Nesting and reproductive success and brown-headed cowbird parasitism of the red-winged blackbird in correlation with its environment: roadside ditches vs. wetlands

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Abstract

With an increase in wetland restoration studies, analyzing the reaction and success of the species in response to the reconstructed wetland can be very valuable when planning for further restoration. Some wetland birds, such as the red-winged blackbird, nest in both natural habitats, (wetlands), or anthropogenic habitats, (roadside ditches). My research was conducted to determine whether the red-winged blackbirds saw a higher nest success rate in the reconstructed wetlands over the anthropogenic linear habitats. Factors that altered between nests (plant height, percent cover, water depth, etc.) were measured. The data was analyzed using the program MARK but only the average water depth was found to have a significant relationship with the success rate. There was no significant difference between the success rate of the nest in the linear habitats and the wetlands habitats, though this could be due to a low sample size. Further research is necessary to verify the results found.

Introduction

In the United States more than half of wetlands have been lost in the last two centuries (Tiner, 1984, National Research Council, 1992). To try and help restore the biodiversity lost with the destruction of these natural wetlands, artificial wetlands are constructed as replacement habitat (Tourenq et al. 2001). Most studies done comparing artificial wetlands against natural wetlands have concluded that the artificial wetland provides suitable habitat for wintering, migrating, and even breeding periods, (Zhijun, 2004). Yet, what if the species has established populations in anthropogenic habitats, such as roadside ditches, after the origninal wetlands were destroyed? If an artificial wetland was constructed would the population within that wetland see higher reproductive success than populations that remain in the other anthropogenic habitats? The different habitats would offer varying conditions of food and shelter availability, parisitism rates, and predation risk. Predation is a large factor on regulating the success of populations (Martin 1995).

The red-winged blackbird (*Agelaius phoeniceus*) is a very common and well-studied species in North America, and breed in habitats that are either natural (wetlands, native grasslands) or anthropogenic (roadside ditches) (Vierling, 2000). Even though red-winged blackbirds are declining in Montana (USGS), their numbers are still significant enough to gauge the relative success of populations in the artificial wetlands versus the anthropogenic linear habitats. Any results found might be insight on how other birds of conservation concern, nesting in the same area, will potentially experience the same predation risk or parasitism rates.

The nests of the red-winged blackbird are also often parasitized by the brown-headed cowbird, *Molothrus ater*. The brown-headed cowbird is a brood parasite that locates nests of other birds and lays their eggs among the host eggs. When the cowbird egg hatches it is raised by the non-cowbird host parents, and, being more aggressive, the cowbird hatchlings can outcompete the host hatchlings for food. Even though the cow-bird hatchling is a burden on the nest, the red-winged blackbird adults are still able to fledge one or two of their own young in addition to the cowbird.

The brown-headed cowbird is thought to cue on visually to poorly hidden host nests or onto conspicuous behavior of the adult host suggesting their nest is nearby (Clotfelter, 1998). The different vegetation types found in artificial wetlands versus roadside ditches may see a disproportianlity in parisitism rates between the two habitat types. Whether the cowbird has a preference over different habitats is not known (Norman, 1975).

Objectives

I conducted research on red-winged blackbirds, comparing the reproductive success of the red-winged blackbirds that nested in linear habitats, such as roadside ditches and canals, and those that nested in the reconstructed wetlands.

The main questions I addressed were 1) is there a correlation between nest location and reproductive success of the red-winged black bird (*Agelaius phoeniceus*) in linear habitats versus wetlands? 2) Does this location difference have an effect on brown-headed cowbird parasitism rates? 3) Does the difference in habitat quality (e.g. water level and vegetative cover) influence the reproductive success and parasitism rates of red-winged blackbird nests?

The predicted results were that the reproductive success of the red-winged blackbird in the wetlands (which is assumed to be a more desirable habitat) would be significantly higher than that of the red-winged blackbirds in the linear habitats. The linear habitat would allow easier access to the nest by predators. The taller and denser vegetation in the wetland would hide the red-winged black bird nests more effectively from brown-headed cowbirds, thus leading to a lower rate of parasitism than the linear habitat with it's lower plant density.

If the brown-headed cowbirds show preference for the wetland nests this could be due to: (1) they are consciously choosing the better habitat to lay their eggs, (2) the nests may not be significantly better hidden, or (3) the higher density of red-winged blackbirds in wetland habitats attract the cowbirds.

Materials and Methods

Study Area

I worked in wetlands and roadside ditches in the CSKT Tribal Trust Lands, MT-FWP Wildlife Management Areas, and USFWS Waterfowl Production Areas. My chosen locations were Herak WPA, Montgomary WPA, Sandsmark WPA, Leon, Johnson WPA, a tribal trust wetland on Herak Rd and Post Creek Rd., and along the railroad tracks. I tried to match pairs of restored wetlands with adjacent road ditches to maintain similar conditions, though conditions did not always permit this. The possible varying conditions between the wetlands were measured, such as insect abundance, water levels, vegetation type, vegetation height, nest height, percent cover, and distance from shore.

Reproductive Success

Within the In the National Bison Range NWR, CSKT Tribal Trust Lands, MT-FWP Wildlife Management Areas, and USFWS Waterfowl Production Areas, I located and monitored nesting sites of the red-winged blackbird in both restored wetlands, roadside ditches, and other such linear habitats. I noted the clutch count and hatchling survival to determine the reproductive success of each location. Each nest was flagged 6 m away from the nest to avoid possible predation threats. I monitored the nests every third day, and the nest were considered successful if it fledges at least one red-winged blackbird nestling. The

presence or absence of any brown-headed cowbird parasitism was noted, including the number of cowbird eggs found in each nest. Abandonment of a nest due to cowbird parasitism was not seen, but this could have been due to low sample size (Capper et al., 2012).

The MARK program was used to determine reproductive success. Eggshell fragments, poop sacs on the rim of the nest, and body fragments were indicators of a successful fledging or not.

Invertebrate Count

I used a sweep net to collect samples of the insect diversity, identifying them into rough categories: beetles, grasshoppers, butterflies/dragonflies, spiders, and misc. This was done three times for 10meter transects around the ditches and wetlands to gauge the food availability for the birds. Due to the close proximity of the linear habitats to the wetlands, it is assumed that both the linear-nesting and wetland-nesting red-winged blackbirds have access to the same sources of food, and any primary difference may be due to different site locations.

Plant Composition

In a study conducted by Donald F. Caccamise, in 1977, nesting success of red-winged blackbirds was monitored in different plant species to see if the birds 1) had a preference for certain species and 2) had higher reproductive success in one species than another. The study concluded that there was no difference in the reproductive success between different plant species of similar height and density. This indicated that the vegetation height and density are more important the species composition. A Robel Pole measurement could have been used in fields surrounding the wetland and road ditches, but it would not have been very effective within the habitats themselves (in the wetland or inside the ditch). I instead try to get an idea of the vegetation chosen by the birds by noting what species their nest was build in. The plant species were placed into loose categories (reeds, bulrush, grass, etc.) in case the different plant species do prove to affect the nest success. The percent vegetation cover over the nest, indicating how well it is hidden from predators, was determined by using the Daubenmire frame placed over the nest. Height

measurements were also taken: total height of the plant, the depth of water, and the height of the nest above the water level.

Results

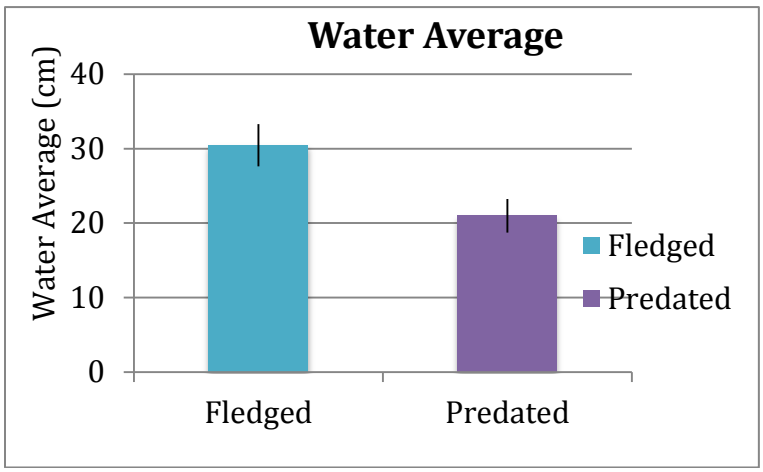
The red-winged blackbirds numbers were not as high as predicted and the sample size was not as large as desired specifically for nests in linear habitat (29 nests, 9 in linear habitat, 20 in wetlands). There was also only one nest found that was parasitized, so a brown-headed cowbird study was not possible with a sample of one. The data collected was run through program MARK to determine the success rate of the nests in relation to: 1) its location (ditch or wetland) 2) the water level beneath the nest 3) height of the nest 4) height of the plant 5) the type of vegetation the nest was in 6) the percent cover over the nest and 7) the distance from the shore.

	AICc	Delta AICc	AICc Weight	Model Likelihood	No. Par.	Deviance
WaterAv	71.408	0	0.37505	1	2	67.3637
Water2	71.6226	0.2146	0.33689	0.8983	2	67.5783
Distance	74.4602	3.0522	0.08153	0.2174	2	70.4159
%Cover	74.8348	3.4268	0.0676	0.1802	2	70.7905
Constant	74.9699	3.5619	1	1	1	72.9551
Vegetation	74.9961	3.5881	1	1	2	70.9518
PlantHeight	75.1105	3.7025	0.0589	0.157	2	71.0662
NestHeight	75.7421	4.3341	0.04295	0.1145	2	71.6978
DitchvsWetland	75.7531	4.3451	1	1	2	71.7083
Water1	76.0361	4.6281	0.03708	0.0989	2	71.9918
Sites	79.7789	8.3709	1	1	5	69.555

Table 1: The survival rate was calculated in MARK and compared to the listed variables to determine the most pertinent model.

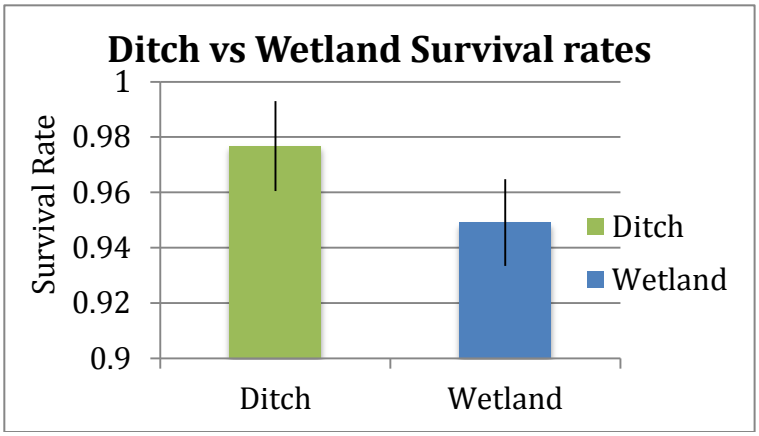
The water average of the nests when compared to the survival rate appears to be the most pertinent model because it has the lowest AICc number. The Delta AICc values indicate which relationships are significant (**Figure 1**). The only two variables that showed a significant relationship were the water average (WtrAv) and water 2. That indicates that the only variable that was in correlation with the survival rate was the depth of water beneath the nest.

The water level seen beneath the successful nests was on average higher than the predated nests (**Graph 1**). This suggests that the higher water level could lead to an increased success rate, also supported by the values produced from the MARK test (**Table 1**).



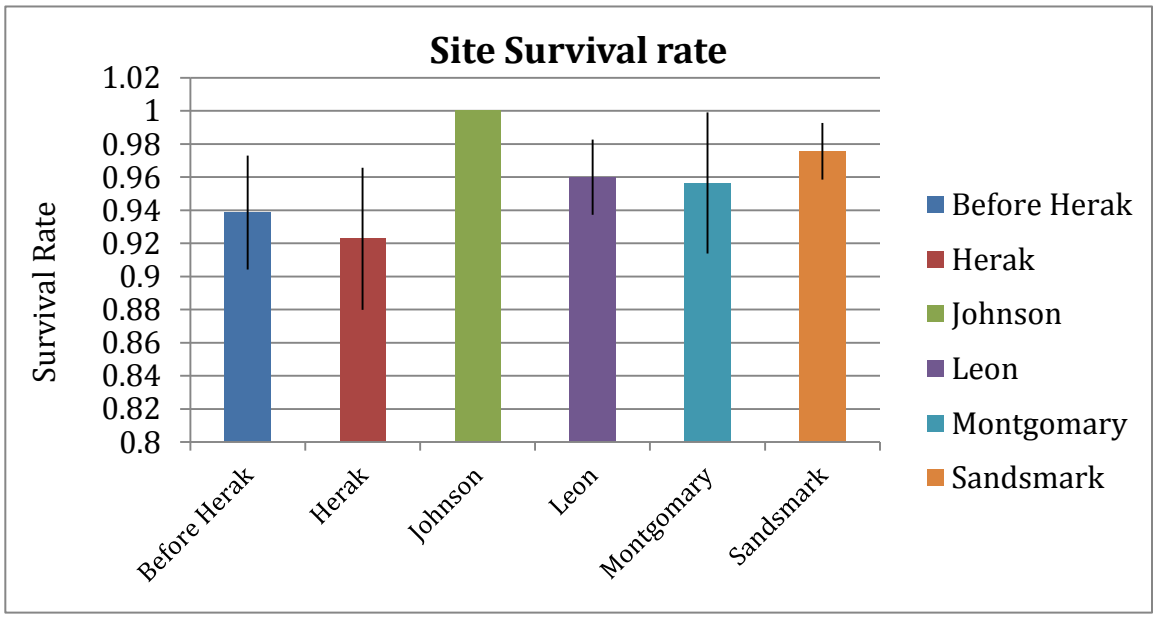
Graph 1: The error bars indicate that there is a significant difference between the water average of the fledged and predated nests, the fledged being, on average, 10cm higher.

Contrary to the predicted results, no difference was seen between the success rate of the nests in linear habitats and those in the wetlands (**Graph 2**). This could have been due to a low sample size.



Graph 2: The error bars are overlapping indicating that there is no significant difference between the success rate of the ditch and wetland nests.

As indicated by the MARK test, there was no significant difference seen between the success rates of each of the sites (**Graph 3**). The 100% success rate seen at the Johnson site is due to there being only 2 nests at that location, so it is not a relative representation within the study and is just ignored.

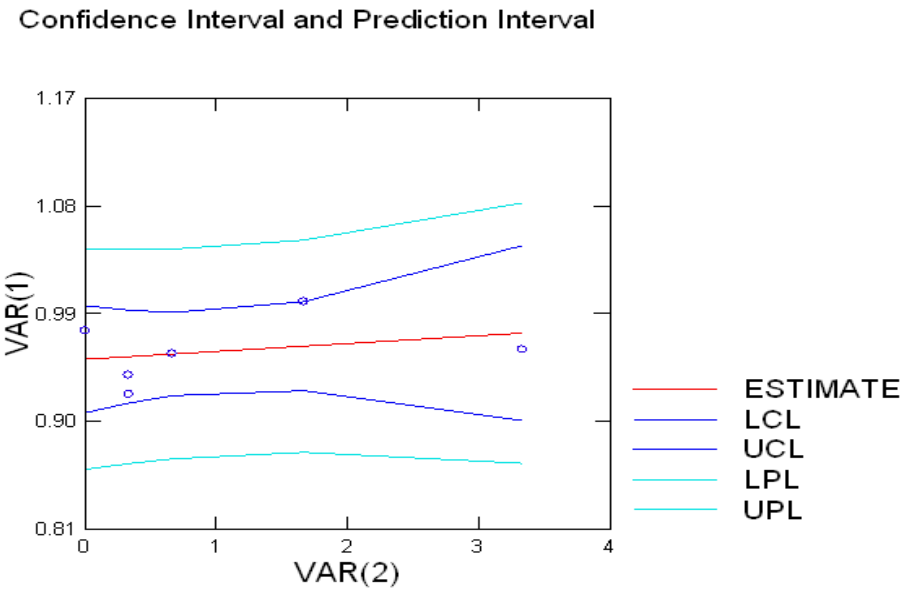


Graph 3: There was no difference between survival rates of the nest matched with their site locations, indicated by the overlapping error bars.

A linear regression was run on the insect data collected, focusing on spiders. Spiders were chosen because they are soft bodied and of a reasonable size and are thus often fed to nestlings (Martin, 1995). The number of spiders at each site was compared to the

corresponding success rate to see if there was a significant relationship. The received p-value of 0.560 indicates that there is not a significant trend between the data.

P-Value= 0.560
R^2 Value= 0.092
Standard Error of Estimate= 0.029



Graph 4: The p-value indicates that there is not a significant relationship between the survival rates and the spider numbers at the corresponding sites.

Discussion

The results found through MARK indicate that the only significant relationship within the data was an increased success rate with an increased water level. There was no significant relationship found between the success rate of nests and their location (linear habitat vs. wetland), their site, percent cover, distance from the shore, height of the plant, or height of the nest. These results could have been skewed due to the low sample size, specifically with the low number of nests found in ditch/linear habitats. The insect data is also a possible source of error, because the sample size was very low and the transects were done after all the nests were fledged or some wetlands were grazed by cattle. This was due to time constraints, but could have altered the outcome of the data. Only insect numbers were taken into account, biomass would have been a better indicator of the food

availability. The year also had very low grasshopper numbers, which could have had a possible effect on nest success.

There are multiple possible active variables that could have affected the data as well. A possible variable is the close proximity of nests in wetlands. This might draw predators more than the more spaced out linear nests, thus increasing the likelihood of predation. The increased predation of the wetland nests could have a negative effect equal to that of the ditch nests being in a linear habitat leading to easier access. The combination of these two factors could account for the relatively even success rates seen between the two habitat types.

In regards to the very low parasitism rate, this could also be accounted for by the low sample size of nests in linear habitats. It was assumed that because brown-headed cowbirds like perching sites such as fencing or telephone wires, both of these found much more frequently next to linear habitats, this would increase the likelihood of parasitism. Yet, the small sample size could not have accurately depicted the parasitism situation.

For future studies it would be mandatory to try to have a larger sample size for both groups (linear habitat and wetland), going farther to find nests if necessary. A more thorough study of the water and reproductive success relationship would help determine the level of interconnectedness between the two factors. A multiple year data collection would also provide a clearer representation of the nesting conditions. Other years may show different results due to varying annual conditions than the first year. The insect analysis needs to be biomass based and performed before the nestlings fledge to create a more accurate map of food availability. Emergence traps also need to be utilized, though they would have to be reasonably small to fit in the linear habitats as well as in the wetlands.

The results seen from this experiment, though not very extensive, could aid in wetland restoration. If a higher success rate is seen with deeper water, perhaps a few larger wetlands, which would be assumed to be deeper, would be more valuable than a larger number of smaller wetlands. With further research the importance of this factor can be determined and then applied in restoration efforts.

Work Cited

Caccamise, DF. (1977). “Breeding success and nest site characteristics of red-winged blackbird.” *The Wilson bulletin* 89.3: 396-403.

Capper, G-L, Guigueno, M.E., and Sealy, S.G. (2012). “Acceptance of Simulated Cowbird Parasitism in a Northern Population of Red-Winged Blackbirds.” *American Midland Naturalist* 167:127-135.

Clotfelter, E.D. (1998). "What cues do brown-headed cowbirds use to locate red-winged blackbird host nests?." *Animal behaviour* 55.5: 1181-1189.

Martin, T. E. (1995). “Avian life history evolution in relation to nest sites, nest predation, and food.” *Ecological Monographs* 65:101–127.

National Research Council (1992). *Restoration of Aquatif Ecosystems: Science, Technology, and Public Policy*. National Academy Press, Washington, DC.

Norman, R.F. and R.J. Robertson (1975). “Nest-searching behavior in brown-headed cowbird.” *The Auk*, 92.3: 610-611.

Robel, R.J., Briggs, J.N., Dayton, A.D., and Hulbert, L.C. (1970). “Relationship between visual obstruction measurements and weight of grassland vegetation.” *Journal of Range Management* 23:295-297.

Tiner, R.W. (1984) *Wetlands of the United States: Current Status and Recent Trends*. US Fish and Wildlife Service, Washington, DC.

Tourenq, C, et al. (2001). "Are ricefields a good alternative to natural marshes for waterbird communities in the Camargue, southern France?." *Biological conservation* 100.3: 335-343.

USGS, North American Breeding Bird Survey Species Group Summary Results. Wetland Breeding species 1966-2010. <http://www.mbr-pwrc.usgs.gov/cgi-bin/guild10.pl>

Vierling, K.T. (2000). “Source and sink habitats of red-winged blackbirds in a rural/suburban landscape.” *Ecological Applications*, 10(4): 1211–1218

Zhijun, Ma, Bo Li, Bin Zhao, Kai Jing, Shimin Tang, and Jiakuan Chen. (2004). "Are artificial wetlands good alternatives to natural wetlands for waterbirds? A case study on Chongming Island, China." *Biodiversity and conservation* 13.2:333-350.