

Columbian White-tailed Deer

Odocoileus virginianus leucurus

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GENERAL RANGE AND WASHINGTON DISTRIBUTION

The Columbian white-tailed deer (*Odocoileus virginianus leucurus*) is the westernmost subspecies of white-tailed deer and the only white-tailed deer found west of the Cascades (Baker 1984). One other subspecies of white-tailed deer occurs in Washington, the northwestern white-tailed deer (*O. v. ochrourus*). The range of this subspecies lies about 300 km (186 mi) east of the current range of the Columbian white-tailed deer (Smith 1985, Smith 1991).

Historically, Columbian white-tailed deer were distributed throughout the lowlands of southwestern Washington (see Figure 1) and western Oregon (Smith 1985). Lewis and Clark observed white-tailed deer in 1806 along the Columbia River from The Dalles to Astoria, Oregon (Thwaites 1905). In 1829 David Douglas encountered white-tailed deer in the bottoms of the Cowlitz River in Washington, and the Willamette and Umpqua Rivers in Oregon (Douglas 1914). By the early 1900s, Columbian white-tailed deer had been extirpated throughout much of their historic range (Jewett 1914, Bailey 1936).

Currently, there are two geographically isolated and distinct populations of Columbian white-tailed deer, one along the lower Columbia River in Washington and Oregon (see Figure 1) and the other in Douglas County, Oregon (Brown 2003, Smith et al. 2003). The Columbian White-tailed Deer National Wildlife Refuge (now the Julia Butler Hansen Refuge for the Columbian White-tailed Deer) was created in 1972 to protect 2105 ha (5200 ac) of Columbia River shoreline and island habitat near Cathlamet, Washington, where a large number of Columbian white-tailed deer remained (Gavin 1979). The lower Columbia River population is divided into four main subpopulations, separated from each other by major channels of the Columbia River (USFWS 1983). These main subpopulations consist of the refuge's mainland and Puget Island in Washington and Tenasillahe Island and the lowlands near Westport in Oregon (Figure 2). Based on surveys in 2002, Washington has an estimated 250 Columbian white-tailed deer, about half of the lower Columbia River population (USFWS, unpublished data). Recent reintroductions of Columbian white-tailed deer have expanded the deer's range up the Columbia River to islands near Longview, Washington, and it is likely that additional subpopulations will become established as a result of these efforts (Brookshier et al. 2000).

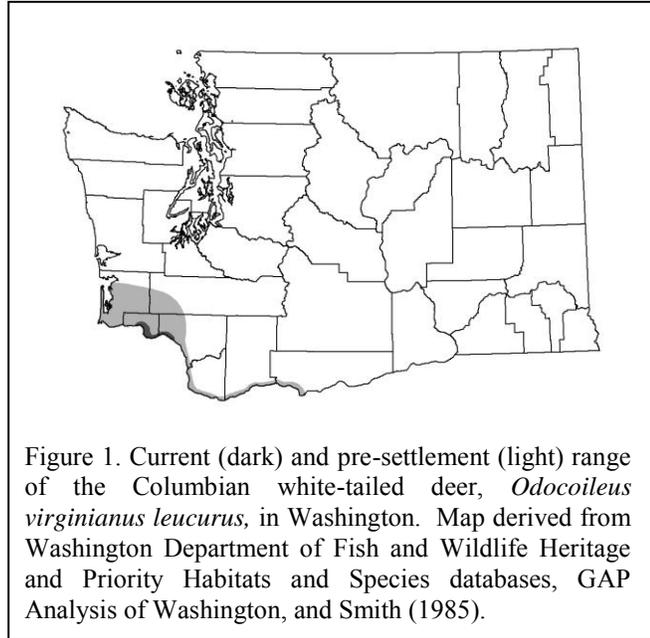
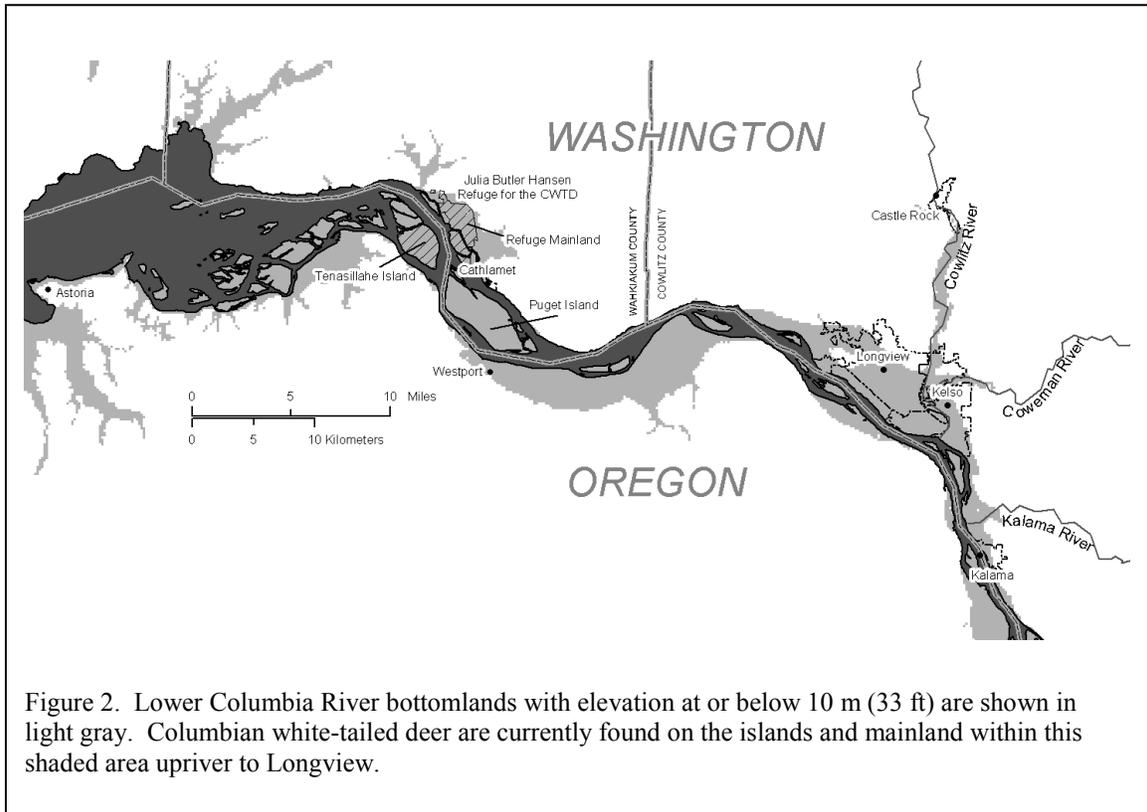


Figure 1. Current (dark) and pre-settlement (light) range of the Columbian white-tailed deer, *Odocoileus virginianus leucurus*, in Washington. Map derived from Washington Department of Fish and Wildlife Heritage and Priority Habitats and Species databases, GAP Analysis of Washington, and Smith (1985).



RATIONALE

In Washington, the Columbian white-tailed deer is listed as a Federal- and State-Endangered species. The clearing of riparian lowlands for agricultural, industrial, and urban development has reduced suitable Columbian white-tailed deer habitat and restricted the deer's range to two disjunct populations (Crews 1939, Scheffer 1940, Gavin 1978, Davison 1979). Small, isolated populations are more vulnerable to extirpation by a variety of factors such as disease and natural catastrophes (Shaffer 1981, Roelke et al. 1993). Continued habitat degradation will impede recovery of the Columbian white-tailed deer by further fragmenting existing habitat and eliminating areas for future range expansion (USFWS 1983).

HABITAT REQUIREMENTS

General Vegetation

Columbian white-tailed deer inhabit riparian forest, brushland, and pasture on islands and within the floodplain of the lower Columbia River (Suring 1974, Gavin et al. 1984). The elevation of these bottomlands is about 3 m (10 ft) above sea level (Gavin 1984). Forested swamps with tall shrubs and Sitka spruce (*Picea sitchensis*), red-osier dogwood (*Cornus stolonifera*), red alder (*Alnus rubra*), black cottonwood (*Populus trichocarpa*), and willow (*Salix* spp.) characterize the native vegetation of this area (Franklin and Dyrness 1973, Davison 1979). Many of the islands used by the deer retain this native plant community, with cottonwoods and willows as the co-dominant species (Davison 1979, Davison and Spencer 1979). In contrast, much of the mainland habitat has been significantly altered by two primary human activities. First, native vegetation has been converted from riparian forest to open pasture. For example, forest cover on the refuge's mainland has been reduced from an estimated 70% in 1939 to 17% in 1972 (Suring 1974). Second, hydrological modifications including the construction of dams, dikes, tide

gates and drainage ditches has greatly altered the floodplain of the lower Columbia, removing thousands of acres from the influence of seasonal flooding (Suring and Vohs 1979, USFWS 1983).

Grasses and forbs commonly found in pastures include fescue (*Festuca* spp.), orchardgrass (*Dactylis glomerata*), clover (*Trifolium* spp.), bluegrass (*Poa* spp.), velvetgrass (*Holcus lanatus*), buttercup (*Ranunculus repens*), ryegrass (*Lolium multiflorum*), and vetch (*Vicia* spp.). Reed canary grass (*Phalaris arundinacea*) and water foxtail (*Alopecurus geniculatus*) often invade wet sites (USFWS 1983). The high deer densities on the refuge's mainland compared to the more densely vegetated islands suggests that a combination of wooded habitat and limited agricultural lands may not entirely be incompatible with the requirements of this species (Gavin et al. 1984, Smith 1985). However, the extensive clearing of woody vegetation throughout their historic range has apparently resulted in negative impacts to Columbian white-tailed deer populations (Scheffer 1940, Gavin 1978, Smith 1987).

Cover

An important component of deer habitat selection is the availability of thermal and security cover (Peek et al. 1982). On the refuge's mainland, Columbian white-tailed deer preferred forest communities for cover, and occasionally used areas dominated by tall forbs such as Canada thistle (*Cirsium arvense*) and common rush (*Juncus effusus*) in the spring and summer. Deer primarily used park forest consisting of an open Sitka spruce canopy with a grass understory, especially in the fall, winter and spring. In the spring and summer, deer increased their use of open canopy forest dominated by western red cedar (*Thuja plicata*), red alder, and Sitka spruce. Grasses and shrubs dominated the understory vegetation of forests used in the spring and summer (Suring and Vohs 1979).

The density of Columbian white-tailed deer was greatest where woodland cover exceeded 50% in southwestern Oregon (Smith 1987). On the refuge's mainland, deer use was significantly higher in areas with a greater percentage of cover (22-27% cover) compared to areas with little interspersed cover (8% cover) (Suring 1974). Closed canopy forests, hydric rush, and dogwood communities provided potential cover. However, deer did not frequent these communities, possibly as a result of shade that reduced forage and attracted cattle that damaged vegetation (Suring and Vohs 1979).

In southwestern Oregon, oak-madrone woodlands were frequently used by fawns (Ricca et al. 2003). Fawns also used riparian areas made up of Oregon ash (*Fraxinus latifolia*), red alder, bigleaf maple (*Acer macrophyllum*), and Oregon white oak (*Quercus garryana*). Fawn habitat use was concentrated within 200 m (656 ft) of streams, possibly due to the greater availability of free water and succulent vegetation (Smith 1981, Ricca et al. 2003). Habitat use by fawns along the lower Columbia River is not well documented; however, Suring (1974) suggested that females selected closed canopy forest for fawning. Use of open canopy forest also increased during the fawning period in spring and early summer (Suring 1974). On the refuge, fawns are most commonly found in tall grass (tall fescue [*Festuca arundinacea*], reed canary grass) fields and mixed deciduous (red alder, black cottonwood, willow, Oregon ash) and Sitka spruce forest (A. Clark, personal communication). They avoid pastures and other short grass areas.

Forage

On the refuge, deer fed in maintained pastures, but only within 250 m (820 ft) of forest cover (Suring and Vohs 1979). Deer were also attracted to areas with vegetation > 70 cm (28 in) high near forage species (Suring and Vohs 1979). On the refuge's mainland, the vast majority of deer were observed grazing while very few were seen browsing (Suring 1974, Suring and Vohs 1979). Researchers on the refuge concluded that Columbian white-tailed deer were primarily grazers based on visual observations of foraging deer (Suring 1974, Suring and Vohs 1979) and rumen analysis (Gavin et al. 1984). In contrast, Dublin (1980) quantified deer diets on the refuge using fecal analysis and reported that, on average, their diets consisted of 23% browse, 39% grasses, and 38% forbs. Deer selected browse in all seasons except spring, selected forbs in all seasons except summer, and avoided grasses in all seasons except spring when grasses were consumed in proportion to their availability.

Most of what is known about the diet of Columbian white-tailed deer was derived from studies on the refuge's mainland (Suring 1974, Dublin 1980, Gavin et al. 1984). The heavy use of grasses and forbs may reflect the deer's adaptation to available habitat rather than their actual foraging preference (Davison 1979). The islands along the lower Columbia River more closely resemble the historical tidal spruce habitat with dense forest cover. Preliminary diet composition data for deer on Crims Island, Oregon, indicated that they fed mainly on browse and forbs in August and September and almost entirely on browse in October through January. Grasses were an important part of the diet only during the spring (USFWS, unpublished data).

Important browse species on the refuge included evergreen blackberry (*Rubus laciniatus*), which comprised 17% of the deer's diet during its fruiting period in September (Dublin 1980). Pacific ninebark (*Physocarpus capitatus*) was consumed throughout the year, while red-osier dogwood and salal (*Gaultheria shallon*) were important in the fall and winter. Conifers such as juniper (*Juniperus* spp.) and western red cedar were consumed in fall and late winter and red elderberry (*Sambucus racemosa*) was eaten only during winter. A few resident deer fed heavily on apple, pear, plum, and acorn (Dublin 1980).

Grasses that made up a significant part of deer's year-round diet were foxtail (*Alopecurus* spp.), orchard grass, tall fescue, mannagrass (*Glyceria* spp.) and common timothy (*Phleum pretense*) (Dublin 1980). Deer selected grass in its early stage of flowering (Dublin 1980). In general, mature grasses and forbs have reduced digestibility and protein (Blair et al. 1977). Deer on the refuge were often observed feeding on water foxtail, a native grass that has a high year-round crude protein content (Gavin et al. 1984). Yarrow (*Achillea millefolium*), woodland phacelia (*Phacelia nemoralis*), red clover (*Trifolium pretense*), and buttercup were forbs consumed by Columbian white-tailed deer (Dublin 1980).

Movements and Home Range

The average lifetime home range on the refuge was 192 ha (475 ac) for males and 159 ha (392 ac) for females (Gavin et al. 1984). Adult males had the largest average home range at 209 ha (516 ac) and male fawns had the smallest range at 65 ha (162 ac). Although home ranges overlap, some females appeared to defend certain well-drained, relatively dry sites used for bedding. Columbian white-tailed deer are not migratory and home ranges tend to be very stable in space and time. The distance between annual centers of activity for individual deer rarely exceeded 300 m (984 ft). Roads and water boundaries (e.g., wide channels, ditches) strongly influenced the shape of home ranges on the refuge. Deer density on the refuge's mainland was estimated at 30 deer/km² (78 deer/mi²) in 1975 and 21 deer/km² (54 deer/mi²) in 1976 (Gavin et al. 1984). Deer densities were as high as 62 deer/km² (160 deer/mi²) from 1984 to 1992 when overpopulation occurred on the refuge's mainland (USFWS 1998).

Interspecific Interactions

At high densities, Columbian white-tailed deer appear to exclude Columbian black-tailed deer (*Odocoileus hemionus columbianus*) from lowland riparian habitats (Smith 1987). However, black-tailed deer readily occupy riparian lowlands when densities of white-tailed deer are reduced (Smith 1987). This can lead to increased competition and potential hybridization (Davison 1979, Smith 1987, Gavin and May 1988, Whitney 2001).

Large herbivores such as elk (*Cervus elaphus*) and domestic cattle (*Bos taurus*) can trample understory vegetation and compete with deer for forage (Dublin 1980, Loft et al. 1987, Kirchoff and Larsen 1998). Columbian white-tailed deer actively avoided close associations with livestock on the refuge (Suring 1974). Deer rarely fed within 30 m (98 ft) of grazing cattle, and deer use of pasture with low cattle stocking rates (below 2.2 cows/ha [1 cow/ac]) was significantly greater compared to those with higher stocking rates (Suring 1974).

LIMITING FACTORS

The degradation of riparian habitat has the greatest negative impact to Columbian white-tailed deer (Crews 1939, Scheffer 1940, Gavin 1978). Habitat alterations favoring Columbian black-tailed deer can also lead to increased competition for food and hybridization between these species (Davison 1979, Smith 1987, Gavin and May 1988, Whitney 2001). Direct causes of adult mortality include malnutrition and disease, vehicle collisions, and poaching (Smith 1981, Gavin et al. 1984, Ricca et al. 2002). Necrobacillosis (foot rot) commonly afflicts deer and probably contributes to adult mortality (USFWS 1983). Deaths from predation, fence entanglement, and drowning occur to a lesser extent. Ricca et al. (2002) reported that 73% of adult mortalities occurred in fall and winter. Malnutrition due to insufficient food resources in winter months is potentially the major limiting factor for Columbian white-tailed deer on the refuge (Creekmore and Glaser 1999). Severe floods, especially when compounded by malnutrition, can result in significant mortality (USFWS 1998). Predation of fawns, primarily by coyotes (*Canis latrans*), can limit recruitment and exacerbate population declines caused by other factors such as flooding, poor nutrition, and habitat loss (USFWS 1998). Fawns are most vulnerable to predation from June through September.

MANAGEMENT RECOMMENDATIONS

Columbian white-tailed deer are strongly associated with riparian habitat (Smith 1985, Ricca 2000), and further degradation of this habitat should be avoided where deer are present or may become reestablished. Riparian corridors are critical to deer dispersal and range expansion (Smith 1985), and protection of riparian habitat is considered a priority (Knutson and Naef 1997). Planting native woody species such as cottonwood, spruce, alder, willow, salal, ninebark, dogwood, and elderberry helps to reestablish cover and browse in extensive clearings. Although the optimum ratio of cover to pasture is unknown for Columbian white-tailed deer, it is reasonable to assume that a diverse landscape with at least 50% woody cover would have the highest probability of meeting deer requirements (Davison 1979, Smith 1987). Based on the Suring and Vohs' (1979) observations, cover should be available within 250 m (820 ft) of foraging areas wherever possible. Trees on cottonwood plantations should be planted and harvested in small, staggered blocks to avoid large displacements of deer when blocks are cut (A. Clark, personal communication). Leaving native trees and shrubs along corridors such as sloughs will help provide cover when cottonwoods are harvested. Islands and low-lying mainland along the Columbia River are susceptible to seasonal flooding, and periodic major floods can result in significant mortality (Davison 1979, USFWS 1998). Diked and higher-elevation mainland areas adjacent to islands inhabited by deer should be managed to provide adequate cover and sanctuary for deer during periodic floods (Davison 1979). Human-deer conflicts can arise when deer damage crops or landscaping. Link (2004) offers suggestions on how to prevent or reduce deer problems using fences, repellents, and deer-resistant plants.

Pasture Management

In improved pastures, grazing by cattle can be manipulated to maintain short, actively growing forage for deer. However, high stocking rates and grazing over extensive areas should be avoided (Whitney 2001). Acceptable stocking rates depend on many factors such as the current condition of the vegetation, soil type, soil fertility, moisture and drainage (see Contacts section for assistance). Cattle should be excluded year-round from woodlots to provide understory development preferred by deer during winter and in the fawning period (Suring and Vohs 1979). Grazing on the refuge occurred from mid-April to late October, which kept forage at a palatable stage of growth (5-10 cm [2-4 in]) in the winter (Gavin et al. 1984). A rotational grazing system can be used to create these favorable foraging conditions for deer (M. Chaney, personal communication). Haying can also be used to maintain short-grass fields in the absence of grazing. However, deer on the refuge selected grazed pastures over hayed fields, and grazed fields apparently had higher plant diversity (Gavin et al. 1984). Small, narrow pastures with interspersed woody cover are recommended over large expanses of unbroken pasture. Pasture and property fences should be no more than 1.2 m (4 ft) high (Link 2004) with at least a 30 cm (12 in) spacing between the top two wires (CDOW 2004). The bottom wire should be 45 cm (17 in) off the ground to allow deer to go under fences (Link 2004). Flagging new fences will help to protect the fence until deer become accustomed to the new barrier

(CDOW 2004). Unused fencing should be removed to prevent deer entanglements (A. Clark, personal communication).

Predation

Coyotes are the main predator for deer on the lower Columbia River (USFWS 1998). Coyote removal may provide short-term benefits to deer by increasing fawn survival and recruitment into older age classes. Predator control can be a useful management tool to maintain the viability of small subpopulations. However, it should not be used indiscriminately because it can lead to deer overpopulation and habitat damage. Decisions regarding predator control should be left to qualified wildlife biologists.

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KEY POINTS

Habitat Requirements

- Strongly associated with lowland riparian forest, brushland, and pasture along the lower Columbia River.
- Use forests and woodlands with a well-developed understory as cover. Prefer habitat that provides both forage and cover.
- Feed in pastures, but only within 250 m (820 ft) of forest cover.
- Browse species in deer diets include evergreen blackberry, Pacific ninebark, red-osier dogwood, and salal.
- Consume grasses such as foxtail, orchard grass, tall fescue, mannagrass, and common timothy. Deer select grasses in the early stage of flowering as mature grasses have reduced digestibility and protein content.
- Consumed forbs include yarrow, woodland phacelia, red clover, and buttercup.
- Home ranges are overlapping and stable. Adult males have the largest home ranges at 209 ha (516 ac).
- Low densities of white-tailed deer may result in the occupation of lowland riparian areas by black-tailed deer.
- Large herbivores such as elk and cattle can trample vegetation and compete with deer for forage. Deer rarely come within 30 m (98 ft) of grazing cattle.

Management Recommendations

- Protect existing riparian habitat and reestablish woody cover in cleared areas.
- Maintain a diverse landscape of at least 50% woody cover wherever possible.
- On cottonwood plantations, plant and harvest cottonwoods in small, staggered blocks. Leave native cover along sloughs and other corridors.
- Provide adequate cover on mainland areas adjacent to Columbia River islands to allow for deer movements off the islands during periodic floods.

- Small, narrow pastures with interspersed cover are recommended over large, unbroken pastures.
- Promote short (5-10 cm [2-4 in]), actively growing forage in pastures by grazing or haying. Grazing should occur on a seasonal basis and cattle should be kept out of woodlots year-round. Rotational grazing systems are recommended.
- Pasture and property fencing should be no more than 1.2 m (4 ft) high with at least 30 cm (12 in) between the top two wires. The bottom wire should be at least 45 cm (17 in) above the ground.
- Remove unused fencing and flag new fencing.
- Predator control should only be considered if a wildlife biologist has determined control is necessary to protect the viability of a small subpopulation.