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According to the US Census Bureau's July 2017 count, the human population of San Francisco reached a new high at 884,363. More humans in our seven square mile city equate to more density and more development. How is the growing human population of San Francisco affecting other species, in particular, the 183 species of birds that also call the city home? Which bird species are adapting and which are collapsing in the face of a surging population?

I asked local bird expert Dominik Mosur about the impact of San Francisco's growing population on bird species. Mosur has been observing birds in San Francisco for 17 years. He says, "If you take into account the economics of the world we live in, there's only a limited amount of space, water and resources. It's logical to think that when more people move to SF, and expand their footprint, there will be less room for other species. More people means more pets, like cats and dogs. More pesticides and rodenticides. More people means more activity that's not good for birds." He continues, "We live in a society that exists to create disruption. Birds need balance in order to acquire energy to nest and reproduce. Every living thing strives to survive and procreate. Birds in San Francisco are striving to do their best to achieve that."

The modern San Francisco that we know today looked very different hundreds of years ago. Native habitats have been replaced with buildings and concrete. Tall skyscrapers present giant roadblocks to migratory bird species. Construction and traffic noise have caused songbirds to sing at a higher pitch or volume. The shrubs and brush that once provided bird habitat are long gone. The planting of non-native trees altered native bird habitat. Mosur explains, "Large portions of the land where we live formerly had no trees. The attempt to create an urban forest destroyed native bird habitat. The birds who lived here for thousands of years lived in chaparral, grassland or marsh."

Now, brush and shrub habitats, as well as wetlands, that were found in San Francisco before human development are relegated to restoration projects, which Mosur believes have a "minimal effect" on bringing back bird populations. "90% of San Francisco Bay wetlands have been destroyed or degraded. In San Francisco, there are only three wetland restorations (Candlestick, Pier 94 and Heron's Head), totaling about 100 acres, compared to formerly about 5,000 acres of wetland. These restored wetlands are so small and isolated that the effect on migratory birds in San Francisco is negligible." Mosur points out that a few bird species have tried to use these wetlands to nest, but they are prone to fail. These species include the Savannah Sparrow, Clapper Rail and American Avocet. These birds are drawn to the wetlands, and invest energy to nest there, but rarely ever succeed.

Some species have succeeded at building habitat in the non-native urban forest in San Francisco. For example, the eucalyptus trees found in abundance on the west side of the city have created habitat for many raptors, such as Red Tailed Hawks, as well as crows and ravens. The eucalyptus blooms during the winter, so their nectar provides a food source for many birds during those months. Small birds like the Pygmy Nuthatch, Chestnut-backed Chickadee and Western Bluebird have sometimes used eucalyptus cavities for their nests, but they prefer cavities in Live Oaks or Monterey Cypress and Monterey Pine.

According to Mosur, bird species that are most affected by human population growth are those that nest directly on the ground. For example, the California Quail, the official bird of San Francisco, was once plentiful and a major food source for the Ohlone people who lived here before European settlement. Numbered in the dozens just a few years ago, today, sadly, there is only one solitary male, named Ishi, still surviving in San Francisco's Botanical Garden. Due to the loss of its native brush habitats, the quail population in the city has taken a nosedive and efforts to repopulate them have been fruitless. The feral cat population in San Francisco is also largely to blame for the decline in city quail. Mosur is not hopeful that quail will survive in San Francisco. Without a female, there's no chance for Ishi to reproduce. Despite healthy populations of quail to the north and south, Mosur says, "[The quail] will become extinct in San Francisco. They cannot fly over the Golden Gate Bridge. They will not run across it. They will not come back to SF and repopulate."

Not all bird species are in decline in San Francisco. Mosur explains that birds that fall into the category of "generalist" tend to do well. Generalists eat a wide variety of foods, and can nest on top of buildings or in freeway overpasses. They fare better than birds that rely on contiguous woodlands or chaparral. For example, the crow and raven (in the Corvid family) are doing much better in San Francisco than they did 40 years ago. So is the Peregrine Falcon, due to the decreased use of pesticides and their penchant for nesting on top of skyscrapers.

Another species that is thriving is the flock of wild parrots, once famous on San Francisco's Telegraph Hill, now almost ubiquitous around the entire city. Mosur commends the parrots' ability survive. "Their numbers, range and distribution have increased. They can be seen more often and in more places than they were ten years ago." Mosur calls the parrots a "charismatic species." He hopes that the parrots will spark an interest in bird watching in San Francisco. Mosur thinks that the parrot could find a new role to play in San Francisco culture: to be an ambassador for education. "Now that the quail is going extinct in San Francisco, the parrot could become the new city bird. It could spur people into action."

Already, volunteer efforts have rallied to rescue and rehabilitate injured parrots and release them back into the urban wild. The wild parrot population in San

Francisco is currently estimated at 300 individuals. Unfortunately, the same grassroots conservation efforts have not been granted to the California Quail, but perhaps a rigorous education effort could reignite an interest in the official city and state bird, and help the sensitive quail to one day repopulate in San Francisco.

Despite resurgences for generalist species and those with help from humans, overall, bird biodiversity in San Francisco is in decline. Fewer migratory birds choose to nest in San Francisco on their journeys from Mexico, Central and South America. Mosur has noticed a decline in migratory species sightings of Warbling Vireo, Olive-studded Flycatcher and Yellow Warbler. According to Mosur, the migratory birds spend too much energy trying to create a breeding area, but are unable to reproduce successfully in the region. Many of these species have not attempted to nest since the 1990s.

Mosur remains optimistic for the biodiversity among bird species to flourish. Recently, the Great-horned Owls nesting and raising owlets in Golden Gate Park have provided a glimmer of hope. "The people who go look at [the owls] have big cameras and are trying to get a great image. But they're also drawing in people who aren't interested in birds." Perhaps a renewed passion for bird watching among San Franciscans could spark increased commitment to bird conservation efforts. Mosur concludes, "When young people become interested in birds at a deeper level, they may want to study birds, and the problems that people are causing for their survival. What we are doing to birds, we're doing to other living things, and to ourselves."

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