FOCUS ON CITIZEN SCIENCE • VOLUME 15, NO. 1

NestWatch Digest

NESTING SEASON 2018

The Cornell Lab of Ornithology

All thanks to you!

Every year when writing the annual report, I am overwhelmed by how many nests, eggs, and nestlings were monitored by citizen scientists like you—and it just keeps increasing! Thanks to your efforts, scientists were able to publish two new research studies in 2018, and we fulfilled six new requests for data from external researchers. We achieved our highest-ever number of reported nests in 2018: 25,607, and added 13 new species to the database!

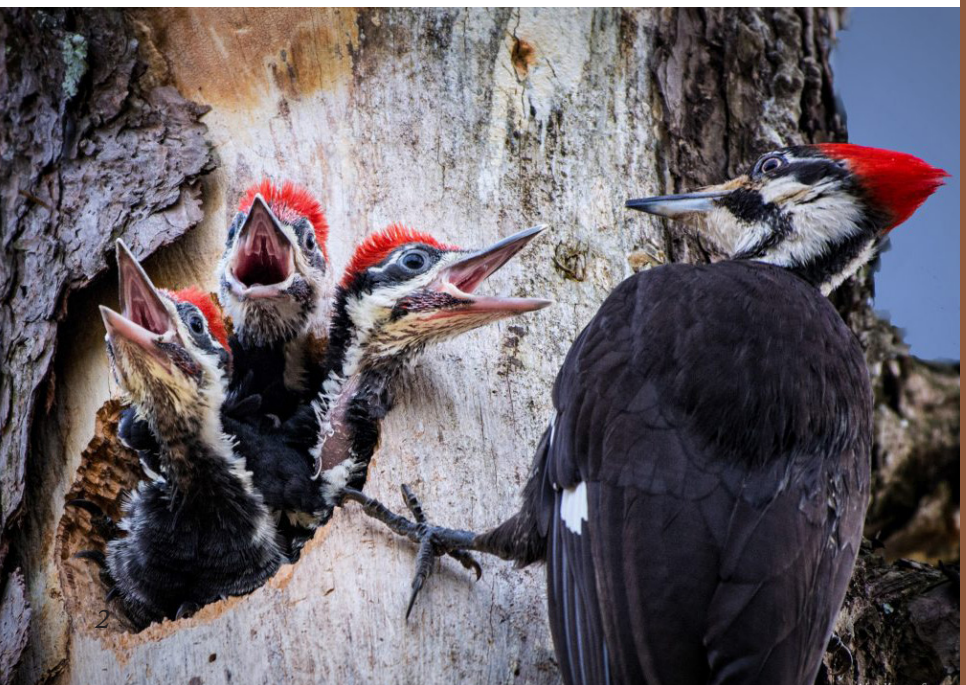
We also published our *Thinking Outside the (Nest) Box* curriculum (see back page for details). If you're an educator, consider requesting a free copy for your 5th–8th grade classroom. In 2018 we also implemented "notifications" in the mobile app to help remind you about your upcoming nest checks. We hope that these friendly reminders will increase the data quality and volume. We also bulk-uploaded 806 nest attempts in 2018, an increase from 2017.

The 2018 season was phenomenal, but I'm beyond excited for new things coming in 2019! We have a new way to participate without ever finding a nest (see page 3 for details), and we have some fun new features coming soon to the mobile app (hint: cameras at the ready). We will also be adjusting the mobile app to accept all international species, to match our website. Please enjoy this edition of the *NestWatch Digest* (now designed with accessiblity features for people with visual impairments), and I hope you'll join us in 2019 for another thrilling season of baby birds!

With gratitude,

Robyn Bailey
NestWatch Project Leader

Cover: Mourning Dove by Lou Orr
Below: Pileated Woodpeckers by Neva Scheve



American Robin by Aimee Benoit

Focus on Citizen Science is a publication highlighting the contributions of citizen scientists. This issue, *NestWatch Digest*, is brought to you by NestWatch, a research and education project of the Cornell Lab of Ornithology. The NestWatch project is made possible by the efforts and support of thousands of citizen scientists. This document has accessibility features for those with visual impairments; for assistance contact nestwatch@cornell.edu.

Editorial Staff

Robyn Bailey
Project Leader and Editor

Holly Faulkner
Project Assistant

David Bonter
Director of Citizen Science

Tina Phillips
Assistant Director of Citizen Science

Join NestWatch!

Anyone, anywhere, who finds a nest is welcome to join. Help scientists monitor nesting birds while you support bird conservation in your own community. To join, visit NestWatch.org and get certified as a nest monitor. Certification is free and ensures that nest monitoring activities follow our code of conduct designed to protect birds and their nests.

The Cornell Lab of Ornithology

159 Sapsucker Woods Road
Ithaca, NY 14850
1-800-843-BIRD
nestwatch@cornell.edu • nestwatch.org

Nest Quest Go!

Digitizing Our Historic Nest Record Cards

BY BECCA RODOMSKY-BISH, NEST RECORD ARCHIVIST

Historical photo of an Eastern Bluebird submitted by Charlie Rouse in 2012, photographer unknown.

"There is nothing new in the world except the history you do not know."
—Harry S. Truman

Tucked away on the second floor at the Cornell Lab of Ornithology sits a treasure trove of bird history we do not know.

The Cornell Lab of Ornithology initiated the North American Nest Record Card Program (NANRCP) in the 1960s and successfully administered the program for more than 30 years. Devoted citizen scientists monitored nests so that ornithologists could better understand the lives of birds throughout North America. Some readers may even have participated in this program (thank you!).

By 1999, the Lab had amassed more than 300,000 completed nest record cards, loaded with valuable information on the lives of hundreds of bird species. Data on these 4x6 historical cards consists of details such as clutch size, number of hatched young, nest outcome, and nest site details.

The effort to document nesting birds transitioned from the NANRCP to the current NestWatch citizen-science project, with online-only data entry. Datasets from both the NANRCP and NestWatch have been used in numerous scientific publications (see the House Finch story on page 4 for an example). There are, however, limitless unexplored questions and answers still hidden in our nest record cards, if only the information was digitized, transcribed, and made readily available.

OVENBIRD NEST BY G. C. EMBODY, 1902

Introducing Nest Quest Go!

We have partnered with Zooniverse, an incredible crowd-sourcing tool, to make transcription easy. Zooniverse is a platform which has well-developed tools for building transcription projects, allowing us to launch this short-term project relatively quickly. For those of you who love historical records, birds, and helping scientists—or those who have a hard time getting out into nature to find nests—we invite you to help us transcribe these cards. For more information, check out **our project page** on NestWatch.org. Once individual transcription projects are completed, the data gleaned from the cards will be uploaded to NestWatch's database. When the epic transcription project is done, and more than 300,000 cards have been entered, we will almost double the total amount of available data in NestWatch!

A major goal of this effort is to have a robust dataset on nesting birds across North America that researchers can use to better understand how bird populations are changing over time. Help us reveal the history that could be acting as an early warning system, and empower scientists to discover long-term population trends by participating in Nest Quest Go!

Learn more and sign up for notifications about Nest Quest Go! on our website: nestwatch.org/nest-quest-go

Egg Laying in a Seed-Eating Bird Tracks Spring Temperature

BY HEATHER E. WATTS, ASSOCIATE PROFESSOR, SCHOOL OF BIOLOGICAL SCIENCES, WASHINGTON STATE UNIVERSITY

NestWatchers have provided an invaluable source of data on long-term patterns of breeding birds. Nesting data have revealed that during the past century many species of birds have shifted to laying eggs earlier in the year, and these shifts are correlated with warmer spring temperatures. Collectively, these findings constitute one of the most thoroughly documented effects of climate change on wild animals.

However, most of these studies have focused on birds that eat insects, or other animals, during the breeding season. Scientists know surprisingly little about whether birds that eat mostly plants (i.e., granivores, frugivores, nectarivores and herbivores) have experienced similar shifts in the timing of breeding. To begin to fill this gap, we recently published a paper in *Ibis* describing patterns of reproductive timing in the House Finch. Although the House Finch is native to the southwestern United States, its distribution now covers much of the country and a wide range of habitats. A frequent backyard visitor, House Finches often nest in and around human structures and landscapes. These characteristics make House Finches highly accessible to birders, and as a result House Finches are well represented in historical nest records.

House finch nest by Pam Iwasaki

House Finches feed primarily on seeds throughout the year, including during the breeding season when they feed their nestlings a diet that is composed almost entirely of seeds. To investigate possible changes in the timing of egg laying in House Finches, we used nest records from the Cornell Lab of Ornithology, as well as from the Museum of Vertebrate Zoology and the Western Foundation of Vertebrate Zoology. We focused on nest records from California, which is part of the native range of this species. In total, we were able to obtain 940 records for our analysis, about one-third of which came from NestWatch. These records spanned more than a century, from 1895 to 2007, and covered most of California's varied ecological regions.

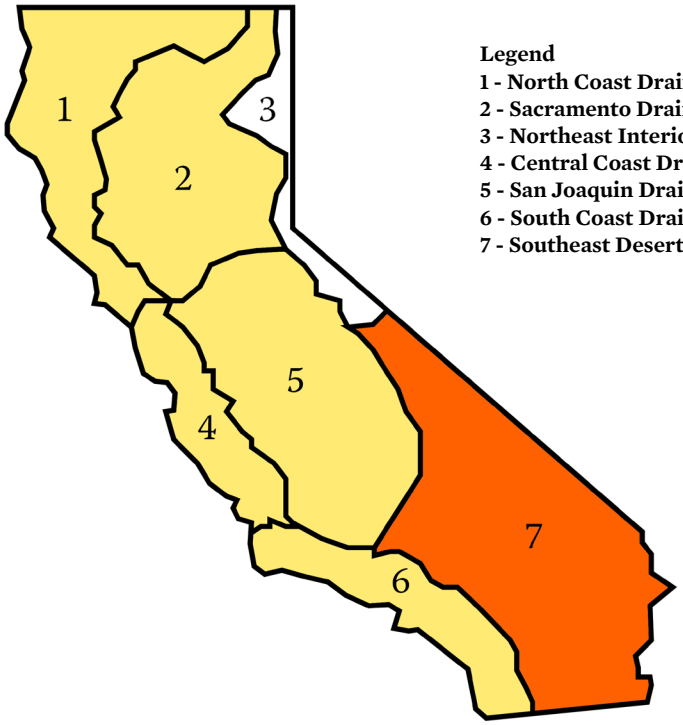
We found that across the state, House Finches laid eggs earlier in years with warmer spring temperatures. This is a pattern similar to what has been found in many other birds. For House Finches, we estimate that eggs are laid an average of 4.6 days earlier for every 1°C increase in average spring temperature. This effect is toward the upper end of the range that has been observed in other bird species, suggesting that House Finches are particularly sensitive to warmer temperatures with respect to the timing of egg laying. Does this mean that all House Finches across California are laying eggs earlier now than they were a hundred years ago? Not necessarily. Although average spring temperatures have increased across the state, long-term changes in the timing of laying vary by region. Only in the hottest region of the state, the southeast desert basin, did we find a long-term pattern of

earlier egg laying. Other regions of California, which are considerably cooler on average, do not show the same changes over time. It may be that temperatures in these areas have so far remained low enough to not induce long-term shifts in breeding.

It is important to note that the relationship between temperature and the timing of egg laying that we found in this study is correlational; this is also the case for other similar long-term studies. This means that we do not know if birds are laying earlier in direct response to temperature, or if they are instead responding to some other cue in the environment that is influenced by temperature. For example, birds may be responding to changes in the phenology (i.e., seasonal timing of events) of plants or insects, which may themselves be sensitive to temperature patterns. In either case, the fact that House Finches nest earlier in warmer springs adds to evidence that this may be a common pattern across a wide range of avian species consuming varied diets, at least in temperate regions. These results also highlight how the effects of climate change can vary regionally. It is only because of the efforts of NestWatchers and other citizen scientists that we are able to examine large-scale patterns, such as these. Just as importantly, these datasets also allow for more detailed analyses across regions. These advances would not be possible without you. Thank you.

House Finch nest by Angie

Climate Divisions of California



Legend
1 - North Coast Drainage
2 - Sacramento Drainage
3 - Northeast Interior Basin
4 - Central Coast Drainage
5 - San Joaquin Drainage
6 - South Coast Drainage
7 - Southeast Desert Basin

Although eggs were laid earlier in warmer springs across the state, in only one region (shown in orange) was there a significant advancement of the timing of egg laying across the study period (1895 to 2007). Region 3 (not colored) was excluded from the analysis because House Finch nests were rare. Figure modified from Watts, H. E., Jimenez, D., Pacheco, V., & Vilgalys, T. P. (2019). Temperature-correlated shifts in the timing of egg-laying in House Finches Haemorhous mexicanus. *Ibis, 161(2), 428–434.* https://doi.org/10.1111/ibi.12676

Regional Roundup

Highlights from the 2018 Season

BY ROBYN BAILEY, PROJECT LEADER

The 2018 nesting season was our biggest year yet. Participants reported 25,607 nest attempts by 260 species. In the pages that follow, you'll find data summaries from the U.S. and Canada; however, we also received data on 51 nests of 41 species from an additional 23 countries in 2018. Excellent work, NestWatchers!

Note that for calculations of nesting success, we can only use nests for which the nest fate was reported. We defined nesting success as the percentage of nests fledging at least one young. We only report results for species having a minimum of 10 nests with known outcomes per year. We used only successful nests to estimate average number of fledglings as a measure of productivity; therefore, average number of fledglings may exceed average clutch size in our regional tables. The "change" column indicates how 2018 nesting success was different from the previous 10-year average (2008–2017). This can help you interpret whether 2018 was a "good year" or a "bad year" for a species in your region, but it's not necessarily an indication of a long-term trend. Two arrows up or down signify an increase or decrease of more than 10%. One arrow signifies an increase or decrease of 5–10%. No arrow is given for changes less than 5%, and an asterisk (*) indicates insufficient data for a region.

2018 NestWatch Season Totals

25,607 NEST ATTEMPTS
2,134 PARTICIPANTS
260 SPECIES
83,318 EGGS
56,691 FLEDGLINGS

Anna's Hummingbird by Rebecca Matsubara

TOP COUNTRIES CONTRIBUTING OUTSIDE OF THE UNITED STATES AND CANADA

INDIA COLOMBIA U.K. COSTA RICA

Hawaii

Reports from Hawaii are increasing each year! Here are the top species for 2018.

HAWAII: 17 NESTS

Rank	*Species*	*2018 Total nests reported*
1	White Tern	15
2	Black-necked Stilt	1
2	Zebra Dove	1

Alaska and Northern Canada

We were excited to see the number of nests reported from Alaska and Northern Canada jumped to 52 in 2018, a huge increase in the number of nests (N=9 in 2017). However, this represented fewer species (down to three from seven last year). We had enough data on Tree Swallows in this region to report that the average clutch size was 4.7 eggs, average fledglings was 4.1, and nesting success rate was 70.0%. We hope that the growth in participation from this region continues!

ALASKA AND NORTHERN CANADA: 52 NESTS

Rank	*Species*	*2018 Total nests reported*
1	Tree Swallow	49
2	Chestnut-backed Chickadee	2
3	American Tree Sparrow	1

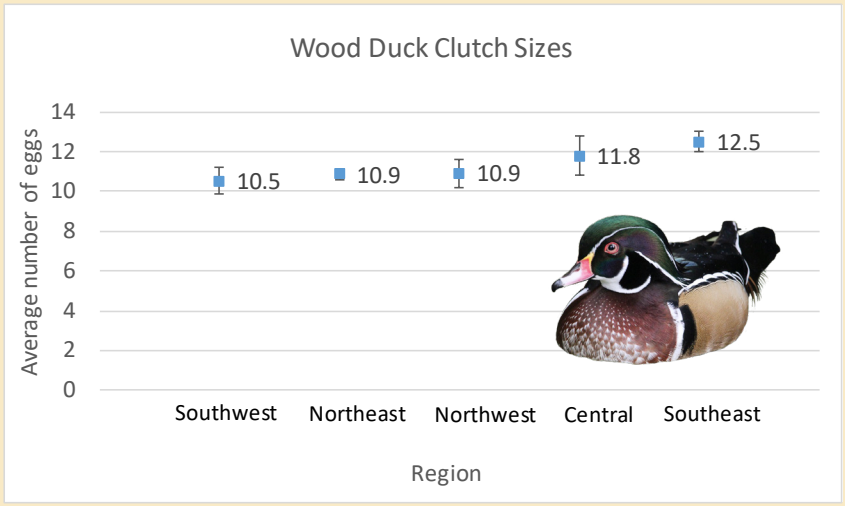
Southwest Region

Violet-green Swallow by James Buch

Violet-green Swallows continued an upward trend in nesting success in 2018, at 94.3%. Their nesting success has been gradually increasing each year since 2015. This is good news for a species that has been experiencing population declines in many parts of the Southwest (particularly California, New Mexico, and Utah). Bewick's Wrens also enjoyed very high nest success with 91.7% of nests fledging at least one young. Bewick's Wren is not officially on any conservation watch lists, but some of the eastern-most populations are in decline.

Nesting success of Western and Mountain Bluebirds was similar (85.2% and 85.6% respectively), and both species were above their 10-year average for nest success. Oak Titmice fledged about 11% fewer nests than in 2017, but overall their 2018 success rate was close to the 10-year average.

Although not a Top-10 species, we noticed that Wood Duck clutch sizes were smallest in the Southwestern region, averaging 10.5 eggs (clutch sizes > 20 were removed due to potential brood parasitism). As you can see from the overlapping 95% confidence intervals in the graph below, there was lots of variation. However, clutch size interval estimates in the Southwest and Southeast did not overlap, suggesting a real difference between these two southern regions.



Wood Duck clutch sizes appear to be smaller in the Southwest than in other regions, although in most cases the 95% confidence intervals overlapped with other regions. All years are combined in this graph, and clutches with >20 eggs were removed due to potential brood parasitism (N = 1,427).

Wood Duck by Julia Jensen

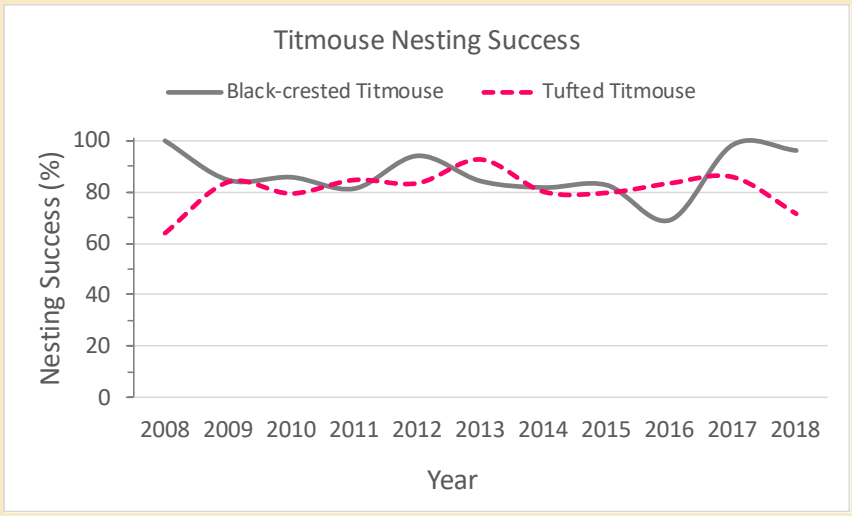
TOP-10 LIST: 3,196 NESTS REPORTED FOR ALL SPECIES

Rank	*Species*	*2018 Total nests reported*	*2018 Average clutch size*	*2018 Average fledglings*	*2018 Average nesting success (%)*	*Previous 10-year average success (%)*	*Change from previous*
1	Tree Swallow	989	5.0	4.2	84.2	81.6	
2	Western Bluebird	787	4.8	4.1	85.2	80.2	▲
3	Mountain Bluebird	564	4.8	4.4	85.6	78.9	▲
4	House Wren	137	6.2	5.6	82.6	81.1	
5	Violet-green Swallow	89	4.3	3.8	94.3	79.1	▲▲
6	Mourning Dove	65	1.9	1.8	55.6	63.2	▼
7	Chestnut-backed Chickadee	49	6.0	5.4	87.0	81.6	▲
8	Ash-throated Flycatcher	42	4.1	3.9	75.8	82.1	▼
9	Oak Titmouse	35	6.2	5.6	76.7	80.5	
10	Bewick's Wren	33	4.9	4.3	91.7	87.5	

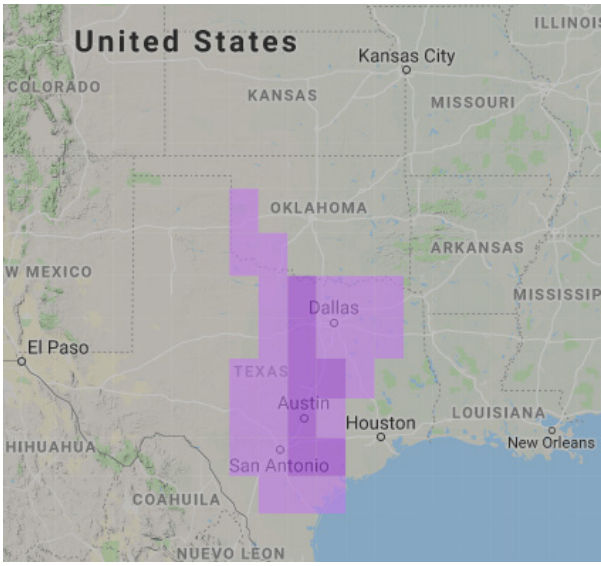
Southeast and Gulf Coast Region

The highest nesting success of the region goes to the Black-crested Titmouse at 96.1%, almost 10% above the average over the last decade. Nesting success for this species has been on the upswing since 2016, the lowest year on record (68.9%). Tufted Titmouse success, on the other hand, was 10% below the 10-year average at 71.4%. We're unsure what would cause Tufted Titmouse to experience 25% lower nesting success than the closely-related Black-crested Titmouse in 2018, but there is very little overlap in range as the two species prefer different habitat types (see map at right).

Eastern Bluebirds had a fairly successful year in the Southeast, nesting success being nearly equal to the 10-year average (~75%). Carolina, Bewick's, and House Wrens also enjoyed relatively high nest success in 2018.



The Black-crested Titmouse has enjoyed very high nesting success for the last two breeding seasons. Tufted Titmouse, on the other hand, experienced a somewhat lower-than-average year in 2018.



Map sourced from eBird.org

Zone of overlap for Tufted Titmouse and Black-crested Titmouse populations. Dark purple indicates higher incidence of recorded observations.

Tufted Titmouse by Cynthia Lockwood

TOP-10 LIST: 4,854 NESTS REPORTED FOR ALL SPECIES

Rank	*Species*	*2018 Total nests reported*	*2018 Average clutch size*	*2018 Average fledglings*	*2018 Average nesting success (%)*	*Previous 10-year average success (%)*	*Change from previous*
1	Eastern Bluebird	3,144	4.4	3.7	75.1	74.7	
2	Carolina Chickadee	372	4.9	4.4	70.9	73.7	
3	Carolina Wren	242	4.7	4.1	78.8	78.3	
4	Bewick's Wren	125	5.5	4.7	82.8	76.7	▲
5	Tree Swallow	70	4.9	4.4	74.1	78.2	
6	Black-crested Titmouse	67	5.4	4.6	96.2	86.3	▲
7	Eastern Phoebe	66	4.2	3.7	65.9	72.2	▼
8	House Wren	62	5.2	4.9	73.9	63.7	▲▲
9	American Robin	61	3.4	2.8	47.1	48.1	
10	Tufted Titmouse	54	5.3	4.7	71.4	81.6	▼▼

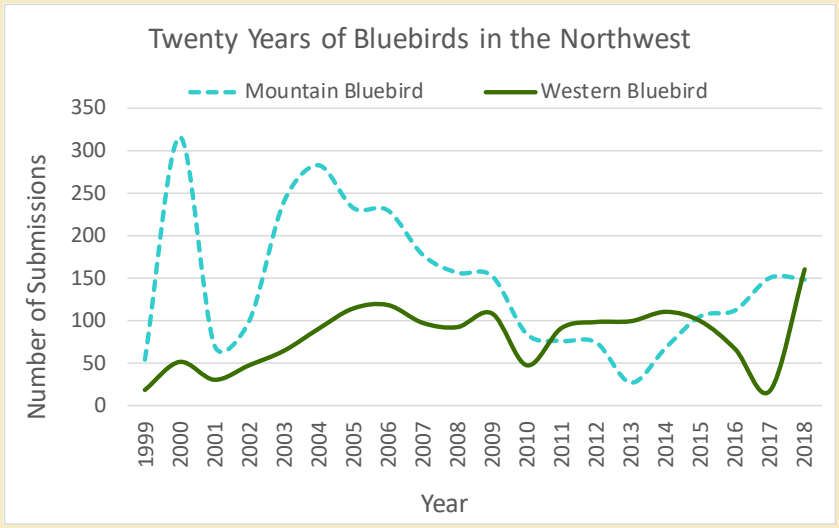
Northwest Region

Western Bluebird by Jim Leonard

Surprisingly, Barn Swallows had the highest nesting success in the Northwest Top 10. This 100% success rate is unexpected because they are open-cup nesters, which typically experience lower nesting success than cavity nesters. However, American Robins also had high success in 2018, at 84.6%, suggesting that it was a good year for open-cup nesters in the Northwest.

Western and Mountain Bluebirds had a favorable year as well, at 72.2% and 83.6% nesting success, respectively. Mountain Bluebirds in this region had the highest mean number of fledglings of any bluebird species in any region (4.7 fledged young per successful nest). Notice that 2018 produced a record-high number of Western Bluebird submissions, while the number of Mountain Bluebird submissions has been decreasing over the past decade.

The most-reported species was Tree Swallow which, like the bluebirds, performed very near the 10-year average for the species. Violet-green Swallow nesting success was 16% less than last year and somewhat lower than the average over the last decade. Black-capped Chickadee nesting success was nearly 10% higher than that of Mountain Chickadee (84.6% versus 75% respectively), however, Mountain Chickadees laid on average 1.4 more eggs than did Black-capped Chickadees.



Mountain and Western Bluebird submissions have fluctuated widely in the previous two decades, but in 2018 we received nearly equal numbers of both species in the Northwest.

TOP-10 LIST: 1,197 NESTS REPORTED FOR ALL SPECIES

Rank	*Species*	*2018 Total nests reported*	*2018 Average clutch size*	*2018 Average fledglings*	*2018 Average nesting success (%)*	*Previous 10-year average success (%)*	*Change from previous*
1	Tree Swallow	467	5.6	5.0	78.1	80.9	
2	Western Bluebird	160	5.0	4.3	72.2	68.5	
3	Mountain Bluebird	149	5.1	4.7	83.6	79.9	
4	House Wren	80	6.4	5.7	84.1	79.3	
5	Barn Swallow	45	3.0	3.0	100.0	*	
6	American Robin	32	3.3	3.1	84.6	75.1	▲
7	Black-capped Chickadee	29	5.4	4.9	84.6	85.8	
8	Mountain Chickadee	26	6.8	5.2	75.0	81.3	▼
9	Violet-green Swallow	24	4.1	3.8	76.5	84.1	▼
10	House Sparrow	18	6.0	*	31.3	6.5	▲▲

*Insufficient data

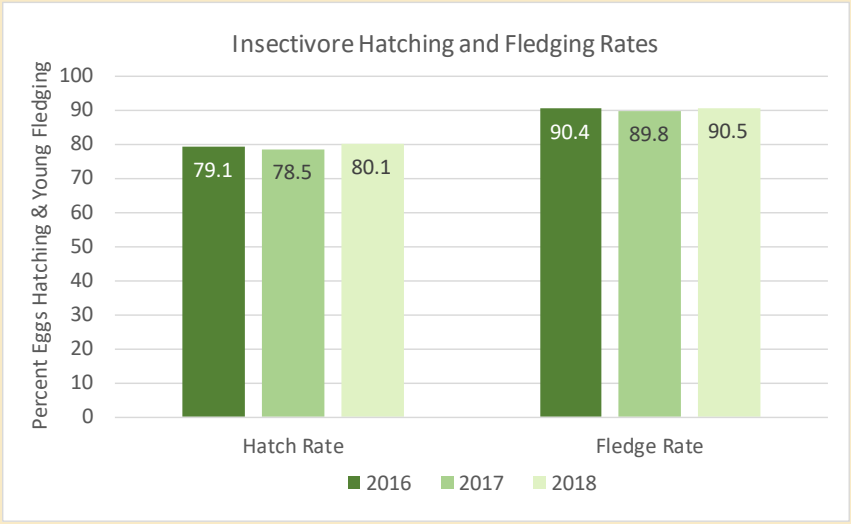
Northeast Region

Eastern Bluebird by Barbara Hostetler

Sue Story, a NestWatcher in the Northeast region, noticed that the spring felt cooler and rainier than usual, which seemed to negatively affect her nesting Eastern Phoebes. She wrote to ask if the cool, rainy spring had noticeably affected insectivorous birds throughout the region in 2018.

To answer Sue's question, we examined data from 10 common insectivorous birds in the region with respect to hatching success (percent of eggs that hatch) and fledging success (percent of live young that fledge) compared to the previous 2 years.

As you can see from the graph to the right, both measures of productivity were highest in 2018, although the differences between years are minimal. Because weather conditions are very localized, we would need to compare local precipitation rates and minimum temperatures to truly answer this question (a great future research project). At this first glance, there is nothing alarming about the regional hatching rates and fledging rates of the 10 most common insectivores in our database (Barn Swallow, Carolina Wren, Eastern Bluebird, Eastern Phoebe, Gray Catbird, House Wren, Northern Mockingbird, Prothonotary Warbler, Purple Martin, and Tree Swallow). Thanks for the thoughtful question, Sue!



Data from 10 common insectivorous birds were pooled and their hatching and fledging rates were examined for 3 consecutive seasons. Overall, 2018 did not seem to be a "bad year" for insectivores hatching and fledging young, despite a cool and rainy start to the season in the Northeast. Only nests with first egg dates prior to June 1 were included for each year, to remove the influence of summer nests.

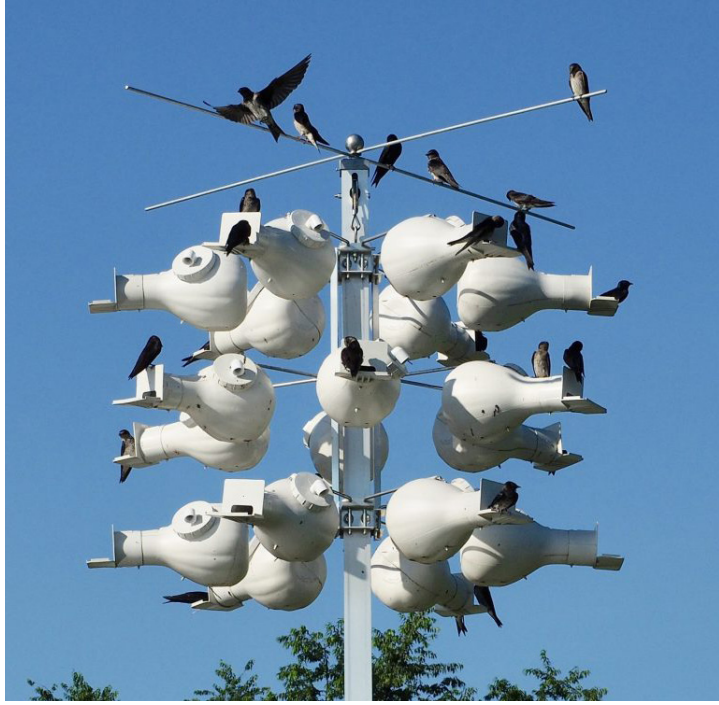
TOP-10 LIST: 15,109 NESTS REPORTED FOR ALL SPECIES

Rank	*Species*	*2018 Total nests reported*	*2018 Average clutch size*	*2018 Average fledglings*	*2018 Average nesting success (%)*	*Previous 10-year average success (%)*	*Change from previous*
1	Eastern Bluebird	4,614	4.2	3.9	77.4	77.4	
2	Tree Swallow	4,340	5.0	4.5	78.9	77.7	
3	House Wren	2,030	5.3	4.9	74.6	75.1	
4	House Sparrow	1,051	3.7	3.6	5.1	4.7	
5	Purple Martin	532	5.0	4.4	87.4	86.7	
6	American Robin	340	3.3	3.0	64.9	63.8	
7	Black-capped Chickadee	302	5.8	5.4	68.3	67.4	
8	Carolina Chickadee	189	5.0	4.4	54.2	62.5	↘
9	Prothonotary Warbler	155	4.9	4.6	70.7	86.8	↘↘
10	Wood Duck	137	10.4	9.7	70.5	73.6	

Central Region

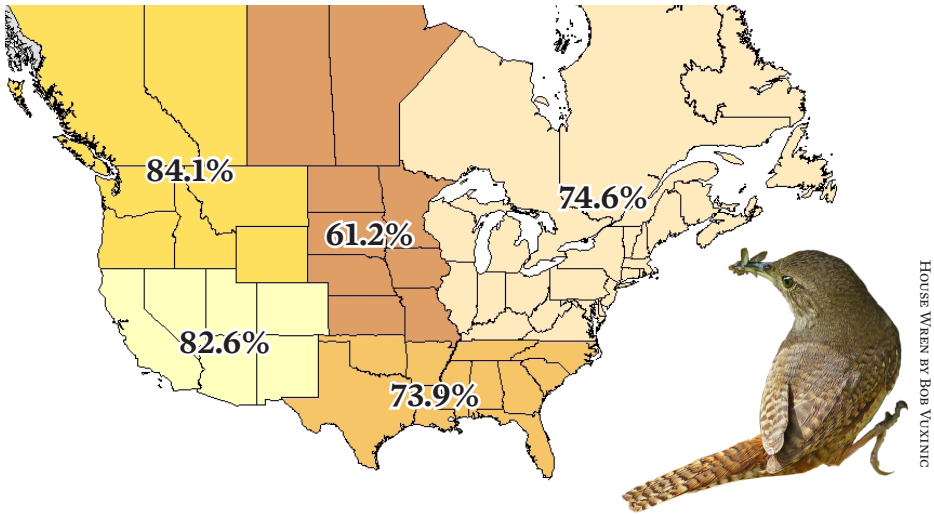
Purple Martins led the Top 10 in nesting success at 100%, a feat also accomplished in 2016. Black-capped Chickadee nesting success was 16% above the historic average for this region, with 80% of nests successfully fledging at least one young. House Wren nesting success, however, was lowest in the Central region in 2018 at 61.2%, about 14% lower than the 10-year average (see map below).

Eastern Bluebirds, the most reported species, enjoyed 76.5% nesting success, which was similar to the 10-year average (78.5%). Barn Swallow, Carolina Wren, House Finch, and American Kestrel lacked sufficient data (at least 10 nests with known fates) to calculate nesting success in 2018.



Purple Martins by John Higgins

Eastern Bluebird by Kathy DeLeo



House Wren by Bob Vuxinic

Looking across all regions, we see that House Wrens experienced the lowest success rate in the Central region in 2018. The 2018 breeding season was a lower-than-average year in this area for the tiny birds.

TOP-10 LIST: 1,130 NESTS REPORTED FOR ALL SPECIES

Rank	*Species*	*2018 Total nests reported*	*2018 Average clutch size*	*2018 Average fledglings*	*2018 Average nesting success (%)*	*Previous 10-year average success (%)*	*Change from previous*
1	Eastern Bluebird	637	4.5	3.9	76.5	78.5	
2	Tree Swallow	154	5.4	4.5	84.0	77.4	▲
3	House Wren	98	5.7	5.1	61.2	74.9	▼▼
4	Purple Martin	37	4.9	4.4	100.0	90.4	▲
5	Black-capped Chickadee	35	5.5	4.8	80.0	64.4	▲▲
6	American Robin	22	3.9	*	72.7	75.1	
7	Barn Swallow	17	5.3	*	*	83.6	*
8	Carolina Wren	16	4.8	*	*	*	*
9	House Finch	13	4.9	*	*	*	*
10	American Kestrel	10	3.7	*	*	*	*

*Insufficient data

Bird-friendly Community: Spotlight on Aldea de Santa Fe

BY LONNIE HOWARD AND LYNN CARSON, NESTWATCH CHAPTER COORDINATORS

Aldea de Santa Fe is a 345-acre community west of Santa Fe, New Mexico. We are currently the only chapter established in the Southwest Desert, and the second homeowner-initiated NestWatch chapter (Brambleton Bluebird and Garden Club of Brambleton, Virginia was the first).

Aldea de Santa Fe has an active birding club, which has collectively identified 101 species of resident and migratory birds in our yards and surrounding piñon-juniper open spaces in Aldea. We also host guest speakers and conduct periodic bird-related events and bird counts. Our chapter has two coordinators, one of whom also sits on our local Permaculture Committee with a mission to conserve, enhance, and integrate the neighborhood to foster a thriving natural habitat. Aldea Community is also certified by the National Wildlife Federation as a Community Wildlife Habitat, the only designated Homeowners Association in New Mexico.

New Mexico is home to approximately one-third of the global population of the **Juniper Titmouse**, estimated at 180,000 individuals. A major factor limiting the population may be fewer large juniper trees due to extensive clearing of piñon-juniper woodlands. Large juniper trees provide nesting cavities without which these feisty little birds cannot nest. Our 18-member core NestWatchers group initiated our flagship Juniper Titmouse monitoring project in 2016, with 70 birdhouses built and installed in juniper or piñon habitat. We've been monitoring for the last 2 years with the following 2018 results: more than 700 visits to the 70 nest boxes, 78 total young, 72 total fledglings (Juniper Titmouse, Bewick's Wren and Mountain Chickadee). We're very proud that our boxes fledged 92% of all hatched young in 2018. For the 2019 season, we've added 7 new Western Screech-Owl boxes to expand our efforts.

Juniper Titmouse by Mark Fuller

Juniper and Oak Titmice were once lumped under the same species name—Plain Titmouse. Ornithologists split the species in 1996.

Lynn Carson

Juniper Titmouse nestlings in a nest box.

According to Robyn Bailey, NestWatch project leader, our chapter has become the primary source of information about the Juniper Titmouse, contributing 72% of all nest records on this species. In addition, "Aldea de Santa Fe has risen to become the most active NestWatching group in New Mexico, contributing 77% of the state's data in 2018," Bailey said via email.

Our chapter recruits and trains members on monitoring techniques and entering data on the NestWatch website. This citizen-scientist endeavor, in conjunction with Cornell Lab of Ornithology's NestWatch project, is a way to demonstrate our goodwill and commitment to the wildlife in Aldea, and to demonstrate our pledge to being a Certified Wildlife Habitat Community. For us, it takes a village to conserve habitat for wildlife.

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NestWatchers Spoke: Here's What We Learned

BY ROBYN BAILEY, PROJECT LEADER

In 2014, a team of researchers led by Dr. Tina Phillips of the Cornell Lab of Ornithology undertook one of the largest evaluations of citizen science to date. In the rapidly growing field of citizen science, it is a good idea to pause and reflect on who participates, why, and what they get out of participation. For example, projects are expected to change environmental behaviors or teach science content. However, these expectations ignore the fact that many people who participate already have a high level of prior knowledge and may even be formally educated in the discipline. Therefore, project leaders need to hear from their members directly in order to understand what benefits they receive and why they stay involved (or why they don't).

Cedar Waxwing by Nikki Buchalski

In this four-year study, the research team interviewed a wide variety of participants across six environmentally based citizen-science projects, one of which was NestWatch. Researchers used rich, qualitative data to compare participants' motivations, feelings, learning, and social relationships surrounding the project, as well as actions undertaken on behalf of the project (e.g., collecting data, using data, recruiting others). In addition to nesting birds, the other projects focused on air quality, water quality, monarch butterflies, American eels, and weather. In this article, we will focus on the study's findings as they relate to NestWatch, but if you would like a copy of the full paper, **you can request one here.**

All interviewee's responses were confidential, and only shared with NestWatch leadership in summary form. Here's what we learned from the responses you gave:

NestWatch participants tend to be female, mostly college-educated, and over the age of 45. Participants are mostly rural residents, and they tend to belong to a conservation or community group focused on nest boxes.

OUR TAKEAWAY: These demographics are fairly typical of most large-scale citizen-science projects, with a few known exceptions. To avoid "preaching to the choir," we should strive to increase diversity in our project. It is to our advantage to reach more young people, urban residents, and those not already motivated by a conservation ethic. To create genuine learning opportunities, we recently created a NestWatch curriculum for middle school students that was translated into Spanish. To increase our geographic diversity, NestWatch recently enabled our mobile app to accept submissions from anywhere in the world (this was already the case for web-based data entry).

NestWatchers expressed mixed emotions about their participation, likely because they enjoy the beauty of witnessing new life, but also dread the sadness of death or negative environmental outcomes.

OUR TAKEAWAY: Nature is both beautiful and difficult to watch. With predators, invasive species, pesticides, and habitat loss threatening birds, it's easy to see why taking a closer look at birds' intimate lives may lead to heartache. We'll try to be transparent about this prospect, and look for practical opportunities to channel negative feelings into productive ways to help birds. We believe that an engaged participant will grow to understand that not all birds that hatch can survive, and this doesn't mean that they have failed. In our experience, the beauty and wonder of birds is not diminished by the

loss of life that one encounters on the trail.

NestWatchers were interested in exploring data and using data to make decisions. For example, some people mentioned using their data to make adjustments to nest boxes to promote better nesting success. However, most participants had little desire to conduct formal statistical analyses or read technical papers. Many people expressed satisfaction with their current roles, and did not necessarily feel the need to go further.

OUR TAKEAWAY: This is compelling evidence that individuals can be empowered by participation. We'll strive to enhance our online data exploration tools and visualizations, without overloading you with technical details. However, if desired, we are available to help you conduct your own analysis and will gladly provide any technical papers you request. We will continue to distill our research findings into digestible annual reports, blog posts, and social media posts.

The biggest barriers to participation were website challenges, the time it takes to submit data, and concerns about causing harm to birds.

OUR TAKEAWAY: We will continue to improve our two time-saving modes of data entry: the mobile app and our bulk-upload system. Realizing that these methods don't work for everyone, we will also aim to improve the website and streamline where possible. We share your concern about causing harm to birds, and we must clearly articulate best practices and protocols to avoid harm. The safety of the birds is our top priority. While the available evidence suggests that nest checking—when done properly—does not have an overall harmful effect on birds, we must ensure our participants are following best practices.

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A man and his grandson check their nest boxes. Social aspects were among the motivations NestWatchers mentioned in this study.

NestWatch interviewees mentioned learning through experience more frequently than did other project participants. They also like contributing data and feeling like they are part of something bigger through their participation.

OUR TAKEAWAY: The experience of monitoring nests is incredibly important to the learning process; NestWatchers learn by doing and are genuinely interested and enjoy what they do. The motivations commonly mentioned were intrinsic, meaning NestWatchers participate because they enjoy it (not because of outside pressure, like guilt, fear, or rewards). With more than 50% of respondents engaged in many of the social and scientific aspects of NestWatching, you are all doing so much more than just collecting data. You are asking and answering questions, sharing your passion with friends and family, and deepening your connection to your local place.

The research team and myself would like to thank all of the NestWatchers who agreed to participate in these interviews. We appreciate you letting us take time to reflect on what we are doing well, what we can improve, and what citizen science is truly accomplishing.

Black-capped Chickadee by Kevin McGowan

Reference:

Phillips, T.B., H.L. Ballard, B.V. Lewensein, and R. Bonney. 2019. Engagement in science through citizen science: Moving beyong data collection. *Science Education*. 2019:1-26. https://doi.org/10.1002/sce.21501

New Middle School Curriculum

BY HOLLY FAULKNER, PROJECT ASSISTANT

In October 2018, NestWatch published its first curriculum—a goal that was three years in the making. The new curriculum, titled *Thinking Outside the (Nest) Box*, was created in partnership with the Sustainable Forestry Initiative® and New York State 4-H .

The curriculum guides educators and students through five activities that cover topics about habitat, building and installing nest boxes, life cycles, proper monitoring and observation of nesting birds in North America, and data collection and analysis. The activities are geared towards students in grades five to eight but can be scaled up or down to fit your group's needs. It includes lessons, worksheets, a list of all materials needed for each activity, and links to the accompanying resources that are available on our website. Also included are a glossary of terms and a table which aligns all activities to the national Next Generation Science Standards and Common Core Standards for grades five through eight.

Thinking Outside the (Nest) Box is available as a free download from the **Cornell Lab K-12 Education** webpage, or hard copies can be requested by emailing us at **nestwatch@cornell.edu**, while supplies last. The curriculum and accompanying slideshow focusing on North American species are also **available in Spanish**.

Cover page of Thinking Outside the (Nest) Box.

Chelsea Benson

Students begin construction of the nest box featured in our curriculum.

Praise for Thinking Outside the (Nest) Box:

It really is a well-developed program... educators with whom our chapter works often ask about building birdhouses. Now, rather than just handing out measurements for the houses, I will be able to share a whole learning curriculum with them. Students will internalize so much more from having worked through the hands-on lessons...which leads so naturally into the all-important citizen-science component.

—Carol Ramsayer, Otter Creek Audubon Society

Chelsea Benson

Students check nest boxes that have been installed on school grounds.