

Satellite Telemetry Fills Gaps Left by Traditional Methods

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We live in an era of rapid response for answers to our questions. Most answers to colloquial questions are just a few keyboard clicks away, and even telemetry data are now available in nearly real-time delivery to our computers and cell phones. Drawing scientific conclusions from data puzzle pieces, however, requires much more patience and diligence (and funding).



Golden Eagle released by Dave Bittner, 2008.

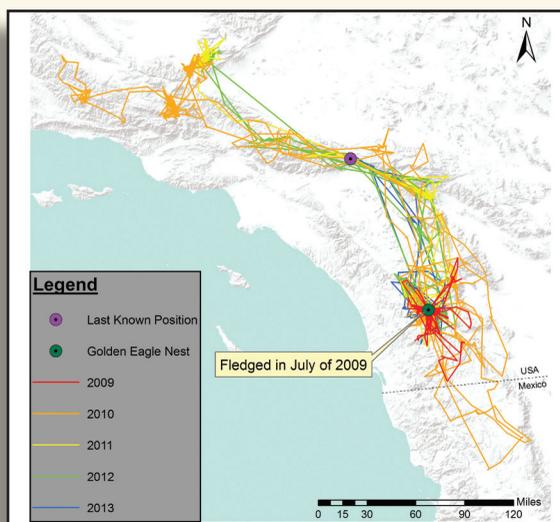
The long-range migratory capabilities of Golden Eagles (*Aquila chrysaetos*) along with a long maturation to adulthood make the species a prime candidate for tracking its movements via telemetry studies. It is difficult for traditional wildlife tracking methods to match the data return capabilities of satellite and GSM telemetry methods. Wildlife Research Institute's (WRI) Montana migration study (2001-2011) applying leg bands and patagial tags on Golden Eagles and other raptors, was enhanced in 2007 by marking a sample of the Golden Eagles each year with 70g GPS Solar transmitters (N=24). Currently, live observation and mortality reportings via patagial tags have returned location data for 17% of 117 individuals not equipped with PTTs and 14% of the total number of subjects sampled (N=141). Satellite telemetry has returned location data for 100% of 24 individuals comprising 17% of the total sample size. Further, WRI has amassed comprehensive migration data per individual over the past seven years as they fly thousands of miles from wintering locations as far south as western Texas to breeding territories in Canada and northern Alaska.

The Golden Eagle dispersal cycle is quite different back home in San Diego. The adult Golden Eagle population in San Diego County is known to be firmly residential with museum records dating back to the late 1800s and evidence of nesting territories that are over 100 years old. We, as human residents of San Diego County, find kinship with the reasons motivating adult Golden Eagles to "stay put" — year-round beautiful weather being the common denominator; of course, food supply and other factors contribute to Golden Eagle territory dynamics. WRI's compilation of historical Golden Eagle territory records along with data from studies conducted since 1988 shape our approach to studying the resident population of Golden Eagles in San Diego County. Our project aims to determine dispersal patterns of fledgling Golden Eagles hatched in San Diego County as they mature to become breeding adults. Leg bands, patagial tags and VHF technologies have helped WRI identify San Diego-hatched juvenile Golden Eagles thousands of miles from their natal territories. One such juvenile Golden Eagle marked with a leg band and patagial tags as a nestling was reported to our

institute as injured from a gunshot wound over 1,000 nautical miles away in Guadalajara, Mexico, within 7 months of fledging. Further, multiple Golden Eagles marked with leg bands and patagial tags as nestlings in their San Diego County territories have been observed alive approximately 7 years later as breeding adults within the county, and in each case in territories different than their natal territory. The patagial tags sometimes become mere illegible remnants after 7 years of weathering but indicate, even without identifying the individual *per se*, that Golden Eagles hatched in San Diego County later breed in the same region. The combination of these incidents well-illustrates the dearth of knowledge of natal dispersal and sub-adult movements prior to acquisition of a breeding territory and mate. Much like in our Montana study, early methods yielded location data for a small percentage of the total sample size whereas satellite telemetry has increased our percentage of location returns exponentially. We are now collecting data on sub-adult dispersal and answering the question: "Where are Golden Eagles from San Diego County going in the first 7-8 years of life and what mortality issues do they face in those places?"

Since 2006, WRI telemetry data have placed Golden Eagles marked with PTTs as nestlings (N=21) up to 500 nautical miles north and 680 nautical miles south of their natal territory and in most cases revisiting the natal territory multiple times along the way. WRI's longest-deployed transmitter on an individual Golden Eagle, "57092a," regularly returns data and is currently in its fifth calendar year. This case study has documented movement data between the natal area in San Diego County and the Tehachapi Mountains east of Santa Barbara, California, covering most inland mountain ranges along the way. Tehachapi Pass Wind Farm is a well-known wind turbine location in California established in the early 1980s. Acknowledging that wind

turbines are a mortality issue for Golden Eagles when they leave San Diego County, it is almost hard to watch as location data approach and remain in the Tehachapi Pass area. Although having completed three round-trip flights to and from Tehachapi Pass, what's even more interesting is this individual stayed in San Diego for its first year and has since returned to its natal area for months



Annual dispersal of Golden Eagle "57092a" tracked via 70g PTT-100 GPS Solar, July 2009-April 2013.

at a time in both January 2011 and July 2012. We are 5 years into this dataset and hope for breeding territory location data within the next 2 years.

Biologists studying birds with a lengthy sub-adult period grow grey waiting for a dataset complete from fledging to breeding adult relative to the usual rapid delivery of answers we seek nowadays. However, we could never document long-range movements in such detail before satellite telemetry methods were available. Thus, it's worth the wait. Special thanks are in order to MITI for investing in and delivering the technology we need as biologists to answer important population management questions for avian and marine species.