Barn Swallow Populations in Wellington County, 2008 - 2010

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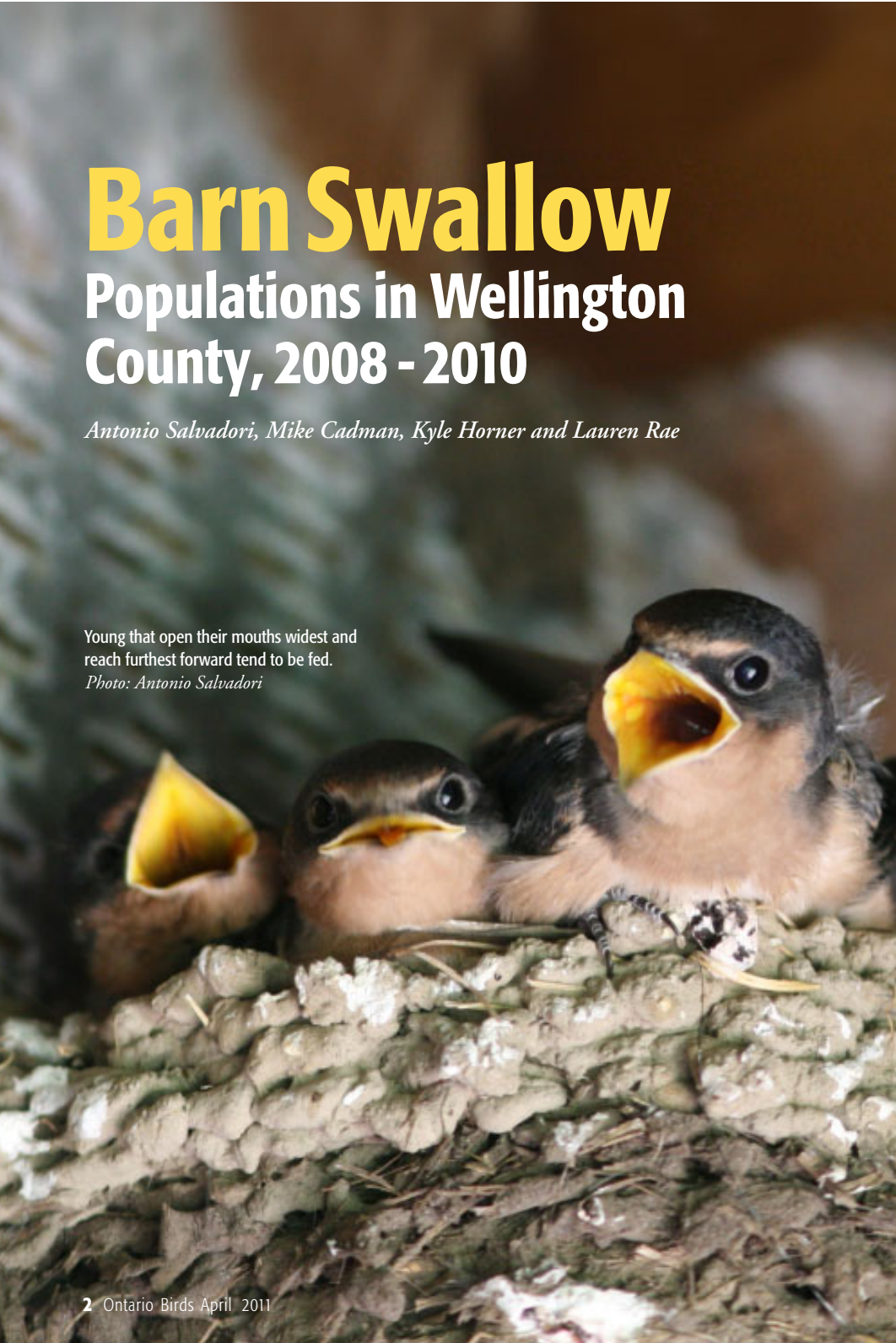
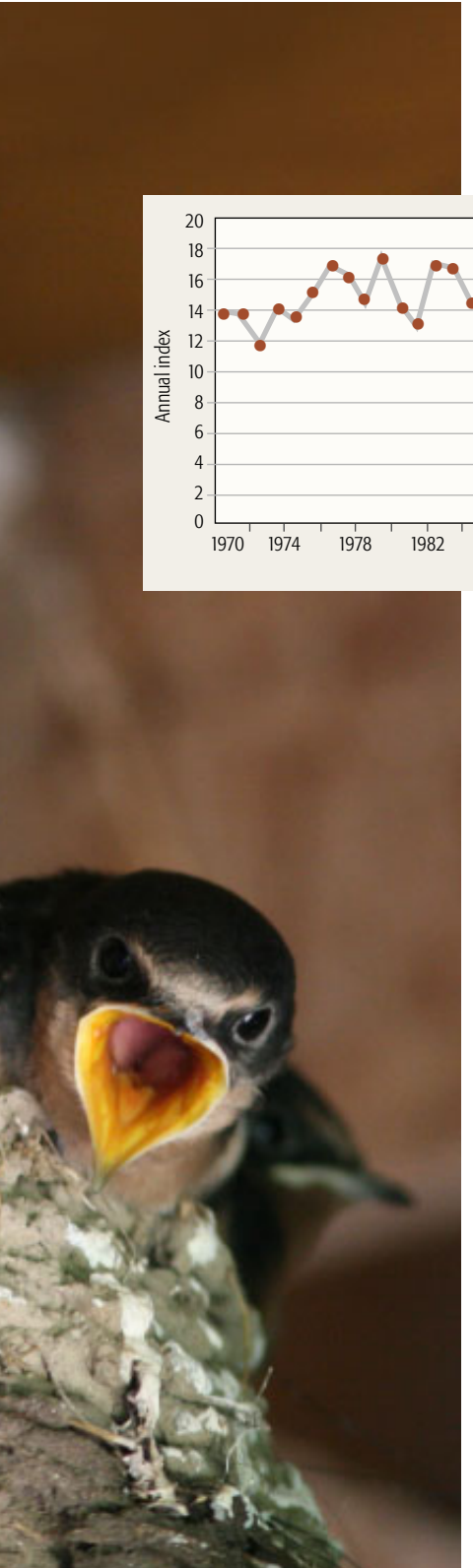


Young that open their mouths widest and reach furthest forward tend to be fed.
Photo: Antonio Salvadori



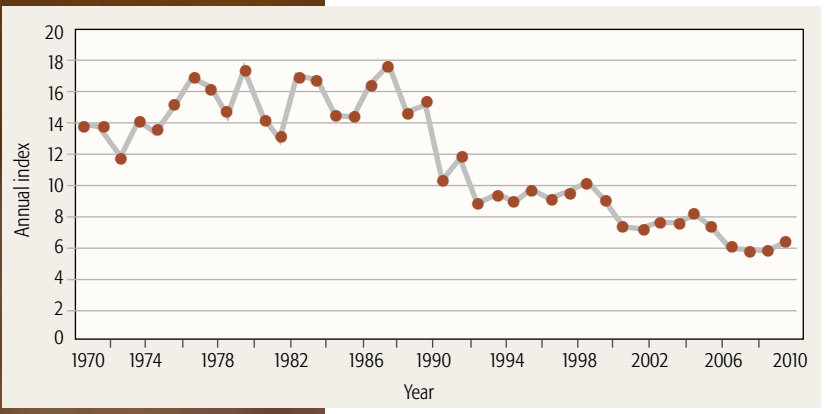


Figure 1. Breeding Bird Survey trend for Barn Swallow in Ontario, 1970 – 2009. (*Environment Canada 2010*)

The Barn Swallow (*Hirundo rustica)* has been declining in recent decades in northeastern North America, along with most other aerial insectivore birds (Nebel *et al.* 2010). According to the Breeding Bird Survey (BBS), the Ontario Barn Swallow population declined at a rate of 2.5% per year from 1970 – 2009. Specifically, declines are reported at 3.4% per year from 1989 – 2009, and at 3.5% per year from 1999 – 2009 (Environment Canada 2010; Figure 1). Note, however, that the population increased slightly from 2006 – 2009. The Ontario Breeding Bird Atlas shows an overall significant decline in the probability of observation of the Barn Swallow in Ontario between the first atlas (1981 – 1985) and the second atlas (2001 – 2005) of 35% (Cadman *et al.* 2007). The largest decline occurred in Northern Ontario (51% in the Northern Shield Region), with a decline of 7% in the Lake Simcoe-Rideau region, which extends north from the Carolinian Region to the southern edge of the Canadian Shield.

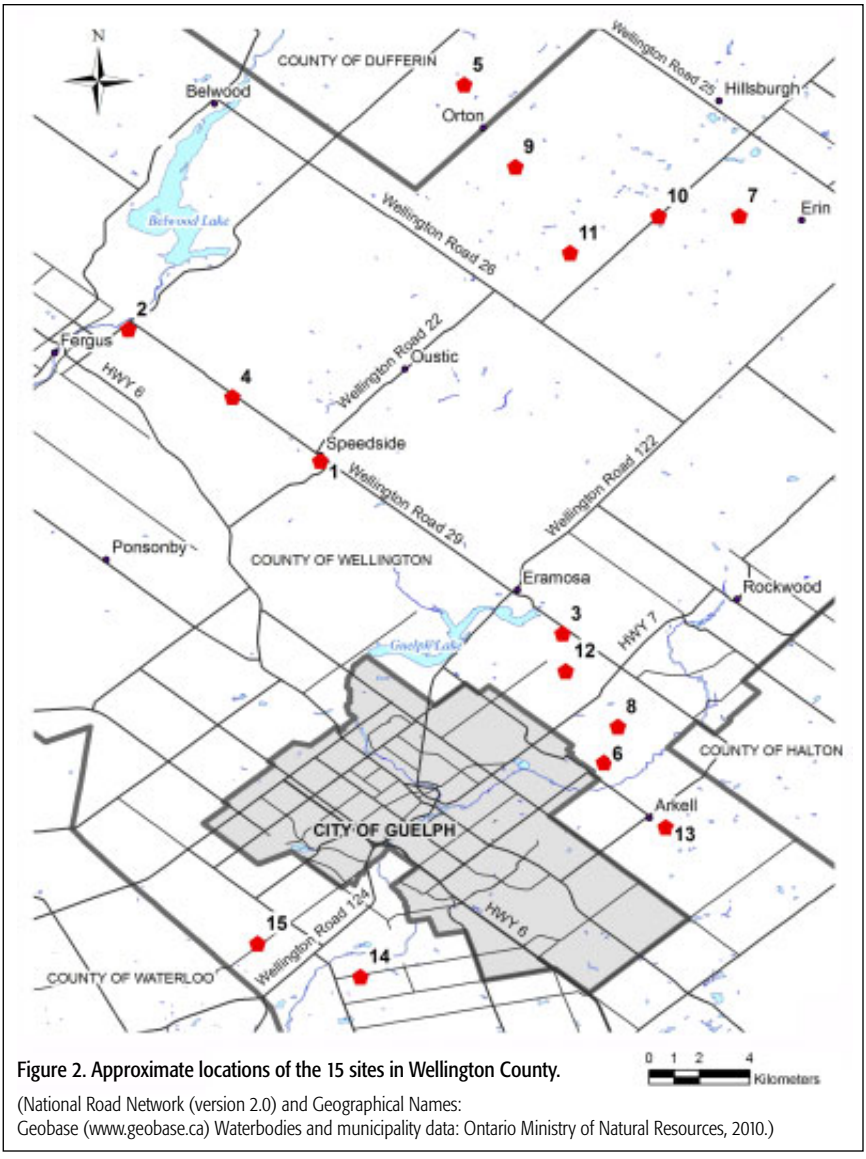


Figure 2. Approximate locations of the 15 sites in Wellington County.

(National Road Network (version 2.0) and Geographical Names: Geobase (www.geobase.ca) Waterbodies and municipality data: Ontario Ministry of Natural Resources, 2010.)

In order to shed light on the Barn Swallow decline, Salvadori (2009) began to study the species during the breeding season at several locations in Wellington County, Ontario. This area falls within the Atlas' Lake Simcoe-Rideau Region (Cadman *et al.* 2007). From 2008 – 2010, the population size and breeding success of Barn Swallows at 15 sites were monitored in a consistent and focussed way. The purpose of this study was to determine whether the population size and

Table 1: Summary of the 15 sites used in the study

Location	Farm Animals Present	Main Crops/ Land Use	Structure Type	Average Colony Size
#1	Goats and chickens	hay, corn, soya	Old barn	46
#2	Cattle	pasture, hay	Old barn	40
#3	No animals	corn, soya	Old barn	21
#4	Horse	corn, soya, wheat, hay	Old barn	19
#5	Horse	pasture, hay, corn	Old barn	16
#6	No animals	hay, corn, soya	Old barn	12
#7	Horse	pasture, corn, wheat, soya	Storage facility	12
#8	Horse	pasture, hay	New barn	11
#9	Horse	pasture, hay	Old barn	10
#10	Cattle	pasture, hay, corn	Old barn	9
#11	Cattle	pasture, hay, corn	Old barn	8
#12	Sheep	pasture, corn, soya	Old barn	7
#13	Mixed animals	pasture, hay	Shed	7
#14	Cattle	corn	Storage facility	3
#15	Sheep, chickens	pasture, corn	New barn	1

reproductive output at these 15 sites was decreasing and to look for potential reasons for the species' decline.

Study area

The farms visited in this study were in the Guelph, Fergus, and Hillsburgh area of Wellington County (Figure 2). The 15 sites were not chosen randomly but are thought to be representative of the farm-nesting population in the area. The owners of sites known to have nesting Barn Swallow populations were contacted to see if we could operate on their property, and only two did not allow us to study the birds on their farm.

All of the sites were in agricultural areas. Five were on horse farms, four were on cattle farms, four had a mix of mostly small animals (goats, sheep, chickens, rabbits, etc), and two had no animals (Table 1). Location 14 was unique, as a couple of cattle were housed in the building which was mostly used as a storage facility. All buildings were surrounded primarily by agricultural fields, mostly various crops and pasture. We distinguished between 'Old' and 'New' barns. 'Old' barns are old and large wooden structures. Old barns are generally more conducive to nesting, as they present more exposed beams and joists for nest construction and more gaps for entry. Normally they consist of a two story building of the historic type; the upper part is used to store hay whilst the lower part houses animals: horses or cattle. 'New' barns are modern one story structures with fewer nesting sites and fewer gaps for entry.

Methods

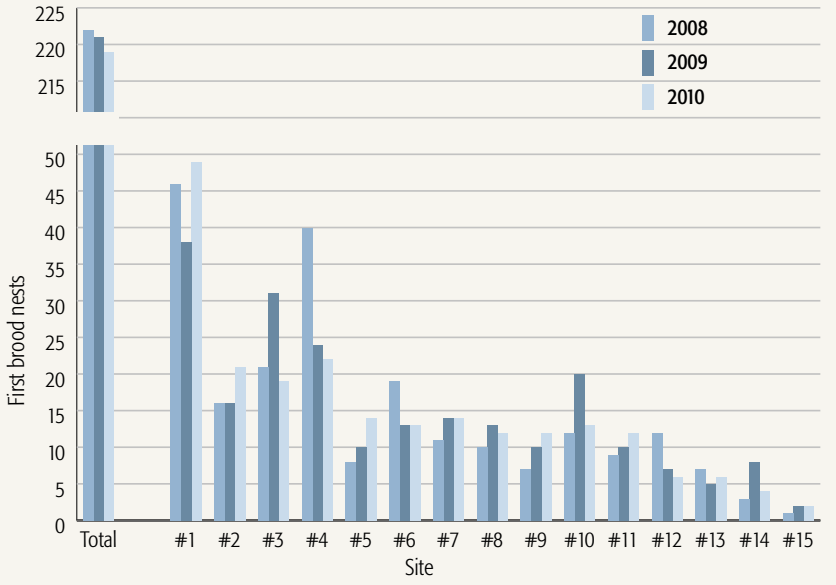
Sites were visited about once per week from the beginning of egg-laying in May until the last young left the nest in August. On each visit, barns were surveyed to determine the number of eggs in each nest (photo below), and whether or not young were present. We considered any clutch started on or before 30 June to be a first brood, and used the number of first broods as a measure of the colony size.

In most cases, young were counted only during banding to minimize disturbance of the young. Young were large enough for banding between 4 and 10 days old. (photo page 2.) All young were banded simultaneously so that the older siblings would not be disturbed at a subsequent visit. We used the total number of young banded from all broods at each site as a measure of reproductive success. We believe the number of young banded was a good estimate of the number of young fledged as very little predation or loss of young was noted after this stage of development — or, for that matter, at any stage of the nesting cycle.

Predation of nests and other disturbance thought to affect either colony size or reproductive success were noted.

Clutches are usually 4-6 eggs, though a few of 7 eggs do occur.
Photo: Mike Cadman

Figure 3. The number of first brood nests overall and for each site from 2008 through 2010.



Results

Colony size

Colony size varied from 1 – 48 nests, with an average of 14 nests per site (Table 1). As shown, locations classified as old barns usually had a greater number of nests than the other sites. The total number of first brood nests for the 15 sites remained almost unchanged during the three years of the study, ranging from 222 in 2008 to 219 in 2010 (Figure 3). Change in colony size among years varied at individual sites, with six sites increasing each year (#2, #5, #7, #9, #11, #15), three decreasing each year (#4, #6, #12) and the rest showing no consistent pattern of increase or decrease.

Reproductive success

The average number of young banded per site per year varied from eight to 255. The total number of young banded at all sites combined was 1,178 in 2008, 1,184 in 2009, and 1,281 in 2010 (Figure 4). This represents an increase in banded young of 0.5% and 8.2%, from 2008 – 2009, and 2009 – 2010, respectively. The number of young fledged per site varied considerably among years and across sites. Specifically, three sites showed an increase in banded young each year (#5, #7, #9); three showed a decrease (#12, #13, #15) and the others showed patterns of up and down (#3, #8, #10, #14), or down and up (#1, #2, #4, #6, #11). These results suggest that when averaging and summarizing Barn Swallow data care should be taken in how the data is interpreted.

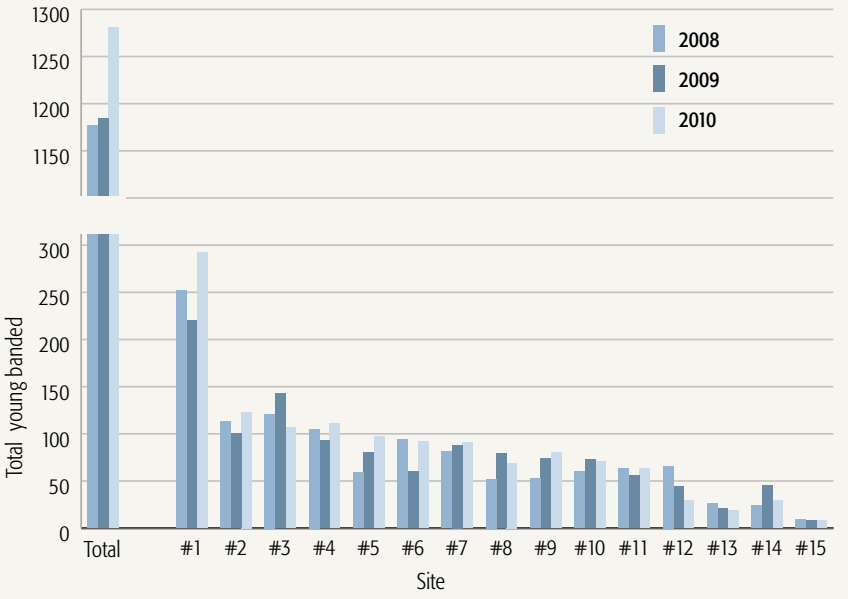


Figure 4. Total number of young Barn Swallows banded at each study site and overall.

Discussion

The number of first broods produced, and therefore presumably breeding pairs, remained almost unchanged over the three years of our study. The small decrease of less than 1% is less than the 3.5% annual decrease shown by the BBS data for Ontario for 1999 – 2009 (Environment Canada 2010). Unfortunately, BBS data for 2010 were not available at the time of writing to determine whether the decline continued through our study period. Our study area covers only a small part of the province, and may not be representative of the province as a whole.

Despite the small drop in number of breeding pairs, the number of young produced in our study actually increased 0.5% from 2008 – 2009 and a further 8.2% from 2009 – 2010. Despite this increase in reproductive output, the number of breeding birds using our study sites did not increase, though it might have helped to slow the decline. Indeed, a small percentage of banded young from previous years were recaptured as adults in subsequent years in their natal location or elsewhere within the study area. The reason for the increase in productivity during the study is unknown, though favourable weather conditions may have played a part.

As with the well known Heisenberg principle in physics, our study may have interfered with the Barn Swallows in a positive way. In some cases, the landowners became very caring of their swallows

and began to protect them from any harm that could befall them. Also, since several of the landowners know one another, they started competing with each other to see who has the largest and best colony. All this lead to a betterment of conditions and a trapping of predators such as raccoons, which may explain in part the increased productivity.

Although populations on our sites were stable, perhaps thanks in part to the protective landowners as discussed above, we did gain some insights into activities that might be negatively affecting the Barn Swallow population in the study area and perhaps elsewhere. These include:

1. Loss or degradation of suitable breeding sites

Although the number of sites occupied in our study was constant at 15, a reduction in the number of suitable breeding sites across broader areas could lead to a decline in population. Although it is difficult to quantify, there has probably been a decline in the number of 'old fashioned' barns in Ontario. The number of dairy farms is much reduced (Statistics Canada 2001), and presumably that means a reduction in the number of suitable barns. The decline in pasture probably means fewer barns are required to stable cows. Evidently, more farmers are keeping their baled hay in plastic wrap which might indicate a reduction in the number of accessible barns.

Furthermore, old barns still in existence are being converted to new uses. Of the 10 old barns that we studied, two (#3, and #6) no longer had farm animals inside them at all. They were used to store farm equipment, and had relatively new windows and doors that could be easily kept shut thus keeping the swallows out. There is some likelihood that these barns will soon become unavailable to nesting Barn Swallows. In addition, four of the 10 old barns we studied have been converted for stabling horses, so they have relatively clean floors compared to the manure- and hay-filled barns used for stabling cows. These uses may be, in some manner, less conducive to Barn Swallow nesting.

The five largest colonies in our study sites were in old barns, suggesting that these structures are particularly well suited to Barn Swallow nesting. The 10 old barns made up 67% of the 15 study sites but accounted for 85% of the nests. The loss of these old barns across Ontario might be affecting the population.

Newer barns are often made of either steel or steel piping covered with heavy plastic and, like many other new farm buildings are only infrequently used by nesting Barn Swallows. None of these plastic covered barns were included in our study. However, two such barns in our study area had no swallows nesting in them, although swallows were seen roosting in them. At a shopping mall in Aurora, swallows do indeed nest on the steel pipes under the plastic sheeting to the great annoyance of the property owners.

2. Deliberate nest destruction by property owners

Some people on farms actively destroy nests due to the excreta nuisance posed by the swallows. It is possible that our study sites are not representative of others in the area in this regard, as we have noticed that at several locations the owners actively protected the swallow nests. This

was certainly the case at several horse farms where the clients were actively discouraged from interfering with the nests. However, in at least two horse farms that we visited, but which were not included in our study, the owners actively destroyed the 'nuisance' nests due to the excreta.

3. Cats

We observed predation of some nests in barns occupied by cats, and it was probably a significant problem in at least one of our sites. In barn #7, where the population and reproductive output declined during our study, cats were able to reach some nests when farm equipment and materials were piled near those nests. Remains of several depredated adults and young were found in this barn. This may also have been a significant problem at barn #10 where many cats were observed. At one location a cat caught and killed a swallow flying about 2 meters off the ground, a truly remarkable feat!

4. Heterospecific competition for nesting locations

Although the House Sparrow (*Passer domesticus)* is generally declining, it might be an added factor exacerbating the Barn Swallow's decline. In barn #10 House Sparrows were a major problem. They built their nests onto the old Barn Swallow nests and in many cases evicted the Barn Swallow. The Barn Swallows were thus forced to move to a potentially less suitable part of the barn. This indeed may explain the low productivity of barn #10 which was an old style barn with many cattle and an excellent location in the judgement of the authors. In two other barns House Sparrows evicted Barn Swallows from their nests but to a less significant effect. At least one landowner actively destroyed House Sparrow nests.

In addition, Cliff Swallows (*Petrochelidon pyrrhonota*) took over some Barn Swallow nests, even when occupied by Barn Swallows, especially near the entrance to the barns. Cliff Swallows have increased in our study sites over the duration of our study. As well as sometimes building directly on top of Barn Swallow nests, Cliff Swallows tend to place their nests immediately inside barn doors, which might reduce the likelihood of Barn Swallows, which are forced to nest deeper inside the barn, using the site. This happened at three sites #2, #4 and #5. Site #4 has two large and expanding Cliff Swallow colonies (33 and 67 nests), and the Barn Swallows are now nesting deeper inside the barn. Barn Swallows seem to prefer good light to nest.

Other factors possibly affecting Barn Swallow numbers in Ontario

Evans *et al.* (2007) showed that, in Britain, aerial insect abundance over pastures was more than double that in silage (hay) fields, and more than three and a half times greater than over cereal fields. The conversion of pasture to these other land uses in Ontario over the past several decades (Blancher *et al.* 2007) has probably greatly reduced flying insect prey for Barn Swallows and other aerial insectivores, which has probably affected swallow numbers in Ontario, as it has in Britain. Similarly, Ghilain and Bélisle (2008) showed that nest occupancy and reproductive success of Tree Swallows

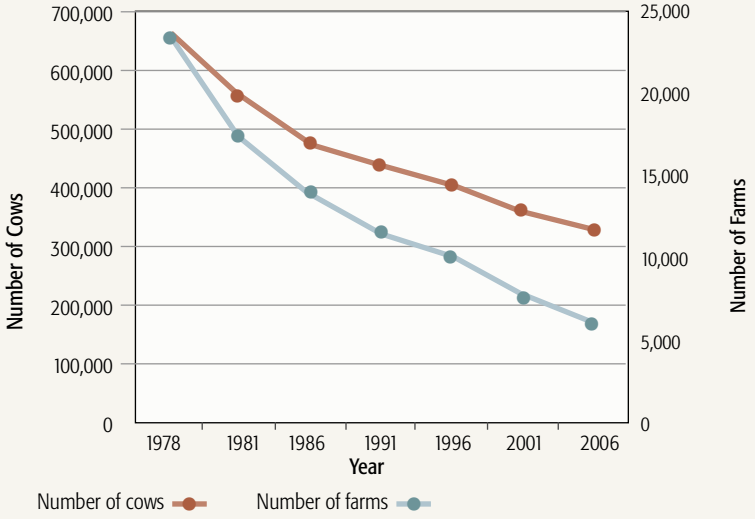


Figure 5. The number of cows and dairy farms in Ontario, 1976 – 2006. *(Statistics Canada 2007)*

(*Tachycineta bicolor*) decreased along a gradient of agricultural intensification.

Møller (2001) showed that in Denmark, the reduction in dairy farming caused a decline in Barn Swallow numbers and reproductive success. Only one of the farms we worked on (#3) was recently a dairy farm, whereas dairy farming was a much more important part of the Ontario landscape in earlier decades (Figure 5). The decline in the number of dairy farms and dairy cows in Ontario might also be an important factor in the decline of the Barn Swallow in this province.

The general decline of aerial insectivore birds in northeastern North America described by Nebel *et al.* (2010), suggests that broad factors such as an overall decline in flying insects may be involved, or that there has been a change in the phenology of insects and/or the birds that prey on them. Some of the factors we have described, such as the major changes in agricultural land use, might well be contributing to those insect declines. However, as Nebel *et al.* (2010) point out, the declines of aerial insectivores are most acute in those species, such as the Barn Swallow, which migrate the longest distances, so it may be that factors on the wintering grounds in South America are a major contributor to the reductions in the populations of these species in Ontario.

Acknowledgements

First and foremost, we would like to thank the 15 landowners who allowed us free and unrestricted access to their properties: the Berry, Flanigan, McFarland, Martini, Moore, Nelson, Osborne, Peller, Speers, Switzer and Tonin families; S. Blue, A. Caldwell, L. Hindmarsh, L. Redshaw. Environment Canada provided support for the project. Thanks to Andrea Clouston

for producing the map. AS would like to thank his long suffering wife, Mary, for foregoing summer vacations for the past seven years while this study and associated previous work was in progress.

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