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Natural and human-made nesting habitat use by Bank Swallow (*Riparia riparia*) in Canada

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Abstract

Bank Swallow (*Riparia riparia*) is a Threatened migratory bird in Canada that nests colonially in burrows excavated in both human-made and natural banks. Until the mid-20th century, nest record cards reported 60% of Bank Swallows in Canada nested in human-made habitats. Here we provide an update on the proportion of Bank Swallow nesting colonies in natural and human-made habitats in Canada's provinces and territories based on data from a variety of sources including breeding bird atlases and eBird. Bank Swallow nesting colonies reported from 2001 to 2017 throughout Canada indicate a reversal in the dominant type of habitat used for nesting, with a 56% probability that nesting occurrences are now found in natural habitats. We discuss possible mechanisms responsible for the apparent reversal and recommend that natural nesting habitat be formally protected and restored where it has been altered, especially where co-benefits include climate change resiliency. With the support of landowners and industry, active colonies in human-made habitats will likely make an important contribution to a resilient Bank Swallow population, the majority of which presently appears to nest in natural habitats across the country.

Key words: Bank Swallow; nesting habitat; *Riparia*; anthropogenic habitat; natural habitat; migratory bird; species-at-risk

Résumé

L'Hirondelle de rivage (*Riparia riparia*) est un oiseau migrateur au statut menacé au Canada qui niche de façon coloniale dans des terriers creusés dans des fronts de talus tant naturels qu'artificiels. Jusqu'au milieu du 20e siècle, les fiches de nidification indiquaient que 60 % des Hirondelles de rivage au Canada nichaient dans des habitats artificiels. Nous présentons ici une mise à jour de la proportion des colonies d'Hirondelles de rivage nichant dans des habitats naturels et artificiels dans les provinces et territoires du Canada, en nous basant sur des données provenant de diverses sources, dont les atlas des oiseaux nicheurs et eBird. Les colonies de nidification d'Hirondelles de rivage signalées de 2001 à 2017 dans l'ensemble du Canada indiquent un renversement du type dominant d'habitat utilisé pour la nidification, avec une probabilité de 56 % que les occurrences de nidification se trouvent maintenant dans des habitats naturels. Nous discutons des mécanismes possibles responsables de ce renversement apparent et recommandons que l'habitat naturel de nidification soit officiellement protégé et restauré là où il a été altéré, surtout lorsque les co-bénéfices incluent la résilience au changement climatique. Avec le soutien des propriétaires fonciers et de l'industrie, les colonies actives dans les habitats artificiels contribueront probablement de manière importante à la résilience de la population d'Hirondelles de rivage, dont la majorité semble actuellement nicher dans des habitats naturels à travers le pays.

Mots-clés : Hirondelle de rivage; habitat de nidification; *Riparia*; habitat artificiel; habitat naturel; oiseau migrateur; espèce en péril

Introduction

Bank Swallow (*Riparia riparia*) is a colonial migratory bird whose breeding range in Canada extends to all provinces and territories except Nunavut. The species nests in burrows dug in vertical or near-vertical banks. Nesting burrows are excavated in friable soils with small particles, such as mixtures of sand and silt (Bols 2017; Garrison and Turner 2020). The presence of this type of substrate is associated with areas where alluvial soils are exposed or near the ground surface (COSEWIC 2013; Bols 2017; Burke 2017; Falardeau 2019). In natural environments, Bank Swallows nest on the banks of water bodies where hydrologic forces expose the soft sediments of

the slopes. These sites are relatively ephemeral in nature due to the dynamic erosion of the slopes (Cadman and Lebrun-Southcott 2013). Some human activities re-create, incidentally, the conditions conducive to Bank Swallow nesting (Ghent 2001; Bols 2017; Burke 2017). The species nests in aggregate pits (e.g., sand or gravel), road cuts, and piles of unconsolidated material (Erskine 1979; Peck and James 1987; Campbell *et al.* 1997; Bols 2017). Structures specifically designed to mimic nesting habitat, e.g., a vertical wall with openings, have been colonized by Bank Swallows (Laberge and Houde 2015). In both natural and human-made nesting environments, Bank Swallows feed on insects captured on the wing in open habitats near the colony, such as wetlands, grasslands, and cropland (Falconer *et al.* 2016; Saldanha 2016; Garrison and Turner 2020).

Due to a population decline of 31% from 2001 to 2011 (COSEWIC 2013; a substantial 98% decline from 1970–2011), Bank Swallow was listed as a Threatened species in Canada under the *Species at Risk Act* in 2017 (SARA Registry 2021). A more recent estimate suggests a 93% population decline from 1970 to 2019 (Smith *et al.* 2020). Reports on the use of different habitat types by Bank Swallows have been published (Peck and James 1987; Campbell *et al.* 1997), but the only nationwide study is over 40 years old (Erskine 1979; see COSEWIC 2013). Based on data reported to the Nest Record Scheme through 1974 (starting in 1955 in British Columbia and in the late 1960s in Quebec; Downes 2000), only 40% of Bank Swallow nests were located in natural habitat and 60% were in human-made settings in Canada (Erskine 1979). The proportion of nests in natural sites was greater in the Maritimes, where coastal cliffs are abundant. The proportion of nests in human-made habitat was greater in British Columbia, Quebec, and Ontario, where the human population was larger and landscape alteration was greater. The highest proportion of nests in human-made habitats observed by Erskine (1979) was in British Columbia. Campbell *et al.* (1997) reported 815 colony observations from the Nest Record Scheme in British Columbia, of which 59% of the 481 colonies assigned to a habitat type were in human-made habitat. In Ontario, the Nest Record Scheme reported 48% of nesting occurrences (colonies or isolated nests) in human-made habitats and 52% in natural habitats (Peck and James 1987). Information on the recent, nationwide and regional distribution of the species' breeding population in relation to human-made versus natural nesting habitat is unknown, but would be useful for the conservation of the species.

Our goal is to update the proportion of Bank Swallow nesting colonies found in natural compared to human-made habitats in Canada. We compiled observations of Bank Swallow nesting colonies made between 2001 and 2017 from a variety of sources, including breeding bird atlases and eBird, and assigned each colony observation as being in natural or human-made habitat. We discuss possible mechanisms responsible for the apparent patterns we uncovered and we end by using our findings to make conservation recommendations to assist with the species' recovery in Canada.

Methods

Data acquisition

Data used are observations of colonies (active or inactive) of Bank Swallow or other evidence of confirmed nesting (such as adults leaving or entering nest sites, or adults carrying food for young), reported from 2001 to 2017 in Canadian provinces and territories. This period begins with the formal onset of the second Alberta (a pilot field season was held in 2000) and Ontario breeding bird atlases. Colony observations were obtained through an extensive search of data sources in Canada, including provincial conservation data centres, the NatureCounts database managed by Birds Canada, eBird checklists, and species-specific inventories from regional offices of the Canadian Wildlife Service (see Acknowledgements). Data from the breeding bird atlases indicating a specific nesting site for rare or colonial species were included in the analysis, but not the nesting indices reported at the scale of 10 km × 10 km atlas squares. eBird records were screened in a three-step process. First, records with blank checklist or species remark fields were excluded, as they did not provide information on nest habitat or bird behaviour. Second, records submitted using the eBird smartphone application were retained and assigned either a 100 m spatial uncertainty for stationary, casual, historical, or incidental protocols, or the travel distance plus 100 m for the travelling protocol. Third, remaining eBird records not submitted using a smartphone were assessed for nest habitat location remarks, validated on a map (see *Assignment of nesting habitat type*), and assigned a 100 m spatial uncertainty. The retained eBird and other data occurrences were required to have a spatial uncertainty of no more than 700 m. We limited this spatial uncertainty distance to the sum of a minimum foraging distance of 500 m (Falconer *et al.* 2016) and the detection distance class of 200 m assigned to Bank Swallow (Blancher *et al.* 2013). The assessment of data quality described above was implemented in addition to the initial vetting of data conducted by regional eBird experts or atlas coordinators. No data meeting the criteria for analysis were available for Nunavut. Following Erskine's (1979) methodology, observations from

the same site within a single year were consolidated to a single colony observation for analysis, but observations from the same site between years were retained as separate colony observations in each year. In addition, observations indicating burrow clusters within the same colony were simplified to one colony observation per year by merging occurrences within ~10 m, or four decimal places of degree coordinates. The dataset contains 1898 unique colony observations.

Assignment of nesting habitat type

Each colony was assigned to a natural or human-made nesting habitat. Most observations could be assigned based on a habitat description. Key words such as gravel, pit, aggregate, dirt, pile, quarry, roadside, and construction, or their equivalent in French suggested nesting in a human-made site. Key words such as shoreline, cliff and river, or their equivalent in French suggested nesting in a natural site. The assignment of habitat type was validated by overlaying observations on aerial images in Google Earth (version 7.3.3.7786, California, USA; Figure S1). Data that did not specify the type of nesting habitat or for which visual examination of the site was inconclusive were classified as "unknown habitat".

Analyses

For a given province or territory, the proportion of colonies in each nesting habitat type represents the number of known colonies per habitat type divided by the total number of known colonies (excluding colonies classified as unknown habitat type) in that province or territory (Table S1). Erskine (1979) presented Nest Record Scheme data by grouping the provinces into four regions: Maritimes (excluding limited data from Newfoundland), Quebec and Ontario, Prairies, and British Columbia. For comparison with historical data, recent colony occurrences have been grouped according to these regions (Figure 1). These data exclude Newfoundland and Labrador, Yukon, and the Northwest Territories.

An important limitation of the dataset is the variable quality or lack of information on the number of breeding pairs in each colony. Bank Swallow colony size can vary from a few to several thousand nests (Peck and James 1987) and is highly variable by region, size of nesting habitat, and habitat type (Cadman and Lebrun-Southcott 2013; Bols 2017;

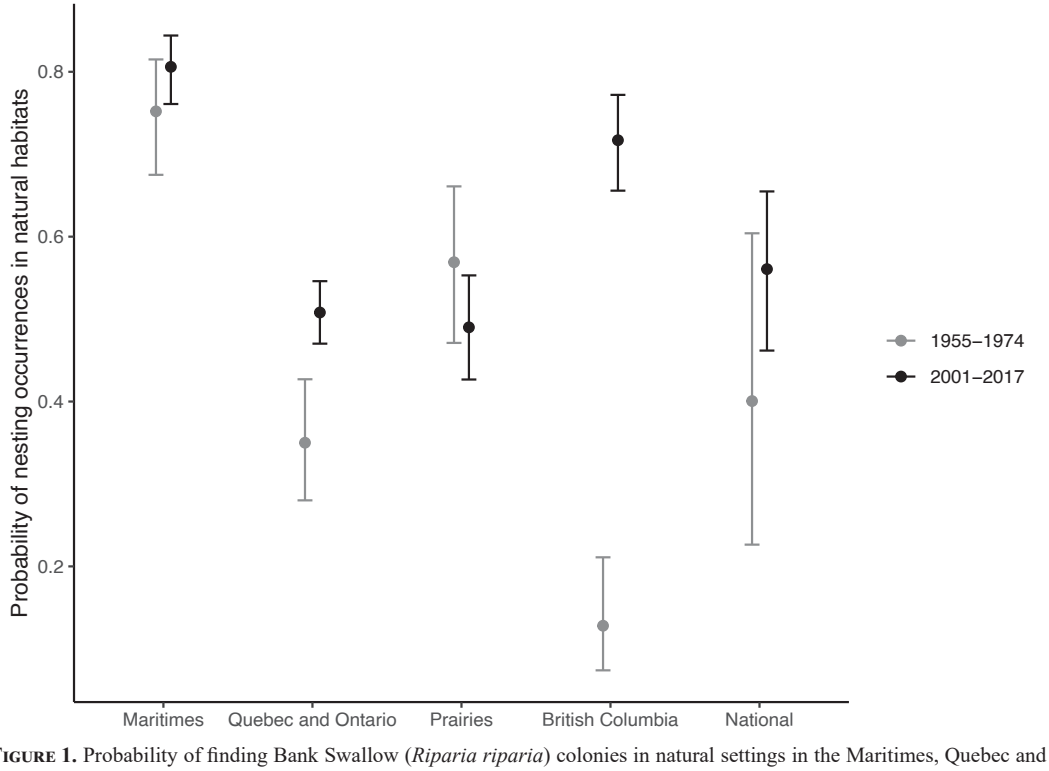

Figure 1. Probability of finding Bank Swallow (*Riparia riparia*) colonies in natural settings in the Maritimes, Quebec and Ontario, the Prairies, British Columbia, and nationally (excluding Yukon, Northwest Territories, and Newfoundland and Labrador). Probabilities are shown with their 95% CIs from the binomial model resulting from the sample size and Partners in Flight confidence limits.

Burke 2017). Thus, the proportions of colonies are not directly comparable to the proportions of nests by habitat type reported by Erskine (1979). The latter is a better indicator of the actual proportion of the breeding population using a habitat type, provided that the sample of nests assigned to habitat types is representative of the species' distribution. The historical data presents the number of nests assigned to each nesting habitat type and the average colony size by region (Erskine 1979). To allow comparison with our data, we divided the number of nests by the average colony size reported by Erskine (1979) in a given region to estimate the number of colonies found in each habitat type (Table S2). This conversion assumes equal median colony sizes in natural and human-made settings, although evidence from Ontario suggests colonies in natural settings can be 4.5 times larger than in human-made settings (Burke 2017).

We estimated a national probability of colonies being in natural settings by weighting regional colony occurrences with proportions of the Bank Swallow population in each region based on Partners in Flight (PIF) estimates (Population Estimates Database, Version 3.1; Partners in Flight 2020). We applied those proportions to both historical and present-day datasets, assuming a negligible change in distribution of the Bank Swallow population between regions.

We conducted a binomial generalized linear model with a logit link function to determine how time period, region, and their interaction affected the probability of a colony having been located in natural habitat. An ANOVA was used to identify that the time period/region effect in the model was significant. We then performed a least square means *post-hoc* test to determine which regions were significantly different between time periods using the "lsmeans" package (Lenth 2016). All analyses were performed in R version 4.1.0 (R Core Team 2021). Statistical significance was accepted at $P < 0.05$.

Results

Nationally, our dataset contains a total of 1802 colonies assigned to nesting habitat type (i.e., natural or human-made). At the national level, excluding Yukon, Northwest Territories, and Newfoundland and Labrador, we found that the probability of finding Bank Swallow colonies in natural settings increased from 40% (95% CI: 23–60%; historical data from Erskine 1979) to 56% (95% CI: 46–65%; 2001–2017 data). However this change is not statistically significant (Figure 1). The proportions of Bank Swallow colonies in natural and human-made habitats vary greatly among provinces and territories (Table 1). Saskatchewan had the fewest observations available ($n = 17$; no unassigned observations). Ontario had the most observations ($n = 391$; 39 unassigned observations). Yukon, Northwest Territories, British Columbia, Alberta, Saskatchewan, Ontario, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador have a higher proportion of colonies in natural settings than in human-made settings. Manitoba and Quebec are the only two provinces where the proportion of colonies is larger in human-made settings.

We found some significant differences in the proportion of colonies found in natural habitat across regions, and the magnitude of those regional differences has changed between the historical and the current dataset ($\chi^2_3 = 74.92$, $P < 0.001$). The proportion of colonies found in natural habitat increased over time in British Columbia ($z = 8.343$, $P < 0.0001$) and

TABLE 1. Number of Bank Swallow (*Riparia riparia*) colonies in human-made or natural settings reported between 2001 and 2017 in Canada.

Region	Human-made habitat	Natural habitat	Total number of assigned colonies	Number of colonies in unknown habitat
Yukon Territory	50	199	249	2
Northwest Territories	12	41	53	0
British Columbia	65	165	230	20
Alberta	6	59	65	8
Saskatchewan	7	10	17	0
Manitoba	109	48	157	7
Ontario	173	218	391	39
Quebec	150	116	266	6
New Brunswick	28	111	139	4
Nova Scotia	36	52	88	5
Prince Edward Island	4	119	123	4
Newfoundland and Labrador	11	13	24	1
National	651	1151	1802	96

the Quebec–Ontario region (z = 3.562, P = 0.0004), but has not changed significantly in the Prairies (z = −1.336, P = 0.1816) and the Maritimes (z = 1.339, P = 0.1806; Figure 1).

Discussion

Our more recent data from 2001 to 2017 indicate that a larger proportion of Bank Swallows now nest in natural habitats than in human-made habitats on a national scale, whereas the reverse was apparent based on Erskine's historical data from 1955 to 1971 (see *Sources of bias* below). The proportions of colonies suggest a recent reversal from the historical occupancy of these two nesting habitats. The switch to natural nesting habitats is stronger when all provinces and territories are considered, with a proportion of 63.9% of colonies in natural settings. However, this proportion must be considered in light of the regional distribution of the Bank Swallow breeding population. In comparison to Erskine's (1979) historical data, the probability of finding Bank Swallow colonies in natural settings increased in the Maritimes, Quebec and Ontario, and British Columbia, but not on the Prairies (Figure 1).

Data from Ontario (Peck and James 1987) and British Columbia (Campbell *et al.* 1997) suggest a transition in the proportions of habitat use over time. Peck and James (1987) found 48% of colonies in human-made settings using the Ontario Nest Record Scheme, compared with 44.2% of colonies in our dataset, which contrasts with nearly two-thirds of nests reported in human-made settings in Quebec and Ontario (Erskine 1979). In British Columbia, the proportion of the breeding population reported in human-made settings decreased from 87% (Erskine 1979) to 59% (Campbell *et al.* 1997) and then to 28.3% (our dataset).

The large change in habitat use over time could be explained by a change in survey efforts in natural and/or human-made settings (bias), and/or a change in the availability of habitat types (actual change). Humans tend to frequent human-modified landscapes and make observations there while natural habitats are often harder to access leading to a historical underrepresentation of natural colonies. Status reports and recovery strategies for Bank Swallows in Canada indicate an overall loss of natural and human-made habitats over the past several decades (COSEWIC 2013; Falconer *et al.* 2016). In Europe, regional Bank Swallow declines have been associated with changes in aggregate resource extraction industry practices (Lind *et al.* 2002; Heneberg 2013). For example, in Italy, inactive quarries do not provide adequate nesting habitat for Bank Swallows if not restored (Masoero *et al.* 2019). In populated areas of Canada, measures to control hydrological regimes and shoreline erosion continue to be implemented and could contribute to the loss of natural nesting habitat (COSEWIC 2013; Falconer *et al.* 2016). On the Atlantic coast, the increased risk of erosion associated with climate change may accelerate shoreline stabilization by heavy engineering structures (Boyer-Villemaire *et al.* 2016) leading to a permanent decrease in nesting habitat.

The availability of human-made habitats has probably changed markedly since the 1970s and reduced the proportion of colonies found in this type of habitat. Notable changes surrounding the aggregate resource industry are attributable to the introduction of regulations on the development and rehabilitation of aggregate pits. In Ontario, the first regulations came into effect in 1971 with the *Pits and Quarry Control Act* (Falconer *et al.* 2016). Under this Act, rehabilitation measures such as slope grading and erosion control were implemented, reducing the habitat available for Bank Swallow (Falconer *et al.* 2016). Legislation was strengthened in 1990 with the *Aggregate Resources Act*, leading to increased rehabilitation measures and the closure of many pits and quarries (Falconer *et al.* 2016). In Quebec, similar requirements were established under the *Environment Quality Act* in 1981 (COSEWIC 2013). In several Canadian jurisdictions, workplace safety standards require the grading of aggregate pit walls at the angle of repose of the sediments, i.e., an angle of 70° or less, reducing the risk of sediment slumping. Following the closure of extraction sites, slopes generally slump and stabilize within a few years. Maintenance and reclamation requirements for aggregate pits likely reduce the period when the slopes are suitable for nesting.

Historically, road cuts were the most common nesting habitat used by Bank Swallows in British Columbia (Erskine 1979; Campbell *et al.* 1997) and in Ontario they accounted for one-quarter of nest occurrences in the 1930s (Falconer *et al.* 2016). In Newfoundland and Labrador, road construction in the 1960s and 1970s is believed to have temporarily created suitable nesting habitat for Bank Swallows (Munro 2009). However, modern industry standards for transportation corridor development require the grading of slopes along roads and railroads (Transportation Association of Canada 2017), diminishing the attractiveness of these sites as nesting habitat. For example, in Ontario, no occurrences of Bank Swallow in roadside trenches have been reported since the 1990s (Falconer *et al.* 2016). Our data indicate a negligible proportion of colonies located in roadside trenches compared to aggregate pits. We note that in the Columbia and Kootenay River valleys of British Columbia, some road and railroad cut faces have been occupied by Bank Swallow colonies for several

decades (Campbell *et al.* 1997) despite the lack of historical human intervention to create or enhance vertical walls along the railroads. It appears that the nesting habitat of colonies historically assigned to human-made habitat can be maintained naturally over several decades in the presence of wind or rain erosion. For comparison with historical records, we assigned such occurrences to human-made settings. However this habitat may be considered in the future as a type of natural habitat (e.g., because a railway company may have incidentally enhanced Bank Swallow habitat that was previously there) and receive a similar level of protection as other natural nesting habitats.

Finally, the increase in the proportion of Bank Swallows nesting in natural settings does not necessarily represent an absolute increase in the number of birds in this type of habitat. In Ontario, monitoring of colonies in natural settings shows that the long-term variation in colony size does not reflect the provincial decline in the Bank Swallow population suggested by Breeding Bird Survey data (Falconer *et al.* 2016). Data from the Breeding Bird Survey, a roadside survey, are probably very sensitive to changes in the availability of Bank Swallow human-made habitat for nesting. Our results suggest that a transition of the breeding population from human-made to natural settings would maintain colony size in natural settings despite the sharp decline in the population at the provincial level since the 1970s.

Sources of bias

Our study updates the previous national study (Erskine 1979) on the use of natural versus human-made nesting habitats by Bank Swallows in Canada. Our analysis includes fewer unassigned colonies to habitat (5.1%) than Erskine's (1979: 29%). Furthermore, we consider our assignment to habitat type to be very robust, because occurrences had to be spatially precise and were assigned based on both written descriptions and aerial image overlay. Erskine (1979) suspected a bias in favour of human-made habitats in the nest record schemes because Bank Swallow colonies are more easily accessible in human-made settings than in natural settings. Such an inventory bias is probably less important in our study for two reasons. First, our data come from an exhaustive search of data sources in Canada that includes diverse and flexible observation methods, some of which allow confirmation of nesting at a distance from the colony. In addition, we suspect that a greater effort to survey natural colonies was made in the years 2001 to 2017 compared to the nest records analyzed by Erskine (1979). During the second breeding bird atlases, a greater emphasis on recording breeding occurrences in less accessible areas might have increased the number of recorded colonies in natural settings compared to nest record scheme data collected prior to 1979. Despite this increased survey effort, occurrences of Bank Swallow colonies are likely to be underrepresented at the northern portion of the species' range.

The substantial decline of the Bank Swallow population in Canada since the 1970s may have prompted more colony surveys in natural settings than in human-made settings. Six data sources in our dataset reported only natural setting occurrences, compared to a single source reporting observations in only human-made settings. It is possible that colonies in natural settings are better represented in recent data, whereas they were underrepresented historically, providing a more accurate picture of recent nesting habitat use. The increased survey effort may also have led to the identification of colonies in human-made habitat that are difficult to access. For instance, in southeastern British Columbia where human-made habitat was created by a railroad, several colonies were only recently identified because they are in a relatively inaccessible location requiring boat access. These potential sources of bias should be kept in mind when interpreting any of the proportional changes we presented between historical and recent time periods.

Conclusions and implications for conservation

Canada is responsible for conserving the nesting habitats of nearly 400 migratory birds, including Bank Swallow, which has one of the steepest population declines in recent decades. Protection of Bank Swallow nesting habitat is essential for this species' conservation (Howie 2015; Falconer *et al.* 2016), although its limiting factors are still not well understood (Falconer *et al.* 2016; Berzins 2020). Historical evidence suggests that Bank Swallow has expanded its range in Canada as a result of the development of aggregate pits and transportation corridors (Erskine 1979; Bols 2017) and the conversion of forest habitat to open foraging habitat (Erskine 1979; Campbell *et al.* 1997). Across Canada, a substantial proportion of Bank Swallows continue to nest in human-made settings that, according to our data, remain the dominant nesting habitat in Manitoba and Quebec. Human-made habitats are conducive to nesting only through continuous intervention that maintains vertical or near-vertical faces (Hjertaas 1984), so the recovery of Bank Swallows should not be based on the long-term maintenance of this type of habitat at broad scales. Faced with limited conservation resources, the protection and maintenance of suitable faces in human-made settings could be counterproductive if these measures are implemented at the expense of the protection and rehabilitation of natural nesting environments.

In existing human-made habitats occupied by Bank Swallows, beneficial management practices can

support the recruitment of individuals into the population by minimizing colony disturbance and the risk of incidental mortality. Inactive or abandoned extraction sites are attractive nesting habitats for Bank Swallows, but colonies may be disturbed or destroyed by the presence of all-terrain vehicles or walkers (COSEWIC 2013). Aggregate pit managers can play a key role in Bank Swallow conservation by implementing beneficial management practices (OMNRF 2017; ECCC 2022), but also by restricting public access to these sites. Known nesting sites in human-made settings should be monitored by authorities to enforce prohibitions under the *Migratory Birds Convention Act, 1994* and the *Species at Risk Act*.

Our study, however, shows that preservation of natural nesting habitats is critical to the recovery and conservation of Bank Swallows in Canada. The availability of natural nesting habitat may have decreased in recent decades, although Erskine (1979) estimated that human activities had a negligible influence on the availability of natural nesting sites. With increasing levels (and different types) of human recreational activities occurring on water bodies, we recommend that further work assess how these activities might negatively impact natural colonies. For instance, wake surf boats have been observed to travel close to colonies in British Columbia (R.D. pers. obs.). The boats produce a large wake (for surfing) that may be eroding banks at an alarming and unnatural rate during the breeding season, which may be causing nests to fail when banks erode.

Potential effects on nesting success resulting from these types of recreational activities are unknown. Moreover, human modifications of the environment through shoreline and coastal erosion control measures, hydroelectric development, and the construction of water-level control structures reduce the availability or quality of natural nesting habitat in Canada (COSEWIC 2013; Falconer *et al.* 2016; Bols 2017). Shoreline and erosion control that account for the needs of Bank Swallows could help to maintain adequate nesting habitat for the species in Canada over the long term. In California, shoreline rehabilitation through the removal of erosion control measures on the Sacramento River has been associated with an increase in Bank Swallow population viability (Girvetz 2010). Similar analyses would help guide shoreline erosion control measures to maximize the viability of Bank Swallow populations in Canada.

In coastal areas and shores of the Great Lakes where light engineering or interventions without hard structures are preferred (Boyer-Villemaire *et al.* 2016), conservation of Bank Swallow nesting habitat may be part of the solution to climate change adaptation. For example, new infrastructure could be built at a greater setback distance from cliffs occupied by Bank Swallows, the presence of which indicates active erosion processes, rather than implementing costly erosion control measures. Regarding human-made habitats, we recommend that further work include a spatial analysis of regional population changes relative to changes in aggregate pit availability. Finally, to ensure effective monitoring of the breeding population of Bank Swallow in Canada and to facilitate subsequent analyses, we recommend that Bank Swallow colony observations include the number of active nests and a precise description of the type of nesting habitat. We encourage the scientific community to determine nesting habitat use in the rest of the North American nesting range, particularly at a scale that would allow an assessment of the impact on population trends. Such an effort would contribute to a better understanding of the causes of the decline in the Bank Swallow population.

Author Contributions

Writing – Original Draft: N.P. and M.C.; Writing – Review & Editing: N.P., J.E.A., R.D., and M.C.; Resources: J.E.A. and R.D.; Methodology: M.C.; Formal Analysis: M.C.; Funding Acquisition: M.C.

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Supplementary Materials:

Figure S1. Aerial images with centre representative of the habitat types assigned to Bank Swallow (*Riparia riparia*) occurrences for human-made settings (a), natural settings (b), and unknown settings (c) and (d).

Table S1. Confirmed nesting occurrences of Bank Swallow (*Riparia riparia*) recorded from 2001 to 2017 with associated bird conservation region, province or territory, and nest habitat type.

Table S2. Number of Bank Swallow colonies reported during the 1955–1971 (transformed from Erskine 1979) and 2001–2017 periods in anthropogenic, natural or unassigned settings in the Maritimes, Quebec and Ontario, the Prairies, British Columbia, and nationally (excluding Yukon, Northwest Territories, and Newfoundland and Labrador).