

Conservation Status Report

Northern Harrier

Scientific Name: *Circus cyaneus*

French Name: *Busard Saint-Martin*

Spanish Name: *Aguilucho colinegro, Aguilucho pálido, Gavilán rastrero*

Body length: 41-50 cm

Wingspan: 97-122 cm

Mass: 290-600 g

(Females are about 13% larger and up to 50% heavier than males)

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

Widely distributed but discontinuous in North America. Breeds from northern Alaska east across most of Canada, south to coastal British Columbia, Washington, Oregon, California, and Baja California, and from central Washington, Oregon, and northeastern California east through the Great Plains and south through most of Nevada, Utah, northeastern New Mexico, northwestern Texas, western Oklahoma, southern Kansas, and central Iowa. Also in central Wisconsin, southern Michigan, northern Ohio, southern Pennsylvania, southeastern Virginia, and possibly, northeastern North Carolina.

Winter range: Winters primarily from southern Canada south through the contiguous U.S., Central America, and the Caribbean, as far south as Panama.

Type of Migrant: Partial

Nest Type: Small nest composed of herbaceous plants and located on the ground in dense clumps of tall vegetation in open areas such as upland meadows or marshes.

Food Habits: Preys primarily on small mammals and birds.

Primary Flight Mode: Buoyant soaring, often close to the ground, with wings in a shallow dihedral, interspersed with deep and slow wing flaps.

ECOLOGY

The Northern Harrier is North America's only harrier. Notable field marks include a distinctive white rump patch, a facial disc similar to that of an owl, and long, narrow wings. The species plumage dimorphic; adult males are gray above with light undersides and black wingtips, whereas adult females are brown above and buffy with brown streaks on their underside. Northern Harriers also are sexually dimorphic in size, with females typically 13% larger and up to 50% heavier than males. Adult males often are referred to as "grey ghosts" due to their unique appearance. The species spends much of its flight time coursing low over open habitats.

The species is unusual among North American raptors in that it nests on the ground primarily in open, vegetated areas in uplands and wetlands. Nests typically are in dense patches of tall vegetation in undisturbed and usually wet areas. Nests are usually 39-63 cm in diameter, and are composed of reeds, grasses, forbs, weeds and water plants from the immediate vicinity of the nest.

Northern Harriers hunt primarily on the wing, coursing low over the ground. The species uses sound to locate prey to a greater extent than other diurnal raptors (Rice

1982). Hunting is conducted over open habitats, with undisturbed areas receiving greater use than grazed pastures or agricultural fields. Diet is influenced by local prey abundance, and consists of voles, mice, cotton rats, shrews, rabbits, ground squirrels, small to intermediate passerines, and small numbers of insects, including beetles, grasshoppers, and crickets (Errington 1933, Selleck and Glading 1943, Bildstein 1987, Barnard et al. 1987).

The Northern Harrier is a *partial migrant*. Individuals breeding in the northern portion of the species' range generally are long-distance migrants, moving >1500 km between breeding and wintering ranges. Although harriers concentrate to some extent along *leading lines* and *diversion lines* during migration, they are less prone to doing so than many other migratory raptors. They are observed at migration watchsites in a variety of weather conditions, including light rain or snow. Harriers also make long flights over water (Kerlinger 1989). Migrants use a mixture of flapping and gliding flight close to the ground, and are less frequently observed soaring on thermals and deflection updrafts than are other species.

POPULATION STATUS

An estimated 450,000 Northern Harriers (35% of the global population) nest in North America (Appendix B, Table 1). Data from *raptor migration counts*, *Breeding Bird Surveys (BBSs)*, and *Christmas Bird Counts (CBCs)* indicate that populations of Northern Harriers have (1) remained stable or declined in northeastern North America since 1974; (2) increased in western North America during the 1980s and 1990s, then declined after the late 1990s; and (3) declined around the Gulf of Mexico since 1995.

Eastern North America

Historic analyses. Bednarz et al. (1990) reported a *statistically significant*, long-term increase in counts of Northern Harriers at Hawk Mountain Sanctuary from 1934 to 1986 and a non-significant increase for the period 1971 to 1986, but no estimates were made of the rates of change. In a study of six raptor migration counts in eastern North America, Titus and Fuller (1990) reported a non-significant regional increasing trend of 5.1% per year from 1972 to 1987. Hussell and Brown (1992) reported that counts of Northern Harriers at Hawk Ridge Bird Observatory declined non-significantly from 1974 to 1989 (-3.7% per year), and those at Grimsby, Ontario (a spring count) increased significantly (5.3% per year, $P \leq 0.01$) from 1975 to 1990. At Cedar Grove, Wisconsin, Mueller et al. (2001) reported counts of harriers declined significantly from 1936 to 1999 ($P \leq 0.01$), and 1951 to 1999 ($P \leq 0.01$), but underwent a non-significant increase from 1989 to 1999.

Recent analyses. Populations of Northern Harriers generally have remained stable or declined in northeastern North America since 1974. From 1974 to 2004, statistically significant declines in migration counts were recorded at Hawk Mountain Sanctuary, Pennsylvania (-2.0% per year, $P \leq 0.01$) and Holiday Beach, Ontario (-2.6% per year, $P \leq 0.01$). Non-significant declines were recorded at Cape May Point, New Jersey (-0.7% per year; 1976–2004), and Waggoner's Gap, Pennsylvania (-0.4% per year). Non-significant increases were recorded Lighthouse Point, Connecticut (0.7% per year), Montclair Hawkwatch, New Jersey (0.6% per year), and Hawk Ridge Bird Observatory, Minnesota (0.6% per year).

From 1994 to 2004, statistically significant declines in counts of Northern Harriers were recorded at Lighthouse Point (-3.7% per year, $P \leq 0.05$), Hawk Mountain

Sanctuary (-4.3 % per year, $P \leq 0.01$), and Holiday Beach (-13.1 % per year, $P \leq 0.01$). Non-significant increases were recorded at l'Observatoire d'oiseaux de Tadoussac, Quebec (1.3% per year), Montclair Hawkwatch (2.4% per year), Waggoner's Gap (2.5% per year), and Hawk Ridge Bird Observatory (0.6% per year), and a non-significant decreasing trend occurred at Cape May Point (-0.7% per year) (Fig. 1). Continued population change at the 1994–2004 rates would lead to a 50% increase in Northern Harrier source populations in approximately 53 years at Tadoussac, 29 years at Montclair, 28 years at Waggoner's Gap, and 116 years at Hawk Ridge, and 50% declines in 19 years at Lighthouse Point, 99 years at Cape May, 16 years at Hawk Mountain, and 5 years at Holiday Beach.

BBSs show a non-significant decline of 2.1% per year in Northern Harrier populations from 1976 to 2003 in northeastern North America (Connecticut, Massachusetts, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, New Brunswick, Nova Scotia, Ontario, and Quebec east of 79° W), which includes the areas from which the eight *raptor migration counts* receive migrants. The inconspicuous nature of this species during the breeding season limits the value of BBSs as a population-monitoring tool.

CBC data for the period 1974 to 2004 indicate *statistically significant* increases in winter counts of Northern Harriers of 1.5% per year ($P \leq 0.01$) in northeastern North America (Massachusetts, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, New Brunswick, Nova Scotia, Ontario, and Quebec) and 0.5% per year ($P \leq 0.05$) in the southeastern United States (Delaware, Florida, Georgia, Kentucky, Maryland, North Carolina, South Carolina, Tennessee, Virginia, West

Virginia). In the last decade (1994–2004), CBCs increased non-significantly in northeastern North America (0.8% per year) and the southeastern United States (0.9% per year).

In sum, raptor migration counts and BBSs suggest that populations of Northern Harriers in northeastern North America have declined over the last 30 years. Increases in CBCs during the same period, however, suggest possible alternative explanations. Increasing CBCs in northeastern North America that accompany decreasing raptor migration counts and BBSs may indicate changes in migration geography, including migration on an increasingly broad front, *leapfrog migration*, or migratory *short-stopping* or a combination of these patterns.

Western North America

Historic analyses. Hoffman and Smith (2003) reported a *statistically significant* increase in migrating Northern Harriers from 1983 to 2001 in the Goshute Mountains, and non-significant increases or stable counts from 1985 to 2001 at the Wellsville Mountains (1987–2001), Manzano Mountains (1983–2001), Sandia Mountains, New Mexico (spring 1985–2001), in the Bridger Mountains (1992–2001), and at Lipan Point (1991–2001).

Recent analyses. Data from raptor migration counts, BBSs, and CBCs suggest that populations of Northern Harriers increased markedly in some areas of western North America between the early 1980s and mid-to-late 1990s, but declined generally in concert with an increase in drought conditions after that. No statistically significant long-term trends but a mix of slight negative and positive rates of change in raptor migration counts were recorded from 1987 to 2004 in the Wellsville Mountains, Utah (0.3% per

year), from 1983 to 2005 in the Goshute Mountains, Nevada (0.4% per year), and from 1985 to 2005 in the Manzano Mountains, New Mexico (-1.3 % per year).

Since 1998, when widespread drought occurred across much of the interior West, statistically significant declines were recorded in the Goshute Mountains (-10.6% per year, $P \leq 0.01$), Manzano Mountains (-8.2% per year, $P \leq 0.01$), and at Lipan (-5.3% per year, $P \leq 0.05$) and Yaki Points (-6.1% per year, $P \leq 0.05$), Arizona. A marginally significant ($P = 0.08$) decline also was recorded at Chelan Ridge, Washington (-10.1% per year), and non-significant declines were recorded at Bonney Butte, Oregon (-3.3% per year), in the Bridger Mountains, Montana (-2.4% per year). No significant long-term trend was recorded at Boise Ridge, Idaho (0.3% per year), where counts increased until 1998, then declined until 2004. In contrast, a regularly fluctuating but comparatively stable long-term pattern occurred across the period of record in the Wellsville Mountains (1987-2004, -0.3% per year) (Fig. 1). These updated analyses confirmed previous estimates of mostly declining recent trends at most of these sites (Hoffman and Smith 2003).

BBSs show a non-significant, long-term decline of 0.9% per year from 1983 to 2004, and a recent decline of 2.0% per year 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. 2004). Unfortunately, the inconspicuous nature of this species during the breeding season limits the value of BBSs as a population monitoring tool.

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) indicate that winter populations declined non-significantly from 1983 to 2005 (-0.5% per year) and from 1995 to 2005 (-2.1% per year).

In sum, Northern Harriers may have responded favorably to the relatively moist El Niño period of the early-to-mid 1990s, but have shown marked declines in most areas since the late 1990s when widespread drought began to occur across much of the interior West. Significant negative rates of change since 1998 (-5.3 to -10.6% per year) were indicated for five of nine sites, with non-significant declines (-2.3 to -3.3% per year) indicated for two other sites and no significant increases indicated for any sites.

A sustained annual decline of 5% per year would result in a 50% decline in the population in 13–14 years.

Gulf of Mexico

Recent analyses. From 1995 to 2005, a statistically significant decline was recorded in raptor migration counts at Veracruz, Mexico (1995–2005, -8.4% per year, $P \leq 0.05$), a marginally significant decline occurred at the Florida Keys (1998–2005, -8.4% per year, $P = 0.09$), and non-significant declines occurred at Smith Point, Texas (1997–2005, -6.1% per year) and Corpus Christi, Texas (1997–2005, -3.1% per year) (Fig. 1). Although each dataset exhibited a high degree of annual variability, all clearly suggested that substantial declines occurred after counts apparently reached high levels between about 1998 and 2000. These declines are consistent with a hypothesized decline in northern, long-distance migrant populations simultaneous with an increase in mid-Atlantic- and southeastern-region populations.

HISTORIC CONSERVATION CONCERN

Northern Harriers were shot less often than most other raptors at migration hot spots in the early 20th century, in part because they were considered beneficial because of their diet of small mammals, and in part because they tended not to concentrate at such locations. Misuse of *DDT* caused decreased eggshell thickness in harriers between 1947 and 1969 (Anderson and Hickey 1972), and this probably led to population declines prior to the banning of DDT.

CURRENT STATUS AND CONCERNS

Today, harrier populations are threatened primarily by development of wetlands, conversion of prairies to intensive agricultural use, overgrazing of pastures, and early mowing of grasslands. Shooting also remains a concern for harriers in communal roosts in the southeastern United States. Increased rate of forest fragmentation and loss, particularly in the boreal zone and the Caribbean may threaten some populations.

Although Canadian and United States populations are considered secure, the U. S. Fish and Wildlife Service ranks the Northern Harrier as a species of concern in FWS regions 2 and 6 (New Mexico, Arizona, Oklahoma, Texas, Colorado, Montana, Nebraska, Utah, Wyoming, Kansas, Dakotas) and in most of the Bird Conservation Regions from the Mississippi River to the Rockies, south of the Dakotas, as well as nationally (Appendix B, Table 1).

In the breeding range monitored by *raptor migration counts* in northeastern North America, the Northern Harrier is considered secure in three states and provinces, apparently secure in three, vulnerable in four, imperiled in two, and critically imperiled in four (Connecticut, Massachusetts, New Jersey, Rhode Island) (NatureServe 2006). In the breeding range monitored by *raptor migration counts* in western North America, the

Northern Harrier is considered secure in three states and provinces, apparently secure in seven, vulnerable in two, imperiled in one, critically imperiled in one (Arizona), and is not ranked or under review in one (NatureServe 2006). Kirk and Hyslop (1998) rated the Northern Harrier as stable in Canada, but noted that it was declining in some of the Boreal Plains ecozone due to intensification of agriculture. Monitoring of the Northern Harrier at *raptor migration counts* is particularly important because it is not well-monitored by *BBSs* on the breeding grounds, and much of its breeding range is located north of *BBS* coverage. Inclusion of additional sites may clarify patterns in population change for this broad-front migrant.

SUMMARY

The Northern Harrier is considered secure in most of North America, but it is a species of concern regionally in many of the BCRs west of the Mississippi River. Migration monitoring suggests that the species has recently declined in all three of the regions for which migration counts are currently available. CBCs have increased slightly in eastern North America during the same period, suggesting that changes in the species' migration geography may have occurred which reduce passage at traditional migration watchsites in this region. Inclusion of additional raptor migration counts and addition of focused breeding season surveys may clarify the Northern Harrier's conservation status.

ADDITIONAL READING:

- Anderson, D.W. and J.J. Hickey.** 1972. Eggshell changes in certain North American birds. Pp 514-540 *in* Proceedings of the XVth International Ornithological Congress (H.H. Voous, ed.). P.J. Brill, Leiden, Netherlands.
- Barnard, P.E., R.B. MacWhirter, R.E. Simmons, G.L. Hansen, and P.C. Smith.** 1987. Timing of breeding and the seasonal importance of passerine prey to Northern Harriers. *Canadian Journal of Zoology* 65: 1942-46.

- Bednarz, J.C., D. Klem, Jr., L.J. Goodrich, and S.E. Senner.** 1990. Migration counts of raptors at Hawk Mountain, Pennsylvania, as indicators of population trends, 1934-1986. *Auk* 107: 96-109.
- Bent, A.C.** 1937. Life histories of North American birds of prey, Part II. U.S. National Museum Bulletin 167. 409pp.
- Bildstein, K.L.** 1987. Behavioral ecology of Red-tailed Hawks (*Buteo jamaicensis*), Rough-legged Hawks (*Buteo lagopus*), Northern Harriers (*Circus cyaneus*) and American Kestrels (*Falco sparverius*) in south central Ohio. Ohio Biological Notes No. 18.
- Clark, W.S. and B. K. Wheeler.** 1987. A Field Guide to Hawks of North America. Houghton Mifflin Company, Boston, MA.
- Errington, P.L.** 1933. Food habits of southern Wisconsin raptors. Part 2. Hawks. *Condor* 35: 19-29.
- Hamerstrom, F.** 1986. Harrier: Hawk of the Marshes, The Hawk That is Ruled by a Mouse. Smithsonian Institution Press, Washington, D.C., USA. 171pp
- Hoffman, S.W. and J.P. Smith.** 2003. Population trends of migratory raptors in western North America, 1977-2001.
- Hussell, D.J.T. and L. Brown.** 1992. Population changes in diurnally-migrating raptors at Duluth, Minnesota (1974-1989) and Grimsby Ontario (1975-1990). Ontario Ministry of Natural Resources, Maple, Ontario, Canada. 67p.
- Kerlinger, P.** 1989. Flight strategies of migrating hawks. University of Chicago Press, Chicago, Illinois, USA 375pp.
- Kirk, D.A. and C. Hyslop.** 1998. Population status and recent trends in Canadian raptors: a review. *Biological Conservation* 83: 91-118.
- MacWhirter, R.B. and K.L. Bildstein.** 1996. Northern Harrier (*Circus cyaneus*). In *The Birds of North America*, No. 210 (A. Poole and F. Gill, eds). The Birds of North America, Inc., Philadelphia, PA.
- Mueller, H.C., D.D. Berger, G. Allez, N.S. Mueller, W. G. Robichaud, and J.L. Kaspar.** 2001. Migrating raptors and vultures at Cedar Grove, Wisconsin, 1936-1999: an index of population changes. Pp 1-22 *in* Hawkwatching in the Americas (K.L. Bildstein & D. Klem, Jr. eds). Hawk Migration Association of North America, North Wales, Pennsylvania, USA. 277p.
- Rice, W. R.** 1982. Acoustical location of prey by the Marsh Hawk: adaptation to concealed prey. *The Auk* 99: 403-413.
- Robbins, C.S.** 1986. Conservation of migratory raptors: an overview based on 50 years of raptor banding. Pp 26-34 *in* Raptor Conservation in the Next 50 Years (S.E. Senner, C.M. White, and J.R. Parrish, eds.). Raptor Research Foundation, Hastings, Minnesota, USA.
- Selleck, D.M. and B. Glading.** 1943. Food habits of nesting Barn Owls and Marsh Hawks at Dune Lakes, California, as determined by the "cage nest" method. *California Fish and Game* 20: 122-131.
- Titus, K. and M.R. Fuller.** 1990. Recent trends in counts of migrant hawks from northeastern North America. *Journal of Wildlife Management* 54: 463-470.

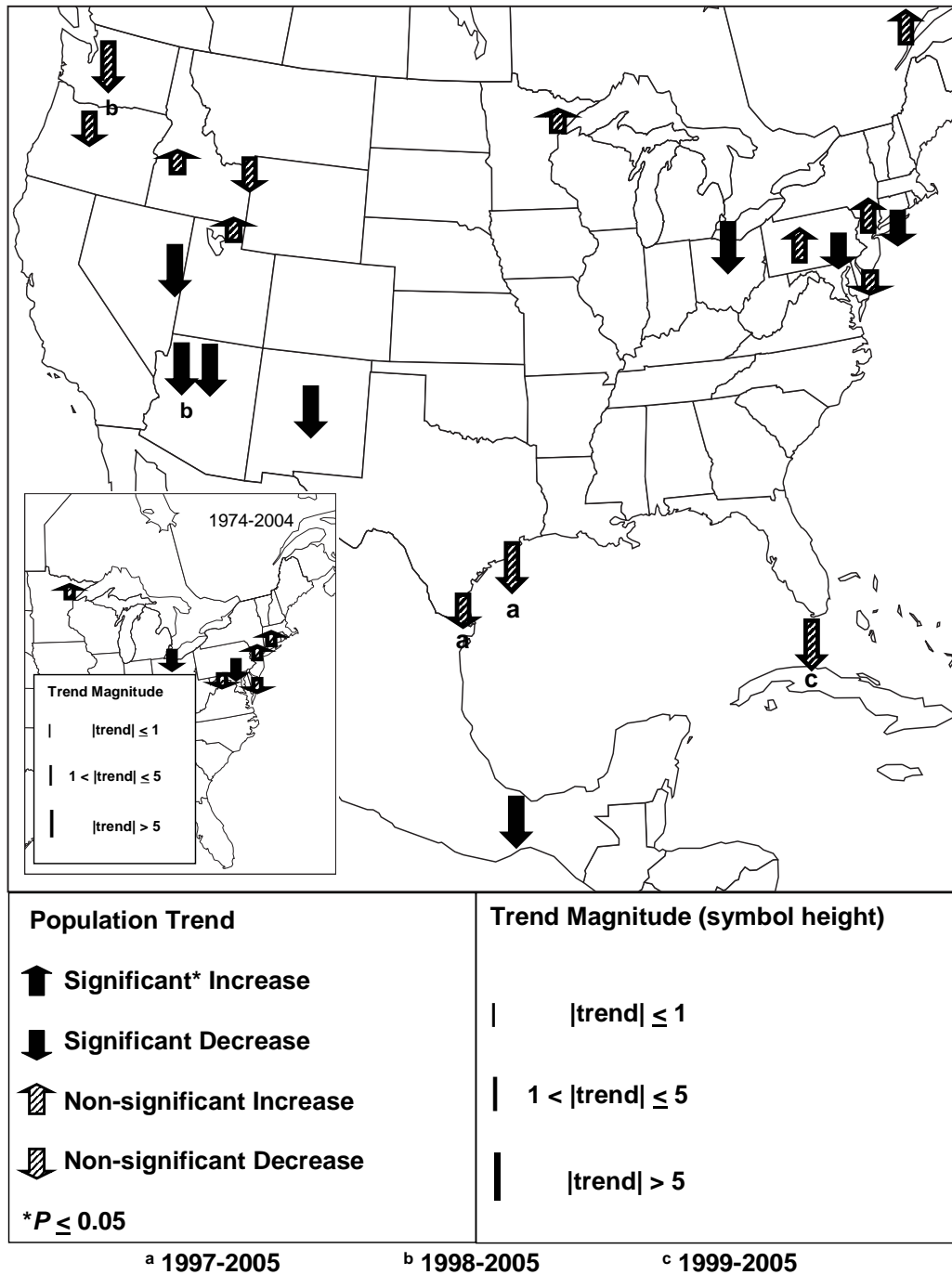


Figure 1. Population trends for Northern Harriers at 8 eastern and midwestern (1994-2004) and 8 western (1995-2005) raptor migration counts in North America, and long-term trends (1974-2004) for 7 eastern counts (inset). Trend magnitudes are expressed in percent change per year.