Conservation Status Report

Merlin

Scientific Name:	*Falco columbarius*
French Name:	*Faucon émerillon*
Spanish Name:	*Esmerejón*
Body length:	24-30 cm
Wingspan:	53-68 cm
Mass:	female: 180-310 g, male: 145-200 g

Breeding Range (words in italics are defined in the glossary):

Alaska, most of Canada south of the tree line, and parts of Idaho, Maine, Michigan, Montana, New York, North Dakota, Oregon, South Dakota, Washington, and Wyoming.

Winter Range: Winters primarily in coastal western Canada and Alaska, in the western and midwestern states, and along the mid-Atlantic and southeastern coasts of the U.S.. Neotropical distribution throughout Central America, Columbia, Ecuador, northern Peru, and Venezuela. There is also a significant population of wintering birds in the northern Great Plains region which is primarily, but not exclusively, urban

Type of Migrant: Partial

Nest Type: Primarily uses old stick nests of other birds (primarily crows and hawks), also rarely nests in cavities, on cliffs or on the ground. Ground nesting not uncommon north of tree line.

Food Habits: Preys primarily on small to medium-sized passerines less than 50g. Avian prey generally are taken in flight, but are sometimes taken from perches.

Primary Flight Mode: Powerful, moderately deep flapping with a rapid cadence.

ECOLOGY

This small falcon is a fast, powerful flier that appears pigeon-like in flight. Adult Merlins have bluish-gray (male) or dark drab brown (female) upperparts with a dark cap and light nape patches on the head. Underparts are generally whitish to buff, with heavy dark brown or rust streaking. Compared to the Peregrine Falcon and American Kestrel, the species has an inconspicuous dark malar or "moustache" mark, and a distinctive dark tail with 2-5 highly contrasting, light bands. Females are 20-30% larger than males. Merlins are most often seen in rapid, direct, flapping flight, and are seldom seen soaring or gliding. The Merlin is a northern species that breeds throughout the boreal zone of Asia, Europe, and North America. In recent years, the species has demonstrated an ability to adapt to living in urban environments and are expanding breeding range southward.

The Merlin is a swift and maneuverable hunter, well suited for capturing avian prey. Hunts are often conducted from perches overlooking large open areas, but also occur while flying rapidly below treetops or close to the ground in an effort to gain the element of surprise on potential prey individuals. Attempts to escape attacking Merlins by some passerines (e.g., Horned Lark) lead to rising aerial chases called "ringing flights."

The species typically nests in old nests of corvids or hawks in conifers or deciduous trees, and apparently prefers nests higher in tress over those on lower branches (Warkentin and James 1988). It also rarely nests in tree cavities or in a shallow scrape on the ground or a cliff ledge. Nests are rarely reused in consecutive years. In Alaska, typical nests were approximately 44 cm in diameter (Laing 1985). Preferred breeding habitat consists of open or semi-open areas near forest openings, woodlots, and small groves of trees, often near bodies of water. Urban populations breed in conifers in residential areas, parks, and cemeteries. Winter habitat includes open forests and grasslands, and also frequently hunts on tidal flats and near grain elevators and other features that attract passerines.

In North America, most studies of prey selection have reported that Merlins specialize on a small number of locally abundant small bird species. Major prey species include the House Sparrow, Horned Lark, Lark Bunting, Chestnut-collared Longspur, Vesper Sparrow, American Tree Sparrow, and Dark-eyed Junco (Hodson 1978, Becker 1985, Laing 1985, James and Smith 1987, Sodhi and Oliphant 1993). Prey species taken in smaller amounts include amphibians, insects, reptiles, and small mammals. Merlins have been observed caching prey on tree branches and in old corvid nests.

The Merlin is a *partial migrant*, but the three North American subspecies have distinctive patterns of migration. The Black Merlin (*F. columbarius suckleyi*) of the Pacific Northwest is largely sedentary, with seasonal, relatively short-distance migrations limited to individuals breeding in the northern and inland portions of the subspecies' range; some of these movements may take them into California. In contrast, the Taiga Merlin (*F. columbarius columbarius*) of the boreal forest is considered largely migratory.

Some individuals make short-distance movements and winter throughout much of the western U.S., along the eastern seaboard south of Massachusetts, and in the Gulf states. Others make long distance migration movements ending up throughout Mexico, the Caribbean, Central America, and as far northern Peru in South America. The Prairie Merlin (*F. columbarius richardsonii*) of the northern plains winters through much of the western United States and northern Mexico, but some individuals remain in and around urban centers throughout the breeding range. Recently, more Merlins (probably of the Taiga subspecies) have been wintering in the eastern mid-Atlantic region suggesting that migratory short-stopping may be occurring, particularly on the part of urban birds. Like Peregrine Falcons, Merlins often cross large bodies of water and may be seen along coastlines not so much to avoid water, but rather remaining along these shores because they are prime hunting areas during migration. In both eastern and western North America, coastal watchsites report many more migrating Merlins than inland watchsites.

POPULATION STATUS

Approximately 50% (650,000 individuals) of the global population is estimated to breed in North America (Appendix B, Table 1). Data from *raptor migration counts*, *Breeding Bird Surveys (BBSs)*, and *Christmas Bird Counts (CBCs)* indicate that Merlin populations have (1) increased throughout eastern North America since 1974; (2) increased in western North America since the early 1980s; and (3) declined in counts in the Florida Keys, but increased or remained stable elsewhere in the Gulf of Mexico region.

<u>Eastern North America</u>

Historic analyses. Bednarz et al. (1990) reported non-significant decreases in counts of Merlins at Hawk Mountain Sanctuary from 1934 to1942, 1946 to 1972 and 1973 to1986, but no estimates were made of the rates of change. In a study of counts at six raptor migration counts in eastern North America, Titus and Fuller (1990) reported a *statistically significant* regional increasing trend of 14.2% per year ($P \leq 0.01$) from 1972 to 1987. Similarly, Hussell and Brown (1992) reported that counts of Merlins at Hawk Ridge Bird Observatory increased a statistically significant 14.3% per year ($P \leq 0.01$) from 1974 to 1989, while spring counts at Grimsby, Ontario increased 9.4% per year ($P \leq 0.05$) from 1975 to 1990. At Cedar Grove, Wisconsin, Mueller et al. (2001) reported *statistically significant* increases in counts of Merlins from 1936 to 1999 ($P \leq 0.01$) and from 1951 to 1999 ($P \leq 0.01$), but noted a non-significant decrease from 1991 to 2001. Overall, previous estimates of population trend for Merlins indicate that populations passing northern *raptor migration count* locations in eastern North America have increased steadily since the early 1970s.

Recent analyses. Raptor migration counts, BBSs, and CBCs indicate that populations of Merlins have increased in northeastern North America since 1974. From 1974 to 2004 (see inset of Fig. 1), statistically significant increases in migration counts were recorded at Lighthouse Point, Connecticut (7.8% per year, $P \leq 0.01$), Montclair Hawkwatch, New Jersey (7.2% per year, $P \leq 0.01$), Hawk Mountain Sanctuary, Pennsylvania (5.1% per year, $P \leq 0.01$), Waggoner's Gap, Pennsylvania (10.2% per year, $P \leq 0.01$), Holiday Beach, Ontario (11.9% per year, $P \leq 0.01$), and Hawk Ridge Bird Observatory, Minnesota (12.0% per year, $P \leq 0.01$), and a non-significant increase was recorded at Cape May Point, New Jersey (1.8% per year).

More recent, 10-year trends indicate that population growth of this species is slowing in northeastern North America (Fig. 1). From 1994 to 2004, a *statistically significant* increase occurred at Waggoner's Gap (10.2% per year), while non-significant increases were recorded at Lighthouse Point (3.0% per year) and Montclair Hawkwatch (4.6% per year), along with non-significant decreases at l'Observtoire d'oiseaux de Tadoussac (-0.8 % per year), Cape May Point (-2.1 % per year), Hawk Mountain Sanctuary (-0.4% per year), Holiday Beach (-1.2 % per year), and Hawk Ridge (-1.9% per year). Continued population change at the estimated 1994–2004 rates would lead to a 50% increase in Merlin source populations in approximately 23 years at Lighthouse Point, 15 years at Montclair, and 7 years at Waggoner's Gap. Fifty percent decreases would occur in 87 years at Tadoussac, 33 years at Cape May, 250 years at Hawk Mountain, 58 years at Holiday Beach, and 36 years at Hawk Ridge.

BBSs underwent a statistically significant increase of 13.6% ($P \leq 0.01$) per year in Merlin populations in northeastern North America (Massachusetts, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, New Brunswick, Nova Scotia, Ontario, and Quebec east of 79 degrees West longitude) from 1976 to 2003, but the precision of this estimate is poor (95% confidence interval: 1.4–85.8% per year). A non-significant increase of 0.6% per year was recorded in the Mississippi flyway (1974–2004; Sauer et al. 2004), but this estimate is based on very few ($n = 7$) routes. These broad geographic regions include the areas from which the eight raptor migration counts receive migrants.

CBC data (National Audubon Society 2002) for the northeastern United States and eastern Canada (Massachusetts, Maine, New Hampshire, New Jersey, New York,

Pennsylvania, Rhode Island, Vermont, New Brunswick, Nova Scotia, Ontario, and Quebec) from 1974 to 2004 indicates a statistically significant increase of 3.0% per year ($P \leq 0.01$). *CBCs* for the southeastern United States increased a statistically significant 2.0% annually ($P \leq 0.01$) during the same period.

Overall, the data suggest strong, long-term increases by this species in northeastern North America; however, these trends contrast with the recent significant decline in counts in the Florida Keys (see below). If long-distance migrants are wintering farther north than in prior years (migratory *short-stopping*), this decline may represent a change in migration pattern and not a true population trend. Band-recovery mapping of migrants banded at different latitudes may assist differentiating between these possibilities.

Western North America

Historic analyses. Hoffman and Smith (2003) reported statistically significant increases in counts of migrating Merlins from 1983 to 2001 in the Goshute Mountains ($P \leq 0.01$), from 1987 to 2001 in the Wellsville Mountains ($P \leq 0.05$), from 1983 to 2001 in the Manzano Mountains ($P \leq 0.05$), and from 1985 to 2001 in the Sandia Mountains (spring counts, $P \leq 0.01$). However, no significant trends were recorded at Lipan Point (1991–2001) or in the Bridger Mountains (1992–2001).

Recent analyses. Data from raptor migration counts, BBSs, and CBCs indicate that Merlin populations have increased in parts of the western United States since the mid-1980s. Statistically significant long-term increases in counts of Merlins were recorded from 1983 to 2005 in the Goshute Mountains, Nevada (9.1% per year, $P < 0.01$), and from 1985 to 2005 in the Manzano Mountains, New Mexico (5.6% per year).

However, since 1998, after which widespread drought began to plague much of the interior West, a statistically significant decrease occurred in the Goshute Mountains (-11.6% per year, $P \leq 0.01$) and the number counted in the Manzano Mountains dropped sharply in 1999 but has been rising again since then (overall non-significant -1.7% decline indicated for 1998–2005). Other shorter-term datasets detected a marginally significant, 6.3% per year increase ($P = 0.06$) at Boise Ridge, Idaho (1995–2005), a non-significant 2.1% per year increase at Bonney Butte, Oregon (1995–2005), and no trend at Chelan Ridge, Washington (1998-2005, -0.4% per year) (Fig. 1). At other western migration sites, average counts of Merlins are too low (< 20/yr) for the RPI index calculation.

BBSs indicate a non-significant, long-term increase of 2.5% per year from 1983 to 2005, and a non-significant recent decrease of 2.3% per year from 1995–2005 in the BBS western region (Arizona, California, Idaho, Nevada, Oregon, Utah, Washington, western Montana, western Wyoming, western Colorado, western New Mexico, British Columbia; Sauer et al. 2005).

CBC data (National Audubon Society 2002) for the western United States and Canada (Alaska, Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, Alberta, British Columbia, Northwest Territories, Yukon Territory) indicates that winter populations of Merlins increased 2.9% per year ($P < 0.01$) from 1983 to 2005, and a non-significant 2.0% per year from 1995 to 2005.

In sum, the significant downturn in counts at the Goshute Mountains coincident with the drought, but not at Boise Ridge farther north in the Intermountain region, and the fact that Merlins do not breed in the Great Basin, appear to provide support for the

hyopothesis that drought resulted in at least a temporary shift of migration routes away from the Great Basin for many species. More generally, the indicators suggest that western Merlin populations experienced a substantial expansion between the early 1980s and mid-1990s, and since then have either maintained stable or continued increasing trends in most areas. The recent analyses indicate that the strong increasing patterns reported for the Goshute and Manzano Mountains (Hoffman and Smith 2003) stabilized and declined at least temporarily coincident with the onset of widespread drought in 1999; however, both counts showed evidence of increasing trajectories again by at least 2005.

Gulf of Mexico

Recent analyses. In the last decade, counts of migrating Merlins decreased significantly in the Florida Keys (1999–2005, -13.4% per year, $P \leq 0.05$), but increased non-significantly at Smith Point, Texas (1997–2005, 4.6% per year), Corpus Christi, Texas (1997–2005, 2.7% per year), and Veracruz, Mexico (1995–2005, 0.4% per year) (Fig. 1). Confidence intervals for trend estimates at all four watchsites were fairly wide, which indicates that the precision of the trend estimates is limited. Nevertheless, the declining trend in the Florida Keys was distinct and the confidence interval does not overlap zero, so there is a high probability that the index there has declined. Such a decline is consistent with a decreased southward movement of migrants from the Northeast (i.e. short-stopping).

HISTORIC CONSERVATION CONCERN

Merlins were shot along with other hawks at well-known migration spots, including Hawk Mountain and Cape May Point, in the early 20th century. During the

DDT era of 1945–1972, Merlin eggshells thinned dramatically and reproductive success declined (Fox 1971). Around this time, research into population declines of Peregrine Falcons identified eggshell thinning as the cause of reproductive failure, and *DDT* residues (primarily the contaminant, DDE) as the cause of eggshell thinning (Cade et al. 1971, Wiemeyer and Porter 1970). The widespread use of *DDT* was banned in the U.S. in 1972. However, as recently as 1988, eggshells of Merlins breeding in Canada were found to contain sufficient concentrations of DDE to reduce reproductive success (Noble and Elliot 1988).

CURRENT STATUS AND CONCERNS

Counts of migrating Merlins at traditional watchsites began to increase in the late 1970s. Recent studies have indicated that shooting still contributes to mortality in parts of Canada (James et al. 1989). Monitoring of migrants at watchsites is particularly important for this species because of the low precision of BBSs on the breeding grounds.

Global and Canadian populations are ranked as secure, whereas United States populations are considered apparently secure (Appendix B, Table 1). In the breeding range monitored by raptor migration counts in northeastern North America, the Merlin is considered secure in three of the states and provinces, apparently secure in two, vulnerable in three, and critically imperiled in two (Vermont, New York) (NatureServe 2006). In the remaining states and provinces of this breeding range, the species is not ranked or is currently under review. In the breeding range monitored by raptor migration counts in western North America, the Merlin is considered secure in two of the states and provinces, apparently secure in three, vulnerable in three, and critically imperiled in one (Idaho) of the states and provinces. In the remaining states and provinces of this breeding

range, the species is not ranked or is currently under review. (NatureServe 2006). Kirk and Hyslop (1998) listed the Merlin as not at risk in Canada, with increasing population trends and evidence that it was adapting to urban environments. In contrast, the recent steep decline in the Florida Keys counts bears further study, as it may represent changes in boreal birds not well sampled by breeding and wintering surveys.

SUMMARY

Data collected from raptor migration counts indicate that Merlin populations increased dramatically in eastern and western North America in the last 20-30 years; however, these trends have moderated at most locations in the last decade. BBS and CBC trends are generally in agreement with this pattern, although the species is not well monitored by BBSs. The significant decrease in raptor migration counts in the Florida Keys since 1999 likely indicates a decrease in the distance migrated by individuals from the Northeast. Further research is needed on migratory movements in the species to fine-tune the interpretation of migration-count trends.

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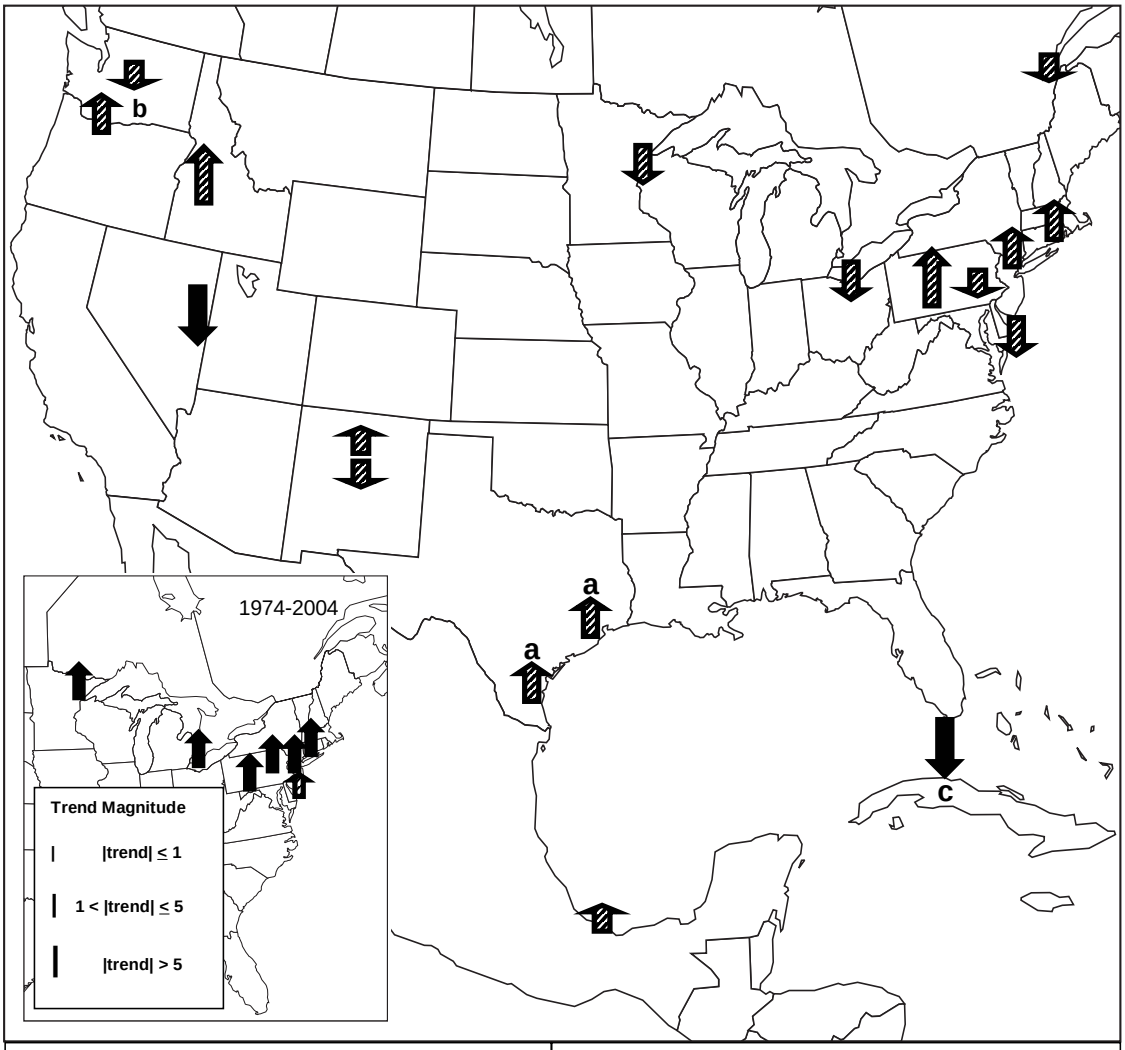

Figure 1. Population trends Merlins at 8 eastern and midwestern (1994-2004) and 5 western (1995-2005) raptor migration counts in North America, and long-term trends (1974-2004) for 7 eastern counts (inset). Trend magnitudes are expressed in percent change per year. A bi-directional arrow indicates that the estimated trend is 0.0% per year.