Resource partitioning among three species of hawks in the Centennial Valley, Montana
by Marco Restani

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Fish and Wildlife Management
Montana State University

Abstract:
Resource partitioning among red-tailed (Buteo iamaicensis), ferruginous (B_ regalis), and Swainson' s hawks (B. swainsoni) along habitat, food, and temporal dimensions was studied during the 1987 and 1988 nesting seasons. The study area encompassed 319 km2 and was located in the Centennial Valley of southwestern Montana. Eighty-six active nests were located over 2 years: 20 red-tailed, 24 ferruginous, and 42 Swainson's. Most (88%) nests were in foothill drainages and distance to nearest neighbor was significantly less than expected. Red-tailed hawks nested in trees significantly more often than ferruginous and Swainson's hawks. Red-tailed hawks nested in significantly taller substrates, deeper within stands, and at higher elevations than ferruginous and Swainson's hawks. Ferruginous and Swainson's hawks nested primarily in willows (Salix spp.).

Ferruginous hawk nests had significantly larger windows, more long distance exposure, and were at lower elevations than Swainson1s hawk nests. Slope aspects at all nests were predominantly oriented northwest or southeast. Nesting chronology of red-tailed and ferruginous hawks overlapped most while Swainson's hawks nested 3 weeks later. Mean fledging dates of red-tailed, ferruginous, and Swainson's hawks were 11 July, 15 July, and 5 August, respectively. Ferruginous hawks were the most productive and Swainson's hawks the least. Distance to nearest neighbor and potential sources of disturbance were not significantly correlated with reduced productivity. Ground squirrels (Spermophilus spp.) were the main prey of each species. Dietary overlap was greatest between red-tailed and ferruginous hawks and least between ferruginous and Swainson's hawks. Ferruginous hawks took significantly more mammals than red-tailed and Swainson's hawks. Red-tailed and ferruginous hawks took significantly more ground squirrels but fewer voles and birds than Swainson's hawks. Adult hawks of each species did not appear to partition foraging habitat or hunting activity periods. Juvenile red-tailed hawks had the longest post-fledging period and Swainson's hawks the shortest. Juveniles appeared to use habitats in proportion to their availability. Dispersal of juveniles of each species occurred the third week of August. Twenty-eight interspecific interactions were observed. Swainson's hawks were most aggressive and dominated in most (92%) encounters in which they were involved.

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This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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ABSTRACT

Resource partitioning among red-tailed (Buteo jamaicensis), ferruginous (B. regalis), and Swainson's hawks (B. swainsoni) along habitat, food, and temporal dimensions was studied during the 1987 and 1988 nesting seasons. The study area encompassed 319 km^2 and was located in the Centennial Valley of southwestern Montana. Eighty-six active nests were located over 2 years: 20 red-tailed, 24 ferruginous, and 42 Swainson's. Most (88%) nests were in foothill drainages and distance to nearest neighbor was significantly less than expected. Red-tailed hawks nested in trees significantly more often than ferruginous and Swainson's hawks. Red-tailed hawks nested in significantly taller substrates, deeper within stands, and at higher elevations than ferruginous and Swainson's hawks. Ferruginous and Swainson's hawks nested primarily in willows (Salix spp.). Ferruginous hawk nests had significantly larger windows, more long distance exposure, and were at lower elevations than Swainson's hawk nests. Slope aspects at all nests were predominantly oriented northwest or southeast. Nesting chronology of red-tailed and ferruginous hawks overlapped most while Swainson's hawks nested 3 weeks later. Mean fledging dates of red-tailed, ferruginous, and Swainson's hawks were 11 July, 15 July, and 5 August, respectively. Ferruginous hawks were the most productive and Swainson's hawks the least. Distance to nearest neighbor and potential sources of disturbance were not significantly correlated with reduced productivity. Ground squirrels (Spermophilus spp.) were the main prey of each species. Dietary overlap was greatest between red-tailed and ferruginous hawks and least between ferruginous and Swainson's hawks. Ferruginous hawks took significantly more mammals than red-tailed and Swainson's hawks. Red-tailed and ferruginous hawks took significantly more ground squirrels but fewer voles and birds than Swainson's hawks. Adult hawks of each species did not appear to partition foraging habitat or hunting activity periods. Juvenile red-tailed hawks had the longest post-fledging period and Swainson's hawks the shortest. Juveniles appeared to use habitats in proportion to their availability. Dispersal of juveniles of each species occurred the third week of August. Twenty-eight interspecific interactions were observed. Swainson's hawks were most aggressive and dominated in most (92%) encounters in which they were involved.

INTRODUCTION

Two species cannot occupy exactly the same niche (Grinnell 1917, Gause 1934). Coexisting species must separate along 1 or more resource dimensions in saturated habitat. In birds, resource partitioning occurs most commonly along habitat dimensions, followed by food, and then temporal dimensions (Lack 1971, Cody 1974, Schoener 1974).

Three species of buteos, red-tailed (Buteo jamaicensis), ferruginous (B. regalis), and Swainson's hawks (B. swainsoni), coexist in abundance in the Centennial Valley of southwestern Montana. Because the struggle for existence is generally most intense between species of the same genus (Darwin 1859), these hawks seemed appropriate subjects for a study of resource partitioning. Studies in Alberta (Schmutz et al. 1980) and Oregon (Cottrell 1981) reported resource partitioning along nesting habitat dimensions among these 3 species while broad overlap occurred in prey utilization and nesting chronology.

The purpose of this study was to record resource partitioning among these 3 hawk species in southwestern Montana. Objectives were to determine: (1) nest site characteristics, (2) nesting chronology, (3) prey utilization, (4) habitat use and foraging activity of adults and, (5) habitat use and dispersal of juveniles. Field work was conducted during 1987 and 1988.

STUDY AREA

Location and Physiography

The study area was located in the Centennial Valley of Beaverhead County in southwestern Montana with its western boundary approximately 16 km east of Lima. Its greatest north-south width (18 km) and east-west length (26 km) resulted in a study area 319 km^2 in size (Fig. 1). Land ownership was 44% private, 43% federal, and 13% state.

The study area, located in the western third of the Centennial Valley, is bordered to the north by the Snowcrest Range and to the south by the Centennial Mountains. Mountains, composed primarily of volcanic and sedimentary rocks, slope gently to the nearly level valley floor. Few rock outcrops occur. Four perennial streams occur on the study area, but the vast majority are ephemeral.

Lowest elevations (1,974 m above mean sea level) occurred beside Lima Reservoir. Highest elevations ranged from 2,544 m in the northeastern corner of the study area to 2,256 m in the south central region along the Continental Divide.

Geology and Soils

Physiography of the study area was determined during the Tertiary Period. Tensional block faulting uplifted the Centennial Mountains and the Snowcrest Range. The Centennial Valley is a block which has