

**Aquatics Specialist Report
Mosquito Fire
Burned Area Emergency Response (BAER) Assessment
Tahoe National Forest**

Resource Specialty: Listed Aquatic Species and Habitat

Fire Name: Mosquito Fire

Month/Year: September/October 2022

Author Name and Home Unit: Dan Teater – American River Ranger District, Aquatic Biologist, Tahoe NF

I. Potential Values at Risk

A. Critical Values

The values at risk considered were federally threatened California red-legged frog (*Rana draytonii*) and associated impacts to designated Critical Habitat unit PLA-1 that exist inside the Mosquito Fire perimeter.

B. Resource Condition Assessment

(a) Resource Setting

This rapid aquatic analysis is based on ground investigation and GIS assessments between the dates of September 28-October 5th, 2022. Additionally, a postfire soil burn severity map was utilized to help highlight areas to focus for the assessment. The soil burn severity map enables BAER teams to prioritize field reviews and locate burned areas that may pose a risk to critical values within or downstream of the burned area. For this assessment designated Critical Habitat (PLA-1) for federally threatened California red-legged frogs (CRLF) were given highest priority for field assessments. Additionally, areas with moderate to high soil burn severity were the areas of focus.

The Mosquito Fire is located on the Tahoe National Forest and Eldorado National and spans two counties: Placer and El Dorado. The Mosquito Fire started on September 9, 2022, near Oxbow Reservoir and Mosquito Road in Placer County. The fire quickly spread into El Dorado County. As of October 4, 2022, the fire is 90% contained at 76,788 acres. A BAER assessment team began field reconnaissance of the burned area on September 25 to begin burn severity mapping, hydrologic response, and to identify geologic hazards. The fire destroyed 78 structures. Forest Service BAER team closely collaborated with the California WERT team. In addition, interagency coordination began with interested representatives from PCWA, mining permittees, and from County, State, and Federal Agencies. The fire resulted in a forest closure in the burn area.

The majority of the fire experienced low soil burn severity (58% low SBS) with smaller isolated moderate to high soil burn severity islands (25% mod and 9%high SBS). The burn area has extremely steep slopes that have inherent slope instability. The risk of flooding,

sediment-laden flows and erosion events will increase as a result of the fire, creating hazardous conditions within and downstream of the burn area.

Approximately 34% of the fire burned at moderate to high soil burn severity (see soil burn severity maps in the 2500-8 report). The rest of the fire was either low or very low/ unburned soil burn severity. It is very important to understand the difference between *fire intensity* or *burn severity* as discussed by fire behavior, fuels, or vegetation specialists, and *soil burn severity* as defined for watershed condition evaluation in BAER analyses. Fire intensity or burn severity as defined by fire, fuels, or vegetation specialists may consider such parameters as flame height, rate of spread, fuel loading, thermal potential, canopy consumption, tree mortality, etc. For BAER analysis, we are not mapping simply vegetation mortality or above-ground effects of the fire. Soil burn severity considers additional surface and below-ground factors that relate to soil hydrologic function, runoff and erosion potential, and vegetative recovery.

Endangered Species Act (ESA) Californian Red-Legged Frog Life History and Status Inside the Mosquito Fire Perimeter

The California red-legged frog, *Rana draytonii*, was federally-listed as threatened on June 24, 1996 (USDI Fish and Wildlife Service 1996). A Final California Red-legged Frog Recovery Plan was released on September 12, 2002 (USDI Fish and Wildlife Service 2002b; 67 FR 57830). Then on March 17, 2010, the USFWS finalized designation of critical habitat within three locations in or adjacent to the Tahoe National Forest (USDI Fish and Wildlife Service 2010; 75 FR 12816), including PLA-1 (Michigan Bluff), NEV-1 (Sailor Flat), and YUB-1 (Oregon Creek).

The California red-legged frog is a highly aquatic species typically found in cold water ponds and stream pools with depths exceeding 0.7 meters and with overhanging vegetation such as willows, as well as emergent and submergent vegetation (Hayes and Jennings 1988). It is generally found at elevations below 4,000 feet, but has been found higher (Martin 1992). It is generally found in or near water but has been known to move away from water after rain storms (Martin 1992). This species breeds along aquatic vegetation in deep, slow water (less than 2 percent gradient) environments during the months of November through March in most of their current range (USDI Fish and Wildlife Service 1996). Breeding in the Sierra Nevada foothills would occur later due to freezing temperatures between November and February.

In 2006, a California red-legged frog site was discovered in the vicinity of Michigan Bluff on private land, near the town of Foresthill. Approximately 50 adults were observed in July 2006 inhabiting the historic Big Gun Diggings mine tailing ponds (elevation 3,335 feet) just east of a historic occurrence reported prior to 1951. The Recovery Plan for the California Red-legged Frog (USFWS 2002b) was written prior to the discovery of this species near Michigan Bluff so approximately 1,245 acres were designated as critical habitat (PLA-1) in 2010 (USFWS 2010, 75 FR 12816).

The Michigan Bluff population is within the Big Gun Conservation Bank owned by Westervelt Ecological Services. The Big Gun Conservation Bank contains seven ponds. Monitoring efforts

by Westervelt Ecological Services has documented the continued existence of the CRLF habitat and the continued presence and use of the site by CRLF. The Bank is approved by the U.S Fish and Wildlife Service and provides conservation credits for the federally threatened CRLF. The Bank is located on the greater 52 acre Big Gun Property. Of this, approximately 46.77 acres are covered under the Conservation Easement and are provided CRLF credits.

On the American River Ranger District, the California Red-Legged Frog Habitat Expansion Project was recently implemented in the spring of 2021. Construction was completed on 18 wetlands for the ESA threatened CRLF. The United States Fish and Wildlife Service recognized this project as the largest conservation effort to date in the Sierra Nevada's for the California red-legged frog. This was a partnership project involving the United States Forest Service, Nevada and Placer County, United States Fish and Wildlife Service and the Shelton Environmental Education Coalition. This project was funded by Nevada and Placer Counties Resource Advisory Committee as well as the United States Fish and Wildlife Service.

On average the wetlands are 4 to 6 feet deep and no more than 50 feet by 50 feet each (See examples in figure 1,2 and 3 below). The wetland locations are all within one mile from the known population of CRLF's at Big Gun Diggings. This is the only known California red-legged frog population in close proximity to the Tahoe National Forest. The California red-legged frog is particularly scarce in the Sierra Nevada with fewer than a dozen known populations. The proposed wetlands are designed to allow expansion of the population from private lands onto public lands and increase suitable foraging and breeding habitat. The purpose and need for the project were to increase the amount of available aquatic habitat to assist in recovery of the California red-legged frog. The low-maintenance wetlands also provide water and foraging habitat for birds, bats, other amphibians, aquatic reptiles, and aquatic insects.



Figure 1. Pre-fire construction on wetland #11, spring, 2021.



Figure 2. Wetland #11 holding water post construction in the spring of 2022.



Figure 3. Post fire view of wetland #11. Notice the ground cover and large woody material placed for California red-legged frog habitat is completely denuded. Photograph taken on September 25, 2022.

Post-fire effects to CRLF habitat may include increased flows, sediment and debris delivery, and reduced quality of riparian cover. Increased flows could be detrimental if sufficient volume to increase the risk of scouring individuals or egg masses or flows may scour riparian

vegetation. Sediment and debris delivery to aquatic habitats can be detrimental if they result in channel scouring debris flows and can lead to the filling of deep-water habitats (mainly ponds and pools). Debris flows and high water flows with increases in floatable debris and fine sediment/ash will impact water quality and could lead to death/injury of frogs and reduction in macroinvertebrates and aquatic insect food sources. Events that occur during the reproductive season have potential to smother or scour away egg masses. There is a concern that because the CRLF population at Big Gun Diggings is small and potentially disconnected from other populations any loss of individuals, reduced recruitment, or long-term degradation to habitat could increase the local extirpation risk.

For California red-legged frogs and designated Critical Habitat PLA-1, a summary risk assessment is provided and is based on the probability of post-fire impacts occurring combined with an estimate of the magnitude of consequences if the impact(s) occur. It looks like this:

Probability is divided into the following categories: Unlikely, Possible, Likely and Very Likely. Magnitude of consequences categories include: Minor, Moderate, and Major. The combination of these ratings leads to a Risk Assessment categorization of: Very Low, Low, Intermediate, High, and Very High. Generally, an emergency exists only in the High and Very High categories of overall risk. This suggests there could be substantial degradation effects to suitable upland or riparian habitats and/or impacts to individuals, including death, inhabiting habitat in a channel.

It should be noted that the outcomes are based on modeling completed by hydrologists (increases in streamflow), soils scientists (erosion risk and volume), and geologists (debris flow risk). These specialists use specific parameters in developing their estimates and are generally based on a specified rainfall event of a given intensity. If a rain event is greater than that modeled, the consequences and overall risk may not be captured in the risk assessment ratings that follow and it is assumed that the risk is greater than that estimated here.

(b) Findings of the On-The –Ground Assessments

Site reconnaissance on September 25th, 29th and 30th confirmed concerns to suitable CRLF habitat, specifically designated Critical Habitat PLA-1. Fire suppression damage (e.g., dozer lines, hand lines, or retardant) from initial attack was not observed in close proximity to the recently constructed wetlands. No amphibian or fish mortality was observed during site visits across the fire boundary. Soil burn severity was found to occur in a mosaic pattern and was most likely the result of the pre-fire vegetation types and densities, topography, and wind events during the fire. Approximately 34% of the burned area has moderate or high soil burn severity. Site visits revealed the largest, contiguous high SBS was mostly limited to dense conifer stands in the steep canyons of the Lower Rubicon River drainage. Within the moderate and high SBS areas, the surface litter, surface vegetation, and canopy vegetation have been mostly consumed. Water infiltration was spot checked throughout the burn scar and the water repellency was severe throughout the fire in areas of moderate and high SBS.

Between September 18th and September 20th 2022, approximately 1-2.25” of precipitation descended on the Mosquito Fire (Remote Automatic Weather Station near the Foresthill Seed

Orchard). This resulted in rutting and channelized flow down the middle of road 3004-010. Forest Service RD 3004-010 has direct hydrologic connectivity with wetland #17 and is likely to contribute adversely impacts. Fine sediment and ash were transported and settled in close proximity to suitable wetland habitat. The burn severity of the entire area within the Mosquito Fire was estimated as 7% unburned/very low, 58% low, 25 % moderate, 9% high (see table 1 below).

Table 1. Acres burned by soil burn severity.

Soil Burn Severity	Total	Percent
Unburned/Very Low	5,691	7.4
Low	45,077	58.3
Moderate	19,292	25
High	7,147	9.3
Total	77,207	100

As previously stated, biological priority surveys were given to designated Critical Habitat PLA-1 and areas around the Big Gun Diggings which is known to be occupied by CRLF inside the Mosquito Fire perimeter. The BAER program conducts a rapid assessment of the fire area and downstream values to determine whether the post-fire effects pose an unacceptable degradation to natural resources such as threatened or endangered (T&E) species. Designated Critical Habitat PLA-1 was directly impacted by the fire throughout the headwaters and potential run-off events are likely to occur after the ensuing first storms.

Westervelt Ecological Services conducted evening surveys on Wednesday, September 28th, 2022 from 7:40 PM-10 PM and WES staff was accompanied by species expert Jeff Alvarez. In total they observed 62 adults, 1 subadult, and about 300 metamorphs which proves the species persisted post fire. Of the 16 adults they physically handled, only 3 of them were females. There is some concern regarding the survival rate of the CRLF females in particular as they may have been in upland habitat during the timeframe of the fire. Additional surveys will be conducted in 2023 to build on the post-fire CRLF population estimates.



Figure 4. California red-legged frogs observed post Mosquito Fire on 9/28/2022. Photograph provided by Westervelt Ecological Services Staff.

Designated Critical Habitat PLA-1

Only 9% of the Mosquito Fire area burned at high burn severity, however over 92% of designated Critical Habitat was impacted by the fire (See Figure 7 below). Over 57% of the acres burned were moderate and high soil burn severity. This may result in significant and long-term impacts to suitable CRLF habitat.

Table 2. Designated Critical Habitat PLA-1 Impacted by Soil Burn Severity

Soil Burn Severity	Acres	Percent %
High	250.5	20.1
Moderate	466.1	37.4
Low	403.9	32.4
Unburned / Very Low	22.0	1.7
Outside Fire Perimeter	102.3	8.2
Grand Total	1,244.8	100

California red-legged frog’s Primary Constituent Elements (PCEs) inside the Mosquito Fire are:

- (1) *Aquatic Breeding Habitat.* Standing bodies of fresh water (with salinities less than 4.5 ppt), 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) *Aquatic Non-Breeding Habitat*. Freshwater pond and stream habitats, as described above, that may not hold water long enough for the species to complete its aquatic life cycle but which provide for shelter, foraging, predator avoidance, and aquatic dispersal of juvenile and adult California red-legged frogs. Other wetland habitats considered to meet these criteria include, but are not limited to: plunge pools within intermittent creeks, seeps, quiet water refugia within streams during high water flows, and springs of sufficient flow to withstand short-term dry periods.

(3) *Upland Habitat*. Upland areas adjacent to or surrounding breeding and non-breeding aquatic and riparian habitat up to a distance of 1 mile (1.6 km) in most cases (i.e., depending on surrounding landscape and dispersal barriers) including various vegetation types such as grassland, woodland, forest, wetland, or riparian areas that provide shelter, forage, and predator avoidance for the California red-legged frog. 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 aquatic, wetland, or riparian habitat. These upland features contribute to: (1) Filling of aquatic, wetland, or riparian habitats; (2) maintaining suitable periods of pool inundation for larval frogs and their food sources; and (3) providing nonbreeding, 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), small mammal burrows, or moist leaf litter.

(4) *Dispersal Habitat*. Accessible upland or riparian habitat within and between occupied or previously occupied sites that are located within 1 mile (1.6 km) of each other, and that support movement between such sites. Dispersal habitat includes various natural habitats, and altered habitats such as agricultural fields, that do not contain barriers (e.g., heavily traveled roads 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 lakes or reservoirs over 50 acres (20 ha) in size, or other areas that do not contain those features identified in PCE 1, 2, or 3 as essential to the conservation of the species.

The PLA-1 unit is considered essential for the conservation of the species because it contains aquatic habitat for breeding and non-breeding activities (PCE 1 and PCE 2), contains upland habitat for foraging and dispersal activities (PCE 3 and PCE 4), and is occupied by the species. PLA-1 is one of six known extant Sierra Nevada foothill populations and is located in the easternmost portion of the species' historical range. This unit would form one of the core areas for the species and would assist in maintaining the distribution of the species within the Sierra Nevada Mountains.

PLA-1 represents the California red-legged frog's adaptation to a wide range of habitat and ecological variability, is currently known to be occupied, and contains high-quality habitat. The essential features in this unit may require special management considerations or protection due to necessary wildland fire suppression activities, which may dewater aquatic habitats and thereby result in the desiccation of egg masses or direct death of adults from water drafting; timber harvest activities; and predation by nonnative species (USDI 2010).



Figure 5 and 6. Left, a view of the newly constructed wetland #17 with large woody material and ground cover in the spring of 2022. On the right is a picture of wetland #17 post fire showing moderate and high soil burn severity with most of the large woody material consumed by the Mosquito Fire.

Within designated Critical Habitat PLA-1 there is approximately 14.06 miles of perennial and seasonal stream channel habitat that provides potential CRLF habitat (see table to 3 below).

Table 3. Stream Miles burned within CRLF Critical Habitat PLA-1 by Soil Burn Severity.

Soil Burn Severity	Perennial Stream	Intermittent Stream	Ephemeral Stream	Grand Total
High	0.61	0.54	2.82	3.96
Moderate	0.36	1.33	3.88	5.57
Low	0.32	0.53	3.58	4.42
Unburned / Very Low			0.02	0.02
Outside Fire Perimeter			0.09	0.09
Grand Total	1.29	2.40	10.38	14.06

Ephemeral streams are the most common channel type inside designated Critical Habitat PLA-1. Ephemeral streams differ from intermittent streams in that they flow only in response to direct precipitation or during snowmelt. Streamflow in the fire area is greatest from November through May (CRLF breeding time period) in most years with lower amounts occurring in the summer and fall. Peak flows occur in response to large winter frontal events which can last for multiple days. Runoff in the burn area can occur in response to rainfall and snowmelt, but is usually driven by the former due to the lower watershed elevations. Peak flows can also occur in localized areas in response to summer convective storms. Runoff in the tributaries to

the Middle Fork American River can be flashy in response to high intensity precipitation events at any time of year.

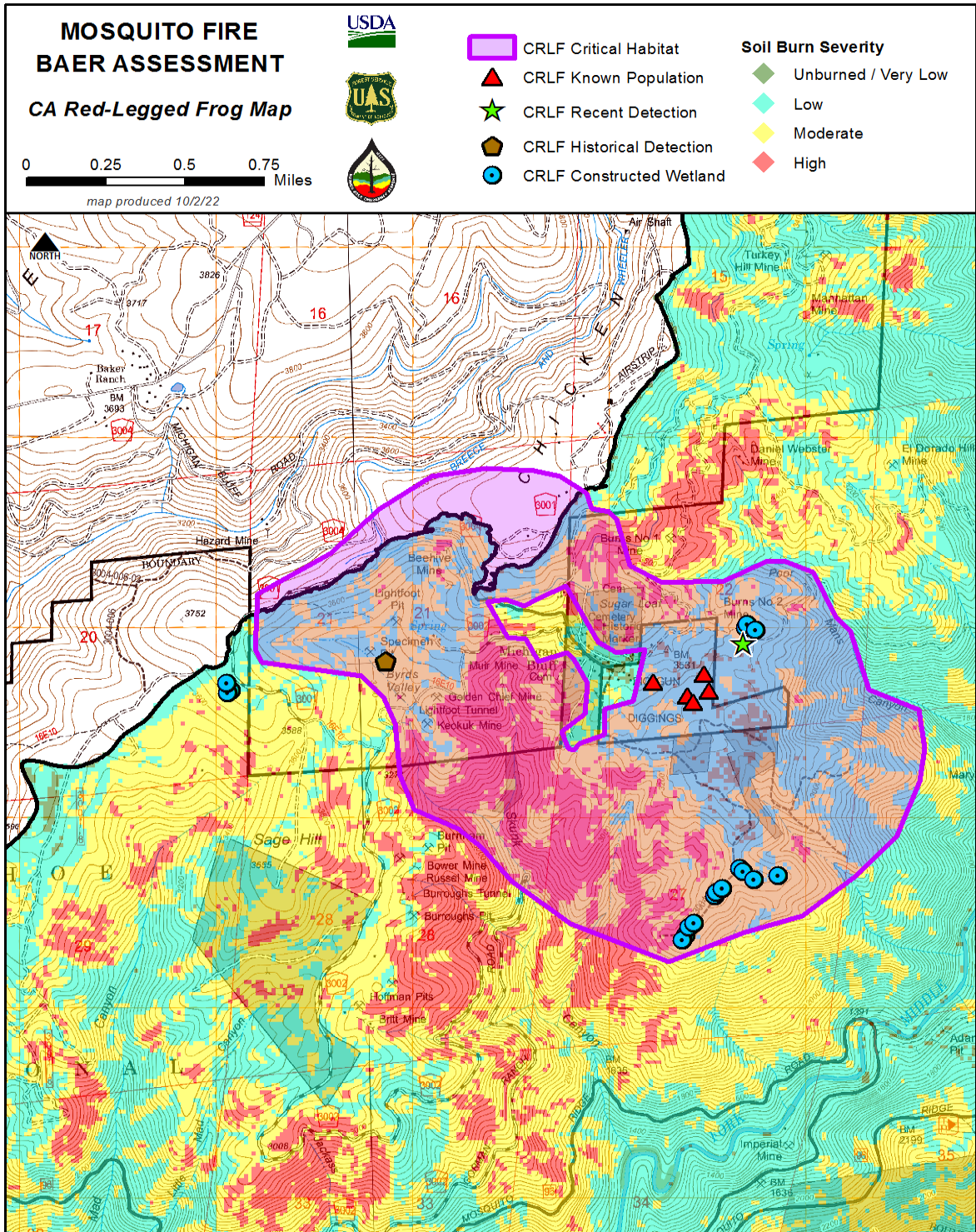


Figure 7. Burn severity type inside the Mosquito Fire. Color schemes designate burn severity as follows: green = unburned/low, yellow = moderate, and red = high.

Methods used to determine burn severity are described in the BAER soils report. Areas of moderate to high burn severity have the greatest potential to mobilize sediment, debris and ash into stream systems, reducing productivity and benthic macroinvertebrate populations and reduce the availability of breeding and rearing habitat, all impacting aquatic biota.

Post fire, stream ecosystem impacts include changes in geomorphology (e.g., sediment filled pools and riffles), decreased pool depth, loss of habitat, increased solar radiation owing to losses in riparian cover, changes in water quality, increased dissolved nutrients and pH, and changes in pool: riffle ratios (Dunham et al. 2003, Earl and Blinn 2007). For California red-legged frogs, habitat reduction, reduced riparian cover, fluctuations in water quality, increased temperature, and reduced natural resource availability all affect amphibian population responses to fire including increased mortality and extirpation. However, these effects may be pronounced or muted depending on the fire burn severity, timing of subsequent precipitation events, intensity and duration of ensuing precipitation, and volume of debris, ash and sediment entering suitable habitat.

(c) **Consequences of the fire on values at risk**

Decreased water quality and loss/damaged habitat for federally threatened CRLF can be facilitated by the following physical, chemical, and biological changes post-fire:

- Increased sedimentation leading to changes in food web structure, reducing primary productivity, with effects to grazers and other benthic macroinvertebrates and their predators (e.g., frogs).
- Changes to water quality and chemistry due to ash, smoke, nutrients, and hazardous materials
- Increased water temperature due to reduction/elimination of riparian cover and increased fine sediment loads
- Spread of *didymosphenia geminata* (impacting prey base)
- Potential loss of access to breeding habitat
- Scouring of riparian/aquatic vegetation
- Loss or decreased streambed/pool habitat due to geomorphic movement (debris flows)
- Loss of pool rearing and resting habitat due to sedimentation and filling of pools, interstitial spaces between streambed substrate
- Mass failure of culverts, drainage structures leading to stream habitat and stream bank degradation
- Potential for road washouts and hillslope material washing into Critical Habitat PLA-1
- Flushing and extirpation of aquatic biota with limited ability to recolonize rivers, including amphibians, downstream during and after flood events, respectively.

II. **BAER Risk Assessment**

An assessment of aquatic critical values in relation to potentials for, hill slope soil erosion/sedimentation/ ash input, decreased water quality and loss of cover indicated that federally threatened California red-legged frog populations and habitats (designated critical habitat) are likely to be adversely affected by post-fire impacts. BAER treatment opportunities across much of the landscape are limited due to slope steepness (>45 percent).

Emergency Determination -

Based on the above assessment, it is my determination that an emergency does exist for federally threatened California red-legged frog populations and the designated Critical Habitat PLA-1 as a result of the Mosquito Fire. The emergency is from the high likelihood of increased sediment and ash delivery to newly constructed wetlands, potential loss or permanent degradation of breeding and rearing habitat inside PLA-1, loss of individuals from debris flows, and reduced suitability to deep water refugia.

Treatment Narrative:

The Mosquito Fire directly impacted 92% of designated Critical Habitat PLA-1, including all 18 newly constructed wetlands surrounding Big Gun Diggins where there is a breeding population of California red-legged frogs. Only 1 (#17) of the 18 wetlands is proposed for treatment. The treatments prescribed include: (1) Drainage excavation, including up to 6 water bars and (2) deploying wood mulch to minimize sediment from the denuded banks and surrounding slopes. The work needed is the use of a grader and a water truck with an operator. Equipment and personnel would need to be mobilized to the site, including the hauling of approximately fifteen (15) cubic yards of wood mulch. The operator would construct the water bars with a grader. A crew would be needed to deploy wood mulch around the wetland of concern. A biologist qualified to work with CRLF will be onsite during work to ensure CRLF are protected during construction. There are no channel treatments prescribed, all work would be completed on suitable wetland habitat.

Table 4. Risk Determinations for Federally-listed California Red-Legged Frogs

Value at Risk	Potential Threats/hazard type	Probability of Damage	Rationale for Probability	Magnitude of Consequence	Rational for Magnitude	Risk
California red-legged frog Designated Critical Habitat (PLA-1) 1,244.8	Loss of breeding pool, pool sedimentation and filling, egg mass scour from increased flows, water turbidity increases, siltation of egg masses.	Likely	57% of the Designated Critical Habitat burned at high and moderate burn severity. 92% of the DCH was impacted by the fire.	Moderate	Damage to designated critical habitat is considerable and potentially long term.	High

Value at Risk	Potential Threats/hazard type	Probability of Damage	Rationale for Probability	Magnitude of Consequence	Rational for Magnitude	Risk
Newly constructed California red-legged frog wetlands	Pool sedimentation and filling, water turbidity increases, siltation of egg masses	Likely	Moderate and high soil burn severity completely denuded ground cover and large woody material around newly constructed wetlands.	Moderate	Damage to designated critical habitat is considerable and potentially long term.	High

Treatment Narrative:

The Mosquito Fire directly impacted 92% of designated Critical Habitat PLA-1, including all 18 newly constructed wetlands surrounding Big Gun Diggins where there is a breeding population of California red-legged frogs. Only 1 (#17) of the 18 wetlands is proposed for treatment. The treatments prescribed include: (1) Drainage excavation, including up to 6 water bars and (2) deploying wood mulch to minimize sediment from the denuded banks and surrounding slopes. The work needed is the use of a grader and a water truck with an operator. Equipment and personnel would need to be mobilized to the site, including the hauling of approximately fifteen (15) cubic yards of wood mulch. The operator would construct the water bars with a grader. A crew would be needed to deploy wood mulch around the wetland of concern. A biologist qualified to work with CRLF will be onsite during work to ensure CRLF are protected during construction. There are no channel treatments prescribed, all work would be completed on suitable wetland habitat.

Table 5. Threatened and Endangered Species Treatment Cost.

Item Description	Unit	Quantity	Unit Price	Total Price
Redirect Drainage, Drivable Water Bar	Each	6	911	5,467
Roadway reconditioning, compaction	Mile	0.15	6,192	927
Course Wood Mulch	Cubic Yard	15	148	1,476
Wood mulch deployment crew	Day	1	600	600
Hauling and equipment mobilization	Days of use	1	959	959
Total Cost				\$9,431

Management Recommendations:

- Tahoe National Forest staff should coordinate with other program areas to determine the extent to which other BAER treatments (for example, road treatments) may affect suitable or occupied CRLF habitat.
- Continue to collaborate with Westervelt Ecological Services to better understand how the CRLF population at Big Gun Diggings responds to the Mosquito Fire.
- e-DNA may be an appropriate tool for detecting presence and absence of CRLF during post fire monitoring.

III. Discussion/Summary/Recommendations

Ground cover vegetation, canopy cover and large woody material used for habitat complexity were denuded by the fire. Post fire watershed response is expected to include increased surface flow, pool sedimentation and filling, and water turbidity. This impacted habitat is all within one mile of a known breeding population of California red-legged frogs, a federally listed Threatened species. The primary risk of increased fines, ash and sediment into suitable wetland habitat is pool filling and aggradation. This will result in a shortened hydroperiod and could eliminate California red-legged frog breeding habitat.

Table 6. Probability of Damage or Loss Matrix

Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	Very High	Very High	Low
Likely	Very High	High	Low
Possible	High	Intermediate	Low
Unlikely	Intermediate	Low	Very Low

All 18 wetlands were directly impacted by the Mosquito Fire. The probability of damage or loss is **likely (50-89%)**. The Mosquito Fire directly impacted 92 percent of the CRLF designated Critical Habitat (PLA-1) near the community of Michigan Bluff which borders the area of Big Gun Diggings. The magnitude of consequence is **moderate (considerable or long term)**, as over 57 percent of the designated Critical Habitat burned at moderate and high soil burn severity. This constitutes a substantial amount and long-term duration potential loss of habitat for the species. The resulting risk is **high**.

Suitable California red-legged frog habitat in high and moderate burn severity are expected to take longer for recovery, but it is not irreversible and is expected to recover. The degree of sediment loading and impacts to designated Critical Habitat PLA-1 affected by the Mosquito

Fire largely depends on the frequency, duration and timing of ensuing rain events. Considering the complexity of potential responses of wetland habitat post-fire, coupled with the likelihood of a future rain event and some level of sediment delivery to the drainages analyzed, it is difficult to provide precise management guidance and must rely on probabilities.

Consultation

During the assessment personal communications were made with the following:

- Mark Young (Westervelt Ecological Services).
- Maresa Scofield (Westervelt Ecological Services).
- Marie Davis (Consultant to Placer County Water Agency).
- Darin Reinjes (Placer County Water Agency, Director of Resource Management).
- Courtney Rowe (California State Parks, Lead Resource Advisor on the Mosquito Fire).
- Clay Allison (California Department of Conservation, WERT, Engineering Geologist).
- John Ramaley (CalFire, WERT, Team Member).

IV. References

Dunham, J.B., Young, M.K., Gresswell, R.E. and B.E. Rieman. 2003. Effects of fire on fish populations: landscape perspectives on persistence of native fishes and nonnative fish invasions. *Forest Ecology and Management* 178: 183-196.

Earl, S.R. and D.W. Blinn. 2003. Effects of wildfire on water chemistry and biota in South-Western U.S.A. streams. *Freshwater Biology* 48: 1015-1030.

Hayes, M. P. and M. R. Jennings. 1988. Habitat correlates of distribution of the California red-legged frog (*Rana aurora draytonii*) and the foothill yellow-legged frog (*Rana boylei*): implications for management. Proceedings of the Symposium on Management of Amphibians, Reptiles and Small Mammals in North America. Gen. Tech. Rpt. RM-166, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, Colorado. Pp 144-158.

Martin, D. L. 1992. Sierra Nevada Anuran Guide. Canorus Ltd. Ecological Research Team. Canorus Ltd. Press, San Jose, California. 28 pp.

USDI Fish and Wildlife Service. 2002. Recovery Plan for the California Red-legged Frog (*Rana aurora draytonii*). U. S. Fish and Wildlife Service, Portland, OR. 173 pp.

USDI Fish and Wildlife Service. 1996. Endangered and Threatened Wildlife and Plants;
Determination of Threatened Status for the California Red-Legged Frog. Federal Register
61(101):25813-25833.