## Phoning It In: A New Approach to Tracking Movement Patterns and Habitat Nuances of Diving Ducks

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Methods to evaluate habitat use and localized movements of diving ducks is complicated by concerns over adverse effects of externally-mounted tracking devices, thus limiting the spatial resolution of inference for these species. However, regional and sub-bay connectivity within the Bay-Delta system is presently undocumented, but represents a region of species-specific ecological needs occurring within a mosaic of habitats. The goal of this project was to test emerging technologies for evaluating wintering diving duck movements and habitat associations in the Bay-Delta region. During the winter 2015-2016, we deployed 14 solar-powered GPS-GSM backpack transmitters using custom molded silicone harnesses developed to facilitate transmitter attachment to diving ducks. Three species were marked in this pilot year: Canvasback (n=12), Greater Scaup (n=2), and Lesser Scaup (n=1). A total of 4,148 GPS-quality (<20m) locations were obtained from marked individuals between December 2015 and May 2016. Individuals utilized a full spectrum of habitats including shallow shoals, tidal marshes, managed marshes, and static deep-water ponds within the Bay sites and transitioned inland towards freshwater habitats during spring months. We describe general movement patterns and habitat nuances highlighted by this methodology, as well as study design considerations for broader applications of this marking scheme. Given looming threats of climate change and cyclical drought conditions the importance of describing key habitat features, spatio-temporal patterns of distribution, and landscape connectivity for these unique-niche species in this ecosystem is essential.

Keywords: Bay-Delta, distribution, diving ducks, GPS-GSM, estuary, tidal habitats, tracking

Poster Topic: Bird Biology, Ecology, & Protection

## Factors Influencing the Abundance of Wintering Western Snowy Plovers at Crown Beach State Memorial Park

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Many shorebird populations are declining worldwide. Survival during the nonbreeding season, when mortality from food shortages and raptor predation is likely highest, influences shorebird population growth. These selection pressures, as well as anthropogenic influences, can shape wintering shorebird habitat use patterns. The Western Snowy Plover (Charadrius alexandrinus nivosus) is a small shorebird that uses sand-spits, dune-backed beaches, open areas around estuaries and river mouth beaches for nesting and roosting. The Pacific Coast population of Western Snowy Plovers is listed as a federally threatened species and as a California Species of Special Concern. Previous studies suggest humans, dogs, crows, and other birds are the main sources of annoyance to plovers on public beaches. We observed Western Snowy Plover behavior and examined these disturbance factors at Crown Beach State Memorial Park in Alameda, California. For over three years, the majority of disturbances to plovers, in decreasing order of abundance are as follows: gull species, beach using public, crows/ravens, and dogs. Roughly 10% of the time, plovers responded negatively to hunting gulls by either flying away and not returning, or by running away along the beach and returning when gulls departed. Plovers showed negative response to hunting corvids nearly 40% of the time, and the most severe reactions to dogs at 78% of the time. Beach using public resulted in disturbance and avoidance behaviors by the plovers during 35% of the observations. In 2014, the District displayed passive signage encouraging beach users to "share the beach" by avoiding roosting Western Snowy Plovers. The following season the plover protection zone was formalized, by installing symbolic fencing, signage, and establishing the "Plover Protection Patrol" volunteer program to monitor plovers and educate the public. From 2014 to 2016, the wintering population of Western Snowy Plovers at this site has increased from six to over thirty individuals.

Keywords: Western Snowy Plover, Bird Conservation

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