State of California
Department of Fish and Wildlife

Memorandum

Date: ~~October 23,~~ November 11 2015

To: Sonke Mastrup
Executive Director
Fish and Game Commission

From: Charlton H. Bonham
Director

Subject: **Petition from the Environmental Protection Information Center and the Center for Biological Diversity to list the Humboldt marten as Endangered under the California Endangered Species Act**

The Department of Fish and Wildlife (Department) prepared the attached petition evaluation report in response to a petition, dated June 1, 2015, received by the Fish and Game Commission (Commission) on June 8, 2015 (Petition) from the Environmental Protection Information Center and the Center for Biological Diversity to list the Humboldt marten (*Martes caurina humboldtensis*) as an endangered species under the California Endangered Species Act (CESA). (See generally Fish and Game code §2073.5, subd. (a); Cal Code Regs., title 14, §670.1, subd. (d)(1).)

In accordance with CESA, the attached petition evaluation report delineates the categories of information required in a petition, evaluates the sufficiency of the information in the Petition, and incorporates additional relevant information that the Department possessed or received during the review period. Based upon the information contained in the Petition, the Department has determined that there is sufficient information to indicate that the petitioned action may be warranted. The Department recommends that the Petition be accepted.

If you have any questions or need additional information, please contact Dan Yparraguirre, Deputy Director, Wildlife and Fisheries Division at (916) 653-4673 or Eric Loft, Chief, Wildlife Branch at (916) 445-3555.

Attachment

State of California
Natural Resources Agency
Department of Fish and Wildlife

REPORT TO THE FISH AND GAME COMMISSION

EVALUATION OF THE PETITION FROM THE ENVIRONMENTAL PROTECTION INFORMATION CENTER AND THE CENTER FOR BIOLOGICAL DIVERSITY TO LIST THE HUMBOLDT MARTEN (*MARTES CAURINA HUMBOLDTENSIS*) AS ENDANGERED UNDER THE CALIFORNIA ENDANGERED SPECIES ACT

Keith Slauson photo used with permission

Prepared by
California Department of Fish and Wildlife

October 13, 2015

I. Executive Summary

The Environmental Protection Information Center (EPIC) and the Center for Biological Diversity (CBD, collectively Petitioners) submitted a petition (Petition) to the Fish and Game Commission (Commission) to list the Humboldt marten (*Martes caurina humboldtensis*) as endangered pursuant to the California Endangered Species Act (CESA)(Fish & G. Code, § 2050, et seq.).

Pursuant to Fish and Game Code Section 2073.5 and Section 670.1 of Title 14 of the California Code of Regulations, the Department of Fish and Wildlife (Department) has prepared this evaluation report for the Humboldt marten petition (Petition Evaluation). The Petition Evaluation is an evaluation of the scientific information discussed and cited in the Petition in relation to other relevant and available scientific information possessed by the Department during the evaluation period. The Department's recommendation as to whether to make Humboldt marten a candidate for listing under CESA is based on an assessment of whether the scientific information in the Petition is sufficient under the criteria prescribed by CESA to determine that listing of the Humboldt marten may be warranted.

In completing its Petition Evaluation, the Department has determined there is sufficient scientific information to indicate that the petitioned action may be warranted. Therefore, the Department recommends the Commission accept the Petition for further consideration under CESA.

After reviewing the Petition and other relevant information, the Department makes the following findings:

I. Population Trend. The population of Humboldt martens in California has declined from an unknown "fairly numerous" number in the early 20th century to a present population which likely numbers less than 100 individuals.

II. Range. The Petition and other available information indicate the Humboldt marten's range in California is substantially reduced from its historical extent.

III. Distribution. Humboldt martens are unevenly distributed within the bounds of their California range. Whether changes in distribution have occurred over time is unknown.

IV. Abundance. Information in the Petition and other information available to the Department indicate that historically martens were far more abundant than they are today.

V. Life History. The Petition contains sufficient information on the relevant life history traits of Humboldt marten.

VI. Kind of Habitat Necessary for Survival. The Petition and other information available to the Department indicate that Humboldt martens are dependent on specialized habitats for their survival and reproduction, and those habitats are limited on the landscape.

VII. Factors Affecting the Ability to Survive and Reproduce. The Petition contains sufficient information to conclude that Humboldt martens are subject to a variety of threats that have the potential to adversely affect their ability to survive and reproduce.

VIII. Degree and Immediacy of Threat. The Petition contains sufficient information to conclude the degree and immediacy of some threats have the potential to adversely affect Humboldt martens at the population level.

IX. Impacts of Existing Management. The Petition contains sufficient information to conclude that existing management efforts alone are unlikely to maintain a self-sustaining population of Humboldt martens in California.

X. Suggestions for Future Management. The Petition contains sufficient information to conclude that additional management efforts may be necessary to maintain a self-sustaining population of Humboldt martens in California.

II. Introduction

A. Candidacy Evaluation

CESA sets forth a two-step process for listing a species as endangered. First, the Commission determines whether a species is a candidate for listing by determining whether "the petition provides sufficient information to indicate that the petitioned action may be warranted." (Fish & G. Code, § 2074.2, subd. (a)(2).) Within 10 days of receipt of a petition, the Commission must refer the petition to the Department for evaluation (Fish & G. Code, § 2073.) The Commission must also publish notice of receipt of the petition in the California Regulatory Notice Register. (Fish & G. Code, § 2073.3, subd. (a).) Within 90 days of receipt of the petition, the Department must evaluate the petition on its face and in relation to other relevant scientific information and submit to the Commission a written evaluation report with one of the following recommendations (Fish & G. Code, § 2073.5, subd. (a)(1)-(2)):

- Based upon the information contained in the petition, there is not sufficient information to indicate that the petitioned action may be warranted, and the petition should be rejected; or
- Based upon the information contained in the petition, there is sufficient information to indicate that the petitioned action may be warranted, and the petition should be accepted and considered.

If the petition is accepted for consideration, the second step requires the Commission to determine, after a year-long review of the subject species based on the best scientific information available to the Department, whether listing as endangered is or is not actually warranted. (Fish & G. Code, § 2074.6, subd. (a) and 2075.5.)

In *Center for Biological Diversity v. California Fish and Game Commission* (2008) 166 Cal.App.4th 597, the California Court of Appeals addressed the parameters of the Commission's discretion in its application of the threshold candidacy test. The court began its discussion by describing the candidacy test previously set forth in *Natural Resources Defense Council v. California Fish and Game Commission* (1994) 28 Cal.App.4th 1104, 1114:

> As we explained in *Natural Resources Defense Council* [citation], "the term 'sufficient information' in section 2074.2 means that amount of information, when considered

> with the Department's written report and the comments received, that would lead a reasonable person to conclude the petitioned action may be warranted." The phrase "may be warranted" "is appropriately characterized as a 'substantial possibility that listing could occur.'" "Substantial possibility," in turn, means something more than the one-sided "reasonable possibility" test for an environmental impact report but does not require that listing be more likely than not.

(*Center for Biological Diversity*, at pp. 609-610.) The court acknowledged that "the Commission is the finder of fact in the first instance in evaluating the information in the record." (*Id.* at p. 611.) However, the court clarified:

> [T]he standard, at this threshold in the listing process, requires only that a substantial possibility of listing could be found by an objective, reasonable person. The Commission is not free to choose between conflicting inferences on subordinate issues and thereafter rely upon those choices in assessing how a reasonable person would view the listing decision. Its decision turns not on rationally based doubt about listing, but on the absence of any substantial possibility that the species could be listed after the requisite review of the status of the species by the Department[.] (*Ibid*.)

B. <u>Petition History</u>

On June 8, 2015, the California Fish and Game Commission received Petitioners' Petition to list Humboldt marten as endangered under CESA. On June 18, 2015, the Commission referred the Petition to the Department for evaluation. The Department requested of the Commission, and was granted, a 30-day extension to the 90-day Petition evaluation period. This is the first time the Humboldt marten has been petition for listing under CESA.

The Humboldt marten was petitioned for listing under the federal Endangered Species Act (ESA) by the same Petitioners in 2010. In April 2015 the United States Fish and Wildlife Service (USFWS) found that listing the coastal distinct population segment (DPS) of the Pacific marten as threatened or endangered under the ESA was not warranted (80 FR 18742). Importantly, the USFWS evaluated coastal Oregon populations of Pacific marten (*Martes caurina caurina*) and the California Humboldt marten population collectively as one DPS when making its determination.

The Department evaluated the sufficiency of the scientific information presented in the Petition it received, using information in the Petition as well as other relevant scientific information available at the time of review. Pursuant to Fish and Game Code section 2072.3 and Section 670.1(d)(1) of Title 14 of the California Code of Regulations, the Department evaluated whether the Petition includes sufficient scientific information regarding each of the following petition components:

- Population trend;

- Range;
- Distribution;
- Abundance;
- Life history;
- Kind of habitat necessary for survival;
- Factors affecting ability to survive and reproduce;
- Degree and immediacy of threat;
- Impacts of existing management;
- Suggestions for future management;
- Availability and sources of information; and
- A detailed distribution map.

C. Humboldt Marten Description and Ecology

The Humboldt marten is a carnivorous mammal (order Carnivora, family Mustelidae), classified as a subspecies of Pacific marten (*Martes caurina*), a species occurring west of the Rocky Mountain Divide which was recently split from the American marten (*Martes americana*, Dawson and Cook 2012). The taxonomy of martens in the Pacific Northwest is currently unsettled, and some recent genetic evidence suggests that Humboldt martens and martens in coastal Oregon currently classified as *M. caurina caurina* are closely related, and should all be classified as Humboldt marten (Slauson et al. 2009a, USFWS 2015 p.5). California is also home to the closely related Sierra marten subspecies (*M. caurina sierrae*), which ranges throughout the Sierra Nevada and northern interior mountains and is not the subject of this Petition (figure 1). Humboldt martens historically occupied the coastal mountains of California from Sonoma County north to the Oregon border from sea level to 915m (3,000 ft.) within 80 km (50 mi.) of the coast, (Grinnell and Dixon 1926, Zielinski et al 2001, USFWS 2015). The current distribution is limited to areas of Humboldt, Del Norte, and Siskiyou Counties, encompassing less than 5% of the probable historical range (figure 1, Slauson et al. 2009b, USFWS 2015).

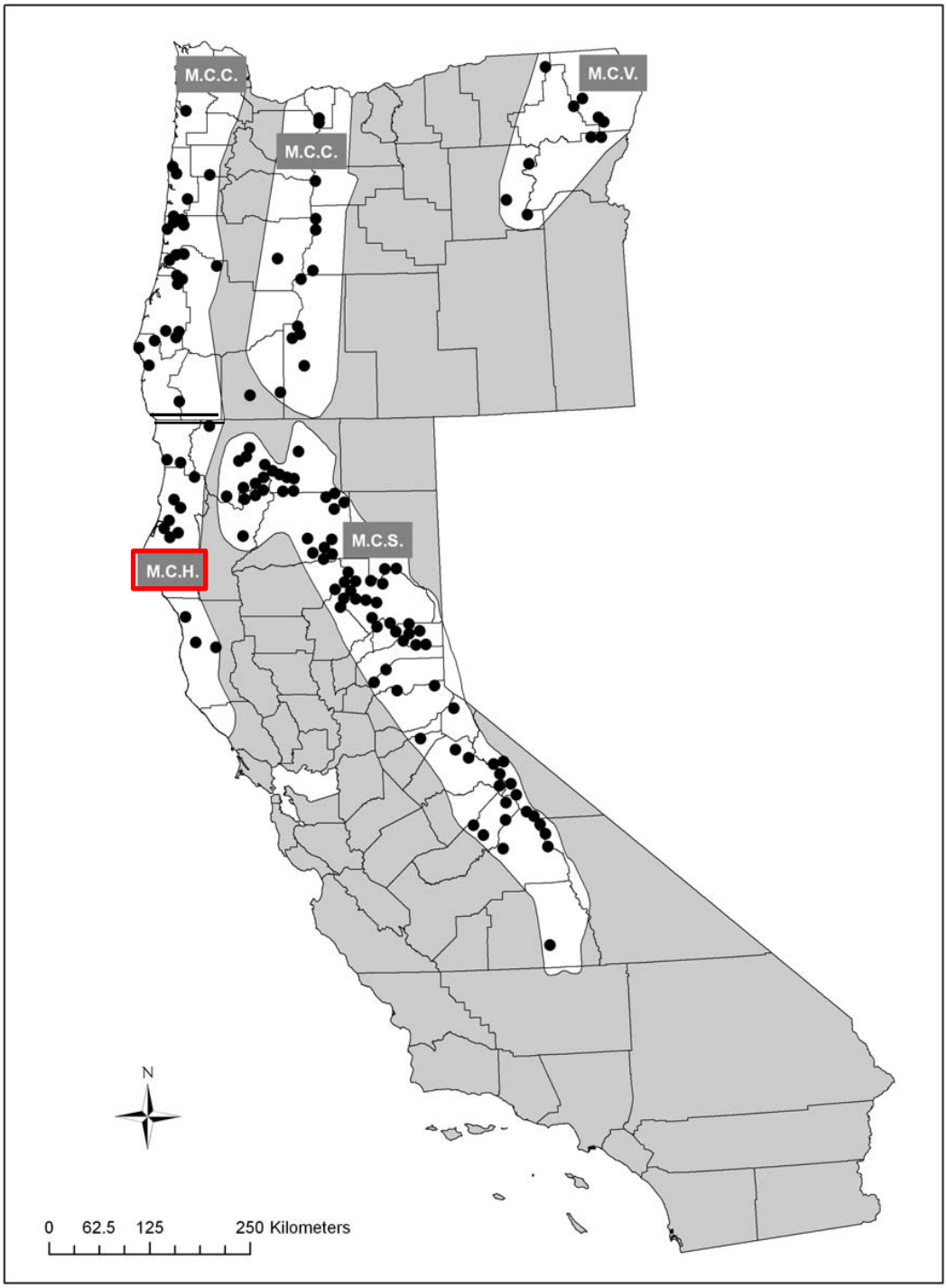

Figure 1. Historical range and distribution of Pacific marten subspecies occurring in Oregon and California. Range boundaries (white polygons) and historical records of occurrence (black circles) are modified from Zielinski et al. (2001, p. 480). Subspecies: *M. c. humboldtensis* (M.C.H.), *M. c. sierrae* (M.C.S.), *M. c. caurina* (M.C.C.), *M. c. vulpina* (M.C.V.). Source: USFWS 2015. Used with permission.

Martens appear elongated and low to the ground as do other members of the weasel family, though larger and stockier than long-tailed weasels (*Mustela frenata*), and with longer tail and body fur than similarly sized minks (*Neovison vison*). Pelage (fur) is brown (varying from yellowish buff to nearly black), with a contrasting lighter patch on the throat and chest. Bushy tails constitute more than 1/3 of the overall body length. Overall body lengths range from 45-70cm (18-28 in.) and weights range from 0.4-1.25 kg (0.88-2.76 lbs.), with males averaging 15% longer than females and up to 65% heavier than females (Powell et al. 2003, Clark et al. 1987). Humboldt martens differ from Sierra marten by having darker, richer golden fur, reduced throat patch, more extensive dark fur on feet, legs, and tail, smaller skulls, narrower faces (rostra), and differences in dentition (Grinnell and Dixon 1926, Grinnell et al. 1937, USFWS 2015).

North American martens are polygamists, with females producing their first litter at around 24 months of age (Markley and Basset 1942). Parturition typically occurs in March or April, with litters averaging 2-3 kits (Strickland et al. 1982). Marten young begin dispersing from their natal range as early as August, and may continue through the following summer (USFWS 2015). The average dispersal distance of North American martens is typically short, less than 15km (9.3 mi., Ibid.). The number of kits that survive to reproductive age is unknown. In California, Pacific martens seldom survive longer than 5 years in the wild (USFWS 2015). Martens are intrasexually territorial (i.e. adults exclude members of the same sex from their territories, but not members of the opposite sex, Powell et al. 2003), with marten home ranges in the Sierra Nevada varying from 170 - 733 ha (420 - 1,811 ac.) for males and from 70 - 580 ha (173 - 1,433 ac.) for females (Buskirk and Zielinski 1997). The limited available information on Humboldt marten home ranges suggests they are similar in size to Sierra marten home ranges (USFWS 2015).

Humboldt marten are strongly associated with two distinct habitat types: late successional conifer stands with dense shrub layers where abundant live and dead standing and downed tree structures are used for resting, denning, and escape cover; and serpentine soil communities of various seral stages with variable tree cover, dense shrubs, and rock piles and rock outcrops used for resting, denning, and escape cover. Large patches of late successional conifer forests or serpentine soil formations appear to be necessary for Humboldt marten occupancy (Slauson et al. 2007). The diet of Humboldt martens consists primarily of small mammals, berries, birds, insects and reptiles. Chipmunks (*Tamias spp.*), red-backed voles (*Myodes californicus*), Douglas's squirrels (*Tamiasciurus douglasii*) and flying squirrels (*Glaucomys sabrinus*) constitute 85 percent of the mammalian biomass in the diet during the summer and fall. Diets shift seasonally, with berries consumed more frequently in the summer and fall (Slauson et al. 2007).

Known predators of martens in western North America include coyote (*Canis latrans*), red fox (*Vulpes vulpes*), bobcat (*Felis rufus*), and great horned owl (*Bubo virginianus*). Fishers are also known to kill martens, and the distribution of fisher populations may limit the distribution of marten (USFWS 2015, Krohn et al. 2004).

II. Sufficiency of Scientific Information to Indicate the Petitioned Action May Be Warranted

A. Population Trend (pp. 4-5)

1. Scientific Information in the Petition

The Petition states that Humboldt martens were historically common, but had become so rare by the late 1990's that some believed the subspecies was extinct before they were detected again in 1996, and no verifiable detection records of Humboldt martens have been found for the period of 1945-1995 (citing Slauson et al. 2001, "Kucera et al. 1995" which is not listed in the literature cited section of the Petition but appears to refer to Kucera and Zielinski 1995 based on content, Zielinski and Golightly 1996, Slauson et al. 2009b, Slauson and Zielinski 2004). The Petition states that the extant population in California is likely less than 100 individuals and the population appears to have declined by over 40% over the period of 2000-2008, and then remained unchanged during the period of 2008-2012 (citing Slauson and Zielinski 2009, but based on content presumably referring to Slauson et al. 2009b and USFWS 2015). Additionally, the Petition states the size of the coastal population of martens in Oregon is unknown, but believed to be small. The Petition also references USFWS (2015) which notes that experts have serious concerns about the viability of the three extant populations of coastal martens (two in Oregon and one in California, citing Slauson et al. 2009a). The Petition further indicates that Kucera (1998) reported concern for Humboldt marten based in part on severe population declines, and Slauson et al. (2009b) expressed concern for the viability of coastal marten populations due to small population size, population isolation, and ongoing threats.

2. Other Relevant Scientific Information

In addition to the sources cited in the Petition, Grinnell et al. (1937) stated that Humboldt martens were "fairly numerous" in "earlier years" (p. 209), however, apparent declines in the Humboldt marten population, at least locally, were noted as early as the 1920s (pp. 209-210). Grinnell et al. (1937) report a tale of one trapper capturing 50 Humboldt martens in a single winter. Although it is impossible to quantify the statement that the species was once "fairly numerous", one can reasonably infer that the number of martens present at that time was larger than the population present in the 1990s when no detections of the species had been recorded for the previous 50 years (Zielinski and Golightly 1996).

3. Conclusion

The Petitioners cite relevant literature regarding the population trend of Humboldt martens in California. While no quantitative data exist regarding the population in the era of European American settlement, qualitative statements suggest the species was not uncommon (Grinnell et al. 1937). The Petitioners reference and accurately represent the findings and conclusions of the only known rigorous

quantitative estimate of the species' population in California derived from occupancy rates (i.e. Slauson et al. 2009b) which found a significant decline in occupancy between the 2000 -2001 field season and the 2008 season. This resulted in an estimate of less than 100 martens in northwestern California. Based upon the Petition and other information available to the Department, it appears the population of Humboldt marten in California has declined from an unknown "fairly numerous" number in the early 20th century to a present population estimate of fewer than 100 individuals.

B. Range and Distribution (pp. 6-7)

1. Scientific Information in the Petition

The Petition describes the historical range of Humboldt marten in California as coastal forests from Sonoma County north to Curry County Oregon (referencing Grinnell et al. 1937, Kucera 1998, and Slauson et al. 2001), and notes records of the species from Colusa, Del Norte, Glenn, Humboldt, Lake, Mendocino, Siskiyou, Tehama, and Trinity Counties from NatureServe (2015). The Petition states that Humboldt martens have been extirpated from 95% of their historic range in California (Slauson et al. 2007), and are now limited to an area approximately 2,273 km^2 (877 mi^2) (Petitioners state the estimate is based on analysis of Slauson et al 2009c data, however it appears the estimate was based on Slauson et al. 2009a).

2. Other Relevant Scientific Information

The Department possesses historical records of Humboldt marten from Del Norte, Humboldt, Siskiyou, Trinity, Tehama, Mendocino, Lake, Colusa, and Glenn Counties (California Natural Diversity Database [CNDDB] query August 8, 2015, fig. 2). Colusa and Glenn Counties are included due to a single record attributed to Snow Mountain near where Colusa, Glenn, and Lake Counties intersect. There are some experts who question whether the Humboldt marten historically occurred in Lake County because historical records from the area are attributed to trapper reports which are known to sometimes refer to the locations of the trapper's camps rather than the locations animals were taken, and because the habitat in Lake County today is dissimilar to the habitat known to be occupied by Humboldt marten in northwestern California (Slauson and Zielinski 2007, Greg Schmidt pers. comm. 7/23/15, USFWS 2015). However, trappers interviewed by Twining and Hensley (1947) reported that martens had formerly been taken as far south as Hull Mountain in northern Lake County and Fort Ross in Mendocino County, suggesting that historical records from this area may be accurate. All historical CNDDB observation records appear to be less than 100 km (<60 mi.) from the coast. The historical range described by Grinnell et al. (1937) was roughly 22,000 km^2 (8,500 mi^2), although not all of the habitat within the bounds of the historical range would have been suitable or occupied. Within the historical range, the distribution of marten record locations is uneven, with concentrations of records from northern Lake and east-central Mendocino County, an area southeast of Eureka, and near the intersection of Del Norte, Humboldt, and Siskiyou counties (fig. 2). Whether these concentrations reflect the relative density of martens within the range or are artifacts of uneven trapping or survey efforts is unknown. By the 1940s a significant decline in Humboldt marten trapping returns and a retraction of the southern

end of the range had been noted (Twining and Hensley 1947). Zielinski et al. (2001) conducted an exhaustive review of historical coastal marten records including published reports, museum specimens, unpublished notes of naturalists and trappers, and interviews of tribal members and others. Based on their review they concluded that a significant reduction in occupied range has occurred.

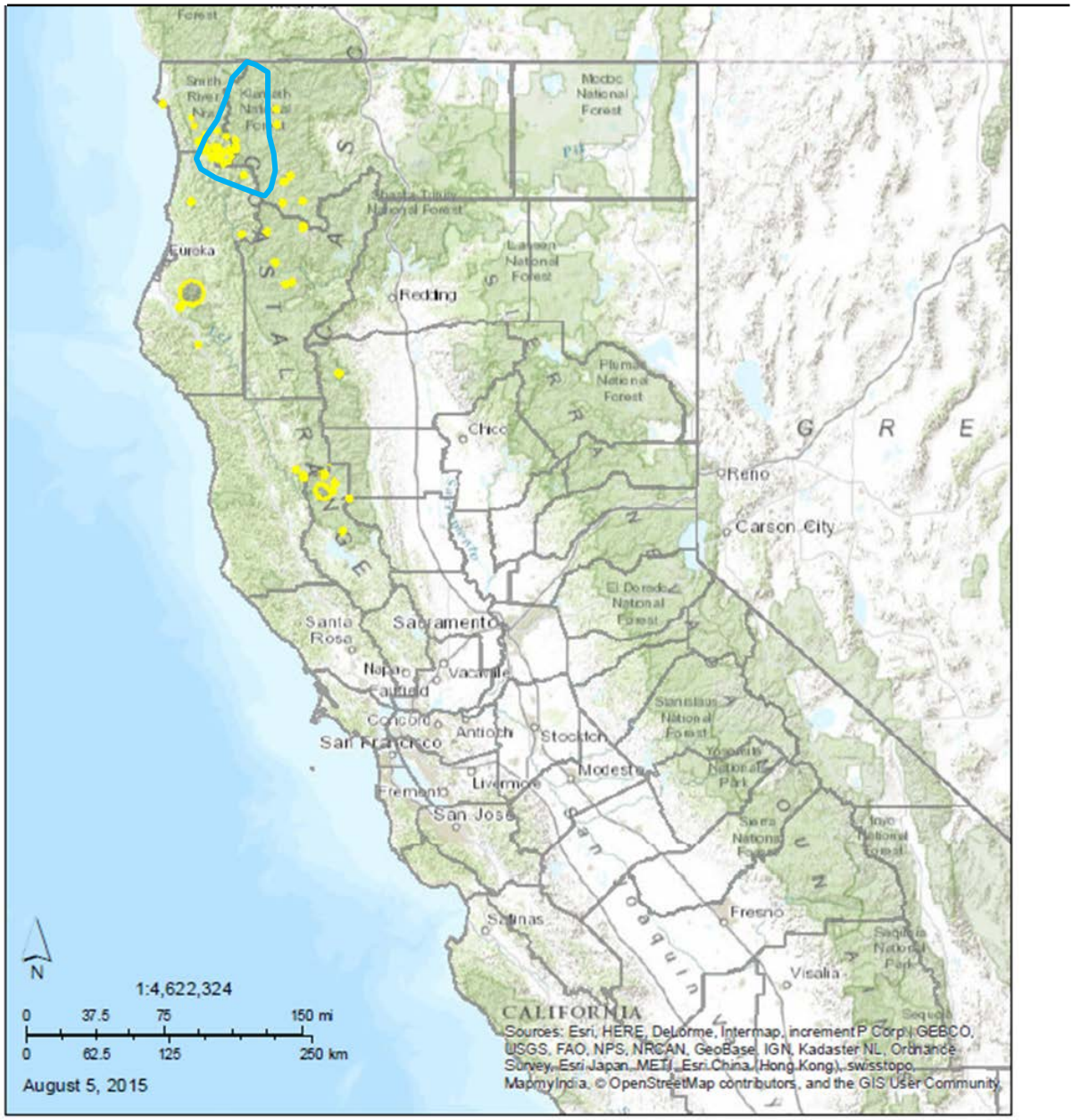

Figure 2. Humboldt marten occurrence records from the California Natural Diversity Database 1889-2004. Blue polygon represents approximate contemporary range in California (Humboldt marten records from database and literature 1995-2015).

The Department is aware of Humboldt marten records only from southern Del Norte, northern Humboldt, and extreme eastern Siskiyou Counties since 1995 (CNDDB query August 8, 2015) despite the fact that surveys during that period covered a much larger portion of the historical range (USFWS 2015). The occupied range (as of year 2008) as circumscribed by a minimum convex polygon drawn around detection locations was recently found to be 627 km^2 (242 mi^2) by Slauson et al. (2009b). Since that time, the known occupied range has expanded slightly with two detections of Humboldt martens in Prairie Creek Redwoods State Park in 2013, a few kilometers from the coast (CDFW 2014). Although there have been recent surveys at over 3,000 locations and 50,000 survey nights, no comprehensive range-wide survey has been conducted for this species (USFWS 2015).

3. Conclusion

Humboldt marten historically ranged from Sonoma County north to the Oregon border within 96 km (60 mi.) of the coast. The size of the historical range described by Grinnell et al. (1937) was roughly 22,000 km^2 (8,500 mi^2), and the area known to be occupied by Humboldt marten in northern California since 1995 is slightly larger than 627 km^2 (242 mi^2, Slauson et al. 2009b). Humboldt martens are distributed unevenly within their range. Based upon the Petition and other information available to the Department, the current range of Humboldt marten in California is clearly substantially reduced from the historical range.

C. <u>Abundance</u> (p. 8))

1. Scientific Information in the Petition

The Petition presents information on the abundance of Humboldt marten in California in a short table listing the estimate of Slauson et al. (2009b) of less than 100 individuals in north coastal California.

2. Other Relevant Scientific Information

The study referenced by the Petitioners is the only known estimate of Humboldt marten abundance in California.

3. Conclusion

The only known estimate of Humboldt marten abundance in California is less than 100 individuals. Historical estimates of abundance do not exist, but anecdotal information on trapping success, and the much larger historical range (Grinnell et al. 1937, Twining and Hensley 1947, Zielinski et al. 2001) could reasonably lead one to conclude that historically martens were more abundant and more widely distributed. Based upon the Petition and other information available to the Department, current abundance of less than 100 individuals leads the Department to conclude that listing marten may be warranted.

D. Life History (pp. 9-13)

1. Scientific Information in the Petition

The Petition describes the physical appearance of Humboldt martens and the morphological differences between Humboldt martens and the Sierran subspecies of martens. The Petition then describes the current accepted taxonomy of Humboldt marten (*M. caurina humboldtensis*) and the results of recent genetic investigations that found both Humboldt martens and martens in coastal Oregon (currently classified *as M. Caurina caurina*) shared unique genetic signatures, suggesting Humboldt martens and coastal Oregon martens share an evolutional lineage, and calling into question the separation of the two subspecies (Slauson et al. 2009a, USFWS 2015).

In describing the life history of Humboldt martens the Petitioners emphasize the traits that limit martens' (all North American marten species) ability to quickly repopulate following a population decline: late sexual maturity (24 months to first litter [Strickland et al. 1982]), low pregnancy rates during times of environmental stress (as low as 50% [Thompson and Colgan 1987]), a single litter per year (Calder 1984), small litter size (ranging from 1-5, averaging 2.85 [Strickland and Douglas 1987]), and relatively low population densities for an animal or their size (Buskirk and Ruggierro 1994, Kucera 1998). Reproductive cycle and longevity are then described in detail.

Home range size and composition are described as well as the relationship between habitat quality and home range size. The Petitioners, citing USFWS (2015), described the strong habitat selection exhibited by martens at the home range scale, with Pacific and American marten home ranges typically including 70% or more late successional forest habitat. The Petitioners note an inverse relationship between habitat quality and home range size, with the largest Pacific marten home ranges in California and Oregon occupying the most intensively logged landscapes (USFWS 2015).

2. Other Relevant Scientific Information

See life history information under Section I above.

3. Conclusion

The Petition accurately describes the appearance of Humboldt martens (see section I of this report for description), and the current taxonomic understanding of the subspecies. The reproductive biology of martens is well described and supported by appropriate literature. Home range size and composition is also accurately described and referenced.

E. Kind of Habitat Necessary for Survival (pp. 13-16)

1. Scientific Information in the Petition

The Petition emphasizes the highly habitat-specific nature of North American martens and their vulnerability to habitat loss and degradation (citing Harris 1984, Buskirk and Ruggiero 1994, Slauson 2003). Petitioners describe the strong association of martens to closed-canopy old-growth forests with complex structure near the ground (Buskirk and Powell 1994, Buskirk and Ruggiero 1994, Bull et al. 2005), the avoidance of young forests and open areas (Drew 1995, Buskirk and Ruggiero 1994, Slauson et al. 2007), and unwillingness to cross large areas with low canopy closure (Hargis and McCullough 1984, Bissonette and Sherburne 1993, Thompson and Harestad 1994, Hargis et al. 1999). The Petition describes the preference of martens for unlogged, old-growth stands with high canopy cover, multiple canopy layers, and high tree and log densities over harvested stands, early seral stages, and stands with few dead trees (citing Spencer et al 1983, Buskirk and Ruggiero 1994, Raphael and Jones 1997, Bull et al. 2005, and others). Regarding Humboldt martens specifically, the Petition quotes Slauson et al. (2003): "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."

The Petition describes three types of coastal conifer forest used by Humboldt marten in California: Old-growth Douglas-fir forests, mixed conifer forests on serpentine soils, and old-growth redwood forests (Slauson 2003, Slauson and Holden 2009). Serpentine soils are described as sites where the mineral composition of the soil creates a harsh growing environment for most plants and results in open, rocky sites with stunted trees (citing Slauson et al. 2007). The Petition further states that in both serpentine soil forests and non-serpentine soil forests, Humboldt martens occupy large areas of dense shrub cover associated with older forest habitats, and are not associated with shrub species that occur in areas of clear cuts and regrowth (Slauson et al. 2007).

The Petition states that martens select habitat at four spatial scales: microhabitat (resting and denning sites), stand, home range, and landscape, and at all scales there is a strong preference for old-growth habitats (no reference).

The Petitioners' description of Humboldt marten microhabitat associations is excerpted directly from USFWS (2015) with citations omitted. Regarding resting structures, the Petition states that rest structures are used daily by martens to provide thermoregulatory benefits and protection from predators. Rest structures are re-used infrequently, and the type of structures used varies seasonally, so multiple structures are required within a home range. Large diameter trees, snags, and logs are the most frequently used rest structures, with martens typically selecting the largest available structures. Humboldt marten rest structures average 95 cm (37 in.) diameter at breast height (dbh) for snags and 88 cm (35 in.) diameter at the larger end for logs. Live trees averaged 94cm (37 in.) dbh. Within these structures, martens typically use cavities, platforms, or chambers created within log piles or rock outcrops. The Petition states there are two types of dens used by Humboldt marten: natal dens where kits are born, and maternal dens to which kits are later moved. Pacific and American marten den site selection appears to be based on the characteristics of the structure as well as the surrounding stand, with females likely selecting for den sites in proximity to quality foraging sites. Cavities within large

trees and snags are most commonly used by denning Pacific and American martens. Three maternal dens from California Humboldt marten have been described, but no natal dens. Two dens were in cavities within the broken tops of a 66 cm (26 in.) dbh golden chinquapin (*Chrysolepis chrysophylla*) and a 113 cm (45 in.) Douglas-fir, and the third den was in a cavity in a 115 cm (45 in.) dbh Douglas-fir snag. All were located within the same old-growth Douglas-fir dominated riparian stand.

The Petition describes the forest stand scale as an area of several hectares containing the structural features required by martens for resting, denning, foraging and mating; and states that martens prefer old-growth stands (citing Buskirk and Powell 1994, Katnik et al. 1994, and Slauson et al. 2007). The Petition references Bull et al.'s 2005 study in northeastern Oregon where the authors found Pacific martens used stands with 50-74% canopy cover more than stands with <50% canopy cover, used stands with more canopy layers than in unused stands, used stands with a greater distance to forest openings more than stands with a shorter distance to openings, and used stands with higher densities of snags, logs, and large trees than unused stands. Additionally, Bull et al. (2005) found that martens used stands with no timber harvesting history more often than stands with any harvesting history, and that martens used stands with harvesting history less than expected based on availability. Specifically referring to Humboldt martens in non-serpentine soil stands the Petition states that martens used late successional stands more than expected based on their availability, used late-mature stands similar to availability, and made little use of all other seral stages (citing Slauson et al. 2007), and that earlier seral stages are not likely selected because they lack one or more key structural features (citing Slauson 2003).

At the home range scale the Petition states that Humboldt martens select the largest available patches of old-growth and late-mature, or serpentine habitat (citing Slauson et al. 2007). The Petition refers to Slauson et al.'s (2007) habitat models which found a 19-26% increase in the probability of Humboldt marten occurrence in an old-growth habitat patch for each 20 ha (49 ac.) increase in patch size, and the authors' conclusion that "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." The Petition also relates Slauson et al.'s (2007) finding that mixed-scale models which consider both the stand and home range scales explained Humboldt marten occurrence better than single scale models. The Petition then states that, because Humboldt martens are negatively associated with logging activities at the microhabitat, stand, and home range scales, logging at the landscape scale (tens to hundreds of km^2) inevitably negatively influences marten occurrence as well.

At the landscape scale, the Petition states loss and fragmentation of mature forest constrain marten movement and demography (Bissonette et al. 1989 [does not appear in Petition literature cited], Frederickson 1990, Phillips 1994, Chapin 1995, Chapin et al. 1998, Hargis 1996 [does not appear in Petition literature cited], Slauson 2003), and martens avoid landscapes where 25-30% of mature forest has been lost (Bisonette et al. 1989, Hargis et al. 1999 [does not appear in Petition literature cited], Potvin et al. 1999, Slauson 2003). The Petition states that fragmented forests and small patches of old-growth do not ensure the long term viability of marten populations. Citing Slauson et al. (2009b), the

Petition states that although Humboldt martens occasionally occupy old-growth forest patches <50ha (124 ac.), occupancy is stable only in larger patches. Further, Slauson et al. (2009b) found declines in sample unit marten occupancy from 2000 -2001 to 2008 in units with highly fragmented old-growth and in serpentine soil areas. The authors calculated that a 30 ha (74 ac.) increase in the amount of old-growth in a sample unit resulted in a 37% decrease in the probability of extinction in that unit. The Petition includes an excerpt from USFWS (2015) which emphasizes the high sensitivity of American and Pacific martens to landscape scale habitat loss and fragmentation created by timber harvesting, and the fact that habitat loss and fragmentation effectively lowers the number of marten home ranges a landscape can support. The Petition's landscape habitat associations section concludes with the statement that patches of suitable habitat in highly fragmented forests may be effectively unavailable to martens if martens cannot cross open areas to reach them. Therefore fragmented landscapes have a lower marten carrying capacity (citing Buskirk and Powell 1994, Thompson and Harestad 1994).

2. Other Relevant Scientific Information

The Petitioners' description of American and Pacific marten preferred habitat types are generally accurate. The term "old-growth" used by the Petitioners can be imprecise. Slauson (2003) uses the term in reference to specific structural attributes of Douglas-fir (*Psuedotsuga menziesii*) and tanoak (*Lithocarpus densiflora)* stands, but other cited authors used terms such as "old structure, unlogged stands" (Bull et al. 2005), and "late successional stands" (Buskirk and Ruggiero 1994) rather than old growth to describe stands favored by martens. Important structural features of these old forests stands, whether termed "old-growth," late successional," or "late seral," include: multiple canopy layers including different tree species , canopy openings which allow the development of dense vegetation on the forest floor, the presence of snags and coarse woody debris on the ground, and the absence of major stand-altering disturbance by humans (Bolsinger and Waddell 1993).

The Petition quotes Slauson et al. (2003), which in turn references Slauson (2003) which was in press at that time. The published version of Slauson (2003) does not contain as strong of a statement about Humboldt marten "only" using late-mature and old-growth forests, and in fact includes reference to marten use of three earlier seral stage stands where structural diversity was present (two were pole sized stands with heavy shrub cover adjacent to old growth stands, and one was a mid seral stand with a large component of larger trees). Additionally, Slauson (2003) contrasts his findings with Baker's (1992) finding that coastal martens on Vancouver Island, B.C. preferentially selected for 10-40 year old stands and against mature and old growth stands, speculating that one reason for the use of the younger stands in the Vancouver study area was the presence of a great deal of residual large woody structure remaining on the site following timber harvest (e.g. large stumps and logs).

The Petitioners' statement regarding the shrub species Humboldt marten are associated with is incomplete. Slauson et al. (2007) wrote that Humboldt martens favor a shade-tolerant, long-lived, mast producing shrub community composed of salal (*Gaultheria shallon*), huckleberry (*Vaccinium spp*.), rhododendron (*Rhododendron macrophyllum*), shrub oak (*Quercus vaccinifolia*), and tanoak, and noted

that this community does not include the shade-intolerant, short lived species such as *Ceanothus spp*. shrubs that occupy more xeric (dry) sites, and dominate sites following logging and other disturbances.

The Petitioners' discussion of microhabitat use is directly excerpted from USFWS 2015, however the three Humboldt marten maternal dens described were all used by the same female in the same year (Slauson and Zielinski 2009). Whether the habitats selected reflect the availability of structures and stands within her territory or her preferences as an individual, or whether they reflect the preferences of all Humboldt martens is impossible to discern. The discussion of Humboldt marten stand scale habitat use referred to a disproportionate use of late-successional stands while the authors (Slauson et al. 2007) used the term old-growth rather than late-successional. The Petitioners' discussion of Slauson et al.'s (2007) Humboldt marten habitat modeling emphasizes forest seral stage and old-growth patch size. Slauson et al.'s (2007) habitat modeling identified percent shrub cover as the most important predictor of Humboldt marten occurrence in both the stand scale and mixed stand and home range scale models.

The Petitioners' statement that logging at the landscape scale inevitably negatively influences marten occurrence is not supported by references. It is unclear whether the Petitioners are positing that any logging within the landscape will render the landscape unsuitable to martens, or whether they are stating that logging an entire landscape would be detrimental to marten. The latter is a logical conclusion based on scientific evidence, the former is not supported by the literature. Whether or not Humboldt martens can occur within a matrix of logged and unlogged habitat patches has not been directly addressed by any information source available to the Department, and would likely depend on the spatial scale, arrangement, and intensity of the logging. In the Petitioners' discussion of landscape scale habitat loss and fragmentation, many of the references cited are from studies of American and Pacific martens in other parts of North America, for example: Frederickson (1990) in Newfoundland, Phillips (1994) in Maine, and Potvin et al. (1999) in Quebec. Slauson (2003) references these studies, but makes no direct statement about constraint of Humboldt marten movement or demography due to landscape patterns.

3. Conclusion

The Petitioners' description of Humboldt marten habitat at the microhabitat, stand, home range, and landscape scales is generally accurate and well supported by literature. Although it is necessary to include references to other North American marten species and subspecies habitat associations due to the paucity of literature on the Humboldt marten subspecies, it is not always clear in the Petition when Humboldt martens specifically are being discussed, or whether information from martens in distant ecosystems (e.g. eastern deciduous forests) can be extrapolated to Humboldt martens. Additionally the critical association of Humboldt martens with extensive dense shrub layers is underemphasized.

F. Factors Affecting Ability to Survive and Reproduce (pp. 14-29)

1. Scientific Information in the Petition

The Petition states the Humboldt marten is threatened by all six of the factors that must be examined by the Commission per Title 14 of the California Code of Regulations section 670.1 when considering whether listing a species as threatened or endangered is warranted:

- present or threatened modification or destruction of its habitat;
- overexploitation;
- predation;
- competition;
- disease;
- other natural events or human-related activities.

Present or Threatened Modification or Destruction of Habitat

Timber Harvest and Logging:

The Petition states that logging threatens Humboldt marten and the species' habitat because it removes the largest and oldest trees available at all habitat scales (citing multiple studies), later noting that the structural features associated with old forests such as large trees, snags, and logs can take >100 years to develop, and little such habitat is expected to regenerate in the next several decades (citing USFWS 20015). The Petition then includes an excerpt from USFWS (2015) which states that the habitat loss and degradation from historical and current logging is the most plausible reason Humboldt marten are absent from much of their historic range, with most of the remaining suitable habitat located on federally owned land (citing Zielinski et al. 2001). The Petitioners go on to state that the majority of coastal forests in private ownership have been logged at least once, primarily by clear-cutting with short rotations of 60-70 years, which creates structurally simplified early seral forests that do not support martens (citing the following references from within Slauson et al. 2007: USDA 1992, Bolsinger and Waddell 1993, Lettman and Campbell 1997, Thornberg et al. 2000). The Petition notes that timber harvesting not only reduces the total amount of late successional forest, it also fragments it into smaller, more isolated patches, providing the example of the Redwood National and State Parks complex containing only three patches of late successional forest >= 2,023 ha (5,000 ac.), with most patches <=40 ha (100 ac., citing USFWS 2015).

Fire Suppression and Salvage Logging:

The Petition states that wildfire can threaten the already small Humboldt marten population by reducing and fragmenting the available habitat (citing Slauson and Zielinski 2004), and notes Slauson (2003) stated that stochastic (random, unpredictable) events such as wildfire present a major challenge to the persistence of Humboldt marten. The Petition states timber harvest and fire suppression exacerbate the threat of wildfire to marten by further fragmenting landscapes. Referencing USFWS (2015) the Petition states that vegetation management activities designed to reduce the risk of wildland fire by removing shrubs, reducing canopy cover, and removing snags and logs potentially negatively effects marten by removing required habitat structures, and removing shrub cover which can reduce prey abundance and improve access for competitors. The Petitioners state that on federal lands salvage

logging and fuels management activities can occur on all land allocation categories except for wilderness areas (Hamlin et al. 2010), and on private lands salvage logging plans are exempt from normal review procedures and automatically approved by the California Department of Forestry and Fire Protection (Cal Fire) through a ministerial process.

Overexploitation

This section of the Petition consists of numerous excerpts from USFWS (2015) and a summary statement that the threat posed to Humboldt marten in California by accidental trapping capture and poaching may be small, but the small, isolated nature of population makes any additional source of mortality significant. Important points from the USFWS excerpts include:

- There have been no studies on the population level effects of coastal marten trapping, but the loss of even a few adult martens, especially when combined with other mortality sources, could reduce the likelihood of long-term population viability.
- Early trapping of Humboldt marten was intensive, with accounts of individual trappers taking 35-50 martens in a single winter. By the early 1900s annual harvest of coastal martens was already declining, prompting Joseph Dixon to call for closing the trapping season in California to prevent an extirpation, however marten harvest continued until a partial closure was enacted in northwestern California in 1946, depleting populations and likely reducing genetic variation within the remaining population (Dixon 1925, Zielinski et al. 2001).
- Currently, trapping marten is illegal in California, though martens may occasionally be trapped inadvertently by trappers targeting other fur bearing species.
- Trapping of coastal martens remains legal in neighboring Oregon, although only three coastal martens were taken in 2013.

Predation

The Petition identifies predation as a major threat to Humboldt marten, stating that predation is the primary source of marten mortality, citing Bull and Heater's (2001) study of Pacific marten in northeastern Oregon which attributed 18 of 22 documented mortalities to predation. The Petition then identifies bobcats (*Lynx rufus*), foxes (*Vulpes* spp.), coyotes (*Canis latrans*), mountain lions (*Puma concolor*), great horned owls (*Bubo virginianus*), goshawks (*Accipiter gentilis*), and Pacific fishers (*Pekania pennanti*) as marten predators (citing Buskirk and Ruggiero 1994, Bull and Heater 2001, and Slauson et al. 2009). The Petition notes that habitat degradation and fragmentation caused by logging increases the threat to martens from predation by habitat generalist predators (citing Slauson et al. 2009), and that in redwood forests over the last 80 years fishers and gray foxes (*Urocyon cinereoargentus*) have expanded their ranges into Humboldt marten habitat as martens have declined (citing Slauson and Zielinski 2007b). Citing Slauson and Zielinski (2010, not listed in Petition literature cited) the Petitioners state that roads may facilitate the presence of larger mesocarnivores in the dense shrub habitats preferred by martens. The Petition states that Slauson et al. (2009) found the greatest declines in Humboldt marten sample unit occupancy between 2001 - 2008 in serpentine soil habitats and where old-growth was more fragmented, possibly due to higher predation rates. The Petition notes

that female martens may be more susceptible to predation by other mesocarnivores due to their smaller body sizes (citing Slauson et al. 2009b).

Competition

The Petition states that no data or studies have been produced to assess the impacts of competition between Humboldt marten and other species, but posits that competition for food and space with other predators is currently a limiting factor for the ability of the species to survive and reproduce, and notes that the USFWS (Hamlin et al. 2010) stated that one of the risks to small populations such as the Humboldt marten is environmental fluctuations in food supply.

Disease

The Petition states that although the threat to Humboldt marten from disease has not been studied, disease is a potential threat to Humboldt martens because of their extremely small population size, quoting the USFWS (2015): "The outbreak of a lethal pathogen within one of the three coastal marten populations could result in a rapid reduction in population size and distribution, likely resulting in a reduced probability of population persistence, given the small size of these populations." The Petition lists several diseases American and Pacific marten are known to be susceptible to, including: rabies, plague, distemper, toxoplasmosis, leptospirosis, trichinosis, sarcoptic mange, canine adenovirus, parvovirus, herpes virus, West Nile virus, and Aleutian disease (citing Strickland et al. 1982, Banci 1989, Green et al. 2008, Brown et al. 2008, Zielinski 1984 – not listed in Petition literature cited), and notes Brown et al. (2008) found dead fisher within the range of Humboldt marten had been exposed to canine parvovirus and canine distemper.

Other Natural Events or Human-related Activities

Vehicle Strikes:

The Petition states that vehicle collisions are a significant threat to Humboldt marten, particularly given their small, isolated populations. Citing USFWS (2015), the Petition states that collisions with vehicles are a known source of mortality for coastal martens, and may negatively affect population viability if roadkill mortalities combined with other sources of mortality exceed annual recruitment rates. Additionally, animals damaged by vehicle strikes would likely be more susceptible to other sources of mortality, such as disease, starvation, or predation.

Inadequacy of Existing Regulatory Mechanisms:

The Petitioners state that although Humboldt marten are protected from trapping in California, there are no regulatory mechanisms in place to protect Humboldt marten habitat from logging which could remove, degrade, and fragment habitat to the point that the species is driven to extinction. The Petitioners further state that conservation of the species will require management to enlarge and reconnect suitable habitat patches because merely aiming to maintain current habitat will not assure marten persistence (citing Slauson et al. 2007, Slauson 2003).

The Petition states that the Humboldt marten occurs on federal lands managed by the U.S. Forest Service and the National Park Service, but the Forest Service manages the majority of the marten's

range on the Six Rivers and Klamath National Forests. On Forest Service lands in Region 5 (California), the Humboldt marten is designated as a Sensitive Species and a Priority Species. As a Sensitive Species, management projects subject to the National Environmental Policy Act (NEPA) must analyze impacts to the species; however, there is no requirement to minimize or mitigate impacts to the species. The Petition further states that much of the Humboldt marten's range on National Forest land is managed under the Northwest Forest Plan (USDA and USDI 1994) which manages land according to seven allocations: Congressionally Reserved Areas, Late Successional Reserves, Managed Late Successional Areas, Adaptive Management Areas, Administratively Withdrawn Areas, Riparian Reserves, and Matrix lands. The Petitioners note that Matrix lands units are intended for timber harvest, yet Slauson (2003) detected Humboldt marten on Matrix lands in 8 out of 31 sample units, and 20% of Slauson et al.'s (2007) analysis area was designated as Matrix land available for logging with 16% of the Matrix land already logged. The Petition further states that Late Successional Reserves (LSR) are intended to support viable populations of late successional and old-growth dependent species such as Humboldt martens, however logging is not prohibited in this land allocation class, and not all LSR is currently in a late successional condition, but rather managed to grow into late successional habitat and therefore may not currently provide Humboldt marten habitat. The Petitioners note that 40% of Slauson et al.'s (2007) study area was designated LSR, with martens detected in 13 of 66 sample units in LSR, and 13% of LSR in the marten's range has been logged (Ibid.). The Petition states that the Humboldt marten was given only a 67% likelihood of remaining well distributed within the range of the northern spotted owl (*Strix occidentalis caurina*) by the Northwest Forest Plan scientific analysis team (USDA and USDI 1994), and Slauson et al. (2009b) concluded that the Northwest Forest Plan does not completely protect the extant population, with 38% of the Humboldt marten distribution outside of NWFP reserves.

Based upon an approximated range of Humboldt marten in northern California created by buffering known marten detections with the maximum marten dispersal distance (Petition figure 1, Lindsay Holm pers. comm. 8/21/15), Petitioners estimate that only 14% of the California Humboldt marten range is contained within the Siskiyou Wilderness, which the Petition states is an insufficient percentage to ensure long term survival of the species. The Petition goes on to state that not all of the Wilderness area is composed of vegetation suitable for martens, for example, Slauson (2003) detected marten on only 3 out of 23 sample units located in Wilderness. The Petition notes that the Forest Service also manages the Smith River National Recreation Area (SRNRA) which is not vulnerable to logging. Although Petitioners estimate that the SRNRA makes up 9% of the Humboldt marten's range in California, management of the area prioritizes recreation over wildlife values.

The Petition notes that National Park Service land in the Humboldt marten range includes the Redwood National Parks Complex managed by the National Parks Service and California State Parks, consisting of Redwood National Park, Prairie Creek Redwoods State Park, Jedediah Smith Redwoods State Park, and Del Norte Coast Redwoods State Park. Petitioners estimate that 10% of the California range of Humboldt marten is made up of these parks. The Petitioners state that although a marten was detected in Prairie Creek Redwoods State Park in 2009 (Slauson and Holden 2009), the parks do not support a significant marten population (Slauson et al. 2003), and habitat in the parks is not extensive enough to support a viable population of Humboldt martens and is not currently in optimal condition for martens.

The Petition notes that non-federal lands in California are governed by the California Forest Practice Act of 1973 (Pub. Resources Code, § 4511 et seq.) and associated Forest Practice Rules (FPR)(Cal. Code Regs., tit. 14, § 894 et seq.), and states that there are no regulations within the FPRs that adequately protect Humboldt marten or its habitat. Section 919.16 requires landowners to provide Cal Fire with stand information when late successional forest stands are proposed for harvesting if the harvest will "significantly reduce the amount and distribution of late successional forest stands or their functional wildlife value so that it constitutes a significant adverse impact on the environment", but there are no specified protective or mitigation measures to offset potentially significant impacts. The Petition notes that on nonfederal lands in the Humboldt marten range there are currently no Habitat Conservation Plans, Native Communities Conservation Plans, or Safe Harbor Agreements in place covering the species. Petitioners estimate that approximately one third of the Humboldt marten range in California is owned by Green Diamond Resources Company and managed as industrial timberland. The Petition states that Slauson et al. (2007) estimated 83% of the private land in their study area had been logged, primarily by clear cutting, and detected martens at only 2 of 36 sample units on private lands. The Petitioners conclude that the existing regulatory mechanisms in place on nonfederal lands are do not adequately protect the species or its habitat.

Petitioners estimate that approximately 9% of the California range of Humboldt marten is on the Yurok Reservation, and less than 1% is on Hoopa Reservation. The Petition states that most of the Yurok Reservation is within the Humboldt marten range; however, most of the reservation is in non-tribal ownership, including Green Diamond Resource Company. The Petitioners state that there are no publicly available data on the status of marten on tribal lands so it is unknown what protective measures may be in place.

Toxicant Exposure:

The Petition identifies toxicant exposure as an emerging significant threat to Humboldt marten survival and conservation. It further states that although there have been no studies of the issue specific to Humboldt martens, information from studies of toxicant exposure in other forest carnivores can be extrapolated to martens. The Petition states that Gabriel et al. (2012) recently found that 79% of fishers on forest lands in California tested positive for exposure to anticoagulant rodenticides (ARs), most showing signs of exposure to multiple ARs (range = 1-4 rodenticides, mean = 1.6). The Petition notes that at least six fishers have died from rodenticide poisoning in recent years (Gabriel et al. 2012, Gabriel et al. 2013). The Petitioners state that ARs detected in fishers from northwestern California include brodifacoum, bromodiolone, chlorophacinone, diphacinone, and warfarin; and brodifacoum and bromodiolone are considered second-generation anticoagulant rodenticides which were introduced when rodents developed resistance to first-generation compounds in the 1970s. The Petition states that strong evidence indicates pervasive illegal outdoor marijuana cultivation is the primary source of these ARs in California (citing Gabriel et al. 2012, 2013, Thompson et al. 2014), and additionally, other highly toxic pesticides, some of which are banned in the United States have been found at illegal marijuana grow sites (citing Thompson et al. 2014). The Petition concludes that toxicant exposure is a current and increasing threat to the small Humboldt marten population.

Climate Change:
The Petition states that the Humboldt marten is threatened by global climate change which could change the current climate characterized by moderate temperatures, high annual precipitation, and summer fog which supports dense conifer tree and shrub cover (citing Slauson et al. 2007). The Petition then presents an excerpt from USFWS (2015), summarized below:

> Increased temperatures and decreased precipitation projected in the range of coastal marten over the next 40-50 years may cause the loss, degradation, or fragmentation of suitable coastal marten habitat. Suitable marten habitat (moist conifer and mixed conifer-hardwood forests) may be replaced by unsuitable hardwood forests, and the dense, shade-tolerant shrub layer required by marten may be lost. These vegetation transitions would create conditions more favorable to marten predators such as gray fox and bobcat and increase predation rates. Additionally, climate changes could result in more frequent, larger, higher severity wildfires in the Humboldt marten range, potentially causing marten mortality and destroying, degrading, and fragmenting marten habitat. Such habitat effects could threaten the viability of Humboldt marten populations which are already small and isolated (key references cited for this section in USFWS 2015 include: Pierce et al. 2013, Littell et al. 2013, Cayan et al. 2012, DellaSalla et al. 2013, Johnstone and Dawson 2010, Lawler et al. 2012).

2. Other Relevant Scientific Information

Present or Threatened Modification or Destruction of Habitat
The Petitioners' statements about the strong habitat associations of Humboldt marten are generally accurate and well supported by literature (e.g. Slauson 2003, Slauson et al. 2007). The impacts of logging, forest management, and salvaging logging on the vegetative structure required by marten is likewise well supported by the citations provided by the Petitioners.

Overexploitation
Due, in part to Dixon's (1925) recommendation, marten trapping was banned by the California Fish and Game Commission in 1946 in District 1 ½, which includes Humboldt, Del Norte, and western Siskiyou and Trinity counties (Twining and Hensley 1947). Today trapping of all martens is prohibited throughout the state (CCR Title 14, §460). Although it is possible that Humboldt martens could be inadvertently trapped by trappers pursuing legal furbearers, trapping in California is highly regulated, and trappers must pass a Department examination demonstrating their skills and knowledge of laws and regulations prior to obtaining a license (CFGC §4005). Additionally, only use of live-traps is permitted for commercial and recreational take of fur bearers and trappers are required to check traps daily and release non-target animals (CFGC §3303, §4004). With the passage of Proposition 4 in 1998, body-gripping traps (including snares and leg-hold traps) were banned in California for commercial and recreational trappers (CFGC § 3003.1). Martens incidentally captured by trappers must be immediately released (CFGC § 465.5(f)(1)).

Predation

The Petitioners' references to Slauson and Zielinski (2007b) referring to the gray fox and fisher expanding their distributions into Humboldt marten habitat can be further informed by Slauson et al. (2007, p.466), who stated that the dense ericaceous shrub layer found in occupied Humboldt marten habitat likely excluded larger bodied predators like gray fox and fisher which were rarely detected in their study area yet fairly common in nearby areas where shrub cover has been reduced or fragmented by forestry practices. To expand on the Petitioners' reference to Bull and Heater (2001), the authors attributed 44% of marten predation to bobcats, 22% to raptors (birds of prey), 22% to other martens, and 11% to coyotes. In a study of Humboldt martens begun in 2012, nine martens have been found dead to date, and all nine mortalities were attributed to bobcat predation (USFWS 2015). Additionally, all nine mortalities occurred in the more fragmented serpentine soil forest habitat, suggesting a link between habitat quality and predation rates (Ibid.). Finally, Slauson et al. (2009b) hypothesized that predation was the likely cause of the 42% decline in Humboldt marten occupancy in their study area between 2001 - 2008.

Competition

The Petitioners speculate that competition for food and space with other predators is currently a limiting factor for Humboldt marten populations, however this speculation is not supported by literature. The USFWS coastal marten species report (2015) does not identify competition as a significant stressor on coastal martens. Additionally, species with very specific habitat associations such as Humboldt marten would be expected to use their preferred habitat more efficiently than would habitat generalist species (Ricklefs 1990, p. 742, Zabala et al. 2009).

Disease

Although Strickland et al. (1982, p. 607) found that American martens in their central Ontario study tested positive for toxoplasmosis, Aleutian disease (a carnivore parvovirus), and leptospirosis; none of the diseases was considered to be a significant mortality factor for martens. Similarly, although Zielinski (1984) discovered antibodies to plague (*Yersinia pestis*) in four of 13 Sierra martens in the Sierra Nevada, he noted martens only appear to show transient clinical signs of the disease. Conversely, the Petition underemphasizes the potential threat to Humboldt marten from canine distemper virus which is known to cause high rates of mortality in wild mustelid populations (members of the weasel family which includes fishers and martens), and was found in wild fisher from the Hoopa Reservation within or near the range of Humboldt martens (Williams et al. 1988, Brown et al. 2008, Deem et al. 2000). The USFWS (2015) states that canine distemper has the potential to greatly reduce the size and distribution of one or more of the small extant coastal marten populations.

Other Natural Events or Human-related Activities

Vehicle Strikes:

There have been no recorded roadkill Humboldt martens in California since 1980 (USFWS 2015). Of nine Humboldt marten mortalities detected between 2012-2014 by researchers, none were killed by vehicle collisions. In southern Oregon where 14 roadkill martens have been recorded since 1980, roadkills are not likely to constitute a significant population level impact (USFWS 2015).

Inadequacy of Existing Regulatory Mechanisms:
Humboldt marten range in California likely also extends into the Shasta-Trinity and Siskiyou National Forests. In addition to National Park and U.S. Forest Service federal land ownership, a small percentage of the range is owned and managed by the U.S. Bureau of Land Management. Although not explicitly stated in the Petition, it can be inferred that logging of designated Matrix lands could not only directly remove Humboldt marten habitat, but perhaps more importantly fragment remaining patches of late seral forest rendering them unavailable to dispersing martens.

A small proportion of the Humboldt marten range occurs within the Redwood State and National Parks. Although the General Plan/General Management Plan governing the management of the parks does not identify specific management action for Humboldt marten, 32.6% of the Park lands are managed as primitive zones where no development or facilities construction occurs and visitor use is limited to foot traffic on existing trails. Additionally, 55.4% of the Park lands are managed as backcountry zones where the preservation and restoration of the natural environment is emphasized, and modification of the environment related to visitor use is limited. Where suitable marten habitat exists within these management zones, it is likely maintained and protected from significant modification and degradation (USDI NPS and State Parks 2000, USDI NPS 2000).

The California Forest Practice Rules specify that an objective of forest management is the maintenance of functional wildlife habitat in sufficient condition for continued use by the existing wildlife community within planning watersheds. This language may result in actions on private lands beneficial to martens (Cal Code Regs., Title 14, § 897, subd. (b)(1)(B).). Nevertheless, information about what constitutes the "existing wildlife community" is frequently lacking in timber harvest plans, and specific guidelines to retain habitat for martens are not provided in the Forest Practice Rules. Further, this guidance would at best conserve habitat where Humboldt martens are known to exist, but would not be expected to result in the creation of additional habitat. Habitat suitable for martens may be retained within Watercourse and Lake Protection Zones (Cal. Code Regs., tit. 14, § 916 et seq.). Watercourse and Lake Protection Zones are defined areas along streams where the Forest Practice Rules restrict timber harvest in order to protect in-stream habitat quality for fish and other resources. Harvest restrictions and retention standards vary according to the presence of anadromous and other fish species, but these zones may encompass 15 m - 45 m (50-150 ft) on each side of a watercourse, 30 m - 91 m (100-300 ft) in total width depending on side slope, location in the state, and the watercourse's classification. Generally, within Watercourse and Lake Protection Zones, at least 50% of the tree overstory and 50% of the understory canopy covering the ground and adjacent waters must be retained in a well distributed multi-storied stand composed of a diversity of species similar to that found before the start of timber operations. For watersheds that fall within Anadromous Salmonid Protection rules (Cal. Code Regs., tit. 14, §§ 916.9, 936.9, and 956.9), the 13 largest trees per acre (live or dead) must be retained.

Toxicant Exposure:
The Petitioners' extrapolation of information on toxicant exposure from other forest carnivores to Humboldt marten, particularly from other forest mustelids such as fisher, is appropriate due to the similar use of habitats and prey species, and because of similarities in physiology and metabolism. The

distinction the Petitioners make between first generation ARs and second generation ARs is important because first-generation compounds generally require several doses to cause intoxication, while second-generation ARs, which are more acutely toxic, often require only a single dose to cause intoxication and persist in tissues and in the environment (Gabriel et al. 2012).

Climate Change:
Miller et al. (2012) reported that the number of fires per year, mean fire size, maximum fire size, and area burned all increased in northwestern California over the period of 1910-2008, and that observed changes in the local climate explained much of the fire trends. Although no trend in percent of high severity fires over time was detected, the authors did note that spikes in high severity fires occurred in years when region-wide lighting strikes caused multiple ignitions. This research demonstrates that the effects of a changing climate may already be impacting Humboldt marten habitat, and highlights the link between climate patterns and wildfire trends in northwestern California forests. In the summer of 2015 the Nickowitz fire burned approximately 2,800ha (7,000 ac.) in and adjacent to the current known range of Humboldt martens (InciWeb 2015). In addition to wildfire-mediated habitat changes resulting from changes in climate, other studies have projected changes in forest disease, insect damage, and other disturbance events which could affect marten habitat quality or availability (USFWS 2015). Finally, Lawler et al. (2012) suggested that martens (all North American species) will be highly sensitive to climate change and will likely experience the greatest impacts at the southernmost latitudes and lowest elevations within their range.

3. Conclusion

Present or Threatened Modification or Destruction of Habitat
Humboldt martens have specific habitat associations which include large trees for structure and cover, and a dense shrub understory. Logging and forest management to reduce fire threat can remove and degrade these requisite features thereby destroying, fragmenting and degrading Humboldt marten habitat. Additionally, modification of marten habitat from these activities may increase the probability of predation by marten predators. These habitat impacts have the potential to reduce Humboldt marten populations by increasing predation rates and decreasing the extent and quality of available habitat.

Overexploitation
Trapping pressure on Humboldt martens was intense during the late 1800s and early 1900s, and likely resulted in significant declines in population size as well as a reduction in range. It is unlikely that trapping currently threatens Humboldt martens in California due to a ban on trapping martens and a ban on lethal traps as well as requirements that licensed trappers check traps daily and release non-target animals.

Predation
Predation is a significant source of Humboldt marten mortality. What is unknown is whether predation rates are greater than Humboldt marten faced historically, or so high that marten recruitment does not exceed the combined mortality rate of predation and all other causes.

Competition
Although the Petitioners state that competition is a significant threat to Humboldt marten populations the statement is largely speculative due to a paucity of information on the subject. Others, including the USFWS (2015) have not identified competition as a significant threat to the species.

Disease
Disease could pose a potential threat to Humboldt marten populations. Martens are known to be vulnerable to several diseases and parasites, including canine distemper which is known to cause high mortality rates in wild mustelid populations and is known to be present in the vicinity of the Humboldt marten population. However, marten mortality rates from disease are unknown. Additionally, it is unknown whether mortality from disease, combined with all other mortality sources exceeds marten recruitment rates.

Other Natural Events or Human-related Activities
Vehicle Strikes:
The Petitioners are correct that vehicle strikes could impact Humboldt marten populations if roadkill mortalities combine with other sources of mortality to exceed recruitment rates; however, as the USFWS (2015) points out, vehicle strikes alone are not likely to constitute a significant threat to Humboldt marten populations in California as there have been none reported since 1980.

Inadequacy of Existing Regulatory Mechanisms:
The Petition correctly states that Humboldt marten are not specifically protected by regulation on public or private lands (with the exception of protection from trapping in California). Federal land use allocations provide varying levels of protection to Humboldt marten habitat. State and private lands are regulated by the California Forest Practice Act which includes some provisions that require disclosure of impacts and retention of trees and canopy, but requires no specific protections for marten.

Toxicant Exposure:
Although no studies specific to Humboldt marten currently exist, studies of toxicant effects on closely related fishers do exist. Toxicants appear to be widespread on the northwestern California landscape and may increase if marijuana cultivation continues to spread. Toxicant exposure possibly impacts Humboldt martens; however, the nature and magnitude of the impact on the California population is unknown.

Climate Change:
Climate change is likely to negatively impact Humboldt marten habitat through increasing temperatures, decreasing precipitation, and decreasing fog extent. These changes are expected to eventually result in

changes to the vegetation communities that constitute marten habitat in northwestern California. Additionally, climate change appears to have increased the extent of wildfire in the region which can destroy and fragment marten habitat.

G. Degree and Immediacy of Threat (p. 29)

1. Scientific Information in the Petition

The Petition states that there is a significant and immediate threat to the survival and conservation of Humboldt marten, largely due to the small size of the extant population and risks of extinction inherent to small populations, and due to the compounding effects of a small population combined with the other identified threats. The Petition's section on urgency states that there are believed to be less than 50 individuals in California and an unknown, but small and declining number in Oregon, while populations of at least several hundred reproductive individuals are required to ensure the long term viability of vertebrate species, with several thousand individuals being the goal (citing Primack 1993). Additionally, the Petition states martens have a low reproductive rate, making recovery from population-level impacts slow (citing Buskirk and Ruggiero 1994). The Petition states that small, isolated populations are inherently vulnerable to extinction for four main reasons: 1. genetic problems due to loss of genetic variability, inbreeding, loss of heterozygosity, and genetic drift; 2. demographic fluctuations due to random variation in birth and death rates; 3. environmental fluctuation due to variation in predation, competition, disease, and food supply; and 4. natural disturbances that occur at irregular intervals such as drought, fires, and severe storms (citing Primack 1993). The smaller the population size the more likely other threats will drive it to extinction (again citing Primack 1993). The Petition cites Slauson and Zielinski (2009, but based on content appears to be referring to Slauson et al. 2009a), who found that the probability of extinction in their study area was higher than the probability of colonization, and stated that conservation actions were needed immediately to ensure the Humboldt marten's persistence.

2. Other Relevant Scientific Information

The Petition discusses the threat inherently posed to Humboldt marten due to the small, isolated nature of their population. Small population size increases the risk of extirpation through demographic, environmental, and genetic stochastic events (random changes over time), particularly if the population is isolated, and through the deleterious effects associated with low genetic diversity (Traill et al. 2007, Traill et al. 2010). Demographic stochasticity can cause unbalanced age or sex ratios resulting in reduced capacity to breed. Genetic stochasticity can result in the loss of adaptive genes from the population or the proliferation of maladaptive genes. Additionally, small populations are less able to weather and recover from random catastrophic events in the environment. The Petition here uses a Humboldt marten population figure of less than 50 individuals, but elsewhere a figure of less than 100 individuals (see Abundance section above), however the discrepancy is of little import as either figure is well below the population size experts believe to be required to ensure long-term viability of a species (e.g. Traill et al. 2007, Traill et al. 2010, Flather et al. 2011). Regarding the Petitioners' comments about

the minimum population size needed to ensure long-term viability, Flather et al. (2011) noted that generalized minimum population recommendations across taxa are not supported by the historical record. The authors do agree that the population sizes required to sustain individual species over the long term are likely to be in the thousands, not hundreds.

The Petitioners' reference to Slauson et al.'s (2009a) extinction and colonization probabilities requires clarification. Slauson et al. (2009a) were referring to the probability of extinction and colonization at a given sample unit within their study area, not extinction and colonization at the population level.

3. Conclusion

The Petitioners correctly point out the inherent risk of extinction to small isolated populations. This inherent risk can compound the risks of other identified threats in terms of immediacy and degree.

H. Impact of Existing Management Efforts (P. 30)

1. Scientific Information in the Petition

The Petition states that there are no existing species-specific protective measures in place for Humboldt marten. It notes that there is currently a multi-agency Humboldt marten Conservation Group in place.

2. Other Relevant Scientific Information

For a discussion of existing management efforts see the discussion of existing management efforts under "Other Natural Events or Human-related Activities" in the Threats section above.

3. Conclusion

As stated above under "Other Natural Events or Human-related Activities" Humboldt martens are not specifically protected by any existing regulations or management plans, although they likely benefit from protections and management efforts aimed at protecting other resources. In the absence of specific actions to manage, restore, and enhance Humboldt marten habitat, existing management is unlikely to prevent the extinction of this species.

I. Suggestions for Future Management (p. 30)

1. Scientific Information in the Petition

The Petition reproduces the management strategy for Humboldt marten from the USFWS 2010 Humboldt marten Species Assessment (Hamlin et al. 2010):

- Maintain all currently occupied habitat.

- Restore habitat to increase and reconnect suitable habitat patches in the vicinity of the known population (Slauson and Zielinski 2004, p. 63).
- Increase the overall size of suitable patches toward the mean size of 447 ac (181 ha) (Slauson et al. 2007, p. 466).
- Restore functional landscape connectivity to enable recolonization of suitable, but currently unoccupied habitat (Slauson and Zielinski 2003, p. 13) and establish connectivity with habitat corridors between populations.
- Establish high priority restoration areas that enlarge small suitable patches, such as late-successional conifer-dominated stands and serpentine stands with dense shrub cover, so that they exceed the minimum patch size occupied by martens [greater than 205 ac (83 ha)]. This will reconnect suitable patches currently separated by unsuitable habitat.
- Restore or maintain dense, productive shrub layers and reduce road densities in the short-term and accelerate development of late-successional stand conditions, such as large diameter live trees, multilayered canopy, and large snags and logs over the long-term (Slauson et al. 2007, p. 466).
- Develop specific stand recommendations to manage early-seral conifer stands with lower tree densities to encourage maintenance of a productive shrub layer and increase tree growth rates (Slauson 2003, p. 71).
- Protect currently suitable resting and denning structures and plan for the future recruitment of new structures (Slauson and Zielinski 2009, p. 43).
- Establish additional populations within the historical range.

2. Other Relevant Scientific Information

Continued research into the ecology and demography of Humboldt marten is needed to increase the understanding of the species' biology, distribution, vital rates, habitat associations, and the ecology of their predators and prey species. Of particular importance is a better understanding of the relationship between habitat types and demographic rates. Additionally, although there have been extensive surveys for this species in recent years, many areas remain that have not been surveyed, or have not been intensively surveyed. Where the geographic boundary lies between the ranges of Humboldt martens and Sierra martens is currently unknown. Identifying the boundary more precisely would refine future estimates of the extent of available habitat and of population size. It is also important to determine whether Humboldt martens in California and the coastal martens of southern Oregon are members of the same subspecies or separate subspecies in order to more fully understand the potential threats to the species related to small population size and genetic isolation. Finally, the need for and feasibility of facilitated translocations and population augmentations from captive breeding should be studied.

3. Conclusion

The suggested management actions are appropriate for recovering Humboldt marten; however additional research on Humboldt marten genetics, distribution, ecology, and demography is also necessary to plan and implement the recovery of the species, and facilitated translocations and population augmentations should be carefully considered.

J. Detailed Distribution Map

The Petition reproduces figure 8.3 from USFWS (2015) showing the known extant Humboldt marten distribution in California.

IV. Status of the Species

The Humboldt marten population in California likely numbers less than 100 individuals. Although quantitative data is nonexistent, qualitative information suggests they were more common in the state in the early 1900s. The Humboldt marten range in California appears to have declined over the last century as well. The available literature indicates that the species requires specific habitats which are currently limited in distribution and fragmented. Although the degree and immediacy of the factors potentially threatening the persistence of the species are unknown, available information suggests that Humboldt martens may be threatened by historical habitat loss and fragmentation, exposure to toxicants, the effects of climate change, diseases, and the risks inherent to small populations.

Having reviewed and evaluated relevant information, including the material referenced in the Petition and other information in the Department's possession, the Department believes there is sufficient scientific information available at this time to indicate that the petitioned action may be warranted. (See Fish & G. Code, § 2073.5, subd. (a)(2); Cal. Code Regs. tit. 14, § 670.1, subd. (d).)

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