FIRST RECORD OF BREEDING BEHAVIOR BY THE CHESTNUT-SIDED WARBLER IN WASHINGTON

MASON W. MARON, P.O. Box 3546, Bay City, Oregon 97107;
mmaron101@gmail.com

CARA BORRE, 4613 Holly Ln NW, Gig Harbor, Washington 98335;
cmborre1@gmail.com

ABSTRACT: The Chestnut-sided Warbler (*Setophaga pensylvanica*) typically breeds in early successional deciduous forests of the northeastern United States and southeastern Canada. In recent decades, however, the species has become increasingly regular as a vagrant in the western U.S. and Canada. Over several weeks in June and July 2023, near Gig Harbor, Pierce County, we observed the first documented breeding behavior of the Chestnut-sided Warbler in Washington State, including territorial singing by the male and nest-building by the female. The increase in early successional vegetation following logging or wildfires could favor the Chestnut-sided Warbler becoming a regular breeding species in the Pacific Northwest.

The Chestnut-sided Warbler (*Setophaga pensylvanica*) breeds across the northeastern United States and southeastern Canada (Byers et al. 2013), nesting in dense thickets within early successional habitat (Schill and Yahner 2009). In recent decades, however, the species has expanded its breeding range west, with confirmed breeding records as far west as Alberta in Canada and Colorado in the U.S. (Byers et al. 2013). With this westward expansion has come an increasing presence in the Pacific Northwest (encompassing the northwestern U.S. and British Columbia) as an annual vagrant during both spring and fall migration (Campbell 2015, Tweit et al. 2022). These vagrants often disperse quickly, staying in their detected location for only hours to days before continuing in migration (Merrill et al. 2019, Tweit et al. 2022). By contrast, we report the first observed breeding behavior of the Chestnut-sided Warbler in Washington State. This apparent attempt at breeding out of range is noteworthy and implies there may be suitable breeding habitat for the Chestnut-sided Warbler in the Pacific Northwest, potentially reshaping the species' future breeding distribution (Campbell 2015).

OBSERVATIONS

On 8 June 2023, in the privately owned Crescent Valley Watershed in Gig Harbor, Pierce Co., Washington, we encountered a singing male Chestnut-sided Warbler along a trail in a young riparian forest composed primarily of Red Alder (*Alnus rubra*) (Figure 1). We were eventually able to locate the bird visually, its black mask and white wingbars assisting in a confident identification as an adult male (Figure 2). The bird was moving around frequently but continuously singing from various trees and bushes. The adult male remained in the area in the following days and continued to sing, as noted almost daily by many other observers. Subsequently, an adult female was also detected at the same location, potentially as early as 11 June, but first confirmed on 13 June by John Puschock. This bird had a yellow-green crown, yellowish tint to the back with less streaking than the male, a short chestnut stripe on the sides, and a streaky mask (Figure 2).

After the pair's discovery, on both 13 and 15 June we observed the female gathering and carrying nesting material and repeatedly returning to a specific cluster of alders, although a nest was never found (Figure 2). The pair was periodically documented through 3 July, and the male on 4 July, after which there were no further detections. No nest, copulation, or fledglings were observed, leaving it unclear

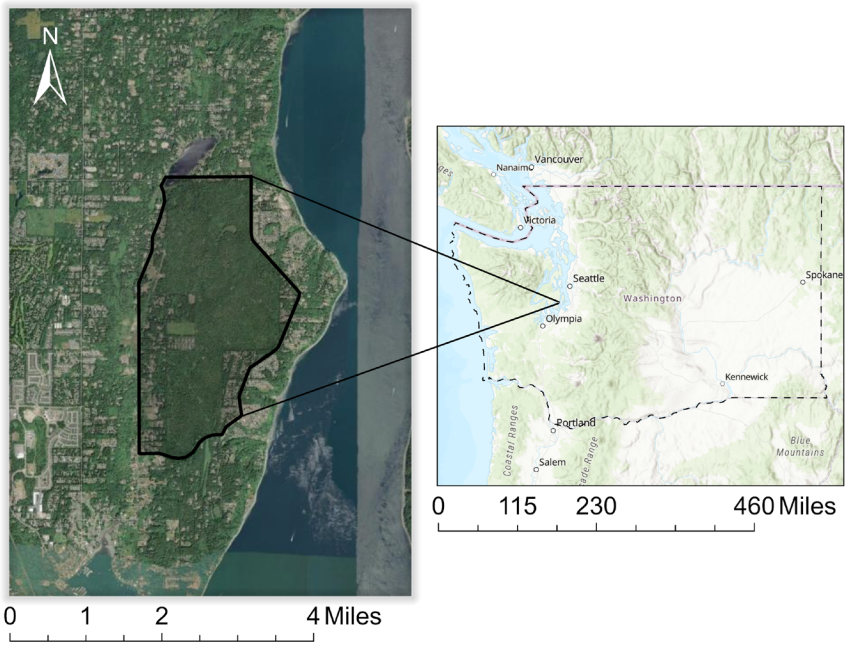

FIGURE 1. (A) Location of the Crescent Valley watershed, Pierce Co., Washington. (B) Satellite imagery of the habitat and landscape. Layer credits: Washington State Parks GIS, ESRI, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, Earthstar Geographics, USGS, Washington Geospatial Open Data.

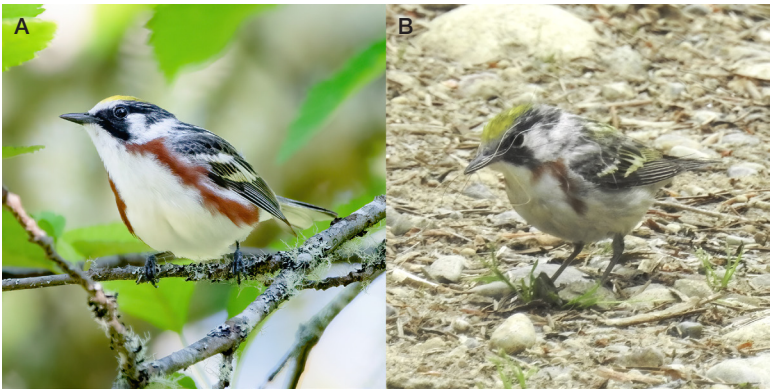

FIGURE 2. Chestnut-sided Warblers at Crescent Valley Watershed, Pierce Co., Washington. (A) Male (11 June) and (B) female gathering nesting material (15 June).

Photos by Mason Maron (A) and Cara Borre (B)

whether the pair nested at this location or simply exhibited early breeding behavior before moving on.

DISCUSSION

This record represents the first known potential attempt by the Chestnut-sided Warbler to breed in Washington, despite its unknown outcome. Detecting Chestnut-sided Warbler nests can be difficult because of the species' preference for nesting in dense vegetation (Lawrence 1948, Schill and Yahner 2009). Attempting to determine with certainty if these birds remained and continued nesting is also made difficult by behavioral changes, as warblers typically behave more secretively following the establishment of a successful nest (Wiley et al. 1994, Hobson and Sealy 1989). Regardless, the male's extended territorial singing and the female's nest-building activities represent breeding behavior (Ficken and Ficken 1965, Kroodsma et al. 1989, Byers 1996).

The occurrence of breeding behavior in Washington may be the result of two individual vagrants arriving in the same area around the same time, an event made more likely by the increased rate of Chestnut-sided Warbler vagrancy in Washington following the state's first record in 1960 (Marshall 1970). To visualize the Chestnut-sided Warbler's trends in the Pacific Northwest, we analyzed reports to eBird.org from 1970 to 2023, received by requesting the eBird Basic Dataset, version EBD_relMay-2024. We selected all observations from the Pacific Northwest region and used density-based clustering (DBSCAN) by location and time in ArcGIS Pro

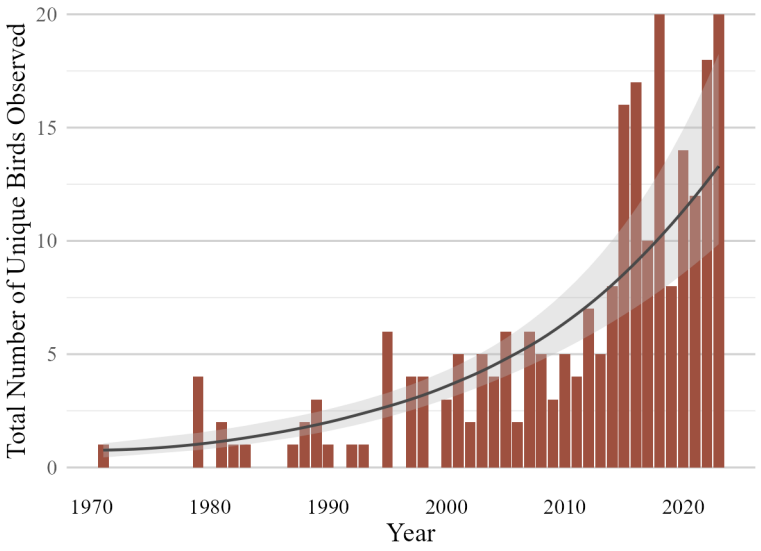

FIGURE 3. Total annual records from https://ebird.org of the Chestnut-sided Warbler in the Pacific Northwest from 1970 to 2023 with an exponential trend line and 95% confidence intervals. The Pacific Northwest is defined according to the "Cascadia bioregion boundary" map created by ArcGIS Online user "Aquila Flower" and available at https://www.arcgis.com/home/item.html?id=c6497941559d433da98e286fb3f63551.

(ESRI, Redlands, CA) to ensure multiple observations of the same individuals were counted as only one record. We then used R (R Core Team 2024) in RStudio (Posit Team 2024) to prepare the data and the package "ggplot2" (Wickham 2016) to graph the annual trend in Chestnut-sided Warbler observations in the region. Our analysis showed a significant positive trend in annual records over time with an exponential model (factor of annual increase 1.0572, $p < 0.001$, $R^2 = 0.6932$), supporting the claims of Campbell (2015) (Figure 3).

The Chestnut-sided Warbler's increasing presence in Washington and the surrounding region may be attributed to changes in landscape composition and, more specifically, to the clearing of dense conifer forests and their subsequent replacement by early successional habitat. Byers et al. (2013) suggested that the logging and removal of old-growth forests, replaced with shrubby, early successional woodlands and forests, is the primary factor driving the species' westward expansion. Additionally, Niemi and Hanowski (1984) found that the habitat conditions created by logging increase the density of nesting Chestnut-sided Warblers, allowing more individuals to nest successfully in logged habitat than in similar pre-logged habitats.

It is difficult to predict whether this instance of Chestnut-sided Warbler breeding behavior in Washington represents an incipient trend. According to Strittholt et al. (2006), approximately 72% of old-growth forest in the Pacific Northwest had been cleared as of 2006, primarily through logging. Additionally, though government restrictions have reduced logging of public old-growth forests in the Pacific Northwest, logging continues on both publicly owned and private timberland while annual losses of Washington's old-growth forest to wildfires are increasing (Washington State Department of Natural Resources 2017, Reilly et al. 2017, 2022). Logging and wildfires both create more of the early seral habitat Chestnut-sided Warblers typically prefer within their normal breeding range (Halofsky et al. 2018, Phalan et al. 2019). Therefore, coming years may expect a steady increase in the prevalence of the Chestnut-sided Warbler's preferred breeding habitat in Washington, especially near the Cascade Mountains where coniferous forests are traditionally the predominant habitat type (Franklin et al. 1981). Simultaneously, continued habitat loss in the species' historical breeding range due to agriculture, urbanization, overharvesting of timber, and active reforestation may further push birds westward (Confer and Pascoe 2003, Byers et al. 2013, Davenport 2023). Future research in which birds are fitted with GPS transmitters may further clarify the species' spread west.

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