The Changes in House Wren Reproductive Success in 24 Years

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Figure 1. House Wren sitting on a shed roof.

The interesting song of a house wren is commonly heard in dense vegetation throughout the summer months in Alberta. But how has its reproductive success differed since 1989 within the Beaverhill Natural Area? In 1989 Quinn conducted his thesis studying house wrens and their breeding density, reproductive success and mating system, but no one has followed up on this study until now.

House Wrens (*Troglodytes aedon*), are small, gray-brown birds with patterned wings and tails. Insects are their main food source. Their familiar song and harsh scolding when alarmed can be heard in dense shrubs and wooded areas. House wrens can inhabit man-made nest boxes or natural cavities found in forested areas. Man made wooden nest

Figure 2. House Wren nest in a nest box of grid B. Eggs are brown speckled white eggs.

boxes, such as those built this past summer at the Beaverhill Bird Observatory, measure 6”x 5” x 12” with a ¾ inch circular opening. A House Wren nest cup is composed of twigs and holds about five to eight white, pink-speckled eggs, which hatch into grey downy young that fledge about 15-17 days after hatching (ODNR, 2013) (see figure 2,3). They usually demonstrate monogamous mating, whereby one male breeds with one female and they share caretaking of young, but males may be slightly polygonous having more than one female mate.

In 1989, Quinn studied the breeding density, reproductive success and mating system of house wrens at the Beaverhill Bird Observatory, 72 kilometers east of Edmonton in rural Tofield. He used four grids of nest boxes, A-D named for the surrounding vegetation. Grid A (west poplar), mainly poplar forest, and B (west willow), of mainly willow, were located west of Lister lake. Grid C (east poplar) had mixed vegetation composed of mostly poplar and some willow, and D (east willow), of mainly willow, were east of Lister Lake. The distance and presence of Lister Lake between grids A/B west of Lister Lake and C/D east of Lister Lake was thought to cause relatively no movement between the grids east or west of the lake, therefore allowing separation when studying the two areas. To study reproductive success, Quinn monitored the nest boxes every three days and

Figure 3. House wrens have hatched! Only a few days old in this picture.

recorded date of laying, hatching and fledging, as well as the number of eggs, hatchlings and fledged young. Quinn found that the grids located in poplar forests (grids A, C) had greater reproductive success, with more fledged young, while having fewer nesting attempts.

In 2013 at the Beaverhill Bird Observatory, the house wren experiment Quinn performed in 1989 was repeated for two of his grids west of lister lake, grids A (west poplar) and B (west willow). The Beaverhill Natural Area has changed drastically since 1989. Due to natural forest succession, poplar and aspen have replaced willow vegetation, and the lake area has reduced in size. House Wrens began building nests in June of 2013, and the last birds to fledge were in early August. Nest boxes were nailed to trees, facing south, 30 meters apart from one another in a grid mirroring the set up Quinn's used in 1989. This set up was used because, as according to Kendeigh (1941), house wrens have a territorial size of 0.56 Ha, and with the 30m spacing between boxes this allows four nest boxes per territory size. This is important because it promotes increased nesting attempts due to decreased intraspecific competition because of the lower nest box density within their territorial area. Grid A was set up in the northwest section of the natural area, behind the observatory, mainly in poplar forest. It had 25 nest boxes in a grid of 5 by 5. In 1989, Quinn's grid A (west poplar) had 23 nest boxes located in the west natural area with mainly poplar forest as well. Grid B was set up in the northeast section of the natural area, in a mixed forest of mostly poplar and some willow. It had 24 nest boxes with a grid of 8 by 3. In 1989, Quinn's Grid B (west willow) had 24

nest boxes located in the west natural area as well, but mainly in willow vegetation as oppose to a mix.

In our experiment in 2013, grid A was set up about one week before grid B. Twice a week the boxes were monitored to determine if any house wrens had taken up residence, and if so, the date of laying and number of eggs laid was recorded. The eggs were monitored to determine date of hatching and the number of chicks that hatched. Hatchlings were banded eight days after hatching. Nest boxes were continually monitored until the chicks fledged, at which point the date of fledging and number of chicks that fledged was recorded. After all chicks had fledged, nest boxes were emptied for reuse next year.

Reproductive success of these house wrens was determined in the same way Quinn had in 1989, allowing comparisons between the years to be made, based on clutch size, number of fledged young and the proportion of nesting attempts resulting in fledged young.. The average clutch size of 2013 for grid A and B was 6, and in 1989 the average clutch size was 7 for both grids. These were determined to not be significantly different via a 2 by 2 contingency table and Fishers exact test (two-tailed p-value: 1.00). The average number of fledged young was found to be 6 for both grids A and B in 2013, compared to an average of 6 for both grids in 1989. These were not significantly

Figure 4. House Wrens after about 8 days. These are ready to band. The only distinction between all the brown feathers are the beaks!

different between the grids or years studied (two-tailed p-value using 2 by 2 contingency table and fishers exact test: 1.00). The number of nesting attempts per grid was determined by the number of times at least one egg laid in the box. In 2013, there were 7 nesting attempts in grid A and 6 in grid B; compared to Quinn's thesis where there was an average of 11 nesting attempts over the three years he studied in grid A, and an average of 8 nesting attempts in grid B for the two years he studied that grid. It was determined using a 2 by 2 contingency table and a Fisher's exact test that these were not significantly different from each other (one tailed p-value:0.553, two-tailed p-value:1.00). The proportion of nesting attempts resulting in fledged young was also compared, which provided insight into reproductive success. It was found that in 2013, grid A had 86% of nesting attempts resulting in fledged young, and grid B had 83% resulting in fledged young. In Quinn's thesis of 1989, he found that grid A had 90% resulting in fledged young, but grid B had only 54% resulting in fledged young. It was found that these were significantly different according to a 2 by 2 contingency table and a Fishers Exact test (two-tailed p-value: 0.0406 and one-tailed p-value: 0.0254). We also found that in grid A, 3 chicks died of unknown causes, and 2 eggs never hatched; in grid B, 7 eggs did not hatch, which was all of the eggs in one nest box. Quinn determined that chick mortality was mainly due to abandonment of young, as well as high predation in willow grids. Predation can explain the drastic change in reproductive success of grid B. In 1989, there was low success due to chick mortality from predation in the willow scrub, but after forest succession to an open poplar forest in 2013, reproductive success increased.

In conclusion, the compelling difference between 1989 to 2013 for House wren's at the Beaverhill Natural Area is the difference in reproductive success. In 1989, Quinn found a higher success rate in grid A (west poplar) at 90%, compared to grid A in 2013 at 83%; while Quinn's grid B (west willow) had a lower reproductive success at 54% than in 2013 at 83%. The 7% reduction in Grid A success likely resulted from the more advanced forest succession of grid A compared to grid B, increasing the number of fallen trees in storms, decreasing habitat for house wren nests. The age of this poplar forest compared to grid B may result in weaker, older trees unable to act as suitable habitat, resulting in lowered reproductive success in grid A. The reproductive success rate differed more drastically between 1989 and 2013 for grid B, increasing success by 30%. The most probable cause is the increased poplar vegetation compared to mainly willow in 1989, which decreases predation on young and increases reproductive success. Although the reproductive success drastically changed between years, clutch size, number of fledged young and nesting attempts did not change significantly. The main conclusions of this experiment are that reproductive success has differed from 1989 to 2013, increasing drastically in grid B concluding that house wrens have greater reproductive success in poplar vegetated grids, such as grid B of 2013, rather than dense willow grids, like grid B in 1989. As more forests succeed towards poplar stands, house wrens will increase in reproductive success, increasing in population as well. Open poplar forests cause greater reproductive success because it allows house wrens to detect potential predators at a distance before they invoke harm (Quinn, 1989). It is interesting to determine that reproductive success has

changed significantly in 24 years, but that the average clutch size, fledgling number and nesting attempts have not. The relative stability in clutch size, fledgling number and nesting attempts is likely due to the stability of house wren population. According to the Boreal Avian Modelling Project (2013), house wren populations have remained stable for many years, and house wrens have a high rate of reproductive success. This is important because it implies that house wrens are a strong species, well adapted to changing conditions, with the ability to remain stable in population due to high reproductive success for 24 years, and likely for more years to come. As forest sucession continues at the Beaverhill Natural Area, the area will become more favorable for some birds, like the house wren that favors open poplar forests, and less favorable for other species which prefer dense willow scrubs. With the changing forest vegetation, species will come and go, changing the diverse bird species favoring the Beaverhill Natural Area.

Tables

(a)

Nesting attempts	2013	1989
Grid A	7	11
Grid B	6	8

(b)

Proportion of Nesting attempts resulting in fledged young	2013	1989
Grid A	86	90

Grid B	83	54

(c)

Mean clutch size	2013	1989
Grid A	6	7
Grid B	6	7

(d)

Mean number of fledged young	2013	1989
Grid A	6	6
Grid B	6	6

Table 1. All 2 by 2 contingency tables used. (a) Total number of nesting attempts, the number of boxes with at least one egg in it. (b) Proportion of these nesting attempts resulting in fledged young. (c) mean clutch size. (d) mean number of fledged young.

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