-Draft- Common Black Hawk Species Account

Strategies for Monitoring Common Black-Hawk (*Buteogallus anthracinus*) Populations in North America

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Introduction

The **Common Black-Hawk** (*Buteogallus anthracinus*; hereafter Black Hawk) is a neotropical riparian obligate raptor and is migratory through part of its range. The species is a permanent resident in central and southernMexico and a summer migrant in the southwestern United States and northern Mexico. Only about 220-250 pairs breed in the U.S., with most pairs (80-90%) occurring in Arizona (Schnell et al. 1988). There are no estimates for numbers throughout the rest of the species range. The U.S. breeding population is thought to be stable but precarious due to persistent loss of riparian habitats (Schnell 1994). There has been little research on Black Hawks (Boal and Mannan 1996) and few studies have focused on the ecology of the species (Schnell 1979, Roderiguez-Estrella 1996). Rather, most of the available information stems from anecdotal accounts (e.g., Carter and Wauer 1965, Maxwell and Husak 1999) and multi-species surveys (Millsap 1981, Roderiguez-Estrella and Brown 1990, Hiraldo et al. 1991). All migration information for Black Hawks is anecdotal, and it appears that the species is poorly suited for monitoring by migrant counts. Christmas Bird Counts and Breeding Bird Surveys also are ineffective methods of monitoring Black Hawk populations. The Black Hawk is dependent upon riparian communities for nest trees and foraging areas, which restricts their distribution and may facilitate monitoring of nesting areas (Boal and Mannan 1996). In this account I evaluate the existing information and attempt to identify the best method for monitoring Black Hawk populations in North America.

Species Characteristics

Subspecies and Subpopulations.

Currently, the Black Hawk is one of five North American *Buteogallus* species recognized by the American Ornithologists' Union (1998). Only the nominate species (*B. a. anthracinus*) occurs with any regularity in the U.S. (Fig. 1). Other subspecies, the Cuban Black Hawk (*B. a. gundlachii*) and Utila Black-Hawk (*B. a. utilensis*), are endemic to islands in the Caribbean Sea (Schnell 1994). The systematics of the genus, however, is not clear and further investigations of ecology and genetics are warranted (Griffiths 1994, Schnell 1994).

Distribution.

Information on the distribution of the species is incomplete for most of the resident range. The species is a permanent resident in Mexico from southern Sonora in the west and southern Tamaulipas in the east, southward along the coastal areas of the Central

American isthmus (Ridgley and Gwynne 1989) and eastward along the coastal areas of northern South America to Guyana (Schnell 1994).

The migrant population of Black Hawks is distributed in Arizona, southwest New Mexico, southern Utah, and western Texas in the U.S., and east Sonora, west Durango, west Chihuahua, and northern Tamaulipas in Mexico (Fig. 1). The U.S. breeding population was estimated at about 220-250 pairs in the mid 1970's with most pairs (80-90%) occurring in Arizona (Schnell et al. 1988). A review of nesting records in natural heritage databases from Arizona, New Mexico, and Utah, and other agency and organization databases indicated 150 breeding areas in Arizona, 35 in New Mexico, 1 in Utah, and as many as 10 to 20 pairs in Texas (Boal and Mannan 1996). More recent information suggests 60-80 pairs in New Mexico (New Mexico Game and Fish 1996). Black Hawks are the most abundant nesting raptor along major rivers in northern Sonora (Rodriguez-Estrella and Brown 1990). They are also considered common in southwestern Chihuahua, but there are no population size estimates available for the resident population in Mexico.

The distribution of Black Hawks in the U.S. and northern Mexico is patchy due to a scarcity of suitable riparian habitat across a generally arid landscape (Schnell et al. 1988, Rodriguez-Estrella and Brown 1990, Boal and Mannan 1996). The majority of breeding Black Hawks in the U.S. are found in Arizona and New Mexico, primarily along the tributaries and main streams of the Bill Williams watershed and the Virgin River in northwest Arizona, the streams draining the Mogollon rim of central Arizona, especially the tributaries and main streams of the Salt and Verde River drainages, and the upper tributaries and main streams in the Gila River drainage in east Arizona and west New Mexico and the Mimbres River in New Mexico (Schnell et al. 1988, Boal and Mannan 1996, New Mexico Game and Fish 1996). In Texas, as many as 12 to 16 pairs breed in the Davis Mountains, 1 to 2 pairs in Big Bend National Park, and possibly a few pairs in a section of the Devils River (K. Bryan, pers. comm., John Economidy, pers. comm.). One or two nesting pairs of Black Hawks have been reported along the Virgin River in Utah, (Carter and Wauer 1965, Wauer and Russel 1967, Behle et al. 1985), but only one nest has been verified (S. Hedges, pers. comm.). In northern Mexico the Black Hawk is the most abundant nesting raptor along the Rio Bavispe and Rio Yaqui (29-31 pairs in 145 km) in northern Sonora (Rodriguez-Estrella and Brown 1990) and are considered common in southwestern Chihuahua.

Black Hawks are occasionally sighted and documented outside of their breeding and wintering ranges. Occasional sightings in southern Florida are possibly vagrant Cuban Black-Hawks (Abramson 1976) or escaped captive birds (Millsap *in* Robertson and Woolfenden 1992). A female Black Hawk was struck and killed by vehicle in Bemidji, Minnesota (Elwell et al. 1978). Several independent sightings have been made in various areas of the western states (see Schnell 1994 for review).

Winter range information for Black Hawks is sparse. Individuals occasionally overwinter in Arizona (Phillips et al. 1964) and New Mexico (Williams and Hubbard 1991). Christmas Bird Count data from Mexico suggests the species is a permanent resident

from as far north as southern Sonora in the west and central Tamaulipas in the east (Table 1). The only recovery of a Black Hawk banded in the United States was in Nayarit, Mexico (Schnell 1994).

Habitat Associations.
The habitat requirements of Black Hawks restrict their distribution within their range. They are associated with aquatic systems throughout their range and found year round in woodlands, scrub, and mangroves bordering swamps, streams, lagoons, beaches and mudflats (Dickey an van Rossem 1938, Slud 1964, Wetmore 1965, Monroe 1968, Palmer 1988, Ridgley and Gwynne 1989).

In the southwestern U.S. and northern Mexico the Black Hawk is an obligate riparian nester, generally dependent on mature broadleaf trees along perennial streams for nest sites (Porter and White 1977, Schnell et al. 1988), although a few nests are situated along intermittent watercourses where small impoundments may persist through the breeding season (Schnell et al. 1988). A reliable supply of riparian associated vertebrate and invertebrate prey are required for successful nesting by Black Hawks (Millsap 1981, Boal and Mannan 1996). Nesting territories are restricted to, and disjunct within, riparian communities (Millsap 1981). Riparian communities in which the species is found include the cottonwood-willow series (1224.53) of the Sonoran Riparian Deciduous Forest (<1,200 m elev.), the cottonwood-willow series (1223.21) and mixed broadleaf series (1223.22) of the Interior Southwestern Riparian Deciduous Forest (1,100-1,800 m elev.), and the cottonwood-willow series (1222.31) and mixed broadleaf series (1222.32) of the Rocky Mountain Riparian Deciduous Forest (1,700-2,300 m elev.) (classifications from Brown et al. 1980). Further habitat descriptions below relate to migrant range only.

Foraging Habitat
Quantitative descriptions of the environments in which Black Hawks forage are lacking. Their foraging habitat is generally characterized as areas with surface water less than 30 cm deep interspersed with riffles, runs, and pools (Schnell et al. 1988). Low branches, downed trees, exposed roots, and prominent rocks are important for hunting perches (Schnell et al. 1988, Snyder and Snyder 1991). Aquatic vertebrates and reptiles form the majority of the Black Hawks diet (Boal and Mannan 1996). Millsap (1981) found Black Hawks were absent from areas that supported one taxon of known prey but lacked others, so a diverse array of prey species may be a necessary component of suitable habitat.

Nest Habitat
General descriptions of nest sites suggest Black Hawks select for relatively isolated groves rather than single trees (Millsap 1981, Schnell et al. 1988). Large trees and high tree densities characterized Black Hawk nest sites in cottonwood-willow communities (Millsap 1981). Cottonwoods (*Populus* spp.; 79%) and sycamore (*Platanus wrightii*; 11%) were the dominant tree species used for nests in Arizona and New Mexico (Millsap 1981, Schnell 1994, Scovill 1995). Other tree species used for nesting include alder (*Alanus oblongifolia*), ash (*Fraxinus velutina*), Arizona walnut (*Juglans major*) Goodding willow (*Salix gooddingi*), emory oak (*Quercus emoryi*), ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*), and mesquite (*Prosopis* spp.) (Bent

1937, Millsap 1981, Glinski *in* Schnell 1994, Scoville 1995). Along the Rio Yaqui in Sonora, Mexico, the most common nest trees are mesquite and *Pithecellobium* (Roderigueq-Estrella and Brown 1990). Elsewhere in Mexico, nests are placed in mangroves, higo (*Opuntia* spp.), higuera (*Ficus* spp.), cottonwood, and cypress (*Taxodium* spp.) (Johnsgard 1990). Stick platform nests are usually built ≥15 m above ground in large, mature trees that are close to surface water. Old nests are often reused, and nests of other species [Cooper's hawk (*Accipiter cooperii*), Zone-tailed hawk (*Buteo albonotatus*)] may be used (Schnell 1994).

Annual Activity Budget

Breeding.

There may be a clinal gradient in the breeding cycle of Black Hawks. For example, Black Hawks initiate courtship displays as early as January in Trinidad (ffrench 1991) and February in Panama (Wetmore 1965). In contrast, migrant Black Hawks first arrive on their breeding areas from early March (Millsap 1981, Schnell et al. 1988, D. Hansen, pers. comm.) to early April (Gifford 1985, Schnell 1979) (Fig. 2). Soon after arriving on the breeding areas, Black Hawks initiate conspicuous courtship displays include soaring with undulating flights, leg dangling, exaggerated wingbeats, and vocalizations (Schnell 1994, Boal pers. obs.). Based on collection dates of egg sets, the breeding season appears to be similar for the species throughout its migrant range (Johnsgard 1990). Nest building begins in late March through mid-April in the U.S. with both sexes participating in nest construction (Schnell 1994). Females become more sedate as egg laying nears (mid-April to mid-June) (Fig. 2), often remaining perched in or near the selected nest tree. During incubation, Black Hawks become less conspicuous when females are incubating eggs and males are away from the nest foraging. Because of the heavily canopied trees typical of riparian gallery forests, nests can often be difficult to see.

Once eggs hatch, females spend approximately 50-100% of their time at the nest until mid-way (i.e., 22 days) through the nestling period (Schnell 1994). Nestlings fledge at approximately 46 days, fly well by 70 days, and may soar with their parents by 80 days (Schnell 1994). Food begging by fledglings ends at about two months post-fledging.

Implications for surveying. The breeding season may be the most favorable period for monitoring Black Hawks, at least in the migrant range. They perform very conspicuous courtship displays and are quite vocal during the courtship period. Further, their habitat requirements limit the search area when surveying for the species. Although they are less conspicuous during the incubation period, they become more conspicuous near their nests during the nestling stage when they make frequent trips to and from the nest and become defensive of the nest area. Also, some individuals will respond to vocal imitations of their common call (Boal pers. obs.), so broadcast surveys may be a viable method of nest location.

Migration.

The only information concerning migration behavior, timing, or routes of Black Hawks is anecdotal. Earliest spring arrivals are in early March (Millsap 1981, Schnell et al. 1988, J. Hansen, pers. comm.). Autumnal departures are usually in October (Snyder and

Snyder 1991, Schnell 1994), with latest sighting in Arizona occurring on 14 October (Millsap 1981) and 24 October (Schnell et al. 1988). Fledglings leave mid-October and return later than adults (Schnell 1994).

The routes and behavior of migrating Black Hawks is unknown, and the little existing information is inconsistent. The species appears to migrate solitarily but exceptions may occur (Snyder and Snyder 1991). A mated pair was observed departing their breeding area together for the autumnal migration on 3 October (Schnell 1994). The routes or landforms Black Hawks use for migration are likewise open to debate. Steve Hoffman (pers. comm.) suspects Black Hawks may migrate by soaring high on thermals or using flapping flight rather than using oreographic lift along ridgelines. Common Black-Hawks were not observed during exploratory assessment of southern Arizona mountain ranges as hawk migration monitoring sites (S. Hoffman, pers. comm.). However, migrant Black Hawks have been observed moving along high mountain ridgelines in southeast Arizona by Snyder and Snyder (1991). In one situation, four Black Hawks moved past an observation point within one hour (Snyder in Schnell 1994). To make matters more confusing, Black Hawks have been observed flying over and roosting in Tucson, Arizona, during both spring and autumn migration (Dawson *in* Schnell 1994, Boal and Mannan 1996, pers. obs.). Two sightings of southward migrant Black Hawks were made near Falfurrias, Texas (J. Economidy, pers. comm.). These two sightings are particularly unusual in that they were approximately 270 miles southeast of the east most nesting area of the species in Texas, and approximately 80 miles east of the Rio Grande River. The raptor migration/banding station in Veracruz, Mexico, is the only active station in Mexico (E. Ruelas-Inzunza, pers. comm.) and although Black Hawks are observed at the station, it is uncertain as to whether the birds observed are migrants or local residents (Z. Smith, pers. comm.).

Winter.
Other than distribution information, there is little information on wintering ecology of resident or migrant Black Hawks.

Population Monitoring

The goal of the North American Raptor Monitoring Strategy is to evaluate the usefulness of different survey methodologies to monitor the status and trends of each North American diurnal and nocturnal bird of prey. Specifically, the objective is to identify one or more methodologies that ensure the ability to detect a 50% reduction in the count or index of a species over a 25-year period with an a = 0.10 and ß = 0.20. Different or multiple methods may be useful for various species. In the case of the Black Hawk, it appears that viable methodologies are limited.

Monitoring of raptor species can be conducted during the breeding season, the migration, and the winter season. The primary methods employed include Breeding Bird Surveys, Christmas Bird Counts, nest surveys, raptor migration counts, roadside counts, feeder watches, and roost counts. Few of these methods are applicable to Black Hawk monitoring. Roadside counts, feeder watches and roost counts are not useful with Black Hawks. The habitat of Black Hawks limits surveys to primarily foot or boat access along

riparian corridors and generally prevents the use of roadside counts. The feeding behavior of Black Hawks does not predispose them to forage at bird feeders, and there is no evidence of communal roosting.

Monitoring migrant Black Hawks is clearly not a viable method for assessing population trends for several reasons. First, the northern most extent of the species range is south of almost all current raptor migration stations. The only current raptor migration stations that may detect migrant Black Hawks are at Corpus Christi, Texas, and in Veracruz, Mexico. Corpus Christi is east of the Black Hawks range and no Black Hawks have been observed in three years of operation (www.hawkwatch.org). The problem with the Veracruz station is a low number of observations and the uncertainty of status (e.g., migrant or resident) of observed Black Hawks.

Standard Breeding Bird Surveys (BBS) are ineffectual in monitoring Black Hawks. Despite approximately 3,700 BBS routes in the continental U.S., Black Hawks are not even included in the list of species for which trend analysis is available (Sauer et al. 2000). This is due to 1) the limited range of the species within the U.S., and 2) the fact that BBS routes are essentially roadside surveys, which are ineffectual for reasons stated above.

Christmas Bird Count (CBC) data appears to be of limited value in monitoring Black Hawks because, aside from anomalous accounts, the species does not winter in the U.S. and is not among the species for which U.S. CBC data and analyses are available (Sauer et al. 1996). A review of CBC data from Mexico, however, indicates some locations may warrant closer investigation as potential monitoring sites (Table 1). The CBC data from Rancho los Colorados, Tamaulipas, indicates an average of 19.8 Common Black-Hawks per count over a six year period, and San Blas, Nayarit, reported an average 5.2 Common Black-Hawks over a 13 year period (Table 1). The inherit problem with the CBCs in Mexico is that many are conducted inconsistently. The Rancho los Colorados CBC has been conducted 6 of the last 8 years and the San Blas CBC has not been conducted in the last 8 years.

Ultimately, monitoring of breeding Black Hawks appears to be the only feasible method of detecting trends in the population. I used program MONITOR (Gibbs and Melvin 1993, Gibbs 1995) to conduct a cursory examination of the efficacy of using breeding pair monitoring as a method for detecting a decrease in the migrant population of Black Hawks. First, I attempted to develop an estimation of Black Hawk breeding densities by referencing published reports. There are no published data for nesting densities in the southern, year-round part of their range, but migrant Black Hawks were reported to nest at densities of 0.34 pairs/km along the Rio Bavispe (65 km), Sonora, 0.10 pairs/km along the Rio Yaqui (80 km), Sonora (Rodriguez-Estrella and Brown 1990), and 0.40 pairs/km in Aravaipa Canyon (28 km), Arizona (Schnell 1994). I calculated the mean breeding density for these study areas and the standard error of the mean density ($\bar{x}$ = 0.28/km, SD = 0.16). Because Black Hawks nest primarily along river corridors I defined a plot as 25 km in length, and simulated monitoring five (125 km) and ten (250 km) plots. I assumed no variation in numerical trends among plots, a constant rate of increase/decrease,

constant sampling variance among plots, and derived power estimated based on 500 simulations. I ran simulations for periods of 5, 15, and 25 years.

Monitoring of both five and ten plots for 5 and 15-year periods proved inadequate to detect a 50% population decline with statistical power of 0.80 (Fig. 3). However, statistical power to detect a 50% decline (2.8% annually) over a 25-year monitoring period exceeded 0.80 for both 5 and 10 plot monitoring programs (Fig. 3). While this attempt at simulating a Black Hawk population is admittedly simplistic, the results suggest that monitoring of breeding pairs in as few as five 25 km stretches of suitable habitat may be sufficient to meet the NARMS monitoring goals for the species, at least for the migratory components of the population. If such a monitoring program were to be undertaken, plot specific densities for the areas being monitored would allow more precise modeling of the population. Further, a similar monitoring program could probably be developed for Black Hawks in the southern part of their range once breeding densities were determined, though a lesser or greater number of plots may be necessary to meet the statistical objectives of the NARMS.

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Table 1. Christmas Bird Count data from count locations in Mexico, 1979-2000.

Location	*State*	$\bar{x}$ */year*	*Range*	*Years operated*
Rancho el Palomino	Chihuahua	0	0	5
Mesa de los Tables	Coahuila	0	0	3
Mexico City	Districto Federal	0	0	8
San Miguel de Allende	Guanajuato	0	0	4
Puerto Vallarta	Jalisco	0	0	1
San Blas	Nayarit	5.2	1-10	13
Cumbres de Monterrey	Nuevo Leon	0	0	5
Tezuitlan	Puebla	0	0	6
Oaxaca de Juarez	Oaxaca	0	0	5
El Naranjo	San Luis Potosi	0.6	1-2	16
Alamosa	Sonora	2.9	1-12	16
Bahia Kino	Sonora	0	0	3
Bavicora	Sonora	0	0	6
Puerto Penasco	Sonora	0	0	16
San Carlos	Sonora	0.1	1	8
Yecora	Sonora	0	0	5
Ejido Farias	Tamaulipas	0	0	3
Gomez Farias	Tamaulipas	0.9	1-3	15
Rancho los Colorados	Tamaulipas	19.8	9-38	6
Rio Corona	Tamaulipas	1.2	1-4	18
Catemaco	Veracruz	5.0	4-8	5
Sayil-Labna	Yucatan	0.3	1-2	10
Telchac Puerto	Yucatan	0	0	1
Uxmal	Yucatan	0	0	14

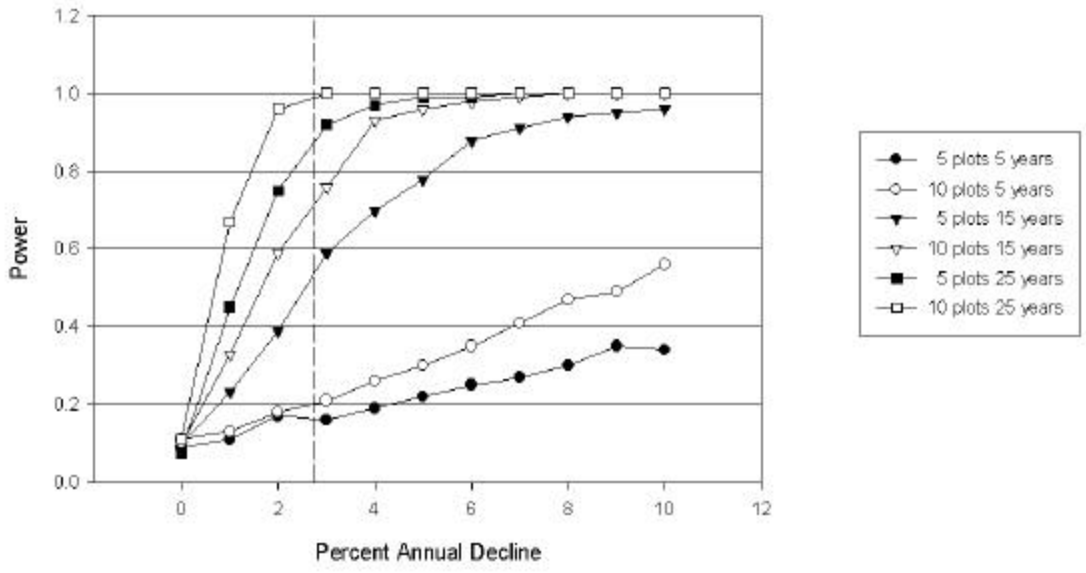

Figure 3. Results of power simulations for breeding area sampling to estimate trends in abundance of breeding Common Black-Hawks in the southwestern United States and northern Mexico. Power curves are constructed using program MONITOR based on 500 simulations. Dashed vertical line indicates an annual rate of decline equivalent to a 50% population decline over a 25-year period.