

## DISSERTATION ABSTRACT

### HISTORY, NESTING BIOLOGY, AND PREDATION ECOLOGY OF RAPTORS IN THE MISSOURI COTEAU OF NORTHWESTERN NORTH DAKOTA

The species composition of raptors (Falconiformes and Strigiformes) that nest in North America's northern Great Plains is being altered due to land use, but detailed case histories of such change are lacking, few long-term data exist to help understand raptor population dynamics in prairie areas, and implications of changes for other prairie wildlife on which raptors prey are poorly understood. I studied mechanisms and implications of land use impacts on raptors in the Missouri Coteau physiographic region of northwestern North Dakota by (1) tracing change during the past century in raptor species composition and habitat on the 108-km<sup>2</sup> Lostwood National Wildlife Refuge (LNWR), (2) assessing current (1981–90) population stability, annual reproductive success, and habitat relationships of raptors on LNWR and comparative species nesting biology on an adjacent area of different land use, and (3) determining prey needs of common, large (>700 g) raptor species on LNWR and use of prey by raptors in relation to habitat on an area of contemporary, mixed land use. Northern harriers (*Circus cyaneus*), Swainson's hawks (*Buteo swainsoni*), ferruginous hawks (*Buteo regalis*), and burrowing owls (*Speotyto cunicularia*) comprised the nesting raptors on LNWR before settlement in the early 1900s, great horned owls (*Bubo virginianus*) were rare but gradually increased over the last 40–50 yr, red-tailed hawks (*B. jamaicensis*) pioneered about 30 yr ago, and Cooper's hawks (*Accipiter cooperii*) pioneered in the past decade. Today, red-tailed hawks and great horned owls have replaced Swainson's and ferruginous hawks as dominant large raptors, coinciding with succession from mixed grass prairie to aspen parkland with brush-dominated uplands. Harrier abundance apparently has changed little, but nesting burrowing owls have been absent more than 40 yr. The most fundamental causes of change in the raptor community probably were altered susceptibility of prey to foraging behaviors of specific raptor species and decreased abundance of certain key prey species. During the 1980s red-tailed hawks and great horned owls exhibited high, stable nesting densities ( $\bar{x}$  = 0.23 and 0.13 occupied nests/km<sup>2</sup>, respectively) but erratic and low annual productivity ( $\bar{x}$  = 0.9 and 0.7 young/occupied nest); both species nested mostly in areas with highest densities of tree clumps and the owl was associated with wetlands. Nearly all Swainson's hawk nests occurred on LNWR's boundary, and an adjacent area (93 km<sup>2</sup>) of different land use had twice as many occupied Swainson's hawk nests/km<sup>2</sup> as LNWR. Great horned owl diets were studied during late spring and Swainson's hawk diets during summer, 1986–87, on land of mixed use; 2900 and 1284 prey items were recorded, respectively. The owl relied heavily on avian prey from wetlands (total wetland prey: 57% of overall frequency and 76% biomass of diet) especially ducks and used less leporid prey than reported elsewhere. Swainson's hawks also used many prey from wetlands (49% overall frequency, 42% biomass) but mammals were the most important prey and overall diet was more diverse compared to findings elsewhere. Variation in use of several categories of prey among Swainson's hawk families was explained mostly by nesting area habitat. A cursory survey of great horned owl and red-tailed hawk diets on LNWR suggested these raptors relied on prey from wetlands, especially ducks.

Fire suppression and other land-use practices that increase woody vegetation across prairies of the northern Great Plains can expand nesting opportunities for red-tailed hawks and great horned owls. Most species of breeding raptors that historically were common in northern prairies, as well as many other species of migratory birds indigenous to the region, may be inimically affected by such changes due to decreased habitat quality or interspecific interaction (e.g., resource competition and predation) with red-tailed hawks and great horned owls.—**Robert K. Murphy. 1993. Ph.D. dissertation, Department of Biology, Montana State University, Bozeman, MT 59717 U.S.A. Present address: U.S. Fish and Wildlife Service, Des Lacs National Wildlife Refuge Complex, Box 578, Kenmare, ND 58746 U.S.A.**