

NEST BOX SELECTION BY MOUNTAIN BLUEBIRDS BASED ON SURROUNDING HABITAT

INTRODUCTION

The Mountain Bluebird (MOBL), *Sialia currucoides*, is a cavity-nesting passerine (Koch 2012) native to northwestern North America. Once a common sight, the Mountain Bluebird now appears to be in decline across the continent. Little information is available specific to MOBL conservation and preservation. While the reasons for the species' apparent decline are largely unknown, speculation exists surrounding the cause or causes. Sympatric competition may exist with other MOBL, or asympatric competition with other species. The Tree Swallow (TRES), *Tachycineta bicolor*, appears to be taking over nest boxes once inhabited by MOBL. Alternatively, or additionally, MOBL decline may be the result of decline of their preferred habitat and food source (Koch 2012).

Hundreds of boxes have been put up on MOBL grids in areas near the Beaverhill Bird Observatory (BBO), but none have been extensively monitored. This study uses quantitative and qualitative data collected from these nest box grids to attempt to determine the habitats surrounding nest boxes that are preferred by MOBL. It was predicted that MOBL would prefer to nest in boxes surrounded by agricultural-type lands. The statistical null hypothesis predicted that there would be no habitat preference made by MOBL.

MATERIALS AND METHODS

Six different MOBL nest box grids were established decades ago by the Beaverhill Bird Observatory: West Elk Island, North Elk Island, East Elk Island, East Elk Island South of Highway 16, South Beaverhill, and East Fort Saskatchewan. As none of these MOBL grids have been monitored in over ten years, extensive surveying of the boxes on the grid was required. Surveying nest box grids included checking bird box condition to determine whether each box needed to be replaced, repaired, or cleaned. New boxes were also inserted along the grid, either where old boxes were missing, or where there was a large distance between two consecutive

boxes. Nest boxes were built with a removable, forward-slanted roof held on by a wire twisted around a screw on each sidewall. While still habitable by tree swallows, nest boxes with these dimensions were found by the BBO to be the most heavily selected by MOBL (Figure 1). Some areas of old grids were also exempt if they were too difficult to reach, or if unwelcoming property owners or threatening dogs were present at the location. Once the surveying was complete, a new numbering system was implemented to replace the original, disorganized system. GPS data points of each box were recorded for easier location of each box.

A total of 292 boxes were monitored weekly starting in mid May. Some boxes required replacement upon surveying but could not be replaced until the chicks fledged. Data recorded while monitoring the boxes included whether a nest was present, stage of completeness of the nest, species of the inhabitant, number and relative temperature of eggs, number of chicks, and a qualitative description of the habitat to the immediate north, south, east, and west of each box. To quantify the qualitative data, the north, south, east, and west faces of each box was assigned a quantitative value of 25%, or one-quarter of the surrounding habitat. Unpaired T-tests were used to compare the number of MOBL nests to nests built by species other than MOBL based on surrounding habitat.

RESULTS

Six different habitat classes were observed: agricultural land, defined as crop or animal field, whether in use or not and with or without sparse tree cover (*i.e.*, no obvious clusters of trees); pond or body of water; muskeg or swamp; industrial land; road, defined as a paved road of at least two lanes wide; and trees, defined as clusters of trees larger than approximately 10 trees in the immediate vicinity of the box. An immediate pattern was noticed such that MOBL nests almost always occurred in boxes in which at least two sides faced agricultural land. Data was consequently organized into two main habitat types: those boxes surrounded by at least 50% agricultural land and those surrounded by less than 50% agricultural land. The only species observed nesting in the boxes were MOBL, TRES, and House Wrens (HOWR), *Troglodytes aedon*.

In every grid except the Fort Saskatchewan grid, there were significantly more MOBL nests in boxes surrounded by at least 50% agricultural land than in those surrounded by less than 50% agricultural land (Figure 2), with $P = 0.0050$ ($P < 0.05$, $n = 6$). The combined total of HOWR and TRES nests in boxes surrounded by 50% agricultural land was significantly higher than the total number of MOBL nests built in boxes in similar habitats in all grids (Figure 3), with $P = 0.0004$ ($P < 0.05$, $n = 6$). Similarly, in boxes surrounded by less than 50% agricultural land, the combined number of TRES and HOWR nests significantly outnumber MOBL nests (Figure 4), with $P = 0.0269$ ($P < 0.05$, $n = 6$).

DISCUSSION

The data presented in Figure 2 by the comparison of the number of MOBL in boxes surrounded by at least 50% agricultural land with those surrounded by less than 50% agricultural land strongly indicate that MOBL show preference for boxes surrounded by agricultural land on at least two of their four faces. Only the Fort Saskatchewan grid indicated no significant difference in this habitat-based nest box selection. The Fort Saskatchewan grid is in the vicinity of numerous industrial sites of varying nature, and this postulated to be the cause of this lack of difference.

A comparison of the number of boxes nested by MOBL and those nested by other species, in both habitats of least 50% agricultural land and those with less (Figures 3 and 4), show that MOBL are hugely outnumbered by other species. Even in habitats preferred by MOBL – *i.e.*, boxes surrounded by at least 50% agricultural land – there are a far greater number of birds of other species than MOBL. MOBL, which once heavily populated these grids, now represent a total of less than 9% of the grids' inhabitants.

Further studies must be done to determine the cause of this decline in MOBL population. While it is apparent from this study that other species, such as HOWR and TRES, are taking over the nesting habitats of MOBL, it is unclear why.

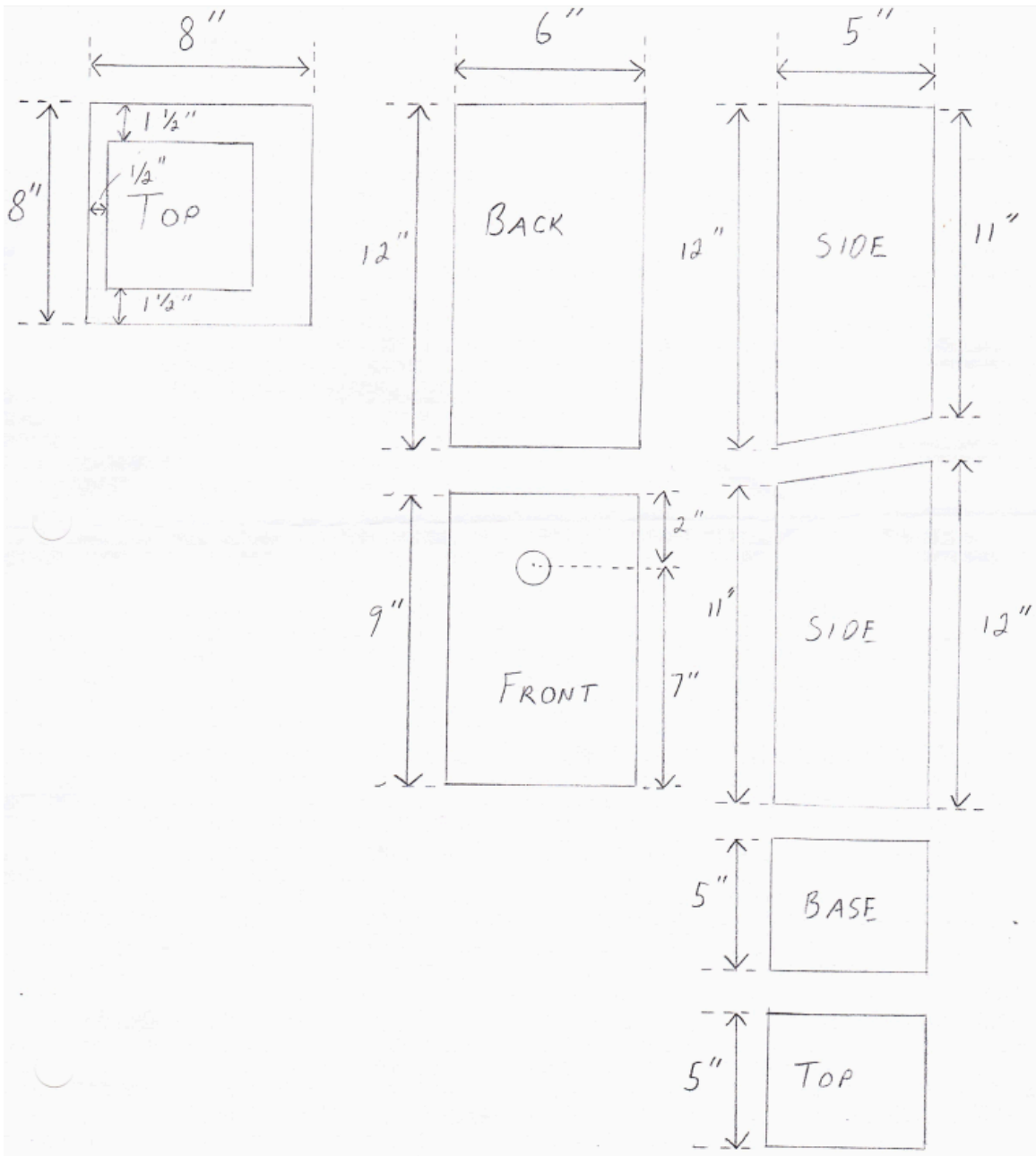


Figure 1. Dimensions of new nest boxes built for MOBL nest box grids.

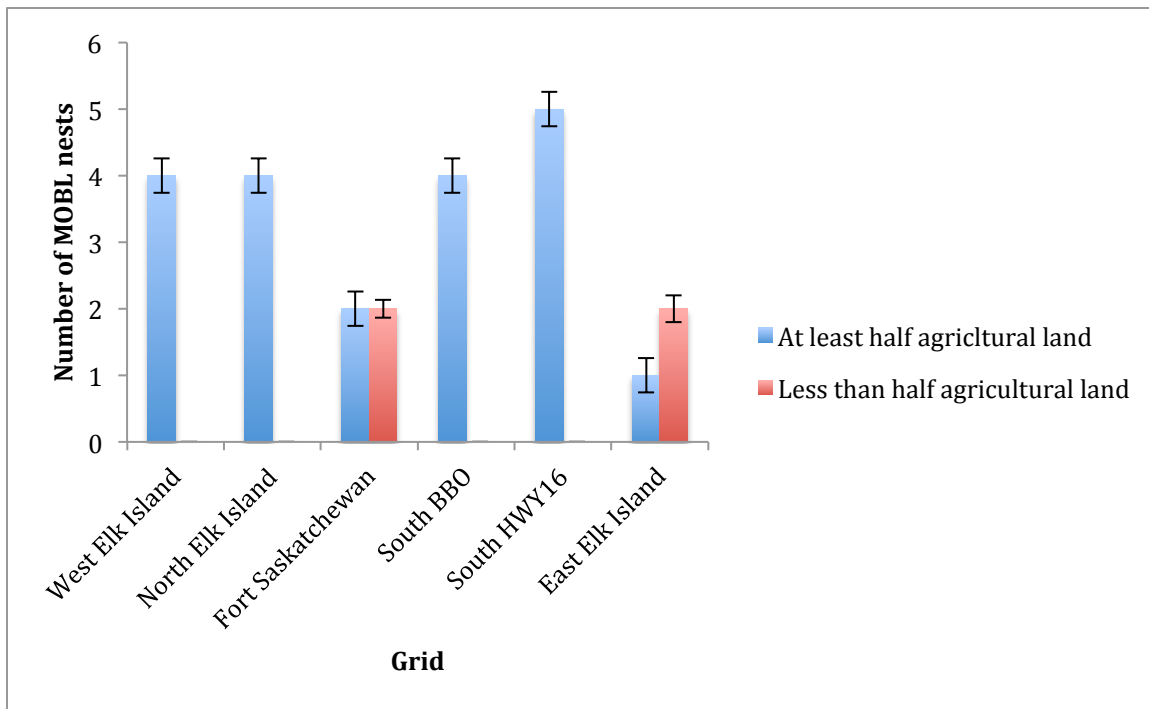


Figure 2. Number of MOBL nests built in boxes surrounded by $\geq 50\%$ agricultural land compared to those surrounded by $< 50\%$ agricultural land. Results indicate significant MOBL preference for boxes surrounded by at least 50% agricultural land than those surrounded by less agricultural land, in all grids except for Fort Saskatchewan. Error bars indicate standard errors. Unpaired T tests produce $P = 0.0050$ ($P < 0.05$, $n = 6$).

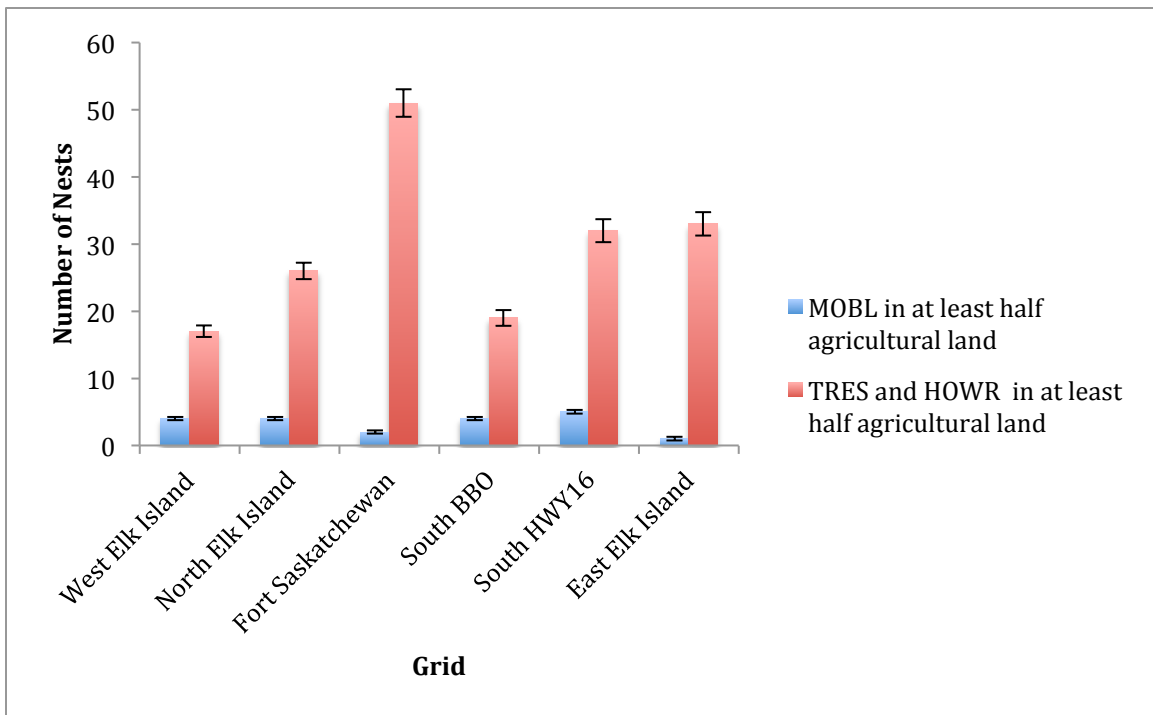


Figure 3. Number of MOBL nests compared to number of nests made by TRES and HOWR in boxes surrounded by $\geq 50\%$ agricultural land. Results indicate a significant difference between the number of nests built by MOBL versus TRES and HOWR in boxes surrounded by at least half agricultural land. This provides evidence that, although MOBL preferentially select for boxes in these habitat types, there is significant competition from birds of other species, whose populations far outnumber MOBL populations, for boxes in these same habitats. Error bars indicate standard errors. Unpaired T tests produce $P = 0.0004$ ($P < 0.05$, $n = 6$).

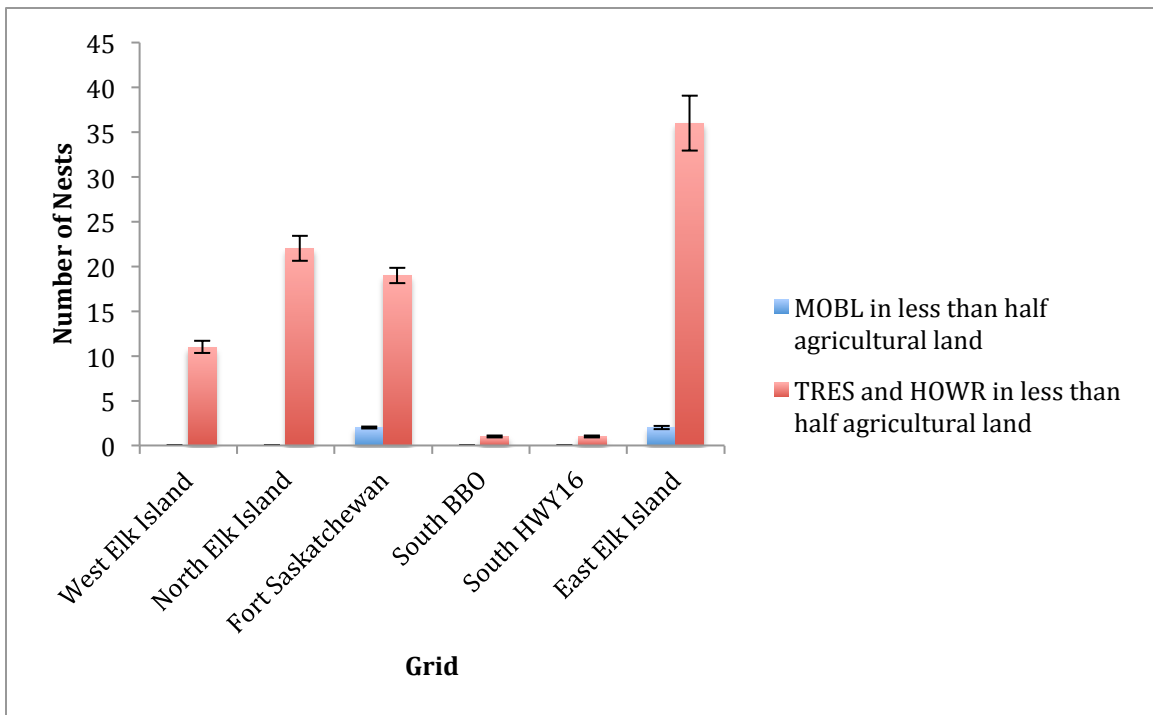


Figure 4. Number of MOBL nests compared to number of nests built by other species built in boxes surrounded by <50% agricultural land. Very few MOBL nests were built in boxes in these habitats, with only two each in Fork Saskatchewan and East Elk Island grids. Results indicate significantly higher preference for boxes surrounded by less than 50% agricultural land by HOWR and TRES combined than by MOBL. Again, it is shown that the populations of HOWR and TRES combined far outnumber MOBL populations. Error bars indicate standard errors. Unpaired T tests produce $P = 0.0269$ ($P < 0.05$, $n = 6$).

WORKS CITED

Koch AJ, Martin K, and Aitken KEH. 2012. *The relationship between introduced European Starlings and the reproductive activities of Mountain Bluebirds and Tree Swallows in British Columbia, Canada*. *Ibis*, 154:590-600.