

Centers of Learning

Northern Arizona University Flagstaff

by Russell P. Balda

Northern Arizona University, located in Flagstaff at an elevation of 7000 ft., is the second highest university in the United States. Flagstaff, a city of 30,000 people, at the gateway to the Grand Canyon, enjoys clean, crisp air and invigorating temperatures. The city is located within the largest continuous ponderosa pine forest in North America. Large tracts of undisturbed forest exist within the city. Situated on the Colorado Plateau in the shadow of the San Francisco Peaks, Northern Arizona University is ideally located for the pursuit of a vigorous program in avian ecology and field behavior.

The latitude of environmental extremes to be found within a 75-mile radius of the campus is unusually broad. Mount Humphreys, the highest point in Arizona (12,670 ft.), lies but a few miles from the campus. The Colorado River, running through the Grand Canyon at an elevation of 2500 ft., is only 75 miles from Flagstaff. A variety of ecological habitats including Great Basin desert, Sonoran desert, grassland, piñon-juniper woodland, ponderosa pine forest, mixed coniferous forest, and alpine tundra are easily accessible to students and faculty interested in field problems. The organization and dynamics of the avian communities in many of these habitats is virtually unknown. Mexico, harboring a variety of species and offering unlimited opportunities for studies, is within easy driving distance of the campus. The environs of Flagstaff support a high diversity of birds and interesting ornithological problems.

The first modern ecological work done in this setting was the research of C. Hart Merriam, which culminated in the formation of the widely used and somewhat controversial Life Zone concept. Ornithological investigations have been continued in northern Arizona through the efforts of Lynn Hargrave and Allen R. Phillips. Their works stand as a baseline for present day comparisons.

The Department of Biological Sciences encompasses a strong emphasis in organismic biology, of which avian biology is an integral part. The department offers an undergraduate/graduate

course in ornithology that emphasizes functional morphology, behavior, and ecology, in a field setting. Graduate courses that incorporate information on birds include systematics, evolution, animal behavior, advanced ecology, vertebrate social systems, and biogeography. Specialized seminars dealing with aspects of avian biology are also taught.

Four faculty members in the department have research and teaching interests in vertebrate zoology.

Russell P. Balda teaches ornithology, advanced ecology and vertebrate social systems. His research interests are in the areas of avian community dynamics and organizations, and the ecology and behavior of birds in the "seed caching guild". Recent studies have dealt with the effects of habitat manipulation on pine forest birds, the social organization in flocks of Piñon Jays, and the migration of owls.

Gary C. Bateman teaches vertebrate zoology and biogeography. His research interests include growth of young birds, implications of varying clutch-sizes, and the biogeographic affinities of Arizona birds.

G. E. Goslow, Jr. teaches comparative vertebrate anatomy and occasional seminars in vertebrate morphology. His research interests center around the adaptiveness of select bone-muscle systems as related to posture and locomotion. Recent studies include work on the modifications of the pelvic limb of raptorial birds which relate to striking behavior.

Terry A. Vaughan, author of the text, *Mammalogy*, has research interests in community organization and foraging behavior of temperate and tropical bats. Dr. Vaughan's interest and expertise on bats has proven to be a valuable asset to students in avian biology.

The graduate program in the biological sciences contains about 75 graduate students, 18 of whom are Ph.D. candidates. The remainder are working on Master of Science degrees. Most of these students receive support from state or grant funds. The number of graduate students working in avian biology usually numbers between five and seven. Recent thesis titles include the following: The coevolution of Clark's Nutcrackers and the piñon pine; nesting energetics of the Piñon Jay; winter territoriality in the Townsend's Solitaire; the effects of wildfire on bird populations; annual flocking cycle of the Pygmy Nuthatch, the effects of powerline construction on breeding bird populations; the importance of snags to cavity nesting birds of the pine forest.

Facilities for research in avian biology include a well-equipped laboratory for most types of physiological studies, holding cages and isolation

chambers with one-way glass for behavioral studies, and a well-equipped laboratory for the analysis as related to locomotion through high speed cinematography, electromyography, histochemistry and motor unit isolation. The library houses a good collection of ornithological books and periodicals. A modest but growing collection of birds from northern Arizona is curated in the Northern Arizona University Vertebrate Museum.

Although somewhat isolated from the centers of learning in the east and west, a viable speakers program including a number of ornithologists has been initiated. Speakers have come from throughout the U.S., Canada, Germany and Australia.

On-campus research support is unusually good at Northern Arizona University. The physics department, with a research program in atmospheric physics, has been helpful in supplying data to the field ornithologists. The mathematics department not only offers an excellent assortment of appropriate statistics courses but employs statisticians sympathetic to the needs of the avian biologist.

Members of the department of forestry have provided valuable assistance and data for field studies.

The Department of Biological Sciences has formal ties and/or working relationships in areas of avian biology with a number of agencies. A Rocky Mountain Forest and Range Experimental Station is located on campus and is staffed by many excellent ecologists. The Museum of Northern Arizona is located in Flagstaff, maintains an active research program in avian ecology, and has a valuable collection of birds. The research facilities of the museum are available to qualified graduate students on a cooperative basis.

The graduate students and faculty of Northern Arizona University have access to natural stands of ponderosa pine forest containing a full complement of bird species, including Golden Eagles, within walking distance of the campus. This is a rather remarkable situation in these times of rampant habitat destruction and urbanization.

Recent and forthcoming books

A Guide to Bird-Watching in Europe. — Ed. James Ferguson-Lees, Quentin Hockliffe & Ko Zeeres. Charles Scribner's & Sons, New York, 1976. 336 pp. Distribution table, maps, drawings \$9.95. A country-by-country guide to birdfinding in all of Europe east of the U.S.S.R., with chapters largely written by local experts. The emphasis is on the birdlife of areas and regions, with not much specific information on precisely where and when to go, how to get there, where to stay, etc. There is also information on organizations, periodicals, and bird banding offices. Undoubtedly a useful one-volume pocket guide; somehow it leaves us with the feeling that it could have been much better.

Atlas of Eastern Canadian Seabirds. — R G B. Brown, D.N. Nettleship, P. Germain, C E Tull, and T. Davis. Canadian Wildlife Service, Ottawa, 1975. 220 pp. Tables, maps. Softcover. \$6.75 Canada; \$8.10 U.S. A fine compilation of maps resulting from several years' field work, of the seabirds of eastern Canada, from west of 40°W and north of 40°N. Thirty-nine species are treated; for many there are several maps, for the Northern Fulmar, for example, there are sixteen. There are chapters on the map-

ping methods, the oceanography, factors influencing breeding ranges, seabird vulnerabilities, and a bibliography.

Audubon, The Kentucky Years. — L. Clark Keating. Univ. Press of Kentucky, Lexington 1x + 92 pp. \$3.95. A volume of the Kentucky Bicentennial Bookshelf. An account of the naturalist's years (1807-1819) in Kentucky, a period when Audubon's painting conflicted disastrously with his efforts to make a living as a businessman. Competent retelling, entertaining.

Birds of the Antarctic and Sub-Antarctic — George E. Watson. Ill. Bob Hines. American Geophysical Union, Washington, D.C. 1975 xviii + 350 pp., 11 color plates, many drawings, maps. \$15. Although of field guide size and usefulness, this admirable volume is truly a handbook of the bird life of the seas, lands, and islands south of 55°S, as well as the ocean islands north to 37°S. Introductory chapters give an excellent synopsis of the avifauna and environment of the region, with tables on zonal distribution and differentiation. The species accounts are exemplary: most include a distribution map. A