

HIGH POPULATION OF BREEDING BIRDS WITHIN AN ARTIFICIAL HABITAT

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The value of data on breeding bird populations within modified or "man-made" habitats is sometimes questioned in the face of our efforts to understand the problems of each species within its *natural* environment. Still, contributory evidence is forthcoming from surveys of such habitats. Aside from this, the high densities of birds which frequently occur under artificial conditions have evoked considerable comment, if only to the effect that birds are "attracted" to man!

During the period from May 20 to June 27, 1941, the writer studied an exceptional concentration of breeding birds within a well-delimited area occupied by the resort village of Dillon Beach, Marin County, California. This isolated village borders a sandy beach at the south end of Bodega Bay. To the north and east, it is surrounded by open grasslands of the coastal hills; to the south lie partially vegetated dunes. Certain distributional records from this region have already been reported (Condor, 1941, 43:294-295).

The breeding birds of terrestrial habitats outside of the village were strikingly few in number. On the open grassy hills, the only breeding species were Savannah Sparrow (*Passerculus sandwichensis*), Horned Lark (*Otocoris alpestris*), and Raven (*Corvus corax*). The Turkey Vulture (*Cathartes aura*) occurred regularly over the open country, but was not found breeding along the coast. Two frequent vagrants from the hinterlands were Red-tailed Hawk (*Buteo jamaicensis*) and Meadowlark (*Sturnella neglecta*). In the dunes, the breeding species about the shrubs and grassy areas were Savannah, White-crowned (*Zonotrichia leucophrys*) and Song (*Melospiza melodia*) sparrows. (A series of water bird species occurred along the beach, on the dune ponds, and on mud flats to the south; but except for single pairs each of the Marsh Hawk (*Circus hudsonius*) and Coot (*Fulica americana*), none of these bred.) In both individuals and species, numbers of breeding grassland and open-country birds increased noticeably inland. The village itself was something of an avifaunal oasis, and the otherwise limited numbers of birds on the coastal hills were increased by addition of several species which made frequent foraging excursions from their breeding sites within the village.

The area of the population study is a roughly rectangular plot of approximately seven and one-half acres. It is bounded by plantings of evergreen (largely cypress, some pine) and eucalyptus trees, which enclose the numerous small cottages of the village. To the east and north, a row of cedar trees borders the village; to the northwest, two rows of trees, eucalyptus flanked by cypresses and pines, are planted on a slope, parallel to the beach; and to the southwest and south, less dense plantings of the same trees complete the inclosure. A small water course, Andrew Creek, also marks the south border and separates the study area from the neighboring dunes. Scattered groves and individual trees of eucalyptus and other broad-leaved species occur within the village. Among the cottages are garden areas, lawns, and roadways with patches and borders of various shrubs. Approximately two acres of the study area are covered by tall trees, and about four-fifths of these are conifers. (Original data with aerial photographs and maps are deposited in the Museum of Vertebrate Zoology.)

Clear delimitation of the study area was facilitated by the sharp habitat changes along the margins of the village. The area was surveyed comprehensively for nests and sites of established pairs on June 2, but daily observations were made to ascertain progress of breeding activities and to note local movements and additions of species or

individuals. Toward the end of the period of observation, no evidence of new or second nesting was found, and the figures given below may be regarded as an accurate approximation of the maximum breeding population density for the season of 1941. The species and numbers of breeding individuals are as follows:

California Quail (*Lophortyx californica*), 1 pair (1 PY*).

Allen Hummingbird (*Selasphorus alleni*), 7 females (1FN, 1FY). A male was noted within the area only on May 21.

Black Phoebe (*Sayornis nigricans*), 1 pair (1PN).

Barn Swallow (*Hirundo erythrogaster*), 1 pair (1PN).

Robin (*Turdus migratorius*), 2 pairs (1PY).

Russet-backed Thrush (*Hylocichla ustulata*), 2 pairs.

Mexican Bluebird (*Sialia mexicana*), 4 pairs (4PNY).

Brewer Blackbird (*Euphagus cyanocephalus*), 20 pairs (1PN, 1PNY, and at least 6PY).

English Sparrow (*Passer domesticus*), 10 pairs (2PN, 2PY).

House Finch (*Carpodacus mexicanus*), 14 pairs (1PN, 1PY).

Pine Siskin (*Spinus pinus*), 10 pairs.

American Goldfinch (*Spinus tristis*), 12 pairs (1PN).

White-crowned Sparrow, 3 pairs (1PY).

Song Sparrow, 3 pairs (1PY).

*Numbers within parentheses are those of established pairs noted with nest or young or both. All young listed above were fledged before the end of the observation period.

The total numbers of pairs is ninety (counting the hummingbirds as mated pairs, also). In terms of the total area of 7.5 acres, this yields about 12 pairs of birds per acre. The number of individuals listed is 173 (=23 breeding birds per acre).

The survey was made with an effort to count established pairs only, although other birds were, of course, noted as well. The figures given above are therefore somewhat below the actual population density, since in the more common species (especially House Finch, Brewer Blackbird, and English Sparrow) there were a number of apparently unmated individuals either wandering or keeping to favored feeding areas and water sources. The south-facing bank of Andrew Creek was usually alive with House Finches, only a few pairs of which were apparently nesting in adjoining eucalyptus trees. On the basis of estimates, the total number of individuals may safely be increased by ten per cent to account for birds present on the area but not established. Approximately 25 individuals, then, were present per acre. Except for the quail and hummingbirds, these were all passerines, and approximately a third of the latter were fringillids.

The following transients were noted on the study area: Flicker (*Colaptes cafer*), June 24; Rough-winged Swallow (*Stelgidopteryx ruficollis*), May 20-June 4; Cliff Swallow (*Petrochelidon albifrons*), frequent and nesting inland; Bewick Wren (*Thryomanes bewickii*), June 17-19; Yellow Warbler (*Dendroica aestiva*), May 20-21; Spotted Towhee (*Pipilo maculatus*), June 2; Brown Towhee (*P. fuscus*), June 2; Purple Finch (*Carpodacus purpureus*), June 10.

Four of the more abundant species nested largely in evergreens or eucalyptus trees in rows along the north, west, and south sides of the village. Selection of either of these vegetation types as nesting sites was as follows: nine (and all) established pairs of siskins in conifers; eight pairs of American Goldfinches (66 per cent of all pairs) in conifers; seven pairs of House Finches in conifers, six in eucalyptus (93 per cent of all pairs); and twelve pairs of Brewer Blackbirds in conifers, eight in eucalyptus (constituting all pairs). Pairs not included in this listing were located in sites other than conifers or eucalyptus. (Inland, Brewer Blackbirds and House Finches were encountered frequently; the American Goldfinch, however, was uncommon, and the siskin was not found elsewhere in the region.)

There was evidence of grouping of the blackbird nests, but the immediate vicinity of the nest was defended by males and encounters were noted only among the males. However, neighboring pairs responded to alarm calls of any individual within their immediate group and would participate in driving off an intruder. Linsdale (Amer. Midl. Nat., 19, 1938:145, 152) recognized colonial nesting in this species, which, however, was monogamous in contrast to other colonial icterids (*Xanthocephalus* and *Agelaius*). During the first week of observation, pairs of Brewer Blackbirds were noted at various stages of the breeding cycle: certain individuals were in courtship and, on the other hand, a few pairs had young in the nest. On cool days during this earlier period, small flocks of seven or eight individuals were formed. Blackbirds foraged over the adjoining open country for distances occasionally as much as one mile (Stemple Creek). Outside of the village, they fed most frequently about the marshes in the dunes. Certain individuals with nests in evergreens along the north border, especially females actively feeding nestlings, were noted commuting over the village to and from dune ponds to the south. Toward the end of the observation period, pairs with young out of the nest wandered away from the village and frequented the borders of these ponds.

Other than occupation of independent nesting sites, there was no evidence of territoriality in either *Carpodacus* or *Spinus*, and these finches flocked generally during feeding. Mixed flocks, occasionally including all three species, were noted on the grasslands several times; in one such flock there were approximately fifty individuals. In neither the blackbirds nor the finches was it possible to determine with accuracy numbers of birds foraging outside of the study area, since such activity was quite irregular and in both groups considerable feeding took place within the village. The blackbirds, however, foraged away from the village with greater frequency and over longer distances than the finches.

Certain figures from other population surveys of man-modified habitats are available for comparison. Kendeigh *et al.* (Bird-Lore, 39, 1937:386; 40, 1938:350; and 41, 1939 (No. 4, supplement):30) records densities varying from 10.9 to 15.9 birds per acre on a country estate in Ohio during the period 1935-1939. Goodman (Bird-Lore, 42, 1940 (No. 4, supplement):491) reports 19.8 birds per acre on a Kansas farm. Cooke (U.S. D.A. Bull. 165, 1923:23) cites a count of 20.2 birds per acre over a 40-acre tract in Golden Gate Park, San Francisco. Lack (Ibis, 1937:372-373) summarizes a series of American and European censuses of "island" gardens. Natural sites may yield as many as 10-15 birds per acre—or even 22 (Bird-Lore, 40, 1938:350)—if considerable habitat "edge" is present.

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