

Supplemental Information—Duck Populations

Wisconsin

Duck pop. Wisconsin, 2015: ¹	372,840 ducks
Duck+CanGeese pop. Wisconsin, 2015: ²	492052 ducks+CanGeese
Wisconsin total area: ³	250,487 km ²
Ducks+CanGeese density Wisconsin:	1.964 ducks+CanGeese/km ²
Just ducks density Wisconsin:	1.48 ducks/km ²

Wisconsin's waterfowl surveys are broken up into four regions based on waterfowl density and habitat type (to account for the fact that ducks attract other ducks and that ducks prefer certain areas more than others). Madison is in Dane County; Dane County is grouped under the Southeast Central (SEC) region:

Duck pop., South-East Central (SEC), WC, 2015: ⁴	183,880 ducks
Duck+CanGeese pop., South-East Central (SEC), WC, 2015:	239319 ducks+CanGeese
Area of South-East Central region: ⁵	17,949 mi ² = 46488 km ²
Ducks+CanGeese density SEC zone:	5.15 ducks+CanGeese/km ²
Just ducks density SEC zone:	4.69 ducks/km ²

New York

New York isn't well covered by government waterfowl surveys. Existing government surveys⁶ (like the one for Wisconsin cited above) do include data coded as "New York," but in reality cover only survey a small sliver of the State (maybe 1/10th overall) and only of the Northern portion of the state (far from New York City). Instead data from the New York State Ornithological Association were used, gathered by volunteers. This dataset was gathered during January and therefore the value is probably low, but it's already higher than the government estimate (something like 305,670 ducks+CanGeese).⁷

New York total area: ⁸	141,297km ²
Duck+CanGeese population in New York, 2014: ^{9,10}	354,641 ducks+CanGeese
Ducks only population, New York, 2014: ¹¹	235,701 ducks

¹ Kent Van Horn *et al.* (2015) Waterfowl Breeding Population Survey for Wisconsin, 1973-2015. *Wisconsin Department of Natural Resources*. 21

² Ibid.

³ United States Census Bureau (2010) State Area Measurements and Internal Point Coordinates. <http://www.census.gov/geo/reference/state-area.html>. Last Update August 2010. Accessed October 2015.

⁴ Kent Van Horn *et al.* (2015) Waterfowl Breeding Population Survey for Wisconsin, 1973-2015. *Wisconsin Department of Natural Resources*. 21

⁵ Ibid.

⁶ U.S. Fish and Wildlife Service, Division of Migratory Bird Management, U.S. Geological Survey, Patuxent Wildlife Research Center. General Database Information. https://migbirdapps.fws.gov/mbdc/databases/db_selection.asp. Accessed October 2015.

⁷ U.S. Fish and Wildlife Service (2011) Overflight Map-Waterfowl Breeding Population and Habitat Survey- Eastern Survey Area. https://migbirdapps.fws.gov/mbdc/databases/mas/WBPHS_2011_eastern_strata_map.pdf. Accessed October 2015.

⁸ United States Census Bureau, "State Area Measurements and Internal Point Coordinates."

⁹ Disaggregated the geese (only included Canadian geese). Region 1: 4930; Region 2: 5730 ; Region 3: 30486 ; Region 4: 2900 ; Region 5: 6380 ; Region 6: 273 ; Region 7: 1321 ; Region 8: 752 ; Region 9: 27189 ; Region 10: 38979.

¹⁰ Bill Ostrander (2014) January Waterfowl Count 2014. *The Kingbird*. 62:2 104-105

¹¹ Ibid.

Duck+CanGeese density, New York:
 Ducks only density, New York:

2.5 ducks/km²
 1.7 ducks/km²

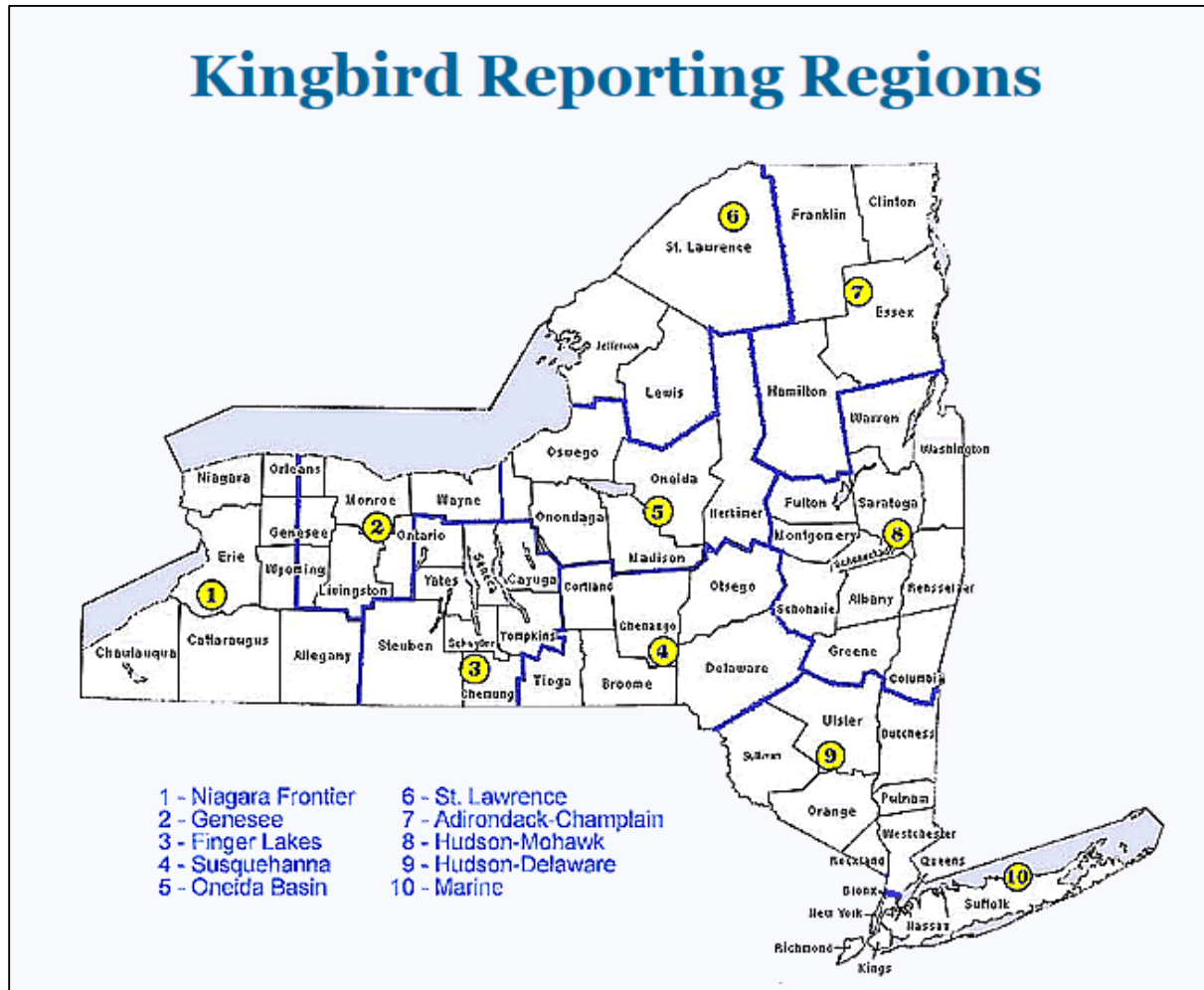


Figure S1. Map of survey reporting regions for the New York State Ornithological Association.¹²

Table S1. Surface Area by New York County		
Region	County	Surface area = Land + water area (mi ²) ^{13,14}
9	Ulster	1124.235+36.525 = 1160.760
9	Dutchess	795.636+29.712 = 825.348
9	Sullivan	968.135+28.587 = 996.722
9	Orange	811.699+26.947 = 838.646
9	Putnam	230.312+15.939 = 246.251
9	Rockland	173.504+25.836 = 199.340

¹² New York State Ornithological Association (2013) Waterfowl Count. <http://nybirds.org/ProjWaterfowl.htm>;
<http://nybirds.org/regionmap.htm>. Accessed October 2015.

¹³ U.S. Census Bureau. http://www2.census.gov/geo/docs/maps-data/data/gazetteer/2015_Gazetteer/2015_gaz_counties_36.txt. Accessed October 2015.

¹⁴ U.S. Census Bureau (2010) New York Land area in square miles, 2010 by County. <http://www.indexmundi.com/facts/united-states/quick-facts/new-york/land-area#map>. Accessed October 2015.

Region	County	Surface area = Land + water area (mi ²) ^{13,14}
9	Westchester	430.516+69.479 = 499.995
10	Bronx	42.051+15.322 = 57.373
10	New York	22.656+11.025 = 33.681
10	Kings	69.813+27.010 = 96.823
10	Queens	108.768+69.263 = 178.031
10	Richmond	58.178+44.115 = 102.293
10	Nassau	284.810+168.666 = 453.476
10	Suffolk	911.722+1461.412 = 2373.134
TOTAL:		6901.113 mi ² = 17873.801 km²

Region 9+10 total area:^{15,16} 17873.801 km²
Region 9+10 total duck+CanGeese (ex. other non-ducks):^{17,18} 163,836 ducks+CanGeese
Region 9+10 total ducks (ex. all non-ducks):¹⁹ 84,599 ducks
Region 9+10 duck+CanGeese density = 16,3836 ducks/15626.62 km² = 9.17 ducks+CanGeese/km²
Region 9+10 ducks only: 4.73 ducks/km²

Correction Factor for New York City

The survey is presumably missing coastal ducks, and since New York City is close to the water this is a potential problem. This dataset was used to correct for “naval” ducks.²⁰

¹⁵ New York State Ornithological Association (2015) JWC Region 9, 1973-2015. http://nybirds.org/Articles/wfc73-15_r9.pdf. Accessed October 2015.

¹⁶ Ibid.

¹⁷ Excluded: other geese to keep this as consistent as possible with the Wisconsin #s (ex. Brant; very few non-CanGeese), swans, loons, grebe, cormorants, coots, and unidentified birds.
Region 9: total used is 40258; Region 10: total used is 123578.

¹⁸ New York State Ornithological Association (2013) Waterfowl Count. <http://nybirds.org/ProjWaterfowl.htm>; <http://nybirds.org/regionmap.htm>. Accessed October 2015.

¹⁹ Region 9: total used is 13069; Region 10: total used is 84599.

²⁰ U.S. Fish and Wildlife Service (2003) Atlantic Flyaway Sea Duck Survey. https://migbirdapps.fws.gov/mbdc/databases/afsos/sds_options.asp. Accessed October 2015.



Atlantic Flyway Sea Duck Survey

State Summary

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Year	Country	State or Province	Species	Count	Segments Available	Segments Flown	Density (Sq. Mi.)	Density(Sq. Km.)
2002	US	NY	BLSC	1788	30	30	16.681594268	6.4412934463
2002	US	NY	BUFF	1060	30	30	9.8895357516	3.8186638999
2002	US	NY	CANV	10	30	30	0.0932975071	0.0360251311
2002	US	NY	COME	105	30	30	0.9796238245	0.3782638769
2002	US	NY	GOLD	344	30	30	3.2094342439	1.2392645109
2002	US	NY	MERG	1079	30	30	10.066801015	3.8871116491
2002	US	NY	LTDU	415	30	30	3.8718465443	1.495042942
2002	US	NY	SCAU	14610	30	30	136.30765786	52.632716583
2002	US	NY	SCOT	354	30	30	3.302731751	1.2752896421
2002	US	NY	SUSC	378	30	30	3.526645768	1.3617499568
2002	US	NY	WWSC	1134	30	30	10.579937304	4.0852498703

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Figure S2. Atlantic Flyway Sea Duck Survey, reproduced from U.S. Fish and Wildlife Service.²¹

Total # for coastal ducks near the New York coast: 21,277 ducks

New York State shoreline coastline:²² 2625 miles (not nautical) = 4224.5km

New York City coastline:²³ 520 miles (not nautical) = 836.8km

$$21,277/4224.5 = x/836.8$$

$$x = 4214.6$$

Assuming even distribution of coastal ducks across the New York coast, about 4214.6 additional “naval” ducks should be around New York City.

²¹ Ibid.

²² NOAA Office for Coastal Management. General Coastline and Shoreline Mileage of the United States. <https://coast.noaa.gov/data/docs/states/shorelines.pdf>. Accessed October 2015.

²³ The City of New York (2013) *Coastal Protection: A Stronger, More Resilient New York*: planNYC.