Arkansas Game and Fish Commission Aerial Waterfowl Survey Report
January 4-8, 2021

Arkansas Game and Fish Commission staff conducted the annual midwinter waterfowl survey Jan. 4-8 in the Arkansas River Valley, Mississippi Alluvial Valley (Delta) and southwest Arkansas. Observers were Jason Carbaugh, Jason Jackson, Cameron Tatom and Alex Zachary.

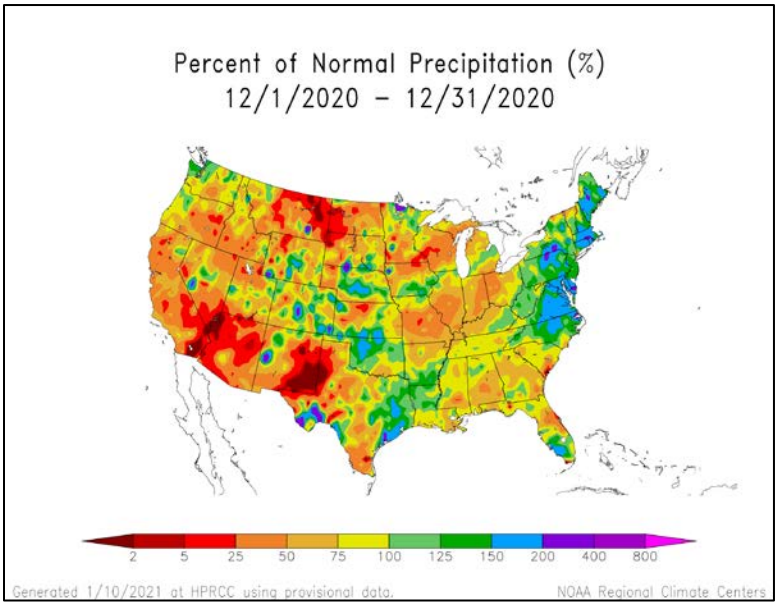
Observers estimated 1.08 million total ducks in the Delta, fewer than half of which were mallards (458,314; Table 1). Duck population estimates in the Arkansas River Valley slightly exceeded 21,000, including just over 9,000 mallards (Table 2), while fewer than 5,000 mallards and barely over 9,000 total ducks were counted in southwest Arkansas. Observers in the Delta estimated around 886,000 light (lesser, snow and Ross's) geese and about 221,000 greater white-fronted geese during this survey. However, this survey is not ideal for estimating goose numbers. This survey was the first time observers noted enough greater white-fronted geese in the Arkansas River Valley to be estimated in calculations. Estimates indicated 6,710 white-fronted geese, all in the West Dardanelle Reservoir survey zone.

The Delta mallard population estimate is the second lowest since formal surveys began in the 2009-10 wintering period and represent only 45% of the 2010-2021 long-term midwinter survey average of about 826,000. The total duck population estimate was a bit below the long-term average of over 1.2 million (Figure 1). Similar to 2020 midwinter survey estimates, mallards accounted for a lower-than-average percent of all ducks. From 2010-2021, mallards accounted for an average of 67% of all ducks during the midwinter survey; this year's mallard percentage was only 43%. Gadwall were the most abundant non-mallard dabbling ducks in the Delta. Northern pintail estimates were low, indicating the beginnings of spring migration, but the shift of pintails from the south into Arkansas having yet to occur. Similar to the Delta, gadwall were the most common non-mallard ducks in both the Arkansas River Valley and southwest Arkansas.

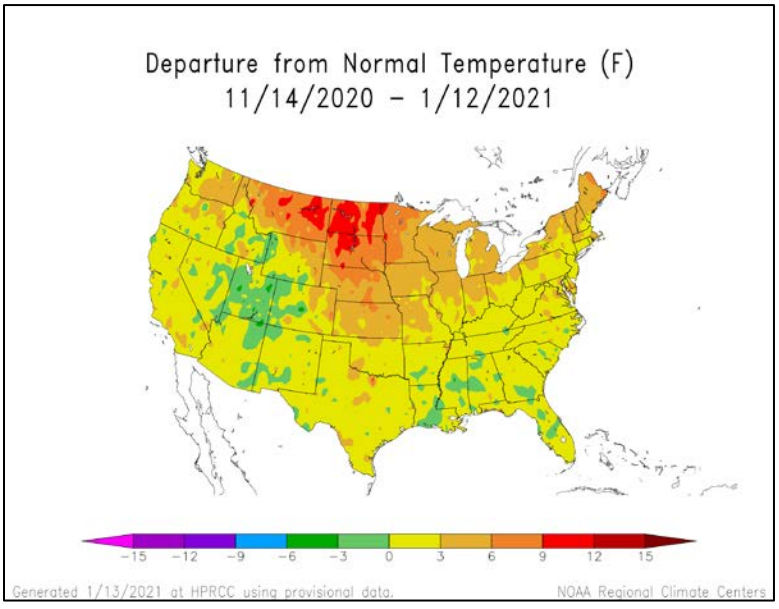
Observers estimated the greatest number of mallards in the Delta in the Bayou Meto, Little River, Lower White and Black River-Upper White survey zones. Duck (Figure 3) and mallard (Figure 4) density maps show this distribution pattern, with several duck hotspots that were slightly different than mallard hotspots. Estimates for mallards and total ducks in the Arkansas River Valley were less than half 2014-2021 averages (Figure 2), with the vast majority of ducks observed in the West Dardanelle survey zone. Duck (Figure 5) and mallard (Figure 6) density maps highlight this distribution.

Observations common during the last few wintering periods held true again during this survey, namely that ducks remained concentrated on established waterfowl sanctuaries and habitats that appeared not to be hunted. Rainfall preceding this survey provided a bit of a boost in habitat availability, but it is unclear how much of that habitat remains on the landscape as of this report. Ducks were uncommon in these fields during these daytime surveys. Birds likely are leaving sanctuary areas at night to take advantage of these new habitats. Big Lake National Wildlife Refuge and Lake Ashbaugh were noticeable hotspots, but at least some feedback from adjacent public hunting areas suggests low success. Similar to last year, ducks seemed to be taking advantage of newly flooded fields without hunting pressure in the Lower St. Francis survey zone near the Mississippi River.

Statewide habitat availability generally has been low this wintering period. Overbank flooding along a few river corridors has not lasted long, in general, and rainfall necessary to flood large expanses of habitat has only recently approached normal for the fall and winter. The most substantial rainfall event of this wintering period mostly impacted southern Arkansas and did not fall in the upper reaches of important watersheds in the Arkansas River Valley or the Cache River and White River, for example, in the Delta.



Temperatures have been about average to only a few degrees above average in Arkansas this fall and winter. This is bit deceptive, however, given much warmer-than-average temperatures throughout much of the midcontinent mallard range. For example, the upper reaches of this range have experienced departures approaching 15 degrees Fahrenheit from normal temperatures from mid-November until now.



Thus, temperature-driven migration events likely have been limited. Combined with the lack of flooding in major river systems, and the resultant reduced habitat availability, mallard population estimates remain low. That said, duck counts in states such as Illinois and Missouri in which regular waterfowl counts are conducted this time of year are not indicating large numbers of ducks yet to move south to Arkansas. For example, the most recent aerial waterfowl survey conducted by staff of the Illinois Natural History Survey indicate relatively

few mallards, including only about 150,000 in the Illinois River Valley and the Mississippi River combined. In Missouri, habitat conditions remain below average and some habitats in the northern part of the state were iced over last week. Missouri mallard counts did indicate decent numbers of birds, with an increase from the previous week and counts about 33 percent above the 20-year average. However, their mallard estimate was 8 percent lower than the most recent 5-year average. Habitat availability isn't likely to increase substantially based on current weather forecasts for the remainder of this wintering period. A big jump in mallard numbers is unlikely as the wintering period comes to an end. And continued hunting pressure throughout the midcontinent mallard range appears to have many ducks conditioned to patterns not conducive to predictable, consistent harvest by individual hunters on historic hunting areas.

Staff will conduct the final waterfowl survey of this wintering period the week of Jan. 18.

Table 1. Waterfowl abundance estimates in Arkansas during the late November (Nov), mid-December (Dec), early-January Midwinter Survey (MWS) and late-January (Jan) aerial waterfowl survey periods, 2009-2021, in the Mississippi Alluvial Valley (MAV) using stratified random sampling of transects.

			Survey Zone											
			Bayou Bartholomew - Bayou Boeuf	Bayou Macon	Bayou Meto - Lower Arkansas	Big Creek	Black - Upper White	Cache	L' Anguille	Lower White - Bayou Des Arc	Little River Ditches	Lower St. Francis	Lower White	MAV Total
Survey Period	Nov-09	Mallards												124,065
		Total Ducks												794,405
	Dec-09	Mallards												648,955
		Total Ducks												2,046,969
	MWS-10	Mallards												2,309,453
		Total Ducks												2,887,810
	Jan-10	Mallards												2,063,243
		Total Ducks												3,153,410
	Nov-10	Mallards												180,198
		Total Ducks												1,133,126
	Dec-10	Mallards												1,247,697
		Total Ducks												1,860,894
	MWS-11	Mallards												671,982
		Total Ducks												1,192,518
	Jan-11	Mallards												1,311,245
		Total Ducks												1,786,677
	Nov-11	Mallards	4,750	-	15,717	66	9,968	47,902	7,577	10,896	2,432	36	32,736	132,080
		Total Ducks	52,662	19,346	174,725	1,367	32,914	77,686	36,010	78,700	40,038	61	114,332	627,841
	Dec-11	Mallards	39,569	2,136	90,328	10,161	73,576	226,861	48,173	206,485	367,290	122,032	283,418	1,470,029
		Total Ducks	135,903	14,267	298,196	32,799	171,366	306,191	94,423	360,232	417,990	247,685	339,894	2,418,946
	MWS-12	Mallards	7,956	989	110,141	87,360	35,244	318,991	51,493	43,618	51,721	8,604	37,862	753,979
		Total Ducks	29,124	2,318	161,830	161,081	51,447	368,370	89,139	60,802	75,241	51,660	65,861	1,116,873
	Jan-12	Mallards	22,365	5,917	48,569	82,272	47,069	102,400	38,682	232,214	80,546	11,193	82,291	753,518
		Total Ducks	47,985	17,165	87,045	114,331	128,018	162,763	105,318	321,724	86,482	70,673	122,334	1,263,838
	Nov-12	Mallards	2,543	7,176	44,732	5,298	50,797	112,327	97,712	14,306	19,136	36,967	51,127	442,121
		Total Ducks	11,037	38,220	95,784	34,352	79,726	171,744	164,874	68,621	25,852	66,825	75,764	832,799
	Dec-12	Mallards	37,887	11,126	40,660	4,525	157,624	54,417	45,467	8,517	29,542	8,993	17,448	416,206
		Total Ducks	121,538	22,648	70,813	18,267	233,838	81,262	95,628	30,981	35,021	45,649	31,270	786,915
	MWS-13	Mallards	30,438	12,508	75,690	16,112	48,272	57,409	32,133	20,437	48,267	4,633	105,865	451,764
		Total Ducks	54,951	19,145	120,222	22,876	60,929	84,871	68,389	27,503	56,231	7,511	142,842	665,470
	Jan-13	Mallards	28,836	8,921	90,090	36,204	93,035	62,369	26,058	7,344	3,511	93,337	27,036	476,741
		Total Ducks	128,058	48,672	127,548	48,364	138,314	103,878	52,116	9,588	3,665	145,229	32,483	837,915
	Nov-13	Mallards	13,582	2,841	24,371	2,900	25,948	66,501	54,163	-	13,242	1,445	39,840	244,833
		Total Ducks	200,157	38,409	107,960	18,100	148,225	111,257	99,517	49,598	46,545	4,206	114,572	938,546
	Dec-13	Mallards	73,158	20,062	71,142	7,904	72,485	25,429	63,845	54,023	37,107	27,422	22,806	475,383
		Total Ducks	154,707	31,980	145,453	26,009	98,951	36,088	122,202	77,353	47,533	33,835	60,612	834,723
	MWS-14	Mallards	104,455	33,520	164,150	3,070	66,080	216,061	934	56,508	25,124	13,835	123,399	807,136
		Total Ducks	114,764	44,313	182,263	3,070	75,082	247,069	1,196	80,835	25,124	17,143	136,817	927,676
	Nov-14	Mallards	9,409	17,100	136,741	22,901	34,196	19,077	3,454	22,216	128,948	69,511	84,007	547,560
		Total Ducks	83,914	51,660	234,759	80,425	70,814	29,520	12,382	45,023	171,835	80,469	132,448	993,249
	Dec-14	Mallards	81,653	48,048	53,377	7,836	159,637	12,105	36,370	8,308	23,966	16,198	172,746	620,244
		Total Ducks	107,261	50,700	168,894	12,430	212,520	18,005	72,920	15,300	24,196	46,082	251,119	979,427
	MWS-15	Mallards	113,960	29,818	162,687	99,270	110,723	25,064	31,083	10,033	8,855	162,042	172,026	925,561
		Total Ducks	130,296	30,988	188,203	106,124	148,309	39,287	55,675	18,601	8,855	321,514	180,142	1,227,994
	Nov-15	Mallards	3,599	43,200	17,915	19,253	15,382	46,418	7,625	15,597	9,093	40,889	42,941	261,912
		Total Ducks	203,640	120,492	126,942	25,333	49,581	149,017	18,051	22,088	14,459	43,547	116,041	889,191
	Dec-15	Mallards	6,103	1,287	59,153	17,784	107,474	109,493	13,682	5,814	11,408	9,242	5,837	347,277
		Total Ducks	98,739	25,214	106,887	100,928	223,106	221,060	65,282	40,127	21,975	28,436	16,697	948,451
	MWS-16	Mallards	31,506	13,806	84,035	14,558	53,900	97,829	106,172	20,482	60,454	-	170,364	653,106
		Total Ducks	55,172	32,204	125,780	37,662	91,665	164,831	155,016	28,744	74,250	3,943	226,832	996,099
	Jan-16	Mallards	22,606	9,068	59,169	22,800	80,590	135,110	-	116,169	-	74,942	96,330	616,784
		Total Ducks	94,269	21,294	75,702	33,212	105,643	184,233	-	291,312	-	74,942	111,648	992,255

Table 1, continued. Waterfowl abundance estimates in Arkansas during the late November (Nov), mid-December (Dec), early-January Midwinter Survey (MWS) and late-January (Jan) aerial waterfowl survey periods, 2009-2021, in the Mississippi Alluvial Valley (MAV) using stratified random sampling of transects.

			Survey Zone											
			Bayou Bartholomew - Bayou Boeuf	Bayou Macon	Bayou Meto - Lower Arkansas	Big Creek	Black - Upper White	Cache	L' Anguille	Lower White - Bayou Des Arc	Little River Ditches	Lower St. Francis	Lower White	MAV Total
Survey Period	Nov-15	Mallards	3,599	43,200	17,915	19,253	15,382	46,418	7,625	15,597	9,093	40,889	42,941	261,912
		Total Ducks	203,640	120,492	126,942	25,333	49,581	149,017	18,051	22,088	14,459	43,547	116,041	889,191
	Dec-15	Mallards	6,103	1,287	59,153	17,784	107,474	109,493	13,682	5,814	11,408	9,242	5,837	347,277
		Total Ducks	98,739	25,214	106,887	100,928	223,106	221,060	65,282	40,127	21,975	28,436	16,697	948,451
	MWS-16	Mallards	31,506	13,806	84,035	14,558	53,900	97,829	106,172	20,482	60,454	-	170,364	653,106
		Total Ducks	55,172	32,204	125,780	37,662	91,665	164,831	155,016	28,744	74,250	3,943	226,832	996,099
	Jan-16	Mallards	22,606	9,068	59,169	22,800	80,590	135,110	-	116,169	-	74,942	96,330	616,784
		Total Ducks	94,269	21,294	75,702	33,212	105,643	184,233	-	291,312	-	74,942	111,648	992,255
	Nov-16	Mallards	0	0	26,781	21,094	0	1,792	3,007	285	16,572	0	12,381	81,912
		Total Ducks	5,983	17,179	71,612	57,213	1,167	24,772	29,140	1,064	33,788	9,724	17,919	269,561
	Dec-16	Mallards	15,104	475	150,591	31,456	23,246	91,324	19,088	8,160	20,241	20,767	64,914	445,364
		Total Ducks	72,010	8,361	207,710	43,213	26,332	115,977	30,448	43,642	30,147	86,977	85,357	750,174
	MWS-17	Mallards	72,405	40,448	219,106	22,908	14,102	128,174	20,651	12,460	8,873	41,202	70,677	651,004
		Total Ducks	95,012	57,394	250,439	26,358	38,389	236,142	36,784	13,479	9,892	75,996	75,677	915,562
	Jan-17	Mallards	7,154	15,135	146,710	20,187	41,860	159,212	47,507	19,013	8,116	31,646	63,039	559,579
		Total Ducks	73,706	66,649	225,301	28,396	87,546	277,917	85,046	57,463	10,021	51,226	91,663	1,054,934
	Dec-17	Mallards	4,921	3,151	116,026	19,729	84,718	38,466	26,874	2,400	26,662	100,522	9,508	432,977
		Total Ducks	28,720	12,448	192,672	24,770	158,347	70,974	64,906	39,102	37,663	139,882	21,915	791,399
	MWS-18	Mallards	2,458	34,577	390,205	92,504	40,402	132,049	35,330	1,402	12,274	54,505	153,625	949,331
		Total Ducks	3,027	62,533	415,037	110,084	44,660	140,405	58,871	3,845	13,969	122,781	180,326	1,155,538
	Jan-18	Mallards	3,276	10,690	104,937	116,012	8,117	21,688	11,050	555	36	70,030	63,378	409,769
		Total Ducks	42,652	35,963	118,023	116,275	10,768	22,626	17,671	2,313	39	143,833	69,635	579,794
	Nov-18	Mallards	251	476	66,867	7,222	91,284	110,677	43,214	1,572	40,305	-	2,226	364,094
		Total Ducks	57,431	17,075	131,319	11,649	214,432	265,268	73,438	3,900	57,849	2,040	2,997	837,398
	Dec-18	Mallards	2,770	7,210	118,723	124,685	33,242	145,660	84,416	9,825	31,723	45,074	83,800	687,126
		Total Ducks	37,533	59,037	202,869	147,520	48,481	185,811	236,571	18,709	43,519	110,004	91,944	1,181,998
	MWS-19	Mallards	50,569	7,541	80,381	22,208	81,122	85,902	38,201	16,263	13,588	119,119	40,885	555,779
		Total Ducks	123,101	28,889	127,772	28,331	168,597	137,596	76,985	24,204	50,781	211,288	77,009	1,054,553
	Jan-19	Mallards	3,592	12,942	91,603	21,192	53,730	132,098	49,299	19,298	3,937	50,190	117,601	555,481
		Total Ducks	35,277	48,923	125,488	65,460	94,400	247,074	99,281	45,922	4,810	63,203	134,519	964,356
	Nov-19	Mallards	4,095	2,656	18,897	10,217	12,387	102,483	28,188	8,764	40,098	1,068	13,419	242,272
		Total Ducks	27,470	33,184	56,514	16,489	47,286	198,832	102,188	28,529	52,422	90,384	28,433	681,730
	Dec-19	Mallards	3,141	1,410	60,346	24,176	73,688	103,543	19,682	9,443	70,195	60,545	20,914	447,083
		Total Ducks	52,686	10,283	129,781	28,373	166,850	185,574	49,036	39,966	74,342	124,603	37,162	898,656
	MWS-20	Mallards	40,730	7,032	49,576	10,209	56,228	76,464	57,146	40,810	11,322	333,707	46,736	729,960
		Total Ducks	179,674	26,737	94,990	35,729	95,958	133,810	148,207	54,851	12,291	611,108	78,730	1,472,083
	Jan-20	Mallards	4,225	7,189	96,105	26,071	130,185	47,918	28,615	3,329	26,127	116,120	61,002	546,885
		Total Ducks	45,122	65,224	198,473	41,544	215,178	75,474	75,084	18,046	34,296	190,198	85,771	1,044,410
	Dec-20	Mallards	17,899	86,795	13,611	8,565	3,869	38,361	20,225	9,044	7,128	36,802	12,753	255,052
		Total Ducks	57,991	169,264	46,643	23,418	18,710	83,276	43,232	14,636	33,444	85,922	56,441	632,977
	MWS-21	**Mallards**	**36,123**	**37,667**	**93,865**	**10,850**	**63,320**	**42,077**	**3,288**	**2,028**	**70,340**	**31,220**	**67,535**	**458,314**
		Total Ducks	**62,282**	**57,556**	**212,836**	**25,105**	**128,287**	**149,534**	**11,855**	**5,967**	**122,325**	**92,015**	**210,449**	**1,078,209**

Table 2. Waterfowl abundance estimates in western Arkansas during the late November (Nov), mid-December (Dec), early-January Midwinter Survey (MWS) and late-January (Jan) aerial waterfowl survey periods, 2009-2021. Beginning in Jan. 2013, surveys in the Arkansas River Valley (ARV) were conducted using stratified random sampling of transects, while past ARV surveys and surveys in southwest Arkansas were conducted using "cruise" surveys.

			Survey Zone										
			Bigelow - Lake Conway	Cadron	East Dardanelle Reservoir	Fourche La Fave	Frog Bayou	Holla Bend	Petit Jean	Pt. Remove - Plumerville	West Dardanelle Reservoir	Arkansas River Valley Total	Southwest Arkansas Total
Survey Period	Nov-09	Mallards										13,731	5,480
		Total Ducks										31,416	19,140
	Dec-09	Mallards										18,580	19,230
		Total Ducks										31,304	31,820
	MWS-10	Mallards										58,815	34,590
		Total Ducks										81,685	36,060
	Jan-10	Mallards										14,359	19,840
		Total Ducks										20,336	27,705
	Nov-10	Mallards										96	14,010
		Total Ducks										5,966	30,300
	Dec-10	Mallards										25,064	2,390
		Total Ducks										28,054	21,106
	MWS-11	Mallards										26,318	15,027
		Total Ducks										40,470	21,267
	Jan-11	Mallards										41,850	-
		Total Ducks										60,635	-
	Nov-11	Mallards										12,225	-
		Total Ducks										19,870	-
	Dec-11	Mallards										21,389	-
		Total Ducks										40,919	-
	MWS-12	Mallards										7,264	-
		Total Ducks										13,339	-
	Jan-12	Mallards										13,900	-
		Total Ducks										21,000	-
	Nov-12	Mallards										1,182	13,090
		Total Ducks										7,732	21,935
	Dec-12	Mallards										13,975	10,245
		Total Ducks										22,417	17,105
	MWS-13	Mallards										16,893	8,165
		Total Ducks										26,058	14,630
	Jan-13	Mallards	-	408	10,000	372	1,837	630	627	1,843	917	16,634	-
		Total Ducks	-	1,428	10,180	372	1,971	990	902	3,687	7,857	28,011	-
	Nov-13	Mallards	240	187	4,660	800	0	144	0	754	253	7,038	4,455
		Total Ducks	320	187	14,320	1,920	0	1,080	528	965	3,307	22,627	19,145
	Dec-13	Mallards	576	245	5,472	1,728	358	162	1,320	3,429	2,176	15,466	10,130
		Total Ducks	1,604	2,713	8,672	1,728	1,836	3,132	1,501	4,329	3,941	29,456	29,070
	MWS-14	Mallards	11,767	816	2,898	4,800	-	2,160	715	13,703	3,449	40,306	18,385
		Total Ducks	14,441	816	8,711	5,124	-	2,934	957	22,177	6,087	61,247	35,875
	Nov-14	Mallards	926	7,140	12,114	704	924	4,518	10,428	7,125	392	44,271	15,890
		Total Ducks	5,040	10,540	45,485	4,256	3,248	4,518	19,932	12,039	624	105,682	29,790
	Dec-14	Mallards	720	224	1,028	640	373	3,006	2,541	1,343	299	10,174	21,200
		Total Ducks	1,242	530	33,805	1,296	373	4,194	4,059	6,991	299	52,789	29,400
	MWS-15	Mallards	3,929	143	5,813	221	-	11,138	0	2,107	3,531	26,882	19,245
		Total Ducks	10,594	755	18,649	221	-	13,455	224	2,107	9,871	55,876	28,695
	Nov-15	Mallards	270	-	1,867	-	149	2,430	561	4,785	64	10,126	21,580
		Total Ducks	270	449	2,898	-	1,170	14,760	726	7,042	64	27,379	37,060
	Dec-15	Mallards	1,440	340	320	160	140	563	165	2,864	1,027	7,019	11,425
		Total Ducks	4,140	374	3,140	992	140	7,088	165	6,913	3,274	26,226	17,950
	MWS-16	Mallards	411	775	352	496	14,000	3,042	726	2,544	6,070	28,416	10,310
		Total Ducks	617	775	6,752	896	17,562	6,102	990	3,808	15,019	52,521	16,715
	Jan-16	Mallards	634	918	2,743	576	373	1,548	14,388	8,479	4,622	34,281	14,735
		Total Ducks	634	918	3,817	1,536	1,966	2,088	18,777	11,815	5,478	47,029	19,565

Table 2, continued. Waterfowl abundance estimates in western Arkansas during the late November (Nov), mid-December (Dec), early-January Midwinter Survey (MWS) and late-January (Jan) aerial waterfowl survey periods, 2009-2021. Beginning in Jan. 2013, surveys in the Arkansas River Valley (ARV) were conducted using stratified random sampling of transects, while past ARV surveys and surveys in southwest Arkansas were conducted using "cruise" surveys. The Bigelow-Lake Conway and Cadron strata were not flown beginning December, 2019.

			Survey Zone										
			Bigelow - Lake Conway	Cadron	East Dardanelle Reservoir	Fourche La Fave	Frog Bayou	Holla Bend	Petit Jean	Pt. Remove - Plumerville	West Dardanelle Reservoir	Arkansas River Valley Total	Southwest Arkansas Total
Survey Period	Nov-16	Mallards	-	-	818	-	0	-	-	-	99	917	5,165
		Total Ducks	-	-	6,530	-	814	-	-	-	100	7,444	14,690
	Dec-16	Mallards	112	-	-	739	187	2,612	296	234	8,186	12,364	34,946
		Total Ducks	333	-	3,165	1,016	988	3,248	550	1,788	10,192	21,278	39,360
	MWS-17	Mallards	24	1,538	180	831	242	448	5,050	1,808	2,333	12,454	19,386
		Total Ducks	325	2,137	453	12,788	2,167	547	5,499	4,461	14,900	43,277	31,679
	Jan-17	Mallards	17	627	16,432	3,812	1,019	5,394	1,561	14,818	4,768	48,448	13,682
		Total Ducks	17	1,647	17,810	11,308	2,595	5,638	1,825	14,836	4,917	60,593	26,594
	Dec-17	Mallards	-	-	821	-	0	1,184	-	-	2,129	4,134	15,487
		Total Ducks	-	-	2,558	-	2,972	3,654	-	-	4,264	13,448	34,822
	MWS-18	Mallards	0	0	10,862	1,013	4,784	22,254	0	5,269	6,711	50,893	18,412
		Total Ducks	510	0	13,785	2,114	5,880	36,695	0	13,843	7,553	80,380	38,114
	Jan-18	Mallards	2,080	3,144	11,881	135	1,115	141,074	845	3,361	5,214	168,849	10,849
		Total Ducks	3,420	4,489	20,281	227	3,826	174,542	3,150	3,313	5,381	218,629	32,928
	Nov-18	Mallards	-	-	273	2,956	3,617	198	4,733	7,074	429	19,280	9,721
		Total Ducks	-	-	5,878	3,319	3,895	253	8,867	9,956	502	32,670	26,969
	Dec-18	Mallards	235	326	2,440	73	179	3,292	462	7,426	605	15,038	9,241
		Total Ducks	240	330	4,483	73	630	3,472	1,771	10,920	605	22,514	35,236
	MWS-19	Mallards	58	382	841	120	389	89	2,413	9,527	4,418	18,237	3,507
		Total Ducks	58	748	4,417	192	2,446	100	3,875	23,206	4,582	39,620	30,973
	Jan-19	Mallards	1,628	-	1,603	169	728	607	2,234	1,928	7,900	16,797	5,978
		Total Ducks	5,295	-	2,252	2,762	869	785	2,381	2,488	10,513	27,347	25,540
	Nov-19	Mallards	1,096	-	1,388	243	4,235	550	592	744	608	9,456	8,016
		Total Ducks	1,081	-	2,067	1,242	20,195	3,054	1,534	5,742	1,754	36,670	17,193
	Dec-19	Mallards	-	-	461	363	1,418	1,171	2,121	2,133	3,377	11,044	-
		Total Ducks	-	-	637	672	1,595	2,286	3,146	4,160	8,194	20,691	-
	MWS-20	Mallards	-	-	7,995	617	277	6,274	655	4,907	196	20,920	2,237
		Total Ducks	-	-	10,702	917	2,711	9,008	2,641	7,409	959	34,346	26,955
	Jan-20	Mallards	-	-	561	460	4,227	1,339	795	1,465	4,153	13,000	1,960
		Total Ducks	-	-	4,792	2,567	5,108	1,633	1,397	3,604	6,254	25,355	18,480
	Dec-20	Mallards	-	-	1,452	294	561	131	1,123	2,538	1,313	7,416	12,367
		Total Ducks	-	-	4,606	471	2,276	205	2,059	4,722	2,616	16,958	45,832
	Dec-20	**Mallards**	**-**	**-**	**0**	**1,594**	**104**	**53**	**707**	**1,592**	**5,315**	**9,366**	**4,597**
		Total Ducks	**-**	**-**	**1,647**	**1,864**	**645**	**337**	**828**	**5,019**	**11,017**	**21,357**	**9,104**

Figure 1. Duck abundance estimates in the Mississippi Alluvial Valley (Delta) of Arkansas during the late November (Nov), mid-December (Dec), early-January Midwinter Waterfowl Survey (MWS) and late-January (Jan) aerial waterfowl survey periods, 2009-2021.

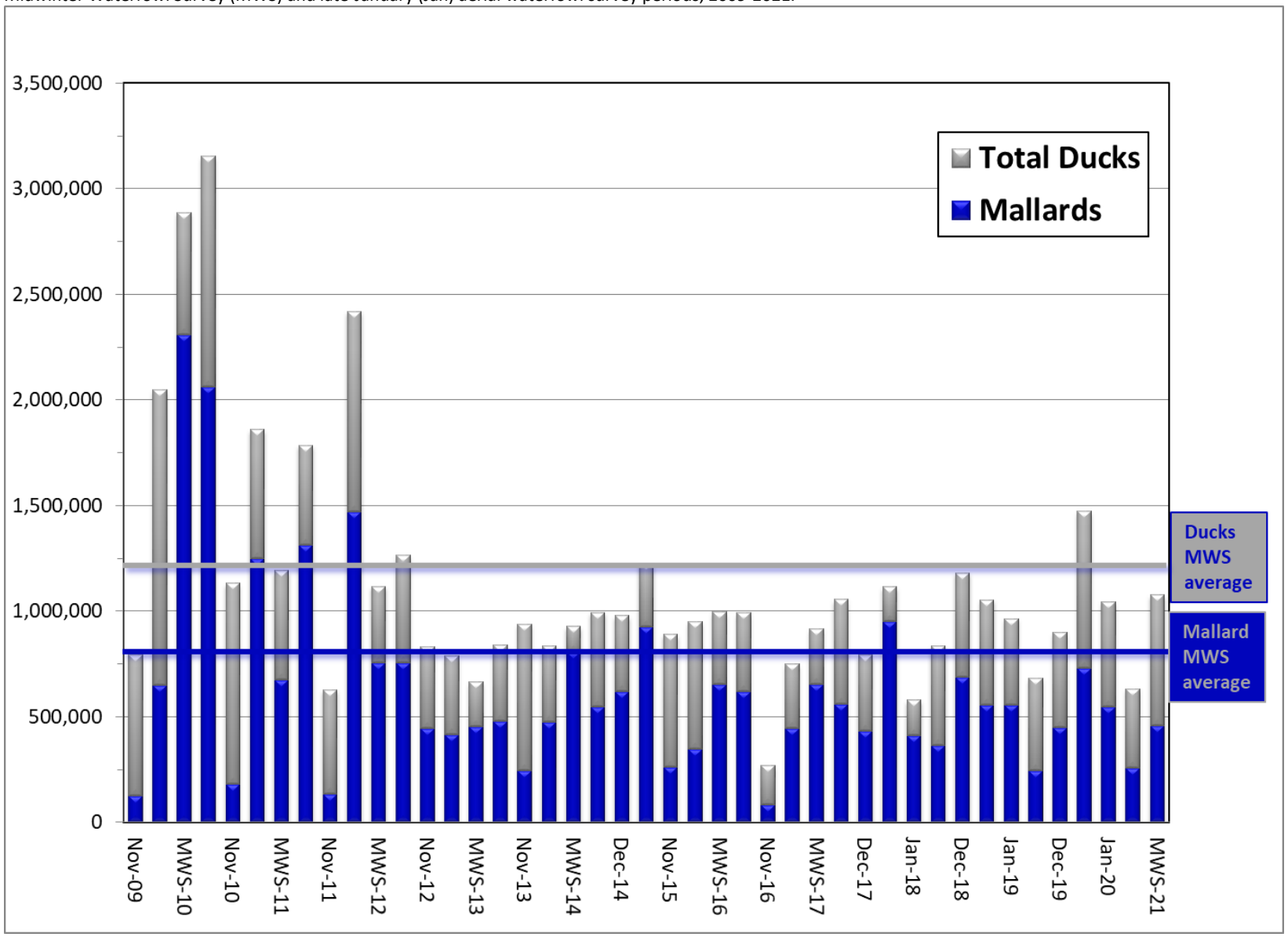


Figure 2. Duck abundance estimates in the Arkansas River valley of Arkansas during the late November (Nov), mid-December (Dec), early-January Midwinter Waterfowl Survey (MWS) and late-January (Jan) aerial waterfowl survey periods, 2009-2021.

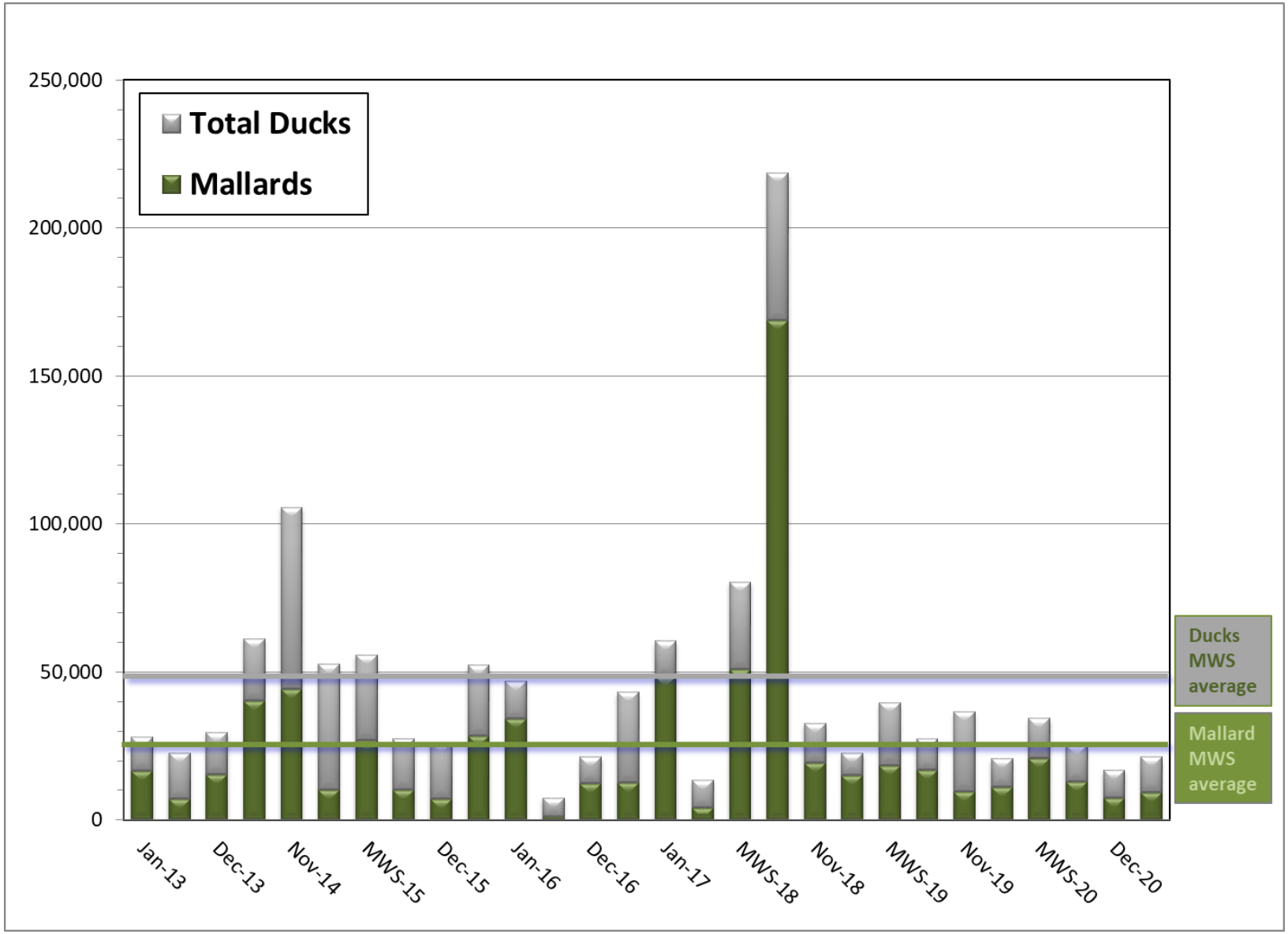


Figure 3. Duck distribution in the Mississippi Alluvial Valley of Arkansas during the midwinter 2021 aerial waterfowl survey period.

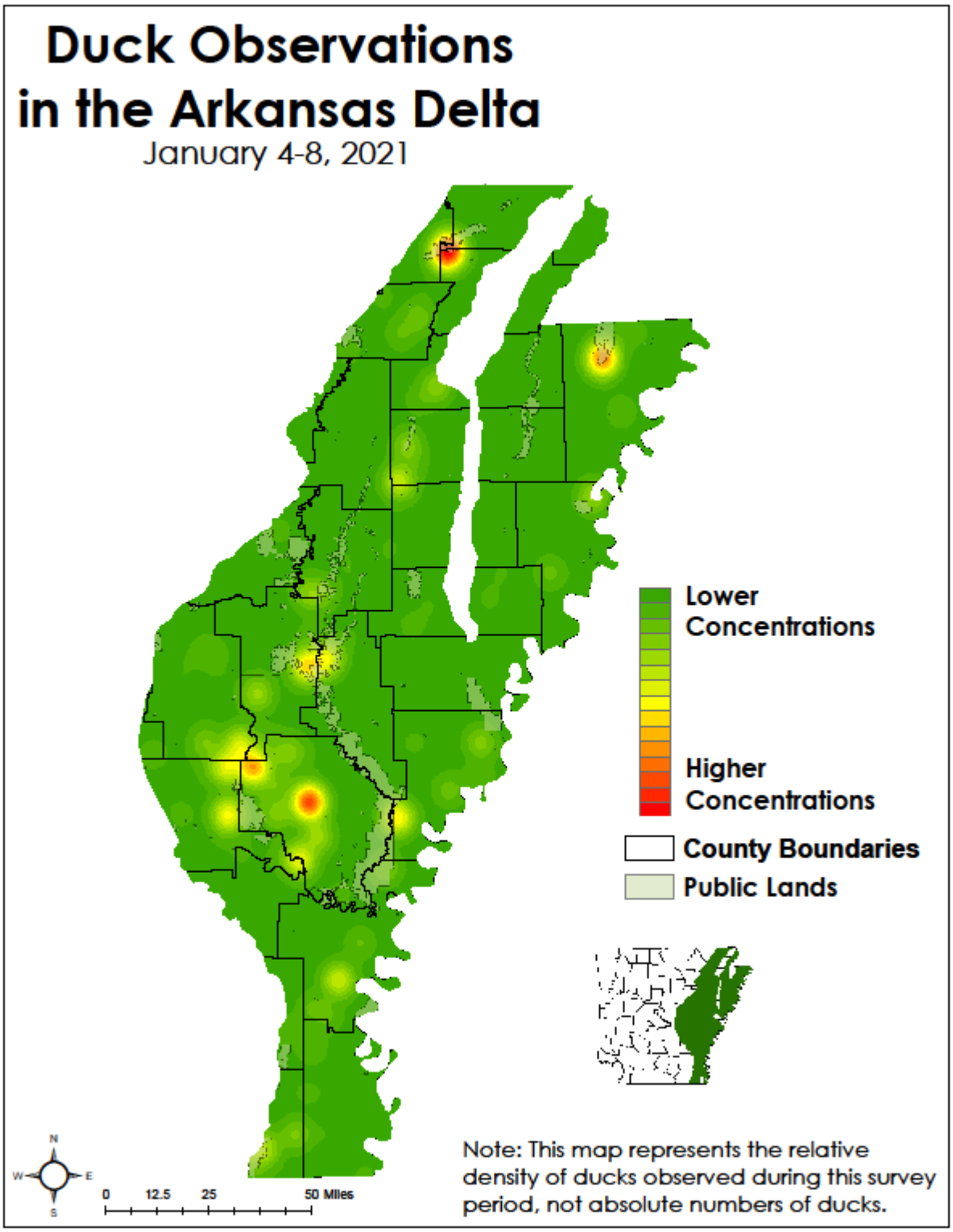


Figure 4. Mallard distribution in the Mississippi Alluvial Valley of Arkansas during the midwinter 2021 aerial waterfowl survey period.

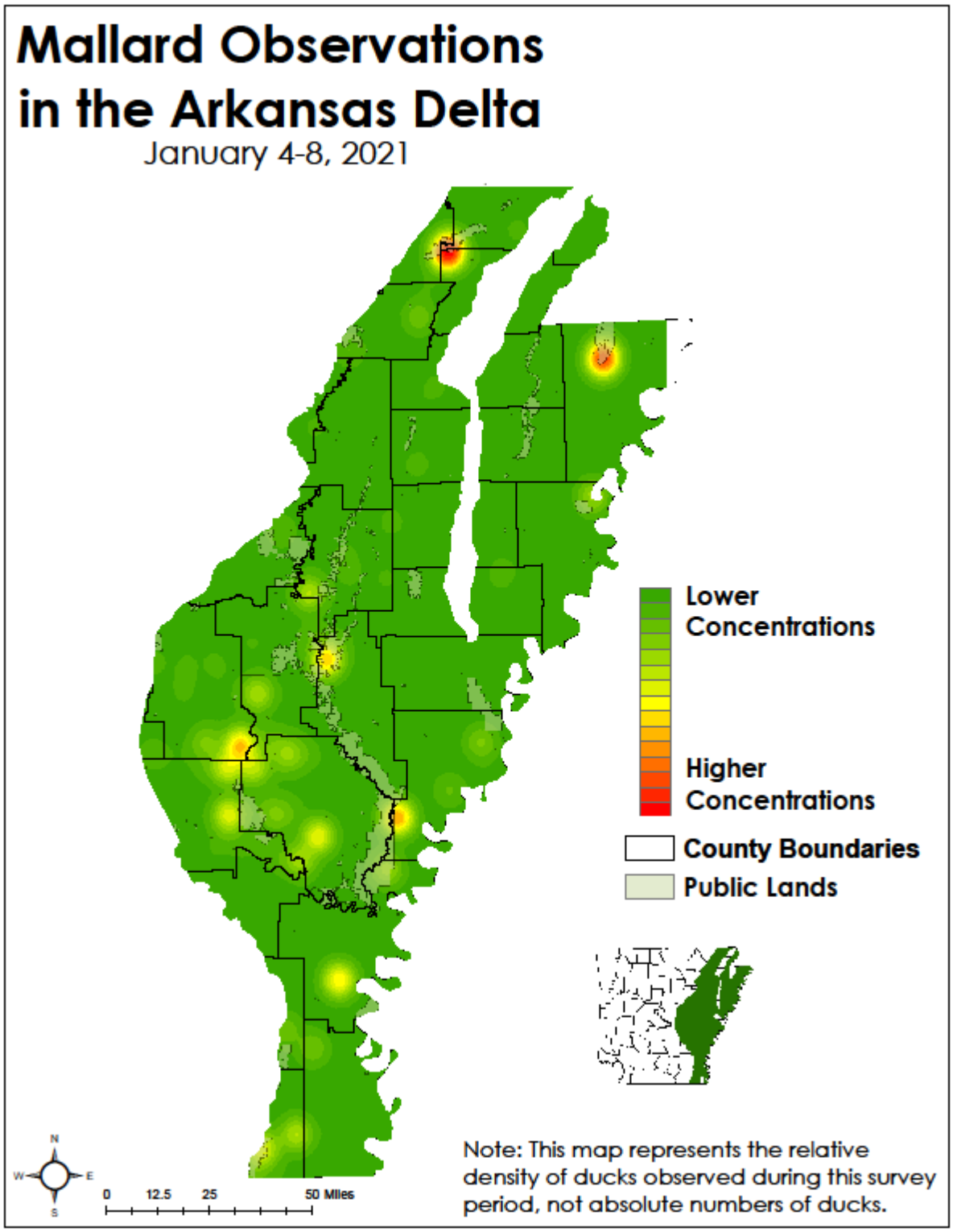


Figure 5. Duck distribution in the Arkansas River Valley (ARV) of Arkansas during the midwinter 2021 waterfowl survey period.

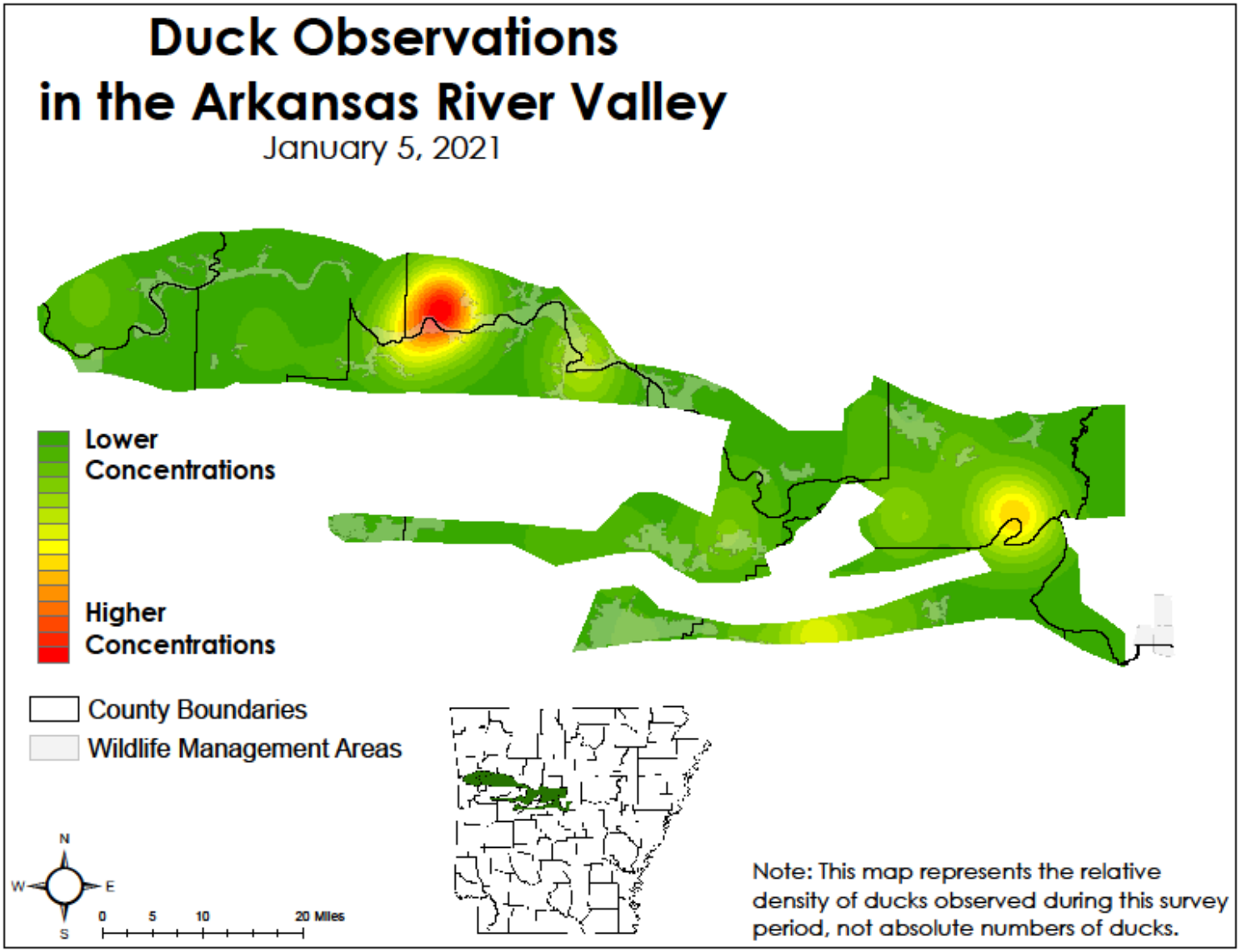
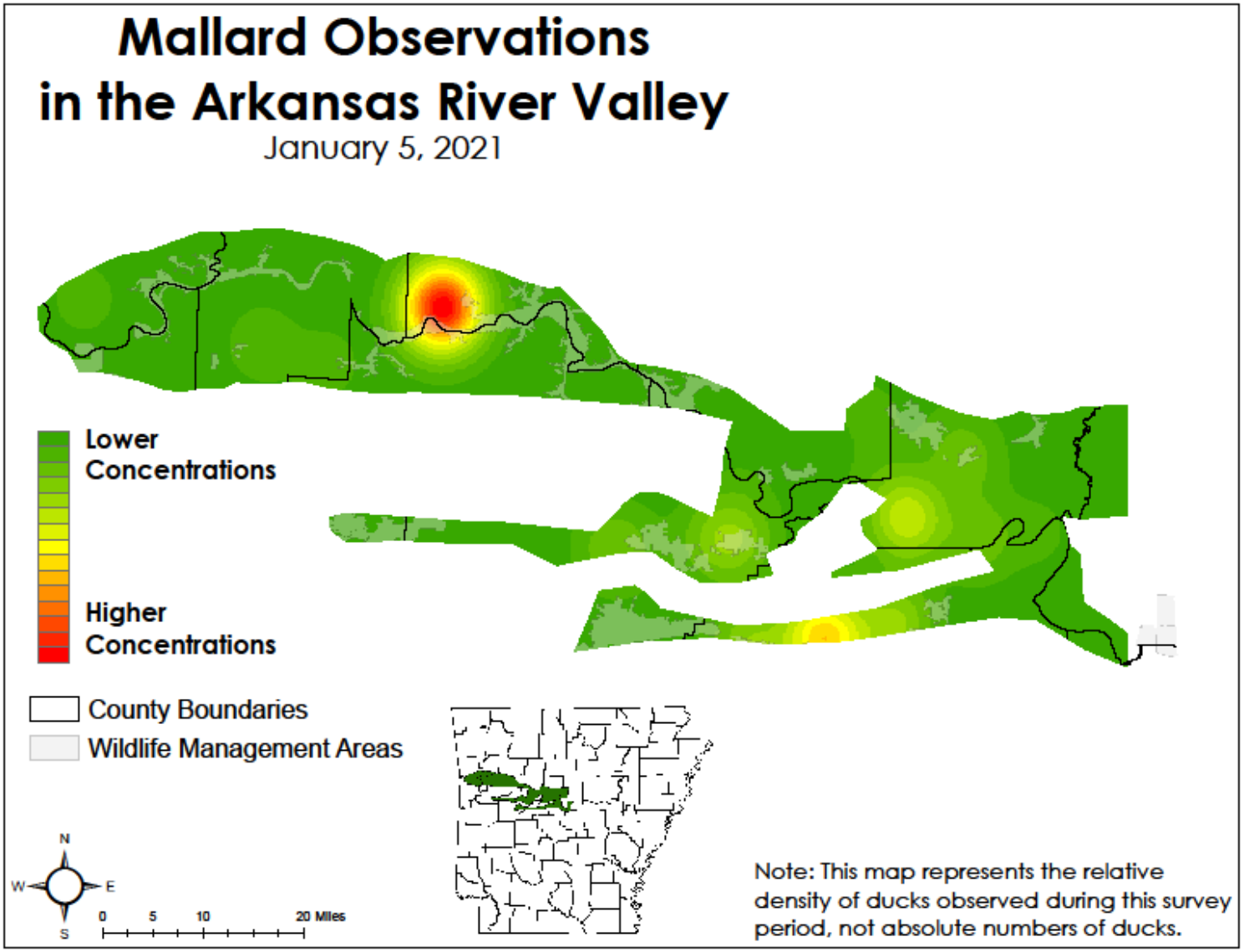


Figure 6. Mallard distribution in the Arkansas River Valley (ARV) of Arkansas during the midwinter 2021 waterfowl survey period.



Survey Design Background

The Mississippi Alluvial Valley is an area of continental significance for migrating and wintering waterfowl, as outlined in the North American Waterfowl Management Plan, and the single most important region for wintering mallards. Habitats found in western Arkansas, including the Arkansas River Valley and southwest Arkansas, such as the Red and Sulphur River floodplains, provide additional critical habitat for migrating and wintering waterfowl. Biologists conduct regular waterfowl surveys in these regions by aircraft up to four times each wintering period.

Winter waterfowl surveys, including the Midwinter Waterfowl Survey, have been conducted across much of the United States since 1935. Many different counting techniques have been used, and recently AGFC and partners have conducted surveys in the MAV using stratified random sampling of aerial fixed width (250m) strips, or transects, that have the advantages of extensive coverage (i.e., no area is excluded from the sample), increased accuracy by counting on fixed strips rather than traditional "cruise" surveys only counting waterfowl on large concentration areas, and availability of measures of sampling error.

Beginning in 2011 in the MAV, survey strata – or sampling zones – follow watershed boundaries (Figure 7). Watersheds in this case are simply land areas that are occupied by a drainage system consisting of a portion of a surface stream and all the tributary surface streams feeding it. For example, the Cache River strata includes lands surrounding and tributaries flowing into the Cache River from the Missouri border on the north to the Cache River's junction with the White River on the south. At the root of this sampling design is the idea that habitat within these zones will share common weather and flooding patterns and, knowing that ducks are keyed in on such patterns, duck distribution will vary among watersheds. This is not a concept foreign to those who follow ducks, particularly duck hunters, as they frequently discuss habitat and duck numbers in terms of conditions in the "Cache River bottoms," for instance. Systematically conducting aerial waterfowl surveys using this design will allow for more efficient allocation of sampling effort and provide precise estimates of waterfowl abundance in the MAV. Such a design offers an opportunity to track changes in abundance in response to changes in land use, flooding patterns or weather conditions, for example. Biologists developed and implemented a similar watershed-based sampling design beginning in January 2013 (Figure 8) and has been in place since that time.

Before each survey period, transects to be flown are randomly selected within each strata. Biologists spend many hours in the air flying each of these transects – totaling over 3,500 miles each survey – recording all waterfowl observations using specialized computer software that collects location information in flight. Biologists also collect habitat information for each duck observation to track trends in habitat use. These data can then be used to generate population estimates for each strata and the entire MAV and develop visual representations of duck distribution (i.e., duck density maps).

Figure 7. Aerial waterfowl survey strata in the Mississippi Alluvial Valley (Delta) of Arkansas.

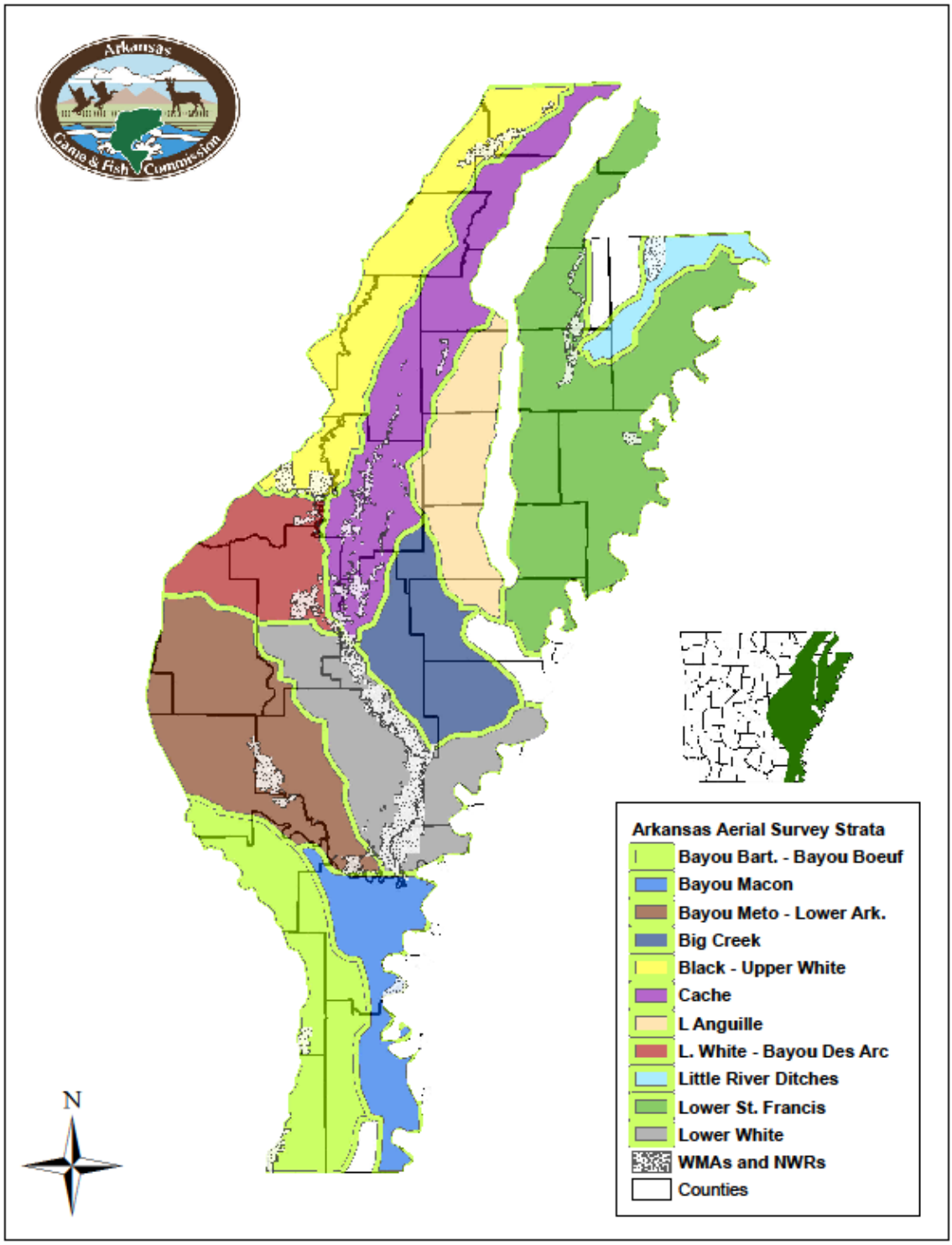


Figure 8. Aerial waterfowl survey strata in the Arkansas River valley (ARV) of western Arkansas.