White-tailed Deer Population Status
2018

By Jennifer Stenglein and Beth Wojcik

Abstract

The statewide post-hunt white-tailed deer population estimate for 2018 was approximately 1,510,400 deer (95% Credible Interval: 1,365,400 – 1,666,700 deer) and the mean estimate was 10% higher than in 2017. Population estimates decreased 0.5% from 2017 to 2018 in the Northern Forest Zone and 7% in the Central Forest Zone. Zonal estimates increased 12% in the Central Farmland and 24% in the Southern Farmland.

Methods

Deer management units (DMUs) and deer management zones changed slightly from what was used in 2017. The Central Forest Zone boundary was modified in Eau Claire and Clark counties, and the Northern Forest Zone boundary was modified in Marinette and Chippewa counties. This latter boundary modification split the Chippewa County DMU, so that the northern portion (305 square miles) of the county was removed from the Central Farmland Zone and added to the Northern Forest Zone as the Chippewa Forest DMU. 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 Harvest Report 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 2018' on dnr.wi.gov), Operation Deer Watch roadside surveys, and Snapshot Wisconsin as well as the previous 4 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 2018 were made for 82 DMUs (Table 1; and 'Herd Abundance' on dnr.wi.gov). Statewide, the 2018 post-hunt population estimate was approximately 1,510,400 deer (95% credible interval: 1,365,400 – 1,666,700) and the mean estimate was 10% higher than in 2017. Mean post-hunt population densities by DMU in 2018 ranged from 3-61 deer/mi^2 of land area and averaged 27 (95% credible interval: 25 – 30) deer/mi^2 of land area (Figure 2; and 'Overwinter Deer Densities' on dnr.wi.gov).

Population estimates decreased 0.5% from 2017 to 2018 in the Northern Forest Zone and 7% in the Central Forest Zone. Zonal estimates increased 12% in the Central Farmland and 24% in the Southern Farmland (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 2018 post-hunt deer population estimate is close to as high as we have seen the population since 2002 (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 2018. The Central Forest Zone post-hunt population estimates have been largely stable since 2009 at 60,000 – 80,000 deer on average. The Central Farmland Zone deer population has increased since 2008 and the 2018 post-hunt deer population estimate was the highest estimate in the last 16 years. For a fourth year in a row, the 2018 post-hunt deer population estimate in the Southern Farmland Zone exceeded 250,000. It also surpassed previous years estimates at over 300,000 deer (Figure 3).

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, 2018.*

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	6,300	5,400	7,300	61	52	71
Adams Forest	19,900	16,500	23,800	34	28	41
Ashland Forest	14,900	12,300	18,100	18	15	22
Barron Farmland	21,100	17,600	25,000	24	20	28
Bayfield Forest	33,100	26,400	41,900	22	18	28
Brown Farmland	11,600	9,800	13,600	22	18	26
Buffalo Farmland	24,200	20,300	28,600	34	29	40
Burnett Forest	22,600	18,500	27,400	26	21	31
Calumet Farmland	5,300	4,400	6,200	13	11	16
Chippewa Farmland	17,200	14,600	20,200	23	20	27
Chippewa Forest	7,600	6,300	8,900	25	21	29
Clark Farmland	21,900	18,300	25,900	25	21	30
Clark Forest	10,800	9,000	12,900	31	26	37
Columbia Farmland	31,300	27,200	36,000	39	34	45
Crawford Farmland	21,100	17,800	24,900	35	30	42
Dane Farmland	22,300	19,300	25,500	18	16	21
Dodge Farmland	17,700	15,200	20,500	20	17	23
Door Farmland	18,100	14,400	22,400	37	29	46
Douglas Forest	32,600	26,200	40,900	24	20	31
Dunn Farmland	23,300	19,800	27,300	27	23	32
Eau Claire Farmland	10,900	9,200	12,700	22	19	26
Eau Claire Forest	5,400	4,500	6,400	34	29	41
Florence Forest	15,600	12,500	19,400	31	25	39
Fond du Lac Farmland	16,100	13,700	18,700	21	18	24
Forest Forest	17,500	14,700	20,700	17	14	20
Grant Farmland	31,600	26,500	37,200	27	22	31
Green Farmland	11,600	9,800	13,700	20	17	23
Green Lake Farmland	14,800	12,700	17,100	39	33	45
Iowa Farmland	26,700	23,200	30,700	35	30	40
Iron Forest	6,900	5,600	8,400	9	7	11
Jackson Farmland	19,000	16,300	22,100	37	31	43
Jackson Forest	10,300	8,600	12,200	21	18	25
Jefferson Farmland	10,900	9,200	12,700	19	16	22
Juneau Farmland	14,000	12,100	16,300	42	36	48
Juneau Forest	12,700	10,700	15,000	27	23	32
Kenosha Farmland	1,600	1,200	2,100	6	4	7
Kewaunee Farmland	12,300	10,200	14,800	36	30	43
La Crosse Farmland	17,100	14,500	20,000	36	30	42
Lafayette Farmland	12,400	10,400	14,700	20	16	23
Langlade Forest	24,000	20,200	28,300	27	23	32
Lincoln Forest	22,900	19,400	26,800	25	21	30
Madeline Island Forest	500	400	600	21	17	25
Manitowoc Farmland	15,700	13,000	18,700	26	22	31

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
Marathon Farmland	49,500	42,000	57,900	31	27	37
Marinette Farmland	23,900	19,800	28,700	36	30	44
Marinette Forest	25,200	20,900	30,300	33	27	39
Marquette Farmland	26,300	22,700	30,400	57	49	66
Milwaukee Farmland	800	700	1,000	3	3	4
Monroe Farmland	28,700	24,600	33,300	42	36	49
Monroe Forest	5,100	4,300	6,000	39	32	46
Oconto Farmland	28,100	23,700	33,000	43	36	50
Oconto Forest	10,700	9,000	12,600	30	25	35
Oneida Forest	25,800	21,900	30,400	21	18	25
Outagamie Farmland	16,000	13,500	18,700	25	21	29
Ozaukee Farmland	3,700	3,000	4,400	16	13	19
Pepin Farmland	7,200	6,000	8,500	29	24	34
Pierce Farmland	13,700	11,200	16,500	23	19	28
Polk Farmland	26,000	21,500	31,100	27	22	32
Portage Farmland	26,000	22,300	30,000	32	27	37
Price Forest	30,500	25,900	35,800	24	20	28
Racine Farmland	2,200	1,700	2,700	6	5	8
Richland Farmland	32,300	27,800	37,400	55	47	63
Rock Farmland	8,900	7,400	10,600	12	10	15
Rusk Forest	27,000	22,800	31,700	29	24	34
Sauk Farmland	37,100	32,200	42,800	44	38	51
Sawyer Forest	25,500	21,700	30,000	21	18	24
Shawano Farmland	42,300	35,900	49,400	46	40	54
Sheboygan Farmland	11,400	9,500	13,600	22	18	26
St. Croix Farmland	12,800	10,600	15,300	17	14	21
Taylor Forest	30,200	25,300	35,600	31	26	36
Trempealeau Farmland	26,300	22,400	30,700	35	30	41
Vernon Farmland	34,700	29,500	40,500	42	36	50
Vilas Forest	17,500	14,400	21,500	19	16	24
Walworth Farmland	5,800	4,800	7,000	10	8	12
Washburn Forest	21,000	17,600	24,800	25	21	29
Washington Farmland	9,900	8,200	11,800	23	19	27
Waukesha Farmland	9,200	7,700	10,900	16	13	19
Waupaca Farmland	38,500	32,900	44,700	50	43	58
Waushara Farmland	25,000	21,500	28,800	39	34	45
Winnebago Farmland	9,600	8,200	11,100	17	14	19
Wood Farmland	13,400	11,300	15,700	29	24	33
Wood Forest	9,200	7,700	10,900	27	23	32
Total/Average	1,510,400	1,365,400	1,666,700	27	25	30

Figure 1. *Wisconsin's deer management units and zones in 2018.*

2018 Winter Deer Pop Estimate Per Sq. Mile

Density
- Less than 10
- 10 to 20
- 20 to 30
- 30 to 40
- 40 to 50
- 50 or more
- Missing

Figure 2. *Estimated 2018 mean post-hunt deer density (deer per square mile of total area) for Wisconsin's deer management units.*
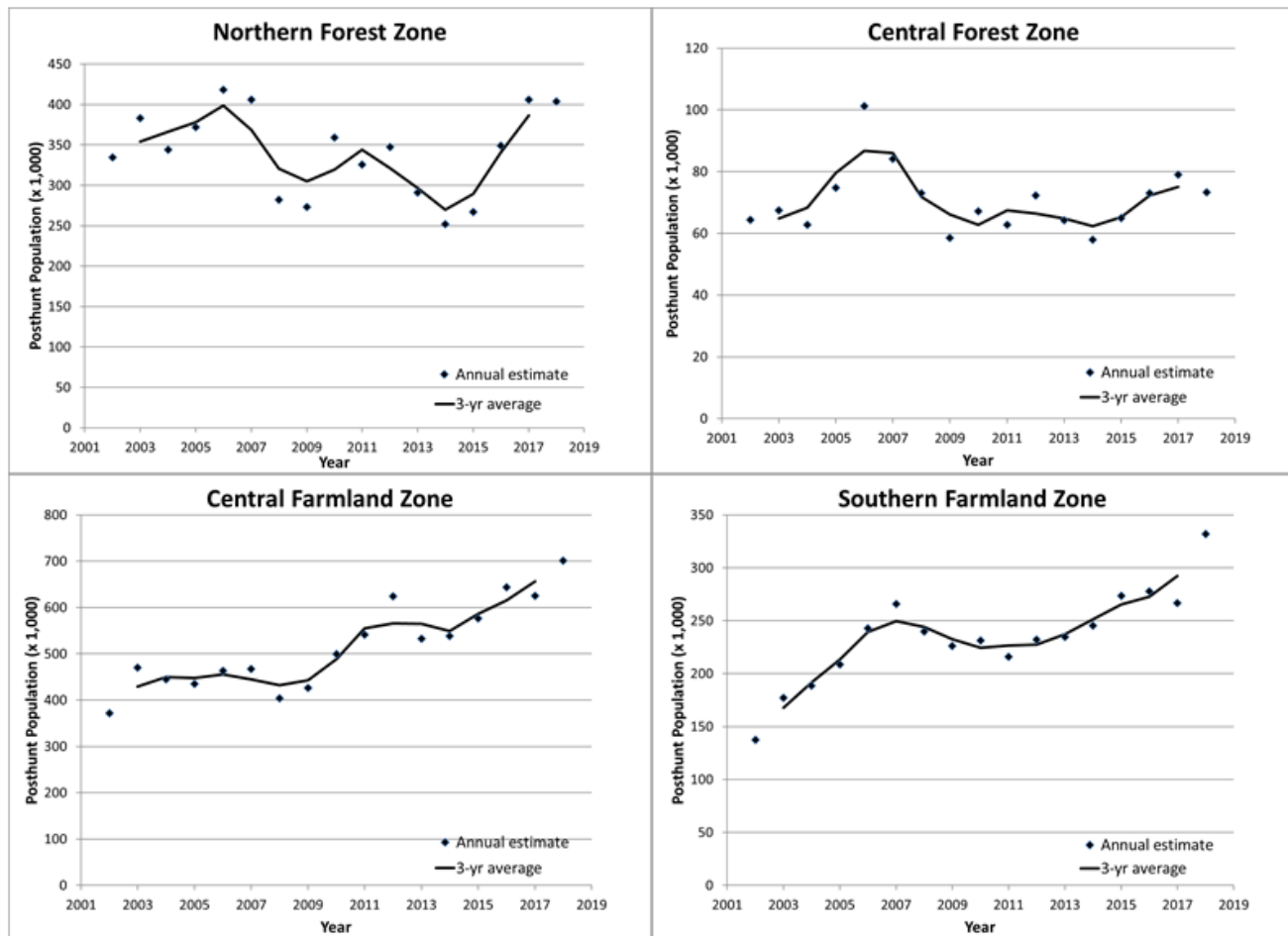
Figure 3. *White-tailed deer population trends in Wisconsin's deer management zones, 2002-2018.*