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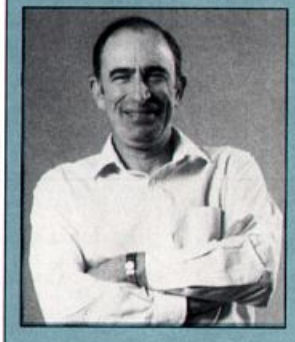
Paul R. Ehrlich

BIRDING FOR FUN



Counting Birds

Illustration by Darryl Wheye

A FEW YEARS AGO, I birded the Louisiana coast with Van Remsen, one of America's leading ornithologists (and a Stanford alumnus, I'm proud to say). As dusk approached, we realized that the sky had become dark with Tree Swallows, swarms of them, flying high. Their awesome numbers beckoned us to estimate how many filled the air above our heads — a daunting task. By making quick counts of the number in the fields of our binoculars, and then figuring out roughly how many binocular fields full of swallows there were, we came to a ballpark guesstimate of tens of millions. Much of the world population of Tree Swallows had to be right there over our heads.

Van and I were just plain curious about the numbers of swallows, but there are often more important reasons for counting the number of birds in a given situation. Conservation biologists want to track population trends in migrants that travel between the heavily fragmented forest habitat of the northeastern United States and Latin America; the U.S. Fish and Wildlife Service needs to know whether cowbird control programs are protecting the remaining Kirtland's Warblers; wildlife managers need population estimates of ducks to help in setting bag limits; and ecologists wishing to understand why bird populations grow or decline must be able to determine whether they are growing or declining. One of these days, you might be interested in helping to estimate numbers of birds—so let's take a look at how it's done.

Sometimes, as with a small colony of seabirds nesting in the open, estimating the number of birds present is just a matter of counting. Indeed, substantial changes in the sizes of colonies of large, prominent seabirds (such as gannets) may be detected by counting individuals in photographs of nesting cliffs. But rarely is it that simple. First of all, birds are mostly seen moving around — and that makes them really tough to count, as Van and I learned. Also, most birds are small, and most small birds spend a great deal of their time hidden, neither of which makes visually counting easy. Recourse to other methods is necessary.

Sometimes, of course, you can take advantage of vocalizations—small birds often make loud noises. So-called "spot-mapping" is one of the most intensive techniques; it is the one used in Breeding Bird Censuses. Spot-mapping requires repeated surveys throughout the breeding season of a patch of 25 acres or more of homogeneous habitat. Each time a bird is identified by sound or sight, its location is registered on a map and information is recorded on its sex and behavior. In breeding bird censuses, the majority of registrations are of males, and if a male is detected in the same area at least three times, it is

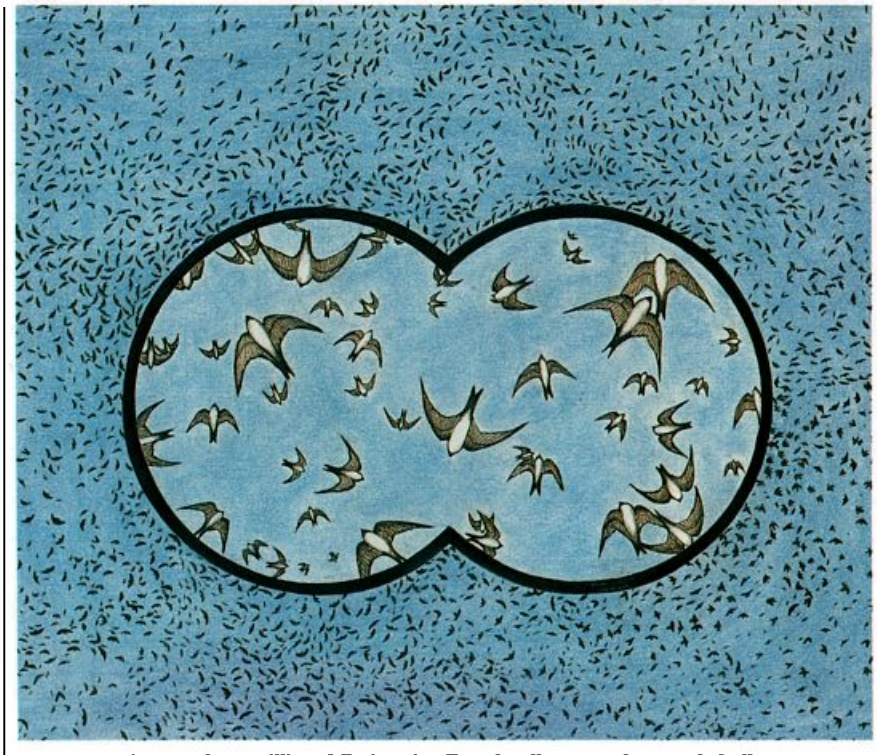
considered to be on territory. Females are detected less frequently, but their presence allows confirmation of a breeding pair. Spot-mapping produces just what the name implies: visit maps on which the location of each bird is recorded and species maps that show the residence pattern of each common species, based on season-long data transferred from the visit maps.

An additional way of censusing birds that depends heavily on sound is called the "variable circular plot method," which is widely used for estimating bird numbers in nonbreeding seasons as well as in difficult wooded terrain where spot-mapping would not be feasible. My student, Tom Sisk, applied this method extensively in a study of bird distributions across edges joining oak woodland and chaparral habitats on Stanford's Jasper Ridge Biological Reserve. On a few early mornings, I did the censuses with him and got a feel for the intensity of data gathering required to get accurate results.

The censuses were done at a series of points arranged in a grid. At each point, we stood for five minutes and estimated the distance from us to each bird heard singing or seen. This information was plotted to see at what distance from the observer the density of each species seems to decline, presumably because some of the individuals are not detected. Birds seen or heard beyond this distance are excluded from the density estimate, so that the final results depend only on those within a circle with a radius equal to the distance over which their detection can be assured. All birds seen or heard are, however, used in the process of determining the distance of certain detection.

Another technique that provides estimates of the total size of a circumscribed population is known as "mark-release-recapture." In principle it is very simple. First, birds are netted or trapped, and banded, then released. Time is allowed for them to return to their normal activities, and then a second trapping or netting session is held. Suppose 100 birds were banded in the first session, and 100 were captured in the second. If 10 of those taken in the second session already had bands, then one could estimate that 10 percent of the whole population had been banded. Since 100 were banded, and that was 10 percent of the population, the population must contain 1000 birds. In practice, there can be serious statistical problems that make mark-release-recapture estimates uncertain. But if sufficient birds are captured, this method can be very informative. The method has not been used frequently by ornithologists, due to the difficulty of banding a large portion of the population and the relative ease of acoustical censusing.

Though these techniques are all subject to shortcomings, each can give a good idea of the density of birds (that is, the number of individuals per unit area) in a given parcel of habitat. Often, however, one is not particularly interested in precisely how many birds there are in a given area but rather in whether that number is increasing or decreasing. Fortunately, it is quicker and easier to get estimates of relative density—to find out whether there are fewer or more Loggerhead Shrikes in, say, Tennessee this year than last. The most common method of doing this is some version of a transect count; that is, counting the birds detected in a narrow strip on either side of the observer while walking or driving a certain distance.



Hundreds, thousands or millions? Estimating Tree Swallows can be a real challenge.

Let's look at some circumstances in which counting birds has proven informative. Ecologists often want accurate estimates of the sizes of bird populations to help answer questions about how nature works. For instance, a study of pheasants on a 400-acre island off the coast of Washington showed how rapidly a population could increase in size if it invaded a new area free of predators and competitors. Two males and six females were introduced to the island in 1937. In 1942, at the end of the sixth breeding season, the island held a population of almost 2000 pheasants—despite considerable winter mortality each year.

Counting birds has also shown that territoriality can greatly limit the number of birds breeding in an area. In 1949 and 1950, classic (if grim) experiments were carried out in an attempt to determine the role of birds in controlling infestations of an important forest pest, the Spruce Budworm. In each season, an attempt was made to greatly reduce or eliminate bird populations from a 40-acre tract of spruce-fir forest by shooting all individuals. The first year's census before the shotguns were brought into play, showed 148 territorial males of all species. After the initial count, more than *302 males were shot* in the process of reducing the males holding territories to about one fifth of their previous number. As territorial males were removed, many were quickly replaced by others that had not held territories, and these too were then shot. In 1950 the pre-collecting census showed 154 territorial males, suggesting that the previous season's shooting had not materially affected the populations. Continuous collecting was again required to reduce the number of birds in the experimental plot because of the influx of new males.

Although results varied from species to species, the experiment strongly supported the general hypothesis that the size of the breeding populations was limited by what might be called the behavioral carrying capacity of the forest—that is, the number of nesting territories that could be established. (Territory size may not be determined primarily by the abundance of food, so that behavioral carrying capacity can be smaller than the number of individuals that can be supported on local food resources.) Clearly in this case, many males were present that could find food but could not obtain suitable territories, and they quickly replaced any males that were removed. Other studies have produced similar results, indicating that commonly there are numerous non-breeding "flock" males that are available to replace any territory holders that die. This often leads to a relatively constant breeding population from season to season.

It is often important to know how many birds there are in an area in order to understand how bird communities are organized—to answer questions such as why do more kinds of birds live together in certain habitats than in others. Tom Sisk's work on birds at habitat edges, now extended to tropical birds in Costa Rica, is one example. It will help us to understand the impact on bird communities of accelerating fragmentation of forests, which increases the amount of edge relative to the area of forest.

Remember,
bird populations are one index to the general health of our environment. Declining numbers of birds should be viewed with the sort of alarm *miners once felt when their canaries started to look ill.*

Another example where counting birds can help us analyze avian communities was in progress when the first draft of this column was being written (at the Rocky Mountain Biological Laboratory). Once again Gretchen Daily and I were trying to outsmart Red-naped Sapsuckers, and a major effort for the summer of 1991 was to find out to what degree secondary hole-nesters (birds that use old sapsucker holes) such as Tree and Violet-green swallows, Mountain Bluebirds, Mountain Chickadees, and Northern Flickers depend upon the sapsuckers. Thus we were censusing the breeding birds in forest plots with and without sapsuckers, counting all species to control for the suitability of the plots for birds in general. After all, a site might lack sapsuckers and secondary cavity nesters simply because it had very few insects present. How much of a "keystone" role the sapsuckers play by providing fresh cavities awaits analysis of our data, but with luck and a lot of looking, listening, and mapping, we'll be able to tell you in a future column. In the meantime, we had a lot of fun, despite mosquitoes, occasional ticks, and getting up at ungodly hours.

Can counting birds add to your birding fun too? Over 42,000 people seem to think so; they participated in the Audubon Society's annual Christmas Bird Count last year. Give it a try this year, if you haven't participated already. You also can take part in Breeding Bird Censuses through the Cornell Laboratory of Ornithology (write to *American Birds* for more information). We need to keep close track of North America's avifauna. Remember, bird populations are one index to the general health of our environment. Declining numbers of birds should be viewed with the sort of alarm *miners once felt when their canaries started to look ill.*

—Paul R. Ehrlich is Bing Professor of Population Studies at Stanford University, and co-author of The Population Explosion, Healing the Planet, *and* The Birder's Handbook