OUTSTANDING MIGRATION AND NESTING RECORDS OF SWAINSON'S HAWKS IN SOUTHERN SONORA, MEXICO

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ABSTRACT: We report multiple sightings of Swainson's Hawks (*Buteo swainsoni*) migrating through the Yaqui Valley of Sonora, Mexico, in fall from 2021 to 2023. The hawks occurred in flocks of up to 800, associating with Turkey Vultures (*Cathartes aura*), Crested Caracaras (*Caracara cheriway*), and other birds foraging in farmland being plowed and tilled before the sowing of wheat for the fall–winter cropping season. On the basis of seven nests from 2023 to 2025, we also report the first evidence of Swainson's Hawk nesting in the region, representing a southward expansion of the known breeding range by >250 km into the coastal plain of northwestern Mexico.

Human activities increasingly explain population trends of migratory and resident raptors (Chapa-Vargas et al. 2019). In this regard, farmlands host extensive food webs where organisms from cultivated and adjacent noncultivated habitats interact to provide the ecosystem services for food production, including pest control, pollination, and seed dispersal (Emmerson et al. 2016). The habitat alteration that generates these agricultural ecosystems may favor the convergence of species with similar requirements, including food, resources for breeding, and roost sites (Grande et al. 2018). Birds of prey provide ecosystem services to farmlands, including pest and scavenger control (Donázar et al. 2016, Horgan et al. 2021).

The Swainson's Hawk (*Buteo swainsonii*) is one of the most widely distributed migratory raptors in the Americas, migrating from its breeding range in North America (northern Mexico as its southern limit) to its wintering grounds in South America. This long migratory path is covered in several weeks (Bechard et al. 2020). The International Union for the Conservation of Nature classifies the Swainson's Hawk as a species of least concern (BirdLife International 2025), but some populations in the United States have declined. For instance, California listed Swainson's Hawk as a threatened species in 1983 because of habitat loss and pollution at nesting sites (Bloom 1980, Oleyar et al. 2021, California Department of Fish and Wildlife 2024). The species is under special protection according to Mexican federal law (Secretaría de Medio Ambiente y Recursos Naturales 2010). Nevertheless, since the early 2000s the population in California has seen a rapid recovery (Furnas et al. 2022).

Northwestern Mexico is a stopover for Swainson's Hawks that breed in the western United States, including California's Central Valley (Airola et al. 2019), but it also harbors breeding populations (Russell and Monson 1998). There is little information on the status of both migratory and reproductive populations in northwestern Mexico, the latter extending to the southern limit of the Sonoran Desert. Therefore, data on the abundance and distribution of Swainson's Hawk in northwestern Mexico may provide guidance for the conservation of this species and other raptors in this rapidly changing region.

The Yaqui River Irrigation District (DRR-041), surrounding Ciudad Obregón in southern Sonora, is the second largest irrigation district in Mexico. It encompasses a monoculture of wheat with modern irrigation and heavy use of agrochemicals on

230,000 ha (Matson et al. 1997, 2012). Before the 1990s, the district had two cropping seasons, spring–summer and fall–winter. Currently, however, DRR-041 supports a fall–winter cropping season only, because water levels in the Álvaro Obregón Reservoir, its primary water source, have been depleted because of persistent drought (Matson and Jewett 2012, McCullough and Matson 2016, Fischer et al. 2022). During the fall–winter season, wheat is grown and harvested from November to May. Croplands remain inactive from June to October, which leads to weeds encroaching after the summer monsoons and hurricanes (Schoups et al. 2012). Preparation of

Table 1 Incidental Records of Swainson's Hawk (*Buteo swainsoni*) and Other Raptors in Farmlands of the Yaqui Valley, Mexico, 2021–2023

Year, date, and time	Latitude and longitude	*n*	Area (ha)[a]	Vegetation height	Prey type	Other species[b]
2021						
10 Sep, 11:07	27.376, –109.933	800	8.0	Tall	Rodents	*C. aura* 250, *C. cheriway* 73
15 Oct, 08:51	27.401, –110.260	107	17.0	Tall	Rodents	*C. aura* 30
15 Oct, 12:21	27.418, –110.005	340	12.1	Tall	Insects	*C. aura* 58, *C. cheriway* 21
18 Oct, 11:42	27.416, –110.1295	85	10.4	Tall	Insects	*C. aura* 15
3 Nov, 17:38	27.366, –109.935	280	11.3	Medium	Rodents	*C. aura* 150, *C. cheriway* 52
2022						
11 Oct, 18:16	27.434, –110.000	32	6.0	Short	Insects	*C. aura* 6
27 Oct, 14:31	27.376. –110.176	200	22.5	Medium	Insects	*C. aura* 30
22 Oct, 11:14	27,356, –110.015	52	15.0	Short	Insects	*C. aura* 16, *C. cheriway* 6, *A. ibis*
23 Oct, 15:14	27.411, –110.197	34	19.0	Short	Insects	*C. aura* 10, *Q. mexicanus*
2023						
13 Sep, 11:24	27.423, -109.853	58	23.2	Tall	Rodents	*C. aura* 12
26 Oct, 13:56	27.370, –110.140	150	24.1	Short	Insects	*C. aura* 56
25 Oct, 12:24	27.410, –109.940	66	10.1	Medium	Insects	*C. aura* 12, *C. cheriway* 58, *A. ibis*, *Q. mexicanus*
2 Nov, 08:45	27.355, –110.150	112	18.1	Short	Insects	*C. aura* 26, *C. cheriway* 16
2 Nov, 18:03	27.411, –110.117	78	94.0	Tall	Rodents	*C. aura* 18, *C. cheriway* 11
23 Nov, 11:23	27.175, –109.851	27	37.0	Medium	Insects	*C. aura* 8, *C. cheriway* 12, *A. ibis*,

[a]Estimated plowed area in which the group was foraging.

[b]*Cathartes aura* (Turkey Vulture), *Caracara cheriway* (Crested Caracara), *Ardea ibis* (Western Cattle Egret), *Quiscalus mexicanus* (Great-tailed Grackle).

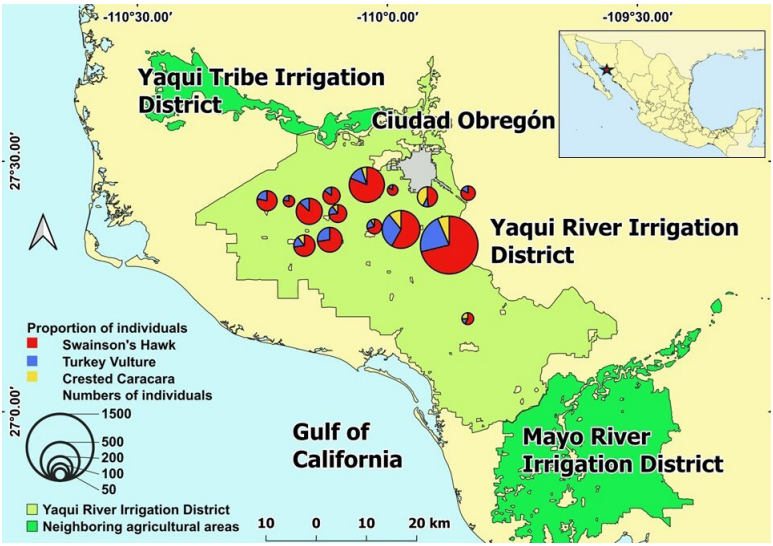

FIGURE 1. Counts of large groups of Swainson's Hawks in the Yaqui Valley, Sonora, Mexico, 2021–2023.

croplands for the next cropping season usually involves the removal of herbaceous and other secondary vegetation through tillage and plowing. These agricultural operations flush the animal community inhabiting these fields, including insect, reptile, and rodent prey for raptors.

Since early October of 2021 (when we detected the first large group), we have surveyed for migratory groups of Swainson's Hawks from a motorized vehicle along roads. Our surveys were opportunistic while driving through the DRR-041 for other purposes. Therefore, we cannot provide estimates of sampling effort. Upon detecting a foraging flock of Swainson's Hawks, we counted all birds, including other raptors, for 10–30 min depending on the group's size, using Vortex Crossfire HD 10 × 42 binoculars. We also estimated the area plowed where the group was foraging.

We detected migrating Swainson's Hawks only in the months of September, October, and November (Table 1), within the species' Pacific route in fall migration (Airola et al. 2019). We detected no migratory groups during the fall–winter cropping seasons of 2024 and 2025, when most cropland at the DRR-041 was not cultivated because no water was allocated to irrigation. We recorded 38 flocks (Figure 1), totaling 3367 individuals: Swainson's Hawk 2421 (71.9%), Turkey Vulture (*Cathartes aura*) 697 (20.7%), and Crested Caracara (*Caracara cheriway*) 249 (7.4%). The counts were the highest in 2021 with 2261 individuals at five sites. In October 2021, at one site of 8 ha, we counted 800 Swainson's Hawks, 250 Turkey Vultures, and 73 Crested Caracaras. We recorded 386 and 720 birds at four and six sites in 2022 and 2023, respectively. Swainson's Hawk occurred with the Turkey Vulture only in 7 instances and with both the Turkey Vultures and Crested Caracara in 8 instances. On 10 occasions (26.3%) Swainson's Hawks occurred with the Western Cattle Egret (*Bubulcus ibis*, 86 birds), and/or Great-tailed Grackle (*Quiscalus mexicanus*, 37 birds). We observed no other raptor species in these foraging groups. Documentation of large groups of Swainson's Hawks in the Yaqui Valley during the fall migration is rare. Eighty-four records of Swainson's Hawk from eBird from 2010 to 2025

include only one large group of 150 hawks near Pueblo Yaqui (= 5.68 ± 1.98 birds per record, Auer et al. 2025). Our observations of large migratory groups confirm the predicted trend for the species to increase within this region during the post-breeding migration (Fink et al. 2023).

Groups of raptors occurred in areas where agricultural machinery was at work, particularly where tractors were removing herbaceous secondary vegetation (Figure 2). The herbaceous cover consisted mainly of redroot pigweed (*Amaranthus retroflexus*), Johnson grass (*Sorghum halepense*), six-weeks grama (*Bouteloua barbata*), mucronate sprangletop (*Dinebra panicea*), beach wiregrass (*Dactyloctenium aegyptium*), and Bermuda grass (*Cynodon dactylon*). We classified herbaceous cover as short (height 0–30 cm, 13 sites, 34.2%), medium (31–100 cm, 11 sites, 29.0%) and tall (>100 cm, 14 sites, 36.8%) (Table 1). Swainson's Hawks descended to capture prey. Other raptors scanned the land with short walks, sprint, and pecks to catch their prey. We observed that Swainson's Hawks took advantage of the abundance of Arizona cotton rats (*Sigmodon arizonae*). Swainson's Hawks frequently consumed only their viscera, and Turkey Vultures and Crested Caracaras ate the remains. This commensalism was observed in 13 out of 38 instances (34.2%). We observed Swainson's Hawks preying upon insects on the other 25 occasions (45.4%). Rodents were typically preyed upon in taller herbaceous vegetation, whereas insects were preyed upon in shorter vegetation.

During the study period, we recorded evidence of seven Swainson's Hawk nests in the DRR-041. These observations were incidental. Evidence included adult birds sitting during the nesting season on a nest structure, and adult birds carrying sticks to nests, on 22 and 23 June and 16 July in 2023 and on 28 May and 12 June in 2024. We observed nestlings in one nest only in 2025 (Figure 3). Evidence of nesting in the region extends the southern border of the species' known breeding distribution by >250 km. Previously Swainson's Hawk had been noted nesting as far south as near Carbó, 60 km north of Hermosillo (Russell and Monson 1998). We observed attempted nests in the trees *Ceiba pentandra* (n = 3 attempts in two trees 5–10 m high), *Enterolobium cyclocarpum* (n = 1, ~9 m), mesquite (*Neltuma* sp., n = 1, ~6 m),

FIGURE 2. Presence of large groups of raptors during plowing of croplands in the Yaqui Valley, Sonora, Mexico, 3 November 2021.

FIGURE 3. Swainson´s Hawk nestling in a *Ficus pertusa* tree in the Yaqui Valley, Sonora, Mexico, 11 July 2025.

Ficus pertusa (n = 1, ~8 m; Figure 3), and Fremont's cottonwood (*Populus fremontii*, n = 1, >9 m). Nests were located at the top of tree canopy, without obstruction toward the neighboring farmland. All nests were <10 m from paved or dirt roads. The expansion of Swainson's Hawk's breeding distribution into the Yaqui Valley (and likely into the agricultural valleys of Sinaloa) may reflect the species' broad ecological tolerance, as evidenced by its well-documented use of farmlands in the Central Valley of California (Estep 1989, Babcock 1995).

In summary, this research provides novel information about the stopover ecology of Swainson's Hawks that are likely from a breeding population listed as threatened. The species' abundance in the Yaqui Valley peaked between September and November. This period, prior to the cropping season, coincides with the plowing and tillage of croplands, which increase the detectability of prey for migrating Swainson's Hawks. Migrating Swainson's Hawks nearly always mix with migrating Turkey Vultures to form large foraging groups while tractors are working. The DRR-041 may be increasingly providing habitat for Swainson's Hawks both migratory and breeding. Greater monitoring effort is needed to confirm habitat use and quality, as well as productivity and nesting success.

Despite the increasing use of farmland in the Yaqui Valley by migratory Swainson's Hawks, the region may also represent an ecological trap. Intensive use of pesticides is ubiquitous in the region, reaching approximately 270 tons of active ingredient across the DRR-041 (García-Hernández et al. 2017). Furthermore, campaigns against field mice to protect plant health through the application of poisoned baits (Contreras-Servín 2022), especially anticoagulant rodenticides (Elliott et al. 2024), exacerbate the risk of poisoning to raptors. The incidental mass poisoning of tens of thousands of Swainson's Hawks in their winter range in Argentina in the 1990s nearly caused their population to collapse (Goldstein et al. 1999). Raptors are especially at risk in agricultural areas for several reasons including high consumption of pest insects as prey, feeding upon the viscera of animals weakened and killed by

pesticides and poisons, and persecution by humans, whose take is facilitated by the birds' gregarious behavior (Mineau et al. 1999). Further evaluation of the effects of pesticides at this stopover site is needed for the potential effects on Swainson's Hawk to be identified and mitigated, particularly for declining populations in the United States.

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