Northern goshawk responses to taped conspecific calls were significantly ($P = 0.02$) higher than their responses to an observer without a tape. Detection rates were highest on transects with broadcasts during the nestling (73.1%) and fledgling-dependency periods (75.0%). During all sampling periods, the probability of detecting a northern goshawk was highest for observers broadcasting a conspecific vocalization within 150–200 m of the nest. During the nestling period, the alarm call elicited the highest detection rate while the wail and begging calls resulted in the highest detection rate during the fledgling-dependency period. Vocal mimics by jays (potential false positives) occurred on 16.7% of the transects. The lowest mimicry rates occurred during the nestling period. We recommend that northern goshawks be surveyed with broadcast conspecific vocalizations during brood rearing at stations that are 300 m apart on transects that are separated by 260 m, and that stations on adjacent transects be offset by 130 m.

Landscape Analysis of Northern Goshawk Habitat in Two Forest Regions of Pennsylvania

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We studied nesting habitat of Northern Goshawks (*Accipiter gentilis*) in Pennsylvania at the landscape level from 1988–92. Our objectives were to 1) contrast habitat "use" (i.e., habitat surrounding goshawk nests) with habitat "availability" (habitat associated with random points), 2) identify differences in habitat use between the Northern Hardwoods (NH) and the Appalachian Oak (AO) forest regions of the state, and 3) evaluate the relative importance of landscape features at varying levels of spatial scale. These levels were represented by six sizes of circular plots centered on nests and random points ranging from 10 ha (i.e., the "nest site" area) to 1960 ha (approximate "home range" area). Color infrared aerial photographs (1:58 000) and 7.5-min topographic maps were used to quantify landscape habitat variables. Univariate analyses indicated that goshawks selected nest sites ($P < 0.05$) on more gentle slopes and further from non-forest edges and medium-heavy duty roads on both forest regions ($N = 46$ and 29 nests and 37 and 38 random points in the NH and AO regions, respectively). At the "home range" level, nests were associated with more extensive forests, greater amounts of evergreen/mixed stands, and less residential land use areas. A slight preference for northerly aspects was observed for nests occurring on steeper slopes in the more southerly AO region. Differences in habitat use between forest regions (independent of habitat availability) indicated that goshawks in the NH region nested at higher topographic positions and in areas containing less conifers proximal to the nest tree. Comparison of results from logistic regression analysis of the different-sized plots suggested that nest site habitat may be more of a limiting factor in the AO region, but that potentially higher quality foraging habitat (represented by extensive forests with mixed/evergreen stands) may be important for goshawks throughout the state. Management recommendations regarding extent of forests and evergreen/mixed stands were derived from logistic regression models and will be presented.

Differential Space Use by Male and Female Prairie Falcons (*Falco mexicanus*): Consequences for Sampling Requirements to Estimate Home Ranges

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Determining the minimum sample of location estimates (fixes) adequate to describe an animal's home range is important in developing sampling protocols. In the Snake River Birds of Prey Area, male and female adult prairie falcons have different spatial use patterns and we report that this influences the minimum number of fixes necessary to describe male and female ranges. We sampled 60 radio-tagged adult falcons throughout the 1991 and 1992 breeding seasons and determined that females remained close to the aerie until late brood-rearing and then traveled throughout a wider foraging range, whereas males traveled throughout their entire foraging range during all phases of the breeding cycle. Maximum home range size of females was, therefore, primarily determined by fixes taken during late brood rearing and post-fledgling stages, whereas male maximum home range size was determined earlier in the breeding cycle. Because of this, it is necessary to obtain most of the fixes from late in the breeding cycle in order to adequately sample a female's home range. Males can be sampled throughout the breeding cycle. The total number of fixes should not be the only criterion used to select adequately sampled home ranges; temporal distribution of fixes is also important. In particular, some females with large numbers of fixes originating early in the breeding cycle had poorly sampled home ranges, while others with fewer total fixes but with a majority late in the breeding cycle had adequately sampled home ranges. Many raptors may show similar differences in male and female spatial use patterns and these differences should be taken into account in deciding how to sample an individual's home range.

Use of Satellite Telemetry for Study of a Gyrfalcon in Greenland

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Long-term research in Greenland has yielded 18 years of incidental sightings and 2 years of surveys and observations of gyrfalcons (*Falco rusticolus*) around Sondrestromfjord, Greenland. Gyrfalcons nest on cliffs along fjords and near rivers and lakes throughout our 2590 sq. km study area. Nestlings are present mid-June to July. In 1990, we marked one adult female gyrfalcon with a 65 g radio-transmitter to obtain location estimates via the ARGOS polar orbiting satellite system. The unit transmitted 8 hours/day every two days. We obtained 145 locations during 5 weeks of the nestling and fledgling stage of breeding. We collected 1–9 locations/day, with a mean of 4/day. We calculated home range estimates based on the Minimum Convex Polygon (MCP) and Harmonic Mean (HM methods and tested subsets of the data based on location quality and number of transmission hours per day. Home range estimated by MCP using higher quality locations was approximately 589 sq. km. Home range estimates were larger when lower-quality locations were included in the estimates. Estimates based on data collected for 4 hours/day were similar to those for 8 hours/day. In the future, it might be possible to extend battery life of the transmitters by reducing the number of transmission hours/day. A longer-lived transmitter could provide information on movements and home ranges throughout the year.

USE OF SATELLITE TELEMETRY IN MONITORING BALD EAGLE MOVEMENTS

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Collecting data on broad-scale movements through the use of conventional radiotelemetry can be limited by inaccessible terrain, large daily movements of the marked animal, and environmental factors. However, a bird-borne satellite transmitter can circumvent these problems by allowing the researcher to reliably obtain frequent locations from a distant position. As part of a research study on bald eagle movements in Glacier Bay National Park and Preserve, we attempted to demonstrate the practical application of a bird-borne satellite transmitter in a field situation. In late summer 1991, three adult bald eagles and three nestling eagles (9–10 weeks) were fitted with satellite transmitters. To verify satellite locations, each adult was also fitted with a VHF transmitter and locations were confirmed using ground and aerial searches. All three immature eagles left the natal territory within 3–6 weeks after fledging. Each immature initially moved northeast and then traveled in a southeasterly direction where they were last located 384.4, 109.2, and 17.4 km southeast of their natal territories. Two of the three satellite marked adults traveled 95 km northeast to the Chilkat River for 6 weeks and then returned to their nest territories by 27 January 1992. The third adult remained within its nest territory. While in the study area, all three adult eagles were visually located (3–4 days/week) within a 5 km radius of each satellite location point. Satellite transmitters provided 4–5 locations per day for 229 days. As confirmed by conventional telemetry, the PTTs were effective in monitoring the broad-scale movements of these adult eagles.

OWLS OF OLD FORESTS OF THE WORLD

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A review of literature on habitat associations of owls of the world revealed that approximately 84 species of owls among 18 genera are known or suspected to be associated with old forests. Old forest is defined as old-growth or undisturbed forests, typically with dense canopies. The 84 owl species include 72 tropical and 12 temperate forms. Specific habitat associations have been studied for only 12 species (7 tropical and 5 temperate), whereas 73 species (65 tropical and 8 temperate) remain mostly unstudied. Some 25 species (35% of all known or suspected old-forest-associated owls in the tropics) are entirely or mostly restricted to tropical islands. Threats to old-forest-associated owls include alteration of habitat, use of pesticides, loss of riparian gallery forests, and loss of cavity nests. Conservation of old-forest-associated owls should include 1) inventories and studies of habitat associations, particularly in poorly studied tropical and insular environments; 2) protection of specific, existing temperate, and tropical old forest tracts; and 3) studies to determine if reforestation and vegetation manipulation can restore or maintain habitat conditions.

BARN OWL REPRODUCTION AND ITS CONSTRAINTS NEAR THE LIMIT OF THE SPECIES' DISTRIBUTION

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I studied reproduction of the barn owl (*Tyto alba*) in irrigated farmlands of northern Utah over 16 years. Three hundred and ninety-one nesting attempts, all in man-made structures, were documented. Most barn owls began nesting at one year of age and produced one brood per year. Rarely, second broods were produced or failed first clutches were replaced. Average size of complete first clutches