

RED TREE VOLES IN THE COLUMBIA RIVER GORGE AND HOOD RIVER BASIN, OREGON

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ABSTRACT—In 2003 to 2008, we conducted surveys to document the eastern and northern range limits of Red Tree Voles (*Arborimus longicaudus*) in the Columbia River Gorge and Hood River basin, Oregon. Our survey indicated the current range of the vole includes the area from Wahkeena Creek, 20 km east of Troutdale to Seneca Fouts State Park, 6 km west of Hood River. We also found a concentration of Red Tree Vole nests in the headwaters of the Lake Branch of Hood River, 27 km southwest of the town of Hood River. Of the 70 vole nests located, 36 (52%) were old unoccupied nests with no evidence of recent use, 24 (34%) were unoccupied but had evidence of recent use as indicated by the presence of fresh green resin ducts or cuttings in the nest, and 10 (14%) were occupied by voles. Of the 70 vole nests, 74% were in forests dominated by mature or old-growth trees and 26% were in stands 25- to 60-y-old. This survey is the first to document the existence of Red Tree Voles in the upper Columbia River Gorge east of Cascade Locks. It also documents the occurrence of Red Tree Voles on the east slope of the Cascade Range in the headwaters of the Lake Branch of Hood River.

Key words: Red Tree Vole, *Arborimus longicaudus*, Columbia River Gorge, Hood River, mammals, Oregon

Although many naturalists have studied and written about Red Tree Voles (*Arborimus longicaudus*), the species is still poorly understood, primarily because it is a nocturnal inhabitant of the forest canopy where it is difficult to detect (Verts and Carraway 1998). This is especially true in the Columbia River Gorge in northern Oregon where the presence of the species is based on only 6 records. The first of these was an oblique reference to Red Tree Voles near the town of Bonneville by Jewett (1920) who later related to Howell (1926:34) that he found unmistakable evidence of Red Tree Voles "... in old nests near the Bonneville Fish Hatchery at Bonneville on the Columbia River." Presumably Jewett was referring to the Cascade Salmon Hatchery, located on Eagle Creek,

1.6 km east of Bonneville and 31 km west-southwest of Hood River. Murray Johnson visited the same general area on 11 May 1957 and collected an adult female and juvenile Red Tree Vole from a nest in a mature Douglas-fir (*Pseudotsuga menziesii*) on the hillside behind the Oxbow Fish Hatchery near Cascade Locks, 26 km west of Hood River (specimens PSM7019 and PSM7020, James R Slater Museum of Natural History, University of Puget Sound, Tacoma, WA). There were no further records of Red Tree Voles in the gorge until 1984, when Gilbert and Allwine (1991) captured 3 in pitfall traps at approximately 3100 ft elevation on the rim of the gorge overlooking the headwaters of Oneonta Creek, 26 km east of Troutdale (specimens CRCM89-1253, CRCM89-1254, CRCM89-1311, Charles R Conner Museum, Washington State University, Pullman, WA). Since 1984, there has been only one other report of Red Tree Voles from the Columbia River Gorge, when 5 unoccupied nests were discovered in 2003 in the headwaters of the Lake Branch of Hood River,

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southwest of the town of Hood River. The latter report was based on the presence of resin ducts located in old nests during a survey conducted by a contract tree climber hired by the US Forest Service (USDA Forest Service, Region 6 Office, unpub. data). If confirmed, the latter record would be the 1st evidence that Red Tree Voles occur on the east slope of the Cascade Range in the Hood River Valley. Because many areas in the Columbia River Gorge have been affected by timber harvest at fire since Jewett and Johnson visited the area, and because most of the area has never been searched for Red Tree Voles, we conducted a systematic search for Red Tree Voles in the Columbia River Gorge between Crown Point State Park, 10.5 km east of Troutdale, and Hatfield West State Park, 2.5 km east of Hood River. Our objective was to better document the eastern and northern limits of the range of the species.

METHODS

To determine presence of Red Tree Voles, we walked through forests visually searching for nests in the forest canopy. We climbed to all suspected nests to determine which species built them and to capture any Red Tree Voles we observed. Red Tree Vole nests are easily distinguished from nests of other arboreal animals by the presence of resin ducts which the voles remove and discard when feeding on conifer needles (Howell 1926; Clifton 1960; Maser 1966). Occupied Red Tree Vole nests typically are lined with green resin ducts and covered by a layer of fresh green cuttings of conifer boughs that are harvested at night and provide an accessible source of food throughout the day (Forsman and others 2009). Unoccupied nests can usually be identified by the presence of old resin ducts, debarked twigs and decayed fecal pellets, which may persist for years after nests are abandoned. To document and capture voles, we gently probed nests with a stiff wire (Swingle 2005) to flush voles out of their nests. We then captured them in our hands or in dip nets when they jumped to the ground or tried to hide on the limbs in the nest tree. Upon capture, each vole was examined, weighed, photographed, and released in the nest or at the base of the nest tree. We assessed vole age based on mass and pelage color. Sex and reproductive status were assessed based on examination of

the external genitalia and evidence of lactation (Howell 1926; Clifton 1960; Hamilton 1962). We also collected a tissue sample from each vole for genetic studies (Bellinger and others 2005; Miller and others 2006). We quantified survey effort as the number of person hours spent conducting surveys and climbing trees.

RESULTS

We spent 44 days and 418 person-hours searching for Red Tree Voles. We climbed 126 trees and examined 142 potential nest structures of which 70 (49%) had evidence of use by Red Tree Voles (Appendix). Of the vole nests, 36 (52%) were old inactive nests, 24 (34%) were unoccupied but had evidence of recent use as indicated by the presence of green resin ducts or cuttings in the nest, and 10 (14%) were occupied by voles. At least 18 (26%) of the vole nests included a mixture of vole sign and squirrel sign indicating serial use of nests by different species. We found no evidence of simultaneous co-occupancy by voles and squirrels, although this has been reported (Maser 1966). The 72 non-vole structures examined included 62 (86%) squirrel (*Glaucomys sabrinus*, *Tamiasciurus douglasii*) or Bushy-tailed Woodrat (*Neotoma cinerea*) nests, 6 bird nests, and 4 debris platforms of uncertain origin.

Of the 70 vole nests found, 18 (26%) were in stands that were 25- to 60-y-old and 52 (74%) were in forests dominated by trees >80-y-old. Of the 10 occupied nests, 3 were in stands dominated by large old-growth (>200-y-old) trees, 6 were in mixed-age stands of mature (80- to 120-y-old) and old-growth trees, and 1 was in a 60-y-old stand that included scattered trees approximately 150-y-old. Overstory trees in all stands were dominated by Douglas-fir, with variable amounts of Bigleaf Maple (*Acer macrophyllum*), Red Alder (*Alnus rubra*), or Oregon White Oak (*Quercus garryana*). All vole nests were in Douglas-fir trees, and all cuttings and resin ducts in vole nests were from Douglas-fir.

Of the 10 voles observed, 2 evaded capture and 8 (3 males, 5 females) were captured. Seven of the 8 voles captured were in non-breeding condition, and 1 was post-lactating. The non-breeding status of adults was expected because our surveys were conducted in the autumn (September-November), when breeding is uncommon (Swingle 2005). Pelage color was

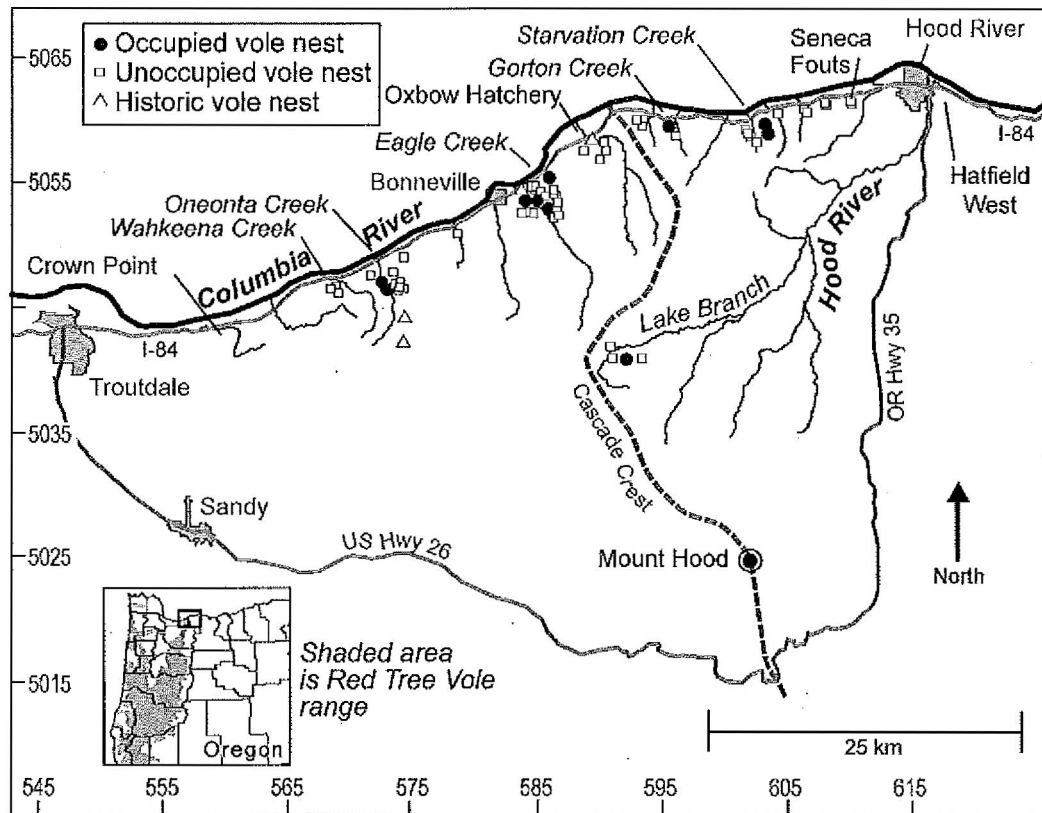


FIGURE 1. Locations of nests detected during surveys of Red Tree Voles (*Arborinus longicaudus*) in the Columbia River Gorge and Hood River drainage, Oregon, 2003–2008; and during previous surveys in the same region. In cases where we found multiple nests in a small area, locations were slightly jittered to avoid overlap of symbols. Approximate range of the Red Tree Vole in Oregon is indicated in the insert. Grid marks are Universal Transmercator coordinates in NAD27, Zone 10.

uniform among individuals with the top of the head and back dull reddish-brown.

The distribution of vole nests found during our survey (Fig. 1) indicated that the current range of the vole includes virtually the entire Oregon side of the Columbia River Gorge from Wahkeena Creek, east to Seneca Fouts State Park, 6 km west of Hood River; and then south on the west side of Hood River to the headwaters of the Lake Branch of Hood River. We found vole nests in many of the drainages in the gorge west of Hood River, but occupied nests were found only at Oneonta Creek, Eagle Creek, Gorton Creek, Starvation Creek, and Lake Branch of Hood River (Fig. 1). The largest concentrations of nests were found in the mature and old-growth forests at Oneonta Creek, Eagle Creek, and Starvation Creek State Park (Fig. 1). The concentration of nests at

Starvation Creek was most unusual because the forest there was a small patch of old-growth on the steep rocky bluffs overlooking Interstate Highway 84. We spent 2 d at this location and found numerous nests of Red Tree Voles and squirrels, plus an adult Northern Spotted Owl (*Strix occidentalis*) roosting in the forest under-story among the Red Tree Vole nest trees. We captured 2 adult voles at this site, and found 6 other nests that had evidence of recent occupancy by Red Tree Voles.

DISCUSSION

Our brief search for Red Tree Voles in the Columbia River Gorge and Hood River drainage revealed that they are still present in the central Columbia River Gorge near the locations where Jewett and Johnson found them over 50 y

ago. In addition, our survey revealed that the range of the vole extends east to Seneca Fouts State Park, 6 km west of Hood River, and includes at least some of the forests in the headwaters of the Lake Branch of Hood River on the east slope of the Cascade Range (Fig. 1). The latter area is the only locality where Red Tree Voles have been confirmed east of the crest of the Cascade Range. We did not have time to extend our search south of the Lake Branch of Hood River, but we suspect the range of the vole may extend further south in that region than our records indicate. We found no evidence of Red Tree Voles in the lower reaches of Lake Branch, but the forests there were primarily in private ownership and had been mostly logged and converted to young forest or agriculture. It is unlikely that Red Tree Voles have been able to persist in much of that area, even if they were there historically.

Although our surveys included many areas dominated by young forest, we found the largest concentrations of voles and vole nests in forests dominated by large old Douglas-fir. This result was not unexpected because other surveys also have found that Red Tree Vole nests tend to be more common in old forests than in young forests (Dunk and Hawley 2009). However, the prevalence of nests in old forests in our survey was noteworthy because many nests that are high up in tall trees are not visible from the ground (Swingle 2005; Swingle and Forsman 2009). Thus, if anything, our surveys probably underestimated the relative abundance of nests in old forests. Although we found some nests in young trees, we suspect that young trees may be less suitable as nest sites on the steep bluffs overlooking the Columbia River because of the strong winds and ice storms that are common in this region. Under these conditions, large old trees with thick trunks, palmate branch whorls, dense deformed limbs, cavities, broken tops, and hollow trunks probably provide more stable and protected nest structures than do young trees.

In our surveys we focused on the eastern edge of the range of the Red Tree Vole between Crown Point State Park and Hood River. More surveys are needed to better document the current distribution of Red Tree Voles in the western portion of the Columbia River Gorge between Wahkeena Creek and Troutdale (Fig. 1). Much of that area has been cutover,

burned, or converted to housing developments in the last century, and is now covered by young forests, farms, towns, and the suburbs of Troutdale. Red Tree Voles probably have been eliminated or reduced in numbers in this region, but without surveys there is no way to be certain.

The reddish-brown pelage of adult Red Tree Voles in the Columbia River Gorge and northwestern Oregon differs from Red Tree Voles in the central and southern regions of western Oregon, which tend to be reddish-cinnamon in color. This was one of the morphological features that led Howell (1926) to regard Red Tree Voles in northern Oregon as a separate species, the Dusky Tree Vole (*Phenacomys silvicola*). Miller and others (2006) found a discontinuity in the distribution of haplotypes between voles in northern and southern Oregon, but it remains unclear whether these differences constitute grounds for listing voles in northern Oregon as a separate subspecies (Bellinger and others 2005). This issue is not likely to be resolved soon because collection of tissue samples from large numbers of voles is difficult, especially in the coastal region of northwest Oregon where we have found relatively few Red Tree Voles in recent years.

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APPENDIX. Status and locations of 70 Red Tree Vole (*Arborimus longicaudus*) nests located during surveys in the Columbia River Gorge and Hood River drainage, Oregon, 2003-2008. UTM easting and northing values are based on NAD27, Zone 10.

Location	Date located	UTME	UTMN	Status
Ainsworth State Park	10/9/2004	573458	5048917	Old, unoccupied
Ainsworth State Park	10/9/2004	573537	5048955	Old, unoccupied
Benson State Park	10/28/2004	570642	5047929	Old, unoccupied
Benson State Park	10/30/2004	570685	5047850	Recent, unoccupied
Eagle Creek	10/2/2003	584750	5053825	Old, unoccupied
Eagle Creek	10/2/2003	584897	5053554	Recent, unoccupied
Eagle Creek	10/2/2003	584897	5053554	Vole escaped
Eagle Creek	10/2/2003	585459	5053460	Female captured
Eagle Creek	10/2/2003	585525	5053501	Old, unoccupied
Eagle Creek	10/2/2003	585526	5053459	Recent, unoccupied
Eagle Creek	10/3/2003	583969	5054325	Recent, unoccupied
Eagle Creek	10/3/2003	583969	5054325	Old, unoccupied
Eagle Creek	10/3/2003	584000	5054306	Male captured
Eagle Creek	10/29/2003	585450	5053481	Recent, unoccupied
Eagle Creek	10/29/2003	585342	5053448	Recent, unoccupied
Eagle Creek	10/29/2003	585342	5053448	Recent, unoccupied
Eagle Creek	10/29/2003	585428	5053433	Male captured
Eagle Creek	10/29/2003	585323	5053555	Recent, unoccupied
Eagle Creek	10/29/2003	585323	5053555	Recent, unoccupied
Eagle Creek	10/29/2003	585292	5053468	Old, unoccupied
Eagle Creek	10/29/2003	585292	5053468	Old, unoccupied
Eagle Creek	10/29/2003	585275	5053564	Old, unoccupied
Eagle Creek	10/29/2003	585275	5053564	Old, unoccupied
Eagle Creek	10/29/2003	585269	5053602	Recent, unoccupied
Eagle Creek	10/29/2003	585485	5053486	Old, unoccupied
Eagle Creek	8/29/2006	583807	5054555	Recent, unoccupied
Gorton Creek	10/30/2003	595609	5059795	Male captured
Gorton Creek	10/30/2003	595617	5059742	Recent, unoccupied
Grays Creek	10/1/2003	593014	5059882	Old, unoccupied
Grays Creek	10/1/2003	593271	5059889	Recent, unoccupied

APPENDIX. Continued.

Location	Date located	UTME	UTMN	Status
Grays Creek	10/1/2003	592326	5060020	Old, unoccupied
McCord Creek	10/8/2004	577700	5050700	Old, unoccupied
Lake Branch Hood River	10/31/2008	591269	5041849	Recent, unoccupied
Lake Branch Hood River	11/1/2008	591917	5041713	Female captured
Lake Branch Hood River	11/1/2008	591916	5041776	Old, unoccupied
Lake Branch Hood River	11/1/2008	592861	5041562	Old, unoccupied
Mitchell Creek	11/2/2003	607364	5061618	Old, unoccupied
Oneonta Creek	10/11/2004	572999	5046868	Vole escaped
Oneonta Creek	10/20/2004	572382	5047996	Old, unoccupied
Oneonta Creek	10/20/2004	573025	5046884	Old, unoccupied
Oneonta Creek	10/20/2004	573034	5046710	Old, unoccupied
Oneonta Creek	10/31/2004	573001	5046663	Female captured
Oneonta Creek	10/31/2004	572668	5047269	Old, unoccupied
Oneonta Creek	10/31/2004	573121	5046829	Old, unoccupied
Oxbow Hatchery	9/30/2003	588952	5057960	Old, unoccupied
Oxbow Hatchery	9/30/2003	589233	5058016	Old, unoccupied
Oxbow Hatchery	9/30/2003	589319	5058010	Old, unoccupied
Oxbow Hatchery	9/30/2003	589319	5058010	Recent, unoccupied
Oxbow Hatchery	9/30/2003	589349	5058168	Old, unoccupied
Oxbow Hatchery	9/30/2003	589334	5058170	Old, unoccupied
Perham Creek	11/1/2003	606082	5061186	Old, unoccupied
Perham Creek	11/1/2003	606242	5060999	Recent, unoccupied
Seneca Pouts State Park	11/2/2003	609697	5061825	Old, unoccupied
Seneca Pouts State Park	11/2/2003	609742	5061834	Recent, unoccupied
Starvation Creek	10/30/2003	602330	5060078	Recent, unoccupied
Starvation Creek	10/30/2003	602387	5060053	Recent, unoccupied
Starvation Creek	10/31/2003	602246	5059944	Old, unoccupied
Starvation Creek	10/31/2003	602413	5060030	Recent, unoccupied
Starvation Creek	10/31/2003	602380	5060063	Female captured
Starvation Creek	10/31/2003	602451	5060089	Old, unoccupied
Starvation Creek	10/31/2003	602371	5059985	Recent, unoccupied
Starvation Creek	10/31/2003	602387	5059984	Old, unoccupied
Starvation Creek	10/31/2003	602378	5059984	Recent, unoccupied
Starvation Creek	10/31/2003	602386	5060005	Female captured
Starvation Creek	8/28/2006	602355	5060127	Recent, unoccupied
Viento Creek	11/1/2003	603941	5060903	Old, unoccupied
Viento Creek	11/1/2003	603978	5060943	Old, unoccupied
Wahkeena Creek	10/28/2004	568110	5047043	Recent, unoccupied
Wahkeena Creek	10/28/2004	568110	5047043	Old, unoccupied
Wahkeena Creek	10/28/2004	568110	5047043	Old, unoccupied