DECLINES IN THE BREEDING POPULATION OF VAUX'S SWIFTS IN NORTHEASTERN OREGON

EVELYN L. BULL, USDA Forest Service, Pacific Northwest Research Station, 1401 Gekeler Lane, La Grande, Oregon 97850

ABSTRACT: I investigated trends in the breeding population of Vaux's Swift (*Chaetura vauxi*) in northeastern Oregon by revisiting in 2003 39 stands of trees that contained swifts in 1991. In 2003 the number of swifts in these stands was significantly fewer, with only 46% of the stands still containing swifts. Only 29% of the 58 nest and roost trees the swifts were using from 1989 to 1997 were still suitable for nesting in 2003; the remainder had fallen over, broken off, or become riddled with cavities. Factors that may be affecting the population include tree mortality caused by insect outbreaks and disease, tree harvesting, wildfire, climatic shifts, and habitat changes in the winter range.

Vaux's Swift (*Chaetura vauxi*) nests in the Pacific Northwest and winters from central Mexico south to Central America (AOU 1998). On the basis of habitat loss and population decline, in California the species is classified as a species of special concern by the California Department of Fish and Game, in Washington it is classified as vulnerable, but in Oregon its status is secure (NatureServe Explorer 2003). In the forests of Oregon, Vaux's Swifts declined significantly in the 1980s (–8.9% annual change; Sharp unpubl. data). From 1980 to 1999 North American Breeding Bird Survey data imply a rate of decline 4.2% per year over 122 survey routes, with long-term declines in British Columbia, western Washington, and northern California (Sauer et al. 2000).

Vaux's Swifts nest and roost primarily in hollow trees in forests, less commonly in chimneys. Hollow trees of large diameter with decayed heartwood provide the structural components necessary for nesting in forests. In northeastern Oregon, these swifts typically nest and roost in forests with tall and dense canopies. The hollow chambers formed in Grand Firs (*Abies grandis*) by the Indian Paint fungus (*Echinodontium tinctorium*) are most commonly used as nest sites, although the Western Larch (*Larix occidentalis*) and Western Redcedar (*Thuja plicata*) are also used (Bull 2003).

The loss of nesting habitat over the last decade may be partially responsible for the observed declines in Vaux's Swift (Bull 2003). In the 1990s insect outbreaks in northeastern Oregon have killed many Grand Firs, including the large-diameter trees used by swifts for nesting (Bull and Collins 1993). The old multilayered stands that typically contain hollow trees where swifts can nest currently constitute less than 3% of the forested landscapes in the interior Columbia River basin (Hann et al. 1997), and there are few or no alternative stands maturing to replace those which have been lost.

The perceived decline of Vaux's Swift's population size and potential nesting habitat was the impetus behind this study. Its objectives were to determine if Vaux's Swift numbers in northeastern Oregon have declined in the last 12 years and to examine the fate of nest and roost trees used in previous years.

METHODS

Swift Surveys

In June 2003, I repeated surveys of Vaux's Swifts in 39 stands of trees in northeastern Oregon that contained swifts during surveys in 1991 (Bull and Hohmann 1993). These stands are located in the Umatilla and Wallowa–Whitman national forests in Baker, Umatilla, Union, and Wallowa counties. Using methods identical to those of the 1991 surveys, I walked a transect 83.5 m long and 30 m wide (representing an area of 0.25 ha) in each stand while watching and listening for swifts for 20 minutes (Bull and Hohmann 1993). Surveys were conducted between 09:00 and 19:00 during periods of dry weather and at temperatures exceeding 13° C. I recorded the maximum number of swifts seen during each survey period. When swifts were absent from my original stands, and if suitable habitat was present in adjacent stands, I conducted a second survey within 10 km of the former location to determine if swifts had moved to nearby areas. Stands suitable for swifts were those that contained large-diameter Grand Fir trees ≥51 cm diameter at breast height (dbh) that could be used for nesting (Bull and Cooper 1991).

As in 1991, I measured canopy closure and height in each of the 0.25-ha transect areas. I also recorded the number of canopy layers, live and dead trees exceeding a dbh of 51 cm, hollow trees, trees with Indian Paint fungus conks, and potential nest trees. Potential nest trees were those that appeared to be hollow, as indicated by their broken tops, or those that contained one or two Pileated Woodpecker (*Dryocopus pileatus*) roost cavities. I recorded the causes of tree loss since 1991 at the stand level. I compared swift abundance and habitat characteristics between 1991 and 2003 for the 39 stands with paired *t* tests.

Nest and Roost Tree Surveys

Additionally, I revisited 62 trees previously used by swifts for nesting and roosting to record the number of trees that remained suitable for swifts and to examine whether the abundance of potential nest trees had changed in the surrounding 1-ha area plots since 1989–97, when these sites were first located. All nest and roost trees used during the initial survey were in Grand Firs with a mean dbh of 81 cm and height of 24 m (unpubl. data). Original nest trees were considered unsuitable if they were broken off below the entrance hole previously used and no hollow chamber was visible in the portion still standing. Because Vaux's Swifts typically nest in trees with only one or two entrance holes, original nest trees containing more than two additional entrance holes within 5 m of the original entrance hole were also considered unsuitable. Potential nest trees were those that were obviously hollow, as indicated by their broken tops, or contained one or two Pileated Woodpecker cavities.

RESULTS

Swift Surveys

In 2003 I detected significantly fewer swifts (mean 1.0 swifts/transect, SE [standard error] 0.19, range 0–4) than in 1991 (mean 2.3 swifts/transect, SE 0.17, range 1–5; $t = -5.12$, df = 38, $P < 0.01$). Swifts were detected in 46% of the original 39 stands that contained swifts in 1991 and in 27% of the 15 alternate stands surveyed. Since 1991, large-scale disturbances such as severe defoliation from insect outbreaks ($n = 8$), tree harvesting ($n = 4$), and a wildfire in 1996 ($n = 1$) had occurred in 13 of the original 39 stands, yet in 2003 the swift's abundance in these stands (1.3 ± 0.4 swifts) was not significantly different from that in 1991 (2.1 ± 0.3 swifts; $t = -1.59$, df = 12, $P = 0.14$). In the 26 stands that had no obvious disturbances since 1991, the swift's abundance in 2003 (mean 0.8 swifts/transect, SE 0.21) was significantly less than in 1991 (mean 2.4, SE 0.20; $t = -5.4$, df = 25, $P < 0.01$). In 1991, 85% of the stands with swifts were in old growth while 15% were in harvested stands. In 2003, 91% of the 22 stands with swifts were in old growth, 4.5% were in harvested areas, and 4.5% were in burned areas.

Percent canopy closure was significantly less in 2003 (mean 55%, SE 4.92) than in 1991 (mean 73%, SE 3.99; $t = -3.22$, df = 38, $P = 0.01$). Canopy height was also significantly less in 2003 (mean 24 m, SE 1.92) than in 1991 (mean 34 m, SE 1.44; $t = -5.03$, df = 38, $P < 0.01$). The reductions in canopy closure and height were associated with tree mortality and breakage due to insect infestations. The abundance of hollow trees was significantly greater in 2003 (mean 0.8 trees/transect, SE 0.19) than in 1991 (mean 0.3 trees/transect, SE 0.08; $t = 2.42$, df = 38, $P = 0.02$). This increase was also associated with high tree mortality due to insect infestation. The number of trees with conks of Indian Paint fungus, signaling trees with appropriate conditions of decay and in which nest hollows may form, was significantly less in 2003 (mean 2.6 trees/plot, SE 0.67) than in 1991 (mean 5.4 trees/plot, SE 0.63; $t = -3.72$, df = 38, $P < 0.01$). However, because conks frequently fall off a Grand Fir after the tree dies, this decline may not accurately reflect the number of trees with the decay. Within the 0.25-ha plots sampled I detected no change in the number of canopy layers, live and dead trees of dbh >51 cm, and potential nest trees.

Nest/Roost Tree Surveys

In 2003 I relocated 58 of the 62 swift nest and roost trees found between 1989 and 1997. Seventy-one percent of these trees were no longer suitable as nest or roost sites because they had broken apart and fallen over completely ($n = 40$) or contained numerous cavities of the Pileated Woodpecker ($n = 4$). The remainder of these nest trees (29%) had at least 10 m of apparently hollow trunk still standing. In 2003, only 28% of the original trees remained alive, compared to 68% when the trees were first found. The number of potential nest or roost trees had similarly declined in 71% of the 1-ha plots surrounding the focal nest trees. Tree mortality due to insect outbreaks ($n = 31$), tree harvesting ($n = 10$) and wildfire ($n = 1$) contributed to the observed reduction in the number of potential nest trees. In 29% of these 1-ha plots, the number of potential nest trees remained the same.

DISCUSSION

The results of this study suggest that numbers of Vaux's Swifts breeding in northeastern Oregon have declined since 1991. Furthermore, the lack of swifts in alternate stands suggests that swifts are not merely moving to other nearby stands but are simply not present in areas they occupied in 1991. Although the number of hollow trees in the 39 surveyed stands increased over time, the number of original and potential nest trees in the survey plots for nest and roost trees declined. Insect outbreaks, tree diseases, and wildfire have reduced the number of nest and roost trees for Vaux's Swifts. The decline of potential nest trees will likely continue as the dead Grand Fir trees fall and as recruitment rates of new nest trees remain low. Changes in numbers of swifts were more pronounced in stands that had not experienced large-scale disturbances affecting forest structure, suggesting other factors may be contributing to the decline. In addition to changes in the availability of nest and roost trees I documented, climatic conditions affecting survival during reproduction or migration, the hazards of roosting in man-made structures along an urbanized migration route, and habitat and climatic shifts in wintering areas may have been contributing factors and require additional investigation. In the eastern United States, the Chimney Swift (*C. pelagica*), a species closely related and ecologically similar to Vaux's Swift, has suffered a similar loss of nesting habitat and decline in population (Clink and Collins 2002).

In northeastern Oregon, Vaux's Swifts readily adopt and breed successfully in nest boxes in forests traditionally used by this species as well as in habitats that currently lack natural nest sites, such as open stands of Ponderosa Pine (*Pinus ponderosa*; Bull 2003). These nest boxes provide alternative nest sites for Vaux's Swifts, and their use in areas where the swift was previously absent supports the conclusion from this study that suitable nest and roost sites may be a factor limiting the swift's population in northeastern Oregon. Additional surveys for Vaux's Swifts in nesting areas and at roosts during migration are needed to determine if the declines in breeding birds observed in northeastern Oregon are part of a more widespread population decline in the species throughout its range.

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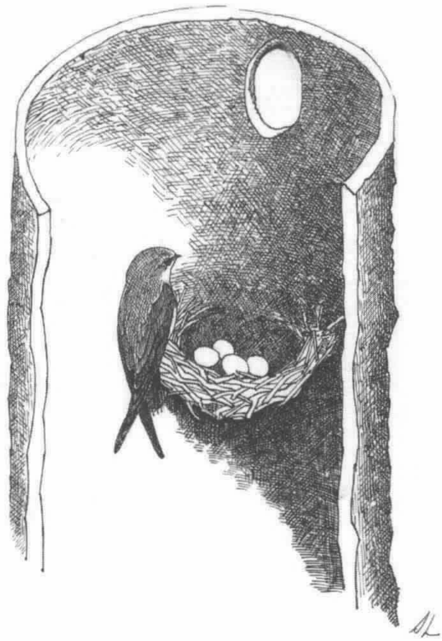

Vaux's Swift

Sketch by Susan Lindstedt