

White-tailed Deer Population Status 2019

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Abstract

The statewide post-hunt white-tailed deer population estimate for 2019 was approximately 1.19 – 1.45 million deer. This year's post-hunt estimate is lower than last year's as could be predicted considering that harvest figures drive population modeling. Importantly, this year's estimate overlaps with last year's post-hunt estimate of 1.37 – 1.67 million deer. The overlap means that the deer population between these two years has not significantly changed.

Methods

DMUs largely followed county boundaries and units with similar deer season frameworks were combined into deer management zones (Figure 1). Deer population size and density were estimated for 82 areas (61 entire counties, 10 counties split between 2 management zones, and Madeline Island as separate from Ashland County). Estimates were not made for tribal reservation units or metro subunits due to lack of harvest or aging data. Density was estimated based on total land area rather than estimates of suitable deer habitat.

Population estimates for DMUs were calculated using the Sex-Age-Kill (SAK) formula. This formula combines information on the age composition of the buck harvest with an estimate of the percentage of adult buck mortality that is due to legal hunting (buck recovery rate) to estimate the annual percentage of the adult buck population that is harvested (annual buck harvest rate). The pre-hunt adult buck population size in each DMU is estimated by dividing the DMU's registered buck harvest by an estimate of annual buck harvest rate. Pre-hunt adult buck population estimates are then expanded to the entire pre-hunt deer population by: 1) multiplying buck population estimates by adult sex-ratios to estimate the adult doe population size, and 2) multiplying doe population estimates by fall fawn to doe ratios to estimate fall fawn populations. Post-hunt deer populations are estimated by subtracting total harvest from pre-hunt estimates with allowance for 15% wounding loss/unreported harvest.

Annual inputs to the SAK formula for each DMU are: 1) registered harvests of antlered and antlerless deer, 2) percentage of yearlings among harvested adult bucks, 3) percentage of yearlings among harvested adult does, 4) buck recovery rate, and 5) early fall fawn to doe ratios. Yearling buck and doe percentages by DMU were estimated from aging data from meat locker and CWD sampling (see 'Deer Ages and Conditions' in Big Game wildlife survey reports on dnr.wi.gov) including the previous 5 years of data to smooth temporally and use of a spatial smoothing model to borrow information from neighboring DMUs and smooth spatially. Fawn to doe ratios were estimated from a combination of Summer Deer Observation surveys (see 'Summer Deer Observations 2019' on dnr.wi.gov), Operation Deer Watch roadside surveys, and Snapshot Wisconsin as well as the previous 5 years of Summer Deer Observation survey data to smooth temporally and a spatial smoothing model to borrow information from neighboring DMUs and smooth spatially. The spatial smoothing model provided an estimate of uncertainty for the aging data and fawn to doe ratio inputs. Buck recovery rate was assumed to be 65 – 75% to allow for uncertainty in this parameter. A hunter selectivity parameter of 5 – 10% was added to all DMUs in Farmland Zones (Figure 1) to account for suspected hunter selection against yearling bucks in areas with higher deer density.

The SAK formula was run in a Bayesian framework using a spatial smoothing model and uniform distribution inputs which led to estimates of uncertainty and 95% credible intervals around point estimates. A 95% credible interval can be defined as 'given our observed data and

the model chosen for these data, there is a 95% probability that the true value falls in this range.'

Results and Discussion

Estimates of post-hunt deer populations during 2019 were made for 82 DMUs (Table 1; and ['Herd Abundance'](#) on dnr.wi.gov). Statewide, the final 2019-20 post-hunt population estimate was 1.19 – 1.45 million deer and was not significantly different than last year's post-hunt estimate. Population estimates are made for each year independent of the previous year's estimate and were finalized following review of the raw deer aging and recruitment data by local biologists. Mean post-hunt population densities by DMU in 2019 ranged from 4 – 62 deer/mi² of land area and averaged 24 (95% credible interval: 21 – 29) deer/mi² of land area (Figure 2; and ['Overwinter Deer Densities'](#) on dnr.wi.gov).

Population estimates decreased in all zones with more reduction in the Forest Zones (Figure 3). Post-hunt deer population estimates in the Northern Forest Zone have ranged from ~250,000 deer to >400,000 deer since 2002 and the 2019 post-hunt deer population estimate is approximately 323,000 (Figure 3). Four mild to moderate winters in a row and limited antlerless harvest help to explain the population growth in the northern deer herd in recent years while the latest possible opening date and winter storm conditions for the 9-day gun season likely resulted in a lower estimate in 2019 than 2018. The Central Forest Zone post-hunt population estimates have been largely stable since 2009 at 60,000 – 80,000 deer on average and the 2019 post-hunt deer estimate was 59,000 (Figure 3). The Central Farmland Zone deer population has increased since 2008 and the 2019 post-hunt deer population estimate was the third highest estimate in the last 17 years. For a fifth year in a row, the 2019 post-hunt deer population estimate in the Southern Farmland Zone exceeded 250,000 (Figure 3).

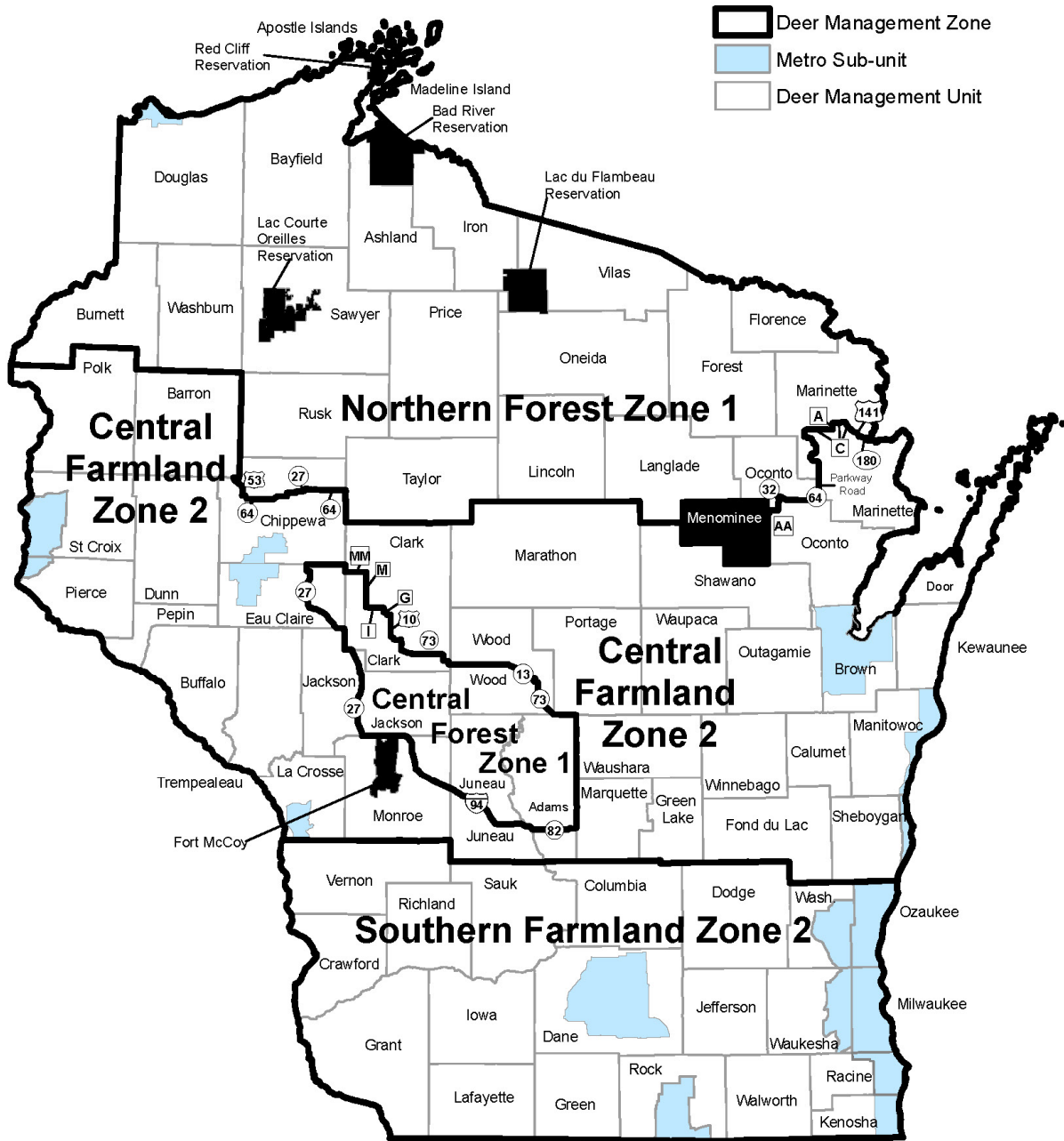


Figure 1. Wisconsin's deer management units and zones in 2019.

Table 1. Deer post-hunt population size estimates and densities (deer per square mile of land area; mean and 95% credible intervals [CrI]) for WI deer management units, 2019.

Deer Management Unit	Post-hunt population size			Post-hunt population density		
	Mean	Lower 95% CrI	Upper 95% CrI	Mean	Lower 95% CrI	Upper 95% CrI
Adams Farmland	6,443	5,569	7,434	62	54	72
Adams Forest	15,827	13,060	18,955	27	22	32
Ashland Forest	11,081	9,143	13,527	14	11	17
Barron Farmland	18,378	15,466	21,671	21	17	24
Bayfield Forest	24,325	19,329	30,885	16	13	21
Brown Farmland	10,623	8,995	12,413	20	17	23
Buffalo Farmland	21,059	17,832	24,691	30	25	35
Burnett Forest	19,687	16,159	23,805	22	18	27
Calumet Farmland	4,591	3,884	5,364	12	10	14
Chippewa Farmland	15,420	13,020	18,089	21	18	25
Chippewa Forest	6,761	5,655	7,985	22	19	26
Clark Farmland	21,937	18,480	25,735	25	21	30
Clark Forest	11,064	9,176	13,159	32	26	38
Columbia Farmland	29,867	26,032	34,171	38	33	43
Crawford Farmland	16,680	14,129	19,591	28	24	33
Dane Farmland	20,686	18,049	23,602	17	15	19
Dodge Farmland	16,724	14,402	19,269	18	16	21
Door Farmland	15,257	12,314	18,781	31	25	38
Douglas Forest	25,478	20,386	31,967	19	15	24
Dunn Farmland	23,815	20,326	27,659	28	24	32
Eau Claire Farmland	10,947	9,372	12,655	22	19	26
Eau Claire Forest	4,517	3,754	5,362	29	24	34
Florence Forest	12,433	10,123	15,372	25	20	31
Fond du Lac Farmland	14,815	12,638	17,203	19	17	22
Forest Forest	11,968	10,085	14,277	11	10	14
Grant Farmland	27,805	23,437	32,721	24	20	28
Green Farmland	10,374	8,737	12,194	18	15	21
Green Lake Farmland	13,204	11,328	15,306	35	30	40
Iowa Farmland	22,486	19,562	25,759	29	25	34
Iron Forest	5,536	4,524	6,843	7	6	9
Jackson Farmland	16,583	14,257	19,144	32	27	37
Jackson Forest	8,923	7,441	10,581	19	15	22
Jefferson Farmland	11,024	9,428	12,791	19	16	22
Juneau Farmland	11,815	10,224	13,622	35	30	40
Juneau Forest	8,748	7,316	10,364	19	16	22
Kenosha Farmland	1,543	1,171	1,999	6	4	7
Kewaunee Farmland	10,353	8,550	12,385	30	25	36
La Crosse Farmland	14,987	12,841	17,406	31	27	36
Lafayette Farmland	10,191	8,511	12,097	16	13	19
Langlade Forest	17,489	14,764	20,602	20	17	23
Lincoln Forest	16,907	14,352	19,760	19	16	22
Madeline Island Forest	428	351	526	19	15	23

Deer Management Unit	Post-hunt population size			Post-hunt population density		
	Mean	Upper 95%	Lower 95%	Mean	Upper 95%	Lower 95%
		CrI	CrI		CrI	CrI
Manitowoc Farmland	13,288	10,994	15,798	22	18	27
Marathon Farmland	42,895	36,556	49,996	27	23	32
Marinette Farmland	24,824	20,780	29,536	38	32	45
Marinette Forest	22,776	19,016	27,294	30	25	35
Marquette Farmland	23,383	20,224	26,947	50	44	58
Milwaukee Farmland	978	795	1,190	4	3	5
Monroe Farmland	25,274	21,819	29,173	37	32	43
Monroe Forest	3,138	2,603	3,737	24	20	28
Oconto Farmland	25,859	22,016	30,223	39	33	46
Oconto Forest	7,045	5,968	8,280	20	17	23
Oneida Forest	19,111	16,152	22,635	15	13	18
Outagamie Farmland	14,056	11,975	16,323	22	19	25
Ozaukee Farmland	4,132	3,408	4,942	18	15	21
Pepin Farmland	7,820	6,608	9,172	31	27	37
Pierce Farmland	13,799	11,406	16,519	23	19	28
Polk Farmland	24,727	20,623	29,346	26	22	31
Portage Farmland	24,036	20,626	27,843	29	25	34
Price Forest	22,795	19,305	26,837	18	15	21
Racine Farmland	2,535	2,017	3,147	7	6	9
Richland Farmland	27,053	23,535	31,018	46	40	53
Rock Farmland	8,788	7,328	10,407	12	10	14
Rusk Forest	22,903	19,280	26,961	25	21	29
Sauk Farmland	30,207	26,275	34,646	36	31	41
Sawyer Forest	17,660	14,932	20,827	14	12	17
Shawano Farmland	37,609	32,082	43,855	41	35	48
Sheboygan Farmland	9,907	8,202	11,781	19	16	23
St. Croix Farmland	13,152	11,000	15,558	18	15	21
Taylor Forest	25,588	21,445	30,140	26	22	31
Trempealeau Farmland	23,214	19,895	26,927	31	27	36
Vernon Farmland	30,127	25,925	34,906	37	32	43
Vilas Forest	15,513	12,783	19,006	17	14	21
Walworth Farmland	5,909	4,831	7,154	10	8	12
Washburn Forest	17,069	14,343	20,173	20	17	24
Washington Farmland	9,303	7,792	10,972	21	18	25
Waukesha Farmland	10,782	9,071	12,707	19	16	22
Waupaca Farmland	35,197	30,221	40,702	46	40	53
Waushara Farmland	22,213	19,177	25,597	35	30	40
Winnebago Farmland	7,786	6,685	9,003	13	12	16
Wood Farmland	12,881	10,945	15,001	27	23	32
Wood Forest	6,988	5,815	8,292	21	17	24
Total/Average	1,311,099	1,108,625	1,542,293	24	21	29

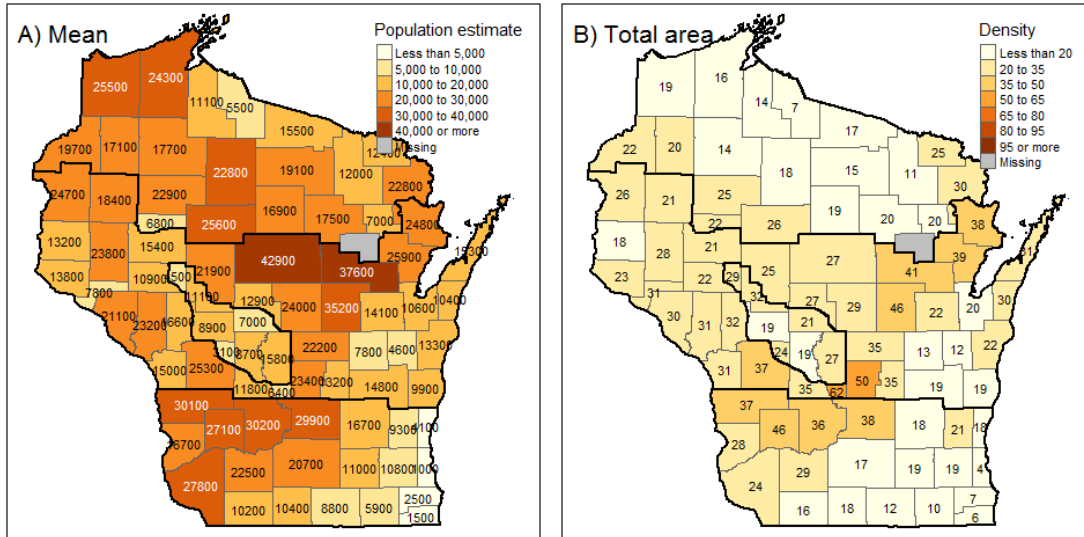


Figure 2. Estimated 2019 mean post-hunt population estimates for each Deer Management Unit of Wisconsin shown as A) mean estimate and B) deer per square mile (total area).

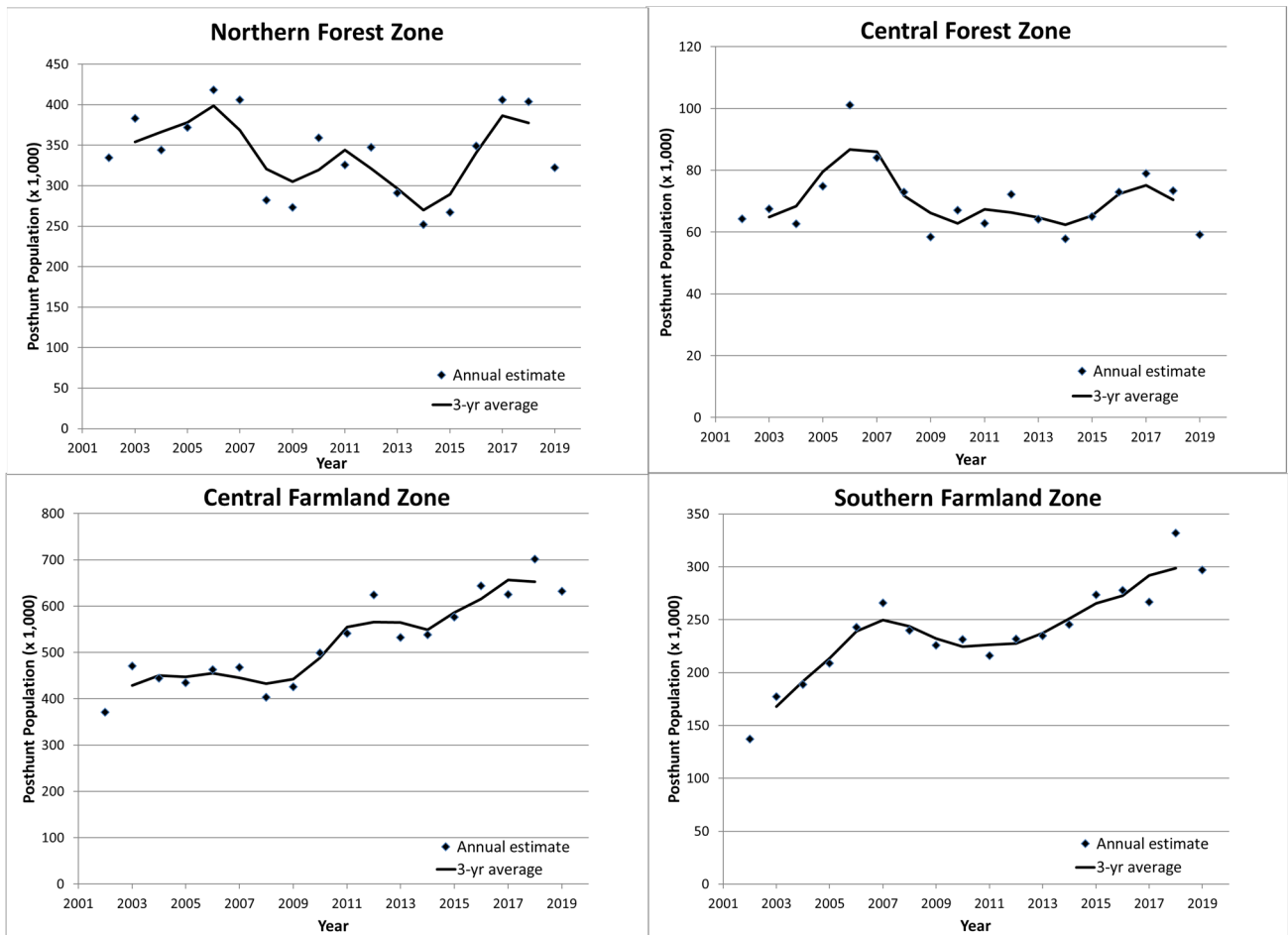


Figure 3. White-tailed deer population trends in Wisconsin's deer management zones, 2002-2019.