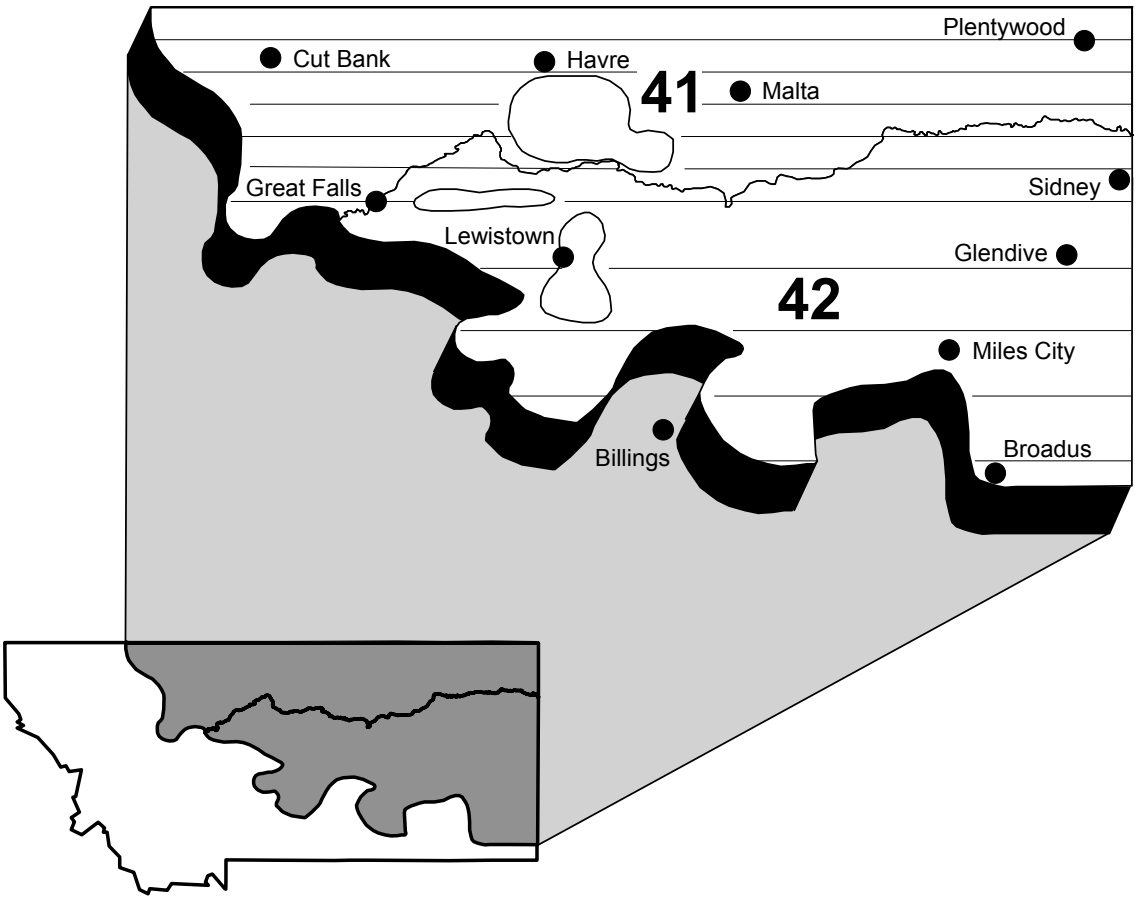
# Waterfowl Breeding Population Survey
# for

# MONTANA




## 2004

**Title:** **Waterfowl Breeding Population Survey for Montana**

**Strata Surveyed:** 41 and 42

**Dates:** May 1 –17, 2004

**Data Supplied by:** U.S. Fish and Wildlife Service (USFWS)
Division of Migratory Bird Management(DMBM)

Aerial Crew:

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Waterfowl Population Surveys, DMBM

Pilot/Observer: Ray, Bentley, Flyway Biologist, DMBM

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**Abstract:**
The 2004 waterfowl breeding population survey for Montana was completed on May 17 with all segments and transects covered as outlined in the survey design. General drought conditions prevailed throughout stratum 42 and much of 41. Spring precipitation including significant late spring snow fall helped to mitigate drought in the northeastern portion of stratum 41 yielding near normal pond counts in the that region. While indicated pond numbers were actually higher than 2003 and above 10-year and long-term mean values it is assumed that this is a result of certain data collection methods and does not reflect an improvement in habitat. Waterfowl population estimates showed decreases from 2003 and were 17.5% below long-term mean values for combined species. Mallard population estimates were nearly 30% below 2003 and 32% below the long-term mean and northern pintail nearly 55% below long-term mean. American widgeon and green-winged teal showed increases over 2003 with the latter observed at near record numbers. Diver species varied widely but generally showed a decline from 2003 with scaup continuing to be well below historic levels. Canada goose population estimates remain 22.9% over long-term mean values and increased from 2003 by 19%. Despite localized areas of favorable habitat and good conditions in the northeast the general outlook for waterfowl production is only marginally fair with expected fall recruitment to be below average.

**Methods:**

Procedures followed in conducting this survey are described in the Standard Operating Procedures for Aerial Breeding Ground Surveys in North America, Section III, revised 1987, 2003 revision pending. The survey design for Montana included 11 air/ground comparison segments comprising 5.7% of the total 193 segments flown. All segments specified in the survey design were counted.

Air and ground crew members met in Pierre SD on April 30. On May 1st ground crew training and ground reconnaissance by the air crew was completed. Aerial survey flights were initiated on May 2 and continued through May 17. Flights were canceled on May 3, 5, 9, 11, 12, and 15 due to adverse weather conditions. Data files and summaries for the western Dakotas were submitted to John Solberg for inclusion in the overall North Dakota and South Dakota report.

A single engine Cessna TR182 (N705) was used to conduct the survey over approximately 53 flight hours. Survey personnel included Jim Voelzer as pilot/observer, Ray Bentley as pilot/observer, Ken Richkus as ground crew leader, and Danielle D'Auria as ground crew assistant. 2004 served as Jim's 27th season flying this survey area and Ray's 4th. This was Ken's second year on ground crew in area 5 and Danielle's first.

Due to technical problems we were unable to utilize the usual GPS interfaced system in 04 instead recording observations onto hand held tape recorders. Daily recorded information minus geo-references was transcribed onto laptop computers. Compilation and summaries were conducted using software developed by Jack Hodges, USFWS/DMBM, Juneau, AK. Processed data files were submitted to Mark Otto, Population and Habitat Assessment Section (PHAS) USFWS/DMBM and Khristi Wilkins (PHAS) in Laurel, MD for application of visibility correction factors and table compilation.

**Weather and Habitat Conditions:**

Eastern Montana continues to suffer from a moderate to severe drought cycle with below normal precipitation and associated degraded habitat conditions. Examination of several NOAA drought and precipitation monitors reflect a progression of drought severity from nearly normal in the northeast quadrant to extreme in the south and west. The Standardized Precipitation Index (SPI) which measures only precipitation and calculates a probability of drought rated eastern Montana moderately dry for the period March through May with an area in the southeast rated as "extremely dry". The Palmer Drought Index (PDI) includes estimates of evapo-transpiration and runoff as well as precipitation in making predictions of drought severity. PDI rated much of eastern Montana as severely dry or exceptionally dry in early spring 04. By May the area near Plentywood and Medicine Lake had improved somewhat to be considered "normal" with precipitation levels, largely from April and May snowfall, adequate to fill many seasonal wetlands and stock dams and charge semi-permanent wetlands. Conversely however by late May the southeastern portion of the state had continued a drying trend and was rated as very dry. Even the zone immediately east of the Rocky Mountains, which is supplied moisture from runoff and is generally higher in elevation was much dryer than in previous surveys and rated moderately dry by drought predictors. Eastern Montana's waterfowl producing habitat is largely dependent on immediate precipitation from eastbound storm systems rather than runoff from higher

elevations. Rather than being widespread frontal systems these precipitation producers tend to be somewhat cellular leaving a mosaic patchwork of moist/dry swaths resulting in areas of fair to even good habitat quickly degrading to poor and back to fair in a relatively short distance. Habitat and agricultural condition generally reflected the dry conditions and varied with areas in the northeast displaying good shoreline and emergent vegetation to the usual parched pond banks devoid of vegetation in the drought affected areas most noticeable in the south and west. Jim Hensen (MT Fish Wildlife and Parks, Billings, MT) concurred with the assessment of a general trend toward improvement of habitat as one moves northeast after earlier ground reconnaissance. CRP cover was somewhat improved from the previous years but still showed evidence of degradation from haying and introduction of livestock during early May. A recurring anomaly in data from aerial estimates of pond numbers which is especially apparent in eastern Montana is that of having a full flowing stream classified as one water body while a semi-dry stream channel with isolated basins of standing water being classified as multiple ponds. This feature was apparent in 2004 and likely explains a 20% increase in pond counts from 03 at 313,300 (Table 1). It is believed that the calculated estimate of higher pond numbers does not reflect actual conditions especially when one considers associated habitat quality. Waterfowl production in the northeastern portion of the strata will likely be near normal provided continued precipitation maintains adequate brood habitat. If early June precipitation in the south and western portions of the strata were to occur, a late nesting/renesting effort could bring production up somewhat and June precipitation has indicated a slight increase. However given the severity of drought going into the 04 breeding season it is felt that at best the remainder of the region will remain fair to poor for waterfowl production.

Stratum 41 (North of the Missouri River)

This area showed pond count estimates of 170,200 a 20% increase from 2003 and up 30% from the long-term average. As stated above it is felt that this “increase” in pond numbers is an anomaly resulting from the method of wetland/stream classification and does not necessarily indicated more ponds. The region north and east of Malta up to and including the area near Plentywood to the high line received substantial snowfall in April and May resulting in areas of good habitat and good potential for adequate brood conditions. The zone north of Havre in the north central portion of stratum 41 also displayed fair/good conditions. Moving west however the effects of drought were apparent with semi-dry stream channels, and many dry basins. The region north of Great falls and continuing north of Cut Bank is considered poor including the far western higher elevation areas which traditionally show improvement from mountain runoff. Spring snowfall has maintain a moisture bank along the north and eastern portion of the stratum and should produce waterfowl at an average level while the western portions are expected to be below average.

Stratum 42 (south of the Missouri River)

The region south of the Missouri River showed pond counts of 143,200 a 15% increase from 2003 and a 3% decline from the 10-year mean. As mentioned earlier any increases noted in 2004 pond numbers should be regarded carefully given certain data collections methodologies which tend to inflate pond count in very dry years. Spring snowfall

further north did not appreciably affect stratum 42 resulting in conditions ranging from marginally fair to poor. The north boundary with stratum 41 shows dry conditions but has received some precipitation in mid May and June and habitat associated with stock pond, natural wetland basins, and stream channels appeared adequate enough for possibly normal to sub-normal waterfowl production however the southern and western portions near Billings displayed overall poor conditions with many dry basins and even dry wetlands classed in other years and permanent. Most stream channels show various degrees of "ponding" stemming from interruption of stream flow due to low water with remaining low areas of the channel containing water. Early and mid spring storm tracks appeared to have mostly by-passed much of stratum 42. In very isolated instances there were small micro-regions of fair to even good habitat but these represented only a minor percentage of the overall area. Waterfowl production is expected to be less than normal in this region even if June precipitation assists in late nesting effort.

**Breeding Population Estimates;**

Initial ground surveys and subsequent aerial observations indicated that survey timing was appropriate with all expected species present and key species exhibiting paired behavior and territorial defense. As early as May 8 in fact evidence of flocked males was apparent indicating either post breeding or failed breeding behavior. Crowding was observed on several occasions particularly in stratum 42 with pairs of multiple species, single males, and flocked males all occupying one pond and lacking recognizable territorial defense response.

Population estimates for dabbler species totaled 704,500 (Table 1). This represents a 21% decrease from 2003 and a nearly 18% decrease from the long-term mean. Still under the effects of good production in the late 90s the 10-year mean for all dabbler species remains 35% over 2004 values. Most species showed a decline from the previous year with the exception of American green-winged teal and American widgeon. Green-winged teal in fact increased 60% from the 10-year mean and over 144% from the long-term mean. Mallard, a key species was nearly 30% below 2003 estimates at 196,600 and 32% below the long-term mean. Northern pintail, a species of particular interest given recent trends also showed a decline from the previous year's estimates as well as declines from 10-year and long-term means. Only three species, northern shoveler, blue-winged teal, and the afore mentioned green-winged teal showed population estimates above the long-term mean.

Population estimates for diving ducks also showed a general decline from 2003 estimates at 52,600(-22.4%). Scaup represented the most frequently observed species at 16,100 yet this was over 34% less than 2003 and nearly 56% below the long-term mean. Redhead, canvasback, and ruddy duck all showed declines from the previous year but remain above estimates for 10-year and long-term mean. Large deviations from historic reference points are to be expected with infrequently encountered species where low sample sizes can yield great shifts in index percentages. Such is the case with ring-necked duck in 2004 showing huge percentage increases from 03 yet only representing an expanded value of 3000 individuals being estimated from both strata.

Canada goose population estimates were back up from 2003 at 67,600. This represents an increase of nearly 19% over the previous year and 23% over the long-term mean.

American coot population estimates were well above those of 2003 with a calculated 43,400 yet remain below 10-year and long-term mean values by 19% and 30% respectively.

As in previous surveys waterfowl population estimates were significantly greater in stratum 41 than 42. This trend was consistent for dabblers, divers, and coots while Canada goose numbers were relatively equal across the two strata. This trend was most apparent in northern pintail and ruddy ducks. Interestingly green-winged teal and American widgeon were nearly identical in representation between the strata and also are the few species to show increases in numbers from 2003.

Graphs #1 through #26 provide visual depiction of trends on waterfowl population estimates over long term.

**Conclusions:**

Observations in 2004 indicate a general decline from 2003 in habitat and waterfowl numbers. Eastern Montana remains under drought conditions for much of the region despite slight increases in actual pond numbers in 2003. Recorded increases in 2004 pond numbers are most likely an artifact of recording methods where semi dry stream channel are classified as multiple water bodies while a full stream channel is classified as a single water body. April and May snowfall in the northeastern portion of stratum 41 served to mitigate the region's overall drought and displayed habitat condition most favorable for waterfowl production. Conversely the southern and western portions of eastern Montana suffer from severe drought with marginal conditions for waterfowl. Within areas of widespread drought there do exist isolated patches of favorable habitat, the result of intermittent spring storm tracks that provided precipitation. These small islands of good habitat however fail to offset the general fair to poor conditions south of the Missouri River. With a low moisture cycle in effect increased agricultural pressure was present with evidence of entry into CRP land and competition for remaining riparian and wetland resources. In some cases semi-permanent wetlands traditionally used in ground reconnaissance for assessing waterfowl breeding status had been tilled with the lack of any standing water. As expected waterfowl numbers were generally down from 2003. Some degree of crowding was observed however not to the extent that may have been anticipated possibly suggesting an overflight to more northern latitudes. Dabbler species were nearly 18% below the long term mean. Departures from the 10-year mean were also negative however this indices still includes the very favorable production of the late 90s where most specie's numbers were calculated well above 10-year and long-term means. Mallard population estimates were 32% below the long term mean and northern pintail displayed a decline of 21% and 17% from 2003 and long-term mean estimates reversing what seemed to be a partial recovery effort in 2003. Also of concern is the continued decline of scaup along with most of the diver species. On infrequently encountered species such as some of the divers one must consider that the low sample size can contribute to large fluctuations in population estimates and the appearance of drastic declines or spectacular percentage increases. American green-winged teal and Canada goose populations appear to have increased from 2003 and remain above the long-term

mean. Given current conditions in eastern Montana waterfowl production is expected to be only fair at best with expected fall recruitment below normal. If June precipitation occurs at levels that will maintain brood habitat or even charge seasonal wetlands there could be some late nesting and re-nesting effort in addition to providing favorable brood conditions for successful May nesters. Under such a scenario overall waterfowl production may improve to a point approaching normal.

Table 1. Status of waterfowl breeding population estimates (thousands, adjusted for visibility bias) by species and stratum with comparison against the previous year, the previous 10-year mean, and the long-term mean for Montana.

| | Stratum | | | | | | % Change From | | |
|---|---|---|---|---|---|---|---|---|---|
| Species/Ponds | 41 | 42 | 2004 Total | 2003 Total | 10-Year Mean | Long-Term Mean | 2003 | 10-Year Mean | Long-Term Mean |
| Ducks | | | | | | | | | |
| Dabblers | | | | | | | | | |
| Mallard | 113.1 | 83.6 | 196.6 | 279.7 | 364.0 | 289.1 | -29.7% | -46.0% | -32.0% |
| Am. black duck | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | -- | -- |
| Gadwall | 62.8 | 32.8 | 95.5 | 109.1 | 219.7 | 116.1 | -12.4% | -56.5% | -17.7% |
| Am. wigeon | 21.4 | 21.0 | 42.4 | 30.7 | 79.2 | 81.1 | 38.0% | -46.4% | -47.7% |
| Am. green-winged teal | 27.6 | 27.7 | 55.3 | 50.2 | 34.4 | 22.6 | 10.2% | 60.5% | 144.8% |
| Blue-winged teal | 80.4 | 46.0 | 126.4 | 171.2 | 134.2 | 99.5 | -26.1% | -5.8% | 27.0% |
| N. shoveler | 96.8 | 21.6 | 118.4 | 158.5 | 130.1 | 92.9 | -25.3% | -9.0% | 27.4% |
| N. pintail | 57.8 | 12.1 | 69.9 | 95.0 | 126.6 | 154.8 | -26.4% | -44.8% | -54.9% |
| Subtotal | 459.8 | 244.7 | 704.5 | 894.3 | 1088.3 | 856.1 | -21.2% | -35.3% | -17.7% |
| | | | | | | | | | |
| Divers | | | | | | | | | |
| Redhead | 8.8 | 2.5 | 11.3 | 14.2 | 6.2 | 6.1 | -20.2% | 83.4% | 84.5% |
| Canvasback | 4.4 | 6.1 | 10.4 | 10.9 | 6.6 | 5.6 | -4.3% | 58.2% | 87.7% |
| Scaups | 10.7 | 5.4 | 16.1 | 24.6 | 26.8 | 36.4 | -34.6% | -39.9% | -55.8% |
| Ring-necked duck | 2.3 | 0.7 | 3.0 | 0.4 | 2.1 | 2.3 | 670.3% | 39.8% | 29.7% |
| Goldeneyes | 0.5 | 0.0 | 0.5 | 0.0 | 0.6 | 0.8 | -- | -7.4% | -33.7% |
| Bufflehead | 0.7 | 0.0 | 0.7 | 0.7 | 0.9 | 1.4 | 0.0% | -29.3% | -52.8% |
| Ruddy Duck | 10.0 | 0.6 | 10.6 | 17.1 | 10.1 | 8.5 | -37.7% | 5.1% | 24.6% |
| Subtotal | 37.4 | 15.3 | 52.6 | 67.8 | 53.3 | 61.1 | -22.4% | -1.2% | -13.9% |
| | | | | | | | | | |
| Miscellaneous | | | | | | | | | |
| Long-tailed duck | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | -- | -100.0% | -100.0% |
| Eiders | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -- | -- | -- |
| Scoters | 0.0 | 0.0 | 0.0 | 0.5 | 0.1 | 0.0 | -100.0% | -100.0% | -100.0% |
| Mergansers | 0.5 | 0.9 | 1.4 | 3.0 | 4.6 | 2.5 | -52.5% | -69.0% | -44.1% |
| Subtotal | 0.5 | 0.9 | 1.4 | 3.5 | 4.8 | 2.6 | -59.3% | -70.3% | -45.3% |
| | | | | | | | | | |
| Total Ducks | 497.7 | 260.9 | 758.6 | 965.6 | 1146.3 | 919.8 | -21.4% | -33.8% | -17.5% |
| Canada Goose | 30.0 | 37.6 | 67.6 | 56.9 | 85.2 | 55.0 | 18.8% | -20.6% | 22.9% |
| Am. coot | 38.4 | 5.1 | 43.4 | 17.7 | 54.1 | 62.5 | 145.2% | -19.8% | -30.5% |
| Ponds | 170.2 | 143.2 | 313.3 | 260.8 | 297.1 | 257.3 | 20.1% | 5.5% | 21.8% |

Table 2. Long-term trend in adjusted May pond estimates (thousands) by stratum with comparisons against the previous year, the previous 10-year mean, and the long-term mean for Montana.

| | Stratum | | |
|---|---|---|---|
| Year | 41 | 42 | Total |
| 1974 | 142.4 | 66.9 | 209.2 |
| 1975 | 150.6 | 128.8 | 279.4 |
| 1976 | 109.3 | 126.3 | 235.5 |
| 1977 | 70.4 | 88.2 | 158.6 |
| 1978 | 145.7 | 156.2 | 301.9 |
| 1979 | 135.0 | 106.2 | 241.2 |
| 1980 | 77.9 | 74.4 | 152.3 |
| 1981 | 103.3 | 73.0 | 176.3 |
| 1982 | 147.1 | 126.5 | 273.5 |
| 1983 | 85.2 | 88.7 | 173.9 |
| 1984 | 88.6 | 117.5 | 206.2 |
| 1985 | 127.3 | 160.0 | 287.3 |
| 1986 | 190.4 | 206.3 | 396.7 |
| 1987 | 102.2 | 127.1 | 229.3 |
| 1988 | 78.3 | 92.0 | 170.3 |
| 1989 | 160.5 | 177.3 | 337.8 |
| 1990 | 121.7 | 124.3 | 246.0 |
| 1991 | 111.6 | 130.1 | 241.6 |
| 1992 | 95.6 | 140.0 | 235.5 |
| 1993 | 94.3 | 100.5 | 194.8 |
| 1994 | 227.4 | 251.1 | 478.5 |
| 1995 | 164.1 | 184.7 | 348.8 |
| 1996 | 209.4 | 174.7 | 384.1 |
| 1997 | 154.3 | 160.2 | 314.5 |
| 1998 | 149.4 | 176.0 | 325.4 |
| 1999 | 227.6 | 149.8 | 377.3 |
| 2000 | 74.6 | 88.0 | 162.6 |
| 2001 | 74.2 | 79.7 | 154.0 |
| 2002 | 71.3 | 93.4 | 164.7 |
| 2003 | 136.4 | 124.4 | 260.8 |
| 2004 | 170.2 | 143.2 | 313.3 |
| | | | |
| 10-year Mean | 148.9 | 148.2 | 297.1 |
| Long-term Mean | 127.5 | 129.7 | 257.3 |
| | | | |
| Percent Change: | | | |
| From 2003 | 0.2 | 0.2 | 0.2 |
| From 10-year Mean | 0.1 | 0.0 | 0.1 |
| From Long-term Mean | 0.3 | 0.1 | 0.2 |

Appendix 1. Long-term trend in adjusted waterfowl breeding population estimates (thousands).

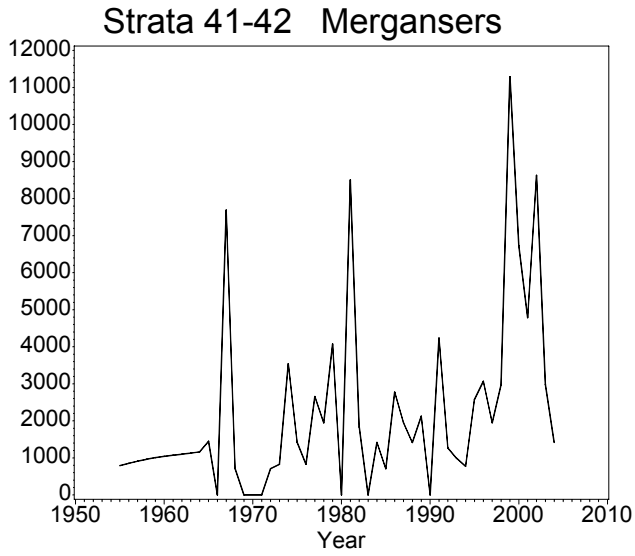
| Species/Ponds | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|---|---|---|
| Ducks | | | | | | | | | | |
| Dabblers | | | | | | | | | | |
| Mallard | 363.3 | 489.4 | 320.9 | 198.5 | 291.3 | 311.5 | 273.9 | 374.2 | 261.3 | 198.2 |
| Am. black duck | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Gadwall | 147.9 | 130.5 | 100.0 | 93.7 | 94.3 | 53.3 | 49.1 | 15.5 | 11.8 | 69.6 |
| Am. wigeon | 36.8 | 43.2 | 63.6 | 68.6 | 85.8 | 92.6 | 58.3 | 129.8 | 99.2 | 76.8 |
| Am. green-winged teal | 22.5 | 18.4 | 29.9 | 20.5 | 8.6 | 28.2 | 11.5 | 31.7 | 51.5 | 21.9 |
| Blue-winged teal | 137.5 | 133.3 | 82.9 | 53.2 | 149.9 | 99.3 | 87.1 | 17.0 | 8.5 | 77.7 |
| N. shoveler | 65.7 | 83.1 | 98.6 | 78.0 | 109.6 | 64.9 | 65.5 | 61.1 | 47.2 | 58.1 |
| N. pintail | 287.4 | 262.9 | 277.3 | 72.2 | 156.4 | 191.2 | 124.3 | 240.6 | 167.7 | 116.8 |
| Subtotal | 1061.2 | 1160.7 | 973.1 | 584.9 | 895.9 | 840.9 | 669.7 | 870.0 | 647.3 | 619.2 |
| Divers | | | | | | | | | | |
| Redhead | 2.6 | 4.2 | 12.4 | 1.4 | 2.6 | 2.0 | 2.4 | 0.0 | 2.4 | 1.0 |
| Canvasback | 3.1 | 0.5 | 1.6 | 3.5 | 5.5 | 3.6 | 5.6 | 6.7 | 9.6 | 1.3 |
| Scaups | 27.8 | 44.7 | 43.0 | 27.0 | 50.0 | 33.2 | 15.6 | 39.5 | 49.2 | 35.8 |
| Ring-necked duck | 3.3 | 0.9 | 7.4 | 2.9 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 2.1 |
| Goldeneyes | 0.0 | 1.3 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 | 8.8 | 2.4 | 0.0 |
| Bufflehead | 1.3 | 1.3 | 0.4 | 2.1 | 1.4 | 0.4 | 0.0 | 1.7 | 0.6 | 1.7 |
| Ruddy Duck | 0.0 | 2.7 | 1.7 | 1.5 | 22.3 | 0.6 | 1.3 | 5.7 | 3.1 | 1.8 |
| Subtotal | 38.1 | 55.7 | 66.4 | 38.3 | 82.7 | 39.9 | 25.0 | 62.4 | 67.4 | 43.8 |
| Miscellaneous | | | | | | | | | | |
| Long-tailed duck | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Eiders | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Scoters | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mergansers | 1.4 | 0.0 | 7.7 | 0.7 | 0.0 | 0.0 | 0.0 | 0.7 | 0.8 | 3.5 |
| Subtotal | 1.4 | 0.0 | 7.8 | 0.7 | 0.0 | 0.0 | 0.0 | 0.7 | 0.8 | 3.5 |
| Total Ducks | 1100.7 | 1216.4 | 1047.3 | 623.9 | 978.6 | 880.8 | 694.6 | 933.1 | 715.5 | 666.6 |
| Canada Goose | 19.0 | 0.0 | 44.9 | 42.2 | 42.2 | 50.4 | 61.2 | 31.6 | 14.0 | 22.1 |
| Am. coot | 13.9 | 19.4 | 23.4 | 58.1 | 31.0 | 22.3 | 9.6 | 17.5 | 38.0 | 22.2 |
| Ponds | | | | | | | | | | 209.2 |

| Species/Ponds | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 |
|---|---|---|---|---|---|---|---|---|---|---|
| Ducks | | | | | | | | | | |
| Dabblers | | | | | | | | | | |
| Mallard | 478.4 | 168.0 | 171.0 | 282.5 | 258.3 | 256.2 | 245.8 | 323.5 | 230.1 | 189.8 |
| Am. black duck | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Gadwall | 72.9 | 55.3 | 19.7 | 174.8 | 78.6 | 83.5 | 119.9 | 95.1 | 71.0 | 38.3 |
| Am. wigeon | 110.6 | 99.7 | 77.1 | 157.0 | 87.9 | 148.9 | 65.2 | 89.4 | 77.9 | 73.0 |
| Am. green-winged teal | 53.1 | 13.6 | 3.9 | 18.2 | 40.1 | 9.9 | 9.1 | 13.4 | 18.9 | 10.6 |
| Blue-winged teal | 98.3 | 207.1 | 93.8 | 93.9 | 117.5 | 103.4 | 81.8 | 211.0 | 79.9 | 52.1 |
| N. shoveler | 100.2 | 102.2 | 31.1 | 179.2 | 189.6 | 52.2 | 121.8 | 160.7 | 61.8 | 65.0 |
| N. pintail | 259.2 | 226.0 | 118.5 | 348.9 | 324.8 | 146.6 | 157.3 | 306.9 | 88.3 | 99.8 |
| Subtotal | 1172.8 | 871.9 | 514.9 | 1254.7 | 1096.7 | 800.7 | 801.0 | 1200.0 | 627.9 | 528.6 |
| Divers | | | | | | | | | | |
| Redhead | 0.7 | 2.7 | 3.2 | 7.0 | 14.7 | 4.4 | 25.0 | 15.0 | 10.5 | 19.2 |
| Canvasback | 2.1 | 16.2 | 3.2 | 6.4 | 10.4 | 4.8 | 5.4 | 12.5 | 5.0 | 3.5 |
| Scaups | 26.4 | 29.9 | 34.4 | 72.1 | 88.6 | 36.8 | 35.8 | 61.0 | 47.1 | 53.3 |
| Ring-necked duck | 0.0 | 1.4 | 0.2 | 0.8 | 0.0 | 0.9 | 0.9 | 2.4 | 16.3 | 3.0 |
| Goldeneyes | 0.0 | 0.0 | 0.6 | 0.0 | 1.1 | 1.6 | 0.0 | 0.0 | 0.0 | 0.6 |
| Bufflehead | 0.4 | 0.6 | 0.0 | 1.3 | 3.6 | 1.0 | 2.4 | 5.6 | 0.4 | 1.8 |
| Ruddy Duck | 2.6 | 1.9 | 1.2 | 14.1 | 12.4 | 0.7 | 17.1 | 17.8 | 9.1 | 11.8 |
| Subtotal | 32.2 | 52.7 | 42.8 | 101.7 | 130.8 | 50.1 | 86.6 | 114.2 | 88.3 | 93.1 |
| Miscellaneous | | | | | | | | | | |
| Long-tailed duck | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Eiders | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Scoters | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 |
| Mergansers | 1.4 | 0.8 | 2.7 | 1.9 | 4.1 | 0.0 | 8.5 | 1.8 | 0.0 | 1.4 |
| Subtotal | 1.4 | 0.8 | 2.7 | 1.9 | 4.1 | 0.0 | 8.5 | 1.8 | 0.2 | 1.4 |
| Total Ducks | 1206.4 | 925.4 | 560.3 | 1358.3 | 1231.5 | 850.8 | 896.0 | 1316.0 | 716.5 | 623.1 |
| Canada Goose | 23.1 | 27.0 | 26.3 | 27.9 | 41.6 | 36.6 | 31.3 | 37.1 | 34.6 | 51.1 |
| Am. coot | 13.8 | 59.5 | 16.4 | 83.1 | 319.4 | 104.2 | 197.7 | 53.3 | 42.9 | 103.5 |
| Ponds | 279.4 | 235.5 | 158.6 | 301.9 | 241.2 | 152.3 | 176.3 | 273.5 | 173.9 | 206.2 |

Appendix 1 (continued). Long-term trend in adjusted waterfowl breeding population estimates (thousands).

| Species/Ponds | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
|---|---|---|---|---|---|---|---|---|---|---|
| Ducks | | | | | | | | | | |
| Dabblers | | | | | | | | | | |
| Mallard | 152.0 | 156.9 | 240.9 | 218.0 | 282.8 | 148.4 | 222.7 | 239.9 | 288.6 | 368.7 |
| Am. black duck | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Gadwall | 40.8 | 33.8 | 32.6 | 30.7 | 128.5 | 56.7 | 96.9 | 154.4 | 181.5 | 182.9 |
| Am. wigeon | 58.7 | 52.0 | 64.9 | 44.0 | 58.8 | 126.2 | 70.3 | 88.2 | 65.5 | 137.7 |
| Am. green-winged teal | 6.4 | 6.2 | 6.0 | 12.0 | 17.0 | 15.7 | 12.4 | 16.3 | 8.4 | 34.0 |
| Blue-winged teal | 38.6 | 21.6 | 40.2 | 83.5 | 65.9 | 76.3 | 77.7 | 89.0 | 60.3 | 186.4 |
| N. shoveler | 34.1 | 69.3 | 73.2 | 33.7 | 58.6 | 86.3 | 51.5 | 27.1 | 92.7 | 194.3 |
| N. pintail | 56.5 | 95.9 | 146.0 | 61.6 | 58.0 | 131.2 | 43.1 | 75.5 | 130.4 | 244.5 |
| Subtotal | 387.0 | 435.6 | 603.8 | 483.6 | 669.6 | 640.6 | 574.7 | 690.4 | 827.4 | 1348.5 |
| Divers | | | | | | | | | | |
| Redhead | 2.7 | 3.6 | 3.4 | 2.7 | 7.0 | 7.8 | 6.4 | 5.5 | 5.3 | 3.4 |
| Canvasback | 2.1 | 2.8 | 1.0 | 2.1 | 5.1 | 10.8 | 1.0 | 5.6 | 9.3 | 12.5 |
| Scaups | 20.0 | 33.4 | 44.7 | 55.9 | 46.9 | 33.1 | 25.2 | 14.0 | 28.3 | 28.6 |
| Ring-necked duck | 4.3 | 7.1 | 0.4 | 1.2 | 3.8 | 0.4 | 0.5 | 3.9 | 4.0 | 5.0 |
| Goldeneyes | 1.3 | 2.5 | 0.0 | 0.0 | 1.1 | 0.6 | 0.7 | 0.0 | 1.5 | 0.0 |
| Bufflehead | 1.0 | 0.4 | 0.0 | 4.1 | 1.7 | 6.0 | 2.2 | 1.3 | 0.4 | 0.3 |
| Ruddy Duck | 8.0 | 4.6 | 0.6 | 25.1 | 5.8 | 9.2 | 38.0 | 9.2 | 1.8 | 4.7 |
| Subtotal | 39.3 | 54.5 | 50.2 | 91.2 | 71.4 | 67.9 | 73.9 | 39.6 | 50.6 | 54.5 |
| Miscellaneous | | | | | | | | | | |
| Long-tailed duck | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Eiders | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Scoters | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mergansers | 0.7 | 2.8 | 1.9 | 1.4 | 2.1 | 0.0 | 4.2 | 1.3 | 1.0 | 0.8 |
| Subtotal | 0.7 | 2.8 | 1.9 | 1.4 | 2.1 | 0.0 | 4.2 | 1.3 | 1.0 | 0.8 |
| Total Ducks | 427.1 | 492.9 | 656.0 | 576.2 | 743.1 | 708.6 | 652.8 | 731.3 | 879.0 | 1403.7 |
| Canada Goose | 49.4 | 32.9 | 39.4 | 67.1 | 79.3 | 97.7 | 70.8 | 90.5 | 103.3 | 76.3 |
| Am. coot | 145.2 | 32.1 | 27.2 | 95.5 | 65.9 | 153.4 | 52.9 | 15.3 | 58.3 | 56.8 |
| Ponds | 287.3 | 396.7 | 229.3 | 170.3 | 337.8 | 246.0 | 241.6 | 235.5 | 194.8 | 478.5 |

| Species/Ponds | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|---|---|---|---|---|
| Ducks | | | | | | | | | | |
| Dabblers | | | | | | | | | | |
| Mallard | 366.0 | 386.9 | 641.2 | 549.5 | 319.0 | 304.1 | 239.1 | 185.8 | 279.7 | 196.6 |
| Am. black duck | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| Gadwall | 359.3 | 201.7 | 513.5 | 232.7 | 205.3 | 125.9 | 179.0 | 87.3 | 109.1 | 95.5 |
| Am. wigeon | 116.9 | 100.2 | 122.4 | 92.9 | 63.1 | 57.6 | 41.6 | 28.6 | 30.7 | 42.4 |
| Am. green-winged teal | 30.3 | 56.1 | 58.1 | 13.3 | 27.2 | 16.5 | 18.1 | 40.6 | 50.2 | 55.3 |
| Blue-winged teal | 94.4 | 89.3 | 138.1 | 225.5 | 241.5 | 50.0 | 72.8 | 73.3 | 171.2 | 126.4 |
| N. shoveler | 81.4 | 109.3 | 209.1 | 90.5 | 235.6 | 60.3 | 86.1 | 76.2 | 158.5 | 118.4 |
| N. pintail | 154.5 | 135.6 | 209.3 | 110.9 | 131.8 | 58.7 | 79.0 | 47 | 95.0 | 69.9 |
| Subtotal | 1202.8 | 1079.1 | 1891.7 | 1315.4 | 1223.5 | 673.1 | 715.7 | 538.7 | 894.3 | 704.5 |
| Divers | | | | | | | | | | |
| Redhead | 3.4 | 8.1 | 4.3 | 6.1 | 6.3 | 1.8 | 4.8 | 9.5 | 8.4 | 11.3 |
| Canvasback | 8.0 | 4.6 | 9.6 | 6.1 | 4.9 | 3.5 | 4.5 | 1.2 | 10.6 | 10.4 |
| Scaups | 21.4 | 35.9 | 32.7 | 14.1 | 28.0 | 30.7 | 31.5 | 20.6 | 24.6 | 16.1 |
| Ring-necked duck | 7.0 | 0.4 | 0.0 | 2.1 | 2.4 | 0.0 | 2.9 | 1.1 | 0.3 | 3.0 |
| Goldeneyes | 0.4 | 0.0 | 0.9 | 0.7 | 1.4 | 0.5 | 0.0 | 1.6 | 0.0 | 0.5 |
| Bufflehead | 0.5 | 0.0 | 2.2 | 1.5 | 1.1 | 1.7 | 0.6 | 0.5 | 0.6 | 0.7 |
| Ruddy Duck | 7.0 | 1.2 | 8.9 | 11.8 | 8.3 | 2.4 | 24.9 | 14.9 | 12.5 | 10.6 |
| Subtotal | 47.7 | 50.1 | 58.6 | 42.4 | 52.5 | 40.6 | 69.3 | 49.5 | 57.0 | 52.6 |
| Miscellaneous | | | | | | | | | | |
| Long-tailed duck | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| Eiders | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| Scoters | 0.0 | 0.3 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0.5 | 0.0 |
| Mergansers | 2.6 | 3.1 | 1.9 | 3.0 | 11.3 | 6.7 | 4.8 | 8.6 | 4.7 | 1.4 |
| Subtotal | 2.6 | 3.4 | 2.4 | 3.0 | 11.8 | 6.7 | 4.8 | 8.6 | 5.2 | 1.4 |
| Total Ducks | 1253.1 | 1132.6 | 1952.7 | 1360.8 | 1287.9 | 720.4 | 789.8 | 596.8 | 956.5 | 758.6 |
| Canada Goose | 98.6 | 106.6 | 78.5 | 84.9 | 84.2 | 94.9 | 88.2 | 82.8 | 56.9 | 67.6 |
| Am. coot | 33.2 | 38.8 | 80.1 | 12.8 | 174.7 | 69.1 | 21.6 | 36.3 | 27.4 | 43.4 |
| Ponds | 348.8 | 384.1 | 314.5 | 325.4 | 377.3 | 162.6 | 154.0 | 164.7 | 260.8 | 313.3 |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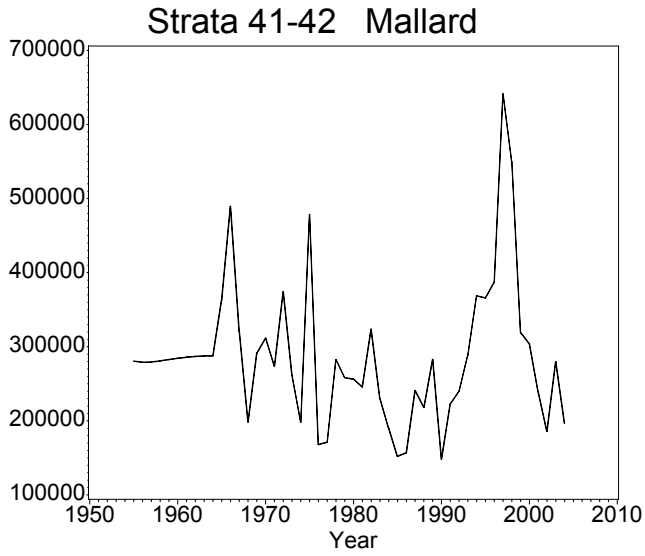
2010
Year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1990
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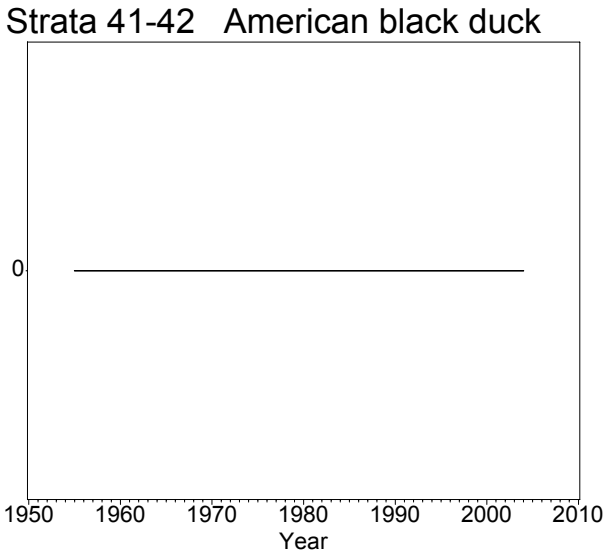
2010
Year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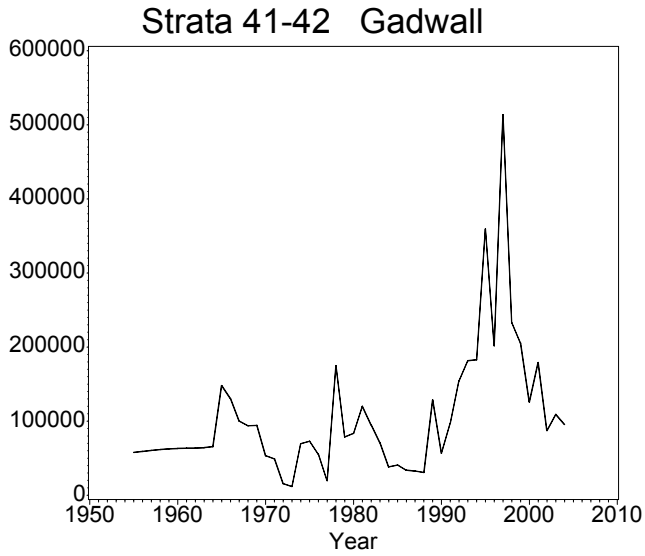
1990
2000
2010
Year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2010
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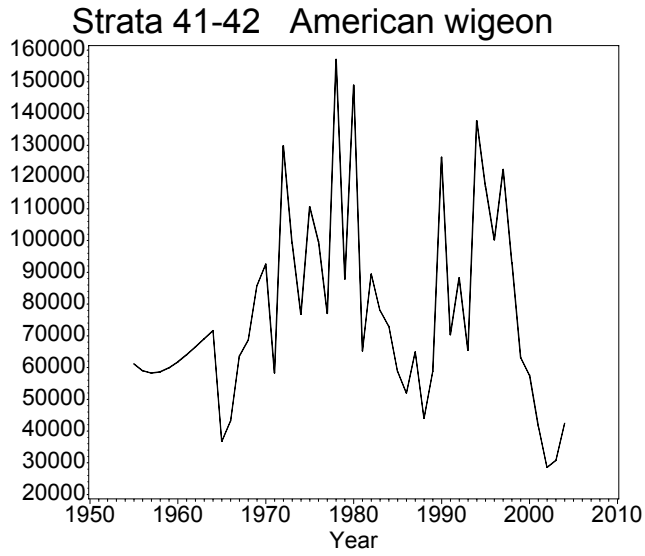
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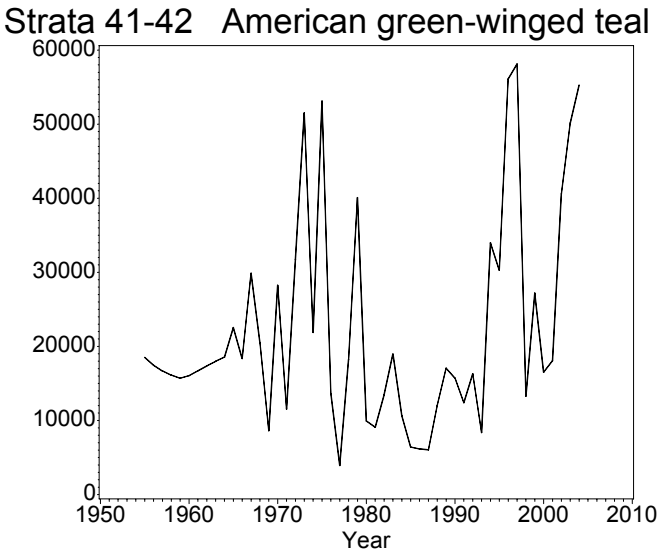
Strata 41-42 American green-winged teal
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2000
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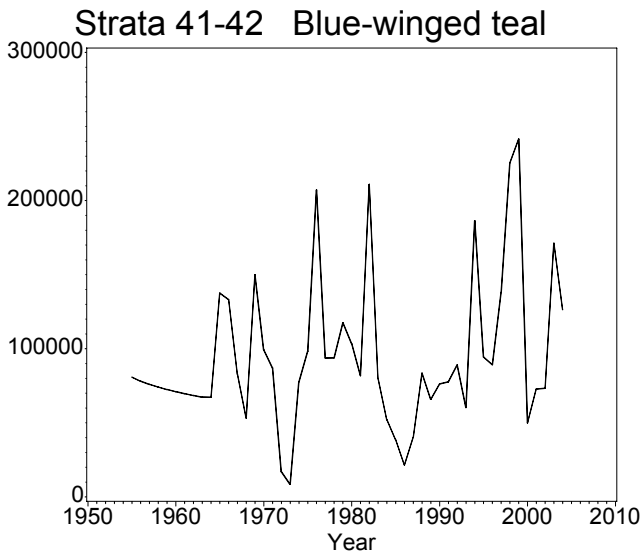
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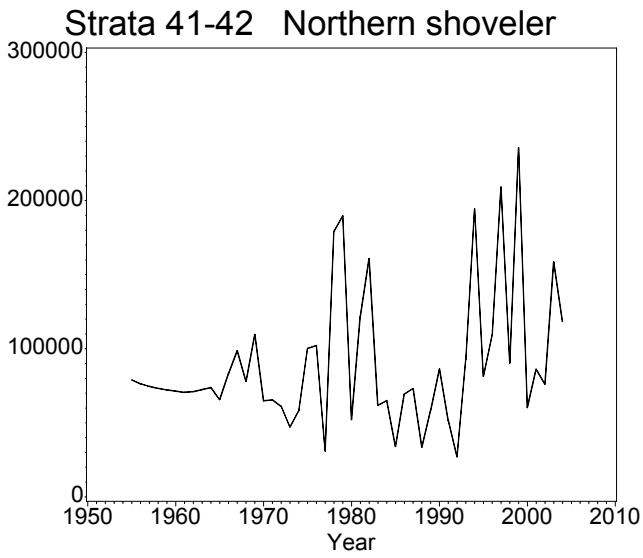
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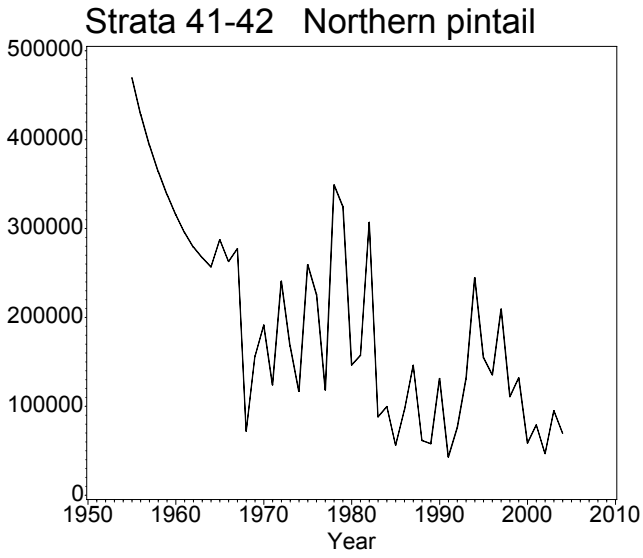
2000
2010
Year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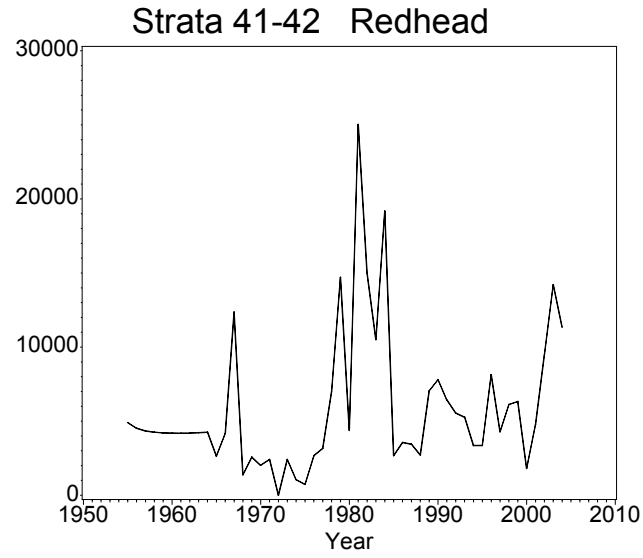
1970
1980
1990
2000
2010
Year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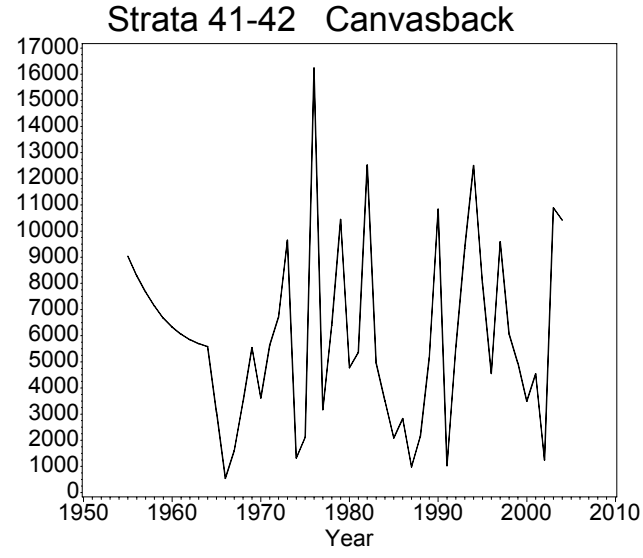
1970
1980
1990
2000
2010
Year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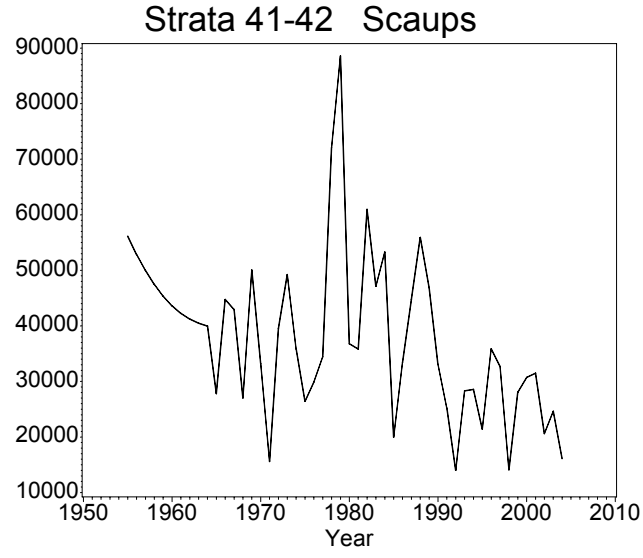
1990
2000
2010
Year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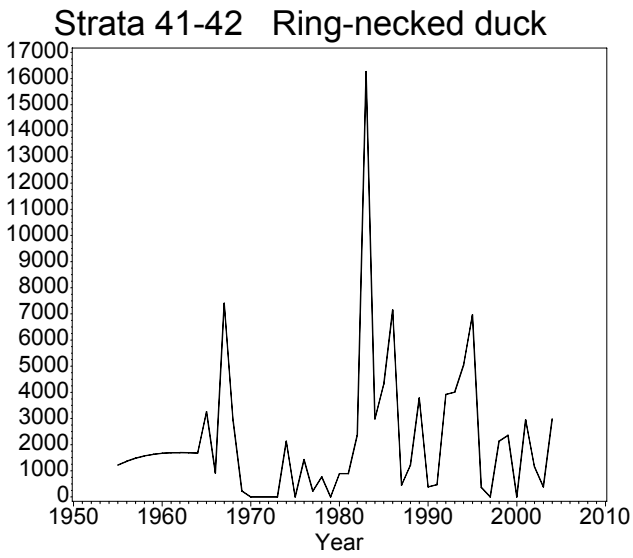
2000
2010
Year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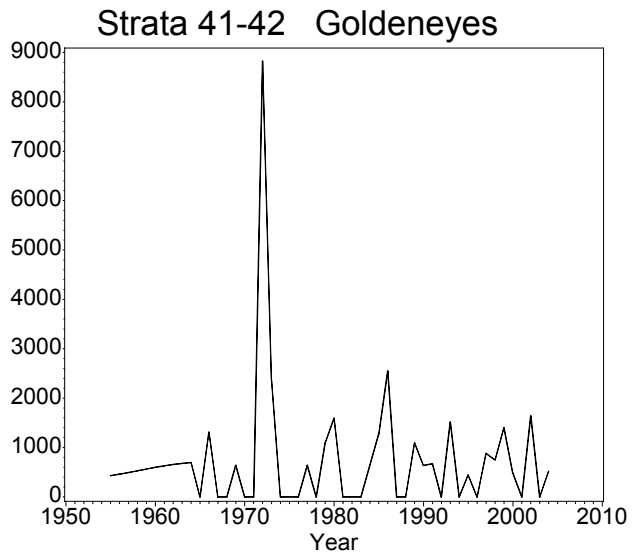
2010
Year


Strata 41-42 Goldeneyes
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1990
2000
2010
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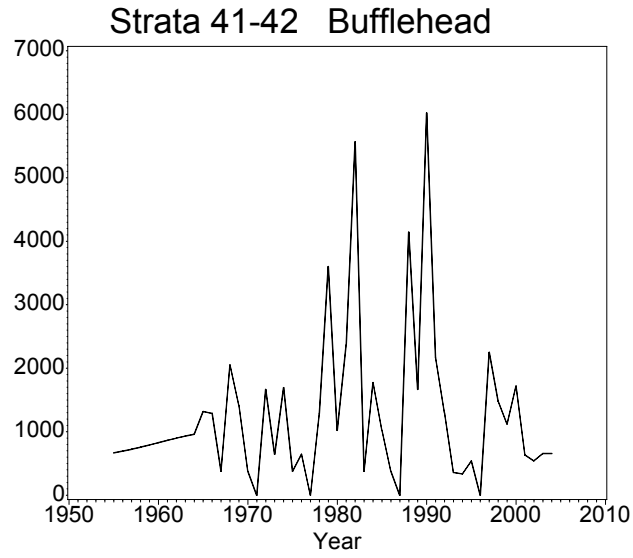
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1990
2000
2010
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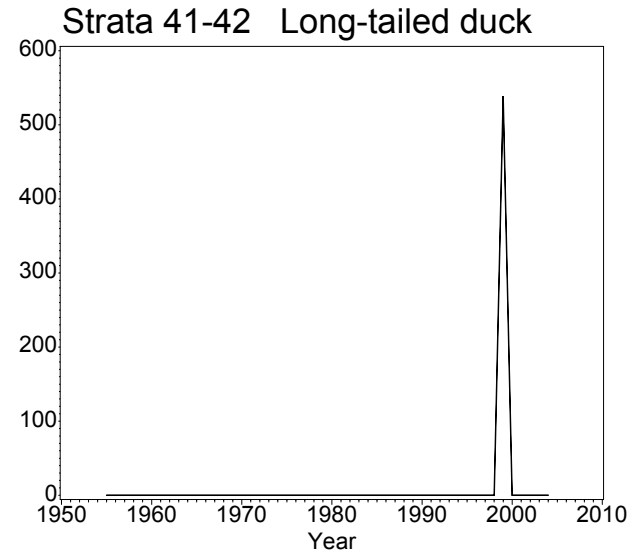
Strata 41-42 Long-tailed duck
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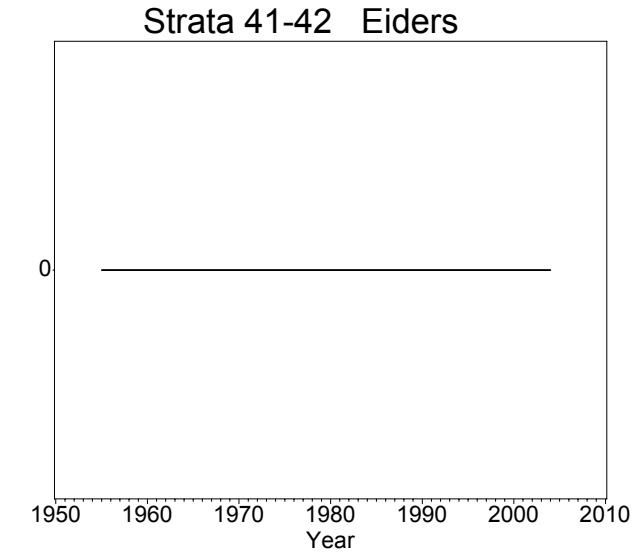
2000
2010
Year


Strata 41-42 Eiders
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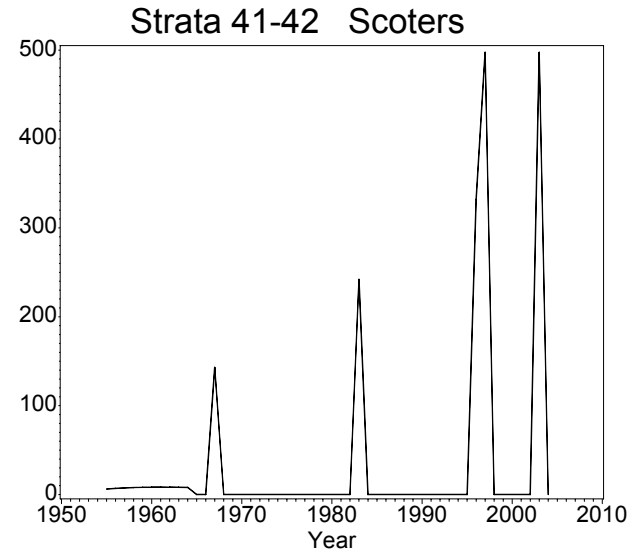
2000
2010
Year


Strata 41-42 Scoters
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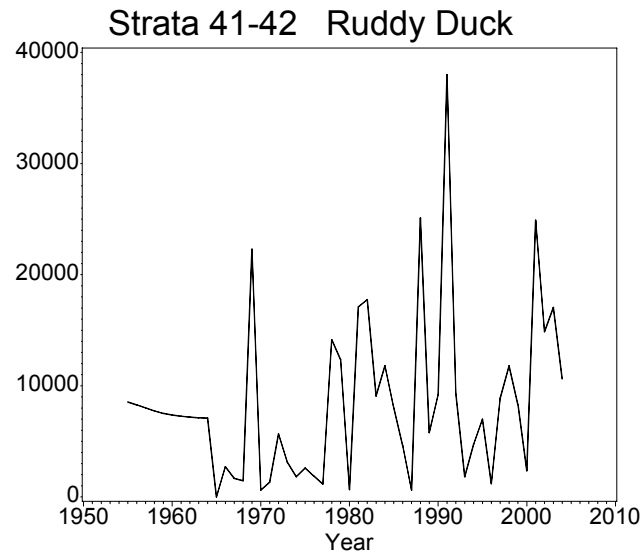
2010
Year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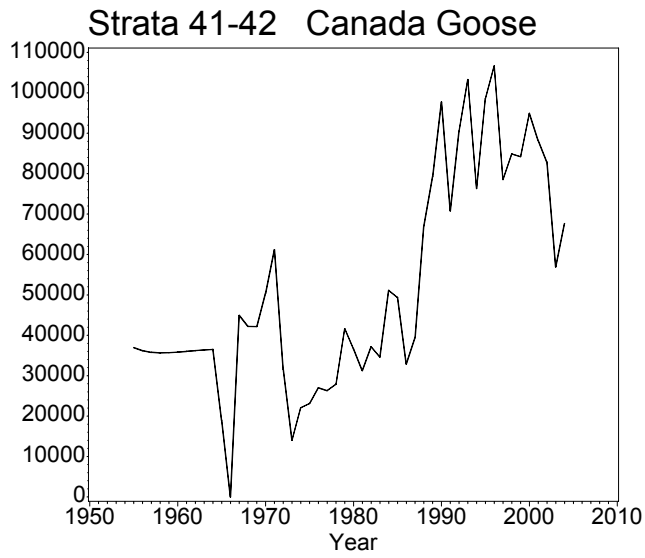
2010
Year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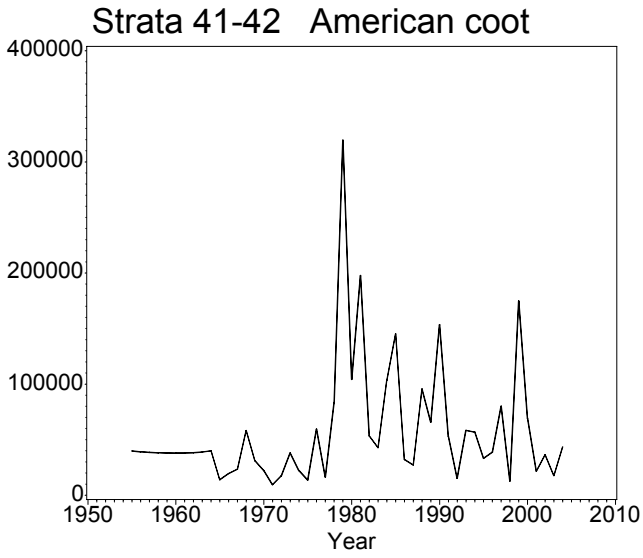
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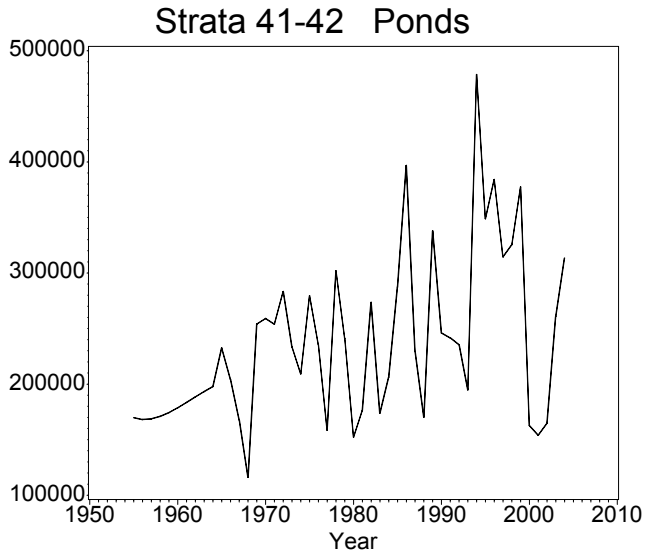
2000
2010
Year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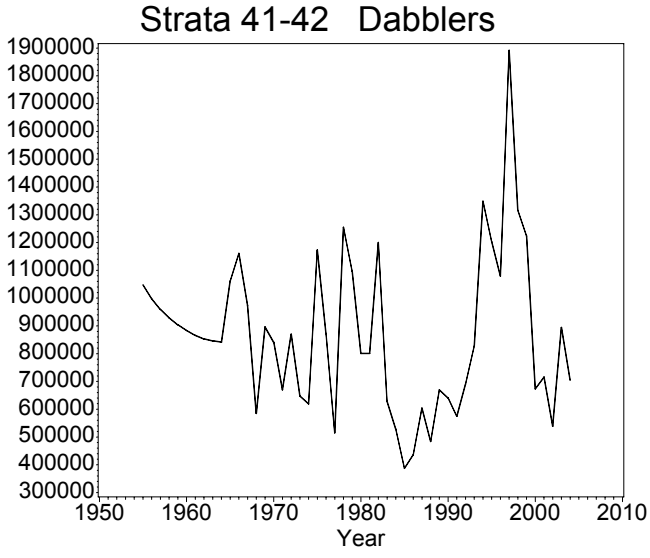
1990
2000
2010
Year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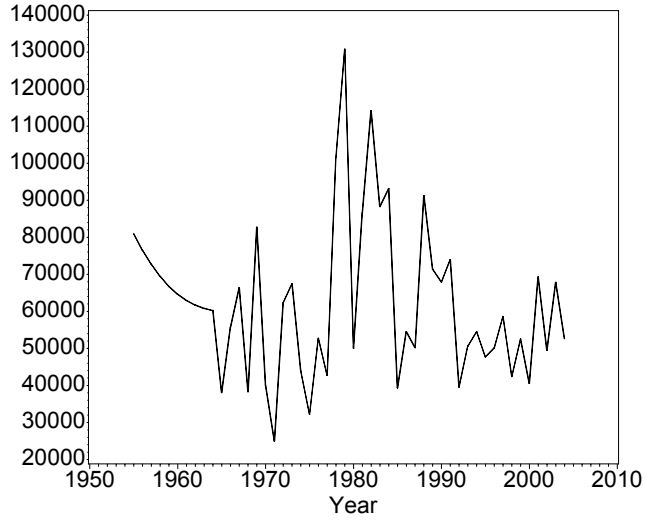
Strata 41-42 Divers
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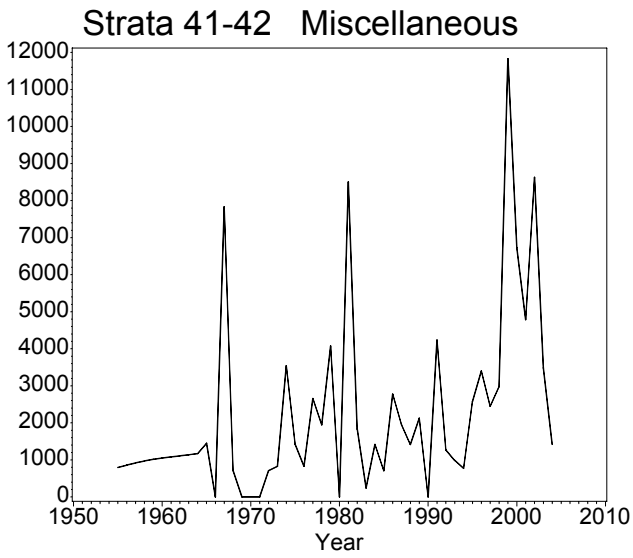
60000
50000
40000
30000
20000
1950
1960
1970
1980
1990
2000
2010
Year


Strata 41-42 Miscellaneous
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7000
6000
5000
4000
3000
2000
1000
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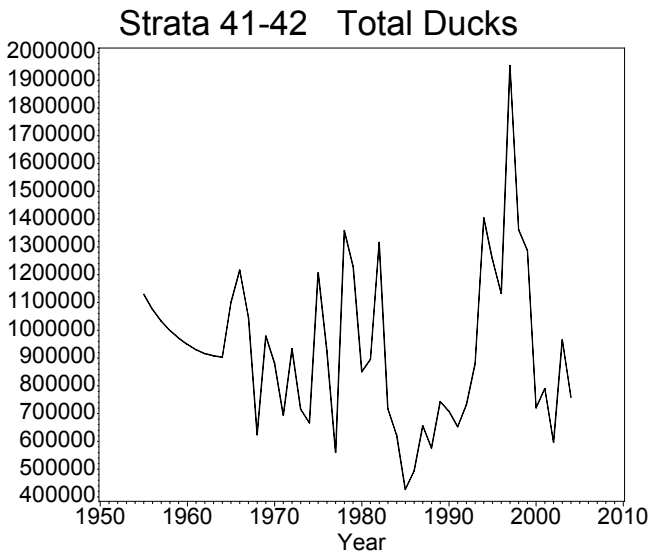
1950
1960
1970
1980
1990
2000
2010
Year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1700000
1600000
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1300000
1200000
1100000
1000000
900000
800000
700000
600000
500000
400000
1950
1960
1970
1980
1990
2000
2010
Year