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# NEW AND EXTRALIMITAL RECORDS OF BREEDING BIRDS FOR PUTAH CREEK, CALIFORNIA

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ABSTRACT: We report on extralimital and new breeding records from a 16-year study of birds along lower Putah Creek, Central Valley, California, that began in 1997. Surveys for breeding birds have confirmed 74 species nesting on the creek, while nesting of 17 further species remains probable. Among rare or extralimital species, we documented nesting of the Hooded Merganser (*Lophodytes cucullatus*), *Selasphorus* sp., Pileated Woodpecker (*Dryocopus pileatus*), Pacific-slope Flycatcher (*Empidonax difficilis*), Bell's Vireo (*Vireo bellii*), Warbling Vireo (*V. gilvus*), Chestnut-backed Chickadee (*Poecile rufescens*), Brown Creeper (*Certhia americana*), Wrentit (*Chamaea fasciata*), Orange-crowned Warbler (*Oreothlypis celata*), Dark-eyed Junco (*Junco hyemalis*), and Western Tanager (*Piranga ludoviciana*). The records of nesting of the Brown Creeper, Chestnut-backed Chickadee, and Western Tanager are the first confirmed for those species on the Central Valley floor. Nine of these species have experienced recent expansions elsewhere in their California ranges, and Bell's Vireo has begun to reoccupy a few other sites in the Central Valley, from which it had been extirpated for decades. We also present evidence for probable breeding by the Hairy Woodpecker (*Picoides villosus*), Western Wood-Pewee (*Contopus sordidulus*), California Thrasher (*Toxostoma redivivum*), Yellow Warbler (*Setophaga petechia*), and Yellow-breasted Chat (*Icteria virens*). These breeding records attest to the pioneering nature of birds and to the importance of Putah Creek in the maintenance of riparian species in the Sacramento Valley.

The primary interest of most bird inventories is to document the regularly occurring species, as these influential members of local ecosystems play a prominent role in ecogeographical studies. Very often less attention is paid to the scarce, rare, or irregularly occurring species as their role in community ecology seems to be slight or even negligible (Patten and Marantz 1996,

Udvardy and Engilis 2001, Mouillot et al. 2013). But the documentation of rarities is becoming more important in faunal studies, and the trends of rare or extralimital bird occurrences help reveal the nature and extent of the species' tendency to pioneer, reflect changes in climate, response to habitat management, or even how they contribute to ecological function (Jones and Diamond 1976, Patten and Burger 1998, Cao et al. 1998, Lyons et al. 2005, Trochet and Engilis 2013, Mouillot et al. 2013).

In California, Putah Creek flows from southern Lake County southeast to Lake Beryessa, Napa County, then east to the Putah Creek Sinks in the Yolo Bypass between Davis and Sacramento. The lower section from just above Lake Solano down to the sinks, separating Yolo County to the north from Solano County to the south, is a 38-km riparian corridor whose birdlife has been monitored by Truan et al. (2010). Putah Creek is particularly interesting because it is one of only a few streams that flows into the Central Valley from the west and is anchored at each end by different habitats, pine–oak woodlands and chaparral of the Coast Range on the west and grassland and marshlands of the Central Valley on the east. Along this habitat shred, species filter both downstream from the foothills and upstream from the wetland basins, and the creek itself serves as a corridor for extralimital wandering (Truan 2004).

The section of the creek we address in this paper is entirely below Monticello Dam. Our highest and westernmost survey site, Interdam, is about 6 km below the dam at elevation 52 m above sea level. This is the only site in the foothills of the Coast Range, all others having Central Valley flatlands on both sides of the stream. Survey sites continue downstream to the Putah Creek Sinks in the Yolo Bypass, a distance of 38 km. Below Solano Diversion Dam the creek is incised, and in places old levees remain. The high banks confine a channel that varies in width from about 30 to 200 m. The vegetation of the channel, no longer regularly scoured, has changed markedly since the completion in 1957 of Monticello Dam. Thirty species of trees occur in the surveyed portion of the creek, 15 of these plus the exotic giant cane or false bamboo (*Arundo donax*) being significant components of the canopy (Truan et al. 2010). Closed-canopy gallery woodland, mainly of cottonwood (*Populus fremontii*) and valley oak (*Quercus lobata*), occurs patchily throughout, as do groves of the exotic blue gum (*Eucalyptus globulus*). Other important canopy components include red willow (*Salix laevigata*), black willow (*S. gooddingii*), Oregon ash (*Fraxinus latifolia*), California walnut (*Juglans californica* var. *hindsii*) and white alder (*Alnus rhombifolia*). The understory vegetation is now varied and in many places well developed. Common native species include California rose (*Rosa californica*), coyote bush (*Baccharis pilularis*), poison oak (*Toxicodendron diversilobum*), buttonbush (*Cephalanthus occidentalis*), and blue elderberry (*Sambucus mexicana*). Understory exotics include false bamboo, tamarisk (*Tamarix parviflora*), and Himalayan blackberry (*Rubus armeniacus*). Himalayan blackberry is by far the most extensive of the shrub species. California blackberry (*R. ursinus*) occurs but is much scarcer. Saplings also contribute to the shrub layer, with sandbar willow (*Salix exigua*), box elder (*Acer negundo*), and Oregon ash most important. The creek's gradient declines from west to east so that slack water increases toward the sinks. At

the uppermost survey sites the current is lively and there are numerous runs and riffles. The flatlands beyond the banks and levees are variously devoted to orchards, row crops and grain fields, and some scattered homes and farm buildings, plus the cities of Winters and Davis.

The first faunal studies along Putah Creek were undertaken by Tracy Storer in the mid-1920s, followed in the 1930s and 1940s by John Emlen, both at the University of California, Davis (Trochet and Engilis 2013). In 1997, Truan began ecological studies assessing the spatial and habitat relationships of birds in this riparian corridor (Truan 2004). In 2004, her efforts were continued and expanded by the Museum of Wildlife and Fish Biology (MWFB) at the University of California, Davis, in coordination with the Solano County Water Agency.

Habitat along lower Putah Creek has been greatly modified over the past 60 years. After the completion of Monticello Dam in 1957, Putah Creek's water was diverted for urban and agricultural uses, and the creek below the dam was allowed to run dry. Flood-management agencies routinely removed riparian growth to keep the channel open for conveyance of flood water. In 2000, a legal agreement, the Putah Creek Water Accord, mandated that water flows must be restored and maintained for habitat function. Sustained flows began in 2000. The Lower Putah Creek Terrestrial Wildlife Monitoring Program of MWFB was born out of this accord with the goal of monitoring the response of wildlife to stream flows and habitat restoration. Birds remained a focus of this monitoring, and the long-term data generated are helping us assess avian community structure (Dybala et al. 2014), population-level changes, distributions, and ecological processes (Truan 2004, Truan et al. 2010). This paper reports on several interesting, extralimital, and important breeding records for California's Central Valley.

## METHODS

The study area of the Lower Putah Creek Terrestrial Wildlife Monitoring Program extends over 38 km from 4.6 km upstream of the Solano Diversion Dam on the west (122.0487° W) to the Putah Creek Sinks in the Yolo Bypass Wildlife Area on the east (121.6107° W) (Figure 1). In general, the north bank of Putah Creek is in Yolo County, the south bank in Solano County.

This program includes 14 study sites along this segment, of which half are on public land and half are on private land. These sites were established for annual monitoring of abundance, productivity, and distribution of species. In addition to surveying at these sites, to identify breeding species and document changes over time, we conducted two Breeding Bird Atlas (BBA) surveys along the entire length of the creek. These followed the standard BBA methods and terminology outlined by the U.S. Geological Survey www.pwrc.usgs.gov/bba/). For the BBA surveys, we divided the creek into 32 blocks each 1.6 km long, numbered from west to east (Figure 1). The width of the area surveyed was determined by the location of levees along the creek, beyond which there was little or no riparian vegetation. Each block was visited numerous times from March to July of 2004–2006 and March to July of 2012–1013. In addition, from 2004 to 2006 we ran three Monitoring Avian Productivity and Survival (MAPS) stations, at the Putah Creek

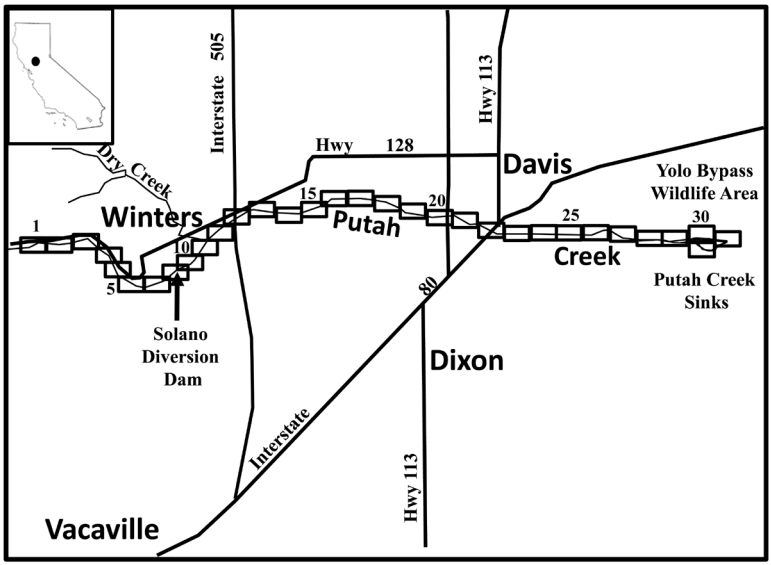


Figure 1. Location of the lower Putah Creek survey blocks. Each block is one mile in length and is limited to the width of the levees north and south of the creek. Block 1 is farthest west, block 32 farthest east.

Sinks (lower reach), Russell Ranch (middle reach), and Dry Creek confluence (upper reach). Our MAPS protocols followed those recommended by the Institute for Bird Populations (DeSante et al. 2005). Finally, we made incidental observations with follow-up visits for promising observations during the breeding season along the entirety of the creek.

We searched historic records to help place our recent observations into regional context. Such data came from specimens in the collections of Museum of Wildlife and Fish Biology (MWFB), Museum of Vertebrate Zoology, University of California, Berkeley (MVZ), California State University, Sacramento (CSUS), and the Western Foundation of Vertebrate Zoology, Camarillo, California (WFVZ). Other resources included published summaries (Grinnell and Miller 1944, Gaines 1974), the field notes of Tracy Storer (1925–1928, archived at the California Academy of Sciences) and John T. Emlen (1935–1943, archived at the MWFB), and the journals of Elizabeth Kimball (Engilis 2013), summarizing 100,000 bird records from the greater Sacramento Region from 1950 to 1983 and archived at the MWFB. We searched the Central Valley Bird List Serve (http://groups.yahoo.com/group/central_valley_birds/), which proved invaluable in finding incidental observations by the wider birding community during the survey period.

To follow up on observations of Bell's Vireo in the Putah Creek Sinks, Whisler followed survey methods recommended by the U.S. Fish and Wildlife Service (2001) and the BBA protocols of the Yolo Audubon Society and University of California, Davis.

## RESULTS

Our combined surveys from 1997 to 2014 resulted in nearly 70,000 observation records and documented 251 bird species for Putah Creek. During the first BBA period (2004–2006), we confirmed 62 species as nesting along lower Putah Creek. In addition, we rated 19 species as probable breeders and three species as possible breeders, bringing the number of either confirmed or suspected breeders to a total of 84 species. In the interval between BBA efforts, we confirmed an additional 11 species, bringing the total number of confirmed breeding species to 73. During the second BBA period (2012–2014), we confirmed breeding by 74 species. An additional 13 species met criteria for probably breeding, and another 14 species were possible breeders on the basis of still less compelling evidence. Cumulatively, 74 species have now been confirmed breeding, with another 17 species as probable breeders (Appendix). Of this total, 17 species represent extralimital or rare breeding in the Central Valley, as detailed below.

## SPECIES ACCOUNTS

HOODED MERGANSER *Lophodytes cucullatus*. Breeding status: Confirmed, first on the basis of a clutch of five infertile eggs collected from a Wood Duck box in the Putah Creek Campus Reserve (block 21) on 22 April 2000, preserved as MWFB 4727). A single female laid eggs and incubated each year from 2000 to 2002 in block 22. Both sites are in Solano County (Pandolfino et al. 2006). Just 2 km north of Putah Creek, a female accompanied by a chick was observed in the arboretum of the University of California, Davis, on 11 May 2000. First recorded in California in 1964, breeding of the Hooded Merganser is now regular but uncommon in the northern Sacramento Valley (Pandolfino et al. 2006, Conard et al. 2013).

ALLEN'S or RUFOUS HUMMINGBIRD *Selasphorus sasin/S.rufus*. Breeding status: Confirmed. On 10 April 2012 at the picnic grounds of the University of California, Davis (block 22), Trochet observed a female Rufous/Allen's hummingbird visit spider webs on three occasions over a period of 25 minutes. Each time she gathered a significant amount of spider silk and dashed off around the creekside edge of a tall willow thicket. Efforts to find the nest were unsuccessful, but gathering nest material confirms nesting by BBA criteria. This observation represents the only known nesting of a *Selasphorus* in Yolo County.

Allen's Hummingbird is, on biogeographic grounds, the likelier *Selasphorus* to breed along Putah Creek. According to the Kimball journals, this species was regular in the breeding season in Courtland, Sacramento County, from 1968 to 1980. It has nested at the Cosumnes River Preserve, Sacramento County, first in 2002 (Coumoutso and Trochet 2002) and at least three times subsequently. Of the five specimen records from the Sacramento Valley, four are based on female and juvenile birds in summer. The date of the lone record of an adult male (Table 1) coincides with the time of Allen's Hummingbird's arrival on the coast of northern California (Clark and Mitchell 2013).

HAIRY WOODPECKER *Picoides villosus*. Breeding status: Probable. The discovery of a single Hairy Woodpecker at Russell Ranch, Yolo County (block 17), on 11 June 2002, occasioned a follow-up visit on 24 June 2002. On the latter date, A. Engilis and Truan found a pair using a freshly excavated cavity, a BBA criterion for probable nesting. The pair was monitored for the following week but breeding was never confirmed.

**Table 1** Allen's Hummingbird Specimens from the Sacramento Valley

| Specimen number | Sex/Age | Date | Locality |
|---|---|---|---|
| WFB 1339 | Female—adult | Summer 1976 | Sacramento: Natomas |
| WFB 4602 | Male—juvenile | 9 Jul 1997 | Yolo: Davis |
| WFB 5737 | ?—juvenile | 16 Jun 2003 | Sacramento: Natomast |
| WFB 6200 | Male—adult | 7 Feb 2005 | Sacramento: Natomas |
| CSUS 2805 | Female—adult | June 1978 | Sacramento: Carmichael |
| YPM 104043 | Male—? | 28 May 1968 | Sacramento: Courtland |

Hairy Woodpeckers are seen rather regularly along the foothill portions of Putah Creek above Lake Solano but rarely on the floor of the Central Valley. In the northern Sacramento Valley in 1972 one pair summered along the Sacramento River at Red Bluff, Tehama County, another at Murphy's Slough, Butte County (D. Gaines and B. Webb, *fide* B. Deuel). F. Oliver and J. Lomax (pers. comm.) observed one at Oroville Wildlife Area, Butte County on 6 June 2004, and A. Maizlich (pers comm.) photographed a female at Colusa National Wildlife Refuge, Colusa County, on 31 May 2013.

PILEATED WOODPECKER *Dryocopus pileatus*. Breeding status: Confirmed. The first record of breeding was at Lake Solano Park, Solano County, 2 km northwest of the Solano Diversion Dam (S. Long; Figure 2). On 1 May 2006, he saw a female's head emerge from a cavity, while below the male was excavating another hole. This was from the vicinity where a single bird had been observed since at least 2001 and a pair since 2004. We recorded probable nesting by a pair at the Interdam site (block

Figure 2. Female Pileated Woodpecker at nest cavity in a cottonwood at Lake Solano Park, Solano County, 5 May 2006.

*Photo by Dee Warenycia*

4) on various dates from 14 April through 16 June, 2009 to 2012. The observations (including calling, drumming, and sightings of a pair) centered on a large grove of cottonwoods on the Solano County side of the creek at 38.511° N, 122.0507° W. In 2012, Trochet found a male Pileated Woodpecker below the Solano Diversion Dam (block 7) on three occasions in May and June. This bird called and drummed in large gray pines (*Pinus sabiniana*) adjacent to a mature cottonwood-dominated riparian grove over an interval that established probable breeding by one BBA criterion. Bousman (2007) reported a spread of the Pileated Woodpecker in the San Francisco Bay area beginning in the 1940s.

WESTERN WOOD-PEWEE *Contopus sordidulus*. Breeding status: Probable, in five areas along Putah Creek. A pair was in the Putah Creek Sinks, Yolo County (block 31), on 30 May 2003. Another singing male, appearing territorial, was at Russell Ranch, Yolo County (block 17), on 6 June 2003. Three counter-singing males remained at one site below the Solano Diversion Dam, Solano County (block 7), from late May to 22 June 2012; this seemed the most promising observation, but the birds did not nest. Again at Russell Ranch, a pair apparently on territory on 2 June 2013 was absent one week later. In block 24, a territorial defense was observed on 7 June 2013.

The Western Wood-Pewee was not found breeding in the Sacramento Valley in the early 20th century but was present commonly in the northern valley and uncommonly in the southern by the 1970s (Gaines 1974). Along Putah Creek, Tracy Storer collected a "breeding male, testes 3.3 × 2.0 mm," on Putah Creek 3 miles southwest of Winters on 20 June 1925 (Trochet and Engilis 2013). But these dimensions are no more than half those breeding male pewees typically reach, so the status of the bird in 1925 may have been the same as in 2013. Despite our failure to confirm nesting on lower Putah Creek, the Western Wood-Pewee has been confirmed nesting in riparian woodlands in the Yolo and Sutter bypasses only 10 km from the Putah Creek Sinks (MWFB 2008), and it has bred regularly in the Cache Creek Settling Basin, ~19 km north of Putah Creek and just east of the town of Woodland, at least since 2010 (S. Hampton pers comm.). This species also breeds regularly in riparian forests of the Cosumnes River Preserve, Sacramento County.

PACIFIC-SLOPE FLYCATCHER *Empidonax difficilis*. Breeding status: Confirmed. In 2004, after a pair had been observed at the Dry Creek confluence, Yolo County (block 10), regularly since late May, on 26 June an adult was seen carrying food. The nest was not located but suspected where the birds made multiple food-provisioning trips into a well-shaded backwater along the creek. R. Melcer reported another pair at the same locale on 14 June 2005. Again a nest could not be found, but a juvenile was captured and banded there on 21 July 2005, a date preceding migration of juveniles (MWFB 2008). On private land in block 24, a pair was tracked from 24 May through to fledged young observed on 23 June 2013. Also in 2013, after having been monitored since 15 May, a pair was observed carrying food on 18 June in the Putah Creek Sinks, Yolo County (block 30). The nest was not found but was located in a willow thicket with a dense understory of blackberry.

This species nests regularly in small numbers at the Cosumnes River Preserve and perhaps irregularly elsewhere in the Central Valley. Grinnell and Miller (1944) indicated the Central Valley as part of its breeding range. If true this seemed no longer to be the case by the 1970s (Gaines 1974). No collected egg sets preserved in MVZ or WFVZ attest to past nesting in the Central Valley, and the valley is excluded from the distribution mapped in Lowther (2000).

LEAST BELL'S VIREO *Vireo bellii pusillus*. Breeding status: Confirmed. The first observations along Putah Creek were three single-day records, of one on 11 May 2004, one mile east of the university's Raptor Center (block 24) by R. Phillips, a sing-

ing male on 25 Jun 2005 below the Solano Diversion Dam (block 7), by B. Campos, and a single bird on 29 September 2005 at Stevenson's Bridge (block 18) by Truan.

On 16 April 2010, C. Swolgaard observed a single male singing at the Putah Creek Sinks, Yolo Bypass Wildlife Area, Yolo County (block 32; Figure 3). Numerous subsequent observations led to comprehensive surveys by Whisler. At least two pairs, along with one or two unmated individuals, remained through the breeding seasons of 2010 (16 April–13 August) and 2011 (7 May–10 July). On 26 April 2010, an adult was observed carrying fluffy plant material. No other signs of nesting (e.g., active nests, fledglings, or adults carrying food) were observed during the surveys. However, both pairs were seen engaging in courtship and territorial defense against one another. The territories were occupied throughout the typical nesting season (April–August). Bell's Vireos were not detected in 2012 despite numerous surveys. In 2013 one was heard singing at the same locale in the sinks on 9 May, but the bird was not detected after that date despite several searches by Whisler and A. Engilis. All observations were from a plot with restored riparian habitat of willow-scrub thickets. Poor access into the habitat hindered surveys.

The observation in 2010 represents the first documented nesting effort of the Least Bell's Vireo in the Sacramento Valley in over 80 years, since the coming of the Brown-headed Cowbird (*Molothrus ater*) into the region. Tracy Storer collected a "breeding" male on Putah Creek 3 miles southwest of Winters on 17 June 1925 (WFB 606z) and reported seeing and hearing others in the same area (Trochet and Engilis 2013). This stretch of the creek is now impounded as Lake Solano. In recent years there have been some signs of recovery in the Central Valley, including confirmed nesting in Stanislaus County in 2005 (Kreitinger and Wood 2005, Howell et al. 2010). The Kimball journals record two Bell's Vireo observations for Putah Creek: 17 August 1973, of one bird at Solano County Park, and 21 September 1974, of one seen at a location not described more precisely than Putah Creek.

WARBLING VIREO *Vireo gilvus*. Breeding status: Confirmed. In May 2009, M. Kusch confirmed a pair nesting on his property along Putah Creek, Solano County (block 18). He found two adults foraging together, then both were carrying food on 5 June 2009. From 29 May to 27 June 2005, M. Chambers and R. Melcer tracked a male singing and aggressively defending a territory at the Solano Diversion Dam, Solano County (block 7).

The Warbling Vireo was once a regular member of the regional breeding avifauna but has long since ceased to be so, owing primarily to brood parasitism by the Brown-headed Cowbird (Sibley 1940, Grinnell and Miller 1944). In June 1925 Tracy Storer collected two birds in breeding condition on Putah Creek 3 miles west of Winters (Trochet and Engilis 2013). The Central Valley is excluded from the breeding distribution mapped by Gardali and Ballard (2000).

CHESTNUT-BACKED CHICKADEE *Poecile rufescens*. Breeding status: Confirmed. Our only breeding record is from 2009. From February to April that year, A. Engilis made a series of visits to private land in block 13 abutting the creek in Solano County. Each month he found an active pair of chickadees. On 26 April, he noted the adults carrying food. Walsh visited this area on 29 May and 4 June, noting adults with two volant fledglings on both dates (Figure 4). The nest cavity was never found, but nesting certainly occurred locally. On 24 June 2006 E. Lindgren found four Chestnut-backed Chickadees at the Yolo Housing Authority (block 13), in Yolo County directly across Putah Creek from the 2009 locale. No note was made that different age classes were detected. But the 2006 record is compelling in light of the 2009 record.

The Chestnut-backed Chickadee's status in the region has undergone a significant change in the last 15 years. Since 2000, and to present, the species has been observed on the lower creek annually in small numbers. The Putah Creek Christmas Bird Count, which includes a long stretch of the creek but also some shaded canyons in the Ber-

Figure 3. This male Least Bell's Vireo, photographed on 16 April 2010, was the first encountered singing in willow thickets in the Putah Creek sinks.

*Photo by Ed Harper*

ryessa Hills, yielded only eight records of the Chestnut-backed Chickadee from 1971 through 2000. Since 2001 the species has become regular, the count averaging 17 birds from 2001 to 2013; the highest number was 58 in 2008 (S. Hampton pers. comm). We can find no other reported breeding of the Chestnut-backed Chickadee the Central Valley, but the species' range has expanded over the last several decades in the Sierra Nevada (Crase 1976), east San Francisco Bay area (Root 1964), and southern California (Unitt and Hargrove in press).

BROWN CREEPER *Certhia americana*. Breeding status: Confirmed. Since 2008 this species has been found nesting along Putah Creek from Interdam (block 4) east to the Oxbow, Solano County (block 9). The first known nesting was below the Solano Diversion Dam, Yolo County (block 7) in 2008. A pair found on 15 April was seen carrying food on 18 May. The nest site was in a moderately large Fremont cottonwood. Nesting by at least one pair has been recorded annually at this site through 2013. On 16 April 2009, in block 4, a pair concentrated their activities at a large dead cottonwood while the male sang repeatedly. At the same site, a pair of Brown Creepers was observed building a nest on 14 April 2010 and video-recorded feeding young on 30 May 2011 (C. Conard pers. comm.). The next year, nesting expanded downstream to block 9, where a pair was observed nest building on 23 Mar 2012. On 24 May a fledgling was following an adult in the same patch of woodland (W. Rockey pers. comm.).

The nesting efforts of the creeper parallel those of the Chestnut-backed Chickadee. Both were first documented nesting beginning in 2008. The creeper, however, has continued to nest on the creek annually through at least 2015. It is regular in the winter in the Sacramento Valley but breeding in the region has not been reported previously. Again paralleling the Chestnut-backed Chickadee, the breeding range of the creeper has expanded over the last few decades in the east San Francisco Bay area, the Diablo Range, and south along the coast of central California (Unitt and Rea 1997).

CALIFORNIA THRASHER *Toxostoma redivivum*. Breeding status: Probable. From 24 February through 23 May 2005 a lone male was observed singing on territory at Oxbow (block 9). The bird sang from blackberry thickets on the Yolo County

Figure 4. Adult Chestnut-backed Chickadee tending a fledgling near El Rio Villa east of Winters, Solano County, 4 June 2009.

*Photo by Robert A. Walsh*

side of the creek. Subsequently, a singing male was found at the same locale annually from 2007 to 2017. Because of restricted access, nesting was not confirmed, but the consistent territorial singing detection during the breeding season over multiple years suggests probable breeding.

Prior to our effort, a pair of California Thrashers first detected on 27 February 1974 was observed and photographed annually through at least 1980. Its nest, in Solano County, was found on 15 May 1974 (Kimball journals). An unsexed specimen (MVZ 176070) was taken along Putah Creek 6 miles east of Winters on 30 June 1951, about 1 km downstream of Stevenson's Bridge (block 18). Grinnell and Miller (1944) mapped the California Thrasher as resident throughout the lower Sacramento Valley but provided no evidence of nesting, and this range seems to be extrapolated from foothill records. The only other confirmed nesting we can find from the floor of the Sacramento Valley is based on an egg set collected on 28 May 1942 on the Feather River (Yuba County) across from Boyd Pump Marina (39.058 N, 121.609° W; MWFB 5165). About 16 km north of Putah Creek, resident California Thrashers follow Cache Creek out of the Coast Range foothills down nearly to Woodland (S. Hampton pers comm.). A singing male was observed at Elkhorn Regional Park (Sacramento River, Yolo County) on 13 May 1982 (Kimball journals); no nest was found. There were several records from Bushy Lake along the American River in Sacramento during the 1970s, where the species was presumed to nest but apparently not confirmed (Kimball journals). The northernmost location of nesting in the San Joaquin Valley is in riparian scrub along the Stanislaus River at Caswell Memorial State Park in San Joaquin County.

WRENTIT *Chamaea fasciata*. Breeding status: Confirmed. Fledged young were observed being attended by adults below the Solano Diversion Dam, Solano County (block 8), on 1 June 2012 and on private land east of Winters, Solano County (38.5303° N, 121.9070° W; block 14), on 13 June 2013. One pair was observed feeding a fledged cowbird chick in the Putah Creek Sink, Yolo County (block 30), on

18 June 2013. Additionally, Wrentits were recorded singing on territory as late as 13 May 2013 in block 4, on 2 June 2012 in block 7, on 1 June 1012 in block 9, on 15 May 2013 in block 10, on 19 June 2012 in block 15, on 18 May 2012 in block 22, and on 3 June 2013 in Putah Creek Sink in block 29. A pair was observed in habitat suitable for nesting in the Putah Creek Riparian Preserve near the Pedrick Road overcrossing (block 20) on 25 April 2012.

Nesting of the Wrentit along Putah Creek is a recent development. We had observed few Wrentits on the creek prior to 2006, and nesting was not confirmed until 2012. The species occurs in a few Sacramento Valley riparian corridors, including the Cosumnes River Preserve, Snodgrass Slough, Stone Lakes National Wildlife Refuge, and American River Parkway (Trochet and C. Conard pers obs.; all locales in Sacramento County). Since 2009, it has been reported in summer from the Cache Creek Settling Basin and Sacramento Bypass in Yolo County (S. Hampton pers comm.).

ORANGE-CROWNED WARBLER *Oreothlypis celata*. Breeding status: Confirmed, on the basis of fledged young being attended by adults at Dry Creek, Yolo County (block 10), on 27 June 2004 (S. Hampton pers. comm.), near the I-505 bridge, Solano County (block 12), on 22 May 2013, and east of the University of California campus, Yolo County (block 24), on 16 June 2013. Several records of probable nesting are from blocks 18, 23, and 27. The 2005 MAPS effort yielded 12 hatch-year birds netted at the Putah Creek Sinks, Yolo County (block 29), and Russell Ranch, Yolo County (block 17) (Melcer et al. 2006). These were potentially reared on the creek.

Migrant Orange-crowned Warblers are common in season along Putah Creek, sparingly into June. Our confirmed nesting records show an extended breeding season on the creek. Nesting seems to be concentrated along the upper reaches of the creek, with a few outliers farther downstream. At the Cosumnes River Preserve, territories are centered in dense riparian shrubbery beneath small to medium-sized broadleaf trees. Surface water is usual but not required. Only a small proportion of this broadly available habitat is used in a given season. In some years no summering birds are detected.

YELLOW WARBLER *Setophaga petechia*. Breeding status: Probable, on the basis of several records. At Dry Creek, Yolo County (block 10), on 30 May 2007, two males were counter-singing vigorously at the terminus of the transect. At the same location on 11 June 2007 one singing male was observed with a paired female moving furtively through the willows. One male was singing territorially from 11 to 18 June 2002 at Diversion Dam, Solano County (block 7), and another was observed on 3 July 2003 in the Putah Creek Sinks, Yolo County (block 30).

The Yellow Warbler is another of the formerly widespread breeders largely extirpated from the Central Valley owing to cowbird brood parasitism and habitat loss. Tracy Storer collected a breeding male (testis 6 × 3 mm) on Putah Creek 3 miles southwest of Winters on 20 June 1925 (Trochet and Engilis 2013). Migrants are commonly detected in season along Putah Creek, sparingly into June. Since 1998, Yellow Warblers have nested along the lower San Joaquin and Mokelumne rivers at least in some years (Dybala et al. 2014, A. Pfeffer pers. comm.), and in 2006, 2010, and 2011 they nested at the Cosumnes River Preserve (Trochet pers obs.). Since 2009, Yellow Warblers have summered in the Sacramento Bypass and Cache Creek Settling Basin, but breeding there has not yet been confirmed (S. Hampton pers comm.).

YELLOW-BREASTED CHAT *Icteria virens*. Breeding status: Probable. Our first record of possible nesting was of a male heard singing from the Oxbow in Yolo County (block 9) on 26 June 2004. The following year, on 21 June 2005, R. Melcer and R. Phillips noted a male singing for over an hour in the same block. A second quiet bird, perhaps the female, was also observed (CVBC listserve archive). The singing bird was redetected in the same tangle of willows and blackberry on 13 July. Elsewhere, singing chats noted in proper habitat during the breeding season include one on 22 May 2013 at the I-505 bridge (block 12), and one on 28 May 2013 at the Putah Creek Sinks (block 32).

Tracy Storer collected a male with "greatly enlarged testes" 3 miles southwest of Winters on 17 June 1925 and commented on how common this species was along this section of the creek (Trochet and Engilis 2013). More recently, although scattered singing birds have persisted intermittently in seemingly appropriate habitat (Dybala et al. 2017), as far as we can find the only confirmed nesting of the chat on the Sacramento Valley floor was in 2011 at the Cosumnes River Preserve. One of a pair on territory since early June fed a fledgling Brown-headed Cowbird on 8 July (Trochet). At least from 1988 to 1992 chats nested in the Sacramento–San Joaquin delta close to the Central Valley: in northeastern Contra Costa County (Glover 2009) and in far southwestern Sacramento County on Sherman Island (Trochet). In Contra Costa County they continue to nest in very small numbers along Piper Slough and Marsh Creek (R Power, B. Mast, and L. Kahle pers. comm.). But in southwestern Sacramento County they no longer do so (C. Conard pers comm.). Grinnell and Miller (1944) reported the species as widespread and nesting throughout California, but their evidence for nesting in the Sacramento Valley was based only on records from Sacramento and Red Bluff.

DARK-EYED JUNCO *Junco hyemalis*. Breeding status: Confirmed. Juncos nested at the Dry Creek confluence (block 10) in 2002, 2003, and 2004. The nests were active from mid-April to May each year. In 2004, the nest was abandoned and collected (MWFB 5564). In all three years the nests failed to fledge young—because of a house cat. The nests were built behind a row of basketball trophies on an outdoor bookshelf facing Dry Creek, Yolo County (Figure 5). During the more recent BBA project, adults were observed feeding nestlings along the creek near I-505, Solano County (block 12), on 16 April 2013.

The Dark-eyed Junco was found nesting in the Central Valley for the first time at the Cosumnes River Preserve in 2000 (Trochet 2000) and has continued to breed there annually (Trochet). Unattended juvenile juncos have been seen at two other locations in the middle Central Valley. One was at Lodi Lake, San Joaquin County, on 6 July 1989 (Bailey et al. 1989), and one was at Babel Slough, Yolo County, on 13 June 2016 (M. Sawyer), suggesting that breeding of the junco on the valley floor may be more widespread than is now known.

WESTERN TANAGER *Piranga ludoviciana*. Breeding status: Confirmed, with two records of nesting in Solano County. The first was at the Oxbow (block 9), where a Western Tanager was observed 11 July 2004 (A. Currier). On 23 July, during a follow-up visit to the site, an adult was observed carrying food (R. Melcer). In 2012, near Stevenson's Bridge (block 18), a persisting pair first suspected of nesting on 22 May was seen feeding two dependent fledglings on 18 June. Evidence of probable nesting included a male on territory at Diversion Dam (block 7) from 24 May to 27 June 2005, nest not found. A male oversummered on Putah Creek on private land near Winters (block 9) in 2014 (Figure 6).

The observations along Putah Creek represent the first confirmations of the Western Tanager nesting in the Sacramento Valley. The species is observed annually all along the creek as an autumn and spring migrant; at the Cosumnes River Preserve small numbers wintered regularly from at least 1999 to 2009. Elsewhere in the Sacramento Valley tanagers were found singing and suspected to be nesting in mid to late June 2005 at Fremont Weir State Wildlife Area, along the Sacramento River northeast of Woodland, and in the Sutter Bypass, Sutter County (Melcer et al. 2006).

## DISCUSSION

The wandering nature of some bird species plays an important role in colonization of new areas. Early on, Grinnell (1922) predicted that accidental, or vagrant birds, were the pioneering individuals that keep the species

Figure 5. Dark-eyed Junco nest photographed on 14 June 2004. The pair nested behind these trophies for three consecutive years, failing in 2004 because of cat depredation. The nest was located in an abandoned shed in Winters, near the confluence of Dry and Putah creeks . The abandoned nest is now in the Museum of Wildlife and Fish Biology, University of California, Davis (WFB 5564).

*Photo by Andrew Engilis, Jr.*

"aware" of the possibility of expansion. On Putah Creek this hypothesis was illustrated by the increasing observations of individual birds followed by nesting attempts, as of the Bell's Vireo, Warbling Vireo, Pileated Woodpecker, and Chestnut-backed Chickadee. However, geography is also important. Habitat corridors that are oriented perpendicularly to the direction of mass movements of birds (for example, the west-to-east flow of Putah Creek to the north–south movement of migrating birds) will intercept a larger number and variety (Gutzwiller and Anderson 1992). The position of Putah Creek in the lower Sacramento Valley, its connection to the Coast Range, and now established steam flow combine to make the creek an attractive site for pioneering movements of birds during the breeding season.

Seven of the species breeding on Putah Creek, the Hairy Woodpecker, Pileated Woodpecker, Pacific-slope Flycatcher, Chestnut-backed Chickadee, Brown Creeper, Dark-eyed Junco, and Western Tanager, are characteristic of wooded uplands but have expanded downstream to a lowland setting. These species breed at higher elevations in the upper Putah Creek watershed, and we suspect they will ebb and flow in response to population dynamics, resource availability, and a changing climate. Nevertheless, all of these but the Hairy Woodpecker have had a history of recent range expansion elsewhere in California (Bousman 2007, Unitt and Hargrove in press).

With these nesting records, we can confirm that the riparian-obligate species of special concern in the Sacramento Valley still pioneer and nest if conditions are ripe. Because of two dams, an incised channel and levees,

Figure 6. Male Western Tanager summering along Putah Creek, 3 August 2014. Successful nesting was confirmed in 2004 and 2012.

*Photo by Andrew Engilis, Jr.*

the creek will never regain its historic hydrologic function. However, habitat restoration has recently focused on reestablishing floodplain function, albeit within this constrained system, from the Solano Diversion Dam east 10 km to beyond Winters. Removal of sediment and non-native plants and construction of a channel are the primary methods used along the stretch. In addition, instream modifications have increased flow rates, allowing for scouring and better water quality downstream from the Solano Diversion Dam (e.g., cooler water temperatures). While improved flows benefit habitat for spawning salmonids, we believe that it also has an effect on the productivity of emergent insects and therefore of insectivorous birds. Improved riparian habitat may also have a downside, making the corridor more attractive to predators, including the roof rat (*Rattus rattus*), to exotic competitors like the European Starling (*Sturnus vulgaris*), and to the brood-parasitic Brown-headed Cowbird.

Many researchers are beginning to think that habitat management and restoration alone are not enough to attract birds back into habitats they once inhabited. The lack of social cues may be just as limiting for recolonization. An argument that these social cues actually trump habitat, and signal to birds that "this is a great place to nest," is compelling (Ahlering and Faaborg

2006). We have tried conspecific attraction by broadcasting songs on Putah Creek with limited success, but this research direction could have positive results if undertaken with greater effort.

It is clear that sustained monitoring effort over nearly two decades has shown that Putah Creek, although limited in scale as a riparian habitat, supports a rich breeding-bird community that should be regionally recognized as an important resource for maintenance of riparian-dependent birds.

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**APPENDIX:** Birds breeding along Putah Creek, 2002–2014. C, breeding confirmed; P, breeding probable.

Canada Goose *Branta canadensis*, C
Wood Duck *Aix sponsa*, C
Mallard *Anas platyrhynchos*, C
Cinnamon Teal *Anas cyanoptera*, P
Gadwall *Anas strepera*, C
Common Merganser *Mergus merganser*, P
Hooded Merganser *Lophodytes cucullatus*, C
Ring-necked Pheasant *Phasianus colchicus*, C
Indian Peafowl *Pavo cristatus*, C
Wild Turkey *Meleagris gallopavo*, C
California Quail *Callipepla californica*, C
Pied-billed Grebe *Podilymbus podiceps*, C
American Bittern *Botaurus lentiginosus*, P
Great Blue Heron *Ardea herodias*, C
Green Heron *Butorides virescens*, C
Black-crowned Night-Heron *Nycticorax nycticorax*, C
Turkey Vulture *Cathartes aura*, P
White-tailed Kite *Elanus leucurus*, C
Northern Harrier *Circus cyaneus*, C
Cooper's Hawk *Accipiter cooperii*, P
Red-shouldered Hawk *Buteo lineatus*, C
Swainson's Hawk *Buteo swainsoni*, C
Red-tailed Hawk *Buteo jamaicensis*, C
American Coot *Fulica americana*, C
Common Gallinule *Gallinula galeata*, C
Killdeer *Charadrius vociferus*, C

Rock Pigeon *Columba livia*, C
Eurasian Collared-Dove *Streptopelia decaocto*, C
Mourning Dove *Zenaida macroura*, C
Western Screech-Owl *Megascops kennicottii*, C
Great Horned Owl *Bubo virginianus*, C
White-throated Swift *Aeronautes saxatalis*, P
Black-chinned Hummingbird *Archilochus alexandri*, C
Anna's Hummingbird *Calypte anna*, C
*Selasphorus* sp., C
Belted Kingfisher *Megaceryle alcyon*, C
Acorn Woodpecker *Melanerpes formicivorus*, C
Nuttall's Woodpecker *Picoides nuttallii*, C
Downy Woodpecker *Picoides pubescens*, C
Hairy Woodpecker *Picoides villosus*, P
Northern Flicker *Colaptes auratus*, C
Pileated Woodpecker *Dryocopus pileatus*, P
American Kestrel *Falco sparverius*, C
Western Wood-Pewee *Contopus sordidulus*, P
Pacific-slope Flycatcher *Empidonax difficilis*, C
Black Phoebe *Sayornis nigricans*, C
Ash-throated Flycatcher *Myiarchus cinerascens*, C
Western Kingbird *Tyrannus verticalis*, C
Loggerhead Shrike *Lanius ludovicianus*, C
Hutton's Vireo *Vireo huttoni*, P
Warbling Vireo *Vireo gilvus*, C
California Scrub-Jay *Aphelocoma californica*, C
Yellow-billed Magpie *Pica nuttalli*, C
American Crow *Corvus brachyrhynchos*, C
Common Raven *Corvus corax*, C
Horned Lark *Eremophila alpestris*, P
Tree Swallow *Tachycineta bicolor*, C
N. Rough-winged Swallow *Stelgidopteryx serripennis*, C
Cliff Swallow *Petrochelidon pyrrhonota*, C
Barn Swallow *Hirundo rustica*, C
Chestnut-backed Chickadee *Poecile rufescens*, C
Oak Titmouse *Baeolophus inornatus*, C
Bushtit *Psaltriparus minimus*, C
White-breasted Nuthatch *Sitta carolinensis*, C
Brown Creeper *Certhia americana*, C
Bewick's Wren *Thryomanes bewickii*, C
House Wren *Troglodytes aedon*, C
Marsh Wren *Cistothorus palustris*, C
Blue-gray Gnatcatcher *Polioptila caerulea*, C
Western Bluebird *Sialia mexicana*, C
American Robin *Turdus migratorius*, C
Wrentit *Chamaea fasciata*, C
Northern Mockingbird *Mimus polyglottos*, C
California Thrasher *Toxostoma redivivum*, P
European Starling *Sturnus vulgaris*, C
Phainopepla *Phainopepla nitens*, C
House Sparrow *Passer domesticus*, C
House Finch *Haemorhous mexicanus*, C
Lesser Goldfinch *Spinus psaltria*, C
American Goldfinch *Spinus tristis*, C
Orange-crowned Warbler *Oreothlypis celata*, C
Yellow Warbler *Setophaga petechia*, P
Common Yellowthroat *Geothlypis trichas*, C
Yellow-breasted Chat *Icteria virens*, P
Spotted Towhee *Pipilo maculatus*, C
California Towhee *Melozone crissalis*, C
Rufous-crowned Sparrow *Aimophila ruficeps*, P
Lark Sparrow *Chondestes grammacus*, C
Grasshopper Sparrow *Ammodramus savannarum*, P
Dark-eyed Junco *Junco hyemalis*, C
Song Sparrow *Melospiza melodia*, C
Western Tanager *Piranga ludoviciana*, C
Black-headed Grosbeak *Pheucticus melanocephalus*, C
Blue Grosbeak *Passerina caerulea*, C
Lazuli Bunting, *Passerina amoena*, C
Red-winged Blackbird *Agelaius phoeniceus*, C
Western Meadowlark, *Sturnella neglecta*, C
Brewer's Blackbird, *Euphagus cyanocephalus*, C
Brown-headed Cowbird *Molothrus ater*, C
Bullock's Oriole *Icterus bullockii*, C
Hooded Oriole *Icterus cucullatus*, C

Black-headed Grosbeak (*Pheucticus melanocephalus*), Stevenson's Bridge, Putah Creek, Solano County, California, 23 April 2017.

*Photo by Andrew Engilis, Jr.*