

Alaska Songbird Institute

Swallow Ecology Project Manual



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Purpose of this manual

This manual is designed to:

1. provide institutional memory to the Fairbanks Tree Swallow nest monitoring projects;
2. aid in continuity and consistency of data collection and management;
3. collate scientific and educational materials related to the project; and
4. provide a resource for new staff and volunteers



Project Rationale

Tree Swallows (*Tachycineta bicolor*) and Violet-green Swallows (*Tachycineta thalassina*) are neotropical migratory songbirds found throughout North America. Alaskan swallows are close to the northern limit of their breeding range, making it an ideal location to look at differences in their life histories in arctic/subarctic ecosystems, as well as responses to changing environmental conditions.

Swallows are aerial insectivores, a guild including swifts, swallows, flycatchers, and nightjars that is experiencing steep decline. (A guild is a group of species utilizing the same resources in a similar way, even though they themselves may not be closely related.) An estimated 32% of aerial insectivores (~160 million birds) have been lost across taxa since 1970,¹ and declines are more acute in species that migrate long distances compared to those that migrate short distances.² Declines are widespread among this group and are influenced by multiple causes. Habitat has been lost to industrial, agricultural, forestry, and urban land-use. The widespread use of pesticides, including neonicotinoids, impacts food availability by decreasing the numbers of flying insects. Neonicotinoids are particularly harmful because they are systemic, persisting in plant tissue, groundwater, and soils, and they are highly toxic to birds, even in small quantities. Finally, aerial insectivores are impacted by phenological shifts (timing of green up, insect emergence, and migration), and subsequent trophic mismatch related to underlying ecosystem and climate change.

History

Tree Swallow nest boxes were first installed and monitored at Creamer's Field Migratory Waterfowl Refuge in 1994. In 1999 the Alaska Bird Observatory (ABO) began to develop a long-term project on Tree Swallow reproduction and survival at high latitudes. Since the very beginning the project combined research and education, as students and scientists worked together to monitor 12 nests the first year. The project grew to include collaboration with sites at the University of Alaska, Fairbanks (UAF) and Wild Rose Farm (west of Fairbanks). Youth mentoring efforts were formalized beginning in 2007, and the first cohort of high school interns began in 2012. The project ebbed and flowed with student interest and organizational capacity. Data is spotty and inconsistent through these early years.

The Alaska Songbird Institute (ASI) adopted the Creamer's Field and UAF Tree Swallow monitoring sites in 2013 after the closure of the Alaska Bird Observatory in 2012. ASI began to capture and band breeding adults, standardized data collection with *Golondrinas de las Americas* (<http://golondrinas.cornell.edu/>), built a central database for the Fairbanks sites, and archived historical data. That same year, the Alaska Department of Fish & Game added Violet-green Swallow boxes to the Creamer's Field site. These were ultimately not utilized and were taken down and retrofitted in 2018-19.

In 2016, ASI led efforts to establish the Alaska Swallow Monitoring Network, a multi-year, collaborative, statewide effort to standardize field protocols and aggregate data to investigate the impact of large-scale ecosystem change on aerial insectivores throughout Alaska (www.aksongbird.org/alaska-swallow-monitoring-network/). Communities that participated in the network included: Fairbanks, Ester, McCarthy, Long Lake (along the McCarthy Rd, inside Wrangell-Saint Elias National Preserve), Quartz Lake (10 miles north of Delta Junction), Anchorage, Bethel, Ruby, King Salmon, Naknek, and Juneau.

Today, ASI works in partnership with 15-20 students in our youth mentoring and high school internship programs to monitor ~150 boxes at Creamer's Field and UAF from nest initiation through fledging. Breeding adults are captured and banded during the early nestling period, and nestlings are banded at ~11 days. These data are added to a continuously growing record of demographic parameters (vital rates) and nesting chronology in varying conditions. At the same time, it provides a unique and powerful science education resource for youth and teens.

Objectives

- To compile a long-term record of chronology (lay, hatch, & fledge dates), occupancy, success, and productivity of nesting *Tachycineta* swallows in Interior Alaska (primarily Tree Swallows)
- To monitor vital rates with potential to be demographic drivers of local population decline in Tree Swallows, such as clutch size, reproductive attempts, return rates, and hatching, fledging, and juvenile recruitment rates³
- To examine site and mate fidelity by banding breeding adults and nestlings
- To monitor aspects of the ecosystem indicative of bird habitat quality and sensitive to climate change, such as the abundance of aerial insects in proximity to nest sites during the breeding season
- To contribute data to large-scale projects and collaborative efforts
- To provide students and families with engaging and meaningful experiences with scientific research in their community
- To provide conservation-based volunteer and training opportunities, especially for youth and teens
- To build public awareness of aerial insectivore ecology and conservation in Interior Alaska

Annual Research Priorities

These are listed in order of importance to the long-term data set and are meant to help prioritize activities when capacity and/or resources are limited.

1. **Record occupancy and nesting success** at each site. Percent occupancy = number of active nests/number of available boxes. Nesting success = number of active nests that fledged at least one chick/total number of nests with at least one egg laid.
2. **Record nest chronology.** Lay, hatch, & fledge dates for each active nest. See protocols for details.
3. **Capture and band all breeding females, and opportunistically band males.** See protocols for details.
4. **Band all nestlings.** See protocols for details.
5. **Capture and band all breeding adults.** See protocols for details.
6. **Monitor the abundance of aerial insects** in the nesting area to assess potential changes in food availability throughout the nesting season



Age in days from left to right:
0; 6; 10; and 20 (An adult is
atop the pole.)



Fairbanks-area Study Sites:

Creamer's Field: 100 Tree Swallow nest boxes located around the front fields, Farmhouse, and Barn.

University of Alaska, Fairbanks: 51 Tree Swallow boxes located in the T-Field (9) and Potato Field (7) on upper campus, on the slope adjacent to the UAF Botanical Gardens (5), and in the cultivated fields of the UAF Experimental Farm located along Tanana Drive (30).

The actual number of boxes available at each site in any given year can vary. Boxes and posts are often damaged over the winter and the ground may not thaw in time to repair for the coming season. It is important to calculate and record the actual number of available boxes each year at each site.

Also note that a significant number of nesting boxes exist nearby at the Tanana Lakes Recreation Area, Fort Wainwright, and at many private residences and local farms. Because of their proximity to our sites, it is highly likely that our banded birds may nest in any of these locations.

Educational Philosophy

ASI's Swallow Ecology Project is a unique opportunity for kids, teens, and community members to engage in meaningful, real-life experiences with scientific research. It is designed with a multi-tiered mentoring structure where younger students, teens, university students, and scientists work and learn together. Everyone is an active participant in the everyday work of field biology, not just observers. Many students progress through the mentoring program to become high school and even university level interns. Although this program focuses on youth and teens, adult community volunteers sometimes assist with site maintenance, nest monitoring, banding, and act as mentors.

The data we collect together is important for bird conservation efforts. However, equally as important are our efforts to help people, especially youth and teens, connect with wild birds and their habitats and to deepen their understanding of how our world is changing and how research contributes to conservation. Such "hyper-local" educational strategies provide relevance and personal connection to global conservation challenges that can often feel distant and overwhelming. This is shown to be a highly effective science and environmental education strategy!¹⁴

The **Youth Mentoring Program** serves ~10-15 students ages 10-16 each year. This is a small, individualized program, and student responsibilities vary with level of commitment, skill, & maturity. Youth are asked to commit at least four hours/week throughout the nesting season; most volunteer much more. Students maintain their own field notebooks and generally do not work with nests or birds unsupervised. These students are learning to systematically record their observations and to carefully record data. Most students will learn to handle adult and nestling birds, however, this is at the group leader's discretion. Bird safety is paramount, and the overall demeanor, maturity, and commitment level of each student should be considered.

The **High School Internship Program** serves ~ 5 students ages 14-18. Interns volunteer a minimum of 85 hours/season, and may earn a ~\$500 stipend upon completion of their internship requirements. Interns are responsible for working with the project lead to set and maintain their schedule. They also set and work towards individualized goals for their internship. Interns maintain field notebooks and receive more intensive training in standardized data collection techniques and handling wild birds. Some high school students are able to monitor nests independently after adequate training and many learn the basics of banding adult and nestling birds. An experienced bander should always be present when students are banding. Interns also assist with data entry and proofing. Returning interns often work on individual research or education projects.

University Internships are sometimes offered for credit and/or stipends. Goals, timeframe and expectations are determined on an individual basis.

Student schedules are usually maintained in a google calendar. Project leads list field times and students sign up for the dates/times that work for their schedules. Registration forms, intern agreements, health forms, liability waivers, photo releases, and evaluation forms are listed in the appendix.

A Note on *Golondrinas de las Americas*:

Golondrinas de las Americas (<http://golondrinas.cornell.edu/>) was a network of researchers from Alaska to Argentina dedicated to studying swallows within the genus *Tachycineta*. It was supported by the National Science Foundation from 2007-2012 and coordinated by Dr. David Winkler at Cornell University. Although the project is no longer supported, it established standardized protocols and catalyzed many continental and international collaborations that continue to the present day. Our project is rooted in this effort. The website still exists and can be a helpful resource.

With the exception of what is noted below, our protocols are compatible with other sites using the *Golondrinas* program. There are a few exceptions:

- 1) *Golondrinas* protocols monitor nest construction and code feathers present in the nest throughout the season. The Fairbanks sites are both migratory stopover points for thousands of Sandhill Cranes and waterfowl. This results in an extreme abundance of feathers available for nest building, so our projects have historically not included these nest measurements.
- 2) Our adult banding sheets include additional measurements such as wing chord and feather molt/wear. This is for consistency with historic datasets and other ASI projects.
- 3) Due to our location at the northern extreme of the Tree Swallow range, our birds are generally larger in size, and timing is very compressed. Our nestlings also grow faster than birds in more southern locations. Our protocols have been adjusted over time to reflect these differences. For example, chicks are banded at day 12 and generally should not be disturbed after this point for risk of premature fledging. Data collected on chicks also include additional morphological measurements. These have varied slightly over the duration of our project.
- 4) The most significant difference in data collection is fat scoring. For simplicity and integration with other data sets, our protocols use the fat scale established by the Alaska Bird Observatory. This is a simple 0-7 scale that incorporates overall fat in all areas. *Golondrinas* protocol codes fat in nine different locations with four different scales. These are clearly outlined in the *Golondrinas* handbook, still available on the website.



Tree Swallow (*Tachycineta bicolor*) Ecology Notes⁵

Tree swallows are neotropical migrants that nest throughout North America and winter in the southern U.S., Mexico, and Central America. They are found in open habitats and woodland edges, especially near water.

Tree Swallows from Creamer's Field were tracked with geolocators in 2013-14 and were logged migrating across central Canada, down the Mississippi River Valley and across the Gulf of Mexico to the Yucatán Peninsula into Central America.

Tree Swallows are aerial insectivores. They eat mosquitoes, as well as Diptera (true flies), Odonata (dragonflies, damselflies), Ephemeroptera (mayflies), and Trichoptera (caddisflies). We have observed our Fairbanks swallows eating a wide variety of these, as well as moths, bees, and beetles. Tree Swallows may be more adaptable than other insectivores and eat berries or vegetation when insects are not available. Although they are known to forage at heights upwards of 100 meters, during inclement weather we have observed them foraging low along the fields and have recorded them eating spiders and terrestrial insects.

*Tree Swallows in Fairbanks have also been known to eat air-breathing, fresh water snails. Shells from two types of snails have been recovered from nests. One is from the genus *Stagnicola*. The other is not yet known. In 2012 & 2013 shells were found in ~20% of nests. Reasons for this alternative food source are unknown and had no significant relationship to timing of lay/hatch/fledge, fitness of female, or nest location (proximity to water).*

(A) Males are iridescent blue above, white below.

(B) Females are green-ish blue above, white below; they become more blue with age.

(C) Some (not all) second year-female are largely brown.

(D) Juveniles are entirely brown above, white below. A gape is often still visible. (This is the soft, stretchy yellow tissue visible at the corners of a young bird's mouth.)

Tree Swallows are cavity nesters, and often use holes excavated by woodpeckers. They will readily use human structures and nest boxes, and they are resilient to disturbance, making them ideal for nest box studies. As a result they are widely studied throughout their range. Tree Swallows can be remarkably faithful to nest locations and it is not uncommon to find banded adults back in the same boxes (or a neighboring box) in subsequent years.

They perform complex courtship flights. Males will fight over mates and nest boxes. They can be polygynous (one male will mate with more than one female). This is not common but is observed regularly at our Fairbanks sites. Although not common, we also regularly boxes with an extra adult associated. This is usually a female, or an adult bird that can not be confidently sexed. Pay careful attention and take good notes!

Nests are constructed of grass and lined with feathers. The size and quality of the nest is often related to age/experience. Clutch size (# of eggs) is 4-7, although we have observed as many as 9 and as few as 3. Most Fairbanks birds will lay 6 eggs in a year with average/good weather. Clutch size is larger and nestling survival is greater when food is abundant. Timing, clutch size, and nestling survival is also related to age/experience. Older birds tend to nest earlier and produce larger clutches.

Both males & females will incubate, although females do so much more often. Incubation lasts 13-16 days; 15 days is most common in Fairbanks. Eggs hatch asynchronously, usually over the course of 24 hours. Young fledge after 16-24 days. Average age at fledge in Fairbanks is 20 days.



A



B



C



D



D

Interior Alaska Swallow Project Timeline*



April—As soon as break up conditions allow, conduct site surveys. Repair and rehang boxes as necessary. Note any posts that need to be replaced when the ground thaws.

Last week of April—Violet-green Swallows begin arriving in Fairbanks as early as 24 April and Tree Swallows often arrive around 1 May. Be sure to note first arrival dates.

First week of May—Swallows will begin scoping out boxes for nest sites.

Second week of May—Nest building begins. Begin checking all nest boxes. Note the day that a nest is begun and completed in your field notebook. Check nests every three days during nest building. Nests can take anywhere from 3-14 days or more to build, and birds may begin build at more than one site before choosing one.

Third/fourth week of May—Many birds are still completing their nests, so it is important to continue to check all boxes. Continue to check boxes at least every third day. (M, W, F works well.) When nests are complete, the females will begin laying. Follow the nest monitoring protocol to record the lay date (first egg) for each nest. **Lay dates in Fairbanks have been recorded as early as 14 May; average is closer to 25 May.** Proceed with caution and minimize disturbance during laying and early incubation. Parents are prone to abandonment early in the nesting process. **No trapping birds during this time!** Females will sit very tight as incubation progresses. If a bird does not get off the nest when the box is opened, experienced staff and interns should be encouraged to sex the bird and read a band, if present. (If the bird is not banded, record it as unbanded.)

Fifth week of May/ first week of June—By this point it should be safe to check only the boxes with active nests. Timing differs year to year, so watch the birds carefully. If you still see active nest building, continue to check all the boxes a bit longer. If you observe a bird on or near a box that you don't have recorded as active, check it! A nest and first egg can appear within a day or two. Run a full check of all boxes again in about a week, and once more later in June, to catch any sneaky, late nests.

First/Second week of June—You should also begin to see eggs hatch around this time, so things get very busy with trapping and banding adults. Calculate expected hatch dates for each nest and check boxes daily beginning at day 14. Incubation time can be longer in cold and rainy weather. **Hatch dates have been recorded as early as 2 June; average is closer to 14 June.** Remember to check again the day after hatch to confirm # of eggs hatched.

Third week of June—Most clutches will finish hatching this week. Adults are easiest to catch between hatch and nestling day 5. This is a very intensive period for feeding, where both adults enter the box with frequency. This week you will also start banding chicks. The window for banding chicks is narrow. In Interior Alaska day 11 is the ideal time. (See the *Nestling Banding Protocol* for more details). **Remember you should not band a chick past 12 days old with consulting the project lead. You should never open a box when the chicks are past 14 days old.** This is a good time to run one last check of all your boxes to catch any late nests you may have missed.

Fourth week in June/ First Week in July—Most clutches will have reached day 11 and be banded by the end of June. Fledge checks begin at nestling day 16. Check all boxes following the *Fledge Check Protocol*. Proceed carefully. Premature fledging can cause mortality.

Second week in July—The season is winding down. Most chicks have fledged. Clean out old nests following the *Nest Clearing Protocol*. Record any anomalies such as the presence of snail shells or other evidence of unusual food sources. Record any chick fatalities.

Third/Fourth Week in July—All but the very latest nests will have fledged by now. Ensure all nests are removed from boxes, data is entered and proofed according to ASI procedure, and any known repairs are made to boxes.

* This timeline reflects an average year. Significant variation can occur in response to weather, timing/intensity of break up, human disturbance etc.

Data Recording & Management

ASI's Swallow Ecology Project is a unique model of community-based research where youth and teens are actively involved, and at times co-leading, the data collection and recording process. It can be extremely helpful to have so many helping hands, and it also requires attention and careful management to ensure the integrity of the data. The key pieces of the Swallow Ecology Project data management plan are: (1) field notebooks (2) nest record sheets (one per box per year), adult banding data sheets, and nestling banding sheets; these are stored together in a site-specific binder for use in the field; (3) electronic data file "AK_TRES-data-template.xlsx" (one per site per year), kept on the ASI shared Programs Drive, TRES folder ; and (4) the compilation data file "FBKS_TRES_ALL" also kept on the ASI shared Programs Drive, TRES folder. This file collates the nest chronology and banding data from all Fairbanks sites from 2015 to present.

Field Notebooks: All students should be given field notebooks and encouraged to use them throughout the season. Teach students how to keep a field notebook. Review what to record, and share your notebook with them. When students are checking nest boxes, ensure at least one person in each team has a field notebook and that they record the data, rather than report it orally. Take the time to teach students how to safely check boxes and record data, and what to do if they encounter a challenge (can't open or see into the box, bird won't get off nest, etc.) Students are often learning how to make and record observations. It is important to remind them to *report only what they actually observe*, even if it might not make sense, or be what they expect. Foster an atmosphere where they feel comfortable asking questions, asking for help, and double checking observations.

Students keep their field notebooks at the end of the season. Ultimately ALL data should also be recorded in ASI staff field notebooks and/or on hard copy nest record and banding sheets. These are archived together.

Here is an example of the data to record in your field notebook during the nest building period. Record the date, time, weather, and the names of everyone on that day's crew. During the nest building period, recording data in your field notebook is sufficient. Record the presence/absence of grass, feathers, and eggs to track the nest building process. As soon as there is an egg, the nest is considered active. Create a nest record sheet. Data from all prior nest checks should be transferred to the nest record sheet.

Box #	Grass	Feathers	# Eggs	Noks
177	0	0	0	
178	0	0	0	chew + air
132	0	0	0	
133	0	0	0	replaced
33	0	0	0	
313	0	0	0	
X1	0	0	0	
333	0	0	0	
312	0	0	0	
311	0	0	0	
310	0	0	0	
27	✓	0	0	
309	0	0	0	Broken
308	✓	✓	0	Dead bee
101	0	0	0	
102	0	0	0	
104	0	0	0	Replaced box
45	0	0	0	Repaired box needs nail hole
304	0	0	0	Squirrel nest w/ baby chewed
305	0	0	0	
306	Moss	hair	0	
303	0	0		chewed
302	0	0	0	chewed, old chickadee nest
301	Moss	hair	7	BOCH.
300-1				
48	0	0	0	broken
108	0	0	0	old
109	0	0	0	nest - drill new hole
110	0	0	0	
316	Moss			
315	0			
130	0			
131	0			rehang
334	0			bird in box
320	0			replaced
130	0			
34	0			
135	0		0	Chickadee nest
135	0	0	0	Bird on Box
316	0	0	0	2811-23389 bird
136	0	0	0	
37	0	0	0	
137	0	0	0	bird, or bo

Box #	Actual Hatch	Banded ♂	Banded ♀	Banded Chicks	Fledge
47	06/12	✓	✓	✓	06/22 ✓
3	06/10	✓	✓	✓	06/20 ✓
158	06/09	✓	✓	✓	06/19 ✓
165	06/08	✓	✓	✓	06/18 ✓
167	06/10	✓	✓	✓	06/20 ✓
174	06/11	✓	✓	✓	06/21 ✓
*159	06/12	NO	✓	✓	06/22 ✓
224					*
173	06/09	✓	✓	✓	06/19 ✓
10	06/10	NO	✓	✓	06/20 ✓
15	06/21	✓	✓	✓	
39	06/11	✓	✓	✓	06/21 ✓
177	06/10	✓	✓	✓	06/20 ✓
33	06/22	✓	✓	✓	06/20 ✓
34	06/11	SN ✓	✓	✓	06/21 ✓
135					
136	06/23	✓	✓	✓	06/20 ✓
37	06/15	NO	✓	✓	06/25 ✓
139					
140					
18	06/12	NO	✓	✓	06/22 ✓
145	06/12	NO	✓	✓	06/27 ✓

In addition to tracking daily field activities and data collection, field notebooks can be a helpful way to summarize observations and organize effort. Consider partitioning your journal into sections that contain charts to help keep up with the seasons events. This can provide a quick reference and a means to double check that all important benchmarks for each nest are completed.

The field journal excerpt at left is a good example of how to summarize these important benchmarks. It ensures these important steps are completed, and acts as a quick reference to see what to prioritize each day. Note that only active boxes are tracked this way, and important reference dates for timing are included (e.g. hatch date, chick banding date).

Data can also be summarized online in a shared google file like the one below, and/or you may replicate the chart in this field journal excerpt online. This aids in sharing information between banders and also serves as a final check that each important step has been completed for every active nest.

Creamer's Field Nest Tracker 2022

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Predicted Hatch Hatched Actual Hatch/Band Parents Parents-Banded Band Chicks Chicks-Banded	First possible Fledge Fledged (date recorded)	In Progress/check: 177, 223, 170 165, 164, 320, -23	1	2	3	4
5	6	7	8	9	10	11
			173, 138-(BCCH), 316 (BCCH)			Tricia
12	13	14	15	16	17	18
8, 101, 106, 130, 132, 166, 308; 334	34, 108, 178	22, 47, 174, 224, 306, 334	15, 20, 26, 43, 104, 110, 139, 141, 145, 158,	27, 122, 127, 160	136	171
33, 2, 120, 8, 101, 130	305 (BCCH), 5 (BOCH)	22, 108, 178, 334	43, 47, 139, 166, 174, 224	15, 20, 26, 306, 404, 110, 145, 158	27, 122	138 & 316 (BCCH)
	106, 132, 308, 334					160
						305
19	20	21	22	23	24	25
Tony, Robert	18, 157	173		33, 2, 120, 8, 101, 130	106, 132, 308, 334	22, 108, 178, 334
171, 136		18		157		
	5			138, 316	X1	
26	27	28	29	30	1	2
Tony						Tricia
173		33, 2, 120, 8, 101, 130	106, 132, 308, 334	22, 108, 178, 334		
43, 47, 139, 166, 174, 224	15, 20, 26, 306, 404, 110, 145, 158	27, 122	160	171, 136	43, 47, 139, 166, 174, 224	15, 20, 26, 306, 404, 110, 145, 158
X1						18

Nest Record Sheets: Each active nest should have a nest record sheet. This serves as a single record of all of the nest checks for each box, as well as summarizes the important dates. Nest record sheets should be printed on rite-in-rain paper for durability in the field. All nest record sheets for a single site are kept in a binder for ease of use in the field. Nest record sheets are also used for entering and proofing nest chronology data.

Adult and Nestling Banding Sheets: A slightly different suite of data is recorded for adult and nestling birds, so it is important to use the correct banding data sheet. Details are included in the adult and nestling banding protocols, and all codes are described on the data sheets themselves. Banding sheets should be printed on rite-in-rain paper and stored in the site-specific binder. These are used for entering and proofing banding data.

Data Entry and Proofing: At the end of the season, data is entered and proofed. Data for each site is kept individually each season in an excel spreadsheet. The template for this is called: AK_TRES-data-template.xlsx. This spreadsheet records the individual nest checks, summarizes the chronology of each nest, includes all the banding data, and also includes a data summary tab. Detailed instructions are included on the last tab of the spreadsheet. Data should be entered by a minimum of two people. Once populated this file should be saved as "Year_site_raw". Once data entry is complete, it is proofed by going through each segment again with the hard copy data. Data should be proofed by a minimum of two people. The file is then re-saved with the file name "Year_site_proofed". Hard copies of all data and ASI staff field notebooks are archived in the project files in ASI's office in the Northern Alaska Environmental Center. Electronic files are stored in the Programs shared drive—TRES—data_all.

The final step is to carefully add the year's data into "FBKS_TRES_ALL" also kept on the ASI shared Programs Drive, TRES folder.

Final note on data collection: It is important for ASI staff to become intimately familiar with the sites. This can not be stressed enough. Invest time in learning where the boxes are, and which boxes are active. Transfer data on a daily basis from your field notebook to the nest record sheets. This is how you will notice inconsistencies and errors that need to be verified. There is often a small window of time where inconsistencies and errors can be verified. You will note that there is considerable repetition in where data is recorded and compiled. This is by design. The season is fast-paced, and the window to catch important benchmarks for each nest is narrow. This is repetition is useful in detecting errors, sorting out inconsistencies, and ensuring nests and birds are not missed.

Online Resources:

Birds of the World - <https://birdsoftheworld.org/> (Use the current ASI log in credentials.)

Golondrinas de las Americas - <http://golondrinas.cornell.edu/>

Tree Swallow Nesting Project- <http://www.treeswallows.org/>

Studies of breeding Tree Swallows at Long Point Bird Observatory-
<http://www.bsc-eoc.org/lpbo/tres.html>



The Birdhouse Network- <http://www.birds.cornell.edu/birdhouse/>

Purple Martin Mentor Program- <http://purplemartin.org/mentorprogram/index.php?loc=ON>

California Partners in Flight Riparian Plan Bird Conservation, Tree Swallow-
http://www.prbo.org/calpif/htmldocs/species/riparian/tree_swallow.htm

References:

¹ Rosenberg, K. V. et al. 2019. Decline of the North American Avifauna. *Science* 365(6461).
<https://www.science.org/doi/10.1126/science.aaw1313>

² Nebel, S., A. Mills, J. D. McCracken, and P. D. Taylor. 2010. Declines of aerial insectivores in North America follow a geographic gradient. *Avian Conservation and Ecology - Écologie et conservation des oiseaux* 5(2):
<http://www.ace-eco.org/vol5/iss2/art1/>

³ Cox, A., R. Robertson, B. Fedy, W. Rendell, and F. Bonier. 2018. Demographic drivers of local population decline in Tree Swallows (*Tachycineta bicolor*) in Ontario, Canada. *The Condor*. 120(4): [DOI: 10.1650/CONDOR-18-42.1](https://doi.org/10.1650/CONDOR-18-42.1)

⁴ Abbasi, Daniel R., 2006. Americans and Climate Change: Closing the Gap Between Science and Action. *Forestry & Environmental Studies Publications Series*. 3. <https://elischolar.library.yale.edu/fes-pubs/3>

⁵ David W. Winkler, Kelly K. Hallinger, Daniel R. Ardia, R. J. Robertson, Bridget J. Stutchbury, and R. R. Cohen. Birds of the World Version: 1.0 — Published March 4, 2020. <https://birdsoftheworld.org/bow/species/treswa>



Tree Swallow Nest Monitoring Protocol

Begin by checking all the boxes at your site. It is important to do this as soon as you can access the boxes, and BEFORE the first Tree Swallow arrives. By May 1, ensure all the nest boxes are: clean and clear of debris; in good condition; and weather-proof (all doors close, top is secure, and there are no leaks). Try to check your nest boxes at the same time of day throughout the season.

Record the date you see the first Tree Swallow at each site in your field notebook.

After the Tree Swallows have arrived, begin checking all the boxes at each site for nest building. Note the date nest building begins and ends in each box. Sometimes swallows may build a nest in more than one box. A nest is considered “active” once the first egg appears. Create a nest record sheet for each active nest. This serves as a record of all nest checks and a data summary of chronology and banding effort for each active nest.

There are a few key dates to catch and record for each active nest.

1. CLUTCH INITIATION DATE

Clutch initiation is the day the first egg is laid. Record this date.

Check active nests at least every third day. More often is ok, but be very cautious. Some birds will abandon their nest with too much disturbance. If you check less frequently or discover a clutch that is already in progress, follow the “1 egg per day rule” to count back to the clutch initiation date. (This means you can assume the female will lay one egg each day. Laying often—but not always—occurs in the morning hours.)

2. CLUTCH COMPLETION DATE & INCUBATION DATE

Clutch completion is the last day that a new egg appears in the nest. Record this date.

At this time, also record the clutch size (total number of eggs). Most clutches will be 4-7 eggs.

Incubation date is the day the female starts to sit on the eggs to keep them at a constant temperature for development. Swallows begin to incubate when the penultimate egg is laid. (This is the second to last egg.) Assume ***the incubation date is one day before the clutch completion date.*** Record the incubation date.

After clutch completion, nest checks should be less frequent until the projected hatch date approaches. This is a sensitive time, and some birds may abandon if they are disturbed or stressed at this time. Once incubation has begun, it is not necessary to check the nest for at least 7 days. This gives the birds a break from disturbance during this sensitive period.

3. PREDICTED AND ACTUAL HATCH DATE

Most Tree Swallow's in Fairbanks incubate for 14-16 days. Calculate the earliest predicted hatch date (day 14 of incubation, starting with the incubation date as DAY ONE). Record this date.

Check the nest daily beginning on day 14 (the earliest predicted hatch date). Eggs hatch asynchronously.

Record the hatch date as the date the first chick emerges from an egg. Return the next day to verify and record the total number of eggs hatched. ***The hatch date is considered DAY 0 when determining the age of chicks.*** Clutches are aged as a whole. It is not necessary to age individual chicks in a nest.

Check in on each active nest every 2-3 days after hatch and until the nestlings are banded (usually on day 11). Count and record the number of nestlings you see. This helps determine the timing of any chick mortality. Nest boxes should NOT be opened after day 12.

4. PREDICTED AND ACTUAL FLEDGE DATE

This is the final important date to catch. The fledge date is recorded as the first date that an empty box is observed (all chicks have left the nest box). Record this date.

Beginning at day 16, check each active nest for fledging. Find a spot to sit comfortably at a safe distance from the box. Watch carefully for at least 10 minutes. Look for signs of activity such as parents returning with food, or the chicks popping their heads out of the hole. If you see any signs of activity, you are done.

The chicks have not fledged. Return to the box tomorrow and try again. This process is repeated until you do not see activity after at least 10 minutes.

After no sign of activity for at least 10 minutes, approach the box carefully and listen for vocalizations. If you hear the chicks in the box, they have not fledged. Return to the box tomorrow and try again.

If you do not see or hear activity after watching for 10 minutes and listening for vocalizations, carefully approach the box. Cover the hole. Slowly and cautiously open the door as little as possible to peek inside. Work as quickly and safely as you can. If the chicks are gone, record that day as the fledge day. If they are still in the box, carefully close the door. Keep the hole covered for a few more moments. Remove your hand slowly and quietly walk away. Try again tomorrow.

Do not approach nestlings that are visible in the hole. You may startle them into fledging prematurely. Swallows that fledge before they are ready may not fly well and can become grounded, making them very vulnerable to predators and unlikely to survive. If you see chicks in the hole, you can continue to watch the box from a safe distance until you see the nestlings actually leave the box, or you can return later that day to verify that the chicks fledged.

Adult Capture & Banding Protocol

Ensure you have all necessary banding equipment and permits in place before going into the field. Tree Swallows typically wear a size 1 band. Violet-green swallows may wear size 0 or size 1. Use a leg gauge whenever necessary to determine the best size. In addition to bands, you will also need: clean bird bags, banding pliers, band removers, wing ruler, leg gauge, calipers, a scale, extra batteries, a weigh cup, data sheets, and trapping supplies (see below). Other useful tools include binoculars, tarp, and camera.

It is critical to be aware of the timing of each nest in your study area and to plan your capture and banding accordingly. Females can be safely captured and banded late in incubation (after day 8) through about 5 days after hatch. Males are easiest to catch just after hatch when feeding is most intensive. If you plan to band both males and females, we recommend banding them at the same time.

Priorities for Data Collection: Whenever possible, band all the breeding adults. This provides the most information for assessing site and mate fidelity and survivorship over time. When time and resources are limited, prioritize banding all females. They take significantly less time to catch and can be often be caught opportunistically over a broad window of time when checking nest boxes. The next priority is banding nestlings, since they do not require time invested in capture. See the *Nestling Banding Protocol* for more information on banding nestlings. Full data includes females, nestlings, and males.

Recommendations for Adult females: We have found adult female *Tree Swallows* in Interior Alaska very easy to trap in the nest box during late incubation (after day 8) and very early after hatch. Do not trap females early in incubation or during laying. At this time they can be sensitive to disturbance and they may abandon. After incubation day 8, you can safely trap females (if you do not plan to trap males.) At this time females sit tight on their nests, and it is usually possible to simply walk up to the box from behind, cover the hole, and gently remove her through the side door. ***Be cautious as you remove females from the nest. They will often grab nesting material, eggs, and even nestlings!*** If you plan to band males, capture and band them both at the same time, just after hatch.

Recommendations for Adult Males: Males are cautious and much harder to catch. Be prepared. After a failed attempt, they are even more difficult the next time. We have been most successful trapping males early after hatch, up to about day 5. This is a very intensive time for feeding and both parents enter the box frequently. As the chicks grow, the male will enter the box with less and less frequency. After the chicks are large enough to reach up for food, he may not enter the box at all. (He will just lean in to pass food to the growing chicks that reach up to the hole.)

Just after hatch, the male will enter the nest box to feed the nestlings, and will often sit in the nest box when the female is out feeding. With careful observation you can watch for him to enter, or for the trade off. We have been most successful by catching one adult first (usually the female). You can hold the first bird safely in a bird bag for up to 25 minutes, during which time the other parent will often enter the box.

We sometimes catch a bird without definitive plumage or sex characteristics. Although not the primary nesting pair, these birds are often still be associated with a box. It is ok to sex a bird as U for unknown if you are uncertain.

Trapping: It is possible to quietly approach the nest box from behind, cover the hole, and reach in to get the bird. However, using a trap door helps significantly. There are a variety of models, all designed such that the bird (or the researcher) triggers the door as soon as the bird enters the box. The bird can not get back out easily, however, some will try and can force their way out rather quickly. Retrieve the bird as soon as possible. We have been successful simply weighting a piece of cardboard with a coin, taping it to the inside

top of the box, and propping the cardboard up with a piece of grass. When the bird enters the box, it knocks down the grass and the door falls closed. ***Be extremely careful to ensure you collect the trap from each and every nest box after trapping.*** We recommend numbering the traps you are using so that you can easily double check that you have all of them at the end of each banding session.

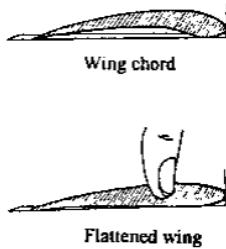
Bird Safety: Find a shaded place a short distance from the nest box to work. Place a tarp down on the ground to avoid losing tools and bands in the grass. Avoid holding and working with the birds in hot, direct sunlight or cold/rain. Note the time when you trap a bird. In good weather conditions, adult birds can be safely held for about 25 minutes, but should never be held longer than 30 minutes. Young chicks need frequent feeding and are not able to thermoregulate, so it is important to allow parents to return to the nest as quickly as possible. Avoid trapping adults at all during cold or wet periods.

Data Collection: All scales and codes are described on the *Adult Banding Sheet*.

Tree Swallows can be reliably sexed during the breeding season by the presence or absence of a brood patch or cloacal protuberance. Females can also be reliably aged as second year (SY) by the presence of significant brown plumage on the back and body. Be cautious, as many older females can have brown plumage around the forehead, face, and under the wings. Unless she is significantly brown, all females should be aged as AHY, as some second year females will also have the blue/green plumage of older birds.

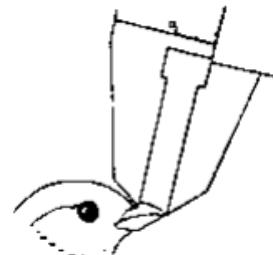
Males can not be reliably aged by plumage, so should be aged in the field as AHY.

Wing Chord & Flat Wing: To measure the wing chord, hold the wing as close to a natural resting position as possible, ensuring that all primaries lie in natural alignment.



Flat wing is measured by using your thumb to press on the coverts, flattening the wing against the ruler. This method removes the natural curvature, so this measurement is longer (~2%) than the wing chord. Flat wing is useful for comparison with large international datasets.

Culmen (nares to tip): Use calipers to measure the distance from the anterior (distal) end of the nostril to the tip of the bill



Signs of stress: The safety and well being of the birds is always your first priority. Their safety is more important than any data we collect. It is important to watch for signs of stress while handling and banding birds and to address these immediately. Remember that prevention goes a long way. We are often banding on hot summer days in areas with little shade. Keep birds out of the direct sun. Shade them with your body. Alternatively, on cooler days it is often necessary to truncate the time you hold a bird. Birds should not be captured or banded in the rain or other adverse weather. Birds in bags should always be held in someone's hands, and never be put down on the ground or tarp. Watch for the following signs of stress:

1. Closing eyes
2. Panting or gaping
3. Limpness
4. Fluffing up feathers

If you notice one or more of these signs, turn the bird upright (if it is not already) and give it a break from the banding process. Transfer the bird back to the bird bag. Ensure it is shaded on a hot day. Most birds will recover quickly. Err on the side of caution. It is always ok to release the bird if you feel it is at risk for increased stress by being held.

Nestling Banding Protocol

Tree Swallow nestlings are measured and banded to investigate growth rates across sites and between years, and to look at overall condition, site fidelity, and survivorship. Nestlings are aged as “locals” (L). The same bander/volunteer should measure and band an entire nest whenever possible to ensure consistency.

Timing: Tree Swallow nestlings can usually be banded from 9 to 12 days old. (Remember that hatch day is day 0.) Day 11 is the ideal day for Fairbanks sites and effort should be made to band all nests on day 11. However, growth rates can vary, especially in years when food is limited (when weather is cold or rainy). Developmental landmarks should always be assessed, as these are much more reliable than age in establishing the correct time to band. A nestling is ready to band when the primaries break sheath and the legs lengthen and become scaly. If you try to band too early, you risk harming the continued growth of the bird’s leg. If you band too late, you risk the nestlings fledging (jumping from the nest) prematurely.

Please note: Many factors (weather, insect availability, parasite load) can affect the growth rate of nestlings, and all nestlings in a nest may not be at the same developmental stage. Also remember that eggs hatch asynchronously. It is common for one or two chicks to be smaller or less developed than their siblings. When in doubt, leave them alone and come back in a day or two to try again. Bird safety and well-being is paramount, and it is ok to delay banding one or more chicks from a nest.

A good indicator of whether a nestling is old enough to band is the development of the feathers. Birds’ feathers grow in a sheath. The developing feather is called a “pinfeather” until the vane emerges from the sheath and expands. A bird with pinfeathers on the wings (nothing yet emerging from the sheath) is too young to band. A nestling with feathers that are beginning to unfurl or extend about one quarter of an inch from the sheath is just right.

Leg size and color should also be used to determine whether a chick is bandable. Tree Swallow nestlings have fat, short legs that lengthen, slim down, and become scaly as they grow. The active areas of bone growth are thicker than the bone they are manufacturing. Because these areas of bone growth are at the tips of the bone, we are waiting for the leg bone (the “tarso-metatarsus”) to grow long enough that the band will not impinge on these active growth areas. If a bird is banded too early, the band will constrict the growth areas and the blood supply that feed them. If you are at all unsure, use a leg gauge to test whether or not the leg is ready to band. All Tree Swallows (nestlings and adults) should fit a size one band.

Once the primary sheath is broken and the legs have slimmed down, nestlings should be banded as soon as possible. Day 11 is usually ideal in Fairbanks. Due to the rapid growth of nestlings in the Far North, ***Tree Swallow nestlings at our sites should not be disturbed after 12 days!*** As with adults, be cautious about holding birds in direct sunlight, and avoid banding during cold or wet periods.

If you are unsure whether a bird is bandable, do not attempt to band it. Consult the project lead. Bands are difficult to remove, and unbanded, healthy nestlings are much better than banded, injured nestlings.

Handling Chicks: Nestlings are soft and squishy. Pick them up very carefully, one at a time, lifting the whole body from the bottom. Like the adults, nestlings have an automatic reflex to grab whatever is beneath them when they are picked up. Use the same procedure to take the nestlings out of the nest box as you would use for adults. Pick each nestling a few inches off the nest and remove whatever is in its feet before removing the bird completely from the nest box. Be very careful if you have long fingernails.

Always remove each nestling individually, but place the entire brood in one bird bag. Count each chick as you place them in the bird bag, and again when you return them to the nest. Nestlings are extremely sensitive to heat and cold, so be sure to keep them out of the sun, wind, & weather.

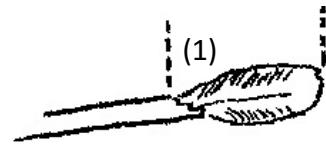
There is little risk of chicks escaping from the hand, so banders can use the gentlest of touches when handling them. They are unable to fly, but often wiggle and struggle, making it difficult to measure and

band them. There is no conventional way used by all banders to hold chicks. Find a way that is comfortable for you, and safe for the birds. Most banders hold a chick as they would an adult in the “bander’s grip.” Keep the wings tucked close to its body; hold its head between your first and second finger with its belly facing up from the palm of your hand.

Chicks don’t always exhibit signs of stress from handling like adults. They can not fluff up their feathers, and they often have their eyes closed and appear limp. This is normal. Pay careful attention to any changes in movement or breathing. Give them a break if they show even the slightest sign of stress. The most visible sign of stress in a chick is gaping (opening the mouth). Nestlings are not fully feathered, and so are extremely sensitive to the elements. Always keep them out of the wind and sun. Parents can become greatly distressed to see you at their nest box removing their young. Sit a short distance from the nest box, out of direct sunlight. Minimize the amount of time that you have the chicks out of the nest box as much as possible. Work quickly, quietly, and efficiently to minimize stress to the chicks and parents.

Data Collection: If possible, band all nestlings in a nest at the same time. However, see above for important safety considerations on timing.

The process of banding chicks is the same as for adults. Chicks take the same band size as adults (size 1). It is usually placed on the right leg. Double check the fit with a leg gauge. As with adults, the band should be freely rotate when closed on the bird’s leg.



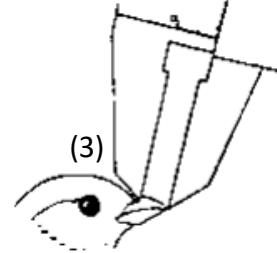
All scales and codes are described on the *Chick Banding Sheet*.

Longest exposed primary: Use calipers to measure from the end of the sheath where the feather emerges to end of the feather. (1)



Flat Wing: Flat wing is measured by flattening the wing against the ruler. (2)

Culmen (nares to tip): Use calipers to measure the distance from the anterior (distal) end of the nostril to the tip of the bill. (3)



Returning Chicks to the Nest Box: When nestlings are returned to the nest box, they usually just sit quietly. If they are active (flapping, cheeping, generally upset), cover the entrance hole for a few minutes until they settle down. Be sure to count the chicks as you return them to the nest box. Depart from the nest site quietly.

Nest Box Clearing

When you are sure all boxes have fledged, it is important to remove the old nests in preparation for next year. It is essential to record the presence of any dead chicks or eggs remaining in the nest. Also be sure to record evidence of unusual food sources, parasites, or predation. Do not use any cleaners or bleach, simply remove the nest from the box. Detailed instructions are below.

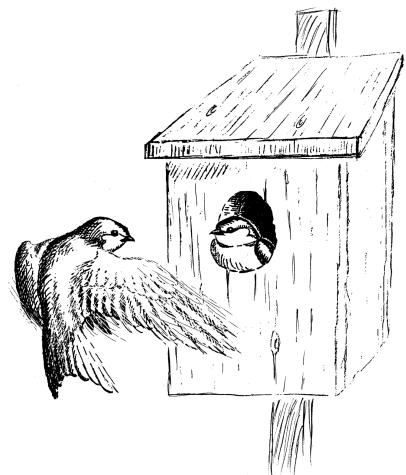
Materials

- Brown paper bags (large-sized lunch bags)
- Permanent marker
- Spatula
- Stapler and Staples
- Field notebook & pencil
- Optional: large trash bags, wagons, or garden carts for transporting the nests

Always ensure the nest is not active when clearing the box. Boxes that have fledged young have substantial levels of excrement and can be quite dusty. Use caution if you have allergies or respiratory conditions.

Data for each nest should be recorded on the bag, in your field notebook, and transferred to the nest record sheet.

1. Label each brown paper bag with the year, field site, and nest box number.
2. Additional nest-specific metrics to observe and record: number of dead young and their band numbers, number of eggs still present, and number of snail shells.
3. Scoop the nest out of the box with the spatula and place it in the bag. ***If dead nestlings are present, DO NOT put them in the bag!*** Once they are recorded, they can be placed on the ground under the box or in nearby vegetation. ***Be sure to record the band number on the bag and in your field notebook.*** Eggs and snail shells can be left in the bag.
4. Close the bag by folding the top down and stapling to seal it.



Appendix:

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<i>Nest Box Record Sheet</i> (two pages, print double-sided; one per box)....	21-22
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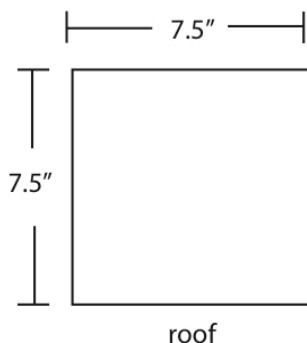
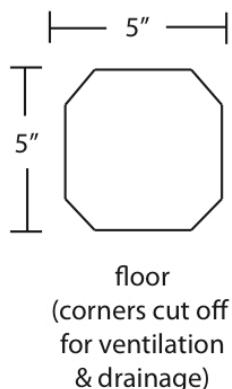
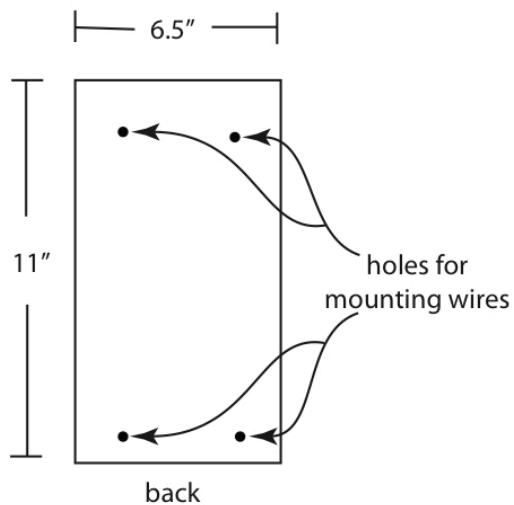
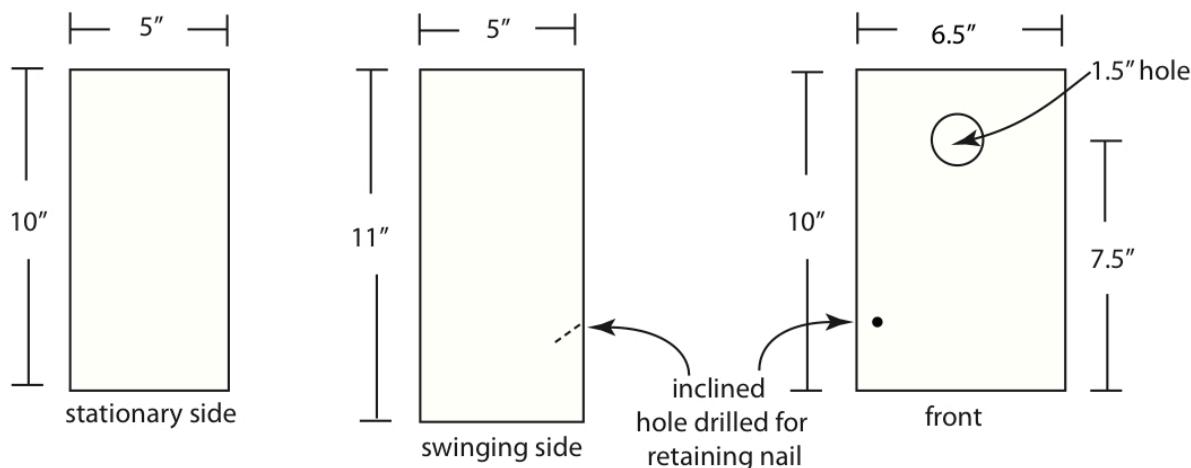
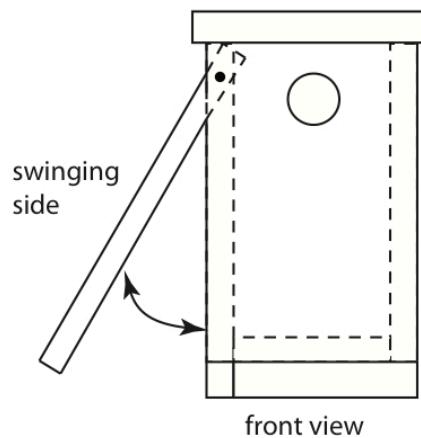
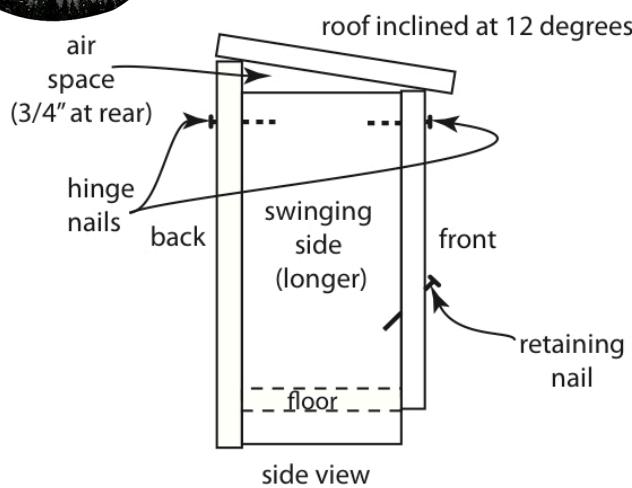
Additional Files Available in ASI Shared Programs Drive (TRES folder)

Database Files
AK_TRES-data-template
Education Programming Paperwork
 Youth Mentoring Application
 High school Internship Application
 Intern Agreement/Goals
 Waiver and Photo Release
 Health/Medical Form
 Mentoring Evaluation
 Internship Evaluation
 High School Student Evaluation



ALASKA SONGBIRD INSTITUTE

Tree Swallow (*Tachycineta bicolor*)
Nest Box Plans



Box #	Species:	Box Location	Site:
		<input type="checkbox"/> field _____	<input type="checkbox"/> trail <input type="checkbox"/> forest edge <input type="checkbox"/> pond <input type="checkbox"/> _____

Continued on back

Data Summary

Nest Initiation	Predicted Hatch	# eggs	Date Banded Male
Nest Completion	Actual Hatch	# hatched	Male Band #
Clutch Initiation	Predicted Fledge	# fledged	Date Banded Chicks
Clutch Completion	Actual Fledge	Date Banded Female	Chick Band #s
Incubation Start	Successful (Y or N)	Female Band #	

Site: _____

Box #: _____

Species: _____

(continued from p. 1)

ADULT Banding Sheet ____ of ____

Year _____

Site _____

Notes

CHICK Banding Sheet ____ of ____

Year _____

Site _____

Notes

DO NOT DISTURB NEST BOXES!

Nesting birds may be present May-July and are federally protected under the Migratory Bird Treaty Act.

Opening or otherwise disturbing a nest box causes stress and can lead birds to abandon the nest. *For more info or to learn how to help, contact the Alaska Songbird Institute at aksongbird.org or (907) 888-2121.*



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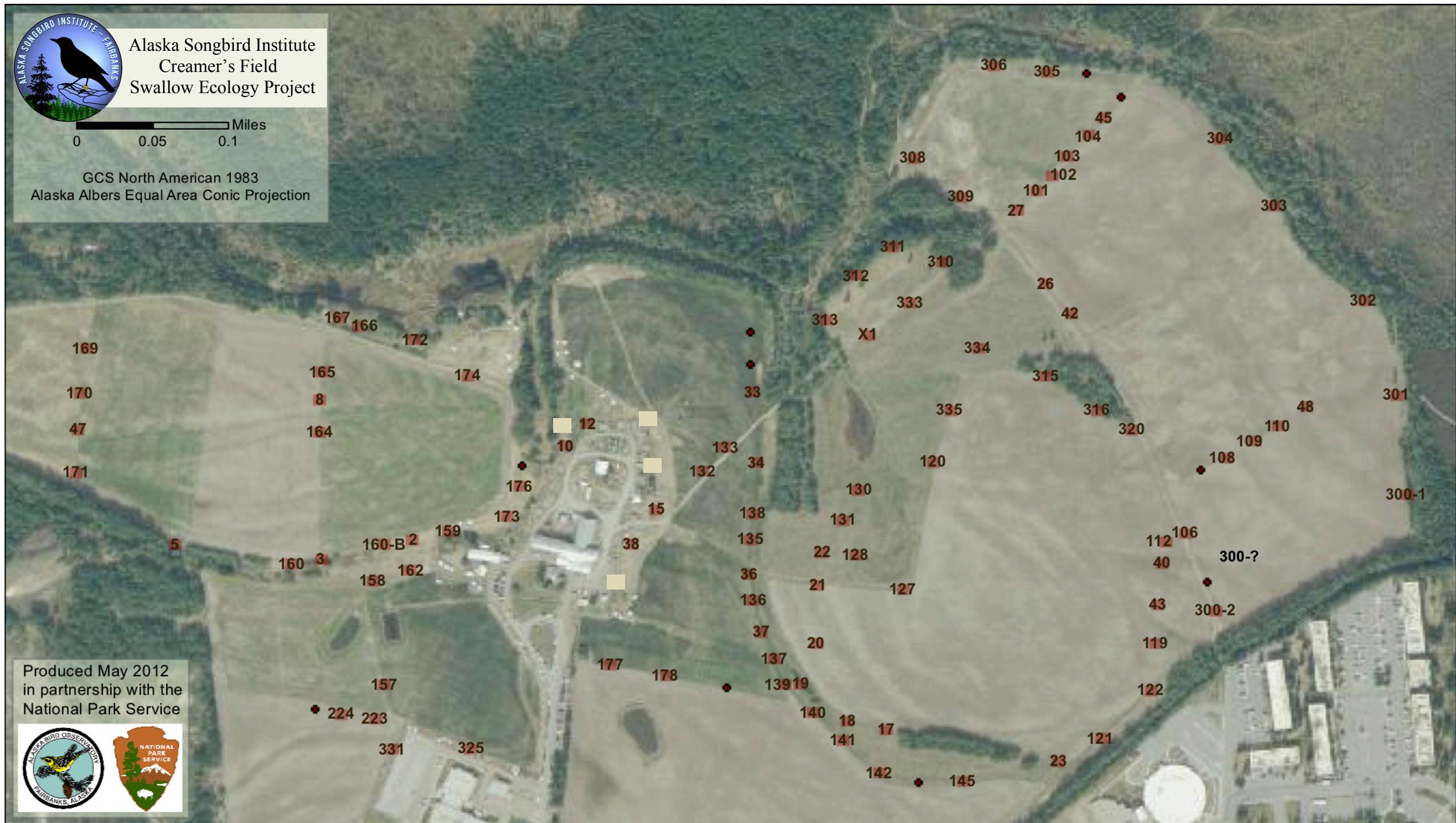




Alaska Songbird Institute
Creamer's Field
Swallow Ecology Project

0 0.05 0.1 Miles

GCS North American 1983
Alaska Albers Equal Area Conic Projection



UAF TRES box map

