

Mountain Lion



September 2023



Executive Summary

The mountain lion (*Puma concolor*) is a biologically and culturally important game animal in Montana, especially in Montana Fish, Wildlife and Parks (FWP) Administrative Region 2. The goal of this report is to summarize mountain lion harvest, management, and conflict *at a regional level*.

New lion regulations went into effect statewide during the 2022-2023 license year. “Hunting Districts”, previously aligned with single or combinations of Deer/Elk HDs, were renamed “Lion Management Units (LMUs)”. Limited Special Lion Licenses (SLLs) were offered in most LMUs, holders of which would be able to harvest a lion of either sex season-long, even if the quota for that LMU had been filled. All other hunters had to hold a Restricted Over the Counter (OTC) Mountain Lion License (previously known as a General Lion License) or Unlimited Special Lion License. Unlimited SLLs were valid for LMUs in one watershed only (Lower Clark Fork, Upper Clark Fork, Bitterroot, or Blackfoot). During the archery/fall season without dogs and in the Missoula Special Management Area (MSMA), lions could be harvested on any license season-long. Hunters who applied for and did not draw a Limited SLL could not purchase an Unlimited SLL but could still purchase a Restricted OTC License.

Regional lion harvest has been stable since approximately 2013, with an average of 129 lions harvested per year (with an average of 38% female harvest). In the 2022 license year, 142 lions were harvested (88 males and 54 females). A slight majority of this harvest occurred in the Bitterroot watershed (37 lions), followed by 35 in the Lower Clark Fork, 29 in the Blackfoot, 22 in the Upper Clark Fork, and 19 in the MSMA.

Human-lion conflict remains an important source of lion mortality throughout the region, with more lions killed as a result of livestock depredation than any other cause (other than legal hunting seasons). While 2022 data is still being compiled, 2021 saw a total of 17 conflict-related lion mortalities.

Contents:

1. The Mountain Lion Monitoring and Management Strategy
2. Timeline of major mountain lion season types in Region 2, 1971-2023
3. Summary of major changes to lion hunting districts, 1994-2023
4. 2022 season harvest summary for Region 2
5. Region 2 lion harvest trends, 1971-2022
6. Other sources of mountain lion mortality
7. Summary of age data, 2010-2022
8. Additional resources

1. The Mountain Lion Monitoring and Management Strategy

Although mountain lions prey on elk and deer and may affect populations of those species, mountain lion hunting (primarily with the aid of trained hounds) is a valued recreational activity among many sportsmen and women. In Region 2, mountain lion hunting regulations have undergone substantial changes over the last 50 years, not only to increase or decrease harvest of the species, but to address conflict among lion hunters stemming from competition over open quotas and prime hunting areas. More recently, FWP initiated research projects to better understand mountain lion population dynamics and effects on prey populations. This work culminated in the development and adoption of the statewide Mountain Lion Monitoring and Management Strategy in 2019. This document, along with research and monitoring reports, may be found on the [FWP website](#)¹.

The Mountain Lion Monitoring and Management Strategy identifies large contiguous areas of the state within which lion habitat is broadly similar. Referred to as ecoregions (Figure 1), these areas cover multiple FWP administrative regions and are the spatial basis of FWP's lion population monitoring program. The four ecoregions are Northwest, West-Central, Southwest, and Eastern. In Region 2, LMUs 201, 202, 282, 285, and 299 (Missoula Special Management Area, or MSMA) are in the Northwest ecoregion, which also encompasses all of FWP Region 1. The remaining 11 LMUs (204, 210, 211, 213, 214, 215, 240, 250, 270, 280, and 290) are in the West-Central ecoregion, which also contains parts of FWP Regions 3 and 4.

We anticipate that the new monitoring and management strategy will play an important role in future season and quota setting. For the Northwest Ecoregion, the strategy was already implemented resulting in a slight reduction of quotas in the Lower Clark Fork LMUs and MSMA, and an increase in the Blackfoot LMUs for the 2022 season. The process to develop recommendations for the West-Central Ecoregion LMUs is currently underway and expected to result in quota recommendations this spring.

¹ <https://fwp.mt.gov/conservation/wildlife-management/mountain-lion>

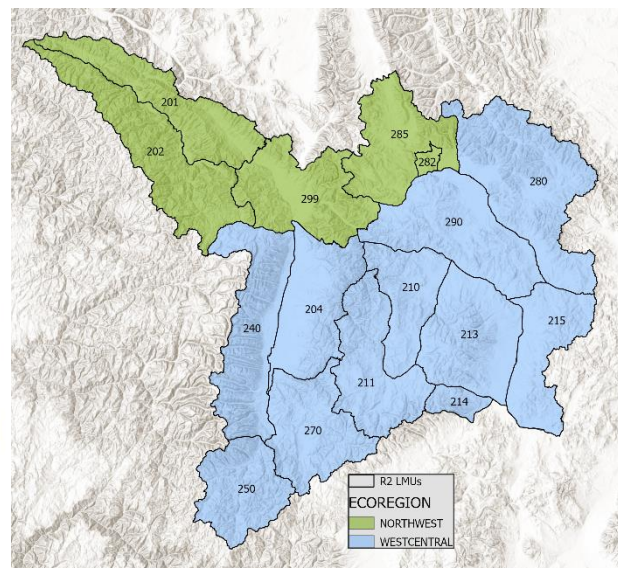
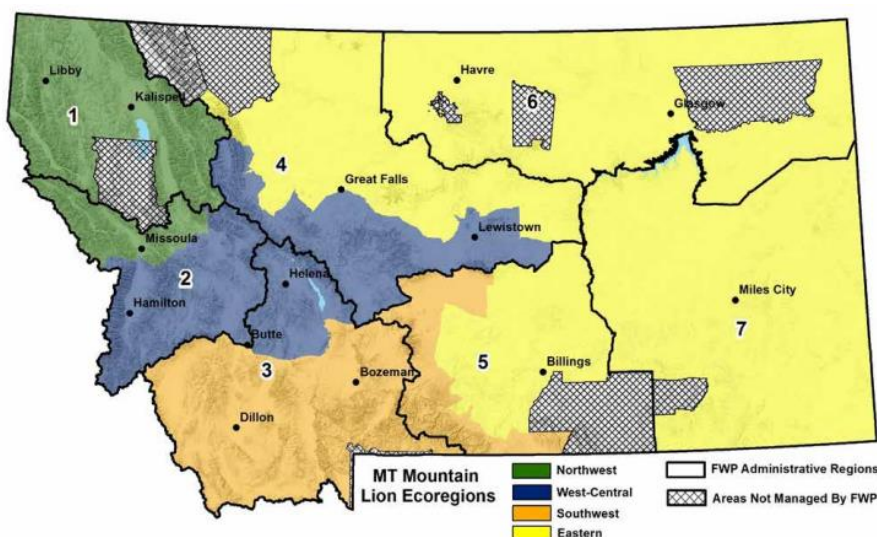


Figure 1. Map showing the four ecoregions identified in the Mountain Lion Monitoring and Management Strategy (left), with breakdown of Region 2 Lion Management Units (LMUs) into the Northwest (green) and West-Central (blue) ecoregions.

2. Timeline of Major Mountain Lion Season Types in Region 2, 1971-2023

1971-1972	Unlimited mountain lion hunting statewide from opening of general big game season to April 30. Use of dogs allowed. Limit one license per person. Females with kittens and juveniles may not be taken. Mandatory inspection of harvested lions. No quotas.
1973-1978	Same as prior regulations except HD280 season opens September 15. HD282 (Blackfoot-Clearwater Wildlife Management Area) closed to lion hunting in 1977.
1979-1988	Similar to prior regulations except season shortened from December 1-February 15, with subsequent chase-only season to April 30. Additional dog chase permit required (free). All WMAs closed to lion hunting/chasing beginning in 1980.
1988-1994	General Lion License valid in all areas until quota filled. Total quota and female sub-quota; males not managed at a specific quota. Some HDs have combined lion quotas. Missoula Special Management Area created in 1994.
1995-1997	Similar to prior regulations, except total quota split into separate male and female quotas.
1998	Lion season end date changed to April 14, with special chase season eliminated. Hound handler (dog chase) permit still required to hunt with hounds.
1999-2002	Similar to prior regulations, except hunting in the archery and fall seasons without dogs limited to 20% of the total quota (i.e. if 20% of the total HD quota is harvested during these seasons, hunting closes until the opening of the winter season).

2003-2007	Similar to prior regulations, but with special permit drawing for lions in eastern half of HD292 (due to the Garnet lion research project) and non-resident non-outfitted hunters limited by special permit drawing in some HDs.
2008-2011	Hunting by limited Special Lion License (SLL) drawing only per HD/group of HDs. Female sub-quota in some HDs. Missoula Special Management Area (MSMA) open to General License-holders with separate male/female quotas, with 2 SLLs available to non-resident hunters.
2012-2021	“Hybrid season”: General Lion License valid during archery and fall season without dogs, with 20% sub-quota (i.e. if 20% of the total HD quota is harvested during these seasons, hunting closes until the opening of the winter season). Limited number of SLLs per HD/group of HDs valid for winter season (Dec 1 – Apr 14). Any remaining open quota on Feb 1 available to General Lion License holders for “late winter” season (Feb 1 – Apr 14). Hybrid season does not apply to MSMA, with male/female quotas open to General Lion License holders, with 2 SLLs available to non-resident hunters.
2022-present	HDs/groups of HDs changed to Lion Management Units (LMUs). Three license types: Unlimited SLL, Limited SLL, and General Lion License. Any license type may be used during archery and fall season without dogs and in the MSMA, with an archery/fall season sub-quota. Except for the MSMA, hunters must hold a Limited or Unlimited SLL for the late winter season. Hunters not applying for a Limited SLL may obtain an Unlimited SLL valid for any LMU in one of 4 watersheds in Region 2 (Lower Clark Fork, Upper Clark Fork, Bitterroot, Blackfoot). Hunting on General Lion License and Unlimited SLL limited by male/female quotas per LMU (except MSMA, which has a total non sex-specific quota). Holders of Limited SLLs may continue to harvest either-sex lion in their LMU even if quota has been met.

3. Summary of Major Changes to Lion Hunting Districts

Prior to 2022, mountain lions were managed within the same hunting district (HD) boundaries as deer and elk, with some HDs combined under a single quota (e.g., HDs 204, 260, 261, and 262 sharing a single quota in the Bitterroot). Combinations of HDs have fluctuated across time, as have the boundaries of those HDs. This makes comparing historic harvest trends with more recent data difficult, especially on smaller (individual HD or LMU) scales.

In 1994, the Missoula Special Management Area (MSMA) was carved out of portions of existing HDs 201, 203, 204, 260, 283, and 292. This area centers on the larger Missoula metro area, with a generally larger harvest quota intended to reduce human-lion conflict in residential and recreational areas.

In the Bitterroot, slight boundary adjustments, focused on Deer and Elk management, occurred in 2014 in HDs 240, 250, and 270. Hunting Districts 240 and 270 were expanded, while HD250 was reduced in size.

In the Upper Clark Fork, changes included boundary adjustments (e.g., HD214) and changes in quota distribution. For example, HDs 213 and 214 shared a quota for many years before being separated. Some HDs shared quotas with various neighbors, such as HD212, which has alternatively shared quotas with HDs 213 and 215.

In the Blackfoot, both HDs 292 and 298 have sometimes been split into portions sharing quotas with different sets of neighboring HDs. Boundary changes and the creation of new HDs have also occurred. HD282, the Blackfoot-Clearwater Wildlife Management Area, has been closed to lion hunting and chasing since 1977 to reduce disturbance to elk on winter range.

In 2022, “Hunting Districts” were renamed “Lion Management Units (LMUs)” to simplify lion regulations. For example, HDs 204/260/261/262, which were previously managed as one hunting area with a shared quota, was renamed “LMU 204”.

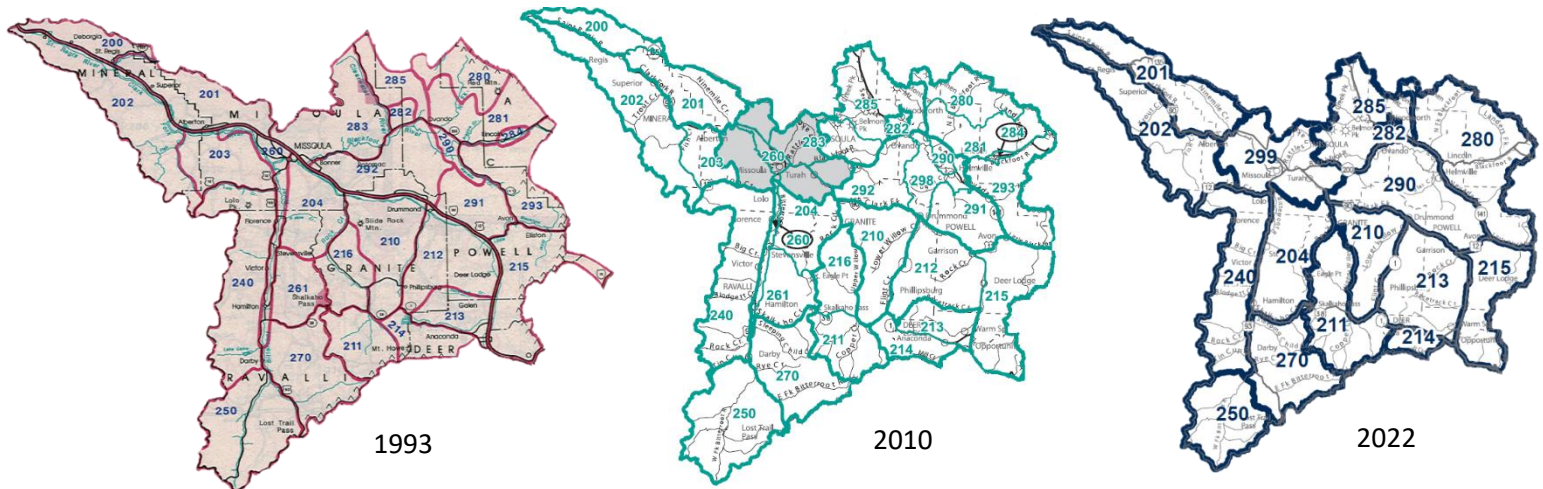


Figure 2. Map of Region 2 Hunting Districts (1993-2010) and Lion Management Units (2022). Notice creation of Missoula Special Management Unit (shaded area in 2010 map, renamed LMU 299 in 2022) and other boundary changes.

4. 2022 Region 2 Mountain Lion Harvest Summary

New lion regulations went into effect statewide during the 2022-2023 license year. Limited Special Lion Licenses (LSLLs) were offered in most LMUs, holders of which would be able to harvest a lion of either sex season-long, even if the quota for that LMU had been filled. All other hunters had to hold a General Lion License or Unlimited Special Lion License. Unlimited SLLs were valid for LMUs in one watershed only (Lower Clark Fork, Upper Clark Fork, Bitterroot, or Blackfoot). During the archery/fall season without dogs and in the Missoula Special Management Area (MSMA), lions could be harvested on any license season-long.

Hunters who applied for and did not draw a Limited SLL could not purchase an Unlimited SLL, but could still purchase a General Lion License.

The number of LSLLs available per LMU was based primarily on historic quota fill and fill rate. For example, in many Upper Clark Fork LMUs and LMU250 in the Bitterroot, previous quotas were typically not met, so there would be less demand for a LSLL. When LSLLs were added, managers judged that holders were more likely to harvest a male, so that number was deducted from the target male quota.

Generally, these new regulations resulted in faster quota fills compared to the hybrid season (2012-2021). Figure 3 compares the mean and range of fill dates for male lions only in the Region 2 LMUs with the 2022-2023 season fill date.

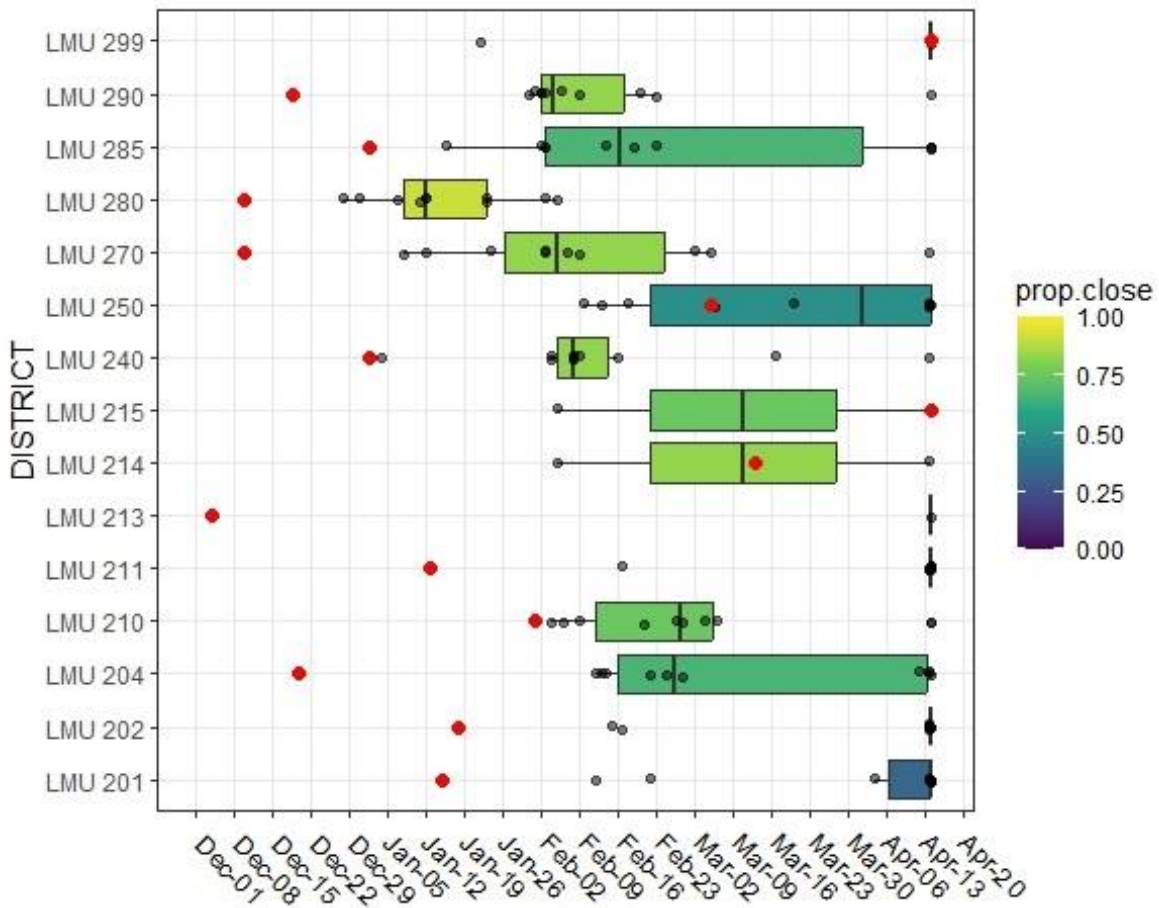


Figure 3. Boxplot showing range of closure dates during the hybrid season (2012-2021) for each LMU, males only. Red marker denotes closure date for 2022 season. Box color indicates the proportion of years an LMU quota closed before the end of the season. Vertical bar denotes mean closure date. Note that boundary changes in the Upper Clark Fork throughout this time period make LMUs in this watershed more difficult to interpret.

As this was the first year of this new and very different regulation, there was some confusion among hunters regarding which license they needed. Hunters were allowed to exchange general lion licenses for the proper Unlimited SLL after harvest. Table 1 shows the number of USLLs sold for the 2022-2023 season, and Table 2 shows the number of available SLLs and male and female quota and harvest for each LMU.

License	Watershed	Number sold
201-05	Lower Clark Fork	99
204-05	Bitterroot	156
210-05	Upper Clark Fork	95
280-05	Blackfoot	100

Table 1. Number of Unlimited Special Lion Licenses sold. Hunters were required to choose one license and thus hunt only one of the four Region 2 watersheds.

	Watershed	2022 Region 2 Lion Harvest							
		Male Quota	Female Quota	Male Harvest	Female Harvest	LSLL Quota	LSLL Harvest	Total Quota (incl LSLL)	Total Harvest
LMU 201	LCF	7	6	7	5	1	1	14	13
LMU 202	LCF	11	9	13	7	2	2	22	22
LMU 204	Bitterroot	3	3	3	3	2	0	8	6
LMU 210	UCF	3	2	3	2	0	NA	5	5
LMU 211	UCF	5	3	5	1	0	NA	8	6
LMU 213	UCF	3	2	4	2	0	NA	5	6
LMU 214	UCF	2	2	2	0	0	NA	4	2
LMU 215	UCF	3	1	2	1	0	NA	4	3
LMU 240	Bitterroot	5	5	6	2	2	1	12	9
LMU 250	Bitterroot	7	5	7	5	0	NA	12	12
LMU 270	Bitterroot	5	6	5	4	2	1	13	10
LMU 280	Blackfoot	4	4	4	4	2	1	10	9
LMU 285	Blackfoot	5	4	5	4	2	1	11	10
LMU 290	Blackfoot	6	4	6	3	2	1	12	10
LMU 299	MSMA	NA	NA	10	9	0	0	20	19

Table 2. Mountain lion harvest in Region 2, 2022 license year. LCF = Lower Clark Fork. UCF = Upper Clark Fork. MSMA = Missoula Special Management Area. LSLL = Limited Special Lion License. Some LMUs did not offer LSLLs due to historic low harvest. Note LSLL harvest relative to availability.

5. Region 2 Mountain Lion Harvest Trends, 1971-2022

Because of the changes in HD/LMU boundaries over the years, comparing harvest trends at the LMU or watershed level is problematic, without the ability to definitively reassign older harvest records to current LMU boundaries. Figure 4 shows the total Region 2 harvest from 1971 to 2022. After the creation of the Missoula Special Management Area (MSMA) in 1994, we can better examine harvest at a watershed level in Figure 5 (the four main Region 2 watersheds plus the MSMA).

Similarly, we can compare how the quotas impacted harvest during this period. Figure 6 shows the harvest (bars) relative to the quota (dashed line) in each watershed and the MSMA. The figure shows that most often, quotas are not met across watersheds. It is important to note that the quotas and harvest in this figure are pooled per watershed, and that quota overruns may happen more often at smaller scales (e.g., individual LMUs).

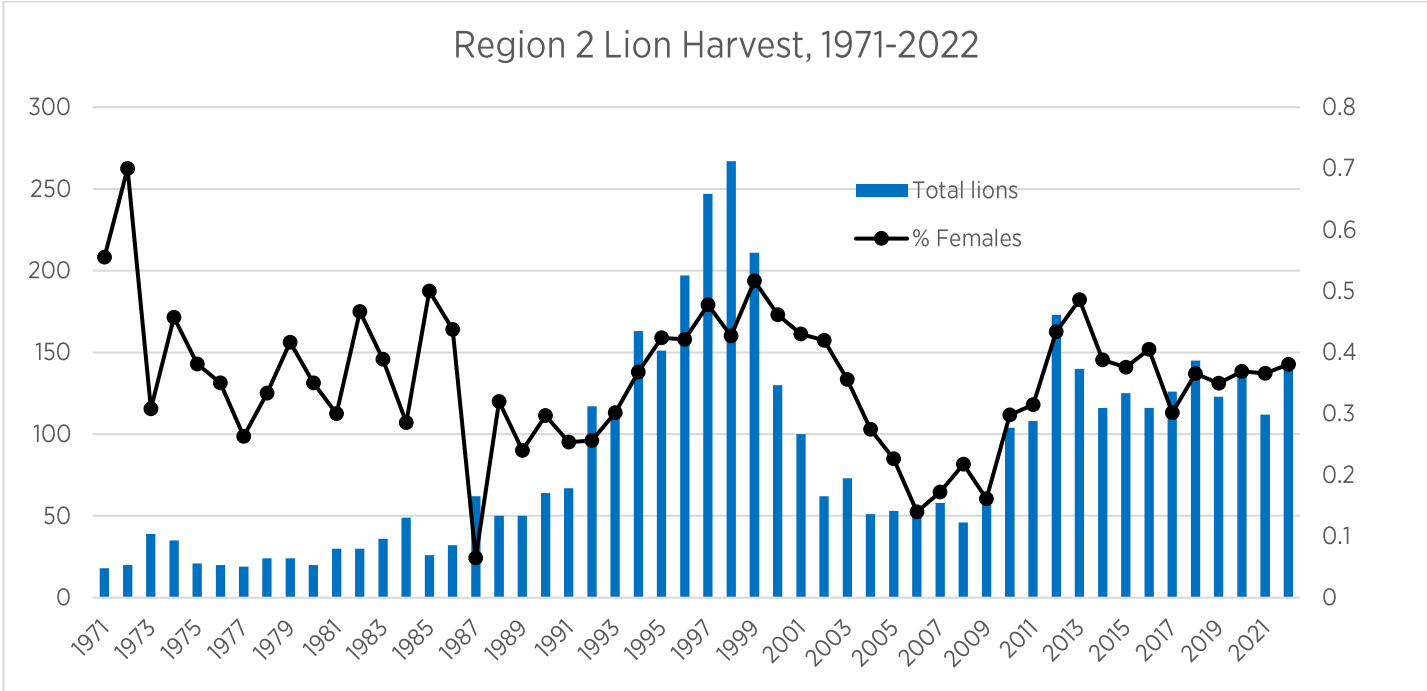


Figure 4. Lion harvest across all of Region 2, 1971-2022. Black line (secondary axis) shows the percent of total harvest made up of females.

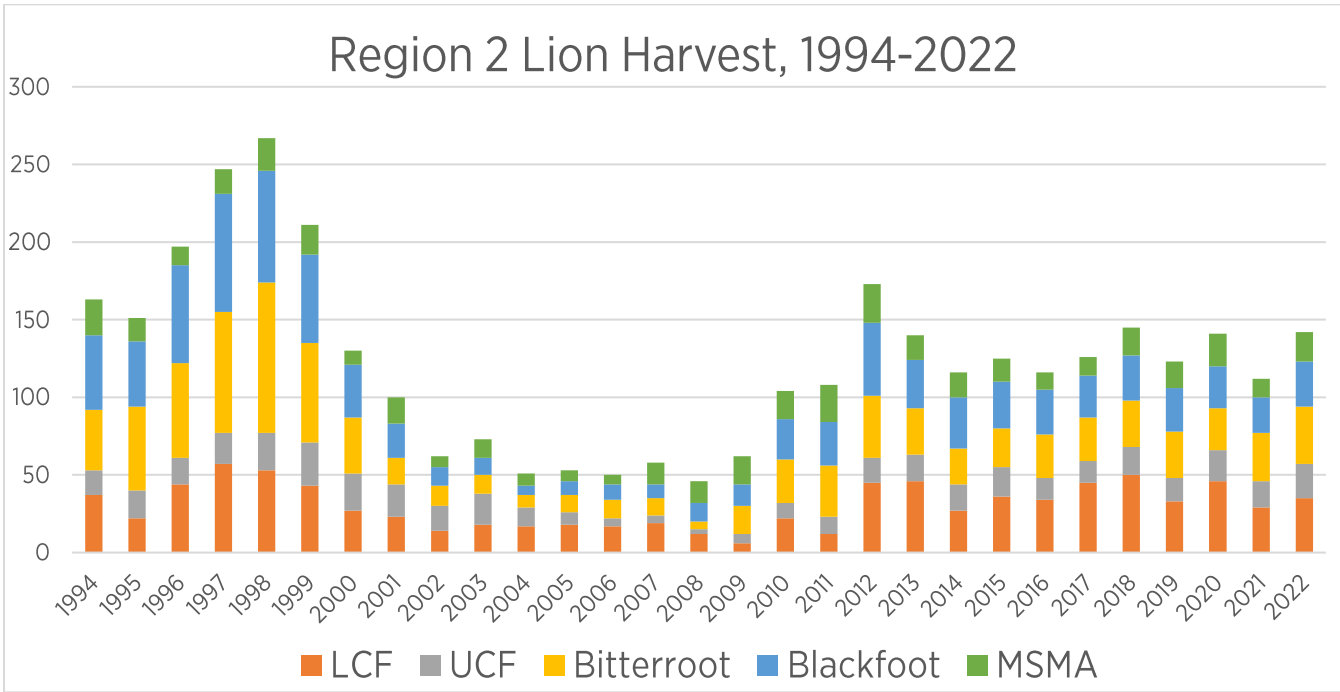


Figure 5. Lion harvest per watershed, 1994-2022. LCF = Lower Clark Fork. UCF = Upper Clark Fork. MSMA = Missoula Special Management Area.

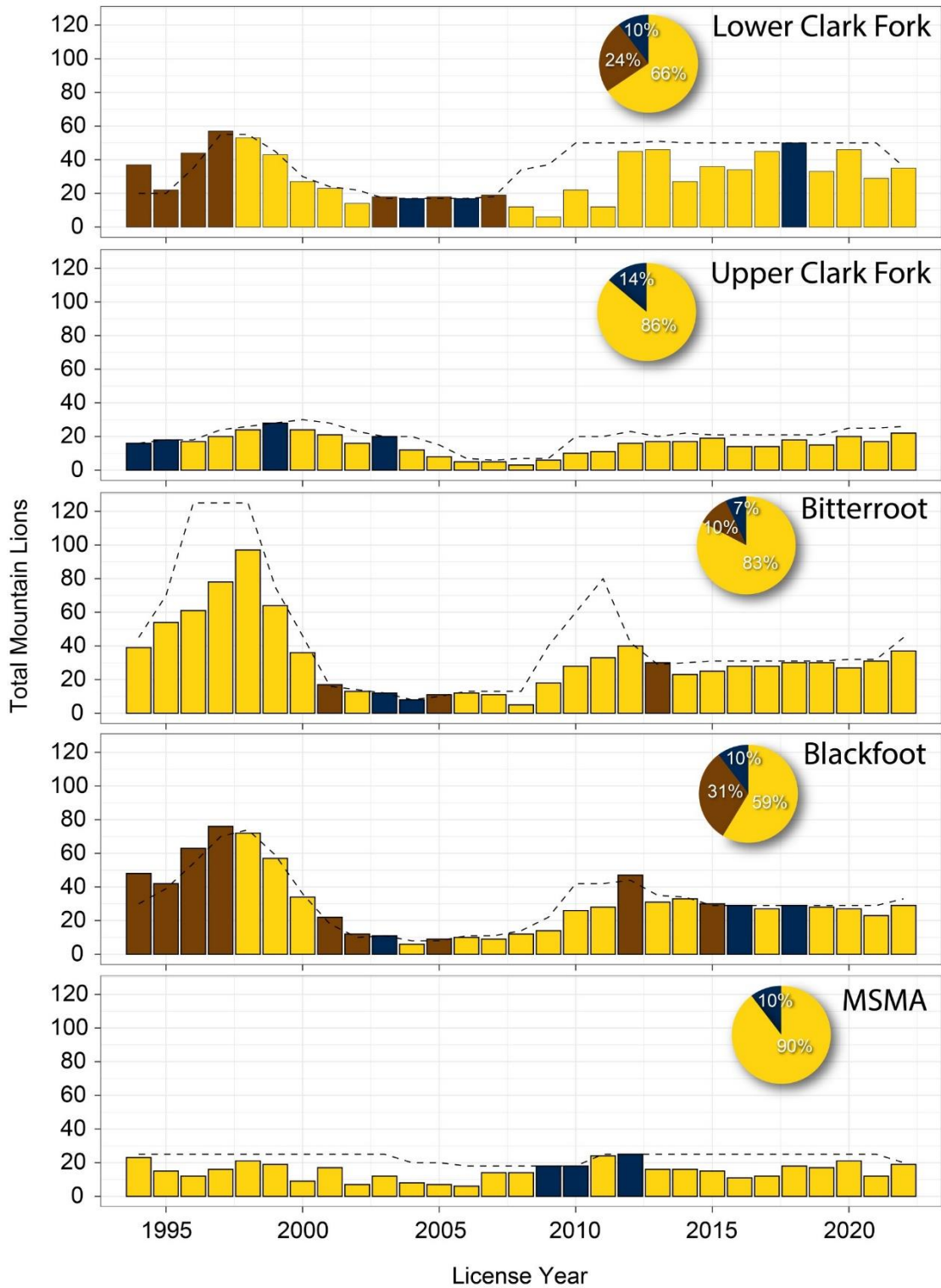


Figure 6. Mountain lion quotas (dashed line) and harvest (bars) in Region 2 by watershed, 1994-2022. Brown color indicates quota overrun, yellow indicates harvest below quota, and dark blue indicates harvest equal to quota. Pie chart shows percentage of years of each quota status. Lower Clark Fork includes Lion Management Units (LMUs) 201 and 202. Upper Clark Fork includes LMUs 210, 211, 213, and 215. Bitterroot includes LMUs 204, 240, 250, and 270. Blackfoot includes LMUs 280, 285, and 290. MSMA=Missoula Special Management Area. Note some years (e.g., 1994, 1996) when quotas were overrun in some watersheds, but that quota overruns were generally rare. Data is preliminary and subject to change.

6. Other sources of mountain lion mortality

In addition to harvest, incidental and conflict-related mortalities are reported as they occur. These include vehicle strikes, lions caught and injured in traps set for other species, lions killed in defense of property (usually pets or livestock), and lions killed in response to livestock depredations. Illegal harvests of mountain lions are also documented, such as lions illegally killed over-quota, without proper licensing, or using illegal means. Lions are occasionally caught in traps but able to be released with no or minor injuries; these instances are documented, but not included in mortality data.

Between 2010-2022, livestock depredations made up the majority of non-hunting lion mortality in Region 2, followed by habituation. There has been an overall decreasing trend in this additional lion mortality during this period, although depredation removals are more variable.

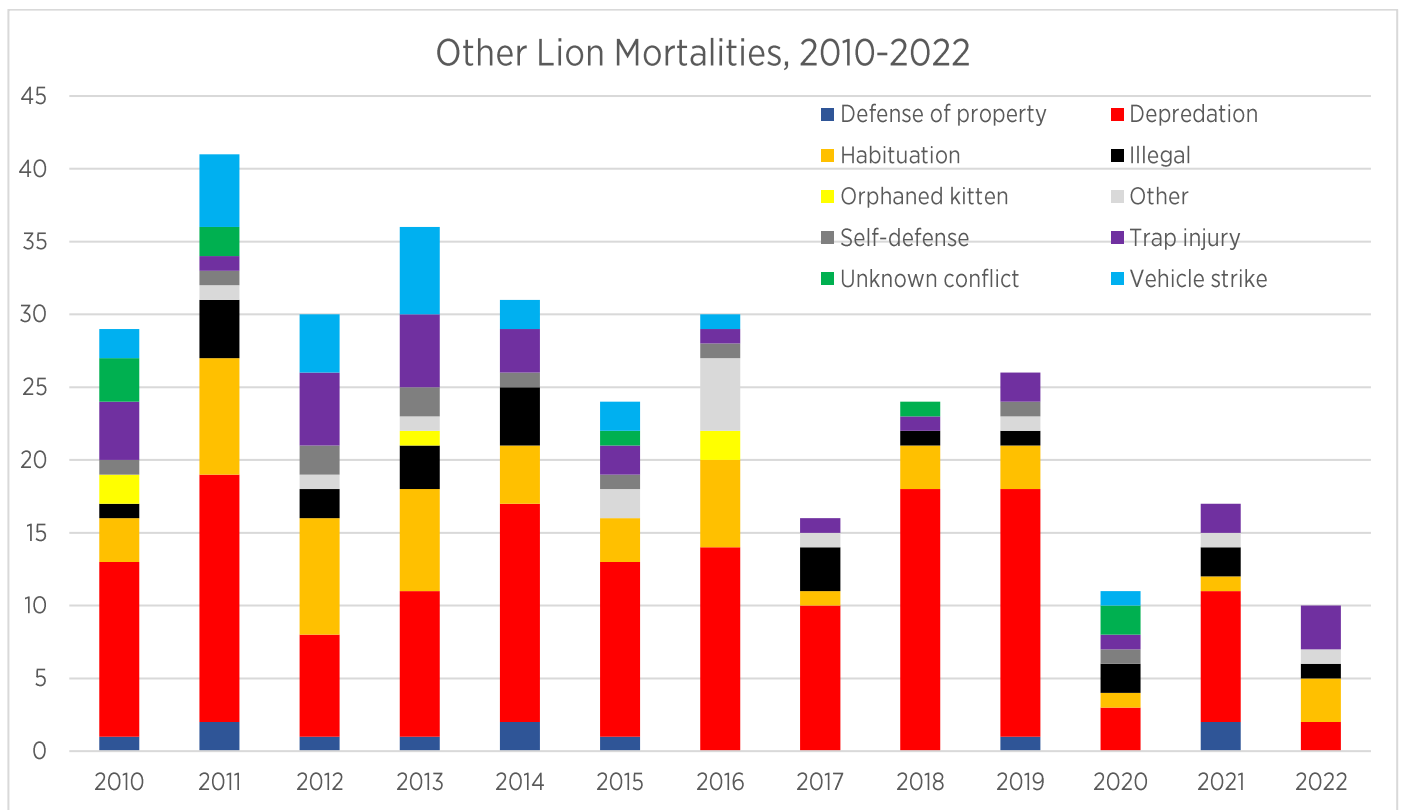


Figure 7. Other lion mortalities in Region 2, 2010-2022. Note that 2022 data is still being compiled and these numbers may increase. "Other" includes lions found dead or euthanized after being found in poor condition. "Orphaned kitten" constitutes kittens euthanized because they were unable to be rehabilitated. "Defense of property" represents lions shot while chasing or pursuing pets or livestock. "Habituation" and "Depredation" sometimes overlap; generally, lions killing dogs are considered "Depredation" while lions removed for killing domestic cats or deer around homes are considered "Habituation". "Unknown conflict" denotes records indicating a lion was removed by USDA Wildlife Services or FWP with no details on depredation vs. habituation vs. defense of property. Data is preliminary and subject to change.

7. Age Data

As part of the inspection procedure following a mountain lion harvest, FWP employees remove the first premolar tooth from the upper jaw for cementum annuli aging. While not all lions are aged this way—some lions are presented too frozen, or teeth are broken during the extraction process—this technique can offer glimpses into the effect of harvest on the lion population, as well as population reconstruction which is an important part of the Integrated Population Model (IPM) used in the Mountain Lion Monitoring and Management Strategy.

Figure 8 and Table 3 below show a decrease in the average age of both lion sexes over the approximate duration of the hybrid season (which began in 2012), with a more pronounced decrease in males. Figure 9 shows age trends in male lions only over a longer time frame (1988-2021).

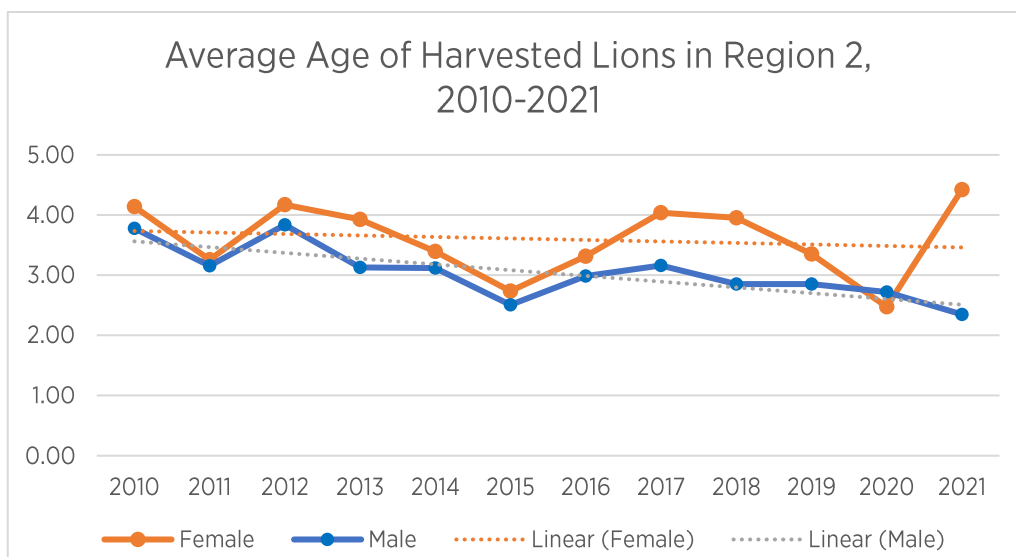


Figure 8. Average age of harvested mountain lions, 2010-2021. 2022 age data is not yet available. Data does not include incidental lion mortalities or lions removed due to conflict.

	Male			Female		
	<i>n</i>	Max	Average	<i>n</i>	Max	Average
2010	64	10	3.78	28	11	4.14
2011	64	7	3.16	31	9	3.26
2012	80	10	3.84	63	12	4.17
2013	62	12	3.13	56	16	3.93
2014	51	10	3.12	33	9	3.39
2015	69	6	2.51	38	6	2.74
2016	62	8	2.98	38	8	3.32
2017	73	9	3.16	27	9	4.04
2018	81	7	2.85	46	11	3.96
2019	47	5	2.85	37	9	3.35
2020	64	7	2.72	40	8	2.48
2021	43	6	2.35	19	10	4.42

Table 3. Number of samples submitted (*n*), maximum age, and average age of harvested male and female lions in Region 2, 2010-2021.

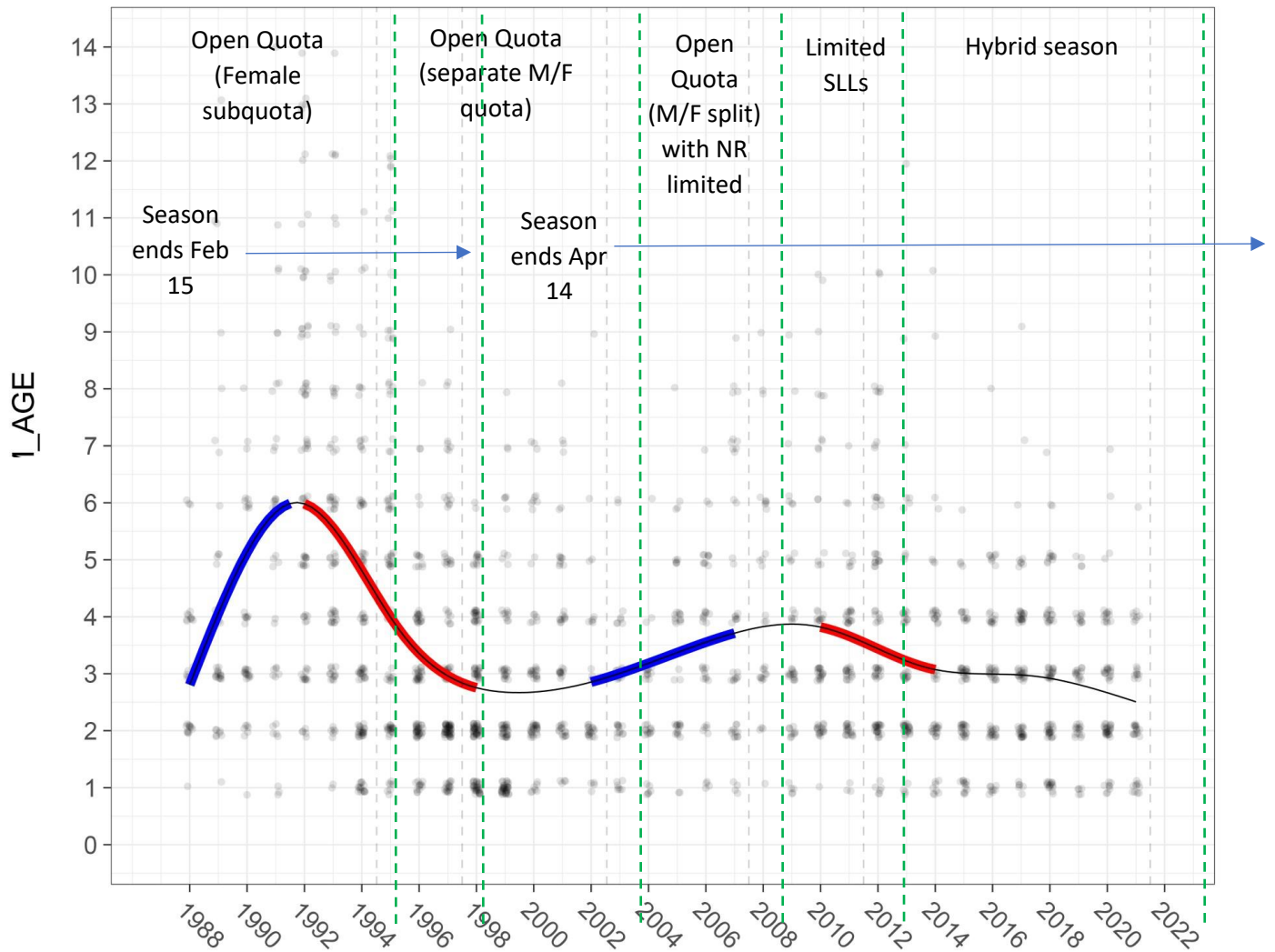


Figure 8. Ages of **male** mountain lions from 1988-2021 in Region 2. Points represent individual age estimates from cementum annuli analysis. The black line represents a fitted nonlinear generalized additive regression line (edf 8.08, $F = 50.03$, $p < 0.001$). The thicker lines show where the fitted regression was significantly ($\alpha = 0.05$) increasing (blue) or decreasing (red). Portions without thicker blue or red lines indicate variation that was not statistically different from no trend. Vertical dashed lines represent years of regulatory changes (see regulations table on Page 2).

8. Additional resources

- Mountain Lion Monitoring and Management Strategy
https://fwp.mt.gov/binaries/content/assets/fwp/conservation/wildlife-reports/mountain-lion/mountain-lion-monitoring-and-management-strategy_final_adopted-1.pdf
- Northwest mountain lion ecoregion population estimate report, 2019-2021
<https://fwp.mt.gov/binaries/content/assets/fwp/conservation/mountain-lion/5-2022-01-31-nw-mountain-lion-ecoregion-report-2019-2021.pdf>
- Bitterroot mountain lion project report (2014)
<https://fwp.mt.gov/binaries/content/assets/fwp/conservation/wildlife-reports/mountain-lion/lion-progress-report---jan-2014.pdf>