

NESTING HABITAT SELECTION AND PRODUCTIVITY
OF NORTHERN GOSHAWKS
IN WEST-CENTRAL MONTANA

By

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N Slope =
83% at
38

Doc. 1057

Approved by:

/s/
Chairperson

Dean, Graduate School

12/29/00
Date

Need to protect
more than nest = 29

harvest cover = 28, 69

nest started = 42, 47
CANO - 31, 32
Prey = 34, 69, 82, 78
log = 35, 47, 67, 71, 75

narrow zone = 68
69

Dist log - 71, 72

managed =
Experimental - 77

CC = 67, 75

K

Nesting chronology.— The overall estimated mean onset of incubation was 5 May \pm 1.42 days (range from 21 April to 14 May); hatching date, 6 June \pm 1.42 days (22 May to 15 June); and fledging date, 12 July \pm 1.42 days (29 June to 23 July).

Nesting chronology differed between years (Mann-Whitney $U = 5.0$, $P = 0.002$). Onset of incubation occurred 10 days earlier in 1998 than in 1997, perhaps due to mild weather. In 1997, mean onset of incubation was 10 May \pm 1.53 days (range from 4 to 14 May); hatching, 11 June \pm 1.53 days (5 to 15 June); and fledging, 17 July \pm 1.53 days (13 to 23 July). In 1998, mean onset of incubation occurred on 30 April \pm 1.93 days (range from 21 April to 9 May); hatching, 1 June (22 May to 10 June); and fledging, 7 July (29 June to 18 July).

Banding effort and band returns.— In 1997, 11 goshawk chicks (6 females, 5 males) from five of the six monitored nests were banded in the nest 19 to 28 days posthatching. In 1998, 12 chicks (6 females, 6 males) from five of the 12 monitored nests were banded. On 23 November 1998 (approximately 139 days postfledging), #1807-69220, which I banded as a nestling female on 23 June 1998, was captured and released by a falconer near Belgrade, Montana, approximately 160 km south/southeast from its

~~natal nest.~~

GOSHAWK DIET

For 1997 and 1998 combined, I identified 101 prey items, 8 mammal and 10 bird species, from the prey remains collected at nests (Table 2). In 1997, the three most common prey species were, in descending order of abundance, snowshoe hare (*Lepus*

Table 2. Prey species frequency distribution. Table shows mammalian and avian prey species, the frequency (%) of each prey item for 1997 and 1998, and the percent of total biomass (1997 and 1998 combined) for each prey item.

Prey species	1997 Frequency (%)		1998 Frequency (%)		Total Biomass (%)
Mammals					
Snowshoe hare (<i>Lepus americanus</i>)	12	(32)	3	(5)	53.39
Mountain cottontail rabbit (<i>Sylvilagus nuttallii</i>)	1	(3)	0	(0)	1.11
Columbian ground squirrel (<i>Spermophilus columbianus</i>)	6	(16)	11	(17)	9.45
Golden-mantled ground squirrel (<i>Spermophilus lateralis</i>)	1	(3)	0	(0)	0.55
Red squirrel (<i>Tamiasciurus hudsonicus</i>)	7	(19)	26	(41)	14.27
Northern flying squirrel (<i>Glaucomys sabrinus</i>)	1	(3)	2	(3)	0.95
Northern pocket gopher (<i>Thomomys talpoides</i>)	1	(3)	1	(2)	0.57
Vole (<i>Microtus</i> sp.)	1	(3)	4	(6)	0.39
Total number of mammal prey items	30	(82)	47	(73)	80.69
Birds					
Blue Grouse (<i>Dendragapus obscurus</i>)	1	(3)	4	(6)	11.57
Ruffed Grouse (<i>Bonasa umbellus</i>)	0	(0)	2	(3)	2.56
Northern Flicker (<i>Colaptes auratus</i>)	0	(0)	3	(5)	0.94
Gray Jay (<i>Perisoreus canadensis</i>)	1	(3)	4	(6)	0.79
Clark's Nutcracker (<i>Nucifraga columbiana</i>)	1	(3)	2	(3)	0.90
Common Raven (<i>Corvus corax</i>)	0	(0)	1	(2)	1.95
Townsend's Solitaire (<i>Myadestes townsendi</i>)	1	(3)	0	(0)	0.08
American Robin (<i>Turdus migratorius</i>)	1	(3)	0	(0)	0.18
Dark-eyed Junco (<i>Junco hyemalis</i>)	1	(3)	0	(0)	0.06
Unknown small bird sp.	1	(3)	1	(2)	0.24
Total number of bird prey items	7	(18)	17	(27)	19.27
Total number of prey items	37		64		

americanus), red squirrel (*Tamiasciurus hudsonicus*), and Columbian ground squirrel (*Spermophilus columbianus*). In 1998, the three most common prey species included red squirrel, Columbian ground squirrel, and an equal number of voles (*Microtus* sp.), Blue Grouse (*Dendragapus obscurus*), and Gray Jays (*Perisoreus canadensis*). Overall, mammals contributed 81.0% of the total prey biomass and birds the remaining 19.0% (Table 2). In terms of biomass, the most important prey species were snowshoe hares, red squirrels, Blue Grouse, and Columbian ground squirrels.

Biomass

HABITAT ANALYSIS

Goshawk distribution patterns.— In general, goshawks nested in either Douglas-fir (57.9%) or lodgepole pine (42.1%) forest cover types with overstory trees comprised of pole-sized or larger size classes (Table 3). Although we surveyed nearly 70.0% of the interior forest across the entire northern half of the Flint Creek Range (25 km² of which was in a roadless area), all goshawk responses were received and all nests found around the periphery of the study area within 1 to 5 km of the grassland/timber interface (Fig. 3). Nests were distributed 2 to 5 km apart at elevations from 1,524 to 2,012 m, with 82.6% of ~~nests located on north aspects. Nests in lodgepole pine cover types were located at the~~

lower elevational extent where lodgepole pine occurs, whereas nests in Douglas-fir were found throughout the elevational range of Douglas-fir. The forested lands that goshawks occupied, adjacent to the grassland/forest interface, have been heavily influenced by timber harvest, associated road building, land exchanges, and livestock grazing (USFS 1995, 1996, 1997) relative to habitats at higher elevations in the forest interior.

log

because landscapes differ geographically and thus require different landscape management approaches (Hejl 1992). Results further demonstrate that, compared with the southern Rockies, habitat availability in the central and northern Rockies is more limited simply because forest cover types change more abruptly with increases in elevation.

Although we surveyed forested habitats in the interior of the study area, including parts of a remote roadless area, no goshawks responded to our alarm calls and no nests were located in these areas. The interior forest adjacent to the Douglas-fir zone is comprised, in ascending elevation, of dense, small-diameter lodgepole pine (often with subalpine-fir in the understory) followed by spruce-fir with dense understory vegetation (USFS 1995). These lodgepole pine areas had regenerated after stand replacement fires in 1910 and 1950 or after clearcut harvest treatments in the 1960s, whereas, the spruce-fir areas had been shaped more by insects, disease, and wind events (Arno 1980, Knight 1994, USFS 1995). The dense understory development found in the higher elevation areas typically supports snowshoe hares (Litvaitis et al. 1985), the goshawk's primary prey species in this study (Table 2). However, goshawks preferred to nest in more open, lower-elevation areas, where habitats are drier and thought to support fewer hares.

The goshawk's avoidance of subalpine-fir, spruce-fir, and the higher-elevation lodgepole in the study area supports the hypothesis that an upper density limit for tree and understory development exists, beyond which nesting goshawks do not occur (DeStefano and McCloskey 1997).

Reynolds

Dist + elevation

SSKA

In the northern Flints, goshawks were strongly associated with one edge of the nest stand and small forest openings near the nest. The preference for one side of the stand could not be analyzed adequately in the absence of a cluster analysis that could account for all stands or patches of forest adjacent to the nest stand. Measurements taken from the nest to nearest landscape features or covertypes indicated that, on average, goshawks selected nests near open-grown Douglas-fir and avoided dense small-diameter lodgepole pine, regenerating clearcuts, and large forest openings. Results demonstrated that within a much larger area, the PFA, nesting goshawks preferred sites with fewer clearcut harvest units (Fig. 6), selected nest sites near small forest openings (Fig. 4, Table 5), and avoided nesting in or near dense small diameter forest (Table 9, Fig. 7). Nesting productivity was inversely related to the size of forest openings near the nest and to the density of small-diameter trees in nest stands, suggesting that such habitats are of low quality to goshawks. Large openings are thought to increase competition from open-forest raptors (Crocker-Bedford 1990), which seen frequently during the duration of this study. Conversely, high densities of small-diameter trees decrease the suitability of nesting habitat (this study) and the availability of prey species to goshawks (e.g. Beier and Drennan 1997). Overall, results are inconclusive because of the small sample size, short study duration, and large number of factors thought to affect productivity in nesting raptors (Newton 1979).

Nest-stand and nest-tree area structure relative to studies in the Northern and Central Rockies.— In the northern Flints, results suggest that nesting goshawks prefer mature to old-growth Douglas-fir or lodgepole pine stands that are open grown, high in

Clue
CC

large
opens