United States Department of the Interior

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In Reply Refer to:
AFWO-14B0051-14F0118

Mr. Brandon Larsen
Senior Environmental Planner, Office of Local Assistance
California Department of Transportation, District 1
Post Office Box 3700
Eureka, California 95502-3700

Subject: Formal Consultation for the Proposed Seismic Retrofit of the Eureka Hill Road Bridge Over the Garcia River in Southwestern Mendocino County, California

Dear Mr. Larsen:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (BO, opinion) based on our review of the proposed seismic retrofit of the Eureka Hill Road Bridge (No. 10C0034) (Project) in Mendocino County, California. You have requested formal consultation for the federally threatened northern spotted owl (*Strix occidentalis caurina*), and the threatened marbled murrelet (*Brachyramphus marmoratus*). You have also requested our concurrence with your determination that the proposed action "… *may affect but is not likely to adversely affect* …" the federally threatened California red-legged frog (*Rana draytonii*). The Project does not overlap, and will not impact, designated critical habitat for any of the three species.

This document was prepared in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. *et seq*.) (Act). Your request for formal consultation was dated April 28, 2014, and received in our office on April 30, 2014. This BO is based on information provided in the April 25, 2014, biological assessment (BA) which was appended to your request for consultation, and on other sources of information contained in our files. A complete decision record of this consultation is on file in the Arcata Fish and Wildlife Office (AFWO).

1.0 BACKGROUND

This action has been proposed jointly by the Mendocino County Department of Transportation (MCDOT) and the California Department of Transportation (CalTrans), and is funded by the Federal Highway Administration of the U.S. Department of Transportation (FHWA). Federal lead agency responsibilities have been assigned to CalTrans under existing FHWA authority (23 CFR 771.109[a-d]). Those responsibilities include compliance with all applicable federal requirements, including those contained in section 7 of the Act (23 CFR 771.133).

1.1 Consultation History

Jan-Apr, 2014 CalTrans, MCDOT, and environmental contractors entered into technical assistance discussion with the Service to resolve various technical issues about the proposed action and to resolve whether to consult at the formal or informal level. A full record of this technical assistance discussion is in an e-mail stream among all parties between January 31 and April 4, 2014. The full e-mail record is shown in Appendix E (“Agency Coordination”) of the April 24, 2014 BA.

April 28, 2014 Arcata Fish and Wildlife Office received a letter from the CalTrans, District 1 Office of Local Assistance requesting formal consultation on the proposed action. Appended to the letter was the April 24, 2014 BA (CalTrans 2014) prepared by LSA Associates, Inc. of Irvine, California, and approved by environmental compliance and planning officials at MCDOT and CalTrans on April 24 and 25, 2014.

2 DESCRIPTION OF THE PROPOSED ACTION

2.1 Location of the Proposed Action

The Eureka Hill Road Bridge (No. 10C0034) (bridge) crosses the Garcia River approximately 5 miles east of the community of Point Arena in southwestern Mendocino County. Under the Public Lands Survey System, the bridge is located within the north half of the southwest quarter of Section 14, in Township 12 North, Range 16 West, Mt. Diablo Baseline and Meridian. On U.S. Geological Survey’s 7.5-minute map series, the project site is found in the southwestern quarter of the “Eureka Hill” quadrangle (Map 1).

2.2 The Proposed Action

The 322-foot bridge consists of four reinforced concrete box girder segments. The bridge superstructure is supported at the eastern and western ends by concrete seat-type abutments, and by three reinforced concrete pier columns, set at the segment joints and spaced 90-feet apart. Beneath the channel bed, each pier column is supported by an approximately 300 square foot concrete foundation. Each pier foundation is currently supported by fifteen driven steel piles in a three-by-five array (Figure 1).

The proposed seismic retrofit will supplement three components of the current bridge structure. Abutments at both ends of the bridge will be supplemented with additional cast pilings and extensions of the existing pile caps and grade beams. Each of the three intermediate pier columns will be clad with a steel column casing. Four additional steel pilings will be driven next to the corners of each column foundation and the foundations will be capped and expanded to about 525 square feet to cover the new pilings. These operations will require some realignment and repaving of the road grade at the eastern and western bridge approaches.

Heavy equipment will have to operate on the riverbed to gain access to abutments and column foundations. This will require construction of a temporary clear water crossing (temporary work pad) on the riverbed. The crossing will be constructed in the following steps. (1) The work area for the temporary pad will be dewatered between 50 feet upstream and 20 feet downstream of the existing bridge and stream flow will be temporarily diverted around the work area until the pad is built. (2) The work pad will consist of corrugated metal pipes embedded in a layer of imported gravel (1-4” diameter) to allow for fish passage and provide a stable grade for heavy equipment operation. (3) Once the pad is constructed, stream flow will be restored to the channel; then the bridge retrofitting work can be initiated. When the bridge retrofit is completed, the work pad will be removed by reversing the steps in the construction process: divert the channel flow, dewater the work site, remove the pad materials, restore the original channel profile and restore channel flow.

To accomplish the bridge retrofitting, two staging areas are designated for the storage of equipment and construction materials. The western staging area, approx. 2.4 acres, is on the north side of Eureka Hill Road and extends roughly from 200 to 700 feet west of the western bridge approach. The eastern staging area, approx. 0.8 acre, is also on the north side of Eureka Hill road and extends roughly from 150 to 300 feet east of the eastern bridge approach.

The project is expected to begin in early-summer 2015 and will be completed in one season (May 15 through October 31). Work within the Garcia River channel will last approximately 4 months, between June 15 and October 15, 2015.

The BA used the California Native Plant Society system (Sawyer and Keeler-Wolf 1995) for classifying current vegetation on the two staging areas. Current vegetation is described as follows: “creeping ryegrass series” on the western staging area; and “redwood series” on the eastern staging area. Our examination of aerial photography and BA Figures 4, 5, and 6 indicates that the reported vegetation on the west and east staging areas are consistent, respectively, with the “pasture” (code PAS) and “redwood” (code RDW) type-descriptions in the California Wildlife Habitat Relations (CWHR) system (Mayer and Laudenslayer, 1988).

2.3 Conservation Measures

2.3.1 Northern Spotted Owl

The six northern spotted owl measures outlined below (NSO-1 through NSO-6) were enumerated in the proposed action and will be implemented by the project proponent. Unless otherwise noted, the text of the measures is taken verbatim from the BA, section 4.2.2.3, pages 27-28. The Service added the alpha-numeric identifiers (NSO-#) for ease of reference.

NSO-1 (as modified by agreement of the Service, CalTrans and MCDOT) – To minimize disturbance during the more critical early part of the northern spotted owl breeding season, work occurring before June 15 will not be located within 330 feet of an active nest site as established through a protocol survey (Service 2012). Protocol surveys will be focused on the task of detecting possible northern spotted owl occupancy and/or nesting activity in the following locations: (a) on suitable and potentially suitable habitats within a 330-foot radius of the center-points of the eastern and western bridge abutments (Service 2006); and (b) within a 330-foot radius of any other point-of-origin for project-generated noise (Service 2006).

NSO-2 - Jackhammers or similar machinery that produces high intensity sounds will only be used for short duration (less than 2 hours total) and will only be operated between the hours of 10:00 AM and 4:00 PM. No blasting will be permitted.

NSO-3 (as modified by agreement of the Service, CalTrans and MCDOT) – If an active northern spotted owl nest is detected at any location described in measure **NSO-1**, all project work will be deferred until the end of the nesting season (September 15) or until a qualified biologist confirms that the young have fledged or are otherwise no longer present.

NSO-4 - No suitable northern spotted owl nest trees will be removed. Tree removal will be limited to the minimum necessary to accomplish bridge rehabilitation, and will include only riparian and understory growth in the immediate vicinity of the bridge. No trees greater than 6 inches dbh will be removed for the project.

NSO-5 - Measures will be implemented to prevent encroachment into adjacent forested areas. All forested lands outside the designated work areas will be designated as environmentally sensitive areas (ESAs) and clearly indicated as such on project construction plans. Project specifications will include a requirement that ESAs are clearly delineated with brightly colored fencing, rope or equivalent prior to beginning construction.

NSO-6 - All work will be performed during daylight hours. No nighttime operations or use of staging lights will be allowed.

2.3.2 Marbled Murrelet

The six marbled murrelet measures outlined below (MM-1 through MM-6) were enumerated in the proposed action and will be implemented by the project proponent. Unless otherwise noted, the text of the measures is taken verbatim from the BA, section 4.2.1.3, pages 25-26. The Service added the alpha-numeric identifiers (MM-#) for ease of reference.

MM-1 (as modified by agreement of the Service, CalTrans and MCDOT) **–** To minimize disturbance during the more critical early part of the marbled murrelet breeding season, work occurring before June 15 will not be located within 330 feet of an active nest site as established through a protocol survey (Mack et al. 2003; as revised by California Department of Fish and Game 2003). Any protocol surveys that are conducted will be focused on the task of detecting possible marbled murrelet occupancy and/or nesting activity in the following locations: (a) on suitable and potentially suitable habitats within a 330-foot radius of the center-points of the eastern and western bridge abutments (Service 2006); and (b) within a 330-foot radius of any other point-of-origin for project-generated noise (Service 2006).

MM-2 – During the marbled murrelet nesting period, March 24 – September 15, all work involving loud equipment (e.g., jackhammers or similar machinery that produces high intensity sounds) will only be used for short duration (less than 2 hours total) and will only be operated between the hours of 10:00 AM and 4:00 PM. No blasting will be permitted.

MM-3 (as modified by agreement of the Service, CalTrans and MCDOT) **–** If marbled murrelet occupancy is detected at any location described in measure **MM-1**, all project work will be deferred until the end of the nesting season (September 15).

MM-4 - No potential marbled murrelet nest trees will be removed. Tree removal will be limited to the minimum necessary to accomplish bridge rehabilitation, and will include only riparian and understory growth in the immediate vicinity of the bridge. No trees greater than 6 inches dbh will be removed for the project.

MM-5 - Measures will be implemented to prevent encroachment into adjacent forested areas. All forested lands outside the designated work areas will be designated as ESAs and clearly indicated as such on project construction plans. Project specifications will include a requirement that ESAs are clearly delineated with brightly colored fencing, rope or equivalent prior to beginning construction.

MM-6 - All work will be performed during daylight hours. No nighttime operations or use of staging lights will be allowed.

2.3.3 California Red-Legged Frog

The first ten California red-legged frog measures outlined below (CRLF-1 through CRLF-10) were enumerated in the proposed action and will be implemented by the project proponent. Unless otherwise noted, the text of the measures is taken verbatim from the BA, section 4.2.3.3, pages 30-32. The Service added the alpha-numeric identifiers (CRLF-#) for quick reference.

CRLF-1 – A qualified biologist (i.e., certified by the Service) will conduct Worker Environmental Awareness Training for the construction workers prior to the start of construction activities. Awareness training will include a brief review of the biology of the California red-legged frog (CRLF) and guidelines that must be followed by all construction personnel to avoid take of CRLF.

CRLF-2 – The qualified biologist will appoint a biological monitor (e.g., the crew foreman) who will be responsible for ensuring that all crewmembers comply with the guidelines. Awareness training will be conducted for new personnel before they can participate in construction activities. The qualified biologist will notify the Resident Engineer who will address any work stoppage, and the Service will be contacted if a CRLS at any life stage (i.e., adults, sub-adults, tadpoles, eggs) is encountered during project activities.

CRLF-3 – Within 24 hours prior to the onset of ground disturbance activities, the qualified biologist will survey the project area for all life stages of the CRLF. Surveys must be conducted immediately prior to ground-disturbing activities to lower the probability of one or more adult or sub-adult frogs moving into or laying eggs within the project area after a survey has already been conducted.

CRLF-4 – If CRLF (including adults, metamorphs, tadpoles, or eggs) are encountered at any time during project activities, construction activities will cease in the area and the Service will be notified to determine how to proceed.

CRLF-5 – Water pumps will be screened with wire mesh screens no larger than 0.2 inch to prevent CRLF tadpoles, sub-adults, and adults from entering the pump system. Although pre-activity surveys may have detected no CRLF, this measure is to ensure that frogs that were missed during the survey are not harmed or killed by water pumps.

CRLF-6 – All food-related trash will be disposed of in closed containers and removed from the project area at least twice per week during the construction period. Food may attract frog predators such as raccoons to the action area.

CRLF-7 - The contractor will implement a toxic materials control and spill response plan. Equipment refueling will only occur at staging areas where fuel will not enter the floodplain.

CRLF-8 – All vegetation removal activities will be done with the use of hand tools only (including chainsaws).

CRLF-9 – The number of access routes, numbers and sizes of staging areas, and the total area of the activity will be limited to the minimum necessary to achieve the project goal. Routes and boundaries will be clearly demarcated.

CRLF-10 – The project site will be revegetated with an assemblage of native riparian, wetland, and upland vegetation suitable for the area. Locally collected plant materials will be used to the extent practicable. Invasive, exotic plants will be controlled to the maximum extent practicable. This measure will be implemented in all areas disturbed by activities associated with the project, unless the Service and the County determine that it is not feasible or practical. Following project completion, all fill slopes, temporary impact and/or otherwise disturbed areas will be restored to preconstruction contours (if necessary) and revegetated with a native seed mix specified in (Table 4 of the BA). Invasive exotic plants will also be controlled to the maximum extent practicable.

CRLF-11 (Service-initiated measure, agreed to by CalTrans and MCDOT) **–** If a rain event (>= 0.1 inch) occurs during the construction period, all construction-related activities will cease for a period of 24 hours after the rain stops. Prior to resuming construction activity, trained construction crew members will examine the site for the presence of CRLF. The examination should include all stacked or stockpiled construction materials, underneath parked construction machinery, within concrete forms that have not yet been poured, and along any silt fences. If no CRLF are found, construction activity may resume immediately. If any CRLF is detected, the designated biological monitor (e.g., crew foreman) will contact the Arcata Fish and Wildlife Office (contact biologist John Peters) or the California Department of Fish and Wildlife (Fort Bragg office) to determine what course of action to take before resuming work.

2.4 Definition of the Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action, including interrelated and interdependent actions, and not merely the immediate area involved in the action (50 CFR 402.02). The Service adopts the two-step process used by CalTrans in their 2014 BA (pages 15-33) to delineate areas potentially affected by the proposed action.

First, the proponent mapped an 18.6-acre Biological Study Area (BSA) (see BA, Figure 4, Figure 6, and Table 3) that is intended to encompass all potential direct effects of project implementation on all species. The BSA includes the following: the existing Eureka Hill Road right-of-way including the two bridge approaches; the bridge deck; the Garcia River channel bed where the clear water crossing would be installed; and the two staging areas for equipment and materials located along the eastern and western bridge approaches (Maps 2 and 3).

The BA defined Cumulative Effects Evaluation Areas (CEEA) in addition to the BSA. The CEEAs are defined differently for individual species or species groups. For the northern spotted owl and marbled murrelet, the CEEA is defined as a one-mile-wide band that encloses the BSA on all sides. The BA does not include a map of the avian CEEA. Based on the BA definition, we estimate the CEEA to be approximately 3,130 acres, and the total action area for the two avian species, including the BSA and the CEEA, to be approximately 3,150 acres.

For the California red-legged frog, the BA defines the CEEA as two one-mile segments of the Garcia River channel, one upstream and one downstream of the Eureka Hill Road bridge. The BA did not include a map or an estimate of the surface area of this CEEA and we noted differences in channel morphology between the upstream and downstream 1-mile river segments so we addressed each segment separately. For purposes of this opinion, we define the CEEA as including the entire bankfull channel width plus a 10-foot wide band of riparian vegetation adjacent to each channel bank. We define the surface area of the CEEA as the average photo-measured mean bankfull channel width, multiplied by the sum of the two 10-foot wide riparian zones on each bank, multiplied by the two 1-mile channel segment lengths described in the BA. The resulting estimate of CEEA area is 21.6 acres for the upstream 1-mile river segment and 15.8 acres for the downstream segment, for a total of 37.4 acres. The total action area for the California red-legged frog, including BSA and CEEA, is 56.0 acres. All estimates are approximate.

3.0 STATUS OF THE SPECIES

Appendix A contains the status of the species discussions for the northern spotted owl, the marbled murrelet, and the California red-legged frog. The Appendix provides detailed descriptions of each species and threats to their continued existence within their historic ranges. For this consultation, the Service has considered all information provided in Appendix A in its assessment of the effects of the project.

4.0 ENVIRONMENTAL BASELINE

The environmental baseline is defined as "the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation in process [50 CFR 402.02].

4.1 Previous and Ongoing Federal Actions

The site of the proposed action and the action area do not encompass or overlap the action areas for any other current or previous Federal actions. We are aware of one pending Federal action in the general vicinity of the action area for this proposed action, but there is no likely overlap between the two action areas. Approximately one half-mile south and one mile east of the project site is the northerly boundary of Mendocino Redwood Company's (MRC) 15,684-acre Garcia River Tract (MRC 2012). MRC is currently negotiating with the Service on a proposed Habitat Conservation Plan (HCP) which includes the Garcia River Tract. Prior to final approval by the Service, the terms of the HCP will be subject to internal section 7 consultation. It is possible that the action area boundary for the pending MRC section 7 review will overlap the action area for the Eureka Hill Road bridge. If the action areas do overlap, the cumulative effects of this proposed action and the pending MRC action will have to be evaluated in the pending MRC section 7 review.

4.2 Environmental Setting

Within and adjacent the action area, the Garcia River channel exhibits two distinct and alternating morphologies: (1) steeply incised canyon terrain with a narrow, confined channel; and (2) a broad, open canyon floor with a wide braided channel combined with river terrace and floodplain features. Away from the channel and floodplain areas, the canyon slopes are moderately-steep to very steep. The land ownership pattern within the action area consists of small owners of dispersed residences, ranches and farmsteads. The land use pattern consists of residential, agricultural, or mixed agriculture and forestry usage. Agricultural use is confined to the floodplain and terrace areas around the river channel, which are all under pasture or hay cultivation. Residential use is also found mostly around the river terraces, but some structures are distributed in forested areas on lower slopes near the river. Upslope, the land is almost entirely under contiguous redwood and mixed-conifer forest cover. Stands are predominantly managed young growth with larger and older residual trees interspersed singly or in small groups. Outside the action area to the north and south are two large forest landowners, one industrial and the other a non-profit entity. Approximately one-half mile south and one mile east of the project site is the northerly boundary of MRC's Garcia River Tract, mentioned above. Less than 1.5 miles north of the action area is the southwestern boundary of the 23,780-acre Garcia River Forest, a non-profit working forest owned by The Conservation Fund (TCF) with a conservation easement held by The Nature Conservancy. At the western end of the Garcia River Forest, nearest the action area, TCF has designated the (approximately) 1,652-acre Olson Gulch tract as an ecological reserve area (The Conservation Fund 2006).

4.3 Status of the Species within the Action Area

4.3.1 Northern Spotted Owl

The northern spotted owl activity site that is nearest to the action area is MEN0208 (Map 4). From the western bridge abutment, the center of the activity site is located almost due south (bearing approximately 185 degrees) at a distance of approximately 1,950 feet (0.37 mile). Over the 24-year period from 1990 to 2013, this activity site has been surveyed in 17 years, with a total of 72 field visits. No surveys were conducted in 1991, 1994, 1995, 1998, 2008, 2009, and 2012.

The five most recent surveys were done in 2006, 2007, 2010, 2011 and 2013. No owls were detected in 2006, 2007 and 2013. In 2010, individual owls of unknown age and pair status were detected three times; two were males and one was of unknown sex. In 4 field visits in the 2011 survey year, 3 individual owls of unknown age and pair status were detected (1 male, 1 female, 1 unknown sex), and a male and female were observed together exhibiting apparent pair behavior, but no nest site was detected. Full results for the 1990-2013 survey years are summarized below.

- No owls were detected in 14 of 17 survey years and in 53 of 72 field visits.
- Individual females of unknown age and pair status were detected in 4 of 17 survey years and in 5 of 72 field visits.
- Individual males of unknown age and pair status were detected in 6 of 17 survey years and in 7 of 72 field visits.
- Individual owls of unknown age, sex and pair status were detected in 3 of 17 survey years and in 4 of 72 field visits.

- A male and female owl were observed together in 2 of 17 survey years (1990 and 1992) and in 2 of 72 field visits; but no evidence of pair behavior or nesting was reported.

- A male and female owl exhibited pair behavior in 1 of 17 survey years (2011) and in 1 of 72 field visits; a nest site was not found. The location of this pair observation is the current map point used to designate the center of the activity site.

4.3.2 Marbled Murrelet

The project proponent did not conduct protocol surveys for marbled murrelets in connection with this proposed action. We examined the California Natural Diversity Database (CNDDB) over the entire Garcia River watershed and found no map points or survey records. The other source of terrestrial survey and habitat suitability information is MRC (2012). The remaining source of information about murrelets in the area is the offshore population survey data (Raphael et al. 2007; Falxa et al. 2013; Falxa et al. 2014) which is relatively abundant and can be reasonably applied to the site of the proposed action.

4.3.2.1 Terrestrial Habitat Mapping, and Terrestrial Surveys

There are few terrestrial breeding season records for marbled murrelets in Mendocino County (Paton and Ralph 1990; Service 1995). Most extant records come from MRC (2012) which owns land approximately 0.5 mile south and 1 mile east of the project site (Map 5). MRC has identified and mapped “potential habitat” in an unnamed tributary of the Garcia River, about 1.5 miles northeast of the project site (Map 5). MRC has also identified and mapped “potential habitat trees” east of the Garcia River between Lee Creek and Rolling Brook, 0.75 to 1.5 miles southeast of the project site (Map 5). The company conducted two radar surveys in 2008 in the North Fork Garcia River, 2-3 miles northeast of the project site (MRC 2012). Each radar survey yielded 3 apparent murrelet detections, but a ground observer was not present to replicate the observations and evaluate for “false-positive” radar detections. MRC (2012) has documented two other areas of concentrated murrelet terrestrial activity in the general vicinity of the proposed action: (1) Lower Alder Creek, 2-3 miles northeast of the Community of Manchester and 6-7 miles northwest of the project site; and (2) near the community of Annapolis, in the Gualala River watershed (Sonoma County) about 8-10 miles southeast of the community of Gualala and 29-31 miles southeast of the project site.

4.3.2.2 Offshore Population Surveys

Breeding adult murrelets are recruited from a very small offshore population along the Mendocino County coastline. Population trend estimates are based on offshore observations during the non-breeding season. For purposes of population monitoring, the offshore area near the mouth of the Garcia River is within Conservation Zone 5, which is a 199-mile section of near-shore waters bounded on the north by the Humboldt-Mendocino county line and on the south by the entrance of San Francisco bay (Raphael et al. 2007), and encompassing the Pacific shoreline of Mendocino, Sonoma and Marin counties. Zone 5 consistently supports the smallest population and lowest bird density among the five Conservation Zones that are monitored under the Northwest Forest Plan (Falxa et al. 2014). Since offshore monitoring began in 2000, the mean population in Zone 5 has fluctuated on a 2-to-4-year cycle within lower and upper averages of 48 to 289 individual birds (Falxa et al. 2014). The most recent (2013) population estimate for Zone 5 is 75 birds with a 95% confidence interval of 0-134 birds (Falxa et al. 2014). For the entire 199-mile length of Conservation Zone 5, the upper limit of the confidence interval (134 birds) represents less than one bird per linear mile of coastline. Offshore density in Zone 5 exhibits a similar 2-to-4-year cycle with lower and upper bounds of 0.02 and 0.13 birds per square mile of ocean surface. The most recent density estimate (2013) is 0.03 birds per square mile (Falxa et al. 2014). For comparison, the next-to-smallest population is found in Zone 2, the western shore of the Olympic Peninsula, Washington. The apparently declining population in Zone 2 ranges from a high of 3,314 birds (2003 data) to a low of 1,189 birds (2011 data), with densities ranging from 0.78 to 0.28 birds per square mile in the same years (Falxa et al. 2014). For the entire monitoring history (2000-2013 data), the highest mean population observed in Zone 5 is less than one-quarter of the lowest population observed in Zone 2; and the highest mean density in Zone 5 is less than half the lowest mean density observed in Zone 2.

Each Conservation Zone is subdivided into Primary Sampling Units (PSUs) for offshore population surveys, with a standard length (north-to-south) of 12.43 miles (20 kilometers) and variable width (east-west) (Raphael et al. 2007). The PSU offshore of the mouth of the Garcia River (GPSU) is the principle source-population for breeding adult marbled murrelets throughout the 144 square mile Garcia River watershed. The adjacent PSUs to the north and south of the GPSU have a record of very low bird populations and are, at most, minor contributors to the Garcia River onshore breeding population. The GPSU is 20.46 square miles in area (Raphael et al. 2007) and the most recent reported murrelet density is 2.59 to 7.77 birds per square mile of ocean surface (Falxa et al. 2013; 2011 survey data). This translates to a population range of 53-159 birds (area-x-density). Note that the 2011 survey data represents the second-most productive survey year reported in Zone 5 since surveys began in 2000 (Falxa et al. 2014).

Using the age class ratios and juvenile survival rates proposed in Beissinger and Peery (2007), we deduced a breeding-age (>= 3 years) population of 48-145 birds in the GPSU. To account for the smaller portion of the adult population that actually participates in breeding, we used the ratios (11-50%) in Peery et al. (2004) to yield an average net breeding adult population of 5-72 birds, or 3-36 pairs. Accounting for fluctuating offshore food availability and limitations on inland habitat availability (Peery et al. 2004) we believe the more plausible year-to-year average is 8-12 breeding pairs. When distributed over the entire 144 square mile Garcia River watershed during nesting season, this would equate to 12-18 square miles per breeding pair. Note again that this estimate is based on offshore bird densities reported in the very productive 2011 survey year.

4.3.3 California Red-Legged Frog

The project proponent conducted a “walkthrough” survey of the project site which included searches for individual adult California red-legged frogs, and for potential breeding habitat; searches were negative for individuals and potential habitat. We examined the California Natural Diversity Database (CNDDB) over the entire Garcia River watershed for survey map points and survey records. We found records of red-legged frog survey activity near the community of Manchester and State Route 1, approximately 8 miles northwest of the action area, but no records elsewhere within the watershed.

4.4 Status of Critical Habitat

The site of the proposed action and the action area do not encompass or overlap any designated critical habitat for the northern spotted owl, the marbled murrelet, or the California red-legged frog.

5.0 EFFECTS OF THE PROPOSED ACTION

5.1 Scientific Basis for Evaluating Potential Effects on the Northern Spotted Owl, the Marbled Murrelet, and the California Red-Legged Frog

The implementing regulations for section 7 of the Act define “effects of the action” as the “direct and indirect effects of an action on the species together with the effects of other activities that are interrelated or interdependent with that action, which will be added to the environmental baseline” (50 CFR 402.02). Indirect effects are caused by, or result from, the agency action and occur later in time, but are reasonably certain to occur. Indirect effects may occur outside of the immediate footprint of the project area, but would occur within the action area (50 CFR 402.02). Potential effects from an agency action to the three species evaluated in this opinion can occur through various pathways including the following: disruption of essential life functions through noise or visual disturbance; injury or fatality of individuals; or modification of habitat. The scientific basis and background for these effects are discussed, by species, in the three following subsections.

5.2 Northern Spotted Owl

5.2.1 Potential Direct Effects to the Northern Spotted Owl

Noise and Visual Disturbance, and Direct Injury or Fatality of Individual Animals

Disturbance refers to any human-caused perturbation of owls in their habitats, by noise or visual contact, which has the potential to adversely impact owl survivorship and reproduction. Human-caused disturbances can negatively impact northern spotted owls and the impacts can be expressed in a number of ways including, but not restricted to: physiological stress responses; repressed foraging activity, repressed food uptake; elevated risk of predation; and interference with breeding and rearing behavior.

Northern spotted owls may respond physiologically to a disturbance with or without exhibiting a visible behavioral reaction. In response to environmental stressors, vertebrates secrete stress hormones called corticosteroids (CSs) (Campbell 1990). In avian species, CS secretion is a primary physiological response that precedes visible behavioral reactions to stress (Carsia and Harvey 2000). The quantity of CS hormones in mammalian and avian feces can be used as a measure of physiological stress. Field collections of feces can be timed to coincide with periods of disturbance and non-disturbance to test possible associations (Wasser et al. 1997). Although these hormones are essential for survival, extended periods with elevated stress hormone levels may have negative effects on reproductive function, disease resistance, or physical condition (Carsia and Harvey 2000; Sapolsky et al. 2000).

Recent studies of fecal CS levels in the closely related California spotted owl (*Strix occidentalis occidentalis*) indicate that low intensity noise of short duration and minimal repetition does not elicit a physiological stress response (Tempel and Gutierrez 2003; Temple and Gutierrez 2004). However, prolonged and repetitious activities such as timber harvesting, construction operations or road use may increase fecal CS levels depending on their proximity to spotted owl core areas (Wasser et al. 1997; Tempel and Gutierrez 2004). Wasser et al. (1997) examined fecal CS responses to disturbance events in captive and wild northern spotted owls in Washington, USA. Responses in the wild differed with the proximity of the core area of the home range to the disturbance, and with the quantity of the disturbance events. Adult males exhibited heightened sensitivity to disturbance throughout the breeding season, but adult females showed heightened sensitivity only during the juvenile fledging period. The authors note that this sex-based response pattern has been observed in numerous avian species.

We have found no field studies on the visible behavioral responses of northern spotted owls to disturbance. One field study of recreational use in proximity to the closely related Mexican spotted owl (*Strix occidentalis lucida*) found that adult owls would vacate otherwise suitable habitats that were adjacent to frequently used hiking trails (Swarthout and Steidl 2001). Another study on the Mexican spotted owl (Delaney et al. 1999) reported that helicopter overflights reduced prey delivery rates to nests. Additional effects of disturbance reported for other raptors include altered selection of foraging sites (McGarigal et al. 1991), increased rates of nest flushing accompanied by reduced nest attendance by adults (Anderson et al. 1989; White and Thurow 1985), and reduced reproductive success (White and Thurow 1985).

The effect of noise on birds is extremely difficult to determine due to the inability of most studies to control for or quantify one or more of the following variables: (1) timing of the disturbance in relation to nesting chronology; (2) type, frequency, and proximity of human disturbance; (3) clutch size; (4) health of individual birds; (5) available food supply; and (6) the outcome of previous interactions between birds and humans (Knight and Skagan 1988). Additional factors that confound the issue of noise disturbance include variance in noise tolerance (i.e., differences among bird species and among individual birds of the same species), ambient sound levels, physical parameters of sound, and the various ways that sounds interact with terrain and vegetation.

Habitat Modification

Any ground disturbing activity that removes vegetation, or modifies vegetative structure or composition, has the potential to alter habitat characteristics and reduce the quality or change the function of suitable habitat for the northern spotted owl (see sections 4.2.3.2 – 4.2.3.4 for explanation of suitable habitat). We use the following categories to describe the degree of change in habitat function.

> *Remove* – complete loss of habitat function following an action (e.g., an area that functioned as foraging habitat for northern spotted owls pre-action does not provide this habitat function post-action).
> *Downgrade* – pre-action habitat is downgraded to the next lower habitat function post-action (e.g., an area that functioned as nesting/roosting habitat before the action functions only as foraging habitat after the action).
> *Maintain* – pre-action habitat function is retained post-action and is still available for use by northern spotted owls (e.g., an area that functioned as nesting/roosting habitat before the action continues to function as such after the action). Habitat in the "maintained" category can then be further divided into subcategories based on the direction and degree of project impacts on habitat quality.
>
> > *Degrade* – Pre-action habitat function is maintained after the action, but pre-action habitat quality is diminished by the action. (Note the distinction between habitat function and habitat quality. The term "degrade" only indicates that

habitat quality is lessened, but the habitat function remains intact after the action. Post-action, any previously suitable foraging habitat would remain suitable for foraging and any previously suitable nesting/roosting habitat would remain suitable for nesting and/or roosting. The term "degrade" does not equate to the "removal" or "downgrading" of habitat.)

Unchanged – Pre-action habitat function is maintained after the action, and pre-action habitat quality remains unchanged after the action.

Improved – Pre-action habitat function is maintained after the action, but post-action habitat quality exceeds that from pre-action.

Landscape-level changes in habitat availability, distribution and configuration have implications for the fitness (i.e., survivorship and reproduction) of individual northern spotted owls and for the viability of owl populations. Outcomes for individual owls and populations depend on (1) the scale and intensity of land management treatments; (2) the juxtaposition of those treatments relative to the location and abundance of suitable habitats; and (3) the current levels of owl occupancy and usage of those habitats.

For example, removal, downgrading, or degradation of habitat within home ranges, and especially close to the nest site, can be expected to have negative effects on northern spotted owls. Bart (1995) reported a linear reduction in northern spotted owl survivorship and breeding productivity as the amount of suitable habitat within a home range declined. In addition, many researchers have stressed the importance of habitat availability within the core area (i.e., high use area) around the nest site (Bingham and Noon 1997; Franklin et al. 2000; Hunter et al. 1995; Meyer et al. 1998; Zabel et al. 2003). These studies suggest that habitat changes within these home ranges and core areas could have disproportionate effects on individual northern spotted owls.

Instances of habitat degradation (i.e., function is maintained but habitat quality is diminished) often leads to shorter term impacts on key habitat components, such as the reduction in the habitat of a key prey species or an alteration in the microclimate properties of a stand. These activities can lead to adverse effects to northern spotted owls, especially when occurring at a large scale (i.e., a large proportion of a home range or a large proportion of an action area) or in important habitat areas.

Potential Effects of Habitat Modification on the Northern Spotted Owl Prey Base

Throughout the coastal and coastal-interior portions of the range of the northern spotted owl (i.e., west of Interstate 5) in Washington, Oregon and California, two principle prey species make up the dominant shares of the owl's diet: the northern flying squirrel (*Glaucomys sabrinus*) and the dusky-footed woodrat (*Neotoma fuscipes*). In all locations, one species, or both species combined, account(s) for 65 percent or more of the owl's dietary biomass (sources reviewed in detail below).

The flying squirrel is typically found in conifer stands of moderate density (40-70 percent canopy closure) and of the small-sawtimber size class or larger (>= 11.0 inches quadratic mean diameter, QMD, at breast height). The suitability of flying squirrel habitat can be affected by alterations in stand structure through thinnings or partial cuttings. The availability of flying squirrel habitat over the long term is open-ended because land managers have the option to retain suitable stands for long periods of time, or to harvest and replace them at will. Rangewide, the removal of riparian trees, mid-story trees, and understory trees in structurally suitable flying squirrel habitat (such as the 0.8-acre staging area in the proposed action), has the potential to simplify stand structure and to negatively affect the abundance of flying squirrels. This "thinning" effect has been reported in several studies on spotted owl foraging habitats in Oregon, Washington and British Columbia, and has been reviewed by Holloway and Smith (2011). Wilson and Forsman (2013) have modeled this effect and concluded that simplified stand structures exposed resident flying squirrels to heightened predation risk and local extirpation by spotted owls.

However, in northwestern California, the northern flying squirrel is a secondary prey species of northern spotted owls, with diminishing importance on a north-to-south gradient. We reviewed northern spotted owl diet-composition studies (i.e., proportions of various prey species by numbers and biomass) with emphasis on coastal and coastal-interior areas between Coos County, Oregon and Marin County, California. In a study area around Coos County, Oregon (Forsman et al. 2004), flying squirrel biomass was about 38% of the spotted owl diet. But flying squirrel dietary biomass declines consistently on a southward gradient and effectively disappears in Mendocino County and points south (Schmidt 2005; Green Diamond Resources Company 2010; White 1998; Ward et al. 1998; Wildland Resource Managers 1996; Pious and Ambrose 1994; Barrows 1987). In coastal California, the southern range limit of the northern flying squirrel is near Point Arena and at the same latitude as the action area (Jameson and Peeters 2004; Smithsonian Institution Online undated), which indicates that flying squirrels are rare or absent in the action area.

The woodrat is found almost exclusively in conifer-hardwood or conifer-shrub stands of high density (>= 70%) and of the sapling-pole size class (5-7" QMD) and containing very dense hardwood or shrub mid-story and understory cover. In a study of owl habitat utilization patterns in coastal and interior northwestern California (Irwin et al. 2013), the sapling-pole size class is also encompassed within a stand basal area range of 40-80 square feet per acre. In the redwood region, the sapling-pole size class generally emerges after a roughly 5-year time-lag that follows a clearcutting or other stand replacement event, and persists until the dense hardwood-shrub understory is repressed by over-topping conifer cover which occurs about 20 years after the stand replacement event. Thus, the sapling-pole stage in redwood forests has a lifespan of about 15 years until it "ages-out" and becomes rapidly less suitable as woodrat habitat (Hamm 1995; Hamm and Diller 2009; Green Diamond Resources Company 2010). The suitability of woodrat habitat is difficult or prohibitively expensive to modify through management activity because it is a small size class that is commercially unavailable for harvesting. The availability of woodrat habitat is regulated by two factors: (a) the frequency and amounts of stand replacement events (harvesting or fire) which generate sapling-pole conditions on a roughly 5-year time-lag in redwood forests; and (b) the rate of "aging-out" of the sapling-pole condition at about 20 years post-disturbance.

In our review of dietary biomass studies, we found an opposite trend for the woodrat. In the Coos County study area the woodrat biomass was at near-parity with flying squirrel, 38 percent each (Forsman et al. 2004). But in study areas to the south, the woodrat biomass increases rapidly, averaging more than 70% of the owl diet with a range of 50-85% (Schmidt 2005; Green Diamond Resources Company 2010; White 1998; Ward et al. 1998; Wildland Resource Managers 1996; Pious and Ambrose 1994; Barrows 1987). In the southern portion of the northern spotted owls' range, the northern flying squirrel is effectively displaced by the dusky-footed woodrat in the owl diet.

5.2.2 Service's Assessment of Potential Direct Effects to the Northern Spotted Owl

Noise and Visual Disturbance, and Direct Injury or Fatality of Individual Animals

When noise or visual disturbances occur during the breeding season, nestlings are exposed to several potential hazards: poor nutrition arising from reduced prey delivery by parental adults; starvation if parental adults abandon the nest prior to fledging; or elevated predation risk if human presence attracts nest predators.

The nearest northern spotted owl activity site is MEN0208; the mapped center of the site is on an approximate compass bearing of 185 degrees and about 1,950 feet distant from the western bridge abutment. For the 24-year period, 1990 to 2013, MEN0208 has been surveyed in 17 years with 72 total field visits. Male and female owls have been observed together on the site in three survey years (1990, 1992, and 2011) and pair behavior was only observed in 2011. There have been no observations of a nest or nest activity on the site in any survey visit. Currently the center of the activity site is mapped at the location where pair behavior was observed in 2011. The project proponent (BA Appendix E) made a site-specific estimate of the threshold distance for noise disturbance on this project based on an average daytime ambient noise level of 77.9 decibels at 50 feet (dB50) from the road centerline, and a maximum noise output from construction machinery of 91-100 dB50. Using Table 1 in the Service's (2006) guidance, the threshold distance for noise disturbance, is approximately 330 feet; roughly one-sixth the distance between the north bridge abutment and the mapped center of MEN0208. If nesting were to occur at that mapped location during the proposed 2015 work period, the noise from the construction activity would have no disruptive effect on nesting.

However, MEN0208 has a sparse record of owl sightings and no observations of nesting. If owls were to nest on this site, there is no guarantee that the nest would be located at the mapped center of the site, about 1,950 feet south of the western bridge abutment. Any nest location would have to be determined through protocol field surveys that are coordinated with the proposed construction activity. For purposes of this proposed action, the 2015 empirical survey data and the professional interpretation of the data only needs to establish whether nesting activity is occurring within 330 feet (threshold distance) of the nearest point of origin for project-generated noise. Conservation measure NSO-3 will require protocol surveys to detect any owl occupancy or breeding activity near the construction site. This measure also requires that construction activity be deferred until the end of the nesting season (September 15) if an active nest is discovered within the threshold distance of the project site. Conservation measures NSO-2, NSO-5 and NSO-6 address the eventuality that nesting occurs in the area but is not detected in protocol surveys; in other words, some level of protection from noise disturbance is in effect whether or not a nest is detected. Measure NSO-2 limits operations that involve high-intensity noise to less than 2 hours in duration, and all construction activity must be conducted between the hours of 10:00 AM and 4:00 PM. Measure NSO-6 limits all operations to daylight hours and prohibits night operations and artificial lighting. Measure NSO-5 prohibits any encroachment of equipment and operations into adjacent forested areas other than those already identified as subject to direct effects; i.e., the area described as the Biological Study Area in the description of the proposed action in section 2 of this document.

Conservation measure NSO-4 requires that no trees greater than 6” diameter breast height will be removed in the staging area in the redwood stand near the eastern bridge approach. This measure will preclude any loss of potential nest trees in the proposed staging area in the 0.8-acre redwood stand north of the eastern bridge abutment. However, in the discussion below on habitat modification, we indicate that this particular redwood stand does not meet minimum criteria for nesting/roosting habitat.

Based on implementation of the preceding northern spotted owl conservation measures, we find that there is little or no likelihood that the proposed action will cause any direct disruption of an active nest site through noise or visual disturbance, or direct physical harm to northern spotted owl nestlings through vegetation removals around a nest site.

Service’s Assessment of the Direct Effects of Habitat Modification

The proposed action includes the use of a 0.8-acre stand of young redwoods as a staging area for construction equipment and materials. This redwood stand is located north of and adjacent the eastern bridge approach; and east of and adjacent the strip of riparian vegetation on the east bank of the Garcia River. The project proponents characterize this redwood stand as potentially suitable breeding habitat for marbled murrelets (BA page 24), but they do not characterize habitat function for the northern spotted owl (BA page 27). We made our own assessment of the suitability of this stand by reviewing the oblique photograph in the BA (Figure 2 in this document; also Figure 5, sheet 2 in the BA) and by using aerial photography to make comparisons of the individual tree crown dimensions with nearby objects in the photo having a known scale. Our conclusion is that this stand is consistent with a California Wildlife Habitat Relationships system (CWHR) (Mayer and Laudenslayer 1988) typing of "Rw3M" and/or "Rw3D" (i.e., a redwood stand of size class 3, having a mean diameter breast-height of 11-24"; and a density class of "medium" or "dense", with canopy closure greater than 40 percent). This typology is consistent with the Service's (2011a) definition of northern spotted owl foraging habitat (i.e., mean diameter greater than 11" and canopy closure greater than 40 percent); this also precludes any potential suitability for marbled murrelet nesting. The proponent's conservation measure NSO-4, which applies directly to this redwood stand, states that any tree cutting will be restricted to "… riparian and understory growth in the immediate vicinity of the bridge. No trees greater than 6 inches dbh will be removed for the project."

Based on the information presented above, as it applies to the proposed 0.8-acre equipment-material staging area in the redwood stand, we conclude that the proposed action will "Maintain" the pre-action habitat function (foraging); and that the quality of the habitat will remain "Unchanged" following the action. This conclusion is more fully justified when we assess the potential effects of the action on the northern spotted owl prey base in the following section. This redwood stand is the only upland site within the action area where vegetation modification is proposed.

Service's Assessment of the Direct Effects of Habitat Modification on the Owl Prey Base

With regard to the proposed 0.8-acre equipment-material staging area in the redwood stand, we conclude that the proposed action will have no effect on the availability, functionality, or quality of sapling-pole-aged habitat that supports the dusky-footed woodrat. The proposed activity does not (a) create future suitable habitat through stand replacement disturbance; (b) remove existing suitable sapling-pole stands; and (c) does not influence the rate at which existing sapling-pole stands become unsuitable with advancing age.

We also noted a potential adverse effect of mid-story and understory tree removals on the northern flying squirrel prey base. For two major reasons we do not believe that this potential adverse effect will materialize in the action area. First, in coastal California, the mapped southern range limit of the northern flying squirrel is near the community of Point Arena (Jameson and Peeters 2004; Smithsonian Institution Online undated), which indicates that flying squirrels are probably rare or absent in the action area. Second, throughout northwestern California, the northern flying squirrel is a secondary prey species of northern spotted owls, with diminishing importance on a north-to-south gradient. In the southern portion of the northern spotted owls' range the northern flying squirrel is effectively displaced by the dusky-footed woodrat in the owl diet.

Previously we concluded that the proposed action will "Maintain" the pre-action habitat function (foraging), and that foraging habitat quality will remain "Unchanged" following the action. This conclusion is justified in the previous discussions of both major prey species (northern flying squirrel and dusky-footed woodrat). The major points in those discussions are:

- The modification of stand structure in the proposed 0.8-acre staging area will not influence sapling-pole stand development patterns and will have no effect on the availability, functionality or quality of woodrat habitat.

- The modifications of stand structure in the proposed 0.8-acre staging area would have no effect on the functionality or quality of northern flying squirrel habitat. Our review of flying squirrel range limits and declining prevalence in the owl diet indicates that this prey species is either rare or absent in the action area, and is uncommon or absent in the northern spotted owl diet. The "thinning effect" reviewed by Holloway and Smith (2011) would not apply in the action area if the affected prey species is not present.

5.2.3 Potential Indirect Effects to the Northern Spotted Owl

With regard to the northern spotted owl, the Service has not identified any potential impacts in this proposed action that meet Service criteria (50 CFR 402.02) for an indirect effect. Those criteria are: (a) the effect occurs within the action area; (b) the effect is caused by the proposed action but appears later in time; and (c) the effect is reasonably certain to occur.

5.2.4 Summary of Direct and Indirect Effects to the Northern Spotted Owl

There is a potential for noise disturbance to breeding northern spotted owls, but that potential exists because of uncertainty about potential future pair activity on HUM0208, which has a sparse history of owl detections. A nest site location has never been established through surveys. Nest activity could potentially appear in an unexpected location, near enough to the project site that breeding adults and/or nestlings are exposed to noise or visual disturbance. Conservation measure NSO-3 requires protocol surveys prior to and during proposed operations to detect any owl occupancy or breeding activity near the site. Construction activity will be deferred until the end of the nesting season (September 15) if an active nest is discovered within the threshold-distance (330 feet) of any project-generated noise source. The most likely place that noise disturbance could occur is south of Eureka Hill Road and within 330 feet of the center of the western bridge abutment. Conservation measures NSO-2, NSO-5 and NSO-5 provide additional protections in case nesting occurs in the area but is not detected in protocol surveys. Measure NSO-2 limits the duration of high-intensity noise to less than 2 hours; and limits operations to the period between 10:00 AM and 4:00 PM. Measure NSO-6 prohibits night operations and artificial lighting. Measure NSO-5 prohibits any encroachment of equipment and operations into adjacent forested areas other than those already identified as subject to direct effects; i.e., the area described as the Biological Study Area in the description of the proposed action in section 2 of this document. The project may involve some limited modification of vegetation within the proposed 0.8-acre equipment-material staging area in the redwood stand north of the eastern bridge abutment. Conservation measure NSO-4 requires that tree removals will be restricted to "… riparian and understory growth … ", and to trees less than or equal to 6 inches diameter breast height. We have concluded that this stand meets Service criteria for foraging habitat. We also conclude that the proposed action will "Maintain" the pre-action habitat function (foraging); and that the quality of the habitat will remain "Unchanged" following the action. We did not identify any potential indirect effects.

5.2.5 Consistency with the 2011 Recovery Plan

Appendix B of the Recovery Plan (Service 2011b) identifies six threat categories: (a) competition from barred owls; (b) the historical and recent loss of habitat due to timber harvesting; (c) ongoing habitat loss due to fire; (d) disease, West Nile virus; (e) loss of genetic variation; and (f) inadequate State and Federal regulatory mechanisms. The Service has determined that the proposed action does not influence or contribute to any of the six threat categories. The proposed action is not a land management activity and has negligible and incidental effects on suitable northern spotted owl habitat; therefore, the action is not designed to address Recovery Action 10 (conservation of high value habitat to provide additional demographic support) and Recovery Action 32 (maintenance and restoration of stands containing high-quality spotted owl habitat).

5.3 Marbled Murrelet

5.3.1 Potential Direct Effects to the Marbled Murrelet

Noise and Visual Disturbance, and Direct Injury or Fatality to Individual Animals

Physiological and behavioral responses to noise and other environmental stressors in marbled murrelets are likely to have much in common with the responses we discussed for northern spotted owls above in 5.2.1. Corticosteroid secretion is a common physiological response among vertebrates (Campbell 1990) and is a precursor to behavioral responses (Carsia and Harvey 2000). When we discussed potential behavioral responses of northern spotted owls, we relied on studies of raptor species or other closely related owl species. But behavioral stress responses have been studied in many avian taxa. Pacific brant (*Branta bernicala nigricans*) in a coastal Alaska lagoon exhibited “alert” or “flight” responses in, respectively, 67 and 49 percent of instances where they were exposed to intrusive noise or visual contacts with humans, in the form of aircraft overflights, approaches by boats, onshore hunters and predators (Ward et al. 1994). Delaney et al. (2000) found that frequency and intensity of behavioral stress responses in red-cockaded woodpeckers (*Picoides borealis*) was inversely related to the distance from a military automatic weapons firing range. Several authors have observed differences in height or elevation selection for nest locations between birds (seabirds, storks, corvids) that were exposed and unexposed to humans (Stoner 1937; Preston and Norris 1947; Anderson and Keith 1980; Knight and Fitzner 1985; Datta and Pal 1993). We located two studies of disturbance effects on three species in the avian family *Alcidae,* which includes the marbled murrelet. Pierce and Simons (1986) in a study of breeding success in tufted puffins (*Fratercula cirrhata*: Alcidae) observed that egg and juvenile survival rates in three colonial breeding sites were inversely related to the frequency of survey visits (i.e., observer disturbance). Piatt et al. (1990) found that egg and juvenile survival and chick growth of least auklets (*Aethia pusilla*: Alcidae) and crested auklets (*Aethia cristalella*: Alcidae) were all inversely related to the frequency of survey visits.

Habitat Modification

Any ground disturbing activity that removes vegetation, or modifies vegetative structure or composition, has the potential to alter habitat characteristics and reduce the quality of suitable habitat for the marbled murrelet. We need only consider suitable terrestrial breeding habitat since murrelets forage offshore; for the murrelet, there is nothing analogous to the northern spotted owl’s terrestrial foraging habitat. The Recovery Plan (Service 1997) outlines five threats to murrelets on their terrestrial habitats. Prominent among those threats are (1) loss of nesting habitat, and (2) fragmentation of suitable habitats and edge effects.

5.3.2 Service’s Assessment of Potential Direct Effects to the Marbled Murrelet

Noise and Visual Disturbance, and Direct Injury or Fatality to Individual Animals

We have no site-specific information about possible murrelet occupancy in or around the action area, or murrelet dispersal through the action area. The California Natural Diversity Database (CNDDB) contains no marbled murrelet records for the Garcia River watershed. No field surveys were conducted in connection with this proposed action to establish murrelet dispersal or occupancy patterns. For lack of empirical information, our approach here is to assess the likelihood that marbled murrelets occupy any portion of the action area that might be adversely affected by project-generated noise and visual disturbance. This assessment applies specifically to the portion of the contiguous redwood stand south of Eureka Hill Road that lies within a 330-foot radius of the western bridge abutment. This is the only potentially suitable marbled murrelet habitat within the action area that is also within the threshold distance for noise and visual disturbance. We reviewed marbled murrelet literature, the biological assessment, and studied aerial photography of the action area and arrived at five points of discussion that are site-specifically relevant to the question of occupancy: two that favor occupancy and three that argue against it.

(1) The straight-line distance from the project site to the coastline (3.8 miles) is favorable for occupancy by breeding adult marbled murrelets. In northern California, the average distance between ten known nest sites and the coastline is 8.1 miles with a 95% confidence interval of 4.5 to 11.8 miles (Hamer and Nelson 1995). Shorter flight distances should result in less energy output and more efficient ocean foraging by breeding adults, and probably enhance diurnal prey delivery rates to the nest. But distance is not a sole determinant of occupancy in any published research (for example, see Meyer et al. 2002). Other variables, including the quality of the nesting habitat, also must be considered.

(2) Suitable nest trees are probably present in the area. We reviewed three tree crown models that correlate stem diameter at breast height to maximum crown width (Crookston 2005; Donnelly 1996; Olson et al. 1998). Using Google Maps ™ photographic coverage of the action area, we measured the widths of dominant tree crowns in the area and used reverse computation to derive approximate stem diameters at breast height. The contiguous redwood stand south of Eureka Hill Road and west of the western bridge abutment is the only area that might support murrelet occupancy, and is also subject to direct effects from noise or visual disturbance. Within that stand, we found numerous trees with maximum crown widths greater than 40 feet and some measuring over 50 feet, indicating that breast-height stem diameters frequently exceed 70 inches, which is probably sufficient (Raphael 2004) to yield the minimum upper-crown branch diameters of 8 inches that are associated with murrelet nest platforms (Hamer and Nelson 1995).

(3) The contiguous stand described above may contain suitable nest trees, but it also contains three human-made clearings (0.25 to 1.0 acre) with structures, driveways, and an unpaved local access road (Hay Ranch Road).

(4) The proximity of this contiguous stand to Eureka Hill Road is problematic for murrelet occupancy. The project proponent (BA Appendix E) characterizes traffic on Eureka Hill Road as follows: (a) average traffic level of 600 vehicles per 24-hour period, of which 5% is truck

traffic; (b) an average traffic speed of 45 miles per hour; and (c) an average daytime ambient noise level of 77.9 decibels at 50 feet (dB50) from the road centerline. In northwestern California, Meyer et al. (2004) report that the mean distance between survey stations within occupied marbled murrelet stands and the nearest road was 968 feet. Distance to roads, taken alone, is not a strong determinant of the presence of marbled murrelets, but it is a significant variable in multivariate models of occupancy and abundance. When distance-to-road was combined with an elevation variable in a multivariate murrelet occupancy model in northwestern California, the regression analysis showed a statistically significant effect for road proximity; and that sites farther from roads were occupied more frequently than sites nearer to roads (Meyer et al. 2004). When a variable for mature forest fragmentation was combined with a distance-to-road variable in an abundance model, the regression analysis showed significantly greater murrelet abundance at sites farther from roads (Meyer et al. 2002). Recall that the portion of the contiguous stand that is of interest in the proposed action is less than or equal to 330 feet from Eureka Hill Road, which is less than half the 755 foot low bound estimate reported above for station-to-road distances (Meyer et al. 2004).

(5) The offshore source-population of breeding adult marbled murrelets in the vicinity of the Garcia River is very small and fluctuates sharply on a 2-to-4 year cycle (Falxa et al. 2013; Falxa et al. 2014). If breeding pairs are scarce, and/or their population is declining, then the likelihood of occupancy of any potential forested breeding habitat is diminished. We estimate that the breeding population in the Garcia River watershed is on the order of 16-to-24 individual birds forming 8-to-12 breeding pairs. That equates to 12-to-18 square miles per breeding pair throughout the 144 square mile watershed. (The methods, reasoning and data sources that we used to estimate the breeding population are outlined in detail in section 4.3.2, above.)

The only area that is susceptible to noise and visual disturbance from the proposed action is the portion of the contiguous redwood stand south of Eureka Hill Road that falls within the noise disturbance threshold radius (330 feet) as measured from the center of the western bridge abutment. After consideration of the five points outlined above, we consider it highly unlikely that the susceptible area would be occupied by breeding marbled murrelets, thus there is no exposure of murrelets to noise or visual disturbance. We believe that the points favoring occupancy (distance to coastline, presence of potentially suitable nest trees) are outweighed by the points against occupancy (human development within the stand, proximity to Eureka Hill Road, and a very small local breeding population).

Habitat Modification

The major points outlined above in section 5.2.2 (northern spotted owl) also apply to the marbled murrelet. The only area where vegetation modification is likely to occur is the 0.8-acre redwood stand which is identified as a staging area for equipment and construction materials. We determined in 5.2.2 that the attributes of the stand (mean stem diameter and canopy closure) make it unsuitable as northern spotted owl nesting/roosting habitat but suitable as foraging habitat; the same stand attributes would also preclude suitability as marbled murrelet nesting habitat. Even with many decades of stand growth and the eventual emergence of old-growth forest characteristics, this stand probably has little future potential as suitable murrelet nesting habitat because of the close proximity of Eureka Hill Road.

5.3.3 Potential Indirect Effects to the Marbled Murrelet

With regard to the marbled murrelet, the Service has not identified any potential impacts in this proposed action that meet Service criteria (50 CFR 402.02) for an indirect effect. Those criteria are: (a) the effect occurs within the action area; (b) the effect is caused by the proposed action but appears later in time; and (c) the effect is reasonably certain to occur.

5.3.4 Summary of Direct and Indirect Effects to the Marbled Murrelet

The most likely place that noise or visual disturbance could occur is south of Eureka Hill Road and within 330 feet of the center of the western bridge abutment. For reasons described above (human-made openings and structures within the stand, proximity to Eureka Hill Road, and low offshore source population for breeding adult murrelets) we believe that the potential for adverse impacts is low enough that murrelet surveys are not warranted for this project. In the very unlikely event that murrelet occupancy or nesting activity occurs in this area, conservation measures MM-2, MM-5 and MM-6 will provide additional protections. Measure MM-2 limits the duration of high-intensity noise to less than 2 hours; and limits operations to the period between 10:00 AM and 4:00 PM. Measure MM-6 prohibits night operations and artificial lighting. Measure MM-5 prohibits any encroachment of equipment and operations into adjacent forested areas other than those already identified as subject to direct effects as described in section 2 of this document, which is also the area described as the "Biological Study Area" in the description of the proposed action in the BA.

The project may involve some limited modification of vegetation within the proposed 0.8-acre equipment-material staging area in the redwood stand north of the eastern bridge abutment. Conservation measure MM-4 requires that tree removals will be restricted to "… riparian and understory growth … ", and to trees less than or equal to 6 inches diameter breast height. From our discussion of the northern spotted owl, we have concluded that this stand meets Service criteria for owl foraging habitat; those criteria preclude any likelihood that the area is suitable as marbled murrelet nesting habitat. We did not identify any potential indirect effects.

5.3.5 Consistency with the 1997 Recovery Plan

The Recovery Plan (Service 1997) outlines five threats to murrelets on their terrestrial habitats: (a) loss of nesting habitat; (b) fragmentation of suitable habitats and edge effects; (c) nest predation; (d) low reproductive success; and (e) predation losses among adult murrelets. The proposed action will have no effect on marine habitat. The proposed action involves no terrestrial habitat modification and there is a very low likelihood of murrelet occupancy near the project area, thus very low likelihood of exposure to noise or visual disturbance. The Service determines that the proposed action does not influence or contribute to any of the five threat categories listed above.

5.4 California Red-Legged Frog

5.4.1 Potential Direct Effects to the California Red-Legged Frog

Destruction of Aquatic Breeding Sites

Egg-laying, hatching and metamorphosis occur in water bodies that have relatively cool temperatures and that are free of high flows and turbulence, such as wetlands, water impoundments, and streamcourse pools that are disconnected from surface channel flow (Service 2002). Aquatic breeding habitats are susceptible to direct damage or elevated predation risk through dewatering or drainage, or direct contact with construction equipment, or by human activities that attract scavengers or predators, such as raccoons (Procyon lotor), that feed on egg masses (Service 2002).

Injury or Fatality to Dispersing Adult Frogs

Flow rates and water levels in the Garcia River channel recede in the summer and fall, exposing much of the channel bed, and confining river flow to narrow and sinuous channels. Frequently, pools become isolated and disconnected from the channel flow by receding waters; these areas are often adjacent the riverbank and close to sheltering riparian vegetation. The Service has observed this effect on recent aerial imagery of the Garcia River that was taken in late-summer. Disconnected pools in a river channel can be highly suitable for use by dispersing adult red-legged frogs when such pools have the combined characteristics of low turbulence, relatively cool water temperatures (attributable to subsurface flow, or to sheltering riparian vegetation), and hiding/escape cover provided by adjacent riparian vegetation (Service 2002). It is likely that such patchy habitats are present along the Garcia River channel in the summer and fall months, and that dispersing adult frogs will move among those habitats throughout those months.

5.4.2 Service Assessment of Potential Direct Effects to the California Red-Legged Frog

Destruction of Aquatic Breeding Sites

The proposed clear water crossing, used for heavy equipment access, will be constructed on the channel bed of the Garcia River. Egg-laying and egg maturation generally occur in March through late-April (Service 2002), but this coincides with the period of high flow levels and high turbulence in the Garcia River channel. Therefore, we conclude that the bankfull river channel does not harbor any aquatic breeding habitat for red-legged frogs. We find that there is no likelihood that the proposed action, which is confined to the bankfull channel, will cause the destruction of aquatic breeding habitat. Likewise, there is no potential that human activity around the construction site will attract scavengers or predators, such as raccoons, that could feed on developing egg masses and tadpoles.

Injury or Fatality to Dispersing Adult Frogs

The Service concludes that there is a reasonable but unquantified likelihood that adult frogs will occupy isolated, disconnected pools in the main channel of the Garcia River during the summer and fall months. We also concluded that there is a related likelihood, also unquantified, that adult frogs will disperse through the site of the proposed clear water crossing in the channel bed, where they are exposed to injury or fatality due to the movement of heavy equipment and materials, and worker foot traffic. Adult frogs are known to disperse overland in fall and winter months and that the movement appears to be triggered by rainfall events (Service 2002). This makes intuitive sense because rainfall will offer some protection against desiccation for dispersing adults; and rainfall may suppress the activity of likely predators, or diminish their ability to locate prey through sight or smell. For this reason, we recognize that late-spring through late-summer rainfall events may potentially trigger frog dispersal.

5.4.3 Potential Indirect Effects to the California Red-Legged Frog

With regard to the California red-legged frog, the Service has not identified any potential impacts in this proposed action that meet Service criteria (50 CFR 402.02) for an indirect effect. Those criteria are: (a) the effect occurs within the action area; (b) the effect is caused by the proposed action but appears later in time; and (c) the effect is reasonably certain to occur.

5.4.4 Summary of Direct and Indirect Effects to the California Red-Legged Frog

The Service believes there is little or no likelihood that the proposed action will have a direct effect on aquatic breeding habitat for red-legged frogs. High winter-spring flow levels make the Garcia River channel unsuitable for egg-laying and egg-maturation. Lower flow levels that coincide with the stated work period in the proposed action (late-spring to late-summer) would be too late to accommodate the red-legged frog’s breeding chronology. The Service believes there is a non-trivial but unquantified likelihood that adult frogs could disperse through the construction site and be exposed to injury or fatality, especially following late-spring through late-summer rainfall events. We did not identify any potential indirect effects.

5.4.5 Consistency with the 2002 Recovery Plan

The Recovery Plan (Service 2002) outlines five broad categories of threats to red-legged frogs on their aquatic and terrestrial habitats: (a) present or threatened destruction, modification, or curtailment of habitat or range; (b) overutilization for commercial, recreational, scientific or educational purposes; (c) disease and predation; (d) inadequacy of existing regulatory mechanisms; and (e) other natural and manmade factors, including drought and contaminants. The proposed action would have no effect on threat categories (b) through (e). With respect to threat category (a), the proposed action would have no effect on aquatic breeding habitat because the action is confined to the main channel of the Garcia River where high winter and spring flow levels coincide with the onset of the frog's breeding season and preclude egg-laying and egg maturation. The proposed action may result in the taking of dispersing adult frogs during the summer-fall period when receding river flows leave isolated disconnected pools and highly mobile adult frogs move through the construction site, thus exposed to injury and mortality from worker foot traffic and the transport of construction equipment and materials. This is a temporary adverse effect on individual frogs and not their habitat; and the effect is confined to the period of construction activity. The effect is not addressed under any of the threat categories in the 2002 Recovery Plan.

6.0 CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

As discussed in the Environmental Baseline section (4.1), above, the Service is not aware of any future State, tribal, local or private actions that are reasonably certain to occur within the action area. It is possible that the action area boundary for the pending section 7 review of MRC's Habitat Conservation Plan (HCP) will overlap the action area for the Eureka Hill Road bridge. The MRC review has not been initiated and the definition of that action area has yet to be determined. If the action areas do overlap, the effects of this proposed action will be incorporated into the Environmental Baseline section of the biological opinion for the MRC HCP.

7.0 CONCLUSION

After reviewing the current status of the northern spotted owl, the marbled murrelet and the California red-legged frog, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of any of the three species. The action area does not overlap designated critical habitat for any of the three species named above; therefore, no destruction or adverse modification of critical habitat is anticipated. Following is a summary of our reasoning for each species. In section 8.0, below, we estimated that no take of individuals would occur for any of the three species examined in this opinion. It follows that if take does not occur at the local scale of the proposed action, then jeopardy also would not occur at the provincial or rangewide scales.

Northern Spotted Owl

(1) Conservation measures NSO-1 and NSO-3 provide for field surveys of suitable breeding habitat occurring within the threshold distance for potential noise disturbance from project activity, and for the cessation of project work for the duration of the breeding season if any nesting activity is detected within the threshold distance.

(2) No suitable breeding habitat is being modified in the proposed action. Suitable foraging habitat will be affected by the action, but we characterize the potential impact as "maintained" functionality with "unchanged" habitat quality.

(3) There is a very low likelihood that breeding activity will occur within the noise disturbance threshold distance because: (a) the close proximity to Eureka Hill Road and its associated traffic noise; (b) the presence of clearings, structures and vehicle traffic within those patches of suitable habitat; and (c) the lack of breeding productivity and sparse history of breeding behavior observed over 17 years of surveys on the nearest activity site, MEN0208.

Marbled Murrelet

(1) Conservation measures MM-1 and MM-3 provide for field surveys of suitable habitat occurring within the threshold distance for potential noise disturbance from project activity, and for the cessation of project work for the duration of the breeding season if any murrelet occupancy is detected within the threshold distance.

(2) No forested habitat that is suitable for murrelet occupancy will be modified in the proposed action.

(3) There is a very low likelihood that murrelet occupancy will occur within the noise disturbance threshold distance because: (a) the close proximity to Eureka Hill Road and its associated traffic noise; (b) the presence of clearings, structures and vehicle traffic within those nearby patches of potentially suitable habitat; and (c) the low offshore murrelet population which serves as the recruitment pool for breeding adults.

California Red-Legged Frog

(1) The Garcia River main channel does not support breeding habitat for the red-legged frog. The egg-laying and egg-maturation season of late-winter and early-spring coincides with periods of high flows and turbulence, thus precluding breeding. Therefore the in-channel work in the proposed action would have no potential effect on breeding habitat.

(2) Scheduled in-channel construction work, mid-June to mid-October, also does not coincide with the egg-laying and egg-maturation periods for the red-legged frog.

(3) Adult frogs may disperse through the project site at any time during the scheduled work period of May 15 through October 31. All eleven conservation measures for this species provide for the avoidance or minimization of potentially adverse effects to dispersing adult frogs. These protections include: (a) prescribed site inspections and training of personnel (CRLF-1, CRLF-2, CRLF-3, CRLF-11); (b) cessation of project activity and resolution procedures if frogs are detected on site (CRLF-4, CRLF-11); (c) predator suppression and control of toxic materials (CRLF-6, CRLF-7); and (d) controls on channel bed and riparian area disturbance (CRLF-5, CRLF-8, CRLF-9).

8.0 INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined by the Service as take that is incidental to, and not for the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Taking Statement.

The measures described below in sections 8.3 (Reasonable and Prudent Measures), 8.4 (Terms and Conditions), and 9.0 (Monitoring and Reporting Requirements) are non-discretionary, and must be undertaken by the agency (Federal Highway Administration, or FHwA) so that they become binding conditions of any grant or permit issued to the applicant (California Department of Transportation and Mendocino County Department of Transportation), as appropriate, for the exemption in section 7(o)(2) to apply. The FHwA has a continuing duty to regulate the activity covered by this incidental take statement. If the FHwA (1) fails to assume and implement the terms and conditions, or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the agency or applicant must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement (50 CFR 402.14(i)(3)).

8.1 Amount or Extent of Take

Northern Spotted Owl

The Service does not anticipate that the proposed action will incidentally take any northern spotted owls. Our reasoning is based on <u>four</u> lines of information relating to the quality of potential breeding habitat near the project site, the reproductive history of the nearest owl home range, the near-absence of habitat modification in the proposed action, and the strength of the conservation measures.

(1) There is a very low probability that northern spotted owls would occupy the potential breeding habitat that is most susceptible to noise disturbance from the project. The forested area most susceptible to project-generated noise disturbance is south of Eureka Hill Road and within a 330-foot radius of the western bridge abutment. Proximity to Eureka Hill Road argues against breeding season occupancy in this area. The forested area is somewhat developed with two or more manmade openings, built structures, driveways and vehicle traffic.

(2) The nearest spotted owl activity site is MEN0208; the center of the activity site (activity center) is mapped about 1,950 feet south of the western bridge abutment. Paired owls and pair behavior were observed on this site in 1990, 1992 and 2011 but nests or nest activities have not been detected in 14 years of surveys between 1990 and 2013.

(3) Habitat modification on forested land is limited to a proposed 0.8 acre staging area for equipment and materials, which is located north of Eureka Hill Road and near the eastern bridge abutment. Tree removals are limited to 6 inches diameter breast height or less. We categorized this stand as potential foraging habitat and we concluded that the function of the habitat (foraging) would be maintained under the proposed action and that the quality of the habitat would remain unchanged.

(4) Conservation measures provide additional protections. Measure NSO-3 ensures that project activity will be deferred for the duration of the breeding season if nesting activity is detected within 330 feet of any project-generated noise sources. Measure NSO-2 sets limits on the duration of equipment usage (e.g., jackhammers) that generates high intensity noise; and measure NSO-6 limits all project activity to daylight hours. Measures NSO-4 and NSO-6 place rigorous constraints on vegetation removals and the encroachment of equipment and activity outside of designated construction areas.

Marbled Murrelet

The Service does not anticipate that the proposed action will incidentally take any marbled murrelets. Our reasoning is based on four lines of information relating to the quality of potential breeding habitat near the project site, the low breeding population in the Garcia River drainage, the near-absence of habitat modification in the proposed action, and the strength of the conservation measures.

(1) See the corresponding argument above for northern spotted owl. The forested area most susceptible to project-generated noise disturbance is south of Eureka Hill Road and within a 330-foot radius of the western bridge abutment. Close proximity of this forested area to Eureka Hill Road and human development (openings, structures and driveways) within the forested stand argue against breeding season occupancy by marbled murrelets in this area.

(2) The offshore murrelet population nearest the mouth of the Garcia River is very small (150 individuals or less). In the previous discussions of site-specific status of the species and effects, above, we estimated that the inland breeding population for the entire Garcia River drainage (144 square miles) is 3-36 pairs (with outlier estimates included), and 8-22 pairs with outliers excluded (Falxa et al. 2013; Peery et al 2004; Beissinger and Peery 2007). With outlier estimates excluded, breeding-pair densities are estimated at 0.06 to 0.15 pairs per square mile. This low density indicates a very low probability that murrelets would occupy any particular stand within the action area.

(3) The proposed 0.8-acre staging area, described above, that will undergo some habitat modification is not suitable breeding habitat for the marbled murrelet so any disturbance effects on that site would have no potential effect on breeding marbled murrelets.

(4) Conservation measures provide additional protections. Measure MM-3 ensures that project activity will be deferred for the duration of the breeding season if nesting activity is detected within 330 feet of any project-generated noise sources. Measure MM-2 sets limits on the duration of equipment usage (e.g., jackhammers) that generates high intensity noise; and measure MM-6 limits all project activity to daylight hours. Measures MM-4 and MM-6 place rigorous constraints on vegetation removals and the encroachment of equipment and activity outside of designated construction areas.

California Red-Legged Frog

The Service does not anticipate that the proposed action will incidentally take any California red-legged frogs. Our reasoning is based on three lines of information that relate to (a) the general lack of suitable breeding habitat in the main channel of the Garcia River, (b) the timing of the proposed action in relation to breeding season, and (c) conservation measures that address protection for adult frogs that may disperse through the project site during the scheduled work period.

(1) Red-legged frog egg-laying and egg maturation generally occur in March through late-April (Service 2002) and rely on waters that are free of high flows and turbulence, such as wetlands, water impoundments, and streamcourse pools that are disconnected from surface channel flow (Service 2002). But this portion of the breeding period coincides with the period of high flow levels and high turbulence in the Garcia River channel. Therefore, we conclude that there is no likelihood that the proposed action, which is confined to the bankfull channel, will cause the alteration or destruction of aquatic breeding habitat.

(2) The schedule of the proposed action does not coincide with the egg-laying and maturation seasons for the red-legged frog. Project work is scheduled between May 15 and October 31, 2015, with in-channel work scheduled between June 15 and October 15, 2015.

(3) Adult frogs may disperse up-channel, or down-channel, or overland, through the project site during scheduled work period. However, all eleven conservation measures for this species provide for the avoidance or minimization of adverse effects that would apply to dispersing adult frogs. These protections include: (a) prescribed site inspections and training of personnel (CRLF-1, CRLF-2, CRLF-3, CRLF-11); (b) cessation of project activity and resolution procedures if frogs are detected on site (CRLF-4, CRLF-11); (c) predator suppression and

control of toxic materials (CRLF-6, CRLF-7); and (d) controls on channel bed and riparian area disturbance (CRLF-5, CRLF-8, CRLF-9).

8.2 Effects of Take

In this biological opinion we determined that there is no anticipated take of northern spotted owl, marbled murrelet or California red-legged frog; therefore, we also determine that the proposed action will not result in jeopardy to these species.

9.0 REASONABLE AND PRUDENT MEASURES

Reasonable and prudent measures are defined in 50 CFR 402.02 as "… those actions the Director believes necessary or appropriate to minimize the impacts, i.e., amount or extent, of incidental take." The Service has not identified any additional measures necessary to further reduce impacts, or potential impacts, to the northern spotted owl and marbled murrelet.

The project proponent is implementing several conservation measures as part of the proposed action that will avoid or minimize the potential for incidental taking of northern spotted owl, marbled murrelet and California red-legged frog.

However, with the concurrence of the project proponent, we have added a new conservation measure that institutes post-rainfall site inspections to improve protections for adult California red-legged frogs that may disperse through the proposed construction site. The new measure is shown below and in section 2.3; the measure is designated as CRLF-11.

- "CRLF-11 -- If a rain event (>= 0.1 inch) occurs during the construction period, all construction-related activities will cease for a period of 24 hours after the rain stops. Prior to resuming construction activity, trained construction crew members will examine the site for the presence of California red-legged frogs. The examination should include all stacked or stockpiled construction materials, underneath parked construction machinery, within concrete forms that have not yet been poured, and along any silt fences. If no California red-legged frogs are found, construction activity may resume immediately. If any California red-legged frog is detected, the designated biological monitor (e.g., crew foreman) will contact the Arcata Fish and Wildlife Office (contact biologist John Peters) or the California Department of Fish and Wildlife (Fort Bragg office) to determine what course of action to take before resuming work."

Rainfall events are known to trigger dispersal of adult red-legged frogs in the fall and winter months (Service 2002). As described in section 5.4, above, the Garcia River probably contains suitable habitat for adult red-legged frogs when channel flow recedes in the summer and fall months and leaves isolated and disconnected pools adjacent to riparian vegetative cover. Summer rainfall events may trigger overland movement of adult frogs up or down the dry portions of the riverbed which could result in dispersal through the proposed project site where they would be subject to injury or fatality from equipment or foot traffic.

9.1 Terms and Conditions

Terms and conditions set out the specific methods by which the reasonable and prudent measures are to be accomplished. Terms and conditions of an incidental take statement must include reporting and monitoring requirements that assure adequate agency oversight of any incidental take (50 CFR 402.14(i)(1)(iv) and (i)(3)). In order to be exempt from the prohibitions of section 9 of the Act, the agency must comply with the specified terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting and monitoring requirements. These terms and conditions are non-discretionary.

The project proponent is implementing several conservation measures as part of the proposed action that will avoid or minimize the potential for incidental taking of northern spotted owl, marbled murrelet and California red-legged frog. Several of these measures contain monitoring and reporting elements. These elements are embedded in conservation measures NSO-1, NSO-3, MM-1 and MM-3. For the California red-legged frog, the specific methods to be used to address the potential take of adult frogs that may disperse through the project site are embedded in conservation measure CRLF-11.

9.2 Monitoring and Reporting Requirements

The following two monitoring and reporting requirements apply to conservation measures NSO-1, NSO-3, MM-1 and MM-3.

All records of field surveys for northern spotted owls and marbled murrelets will be retained by the project proponent including but not limited to: maps, aerial photographs, ground-level photographs, field data forms, field notes, and reports on the surveys including interpretations of the survey outcomes. Those records shall be retained, at minimum, for a period of one year following the conclusion of the seismic retrofit work; and those records shall be made available to the Service upon request.

Pursuant conservation measures NSO-3 and MM-3, the project proponent will report to the Service, in writing, any instance where project work is deferred until the end of the nesting season because northern spotted owl breeding activity or marbled murrelet stand-occupancy was detected within 330 feet of the point of origin of any project-generated noise sources. Reports shall be submitted to the Service electronically no later than one business day (Monday through Friday) following the deferral of project activity; and reports shall be submitted to the Service, electronically or by posted hardcopy, no less than five business days before project work is resumed at the end of the nesting season.

10.0 CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species and the ecosystems upon which they depend. Regulations in 50 CFR 402.02 define conservation recommendations as "… suggestions of the Service regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information." Conservation recommendations are advisory and are not intended to carry any binding legal force (50 CFR 402.14(j)). The Service has not identified any discretionary or voluntary measures that could be undertaken by the project proponent that meet the criteria in 50 CFR 402.02.

11.0 REINITIATION NOTICE

This concludes formal consultation on the proposed Garcia River bridge seismic retrofit on Eureka Hill Road in southwestern Mendocino County, California. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained, or authorized by law, and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in the opinion; (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operation causing such take must cease pending reinitiation.

If you have any questions regarding this biological opinion, please contact John Peters of my staff at (707) 822-7201.

Sincerely,

for Bruce Bingham,
Field Supervisor

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FIGURES AND MAPS

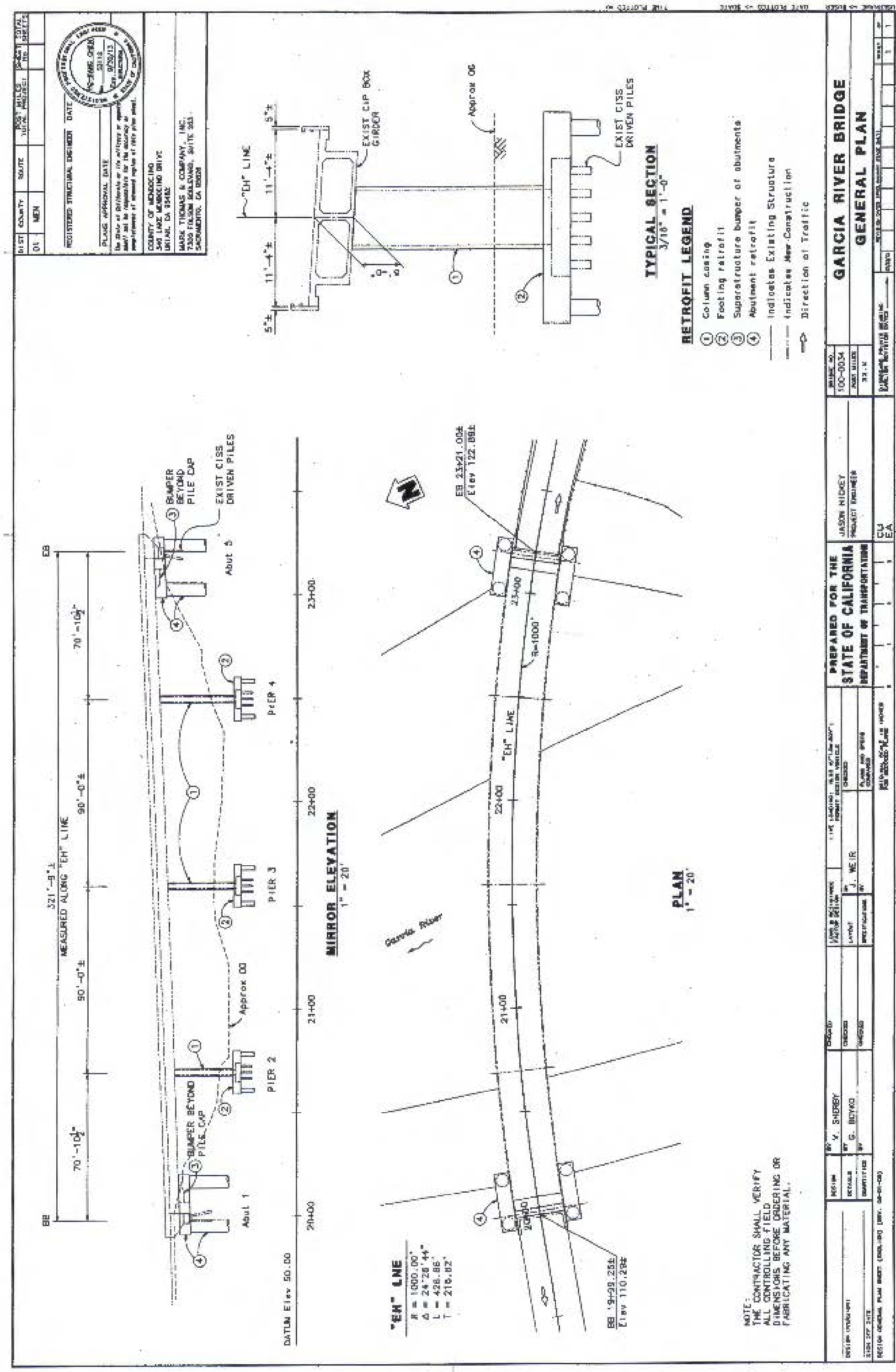

Figure 1: General Design Plan, Garcia River Bridge, Eureka Hill Road, Mendocino County, CA.
(Source: Biological Assessment, Appendix A, Sheet 1 of 1)

Figure 2: Oblique view of the redwood stand immediately north of Eureka Hill Road and east of the eastern bridge abutment.
(Source: Biological Assessment, Page 16, Figure 5, Sheet 1)

Redwood grove northwest of the Eureka Hill Road Bridge.

Map 1: Project vicinity.
(Source: Biological Assessment, Page 3, Figure 2)

Caltrans

LEGEND

Biological Study Area

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SOURCE: USGS Topo Map (Eureka Hill Quadrangle)
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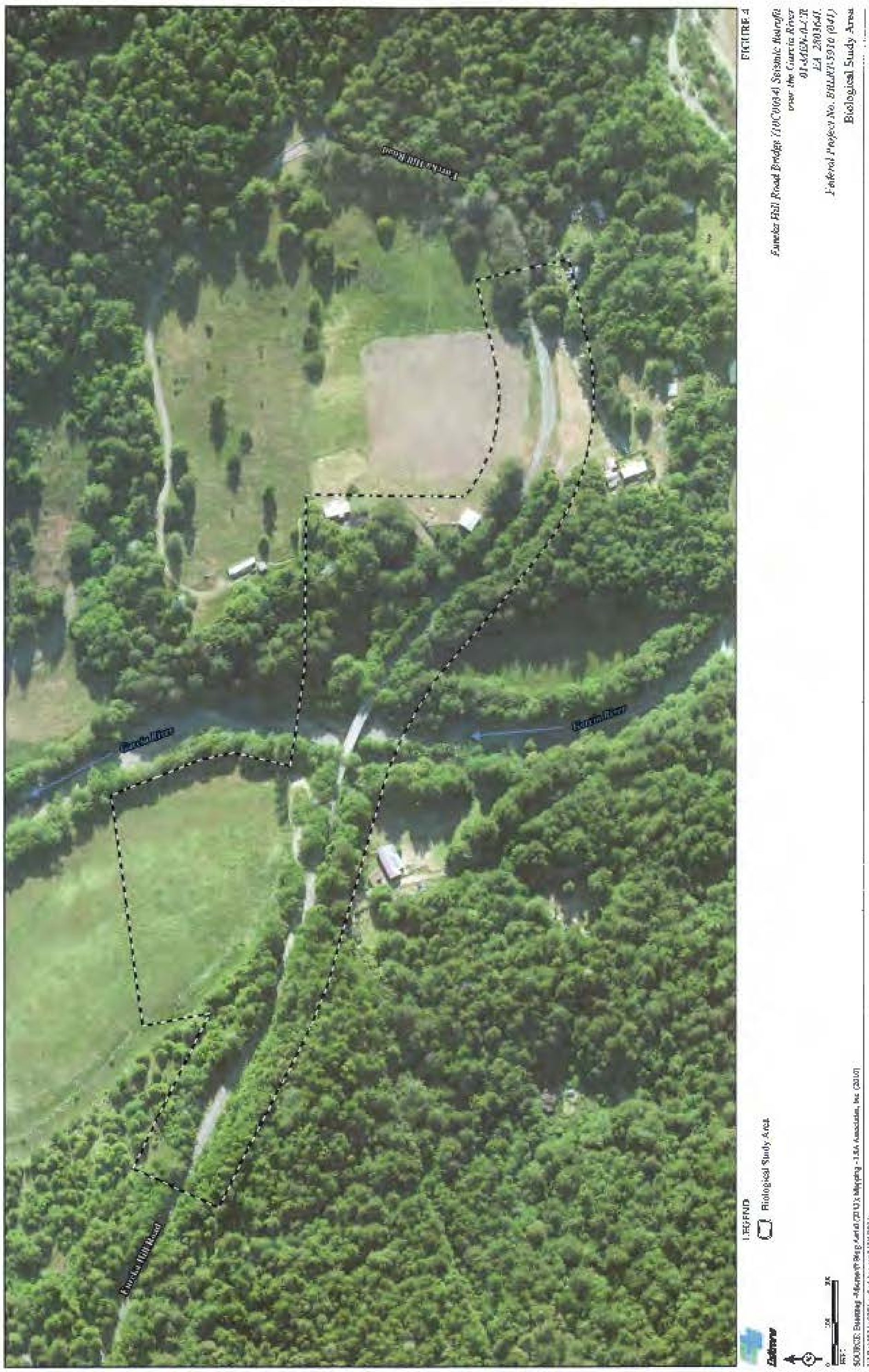
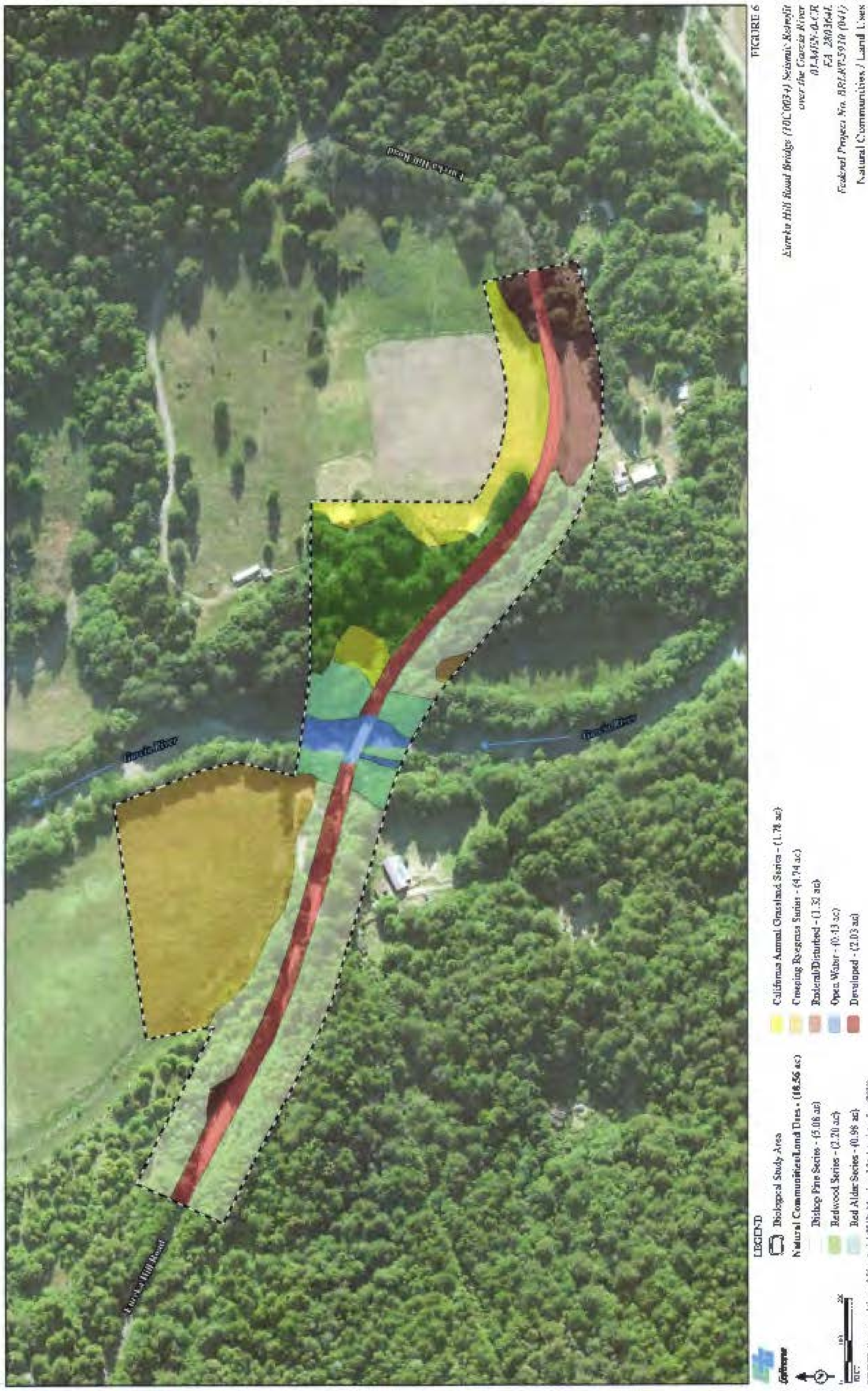
FIGURE 2

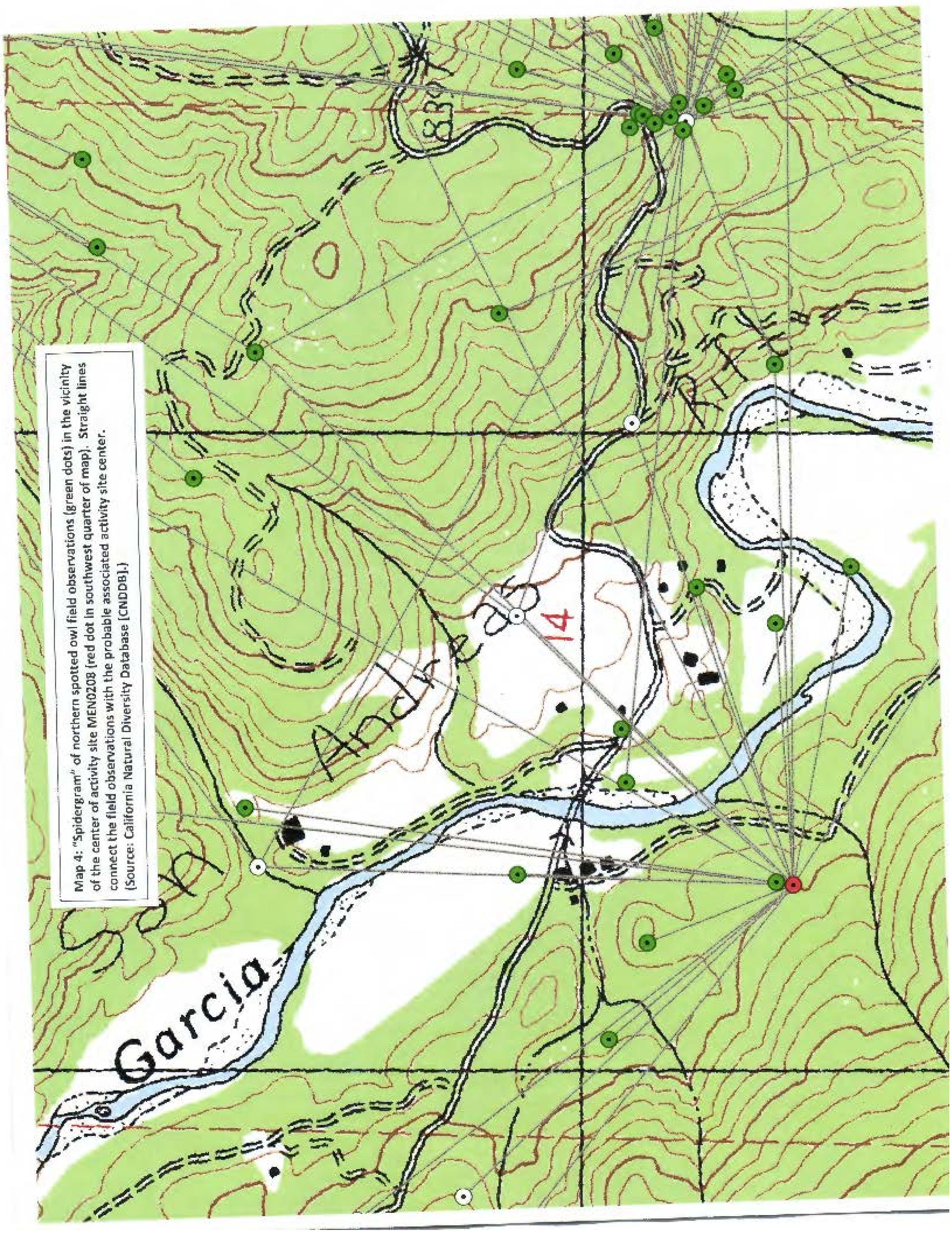
Eureka Hill Road Bridge (10C0034) Seismic Retrofit
over the Garcia River
01-MEN-0-CR
EA 280364L
Federal Project No. BRLRT-5910 (041)
Project Vicinity on Topograhic Base

Map 2: Area subject to direct impacts from vegetation modification.
[Source: Biological Assessment, Page 8, Figure 4; "Biological Study Area".]



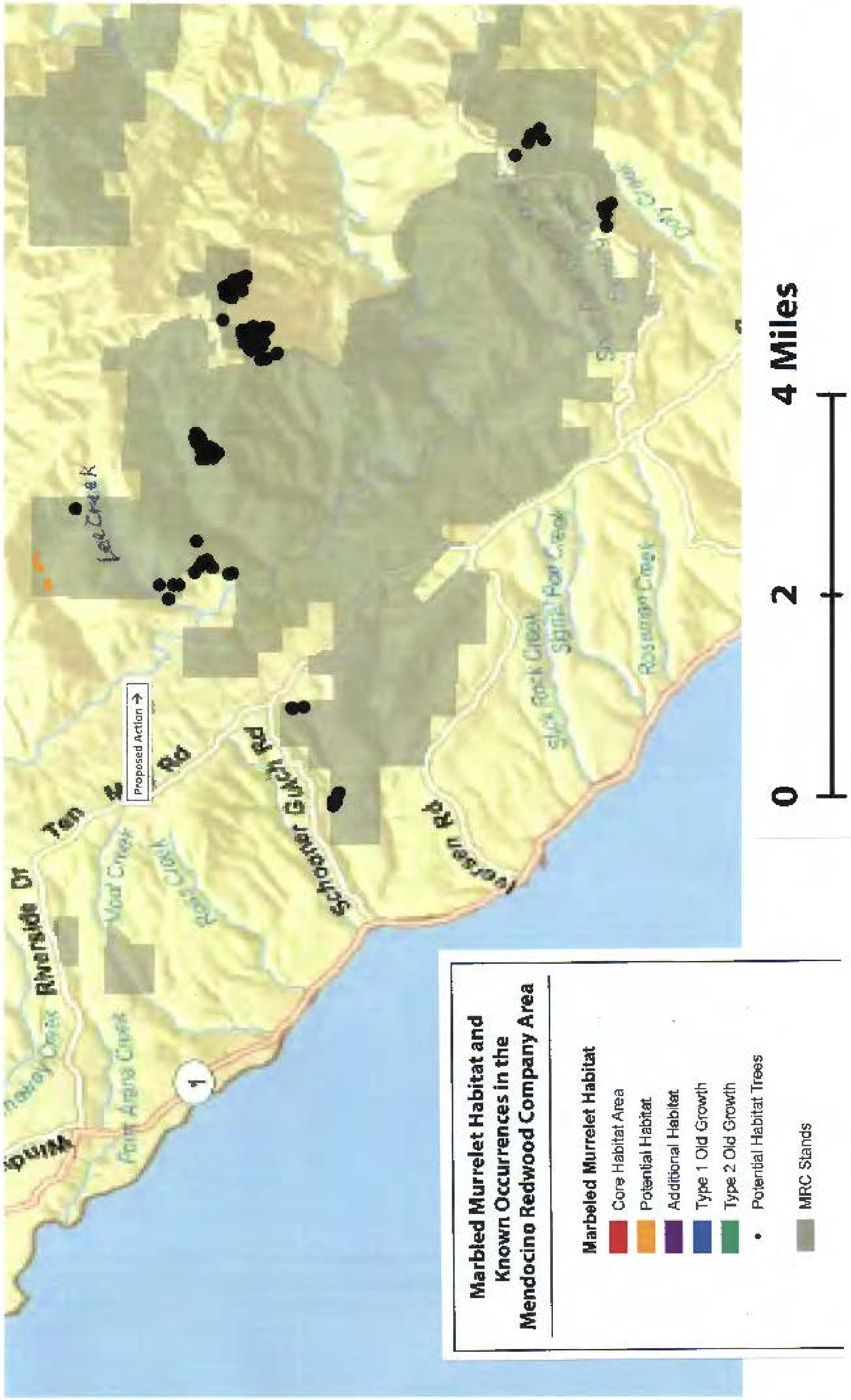
Map 3: Vegetation communities within the area subject to direct impacts from vegetation modification. (Source: Biological Assessment, Page 18, Figure 6; "Natural Communities".)





Map 4: "Spidergram" of northern spotted owl field observations (green dots) in the vicinity of the center of activity site MEN0208 (red dot in southwest quarter of map). Straight lines connect the field observations with the probable associated activity site center. (Source: California Natural Diversity Database [CNDDB].)

Map 5: Marbled murrelet potential habitat patches, potential habitat trees, and known occurrences on Mendocino Redwood Company lands in the Garcia River watershed. (Source: Mendocino Redwood Company HCP/NCCP Public Draft, 2012, Map 7c.)



APPENDIX

Status of the Species, Rangewide

Including Northern Spotted Owl, Marbled Murrelet, and California Red-Legged Frog

STATUS OF THE NORTHERN SPOTTED OWL

This section summarizes the legal and biological status, and key threats to the northern spotted owl within its historic range. Appendix A provides a detailed description of the species and threats to its continued existence. For this consultation, the Service has considered all information provided in Appendix A in its assessment of the project effects. The following summary describes those aspects of the species' ecology and its threats that have direct bearing on the analysis of the proposed action being considered in this consultation.

Legal Status

The northern spotted owl was listed as threatened on June 26, 1990 due to widespread loss and adverse modification of suitable habitat across the owl's entire range and the inadequacy of existing regulatory mechanisms to conserve the subspecies (55 FR 26114). On June 28, 2011, the Service completed a Revised Recovery Plan for the northern spotted owl (Service 2011).

Critical habitat for the northern spotted owl was first designated in 1992 (57 FR 1796), but revised in 2008 (73 FR 47326), and again in 2012 (77 FR 14062). The 2012 revised critical habitat designation, which took effect on January 3, 2013, includes approximately 9,577,969 acres in 11 units and 60 subunits in California, Oregon, and Washington.

Taxonomy and Range

The northern spotted owl is one of three subspecies of spotted owls currently recognized by the American Ornithologists' Union: northern subspecies, Mexican subspecies (*S. o. lucida*), and California subspecies (*S. o. occidentalis*). The current range of the northern spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California, as far south as Marin County (55 FR 26114). The range of the northern spotted owl has been partitioned into 12 physiographic provinces (Appendix A: Figure 1) based on recognized landscape subdivisions exhibiting different physical and environmental features since 1990. The Revised Recovery Plan (Service 2011) adopted the physiographic provinces as recovery units with the exception of the Willamette Valley, because that area contained large amounts of non-habitat.

Biology and Ecology

The northern spotted owl is a medium-sized owl and is the largest of the three subspecies of spotted owl (Gutiérrez 1996). They spend virtually their entire lives beneath the forest canopy (Courtney *et al.* 2004) seeking sheltered roosts to avoid inclement weather, summer heat, and predation (Forsman 1976, 1980; Barrows and Barrows 1978; Barrows 1981; Forsman *et al.* 1984; Ting 1998). Northern spotted owls are primarily nocturnal (Forsman *et al.* 1984), foraging between dusk and dawn and sleeping during the day with peak activity occurring during the two hours after sunset and the two hours prior to sunrise (Forsman *et al.* 1984; Gutiérrez *et al.* 1995; Delaney *et al.* 1999). Their diet varies geographically and by forest type. Generally, flying squirrels (*Glaucomys sabrinus*) are the most prominent prey for northern spotted owls in Douglas-fir and western hemlock (*Tsuga heterophylla*) forests (Forsman *et al.* 1984) in

Washington (Hamer *et al.* 2001) and Oregon, while dusky-footed wood rats (*Neotoma fuscipes*) are a major part of the diet in the Oregon Klamath, California Klamath, and California Coastal provinces (Forsman *et al.* 1984; 2004; Ward *et al.* 1998).

The northern spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Gutiérrez *et al.* 1995). Most pairs do not nest every year, and nesting pairs are not successful every year (Forsman *et al.* 1984, Anthony *et al.* 2006). Courtship behavior usually begins in February or March, and females typically lay eggs in late March or April. The timing of nesting and fledging varies with latitude and elevation (Forsman *et al.* 1984). Natal dispersal of northern spotted owls typically occurs in September and October with a few individuals dispersing in November and December (Forsman *et al.* 2002).

Northern spotted owls are territorial, actively defending their nests and young from predators (Forsman 1976; Gutiérrez *et al.* 1995). They will regularly confront other spotted owls with aggressive vocal displays (Forsman 1976, 1980; Forsman *et al.* 1984; Gutiérrez *et al.* 1995; Franklin *et al.* 1996). However, home ranges of adjacent pairs overlap (Forsman *et al.* 1984; Solis and Gutiérrez 1990) suggesting that the area defended is smaller than the area used for foraging. Median annual home range size varies from 985 acres in the California Coast Redwood Region to 14,211 acres on the Olympic Peninsula. Within the home range, there is a core area of concentrated use (approximately 20 percent of the home range) during the breeding season (Bingham and Noon 1997).

Habitat Use

Forsman *et al.* (1984) reported that northern spotted owls have been observed in many forest types, including Douglas-fir, western hemlock, grand fir (*Abies grandis*), white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), Shasta red fir (*Abies magnifica shastensis*), mixed evergreen, mixed conifer-hardwood, and coast redwood (*Sequoia sempervirens*), and generally rely on older forested habitats containing the structures and characteristics required for nesting, roosting, and foraging. Such features typically include moderate to high (60 to 90 percent) canopy closure; a multi-layered, multi-species canopy with large overstory trees of 30 inches or greater dbh; large trees with various deformities and decadence; large snags; large accumulations of woody debris; and open space below the canopy (Thomas *et al.* 1990). Foraging activity is associated with tree height diversity (North *et al.* 1999), canopy closure (Irwin *et al.* 2000, Courtney *et al.* 2004), snag volume, density of snags greater than 20 in. (50 cm) dbh (North *et al.* 1999, Irwin *et al.* 2000, Courtney *et al.* 2004), density of trees ≥ 31 in. (80 cm) dbh (North *et al.* 1999), volume of woody debris (Irwin *et al.* 2000), and other structural characteristics of old forests (Carey *et al.*1992, Irwin *et al.* 2000). Dispersal habitat consists of stands with adequate tree size and canopy closure to provide protection from avian predators and opportunities to forage. A mosaic of late-successional habitat interspersed with other seral conditions may benefit northern spotted owls more than large, homogeneous expanses of older forests (Zabel *et al.* 2003; Franklin *et al.* 2000; Meyer *et al.* 1998).

Threats

The 2011 revised recovery plan for the northern spotted owl indicates that past and current habitat loss from timber harvest and wildfire, and competition from barred owls are the most pressing threats to northern spotted owl recovery. Addressing the threats associated with past and current habitat loss must be conducted simultaneously with addressing the threats from barred owls (Service 2011).

At the time of listing, there was recognition that large-scale wildfire posed a threat to northern spotted owl habitat (55 FR 26114). Studies indicate that the effects of wildfire vary with fire intensity, severity and size. Within fire-adapted forests, northern spotted owls have adapted to withstand fires of variable sizes and severities. However, fire is often considered a primary threat to spotted owls because of its potential to rapidly alter habitat (Bond *et al.* 2009), and is a major cause of habitat loss on Federal lands (Courtney *et al.* 2004). Hanson (2009) believed northern spotted owls suffer adverse consequences from a deficit of fire that creates habitat necessary for an abundance of their key prey species. Climate change is expected to make unpredictable changes to habitat, due to warmer temperatures increasing the probability of severe fire and length of fire season (Skinner 2007).

Barred owls may be exacerbating the northern spotted owl population decline by reducing northern spotted owl site occupancy, reproduction, and survival (Dark *et al.* 1998; Gutiérrez *et al.* 2004; Courtney *et al.* 2004; Olson *et al.* 2005; Anthony *et al.* 2006). Barred owls compete with northern spotted owls for prey (Hamer *et al.* 2001, 2007; Gutiérrez *et al.* 2007; Livezey and Fleming 2007) and habitat (Hamer *et al.* 1989; Dunbar *et al.* 1991; Herter and Hicks 2000; Pearson and Livezey 2003; Singleton *et al.* 2010). Barred owl presence also affects the monitoring and management of northern spotted owls due to a reduction in detectability, when barred owls are present (Kelly *et al.* 2003; Courtney *et al.* 2004; Olson *et al.* 2005; Crozier *et al.* 2006).

Population Status

Two recent (January 2009) meta-analyses modeled rates of population change for up to 24 years using the re-parameterized Jolly-Seber method (λ_{RJS})(Forsman *et al.* 2011). Point estimates of λ_{RJS} were all <1.0 (range 0.929 to 0.996) for 11 long-term study areas, with strong evidence that populations declined (i.e., λ_{RJS} significantly <1.0) on 7 of the 11 areas, including Rainier, Olympic, Cle Elum, Coast Range, HJ Andrews, Northwest California and Green Diamond (Forsman *et al.* 2011). On Tyee, Klamath, Southern Cascades, and Hoopa, populations were either stable or the precision of the estimates was not sufficient to detect declines. In the second meta-analysis, the mean λ_{RJS} of 0.972 (SE = 0.006, 95 percent CI = 0.958 to 0.985) was reported for the eight demographic monitoring areas (Cle Elum, Olympic, Coast Range, HJ Andrews, Tyee, Klamath, Southern Cascades and Northwest California) included in the effectiveness monitoring program of the Northwest Forest Plan (NWFP), an estimated decline of 2.8 percent per year. Forsman *et al.* (2011) indicated that the number of declining populations on study areas in Washington and northern Oregon together with their rates of decline are concerning for the long-term sustainability of northern spotted owl populations.

Conservation and Recovery

The 2011 revised recovery plan (Service 2011) identifies three main priorities for achieving recovery: (1) protecting the best of its remaining habitat, (2) actively managing forests to improve forest health, and (3) reducing competition from barred owls.

The NWFP continues to guide the management of Federal forest lands within the range of the northern spotted owl (USFS and Bureau of Land Management [BLM] 1994a, 1994b), protecting large blocks of late-seral forest, and providing habitat for species, including the northern spotted owl, that depend on those forests.

The Service presumes that private lands will provide habitat connectivity between Federal Lands and will contribute demographic support (pair or cluster protection) to Federal lands. There are 15 current and ongoing habitat conservation plans (HCP) that have incidental take permits issued for spotted owls—eight in Washington, three in Oregon, and four in California (Service 2011). The HCPs range in size from 40 acres to more than 1.6 million acres. HCPs cover approximately 2.9 million acres (9.1 percent) of the 32 million acres of non-Federal forest lands in the range of the northern spotted owl, with terms ranging from 5 to 100 years.

Range-wide Habitat Baseline

The Service has used information provided by the USFS, BLM, and National Park Service to update the habitat baseline conditions by tracking relative habitat changes over time on Federal lands for northern spotted owls on several occasions, since the northern spotted owl was listed in 1990 (USFS and BLM 1994b; Service 2001; Lint 2005; Davis *et al*. 2011). The estimate of 7.4 million acres used for the NWFP in 1994 (USFS and BLM 1994b) was believed to be representative of the general amount of northern spotted owl habitat on NWFP lands at that time. The most recent mapping effort (Davis *et al*. 2011, Appendix D, Table D) indicates approximately 8.85 million acres of spotted owl nesting/roosting habitat existed on Federal lands and 4.19 million acres existed on non-federal lands at the beginning of the NWFP in 1994/1996. Davis *et al*. (2011) further evaluated changes in spotted owl nesting/roosting habitat using data from California that covered 14 years from 1994 to 2007, and data from Oregon and Washington that covered 10 years from 1996 to 2006. Although the spatial resolution of this new habitat map currently makes it unsuitable for tracking habitat effects at the scale of individual projects, the Service has evaluated the map for use in tracking provincial and range-wide habitat trends and now considers these data as the best available information on the distribution and abundance of extant spotted owl habitat within its range as of 2006 for Oregon and Washington, and 2007 for California, when the base imagery was collected.

Periodic range-wide evaluations of habitat, as compared to the Final Supplemental Environmental Impact Statement (FSEIS; USFS and BLM 1994b), are necessary to determine if the rate of potential change to northern spotted owl habitat is consistent with the change anticipated in the NWFP: a reduction in suitable habitat of approximately 2.5 percent per decade (USFS and BLM 1994a). In particular, the Service considers habitat effects that are documented through the section 7 consultation process since 1994. In general, the analytical framework of these consultations focuses on the reserve and connectivity goals established by the NWFP land-use allocations (USFS and BLM 1994a), with effects expressed in terms of changes in suitable northern spotted owl habitat within those land-use allocations.

In 2001, the Service conducted the first assessment of habitat baseline conditions since implementation of the NWFP (Service 2001). The Service determined that actions and effects were consistent with the expectations for implementation of the NWFP from 1994 to June 2001 (Service 2001). April 13, 2004, marked the start of the second decade of the NWFP. Decade-specific baselines and summaries of effects by State, physiographic province and land use function from proposed management activities and natural events are not provided here, but are consistent with expected habitat changes under the NWFP.

In February 2013, the Service adopted the 2006/07 satellite imagery data on spotted owl habitat as the new range-wide habitat baseline for Federal lands which effectively resets the timeframe for establishing changes in the distribution and abundance of spotted owl habitat. On that basis, the assessment of local, provincial and range-wide spotted owl habitat status in this and future Opinions as well as Biological Assessments will rely on these 2006/07 habitat data to characterize changes in the status of spotted owl habitat.

Service's Consultation Database

To update information considered in 2001 (Service 2001), the Service designed the Consultation Effects Tracking System database in 2002, which recorded impacts to northern spotted owls and their habitat at different spatial and temporal scales. In 2011, the Service replaced the Consultation Effects Tracking System with the Consulted on Effects Database located in the Service's Environmental Conservation Online System (ECOS). The ECOS Database corrected technical issues with the Consultation Effects Tracking System. Data are currently entered into the ECOS Database under various categories including; land management agency, land-use allocation, physiographic province, and type of habitat affected.

Range-wide Analysis: 1994– July 24, 2014

Between 1994 and July 24, 2014, the Service has consulted on the proposed removal/downgrade of approximately 204,255 acres (Table 1) or 2.4 percent of the 8.555 million acres of northern spotted owl nesting/roosting habitat estimated by Davis *et al*. (2011) to have occurred on Federal lands (Table 1). These changes in suitable northern spotted owl habitat are consistent with the expectations for implementation of the NWFP, which anticipated a rate of habitat harvested at 2.5 percent per decade (USFS and BLM 1994a).

The Service tracks habitat changes on non-NWFP lands through consultations for long-term Habitat Conservation Plans, Safe Harbor Agreements, or Tribal Forest Management Plans. Service consultations conducted since 1992 have documented the eventual loss of over 483,382 acres of habitat on non-NWFP lands. Most of these losses have yet to be realized because they are part of large-scale, long-term Habitat Conservation Plans. However, the NWFP 15 year monitoring report documented habitat losses on non-federal lands associated with timber harvest continues to occur at a rate of approximately 2 percent per year in Oregon and Washington, and at a lesser rate in California (Davis *et al*. 2011).

Range-wide Analysis: 2006/2007 to July 24, 2014

The Service updated the ECOS Database to reflect the 2006/2007 habitat baseline developed for the NWFP 15-year monitoring report (Davis *et al*. 2011, Appendix D, Table D). This mapping effort accounted for habitat loss due to wildfire, harvest, insects and disease, and indicates approximately 8.555 million acres of spotted owl nesting/roosting habitat existed on Federal lands in 2006/2007. Because the data developed for the NWFP monitoring program is only current through 2006/2007, the Service continues to rely on information compiled in the spotted owl consultation database to summarize current owl habitat trends at provincial and range-wide scales. Table 2 summarizes the habitat impacts on Federal lands that have occurred since 2006/2007.

Habitat loss from Federal lands since 2006/2007 due to land management activities and natural events has varied among the individual provinces with most of the impacts concentrated within the 'Non-Reserves' land-use allocations relative to the 'Reserve' land-use allocations (Table 2). When habitat loss is evaluated as a proportion of the affected acres range-wide, the most pronounced losses have occurred within Oregon (55.1 percent; especially within its Cascades West [22.2 percent] and Cascades East [18.4 percent] provinces; Table 2), followed by California (37.6 percent; with nearly all [36.9 percent] from the Klamath Province; Table 2). In contrast, much smaller habitat losses have occurred in Washington (7.3 percent; Table 2). When habitat loss is evaluated as a proportion of provincial baselines, the Oregon Cascades East (5.3 percent), and the California Klamath (1.5 percent) provinces have proportional losses greater than the loss of habitat across all provinces (1.27 percent; Table 2).

Of the total Federal acres consulted on for 'Habitat Removed/Downgraded' in Table 2, approximately 52,537 acres or 0.61 percent of 8.555 million baseline acres of northern spotted owl habitat were removed/downgraded as a result of land management activities. Of these activities 45,436 acres were a result of timber harvest (Table 3). Table 2 also estimates northern spotted owl habitat lost due to 'Natural Events' (e.g., wildfires, wind throw, disease) at 56,460 acres range-wide, with the California Klamath province contributing the majority (39,481 acres or 70 percent) of habitat lost, followed by the Oregon Cascades East province (9,620 acres or 17 percent).

Table 1. Range-wide aggregate of changes to NRF[1] habitat acres from activities subject to section 7 consultations and other causes from 1994 to July 24, 2014.

Land Ownership	Consulted On Habitat Changes[2]		Other Habitat Changes[3]	
	Removed/ Downgraded	Maintained/ Improved	Removed/ Downgraded	Maintained/ Improved
NWFP (FS,BLM,NPS)	204,255	547,471	251,276	39,720
Bureau of Indian Affairs/Tribes	111,662	28,372	2,398	0
Habitat Conservation Plans/Safe Harbor Agreements	303,007	14,539	N/A	N/A
Other Federal, State, County, Private Lands	68,713	28,447	2,392	0
Total Changes	687,637	618,829	256,006	39,720

[1]Nesting, roosting, foraging (NRF) habitat. In California, suitable habitat is divided into two components; nesting - roosting (NR) habitat, and foraging (F) habitat. The NR component most closely resembles NRF habitat in Oregon and Washington. Due to differences in reporting methods, effects to suitable habitat compiled in this, and all subsequent tables include effects for nesting, roosting, and foraging (NRF) for 1994-6/26/2001. After 6/26/2001 suitable habitat includes NRF for Washington and Oregon but does not include foraging only (F) for California.

[2]Includes both effects reported in Service 2001 and subsequent effects reported in the Northern Spotted Owl Consultation Effects Tracking System (web application and database.)

[3]Includes effects to suitable NRF habitat (as generally documented through technical assistance, etc.) resulting from wildfires (not from suppression efforts), insect and disease outbreaks, and other natural causes, private timber harvest, and land exchanges not associated with consultation.

Table 2. Summary of northern spotted owl suitable habitat (NRF[1]) acres removed or downgraded as documented through Section 7 consultations on all Federal Lands within the Northwest Forest Plan area. Environmental baseline and summary effects by state, physiographic province, and land use function from 2006 to July 24, 2014.

		Evaluation Baseline (2006/2007)[3]			Habitat Removed/Downgraded[4]								
					Land Management Effects			Habitat Loss from Natural Events					
	Physiographic Province[2]	Nesting/ Roosting Acres in Reserves	Nesting/ Roosting Acres in Non-Reserves	Total Nesting/ Roosting Acres	Reserves[5]	Non-Reserves	Total	Reserves[5]	Non-Reserves	Total	Total NRF Removed/ Downgraded	% Provincial Baseline Affected	% Range-wide Effects
WA	Eastern Cascades	462,400	181,100	643,500	2,700	2,238	4,938	1,559	132	1,691	6,629	1.03	6.08
	Olympic Peninsula	729,000	33,400	762,400	6	0	6	0	1	1	7	0	0.01
	Western Cascades	1,031,600	246,600	1,278,200	529	831	1,360	3	0	3	1,363	0.11	1.25
	Western Lowlands	24,300	0	24,300	0	0	0	0	0	0	0	0	0
OR	Cascades East	248,500	128,400	376,900	2,994	7,484	10,478	7,639	1,981	9,620	20,098	5.33	18.44
	Cascades West	1,275,200	939,600	2,214,800	1,183	22,995	24,178	0	0	0	24,178	1.09	22.18
	Coast Range	494,400	113,400	607,800	750	1,623	2,373	0	0	0	2,373	0.39	2.18
	Klamath Mountains	549,400	334,900	884,300	2,985	5,209	8,194	1,468	3,696	5,164	13,358	1.51	12.26
	Willamette Valley	700	2,600	3,300	0	0	0	0	0	0	0	0	0
CA	Cascades	101,700	102,900	204,600	10	1	11	325	0	325	336	0.16	0.31
	Coast	132,900	10,100	143,000	274	1	275	0	175	175	450	0.31	0.41
	Klamath	910,900	501,200	1,412,100	75	649	724	19,072	20,409	39,481	40,205	2.85	36.89
	Total	**5,961,000**	**2,594,200**	**8,555,200**	**11,506**	**41,031**	**52,537**	**30,066**	**26,394**	**56,460**	**108,997**	**1.27**	**100**

[1]Nesting, roosting, foraging (NRF) habitat. In WA/OR, the values for Nesting/Roosting habitat generally represent the distribution of suitable owl habitat, including foraging habitat. In CA, foraging habitat occurs in a much broader range of forest types than what is represented by nesting/roosting habitat. Baseline information for foraging habitat as a separate category in CA is currently not available at a provincial scale in this database; however, California consultations use locally derived information to assess effects to foraging only.

[2]Defined in the Revised Recovery Plan for the Northern Spotted Owl (Service 2011) as Recovery Units as depicted on page A-3.

[3]Spotted owl nesting and roosting habitat on all Federal lands (includes USFS, BLM, NPS, DoD, USFWS, etc.) as reported by Davis et al. 2011 for the Northwest Forest Plan 15-Year Monitoring Report (PNW-GTR-80, Appendix D). NR habitat acres are approximate values based on 2006 (OR/WA) and 2007 (CA) satellite imagery.

[4]Estimated NRF habitat removed or downgraded from land management (timber sales) or natural events (wildfires) as documented through section 7 consultation or technical assistance. Effects reported here include all acres removed or downgraded from 2006 to present. Effects in California reported here only include effects to Nesting/Roosting habitat. Foraging habitat that is independent of Nesting/Roosting habitat but is removed or downgraded in California is not summarized in this table.

[5]Reserve land use allocations under the NWFP intended to provide demographic support for spotted owls include LSR, MLSA, and CRA. Non-reserve allocations under the NWFP intended to provide dispersal connectivity between reserves include AWA, AMA, and MX.

Table 3: Summary of northern spotted owl suitable habitat (NRF)[1] acres removed or downgraded on Federal lands within the Northwest Forest Plan area through timber harvest, natural disturbance, or other management actions as documented through section 7 consultation and technical assistance. Range-wide changes by land-use function from 2006 to July 24, 2014.

Suitable Habitat (NRF) Effects	Reserves LSR, MLSA, CRA[3]	Non-reserves AWA, AMA, Matrix[3]	Totals
Evaluation Baseline (2006/2007)[2]	5,961,000	2,594,200	8,555,200
Removed/Downgraded (timber harvest only)[4]	8,100	38,472	46,572
Removed/Downgraded (other management activities)[5]	3,406	2,559	5,965
Subtotal	11,506	41,031	52,537
Removed/Downgraded (natural disturbance)[6]	30,066	26,394	56,460
Total net change	41,472	67,425	108,997
Baseline balance	**5,919,428**	**2,526,775**	**8,446,203**
Habitat Maintained[7]	37,609	61,894	99,503

Table 3 Notes:

1. Nesting, roosting, foraging (NRF) habitat. In WA/OR, the values for Nesting/Roosting habitat generally represent the distribution of suitable owl habitat, including foraging habitat. In CA, foraging habitat occurs in a much broader range of forest types than what is represented by nesting/roosting habitat. Baseline information for foraging habitat as a separate category in CA is currently not available at a provincial scale. Effects to spotted owl habitat in California reported here include effects to Nesting/Roosting habitat only. Foraging habitat removed or downgraded in California is not summarized in this table; California consultations use locally derived information to assess effects to foraging only.
2. Spotted owl nesting and roosting habitat on all Federal lands (includes USFS, BLM, NPS, DoD, USFWS, etc.) as reported by Davis *et al.* 2011 for the Northwest Forest Plan 15-Year Monitoring Report (PNW-GTR-80, Appendix D). NR habitat acres are approximate values based on 2006 (OR/WA) and 2007 (CA) imagery.
3. Reserve land use allocations under the NWFP intended to provide demographic support for spotted owls include LSR, MLSA, and CRA. Non-reserve allocations under the NWFP intended to provide dispersal connectivity between reserves include AWA, AMA, and MX.
4. NRF habitat removed or downgraded from timber harvest on Federal lands.
5. NRF habitat removed or downgraded from recreation, roads, minerals, or other non-timber programs.
6. NRF habitat losses resulting from wildfires, insect and disease, windthrow or other natural causes.
7. Habitat maintained means that stands have been modified by management, but the habitat function remains the same.

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MARBLED MURRELET

Status of the Species, Marbled Murrelet (Updated June, 2013)

Legal Status

The marbled murrelet was listed as a threatened species[1] on September 28, 1992, in Washington, Oregon, and northern California (57 FR 45328 [October 1, 1992]). Since the species' listing, the Service has completed two 5-yr status reviews of the species: September 1, 2004 (Service 2004) and June 12, 2009 (Service 2009). The legal status of the marbled murrelet remains unchanged from the original designation.

The Service originally designated critical habitat for the marbled murrelet in Washington, Oregon, and California on May 24, 1996 (61 FR 26256). The Service revised the 1996 rule in October 2011 (76 FR 61599).

Taxonomy and Range

The marbled murrelet is a small seabird that inhabits the coastal forests and nearshore marine environment along the Pacific coast of North America from southern California to southern Alaska and the Aleutian Islands (Carter and Morrison 1992; Ralph *et al.* 1995; Nelson 1997). The long-billed murrelet (B. *perdix*) and Kittlitz's murrelet (B. *brevirostris*), which are mostly restricted to northeastern Asia and Alaska, respectively, are the only other species in the Brachyramphus genus worldwide. The long-billed and marbled murrelets were long considered to be 2 races of the same species, despite several morphological differences. However, in 1997, the American Ornithologists' Union recognized the marbled and long-billed murrelets as separate species (American Ornithologists' Union 1997).

The breeding range of the marbled murrelet extends along the Pacific coast from Alaska to Monterey Bay in central California. Some wintering birds occur as far south as northern Baja California, Mexico. However, only the Washington, Oregon, and California population segment are Federally listed as threatened (Service 1992).

Limited information is available on their historic distribution and numbers; however, most summaries give indications that the distribution of marbled murrelet populations was significantly reduced as habitat was removed throughout its' range. Populations declined as a result. In some areas, only small numbers of marbled murrelets persist or have been locally extirpated, risking maintenance of the species' distribution. These areas are identified as "areas of concern" (Service 1997). They include distribution gaps in central California, northwestern Oregon, and southwestern Washington, where very little suitable habitat remains, and what habitat does remain occurs in small, fragmented patches.

Biology and Ecology

Marbled murrelets are long-lived seabirds that spend most of their life in the marine environment, with breeding adult birds annually nesting in the forest canopy of mature and old-growth forests. Breeding occurs from about March 24 through September 15, is asynchronous and spread over a more prolonged season than for most temperate seabirds. Marbled murrelets have a naturally low reproductive rate. Marbled murrelets lay just one egg, and are thought to

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[1] The Act defines a threatened species as a species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

usually first breed at age 3. Renesting in the event of nest failure appears to be uncommon, but does occur (Hebert *et al.* 2003; Piatt *et al.* 2007). Incubation is shared by both sexes with incubation shifts lasting 24 hours and exchanges occurring at dawn (Nelson 1997). Chicks fledge 27-40 days after hatching (Nelson 1997).

Marbled murrelets are known to be opportunistic feeders, diving after small schooling fish and large pelagic crustaceans (euphausiids, mysids, amphipods). They will carry a single energy-dense fish to their chick: typically larger sand lance, immature herring, anchovy, smelt, and occasionally salmon smolts (Carter and Sealy 1987; Burkett 1995; Nelson 1997). Radio marked marbled murrelets in California confirm that breeders forage more closely to nesting habitat once nesting is initiated than non-breeders (Peery *et al.* 2009; Hebert and Golightly 2008).

Habitat Use

Throughout most of its breeding range, including the listed range from Washington to California, the marbled murrelet uses old-growth coniferous forest habitat for nesting and forages in the nearshore marine environments. Nests are not built, but rather the egg is placed in a small depression or cup made in moss or other debris on the limb (Service 1997). At the north end of the range, ground-nesting occurs in the Aleutian Islands and parts of southern Alaska. The distance inland that marbled murrelets breed is variable and influenced by a number of factors, however, the Service considers 50 miles (80 km) as the maximum inland distance for determining habitat suitability and amount of habitat within the listed range (Service 2009).

In California, recent radio marked marbled murrelets confirm that breeders forage more closely to nesting habitat once nesting is initiated than non-breeders (Peery *et al.* 2009; Hebert and Golightly 2008). In northern California, mean home range size was 655 kilometer squared (km2) for non-nesters and 240 km2 for nesters (Hebert and Golightly 2008. Mean along shore movement was 69 km for nesting females and 78 km for nesting males (Hebert and Golightly 2008). Mean offshore movement was within 1.4 km regardless of sex or nesting status (Hebert and Golightly 2008). In central California, nesting birds spent night time hours resting No on the ocean an average of 5.1 km from the mouths of drainages used to reach nesting habitat, and commuted from these resting areas to daytime foraging locations (Peery *et al.* 2009). These at-sea resting areas associated with inshore nesting habitat appear important to breeding marbled murrelets as they are constrained by the need to attend nest sites (Peery *at el.* 2009). Non-breeders often spent the night near daytime foraging areas (Peery *et al.* 2009).

In Washington, home range size during the breeding season was more variable. Here, average marine home range size was five times larger in 2005 (2,098 km2) compared to 2004 (469 km2) during the breeding season (Bloxton and Raphael 2006). In 2004, the radio-tagged marbled murrelets had relatively confined home ranges within a single part of the study area. However, in 2005, they used multiple core feeding areas, likely in response to poor oceanographic conditions (Bloxton and Raphael 2006). These numbers include both nesting and non-nesting individuals, and the 2005 mean home range size was considerably larger than observed in northern California by Hebert and Golightly (2008). Overall, there appear to be differences in home range size and use across the range. This may be related to habitat use and forage availability.

Threats
Several threats to marbled murrelets, present in both the marine and terrestrial environments, have been identified. These threats collectively comprise a suite of environmental stressors that, individually or through interaction, have significantly disrupted or impaired behaviors which are essential to the reproduction or survival of individuals. When combined with the species naturally low reproductive rate, these stressors have led to declines in marbled murrelet abundance, distribution, and reproduction at the population scale within the listed-range.

When the marbled murrelet was listed under the Endangered Species Act (57 FR 45333-45336 [October 1, 1992]) and threats summarized in the Recovery Plan (Service 1997), several anthropogenic threats were identified as having caused the dramatic decline in the species.

- habitat destruction and modification in the terrestrial environment from timber harvest and human development caused a severe reduction in the amount of nesting habitat
- unnaturally high levels of predation resulting from forest "edge effects" ;
- the existing regulatory mechanisms, such as land management plans (in 1992), were considered inadequate to ensure protection of the remaining nesting habitat and reestablishment of future nesting habitat; and
- manmade factors such as mortality from oil spills and entanglement in fishing nets used in gill-net fisheries.

There have been changes in the levels of these threats since the 1992 listing (Service 2004; Service 2009). The regulatory mechanisms implemented since 1992 that affect land management in Washington, Oregon, and California (for example, the Northwest Forest Plan (NWFP)) and new gill-netting regulations in northern California and Washington have reduced the threats to marbled murrelets (Service 2004). The threat levels for the other threats identified in 1992 listing (57 FR 45333-45336 [October 1, 1992]) including the loss of nesting habitat, predation rates, and mortality risks from oil spills and gill net fisheries (despite the regulatory changes) remained unchanged following the Service's 2004, 5-year, range-wide status review for the marbled murrelet (Service 2004).

However, new threats were identified in the Service's 2009, 5-year review for the marbled murrelet (Service 2009). These new stressors are due to several environmental factors affecting marbled murrelets in the marine environment. These new stressors include:

- Habitat destruction, modification, or curtailment of the marine environmental conditions necessary to support marbled murrelets due to:
    - elevated levels of polychlorinated biphenyls in marbled murrelet prey species;
    - changes in prey abundance and availability;
    - changes in prey quality;
    - harmful algal blooms that produce biotoxins leading to domoic acid and paralytic shellfish poisoning that have caused marbled murrelet mortality; and

  - climate change in the Pacific Northwest.

- Manmade factors that affect the continued existence of the species include:
  - derelict fishing gear leading to mortality from entanglement;
  - energy development projects (wave, tidal, and on-shore wind energy projects) leading to mortality; and
  - disturbance in the marine environment (from exposures to lethal and sub-lethal levels of high underwater sound pressures caused by pile-driving, underwater detonations, and potential disturbance from high vessel traffic;, particularly a factor in Washington state).

Detailed discussions of the above-mentioned threats, life-history, biology, and status of the marbled murrelet are presented in the Federal Register, listing the marbled murrelet as a threatened species (57 FR 45328 [October 1, 1992]); the Recovery Plan, Ecology and Conservation of the Marbled Murrelet (Ralph *et al.* 1995); the final rule designating marbled murrelet critical habitat (61 FR 26256 [May 24, 1996]); the Evaluation Report in the 5-Year Status Review of the Marbled Murrelet in Washington, Oregon, and California (McShane *et al.* 2004); the 2004 and 2009, 5-year Reviews for the Marbled Murrelet (Service 2004; Service 2009), and the final rule revising critical habitat for the marbled murrelet (76 FR 61599 [October 5, 2011]).

Population Status

The initial at-sea surveys for marbled murrelets that began during the 1990s in the marine waters of Washington, Oregon, and California were generally independent and sporadic efforts to assess marbled murrelet population status (abundance, trends, distribution, and fecundity). In 1999, researchers developed the EM plan for the NWFP (Madsen *et al.* 1999) brought a unified sampling protocol to assessing marbled murrelet population status and trend for the coastal marine waters offshore of the five Conservation Zones within the NWFP planning area. Standardized at-sea surveys using this protocol began in 2000, as part of the EM Program (Bentivoglio *et al.* 2002). At-sea surveys are also conducted in Conservation Zone 6, independent of the EM Program, but conducted using similar survey methods. The at-sea survey data collected prior to the EM Program are generally not suitable for statistical comparisons or trend analyses due to differences in survey methods (McShane *et al.* 2004).

<u>Abundance and Distribution</u>

Marbled murrelet abundance during the early 1990s in Washington, Oregon, and California was estimated at 18,550 to 32,000 birds (Ralph *et al.* 1995). Based primarily on the results from the EM Program, the 2011 marbled murrelet population for the listed range (Table A.2.1) is estimated at about 23,000 birds (95 percent confidence interval [CI]: 17,691 – 28,364; Table A.2.1). This number is higher than in the previous four years, when estimates were consistently below 18,000 birds (Miller *et al.* 2012). Based on the 2011 estimates, Conservation Zones 3 and 4 support approximately 60 percent of the marbled murrelet population within the U.S., and consistently have the highest at-sea densities during the nesting season (Falxa *et al.* 2011). Marbled murrelets occur in the lowest abundance in Conservation Zones 5 and 6.

At the time of listing, the distribution of active nests in nesting habitat was described as non-continuous (Service 1997). The at-sea extent of the species currently encompasses an area similar in size to the species' historic distribution, but with the extremely low density of marbled murrelets in Conservation Zone 5, and the small population in Conservation Zone 6, the southern end of the marbled murrelet distribution is sparsely populated compared to Conservation Zones 1-4.

Table A.2.1. Estimates of marbled murrelet density and population size (95 percent confidence interval (CI)) in Conservation Zones 1 through 5 during the 2011 breeding season (Northwest Forest Plan Effectiveness Monitoring Program), and in Conservation Zone 6 during the 2011 breeding season (Henry *et al.* 2012).

Conservation Zone	**Density** (birds/km^2)	**Coefficient of Variation** (% Density)	**Population Size Estimates with 95% CI**			**Survey Area** (km^2)
			Number of Birds	Lower	Upper	
1	2.06	18.0	7,187	4,512	9,745	3,497
2	0.72	32.2	1,189	597	2,060	1,650
3	4.65	16.4	7,417	5,200	10,078	1,595
4	5.61	29.9	6,507	3,349	10,214	1,159
5	0.32	44.2	282	57	564	883
6	-	-	433	339	553	-
Zones 1-6	-	-	23,015	17,691	28,364	-

The at-sea distribution also exhibits discontinuity within Conservation Zones 1, 2, 5, and 6, where five areas of discontinuity are noted: a segment of the border region between British Columbia, Canada and Washington, southern Puget Sound, WA, Destruction Island, WA to Tillamook Head, OR, Humboldt County, CA to Half Moon Bay, CA, and the entire southern end of the breeding range in the vicinity of Santa Cruz and Monterey Counties, CA (McShane *et al.* 2004).

Trend

There are two general approaches that researchers use to assess marbled murrelet population trend: at-sea surveys and population modeling based on demographic data. In general, the Service assigns greater weight to population trend and status information derived from at-sea surveys than estimates derived from population models because survey information generally provides more reliable estimates of trend and abundance.

Marine Surveys

Researchers from the EM Program detected a statistically significant decline ($p < 0.001$) in the abundance of the population in Conservation Zones 1 through 5 combined, for the 2001-2010 sample period (Miller *et al.* 2012). The estimated average annual rate of decline for this period was 3.7 percent (95 percent CI: -4.8 to -2.7 percent). This rate of annual decline suggests a total population decline of about 29 percent between 2001 and 2010 (Miller *et al.* 2012).

At the scale of individual conservation zones for this period, the marbled murrelet population in Conservation Zone 1 declined at an estimated average rate of 7.4 percent per year (95 percent CI:

-11.2 to -3.5) (Miller *et al.* 2012). In that same analysis, statistically significant trends were not detected elsewhere at the single-zone scale, but evidence of a declining trend was strong in Zone 2 (6.5% annual rate of decline, $P = 0.06$). For Washington State (Conservation Zones 1 and 2 combined) there was a 7.31 percent (standard error = 1.31 percent) annual rate of decline in marbled murrelet density for the 2001-2010 period (Pearson *et al*. 2011), which equates to a loss of approximately 47 percent of the marbled murrelet population since 2001. Subsequent to this analysis, the 2011 estimate for Conservation Zones 1 through 5 combined (Table A.2.1) increased markedly in 2011, reflecting substantially higher estimates in Conservation Zones 1 and 4, compared to the estimates from recent prior years as reported by Miller *et al.* (2012). Whether the higher 2011 estimates represent a change in marbled murrelet numbers or trend, or a sampling artifact remains to be determined, pending additional years of population monitoring.

In Conservation Zone 6, the 2008 population estimate for Conservation Zone 6 suggested a decline of about 55 percent from the 2007 estimate and a 75 percent decline from the 2003 estimate (Peery *et al*. 2008). However, in the most recent population estimate available, the 2011 estimate were greater than the 2007-2008 estimates, and somewhat lower than the 1999-2003 estimates (Henry *et al*. 2012). Henry *et al.* (2012) speculated that their recent results may be explained by marbled murrelets in central California moving out of the survey area in 2007 and 2008, and then subsequently returning.

Population Models

Prior to the use of survey data to estimate trend, demographic models were more heavily relied upon to generate predictions of trends and extinction probabilities for the marbled murrelet population (Beissinger 1995; Cam *et al.* 2003; McShane *et al.* 2004; Service 1997). However, marbled murrelet population models remain useful because they provide insights into the demographic parameters and environmental factors that govern population stability and future extinction risk, including stochastic factors that may alter survival, reproductive, and immigration/emigration rates.

In a report developed for the 5-year Status Review of the Marbled Murrelet in Washington, Oregon, and California (McShane *et al.* 2004), computer models were used to forecast 40-year marbled murrelet population trends. A series of female-only, multi-aged, discrete-time stochastic Leslie Matrix population models were developed for each conservation zone to forecast decadal population trends over a 40-year period with extinction probabilities beyond 40 years (to 2100). The authors incorporated available demographic parameters (Table A.2.2) for each conservation zone to describe population trends and evaluate extinction probabilities (McShane *et al.* 2004).

McShane *et al.* (2004) used mark-recapture studies conducted in British Columbia by Cam *et al.* (2003) and Bradley *et al.* (2004) to estimate annual adult survival and telemetry studies or at-sea survey data to estimate fecundity. Model outputs predicted -3.1 to -4.6 percent mean annual rates of population change (decline) per decade the first 20 years of model simulations in marbled murrelet Conservation Zones 1 through 5 (McShane *et al.* 2004). Simulations for all zone populations predicted declines during the 20 to 40-year forecast, with mean annual rates of -2.1 to -6.2 percent per decade (McShane *et al.* 2004). These reported rates of decline are similar to the estimates of -4 to -7 percent per year reported in the Recovery Plan (Service 1997).

Table A.2.2. Rangewide marbled murrelet demographic parameter values based on four studies all using Leslie Matrix models.

Demographic Parameter	Beissinger 1995	Beissinger and Nur 1997*	Beissinger and Peery (2007)	McShane *et al.* 2004
Juvenile Ratio (Ŕ)	0.10367	0.124 or 0.131	0.089	0.02 - 0.09
Annual Fecundity	0.11848	0.124 or 0.131	0.06-0.12	-
Nest Success	-	-	0.16-0.43	0.38 - 0.54
Maturation	3	3	3	2 - 5
Estimated Adult Survivorship	85 % – 90%	85 % – 88 %	82 % - 90 %	83 % – 92 %

*In Service (1997).

McShane *et al.* (2004) modeled population extinction probabilities beyond 40 years under different scenarios for immigration and mortality risk from oil spills and gill nets. Modeled results forecast different times and probabilities for local extirpations, with an extinction risk[2] of 16 percent and mean population size of 45 individuals in 100 years in the listed range of the species (McShane *et al.* 2004).

Reproduction

Generally, estimates of marbled murrelet fecundity are directed at measures of breeding success, either from direct assessments of nest success in the terrestrial environment, marine counts of hatch-year birds, or computer models. Telemetry estimates are typically preferred over marine counts for estimating breeding success due to fewer biases (McShane *et al.* 2004). However, because of the challenges of conducting telemetry studies, estimating marbled murrelet reproductive rates with an index of reproduction, referred to as the juvenile ratio (Ŕ),[3] continues to be important, despite the debate over use of this index (see discussion in Beissinger and Peery 2007).

Although difficult to obtain, nest success rates[4] are available from telemetry studies conducted in California (Hebert and Golightly 2006; Peery *et al.* 2004) and Washington (Bloxton and Raphael 2006). In northwest Washington, Bloxton and Raphael (2005) documented a nest success rate of 0.20 (2 chicks fledging from 10 nest starts). In central California, marbled murrelet nest success is 0.16 (Peery *et al.* 2004) and in northern California it is 0.31 to 0.56 (Hebert and Golightly 2006). No studies or published reports from Oregon are available.

Unadjusted and adjusted values for annual estimates of marbled murrelet juvenile ratios suggest extremely low breeding success in Conservation Zone 4 (mean ratio for 2000-2011 of 0.046,

[2] Extinction was defined by McShane *et al.* (2004) as any murrelet conservation zone containing less than 30 birds.

[3] The juvenile ratio (**Ŕ**) for murrelets is derived from the relative abundance of hatch-year (HY; 0-1 yr-old) to after-hatch-year (AHY; 1+ yr-old) birds (Beissinger and Peery 2007) and is calculated from marine survey data.

[4] Nest success here is defined by the annual number of known hatchlings departing from the nest (fledging) divided by the number of nest starts.

range 0.01 to 0.1, Crescent Coastal Research 2012), northern California (0.003 to 0.029 - Long *et al.* 2008; Crescent Coastal Research 2012), central California (0.035 and 0.032 - Beissinger and Peery 2007), and in Oregon (0.0254 - 0.0598 - Crescent Coastal Research 2008). Estimates for **Ŕ** (adjusted) in the San Juan Islands in Washington have been below 0.15 every year since surveys began in 1995, with three of those years below 0.05 (Raphael *et al.* 2007).

These current estimates of **Ŕ** are assumed to be below the level necessary to maintain or increase the marbled murrelet population. Demographic modeling suggests marbled murrelet population stability requires a minimum reproductive rate of 0.18 to 0.28 (95 percent CI) chicks per pair per year (Beissinger and Peery 2007; Service1997). The estimates for Ŕ discussed above from individual studies, as well as estimates for the listed range (0.02 to 0.13; Table A.2.2) are all below the lowest estimated value (0.18) identified as required for population stability (Service 1997; Beissinger and Peery 2007).

The current estimates for **Ŕ** also appear to be well below what may have occurred prior to the marbled murrelet population decline. Beissinger and Peery (2007) performed a comparative analysis using historic data from 29 bird species to predict the historic **Ŕ** for marbled murrelets in central California, resulting in an estimate of 0.27 (95 percent CI: 0.15 - 0.65). Therefore, the best available scientific information of current marbled murrelet fecundity from model predictions, and from juvenile ratios and trend analyses based on of population survey data appear to align well. Both indicate that the marbled murrelet reproductive rate is generally insufficient to maintain stable population numbers throughout all or portions of the species' listed range.

<u>Summary: Marbled Murrelet Abundance, Distribution, Trend, and Reproduction</u>
The 2010 estimated abundance for marbled murrelets within Conservation Zones 1-5 was the lowest recorded since inception of the EM program (Falxa *et al.* 2011), with the 2010 population size for the listed range of the species estimated at 17,322 birds (95 percent CI: 13,524 – 21,192) (Table A.2.1). The confidence limits indicate that population estimates are not precise, however this low number is consistent with a pattern of decreasing estimates from 2001 to 2010 (Falxa *et al.* 2011). Although marbled murrelets are distributed throughout their historical range, the area of occupancy within their historic range appears to be reduced from historic levels. The distribution of the species also exhibits five areas of discontinuity: the British Columbia-Washington border region; southern Puget Sound, WA; Destruction Island, WA to Tillamook Head, OR; southern Humboldt County, CA to Half Moon Bay, CA; and the southern end of the breeding range including Monterey County and southern Santa Cruz County, CA (McShane *et al.* 2004).

The overall population trend from the combined 2001-2010 population estimates (Conservation Zones 1 – 5 combined) indicate a significant, range-wide annual rate of decline of about 3.7 percent (95 percent CI: -4.8 to -2.7 percent; Falxa *et al.* 2011). In addition, at the single-zone scale, a decline was observed for the Conservation Zone 1 population, and there is strong evidence for a decline in Conservation Zone 2 for the same period (Falxa *et al.* 2011).

The current range of estimates for **Ŕ**, the juvenile to adult ratio, is below the level assumed to be necessary to maintain or increase the marbled murrelet population. Whether derived from marine surveys or from population modeling (**Ŕ** = 0.02 to 0.13, Table A.2.2), the available information is in general agreement that the current reproductive success, as indicated by the ratio of hatch year birds to after-hatch year birds, is insufficient to maintain a stable marbled murrelet population throughout the listed range. The current estimates for **Ŕ** also appear to be well below what may have occurred prior to the marbled murrelet population decline (Beissinger and Peery 2007) and model predictions forecast an extinction risk of 16 percent over a 100-year period, with a 3-state mean population size of 45 individuals in 100 years in the listed portion of the species' range (McShane *et al.* 2004).

Thus, considering the best available data on abundance, distribution, population trend, and the low reproductive success of the species, the Service concludes the marbled murrelet population within the portion of its listed range currently has little or no capability to self-regulate, as indicated by the significant, annual decline in abundance the species is currently undergoing throughout the listed range. The Service expects the species to continue to exhibit further reductions in the distribution and abundance into the foreseeable future, due largely to the expectation that the variety of current environmental stressors present in the marine and terrestrial environments (discussed in the *Threats to Marbled Murrelet Survival and Recovery* section) will continue into the foreseeable future.

Conservation and Recovery

The Marbled Murrelet Recovery Plan outlines the conservation strategy with both short- and long-term objectives. The Plan places special emphasis on the terrestrial environment for habitat-based recovery actions due to nesting occurring in inland forests.

In the short-term, specific actions identified as necessary to stabilize the populations include protecting occupied habitat and minimizing the loss of unoccupied but suitable habitat (Service 1997). Specific actions include maintaining large blocks of suitable habitat, maintaining and enhancing buffer habitat, decreasing risks of nesting habitat loss due to fire and windthrow, reducing predation, and minimizing disturbance. The designation of critical habitat also contributes towards the initial objective of stabilizing the population size through the maintenance and protection of occupied habitat and minimizing the loss of unoccupied but suitable habitat.

Long-term conservation needs identified in the Plan include:

- increasing productivity (abundance, the ratio of juveniles to adults, and nest success) and population size;
- increasing the amount (stand size and number of stands), quality, and distribution of suitable nesting habitat;
- protecting and improving the quality of the marine environment; and
- reducing or eliminating threats to survivorship by reducing predation in the terrestrial environment and anthropogenic sources of mortality at sea.

<u>Recovery Zones</u>

The Plan identified six Conservation Zones (Figure A.2.1) throughout the listed range of the species: Puget Sound (Conservation Zone 1), Western Washington Coast Range (Conservation Zone 2), Oregon Coast Range (Conservation Zone 3), Siskiyou Coast Range (Conservation Zone 4), Mendocino (Conservation Zone 5), and Santa Cruz Mountains (Conservation Zone 6). Recovery zones are the functional equivalent of recovery units as defined by Service policy (Service 1997).

Recovery Zones in California

Conservation Zone 4 extends from North Bend, Oregon to the southern end of Humboldt County, California. In general, it extends inland 35 miles (56 km) from the Pacific Ocean shoreline, and includes waters within 1.2 miles of the shoreline. Conservation Zone 5 extends south from the southern boundary of Humboldt County to the mouth of San Francisco Bay. It also includes marine waters within 1.2 miles of the Pacific Ocean shoreline, and extends inland a distance of up to 25 miles (40 km) from that shoreline. Conservation Zone 6 extends south from the mouth of San Francisco Bay to Point Sur, Monterey County, California; this zone includes marine waters within 1.2 miles of the Pacific Ocean shoreline, and extends inland a distance of up to 15 miles (24 km) from that shoreline (Service 1997).

Lands considered essential for the recovery of the marbled murrelet within Conservation Zones 4, 5 and 6 are: 1) any suitable habitat managed by the Federal government in LSRs located in the Forest Ecosystem Management Assessment Team Zone 1 (see pages IV-23 and IV-24 in U.S. Department of Agriculture *et al.* 1993 for a description of this Zone 1), 4) other large areas of suitable habitat on Federal lands outside of LSRs, 3) large areas of suitable habitat on state lands within 25 miles (40 km) of the coast in California and Oregon, 4) suitable habitat on county park lands within 25 miles (40 km) of the coast in San Mateo and Santa Cruz Counties, California, 5) suitable nesting habitat on Pacific Lumber Company (now Humboldt Redwood Company) lands in Humboldt County, California (Service 1997).

Marine areas in California considered essential for recovery of the marbled murrelet include: 1) nearshore waters (within 1.2 miles of the shore) along the Pacific Coast from the Oregon-California border south to Cape Mendocino in northern California, including Humboldt and Arcata Bays, and river mouths; and 2) nearshore waters (within 1.2 miles of shore) along the Pacific Coast in central California from San Pedro Point south to the mouth of the Pajaro River (Service 1997).

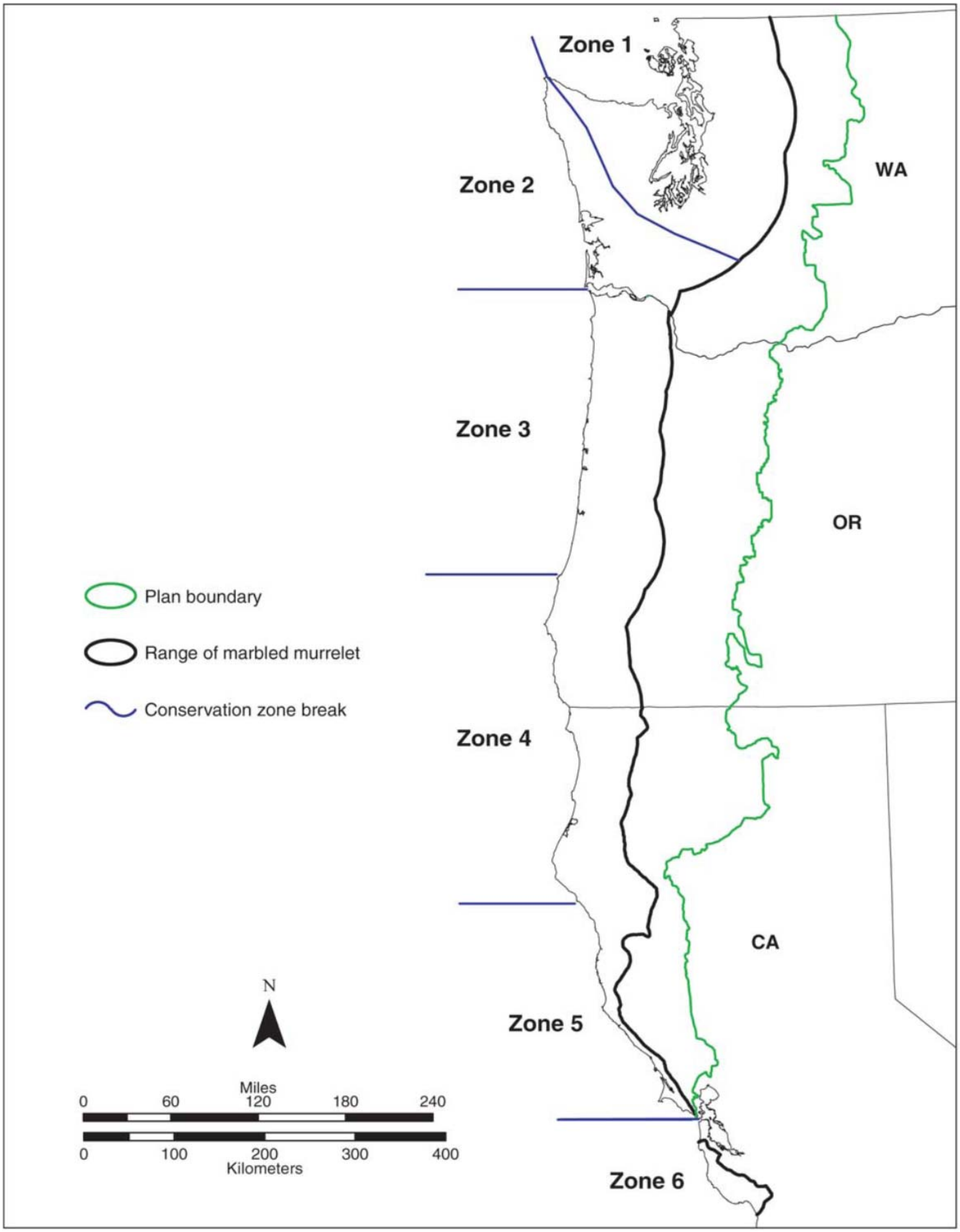

Figure A.2.1. The six geographic areas identified as Conservation Zones in the recovery plan for the marbled murrelet (Service 1997). Note: "Plan boundary" refers to the Northwest Forest Plan. Figure adapted from Huff *et al.* (2006).

Conservation Needs of the Species

Reestablishing an abundant supply of high quality marbled murrelet nesting habitat is a vital conservation need given the extensive removal during the 20th century. However, there are other conservation imperatives. Foremost among the conservation needs are those in the marine and terrestrial environments to increase marbled murrelet fecundity by increasing the number of breeding adults, improving marbled murrelet nest success (due to low nestling survival and low fledging rates), and reducing anthropogenic stressors that reduce individual fitness[5] or lead to mortality.

The overall reproductive success (fecundity) of marbled murrelets is directly influenced by nest predation rates (reducing nestling survival rates) in the terrestrial environment and an abundant supply of high quality prey in the marine environment during the breeding season (improving potential nestling survival and fledging rates). Anthropogenic stressors affecting marbled murrelet fitness and survival in the marine environment are associated with commercial and tribal gillnets, derelict fishing gear, oil spills, and high underwater sound pressure (energy) levels generated by pile-driving and underwater detonations (that can be lethal or reduce individual fitness).

General criteria for marbled murrelet recovery (delisting) were established at the inception of the Plan and they have not been met. More specific delisting criteria are expected in the future to address population, demographic, and habitat based recovery criteria (Service 1997). The general criteria include:

- documenting stable or increasing population trends in population size, density, and productivity in four of the six Conservation Zones for a 10-year period and
- implementing management and monitoring strategies in the marine and terrestrial environments to ensure protection of marbled murrelets for at least 50 years.

Thus, increasing marbled murrelet reproductive success and reducing the frequency, magnitude, or duration of any anthropogenic stressor that directly or indirectly affects marbled murrelet fitness or survival in the marine and terrestrial environments are the priority conservation needs of the species. The Service estimates recovery of the marbled murrelet will require at least 50 years (Service 1997).

Summary

The level of risk posed by some threats to the marbled murrelet population may have been reduced as a result of the species' listing under the Act, such as the passage of the Oil Pollution Act and implementation of the NWFP. However, the Service is not aware that any threats have been removed since listing and in some portions of the listed range, new threats (identified above) have been identified which affect the species at the local population or listed-entity scales. Currently, the Service expects these threats to continue into the foreseeable future and those that cause direct mortality or reduce individual fitness are likely to contribute to marbled murrelet population declines.

[5] Fitness is measure of the relative capability of individuals within a species to reproduce and pass its' genotype to the next generation.

Considering the life history characteristics of the marbled murrelet, the species' capability to recover from the mortality or reduced-fitness stressors is extremely low. The low observed reproductive rate causes the marbled murrelet population to be highly sensitive to mortality and fitness-reducing stressors, particularly when they occur at a frequency which exceeds the species' loss-replacement rate. Despite the relatively long life span of marbled murrelets and a reasonably high adult survival rate, the annual replacement rates needed for long-term population maintenance and stability is currently well below the annual rate of individuals being removed from each Conservation Zone.

Therefore, given the interactive effect of an extremely low fecundity and the current threats facing the species, it is reasonable to predict that the marbled murrelet populations (in each Conservation Zone) throughout the listed range are likely to continue to decline. The decline is expected to continue until marbled murrelet fecundity is significantly improved and the anthropogenic stressors affecting fitness, survivorship, and nest success are eliminated or sufficiently reduced.

Range-wide Habitat Baseline

The destruction, modification, or curtailment of nesting habitat from logging, urbanization, and land use conversion has generally been regarded as the most influential environmental stressor that led to the 1992 Federal listing of the species under the Act. The Service estimates that over 80 percent of the historic nesting habitat has been rendered unsuitable for nesting (57 FR 45328 [October 1, 1992]). Because of the important role nesting habitat plays in the survival and recovery of the species, significant attention has been given to describing the quality, quantity, and location of the remaining nesting habitat and planning for the restoration of nesting habitat in California, Oregon, and Washington.

<u>Loss of Nesting Habitat Since 1992</u>

The Service has determined that the rate of habitat loss has declined since listing, particularly on Federal lands due to implementation of the NWFP (Service 2004). Between 1992 and 2003, the estimated loss of suitable marbled murrelet habitat totaled 22,398 acres in Washington, Oregon, and California combined, of which 5,364 acres resulted from timber harvest and 17,034 acres resulted from natural events (McShane *et al.* 2004). Those data primarily represented losses on Federal lands, and did not include data for most private or State lands within the marbled murrelet's range.

More recent data on habitat losses, and from all ownerships, comes from the NWFP Effectiveness Monitoring (EM) Program. They used spatial habitat models to estimate distribution and losses of potential suitable marbled murrelet nesting habitat during the period from 1994-1996 to 2006-2007 on both Federal and non-Federal lands within the five Conservation Zones in the NWFP area (Raphael *et al.* 2011). Results indicate that losses of potential nesting habitat have been greater than previously estimated, with losses ranging from 270,000 to 490,000 acres of higher-suitability habitat in the 5-Conservation Zone area (amount of loss depends on the method of calculating losses, as discussed below and in Raphael *et al.* 2011). Of this habitat loss, about 72,000 to 77,000 acres (16 to 26 percent) occurred on Federal lands and about 200,000 to 414,000 acres (74 to 84 percent) on non-Federal lands. Fire was the primary cause of loss (74 percent) on Federal lands during this period, followed by harvest (20 percent, about 15,300 acres), while harvest caused most loss (95 percent) on non-Federal lands (Raphael *et al.* 2011, Table 5). Most of the fire loss on federal lands was associated with the 2002 Biscuit Fire in southwestern Oregon.

Current Amount of Nesting Habitat

McShane *et al.* (2004), reviewed and summarized habitat estimates from 16 sources and estimated the amount of marbled murrelet nesting habitat at 2,223,048 acres distributed throughout Washington, Oregon, and California (McShane *et al.* 2004). Washington State contains almost half of all remaining nesting habitat with an estimated 1,022,695 acres or 48 percent of the total. Approximately 93 percent (2,000,000 acres) are reported to occur on Federal lands (McShane *et al.* 2004).

Recently, Raphael *et al.* (2011) used models to predict the amount, location, and distribution of potentially suitable marbled murrelet nesting habitat. Their habitat model used the Maximum Entropy (Maxent) methodology (Phillips and Dudik 2008) to compare vegetation and physical attributes for known marbled murrelet occupied polygons or nest locations with conditions over the entire range of forested lands in which marbled murrelets occurred. The resulting habitat maps ranked suitability as nesting habitat throughout the entire range, relative to conditions at those known nest locations and occupied sites. Separate models and maps were developed for each state for a baseline year of 1994-1996, and resulted in maps of habitat suitability broken into 4 classes, ranging from lowest (Class 1) to highest (Class 4) suitability nesting habitat, each with acreage estimates. In Washington, 2.3 million acres of habitat were classified as "higher suitability" (Classes 3 plus 4), of which 1.0 million acres were in the "highest suitability" class (Class 4). In Oregon, 1.4 million acres of habitat were classified as higher suitability, of which 0.6 million acres were Class 4. In California, about 133,000 acres of habitat were rated as higher suitability, of which about 51,000 acres of habitat were Class 4.

The above estimates are for the baseline period of 1994 (California) or 1996 (Oregon and Washington). Raphael *et al.* (2011) also provide more estimates of habitat, based on projecting the same Maxent habitat suitability models onto maps with vegetation conditions in 2006-2007. They also used separate LandTrendr spatial data on vegetation change (Kennedy *et al.* 2010) to refine the estimates of habitat loss as determined by the model projections. This helped identify likely causes of habitat loss, and provided estimates of suitable nesting habitat in 2006-2007. As detailed in Raphael *et al.* (2011), they used two methods to estimate habitat in those years, resulting in 2 estimates, resulting in a range of estimates. The estimated amount of higher-suitability habitat (Class 3 plus 4) for Washington in 2006 is 2.05 to 2.1 million acres, for Oregon in 2006 is 1.15 to 1.31 million acres, and for California in 2007 is 124,000 to 130,000 acres.

The Service believes the Raphael *et al.* (2011) models, which use characteristics of known (occupied) marbled murrelet nest stands to estimate habitat abundance, distribution, and quality, represent the best available information on the subject. While not necessarily the best means to describe suitable habitat at the site scale, the Service expects these models have higher reliability for state or provincial-scale analysis compared to previous efforts.

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CALIFORNIA RED-LEGGED FROG

California Red-Legged Frog, Status of the Species

Legal Status

The California red-legged frog was listed as a threatened species on May 23, 1996 (61 FR 25813; USFWS 1996). Critical habitat was designated for this species on April 13, 2006 (71 FR 19244) (USFWS 2006) and revisions to the critical habitat designation were published on March 17, 2010 (75 FR 12816; USFWS 2010). A recovery plan was published for the California red-legged frog on September 12, 2002 (USFWS 2002). Section 4(c)(2)(A) of the Act requires the Service to conduct a review of listed species at least once every 5 years. Then, on the basis of such reviews ("5-year reviews") under section 4(c)(2)(B), we determine whether or not any species should be removed from the List (at 50 CFR 17.11 [for animals] and 17.12 [for plants]), or reclassified from endangered to threatened or from threatened to endangered. In 2011, the Service published a notice stating that it had initiated a status review for the species (76 FR 30377; USFWS 2011).

Taxonomy and Range

In 2010, the Service recognized the taxonomic change from *Rana aurora draytonii* to *Rana draytonii*, based on genetic research by Shaffer *et al*. (2004), which indicated that the intergrade zone between the California red-legged frog and closely-related northern red-legged frogs (*Rana aurora*; formerly, *Rana aurora aurora*) was likely narrower geographically than previously thought (75 FR 12816; USFWS 2010). Consequently, the Service changed (for regulatory purposes) the extent of the geographic range of the California red-legged frog to reflect the entire range of the subspecies, which includes locations in southern coastal Mendocino County (75 FR 12816; USFWS 2010).

The historical range of the California red-legged frog extended coastally from southern Mendocino County and inland from the vicinity of Redding, California, southward to northwestern Baja California, Mexico (Storer 1925; Jennings and Hayes 1985; Shaffer *et al.* 2004). The California red-legged frog has sustained a 70 percent reduction in its geographic range as a result of several factors acting singly or in combination (Jennings *et al*. 1992). Only a few drainages are currently known to support California red-legged frogs in the Sierra Nevada foothills, compared to more than 60 historical records. In southern California, the California red-legged frog has essentially disappeared from the Los Angeles area south to the Mexican border; the only known population in Los Angeles County is in San Francisquito Canyon on the Angeles National Forest. The species is believed to be extirpated from the southern Transverse and Peninsular ranges, but is still present in Baja California, Mexico (CDFG 2011).

Biology and Ecology

The California red-legged frog is the largest native frog in the western United States ranging from 1.75 to 5.25 inches from the tip of the snout to the vent (Stebbins 2003). From above, the California red-legged frog can appear brown, gray, olive, red, or orange, often with a pattern of dark flecks or spots. The back is bordered on either side by an often prominent ridge (dorsolateral fold) running from the eye to the hip. The hind legs are well-developed with large, webbed feet. A cream, white, or orange stripe usually extends along the upper lip from beneath the eye to the rear of the jaw. The undersides of adult California red-legged frogs are white, usually with patches of bright red or orange on the abdomen and hind legs. The groin area sometimes exhibits bold black mottling with a white or yellow background.

California red-legged frogs breed from November through March; earlier breeding has been recorded in southern localities (Storer 1925). Males appear at breeding sites from two to four weeks before females (Storer 1925). They typically call in small, mobile groups of three to seven individuals to attract females (Jennings and Hayes 1985). Female California red-legged frogs deposit egg masses on emergent vegetation so that the masses float on the surface of the water (Hayes and Miyamoto 1984). Egg masses contain about 2,000 to 5,000 moderate-size (0.08 to 0.11 inch in diameter), dark reddish brown eggs (Storer 1925; Jennings and Hayes 1985). Eggs hatch in 6 to 14 days (Storer 1925). Larvae undergo metamorphosis 2.5 to 7 months after hatching (Storer 1925; Jennings and Hayes 1990; USFWS 2002). Egg predation is infrequent; most mortality probably occurs during the tadpole stage (Kiesecker and Blaustein 1997), although eggs are susceptible to being washed away during high stream flows. Rathbun (1998) reported predation of California red-legged frog eggs by newts (*Taricha* sp.). Sexual maturity can be attained at two years of age by males and three years of age by females (Jennings and Hayes 1985); adults may live 8 to 10 years (Jennings *et al.* 1992), although the average life span is probably much shorter.

The diet of California red-legged frogs is highly variable. Tadpoles probably eat algae (Jennings *et al.* 1992). Hayes and Tennant (1985) found invertebrates to be the most common food item for adults. Vertebrates such as Pacific chorus frogs (*Pseudacris regilla*) and California mice (*Peromyscus californicus*), represented over half of the prey mass eaten by larger frogs (Hayes and Tennant 1985). Feeding activity probably occurs along the shoreline and on the surface of the water. Hayes and Tennant (1985) found juvenile California red-legged frogs to be active diurnally and nocturnally, whereas adult California red-legged frogs were primarily nocturnal.

During periods of wet weather, starting with the first rains of fall, some individuals may make long-distance overland excursions through terrestrial habitats to reach breeding sites. In Santa Cruz County, Bulger *et al.* (2003) found marked California red-legged frogs moving up to 1.7 miles through terrestrial habitats, via point to point, straight-line migrations without apparent regard to topography, rather than following riparian corridors. Most of these overland movements occurred at night in association with rain events, and took up to two months. Similarly, in San Luis Obispo County, Rathbun and Schneider (2001) documented the movement of a male California red-legged frog between two ponds that were 1.8 miles apart; this was accomplished in less than 32 days. However, most California red-legged frogs in the Bulger *et al.* (2003) study were non-migrating frogs and always remained within 426 feet of their aquatic site of residence (half of the frogs always stayed within 82 feet of water). Rathbun *et al.* (1993) radio-tracked several California red-legged frogs near the coast in San Luis Obispo County at various times between July and January; these frogs also stayed rather close to water and never strayed more than 85 feet into terrestrial vegetation.

After breeding, California red-legged frogs often disperse from their breeding habitat to forage and seek suitable dry-season habitat. During the dry season, terrestrial cover near aquatic habitat could include boulders; downed trees; logs; agricultural features, such as drains, watering troughs, spring boxes, abandoned sheds, or hay-ricks; and, industrial debris (USFWS 2002).

California red-legged frogs use small mammal burrows and moist leaf litter (Rathbun *et al*. 1993; Jennings and Hayes 1994; Tatarian 2008); incised stream channels with portions narrower and deeper than 18 inches may also provide habitat (61 FR 25813). This type of dispersal and habitat use, however, is not observed in all California red-legged frogs and is most likely dependent on the year to year variations in climate and habitat suitability and varying requisites per life stage. For the California red-legged frog, dry-season habitat potentially includes all aquatic and riparian areas within the range of the species and any landscape features that provide cover and moisture (61 FR 25813).

Metapopulations are ensembles of interacting populations that exchange genetic information through individual dispersal events, and exhibit a finite lifetime (Hanski and Gilpin 1991). For amphibians, a classic metapopulation model assumes a “pond-as-patch” view of spatial dynamics, in which subpopulations in breeding ponds go in and out of existence, with extinction and colonization rates being a function of the spatial arrangement of ponds or aquatic breeding habitat (Sjögren-Gulve 1994; Marsh and Trenham 2001). Based on these definitions, California red-legged frog populations appear to exhibit metapopulation characteristics (USFWS 2002).

Habitat Use

California red-legged frogs rely upon aquatic habitats throughout the year, both for breeding purposes during the wet season (generally, December through March), and to survive during the rest of the year (USFWS 2002). In addition, California red-legged frogs utilize a variety of terrestrial habitats for purposes of sheltering throughout the year, and dispersal, primarily in association with rain events and breeding activities (USFWS 2002; Bulger *et al*. 2003). California red-legged frogs have been found at elevations that range from sea level to about 5,000 feet. The California red-legged frog uses a variety of habitat types, which include various aquatic systems, riparian, and terrestrial habitats. California red-legged frogs may complete their entire life cycle in a particular area without using other habitat components (i.e., a pond is suitable for each life stage and use of terrestrial habitat or a riparian corridor is not necessary).

Aquatic Habitats. California red-legged frogs predominately inhabit permanent water sources such as streams, lakes, marshes, natural and manmade ponds, and ephemeral drainages in valley bottoms and foothills up to 4,921 feet in elevation (Jennings and Hayes 1994; Bulger *et al*. 2003; Stebbins 2003). However, they also inhabit ephemeral creeks, drainages and ponds with minimal riparian and emergent vegetation. California red-legged frogs breed from November to April, although earlier breeding records have been reported in southern localities. Breeding generally occurs in still or slow-moving water often associated with emergent vegetation, such as cattails, tules or overhanging willows (Storer 1925; Hayes and Jennings 1988). Female frogs deposit egg masses on emergent vegetation so that the egg mass floats on or near the surface of the water (Hayes and Miyamoto 1984). In a coastal marsh in San Mateo County, Reis (1999) found egg masses of California red-legged frogs that successfully produced tadpoles in water as shallow as 4 inches; adults selected shallow and warm water locations over either cold or deep-water locations for laying eggs. While California red-legged frogs successfully breed in streams and riparian systems, high spring flows and cold temperatures in streams often make these sites risky egg and tadpole environments (USFWS 2002). An important factor influencing the suitability of aquatic breeding sites is the general lack of introduced aquatic predators, such as bullfrogs (*Rana catesbeiana*) (USFWS 2002).

During dry intervals of the year (generally, April through October or November), adult and recently metamorphosed California red-legged frogs are in close proximity to (generally, within about 30 feet) their pools or ponds of residence, or other water sources such as seeps or springs (Bulger *et al*. 2003; Fellers and Kleeman 2007). In addition, egg masses and tadpoles occur in pools or ponds after adults have completed breeding activities (Reis 1999).

Terrestrial Habitats. Throughout the year, California red-legged frogs utilize terrestrial habitats, both within and outside of riparian zones, for sheltering purposes, using woody cover, plant cover, and small mammal burrows (Bulger *et al*. 2003; Tatarian 2008). In addition, California red-legged frogs utilize a variety of terrestrial habitats for dispersal and foraging purposes, moving through various macro-habitat types such as coniferous forest, grass/scrub rangeland, and agricultural land, including both recently-tilled fields and maturing crops (Bulger *et al*. 2003; Tatarian 2008).

Threats

Habitat loss, non-native species introduction, and urban encroachment are the primary factors that have adversely affected the California red-legged frog throughout its range ([61 FR 25813; USFWS 1996]; USFWS 2002). Several researchers in central California have noted the decline and eventual local disappearance of California and northern red-legged frogs in systems supporting bullfrogs (Jennings and Hayes 1990; Twedt 1993), red swamp crayfish (*Procambarus clarkia*), and several species of warm water fish including sunfish (family Centrarchidae), goldfish (*Carassius auratus auratus*), common carp (*Cyprinus carpio*), and mosquitofish (genus Gambusia) (Barry in litt. 1992; Hunt in litt. 1993; Fisher and Schaffer 1996; Moyle and Marchetti 2006). This has been attributed to predation, competition, and reproduction interference. Twedt (1993) documented bullfrog predation of juvenile northern red-legged frogs, and suggested that bullfrogs could prey on subadult California red-legged frogs as well. Bullfrogs may also have a competitive advantage over California red-legged frogs. For instance, bullfrogs are larger and possess more generalized food habits (Snow and Witmer 2010). In addition, bullfrogs have an extended breeding season (Storer 1933) during which an individual female can produce as many as 20,000 eggs (Emlen 1977). Furthermore, bullfrog larvae are unpalatable to predatory fish (Kruse and Francis 1977). Bullfrogs also interfere with California red-legged frog reproduction by eating adult male California red-legged frogs. Both California and northern red-legged frogs have been observed in amplexus (mounted on) with bullfrogs (Jennings and Hayes 1990; Twedt 1993; D'Amore 2009b). In a study that quantified aquatic habitat characteristics associated with presence of both invasive American bullfrogs and California red-legged frogs, D'Amore *et al.* (2009a) concluded that bullfrogs were more successful than California red-legged frogs at aquatic sites with hydrological alteration, landscape-level habitat fragmentation and degradation of habitat. Thus, bullfrogs are able to prey upon and out-compete California red-legged frogs, especially in sub-optimal habitat.

The urbanization of land within and adjacent to California red-legged frog habitat has also threatened the California red-legged frog. These declines are attributed to channelization of riparian areas, enclosure of the channels by urban development that blocks dispersal, road mortality, and the introduction of predatory fishes and bullfrogs. The necessity of moving between multiple habitats and breeding ponds means that many amphibian species, such as the

California red-legged frog are especially vulnerable to roads and well-used large paved areas in the landscape.

Diseases may also pose a significant threat, although the specific effects of disease on the California red-legged frog are not known. Pathogens are suspected of causing global amphibian declines (Davidson *et al*. 2003). Chytridiomycosis and ranaviruses are a potential threat because these diseases have been found to adversely affect other amphibians, including the listed species (Davidson *et al*. 2003; Lips *et al*. 2006). Mao *et al*. (1999) reported northern red-legged frogs infected with an iridovirus, which was also presented in sympatric threespine sticklebacks in northwestern California. Non-native species, such as bullfrogs and non-native tiger salamanders that live within the range of the California red-legged frog have been identified as potential carriers of these diseases (Garner *et al.* 2006). Humans can facilitate the spread of disease by encouraging the further introduction of non-native carriers and by acting as carriers themselves (i.e., contaminated boots, waders or fishing equipment). Human activities can also introduce stress by other means, such as habitat fragmentation, which results in the listed species being more susceptible to the effects of disease.

Population Status
On May 25, 2011, the Service initiated a 5-year review for the species (76 FR 30377), which has not yet been completed. Additional information not included in USFWS (2002) regarding population status of the species will be available upon completion of this 5-year review.

Conservation and Recovery
The recovery plan for the California red-legged frog identifies eight recovery units (USFWS 2002). The establishment of these recovery units is based on the determination that various regional areas of the species' range are essential to its survival and recovery. These recovery units are delineated by major watershed boundaries as defined by U.S. Geological Survey (USGS) hydrologic units and the limits of its range. The goal of the recovery plan is to protect the long-term viability of all extant populations within each recovery unit. Within each recovery unit, core areas have been delineated and represent contiguous areas of moderate to high California red-legged frog densities that are relatively free of exotic species such as bullfrogs. The goal of designating core areas is to protect metapopulations. Thus when combined with suitable dispersal habitat, will allow for the long term viability within existing populations. The management strategy identified within the recovery plan will allow for the recolonization of habitats within and adjacent to core areas that are naturally subjected to periodic localized extinctions, thus assuring the long-term survival and recovery of California red-legged frogs.

Rangewide Habitat Baseline (Current condition rangewide)
On May 25, 2011, the Service initiated a 5-year review for the species (76 FR 30377), which has not yet been completed. Additional information not included in USFWS (2002) regarding rangewide habitat baseline of the species will be available upon completion of this 5-year review.

Red-legged Frog Critical Habitat

The Service designated critical habitat for the California red-legged frog on April 13, 2006 (71 FR 19244) (USFWS 2006) and a revised designation to the critical habitat was published on March 17, 2010 (75 FR 12816) (USFWS 2010). At this time, the Service recognized the taxonomic change from *Rana aurora draytonii* to *Rana draytonii* (Shaffer *et al*. 2004). Critical habitat is defined in Section 3 of the Act as: (1) The specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (a) essential to the conservation of the species and (b) that may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. In determining which areas to designate as critical habitat, the Service considers those physical and biological features that are essential to a species' conservation and that may require special management considerations or protection (50 CFR 424.12(b)). The Service is required to list the known Primary Constituent Elements (PCE's) together with the critical habitat description. Such physical and biological features include, but are not limited to, the following:

1. Space for individual and population growth, and for normal behavior;
2. Food, water, air, light, minerals, or other nutritional or physiological requirements;
3. Cover or shelter;
4. Sites for breeding, reproduction, rearing of offspring, or dispersal; and
5. Generally, habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species.

The PCE's defined for the California red-legged frog was derived from its biological needs. The area designated as revised critical habitat provides aquatic habitat for breeding and non-breeding activities and upland habitat for shelter, foraging, predator avoidance, and dispersal across its range. The PCE's and, therefore, the resulting physical and biological features essential for the conservation of the species were determined from studies of California red-legged frog ecology. Based on the above needs and our current knowledge of the life history, biology, and ecology of the species, and the habitat requirements for sustaining the essential life-history functions of the species, the Service determined that the PCE's essential to the conservation of the California red-legged frog are:

1. Aquatic Breeding Habitat. Standing bodies of fresh water (with salinities less than 7.0 parts per thousand), including: natural and manmade (e.g., stock) ponds, slow-moving streams or pools within streams, and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a minimum of 20 weeks in all but the driest of years.
2. Non-Breeding Aquatic Habitat. Freshwater and wetted riparian habitats, as described above, that may not hold water long enough for the subspecies to hatch and complete its aquatic life cycle but that do provide for shelter, foraging, predator avoidance, and aquatic dispersal for juvenile and adult California red-legged frogs. Other wetland habitats that would be considered to meet these elements include, but are not limited to: plunge pools within intermittent creeks; seeps; quiet water refugia during high water flows; and springs of sufficient flow to withstand the summer dry period.

3. Upland Habitat. Upland areas adjacent to or surrounding breeding and non-breeding aquatic and riparian habitat up to a distance of 1 mile in most cases and comprised of various vegetation series such as grasslands, woodlands, wetland, or riparian plant species that provide the frog shelter, forage, and predator avoidance. Upland features are also essential in that they are needed to maintain the hydrologic, geographic, topographic, ecological, and edaphic features that support and surround the wetland or riparian habitat. These upland features contribute to the filling and drying of the wetland or riparian habitat and are responsible for maintaining suitable periods of pool inundation for larval frogs and their food sources, and provide breeding, non-breeding, feeding, and sheltering habitat for juvenile and adult frogs (e.g., shelter, shade, moisture, cooler temperatures, a prey base, foraging opportunities, and areas for predator avoidance). Upland habitat should include structural features such as boulders, rocks and organic debris (e.g., downed trees, logs), as well as small mammal burrows and moist leaf litter.
4. Dispersal Habitat. Accessible upland or riparian dispersal habitat within designated units and between occupied locations within a minimum of 1 mile of each other that allow for movement between such sites. Dispersal habitat includes various natural habitats and altered habitats such as agricultural fields, which do not contain barriers (e.g., heavily traveled road without bridges or culverts) to dispersal. Dispersal habitat does not include moderate- to high-density urban or industrial developments with large expanses of asphalt or concrete, nor does it include large reservoirs over 50 acres in size, or other areas that do not contain those features identified in PCE's 1, 2, or 3 as essential to the conservation of the subspecies.

With the revised designation of critical habitat, the Service intends to conserve the geographic areas containing the physical and biological features that are essential to the conservation of the species, through the identification of the appropriate quantity and spatial arrangement of the PCE's sufficient to support the life-history functions of the species. Not all life-history functions require all the PCE's; therefore, not all areas designated as critical habitat contain all the PCE's. Please refer to the final designation of critical habitat for California red-legged frog for additional information (75 FR 12816).

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