Searching for Barn Swallow Fall Premigratory Roosts with Doppler Weather Radar in western North America

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Extended Abstract

Doppler Weather Service Radar (WSR-88/D or NEXRAD) images from 25 west coast US weather radar stations, posted to the Internet at 5-10 min. intervals, were monitored daily at dawn between mid August and late October 2006 to search western North America west of the Rocky Mountains from southern British Columbia (BC) to the California-Mexico border for evidence of western Purple Martin (*Progne subis*), Tree Swallow (*Tachycineta bicolor*) and Barn Swallow (*Hirundo rustica*) late summer - fall premigratory roosts. These members of the swallow family are known to form very large single or mixed species roosts at the end of the breeding season (del Hoyo et al, 2004) that can persist for up to 8-10 weeks, at their peak may contain tens to hundreds of thousands of birds, and produce a characteristic expanding blob/ring "signature" on Doppler weather radar during daily pre-dawn dispersal (Russel et al, 1998). Birds typically move to the roost area in late summer and early fall, sometimes from a considerable distance, spend several weeks roosting nightly at the roost site and feeding in the surrounding landscape during the day, in preparation for the remainder of fall migration, then depart in small groups for their wintering grounds in South America. Roost size builds gradually to a peak as more birds arrive daily, and then slowly subsides as daily departures of migrants exceed new arrivals.

This search located a very large predominantly Barn Swallow roost complex (up to 6 roost sites) in the Portland – Salem area of Oregon, primarily in the Willamette River valley. The primary roost site in this complex, near Dayton, OR, is known by local birders to have occurred in corn fields here each fall for the past 8-10 years, containing an estimated 300,000-500,000 birds, but has not been formally documented previously. This roost complex may briefly contain much of the Pacific Northwest breeding population and their newly fledged young. Birders in the area were able to locate several of the 6 separate roost sites detected on radar by following groups of swallows moving into the roost sites at dusk. All but one roost appeared from radar and satellite imagery to occur in heavily developed agricultural areas along the floor of the broad low-gradient Willamette River Valley and those located were in large corn fields. The swallows were observed and photographed by F. Shrock roosting densely in the upper portions of the 10-12' tall corn plants. The one roost not in an agricultural area within the Willamette Valley was situated near several islands along the Columbia River near Portland, but was not located on the ground, so habitat type was not confirmed. Tree and Barn Swallows (and Purple Martins) have traditionally used brush and reed islands within lakes and rivers as premigratory roost sites. Further effort will be required to locate, identify and characterize this roost.

Several other smaller roost sites probably containing swallow species were also found along this valley flyway east of the Coast Range, further south within the Central Valley of California, but were not ground checked. These were in the Delta area at the confluence of the Sacramento and San Joachin Rivers and near Fresno, CA.

Another large premigratory roost complex apparently also containing Barn and Tree Swallows (from identification of staging flocks reported nearby in evening) was located along the lower Colorado River Valley near Yuma, Arizona, but was not ground checked. This complex contained at least three prominent roost sites, one located in crop fields in a heavily developed agricultural portion of the Colorado R. Valley near Blythe, CA, another in apparently undeveloped landscape along a large reservoir on the Colorado R. in the Picacho State Recreational Area, and a third in extensive irrigated crop fields just south of the California-Mexico border, in the delta area west of the confluence of the Colorado and Gila Rivers.

The Willamette R. Valley – lower Columbia R. roost complex is situated near the north end of a long nearly continuous north-south inland valley flyway between the coast Range Mountains and the Cascade and Sierra Nevada

Mountains, extending from the lower Columbia River Basin via the Willamette R. Valley and the Sacramento and San Joachin R Valleys (collectively the intensively agriculturally developed California Central Valley) almost to the Salton Sea in southern CA and the mouth of the Colorado River at the head of the Gulf of California in Mexico. Topography suggests this flyway and roost complex could receive migrants following major river valleys, inland marine waterways and coastlines at low elevation from the entire BC outer coast, Vancouver Island and Strait of Georgia, Puget Sound, the interior of BC and WA via the Fraser and Columbia River Valleys, and parts of eastern WA and OR via the Columbia River Gorge passage through the Cascade Range. This flyway also connects with the Pacific Coast at the mouth of the Columbia River and at San Francisco Bay, through which the Central Valley of CA drains to the Pacific Ocean. This inland flyway and the outer coast provide virtually unobstructed low elevation pathways from BC and WA to the Mexico border with maximum elevations of only a few hundred metres.

Similarly, the lower Colorado River Valley roost complex lies at the southern end of the broad inland basin and plateau area between the Cascade and Sierra Nevada mountain ranges and the Rocky Mountains and could receive migrants breeding throughout this area. As well, the timing of first detection of the lower Colorado R. Valley roost complex on Doppler radar, its peak size and eventual disappearance was 3-4 weeks later than timing of the same events for the Willamette R. Valley roost complex, as might be expected from its much more southerly latitude.

These are the first large swallow premigratory roost identified and documented west of the Rocky Mountains to our knowledge. Perhaps most significantly, despite an extensive search by Doppler weather radar with nearly complete radar coverage from 25 stations, these were the *only* large premigratory roosts found within the entire western USA west of the Rocky Mountains, from southern BC to the Mexico border. This is in stark contrast to the situation in eastern North America, where over 200 such roosts were detected by radar and catalogued in late summer-fall of 2004 by the Purple Martin Conservation Association as the first stage of an initiative to locate, identify, describe and conserve eastern Purple Martin premigratory roosts (Tautin et al, 2005), many of which were also monitored for reference and comparison during this study. (Only a small proportion, perhaps 15-20%, of the eastern roost sites detected on radar have been ground checked so far and confirmed to be martin roosts.) The reason for this difference is likely the pronounced differences in topography – North America west of the Rocky Mountains is characterized by an east-west geologically compressed and folded topography with long north-south oriented high mountain ranges and intervening valleys, while the landscape east of the Rocky Mountains is relatively flat undulating terrain. The latter would allow a wide distribution of smaller premigratory roost sites across the landscape in suitable habitat, while in the west the mountainous terrain may constrain roost sites to a few key strategic locations with suitable rich valley-bottom aerial feeding habitat along major river valley flyways.

The implications of this difference are significant, since very large numbers of Barn and Tree Swallows from extensive breeding ranges throughout western North America appear to be concentrated for a period of time each year in only a very few potentially critical premigratory roost and feeding locations, often in heavily developed and intensively managed seasonal agricultural crop production areas of the USA and northern Mexico. These areas may have similar ecological importance for successful migration and survival of these swallow species to the major coastal estuary, mud flat and wetland feeding stopover areas on which migrating waterfowl and shorebirds depend, and are likely also important in terms of both location along low elevation migration pathways and reliably abundant flying insect food supplies for these obligate aerial insectivores. This is not to suggest there is necessarily an immediate crisis at hand – these extensive agricultural croplands are re-seeded as rich primary succession habitat each spring and harvested and mowed back to bare soil each fall, a sustained annual crop cycle that so far seems to fit well with fall migration timing. However, this situation does merit better recognition and understanding, since changes in crops, harvest patterns and timing, agricultural practices effecting late summer-fall flying insect abundance and consequences of ongoing climate change may have significant impacts.

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