

## POPULATION TRENDS AND CURRENT STATUS OF SELECTED WESTERN RAPTORS

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*Abstract.* The term status can reflect either numbers or inherent biological characteristics (e.g., sensitivity to environmental conditions). The Ferruginous Hawk (*Buteo regalis*), for example, may undergo wide fluctuations that may follow, in part, changes in prey abundance. Thus, numbers of breeders change annually, although this indicates little about the hawk's future population size. Brief case studies are given for selected raptors, e.g., Bald Eagle (*Haliaeetus leucocephalus*), Peregrine Falcon (*Falco peregrinus*), several species of hawks (*Buteo* and *Accipiter*), and the Saw-whet Owl (*Aegolius acadicus*) and Flammulated Owl (*Otus flammeolus*). A few species are stable, some are declining for various reasons, and several are increasing mainly due to human-caused habitat alterations. In the future conservation efforts should emphasize species that can co-exist with humans.

*Key Words:* Raptors; birds of prey; population trends; status; habitat alteration.

Status goes beyond population size at any particular moment; it also includes trends in abundance. For raptors, a confounding effect is the fact that tens of thousands were shot during the first half of this century. It is not known what effect this had on the population structure of these largely "K-selected" species, the very sort of species that lend themselves to rarity or endangerment. Another complication is that we do not fully understand the ecological relationships that may drive status change, although one seemingly well documented case is that of the Bald Eagle (*Haliaeetus leucocephalus*) in Glacier National Park (Spencer et al. 1991). Eagles had been studied for more than two decades as they gathered there during migration. Apparently, the introduced opossum shrimp (*Mysis relecta*) reduced or eliminated zooplankton necessary to sustain a reproductive population of kokanee salmon (*Oncorhynchus nerka*). Dying salmon, the principal food for eagles, attracted several hundred eagles annually since their first record in 1939. There was a cascading interaction and once the salmon were gone so were the eagles, which did not decline but simply shifted to new locations. By contrast, non-breeding Bald Eagles are increasing in southeast Alaska (Hansen and Hodges 1985) but the reasons for this change are not clear.

Some species undergo natural numerical oscillations over time and this may affect

our judgment of their status. For example, in the Ferruginous Hawk (*Buteo regalis*), numbers appear outwardly to be related to cyclicity of prey (e.g., rabbits, ground squirrels). Overall, however, hawk numbers may change but not in accordance with prey numbers. Thus, focussing on current numbers or directional trends does not necessarily provide an accurate understanding of the species.

Some species are stable but have reached that point following historical increases or declines. Others are stable and have "always" been so historically. In many cases, however, we know little about change because a historical baseline is essentially nonexistent. Most recent authors (e.g., Johnson 1988, 1990; Voous 1988; Snyder and Snyder 1991) summarize population status, but there were earlier and more detailed attempts at assessing numbers of some western diurnal raptors (Porter and White 1975, Evans 1982). More thorough reviews of current trends and status are in Ladd and Schempf (1982), Glinski et al. (1988), and National Wildlife Federation (1989). In the latter, trends are listed for five medium-sized owls in nine western states. In general, species were stable except for the Burrowing Owl [*Athene (Speotyto) cunicularia*], which tended to be declining. Of 36 western raptors summarized (National Wildlife Federation 1989), 13 were too poorly studied

to reveal trends. Eleven were recorded as stable, six were increasing, and five were either decreasing or decreasing/stable. From one decade to the next the status of some raptors is likely to change quickly, even by several orders of magnitude [see comments under Peregrine Falcon (*Falco peregrinus*)]. Thus, current allocation to categories is tentative. In Table 1, I evaluate 48 species of western raptors based on the literature, personal communications and observations. Note that 24 (50%) are considered to be either in jeopardy or potentially so (Table 2). Interestingly, the percentage of those listed changed little over the past two decades (cf. White 1974, LeFranc and Millsap 1984).

### HISTORICAL FRAMEWORK

Raptors have been revered as emblems of justice, power, and nations and appear on coinage; athletic teams carry their names. At the same time, they have been persecuted and abused for economic gain or for other human "needs". In fact, our national emblem, the Bald Eagle, was subject to a bounty for several decades. Until the 1960s raptors were generally viewed as "vermin", even in North America (cf. White 1990). To detect changes in perceptions I reviewed a sample of 54 papers in *The Condor* over the past century (see Table 3). The most personally-exciting paper, in Volume 1, reported eggs of the Peregrine Falcon taken from an eyrie on a very small 11 m cliff in northern Utah (Johnson 1899), about 20 km from my home. The small cliff of easy access was of a type often used by Peregrines at the turn of the century, and indicated a large and numerically healthy population. Today, such nest sites, except in arctic and sub-arctic regions, would be viewed as marginal or unacceptable.

The "vermin" image of raptors in the first half of this century was not portrayed in any of the articles (Table 3), which simply reflected the sort of science conducted at that time. One article in 1955 even anticipated the forthcoming conservation movement by heralding the rarity of the White-tailed Kite

(*Elanus leucurus*) in California. In the 1950s such names as "chicken hawk", Big and Little Blue Darter, Bullet Hawk and Prairie Falcon (*Falco mexicanus*) appeared as unprotected species on the hunting proclamation in Utah. Attitudes have changed dramatically, even to the extent that raptors are sometimes considered to be environmental barometers (see Morrison 1983, and Temple and Wiens 1989 for a discussion). The Bald Eagle represents an excellent example of this shift in attitude. Up to 1952, over \$133,000 was spent on bounty payments (about 130,000 eagles killed). Following the eagle's protection and its declaration as an endangered species, millions of dollars have been spent on protection and restoration.

### APPARENT TRENDS AND PATTERNS

Most species of western raptors declined, independent of agricultural biocides, as a simple consequence of human encroachment and use of the landscape. Prime examples are the Bald Eagle (also affected by biocides), Swainson's Hawk (*Buteo swainsoni*), and Golden Eagle (*Aquila chrysaetos*) (locally). For example, early in this century flocks of over 2000 Swainson's Hawks were still together when they reached the northern tier of states during spring migration (Cameron 1907, see also Bendire 1877). Today such large single aggregations are only seen in autumn as they reach the lower part of the U.S. or Latin America. Contemporary declines in local breeding areas also have been extensive, such as in California with a 90% loss (Risebrough et al. 1989) and Oregon (Littlefield et al. 1984). These changes seem to be related to breeding ground habitat alterations, although changes in the Latin American non-breeding habitat cannot be ruled out (cf. White et al. 1989).

Notable exceptions to earlier general declines may be the Red-tailed Hawk (*Buteo jamaicensis*), American Kestrel (*Falco sparverius*) and perhaps the Great-horned Owl (*Bubo virginianus*). All seem to have benefited from landscape modifications be-

TABLE 1. SUMMARY OF SOME EVENTS CAUSING OR REFLECTED IN THE CURRENT STATUS OF WESTERN RAPTOR SPECIES OVER THE PAST CENTURY. DATA ON MOST SPECIES ARE CURRENT ONLY TO 1990

Species	Status/trend	Event/condition
Black Vulture ( <i>Coragyps atratus</i> )	Stable/increasing	Range expansion; increased in west in past century. Unknown cause of response; perhaps weather related?
Turkey Vulture ( <i>Cathartes aura</i> )	Increasing	
California Condor <sup>1</sup> ( <i>Gymnogyps californianus</i> )	Extinct in wild	Expansion of livestock industry? Last wild condor taken into captivity 1987. Captive breeding for reintroduction into wild. <sup>1</sup>
Osprey ( <i>Pandion halieatus</i> )	Variable by region, fluctuating?	Increasing in response to regional habitat alterations (newly created habitat); was affected by agricultural biocides.
White-tailed Kite ( <i>Elanus leucurus</i> )	Increasing	Severe population loss in first third of century and current recovery and range expansion; perhaps recurring local losses?
Mississippi Kite <sup>2</sup> ( <i>Ictinia mississippiensis</i> )	Increasing	Range expansion. <sup>2</sup>
Bald Eagle ( <i>Haliaeetus leucocephalus</i> )	Increasing	Earlier depression of populations because of bounty shooting, habitat alterations or loss, and agricultural biocides.
Northern Harrier ( <i>Circus cyaneus</i> )	Variable, may be decreasing?	Populations may be impacted because of habitat alterations (wetlands loss).
Sharp-shinned Hawk ( <i>Accipiter striatus</i> )	Undetermined—stable?	Information unclear; possible recent (post 1980) increases as suggested from migration data.
Cooper's Hawk ( <i>Accipiter cooperi</i> )	Undetermined	Information unclear; earlier in century heavily persecuted and affected by agricultural biocides. Migration data suggest increases.
Northern Goshawk ( <i>Accipiter gentilis</i> )	Undetermined	Recently (1990) said to be seriously declining locally because of habitat alterations (see text for discussion); earlier heavily persecuted.
Common Black-Hawk <sup>2,3</sup> ( <i>Buteo gallus anthracinus</i> )	Stable	Status appears stable; sensitive riparian habitats mandate close monitoring. <sup>2,3</sup>
Harris Hawk <sup>2,3</sup> ( <i>Parabuteo unicinctus</i> )	Stable/increasing	May be affected by habitat alterations (urbanization) but no clear trend; highly adaptable; probably lost some range earlier in century; increasing locally in Arizona thornscrub. <sup>2,3</sup>
Gray Hawk <sup>2,3</sup> [ <i>Buteo (Asturina) nitidus</i> ]	Increasing	Riparian habitats becoming increasingly protected; may have increased locally early in century due to habitat alteration. <sup>2,3</sup>
Red-shouldered Hawk ( <i>Buteo lineatus</i> )	Increasing	Positive local adjustments to urbanization.
Broad-winged Hawk ( <i>Buteo platypterus</i> )	Increasing?	Newly determined migration patterns; western occurrence recently clarified and expanding range westward.
Swainson's Hawk ( <i>Buteo swainsoni</i> )	Declining <sup>4</sup>	Apparent significant (regional) reductions perhaps related to habitat alterations; agricultural chemicals often suggested as reason for decline; status in question.
Zone-tailed Hawk <sup>3,5</sup> ( <i>Buteo albonotatus</i> )	Stable?	Apparent habitat loss locally but may also be undergoing local range expansion. <sup>3,5</sup>
Hawaiian Hawk <sup>4</sup> ( <i>Buteo solitarius</i> )	Currently stable?	Earlier loss of range; now breeds on only one island.
Red-tailed Hawk ( <i>Buteo jamaicensis</i> )	Stable—increasing?	May be increasing locally.
Ferruginous Hawk ( <i>Buteo regalis</i> )	Variable	Recently petitioned for U.S. Fish and Wildlife threatened listing (see text for discussion); range expanding eastward.
Rough-legged Hawk ( <i>Buteo lagopus</i> )	Not analyzed—stable? <sup>4</sup>	No historical data.
Golden Eagle ( <i>Aquila chrysaetos</i> )	Stable?	Earlier heavily persecuted (mainly by domestic livestock owners); local losses; currently stable(?) in some areas, declining(?) in others.

TABLE 1. CONTINUED

Species	Status/trend	Event/condition
Crested Caracara <sup>3</sup> ( <i>Polyborus plancus</i> )	Stable?	Some local losses early in century, probably not affecting populations in southwest. <sup>3</sup>
American Kestrel ( <i>Falco sparverius</i> )	Stable/increasing <sup>4</sup>	Increases seem to be regional or local.
Merlin ( <i>Falco columbarius</i> )	Increasing	Recent positive effects of habitat alterations and responses to reduced agricultural chemicals. Local positive responses to urbanization.
Peregrine Falcon ( <i>Falco peregrinus</i> )	Increasing	Drastic decrease by 1950 because of agricultural chemicals. Subsequent and remarkable recovery aided by human manipulation and captive breeding for release to wild (see text).
Aplomado Falcon ( <i>Falco femoralis</i> )	Declining <sup>6</sup>	Essentially extirpated from U.S. range. Habitat alterations in Mexican range. <sup>6</sup>
Prairie Falcon ( <i>Falco mexicanus</i> )	Stable <sup>4</sup>	Perhaps very local losses?
Gyr Falcon ( <i>Falco rusticolus</i> )	Stable <sup>4</sup>	Wide fluctuations in breeding numbers with food cycles.
Common Barn-Owl ( <i>Tyto alba</i> )	Stable? <sup>4</sup>	Heavy local and temporary winter loss but no declining trend.
Flammulated Owl ( <i>Otus flammeolus</i> )	Stable?	Recent advances in population knowledge; common and widespread with "clumped" breeding populations.
Western Screech-Owl ( <i>Otus kennicottii</i> )	Stable <sup>4</sup>	Recent clarification of systematic status; separation from Eastern Screech Owl.
Whiskered Screech-Owl ( <i>Otus trichopsis</i> )	Not analyzed	Status unknown?
Great Horned Owl ( <i>Bubo virginianus</i> )	Stable/increasing	Occupies wide variety of habitats.
Snowy Owl ( <i>Nyctea scandiaca</i> )	Not analyzed—stable?	No census data; undergoes wide fluctuations following food cycles.
Northern Hawk Owl ( <i>Surnia ulula</i> )	Not analyzed	No census data.
Northern Pygmy-Owl ( <i>Glaucidium gnoma</i> )	Stable?	No reported losses; inadequate surveys.
Ferruginous Pygmy-Owl ( <i>Glaucidium brasilianum</i> )	Declined <sup>3</sup>	Severe declines in U.S. range since early in century. <sup>3</sup>
Elf Owl <sup>3</sup> ( <i>Micrathene whitneyi</i> )	Not analyzed	Appears to have decreased in extreme western part of range. <sup>3</sup>
Burrowing Owl [ <i>Athene (Speotyto) cunicularia</i> ]	Declining <sup>4</sup>	Habitat alterations and other human impacts; human intervention and manipulation (nest site improvements) locally.
Spotted Owl ( <i>Strix occidentalis</i> )	Declining/uncertain?	Treated elsewhere in this volume (Gutiérrez 1994).
Barred Owl ( <i>Strix varia</i> )	Increasing?	Recent range expansion.
Great Gray Owl ( <i>Strix nebulosa</i> )	Not analyzed	Reportedly vulnerable in Canada; at risk to habitat alterations in southern part of range in U.S.
Long-eared Owl ( <i>Asio otus</i> )	Stable? <sup>4</sup>	Some local losses in far west. <sup>3</sup>
Short-eared Owl ( <i>Asio flammeus</i> )	Declining? <sup>4</sup>	Apparent recent reductions because of habitat loss; difficult to assess because of large oscillations in numbers.
Boreal Owl ( <i>Aegolius funereus</i> )	Increasing	Recent southern range expansions (Johnson, this volume).
Saw-whet Owl ( <i>Aegolius acadicus</i> )	Stable	Apparent recent population increase and range expansions in north (see text).

<sup>1</sup> Snyder and Snyder 1989; <sup>2</sup> R. L. Glinski, pers. comm., 1993; <sup>3</sup> Glinski et al. 1988; <sup>4</sup> National Wildlife Federation 1989; <sup>5</sup> Snyder and Snyder 1991; <sup>6</sup> Hector 1987.

TABLE 2. STATUS OF WESTERN NORTH AMERICAN RAPTORS SUGGESTED BY DIFFERENT ORGANIZATIONS. CATEGORY 2 IS GIVEN TO SPECIES FOR WHICH THERE ARE NOT ENOUGH DATA TO INDICATE A THREATENED OR ENDANGERED DESIGNATION

Species	List/organization	Status
Northern Harrier	1. Blue List, American Birds <sup>1</sup>	"Down"
Bald Eagle	1. T&E List, U.S. Fish and Wildlife Service <sup>2</sup>	Endangered
Northern Goshawk	1. Candidate List, U.S. Fish and Wildlife Service <sup>3</sup> 2. Sensitive List, U.S. Forest Service <sup>4</sup>	Category 2 Sensitive
Cooper's Hawk	1. Blue List 2. Jeopardy List, Canadian Wildlife Service <sup>5</sup>	"Down" Vulnerable
Sharp-shinned Hawk	1. Blue List	"Down"
Harris' Hawk	1. Sensitive List	Sensitive
Ferruginous Hawk	1. Blue List 2. Sensitive List 3. Jeopardy List 4. Candidate List	"Down" Listed Threatened Category 2
Swainson's Hawk	1. Blue List 2. Sensitive List	"Down" Sensitive
Zone-tailed Hawk	1. Sensitive List	Sensitive
Gray Hawk	1. Candidate List	Category 2
Hawaiian Hawk	1. T&E List	Endangered
Crested Caracara	1. Sensitive List	Sensitive
Merlin	1. Blue List	"Down"
Aplomado Falcon	1. T&E List	Endangered
Prairie Falcon	1. Sensitive List	Sensitive
Peregrine Falcon race <i>pealei</i>	1. Sensitive List 2. Jeopardy List	Sensitive Vulnerable
race <i>tundrius</i>	1. Jeopardy List 2. T&E List	Vulnerable Threatened
race <i>anatum</i>	1. Jeopardy List 2. T&E List	Endangered Endangered
Common Barn-Owl	1. Blue List	"Down"
Burrowing Owl	1. Blue List 2. Sensitive List 3. Jeopardy List	Declining Sensitive Vulnerable
Spotted Owl	1. Blue List 2. Sensitive List 3. Jeopardy List 4. T&E List	In trouble Sensitive Threatened Threatened
Great Gray Owl	1. Sensitive List 2. Jeopardy List	Sensitive Vulnerable
Ferruginous Pygmy-Owl	1. Sensitive List	Sensitive
Elf Owl	1. Sensitive List	Sensitive
Flammulated Owl	1. Sensitive List 2. Jeopardy List	Sensitive Vulnerable
Boreal Owl	1. Sensitive List	Sensitive

<sup>1</sup> Tate 1986; <sup>2</sup> U.S. Department of Interior 1992c; <sup>3</sup> U.S. Department of Interior 1991; <sup>4</sup> Rath, M., U.S. Forest Service, Region 4, Threatened and Endangered Species program, pers. comm. 1993; <sup>5</sup> Steenhof 1993.

cause they are so ecologically versatile, and all adapt well to urbanization. Other raptors, such as the Merlin (*Falco columbarius*) in Canada (Oliphant and Haug 1985, James 1988), have recently adapted to urbaniza-

tion. With the general protection of raptors over the past three decades, there is some suggestion of increase in most species analyzed in Breeding Bird Surveys from 1965 to 1979 (Robbins et al. 1986). Migration

TABLE 3. SURVEY OF *Condor* RAPTOR ARTICLES BY PERIODIC INTERVALS

Year	Total articles in volume	Raptor articles (%)	General content
1899	83	8 (10)	Mainly egg collecting or occurrence records (including capture methods for the California Condor).
1925	90	4 (4)	Mainly notes on food habits, distribution or status, and behavior (does not include the bird banding section or "Birds of . . ." articles).
1955	89	8 (9)	Taxonomic, status/records of occurrence, physiology, ecology (including one lengthy annotated list "Birds of Mexico" with extensive raptor data), rare species.
1975	109	13 (12)	Several were notes, physiology (2), ecology (2), behavior (3), rare species, general biology, distribution.
1991	181	11 (6)	Migration, energetics, behavior, ecology, environment/conservation, molecular systematics, distribution.

data for the west started being collected some two decades ago (Hoffman 1985) and may prove valuable in detecting trends (Hussell 1985). To date most of the 15 species analyzed from migration data between 1977 and 1991 either were stable or showed an upward trend (Hoffman et al. 1992).

Generally, grassland and wetland species may have been more severely impacted than woodland species because of greater habitat loss. A decline in the Burrowing Owl may also reflect the loss of prairie dog towns. With alterations of wetlands one would also expect the Northern Harrier (*Circus cyaneus*) to have declined but current migration numbers do not indicate this. The White-tailed Kite's post-settlement decline in California (May 1935) was a classic example of the multiple negative effects of landscape alterations (Waian and Stendell 1970, Pruett-Jones et al. 1980). Reasons for the decline were not fully documented but

shooting, habitat alterations and subsequent reductions in the food base for this food specialist seem to have been involved. The kite represents an even more interesting example since currently, in the face of continued habitat alterations from native habitats to agriculture, it has conspicuously increased in the west in the past several decades and is also expanding its range (cf. Palmer 1988). Agricultural lands that replaced native habitats provided, however, stable habitats and their stability in turn seemingly provided the necessary elements for the increase of kites (Pruett-Jones et al. 1980).

#### CASE HISTORIES

To follow are sketches of population trends and changes in status of selected raptors over the past century. Most statements rely on data from the past three to four decades since intensive studies were not generally available prior to that time. These examples illustrate the diversity of factors affecting status.

##### *Saw-whet Owl (Aegolius acadicus)*

Early in this century the Saw-whet Owl was found only in the southeastern portion of Alaska (Gabrielson and Lincoln 1959). In adjacent British Columbia the species is still little known (perhaps rare) outside the southern half of the province (Campbell et al. 1990). Kessel and Gibson (1978) listed it as a probable breeder in the vicinity of Anchorage, Alaska. Over the past eight years Ted Swem (pers. comm. 1992) erected 110 owl nest boxes around Anchorage of which 25 different boxes were used by Saw-whet Owls. Annual use gradually increased over the eight years and 11 boxes were occupied in 1992.

##### *Flammulated Owl (Otus flammeolus)*

This owl, once thought to be rare, has proven to be rather common in appropriate habitats (see Johnsgard 1988). Its apparent increase probably resulted from greater

search effort and better techniques. There is no evidence for a real population change and numbers can be sporadic. Marshall (1957), for example, found five singing males one season and 14 the next in the same area. Fortunately, they respond well to playback of recorded calls of their own and other species. While using playback calls and searching for Spotted Owls (*Strix occidentalis*) on the Dixie National Forest, Utah in 1990–1991, S. E. Rinkevich (pers. comm.) found that six owl species gave 280 independent responses. Flammulated Owls responded 116 times (41%) of the total, indicating their commonness.

#### *Osprey, eagles and falcons*

Several taxa, among them the Osprey (*Pandion haliaetus*), Bald Eagle, and at least three falcons, of which the Merlin and Peregrine are mentioned here, were all affected to some degree by synthetic agricultural biocides in the 1950s–1970s. All are now showing increases (Bird 1983, Cade et al. 1988). In western North America the Osprey was least affected, especially in Baja California (Henny and Anderson 1979) where, on the other hand, the Peregrine suffered severe declines (Cade et al. 1988). Ospreys responded well to artificial nest platforms, a fact that aided in their recovery and expansion (Poole 1989). Their increase in the west is reflected in migration counts at several observation stations between 1983–1991 (Hoffman et al. 1992).

The Bald Eagle suffered large losses from habitat alterations, bounties in Alaska, and biocide poisoning. The recovery plan for the “Pacific” population set a goal of 800 pairs (Steenhof 1990). Over the decade of the 1980s the numbers of pairs doubled in many states (e.g., Washington 99 to 398 pairs, Wyoming 19 to 49), and by 1990 there were 861 pairs (Steenhof 1990).

While the Merlin may be contracting from the southern portion of its range (e.g., Wyoming, pers. obs.) it has increased in some other areas (e.g., Alberta, R. Fyfe, pers. comm.) and spread into urban situations

(Oliphant and Haug 1985). With populations having been somewhat depressed because of biocides (Cade 1982), their increase was detectable in migration data at western localities (Hoffman et al. 1992). This increase was also seen on the nonbreeding grounds. In Utah, for example, the western prairie-parkland subspecies (*F. c. richardsoni*) (see Temple 1972) was represented by only three or four specimens before 1968. Many Merlins were seen or trapped each winter by competent observers between 1945 and 1968 (pers. obs.). None was *richardsoni*. Then in 1968, an adult female was found near Salt Lake City. Now, about 30% of all observations or specimens in Utah (1975–1992) are *richardsoni*. This may be a function of increasing populations, or may reflect a shift in the non-breeding range. Such shifts are not unknown and the occurrence and subsequent increase in wintering Bald Eagles in Utah since the 1930s represents an example (Palmer 1988, J. R. Murphy, pers. comm.).

The Peregrine Falcon may represent the best documented case of a decrease and subsequent increase. The species’ decline in North America (Hickey 1969, Cade and Fyfe 1970) and recovery (White 1984, Cade et al. 1988) is well chronicled. Because pre-decline numbers were not known (cf. Bond 1946, Beebe 1960, and Cade 1960) several studies have tried to reconstruct that baseline (cf. Enderson 1965, Beebe 1969, Herman et al. 1970, Porter and White 1973, and Henny and Nelson 1981). However, their success in determining accurate numbers against which to measure recovery is debated.

The following numbers reflect the recovery: California, 38 pairs (1981) to 123 (1992) aided by reintroduction (Kirven and Walton 1992); Arizona, 17 (1980) to 179 (1992) by natural increase but also reflecting more extensive survey coverage (T. Tibbits, pers. comm.); and Colville River, arctic Alaska, 15 (1973) to 57 (1992) by natural increase (T. Swem, pers. comm.). Numbers have not increased proportionately in Alberta (West-

ern Raptor Technical Committee 1988) and perhaps interior British Columbia (Campbell et al. 1990).

In addition to a residual wild population in the west, the recovery was aided by releasing captive bred falcons by The Peregrine Fund, the Canadian Wildlife Service, and other peregrine breeders. The Peregrine Fund (1992) released over 2200 young peregrines in the west between 1974 and 1991. There are approximately 550 known or suspected pairs currently (1992) in 12 western states (Recovery Team 1992) representing nearly 150 more pairs than thought necessary for down listing and about 100 more than had been documented historically for this same region.

### Hawks

Three western hawks allegedly showed sufficient declines in the past two decades to receive special attention by the U.S. Fish and Wildlife Service. The Swainson's Hawk, mentioned earlier in connection with local declines in California and Oregon, was listed by a special designation in 1982 (U.S. Department of Interior 1982). It was not, however, on any U.S. Fish and Wildlife list in 1991 (U.S. Department of Interior 1991) because insufficient data indicated that it was threatened.

The Ferruginous Hawk, which also appeared on the 1982 list, was petitioned in May 1991 for listing as endangered. Widespread declines were believed to be human-caused: 1) by increased disturbance, 2) direct mortality, and 3) habitat alterations that reduced prey or nesting substrate (cf. Olen-dorff 1993). Some local populations have been entirely lost in the last two decades (Woffinden and Murphy 1989). However, almost 2000 more pairs than had been estimated for the species in 1979 were found recently (U.S. Department of Interior 1992a). The increase seems to be accounted for by denser populations in Canada (especially Alberta but also Manitoba) that more than offset losses elsewhere (U.S. Department of Interior 1992a).

In 1991 the Northern Goshawk (*Accipiter gentilis*) was believed to be seriously declining in Arizona, New Mexico, and southern Utah because of habitat loss or alteration and was petitioned for emergency listing (Silver 1991). Much of the petition was based on Crocker-Bedford (1990) who claimed a decline greater than 80% over pre-settlement populations. But goshawk populations, especially in the northern part of their range, fluctuate widely with oscillations of prey (e.g., rabbits, ground squirrels and grouse). There may have been local declines (cf. U.S. Department of Interior 1992b) and slight reductions generally over pre-settlement times, but increasing data suggest that the species is stable over most of its southern range.

### Broad-winged Hawk (*Buteo platypterus*)

Although generally a species of the mid-west and east, prior to the 1960s it was known to extend westward into Alberta (Salt and Wilk 1958, Godfrey 1966). It was neither recorded in Washington (Jewett et al. 1953), Oregon (Gabrielson and Jewett 1940), nor California (Grinnell and Miller 1944) nor mentioned in raptor literature for Nevada (Herron et al. 1985), Utah (Eyre and Paul 1973) and Wyoming (Williams and Matteson 1948). The first records for Arizona (1956), New Mexico (1951), and Nevada (1973) were of single specimens (Phillips et al. 1964, Hubbard 1970, Alcorn 1988). It was first recorded on the west coast in 1966 (McCaskie 1968) and was found with increasing frequency through the 1980s on Great Basin migration routes (Hoffman et al. 1992). This increase corresponded with an apparent population upswing in British Columbia, where first recorded in 1965, and by the 1980s was seen regularly in local areas (Campbell et al. 1990).

### THE FUTURE

Senner et al. (1986) and Jehl (1986) attempted to predict future trends for North American birds, a difficult task. Some trends, however, seem likely. Some taxa may go



extinct in the face of human impact and landscape use, as happened with the Guadalupe Caracara (*Caracara lutosus*) at the turn of the century. We know well the fate of the California Condor (*Gymnogypus californianus*). One wonders about the security of the Hawaiian Hawk (*Buteo solitarius*) if the brown tree snake (*Boiga irregularis*), which has caused havoc with birds in Guam, successfully reaches Hawaii. Perhaps most species will show declines because of continued habitat alterations. Habitat alterations may also increase the risk of predation by mammals (e.g., foxes and raccoons which increase as a result of those alterations). Burrowing and Short-eared Owls (*Asio flammeus*) may be especially vulnerable. In spite of the recovery of the Bald Eagle, continued habitat deterioration may cause another decline (K. Steenhof, pers. comm.). Habitat alterations are viewed as the main threat to the Northern Goshawk and Spotted Owl (Gutiérrez 1994). The Peregrine Falcon, Osprey, Bald Eagle and White-tailed Kite are examples of significant recovery, following very severe declines, even to the point of expanding their ranges and overshooting their presumed historical levels (e.g., Peregrine). Some raptors viewed as real "wilderness" species are adapting to human use of the environment; Prairie Falcons use power transmission towers and Gyrfalcons (*Falco rusticolus*) occupy oil pipelines for nesting (Roppe et al. 1989, Ritchie 1991).

An optimistic future, however, seems to lie with raptors that can adapt to urbanization within the human matrix (e.g., American Kestrels, Red-tailed Hawk, Merlins [in Canada] and Red-shouldered Hawks (*Buteo lineatus*) [in California]). The latter example has involved behavioral changes and smaller territory sizes in highly urbanized areas (Bloom et al. 1993) beyond those reported by Wiley (1975). In addition to breeding of Peregrine Falcons in many major cities in North America, the Cooper's Hawk (*Accipiter cooperii*) now nests in a busy city park in the center of Salt Lake City, Utah. If these two species can breed in cities, then we can

expect others to follow. There is no reason why raptors could not be as "common" in urban situations as reported by Galushin (1971), who found an average density in Delhi, India to be approximately 19.3 pairs/km<sup>2</sup>. For this to happen, however, the most important ingredient, in addition to food and nesting sites, will be, as Galushin found, the good will of people toward raptors.

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