

Shorebird Surveys

NJAS Citizen Science Program

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The purpose of the shorebird migration survey is to:

1. Monitor trends in population size.
2. Monitor shorebird use at stopover sites.
3. Determine distribution, abundance and habitat use.

New Jersey Audubon together with the NJ DEP Endangered and Nongame Species Program undertook surveys migrant shorebirds in the fall of 2004. Counts were made from early August until late October. The surveyed sites included only areas south of Brigantine. This year we are expanding these surveys to include sites further north along the coast and in the Meadowlands region with the help of Citizen Scientists.

Our shorebird migration survey ties into several other similar efforts that already exist or that are being initiated to survey shorebirds during migration. One of these, the International Shorebird Survey (ISS) was started in 1974 by the Manomet Center for Conservation Sciences. ISS data helped spark the formation of the Western Hemisphere Shorebird Reserve Network (WHSRN) and have been used to identify sites in North and South America that qualify for WHSRN site designation. Another survey, the Maritimes Shorebird Survey (MSS) started in the 1970's and covers areas in Southeast Canada. We will follow methodology similar to the ISS and MSS. Our survey will also follow guidelines set forth by the "Program for Regional and International Shorebird Monitoring" (PRISM), a program being implemented by a Canada-U.S. Shorebird Monitoring and Assessment Committee. PRISM is based on the shorebird conservation plans recently completed in Canada and the U.S. and provides a single blueprint for implementing both of these plans.

Why a shorebird survey is needed

Aspects of shorebird biology, such as low reproductive rates, long migrations, and high concentrations in certain areas during migration make shorebirds very susceptible to human impacts. In fact, in many areas they are in direct competition with encroaching human development, as they tend to use beach habitats, which are also heavily valued by people. In addition, some of the water bodies in sensitive areas used by shorebirds are also prone to human driven catastrophic events. For example, Delaware Bay, Raritan Bay, and the Arthur Kill are areas of heavy industrial production and tanker traffic and have been subject to oil spills.

Populations of several species of shorebirds have declined over the past three decades. Of 35 species of North American shorebirds for which analyses are available, 28 (80%) show negative trend values, and 19 show statistically significant or persistent declines (see Table I). Some, like the Red Knot, have been declining even more precipitously during the past few years.

Aerial surveys conducted from 2001-2003 to count wintering Red Knots in South America indicate that their populations are currently less than half what they were in the mid-80s.

	1982-85	2001	2002	2003
All sites --Argentina and Chile	67,496	29,745	29,271	30,475
Bahia Lomas (Chile)	41,700	29,745	21,855	25,500

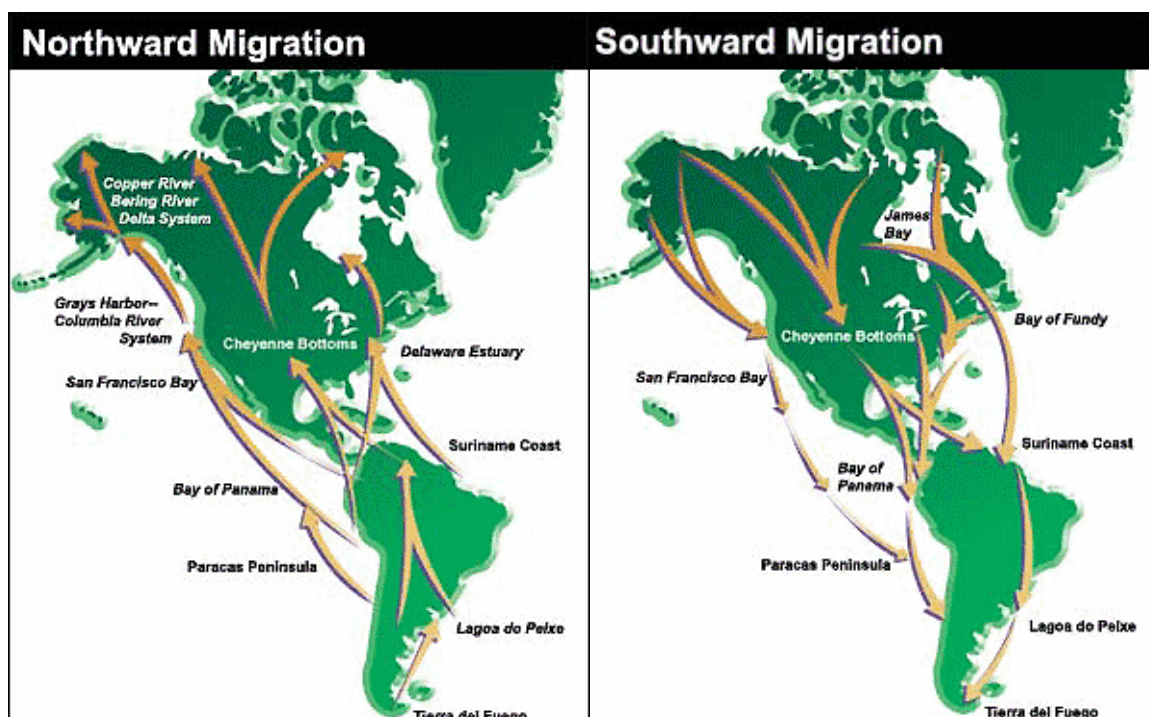
(Morrison, R.I.G., R. K. Ross, and L.J. Niles. 2004. Declines in wintering populations of Red Knots in Southern South America. Condor 106: 60-70)

Other studies show that annual survival of adult Red Knots has decreased by 37%, and that the number of second year birds, which provides an indication of reproductive success, has declined by 47%.

(Baker, A. J., P. M. Gonzalez, T. Piersma, L. J. Niles, I. L. S. do Nascimento, P. W. Atkinson, n. a. Clark, C. D. T. Minton, M. K. Peck, and G. Aarts. 2004. Rapid population decline in Red Knots: fitness consequences of decreased refueling rates and late arrival in Delaware Bay. Proc. R. Soc. Lond. 271: 875-882).

Shorebird Migration

Shorebird migration routes are elliptical in many species -- that is, the birds do not follow the same path northward and southward.



Spring migration tends to be very rapid and strictly timed since birds need to arrive in the arctic early enough to have sufficient time to breed, but late enough so that there is adequate food supply. On their northbound flight to the arctic, Ruddy Turnstones, Sanderling, Semipalmated Sandpipers, and Red Knots stop in Delaware Bay and fatten up on horseshoe crab eggs. Once in the arctic, breeding season is short and constrained by weather conditions.

Most shorebirds reach the arctic tundra when it is still covered in snow. Shorebirds produce 4 eggs and are usually unable to have another clutch if the first one fails. By the time the young hatch, insect life is booming. Typically one parent stays with hatchlings on the breeding grounds while the other parent leaves to migrate south. Some adults leave breeding grounds as early as the 2nd week in July, and they can be seen in NJ by the middle of July.

Fall migration is more leisurely than that of spring as shorebirds move south over several months. As the arctic insects begin to diminish, shorebirds set off to feast on marine invertebrate populations on the Atlantic coast. By June and July these populations are growing in the coastal tidal flats. Available shore invertebrates are a resource that usually exceeds the harvesting capacity of the shorebird migrants. Juveniles start appearing later at staging areas; they spend 3-4 weeks longer in the arctic where they fledge and join juvenile flocks. The number of juveniles compared to that of adults during southbound migration indicates how many young were successfully fledged, and provides an index of breeding success.

Site selection

Two types of sites will be surveyed –more heavily used sites and sites that support smaller shorebird populations. For monitoring trends in populations, larger sites may be more important. However, for determining utilization of different habitats and areas, studies at smaller sites are also needed. More importantly, loss of species from smaller sites may provide an early indication of population declines. These smaller habitat areas often support the overflow populations from the other bigger areas when the populations are thriving, but they are the first to stop being used by the shorebirds as their populations shrink.

Heavily used sites

- Stone Harbor/Hereford Inlet
- North Brigantine
- Two-mile Beach (Cape May)
- Port Norris - Bivalve
- Matts Landing
- Great Bay Blvd in Tuckerton
- Sedge Islands
- Holgate
- Forsythe

Smaller sites

- Sandy Hook
- Conaskonk Point
- Wreck Pond in Sea Girt/Spring Lake
- High Bar Island in Barnegat Bay
- Island Beach State Park
- Corson's Inlet
- Fortescue

Table I

Species (common name)	Species or subspecies (scientific name)	Conservation Category (USSCP) ¹	Maritime Provinces Canada 1974-1998 Annual % change ²	East Coast USA 1974-1982 Annual % change ³
Black-bellied plover	<i>Pluvialis squatarola cynosurae</i>	3	+0.366	-5.4
Semipalmated plover	<i>Charadrius semipalmatus</i>	2	-1.55	-9.5
American oystercatcher	<i>Haematopus palliatus palliatus</i>	4	NA	NA
Greater yellowlegs	<i>Tringa melanoleuca</i>	3	NA	-3.1
Lesser yellowlegs	<i>Tringa flavipes</i>	3	NA	+3.5
Solitary sandpiper	<i>Tringa solitaria</i>	2	NA	NA
Spotted sandpiper	<i>Actitis macularia</i>	2	-3.06	NA
Whimbrel	<i>Numenius phaeopus hudsonicus</i>	5	+4.37	-8.3
Ruddy turnstone	<i>Arenaria interpres morinella</i> (low arctic Canada)	4	-3.28	-8.5
Red knot	<i>Calidris canutus rufa</i>	4	-17.6	-11.7
Sanderling	<i>Calidris alba</i>	4	-7.78	-13.7
Semipalmated sandpiper	<i>Calidris pusilla</i>	3	-7.66	-6.7
Western sandpiper	<i>Calidris mauri</i>	4	NA	NA
Least sandpiper	<i>Calidris minutilla</i>	3	-15.8	+2.9
White-rumped sandpiper	<i>Calidris fuscicollis</i>	2	-10.9	NA
Pectoral sandpiper	<i>Calidris melanotos</i>	2	+2.54	NA
Dunlin	<i>Calidris alpina hudsonia</i>	3	-7.17	NA
Stilt sandpiper	<i>Calidris himantopus</i>	3	NA	NA
Short-billed dowitcher	<i>Limnodromus griseus</i>	4	NA	NA
Long-billed dowitcher	<i>Limnodromus scolopaceus</i>	2	NA	NA

¹Conservation categories are as follows: 1 - species not at risk, 2 - species of low concern, 3 - species of moderate concern, 4 - species of high concern, 5 - highly imperiled.

²Population changes from Morrison R.I.G., Y. Aubry, R.W. Butler, G. W. Beyersbergen, G. M. Donaldson, C. L. Gratto-Trevor, P. W. Hicklin, V. H. Johnston, R. K. Ross. 2001. Declines in North American shorebird populations. International Wader Study Group Bulletin 94: 34-38.

³East Coast USA data from: Howe, M.A., Geissler, H. and Harrington, B. A. 1989. Population trends of North American shorebirds based on the International Shorebird Survey. Biological Conservation 49: 185-199.

Shorebird Survey Methodology

Objectives

- 1) Count the numbers of birds of different migratory species using coastal beach/inlet areas or mudflats along the ocean or the Delaware Bay.
- 2) **Fall survey only!** Determine the number of adults and juvenile birds of target species: Red Knots, Ruddy Turnstones, Sanderlings and Semipalmated Sandpipers. Determine the number of adults and juvenile birds of other species if time allows.
- 3) Record levels of disturbance at the site to determine what types of disturbance and how much of each disturbance has a negative effect on the birds.
- 4) Make behavioral observations of the birds to determine whether they utilize a certain site mostly for feeding, roosting, etc.
- 5) If possible, scan flocks to identify color-marked shorebirds, especially Red Knots, Semipalmated Sandpipers (second priority - Ruddy Turnstones, Sanderlings).

Survey Frequency and Timing

Fall surveys will follow a modified ISS protocol (below):

The survey period for fall counts in the ISS program runs from the 15th of July through the 31st of October. Our request is for one count to be made each third of the month throughout the survey period.

Survey the site once each third of the month from July 11th to October 31st. In other words, one count between July 11th and July 20th, one count between July 21st and July 31st, one count between August 1st and August 10th, etc. If you can continue the counts into November we would be delighted. Counts should be conducted at least 5 days apart. In other words, please do not count on 20 July for the first survey window and then on 21 July for the second survey window.

Spring surveys will be more intensive. Sites will be visited once a week (4 times) between May 7th and June 7th. Counts should be conducted at least 4 days apart.

Survey Methodology

Recording preliminary data

- Observer name
- Date
- Time
- Name of the study site and county
- Tidal or inland water level
- Weather conditions (optional)
 - Wind speed/direction (optional)
 - Sky conditions/precipitation (optional)
 - Temperature (optional)

Shorebird identification

Volunteers will be trained and become familiar with the key characteristics that distinguish all focal species, with the expectation that most volunteers will be experienced birders. Knowledge of shorebird migration timing, general habitat preferences, sizes/silhouettes and morphometric proportions (e.g., ratio of wing to tail length, or body to leg length), and postures/feeding styles and other behavioral information is extremely helpful and will be included in the training materials. On occasion birds may need to be lumped into some sort of category. (For example, counts for Long- and Short-billed Dowitchers, and for Lesser and Greater Yellowlegs, are frequently combined because distinguishing them under most field conditions can be difficult even for the most-experienced biologist or birder [Stenzel and Page 1988]. Vocalizations, however, can provide definitive identifications; so become familiar with their calls as well.)

Counting flocks

Counting shorebirds is accomplished by either directly counting individuals of each species present at a roost site or through a feeding area, or estimating if numbers are in the thousands. With a bit of experience individually assessing numbers of birds up to a few thousand is not difficult; however when flocks exceed several thousand, estimating is a faster and often more appropriate method.

In smaller sites it is desirable to count the whole site from a single vantage point to minimize disturbance and possibility of birds being counted twice. However, this is not possible on larger sites. The larger sites have to be divided into counting sectors. These can be defined by the features of the area, the availability of vantage points and whether each section can be counted easily in one go

Two main techniques are used to view a wetland and count the birds present.

1. The observer can walk along the edge of the lake or coastal shore, using binoculars to see where concentrations of water birds occur. The observer can then stop and, by using binoculars and a telescope mounted on a tripod, count and identify the birds. If only a small number of birds are present the observer can walk and stop every 100-200 m to count and identify the birds. Care must be taken not to disturb the birds.
2. Alternatively, a concealed or raised position can be found from which the birds can be seen without disturbance. Binoculars can be used to locate the birds, and a telescope mounted on a tripod can be used to identify and count them.

There are two main methods for counting, and their use depends on the size of the flock and ease of counting, direct counting and estimation methods.

Direct counting

This method can be used in ground and boat surveys. If the flock is smaller than about 3000 birds --suggested number, figure out what you are comfortable with--, a suitable vantage point should be located and all the individual birds should be counted directly using binoculars or a telescope. This becomes progressively more difficult with large numbers, smaller birds and greater distance. For this method it is important that

- There are small numbers of birds, little disturbance, limited movement of birds.
- The observer is far enough from the birds so as not to disturb them.
- The observer avoids walking directly towards the flock as this might make them fly.
- The observer should try to count the birds with the sun behind, so that the patterns and colors of the different species can be seen clearly.
- The observer should not walk along the “skyline” as he/she will be silhouetted and this might scare the birds. The observer should try to blend in with the environment as much as possible.
- The observer should remain quiet and avoid sudden movements that scare the birds.

Estimation methods

As numbers of birds in the area increase estimation methods need to be used. These methods can be used from the ground or from boats.

Estimation procedures should be used if:

- There are large numbers of birds present (more than about 3000, or less depending on experience, type of site being surveyed and bird behavior).
- The birds are continually in flight.
- There is much disturbance.
- The birds are very tightly packed in a roost site.

This method involves counting or estimating a ‘block’ of birds within a flock, e.g. 5, 10, 20, 50, 100, 500, 1000 birds depending on the total number of birds in the flock and the size of the birds. To do this, count a small number of birds (e.g., 10) to gain a sense of what a group of 10 birds “looks like.” Then count by 10s to 50s or 100 birds to gain a sense of what 50 or 100 birds “looks like.” The block is then used as a model to measure the remainder of the flock. After you have a sense what block of birds look like, count by 50s or 100s to 1000 birds, and so on until you have counted all the birds visible from your survey point.

To do this, either using binoculars or spotting scope, pan across the area occupied by the birds. Often, the birds are equally spread. Starting at say the left hand side of the flock, count how many are in one field of view, then move the view to the right and assess if a similar number are in that view. Continue moving to the right and determine how many views the whole flock use, then multiply the first assessment by the total number of views. For example, suppose you find a flock of Red Knot spread over a roost site of

150m. You position your binocular view at the left hand side of the flock and count 120 birds in the first view. You then pan to the right and find that 10 fields of view account for the majority of the flock and that the density of birds in each of the ten views is similar (naturally some views will have higher and lower density). The whole flock can be assessed as 120 birds multiplied by 10 views equaling approximately 1200 Red Knots. Again, experience at trying this method will increase your ability to use it. The more times you use this method the better you will become at using it. For best results, always try and have the birds you are assessing with the sun either behind you or to the side. It is always difficult to count or estimate bird numbers if you are looking into the sun since its light will glare off the water and mud. To gauge how your experience is growing, always use and compare the direct counting and the assessment methods where practicable.

Landmarks can be used to break up large flocks into more manageable sections. If possible counts should be repeated several times and another observer's opinion obtained on the number of birds before it is written down. **Remember to indicate the accuracy level of your counts, ie. actual count (*), systematic estimate like that just described (**), or a 'guesstimate' (circle)**

With large flocks of different density the accuracy of estimation will not be the same. For example in large flocks which are widely spread it may be possible to count the birds in flocks, and the large spread can give the illusion of larger numbers than actual. In flocks that are closely packed the estimation method is more difficult and the smaller area of the flock may give the impression of smaller numbers.

Many shorebird observers prefer to count birds at high tide roosts. This is simply because a number of species often congregate in a few discrete locations along or adjacent to the estuary as described in the critical habitat section. It can be logistically more efficient to estimate estuary populations using this strategy, especially if a boat is unavailable to explore the estuary at low tide. Shorebird counts at roosts are made 2 hours either side of high tide. As the tide begins to ebb, shorebirds disperse from roost sites to their preferred foraging habitat and this can greatly increase the amount of time and effort required to assess the population.

Small roosts (a few hundred birds) can usually be counted from a suitable vantage point. Larger roosts, and those comprised of the smaller species are more difficult to count accurately, and considerable care must be taken when arriving at totals. Count the stationary birds while they are roosting at high tide, repeating the counts several times. This is the best method as long as the birds are not tightly packed, as is the case for smaller species like Red Knot, Sanderling, and Semipalmated Sandpiper.

When similar species cannot be distinguished from each other it may be necessary to extrapolate species numbers by "sub-sampling". Sub-sampling first entails estimating the overall percentage of each species in the group. To estimate percentages, choose several subsets of birds across the group (stratifying by habitat or water depth if necessary), then count and identify all individuals within those subsets (recording your numbers by species) and average the percentages for each species or size class across all

subsets. Then use the resulting percentages to extrapolate numbers of each species or size class for the entire group. For example, in four subsets of 30 peeps each, you counted a total of 12 Least Sandpipers (10%), 72 Semipalmated Sandpipers (60%), and 36 White-rumped Sandpipers (30%). If your total count of peeps across the entire group was 2000, your extrapolations to all 2000 birds would yield 200 Least Sandpipers, 1200 Semipalmated Sandpipers, and 600 White-rumped Sandpipers for the entire segment.

When you report, report 1880 PEEP and your actual counts of the identified species.

Proportion of adults and juveniles in flocks -- FALL ONLY

After the numbers of each species have been counted, determine the proportion of juveniles to adult birds in a flock (prioritize: Red Knots and Semipalmated Sandpipers, Sanderlings, Ruddy Turnstones). When scanning a flock to count adult and juvenile birds, the following quantitative method should be used.

Scan in one direction through a flock, counting individual birds as you go along; when a juvenile is encountered, record the bird's number; that is "1, 2, 3, 4, *bird 5 juvenile*, 6, 7, 8, 9, *bird 10 juvenile*, 11, 12" and so on until the flock flushes or is completely counted. The total number of birds counted before they flush minus the number of juveniles detected, gives the total number of adults. This is divided by the number of juveniles to determine the adult/juvenile ratio.

The reason for counting this way is because there are likely to be many fewer juveniles than adults. If the ratios are reversed (unlikely) one can count individual birds and when an adult is encountered, record the bird's number.

IMPORTANT: the critical determination for this method is the number of juveniles relative to the number of adults in one scan (the proportion of juveniles to adults). It is not critical to count through an entire flock (flocks will flush or change direction causing you to lose your place).

When doing the proportions count, please do not count the flock first and then go through a second time and count the number of juveniles. (The flock may flush and you won't be able to determine the total number of juveniles in the flock.)

You must record each count as a separate count. If a flock flushes, you can start the count over as a new count, but do not try to pick up where you left off, and do not throw out the first count. It is valid data

Count as many different flocks as you can.

Recording disturbance and bird behavior

Human activities on coastal habitats alter the way the birds can use these habitats. The impacts of this disturbance vary depending on the type and the intensity of the disturbance. Generally, fishing is a lower impact activity than walking, and they are both lower impact than jogging. Vehicles and boat traffic can have an even greater impact than any of the above activities. In addition, the type of water craft and the speed and direction at which a watercraft or vehicle is moving will influence the strength of response of the shorebirds to this disturbance.

Human disturbance can have various effects on the birds. It can make them flush from their nests or fly away from feeding or roosting sites. Human disturbance also can alter avian behavior by decreasing the amount of time birds spend foraging and increasing the amount of time spent being vigilant. A distance of 100 m from the disturbance has been used as an effective buffer in management and in other research studies.

We want to collect data on both human disturbance and bird behavior. In addition to correlating the two, this type of info will allow us to correlate site use to human use and to further explore for what purposes the sites are used by the shorebirds.

Data to collect during the survey:

Disturbance

Count for the entire time period of the count.

- Number of people within 100 m (300ft) of the birds
- Number of vehicles
- Number of dogs
- Number of boats

Behavior

Scan a sample of the birds during the count for numbers of individuals, or count total number of birds involved in each of those activities

- Feeding
- Roosting
- Flying
- Other

Please record whether you were able to count all birds or whether you estimated the number of birds involved in various activities through extrapolation.

Shorebird count ethics

1. **Record only what you know to be accurate.** Use your instincts to guide your field work, but don't let gut feelings get into your data.
2. **Err on the side of caution.** If a situation or an area feels unsafe please do not census.
3. **Do not trespass on posted land.** Remember, while censusing in suburbia, home owners may get upset if they see you aiming binoculars towards their homes. Please be sensitive to land/home owners.
4. **Beach nesting bird colonies are not to be entered.** If you are counting shorebirds in a fenced off area with breeding beach nesting birds, please complete your counts from outside the fence.
5. **Migratory birds are protected by federal and state laws.** Do not harass the birds; do your counts from a large enough distance that their behavior is not affected by your presence.
6. **Honestly evaluate your birding and surveying skills.** State your level of comfort with species identification and count accuracy. There is work for all levels of experience, and if you let us know your weaknesses we will know what additional training to provide.