# BEFORE THE SECRETARY OF THE INTERIOR

## Petition to List the Humboldt Marten (*Martes americana humboldtensis)* as Threatened or Endangered under the Endangered Species Act

**September 28, 2010**

**Petitioners:**
Center for Biological Diversity
Environmental Protection Information Center

CENTER *for* BIOLOGICAL DIVERSITY *Because life is good.*

September 28, 2010

Mr. Ken Salazar
Secretary of the Interior
Department of the Interior
18th and "C" Street, N.W.
Washington, D.C. 20240

CC: Mr. Ren Lohoefener
Pacific Southwest Regional Director
U.S. Fish and Wildlife Service
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Dear Mr. Salazar:

Pursuant to Section 4(b) of the Endangered Species Act ("ESA"), 16 U.S.C. §1533(b), Section 553(3) of the Administrative Procedures Act, 5 U.S.C. § 553(e), and 50 C.F.R. §424.14(a), the Center for Biological Diversity, the Environmental Protection Information Center, Tierra Curry, and Noel Soucy hereby formally petition the Secretary of the Interior, through the United States Fish and Wildlife Service ("FWS", "the Service"), to list the Humboldt Marten (*Martes americana humboldtensis*) as a Threatened or Endangered subspecies and to designate critical habitat concurrent with listing. Because genetic research is being conducted which will revise the taxonomy of martens, we are petitioning for either the currently recognized subspecies *Martes americana humboldtensis*, or for the Humboldt marten as a future recognized subspecies of Pacific marten, *Martes caurina humboldtensis*, or for the Humboldt Marten Distinct Population Segment of Pacific marten.

U.S. Fish and Wildlife Service has jurisdiction over this petition. This petition sets in motion a specific process, placing definite response requirements on FWS. Specifically, FWS must issue an initial finding as to whether the petition "presents substantial scientific or commercial information indicating that the petitioned action may be warranted." 16 U.S.C. §1533(b)(3)(A). FWS must make this initial finding "[t]o the maximum extent practicable, within 90 days after receiving the petition." *Id.* Petitioners need not demonstrate that listing *is* warranted, rather, petitioners must only present information demonstrating that such listing *may* be warranted. While petitioners believe that the best available scientific information demonstrates that listing the Humboldt marten as endangered *is* in fact warranted, there can be no reasonable dispute that the available information indicates that listing the species as either threatened or endangered *may* be warranted. As such, FWS must promptly make an initial finding on the petition and commence a status review as required by 16 U.S.C. § 1533(b)(3)(B).

The Humboldt marten was once common, but now there are fewer than 50-100 surviving members of this subspecies in California and an unknown but small number in Oregon. The marten is severely threatened by logging and other threats and clearly warrants protection under the Endangered Species Act.

**PETITIONERS:**

The petitioners are conservation organizations. Failure to grant the requested petition will adversely affect the aesthetic, recreational, commercial, research, and scientific interests of petitioning organizations' members and of the citizens of the United States. Morally, aesthetically, recreationally, and commercially, the public shows increasing concern for wild ecosystems and for biodiversity in general.

**The Center for Biological Diversity** is a nonprofit conservation organization with 255,000 members and online activists dedicated to the protection of endangered species and wild places. http://www.biologicaldiversity.org

**The Environmental Protection Information Center** works to protect and restore ancient forests, watersheds, coastal estuaries, and native species throughout Northwestern California, including both public and industrial forestlands. EPIC uses an integrated, science-based approach, combining public education, citizen advocacy, and strategic litigation. http://www.wildcalifornia.org/

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## EXECUTIVE SUMMARY

The Humboldt marten (*Martes americana humboldtensis*) is a slender forest carnivore in the weasel family which is so rare that until recently it was thought to be extinct. Only 20 individuals were detected in 2008 surveys for this subspecies, and under the most optimistic scenario, there are likely fewer than 50-100 surviving individuals of this once common mammal in California, and an unknown but likely equally small number in Oregon. The lone surviving California population is perilously small and declined by more than 40 percent from 2002-2008. The Humboldt marten has been extirpated from 95 percent of its historical range in California and from the vast majority of its range in Oregon. It now has an extremely restricted distribution in coastal old-growth forests and serpentine areas in northern California and southern and central coastal Oregon.

The Endangered Species Act states that a species shall be determined to be endangered or threatened based on any one of five factors (16 U.S.C. § 1533 (a)(1)). The Humboldt marten is threatened by all five of these factors and thus warrants listing as a threatened or endangered subspecies because it is imminently threatened with extinction due to loss and curtailment of habitat or range, overutilization, disease and predation, numerous other natural and human-caused factors, and the inadequacy of existing regulatory mechanisms to ensure its continued existence.

## INTRODUCTION

Historically the Humboldt marten (*Martes americana humboldtensis*) was an abundant mammal in coastal old-growth forests (Slauson et al. 2001). This subspecies was once so common that it was regularly taken by trappers for its attractive fur. Due to historic trapping and drastic loss of old-growth forests from logging, there are fewer than 50-100 extant members of this subspecies in California, which now survives in less than 5 percent of its historic range in a single small, declining population (Slauson et al. 2009). Recent genetic work indicates that martens in the coastal mountains of Oregon are more closely related to the Humboldt marten than to martens in the interior portion of the state, and that the boundaries of the Humboldt subspecies should be expanded to include coastal Oregon populations (Slauson et al. 2009b). Fewer data are available on the status of martens in coastal Oregon, but the data which are available indicate that the marten has been extirpated from the vast majority of its historic range and that Oregon coastal populations have also undergone drastic decline.

This petition summarizes the natural history of the Humboldt marten, its population status, and the ongoing threats to the subspecies and its habitat. The Petition then clearly demonstrates that, in the context of the ESA's five statutory listing factors, the U.S. Fish and Wildlife Service should list the Humboldt marten as Threatened or Endangered.

## NATURAL HISTORY AND ECOLOGY

### Description

The marten is a forest-dwelling carnivore and a member of the weasel family (Mustelidae). Although martens are in the mustelid family with skunks and other species with powerful musk glands, the marten produces odors only weakly perceptible to humans (Buskirk and Ruggiero 1994). Martens have medium length glossy fur that ranges from tan to chocolate in color, an irregular cream or amber colored gular (throat) patch, lighter shaded fur on their underside, and darkly furred legs and tail. They are slender with a fox-like face, and large triangular-shaped ears that extend beyond the top of the head (Strickland et al. 1982). Of the two subspecies that occur in California, the Humboldt marten is darker with richer golden tone overall and with less orange and yellow in the throat patch (Grinnell and Dixon 1926, Buskirk and Zielinski 1999). It also has a smaller skull, and smaller and less crowded premolars and molars than the Sierra subspecies (Ibid.). One male Humboldt marten captured in mid-fall that had molted into winter pelage had brighter overall reddish brown coloration, dense fur on its underside, and dense fur around the pads of the feet (Slauson et al. 2002). Martens have five toes on each foot, all of which touch the ground, and semi-retractable claws (Buskirk 1994). Adult American martens weigh from 500-1400 grams and are 500-680 mm long (Buskirk and McDonald 1989). Sexual dimorphism is pronounced, with males being 20-40 percent larger than females. Live capture data of 14 martens in the range of the Humboldt subspecies in coastal northwestern California show that martens in this geographic location are on the smaller end of the size range with an average weight of 889 grams for males (SD = 100), and an average weight of 598 grams for females (SD = 39) (Slauson et al. 2002).

### Taxonomy

The Humboldt marten (*Martes americana humboldtensis*) was described as a subspecies by Grinnell and Dixon (1926) and is a currently recognized subspecies of American marten (*Martes americana*) (Hall 1981, Clark et al. 1987). Ongoing genetic research suggests that the American marten should be divided into two species—*M. americana* and *M. caurina*, the Pacific marten (Carr and Hicks 1997, Dawson 2008). The Humboldt marten may thus become a subspecies of Pacific marten. In light of ongoing genetic work, we hereby petition for the currently recognized subspecies of Humboldt marten (*M. americana humboldtensis*) *or* for the re-designated subspecies of Humboldt marten within the Pacific marten complex (*M. caurina humboldtensis*) *or* for the Humboldt marten Distinct Population Segment (DPS) of Pacific marten.

Merriam (1890) originally proposed two species of North American marten, *M. caurina* and *M. americana*, based on differences in morphology. Wright (1953) re-described the Pacific marten as a subspecies of American marten, *M. americana caurina*, based on a zone of integradation between the two species in Montana. Later genetic research has revealed fixed differences which support the division into the two originally described species (Carr and Hicks 1997, Stone et al. 2002, Small et. al 2003, Dawson 2008). Pure

populations of Pacific marten are found in coastal habitats in Alaska, British Columbia, Washington, Oregon and California (Dawson 2008). The Pacific marten and American marten contact in the Rocky Mountains and in southeast Alaska (Dawson 2008).

The Humboldt marten was described as a subspecies based on coloration differences and skeletal measurements which differentiate it from *M. a. sierrae* to the east in the Sierra Nevada Mountains in California and from *M. a. caurina* to the north in the Cascade Mountains of Oregon. Recent genetic analyses have revealed that populations of marten from coastal Oregon are more closely related to *M. a. humboldtensis* than to *M. a. caurina* in the Cascades, and that the Humboldt marten subspecies should be expanded to include the coastal Oregon populations (Dawson 2008, Slauson et al. 2009b). There are no historical or current biogeographic barriers which prevent the north-south movement of martens along the coast, and marten populations inhabiting coastal forests in Oregon and California should thus be managed collectively in order to preserve historic connectivity (Slauson et al. 2009b).

The Humboldt marten will likely be designated as a subspecies of Pacific marten. Should it not maintain its status as a subspecies, however, it clearly qualifies as a Distinct Population Segment under the Policy Regarding the Recognition of Distinct Vertebrate Population Segments under the Endangered Species Act ("the Policy," USDI 1996). Three elements are considered in a decision regarding the status of a possible DPS as endangered or threatened under the Act:

1). Discreteness of the population segment in relation to the remainder of the species to which it belongs;
2). The significance of the population segment to the species to which it belongs;
3). The population segment's conservation status in relation to the Act's standards for listing (i.e., is the population segment, when treated as if it were a species, endangered or threatened?).

The Humboldt marten meets all three of the elements required for listing as a DPS. It meets the Policy's requirements for discreteness in that, "it is markedly separated from other populations of the taxon as a consequence of physical, physiological, ecological, or behavioral factors," and "quantitative measures of genetic and morphological discontinuity provide evidence of this separation." As a currently recognized subspecies, the Humboldt marten is known to differ morphologically from other populations of marten, based on coloration differences and skeletal measurements (Grinnell and Dixon 1926, Grinnel et al. 1937, Buskirk and Zielinski 1999). The Humboldt marten is darker in color with richer golden tone overall and with less orange and yellow in the throat patch, and has a smaller skull, and smaller and less crowded premolars and molars than the Sierra subspecies (Ibid.). The Humboldt marten also differs genetically from other populations of marten. Slauson et al. (2009b) compared mitochondrial DNA (mtDNA) sequence diversity from a museum specimen of *M. a. humboldtensis* with mtDNA collected from contemporary individuals within the described range of *M. a. humboldtensis*, and individuals from the nearby ranges of *M. a. sierrae* and *M. a. caurina.* They found that martens from the rediscovered population within the historical

range of Humboldt marten shared a haplotype (#2) with the museum specimen of Humboldt marten. Haplotype 2 was found only in the coastal regions of Oregon and California. Their findings demonstrate that the Humboldt marten is genetically distinct from other marten populations, and that the range of the subspecies or DPS should include Oregon coastal populations.

The Humboldt marten also meets the Policy's requirements for significance in that it "differs markedly from other populations of the species in its genetic characteristics," "persists in an ecological setting unusual or unique for the taxon," and "loss of the discrete population segment would result in a significant gap in the range of the taxon." In terms of difference in genetic characteristics, Slauson et al. (2009b) found that *M. a. humboldtensis* differs substantially from *M. a. sierrae* and *M. a. caurina*, which suggests that marten divergence likely occurred in separate glacial refugia. They state:

> "Our results support the hypothesis that the population currently in coastal California (Del Norte County) represents descendants of a relictual population of martens that previously existed along the coast; supported by a common haplotype (#2) present in both the historical Humboldt marten museum skin of 1927 and coastal California and coastal Oregon populations but not found in the 8 individuals analyzed from outside of this region" (p. 1340).

The Humboldt marten not only meets the genetic criterion for significance, but also persists in an ecological setting unique for the taxon. In addition to using old-growth forest habitats which are typical of the species, the Humboldt marten uses two habitat features which are distinct for the species—serpentine soils, and dense, spatially extensive shrub cover. Slauson et al. (2009a) state:

> "Importantly these studies have revealed that martens in California coastal forests occupy low elevation areas with little or no snowfall and select forest habitats with some distinctly different features (e.g., dense, spatially extensive shrub cover) than Sierran martens (*M. a. sierrae*). Furthermore, Humboldt martens utilize two distinct types of fog-influenced forest habitats, Old Growth Douglas fir (*Psuedotsuga menzesii*) dominated forests and mixed conifer (e.g., Douglas-fir, Sugar pine [*Pinus lambertiana*], Western white pine [*P. monticola*], Lodgepole pine [*P. contorta*]) forest occurring on serpentine soils" (p. 3).

Though use of serpentine habitats is a unique ecological characteristic of Humboldt martens, use of serpentine areas may have resulted from extensive logging of the marten's preferred old-growth habitat, as serpentine areas do not provide optimal habitat. Marten researchers have documented reproduction and stable summer-fall home ranges occurring in serpentine areas, but a more pronounced decline in sample unit occupancy has occurred in serpentine areas than in old-growth non-serpentine areas (Slauson et al. 2009a).

Humboldt martens are also unique in that they prefer dense shrub cover in serpentine and non-serpentine areas. Humboldt martens are associated with shrub areas dominated by

shade-tolerant, long-lived, mast-producing species tolerant of acidic soils such as salal (*Gaultheria shallon)*, huckleberry (*Vaccinium ovatum, V. californica)*, rhododendron (*Rhododendron macrophyllum*), and shrub oaks (*Quercus vaccinifiolia*, *Lithocarpus densiflora echinoides*). Importantly, Humboldt martens are not associated with shrub species which dominate sites after logging, such as ceanothus (*C. veluntinus, C. thyrsiflorus*) (Slauson et al. 2007). Perhaps due to their preference for dense, shrub environments, the diet of the Humboldt marten consists of a higher reported frequency of berries and birds than that of other marten subspecies (Slauson and Zielinski 2007).

The Humboldt marten further meets the Policy's criteria for significance in that its loss would result in a significant gap in the range of the taxon. The Humboldt marten is the southernmost population of Pacific marten, which ranges discontinuously from coastal Alaska to coastal northern California (Dawson 2008). Populations at the edge of species' ranges generally exhibit differences from populations at the center and are of great importance for the long-term persistence of the species and its ability to adapt when faced with changing environmental conditions (Meffe and Carroll 1994). The loss of the Humboldt marten would mean the extirpation of the southernmost population of the species, and the loss of unique haplotypes and unique ecological characteristics, as identified in the preceding paragraphs.

The coastal northern California and coastal Oregon population of Humboldt marten clearly qualifies as a Distinct Population Segment in that it is both morphologically and genetically discrete, it is both genetically and ecologically significant, and its loss would result in a significant gap in the range of the taxon. The conservation status of the Humboldt DPS also clearly meets the Act's standards for listing due to habitat loss and degradation and other threats, as discussed below in the Threats section.

**Range**

In California, the Humboldt marten historically occurred in coastal forests from Sonoma County, California north to Curry County, Oregon (Slauson et al. 2001). Grinnel et al. (1937) described the range of the "well-marked race" as the coastal redwood (*Sequoia sempervirens*) zone from Sonoma County north to the Oregon border (Kucera 1998). There are natural heritage records for this subspecies from Colusa, Del Norte, Glenn, Humboldt, Lake, Mendocino, Siskiyou, Tehama, and Trinity counties in California (NatureServe 2010).

The Humboldt marten has been extirpated from more than 95 percent of its historic range in California (Slauson et al. 2007). There is now only a single known population of this subspecies in the state (Zielinski et al. 2001, Slauson 2003, Slauson et al. 2007). Slauson et al. (2007) define the California study area for the Humboldt marten as portions of the Klamath-Siskiyou and Northern California Coastal Forest ecoregions in Del Norte, Humboldt, and Siskiyou counties, California. Slauson et al. (2009) estimate that within its potential habitat, the single known California population of this subspecies currently occupies an area of 637 $km^2$, using minimum convex polygon estimation. Based on a GIS analysis of Slauson's data and more recent unpublished data, the Environmental

Protection Information Center (EPIC) estimates the total California range of the subspecies to be approximately 2273 $km^2$ (Fig. 1).

In light of recent genetic discoveries which indicate that Pacific martens in coastal Oregon are more closely related to Humboldt martens than to other subspecies (Dawson 2008, Slauson et al. 2009b), the defined range of the Humboldt marten as either a subspecies or a DPS should be expanded to include the coastal Oregon populations.

The marten once occurred throughout coastal Oregon forests, but has been lost throughout significant portions of its historic range in the state (Zielinski et al. 2001). There are natural heritage records for the American marten from Coos, Curry, Douglas, Jackson, Jefferson, Josephine, Klamath, Lane, Lincoln, and Linn counties in Oregon (NatureServe 2010). Martens are likely still extant in the Coast Range only in west-central and extreme southwestern Oregon (Zielinski et al. 2001).

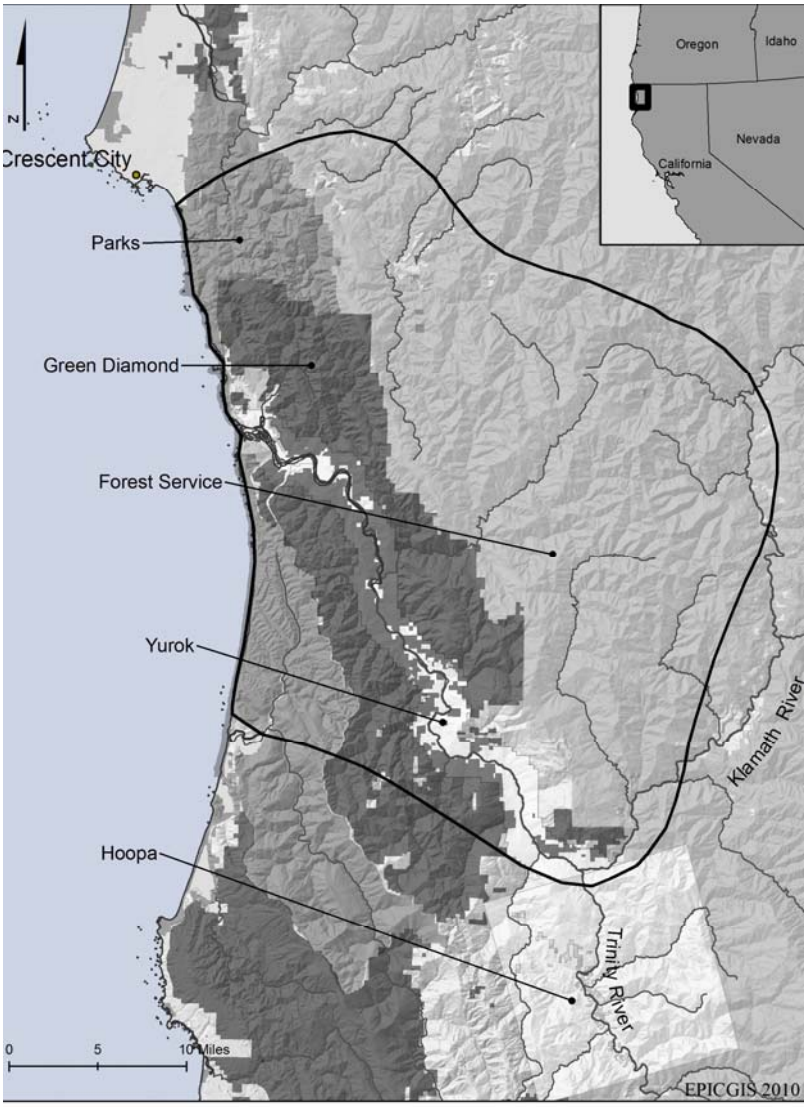


**Figure 1. Humboldt Marten California Range and Land Management.** Map by EPIC GIS.

## Land Management

The U.S. Forest Service manages much of the range of the Humboldt marten including Six Rivers National Forest, the Smith River National Recreation Area (part of Six Rivers NF), the Siskiyou Wilderness (administered by Six Rivers, Klamath and Siskiyou National Forests), the western Siskiyou National Forest in southwestern Oregon, and the Siuslaw National Forest in the central Coast Range of Oregon. The National Park Service, in conjunction with the State of California, manages Redwood National and State Parks. The range of the Humboldt marten also includes lands owned by the Yurok and Hoopa Valley Tribes, and private industrial timberlands owned by Green Diamond Resource Company.

Based on a GIS analysis by EPIC of the Humboldt marten's California range, about half the area is managed by the U.S. Forest Service, approximately a quarter by Green Diamond Resource Company, and less than ten percent lies in State and National Parks. While the Yurok Reservation lies almost entirely within the marten's range, and makes up just under ten percent of the area, most of the reservation is in non-Tribal ownership, including a significant portion owned by Green Diamond. These estimates are based on available public records and do not reflect recent or pending changes in land ownership.

## Habitat

Martens are one of the most habitat-specific mammals in North America, and are thus highly vulnerable to habitat loss and degradation (Harris 1984, Buskirk and Ruggiero 1994, Slauson 2003). Martens are very strongly associated with closed-canopy, old-growth forests with complex structure on or near the ground (Buskirk and Powell 1994, Buskirk and Ruggiero 1994, Bull et al. 2005). Martens are known to avoid younger forests and open areas such as clear-cuts (Drew 1995, Buskirk and Ruggiero 1994, Slauson et al. 2007). Martens avoid fragmented areas, and will not cross large areas with low canopy closure (Hargis and McCullough 1984, Bissonette and Sherburne 1993, Thompson and Harestad 1994, Hargis et al. 1999).

Numerous studies demonstrate the preference of martens for unlogged, old-growth habitat (Spencer et al. 1983, Wynne and Sherburne 1984, Snyder and Bissonette 1987, Koehler et al. 1990, Lofroth 1993, Buskirk and Ruggiero 1994, Raphael and Jones 1997, Ruggiero et al. 1998, Bull et al. 2005). For example, radio-collared martens in northeastern Oregon demonstrated a strong preference for old, unlogged stands with greater than 50 percent canopy closure, canopy layers, and high density of logs and dead trees (Bull et al. 2005). Martens specifically avoided harvested stands, early structural classes, and areas with low densities of dead trees (Ibid.). Younger forests and forests where old-growth loss has been extensive simply do not provide adequate habitat for martens:

> "The (Humboldt) marten does not occur in extensively logged redwood forests and *currently* only occurs in conifer-dominated, late-mature and old-growth

forests with dense shrub cover or near-coast serpentine communities with dense shrub cover" (Slauson et al. 2003, p. 13, emphasis added).

The Humboldt marten population documented in Slauson's 2003 study used two distinct types of fog-influenced coastal low-elevation forests—old-growth Douglas-fir (*Psuedotsuga menzesii*) dominated forests, and mixed conifer forest occurring on serpentine soils with Douglas-fir, Sugar pine (*Pinus lambertiana*), Western white pine (*P. monticola*), and Lodgepole pine (*P. contorta*) (Slauson 2003). The more recent documentation of Humboldt marten presence in a third type of fog-influenced coastal low-elevation forest – old growth redwood forest – is consistent with both the earlier results and with the historical record (Grinnel et al. 1937, Kucera 1998, Slauson et al. 2001, Slauson and Holden 2009).

Serpentine soils have low levels of essential nutrients and high concentrations of detrital elements which creates a harsh growing environment and results in open and rocky sites with rich plant diversity, slow-growing woody plants, and stunted trees (Slauson et al. 2007). Serpentine areas provide lower quality habitat for martens than old-growth habitats (Slauson et al. 2009). In both serpentine and non-serpentine areas, the Humboldt marten occupies areas with dense, spatially extensive shrub cover comprised of shrub species associated with older forest habitats and importantly, not associated with shrub species that occur in areas of clear-cuts and re-growth (Slauson et al. 2007).

Martens select habitat at three spatial scales-- microhabitat, stand, and home range, with a fourth scale, landscape, serving as an upper constraint on habitat selection (Bissonette et al. 1997, Slauson 2003). At all of these scales, martens demonstrate strong preference for old-growth habitats.

The microhabitat scale is comprised of several square meters in area, and at this level martens require specific elements for resting, denning, and foraging, such as large, downed logs, broken top platforms, and cavities and chambers (Gilbert et al. 1997, Ruggiero et al. 1998, Slauson et al. 2007). Martens use resting habitat for protection from predators and for thermal refugia. Consistent with resting site selection by other marten subspecies, Humboldt martens use enclosed and/or elevated resting structures in the largest size classes of trees and snags available (Slauson and Zielinski 2009). In a study of resting structures used by radio-collared Humboldt martens, martens were detected using resting structures on 55 occasions, and used snags on 37 percent of the occasions, logs 23 percent, live-trees 17 percent, slash-piles 10 percent, rock-piles 8 percent, and shrub clumps on 6 percent of the occasions (Slauson and Zielinksi 2009). Within these structures, martens rested in chambers (33 percent), cavities (33 percent), broken tops (22 percent), branch platforms (6 percent), ground sites (6 percent), and basal hollows (2 percent). The woody structures where Humboldt martens rested were very large, with mean dbh (diameter at breast height) of 94 cm for live-trees, 95 cm for snags, and 88 cm for logs (maximum diameter). The resting structures were also old, ranging from 131-666 years, and averaging 339 years (Slauson and Zielinksi 2009).

Martens also require old-growth elements for denning sites. Breeding females use two or more den sites during the breeding season: kits are born in natal dens, and subsequently relocated to one or more maternal dens until they are weaned and ready to disperse (Ruggiero et al. 1998). Den sites provide a thermally stable refuge from predators (Taylor 1993) and can occur in downed logs, tree cavities, snags, rock crevices, slash piles, or squirrel middens (Ruggiero et al. 1998, Bull and Heater 2000). Natal dens used by a population of marten in northeastern Oregon tended to be dry, insulated, and secure from predators, while maternal dens provided somewhat less protection (Bull and Heater 2000). From a review of 14 studies on marten den structure, Ruggiero et al. (1998) report that 70 percent of dens were found in trees, logs, and rock-piles. Tree dens were found in larger-than-average trees associated with late-successional forests, consistent with reports by other studies that martens disproportionately select the largest available trees and structures for denning sites (Wilbert 1992, Gilbert et al. 1997, Raphael and Jones 1997). Because most resting and denning structures require more than a century to develop, and because marten also avoid openings and areas with harvest activity to reach these sites, logging significantly degrades or destroys marten habitat at the micro-stand scale.

At the stand scale, which consists of several hectares, martens prefer old-growth stands with structural features that fulfill their life-history requirements such as resting and denning structures, abundant prey populations, access to mates, etc. (Buskirk and Powell 1994, Katnik et al. 1994, Slauson et al. 2007). Bull et al. (2005) compared habitat characteristics in 2,558 plots in occupied and unoccupied areas in northeastern Oregon and found that marten use stands with 50-74 percent canopy closure more than stands with less than 50 percent canopy closure ($P < 0.01$), and that stands used by martens had more canopy layers, a longer distance to an opening, and higher densities of snags, logs, and large trees than unused areas. Importantly, they found that stands with no harvesting activity were used more, and that stands with *any* harvesting activity were used less than expected based on availability ($P < 0.01$; emphasis added).

At the stand scale in non-serpentine areas, Humboldt martens select old-growth developmental stages at a rate highly disproportionate to availability, use late-mature stands similar to availability, and make little or no use of all other developmental stages (Slauson et al. 2007). In serpentine areas where tree growth is stunted, martens select for percent shrub cover and relative percent conifer cover at rates similar to those found in non-serpentine stands (Slauson et al. 2007). In both serpentine and non-serpentine areas, dense sub-canopy shrub cover which continues unbroken throughout entire stands and into adjacent stands is consistently selected by martens (Ibid.). Large contiguous patches of dense shrub cover support prey populations, provide refuge from predators, and could also deter larger-bodied competitors (Slauson et al. 2007). The spatially extensive shrub cover preferred by the Humboldt marten is dominated by shade-tolerant, long-lived, mast-producing species such as salal, rhododendron, huckleberries, and shrub oaks, and does not include shade-intolerant and short-lived shrub species which dominate sites after logging such as ceanothus (e.g., *C. veluntinus*, *C. thyrsiflorus*) (Slauson et al. 2007).

In contrast to other studies, Baker (1992) found that pine martens in coastal forests of Vancouver Island, British Columbia, Canada, select for second growth forest stands and

use mature (40–120 yr) and old-growth (greater than 120 yr) forest stands less than expected. Baker's study area, however, is atypical in that the second-growth stands were structurally complex with large amounts of residual large woody structures and abundant overhead shrub cover, and also differed in terms of prey availability. Old-growth forest–associated rodents that are typical marten prey are scarce on Vancouver Island (Nagorsen et al. 1989), and marten use of second-growth sites is likely influenced by the relative abundance of potential prey associated with early successional forests such as deer mice (*Peromyscus maniculatus*) (Slauson et al. 2007). Due to the differences in habitat characteristics and prey availability in Baker's study area, the results have limited applicability for the Humboldt marten and starkly contrast with studies of Humboldt marten habitat use (Slauson 2003, Slauson et al. 2007, 2009).

The home range scale for martens consists of one half to several square kilometers (Slauson et al. 2007), and is 3-4 times larger than the area that would be expected for a mammalian carnivore of their size (Buskirk and Ruggiero 1994). At the home range scale, martens require an array of forest stands which meet their year-round life-history requirements, and they defend their home range from same-sex conspecifics (Slauson et al. 2007). Bull et al. (2005) found that martens select home ranges with denser canopy, more canopy layers, larger diameter live and dead trees, larger logs, and a higher density of potential rest sites such as trees with cavities, hollow logs, and trees with platforms, than unoccupied areas. They state, "Unoccupied habitat either lacked these features or contained them in lower densities and may explain the lack of martens in these areas" (p. 42).

For their home-ranges, Humboldt martens select the largest available patches of old-growth, old-growth and late-mature, or serpentine habitat (Slauson et al. 2007), similar to home-range selection for other marten subspecies which also select for the largest available forest patches (Chapin et al. 1998). Slauson et al. (2007) developed habitat models for Humboldt marten and found that a 20-ha increase in old-growth patch size was associated with a 19-26 percent increase in marten occurrence, after accounting for the amount of serpentine habitat. They conclude:

> "The best models suggest that home range areas with larger patch sizes of old-growth, old-growth plus late-mature, or serpentine habitat within a 1-km radius of each sample unit are important for marten occurrence. Martens disproportionately used sample units within these largest patch sizes" (p. 462).

As expected based on habitat requirements, logging is negatively associated with Humboldt marten home-range selection. Slauson et al. (2007) found that a 10 percent increase in the amount of area logged was associated with a 23 percent decrease in the odds of marten occurrence, after accounting for amount of serpentine habitat and old-growth patch size. Sixty percent of the sample units where they detected martens had less than or equal to 13 percent of the 1-km radius logged, and no martens were detected in sample units where greater than 50 percent of the total area within a 1-km radius had been logged (Slauson et al. 2007).

Slauson et al. (2007) also found that mixed-scale models from both the stand and home-range scales best explained Humboldt marten occurrence compared to one scale alone. Because martens are negatively associated with logging activities at the microhabitat, stand, and home-range scale, it follows that logging at the landscape scale, which is comprised of tens to hundreds of square kilometers, inevitably negatively influences marten occurrence.

At the landscape scale, loss and fragmentation of mature forest and the resultant changes in landscape pattern constrain marten movement and demography (Bissonette et al.1989, Fredrickson 1990, Phillips 1994, Chapin 1995, Chapin et al. 1998, Hargis 1996, Slauson 2003). Martens avoid landscapes where more than 25-30 percent of mature forest has been lost (Bissonette et al. 1997, Hargis et al. 1999, Potvin et al. 1999, Slauson 2003). Fragmented forests and small patches of old growth are not adequate to ensure the long-term viability of marten populations. Slauson et al. (2009) found that Humboldt martens may occasionally occupy patches of old growth forest that are less than 50 ha, but that these patches do not provide the same value to martens as larger patches, stating:

> "The biggest difference between sites with stable marten occupancy versus unstable occupancy, in our study, was the size of the patch of Old Growth forest that encompassed them, with larger patches having more stable marten occupancy" (p. 12).

Slauson et al. (2009) documented a sharp decline in Humboldt marten sample unit occupancy in sample units where the old-growth vegetation type is highly fragmented and in serpentine areas, and found that sample units with more old growth in their vicinity were more likely to have stable marten occupancy between 2000-01 and 2008 (Slauson et al. 2009). Old growth patches encompassing sample units where marten occupancy remained constant between 2000-01 and 2008 were approximately 40 percent larger on average than patches that became unoccupied in 2008 (Slauson et al. 2009). The authors calculated the probability of extinction for the marten based on old-growth patch size and found that martens were less likely to go extinct in sample units with more old growth. For example, a 30 hectare increase in the amount of old growth resulted in a 37 percent decrease in the probability of extinction.

Loss of late-successional conifer forests is the primary cause of marten population decline in areas where martens are currently threatened or already extirpated (Yeager 1950, Archibald and Jessup 1984, Thompson and Harestad 1994, Bull et al. 2005). Due to patterns of land ownership, extensive loss of old-growth habitat, and ongoing forest management practices in the range of the Humboldt marten, there is "considerable concern" regarding the long-term persistence of the subspecies (Slauson et al. 2007, p. 458). Within the range of the Humboldt marten, most forests are intensively managed for timber production, and much of the landscape already exceeds the 25-30 percent threshold of mature forest loss (United States Department of Agriculture 1992, Bolsinger and Waddell 1993, Thornburg et al. 2000, Slauson 2003). The Humboldt marten has already been extirpated from more than 95 percent of its historic range, and the threat of further habitat loss is ongoing (Slauson et al. 2007). With only 50-100 extant individuals

of this subspecies, further habitat loss could cause its extinction. The Humboldt marten and its habitat are in dire need of Endangered Species Act protection.

**Diet and Foraging**

Martens are dietary generalists which take advantage of seasonally abundant foods including small mammals, birds, eggs, reptiles, fish, carrion, insects, and berries. Diet is both regionally and seasonally variable, with small mammals comprising a higher proportion of winter consumption, and bird eggs, insects, and berries becoming more important in spring and summer (Buskirk and Ruggiero 1994). The most diverse marten diets tend to be those from the western temperate region, including California (Ibid.). The diet of the Humboldt marten contains a similar level of small mammal consumption as marten in other locations, but contains a higher reported frequency of berries and birds (Slauson and Zielinski 2007b). An analysis of over 400 scats of *M. a. humboldtensis*, collected from July through November, found small mammals to be the most common food item (93 percent frequency of occurrence), followed by berries (85 percent), birds (21 percent), insects (20 percent) and reptiles (7 percent) (Slauson and Zielinski 2007b). Mammal prey consisted primarily of Rodentia, including Scuirids (especially *Tamias* squirrels), and Murid voles (*Clethrionomys* and *Arborimus*). Berry composition was dominated by *Gaultheria shallon* (33 percent*), Vaccinium ovatum* (26 percent), *V. parviflora* (23 percent), and *Arctostaphylos* (11 percent). Bird prey included winter wren (*Troglodytes troglodytes*) and Steller's jay (*Cyanocitta stelleri*).

Martens use both visual and olfactory cues to find food, and typically forage on the ground, often focusing on patches of herbaceous shrubs where voles (*Microtus spp.)* and other small mammal prey are found (Buskirk and Ruggiero 1994). In serpentine areas of Northern California, martens frequently forage in the spaces amongst rock piles where chipmunks (*Tamias spp.)* and golden-mantled ground squirrels (*Spermophilus lateralis*) are observed. During winter, *M. a. humboldtensis* forage in the subnivean zone (under the snow layer), and may also ascend trees in search of prey (Zielinski et al. 1983). Martens demonstrate seasonal variation in the timing of foraging to synchronize their daily foraging with periods of peak prey activity—in summer, foraging is largely diurnal, whereas in winter it is nocturnal (Ibid.).

Old-growth forest habitats are important for maintaining healthy prey populations for martens. Red-backed voles (*Clethrionomys sp.)* are associated with old-growth forest features including dense canopy, large-diameter trees and logs, dense and large-diameter snags, and dense understory plant cover (Hayes and Cross 1987, Raphael 1989, Nordyke and Buskirk 1991). Red and Douglas squirrels (*Tamiasciurus spp*.) primarily occupy coniferous forests in late-successional and cone-producing stages (Flyger and Gates 1982). Martens likely choose foraging locations where prey species are abundant and where the habitat structure at the site renders prey vulnerable to capture (Buskirk and Powell 1994). In North Central Washington, Koehler et al. (1990) found that marten frequented forests greater than 82 years of age where voles (*Microtus* spp. and *Clethrionomys* spp.) and red squirrel middens were available, and that martens avoided forests less than 43 years of age, concluding: "Mature and old-growth forests are

important habitats for marten, providing voles for prey during critical winter periods" (p. 1).

**Life History and Demography**

The life history traits of martens make recovery from population decline difficult. For a mammal of their size, martens have relatively late sexual maturity and low reproductive capacity. The predicted time to sexual maturity for a 1-kg mammal is five months (Taylor 1965), but most female martens first mate at 15 months of age and don't produce their first litters until 24 months (Strickland et al. 1982). During periods of environmental stress, pregnancy rates for marten can be as low as 50 percent, and females less than two years of age may not ovulate (Thompson and Colgan 1987). Martens produce only one litter per year, which is lower than the predicted frequency of 1.4 liters per year for similar sized mammals (Calder 1984). Litter size ranges from one to five with an average of 2.85 (Strickland and Douglas 1987), which is also low for a mammal its size (Calder 1984). Litter size is likely age-dependent, and peaks at age six. Senescence occurs at twelve years or greater, with decreased litter size beginning at twelve years (Mead 1994). Marten population densities are low, and are only about one-tenth the expected based on body size (Buskirk and Ruggiero 1994, Kucera 1998).

Martens mate from late June to early August, with most mating occurring in July (Markley and Bassett 1942). Ovulation may be induced by copulation (Mead 1994). Like other species of Carnivora, marten undergo delayed implantation, and the active pregnancy period is only 27 days (Strickland et al. 1982). The onset of active gestation is controlled by photoperiod (Enders and Pearson 1943), and coincides with the development of mammaries (Mead 1994). Martens give birth in March and April, with newborn kits weighing approximately 28 grams (Strickland et al. 1982). Kits are weaned at 42 days, which is later than the predicted age for weaning of a 1-kg mammal of 28 to 34 days (Blaxter 1971, Millar 1977). At 50 days, young martens emerge from their dens and begin foraging independently (Hauptman 1979, Strickland et al. 1982). Juveniles disperse from early August to October. Marten are promiscuous, with both males and females having several mates, though it is unknown if multiple matings result in litters of multiple paternity (Strickland et al. 1982). Consistent with other polygynous Carnivora, only maternal care has been reported and includes establishing and maintaining the natal den, moving kits among alternative den sites, and grooming, nursing and bringing food to the young (Mead 1994).

Martens can live up to 14.5 years in the wild (Strickland and Douglas 1987). There are numerous mortality factors for marten including predation, exposure, accidents, collisions with automobiles, disease, and trapping. Bull and Heater (2001) reported that of 22 documented marten deaths in northeastern Oregon, 18 were killed by predators, 3 by exposure (hypothermia), and one in a collar-related accident. Of the 18 predator mortalities, 8 martens were killed by bobcats, 4 by raptors, 4 by other martens, and 2 by coyotes. Mortality rates were approximately equal for males and females, though predation rates are generally higher for females, which are smaller (Slauson et al. 2009). Accidents may include falling out of trees and drowning (Buskirk and Ruggiero 1994).

Predation, disease, and trapping are discussed below in the Threats section. The risk of mortality for martens increases in suboptimal habitat (Slauson et al. 2009).

Survival rates for martens vary based on whether the population is wild and trapped or wild and untrapped, since in trapped areas, more than 90 percent of mortality results from trapping (Strickland and Douglas 1987, Hodgman et al. 1994). Hodgman et al. (1997) report that in a wild untrapped population in Maine, annual survival rates for adult males averaged 0.87 (95% CI = 0.75-l.00), and for adult females 0.53 (95% CI = 0.34-0.83). Bull and Heater (2001) radio-collared martens in an untrapped area in northeastern Oregon, and found that of the 35 martens collared, 22 died during the four year study, 10 survived, and 3 had unknown fates. The mean annual survival rate for this wild, untrapped population was 0.63 (95% CI = 0.39-0.87). While survival rates for the Humboldt marten are unavailable, Slauson et al. (2009) measured a 42 percent decline in sample unit occupancy between 2001 and 2008, which implies an extremely low survival rate.

**Status and Trend**

**Population Status**

Historically Humboldt martens were common (Slauson et al. 2001). This subspecies has undergone drastic decline and in California now likely exists as a single small population which itself is declining (Slauson et al. 2009). Until the late 1990's, the Humboldt marten was thought to be either extremely rare or extinct (Kucera et al. 1995) until martens were detected at two of 468 track plate stations within the range of the Humboldt marten by Zielinski et al. (1998). Prior to the redetection, Zielinski and Golightly (1996) were unable to verify a single marten detection within the historical range of *M. a. humboldtensis* since the 1940's. Despite extensive survey efforts, martens have only been redetected in the north-central portion of their former California range (Slauson and Zielinski 2007, Douglas and Holley 2009).

The lone extant population of Humboldt marten in California appears to have declined by more than 40 percent from 2000-2008. Slauson et al. (2009a) report:

> "The change between 2000-01 and 2008 marks a significant decline in site occupancy, equaling a change in occupancy rate (λ) = 0.58 (SE = 0.13, 95% CI = 0.31 to 0.81) or a 42% decline in sample unit occupancy over the 7 year period" (p. 10).

Because the researchers could not access all sites due to fires, the authors report that the decline in occupancy may likely be even higher than the reported 40 percent (Slauson et al. 2009).

The population is perilously small. Slauson et al. (2009a) estimated the population size in 2000-2001 at 31.5 individuals (95% C.I = 24-40), and in 2008 at 20.2 individuals (95% C.I = 11-30). Because they could not sample all potentially occupied habitat, this number could be an underestimate, and the authors estimate that even under the most optimistic

scenario, the population in 2008 was likely less than 50-100 individuals. Slauson et al. (2009a) estimate that the probability of extinction ($\varepsilon = 0.49$, SE = 0.12) for the Humboldt marten is higher than the probability of colonization ($\gamma = 0.29$, SE = 0.23), and that conservation actions are needed immediately for the remnant population.

The marten once occurred throughout coastal Oregon forests, but has been lost throughout the vast majority of its historic range (Zielinski et al. 2001). Martens are still extant in the Coast Range in west-central and extreme southwestern Oregon, but are likely extirpated from northwestern Oregon based on the limited amount of appropriate habitat and absence of reported road kills in the northern portion of the state (Zielinski et al. 2001). In the central Coast Range, from 1980-1998 there were 9 reported road kills on Highway 101 in the Siuslaw National Forest and Oregon Dune National Recreation Area, and one reported road kill from a National Forest road in the area.

Detailed data on the status of martens in the Oregon Coast Range are not available, but the data which are available strongly suggest that the Humboldt subspecies is declining in the state. Marten trapping is still legal in Oregon, and the number of martens reported as harvested from coastal Oregon has been in decline since the 1940s, especially in Coos and Curry counties in southwestern Oregon (Ibid.). Martens were considered very rare along the Oregon coast by the 1970s (Mace 1970, Maser et al. 1981). During the 1980s, there was a large increase in the price paid per marten pelt with no corresponding increase in the number harvested for any of the coastal counties (Verts and Carraway 1998), which strongly suggests large population decline (Zielinski et al. 2001).

Martens in the coastal forests of Oregon and California have experienced greater decline than martens in the Sierra and Cascade mountains, because the narrow coastal forests are "more accessible to trappers, more accessible to logging, more rapidly affected by fragmentation of habitat and populations, and are composed of proportionately little late-successional reserves or wilderness areas" (Slauson and Zielinski 2004, p. 63).

**Conservation Status**

The California Department of Fish and Game classifies the American marten as a Species of Special Concern. The Oregon Department of Fish and Wildlife classifies the marten as a furbearer and it can still be legally trapped in the state. The marten is a Forest Service priority Sensitive Species in Region 5 (California), but has no special status in Region 6 (Oregon). NatureServe (2010) ranks the Humboldt marten as an imperiled subspecies (T2S2) (last reviewed 2003). Kucera (1998) reports that *M. a. humboldtensis* "appears to meet CESA (California Endangered Species Act) criteria for listing as Endangered in its historic range of Del Norte, Humboldt, Mendocino, and Sonoma counties" due to historic trapping, habitat loss caused by logging, and severe population reduction (p. 141). Slauson et al. (2009b) report that they have serious concerns about the viability of coastal marten populations due to small population size, population isolation, and ongoing threats from logging.

## The Humboldt Marten Warrants Listing under the Endangered Species Act

Under the ESA, 16 U.S.C. § 1533(a)(1), FWS is required to list the Humboldt marten if it is in danger of extinction or threatened by possible extinction in all or a significant portion of its range. In making such a determination, FWS must analyze the marten's status in light of five statutory listing factors:

> (A) the present or threatened destruction, modification, or curtailment of habitat or range;
> (B) overutilization for commercial, recreational, scientific, or educational purposes;
> (C) disease or predation;
> (D) the inadequacy of existing regulatory mechanisms;
> (E) other natural or manmade factors affecting its continued existence.
> 16 U.S.C. § 1533(a)(1)(A)-(E); 50 C.F.R. § 424.11(c)(1) - (5).

All five of these factors threaten *Martes americana humboldtensis.* The Humboldt marten is threatened by habitat destruction and modification, overutilization, predation, the inadequacy of existing regulatory mechanisms, and several other natural and anthropogenic factors including small population size, restricted breeding range, and global climate change. Threats to the Humboldt marten in light of each of these factors are discussed in detail below. Due to its small population size, restricted range, and imminent threats, the Humboldt marten clearly warrants protection under the Endangered Species Act.

## THREATS

### *A. Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range*

## LOGGING

The primary cause of marten population decline and extirpation is loss of old-growth coniferous forests (Yeager 1950, Archibald and Jessup 1984, Thompson and Harestad 1994, Bull et al. 2005). Logging, by its very nature, necessarily threatens martens and their habitat because martens select the largest and oldest trees available at the microhabitat, stand, home range, and landscape scale (Wilbert 1992, Buskirk and Ruggiero 1994, Gilbert et al. 1997, Raphael and Jones 1997, Ruggiero et al. 1998, Bull et al. 2005, Slauson et al. 2007, 2009).

At the microhabitat scale, the woody structures selected by Humboldt martens as resting sites are, on average, 339 years of age. The live trees chosen as resting locations average 94 cm diameter at breast height (dbh); snags average 95 cm and logs average 88 cm (Slauson and Zielinski 2009). Leaving old-growth structural elements logging operations is not enough to provide habitat for the Humboldt marten, as martens avoid clear-cuts, fragmented areas, and younger forests, and will not cross large areas with low canopy

closure (Hargis and McCullough 1984, Bissonette and Sherburne 1993, Buskirk and Ruggiero 1994, Thompson and Harestad 1994, Drew 1995, Hargis et al. 1999, Slauson et al. 2007).

At the stand scale, Bull et al. (2005) found that stands with no harvesting activity were used more frequently by martens, and that stands with any harvesting activity were used less than expected based on availability ($P < 0.01$). Slauson et al. (2007) found that at the stand scale, Humboldt martens select old-growth developmental stages highly disproportionate to availability, use late-mature stands similar to availability, and make little or no use of all other developmental stages.

At the home-range scale, Humboldt martens select the largest available patches of old-growth, old-growth and late-mature, or serpentine habitat (Slauson et al. 2007). Bull et al. (2005) found that at the home range scale, martens in northeastern Oregon selected for areas with denser canopy, more canopy layers, larger diameter live and dead trees, larger logs, and closer proximity to water compared to available habitat, concluding, "Unoccupied habitat either lacked these features or contained them in lower densities and may explain the lack of martens in these areas" (p. 42). Slauson (2003) found that at the home range scale, the probability that a marten would be detected increased as the size of the largest contiguous patch of old growth or old growth plus late-mature forest increased, and that martens were more likely to be detected as the total amount of old growth and late-mature forest increased. Slauson et al. (2007) found that a 10 percent increase in the amount of area logged was associated with a 23 percent decrease in the odds of marten occurrence at the home-range scale. Sixty percent of the sample units where they detected martens had less than or equal to 13 percent of the 1-km radius logged, and no martens were detected in sample units where greater than 50 percent of the total area within a 1-km radius had been logged (Slauson et al. 2007).

At the landscape scale, the Humboldt marten does not use extensively logged forests and is found only in conifer-dominated, late-mature and old-growth forests with dense shrub cover or in near-coast serpentine communities with dense shrub cover (Slauson et al. 2003), though serpentine areas do not provide optimal habitat for the marten (Slauson et al. 2009). Martens respond negatively to even low levels of habitat fragmentation. Hargis et al. (1999) found that marten presence decreases as the level of habitat fragmentation increases. Importantly, they found that martens were absent from landscapes with greater than 25 percent non-forest cover, even though forest connectivity was still present. Numerous studies demonstrate that martens avoid landscapes where more than 25-30 percent of mature forest has been lost (Bissonette et al. 1997, Hargis et al. 1999, Potvin et al. 1999, Slauson 2003).

Fragmented forests and small patches of old growth are not adequate to ensure the long-term viability of marten populations. Slauson et al. (2009) found that Humboldt martens may occasionally occupy patches of old growth forest that are less than 50 ha, but that these patches do not provide the same value to martens as larger patches, stating:

> "The biggest difference between sites with stable marten occupancy versus unstable occupancy, in our study, was the size of the patch of Old Growth forest that encompassed them, with larger patches having more stable marten occupancy" (p. 12).

Logging threatens the Humboldt marten because this subspecies needs large areas of unfragmented old-growth forest to survive. Slauson et al. (2009) documented a sharp decline in Humboldt marten sample unit occupancy in sample units where the old-growth vegetation type is highly fragmented and in serpentine areas, and found that sample units with more old growth in their vicinity were more likely to have stable marten occupancy between 2000-01 and 2008 (Slauson et al. 2009). Old growth patches encompassing sample units where marten occupancy remained constant between 2000-01 and 2008 were approximately 40 percent larger on average than patches that became unoccupied in 2008 (Slauson et al. 2009). The authors calculated the probability of extinction for the marten based on old-growth patch size and found that martens were less likely to go extinct in sample units with more old growth. For example, a 30 hectare increase in the amount of old-growth resulted in a 37 percent decrease in the probability of extinction.

There is no question that logging threatens the Humboldt marten both by reducing available habitat at all scales and by preventing dispersal and isolating populations. In a 2001 review of the status of martens in Pacific coastal forests, Zielinski et al. (2001) conclude:

> "We believe that the effect of timber harvest in the redwood region is the most plausible reason for the continued absence of martens from most of the coastal range . . . it is likely that the intensity of timber harvest, especially on private land, has reduced the habitat value over much of the region and may affect immigration of martens to California from populations on public forest land in southwestern Oregon" (p. 487).

Due to extensive loss of old-growth habitat and ongoing logging in the range of the Humboldt marten, there is "considerable concern" regarding the long-term persistence of the subspecies (Slauson et al. 2007, p. 458). Within the range of the Humboldt marten, many forests are intensively managed for timber production, and much of the landscape already exceeds the 25-30 percent threshold of mature forest loss associated with marten avoidance (Slauson 2003). More than 90 percent of coastal forests in northern California (Thornburg et al. 2000) and more than 70 percent of coastal forests in Oregon (USDA 1992) have been logged. Approximately 95 percent of old-growth and mature redwood forests have been logged (Thornburg et al. 2000). The majority of adjacent near-coast coniferous forest types, including Douglas fir forests, have also been lost (Bolsinger and Waddell 1993). In the range of the Humboldt marten in California, only 27 percent of forests (EPIC 2010), are now classified as size class 5D, defined as dense forests with canopy closure greater than or equal to 60 percent and medium to large trees with dbh greater than or equal to 24 inches based on the California Department of Fish and Game's Wildlife Habitat Relationships System (U.S. Forest Service 2005).

The majority of coastal forests on private lands have been logged at least once. Private forests are logged primarily by clear-cutting, and are currently managed under short-rotation even-aged silvicultural regimes (60-70 years) which create structurally simplified, early to mid-seral landscapes that do not support martens (USDA 1992, Bolsinger and Waddell 1993, Lettman and Campbell 1997, Thornburg et al. 2000). In the California study area of the Humboldt marten (Slauson et al. 2007), 27 percent of the land is owned by Green Diamond Resources, a private timber company, and is managed for the production of wood on a short-rotation, even-aged silvicultural regime that does not provide and will not restore the habitats used by martens. Of the private land, 83 percent has been logged, primarily by clear-cutting (Slauson et al. 2007). Since 1997, Green Diamond has clearcut 1.3 percent of forests within the California range of the Humboldt marten, including 1,810 acres of stands classified as size class 5D (EPIC 2010). An estimated fourteen percent of remaining 5D stands in the marten's range is at-risk of being clearcut by the company (EPIC 2010).

Most remaining coastal late-successional forest occurs on public lands in a highly fragmented mosaic which is not optimal for marten persistence (USDA 1992, Slauson et al. 2007). In the 2003 Humboldt marten study area in California, twenty percent of the land is managed by the Six Rivers National Forest under the Northwest Forest Plan (USDA/USDI 1994) as 'matrix' land that is available for logging; some16 percent of that 20 percent has already been logged (Slauson et al. 2007). Forty percent of the national forest land within the study area is managed as late-successional reserve (LSR), 13 percent of which has been logged. Late-successional reserves are not necessarily in mature forest condition, but are supposed to be managed to develop late-seral conditions over time. The majority of logging on public lands has been clear-cutting (Slauson et al. 2007). While the majority of future logging on public lands in the area is expected to be selection-based, current plans including the Northwest Forest Plan and Six Rivers Forest Plan allow clear-cutting prescriptions. Forest Service projects continue to include, and the timber industry continues to press for, clear-cutting units (called 'green tree retention' in Forest Service planning documents).

Slauson (2003) reports that 38 percent of Humboldt marten detections in 2000-2001 were on matrix lands and private industrial timber lands currently available for logging and that lack strategies to maintain suitable marten habitat. Since 1997, Timber Harvest Plans have been submitted for nearly 4 percent of the total California range of the Humboldt marten, meaning that logging either has occurred or will soon occur (EPIC 2010).

Further loss of old-growth habitat could push the Humboldt marten to extinction. Slauson (2003) states, "Both martens and their habitat are patchily distributed in the area, and further loss or degradation of limited suitable habitat could decrease the chances for the persistence of this remnant population" (p. 70). The marten and its habitat are clearly threatened by logging and thus warrant Endangered Species Act protection.

## FIRE AND FIRE SUPPRESSION

Over the long-term, wildfire plays a role in developing the habitat components on which martens depend, such as snags, but because the marten's habitat has been so severely reduced due to logging, fires are now a threat to the subspecies. Due to its critically low population size and restricted range, fire threatens the marten with both direct mortality and with short-term loss and fragmentation of suitable habitat (Slauson and Zielinski 2004). Slauson (2003) identifies the risk of being extirpated by a stochastic event, such as an intense wildfire, as a "major challenge" to the persistence and restoration of the Humboldt marten (p. 71). Commercial timber harvest and fire suppression have exacerbated the threat posed to the marten by fire by creating landscapes that are both more prone to and more vulnerable to high severity fire events (Frost and Sweeney 2000, Stuart and Stephens 2006).

Recent fires are known to have affected marten habitat. Concerning the 2002 Biscuit Fire which burned portions of the Siskiyou National Forest and the Six Rivers National Forest, Slauson and Zielinski (2004) state:

> "The situation for the population of martens on the Siskiyou National Forest may have been exacerbated by the recent Biscuit Fire in 2002. Wildfire is a natural and essential component of these coastal forests and plays a role in developing important habitat elements for martens (e.g., snags). However, given that late-seral conifer habitat is already reduced in coastal Oregon, the fire may have caused a short-term loss and fragmentation of suitable habitat. In the coastal forests of California and Oregon martens use stands with dense, spatially extensive shrub cover (Slauson 2003; Slauson and Zielinski 2003). The shrub layers are dominated by Ericaceous species (e.g., *Rhododendron macrophylum*, *Gaultheria shallon*) which have waxy leaves and are highly flammable (Agee 1993). Significant loss of the shrub layer may reduce habitat suitability, due to reduction in prey abundance or improved access to these areas by competitors that may otherwise be limited by dense shrubs (Slauson 2003; Slauson and Zielinski 2003)" (p. 63).

During 2008, more than 21,400 acres burned in the California range of the Humboldt marten (EPIC 2010). Subsequent site visits to some of the burned areas have revealed that the dense understory has been removed, likely reducing the suitability of these sites over the short term (Slauson et al. 2009). The burned area included 20 percent of the observed occupied range in 2008 (Slauson et al. 2009).

## RECREATION

Recreational activities, including use of off-highway vehicles, snowmobiles, dirt bikes, hiking, and camping, could degrade marten habitat, interfere with normal marten behavior, and/or cause martens to shift to less than optimal habitat areas where they are move vulnerable to predation or starvation. The threat posed to the Humboldt marten by recreation is unknown, but potentially serious because martens are associated with remote

conditions and have not evolved with human disturbance (Zielinski et al. 2007). Due to the remoteness of Humboldt marten habitat and dense shrub cover preferred by the species, the threat posed by recreation is likely low.

***B. Overutilization for Commercial, Scientific, Educational, or Recreational Purposes***

Historical trapping was a primary contributor to the decline of martens in California, including in Humboldt and Del Norte counties. The beautiful pelts of martens were highly valued, and trapping records show that in the course of a single winter, individual trappers routinely caught up to 50 martens (Slauson et al. 2001). By the early 1940's fewer martens were caught, likely due to drastic population decline, and by the late 1940's, there was concern about the marten's population status (Twining and Hensley 1947 cited in Kucera 1998). Trapping of martens was prohibited in California in 1953 (Calif. Dept. Fish and Game unpubl. data cited in Kucera 1998). The current genetic ramifications of historical over-trapping are unknown, but potentially serious due to population isolation resulting from logging.

In California, martens are still vulnerable to poaching and incidental capture in live-traps set for other furbearers (eg. Lewis and Zielinski 1996). Martens can potentially injure their teeth and/or feet while trying to escape from live traps, which could lead to infection, reduced hunting ability, and reduced ability to escape from predators once released from the live traps.

Trapping remains a threat to Humboldt martens in their Oregon range. Martens can be legally trapped in the entire state of Oregon from November 1-January 31. The Department of Fish and Wildlife only requests that furtakers provide the date, location of harvest, and sex of all marten they take, and that all marten carcasses be turned in to the local ODFW office prior to March 1, following each season (Oregon Dept. of Fish and Wildlife 2008).

The threat posed to the Humboldt marten by accidental capture and poaching in California and by legal trapping in Oregon is magnified by other threats such as small population size, population isolation, and habitat fragmentation resulting from logging and fire.

***C. Predation and Disease***

Predation is a significant threat to the Humboldt marten. The lone known surviving population of Humboldt marten in California is very small and highly vulnerable to mortality events and further population decline. Though unstudied, the situation is likely similar for remaining coastal populations of marten in Oregon. Predation is a primary source of marten mortality. Bull and Heater (2001) report that of 22 documented marten deaths in their study in northeastern Oregon, 18 of the martens were killed by predators (82 percent). Martens face many predators including bobcats, foxes, coyotes, mountain lions, great horned owls, goshawks, Pacific fishers, and other martens (Buskirk and Ruggiero 1994, Bull and Heater 2001, Slauson et al. 2009). In Bull and Heater's study

(2001), of the 18 predator-caused mortalities, 8 martens were killed by bobcats (44 percent), 4 by raptors (22 percent), 4 by other martens (22 percent), and 2 martens were killed by coyotes (11 percent).

Habitat degradation and fragmentation caused by logging increases the threat of predation for martens by favoring generalist predators which fare better in logged landscapes (Slauson et al. 2009). Higher predation rates attributable to habitat fragmentation and degradation may suppress marten populations. Slauson et al. (2009) found a higher decline in Humboldt marten sample unit occupancy from 2001-2008 in serpentine habitats and in sample units where old-growth is more fragmented and the risk of predation is increased. They state:

> "Martens have been shown to be very sensitive to relatively low levels of forest fragmentation, with several studies demonstrating that martens do not persist in landscapes where >30% of mature forest cover is lost (Chapin et al. 1998, Hargis et al. 1999, Potvin et al. 1999). The biggest difference between sites with stable marten occupancy versus unstable occupancy, in our study, was the size of the patch of Old Growth forest that encompassed them, with larger patches having more stable marten occupancy. Patch sizes of Old Growth in the study area have been reduced and fragmented through logging, all prior to 2000. Remaining smaller patches are typically adjacent to roads and young regenerating clearcuts. Early seral forest habitats are lower quality for martens and likely pose higher predation risks due to the presence of largerbodied generalist mesocarnivores (e.g., bobcats [*Felis rufus*]) that typically exploit these early-seral habitats. Furthermore, small, fragmented coastal Old Growth patches can also be used by larger-bodied mesocarnivores that don't typically occur in larger patches. Indeed one the most fragmented sites occupied by a breeding female marten in 2000 was occupied by a male fisher in 2008. Thus, these smaller Old Growth patches (e.g., <50 ha) may be occasionally occupied, but they may not provide the same value to martens as the larger patches" (p. 12).

Slauson et al. (2009) also found that sample unit occupancy declined more dramatically in units occupied by only female martens than in units with dual-gender or male-only occupancy. Because body size of female martens is generally 40 percent smaller than males, females are likely more vulnerable to predation from larger-bodied mesocarnivores associated with early seral and fragmented landscapes (Ibid.). Due to the extensive loss and fragmentation of old-growth forest habitats in coastal forests in California and Oregon and the resulting habitat conditions which favor marten predators, the Humboldt marten faces heightened predation threat.

The threat posed to the Humboldt marten by disease has not been studied, but given its small population size, is potentially critical. Martens are susceptible to several mesocarnivore diseases and parasites including but not limited to rabies, plague, distemper, toxoplasmosis, leptospirosis, trichinosis, sarcoptic mange, canine adenovirus, parvovirus, and herpes virus, West Nile virus, and Aleutian disease (Strickland et al. 1982, Banci 1989, Green et al. 2008, IERC 2008). Though little information on the threat

posed to the Humboldt marten by disease is available, many of the diseases to which it is susceptible are known to cause mortality in carnivores (eg. Brown et al. 2008). Secondary infections resulting from intra-species fighting or encounters with other larger predators may also cause mortality.

### *D. Other Natural or Anthropogenic Factors Affecting the Continued Existence of the Humboldt Marten*

Several other factors threaten the continued survival of the Humboldt marten including small population size, population isolation, mortality from several factors, and global climate change.

#### Vulnerability of Small, Isolated Populations

Existence in small, isolated populations is a major challenge to the persistence of the Humboldt marten in California and in coastal Oregon. The effects of widespread logging and drastic reduction of suitable habitat have isolated coastal marten populations, and remnant populations are small due to historical trapping effects and limited habitat availability. Small populations are at heightened risk for loss of genetic variation and are more vulnerable to extirpation from stochastic demographic or environmental events (Nei et al. 1975, Fager 1991, Slauson 2003).

Genetic analyses by Slauson et al. (2009b) indicate that historically, coastal marten populations in California and Oregon were connected, and that the coastal Oregon populations of marten are more closely related to the Humboldt marten than to the inland subspecies (*M. a. sierrae*). The Oregon coastal marten populations are separated from each other by more than 125 km, which is 3 times the maximum reported dispersal distance and 4 to 10 times the median reported dispersal distance for juvenile martens (Slauson and Zielinski 2004). The southern Oregon population and northern California population are separated by more than 50 km, which is 1.2 times the maximum dispersal distance and1.5 to 4 times the median dispersal distance known for juvenile martens (Ibid.).

Remaining coastal marten populations are not only isolated, but also perilously small. The lone extant population of Humboldt marten in California likely consists of fewer than 50-100 individuals, and appears to have declined by more than 40 percent from 2000-2008 (Slauson et al. 2009a). The probability of extinction for this population is estimated to be higher than its probability of colonization (Ibid.). Detailed data on the population size of martens in the Oregon Coast Range are not available, but the data which are available indicate that the populations are very small. Marten trapping is still legal in Oregon, and during the 1980s, there was a large increase in the price paid per marten pelt with no corresponding increase in the number harvested for any of the coastal counties (Verts and Carraway 1998), which strongly suggests small population size (Zielinski et al. 2001).

Small population size and population isolation led Slauson and Zielinski (2004) to express concern about the long-term persistence of the Humboldt marten. They conclude:

> "We have serious concerns about the viability of these coastal populations of martens. They are small, patchily distributed populations, due to both natural distribution of suitable habitat and to the effects of logging, and they are separated by substantial distances" (p. 63).

**Mortality Factors**

The Humboldt marten is threatened by several sources of mortality including vehicle strikes, poisoning, and starvation. In the central Oregon Coast Range, from 1980-1998 there were 9 reported marten road kills on Highway 101 in the Siuslaw National Forest and Oregon Dune National Recreation Area, and one reported road kill from a National Forest road in the area. There have been no reported road kills in coastal California (Zielinski et al. 2001), though vehicular collision is a recognized source of mortality for the closely related fisher (Truex et al. 1998, Sweitzer and Barrett 2009). Martens are also vulnerable to mortality from starvation and from poisoning, though the extent of the threat of these factors to the Humboldt marten has not been quantified.

**Global Climate Change**

The Humboldt marten is threatened by global climate change. Currently the climate in Humboldt marten habitat is characterized by moderate temperatures, high annual precipitation, and summer fog which support dense and continuous tree and shrub cover (Slauson et al. 2007). A change in any of these parameters resulting from climate change would threaten the survival of the Humboldt marten. Global climate change is expected to have significant effects on species and habitats due to altered precipitation patterns, vegetation changes, increased forest disease outbreaks, and other factors (Karl et al. 2009). Vegetation changes resulting from climate change could cause changes in the type and availability of prey for martens, and could affect the availability of resting and denning sites, shrub cover, and canopy cover. Climate change could also lead to widespread tree kills resulting from insect infestation, disease, and drought (Cayan et al. 2006, Lenihan et al. 2003). Stress resulting from climate change also exacerbates the threat posed to marten by other factors such habitat degradation and disease.

***E. The Inadequacy of Existing Regulatory Mechanisms to Protect the Humboldt Marten***

There are no existing regulatory mechanisms which adequately protect the Humboldt marten on federal, state, Tribal, or private lands. Though the marten is protected from fur trapping in California, it is not protected from trapping in Oregon, and there are no regulatory mechanisms which adequately protect its habitat in either state.

Humboldt martens are dependent on large areas of old-growth forest or serpentine areas with dense shrub cover, though serpentine areas provide less than optimal habitat

(Slauson et al. 2009a). The vast majority of coastal old-growth forests in California and Oregon have been logged, causing drastic loss and fragmentation of marten habitat (Slauson 2003). Logging negatively affects martens at the microhabitat, stand, homerange, and landscape scale (see Habitat section of this petition). Martens prefer high canopy closure and the largest available contiguous patches of old-growth and late-mature forest, and the probability of detecting a Humboldt marten decreases as the amount of area logged increases (Slauson 2003). The historical and contemporary effects of logging and fur trapping have isolated coastal marten populations, which are now severely threatened by small population size, population isolation, and ongoing habitat loss and fragmentation. Recent genetic research indicates that coastal marten populations in Oregon likely belong to the Humboldt subspecies, and that these populations should be managed collectively to establish and preserve historical connectivity (Slauson et al. 2009b). Currently the distance and intervening unsuitable habitat separating the three known coastal marten populations from each other (one in northern California and two in Oregon) exceeds reported marten dispersal distance, threatening their persistence (Slauson et al. 2007).

Existing regulatory mechanisms are not adequate to protect and restore the habitat the marten needs to survive. Much marten habitat is currently available for logging, and further loss or degradation of its limited suitable habitat could push the Humboldt marten to extinction. Most forest management currently occurs at the stand scale, but marten conservation will require landscape management to enlarge and reconnect suitable patches of habitat (Slauson et al. 2007). Conservation measures that aim only to maintain current marten habitat conditions will not ensure the Humboldt marten's long-term persistence (Slauson 2003).

**Federal Lands**

The Humboldt marten occurs on federal lands managed by the U.S. Forest Service and the National Park Service. The Forest Service manages the majority of the marten's range (Slauson et al. 2007, EPIC 2010). The range of the Humboldt marten includes the Six Rivers National Forest and Klamath National Forest in California, the Siskiyou National Forest in southwestern Oregon, and the Siuslaw National Forest in the central Oregon Coast Range. In California (Region 5), the American marten is a Forest Service Sensitive Species, and was recognized as a priority species in Fiscal Year 2007. In Oregon (Region 6) the marten does not have Sensitive Species status (FS 2010). Sensitive Species status, even as a priority species, does not afford the marten or its habitat the protection it needs to survive. Sensitive Species are not afforded any regulatory habitat protection; rather the agency is only required to analyze the impacts of its actions on the marten under the National Environmental Policy Act (NEPA). This requirement in no way mandates the agency to select an environmentally benign alternative or to try to mitigate the adverse impacts of projects. Moreover, any protections afforded the marten under the Sensitive Species program are discretionary. Discretionary mechanisms are not adequate to protect the marten on National Forest lands because National Forests are managed to meet multiple objects including providing access to recreation opportunities for the public and

serving as an economic development resource for the regions where they occur (eg. Six Rivers National Forest 2010).

Much of the marten's range on National Forests is managed under the Northwest Forest Plan (USDA/USDI 1994a, 1994b). The NWFP created seven types of land allocations including Congressionally Reserved Areas, Late-Successional Reserves, Managed Late-Successional Areas, Adaptive Management Areas, Administrative Withdrawn Areas, Riparian Reserves, and Matrix lands, each with different management guidelines. Though matrix lands harbor some of the remaining old-growth forest in the range of the marten, these lands were intended to provide for commercial timber harvest rather than to provide wildlife values. Slauson (2003) detected martens on 8 of 31 sample units in matrix lands, where the threat of timber harvest poses a dire threat to its persistence. Of the land managed by the Forest Service in the range of the Humboldt marten surveyed by Slauson et al. (2007), 20 percent was designated as matrix land that is currently available for logging. Sixteen percent of the matrix land has already been logged (Slauson et al. 2007).

Under the NWFP, reserves were intended to support viable populations of late-successional and old-growth associated species, but some rare species, including the marten, are not effectively protected by the reserve system. Of the FS land in the range of the Humboldt marten surveyed by Slauson et al. (2007), 40 percent was designated as late-successional reserve. Late-successional reserves are not necessarily in late-seral condition, but are being managed to develop mature forest conditions over time. These reserves do not necessarily provide habitat benefit to the marten currently because the conditions which marten prefer may take centuries to develop. Slauson (2003) detected martens at 13 of 66 sample units in late-successional reserves. Thirteen percent of the late-successional reserves in the marten's range have been logged (Slauson et al. 2007).

Though the status of the marten was considered during the planning process for the NWFP, the process "did not include significant review of existing data or collection of new data" concerning the marten (Zielinski et al. 2001). The marten was given the second poorest score among mammals by the Forest Ecosystem Management Scientific Analysis Team for likelihood of remaining well distributed, with only a 67 percent likelihood of remaining well distributed within the range of the northern spotted owl (USDA/USDI 1994). Even this bleak projection, however, was overly optimistic, and Slauson et al. (2009a) conclude that the Northwest Forest Plan has not proven adequate to protect the Humboldt marten:

> "In reality, the situation is far worse, martens on federal lands in the Coast Range of California are restricted to a single refugia and have been extirpated from a significant portion (>95%) of their historical range. Within their last stronghold, measures including the protection of Riparian Reserves, Late-Successional Reserves, northern spotted owl and marbled murrelet conservation measures, do not completely protect the population" (p. 3).

Slauson et al. (2009a) report that at least 38 percent of the distribution of martens in coastal California occurs outside of NWFP reserves, and the reserves themselves may not contain suitable old-growth habitat, as discussed above.

The Forest Service also manages the Siskiyou Wilderness which is administered by the Six Rivers, Klamath and Siskiyou National Forests. The proportion of the marten's range which is designated as wilderness is not sufficient in and of itself to provide enough habitat to ensure long-term marten persistence for several reasons. First, designated wilderness makes up only a small portion of the marten's range. EPIC (2010) estimates that 14 percent of the California range of the Humboldt marten consists of designated wilderness. Of the FS land in the range of the Humboldt marten surveyed by Slauson et al. (2007), 18 percent was designated as wilderness. Second, not all vegetation types in the Siskiyou Wilderness support martens. Slauson (2003) detected martens at only 3 of 23 sample units in wilderness. Much of the Siskiyou Wilderness is composed of higher elevation vegetation such as white-fir and hardwood-dominated stands which are not preferred by the Humboldt marten (Slauson 2003). Even in designated wilderness, the marten is vulnerable to mortality from fire due to its low population size and restricted range. Habitat for the Humboldt marten burned in the severe Biscuit fire in the Siskiyou National Forest in 2002. In 2008, five sample units in the Humboldt marten's habitat were inaccessible due to the Blue II wildfire, which burned in a number of areas where martens had been detected immediately prior to the fire (Slauson et al. 2009). The Blue II fire burned 20 percent of the 2008 observed occupied California range of the marten, removing the dense shrub understory, reducing the short-term habitat suitability of the area, and likely contributing to the decline in marten occupancy observed from 2000-2008 (Ibid.). During 2008, more than 21,400 acres of Humboldt marten habitat burned in California (EPIC 2010).

The Forest Service also manages the Smith River National Recreation Area, which is part of the Six Rivers National Forest. Occurrence in the NRA is not adequate to protect the Humboldt marten because management of National Recreation Areas prioritizes recreational opportunities over wildlife values. Though the habitat of the marten in the NRA is not vulnerable to timber harvest, it remains vulnerable to other threats including recreational impacts and fire. EPIC (2010) estimates that the Smith River NRA makes up 9 percent of the California range of the Humboldt marten.

The Humboldt marten also occurs on federal lands managed by the National Park Service. The Redwood National Parks complex consists of a series of parks managed by the National Parks Service and California State Parks including Prairie Creek, Jedediah Smith, and Del Norte Coast Redwoods State Parks. Martens were not known to be extant in the parks until 2009 when a marten was detected in Prairie Creek Redwoods State Park via a remote sensing camera (Slauson and Holden 2009). Habitat in the parks is not sufficient to ensure the survival of the Humboldt marten because the parks make up only a small portion of the marten's range, the parks do not currently support a significant marten population (Slauson et al. 2003), and because habitat conditions in the parks are not currently optimal for marten. Broad restoration efforts within second growth areas of the parks would be required to return key structural elements and dense shrub cover

preferred by martens, including in the recently acquired Mill Creek acquisition of Del Norte Coast Park where habitat conditions are not currently suitable for marten (Slauson et al. 2003). The parks also may not be sufficiently connected to currently occupied habitat to provide for marten dispersal (Slauson et al. 2003). Even though habitat in the parks is not vulnerable to logging, park management prioritizes recreational values over wildlife values, and marten may be vulnerable to recreational disturbance. EPIC (2010) estimates that 10 percent of the California range of the Humboldt marten is on land managed by Redwood National and State Parks.

In sum, there are no existing regulatory mechanisms at the federal level which are adequate to provide for the long-term survival of the Humboldt marten.

**State Lands**

The California Department of Fish and Game classifies the Humboldt marten as a 'Species of Special Concern' (Kucera 1998). The marten is protected from fur trapping in the state of California, though injuries to the marten may result if it is incidentally caught in live traps set for other species. In Oregon, coastal populations of marten can be legally trapped for their fur, and the marten has no special protective status in the state (ODFW 2008).

California Forest Practice Rules lack specific protections for the marten, and current state logging practices reduce habitat suitability for the marten, but none of the known range of the Humboldt marten occurs on state-owned land, with the exception of Redwood National and State Park land jointly managed with the National Park Service.

**Private Lands**

There are no existing regulatory mechanisms that protect the Humboldt marten's habitat on private lands. EPIC (2010) estimates that approximately one-third of the California range of the marten is owned by Green Diamond Resources and is managed as industrial timberland. Of the private land in the Slauson et al. (2007) Humboldt marten study area, 83 percent has been logged, primarily by clear-cutting. Since 1997 Green Diamond Resources has clear-cut 1.3 percent of forests within the California range of the Humboldt marten, including 1,810 acres of forest classified as size class 5D, the forest type with the largest trees and highest canopy closure under the California Department of Fish and Game's Wildlife Habitat Relationship system. (EPIC 2010). Fourteen percent of remaining forest classified as 5D in the marten's range is at-risk of being clear-cut by the company (EPIC 2010).

Martens are "faring worse" on private lands than on public lands (Zielinski et al. 2001, p. 488). Slauson et al. (2007) detected martens at only 2 of 36 (5.5%) sample units on private timberlands, whereas martens were detected at 24 of 123 (19.5%) sample units on lands administered by the Forest Service where less than 15 percent of the area has been logged. Both of the sample units where martens were detected on private timberlands were within 200 m of Forest Service lands and adjacent to or within unlogged serpentine

stands (Slauson 2003). Regulatory mechanisms on private lands are not adequate to prevent further loss of marten habitat. Public lands alone are not sufficient to ensure the persistence of the marten because public lands containing coastal late-successional forest are disjunct, make up only a small proportion of the total coastal forest area in California and Oregon, and many public lands are themselves managed for timber production (USDA 1992, Noss et al. 2000, Slauson et al. 2007).

Part of the Humboldt marten's range overlaps with the range of another imperiled old-growth associated mammal, the Pacific fisher (*Martes pennanti*). The fisher is a federal candidate for Endangered Species Act protection, but candidates receive no regulatory protection, so the fisher's status does not benefit the marten. Most voluntary agreements to try and benefit fisher, such as the retention of old-growth structures during timber operations, are unlikely to benefit the marten because martens will not cross areas of low canopy cover and appear to be even more dependent on large patches of intact old-growth forest than are fisher, which are themselves habitat specialists. Discretionary management activities to benefit the fisher will not necessarily benefit the marten because fishers appear to avoid areas of dense shrub cover where martens typically occur and because fishers prey upon martens (Slauson et al. 2007).

The marten's habitat also overlaps with northern spotted owl (*Strix occidentalis caurina*) habitat on private lands. Green Diamond Resources is party to a Habitat Conservation Plan for the owl. This HCP, however, is of little benefit to the marten because it was established to allow take of the owl through logging of its habitat.

**Tribal Lands**

EPIC (2010) estimates that approximately 9 percent of the California range of the marten lies within the boundaries of the Yurok reservation, and less than one percent within the Hoopa reservation. While the Yurok Reservation lies almost entirely within the marten's range, most of the reservation is in non-Tribal ownership, including a significant portion owned by Green Diamond. There are no publicly available data on the status of the marten on Tribal lands.

In conclusion, there are no existing regulatory mechanisms which adequately protect the Humboldt marten's habitat on public or private lands. A large proportion of the marten's range is threatened by logging, and all of it is threatened by fire. Slauson (2003) reports that 38 percent of marten detections were on lands that are currently available for logging and that lack strategies to maintain suitable marten habitat. More than 95 percent of the historic range of the Humboldt marten has already been lost (Slauson et al. 2007), and without federal protection, even more of the marten's already severely-limited habitat is likely to be lost. Maintaining current conditions will not ensure the marten's long-term persistence (Slauson 2003). It is known that increasing the area of old-growth habitat available to the marten will increase its chances of survival. Slauson et al. (2009) calculated the probability of extinction for the marten based on old-growth patch size and found that martens were less likely to go extinct in sample units with more old growth. For example, a 30 hectare increase in the amount of old growth resulted in a 37 percent

decrease in the probability of extinction. Humboldt marten populations are perilously small, isolated from one another, highly vulnerable to extirpation, and in dire need of Endangered Species Act protection before more habitat is lost and they are pushed even closer to the brink of extinction.

**Conclusion**

The Humboldt marten is in imminent danger of extinction. Only 20 martens were detected in 2008 California surveys for this subspecies, and total population size, under the most optimistic scenario, is fewer than 100 surviving individuals (Slauson et al. 2009a). The marten has been extirpated from more than 95 percent of its historical range in California, and the lone surviving California population is perilously small and declined by more than 40 percent from 2002-2008 (Ibid.). Genetic research indicates that the two known surviving populations of marten on the coast of Oregon likely belong to the Humboldt species (Slauson et al. 2009b), and the status of these populations is also dire (Zielinski et al. 2001). In Oregon, the marten remains threatened by fur trapping. The marten's remaining habitat is threatened by logging, fire, and climate change, and there are no existing regulatory mechanisms which adequately protect the already severely-restricted habitat of this subspecies from further loss. Slauson et al. (2009a) estimate that the probability of extinction for the Humboldt marten is higher than the probability of colonization, and that conservation actions to benefit the remnant population are needed immediately. Conservation actions based solely on measures to maintain current habitat conditions for the Humboldt marten will not ensure its long-term persistence (Slauson 2003, p. 71). Given the marten's extremely small population size, declining population status, limited range, and the variety and magnitude of threats to its continued survival, it clearly warrants Endangered Species Act protection. The protection provided under the Endangered Species Act, along with critical habitat designation, is necessary to prevent the Humboldt marten's extinction.

**Request for Critical Habitat Designation**

The ESA mandates that when FWS lists a species as endangered or threatened the agency must also concurrently designate critical habitat for that species. Section 4(a)(3)(A)(i) of the ESA states that, "to the maximum extent prudent and determinable," the USFWS: shall, concurrently with making a determination . . . that a species is an endangered species or threatened species, designate any habitat of such species which is then considered to be critical habitat . . . . 16 U.S.C. § 1533(a)(3)(A)(i); *see also id.* at § 1533(b)(6)(C). The ESA defines the term "critical habitat" to mean:

i. the specific areas within the geographical area occupied by the species, at the time it is listed . . . , on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and ii. specific areas outside the geographical area occupied by the species at the time it is listed . . . , upon a determination by the Secretary that such areas are essential for the conservation of the species.*Id.* at § 1532(5)(A).

The petitioners expect that FWS will comply with this unambiguous mandate and designate critical habitat concurrently with the listing of the Humboldt marten. Sufficient critical habitat should be designated to support dispersal between the coastal California and coastal Oregon populations of marten which were historically connected.

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