

# Using eBird to Track Latitudinal Migration in Orange-crowned Warblers

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## Introduction

One of the most rapidly growing aspects of birding and ornithology is the use of advanced technology to understand migration and population trends. Many tools are available to do this, and one of the most accessible to birders is a joint project between Cornell Lab of Ornithology and Audubon called eBird ([www.ebird.org](http://www.ebird.org)), an online data archiving and distribution database. Cornell has organized many efforts to turn the casual birder into the “citizen scientist” who, through their birding observations, can gather information useful to science and conservation (Cornell Lab of Ornithology, 2003). eBird is Cornell’s latest citizen science tool, and is revolutionary in that it allows birders to see how their data fit into regional and national patterns, all in real time. eBird has many visualization tools that allow users to explore patterns in bird distribution and abundance.

To test and demonstrate the usefulness of eBird visualizations,

we analyzed eBird data to answer a simple question about the timing of Orange-crowned Warbler (*Vermivora celata*) spring migration in Oregon. Our question was: Can latitudinal differences in the timing of spring arrival be observed using eBird?

## Methods

After logging on to eBird, the View and Explore Data tab was selected and within this screen, the Maps function was selected. Orange-crowned Warbler was entered in the Species Selection box, and location was configured so that data could be examined by county. Oregon was selected from within the United States, and on the following screen, each desired county was selected. The following western Oregon counties were used in the analysis: Curry, Josephine, Jackson, Douglas, Coos, Lane, Lincoln, Benton, Linn, Polk, Marion, Yamhill, Tillamook, Clatsop, Washington, Columbia, Multnomah, and Clackamas. Each selected county generated

an individual URL-based eBird query (see Fig. 1 for an example from Jackson County).

Data from each county-specific query were downloaded by clicking the Download Histogram Data function, which contained frequency calculations and number of checklists submitted, separated by year (2004-2008). Because eBird data are continuously entered by users, query results can differ depending on the day a query is executed. All data used in the analysis were downloaded on a single day, May 14, 2008.

Data were lacking in some areas of Oregon, therefore we combined counties into 2 regions, southwestern Oregon and northwestern Oregon, for analysis of spring arrival timing. Southwestern Oregon consisted of Curry, Coos, Jackson, Josephine, and Douglas counties, and northwestern Oregon consisted of Lane, Lincoln, Benton, Linn, Polk, Marion, Yamhill, Tillamook, Clatsop, Columbia, Washington,

*Frequency of Observation of Orange-crowned Warbler in Northwestern and Southwestern Oregon*

	<i>March 1</i>	<i>March 8</i>	<i>March 15</i>	<i>March 22</i>	<i>April 1</i>	<i>April 8</i>	<i>April 15</i>	<i>April 22</i>	<i>May 1</i>	<i>May 8</i>	<i>May 15</i>	<i>May 22</i>
<i>SW Oregon</i>	0.00 (0)	0.00 (0)	0.06 (1)	0.10 (3)	0.11 (6)	0.03 (1)	0.23 (10)	0.20 (8)	0.31 (12)	0.17 (4)	0.14 (1)	0.00 (0)
<i>NW Oregon</i>	0.02 (3)	0.01 (2)	0.01 (1)	0.05 (8)	0.07 (8)	0.09 (11)	0.10 (13)	0.10 (17)	0.11 (13)	0.09 (9)	0.04 (3)	0.05 (5)

*Table 2. Frequency of observation of Orange-crowned Warbler in northwestern and southwestern Oregon during spring migration, 2004-2008. Number of checklist submitted shown in parentheses.*

Multnomah and Clackamas counties. By combining counties into regions, data were pooled into two broad spatial areas, allowing for a finer temporal analysis and more precise spring arrival timing results. Data were modified in an Excel worksheet to calculate frequency of occurrence (number of checklists that included Orange-crowned Warblers divided by number of checklists submitted) by week, with all years combined, in northwestern and southwestern Oregon.

### Results

Analysis of the data using a fine temporal approach (weekly) and broad spatial scale (regional) showed the first major wave of Orange-crowned Warblers arriving in the southwestern portion of the study area during the week of March 22, when

they were observed on about ten percent of checklists submitted from 2004-2008 (see Table 1 and Figure 1). Orange-crowned Warblers appear on a similar percentage of checklists in northwestern Oregon three weeks later, during the week of April 15. Also during the week of April 15, a second, larger pulse of Orange-crowned Warblers appears on checklists in southwestern Oregon, with higher frequencies lasting for about three weeks. Meanwhile, frequencies remain relatively constant in northwestern Oregon, with Orange-crowned Warblers being recorded on about ten percent of checklists. By the week of May 8th, frequencies begin to decline in both the southwestern and northwestern regions (see Table 1 and Fig. 1).

### Discussion

Based on our results, it appears

that latitudinal differences in spring arrival timing of Orange-crowned Warblers can be observed in two western Oregon regions using eBird. The observed difference corresponds with the south to north pattern of spring migration in Neotropical migrant songbirds. In addition to Orange-crowned Warbler frequencies occurring earlier in southwestern Oregon, frequencies were also higher in this region. This could be caused by increased bird numbers or increased bird detectability due to behavior, or to increased observer effort (see Table 1 for frequencies and number of checklists submitted). Decreased frequency in the northern portion of the state at this time could result from a portion of the overall migrant Orange-crowned Warblers settling onto breeding territories in the southern portion of the state.

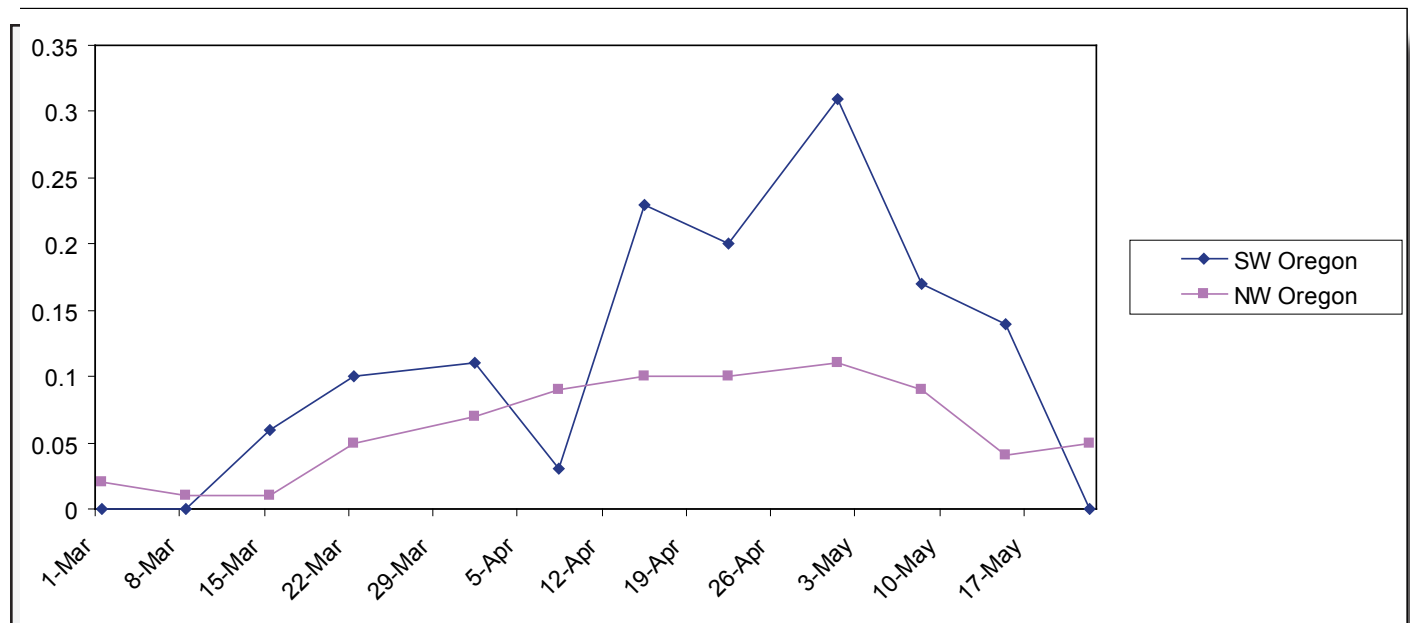


Figure 1. Frequency of observation of Orange-crowned Warbler on eBird checklists in western Oregon during spring migration, 2004-2008

Multiple peaks in frequency in southern Oregon could be associated with a subspecies-specific migration pattern being seen, with the first peak representing the arrival of summer resident birds, and the second being migrant birds passing through to breeding grounds farther north. The predominant breeding subspecies of Orange-crowned Warbler in western Oregon is *V. c. lutescens*, which arrives before the northern-breeding *V. c. celata* (Dillingham, 2003).

One serious challenge for this analysis was low checklist submission rates. This was addressed by using frequency calculations, in combination with conducting the analysis using broader spatial units. Increased use of eBird within the Oregon birding community would help provide better checklist coverage across the state. Audubon chapters in southern Oregon have teamed

up with northern California chapters, and the Klamath Bird Observatory – Redwood Sciences Laboratory Avian Data Center to increase awareness of eBird in the Northwest through development of a regional eBird portal called Klamath-Siskiyou eBird ([www.ebird.org/klamath-siskiyou](http://www.ebird.org/klamath-siskiyou)).

An additional challenge, which we did not address in this analysis, was observer experience. To account for observer experience levels, one would need to evaluate the skill level of the persons submitting checklists. In this analysis, we assume no variation in observer's abilities to identify Orange-crowned Warblers over region or time.

eBird is a highly useful tool that makes the observations of birders relevant and useful for ornithologists and conservation communities. It also allows users to combine their personal observations with observations

from throughout the Western Hemisphere, connecting birders with the science of conservation by demonstrating how the casual observer can contribute to continent-wide coordinated bird monitoring efforts.

### Acknowledgements

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### Works Cited

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### Circle Birding: John Gatchet

This circle includes a portion of Multnomah County as well. A Vesper Sparrow on Oak Island in this county is the only bird that was not found in Columbia County.

I hiked a great deal and many times walked 10-12 miles seeing most of the non-road areas of Sauvie Island. Oak Island is a great place to hike as well and with drier weather I was able to walk from this island to the Gilbert River. The hiking was so enjoyable that it probably took me away from River watching that may have netted me more bird

species.

When the water was high my wife and I traveled by Canoe all through the Sauvie Island area of Columbia County. While canoeing the flooded area we assisted a fisherman who was lost and did not know how to get back to the Gilbert River from Sturgeon Lake. It was a unique experience canoeing close to birds in the flooded trees.

The total number of species for the year was 199. Highlights above Scappoose were Long-eared and Pygmy Owl, Mountain Quail, Dusky Grouse, Townsend's Solitaire and Gray Jay along Holiday and Pisgah Home Road.

The Bonnie Falls area of Scappoose Creek along the Scappoose-Vernonia Highway had nesting Dipper. Honeyman Road through Scappoose Bottoms had Brewer's Sparrow, Tree Sparrow, White-throated Sparrow, Chipping Sparrow, Golden Eagle, Rough-legged Hawk and Short-eared Owl. On Sauvie Island Rentenaar Road had Northern Goshawk, Clay-colored Sparrow, Yellow-headed and Rusty Blackbird as well as shorebirds such as Short-billed Dowitcher, Semi-palmated Plover and Black-bellied Plover. Walking from the end of Rentenaar Road to the mud flats of Sturgeon Lake the best shorebirds were Sanderling, Semi-palmated and Solitary Sandpiper.