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FEATURE ARTICLES

ESTIMATING SHOREBIRD NUMBERS AT MIGRATION STOPOVER SITES

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Abstract. We describe a method for estimating the total number of shorebirds that use a migration stopover site during spring and fall migration. We combined weekly shorebird counts with parameter estimates for detection probability, sampled proportion, and length of stay on the Squaw Creek National Wildlife Refuge. Double sampling was used to determine detection probability and estimated values varied among wetland units from a low of 0.07 to a high of 0.82. The sampled proportion of most wetland units was 100% but was lower in some of the larger units. Length of stay (measured for Pectoral [*Calidris melanotos*] and Least Sandpipers [*C. minutilla*] combined) averaged 10.0 days in spring and 3.7 days in fall. Spring shorebird numbers were approximately five times greater than fall numbers on the Refuge. Annual shorebird numbers varied among years from an estimated low in 2003 of 15 734 to a high in 2002 of 69 570. Peak daily counts during study years averaged only 12% of estimated spring totals and 4% of fall totals. An estimate of shorebird numbers based on summing weekly counts, not corrected for detection probability or sampled proportion, would have been only 21% (spring) to 31% (fall) of the total number of birds. These results reveal that peak counts and nonadjusted counts can significantly underestimate the number of shorebirds that use migration stopover sites in the midcontinent of North America.

Key words: Calidris melanotos, Calidris minutilla, *detectability, Least Sandpiper, length of stay, migration stopover, Pectoral Sandpiper.*