

Central Valley Winter Raptor Survey (2007-2010): Variation in Grassland Raptor Density among Survey Routes

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Information on the relative quality of habitats for raptors across a large geography as the Central Valley (CV) provides a basis for identifying priority areas where limited conservation resources can be focused most effectively. For this purpose, we examined our data across all 19 CV raptor survey routes by habitat type and species to see if a certain routes showed significantly higher densities for a given habitat than others. We found no significant differences in raptor densities among routes for all habitat types except grassland. Significant route-to-route variations for some species in grassland are summarized here.

STUDY AREA AND METHODS

Survey methods are described in the accompanying overview and methods paper (Pandolfino and Smith 2011). We determined the average densities (birds per 40 ha block) of each raptor in each habitat and compared the densities between routes for each species. In each case, we determined the 95% confidence interval around the average densities using the Data Analysis Package of Microsoft Excel.

RESULTS AND DISCUSSION

We found no significant differences in the density of raptors between survey routes for any habitat except grassland. Four species showed significant route-to-route variation in grassland: the Red-tailed Hawk, Ferruginous Hawk, Rough-legged Hawk, and Prairie Falcon. Interestingly, the last three species are also the only ones that show a positive association with grassland and with no other habitat type (Pandolfino et al. 2011). Figures 1-4 show the variation in density of these four species across the 14 routes that include at least 1,000 ha of grassland habitat. Figure 5 directly compares the three grassland specialist species (Ferruginous Hawk, Rough-legged Hawk, and Prairie Falcon) across routes individually and in total. Three routes (Linden, Oakdale, and LeGrand) consistently showed high densities of these raptors, all of which are in the northeast corner of the San Joaquin Valley in eastern San Joaquin, Stanislaus, Merced, and western Mariposa counties (Figure 6). We then compared the density of the three grassland specialists in grassland from those three northeast San Joaquin Valley routes to grassland density on all other routes (Figure 7). For each

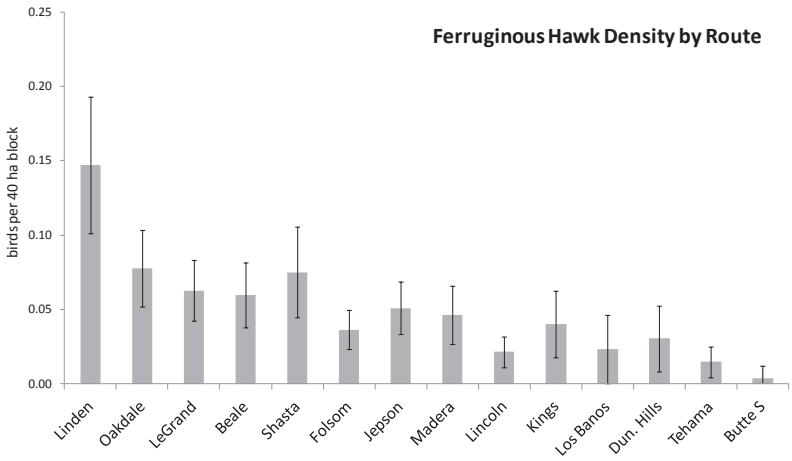


Figure 1. Comparison of density (birds per 40 ha block) of Ferruginous Hawks in grassland habitat across 14 survey routes. Error bars represent 95% confidence interval.

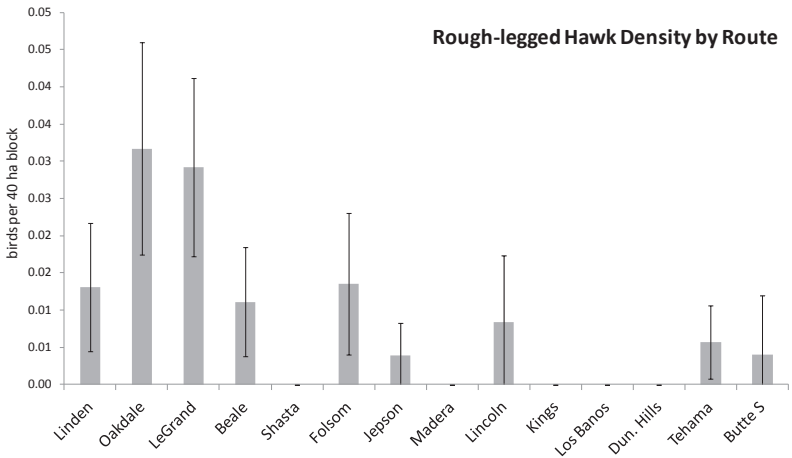


Figure 2. Comparison of density (birds per 40 ha block) of Rough-legged Hawks in grassland habitat across 14 survey routes. Error bars represent 95% confidence interval.

species, the grassland density on those three routes was significantly higher than that observed in grassland from all other routes.

While there are differences in prey preference among the four species that showed significant route-to-route variation (Johnsgard 1996), there is also considerable overlap (Craighead and Craighead 1956, Bildstein 1987, Bechard and Schmutz 1995, Steenhof 1998). They also overlap in hunting styles, with the three Buteos primarily using perches to hunt, but Prairie

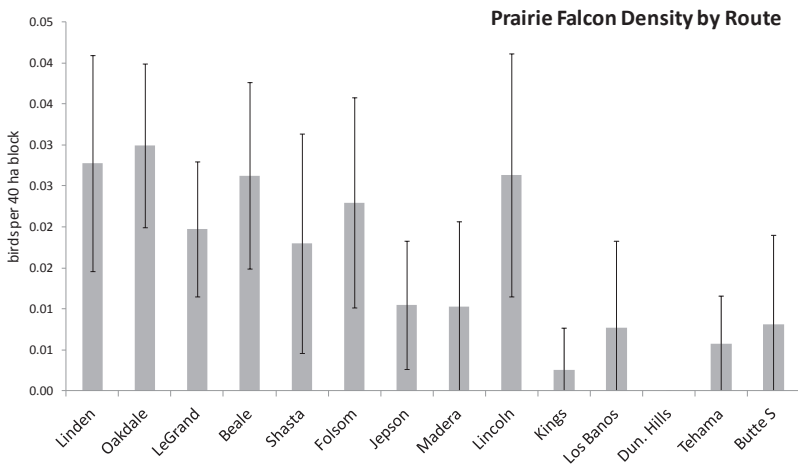


Figure 3. Comparison of density (birds per 40 ha block) of Prairie Falcons in grassland habitat across 14 survey routes. Error bars represent 95% confidence interval.

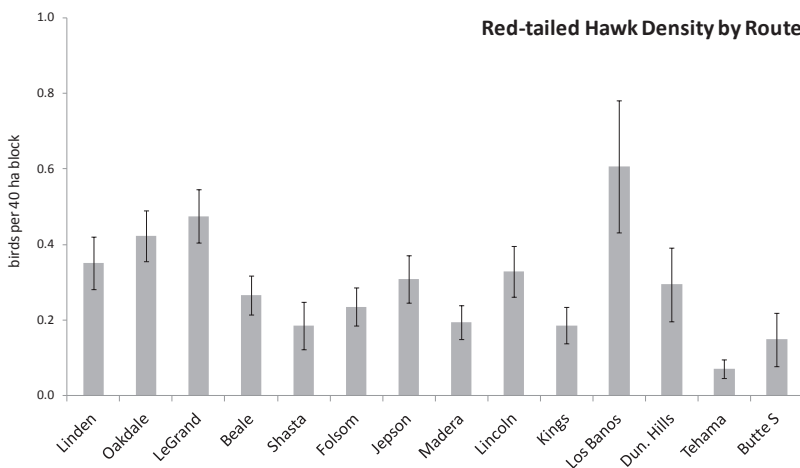


Figure 4. Comparison of density (birds per 40 ha block) of Red-tailed Hawks in grassland habitat across 14 survey routes. Error bars represent 95% confidence interval.

Falcons also frequently hunting from perches. Therefore, it is not surprising that all four species might find the same type of grasslands attractive. Our study was not designed to determine habitat use or prey productivity, but it is reasonable to assume that the higher densities of these raptors in certain grasslands are correlated with foraging success. While this use may be related to greater rodent abundance in these areas, the interplay between rodent abundance and hunting success is complex (Craighead and Craighead

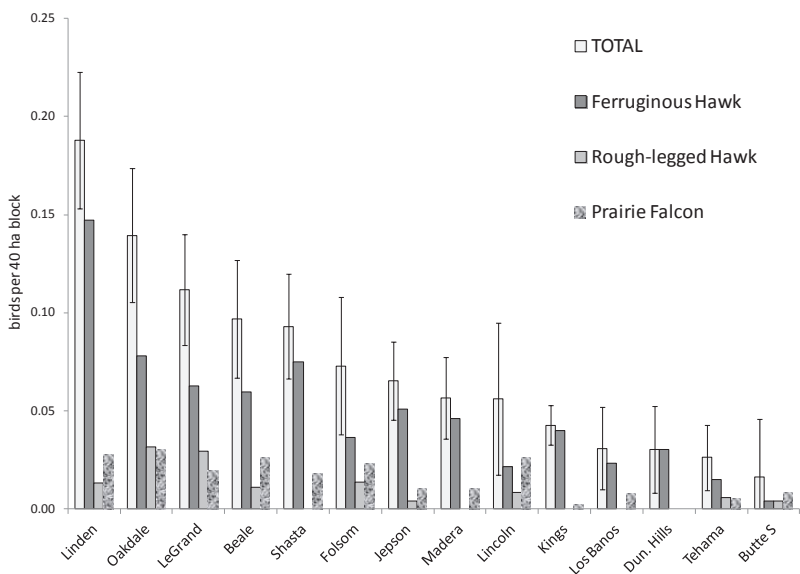


Figure 5. Comparison of density (birds per 40 ha block) of Ferruginous Hawks, Rough-legged Hawks, Prairie Falcons, and the sum of all three (TOTAL) in grassland habitat across 14 survey routes. Error bars shown only for TOTAL and represent 95% confidence interval.

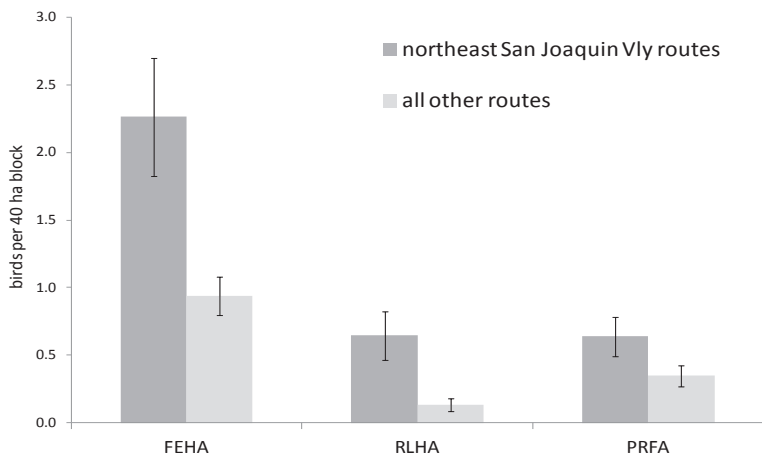


Figure 7. Comparison of density (birds per 40 ha block) of Ferruginous Hawks, Rough-legged Hawks, and Prairie Falcons in grassland habitat of the three northeast San Joaquin Valley routes (Linden, Oakdale, and LeGrand) and all other survey routes. Error bars represent 95% confidence interval.

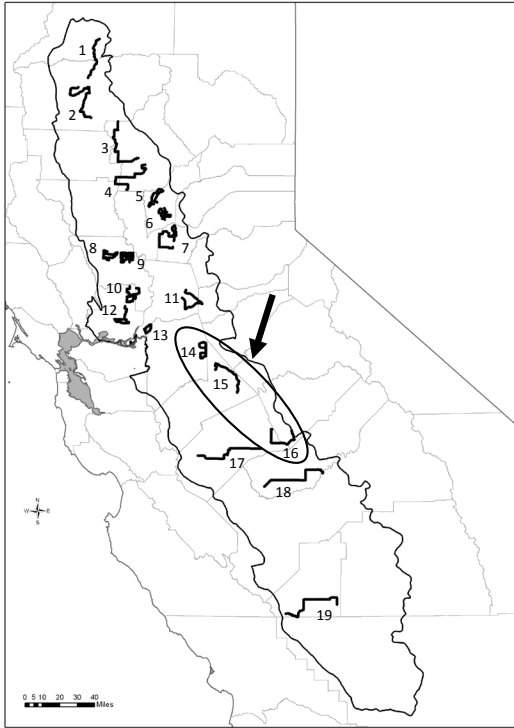


Figure 6. Map of all 19 survey routes with three routes (Linden, Oakdale, and LeGrand) on the northeastern edge of the San Joaquin Valley circled. (1 = Shasta, 2 = Tehama, 3 = Butte North, 4 = Butte South, 5 = Yuba, 6 = Beale, 7 = Lincoln, 8 = Dunnigan Hills, 9 = Woodland, 10 = Davis, 11 = Folsom, 12 = Jepson, 13 = Delta, 14 = Linden, 15 = Oakdale, 16 = LeGrand, 17 = Los Banos, 18 = Madera, 19 = Kings).

1956, Baker and Brooks 1981, Johnson and Horn 2008) with many factors in the habitat influencing one aspect or the other.

Our results suggest that some grassland areas may support many more raptors than others. Therefore, it is important to know what factors affect abundance, so that conservation efforts can be focused on the most productive habitats. To this end, we intend to examine a large set of variables (soil type and depth, rainfall, temperature, patch size, proximity to other habitats, etc.) to see if we can produce a model that can be used to predict which grasslands will support the highest concentrations of raptors in the CV.

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