

Putah Creek Nestbox Highway 2020 Annual Report

UC Davis Museum of
Wildlife and Fish Biology



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Prepared by
Hanika Cook, Melanie Truan, and Andrew Engilis, Jr.

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Cover photo: Tree swallow nestlings in a Putah Creek nest box. Photo by Monica Burnett

Acknowledgements

On behalf of the UC Davis Museum of Wildlife and Fish Biology (MWFB), we wish to thank everyone involved in the 2020 Putah Creek Nestbox Highway field season. We would especially like to thank Solano County Water Agency General Manager Roland Sanford and Putah Creek Streamkeeper Rich Marovich for their ongoing support and collaborative efforts to enhance Putah Creek. We also wish to thank the many generous private and public landowners who allowed us access to their properties. We are most grateful to Ron Ringen for donating handmade nestboxes to the project this year. We also wish to extend our gratitude to the Department of Wildlife, Fish, and Conservation Biology for project administrative support. Lastly but certainly not least, this project would not be possible without the annual dedication of our undergraduate student workforce and other UC Davis volunteers. Thanks go out to our hard-working 2020 crew, including field assistants Estefania Maravillas, Monica Burnett, Alison Ke, Michelle Mah, and Doris Wu. Despite the challenges that came with coronavirus-related restrictions on the size of our team in 2020, our small crew worked tirelessly and carefully to monitor all of our nestboxes and gather this year's data.



White-breasted Nuthatch nestlings. Photo by Estefania Maravillas

Introduction

The Putah Creek Nestbox Highway (PCNH) is an important, local conservation effort that, since its inception in 2000, has provided breeding habitat for a variety of secondary cavity nesting birds along Putah Creek (Yolo and Solano Counties, California). The PCNH consists of 200 artificial hanging nest boxes that imitate the tree cavities that hole-nesting birds use to raise their young. Nest boxes have proven invaluable since natural tree cavities in Putah Creek's narrow ribbon of habitat are limited and often usurped by non-native species such as European Starling (*Sturnus vulgaris*) and House Sparrow (*Passer domesticus*).

The Putah Creek Nestbox Highway currently comprises nine separate nest box trails arrayed along the lower 20 miles of Putah Creek from the Interdam Reach to the Yolo Bypass. As a combined conservation, research, and environmental education project, the PCNH helps augment regional bird populations while serving as a platform for collecting detailed observations on nesting activity. By monitoring sites weekly and measuring and banding nestlings, we are able to keep track of nest status, productivity, and fledgling dispersal. The project also provides training and field experience for university interns, our next generation of wildlife professionals.

Over the last 21 years, the PCNH has successfully fledged more than 13,000 young birds, of nine different species, including: Tree Swallow (*Tachycineta bicolor*), Western Bluebird (*Sialia mexicana*), Ash-throated Flycatcher (*Myiarchus cinerascens*), House Wren (*Troglodytes aedon*), and White-breasted Nuthatch (*Sitta carolinensis*). We are particularly gratified that Western Bluebird populations and reproductive success have increased substantially as a result of this project.



Western Bluebird nestling with new bands. Photo: Hanika Cook

2020 Results

In 2020, five species of birds successfully nested between mid-March and mid-August. A total of 282 clutches were produced from 200 available boxes, excluding three House Sparrow nests. From these clutches, 1361 eggs were produced, hatching into 990 nestlings, resulting in 848 successful fledglings (Table 1). Tree Swallows produced the most fledglings, about 52% of the total, followed by Western Bluebirds (35%) House Wrens (10%), Ash-throated Flycatchers (3%) and White-breasted Nuthatches (less than 1%).

Table 1. Summary and comparison between 2019 and 2020

Species	Year	# Clutches	# Eggs	# Nestlings	# Fledglings	Hatching Success	% Change Hatching Success 2019-2020	Fledging Success	% Change Fledging Success 2019-2020
Ash-throated Flycatcher	2020	10	41	26	25	63.41%	+15.9%	96.15%	+11.5%
	2019	11	53	29	25	54.72%		86.21%	
House Wren	2020	24	146	89	83	60.96%	-24.8%	93.26%	+10.4%
	2019	32	222	180	152	81.08%		84.44%	
Tree Swallow	2020	127	644	500	437	77.64%	+12.8%	87.40%	+31.8%
	2019	167	828	570	378	68.84%		66.32%	
Western Bluebird	2020	119	519	368	298	70.91%	+5.2%	80.98%	+3.3%
	2019	86	371	250	196	67.39%		78.40%	
White-breasted Nuthatch	2020	2	11	7	5	63.64%	-33.2%	71.43%	-4.8%
	2019	4	21	20	15	95.24%		75.00%	
TOTAL	2020	282	1361	990	848	72.74%	+3.7%	85.66%	+17.3%
	2019	300	1495	1049	766	70.17%		73.02%	

*Table does not include House Sparrow clutches

Hatching and fledging success increased in 2020 compared to 2019, though the number of nesting attempts and eggs were lower in 2020. Fewer nestling deaths and less depredation occurred in 2020 compared to 2019, which may have made it unnecessary for birds to lay as many eggs as they did in 2019. Tree Swallows experienced the greatest increase in fledging success. Most species had greater overall fledging success and produced more fledglings in 2020 than in 2019, except for House Wren and White-breasted Nuthatch. Nuthatches usually do not produce many nests or fledglings in our nest boxes, and 2019 was an unusually successful year for them. While House Wrens seem to have experienced more depredation in 2020 than in 2019, overall depredation decreased by around 38%, and the number of nestlings perishing for other reasons decreased from 143 to 88.

The busiest period of nesting activity came between late April and mid-June (Fig. 1). Late April and early May (4/26-5/9) had the highest peak of egg-laying activity, with about 454 eggs laid. A second wave of eggs followed in mid-June (6/7-6/20), peaking at about 186 eggs. Subsequent waves of nestlings followed about one month after initial egg-laying, followed a couple of weeks later by fledglings (Figs. 1 and 2).

Total Reproductive Productivity in 2020

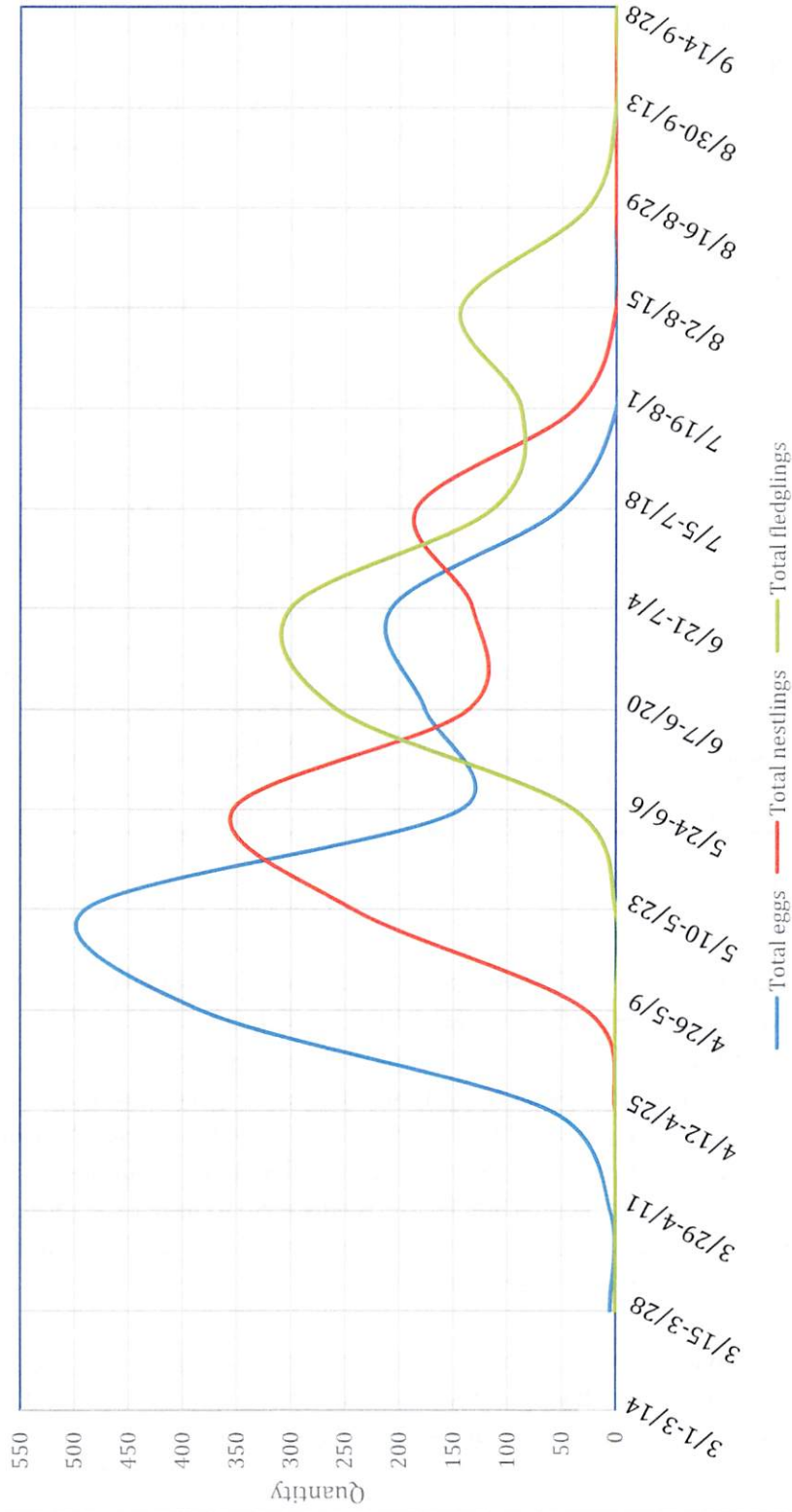


Figure 1. Overall reproductive productivity spread over biweekly segments.

Reproductive Productivity in 2020

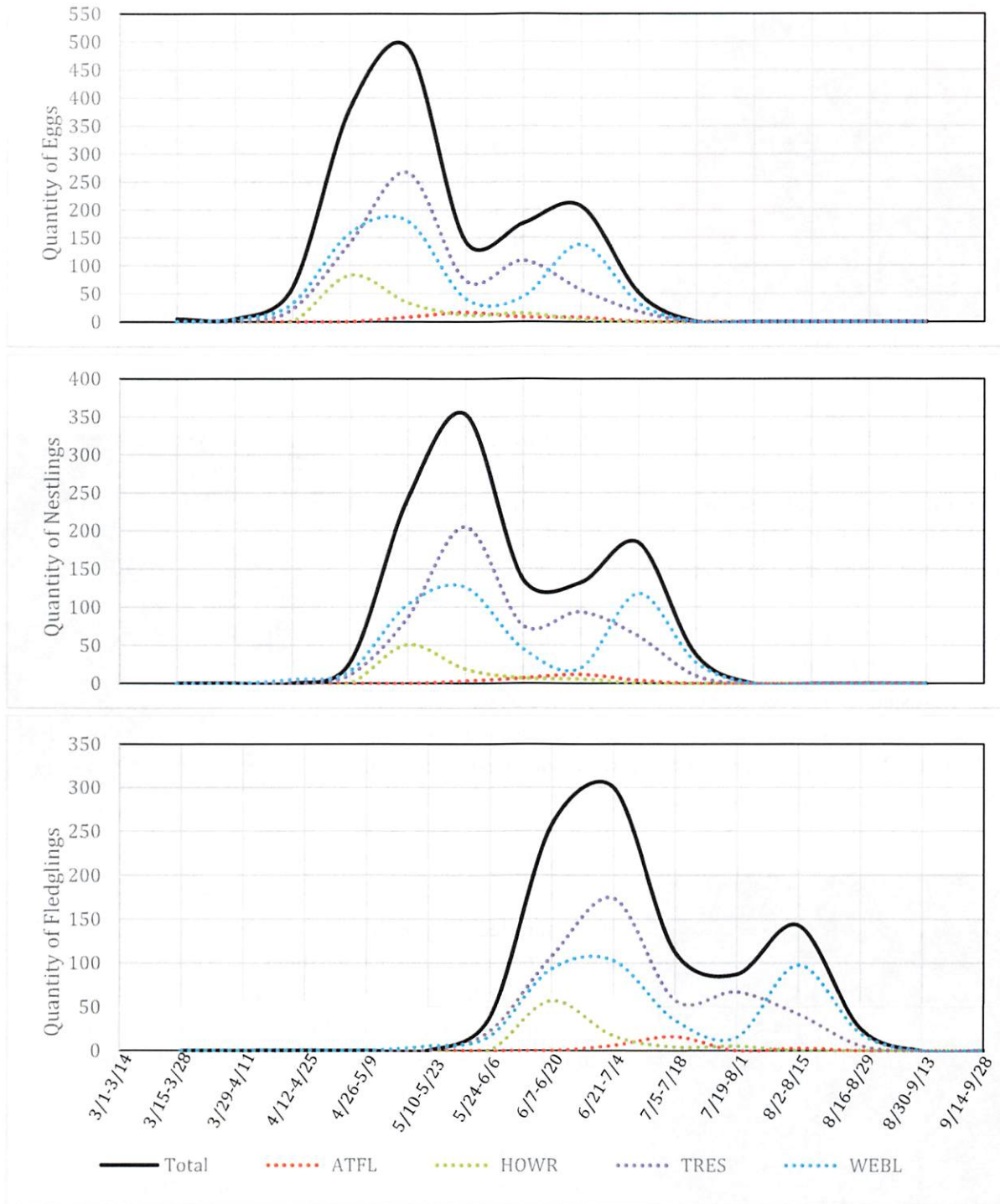


Figure 2. Reproductive productivity spread over biweekly segments, including species-level comparisons between four most productive species: ATFL=Ash-throated Flycatcher; HOWR=House Wren; TRES=Tree Swallow; WEBL=Western Bluebird.

Species-specific Results



House Wren nestling. Photo: Hanika Cook

House Wren

House Wrens produced 24 clutches and a total of 146 eggs (Table 1). 89 of the eggs hatched, and 83 nestlings fledged successfully. Overall egg production, hatching success, and fledging numbers were lower in 2020 than in 2019, though fledging success increased slightly between these years. House wrens started producing eggs about a week later in 2020 than in 2019. In 2020, about one third of all house wren nests and fledglings were at Russell Ranch, while the rest of the nest attempts were found more evenly along the creek.

White-breasted Nuthatch

There were two White-breasted Nuthatch clutches this year. They produced a total of 11 eggs of which seven hatched (Table 1). Five of these nestlings fledged successfully, compared to 15 fledglings from 21 eggs in 2019. Aside from 2019, low nest and fledging numbers for White-breasted Nuthatches have been the norm in our nest boxes.

One very late White-breasted Nuthatch nest was apparently started at the end of June 2020 at the Picnic Grounds site in Davis, making this the latest nest start in our records by this species. We observed a nest made with fur, a typical material for this species' nests, and a nearby White-Breasted Nuthatch adult was observed carrying nesting material. This nest then was abandoned before any eggs were laid.



White-breasted Nuthatch nestling.
Photo: Estefania Maravillas



Tree Swallow nestling and eggs.
Photo: Hanika Cook

Tree Swallow

Tree Swallows continued to make up about half of all nesting efforts and fledglings produced. In 2020, they produced 127 clutches, 644 eggs, and 500 nestlings (Table 1); 437 of these nestlings fledged successfully, representing a 31.8% increase in fledging success compared to 2019. Weather conditions seem to have been more favorable in 2020 for Tree Swallows (as well as Western Bluebirds).

2020 marked the second-earliest estimated first egg of the season for Tree Swallows. The first egg in 2020 was laid on about April 3rd, while the earliest estimated first egg date in our records for this species was March 29th in 2015. The latest first egg date we have for this species was May 2nd in 2001, a difference of over a month.

Western Bluebird

298 Western Bluebird fledglings were produced in 2020 – over 100 more than in 2019 (Table 1). There were slight increases in hatching and fledging success in 2020, but the larger number of fledglings compared to 2019 is mostly due to a greater number of eggs laid in 2020. Bluebirds were the last to finish nesting this year, with several clutches fledging in the last few days of July.



Photo: Hanika Cook

Ash-throated Flycatcher

10 clutches were produced by Ash-throated Flycatchers in 2020 (Table 1). 41 eggs were laid, producing 26 nestlings and 25 fledglings. In 2019, there were also 25 fledglings, but more eggs and nestlings, meaning fledging success was greater in 2020. More than a third of the 2020 Ash-throated Flycatcher fledglings came from four Russell Ranch nest boxes, while the remaining nest attempts were scattered across the rest of the trails. While in 2019 multiple flycatcher eggs were found alongside eggs of other species in the same nest, in 2020 this was not observed, suggesting there may have been less competition for nest boxes in 2020.



Ash-throated Flycatcher eggs.
Photo: Hanika Cook

House Sparrows

House Sparrows are non-native species that can take over territories and monopolize nest boxes across seasons. Thus, we remove House Sparrow nests when they are found in our boxes. In 2020, we had three confirmed nesting attempts, all at the Triangle Orchard. One of these nests produced three fledglings, but the House Sparrow nests in the other boxes were removed before nestlings could hatch. There was possible House Sparrow nesting material in some of the Dry Creek Confluence boxes, but no sparrow eggs were found there.

Site-level Results

The Putah Creek Nestbox Highway currently consists of nine nest box trails (Fig. 3), containing a total of 200 boxes. In 2020, birds occupied 184 of the available boxes (92% occupancy). To compare nesting activity among different segments of the creek, we grouped trails into three different reaches: upper, middle, and lower. The upper reach contained sites upstream of Interstate 505, the middle reach included sites between I-505 and Pedrick Road, and the lower reach included sites downstream of Pedrick Road.



Figure 3. Map of the Putah Creek Nestbox Highway trails, 2020. INT=Interdam; DVD=Diversion Dam; DCC=Dry Creek Confluence; WIN=Winters Putah Creek Park; TRO=Triangle Orchard; RRR=Russell Ranch; PIC=Picnic Grounds; DRR=Old Davis Rd/Restoria; MBN=Mace Blvd North.

Table 2 presents overall reproductive activity by reach and site. Due to differences in box numbers at different sites, we standardized fledgling production by the number of boxes available for each trail (Fig. 4).

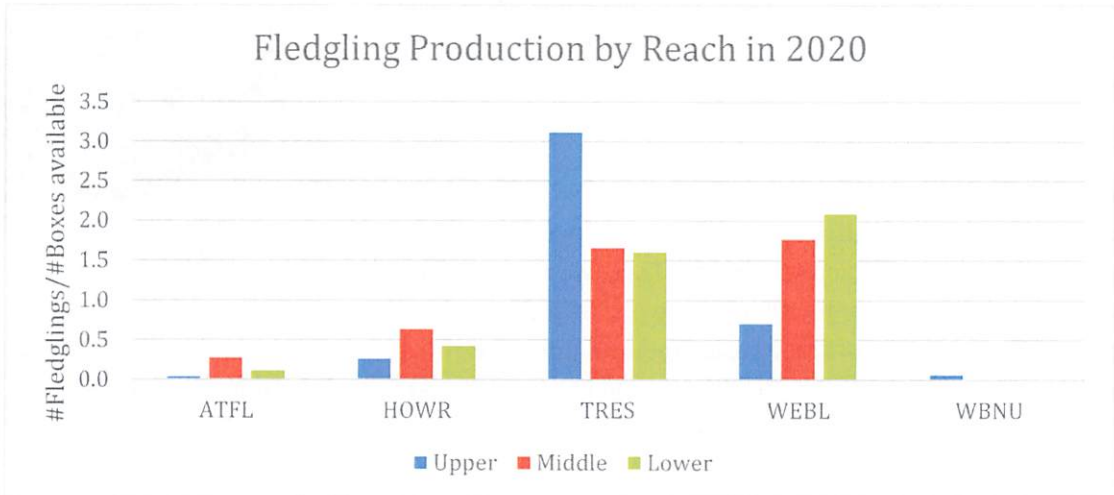


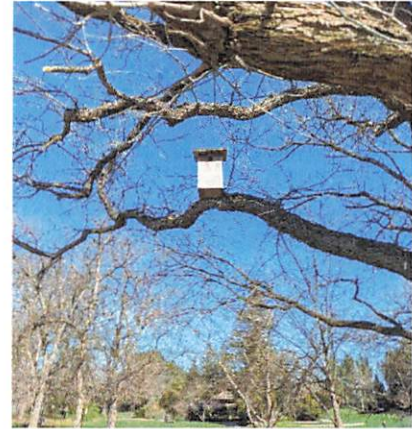
Figure 4. Distribution of fledgling production among the Upper, Middle, and Lower reaches. #Fledglings standardized by number of boxes available at a given reach. ATFL=Ash-throated Flycatcher; HOWR=House Wren; TRES=Tree Swallow; WEBL=Western Bluebird; WBNU=White-breasted Nuthatch.

Table 2. Reproductive activity by reach and site, 2020

	Site	Boxes	Boxes used	Clutches	Eggs	Nestlings	Fledglings	#Fledglings/ #Boxes
UPPER REACH	Interdam	20	18	24	135	92	89	4.45
	House Wren			3	16	7	6	0.30
	Tree Swallow			21	119	85	83	4.15
	Diversion Dam	19	15	22	120	67	58	3.05
	House Wren			5	31	16	14	0.74
	Tree Swallow			11	58	30	24	1.26
	Western Bluebird			5	26	16	15	0.79
	White-breasted Nuthatch			1	5	5	5	0.26
	Dry Creek Confluence	22	21	35	154	112	102	4.64
	Ash-throated Flycatcher			1	4	0	0	0.00
	Tree Swallow			18	87	68	66	3.00
	Western Bluebird			16	63	44	36	1.64
	Winters	14	13	18	93	86	66	4.71
	Ash-throated Flycatcher			1	4	3	3	0.21
	Tree Swallow			15	78	77	61	4.35
Western Bluebird			2	11	6	2	0.14	
Upper reach total	75	67	99	502	357	315	4.20	
MIDDLE REACH	Triangle Orchard	20	20	31	141	117	105	5.25
	Ash-throated Flycatcher			1	4	4	4	0.20
	House Sparrow			1	4	4	3	0.15
	Tree Swallow			15	69	59	54	2.70
	Western Bluebird			14	64	50	44	2.20
	Russell Ranch	27	26	34	169	128	102	3.78
	Ash-throated Flycatcher			4	16	10	9	0.33
	House Wren			8	47	30	30	1.11
	Tree Swallow			6	30	28	24	0.89
	Western Bluebird			15	70	58	39	1.44
	White-breasted Nuthatch			1	6	2	0	0.00
	Middle reach total	47	46	65	310	245	207	4.40
	LOWER REACH	Picnic Grounds	35	32	51	236	146	124
House Wren				4	25	15	15	0.43
Tree Swallow				15	76	46	40	1.14
Western Bluebird				32	135	85	69	1.97
Old Davis Rd		23	19	31	139	101	81	3.52
Ash-throated Flycatcher				2	9	5	5	0.22
House Wren				3	17	11	10	0.43
Tree Swallow				8	31	29	22	0.96
Western Bluebird				18	82	56	44	1.91
Mace Blvd		20	20	38	171	142	125	6.25
Ash-throated Flycatcher				1	4	4	4	0.20
House Wren				2	12	8	8	0.40
Tree Swallow				19	93	77	63	3.15
Western Bluebird				16	66	53	50	2.50
Lower reach total		78	71	120	546	389	330	4.23

UC Davis Arboretum

The nest boxes at the Shields Oak Grove in the UC Davis Arboretum were set up in partnership with the UC Davis student-led conservation group “Wild Campus” but are currently monitored by MWFB staff and volunteers. This is an additional site separate from the Putah Creek Nestbox Highway. These nest boxes provide breeding habitat for campus birds and education and outreach opportunities for students and the public. In 2020, Western Bluebirds occupied seven of the 11 Arboretum boxes, producing 40 fledglings (Table 3).



Nestbox at UCD Arboretum. Photo: Hanika Cook

Table 3. Nestbox results for the Arboretum, 2020

Site	Boxes	Boxes used	Clutches	Eggs	Nestlings	Fledglings	#Fledglings /#Boxes
Arboretum	11	7	10	49	43	40	3.64
Western Bluebird			10	49	43	40	3.64

Davis Nestbox Network

The Davis Nestbox Network is another site located outside of the Putah Creek Nestbox Highway. These nest boxes were set up in 2019 along the Covell Greenbelt in north Davis in partnership with the City of Davis and the UC Davis student chapter of the Society for Conservation Biology. The trail runs from Community Park, through Covell Park, through Northstar Park and now into the North Davis Upland Habitat Area. This urban nest box trail provides habitat for birds and viewing opportunities for the local public. In 2020, Tree Swallows and Western Bluebirds occupied 15 of the 20 boxes, producing 85 fledglings (Table 4). Five of the nest boxes are new pole-mounted boxes that had just been installed in the upland habitat area before the 2020 nesting season; all five were occupied in 2020.



Western Bluebird nestlings in a nestbox in Community Park. Photo: Melanie Truan

Table 4. Nestbox results for the Davis Nestbox Network, 2020

Site	Boxes	Boxes used	Clutches	Eggs	Nestlings	Fledglings	#Fledglings /#Boxes
Davis Nestbox Network	20	15	22	112	97	85	4.25
Tree Swallow			9	46	46	39	1.95
Western Bluebird			13	66	51	46	2.30

Dispersal

Based on our recapture and re-sighting records, Western Bluebirds show strong natal philopatry, meaning that birds often remain to live and breed in the area where they were born. However, we have several records of bluebirds moving from Winters to Davis or vice versa, and some travelling to Dixon or Sacramento. The furthest known movement of a bluebird banded on Putah Creek was from Dry Creek/Putah Creek in Winters to Slide Hill Park in Davis – a distance of about 23 km.

The Tree Swallows we have banded are more often recaptured from nest boxes and less often re-sighted (due to their lack of color bands) than Western Bluebirds. Our furthest record of Tree Swallow dispersal is almost 80 km, from the Dry Creek area in Winters in 2017 to a residential area of Stockton in 2020. This species is known to migrate much further than Western Bluebirds.

Wildfires

The LNU Lighting Complex Hennessey Fire started in late August of 2020, thankfully after the year's nest box breeding season was over. However, fire transformed the landscape in areas surrounding Lake Berryessa, including the Interdam site, our westernmost nest box site. Several nest boxes are missing. While the boxes can be replaced, it will take years for vegetation to regrow and resemble its former state. Yet recent visits to the site are encouraging in that Western Bluebirds are present onsite, basing themselves in unburned areas and coming out to forage in the burned patches. With much of the aboveground foliage burned off, birds appear to be actively foraging for seeds and insects on the ground and on burned woody debris. White-breasted Nuthatches and a variety of woodpeckers are abundant, taking advantage of the burned snags for foraging. Continued nest box monitoring at this site may lead to interesting data on post-fire wildlife recovery in this riparian habitat.



Escaping the flames, a nest box at Interdam site remains after the LNU Complex Hennessey fire in August of 2020. Photo: John Hansen.

Future Directions

The Putah Creek Nestbox Highway continues to supply significant long-term scientific data on cavity-nesting bird population status, reproduction, phenology, and behavior. Data on reproductive markers such as clutch size, fledgling number and fledgling health can be combined with spatial and environmental data such as precipitation, temperature, and vegetation cover to explore the relative influences of habitat and climate on reproductive success.

For more information on the Putah Creek Nestbox Highway project, and to view stories and photos, we invite you to visit our blog: <https://mwfb-songbird-nestbox.wordpress.com>.