



## Arkansas Game and Fish Commission Aerial Waterfowl Survey Report December 4-7, 2017

Arkansas Game and Fish Commission biologists conducted the Dec. 2017 aerial waterfowl survey Dec. 4-7 in the Mississippi Alluvial Valley (Delta), Dec. 6 in the Arkansas River Valley (ARV) and Dec. 7 in southwest Arkansas. Observers estimated 791,399 ducks in the Delta, including 432,977 mallards (Table 2), and a total of 13,448 ducks in the ARV, including only 4,134 mallards (Table 3). The southwest Arkansas duck population index was 34,822, including 15,487 mallards (Table 3). Biologist observers were J.J. Abernathy, Jason Carbaugh, Jason Jackson, Cameron Tatom and Alex Zachary.

The Delta mallard population estimate is lower than the 2009-2017 long-term December average of a slightly under 680,000, but is similar to the average for the last six December surveys and the December 2016 mallard estimate of 445,364. The December duck population estimate was much lower than the long-term average of over 1.27 million (Figure 1). Mallard estimates were highest in the Bayou Meto–Lower Arkansas, Lower St. Francis and Black–Upper White survey zones (Table 2; Figure 7).

Observers noted over 80% of mallards in the Delta in five habitat types: rice fields; buckbrush/buttonbush wetlands; aquaculture reservoirs; agricultural reservoirs; and, moist-soil units. Over 47% of mallards were in rice fields. Mallards in the Arkansas River valley were distributed among oxbow lakes (75%), moist-soil habitat (18%) and farm ponds (5%).

The driest fall on record throughout much of Arkansas (Table 1) has led to limited waterfowl habitat availability statewide. However, about average numbers of mallards, migrating on a series of cold fronts, have settled in this limited habitat. With no natural flooding via runoff, flooded area is limited to locations with artificial flooding capabilities. Private landowners typically provide a majority of this early habitat in most years, and the fall of 2017 is no exception. Public land managers (AGFC and the USFWS) also were implementing staged flooding of non-forested wetlands during the survey period. Observers noted the largest concentration of ducks in flooded fields located among a complex of flooded fields; isolated flooded fields rarely had substantial numbers of ducks.

Table 1. National Weather Service fall rainfall records for select Arkansas cities.

<i>Precipitation from September 1 - November 30, 2017</i>				
Site	Amount	Normal	+/-	% of Normal
Fayetteville (NW AR)	6.47	13.38	-6.91	48%
Harrison (NC AR)	3.83	11.98	-8.15	32%
Jonesboro (NE AR)	2.43	12.22	-9.79	20%
Fort Smith (WC AR)	3.57	12.81	-9.24	28%
Little Rock (C AR)	2.24	13.37	-11.13	17%
West Memphis (EC AR)	5.17	12.00	-6.83	43%
Texarkana (SW AR)	4.29	13.18	-8.89	33%
El Dorado (SC AR)	3.73	13.19	-9.46	28%
Pine Bluff (SE AR)	2.01	12.52	-10.51	16%

Table 2. 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, 2009-2017, in the Mississippi Alluvial Valley (MAV) using stratified random sampling of transects.

			Survey Zone											MAV Total	
			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		
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		515,764
		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	
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	

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, 2009-2017. 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	
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	

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, 2009-2017.

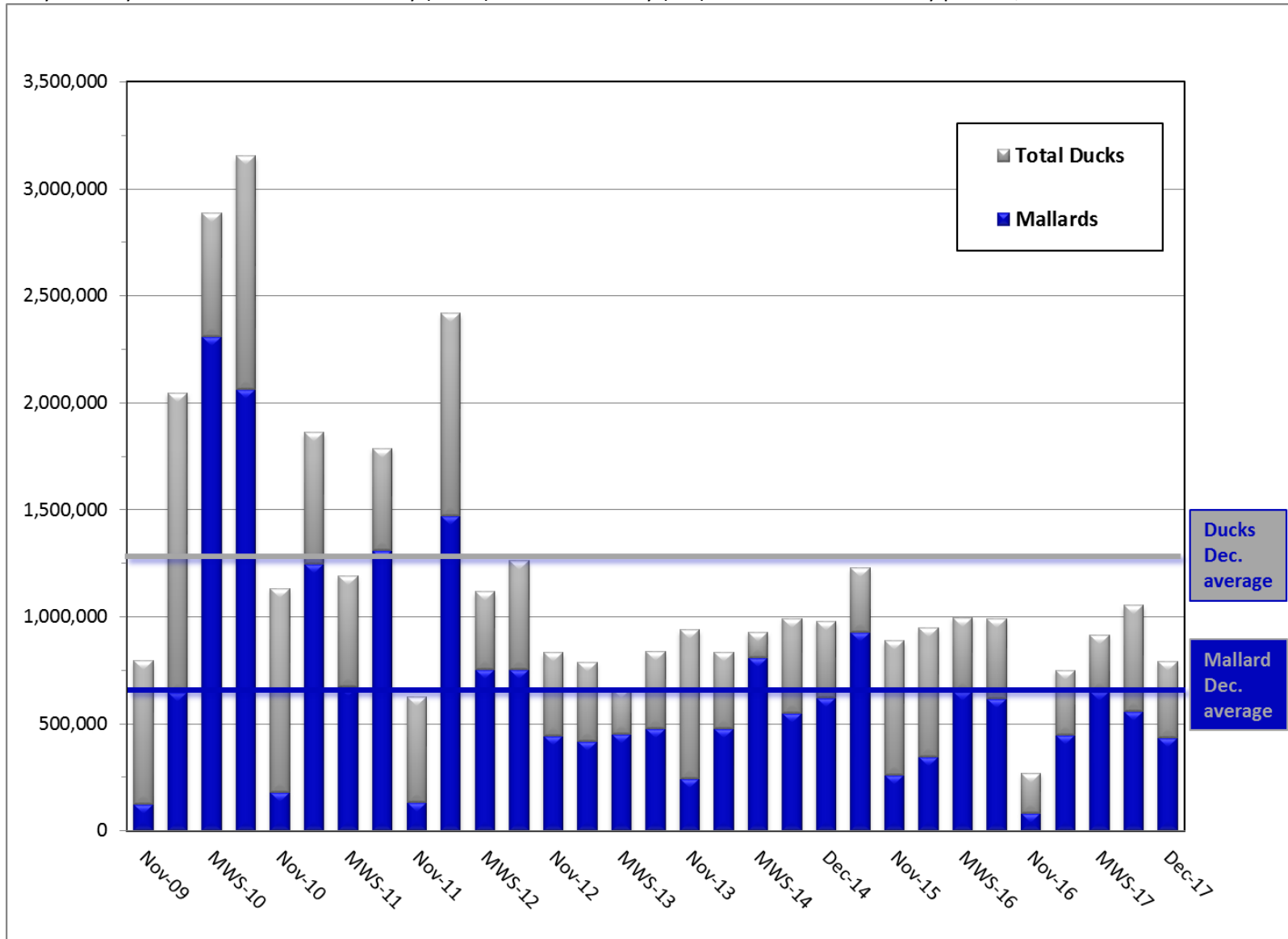


Figure 2. Duck abundance estimates in the Arkansas River valley of Arkansas during the late November (Nov), mid-December (Dec), early-January Midwinter Waterfowl Survey (MWS) and late-January (Jan) aerial waterfowl survey periods, 2013-2017.

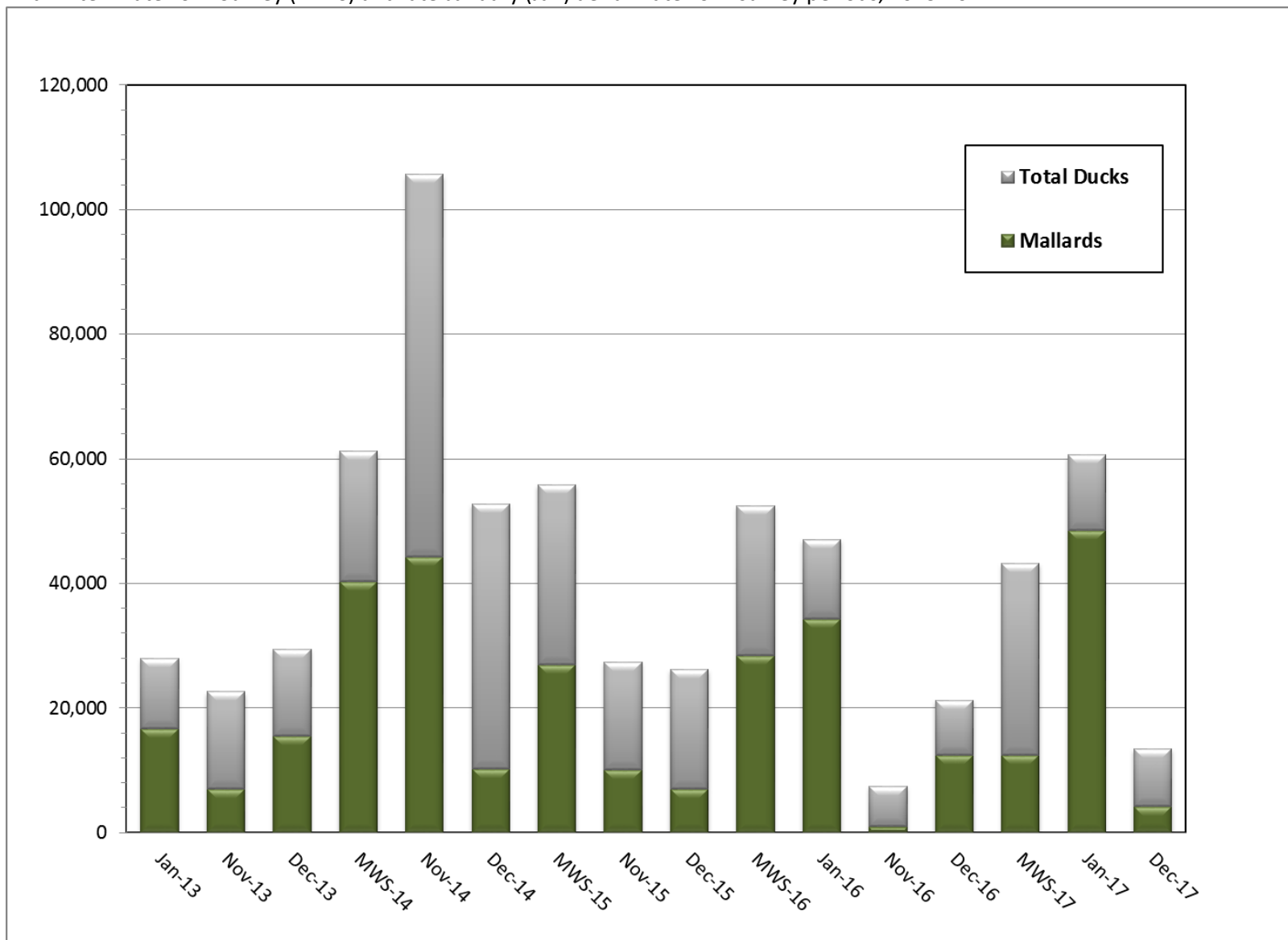


Figure 3. Duck distribution in the Mississippi Alluvial Valley of Arkansas during the December 2017 aerial waterfowl survey period.

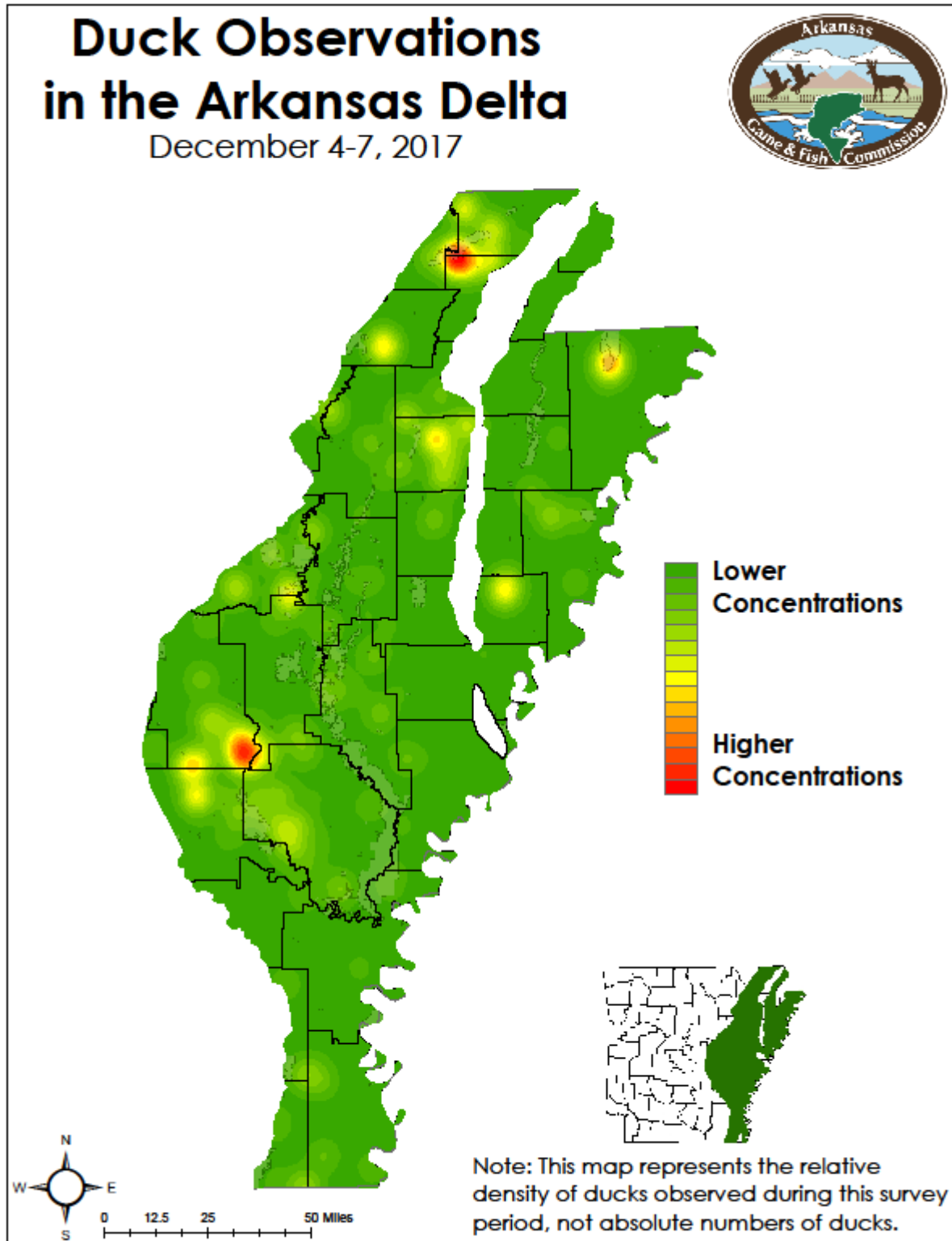


Figure 4. Mallard distribution in the Mississippi Alluvial Valley of Arkansas during the December 2017 aerial waterfowl survey period.

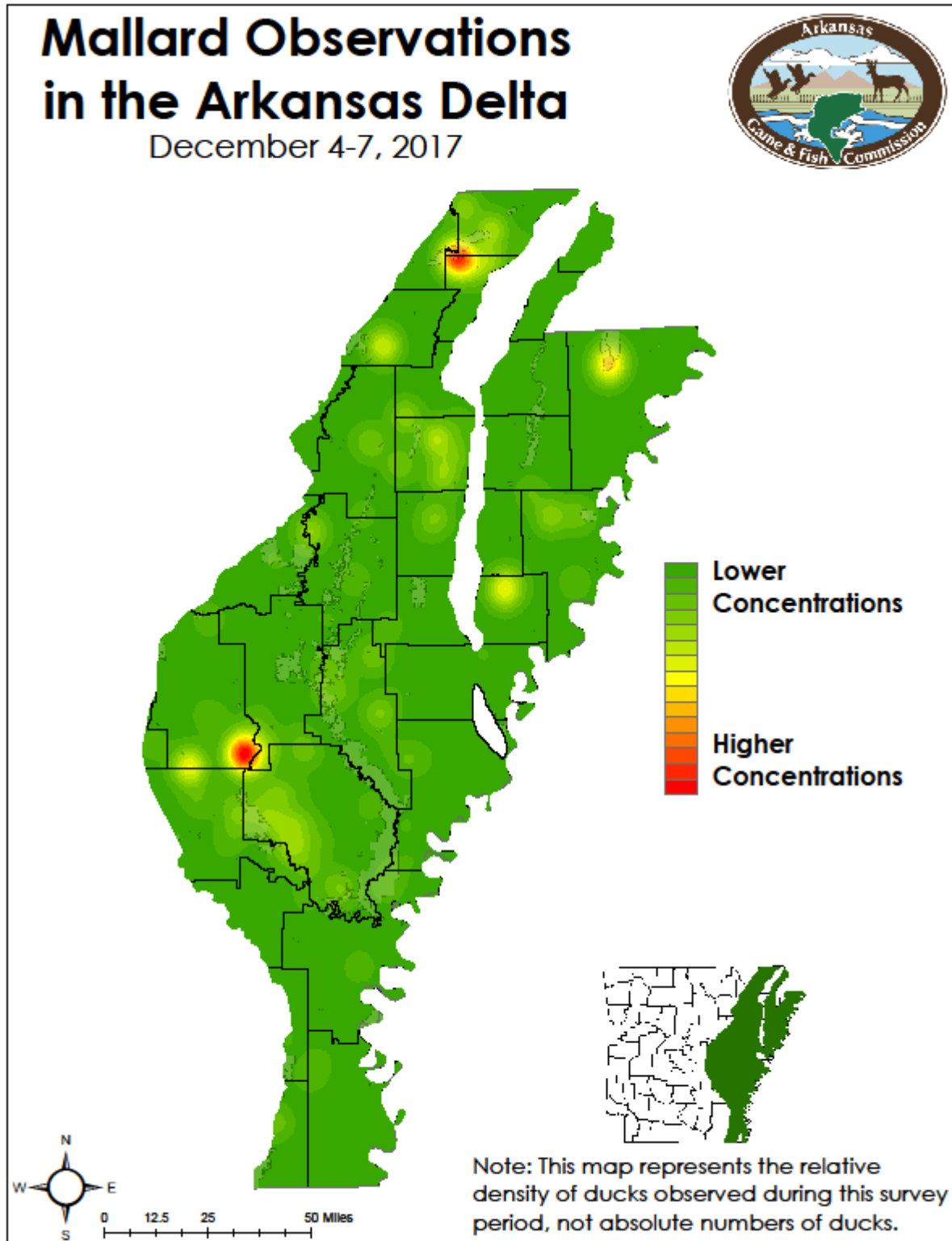


Figure 5. Duck distribution in the Arkansas River Valley (ARV) of Arkansas during the December 2017 waterfowl survey period.

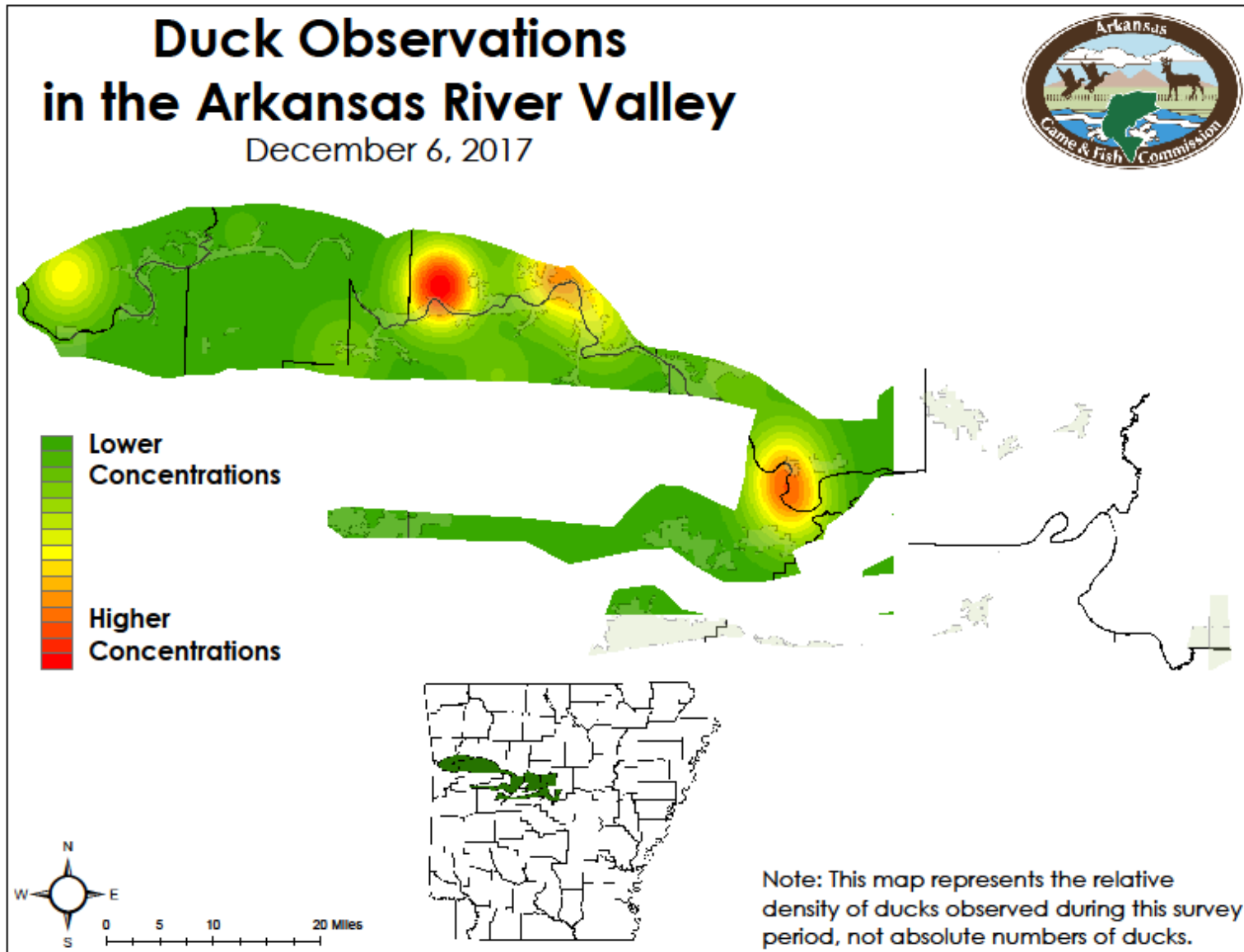
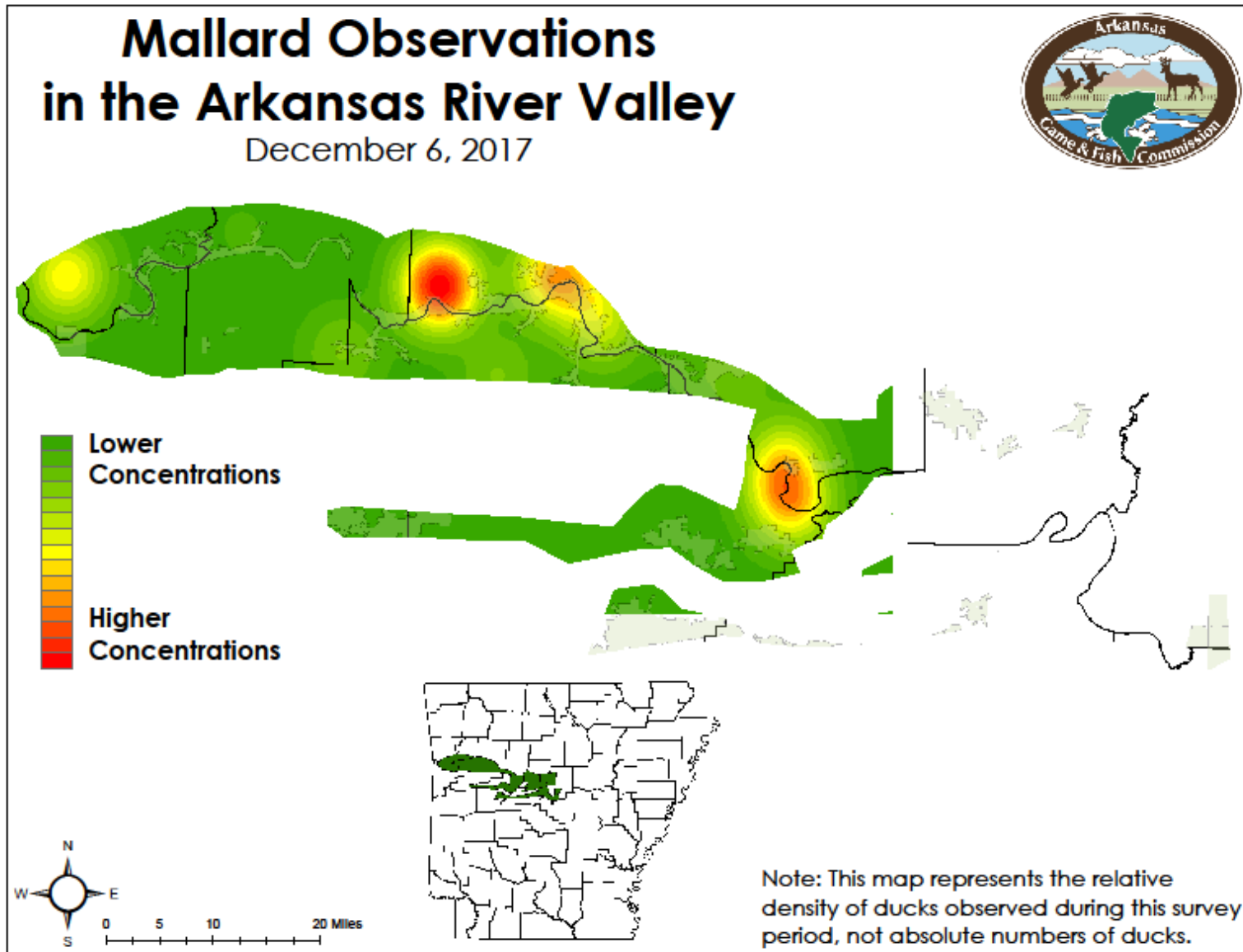




Figure 6. Mallard distribution in the Arkansas River Valley (ARV) of Arkansas during the December 2017 waterfowl survey period.



## **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 4). 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.

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.

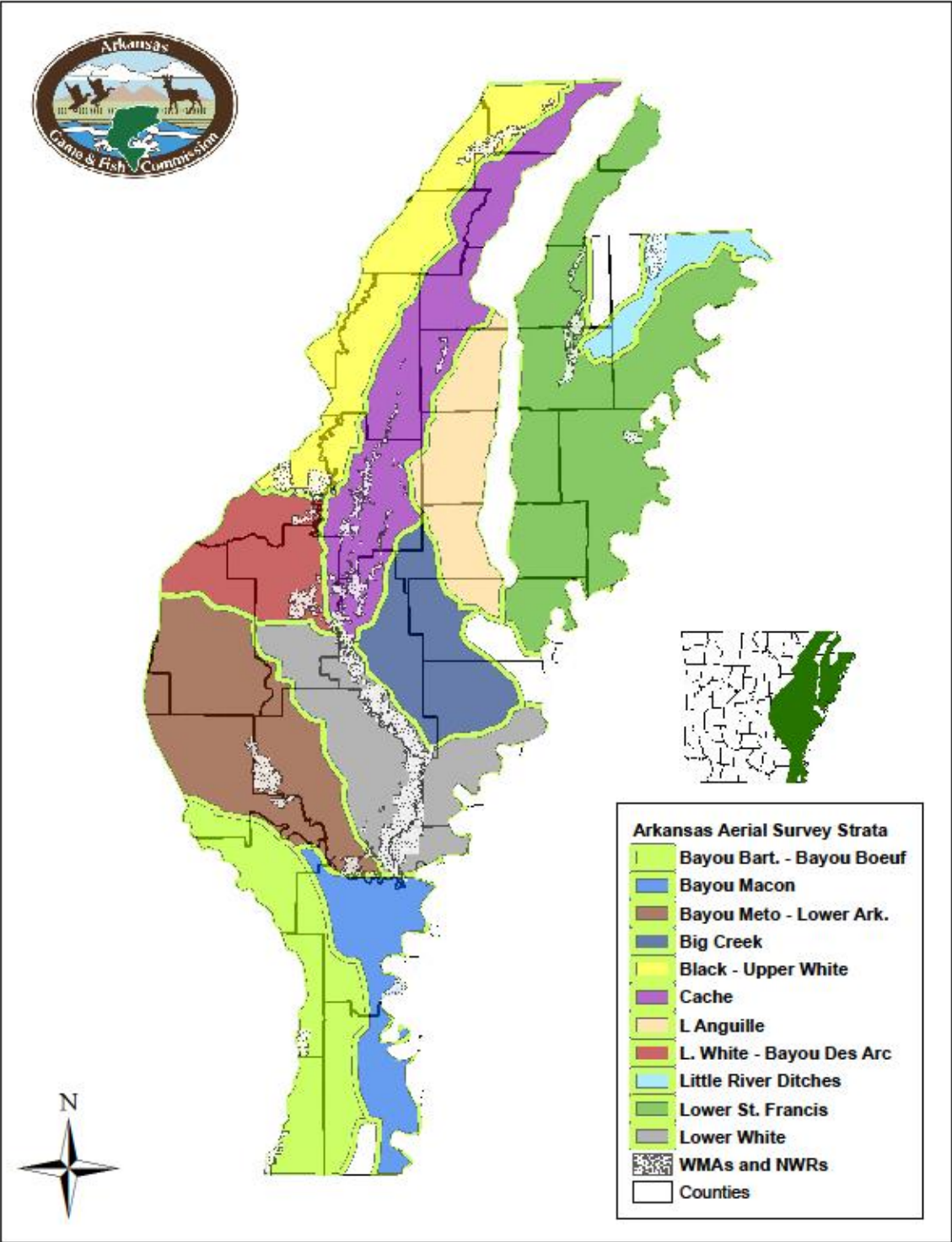


Figure 8. Aerial waterfowl survey strata in the Arkansas River valley (ARV) of western Arkansas.

