Decline of the North American Avifauna

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Abstract: Species extinctions have defined the global biodiversity crisis, but extinction begins with loss in abundance of individuals that can result in compositional and functional changes of ecosystems. Using multiple and independent monitoring networks, we report population losses across much of the North American avifauna over 48 years, including once common species and from most biomes. Integration of range-wide population trajectories and size estimates indicates a net loss approaching 3 billion birds, or 29% of 1970 abundance. A continent-wide weather radar network also reveals a similarly steep decline in biomass passage of migrating birds over a recent 10-year period. This loss of bird abundance signals an urgent need to address threats to avert future avifaunal collapse and associated loss of ecosystem integrity, function and services.

One Sentence Summary: Cumulative loss of nearly three billion birds since 1970, across most North American biomes, signals a pervasive and ongoing avifaunal crisis.

Main Text:

Slowing the loss of biodiversity is one of the defining environmental challenges of the 21st century (*1*–*5*). Habitat loss, climate change, unregulated harvest, and other forms of human-caused mortality (*6*, *7*) have contributed to a thousand-fold increase in global extinctions in the Anthropocene compared to the presumed prehuman background rate, with profound effects on ecosystem functioning and services (*8*). The overwhelming focus on species extinctions, however, has underestimated the extent and consequences of biotic change, by ignoring the loss of abundance within still-common species and in aggregate across large species assemblages (*2*, *9*). Declines in abundance can degrade ecosystem integrity, reducing vital ecological, evolutionary, economic, and social services that organisms provide to their environment (*8*, *10*–*15*). Given the current pace of global environmental change, quantifying change in species abundances is essential to assess ecosystem impacts. Evaluating the magnitude of declines requires effective long-term monitoring of population sizes and trends, data which are rarely available for most taxa.

Birds are excellent indicators of environmental health and ecosystem integrity (*16*, *17*), and our ability to monitor many species over vast spatial scales far exceeds that of any other animal group. We evaluated population change for 529 species of birds in the continental United States and Canada (76% of breeding species), drawing from multiple standardized bird-monitoring datasets, some of which provide close to fifty years of population data. We integrated range-wide estimates of population size and 48-year population trajectories, along with their associated uncertainty, to quantify net change in numbers of birds across the avifauna over recent decades (*18*). We xalso used a network 143 weather radars (NEXRAD) across the contiguous U.S. to estimate long-term changes in nocturnal migratory passage of avian biomass through the airspace in spring from 2007 to 2017. The continuous operation and broad coverage of NEXRAD provide an automated and standardised monitoring tool with unrivaled temporal and spatial extent (*19*). Radar measures cumulative passage across all nocturnally migrating species, many of which breed in areas north of the contiguous U.S. that are poorly monitored by avian surveys. Radar thus expands the area and the proportion of the migratory avifauna that is sampled relative to ground surveys.

Results from long-term surveys, accounting for both increasing and declining species, reveal a net loss in total abundance of 2.9 billion (95% CI = 2.7-3.1 billion) birds across almost all biomes, a reduction of 29% (95% CI = 27-30%) since 1970 (Figure 1; Table 1). Analysis of NEXRAD data indicate a similarly steep decline in nocturnal passage of migratory biomass, a reduction of 13.6 ± 9.1% since 2007 (Figure 2A). Reduction in biomass passage occurred across the eastern U.S. (Figure 2 C,D), where migration is dominated by large numbers of temperate- and boreal-breeding songbirds; we observed no consistent trend in the Central or Pacific flyway regions (Figure 2B,C,D, Table S5). Two completely different and independent monitoring techniques thus signal major population loss across the continental avifauna.

Species exhibiting declines (57%, 303/529) based on long-term survey data span diverse ecological and taxonomic groups. Across breeding biomes, grassland birds showed the largest magnitude of total population loss since 1970—more than 700 million breeding individuals across 31 species— and the largest proportional loss (53%); 74% of grassland species are declining. (Figure 1; Table 1). All forest biomes experienced large avian loss, with a cumulative reduction of more than 1 billion birds. Wetland birds represent the only biome to show an overall

net gain in numbers (13%), led by a 56% increase in waterfowl populations (Figure 3, Table 1). Surprisingly, we also found a large net loss (63%) across 10 introduced species (Figure 3D,E, Table 1).

A total of 419 native migratory species experienced a net loss of 2.5 billion individuals, whereas 100 native resident species showed a small net increase (26 million). Species overwintering in temperate regions experienced the largest net reduction in abundance (1.4 billion), but proportional loss was greatest among species overwintering in coastal regions (42%), southwestern aridlands (42%), and South America (40%) (Table 1; Figure S1). Shorebirds, most of which migrate long distances to winter along coasts throughout the hemisphere, are experiencing consistent, steep population loss (37%).

More than 90% of the total cumulative loss can be attributed to 12 bird families (Figure 3A), including sparrows, warblers, blackbirds, and finches. Of 67 bird families surveyed, 38 showed a net loss in total abundance, whereas 29 showed gains (Figure 3B), indicating recent changes in avifaunal composition (Table S2). While not optimized for species-level analysis, our model indicates 19 widespread and abundant landbirds (including 2 introduced species) each experienced population reductions of >50 million birds (Data S1). Abundant species also contribute strongly to the migratory passage detected by radar (*19*), and radar-derived trends provide a fully independent estimate of widespread declines of migratory birds.

Our study documents a long-developing but overlooked biodiversity crisis in North America—the cumulative loss of nearly 3 billion birds across the avifauna. Population loss is not restricted to rare and threatened species, but includes many widespread and common species that may be disproportionately influential components of food webs and ecosystem function. Furthermore, losses among habitat generalists and even introduced species indicate that declining species are not replaced by species that fare well in human-altered landscapes. Increases among waterfowl and a few other groups (e.g. raptors recovering after the banning of DDT) are insufficient to offset large losses among abundant species (Figure 3). Importantly, our population loss estimates are conservative since we estimated loss only in breeding populations. The total loss and impact on communities and ecosystems could be even higher outside the breeding season if we consider the amplifying effect of "missing" reproductive output from these lost breeders.

Extinction of the Passenger Pigeon (*Ectopistes migratorius*), once likely the most numerous bird on the planet, provides a poignant reminder that even abundant species can go extinct rapidly. Systematic monitoring and attention paid to population declines could have alerted society to its pending extinction (*20*). Today, monitoring data suggest that avian declines will likely continue without targeted conservation action, triggering additional endangered species listings at tremendous financial and social cost. Moreover, because birds provide numerous benefits to ecosystems (e.g., seed dispersal, pollination, pest control) and economies (47 million people spend 9.3 billion U.S. dollars per year through bird-related activities in the U.S. (*21*)), their population reductions and possible extinctions will have severe direct and indirect consequences (*10*, *22*). Population declines can be reversed, as evidenced by the remarkable recovery of waterfowl populations under adaptive harvest management (*23*) and the associated allocation of billions of dollars devoted to wetland protection and restoration, providing a model for proactive conservation in other widespread native habitats such as grasslands.

Steep declines in North American birds parallel patterns of avian declines emerging globally (*14*, *15*, *22*, *24*). In particular, depletion of native grassland bird populations in North America, driven by habitat loss and more toxic pesticide use in both breeding and wintering areas (*25*), mirrors loss of farmland birds throughout Europe and elsewhere (*15*). Even declines among introduced species match similar declines within these same species' native ranges (*26*). Agricultural intensification and urbanization have been similarly linked to declines in insect diversity and biomass (*27*), with cascading impacts on birds and other consumers (*24*, *28*, *29*). Given that birds are one of the best monitored animal groups, birds may also represent the tip of the iceberg, indicating similar or greater losses in other taxonomic groups (*28*, *30*).

Pervasiveness of avian loss across biomes and bird families suggests multiple and interacting threats. Isolating spatio-temporal limiting factors for individual species and populations will require additional study, however, since migratory species with complex life histories are in contact with many threats throughout their annual cycles. A focus on breeding season biology hampers our ability to understand how seasonal interactions drive population change (*31*), although recent continent-wide analyses affirm the importance of events during the non-breeding season (*19*, *32*). Targeted research to identify limiting factors must be coupled with effective policies and societal change that emphasize reducing threats to breeding and non-breeding habitats and minimizing avoidable anthropogenic mortality year-round. Endangered species legislation and international treaties, such as the 1916 Migratory Bird Treaty between Canada and the United States, have prevented extinctions and promoted recovery of once-depleted bird species. History shows that conservation action and legislation works. Our results signal an urgent need to address the ongoing threats of habitat loss, agricultural intensification, coastal disturbance, and direct anthropogenic mortality, all exacerbated by climate change, to avert continued biodiversity loss and potential collapse of the continental avifauna.

References and Notes:

1. M. C. Urban, Accelerating extinction risk from climate change. *Science*. 348, 571–573 (2015).

2. R. Dirzo, H. S. Young, M. Galetti, G. Ceballos, N. J. B. Isaac, B. Collen, Defaunation in the Anthropocene. *Science*. 345, 401–406 (2014).

3. S. L. Pimm, C. N. Jenkins, R. Abell, T. M. Brooks, J. L. Gittleman, L. N. Joppa, P. H. Raven, C. M. Roberts, J. O. Sexton, The biodiversity of species and their rates of extinction, distribution, and protection. *Science*. 344, 1246752–1246752 (2014).

4. A. D. Barnosky, N. Matzke, S. Tomiya, G. O. U. Wogan, B. Swartz, T. B. Quental, C. Marshall, J. L. McGuire, E. L. Lindsey, K. C. Maguire, B. Mersey, E. A. Ferrer, Has the Earth's sixth mass extinction already arrived? *Nature*. 471, 51–57 (2011).

5. W. Steffen, P. J. Crutzen, J. R. McNeill, The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature. *AMBIO: A Journal of the Human Environment*. 36, 614–621 (2007).

6. S. R. Loss, T. Will, P. P. Marra, Direct Mortality of Birds from Anthropogenic Causes. *Annual Review of Ecology, Evolution, and Systematics*. 46, 99–120 (2015).

7. A. M. Calvert, C. A. Bishop, R. D. Elliot, E. A. Krebs, T. M. Kydd, C. S. Machtans, G. J. Robertson, A Synthesis of Human-related Avian Mortality in Canada. *Avian Conservation and Ecology*. 8 (2013), doi:10.5751/ACE-00581-080211.

8. D. U. Hooper, E. C. Adair, B. J. Cardinale, J. E. K. Byrnes, B. A. Hungate, K. L. Matulich, A. Gonzalez, J. E. Duffy, L. Gamfeldt, M. I. O'Connor, A global synthesis reveals biodiversity loss as a major driver of ecosystem change. *Nature*. 486, 105 (2012).

9. G. Ceballos, P. R. Ehrlich, R. Dirzo, Biological annihilation via the ongoing sixth mass extinction signaled by vertebrate population losses and declines. *Proceedings of the National Academy of Sciences*, 201704949 (2017).

10. C. J. Whelan, Ç. H. Şekercioğlu, D. G. Wenny, Why birds matter: from economic ornithology to ecosystem services. *Journal of Ornithology*. 156, 227–238 (2015).

11. M. Galetti, R. Guevara, M. C. Cortes, R. Fadini, S. Von Matter, A. B. Leite, F. Labecca, T. Ribeiro, C. S. Carvalho, R. G. Collevatti, M. M. Pires, P. R. Guimaraes, P. H. Brancalion, M. C. Ribeiro, P. Jordano, Functional Extinction of Birds Drives Rapid Evolutionary Changes in Seed Size. *Science*. 340, 1086–1090 (2013).

12. G. C. Daily, Ed., *Nature's services: societal dependence on natural ecosystems* (Island Press, Washington, DC, 1997).

13. S. Bauer, B. J. Hoye, Migratory Animals Couple Biodiversity and Ecosystem Functioning Worldwide. *Science*. 344, 1242552–1242552 (2014).

14. K. Gaston, R. Fuller, Commonness, population depletion and conservation biology. *Trends in Ecology & Evolution*. 23, 14–19 (2008).

15. R. Inger, R. Gregory, J. P. Duffy, I. Stott, P. Voříšek, K. J. Gaston, Common European birds are declining rapidly while less abundant species' numbers are rising. *Ecology Letters*. 18, 28–36 (2015).

16. M. L. Morrison, in *Current Ornithology*, R. F. Johnston, Ed. (Springer US, Boston, MA, 1986; http://link.springer.com/10.1007/978-1-4615-6784-4_10), pp. 429–451.

17. J. Burger, M. Gochfeld, Marine Birds as Sentinels of Environmental Pollution. *EcoHealth*. 1 (2004), doi:10.1007/s10393-004-0096-4.

18. Supplemental Materials.

19. A. M. Dokter, A. Farnsworth, D. Fink, V. Ruiz-Gutierrez, W. M. Hochachka, F. A. La Sorte, O. J. Robinson, K. V. Rosenberg, S. Kelling, Seasonal abundance and survival of North America's migratory avifauna determined by weather radar. *Nature Ecology & Evolution*. 2, 1603–1609 (2018).

20. J. C. Stanton, Present-day risk assessment would have predicted the extinction of the passenger pigeon (Ectopistes migratorius). *Biological Conservation*. 180, 11–20 (2014).

21. U.S. Department of the Interior, U.S. Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau, "National Survey of Fishing, Hunting, and Wildlife-Associated Recreation." (2016).

22. C. H. Sekercioglu, G. C. Daily, P. R. Ehrlich, Ecosystem consequences of bird declines. *Proceedings of the National Academy of Sciences*. 101, 18042–18047 (2004).

23. J. D. Nichols, M. C. Runge, F. A. Johnson, B. K. Williams, Adaptive harvest management of North American waterfowl populations: a brief history and future prospects. *Journal of Ornithology*. 148, 343–349 (2007).

24. C. A. Hallmann, R. P. B. Foppen, C. A. M. van Turnhout, H. de Kroon, E. Jongejans, Declines in insectivorous birds are associated with high neonicotinoid concentrations. *Nature*. 511, 341–343 (2014).

25. R. L. Stanton, C. A. Morrissey, R. G. Clark, Analysis of trends and agricultural drivers of farmland bird declines in North America: A review. *Agriculture, Ecosystems & Environment*. 254, 244–254 (2018).

26. J. De Laet, J. D. Summers-Smith, The status of the urban house sparrow Passer domesticus in north-western Europe: a review. *Journal of Ornithology*. 148, 275–278 (2007).

27. F. Sánchez-Bayo, K. A. G. Wyckhuys, Worldwide decline of the entomofauna: A review of its drivers. *Biological Conservation*. 232, 8–27 (2019).

28. B. C. Lister, A. Garcia, Climate-driven declines in arthropod abundance restructure a rainforest food web. *Proceedings of the National Academy of Sciences*, 201722477 (2018).

29. D. L. Narango, D. W. Tallamy, P. P. Marra, Nonnative plants reduce population growth of an insectivorous bird. *Proceedings of the National Academy of Sciences*, 201809259 (2018).

30. R. E. A. Almond, M. Grooten, "Living Planet Report - 2018: Aiming Higher" (WWF, Gland, Switzerland, 2018).

31. P. P. Marra, E. B. Cohen, S. R. Loss, J. E. Rutter, C. M. Tonra, A call for full annual cycle research in animal ecology. *Biology Letters*. 11, 20150552 (2015).

32. F. A. La Sorte, D. Fink, P. J. Blancher, A. D. Rodewald, V. Ruiz-Gutierrez, K. V. Rosenberg, W. M. Hochachka, P. H. Verburg, S. Kelling, Global change and the distributional dynamics of migratory bird populations wintering in Central America. *Global Change Biology*. 23, 5284–5296 (2017).

33. J. R. Sauer, W. A. Link, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, The North American Breeding Bird Survey 1966–2011: Summary Analysis and Species Accounts. *North American Fauna*. 79, 1–32 (2013).

34. K. V. Rosenberg, P. J. Blancher, J. C. Stanton, A. O. Panjabi, Use of North American Breeding Bird Survey data in avian conservation assessments. *The Condor*. 119, 594–606 (2017).

35. J. C. Stanton, P. J. Blancher, K. V. Rosenberg, A. O. Panjabi, W. E. Thogmartin, Estimating uncertainty of North American landbird population sizes. *Avian Conservation and Ecology*. in press (2019).

36. North American Bird Conservation Initiative, The state of Canada's birds, 2012. *Environment Canada, Ottawa, ON* (2012) (available at http://www.stateofcanadasbirds.org/).

37. North American Bird Conservation Initiative, U.S. Committee, "The State of the Birds, United States of America" (U.S. Department of Interior, Washington, DC, 2009).

38. B. Collen, J. Loh, S. Whitmee, L. McRAE, R. Amin, J. E. Baillie, Monitoring change in vertebrate abundance: the Living Planet Index. *Conservation Biology*. 23, 317–327 (2009).

39. S. N. Wood, *Generalized additive models: an introduction with R* (Chapman and Hall/CRC, 2017).

40. W. A. Link, J. R. Sauer, Bayesian Cross-Validation for Model Evaluation and Selection, with Application to the North American Breeding Survey. *Ecology*, 15-1286.1 (2015).

41. K. Rosenberg, J. Kennedy, R. Dettmers, R. Ford, D. Reynolds, J. Alexander, C. Beardmore, P. Blancher, R. Bogart, G. Butcher, Partners in flight landbird conservation plan: 2016 revision for Canada and continental United States. *Partners in Flight Science Committee* (2016).

42. T. Rich, C. Beardmore, H. Berlanga, P. Blancher, M. Bradstreet, G. Butcher, D. Demarest, E. Dunn, W. Hunter, E. Iñigo-Elias, Partners in Flight North American landbird conservation plan. Ithaca, NY: Cornell Lab of Ornithology (2004).

43. S. Brown, C. Hickey, B. Gill, L. Gorman, C. Gratto-Trevor, S. Haig, B. Harrington, C. Hunter, G. Morrison, G. Page, National shorebird conservation assessment: Shorebird conservation status, conservation units, population estimates, population targets, and species prioritization. *Manomet Center for Conservation Sciences, Manomet, MA* (2000).

44. J. A. Kushlan, M. J. Steinkamp, K. C. Parsons, J. Capp, M. A. Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, Waterbird conservation for the Americas: the North American waterbird conservation plan, version 1 (2002).

45. North American Bird Conservation Initiative, The State of North America's Birds 2016. *Environment and Climate Change Canada: Ottawa, Ontario* (2016) (available at http://www.stateofthebirds.org/2016/).

46. Partners in Flight, Avian Conservation Assessment Database, version 2017. Available at http://pif.birdconservancy.org/ACAD. Accessed on Nov 5 2018.

47. J. R. Sauer, W. A. Link, Analysis of the North American Breeding Bird Survey Using Hierarchical Models. *The Auk*. 128, 87–98 (2011).

48. J. R. Sauer, D. K. Niven, K. L. Pardieck, D. J. Ziolkowski, W. A. Link, Expanding the North American Breeding Bird Survey Analysis to Include Additional Species and Regions. *Journal of Fish and Wildlife Management*. 8, 154–172 (2017).

49. J. R. Sauer, K. L. Pardieck, D. J. Ziolkowski, A. C. Smith, M.-A. R. Hudson, V. Rodriguez, H. Berlanga, D. K. Niven, W. A. Link, The first 50 years of the North American Breeding Bird Survey. *The Condor*. 119, 576–593 (2017).

50. J. A. Veech, K. L. Pardieck, D. J. Ziolkowski, How well do route survey areas represent landscapes at larger spatial extents? An analysis of land cover composition along Breeding Bird Survey routes. *The Condor*. 119, 607–615 (2017).

51. M. F. Delany, R. A. Kiltie, R. S. Butryn, Land cover along breeding bird survey routes in Florida. *Florida Field Naturalist*. 42, 15–28 (2014).

52. J. A. Veech, M. F. Small, J. T. Baccus, Representativeness of land cover composition along routes of the North American Breeding Bird Survey. *The Auk*. 129, 259–267 (2012).

53. C. M. E. Keller, J. T. Scallan, Potential Roadside Biases Due to Habitat Changes along Breeding Bird Survey Routes. *The Condor*. 101, 50–57 (1999).

54. J. B. C. Harris, D. G. Haskell, Land Cover Sampling Biases Associated with Roadside Bird Surveys. *Avian Conservation and Ecology*. 2 (2007), doi:10.5751/ACE-00201-020212.

55. S. L. Van Wilgenburg, E. M. Beck, B. Obermayer, T. Joyce, B. Weddle, Biased representation of disturbance rates in the roadside sampling frame in boreal forests: implications for monitoring design. *Avian Conservation and Ecology*. 10 (2015), doi:10.5751/ACE-00777-100205.

56. M. G. Betts, D. Mitchell, A. W. Diamond, J. Bêty, Uneven Rates of Landscape Change as a Source of Bias in Roadside Wildlife Surveys. *Journal of Wildlife Management*. 71, 2266 (2007).

57. C. U. Soykan, J. Sauer, J. G. Schuetz, G. S. LeBaron, K. Dale, G. M. Langham, Population trends for North American winter birds based on hierarchical models. *Ecosphere*. 7, e01351 (2016).

58. J. Bart, S. Brown, B. Harrington, R. I. Guy Morrison, Survey trends of North American shorebirds: population declines or shifting distributions? *Journal of Avian Biology*. 38, 73–82 (2007).

59. R. K. Ross, P. A. Smith, B. Campbell, C. A. Friis, R. G. Morrison, Population trends of shorebirds in southern Ontario, 1974-2009. *Waterbirds*, 15–24 (2012).

60. M. E. Seamans, R.D. Rau, "American woodcock population status, 2017" (U.S. Fish and Wildlife Service, Laurel, Maryland, 2017), (available at https://www.fws.gov/birds/surveys-and-data/reports-and-publications/population-status.php).

61. U.S. Fish and Wildlife Service, "Waterfowl population status, 2017" (U.S. Department of the Interior, Washington, D.C. USA, 2017), (available at https://www.fws.gov/birds/surveys-and-data/reports-and-publications.php).

62. Anthony D Fox, James O Leafloor, "A global audit of the status and trends of Arctic and Northern Hemisphere goose populations" (Conservation of Arctic Flora and Fauna International Secretariat, Akureyri, Iceland, 2018).

63. D. J. Groves, "The 2015 North American Trumpeter Swan Survey" (U.S. Fish and Wildlife Service, Juneau Alaska, 2017), (available at https://www.fws.gov/birds/surveys-and-data/reports-and-publications.php).

64. K. V. Rosenberg, P. J. Blancher, in *Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference 2002 (C.J. Ralph and T.D. Rich, eds.) PSW-GTR-191* (U.S.D.A. Forest Service, Albany, CA, 2005), vol. 191, pp. 57–67.

65. P. Blancher, K. Rosenberg, A. Panjabi, B. Altman, J. Bart, C. Beardmore, G. Butcher, D. Demarest, R. Dettmers, E. Dunn, Guide to the Partners in Flight Population Estimates Database. Version: North American Landbird Conservation Plan 2004. Partners in Flight Technical Series No 5. *US Geological Survey Patuxent Wildlife Research Center, Laurel, Md* (2007) (available at https://www.partnersinflight.org/resources/pif-tech-series/).

66. P. J. Blancher, K. V. Rosenberg, A. O. Panjabi, B. Altman, A. R. Couturier, W. E. Thogmartin, Handbook to the partners in flight population estimates database, version 2.0. *PIF Technical Series* (2013) (available at http://pif.birdconservancy.org/PopEstimates/).

67. W. E. Thogmartin, F. P. Howe, F. C. James, D. H. Johnson, E. T. Reed, J. R. Sauer, F. R. Thompson, A review of the population estimation approach of the North American Landbird Conservation Plan. *The Auk*. 123, 892 (2006).

68. Sea Duck Joint Venture, "Recommendations for Monitoring Distribution, Abundance, and Trends for North American Sea Ducks" (U.S. Fish and Wildlife Service, Anchorage, Alaska and Canadian Wildlife Service, Sackville, New Brunswick, 2007), (available at http://seaduckjv.org).

69. B. A. Andres, P. A. Smith, R. G. Morrison, C. L. Gratto-Trevor, S. C. Brown, C. A. Friis, Population estimates of North American shorebirds, 2012. *Wader Study Group Bull*. 119, 178–194 (2012).

70. U.S. Shorebird Conservation Partnership, "Shorebird Flyway Population Database (Accessed: 28 Feb 2018)" (2016), (available at https://www.shorebirdplan.org/science/assessment-conservation-status-shorebirds/).

71. P. G. Rodewald (Editor), *The Birds of North America* (Cornell Laboratory of Ornithology, Ithaca, NY, USA, 2018; https://birdsna.org).

72. A. O. Panjabi, P. J. Blancher, W. E. Easton, J. C. Stanton, D. W. Demarest, R. Dettmers, K. V. Rosenberg, Partners in Flight Science Committee, "The Partners in Flight handbook on species assessment Version 2017," *Partners in Flight Technical Series No. 3. Bird Conservancy of the Rockies* (Partners in Flight, 2017).

73. Wetlands International, Waterbird Population Estimates (2018), (available at wpe.wetlands.org).

74. S. Bauer, J. W. Chapman, D. R. Reynolds, J. A. Alves, A. M. Dokter, M. M. H. Menz, N. Sapir, M. Ciach, L. B. Pettersson, J. F. Kelly, H. Leijnse, J. Shamoun-Baranes, From Agricultural Benefits to Aviation Safety: Realizing the Potential of Continent-Wide Radar Networks. *BioScience*. 67, 912–918 (2017).

75. T. D. Crum, R. L. Alberty, The WSR-88D and the WSR-88D Operational Support Facility. *Bulletin of the American Meteorological Society*. 74, 1669–1687 (1993).

76. A. M. Dokter, F. Liechti, H. Stark, L. Delobbe, P. Tabary, I. Holleman, Bird migration flight altitudes studied by a network of operational weather radars. *Journal of The Royal Society Interface*. 8, 30–43 (2011).

77. K. G. Horton, B. M. Van Doren, F. A. La Sorte, E. B. Cohen, H. L. Clipp, J. J. Buler, D. Fink, J. F. Kelly, A. Farnsworth, Holding steady: Little change in intensity or timing of bird migration over the Gulf of Mexico. *Global Change Biology* (2019), doi:10.1111/gcb.14540.

78. S. Ansari, S. Del Greco, E. Kearns, O. Brown, S. Wilkins, M. Ramamurthy, J. Weber, R. May, J. Sundwall, J. Layton, A. Gold, A. Pasch, V. Lakshmanan, Unlocking the Potential of NEXRAD Data through NOAA's Big Data Partnership. *Bulletin of the American Meteorological Society*. 99, 189–204 (2018).

79. A. D. Siggia, R. E. Passarelli, in *Proc. ERAD* (2004), vol. 2, pp. 421–424.

80. J. N. Chrisman, C. A. Ray, in *32nd Conference on Radar Meteorology* (2005).

81. R. L. Ice, R. D. Rhoton, D. S. Saxion, C. A. Ray, N. K. Patel, D. A. Warde, A. D. Free, O. E. Boydstun, D. S. Berkowitz, J. N. Chrisman, J. C. Hubbert, C. Kessinger, M. Dixon, S. Torres, in *23rd International Conference on Interactive Information Processing Systems for Meteorology, Oceanography, and Hydrology* (2007).

82. P. M. Stepanian, K. G. Horton, V. M. Melnikov, D. S. Zrnić, S. A. Gauthreaux, Dual-polarization radar products for biological applications. *Ecosphere*. 7, e01539 (2016).

83. A. M. Dokter, P. Desmet, J. H. Spaaks, S. van Hoey, L. Veen, L. Verlinden, C. Nilsson, G. Haase, H. Leijnse, A. Farnsworth, W. Bouten, J. Shamoun-Baranes, bioRad: biological analysis and visualization of weather radar data. *Ecography* (2018), doi:10.1111/ecog.04028.

84. A. M. Dokter, adokter/vol2bird: vol2bird (Version 0.4.0). Zenodo. (2019), (available at http://doi.org/10.5281/zenodo.3369999).

85. A. M. Dokter, S. Van Hoey, P. Desmet, adokter/bioRad: bioRad (Version 0.4.0). Zenodo. (2019), (available at http://doi.org/10.5281/zenodo.3370005).

86. R. J. Doviak, D. S. Zrnić, *Doppler radar and weather observations* (Dover Publications, Mineola, N.Y, 2nd ed., Dover ed., 2006).

87. T. Chen, C. Guestrin, in *Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining - KDD '16* (ACM Press, San Francisco, California, USA, 2016; http://dl.acm.org/citation.cfm?doid=2939672.2939785), pp. 785–794.

88. T. Chen, T. He, M. Benesty, V. Khotilovich, Y. Tang, *xgboost: Extreme Gradient Boosting* (2017; https://github.com/dmlc/xgboost).

89. J. Davis, M. Goadrich, (ACM, 2006), pp. 233–240.

90. C. R. Vaughn, Birds and insects as radar targets: A review. *Proceedings of the IEEE*. 73, 205–227 (1985).

91. E. J. Pebesma, Multivariable geostatistics in S: the gstat package. *Computers & Geosciences*. 30, 683–691 (2004).

92. P. M. Stepanian, C. E. Wainwright, Ongoing changes in migration phenology and winter residency at Bracken Bat Cave. *Global Change Biology*. 24, 3266–3275 (2018).

93. A. L. Russell, M. P. Cox, V. A. Brown, G. F. McCracken, Population growth of Mexican free-tailed bats (Tadarida brasiliensis mexicana) predates human agricultural activity. *BMC Evolutionary Biology*. 11 (2011), doi:10.1186/1471-2148-11-88.

94. V. A. Drake, D. R. Reynolds, *Radar entomology: observing insect flight and migration* (Cabi, 2012).

95. S. N. Wood, Fast stable restricted maximum likelihood and marginal likelihood estimation of semiparametric generalized linear models: Estimation of Semiparametric Generalized Linear Models. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*. 73, 3–36 (2011).

96. Kamil Barton, "MuMIn: Multi-Model Inference" (R package version 1.42.1, 2018), (available at https://CRAN.R-project.org/package=MuMIn).

97. K. P. Burnham, D. R. Anderson, *Model selection and multimodel inference: a practical information-theoretic approach* (Springer, New York, NY, 2. ed., 2010).

98. D. Bates, M. Mächler, B. Bolker, S. Walker, Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software*. 67 (2015), doi:10.18637/jss.v067.i01.

99. D. W. Winkler, S. M. Billerman, I. J. Lovette, *Bird families of the world: An invitation to the spectacular diversity of birds* (Lynx Edicions, 2015).

100. R. T. Chesser, K. J. Burns, C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, P. C. Rasmussen, J. V. Remsen, D. F. Stotz, B. M. Winger, K. Winker, Fifty-ninth Supplement to the American Ornithological Society's Check-list of North American Birds. *The Auk*. 135, 798–813 (2018).

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be published in future versions of the Avian Conservation Assessment Database (http://pif.birdconservancy.org/ACAD/).

Supplementary Materials:

Materials and Methods

Figures S1-S7

Tables S1-S5

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References (*33-100*)

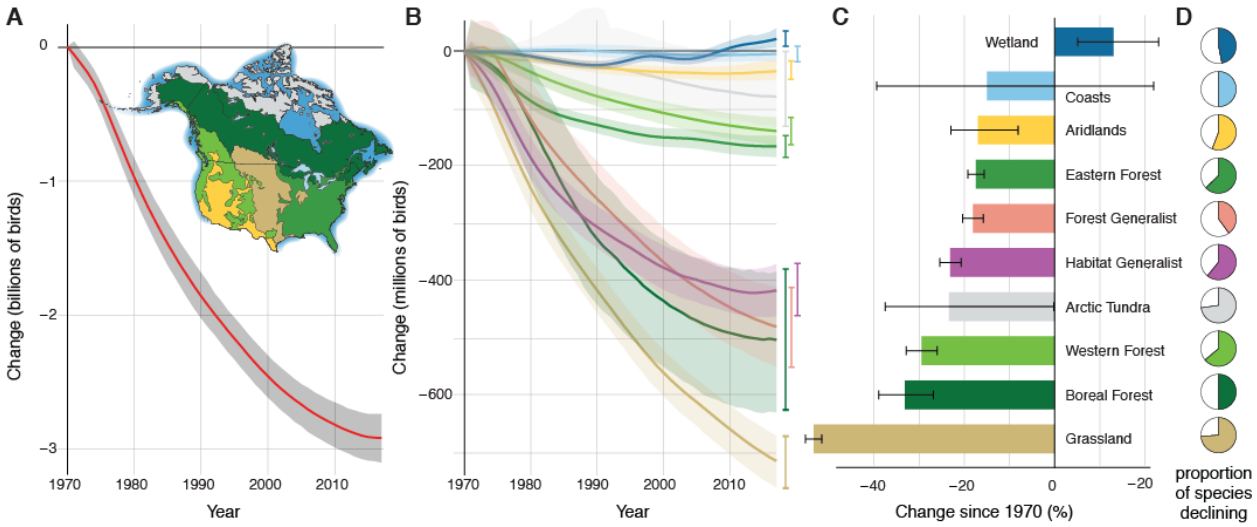

Fig. 1. Net population change in North American birds. (**A**) By integrating population size estimates and trajectories for 529 species (*18*), we show a net loss of 2.9 billion breeding birds across the continental avifauna since 1970. Gray shading represents ± 95% credible intervals around total estimated loss. Map shows color-coded breeding biomes based on Bird Conservation Regions and land cover classification (*18*). (**B**) Net loss of abundance occurred across all major breeding biomes except wetlands (see Table 1). (**C**) Proportional net population change relative to 1970, ±95% C.I. (**D**) Proportion of species declining in each biome.

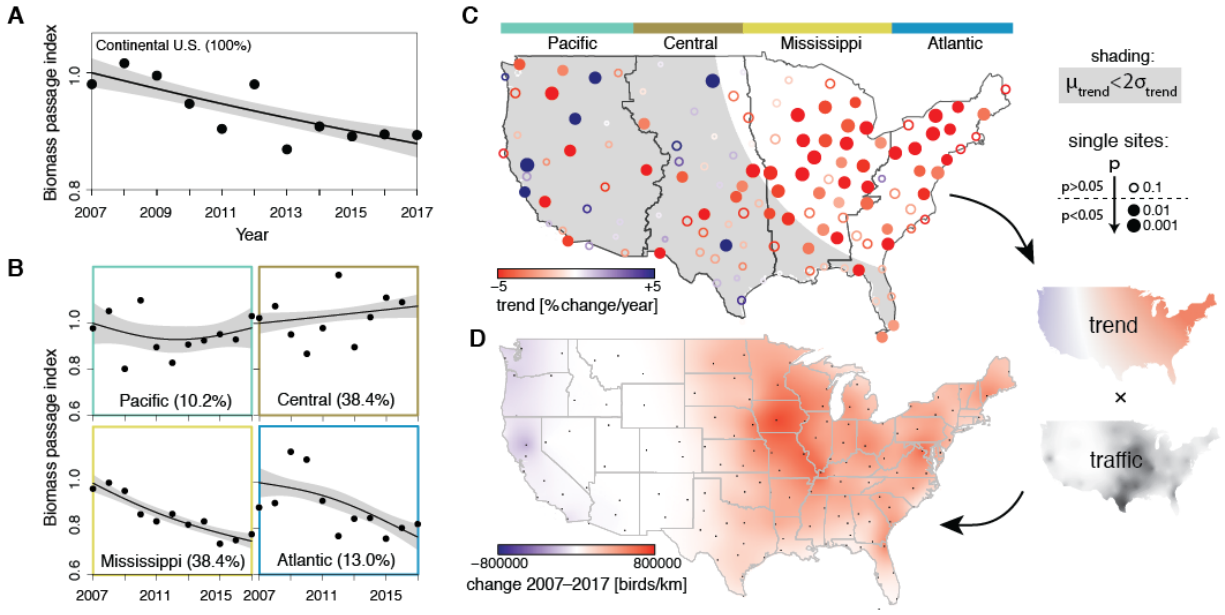

Fig. 2. NEXRAD radar monitoring of nocturnal bird migration across the contiguous U.S. **(A)** Annual change in biomass passage for the full continental U.S. (black) and **(B)** the Pacific (green), Central (brown), Mississippi (yellow), and Atlantic (blue) flyways (borders indicated in panel C), with percentage of total biomass passage (migration traffic) for each flyway indicated; Declines are significant only for the full U.S. and the Mississippi and Atlantic flyways (Table S3-5). **(C)** Single-site trends in seasonal biomass passage at 143 NEXRAD stations in spring (1 Mar – 1 Jul), estimated for the period 2007-2017. Darker red colors indicate higher declines and loss of biomass passage, while blue colors indicate biomass increase. Circle size indicates trend significance, with closed circles being significant at a 95% confidence level. Only areas outside gray shading have a spatially consistent trend signal separated from background variability. **(D)** 10-year cumulative loss in biomass passage, estimated as the product of a spatially-explicit (generalized additive model) trend, times the surface of average cumulative spring biomass passage.

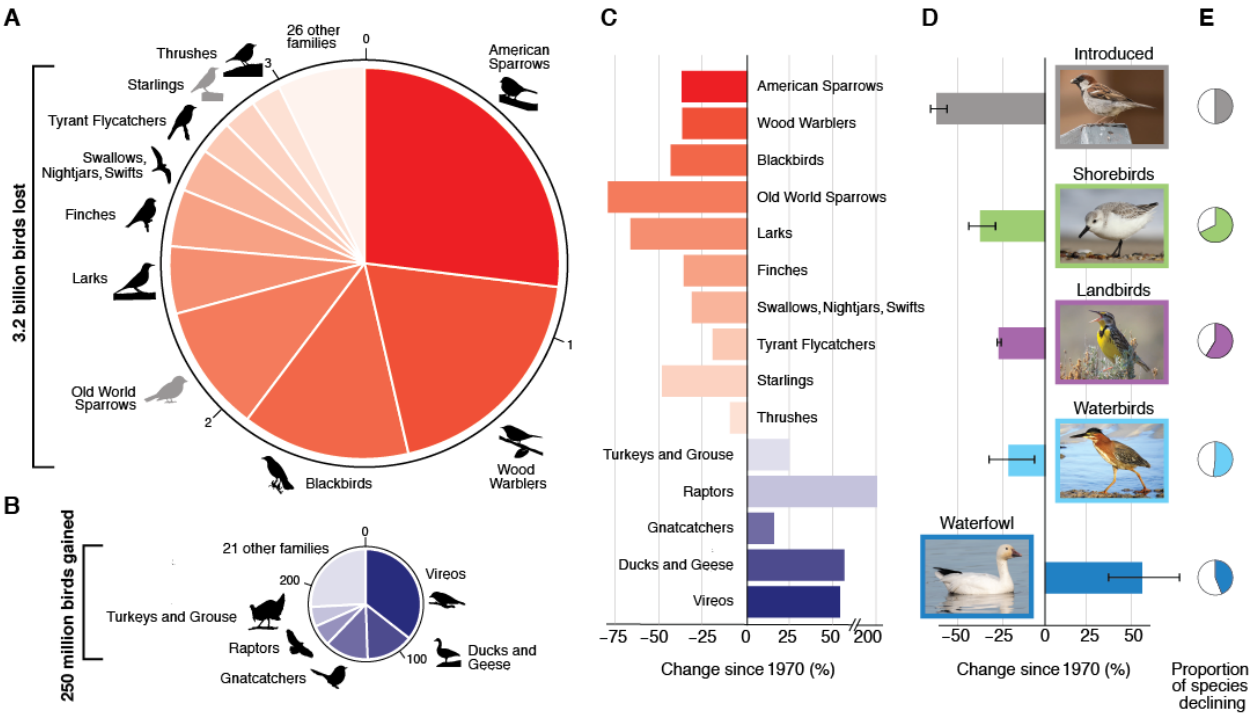

Fig. 3. Gains and losses across the North American avifauna over the last half century. (A) Bird families were categorized as having a net loss (red) or gain (blue). Total loss of 3.2 billion birds occurred across 38 families; each family with losses greater than 50 million individuals is shown as a proportion of total loss, including two introduced families (gray). Swallows, nightjars, and swifts together show loss within the aerial insectivore guild. (**B**) 29 families show a total gain of 250 million individual birds; the five families with gains greater than 15 million individuals are shown as a proportion of total gain. Four families of raptors are shown as a single group. Note that combining total gain and total loss yields a net loss of 2.9 billion birds across the entire avifauna. (**C**) For each individually represented family in B and C, proportional population change within that family is shown. See Table S2 for statistics on each individual family. (**D**) *Left,* proportion of species with declining trends and, *Right*, percentage population change among introduced and each of four management groups (*18*). A representative species from each group is shown (top to bottom, house sparrow, *Passer domesticus*; sanderling, *Calidris alba*; western meadowlark, *Sturnella neglecta*; green heron, *Butorides virescens*; and snow goose, *Anser caerulescens*).

Species Group	Number of Species	Net Abundance Change (Millions) & 95% CI			Percent Change & 95% CIs			Proportion Species in Decline
		Change	LC95	UC95	Change	LC95	UC95	
Species Summary								
All N. Am. Species	529	-2,911.9	-3,097.5	-2,732.9	-28.8%	-30.2%	-27.3%	57.3%
All Native Species	519	-2,521.0	-2,698.5	-2,347.6	-26.5%	-28.0%	-24.9%	57.4%
Introduced Species	10	-391.6	-442.3	-336.6	-62.9%	-66.5%	-56.4%	50.0%
Native Migratory Species	419	-2,547.7	-2,723.7	-2,374.5	-28.3%	-29.8%	-26.7%	58.2%
Native Resident Species	100	26.3	7.3	46.9	5.3%	1.4%	9.6%	54.0%
Landbirds	357	-2,516.5	-2,692.2	-2,346.0	-27.1%	-28.6%	-25.5%	58.8%
Shorebirds	44	-17.1	-21.8	-12.6	-37.4%	-45.0%	-28.8%	68.2%
Waterbirds	77	-22.5	-37.8	-6.3	-21.5%	-33.1%	-6.2%	51.9%
Waterfowl	41	34.8	24.5	48.3	56.0%	37.9%	79.4%	43.9%
Aerial Insectivores	26	-156.8	-183.8	-127.0	-31.8%	-36.4%	-26.1%	73.1%
Breeding Biome								
Grassland	31	-717.5	-763.9	-673.3	-53.3%	-55.1%	-51.5%	74.2%
Boreal forest	34	-500.7	-627.1	-381.0	-33.1%	-38.9%	-26.9%	50.0%
Forest Generalist	40	-482.2	-552.5	-413.4	-18.1%	-20.4%	-15.8%	40.0%
Habitat Generalist	38	-417.3	-462.1	-371.3	-23.1%	-25.4%	-20.7%	60.5%
Eastern Forest	63	-166.7	-185.8	-147.7	-17.4%	-19.2%	-15.6%	63.5%
Western forest	67	-139.7	-163.8	-116.1	-29.5%	-32.8%	-26.0%	64.2%
Arctic Tundra	51	-79.9	-131.2	-0.7	-23.4%	-37.5%	-0.2%	56.5%
Aridlands	62	-35.6	-49.7	-17.0	-17.0%	-23.0%	-8.1%	56.5%
Coasts	38	-6.1	-18.9	8.5	-15.0%	-39.4%	21.9%	50.0%
Wetlands	95	20.6	8.3	35.3	13.0%	5.1%	23.0%	47.4%
Nonbreeding Biome								
Temperate North America	192	-1,413.0	-1,521.5	-1,292.3	-27.4%	-29.3%	-25.3%	55.2%
South America	41	-537.4	-651.1	-432.6	-40.1%	-45.2%	-34.6%	75.6%
Southwestern Aridlands	50	-238.1	-261.2	-215.6	-41.9%	-44.5%	-39.2%	74.0%
Mexico-Central America	76	-155.3	-187.8	-122.0	-15.5%	-18.3%	-12.6%	52.6%
Widespread Neotdropical	22	-126.0	-171.2	-86.1	-26.8%	-33.4%	-19.3%	45.5%
Widespread	60	-31.6	-63.1	1.6	-3.7%	-7.4%	0.2%	43.3%
Marine	26	-16.3	-29.7	-1.2	-30.8%	-49.1%	-2.5%	61.5%
Coastal	44	-11.0	-14.9	-6.7	-42.0%	-51.8%	-26.7%	68.2%
Caribbean	8	-6.0	1.4	-15.7	12.1%	-2.8%	31.7%	25.0%

Table 1. Net change in abundance across the North American avifauna, 1970-2017. Species are grouped into native and introduced species, management groups (landbirds, shorebirds, waterbirds, waterfowl), major breeding biomes, and nonbreeding biomes (see Data S1 in (*18*) for

assignments and definitions of groups and biomes). Net change in abundance is expressed in millions of breeding individuals, with upper and lower 95% credible intervals (CI) shown. Percentage of species in each group with negative trend trajectories are also noted. Rows colored in red indicate declines and loss; blue rows indicate gains.

5

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Supplementary Materials for

Decline of the North American Avifauna

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This PDF file includes:

Other Supplementary Materials for this manuscript include the following:

Materials and Methods

General approach to estimating long-term net population change

We compiled estimates of long-term population change and current population size for 529 species from a variety of sources (Table S1), as described below. For every species, we selected the most appropriate data sources and assessed the quality of population size and change estimates, based on sampling methodology, range coverage, and precision of the estimates. Our primary source of population change estimates was the North American Breeding Bird Survey (BBS) (*33*), which provides conservation assessment information for hundreds of bird species (*34*). For our current analysis we relied on the full trajectory of population change for each species, which we define as the scaled time-series of annual population indices derived from the underlying trend model. Note that using the full trajectory provides much more information on population change than the simple trend value (% change/yr) usually associated with survey data. We used Partners in Flight's (PIF) recently published population size estimates for North American landbirds (*35*), and we supplemented these with data from several other surveys (Table S1). Values for all U.S./Canada population size estimates, along with their sources, are provided in Data S1.

After compiling population size and trajectory estimates for all species (Data S1), we integrated these into a single hierarchical Bayesian model that estimates the full time-series (1970-2017) of population sizes for each species and for the overall avifauna. Because some species are better monitored than others, the precision of estimates varied greatly among species (Data S1). To reduce the effects of imprecise species-level estimates on our overall estimates of population change, our model included a hierarchical structure that allowed for estimation of composite change based on shrinkage estimators, in which imprecise species results are shrunk toward species-group means based on common ecological biomes in which they breed and overwinter (see below). For summaries, estimates of net population change were computed for four general management categorizations (shorebirds, landbirds, waterbirds, waterfowl), taxonomic familes, and breeding and nonbreeding biomes.

Our hierarchical model of composite change is similar in concept to the bird-group indicator models used to summarize the status of major bird groups at a national level in recent State of the Birds reports in Canada and the United States (*36*, *37*). These indicator models estimate an average population trajectory with respect to a base-year, across species in a group. To this basic group-level model, we added 4 major components: (1) we added a non-parametric smooth to each species estimated population trajectory, accounting for the uncertainty of each annual value, to emphasize the medium- and long-term changes in species populations and reduce the effects of annual fluctuations; (2) we added a second layer to the hierarchical structure to account for influences on each species population trajectory from across the full annual cycle (both nonbreeding and breeding biome); (3) we used the species-level predictions, instead of the group-level trajectories summarized for the State of the Birds reports, as improved estimates of a species population trajectory; and (4) we integrated these improved species trajectories with the species-level population size estimates, to sample the full posterior distribution of population change estimates for each species. The model, an R-script to run it, and all of the orginal data are available on GitHub (https://github.com/AdamCSmithCWS/Rosenberg_et_al).

Data included in the modeling were (1) species (s) population indices by year (y) and associated variances ($\hat{\imath}_{s,y}, \hat{\sigma}^2_{s,y}$); (2) species population size estimates and associated variances ($\hat{n}_s, \sigma^2_{n_s}$); (3) year(s) in which each species population size was estimated (e.g., most PIF

population estimates represent the species mean population size in the years 2006-2015; ($K_s = 10, k_s = 2006 - 2015$); and (4) information regarding wintering region and breeding biome associations for each species (w = wintering region, b = breeding biome).

Non-parametric smoothing of species' trajectories, centering, and missing data

We used a generalized additive model (GAM) to smooth each species population trajectory ($\hat{\imath}_{s,y}, \hat{\sigma}^2_{s,y}$) before including them in the main model, similar to (*38*). The GAM smooth allowed us to accommodate the wide variation in the underlying population trajectory data and models across the various datasets; for example, some species trajectories have gaps in the time-series when data were not available in a particular year, but were available before and after, and other trajectories are derived from models that allow annual values to fluctuate completely independently, leading to extreme annual fluctuations in relation to other species. Modeling each species trajectory with a flexible smoother retains the most important medium- and long-term patterns in the species' population, and reconciles the level of annual variation among species. We used the R-package mgcv (*39*) to smooth each species trajectory, using a hierarchical Bayesian GAM that accounted for the uncertainty of each annual index in the trajectory to model most species, and for the few species where published estimates of uncertainty were not available (N = 3, Trumpeter Swan, Emperior Goose, and American Woodcock), we used a simpler non-Bayesian GAM function from the same package.

The annual predictions from the GAM smooth ($i_{s,y}, \sigma^2_{s,y}$) for each species and from each data-source were in different units, e.g., BBS estimates are scaled to the number of birds seen on a single route and CBC estimates are scaled to the number observed in an average count-circle. To allow for the hierarchical structure of the model that pools information across groups of species (e.g., grassland birds that winter in Mexico), each species' trajectory was re-scaled to a common base-year (1970) and log-transformed.

$$\hat{\theta}_{s,y} = \ln\left(\frac{i_{s,y}}{i_{s,1970}}\right)$$

Where, $\hat{\theta}_{s,y}$ is the log-transformed standardized annual estimate for year y and species s ($i_{s,y}$) and represents the status of the species in year-y, as a proportion of the original estimate in the base-year, 1970 ($i_{s,1970}$). We calculated the variance of $\hat{\theta}_{s,y}$ as the log transformation of the variance of a ratio of two random variables (Cochran 1977, pg. 183), making the simplifying assuming that the annual estimates are independent in time. We acknowledge that this assumption of independent estimates in time is certaintly invalid for adjacent years, but becomes more plausible as length of the time-series increases

$$\sigma^2_{\hat{\theta}_{s,y}} = \ln\left(1 + \frac{\sigma^2_{i_{s,y}}}{i^2_{s,y}} + \frac{\sigma^2_{i_{s,1970}}}{i^2_{s,1970}}\right)$$

For 8% of species (43), population trajectories spanning 1970-2017 were not available. About half have data-sources that started in the early 1970s and most of the remainder have trajectories starting in the 1990s. In these cases, we assumed that the population did not change during the missing years. Years with missing trajectory information at the beginning of the time-series (e.g., no data before 1993 for some boreal species monitored by the BBS) were given

values equal to the first year with data (i.e. a conservative assumption of no overall change) but we increased the estimated variance ($\sigma^2_{\hat{\theta}_{s,y}}$) by the square of the number of years since non-missing data, so that these imputed data would have little overall effect on the final results. For these species and years, because of the extremely high variance and the hierarchical structure of the model, the modeled population trajectories and the annual number of birds were almost entirely determined by the group-level mean trajectories for the other species sharing the same wintering region and breeding biome.

The primary model: population trajectories accounting for nonbreeding and breeding biome

Each species' estimated status in a given year ($\hat{\theta}_{s,y}$) was treated as a normal random variable with mean $\theta_{s,y}$ and a variance estimated from the species data ($\sigma^2_{\hat{\theta}_{s,y}}$).

$$\hat{\theta}_{s,y} \sim N\left(\theta_{s,y}, \sigma^2_{\hat{\theta}_{s,y}}\right)$$

The the species status parameter $\theta_{s,y}$was assumed to be normally distributed, governed by a hyperparameter ($\mu_{w,b,y}$) with year-specific variance ($\sigma^2_{\mu_y}$),

$$\theta_{s,y} \sim N\left(\mu_{w,b,y}, \sigma^2_{\mu_y}\right)$$

representing mean status for all species with the same combination of wintering range and breeding biome (e.g., all species that winter in South American and breed in the boreal forest). This structure has the effect of shrinking each species population trajectory towards the mean trajectory for species in the same nonbreeding-by-breeding group. The mean trajectories for each group ($\mu_{w,b,y}$) were estimated using an additive sub-model that combined the effects of nonbreeding and breeding biomes. The biome-level components of the additive model were estimated using random-walk time-series for the effects of nonbreeding biomes ($\omega_{w,y}$) and breeding biomes ($\beta_{b,y}$).

$$\mu_{w,b,y} = \omega_{w,y} + \beta_{b,y}$$

$$\omega_{w,y} = N(\omega_{w,y-1}, \sigma^2_{\omega_w})$$
$$\omega_{w,1970} = 0$$

$$\beta_{b,y} = N(\beta_{b,y-1}, \sigma^2_{\beta_y})$$
$$\beta_{b,1970} = 0$$

The random-walk structure has the effect of slightly smoothing large annual fluctuations in the wintering-group annual means, while also allowing for non-linear temporal changes across the 48-year time series.

Integrating the population sizes and population trajectories

Each species' population size estimate was incorporated in the model as the mean ($\hat{n}_s$) and variance ($\sigma^2_{n_s}$) of a normal distribution. Random draws from those distributions (n_s) allowed the model to incorporate the uncertainty around each species' population estimate. We used the

estimated population sizes and the population trajectories during the relevant years represented by each species' population estimate to calculate a scaling factor (ψ_s) that allowed us to re-scale the species estimated population trajectory (θ_{s,y_i}) to an estimated number of birds in each year of the time-series ($\nu_{s,y}$). Each population estimate was related to a specific year or range of years; e.g., all PIF population estimates reflect the species' mean population size between 2006 and 2015 ($K_s = 10, k = 2006 - 2015$). We estimated the scaling factors by averaging the ratio across the relevant span of years, with $K_s = 3$ as a minimum in a few cases where the species' estimated population reportedly related to a single year.

$$\psi_s = \frac{\sum_{y_i}^{y_k} \left(\frac{n_s}{\exp(\theta_{s,y_i})} \right)}{K_s}$$

$$\nu_{s,y} = \psi_s * \theta_{s,y}$$

All precision parameters were given diffuse gamma prior distributions, with scale and shape parameters set to 0.001. Formal measures of model fit are difficult to implement for complex hierarchical models, and are generally not presented for analyses of complex surveys (*40*). We used graphical comparisons between data and predictions (see additional figures available in the data and code repository) to ensure there was no important lack of fit between the model and the data.

Annual number of birds and overall population change

We calculated the overall population change by species (λ_s) using the posterior distribution of the difference between the estimated number of birds in 1970 and the number in 2017. We calculated the estimated number of birds in the North American avifauna for each year (N_y) using the posterior distribution of the annual sums of all species estimates. We calculated the overall net change in the North American avifauna using the posterior distribution of the sum of the species-level change estimates (Λ). Estimates of the annual number of birds (N_y) and overall change (Λ) by family, nonbreeding biome (Figure S1), breeding biome (Figure 1A), and combinations of nonbreeding and breeding biome (Figure S2) were made from the posterior distribution of group-level summaries across all S-species in a group.

$$\lambda_s = \nu_{s,1970} - \nu_{s,2017}$$

$$N_y = \sum_{s_i}^{S} (\nu_{s,y})$$

$$\Lambda = \sum_{s_i}^{S} (\lambda_s)$$

Sources of Population Trajectories for North American Birds

We compiled long term population trajectories for 529 species, based on the best available survey data for each species (Table S1; see Data S1 for species-specific information). We note that this compilation reflects standard data sources used by North American bird conservation and management (*23*, *36*, *41–45*). We are fortunate that standardized, long-term survey data exist for a majority of North American bird species, perhaps the best-monitored group of organisms

globally. We used trajectory estimates based on surveys of breeding populations whenever possible; however not all species are well-monitored during the breeding season, and for 18% of species we relied on surveys from migration periods or winter (Table S1). In all cases, trajectories and population estimates for each species were calculated from data during the same season (i.e., breeding to breeding, winter to winter). We could not find credible surveys for estimation of continent-scale trajectories for oceanic birds, many coastal-nesting seabirds, and other rare, secretive, range-restricted or nocturnal species. However, our synthesis includes 76% of species that breed regularly in the continental U.S. and Canada (*46*), and these species likely account for 95%-99% of total breeding abundance across the North American avifauna (i.e., most species omitted have very small populations in the U.S. and Canada).

For 434 species (82% of 529 species considered) we used trajectories from BBS data, most of which are updated annually and publicly available at https://www.mbr-pwrc.usgs.gov/. For species surveyed by the BBS, a hierarchical model (*47*) was used to estimate annual indices of abundance. In our hierarchical analysis, annual indices are based on regional fits within states and provinces that are weighted by area and local abundance to accommodate differences in population sizes among strata. For a majority of species (415) we used data from the 'core' BBS area from 1970-2017, based on road-based survey routes in the contiguous U.S. and southern Canada. For 19 species with restricted or northern breeding distributions (See Data S1), we used data from an expanded analysis beginning in 1993, including additional BBS routes in Alaska and northern Canada (*48*). The proportion of each species' breeding range covered by the BBS is provided in (*33*), and all metadata and data are available (https://www.pwrc.usgs.gov/bbs/).

Potential limitations or biases in BBS trends (overall rates of change across the trajectories) have been extensively examined and documented (e.g., (*33*, *49*)). In general, there is no evidence to suggest that estimates of population trends from the BBS are systematically biased across large spatial areas or across many species. Published studies that have examined the potential roadside bias in BBS trends have found that the magnitudes of bias in the sampling of habitat-change are generally small, e.g. (*50–53*), that potential biases vary in space (e.g., contrasting biases in the regions used in (*54*), or in (*55*)), and that they vary among species (i.e., if biases exist, some species' trends may be underestimated and others overestimated, e.g., (*55*, *56*)). Overall, BBS routes survey a reasonably representative sample of the overall habitat in the landscape at the broad spatial and temporal scales, for which the BBS was designed (*50*).

National Audubon Society Christmas Bird Counts (*57*) provided trajectory data for 58 species; these are primarily species that breed in northern regions not surveyed by the BBS, but are encountered in CBCs because they spend the non-breeding season primarily within the U.S. and southern Canada. The CBC protocols are less standardized than BBS, but annual winter-season counts in fixed 15-mile diameter circles cover a large portion of the U.S. and Canada, especially in coastal regions. Trajectories from CBC data were estimated using a hierarchical model that controlled for effort (*57*). Annual indices to compute trajectories from the CBC for the 1970-2017 period were provided to us by Tim Meehan (National Audubon).

Trajectories for 20 species of long-distance migrant shorebirds came from an analysis of migration monitoring surveys carried out across Canada and the United States (*58*, *59*). The shorebird migration surveys used here are part of the International Shorebird Survey, coordinated by Manomet, and the Atlantic Canada and Ontario Shorebird Surveys, coordinated by Environment and Climate Change Canada. Volunteers carry out surveys every 10 days in spring and fall, at sites distributed across Canada and the United States but concentrated primarily in the eastern half of the continent. Analyses of shorebird trajectories from fall count data, 1974-2016,

were carried out using hierarchical Bayesian models similar to those used for the BBS (*47*), with an additional General Additive Model (GAM) component to describe variation in birds' abundance during the period of migratory passage. The model assumes that counts follow an overdispersed Poisson distribution, and includes terms for a long-term, log-linear trend, year-effects and site-level abundance. Sites were grouped into biologically relevant regions, and trend terms within each region were estimated as hierarchical random effects distributed around a mean, continental trend. Methods and survey coverage are described in more detail at wildlife-species.canada.ca/bird-status (https://tinyurl.com/yak95ssn). For one shorebird species, American Woodcock, we made use of Singing-ground Survey estimates from the 2017 American Woodcock Status report (*60*).

For nine species of intensely managed waterfowl we relied on trajectory data from the U.S. Fish and Wildlife Service (USFWS) (*61*), and trajectories for nine additional waterfowl species came from other species-specific sources (see Table S1, Data S1). Trajectories for many waterfowl species were computed using population estimates from Spring Breeding Ground Surveys, which use a combination of aerial and ground-based counts in late spring, covering 2.0 million square miles in Alaska, Canada, and the northern U.S. (Table c3 in (*61*)). For a small subset of species, we employed other sources of trajectory information where this resulted in better coverage of North American populations, and/or more current information. For all goose species we relied on estimated trajectories from the same sources of information on population trends reported for North American goose populations by Fox and Leafloor (*62*); these sources represent the most appropriate survey for each species as determined by experts on goose populations. Finally, for Trumpeter Swans we relied on values in the 2015 North American Trumpeter Swan Survey report (*63*).

Sources of Population Size Estimates and Variances

We relied on the best available data sources and published estimates of North American breeding population size and variance for all species with credible data (Table S1; Data S1). The largest source of population estimates for our current analysis (65% of species) was the recently published PIF estimates for 344 landbird species (*35*). The PIF estimates were based on extrapolations from BBS count data from 2006-2015, using previously described methods (*64–67*). Averaged annual BBS counts were converted to a regional (landscape-scale) abundance estimate through the application of detectability adjustment factors for time-of-day, detection distance, and likelihood of both members of a pair being detected on BBS routes, and extrapolation from BBS count area to area of the region. These regional estimates are calculated for each state, province and territory portion of each Bird Conservation Region (BCR), and then summed across regions to derive U.S.-Canada population estimates. Estimates incorporated uncertainty in the estimation components, resulting in confidence bounds around the final estimates (*35*). Population estimates are therefore adjusted for detection, account for variation in relative abundance across the species' range, and are accompanied by a measure of uncertainty. This approach to estimation of total population size has been widely adopted in conservation planning (*35*), and is considered to be conservative, likely underestimating true population size due to sampling concerns associated with BBS data (*67*).

The PIF methods for estimating population size have historically been applied only to landbirds (*41*, *42*). For this analysis, we determined that the BBS also provides adequate survey coverage for 46 waterbirds, and 6 waterfowl that otherwise were lacking useful population estimates (see Data S1 for sources by species), and we applied the PIF approach for calculating

population size estimates to data for these species. Adjustment factors used in the estimation of U.S.-Canada population sizes for the current analysis, based on BBS relative abundances, are provided in Table S2. More details on the use of adjustment factors and their ranges of uncertainty for landbirds can be found in (*35*).

Estimates of population size for many shorebirds and waterfowl came from published sources that rely on other surveys. Estimates for 12 waterfowl species were from the 2017 USFWS Waterfowl Status Report (*61*) (7 species from traditional area surveys, 2 from eastern survey area, 2 summed from traditional and eastern surveys, and 1 from western survey area) – for these species, we used an average of published estimates across the last 5 years (2013-2017) to smooth out annual variance in population sizes. Estimates for 14 additional waterfowl species were based on a 2007 Seaduck Joint Venture Report (*68*). All 45 shorebird species estimates were North American population estimates (*69*) from the Shorebird Flyway Population Database (*70*).

Other estimates of population size came from species-specific sources (Table S1; Data S1): We used published estimates from Birds of North America (BNA) accounts (*71*) for 33 species; a Conservation of Arctic Flora and Fauna (CAFF) 2018 report provided current estimates for 7 goose species (*62*); estimates for 17 landbird species without useful BBS-based estimates were taken from the Avian Conservation Assessment Database ACAD (*46*, *72*), which itself relied on a variety of sources; the 2015 North American Trumpeter Swan Survey (*63*) was used for Trumpeter Swan, and the Waterbird Population Estimates database (WPE5) provided estimates for Arctic Tern (*73*).

Most sources of population estimates also provided estimates of variance in population size, which we incorporated into our analysis. For those that did not, we estimated a range of variance based on a description of methods used for population estimation. For example, we applied a range 10% below and above the mean for species if estimates were based on well-designed surveys with good population coverage, versus 75% below and above the mean for species with ballpark estimates and/or low coverage of relevant populations, with an intermediate range of variance if limitations were between those two.

Note that our goal was to compile and use the most current estimates of breeding population size for each species; i.e., the number of breeding adult individuals in the population. We did not attempt to estimate the annual increase in population size due to the influences of reproductive output, as this will likely vary greatly across species and years and be subject to density-dependent effects. Total population size varies throughout the annual cycle, but post-breeding total population could increase as much as four to five times the size of the pre-breeding population size depending on recruitment success of young of the year. Estimating this annual variation for individual species is currently impossible, but it is important to point out that the cumulative impact of population loss on ecosystems throughout the year could be quite significant. Our estimates of population change are therefore conservative.

Assigning species to management and biome categories

For the purpose of summarizing changes in abundance across the North American avifauna, we recognize four broad species categories used for management and conservation planning: *Landbirds* are defined by Partners in Flight (*41*, *42*) as all birds occupying terrestrial habitats and a few species from primarily terrestrial bird families that use wetland habitats (e.g., Marsh Wren, *Cistothorus palustris*). The ACAD lists (448) native landbirds breeding in the U.S. and Canada; in this paper we include 366 landbird species with adequate population size and trajectory data, including 9 introduced species. *Shorebirds* include all sandpipers, plovers, stilts, avocets, and oystercatchers that are considered under the U.S. Shorebird Conservation Partnership

(*43*); we had adequate data for 45 shorebird species for the current analysis. *Waterfowl* include all ducks, geese, and swans, which are managed separately under the North American Waterfowl Management Plan; most species have populations that are adaptively managed for sport hunting (*23*). We had adequate data for 42 species in the current analysis, including 1 introduced species. Other *Waterbird* species that are not specifically covered by the three plans above are included under the Waterbird Conservation for the Americas initiative (*44*); these include colonial-nesting seabirds, herons, beach-nesting species and secretive marshbirds. *Waterbirds* are most poorly represented in our dataset, as many species are poorly monitored. We had adequate data for 77 species in the current analysis.

We assigned each species to a primary breeding biome and a primary nonbreeding biome, using the Avian Conservation Assessment Database. The ACAD provides broad breeding-habitat categories (e.g., forests, grasslands, oceans) derived from similar categories used to develop habitat indicators for State of the Birds reports in the U.S. and Canada (e.g., (*36*, *45*)), as well as more descriptive sub-categories within major habitats (e.g., Temperate Eastern Forest; Desert Scrub, Freshwater Marsh). All category assignments were based on literature review (primarily BNA accounts) or expert knowledge and underwent extensive review as part of the ACAD process (*66*). Species that use three or more broad habitats in similar importance were considered habitat generalists.

For this paper, we used a combination of *Primary Breeding Habitat* and *Breeding Habitat Description* sub-categories defined in the ACAD to derive a single set of unique breeding biome categories across the North American avifauna (shown in Figure 1A), as follows:

- *Wetlands* = freshwater, inland wetlands; does not include coastal marshes or Arctic tundra.
- *Coasts* = all habitats associated with the Coastal zone, including saltmarsh, beach and tidal estuary, mangroves, and rocky cliffs and islands; includes birds that forage primary in the marine zone
- *Tundra* = Alpine tundra and Arctic tundra, including upland and low, seasonally wet tundra
- *Grasslands* = native grassland, prairie, pasture, and agriculture that supports grassland birds
- *Aridlands* = all arid shrub-dominated communities; primarily in southwestern U.S. and northwestern Mexico; includes ACAD sub-categories of sagebrush, chaparral, desert scrub, barren rocky cliffs, and extensions of tropical dry forest (thornscrub) in southern Texas
- *Boreal forest* = "True" boreal forest of Canada and Alaska; note that some boreal-forest birds also use the boreal zone (primarily spruce-fir) of high mountains in the western and northeastern U.S.
- *Eastern forest* = all temperate forest types of eastern U.S. and southeastern Canada (south of the boreal), including northern hardwoods, oak-hickory, pine-oak, southern pine, and bottomland hardwood associations
- *Western forest* = all temperate forest types of western U.S. and Canada (south of the boreal) and extending in high mountains south into northwestern Mexico; includes Pacific Northwest rainforest, all western conifer, oak-dominated, and riparian forests, pinyon-juniper, juniper-oak woodlands of Edward's Plateau, pine-oak and high-elevation conifer forests of northwestern Mexico
- *Forest generalist* = occurs in similar abundance in two or more forest biomes as described above

- *Habitat Generalist* = occurs in similar abundance in three or more major habitat types, usually including forest and non-forest categories

The ACAD database also lists *Primary Wintering Regions*, in which a majority of the population of each species spends the stationary nonbreeding period during the boreal winter. For this paper we modified and lumped ACAD regions into broader nonbreeding biome categories, using published range maps and eBird distributional data (https://ebird.org/explore), as follows:

- *Temperate North America* = broad region encompassing all of Canada and most of the U.S., excluding arid regions in the Southwest
- *Southwestern Aridlands* = arid regions of southwestern U.S., northwestern Mexico and Mexican Plateau; included species that winter in arid Chihuahuan grassland habitat
- *Mexico-Central America* = combination of ACAD regions within Mexico and Central America, including *Pacific Lowlands, Gulf-Caribbean Lowlands, Mexican Highlands*, and species from *Central and South American Highlands* that winter primarily in Central America
- *South America* = includes *South American Lowlands*, species from *Central and South American Highlands* that winter primarily in South America, and *Southern Cone* ACAD regions
- *Caribbean* = West Indies region, including Cuba, Bahamas, Greater and Lesser Antilles
- *Widespread Neotropical* = occurs in similar numbers in two or more biome regions within the Neotropics
- *Coastal* = coastline habitats throughout the western Hemisphere from Arctic to Atlantic and Pacific Coasts of North, Middle, and South America; eastern Hemisphere coastlines were included to incorporate the main wintering grounds of Pacific Golden-Plover
- *Marine* = littoral zone; area of oceans influenced by continental coastlines; includes bays and deep estuaries (includes a few species that are largely pelagic in the nonbreeding season)
- *Widespread* = occurs in similar abundance in 3 or more nonbreeding biomes, usually encompassing both temperate North American and Neotropical regions
- *Southeast Asia* = overwintering region for Arctic Warbler (and additional Arctic-breeding species not included in the present analysis); note that this nonbreeding biome is not included in summaries presented in Table 1 and Figure S1, but data for Arctic Warbler (Data S1) and included in higher level summaries of population change for all birds, breeding biomes, etc.

Computing vertical profile time series of birds from NEXRAD radar data

While designed to monitor meteorological phenomena (e.g., precipitation, tornados, hail), weather radars routinely detect migrating birds. Weather radar infrastructure represents a biological monitoring tool that achieves an unprecedented spatial and temporal coverage for studying bird migration (*74*). The NEXRAD weather radar network consists of 143 radars in the contiguous US that continuously survey the airspace above the US (*75*). Each of these radars was used to estimate vertical profiles of birds , which summarize a radar's scans completed at a given timestep into the amount, speeds, and directions of birds aloft as a function of altitude. Profile data can be used to accurately estimate migratory biomass abundance and its change throughout the year at comprehensive continental scales (*19*, *77*), an approach we extended here to detect long-

term change in migratory passage across the full US. We restricted our analysis to spring data only (Mar 1 to Jul 1), which is the migratory period closest in time to the breeding bird surveys by BBS. Also, aerial insects are far less numerous in the airspace in early spring as compared to autumn, therefore the spring period allows us to obtain the cleanest bird signal from NEXRAD (see final paragraph of section "Calculating biomass passage from vertical profile time series" below).

Data were obtained from the NOAA-nexrad-level2 public S3 bucket on Amazon Web Services (*78*). Data were analyzed for the period 2007-2018, the period after the Open RDA deployment in NEXRAD (RDA build 7.0), which was a significant upgrade to the Radar Data Acquisition (RDA) functional area of the WSR-88D. In particular, it implemented Gaussian Model Adaptive Processing (GMAP) (*79*, *80*), replacing and improving over the legacy ground clutter filter (*81*) by Doppler filtering. We did not include older potentially lower quality data in the analysis to limit the possibility of legacy filter settings affecting our results. Trend analyses (see following sections for details) controlled for two important data acquisition updates, the gradual upgrades to superresolution (2008-2009) and dual-polarization (2010-2013). The superresolution upgrade increased the azimuthal resolution from 1 to 0.5 degree and range resolution from 1 km to 250 m. The dual-polarization upgrade added functionality to receive horizontally and vertically polarized electromagnetic waves independently, which provided additional products that greatly simplify the classification of meteorological and biological scatterers (*82*).

Night-time polar volumes (level-II data) were processed for all 143 radars in the contiguous US at half-hour interval from 2007-2018 using the vol2bird algorithm (version 0.4.0) (*76*, *83*, *84*), available in R-package bioRad (version 0.4.0) (*83*, *85*). Using cloud computing with 1000 parallel cores on Amazon Web Services (AWS) we reduced this computational task of ~ 4 years on a single CPU to less than a day. Data were processed using the vol2bird algorithm in single-polarization mode (*76*), which requires radial velocity and reflectivity factor information only and no dual-polarization data. Dual-polarization data became available only after mid-2013, and therefore cannot be used for analyses involving older data. In single-polarization mode, resolution samples with high reflectivity values are masked out (η above 36000 cm^2/km^3, i.e., 31 dBZ at S-band / 20 dBZ at C-band, cf. algorithm parameter ETAMAX and paragraph 3.2 in (*76*)), since such high reflectivities are typically associated with precipitation (*76*). The algorithm also identifies contiguous areas of direct neighbors (in a queen's case sense; i.e., diagonal pixels are included as direct neighbors) of reflectivity above 0 dBZ, denoted as reflectivity cells. Cells with a mean reflectivity above 11500 cm^2/km^3 (i.e., 26 dBZ at S-band / 15 dBZ at C-band, cf. algorithm parameter ETACELL and Z_{cell} in (*76*)) are masked from the data. Following recommendations for S-band data discussed in (*83*), we used sd_vvp_threshold=1 m/s (cf. Eq. A2 in (*76*)) and STDEV_CELL=1 m/s (cf. Eq. A3 in (*76*)) to limit masking based on radial velocity texture at S-band.

At S-band, single-polarization mode masks out only the strongest precipitation areas, and weaker precipitation may remain (*83*) (see Figure S3C/E). Precipitation is generally easily identifiable in vertical profiles by experts, based on high reflectivities extending over a relatively large portion of the altitude column (see Figure S3D). Such precipitation cases stand out from bird migration cases, which are characterized by low reflectivities that typically decrease with altitude (see Figure S3A). We used machine learning to develop a full-profile classifier that automatically identifies precipitation-contaminated profiles, as follows.

Years when dual-polarization data were available (2014-2017) were processed a second time in dual-polarization mode (*19*, *83*), which adequately removes precipitation based on high correlation coefficient values (*19*, *82*). These precipitation-free profile data were paired with the single-polarization profile data. By comparing the precipitation-free reflectivity (η_{dualpol}, cf.

Figure S3A) with the total reflectivity including precipitation (η_{total} derived from reflectivity factor DBZH, cf. Figure S3D), we defined a measure that indicates the range of altitudes H (m) likely containing precipitation, as follows:

$$H = \sum_{i=1}^{n_{\text{layer}}} (\text{if } \eta_{\text{total},i} - \eta_{\text{dualpol},i} > \Delta \text{ then } w_{\text{layer}} \text{ else } 0)$$

with Δ=50 cm^2 km^{-3} (corresponding to 3 dBZ at S-band), and w_{layer} the width of a single altitude layer (200 m). The value of Δ amounts to a fairly low threshold value for classifying potential precipitation, as meteorologists typically assume weak precipitation to start at 7 dBZ (*86*) (133 cm^2 km^{-3} at a 10 cm S-band wavelength), and therefore the vast majority of rain events will show differences in reflectivity exceeding Δ. We labelled all single-polarization profiles in the 4-year dataset with their corresponding H value.

Next, we used gradient boosted trees to detect rain-contaminated profiles computed in single-polarization mode automatically in an unsupervised learning approach, using the H value as our labeling of profiles, with higher H values indicating a wider altitudinal range containing precipitation. We used the R implementation of XGBoost, a highly efficient and scalable gradient boosting algorithm, which can deal with complex nonlinear interactions and collinearity among predictors (*87*, *88*). We used default hyperparameter settings of the xgboost algorithm (learning rate eta=0.3, tree depth max_depth=6, min_child_weight=1, gamma=1, colsample_bytree=1, and subsample=1). Full-profile classifiers were trained for each radar separately. Response variable was the range of altitudes with precipitation H. Predictors included total reflectivity factor (DBZH), precipitation-filtered reflectivity in single-polarization mode (eta), ground speed components (u,v), all at each of the 20 profiles altitude layers, as well as day of year (1-366) and time of day (UTC time). Profiles of each radar were randomly assigned to training (75%) and testing (25%) datasets.

Finally, we determined the parameter H_{max} as the value of H above which profiles are removed in order to discard precipitation contaminations. The value of H_{max} was determined using Figure S4, showing an R-squared measure that quantifies the correspondence between the seasonal migration traffic MT (see next paragraph for definition) of the single-polarization vertical profile time series (with contaminated profiles removed by the full-profile classifier), and the seasonal migration traffic of the reference computed in dual-polarization mode. This R-squared measure amounts to the the coefficient of determination of the scatter points in Figure S5 for a given value of H_{max}. We choose the value of H_{max}=1600 m, producing the best correspondence between the dual-polarization reference and our new single-polarization method. Gaps in a radar's profile time series (after removal of rain-contaminated profiles) of less than 4 hours were filled by linearly interpolating between the neighboring profiles directly before and after the gap.

Applying this value of H_{max} and the full-profile classifier on the testing dataset, we find a precision to correctly classify a profile as rain-contaminated of 99.2%, and a recall of rain-contaminated cases of 97.4%. Precision and recall (*89*) did not depend strongly on the value of the H_{max} threshold, e.g., for H_{max} = 800 m we have a precision of 97.0 % and recall of 99.0%. Our classification performance therefore did not depend critically on the adopted value of the H_{max} parameter.

Calculating biomass passage from vertical profile time series

Nightly reflectivity traffic (RT) (*83*) was calculated for the vertical profile time series of each station for each night with the integrate_profile() function in bioRad (version 0.4.0) (*83*, *85*), which equals the total reflectivity crossing the radar stations per season per one kilometer transect perpendicular to the ground speed direction of movement. Reflectivity traffic is closely related to the amount of biomass that has passed the radar station (*83*). It can be converted to migration traffic (MT), the number of individual birds having passed the radar station per km transect, under assumption of radar cross section (RCS) per individual bird, as in MT = RT/RCS. To express RT in a more intuitive unit, we report MT values in figures using a constant seasonal mean RCS = 11 cm^2 for an individual bird. This value was determined in a calibration experiment spanning a full spring and autumn migration season (*76*), corresponding to passerine-sized birds (10-100 g range) (*90*), which represents the highest-abundance species group dominating our radar signals (*19*). As additional quality control for non-avian signals, we only included altitude layers of profiles for which the ground speed direction was in the northward semicircle surrounding a radar, since migratory bird movements in spring are expected to fall within this semicircle.

Spatial interpolations across the contiguous US of nightly migration traffic were estimated by ordinary kriging with a spherical variogram model, using the R package gstat (*91*). We clipped water areas after interpolating, leaving land areas of the contiguous United States. Missing estimates of nightly migration traffic (e.g., due to temporary radar down time) were imputed from nightly kriging-interpolated maps of MT based on operational stations, imputing the MT value at the location of the inactive radars. Parameters of the spherical variogram model were estimated for each night. In cases where the variogram fit did not converge - typically during nights with very limited migration - we used variogram parameters fit to the average seasonal spring migration traffic (partial sill = 0.577, range = 1093 km). Radar availability was very high, therefore only a small percentage of in total 2.8% of nightly MT values were imputed by this procedure.

Total seasonal migration traffic was calculated as the sum of nightly MT values within a season from Mar 1 to Jul 1. Radar seasons were excluded from trend analysis entirely if data availability dropped below 80% in the period 1 Mar – 1 Jul (4.8% of radar seasons for 143 stations during 11 spring seasons).

While traffic rates suppress any non-migratory stationary signals, like those of non-directed foraging movements of insects or bats (*19*), a small contribution of directed migratory movements of bats or insects could remain in our data. Free-tailed bats in the south are known to show up in radar (*92*) and have a population size estimated up to 100 million individuals (*93*), which amounts to up to a few percent of the total migratory passage of several billion birds along the southern border (*19*). In the North-East - where we observe strongest declines in biomass passage - several migratory tree-dwelling bat species occur, but their population sizes are thought to be smaller than of free-tailed bats. For the period 2013-2017 we have provided earlier a detailed quantitative estimate of the upper limit to the migratory insect contribution to the migratory passage in autumn, when insect abundances are highest. The estimated passage due to insects was 2.1 % (northern US border) – 3.8 % (southern US border) (*19*). Our current study is conducted in spring when aerial insect abundances are far lower (*94*), especially in the North East where we observe most declines, and we estimate the insect contribution to the biomass passage to be on the order of a percent or less.

Calculating trends from seasonal biomass passage values

To correct for potential radar sensitivity changes related to radar processing upgrades, we determined the timing of the upgrade to super-resolution and the upgrade to dual-polarization for

each station. Radar seasons for which the upgrade fell within a migration period were excluded from the analysis. The mode of operation was classified as "legacy" (before superresolution upgrade), "superres" (after superresolution upgrade, before dual-polarization upgrade) or "dualpol" (after dual-polarization upgrade), and stored as a factor variable 'mode' having three factor levels to denote each mode of operation. Variable 'mode' was included in models to correct for changes in operational mode. We also tested for the effect of dual-polarization and superresolution upgrade separately. In these cases, factor variable 'mode' was replaced with a logical explanatory variable 'dualpol' (true after dual-polarization upgrade, otherwise false) or 'superres' (true after superresolution upgrade, otherwise false) in the trend models. The total model candidate set thus contained 4 models, encompassing all combinations of possible corrections for mode of operation, including no correction.

We estimated geographically varying trend patterns using a spatial GAM (*95*) using the mgcv package in R (*39*). Seasonal migration traffic was standardized to each radar's 11-year mean, stored as variable 'index'. We then modeled the spatial trend using an offset tensor product smooth te(lon,lat) and a tensor smooth representing a spatially varying linear trend with year te(lon,lat,by=year) on the linear predictor scale (see Table S3). We used a Gamma distribution with log-link, such that our linear trend smooth term on the linear predictor scale represents a spatially varying annual rate of change μ_{trend} (with standard deviation σ_{trend}) on the response scale. The Gamma distribution accommodates a small right-skew in our continuous positive response variable and warrants normality of deviance residuals, as inspected using QQ plots. Plots of the spatial trend surfaces estimated for the models in Table S3 are shown in Figure S7.

Changes in seasonal migration traffic (Table S4, Figure 2D) were calculated as the GAM prediction for year 2007 minus 2017 (the proportional loss over 11 years), times the 11-year average seasonal migratory traffic (MT) of each station. The surface of average migratory traffic was obtained from a kriging interpolation of the 11-year mean seasonal MT value for each station (see Figure S6, 2). Average trends for the entire US (see main text and Table S3) were averaged over all pixels of these spatially-explicit decline and loss surfaces across the contiguous US, using arithmetic mean and harmonic mean for calculating mean and variance values, respectively, effectively weighing the trend by passage of biomass. The trend value reported in the main text refers to this biomass-weighted average trend for a model average of all GAM models in our candidate set (listed in Table S3). Models were averaged using package MuMIn (*96*), which averages models based on AIC (*97*).

We also estimated continental-wide trends in migratory passage and trends for four flyway regions: Atlantic, Mississippi, Central and Western, following the definitions of the US Fish and Wildlife Service, REF (cf. Figure 2B,C). We fitted generalized linear mixed models using R-package lme4 (*98*), including radar station as a random offset, and region and the interaction year:region as fixed effects, see Table S4 for model structures and Table S5 for estimated model parameters. Like in the GAM analysis, the candidate model set equaled for 4 models, containing all combinations of possible corrections for operational mode.

Regional biomass passage indices (Figure 2A,B) were calculated as the yearly sum of seasonal migration traffic values MT for the radars within each region, standardized by the sum of seasonal migration traffic values MT for all radars in the network of the first year (2007). Values of regionalized decline rates (Atlantic, Mississippi, Central and Western) in the main text are based on the model average (*96*) of all GLMs in the candidate set. Reported errors represent standard errors at a 95% confidence level.

Our GAM analysis (Table S3) and GLM analysis (Table S5) both found support for the dual-polarization upgrade affecting the value of MT, but not for the superresolution upgrade: including variable 'mode' did not produce a more informative model relative to a model with variable 'dualpol' that makes no distinction between "legacy" and "superresolution" data. Effect of the dual-polarization upgrade was a reduction in seasonal migration traffic by a factor 0.85 ± 0.03 (regionalized GLM) or 0.88 ± 0.05 (spatial GAM). Accounting for potential changes in detectability effectively reduced the steepness of decline rates and biomass loss. Both the superresolution and dual-polarization upgrades were designed to prevent changes in detectability and minimize bias effects for meteorological echoes as much as possible, and it is not known whether including correction terms for biological echoes is required. We report versions of the models with and without correction terms such that the effects of these corrections can be compared. By including correction terms, potentially part of the declines in seasonal migration traffic are modelled by the detection-related explanatory variables, and our estimates of decline of models with most information-theoretic support (model 1, model 5) are thus potentially too conservative. Importantly, the presence of an average decline in the passage of migratory biomass is robust to inclusion of correction terms for changes in operational mode of the radar, and even our most conservative rates of decline are alarming.

Supplementary References

33. J. R. Sauer, W. A. Link, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, The North American Breeding Bird Survey 1966–2011: Summary Analysis and Species Accounts. *North American Fauna*. 79, 1–32 (2013).

34. K. V. Rosenberg, P. J. Blancher, J. C. Stanton, A. O. Panjabi, Use of North American Breeding Bird Survey data in avian conservation assessments. *The Condor*. 119, 594–606 (2017).

35. J. C. Stanton, P. J. Blancher, K. V. Rosenberg, A. O. Panjabi, W. E. Thogmartin, Estimating uncertainty of North American landbird population sizes. *Avian Conservation and Ecology*. in press (2019).

36. North American Bird Conservation Initiative, The state of Canada's birds, 2012. *Environment Canada, Ottawa, ON* (2012) (available at http://www.stateofcanadasbirds.org/).

37. North American Bird Conservation Initiative, U.S. Committee, "The State of the Birds, United States of America" (U.S. Department of Interior, Washington, DC, 2009).

38. B. Collen, J. Loh, S. Whitmee, L. McRAE, R. Amin, J. E. Baillie, Monitoring change in vertebrate abundance: the Living Planet Index. *Conservation Biology*. 23, 317–327 (2009).

39. S. N. Wood, *Generalized additive models: an introduction with R* (Chapman and Hall/CRC, 2017).

40. W. A. Link, J. R. Sauer, Bayesian Cross-Validation for Model Evaluation and Selection, with Application to the North American Breeding Survey. *Ecology*, 15-1286.1 (2015).

41. K. Rosenberg, J. Kennedy, R. Dettmers, R. Ford, D. Reynolds, J. Alexander, C. Beardmore, P. Blancher, R. Bogart, G. Butcher, Partners in flight landbird conservation plan: 2016 revision for Canada and continental United States. *Partners in Flight Science Committee* (2016).

42. T. Rich, C. Beardmore, H. Berlanga, P. Blancher, M. Bradstreet, G. Butcher, D. Demarest, E. Dunn, W. Hunter, E. Iñigo-Elias, Partners in Flight North American landbird conservation plan. Ithaca, NY: Cornell Lab of Ornithology (2004).

43. S. Brown, C. Hickey, B. Gill, L. Gorman, C. Gratto-Trevor, S. Haig, B. Harrington, C. Hunter, G. Morrison, G. Page, National shorebird conservation assessment: Shorebird conservation status, conservation units, population estimates, population targets, and species prioritization. *Manomet Center for Conservation Sciences, Manomet, MA* (2000).

44. J. A. Kushlan, M. J. Steinkamp, K. C. Parsons, J. Capp, M. A. Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, Waterbird conservation for the Americas: the North American waterbird conservation plan, version 1 (2002).

45. North American Bird Conservation Initiative, The State of North America's Birds 2016. *Environment and Climate Change Canada: Ottawa, Ontario* (2016) (available at http://www.stateofthebirds.org/2016/).

46. Partners in Flight, Avian Conservation Assessment Database, version 2017. Available at http://pif.birdconservancy.org/ACAD. Accessed on Nov 5 2018.

47. J. R. Sauer, W. A. Link, Analysis of the North American Breeding Bird Survey Using Hierarchical Models. *The Auk*. 128, 87–98 (2011).

48. J. R. Sauer, D. K. Niven, K. L. Pardieck, D. J. Ziolkowski, W. A. Link, Expanding the North American Breeding Bird Survey Analysis to Include Additional Species and Regions. *Journal of Fish and Wildlife Management*. 8, 154–172 (2017).

49. J. R. Sauer, K. L. Pardieck, D. J. Ziolkowski, A. C. Smith, M.-A. R. Hudson, V. Rodriguez, H. Berlanga, D. K. Niven, W. A. Link, The first 50 years of the North American Breeding Bird Survey. *The Condor*. 119, 576–593 (2017).

50. J. A. Veech, K. L. Pardieck, D. J. Ziolkowski, How well do route survey areas represent landscapes at larger spatial extents? An analysis of land cover composition along Breeding Bird Survey routes. *The Condor*. 119, 607–615 (2017).

51. M. F. Delany, R. A. Kiltie, R. S. Butryn, Land cover along breeding bird survey routes in Florida. *Florida Field Naturalist*. 42, 15–28 (2014).

52. J. A. Veech, M. F. Small, J. T. Baccus, Representativeness of land cover composition along routes of the North American Breeding Bird Survey. *The Auk*. 129, 259–267 (2012).

53. C. M. E. Keller, J. T. Scallan, Potential Roadside Biases Due to Habitat Changes along Breeding Bird Survey Routes. *The Condor*. 101, 50–57 (1999).

54. J. B. C. Harris, D. G. Haskell, Land Cover Sampling Biases Associated with Roadside Bird Surveys. *Avian Conservation and Ecology*. 2 (2007), doi:10.5751/ACE-00201-020212.

55. S. L. Van Wilgenburg, E. M. Beck, B. Obermayer, T. Joyce, B. Weddle, Biased representation of disturbance rates in the roadside sampling frame in boreal forests: implications for monitoring design. *Avian Conservation and Ecology*. 10 (2015), doi:10.5751/ACE-00777-100205.

56. M. G. Betts, D. Mitchell, A. W. Diamond, J. Bêty, Uneven Rates of Landscape Change as a Source of Bias in Roadside Wildlife Surveys. *Journal of Wildlife Management*. 71, 2266 (2007).

57. C. U. Soykan, J. Sauer, J. G. Schuetz, G. S. LeBaron, K. Dale, G. M. Langham, Population trends for North American winter birds based on hierarchical models. *Ecosphere*. 7, e01351 (2016).

58. J. Bart, S. Brown, B. Harrington, R. I. Guy Morrison, Survey trends of North American shorebirds: population declines or shifting distributions? *Journal of Avian Biology*. 38, 73–82 (2007).

59. R. K. Ross, P. A. Smith, B. Campbell, C. A. Friis, R. G. Morrison, Population trends of shorebirds in southern Ontario, 1974-2009. *Waterbirds*, 15–24 (2012).

60. M. E. Seamans, R.D. Rau, "American woodcock population status, 2017" (U.S. Fish and Wildlife Service, Laurel, Maryland, 2017), (available at https://www.fws.gov/birds/surveys-and-data/reports-and-publications/population-status.php).

61. U.S. Fish and Wildlife Service, "Waterfowl population status, 2017" (U.S. Department of the Interior, Washington, D.C. USA, 2017), (available at https://www.fws.gov/birds/surveys-and-data/reports-and-publications.php).

62. Anthony D Fox, James O Leafloor, "A global audit of the status and trends of Arctic and Northern Hemisphere goose populations" (Conservation of Arctic Flora and Fauna International Secretariat, Akureyri, Iceland, 2018).

63. D. J. Groves, "The 2015 North American Trumpeter Swan Survey" (U.S. Fish and Wildlife Service, Juneau Alaska, 2017), (available at https://www.fws.gov/birds/surveys-and-data/reports-and-publications.php).

64. K. V. Rosenberg, P. J. Blancher, in *Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference 2002 (C.J. Ralph and T.D. Rich, eds.) PSW-GTR-191* (U.S.D.A. Forest Service, Albany, CA, 2005), vol. 191, pp. 57–67.

65. P. Blancher, K. Rosenberg, A. Panjabi, B. Altman, J. Bart, C. Beardmore, G. Butcher, D. Demarest, R. Dettmers, E. Dunn, Guide to the Partners in Flight Population Estimates Database. Version: North American Landbird Conservation Plan 2004. Partners in Flight Technical Series No 5. *US Geological Survey Patuxent Wildlife Research Center, Laurel, Md* (2007) (available at https://www.partnersinflight.org/resources/pif-tech-series/).

66. P. J. Blancher, K. V. Rosenberg, A. O. Panjabi, B. Altman, A. R. Couturier, W. E. Thogmartin, Handbook to the partners in flight population estimates database, version 2.0. *PIF Technical Series* (2013) (available at http://pif.birdconservancy.org/PopEstimates/).

67. W. E. Thogmartin, F. P. Howe, F. C. James, D. H. Johnson, E. T. Reed, J. R. Sauer, F. R. Thompson, A review of the population estimation approach of the North American Landbird Conservation Plan. *The Auk*. 123, 892 (2006).

68. Sea Duck Joint Venture, "Recommendations for Monitoring Distribution, Abundance, and Trends for North American Sea Ducks" (U.S. Fish and Wildlife Service, Anchorage, Alaska and Canadian Wildlife Service, Sackville, New Brunswick, 2007), (available at http://seaduckjv.org).

69. B. A. Andres, P. A. Smith, R. G. Morrison, C. L. Gratto-Trevor, S. C. Brown, C. A. Friis, Population estimates of North American shorebirds, 2012. *Wader Study Group Bull*. 119, 178–194 (2012).

70. U.S. Shorebird Conservation Partnership, "Shorebird Flyway Population Database (Accessed: 28 Feb 2018)" (2016), (available at https://www.shorebirdplan.org/science/assessment-conservation-status-shorebirds/).

71. P. G. Rodewald (Editor), *The Birds of North America* (Cornell Laboratory of Ornithology, Ithaca, NY, USA, 2018; https://birdsna.org).

72. A. O. Panjabi, P. J. Blancher, W. E. Easton, J. C. Stanton, D. W. Demarest, R. Dettmers, K. V. Rosenberg, Partners in Flight Science Committee, "The Partners in Flight handbook on species assessment Version 2017," *Partners in Flight Technical Series No. 3. Bird Conservancy of the Rockies* (Partners in Flight, 2017).

73. Wetlands International, Waterbird Population Estimates (2018), (available at wpe.wetlands.org).

74. S. Bauer, J. W. Chapman, D. R. Reynolds, J. A. Alves, A. M. Dokter, M. M. H. Menz, N. Sapir, M. Ciach, L. B. Pettersson, J. F. Kelly, H. Leijnse, J. Shamoun-Baranes, From Agricultural Benefits to Aviation Safety: Realizing the Potential of Continent-Wide Radar Networks. *BioScience*. 67, 912–918 (2017).

75. T. D. Crum, R. L. Alberty, The WSR-88D and the WSR-88D Operational Support Facility. *Bulletin of the American Meteorological Society*. 74, 1669–1687 (1993).

76. A. M. Dokter, F. Liechti, H. Stark, L. Delobbe, P. Tabary, I. Holleman, Bird migration flight altitudes studied by a network of operational weather radars. *Journal of The Royal Society Interface*. 8, 30–43 (2011).

77. K. G. Horton, B. M. Van Doren, F. A. La Sorte, E. B. Cohen, H. L. Clipp, J. J. Buler, D. Fink, J. F. Kelly, A. Farnsworth, Holding steady: Little change in intensity or timing of bird migration over the Gulf of Mexico. *Global Change Biology* (2019), doi:10.1111/gcb.14540.

78. S. Ansari, S. Del Greco, E. Kearns, O. Brown, S. Wilkins, M. Ramamurthy, J. Weber, R. May, J. Sundwall, J. Layton, A. Gold, A. Pasch, V. Lakshmanan, Unlocking the Potential of NEXRAD Data through NOAA's Big Data Partnership. *Bulletin of the American Meteorological Society*. 99, 189–204 (2018).

79. A. D. Siggia, R. E. Passarelli, in *Proc. ERAD* (2004), vol. 2, pp. 421–424.

80. J. N. Chrisman, C. A. Ray, in *32nd Conference on Radar Meteorology* (2005).

81. R. L. Ice, R. D. Rhoton, D. S. Saxion, C. A. Ray, N. K. Patel, D. A. Warde, A. D. Free, O. E. Boydstun, D. S. Berkowitz, J. N. Chrisman, J. C. Hubbert, C. Kessinger, M. Dixon, S. Torres, in *23rd International Conference on Interactive Information Processing Systems for Meteorology, Oceanography, and Hydrology* (2007).

82. P. M. Stepanian, K. G. Horton, V. M. Melnikov, D. S. Zrnić, S. A. Gauthreaux, Dual-polarization radar products for biological applications. *Ecosphere*. 7, e01539 (2016).

83. A. M. Dokter, P. Desmet, J. H. Spaaks, S. van Hoey, L. Veen, L. Verlinden, C. Nilsson, G. Haase, H. Leijnse, A. Farnsworth, W. Bouten, J. Shamoun-Baranes, bioRad: biological analysis and visualization of weather radar data. *Ecography* (2018), doi:10.1111/ecog.04028.

84. A. M. Dokter, adokter/vol2bird: vol2bird (Version 0.4.0). Zenodo. (2019), (available at http://doi.org/10.5281/zenodo.3369999).

85. A. M. Dokter, S. Van Hoey, P. Desmet, adokter/bioRad: bioRad (Version 0.4.0). Zenodo. (2019), (available at http://doi.org/10.5281/zenodo.3370005).

86. R. J. Doviak, D. S. Zrnić, *Doppler radar and weather observations* (Dover Publications, Mineola, N.Y, 2nd ed., Dover ed., 2006).

87. T. Chen, C. Guestrin, in *Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining - KDD '16* (ACM Press, San Francisco, California, USA, 2016; http://dl.acm.org/citation.cfm?doid=2939672.2939785), pp. 785–794.

88. T. Chen, T. He, M. Benesty, V. Khotilovich, Y. Tang, *xgboost: Extreme Gradient Boosting* (2017; https://github.com/dmlc/xgboost).

89. J. Davis, M. Goadrich, (ACM, 2006), pp. 233–240.

90. C. R. Vaughn, Birds and insects as radar targets: A review. *Proceedings of the IEEE*. 73, 205–227 (1985).

91. E. J. Pebesma, Multivariable geostatistics in S: the gstat package. *Computers & Geosciences*. 30, 683–691 (2004).

768 92. P. M. Stepanian, C. E. Wainwright, Ongoing changes in migration phenology and winter residency at Bracken
769 Bat Cave. *Global Change Biology*. 24, 3266–3275 (2018).

770 93. A. L. Russell, M. P. Cox, V. A. Brown, G. F. McCracken, Population growth of Mexican free-tailed bats
771 (Tadarida brasiliensis mexicana) predates human agricultural activity. *BMC Evolutionary Biology*. 11 (2011),
772 doi:10.1186/1471-2148-11-88.

773 94. V. A. Drake, D. R. Reynolds, *Radar entomology: observing insect flight and migration* (Cabi, 2012).

774 95. S. N. Wood, Fast stable restricted maximum likelihood and marginal likelihood estimation of semiparametric
775 generalized linear models: Estimation of Semiparametric Generalized Linear Models. *Journal of the Royal*
776 *Statistical Society: Series B (Statistical Methodology)*. 73, 3–36 (2011).

777 96. Kamil Barton, "MuMIn: Multi-Model Inference" (R package version 1.42.1, 2018), (available at
778 https://CRAN.R-project.org/package=MuMIn).

779 97. K. P. Burnham, D. R. Anderson, *Model selection and multimodel inference: a practical information-theoretic*
780 *approach* (Springer, New York, NY, 2. ed., 2010).

781 98. D. Bates, M. Mächler, B. Bolker, S. Walker, Fitting Linear Mixed-Effects Models Using lme4. *Journal of*
782 *Statistical Software*. 67 (2015), doi:10.18637/jss.v067.i01.

783 99. D. W. Winkler, S. M. Billerman, I. J. Lovette, *Bird families of the world: An invitation to the spectacular*
784 *diversity of birds* (Lynx Edicions, 2015).

785 100. R. T. Chesser, K. J. Burns, C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, P. C. Rasmussen, J. V.
786 Remsen, D. F. Stotz, B. M. Winger, K. Winker, Fifty-ninth Supplement to the American Ornithological
787 Society's Check-list of North American Birds. *The Auk*. 135, 798–813 (2018).

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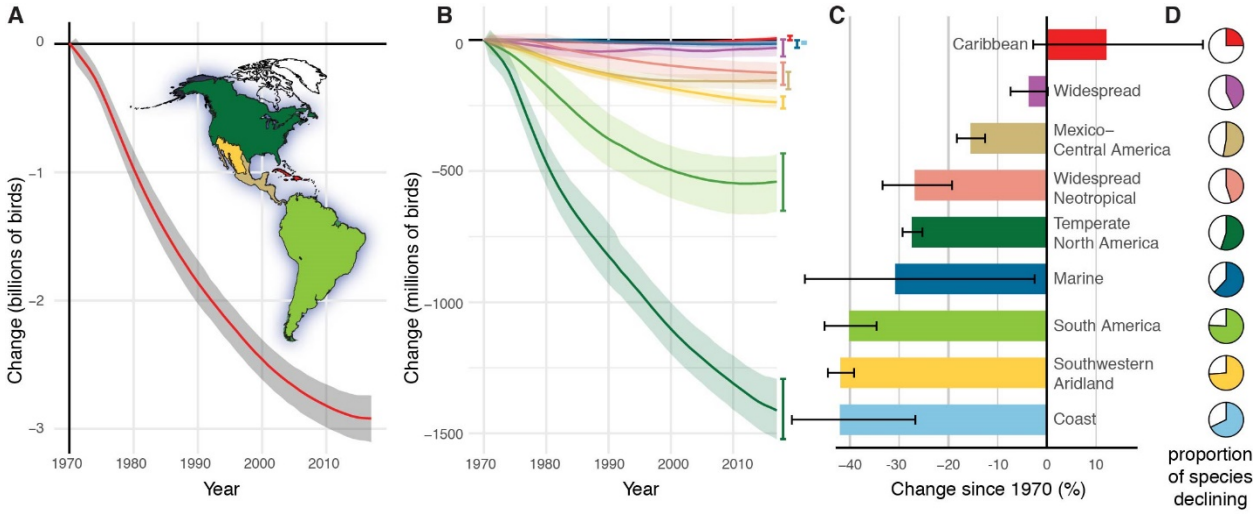
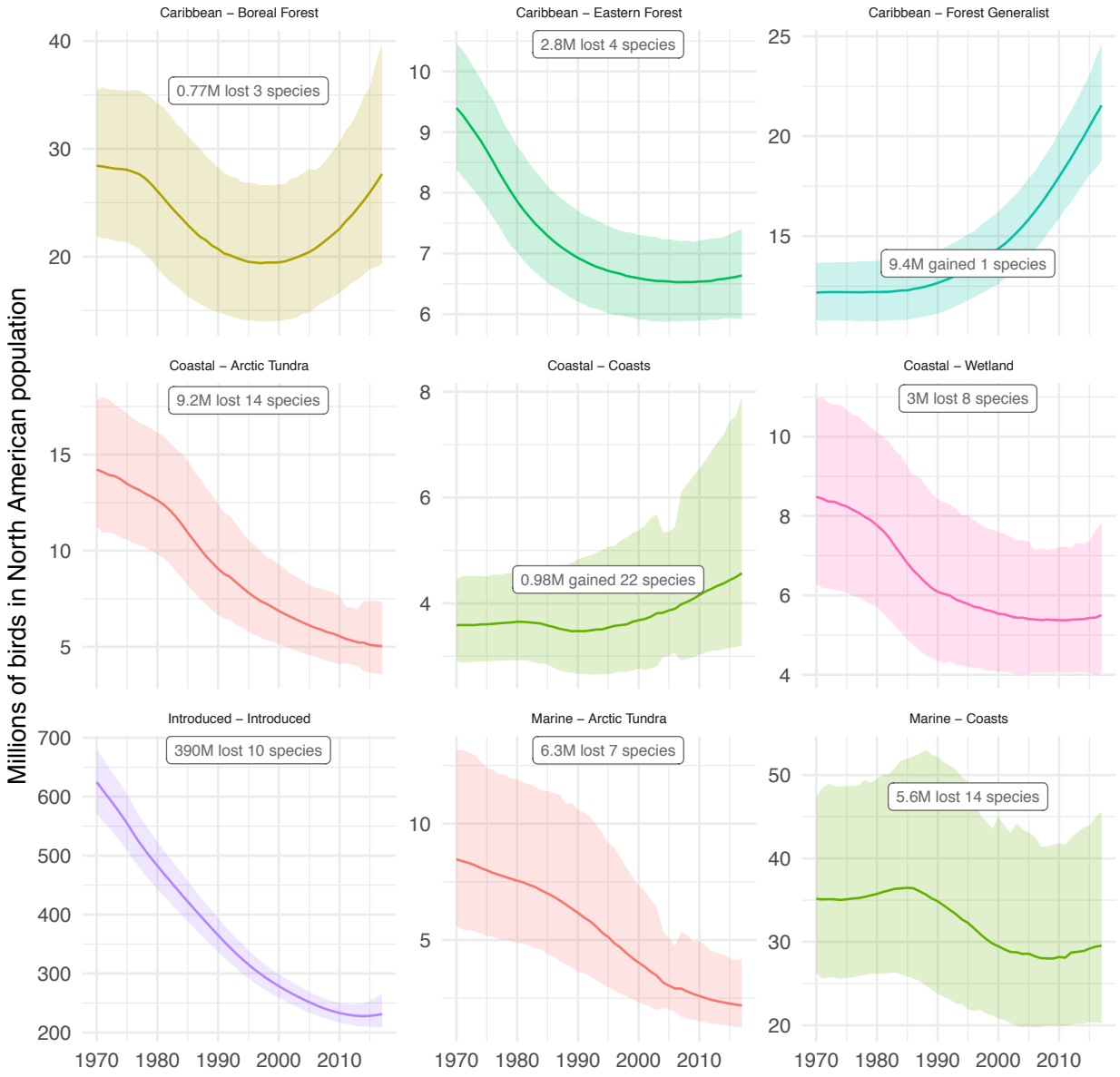
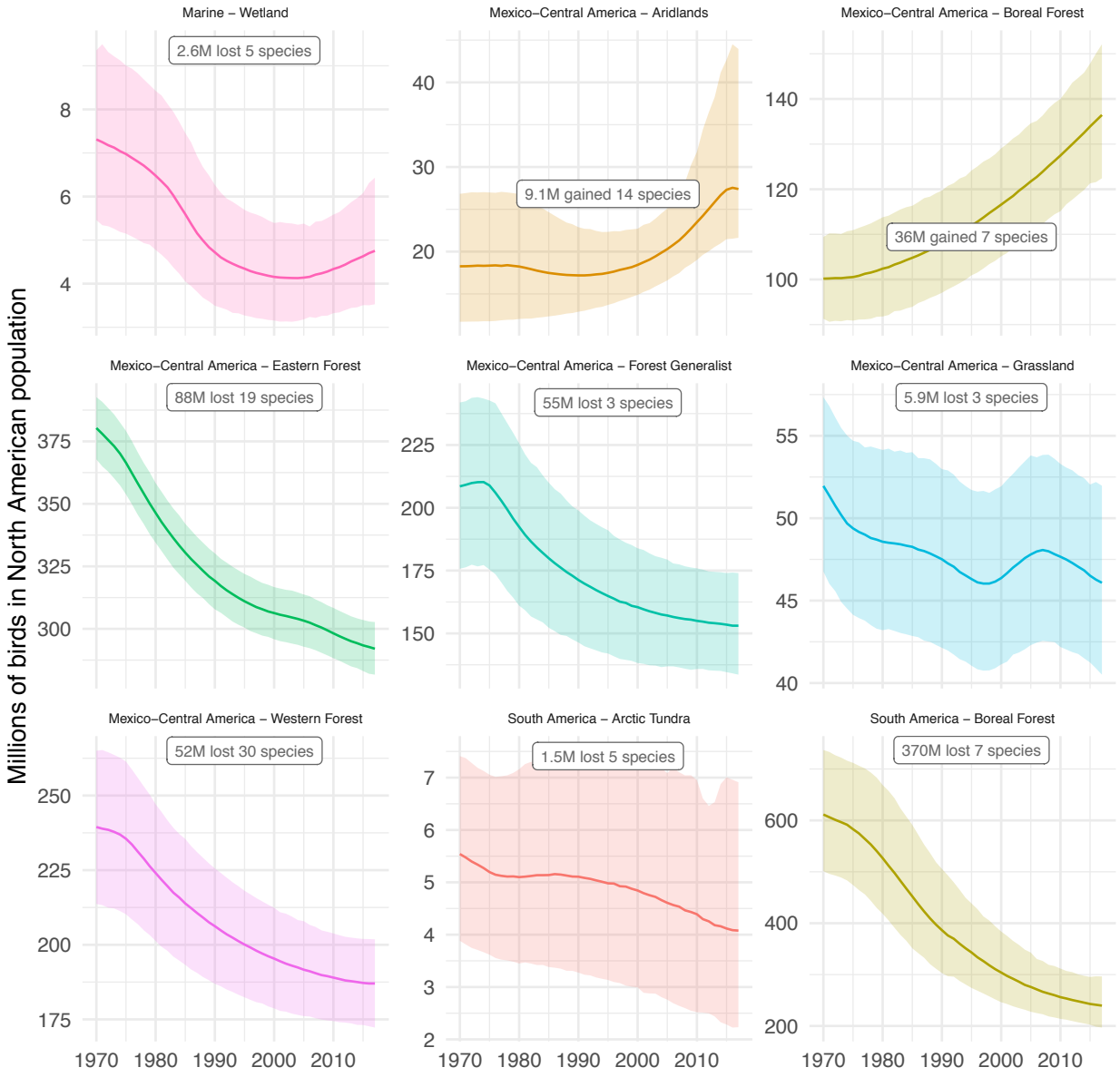


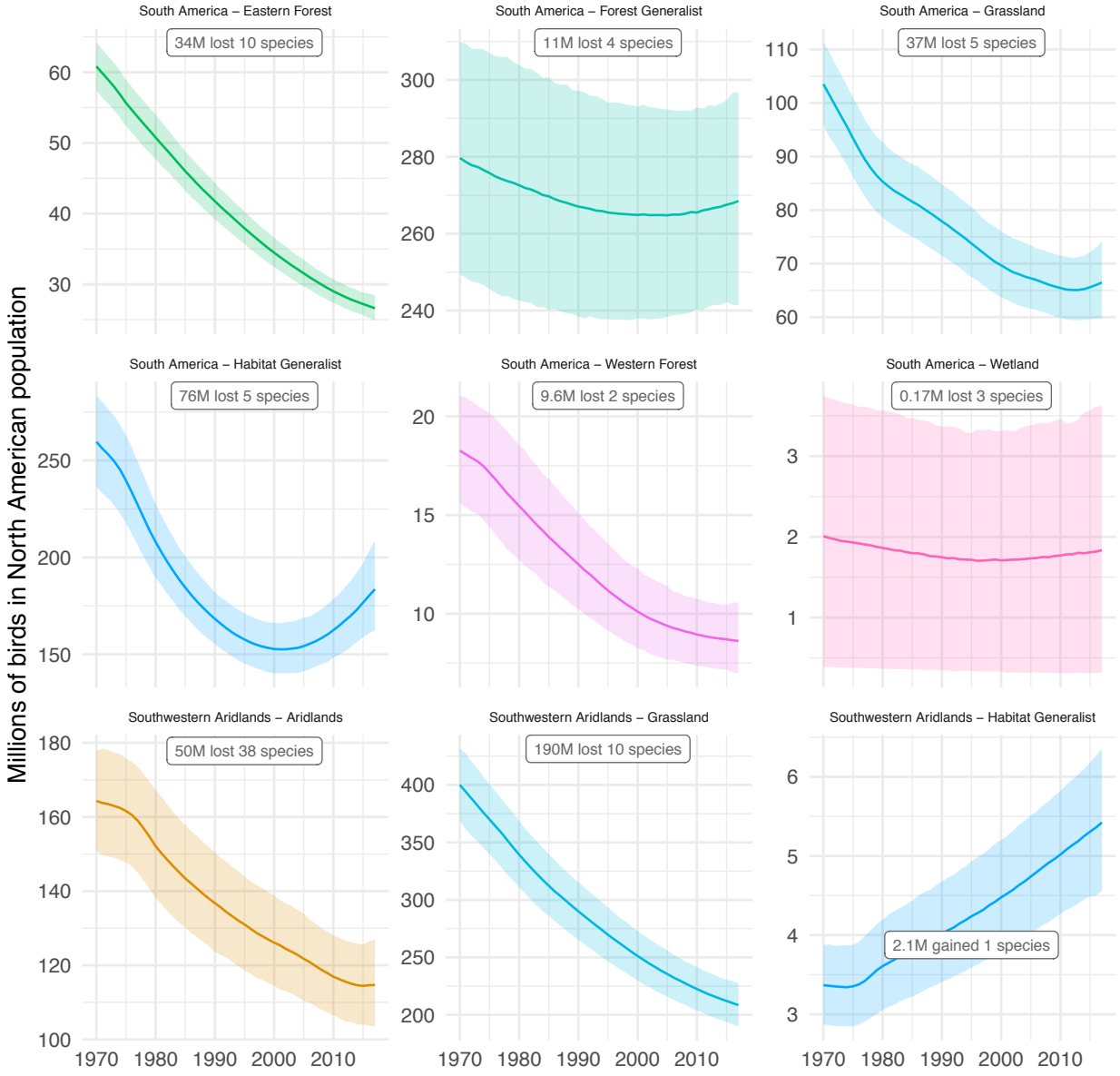
Fig. S1. **Net population change in North American migratory birds grouped by non-breeding biome**. (**A**) By integrating breeding-season population trajectory and size estimates for 529 species (see Methods), we show tthe continental avifauna lost > 2.9 billion breeding birds since 1970. Gray shaded region represents ± 95% credible intervals around total estimated loss. Map shows color-coded non-breeding biomes based on primary overwinter distributions of each species (See Methods). (**B**) Net loss of abundance occurred across all major non-breeding biomes, except Caribbean (see Table 1). (**C**) Proportional population loss, ±95% C.I. (**D**) Proportion of species declining in each biome.


Caribbean – Boreal Forest
0.77M lost 3 species
Caribbean – Eastern Forest
2.8M lost 4 species
Caribbean – Forest Generalist
9.4M gained 1 species
Coastal – Arctic Tundra
9.2M lost 14 species
Coastal – Coasts
0.98M gained 22 species
Coastal – Wetland
3M lost 8 species
Introduced – Introduced
390M lost 10 species
Marine – Arctic Tundra
6.3M lost 7 species
Marine – Coasts
5.6M lost 14 species
Millions of birds in North American population
1970
1980
1990
2000
2010

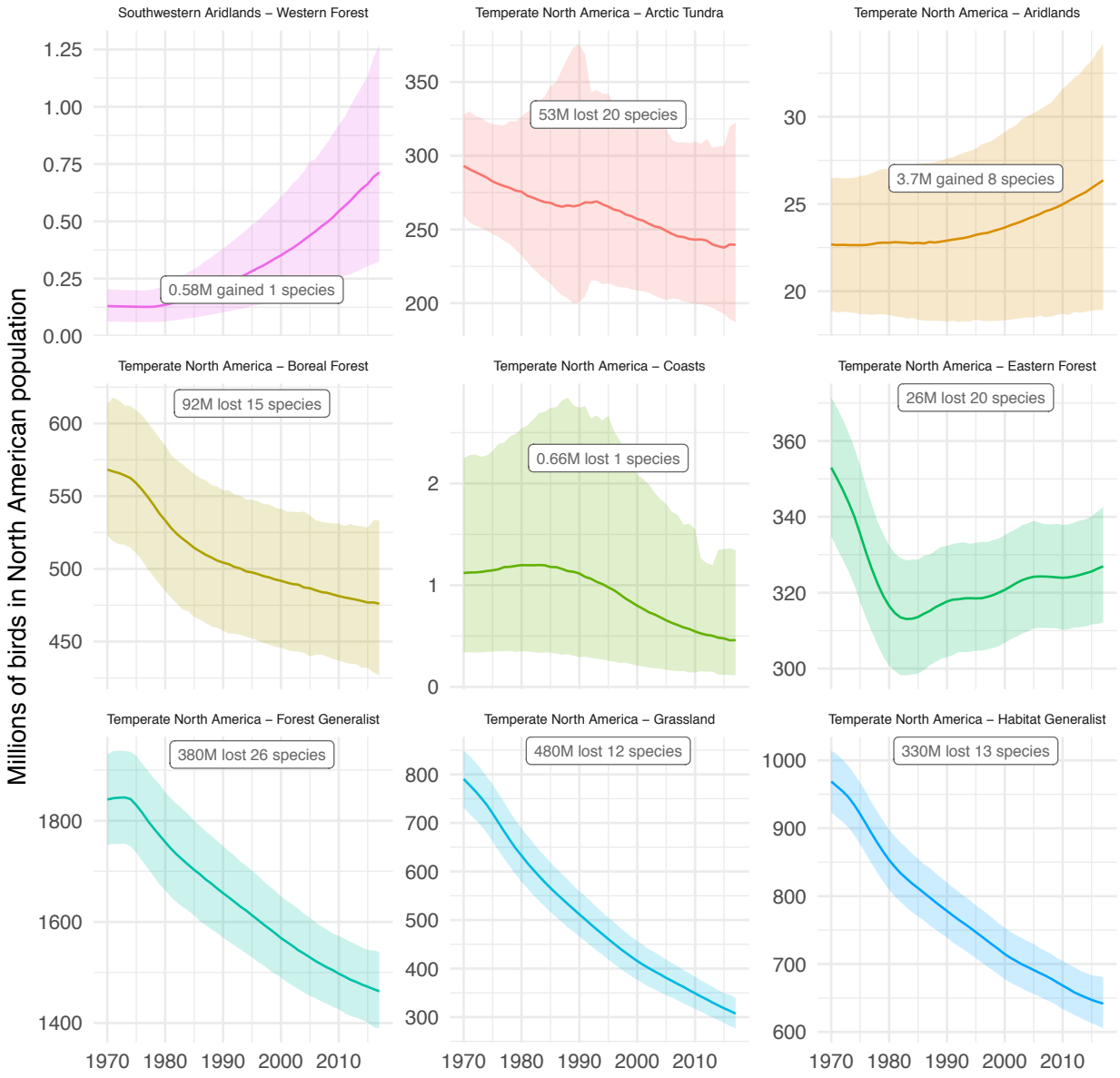
801


Marine – Wetland
2.6M lost 5 species
Mexico–Central America – Aridlands
9.1M gained 14 species
Mexico–Central America – Boreal Forest
36M gained 7 species
Mexico–Central America – Eastern Forest
88M lost 19 species
Mexico–Central America – Forest Generalist
55M lost 3 species
Mexico–Central America – Grassland
5.9M lost 3 species
Mexico–Central America – Western Forest
52M lost 30 species
South America – Arctic Tundra
1.5M lost 5 species
South America – Boreal Forest
370M lost 7 species
Millions of birds in North American population
1970
1980
1990
2000
2010

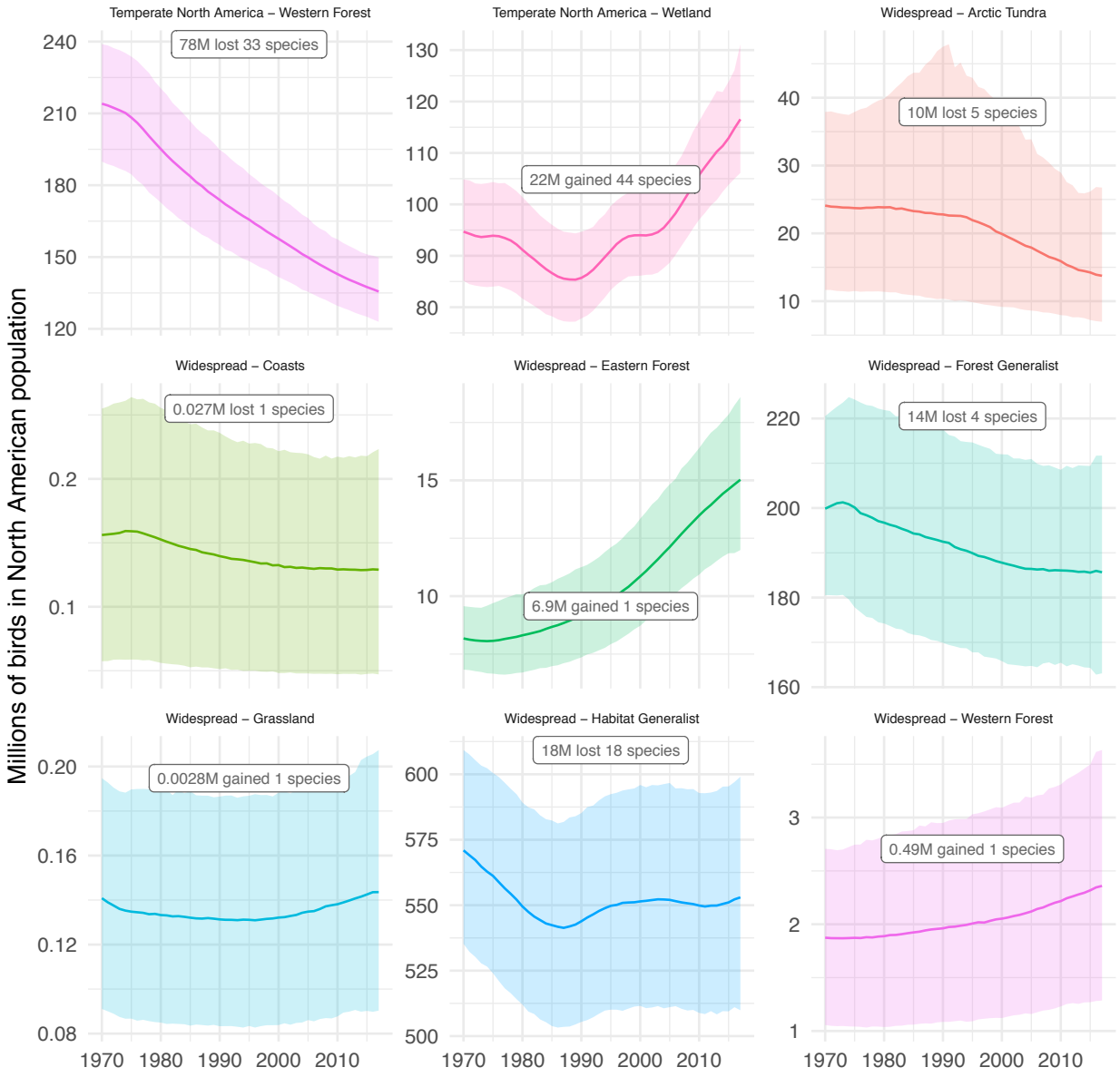
802


South America – Eastern Forest
34M lost 10 species
South America – Forest Generalist
11M lost 4 species
South America – Grassland
37M lost 5 species
South America – Habitat Generalist
76M lost 5 species
South America – Western Forest
9.6M lost 2 species
South America – Wetland
0.17M lost 3 species
Southwestern Aridlands – Aridlands
50M lost 38 species
Southwestern Aridlands – Grassland
190M lost 10 species
Southwestern Aridlands – Habitat Generalist
2.1M gained 1 species
Millions of birds in North American population
1970
1980
1990
2000
2010

803


Southwestern Aridlands – Western Forest
0.58M gained 1 species
Temperate North America – Arctic Tundra
53M lost 20 species
Temperate North America – Aridlands
3.7M gained 8 species
Temperate North America – Boreal Forest
92M lost 15 species
Temperate North America – Coasts
0.66M lost 1 species
Temperate North America – Eastern Forest
26M lost 20 species
Temperate North America – Forest Generalist
380M lost 26 species
Temperate North America – Grassland
480M lost 12 species
Temperate North America – Habitat Generalist
330M lost 13 species
Millions of birds in North American population
1970
1980
1990
2000
2010

804


Temperate North America – Western Forest
78M lost 33 species
Temperate North America – Wetland
22M gained 44 species
Widespread – Arctic Tundra
10M lost 5 species
Widespread – Coasts
0.027M lost 1 species
Widespread – Eastern Forest
6.9M gained 1 species
Widespread – Forest Generalist
14M lost 4 species
Widespread – Grassland
0.0028M gained 1 species
Widespread – Habitat Generalist
18M lost 18 species
Widespread – Western Forest
0.49M gained 1 species
Millions of birds in North American population
1970
1980
1990
2000
2010

805

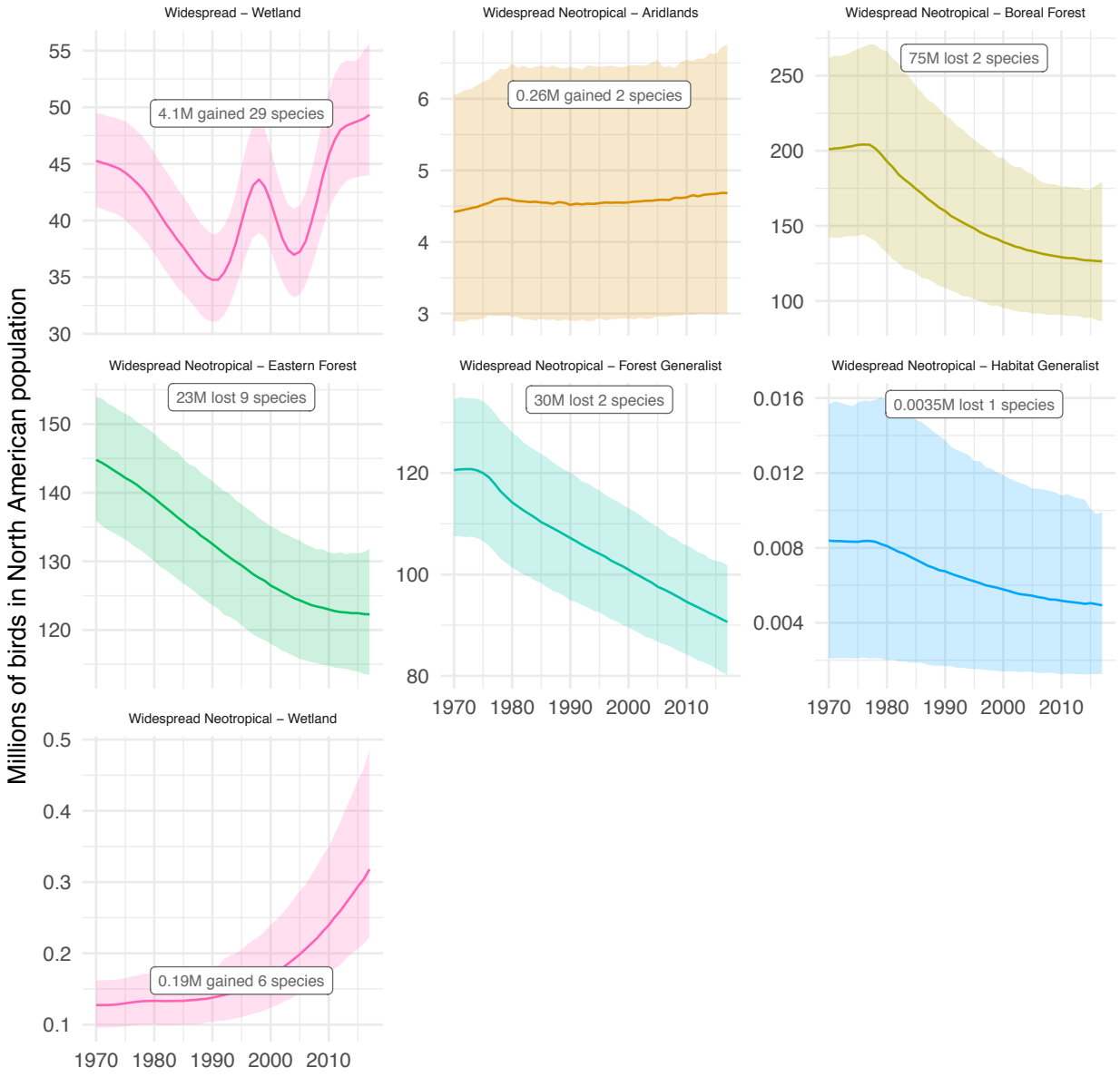


Fig. S2.

Change in number of birds in North America by combined nonbreeding and breeding biomes from 1970–2017. Each panel of the figure shows the 1970-2017 trajectory of summed abundance across the species that share a given combination of nonbreeding and breeding biomes (e.g., the first panel shows the trajectory in summed abundance across the 3 species that winter in the Caribbean and breed in the boreal forest). The panel title indicates the wintering biome followed by the breeding biome; labels within the plots show the estimated change in total abundance in millions (M) of birds between 1970 and 2017, and the number of species included in the group. Colored lines and the colored uncertainty bounds represent the median and 95% C.I. of the posterior distribution from the hierarchical Bayesian model. The panels are sorted by nonbreeding biome and the lines are coloured based on the breeding biome.

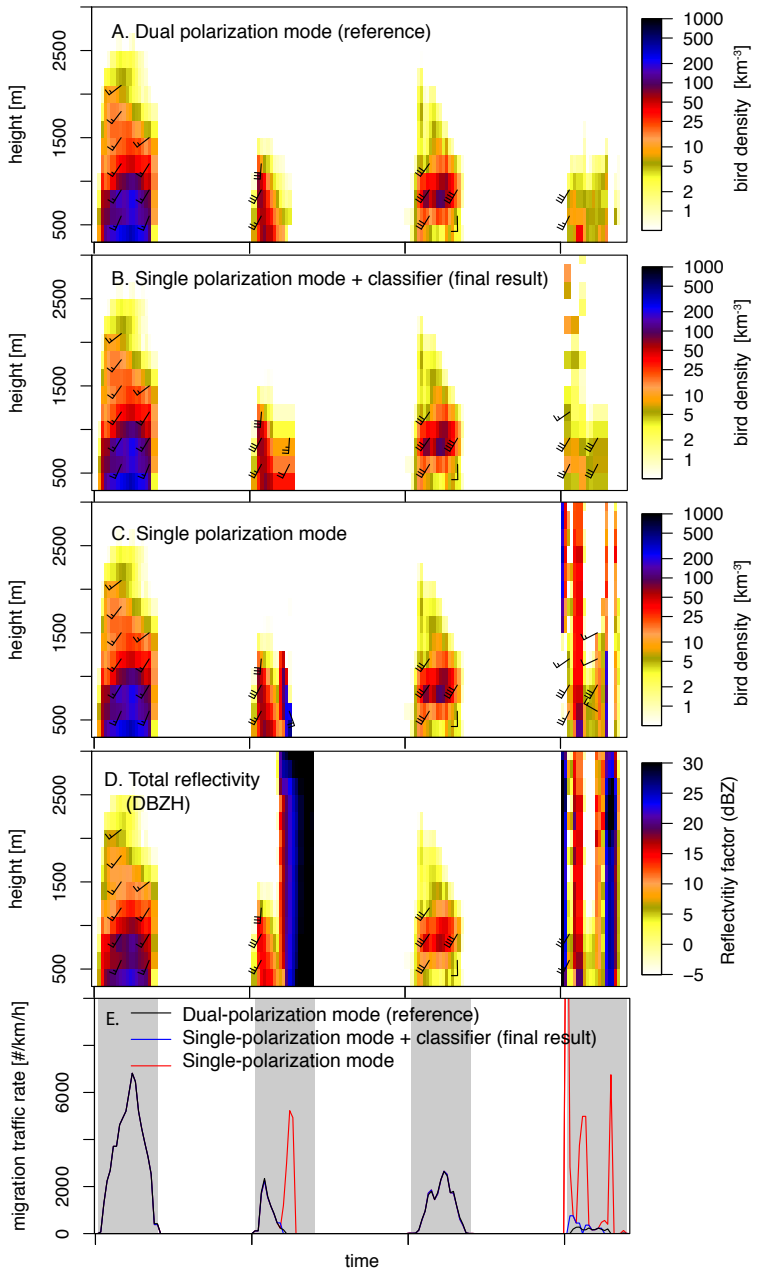


Fig. S3.

Example of vertical profile time series for bird density and speed retrieved in dual polarization mode (A, precipitation-free reference) and the final single-polarization product used in the study (B) for the KBGM radar from 28-31 May 2017. The full-profile classifier that screens precipitation uses the reflectivity product obtained in single-polarization mode (C) and the total reflectivity including precipitation (D). Precipitation is characterized by high reflectivities spanning a large part of the vertical air column (see D), as well by cases in which the single-polarization rain filter removes part (but not necessarily all) of the signal (C versus D). The final single-polarization product (B) closely matches the dual-polarization mode reference (A), see also E, black and blue lines closely overlapping).

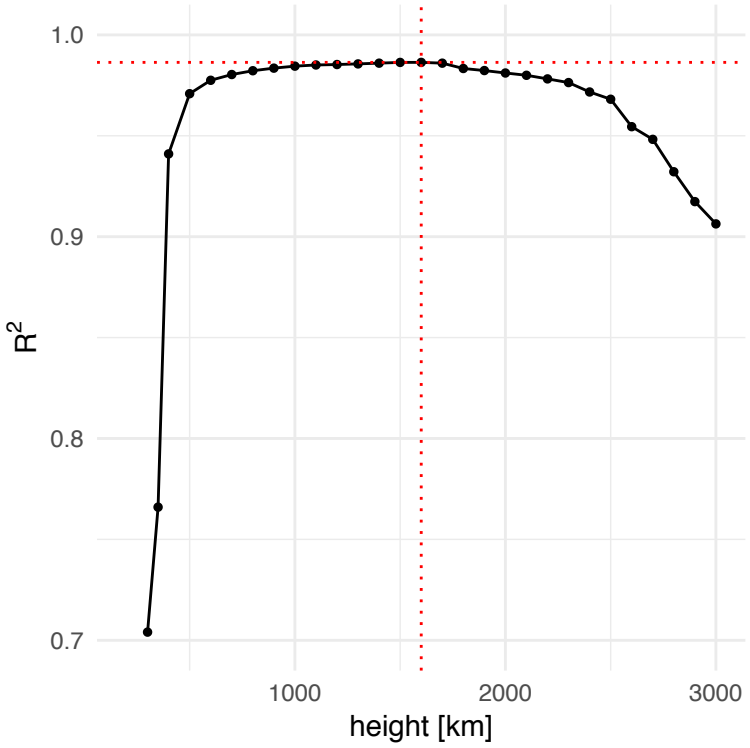


Fig. S4.

Coefficient of determination R^2 between full-spring seasonal migration traffic values calculated in single polarization mode (rain-filtered using full-profile classifier) and dual-polarization mode reference (R^2 based on n=143 stations * 4 years = 572 points), as a function of the classification threshold H_{max}. The value of R^2 peaks at H_{max} = 1600 m .

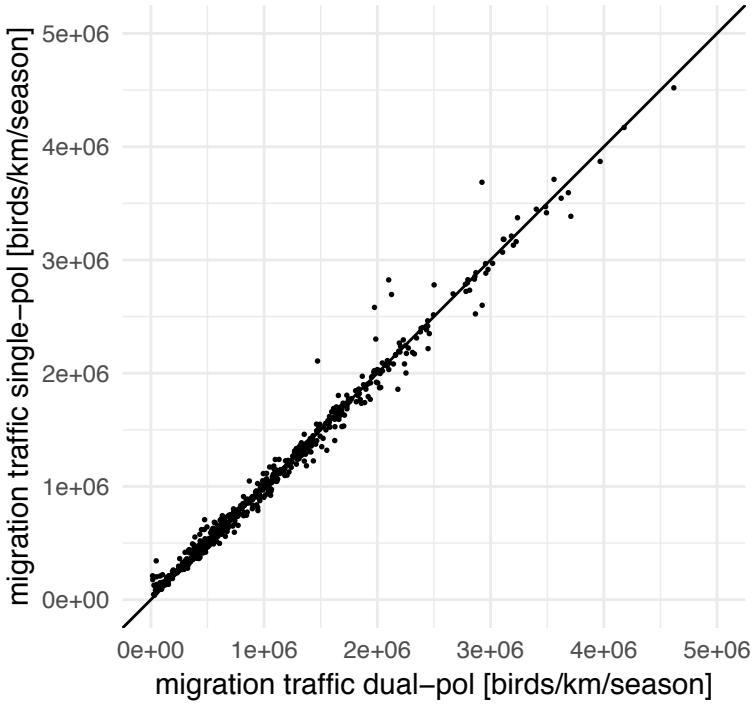
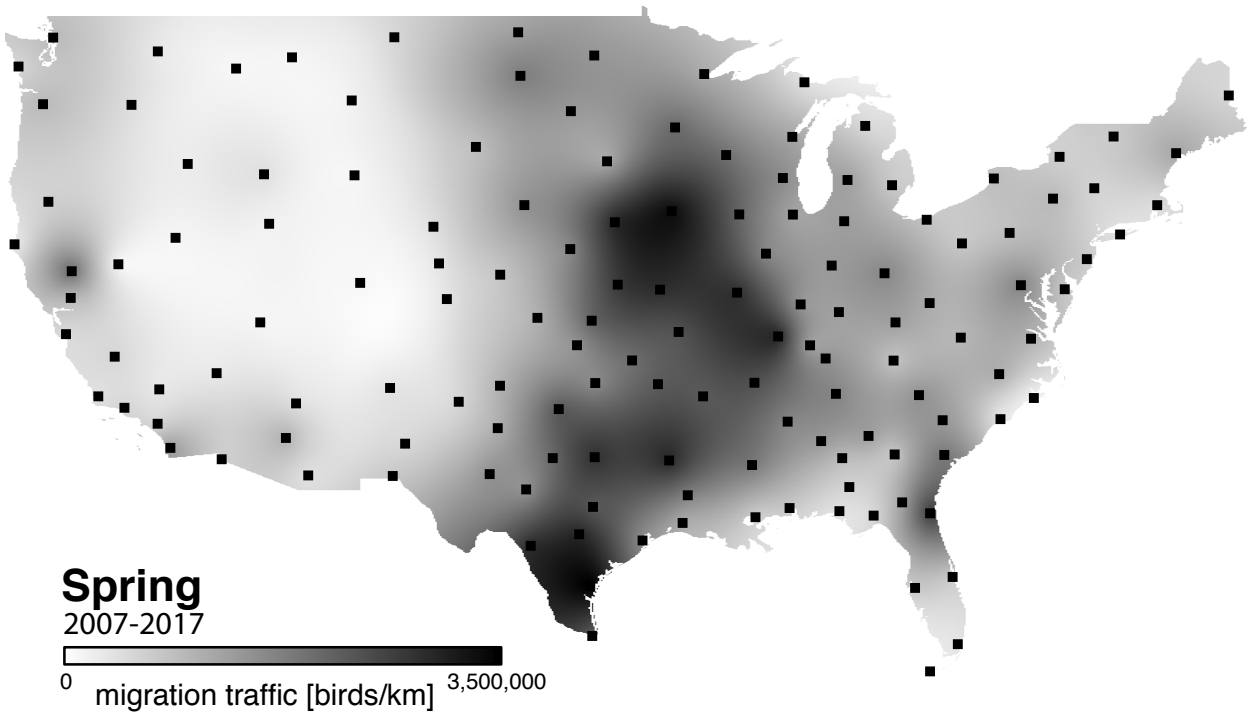


Fig. S5. Seasonal migration traffic (MT) as estimated in dual-polarization mode and in single-polarization mode (rain-filtered using full-profile classifier) for the years 2014-2017 (n=143 stations * 4 year = 572 points). Solid line equals the y=x line of perfect correspondence. This figure shows MT values for H_{max} = 1600 m, which achieves the best correspondence with the dual-polarization reference mode (see Figure S4).



843

844 **Fig. S6.** Cumulated nocturnal migration traffic (biomass passage) MT in spring (1 Mar – 1 Jul)
845 averaged over 11 seasons (2007-2017). Darker colors indicate more migratory biomass passage
846 MT. Values give the numbers of birds passing per 1 km transect perpendicular to the migratory
847 direction per spring season. Radar reflectivity was converted to bird numbers under the
848 assumption of a constant radar cross section of 11 cm^2 per bird. Ordinary kriging was used to
849 interpolate between radar stations. Dots indicate locations of radar station sites.
850

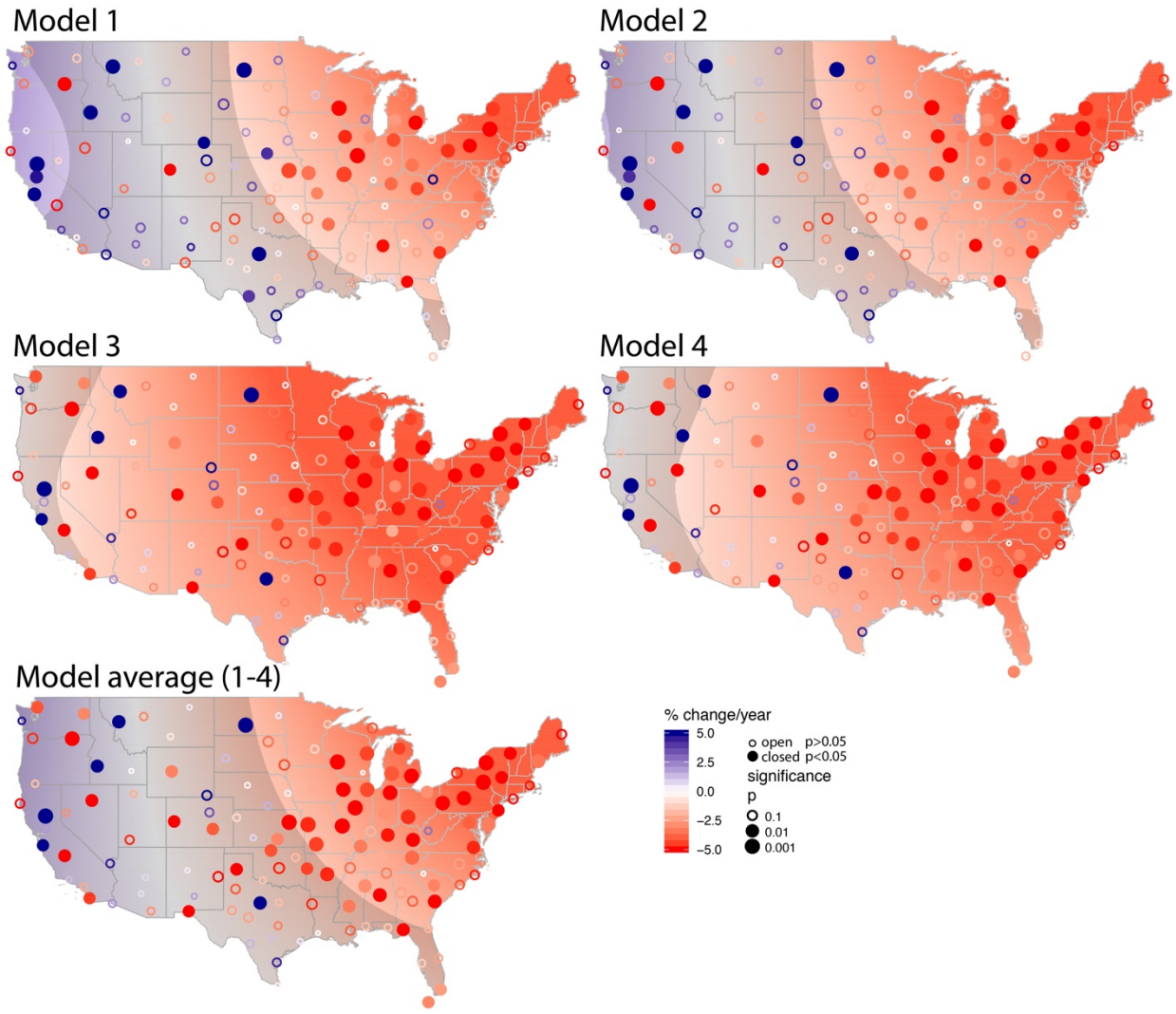


Fig. S7. GAM spatial trend surfaces estimated for the models in Table S3 for the period 2007-2017. Darker red colors indicate higher declines and loss of migration traffic (biomass passage) MT, while blue colors indicate migration traffic increase. Gray shaded regions have an annual rate of change μ_{trend} that is smaller than twice the standard deviation in the rate of change σ_{trend}, i.e. $\mu_{trend} < 2*\sigma_{trend}$. Overlaid circles indicate single-site trend estimates (circle color) and their significance (circle area ~ log(1/p)), with closed circles being significant at a 95% confidence level. Single site trends are fits to seasonal migration traffic data of each radar site separately, using a Generalized Linear Model (GLM) with a Gamma distributional family and log-link. Detectability effects as estimated by the GAM were accounted for in the single-site data prior to fitting the GLMs.

Table S1.

Data sources for population size estimates and population trajectories for 529 North American bird species included in the net population change analysis for the present study. We used published sources of data wherever possible, and applied published methods to calculate estimates for the remaining species. Brief description of methodology, time-span, seasonal, and geographic coverage of surveys and other data sources provided, along with number of species for which that source was used and key citations.

Data source	Years	Season	Methods	Coverage	N Spp. Trajectory	N Spp. Pop	Refs
North American Breeding Bird Survey (BBS)	1970-2017	Breeding	25-mile roadside surveys with 50 3-minute point counts	>4,100 routes in contiguous U.S., southern Canada	415	0	(*33*, *34*, *47*)
North American Breeding Bird Survey (BBS)	1993-2017	Breeding	25-mile roadside surveys with 50 3-minute point counts	Same as above, with additional routes in northern Canada and Alaska	19	0	(*48*)
Audubon Christmas Bird Count (CBC)	1970-2017	Winter	Non-standard counts within 15-mile diameter circles	1,500-2,000 circles in U.S. and Canada	58	0	(*57*)
Partners in Flight (PIF) Population Estimates	2006-2015	Breeding adults	Extrapolation from BBS and other survey count data	Same as BBS, above	0	399*	(*35*)
Arctic goose surveys (CAFF 2018)	1975-2014	Variable	Aerial or ground surveys or mark-recapture models, depending on species	Continentwide for each species	7	7	(*62*)
Shorebird Migration Surveys	1974-2016	Fall migration	Volunteer-conducted surveys at pre-determined sites	Canada and U.S., concentrated in eastern portion	20	0	(*58*, *59*)
USFWS Breeding Waterfowl Surveys	1970-2017	Breeding	Aerial surveys corrected for detectability with ground surveys	2.0 million square miles in Alaska, Canada, and northern U.S.	9	13	(*61*)
North American Trumpteter Swan Survey	1968-2015	Breeding	Aerial surveys and ground counts	Rangewide	1	1	(*63*)
American Woodcock Singing Ground Survey	1968-2017	Breeding	3.6-mile roadside routes	1,500 routes in eastern North America	1	0	(*60*)
2007 Seaduck Joint Venture Report	1970-2007	Variable	Compilation of best available estimates	Continentwide for each species	0	14	(*68*)

Shorebird Flyway Population Database	2012	Breeding population	Compilation of best available estimates	Continentwide for each species	0	45	(*69*, *70*)
Birds of North America (BNA) species accounts	1970-2007	Breeding adults	Variable; best for each species	Continentwide for each species	0	33	(*71*)
Avian Conservation Assessment Database (ACAD)	Variable	Breeding adults	Variable; compiled from other sources	North American estimates	0	17	(*46*)

876 * Estimates for 344 landbird species provided by (*35*); identical methods applied to 55 additional non-landbird
877 species in the present study.
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Table S2.

Net change in abundance across North American bird families, 1970-2017. Taxonomy and common names of families follow (*99*); families listed in order of greatest decline. Net change in abundance expressed in millions of breeding individuals, with upper and lower 90% credible intervals (CI) shown. Percentage of species in each group with negative trend trajectories also noted.

Family	Common Name	N Spp	Net Abundance Change (Millions) & 90% CI			Percent Change & 90% CIs			% Spp in Decline
			Change	UC90	LC90	Change	LC90	UC90	
Passerellidae	New World Sparrows	38	-862.0	-925.7	-798.6	-38.0%	-40.1%	-35.8%	87%
Parulidae	New World Warblers	44	-617.5	-737.8	-509.0	-37.6%	-42.0%	-33.0%	64%
Icteridae	New World Blackbirds	18	-439.8	-467.8	-412.4	-44.2%	-45.9%	-42.4%	83%
Passeridae	Old World Sparrows	2	-331.0	-374.6	-290.2	-81.1%	-82.7%	-79.4%	50%
Alaudidae	Larks	1	-182.0	-207.2	-157.8	-67.4%	-70.9%	-63.7%	100%
Fringillidae	Finches and Allies	13	-144.6	-189.2	-91.9	-36.7%	-45.9%	-23.8%	62%
Tyrannidae	Tyrant Flycatchers	26	-88.2	-107.3	-69.5	-20.1%	-23.7%	-16.2%	50%
Sturnidae	Starlings	1	-83.2	-94.7	-72.6	-49.3%	-52.4%	-46.0%	100%
Turdidae	Thrushes	11	-77.6	-114.2	-38.1	-10.1%	-14.6%	-5.0%	55%
Hirundinidae	Swallows	8	-60.8	-86.7	-31.4	-22.1%	-30.1%	-11.9%	75%
Caprimulgidae	Nightjars	5	-39.3	-44.0	-34.9	-55.0%	-58.0%	-51.5%	60%
Calcariidae	Longspurs	5	-39.3	-79.0	34.3	-31.2%	-60.5%	26.8%	80%
Odontophoridae	New World Quail	5	-21.1	-32.6	-10.0	-51.6%	-61.2%	-35.7%	80%
Laridae	Gulls, Terns	22	-20.1	-27.6	-13.3	-50.5%	-58.4%	-39.9%	73%
Apodidae	Swifts	4	-19.2	-21.4	-17.1	-65.3%	-68.1%	-61.6%	100%
Trochilidae	Hummingbirds	8	-18.9	-36.0	-2.2	-17.0%	-27.7%	-2.6%	63%
Mimidae	Thrashers and Allies	10	-18.3	-22.1	-14.6	-19.4%	-22.9%	-16.0%	80%
Regulidae	Kinglets	2	-17.9	-47.6	12.1	-7.1%	-17.7%	5.0%	50%
Scolopacidae	Sandpipers	32	-15.4	-19.9	-11.1	-38.4%	-46.7%	-28.6%	72%
Cardinalidae	Cardinals and Allies	14	-10.8	-20.6	-1.0	-3.3%	-6.3%	-0.3%	43%
Laniidae	Shrikes	2	-10.3	-11.6	-9.0	-69.0%	-72.2%	-65.7%	100%
Cuculidae	Cuckoos	4	-8.9	-10.5	-7.4	-47.9%	-53.6%	-41.5%	75%
Motacillidae	Pipits, Wagtails	2	-8.1	-12.7	-2.4	-29.0%	-44.0%	-8.6%	100%
Corvidae	Jays, Crows	16	-6.6	-11.8	-1.2	-6.5%	-11.4%	-1.1%	69%
Phylloscopidae	Leaf Warblers	1	-6.4	-16.3	0.7	-50.4%	-76.8%	5.6%	100%
Paridae	Tits, Chickadees	10	-5.3	-11.4	0.8	-4.9%	-10.2%	0.7%	70%
Alcidae	Auks	11	-4.6	-16.8	9.0	-15.9%	-45.8%	33.4%	45%
Icteriidae	Yellow-breasted Chat	1	-3.9	-5.4	-2.5	-21.2%	-28.0%	-13.9%	100%
Ardeidae	Herons	12	-3.4	-4.4	-2.4	-28.0%	-34.1%	-21.2%	58%
Remizidae	Penduline-Tits	1	-2.6	-4.0	-1.4	-42.0%	-53.2%	-28.0%	100%
Charadriidae	Plovers	8	-1.9	-3.1	-0.9	-38.6%	-47.4%	-32.0%	88%

Alcedinidae	Kingfishers	1	-1.6	-1.9	-1.3	-47.8%	-51.5%	-44.0%	100%
Procellariidae	Petrels	1	-1.0	-3.8	3.7	-33.8%	-79.3%	104.4%	100%
Aegithalidae	Long-tailed Tits	1	-0.9	-1.4	-0.3	-28.4%	-42.5%	-10.7%	100%
Podicipedidae	Grebes	6	-0.7	-2.6	1.9	-10.9%	-35.8%	35.7%	50%
Sylviidae	Sylviid Warblers	1	-0.6	-1.1	-0.3	-27.7%	-38.0%	-15.4%	100%
Cinclidae	Dippers	1	-0.03	-0.05	0.00	-15.5%	-27.2%	-2.0%	100%
Aramidae	Limpkin	1	0.00	-0.02	0.02	-15.0%	-62.1%	89.0%	100%
Ciconiidae	Storks	1	0.01	0.00	0.02	77.6%	18.3%	166.9%	0%
Haematopodidae	Oystercatchers	2	0.01	0.01	0.02	123.7%	59.5%	218.0%	0%
Falconidae	Falcons, Caracaras	6	0.03	-0.49	0.63	0.5%	-9.3%	12.6%	33%
Anhingidae	Anhingas	1	0.03	0.02	0.04	109.1%	66.3%	164.5%	0%
Psittacidae	Parrots	1	0.1	0.0	0.3	>1000%	>1000%	>1000%	0%
Tytonidae	Barn Owls	1	0.1	0.1	0.2	211.6%	132.6%	317.8%	0%
Recurvirostridae	Avocets, Stilts	2	0.2	0.0	0.5	57.5%	16.2%	174.6%	0%
Ptiliogonatidae	Silky Flycatchers	1	0.3	0.0	0.7	26.4%	-3.8%	65.2%	0%
Sulidae	Boobies	1	0.4	0.2	0.7	988.6%	497.0%	1891.7%	0%
Gaviidae	Loons	3	0.4	0.1	0.8	32.6%	11.7%	60.7%	33%
Pandionidae	Osprey	1	0.4	0.3	0.5	304.4%	248.4%	370.3%	0%
Rallidae	Rails, Coots	7	0.6	-1.9	4.2	6.2%	-18.1%	40.5%	57%
Gruidae	Cranes	1	0.7	0.5	0.9	914.5%	743.0%	1119.1%	0%
Pelecanidae	Pelicans	2	0.7	0.5	1.2	810.4%	534.6%	1214.2%	0%
Phalacrocoracidae	Cormorants	4	0.8	0.4	1.3	152.3%	73.1%	267.3%	50%
Strigidae	Owls	11	1.7	0.5	3.4	15.9%	4.6%	30.1%	64%
Certhiidae	Treecreepers	1	2.5	1.5	3.7	33.6%	20.8%	47.9%	0%
Threskiornithidae	Ibises, Spoonbills	4	2.9	1.4	6.3	332.8%	167.3%	639.4%	0%
Columbidae	Doves, Pigeons	7	3.6	-17.4	43.3	1.9%	-9.0%	23.1%	57%
Accipitridae	Hawks	16	5.5	5.0	6.0	78.9%	71.8%	86.4%	19%
Bombycillidae	Waxwings	2	8.0	2.1	14.6	13.8%	3.6%	25.0%	50%
Cathartidae	New World Vultures	2	9.4	8.3	10.6	265.3%	238.7%	293.6%	0%
Troglodytidae	Wrens	10	13.3	6.5	20.7	13.8%	6.8%	21.5%	40%
Picidae	Woodpeckers	21	13.6	10.2	17.2	18.5%	13.9%	23.4%	33%
Sittidae	Nuthatches	4	14.4	11.0	18.4	66.6%	50.5%	85.0%	50%
Phasianidae	Grouse and Allies	12	15.2	2.9	36.6	24.3%	4.5%	56.4%	33%
Polioptilidae	Gnatcatchers	2	31.9	12.7	54.5	15.6%	6.2%	26.3%	0%
Anatidae	Waterfowl	42	34.8	24.5	48.3	56.1%	37.9%	79.5%	43%
Vireonidae	Vireos	12	89.9	78.6	102.1	53.6%	46.7%	60.7%	17%

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Table S3.

GAM spatial trend analysis and model comparison. AIC gives Akaike's An Information Criterion. df gives degrees of freedom. Models significantly different according to a Chi-squared likelihood ratio test are labelled by different letters (a,b). Change in biomass traffic was calculated as a spatial mean of the multiplication of spatial trend and kriging-interpolated biomass passage. Changes in biomass traffic are based on spatial averages of the GAM predictions over the contiguous US, as detailed in the text. From left to right: % / yr = annual rate of decline in seasonal migration traffic, % = decline over the period 2007-2017, loss in seasonal migration traffic, p = significance of the te(lon,lat):year trend term. See Figure S7 for plots of the estimated smoothed spatial trend.

					change in biomass traffic 2007-2017			
Model*	Formula	AIC	df		% / yr	%	10^5 birds/km	p
1	index ~ te(lon,lat) + te(lon,lat):year + dualpol†	337	10	a	-1.2 ± 0.7	-11.6 ± 5.9	-1.4 ± 1.7	<0.0001
2	index ~ te(lon,lat) + te(lon,lat):year + mode‡	338	11	a	-1.6 ± 0.8	-14.8 ± 7.2	-1.8 ± 1.9	<0.0001
3	Index ~ te(lon,lat) + te(lon,lat):year + superres§	342	10	b	-2.9 ± 0.5	-25.6 ± 4.2	-3.2 ± 2.8	<0.0001
4	index ~ te(lon,lat) + te(lon,lat):year	360	9	c	-3.3 ± 0.6	-28.7 ± 4.1	-3.7 ± 3.1	<0.0001
1-4	(model average)				-1.5 ± 1.0	-13.6 ± 9.1	-1.7 ± 1.8	

*Family=Gamma(link=log)

‡mode is a factor variable with levels "legacy", "superres" and "dualpol", distinguishing the three time periods in which the radar acquired legacy, super-resolution and dual-polarization data. Note that the dual-polarization upgrade occurred after the super-resolution upgrade, and dual-polarization data includes super-resolution.

†dualpol is a logical variable that is true after the dual-polarization upgrade, and false before

§superres is a logical variable that is true after the superresolution upgrade, and false before

Table S4.

Model comparison of regionalized generalized mixed models, differentiating in four geographic flyway regions: Atlantic, Mississippi, Central and Western (see Fig. XXX). AIC gives Akaike's An Information Criterion, df degrees of freedom. Models significantly different according to a Chi-squared likelihood ratio test are labelled by different letters (a,b). We found support for an effect of dual-polarization upgrade on detected biomass passage (cf. model 5), but not for additional correction for the superresolution upgrade (model 6 did not improve over model 5). See Table S5 for fixed effect estimates.

Model*	Formula	AIC	df	
5	index ~ region + year:flyway + (1 | radar) + dualpol†	338	11	a
6	index ~ region + year:flyway + (1 | radar) + mode‡	340	12	a
7	Index ~ region + year:flyway + (1 | radar) + superres	343	11	b
8	Index ~ region + year:flyway + (1 | radar)	361	10	c

*Family=Gamma(link=log)

‡mode is a factor variable with levels "legacy", "superres" and "dualpol", distinguishing the three time periods in which the radar acquired legacy, super-resolution and dual-polarization data. Note that the dual-polarization upgrade occurred after the super-resolution upgrade, and dual-polarization data includes super-resolution.

†dualpol is a logical variable that is true after the dual-polarization upgrade, and false before

§superres is a logical variable that is true after the superresolution upgrade, and false before

Table S5.

Parameter estimates of temporal and detection-related fixed effects, based on generalized mixed models differentiating in three geographic regions: west (lon < -105°), central (-105° < lon < -95°) and east (lon> -95°). Estimates of change in migratory biomass traffic are expressed as percentages change per year. Explanatory variable year was scaled to zero at 2007. Significant model terms are highlighted in **bold**. See Table S4 for model comparisons.

Model	Fixed effect	Estimate	Unit	t	p
5	**year:flyway_Atlantic**	**-3.0 ± 0.6**	**%/yr**	**-4.7**	**<0.0001**
5	**year:flyway_Mississippi**	**-2.7 ± 0.6**	**%/yr**	**-4.5**	**<0.0001**
5	year:flyway_Central	0.6 ± 0.6	%/yr	1.0	0.3
5	year:flyway_Pacific	0.2 ± 0.6	%/yr	0.3	0.8
5	**dualpol=TRUE**	**-16 ± 3**	**%**	**-5.0**	**<0.0001**
6	**year:flyway_Atlantic**	**-3.4 ± 0.7**	**%/yr**	**-4.5**	**<0.0001**
6	**year:flyway_Mississippi**	**-3.0 ± 0.7**	**%/yr**	**-4.2**	**<0.0001**
6	year:flyway_Central	0.2 ± 0.7	%/yr	0.3	0.7
6	year:flyway_Pacific	0.1 ± 0.8	%/yr	-0.2	0.9
6	mode="superres"	25 ± 27	%	0.9	0.4
6	**mode="dualpol"**	**-12 ± 5**	**%**	**-2.4**	**0.02**
7	**year:flyway_Atlantic**	**-4.7 ± 0.5**	**%/yr**	**-9.9**	**<0.0001**
7	**year:flyway_Mississippi**	**-4.4 ± 0.4**	**%/yr**	**-10.2**	**<0.0001**
7	**year:flyway_Central**	**-1.2 ± 0.4**	**%/yr**	**-2.7**	**0.007**
7	**year:flyway_Pacific**	**-1.5 ± 0.5**	**%/yr**	**-3.0**	**0.003**
7	**superres=TRUE**	**8 ± 2**	**%**	**4.4**	**<0.0001**
8	**year:flyway_Atlantic**	**-5.2 ± 0.5**	**%/yr**	**-10.9**	**<0.0001**
8	**year:flyway_Mississippi**	**-4.8 ± 0.4**	**%/yr**	**-11.3**	**<0.0001**
8	**year:flyway_Central**	**-1.5 ± 0.4**	**%/yr**	**-3.5**	**0.0004**
8	**year:flyway_Pacific**	**-1.9 ± 0.5**	**%/yr**	**-3.8**	**0.0001**
5-8 (average)[†]	**year:flyway_Atlantic**	**-3.2 ± 0.8**	**%/yr**	**4.1**[*]	**<0.0001**
5-8 (average)[†]	**year:flyway_Mississippi**	**-2.9 ± 0.7**	**%/yr**	**3.9**[*]	**0.0001**
5-8 (average)[†]	year:flyway_Central	0.4 ± 0.8	%/yr	0.5[*]	0.6
5-8 (average)[†]	year:flyway_Pacific	0.3 ± 0.8	%/yr	0.0[*]	1.0

[*]z value instead of t value

[†]showing full model-averaged coefficients for temporal fixed effects only

Data S1. (separate file)

Species-specific data and results for analysis of net population change in the North American avifauna. Included are 529 species with common and scientific names, taxonomic sort number (*100*), bird family, species group and biome assignments, absolute and proportional changes in abundance with associated variance, start and end-year population estimates with variance, and source data for population size estimates and population trajectories for each species. A separate worksheet in the same file contains definitions of each column header.

Data S2. (separate file)

Species-specific adjustment factors used in the calculation of Partners in Flight (PIF) population size estimates based on BBS count data. Included are 399 species, including 344 landbird species previously published in (*35*), and 55 additional non-landbird species for which we estimated population size using identical methods. Unrounded population size estimates (PopUsCa) ate the same as in Data S1, and are provided here for easy reference. Adjustment factors are further defined and described in (*35*).

species	sci_name	sort	Breeding.Bi	Winter.Bio	Family	bird.group	Migrate	AI	native	popest	popestlci	popestuci	first_year_	last_year_p	Pop.source	Trajectory_	Trajectory_	Trajectory_	Loss_med	Loss_lci	Loss_uci	Loss_lqrt	Loss_uqrt
Abert's Towhee	Melozone a	1817	Aridlands	Southwest	Passerellid	landbird	R	other	native	890243	429538	1469410	2006	2015	PIF0615	BBS7017	1970	2017	-271177	-726620	-26148.4	-399159	-168279
Acadian Flycatcher	Empidonax	1303	Eastern For	Mexico-Cer	Tyrannidae	landbird	M	other	native	5227271	4728009	5829898	2006	2015	PIF0615	BBS7017	1970	2017	470107.7	-30583.6	944779.1	302529.3	631900.5
Acorn Woodpecker	Melanerpes	939	Western Fo	Widesprea	Picidae	landbird	R	other	native	2226303	1452256	3390813	2006	2015	PIF0615	BBS7017	1970	2017	-472997	-1177341	-37943.2	-676790	-308044
Alder Flycatcher	Empidonax	1304	Boreal Fore	South Ame	Tyrannidae	landbird	M	other	native	1.18E+08	99384651	1.41E+08	2006	2015	PIF0615	BBS7017	1970	2017	43413071	28809038	59401956	38418052	48719058
Allen's Hummingbi	Selasphoru	342	Aridlands	Mexico-Cer	Trochilidae	landbird	M	other	native	1484682	348049	4475111	2006	2015	PIF0615	BBS7017	1970	2017	4605856	3.023885	11266872	2347939	6907417
American Avocet	Recurvirost	444	Wetland	Widesprea	Recurvirost	shorebird	M	other	native	450000	180000	1125000	2011	2013	Shoreb12	BBS7017	1970	2017	-85487.1	-322752	3663.752	-148701	-38619.4
American Bittern	Botaurus le	727	Wetland	Temperate	Ardeidae	waterbird	M	other	native	2507797	2005616	3117498	2006	2015	PIF0615	BBS7017	1970	2017	715897.4	173483.1	1234861	529610.2	894811.8
American Black Du	Anas rubrip	49	Wetland	Temperate	Anatidae	waterfowl	M	other	native	583500	500200	666800	2013	2017	FWS1317	BBS7017	1970	2017	340512.1	177868.2	505661.6	285368.6	396500.9
American Coot	Fulica amer	435	Wetland	Widesprea	Rallidae	waterbird	M	other	native	5517522	4109506	7381712	2006	2015	PIF0615	BBS7017	1970	2017	-181609	-3237243	1759719	-1047916	543020.1
American Crow	Corvus brac	1395	Habitat Ger	Temperate	Corvidae	landbird	M	other	native	28047630	26447403	29639378	2006	2015	PIF0615	BBS7017	1970	2017	-837553	-2431116	734755.6	-1392338	-310653
American Dipper	Cinclus me	1514	Wetland	Temperate	Cinclidae	landbird	R	other	native	151919	114060	200186	2006	2015	PIF0615	BBS7017	1970	2017	27183.93	2510.775	52532.67	18845.9	35727.05
American Golden-P	Pluvialis dc	452	Arctic Tund	South Ame	Charadriid	shorebird	M	other	native	500000	294200	705800	2011	2013	Shoreb12	Mig7416	1974	2016	478098.1	204909.9	827569.8	377772.4	587140.6
American Goldfincl	Spinus trist	1771	Forest Gen	Temperate	Fringillidae	landbird	M	other	native	44092850	41554624	46767583	2006	2015	PIF0615	BBS7017	1970	2017	2743107	-883054	6269189	1499409	3953985
American Kestrel	Falco sparv	998	Habitat Ger	Widesprea	Falconidae	landbird	M	other	native	2827776	2564206	3116508	2006	2015	PIF0615	BBS7017	1970	2017	1878754	1595457	2174950	1781703	1978651
American Oystercat	Haematopu	446	Coasts	Coastal	Haematopc	shorebird	M	other	native	11000	10700	11300	2011	2013	Shoreb12	CBC7017	1970	2017	-3624.98	-10115.3	363.068	-5490.83	-2030.91
American Pipit	Anthus rub	1678	Arctic Tund	Temperate	Motacillida	landbird	M	other	native	18034890	17874051	18354686	2006	2015	PIF0615	CBC7017	1970	2017	4465486	-1215829	8819001	2742905	6050415
American Redstart	Setophaga	1983	Eastern For	Widesprea	Parulidae	landbird	M	other	native	42464674	37027311	48475245	2006	2015	PIF0615	BBS7017	1970	2017	4242063	-423721	8951280	2703869	5863376
American Robin	Turdus mig	1603	Forest Gen	Temperate	Turdidae	landbird	M	other	native	3.66E+08	3.37E+08	3.93E+08	2006	2015	PIF0615	BBS7017	1970	2017	-2E+07	-3.7E+07	-3750046	-2.6E+07	-1.4E+07
American Three-toe	Picoides dc	958	Boreal Fore	Temperate	Picidae	landbird	R	other	native	1564320	1108671	2160148	2006	2015	PIF0615	BBS7017	1970	2017	-1574551	-2608131	-875172	-1887474	-1298197
American Tree Spar	Spizelloide	1828	Arctic Tund	Temperate	Passerellid	landbird	M	other	native	26412817	19492087	36200474	2006	2015	PIF0615	CBC7017	1970	2017	29847392	19971565	40527844	26299536	33469530
American White Pe	Pelecanus e	724	Wetland	Temperate	Pelecanida	waterbird	M	other	native	414730	299521	546711	2006	2015	PIF0615	BBS7017	1970	2017	-598682	-1038608	-340170	-722401	-492236
American Wigeon	Mareca am	44	Wetland	Temperate	Anatidae	waterfowl	M	other	native	2997300	2640100	3354500	2013	2017	FWS1317	FWS7017	1970	2017	211210	-578048	900440	-51414.6	455778.9
American Woodcoc	Scolopax m	512	Eastern For	Temperate	Scolopacid	shorebird	M	other	native	3500000	3000000	4000000	2011	2013	Shoreb12	SGS6817	1970	2017	1664212	1325504	2031493	1544191	1785860
Ancient Murrelet	Synthlibor	555	Coasts	Marine	Alcidae	waterbird	M	other	native	1000000	500000	1500000	1990	1992	BNA2010	CBC7017	1970	2017	-1739879	-4634318	-487306	-2480741	-1191479
Anhinga	Anhinga an	723	Wetland	Widesprea	Anhingidae	waterbird	M	other	native	27000	20000	34000	1978	1980	BNA2000	BBS7017	1970	2017	-27796.8	-44385	-16120.8	-33010.8	-23330.6
Anna's Hummingbi	Calypte anr	336	Aridlands	Temperate	Trochilidae	landbird	M	other	native	8772569	4880026	16549527	2006	2015	PIF0615	BBS7017	1970	2017	-6791952	-1.2E+07	-2325109	-8504644	-5231861
Arctic Tern	Sterna para	615	Arctic Tund	Coastal	Laridae	waterbird	M	other	native	1000000	250000	1750000	2004	2006	WPE5	BBS9317	1993	2017	494844.8	45941.65	1169517	317837	698859.4
Arctic Warbler	Phylloscop	1526	Arctic Tund	Widesprea	Phylloscop	landbird	M	other	native	8201201	2638973	16439186	2006	2015	PIF0615	BBS9317	1993	2017	6128758	-474299	15763298	3440842	9088913
Ash-throated Flycat	Myiarchus	1247	Aridlands	Mexico-Cer	Tyrannidae	landbird	M	other	native	6847348	5661743	8193398	2006	2015	PIF0615	BBS7017	1970	2017	-2577423	-3580302	-1747999	-2909963	-2271995
Atlantic Puffin	Fratercula	562	Coasts	Marine	Alcidae	waterbird	M	other	native	375000	350000	400000	1998	2000	BNA2002	CBC7017	1970	2017	-509047	-1397635	-122553	-738613	-334345
Bachman's Sparrow	Peucaea ae	1825	Eastern For	Temperate	Passerellid	landbird	R	other	native	167964	102917	256160	2006	2015	PIF0615	BBS7017	1970	2017	453787.5	242709.4	667229.6	379020.5	526336.1
Baird's Sandpiper	Calidris bai	500	Arctic Tund	South Ame	Scolopacid	shorebird	M	other	native	300000	120000	750000	2011	2013	Shoreb12	Mig7416	1974	2016	-73534	-338993	21388.27	-138017	-26211.9
Baird's Sparrow	Centronyx	1844	Grassland	Southwest	Passerellid	landbird	M	other	native	3440174	2322349	4825893	2006	2015	PIF0615	BBS7017	1970	2017	5962461	3593246	8610544	5113821	6841097
Bald Eagle	Haliaeetus	795	Wetland	Temperate	Accipitrida	landbird	M	other	native	200000	100000	300000	2015	2017	ACAD	BBS7017	1970	2017	-199325	-312190	-96947.8	-236329	-162465
Baltimore Oriole	Icterus galt	1922	Eastern For	Widesprea	Icteridae	landbird	M	other	native	11806532	10808329	12963225	2006	2015	PIF0615	BBS7017	1970	2017	8601411	7298291	10020637	8136466	9067441
Band-tailed Pigeon	Patagioena	156	Western Fo	Mexico-Cer	Columbida	landbird	M	other	native	1455144	1049053	1990079	2006	2015	PIF0615	BBS7017	1970	2017	1428395	877056.2	2065349	1221243	1641593
Bank Swallow	Riparia ripa	1430	Habitat Ger	South Ame	Hirundinid	landbird	M	AI	native	7940368	6125188	10752527	2006	2015	PIF0615	BBS7017	1970	2017	56359017	39379185	73792279	50452682	62176291
Barn Owl	Tyto alba	828	Habitat Ger	Widesprea	Tytonidae	landbird	R	other	native	130751	81975	193386	2006	2015	PIF0615	BBS7017	1970	2017	-108515	-190380	-54157.3	-132808	-87354
Barn Swallow	Hirundo ru	1433	Habitat Ger	South Ame	Hirundinid	landbird	M	AI	native	46855476	43409178	50012099	2006	2015	PIF0615	BBS7017	1970	2017	26205491	22382615	30335589	24893553	27584463
Barred Owl	Strix varia	860	Forest Gen	Temperate	Strigidae	landbird	R	other	native	3458782	3024086	3952819	2006	2015	PIF0615	BBS7017	1970	2017	-2129260	-2605653	-1721838	-2288824	-1980560
Barrow's Goldeney	Bucephala	74	Wetland	Temperate	Anatidae	waterfowl	M	other	native	204250	102125	306375	2004	2006	SeDu07	BBS7017	1970	2017	127372.1	44650.67	234717.3	96082.26	161048.1
Bay-breasted Warbl	Setophaga	1990	Boreal Fore	Mexico-Cer	Parulidae	landbird	M	other	native	9892605	6894711	13872180	2006	2015	PIF0615	BBS7017	1970	2017	1601578	-1778854	4546113	553700.7	2583102
Bell's Sparrow	Artemisiosp	1840	Aridlands	Southwest	Passerellid	landbird	M	other	native	214853	89930	390058	2006	2015	PIF0615	BBS7017	1970	2017	15185.27	-51467.5	83358.42	-2835.01	35778.58
Bell's Vireo	Vireo bellii	1349	Aridlands	Mexico-Cer	Vireonidae	landbird	M	other	native	4599734	3593221	5764813	2006	2015	PIF0615	BBS7017	1970	2017	-1778207	-3052932	-840648	-2172755	-1425545
Belted Kingfisher	Megaceryle	907	Wetland	Widesprea	Alcedinida	landbird	M	other	native	1843798	1568548	2159306	2006	2015	PIF0615	BBS7017	1970	2017	1557332	1271728	1866622	1456772	1659761
Bendire's Thrasher	Toxostoma	1625	Aridlands	Southwest	Mimidae	landbird	M	other	native	56338	30887	93302	2006	2015	PIF0615	BBS7017	1970	2017	272275.9	120411.9	429938.8	219764.2	327550.5
Bewick's Wren	Thryomane	1472	Aridlands	Temperate	Troglodytic	landbird	R	other	native	4567446	3627322	5765670	2006	2015	PIF0615	BBS7017	1970	2017	1857632	1120961	2657191	1606426	2124605
Black-and-white W	Mniotilta v	1954	Eastern For	Widesprea	Parulidae	landbird	M	other	native	17709569	15812133	19681290	2006	2015	PIF0615	BBS7017	1970	2017	6751218	4395734	9215736	5924929	7567140
Black-backed Wooc	Picoides ar	959	Boreal Fore	Temperate	Picidae	landbird	R	other	native	1734181	1251409	2296411	2006	2015	PIF0615	BBS7017	1970	2017	-1291984	-2079847	-753337	-1530952	-1085538
Black-bellied Plove	Pluvialis sq	450	Arctic Tund	Coastal	Charadriid	shorebird	M	other	native	362700	200667	541500	2011	2013	Shoreb12	Mig7416	1974	2016	301896.5	128695.1	534467.2	237408.7	376120
Black-billed Cuckoo	Coccyzus er	209	Eastern For	South Ame	Cuculidae	landbird	M	other	native	875781	735134	1051851	2006	2015	PIF0615	BBS7017	1970	2017	1473177	1066337	1901169	1329195	1619382
Black-billed Magpie	Pica hudso	1391	Habitat Ger	Temperate	Corvidae	landbird	R	other	native	6023555	5190448	7003608	2006	2015	PIF0615	BBS7017	1970	2017	1709069	1086576	2358396	1493302	1925879
Black-capped Chick	Poecile atri	1436	Forest Gen	Temperate	Paridae	landbird	R	other	native	43031705	39633241	46269089	2006	2015	PIF0615	BBS7017	1970	2017	-1.2E+07	-1.5E+07	-8230942	-1.3E+07	-1E+07
Black-chinned Hum	Archilochu	333	Western Fo	Mexico-Cer	Trochilidae	landbird	M	other	native	8179118	5809219	10961926	2006	2015	PIF0615	BBS7017	1970	2017	-3057487	-4839297	-1704018	-3623597	-2532567
Black-chinned Spar	Spizella atr	1834	Aridlands	Southwest	Passerellid	landbird	M	other	native	293554	150962	524619	2006	2015	PIF0615	BBS7017	1970	2017	355805.5	119241.2	643166.6	268128	449698.8
Black-crested Titmc	Baeolophus	1446	Aridlands	Temperate	Paridae	landbird	R	other	native	642491	414558	1018349	2006	2015	PIF0615	BBS7017	1970	2017	209499.5	35062.53	418974.3	145156.6	275685.7
Black-crowned Nigl	Nycticorax	754	Wetland	Widesprea	Ardeidae	waterbird	M	other	native	419820	292104	595456	2006	2015	PIF0615	BBS7017	1970	2017	73103.29	-10707.7	162084.8	45729.67	101405.2
Black-headed Grost	Pheucticus	2052	Western Fo	Mexico-Cer	Cardinalid	landbird	M	other	native	12185173	10701801	13695616	2006	2015	PIF0615	BBS7017	1970	2017	-2853073	-4296573	-1584113	-3336660	-2386265
Black-legged Kittiw	Rissa tridac	566	Coasts	Marine	Laridae	waterbird	M	other	native	1550000	1162500	1937500	2006	2008	BNA2009	CBC7017	1970	2017	1509438	167534.5	2876618	1096247	1947205
Black-necked Stilt	Himantopu	443	Wetland	Widesprea	Recurvirost	shorebird	M	other	native	177100	70840	442750	2011	2013	Shoreb12	BBS7017	1970	2017	-128074	-308251	-0.88997	-183658	-78187.1
Black-tailed Gnatca	Polioptila r	1509	Aridlands	Southwest	Polioptilid	landbird	R	other	native	6527338	4101720	10094127	2006	2015	PIF0615	BBS7017	1970	2017	-494178	-3156823	1296528	-1239887	142717.1
Black-throated Blu	Setophaga	1995	Boreal Fore	Caribbean	Parulidae	landbird	M	other	native	2415903	2069260	2822969	2006	2015	PIF0615	BBS7017	1970	2017	-1420318	-1886049	-1028556	-1577242	-1276479
Black-throated Gra	Setophaga	2008	Western Fo	Mexico-Cer	Parulidae	landbird	M	other	native	3130246	2558225	3733825	2006	2015	PIF0615	BBS7017	1970	2017	2084363	1376458	2839442	1835279	2340499
Black-throated Gre	Setophaga	2012	Boreal Fore	Mexico-Cer	Parulidae	landbird	M	other	native	9177716	7924382	10581319	2006	2015	PIF0615	BBS7017	1970	2017	-1641064	-3228729	-305009	-2161892	-1163480
Black-throated Spa	Amphispiza	1838	Aridlands	Southwest	Passerellid	landbird	M	other	native	31040032	26228164	36813986	2006	2015	PIF0615	BBS7017	1970	2017	20074030	13326489	27205271	17811405	22457575
Black-whiskered Vi	Vireo altilo	1362	Eastern For	South Ame	Vireonidae	landbird	M	other	native	84242	1998	207072	2006	2015	PIF0615	BBS9317	1993	2017	18907.21	-71426.6	108500.8	0.474938	44810.37
Black Guillemot	Cepphus gr	547	Coasts	Marine	Alcidae	waterbird	M	other	native	500000	250000	750000	1984	1986	BNA2002	CBC7017	1970	2017	-890911	-2926060	-135680	-1390601	-539480
Black Oystercatche	Haematopu	447	Coasts	Coastal	Haematopc	shorebird	R	other	native	10000	6667	15000	2011	2013	Shoreb12	CBC7017	1970	2017	-8978.13	-18664.6	-3868.68	-11620.4	-6890.41
Black Phoebe	Sayornis ni	1317	Wetland	Temperate	Tyrannidae	landbird	M	other	native	1170291	816450	1641836	2006	2015	PIF0615	BBS7017	1970	2017	-948257	-1439790	-567119	-1102771	-806415
Black Scoter	Melanitta a	70	Arctic Tund	Marine	Anatidae	waterfowl	M	other	native	350000	262500	437500	2004	2006	SeDu07	CBC7017	1970	2017	400731.4	44419.98	788547.2	290132.9	518006.8
Black Skimmer	Rynchops n	621	Coasts	Coastal	Laridae	waterbird	M	other	native	60000	48000	72000	1975	1977	BNA1994	BBS7017	1970	2017	39418.8	20845.33	55142.13	33712.45	44751.63
Black Swift	Cypseloide	253	Western Fo	South Ame	Apodidae	landbird	M	AI	native	88506	34390	198559	2006	2015	PIF0615	BBS7017	1970	2017	661817.6	46956.59	1325405	450347.6	880641.5
Black Tern	Chlidonias	610	Wetland	Marine	Laridae	waterbird	M	other	native	2331116	1695896	3119894	2006	2015	PIF0615	BBS7017	1970	2017	2809048	1433388	4459359	2310919	3327047
Black Turnstone	Arenaria m	483	Coasts	Coastal	Scolopacid	shorebird	M	other	native	95000	76000	114000	2011	2013	Shoreb12	CBC7017	1970	2017	14548.31	-16263	40849.72	5146.065	23421.02
Black Vulture	Coragyps at	765	Habitat Ger	Widesprea	Cathartidae	landbird	R	other	native	1864137	1555779	2249923	2006	2015	PIF0615	BBS7017	1970	2017	-2326573	-2932660	-1796159	-2525527	-2132346
Blackburnian Warb	Setophaga	1991	Boreal Fore	South Ame	Parulidae	landbird	M	other	native	13271149	10865077	16109037	2006	2015	PIF0615	BBS7017	1970	2017	-1387357	-3305716	266365.9	-1988294	-807793
Blackpoll Warbler	Setophaga	1994	Boreal Fore	South Ame	Parulidae	landbird	M	other	native	59716232	45066327	76124820	2006	2015	PIF0615	BBS7017	1970	2017	3.07E+08	2.15E+08	4.16E+08	2.75E+08	3.42E+08
Blue-gray Gnatcatcl	Polioptila c	1506	Habitat Ger	Widesprea	Polioptilid	landbird	M	other	native	2.29E+08	1.95E+08	2.67E+08	2006	2015	PIF0615	BBS7017	1970	2017	-3.2E+07	-5.3E+07	-1.3E+07	-3.9E+07	-2.5E+07
Blue-headed Vireo	Vireo solita	1355	Boreal Fore	Mexico-Cer	Vireonidae	landbird	M	other	native	12765014	11050138	14721085	2006	2015	PIF0615	BBS7017	1970	2017	-1.1E+07	-1.5E+07	-8859233	-1.2E+07	-1E+07
Blue-winged Teal	Spatula dis	38	Wetland	Widesprea	Anatidae	waterfowl	M	other	native	7879800	7110600	8648900	2013	2017	FWS1317	FWS7017	1970	2017	-3302788	-5390736	-1650457	-3986128	-2699642
Blue-winged Warbl	Vermivora	1953	Eastern For	Mexico-Cer	Parulidae	landbird	M	other	native	684415	578230	803348	2006	2015	PIF0615	BBS7017	1970	2017	379078.1	273839	490287.7	342495.4	416588.7
Blue Grosbeak	Passerina c	2058	Forest Gen	Mexico-Cer	Cardinalid	landbird	M	other	native	20938581	19404702	22644996	2006	2015	PIF0615	BBS7017	1970	2017	-7109707	-8727595	-5611959	-7644864	-6582229
Blue Jay	Cyanocitta	1382	Eastern For	Temperate	Corvidae	landbird	M	other	native	17238587	15864197	18715069	2006	2015	PIF0615	BBS7017	1970	2017	5391960	4456773	6381627	5057991	5726875
Boat-tailed Grackle	Quiscalus n	1940	Wetland	Temperate	Icteridae	landbird	R	other	native	2156489	1297665	3550285	2006	2015	PIF0615	BBS7017	1970	2017	923304.9	316543.3	1743162	688421.4	1175833
Bobolink	Dolichony	1887	Grassland	South Ame	Icteridae	landbird	M	other	native	10195298	8796086	11917384	2006	2015	PIF0615	BBS7017	1970	2017	15777561	12973015	18704343	14817756	16756540
Bohemian Waxwing	Bombycilla	1637	Boreal Fore	Temperate	Bombycilli	landbird	M	other	native	2507863	1641840	3491482	2006	2015	PIF0615	BBS9317	1993	2017	2730215	1473152	4121367	2284316	3200383
Bonaparte's Gull	Chroicocep	570	Wetland	Coastal	Laridae	waterbird	M	other	native	785266	442937	1198079	2006	2015	PIF0615	BBS9317	1993	2017	96980.37	-319527	416338.2	-17181.7	203100.6
Boreal Chickadee	Poecile huc	1440	Boreal Fore	Temperate	Paridae	landbird	R	other	native	13208240	10477170	16444759	2006	2015	PIF0615	BBS7017	1970	2017	1562983	-1080801	3946003	682398	2385224
Brandt's Cormorant	Phalacroco	717	Coasts	Coastal	Phalacroco	waterbird	M	other	native	125000	81250	168750	1989	1991	BNA1998	CBC7017	1970	2017	-307415	-534912	-165555	-375580	-250293
Brant	Branta berr	20	Arctic Tund	Coastal	Anatidae	waterfowl	M	other	native	403482	363134	443830	2013	2015	CAFF18	CAFF	2000	2016	284384.7	171166.4	400741.2	246733	323198.2
Brewer's Blackbird	Euphagus c	1938	Habitat Ger	Temperate	Icteridae	landbird	M	other	native	23324285	20136678	27110785	2006	2015	PIF0615	BBS7017	1970	2017	33853363	28211780	39805600	31910053	35809392
Brewer's Sparrow	Spizella bre	1831	Aridlands	Southwest	Passerellid	landbird	M	other	native	16834981	13155782	21238196	2006	2015	PIF0615	BBS7017	1970	2017	10528151	6697274	14897547	9183193	12007943
Bridled Titmouse	Baeolophus	1442	Western Fo	Mexico-Cer	Paridae	landbird	R	other	native	69340	22843	147260	2006	2015	PIF0615	BBS9317	1993	2017	3148.158	-91899.3	58845.03	-14364.8	20085.11
Broad-tailed Humm	Selasphoru	340	Western Fo	Mexico-Cer	Trochilidae	landbird	M	other	native	8804795	5880867	12313443	2006	2015	PIF0615	BBS7017	1970	2017	9073828	5572515	12990766	7818108	10348963
Broad-winged Hawl	Buteo platy	820	Forest Gen	Widesprea	Accipitrida	landbird	M	other	native	1804126	1598612	2029385	2006	2015	PIF0615	BBS7017	1970	2017	-605922	-807666	-436703	-672008	-545128
Bronzed Cowbird	Molothrus	1932	Aridlands	Widesprea	Icteridae	landbird	M	other	native	816191	439751	1339476	2006	2015	PIF0615	BBS7017	1970	2017	-105811	-402373	83878.67	-190751	-37287.6
Brown-crested Flyc	Myiarchus	1250	Aridlands	Mexico-Cer	Tyrannidae	landbird	M	other	native	1032206	639470	1584755	2006	2015	PIF0615	BBS7017	1970	2017	-1031626	-1692682	-515610	-1240980	-844175
Brown-headed Cow	Molothrus	1933	Habitat Ger	Temperate	Icteridae	landbird	M	other	native	1.27E+08	1.18E+08	1.36E+08	2006	2015	PIF0615	BBS7017	1970	2017	40902527	32324567	49507922	38026025	43814928
Brown-headed Nutl	Sitta pusill	1452	Eastern For	Temperate	Sittidae	landbird	R	other	native	1578602	1352620	1826550	2006	2015	PIF0615	BBS7017	1970	2017	286339.8	109394.4	461233.7	225573.9	348194.8
Brown Creeper	Certhia am	1453	Forest Gen	Temperate	Certhiidae	landbird	M	other	native	9484338	7757209	11639138	2006	2015	PIF0615	BBS7017	1970	2017	-2487358	-3722358	-1494289	-2881264	-2113948
Brown Pelican	Pelecanus c	725	Coasts	Coastal	Pelecanida	waterbird	M	other	native	100000	90000	110000	1998	2000	BNA2014	BBS7017	1970	2017	-127274	-279306	-49554.7	-168357	-94738.7
Brown Thrasher	Toxostoma	1622	Eastern For	Temperate	Mimidae	landbird	M	other	native	6168180	5625720	6771313	2006	2015	PIF0615	BBS7017	1970	2017	3614005	3148641	4104648	3456274	3781074
Buff-breasted Sand	Calidris sub	504	Arctic Tund	South Ame	Scolopacid	shorebird	M	other	native	56000	35000	78000	2011	2013	Shoreb12	Mig7416	1974	2016	-18592.1	-68339.2	4769.784	-31791.3	-8843.8
Bufflehead	Bucephala	72	Wetland	Temperate	Anatidae	waterfowl	M	other	native	1400000	1050000	1750000	2004	2006	SeDu07	BBS7017	1970	2017	-1699058	-2504845	-1102931	-1950290	-1469745
Bullock's Oriole	Icterus bull	1916	Western Fo	Mexico-Cer	Icteridae	landbird	M	other	native	6949229	6086900	7839504	2006	2015	PIF0615	BBS7017	1970	2017	2378753	1638170	3156935	2119069	2638434
Burrowing Owl	Athene cun	856	Grassland	Temperate	Strigidae	landbird	M	other	native	987921	625174	1537376	2006	2015	PIF0615	BBS7017	1970	2017	308476.1	110350.6	565890.7	234925.9	389962.4
Bushtit	Psaltriparu	1448	Western Fo	Temperate	Aegithalida	landbird	R	other	native	2310447	1807618	2949870	2006	2015	PIF0615	BBS7017	1970	2017	877862.2	360451.8	1433075	698217.5	1060235
Cackling Goose	Branta hut	22	Arctic Tund	Temperate	Anatidae	waterfowl	M	other	native	4510202	4059182	4961222	2013	2015	CAFF18	CAFF	1975	2016	-4026866	-6623053	-2405365	-4797162	-3378340
Cactus Wren	Campylorh	1482	Aridlands	Southwest	Troglodytic	landbird	R	other	native	3034276	2268727	4012714	2006	2015	PIF0615	BBS7017	1970	2017	4351025	3013705	5833059	3862837	4851696
California Gull	Larus califo	585	Wetland	Temperate	Laridae	waterbird	M	other	native	1065791	658357	1567466	2006	2015	PIF0615	BBS7017	1970	2017	785816.2	139858.6	1473702	569412.5	1013140
California Quail	Callipepla c	104	Aridlands	Temperate	Odontophc	landbird	R	other	native	3358401	2374290	4473991	2006	2015	PIF0615	BBS7017	1970	2017	-1259923	-2116262	-646222	-1524560	-1025116
California Scrub-Ja	Aphelocom	1385	Western Fo	Temperate	Corvidae	landbird	R	other	native	1346997	859873	2030181	2006	2015	PIF0615	BBS7017	1970	2017	135601	-19700.4	316679.9	83643.41	193982.6
California Thrasher	Toxostoma	1627	Aridlands	Temperate	Mimidae	landbird	R	other	native	155226	77498	274331	2006	2015	PIF0615	BBS7017	1970	2017	123963.2	42671.75	215923.7	95698.15	153536.6
California Towhee	Melozone c	1816	Aridlands	Temperate	Passerellid	landbird	R	other	native	5247688	3750592	7222092	2006	2015	PIF0615	BBS7017	1970	2017	992530	64954.17	1969980	683326.6	1313120
Calliope Humming	Selasphoru	346	Western Fo	Mexico-Cer	Trochilidae	landbird	M	other	native	4463289	2652793	7024258	2006	2015	PIF0615	BBS7017	1970	2017	844514.3	-28772.5	1954856	545079.5	1188922
Canada Goose	Branta can	23	Wetland	Temperate	Anatidae	waterfowl	M	other	native	6919635	6227672	7611599	2014	2016	CAFF18	CBC7017	1970	2017	-7011283	-1.8E+07	-2540856	-9781978	-5017736
Canada Jay	Perisoreus	1364	Boreal Fore	Temperate	Corvidae	landbird	R	other	native	26652111	23501504	30178807	2006	2015	PIF0615	BBS7017	1970	2017	3548942	-1362305	7730558	1994763	4996020
Canada Warbler	Cardellina	2022	Boreal Fore	South Ame	Parulidae	landbird	M	other	native	2597361	2028500	3242734	2006	2015	PIF0615	BBS7017	1970	2017	4205252	3134019	5321449	3820760	4572029
Canvasback	Aythya vali	54	Wetland	Temperate	Anatidae	waterfowl	M	other	native	739700	621300	858100	2013	2017	FWS1317	FWS7017	1970	2017	-217374	-394999	-74753	-272563	-164047
Canyon Towhee	Melozone f	1814	Aridlands	Southwest	Passerellid	landbird	R	other	native	2792820	2085096	3605781	2006	2015	PIF0615	BBS7017	1970	2017	2778772	1741746	3992604	2399291	3173874
Canyon Wren	Catherpes r	1457	Aridlands	Southwest	Troglodytic	landbird	R	other	native	423956	325189	554507	2006	2015	PIF0615	BBS7017	1970	2017	-4671.56	-80642.9	62796.82	-29268.6	17507.88
Cape May Warbler	Setophaga	1985	Boreal Fore	Caribbean	Parulidae	landbird	M	other	native	7043668	4900702	9894881	2006	2015	PIF0615	BBS7017	1970	2017	2947236	-483293	6354693	1858626	4051865
Carolina Chickadee	Poecile car	1435	Eastern For	Temperate	Paridae	landbird	R	other	native	13179980	12174905	14399165	2006	2015	PIF0615	BBS7017	1970	2017	3057030	2152186	3947359	2744236	3361944
Carolina Wren	Thryothoru	1471	Eastern For	Temperate	Troglodytic	landbird	R	other	native	17733395	15969003	19620346	2006	2015	PIF0615	BBS7017	1970	2017	-6141404	-9569560	-3307512	-7228508	-5116236

Caspian Tern	Hydroprog	608	Wetland	Coastal	Laridae	waterbird	M	other	native	78325	41255	130130	2006	2015	PIF0615	BBS7017	1970	2017	-26345.6	-67560.4	-4025.23	-38047.5	-16984.3
Cassin's Auklet	Ptychoram	556	Coasts	Marine	Alcidae	waterbird	M	other	native	3200000	2400000	4000000	2007	2009	BNA2011	CBC7017	1970	2017	769955.6	-4784197	3699968	-510120	1793990
Cassin's Finch	Haemorhou	1751	Western Fo	Temperate	Fringillidae	landbird	M	other	native	3191950	2521299	4034402	2006	2015	PIF0615	BBS7017	1970	2017	4177144	3053576	5448139	3783289	4600123
Cassin's Kingbird	Tyrannus vo	1275	Western Fo	Mexico-Cer	Tyrannidae	landbird	M	AI	native	2480328	1833328	3291825	2006	2015	PIF0615	BBS7017	1970	2017	-240693	-888876	251999.8	-439888	-63998.3
Cassin's Sparrow	Peucaea ca:	1824	Grassland	Southweste	Passerellida	landbird	M	other	native	9598748	7485112	12176616	2006	2015	PIF0615	BBS7017	1970	2017	3972623	1421435	6563651	3143413	4860056
Cassin's Vireo	Vireo cassir	1354	Western Fo	Mexico-Cer	Vireonidae	landbird	M	other	native	4560260	3775193	5412799	2006	2015	PIF0615	BBS7017	1970	2017	-1670336	-2604824	-958422	-1957280	-1404222
Cattle Egret	Bubulcus ib	748	Wetland	Widesprea	Ardeidae	waterbird	M	other	native	2804856	2196814	3562031	2006	2015	PIF0615	BBS7017	1970	2017	2329124	1636274	3125673	2083580	2591015
Cave Swallow	Petrochelic	1432	Aridlands	Mexico-Cer	Hirundinid	landbird	M	AI	native	2769841	1680817	4407644	2006	2015	PIF0615	BBS7017	1970	2017	-5303540	-2.2E+07	-1299690	-8684163	-3260894
Cedar Waxwing	Bombycilla	1638	Forest Gene	Temperate	Bombycilli	landbird	M	other	native	63975308	58030057	70240507	2006	2015	PIF0615	BBS7017	1970	2017	-1.1E+07	-1.7E+07	-5082236	-1.3E+07	-8817489
Cerulean Warbler	Setophaga	1986	Eastern For	South Amer	Parulidae	landbird	M	other	native	528920	363210	714480	2006	2015	PIF0615	BBS7017	1970	2017	1161090	765897.8	1565903	1020376	1295156
Chestnut-backed Cl	Poecile rufe	1439	Western Fo	Temperate	Paridae	landbird	R	other	native	12062509	8656467	16306921	2006	2015	PIF0615	BBS7017	1970	2017	9484580	6134406	13432190	8258732	10803610
Chestnut-collared L	Calcarius o	1774	Grassland	Southweste	Calcariidae	landbird	M	other	native	3095825	2101824	4336047	2006	2015	PIF0615	BBS7017	1970	2017	16283043	10349767	22493605	14189570	18417090
Chestnut-sided Wa	Setophaga	1993	Eastern For	Mexico-Cer	Parulidae	landbird	M	other	native	18265512	16119410	20584431	2006	2015	PIF0615	BBS7017	1970	2017	11944485	9323966	14756127	10993907	12889520
Chihuahuan Raven	Corvus cryp	1406	Aridlands	Southweste	Corvidae	landbird	M	other	native	277286	193193	390354	2006	2015	PIF0615	BBS7017	1970	2017	32909.66	-38935.5	101245.3	10182.1	55850.88
Chimney Swift	Chaetura p	260	Eastern For	South Amer	Apodidae	landbird	M	AI	native	8808551	8013311	9665731	2006	2015	PIF0615	BBS7017	1970	2017	17811323	15899653	19800343	17135664	18491796
Chipping Sparrow	Spizella pas	1829	Forest Gene	Temperate	Passerellida	landbird	M	other	native	2.31E+08	2.13E+08	2.5E+08	2006	2015	PIF0615	BBS7017	1970	2017	79503437	60736278	98183880	72857129	86031360
Chuck-will's-widow	Antrostom	236	Eastern For	Mexico-Cer	Caprimulgi	landbird	M	AI	native	5642111	4800407	6606314	2006	2015	PIF0615	BBS7017	1970	2017	9545319	7869201	11235616	8976951	10121135
Chukar	Alectoris ch	114	Introduced	Introduced	Phasianida	other	Introduced	other	Introduced	392143	227755	612200	2006	2015	PIF0615	BBS7017	1970	2017	-188483	-429208	-51072.9	-256748	-131675
Cinnamon Teal	Spatula cya	39	Wetland	Temperate	Anatidae	waterfowl	M	other	native	442510	275337	674629	2006	2015	PIF0615	BBS7017	1970	2017	617237.2	328128.2	934033.2	515432.3	721892.7
Clapper Rail	Rallus crepi	409	Coasts	Coastal	Rallidae	waterbird	R	other	native	170587	85438	286396	2006	2015	PIF0615	BBS7017	1970	2017	58537.63	-2026.51	139222.7	36192.04	83942.73
Clark's Grebe	Aechmoph	147	Wetland	Temperate	Podicipedi	waterbird	M	other	native	71737	18009	161501	2006	2015	PIF0615	CBC7017	1970	2017	145485.8	98.41409	298343.6	94134.45	197216.1
Clark's Nutcracker	Nucifraga c	1390	Western Fo	Temperate	Corvidae	landbird	R	other	native	290441	227717	363870	2006	2015	PIF0615	BBS7017	1970	2017	4313.497	-69708.9	65170.23	-17589	26032.34
Clay-colored Sparr	Spizella pal	1830	Grassland	Southweste	Passerellida	landbird	M	other	native	60149306	51415968	69884231	2006	2015	PIF0615	BBS7017	1970	2017	43211619	33500569	54023773	39720474	46764935
Cliff Swallow	Petrochelic	1431	Habitat Ger	South Amer	Hirundinid	landbird	M	AI	native	77981069	67646472	89137460	2006	2015	PIF0615	BBS7017	1970	2017	-3.6E+07	-5.5E+07	-2E+07	-4.2E+07	-3E+07
Common Eider	Somateria	64	Coasts	Coastal	Anatidae	waterfowl	M	other	native	1264000	948000	1580000	2004	2006	SeDu07	CBC7017	1970	2017	-408544	-3419333	592056.6	-1082415	21895.41
Common Gallinule	Gallinula ga	431	Wetland	Widesprea	Rallidae	waterbird	M	other	native	500214	251427	938525	2006	2015	PIF0615	BBS7017	1970	2017	288652.9	83999.12	557797.6	209968.4	372618.9
Common Goldeney	Bucephala	73	Wetland	Temperate	Anatidae	waterfowl	M	other	native	1300000	975000	1625000	2004	2006	SeDu07	BBS7017	1970	2017	-406337	-782874	-132805	-523462	-302446
Common Grackle	Quiscalus q	1939	Habitat Ger	Temperate	Icteridae	landbird	M	other	native	67132986	61123537	74085853	2006	2015	PIF0615	BBS7017	1970	2017	82979126	73933519	92454560	79756716	86273630
Common Ground-D	Columbina	170	Aridlands	Southweste	Columbida	landbird	R	other	native	1989124	1585896	2440861	2006	2015	PIF0615	BBS7017	1970	2017	674901.6	312107	1051247	555725.6	798884.8
Common Loon	Gavia imme	629	Wetland	Temperate	Gaviidae	waterbird	M	other	native	1108865	941048	1319057	2006	2015	PIF0615	BBS7017	1970	2017	-333381	-531502	-175052	-396892	-275644
Common Merganse	Mergus me	77	Wetland	Temperate	Anatidae	waterfowl	M	other	native	1200000	600000	1800000	2004	2006	SeDu07	BBS7017	1970	2017	200412.6	-48845.5	491983.3	114195.7	292200.7
Common Murre	Uria aalge	543	Coasts	Marine	Alcidae	waterbird	M	other	native	7400000	5550000	9250000	2000	2002	BNA2002	CBC7017	1970	2017	568368	-9265601	5644138	-1867886	2468045
Common Nighthaw	Chordeiles	227	Habitat Ger	South Amer	Caprimulgi	landbird	M	AI	native	21789605	19345867	24683737	2006	2015	PIF0615	BBS7017	1970	2017	25989826	22044493	30281368	24582541	27422670
Common Poorwill	Phalaenopt	230	Aridlands	Southweste	Caprimulgi	landbird	M	AI	native	1333400	965383	1769426	2006	2015	PIF0615	BBS7017	1970	2017	-202807	-480452	10986.41	-289595	-125091
Common Raven	Corvus cora	1407	Habitat Ger	Widesprea	Corvidae	landbird	R	other	native	8250632	7605338	8984942	2006	2015	PIF0615	BBS7017	1970	2017	-6686854	-8000479	-5501274	-7108395	-6265039
Common Redpoll	Acanthis fla	1754	Arctic Tund	Temperate	Fringillidae	landbird	M	other	native	39008853	30299103	49713410	2006	2015	PIF0615	BBS9317	1993	2017	28960270	8989946	46984894	22622273	35253245
Common Tern	Sterna hiru	614	Wetland	Coastal	Laridae	waterbird	M	other	native	468971	175901	985601	2006	2015	PIF0615	BBS7017	1970	2017	617624.6	90869.32	1234947	422917.6	821831.4
Common Yellowthr	Geothlypis	1976	Habitat Ger	Widesprea	Parulidae	landbird	M	other	native	75588462	70946562	80532206	2006	2015	PIF0615	BBS7017	1970	2017	35511230	29832666	41334660	33528491	37463004
Connecticut Warbl	Oporornis	1966	Boreal Fore	South Amer	Parulidae	landbird	M	other	native	1751333	970368	2676400	2006	2015	PIF0615	BBS7017	1970	2017	2197716	1102707	3439947	1806168	2609499
Cooper's Hawk	Accipiter co	790	Forest Gene	Widesprea	Accipitrida	landbird	M	other	native	844899	770821	925643	2006	2015	PIF0615	BBS7017	1970	2017	-797391	-923902	-681504	-838337	-756988
Cordilleran Flycatcl	Empidonax	1313	Western Fo	Mexico-Cer	Tyrannidae	landbird	M	other	native	1966693	1283176	2953557	2006	2015	PIF0615	BBS7017	1970	2017	243687.4	-60237.4	594898.6	142953.5	356938.8
Costa's Hummingbi	Calypte cos	337	Aridlands	Southweste	Trochilidae	landbird	M	other	native	1583926	611798	3182531	2006	2015	PIF0615	BBS7017	1970	2017	56114.03	-672530	672698.3	-113632	239452.4
Couch's Kingbird	Tyrannus co	1274	Aridlands	Mexico-Cer	Tyrannidae	landbird	R	AI	native	250613	133762	447501	2006	2015	PIF0615	BBS7017	1970	2017	-427145	-825298	-148229	-542206	-324956
Crested Caracara	Caracara ch	994	Aridlands	Southweste	Falconidae	landbird	R	other	native	124568	87260	172735	2006	2015	PIF0615	BBS7017	1970	2017	-171252	-254350	-105082	-197860	-146735
Crissal Thrasher	Toxostoma	1629	Aridlands	Southweste	Mimidae	landbird	R	other	native	82115	48009	124579	2006	2015	PIF0615	BBS7017	1970	2017	16571.07	-5673.59	41029.61	8892.936	24405.59
Curve-billed Thrash	Toxostoma	1620	Aridlands	Southweste	Mimidae	landbird	R	other	native	1026123	728790	1467368	2006	2015	PIF0615	BBS7017	1970	2017	268031.1	78700.3	494623.1	200493.7	340084
Dark-eyed Junco	Junco hyen	1861	Forest Gene	Temperate	Passerellida	landbird	M	other	native	2.24E+08	1.96E+08	2.54E+08	2006	2015	PIF0615	BBS7017	1970	2017	1.68E+08	1.37E+08	2.03E+08	1.57E+08	1.8E+08
Dickcissel	Spiza ameri	2065	Grassland	South Amer	Cardinalida	landbird	M	other	native	27896722	23981764	32368972	2006	2015	PIF0615	BBS7017	1970	2017	4127773	-655746	8530709	2569466	5667241
Double-crested Cor	Phalacroco	719	Wetland	Temperate	Phalacroco	waterbird	M	other	native	557887	365672	827251	2006	2015	PIF0615	BBS7017	1970	2017	-653515	-1142889	-339097	-801521	-528934
Dovekie	Alle alle	542	Coasts	Marine	Alcidae	waterbird	M	other	native	1500	1125	1875	2001	2003	BNA2002	CBC7017	1970	2017	823.52	-713.022	1951.908	451.7559	1182.934
Downy Woodpecke	Dryobates	961	Forest Gene	Temperate	Picidae	landbird	R	other	native	13422111	12764602	14141250	2006	2015	PIF0615	BBS7017	1970	2017	-272580	-1113824	535941.2	-557746	3753.167
Dunlin	Calidris alp	497	Arctic Tund	Widesprea	Scolopacid	shorebird	M	other	native	1500000	744700	2750300	2011	2013	Shoreb12	Mig7416	1974	2016	2372383	766911.7	4447176	1780872	3007260
Dusky Flycatcher	Empidonax	1310	Western Fo	Mexico-Cer	Tyrannidae	landbird	M	other	native	8797209	7024376	10767331	2006	2015	PIF0615	BBS7017	1970	2017	2698638	968664.3	4396337	2118981	3266369
Dusky Grouse	Dendragap	132	Western Fo	Temperate	Phasianida	landbird	R	other	native	300000	75000	525000	2008	2010	ACAD	BBS7017	1970	2017	-150968	-379067	-28650.6	-215621	-99912.4
Eared Grebe	Podiceps ni	145	Wetland	Temperate	Podicipedi	waterbird	M	other	native	1950442	943872	3659128	2006	2015	PIF0615	BBS7017	1970	2017	-955391	-2870067	-118235	-1457020	-573178
Eastern Bluebird	Sialia sialis	1557	Eastern For	Temperate	Turdidae	landbird	M	other	native	21439020	20142880	22957637	2006	2015	PIF0615	BBS7017	1970	2017	-1.1E+07	-1.4E+07	-8273353	-1.2E+07	-9892270
Eastern Kingbird	Tyrannus ty	1278	Grassland	South Amer	Tyrannidae	landbird	M	AI	native	25924168	24123810	27704273	2006	2015	PIF0615	BBS7017	1970	2017	17516040	15312357	19904184	16740969	18314826
Eastern Meadowlar	Sturnella m	1888	Grassland	Temperate	Icteridae	landbird	M	other	native	24431724	21928274	27309341	2006	2015	PIF0615	BBS7017	1970	2017	73964321	65250234	83087759	70911711	76898314
Eastern Phoebe	Sayornis ph	1318	Eastern For	Temperate	Tyrannidae	landbird	M	other	native	34684436	32601625	37210378	2006	2015	PIF0615	BBS7017	1970	2017	-6237995	-1.2E+07	-1599972	-7929945	-4557282
Eastern Screech-Ow	Megascops	833	Eastern For	Temperate	Strigidae	landbird	R	other	native	496240	378219	645235	2006	2015	PIF0615	BBS7017	1970	2017	218413.2	124949.8	323159.3	184260	253383
Eastern Towhee	Pipilo eryth	1806	Eastern For	Temperate	Passerellida	landbird	M	other	native	29338492	27153590	31703146	2006	2015	PIF0615	BBS7017	1970	2017	23885938	21115304	26746899	22944887	24854887
Eastern Whip-poor-	Antrostom	242	Eastern For	Mexico-Cer	Caprimulgi	landbird	M	AI	native	1829892	1442373	2231099	2006	2015	PIF0615	BBS7017	1970	2017	4073303	3167559	5043395	3755960	4396910
Eastern Wood-Pew	Contopus v	1296	Eastern For	South Amer	Tyrannidae	landbird	M	AI	native	6454082	5897588	7036229	2006	2015	PIF0615	BBS7017	1970	2017	5199068	4563751	5878005	4979383	5432503
Emperor Goose	Anser canag	11	Coasts	Coastal	Anatidae	waterfowl	M	other	native	97953	88158	107748	2013	2015	CAFF18	CAFF	1985	2016	31579.55	-11384.5	65940.25	18246.44	43950.03
Eurasian Collared-D	Streptopeli	165	Introduced	Introduced	Columbida	other	Introduced	other	Introduced	8716074	7657339	10020862	2006	2015	PIF0615	BBS7017	1970	2017	-3.4E+07	-6.8E+07	-1.7E+07	-4.3E+07	-2.7E+07
Eurasian Tree Sparr	Passer mon	1669	Introduced	Introduced	Passeridae	other	Introduced	other	Introduced	147064	83601	235172	2006	2015	PIF0615	BBS7017	1970	2017	-197693	-388822	-84320.5	-252023	-152979
European Starling	Sturnus vul	1635	Introduced	Introduced	Sturnidae	other	Introduced	other	Introduced	93371907	85941592	1.02E+08	2006	2015	PIF0615	BBS7017	1970	2017	83350978	72594865	94770107	79563582	87124509
Evening Grosbeak	Coccothrau	1701	Boreal Fore	Temperate	Fringillidae	landbird	M	other	native	3783375	2963915	4803280	2006	2015	PIF0615	BBS7017	1970	2017	26672914	19981619	33803178	24325378	29043776
Ferruginous Hawk	Buteo regal	827	Grassland	Temperate	Accipitrida	landbird	M	other	native	109004	86288	135921	2006	2015	PIF0615	BBS7017	1970	2017	-39894.1	-59899.3	-24127.5	-46332.4	-33978
Field Sparrow	Spizella pus	1832	Eastern For	Temperate	Passerellida	landbird	M	other	native	9333611	8343751	10393211	2006	2015	PIF0615	BBS7017	1970	2017	16311719	14318723	18466928	15619988	17003536
Fish Crow	Corvus ossi	1404	Habitat Ger	Temperate	Corvidae	landbird	R	other	native	466887	400029	541005	2006	2015	PIF0615	BBS7017	1970	2017	-109419	-173270	-55358.1	-130300	-90037.7
Forster's Tern	Sterna forst	616	Wetland	Temperate	Laridae	waterbird	M	other	native	127120	72306	202189	2006	2015	PIF0615	BBS7017	1970	2017	86601.04	29816.92	157355.8	65652.43	109707.1
Fox Sparrow	Passerella il	1851	Forest Gene	Temperate	Passerellida	landbird	M	other	native	34605524	27334565	44390905	2006	2015	PIF0615	BBS7017	1970	2017	23716178	13604342	34601773	20208675	27345234
Franklin's Gull	Leucophae	577	Wetland	Coastal	Laridae	waterbird	M	other	native	2329478	1604153	3238650	2006	2015	PIF0615	BBS7017	1970	2017	2656170	896974.9	4489454	2072585	3258320
Fulvous Whistling-I	Dendrocyg	10	Wetland	Widesprea	Anatidae	waterfowl	M	other	native	44000	24000	64000	1989	1991	BNA2001	BBS7017	1970	2017	-124767	-275932	-50542.7	-165983	-92707.5
Gadwall	Mareca stre	41	Wetland	Temperate	Anatidae	waterfowl	M	other	native	3777700	3371500	4183900	2013	2017	FWS1317	FWS7017	1970	2017	-2473106	-3362634	-1762073	-2756928	-2206186
Gambel's Quail	Callipepla g	105	Aridlands	Southweste	Odontophc	landbird	R	other	native	5196496	3616310	7051087	2006	2015	PIF0615	BBS7017	1970	2017	636185.7	-851622	1966400	178313.7	1073599
Gila Woodpecker	Melanerpe	948	Aridlands	Southweste	Picidae	landbird	R	other	native	589899	288218	1038427	2006	2015	PIF0615	BBS7017	1970	2017	110027.1	-68511.3	324338	51630.98	175616.7
Gilded Flicker	Colaptes ch	978	Aridlands	Southweste	Picidae	landbird	R	other	native	192377	84549	358522	2006	2015	PIF0615	BBS7017	1970	2017	82140.44	3810.685	196093.7	50985.81	118051.9
Glaucous-winged G	Larus glauc	591	Coasts	Coastal	Laridae	waterbird	M	other	native	436461	249983	673385	2006	2015	PIF0615	BBS7017	1970	2017	79742.35	-168383	282258.3	9367.937	148088.2
Glaucous Gull	Larus hyper	592	Coasts	Temperate	Laridae	waterbird	M	other	native	510000	170000	850000	2011	2013	BNA2012	CBC7017	1970	2017	606820.9	58856.1	1429784	398847.9	844057.6
Glossy Ibis	Plegadis fal	759	Wetland	Widesprea	Threskiorni	waterbird	M	other	native	36394	13092	71380	2006	2015	PIF0615	BBS7017	1970	2017	-45944	-146708	-7697.4	-70421.7	-28914.5
Golden-crowned Ki	Regulus sat	1517	Forest Gene	Temperate	Regulidae	landbird	M	other	native	1.33E+08	1.03E+08	1.68E+08	2006	2015	PIF0615	BBS7017	1970	2017	38271559	14916976	63120062	30184745	46830724
Golden-crowned Sp	Zonotrichia	1859	Arctic Tund	Temperate	Passerellida	landbird	M	other	native	7502564	4149449	12855995	2006	2015	PIF0615	BBS9317	1993	2017	1693048	-3053782	5782064	411981.6	3016929
Golden-fronted Wo	Melanerpes	950	Aridlands	Mexico-Cer	Picidae	landbird	R	other	native	805604	554852	1125322	2006	2015	PIF0615	BBS7017	1970	2017	370883.7	199258.4	580882.9	306812.9	440437.7
Golden-winged Wa	Vermivora	1952	Eastern For	South Amer	Parulidae	landbird	M	other	native	393305	273065	539488	2006	2015	PIF0615	BBS7017	1970	2017	753363.8	492307.4	1042482	659197.4	849497.8
Golden Eagle	Aquila chry	778	Habitat Ger	Temperate	Accipitrida	landbird	M	other	native	146673	125252	171932	2006	2015	PIF0615	BBS7017	1970	2017	-6234.26	-21307.2	7307.245	-11283.3	-1251.73
Grace's Warbler	Setophaga	2007	Western Fo	Mexico-Cer	Parulidae	landbird	M	other	native	1513808	887803	2350028	2006	2015	PIF0615	BBS7017	1970	2017	3307198	1659551	5143991	2723602	3920912
Grasshopper Sparrc	Ammodran	1843	Grassland	Temperate	Passerellida	landbird	M	other	native	33439280	29662396	37709841	2006	2015	PIF0615	BBS7017	1970	2017	69889205	60136528	80105313	66499968	73402227
Gray-cheeked Thrus	Catharus m	1581	Boreal Fore	South Amer	Turdidae	landbird	M	other	native	41722960	27552192	60727662	2006	2015	PIF0615	BBS9317	1993	2017	3316972	-2.6E+07	22281109	-4624736	10040474
Gray Catbird	Dumetella	1614	Eastern For	Mexico-Cer	Mimidae	landbird	M	other	native	28700211	26885945	30804790	2006	2015	PIF0615	BBS7017	1970	2017	-748542	-2385991	805912.2	-1308626	-201773
Gray Flycatcher	Empidonax	1309	Western Fo	Mexico-Cer	Tyrannidae	landbird	M	other	native	2897568	2057762	4045062	2006	2015	PIF0615	BBS7017	1970	2017	-2053173	-3203016	-1195986	-2413585	-1720821
Gray Kingbird	Tyrannus d	1279	Eastern For	South Amer	Tyrannidae	landbird	M	AI	native	23009	3657	62695	2006	2015	PIF0615	BBS9317	1993	2017	0.230916	-25094.2	15604.87	-4175.7	3815.377
Gray Partridge	Perdix perd	119	Introduced	Introduced	Phasianida	other	Introduced	other	Introduced	823861	635590	1041588	2006	2015	PIF0615	BBS7017	1970	2017	452582.9	209172.7	711547.2	368022	538971.7
Gray Vireo	Vireo vicini	1350	Western Fo	Southweste	Vireonidae	landbird	M	other	native	548027	294748	855433	2006	2015	PIF0615	BBS7017	1970	2017	-581621	-1089068	-254797	-728253	-456576
Great-tailed Grackl	Quiscalus n	1941	Habitat Ger	Widesprea	Icteridae	landbird	R	other	native	8242011	5511749	11832954	2006	2015	PIF0615	BBS7017	1970	2017	-6413203	-1.1E+07	-3402130	-7748679	-5239712
Great Black-backed	Larus marir	593	Wetland	Temperate	Laridae	waterbird	M	other	native	145361	70184	251320	2006	2015	PIF0615	BBS7017	1970	2017	241808	82441.38	437609.7	182080.5	303818.2
Great Blue Heron	Ardea hero	734	Wetland	Widesprea	Ardeidae	waterbird	M	other	native	618606	552453	698624	2006	2015	PIF0615	BBS7017	1970	2017	-163987	-212822	-119758	-179757	-147949
Great Crested Flyca	Myiarchus	1249	Eastern For	Mexico-Cer	Tyrannidae	landbird	M	other	native	8799301	7950620	9769449	2006	2015	PIF0615	BBS7017	1970	2017	-62367.6	-526727	384674.3	-216835	93743.71
Great Egret	Ardea alba	738	Wetland	Widesprea	Ardeidae	waterbird	M	other	native	712641	580603	863838	2006	2015	PIF0615	BBS7017	1970	2017	-581015	-806365	-409754	-651764	-520434
Great Gray Owl	Strix nebul	862	Boreal Fore	Temperate	Strigidae	landbird	R	other	native	71240	34370	122631	2006	2015	PIF0615	BBS9317	1993	2017	-33627.4	-86602.9	-7149.85	-48326.8	-21904.9
Great Horned Owl	Bubo virgin	845	Habitat Ger	Widesprea	Strigidae	landbird	R	other	native	3784896	3310994	4288285	2006	2015	PIF0615	BBS7017	1970	2017	527838.4	169392.7	873174.2	407990.6	644859
Greater Prairie-Chi	Tympanuch	135	Grassland	Temperate	Phasianida	landbird	R	other	native	360504	197651	635645	2006	2015	PIF0615	BBS7017	1970	2017	-356167	-1171618	-66792	-549123	-220815
Greater Roadrunne	Geococcyx	220	Aridlands	Southweste	Cuculidae	landbird	R	other	native	841270	686699	1023445	2006	2015	PIF0615	BBS7017	1970	2017	-318713	-591516	-122277	-401047	-244024
Greater Sage-Grous	Centrocerc	126	Aridlands	Temperate	Phasianida	landbird	R	other	native	430000	215000	645000	2015	2017	ACAD	BBS7017	1970	2017	629099.6	252813.1	1154736	479159.8	785551.1
Greater Scaup	Aythya mar	59	Arctic Tund	Temperate	Anatidae	waterfowl	M	other	native	1606158	513593	3551089	2006	2015	PIF0615	CBC7017	1970	2017	952624.5	-34935.5	2679129	518099.6	1490622
Greater White-fron	Anser albifr	15	Arctic Tund	Temperate	Anatidae	waterfowl	M	other	native	3429375	3086438	3772313	2013	2015	CAFF18	CAFF	1975	2016	-1002744	-2.3E+07	3008978	-4218404	633096.7
Greater Yellowlegs	Tringa mela	528	Wetland	Widesprea	Scolopacid	shorebird	M	other	native	137000	54800	342500	2011	2013	Shoreb12	Mig7416	1974	2016	-21424	-102596	11180.54	-41828.7	-6810.04
Green-tailed Towhe	Pipilo chlo	1804	Aridlands	Southweste	Passerellida	landbird	M	other	native	4766829	3664896	6155067	2006	2015	PIF0615	BBS7017	1970	2017	918749.2	127862.6	1755432	649450	1191264
Green-winged Teal	Anas crecca	53	Wetland	Temperate	Anatidae	waterfowl	M	other	native	3929100	3362500	4495600	2013	2017	FWS1317	FWS7017	1970	2017	-2029082	-2984342	-1285685	-2327413	-1757825
Green Heron	Butorides v	750	Wetland	Widesprea	Ardeidae	waterbird	M	other	native	772671	689060	862103	2006	2015	PIF0615	BBS7017	1970	2017	941979	817552.8	1070627	898655	985896.3
Green Jay	Cyanocora	1375	Aridlands	Mexico-Cer	Corvidae	landbird	R	other	native	56639	30791	92979	2006	2015	PIF0615	BBS7017	1970	2017	-90734.2	-189944	-34317.5	-118555	-68491.1
Groove-billed Ani	Crotophaga	224	Habitat Ger	Widesprea	Cuculidae	landbird	R	other	native	5000	1250	8750	2015	2017	ACAD	BBS7017	1970	2017	3155.065	295.7967	8122.665	1943.596	4631.679
Gull-billed Tern	Gelochelid	607	Coasts	Coastal	Laridae	waterbird	M	other	native	8000	7200	8800	2001	2003	BNA2014	BBS7017	1970	2017	-3049.07	-12660.3	1617.565	-5579.3	-1146.33
Gyrfalcon	Falco rustic	1005	Arctic Tund	Temperate	Falconidae	landbird	M	other	native	41722	33772	57859	2006	2015	PIF0615	CBC7017	1970	2017	13863.45	1469.757	25928.91	9684.636	17887.65
Hairy Woodpecker	Dryobates	965	Forest Gene	Temperate	Picidae	landbird	R	other	native	8681068	7874994	9508689	2006	2015	PIF0615	BBS7017	1970	2017	-3096167	-3779136	-2478797	-3329311	-2872675
Hammond's Flycatc	Empidonax	1308	Western Fo	Mexico-Cer	Tyrannidae	landbird	M	other	native	20160045	16231089	24518510	2006	2015	PIF0615	BBS7017	1970	2017	-4669056	-8610735	-1641291	-5918496	-3524201
Harlequin Duck	Histrionicu	65	Wetland	Marine	Anatidae	waterfowl	M	other	native	214000	107000	321000	2004	2006	SeDu07	CBC7017	1970	2017	37724.55	-115286	155781.1	-3818.27	76055.91
Harris's Hawk	Parabuteo	812	Aridlands	Southweste	Accipitrida	landbird	R	other	native	51689	29505	86815	2006	2015	PIF0615	BBS7017	1970	2017	46573.71	19452.61	78602.7	36779.27	56963.78
Harris's Sparrow	Zonotrichia	1857	Arctic Tund	Temperate	Passerellida	landbird	M	other	native	2000000	500000	3500000	2015	2017	ACAD	CBC7017	1970	2017	2537435	597616.7	4783561	1849030	3251391
Henslow's Sparrow	Centronyx	1845	Grassland	Temperate	Passerellida	landbird	M	other	native	408187	290235	547708	2006	2015	PIF0615	BBS7017	1970	2017	173828.4	13302.12	327631	121409.9	226459.1
Hepatic Tanager	Piranga flav	2032	Western Fo	Mexico-Cer	Cardinalida	landbird	M	other	native	411228	263215	591940	2006	2015	PIF0615	BBS7017	1970	2017	-370234	-627399	-196646	-447404	-301623
Hermit Thrush	Catharus gu	1584	Forest Gene	Temperate	Turdidae	landbird	M	other	native	71726125	54075176	95680929	2006	2015	PIF0615	BBS7017	1970	2017	-9234986	-2E+07	-654531	-1.3E+07	-6079111
Hermit Warbler	Setophaga	2010	Western Fo	Mexico-Cer	Parulidae	landbird	M	other	native	2525603	1808648	3357140	2006	2015	PIF0615	BBS7017	1970	2017	313766.7	-252048	857568.1	131331.1	491442.1
Herring Gull	Larus argen	586	Wetland	Temperate	Laridae	waterbird	M	other	native	2891313	1563414	4831139	2009	2011	BNA2017	BBS7017	1970	2017	10362885	4307707	17229497	8259843	12630212

Hoary Redpoll	Acanthis hc	1756	Arctic Tund	Temperate	Fringillidae	landbird	M	other	native	12815104	12474111	13252214	2006	2015	PIF0615	CBC7017	1970	2017	-8412361	-3E+07	694118.2	-1.4E+07	-4425774
Hooded Merganser	Lophodyte:	76	Wetland	Temperate	Anatidae	waterfowl	M	other	native	485000	363750	606250	2004	2006	SeDu07	BBS7017	1970	2017	-745843	-1096337	-488242	-855318	-645439
Hooded Oriole	Icterus cuc	1910	Aridlands	Mexico-Cer	Icteridae	landbird	M	other	native	350616	236805	494427	2006	2015	PIF0615	BBS7017	1970	2017	-175616	-326439	-79101.2	-220080	-137726
Hooded Warbler	Setophaga	1982	Eastern For	Mexico-Cer	Parulidae	landbird	M	other	native	5185197	4523541	5902847	2006	2015	PIF0615	BBS7017	1970	2017	-2623094	-3451278	-1911138	-2882650	-2363169
Horned Grebe	Podiceps au	143	Wetland	Temperate	Podicipedi	waterbird	M	other	native	246553	159574	364503	2006	2015	PIF0615	BBS7017	1970	2017	202267	98469.34	325658.7	164744.7	242551.8
Horned Lark	Eremophila	1412	Grassland	Temperate	Alaudidae	landbird	M	other	native	1.01E+08	90290833	1.13E+08	2006	2015	PIF0615	BBS7017	1970	2017	1.82E+08	1.58E+08	2.07E+08	1.74E+08	1.91E+08
House Finch	Haemorhou	1749	Habitat Ger	Widesprea	Fringillidae	landbird	R	other	native	33246130	29546633	37992529	2006	2015	PIF0615	BBS7017	1970	2017	-2183694	-6518744	1624152	-3574124	-819800
House Sparrow	Passer dom	1668	Introduced	Introduced	Passeridae	other	Introduced	other	Introduced	92842101	83703006	1.04E+08	2006	2015	PIF0615	BBS7017	1970	2017	3.31E+08	2.89E+08	3.75E+08	3.16E+08	3.46E+08
House Wren	Troglodyte:	1461	Forest Gen	Temperate	Troglodytic	landbird	M	other	native	43318358	39758949	47473572	2006	2015	PIF0615	BBS7017	1970	2017	-6013779	-1E+07	-2356280	-7353318	-4734260
Hudsonian Godwit	Limosa hae	480	Wetland	South Amer	Scolopacid	shorebird	M	other	native	77000	56424	107100	2011	2013	Shoreb12	Mig7416	1974	2016	120479.9	43346.02	218544.8	93566.59	150717.5
Hutton's Vireo	Vireo huttc	1351	Western Fo	Temperate	Vireonidae	landbird	R	other	native	964653	744358	1213151	2006	2015	PIF0615	BBS7017	1970	2017	-380352	-594853	-216543	-446999	-318451
Inca Dove	Columbina	169	Aridlands	Southwest	Columbida	landbird	R	other	native	619057	491301	765612	2006	2015	PIF0615	BBS7017	1970	2017	-318794	-535573	-173030	-384240	-262939
Indigo Bunting	Passerina c	2060	Eastern For	Mexico-Cer	Cardinalid	landbird	M	other	native	77494167	73235841	82041052	2006	2015	PIF0615	BBS7017	1970	2017	31485546	26846872	36179744	29841978	33097888
Juniper Titmouse	Baeolophu:	1444	Western Fo	Temperate	Paridae	landbird	R	other	native	291637	201086	392881	2006	2015	PIF0615	BBS7017	1970	2017	-74868.8	-152099	-19345.6	-98465.7	-53567.6
Kentucky Warbler	Geothlypis	1970	Eastern For	Mexico-Cer	Parulidae	landbird	M	other	native	2595606	2284175	2937212	2006	2015	PIF0615	BBS7017	1970	2017	1206007	881477.7	1543746	1091370	1321873
Killdeer	Charadrius	463	Habitat Ger	Widesprea	Charadriid	shorebird	M	other	native	2000000	800000	5000000	2011	2013	Shoreb12	BBS7017	1970	2017	1040697	0.561577	2162057	666955	1415029
King Eider	Somateria	63	Arctic Tund	Marine	Anatidae	waterfowl	M	other	native	560000	280000	840000	2004	2006	SeDu07	CBC7017	1970	2017	2802961	1118325	6116162	2120670	3704472
King Rail	Rallus elega	412	Wetland	Temperate	Rallidae	waterbird	M	other	native	63219	26563	122039	2006	2015	PIF0615	BBS7017	1970	2017	327812.4	85077.59	589958.9	244392.6	416435.6
Ladder-backed Wo	Dryobates	963	Aridlands	Southwest	Picidae	landbird	R	other	native	2377162	1983369	2827402	2006	2015	PIF0615	BBS7017	1970	2017	-296494	-586888	-49055.9	-389432	-208196
Lapland Longspur	Calcarius la	1773	Arctic Tund	Temperate	Calcariidae	landbird	M	other	native	68032536	60265772	80590222	2006	2015	PIF0615	BBS9317	1993	2017	8825957	-6.1E+07	44827435	-9904095	22951779
Lark Bunting	Calamospiz	1841	Grassland	Southwest	Passerellid	landbird	M	other	native	11992598	9194389	15233830	2006	2015	PIF0615	BBS7017	1970	2017	31580727	22361174	41720574	28384489	34870009
Lark Sparrow	Chondeste:	1836	Grassland	Mexico-Cer	Passerellid	landbird	M	other	native	10638361	9078588	12343951	2006	2015	PIF0615	BBS7017	1970	2017	4346085	3006262	5781341	3885549	4843317
Laughing Gull	Leucophae	576	Coasts	Coastal	Laridae	waterbird	M	other	native	684463	425116	997966	2006	2015	PIF0615	BBS7017	1970	2017	-405504	-985363	-109418	-558616	-279569
Lawrence's Goldfin	Spinus lawr	1770	Aridlands	Southwest	Fringillidae	landbird	M	other	native	347128	188186	574120	2006	2015	PIF0615	BBS7017	1970	2017	107567.7	-27113.4	259904.2	63032.14	154452.6
Lazuli Bunting	Passerina a	2059	Western Fo	Mexico-Cer	Cardinalid	landbird	M	other	native	6453834	5417754	7643998	2006	2015	PIF0615	BBS7017	1970	2017	-1172392	-2156594	-378723	-1470958	-874565
Least Bittern	Ixobrychus	729	Wetland	Widesprea	Ardeidae	waterbird	M	other	native	131773	66196	217720	2006	2015	PIF0615	BBS7017	1970	2017	-33842.4	-88287.4	-2668.34	-49909.5	-20955.6
Least Flycatcher	Empidonax	1307	Eastern For	Mexico-Cer	Tyrannidae	landbird	M	other	native	27244220	24465739	30286260	2006	2015	PIF0615	BBS7017	1970	2017	31461126	27285889	36051548	30008697	32967791
Least Sandpiper	Calidris mir	502	Wetland	Widesprea	Scolopacid	shorebird	M	other	native	700000	466667	1050000	2011	2013	Shoreb12	Mig7416	1974	2016	58506.84	-373069	367605.2	-56614.6	165289.9
Least Tern	Sternula an	604	Coasts	Coastal	Laridae	waterbird	M	other	native	51692	21444	97858	2006	2015	PIF0615	BBS7017	1970	2017	153306.4	38913.78	285908.5	113274	196866.9
LeConte's Sparrow	Ammospiza	1846	Grassland	Temperate	Passerellid	landbird	M	other	native	5128134	4121245	6262076	2006	2015	PIF0615	BBS7017	1970	2017	8054350	6093973	10297745	7351113	8798764
LeConte's Thrasher	Toxostoma	1628	Aridlands	Southwest	Mimidae	landbird	R	other	native	45644	15853	93422	2006	2015	PIF0615	BBS7017	1970	2017	60320.87	9103.802	119780.6	42057.64	79644.42
Lesser Goldfinch	Spinus psal	1769	Western Fo	Temperate	Fringillidae	landbird	M	other	native	5723877	4542330	7132984	2006	2015	PIF0615	BBS7017	1970	2017	-2154906	-3396582	-1211644	-2545780	-1791371
Lesser Nighthawk	Chordeiles	226	Aridlands	Widesprea	Caprimulgi	landbird	M	AI	native	3801395	2399615	5545863	2006	2015	PIF0615	BBS7017	1970	2017	-150010	-1143791	649061.2	-449756	123724
Lesser Scaup	Aythya affir	60	Wetland	Widesprea	Anatidae	waterfowl	M	other	native	2626619	1903177	3511659	2006	2015	PIF0615	BBS7017	1970	2017	1242205	37686.19	2332715	875378	1609688
Lesser Yellowlegs	Tringa flavi	524	Wetland	Widesprea	Scolopacid	shorebird	M	other	native	660000	264000	1650000	2011	2013	Shoreb12	Mig7416	1974	2016	1066078	1.929816	2399662	665628.9	1498627
Lewis's Woodpecke	Melanerpes	935	Western Fo	Temperate	Picidae	landbird	M	other	native	81507	52913	119611	2006	2015	PIF0615	BBS7017	1970	2017	107348.7	60489.74	162086.4	90527.13	125402
Limpkin	Aramus gua	437	Wetland	Widesprea	Aramidae	waterbird	R	other	native	9000	6000	12000	1993	1995	BNA2002	CBC7017	1970	2017	1940.927	-22315.1	14961.01	-3965.7	6634.087
Lincoln's Sparrow	Melospiza l	1853	Boreal Fore	Temperate	Passerellid	landbird	M	other	native	88078735	78262006	98782691	2006	2015	PIF0615	BBS7017	1970	2017	2035820	-1.6E+07	17153735	-3912516	7653536
Little Blue Heron	Egretta cae	745	Wetland	Widesprea	Ardeidae	waterbird	M	other	native	270582	191382	368199	2006	2015	PIF0615	BBS7017	1970	2017	223015.8	143146.1	315468.7	194465.2	253252.2
Loggerhead Shrike	Lanius ludc	1325	Grassland	Temperate	Laniidae	landbird	M	other	native	4557457	4080246	5094115	2006	2015	PIF0615	BBS7017	1970	2017	10195978	8901422	11512725	9746170	10638184
Long-billed Curlew	Numenius	474	Grassland	Widesprea	Scolopacid	shorebird	M	other	native	140000	98000	198000	2011	2013	Shoreb12	BBS7017	1970	2017	-3443.98	-32314.4	20209.34	-12270.4	4495.726
Long-billed Dowitc	Limnodron	509	Arctic Tund	Widesprea	Scolopacid	shorebird	M	other	native	500000	333333	750000	2011	2013	Shoreb12	Mig7416	1974	2016	-39506.1	-1036346	248319.4	-221625	66896.05
Long-billed Thrashe	Toxostoma	1623	Aridlands	Mexico-Cer	Mimidae	landbird	R	other	native	95573	53639	153900	2006	2015	PIF0615	BBS7017	1970	2017	-125260	-217240	-56871	-153318	-100220
Long-eared Owl	Asio otus	863	Forest Gen	Temperate	Strigidae	landbird	M	other	native	37707	15671	68758	2006	2015	PIF0615	CBC7017	1970	2017	55291.04	16281.04	99923.41	41268.74	70079.11
Long-tailed Duck	Clangula hy	71	Arctic Tund	Marine	Anatidae	waterfowl	M	other	native	1000000	500000	1500000	2004	2006	SeDu07	CBC7017	1970	2017	1890498	463889.9	4335005	1352052	2543619
Louisiana Waterthr	Parkesia mo	1949	Eastern For	Mexico-Cer	Parulidae	landbird	M	other	native	446545	377921	529134	2006	2015	PIF0615	BBS7017	1970	2017	-148890	-209781	-99305.1	-168863	-130753
Lucy's Warbler	Oreothlypi:	1962	Aridlands	Mexico-Cer	Parulidae	landbird	M	other	native	2829708	1620023	4473592	2006	2015	PIF0615	BBS7017	1970	2017	-1092282	-2483918	-305531	-1498202	-767328
MacGillivray's Warl	Geothlypis	1968	Western Fo	Mexico-Cer	Parulidae	landbird	M	other	native	11191876	9091713	13546236	2006	2015	PIF0615	BBS7017	1970	2017	5797877	4017441	7818029	5158532	6457462
Magnolia Warbler	Setophaga	1989	Boreal Fore	Mexico-Cer	Parulidae	landbird	M	other	native	38757259	33706369	44351863	2006	2015	PIF0615	BBS7017	1970	2017	-9625430	-1.7E+07	-3953675	-1.2E+07	-7556024
Mallard	Anas platyr	48	Wetland	Widesprea	Anatidae	waterfowl	M	other	native	11477600	10557400	12397900	2013	2017	FWS1317	FWS7017	1970	2017	-2031438	-4193861	-96565.8	-2737642	-1342687
Marbled Godwit	Limosa fedc	481	Wetland	Coastal	Scolopacid	shorebird	M	other	native	174000	116000	261000	2011	2013	Shoreb12	BBS7017	1970	2017	62862.13	28780.59	108748.7	49981	77361.86
Marbled Murrelet	Brachyram	550	Coasts	Marine	Alcidae	waterbird	M	other	native	545550	256600	834500	1994	1996	BNA1997	CBC7017	1970	2017	53095.45	-303376	321934.4	-37325.9	141989.4
Marsh Wren	Cistothoru:	1470	Wetland	Temperate	Troglodytic	landbird	M	other	native	10846904	8009975	14414465	2006	2015	PIF0615	BBS7017	1970	2017	-7736662	-1.2E+07	-4705167	-8982393	-6603144
McCown's Longspu	Rhynchoph	1776	Grassland	Southwest	Calcariidae	landbird	M	other	native	844821	487327	1322335	2006	2015	PIF0615	BBS7017	1970	2017	3888683	1957915	6169425	3203015	4639636
Merlin	Falco colun	1000	Habitat Ger	Widesprea	Falconidae	landbird	M	other	native	1620998	1325156	1975531	2006	2015	PIF0615	BBS7017	1970	2017	-1612792	-2138265	-1189028	-1781364	-1462658
Mew Gull	Larus canus	581	Wetland	Temperate	Laridae	waterbird	M	other	native	1286450	659195	2419626	2006	2015	PIF0615	BBS9317	1993	2017	1821392	569413.5	3228198	1370506	2286999
Mexican Jay	Aphelocom	1388	Western Fo	Mexico-Cer	Corvidae	landbird	R	other	native	142059	31219	355566	2006	2015	PIF0615	BBS9317	1993	2017	3873.173	-167669	111852.1	-23083.1	35303.46
Mississippi Kite	Ictinia miss	798	Eastern For	South Amer	Accipitrida	landbird	M	other	native	695177	537854	881937	2006	2015	PIF0615	BBS7017	1970	2017	-301595	-580603	-108736	-386194	-226066
Monk Parakeet	Myiopsitta	1010	Introduced	Introduced	Psittacidae	other	Introduced	other	Introduced	59268	1094	158202	2006	2015	PIF0615	CBC7017	1970	2017	-64435.8	-313924	-0.99289	-118027	-30533.9
Mottled Duck	Anas fulvigi	50	Wetland	Temperate	Anatidae	waterfowl	M	other	native	238785	148277	355630	2006	2015	PIF0615	BBS7017	1970	2017	427891.9	233584.8	643483	360360.5	500409.3
Mountain Bluebird	Sialia curru	1559	Western Fo	Temperate	Turdidae	landbird	M	other	native	5568751	4615920	6673385	2006	2015	PIF0615	BBS7017	1970	2017	1039371	347961.7	1760562	804174.6	1271889
Mountain Chickade	Poecile gan	1437	Western Fo	Temperate	Paridae	landbird	R	other	native	7855197	6597745	9279875	2006	2015	PIF0615	BBS7017	1970	2017	7054024	5510211	8801690	6505060	7646174
Mountain Plover	Charadrius	465	Grassland	Southwest	Charadriid	shorebird	M	other	native	20000	13333	30000	2011	2013	Shoreb12	BBS7017	1970	2017	49755.24	27432.87	78529.69	41718.1	58828.68
Mountain Quail	Oreortyx pi	94	Western Fo	Temperate	Odontopho	landbird	R	other	native	250825	174335	348548	2006	2015	PIF0615	BBS7017	1970	2017	69792.51	11881.85	133017.8	49616.46	90872.55
Mourning Dove	Zenaida ma	198	Habitat Ger	Widesprea	Columbida	landbird	M	other	native	1.33E+08	1.23E+08	1.43E+08	2006	2015	PIF0615	BBS7017	1970	2017	22343284	13783136	31436580	19386865	25298364
Mourning Warbler	Geothlypis	1969	Boreal Fore	South Amer	Parulidae	landbird	M	other	native	13827473	11375932	16818340	2006	2015	PIF0615	BBS7017	1970	2017	10581352	7589476	13954068	9514445	11692061
Mute Swan	Cygnus olo	25	Introduced	Introduced	Anatidae	other	Introduced	other	Introduced	12000	9000	15000	1992	1994	BNA1997	BBS7017	1970	2017	-22470.7	-44877.7	-10649.1	-28667.8	-17614.2
Nashville Warbler	Oreothlypi:	1963	Boreal Fore	Mexico-Cer	Parulidae	landbird	M	other	native	39717135	34046329	46021851	2006	2015	PIF0615	BBS7017	1970	2017	-947001	-6564073	4105630	-2777841	869582.6
Nelson's Sparrow	Ammospiza	1848	Wetland	Coastal	Passerellid	landbird	M	other	native	1012433	860211	1182894	2006	2015	PIF0615	BBS7017	1970	2017	-750892	-1177019	-444523	-881076	-634526
Northern Bobwhite	Colinus virg	99	Eastern For	Temperate	Odontopho	landbird	R	other	native	5800000	2900000	8700000	2008	2010	ACAD	BBS7017	1970	2017	20999410	10585392	31967593	17377761	24700104
Northern Cardinal	Cardinalis c	2047	Eastern For	Temperate	Cardinalid	landbird	R	other	native	1.18E+08	1.08E+08	1.29E+08	2006	2015	PIF0615	BBS7017	1970	2017	-1.2E+07	-1.8E+07	-5578104	-1.4E+07	-9435179
Northern Flicker	Colaptes au	977	Forest Gen	Widesprea	Picidae	landbird	M	other	native	10997056	10030079	12029437	2006	2015	PIF0615	BBS7017	1970	2017	7961296	6849654	9122472	7572993	8352821
Northern Fulmar	Fulmarus gl	660	Coasts	Marine	Procellariic	waterbird	M	other	native	2200000	1650000	2750000	2009	2011	BNA2012	CBC7017	1970	2017	1005941	-3530905	3510282	83124.65	1774800
Northern Gannet	Morus bass	716	Coasts	Marine	Sulidae	waterbird	M	other	native	144596	130136	159056	1998	2000	BNA2002	CBC7017	1970	2017	-349416	-718953	-162712	-449623	-272497
Northern Goshawk	Accipiter ge	793	Forest Gen	Temperate	Accipitrida	landbird	M	other	native	205103	144935	279609	2006	2015	PIF0615	BBS7017	1970	2017	-48108.8	-93351.6	-16110.1	-61842	-35855.6
Northern Harrier	Circus huds	783	Habitat Ger	Temperate	Accipitrida	landbird	M	other	native	822326	731377	921329	2006	2015	PIF0615	BBS7017	1970	2017	344624.2	261367.8	431566.3	315474.3	374139.9
Northern Mockingb	Mimus poly	1634	Habitat Ger	Temperate	Mimidae	landbird	M	other	native	33748673	30589410	37047818	2006	2015	PIF0615	BBS7017	1970	2017	10508038	7913823	13219746	9603651	11437382
Northern Parula	Setophaga	1987	Forest Gen	Caribbean	Parulidae	landbird	M	other	native	18173930	16508547	19946040	2006	2015	PIF0615	BBS7017	1970	2017	-9336990	-1.2E+07	-7147782	-1E+07	-8553133
Northern Pintail	Anas acuta	52	Wetland	Temperate	Anatidae	waterfowl	M	other	native	3021200	2644500	3397900	2013	2017	FWS1317	FWS7017	1970	2017	2958537	1832624	4093474	2569665	3342651
Northern Pygmy-O	Glaucidium	848	Western Fo	Temperate	Strigidae	landbird	R	other	native	129397	77555	214434	2006	2015	PIF0615	BBS7017	1970	2017	-31537.5	-69141.7	-8545.25	-42769.6	-22129.3
Northern Rough-wi	Stelgidopte	1428	Habitat Ger	Widesprea	Hirundinid	landbird	M	AI	native	19956056	15363114	26977637	2006	2015	PIF0615	BBS7017	1970	2017	3927099	1950256	6264862	3220706	4694797
Northern Saw-whet	Aegolius ac	869	Forest Gen	Temperate	Strigidae	landbird	M	other	native	2000000	500000	3500000	2007	2009	ACAD	CBC7017	1970	2017	-1351855	-2943058	-316622	-1804763	-957153
Northern Shoveler	Spatula cly	40	Wetland	Temperate	Anatidae	waterfowl	M	other	native	4548300	4125700	4970800	2013	2017	FWS1317	FWS7017	1970	2017	-2429073	-3700153	-1483874	-2817194	-2076330
Northern Shrike	Lanius bore	1326	Arctic Tund	Temperate	Laniidae	landbird	M	other	native	400000	100000	700000	2003	2005	ACAD	CBC7017	1970	2017	96025.32	21605.74	198496.7	67838.14	127428.9
Northern Waterthr	Parkesia no	1950	Boreal Fore	Widesprea	Parulidae	landbird	M	other	native	17166584	14259921	20524318	2006	2015	PIF0615	BBS7017	1970	2017	-6228102	-9085386	-3916686	-7138821	-5378017
Northwestern Crow	Corvus caui	1396	Western Fo	Temperate	Corvidae	landbird	R	other	native	701805	421865	1111796	2006	2015	PIF0615	BBS7017	1970	2017	-45148.4	-278049	117427.8	-109414	11107.21
Nuttall's Woodpecl	Dryobates	962	Western Fo	Temperate	Picidae	landbird	R	other	native	752044	500760	1076906	2006	2015	PIF0615	BBS7017	1970	2017	-307140	-515157	-160996	-372602	-250457
Oak Titmouse	Baeolophu:	1443	Western Fo	Temperate	Paridae	landbird	R	other	native	706717	407725	1196605	2006	2015	PIF0615	BBS7017	1970	2017	576678.4	249663.9	966838.6	459377.8	701327.8
Olive-sided Flycatcl	Contopus c	1291	Forest Gen	South Amer	Tyrannidae	landbird	M	AI	native	1916763	1576589	2322865	2006	2015	PIF0615	BBS7017	1970	2017	4943195	3934613	5997448	4592708	5299625
Olive Sparrow	Arremonop	1798	Aridlands	Mexico-Cer	Passerellid	landbird	R	other	native	829024	486176	1252969	2006	2015	PIF0615	BBS7017	1970	2017	-792427	-1467900	-372448	-994307	-625849
Orange-crowned W	Oreothlypi:	1960	Forest Gen	Temperate	Parulidae	landbird	M	other	native	81919229	69421324	95720231	2006	2015	PIF0615	BBS7017	1970	2017	39613137	26495091	53864624	34983046	44251139
Orchard Oriole	Icterus spu	1909	Eastern For	Mexico-Cer	Icteridae	landbird	M	other	native	10894813	9896563	11930180	2006	2015	PIF0615	BBS7017	1970	2017	4551646	3494193	5651655	4182953	4923404
Osprey	Pandion ha	770	Wetland	Widesprea	Pandionid	landbird	M	other	native	399228	328092	483403	2006	2015	PIF0615	BBS7017	1970	2017	-389022	-508103	-291572	-427427	-352897
Ovenbird	Seiurus aur	1947	Eastern For	Widesprea	Parulidae	landbird	M	other	native	26312390	22777813	30231156	2006	2015	PIF0615	BBS7017	1970	2017	-345928	-2803805	1985590	-1188935	449536.2
Pacific-slope Flycat	Empidonax	1312	Western Fo	Mexico-Cer	Tyrannidae	landbird	M	other	native	8585203	6751118	10839307	2006	2015	PIF0615	BBS7017	1970	2017	1109050	-282197	2431693	658484.9	1558167
Pacific Golden-Plov	Pluvialis ful	453	Arctic Tund	Coastal	Charadriid	shorebird	M	other	native	42500	35000	50000	2011	2013	Shoreb12	BBS9317	1993	2017	20160.66	-31041.2	52636.71	7375.194	31258.61
Pacific Wren	Troglodyte:	1466	Western Fo	Temperate	Troglodytic	landbird	M	other	native	7528567	5392359	10095516	2006	2015	PIF0615	BBS7017	1970	2017	2061937	273466.3	3883182	1457687	2657056
Painted Bunting	Passerina ci	2064	Eastern For	Mexico-Cer	Cardinalid	landbird	M	other	native	12778114	10848520	14991104	2006	2015	PIF0615	BBS7017	1970	2017	2607566	511527.7	4581434	1926235	3291078
Palm Warbler	Setophaga	1996	Boreal Fore	Caribbean	Parulidae	landbird	M	other	native	13172938	9852145	17350184	2006	2015	PIF0615	BBS7017	1970	2017	-782087	-9788947	5294725	-3374767	1428649
Pectoral Sandpiper	Calidris me	505	Arctic Tund	South Amer	Scolopacid	shorebird	M	other	native	1600000	1129600	2070400	2011	2013	Shoreb12	Mig7416	1974	2016	1529641	674489.6	2536008	1233412	1852677
Pelagic Cormorant	Phalacroco	722	Coasts	Coastal	Phalacroco	waterbird	M	other	native	135000	67500	202500	1989	1991	BNA2013	BBS7017	1970	2017	92128.62	10935.61	188538.1	64387.72	121662.8
Peregrine Falcon	Falco pereg	1006	Habitat Ger	Widesprea	Falconidae	landbird	M	other	native	40000	20000	60000	2001	2003	ACAD	BBS7017	1970	2017	-86746.2	-149705	-41177.2	-106188	-69942.9
Phainopepla	Phainopepl	1647	Aridlands	Southwest	Ptiliogonat	landbird	M	other	native	1285683	905747	1775051	2006	2015	PIF0615	BBS7017	1970	2017	-271987	-742194	46381.36	-410086	-151340
Philadelphia Vireo	Vireo phila	1357	Boreal Fore	Mexico-Cer	Vireonidae	landbird	M	other	native	3968582	3039944	5019728	2006	2015	PIF0615	BBS7017	1970	2017	-2863408	-5379097	-1284149	-3591843	-2235425
Pied-billed Grebe	Podilymbu	141	Wetland	Widesprea	Podicipedi	waterbird	M	other	native	1138963	905996	1412585	2006	2015	PIF0615	BBS7017	1970	2017	-316528	-723216	-30089.9	-444442	-209271
Pigeon Guillemot	Cepphus cc	548	Coasts	Marine	Alcidae	waterbird	R	other	native	235100	117550	352650	1992	1994	BNA1993	CBC7017	1970	2017	-71649.2	-301829	44983.16	-131360	-26962.8
Pileated Woodpeck	Dryocopus	983	Eastern For	Temperate	Picidae	landbird	R	other	native	2648713	2398947	2931122	2006	2015	PIF0615	BBS7017	1970	2017	-1558515	-1813506	-1320917	-1645356	-1475255
Pine Grosbeak	Pinicola en	1743	Boreal Fore	Temperate	Fringillidae	landbird	M	other	native	5530332	4039601	7262401	2006	2015	PIF0615	BBS7017	1970	2017	2342110	-7059236	6902691	182822.2	3957376
Pine Siskin	Spinus pinu	1763	Forest Gen	Temperate	Fringillidae	landbird	M	other	native	44719558	37972998	52314211	2006	2015	PIF0615	BBS7017	1970	2017	1.2E+08	95152611	1.47E+08	1.11E+08	1.29E+08
Pine Warbler	Setophaga	1998	Eastern For	Temperate	Parulidae	landbird	M	other	native	13108682	11923661	14327429	2006	2015	PIF0615	BBS7017	1970	2017	-4543752	-6379468	-2950226	-5134315	-4003254
Pinyon Jay	Gymnorhin	1380	Western Fo	Temperate	Corvidae	landbird	R	other	native	755415	525819	1068774	2006	2015	PIF0615	BBS7017	1970	2017	2327893	1479402	3233357	2034879	2624569
Plumbeous Vireo	Vireo plum	1356	Western Fo	Mexico-Cer	Vireonidae	landbird	M	other	native	2999048	2194985	3986302	2006	2015	PIF0615	BBS7017	1970	2017	1053041	35627.83	2023725	724575.8	1380595
Prairie Falcon	Falco mexic	1007	Aridlands	Southwest	Falconidae	landbird	M	other	native	97855	76690	121492	2006	2015	PIF0615	BBS7017	1970	2017	-46807.6	-67473.9	-30746.6	-53300.2	-40920.6
Prairie Warbler	Setophaga	2003	Eastern For	Caribbean	Parulidae	landbird	M	other	native	3555356	3156416	4009433	2006	2015	PIF0615	BBS7017	1970	2017	3786988	3087786	4542322	3542900	4042205
Prothonotary Warb	Protonotar	1955	Eastern For	Mexico-Cer	Parulidae	landbird	M	other	native	2069931	1633108	2645686	2006	2015	PIF0615	BBS7017	1970	2017	1278490	891442.2	1711154	1141925	1420549
Purple Finch	Haemorhou	1750	Forest Gen	Temperate	Fringillidae	landbird	M	other	native	6539107	5746681	7363210	2006	2015	PIF0615	BBS7017	1970	2017	4739732	3785766	5747048	4414121	5072598
Purple Gallinule	Porphyrio	428	Wetland	Widesprea	Rallidae	waterbird	M	other	native	19522	9167	33564	2006	2015	PIF0615	BBS7017	1970	2017	20343.05	5846.802	38866.73	14847.97	26228.36
Purple Martin	Progne sub	1413	Habitat Ger	South Amer	Hirundinid	landbird	M	AI	native	8728591	7776376	9841533	2006	2015	PIF0615	BBS7017	1970	2017	3333177	2384600	4331774	3007908	3670224
Purple Sandpiper	Calidris ma	499	Arctic Tund	Coastal	Scolopacid	shorebird	M	other	native	25000	16667	37500	2011	2013	Shoreb12	CBC7017	1970	2017	13316.62	-799.684	28389.12	8549.64	18268.98
Pygmy Nuthatch	Sitta pygm	1451	Western Fo	Temperate	Sittidae	landbird	R	other	native	3103791	2051268	4410534	2006	2015	PIF0615	BBS7017	1970	2017	603600	-352646	1522363	307763.9	909903.8
Pyrrhuloxia	Cardinalis s	2048	Aridlands	Southwest	Cardinalid	landbird	R	other	native	1578426	1076870	2208564	2006	2015	PIF0615	BBS7017	1970	2017	1398061	851520.3	2036087	1200046	1609156
Razorbill	Alca torda	545	Coasts	Marine	Alcidae	waterbird	M	other	native	76000	38000	114000	2000	2002	BNA2009	CBC7017	1970	2017	-535979	-2742829	-95542.3	-940918	-299403
Red-bellied Woodp	Melanerpes	951	Eastern For	Temperate	Picidae	landbird	R	other	native	15518241	14095781	16973039	2006	2015	PIF0615	BBS7017	1970	2017	-6477117	-7555176	-5469825	-6835596	-6122244
Red-breasted Merg	Mergus serr	78	Arctic Tund	Marine	Anatidae	waterfowl	M	other	native	350000	175000	525000	2004	2006	SeDu07	BBS7017	1970	2017	646173.1	245269.4	1255038	489864.3	825656.5
Red-breasted Nuth	Sitta canad	1449	Forest Gen	Temperate	Sittidae	landbird	M	other	native	19689413	17772520	21658078	2006	2015	PIF0615	BBS7017	1970	2017	-8767892	-1.3E+07	-5695489	-9961004	-7667907

Red-breasted Sapsu	Sphyrapicu	956	Western Fo	Temperate	Picidae	landbird	M	other	native	2755899	1872219	3799342	2006	2015	PIF0615	BBS7017	1970	2017	-1326732	-2228692	-716471	-1603251	-1086480
Red-cockaded Woo	Dryobates l	964	Eastern For	Temperate	Picidae	landbird	R	other	native	15000	11250	18750	2005	2007	ACAD	BBS7017	1970	2017	20336.79	10164.08	31614.46	16789.21	23994.21
Red-eyed Vireo	Vireo olivac	1360	Forest Gene	South Ame	Vireonidae	landbird	M	other	native	1.31E+08	1.21E+08	1.41E+08	2006	2015	PIF0615	BBS7017	1970	2017	-4.4E+07	-5.4E+07	-3.5E+07	-4.7E+07	-4.1E+07
Red-faced Cormora	Phalacroco	721	Coasts	Coastal	Phalacroco	waterbird	R	other	native	84500	42250	126750	1992	1994	BNA2002	CBC7017	1970	2017	83285.86	6664.472	177944.2	57961.77	110021.3
Red-faced Warbler	Cardellina r	2024	Western Fo	Mexico-Cer	Parulidae	landbird	M	other	native	252600	70739	503841	2006	2015	PIF0615	BBS9317	1993	2017	78611.38	-123124	286046.9	22482.27	141427.8
Red-headed Woodp	Melanerpes	938	Eastern For	Temperate	Picidae	landbird	M	other	native	1802639	1587954	2066531	2006	2015	PIF0615	BBS7017	1970	2017	2438936	2062909	2843254	2303393	2577544
Red-naped Sapsuck	Sphyrapicu	955	Western Fo	Temperate	Picidae	landbird	M	other	native	1974818	1596661	2425112	2006	2015	PIF0615	BBS7017	1970	2017	-831754	-1287221	-480910	-975677	-697846
Red-necked Grebe	Podiceps gr	144	Wetland	Marine	Podicipedi	waterbird	M	other	native	737518	482463	1054730	2006	2015	PIF0615	BBS7017	1970	2017	-298300	-669475	-57923.6	-406750	-203238
Red-shouldered Ha	Buteo linea	818	Forest Gene	Temperate	Accipitrida	landbird	M	other	native	1827010	1607481	2085341	2006	2015	PIF0615	BBS7017	1970	2017	-1675497	-1969607	-1411910	-1771469	-1583843
Red-tailed Hawk	Buteo jama	825	Habitat Ger	Widesprea	Accipitrida	landbird	M	other	native	2808115	2579824	3052334	2006	2015	PIF0615	BBS7017	1970	2017	-1649718	-1868102	-1451142	-1724720	-1577264
Red-throated Loon	Gavia stella	626	Arctic Tund	Marine	Gaviidae	waterbird	M	other	native	358396	96811	792502	2006	2015	PIF0615	BBS9317	1993	2017	-64174.8	-471009	101679	-160451	-4466.97
Red-winged Blackbi	Agelaius ph	1926	Habitat Ger	Temperate	Icteridae	landbird	M	other	native	1.73E+08	1.55E+08	1.97E+08	2006	2015	PIF0615	BBS7017	1970	2017	92754828	77318657	1.09E+08	87286802	98222647
Red Crossbill	Loxia curvi	1757	Forest Gene	Temperate	Fringillidae	landbird	M	other	native	9585953	7856459	11542746	2006	2015	PIF0615	BBS7017	1970	2017	-521052	-3406695	1659049	-1430356	262580.4
Red Knot	Calidris can	485	Arctic Tund	Coastal	Scolopacid	shorebird	M	other	native	139000	107715	196500	2011	2013	Shoreb12	Mig7416	1974	2016	786817	451716.6	1320313	658298.1	947035.5
Reddish Egret	Egretta rufe	747	Coasts	Coastal	Ardeidae	waterbird	M	other	native	4000	3600	4400	1995	1997	BNA2002	CBC7017	1970	2017	-2169.74	-3844.42	-978.25	-2672.08	-1724.88
Redhead	Aythya ame	55	Wetland	Temperate	Anatidae	waterfowl	M	other	native	1216200	1022900	1409500	2013	2017	FWS1317	FWS7017	1970	2017	-614728	-915837	-384342	-708527	-528118
Rhinoceros Auklet	Cerorhinca	561	Coasts	Marine	Alcidae	waterbird	M	other	native	900000	450000	1350000	1997	1999	BNA1993	CBC7017	1970	2017	-704894	-1937159	-153527	-1017267	-462626
Ring-billed Gull	Larus delaw	582	Wetland	Temperate	Laridae	waterbird	M	other	native	3740458	2828976	4916343	2006	2015	PIF0615	BBS7017	1970	2017	-2040795	-3250218	-1163597	-2416011	-1706859
Ring-necked Duck	Aythya coll	57	Wetland	Temperate	Anatidae	waterfowl	M	other	native	527400	370400	684300	2013	2017	FWS1317	BBS7017	1970	2017	-438992	-716450	-254973	-520050	-365060
Ring-necked Pheasa	Phasianus c	123	Introduced	Introduced	Phasianida	other	Introduced	other	Introduced	16642331	14252196	19372599	2006	2015	PIF0615	BBS7017	1970	2017	4081809	1458413	6850717	3189837	5015259
Rock Pigeon	Columba liv	149	Introduced	Introduced	Columbida	other	Introduced	other	Introduced	16195053	14584425	17988593	2006	2015	PIF0615	BBS7017	1970	2017	9716674	7473179	12160766	8923917	10507280
Rock Sandpiper	Calidris ptil	498	Arctic Tund	Coastal	Scolopacid	shorebird	M	other	native	144800	67900	334400	2011	2013	Shoreb12	CBC7017	1970	2017	157006.2	-27577.1	476867.3	83253.48	249097.8
Rock Wren	Salpinctes o	1454	Aridlands	Southweste	Troglodytic	landbird	M	other	native	3362014	2744880	4115789	2006	2015	PIF0615	BBS7017	1970	2017	2470864	1818269	3217035	2232387	2719110
Rose-breasted Gros	Pheucticus	2051	Eastern For	Widesprea	Cardinalida	landbird	M	other	native	4715733	4058034	5474743	2006	2015	PIF0615	BBS7017	1970	2017	1965605	1416636	2584608	1774278	2162243
Roseate Spoonbill	Platalea aja	764	Wetland	Widesprea	Threskiorni	waterbird	M	other	native	11000	8250	13750	1997	1999	BNA2000	BBS7017	1970	2017	-46069.7	-81166	-25815.2	-55900	-37477
Ross's Goose	Anser rossii	13	Arctic Tund	Temperate	Anatidae	waterfowl	M	other	native	2122006	1909805	2334207	2013	2015	CAFF18	CAFF	1989	2016	-1839191	-6621366	-442546	-2907504	-1154893
Rough-legged Hawk	Buteo lagop	826	Arctic Tund	Temperate	Accipitrida	landbird	M	other	native	296141	248433	370060	2006	2015	PIF0615	CBC7017	1970	2017	-11203.7	-64564.2	34041.65	-28323.8	5101.117
Royal Tern	Thalasseus r	617	Coasts	Coastal	Laridae	waterbird	M	other	native	35206	10179	70873	2006	2015	PIF0615	BBS7017	1970	2017	-2120.6	-39981.1	18352.05	-10540.9	3782.684
Ruby-crowned King	Regulus cal	1518	Boreal Fore	Temperate	Regulidae	landbird	M	other	native	99900936	90024695	1.11E+08	2006	2015	PIF0615	BBS7017	1970	2017	-2E+07	-3.7E+07	-4867386	-2.5E+07	-1.4E+07
Ruby-throated Hum	Archilochu	332	Eastern For	Mexico-Cer	Trochilidae	landbird	M	other	native	35777111	31236693	40921667	2006	2015	PIF0615	BBS7017	1970	2017	-1.7E+07	-2.1E+07	-1.4E+07	-1.8E+07	-1.6E+07
Ruddy Duck	Oxyura jam	80	Wetland	Widesprea	Anatidae	waterfowl	M	other	native	1334697	970409	1802652	2006	2015	PIF0615	BBS7017	1970	2017	-777078	-1362991	-383815	-952700	-616257
Ruddy Turnstone	Arenaria int	482	Arctic Tund	Coastal	Scolopacid	shorebird	M	other	native	245000	163333	367500	2011	2013	Shoreb12	Mig7416	1974	2016	1096850	608565.1	1756909	915241.9	1296343
Ruffed Grouse	Bonasa uml	125	Forest Gene	Temperate	Phasianida	landbird	R	other	native	16500000	8250000	24750000	2004	2006	ACAD	BBS7017	1970	2017	-2277000	-6333563	376825.4	-3502130	-1228649
Rufous-crowned Sp	Aimophila r	1808	Aridlands	Southweste	Passerellida	landbird	R	other	native	601135	407380	851057	2006	2015	PIF0615	BBS7017	1970	2017	222458.5	77386.16	399516	168728.2	279873.7
Rufous Hummingbi	Selasphoru	341	Western Fo	Mexico-Cer	Trochilidae	landbird	M	other	native	21694644	13724171	32781297	2006	2015	PIF0615	BBS7017	1970	2017	31516706	17402886	45836612	26540140	36517788
Rusty Blackbird	Euphagus c	1937	Boreal Fore	Temperate	Icteridae	landbird	M	other	native	6804603	4919111	9459126	2006	2015	PIF0615	BBS7017	1970	2017	23805588	15151219	33203095	20793996	26957828
Sage Thrasher	Oreoscopte	1630	Aridlands	Southweste	Mimidae	landbird	M	other	native	6362519	4673219	8479429	2006	2015	PIF0615	BBS7017	1970	2017	4306712	2678704	6236332	3712433	4930130
Sagebrush Sparrow	Artemisiosp	1839	Aridlands	Southweste	Passerellida	landbird	M	other	native	5386123	3477545	8199885	2006	2015	PIF0615	BBS7017	1970	2017	396872.7	-1315488	1911859	-105161	890716.3
Sanderling	Calidris alb	496	Arctic Tund	Coastal	Scolopacid	shorebird	M	other	native	300000	120000	750000	2011	2013	Shoreb12	Mig7416	1974	2016	773200.7	3.045663	1696297	492589.6	1072115
Sandhill Crane	Antigone ca	438	Wetland	Widesprea	Gruidae	waterbird	M	other	native	500000	450000	550000	2009	2011	BNA2014	BBS7017	1970	2017	-693633	-877673	-549334	-751478	-640981
Sandwich Tern	Thalasseus s	619	Coasts	Coastal	Laridae	waterbird	M	other	native	93890	70418	117363	1984	1986	BNA2016	CBC7017	1970	2017	-56071.2	-117368	-14729.6	-74403.6	-40020.7
Savannah Sparrow	Passerculus	1842	Grassland	Temperate	Passerellida	landbird	M	other	native	1.69E+08	1.44E+08	1.95E+08	2006	2015	PIF0615	BBS7017	1970	2017	1.4E+08	1.14E+08	1.69E+08	1.31E+08	1.5E+08
Say's Phoebe	Sayornis sa	1319	Habitat Ger	Southweste	Tyrannidae	landbird	M	other	native	5044646	4348767	5764857	2006	2015	PIF0615	BBS7017	1970	2017	-2048911	-2653374	-1524270	-2253522	-1858591
Scaled Quail	Callipepla s	102	Aridlands	Southweste	Odontopho	landbird	R	other	native	2393345	1766520	3168001	2006	2015	PIF0615	BBS7017	1970	2017	1219606	-1903248	3266030	348096.3	1981454
Scarlet Tanager	Piranga oliv	2034	Eastern For	South Ame	Cardinalida	landbird	M	other	native	2574915	2256623	2956329	2006	2015	PIF0615	BBS7017	1970	2017	301716.3	117878.6	497516.1	236828.3	368151.9
Scissor-tailed Flycat	Tyrannus fo	1282	Grassland	Mexico-Cer	Tyrannidae	landbird	M	AI	native	7914013	6502356	9635329	2006	2015	PIF0615	BBS7017	1970	2017	2308550	1308705	3387566	1963949	2676523
Scott's Oriole	Icterus pari	1924	Western Fo	Mexico-Cer	Icteridae	landbird	M	other	native	1721724	1332821	2134384	2006	2015	PIF0615	BBS7017	1970	2017	773869.9	439813	1148394	654043.9	894665.1
Seaside Sparrow	Ammospiza	1847	Coasts	Coastal	Passerellida	landbird	M	other	native	196782	32213	523319	2006	2015	PIF0615	BBS7017	1970	2017	-102593	-432238	-0.39529	-186331	-45587.7
Sedge Wren	Cistothorus	1469	Grassland	Temperate	Troglodytic	landbird	M	other	native	5017990	4252225	5954334	2006	2015	PIF0615	BBS7017	1970	2017	-1826942	-3145970	-829929	-2241364	-1454877
Semipalmated Plov	Charadrius	460	Arctic Tund	Coastal	Charadriida	shorebird	M	other	native	200000	80000	500000	2011	2013	Shoreb12	Mig7416	1974	2016	25352.83	-38834.1	121400.4	4909.987	52077.8
Semipalmated Sanc	Calidris pus	506	Arctic Tund	Coastal	Scolopacid	shorebird	M	other	native	2260000	1728400	2791600	2011	2013	Shoreb12	Mig7416	1974	2016	4759231	2633540	7463647	3998809	5598012
Sharp-shinned Haw	Accipiter st	789	Forest Gene	Widesprea	Accipitrida	landbird	M	other	native	405947	303414	524274	2006	2015	PIF0615	BBS7017	1970	2017	-183725	-261125	-121987	-208631	-160915
Sharp-tailed Grouse	Tympanuch	134	Grassland	Temperate	Phasianida	landbird	R	other	native	761942	569936	975726	2006	2015	PIF0615	BBS7017	1970	2017	-258040	-494499	-90047.8	-331274	-192635
Short-billed Dowitc	Limnodrom	508	Wetland	Coastal	Scolopacid	shorebird	M	other	native	153000	61200	382500	2011	2013	Shoreb12	Mig7416	1974	2016	160634.6	0.59968	478349.9	84331.32	251938.1
Short-eared Owl	Asio flamm	865	Habitat Ger	Temperate	Strigidae	landbird	M	other	native	602353	485388	747895	2006	2015	PIF0615	BBS7017	1970	2017	563323.3	309857.8	806621.3	479243.1	647091.4
Smith's Longspur	Calcarius pi	1775	Arctic Tund	Temperate	Calcariidae	landbird	M	other	native	75000	18750	131250	1992	1994	ACAD	CBC7017	1970	2017	-20469.5	-167427	32203.01	-53020.7	-670.689
Snow Bunting	Plectrophe	1777	Arctic Tund	Temperate	Calcariidae	landbird	M	other	native	14267309	14267309	14267309	2006	2015	PIF0615	CBC7017	1970	2017	12024394	1236737	19124710	9047340	14706712
Snow Goose	Anser caeru	12	Arctic Tund	Temperate	Anatidae	waterfowl	M	other	native	15305450	13774905	16835995	2013	2015	CAFF18	CAFF	1970	2016	-1.3E+07	-1.9E+07	-8399855	-1.5E+07	-1.1E+07
Snowy Egret	Egretta thu	744	Wetland	Widesprea	Ardeidae	waterbird	M	other	native	215935	152524	300633	2006	2015	PIF0615	BBS7017	1970	2017	-155729	-262335	-84327.9	-187901	-128165
Snowy Owl	Bubo scand	846	Arctic Tund	Temperate	Strigidae	landbird	M	other	native	14000	7000	21000	2011	2013	ACAD	CBC7017	1970	2017	12142.51	4842.862	21414.12	9368.028	15129.86
Snowy Plover	Charadrius	457	Coasts	Coastal	Charadriida	shorebird	M	other	native	31350	23840	41225	2011	2013	Shoreb12	CBC7017	1970	2017	-4768.37	-18300.8	4278.074	-8803.72	-1335.52
Solitary Sandpiper	Tringa solit	521	Wetland	South Ame	Scolopacid	shorebird	M	other	native	189000	75600	472500	2011	2013	Shoreb12	BBS7017	1970	2017	-41584	-160961	2407.353	-73025.6	-18254
Song Sparrow	Melospiza r	1852	Habitat Ger	Temperate	Passerellida	landbird	M	other	native	1.26E+08	1.19E+08	1.34E+08	2006	2015	PIF0615	BBS7017	1970	2017	55082452	44568049	65846626	51610368	58699961
Sooty Grouse	Dendragap	133	Western Fo	Temperate	Phasianida	landbird	R	other	native	2000000	1000000	3000000	2008	2010	ACAD	BBS7017	1970	2017	1145824	465286	2070626	885899.9	1435444
Sora	Porzana car	419	Wetland	Temperate	Rallidae	waterbird	M	other	native	4428137	3481892	5601019	2006	2015	PIF0615	BBS7017	1970	2017	-895239	-3035397	512670.7	-1551785	-353288
Spotted Sandpiper	Actitis mac	519	Wetland	Widesprea	Scolopacid	shorebird	M	other	native	660000	264000	1650000	2011	2013	Shoreb12	BBS7017	1970	2017	582634.1	0.954427	1223862	368898.5	803089
Spotted Towhee	Pipilo macu	1805	Western Fo	Temperate	Passerellida	landbird	M	other	native	35271543	31027431	39773372	2006	2015	PIF0615	BBS7017	1970	2017	2711186	-2132430	7092111	1136179	4285534
Sprague's Pipit	Anthus spra	1680	Grassland	Southweste	Motacillida	landbird	M	other	native	1394136	936560	2009643	2006	2015	PIF0615	BBS7017	1970	2017	3882885	2344143	5539403	3329344	4434187
Spruce Grouse	Falcipennis	128	Boreal Fore	Temperate	Phasianida	landbird	R	other	native	11000000	5500000	16500000	2007	2009	ACAD	CBC7017	1970	2017	-5250276	-1.8E+07	141256.8	-8480635	-2861758
Steller's Eider	Polysticta s	61	Arctic Tund	Marine	Anatidae	waterfowl	M	other	native	181000	135750	226250	2004	2006	SeDu07	CBC7017	1970	2017	307339.5	36831.06	675018.3	222462.7	404786
Steller's Jay	Cyanocitta	1381	Western Fo	Temperate	Corvidae	landbird	R	other	native	2705843	2239068	3237856	2006	2015	PIF0615	BBS7017	1970	2017	343052.4	85551.84	604762.9	255702.2	431977.5
Stilt Sandpiper	Calidris hin	490	Arctic Tund	Widesprea	Scolopacid	shorebird	M	other	native	1243700	418800	2068600	2011	2013	Shoreb12	Mig7416	1974	2016	737399	-154531	1850642	432578.8	1069449
Summer Tanager	Piranga rub	2033	Eastern For	Widesprea	Cardinalida	landbird	M	other	native	11302422	10343397	12384415	2006	2015	PIF0615	BBS7017	1970	2017	-1526407	-2389738	-709811	-1819119	-1241058
Surf Scoter	Melanitta p	67	Wetland	Marine	Anatidae	waterfowl	M	other	native	600000	450000	750000	2004	2006	SeDu07	CBC7017	1970	2017	-59228.6	-263419	103813.3	-121422	-1192.87
Surfbird	Calidris virg	486	Arctic Tund	Coastal	Scolopacid	shorebird	M	other	native	70000	46667	105000	2011	2013	Shoreb12	CBC7017	1970	2017	60758.09	19526.15	114455.7	45593.92	77309.53
Swainson's Hawk	Buteo swai	823	Grassland	South Ame	Accipitrida	landbird	M	other	native	822598	714482	956228	2006	2015	PIF0615	BBS7017	1970	2017	-336424	-440947	-247854	-370365	-304007
Swainson's Thrush	Catharus us	1583	Forest Gene	South Ame	Turdidae	landbird	M	other	native	1.22E+08	1.02E+08	1.44E+08	2006	2015	PIF0615	BBS7017	1970	2017	42700637	27254661	59294664	37301135	48201576
Swainson's Warbler	Limnothlyp	1956	Eastern For	Caribbean	Parulidae	landbird	M	other	native	156081	99540	235309	2006	2015	PIF0615	BBS7017	1970	2017	-112647	-184019	-59362	-135304	-92571.9
Swallow-tailed Kite	Elanoides fo	775	Eastern For	Widesprea	Accipitrida	landbird	M	other	native	7500	3750	11250	2015	2017	ACAD	BBS7017	1970	2017	-7282.7	-11486.9	-3572.39	-8612.62	-5956.78
Swamp Sparrow	Melospiza g	1854	Wetland	Temperate	Passerellida	landbird	M	other	native	23261464	20193095	26315495	2006	2015	PIF0615	BBS7017	1970	2017	-1E+07	-1.4E+07	-6799244	-1.2E+07	-9009436
Tennessee Warbler	Oreothlypis	1959	Boreal Fore	Widesprea	Parulidae	landbird	M	other	native	1.11E+08	80906890	1.49E+08	2006	2015	PIF0615	BBS7017	1970	2017	78836370	41615592	1.22E+08	65547365	93499168
Thick-billed Murre	Uria lomvia	544	Coasts	Marine	Alcidae	waterbird	M	other	native	8000000	4000000	12000000	1997	1999	BNA2000	CBC7017	1970	2017	7659125	1134189	17289832	5397067	10382089
Townsend's Solitair	Myadestes t	1560	Western Fo	Temperate	Turdidae	landbird	M	other	native	1050595	834475	1298011	2006	2015	PIF0615	BBS7017	1970	2017	-160780	-330078	-26726.1	-215607	-110946
Townsend's Warble	Setophaga t	2009	Western Fo	Mexico-Cer	Parulidae	landbird	M	other	native	21262275	16792636	26233697	2006	2015	PIF0615	BBS7017	1970	2017	8275273	3515713	13077119	6709572	9889692
Tree Swallow	Tachycineta	1420	Habitat Ger	Widesprea	Hirundinid	landbird	M	AI	native	18581775	16732180	20563777	2006	2015	PIF0615	BBS7017	1970	2017	12732185	10394535	15211118	11947497	13571232
Tricolored Blackbir	Agelaius tri	1928	Wetland	Temperate	Icteridae	landbird	M	other	native	394858	296144	493573	2007	2009	ACAD	BBS7017	1970	2017	34673.92	-566433	314292.4	-103217	137561.6
Tricolored Heron	Egretta tric	746	Wetland	Widesprea	Ardeidae	waterbird	M	other	native	57579	34376	88724	2006	2015	PIF0615	BBS7017	1970	2017	11966.02	-1594.2	27353.02	7253.648	16856.08
Trumpeter Swan	Cygnus buc	26	Wetland	Temperate	Anatidae	waterfowl	M	other	native	63016	56714	69318	2014	2016	NATSS15	NATS6815	1970	2015	-55452.6	-86169.9	-35157.5	-64440.9	-47470
Tufted Titmouse	Baeolophus	1445	Eastern For	Temperate	Paridae	landbird	R	other	native	11970837	10921948	13128862	2006	2015	PIF0615	BBS7017	1970	2017	-4964573	-6276239	-3808195	-5403184	-4555522
Tundra Swan	Cygnus colu	27	Arctic Tund	Temperate	Anatidae	waterfowl	M	other	native	183000	129200	236900	2013	2017	FWS1317	CBC7017	1970	2017	-7037.89	-124840	77042.73	-40764.8	22247.23
Turkey Vulture	Cathartes a	766	Habitat Ger	Widesprea	Cathartidae	landbird	M	other	native	8418387	7705474	9163886	2006	2015	PIF0615	BBS7017	1970	2017	-7063505	-8098500	-6085736	-7422215	-6721785
Upland Sandpiper	Bartramia l	469	Grassland	South Ame	Scolopacid	shorebird	M	other	native	750000	500000	1125000	2011	2013	Shoreb12	BBS7017	1970	2017	-155246	-284443	-65306.6	-196445	-119942
Varied Bunting	Passerina v	2063	Aridlands	Mexico-Cer	Cardinalida	landbird	M	other	native	69313	27061	135722	2006	2015	PIF0615	BBS9317	1993	2017	-23240	-77309.2	-87.1145	-37523.6	-12813.4
Varied Thrush	Ixoreus nae	1609	Western Fo	Temperate	Turdidae	landbird	M	other	native	34514221	26180031	44500981	2006	2015	PIF0615	BBS7017	1970	2017	52090538	37456216	67858346	46836755	57404178
Vaux's Swift	Chaetura va	261	Western Fo	Mexico-Cer	Apodidae	landbird	M	AI	native	418576	284294	607235	2006	2015	PIF0615	BBS7017	1970	2017	253429	137094.1	399483.1	210648.5	301133.1
Veery	Catharus fu	1580	Forest Gene	South Ame	Turdidae	landbird	M	other	native	11186101	9451271	13166545	2006	2015	PIF0615	BBS7017	1970	2017	6970872	5334514	8781439	6398073	7560335
Verdin	Auriparus fl	1447	Aridlands	Southweste	Remizidae	landbird	R	other	native	3810209	2615935	5392903	2006	2015	PIF0615	BBS7017	1970	2017	2577465	1406286	4010112	2150899	3039045
Vermilion Flycatch	Pyrocephal	1320	Aridlands	Mexico-Cer	Tyrannidae	landbird	M	other	native	538032	324197	798482	2006	2015	PIF0615	BBS7017	1970	2017	-242817	-454180	-106091	-306005	-188311
Vesper Sparrow	Pooecetes g	1835	Grassland	Southweste	Passerellida	landbird	M	other	native	35053955	30378748	40800937	2006	2015	PIF0615	BBS7017	1970	2017	17080117	12836817	21808631	15583249	18631978
Violet-green Swallo	Tachycineta	1423	Western Fo	Mexico-Cer	Hirundinid	landbird	M	AI	native	6724535	5560970	8017545	2006	2015	PIF0615	BBS7017	1970	2017	2631578	1644027	3714568	2290794	2998080
Virginia's Warbler	Oreothlypis	1964	Western Fo	Mexico-Cer	Parulidae	landbird	M	other	native	904013	567681	1360062	2006	2015	PIF0615	BBS7017	1970	2017	1216334	643208.9	1886995	1004733	1433329
Virginia Rail	Rallus limic	413	Wetland	Temperate	Rallidae	waterbird	M	other	native	232547	160326	321031	2006	2015	PIF0615	BBS7017	1970	2017	-125520	-212324	-64428.4	-151928	-101401
Wandering Tattler	Tringa incar	523	Arctic Tund	Coastal	Scolopacid	shorebird	M	other	native	17500	10000	25000	2011	2013	Shoreb12	CBC7017	1970	2017	92835.54	51361.36	144484.1	77898.28	109097.8
Warbling Vireo	Vireo gilvus	1358	Forest Gene	Mexico-Cer	Vireonidae	landbird	M	other	native	52333042	46022570	58752802	2006	2015	PIF0615	BBS7017	1970	2017	-1.9E+07	-2.4E+07	-1.4E+07	-2.1E+07	-1.7E+07
Western Bluebird	Sialia mexic	1558	Western Fo	Temperate	Turdidae	landbird	M	other	native	5661189	4392144	7058744	2006	2015	PIF0615	BBS7017	1970	2017	-1879407	-3002560	-1049029	-2226141	-1562686
Western Grebe	Aechmoph	146	Wetland	Temperate	Podicipedi	waterbird	M	other	native	989858	425689	1889334	2006	2015	PIF0615	CBC7017	1970	2017	1980131	522348.4	3602622	1468003	2498605
Western Gull	Larus occid	583	Coasts	Coastal	Laridae	waterbird	M	other	native	44003	11262	90819	2006	2015	PIF0615	BBS7017	1970	2017	23789.38	-22868.8	77000.51	9680.538	40009.37
Western Kingbird	Tyrannus ve	1277	Grassland	Mexico-Cer	Tyrannidae	landbird	M	AI	native	28830127	24939575	33543450	2006	2015	PIF0615	BBS7017	1970	2017	-812844	-3997120	1979095	-1866827	186957.4
Western Meadowla	Sturnella n	1889	Grassland	Southweste	Icteridae	landbird	M	other	native	95124368	83326234	1.07E+08	2006	2015	PIF0615	BBS7017	1970	2017	65058633	52952201	78157580	60737088	69506571
Western Sandpiper	Calidris ma	507	Arctic Tund	Widesprea	Scolopacid	shorebird	M	other	native	3500000	2333333	5250000	2011	2013	Shoreb12	CBC7017	1970	2017	342805.2	-1502034	1720787	-164838	799659.4
Western Screech-O	Megascops	832	Western Fo	Temperate	Strigidae	landbird	R	other	native	240461	121691	401313	2006	2015	PIF0615	BBS7017	1970	2017	129693.9	42585.88	245805.5	95237.63	166223.4
Western Tanager	Piranga lud	2035	Western Fo	Mexico-Cer	Cardinalida	landbird	M	other	native	15020244	12899162	17361777	2006	2015	PIF0615	BBS7017	1970	2017	-6266666	-8347561	-4541531	-6974160	-5622433
Western Wood-Pew	Contopus s	1295	Western Fo	South Ame	Tyrannidae	landbird	M	AI	native	8845348	7660907	10112663	2006	2015	PIF0615	BBS7017	1970	2017	8929257	7026400	10979669	8268680	9623264
Whimbrel	Numenius p	471	Arctic Tund	Coastal	Scolopacid	shorebird	M	other	native	80000	53333	120000	2011	2013	Shoreb12	Mig7416	1974	2016	89253.9	35075.98	162338.6	69327.17	111649.6
White-breasted Nut	Sitta caroli	1450	Forest Gene	Temperate	Sittidae	landbird	R	other	native	10035072	9249484	10873200	2006	2015	PIF0615	BBS7017	1970	2017	-6484091	-7543641	-5519823	-6829647	-6151025
White-crowned Spa	Zonotrichia	1858	Habitat Ger	Temperate	Passerellida	landbird	M	other	native	79258794	63587655	97291972	2006	2015	PIF0615	BBS7017	1970	2017	9065231	-7840055	24340230	3645958	14271568
White-eyed Vireo	Vireo griseu	1340	Eastern For	Mexico-Cer	Vireonidae	landbird	M	other	native	22090753	20223913	24179468	2006	2015	PIF0615	BBS7017	1970	2017	-7065591	-8978314	-5239991	-7727956	-6425969
White-faced Ibis	Plegadis ch	760	Wetland	Widesprea	Threskiorni	waterbird	M	other	native	1332908	700651	2146390	2006	2015	PIF0615	BBS7017	1970	2017	-1266738	-4226088	-187354	-1971669	-754582
White-headed Woo	Dryobates a	966	Western Fo	Temperate	Picidae	landbird	R	other	native	243113	168463	340504	2006	2015	PIF0615	BBS7017	1970	2017	-86051.6	-151841	-39968.4	-105659	-67784.4
White-rumped Sanc	Calidris fusc	503	Arctic Tund	South Ame	Scolopacid	shorebird	M	other	native	1694000	560100	3827900	2011	2013	Shoreb12	Mig7416	1974	2016	-400222	-2180658	223590.8	-816447	-122982
White-tailed Kite	Elanus leuc	772	Habitat Ger	Widesprea	Accipitrida	landbird	R	other	native	15718	8293	26310	2006	2015	PIF0615	BBS7017	1970	2017	12125.57	4778.759	20864.42	9470.142	14941.45
White-throated Spa	Zonotrichia	1856	Boreal Fore	Temperate	Passerellida	landbird	M	other	native	1.63E+08	1.39E+08	1.89E+08	2006	2015	PIF0615	BBS7017	1970	2017	93507759	71792609	1.18E+08	85735347	1.02E+08
White-throated Sw	Aeronautes	274	Aridlands	Southweste	Apodidae	landbird	M	AI	native	2382771	1600983	3298803	2006	2015	PIF0615	BBS7017	1970	2017	482917	-167050	1129058	277767.2	693358.5
White-winged Cros	Loxia leuco	1760	Boreal Fore	Temperate	Fringillidae	landbird	M	other	native	39691698	30030233	51497702	2006	2015	PIF0615	BBS7017	1970	2017	-3E+07	-6.8E+07	-1.1E+07	-4.1E+07	-2.2E+07
White-winged Dove	Zenaida asi	195	Aridlands	Southweste	Columbida	landbird	M	other	native	5159586	3579714	7462483	2006	2015	PIF0615	BBS7017	1970	2017	-2448746	-4592524	-1053151	-3109395	-1888045

White-winged Scot	Melanitta fi	68	Wetland	Marine	Anatidae	waterfowl	M	other	native	400000	200000	600000	2004	2006	SeDu07	CBC7017	1970	2017	41189.93	-350756	288668.4	-56350.2	121532.4							
White Ibis	Eudocimus	757	Wetland	Widespreac	Threskiorni	waterbird	M	other	native	1170987	807222	1696093	2006	2015	PIF0615	BBS7017	1970	2017	-1394174	-2587259	-682714	-1723512	-1106709							
Wild Turkey	Meleagris g	137	Forest Gene	Temperate	Phasianida	landbird	R	other	native	6750000	6075000	7425000	2008	2010	BNA2014	BBS7017	1970	2017	-1.1E+07	-1.5E+07	-8873202	-1.2E+07	-1E+07							
Willet	Tringa semi	525	Wetland	Coastal	Scolopacid	shorebird	M	other	native	250000	100000	625000	2011	2013	Shoreb12	BBS7017	1970	2017	66334.26	0.361178	166538.2	39646.7	96933.03							
Williamson's Sapsu	Sphyrapicu	953	Western Fo	Temperate	Picidae	landbird	M	other	native	294829	209789	398019	2006	2015	PIF0615	BBS7017	1970	2017	-32100.3	-109782	23124.9	-55295.1	-11888.6							
Willow Flycatcher	Empidonax	1305	Eastern For	Widespreac	Tyrannidae	landbird	M	other	native	8095093	6902363	9486416	2006	2015	PIF0615	BBS7017	1970	2017	2940723	1949424	4016124	2588135	3308646							
Willow Ptarmigan	Lagopus lag	129	Arctic Tund	Temperate	Phasianida	landbird	M	other	native	12784429	7232901	21298386	2006	2015	PIF0615	BBS9317	1993	2017	-306805	-1.9E+07	8120169	-4398420	2794435							
Wilson's Phalarope	Phalaropus	532	Wetland	South Ame	Scolopacid	shorebird	M	other	native	1500000	600000	3750000	2011	2013	Shoreb12	BBS7017	1970	2017	65525.64	-346015	559622.5	-20112.5	198928.8							
Wilson's Plover	Charadrius	458	Coasts	Coastal	Charadriid	shorebird	M	other	native	8600	5733	12900	2011	2013	Shoreb12	CBC7017	1970	2017	7902.019	-454.683	16313.62	5246.921	10574.41							
Wilson's Snipe	Gallinago d	516	Wetland	Widespreac	Scolopacid	shorebird	M	other	native	2000000	800000	5000000	2011	2013	Shoreb12	BBS7017	1970	2017	-356660	-1014232	-0.24069	-545459	-197857							
Wilson's Warbler	Cardellina p	2023	Forest Gene	Mexico-Cer	Parulidae	landbird	M	other	native	81271984	65743361	98288305	2006	2015	PIF0615	BBS7017	1970	2017	81257567	61964991	1.02E+08	74336542	88378279							
Winter Wren	Troglodyte	1467	Boreal Fore	Temperate	Troglodytic	landbird	M	other	native	11140437	9052643	13798379	2006	2015	PIF0615	BBS7017	1970	2017	-2182791	-5115623	23901.2	-3121130	-1350791							
Wood Duck	Aix sponsa	35	Wetland	Temperate	Anatidae	waterfowl	M	other	native	2148806	1930697	2371212	2006	2015	PIF0615	BBS7017	1970	2017	-1382266	-1651781	-1141445	-1472195	-1297891							
Wood Stork	Mycteria ar	706	Wetland	Widespreac	Ciconiidae	waterbird	M	other	native	15700	12560	18840	1994	1996	BNA1999	BBS7017	1970	2017	-9686.47	-23040.5	-1877.7	-13538.1	-6586.39							
Wood Thrush	Hylocichla	1585	Eastern For	Mexico-Cer	Turdidae	landbird	M	other	native	12191387	10959424	13589692	2006	2015	PIF0615	BBS7017	1970	2017	15227071	13130268	17436955	14500401	15967893							
Woodhouse's Scrut	Aphelocom	1386	Western Fo	Temperate	Corvidae	landbird	R	other	native	692935	476075	1023759	2006	2015	PIF0615	BBS7017	1970	2017	71987.24	-8413.72	167626.1	44321.77	101466.8							
Worm-eating Warb	Helmitherc	1948	Eastern For	Caribbean	Parulidae	landbird	M	other	native	784060	608710	988276	2006	2015	PIF0615	BBS7017	1970	2017	-145853	-276841	-41141.2	-188245	-108293							
Wrentit	Chamaea fa	1530	Aridlands	Temperate	Sylviidae	landbird	R	other	native	1753863	1095353	2807164	2006	2015	PIF0615	BBS7017	1970	2017	612755.7	257008.7	1078014	475683.6	758666.6							
Yellow-bellied Flyca	Empidonax	1302	Boreal Fore	Mexico-Cer	Tyrannidae	landbird	M	other	native	13047639	10169586	16383394	2006	2015	PIF0615	BBS7017	1970	2017	-1.1E+07	-1.7E+07	-6379784	-1.3E+07	-9032267							
Yellow-bellied Saps	Sphyrapicu	954	Eastern For	Widespreac	Picidae	landbird	M	other	native	13523418	11628336	15891341	2006	2015	PIF0615	BBS7017	1970	2017	-6852842	-9680783	-4632455	-7769014	-6048174							
Yellow-billed Cuckc	Coccyzus a	205	Eastern For	South Ame	Cuculidae	landbird	M	other	native	8358126	7571171	9214892	2006	2015	PIF0615	BBS7017	1970	2017	7765674	6309631	9265539	7259180	8257018							
Yellow-billed Loon	Gavia adam	630	Arctic Tund	Marine	Gaviidae	waterbird	M	other	native	12000	8000	16000	2013	2017	FWS2014	CBC7017	1970	2017	37697.22	21594.63	59920.24	31547.6	44723.16							
Yellow-billed Magp	Pica nuttall	1392	Western Fo	Temperate	Corvidae	landbird	R	other	native	396399	319891	491206	2007	2009	BNA2009	BBS7017	1970	2017	686814.7	501752	903559.9	619190.7	756379.6							
Yellow-breasted Ch	Icteria virer	1885	Eastern For	Mexico-Cer	Icteriidae	landbird	M	other	native	15066335	13315869	16929873	2006	2015	PIF0615	BBS7017	1970	2017	3913521	2390558	5420511	3402197	4429401							
Yellow-crowned Nig	Nyctanassa	755	Coasts	Widespreac	Ardeidae	waterbird	M	other	native	129442	72714	233481	2006	2015	PIF0615	BBS7017	1970	2017	23953.77	-5471.65	63560.05	13397.82	36092.5							
Yellow-headed Blac	Xanthocepl	1886	Wetland	Temperate	Icteridae	landbird	M	other	native	11338466	8566820	14826716	2006	2015	PIF0615	BBS7017	1970	2017	976561	-1180430	2942683	292291.1	1642615							
Yellow-rumped Wa	Setophaga	1999	Forest Gene	Widespreac	Parulidae	landbird	M	other	native	1.74E+08	1.56E+08	1.91E+08	2006	2015	PIF0615	BBS7017	1970	2017	7197191	-1.1E+07	24453427	927860.6	13250777							
Yellow-throated Vir	Vireo flavifr	1352	Eastern For	Mexico-Cer	Vireonidae	landbird	M	other	native	4705278	4250092	5161482	2006	2015	PIF0615	BBS7017	1970	2017	-2146791	-2589822	-1745190	-2293583	-2002721							
Yellow-throated W	Setophaga	2000	Eastern For	Caribbean	Parulidae	landbird	M	other	native	2039116	1732805	2359505	2006	2015	PIF0615	BBS7017	1970	2017	-768608	-1121737	-462950	-880751	-658077							
Yellow Warbler	Setophaga	1992	Forest Gene	Widespreac	Parulidae	landbird	M	other	native	92640979	83231903	1.03E+08	2006	2015	PIF0615	BBS7017	1970	2017	30516333	22777261	38840680	27767231	33373984							

Column Name	Meaning
species	English Name, according to 59th supplement of AOS checklist - this spreadsheet contains species that occur regularly in the USA and/or Canada, AND that have population estimates and trends
sci_name	Scientific Name, from AOS 59th supplement
sort	taxonomic sort order, based on AOS 59th supplement, for each species
Breeding.Biome	Breeding biome categories assigned to each species, used to summarize loss results across species groups
Winter.Biome	Non-breeding Region categories assigned to each species, used to summarize loss results across species groups
Family	Taxonomic Family, as assigned in the 59th supplement of the AOS checklist
bird.group	assignment to 1 of 4 bird groups: landbird, shorebird, waterbird, waterfowl
Migrate	Migration category, assigned to each species: "R" - year-round resident; "M" - migrant: includes partial migrants (substantial overlap of breeding and winter ranges, but some parts of range occupied only seasonally) and full migrants (little or no overlap of breeding and winter ranges)
AI	identifies species in the "Aerial Insectivore" group, birds that capture flying insects while in flight
native	identifies native and introduced species across U.S./Canada (from AOS 59th supplement)
popest	Estimated North American population during range of years between first_year_popest and last_year_popest
popestlci	Lower bound estimated North American population during range of years between first_year_popest and last_year_popest
popestuci	Upper bound estimated North American population during range of years between first_year_popest and last_year_popest
first_year_popest	beginning of the time-period to which the estimated population applies. Note for species where this first_year - last_year spans 3 years, the published estimate was reported to apply to the single year in the middle of the range, but for analysis purposes we averaged across a minimum of 3 years
last_year_popest	end of the time-period to which the estimated population applies. Note for species where this first_year - last_year spans 3 years, the published estimate was reported to apply to the single year in the middle of the range, but for analysis purposes we averaged across a minimum of 3 years
Pop.source	Source of recent population size estimates and variances for North America, as follows: ACAD - Avian Conservation Assessment Database BNA - Birds of North American accounts, various years CAFF18 - Conservation of Arctic Flora and Fauna 2018 report FWS1317 - average of 2013 to 2017 estimates from the 2017 USFWS Waterfowl Status Report FWS2014 - USFWS report on Yellow-billed Loon NATSS15 - North American Trumpeter Swan Survey, 2015 PIF0615 - Partners in Flight (PIF) calculated estimate, based mainly on BBS data from the years 2006-2015, as described by Stanton et al. 2019 SeDu07 - 2007 Seaduck Joint Venture Report Shoreb12 - Shorebird Flyway Population Database WPE5 - Waterbird Population Estimates Database see Supplemental Methods text for details
Trajectory_data_so	source of population trajectory for individual species in this analysis, as follows: BBS7017 - North American Breeding Bird Survey, 1970 to 2017 BBS9317 - North American Breeding Bird Survey, 1993 to 2017 CAFF - trends based on population change in CAFF 2018 report (Fox and Leafloor 2018); numbers after "CAFF" indicate start year and end year of estimates for each species, from which trend was estimated CBC7017 - Audubon Christmas Bird Count, 1970 to 2017 FWS7017 - US Fish & Wildlife Service waterfowl survey trends, 1970 to 2017 Mig7416 - Migration Monitoring of Shorebirds, 1974 to 2016 NATS6815 - Trumpeter Swan Survey trends, 1968-2015 SGS6817 - American Woodcock Singing Ground Survey trends, 1968 to 2017 see Supplemental Methods text for details
Trajectory_firstyea	first year of available estimates for the population trajectory
Trajectory_lastyear	first year of available estimates for the population trajectory
Loss_med	Estimated change in number of breeding individuals over the trend period (usually 1970-2017), based on a combination of current population estimates and long-term trajectories. Median of the posterior distribution from the hierarchical Bayesian model
Loss_lci	Lower bound (2.5 percentile of the posterior distribution) on the estimated change in number of breeding individuals over the trend period (usually 1970-2017), based on a combination of current population estimates and long-term trajectories. Median of the posterior distribution from the hierarchical Bayesian model
Loss_uci	Upper bound (97.5 percentile of the posterior distribution) on the estimated change in number of breeding individuals over the trend period (usually 1970-2017), based on a combination of current population estimates and long-term trajectories. Median of the posterior distribution from the hierarchical Bayesian model
Loss_lqrt	Lower quartile (25 percentile of the posterior distribution) on the estimated change in number of breeding individuals over the trend period (usually 1970-2017), based on a combination of current population estimates and long-term trajectories. Median of the posterior distribution from the hierarchical Bayesian model
Loss_uqrt	Upper quartile (75 percentile of the posterior distribution) on the estimated change in number of breeding individuals over the trend period (usually 1970-2017), based on a combination of current population estimates and long-term trajectories. Median of the posterior distribution from the hierarchical Bayesian model

see "Definitions" worksheet for meaning of column headers

Species	sci_name	sort	group	PopUsCa	PopLC95	PopUC95	TimeAdj.meanlog	TimeAdj.sdlog	Distance Adj.	Pair Adj.
Abert's Towhee	Melozone aberti	1817	landbird	890,243	429,538	1,469,410	0.926068294	0.03279521	125	2
Acadian Flycatcher	Empidonax virescens	1303	landbird	5,227,271	4,728,009	5,829,898	0.219216886	0.007581933	125	2
Acorn Woodpecker	Melanerpes formicivorus	939	landbird	2,226,303	1,452,256	3,390,813	0.261513967	0.032915038	200	1.75
Alder Flycatcher	Empidonax alnorum	1304	landbird	117,998,630	99,384,651	141,184,247	0.279321986	0.014289896	125	2
Allen's Hummingbird	Selasphorus sasin	342	landbird	1,484,682	348,049	4,475,111	0.291735312	0.022923659	50	1.25
American Crow	Corvus brachyrhynchos	1395	landbird	28,047,630	26,447,403	29,639,378	0.509424135	0.035825627	400	1.75
American Dipper	Cinclus mexicanus	1514	landbird	151,919	114,060	200,186	0.120627704	0.002232302	125	1.75
American Goldfinch	Spinus tristis	1771	landbird	44,092,850	41,554,624	46,767,583	0.311311237	0.018869851	125	1.25
American Kestrel	Falco sparverius	998	landbird	2,827,776	2,564,206	3,116,508	0.290453514	0.006693885	200	1.25
American Pipit	Anthus rubescens	1678	landbird	18,034,890	17,874,051	18,354,686	0.331264898	0.018339887	200	2
American Redstart	Setophaga ruticilla	1983	landbird	42,464,674	37,027,311	48,475,245	0.081164913	0.00961596	100	2
American Robin	Turdus migratorius	1603	landbird	366,076,928	337,429,985	392,723,825	0.816820459	0.040591642	200	2
American Three-toed Woodpecker	Picoides dorsalis	958	landbird	1,564,320	1,108,671	2,160,148	0.231914705	0.005639455	125	1.5
American Tree Sparrow	Spizelloides arborea	1828	landbird	26,412,817	19,492,087	36,200,474	0.48677923	0.263794299	200	2
Anna's Hummingbird	Calypte anna	336	landbird	8,772,569	4,880,026	16,549,527	0.188295714	0.007918482	50	2
Arctic Warbler	Phylloscopus borealis	1526	landbird	8,201,201	2,638,973	16,439,186	0.336241881	0.212251379	125	2
Ash-throated Flycatcher	Myiarchus cinerascens	1247	landbird	6,847,348	5,661,743	8,193,398	0.285893654	0.012720806	200	1.5
Bachman's Sparrow	Peucaea aestivalis	1825	landbird	167,964	102,917	256,160	0.353020961	0.010014486	200	2
Baird's Sparrow	Centronyx bairdii	1844	landbird	3,440,174	2,322,349	4,825,893	0.347885573	0.018872062	125	2
Baltimore Oriole	Icterus galbula	1922	landbird	11,806,532	10,808,329	12,963,225	0.141448158	0.008339067	125	1.75
Band-tailed Pigeon	Patagioenas fasciata	156	landbird	1,455,144	1,049,053	1,990,079	0.445606274	0.021296333	200	1.75
Bank Swallow	Riparia riparia	1430	landbird	7,940,368	6,125,188	10,752,527	0.642518351	0.054160354	200	1
Barn Owl	Tyto alba	828	landbird	130,751	81,975	193,386	1.639980926	0.005870793	200	2
Barn Swallow	Hirundo rustica	1433	landbird	46,855,476	43,409,178	50,012,099	0.288208703	0.028063207	200	1.5
Barred Owl	Strix varia	860	landbird	3,458,782	3,024,086	3,952,819	2.246063781	0.003138642	200	2
Bay-breasted Warbler	Setophaga castanea	1990	landbird	9,892,605	6,894,711	13,872,180	0.153659869	0.007650575	80	2
Bell's Sparrow	Artemisiospiza belli	1840	landbird	214,853	89,930	390,058	0.356608677	0.06387064	200	2
Bell's Vireo	Vireo bellii	1349	landbird	4,599,734	3,593,221	5,764,813	0.180378292	0.007557468	125	2
Belted Kingfisher	Megaceryle alcyon	907	landbird	1,843,798	1,568,548	2,159,306	0.290382383	0.001070783	200	2
Bendire's Thrasher	Toxostoma bendirei	1625	landbird	56,338	30,887	93,302	0.151208587	0.03780064	200	2
Bewick's Wren	Thryomanes bewickii	1472	landbird	4,567,446	3,627,322	5,765,670	0.263952086	0.012017096	200	1.75
Black Phoebe	Sayornis nigricans	1317	landbird	1,170,291	816,450	1,641,836	0.490597113	0.0123837	125	1.5
Black Swift	Cypseloides niger	253	landbird	88,506	34,390	198,559	0.419278592	0.342734085	200	1.25
Black Vulture	Coragyps atratus	765	landbird	1,864,137	1,555,779	2,249,923	1.046186196	0.034351103	400	1.5
Black-and-white Warbler	Mniotilta varia	1954	landbird	17,709,569	15,812,133	19,681,290	0.152823762	0.008002952	100	2
Black-backed Woodpecker	Picoides arcticus	959	landbird	1,734,181	1,251,409	2,296,411	0.427240724	0.004502838	125	1.5
Black-billed Cuckoo	Coccyzus erythropthalmus	209	landbird	875,781	735,134	1,051,851	0.283172906	0.005624163	200	2
Black-billed Magpie	Pica hudsonia	1391	landbird	6,023,555	5,190,448	7,003,608	0.235896152	0.020103119	300	1.75
Black-capped Chickadee	Poecile atricapillus	1436	landbird	43,031,705	39,633,241	46,269,089	0.378610362	0.015744777	125	2
Black-chinned Hummingbird	Archilochus alexandri	333	landbird	8,179,118	5,809,219	10,961,926	0.261764193	0.005802987	50	1.5
Black-chinned Sparrow	Spizella atrogularis	1834	landbird	293,554	150,962	524,619	0.48677923	0.263794299	200	1.75
Black-crested Titmouse	Baeolophus atricristatus	1446	landbird	642,491	414,558	1,018,349	0.167287607	0.015324212	200	1.25
Black-headed Grosbeak	Pheucticus melanocephalus	2052	landbird	12,185,173	10,701,801	13,695,616	0.35677819	0.014358481	125	2
Black-tailed Gnatcatcher	Polioptila melanura	1509	landbird	6,527,338	4,101,720	10,094,127	0.507418109	0.013481356	80	1.75
Black-throated Blue Warbler	Setophaga caerulescens	1995	landbird	2,415,903	2,069,260	2,822,969	0.123733234	0.007484617	125	2
Black-throated Gray Warbler	Setophaga nigrescens	2008	landbird	3,130,246	2,558,225	3,733,825	0.234857209	0.011166783	125	2
Black-throated Green Warbler	Setophaga virens	2012	landbird	9,177,716	7,924,382	10,581,319	0.123030348	0.008231303	125	2
Black-throated Sparrow	Amphispiza bilineata	1838	landbird	31,040,032	26,228,164	36,813,986	0.536376292	0.030266055	125	2
Black-whiskered Vireo	Vireo altiloquus	1362	landbird	84,242	1,998	207,072	0.252790135	0.052592429	125	2
Blackburnian Warbler	Setophaga fusca	1991	landbird	13,271,149	10,865,077	16,109,037	0.191437754	0.009454552	80	2
Blackpoll Warbler	Setophaga striata	1994	landbird	59,716,232	45,066,327	76,124,820	0.036936066	0.007389098	80	2
Blue Grosbeak	Passerina caerulea	2058	landbird	20,938,581	19,404,702	22,644,996	0.425252098	0.010625576	125	2
Blue Jay	Cyanocitta cristata	1382	landbird	17,238,587	15,864,197	18,715,069	0.196211491	0.011653135	200	1.25
Blue-gray Gnatcatcher	Polioptila caerulea	1506	landbird	229,194,394	195,048,713	266,969,269	0.507549726	0.013481573	50	1.75
Blue-headed Vireo	Vireo solitarius	1355	landbird	12,765,014	11,050,138	14,721,085	0.191732584	0.009143537	125	2
Blue-winged Warbler	Vermivora cyanoptera	1953	landbird	684,415	578,230	803,348	0.245414125	0.00681225	125	2
Boat-tailed Grackle	Quiscalus major	1940	landbird	2,156,489	1,297,665	3,550,285	0.627797265	0.044839671	200	1.25
Bobolink	Dolichonyx oryzivorus	1887	landbird	10,195,298	8,796,086	11,917,384	0.240408992	0.018723365	200	1.75
Bohemian Waxwing	Bombycilla garrulus	1637	landbird	2,507,863	1,641,840	3,491,482	0.251637205	0.021000969	125	1.75
Boreal Chickadee	Poecile hudsonicus	1440	landbird	13,208,240	10,477,170	16,444,759	0.123606521	0.006154629	80	1.25
Brewer's Blackbird	Euphagus cyanocephalus	1938	landbird	23,324,285	20,136,678	27,110,785	0.285067694	0.042310849	200	1.25
Brewer's Sparrow	Spizella breweri	1831	landbird	16,834,981	13,155,782	21,238,196	0.554371096	0.03152307	200	2
Bridled Titmouse	Baeolophus wollweberi	1442	landbird	69,340	22,843	147,260	0.167287607	0.015324212	200	1.75
Broad-tailed Hummingbird	Selasphorus platycercus	340	landbird	8,804,795	5,880,867	12,313,443	0.270066821	0.013827063	80	1.75
Broad-winged Hawk	Buteo platypterus	820	landbird	1,804,126	1,598,612	2,029,385	0.923824468	0.001843574	125	2
Bronzed Cowbird	Molothrus aeneus	1932	landbird	816,191	439,751	1,339,476	0.196381735	0.015392618	125	1.25
Brown Creeper	Certhia americana	1453	landbird	9,484,338	7,757,209	11,639,138	0.327781306	0.007039325	80	2
Brown Thrasher	Toxostoma rufum	1622	landbird	6,168,180	5,625,720	6,771,313	0.141308812	0.007605114	200	1.5
Brown-crested Flycatcher	Myiarchus tyrannulus	1250	landbird	1,032,206	639,470	1,584,755	0.236362278	0.026662982	200	2
Brown-headed Cowbird	Molothrus ater	1933	landbird	126,705,388	117,868,557	135,950,409	0.196359385	0.015316476	125	1.75
Brown-headed Nuthatch	Sitta pusilla	1452	landbird	1,578,602	1,352,620	1,826,550	0.193256417	0.011315643	125	1.5
Bullock's Oriole	Icterus bullockii	1916	landbird	6,949,229	6,086,900	7,839,504	0.171626668	0.013381537	125	1.75
Burrowing Owl	Athene cunicularia	856	landbird	987,921	625,174	1,537,376	0.248559878	0.013839293	200	1.75
Bushtit	Psaltriparus minimus	1448	landbird	2,310,447	1,807,618	2,949,870	0.180014259	0.016575529	125	1.5
Cactus Wren	Campylorhynchus brunneicapil	1482	landbird	3,034,276	2,268,727	4,012,714	0.38994346	0.015947778	200	1.5
California Quail	Callipepla californica	104	landbird	3,358,401	2,374,290	4,473,991	0.386160727	0.019277203	200	1.5
California Scrub-Jay	Aphelocoma californica	1385	landbird	1,346,997	859,873	2,030,181	0.162746	0.013553	200	1.25
California Thrasher	Toxostoma redivivum	1627	landbird	155,226	77,498	274,331	0.151208587	0.03780064	200	1.75
California Towhee	Melozone crissalis	1816	landbird	5,247,688	3,750,592	7,222,092	0.953116186	0.024293546	125	2
Calliope Hummingbird	Selasphorus calliope	346	landbird	4,463,289	2,652,793	7,024,258	0.222786696	0.005361244	50	2
Canada Jay	Perisoreus canadensis	1364	landbird	26,652,111	23,501,504	30,178,807	0.206075389	0.008834811	125	1
Canada Warbler	Cardellina canadensis	2022	landbird	2,597,361	2,028,500	3,242,734	0.144498738	0.005886014	100	2
Canyon Towhee	Melozone fusca	1814	landbird	2,792,820	2,085,096	3,605,781	0.901022212	0.013820457	125	2
Canyon Wren	Catherpes mexicanus	1457	landbird	423,956	325,189	554,507	0.627107745	0.00823747	200	2
Cape May Warbler	Setophaga tigrina	1985	landbird	7,043,668	4,900,702	9,894,881	0.325792288	0.005702945	80	2

Carolina Chickadee	Poecile carolinensis	1435	landbird	13,179,980	12,174,905	14,399,165	0.23301274	0.013259707	125	1.25
Carolina Wren	Thryothorus ludovicianus	1471	landbird	17,733,395	15,969,003	19,620,346	0.2685187	0.014746994	200	1.5
Cassin's Finch	Haemorhous cassinii	1751	landbird	3,191,950	2,521,299	4,034,402	0.290200251	0.012993251	125	2
Cassin's Kingbird	Tyrannus vociferans	1275	landbird	2,480,328	1,833,328	3,291,825	0.429312979	0.017320122	200	2
Cassin's Sparrow	Peucaea cassinii	1824	landbird	9,598,748	7,485,112	12,176,616	0.324927907	0.022658797	200	1.75
Cassin's Vireo	Vireo cassinii	1354	landbird	4,560,260	3,775,193	5,412,799	0.29475794	0.011141985	125	2
Cave Swallow	Petrochelidon fulva	1432	landbird	2,769,841	1,680,817	4,407,644	0.601584903	0.097402064	200	1
Cedar Waxwing	Bombycilla cedrorum	1638	landbird	63,975,308	58,030,057	70,240,507	0.251384113	0.021058939	100	1.75
Cerulean Warbler	Setophaga cerulea	1986	landbird	528,920	363,210	714,480	0.214654972	0.006059708	100	2
Chestnut-backed Chickadee	Poecile rufescens	1439	landbird	12,062,509	8,656,467	16,306,921	0.172673671	0.018267892	80	1.25
Chestnut-collared Longspur	Calcarius ornatus	1774	landbird	3,095,825	2,101,824	4,336,047	0.47764042	0.035721667	200	1.5
Chestnut-sided Warbler	Setophaga pensylvanica	1993	landbird	18,265,512	16,119,410	20,584,431	0.207905027	0.009565074	125	2
Chihuahuan Raven	Corvus cryptoleucus	1406	landbird	277,286	193,193	390,354	0.246353299	0.018415724	400	1.75
Chimney Swift	Chaetura pelagica	260	landbird	8,808,551	8,013,311	9,665,731	0.281915163	0.018153048	200	1.75
Chipping Sparrow	Spizella passerina	1829	landbird	230,957,566	213,377,234	249,914,852	0.695273332	0.023465322	125	2
Chuck-will's-widow	Antrostomus carolinensis	236	landbird	5,642,111	4,800,407	6,606,314	3.018785009	0.008504079	300	2
Chukar	Alectoris chukar	114	landbird	392,143	227,755	612,200	0.516304491	0.161395519	300	2
Clark's Nutcracker	Nucifraga columbiana	1390	landbird	290,441	227,717	363,870	0.324373017	0.0131279	300	1.25
Clay-colored Sparrow	Spizella pallida	1830	landbird	60,149,306	51,415,968	69,884,231	0.399192981	0.026524177	125	2
Cliff Swallow	Petrochelidon pyrrhonota	1431	landbird	77,981,069	67,646,472	89,137,460	0.602018152	0.097550427	200	1
Common Grackle	Quiscalus quiscula	1939	landbird	67,132,986	61,123,537	74,085,853	0.408425194	0.055505963	200	1.25
Common Ground-Dove	Columbina passerina	170	landbird	1,989,124	1,585,896	2,440,861	0.505966382	0.012083732	125	1.5
Common Nighthawk	Chordeiles minor	227	landbird	21,789,605	19,345,867	24,683,737	2.15054635	0.015134556	300	2
Common Poorwill	Phalaenoptilus nuttallii	230	landbird	1,333,400	965,383	1,769,426	3.361205639	0.001459633	300	2
Common Raven	Corvus corax	1407	landbird	8,250,632	7,605,338	8,984,942	0.322897689	0.015933012	400	1
Common Redpoll	Acanthis flammea	1754	landbird	39,008,853	30,299,103	49,713,410	0.195174643	0.022312919	125	2
Common Yellowthroat	Geothlypis trichas	1976	landbird	75,588,462	70,946,562	80,532,206	0.105097389	0.010027601	125	2
Connecticut Warbler	Oporornis agilis	1966	landbird	1,751,333	970,368	2,676,400	0.251795457	0.006130415	125	2
Cooper's Hawk	Accipiter cooperii	790	landbird	844,899	770,821	925,643	0.266253374	0.002707433	125	2
Cordilleran Flycatcher	Empidonax occidentalis	1313	landbird	1,966,693	1,283,176	2,953,557	0.286041028	0.009418091	125	2
Costa's Hummingbird	Calypte costae	337	landbird	1,583,926	611,798	3,182,531	0.282947489	0.030666539	50	1.25
Couch's Kingbird	Tyrannus couchii	1274	landbird	250,613	133,762	447,501	0.287611169	0.196137195	200	2
Crested Caracara	Caracara cheriway	994	landbird	124,568	87,260	172,735	0.263500335	0.064231078	300	1
Crissal Thrasher	Toxostoma crissale	1629	landbird	82,115	48,009	124,579	0.151208587	0.03780064	200	2
Curve-billed Thrasher	Toxostoma curvirostre	1620	landbird	1,026,123	728,790	1,467,368	0.288256196	0.01118764	200	2
Dark-eyed Junco	Junco hyemalis	1861	landbird	223,552,461	196,287,624	253,775,451	0.541617969	0.066552841	125	2
Dickcissel	Spiza americana	2065	landbird	27,896,722	23,981,764	32,368,972	0.149758908	0.022316003	200	1.75
Downy Woodpecker	Dryobates pubescens	961	landbird	13,422,111	12,764,602	14,141,250	0.297784285	0.00653134	125	2
Dusky Flycatcher	Empidonax oberholseri	1310	landbird	8,797,209	7,024,376	10,767,331	0.151740992	0.009723034	125	2
Eastern Bluebird	Sialia sialis	1557	landbird	21,439,020	20,142,880	22,957,637	0.161933803	0.010916627	125	1.5
Eastern Kingbird	Tyrannus tyrannus	1278	landbird	25,924,168	24,123,810	27,704,273	0.144573269	0.008622775	125	1.75
Eastern Meadowlark	Sturnella magna	1888	landbird	24,431,724	21,928,274	27,309,341	0.245182991	0.017067785	200	1.75
Eastern Phoebe	Sayornis phoebe	1318	landbird	34,684,436	32,601,625	37,210,378	0.898152488	0.011850315	125	2
Eastern Screech-Owl	Megascops asio	833	landbird	496,240	378,219	645,235	2.114649232	0.001820302	125	2
Eastern Towhee	Pipilo erythrophthalmus	1806	landbird	29,338,492	27,153,590	31,703,146	0.302646684	0.016049386	125	2
Eastern Whip-poor-will	Antrostomus vociferus	242	landbird	1,829,892	1,442,373	2,231,099	3.32522679	0.00433927	300	2
Eastern Wood-Pewee	Contopus virens	1296	landbird	6,454,082	5,897,588	7,036,229	0.110277554	0.008288144	200	2
Eurasian Collared-Dove	Streptopelia decaocto	165	landbird	8,716,074	7,657,339	10,020,862	0.353765248	0.013942027	200	1.75
Eurasian Tree Sparrow	Passer montanus	1669	landbird	147,064	83,601	235,172	0.237386145	0.043432442	125	1.75
European Starling	Sturnus vulgaris	1635	landbird	93,371,907	85,941,592	102,256,039	0.455644428	0.068393305	200	1
Evening Grosbeak	Coccothraustes vespertinus	1701	landbird	3,783,375	2,963,915	4,803,280	0.252268742	0.012436775	125	1.75
Ferruginous Hawk	Buteo regalis	827	landbird	109,004	86,288	135,921	0.136893402	0.004679038	300	1.25
Field Sparrow	Spizella pusilla	1832	landbird	9,333,611	8,343,751	10,393,211	0.080762136	0.009480465	200	2
Fish Crow	Corvus ossifragus	1404	landbird	466,887	400,029	541,005	0.487620817	0.015744456	400	1.25
Fox Sparrow	Passerella iliaca	1851	landbird	34,605,524	27,334,565	44,390,905	0.088786254	0.011202226	200	2
Gambel's Quail	Callipepla gambelii	105	landbird	5,196,496	3,616,310	7,051,087	0.617677484	0.028464202	200	1.75
Gila Woodpecker	Melanerpes uropygialis	948	landbird	589,899	288,218	1,038,427	0.327182639	0.046172265	200	1
Gilded Flicker	Colaptes chrysoides	978	landbird	192,377	84,549	358,522	0.262542044	0.045968827	200	1.25
Golden Eagle	Aquila chrysaetos	778	landbird	146,673	125,252	171,932	0.42719715	0.001560231	400	1.75
Golden-crowned Kinglet	Regulus satrapa	1517	landbird	133,267,079	103,060,126	168,352,603	0.19966966	0.011538985	50	2
Golden-crowned Sparrow	Zonotrichia atricapilla	1859	landbird	7,502,564	4,149,449	12,855,995	0.238439032	0.019158995	200	2
Golden-fronted Woodpecker	Melanerpes aurifrons	950	landbird	805,604	554,852	1,125,322	0.327182639	0.046172265	200	1
Golden-winged Warbler	Vermivora chrysoptera	1952	landbird	393,305	273,065	539,488	0.133705003	0.005624412	125	2
Grace's Warbler	Setophaga graciae	2007	landbird	1,513,808	887,803	2,350,028	0.152835663	0.065246383	125	2
Grasshopper Sparrow	Ammodramus savannarum	1843	landbird	33,439,280	29,662,396	37,709,841	0.391507599	0.013630016	125	2
Gray Catbird	Dumetella carolinensis	1614	landbird	28,700,211	26,885,945	30,804,790	0.424676515	0.013687414	125	2
Gray Flycatcher	Empidonax wrightii	1309	landbird	2,897,568	2,057,762	4,045,062	0.253852676	0.009005444	125	2
Gray Kingbird	Tyrannus dominicensis	1279	landbird	23,009	3,657	62,695	0.287611169	0.196137195	200	1.75
Gray Partridge	Perdix perdix	119	landbird	823,861	635,590	1,041,588	0.255873113	0.005627355	125	2
Gray Vireo	Vireo vicinior	1350	landbird	548,027	294,748	855,433	0.252790135	0.052592429	125	2
Gray-cheeked Thrush	Catharus minimus	1581	landbird	41,722,960	27,552,192	60,727,662	0.440536327	0.077167878	125	2
Great Crested Flycatcher	Myiarchus crinitus	1249	landbird	8,799,301	7,950,620	9,769,449	0.223953898	0.009044568	200	1.75
Great Gray Owl	Strix nebulosa	862	landbird	71,240	34,370	122,631	0.788077555	0.005099447	200	2
Great Horned Owl	Bubo virginianus	845	landbird	3,784,896	3,310,994	4,288,285	2.450156066	0.003001912	300	2
Great-tailed Grackle	Quiscalus mexicanus	1941	landbird	8,242,011	5,511,749	11,832,954	0.355734022	0.028093388	200	1
Greater Prairie-Chicken	Tympanuchus cupido	135	landbird	360,504	197,651	635,645	0.30719296	0.010294537	200	2
Greater Roadrunner	Geococcyx californianus	220	landbird	841,270	686,699	1,023,445	0.413389213	0.006077421	200	2
Green Jay	Cyanocorax yncas	1375	landbird	56,639	30,791	92,979	0.196506623	0.024782332	200	1.5
Green-tailed Towhee	Pipilo chlorurus	1804	landbird	4,766,829	3,664,896	6,155,067	0.634658223	0.019805701	200	2
Gyrfalcon	Falco rusticolus	1005	landbird	41,722	33,772	57,859	0.26349032	0.064226508	300	1.5
Hairy Woodpecker	Dryobates villosus	965	landbird	8,681,068	7,874,994	9,508,689	0.249314168	0.004190679	125	2
Hammond's Flycatcher	Empidonax hammondii	1308	landbird	20,160,045	16,231,089	24,518,510	0.383876374	0.015184249	100	2
Harris's Hawk	Parabuteo unicinctus	812	landbird	51,689	29,505	86,815	0.393264523	0.22105359	300	1.5
Henslow's Sparrow	Centronyx henslowii	1845	landbird	408,187	290,235	547,708	0.678606158	0.010664453	125	2
Hepatic Tanager	Piranga flava	2032	landbird	411,228	263,215	591,940	0.249492464	0.139360358	125	2
Hermit Thrush	Catharus guttatus	1584	landbird	71,726,125	54,075,176	95,680,929	0.34889321	0.013521061	200	2
Hermit Warbler	Setophaga occidentalis	2010	landbird	2,525,603	1,808,648	3,357,140	0.169558798	0.01638279	125	2

Hoary Redpoll	Acanthis hornemanni	1756	landbird	12,815,104	12,474,111	13,252,214	0.195275926	0.022255784	125	2
Hooded Oriole	Icterus cucullatus	1910	landbird	350,616	236,805	494,427	0.134838091	0.034837138	125	1.75
Hooded Warbler	Setophaga citrina	1982	landbird	5,185,197	4,523,541	5,902,847	0.165781479	0.006677477	125	2
Horned Lark	Eremophila alpestris	1412	landbird	100,607,831	90,290,833	112,734,630	0.319579262	0.038106901	200	2
House Finch	Haemorhous mexicanus	1749	landbird	33,246,130	29,546,633	37,992,529	0.106257564	0.012699766	125	1.75
House Sparrow	Passer domesticus	1668	landbird	92,842,101	83,703,006	104,203,385	0.23727539	0.043700479	125	1
House Wren	Troglodytes aedon	1461	landbird	43,318,358	39,758,949	47,473,572	0.157442539	0.010356315	125	2
Hutton's Vireo	Vireo huttoni	1351	landbird	964,653	744,358	1,213,151	0.412118002	0.007851349	125	2
Inca Dove	Columbina inca	169	landbird	619,057	491,301	765,612	0.259561594	0.009810166	125	1.25
Indigo Bunting	Passerina cyanea	2060	landbird	77,494,167	73,235,841	82,041,052	0.334016374	0.015511967	125	2
Juniper Titmouse	Baeolophus ridgwayi	1444	landbird	291,637	201,086	392,881	0.161396989	0.009527298	200	1.25
Kentucky Warbler	Geothlypis formosa	1970	landbird	2,595,606	2,284,175	2,937,212	0.165429467	0.007695189	125	2
Ladder-backed Woodpecker	Dryobates scalaris	963	landbird	2,377,162	1,983,369	2,827,402	0.335269007	0.009487836	125	2
Lapland Longspur	Calcarius lapponicus	1773	landbird	68,032,536	60,265,772	80,590,222	0.479198426	0.03584308	200	1.75
Lark Bunting	Calamospiza melanocorys	1841	landbird	11,992,598	9,194,389	15,233,830	0.286366646	0.05170139	200	1
Lark Sparrow	Chondestes grammacus	1836	landbird	10,638,361	9,078,588	12,343,951	0.14314708	0.013175516	200	1.5
Lawrence's Goldfinch	Spinus lawrencei	1770	landbird	347,128	188,186	574,120	0.312388451	0.021341133	125	1.75
Lazuli Bunting	Passerina amoena	2059	landbird	6,453,834	5,417,754	7,643,998	0.253922015	0.011113142	125	2
Least Flycatcher	Empidonax minimus	1307	landbird	27,244,220	24,465,739	30,286,260	0.087097838	0.009253083	125	2
LeConte's Sparrow	Ammospiza leconteii	1846	landbird	5,128,134	4,121,245	6,262,076	0.705896323	0.014200509	125	2
LeConte's Thrasher	Toxostoma lecontei	1628	landbird	45,644	15,853	93,422	0.151208587	0.03780064	200	1.75
Lesser Goldfinch	Spinus psaltria	1769	landbird	5,723,877	4,542,330	7,132,984	0.300588294	0.01824926	125	1.75
Lesser Nighthawk	Chordeiles acutipennis	226	landbird	3,801,395	2,399,615	5,545,863	2.125465631	0.019269463	300	2
Lewis's Woodpecker	Melanerpes lewis	935	landbird	81,507	52,913	119,611	0.327182639	0.046172265	200	1.5
Lincoln's Sparrow	Melospiza lincolnii	1853	landbird	88,078,735	78,262,006	98,782,691	0.650857783	0.015359268	125	2
Loggerhead Shrike	Lanius ludovicianus	1325	landbird	4,557,457	4,080,246	5,094,115	0.257515395	0.008301429	125	1.25
Long-billed Thrasher	Toxostoma longirostre	1623	landbird	95,573	53,639	153,900	0.151208587	0.03780064	200	2
Long-eared Owl	Asio otus	863	landbird	37,707	15,671	68,758	0.950630863	0.005753235	125	2
Louisiana Waterthrush	Parkesia motacilla	1949	landbird	446,545	377,921	529,134	0.327908312	0.00514556	200	2
Lucy's Warbler	Oreothlypis luciae	1962	landbird	2,829,708	1,620,023	4,473,592	0.213627285	0.029472214	125	2
MacGillivray's Warbler	Geothlypis tolmiei	1968	landbird	11,191,876	9,091,713	13,546,236	0.154940761	0.008899679	125	2
Magnolia Warbler	Setophaga magnolia	1989	landbird	38,757,259	33,706,369	44,351,863	0.128230092	0.011292731	125	2
Marsh Wren	Cistothorus palustris	1470	landbird	10,846,904	8,009,975	14,414,465	0.865362685	0.017776852	125	2
McCown's Longspur	Rhynchophanes mccownii	1776	landbird	844,821	487,327	1,322,335	0.477568371	0.036353088	200	1.5
Merlin	Falco columbarius	1000	landbird	1,620,998	1,325,156	1,975,531	0.136416034	0.001135255	125	2
Mexican Jay	Aphelocoma wollweberi	1388	landbird	142,059	31,219	355,566	0.162911473	0.013297024	200	1.25
Mississippi Kite	Ictinia mississippiensis	798	landbird	695,177	537,854	881,937	1.03847348	0.012618132	300	1.75
Monk Parakeet	Myiopsitta monachus	1010	landbird	59,268	1,094	158,202	0.336241881	0.212251379	125	1.5
Mountain Bluebird	Sialia currucoides	1559	landbird	5,568,751	4,615,920	6,673,385	0.561682314	0.019043058	200	2
Mountain Chickadee	Poecile gambeli	1437	landbird	7,855,197	6,597,745	9,279,875	0.281720767	0.014457926	125	1.25
Mountain Quail	Oreortyx pictus	94	landbird	250,825	174,335	348,548	0.40626839	0.014460376	300	2
Mourning Dove	Zenaida macroura	198	landbird	133,072,464	123,233,806	143,006,188	0.316423592	0.022409558	200	1.75
Mourning Warbler	Geothlypis philadelphia	1969	landbird	13,827,473	11,375,932	16,818,340	0.259959923	0.011418499	125	2
Nashville Warbler	Oreothlypis ruficapilla	1963	landbird	39,717,135	34,046,329	46,021,851	0.213572778	0.014052851	125	2
Nelson's Sparrow	Ammospiza nelsoni	1848	landbird	1,012,433	860,211	1,182,894	0.571305714	0.009063602	125	2
Northern Cardinal	Cardinalis cardinalis	2047	landbird	118,228,958	107,977,674	129,207,132	0.866690425	0.028147857	200	2
Northern Flicker	Colaptes auratus	977	landbird	10,997,056	10,030,079	12,029,437	0.263105839	0.045989788	200	1.25
Northern Goshawk	Accipiter gentilis	793	landbird	205,103	144,935	279,609	0.350349154	0.002368837	125	2
Northern Harrier	Circus hudsonius	783	landbird	822,326	731,377	921,329	0.222768112	0.005077001	300	2
Northern Mockingbird	Mimus polyglottos	1634	landbird	33,748,673	30,589,410	37,047,818	0.099038838	0.013748544	200	1.5
Northern Parula	Setophaga americana	1987	landbird	18,173,930	16,508,547	19,946,040	0.165653455	0.008870983	100	2
Northern Pygmy-Owl	Glaucidium gnoma	848	landbird	129,397	77,555	214,434	1.056103865	0.003481108	200	2
Northern Rough-winged Swallow	Stelgidopteryx serripennis	1428	landbird	19,956,056	15,363,114	26,977,637	0.303402591	0.013563681	125	1.75
Northern Waterthrush	Parkesia noveboracensis	1950	landbird	17,166,584	14,259,921	20,524,318	0.108962749	0.006741665	200	2
Northwestern Crow	Corvus caurinus	1396	landbird	701,805	421,865	1,111,796	0.438962554	0.094806648	400	1.5
Nuttall's Woodpecker	Dryobates nuttallii	962	landbird	752,044	500,760	1,076,906	0.27959732	0.034920096	125	1.5
Oak Titmouse	Baeolophus inornatus	1443	landbird	706,717	407,725	1,196,605	0.203429085	0.015921436	200	1.25
Olive Sparrow	Arremonops rufivirgatus	1798	landbird	829,024	486,176	1,252,969	0.709359899	0.020977793	200	1.75
Olive-sided Flycatcher	Contopus cooperi	1291	landbird	1,916,763	1,576,589	2,322,865	0.109373062	0.006610393	300	2
Orange-crowned Warbler	Oreothlypis celata	1960	landbird	81,919,229	69,421,324	95,720,231	0.237215061	0.013613313	125	2
Orchard Oriole	Icterus spurius	1909	landbird	10,894,813	9,896,563	11,930,180	0.099898312	0.00769728	125	1.75
Osprey	Pandion haliaetus	770	landbird	399,228	328,092	483,403	0.49973566	0.00742224	300	1.25
Ovenbird	Seiurus aurocapilla	1947	landbird	26,312,390	22,777,813	30,231,156	0.214366322	0.014149396	200	2
Pacific Wren	Troglodytes pacificus	1466	landbird	7,528,567	5,392,359	10,095,516	0.513974173	0.013003866	200	1.75
Pacific-slope Flycatcher	Empidonax difficilis	1312	landbird	8,585,203	6,751,118	10,839,307	0.141806818	0.01059711	125	2
Painted Bunting	Passerina ciris	2064	landbird	12,778,114	10,848,520	14,991,104	0.219191714	0.013373231	125	1.75
Palm Warbler	Setophaga palmarum	1996	landbird	13,172,938	9,852,145	17,350,184	0.265520256	0.008448309	125	2
Phainopepla	Phainopepla nitens	1647	landbird	1,285,683	905,747	1,775,051	0.318642933	0.0145247	125	1.5
Philadelphia Vireo	Vireo philadelphicus	1357	landbird	3,968,582	3,039,944	5,019,728	0.179034235	0.008993391	125	2
Pileated Woodpecker	Dryocopus pileatus	983	landbird	2,648,713	2,398,947	2,931,122	0.531071086	0.007285076	300	2
Pine Grosbeak	Pinicola enucleator	1743	landbird	5,530,332	4,039,601	7,262,401	0.194545309	0.00688874	125	2
Pine Siskin	Spinus pinus	1763	landbird	44,719,558	37,972,998	52,314,211	0.320507011	0.025718467	100	1.5
Pine Warbler	Setophaga pinus	1998	landbird	13,108,682	11,923,661	14,327,429	0.092765876	0.010964286	125	2
Pinyon Jay	Gymnorhinus cyanocephalus	1380	landbird	755,415	525,819	1,068,774	0.276028144	0.039592912	300	1.25
Plumbeous Vireo	Vireo plumbeus	1356	landbird	2,999,048	2,194,985	3,986,302	0.328010835	0.012195375	125	2
Prairie Falcon	Falco mexicanus	1007	landbird	97,855	76,690	121,492	0.347099863	0.003094445	300	2
Prairie Warbler	Setophaga discolor	2003	landbird	3,555,356	3,156,416	4,009,433	0.199783094	0.00775599	125	2
Prothonotary Warbler	Protonotaria citrea	1955	landbird	2,069,931	1,633,108	2,645,686	0.170661673	0.007759922	125	2
Purple Finch	Haemorhous purpureus	1750	landbird	6,539,107	5,746,681	7,363,210	0.208481863	0.010983563	125	2
Purple Martin	Progne subis	1413	landbird	8,728,591	7,776,376	9,841,533	0.24446211	0.028144531	200	1.25
Pygmy Nuthatch	Sitta pygmaea	1451	landbird	3,103,791	2,051,268	4,410,534	0.462447564	0.023220006	125	1.75
Pyrrhuloxia	Cardinalis sinuatus	2048	landbird	1,578,426	1,076,870	2,208,564	0.172854465	0.013073557	200	1.75
Red Crossbill	Loxia curvirostra	1757	landbird	9,585,953	7,856,459	11,542,746	0.337778176	0.023354528	125	1.5
Red-bellied Woodpecker	Melanerpes carolinus	951	landbird	15,518,241	14,095,781	16,973,039	0.364972699	0.012239403	200	1.75
Red-breasted Nuthatch	Sitta canadensis	1449	landbird	19,689,413	17,772,520	21,658,078	0.218424232	0.008984852	125	1.75
Red-breasted Sapsucker	Sphyrapicus ruber	956	landbird	2,755,899	1,872,219	3,799,342	0.221030989	0.007558361	125	1.5
Red-eyed Vireo	Vireo olivaceus	1360	landbird	130,756,817	121,405,110	141,235,333	0.250511261	0.017879662	125	2

Red-faced Warbler	Cardellina rubrifrons	2024	landbird	252,600	70,739	503,841	0.148410299	0.009848297	125	2
Red-headed Woodpecker	Melanerpes erythrocephalus	938	landbird	1,802,639	1,587,954	2,066,531	0.27695727	0.007585097	200	1.25
Red-naped Sapsucker	Sphyrapicus nuchalis	955	landbird	1,974,818	1,596,661	2,425,112	0.203846865	0.008044308	125	2
Red-shouldered Hawk	Buteo lineatus	818	landbird	1,827,010	1,607,481	2,085,341	0.310636921	0.00749664	200	2
Red-tailed Hawk	Buteo jamaicensis	825	landbird	2,808,115	2,579,824	3,052,334	0.437107989	0.008314715	300	1.25
Red-winged Blackbird	Agelaius phoeniceus	1926	landbird	172,973,570	154,908,749	196,698,929	0.294722634	0.048341194	200	1.25
Ring-necked Pheasant	Phasianus colchicus	123	landbird	16,642,331	14,252,196	19,372,599	0.748822706	0.0176056	300	2
Rock Pigeon	Columba livia	149	landbird	16,195,053	14,584,425	17,988,593	0.541589606	0.032519759	200	1
Rock Wren	Salpinctes obsoletus	1454	landbird	3,362,014	2,744,880	4,115,789	0.245743709	0.009882728	200	2
Rose-breasted Grosbeak	Pheucticus ludovicianus	2051	landbird	4,715,733	4,058,034	5,474,743	0.152079089	0.007135443	200	2
Rough-legged Hawk	Buteo lagopus	826	landbird	296,141	248,433	370,060	0.429513809	0.219098555	300	2
Ruby-crowned Kinglet	Regulus calendula	1518	landbird	99,900,936	90,024,695	110,791,661	0.135844836	0.011392073	125	2
Ruby-throated Hummingbird	Archilochus colubris	332	landbird	35,777,111	31,236,693	40,921,667	0.296114683	0.004821445	50	2
Rufous Hummingbird	Selasphorus rufus	341	landbird	21,694,644	13,724,171	32,781,297	0.310051644	0.008407568	50	1.5
Rufous-crowned Sparrow	Aimophila ruficeps	1808	landbird	601,135	407,380	851,057	0.35990617	0.014617059	200	2
Rusty Blackbird	Euphagus carolinus	1937	landbird	6,804,603	4,919,111	9,459,126	0.355534902	0.008725154	125	1.75
Sage Thrasher	Oreoscoptes montanus	1630	landbird	6,362,519	4,673,219	8,479,429	0.1967526	0.015607969	200	2
Sagebrush Sparrow	Artemisiospiza nevadensis	1839	landbird	5,386,123	3,477,545	8,199,885	0.358413472	0.061624713	200	2
Savannah Sparrow	Passerculus sandwichensis	1842	landbird	168,676,799	144,322,771	195,333,538	0.357062427	0.025102403	125	2
Say's Phoebe	Sayornis saya	1319	landbird	5,044,646	4,348,767	5,764,857	0.942517033	0.009950062	200	2
Scaled Quail	Callipepla squamata	102	landbird	2,393,345	1,766,520	3,168,001	0.533186089	0.016925686	200	1.75
Scarlet Tanager	Piranga olivacea	2034	landbird	2,574,915	2,256,623	2,956,329	0.101735649	0.006773229	200	2
Scissor-tailed Flycatcher	Tyrannus forficatus	1282	landbird	7,914,013	6,502,356	9,635,329	0.27142701	0.021457588	200	2
Scott's Oriole	Icterus parisorum	1924	landbird	1,721,724	1,332,821	2,134,384	0.238065553	0.008735328	125	1.75
Seaside Sparrow	Ammospiza maritima	1847	landbird	196,782	32,213	523,319	0.457471505	0.125282849	125	1.25
Sedge Wren	Cistothorus platensis	1469	landbird	5,017,990	4,252,225	5,954,334	0.459508553	0.012025593	125	2
Sharp-shinned Hawk	Accipiter striatus	789	landbird	405,947	303,414	524,274	0.19572212	0.001721087	125	2
Sharp-tailed Grouse	Tympanuchus phasianellus	134	landbird	761,942	569,936	975,726	0.307188253	0.010358181	200	2
Short-eared Owl	Asio flammeus	865	landbird	602,353	485,388	747,895	0.381400506	0.008177428	200	1.75
Snow Bunting	Plectrophenax nivalis	1777	landbird	14,267,309	14,267,309	14,267,309	0.477568371	0.036353088	200	1.75
Song Sparrow	Melospiza melodia	1852	landbird	126,053,605	118,934,257	133,938,545	0.377871011	0.025177923	125	2
Spotted Towhee	Pipilo maculatus	1805	landbird	35,271,543	31,027,431	39,773,372	0.808232166	0.02023887	125	2
Sprague's Pipit	Anthus spragueii	1680	landbird	1,394,136	936,560	2,009,643	0.329678876	0.01811783	200	2
Steller's Jay	Cyanocitta stelleri	1381	landbird	2,705,843	2,239,068	3,237,856	0.183671434	0.011063169	200	1.25
Summer Tanager	Piranga rubra	2033	landbird	11,302,422	10,343,397	12,384,415	0.278798745	0.012069164	125	2
Swainson's Hawk	Buteo swainsoni	823	landbird	822,598	714,482	956,228	0.14557514	0.006763745	300	1.5
Swainson's Thrush	Catharus ustulatus	1583	landbird	121,704,609	102,456,492	144,203,885	0.516449016	0.025017579	200	2
Swainson's Warbler	Limnothlypis swainsonii	1956	landbird	156,081	99,540	235,309	0.334319283	0.004325713	200	2
Swamp Sparrow	Melospiza georgiana	1854	landbird	23,261,464	20,193,095	26,315,495	0.505455805	0.013070146	125	2
Tennessee Warbler	Oreothlypis peregrina	1959	landbird	111,454,361	80,906,890	149,074,619	0.19793209	0.016972245	125	2
Townsend's Solitaire	Myadestes townsendi	1560	landbird	1,050,595	834,475	1,298,011	0.117084632	0.005982225	200	2
Townsend's Warbler	Setophaga townsendi	2009	landbird	21,262,275	16,792,636	26,233,697	0.194158878	0.013715638	100	2
Tree Swallow	Tachycineta bicolor	1420	landbird	18,581,775	16,732,180	20,563,777	0.136023938	0.016419183	200	1.75
Tufted Titmouse	Baeolophus bicolor	1445	landbird	11,970,837	10,921,948	13,128,862	0.165596732	0.012740487	200	1.25
Turkey Vulture	Cathartes aura	766	landbird	8,418,387	7,705,474	9,163,886	1.094905764	0.02839236	400	1.75
Varied Bunting	Passerina versicolor	2063	landbird	69,313	27,061	135,722	0.342755297	0.067921347	125	1.75
Varied Thrush	Ixoreus naevius	1609	landbird	34,514,221	26,180,031	44,500,981	0.836969707	0.023621132	200	2
Vaux's Swift	Chaetura vauxi	261	landbird	418,576	284,294	607,235	0.81044058	0.01750757	200	1.75
Veery	Catharus fuscescens	1580	landbird	11,186,101	9,451,271	13,166,545	0.483652865	0.014851972	200	2
Verdin	Auriparus flaviceps	1447	landbird	3,810,209	2,615,935	5,392,903	0.216241891	0.01368995	125	1.5
Vermilion Flycatcher	Pyrocephalus rubinus	1320	landbird	538,032	324,197	798,482	0.309093639	0.270946381	125	2
Vesper Sparrow	Pooecetes gramineus	1835	landbird	35,053,955	30,378,748	40,800,937	0.395480333	0.023570974	200	2
Violet-green Swallow	Tachycineta thalassina	1423	landbird	6,724,535	5,560,970	8,017,545	0.195622727	0.024180882	200	1.5
Virginia's Warbler	Oreothlypis virginiae	1964	landbird	904,013	567,681	1,360,062	0.123544103	0.007611996	125	2
Warbling Vireo	Vireo gilvus	1358	landbird	52,333,042	46,022,570	58,752,802	0.230417562	0.011166342	125	2
Western Bluebird	Sialia mexicana	1558	landbird	5,661,189	4,392,144	7,058,744	0.696104544	0.017579858	125	2
Western Kingbird	Tyrannus verticalis	1277	landbird	28,830,127	24,939,575	33,543,450	0.592717171	0.021322477	200	2
Western Meadowlark	Sturnella neglecta	1889	landbird	95,124,368	83,326,234	107,339,715	0.27317075	0.029996622	200	1.5
Western Screech-Owl	Megascops kennicottii	832	landbird	240,461	121,691	401,313	2.687968772	0.002995476	125	2
Western Tanager	Piranga ludoviciana	2035	landbird	15,020,244	12,899,162	17,361,777	0.447457356	0.014480276	200	2
Western Wood-Pewee	Contopus sordidulus	1295	landbird	8,845,348	7,660,907	10,112,663	0.114093527	0.013682786	200	2
White-breasted Nuthatch	Sitta carolinensis	1450	landbird	10,035,072	9,249,484	10,873,200	0.300171347	0.007606023	125	1.5
White-crowned Sparrow	Zonotrichia leucophrys	1858	landbird	79,258,794	63,587,655	97,291,972	0.735826366	0.024616882	200	2
White-eyed Vireo	Vireo griseus	1340	landbird	22,090,753	20,223,913	24,179,468	0.345526823	0.014272054	125	2
White-headed Woodpecker	Dryobates albolarvatus	966	landbird	243,113	168,463	340,504	0.27959732	0.034920096	125	2
White-tailed Kite	Elanus leucurus	772	landbird	15,718	8,293	26,310	0.393264523	0.22105359	300	1.5
White-throated Sparrow	Zonotrichia albicollis	1856	landbird	162,847,702	138,867,549	189,194,261	0.810191169	0.028959236	200	2
White-throated Swift	Aeronautes saxatalis	274	landbird	2,382,771	1,600,983	3,298,803	1.44612641	0.03742553	200	1.25
White-winged Crossbill	Loxia leucoptera	1760	landbird	39,691,698	30,030,233	51,497,702	0.315993228	0.034746756	125	1.25
White-winged Dove	Zenaida asiatica	195	landbird	5,159,586	3,579,714	7,462,483	0.154560911	0.01908313	200	1.5
Williamson's Sapsucker	Sphyrapicus thyroideus	953	landbird	294,829	209,789	398,019	0.129722328	0.00726301	125	1.5
Willow Flycatcher	Empidonax traillii	1305	landbird	8,095,093	6,902,363	9,486,416	0.192252001	0.007418508	125	2
Willow Ptarmigan	Lagopus lagopus	129	landbird	12,784,429	7,232,901	21,298,386	0.516304491	0.161395519	125	2
Wilson's Warbler	Cardellina pusilla	2023	landbird	81,271,984	65,743,361	98,288,305	0.150728497	0.010994367	100	2
Winter Wren	Troglodytes hiemalis	1467	landbird	11,140,437	9,052,643	13,798,379	0.450595909	0.010210473	200	1.75
Wood Thrush	Hylocichla mustelina	1585	landbird	12,191,387	10,959,424	13,589,692	0.841982739	0.014786107	200	2
Woodhouse's Scrub-Jay	Aphelocoma woodhouseii	1386	landbird	692,935	476,075	1,023,759	0.162746	0.013553	200	1.25
Worm-eating Warbler	Helmitheros vermivorum	1948	landbird	784,060	608,710	988,276	0.308009094	0.006566743	125	2
Wrentit	Chamaea fasciata	1530	landbird	1,753,863	1,095,353	2,807,164	0.568239126	0.018344846	200	2
Yellow Warbler	Setophaga petechia	1992	landbird	92,640,979	83,231,903	102,629,283	0.100828316	0.012896374	125	2
Yellow-bellied Flycatcher	Empidonax flaviventris	1302	landbird	13,047,639	10,169,586	16,383,394	0.180646794	0.007272063	125	2
Yellow-bellied Sapsucker	Sphyrapicus varius	954	landbird	13,523,418	11,628,336	15,891,341	0.505398175	0.010805358	125	1.5
Yellow-billed Cuckoo	Coccyzus americanus	205	landbird	8,358,126	7,571,171	9,214,892	0.322683865	0.010071364	200	2
Yellow-breasted Chat	Icteria virens	1885	landbird	15,066,335	13,315,869	16,929,873	0.530142376	0.016546429	200	2
Yellow-headed Blackbird	Xanthocephalus xanthocephalu	1886	landbird	11,338,466	8,566,820	14,826,716	0.352608969	0.031402487	200	1
Yellow-rumped Warbler	Setophaga coronata	1999	landbird	173,685,250	155,879,524	190,742,853	0.260143255	0.050020994	125	2
Yellow-throated Vireo	Vireo flavifrons	1352	landbird	4,705,278	4,250,092	5,161,482	0.234056711	0.007699809	125	2

Yellow-throated Warbler	Setophaga dominica	2000	landbird	2,039,116	1,732,805	2,359,505	0.10886397	0.007825739	125	2
American Bittern	Botaurus lentiginosus	727	waterbird	2,507,797	2,005,616	3,117,498	0.527650945	0.011264365	200	2
American Coot	Fulica americana	435	waterbird	5,517,522	4,109,506	7,381,712	0.091181	0.028935	200	1.5
American White Pelican	Pelecanus erythrorhynchos	724	waterbird	414,730	299,521	546,711	0.084189689	0.025513834	400	1
Black Tern	Chlidonias niger	610	waterbird	2,331,116	1,695,896	3,119,894	0.055300719	0.022582891	200	1.5
Black-crowned Night-Heron	Nycticorax nycticorax	754	waterbird	419,820	292,104	595,456	0.271239784	0.036710416	200	1.5
Bonaparte's Gull	Chroicocephalus philadelphia	570	waterbird	785,266	442,937	1,198,079	0.050057063	0.099057022	200	1.5
California Gull	Larus californicus	585	waterbird	1,065,791	658,357	1,567,466	0.16502702	0.015519872	400	1.5
Caspian Tern	Hydroprogne caspia	608	waterbird	78,325	41,255	130,130	0.163403021	0.071489661	300	1.5
Cattle Egret	Bubulcus ibis	748	waterbird	2,804,856	2,196,814	3,562,031	0.201800416	0.011434455	400	1.5
Clapper Rail	Rallus crepitans	409	waterbird	170,587	85,438	286,396	0.309266965	0.061032497	125	2
Clark's Grebe	Aechmophorus clarkii	147	waterbird	71,737	18,009	161,501	0.327301587	0.071165835	200	1.5
Common Gallinule	Gallinula galeata	431	waterbird	500,214	251,427	938,525	0.332267887	0.047506546	125	1.5
Common Loon	Gavia immer	629	waterbird	1,108,865	941,048	1,319,057	0.240477867	0.013040758	400	1.5
Common Tern	Sterna hirundo	614	waterbird	468,971	175,901	985,601	0.320800777	0.042272434	300	1.5
Double-crested Cormorant	Phalacrocorax auritus	719	waterbird	557,887	365,672	827,251	0.103993752	0.100658	400	1
Eared Grebe	Podiceps nigricollis	145	waterbird	1,950,442	943,872	3,659,128	0.294673952	0.084976757	200	1.5
Forster's Tern	Sterna forsteri	616	waterbird	127,120	72,306	202,189	0.202232424	0.029298304	300	1.5
Franklin's Gull	Leucophaeus pipixcan	577	waterbird	2,329,478	1,604,153	3,238,650	0.091120732	0.032918325	400	1.5
Glaucous-winged Gull	Larus glaucescens	591	waterbird	436,461	249,983	673,385	0.322673266	0.123204805	400	1.5
Glossy Ibis	Plegadis falcinellus	759	waterbird	36,394	13,092	71,380	0.352951887	0.079788377	400	1.5
Great Black-backed Gull	Larus marinus	593	waterbird	145,361	70,184	251,320	0.030213943	0.023732224	400	1.5
Great Blue Heron	Ardea herodias	734	waterbird	618,606	552,453	698,624	0.071842395	0.009481229	400	1.5
Great Egret	Ardea alba	738	waterbird	712,641	580,603	863,838	0.175690938	0.013181371	400	1.5
Green Heron	Butorides virescens	750	waterbird	772,671	689,060	862,103	0.098627595	0.008045328	200	1.5
Horned Grebe	Podiceps auritus	143	waterbird	246,553	159,574	364,503	0.09042579	0.021862375	200	1.5
King Rail	Rallus elegans	412	waterbird	63,219	26,563	122,039	0.283911869	0.036458681	125	2
Laughing Gull	Leucophaeus atricilla	576	waterbird	684,463	425,116	997,966	0.21459953	0.021046466	400	1.5
Least Bittern	Ixobrychus exilis	729	waterbird	131,773	66,196	217,720	0.290920543	0.026400578	125	2
Least Tern	Sternula antillarum	604	waterbird	51,692	21,444	97,858	0.191317513	0.032927712	300	1.5
Little Blue Heron	Egretta caerulea	745	waterbird	270,582	191,382	368,199	0.342808263	0.021884574	400	1.5
Mew Gull	Larus canus	581	waterbird	1,286,450	659,195	2,419,626	0.441761548	0.041289721	400	1.5
Pied-billed Grebe	Podilymbus podiceps	141	waterbird	1,138,963	905,996	1,412,585	0.282039569	0.01985522	200	1.5
Purple Gallinule	Porphyrio martinicus	428	waterbird	19,522	9,167	33,564	0.332267887	0.047506546	125	1.5
Red-necked Grebe	Podiceps grisegena	144	waterbird	737,518	482,463	1,054,730	0.202501856	0.033230746	200	1.5
Red-throated Loon	Gavia stellata	626	waterbird	358,396	96,811	792,502	0.244497532	0.035106588	400	1.5
Ring-billed Gull	Larus delawarensis	582	waterbird	3,740,458	2,828,976	4,916,343	0.157577311	0.056544667	400	1.5
Royal Tern	Thalasseus maximus	617	waterbird	35,206	10,179	70,873	0.194921686	0.040665774	300	1.5
Snowy Egret	Egretta thula	744	waterbird	215,935	152,524	300,633	0.210499937	0.030390356	400	1.5
Sora	Porzana carolina	419	waterbird	4,428,137	3,481,892	5,601,019	0.288164849	0.012031816	200	2
Tricolored Heron	Egretta tricolor	746	waterbird	57,579	34,376	88,724	0.26703882	0.046543675	400	1.5
Virginia Rail	Rallus limicola	413	waterbird	232,547	160,326	321,031	0.252412972	0.03342029	125	2
Western Grebe	Aechmophorus occidentalis	146	waterbird	989,858	425,689	1,889,334	0.327301587	0.071165835	200	1.5
Western Gull	Larus occidentalis	583	waterbird	44,003	11,262	90,819	0.256373679	0.060149017	400	1.5
White Ibis	Eudocimus albus	757	waterbird	1,170,987	807,222	1,696,093	0.488264444	0.029355231	400	1.5
White-faced Ibis	Plegadis chihi	760	waterbird	1,332,908	700,651	2,146,390	0.379365235	0.051336527	400	1.5
Yellow-crowned Night-Heron	Nyctanassa violacea	755	waterbird	129,442	72,714	233,481	0.179941759	0.019799945	200	1.5
Cinnamon Teal	Spatula cyanoptera	39	waterfowl	442,510	275,337	674,629	0.027890615	0.019861372	200	1.5
Greater Scaup	Aythya marila	59	waterfowl	1,606,158	513,593	3,551,089	0.141999695	0.032817988	200	1.5
Lesser Scaup	Aythya affinis	60	waterfowl	2,626,619	1,903,177	3,511,659	0.066772453	0.033750911	200	1.5
Mottled Duck	Anas fulvigula	50	waterfowl	238,785	148,277	355,630	0.185317762	0.042453552	200	1.5
Ruddy Duck	Oxyura jamaicensis	80	waterfowl	1,334,697	970,409	1,802,652	0.155034166	0.041770739	200	1.5
Wood Duck	Aix sponsa	35	waterfowl	2,148,806	1,930,697	2,371,212	0.255417551	0.006689409	125	1.5

Column Name	Meaning
Species	English Name, according to 59th supplement of AOS checklist - this spreadsheet contains species that occur regularly in the USA and/or Canada, AND that have population estimates and trends
sci_name	Scientific Name, from AOS 59th supplement
sort	taxonomic sort order, based on AOS 59th supplement, for each species
group	assignment to 1 of 4 bird groups: landbird, shorebird, waterbird, waterfowl
PopUsCa	Population estimate of individuals in the United States and Canada, normally based on breeding season surveys, sometimes approximated depending on information provided by source
PopLC95	lower end of a 95% range of variation around population estimate
PopUC95	upper end of a 95% range of variation around population estimate
TimeAdj.meanlog	mean log of time-of-day adjustment factor, which is the ratio of peak/mean detection rates across 50 BBS stops
TimeAdj.sdlog	standard deviation of above mean log time-of-day adjustment factor
Distance Adj.	distance adjustment factor: A categorical adjustment assigned to each species to modify the presumed sampling radius and adjust density estimates based on expected detecti
Pair Adj.	pair adjustmemt factor, based on proportion of males and females detected on surveys; ranges from 1 (both sexes detected equally) to 2 (only males detected)