Golden's Tree Swallow Nesting Box Project

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Prepared by: Rachel Darvill, B.Sc., M.Sc., R.P.Bio
Goldeneye Ecological Services
racheldarvill@gmail.com
Contract biologist to Wildsight Golden

goldeneye
ECOLOGICAL SERVICES

wildsight
golden

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Executive Summary

The Golden Tree Swallow Nesting Box Project was launched in 2025 to support declining populations of Tree Swallows (*Tachycineta bicolor*)—aerial insectivores facing regional and continental population declines—by enhancing local breeding habitat and contributing to natural mosquito control efforts. The initiative involved the installation of 20 nest boxes across three wetland-adjacent sites in Golden, BC: Edelweiss Slough, the Golden Airport, and Reflection Lake. The project also aimed to raise public awareness and engage community volunteers in swallow conservation monitoring.

Monitoring took place from April to July 2025, with contractors and trained volunteers conducting regular checks on nest box activity following established Tree Swallow monitoring protocols. Key breeding metrics were recorded, including dates of nest building and egg laying, clutch size, hatch and fledge dates, and fledgling success.

Key Results:

- 85% of nest boxes (17 out of 20) were used to some extent by Tree Swallows during the breeding season.
- 12 boxes hosted Tree Swallow eggs, 11 boxes had chicks, and 10 boxes successfully fledged a total of 43 Tree Swallows.
- Clutch sizes averaged 5 eggs, with 74% hatching success and 93.5% fledgling success among hatched chicks.
- No fledglings were produced at Reflection Lake, highlighting the potential for further investigation into site-specific factors.
- Other species, such as Eastern Kingbirds and Black-capped Chickadees, also made use of the nest infrastructure at Edelweiss Slough and produced fledglings at the nest boxes.

The success of the project in terms of high occupancy and fledgling rates in the first year demonstrates the value of nest boxes in supplementing natural cavities lost due to lost habitat (tree cavities).

Recommendations:

- Expand the project by installing additional nest boxes and continuing monitoring.
- Broaden the program to include conservation goals for other aerial insectivores (e.g., dragonflies, nighthawks, swifts) through habitat enhancement, citizen science, and/or public education about these species.
- Collaborate with current community bat programs to help boost bat populations.
- Promote insect-friendly landscaping practices to increase habitat that supports insectivorous species.
- Foster partnerships with local landowners, schools, Indigenous communities, and government bodies to increase conservation impacts.

The 2025 Tree Swallow Nesting Box Project represented a low-cost, community-engaged conservation model with the dual benefits of species support and pest control. With continued monitoring and expansion, it can serve as a model for broader aerial insectivore recovery efforts in the Columbia Valley and beyond.

Table of Contents

Table of Figures

List of Tables

1.0 Introduction

Tree Swallows (*Tachycineta bicolor*) are small migratory songbirds widely distributed across North America, known for their iridescent blue plumage and agile flight. These insectivorous birds primarily feed on flying insects and are commonly found in open areas near water, including wetlands, meadows, and agricultural lands. In British Columbia (BC) and across Canada, Tree Swallows are considered a species of Least Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). However, their populations—along with those of most other aerial insectivores—have shown population declines in recent decades. Tree Swallows are not facing alarming population trends like close relatives the Bank Swallow (*Riparia riparia*) and Barn Swallow (*Hirundo rustica*), but BC Breeding Bird Survey data have shown that Tree Swallow populations are experiencing a gradual decline (Ryder, J.M., 2015). That decline is more pronounced in BC compared to the rest of Canada (Ryder, J.M., 2015).

Avian aerial insectivores, which include swallows, swifts, nightjars, and flycatchers, represent one of the most rapidly declining bird groups in North America. Widespread population declines have been attributed to a combination of factors: loss of insect prey due to pesticide use and climate change, loss of nesting habitat, and challenges encountered during long migratory journeys (Spiller & Dettmers, 2019). While Tree Swallows remain relatively common in some regions, including Golden, they are not immune to these pressures. For Tree Swallows, and other aerial insectivores, long-term conservation requires proactive measures.

Golden's Tree Swallow Nesting Box Project was initiated to create artificial breeding habitat to help boost the population of nesting Tree Swallows in the Golden area, and also in response to concerns over the mosquito population causing a significant annoyance. Boosting populations of aerial insectivores can help with natural mosquito control, which could also help reduce the reliance of the larvicide Bti (*Bacillus thuringiensis subspecies israelensis*). Bti is not well studied, but is generally considered an environmentally-safe and target-specific product. However, a growing body of research makes links to impacts in food-web effects at higher trophic levels, e.g., with dragonflies, swallows, nighthawks, bats, frogs, etc. (e.g., Belousava et al., 2021; Bruhl et al., 2020; Jakob, C., & Poulin, B., 2016; Madelaine, et al., 2025; Poulin, Tétrel & Lefebvre, 2022a; van Nieupoort, J.C., 2025). While mosquitoes are not generally a primary food source for Tree Swallows, they do consume them.

Natural nesting cavities—typically found in old or dead trees—are increasingly removed due to land use changes, urban development, and removal of standing deadwood. By installing and monitoring artificial nesting boxes, the project aimed to provide supplemental nesting opportunities for Tree Swallows and increase the population of this aerial insectivore. To determine the effectiveness of the nest boxes we collected data on reproductive timing and nesting success. This report presents the outcomes of the 2025 Golden Tree Swallow Nesting Box Project, documenting its implementation, monitoring results, and key insights for future

conservation and habitat enhancement efforts to boost populations for an aerial insectivore species in the region.

2.0 Methods

2.1 Nest Box design and installation

The locations for installation of twenty nest boxes in Golden were chosen based upon accessibility to town, placement on public land. They also needed to be in close proximity to water in open habitat to satisfy Tree Swallow breeding habitat requirements. Sites were chosen to maximize access to aerial insect foraging zones and to compensate for the scarcity of natural cavities at those locations. Three sites were selected in open habitats near wetlands, riparian corridors, and communal green spaces – Reflection Lake, Edelweiss Slough, and the airport. Permission was sought and provided by the Town of Golden to install nesting boxes within their land jurisdiction. Nest boxes were constructed by a local contractor (Don Stenner Cabinet Maker) following proven design guidelines available through a trusted organization dedicated to learning about, creating and managing tree swallow nest box projects (Tree Swallow Projects, n.d.). They offer comprehensive, research-backed guidance on various aspects of nest box design, installation and maintenance (Tree Swallow Projects, n.d.).

Boxes were built with hinged doors for easy maintenance and drainage, with ventilation holes under the roof (figure 1). Sides that swing open for easy checking of box contents and cleaning were used; the doors open at the top and swing down. Roofs slope down with overlapping sides and fronts. The interiors were unpainted or unstained. The boxes were made of rough-cut plywood (exterior-grade only) no less than 1/2" thick. Entrance holes were 1-3/8" to 1-1/2" to keep larger birds out. This reduced exposure to rain and makes it harder for predators to reach inside. Nest boxes were designed with predator guards, which were baffles (stovepipes) mounted below the box to prevent climbing predators (figure 1). All boxes were placed on free standing poles with the predator guards in place. The poles were duct pipe purchased locally in Golden; black 1/2" x 21' pipe which came in 21' lengths (figure 1). Those poles are smooth, metal poles that are hard for predators to climb. Predator guards were 8" 30ga galvanized duct pipe in 5' lengths.

Since nestlings have been known to overheat in nest boxes, ten of the 20 boxes were built with heat shields, which are 1/8" plywood 'shields' installed on all four sides and the top of the box (figure 1). Two different boxes (one with and one without heat shields) were constructed to see if there was a difference in nest successes between the two box types. Perches were added above each box (figure 1). The known benefits of perches are that Tree Swallows often use them to rest, preen, and closely guard their nest. The perch can also help them defend their territory more effectively. Nest box entrance holes can't be seen from these perches. They offer no physical advantage for avian or mammalian predators. As best as possible, the boxes were placed away

from trees, fences, or structures predators can launch from. Boxes were spaced 30 meters apart, replicating previous BC protocols that balanced occupancy potential with territorial spacing.

Figure 1. Tree Swallow nesting box installed at Reflection Lake.

2.2 Monitoring Protocol

The monitoring period spanned from April 23, 2025 to July 18, 2025, coinciding with the breeding season for Tree Swallows in southeastern BC. Volunteers were trained to conduct systematic checks approximately every 3–7 days (depending on the stage of the nest), aligning with protocols used in the Tree Swallow Ecology Project conducted by the Alaska Swallow Monitoring Network (Alaska Songbird Institute, n.d.). We modified this protocol slightly and also created a modified data form. Volunteer training included guidelines to minimize disturbance during nest visits. Boxes were inspected using gentle visual observation; due to their accessible mounting height (≤5.3 feet), stepladder assistance was occasionally necessary. Project contractors were in continual communication with volunteers about nest checks.

During each inspection, volunteers or project contractors recorded the following: presence or absence of occupancy (nest building or eggs present), date of the first egg laid/clutch initiation (assuming one egg per day if discovered mid-laying), clutch size (maximum eggs countable over consecutive visits), hatch date, hatching progress (through nestling counts and estimated hatch date), fledge date and fledging outcome (number of chicks fledged). After an egg was seen in a box, the monitoring frequency changed according to what stage the birds were at. For instance, after an egg was found, active nests were checked every three to five days, but no more than once every three days since a bird could abandon their nest with too much disturbance. Once incubation began, nests were not checked for at least seven days to avoid disturbance during that sensitive time. Once chicks hatched, nest boxes were not opened after day 12 to prevent premature fledging. Beginning on day 16, each nest was checked for fledglings by viewing the box from a distance to see if chicks were still present in the box, or not.

Details on each site visit were recorded, including start time, end time, temperature, precipitation, cloud cover, wind speed, observer name and also notes. Any additional field observations were also collected, e.g., adults in the area, use of perches on boxes. Nest contents (old nests, unhatched eggs, deceased nestlings) were documented and post-fledging cleaning was done on July 30, 2025 to minimize parasite build-up for future seasons. All field observations were sent to program contractors and digitized.

3.0 Results

Seven nest boxes were installed at Edelweiss, eight installed at the airport, and five at Reflection Lake. The frequency of visits to the nest boxes varied according to how many boxes were active at each site, but also varied due to asynchronous nest building and egg laying. Monitoring took place between April 18th to July 18th. At Edelweiss Slough nest box monitoring took place over 35 days, 35 days of monitoring at the Golden airport, and 25 days of monitoring at Reflection Lake. Six people were involved with monitoring. We recorded the dates for clutch initiation and completion, hatch dates, and predicted fledge dates (table 1). The data was reviewed nearly every day during the breeding season, to ensure key dates (clutch completion, hatch date and fledge date) were accurately captured. In total, there were 336 data records made for next box checks.

On April 23rd some nesting material was already seen in some of the boxes, but the first egg was not laid until May 27th (table 1). The total number of eggs laid was 62; 46 of those hatched (74% of eggs hatched) (table 1). Causes of egg mortality were unknown. The average clutch size was five eggs per nest, but the range was three to six eggs. The first hatch date was between June 13-15th with the average hatch date June 16-17th (table 1). The hatch date ranged from June 13 to June 30th. The average brood size was four, and it ranged from three to five chicks (table 1).

Of the 20 available nest boxes, 17 (or 85%) had at least some level of use by Tree Swallows. Twelve boxes had eggs, 11 of those boxes had chicks, and 10 of those boxes produced 43 fledglings in total (table 1). No boxes at Reflection Lake produced fledglings, although one nest had unhatched eggs and one box had chicks, but they did not survive (table 1). One additional box at Reflection Lake had feathers inside it (initial nest building), but it did not progress beyond that. Only one box at Edelweiss did not produce fledglings, but a pair of Eastern Kingbirds built a nest on top of that nest boxes' predator guard, which produced an undetermined number of fledglings (table 1, figure 2). At another box at Edelweiss (Box 1), a pair of Black-capped Chickadees produced a successful clutch early in the season prior to being occupied with nesting Tree Swallows, which also produced fledglings.

At the airport, four boxes had eggs and all of those produced fledglings; the remaining four boxes at the airport had some degree of partial nests built in them. None of the nest boxes had second broods. There was no notable difference in nest successes between the two box types (ones with heatshield and those without), but the weather was not unseasonably hot this year. The percentage of boxes used was 85%, and 50% of the boxes produced fledglings. The percentage of eggs that hatched was 73%; 68.3% of eggs laid fledged. The percent of nestlings that fledged was 93.5%. Causes of egg or chick mortality were unknown.

To increase public knowledge about Tree Swallow conservation and this pilot initiative, a website was produced for this project and eight social media posts were made (Wildsight, n.d.). Additionally, three eBlast messages were sent via email to all Wildsight Golden members. A few

community members reached out to the author about wanting Tree Swallow nest boxes on their property and were looking to purchase them.

Table 1. Summary of data from Golden's Tree Swallow Nest Box Project in 2025.

Box #	Location	Aspect	Easting	Northing	Heat Shield Y/N	Clutch Initiation Date	Total egg count	Clutch Completion Date	Incubation Date	Hatch Date	Total Hatchling Count	Fledge Date	Fledged (Y/N)	# of fledglings	Results of box clean out (July 30, 2025)
1	Edelweiss Slough	SE 138°	501570	5685407	N	June 4	4	June 7	June 6	June 20 -21	4	July 11-12	Y	4	Empty nest
2	Edelweiss Slough	N 17°	501570	5685431	N	May 28	6	June 1	June 1	June 26-30	5	July 16-18	Y	5	Empty nest
3	Edelweiss Slough	S 218°	501560	5685460	Y	May 29	6	June 3	June 2	June 16-17	5	July 7-8	Y	5	Empty nest
4	Edelweiss Slough	N 18°	501553	5685520	N	May 30	5	June 3	June 2	June 16-17	3	July 8-11	Y	3	2 old eggs
5	Edelweiss Slough	N 20°	501553	5685521	N	May 27	5	May 31	May 30	June 13-15	4	July 5-6	Y	4	Empty nest
6	Edelweiss Slough	S 180°	501518	5685533	Y	May 30	5	June 3	June 2	June 16-17	4	July 8-11	Y	4	1 old egg
7	Edelweiss Slough	S 180°	517724	5664566	Y	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Empty box, but EAKI nest on predator guard.
8	Reflection Lake	S 180°	503756	5681563	Y	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Empty box
9	Reflection Lake	S 180°	503781	5681548	N	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Empty box
10	Reflection Lake	S 180°	503799	5681517	Y	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	few feathers
11	Reflection Lake	S 180°	503810	5681492	N	June 26	4	June 28	June 27	n/a	n/a	n/a	n/a	n/a	3 old eggs and what looked like part of a 4th egg with yolk
12	Reflection Lake	S 180°	503826	5681466	Y	June 1	5	June 5	June 4	June 16-18	3	dead chick, other chicks missing	n/a	n/a	Empty box
13	Golden Airport	S 180°	501388	5682594	Y	May 30	6	May 30	June 3	?	5	July 7-8	Y	5	Empty nest
14	Golden Airport	S 180°	501390	5682582	N	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Some pieces of grass.
15	Golden Airport	S 180°	501404	5682553	Y	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Some grass in box.
16	Golden Airport	S 180°	501413	5682521	N	June 10	6	June 15	June 14	June 26	5	July 16-18	Y	5	Empty nest
17	Golden Airport	S 180°	501423	5682498	Y	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Ring of grass with feathers.
18	Golden Airport	S 180°	501428	5682476	N	June 7	5	June 11	June 10	June 23-25	3	July 14-16	Y	3	Empty nest
19	Golden Airport	S 180°	501437	5682448	Y	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Some pieces of grass.
20	Golden Airport	S 180°	501444	5682424	N	May 31-June 4	6	?	?	June 15	5	July 8	Y	5	1 dead chick

Figure 2. Eastern Kingbird seen sitting on its nest, which is built on top of a predator guard at nest box located at Edelweiss Slough.

4.0 Discussion and Recommendations

Golden's Tree Swallow Monitoring Project was successful in its first year of implementation. Twenty nest boxes were made locally using the best design guidelines available. Tree swallow habitat was created in areas where it lacked and volunteers were involved with monitoring. The number of boxes used (i.e., at least initial nest construction) by Tree swallows was 85%; 50% of the nest boxes produced 43 Tree Swallow fledglings in total. None of the Tree Swallow boxes at Reflection Lake produced fledglings. Investigating potential causation into why no boxes were successful there was beyond the scope of this project, but it does warrant future investigation, especially if none of the boxes at Reflection Lake are successful in 2026.

Tree Swallows are aerial insectivores and their diet has a high degree of variation. Studies have reported they consume large amounts of various species in the order Diptera (true flies including midges, crane flies, black flies, etc.), including some pest species like house flies and mosquitoes (Winkler et al., 2020). There are approximately 150,000 species in the Order Diptera in BC (Yeates & Wiegmann, 2005). Tree Swallows also consume large amounts of Odonata (dragonflies and damselflies; 2-82% biomass), Ephemeroptera (mayflies; 0-33% biomass), and Trichoptera (caddisflies; 0-29% biomass) (Winkler et al., 2020). To continue to increase breeding habitat availability for Tree Swallows, additional boxes should be installed. All nesting boxes should be monitored for their effectiveness. Monitoring should continue to involve community volunteers; it brings people a sense of enjoyment and it helps increase community awareness about the natural environment.

A number of additional actions could be taken to increase habitat for a diversity of aerial insectivores (e.g., additional swallow species, swifts, nightjars, bats), many of which are facing population declines. A larger aerial insectivore program should integrate science-based conservation practices, public outreach, habitat enhancement, and collaboration with stakeholders such as private landowners and municipalities. Much research and conservation action in the region has already occurred with Barn and Bank Swallows through the Upper Columbia Swallow Habitat Enhancement Project (Darvill, 2025) and also with bats (e.g., Lausen, Gates, Low & Rae, 2023). Future aerial insectivore programs should further collaborate. Additionally, more could be learned about some aerial insectivore species we know very little about.

Program components for boosting habitat and conservation initiatives for a larger aerial insectivore project could involve research and monitoring (e.g., baseline surveys to assess aerial insectivore populations (e.g. Black Swift or dragonflies), additional habitat enhancement (e.g., install additional nest boxes), conservation designations (e.g., Wildlife Habitat Areas established), promoting insect-friendly landscapes (e.g., wildflower gardens), discourage overly manicured yards or pesticide land management through public education and outreach (social media, presentations, install interpretive signage), host community workshops for installing nest boxes

on private land, partner with schools and Indigenous communities for citizen science involvement. Developing partnerships and collaborations could occur, including work with farmers and ranchers to encourage wildlife-friendly practices, and working with municipal governments for bat/bird-friendly building codes or 'eco-certifications' for aerial insectivore friendly landowners. The Golden community could have pilot sites and demonstration projects and use those as ‘living labs’ to demonstrate how insectivore-friendly management improves biodiversity, which can help reduce mosquito populations.

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