United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Migratory Bird Management
Branch of Assessment and Decision Support
11510 American Holly Drive
Laurel, Maryland, 20708-4016

MEMORANDUM

TO: Mark Seamans

FROM: Joshua Dooley

DATE: 15 August 2024

SUBJECT: Atlantic Population Canada Goose Integrated Population Model 2025 Abundance Prediction

In fall 2020, the Atlantic Flyway Council adopted the use of an integrated population model (IPM) to inform harvest management decisions for Atlantic Population Canada geese (AP CAGO; Dooley 2019). The AP CAGO harvest strategy established regulatory thresholds relative to the IPM out-year prediction of breeding pairs (Table 1) and consideration of status and trends in productivity and total population size. The AP CAGO IPM predicted 2025 median number of breeding pairs was 133,500 (95% CI = 93,000–187,500; Figure 1, Table 3), indicating moderate hunting regulations for the 2025–26 hunting season.

Input data included in the AP CAGO IPM were provided in Table 2. Aerial surveys and banding operations were not conducted in 2020 and 2021 due to the COVID-19 pandemic. The IPM predicted adult harvest probability for the 2024–25 hunting season was 0.046 (95% CI = 0.037–0.058; Figure 1, Table 3). The IPM predicted August 2024 juvenile:adult age ratio was 1.53 (95% CI = 1.23–1.82), which was greater than the observed 1997–2023 average (1.28). Average temperature during May 2024 at Kuujjuaq, Québec was 3.7°C ($\bar{x}_{1997\text{-}2023}$= 1.6°C), and the proportion of snow/ice cover on the Ungava Peninsula on 15 June 2024 was 0.29 ($\bar{x}_{1997\text{-}2023}$= 0.39). In last year's memo, the out-year (2024) median breeding pair prediction from the IPM was 147,500 (95% CI = 105,000–199,000), which was +66% greater than the observed 2024 aerial survey breeding pair estimate of 88,890 ± 9,050 (SE; Lefebvre et al. 2024).

LITERATURE CITED

Dooley, J. L. 2019. Atlantic Population Canada Goose Integrated Population Model. Unpubl. Report to Atlantic Flyway Technical Section. U. S. Fish and Wildlife Service, Laurel, MD. November 2019.

Lefebvre, J., F. St-Pierre, and R. Spangler. 2024. A breeding pair survey of Canada Geese in northern Québec - 2024. Canadian Wildlife Service, Québec Region. Report to the Atlantic Flyway Technical Section. July 2024.

Table 1. Current prescribed Atlantic Population Canada goose harvest strategy showing population abundance thresholds and corresponding hunting regulations.

Abundance threshold (IPM out-year prediction of breeding pairs)	Package	Regulations (Days/Bag)
>160K	Liberal	Chesapeake (45/2), New England/Mid-Atlantic (45/3), NC (30/2), Canada (full season length/5)
Between 125–160K	Moderate	Chesapeake (30/2), New England/Mid-Atlantic (30/3), NC (30/1), Canada (25% decrease from liberal)
Between 60–125K	Restrictive	All U.S. AP harvest zones (30/1), Canada (50% decrease from liberal)
<60K and negative trend	Potential Closure	All areas (0/0)

Table 2. Input data included in the Atlantic Population Canada goose integrated population model and summarized band-recovery data, 1997–2024.

	Survey abundance (in thousands)							Harvest Regulations (days, bag)							
	Breeding Pairs		Total		Banding age ratio	Env. Covariate		Ches.		MidAtl/NE		Canada		Total	
Year	Est	SE	Est	SE	Juv:Ad	MayTemp	Prop. SnowIce	d	b	d	b	d	b	d	b
1997	72	7	444	44	1.42	1.5	0.25	0	0	0	0	0	0	0	0
1998	49	4	513	51	1.73	2.9	0.09	0	0	0	0	0	0	0	0
1999	84	8	468	45	1.33	2.8	0.61	6	1	15	1	20	3	41	5
2000	96	8	695	71	0.90	0.8	0.83	6	1	15	1	20	3	41	5
2001	135	13	602	60	1.86	4.8	0.07	30	1	30	2	30	5	90	8
2002	182	18	1,069	108	1.23	-1.1	0.65	45	1	45	2	45	5	135	8
2003	175	17	864	87	1.61	4.7	0.18	45	1	45	2	45	5	135	8
2004	192	19	1,096	112	1.02	-0.6	0.76	45	1.5	45	3	45	5	135	9.5
2005	176	17	1,219	126	1.64	4.7	0.08	45	2	45	3	45	5	135	10
2006	186	20	1,263	141	1.49	5.3	0.26	45	2	45	3	45	5	135	10
2007	207	21	1,297	132	0.94	-1.7	0.84	45	2	45	3	45	5	135	10
2008	174	18	934	104	1.80	5.5	0.09	45	2	45	3	45	5	135	10
2009	187	20	1,203	128	1.05	-1.9	0.90	45	2	45	3	45	5	135	10
2010	165	18	811	82	1.42	1.2	0.28	45	2	45	3	60	5	150	10
2011	216	23	980	104	1.03	-1.0	0.46	45	2	45	3	60	5	150	10
2012	190	20	871	93	1.37	1.9	0.10	50	2	50	3	60	5	160	10
2013	—	—	—	—	1.11	0.8	0.28	50	2	50	3	60	5	160	10
2014	191	20	808	87	1.23	1.7	0.13	50	2	50	3	60	5	160	10
2015	161	16	864	89	1.30	1.5	0.34	50	2	50	3	60	5	160	10
2016	192	25	663	80	0.99	0.9	0.45	50	2	50	3	60	5	160	10
2017	161	17	706	73	1.67	2.1	0.18	50	2	50	3	60	5	160	10
2018	112	11	739	77	0.01	-5.1	0.99	50	2	50	3	60	5	160	10
2019	120	12	622	64	1.28	4.3	0.18	30	1	30	2	60	5	120	8
2020	—	—	—	—	—	-0.8	0.94	30	1	30	2	30	3	90	6
2021	—	—	—	—	—	3.4	0.42	30	1	30	1	30	3	90	5
2022	164	17	1,316	142	1.25	1.3	0.12	30	1	30	1	30	3	90	5
2023	115	12	612	65	1.33	2.4	0.11	45	2	45	3	30	3	120	8
2024	89	9	607	65	—	3.7	0.29	30	2	30	3	30	3	90	8

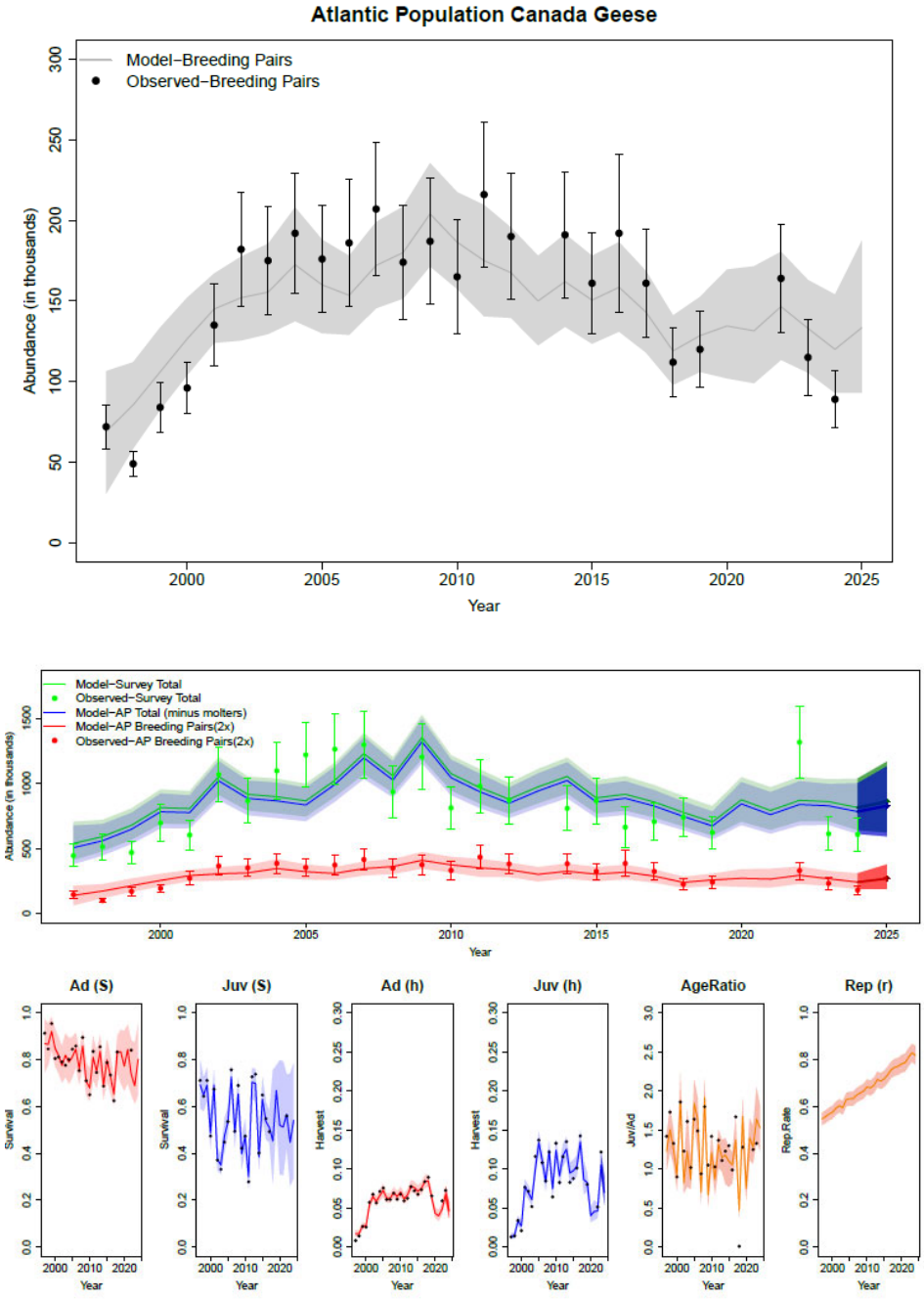
ADULT

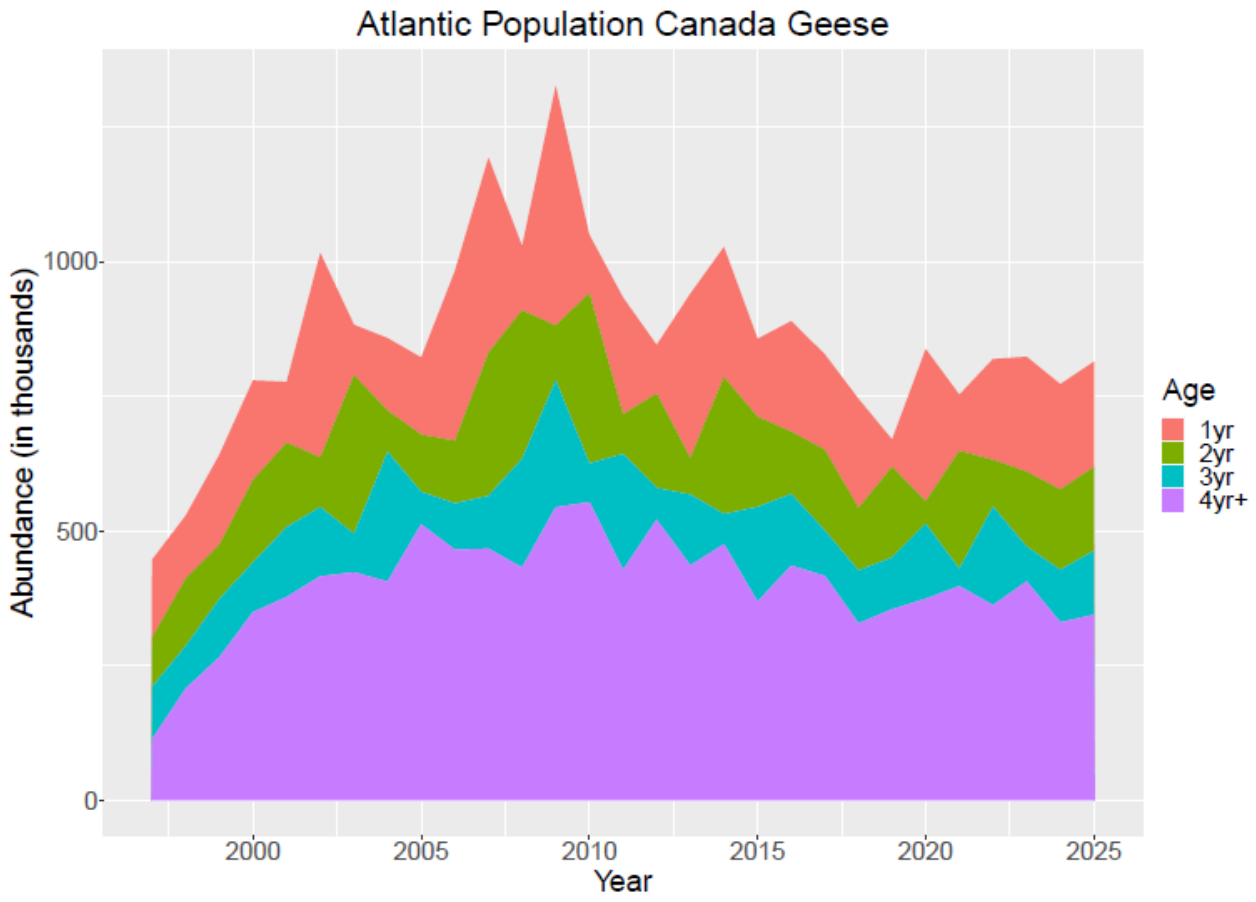
Year	Bandings	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
1997	1299	6	6	14	15	28	29	16	19	17	14	7	6	8	5	1	2	0	2	0	3	1	0	0	0	0	0	0
1998	1981	0	17	21	25	44	47	18	33	36	11	14	9	11	14	8	6	3	1	3	0	1	0	0	0	0	0	0
1999	2987	0	0	43	45	97	65	60	48	40	38	18	27	19	11	8	5	6	2	5	4	2	0	1	1	0	0	0
2000	2312	0	0	0	34	69	63	42	39	37	24	19	16	21	13	9	5	4	3	2	3	0	2	0	0	0	0	0
2001	2706	0	0	0	0	79	83	72	61	56	37	24	28	22	15	18	10	15	4	3	4	3	1	1	0	1	0	1
2002	3098	0	0	0	0	0	137	98	80	67	49	35	30	33	22	12	19	18	14	3	4	6	1	1	0	0	0	0
2003	2064	0	0	0	0	0	0	71	73	57	42	32	40	23	21	13	11	9	9	5	8	2	3	2	1	1	1	0
2004	1119	0	0	0	0	0	0	0	55	43	25	20	26	16	26	7	7	2	8	2	5	3	0	1	0	0	0	0
2005	1127	0	0	0	0	0	0	0	0	61	34	30	28	23	18	6	12	8	6	6	5	4	4	0	0	0	1	1
2006	2911	0	0	0	0	0	0	0	0	0	121	83	92	59	52	32	25	31	23	24	16	8	8	6	2	3	3	2
2007	2106	0	0	0	0	0	0	0	0	0	0	97	64	56	43	23	20	18	19	17	14	13	4	6	3	1	2	1
2008	2187	0	0	0	0	0	0	0	0	0	0	0	116	59	71	24	45	31	26	13	14	19	7	5	3	1	1	2
2009	1412	0	0	0	0	0	0	0	0	0	0	0	0	63	39	27	25	21	18	13	7	7	4	7	3	2	2	5
2010	1824	0	0	0	0	0	0	0	0	0	0	0	0	0	98	34	32	44	42	22	23	13	6	5	7	6	2	2
2011	1018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46	36	30	25	22	10	14	13	6	4	3	3	4
2012	1416	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72	49	45	25	26	25	12	10	13	3	5	5
2013	1720	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104	68	54	39	31	24	19	9	6	4	13
2014	1773	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	49	53	43	22	27	14	9	11	9
2015	1317	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72	50	40	22	30	12	13	10	11
2016	1928	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	112	75	60	27	24	15	27	22
2017	1502	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	107	45	30	27	25	20	18
2018	3723	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	276	163	75	59	66	64
2019	1332	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	40	35	33	37
2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	1267	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54	69
2023	1306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	77

JUVENILE

Year	Bandings	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
1997	1676	12	12	16	7	22	30	17	12	18	13	10	8	4	10	3	2	3	1	3	1	1	0	1	0	0	0	0
1998	3502	0	28	41	28	46	44	37	35	32	29	26	16	12	18	12	9	11	6	3	5	0	1	0	0	0	1	0
1999	4303	0	0	84	54	82	71	46	65	47	25	30	28	19	12	9	14	9	11	1	2	6	3	3	0	0	0	0
2000	2214	0	0	0	27	39	31	16	19	21	18	12	10	7	8	5	2	4	5	6	2	2	0	1	1	0	0	0
2001	5389	0	0	0	0	244	166	84	79	82	45	49	38	39	35	23	20	19	14	14	12	11	3	3	2	0	0	0
2002	4007	0	0	0	0	0	172	63	54	36	27	15	26	21	18	8	8	7	3	3	4	8	2	1	0	0	2	0
2003	6185	0	0	0	0	0	0	196	106	68	50	44	33	35	24	13	13	17	13	12	8	5	6	3	0	1	0	1
2004	2430	0	0	0	0	0	0	0	175	59	28	30	26	20	15	8	9	6	7	5	9	5	5	4	2	1	0	0
2005	3909	0	0	0	0	0	0	0	0	338	103	73	54	37	41	26	22	15	11	8	7	13	6	6	1	1	0	1
2006	4674	0	0	0	0	0	0	0	0	0	324	197	111	82	72	42	38	29	18	22	12	14	12	18	2	1	2	2
2007	2144	0	0	0	0	0	0	0	0	0	0	118	66	33	23	13	10	13	11	8	8	13	6	5	0	2	0	1
2008	4300	0	0	0	0	0	0	0	0	0	0	0	346	183	79	44	37	40	36	18	18	18	12	8	8	4	4	2
2009	1555	0	0	0	0	0	0	0	0	0	0	0	0	67	32	22	11	15	15	5	5	5	1	3	3	1	3	0
2010	2774	0	0	0	0	0	0	0	0	0	0	0	0	0	251	82	46	46	30	14	17	13	9	9	3	2	1	7
2011	1120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	64	20	12	12	7	4	4	1	1	1	1	1	0
2012	2134	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	173	97	61	42	26	38	26	17	5	5	9	9
2013	2104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	202	104	42	45	35	18	16	8	4	5	15
2014	2345	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	140	61	39	30	24	15	4	3	8	2
2015	1852	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	119	82	52	42	11	8	6	10	15
2016	2083	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	156	76	55	23	23	10	11	9
2017	2628	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	281	113	56	32	11	18	15
2018	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019	1762	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	109	43	34	33	24
2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	1725	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71	57
2023	2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	199

Figure 1 and Table 3. Atlantic Population Canada goose integrated population model posterior estimates (median/95% credible limits[line/shading]) of breeding pairs (top plot), total and breeding abundance indices (with 2025 out-year prediction in darker shading), other model parameters (middle plot; ad=adult; juv=juvenile; S=survival; h=harvest rate; AgeRatio=juvenile:adult at banding; r=reporting rate), and abundance indices by age class (bottom plot). Observed data (abundance, age ratios) and estimates of survival and harvest rates from other band-recovery analyses (i.e., fitting a global model in Program MARK) were included as points.




Atlantic Population Canada Geese
Abundance (in thousands)
1000
500
0
2000
2005
2010
2015
2020
2025
Year
Age
1yr
2yr
3yr
4yr+

Year	Abundance						Survival				Harvest				Juv:Adult	
	Breeding Pairs		Breeding Pairs (2X)		Total		Adult		Juvenile		Adult		Juvenile		Age Ratio	
	median	95% CI	median	95% CI	median	95% CI	median	95% CI	median	95% CI	median	95% CI	median	95% CI	median	95% CI
1997	69,000	(30,500-106,500)	138,000	(61,000-213,000)	537,000	(411,000-705,000)	0.871	(0.749-0.974)	0.694	(0.593-0.799)	0.017	(0.013-0.022)	0.013	(0.010-0.018)	1.23	(0.99-1.45)
1998	85,500	(58,500-112,000)	171,000	(117,000-224,000)	590,000	(478,000-719,000)	0.866	(0.776-0.955)	0.649	(0.580-0.725)	0.017	(0.014-0.022)	0.015	(0.011-0.019)	1.51	(1.22-1.78)
1999	106,000	(82,500-133,500)	212,000	(165,000-267,000)	678,000	(567,000-807,000)	0.922	(0.842-0.984)	0.693	(0.624-0.767)	0.027	(0.024-0.032)	0.034	(0.028-0.040)	1.25	(1.06-1.51)
2000	126,500	(104,000-152,000)	253,000	(208,000-304,000)	813,000	(689,000-953,000)	0.849	(0.772-0.933)	0.487	(0.420-0.562)	0.027	(0.024-0.031)	0.027	(0.022-0.034)	0.92	(0.73-1.08)
2001	145,000	(124,000-167,000)	290,000	(248,000-334,000)	806,000	(688,000-940,000)	0.820	(0.742-0.899)	0.692	(0.631-0.756)	0.054	(0.049-0.060)	0.077	(0.069-0.087)	1.88	(1.63-2.23)
2002	152,000	(125,500-177,500)	304,000	(251,000-355,000)	1,051,000	(910,000-1,201,000)	0.776	(0.703-0.859)	0.374	(0.329-0.425)	0.065	(0.059-0.071)	0.070	(0.061-0.079)	0.82	(0.69-1.00)
2003	155,500	(129,500-185,500)	311,000	(259,000-371,000)	915,000	(791,000-1,052,000)	0.820	(0.726-0.914)	0.351	(0.312-0.397)	0.058	(0.053-0.065)	0.061	(0.053-0.069)	1.23	(0.78-1.77)
2004	172,500	(137,500-208,000)	345,000	(275,000-416,000)	897,000	(771,000-1,035,025)	0.791	(0.698-0.894)	0.473	(0.407-0.550)	0.066	(0.060-0.074)	0.100	(0.088-0.114)	0.87	(0.74-1.10)
2005	160,000	(130,000-188,000)	320,000	(260,000-376,000)	865,000	(745,000-997,000)	0.813	(0.724-0.898)	0.533	(0.478-0.595)	0.072	(0.065-0.081)	0.134	(0.120-0.148)	1.84	(1.59-2.15)
2006	153,500	(129,000-178,000)	307,000	(258,000-356,000)	1,023,000	(897,000-1,158,025)	0.846	(0.770-0.917)	0.727	(0.670-0.777)	0.063	(0.057-0.069)	0.111	(0.100-0.123)	1.64	(1.21-1.92)
2007	172,000	(145,500-199,000)	344,000	(291,000-398,000)	1,228,000	(1,072,000-1,386,000)	0.762	(0.695-0.842)	0.491	(0.424-0.567)	0.063	(0.057-0.069)	0.084	(0.072-0.097)	0.71	(0.56-0.84)
2008	180,000	(151,500-208,500)	360,000	(303,000-417,000)	1,057,000	(929,000-1,200,000)	0.860	(0.771-0.924)	0.655	(0.584-0.724)	0.070	(0.064-0.077)	0.124	(0.111-0.137)	1.92	(1.52-2.16)
2009	204,000	(171,500-235,500)	408,000	(343,000-471,000)	1,352,000	(1,191,000-1,526,000)	0.709	(0.649-0.789)	0.399	(0.332-0.478)	0.065	(0.059-0.072)	0.075	(0.063-0.088)	0.67	(0.52-0.78)
2010	186,500	(157,500-217,500)	373,000	(315,000-435,000)	1,075,000	(945,000-1,216,000)	0.680	(0.625-0.762)	0.475	(0.413-0.547)	0.071	(0.064-0.078)	0.124	(0.111-0.138)	1.21	(1.04-1.47)
2011	175,000	(140,500-209,500)	350,000	(281,000-419,000)	966,000	(843,000-1,107,000)	0.811	(0.716-0.902)	0.301	(0.252-0.360)	0.062	(0.055-0.069)	0.091	(0.078-0.107)	0.87	(0.67-1.01)
2012	167,500	(139,500-195,500)	335,000	(279,000-391,000)	878,000	(767,000-1,002,000)	0.752	(0.677-0.840)	0.704	(0.631-0.765)	0.067	(0.060-0.074)	0.117	(0.103-0.132)	1.32	(1.02-1.51)
2013	150,000	(122,500-178,000)	300,000	(245,000-356,000)	973,000	(847,000-1,111,000)	0.837	(0.754-0.907)	0.700	(0.624-0.760)	0.078	(0.071-0.086)	0.126	(0.111-0.141)	1.15	(0.97-1.38)
2014	162,000	(134,000-191,500)	324,000	(268,000-383,000)	1,053,000	(922,000-1,198,000)	0.692	(0.631-0.776)	0.385	(0.328-0.452)	0.076	(0.069-0.084)	0.095	(0.083-0.108)	1.18	(0.81-1.40)
2015	150,500	(123,500-178,000)	301,000	(247,000-356,000)	888,000	(769,000-1,024,000)	0.800	(0.708-0.888)	0.632	(0.546-0.725)	0.072	(0.064-0.079)	0.098	(0.085-0.112)	1.10	(0.77-1.28)
2016	158,500	(131,000-186,500)	317,000	(262,000-373,000)	916,000	(791,000-1,054,000)	0.730	(0.657-0.817)	0.537	(0.460-0.621)	0.075	(0.068-0.083)	0.104	(0.091-0.118)	1.06	(0.82-1.22)
2017	143,000	(118,000-168,500)	286,000	(236,000-337,000)	856,000	(738,000-986,000)	0.654	(0.607-0.722)	0.510	(0.447-0.581)	0.084	(0.076-0.093)	0.135	(0.121-0.150)	1.38	(1.19-1.67)
2018	119,000	(98,000-141,000)	238,000	(196,000-282,000)	776,000	(669,000-901,000)	0.834	(0.745-0.905)	0.454	(0.273-0.756)	0.085	(0.078-0.093)	0.086	(0.068-0.110)	0.47	(0.38-0.57)
2019	128,500	(106,000-152,500)	257,000	(212,000-305,000)	703,000	(597,000-824,000)	0.835	(0.698-0.929)	0.670	(0.538-0.776)	0.063	(0.057-0.071)	0.083	(0.071-0.096)	1.67	(1.35-1.92)
2020	134,500	(102,000-169,500)	269,000	(204,000-339,000)	873,000	(707,000-1,047,000)	0.774	(0.668-0.924)	0.520	(0.311-0.798)	0.043	(0.038-0.051)	0.040	(0.032-0.051)	0.75	(0.60-0.90)
2021	131,500	(99,000-171,500)	263,000	(198,000-343,000)	791,000	(643,000-970,000)	0.844	(0.701-0.951)	0.513	(0.308-0.794)	0.040	(0.034-0.047)	0.046	(0.035-0.060)	1.40	(1.12-1.65)
2022	146,500	(113,488-180,512)	293,000	(226,975-361,025)	869,000	(709,000-1,051,000)	0.740	(0.652-0.886)	0.567	(0.426-0.738)	0.049	(0.042-0.057)	0.046	(0.037-0.057)	1.28	(1.07-1.55)
2023	133,000	(105,500-163,000)	266,000	(211,000-326,000)	859,000	(710,000-1,032,000)	0.690	(0.613-0.872)	0.448	(0.261-0.742)	0.068	(0.059-0.078)	0.105	(0.092-0.120)	1.64	(1.37-2.05)
2024	120,000	(93,000-154,000)	240,000	(186,000-308,000)	814,000	(640,000-1,037,000)	0.802	(0.649-0.955)	0.541	(0.295-0.786)	0.046	(0.037-0.058)	0.070	(0.054-0.089)	1.53	(1.23-1.82)
2025	133,500	(93,000-187,500)	267,000	(186,000-375,000)	859,000	(622,000-1,166,000)										