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Date: June 21, 2013

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Ecological Services  
Sacramento Fish and Wildlife Office  
2800 Cottage Way, Room W-2605  
Sacramento, CA 95864  
Attn: 08ESMF00-2013-TA-0320-2

Dear Mr. Sanchez,

In the letter dated April 25, 2013, the USFWS requested that I serve as peer reviewer for proposed rules and proposed critical habitat for *Rana sierrae*, the northern DPS of *Rana muscosa*, and *Anaxyrus canorus*. The following review represents my professional opinion.

Please contact me if you have questions.

Thank you very much.

Sincerely,

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## Proposed Rule for the Yosemite Toad

**1. Are the Service's descriptions, analyses, and biological findings and conclusions accurate, logical, and supported by the data and information in the proposed rule; especially in regards to the species' biology, historical and current status, current habitat, range, distribution, population size, and population trends? Have we accurately described the biological or ecological requirements of the species and ongoing conservation measures for the species and their habitats?**

Overall, the proposed rule provides a comprehensive, accurate, well-written synthesis of the current state of knowledge of the Yosemite toad's biology, status and trend, and habitat.

Following are some specific comments and suggestions to improve accuracy, to refine the focus to highlight important aspects of the species' ecology, and to more clearly tie the different sections together. In several cases, supporting information about the species ecology is contained in the proposed rule, but the overall pertinent point may be lost on readers less familiar with the species.

a. Page 24498- The following suggested edits to the habitat and life history descriptions would provide a more explicit background for the 'factors affecting the species' and 'critical habitat' sections.

1. More clearly distinguish between breeding and nonbreeding habitat. Most general descriptions in the literature actually describe breeding habitats, and only recently have studies addressed nonbreeding habitat (Martin 2008, Liang 2010, Morton and Pereyra 2010). See the discussion in Martin 2008 (pg. 144). Most of the description in the first two paragraphs of this section of the proposed rule addresses breeding sites (e.g., meadows). Following is a framework the Service could use that reflects the most current knowledge.

- Yosemite toads are associated with wet meadows because of their breeding ecology.
- Yosemite toads most commonly breed in wet meadows in small shallow pools or in standing or slow-flowing water covering meadow vegetation. They less frequently breed in ponds, at the edges of lakes, and in slow-moving streams. Even when these habitats are used, they are often, though not always, associated with meadows.
- Nonbreeding habitat for adult and subadult toads is poorly known.
- Recent studies have documented adult nonbreeding habitat use in breeding meadows away from breeding pools (Martin 2008, Morton and Pereyra 2010), upland springs, seeps, willow thickets, granitic boulders and talus areas (Martin 2008, Morton and Pereyra 2010), and forest clearings (Liang 2010). Martin (2008) found toads near water, but Liang (2010) found toads in the forest away from water sources. Bring in the other details written in the proposed rule including use of rodent burrows and other microhabitats used.
- Discussion on distances between breeding and nonbreeding habitats. The telemetry data addresses this question as well as dispersal ability.

2. Because much of what is commonly cited from the literature are general habitat associations, I would rephrase statements so that the information is linked with the source. For example, "Camp (1916) found Yosemite toads associated with lodgepole and whitebark pine." This puts a more appropriate weight on the information.

3. Later in this section (paragraph 4), it is stated that breeding habitat includes the "edges of wet meadows and slow-flowing streams", which is not accurate. Breeding occurs in shallow warm water areas in wet meadows (not the edges) such as pools and flooded vegetation, ponds, lakes edges, and streams.

4. I would more explicitly state that Yosemite toads have a short growing season and their reproductive strategy is to lay eggs early (at snowmelt) in warm water and develop fast. This has implications for understanding habitat requirements and susceptibility to risk factors such as alterations to meadow hydrology and climate change. For example, toads breed in very shallow water that attain warm temperatures conducive to fast development (e.g., reported water depths at egg mass sites include < 4 cm (Sadinski 2004), < 5 cm (Kagarise Sherman 1980), < 7.6 cm (Karlstrom 1962); water temperatures can reach > 30° C, Sadinski 2004, C. Brown unpublished data).

5. Paragraph 7 of this section discusses some implications of this habitat use, but I would reorganize to more explicitly state:

- the importance of retention of this shallow water habitat for the duration of tadpole development (6-8 weeks) and thus the importance of meadow hydrology.
- the natural occurrence of high egg and tadpole mortality from freezing and desiccation.

6. I would link the text on adult longevity (paragraph 3) with the text on high egg, tadpole, and metamorph mortality (paragraph 7) to discuss the importance of these stages for persistence. Persistence may require long-lived adults that continue to breed as well as periodic years of high recruitment. As written, these are two separate topics and the important point may be lost on some readers. Also see Brown et al. (2012, p. 125) for a discussion on this.

7. Brown et al. (2012, p. 124, 126) gives quantitative information on high site fidelity. During a four year period, only 3 of 130 males moved to different breeding meadows although they did move among breeding areas within the meadow.

8. Update paragraph 8 on adult habitat use as discussed in 1b above.

b. Page 24499: Distribution - There are known populations south of the Evolution Lake/ Darwin Canyon area. I refer to the southern boundary of the Yosemite toad's range generally as close to the northern rim of Kings Canyon. I believe the polygon boundary in Figure 2 reflects this range modification.

c. Page 24500-24501: Population Estimates and Status

1. Consider adding National Park data to paragraph 1 to provide information on this major portion of the species' range.
2. Add the date range to define 'recent inventories'
3. Page 24500: Paragraph 1- Cite Brown and Olsen (2013) for timing of surveys relative to detection. This publication presents quantitative data on this question.
4. Page 24501: column 2, paragraph 2.
  - i. Clarify that this monitoring addresses the status of the Yosemite toad on National Forest lands across its range. It does not, for example, address National Park lands.
  - ii. Delete 'at' in the second sentence. It should read 'This study is designed....across 5-year monitoring cycles with 134 watersheds...'
  - iii. Delete the phrase 'make year-to-year comparisons'
  - iv. Organize the results in this order and add standard errors:

prior to 1990 – change 12% to 13%  $\pm$  0.04%

1990-2001 – change 81% to 84%  $\pm$  0.03%

Rangewide trends – this is baseline information but does not inform the status or trend assessment. Change 22% to 22%  $\pm$  0.01%

v. Replace Brown et al. 2011 citations with Brown et al. 2012. (see #5 for full citation).  
vi. Add to the C. Brown pers. comm. citation, Brown and Olsen 2013. (see #5 for full citation).

5. Page 24501: column 2, paragraph 3. Add this caveat to the statement “only 18% of occupied survey watersheds rangewide had large populations” – not all surveys were conducted at the peak of tadpole presence and adults are not reliably found outside of breeding. This is an important caution to be aware of when interpreting these results. Still, Brown et al. (2012) surveyed many sites at optimal times and rarely found large numbers of tadpoles or metamorphs that would be expected if population sizes were similar to those reported by Kagarise Sherman (1980) and Kagarise Sherman and Morton (1993).

6. I suggest adding Amy Lind’s mark-recapture data. She found similarly small numbers in 19 meadows over a 5-year period.

d. Page 24501: Factor A. An important point to make is that because of the Yosemite toad’s reliance on very shallow, ephemeral water, they may be sensitive to even minor changes in their habitats, particularly hydrology. I suggest making this link more specifically. Toads need shallow warm surface water that persists through the metamorphosis period (6-8 weeks). Loss of suitable available habitat and shorter hydroperiods of water in that habitat can reduce reproductive success. This is even more critical given small population sizes.

e. Page 25403: column 2, paragraph 2- Change ‘long-term’ to ‘5-year’.

f. Page 25405: Correct spelling to ‘subalpine’.

g. Page 25405: col 3, par 3 - Climate change may reduce both the amount of suitable breeding habitat and the hydroperiod (duration of water retention) of that habitat. Both are important.

h. Page 25409: I am unaware of research linking development to grazing. I would be cautious about statements like this and include more of the specific results.

i. Page 25410: Par 1- replace ‘warm’ with ‘dry’ in sentence reading.... ‘When it is too dry [warm], tadpoles are lost to pool desiccation’.

j. Page 24510: Small Population Size

1. col 3, par 1 - I suggest rewording the sentence stating that ‘The populations that remain are small...’. The current phrasing overstates the results. I would reword to make the point that there is growing evidence that abundances may be small in populations across the species’ range (Kagarise Sherman and Morton 1993, Brown et al. 2012, A. Lind pers. comm.).

2. In small populations, the loss of even 1 or 2 individuals may be significant. Thus, although events such as road mortality or trampling by livestock or recreationists may not occur very frequently, it may matter if populations are very small. This is mentioned on Page 24511.

3. Wang (2012) presents data on effective population size ( $N_e$ ) in Yosemite National Park.

k. Proposed Determination

1. Paragraph 1: I suggest restating the last two sentences. The species appears to persist throughout its range, but has disappeared from a significant portion of its historical localities. In addition, populations appear to be small.

**2. Are there instances in the proposed rule where a different, yet equally reasonable and scientifically-sound conclusion might be drawn from that reached by the Service?**

Although it is not possible to know the distribution and abundance of the species historically, several studies found significant declines from sets of specific historically occupied localities. Similar results were found in a probabilistic rangewide assessment of the species' status. Declines were not as great in watersheds occupied in the decade just prior to the monitoring period. Importantly, there is a growing body of evidence that populations may be very small. There has been known dramatic declines in abundance at a few sites (Kagarise Sherman and Morton 1993). The few recent mark-recapture studies that have been conducted have found very small population sizes, and although surveys were not always conducted at optimum times, rangewide surveys rarely have found large numbers of tadpoles or metamorphic toads that would indicate abundances similar to those reported historically. On page 24511, the Service states the criteria for a threatened species to be 'a species "that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future" '. The Yosemite toad is naturally susceptible to chance events such as drought or freezing, and small abundances place populations more at risk. We lack the data to know whether populations currently are stable and persisting at low numbers of animals or whether there is a persistent decline in abundance. It is possible that there may a widespread loss of these small populations.

**3. Does the proposed rule provide accurate and balanced reviews and analyses of the threats to the species; including potential impacts from climate change? Are the Service's findings regarding threats to the species biologically sound and supportable based on the information and data presented in the proposed rule?**

There are few studies that directly address the threats relative to the Yosemite toad. The findings rely on what is known about the species' biology and how the threats may affect the species or its habitats.

**4. Did the Service accurately describe the analyses, studies, and literature that are referenced in the proposed rule, and did the Service use the best available science to support its assumptions, arguments, and biological conclusions?**

Yes. There are some new publications available that provide further information on adult habitat use. These are mentioned in #1 above and #5 below.

**5. Are there any significant peer-reviewed scientific papers that the proposed rule omits from consideration that would enhance the scientific quality of the document?**

There are some recent publications that could contribute to the proposed rule. I list these and point out some of the pertinent results.

Brown, C., K. Kiehl, and L. Wilkinson. 2012. Advantages of long-term, multi-scale monitoring: Assessing the current status of the Yosemite toad (*Anaxyrus [Bufo] canorus*) in the Sierra Nevada, California, USA. *Herpetological Conservation and Biology* 7: 115-131.

- Status results from this document are included in the proposed rule. I suggest citing this document rather than Brown et al. (2011). (see 1.c.4.iv)
- Includes discussion on rangewide abundances (see 1.c.5)
- Includes quantitative and descriptive data on site fidelity (see 1.a.7)
- Discusses how long-term persistence may depend on long-lived adults and occasional years of high recruitment (see 1.a.6)
- Includes data on spatial and temporal occupancy patterns that may inform population structure. About 1/3 of sites were consistently occupied by breeding every year, with the others occupied more sporadically. Further, watersheds tended to have 1-2 sites that were consistently used for reproduction with others that were only occasionally used. Reasons for the patterns are unknown and may relate to small population sizes, differences in habitat quality, or population structure of the Yosemite toads.

Brown, C., and A.R. Olsen. 2013. Bioregional monitoring design and occupancy estimation for two Sierra Nevada amphibian taxa. *Freshwater Science* 32:675-691.

- Includes data on how date of survey relates to detection of the species (see 1c3)

Liang, C.T., and T.J. Stohlgren. 2011. Habitat suitability of patch types: A case study of the Yosemite toad. *Front. Earth. Sci* 5: 217-228.

- Examined environmental factors associated with consistently and intermittently used sites.

I suggest adding Amy Lind's mark-recapture data. She found similarly small numbers in 19 meadows.

Roche, L.M., B. Allen-Diaz, D.J. Eastburn, and K.W. Tate. 2012. Cattle grazing and Yosemite toad (*Bufo canorus* Camp) breeding habitat in Sierra Nevada meadows. *Rangeland Ecology & Management* 65: 56-65.

- Presents results from the US Forest Service livestock grazing study

Roche, L.M., A.M. Latimer, D.J. Eastburn, and K.W. Tate. 2012. Cattle grazing and conservation of a meadow-dependent amphibian species in the Sierra Nevada. *PLoS ONE* 7(4): e35734.

- Presents results from the US Forest Service livestock grazing study

Wang, I.J. 2012. Environmental and topographic variables shape genetic structure and effective population sizes in the endangered Yosemite toad. *Diversity and Distributions*, 18:1033–1041.

- Examined landscape scale genetics in Yosemite National Park
- Found an isolation by distance pattern among populations
- Includes data on small effective population sizes

**6. Are there parts of the proposed rule that need additional detail or explanation? Are there parts that are superfluous, or that could be condensed?**

The level of detail and explanation was appropriate.

**7. Is the scientific foundation of the proposed rule fundamentally sound? Can the scientific foundation be strengthened, and if so, how?**

As discussed above, the rationale behind the proposed listing as threatened is based on the science as well as the descriptions of possible threats. Given the lack of available information directly applicable to threats and the Yosemite toad, the proposed rule adequately synthesizes the species ecology and habitat requirements with what is known about the threats.

**8. Are scientific uncertainties clearly identified and characterized, and are the potential implications of the uncertainties for the technical conclusions clear?**

There was not a lot of discussion on scientific uncertainties and their implications. However, the proposed rule did state when information was lacking, and generally, the level of certainty in conclusions was clear.

### **Critical Habitat for the Yosemite Toad**

Note that my comments on critical habitat address National Forest lands, but not National Park lands. I am not as familiar with the distribution of Yosemite toads in the National Parks.

#### **1. Our application of biological and ecological principles in the methods section, and in the criteria used for determining the extent and distribution of proposed critical habitat for the species.**

The species' habitat requirements, particularly the PCEs, were accurately described. I made some specific suggestions in #7 below. The available range-wide occurrence information was comprehensively incorporated and the narrative relates the methods to the species' ecology.

Page 24526: I did not understand the methods used to calculate movement distances but the ultimate distances used were reasonable based on Liang (2010), Martin (2008), and Morton and Pereyra (2010).

#### **2. Whether we have correctly evaluated the effects of climate change and whether our current proposed critical habitat designation is sufficient to address this threat factor.**

The comprehensive inclusion of habitat redundancy, variety, and connectivity (page 24521) should facilitate conservation options as more is learned about the effects of climate change on the Yosemite toad.

#### **3. The size, location, connectivity, and total area of the proposed critical habitat and its constituent units, and whether the proposed critical habitat is sufficient to provide for viable populations and the conservation of the species.**

The proposed critical habitat is fairly comprehensive relative to known Yosemite toad localities. It encompasses a large proportion of known occupied areas, is delineated to support connectivity among these areas, and is spatially representative of the species' range. The comprehensiveness and connectivity of the critical habitat provides redundancy and potential resiliency for the apparent small populations.

#### **4. Whether there are additional areas that should have been considered or selected as critical habitat units, such as areas outside the historic range of the species as we know it. If so, please provide information on why such areas are essential to the conservation of the species.**

There are two areas we have found that have relatively large abundances and are outside of areas proposed as critical habitat. These are:

- a) The headwaters of the West Walker at the base of Hawksbeak Peak (Toiyabe NF) .
- b) Meadows to the southwest of Volcanic Knob on the Sierra National Forest (east of Lake Edison).

#### **5. Additional information concerning the range, distribution, life history requirements, and conservation needs of the respective species for which critical habitat units are delineated.**

I do not know of additional information to add to that used by the Service.

**6. Specific information on the amount and distribution of designated habitat, and whether that habitat is essential to the conservation of the species and why.**

See #3 above.

**7. Our definition of the essential habitat features used in the development of the primary constituent elements that we have described for each species.**

My comments regarding habitat for the proposed rule (1a) also apply here. The pertinent points are all mentioned but a reorganization of the information as suggested in the proposed rule would more effectively highlight the important habitat features.

Following are some suggested edits to the text:

a) Page 24520:

1) Paragraph 1 on upland habitat - I would couch the discussion on area used in terms of known movement distances. The 850 m is the result of one study, and Liang (2010) and Martin (2008) found relatively similar but specifically different distances.

2) Paragraph 2 - The vegetation types in Liang (2010) are associated with occupied meadows. One could make the assumption that since toads do not move that far, the upland vegetation types would be the same as the breeding meadows. If this is the intent, this assumption should be explicitly stated. My suggestion is as stated above, to be clear about breeding versus nonbreeding habitats. Note that this comment applies throughout. Also, the vegetation associations found by Liang and Stohlgren (2011) are interesting and it will be interesting to see if these habitat associations hold with other studies. I would phrase statements to say that Liang and Stohlgren (2011) found Yosemite toad locations to be associated with these vegetation types.

b) Is the Cover section intended to address adults and subadults, and not tadpoles?

c) Page 24521: Reproduction Section

1) Paragraph 1 - Yosemite toads breed in wet meadows, not at the edges of the meadows. See comments for the proposed rule (1a3). I suggest deleting this first clause from 'at the edges of meadows or in slow-flowing runoff streams but also'. The rest of this sentence repeats this and is more accurate.

2) Paragraph 2 - Roche et al. (2012) found that only lentic sites were occupied during the dry year 2007. Thus, although the point of this sentence is pertinent, it does not seem that Roche et al. (2012) supports it. Also, toads will breed in very shallow sheet flow, or pools with flow, which are different habitats than streams. Toads do occasionally breed in streams.

d) Page 24522:

PCE's 1(ii) - I suggest this be 7-8 weeks to be conservative and include egg through metamorphosis stage. Toads can develop quicker but not always.

Change 'hold water' to 'hold surface water'

PCE 1(b) - This is an excellent point to make.

PCE (2) upland area - the Service might also mention talus (Morton and Pereyra 2010) and boulders

(Martin 2008)

**8. The use of the scientific or commercial data/publications/reports identified in the proposed critical habitat designation, and identification of any additional scientific material that we may have omitted from our analysis.**

The Service referenced all the information for which I am aware and I do not know of any information that has not been included by the Service, other than that already mentioned.

## Proposed Rule for the Sierra Nevada Yellow-legged Frog and the Northern DPS of the Mountain Yellow-legged Frog

**1. Are the Service's descriptions, analyses, and biological findings and conclusions accurate, logical, and supported by the data and information in the proposed rule; especially in regards to the species' biology, historical and current status, current habitat, range, distribution, population size, and population trends? Have we accurately described the biological or ecological requirements of the species and ongoing conservation measures for the species and their habitats?**

The proposed rule generally provides a comprehensive, accurate, well-written synthesis of the current state of knowledge of the biology, status and trend, and habitat of the mountain yellow-legged frog complex. Following are some specific comments and suggestions.

a) Page 24476:

- 1) Matthews and Miaud (2007) present data on longevity.
- 2) Habitat and Life History - I would present results by linking results with the source. For example, "Mullally and Cunningham (1956a) found frogs sitting on shorelines with little vegetation". There are few quantitative habitat studies and this puts a more appropriate weight on the information.
- 3) Stream discussion – I would state up front that little is known about the ecology of the species in stream habitats in the Sierra Nevada. Frogs are found in small creeks, though whether these are remnant populations now excluded from more preferred habitats is not known. Also, the extent they use small creeks for breeding or nonbreeding habitat is not known. In some cases it is clear this is nonbreeding use, but we have found at least one tadpole in small creek habitat.

b) Page 24477:

- 1) Matthews and Preisler (2010) present data on site fidelity.
- 2) Some of the frogs that Wengert (2008) radio-tracked may have been *Rana boylei*. There is uncertainty on the taxonomy of the frogs in this area to be resolved.
- 3) The USFS found *Rana sierrae* at one site on the Lassen National Forest in 2005. I believe no frogs were found at this location on subsequent surveys by CDFW.

c) Page 24479: For the discussion on SNAMPH results.

- 1) Clarify that this monitoring addresses the status of the mountain yellow-legged frog on National Forest lands in the Sierra Nevada. It does not, for example, address National Park lands.
- 2) The citation, Brown et al. In Press, applies in addition to Brown et al. 2011.
- 3) Organize the results in this order, add standard errors, and I include suggested phrasing:
  - i) The species have declined in both distribution and abundance.
  - ii) Based on surveys conducted from 2002-2009, breeding activity was found in about half ( $48\% \pm 0.04$ ) of watersheds where the species were found in the decade prior to the monitoring (1990-2001).
  - iii) Breeding activity was found in  $3\% \pm 0.03$  of watersheds where the species had been found only prior to 1990
  - iv) Rangewide breeding activity was found in  $4\% \pm 0.01$  of watersheds.  
(Note that rangewide occupancy is baseline information but does not inform the status or trend assessment. We do not have historical rangewide data to compare with these results.)
  - v) The relative abundance discussion is accurate as written.

d) Page 24483-24484: There is higher potential overlap, and thus risk, between *R. sierrae* and some

threats discussed in the proposed rule such as timber harvest, roads, and fire and fire management activity in the northern and lower elevation parts of the species' range where the frogs occur in streams and meadows in forested environments. In this region, populations are very small and isolated.

e) Page 24495 and 24496: Science indicates that both fish and Bd are causes of declines of *R. sierrae* and *R. muscosa* (Knapp and Matthews 2000, Knapp et al. 2007, Rachowicz et al. 2006, Briggs et al. 2010, Vredenburg et al. 2010).

**2. Are there instances in the proposed rule where a different, yet equally reasonable and scientifically-sound conclusion might be drawn from that reached by the Service?**

Status assessments have found that this species has declined in both distribution and abundance. Multiple studies found significant declines from sets of specific historically occupied localities, and similar results were found in a probabilistic rangewide assessment of the species' status. The latter assessment found about a 50% reduction in breeding occupancy in watersheds where the species had been found as recently as the 1990's. Many populations are now small and isolated.

**3. Does the proposed rule provide accurate and balanced reviews and analyses of the threats to the species; including potential impacts from climate change? Are the Service's findings regarding threats to the species biologically sound and supportable based on the information and data presented in the proposed rule?**

The proposed rule accurately describes threats based on current research, and for those with no existing studies that directly address the threat relative to the mountain yellow-legged frog complex, the findings rely on what is known about the species' biology and how the threats may affect the species or their habitats.

**4. Did the Service accurately describe the analyses, studies, and literature that are referenced in the proposed rule, and did the Service use the best available science to support its assumptions, arguments, and biological conclusions?**

The proposed rule accurately described the literature referenced and, with a few exceptions mentioned in #5 below, was comprehensive in synthesizing existing knowledge about the species.

**5. Are there any significant peer-reviewed scientific papers that the proposed rule omits from consideration that would enhance the scientific quality of the document?**

Following are additional publications not mentioned in the proposed rule.

Brown, C., L.R. Wilkinson, K.B. Kiehl. In press. Comparing the status of two sympatric amphibians in the Sierra Nevada, California: insights on ecological risk and monitoring common species. *Journal of Herpetology*.

Footo R., C. Brown, K. Kiehl, and L. Wilkinson. 2013. Sierra Nevada yellow-legged frog monitoring: HFQLG pilot project area: Plumas and Tahoe National Forests. Final report to Plumas National Forest, Quincy, CA. 36pp.

Knapp, R.A., C.J. Briggs, T.C. Smith, and J.R. Maurer. 2011. Nowhere to hide: impact of a temperature-sensitive amphibian pathogen along an elevation gradient in the temperate zone. *Ecosphere*. 2:1–26.

Matthews, K.R., and C. Miaud. 2007. A skeletochronological study of the age structure, growth, and longevity of the mountain yellow-legged frog, *Rana muscosa*, in the Sierra Nevada, California. *Copeia* 2007: 986–993.

Matthews, K.R. and H.K. Preisler. 2010. Site fidelity of the declining amphibian *Rana sierrae* (Sierra Nevada yellow-legged frog). *Canadian Journal of Fisheries and Aquatic Science* 67: 243-255.

**6. Are there parts of the proposed rule that need additional detail or explanation? Are there parts that are superfluous, or that could be condensed?**

The level of detail and explanation was appropriate.

**7. Is the scientific foundation of the proposed rule fundamentally sound? Can the scientific foundation be strengthened, and if so, how?**

The rationale behind the proposed listing as endangered is based on the science as well as the descriptions of threats.

**8. Are scientific uncertainties clearly identified and characterized, and are the potential implications of the uncertainties for the technical conclusions clear?**

Overall, the proposed rule stated when information was lacking, and generally, the level of certainty in conclusions was clear.

## **Critical Habitat for the Sierra Nevada Yellow-legged Frog and the Northern DPS of the Mountain Yellow-legged Frog**

Note that my comments on critical habitat address National Forest lands, but not National Park lands. I am not as familiar with the distribution of these species in the National Parks.

### **1. Our application of biological and ecological principles in the methods section, and in the criteria used for determining the extent and distribution of proposed critical habitat for the species.**

The Service used all available information that I am aware of to delineate critical habitat. The PCEs specify the important components of the species' habitat and generally reflect descriptions of the species' habitat.

### **2. Whether we have correctly evaluated the effects of climate change and whether our current proposed critical habitat designation is sufficient to address this threat factor.**

The comprehensive inclusion of habitat redundancy, variety, and connectivity (page 24521) should facilitate conservation options as more is learned about the effects of climate change on the mountain yellow-legged frog complex.

### **3. The size, location, connectivity, and total area of the proposed critical habitat and its constituent units, and whether the proposed critical habitat is sufficient to provide for viable populations and the conservation of the species.**

The proposed critical habitat is comprehensive and includes most currently occupied localities. It is delineated to support connectivity within and among the areas. These features provide redundancy and potential resiliency. For the most part the proposed critical habitat is as spatially representative of the different clades of the two species as is possible given the isolation and fragmentation of current populations. The exception is the southwest corner of Clade 3 on the Sierra National forest where several low elevation populations occur in streams and meadows. See #4.

### **4. Whether there are additional areas that should have been considered or selected as critical habitat units, such as areas outside the historic range of the species as we know it. If so, please provide information on why such areas are essential to the conservation of the species.**

Populations on the west side of the Sierra National Forest are not included in the proposed critical habitat. These populations represent the southwest portion of Clade 3 and several are ecologically unique because they occur in meadows and streams.

*R. sierrae* occurs in multiple areas in Lakecamp Lake and Ershim Meadow, and there are other nearby historical localities. Moderate size populations have been found in streams, meadows, and springs in this area. This is an ecologically unique population.

### **5. Additional information concerning the range, distribution, life history requirements, and conservation needs of the respective species for which critical habitat units are delineated.**

I do not know of additional information to add to that used by the Service.

**6. Specific information on the amount and distribution of designated habitat, and whether that habitat is essential to the conservation of the species and why.**

See #3 above.

**7. Our definition of the essential habitat features used in the development of the primary constituent elements that we have described for each species.**

a) Page 24519 and 24524:

The northern Sierra Nevada frogs studied by Wengert (2008) may have been *Rana boylei*. To my knowledge, this has not yet been confirmed.

b) Page 24519, last paragraph under 'Space for Individual and Population Growth and Normal Behavior' - Streams and meadows may also be important for some populations.

c) Page 24520, Section on 'Sites for Breeding, Reproduction or Rearing' - The need for perennial water that does not freeze overwinter is not explicitly stated in the summary, though is discussed earlier. It is explicit in the PCE's discussed later.

d) Page 24522

i) PCE (1)(e)(i) – I assume the purpose of the substrates mentioned are for basking and cover? If so, explicitly state this.

ii) PCE (1)(e)(iv) - Vegetation can also provide cover.

These comments also apply to nonbreeding habitat PCEs.

e) Page 24523: Paragraph 2. The spread of pathogens is not mentioned in the list of management considerations for these species.

**8. The use of the scientific or commercial data/publications/reports identified in the proposed critical habitat designation, and identification of any additional scientific material that we may have omitted from our analysis.**

The Service referenced all the information for which I am aware and I do not know of any information that has not been included by the Service, other than that already mentioned.