

# FALL MIGRATION OF TURKEY VULTURES AND RAPTORS THROUGH THE SOUTHERN SIERRA NEVADA, CALIFORNIA

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The migration of Turkey Vultures (*Cathartes aura*) is not nearly as well studied as that of many species of raptors. Raptor migration counts are conducted annually at numerous locations throughout North America (Kerlinger and Gauthreaux 1985, Heintzelman 1986, Kerlinger 1989). Count sites are generally located along mountain ridges or coastlines where migrating raptors congregate (Kerlinger and Gauthreaux 1985, Kerlinger 1989). Both raptors and vultures migrate by day, taking advantage of thermal updrafts. However, sites that provide good conditions for migrating raptors, or for raptor viewing, do not necessarily provide optimal conditions for migrating vultures. Indeed, large flights of migrating vultures (i.e., >5000 individuals) are rarely recorded at hawk-watch sites.

In southern California, Turkey Vultures are known to migrate in large numbers through the Mojave Desert during spring and fall (Jaeger 1981, Rosenberg et al. 1991). Fall counts of Turkey Vultures migrating southeast from Victorville, San Bernardino Co., have recorded in excess of 10,000 individuals per season (Watkins 1976, Yurkunas 1994). Spring counts (February through April) at Victorville yielded only one tenth of this number (Watkins 1976). A similar pattern appears to prevail in the Kern River Valley (S. Laymon pers. comm.). Migration in spring appears to be more protracted and much lower in magnitude than in fall.

The migratory route of vultures has been mapped from the Mojave River in the vicinity of Victorville to Blythe, Riverside Co., along the Colorado River (Watkins 1976). However, little else is known of the magnitude of Turkey Vulture migration in the western United States. Here we document the largest known Turkey Vulture flyway north of Mexico and report observations of migrating raptors during fall 1994.

## STUDY SITE

Our count site is located 8 km (5 miles) south of Weldon, Kern Co., California, at the southern terminus of the Sierra Nevada. The site (elevation 900 m; 2950 feet) is just west of Kelso Creek on a low rise at a point where the valley narrows in width to 1 km (0.6 mile) from 4 km (2.5 miles) at the mouth. Kelso Creek runs southeast-northwest into the South Fork Kern River (elevation 800 m; 2650 feet) and is bordered by two desert mountain ranges, the Scodie Mountains on the east and the Piute Mountains on the west. The South Fork Kern Valley is bisected by extensive cottonwood/willow riparian forest bordering the South Fork Kern River. The forest is surrounded by agricultural lands and desert mountains. The forest provides roosting sites for a large percentage of the migrating Turkey Vultures that pass the count site.

## MIGRATION OF TURKEY VULTURES

### METHODS

We conducted counts daily from 7 September through 26 October 1994 (except 9–10 September and 22–23 October). Observations commenced between 08:30 and 10:00 PST and lasted from three to six hours depending on the intensity of the vulture movement and availability of observers. From 7 to 30 September observations ended about 12:00 when migration activity appeared to cease; however, on 1 October a second wave of activity was observed in early afternoon. Subsequent observations (1 to 26 October) were conducted until the afternoon wave ceased, generally between 14:00 and 15:00.

We made our counts from a single station. From the count site we had a nearly 360-degree view of the surrounding desert and mountains. At least two observers were present during all observations. Both observers actively located and counted vultures, but only one observer recorded data. Observers frequently communicated the location, activity, and numbers of vultures seen. Vultures were typically first spotted in kettles forming to the north of the count site. We attempted to keep track of the kettles as they dispersed and re-formed before recording them. Kettles were observed until individuals began to “break out” and glide past the count site. Because vultures frequently break out of kettles individually and in single file, it is often possible to obtain exact counts. When kettles drifted past the count site or when large numbers of individuals broke out simultaneously, passing in a broad front, we estimated by groups of ten. In nearly all cases, all birds were counted or estimated by both observers, who then agreed on the number to be recorded. Time of passage was recorded for all individuals or groups. Temperature, estimated wind speed, wind direction, and percent cloud cover were recorded at the beginning and end of each observation period.

We recorded observations of raptors in the same manner as those of vultures. We assessed whether individual raptors were residents or migrants by noting flight behavior and direction. Only raptors that we considered migrants were recorded.

### RESULTS

We recorded 27,415 Turkey Vultures during 46 days (162.5 hours) of observations, averaging 596 vultures/day (169 vultures/hour). A high count of 4521 Turkey Vultures was recorded on 7 October following three days of inclement weather, characterized by strong, gusty winds, high cloud cover, light rain, and few vultures. The second highest count (3694 individuals) was on 2 October immediately before the passage of this front. The median migration date, calculated from daily vulture totals, was 1 October. Peak activity occurred during the 7-day period from 29 September to 5 October when 37% (10,228) of all vultures were recorded (Figure 1).

We recorded 328 raptors of 13 species and 12 unidentified individuals. Red-tailed Hawks (*Buteo jamaicensis*) and Cooper’s Hawks (*Accipiter cooperii*) were the most commonly observed migrants, accounting for 33% (108) and 32% (105), respectively, of all raptors identified. Sharp-shinned Hawks (*Accipiter striatus*) (9.5%; 31) and American Kestrels (*Falco*

## MIGRATION OF TURKEY VULTURES

*sparverius*) (9%; 30) were the next most abundant. The remaining nine species, accounting for 16% of the total, included the Northern Harrier (*Circus cyaneus*) (13 from 13 September to 17 October), Prairie Falcon (*Falco mexicanus*) (11 from 2 to 26 October), Osprey (*Pandion haliaetus*) (9 from 19 September to 11 October), Ferruginous Hawk (*Buteo regalis*) (5 from 30 September to 24 October), Golden Eagle (*Aquila chrysaetos*) (5 on 8 October), Northern Goshawk (*Accipiter gentilis*) (5 from 30 September to 24 October), Swainson's Hawk (*Buteo swainsoni*) (4 from 11 to 30 September), and a single Peregrine Falcon (*Falco peregrinus*) on 20 October. Notable species were the Northern Goshawk, previously undocumented as a migrant in the region (S. Laymon pers. comm.), and a single Zone-tailed Hawk (*Buteo albonotatus*) on 3 October, only the second reported for Kern County (M. Heindel pers. comm.; record currently being considered by the California Bird Records Committee). Raptors averaged 2.0 per hour. We detected no seasonal peak in activity. However, raptors tended to migrate in pulses; on 11 days no raptors were recorded, while on four days 20 or more were recorded. Of the four most commonly recorded species only the Sharp-shinned Hawk revealed a distinct seasonal trend, increasing sharply in early to mid-October (Figure 2). High counts of raptors were 26 (6 species) on 7 October and 24 (5 species) on 11 October.

## DISCUSSION

Although the exact route used is unknown, anecdotal observations suggest that large numbers of fall-migrant vultures in California follow the west side of the Sierra Nevada (east side of the Central Valley) before passing through the Mojave Desert. Published reports of migrating vultures in fall include 2500 to 3000 counted in 30 minutes over Springville, Tulare Co., on 29 September 1965 (Chase 1966); 1000 at Chico, Butte Co., on 28

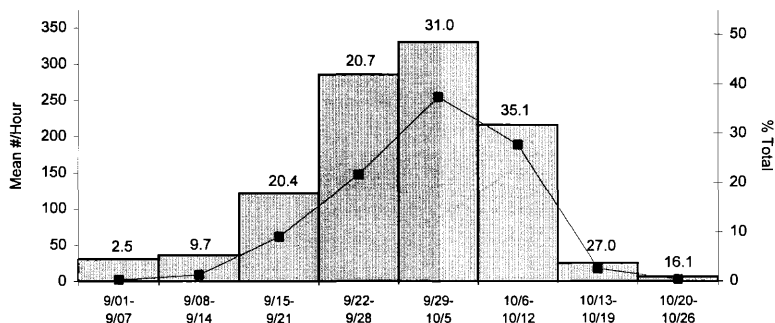


Figure 1. Seasonal timing of Turkey Vulture migration through the Kern River Valley, California, in fall 1994, expressed as mean number of vultures recorded per hour (bars) and percent total (line) by 7-day period. Total number of hours of observation per 7-day period is shown above bars.

## MIGRATION OF TURKEY VULTURES

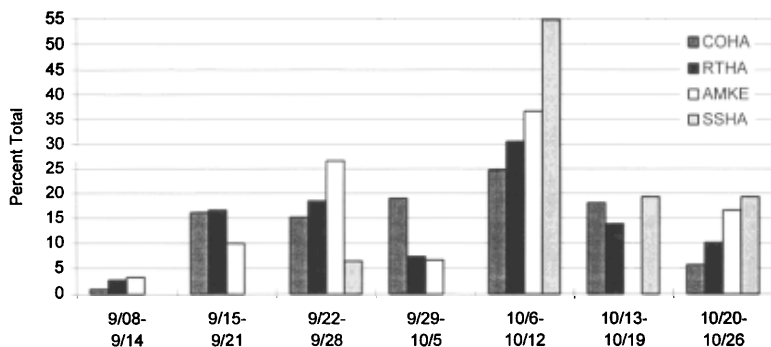


Figure 2. Seasonal distribution of the four most commonly recorded raptors migrating through the Kern River Valley, California, in fall 1994, expressed as percent total by 7-day period. COHA, Cooper's Hawk; RTHA, Red-tailed Hawk; AMKE, American Kestrel; SSHA, Sharp-shinned Hawk.

September and hundreds in Fresno Co. on 3 and 4 October 1972 (DeSante and Remsen 1973); and 100+ at various locations from Chico to Fresno Co. from 15 September through 5 October 1973 (Remsen and Gaines 1974). Flocks of up to 500 a day in late September and early October regularly roost near Porterville, Tulare Co. (B. Barnes pers. comm.).

Once vultures reach the desert, known suitable nocturnal roost sites are limited to riparian forests. The riparian forest along the South Fork Kern River is the last large patch of suitable roosting habitat available to vultures before they migrate out over the desert. The next known major roost site is along the Mojave River, in the vicinity of Victorville, approximately 160 km (100 mi) to the southeast (Watkins 1976, Jaeger 1981). The Kern River Valley lies directly in the path of vultures as they migrate down the west side of the Sierra Nevada toward the Mojave River. Once vultures have reached the Kern River Valley the most direct route to the Mojave Desert is southeast along Kelso Creek. The Scodie and Piute mountains appear to act as leading lines, funneling migrating vultures southeast along Kelso Creek toward the Mojave River.

To our knowledge, the Turkey Vulture migration through the Kern River Valley is the largest documented north of Mexico. We were able to locate reports of only three sites in the United States and Canada that regularly record more than 5000 Turkey Vultures per season. Observers at Michigan's Lake Erie Metro Park reported an 8-year average of 10,767 Turkey Vultures per season and in 1993 recorded an all-time high of 21,720 vultures (Benoit 1994). Observers at Holiday Beach, Ontario, reported a 20-year high count of 16,692 in 1991 (Latta 1994). In the western United States, the Mojave Desert Raptor Watch has recorded a high of 12,238 Turkey Vultures migrating over Apple Valley, near Victorville (Yurkunas 1994).

We believe that most of the vultures recorded at Apple Valley are those that have previously passed through the Kern River Valley. The timing of

## MIGRATION OF TURKEY VULTURES

peak numbers at the Mojave River roosts near the Apple Valley count site coincides closely with peak movement past our site (Watkins 1976, Yurkunas pers. comm.). These roost sites lie directly along the route vultures travel when leaving the Kern River Valley. Watkins (1976) stated that fall migrants follow the San Joaquin Valley then pass over the Tehachapi Mountains before roosting along the Mojave River in the vicinity of Victorville. However, he was apparently unaware of the movement through the Kern River Valley and did not observe fall migrants before they reached the Mojave River roosts. Although some vultures certainly do continue south through the Central Valley and around the southern end of the Sierra Nevada our data suggest that the vast majority leave the Central Valley, crossing over the west edge of the Sierra and into the Kern River Valley.

Our observations early in the season were limited to the morning hours; hence it is likely that 5000 to 10,000 vultures may have passed unrecorded. With more intensive coverage we believe as many as 40,000 vultures may be recorded annually from this location. Additional count sites located in the Central Valley and Transverse Ranges (e.g., near Bakersfield and Tehachapi) are necessary to determine the number of migrating vultures that continue moving southward through the Central Valley, passing over the Tehachapi Mountains instead of crossing into the Kern River Valley. The large number of Turkey Vultures that pass through the Kern River Valley probably represents a significant portion of the vulture population in the Pacific Northwest, west of the Cascade-Sierra Nevada axis, making this a prime location for monitoring long-term trends in vulture numbers in the West.

### SUMMARY

Turkey Vultures and raptors use the valley of Kelso Creek, Kern County, California, as a fall migration route, after roosting in the riparian forest along the South Fork Kern River. From 7 September to 26 October 1994 we counted 27,415 Turkey Vultures, the largest flight yet recorded in the United States. The South Fork Kern River and Kelso Creek appear to lie along a flyway leading from the east side of the Central Valley to the Mojave River near Victorville, previously found to be a major roost site for migrating vultures. The flyway is also used by raptors (328 of 13 species counted over the same period as the vultures), including a few Northern Goshawks.

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## MIGRATION OF TURKEY VULTURES

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