

## The Urban Buteo: Red-shouldered Hawks in Southern California

Peter H. Bloom and Michael D. McCrary

**Abstract** – Red-shouldered hawks nesting in both natural and urban habitats were studied in southern California. Of 170 red-shouldered hawk breeding territories examined, 30 (17.6%) were in urban environments. Although not classified as urban, another 24 territories (14.1%) contained active nests within 100 m of a ranch house, fire station, or water treatment facility. These 24 pairs were frequently exposed to high levels of human activity. Of 77 urban nests, 37.7% were in non-native trees including several species of eucalyptus, California fan palm, and deodara cedar. These observations suggest this species is relatively adaptable to human-altered landscapes. Well-planned parks and reserves will ensure that this adaptable hawk will continue to exist in California even in the midst of large-scale urban development.

**Key words:** red-shouldered hawk; urban; territory; adaptable.

Several diurnal North American raptors demonstrate high degrees of adaptation to human populations and the pressures they exert on them. Raptors noted for their ability to adapt to human environments include the peregrine falcon (Cade *et al.* 1988), merlin (Oliphant and Haug 1985), American kestrel (Palmer 1988), and osprey (Palmer 1988, Poole 1989). With the exception of the merlin, which to date has been reported using urban environments only in Canada, these four raptors routinely hunt, mate and reproduce in urban areas throughout their range in North America.

In contrast, members of other genera, such as *Cathartes*, *Elanus*, *Circus*, *Accipiter* (PB unpubl. data) and *Aquila* (Scott 1985) are much less tolerant of human activity and rarely, or in some cases never nest in urban environments. Human presence may not entirely exclude these raptors as they sometimes nest in the interface between urban and natural areas, although this relationship is often temporary. Similarly, some nocturnal raptors have not adjusted to urbanization in southwestern California. As a result of urbanization, nesting long-eared owls have declined by at least 55% in that region and are not adapting to urban pressures (Bloom 1994).

Members of the genus *Buteo* exhibit a broad range of adaptability to human-altered environments in California. The western subspecies of the red-shouldered hawk appears to be the most adaptable of the 10 North American

breeding *Buteos*, with some pairs using urban habitats almost exclusively (Bloom *et al.* 1993). The Swainson's hawk in California seems to be the next most flexible *Buteo*. Some pairs spend the majority of their time hunting in agricultural areas and nest inside residential areas (James 1992, England *et al.* unpubl. data, PB pers. obs.). Red-tailed hawks commonly nest adjacent to occupied ranch houses and forage in agricultural areas. However, only under unique circumstances does the species nest and forage in urban environments (PB unpubl. data). Red-tailed hawk territories in or near urban areas are often transitory and usually disappear as development increases. Ferruginous hawks appear the least tolerant and to our knowledge have never been reported nesting in or adjacent to urban environments.

In this paper we present information on the frequency of urban nesting red-shouldered hawks, habitat, behavior, comparisons with other California-nesting raptors, and evidence that this species has the capacity to adjust to some types of urban development.

## STUDY AREA

The 1435 km<sup>2</sup> study area is located in coastal southern California and extends from the San Luis Rey River in San Diego County north to the Santa Ana River in Orange County. The study area is bounded on the west by the Pacific Ocean and extends east about 15–30 km to the crest of the Santa Ana and Santa Margarita Mountains. Principal research areas of pairs nesting in native habitats include Starr Ranch Audubon Sanctuary, Camp Pendleton Marine Corps Base, Rancho Mission Viejo, Irvine Ranch and numerous Orange County Parks (Bloom *et al.* 1993). In contrast to some of our previous research (McCrary and Bloom 1984a, 1984b, McCrary *et al.* 1992, Bloom *et al.* 1993), the focus of this study is on urban and urban-interface nesting pairs and not on pairs nesting in natural areas.

Habitat of most urban-nesting red-shouldered hawks consisted of exotic non-native vegetation, manicured lawns, athletics fields, buildings, roads, parking lots and utility poles. Many however, consisted of a central core area and/or perimeter of natural habitat. Understory grasses were primarily non-native Mediterranean annuals consisting of ripgut brome and foxtail chess. Characteristic non-native trees include numerous species of eucalyptus, with blue gum predominating; California fan palm; and several pine species (*Pinus* spp.). Dominant trees in natural habitats included coast live oak, western sycamore and black willow.

## METHODS

We have studied nesting red-shouldered hawks for approximately 25 yrs. During this time most of our focus was on pairs nesting in natural habitats,

which has probably resulted in an underestimation of urban red-shouldered hawk nesting territories in our study area. In the case of urban-nesting red-shouldered hawks we noted location, tree species, proximity to nearest human habitations, human activity level, and recorded the fledging success of certain pairs. Two members of two urban pairs were also equipped with radio transmitters (Bloom *et al.* 1993).

In this study our focus was on the successful adjustment of urban-nesting red-shouldered hawks to human-modified environments. We defined urban-nesting pairs as those pairs with territories that were estimated to be at least 50% urban. Many territories were entirely surrounded by residential, light industrial, or other buildings and were nearly always in view of people or vice versa. Urban territories were also characterized by pairs that selected nest trees in residential areas, college campuses, golf courses, cemeteries, vacant lots, city and county parks, and were frequently observed foraging within these areas.

We made no attempt to identify all natural and urban breeding territories but were probably successful in locating the majority. In addition to our normal yearly survey activities, in 1993 and 1994 we published a request for information on red-shouldered hawk nest sites in the newsletters of two local National Audubon Society chapters. All nest sites were plotted on US Geological Survey (USGS) topographic maps. Nest tree species, habitat, and fledging success were recorded when known.

## RESULTS AND DISCUSSION

### Urban Territory Types

We identified 170 red-shouldered hawk nesting territories and classified 30 (17.6%) of these as urban. The presence of several urban locations throughout the study area where individuals or pairs were calling suggests more urban nests remain to be found.

While only 30 of 170 territories fit our description of urban nesting pairs, nests in 24 (14.1%) other territories were within 100 m of buildings such as a ranch house, fire station, or water treatment facility. These 24 pairs were frequently exposed to high levels of human activity at close range, and although not classified as urban pairs, they further indicate the adaptability of red-shouldered hawks to human environments.

The urban environment of red-shouldered hawks can be classified into four general types, which may also reflect different processes in the adaptation of this species to human populations. Type 1 consists of situations where development (urban environment) has encroached and totally surrounded a nesting territory complete with its natural habitat. Territories of this type are characterized by large mature trees, water and an adequate quantity of foraging habitat as well as areas of seclusion from people. These hawks regularly interact with people

owing to the closeness of hunting perches and their nest to the urban edge. We characterized three territories as Type 1.

Type 2 consists of situations where an urban environment is created in an area not previously occupied by red-shouldered hawks. Red-shouldered hawks do not hunt from the wing and require hunting perches (Bloom *et al.* 1993). They also require trees for nesting and are not known to nest on cliffs or man-made structures e.g. utility poles. In this situation, suitable nest trees and hunting perches were lacking, but over time exotic trees used for landscaping became available. Hunting perches were provided by other exotic trees and utility structures. Thus, new red-shouldered hawk habitat was created through urban development. These nesting territories may be short-lived, since adjacent requisite hunting areas may eventually be developed. However, we are aware of protected nesting territories that have existed for decades in human-created habitats outside our study area, at the San Diego Wild Animal Park, and San Diego and Los Angeles Zoos. We classified six territories as Type 2.

Type 3 is where development has occurred adjacent to an existing territory, leaving most of the territory intact. In this situation a pair expands its home range by occupying the newly created urban habitat via the use of utility poles and landscape trees used as hunting perches and nest sites. These territories are characterized by mature natural woodlands, small to large exotic trees, water, adequate hunting habitat, and areas of seclusion from people. Twelve territories fit this description.

Type 4 is where hawks reside in heavily used county or city parks including both predominantly natural parks and intensively managed lawn or playing field parks. Nine territories were classified as Type 4. These parks receive low to moderate use five days/week and low to intense use on weekends. Vegetation in the parks is characterized by young to mature exotic and native trees. Some pairs nested in large mature trees found in golf courses and hunted in the surrounding natural habitat. Likewise, some pairs used college campuses in a similar fashion. We classified 140 territories as natural.

## Behavior

Red-shouldered hawks nesting in urban environments seem undisturbed by the presence of people; even large crowds (>100) at 7 territories playing athletic sports, conducting equestrian activities, and camping directly underneath their nest trees in county parks did not cause nest abandonment. Most hawks also develop a tolerance for joggers or people climbing in and out of their vehicles and do not abandon hunting perches unless approached within 10–50 m. However, some individuals become very protective of their nests and are as aggressive as some northern goshawks (Bent 1937, PB pers. obs.). Six adults from five urban territories were captured and removed following complaints from people who sustained head injuries. We generally average one phone call per year concerning aggressive red-shouldered hawks in southern California.

The differences in adjustments to human activity is most apparent when

attempting to observe radio-tagged and/or color-banded individuals. Those individuals occupying urban environments are readily observed and can be approached quite closely, facilitating the reading of color-bands and even US Fish and Wildlife Service bands. Once located, these individuals can be visually monitored for entire days without disturbing them (McCrary 1981, Bloom 1989). In contrast, those occupying natural environments with low levels of human activity are markedly more difficult to observe. Radio-tagged hawks in natural areas may seldom be seen and will be disturbed if approached.

### Nest Trees

In contrast to red-shouldered hawk territories in natural areas where predominantly native trees were used for nest sites, urban pairs frequently nested in non-native species.

A variety of nest trees was selected by urban-nesting red-shouldered hawks, including natives when portions of the natural habitat were left undisturbed. Of 77 nest trees recorded in urban environments the most frequently used native trees were western sycamore (52.9%) and coast live oak (10.4%). Exotic nest trees included several species of eucalyptus (32.5%), fan palm (3.9%) and deodara cedar (1.3%). The introduction of eucalyptus has contributed enormously to the expansion of nesting red-shouldered hawks into otherwise unsuitable breeding habitat in California. Location of nest trees relative to human activity does not seem important as several territories had nests located in trees within the area of highest human use. Importantly however, these trees were among the largest in the territory.

### Reproduction

Reproductive success in this study of pairs nesting in urban locations was greater than that previously reported in natural areas in the same region (Wiley 1975). Wiley (1975) reported 1.34 young fledged per nesting attempt and 2.05 young fledged per successful nest from non-urban territories. We found 1.80 young fledged per nesting attempt ( $N = 50$ ) and 2.50 fledged per successful nest ( $N = 36$ ) in urban environments. Nest success was 65.5% on Wiley's study (1975) and 72.0% in this study. The higher fledging success and nest success observed in this study suggests the possibility that predation pressure may be lower, and/or hunting success greater in urban environments. However, the two studies are not directly comparable because nests in our study were usually examined only two to three times per season when chicks were two weeks or older and some mortality may have been missed, particularly in the early nestling stage. Wiley (1975) examined chicks at 1–3 day intervals beginning at hatching, allowing for more accurate assessment of fledging success, but increased potential for higher predation.

## Food habits

Although we have not analyzed prey of urban red-shouldered hawks separately from others, the general food habits of this species, i.e. preying upon invertebrates and small vertebrates, contribute to this species' adaptability to urban environments (Bloom *et al.* 1993). Compared with red-tailed hawks nesting in southern California, red-shouldered hawks tend to consume smaller prey species (authors unpubl. data). Smaller species preyed upon by red-shouldered hawks probably predominate over larger ones in urban environments because populations of larger prey such as Audubon's cottontail and California ground squirrels have been locally reduced or extirpated.

Anecdotal observations of red-shouldered hawk behavior in urban environments also indicate the potential importance of diet in this species' adaptability to human presence. Red-shouldered hawks have been noted feeding on processed food used in zoos (J. Nagata-Lewis pers. obs.) and food discarded around buildings and athletic fields (MM pers. obs.).

## Space Use

Red-shouldered hawks have unusually small breeding seasons and annual home ranges (Bloom *et al.* 1993), and pairs nesting in urban environments are no exception. Home range size (100% minimum convex polygon) of radio-tagged red-shouldered hawks in southern California averaged 1.69 km<sup>2</sup> for 7 males and 1.15 km<sup>2</sup> for 6 females. Home ranges of 2 radio-tagged males classified as urban were 0.45 km<sup>2</sup> and 0.69 km<sup>2</sup>. These hawks used tiny home ranges despite the fact that much of the habitat within their home ranges consisted of buildings and asphalt. In comparison, home ranges (100% minimum convex polygon) of 2 male and 1 female radio-tagged red-tailed hawks from the same study area were 3.61, 7.19, and 13.57 km<sup>2</sup>, respectively.

Of interest, three radio-tagged red-shouldered hawks used hunting areas that were disconnected from the main body of their home ranges (Bloom *et al.* 1993). These areas were separated from their main ranges by large tracts of habitat unsuitable for hunting, e.g. devoid of hunting perches. Similarly, we have observed urban-nesting red-shouldered hawks making direct flights to favored disjunct hunting areas while bypassing large expanses of unsuitable commercial or residential areas. The reduced space needs of red-shouldered hawks compared with other *Buteos* may allow this species to occupy small tracts of natural vegetation that may remain after development. This aspect of their adaptability may be further enhanced by their use of isolated hunting areas within the urban environment.

## Comparisons with Other Raptors

While 17.6% (30) of 170 red-shouldered hawk territories met our definition of urban territories, only 2.2% (8) of 361 red-tailed hawk territories could be

classified as such. Of the eight urban territories six nests were in eucalyptus and two were on utility poles. Importantly, four territories were in existing locations (Type 1) prior to being surrounded by development, and incremental urbanization may ultimately exclude them. These territories presently contain modest amounts of unprotected natural open space in the form of utility easements, vacant lots, or flood channels. The other four territories included pairs with nests in residential areas but adjacent to vast range lands or wilderness parks.

In contrast to red-shouldered hawks which have expanded into urban environments, in our experience red-tailed hawks almost always disappear from these areas. Five territories were abandoned when approximately 50–100% of their home ranges were urbanized. Three other territories were abandoned when hunting areas remained, but nest trees were removed for gravel mining. The latter three territories still have the potential to be reoccupied should trees again reach maturity. Some red-tailed hawk territories may thrive when surrounded by urban environments, but only when large quantities of natural open space are preserved (PB unpubl. data).

Similarly, only 4.8% (3) of 62 Cooper's hawk breeding territories were found in urban environments. However, two of these territories were in existing natural areas prior to park designation and while the parks receive considerable recreational use, both parks have large amounts of intact natural habitat, suggesting not so much adaptation to an urban environment as the retention of a traditional nesting area. The level of urban hunting in the surrounding residential community is unknown but appears limited. The third territory was located 150 m from the urban edge in exotic trees on the interface between coastal sage scrub/riparian habitats and an urban environment. In common with the above two urban Cooper's hawk territories this one had even larger amounts of natural open space in the form of a military reservation next to it. None of 62 Cooper's hawk breeding territories were found inside residential areas, suggesting that basic ecological requirements such as nesting habitat and/or prey are probably limiting.

Of 103 white-tailed kite nesting territories no nests were found inside residential areas, or any closer than 150 m from an urban environment. Likewise, of 12 northern harrier nesting territories no nests were found inside urban environments; the nearest nest being 250 m from the urban edge. As one might predict from the predilection of both species for grasslands (Palmer 1988), urban areas with no grassland or compatible crops such as alfalfa, result in no use by these two species for nesting.

## CONCLUSIONS

Red-shouldered hawks are regular components of the urban nesting avifauna in coastal southern California where land managers have preserved adequate open space and habitat. In contrast to other coastal southern California nesting raptors, including the red-tailed hawk, Cooper's hawk, white-tailed kite, and

- JAMES, P.C. 1992. Urban-nesting Swainson's hawks in Saskatchewan. *Condor* 94: 773–774.
- MCCRARY, M.D. 1981. Space and habitat utilization by red-tailed hawks (*Buteo lineatus elegans*) in southern California. M.S. thesis, California State Univ., Long Beach.
- MCCRARY, M.D. AND P.H. BLOOM. 1984a. Lethal effects of introduced grasses in red-shouldered hawks. *J. Wildl. Manage.* 48: 1005.
- MCCRARY, M.D. AND P.H. BLOOM. 1984b. Observations on female promiscuity in the red-shouldered hawk. *Condor* 86: 486.
- MCCRARY, M.D., P.H. BLOOM AND M.D. GIBSON. 1992. Observations on the behavior of surplus adults in a red-shouldered hawk population. *J. Raptor Res.* 26: 10–12.
- OLIPHANT, L.W. AND E. HAUG. 1985. Productivity, population density and rate of increase of an expanding merlin population. *Raptor Res.* 19: 56–59.
- PALMER, R.S. 1988. *Handbook of North American Raptors, Vol. 4, Diurnal Raptors*. Yale University Press, New Haven.
- POOLE, A.F. 1989. *Ospreys: A natural and unnatural history*. Cambridge University Press, Cambridge.
- SCOTT, T.A. 1985. Human impacts on the golden eagle population of San Diego County from 1928 to 1981. M.S. thesis. San Diego State Univ.
- WILBUR, S.R. 1973. The red-shouldered hawk in the western United States. *West. Birds* 4: 15–22.
- WILEY, J.W. 1975. The nesting and reproductive success of red-tailed hawks and red-shouldered hawks in Orange County, California. *Condor* 77: 133–139.