APPENDIX E.
CALIFORNIA RED-LEGGED FROG (*RANA DRAYTONII*)
BAJA CALIFORNIA/SOUTHERN CALIFORNIA GENETIC LINEAGE
TRANSLOCATION PLAN
2020 - 2025

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Introduction

The California red-legged frog (*Rana draytonii*) is endemic to California and Northern Baja California, Mexico. The species has been extirpated from 70 percent of its former range in California including the coastal drainages of Central California, from Marin County, California, south to Northern Baja California, Mexico, and in isolated drainages in the Sierra Nevada, Northern Coast, and Northern Transverse Ranges (Backlin et al. 2017; USFWS 2002). In Southern California, the California red-legged frog is considered extirpated south of the Santa Monica Mountains, but was previously known from 80 (USFWS 2002, Backlin et al. 2017). The southernmost population of the California red-legged frog occurs within the Las Virgenes Canyon Open Space Preserve in Los Angeles County. In Riverside County, historical records were recorded at the Santa Rosa Plateau Ecological Reserve. The Santa Rosa Plateau population persisted at Cole Creek until the early 2000s (Backlin et al. 2017; Z. Principe 2019, pers. comm.). Within San Diego County, the last observations were recorded at Sentenac Canyon in the San Felipe Creek system of the Southern Peninsular Ranges and have not been observed since the 1960s (USFWS 2002).

The California red-legged frog was federally listed as threatened on May 23, 1996 (USFWS 1996) and is not listed by the state of California. The final Recovery Plan for the California red-legged frog was completed in 2002 and states that the goal of recovery efforts is to reduce threats and improve the population status of the California red-legged frog sufficiently to warrant delisting. The Recovery Plan describes a strategy for delisting, which includes: (1) protecting known populations and reestablishing historical populations; (2) protecting suitable habitat, corridors, and core areas; (3) developing and implementing management plans for preserved habitat, occupied watersheds, and core areas; (4) developing land use guidelines; (5) gathering biological and ecological data necessary for conservation of the species; (6) monitoring existing populations and conducting surveys for new populations; and (7) establishing an outreach program (USFWS 2002).

Mitochondrial DNA indicates that the Santa Rosa Plateau population is also more closely related to extant populations in Northern Baja California, Mexico than to other populations in Southern California (Shaffer et al. 2004; Richmond et al. 2013). This genetic lineage likely extended throughout the historical range of the California red-legged frog in Riverside County, San Diego County and Northern Baja California (USFWS 2002).

The eligible lands covered under the Programmatic Safe Harbor Agreement and Translocation Plan consists of those hydrologic units in Recovery Unit 8 – Southern Transverse and Peninsular regions, south of Los Angeles County that have suitable frog habitat including non-Federal lands. Enrolled lands would help in the recovery of the frog by restoring habitat, reestablishing populations at extirpated localities, facilitate watershed protection and management practices and contribute to increased public awareness and involvement in the protection of the frog (USFWS 2002). Specifically, this program builds on an augmentation and reestablishment project with program partners identified in the 2002 Recovery Plan for the California red-legged Frog.

Reestablishment can be an important tool for repopulating the historic range of the California red-legged frog where it is now extirpated. Successful translocation programs have occurred

within the Recovery Unit in the Santa Monica Mountains and the lessons learned from these previous translocations will be applied to this project. This plan provides guidance on translocation goals, risk assessment, reintroduction site selection, source site assessment, propagule collection and translocation methods, adaptive management measures, and exit strategies based upon existing literature and research conducted by the program partners.

Goals and Objectives

The goal of the Translocation Plan and Programmatic Safe Harbor Agreement is to reintroduce the California red-legged frogs within the historical range in Orange, Riverside and San Diego Counties and Northern Baja California. The objectives of the Plan are as follows:

1. Identify suitable sites for translocation of the California red-legged frog;
2. Determine the appropriate timeframe to collect egg masses;
3. Evaluate and potentially modify existing protocols for transporting egg masses from Baja California;
4. Monitor sites to determine translocation success as evidenced by the presence of egg masses, juvenile and adult frogs within six years of the first translocation; and,
5. Once reestablished and stabilized, use populations at recipient sites covered under this Plan as sources to reestablish frogs in appropriate habitats in Southern California and Northern Baja California, Mexico.

Site Selection Criteria

The following criteria will be used to assess the potential for translocation to enrolled lands covered under this Agreement and is modified from the 2002 California Red-legged Frog Recovery Plan.

1. The site is within the historical range of the California red-legged frog;
2. Suitable aquatic habitat is present within the focal area, including a favorable mix of breeding, rearing, and summer habitats. Ideally more than one potential breeding/rearing sites should be identified within each habitat area. Sites should be protected from threats and incompatible uses to the extent feasible;
3. Suitable habitat should be relatively free of predators, especially exotic fish and frogs. If predators are present, a predator control program should be established to improve success of the translocation effort, particularly in the first few years;
4. The reasons for the species' absence have been determined and eliminated or minimized; and,
5. No reproducing populations of the California red-legged frog remain in the area, and it is not likely to be recolonized from surrounding populations in the near future.

Habitat Requirements

Based on our knowledge of the biology of the California red-legged frog, essential habitat consists of aquatic breeding and non-breeding habitat, upland habitat, and dispersal habitat.

Breeding sites of the California red-legged frog are in aquatic habitats; larvae, juveniles, and adult frogs have been collected from streams, creeks, ponds, marshes, deep pools and backwaters

within streams and creeks, dune ponds, lagoons, and estuaries. Aquatic breeding habitat consists of standing bodies of freshwater (with salinities less than 4.5 parts per thousand), including natural and manmade (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. While the frog successfully breeds in streams and riparian systems, high spring flows and cold temperatures in streams often make these sites risky egg and tadpole environments. The California red-legged frog frequently breeds in artificial impoundments such as stock ponds, given the proper management of hydro-period, pond structure, vegetative cover, and control of exotic predators. An important factor influencing the suitability of aquatic breeding sites is the general lack of introduced aquatic predators.

Aquatic non-breeding habitat may or may not hold water long enough for the species to complete the aquatic portion of its lifecycle. However, non-breeding habitat provides shelter, foraging, predator avoidance, and a capacity for dispersal. When present, California red-legged frogs spend considerable time in riparian plant communities which may facilitate dispersal in addition to providing pools and backwater aquatic areas for breeding. Accessibility to sheltering habitat is essential for the survival of California red-legged frogs within a watershed and can be a factor limiting population numbers and distribution.

During periods of wet weather, starting with the first rains of fall, some individuals may make long-distance excursions through upland habitats to reach breeding sites. Upland habitat is adjacent to or surrounding breeding and non-breeding habitat up to a distance of one mile 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. Upland habitat should include structural features such as boulders, rocks, organic debris (e.g., downed trees, logs), small mammal burrows, or moist leaf litter to provide shelter and protection from predators.

After breeding, the California red-legged frog often disperses from breeding habitat to forage and seek suitable dry-season habitat. Dispersal habitat consists of upland or riparian habitat within and between sites that are located within one mile of each other, and that support movement between such sites. Dispersal habitat includes various natural and altered habitats (e.g. agricultural fields) that do not contain barriers to dispersal (e.g. heavily traveled roads without bridges or culverts). 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 in size, or other areas that do not contain the essential habitat features described above.

Threats

The causes of rangewide decline of the California red-legged frog are many and include: loss and alteration of wetland habitat; fragmentation leading to limited dispersal and increased genetic isolation; modified hydrologic patterns; contamination and diminished water quality; channelization and flood control; mining; poorly managed livestock grazing; increased predation; proliferation of nonnative predators (e.g. bullfrogs, crayfish, nonnative fish); and, drought (USFWS 2002; Peralta-García et al. 2016).

Prior to any translocation action, potential recipient sites should be evaluated for the historical causes of decline and current threats. To the extent possible, threats should be ameliorated or reduced such that translocated propagules and progeny are not placed at unnecessary risk and the likelihood for successful population reestablishment is high.

Planning and Permitting

Planning for the translocation of the California red-legged frog involves multiple partners (described further below), including the US Fish and Wildlife Service, US Geological Survey, The Nature Conservancy, San Diego Natural History Museum, and Fauna del Noroeste. Each party plays a critical role to plan, permit, fundraise for, implement, and monitor the translocation program. All parties participate in monthly coordination meetings to facilitate planning, including a review of potential recipient sites, consider source population sustainability, and discuss budget development, funding sources, permitting requirements, logistical planning and other relevant topics.

The only available source populations for the Southern California/Northern Baja California genetic lineage are in Baja California, Mexico. As such, initial translocations will include the export of propagules from Mexico and the import of propagules to the United States. This necessitates securing three federal permits: 1) Collection Permit from the government of Mexico; 2) Export Permit from the government of Mexico; and, 3) Import Permit from the government of the United States.

The California red-legged frog is not listed by the state of California; however, the California Department of Fish and Wildlife (CDFW) has developed a Translocation Policy (2017) affecting all potential movement of species in California, including unlisted species. CDFW has also developed a Captive Rearing Policy (2017), which must be complied with when animals are kept in captivity, including in the case of a soft release of egg masses into predator-proof enclosures. Both policies will be addressed and approvals requested by CDFW as a part of this planning process. Lastly, landowner permission will be secured prior to any translocation to any recipient sites.

Implementation

The following protocols are based on established practices for successful reintroduction of the California red-legged frog including translocations at the Santa Monica Mountains National Recreation Area, Yosemite National Park, and Pinnacles National Monument (USFWS 2016). Translocation activities will be coordinated with the Service and program partners. Upon approval, a qualified biologist may implement the translocation protocol as described below. Translocation activities will be conducted by a qualified biologist with documented experience handling, capturing, pit tagging, and/or telemetry of threatened or endangered amphibian species.Qualifications will be provided to the Service prior to implementing the protocol.

Recipient Site Selection

Surveys will be conducted at potential recipient sites to confirm they have habitat characteristics important for successful reproduction (Hayes and Jennings 1988, Alvarez et al. 2013). These characteristics include: 1) hiding places for escape cover (e.g. emergent vegetation, bank over-hangs, etc.); 2) water depths that include a range from 0.5-0.7 m, still or slow-moving water, a stable water source that will allow sufficient time for tadpoles to metamorphose; and, 3) to the extent feasible, absence of incompatible uses and threats, including invasive aquatic predators.

Habitat requirements for juveniles or over-wintering larvae during the non-breeding (dry season) include perennial water at least 0.5 m deep. If habitat dries, adults will use damp leaf litter or small mammal burrows (Jennings and Hayes 1994). Surveys of potential recipient sites will also be conducted for nonnative fish, bullfrogs, and crayfish which are known to depredate eggs and larvae of the frog (Hayes and Jennings 1986, Lawler et al. 1999, Kiesecker et al. 2001, D'Amore et al. 2009). Generalized habitat and water quality data will be collected to compare against those of source sites in Baja California or elsewhere. The Recipient Site Habitat Assessment will be completed (Attachment 1; Scott and Rathburn 2009).

Source Population Assessment

When considering a source population for translocation, efforts should be made to gather any useful information regarding the most current population sizes and trends. Understanding the historical timing of egg mass deposition through an evaluation of literature, communications with land managers, and current surveys is also important. Diurnal and nocturnal visual encounter surveys should be conducted for California red-legged frog egg masses and adults at potential source populations within the Southern California/Northern Baja California genetic lineage. Before conducting any surveys, the appropriate biosecurity measures must be implemented (Phillott et al. 2010, Appendix F of the Programmatic Safe Harbor Agreement). Surveys are to focus in creeks or ponds and adjacent banks. In the weeks prior to a proposed translocation, an assessment of population size should confirm that sufficient reproduction is occurring in each population to provide the necessary egg masses.

Egg Mass Surveys

Egg mass surveys should be conducted during daylight hours between January – April walking along the banks or in the stream or ponds searching for egg masses using protocols established by the USFWS (USFWS 2005), with the modifications suggested by Wilcox et al. (2017). Egg mass surveys will focus on near shore emergent vegetation within 1 meter of the shore edge, which is the preferred site of egg deposition for the species (Alvarez et al. 2013). Shallow water is the preferred microhabitat type for eggs, and because of their large size (10 cm in diameter) they are often easy to find when laid at or near the surface (usually in 0.5 m deep). Areas of reproductive activity in microhabitats where male frogs are emitting advertisement calls should also be searched. Identified masses will be flagged and monitored as necessary to estimate hatching date. Data collected per egg mass will include GPS location, water temperature and pH, depth of egg mass under water, depth of water at deposition site, distance to shore, attachment type, egg mass diameter, and note any signs of overall condition, including saprolegnia

mold. A general description of the habitat where the eggs were found will also be recorded.

Adult Frog Surveys

Adult surveys are conducted after dark and can be completed during most times of the year. To detect the largest numbers of adult frogs, surveys should be conducted between July and September. Surveys are conducted by slowly walking the banks or in the water using a light to detect frogs or their eye shine. Once detected, frogs will be captured by hand, dip nets, or seines. Data collected for adults will include an estimate of age, sex, weight, length, and a GPS location. Frogs will be examined for deformities, lesions, and parasites then swabbed for the presence of the amphibian chytrid fungus (*Batrachochytrium dendrobatidis* – Bd). Whenever possible, frogs will be PIT tagged if they are not already. Using sterile equipment, a small v-shaped cut will be made in the skin just behind the sacral hump. The PIT tag will then be inserted under the skin. All captured frogs will be released at the site of capture. The data collected will be used to estimate the size of the source populations, and to verify a sustainable egg mass harvest. Other data collected will include the presence of exotic/invasive species and other aquatic vertebrates. Generalized habitat and water quality data will be collected to compare with that of the recipient site. Any frog handling will be conducted while wearing a new pair of single use vinyl gloves.

Propagule Collection and Transport

Eggs are the preferred life stage for propagule collection and translocation, due to the strong homing instinct of juveniles and adults (Rathbun and Schneider 2001). If other life stages are needed, translocation of juvenile and adult frogs should occur during the dry, non-breeding season to minimize the opportunity for long-distance travel through upland habitat that occurs during the wet season.

The cheapest and most efficient way to secure propagules for reestablishment is to collect partial egg masses as necessary to provide at least 500 eggs for each translocation site. Ideally, releases of at least 500 eggs (typically found in one half-egg mass) should be made at each breeding site for at least three consecutive years. In an emergency (extreme drought, flooding), a year may be skipped. In that case, the intended releases should be made to compensate for the skipped year.

Egg Mass Translocations

To maximize genetic diversity, eggs will be collected from several egg masses at each source population. No more than 10 percent of total egg biomass detected will be collected per site per year. To ensure genetic representation is maintained at the source population, no more than 50 percent of each egg mass found (half-egg masses) will be collected. Furthermore, a minimum of five egg masses must be detected at a source population before any collection may occur. Thus, if five egg masses are detected, half of one egg mass may be collected.

To minimize impact on the source population, most egg masses will remain untouched. Before collecting eggs, each mass will be photographed in place from three different

angles using a white plastic background sheet and a ruler in each photo. Photos will be examined offsite at a later time, to estimate the size of and number of eggs in each mass, prior to removal of 50 percent of each mass for translocation. The sampled portion of the egg mass will be collected carefully, leaving the remaining eggs attached to the substrate. Half-masses will be subjected to a biosecurity protocol whereby half-masses will be rinsed three times with clean, Bd-free water in order to minimize the likelihood of any disease transmission (Appendix 1). Once rinsed, the egg mass will be placed in a sterile container with clean, Bd-free water for transport. The egg mass containers will be aerated and placed in temperature-regulated coolers for transport to recipient site(s) as quickly as possible. Egg masses transferred between Mexico and the United States should be transported by aircraft to reduce travel time to recipient sites.

In instances of translocation of egg masses from Mexico to the United States, Mexican environmental protection agency officials (PROFEPA) must certify the exportation prior to delivery to the United States. Following final inspection, coolers with propagules will be flown to California, USA, for customs and USFWS law enforcement clearance. Following import inspection and approval, the coolers containing egg masses will be loaded into vehicles for transport to the recipient sites. The total travel time from the collection site to recipient site should be no more than six hours, if possible. Within this time frame the eggs masses will be at a minimum risk of negative effects (Randall et al. 2018).

Release

Predator-proof enclosures (cages) for the egg and tadpoles should be installed at recipient sites at least two months prior to release so that the cages develop algal growth as a tadpole food source (Figure 1). Cages can be constructed of a PVC pipe frame and mesh screening (Figures 1-2). The general dimensions for the cages are 1 m^3. However, depending on the specific microhabitat characteristics of the release site the enclosures may vary in size. The enclosures should be secured to the shoreline with a rope (Figure 2). Access to the interior of the enclosure can be provided by a drawstring on the top of the enclosure that can be secured when not in use. Cages should be placed in areas with sufficient shade, to minimize the negative effects UV-B radiation which has been demonstrated in the closely related congener *Rana aurora* (Belden and Blaustein 2002). Upon arrival to the recipient site, egg masses will be floated on top of the water within the collection container until the temperature has equilibrated. After reaching temperature equilibrium, the egg masses will be divided as necessary and moved to a coarse mesh bag within the cage. The coarse mesh bag holding the eggs will be attached to the cage such that eggs are at approximately the same depth as that which they were found at the source site to increase the likelihood that tadpoles will hatch normally.

Figure 1. Photo of egg mass enclosure. Dimensions vary based on size restrictions of recipient site.

Figure 2. Photo of predator-proof egg mass enclosure pen in situ.

Monitoring

Monitoring reestablished populations is critical. If the fate of the population is not known, the effort is wasted. Much can be learned by monitoring even a failed reestablishment effort. Detailed monitoring is especially important following the first translocation effort, as the lessons learned will be used to guide all future efforts. Successful establishment of breeding adults on eligible lands will result in reestablishing the historic range for the species and increasing population numbers of the Southern California/Northern Baja California genetic lineage. Translocations will be considered successful if tadpoles, juveniles and adults are present at the translocation sites within six years following initial reintroduction. Monitoring will be conducted to determine if successful reestablishment of the species on eligible lands has been achieved.

Recipient Sites Surveys - Post Release

After the translocation of eggs, newly hatched tadpoles can move through the coarse mesh bag and into the predator-proof enclosure cage. Once tadpoles are larger, approximately two weeks after hatching, any remaining in the mesh bag should be released into the larger predator-proof enclosure cage. Tadpoles will be fed organic lettuce, algae rounds, and protein pellets as needed. Care must be taken when opening cages to ensure predators do not enter. Weekly monitoring of the recipient site will occur during the time eggs and tadpoles are in enclosures. Tadpole counts will be estimated during every visit to monitor survivorship. After 1 to 2 months or when tadpoles are large and robust, tadpoles will be released from the predator-proof cages directly into the natural stream or pond at the recipient site. Post-release surveys will be conducted to evaluate survivorship and will include visual surveys and dip-netting. Diurnal and nocturnal visual and auditory surveys for egg masses, tadpoles and adult frogs at the source population and the recipient sites will be conducted for six years following the first translocation action to monitor population trends and sustainability.

Source Population Surveys – Post Collection

All egg masses observed at the source site will continue to be monitored until they hatch. Egg mass surveys will continue through April or until all eggs hatch or terminate development and additional signs of reproduction are no longer observed. Monitoring the survivorship of eggs will improve an understanding of reproductive timelines at the source sites in Mexico.

Regular focused surveys of the adult source population will also occur to ensure any sudden changes in population size are documented and to inform future decisions regarding egg harvest. Nocturnal surveys of adults can be completed during most times of the year. However, the frogs are most active between July and September and focused surveys for adults should be scheduled during this time period whenever possible.

Surveys are conducted by slowly walking the banks or in the water using a light to detect frogs or their eye shine. Once detected, frogs will be captured by hand, dip nets, or seines. Data collected for adults will include an estimate of age, sex, weight, length, and a GPS location. Frogs will be examined for deformities, lesions, and parasites then swabbed for the presence of the amphibian chytrid fungus (*Batrachochytrium dendrobatidis* – Bd).

Whenever possible, frogs will be PIT-tagged if they are not already. Using sterile equipment, a small v-shaped cut will be made in the skin just behind the sacral hump. The PIT tag will then be inserted under the skin. All captured frogs will be released at the site of capture. The data collected will be used to estimate the size of the source populations, and to verify a sustainable egg mass harvest. Other data collected will include the presence of exotic/invasive species and other aquatic vertebrates. Generalized habitat and water quality data will be collected to compare with that of the recipient site. Any frog handling will be conducted while wearing a new pair of single use vinyl gloves.

Genetic Sample Collections

In order to genotype and monitor genetic diversity of the source populations and the reintroduced animals, tissue samples may be collected. For adults, toe clips may be taken and for egg masses, a maximum of five eggs within an egg mass may be sacrificed. Tissue will be stored in RNA-later for export and analysis in the United States by Dr. Jonathan Richmond of the USGS. Genetic profiles will be generated using Single Nucleotide Polymorphism (SNP) data using the ddRADseq technique. The information provided from this data will guide and inform future management decisions for the southern clade of California red-legged frog. Genetic monitoring should occur up to 10 years post-translocation to ensure adequate genetic variability exists within the translocated populations.

Success Criteria

Translocation efforts will be considered successful if the following occurs:

1. Reintroduction of frog egg masses has occurred at two or more sites;
2. Egg masses, juveniles and adults are present at the recipient sites (indicating evidence of breeding) within six years following the initial translocation;
3. The population size at recipient sites is stable or increasing at six years.

Risk Assessment

The California red-legged frog is native to Southern California and Northern Baja California. Reintroduction of the species will not create human or health risks, nor will it impact activities covered in the Safe Harbor Agreement, including current and proposed land use activities and uses, and conservation measures.

The amphibian fungal pathogen, Bd, is understood to be ubiquitous throughout Southern California and Northern Baja California. California red-legged frog populations are understood to be infected with Bd, and animals appear to be sustaining non-lethal loads. Thus, Bd is present in both the source populations and at recipient sites, and this species appears to be coping with infections where it occurs, but does not develop disease symptoms. Furthermore, egg masses are an ideal life stage for translocation as they cannot carry chytrid. Finally, as an additional measure to ensure chytrid is not moved in collection water, egg mass collection procedures will include three rinses of egg masses in clean (non-Bd) water and then transport of egg masses in clean (non-Bd water). Thus, there is a very low likelihood that these translocations will pose any risk caused by this pathogen.

Adaptive Management Measures

One benefit of monitoring is the utility of gathering data that will allow an evaluation and enhanced understanding of the translocation program, to more accurately define predictions and objectives over time. Specifically, information after the initial releases can help define the optimum number and size of future collections and releases. Additionally, changing threats at the source and recipient sites may be addressed with appropriate management actions. Conversely, if factors change beyond management control, continued use source and recipient sites may be reconsidered.

This translocation program will include annual monitoring of the California red-legged frog at source and recipient sites for a minimum of six years (through 2025). The data gathered, including changing habitat suitability, population trajectories, or novel threats will inform any necessary changes in management over time.

Partners

U.S. Fish and Wildlife Service is responsible for issuing the Enhancement of Survival Permit that authorizes incidental take associated with covered activities and conservation measures covered under this Agreement. A Section 10(a)(1)(A) recovery subpermit (FWSCFWO-37) authorizes Service activities associated with this Agreement including the harassment of the California red-legged frog by survey, capture, handle, swab, mark, and release. The Service holds an Endangered Species Act Import Permit to collect and transport California red-legged frog egg masses imported from Baja California, Mexico including future exports to Baja California, Mexico from established populations in Southern California. The Service is also responsible for land management activities at Wheatley Ranch.

U.S. Geological Survey Western Ecological Research Center holds the necessary 10(a)(1)(A) permit (TE-045994) and experience to capture, reintroduce, survey, handle, transport and monitor California red-legged frogs. They are responsible for the collection and transport of egg masses between translocation sites within the United States. They will also determine the appropriate timing and methodology for relocating egg masses to new locations.

San Diego Natural History Museum is providing herpetological expertise and coordination with the partners in Mexico (Fauna del Noroeste A.C) to investigate the feasibility and logistics of the California red-legged frog translocation. They are responsible for the collection and transport of egg masses from Mexico to the United States. The Museum developed an Egg Mass Translocation Plan which establishes protocols for harvesting and transporting egg masses covered under this Agreement.

The Nature Conservancy is an important partner in recipient site selection and overall program planning, coordination, fundraising, and implementation. They have management responsibilities for two priority translocation sites anticipated under this Agreement, including the historic occurrence at the Santa Rosa Plateau and Wheatley Ranch, and own fee title and conservation easements, and manage other potential recipient sites throughout Southern California.

Conservación de Fauna del Noroeste A.C. (Fauna del Noroeste) is responsible for acquisition of permits from the federal government of Mexico, (e.g. Collection and Export Permits) and annual reporting of all activities to the government of Mexico. They are responsible for communication and permits with source population landowners. They also share responsibility with the San Diego Natural History Museum on source population monitoring, including egg mass surveys and adult surveys to estimate population size and the level of adequate egg harvest in each translocation effort. They are responsible for habitat enhancement in both source populations and provide expertise regarding possible future source sites for translocation.

Schedule

	Action	Timing/Deadline	Responsible Party	Term
Implementation				
	Source population assessment	1 year prior to collection	SDNHM, FAUNO	1 year prior, 3 years post-translocation
	Recipient site habitat assessment	Sept – Feb	USGS, land managers	annual
	Placement of cages at recipient site	Nov - Jan annually	USGS	annual
	Egg mass collection and transport	Jan - Apr annually	SDNHM, FAUNO, USGS	annual
	Caged development of egg masses	Feb – Apr annually	USGS	1-2 months
	Release from cages	Mar- Jul annually	USGS	annual
Monitoring and Evaluation				
	Source Site: Egg mass and adult surveys	Feb - July	FAUNO; SDNHM	1 year prior, 3 years post-translocation
	Recipient Site: Egg mass and tadpole survey (in cages)	Twice weekly	USGS	1 – 2 months
	Recipient Site: Post-release monitoring	Mar - Sept	USGS	annual

Exit Strategies

Monitoring results will inform an evaluation of the translocation program in order to determine that continued investment of resources (financial, organizational and staff) is worthwhile.

1. If after three consecutive translocations, evidence of successful breeding is detected, a decision may be made to discontinue translocations unless population size or genetic variability are insufficient to ensure the persistence of a self-sustaining population.

2. If any life stage of California red-legged frog is not observed at each recipient site within three years following the first translocation, then translocations to that site will cease until the cause of failure is determined and addressed.

3. If significant threats, particularly nonnative predators, reemerge at a recipient site in any single year, translocations will not continue until the threat has been abated or substantially reduced.

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Attachment 1. Recipient Site Habitat Assessment

The stream scoring data sheet scores streams for potential breeding habitat for California red-legged frogs (*Rana draytonii*) in Santa Monica Mountains NRA and Simi Hills. This form and its contents are based on N. J. Scott and G. B. Rathbun's "Management guidelines for the California red-legged frog," Elkhorn Slough Training Program, February 2009.

http://www.elkhornsloughctp.org/reference/subissue_detail.php?SUBISSUE_ID=37

The scoring system is based on experience of various scientists and field experts (including N.J. Scott and G.B. Rathbun of USGS), USFWS/USGS literature reviews, and the biology and ecology of California red-legged frogs in Southern California. Although this is a number-based scoring system, it is highly subjective. Note that all biologist conducting surveys will coordinate at the beginning of each season to ensure consistent scoring between surveyors. At each initial survey, a "stream scoring" data sheet should be filled out by the surveyor(s).

Date:	Site Name:		
Surveyors:			
Stream Scoring Data Sheet			
		Points	Score
Pool duration (through July or August)*	Pools with tadpole habitat present through August	5	
	Pools do not hold water through July most years	0	
Pool depth	Pools >0.5 m	3	
	Pools <0.5 m	0	
Egg and tadpole rearing area	Greater than 10% of surveyed stream reach	5	
	Less than 10% of surveyed stream reach	0	
Summer/juvenile refuges*[1]	Summer/juvenile refuges at site or within 200 m	2	
	Summer/juvenile refuges >2 km away	0	
Metamorph habitat*	Aquatic micro-habitat with good cover[1] and few adult	3	
	No cover and abundant adults or other predators	0	
Aquatic vegetation	Mosaic of open and vegetated water (a rocky cobble substrate can substitute for vegetation in a stream)	5	
	Choked with vegetation	2	
	No vegetation	0	
Exotic fish and/or crayfish present*	No fish	5	
	Mosquitofish or crayfish	3	
	Fish present, little cover for tadpoles	0	
Bullfrogs	No bullfrogs	3	
	Bullfrogs abundant and reproducing	0	
New Zealand mudsnails	NZMS absent	1	
	NZMS present	0	
Urban proximity	Urban development further than 1 km	2	
	Urban development closer than 200 m	0	
Agriculture proximity (pesticide exposure)	Agriculture or winery not upstream within 2 km	3	
	Agriculture or winery upstream/near watershed within 2 km	0	
		Total	

*If any of these criteria are consistently scored 0, frogs will probably not breed in these habitats.

[1] Refuges will include emergent bank vegetation,undercut banks, semi-submerged root balls, nearby small mammal burrows, and grassland seeps or springs.

Notes:			

Instructions for completing form

1. Pool duration: Surveys will be done in late summer/early fall to determine water persistence. Pools with breeding habitat (deep pools) will be given the highest score, whereas dry, shallow, or damp streams will be given the lowest.

2. Pool depth: Measure or estimate depth of the deepest pool or pools.

3. Egg and tadpole rearing area: Measure or estimate amount of adequate breeding area over the entire stream reach surveyed during that period.

4. Summer/juvenile refuge: Adults and juveniles need perennial water at least 0.5m deep.

5. They will disperse if breeding habitat dries up, will use spaces under debris, rocks, damp leaf litter, small mammal burrows. Look for these sites nearby, especially perennial water sources.

6. Metamorph habitat: Metamorph habitat should include places to escape from potential predators (adult CRLF and bullfrogs) such as emergent bank vegetation, undercut banks, emergent tree root balls, nearby small mammal burrows near moist soil, grassland seeps or springs.

7. Aquatic vegetation: Aquatic vegetation should be present along with open areas with no vegetation. If the stream is choked with vegetation or there is no vegetation then the stream will not be suitable for reproduction.

8. Exotic fish present: Any exotic fish species will be predators of eggs, larvae, and juveniles.

9. Bullfrogs: Will be predators of eggs, larvae, and juveniles.

10. New Zealand mudsnails: New Zealand mudsnails can lower the available food in a stream.

11. Urban proximity: Nearby urban development can inhibit upland movement of dispersing frogs.

12. Agriculture proximity: Nearby agriculture can introduce pesticides, stream silting, and fertilizers that can create aquatic vegetation blooms which block the flow of streams.