Missouri Duck Season Dates and Zone Boundaries Review

Weather, Migration, and Harvest Data for Missouri

January 2025

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Introduction

The Missouri Department of Conservation (Department) is seeking public input regarding duck zone boundaries, the choice between continuous versus split seasons and season date formulas. The opportunity to change duck season structure (continuous or split seasons and zone boundaries) is available to states about every five years by the U.S. Fish and Wildlife Service (FWS). FWS will allow states to submit zone boundary and continuous versus split season recommendations by August 2025 for the 2026-2030 duck seasons. The zone options selected for 2026-2030 must remain in place even if the duck season is shortened to 45 or 30 days. Duck season structure options provided by the FWS for 2026-2030 include the following:

- 1 (statewide) zone with up to 3 season segments per zone (2 splits per zone)
- 2 zones with up to 3 season segments per zone (2 splits per zone)
- 2 zones with up to 2 season segments per zone (1 split per zone)
- 3 zones with up to 2 season segments per zone (1 split per zone)
- 4 zones with a continuous season in each zone (no splits)

The Department will also be reviewing the duck season date formulas that have been in place since 2021 and will adjust as needed for the 2026-2030 duck seasons. Hunting conditions can vary tremendously from one year to the next. During some years, the best hunting can occur early in the season; during other years, it can occur late. Limiting changes to about every five years helps the Department evaluate the effectiveness of zone boundaries and season dates over a range of conditions. The formula for the 2021-2025 duck season can be found on page 14.

Hunter input is an essential part of the equation for establishing duck season dates and zone boundaries. The Department will use a web-based survey made available to Missouri migratory bird hunters in fall/winter 2024/2025 to capture a broad range of duck hunter perspectives regarding Missouri's duck season structure. In addition, the Department is hosting a series of workshops during January and February 2025. The purpose of the workshops is to share information used to develop hunting season recommendations and to provide hunters a chance to offer their views about season dates, zone boundaries, and continuous vs split seasons for the 2026-2030 seasons.

This report provides weather, migration, and harvest data to assist hunters when developing their recommendations for zone boundaries, a continuous versus a split season, and season date formulas for 60-day, 45-day and 30-day seasons. Data are compiled to depict information from statewide, zone, and regional perspectives.

Missouri Duck Season Structure Objectives and Guiding Principles

Objective

To establish zone boundaries and season dates that best accommodate hunter preferences, including those of hunters with varying levels of experience and those who hunt in different types of habitat (e.g., shallow water versus rivers and reservoirs), target different species (e.g., mallards versus early-season migrants), have varying physical capabilities (e.g. tolerance for cold and ice), and employ different hunting styles (e.g., water versus field hunting).

Given the range of hunter preferences, it is likely that not all hunters will be completely satisfied regardless of which season dates or zone boundaries are selected. The challenge is to provide a balance that will accommodate at least a portion of most hunters' desires. The choice of duck season structure and season dates has little impact on the overall status of duck populations. As a result, biological considerations are not as critical as providing duck seasons that contribute to overall quality hunting experiences. The FWS uses an Adaptive Harvest Management approach to determine if the season will be 60 days, 45 days, or 30 days in length and if the overall bag limit will be six ducks or three ducks. The combination of season length and bag limits is determined by the size of duck populations and habitat on the breeding grounds. States can select opening and closing dates between the Saturday nearest September 24 and January 31.

Guiding Principles

1. Current duck season options must consider the possibilities for 30-day, 45-day, and 60-day seasons. We have experienced nearly unprecedented opportunity with 60-day seasons since 1997. There is no guarantee that this will continue and potential season lengths of 30 and 45 days are possibilities that must be considered as changes in season structure are contemplated.
2. Duck season dates and zone boundaries will be recommended to accommodate a range of hunting styles and preferences. Dates that completely favor one group will likely disenfranchise another and may not accommodate the range of hunting styles throughout a region.
3. Duck season date and zone boundary selections will seek to balance providing opportunities for new hunters and satisfying more avid hunters. Over the past two decades, duck hunter numbers have declined across the country, but have remained relatively stable in Missouri. The Department will continue to consider the implications of season structure for recruiting new hunters as well as for retaining existing hunters.
4. Duck season dates for each zone must balance the hunter preferences from different regions within each zone.
5. Duck zone boundaries will be based upon the preferred season dates for hunters and historic harvest throughout a region. Boundaries will not be designed to accommodate a particular area or ownership, whether it is public or private.

6. The purpose of duck zones is to provide the "best" season dates for a particular region, not to extend the season for hunters who travel from zone to zone to extend their hunting season.
7. Recommendations for 2026-2030 will depend upon waterfowl migration timing, hunter harvest data, and hunters' preferences and input. If most hunters from a particular region prefer a different season structure (zones and splits) or season dates, a change will likely be recommended. The time and effort taken by hunters to provide their input is valued and it will help us develop the best possible recommendation for Missouri duck hunters.

Duck Season Data for Missouri

In the pages that follow, we first summarize weather, migration, and harvest data at the zone level and then by 14 regions in Missouri (figure 1). The zone-wide section provides a broad overview, while data summarized by region are intended to serve as a reference as hunters contemplate what season dates and zone boundaries they prefer in the regions they hunt most often. It also illustrates regional differences within zones that will need to be accommodated when season dates are set and zone boundaries established. Long-term weather data helps predict when regions of the state can expect weather that will likely result in the arrival or departure of ducks. Waterfowl counts from state and federal refuges show when ducks typically are most abundant in Missouri and harvest data reveals when hunters harvest the most ducks.

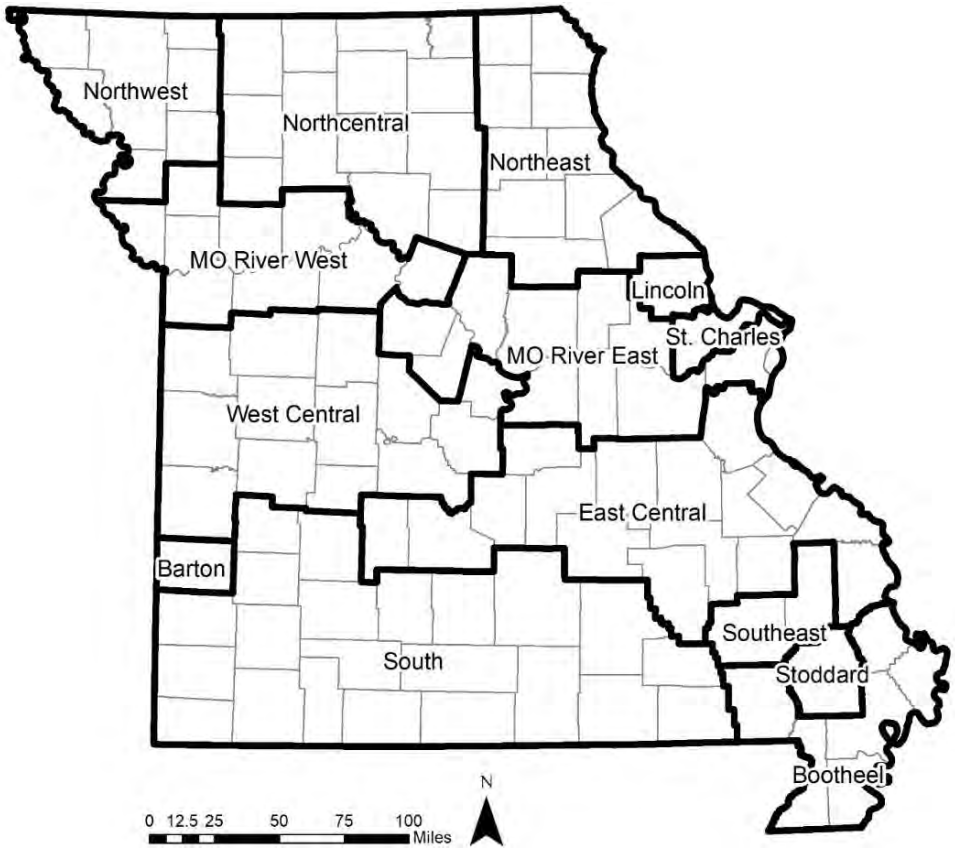


Figure 1. Regional areas used for summary of weather, migration, and harvest data.

Weather Data

1) *Dates when temperatures will likely fall below 24°F.*

For most duck hunters, a key question is when they can expect wetlands and lakes to freeze-up. A temperature that causes "freeze-up" cannot be specifically defined. Size of the water body, water depth, vegetation, wind protection, flowing water, and other factors all have a bearing on whether or not a particular body of water freezes over at a certain temperature. We selected a daily low temperature of 24°F to represent initial ice formation on shallow water areas and the likely arrival of mallards in reasonable numbers. The Missouri Climate Center Information provided daily temperature data from 14 weather stations that correspond to the 14 regions used to summarize population, migration, and harvest data.

2) *The percentage of years regions with intensively managed wetland areas recorded ice conditions during the periods 2017-2023*.

The presence of ice conditions suggests that most wetlands are unavailable for hunting without the aid of ice eaters or pumping water. When the presence of ice greater than two inches thick occurs, waterfowl concentrations and hunting are primarily limited to rivers, reservoirs, and fields. Duck numbers often begin declining if the ice conditions remain prevalent for multiple days. The presence of ice on intensively managed wetland areas were provided by Department wetland managers who record ice conditions on their respective conservation areas each day of the hunting season.

3) *Average fall and winter temperatures from 1895 through 2023.*

One of the greatest unknowns is what weather patterns will be like every year and the impact yearly weather fluctuations will have on duck migrations. Average temperatures from November through January across more than 100 years provide insights about annual variation in weather and cyclical cooling and warming trends. At the state level, these data were provided by Dr. Patrick Guinan, the Missouri state climatologist, from the Missouri Climate Center at the University of Missouri-Columbia.

Migration data

1) *A comparison of migration timing between the short-term (2017-2023) and the long-term (2003-2023).*

Corresponding to annual variation and uncertainty about weather patterns, hunters and waterfowl biologist alike are beginning to raise questions about the timing of migration, including: Are ducks arriving in Missouri later than in the past? Are they staying longer? Fortunately, Missouri has one of the longest-running datasets of weekly waterfowl numbers in the country that dates to the early 1950s. In this report, we provide comparisons at the zonal and regional levels using data from the short-term (2017-2023) and the long-term (2003-2023) to illustrate how recent experiences compare to the long-term average and if there are any trends over time. These data are the result of weekly or biweekly surveys on state and federal wetland areas, reported as the

percent of the fall/winter duck use that occurred by week. For some areas that have been acquired or developed more recently (e.g., Nodaway Valley CA or Ten Mile Pond CA), the population data may be less than the long-term usually available. In other instances (e.g., the south region of Missouri), no managed state or federal wetland area exists in the region; in these instances, no population data are presented.

2) *A comparison of migration timing of mallards versus other species of dabbling ducks.*

Hunter season date preferences depend, in part, on which species of ducks they tend to hunt. Species such as pintails, green-winged teal, gadwall, wigeon, and shovelers tend to arrive earlier than mallards, while some species of diving ducks may arrive later or stay longer. This report provides comparisons of the timing of migration of mallards versus other species of dabbling ducks (early dabblers) from 2017-2023 to examine differences in timing and ensure hunters who target all species are accounted for. These data come from the weekly or biweekly waterfowl counts on Missouri Department of Conservation (MDC) intensively managed wetlands and are reported as the percent of the fall/winter mallard or early dabbler use that occurred by week.

Harvest data

1) *Average daily harvest per week on public and private land for all duck species combined.*

Each year the FWS asks a sample of hunters to record harvest from each of their hunting trips and a smaller sample to submit a wing from each of the ducks they harvested. These data are used to estimate the size and species composition of the harvest. The FWS sample sizes for regions can be small and result in imprecise estimates and require longer time periods to provide sufficient data for examining harvest trends among regions. We have data from 2011-2023, divided into two time periods, 2011-2016 and 2017-2023. This allows for comparison among zones and regions, which provide clues about the distribution and timing of harvest across Missouri throughout the fall and winter, and timing of harvest and changes in zones and season dates affect harvest distribution. Data are summarized and reported as the percent of the season total duck harvest that occurred by week and averaged across years, providing a general perspective of how much the average daily harvest each week contributes to the overall harvest.

2) *Average daily harvest per week on public lands of all ducks based on harvest estimates from MDC intensively managed wetland areas within a region.*

Missouri Department of Conservation wetland area managers record the number of hunters and their harvest each day. We took a similar approach with harvest on MDC intensively managed wetlands as we did with FWS harvest estimates and looked at data from two periods: 2017-2020 and 2021-2023. This allows for comparison among zones and regions which provide clues about the distribution and timing of harvest across Missouri throughout the fall and winter and if the most recent change in zones and season dates in 2021 affected harvest distribution. Data are summarized and reported as the percent of the season total duck harvest that occurred by week and averaged across years, providing a general perspective of how much the average daily harvest each week contributes to the overall harvest. In some instances, the analysis may exclude

Conservation Areas when data were not available. In regions that do not have a Conservation Area, no area MDC intensively managed wetland harvest data are presented.

3) *Average harvest per week on public lands of mallards and other ducks based on harvest estimates from MDC intensively managed wetlands within a region.*

This analysis is based on the same database used to calculate average harvest from public lands within a region of all duck species per week, however, this analysis allows us to compare the timing of harvest of mallards and early dabblers using data combined from 2017-2023. This allows for comparison among zones and regions, which provide clues about the distribution of mallard and other duck harvest across Missouri. Data are summarized and reported as the percent of the season mallard and other duck harvest that occurred by week and averaged across years, providing a general perspective of how much the average daily harvest each week contributes to the overall harvest. In some instances, the analysis may exclude Conservation Areas when data were not available. In regions that do not have a Conservation Area, no area MDC intensively managed wetland harvest data are presented.

4) *Average daily mallard and early dabbler band recoveries across zones and regions in Missouri.*

Duck band recovery data provide another source of information about harvest distribution on public and private land by location and date. Mallards are the most banded and recovered duck in Missouri, providing the best representation out of band recoveries. Although we include early dabblers in this analysis, it is possible that for many regions and zones there are not enough birds banded and recovered in Missouri to get an adequate representation of the timing of harvest of early dabblers. The band recovery data are summarized in a similar fashion as the harvest data, reported as the percent of the season mallard and other duck band recoveries that occurred by week and averaged across years, with data from 2017-2023.

History of Duck Zones and Season Dates in Missouri

Zone Boundaries

Zones were first employed in Missouri for the 1977-78 and 1978-79 seasons with the state divided into a North and South Zone. Seasons in the North Zone were timed about three weeks earlier than South Zone seasons.

In 1991, following more than a decade of annual proposals from states for split season and zone boundary changes, the FWS developed criteria to limit the season structure options and to limit the frequency of change to 5-year intervals. The limited split season/zone options included: 1) a statewide season (no zones) with no more than three segments (two splits), 2) two zones with an option of a split season with no more than two segments in either or both zones, or 3) three zones with no splits. In 2012, the FWS offered states two new options, four zones with no splits or three zones with split seasons. In 2019, the FWS added the option of two zones that each could include two splits and three segments.

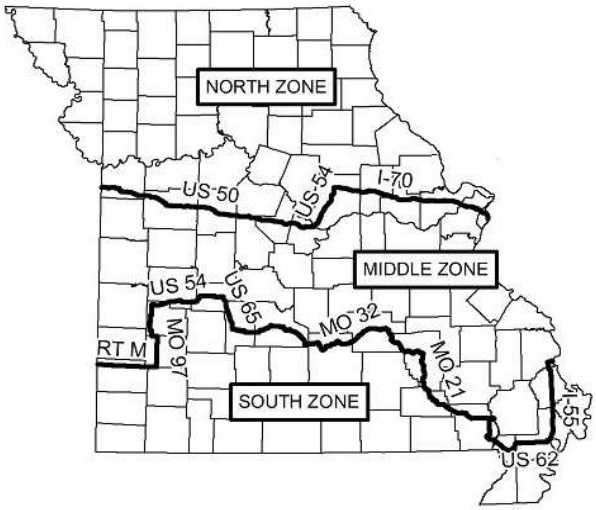
Missouri Duck Zones, Prior to 1977

Missouri Duck Zones, 1977-79

Missouri Duck Zones, 1980-85

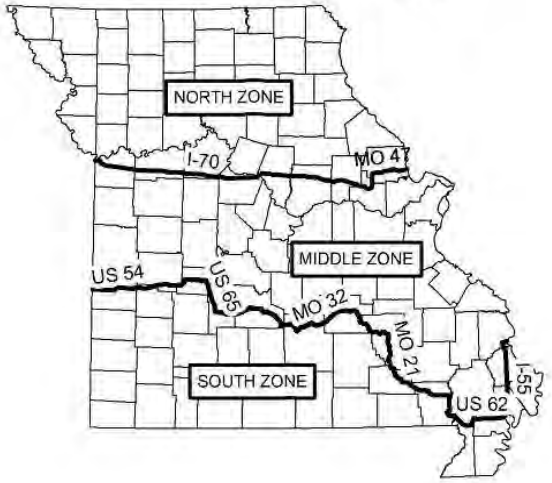
Missouri Duck Zones, 1986-90

Missouri Duck Zones, 1991-2000



Missouri Duck Zones, 2001-2005

Missouri Duck Zones, 2006-2010



Missouri Duck Zones, 2011-2016

Missouri Duck Zones, 2017-2020

Figure 2. Missouri duck zones (before 1977 through 2025).

Missouri has included three zones since 1991, but MDC has made several adjustments to zone boundaries. The 2001-2005 review resulted in an adjustment to the North/Middle Zone boundary to include portions of Lincoln, Warren, and St. Charles counties in the Middle Zone and the Middle/South Zone boundary was modified to include Barton, northern Jasper and southern Vernon counties in the South Zone. The 2006-2010 season review resulted in the North/Middle zone boundary in western Missouri shifting north from Hwy 54 and Hwy 50 to I-70 to accommodate the desire for later hunting opportunity in this region. The 2011-2015 season structure review resulted in the Middle/South boundary line in western Missouri being modified to return to a location like the 1991-2000 boundary with the exception that it left a greater portion of Barton County in the South Zone. Additionally, the Middle/South Zone boundary in southeast Missouri was moved from I-55 west to Hwy 25 to accommodate a desire for later season dates that more closely aligned with timing of duck movements and habitat use in this portion of the state. The 2017-2020 season structure review saw a return of the Middle/South Zone boundary to the location it occupied from 2011-2015 and an adjustment north to the western portion of the North/Middle Zone boundary which shifted much of the Missouri River floodplain in that part of the state into the Middle Zone, thus, accommodating a desire for later season dates expressed by Missouri River hunters. The 2021-2025 season structure review resulted in returning the zone boundary between the North and Middle zones back to I-70 to Hwy 65 to Hwy 41 to Hwy 24 so that the river bottoms east of Miami, MO were in the North Zone. Additionally, this boundary in the eastern part of the state was moved back to I-70. Each of the resulting zone boundaries represented a compromise between regions and among hunters within regions based on different habitats, different species hunted, and different hunting styles.

Table 1. Season dates and bag limits from 1960 through 2024.

Season	Days	Bag Limit	Statewide	North Zone	Middle Zone	South Zone
1962	25	2	11/2-11/26			
1963	35	4	10/25-11/28			
1964	40	4	10/30-12/8			
1965	40	4	10/29-12/7			
1966	45	4	11/1-12/15			
1967	40	4	11/1-12/10			
1968	30	3	11/1-11/30			
1969	30	4	11/1-11/30			
1970	55	6	10/24-12/17			
1971	50	4	10/31-12/19			
1972	50	4	10/29-12/17			
1973	45	7	11/1-12/15			
1974	50	7	10/30-12/18			
1975	50	7	10/29-12/17			
1976	50	10	10/26-12/5 & 12/26-1/3			
1977	45	10		10/25-12/8		11/15-12/29
1978	50	10		10/24-12/12		11/14-1/2
1979	50	10		10/24-12/12		11/14-1/2
1980	50	10		10/18-10/22 & 11/1-12/15		11/1-12/15 &12/26-12/30
1981	50	10		10/17-10/21 & 10/31-12/14		10/31-12/14 & 12/26-12/30
1982	50	10		10/16-10/20 & 10/30-12/13		10/30-12/13 & 1/8-1/12
1983	50	10		10/15-10/19 & 11/1-12/15		11/1-12/4 & 12/17-1/1
1984	50	10		10/20-24 & 11/1-12/15		11/1-12/2 & 12/15-1/1
1985	40	5		10/19-10/21 & 11/2-12/8		11/2-12/1 & 12/27-1/5
1986	40	5		11/1-12/10		11/22-12/14 & 12/27-1/12
1987	40	5		10/31-12/9		11/21-12/13 & 12/26-1/11
1988	30	3		11/5-12/4		11/19-12/4 & 12/26-1/8
1989	30	3		11/4-12/3		11/18-12/4 & 12/26-1/7
1990	30	3		11/3-12/2		11/17-12/4 & 12/26-1/6
1991	30	3		11/2-12/1	11/9-12/8	11/30-12/29
1992	30	3		10/31-11/29	11/7-12/6	11/28-12/27
1993	30	3		10/30-11/28	11/6-12/5	11/27-12/26
1994	40	3		10/29-12/7	11/5-12/14	11/25-1/3
1995	50	5		10/28-12/16	11/4-12/23	11/22-1/10
1996	50	5		10/26-12/14	11/2-12/21	11/23-1/11
1997	60	6		10/23-12/21	10/30-12/28	11/13-1/11

Season	Days	Bag Limit	Statewide	North Zone	Middle Zone	South Zone
1998	60	6		10/22-12/20	10/29-12/27	11/12-1/10
1999	60	6		10/23-12/21	10/30-12/28	11/13-1/11
2000	60	6		10/26-12/24	11/2-12/31	11/16-1/14
2001	60	6		10/27-12/25	11/3-1/1	11/22-1/20
2002	60	6		10/26-12/24	11/2-12/31	11/23-1/21
2003	60	6		10/25-12/23	11/1-12/30	11/22-1/20
2004	60	6		10/30-12/28	11/6-1/4	11/26-1/24
2005	60	6		10/29-12/27	11/5-1/3	11/25-1/23
2006	60	6		10/28-12/26	11/4-1/2	11/24-1/22
2007	60	6		10/27-12/25	11/3-1/1	11/23-1/21
2008	60	6		10/25-12/23	11/1-12/30	11/27-1/25
2009	60	6		10/31-12/29	11/7-1/5	11/26-1/24
2010	60	6		10/30-12/28	11/6-1/4	11/25-1/23
2011	60	6		10/29-12/27	11/5-1/3	11/24-1/22
2012	60	6		10/27-12/25	11/3-1/1	11/22-1/20
2013	60	6		10/26-12/24	11/2-12/31	11/28-1/26
2014	60	6		10/25-12/23	11/1-12/30	11/27-1/25
2015	60	6		10/31-12/29	11/7-1/5	11/26-1/24
2016	60	6		10/29-12/27	11/5-1/3	11/24-1/22
2017	60	6		11/4-1/2	11/4-10 & 11/16-1/7	11/23-26 & 12/4-1/28
2018	60	6		11/3-1/1	11/3-9 & 11/15-1/6	11/22-25 & 12/2-1/27
2019	60	6		11/2-12/31	11/9-15 & 11/21-1/12	11/28-12/1 & 12/7-1/31
2020	60	6		11/7-1/5	11/7-13 & 11/19-1/10	11/26-29 & 12/7-1/31
2021	60	6		10/30-12/28	11/6-14 & 11/20-1/9	11/25-28 & 12/7-1/31
2022	60	6		10/29-12/27	11/5-13 & 11/19-1/8	11/24-27 & 12/7-1/31
2023	60	6		10/28-12/26	11/4-12 & 11/18-1/7	11/23-26 & 12/7-1/31
2024	60	6		11/2-12/31	11/2-10 & 11/16-1/5	11/28-12/1 & 12/7-1/31

Continuous versus split seasons

Missouri had its first experience with a split season in 1976. At the time, there were no zones, and the statewide season included a 41-day segment (Oct. 26-Dec. 5) followed three weeks later by a nine-day segment (Dec. 26-Jan. 3). The split was designed to provide late season opportunity that had not been available during most years. The following year, Missouri returned to a continuous season but divided the state into two zones. The option to have a split season in two zones was first offered in 1980 and used in Missouri from 1980-1985. During 1980-82, a 5-day early segment in the North Zone and a 5-day late segment in the South Zone complemented a statewide segment of 45 days. An early segment of 3-5 days was retained in the North Zone during 1983-85 (40 to 50-day seasons), while the late segment in the South Zone was expanded to 10-18 days. The North Zone returned to a continuous season of 30-40 days during 1986-90, whereas the South Zone retained a split season that included an early segment of 16-23 days and a late segment of 12-17 days. In 1991, based upon hunter input and preferences, Missouri opted to take the new option of three-zones with no split seasons rather than maintaining two zones with a split. By the 2017-2020 open season, however, hunter consensus had coalesced around a desire for later season dates and strong interest in using the new option of three zones with a split to achieve this objective. The 2017-2020 seasons include a split in the Middle and South Zones although the North Zone retained a continuous season structure. The Middle Zone opens for a 7-day segment, closes for a 5-day split, and then reopens a second 53-day segment. The South Zone season is structured with an opening 4-day segment occurring over the Thanksgiving Day holiday weekend followed by a split of sufficient length to ensure the second segment runs to January 31 which is as late as the federal framework allows. For the 2021-2025 structure review, no changes with the timing or length of splits occurred in the state.

Season Dates

Season dates have gradually shifted later. In the early 1960s, when hunters experienced seasons of 25 and 35 days, the statewide season opened either in late October or early November and closed by the end of November. In 1975, the last year without zones, the statewide season closed on December 17th, over a month earlier than when it now closes in the South Zone. Up until the mid-1990s, the North Zone closed by mid-December, in part due to shorter seasons. The Middle Zone closing date in the 1990s ranged from December 5 in 1993 to December 28 in 1999. In the South zone closing dates ranged from December 26 in 1993 to January 11 in 1999. Beginning in 2001, South Zone dates were shifted about a week later and North and Middle Zone dates followed suit in 2004.

Prior to 2011, the Department adjusted waterfowl season dates each year. During the 2011 duck season structure review, the Department sought input about establishing a season date formula that would remain in place for several years. This option would not leave hunters guessing from one year to the next what the season dates would be in the event of 60, 45, and 30-day seasons. It also provided a much more realistic timeframe to evaluate hunter opinions of season dates under a greater range of conditions than is possible after just one year. Hunters were supportive of this change and the first duck season date formulas were implemented in 2011. These formulas maintain opening dates associated with a specific weekend of the month, or holiday as was the case in the South Zone. As a result, season dates can vary by seven days within a six-year period. This variation in dates accommodates those with earlier or later season preferences over an extended period.

By the 2017-2020 open season, hunter consensus had coalesced around a desire for later season dates and strong interest in using a split to achieve this objective. The season date formulas implemented after the 2017-2020 season structure review reflect this desire for later season dates expressed by waterfowl hunters in the statewide survey and workshops. Surprisingly, from the 2021-2025 zone structure review, season dates shifted to opening

slightly earlier in the season in the north and middle zones, while retaining the splits in the middle and south zones (table 2).

Table 2. Season date formulas for the North, Middle, and South Zone, 2021-2025.

Zone	Liberal (60 Days)	Moderate (45 Days)	Restrictive (30 Days)
North	• Opens on the Saturday nearest October 31	Make season date recommendations as needed.	
Middle	• Opens on the first Saturday in November for nine days • Closes for five days • Opens again for 51 days		
South	• Opens on Thanksgiving Day for four days • Closes • Opens December 7 through January 31 (as late as the federal framework allows)		

Weather

Temperatures vary annually in Missouri, and dramatic differences may occur from one year to the next. The chart below (figure 3) shows that fall and winter temperatures (November-January) were well above the long-term average during the 1930s but were generally below the long-term average from the mid-1970s to the early to mid-1990s. Temperatures during the 2000s were generally above normal, but the decade ended with two years just below normal. This trend continued during the 2010s with above average temperatures in six years, near average or slightly below average for three years and below average occurring only once during the decade. Although climate models generally suggest the possibility of warmer temperatures over the next century in Missouri, it is uncertain how annual fluctuations, long-term cyclical patterns, and climate change will influence the weather patterns over the next five years.

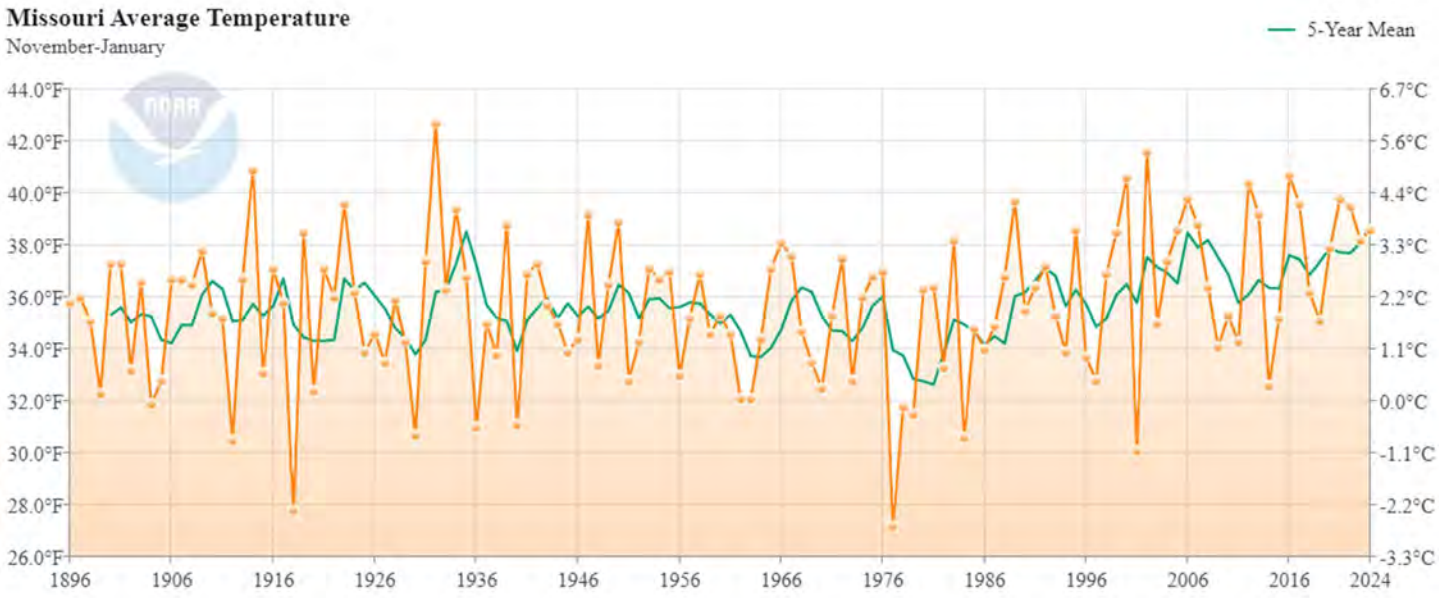


Figure 3. Missouri average temperature (November – January) from 1895-2023.

Harvest

FWS band recoveries and harvest estimates allow us to evaluate how much each of the 14 regions contributed, on average, to the overall statewide harvest from 2017-2023 (figure 4). Although patterns based on FWS estimates and mallard band recoveries differ slightly, together they provide some indications about the statewide distribution of harvest. Hunters in West Central Missouri accounted for 18% of the statewide harvest. This region covers a large geographic area and includes more habitat than most regions with the combination of public and private hunting opportunity associated with Truman Reservoir and several public areas including Schell-Osage CA, Four Rivers CA, and Montrose CA. St. Charles and Stoddard regions represent a much smaller geographic area but each region still accounted for 3 and 10% of the average statewide harvest estimate from 2017-2023.

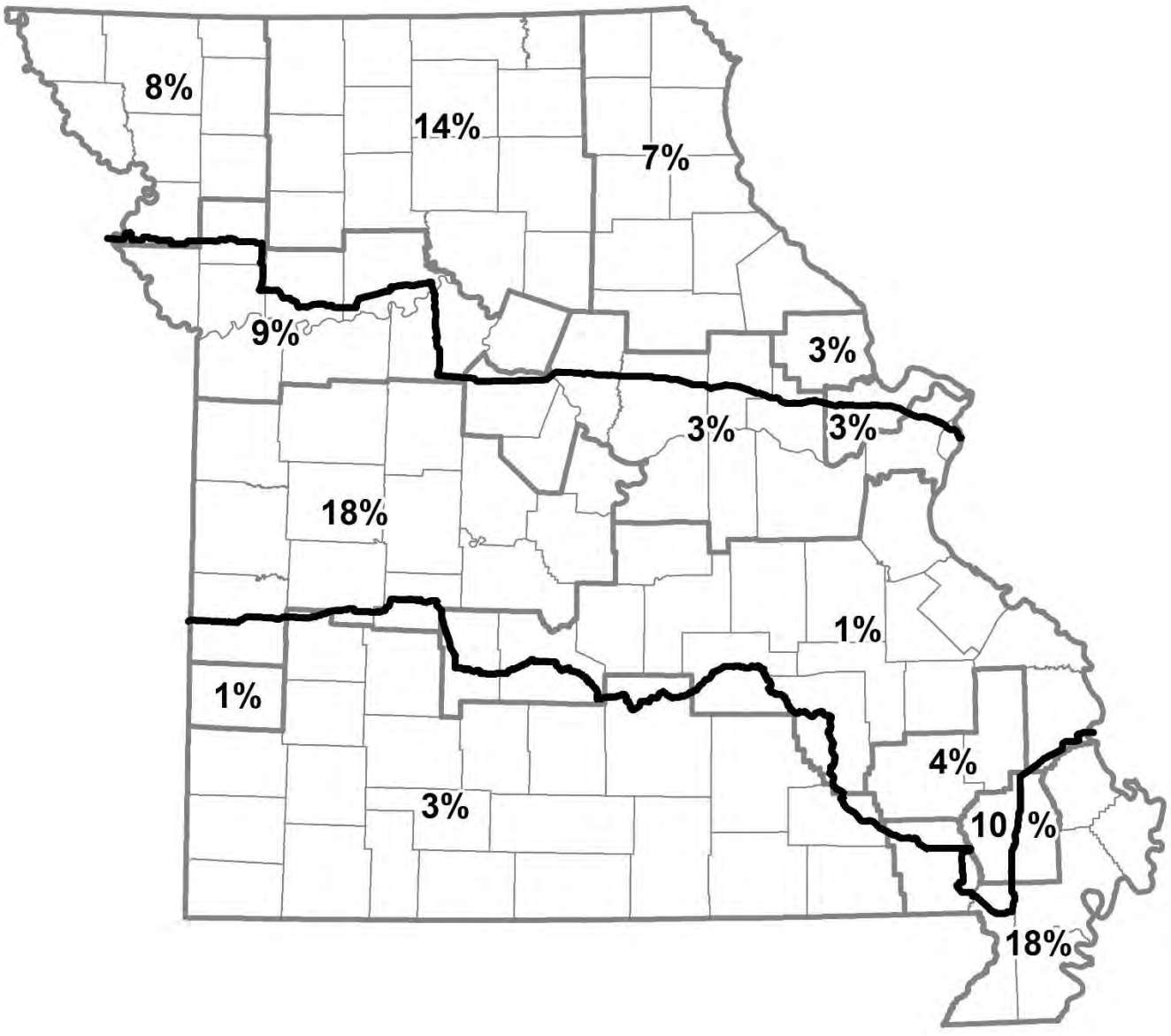


Figure 4. Percentage of total state harvest by region from USFWS harvest data, 2017-2023.

Migration and Harvest Trends in the North, Middle, and South Zones

North Zone

Migration Timing:

We examined waterfowl counts at eight areas to determine average migration time in the North Zone: Columbia Bottom CA, Loess Bluffs NWR, Nodaway Valley CA, Fountain Grove CA, Swan Lake NWR, Ted Shanks CA, Clarence Cannon NWR, and BK Leach CA (left). Migration events in October and early November result in increasing numbers of mallards until the peak in mid- to late November, while early dabblers peak in early November (right). It is important to note that the sharp rise in early dabblers in the first part of October aligns with the beginning of pumping to increase water on these areas and may not fully show the beginning of migration into Missouri (right). Mallard numbers then begin a decline through mid- to late December as the shallow water habitats on these areas freeze up (right). Both the early dabblers and mallards showed similar timing when looking at the percent of total counts throughout the season when comparing the timing of migration between the previous long-term average and the short-term, suggesting no change in timing of migration within the North Zone (bottom).

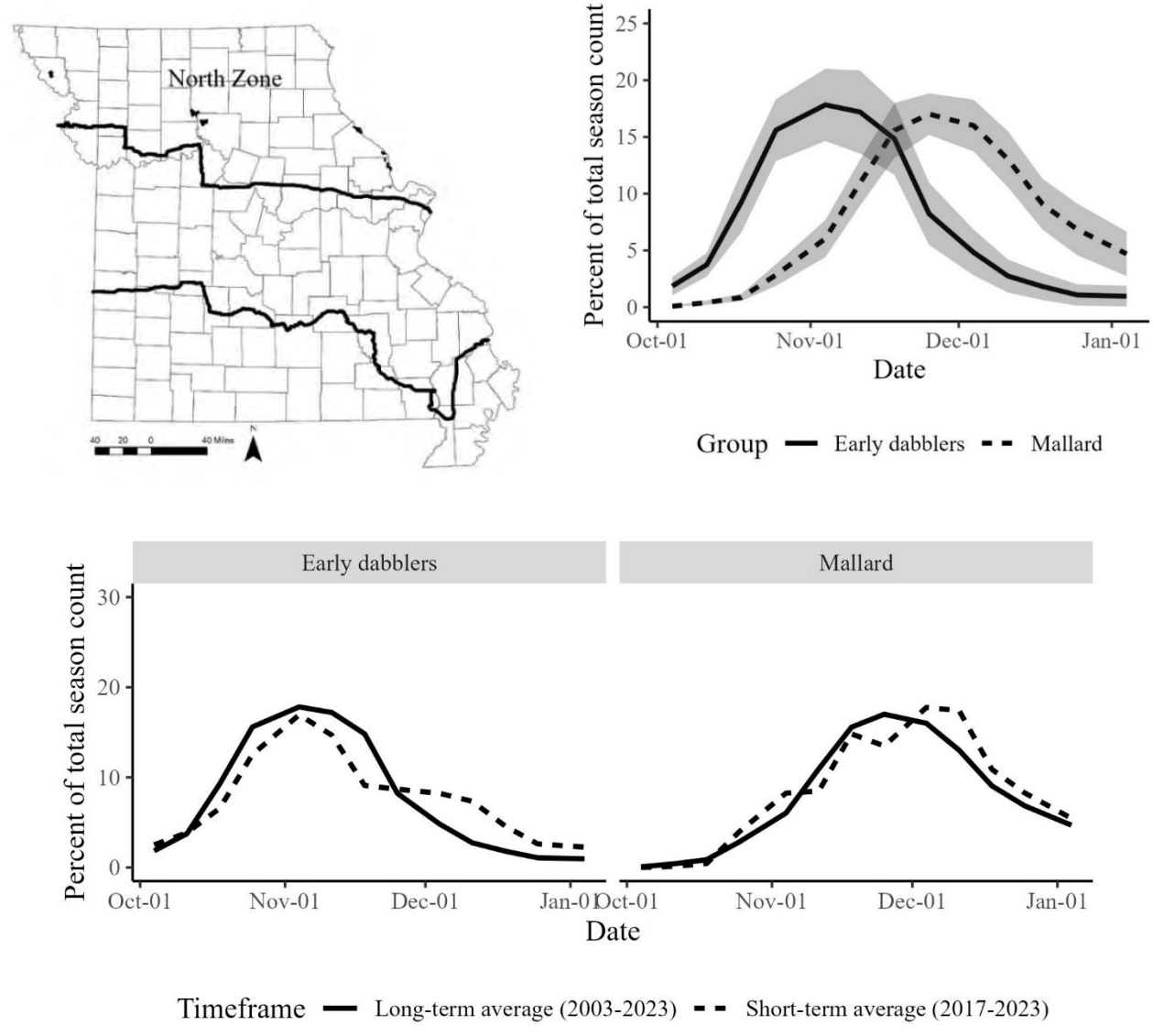


Figure 5. Left: Map of Missouri showing the North Zone boundary for 2021-2025. Right: Average proportion of total counts of early dabblers and mallards in the North Zone (2017-2023). Bottom: Average proportion of total counts of early dabblers and mallards for the long-term (2003-2023) and short-term (2017-2023) in the North Zone.

Harvest:

FWS harvest data indicate that harvest gradually built toward a peak the fourth week in November before declining into December (top left). The 2017-2020 peak harvest on the MDC intensively managed wetland areas (Bob Brown CA, Nodaway Valley CA, Fountain Grove CA, Ted Shanks CA, and B.K. Leach CA) was during the third or fourth week of November, while the 2021-2023 peak harvest occurred slightly later, during the fourth week of November (bottom left). For both sets of years, harvest declined after the last week of November. For 2017-2020, most mallards were harvested from the third week of November through the first week of December while most other species were harvested during the first two weeks of November (bottom right). Mallard band recoveries suggest a similar pattern, with harvest bands increasing through the month of November before declining in Missouri (top right).

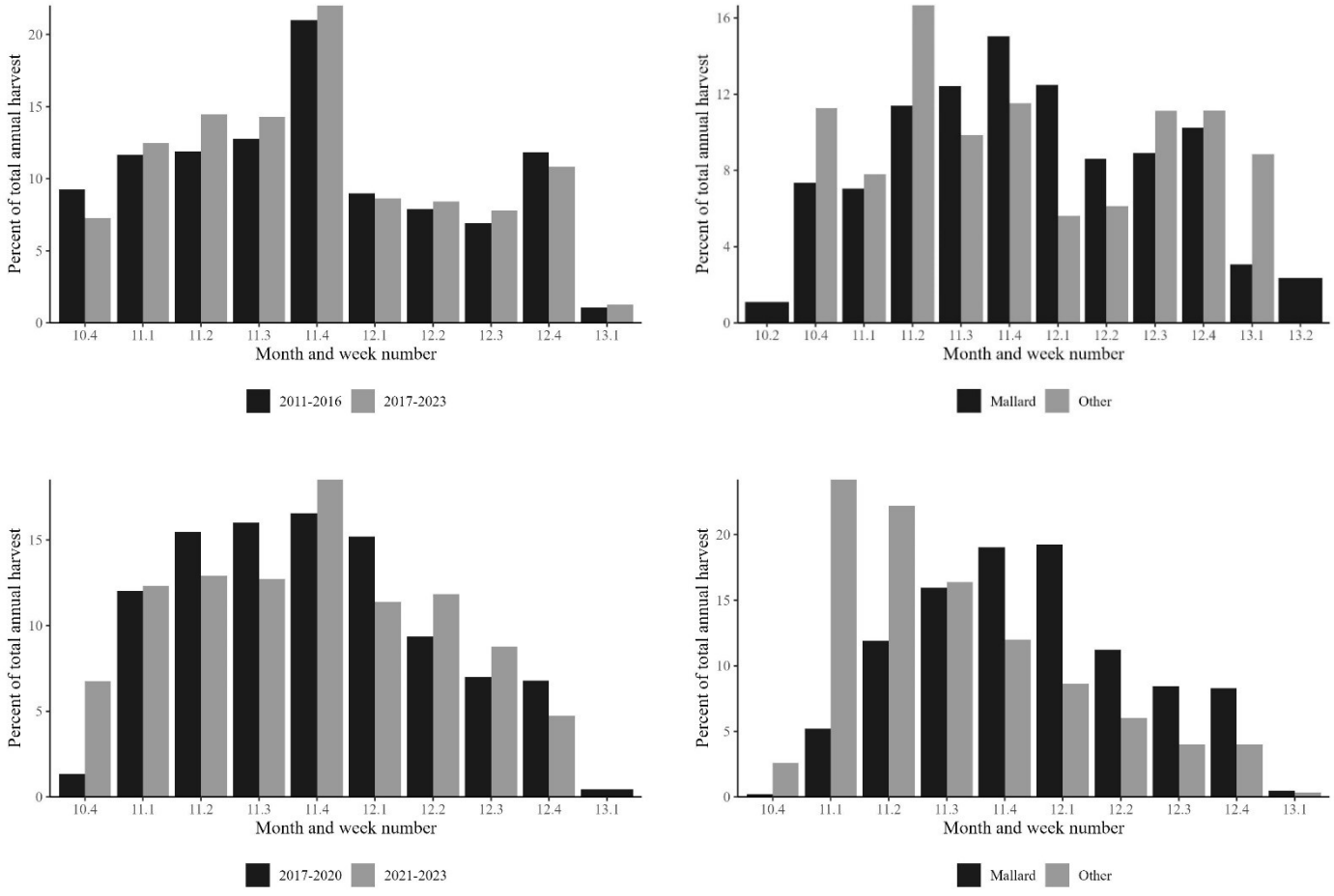


Figure 6. Top Left: Average percent of total annual harvest per week on public and private ground in the North Zone (2011-2023).. Top Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the North Zone, 2017-2023. Bottom Left: Average percent of total annual harvest per week of all ducks on MDC wetlands in the North Zone, 2017-2020 and 2021-2023. Bottom Right: Average percent of total annual harvest per week of mallards and all other duck species on MDC wetlands in the North Zone, 2017-2023.

Middle Zone

Migration timing:

We examined waterfowl counts at six areas to determine average migration time in the Middle Zone: Grand Pass CA, Eagle Bluffs CA, Four Rivers CA, Mingo NWR, Duck Creek CA, and Otter Slough CA (left). Like the North Zone, migration events in mid- to late October and early November led to a peak of early dabblers in early to mid-November over the short-term average (2017-2023) (right). Mallards increased in number throughout November and peaked in early December based on the short-term average (right). Early dabblers began a decline in late November while mallards began to decline in mid-December when shallow water habitats on these areas began freezing (right). The percent of total counts for the short-term (2017-2023) were comparable to the long-term (2003-2023) and did not indicate a time shift in when most mallards or early dabblers were occurring on the intensively managed wetlands in the Middle Zone (bottom).

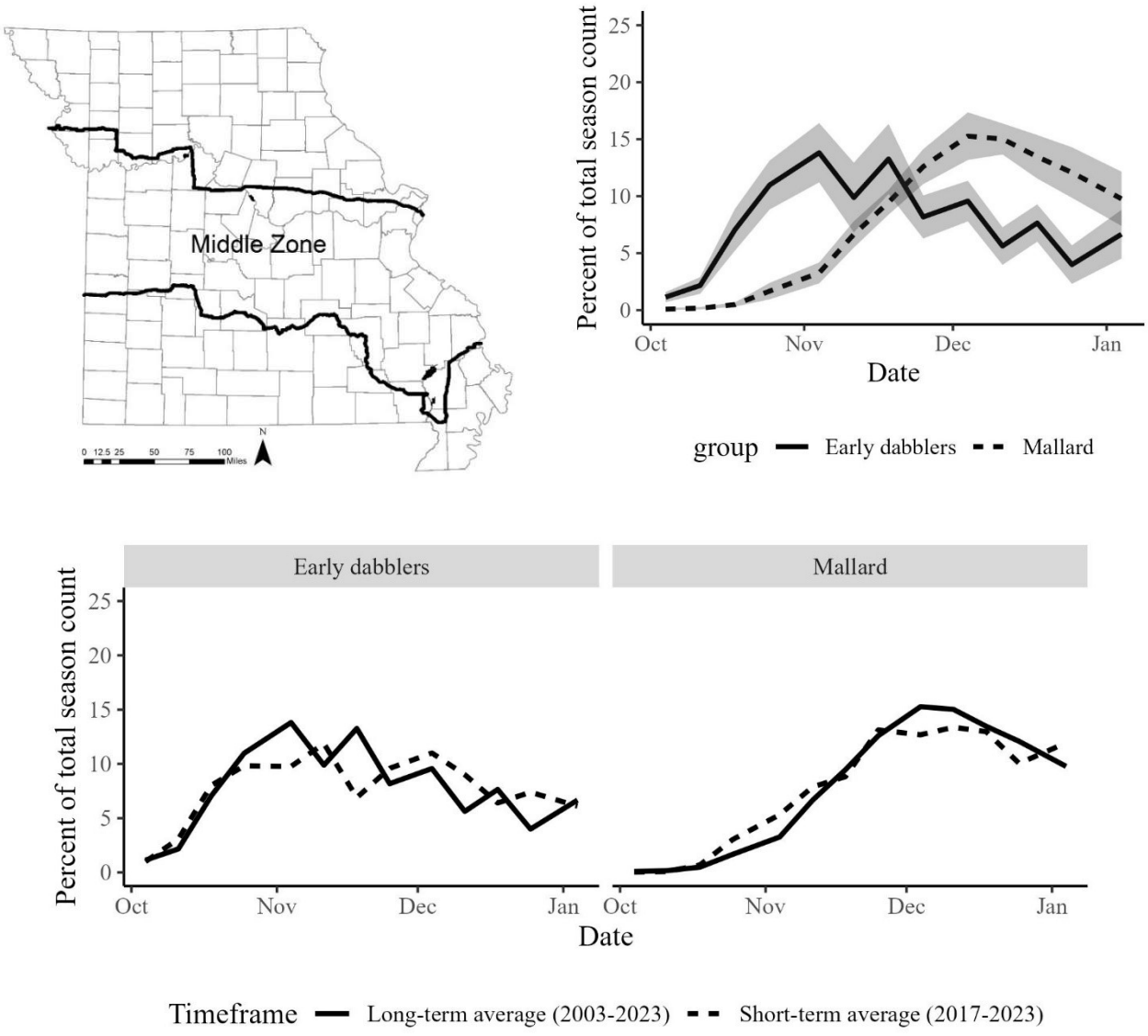


Figure 7. Left: Map of Missouri showing the Middle Zone boundary for 2021-2025. Right: Average proportion of total counts of early dabblers and mallards in the Middle Zone (2017-2023). Bottom: Average proportion of total counts of early dabblers and mallards for the long-term (2003-2023) and short-term (2017-2023) in the Middle Zone.

Harvest:

FWS harvest data, indicate that harvest remained steady throughout November and December, with a peak in harvest at the end of November and end of December (top left). Harvest on MDC intensively managed wetlands in the Middle Zone (Columbia Bottom CA, Grand Pass CA, Eagle Bluffs CA, Four Rivers CA, Duck Creek CA, and Otter Slough CA) remained constant from the last week in November through the end of December, with the peak harvest occurring at the end of November and beginning of December from 2017-2020, after mid-December, total harvest began declining through the end of the season (bottom left). From 2021-2023, total harvest followed similar trends with a peak in late November and decline from the end of December through the end of the season (bottom left). Most mallard harvest on MDC wetlands occurred during the last week in November and the first two weeks of December while most early dabblers were harvested during the month of November (bottom right). The daily average number of mallard band recoveries follows a similar trend, with an increase through the month of November before declining at the end of December (top right).

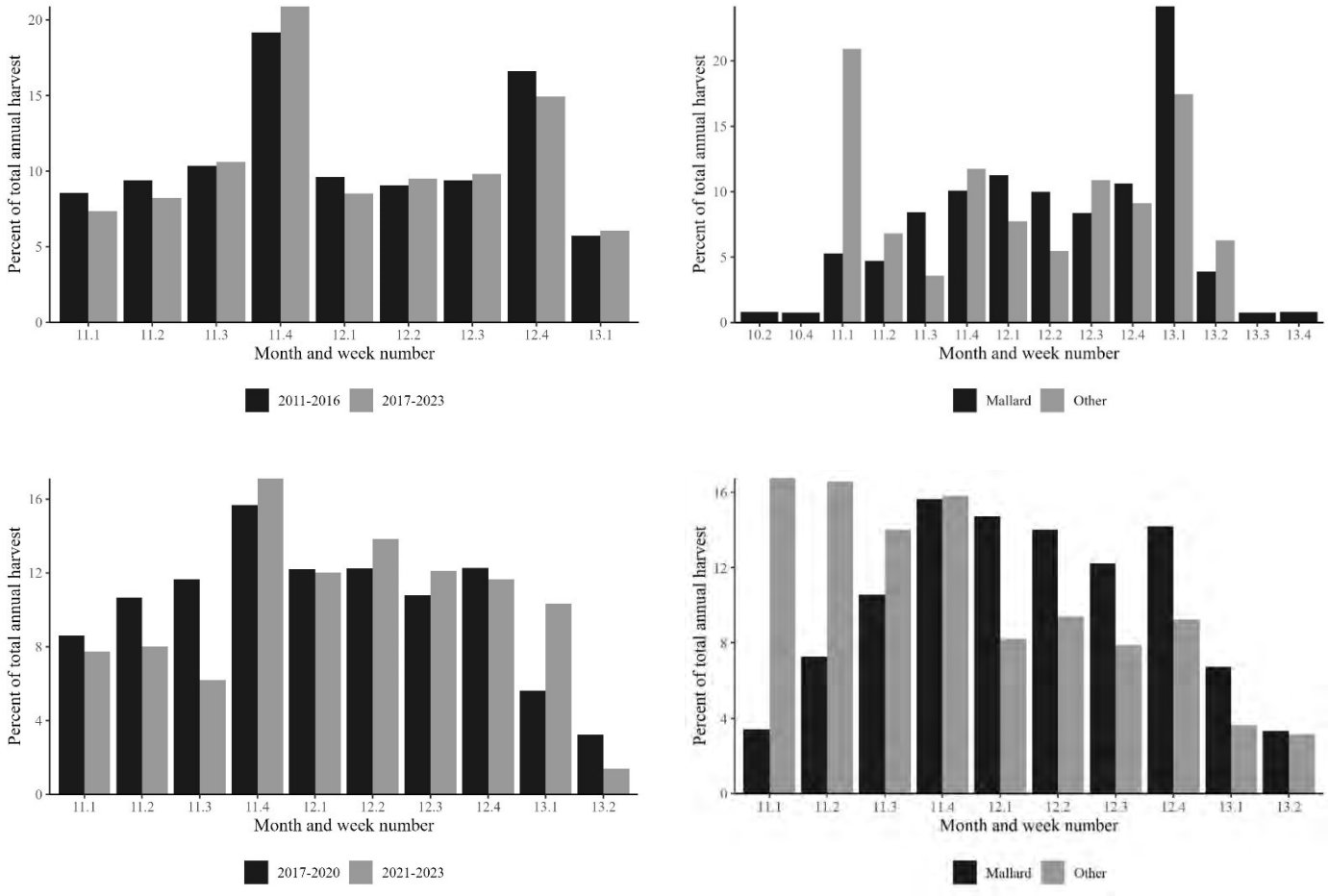


Figure 8. Top Left: Average percent of total annual harvest per week on public and private ground in the Middle Zone (2011-2023). Top Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the Middle Zone, 2017-2023. Bottom Left: Average percent of total annual harvest per week of all ducks on MDC wetlands in the Middle Zone, 2017-2020 and 2021-2023. Bottom Right: Average percent of total annual harvest per week of mallards and all other duck species on MDC wetlands in the Middle Zone, 2017-2023.

South Zone

Migration timing:

Ten Mile Pond CA is the only public wetland area represented in the South Zone, so migration timing is based on data from only this area (left). It is also important to note that waterfowl counts end the first or second week of January, and there are no data for counts beyond the second week of January (right and bottom). There are no data for the western part of the South Zone where shallow water wetlands, irrigation lakes, and reservoirs are found. Based on the short-term average (2017-2023), there is a steady increase in duck numbers from early November until December, when duck numbers plateau and remain constant for the remainder of the survey period (right). In this zone, when freeze ups do occur, ducks often move only a short distance and may return within a few days. Migration timing is similar between the long-term (2003-2023) and short-term (2017-2023) averages, except that we saw an increase in early dabblers in late October for the most-recent years (bottom).

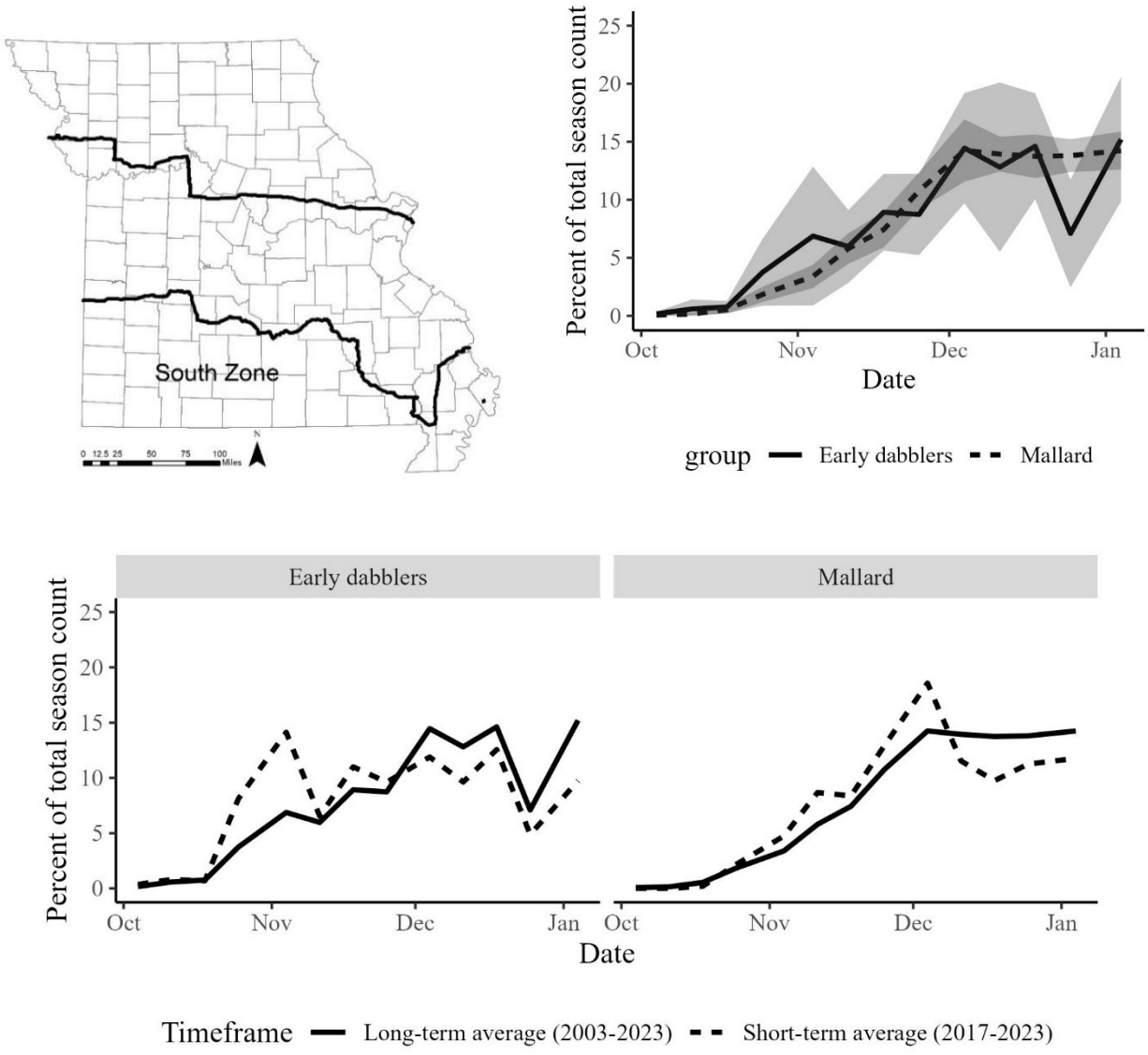


Figure 9. Top Left: Map of Missouri showing the South Zone boundary for 2021-2025. Bottom Left: Average proportion of total counts of early dabblers and mallards in the South Zone (2017-2023). Bottom Right: Average proportion of total counts of early dabblers and mallards for the long-term (2003-2023) and short-term (2017-2023) in the South Zone.

Harvest:

Based on FWS harvest estimates from 2011-2016, average daily harvest late peaks in November and December, with the harvest constant throughout the remaining weeks of the season, while average daily harvest from 2017-2023 follows the same harvest trends except for an additional peak during the last week of the season (fourth week of January) (top left). The 2017-2020 harvest pattern at MDC intensively managed wetland areas in the South Zone (Ten Mile Pond CA) shows peaks in harvest during late December and late January, with relatively constant harvest throughout the remainder of the season (bottom left). The 2021-2023 harvest pattern at MDC intensively managed wetlands shows similar trends, with peaks in early January and late January (bottom left). Compared to the other zones, there is little difference in the timing of mallard harvest compared to other species on MDC wetlands (bottom right). Mallard band recoveries suggest an increasing harvest throughout the season, peaking at the end of the season in late-January (top right).

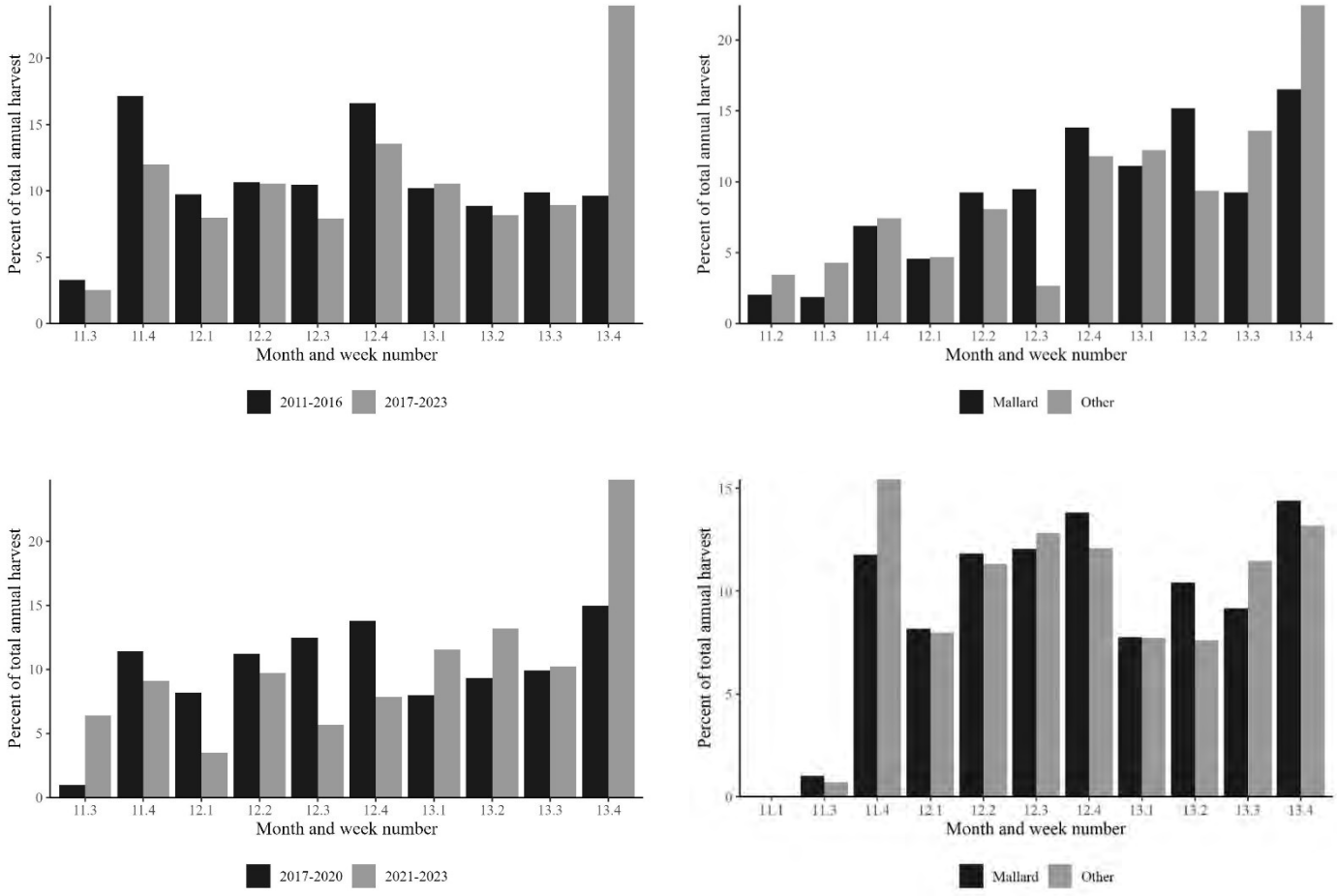
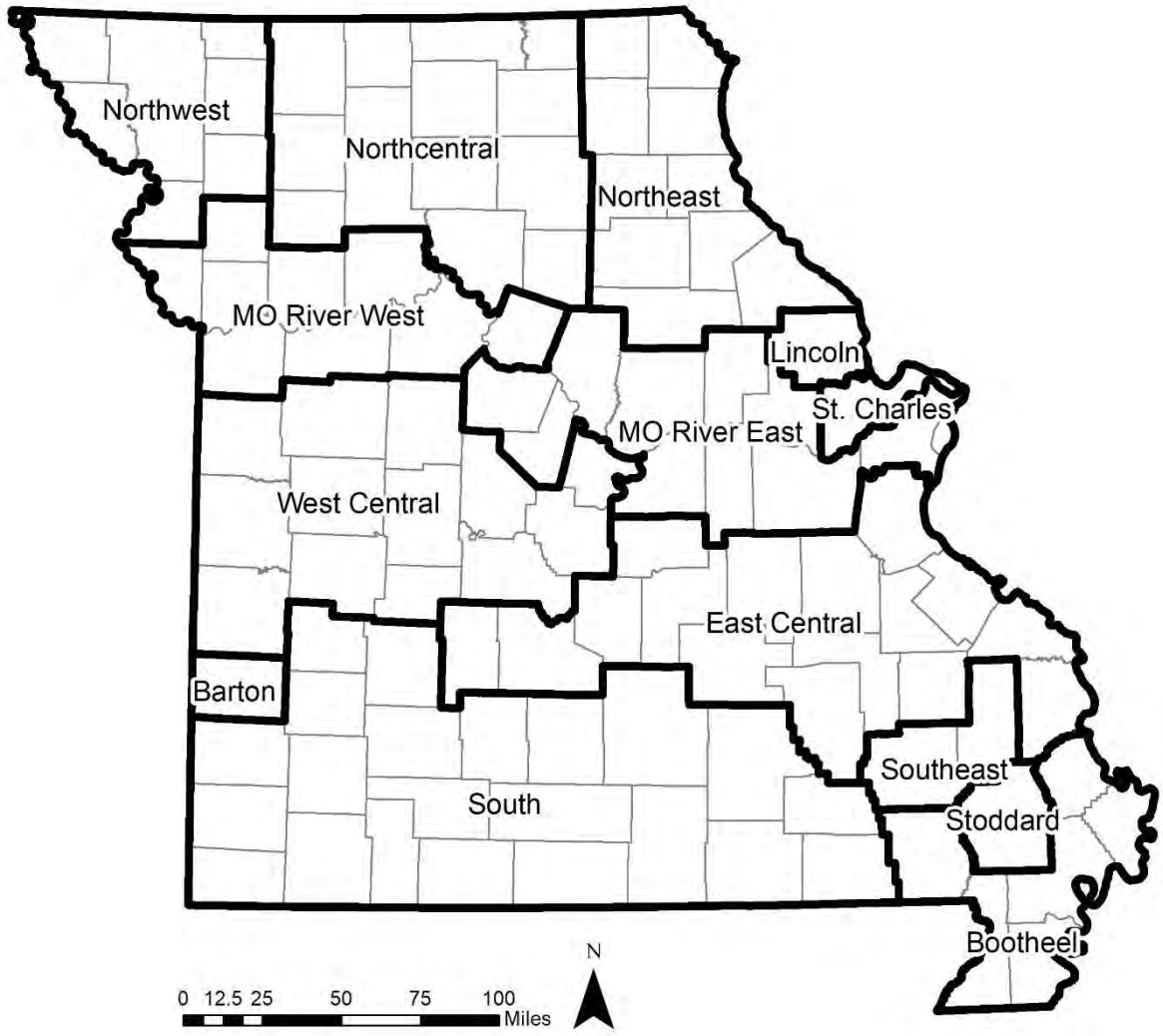


Figure 10. Top Left: Average percent of total annual harvest per week on public and private ground in the South Zone (2011-2023). Top Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the South Zone, 2017-2023. Bottom Left: Average percent of total annual harvest per week of all ducks on MDC wetlands in the South Zone, 2017-2020 and 2021-2023. Bottom Right: Average percent of total annual harvest per week of mallards and all other duck species on MDC wetlands in the South Zone, 2017-2023.

Weather, Migration, and Harvest Trends in 14 Regions in Missouri



Northwest

Weather:
Precipitation in this region gradually declines from late summer through winter (figure 11, right). Average low temperatures fall below freezing by mid-November (figure 12, right). There is a 50% probability of achieving a low temperature of 24° F by November 4 (figure 12, right). By December 13, there is 90% probability temperatures will dip down to 16° F and form more significant ice (figure 12, right). From 2017-2023, the surveyed wetlands (Bob Brown CA, Nodaway Valley CA, and Loess Bluffs NWR) had ice over more than half of the years by December 1 and had ice over 75% of the years by the end of December (figure 12, left).

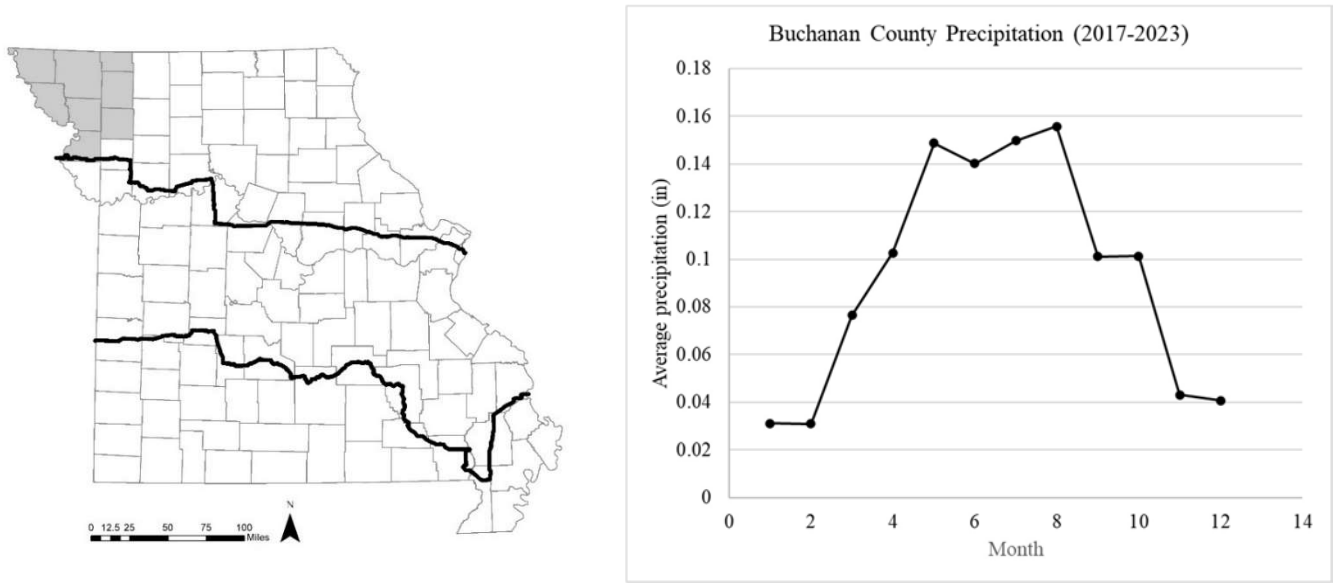
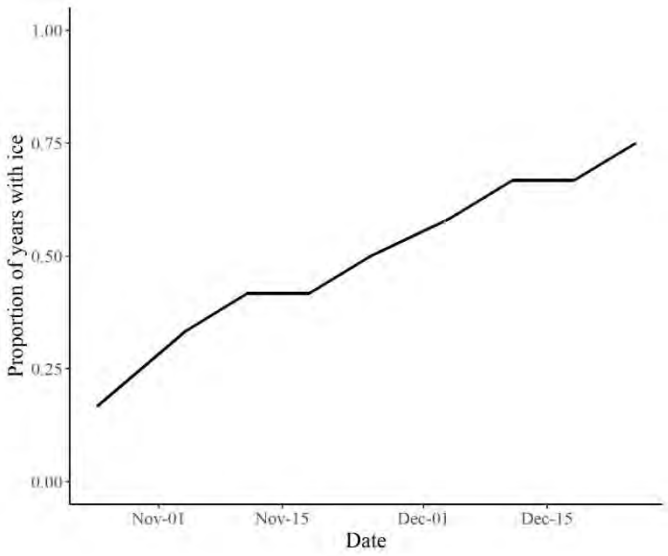


Figure 11. Left: Map showing 2021-2025 duck zones and the northwest region of Missouri. Right: Precipitation patterns for the northwest region of Missouri using Buchanan county data.



Probability	Date
0.10	October 20
0.30	October 29
0.50	November 4
0.70	November 10
0.90	November 20

Figure 12. Left: Proportion of years (2017-2023) ice was recorded on MDC wetland areas in the northwest region of Missouri. Right: Probability that a temperature of 24°F will be reached in St. Joseph, MO using data from 2017-2023.

Migration timing:

The long-term average for this part of the state shows a gradual buildup of mallards beginning in early November, with a peak during the last week of November through early December. Early dabblers peak earlier than mallards, in early December, and gradually decline throughout the season. The short-term average (2017-2023) of early dabblers shows less of a peak in early November with some increase in the beginning of December compared to the long-term average (2003-2023). The short-term and long-term average of mallards remain aligned, with little change in migration timing.

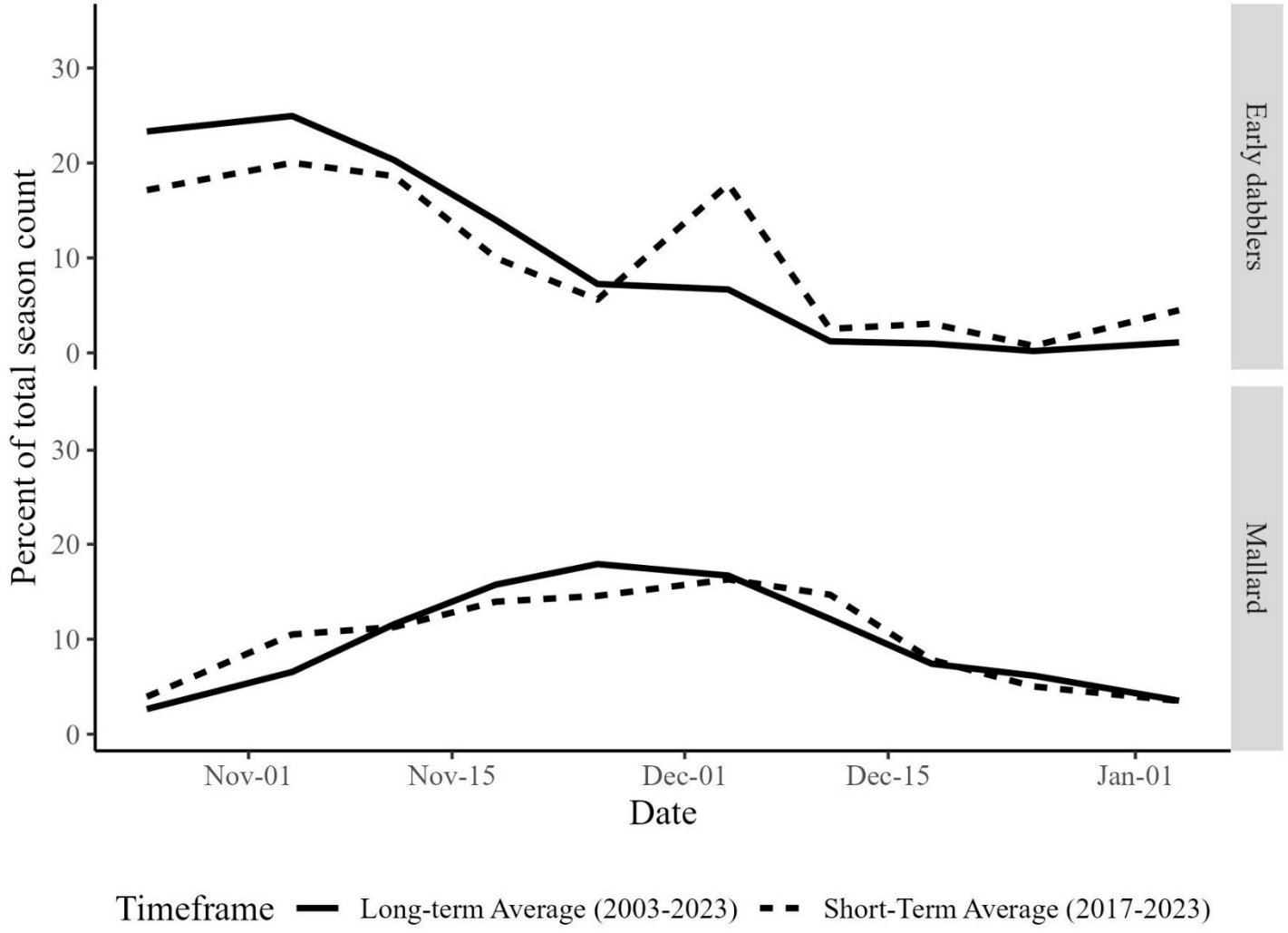


Figure 13. Average proportion of total counts of early dabblers and mallards during the long-term average (2003-2023) and the short-term (2017-2023) in the northwest region of Missouri.

Harvest:

During 2011-2016, FWS harvest data suggests harvest in the Northwest Region steadily increased from the last week in October through the end of November, then decreased through early December and varying through the end of the season (top left). From 2017- 2023, the same trend was followed, although the proportion of birds harvested in December increased slightly from the earlier period (2011-2016) (top left). During the 2017-2020 seasons, the highest percent of total harvest occurred during the first week in November on the MDC intensively managed wetland conservation areas but remained high until a decrease in total harvest beginning in December and continued through the end of the season (bottom left). The years 2021-2023 showed peak harvest around the last week of November with a steady decline in harvest after that (bottom left). On MDC wetlands, mallards and other ducks were harvested at their greatest numbers during throughout the month of November, with mallards hanging on an extra week into early December (bottom right). Mallard band recoveries increased dramatically in the second week of November before remaining constant through the first week of December before declining through the end of the season (top right).

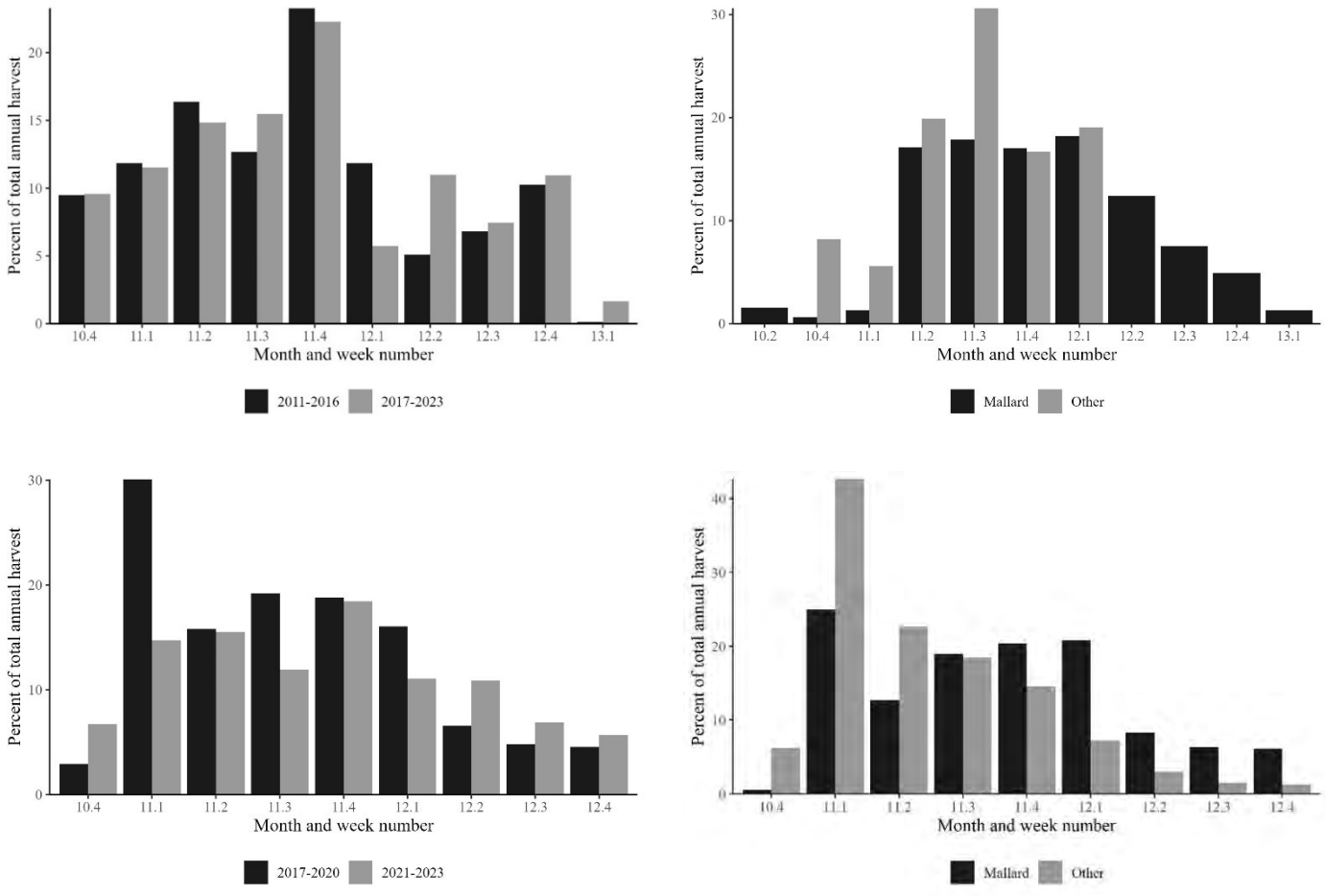
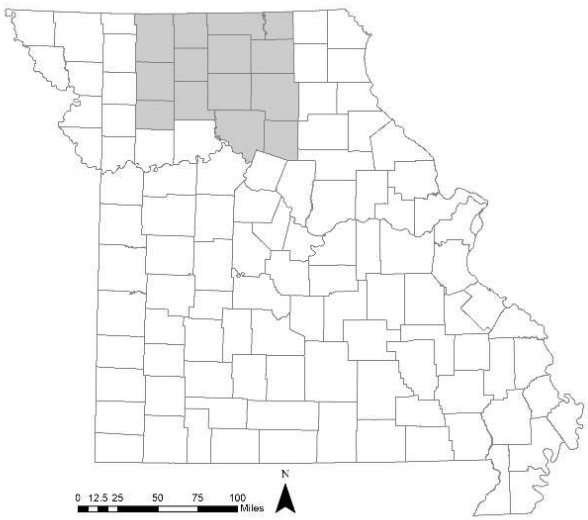


Figure 14. Top Left: Average percent of total annual harvest per week on public and private ground in the northwest region of Missouri, 2011-2016 and 2017-2023. Bottom Left: Average percent of total annual harvest per week of all ducks on MDC wetlands in the northwest region of Missouri, 2017-2020 and 2021-2023. Top Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the northwest region of Missouri, 2017-2023. Bottom Right: Average percent of total annual harvest per week of mallards and all other duck species on MDC wetlands in the northwest region of Missouri, 2017-2023.

North Central

Weather:

Precipitation gradually declines after September (figure 15, right). By November 6th, there is a 50% probability of a low temperature of 24°F resulting in the creation of skim ice, like the Northwest Region (figure 16, right). Ice appeared on wetland areas (Fountain Grove CA, Swan Lake NWR) by December 1 in over 50% of the years from 2017-2023, and ice of over 2 inches thick by December 16th in 60% of the years (figure 16, left).



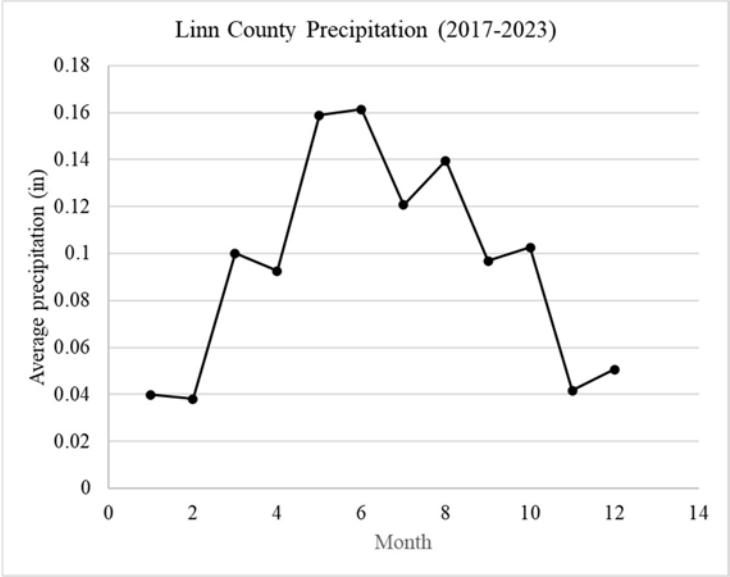
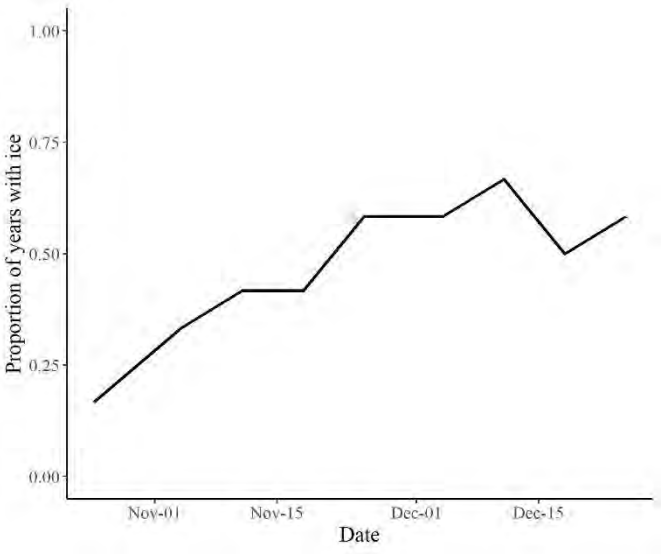


Figure 15. Left: Map showing 2021-2025 duck zones and the north central region of Missouri. Right: Precipitation patterns for the north central region of Missouri using Linn county data.



Probability	Date
0.10	October 23
0.30	November 1
0.50	November 6
0.70	November 13
0.90	November 22

Figure 16. Left: Proportion of years (2017-2023) ice was recorded on MDC wetland areas in the north central region of Missouri. Right: Probability that a temperature of 24°F will be reached in Brookfield, MO using data from 2017-2023.

Migration timing:
The peak number of early dabbling ducks in this area occurs during early November and declines into December while the number of mallards increases through November and peaks during the last week, then declines gradually throughout December. The mallard patterns for the more recent years (2017-2023) are like the long-term average (2003-2023), however, both the early dabblers and mallards have remained more abundant later into the season in mid- and late December.

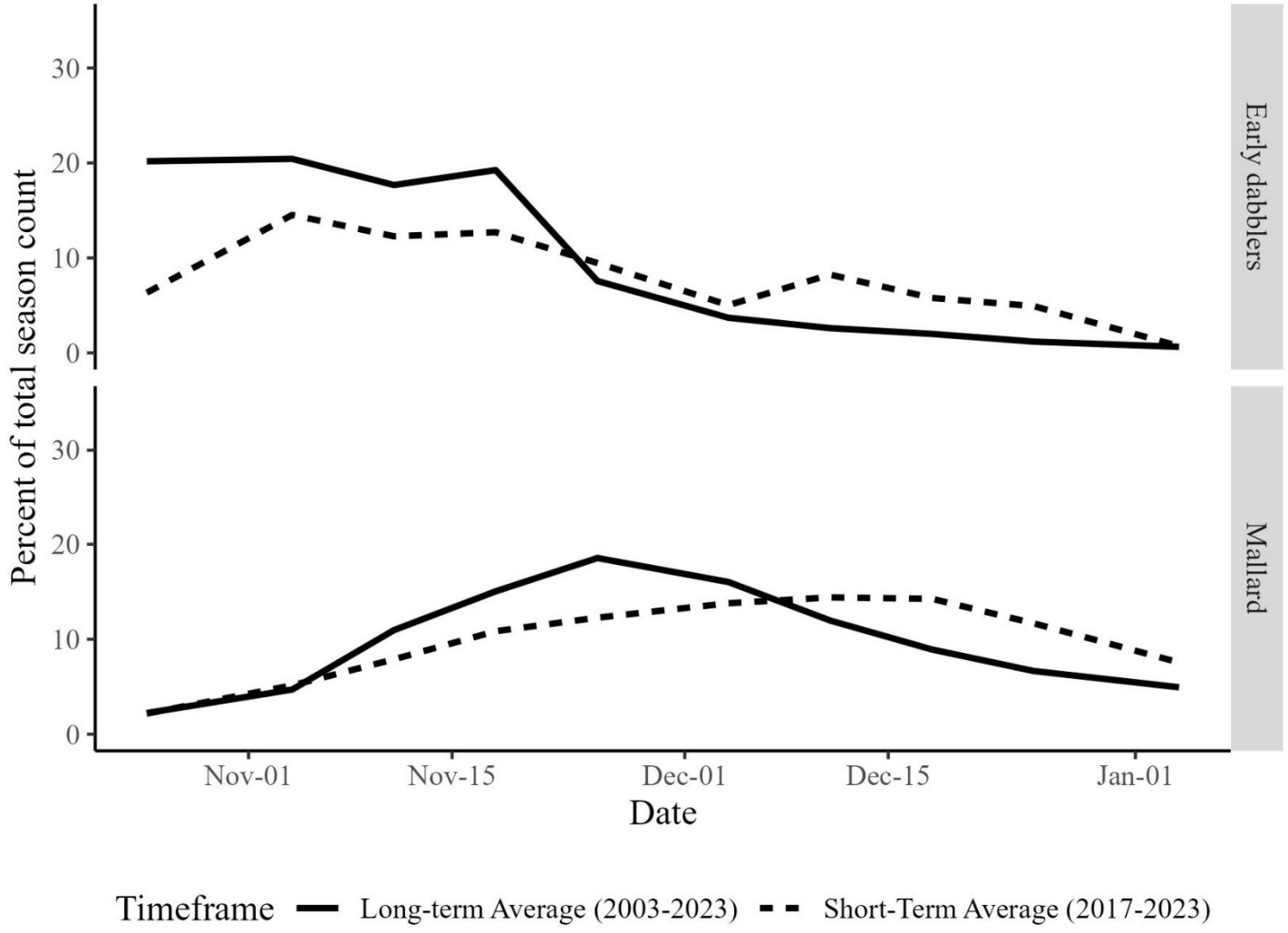


Figure 17. Average proportion of total counts of early dabblers and mallards during the long-term average (2003-2023) and the short-term (2017-2023) in the north central region of Missouri.

Harvest:

The FWS harvest estimate, suggests that a substantial portion of total duck harvest occurs through the month of November in both time periods, 2011-2016 and 2017-2023 (top left). After November, harvest drops significantly into early December before remaining stable through the remainder of the season (top left). On intensively managed wetlands in the north central region (Fountain Grove CA), duck harvest was at its highest throughout November from 2017-2020 (bottom left). In the last few years (2021-2023), we see a gradual increase in harvest throughout November with a peak during the last week of the month (bottom left). On MDC wetlands, the harvest of mallards occurred slightly later than harvest of early dabblers, with more mallards harvested at the end of November and beginning of December compared to the early dabbler harvest in early to mid-November (bottom right). Mallard band recovery estimates suggest harvest peaks in late November before declining into December and stabilizing for the remainder of the season (top right).

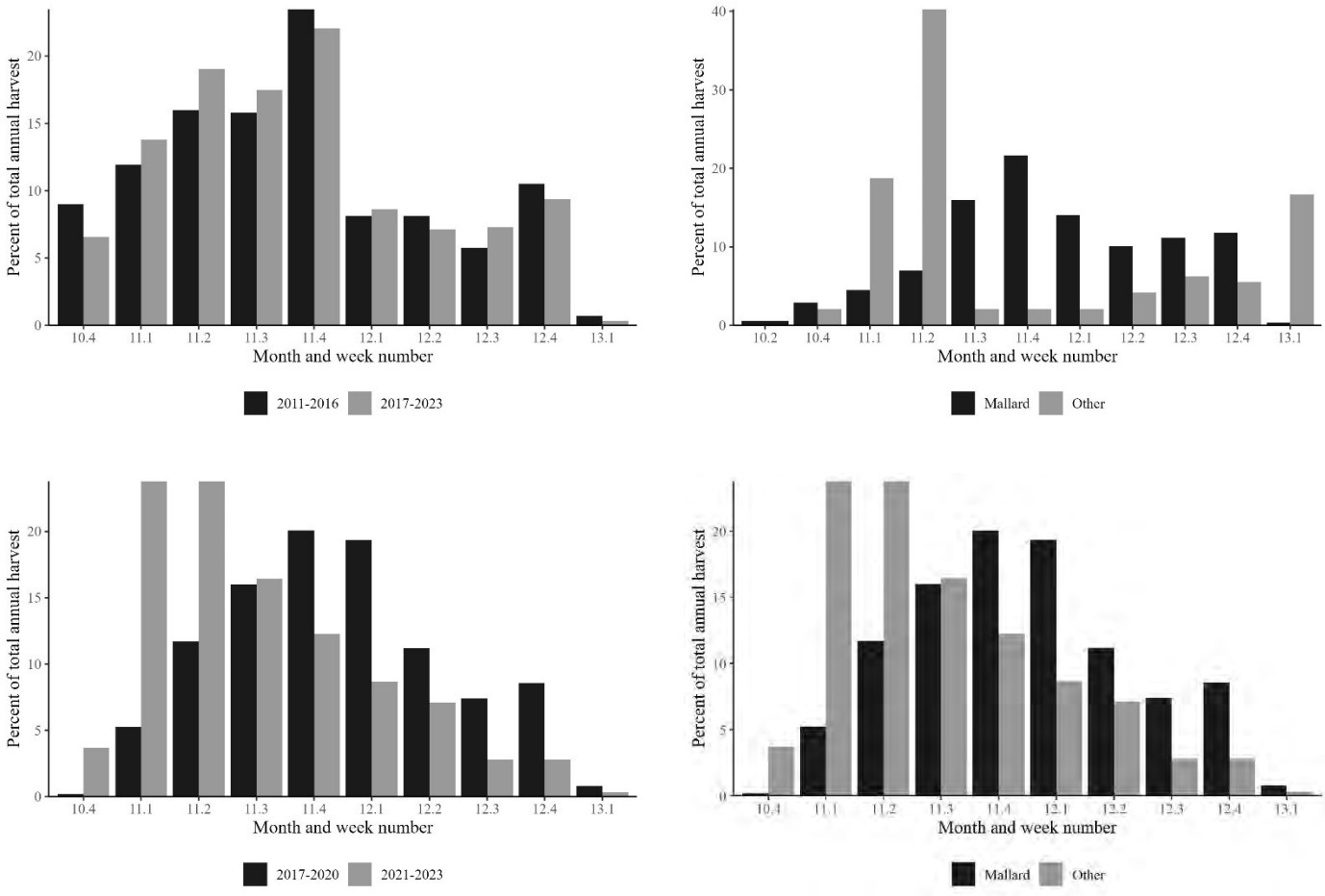


Figure 18. Top Left: Average percent of total annual harvest per week on public and private ground in the north central region of Missouri, 2011-2016 and 2017-2023. Bottom Left: Average percent of total annual harvest per week of all ducks on MDC wetlands in the north central region of Missouri, 2017-2020 and 2021-2023. Top Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the north central region of Missouri, 2017-2023. Bottom Right: Average percent of total annual harvest per week of mallards and all other duck species on MDC wetlands in the north central region of Missouri, 2017-2023.

Northeast

Weather:

In the northeast region of the state, precipitation gradually declines throughout the fall, but not as dramatically as other areas (figure 19, left). Freezing conditions are not expected until the latter half of November and into December, and they do not consistently occur until mid-December (figure 20, right). It is not until November 14th that there is a 50% probability of seeing temperatures below 24°F, a week later than the northwest region (figure 20, right). In mid-December, ice conditions were present on MDC intensively managed wetlands (Ted Shanks CA) in the northeast region about 25% of years from 2017-2023 (figure 20, left).

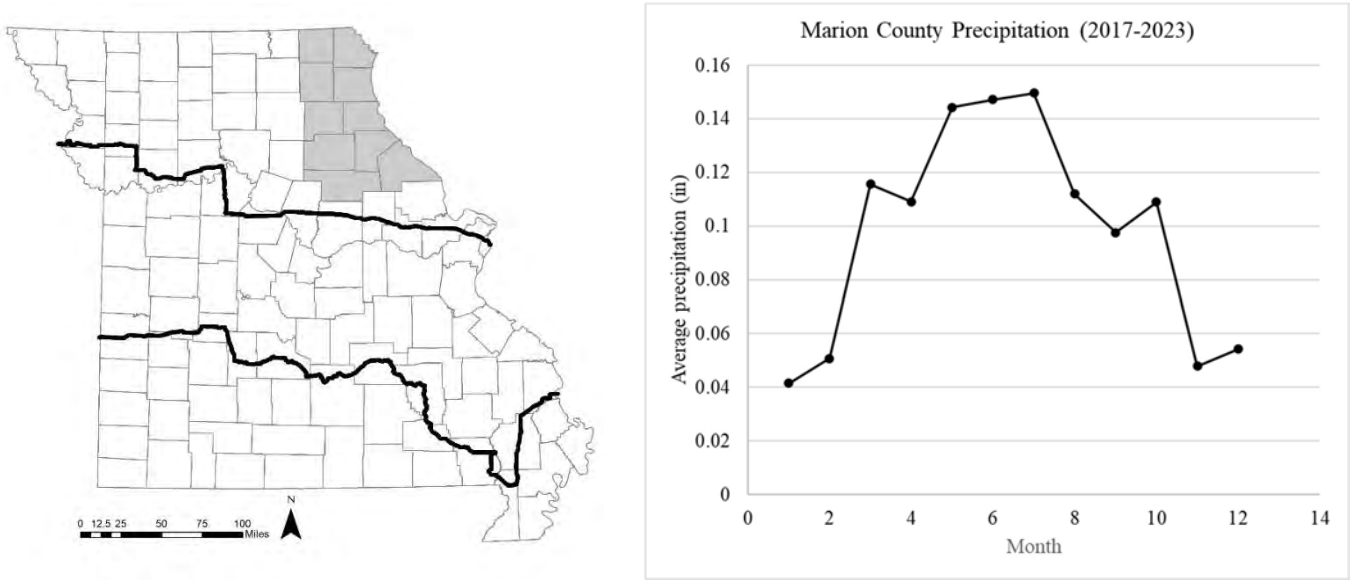
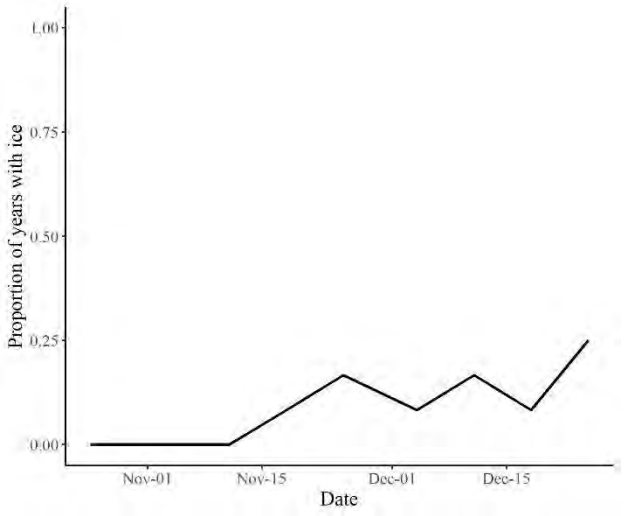


Figure 19. Left: Map showing 2021-2025 duck zones and the northeast region of Missouri. Right: Precipitation patterns for the northeast region of Missouri using Marion County data.



Probability	Date
0.10	October 30
0.30	November 7
0.50	November 14
0.70	November 22
0.90	December 1

Figure 20. Left: Proportion of years (2017-2023) ice was recorded on MDC wetland areas in the northeast region of Missouri. Right: Probability that a temperature of 24°F will be reached in Marion County, MO using data from 2017-2023.

Migration timing:

Over the long-term (2003-2023), peak duck abundance occurs about the fourth week of November into the first week of December in the northeast region (using counts from MDC intensively managed wetland areas. Early dabblers reach their maximum abundance in mid-November and begin declining in late November, while mallards increase in abundance into December before beginning a slow decline at the end of December. Over the short-term (2017-2023), the early dabblers have continued to follow their long-term average trends, while mallards have remained more abundant through mid-December compared to the long-term average.

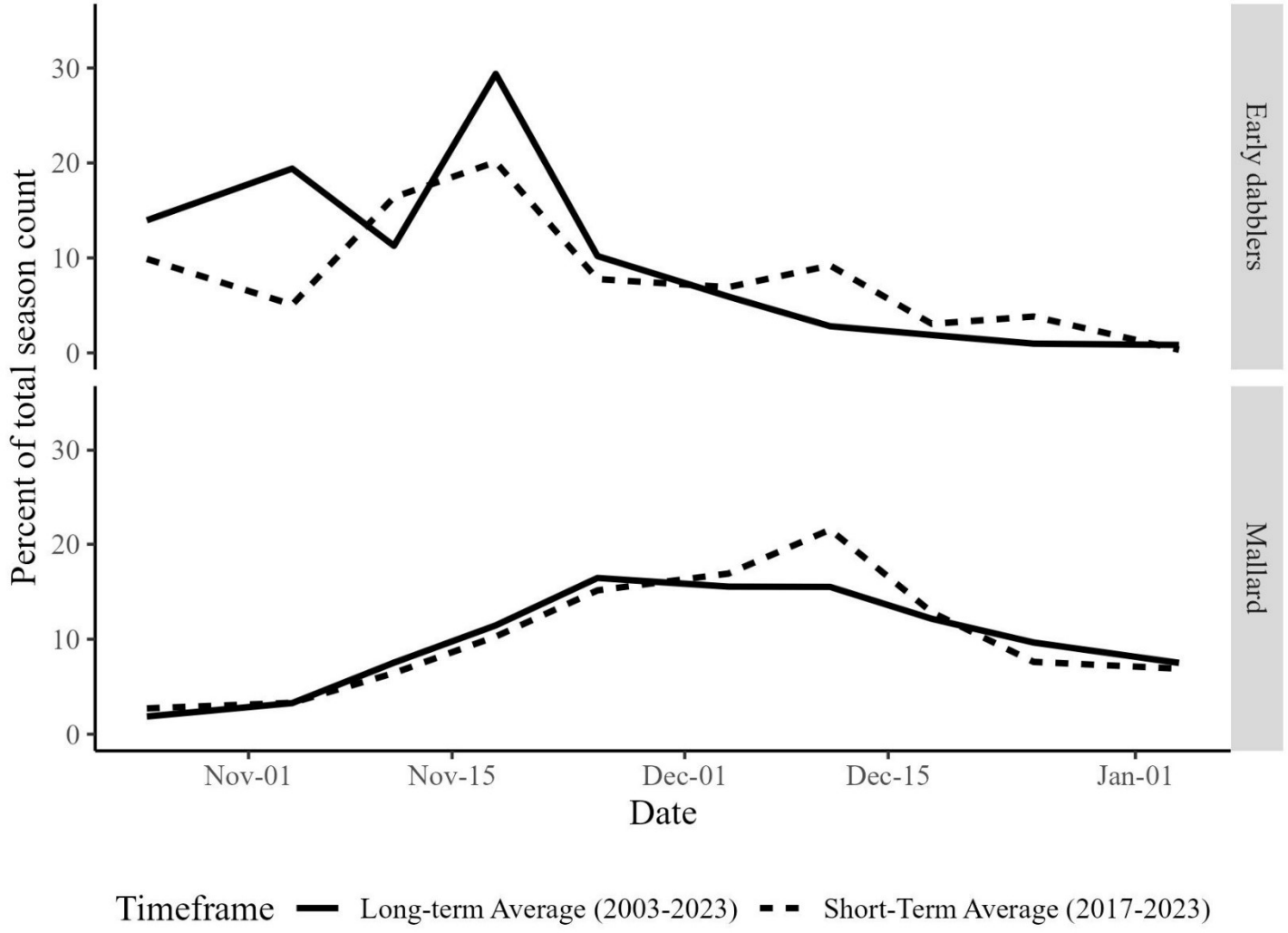


Figure 21. Average proportion of total counts of early dabblers and mallards during the long-term average (2003-2023) and the short-term (2017-2023) in the northeast region of Missouri.

Harvest:

During 2011-2016, the average daily harvest per week increased from the last week in October until peaking in the last week of November in both time periods (top left). Harvest then significantly declined into early December before stabilizing through the rest of the season (top left). From 2017-2020, harvest on MDC wetlands was greatest throughout November and into the beginning of December before declining through December (bottom left). During the 2021-2023 seasons, harvest peaked during the last week of November and stayed relatively higher through the second week of December before declining (bottom left). Harvest of mallards on MDC wetlands was greatest during the last week of November and the first week of December while early dabblers were harvested the most during the first and second week of November (bottom right). Mallard band recoveries show fluctuation near the end of the season, however, roughly an equal proportion of mallards were harvested throughout November and December (top right).

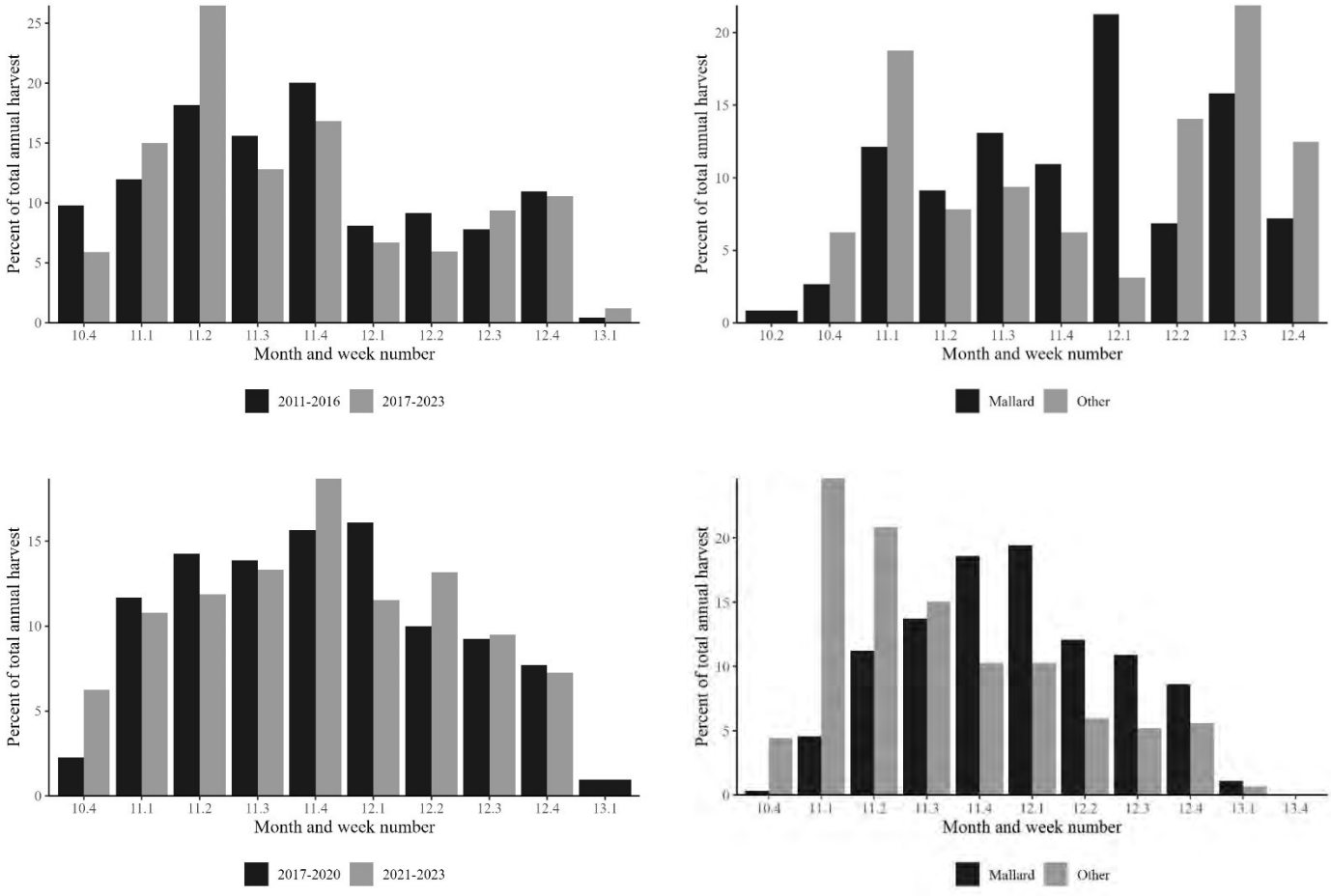


Figure 22. Top Left: Average percent of total annual harvest per week on public and private ground in the northeast region of Missouri, 2011-2016 and 2017-2023. Bottom Left: Average percent of total annual harvest per week of all ducks on MDC wetlands in the northeast region of Missouri, 2017-2020 and 2021-2023. Top Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the northeast region of Missouri, 2017-2023. Bottom Right: Average percent of total annual harvest per week of mallards and all other duck species on MDC wetlands in the northeast region of Missouri, 2017-2023.

Missouri River West

Weather:

Precipitation patterns in the Missouri River West typically result in lower fall precipitation than the northwest region (figure 23, right). The temperatures are slightly milder than the northwest region, with a 50% probability of a low temperature of 24°F by November 7th and a 50% probability of ice conditions by November 21 from 2017-2023 (figure 24, right). About 75% of all years 2017-2023, ice conditions existed on MDC intensively managed wetland areas (Grand Pass CA) after the first week of December.

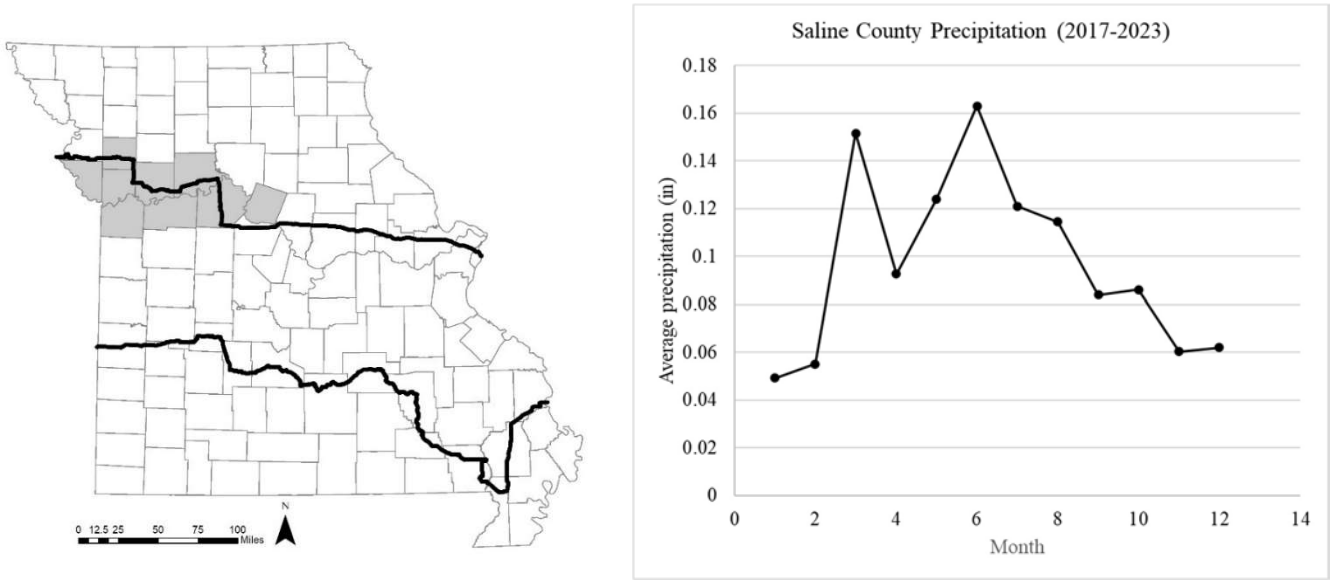
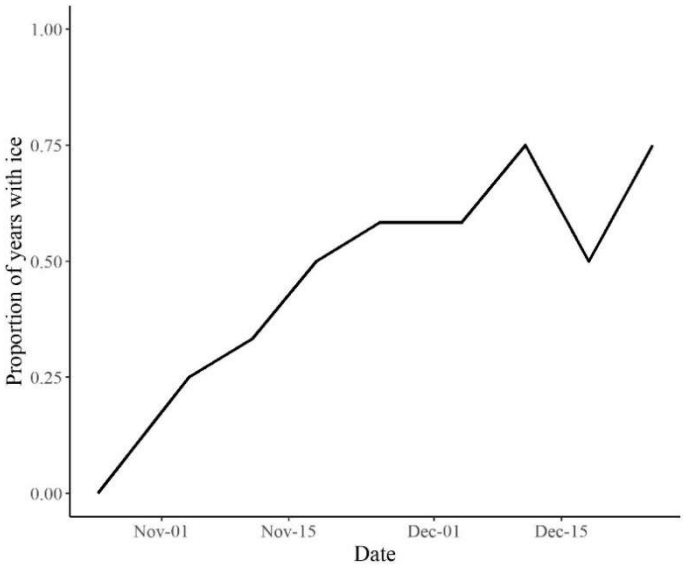


Figure 23. Left: Map showing 2021-2025 duck zones and the Missouri River west region of Missouri. Right: Precipitation patterns for the Missouri River west region of Missouri using Saline County data.



Probability	Date
0.10	October 23
0.30	November 1
0.50	November 7
0.70	November 14
0.90	November 25

Figure 24. Left: Proportion of years (2017-2023) ice was recorded on MDC wetland areas in the Missouri River west region of Missouri. Right: Probability that a temperature of 24°F will be reached in Saline County, MO using data from 2017-2023.

Migration timing:
The long-term average (2003-2023) indicates that early dabblers peaked during the last week of October into mid-November and declined dramatically towards the end of November. Meanwhile, Mallards gradually increased in numbers beginning in early November and peaked mid- December before beginning a gradual decline. The short-term average (2017-2023) showed similar patterns for early dabblers and mallards to the long-term average.

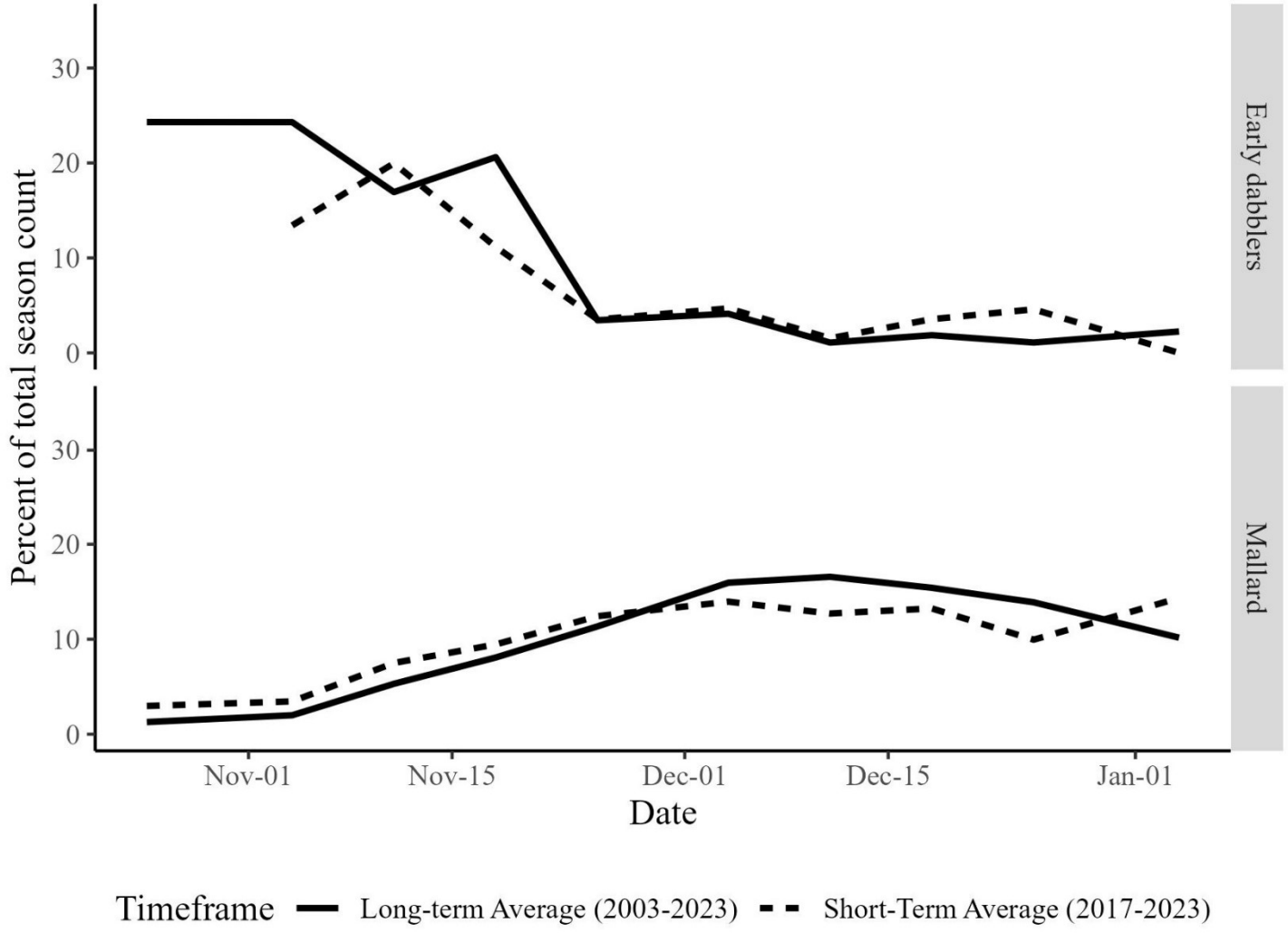


Figure 25. Average proportion of total counts of early dabblers and mallards during the long-term average (2003-2023) and the short-term (2017-2023) in the Missouri River west region of Missouri.

Harvest:

Harvest in this region generally peaked in late November and to mid-December and remained stable throughout the season as indicated by FWS harvest estimates (top left). Harvest on MDC intensively managed wetland areas peaked during late November during the 2017-2020 period and gradually declined throughout the season (bottom left). During the 2021-2023 period, harvest peaked two weeks later during the second week in December and remained higher throughout December (bottom left). Early dabblers were harvested mostly during the second week of November compared to mallards, which were harvested mostly during the last week of November and the first week of December (bottom right). Mallard band recoveries in the region reflect a similar pattern with peak recoveries reported in late November before remaining stable through the end of the season (top left).

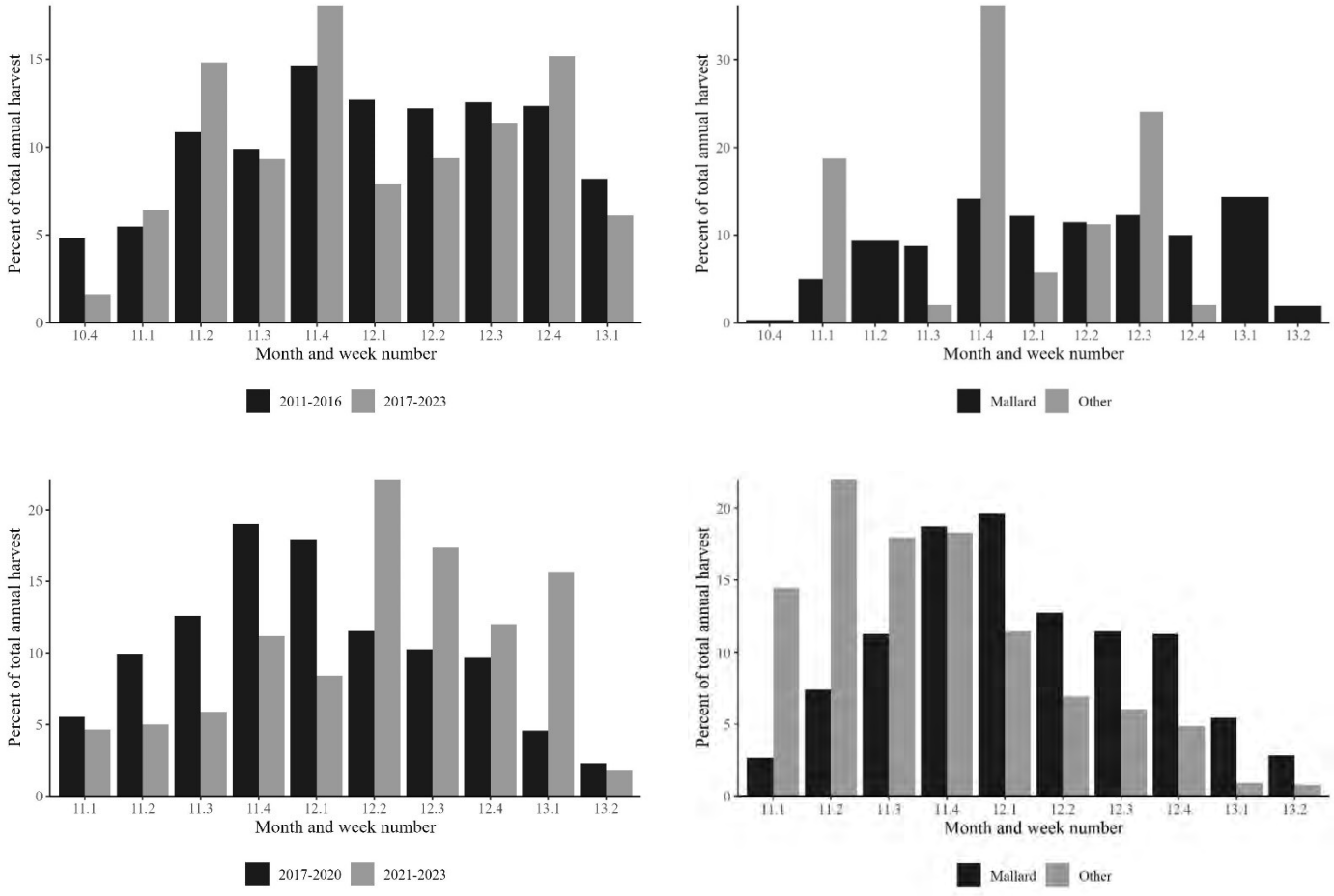


Figure 26. Top Left: Average percent of total annual harvest per week on public and private ground in the Missouri River west region of Missouri, 2011-2016 and 2017-2023. Bottom Left: Average percent of total annual harvest per week of all ducks on MDC wetlands in the Missouri River west region of Missouri, 2017-2020 and 2021-2023. Top Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the Missouri River west region of Missouri, 2017-2023. Bottom Right: Average percent of total annual harvest per week of mallards and all other duck species on MDC wetlands in the Missouri River west region of Missouri, 2017-2023.

Missouri River East

Weather:
Precipitation in the Missouri River East Region peaks slightly later than in the Missouri River West Region, with a little more precipitation (figure 27, right). Temperatures also drop about a week later in this region, with a 50% probability of a low temperature of 24°F by November 14 (figure 28, right). Ice on MDC intensively managed wetland areas (Eagle Bluffs CA) also occurs later in this region, with ice forming by the second week of December 50% of years from 2017-2023 (figure 28, left).

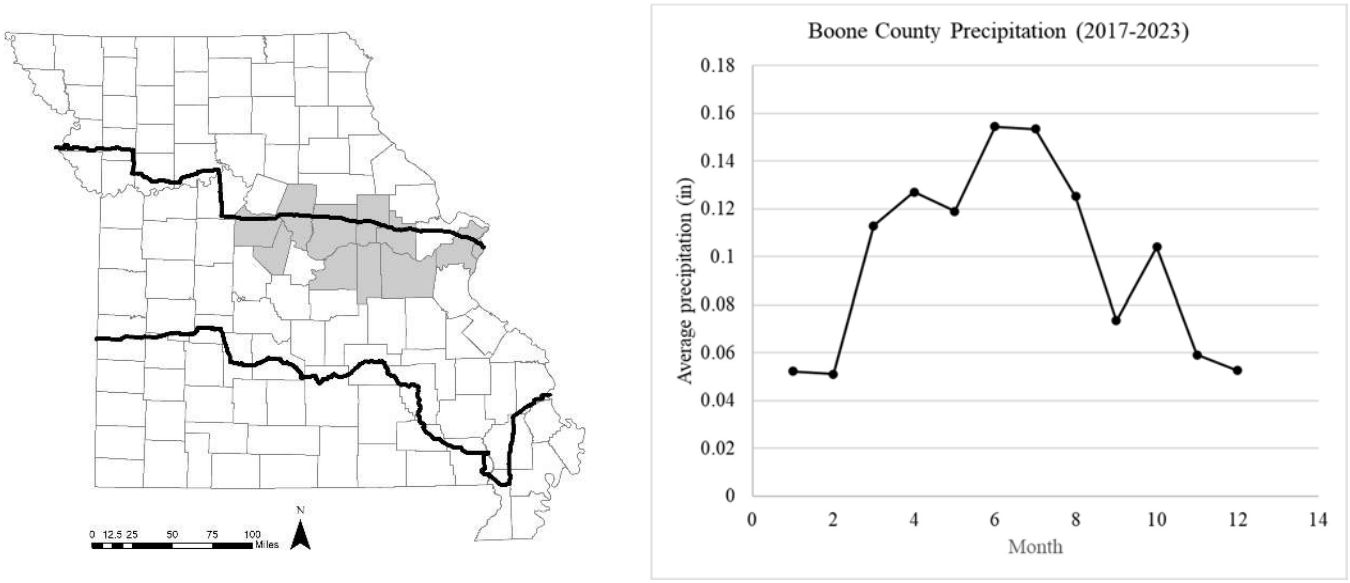
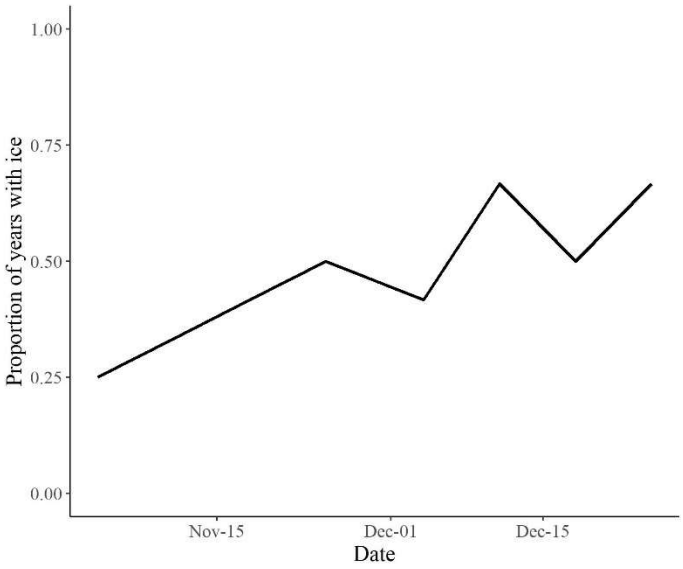


Figure 27. Left: Map showing 2021-2025 duck zones and the Missouri River east region of Missouri. Right: Precipitation patterns for the Missouri River east region of Missouri using Saline County data.



Probability	Date
0.10	October 31
0.30	November 7
0.50	November 14
0.70	November 22
0.90	December 1

Figure 28. Left: Proportion of years (2017-2023) ice was recorded on MDC wetland areas in the Missouri River east region of Missouri. Right: Probability that a temperature of 24°F will be reached in Boone County, MO using data from 2017-2023.

Migration timing:

On average, in the Missouri River East Region, early dabblers peaked around the first week of November and declined sharply after the third week of November. Mallards peaked during the first week of December, declined slightly, then remained steady throughout the remainder of the year. The short-term average (2017-2023) showed similar patterns for early dabblers and mallards to the long-term average (2003-2023).

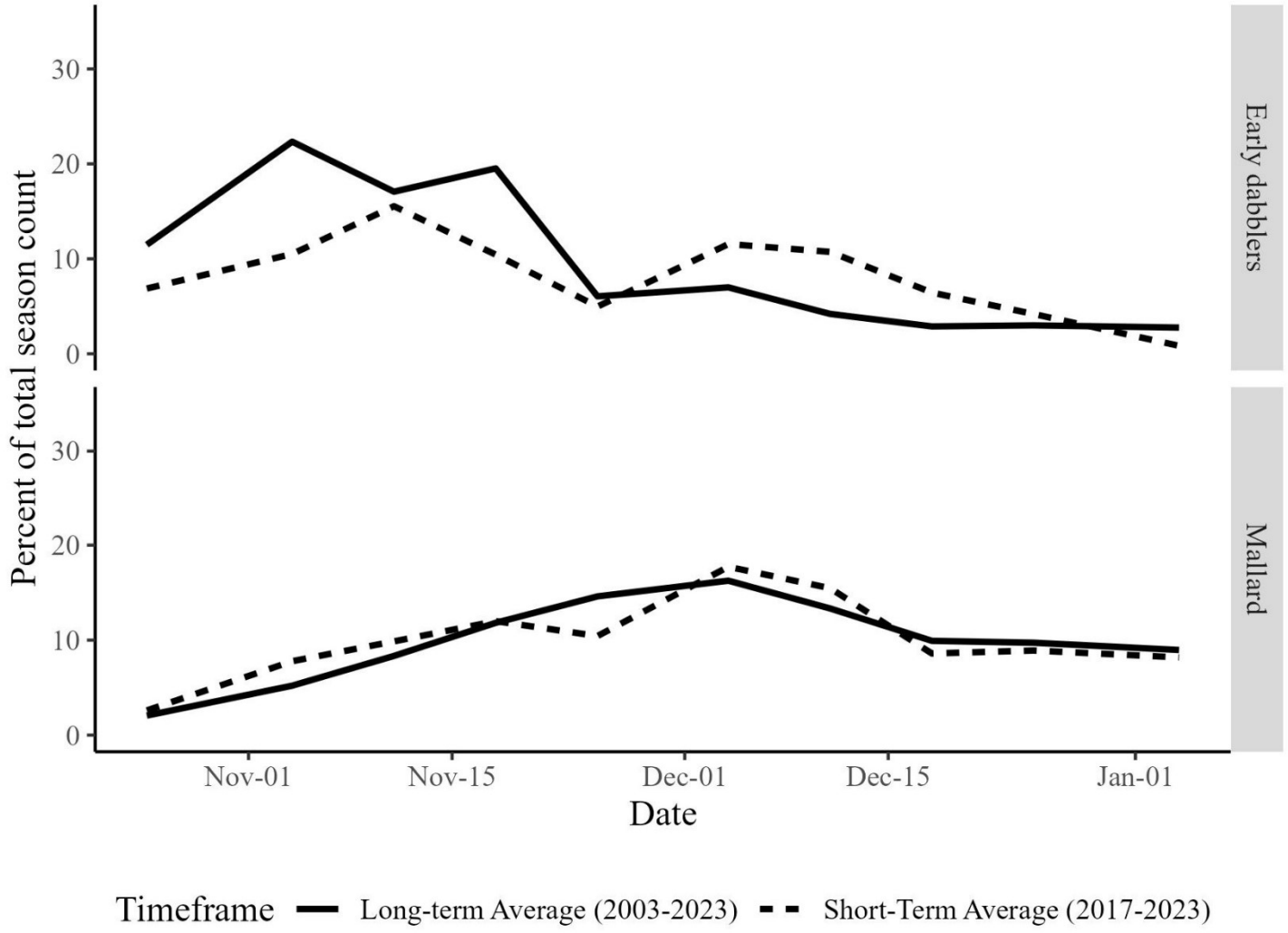


Figure 29. Average proportion of total counts of early dabblers and mallards during the long-term average (2003-2023) and the short-term (2017-2023) in the Missouri River east region of Missouri.

Harvest:

During 2011-2016, FWS data indicates harvest remained stable throughout the entire season (top left). From 2017-2023, harvest increased throughout November before fluctuating throughout December and the end of the season (top left). On MDC intensively managed wetland areas in the Missouri River East Region, peak harvest in all ducks occurred during the last week of November and last week of December from 2017-2020 (bottom left). This changed during the 2021-2023 period when peak harvest occurred during the last week of November and then gradually declined through the end of the season (bottom left). From 2017-2020, early dabblers were harvested throughout November while mallards were mainly harvested at the end of November and beginning of December on MDC wetlands (bottom right). Mallard band recoveries suggest a peak mallard harvest at the end of December and beginning of January (top right).

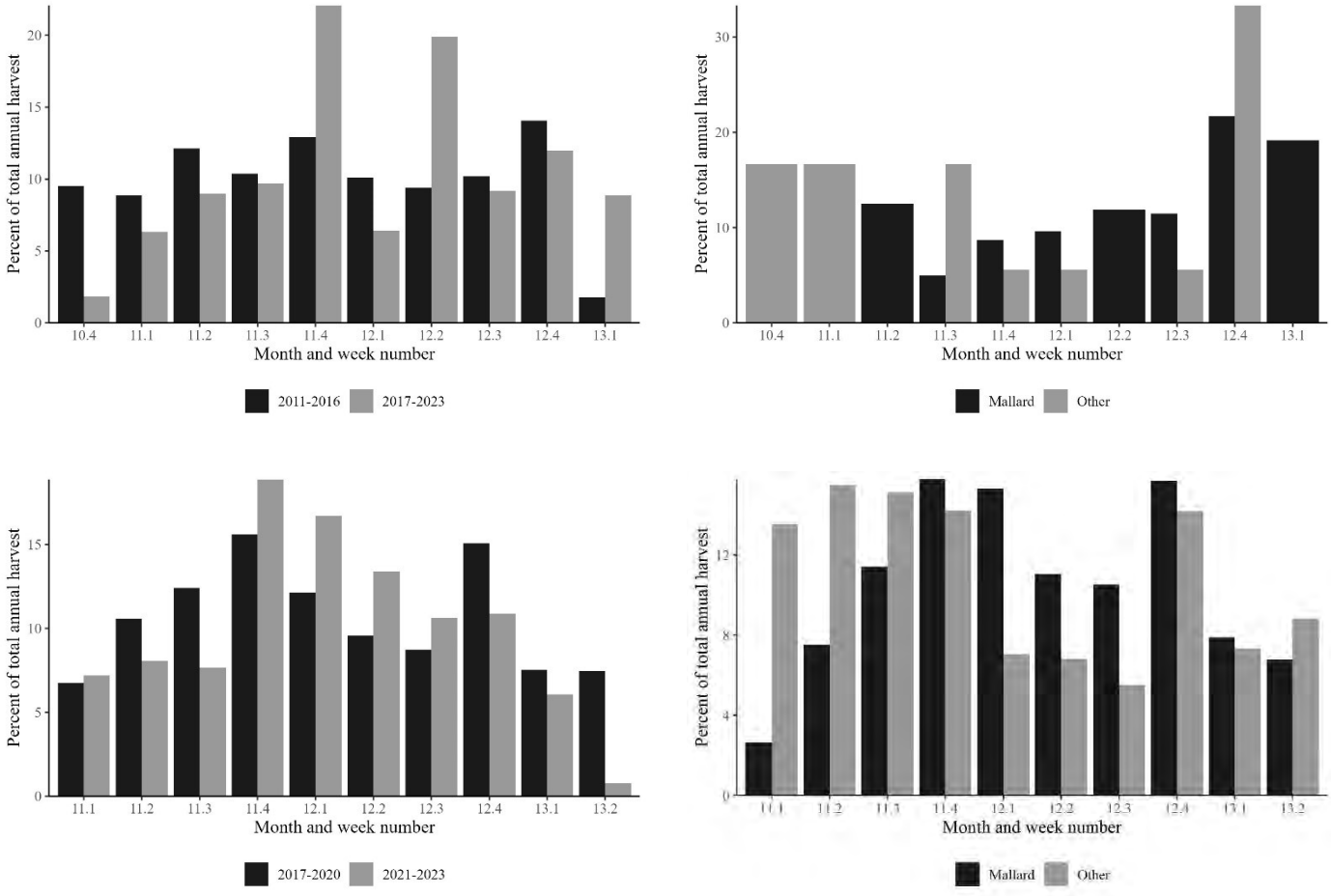


Figure 30. Top Left: Average percent of total annual harvest per week on public and private ground in the Missouri River east region of Missouri, 2011-2016 and 2017-2023. Bottom Left: Average percent of total annual harvest per week of all ducks on MDC wetlands in the Missouri River east region of Missouri, 2017-2020 and 2021-2023. Top Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the Missouri River east region of Missouri, 2017-2023. Bottom Right: Average percent of total annual harvest per week of mallards and all other duck species on MDC wetlands in the Missouri River east region of Missouri, 2017-2023.

Lincoln

Weather:

Like other northern portions, precipitation peaks around the end of summer and gradually declines throughout fall (figure 31, right). There is a 50% probability of seeing a low temperature of 24°F by November 9th, with ice occurring on MDC intensively managed wetlands (B.K. Leach CA) by early December, in 50% of the years from 2017-2023 (figure 32).

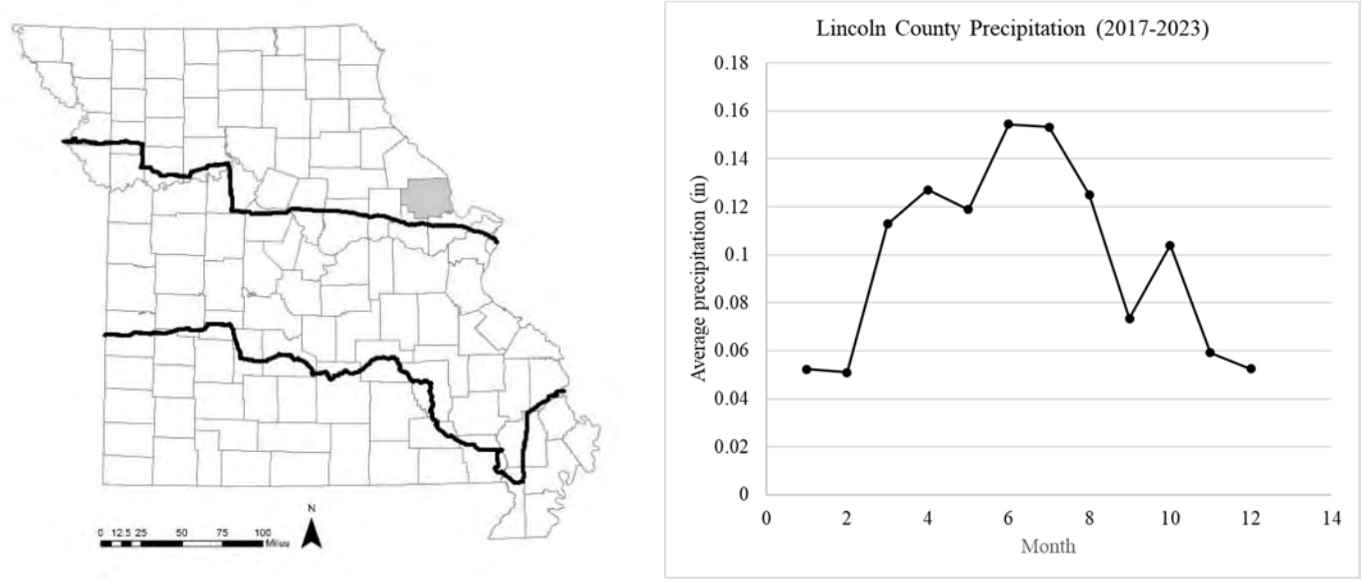
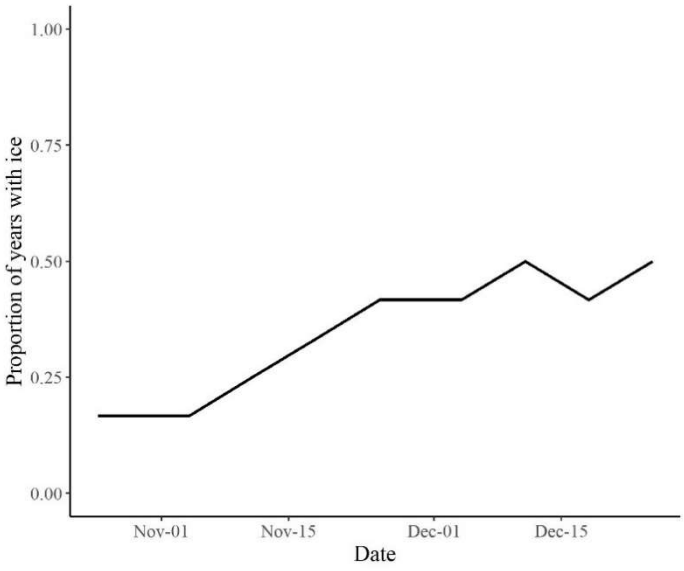


Figure 31. Left: Map showing 2021-2025 duck zones and the Lincoln region of Missouri. Right: Precipitation patterns for the Lincoln region of Missouri using St. Louis County data.



Probability	Date
0.10	October 23
0.30	November 2
0.50	November 9
0.70	November 16
0.90	November 27

Figure 32. Left: Proportion of years (2017-2023) ice was recorded on MDC wetland areas in the Lincoln region of Missouri. Right: Probability that a temperature of 24°F will be reached in Lincoln County, MO using data from 2017-2023.

Migration timing:
Early dabblers peaked around the second week of November during the last long-term average (2003-2023), while mallards peaked two weeks later at the end of November. Over the short-term (2017-2023), early dabblers peaked two weeks later, in early December, than over the long-term average. Mallards arrived at similar times to the long-term average but remained a week later during the short-term.

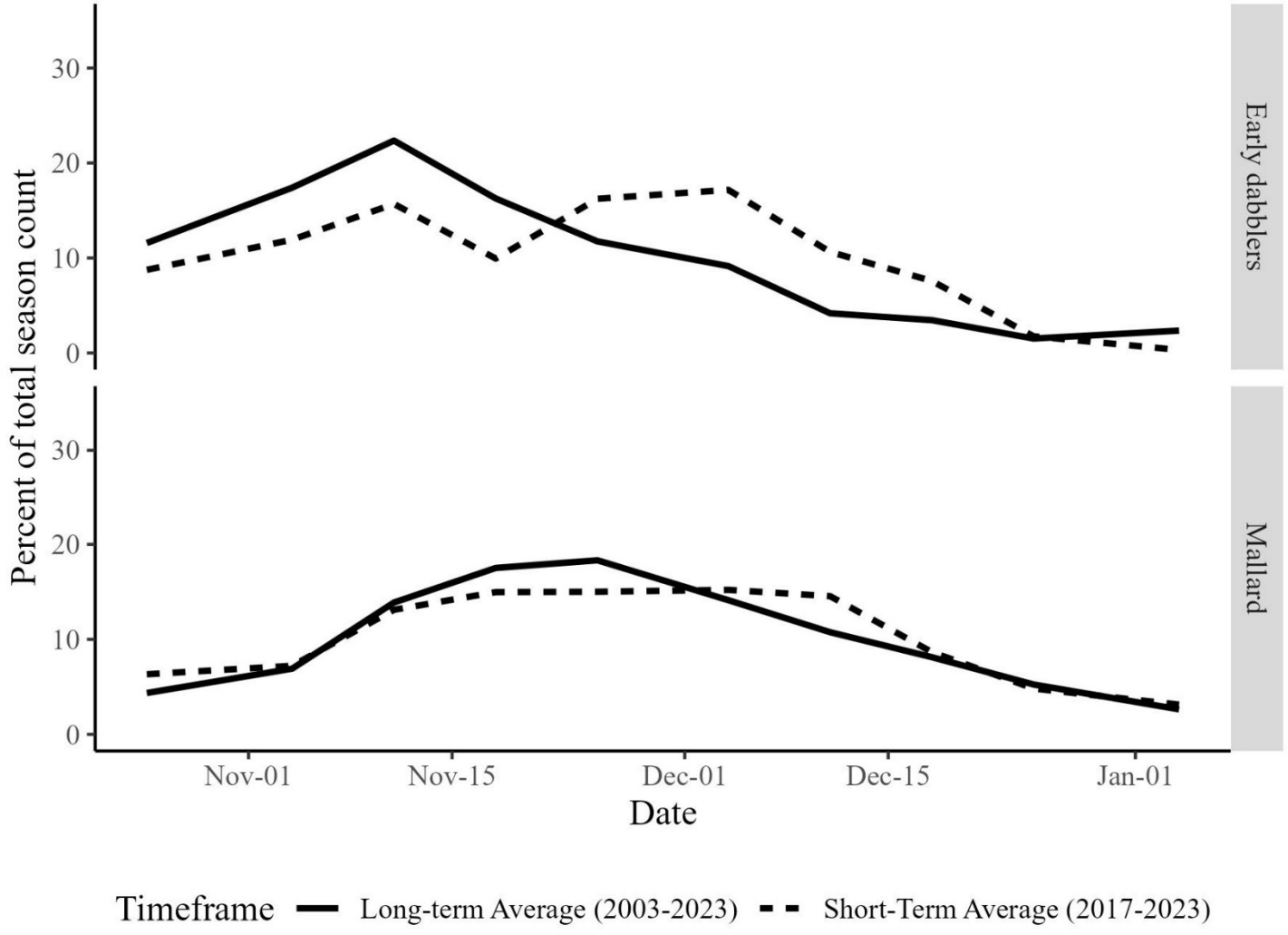


Figure 33. Average proportion of total counts of early dabblers and mallards during the long-term average (2003-2023) and the short-term (2017-2023) in the Lincoln region of Missouri.

Harvest:

For all years (2011-2023), FWS harvest increased through mid-November, peaking in late November, before decreasing in early December (top left). After the decrease in early December, harvest increases slightly through the end of the season (top left). Harvest of all ducks on MDC wetlands peaked during the first two weeks of November and gradually declined throughout the season during the 2017-2020 period and followed a similar trend during the 2021-2023 seasons (bottom left). On MDC wetlands, early dabblers were harvested the most during the first week of November in the 2017-2020 period, while mallards peaked in harvest during the mid-November (bottom right). Mallard band recoveries peaked during the third week of November in this region (top right).

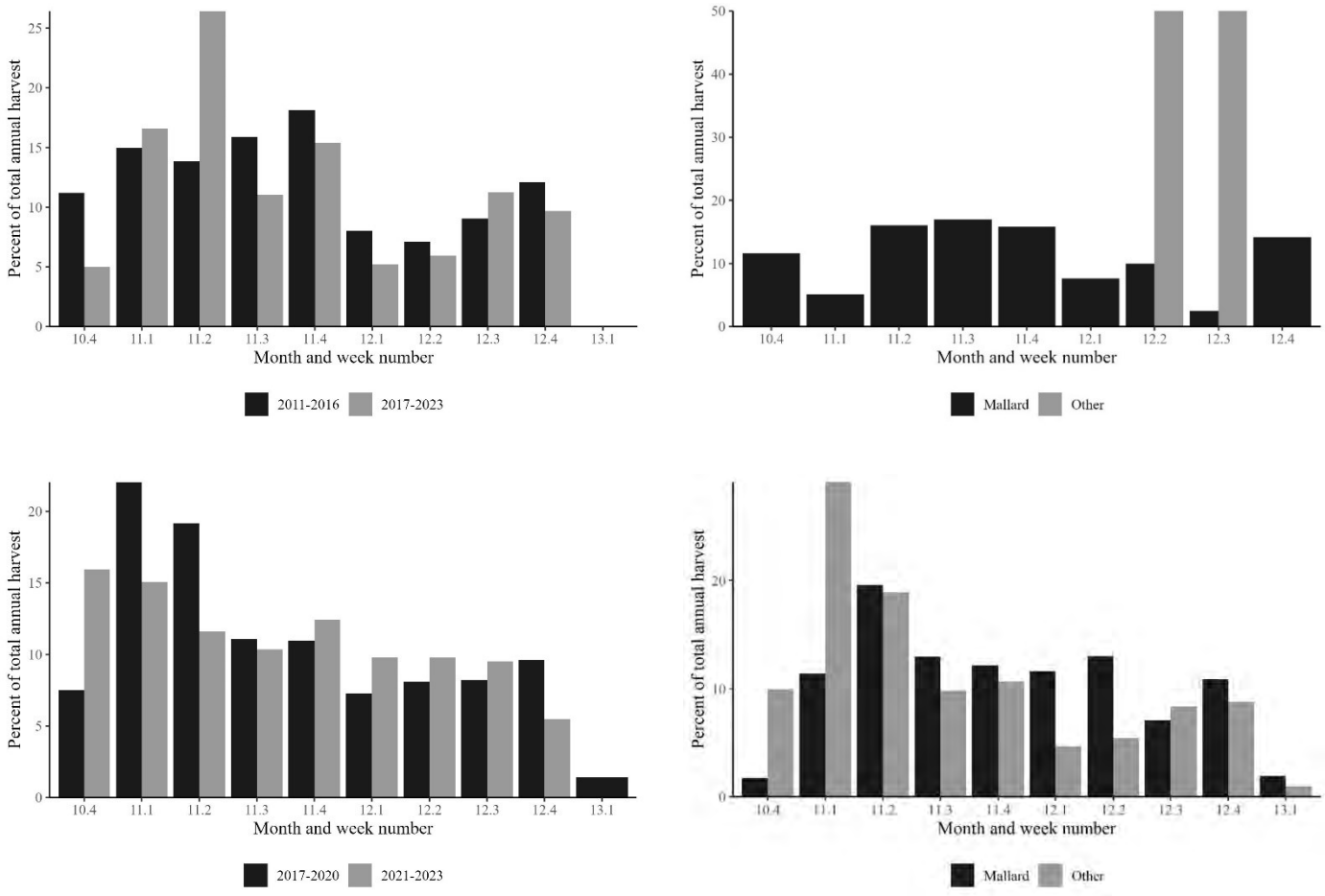


Figure 34. Top Left: Average percent of total annual harvest per week on public and private ground in the Lincoln region of Missouri, 2011-2016 and 2017-2023. Bottom Left: Average percent of total annual harvest per week of all ducks on MDC wetlands in the Lincoln region of Missouri, 2017-2020 and 2021-2023. Top Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the Lincoln region of Missouri, 2017-2023. Bottom Right: Average percent of total annual harvest per week of mallards and all other duck species on MDC wetlands in the Lincoln region of Missouri, 2017-2023.

St. Charles

Weather:

Precipitation peaks during late summer in the St. Charles Region and declines rapidly through August and into the fall (figure 35, right). There is a 50% probability of seeing a low temperature of 24° F by November 17, but ice conditions on MDC intensively managed wetland areas (Marais Temps Clair CA) did not occur in more than 50% of years (2017-2023) until mid-December (figure 36).

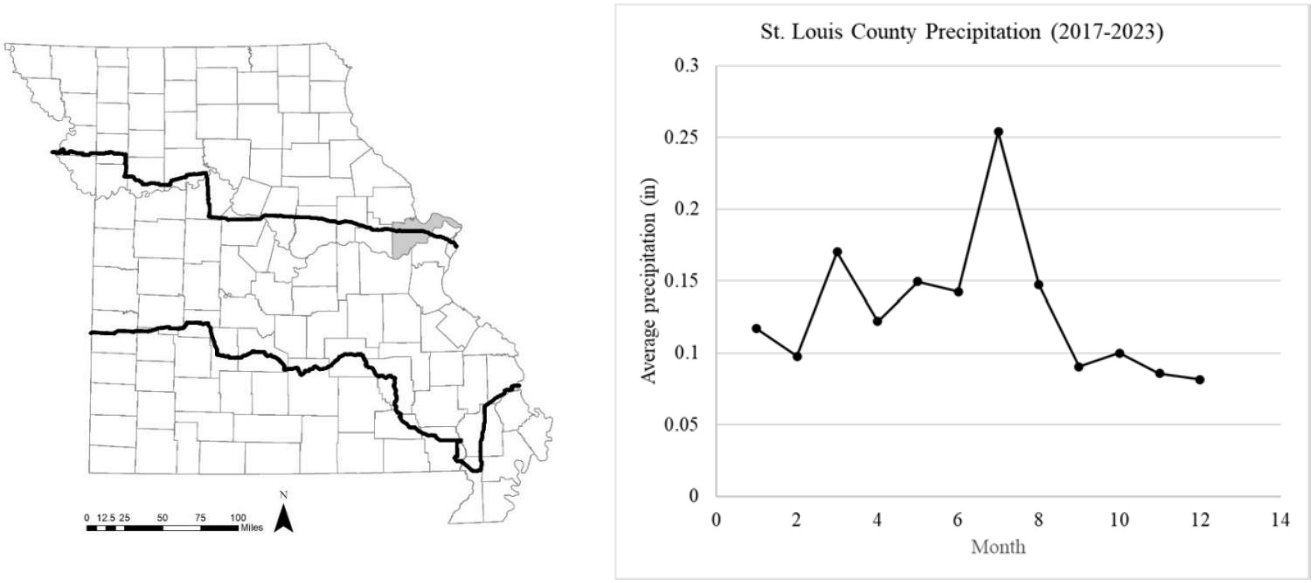
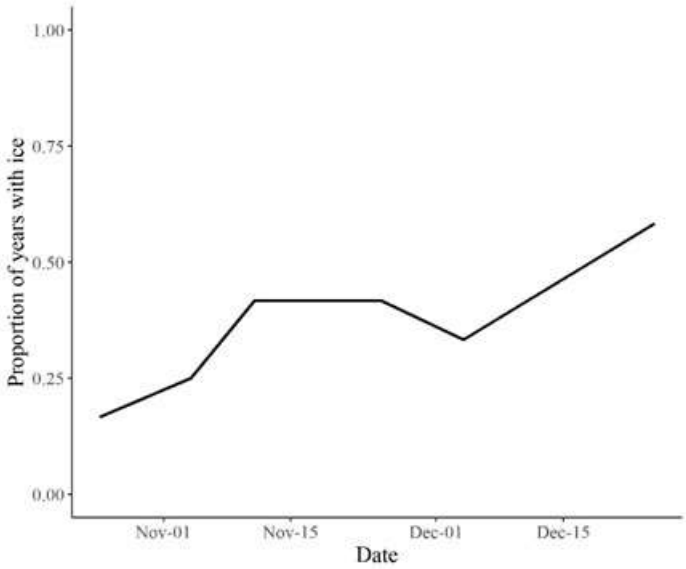


Figure 35. Left: Map showing 2021-2025 duck zones and the St. Charles region of Missouri. Right: Precipitation patterns for the St. Charles region of Missouri using St. Louis County data.



Probability	Date
0.10	October 31
0.30	November 9
0.50	November 17
0.70	November 26
0.90	December 5

Figure 36. Left: Proportion of years (2017-2023) ice was recorded on MDC wetland areas in the St. Charles region of Missouri. Right: Probability that a temperature of 24°F will be reached in St. Charles County, MO using data from 2017-2023.

Migration timing:

Early dabblers peaked in late November, slightly before the peak in mallards during the first week of December for the long-term average (2003-2023). Over the short-term (2017-2023), early dabblers peaked later in mid-December compared to the long-term average (2003-2023), which peaked in late November. The short-term average for mallards was like the long-term average.

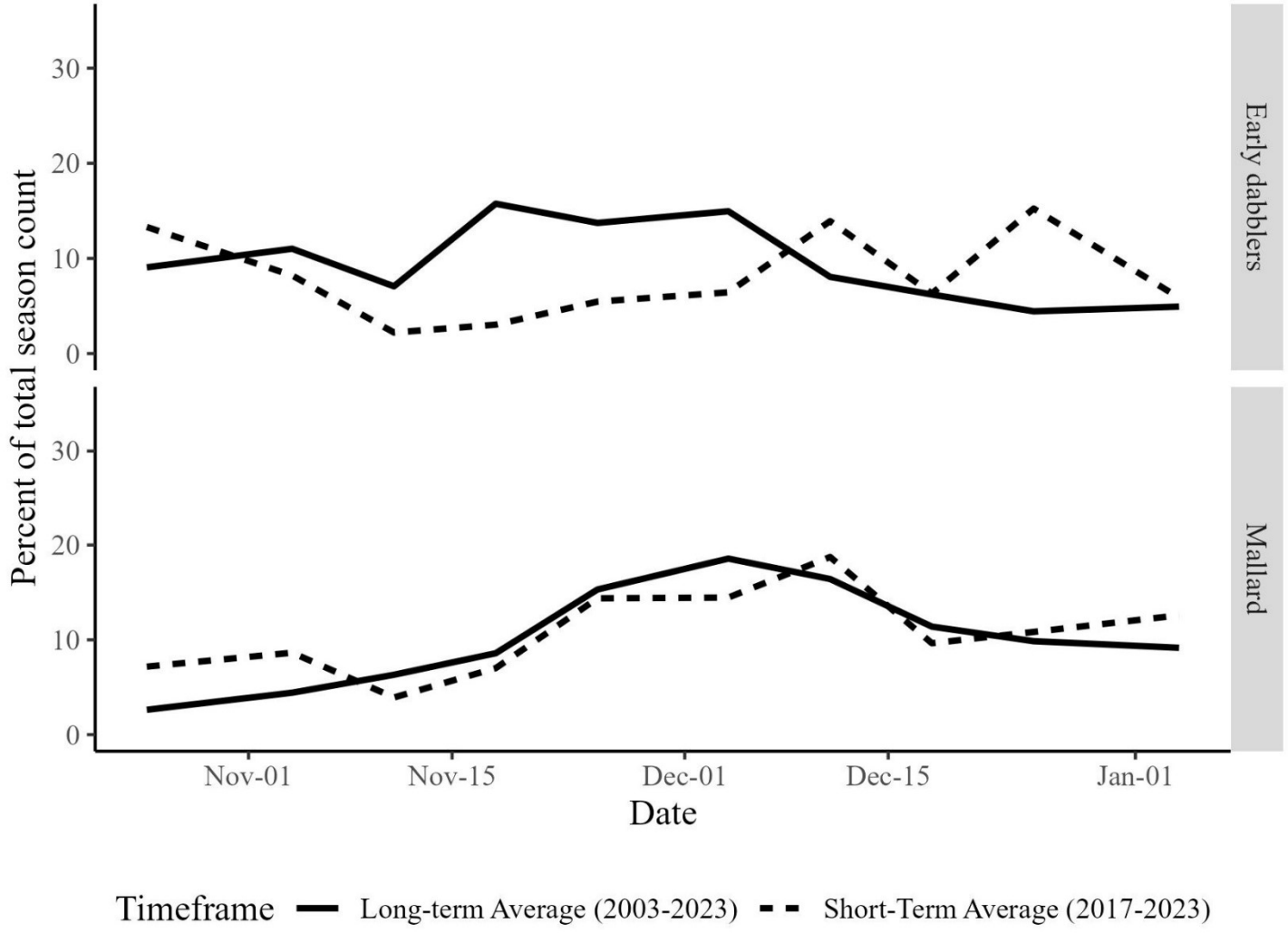


Figure 37. Average proportion of total counts of early dabblers and mallards during the long-term average (2003-2023) and the short-term (2017-2023) in the St. Charles region of Missouri.

Harvest:

During 2011-2016, FWS average daily harvest on public and private ground peaked during the second and third weeks of November, with a second peak in the latter half of December (top left). From 2017-2023 on MDC wetlands, harvest peaked the last week of November with a second peak at the end of December (bottom left). From 2017-2020, total duck harvest peaked around late November and remained stable through the end of December (bottom left). For the 2021-2023 period, harvest was greater throughout the early part of the season but remained stable through the end of December (bottom left). Mallards were mostly harvested during and after the last week of November for the 2017-2023 period, while other ducks were mostly harvested during the first and second week of November (bottom right). Mallard band recoveries suggest a slightly different harvest pattern as mallard band recoveries peak in mid-November with another peak in mid- to late December (top right).

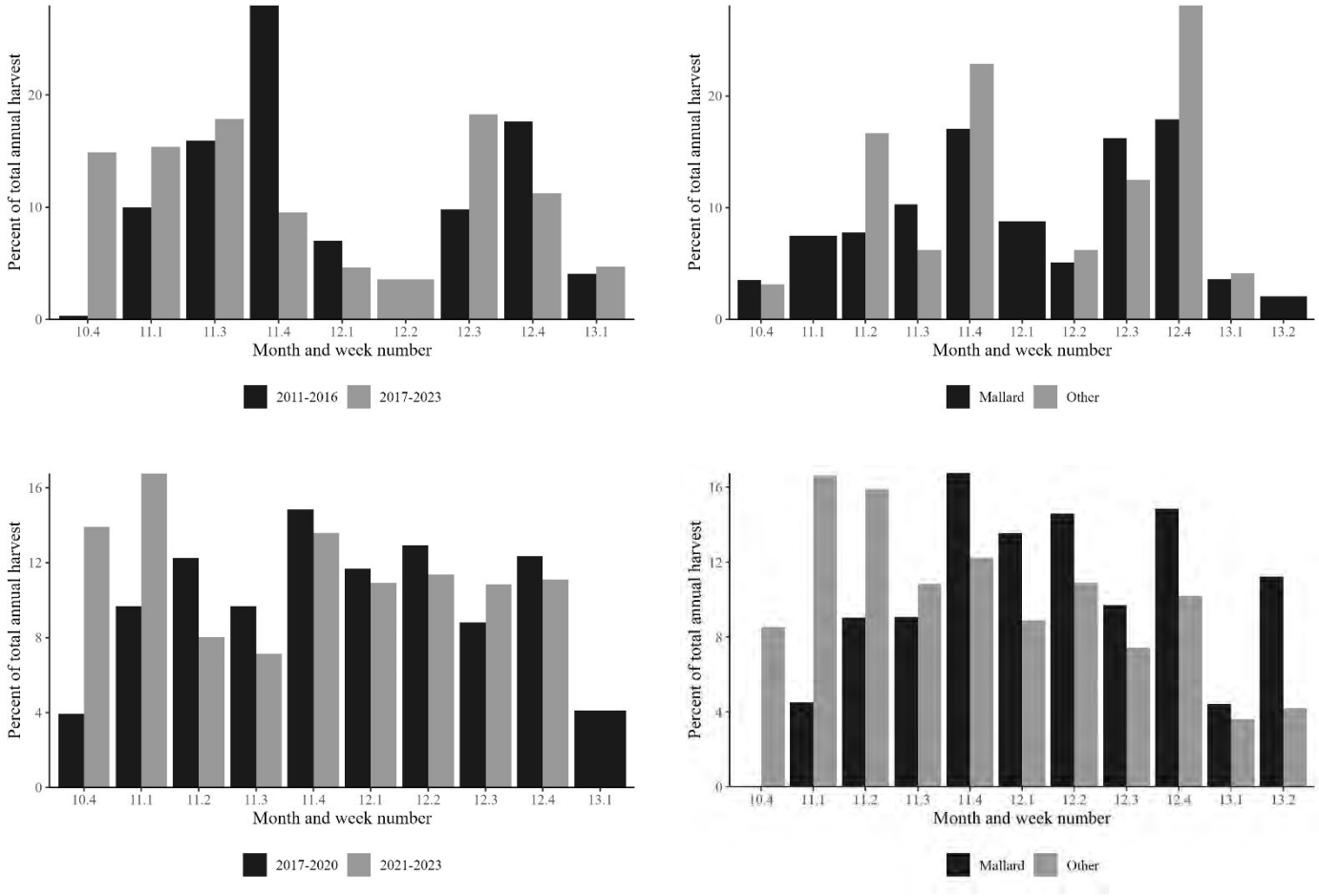


Figure 38. Top Left: Average percent of total annual harvest per week on public and private ground in the St. Charles region of Missouri, 2011-2016 and 2017-2023. Bottom Left: Average percent of total annual harvest per week of all ducks on MDC wetlands in the St. Charles region of Missouri, 2017-2020 and 2021-2023. Top Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the St. Charles region of Missouri, 2017-2023. Bottom Right: Average percent of total annual harvest per week of mallards and all other duck species on MDC wetlands in the St. Charles region of Missouri, 2017-2023.

West Central

Weather:

Precipitation remains relatively sustained until later into the fall for the West Central Region and temperatures are like the Missouri River West region (figure 39, left). A 50% probability of seeing a low temperature of 24°F occurs on November 5th, and then experiences a freeze-thaw pattern through December (figure 40, right). Ice conditions on MDC intensively managed wetland areas (Four Rivers CA, Schell-Osage CA, and Montrose CA) occurred in 50% of years from 2017-2023 after mid-December (figure 40, left).

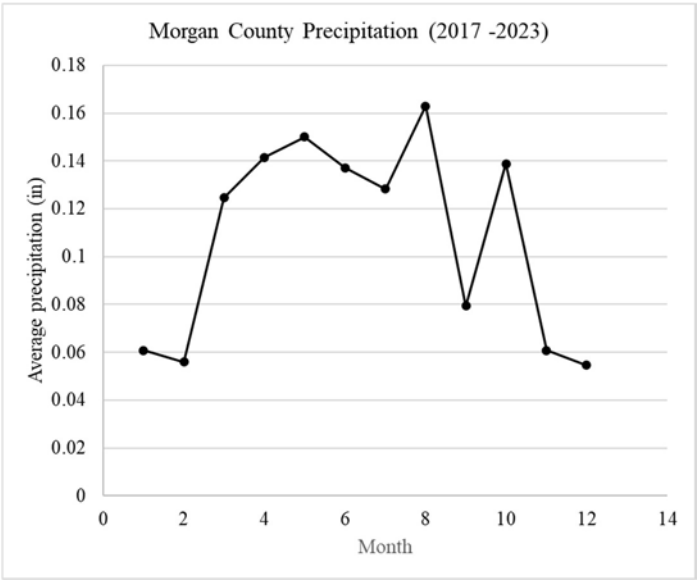
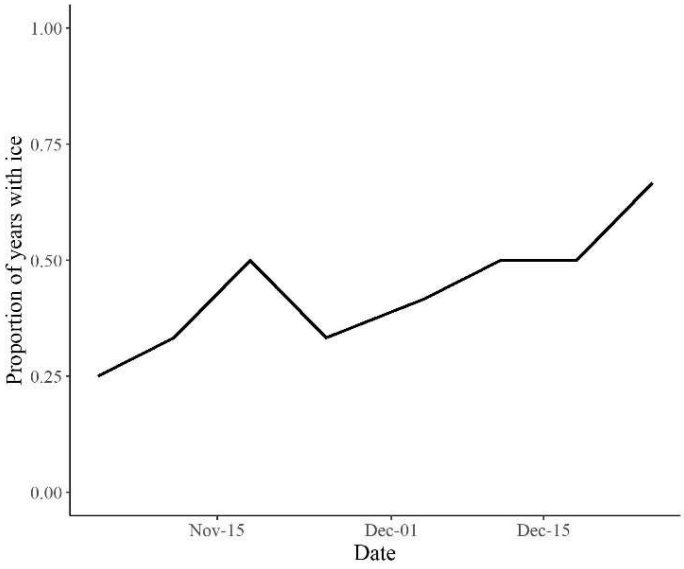


Figure 39. Left: Map showing 2021-2025 duck zones and the west central region of Missouri. Right: Precipitation patterns for the west central region of Missouri using Morgan County data.



Probability	Date
0.10	October 21
0.30	November 1
0.50	November 5
0.70	November 12
0.90	November 22

Figure 40. Left: Proportion of years (2017-2023) ice was recorded on MDC wetland areas in the west central region of Missouri. Right: Probability that a temperature of 24°F will be reached in Morgan County, MO using data from 2017-2023.

Migration timing:
The highest proportion of early dabblers occurred in early November and then gradually declined throughout the season while mallards increased throughout November and peaked in late November during the long-term average (2003-2023). Compared to the long-term average, over the short-term (2017-2023) early dabblers declined more quickly early in the season but peaked again in the first week of December while mallards continued to follow the long-term trends.

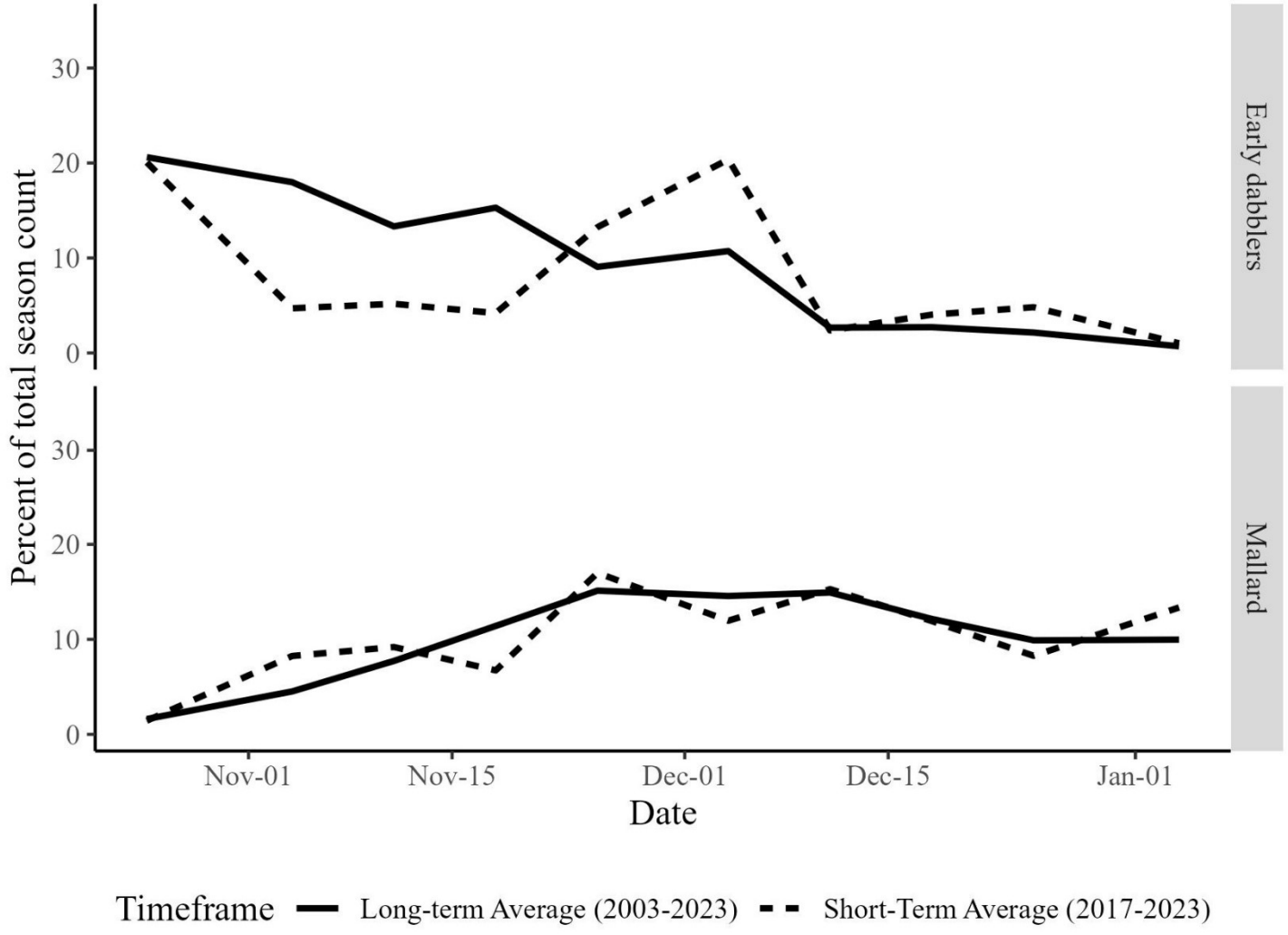


Figure 41. Average proportion of total counts of early dabblers and mallards during the long-term average (2003-2023) and the short-term (2017-2023) in the west central region of Missouri.

Harvest:

FWS harvest data indicated peak harvest occurred in late November and remained steady through the remainder of the season, with a slight decrease at the end of December and beginning of January; little change occurred between 2011-2016 and 2017-2023 (top left). From 2017-2020, harvest of all ducks remained relatively stable from early November through mid-December while freeze-thaw cycles from 2021-2023 creating a more variable harvest, with peaks the first week of November, the last week of November, and the first week of January on MDC wetlands (bottom left). Early dabblers were mainly harvested during the first two weeks of November while mallards were harvested consistently throughout late November and December on MDC wetlands (bottom right). The number of mallard band recoveries increased through mid-November before remaining stable throughout the season (top right).

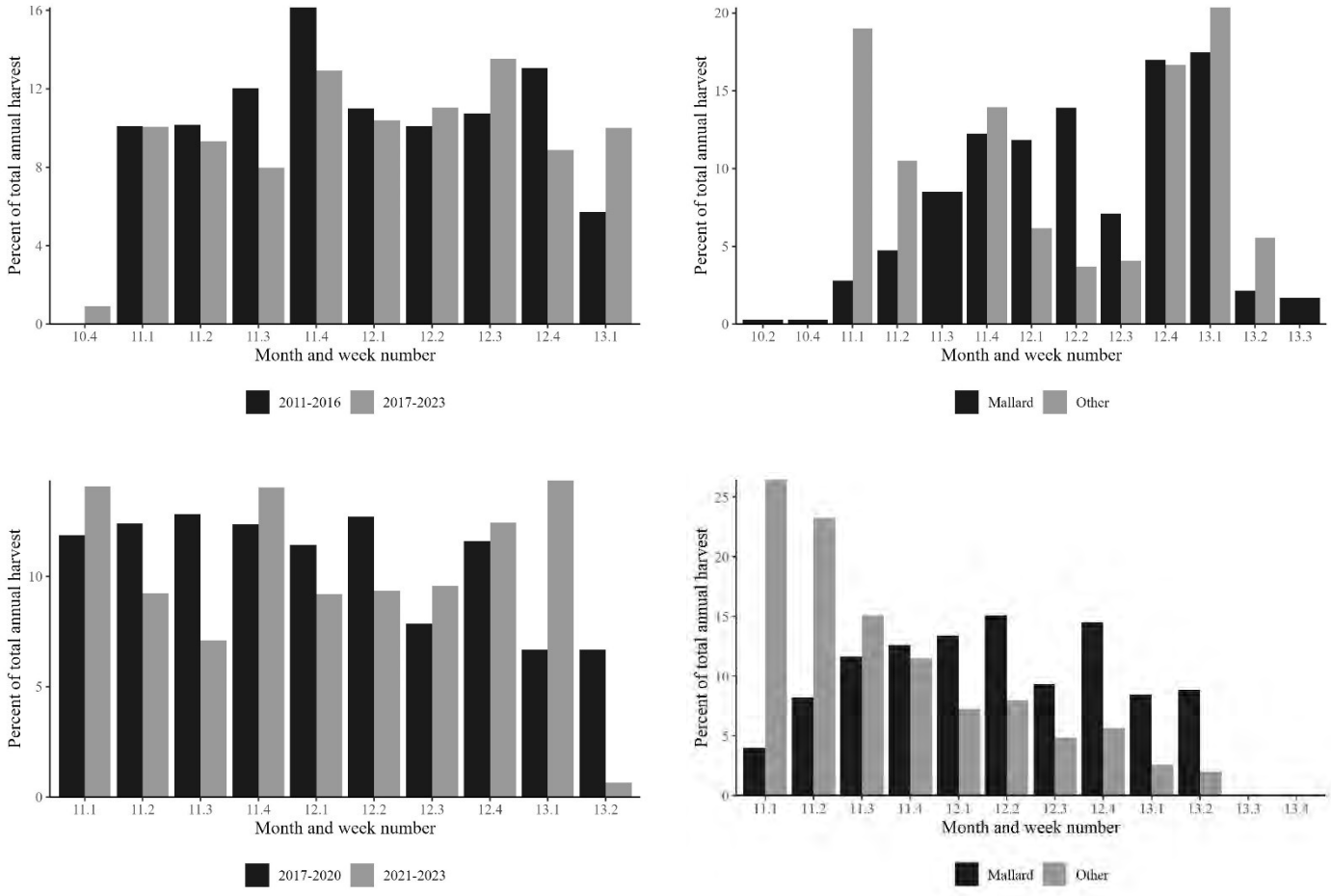
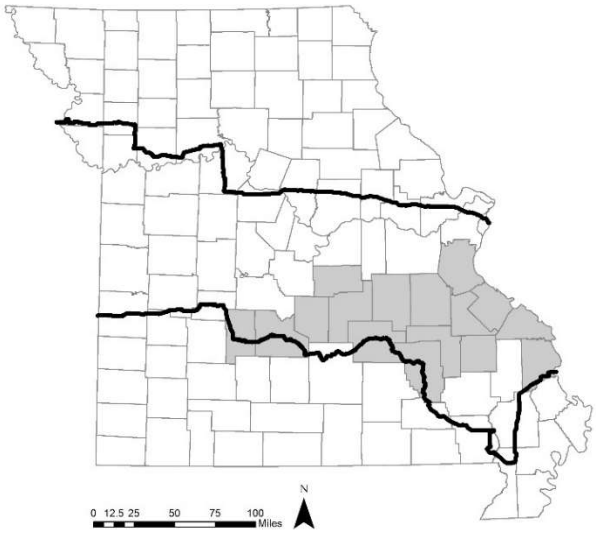
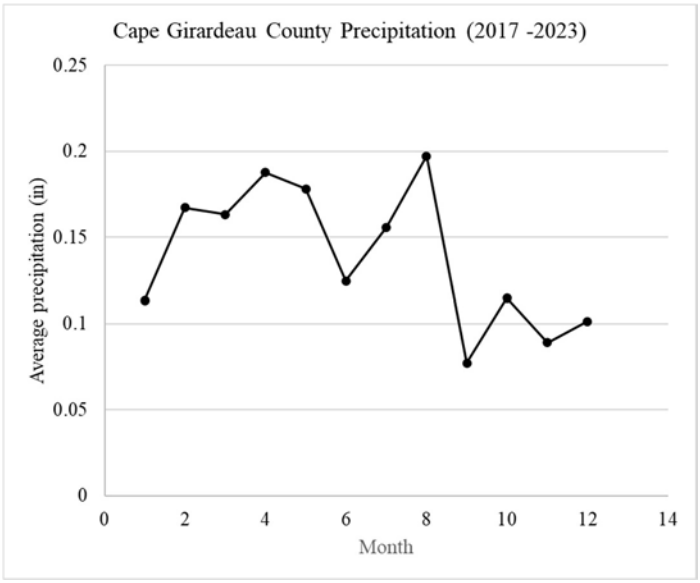


Figure 42. Top Left: Average percent of total annual harvest per week on public and private ground in the west central region of Missouri, 2011-2016 and 2017-2023. Bottom Left: Average percent of total annual harvest per week of all ducks on MDC wetlands in the west central region of Missouri, 2017-2020 and 2021-2023. Top Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the west central region of Missouri, 2017-2023. Bottom Right: Average percent of total annual harvest per week of mallards and all other duck species on MDC wetlands in the west central region of Missouri, 2017-2023.

East Central

Weather:
Precipitation in the east central region slightly declines from summer levels at the beginning of fall, but then remains steady through fall and winter (figure 43, right). Although backwaters and floodplain depressions freeze by mid-December, rivers remain open through December in most years. From 2017-2023, there was a 50% probability of seeing a temperature as low as 24° F by November 14th (bottom). No intensively managed wetland areas are in this region, so there is no available date on ice conditions.





Probability	Date
0.10	October 28
0.30	November 6
0.50	November 14
0.70	November 22
0.90	December 3

Figure 43. Left: Map showing 2021-2025 duck zones and the east central region of Missouri. Right: Precipitation patterns for the west central region of Missouri using Cape Girardeau County data. Bottom: Probability that a temperature of 24°F will be reached in Cape Girardeau County, MO using data from 2017-2023.

Harvest:

This region shows high harvest in early November, followed by a decrease before increasing throughout the remainder of the season (left). Mallard band recoveries suggest even harvest throughout the season; however this is a small sample size (right).

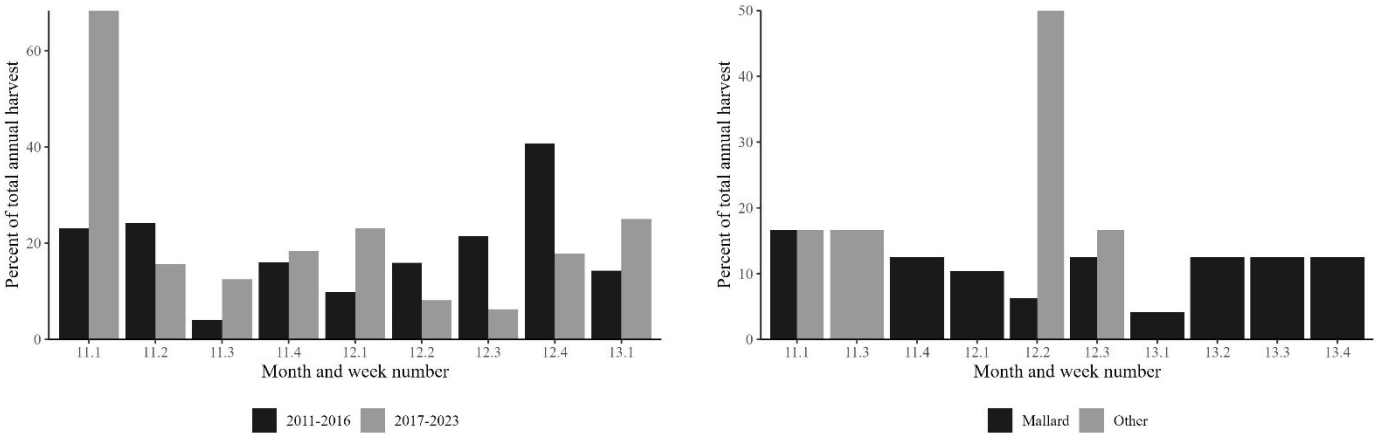
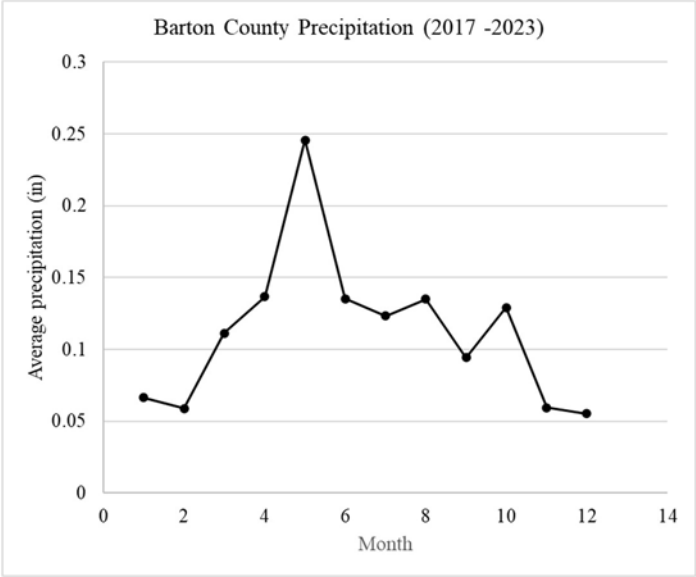


Figure 44. Left: Average percent of total annual harvest per week on public and private ground in the east central region of Missouri. Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the east central region of Missouri, 2017-2023.

Barton

Weather:
Precipitation peaks in early summer in the Barton region and declines throughout the rest of summer and into fall (right). There is a 50% probability of seeing a low temperature of 24°F by November 19th, but there are no intensively managed wetland areas in this region and thus no data on ice conditions for this region (bottom).



Probability	Date
0.10	November 1
0.30	November 10
0.50	November 19
0.70	November 28
0.90	December 7

Figure 45. Left: Map showing 2021-2025 duck zones and the Barton region of Missouri. Right: Precipitation patterns for the Barton region of Missouri using Barton County data. Bottom: Probability that a temperature of 24°F will be reached in Barton County, MO using data from 2017-2023.

Harvest:

During 2011-2016, approximately half of this region was in the Middle Zone and opened the first week of November, and half was in the South Zone and opened on Thanksgiving Day. From 2017-2023, the entire region was in the South Zone opening on Thanksgiving Day, experienced a split after the first four days of the season and closed the last week of January. Despite the changes in season dates, the relative trends are the same. FWS data shoes harvest increased throughout November from 2011-2016, increased throughout December for 2011-2023, and increased until late January from 2017-2023 (left). Mallard band recoveries show a slight increase in harvest throughout December and into the third week of January (right).

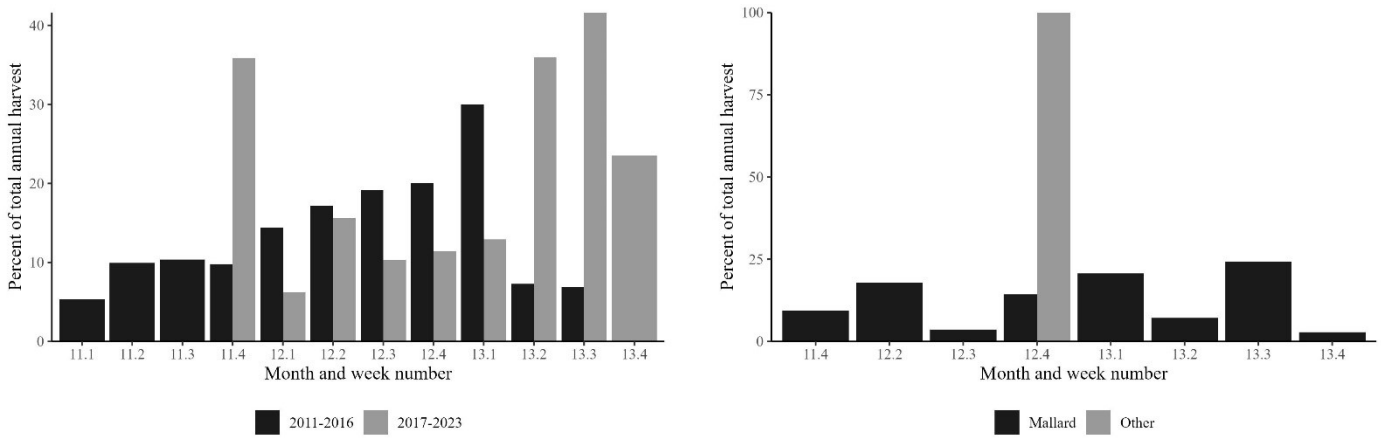
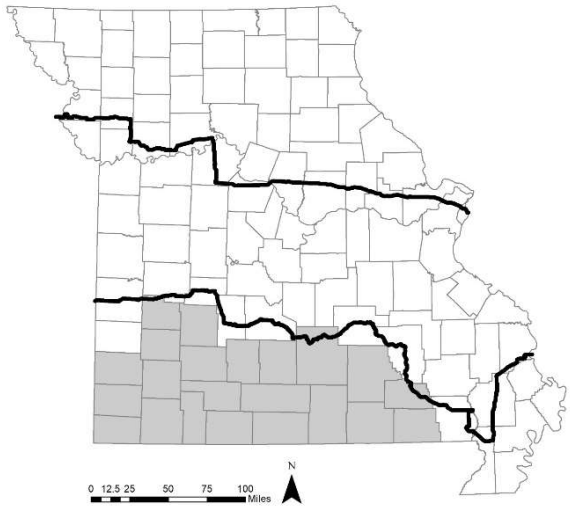


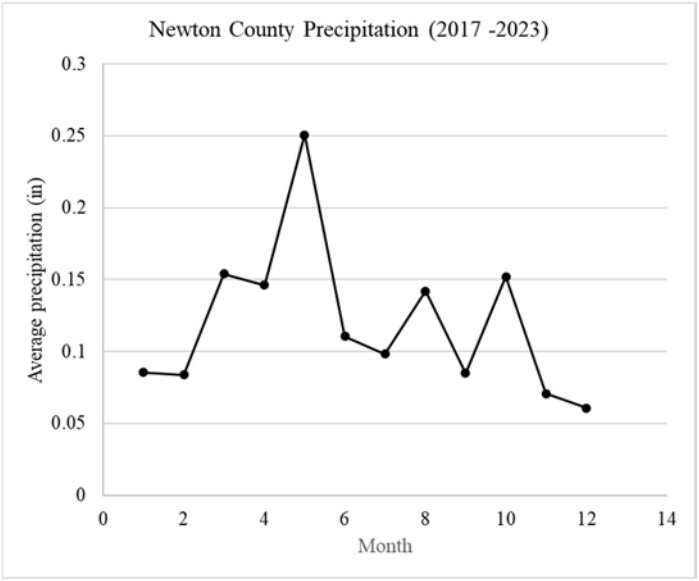
Figure 46. Left: Average percent of total annual harvest per week on public and private ground in the Barton region of Missouri, 2011-2016 and 2017-2023. Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the Barton region of Missouri, 2017-2023.

South

Weather

Precipitation declines steadily from summer through fall in the South region (right). There is a 50% probability of seeing a low temperature of 24°F by November 9th (bottom). There are no intensively managed wetland areas in this region and thus no data on ice conditions for this region.





Probability	Date
0.10	October 20
0.30	November 11
0.50	November 9
0.70	November 17
0.90	November 27

Figure 47. Left: Map showing 2021-2025 duck zones and the south region of Missouri. Right: Precipitation patterns for the south region of Missouri using Newton County data. Bottom: Probability that a temperature of 24°F will be reached in Newton County, MO using data from 2017-2023.

Harvest:

During 2011-2016, FWS harvest estimates suggests peak harvest occurs in mid-December, followed by relatively steady harvest during remaining weeks in December and declining slightly through January (left). A similar pattern occurred from 2017-2023, except harvest remained more stable throughout January (left). Band recoveries suggest an increase in harvest of mallards throughout December before harvest leveled off and remained stable through the end of the season (right).

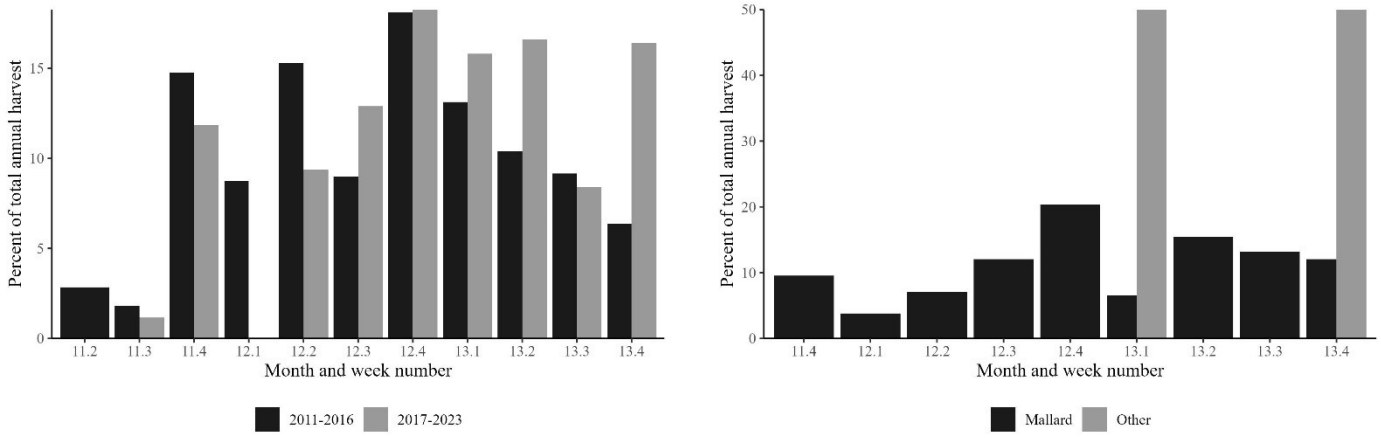


Figure 48. Left: Average percent of total annual harvest per week on public and private ground in the south region of Missouri. Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the south region of Missouri, 2017-2023.

Southeast

Weather:
Precipitation in the southeast peaks in spring and gradually declines throughout the late summer and into the fall (figure 49, right). From 2017-2023, there was a 50% probability of seeing a temperature as low as 24°F by November 9th (figure 50, right). Ice conditions on MDC intensively managed wetland areas (Duck Creek CA and Mingo NWR) occurred in 50% of years from 2017-2023 after mid-December (figure 50, left).

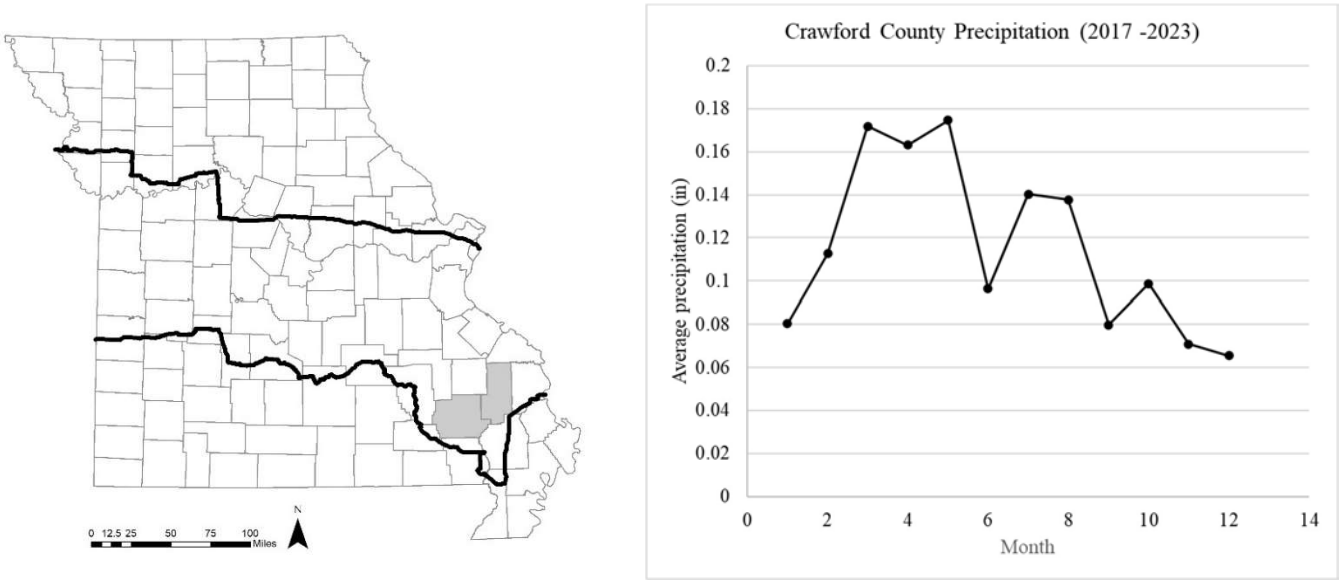
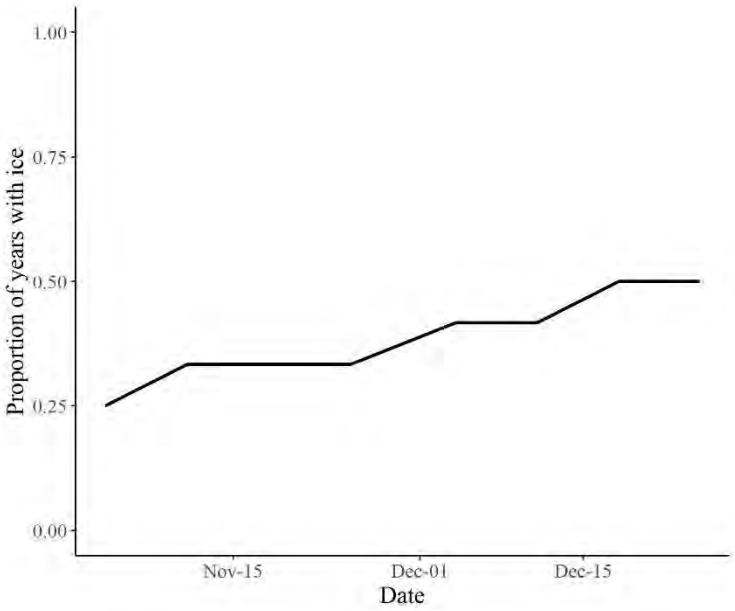


Figure 49. Left: Map showing 2021-2025 duck zones and the southeast region of Missouri. Right: Precipitation patterns for the southeast region of Missouri using Crawford County data.



Probability	Date
0.10	October 23
0.30	November 2
0.50	November 9
0.70	November 17
0.90	November 28

Figure 50. Left: Proportion of years (2017-2023) ice was recorded on MDC wetland areas in the southeast region of Missouri. Right: Probability that a temperature of 24°F will be reached in Crawford County, MO using data from 2017-2023.

Migration timing:

Overall duck numbers in the southeast region increase steadily throughout November before peaking in early December and remaining consistent through the rest of the survey period. The proportion of early dabblers peaked during the second week of November while mallards peaked slightly later in the first week of December then remaining stable for the season. The migration timing of the short-term average (2017-2023) was like the long-term average (2003-2023) for both early dabblers and mallards.

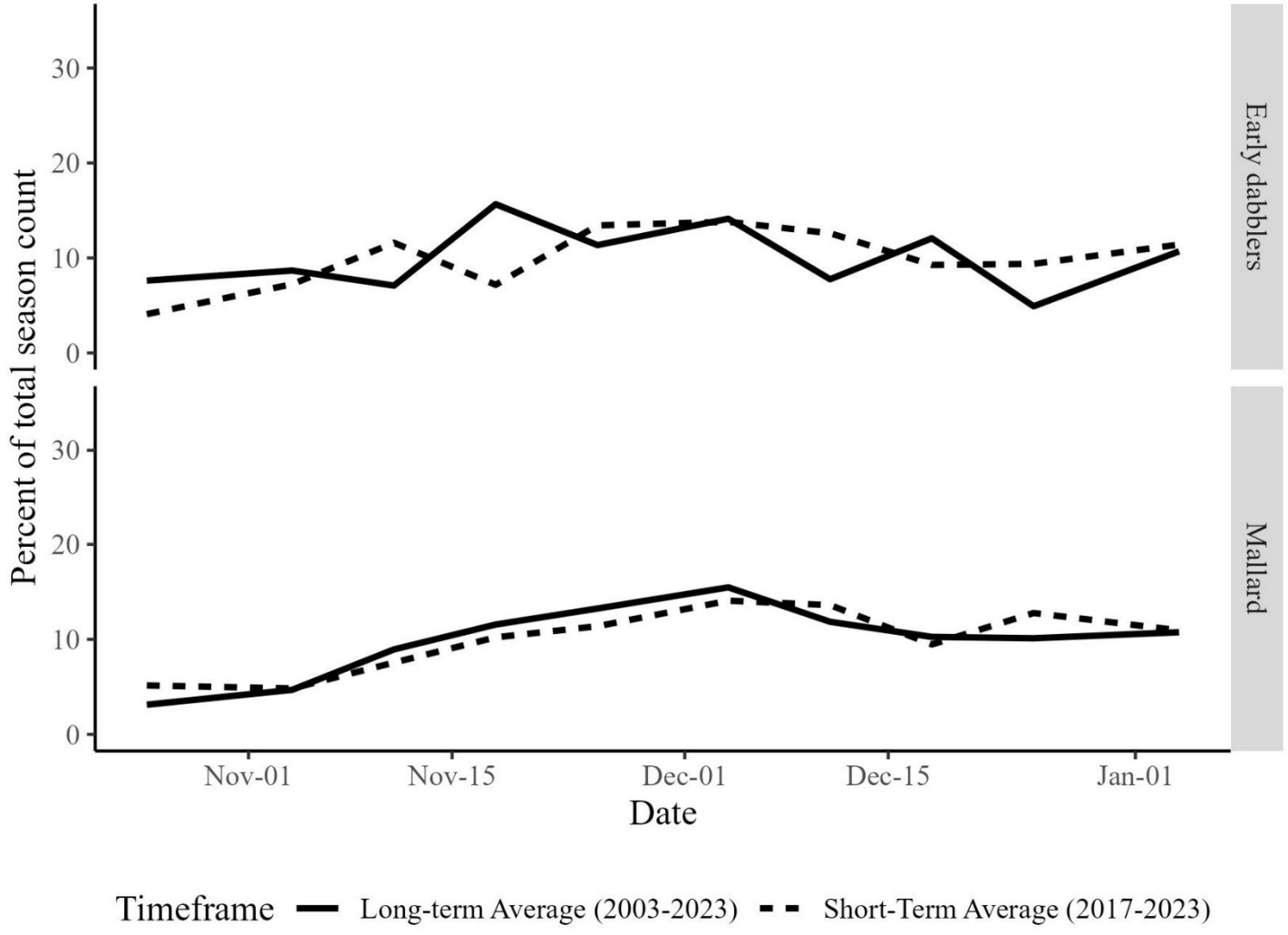


Figure 51. Average proportion of total counts of early dabblers and mallards during the long-term average (2003-2023) and the short-term (2017-2023) in the southeast region of Missouri.

Harvest:

During 2011-2016, FWS estimates of average daily harvest on public and private wetlands indicate harvest peaked the mid- to late November (top left). Harvest remained stable throughout the season before another peak in early January (top left). From 2017-2023, harvest peaked in early November before remaining stable throughout the season on (top left). From 2017-2020, harvest of all ducks gradually increased throughout November and peaked during the last week of December before declining on MDC wetlands (bottom left). In contrast, harvest peaked during the last week of November and gradually declined for the 2021-2023 seasons (bottom left). Early dabblers were mainly harvested during November while mallards were harvested consistently throughout late November and December on MDC wetlands (bottom right). Mallard band recoveries suggest harvest peaks in mid-December (top right).

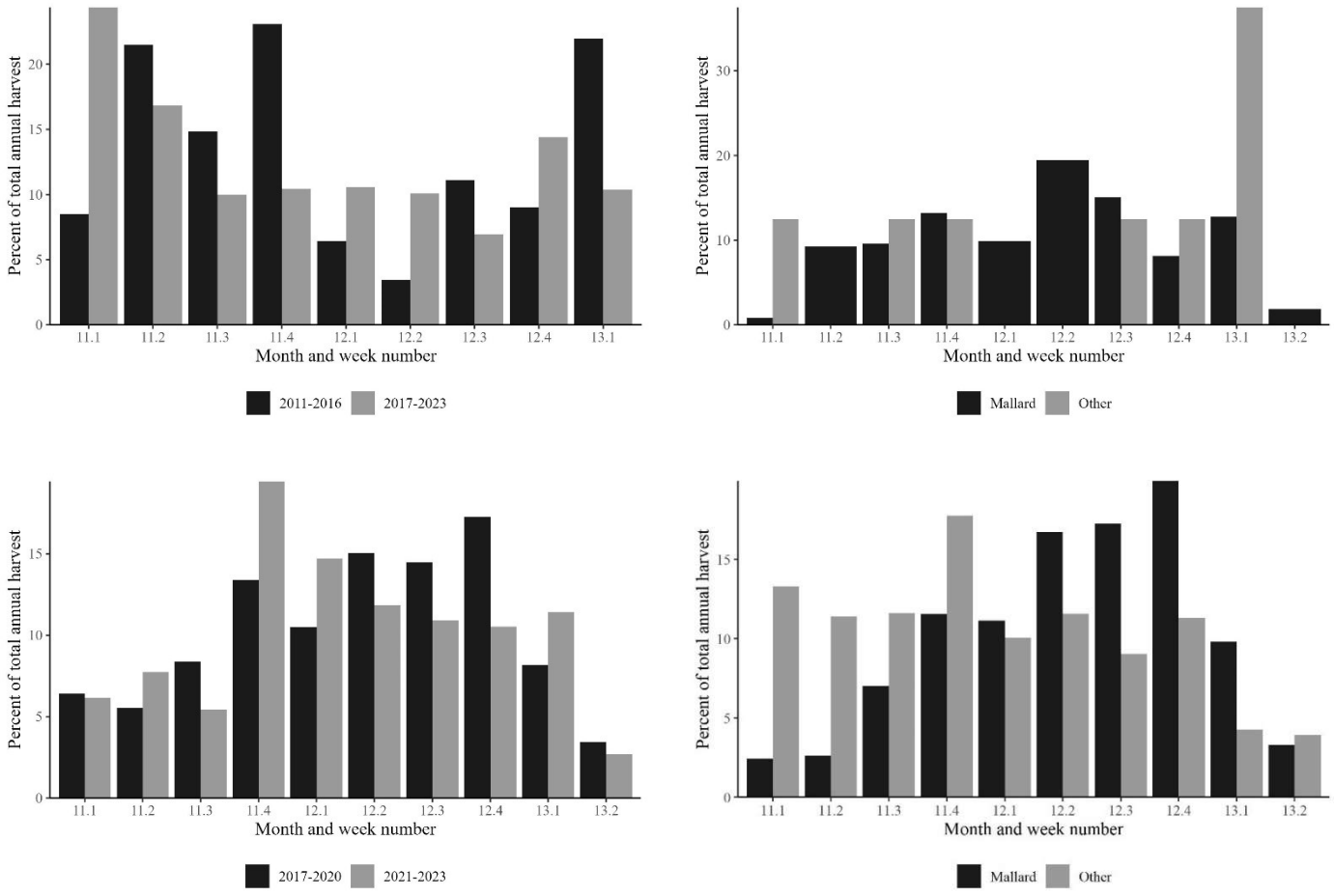


Figure 52. Top Left: Average percent of total annual harvest per week on public and private ground in the southeast region of Missouri, 2011-2016 and 2017-2023. Bottom Left: Average percent of total annual harvest per week of all ducks on MDC wetlands in the southeast region of Missouri, 2017-2020 and 2021-2023. Top Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the southeast region of Missouri, 2017-2023. Bottom Right: Average percent of total annual harvest per week of mallards and all other duck species on MDC wetlands in the southeast region of Missouri, 2017-2023.

Stoddard

Weather:

In the bootheel region, precipitation gradually declines throughout the late summer into fall and temperatures remain warm through November. Ice conditions are not as likely as in other regions, but in over 25% of the years 2017-2023, the MDC intensively managed wetland areas (Otter Slough CA) reported ice by mid-December (figure 53, right).

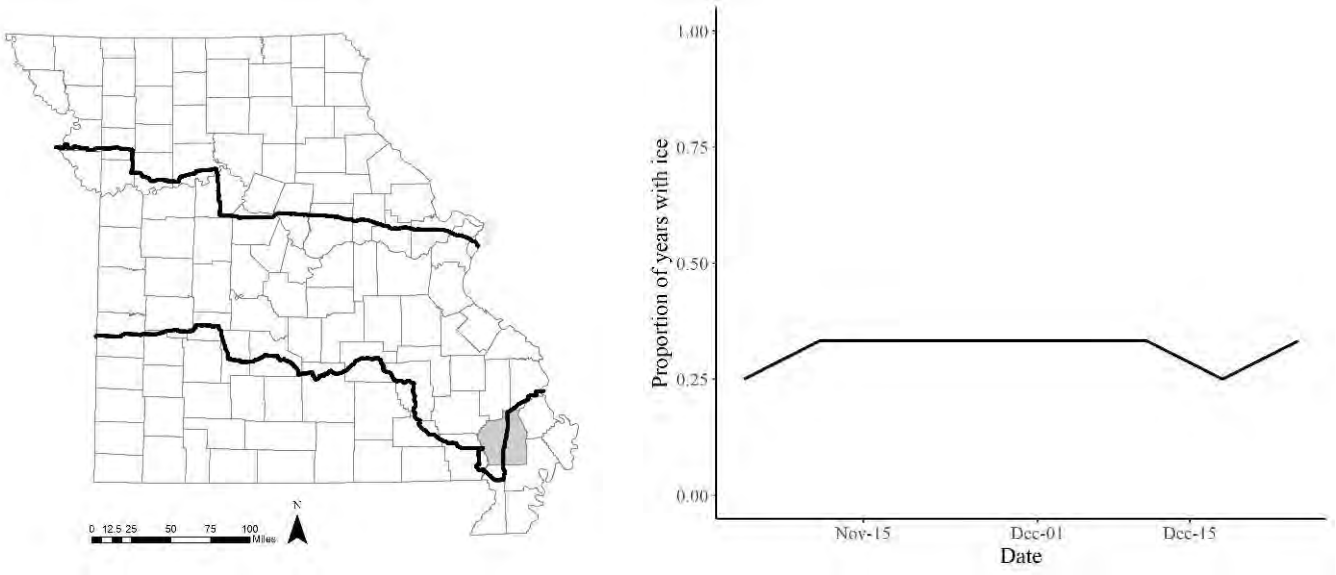


Figure 53. Left: Map showing 2021-2025 duck zones and the Stoddard region of Missouri. Right: Proportion of years (2017-2023) ice was recorded on MDC wetland areas in the Stoddard region of Missouri.

Migration timing:
In contrast to regions in north Missouri, where numbers increase and then decline rapidly, ducks in this region are present for a much more extended period, with early dabblers arriving in late October/early November and remaining stable throughout the season. Mallards arrive later, in mid- to late November with a peak in early December before stabilizing for the remainder of the season. The short-term average (2017-2023) was like the long-term average (2003-2023) for both early dabblers and mallards.

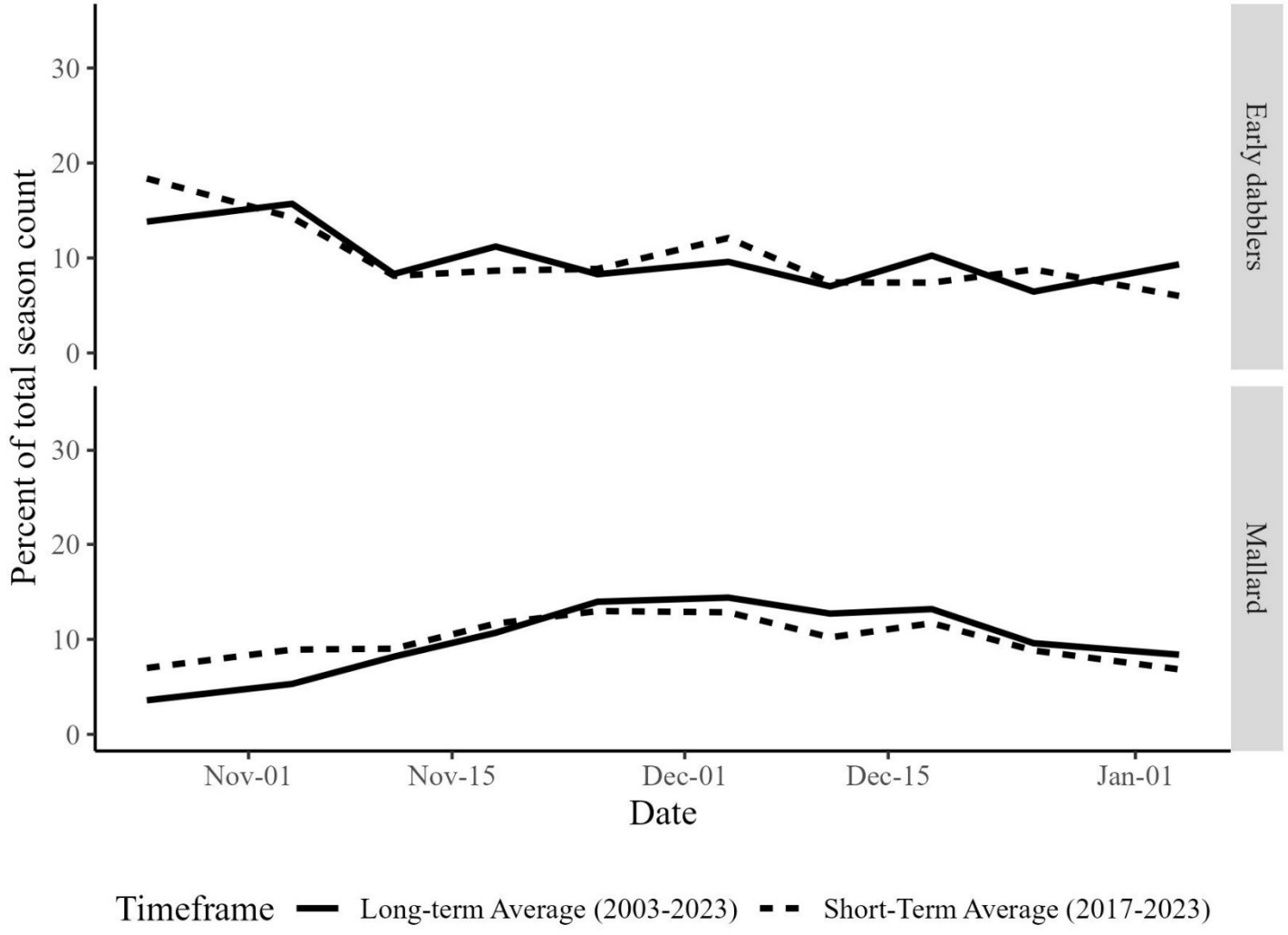


Figure 54. Average proportion of total counts of early dabblers and mallards during the long-term average (2003-2023) and the short-term (2017-2023) in the Stoddard region of Missouri.

Harvest:

FWS harvest data includes reports from Middle and South Zone portions of Stoddard County. During 2011-2016, harvest was greatest during November before slowly declining throughout December (top left). Harvest numbers in 2017-2023, were also greatest during November before slowly declining in December, however, there was a second increase and peak in early January (top left). Duck harvest at MDC intensively managed wetlands was relatively constant throughout the season, with most ducks harvested from the beginning of November through mid-December before tapering off at the end of the season (bottom left). Mallard and early dabbler harvest on MDC intensively managed wetlands followed similar harvest patterns, with higher harvest throughout November and December (bottom right). Mallard band recoveries suggest a similar pattern, with greater harvest at the beginning of December and a second smaller peak occurring at the end of December (top right).

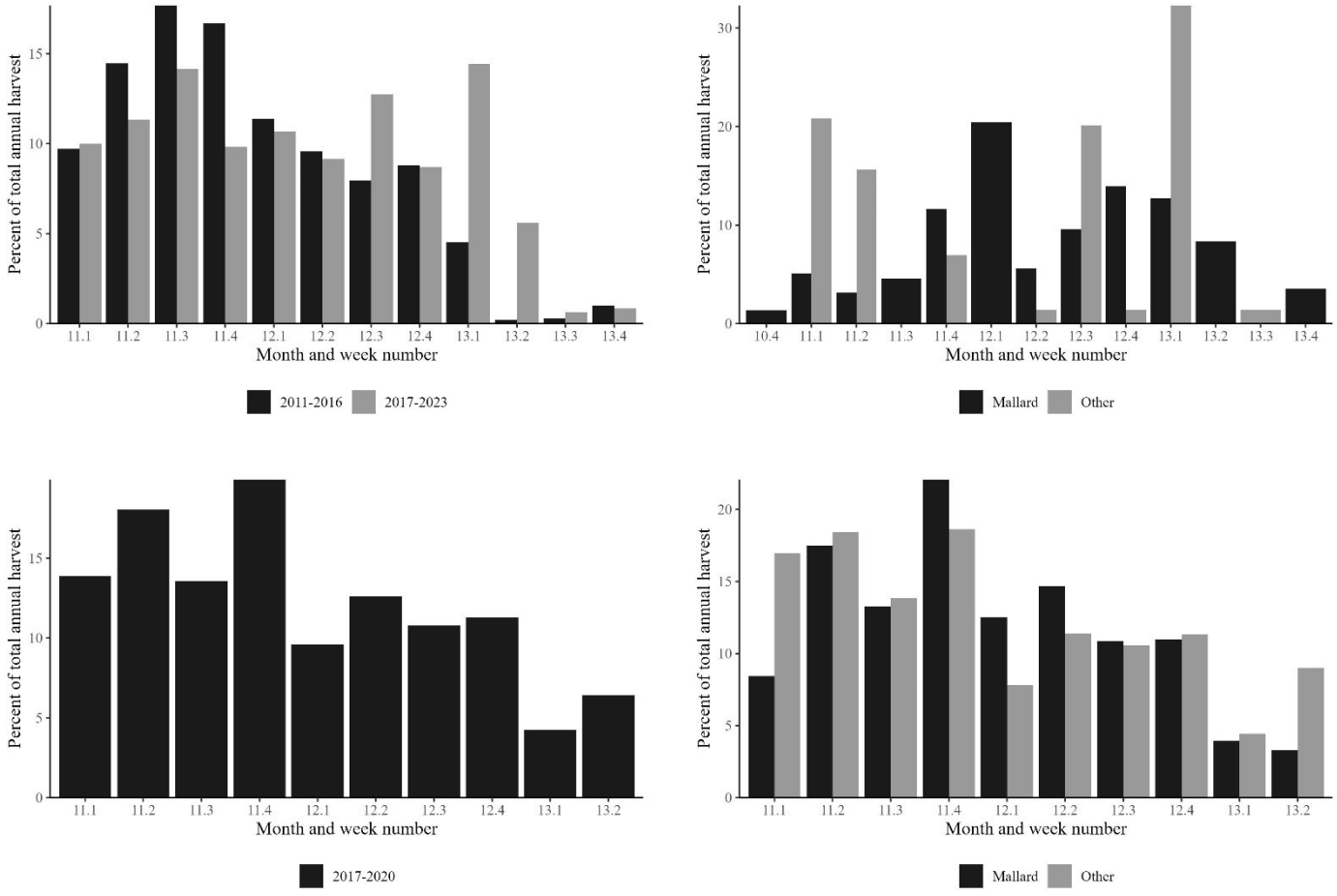


Figure 55. Top Left: Average percent of total annual harvest per week on public and private ground in the Stoddard region of Missouri, 2011-2016 and 2017-2023. Bottom Left: Average percent of total annual harvest per week of all ducks on MDC wetlands in the Stoddard region of Missouri, 2017-2020 and 2021-2023. Top Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the Stoddard region of Missouri, 2017-2023. Bottom Right: Average percent of total annual harvest per week of mallards and all other duck species on MDC wetlands in the Stoddard region of Missouri, 2017-2023.

Bootheel

Weather:
Precipitation gradually declines throughout the late summer and through the fall in the bootheel region, and temperatures remain warm through November (figure 56, right). From 2017-2023, there was a 50% probability of seeing a temperature as low as 24°F by December 1st in the bootheel region (figure 57, right). Ice conditions on MDC intensively managed wetland areas (Ten Mile Pond) occurred in 50% of years from 2017-2023 after mid-December (figure 57, left).

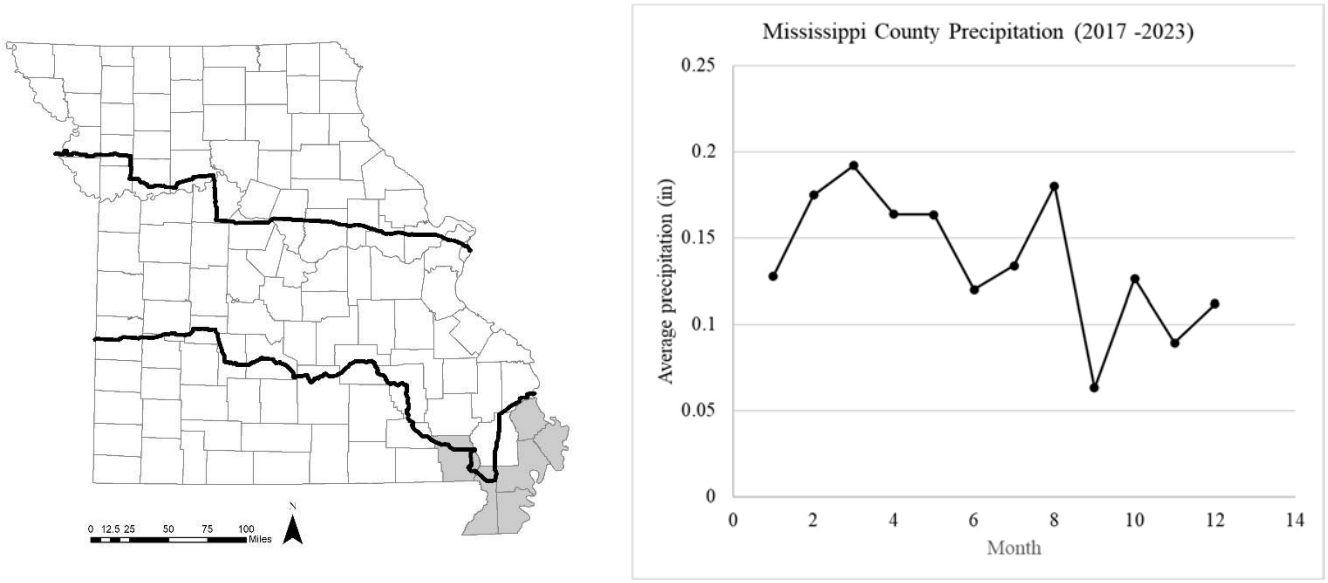
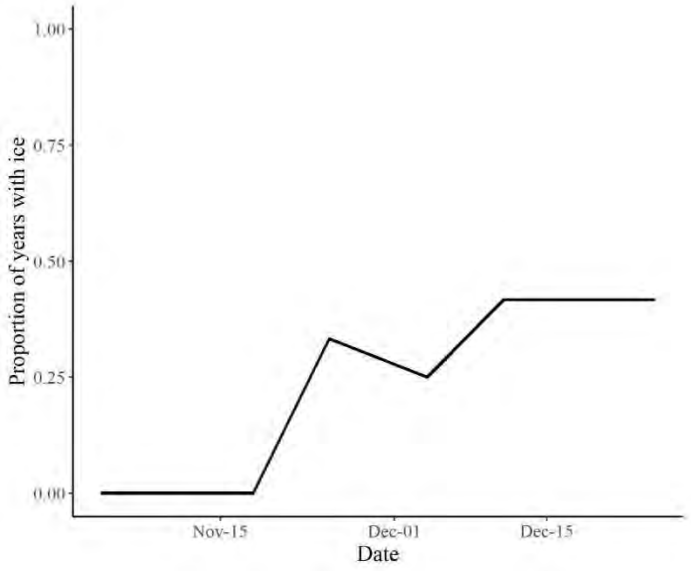


Figure 56. Left: Map showing 2021-2025 duck zones and the bootheel region of Missouri. Right: Precipitation patterns for the bootheel region of Missouri using Mississippi County data.



Probability	Date
0.10	November 11
0.30	November 23
0.50	December 1
0.70	December 9
0.90	December 21

Figure 57. Left: Proportion of years (2017-2023) ice was recorded on MDC wetland areas in the bootheel region of Missouri. Right: Probability that a temperature of 24°F will be reached in Mississippi County, MO using data from 2017-2023.

Migration timing:

Over the long-term average (2003-2023), overall duck numbers increased throughout November before remaining steady through December and into January. Unlike other areas of the state, early dabblers and mallards follow similar timing of migration over the long-term (2003-2023). Compared to the long-term average, the short-term average (2017-2023) showed a higher number of early dabblers in early November and fewer early dabblers throughout December. Mallards showed a similar pattern.

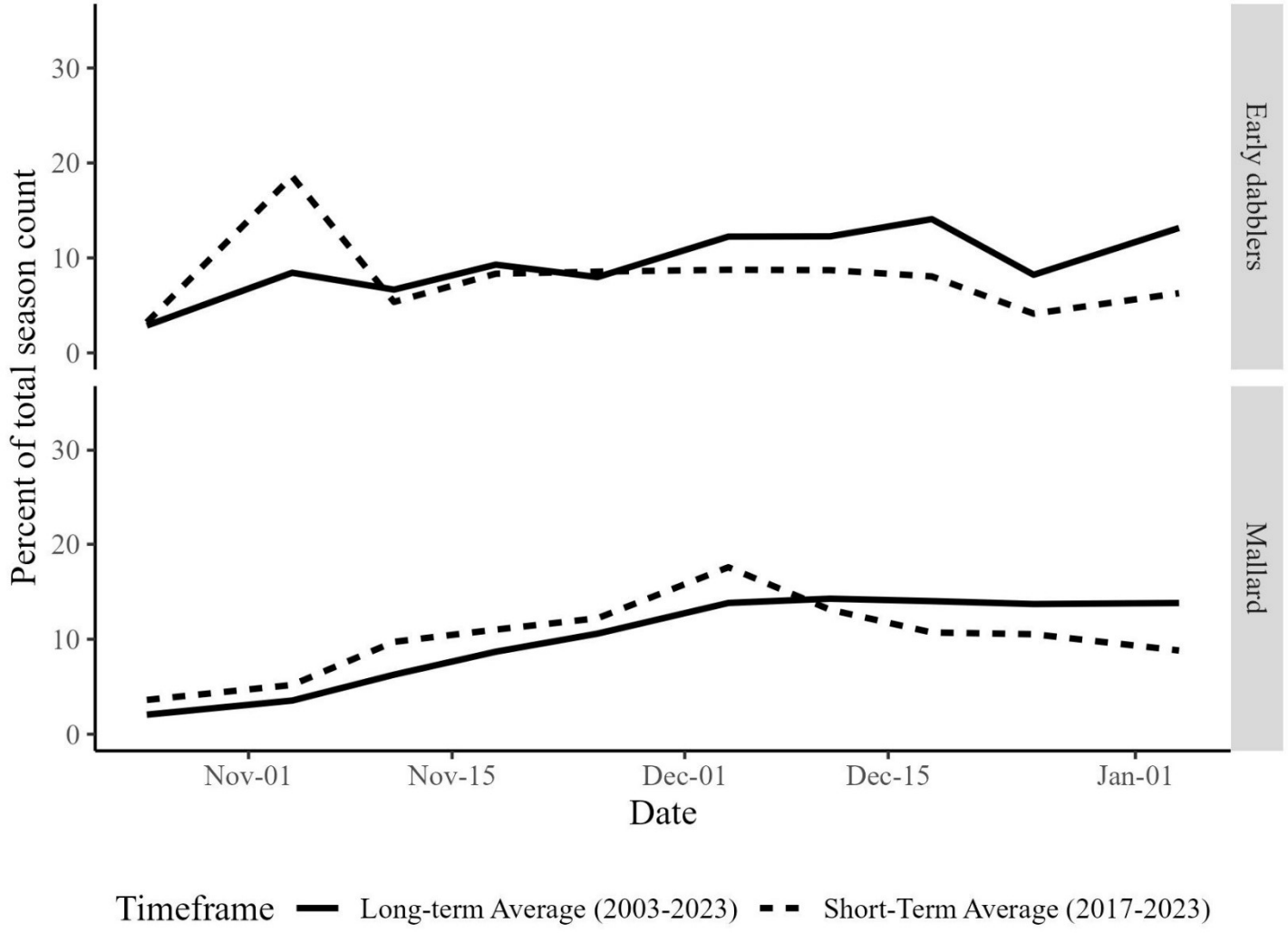


Figure 58. Average proportion of total counts of early dabblers and mallards during the long-term average (2003-2023) and the short-term (2017-2023) in the bootheel region of Missouri.

Harvest:

FWS harvest trends remained stable throughout the season for both time periods, 2011-2016 and 2017-2023 (top left). On MDC intensively managed conservation areas, harvest of all ducks was distributed throughout the entire season, with peaks during the last week of November and the last week of January for the 2017-2020 seasons (bottom left). Harvest peaked during the 2021-2023 seasons in the last week of January (bottom left). Both mallards and other duck species were mostly harvested throughout December and the last week of January during the 2017-2020 season (bottom right). Mallard band recoveries suggest a peak of harvest occurs at the end of December (top right).

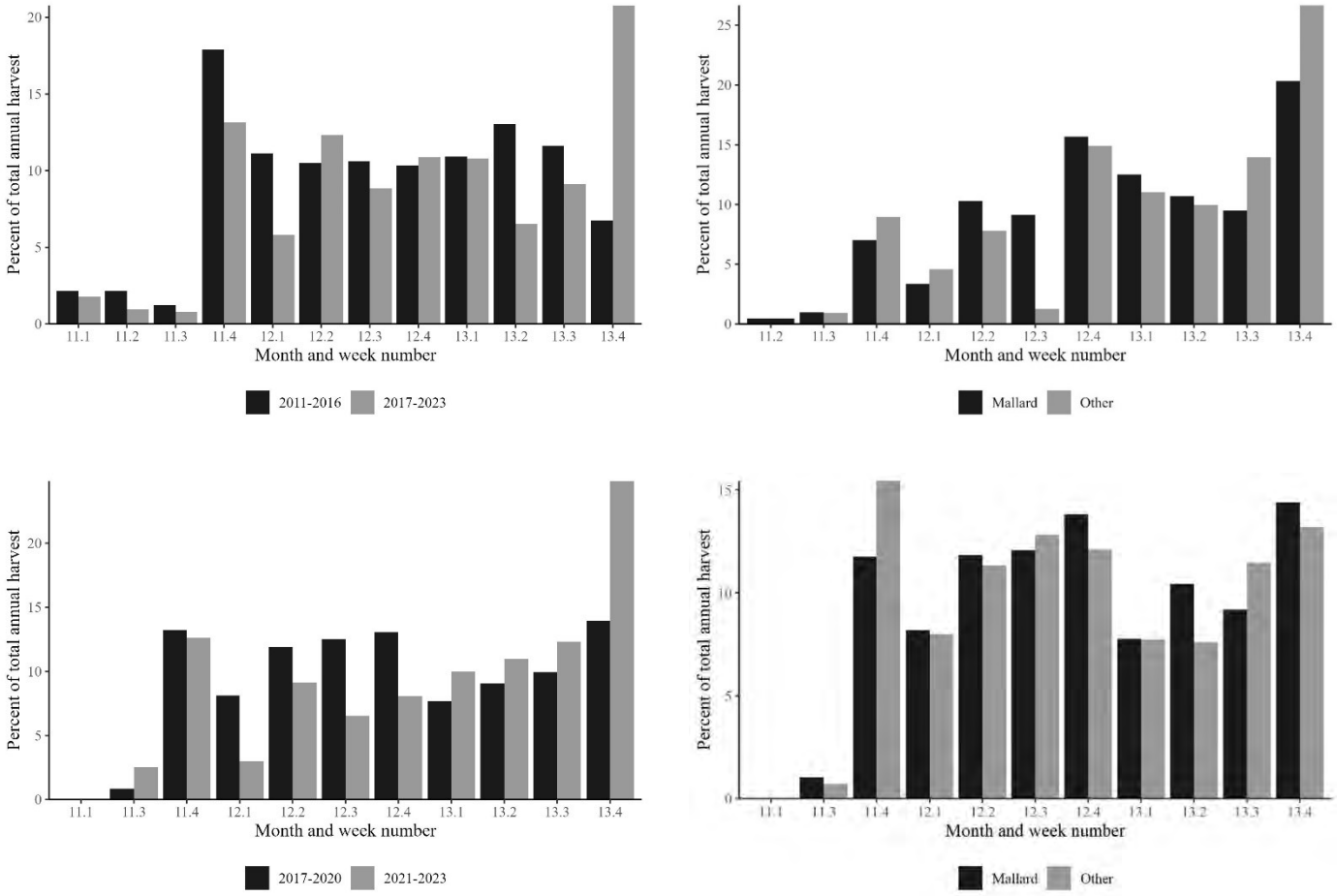


Figure 59. Top Left: Average percent of total annual harvest per week on public and private ground in the bootheel region of Missouri, 2011-2016 and 2017-2023. Bottom Left: Average percent of total annual harvest per week of all ducks on MDC wetlands in the bootheel region of Missouri, 2017-2020 and 2021-2023. Top Right: Average percent of mallard and early dabbler annual band recoveries per week on public and private ground in the bootheel region of Missouri, 2017-2023. Bottom Right: Average percent of total annual harvest per week of mallards and all other duck species on MDC wetlands in the bootheel region of Missouri, 2017-2023.