Kent Butler Groundwater Essay

Impact of Distance from Water on Cardinals in St. Edwards Park

For one of my classes in high school I was tasked with a project that required cataloging specific biodiversity in parks. We were given the freedom of picking an organism and tracking characteristics about them, so I conducted a study with a purpose of estimating how distance from water affected the population of Northern Cardinals in St. Edwards Park, a park located in Northwest Austin along the Bull Creek greenbelt. I visited the park and went along trail transects for a few months, and through this experience I learned so much about the impact that health of the Northern Edwards Aquifer has on Bull Creek and how other site factors such as proximity to urban or industrial areas, human impact on the area, and topography play a huge role in the abundance of wildlife in parks.

I started out with a hypothesis that there would be more birds living closer to water than there were farther away. This was because birds need water to survive, and there should be more abundance of them near their water source for easier access. In terms of St. Edwarks Park, it had a minimum elevation of 204.36 m and a maximum elevation of 262.32 m ("Topographic…"). The park was overall flat and field-like, but it had areas with dramatic area changes. These areas mostly occurred as Bull Creek approached, as if they were eroded away.

There are a number of factors that affect the abundance of birds in parks, so I wanted to see what other people were saying regarding some of those factors. There was a study conducted in the Connecticut Valley region of Massachusetts studying the relationships of breeding bird density and diversity to habitat variables in forested wetlands. The research was conducted in eight deciduous forested wetlands, each 30 ha or larger, and study areas were selected to provide

a wide range of vegetation structure, hydrologic patterns, and geographic location. Singing male birds were counted on 10 circular 0.25-ha plots in each study area. The bird populations of a total of 46 species were then observed, with estimated densities being calculated. The results suggest that breeding bird communities in forested wetlands are significantly related to hydrology. Generally, the more poorly drained sites appeared to have the most abundant and diverse breeding bird populations (Mills). This shows that the density of avian birds was higher near the water sites as compared to birds farther away from water.

There was another study cataloguing four separate studies conducted at 31 sites that were concerning the strong correlation between bird density and the index of total vegetation volume. The studies were conducted in southwestern shrub and desert habitats between 1974 and 1987. The studies were conducted based on an underlying assumption of theoretical models of avian community structure generated in the 1960s that said that the number and diversity of birds in an area reflect the availability of critical resources (Swift). The study results show that there were high avian breeding densities in Southwest Riparian habitats, showing that higher density of birds are found in wetter habitats.

Something that I had not considered before was that there was likely a huge impact on bird density from human activity. There was a study conducted at a Santa Barbara beach, where there were a hundred birds, eighteen people, and two dogs per kilometer. There were several variables being tested, including human activity. Bird distributions along the beach were determined by habitat type, and there was an observational study conducted where the behavior of the birds were observed. The study showed that interactions between birds and people often caused birds to move or fly away, particularly when people were within 20 m. Bird species

varied in the frequency that they were disturbed, partially because a few bird species foraged on the upper beach where contact with people was less frequent. For crows, there was some evidence that access to urban refuse increased abundance (Lafferty). This highlights an error in the study, where higher amounts of human activity at the transects could have decreased the amount of cardinals detected.

The results show that there is a higher population density near water (4.56 cardinals/ha) than there is far from water (2.96 cardinals/ha), which is nearly 1.6 cardinals/ha higher and significantly different. This difference proves that there are factors such as distance from water that impact population density. Through various statistical analyses I was also able to prove that the differences in the amount of human activity, coefficient of detectability, and full detection strips between both my near water and far from water transects were not significantly different, respectively. It showed that the variables in both the transects, which are supposed to be the same to have more accurate results, are close to the same.

Although the study showed significant results, it had some problems and some modifications that need to be made in future pursuits. I had far from water and near water transects, but they were on the same days each time. The first transect far from water was completed in early October (the 9th), while the first close to water transect was completed late October (the 21st). Because of this, several things were different, including the weather and the conditions. The public also had access to the park, interfering with the seemingly uninterrupted transect, meaning that more human activity could have scared away the birds and decreased the number of them. I also noted that some of the days I went to plot transects, the dirt had much more moisture, as it had rained before. Though initially insignificant, I realized that because the

red cardinals' diet consists of fresh berries and insects, those would be more abundant near the creek, making the birds travel closer to the water.

A study about elevation for cardinals would add insights to the data. This is because at the park, the transect at the lower elevation was the close to water transect, which had significantly more birds. Once the factor of the creek is removed, it'd be interesting to see if the birds were still more plentiful at the lower elevation.

Ultimately, this project sparked a huge interest in me to continue learning about the relationship between species and their access to water supply. It also prompted me to attend a lecture at Brackenridge Field Lab on speciation and hybridization by ecologist Adrius Dagilis to continue to learn about evolution and ecology. I hope to continue studying about and raising awareness on the impacts of groundwater on biodiversity.

Bibliography

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