

Local Occurrence

Nesting red-tailed hawks are found throughout the Snake River study area. We have found red-tailed hawks nesting within almost every forested habitat within the study area, including dense Douglas fir forest, mixed fir and lodgepole pine, cottonwood riparian forest, and isolated cottonwoods and aspens in cultivated lands. Red-tailed hawks were detected within eight of our sample sections.

Reproductive Biology

Red-tailed hawk incubation lasts from 28-32 days, with fledging normally at 44-46 days after hatching (Luttich et al. 1971). Locally, red-tailed hawks initiate incubation in the first or second week of April, with hatching in early May (Whitfield and Maj 1994). Red-tailed hawk fledging occurs from mid-June to the first of July.

Kirkley and Springer (1980) reported a range in clutch sizes of 2.0 to 2.9 eggs and brood sizes of 1.9 to 2.6 young for 9 studies over a broad geographic range. In Teton Valley, Idaho/Wyoming in 1992 and 1993 (Whitfield and Maj 1994), average clutch size at sampled nests was 2.9 eggs (N = 49) with no annual variation. Average advanced brood size in 1992 was 2.47 advanced young/successful nest (N = 17), and in 1993 was 2.24 advanced young/successful nest (N = 25).

Ecology and Habitat Relationships

The red-tailed hawk has an extremely wide tolerance for habitat variation, in part due to a broad spectrum of prey species (Johnsgard 1990). Red-tailed hawks are diverse in nest site selection; they will nest in conifers and hardwoods or cliffs or other elevated sites where trees are lacking (Smith and Murphy 1973). In nesting habitat and prey selection, red-tailed hawks are notably similar to great-horned owls, which often use red-tailed hawk nests.

In summer, red-tailed hawks are typi-

cally found in upland hardwood forests (aspen and cottonwoods in our area), and grass dominated cover types. Most of the hunting is in short grass areas (Peterson 1979). Nests are typically at the edge of dense stands or within open canopy forests in tall trees, not in the interior of dense forest (Gates 1972). Howell et al. (1978) noted that breeding areas with high proportions of fallow pasture relative to crop pasture had greater productivity. In Teton Valley (Whitfield and Maj 1994), dryland pasture dominated territories were significantly more productive than territories dominated by wetlands, probably because of high ground squirrel populations in the dryland areas.

Detection Methods

Surveys for red-tailed hawk nests are best initiated prior to leaf-out in deciduous forests. Any medium size (2-3' diameter) stick nests located in the tree canopies should be noted and later surveyed from the ground for occupancy from late March to mid-May when incubating birds can be observed. Adults are quite vocal during their nesting period and this behavior alone may direct attention to specific nesting areas. Young birds are also vocal. Their food-begging vocalizations from mid-June to early August will focus attention to potential nest sites. All ground surveys should be conducted in a manner that will minimize disturbance to nesting birds so as to avoid the potential of territory abandonment. Surveyors should remain alert and use spotting scopes to view nests from a distance when possible.

Swainson's Hawk (*Buteo swainsoni*)

Swainson's hawks breed locally in east-central Alaska, western Canada, and the western United States east of the coast ranges (Johnsgard 1990). The Swainson's hawk has declined significantly throughout much of its range including California (Bloom 1980), Nevada (Herron and Lucas 1978), Southeast Oregon (Littlefield et al. 1984), and Saskatchewan (Herron and Bechard

1983). Although historically documented as one of the most abundant buteos in the west, red-tailed hawks now outnumber Swainson's hawks throughout their range. These declines are mostly due to loss of habitat, losses of bottomland forested areas and shelterbelts, and also to pesticide use on winter ranges. There is also some concern that red-tailed hawks are replacing Swainson's hawks because of habitat change. In California, Swainson's hawks are listed as threatened, and in four other states as species of special concern. The Swainson's hawk is listed as a BLM sensitive species. Swainson's hawks are neotropical migrants: Swainson's migrate to the pampas of Argentina for the winter, although a few rarely winter in the extreme southern U. S.. It also appears to have a lower breeding potential than its more successful cousin, the red-tailed hawk. Although common in Idaho, it has declined in much of its former range. For these reasons, we regard the Swainson's hawk as a species worthy of close monitoring in this area.

Local Occurrence

We have found Swainson's hawks nesting in aspen stands on upland portions of the study area and along the mainstem Snake River at the edge of cultivated fields and pasture lands in the lower end of the area. We commonly see foraging Swainson's hawks over hayfields and meadows and at the edge of the foothills in Swan Valley, and over farmlands at the edge of the Snake River corridor at lower elevations. We saw Swainson's hawks at two sample sections. Although frequently seen, Swainson's hawks are far less common locally than are red-tailed hawks.

Reproductive Biology

Swainson's hawks arrive in the study area in late April and begin to nest in early May (Whitfield and Maj 1994). Egg-laying occurs in mid-May, with hatch dates in mid-June. Fledging occurs in late July-early August. Incubation in the Swainson's hawk lasts for about 34 days. Fledglings leave the nest after 38-46 days, and

may remain largely dependent upon the adults for food until near migration (Fitzner 1978). Swainson's hawks migrate south from the study area by early October.

Clutch sizes are usually 1-3 (Dunkle 1977, Fitzner 1978). In nearby Teton Valley (Whitfield and Maj in prep), average clutch size for 1992-1994 was 2.13 eggs/active nest (N = 15), and average advanced brood size of 1.78 young/brood (n = 13).

Ecology and Habitat Relationships

Swainson's hawks return to old nests, and also use old magpie nests, or old crow or raven nests (Fitzner 1978). Nesting areas are usually in broken grasslands and cultivated areas with scattered trees (Dunkle 1977). Woodbridge (1987) reported that Swainson's hawks in California strongly preferred irrigated alfalfa fields over drier rangelands, probably because of the greater prey base. Bechard (1982) found that cultivated fields were not highly used for foraging until after crop harvest had reduced plant cover. He suggested that vegetative cover may have been more important in foraging habitat selection than relative prey density. In Teton Valley (Whitfield and Maj 1994), Swainson's hawk nests are in valley uplands near the valley edge. These areas feature scattered aspen stands, pasture lands and cultivated fields. Hayfields are highly used for foraging throughout the summer, most notably early in the irrigation season and after cutting when vegetative canopy cover is relatively low. Schlorff (1985) noted that Swainson hawk population declines in California are in part due to loss of nesting trees from agricultural development.

Detection Methods

Swainson's hawk nest surveys follow the same protocol as that for red-tailed hawks: detection of nests prior to leaf-out and follow-up ground surveys to determine species occupancy. It is important to keep in mind that Swainson's hawks nest later than most local raptors (Ap-

pendix A, Table 1). Detection of medium size stick nests in trees (often in a single tree or narrow stringer of trees) is preferably initiated prior to leaf-out. We have, however, noted that Swainson's hawks often build new nests after leaf-out. Swainson's nests are also smaller and less conspicuous than red-tailed hawk nests, in part because they are often built low in the canopies of relatively small trees.

Medium size stick nests, vocalizations, defensive adults and food-begging juveniles are all important clues to focus nest searches. Ground surveys for territorial adults can be initiated in early May and continue until mid-August in southeastern Idaho. This window of time includes that period when juveniles are still in the nest or within close proximity and vocally food-begging.

Ferruginous Hawk (*Buteo regalis*)

This raptor is distinctively a species of the Great Plains of North America (Johnsgard 1990). The ferruginous hawk breeds from the grasslands of Canada south to Oregon, Nevada, Arizona and Oklahoma. Populations within the intermountain west utilize large expanses of grassland habitat often associated with broad valley bottoms. Because of this dependence upon large undisturbed grasslands, the rarest habitat in North America, the Ferruginous hawk is in serious decline in many areas (Houston and Bechard 1984, Schmutz 1984, Woffinden and Murphy 1985, USDI 1992). The total ferruginous hawk population in North America has been recently estimated at 3-4,000 (Woffinden and Murphy 1989). The Idaho population has been estimated at 200-250 pairs in 1979 to a minimum population of 100 breeding pairs (USDI 1992). Wyoming probably has as good a population of this species as any state, with over 800 pairs (Oakleaf 1986). The ferruginous hawk is listed as a Category 2 candidate species throughout its range. It is a BLM sensitive species. The ferruginous hawk is a Priority 3 species in Wyoming, and a sensitive species in regions 1, 2, 3, and 4 of the Forest Service. This species has been considered, but thus far denied, for federal listing

under the Endangered Species Act (USDI 1992). The ferruginous hawk is considered threatened in Canada.

Local Occurrence

Ferruginous hawks were not detected this past field season in the study area. Potential nesting habitat exists in the lower end of our study area and on some of the grass/sage benches above the Snake River Canyon. In general, our study area offers marginal habitat compared to more suitable habitat in our region.

Reproductive Biology

Ferruginous hawks will use natural and man-made structures for nesting platforms (Gaines 1985). A variety of nests sites and substrates are used by ferruginous hawk including power poles, artificial nest platforms, trees, willow and ground nests (Thurow and White 1983, Schmutz 1984, Gaines 1985, Bechard et. al. 1990, Restani 1991). More so than other large buteos, the ferruginous is thought to have relatively high reproductive potential. Adult courtship occurs in mid-March, with initiation of nesting in April. Clutches vary from 2-4 eggs per nest and has been correlated with both nest substrate (ground vs tree) and prey abundance (Lokemoen and Duebbert 1976, Woffinden and Murphy 1977, Smith et. al. 1981). Incubation lasts 32 days with both adults participating.

Young ferruginous hawks fledge between mid-June and late July, at about 30-50 days post hatching. Number of young fledged per nest ranged from .67 to 2.67 (Fitzner et. al. 1977). Based upon adult (25%) and first year (60%) mortality rates, 1.5 young fledged per nest is necessary for population stability (Wollfiden and Murphy 1989). Juvenile birds will stay in the nesting territory anywhere from 10-40 days (Konrad and Giler 1986).

Ecology and Habitat Relationships

The ferruginous hawk is typically a resi-

dent of open grassland habitat. Local areas may be used during migration and the post-breeding season as northern birds migrate south. Nesting is well documented in Dubois, Kilgore and Roberts Idaho. A number of studies describe the variable responsible for the separation and co-existence red-tailed, Swainson's and ferruginous hawks relative to their habitat, nest structures and prey (Thurrow and White 1983, Bechard et al. 1990). Restani 1991, found the greatest nesting chronology and prey overlap between red-tailed hawks and ferruginous hawk which had the least nesting habitat overlap. The reverse was true between Swainson's hawk and ferruginous. In general this species avoids areas where large tree stands and agriculture (plowed lands) dominate the terrain. They are closely associated with shrub-steppe and grassland communities. Their main prey base is made up of small mammals and birds including; jackrabbits, pocket gophers, desert cottontails, ground squirrels, western meadowlark, black-billed magpie and snakes (Fitzner et al. 1977, Thurrow and White 1983, Olendorff and Fish 1985, Restani 1991). Local impacts may occur if a nest site is repeatedly subjected to human disturbance. At the larger scale, habitat loss through the conversion of grassland to monotypic crop lands has significantly impacted this species (Gilmer and Stewart 1983, Schmutz 1984).

Detection Methods

Ferruginous hawk build large stick nests (>2.5 feet in diameter) on raised surfaces such as rock outcrops and cliffs, in a single juniper, man-made structure or on the ground. Such nests are quite conspicuous, particularly when viewed in the open habitat where ferruginous hawks typically reside. Nests are easily detected by ground surveys (driving or walking). Adult ferruginous hawks display territorial behaviors within .5 miles of their nests. Surveys should be initiated in March at courtship and continue into mid-April, the nesting period in southeastern Idaho. It is during this time that the large, light-plumaged juveniles are conspicuous on nests.

Ferruginous hawks are sensitive to human disturbance and should thus be avoided prior to hatching.

Northern Harrier (*Circus cyaneus*)

The northern harrier is a resident of the western United States, Canada and Alaska (Johnsgard 1990). Northern populations of the harrier generally migrate southward to the lower tier States, some birds migrating as far south as Mexico and Central America. The extent of migration from nesting habitat is dependent upon availability of prey and severity of weather conditions (Craighead and Craighead 1956). The single harrier species residing in North America is thought to be common within limits of its normal range and suitable habitat (Martin 1987). Johnsgard (1990), however, described the southern breeding range of the species as retracting and the overall population in decline. The northern harrier has been on the Audubon Society's Blue list of potentially declining species from 1972 through 1986 (Johnsgard 1990). Habitat loss and degradation are the suspected causes of population depressions.

Local Occurrence

Though a common diurnal raptor of southeastern Idaho, harriers were detected in only 1 of our sample plots on the western end of the study area. We observed them frequently in open grass/shrub communities adjacent to our sample areas. Our observations suggest that harriers are common in the general area, but most often in sage/grassland habitats and seeded grasslands outside our sample area.

Reproductive Biology

Courtship starts in early April with dramatic aerial flights and ground nest building, which is primarily completed by the male. Egg laying is in early May. A clutch of 4-5 eggs is incubated for 30-32 days, and hatched generally by the end of June. Hatching can be extended for

1-10 days due to the long interval between egg laying and the variable onset of incubation. The female may simultaneously attend a young brood and still be incubating the remaining clutch of unhatched eggs. A ground nester, harriers are highly susceptible to terrestrial predators. The number of successfully fledged young can vary considerably, ranging from 1.6 to 2.4 young on average. The adult male may abandon the nest area prior to fledging of young as the adult female increases her hunting effort.

Ecology and Habitat Relationships

The harrier is a species of open country. This diurnal raptor is specifically associated with mesic grasslands and wetland habitats for nesting. Harriers forage in a diversity of habitats, but use mesic sites and cultivated areas disproportionate to their occurrence. Martin (1987) found harriers a considerable distance from wetlands in dry shrub steppe habitats in southwestern Idaho. The northern harrier has been described as a "hawk that is ruled by a mouse", indicating its close tie to voles (Hamerstrom 1986). This raptor does show an ability to diversify its prey base, to include cottontail rabbits, ground squirrels and small passerine birds, dependent upon seasonal availability. The northern harrier is similar to the short-eared owl in its hunting adaptations (facial disk) and strategies (reliance on auditory cues) in locating prey (Rice 1982). There have been a number of studies illustrating the prey and habitat overlap between these two species (Weller et al. 1955, Clark 1972). The home range of adult harriers has been estimated at 2.41-14.0 sq km. (Martin 1987). The mesic, grassland habitats selected by the harrier reduces competition with other local diurnal hawks.

Detection Methods

Ground surveys are the most reliable method for detection of northern harrier ground nests, which are commonly located in densely vegetated, wet areas. Rather than randomly surveying a large area, nests can be located by

observing paired adults during the nesting period to focus ground survey efforts. Adult courtship flights, prey deliveries and later in the season, fledged young, can indicate areas of nesting activity. Locations where these observations are made should be systematically searched.

Northern Goshawk (*Accipiter gentilis*)

The northern goshawk is holarctic in distribution. In North America, it is found in the northern forests of California, Washington, Oregon, and the Northern Rockies across to the northeastern states and south into the western montane zone of California, Arizona, New Mexico and Nevada. It is an interior forest species associated with both deciduous and coniferous forests. Research performed in the Southwest, Pacific Northwest and Intermountain areas indicate goshawk population declines. Breeding bird surveys suggest a significant downward trend in the United States population, although the western population is listed as stable (1980-1989). The northern goshawk is listed as a category 2 candidate for listing as a threatened or endangered species. The northern goshawk is recognized as a sensitive species in Forest Service Regions 2, 3, and 4, which includes southeast Idaho.

Local Occurrence

Nesting goshawks have been found in conifer, cottonwood, aspen and coniferous forests along the South Fork of the Snake River. An interior forest raptor, goshawks are not easily detected nor commonly observed. Population trend is unknown since the historic occurrence and density of the goshawk is undocumented for the study area. There are a diversity of suitable nesting habitats. Goshawks are also known to congregate in low elevation stands of deciduous trees and shrub in the winter (pers. observation M. Maj). It is speculated that these birds may represent goshawks that nest at higher elevations in surrounding coniferous forests. The moderate winter temperatures and deciduous