

**Movements and Arrival Dates of Coastal Plain, North Carolina
Winter Banded Canada geese, 1984-1996.**



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May 2000

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Four distinct populations of Canada geese (*Branta canadensis*) can be found in North Carolina. These include a growing resident population and 3 migratory populations. The migratory geese include the Atlantic Population (AP), North Atlantic Population (NAP) and Southern James Bay Population (SJB). In North Carolina, numbers of migratory geese from all 3 populations have been declining since the 1950's. Hunting seasons were first closed west of Interstate 95 in 1987 to protect SJB geese and closed in 1992 in the remainder of the state to protect AP geese. Hunting for resident geese is permitted from September through the middle of November throughout most of the state. Likewise, in response to declining numbers of AP geese in the Atlantic Flyway, hunting was suspended throughout the flyway in 1995. Populations have since rebounded and limited hunting in portions of the flyway was allowed in 1999. In 1998, hunting for NAP geese in the Atlantic Flyway was also allowed in those areas determined to contain primarily NAP geese. Prior to this time, AP and NAP geese in the United States had been managed collectively.

As part of 2 cooperative Atlantic Flyway studies researching various goose population parameters, the North Carolina Wildlife Resources Commission trapped and neck-collared Canada geese in winter from 1984 through 1994. Subsequent observations of neck-collars were gathered by personnel in North Carolina as well as other Atlantic and Mississippi flyway states. Goose flocks thought to be migratory were targeted and bandings occurred primarily in the Piedmont and northern coastal plain regions of the state. While previous analysis of neck collar observations has focused on identifying regional and flyway survival rates and movements, little work has been done to identify population characteristics of geese banded specifically in North Carolina. Our objectives were to determine:

- (1) inter-state movements of winter banded geese
- (2) possible population affiliation (resident vs. migrant, AP vs. NAP vs. SJB)
- (3) arrival dates of potential migratory Canada geese
- (4) movements of North Carolina winter banded geese through the flyway
- (5) relative numbers of migratory Canada geese (1992-1995) throughout the fall and winter based on neck collar observations, and
- (6) fidelity to North Carolina by banding site.

Methods:

We banded and neck collared 5411 geese during the winter from 1984 through 1994 in numerous locations in northern coastal plain counties in North Carolina (Figure 1, Appendix A). The area trapped potentially included geese from all 3 migratory populations (Figure 2). Although, numerous resident Canada geese are located in this region, personnel focused efforts on flocks with the most likelihood of being migratory. A previous report, (*Movements and Arrival Dates of Piedmont, North Carolina Winter Banded Canada geese, 1984-1996*, North Carolina Wildlife Resources Commission, 1997) focused primarily on Piedmont geese, whereas this report focuses on coastal plain banded geese.

After being trapped, geese were aged, sexed, and fitted with a U.S. Fish and Wildlife Service legband. From 1984 through 1990, a yellow, rigid, cylinder type neck collar, stamped with a black unique 4 digit alpha-numeric code was also added (Samuel et. al. 1990). From winter 1991 to 1994, white, cone shaped neck collars stamped with a black unique alpha-numeric-symbol code were used (Castelli and Trost 1996). From 1984 to 1996, personnel were assigned in North Carolina and other Atlantic Flyway states to observe geese

and to record observation locations and collar codes. An observer in North Carolina also made observations during summer months. Personnel in the Mississippi Flyway also made observations of Canada geese as part of separate Canada goose studies. No observers in the Mississippi Flyway routinely made observations of geese during summer months.

In North Carolina, 2 full-time observers were employed from 1984 through 1990. Both observers covered an approximate 15 county region. This area encompasses the primary range of AP and NAP geese in North Carolina. Due to declining goose numbers and other work priorities, only 1 full-time observer was available from 1991 to 1996. Throughout the time period it took the observer(s) 1-2 weeks to visit all known goose locations in the region. All banding and observation records were sent to researchers heading flyway projects for compilation into master banding and observation files for the flyway.

To determine population characteristics, we queried several databases including:

1. Observations within the Atlantic Flyway of North Carolina winter banded geese from 1984 to 1996. Observations outside of North Carolina of geese banded with yellow/black collars from 1984 to 1990 were not available after 1990.
2. Observations within the Mississippi Flyway of North Carolina winter banded geese. Observations were available from 1984 to 1996.
3. Observation of geese neck collared outside of North Carolina and observed in North Carolina from 1984 to 1996.
4. Legband recovery data as of April 1997.

We assigned geese to a population affiliation by reviewing observation and harvest data (Table 1). Geese were considered residents if they were observed or harvested anywhere south of 47 degrees latitude from 16 May - 15 September (Atlantic Flyway Canada Goose Committee, Requested Data for Evaluation of Special Canada Goose Seasons, 1996). Geese located south of 47 degrees longitude and during this time period are highly likely to be resident geese (Hindman and Ferrigno 1990). Geese were considered potential migrants (PM) if they had been observed in any state other than North Carolina and were never observed within the 16 May - 15 September time period. Geese were considered to have an unknown population affiliation if they were never seen outside of North Carolina and were not seen in the 16 May - 15 September time period. We also plotted observation and legband recovery locations of resident and potential migrant geese to help determine if geese were from the AP, NAP or SJB. Hanson and Smith (1950) describe the breeding and wintering distribution of SJB geese, while Bellrose (1980) and the Atlantic Flyway Technical Section (1998) describe the distribution of Atlantic and North Atlantic Population geese respectively (Figure 3). We considered geese to have an exclusive NAP affiliation if they were observed/harvested in Prince Edward Island (PEI), Nova Scotia (NS), New Brunswick (NB), or Newfoundland (NF).

To determine arrival dates of migrant geese, we looked to see what dates potential migrant birds banded in North Carolina were reobserved in North Carolina and arrival dates of potential migrant geese banded outside of North Carolina. We looked at all observations of geese east of the 77th degree line of longitude to gather observation data of out-of-state banded geese (Figure 4). We chose this somewhat arbitrary line because nearly all

observations of known SJBP geese are found west of this line and most known concentrations of AP and NAP geese are found east of this line in North Carolina.

Numbers of wintering AP and NAP Canada geese were estimated by identifying numbers of unique collared geese observed per month and multiplying this by a conversion factor relating total number of migrant geese per neckband (Atl. Flyway Canada Goose Committee, Requested Data for Evaluation of Special Canada Goose Seasons, 1996). We included only collars observed north of 35 degrees latitude and east of 78 degrees longitude. This is thought to include the entire range of AP and NAP geese in North Carolina. We compared the January neck collar estimate to our annual mid-winter inventory. The mid-winter inventory data included survey units encompassing the primary range of AP and NAP geese and was corrected by subtracting a constant of 2856 resident geese. Resident geese were estimated from a September 1995 survey of the same area.

To get an idea of fall movements of North Carolina banded geese in the flyway, we looked at earliest first-time observations of geese in different latitudinal ranges for different time periods. Charts were plotted to look for trends (if any) in a southward migration through the flyway. Fidelity to North Carolina was determined by totaling numbers of geese reobserved in North Carolina 1 or more years after banding.

Results

Population affiliation & Inter-state movements

Of 5411 collared geese, 3958 (73.1%) were subsequently reobserved or harvested after banding and are included for analysis (Table 1). A total of 3156 (79.7%) of the collared geese were considered potential migrants. Geese considered as residents accounted for 4.3% of birds observed while 16.0% of geese observed were not assigned a population affiliation (Table 1). See Appendix B for a breakdown of population affiliation by banding site.

Geese considered potential migrants were observed in 28 states and provinces (Table 2) with 69.4% of the observations of unique collared birds occurring in Maryland, New York, and North Carolina. Resident geese were seen primarily in North Carolina (Table 2). Plots of observed and harvested geese from many banding sites indicate that most geese were affiliated with the AP (Figures 5-21). Three sites (Spot, Pea Island, and Weeksville) appeared to have a mixture of both AP and NAP geese. At Spot, 19.4% of PM geese were seen or harvested in either PEI, NS, NB, or NF, 18.7% at Pea Island, and 4.8% at Weeksville. No other banding site had a percentage greater than 1.3%. Nearly all banding sites had geese that were either seen or harvested in the Mississippi Flyway. However, no site appeared to have an overwhelming number of geese in this region and would not appear to be a good candidate for exclusive SJBP affiliation.

Table 1. Summary of banding totals and population affiliation of geese banded in Coastal Plain North Carolina, 1983-1994.

Total Banded	5411
Total Observed or Harvested	3958 (73.1%)
Potential Migrant	3156 (79.7%)
Resident	167 (4.3%)
Unknown	635 (16.0%)

Table 2. Numbers of geese observed and/or harvested in various states and provinces, winter banded in Coastal Plain, North Carolina, 1984-1994. Note: In several instances a single goose may have been observed in more than 1 state or province.

Place Observed	Population Affiliation	
	Resident	Migrant
Atlantic Flyway		
Connecticut	0	69
Delaware	0	441
Maine	0	4
Maryland	8	2075
Massachusetts	3	28
New Brunswick	0	12
New Hampshire	0	1
New Jersey	9	167
New York	29	1036
North Carolina	125	870
Nova Scotia	0	14
Ontario	0	57
Pennsylvania	14	303
Prince Edward Island	0	89
Quebec	0	113
Rhode Island	0	13
South Carolina	0	7
Vermont	0	4
Virginia	13	390
West Virginia	0	2
Mississippi Flyway ^a		
Alabama	0	3
Kentucky	0	1
Illinois	0	4
Indiana	0	1
Michigan	0	8
Ohio	0	16
Tennessee	0	1
Wisconsin	0	8

^a no routine collar observations were made during summer months in the Mississippi flyway.

Geese banded outside of North Carolina were also observed. Of the 299 geese observed, 215 (71.9%) were considered potential migrants (Table 3). Of the remaining 84 geese considered residents, 77.4% were banded in New York. The majority of resident geese banded in New York were observed in the Pungo area of Washington County.

Table 3. Numbers of resident and potential migrant geese observed east of 77 degrees longitude, North Carolina and banded outside of North Carolina, 1983-1995.

Place Banded	Population Affiliation	
	Resident	Potential Migrant
Connecticut	2	1
Delaware	3	11
Maryland	2	105
Massachusetts	1	
New Jersey	5	7
New York	65	33
Pennsylvania	1	8
Prince Edward Island		8
South Carolina	2	12
Virginia	2	30
West Virginia	1	

Arrival dates of migrant geese

Of those geese banded in North Carolina, earliest arrival dates occur in the 16 September – 30 September time period. However, this accounted for only 0.1% of the observations. Significant numbers of migratory geese started arriving in the 16 October – 31 October time period, with 11.1% of the first time observations occurring then. After this time period, similar numbers of unique collared geese were observed for subsequent two-week time periods (Fig 22). Arrival dates of geese by banding site were quite variable and showed no discernable pattern. One notable exception was that geese banded at Edenton were reobserved for the first time earlier in the fall when compared to other banding locations. Geese banded outside of North Carolina were typically observed later in the winter for the first time with peak numbers occurring in the 1 January – 15 January time period (Fig 23)

Numbers of AP and NAP Canada geese (1992-1995)

For the time period, numbers of Canada geese showed an increasing trend from October through January (Figure 24). Numbers declined slightly in February in most years. The highest estimated total of AP and NAP geese was 6784 in January 1993. Numbers of Canada geese estimated by neck collars consistently were lower than those estimated by aerial survey, but do track the year to year trend for the time period (Figure 25)

Migrational Progression of geese through the flyway

Of geese banded in North Carolina, there was generally a downward trend for first-time observations as the fall progressed in the 42-44 degree latitude range and the 38-40 latitude range (Fig. 26). While there was a downward trend in the 38-40 degree latitude range, at least 40% of geese were observed for the first time throughout the winter in this area. There was generally an upward trend throughout the fall and winter for first time observations in the 36-38 and 34-36 degree latitude range. Percentage of first time observations of unique collared geese remained relatively steady throughout the fall and winter in the 40-42 degree latitude range.

Fidelity to North Carolina by banding site.

The percentage of geese reobserved in North Carolina in at least 1 year following banding varied considerably among banding sites. Of those sites with at least 100 PM geese banded, percent reobserved ranged from 7.0% at Weeksville, to 46.1% at Waupoppin Canal (Table 4).

Table 4. Percent of potential migrant geese reobserved in North Carolina at least 1 year subsequent to banding. See Appendix A for corresponding county locations and 10 minute banding blocks.

Banding Location	# of Potential Migrants	% reobserved in NC
Mattamuskeet NWR (Waupoppin Canal)	165	49.7
20/20 Sand & Gravel	7	42.9
Pea Island NWR	294	39.8
Mattamuskeet NWR (Lake Landing)	457	39.2
Seaboard (Woodard's)	29	37.9
Mattamuskeet NWR (Hester Lakeshore)	152	35.5
Grandy (Ralph Barco)	158	32.3
Mattamuskeet NWR (Sandy Dike)	136	30.9
Pendleton (Collin's pond)	41	29.3
Edenton (Crisanti's, Gilliam Woods)	457	27.1
Yeopim (Drummond's Point)	105	25.7
Lake Phelps	16	25.0
Tetterton farm	16	25.0
Spot (United Turf farm)	165	23.6
Merry Hill (Avoca, Scotch Hall, Willow Branch)	185	23.8
Colerain (Perry's pond, Perry's Point)	194	21.6
Pocosin Lakes NWR (Pungo Lake)	253	11.9
Mackay Island NWR	10	10.0
Ahoskie	25	8.0
Weeksville (Leigh farms)	272	7.0
Glover's	7	0.0
Mapleton	5	0.0
Pollocksville (Bell Farm)	5	0.0
Barco (Morris pond)	2	0.0
Margaretsville Gravel Pit	No potential migrants banded	
New Bern	No potential migrants banded	
Total	3156	27.6

Discussion

Population affiliation of winter banded geese

Potential migrants

The majority of geese banded during these studies were considered potential migrants. This is in direct contrast to geese banded in the Piedmont portion of state, where an earlier report identified that most geese banded in that area were considered residents. Plots of observed and harvested geese suggest that the majority of geese were from the AP, with fewer geese deriving from the NAP or SJBP. Delineation of areas in North Carolina that may be considered AP, NAP, or SJBP exclusive would be difficult. However, the Outer Banks portion of North Carolina should be considered to contain the primary wintering area for NAP geese in North Carolina. Only 3 areas had greater than 2% of banded geese classified as NAP exclusive. Two of the sites, Pea Island and Spot, are located on the Outer Banks. Geese at the third area (Weeksville) apparently no longer winter at this site as very few have been observed there in the last 6-8 years.

The relatively low number of geese reobserved in North Carolina (22% of potential migrants) indicates that many of the geese banded may have a low wintering affinity to North Carolina. There is a possibility that many geese banded during these studies were displaced birds from other areas. Trapping was mostly conducted during January and February at a time when displaced birds were most likely to be present and success was higher during years with colder than normal weather.

Resident geese

In accordance with study objectives of banding migratory geese, banders were very successful as few resident birds were marked. Most resident geese marked were later observed in North Carolina indicating that they are probably residents of the state. Very few resident geese were seen outside of North Carolina. With the exception of a large group of geese marked in New York, very few resident geese from other states were observed in coastal plain North Carolina. It is interesting to note that the flock of New York resident geese was estimated at 300-400 birds. This group of birds was observed for several years in the Pungo Lake area where from 1992-1995 the total geese surveyed in the mid-winter inventory ranged from 430 to 1200 birds. It is not know if this group of geese from New York still makes annual migrations to North Carolina.

Arrival Dates of Migrant Geese

Observations indicate that migratory Canada geese start to arrive in the northern coastal plain during the first 2 weeks of October. Year to year variation in arrival dates is not well known as the low number of collars observed in individual years makes interpretation more difficult. The low numbers of geese observed that were banded in other states and the overall later arrival date of these birds implies that out-of-state banded geese may have lower wintering affinity to North Carolina. Movement of these geese to North Carolina may be

weather related. The earlier arrival date of North Carolina banded birds implies that at least a portion of these birds have a strong affinity to North Carolina.

In contradiction to arrival dates of Piedmont winter banded geese, we feel that observed arrival dates are reasonably reflective of actual dates. Observers in the coastal plain were generally able to visit all locations within 2 weeks and special attention was made during the last couple of weeks in September to record arriving migrants. Especially for the late September to mid-October time period, lag time between arrival and observation was considered minimal.

Numbers of AP and NAP Canada geese (1992-1995)

Estimation of numbers of Canada geese confirm previous observations indicating that Canada goose numbers peak in January and provides evidence that the mid-winter inventory tracks the year to year trend in migratory goose numbers. The actual estimate was likely lower than aerial survey estimates due to the lack of a conversion factor for the observation of yellow-black neck collars. Yellow-black collars were placed on birds in the mid-late 80's and many were observed during the 1992-1995 time period.

Migrational Progression of geese through the flyway

Our attempt to monitor movements of North Carolina banded geese was an effort to determine if there were areas in the flyway that essentially contain no North Carolina geese at specific times of the fall and winter. We felt this was important in light of the reopening of hunting seasons on AP geese. From this analysis, it appears that North Carolina banded Canada geese were found throughout the flyway throughout the fall and winter, although relatively small percentages of geese were ever observed north of 40 degrees latitude. While there was a downward trend as the season progressed, the 38-40 degree latitude range contained a large percentage of Canada geese throughout the fall and winter. A specific recommendation of season dates to sharply limit the take of North Carolina winter banded geese would be difficult. The general recommendation of hunting as late as possible is the best suggestion from this analysis.

Fidelity of geese to North Carolina by banding site.

Interpretation of wintering fidelity based on collars reobserved is difficult as we have no basis to judge what percentage can be classified as a high or low fidelity. However, the wide range in the percent of geese reobserved by banding site suggests that certain flocks of geese do have a stronger winter fidelity to North Carolina, when compared to other flocks. It is interesting to note that all flocks of geese banded in the Lake Mattamuskeet NWR area had a much higher percentage of reobservations when compared to other flocks. Historically and currently, Lake Mattamuskeet National Wildlife Refuge (NWR) is considered to hold the "core" group of migratory Canada geese in coastal plain North Carolina. In light of tremendous declines in geese migrating to North Carolina, a continued strong fidelity to this area is deemed very important.

Although it appears that there are differences in fidelity based on banding location, all areas in the coastal plain have experienced declines in goose numbers. Geese banded at Pungo NWR appear to have a relatively low fidelity to North Carolina, and as would be

expected, goose numbers have dropped greatly in this area. Conversely, fidelity appears much stronger from geese banded at Lake Mattamuskeet and Pea Island NWR's. In contradiction as to what would be expected, goose numbers have declined greatly in these areas also.

Management Implications

Due to declining numbers of Canada geese in the AP/NAP area (Figure 27), hunting for AP/NAP Canada geese in North Carolina was closed in 1992, while the remainder of the Atlantic Flyway was closed to hunting in 1995. Goose numbers have since increased to allow a very limited season in the flyway. Hunting for AP/NAP geese remains closed in North Carolina. Because of increasing resident goose numbers, the NCWRC has taken an active approach in attempting to maximize resident goose hunting while attempting to minimize migratory goose harvest. Based on neck collar observations, aerial surveys, and historical distribution, 11 counties in North Carolina are considered to hold nearly all AP and NAP Canada geese. To minimize migratory goose harvest in this area, hunting for resident geese does not extend past 30 September in 1 county and does not extend past 20 September in the remaining counties (Figure 28). The selection of season closing dates in this area has been based on known arrival dates (neck collar observations) with some conservatism built in to allow for the lag time between goose arrival and actual neck collar observation. If the goal is to allow no incidental AP harvest in seasons set for resident geese, this analysis indicates that there is no opportunity for season length expansion in the AP goose area. Federal regulations allow for a maximum 10% harvest of AP geese during resident goose seasons and results from this analysis indicate that this number is not likely being exceeded. In fact, only 2 potential migrant geese have been observed during the 16 September – 30 September period. Extending the goose season to 30 September in those counties with a current season closure of 20 September is unlikely to exceed the 10% AP goose harvest limit. Special late goose hunting seasons for this area are also not likely. Survey data suggest that many migratory Canada geese still remain in February and little observation data has been collected in March. Hunting for resident geese in March may not be desirable as many geese have begun to pair and are dispersed.

Efforts to protect North Carolina winter banded geese in other parts of the flyway will be difficult. This analysis shows that many geese banded in North Carolina are subsequently observed further north in the flyway throughout the winter. This suggests that some portion of North Carolina's winter banded geese simply do not have a strong affinity to return to the state. We do not know if this reflects a change in goose migration patterns or if simply a portion of the geese that were banded temporarily shifted to North Carolina due to inclement weather.

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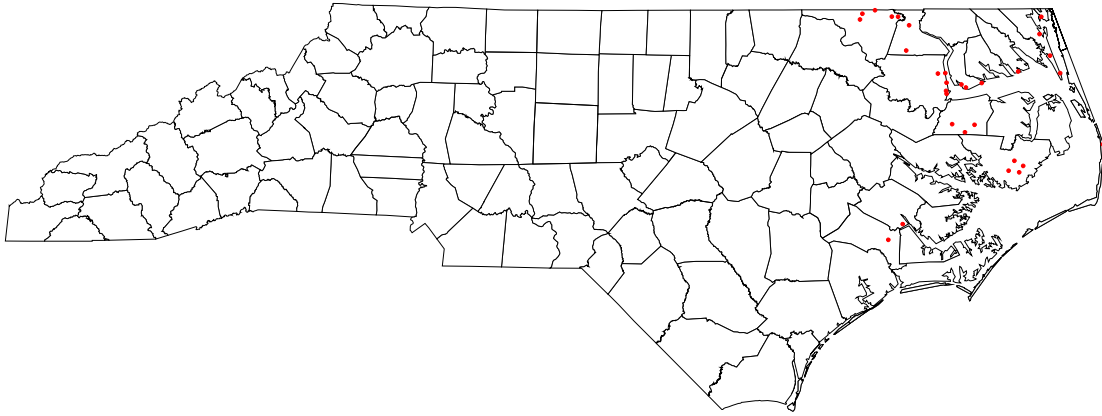


Figure 1. Locations of Coastal Plain, winter goose banding sites, 1984-1994.

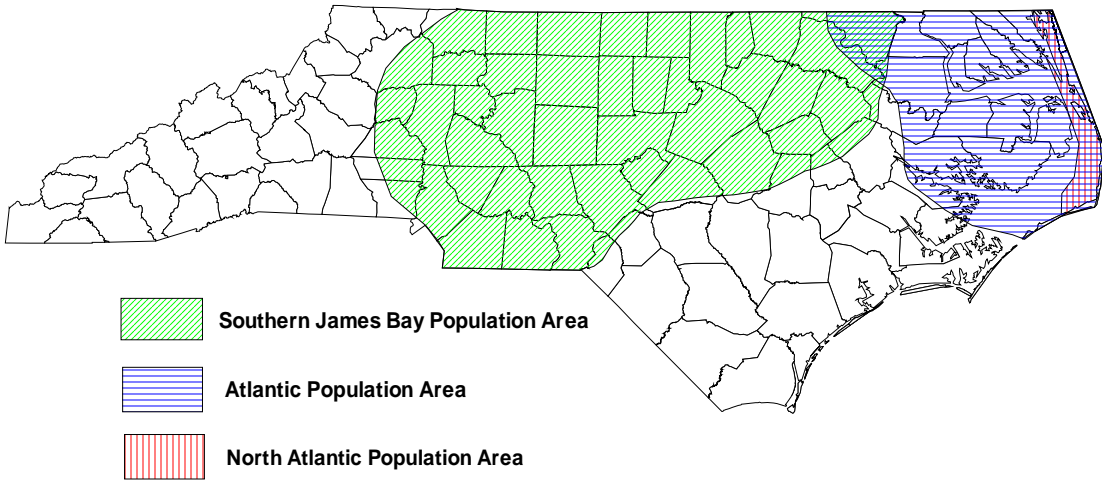


Figure 2. Southern James Bay, Atlantic and North Atlantic Population wintering areas in North Carolina.

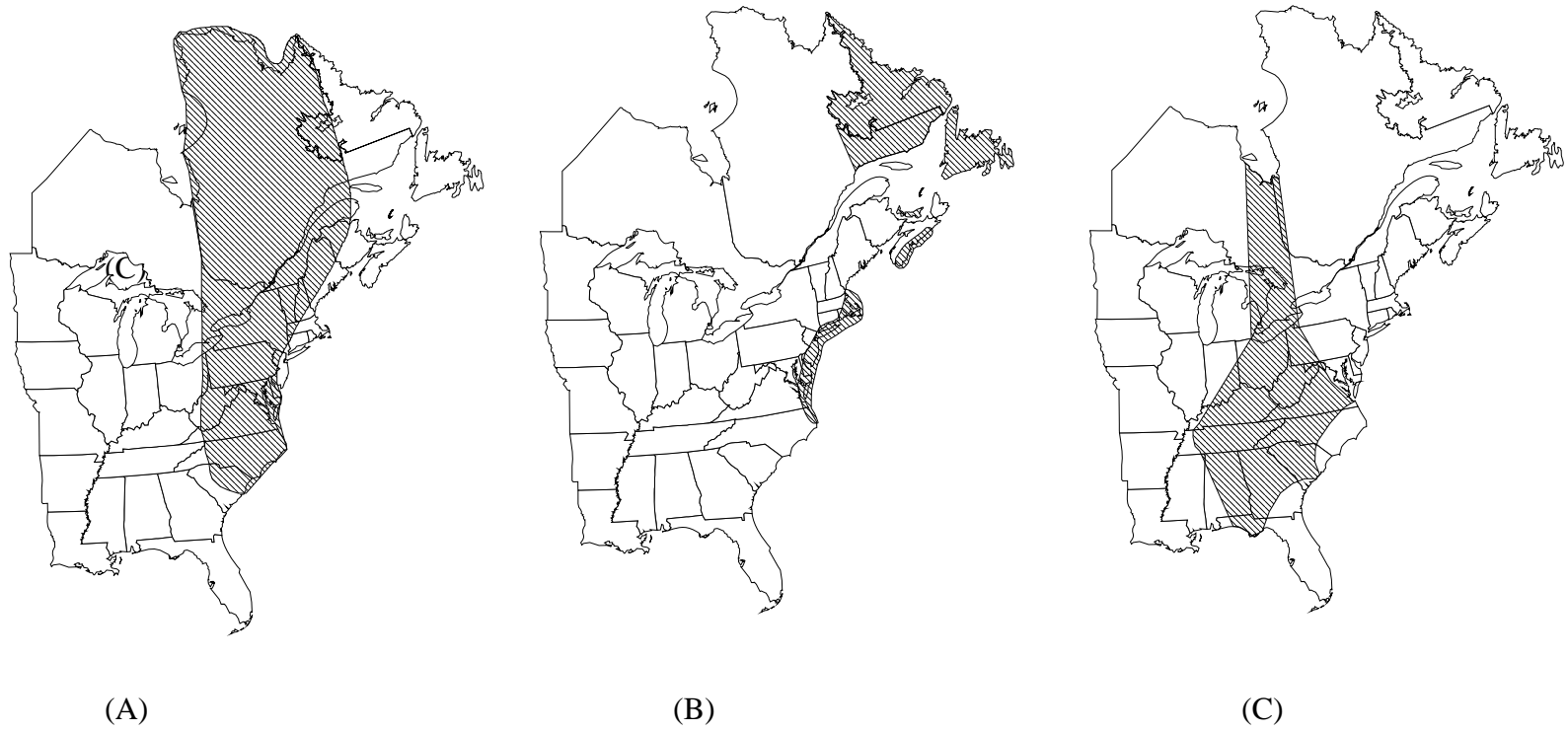


Figure 3. A. Distribution of Atlantic Population Canada geese described by Bellrose (1978). B. Distribution of North Atlantic Population Canada geese described by Atlantic Flyway Technical Section (1998). C. Distribution of Southern James Bay Population Canada geese described by Hanson and Smith (1950).

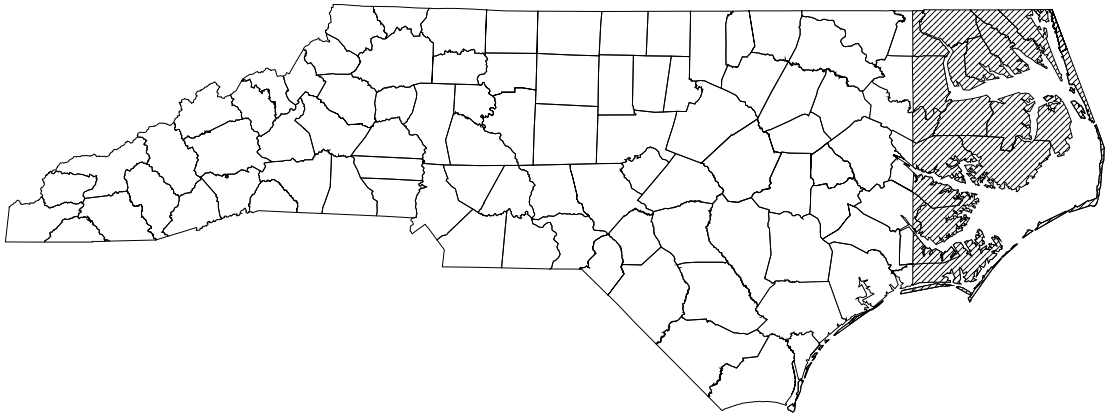


Figure 4. Area (slashed) included in database search for out-of-state banded Canada geese.

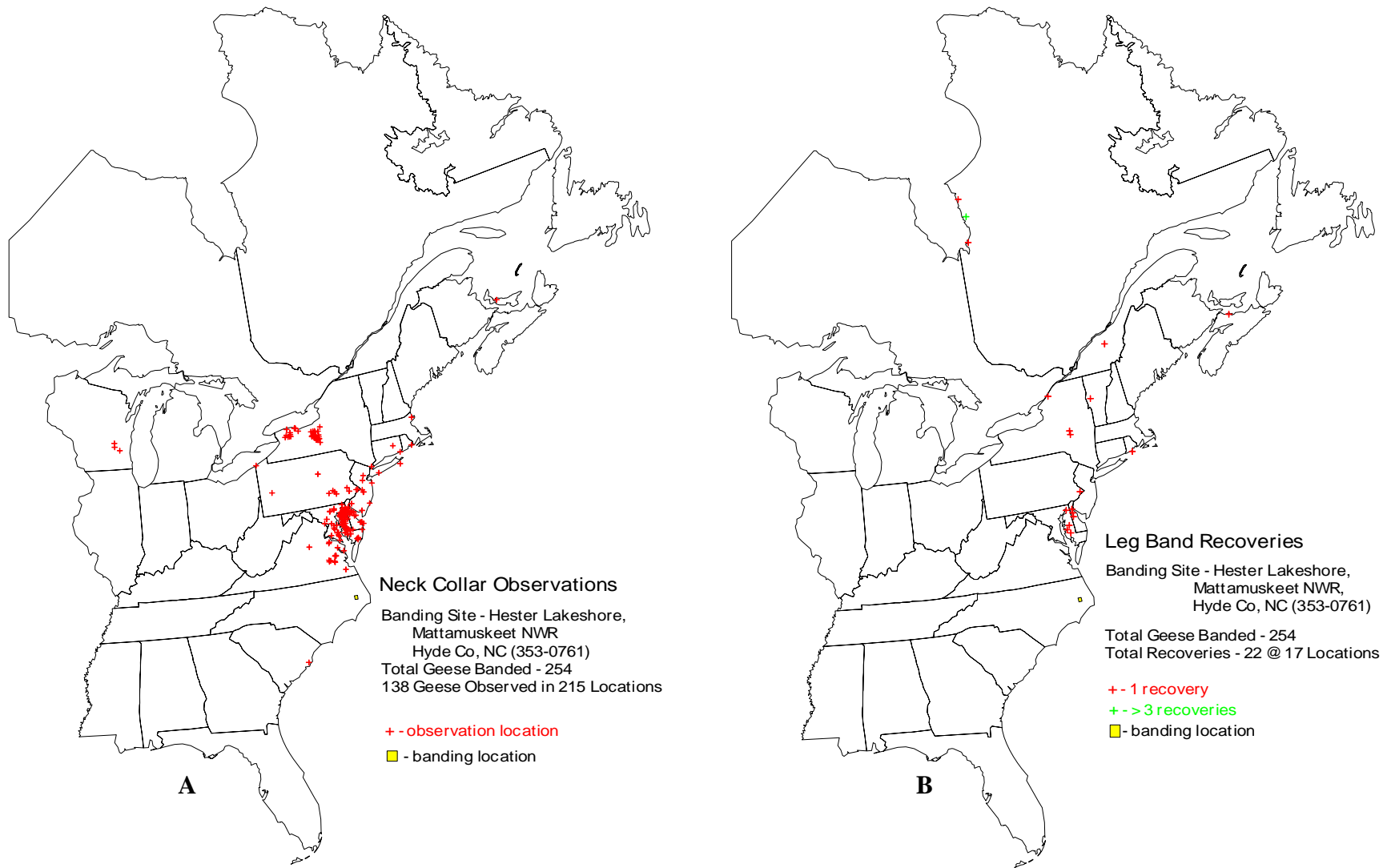


Figure 5. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, at Lake Mattamuskeet National Wildlife Refuge (Hester Lakeshore), Hyde County, North Carolina.

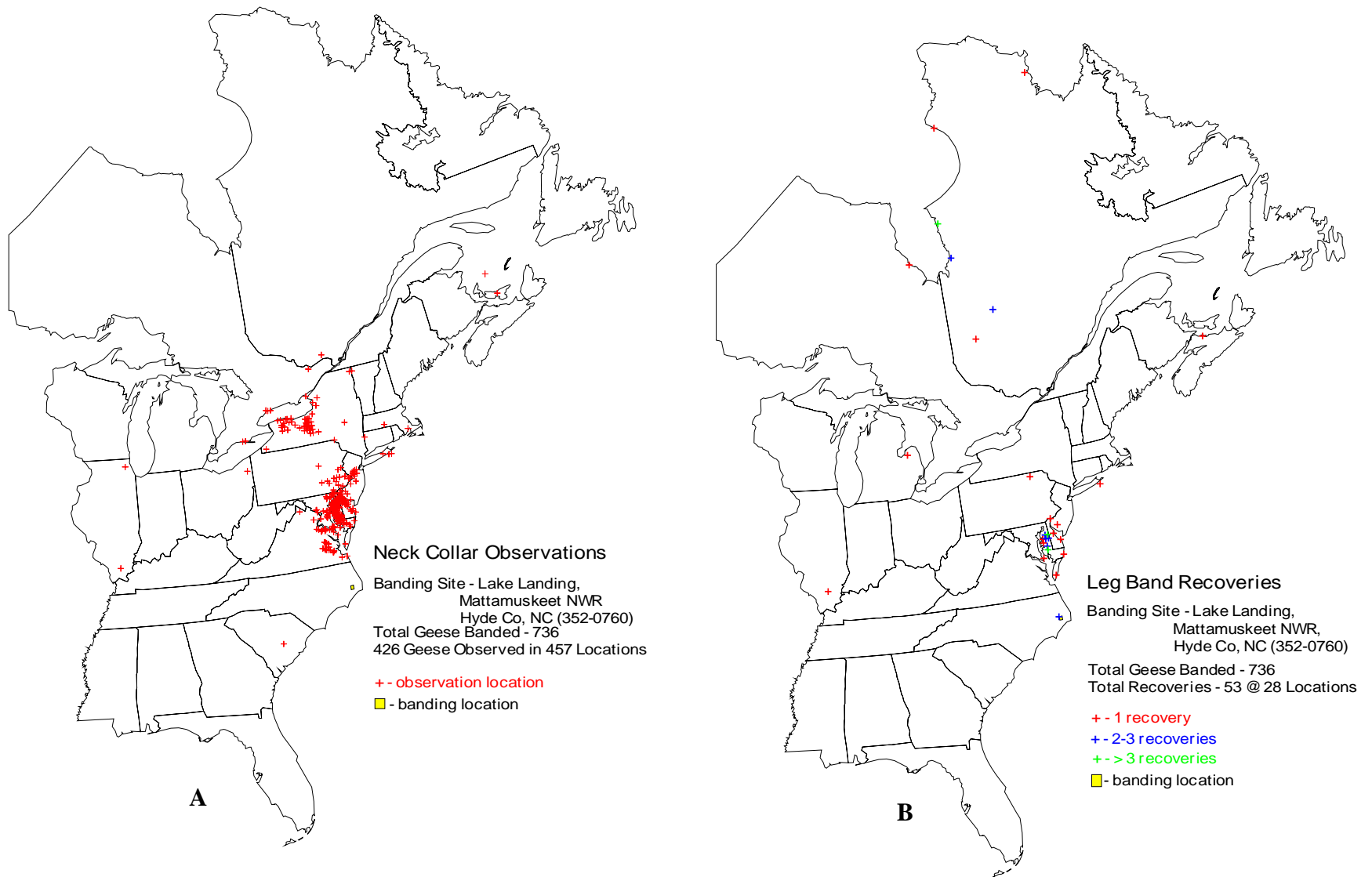


Figure 6. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, at Lake Mattamuskeet National Wildlife Refuge (Lake Landing), Hyde County, North Carolina.

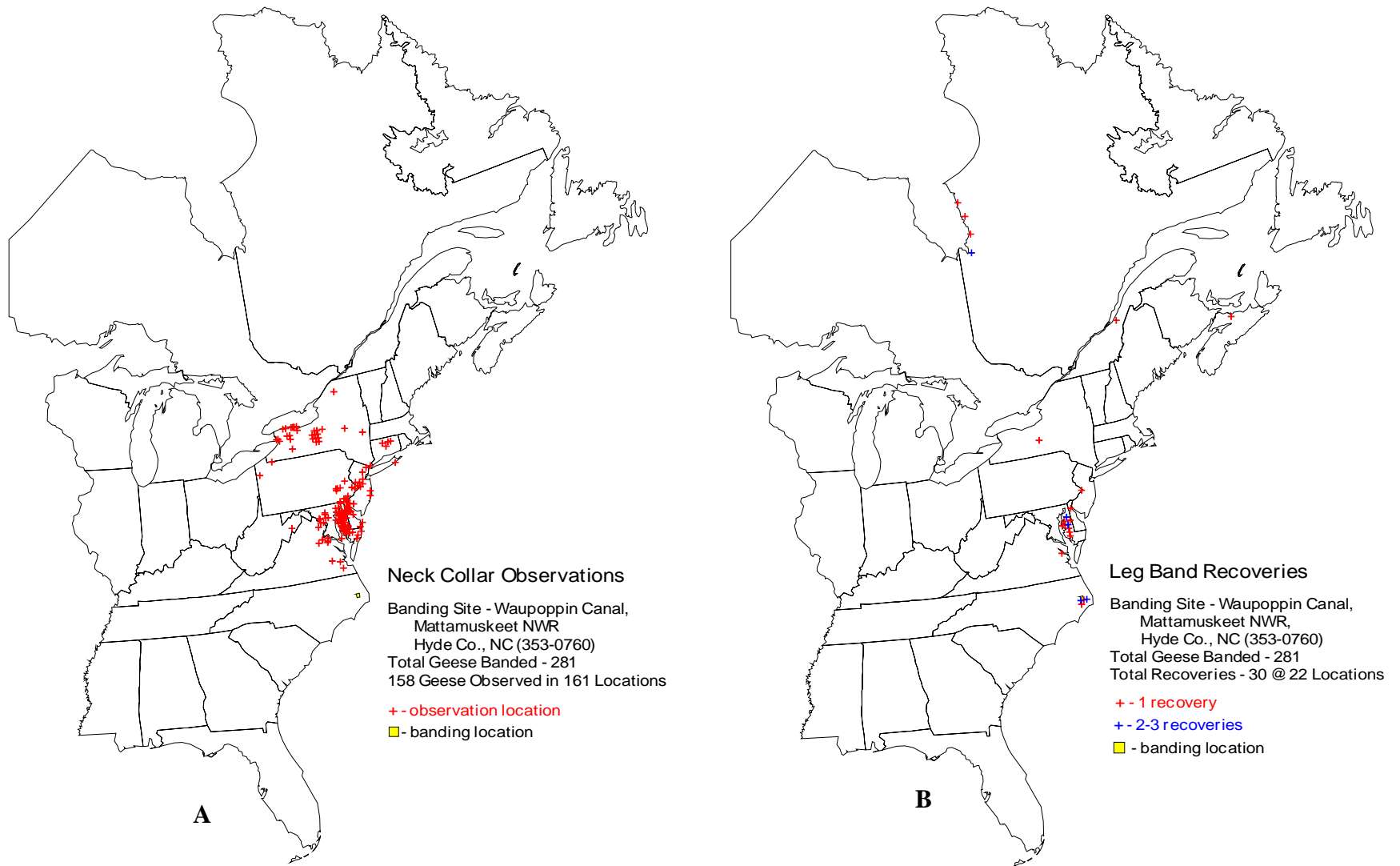


Figure 7. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, at Lake Mattamuskeet National Wildlife Refuge (Waupopin Canal), Hyde County, North Carolina.

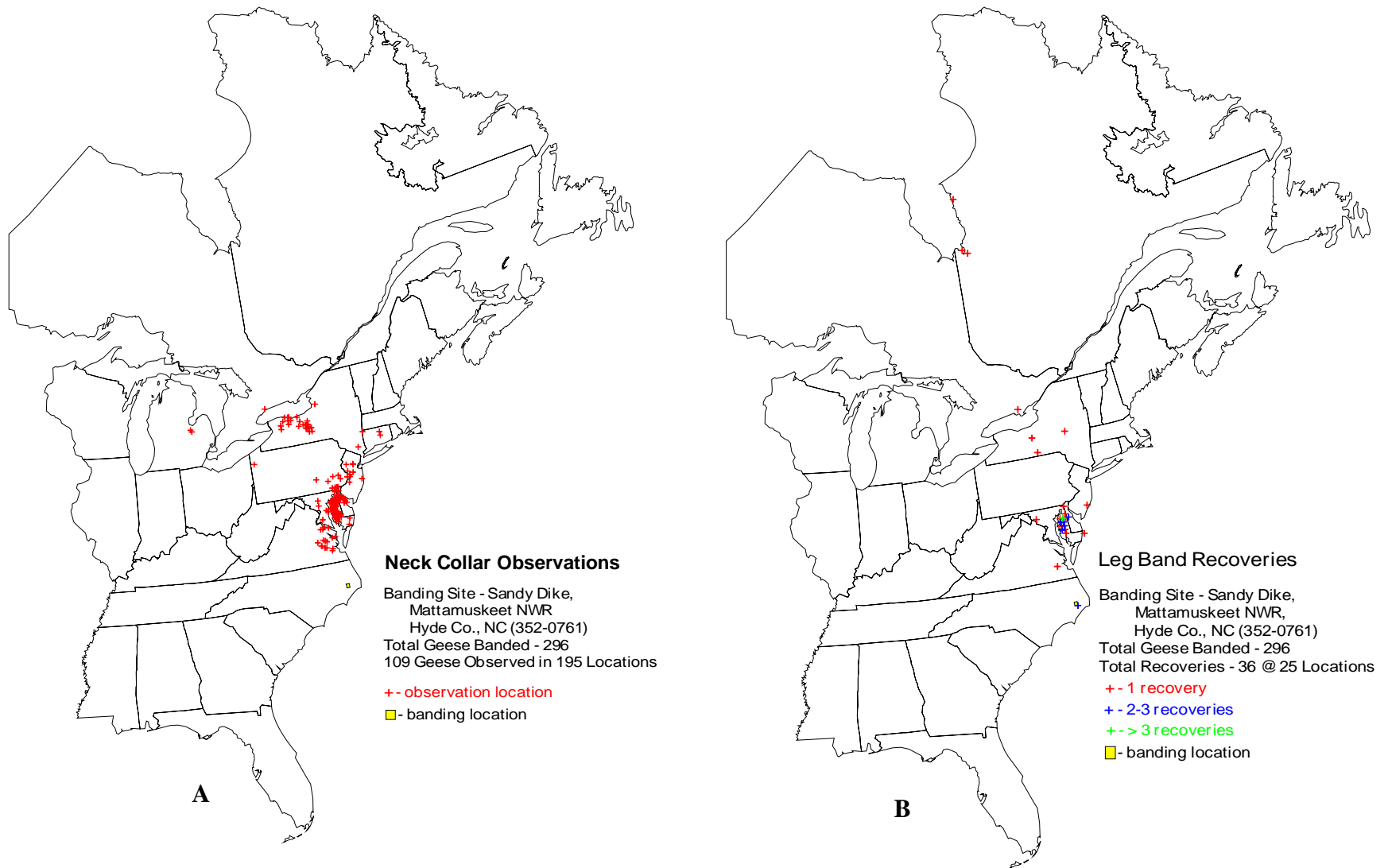


Figure 8. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, at Lake Mattamuskeet National Wildlife Refuge (Sandy Dike), Hyde County, North Carolina.

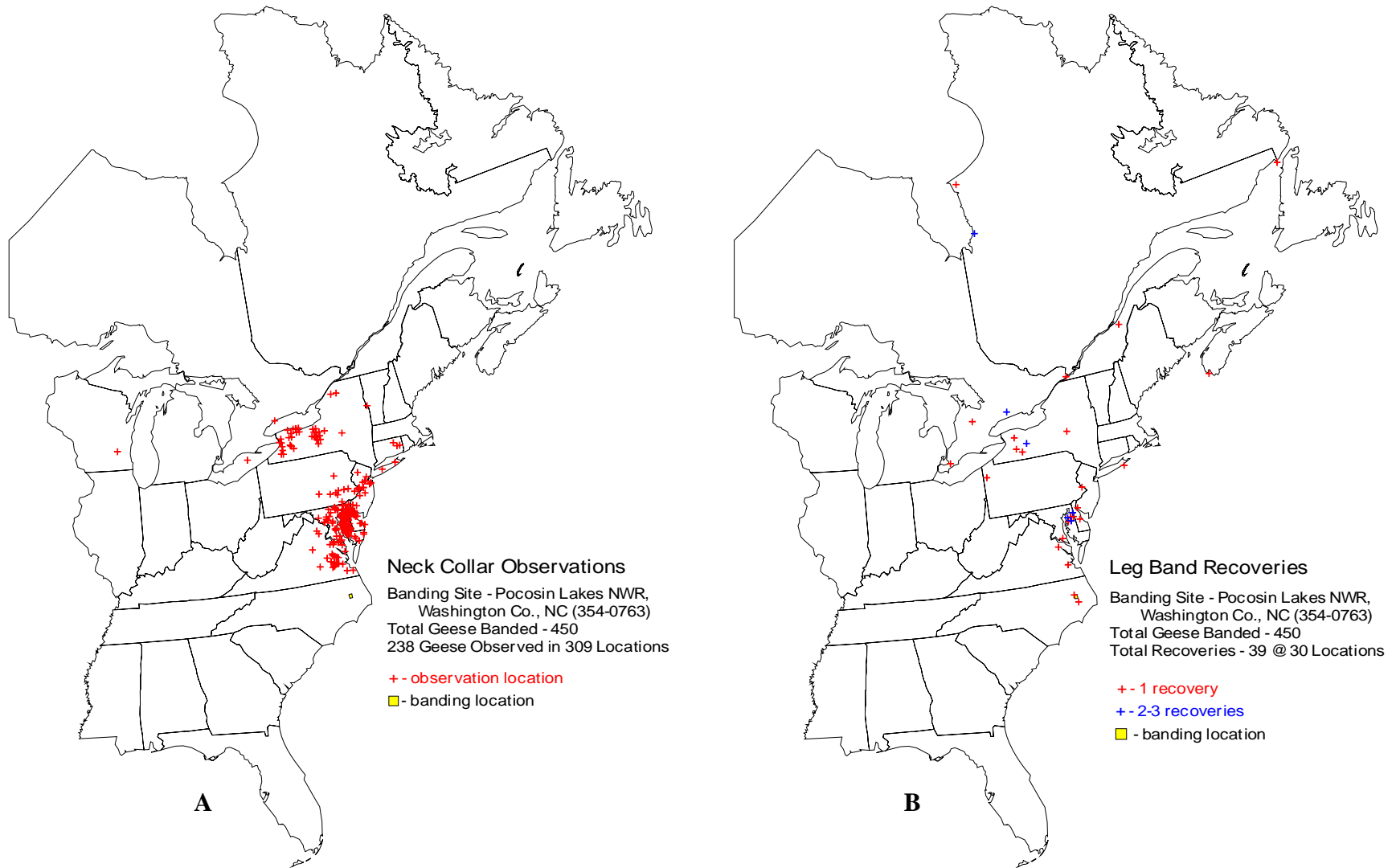


Figure 9. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, at Pocosin Lakes NWR (Pungo Unit), Washington County, North Carolina.

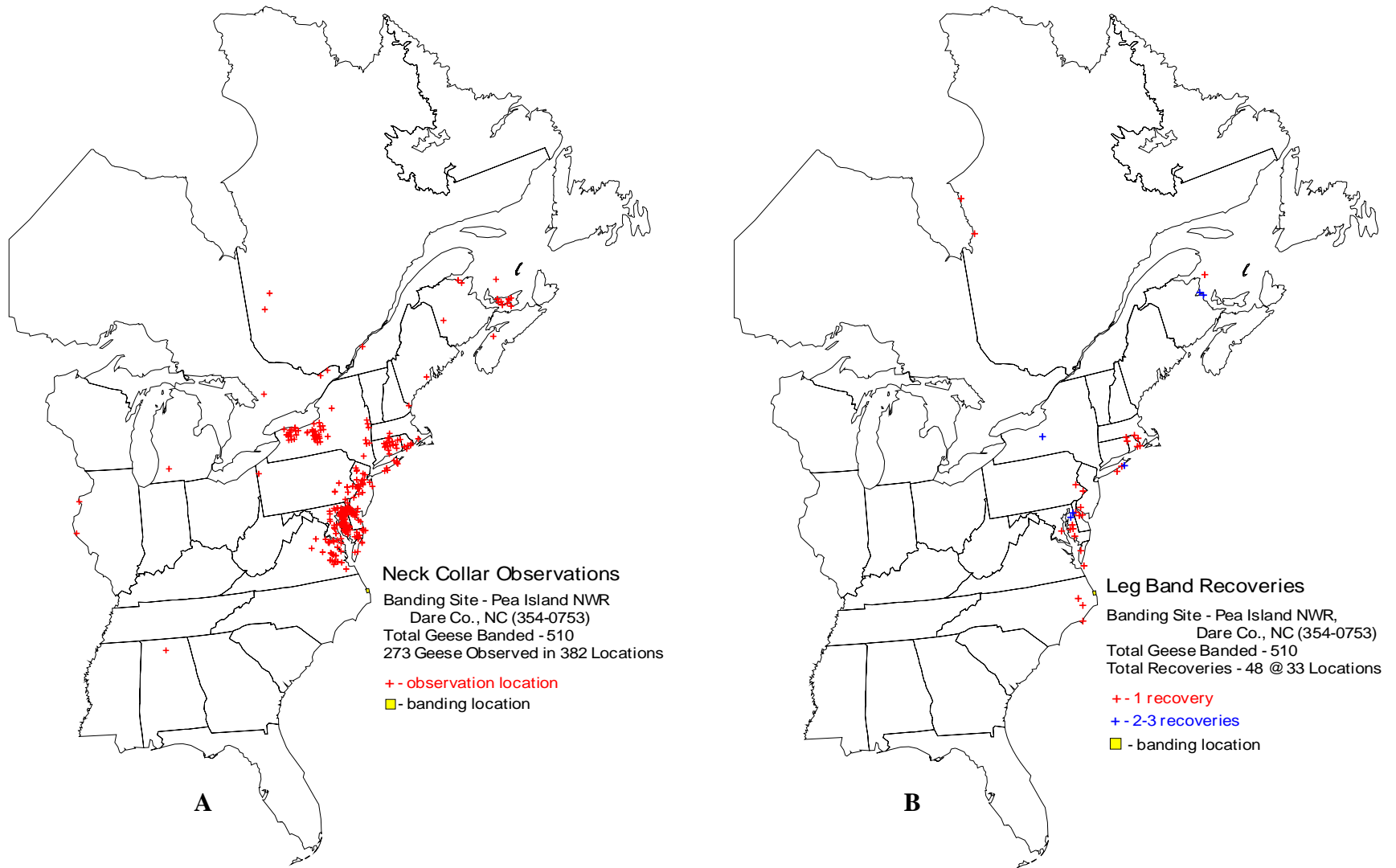


Figure 10. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, at Pea Island National Wildlife Refuge, Dare County, North Carolina.

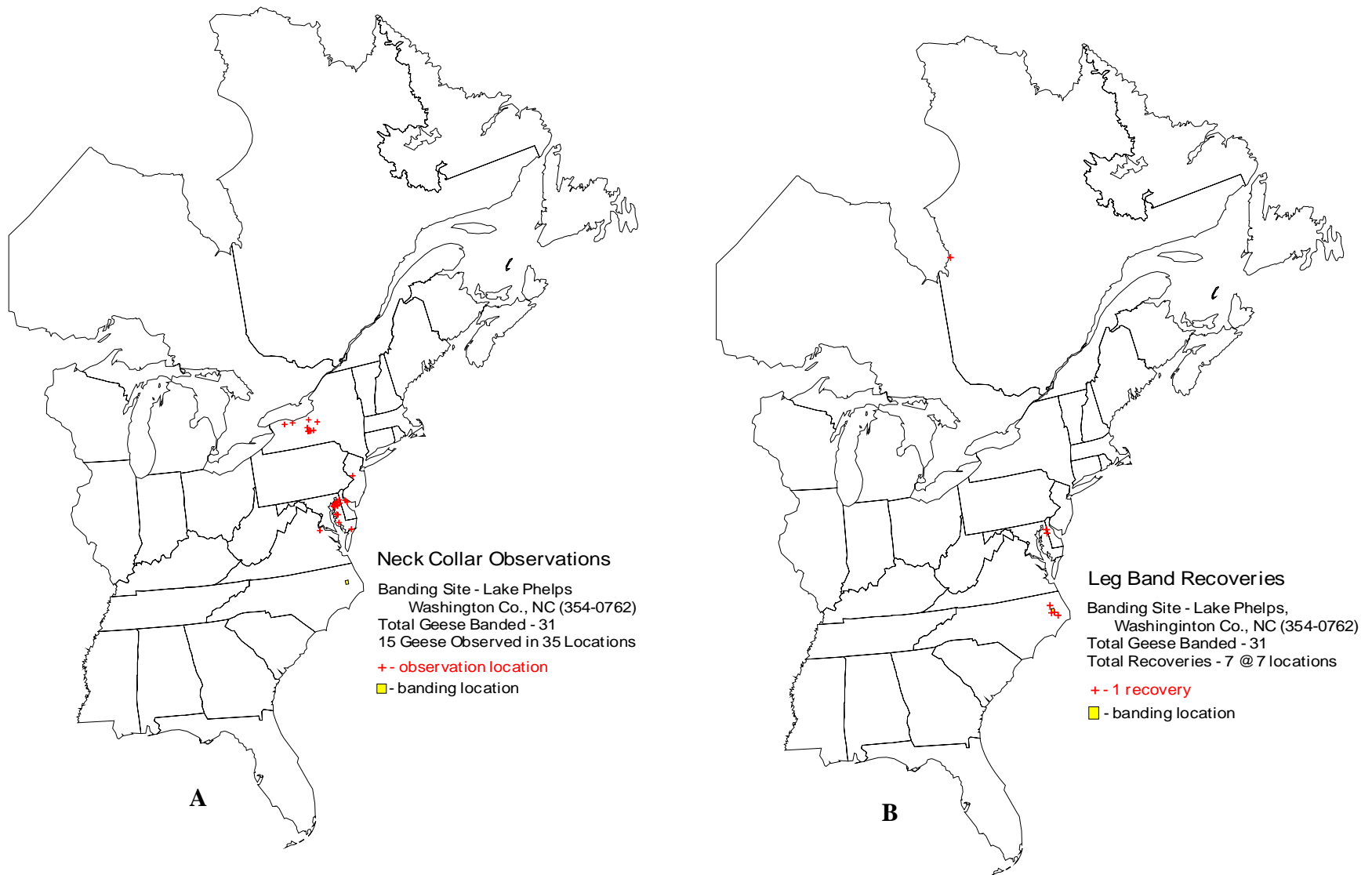


Figure 11. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, at Lake Phelps, Washington County, North Carolina.

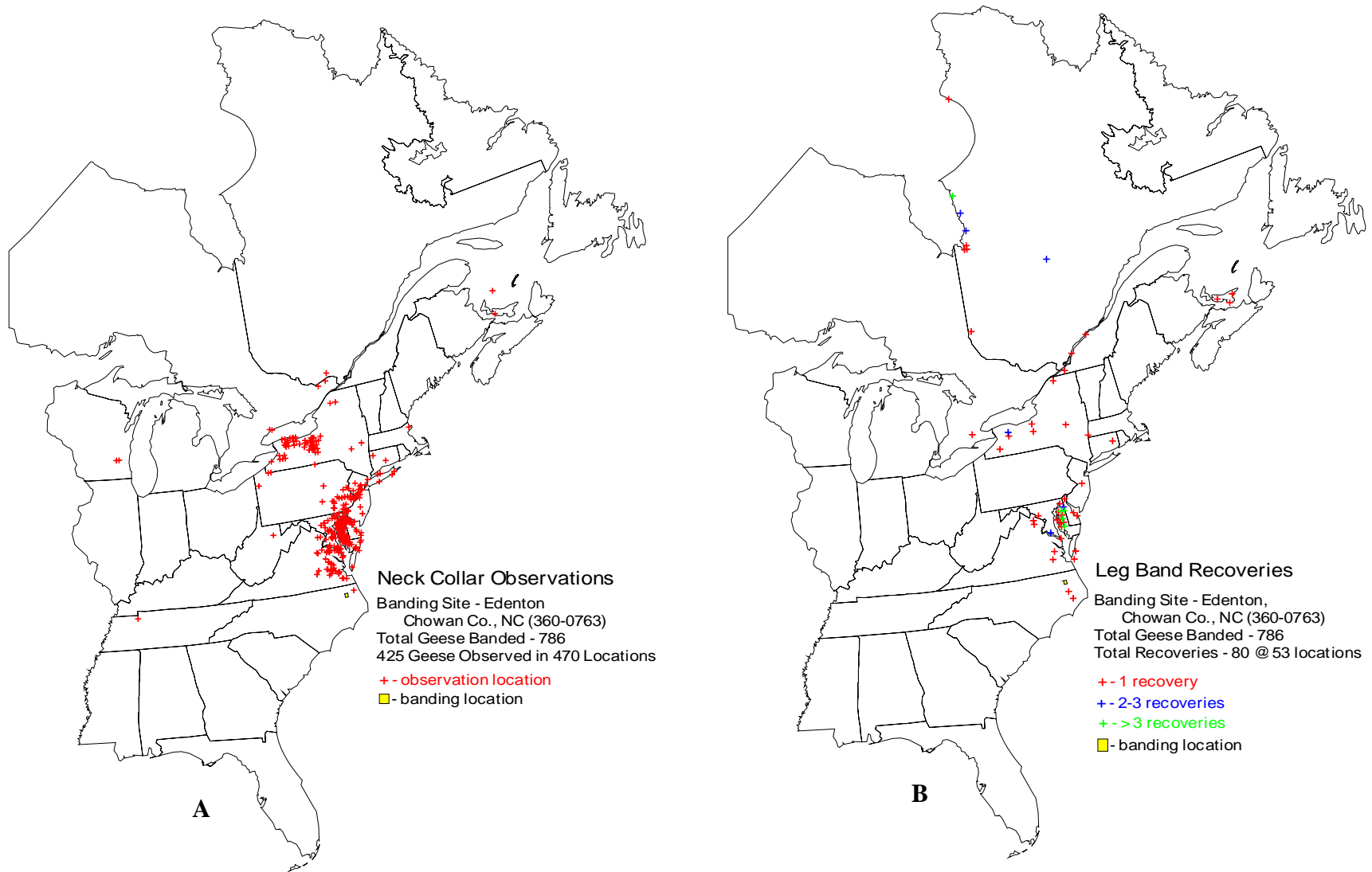


Figure 12. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, near Edenton, Chowan County, North Carolina.

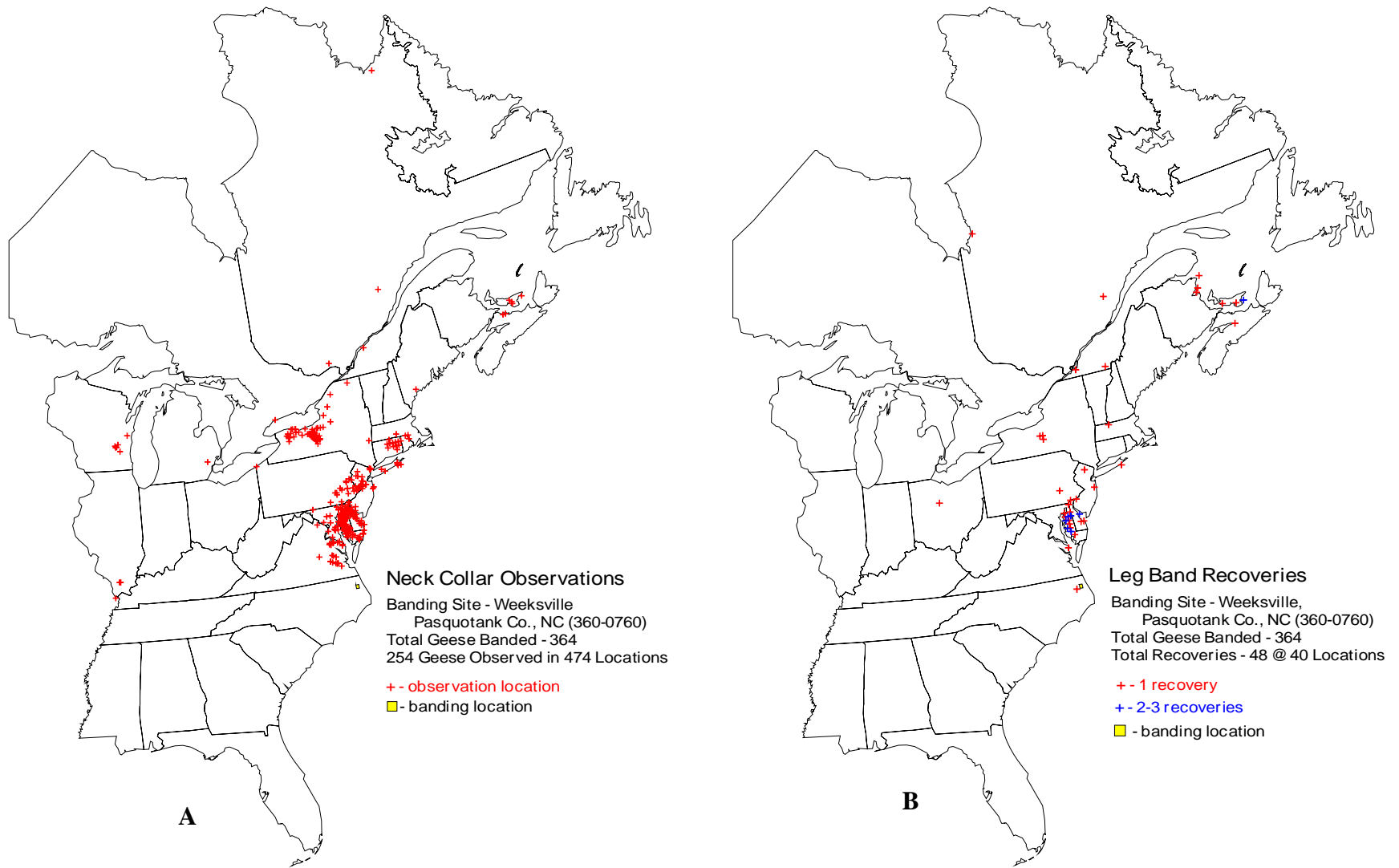


Figure 13. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, near Weeksville, Pasquotank County, North Carolina.

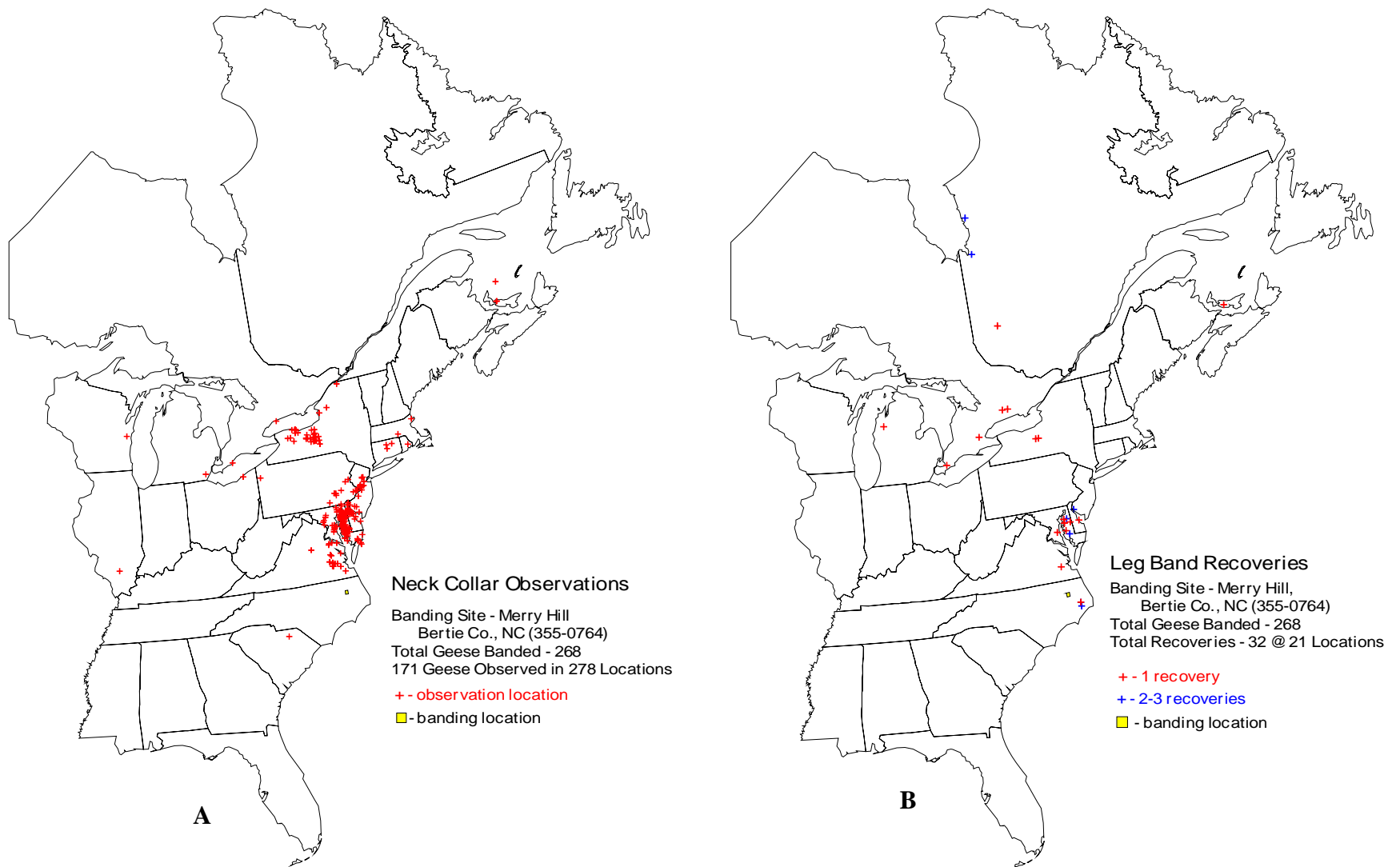


Figure 14. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, near Merry Hill, Bertie County, North Carolina.

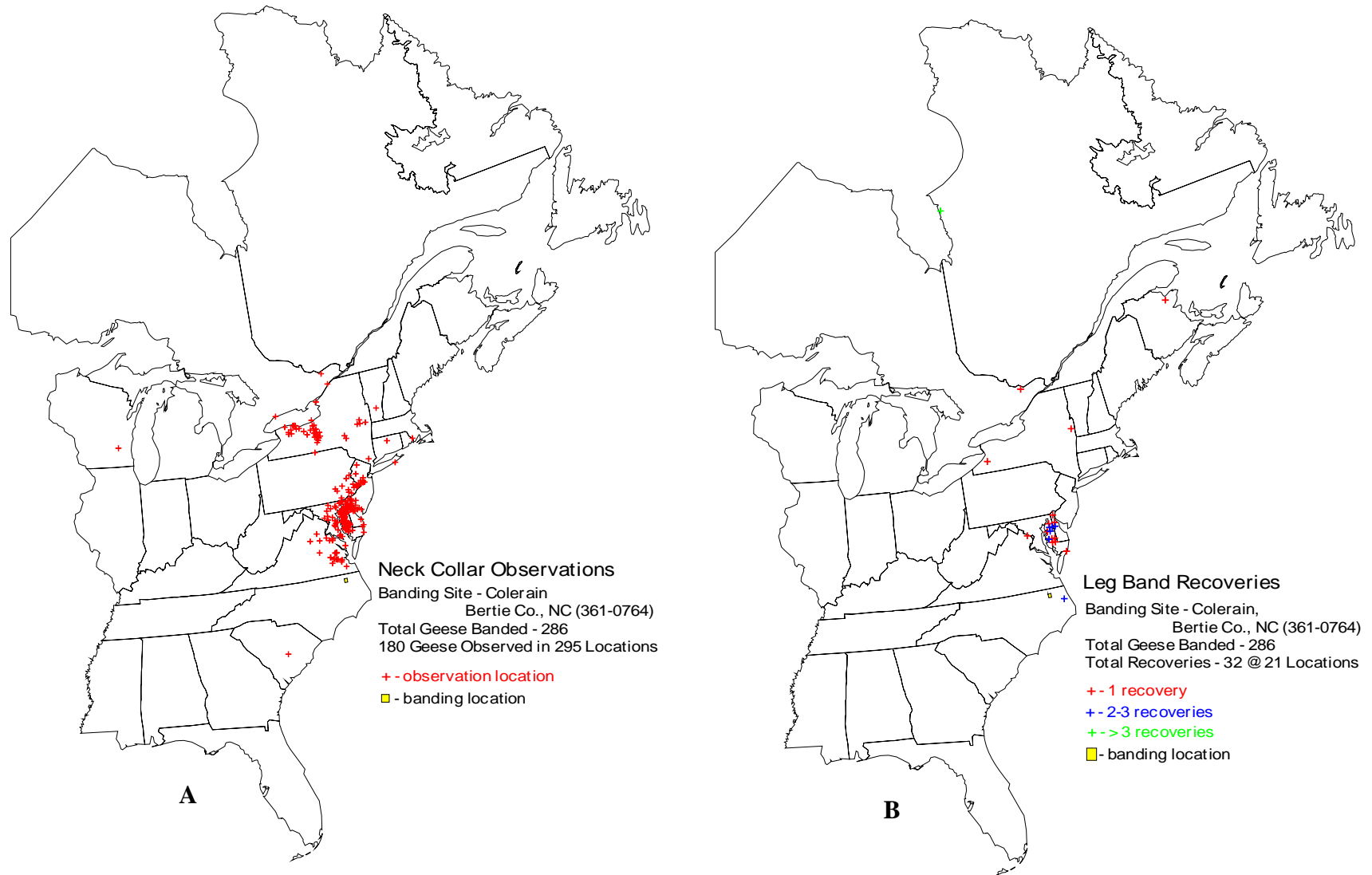


Figure 15. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, near Colerain, Bertie County, North Carolina.

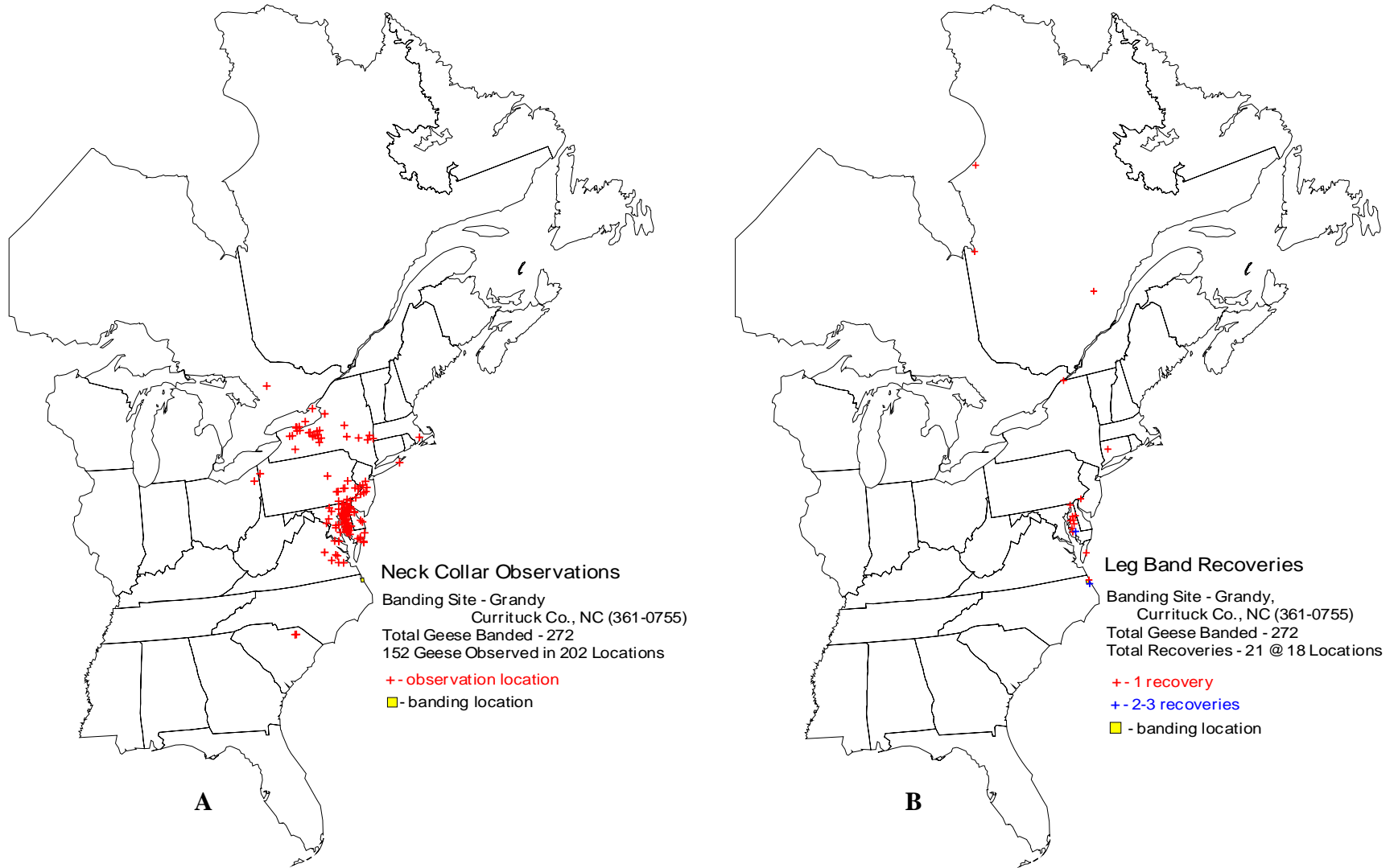


Figure 16. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, near Grandy, Currituck County, North Carolina.

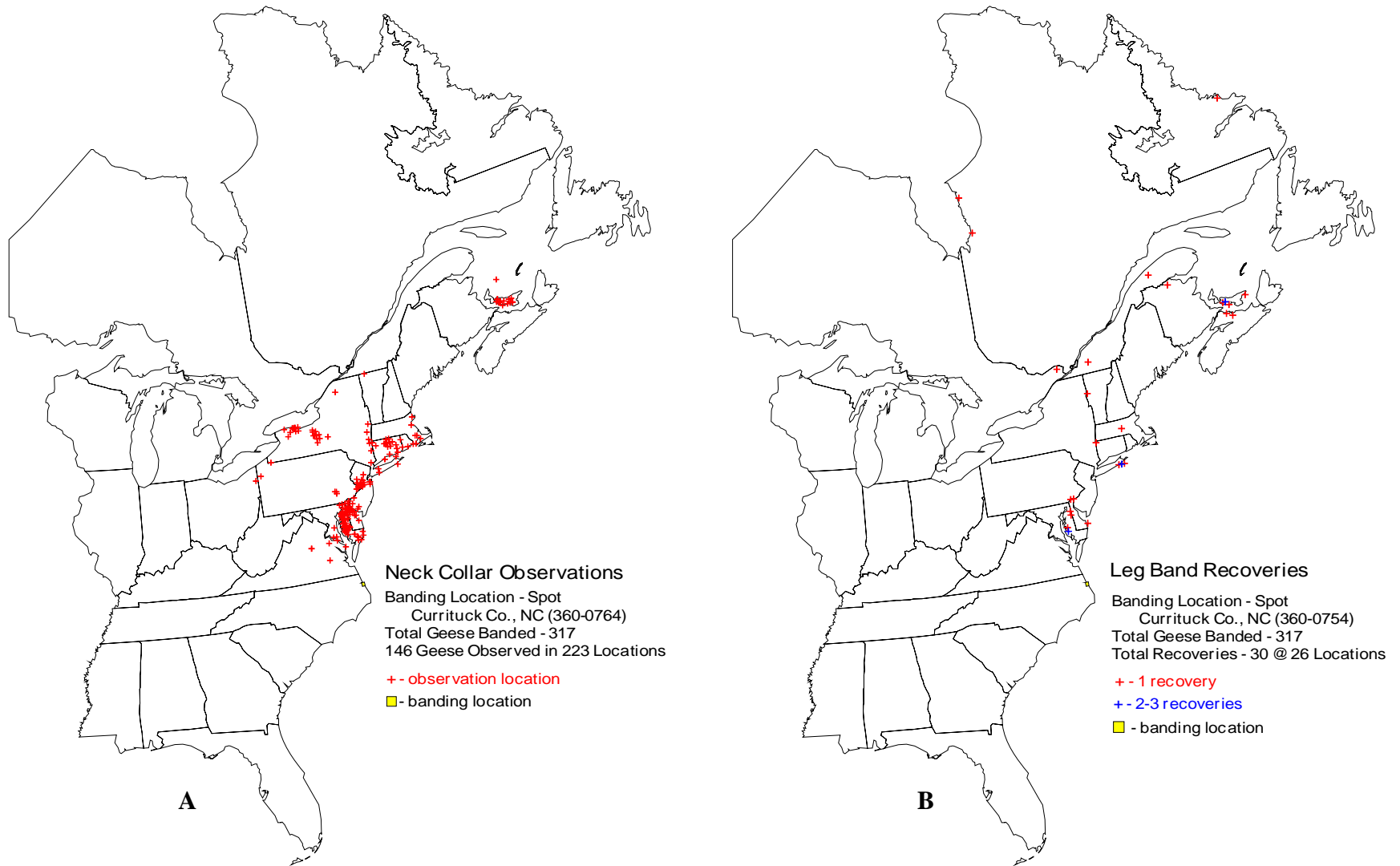


Figure 17. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, near Spot, Currituck County, North Carolina.

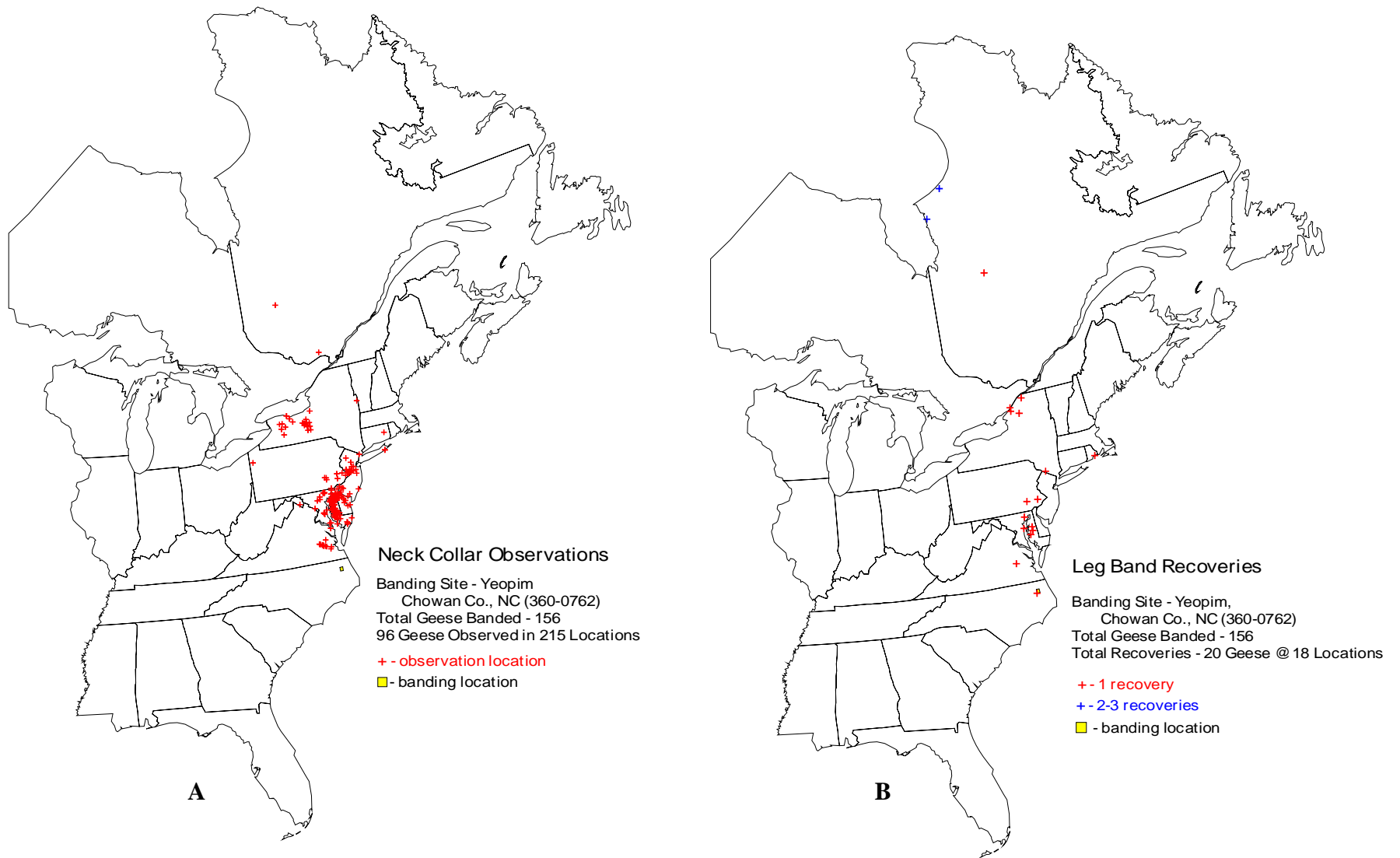


Figure 18. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, near Yeopim, Chowan County, North Carolina.

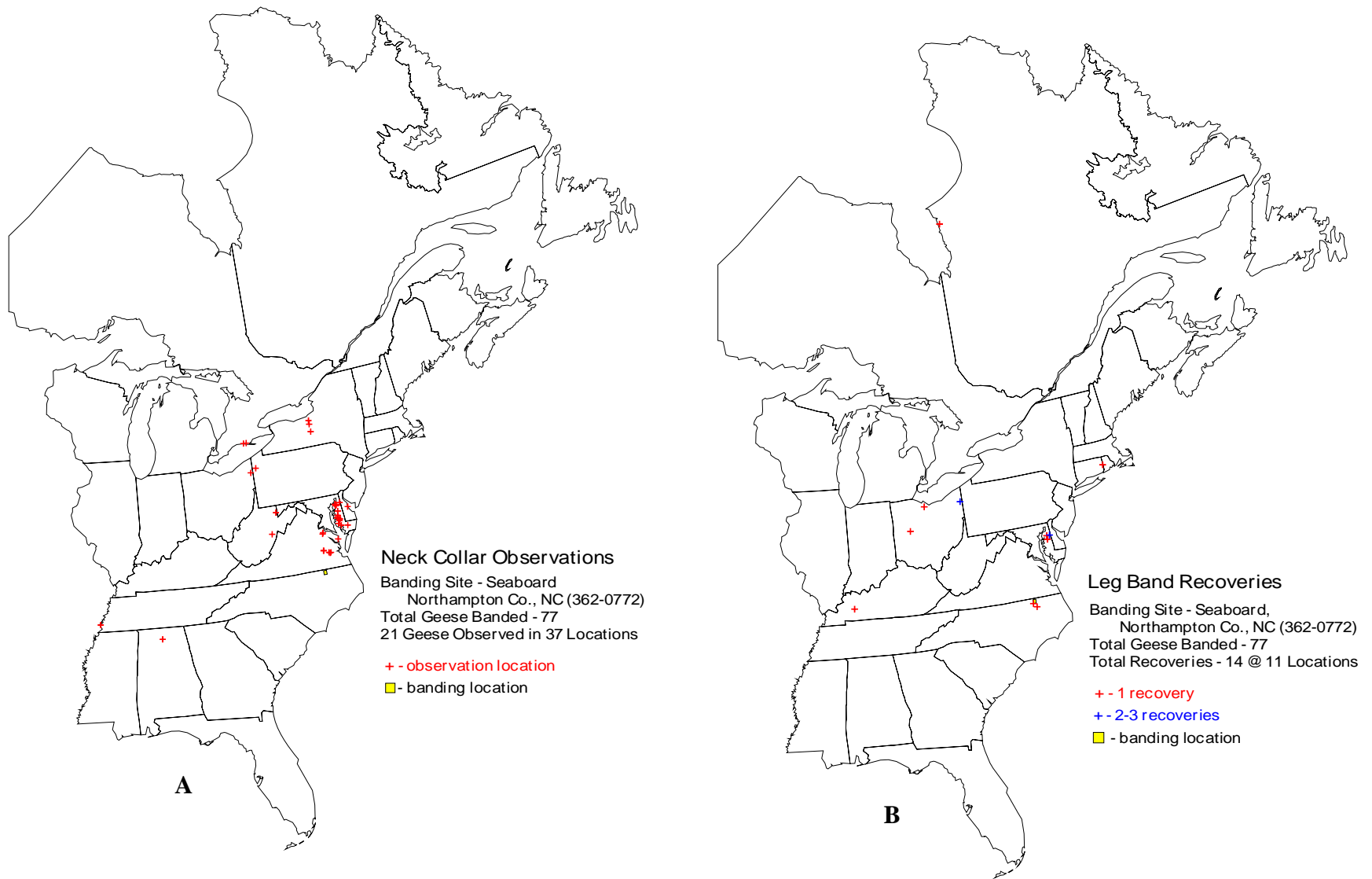


Figure 19. Locations of neck collar observations (A) and legband recoveries (B) of Canada geese banded in winter, 1984-1994, near Seaboard, Northampton County, North Carolina.

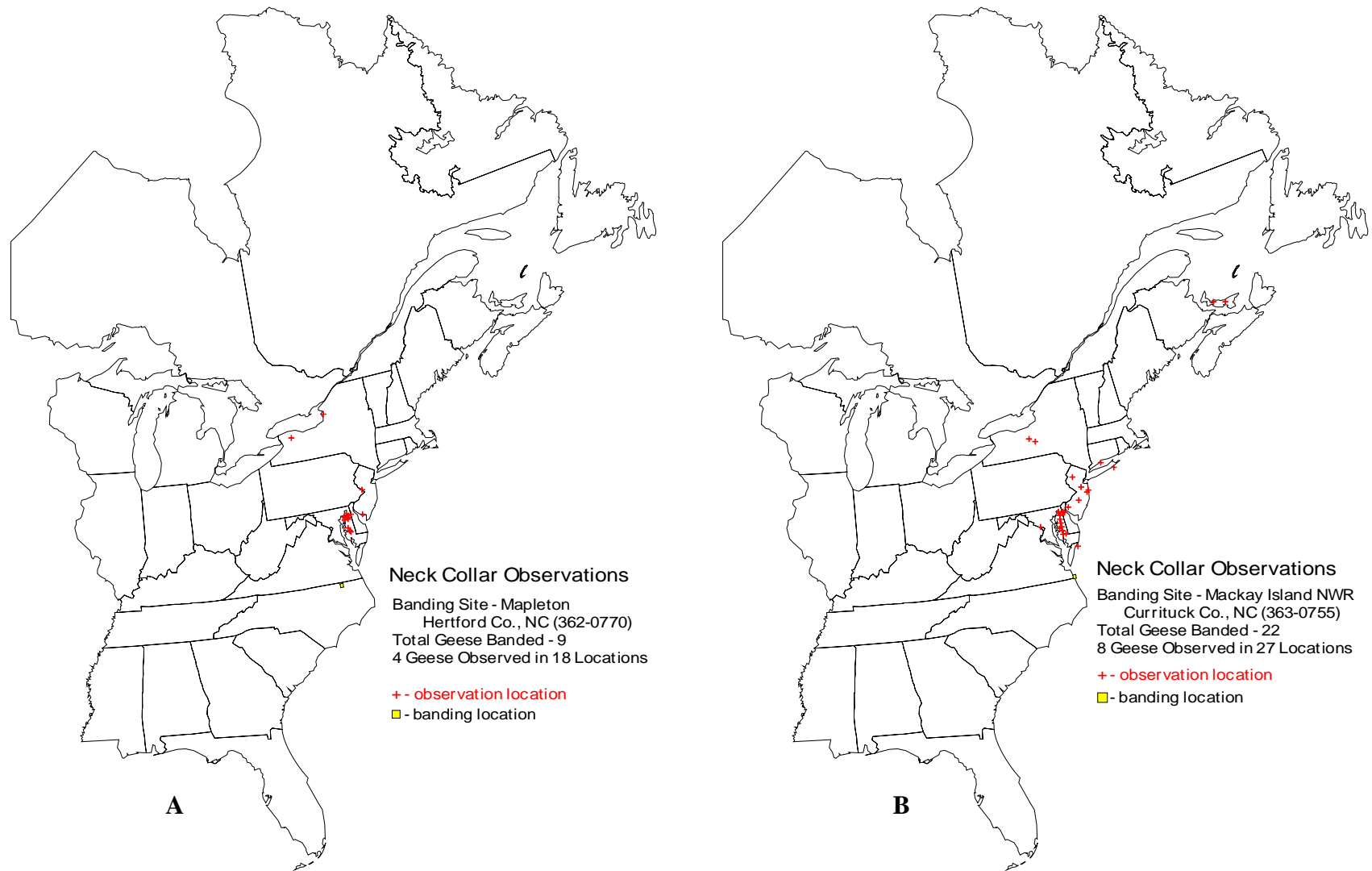


Figure 20. Locations of neck collar observations of Canada geese banded in winter, 1984-1994, at Mapleton, Hertford County, North Carolina (A) and Mackay Island National Wildlife Refuge, Currituck County, North Carolina (B).

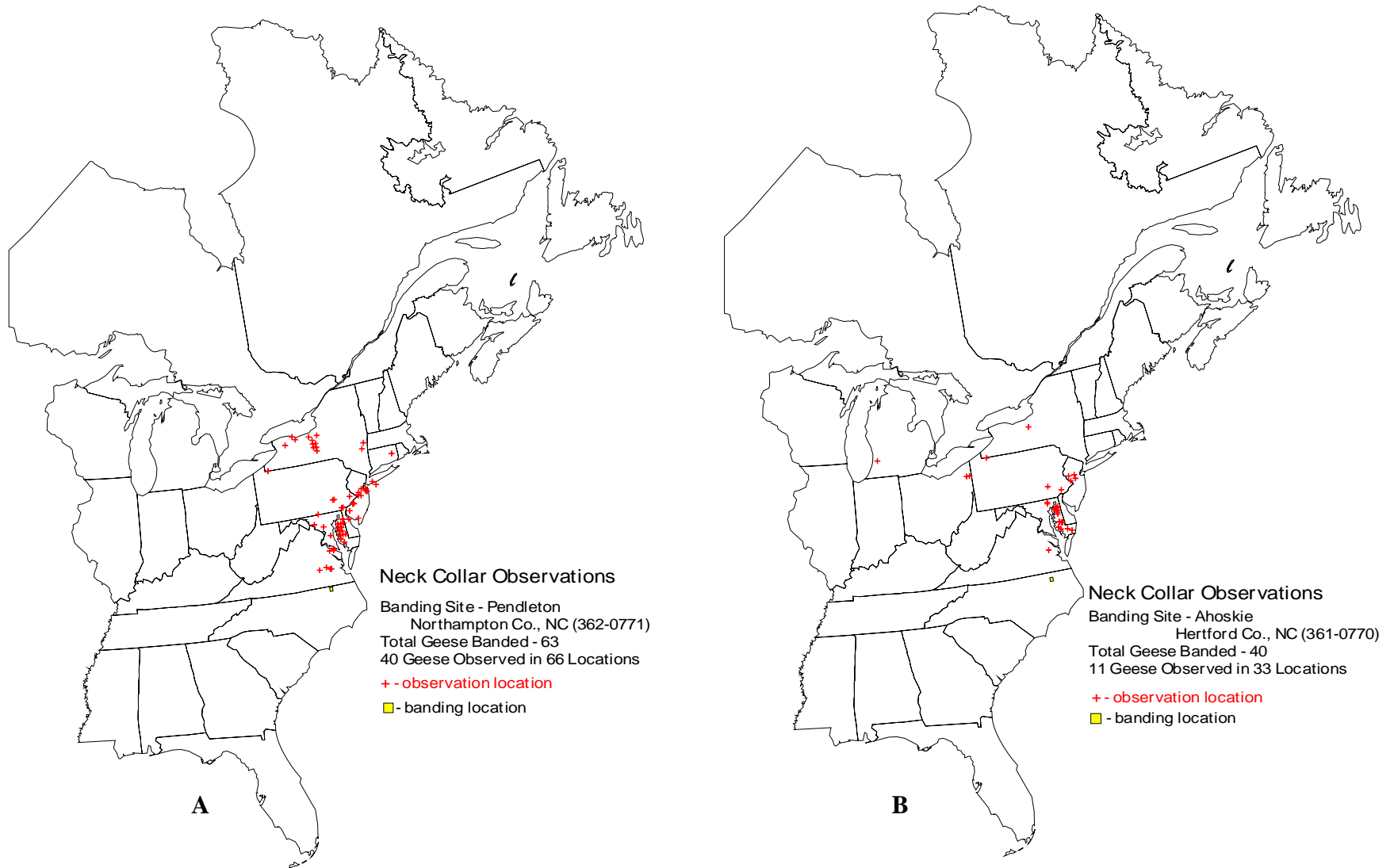


Figure 21. Locations of neck collar observations of Canada geese banded in winter, 1984-1994, near Pendleton, Northampton County, North Carolina (A) and near Ahoskie, Hertford County, North Carolina (B).

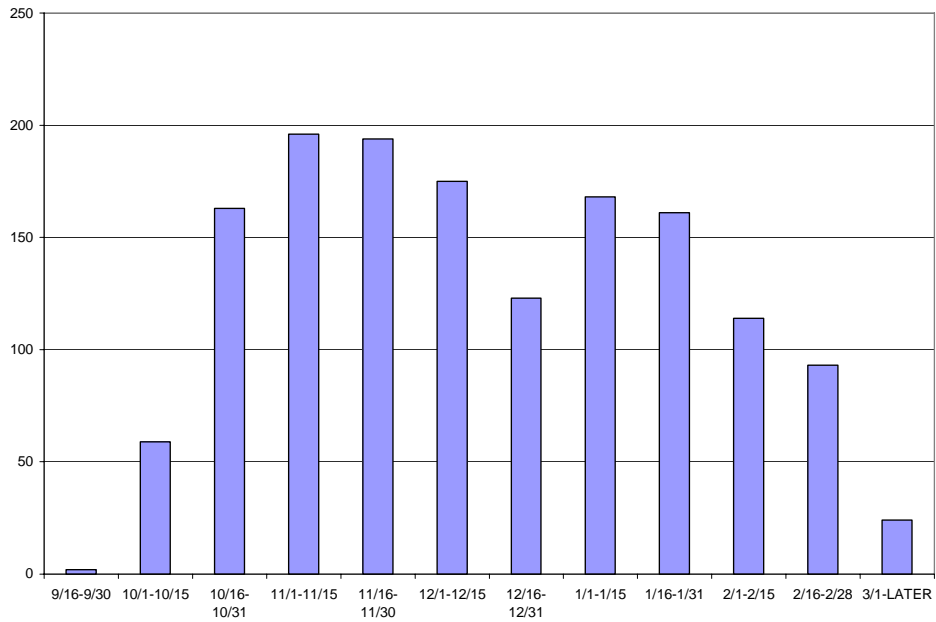


Figure 22. Number of unique collared geese reobserved in North Carolina by two week time period. All geese banded in North Carolina.

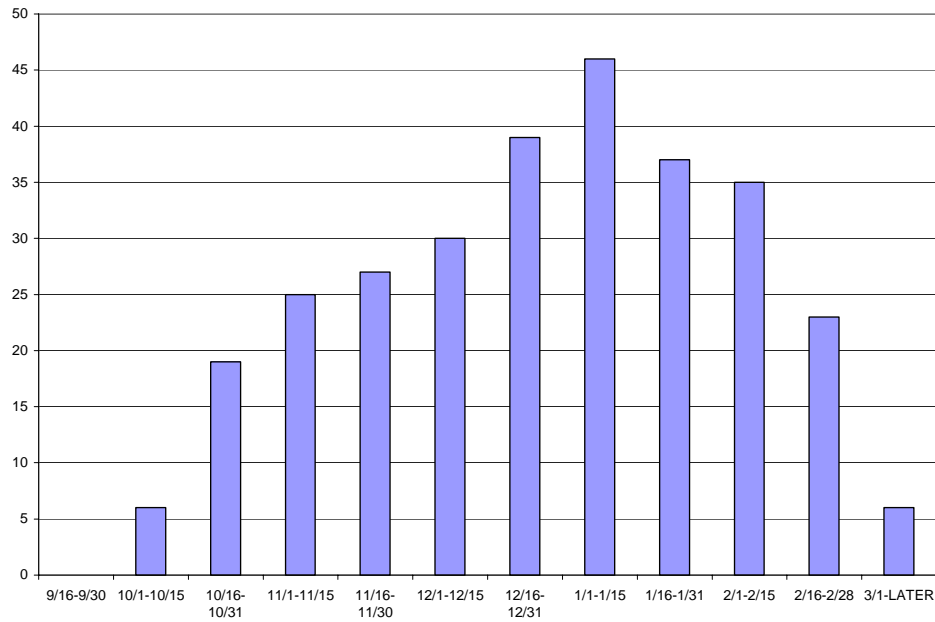


Figure 23. Number of unique collared geese observed for the first time in North Carolina by two week time period. All geese banded outside of North Carolina.

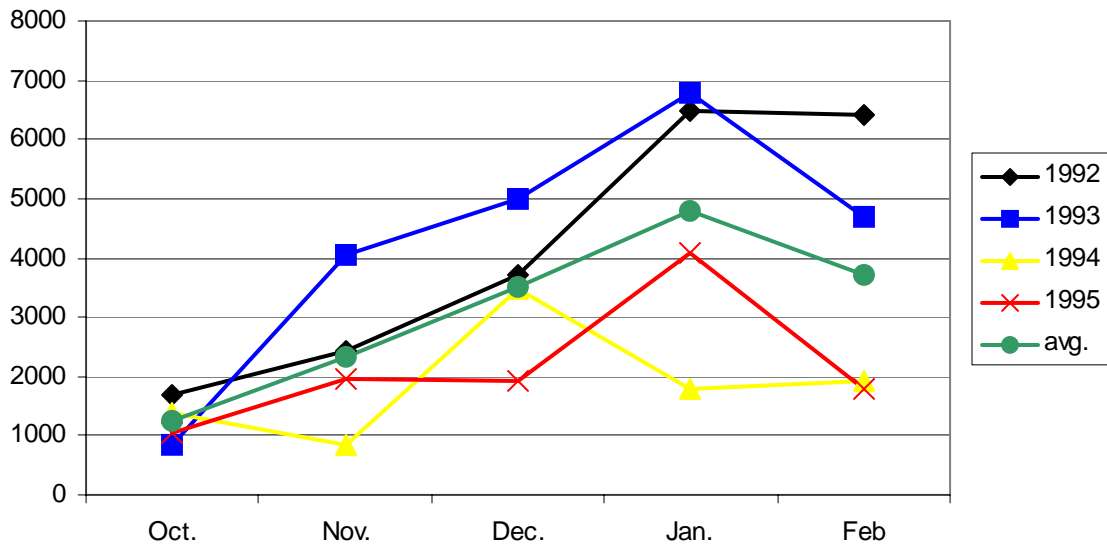


Figure 24. Average number of Atlantic and North Atlantic Population Canada geese during fall and winter as estimated by neck collar observations in North Carolina, 1992-1995.

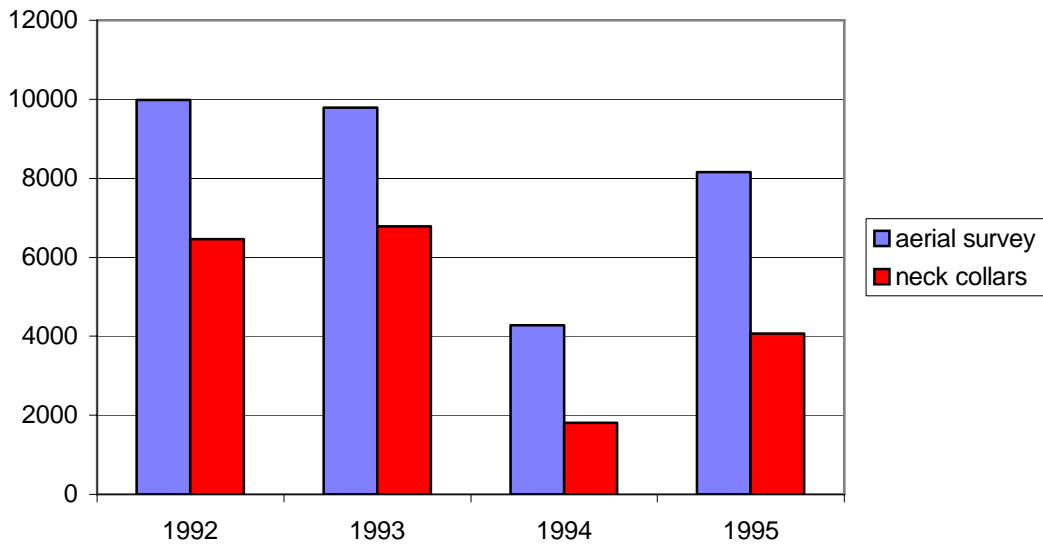


Figure 25. Comparison of estimated numbers of migratory Canada geese as determined by neck collar estimation (January estimate) and aerial survey in North Carolina, 1992-1995.

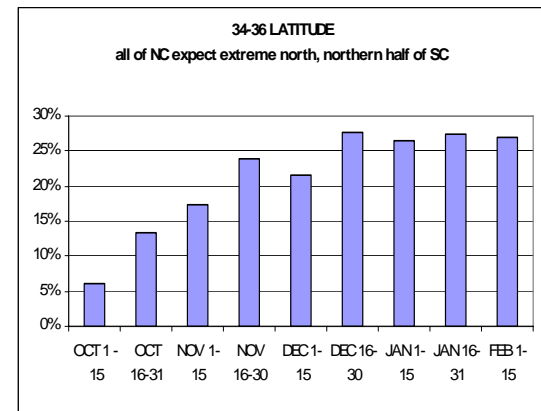
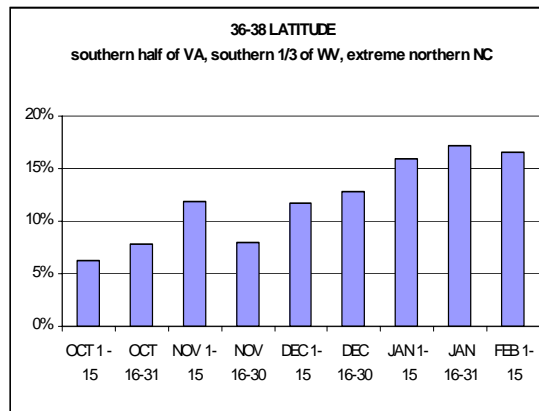
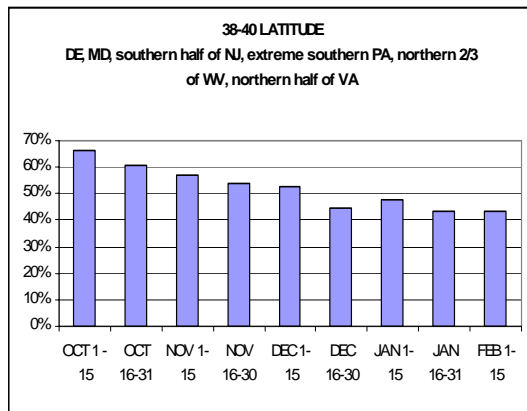
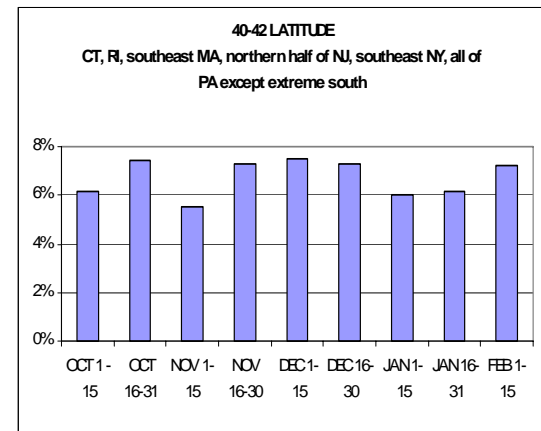
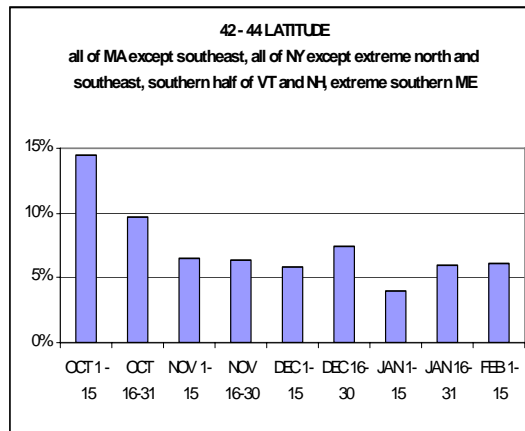
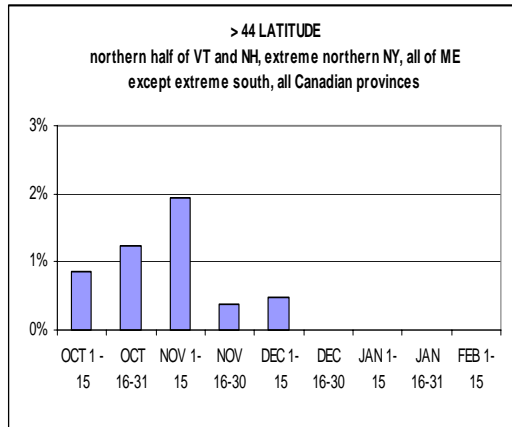


Figure 26. Percentage (compared to entire flyway) of North Carolina banded geese observed for the first time within specific latitudinal ranges at 2 week intervals during the fall and winter, 1984-1996.

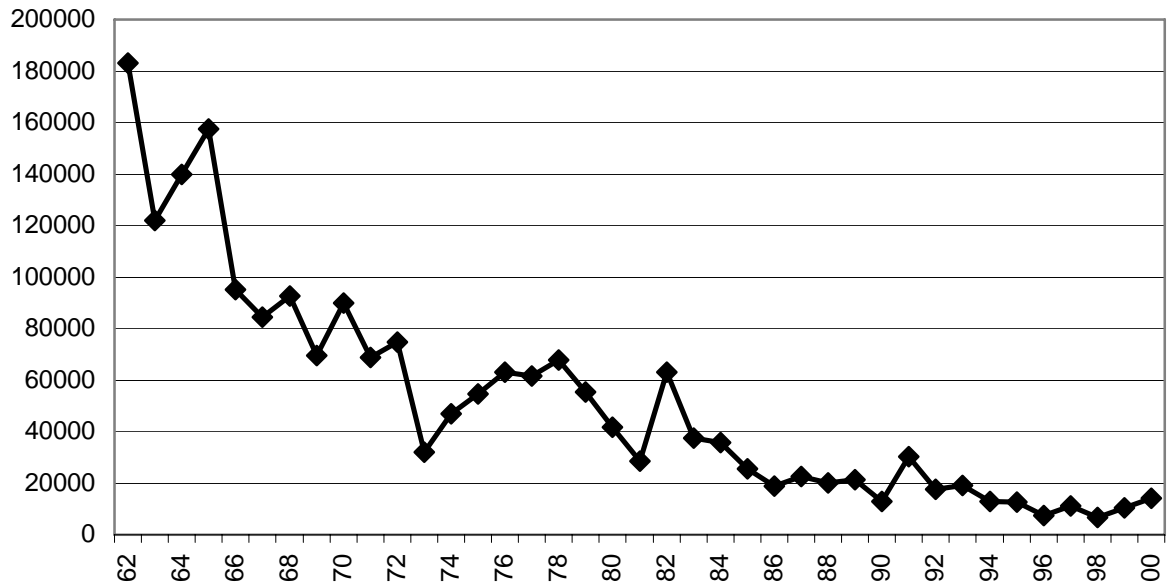
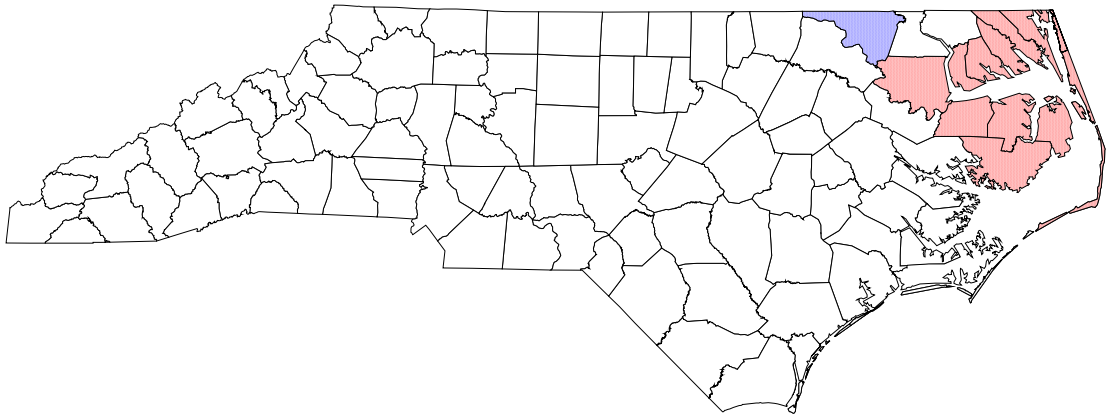


Figure 27. Numbers of Canada geese observed in the mid-winter inventory in North Carolina, 1962 – 2000. Totals are from units known to contain the primary range of Atlantic and North Atlantic Population geese. Units include: 1, 3, 4, 5, 6a, 6b, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 29, 30, 31, 32, 33, 34, 35, 36, and 43.





	<u>September (Early) Season</u> bag limit - 5	<u>Regular Season</u> bag limit - 2
 Western hunt unit	Sept. 2 - 30	Oct. 1 - Nov. 15
 Northeast hunt unit	Sept. 2 - 20	closed
 Northampton County	Sept. 2 - 30	closed

Figure 28. North Carolina's 1999-2000 Canada goose hunting season dates, locations, and bag limits.

Appendix A. Locations, 10 minute banding blocks, and total numbers of geese banded in Coastal Plain, North Carolina, 1984-1994.

Location - Coordinates	Total Banded											
	84	85	86	87	88	89	90	91	92	93	94	Total
Mattamuskeet NWR (Hester Lakeshore), Hyde Co. - 353-0761	116							138				254
Mattamuskeet NWR (Lake Landing), Hyde Co. - 352-0760	39	416	57	183	14			9	18			736
Mattamuskeet NWR (Waupoppin Canal), Hyde Co. - 353-0760		91	10					60	102	18		281
Mattamuskeet NWR (Sandy Dike), Hyde Co. - 352-0761		76	45	81					94			296
Pocosin Lakes NWR (Pungo Lake), Washington Co. - 354-0763		54	65	78	185			46			22	450
Pea Island NWR, Dare Co. - 354-0753	107	92	51	76	23			28	27	37	69	510
Lake Phelps, Washington Co. - 354-0762	31											31
Edenton (Crisanti's, Gilliam Woods), Chowan Co. - 360-0763	83	7	199	278	62			67	5	56	29	786
Weeksville (Leigh Farms), Pasquotank Co. - 360-0760	232	132										364
Merry Hill (Avoca, Scotch Hall, Willow Branch), Bertie Co. - 355-0764		97	64	87					20			268
Colerain (Perry's pond, Perry's Point), Bertie Co. - 361-0764		86	17	145	38							286
Grandy (Ralph Barco), Currituck Co. - 361-0755				79	112			67	14			272
Spot (United Turf Farm) – Currituck Co. - 360-0754				140	106			51	20			317
Barco (Morris' pond), Currituck Co. - 362-0755								8				8
Pollocksville (Bell Farm), Jones Co. - 345-0771								22				22
Yeopim (Drummond's Point), Chowan Co. - 360-0762		96						49		11		156
New Bern, Craven Co. - 350-0770								6				6
Tetterton farm, Washington Co. 354-0764									48			48
Mackay Island NWR, Currituck Co. - 363-0755	13									9		22
Seaboard (Woodard's), Northampton Co. - 362-0772	20	18	39									77
Mapleton, Hertford Co. - 362-0770	9											9
Ahoskie, Hertford Co. - 361-0770	40											40
Pendleton (Collin's pond,) Northampton Co. - 362-0771								63				63
Margarettsville Gravel Pit, Northampton Co. - 363-0772									23			23
20/20 Sand & Gravel, Northampton Co. - 363-0770									55			55
Glover's, Northampton Co. - 363-0772										31		31
Total	690	1165	547	1147	540			614	426	162	120	5411

Appendix B. Population affiliation of Coastal Plain, North Carolina Winter Banded Canada Geese.

Location - Coordinates	Total Banded	Total Seen and/or harvested	Resident	Potential Migrant	Unknown
Mattamuskeet NWR (Hester Lakeshore), Hyde Co. - 353-0761	254	198 (78.0%)	12 (6.1%)	152 (76.8%)	34 (17.2%)
Mattamuskeet NWR (Lake Landing), Hyde Co. - 352-0760	736	571 (77.6%)	1 (0.2%)	457 (80.0%)	113 (19.8%)
Mattamuskeet NWR (Waupopin Canal), Hyde Co. - 353-0760	281	222 (79.0%)	3 (1.4%)	165 (74.3%)	54 (24.3%)
Mattamuskeet NWR (Sandy Dike), Hyde Co. - 352-0761	296	215 (72.6%)	2 (0.9%)	136 (63.3%)	77 (35.8%)
Pocosin Lakes NWR (Pungo Lake), Washington Co. - 354-0763	450	280 (62.2%)	8 (2.9%)	253 (90.4%)	19 (6.8%)
Pea Island NWR, Dare Co. - 354-0753	510	396 (77.7%)	10 (2.5%)	294 (74.2%)	92 (23.2%)
Lake Phelps, Washington Co. - 354-0762	31	22 (71.0%)	0	16 (72.7%)	6 (27.3%)
Edenton (Crisanti's, Gilliam Woods), Chowan Co. - 360-0763	786	581 (73.9%)	35 (6.0%)	457 (78.7%)	89 (15.3%)
Weeksville (Leigh Farms), Pasquotank Co. - 360-0760	364	279 (76.7%)	0	272 (97.5%)	7 (2.5%)
Merry Hill (Avoca, Scotch Hall, Willow Branch), Bertie Co. - 355-0764	268	204 (76.1%)	2 (1.0%)	185 (90.7%)	17 (8.3%)
Colerain (Perry's pond, Perry's Point), Bertie Co. - 361-0764	286	205 (71.7%)	0	194 (94.6%)	11 (5.4%)
Grandy (Ralph Barco), Currituck Co. - 361-0755	272	176 (64.7%)	6 (3.4%)	158 (89.8%)	12 (6.8%)
Spot (United Turf Farm) - Currituck Co. - 360-0754	317	207 (65.3%)	9 (4.4%)	165 (79.7%)	33 (15.9%)
Barco (Morris' pond), Currituck Co. - 362-0755	8	5 (62.5%)	2 (40.0%)	2 (40.0%)	1 (20.0%)
Pollocksville (Bell Farm), Jones Co. - 345-0771	22	9 (40.9%)	4 (44.4%)	5 (55.6%)	0
Yeopim (Drummond's Point), Chowan Co. - 360-0762	156	125 (80.1%)	9 (7.2%)	105 (84.0%)	11 (8.8%)
New Bern, Craven Co. - 350-0770	6	6 (100.0%)	6 (100.0%)	0	0
Tetterton farm, Washington Co. 354-0764	48	30 (62.5%)	11 (36.7%)	16 (53.3%)	3 (10.0%)
Seaboard (Woodard's), Northampton Co. - 362-0772	77	43 (55.8%)	0	29 (67.4%)	14 (32.6%)
Mapleton, Hertford Co. - 362-0770	9	5 (55.6%)	0	5 (100.0%)	0
Mackay Island NWR, Currituck Co. - 363-0755	22	11 (50.0%)	0	10 (90.9%)	1 (9.1%)
Pendleton (Collin's pond), Northampton Co. - 362-0771	63	53 (84.1%)	4 (7.6%)	41 (77.4%)	8 (15.1%)
Ahoskie, Hertford Co. - 361-0770	40	27 (67.5%)	0	25 (92.6%)	2 (7.4%)
Margarettsville Gravel Pit, Northampton Co. - 363-0772	23	23 (100.0%)	17 (73.9%)	0	6 (26.1%)
20/20 Sand & Gravel, Northampton Co. - 363-0770	55	45 (81.8%)	15 (76.4%)	7 (16.7%)	23 (51.1%)
Glover's, Northampton Co. - 363-0772	31	20 (64.5%)	11 (55.0%)	7 (35.0%)	2 (10.0%)
Total	5411	3958 (73.1%)	167 (4.3%)	3156 (79.7%)	635 (16.0%)