

How broadly do nesting herons and egrets search the landscape to find food?

Foraging Horizons

by John P. Kelly and Mark T. McCaustland

According to specialists who study flight energetics, the slow, powerful wingbeat that lends rhythm and grace to the movements of herons and egrets is a relatively inefficient form of bird flight. The evolutionary engineering of these birds has, apparently, sacrificed fuel efficiency to meet other ecological needs, such as skillful landings in nest trees or quick take-offs from tight spaces in marshes or along creeks. For extended travel, soaring would be far more efficient. If you know this, the sight of a commuting egret winging steadily along a waterway is a display of the costly expenditure of energy required to access productive feeding areas. This may explain why egrets occasionally seek thermals for extra lift when traveling extended distances. If flight costs challenge the ability of herons and egrets to adequately provision their young, any loss or degradation of habitat that forces them to travel farther to find food might threaten their ability to reproduce.

The quality of wetland foraging sites fluctuates dynamically over short periods of time, a consequence of changing water levels, seasonal growth of wetland vegetation, and the dynamics of various prey populations. To make the most of wetland feeding opportunities, herons and egrets have become masters at searching huge landscapes to find sites of temporarily high prey abundance (Kushlan and Hancock 2005). In spite of this ability, they seem to concentrate their feeding activities near the colony site—a pattern suggesting limits related to the costs of extended travel. In our investigations at Audubon Canyon Ranch, we are asking how this apparent clustering of heron and egret feeding activity near heronries might affect the spatial patterns of other life across wetland landscapes, as well as regional goals for wetland habitat protection and restoration.

We employ two complementary methods to study the foraging dispersion of herons and egrets. First, teams of observers at selected colony sites watch and record the



Flying Great Blue Heron.

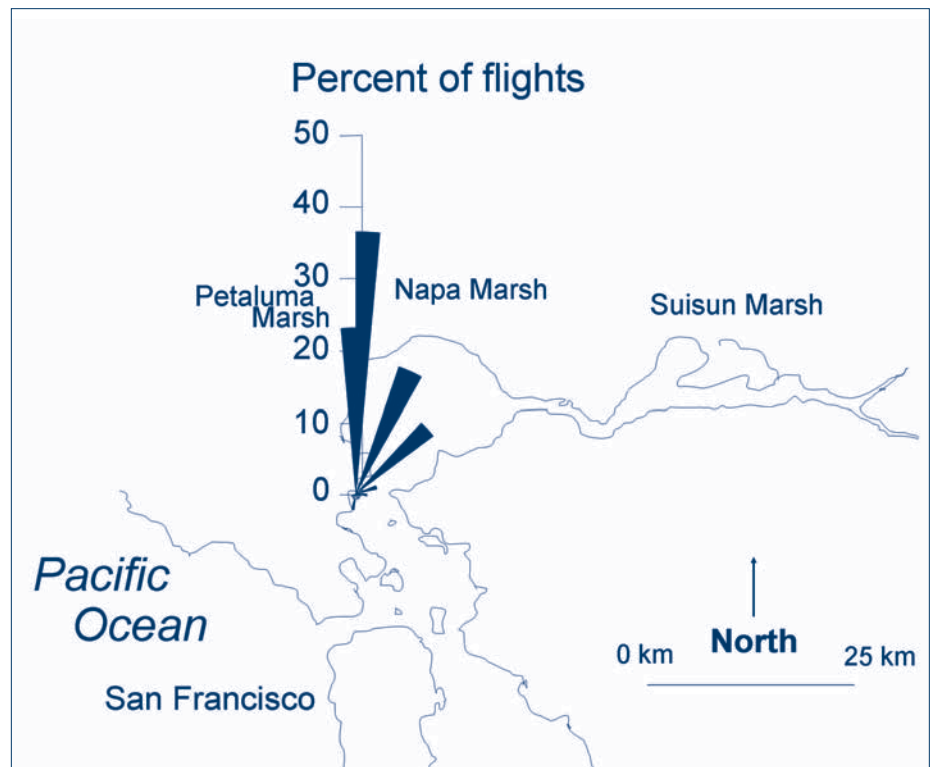


Figure 1. Percent of Great Egret arrival and departure flights (pooled) within 16 compass sectors during low tide (3.1–2.1 ft above MLLW) at West Marin Island in 2006. Most flights were oriented to the north, toward the Petaluma and Napa marshes and the western shoreline of San Pablo Bay.

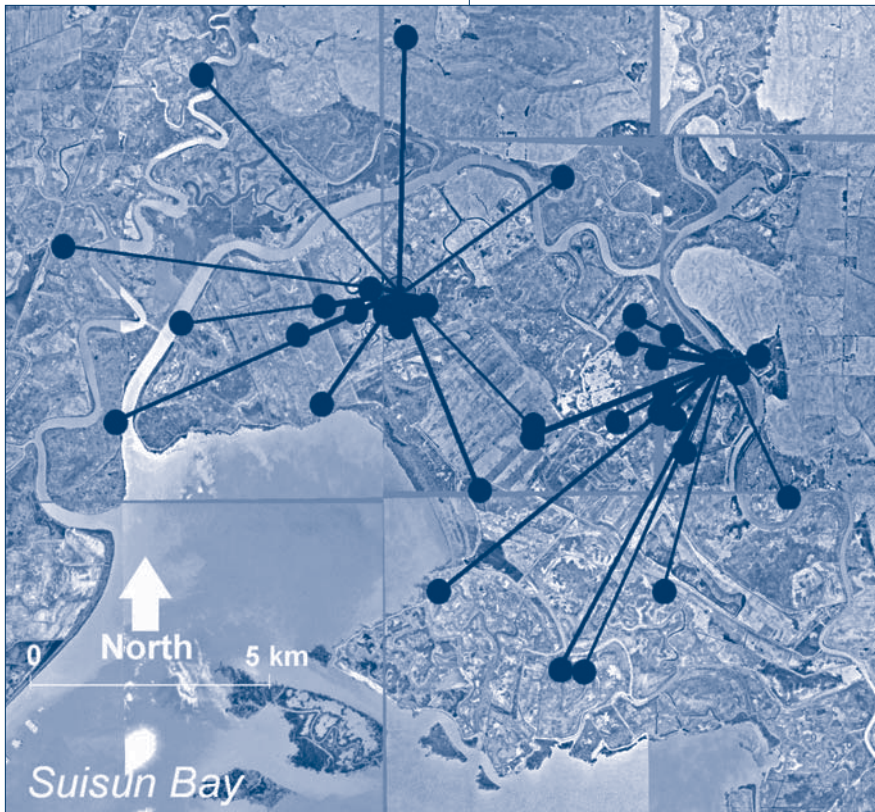


Figure 2. Great Egret foraging flight vectors from two nesting colonies in Suisun Marsh.

flight directions of departing and arriving birds, using panoramic photographs and maps to indicate compass directions from the center of a colony to numerous reference points in the field (Figure 1). But “bird watching” this isn’t. It’s more like air traffic control, except that the “pilots” (birds) maintain complete radio silence with the observers. Observers follow departing

birds as far as possible, and the bearings of arriving birds are recorded as soon as they are picked up, often 2–3 km out. It’s not unusual to track three or four or even six birds at once, coming and going in all directions. At a large colony site such as West Marin Island, near San Rafael, we can easily record over 180 flight lines per hour. For the sake of comparison, the tower at San Francisco In-

ternational Airport coordinates at most 120 takeoffs and landings per hour—with radar.

Flight lines provide an inexpensive way to determine the directions of preferred feeding areas, but they do not reveal distances or particular locations. A second method of evaluating foraging dispersion involves using aircraft to track the flights of individual birds (Figure 2). Following herons and egrets around with airplanes is intense, exhilarating, and expensive, but general patterns begin to emerge fairly quickly. Landscapes that are familiar from the ground take on a fantastical and disorienting aspect when viewed from an altitude of 300–350 m down the wing of a tightly circling Cessna. In Suisun Bay (Figure 2), verdant marshes extend out in all directions, forming a shimmering palette of greens and muted golds laced with meandering, mud-brown sloughs. The twin peaks of Mt. Diablo provide a conspicuous southern reference, and the eastern horizon is marked by the familiar lines of wind turbines along the Montezuma Hills.

It is difficult to coordinate the flight of a single-engine aircraft, throttled back to its minimum flyable threshold of perhaps 135 km per hour, to follow a foraging egret with an air speed of about 35 km per hour (Custer and Osborne 1978, Pennyquick 2001). Such work strongly depends on skilled pilots and copilots who volunteer their expertise and aircraft. Inside the cockpit, it is hot and noisy. Communication is possible only through headsets and hand signals. Sometimes the target bird gets lost in the glare or catches a thermal and rapidly spirals above the plane. But herons and egrets usually fly straight and low, as if following a plumb line to their foraging destination.

We followed one Great Egret as it flew from the Delta Pond colony in the Laguna de Santa Rosa, northward along the Russian River valley. We managed to stay with it for over 20 minutes as it flew with stately, unwavering precision past several apparently suitable marshes and ponds. The bird finally landed in a water treatment pond west of Healdsburg, over 15 km from its nest. Even determined observers find that concentrating, scanning, and circling over a traveling egret can be exhausting and even nauseating. After a long flight, they may feel as if they had done all the flapping themselves!

We use these “following flights” to build statistical models that predict the general pattern of flight distances from heronries. The flight distances we have observed are

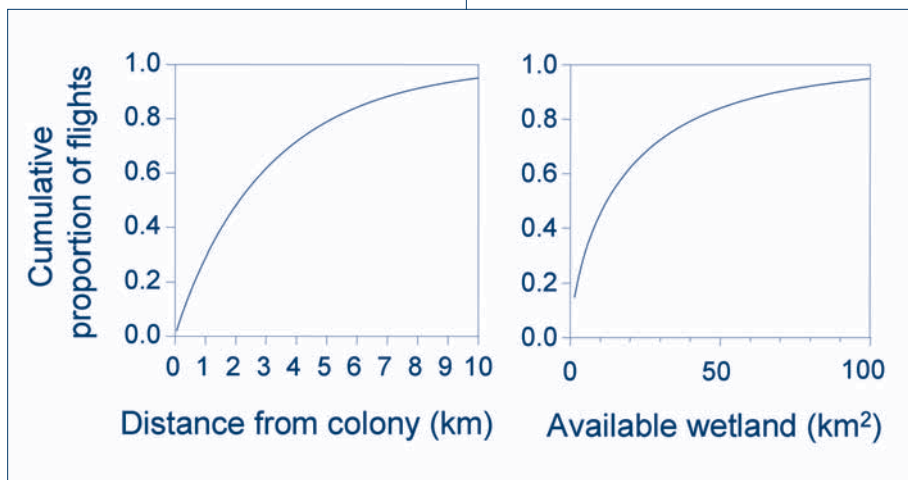


Figure 3. Estimated cumulative foraging dispersion of Great Egrets from heronries in Suisun Marsh, relative to (A) flight distance and (B) areal extent of estuarine and palustrine emergent wetland accessible within the flight radius (models based on 1000 bootstrap samples of 36 flights).

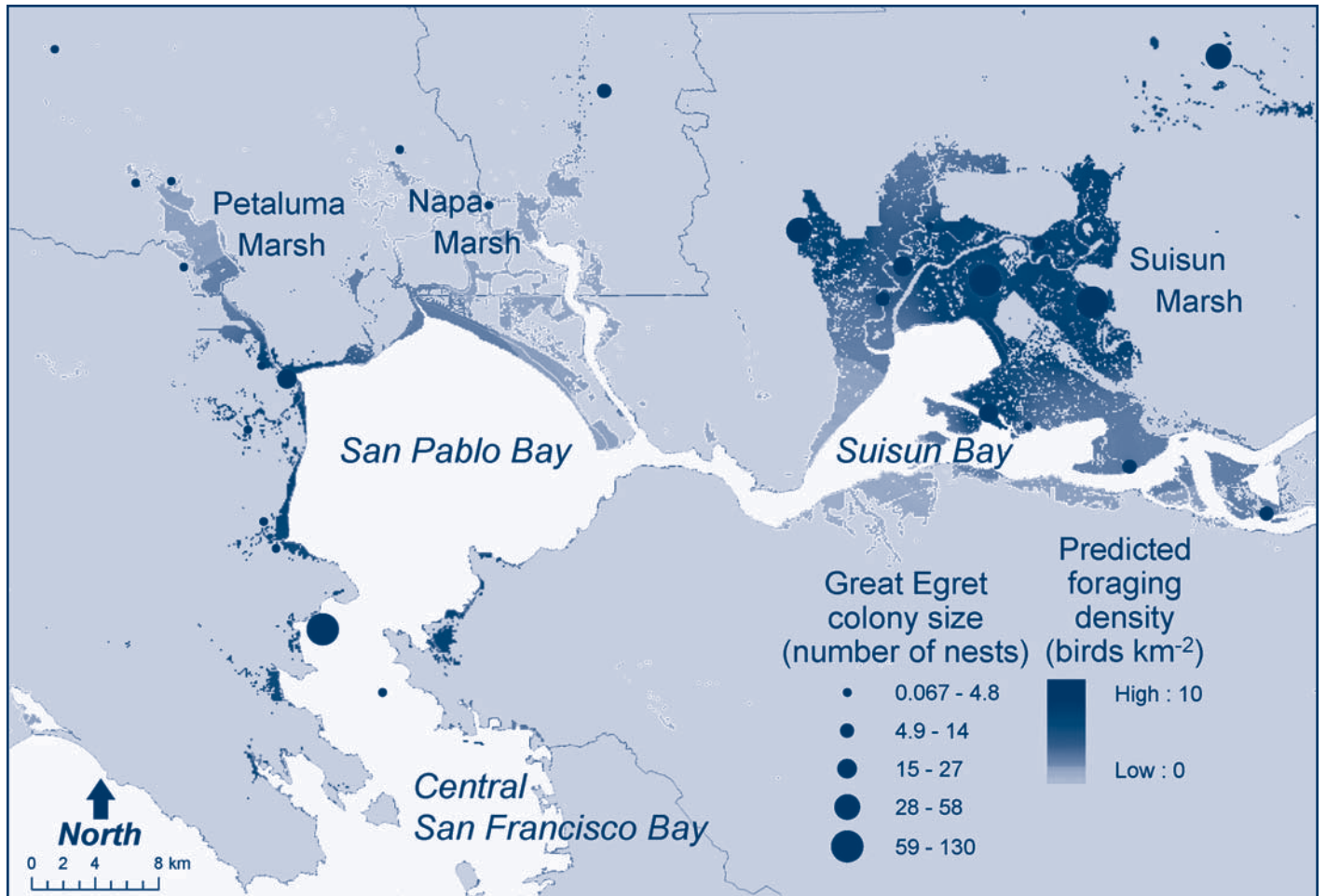


Figure 4. Predicted Great Egret foraging densities in estuarine and palustrine emergent wetlands in northern San Francisco Bay, based on average nesting distribution, 1991–2005, and foraging dispersion from heronries relative to the extent of wetlands accessible within flight distances.

similar to those exhibited by herons and egrets in other regions (Custer and Osborne 1978, Smith 1995, Custer and Galli 2002). We estimated that about 60% of the Great Egrets foraged within 3 km of the heronry or within a radius that encompassed approximately 20 km² of estuarine/palustrine emergent wetland (Figure 3). This information is then used to create maps that predict landscape foraging patterns (Figure 4). The patterns are calculated by summing, for each point on the map (100-m resolution), the number of birds expected to disperse from each colony site in the region (Kelly et al. 2006).

The predictive map for Great Egrets suggested that foraging densities were substantially concentrated near heronries, even when relatively fewer wetlands were available nearby (Figure 4). Based on these predictions, regional foraging densities should be highest in Suisun Marsh, the lower Petaluma Marsh, and along the western shoreline of San Pablo Bay southward to the northern

shoreline marshes of Central San Francisco Bay. However, information is lacking on the extent to which areas far from heronries might be subject to foraging by non-breeding individuals not limited by the need to return to nest sites. The map also suggests that the restoration of wetlands in northern San Pablo Bay may result in a limited increase in the number of foraging egrets, whereas restoration sites in Suisun Bay may be subject to more intensive egret predation.

Of course, many influences on foraging movements remain unknown, including the complex dynamics of prey availability and the mysterious habitat cues herons and egrets use to optimize foraging success. Nonetheless, predictions of foraging dispersion provide a basis for comparing levels of heron and egret predation between marshes and evaluating the extent to which nesting herons and egrets might be affected by changes in the wetland landscape. Ultimately, such information could be important in understanding how wetland restoration

projects are likely to influence—or be influenced by—the foraging activities of these wide-ranging predators.

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