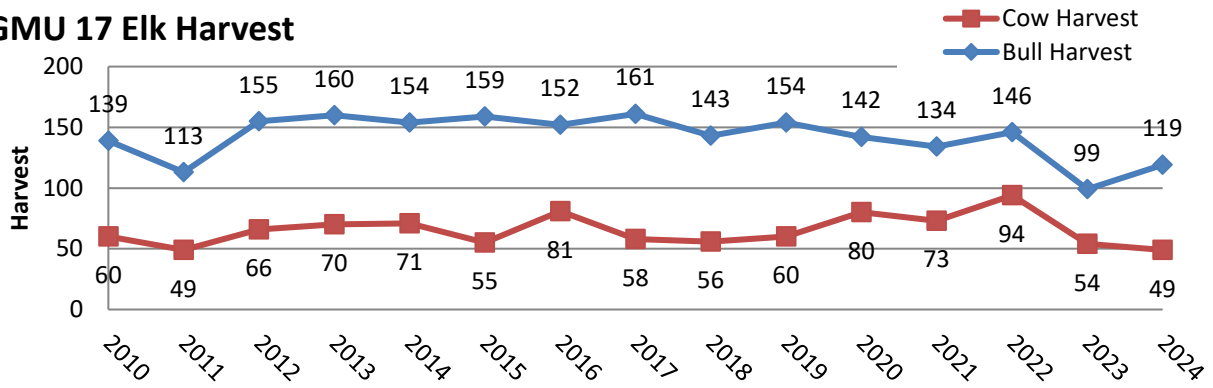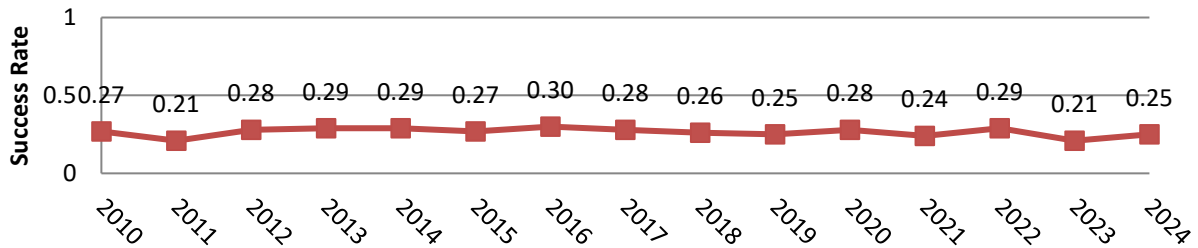
Lesser Gila Herd (GMUs 21A, 21B, 23 and 24)
Opportunity Management
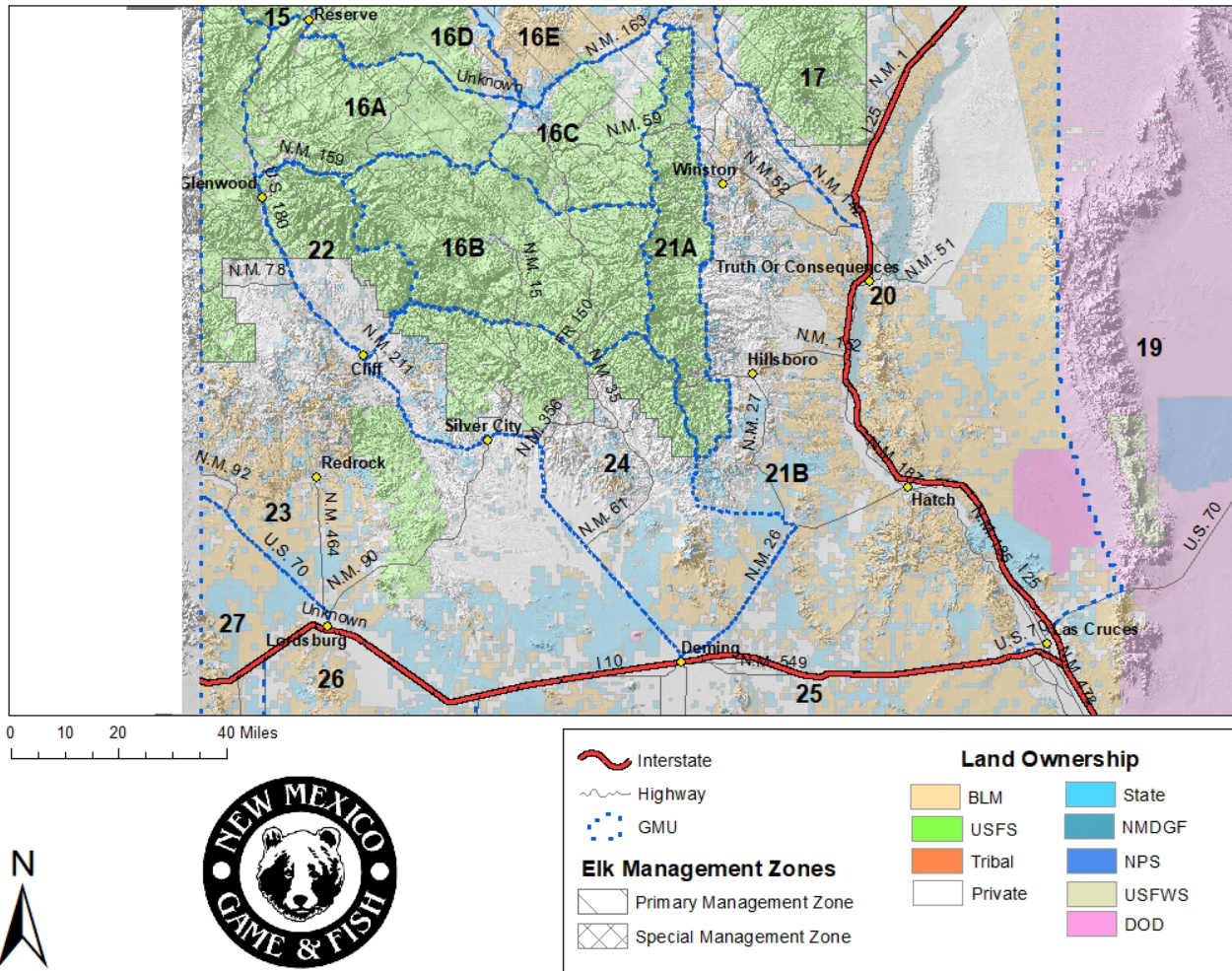
The Lesser Gila elk herd unit spans across a combination of National Forest, BLM, State, and private properties. Only GMU 21A is managed entirely within the Primary Management Zone, all other units are combined Primary and Secondary Management Zones. Although public property contributes most of the land, much of it lies outside the Primary Management Zone and thus public draw permits are more limited than other regions. Elk are surveyed regularly, but not in every segment of the population so hunter harvest information is important for monitoring the Lesser Gila herd. Population size estimates are made across all GMUs within the Lesser Gila herd, which is considered stable to slightly increasing.

Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
1,300 – 4,400*	39:100:27	80 – 280 Males
Stable		70 – 280 Females

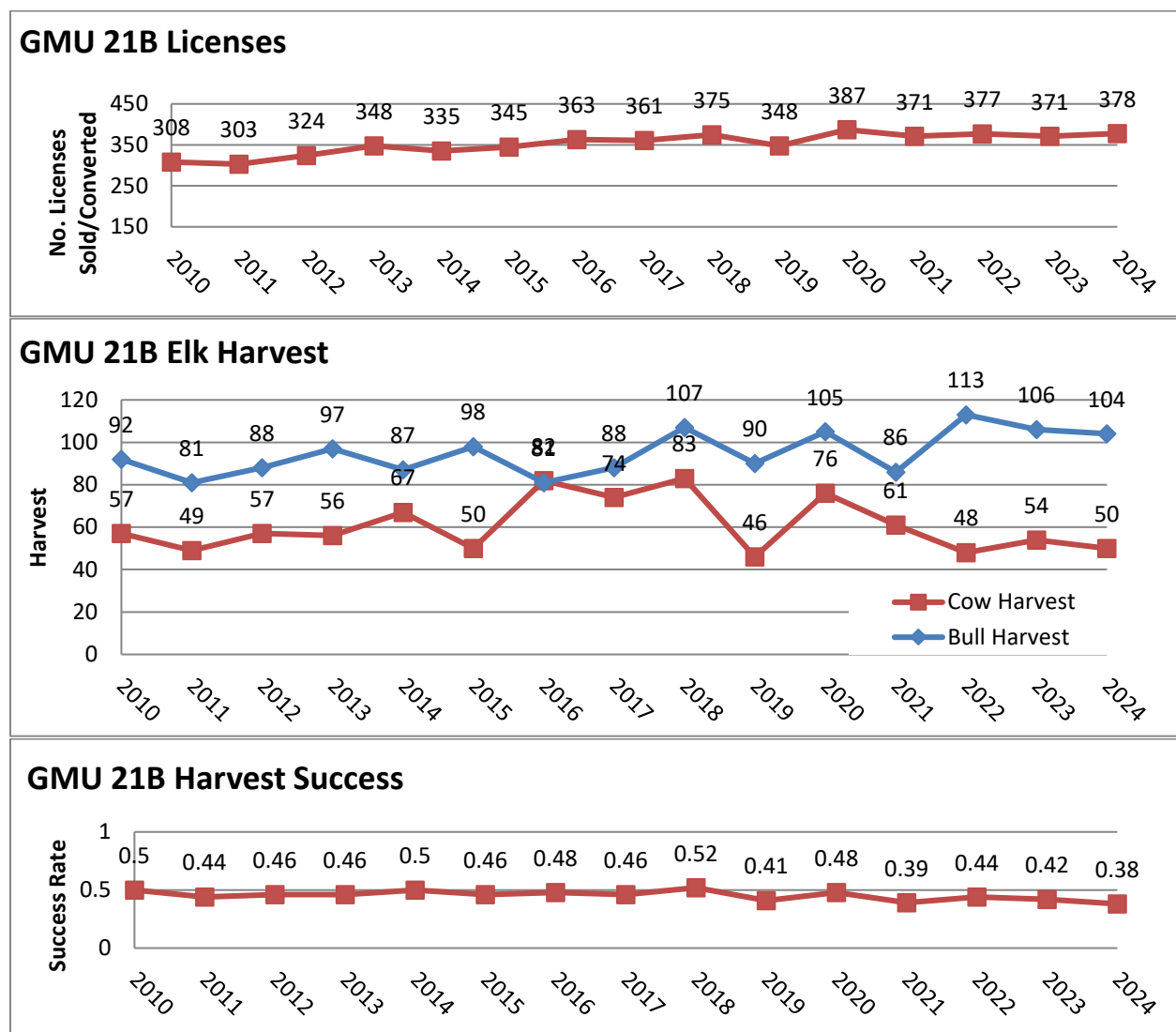*Note: Elk populations within the Lesser Gila herd unit are estimated at the regional level and population estimates are calculated across GMUs 21A, 21B, 23, and 24.

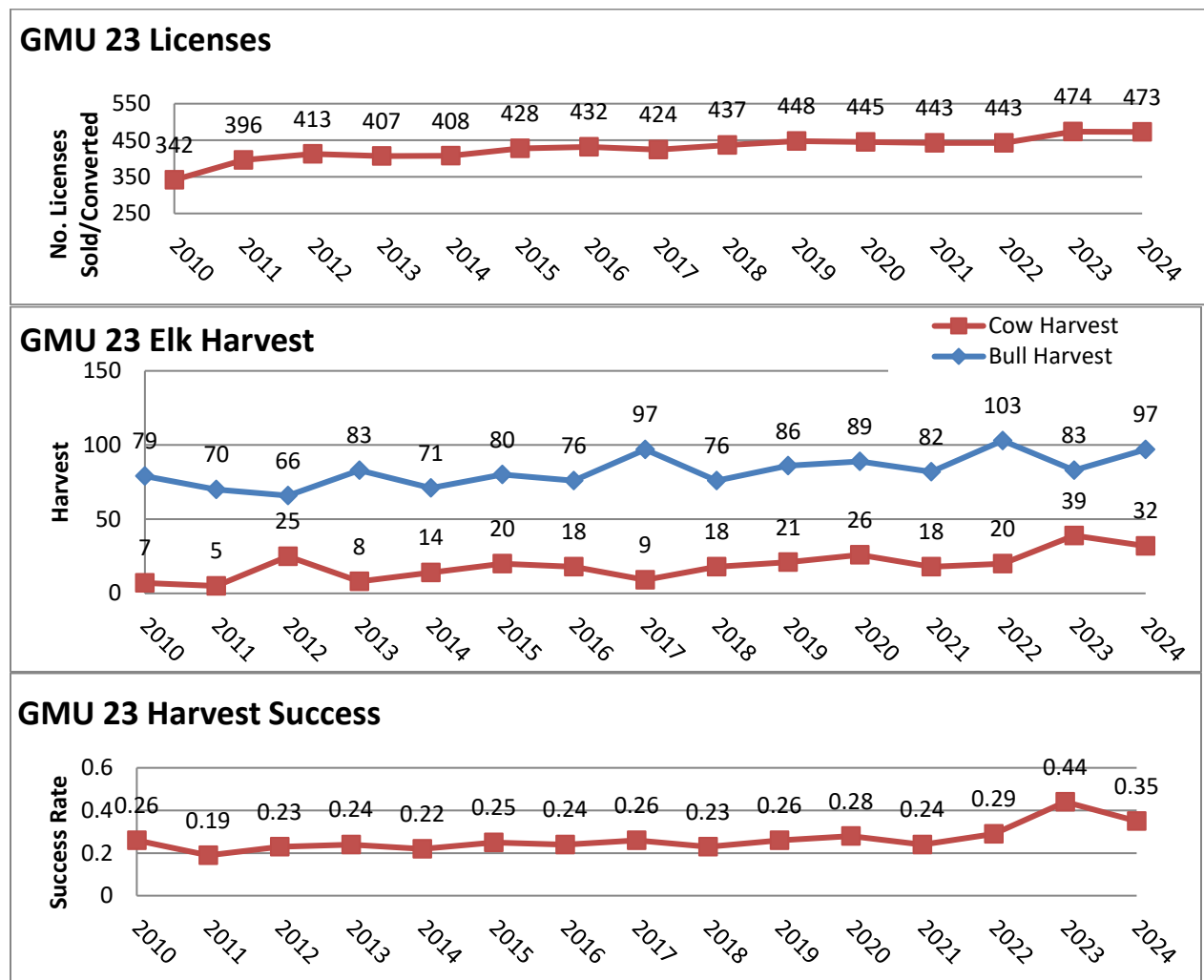## GMU 21A (part of the Lesser Gila Herd; opportunity management)
Unit Map: 21A

BIOLOGY – Elk in GMU 21A are part of the Lesser Gila herd and population estimates include several GMUs (see regional description). The habitat is dominated by ponderosa pine and scrub oak forests throughout. Portions of this unit, especially within the Aldo Leopold Wilderness area, are extremely rugged. Elk are typically found in lower densities; however, localized groups can be found where resources are plentiful. Much of the southern portion of the unit burned in the 2013 Silver fire, providing early growth forests with plentiful forage during normal precipitation years.

HUNTING – GMU 21A is 98% public land and contains a portion of the Aldo Leopold Wilderness Area. Road access is limited, but Forest Service roads and trailheads provide several starting points. Hunters may have better success using livestock to get into the roadless areas and will need to stay flexible to find mobile concentrations of elk as they will move across the landscape.

GMU 21A Licenses

No. Licenses Sold/Converted

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
203	205	207	206	203	236	234	234	235	257	254	254	255	254	257

GMU 21A Elk Harvest

Cow Harvest / Bull Harvest

Harvest

Bull Harvest: 87, 49, 59, 59, 51, 68, 57, 47, 61, 50, 43, 37, 45, 40, 49

Cow Harvest: 0, 1, 4, 0, 1, 12, 13, 14, 14, 10, 6, 13, 9, 11, 19

GMU 21A (Lesser Gila)

Success Rate

| 2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
0.44	0.27	0.32	0.32	0.28	0.38	0.32	0.28	0.34	0.25	0.22	0.24	0.24	0.31	0.42

GMU 21B (part of the Lesser Gila Herd Unit; opportunity management)
Unit Map: 21B

BIOLOGY – Elk in GMU 21B are part of the Lesser Gila herd and population estimates include several GMUs (see regional description). The unit is dominated by arid shrub and grasslands and deserts. Clusters of elk are typically found where precipitation and moisture support localized forage and water resources.

HUNTING – This unit is comprised of 63% public land (BLM and State land only) spread across the landscape in pockets and access is limited. Elk move throughout the unit depending on moisture events and hunting pressure. Good knowledge of the landscape is helpful. Hunters should expect to be familiar with ownership boundaries and carry maps or GPS software with updated landownership.

GMU 21B Licenses

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
No. Licenses Sold/Converted	308	303	324	348	335	345	363	361	375	348	387	371	377	371	378

GMU 21B Elk Harvest

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cow Harvest	57	49	57	56	67	50	82	74	83	46	76	61	48	54	50
Bull Harvest	92	81	88	97	67	98	82	88	107	90	105	86	113	106	104

GMU 21B Harvest Success

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Success Rate	0.5	0.44	0.46	0.46	0.5	0.46	0.48	0.46	0.52	0.41	0.48	0.39	0.44	0.42	0.38

GMU 23 (part of the Lesser Gila Herd Unit; opportunity management)

Unit Map: 23

BIOLOGY – Elk in GMU 23 are part of the Lesser Gila herd and population estimates include several GMUs (see regional description). Ponderosa pine forests with some grasslands are found on the northern end of this unit while desert habitats and arid shrublands dominate the southern portion. Elk populations are localized. However, elk have expanded in this unit over the past 20 years.

HUNTING – This unit is comprised of 63% public land that can be accessed through the network of Forest Service and BLM roads. The Blue Ridge Wilderness is found in this unit providing an opportunity to get away from roads. Hunters should be flexible and look for elk where rain events have more recently occurred. Elk have been expanding in this unit and there are portions in the south that have potential to hold older age class bulls.

GMU 24 (part of the Lesser Gila Herd Unit; opportunity management)

Unit Map: 24

BIOLOGY – Elk in GMU 24 are part of the Greater Gila herd and population estimates include several GMUs (see regional description). Ponderosa pine forests with some grasslands are found on the northern end of this unit while desert habitats and arid shrublands dominate the southern portion. Resource availability, primarily driven by precipitation and moisture, dictate locations and movement of elk across the landscape.

HUNTING – This unit is comprised of 63% public land with good road access. Overall the unit has relatively low elk densities. Elk are generally found in small, local pockets on public land. Success rates are moderate.
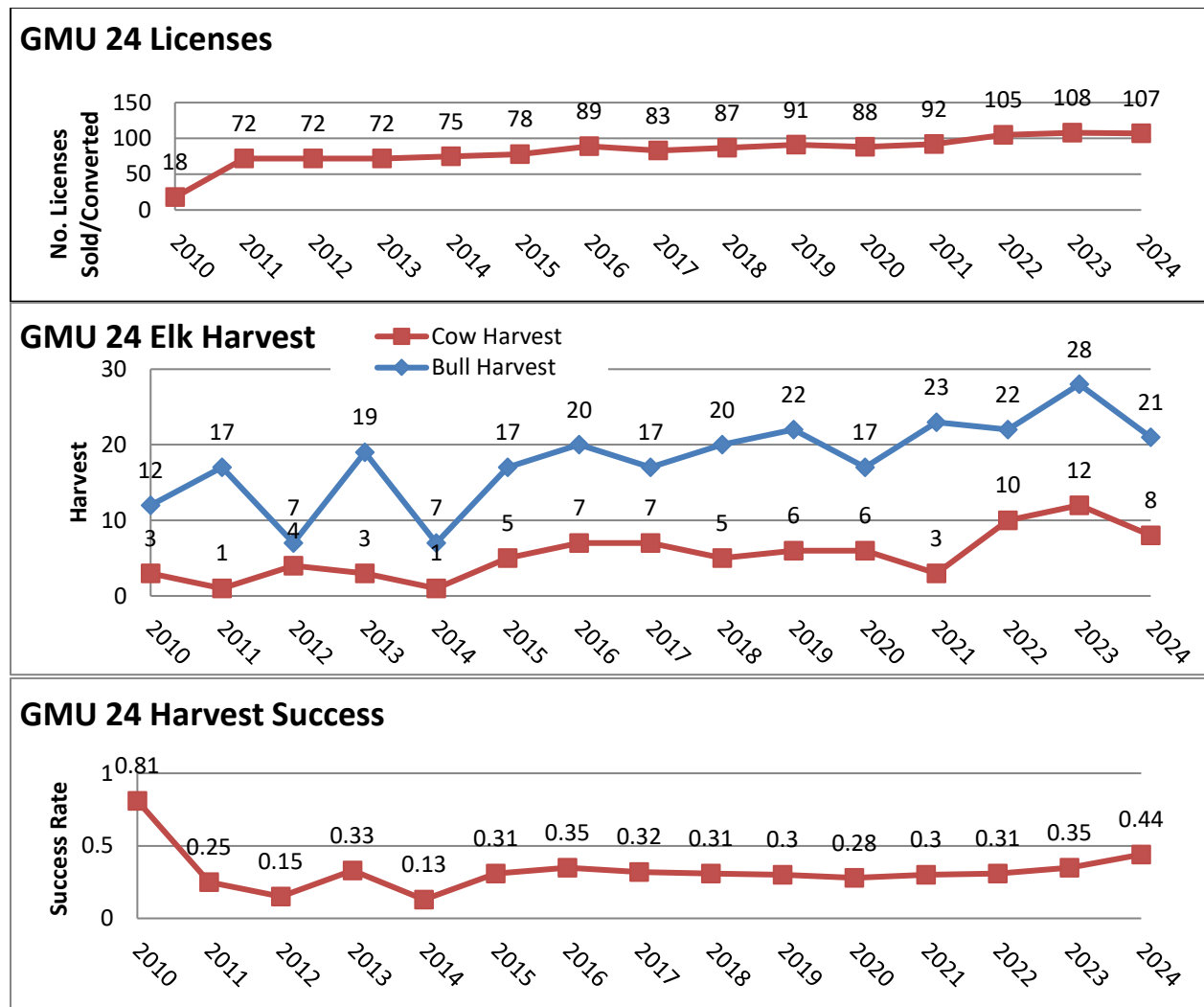
Southeast Region – Sacramento and Ruidoso Herds

The Southeast Region of New Mexico is a popular destination for both resident and nonresident elk hunters. The popularity of the southeast can be attributed to high harvest success rates and the opportunity to harvest older age class bulls. Although public draw licenses are available outside GMUs 36 and 34, the majority of elk hunting occurs on the Lincoln National Forest within the PMZ in these two units. Roads on forest service lands provide good access to some quality areas, and if a hunter wants to get further away from people, there are two wilderness areas with large elk populations: the White Mountain Wilderness in GMU 36 and the Capitan Wilderness in GMU 37. The Sacramento and Ruidoso herds consistently have some of the highest bull to cow ratios in the state as well as one of the most productive elk herds in the state. Beginning in 2022, NMDGF has collaborated with biologists from the Mescalero Apache Division of Resource Management and Protection to better understand elk populations and management across the Sacramento Mountains. By incorporating datasets, investigating movement across jurisdictions, and monitoring adjacent populations in tandem, biologists are able to consider management strategies for elk across one large contiguous mountain range, rather than distinct populations separated by landownership boundaries.
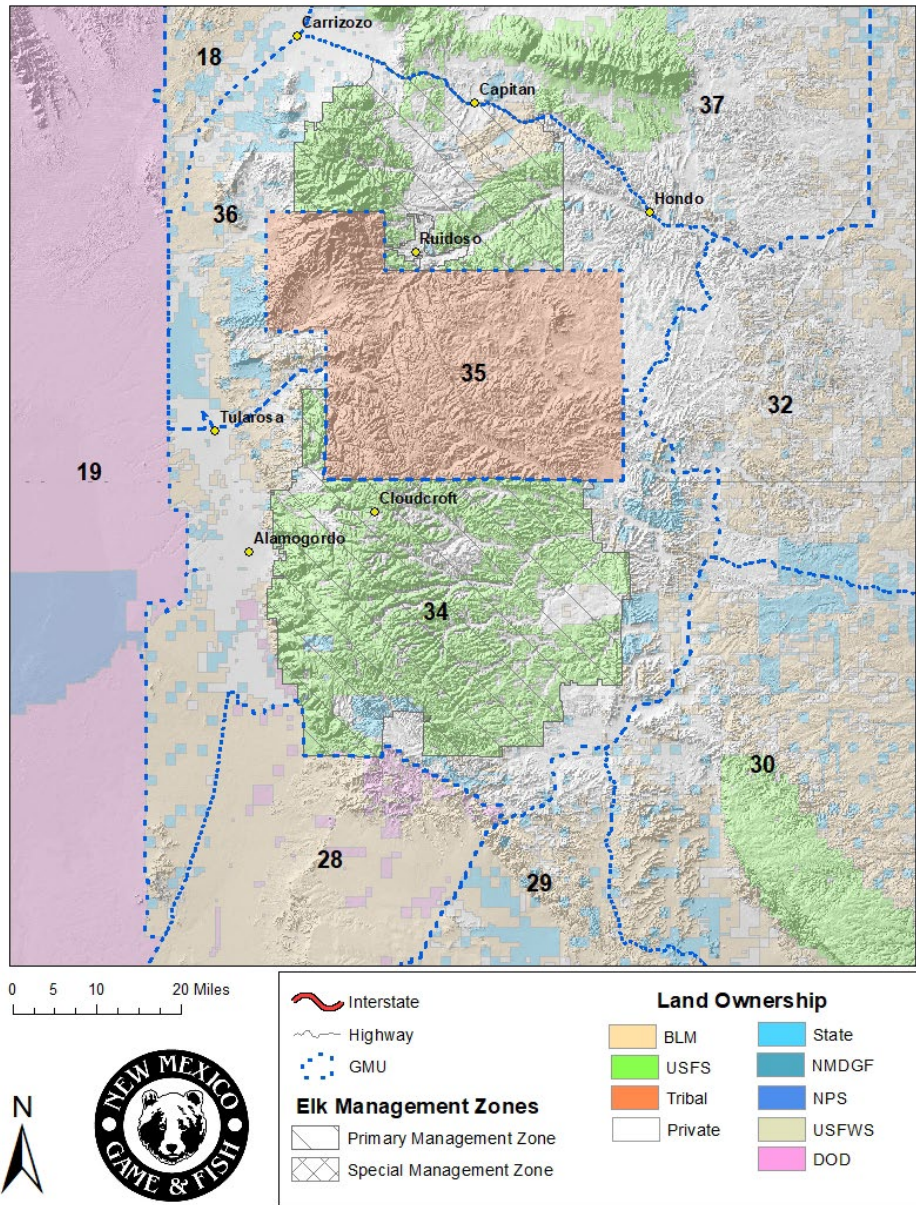
Sacramento Herd (GMU 34)

Opportunity Management

Unit Map: 34
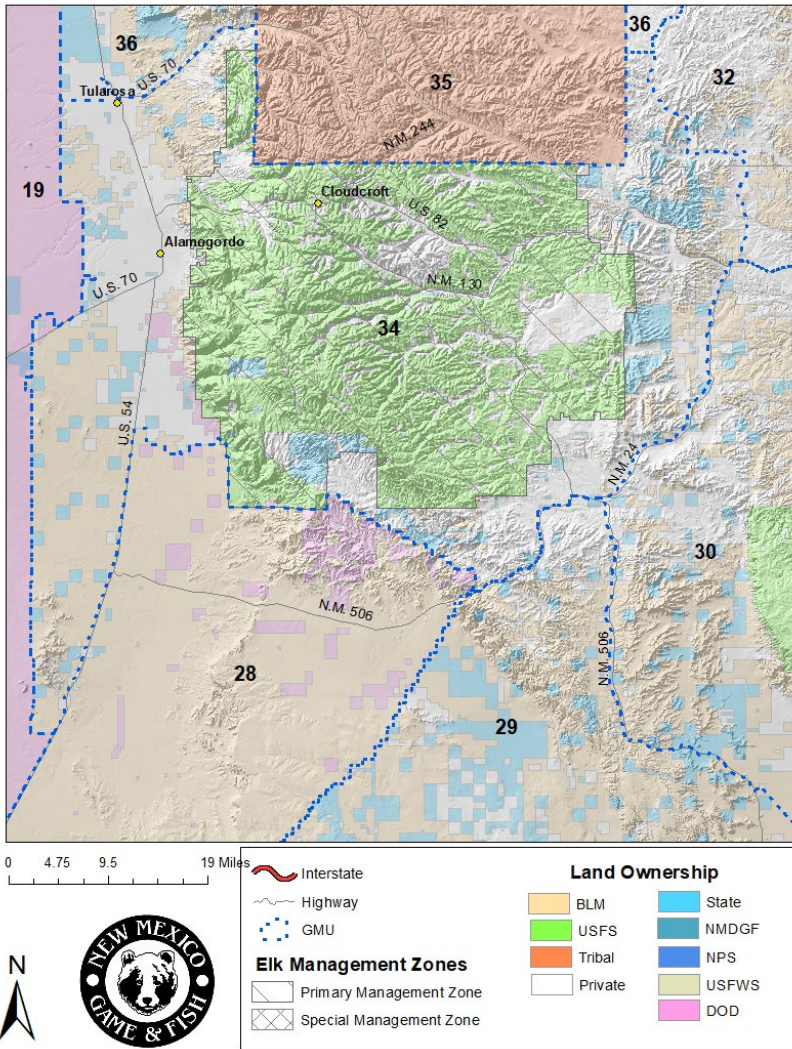
BIOLOGY – GMU 34 is considered a standalone elk herd unit, the Sacramento herd. Most likely the Sacramento herd is part of a larger herd complex that includes the Ruidoso herd (GMU 36) to the north and encompasses Mescalero tribal land in-between. However, since Mescalero tribal lands split these two units, 34 and 36, the Department considers each GMU on its own for purposes of generating population estimates and making management recommendations. Elevations in GMU 34 range from 4,300-9,700 feet and the habitat is creosote/mesquite and pinyon-juniper woodlands in lower elevations with mixed conifer forests in higher elevations. Heavy snowfall in the high elevations will cause elk to move to lower elevations. However, the climate in this region is typically milder than that of the northern mountains and snowfall events aren't always severe enough to spur elk movement during winter months. Elk populations are monitored annually via aerial surveys; population sizes are estimated using a combination of survey data and annual hunter harvest data. The herd is increasing, despite the higher female harvest in recent years.

HUNTING – This unit is comprised of 67% public land and road access is excellent throughout. A large portion of the unit falls within the Lincoln National Forest. This unit is managed as an opportunity area and has one of the highest bull to cow ratios in the state. Hunter success in this unit is consistently high with older-age class males taken annually. Hunters should be aware that Chronic Wasting Disease (CWD) has been detected in this unit and are advised to check the regulations for transporting their elk carcass (Carcass transport regulations webpage).

Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
7,400 – 8,600	52:100:39	500 – 660 Males
Increasing		610 – 710 Females

GMU 34 Licenses

No. Licenses Sold/Converted

2350, 2337, 2398, 2599, 2445, 2601, 2601, 3136, 2873, 3104, 3138, 3170, 3198, 3695, 3721

(2010–2024)

GMU 34 Elk Harvest

- ■ Cow Harvest
- ◆ Bull Harvest

Harvest

Cow Harvest: 467, 478, 604, 670, 465, 558, 556, 781, 716, 915, 980, 829, 782, 1004, 1031

Bull Harvest: 565, 438, 514, 539, 542, 600, 663, 623, 604, 717, 690, 749, 742, 731, 723

(2010–2024)

GMU 34 Harvest Success

Success Rate

0.45, 0.42, 0.49, 0.49, 0.45, 0.47, 0.49, 0.47, 0.48, 0.56, 0.56, 0.52, 0.5, 0.54, 0.48

(2010–2024)
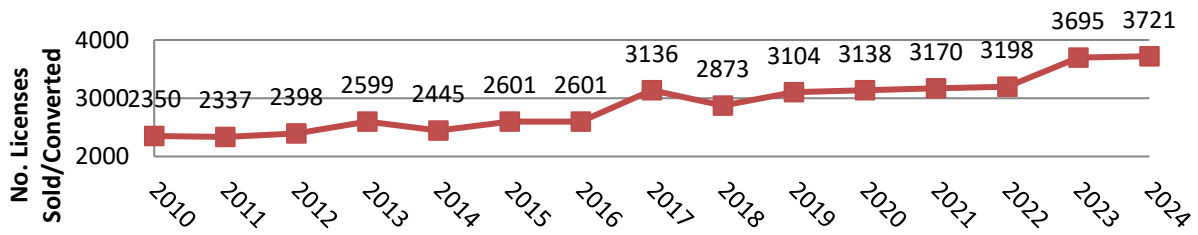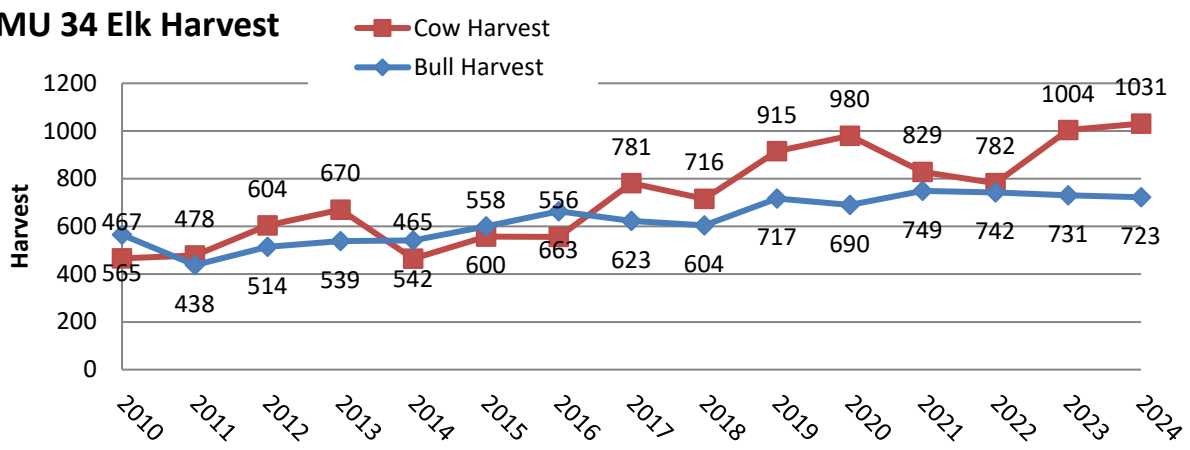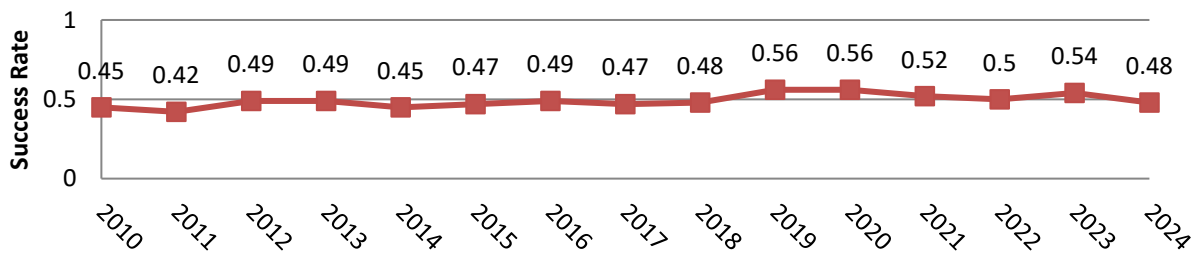
Ruidoso Herd (GMU 36)
Quality Management
Unit Map: 36
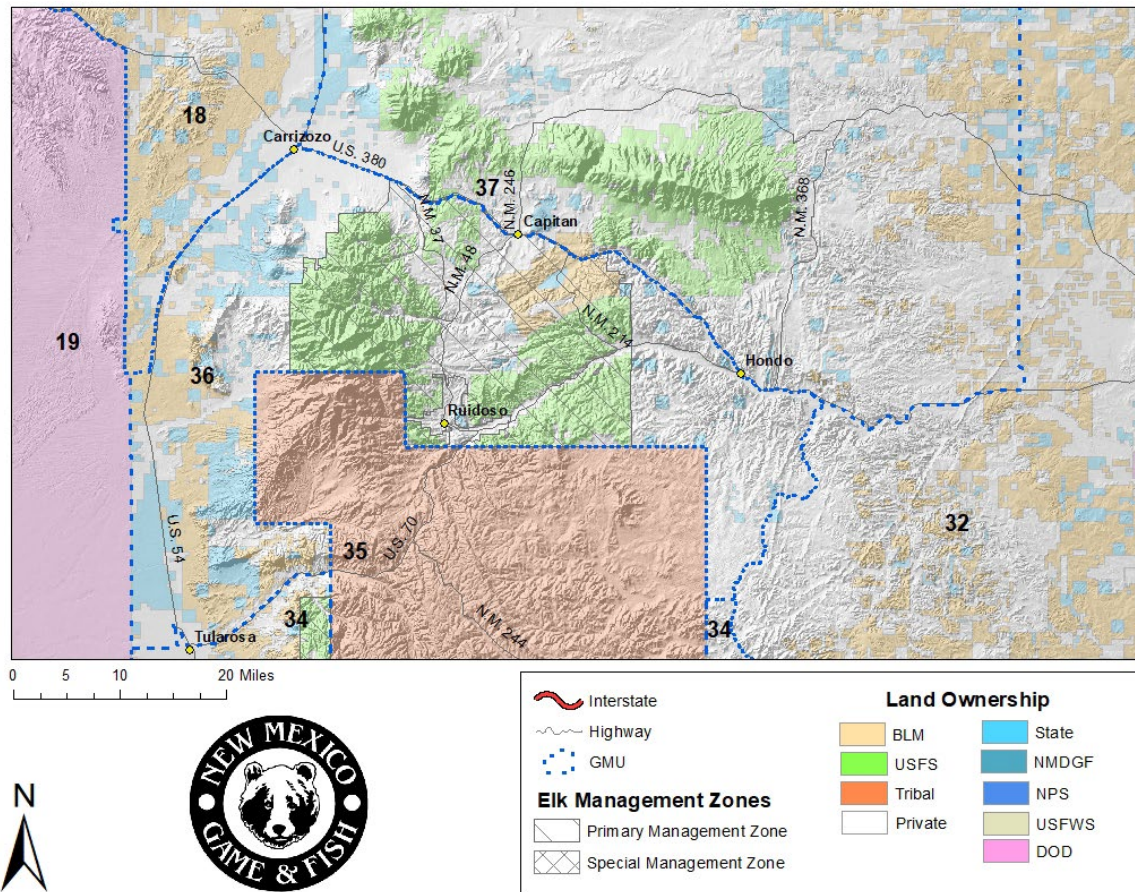
BIOLOGY – GMU 36 is considered a standalone elk herd unit, the Ruidoso herd. Most likely the Ruidoso herd is part of a larger herd complex that includes the Sacramento herd (GMU 34) to the south and encompasses Mescalero tribal land in between. However, since Mescalero tribal lands split these two units, 34 and 36, the Department considers each GMU on its own for purposes of generating population estimates and making management recommendations. Elevations in this unit range from 4,800-10,800 feet and the habitat ranges from pinyon-juniper woodlands in the lower elevations to high elevation oak woodlands and mixed conifer forests. Heavy snowfall in the high elevations will push elk down to lower elevations, but due to a mild climate these snowfalls don't always occur. As such, these elk do not migrate as regularly as some herds in northern New Mexico. The White Mountain Wilderness is ideal for those looking to get away from roads. Elk populations are monitored annually via aerial surveys and population sizes are estimated using a combination of survey and annual hunter harvest data. The herd is increasing.

HUNTING – This unit is comprised of 53% public land and road access is good. This unit is managed as a quality area, and success rates are consistently high. This unit has one of the highest bull to cow ratios in the state, and large, older-age class bulls are harvested every year. With the highest bull to cow ratios in the state, bull hunters should be able to observe quite a few males and can be picky about their harvest. Hunter success rates are consistently higher than average in this unit.

Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
5,400 -8,500	66:100:43	370 – 640 Males
Slightly Increasing		610 – 710 Females

GMU 36 Licenses
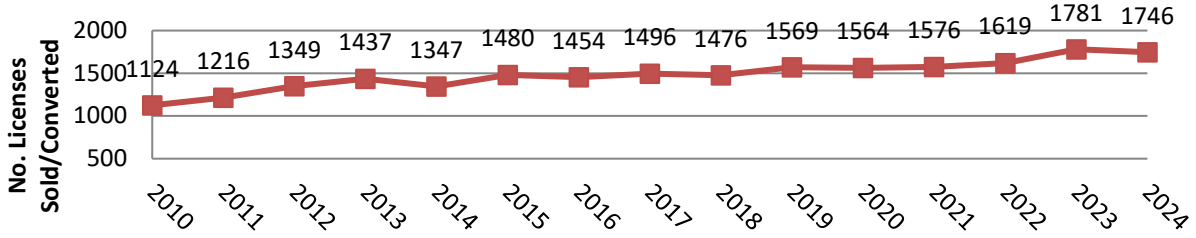
GMU 36 Elk Harvest
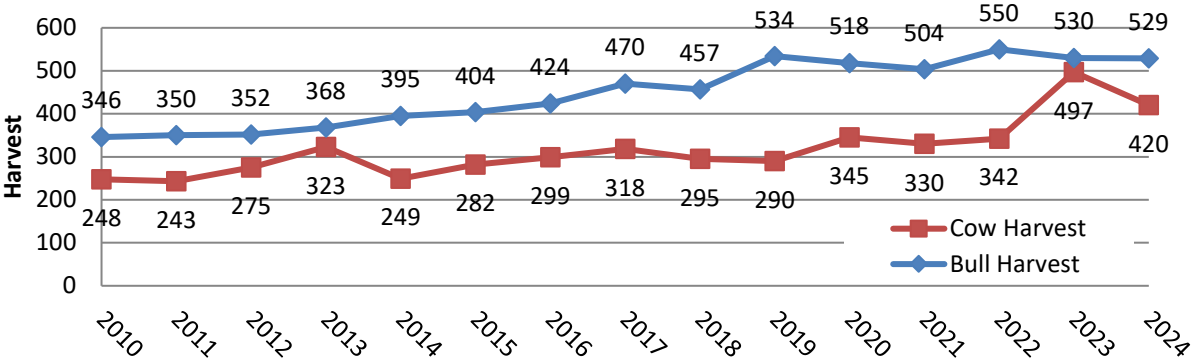
GMU 36 Harvest Success
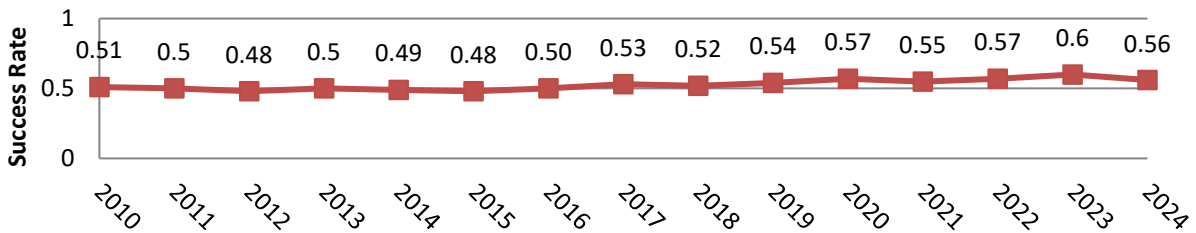
Northeast Region – Pecos, Whites Peak, and Peñasco Herds

The Northeast Region offers a variety of elk hunting opportunities with habitats ranging from eastern plains to alpine, and it can accommodate everyone's unique hunting style. Elk populations are healthy and most herds are stable to increasing. Habitats range from semi-arid grass and scrubland to sub-alpine forests within high elevation wilderness areas. Much of the hunting opportunities within these herds is offered in predominately public land areas with moderate to good access (with the exception of GMUs in Special Management Zones). Although the Northeast doesn't receive as much attention for producing large antlered elk, those who draw a license stand a good chance at harvesting an elk and some older-age class bulls may be taken.
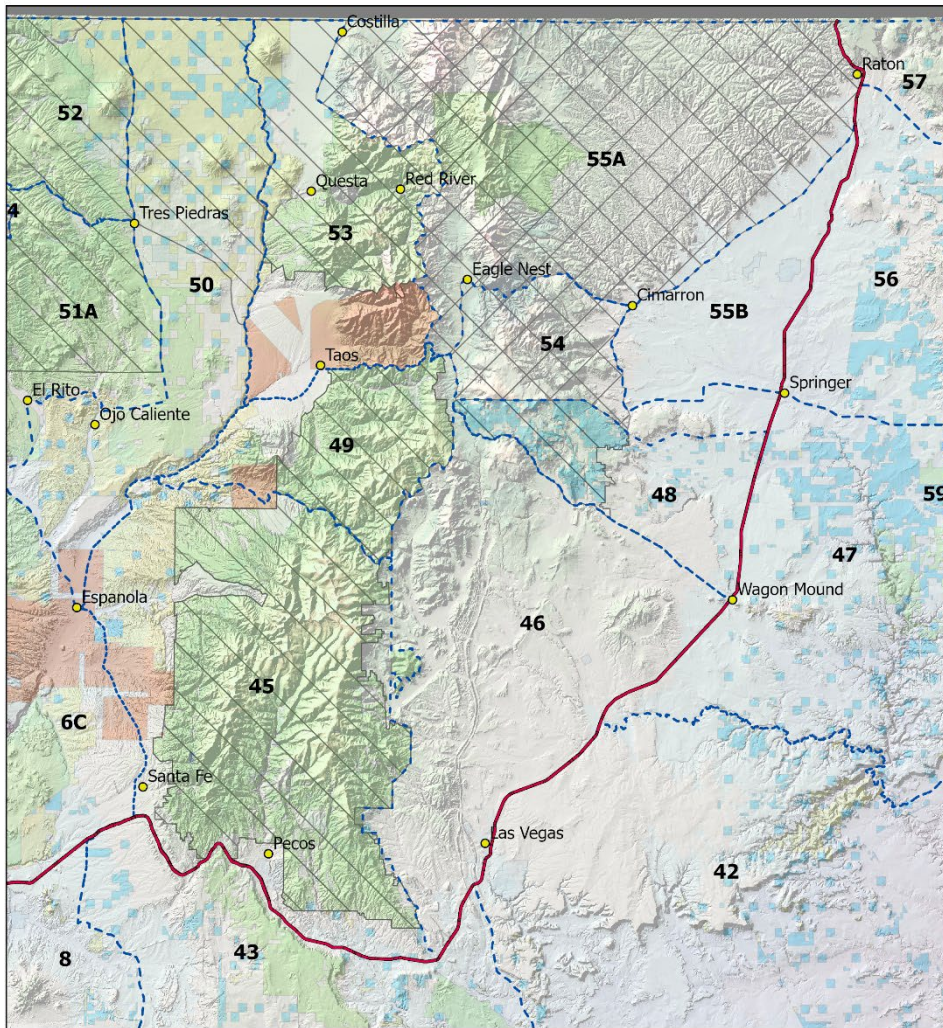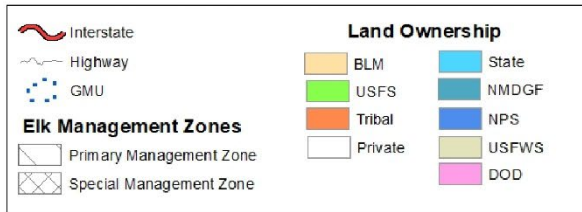
Pecos Herd (GMU 45)

Quality Management

Unit Map: 45
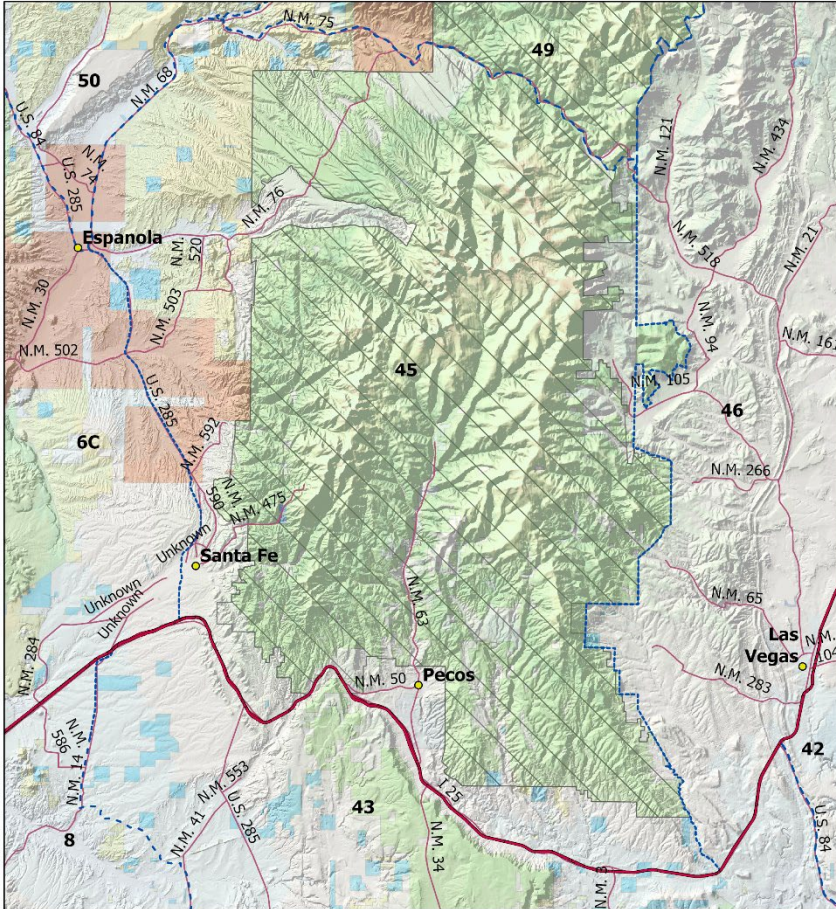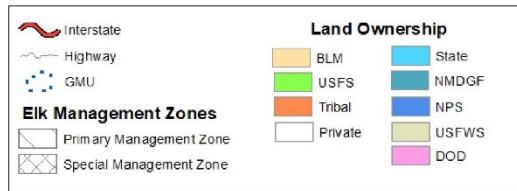
BIOLOGY – GMU 45 is considered a standalone elk herd unit, the Pecos herd. Habitats range from pinyon-juniper woodlands in the lower elevations to high elevation mixed-conifer forests and alpine meadows. Snow accumulation forces elk to migrate annually from the higher elevations to lower elevations in the surrounding regions during winter months. Due to the dense tree cover in most of the unit, aerial surveys are not productive and not flown often. The herd is assessed mostly based on hunter harvest data. The Pecos herd is considered stable.

HUNTING – This unit is 74% public land and contains some of the highest peaks in New Mexico. Road access to this unit is good in some places while the Pecos Wilderness Area restricts vehicular access for a large portion of the north half of the unit. This unit has good numbers of elk throughout. However, the rugged and high elevation terrain can make the hunt difficult. Success rates for this herd are average to good.

Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
1,100 – 2,100	35:100:32	80 – 150 Males
Stable		90 – 160 Females

GMU 45 Licenses

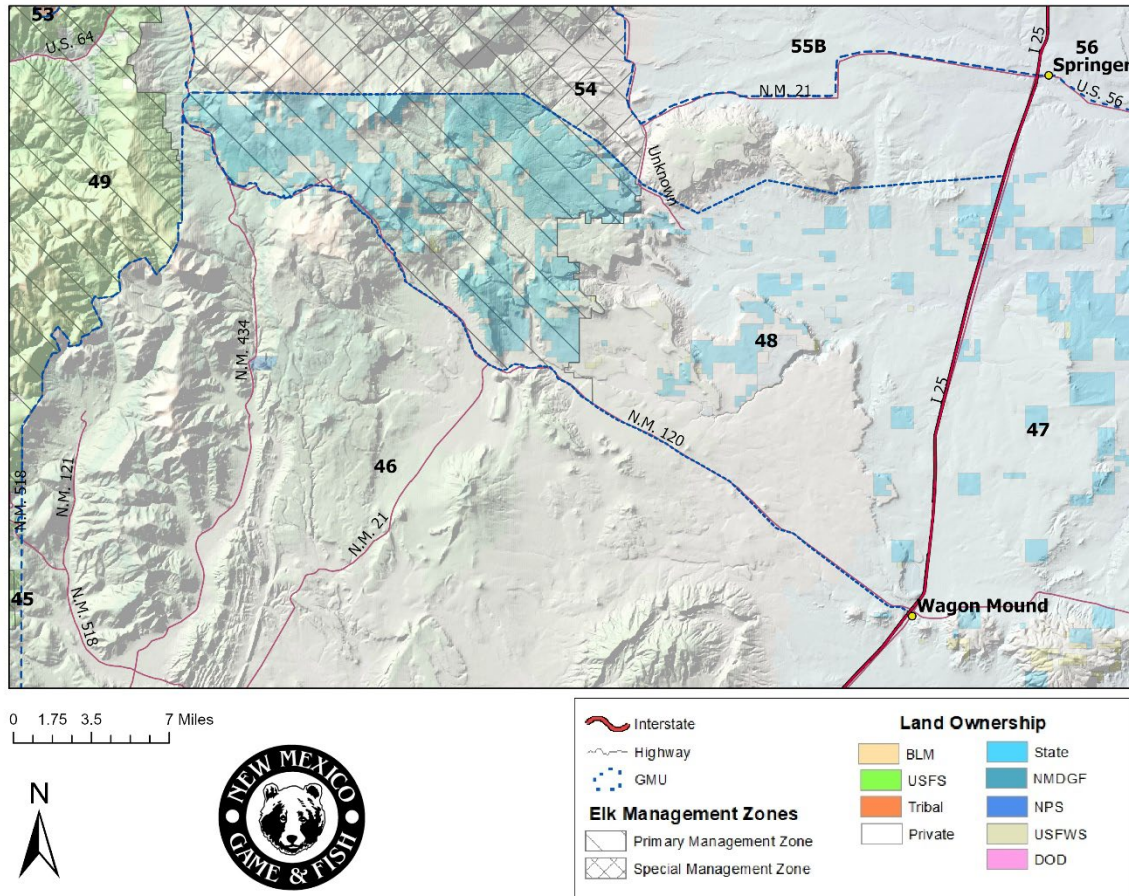## GMU 45 Elk Harvest
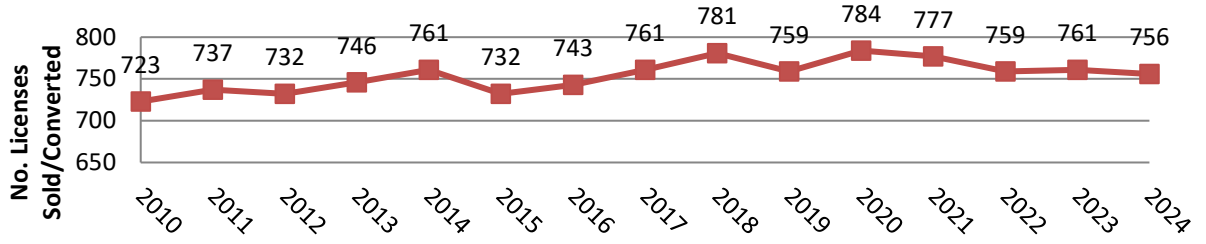
Cow Harvest
Bull Harvest
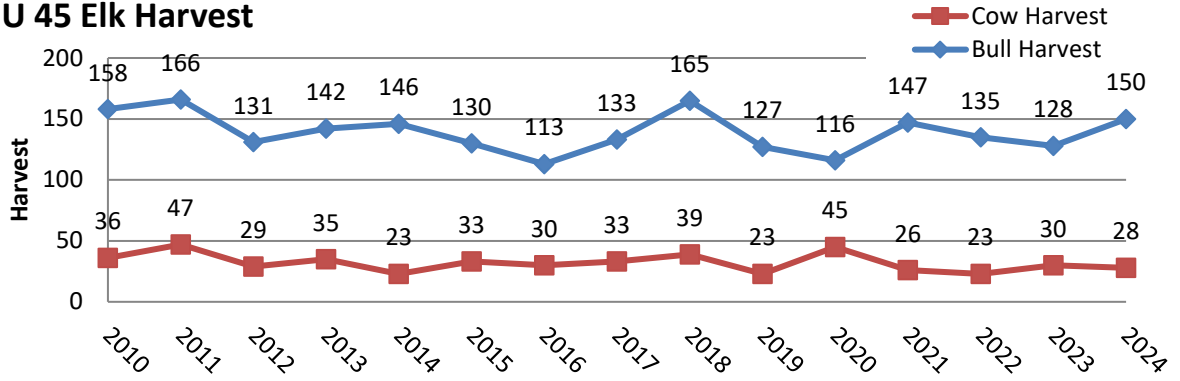
GMU 45 Harvest Success
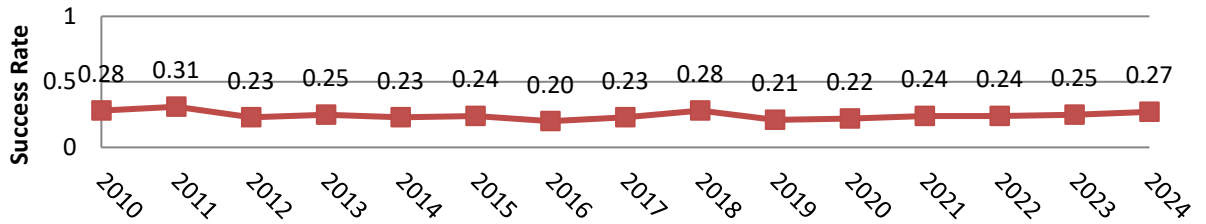
Whites Peak Herd (GMU 48)

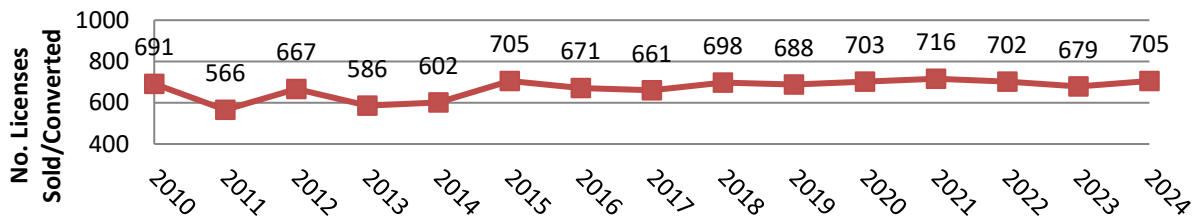## Opportunity Management

Unit Map: [48](48)

BIOLOGY – GMU 48 is considered a standalone elk herd unit, the Whites Peak herd. The habitat ranges from plains and grasslands to mixed conifer forests at the higher elevations of the Sangre de Cristo Mountains. Topography is varied and includes both steep cliff-lined drainages, rolling foothills, and flat open country. Elk are concentrated on the western side of the unit. The herd is not surveyed regularly but hunter harvest metrics indicate the population is stable.

HUNTING – This unit is 29% public land and access can be difficult due to the checkerboarded nature of the private land and NM State Trust Land. Although some State Trust Lands are accessible for hunting, these designations may change. For more information regarding specific State Trust Lands, visit the State Land Office webpage. Success rates hover near average.

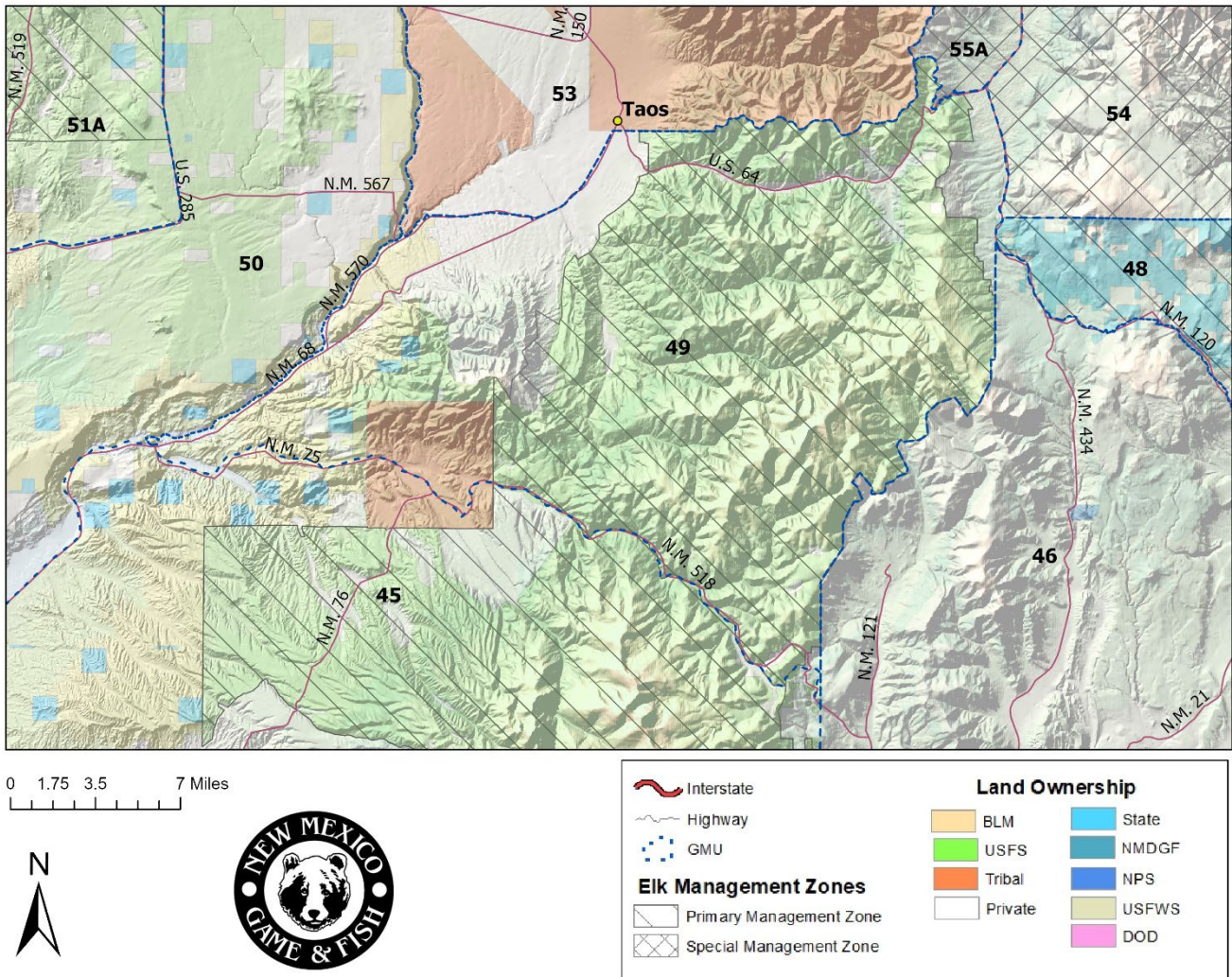| Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
1,200 – 2,000	35:100:32	70 – 140 Males
Stable		90 – 150 Females

GMU 48 Licenses

No. Licenses Sold/Converted

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Licenses	691	566	667	586	602	705	671	661	698	688	703	716	702	679	705

GMU 48 Elk Harvest

Cow Harvest
Bull Harvest

Harvest

Bull Harvest: 129, 117, 151, 122, 130, 145, 118, 141, 150, 124, 124, 137, 141, 126, 128
Cow Harvest: 125, 59, 119, 83, 88, 126, 97, 78, 126, 88, 88, 86, 104, 94, 102

GMU 48 Harvest Success

Success Rate

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Success	0.35	0.31	0.39	0.36	0.38	0.40	0.32	0.33	0.41	0.33	0.36	0.32	0.36	0.36	0.37

Peñasco Herd (GMU 49)
Opportunity Management
Unit Map: 49

BIOLOGY – GMU 49 is considered a standalone elk herd unit, the Peñasco herd. Similar to other units in the Sangre de Cristo Mountain range, this unit contains some high elevation habitat. Habitat ranges from pinyon-juniper woodlands in the lower elevations to high elevation mixed conifer forests and upper montane forest habitats. Seasonal movements between high elevation summer range and lower elevation winter range occurs during heavy snow months. The herd is monitored using hunter harvest data along with periodic aerial surveys, and is considered stable to slightly increasing.

HUNTING – This unit is 78% public land, and road access is good throughout Carson National Forest. The majority of this hunt unit is comprised of National Forest lands with mountainous topography, providing a variety of elk habitats and escape terrain. Herd productivity in this unit is stable with hunter satisfaction ratings above the state average.

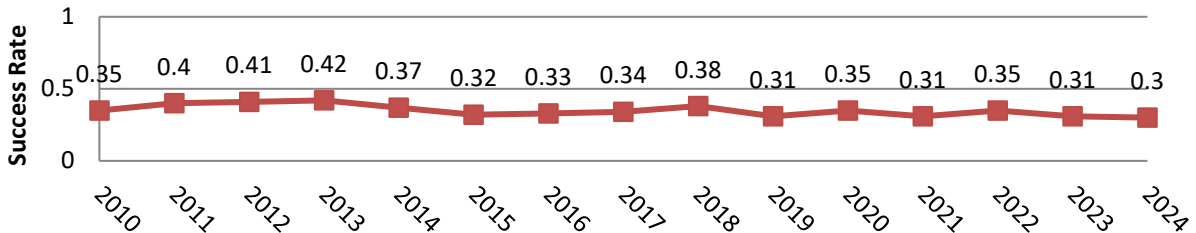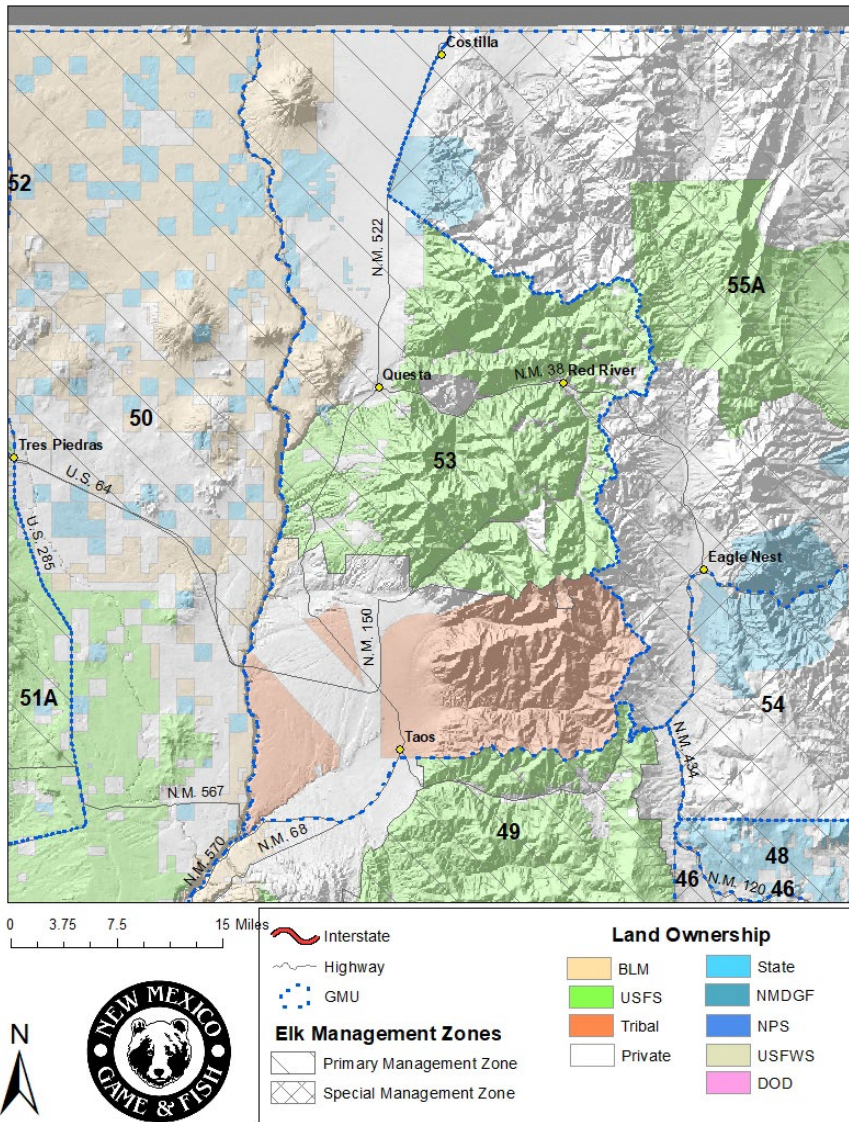| Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
1,100 – 2,400	35:100:32	70 – 200 Males
Stable to Slightly Increasing		40 – 100 Females

GMU 49 Licenses
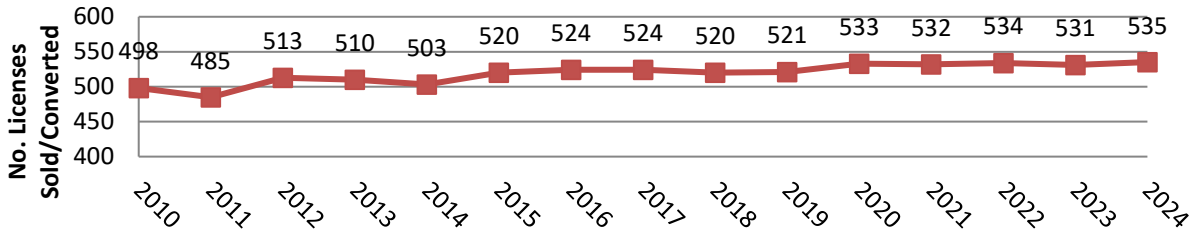
GMU 49 Elk Harvest
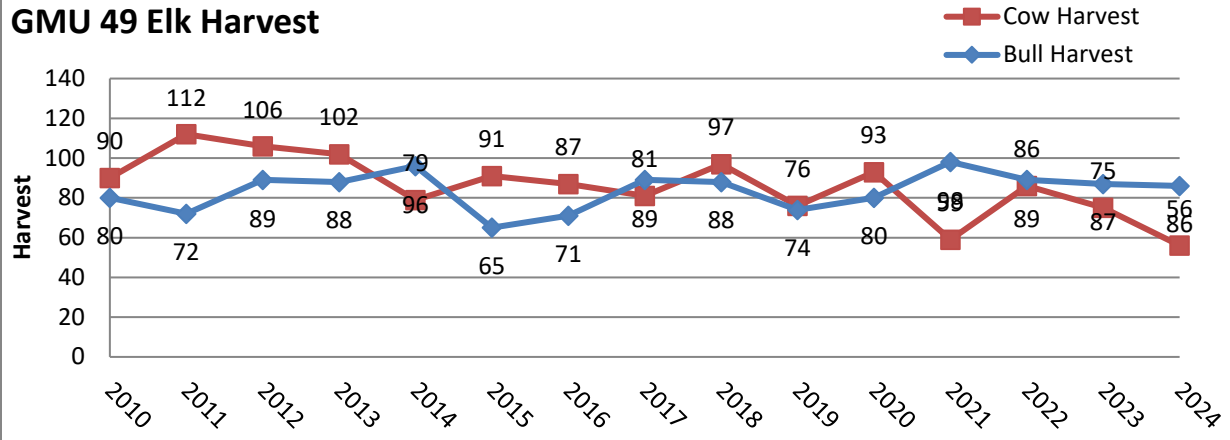
GMU 49 Harvest Success

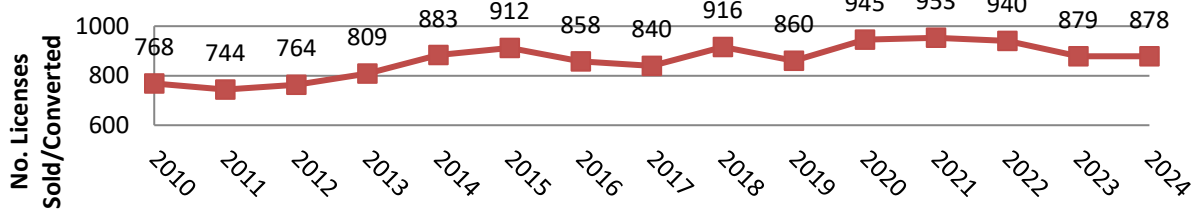# Ute/Midnight/San Cristobal Herd (GMU 53)
Opportunity Management
Unit Map: 53

BIOLOGY – GMU 53 is considered a standalone elk herd unit, the Ute/Midnight/San Cristobal herd. The habitat ranges from scrub oak at the lower elevations to high elevation mixed conifer forests and alpine meadows. Elk behavior and habitat use in this unit are influenced by annual snowfall with elk moving to lower elevations when snow accumulates. The herd is monitored annually and population size estimates are generated using aerial surveys and hunter harvest data. The observed calf:cow ratio is lower than the statewide average, but the herd is still considered stable.
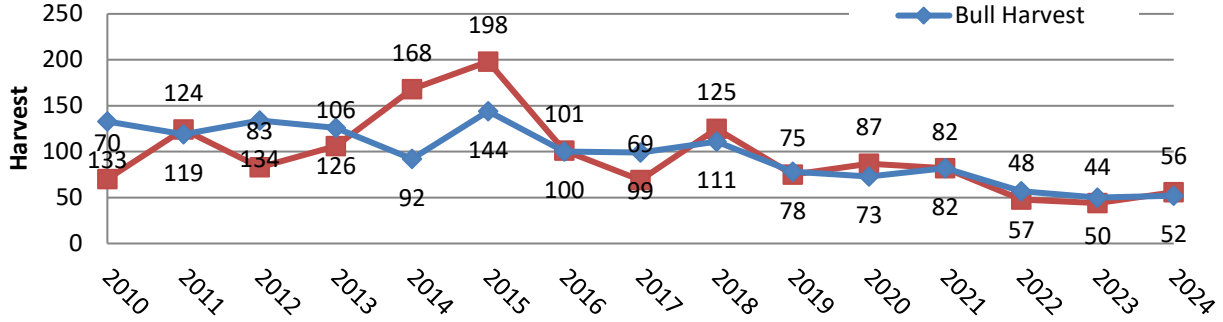
HUNTING – This unit is 47% public land with good road access. There are also 3 roadless wilderness areas (the Columbine-Hondo, Latir Peak, and Wheeler Peak Wilderness areas) for hunters wanting to get away from crowds. Due to the steep nature of the terrain, the hunt can be physically taxing. Hunters should consider hiking away from the roads for the best chance at encountering elk and having a successful hunt.

Population Estimate (2022)	Bull:Cow:Calf	Sustainable Harvest Est.
1,400 – 2,900	34:100:24	70 – 160 Males
Stable		90 – 180 Females

GMU 53 Licenses

No. Licenses Sold/Converted

768 744 764 809 883 912 858 840 916 860 945 953 940 879 878

2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024

GMU 53 Elk Harvest

Harvest

Cow Harvest
Bull Harvest

124 — 83 — 106 — 168 — 198 — 101 — 69 — 125 — 75 — 87 — 82 — 48 — 44 — 56

70 — 133 — 119 — 134 — 126 — 92 — 144 — 100 — 99 — 111 — 78 — 73 — 82 — 57 — 50 — 52

2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024

GMU 53 Harvest Success

Success Rate

0.27 0.33 0.29 0.31 0.32 0.40 0.24 0.21 0.27 0.19 0.18 0.19 0.12 0.14 0.14

2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024

Secondary Management Zone GMUs

The following GMUs are designated as Secondary Management Zones (SMZ) where the Department does not designate specific management objectives (i.e. opportunity or quality management). In these areas hunters can find opportunities through the public draw or through private landowner authorizations. For private land hunts, elk licenses are available over the counter; however, hunters must obtain and present an active SMZ ranch code to purchase a license and must also have written permission to hunt on that land. Private land elk licenses are only valid on private, deeded lands within the SMZ where hunters have been given written permission to hunt. Some GMUs throughout the state combine both Primary and Secondary Management Zones and hunters are advised to be familiar with management zone boundaries and property boundaries.

Elk populations and herd productivity are not surveyed regularly by the Department in Secondary Management Zones. Populations in these regions are monitored through mandatory harvest reporting, which provide data used in population models to estimate population sizes.

GMU 14
Unit Map: 14

BIOLOGY/HUNTING – This unit opened to elk hunting for in 2019 and public opportunities are found in the Forest Service land in the Manzano Mountains. A network of Forest Service roads provides access. This unit is dominated by grass and shrublands at the lower elevations to mixed conifer forests at high elevations in the mountains. The elk population has been increasing in recent years but there is limited data on elk densities.

GMU 18
Unit Map: 18

BIOLOGY/HUNTING – This unit is comprised of 57% public land that can be accessed through a network of BLM roads. This unit is dominated by pinyon-juniper woodlands and arid grasslands. Elk densities are low in this unit and found in localized pockets.

GMU 20
Unit Map: 20

BIOLOGY/HUNTING – Landownership within this unit is mixed within this unit, including both state parks and National Wildlife Refuge properties. Hunters are advised to use available navigation tools and recognize varied ownership and property boundaries. Habitat is typical of lowland sagebrush steppe and high desert creosote with limited forage and water availability. Populations within this unit have been shown to exploit resources within Bosque Del Apache NWR and riparian corridors present along the river, supporting localized populations and some harvest (DeVore et al. 2016, DeVore et al. 2018, APPENDIX A)

GMU 28
Unit Map: [28](#)

BIOLOGY/HUNTING – This unit is located on McGregor Range, a tract of BLM land that is managed by the military. There are additional requirements for hunting on McGregor Range, so hunters should be familiar with these rules. Additionally, hunt dates are subject to change based on military operations and hunters applying for this unit should be flexible to accommodate last minute changes. Pinyon-juniper woodlands dominate this unit and success rates are very high. Chronic Wasting Disease (CWD) has been detected in this unit; hunters should check the requirements for transporting an elk carcass from this unit ([Carcass transport regulations webpage](#)).

GMU 29/30
Unit Map: [29](#), [30](#)

BIOLOGY/HUNTING – These units are 75% public land which can be accessed through the Forest Service and BLM road system. The highest elk densities in this unit are in the Guadalupe Mountains which is characterized by pinyon-juniper woodlands. Success rates are high in this unit and some older age class bulls are harvested every year.

GMU 37
Unit Map: [37](#)

BIOLOGY/HUNTING – This unit is comprised of 39% public land with good road access. The Capitan Mountain Wilderness is an area with options for roadless hunting. Elevations in this unit range from 6,000-9,500 feet and the habitats range from pinyon-juniper woodlands in the lower elevations to high elevation mixed conifer forests. This unit has consistently high success rates and produces some older-age class bulls.

GMU 38
Unit Map: [38](#)

BIOLOGY/HUNTING – This unit is 27% public land with very good road access to the available public land. Habitats range from pinyon-juniper woodlands in the lower elevations to mixed conifer forests in the Gallinas Mountains. Elk densities and success rates are moderate in this unit. Hunters who get away from roads will have a better chance at encountering elk.

GMUs 39, 42, 47, 56, 57, 58 and 59
Unit Maps: [39](#), [42](#), [47](#), [56](#), [57](#), [58](#), [59](#)

BIOLOGY/HUNTING – These units are dominated by private land with State Land Office properties checkerboarded throughout. Due to the checkerboarded nature, finding access points can be difficult and hunters should be familiar with landownership. A good GPS or map is recommended. Not all roads are open to the public, so hunters should identify which are county roads that are open to the public and which are private. This information can be found by contacting the counties. These units consist of large swaths of grassland broken by volcanic

cones, rivers, canyons and arroyos. Elk can be found throughout these units, but hunters will have to scout and hunt hard to find them in areas accessible to public license holders. The Sabinoso Wilderness Area in GMU 42 provides a large area of contiguous public land to hunt. Hunters experience average to good success in many of these units.

GMU 46
Unit Map: 46

BIOLOGY/HUNTING – Elk are found in good numbers throughout this unit, but the GMU is almost entirely private land and written permission must be obtained to hunt on private lands. Hunters must acquire an authorization number, hunt code, and ranch number from a landowner participating in the E-PLUS program. Habitats range from pinyon-juniper woodland in the lower elevations to high elevation aspen and mixed conifer forests.

GMU 55B
Unit Map: 55B

BIOLOGY/HUNTING – This hunt unit is almost exclusively private land with licenses issued through the E-PLUS system. If hunting elk on private land, hunters should consult the E-PLUS webpage for current requirements. Habitat in this unit is primarily low elevation grassland, irrigated cropland, and riparian corridors.

Special Management Zone GMUs

The following GMUs (or segments) are in Special Management Zones. These GMUs contain quality elk habitat, but a large proportion of the landscape is privately owned. For this reason, the Primary and Secondary Management Zone designations cannot be applied as in other areas with a higher proportion of public land. Authorizations within the Special Management Zone are determined on a ranch-by-ranch basis through a negotiation between the landowner and appropriate local department staff. Private landowners are issued private land elk authorizations for deeded acres enrolled in the E-PLUS program. All authorizations issued within the Special Management Zone are ranch-only and transferrable to other private lands within the same GMU and management zone with written permission from the landowner. A list of participating landowners and their contact information is available at the Department's private lands hunting webpage.

Elk populations are not surveyed by the Department in some Special Management Zones. When aerial survey data is unavailable the Department monitors populations through mandatory harvest reporting.

GMU 54
Unit Map: 54

BIOLOGY/HUNTING – This unit is largely private land with one Wildlife Management Area, the Colin Neblett WMA. If hunting on private land, hunters should consult the E-PLUS webpage for current requirements. A list of participating landowners and their contact information is available at the Department's private lands hunting webpage. The Colin Neblett Wildlife Management Area offers public draw hunts, but only to New Mexico residents. Habitats range from pinyon-juniper woodland in the lower elevations to high elevation mixed conifer forests. Access to the Colin Neblett is limited and hunters should be prepared to hike in steep terrain.

GMU 55A
Unit Map: 55A

BIOLOGY/HUNTING – The majority of GMU 55A is private but some public hunting opportunities are available through the draw on several Wildlife Management Areas (Urraca WMA, Elliott Barker WMA, Colin Neblett WMA) and on the Valle Vidal unit of the Carson National Forest. Public hunters should remember that WMAs are open to hunting for New Mexico residents only. Elk hunting on Valle Vidal Unit of the Carson National Forest is offered through the draw and is designated as a 'once-in-a-lifetime' license. These licenses are highly coveted. Mature bull hunters lucky enough to draw the 55A Valle Vidal license can pursue older-age class bulls and success rates for this hunt are high. Elk within this unit exhibit typical seasonal movements seeking lush forage in high elevation summer range, and easier access food sources during winter at low elevations (Fig 10).This unit contains the only once-in-a-lifetime elk license, and the Valle Vidal is considered to be one of the most prime hunting areas in the state. Northern mountain regions in New Mexico typically produce higher forage yield. Varied elevation and moisture gradients promote a mosaic of habitat types suitable for all stages of an elk's life history. The Department views the Valle Vidal as an irreplaceable land of ecological importance. Investigations into the selection of calf-rearing cows (Pitman et al. 2014), and impacts on calf survival from predation (Tatman 2016, Tatman et al. 2018; APPENDIX A) have helped biologists understand challenges faced by this herd and use this information to help guide management decisions.

Figure 10. Seasonal movements and ranges for the San Christobal elk herd in northern New Mexico. From USGS Ungulate Migrations of the Western United States, Vol 5 (pg. 80)
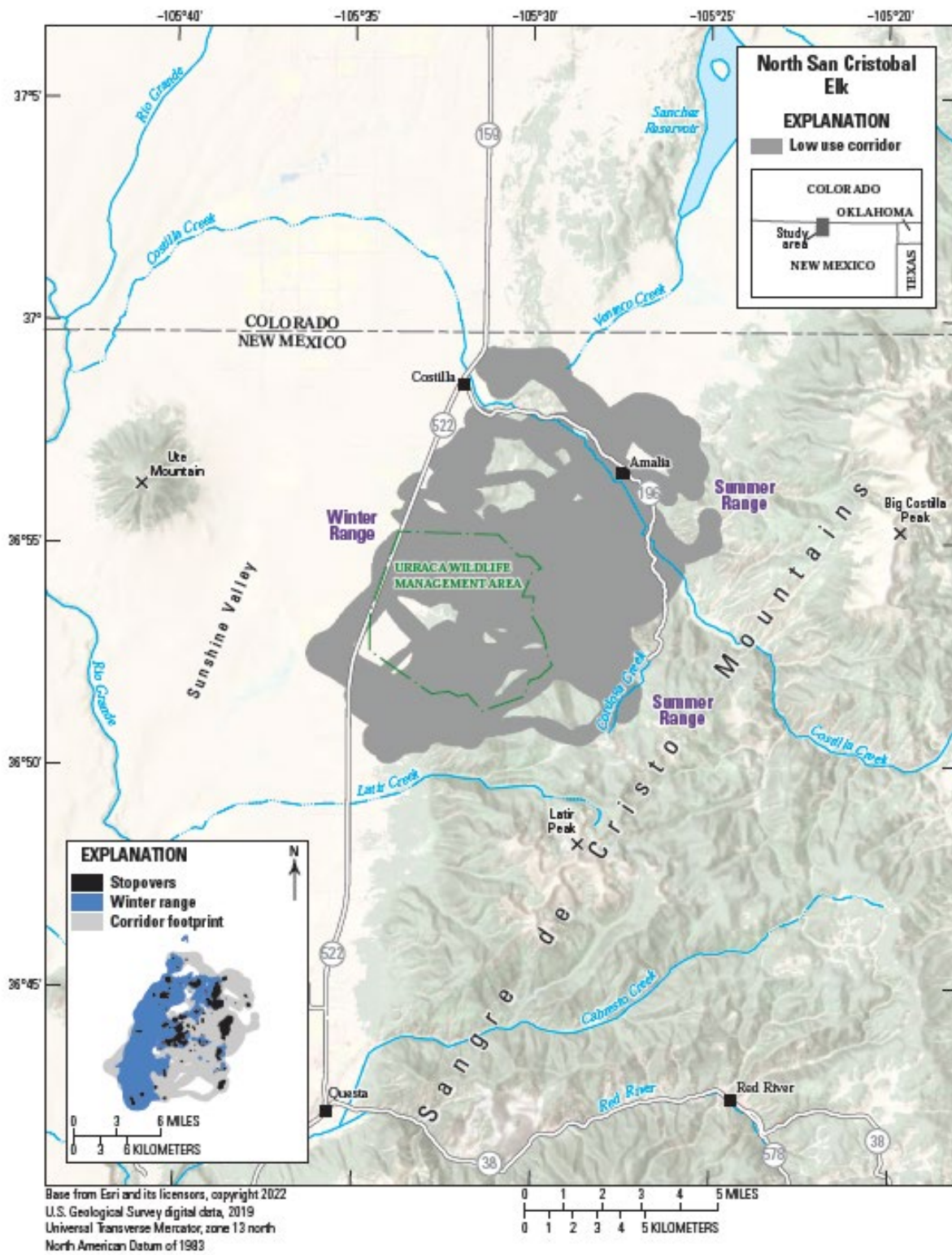
HELPFUL LINKS

For more information on Federally owned (public) property

Bureau of Land Management
https://www.blm.gov/node/7050

U.S. Forest Service
https://www.fs.usda.gov/r3

U.S. Fish and Wildlife Service National Wildlife Refuge System
https://www.fws.gov/locations?type=%5B%22National%20Wildlife%20Refuge%22%5D

National Park Service (Valles Caldera National Preserve)
https://www.nps.gov/vall/planyourvisit/need-to-know.htm

For more information on State owned lands

New Mexico Department of Game and Fish Wildlife Management Areas
http://www.wildlife.state.nm.us/conservation/state-game-commission-lands/

New Mexico State Land Office
https://www.nmstatelands.org/resources/recreational-access/hunting-access-information/

For more information on Privately owned lands

New Mexico Department of Game and Fish
https://wildlife.dgf.nm.gov/hunting/maps/eplus/

APPENDIX A: Referenced NM Elk Research

GMU 6B:

Bernal, Lance J. (2012) Investigations into possible factors affecting the recruitment of rocky mountain elk (Cervus elaphus) on the Valles Caldera National Preserve. M.S. Thesis, Texas Tech University, Lubbock, TX, USA.

ABSTRACT: The Valles Caldera National Preserve (VCNP) is a relatively new public land holding located in the Jemez Mountains in north-central New Mexico. For the past decade, low calf:cow ratios of elk (*Cervus elaphus*) have been recorded on the VCNP prompting concern by both the Valles Caldera Trust, the managing body for the VCNP and the New Mexico Department of Game and Fish (NMDGF) managers who are responsible for ensuring a sustainable elk population. These studies were done to look at possible factors that may be contributing to the low recruitment of elk on the VCNP as well as simulate how the population may respond to different management actions.

A serological survey was conducted on hunter-harvested elk from the VCNP during the 2010 and 2011 fall hunting seasons. We tested 119 (2010, $n = 74$; 2011, $n = 45$) for brucellosis, bovine viral diarrhea virus (BVDV), infectious bovine rhinotracheitis (IBR), bluetounge (BT) and epizootic hemorrhagic disease (EHD), parainfluenza-3 (PI-3) and 5 serovars of Leptospirosis. Exposure rates were highest for PI-3 (34.5%) and IBR (10.1%) for total samples. Exposure for BVDV was found in 2.5% of the total samples. Exposure to EHD and BT was in 1.7% and 0.8% of the total samples. Exposure to the Leptospirosis serovars *hardjo* (n=2) and *canicola* (n=1) were found in the samples tested. All samples tested negative for Brucellosis. The low to medium positive exposure to all the diseases except brucellosis indicate these diseases are present within the VCNP elk population but are not likely causing the low recruitment rates.

A secondary study was done to address the hypothesis that the observed low calf:cow ratios on the VCNP may be the result of low survival rates. To determine cause-specific mortality and estimate survival, we radio marked elk calves ($n = 140$) born within the VCNP from 2009-2011. Two approaches were done to estimate 14 day survival, overall summer survival ($t = 13$ weeks), and annual survival. First, biological covariates were used to model survival for 14 day post capture and weekly summer survival for all calves. This was done in order to compare survival estimates to other studies experiencing low calf;cow ratios in the western United States. Then, the data was re-analyzed by censoring calves ($n = 9$) which died the day after tagging. This would provide a more conservative survival estimate which would eliminate possible biases due to handling calves and its effect it could have on survival. Fourteen day survival was 0.57 (SE = 0.05, 95%CI: 0.48-0.66) when using uncensored data; survival was 0.64 (SE = 0.05, 95%CI 0.54-0.72) using censored data. Summer survival was estimated to be 0.37 (SE = 0.05, 95%CI 0.28-0.47) using uncensored data; summer survival was estimated 0.43 (SE = 0.05, 95%CI: 0.33-0.53) using censored data. Fall/winter survival (mid-August-April) ranged from 0.76-0.95 based on study year. Annual survival ranged from 0.32-0.55 with a mean of 0.42 using uncensored data; annual survival ranged from 0.32-0.59 with a mean of 0.46 using censored data. Predation accounted for 94.8% of the known deaths. Black bears (*Ursus americana*) were the highest source of predation (47.3%, $n = 26$) and overall mortality (40.6%). Coyotes (*Canis latrans*) were the second highest source of predation (41.8%, $n = 23$) and overall mortality (35.9%). The results using both uncensored and censored data are comparable to other studies which were experiencing low calf:cow ratios. Therefore is predation of elk calves is likely additive and causing suppressed recruitment rates in the elk population on

the VCNP. However, it is highly recommend a population estimate of the large predators prior to any large predator management action to ensure populations of large predators are not reduced to a level from which they cannot recover.

For the third part of this study the overall objective was to incorporate data that was available into the population simulation program POP-II, to model current population trends based the current data and then run simulated population trends based on possible management decisions. Data that was used included: summer survey data which used distance sampling to estimate population size and herd ratios; fall harvest numbers for adult male and adult female elk; and estimated summer survival rates of elk calves born on the VCNP. Models were developed based on current preseason mortality of neonatal elk with a reduction in harvest of adult males and females by 10%, both separately and collectively. Current harvest numbers were maintained while preseason mortality of neonates was reduced by 25% and 50%. Comparisons of the model output were then made for both the reduction of preseason mortality along with a reduction in harvests. Models showed that decreasing preseason mortality while maintaining current harvest rates would either stabilize or begin a positive increase in the population trend. The models also showed that making a 10% sex-specific (males only or females only) harvest reduction while maintaining current preseason mortality would maintain the current population trend. Making a 10% harvest reduction of either sexes or both sexes along with a reduction in preseason mortality should lead to positive population trends.

The work done for this study could be used as a possible guide to make adaptive management decisions in regards to the population trend of the elk herd in the Valles Caldera National Preserve.

GREATER GILA HERD

Tatman, Nicole & Ballard, Warren & Liley, Stewart & Gipson, Philip & Breck, Stewart & Cain III, James & Oakleaf, John & Bergman, David & Pitman, James. (2012). Elk calf mortality patterns in the Blue Range Wolf Recovery Area: New Mexico.

ABSTRACT: This year (2011) was the first of a 3-year study investigating elk calf survival and mortality patterns in the Gila National Forest of western New Mexico. Crews captured 37 elk calves from May 22 through June 19, 2011. Calves were captured by hand and equipped with an ear tag transmitter. As of November 2011 we observed 28 mortalities; 12 were attributed to black bear predation, 7 were coyote mortalities, 3 were mountain lion kills, 3 were killed by unknown predators, and 3 were unknown mortalities. When applicable, field necropsies were performed to search for subcutaneous hemorrhaging. Bite and scratch marks, along with tracks, scat and other site evidence were used to identify the predator species responsible. We monitored for the presence of Mexican wolves at mortality locations to help determine if wolf predation may have occurred. No radio-collared wolves were found in the immediate vicinity of any predated calf when we had the ability to scan for packs. However, diversionary feeding of one wolf pack was used during 2011 as a management action in response to an unrelated matter, and could have possibly impacted the fates of the 7 elk calves captured in this particular area. Future data collection will resume in May —August 2012 and 2013. We hope to identify causes and timing of mortalities of elk calves in the Gila National Forest that will assist wildlife biologists in making management decisions to best benefit elk populations in the area in the area.

Pitman, James & Cain III, James & Liley, Stewart & Gould, William & Tatman, Nicole & Ballard, Warren. (2014). Post-Parturition Habitat Selection by Elk Calves and Adult Female Elk in New Mexico. The Journal of Wildlife Management. 78. 10.1002/jwmg.776.

ABSTRACT: Neonatal survival and juvenile recruitment are crucial to maintaining viable elk (Cervus elaphus) populations. Neonate survival is known to be influenced by many factors, including bed-site selection. Although neonates select the actual bed-site location, they must do so within the larger calf-rearing area selected by the mother. As calves age, habitat selection should change to meet the changing needs of the growing calf. Our main objectives were to characterize habitat selection at 2 spatial scales and in areas with different predator assemblages in New Mexico. We evaluated bed-site selection by calves and calf-rearing area selection by adult females. We captured 108 elk calves by hand and fitted them with ear tag transmitters in two areas in New Mexico: the Valle Vidal and Blue Range Wolf Recovery Area. In both study areas, we found that concealing cover structure and distance to that cover influenced bed-site selection of young calves (i.e., <2 weeks of age). Older calves (i.e., 3–10 weeks of age) still selected areas in relation to distance to cover, but also preferred areas with higher visibility. At the larger spatial scale of calf-rearing habitat selection by the adult female, concealing cover (e.g., rocks, shrubs, and logs) and other variables important to the hiding calves were still in the most supported models, but selection was also influenced by forage availability and indices of forage quality. Studies that seek to obtain insight into microhabitat selection of ungulate neonates should consider selection by the neonate and selection by the adult female, changes in selection as neonates age, and potential selection differences in areas of differing predation risk. By considering these influences together and at multiple scales, studies can achieve a broader understanding of neonatal ungulate habitat requirements. Published 2014. This article is a U.S. Government work and is in the public domain in the USA.

Pitman, James W. (2013) Microhabitat selection and mortality site characteristics of elk (Cervus canadensis) calves and adult elk calf-rearing habitat selection in areas of differing predation influences in New Mexico. M.S. Thesis, New Mexico State University, Las Cruces New Mexico, USA.

ABSTRACT: Elk (Cervus canadensis) in New Mexico have been free from wolf predation since extirpation of the Mexican grey wolf (Canis lupus baileyi) by the mid to late 1900s. The Mexican Wolf Recovery Plan was initiated with the goal of reestablishing these wolf populations. The initial recovery area, the Blue Range Wolf Recovery Area, was designated in New Mexico and Arizona, with reintroductions beginning in 1998. However, the impacts of wolf reintroduction, along with existing predator impacts, on neonate survival and recruitment have not been assessed. The main purposes of this study are to characterize microhabitats selected for calf bedding sites and at cause-specific mortality sites, and determine if these characteristics are related to survival. Objectives were met by tracking tagged calves to bed site locations as well as at random sites and mortality sites. It was found that hiding cover structures and distance to cover were important in site selection of calves less than two weeks of age. Calves older than two weeks still selected areas in relation to cover but also preferred areas with higher visibility. When expanded to the larger spatial scale of calf-rearing habitat selection by the adult, selection was also influenced by forage availability. Surviving and non-surviving calves selected similar habitat variables as did calves in high and low wolf use areas. It was also found that decreasing visibility at the level of the standing adult increased the probability of mortality sites. I recommend that habitat improvement projects, such as burning and thinning, be implemented in only portions of the management area. This could help ensure management practices do not remove all areas of greater hiding cover needed by elk calves

early in life. However, burning or thinning in portions of the management area will open up forest stands and increase visibility that will benefit calves during the late summer. Knowledge of these relationships and implementation of management recommendations may help maintain optimal calf rearing habitat, reduce depredation impacts, and support sustainable populations in these areas.

Farley, Zachary J. (2022). Influences of Mexican gray wolves on elk behavior in relation to maternal constraints, multitasking, and predation risk. M.S. Thesis, New Mexico State University, Las Cruces, NM, USA.

ABSTRACT: The non-consumptive effects of predation can reduce prey fitness by reducing foraging time, increasing stress levels, and shifting habitat use to lower quality habitat resulting in reduced birth rates and decrease neonate survival. However, prey have the ability to increase their vigilance to avoid predation and decrease the non-consumptive effects of predation via behavioral changes, such as spatiotemporal avoidance of predators and multitasking. This study aims to quantify the effects of the Mexican gray wolf (*Canis lupus baileyi*) reintroduction to Arizona and New Mexico on elk (*Cervus canadensis*) behavior. We conducted behavioral observations on elk herds and adult females, with and without calves, across energetically and biologically important periods. We developed multiple spatiotemporal predation risk indices using a combination of GPS locations of collared Mexican wolves, elk killed by Mexican wolves, and landscape covariates. Using generalized linear mixed models implemented in a Bayesian framework, I compared *a priori* models, to determine the best predictors of multitasking and elk behavior at the individual and herd level. Predation risk from Mexican wolves was a top predictor in all datasets. Adult females showed strong increases in the probability of vigilance due to increasing predation risk whereas as herd behavior did not. At the individual and herd level, predation risk increased the probability of foraging and decreased resting. In a *post hoc* analysis, the effects of predation risk on the probabilities of foraging and resting differed across diurnal periods, at both scales, with an increased probability of foraging in relative high predation risk areas during a period of relative low wolf activity, midday. These results suggest elk are temporally avoiding the risk of predation by Mexican wolves by trading resting for foraging, a trade-off often not incorporated in behavioral studies. Increased estimated predation risk from Mexican wolves increased the probability of adult females multitasking suggesting that adult female elk may be offsetting reduced feeding time due to the non-consumptive effects of Mexican wolves. These results shed light on potentially important but often excluded behaviors and trade-offs elk may use to reduce the indirect effects of predation, contributes additional context to our understanding of predator-prey dynamics, and provides baseline data in an ecosystem exhibiting sustained population growth by a recolonizing predator.

Thompson, Cara J. (2022). Elk habitat selection in response to predation risk from Mexican gray wolves. M.S. Thesis, New Mexico State University, Las Cruces, NM, USA.

ABSTRACT: Predation is a primary limiting factor for prey and in addition to direct impacts (killing of prey), it establishes risk, which indirectly influences prey behavior and ecology. I evaluated the influence of Mexican gray wolves (*Canis lupus baileyi*) on habitat selection and spatio-temporal predator avoidance strategies of elk (*Cervus canadensis*). We fit 866 adult female elk with GPS collars across areas of varying wolf densities within the Mexican wolf experimental population area (MWEPA) of eastern Arizona and western New Mexico. Using step-selection functions I examined relative intensity of elk use in relation to landscape attributes, predator/prey diel activity, and multiple measures of risk, including predicted wolf presence—a function of wolf habitat selection, utilization distributions, and pack size—as well as openness, and predicted risky

places, modeled from attributes of locations where wolves killed elk. Wolf activity varied across seasons and exhibited higher activity midday and at night in fall and monsoon seasons than anticipated. Analyses revealed the effects of risk and wolf activity on elk habitat selection were variable, but across all seasons, relative use by elk was best explained by incorporating an interaction between diel period and predicted risky places. Elk utilized risky places at less risky times, particularly in times of nutritional deficit (April-Sept.) and in higher wolf presence. Additionally, elk exhibited a functional response indicating use of risky places varies relative to the level of exposure to Mexican wolf presence. These behaviors support evidence that in ecosystems where predators and prey are highly mobile and largely overlap in space, temporally responding to predictable and relatively static environmental characteristics which influence encounter and kill rates may better balance energetic trade-offs than spatially avoiding predator presence. Female elk also appear to be more willing to take chances and make trade-offs during the seasons they can best increase net fitness, suggesting both reactive and proactive approaches are utilized to mitigate risk.

Martinez, Samuel I. M. (2024). Kill rates and prey consumption of Mexican gray wolves (Canis lupus baileyi) and cougars (Puma concolor) in the southwest. M.S. Thesis, New Mexico State University, Las Cruces, NM, USA.

ABSTRACT: Large carnivores are considered to be a critical component for healthy functioning ecosystems, but their effects can be difficult to accurately quantify due to funding limitations, logistical constraints, and the cryptic behavior of large carnivores. Nearly 25 years since the reintroduction of Mexican gray wolves (*Canis lupus baileyi*) into the Mexican Wolf Experimental Population Area (MWEPA) within Arizona and New Mexico, there remains a lack of data to characterize predation patterns and to assess their influence on prey species and established sympatric cougars (*Puma concolor*). I continuously monitored and investigated GPS clusters formed by Mexican wolves and cougars in overlapping ranges across the MWEPA to estimate seasonal kill and scavenging rates and diet composition for wolf packs and individual cougars. I estimated kill and scavenging rates using a year-round three season approach to characterize shifts in behaviors during hunting season for Mexican wolves, while I utilized the traditional two season approach for cougars. Kill rates of Mexican wolves (1.76 kills/week) and cougars (1.13 kills/week) peaked during summer months, coinciding with the ungulate neonate birth pulse. Wolves shifted predation behavior during the fall hunting season (0.93 kills/week) beginning in September, the period when active elk hunting begins throughout the MWEPA. Biomass acquired by Mexican wolves remained relatively constant during summer (48.25 kg/week/wolf) and winter (47.71 kg/week/wolf) seasons despite shifts in numerical kill rates, although kill rates decreased considerably during the hunting season (24.19 kg/week/wolf when diets were subsidized through scavenging opportunities. Pack sizes of Mexican wolves had varying influence on the relationship between ungulate kill rates, scavenging rates and sex and age specific kill rates prey. Kill rates increased during summer and winter with increasing pack sizes, while scavenging rates indicated a non-significant negative relationship. Scavenging rates of wolves decreased with increasing pack size. Elk (*Cervus canadensis*) made up the largest proportions of prey species killed overall for both Mexican wolves (84%) and cougars (80.7%). Additionally young of the year (YOY) elk calves were the most frequent unique prey item, making up 40.3% of Mexican wolf and 59.7% of cougar kills overall. Unlike cougars, Mexican wolves utilized highly abundant scavenging opportunities remaining after hunter harvest of elk, leading to a reduction in kill rate and a subsequent increase in scavenging rates. Diet overlap between wolves and cougars was high during the summer (PC = 0.88), when both species were predominantly preying on YOY, though we saw divergence in overlap during hunting season (PC = 0.54), when Mexican wolf scavenging

increased. Predictive modeling of wolves and cougar kills yielded mixed results, as wolf behavior can be unpredictable when attempting to characterize large family units based on the movement of a single individual. While our cougar models were highly accurate overall, modeling for wolves produced unreliable predictions in kill site identification. To accurately research wolf behavior in the future, field site investigations will continue to be required. Our findings in the field suggest that abundant anthropogenic scavenging opportunities subsidize wolf diets seasonally, reducing kill rates and increasing time between kills. These findings highlight the need for adjustments in sampling designs for future research of gray wolves to capture shifts in behaviors that influence their ecology at a population scale. As wolves continue to expand throughout North America and interactions between cougars and wolves become increasingly common, its critical to understand how not only apex predator reintroductions affect prey, but also sympatric carnivores.

ABSTRACT: Natural selection should favor development of behaviors that increase survival, including juvenile survival. Habitat characteristics (e.g., hiding cover, forage quality and availability), maternal habitat selection, and microhabitat selection by the calf may influence elk (*Cervus canadensis*) calf survival and recruitment. We assessed diurnal microhabitat selection of bed sites by elk calves and calf-rearing areas selected by adult females to determine if these characteristics were associated with calf survival. We radio-tagged 33 elk calves in west-central New Mexico in 2011 and 55 calves in north-central New Mexico in 2012. We tracked calves daily to locate calf bedding sites and collected data on selected physical features and vegetation characteristics at used and paired random sites. The paired differences in these characteristics were then associated with calf fate. At the calf selection scale, for every 1-m difference in the distance to nearest concealment cover, the odds that a site was from a surviving calf increased by 7.8%. Habitat selection by adult females also was associated with calf survival. The odds of a bed site being from a surviving calf increased by 1.9% for every 1% difference in percentage of grass cover. High levels of concealment cover at the bed site were related to calf survival status. When we expanded selection to the adult level, females with surviving calves selected areas with higher grass cover, suggesting adult selection for higher forage availability while still providing high concealment cover for the calf.

GMU 20:

ABSTRACT: Elk (Cervus elaphus) have depredated corn at Bosque del Apache National Wildlife Refuge (BDANWR), New Mexico, USA, which has interfered with the refuge's ability to provide supplemental nutrition to overwintering sandhill cranes (Grus canadensis) and other waterbirds. To identify management options for minimizing cropland depredation, we examined elk resource selection patterns using negative binomial generalized linear mixed models. We used 8,244 global positioning system (GPS) locations collected from 9 adult female elk to model fine-scale resource use (sampling units were 100 × 100-m cells; n = 3,646) and corn field use (sampling units were corn fields; n = 18) by a resident herd along the Rio Grande River in central New Mexico, USA.

The fine-scale model suggested that elk use in cropland areas increased when alfalfa and corn were present and elk use was greatest 0.14 km from uncultivated areas. Elk use in uncultivated areas increased as canopy cover increased. Elk use exhibited a quadratic relationship with hiding cover, which varied with distance to cropland. We validated the fine-scale model with an independent sample of radio-marked adult female elk (n = 12; 1,106 locations). The fine-scale model was successful in predicting elk use; 84.1% (SE = 1.1) of radio-marked elk locations fell within high or medium-high use cells. Corn field use models indicated that elk use increased as the proportion of the corn field perimeter adjacent to alfalfa increased. Elk use of corn fields declined as distance to uncultivated areas and the proportion of other corn fields at the same growth stage increased. Probability of elk use peaked when corn reached heights of 1.4 m to 1.7 m and use varied with distance to uncultivated areas. Corn fields at these heights were in the late vegetative or tassel-milk growth stage, which are the stages at which damage to corn plants is most detrimental to yield. The average distance each elk moved per day during the corn growing season was 5,013 m (SD = 957) and varied among individuals (3,251–6,317 m). This is relatively large in relation to the size of the managed floodplain at BDANWR. Our results, couched in elk daily movements, can help direct crop management, vegetation manipulation, and timing of hazing efforts aimed at reducing elk use of crops. © 2016 The Authors. Journal of Wildlife Management Published by Wiley Periodicals, Inc. on behalf of The Wildlife Society.

DeVore, Ryan & Butler, Matthew & Wallace, Mark & Liley, Stewart. (2018). Population Dynamics Model to Inform Harvest Management of a Small Elk Herd in Central New Mexico. Journal of Fish and Wildlife Management. 9. 10.3996/012018-JFWM-008.

ABSTRACT: Crop depredation by wildlife is a frequent concern for natural resource managers and mitigation of this issue is often an important task for wildlife agencies. Elk Cervus elaphus and other ungulate species have depredated corn Zea mays at Bosque del Apache National Wildlife Refuge, New Mexico, USA, interfering with the ability of the Refuge to provide sufficient supplemental nutrition to overwintering sandhill cranes Antigone canadensis and geese (Anatidae). We estimated annual adult survival and calf recruitment rates of elk from 2011 to 2013 at Bosque del Apache National Wildlife Refuge. Natural adult survival (excludes human-related mortalities) was high (mean ¼ 98.3%; 95% CI ¼ 95.0–100.0%). Calf recruitment was lower than in some populations, and ranged from 13.0 to 36.7 calves: 100 cows at time of recruitment (March and April) with a mean of 21.9 (SD ¼12.9). Using this information, we constructed a harvest management model to determine annual harvest quotas required to stabilize the growth of the elk herd on the Refuge. The female segment of the herd is growing at an annual rate of 9.0% (95% CI ¼ 1.1–24.1%). To stabilize the growth rate of the female elk population, 8.0% (95% CI ¼ 1.1–19.4%) of the cows would need to be harvested annually. We estimated an adult elk abundance of 40.0 (SE ¼ 4.57; 95% CI ¼ 33.8–52.6) in 2012 and 61.1 (SE ¼ 7.21; 95% CI ¼ 49.9–78.8) in 2013. Our harvest management model provides Refuge staff, who ultimately intend to improve corn yield, with valuable information needed to stabilize the elk herd. Further, our approach outlines a simple, easily implemented modeling technique that can be used for the management of other ungulate herds.

GMU 55A

Pitman, James & Cain III, James & Liley, Stewart & Gould, William & Tatman, Nicole & Ballard, Warren. (2014). Post-Parturition Habitat Selection by Elk Calves and Adult Female Elk in New Mexico. The Journal of Wildlife Management. 78. 10.1002/jwmg.776.

ABSTRACT: Neonatal survival and juvenile recruitment are crucial to maintaining viable elk (Cervus elaphus) populations. Neonate survival is known to be influenced by many factors, including bed-site selection. Although neonates select the actual bed-site location, they must do so within the larger calf-rearing area selected by the mother. As calves age, habitat selection should change to meet the changing needs of the growing calf. Our main objectives were to characterize habitat selection at 2 spatial scales and in areas with different predator assemblages in New Mexico. We evaluated bed-site selection by calves and calf-rearing area selection by adult females. We captured 108 elk calves by hand and fitted them with ear tag transmitters in two areas in New Mexico: the Valle Vidal and Blue Range Wolf Recovery Area. In both study areas, we found that concealing cover structure and distance to that cover influenced bed-site selection of young calves (i.e., <2 weeks of age). Older calves (i.e., 3–10 weeks of age) still selected areas in relation to distance to cover, but also preferred areas with higher visibility. At the larger spatial scale of calf-rearing habitat selection by the adult female, concealing cover (e.g., rocks, shrubs, and logs) and other variables important to the hiding calves were still in the most supported models, but selection was also influenced by forage availability and indices of forage quality. Studies that seek to obtain insight into microhabitat selection of ungulate neonates should consider selection by the neonate and selection by the adult female, changes in selection as neonates age, and potential selection differences in areas of differing predation risk. By considering these influences together and at multiple scales, studies can achieve a broader understanding of neonatal ungulate habitat requirements. Published 2014. This article is a U.S. Government work and is in the public domain in the USA.

Tatman, Nicole. (2016). Predator-prey relationships between rocky mountain elk and black bears in northern New Mexico.

We conducted a 4-year study (2009–2012) evaluating the role of predation and nutrition in limiting the productivity of an elk (Cervus elaphus) population in northern New Mexico. In the years leading up to the initiation of the study, we observed low (<25:100) calf:cow ratios, suggesting calf recruitment was lower than desired. We sought to identify the reason for low recruitment by assessing the role of predation and nutrition in the population. We captured and fixed ear-tag radio transmitters to 245 elk calves (126M, 119F) to determine cause specific mortality. We quantified summer calf survival using Program MARK and annual survival using Cox Proportional Hazards models. During the second half of our study, we implemented spring black bear (Ursus americanus) harvest that included supplemental take by New Mexico Department of Game and Fish personnel and evaluated the response in calf survival. Across all years of our study we quantified how risk of mortality varied for juvenile elk both spatially and temporally by comparing the landscape surrounding black bear and mountain lion predation sites to sites where elk calves were captured. Simultaneously, we captured 9 black bears in 2011 and 2012 and equipped them with Global Positioning System (GPS) collars to quantify patterns of landscape use. Global positioning collars deployed on black bears obtained multiple locations per day and we evaluated bear habitat use in relation to presence of elk calves on the landscape. We also assessed the nutritional condition of adult female elk by quantifying herd-wide percent ingesta-free body fat (IFBF) and pregnancy rates. To achieve this, sport hunters harvested adult female elk from autumn through winter 2009–2012. We estimated autumn ingesta-free body fat (IFBF) using the Kistner subset score when possible (n = 1,130) or the kidney fat mass method (n = 284) when the Kistner score was not possible. We developed a set of models to explain IFBF of females through autumn and winter.The primary cause of death for calves across all years was black bear predation (57 of 140 non-anthropogenic mortalities). Predation was the primary cause of death for juveniles during their first 3 weeks of life, resulting in 84 of 92 non-anthropogenic mortalities. During this time,

black bears were the primary predator (n = 49), but coyotes (Canis latrans, n = 26) and mountain lions (Puma concolor, n = 4) were also predators. Black bear and mountain lion predation sites had higher percent canopy cover (64%, 95% CI=0.531–0.741) than capture sites (19%, 95% CI=0.152–0.220). For every 1% increase in canopy cover, a site was approximately 2 times more likely to be a black bear or mountain lion predation site than a capture site. We suspect that increased predation pressure in the forest edge environment likely influenced selective pressure on maternal elk to choose more open habitats postpartum because they were less risky for juvenile elk early in life. Annual calf survival was greater when spring black bear harvest was moderate to heavy (0.44–0.47) compared to low (0.33–0.35). For every additional bear harvested in spring, radio-tagged elk calves were 2.6% more likely to survive the summer. Though black bear predation is typically considered an additive form of mortality, when we only considered Ursid predation patterns we observed this predation on calves to be dependent on the size of the calf (P = 0.0403, P = 0.00251). This size-dependent predation suggests that ursid predation on elk calves may not have been entirely additive during our study. Black bears fixed with GPS-collars used a variety of vegetation types, demonstrating the generalist nature of black bears in New Mexico. Despite having a small sample size of GPS-collared bears during the calving season (n = 4), we found that black bears tended to have smaller home ranges that overlapped the calving area to a greater extent during the calving season compared to other seasons. This suggests that it is possible that black bears are keying in on elk calves during the calving period.Adult female elk were harvested by sport hunters from October through March 2009– 2012 (n = 1,808). Across years and age classes 82% (SE = 1%) of females were pregnant. Pregnancy rate was greatest for prime aged (2–14 years) females (88%, SE = 1%) and lower for young (<2 years, 11%, SE = 4%) and senescent (>14 years, 47%, SE = 5%) females ($\chi2$ = 267.3, P < 0.001). Our herd-wide estimate of autumn IFBF was 11.41% (SE = 0.19) but varied by age class, pregnancy status, and lactation status. Prime-aged females that were pregnant had greater autumn IFBF (12.51%, SE = 0.51%) than females that were not pregnant (9.95%, SE = 0.21; $F_{1,725}$ = 88.09; P < 0.001). Ingesta-free body fat decreased as winter progressed ($F_{1,1408}$ = 58.37; P<0.001), with body fat being an average of 1.29% lower during winter than autumn, but this also depended upon age class and lactation status. We found that IFBF was best explained by a model incorporating both environmental (winter severity and harvest unit) and biological (pregnancy status, lactation status, herd-wide calf survival, and age) covariates. The range of variables deemed significant underscores the importance of considering multiple factors that may influence a large herbivore population and IFBF of adult females in particular. Simple models (those with a single predictor variable) performed worse than models that were more complex, suggesting that IFBF is influenced by a combination of environmental and biological factors.Low calf recruitment despite adequate condition and nutrition of adult females in the study area suggested that substantial black bear predation was limiting population productivity. Despite observing black bear predation that may have been partially compensatory, when spring bear harvest was heavy calves were 1.5 (95% CI = 0.97–2.32) times more likely to die compared to when black bears were heavily harvested (P = 0.068). Results from our study suggest that productivity could be increased by implementing a spring black bear harvest strategy, targeting hunting or removal efforts near calving areas. However, we were unable to sustain higher spring black bear harvest with hunter effort alone. We recommend that a combination of analysis of IFBF on hunter harvested adult female elk and an assessment of cause-specific neonatal survival can be used to assess the limiting nature of predation and nutrition in many settings.

Tatman, Nicole M., Stewart G. Liley, James W. Cain III, and James Pitman. (2018) Effects of calf predation and nutrition on elk vital rates. The Journal of Wildlife Management, Vol 82, Issue 7, pg 1417-1428.

ABSTRACT: Demographic data indicated a population of elk (*Cervus canadensis*) in northern New Mexico had reduced juvenile recruitment, resulting in a concern over quality hunting opportunities. Following several years of low calf:female ratios of <25:100, we conducted a 4-year study from 2009–2012 to identify reasons for poor recruitment and evaluated the role of predation and nutrition in limiting productivity. We captured and fixed ear-tag radio transmitters to 245 elk calves (126 males, 119 females) to determine cause-specific mortality and estimate calf survival. During the second half of our study, we implemented a new spring black bear (*Ursus americanus*) season resulting in higher spring black bear harvest and evaluated response in calf survival. We also quantified herd-wide nutritional condition and productivity. We estimated percent ingesta-free body fat (IFBF) and pregnancy rates by sampling 1,808 hunter-harvested female elk from autumn through winter. The primary cause of summer mortality for calves across all years was black bear predation. Estimates for annual calf survival were greater when spring black bear harvest was moderate to high (0.44–0.47) compared to periods with lower bear harvest (0.33–0.35). For every additional bear harvested in spring, radio-tagged elk calves were 2.4% more likely to survive the summer. Across years and age classes $82 \pm 1\%$ (SE) of females were pregnant. Pregnancy rate was greatest for prime-aged (2–14 yr) females ($88 \pm 1\%$). Our herd-wide estimate of IFBF for prime-aged adult female elk was $11.9 \pm 0.19\%$ but varied by pregnancy and lactation status. Our results that black bear predation was the primary cause of summer calf mortality and that adult females were in adequate nutritional condition suggested that black bear predation was limiting population productivity. Additionally, calf survival was higher in drought years, the same years when targeted spring black bear harvest was implemented. Our results demonstrated that productivity could be increased by implementing a spring black bear harvest strategy targeted around calving areas and could be applied in other areas experiencing low elk calf survival.