APPENDIX B

Foothill Yellow-Legged Frog

Standard Operating Procedures for
River and Creek Visual Encounter Surveys

The following standard operating procedures (SOPs) describe the parameters and data collection methods for completing river and creek visual encounter surveys (VESs) for foothill yellow-legged frogs (FYLFs). Depending on the level of information required, all or a portion of the parameters described in these SOPs may be used during the VESs.

General Parameters and Methods

1. All measurements should be recorded in metric units unless otherwise indicated.
2. Many of the data sheet parameters will be recorded as a numerical code. A guide for these codes is included in the following SOPs, and most of the frequently used codes are also provided at the bottom of each VES data sheet.
3. For consistency in data collection, surveys will be started and completed by the same crew members.
4. Where practicable, surveyors will initiate the VES at the bottom of the site and work upstream.
5. All observations and comments on amphibians and aquatic habitat will be recorded on the VES data sheets. Each crew member will have a field notebook. Notebooks will be identified with the crew member’s name and initials (a three letter code from the first letter of the first, middle, and last name of the crew member) and numbered sequentially in the order used. The notebook will be used to record observations and comments on habitat conditions not included on the data sheet. Entries on all pages should be dated.
6. Right bank and left bank will be designated facing in a downstream direction.
7. Time entries should be recorded in military format (e.g., 4:00 PM is 1600).
8. Distance and length measurements should be taken with a hip chain, metric tape, or range finder.
9. Velocity measurements should be made with a Marsh-McBurney (or similar) flow meter. Record velocity measurements to the nearest cm/sec.
10. Weather conditions: VESs should generally be conducted on warm, sunny days with light winds (≤ 20 mph) when the probability of observing frogs out in the open is greatest. Surveys should be avoided on cold or very windy days (> 20 mph, depending on the exposure of the habitat). On extremely hot days, surveys should be conducted during the cooler portion of the day (i.e., morning and late afternoon to evening).
11. Poor weather conditions may preclude conducting VESs during all or a portion of the day. If field conditions are safe, site habitat assessments may still be completed.
12. Amphibian surveys should be performed at the time of day the target species is most likely to be observed. In general, surveys should be conducted between about 0900 and 1900. However, this is dependent on the time of year and local weather conditions. If significant changes in weather occur during the survey (e.g., significant drop in temperature or increase in wind speed), the survey should be discontinued.

13. Polarized sunglasses are highly recommended to reduce glare and increase visibility at aquatic sites.

14. Photographs of FYLF microhabitats, egg masses, tadpoles, etc. should follow the methods outlined in Section 6.2 of the main text. Photographs should be logged on field data sheets and additional notes kept in the field notebook.

15. If available, copies of aerial photographs should be used to denote site boundaries, area surveyed, search pattern, transect locations, and prominent habitat features. If not available, a site drawing should be included on the back of the site habitat assessment data sheet. The location of egg masses, tadpoles, and the general location of frogs should also be indicated on the aerial photograph or drawing.

16. Care should always be exercised not to disturb amphibian habitat or amphibians any more than is necessary to conduct the surveys. Cover objects (e.g., bark, logs, rocks, vegetation) should be carefully lifted or tipped up and replaced in their original positions before replacing amphibians.

17. When capturing and handling amphibians, the surveyor’s hands should be clean (no sun protection products, insect repellent, or other lotions). In addition, the use of surgical gloves for handling frogs will reduce the likelihood of transmitting diseases. Surveyors should limit the time that amphibians are handled, and should release animals at the point of capture. If handling amphibians for an extended period is necessary for identification purposes or to take photographs, a clean plastic bag or jar partially filled with ambient water may be used for holding animals for a short period of time (< 5 min.). When conducting a formal VES, any time expended identifying or capturing animals should not be included as part of the total time spent surveying.

18. To decrease the possibility of transmission of infectious agents (chytrid fungus, or other fungal or bacterial infections) from handling potentially infected frogs, the following procedures developed by Speare, et al. (1998) and the Declining Amphibian Populations Task Force should be utilized during all field surveys. The following protocols are also the accepted procedures being used by the U. S. Forest Service.

With increasing focus on amphibians and field surveys to; identify and document the presence and distribution of special-status species (e.g., FYLF) and determine utilization of habitats, there is a high risk that field crews could spread disease among other amphibian populations. There is growing evidence that the occurrence of the chytrid fungus is increasing in the Sierra Nevada. Consequently, it is essential that field crews follow a standard protocol for cleaning equipment before conducting surveys in other drainages. It is not necessary to clean equipment between sites within drainages.

In tadpoles, the chytrid fungus attacks the keratin tooth rows and horny beak. In frogs, the fungus is associated with the keratinized layers of the skin. In the field, signs of infection may be observed by examining the mouths of tadpoles. Infected individuals will typically have: tooth rows that are mostly or entirely missing; beaks that lack black pigment; and occasionally slight deformities in the soft, fleshy parts of the mouth in addition to the above conditions.

When conducting surveys for FYLFs (or other amphibians), there are two methods for handling frogs that will significantly reduce the potential for transmitting infectious agents between frogs. These are: 1) the use of disposable gloves (e.g., Surgigloves), changing gloves after handling each animal; and 2) the capture and handling of frogs using new plastic bags for each animal. In both
In most cases, the frogs do not come in contact with the surveyor’s skin or clothing. When frogs are difficult to catch, the surveyor’s skin or clothing may come in contact with the frog. If this occurs, all contact surfaces should be cleaned with an antiseptic solution. Used gloves, plastic bags, nets, and/or jars used to capture or hold frogs should not come in contact with clean equipment. Several nets, plastic bags, and gloves should be available for each site. When the survey is completed, dispose of all gloves and plastic bags, and clean other equipment, hands, and clothing with hospital grade disinfectant or 70% ethanol.

To reduce the risk of spreading infections to other areas, clean hands, clothes, boots, and potentially vehicle tires if contact with aquatic habitats occurs. Bleach can be used to clean and disinfect equipment, but it loses effectiveness over time and should be replaced after a month or two. Before leaving a site, remove mud, organisms, algae, and other debris from nets, boots, vehicle tires, and other gear. Do not clean equipment in the immediate vicinity of aquatic habitats. Be sure to rinse all gear thoroughly with fresh water after cleaning. Refer to Speare, et al. (1998) for more information: www.jcu.edu.au/school/phtm/PHTM/frogs/ampdis.htm or www.mpm.edu/collect/vertzo/herp/Daptf/code_e.html.

19. Voucher specimens may be collected if positive identification cannot be made in the field. Collect only as many specimens as needed to complete the identification. If fewer than four FYLFs are found at a site, they should not be collected, and no more than two specimens should be taken at any site. The specimens should be placed in a glass or Nalgene container with 10% isopropyl alcohol (or 10% ethanol) for temporary storage. The final storage solution should be 70% ethanol.

20. Field data sheets will be QA/QC checked as each sheet is completed. The reviewer’s initials and the review date will be recorded at the bottom of the data sheet.

**Upper Portion of Data Sheet**

Below are instructions for completing the river and creek VES data sheets, beginning with the upper left corner. Specific differences between rivers and creeks are noted. Using the criteria provided in the main text for determining stream type, circle either River or Creek in the title of all data sheets completed for the site. There are specific data sheets for each major life stage: one for egg masses, one for tadpoles, and one for juveniles/subadults and adults. The instructions for each version are included below.

**Date** – Record the date of the survey in the following format: month / day / year (e.g., 07/02/01).

**Site #** – Record the site number designated during the preliminary habitat assessment (e.g., 1, 2, 3).

**Subsite #** – The river and creek SOPs differ, as follows.

**For rivers:** Subsites should be designated at river locations where more than one suitable habitat type is present, or where there are discontinuous sections of the same habitat type (e.g., lateral bars separated by bedrock outcrops). (Example: Within the site, there are two lateral cobble bars with suitable habitat located along the right bank of the river that are separated by a section of steep bedrock. FYLF are observed at the upper bar, but not at the lower one. The two bars should be designated as separate subsites and separate data sheets should be completed for each one.) Ideally, subsites should be based upon the occurrence of FYLFs. However, if monitoring is a project objective, suitable habitat in close proximity to known locations should be
designated as subsites, and VESs should be conducted at each subsite. Site/subsite notations will be numeric/alpha (e.g., 1a, 1b) and should be assigned beginning with the downstream subsite and sequentially working upstream.

**For creeks:** Since FYLFs are typically dispersed along creeks during the summer and may occupy several different habitats, the designation of subsites may not be necessary. However, subsites should be designated at creek locations where FYLFs and breeding habitat is present, or at locations where aggregations of frogs occur. Separate VESs should be conducted at each subsite. These habitat areas may be discontinuous and separated by other types of habitat (e.g., cascade/pool and riffle areas separated by steep bedrock cascades). Site/subsite notations will be numeric/alpha (e.g., 1a, 1b) and should be assigned beginning with the downstream subsite sequentially working upstream.

**River or Creek Name/Location** – Record the river or creek name, if available, and describe the location of the site/subsite or use other identifying information (such as a local landmark or relative position). For creeks, also provide approximate survey location along the creek. Include a landmark or other indicator provided on the USGS topographic map.

**Observers** – For tandem VESs, the initials of both team members should appear on the data sheet. The initials of the team member filling out the data sheet should be noted first. For a separate/individual VES, record only the initials of the biologist conducting the survey.

**Survey Method** – Indicate the search method used for the VES – tandem or separate/individual.

**Start Time** – Record the time the VES is started.

**End Time** – Record the time the VES is completed.

**Actual VES Time** – Record the time actually spent conducting the VES. This represents the time spent between the start and end time that is exclusively expended searching for FYLFs. Time spent filling out VES data sheets, and capturing or identifying animals is included within the start and end times, but is not included in the actual VES time.

**Air Temp.** – Measure and record starting and ending air temperatures. Readings should be taken in the shade at chest height and should be recorded in degrees Celsius.

**Water Temp.** – Water temperatures should be recorded in degrees Celsius. River and creek water temperatures should be obtained along the shoreline in edgewater areas, and at a location further from shore that is representative of the main stream temperature. In lentic habitats (side pools, scour pools, etc.), water temperatures should be representative of the habitat.

**Discharge** – Estimate the flow in cubic feet per second (cfs). Where available, use stream gage data.

**Total Site Length** – Record the total length of the site. If subsites have been designated, this measurement should include all subsites, including the areas between subsites (e.g., steep bedrock walls, sand beaches, areas with dense overhanging vegetation, etc.) that are not considered suitable habitat. For rivers, include both banks if subsites have been designated on both sides of the river. For creeks, both banks are always included in the total site length.
Subsite Length – The river and creek SOPs differ, as follows.
For rivers: After finishing the VES, measure and record the subsite length on all completed VES data sheets. If the subsite includes both banks of the river, they should be measured separately and combined for the subsite length.
For creeks: After completing the VES, measure and record the length of each subsite (both banks are included) on all VES data sheets, if applicable.

Search Area Length – The river and creek SOPs differ, as follows:
For rivers: Indicate the overall length of the area searched (survey area) for the site or subsite. If a site or subsite includes both sides of the river, the search area length will include both transect lengths.
For creeks: Record the total length of the creek that is included in the VES.

Search Area Width – The river and creek SOPs differ, as follows.
For rivers: Record the average width of the area that is surveyed (amphibian habitat only). This should be measured from the river bank and extend into habitats that were included in the VES (e.g., edgewater, riffles, pools, etc.). This may be measured with a hip chain or tape.
For creeks: Record the average width of the area that is surveyed. This should be an estimate of the average creek width that was included in the VES.

Total Area Searched – This represents the survey area length times the average survey area width. Total area should be recorded in square meters.

Site Visit – Indicate if this is the first, second, third, or fourth site visit during the course of the year.

Weather – Indicate current weather, including sky conditions and wind conditions, experienced during the VES. Use the following general guidelines:
Sky conditions:
Overcast: > 60% cloud cover
Partly overcast: 20%–60% cloud cover
Clear: < 20% cloud cover

Wind conditions:
Inclement: winds > 20 mph
Fair: winds 10–20 mph
Ideal: calm to winds < 10 mph

Example: weather that is Overcast/Fair = greater than 60% cloud cover and winds between 10 and 20 mph.

Weather Past 24 Hours – Indicate what the weather conditions were over the last 24-hour period, per the criteria specified above.

Photograph # – Record the photograph number, so it can be indexed to the notes and description recorded in the field notebook. For detailed methods refer to Section 6.2 in the main text.
Roll/Disc/Card # – Record the film roll number or digital disc/card number. This should be a sequential number with the photographer or crew leader’s initials as a prefix (e.g., CWH1, CWH2, and so on). The roll number should be recorded on each film canister with indelible pen. Digital discs should be labeled as directed above for 35 mm film. Digital cards should be placed in small sealed envelopes, and the envelopes labeled with the same information.

Middle Portion of Data Sheet

Data Sheet Parameters Specific to Egg Masses

On the data sheet for egg masses, use the following instructions for recording data in the 15 columns that appear in the center of the data sheet. For those data sheet parameters that have several potential categories from which to choose, record the number in parenthesis (#) that corresponds to the most appropriate answer.

Egg Mass Letter – A letter should be assigned to each specific egg mass, or group of egg masses, that is observed at the site or subsite. These letters should be sequential from the downstream end of the site to the upstream end. If more than 26 egg masses or groups of egg masses are observed at a given site, continue to assign Egg Mass Letters as follows: egg mass 26 = Z, 27 = AA, 28 = BB, etc.

Distance – Record the distance from the bottom of the site or subsite to the location of the egg mass or egg mass group.

Number of Egg Masses – Record the number of egg masses at a given location. For a group of egg masses, indicate which egg mass pertains to the data being collected. For example: If three egg masses are found for “Group A”, record the number as 1 of 3, 2 of 3, and 3 of 3, starting at the downstream end of the egg mass group and continuing upstream.

Egg Mass Attachment Substrate – Record the specific substrate category to which the egg mass is attached. Size classifications for substrate categories follow the modified Wentworth (1922) scale, and information on woody debris was obtained from CDFG (1994).

<table>
<thead>
<tr>
<th>Substrate Type</th>
<th>Size Range (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Sand</td>
<td>0.06 – 1</td>
</tr>
<tr>
<td>(2) Gravel/Pebble</td>
<td>2 – 63</td>
</tr>
<tr>
<td>(3) Cobble</td>
<td>64 – 256</td>
</tr>
<tr>
<td>(4) Boulder</td>
<td>&gt; 256</td>
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<tr>
<td>(5) Bedrock</td>
<td>–</td>
</tr>
<tr>
<td>(6) Small Woody Debris</td>
<td>&lt; 307 diameter</td>
</tr>
<tr>
<td>(7) Large Woody Debris</td>
<td>&gt; 307 diameter</td>
</tr>
<tr>
<td>(8) Other</td>
<td>–</td>
</tr>
</tbody>
</table>

Distance From Shore – Measure the distance of each egg mass from the water's edge. The distance should be measured with a metric tape or ruler.

Depth of Egg Mass – Record the water depth from the surface to the center of each egg mass. The water depth should be measured with a metric stick or ruler.
% Silt on Egg Mass – Estimate the percentage of the egg mass surface area that is covered by silt as follows:
   1. None
   2. < 25%
   3. 25 – 50%
   4. 51 – 75%
   5. > 75%

Egg Mass Orientation – Record the stream orientation of the egg mass on the attachment substrate, as follows:
   1. Upstream side
   2. Downstream side
   3. Shore side
   4. Stream side
   5. On top of substrate
   6. Underneath substrate

Flow Orientation – Record the direction of streamflow relative to the location of the egg mass, as follows:
   1. Oriented into flow (e.g., egg mass on upstream side of attachment substrate facing into the current)
   2. Sheltered from flow by attachment substrate
   3. Flow along side of egg mass (shear flow)
   4. Located in eddy current from sheltering substrate
   5. Flow over the top
   6. No flow (egg mass in standing or still water)

Velocity – Measure the water velocity (in cm/sec) in the water column as close to the egg mass as possible. The reading should be taken adjacent to the center of the egg mass. This measurement should represent the average flow velocity at the location of the egg mass at the time of the VES.

River and Creek Habitat – Record the appropriate habitat types from the following choices:
Habitat types were extracted from Rosgen (1996).
   1. Low gradient riffle (little or no whitewater, moderate velocities 20-50 cm/s, substrate of gravel and cobble - totally to partially submerged, <4% slope)
   2. High gradient riffle (considerable whitewater, fast velocities >50 cm/s, substrate of cobble and boulder - exposed, 4-7% slope)
   3. Run (no water turbulence; swift velocity; substrate of gravel, cobble, and boulder; low slope; occurs over a definite thalweg)
   4. Glide (no water turbulence; low to moderate even velocity; substrate of sand, gravel and cobble; 0-1% slope; occurs over a wide channel lacking a definite thalweg)
   5. Main channel pool (low velocities, usually large and deep and fills most of the channel, substrate - variable, no slope)
   6. Step-pool (varying velocities, boulder substrate, high-gradient, pools separated by short riffles or cascades)
   7. Other

Microhabitat – Record the microhabitat type that characterizes the location where the egg mass is found, using the habitat categories provided below:
   1. Isolated Side Pool – An isolated side pool is hydraulically isolated from the main channel or creek channel and receives little or no surface flow. This type of pool may be fed by a seep or spring that discharges to the river or creek.
(2) **Connected Side Pool** – A connected side pool is located adjacent to and hydraulically connected with the main river or creek. In rivers, these pools are often located along cobble/boulder bars or in boulder/sedge habitat.

(3) **Scour Pool** – A scour pool is an isolated pool formed at higher flows, and is normally filled during high flows. Scour pools are often located on bars or in bedrock areas.

(4) **Backwater Pool** – Backwater pools occur along the margins of rivers or creeks at the edge of the main flow, and are usually characterized by reverse currents. Backwater pools may occur at river or creek bends, at the bottom of main channel pools, below channel obstructions, etc.

(5) **Side Channel** – A side channel is smaller than the main channel, and generally only receives a portion of the streamflow, and may dry up at lower flows. Side channels are usually close to the main channel in wider sections of the river or creek.

(6) **Boulder/Sedge** – Boulder and sedge habitat occurs in low relief areas along the margin of the river or creek. It is characterized by exposed and submerged boulders and cobble with interspersed sedge clumps, with slow-moving water and small pools (isolated and/or connected).

(7) **Edgewater** – Edgewater habitat generally occurs in shallow, slow moving or calm water areas along margins of river bars or margins of creeks. Appropriate substrates consist primarily of cobble and boulders, often with some gravel.

(8) **Pool Tail-Out** – Pool tail-outs normally occur at the downstream end of main channel pools adjacent to the main outflow. These areas are typically shallow with slow moving water. In rivers, pool tail-outs typically have cobble and/or boulder substrates.

(9) **Riffle** – Riffles (both high and low gradient) normally occur in areas with cobble and boulder substrates, and are usually associated with changes in stream gradient. Riffles may occur in side channels as well as the main channel.

(10) **Other** – This category includes any habitat type that is not described above. Provide a description of the area in the Comments portion of the data sheet.

Note: if more than one microhabitat occurs where egg masses are observed (e.g., a riffle in a side channel or edgewater in a pool tail-out), indicate all such microhabitat types by recording the appropriate codes.

**Substrate at Egg Mass** – Indicate the dominant substrate types in a 1-m² area surrounding the egg mass. Size classifications for substrate categories follow the modified Wentworth (1922) scale, and information on woody debris was obtained from CDFG (1994).

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**Max. Water Depth** – Record the total water depth where the egg mass is located. The water depth should be measured with a metric stick or ruler.

**Water Temperature** – Record the water temperature in degrees Celsius where each egg mass is located.
Data Sheet Parameters Specific to Tadpoles

On the data sheet for tadpoles, use the following instructions for recording data in the 14 columns that appear in the center of the data sheet. For those data sheet parameters that have several potential categories from which to choose, record the number in parenthesis (#) that corresponds to the most appropriate answer.

**Group Letter** — A letter should be assigned to groups of tadpoles that are observed at a site or subsite. These letters should be sequential from the downstream end of the site or subsite to the upstream end. If several aggregations of tadpoles are observed together, they should be recorded as one group. If more than 26 groups of tadpoles are observed at a site or subsite, continue to assign Group Letters as follows: 26 = Z, 27 = AA, 28 = BB, etc.

**Distance** — Record the distance from the bottom of the survey site or subsite to the location of the tadpoles.

**Approximate Number of Tadpoles** — If the site is small, search the entire area and estimate the total number of tadpoles present. If the site is large, estimate the number of tadpoles per m² based on several random counts (#/m²) obtained within representative areas where tadpoles are observed. Use these data to estimate the total number of tadpoles for the site.

**Distance from Shore** — Measure the distance the tadpoles are from the water's edge. For an aggregation of tadpoles take a measurement at the center of the group. If tadpoles are dispersed along the shoreline, record an average distance from the water’s edge. The distance should be measured with a metric tape or ruler.

**Velocity** — Measure the water velocity (in cm/sec) where tadpoles are located.

**Tadpole Stage** — Record the tadpole developmental stage based upon the following choices. Tadpoles include all tadpole stages (completely aquatic) from the day of hatching, through metamorphosis to the point where they move to terrestrial habitats (no vestiges of their tadpole form remain). The developmental stage should represent the dominant stage of tadpoles present, as individuals or in groups.

1. No legs
2. Rear legs
3. Rear legs and front nubs
4. Legs fully grown, but with tail
5. Mixed; use this code only if the group consists of tadpoles at various stages of development.

**Average TL (Total Length)** — Estimate the average TL of the tadpoles, including those observed in groups. Estimates should periodically be verified by actual measurements of representative individuals.

**River and Creek Habitat** — Record the appropriate habitat types from the following choices. Habitat types were extracted from Rosgen (1996):

1. *low gradient riffle* (little or no whitewater, moderate velocities 20-50 cm/s, substrate of gravel and cobble - totally to partially submerged, <4% slope)
2. *high gradient riffle* (considerable whitewater, fast velocities >50 cm/s, substrate of cobble and boulder - exposed, 4-7% slope)
(3) run (no water turbulence; swift velocity; substrate of gravel, cobble and boulder; low gradient slope; occurs over a definite thalweg)
(4) glide (no water turbulence; low to moderate even velocity; substrate of sand, gravel and cobble; 0-1% slope; occurs over a wide channel lacking a definite thalweg)
(5) main channel pool (low velocities, usually large and deep and fills most of the channel, substrate - variable, no slope)
(6) step-pool (varying velocities, boulder substrate, high-gradient, pools separated by short riffles or cascades)
(7) other

Note: if more than one habitat type occurs within a site or subsite, record all appropriate habitat types.

**Microhabitat** — Record the microhabitat type (from the habitat types provided below) that characterizes the location where the tadpoles are observed.

(1) **Isolated Side Pool** — An isolated side pool is hydraulically isolated from the main channel or creek channel and receives little or no surface flow. This type of pool may be fed by a seep or spring that discharges to the river or creek.
(2) **Connected Side Pool** — A connected side pool is located adjacent to and hydraulically connected with the main river or creek. In rivers, these pools are often located along cobble/ boulder bars or in boulder/sedge habitat.
(3) **Scour Pool** — A scour pool is an isolated pool formed at higher flows, and is normally filled during high flows. Scour pools are often located on bars or in bedrock areas.
(4) **Backwater Pool** — Backwater pools occur along the margins of rivers or creeks at the edge of the main flow, and are usually characterized by reverse currents. Backwater pools may occur at river or creek bends, at the bottom of main channel pools, below channel obstructions, etc.
(5) **Side Channel** — A side channel is smaller than the main channel, and generally only receives a portion of the streamflow, and may dry up at lower flows. Side channels are usually close to the main channel in wider sections of the river or creek.
(6) **Boulder/Sedge** — Boulder and sedge habitat occurs in low relief areas along the margin of the river or creek. It is characterized by exposed and submerged boulders and cobble with interspersed sedge clumps, with slow-moving water and small pools (isolated and/or connected).
(7) **Edgewater** — Edgewater habitat generally occurs in shallow, slow moving or calm water areas along margins of river bars or margins of creeks. Appropriate substrates consist primarily of cobble and boulders, often with some gravel.
(8) **Pool Tail-Out** — Pool tail-outs normally occur at the downstream end of main channel pools adjacent to the main outflow. These areas are typically shallow with slow moving water. In rivers, pool tail-outs typically have cobble and/or boulder substrates.
(9) **Riffle** — Riffles (both high and low gradient) normally occur in areas with cobble and boulder substrates, and are usually associated with changes in stream gradient. Riffles may occur in side channels as well as the main channel.
(10) **Other** — This category includes any habitat type that is not described above. Provide a description of the area in the Comments portion of the data sheet.

Note: If more than one microhabitat occurs where tadpoles are observed (e.g., edgewater in a pool tail-out), indicate all such microhabitat types by recording the appropriate codes.

**Dominant Substrate** — Record the dominant substrate types in a 1-2 m² area where tadpoles are observed. If tadpoles are distributed along the shoreline, indicate the dominant substrate types for the area where tadpoles are observed. Size classifications for substrate types follow the modified Wentworth (1922) scale, and information on woody debris was obtained from CDFG (1994).

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<td>(9) Aquatic Vegetation</td>
<td>–</td>
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</table>

% **Algae** – Estimate to the nearest 10% the amount of algae present where tadpoles are observed.

% **Detritus** – Estimate to the nearest 10% the amount of detritus present on substrates where tadpoles are observed.

**Max. Water Depth** – Record the maximum water depth where tadpoles are found. The water depth should be measured with a metric stick or ruler.

**Water Temp.** – Record the water temperature in degrees Celsius where tadpoles occur.

**Data Sheet Parameters Specific to Juveniles/Subadults and Adults**

On a data sheet for juveniles/subadults and adults, use the following instructions for recording data in the 10 columns that appear in the center of the data sheet. For data sheet parameters that have several potential categories from which to choose, record the number in parenthesis (#) that corresponds to the most appropriate answer.

**Number of Frogs** – Indicate the number of individuals observed within the site or subsite. If a large number of juveniles/subadults or adults is encountered, an estimate of the total number present may have to be sufficient.

**Distance** – Record the distance from the bottom of the site or subsite to the location of the frog or aggregation of frogs.

**Sex (M/F)** – When possible, determine the sex of captured frogs, and for those frogs that can usually be sexed without handling (e.g., during the breeding period, most males typically have enlarged forearms and thumb pads for grasping females). Do not record sex if a positive determination cannot be made.

**Age (J, A)** – Indicate the approximate age of the frogs observed (when possible) using the following categories: **Juvenile/Subadult** – includes recently metamorphosed individuals that have no vestiges of their tadpole form, up to about 1 1/2 to two years old (generally 39 mm or less snout-vent length); **Adult** – includes all sexually mature frogs (generally two years old or older, with a 40 mm or greater snout-vent length). Note: Adult males are typically smaller (snout-vent length) than adult females for individuals from the same year-class.

**Snout-Vent Length** – This represents the distance from the tip of the frog's snout to the vent, and should be recorded in millimeters.
Activity – Record the individual's activity from the following choices: (1) sitting in shade, (2) basking, (3) hiding, (4) calling, (5) swimming, (6) foraging, (7) amplexus, (8) floating, (9) underwater, or (10) other.

River and Creek Habitat – Record the appropriate habitat types from the following choices. River habitat types were extracted from Rosgen (1996).

1. low gradient riffle (little or no whitewater, moderate velocities 20-50 cm/s, substrate of gravel and cobble - totally or partially submerged, <4% slope)
2. high gradient riffle (considerable whitewater, fast velocities >50 cm/s, substrate of cobble and boulder - exposed, 4-7% slope)
3. run (no water turbulence; swift velocity; substrate of gravel, cobble and boulder; low gradient slope; occurs over a definite thalweg)
4. glide (no water turbulence; low to moderate even velocity; substrate of sand, gravel and cobble; 0-1% slope; occurs over a wide channel lacking a definite thalweg)
5. main channel pool (low velocities, usually large and deep and fills most of the channel, substrate - variable, no slope)
6. step-pool (varying velocities, boulder substrate, high-gradient, pools separated by short riffles or cascades)
7. other

Note: if more than one habitat type occurs within a site or subsite, record all appropriate habitat types.

Microhabitat – Record the microhabitat type that characterizes the location where frogs are observed from the habitat types provided below.

1. Isolated Side Pool – An isolated side pool is hydraulically isolated from the main channel or creek channel and receives little or no surface flow. This type of pool may be fed by a seep or spring that discharges to the river or creek.
2. Connected Side Pool – A connected side pool is located adjacent to and hydraulically connected with the main river or creek. In rivers, these pools are often located along cobble/boulder bars or in boulder/sedge habitat.
3. Scour Pool – A scour pool is an isolated pool formed at higher flows, and is normally filled during high flows. Scour pools are often located on bars or in bedrock areas.
4. Backwater Pool – Backwater pools occur along the margins of rivers or creeks at the edge of the main flow, and are usually characterized by reverse currents. Backwater pools may occur at river or creek bends, at the bottom of main channel pools, below channel obstructions, etc.
5. Side Channel – A side channel is smaller than the main channel, and generally only receives a portion of the streamflow, and may dry up at lower flows. Side channels are usually close to the main channel in wider sections of the river or creek.
6. Boulder/Sedge – Boulder and sedge habitat occurs in low relief areas along the margin of the river or creek. It is characterized by exposed and submerged boulders and cobble with interspersed sedge clumps, with slow-moving water and small pools (isolated and/or connected).
7. Edgewater – Edgewater habitat generally occurs in shallow, slow moving or calm water areas along margins of river bars or margins of creeks. Appropriate substrates consist primarily of cobble and boulders, often with some gravel.
8. Pool Tail-Out – Pool tail-outs normally occur at the downstream end of main channel pools adjacent to the main outflow. These areas are typically shallow with slow moving water. In rivers, pool tail-outs typically have cobble and/or boulder substrates.
9. Riffle – Riffles (both high and low gradient) normally occur in areas with cobble and boulder substrates, and are usually associated with changes in stream gradient. Riffles may occur in side channels as well as the main channel.
10. Exposed Bank – Exposed locations along the river margin (e.g., boulders, bedrock, sand or mud bank, etc.)
11. Protected Bank – Protected locations along the river margin (e.g., under an overhanging bank or boulder, large cracks between boulders, etc.)
Other – This category includes any habitat type that is not described above. Provide a description of the area in the Comments portion of the data sheet.

Note: if more than one microhabitat characterizes the area where frogs are observed (e.g., riffle in a side channel), indicate both microhabitat types using the codes provided above.

**Dominant Substrate** – Record the dominant substrate types that are being utilized by frogs at the time of the observation. Size classifications for substrate types follow the modified Wentworth (1922) scale, and information on woody debris was obtained from CDFG (1994).

<table>
<thead>
<tr>
<th>Substrate Type</th>
<th>Size Range (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Silt/Clay/Mud</td>
<td>&lt; 0.059</td>
</tr>
<tr>
<td>(2) Sand</td>
<td>0.06 – 1</td>
</tr>
<tr>
<td>(3) Gravel/Pebble</td>
<td>2 – 63</td>
</tr>
<tr>
<td>(4) Cobble</td>
<td>64 – 256</td>
</tr>
<tr>
<td>(5) Boulder</td>
<td>&gt; 256</td>
</tr>
<tr>
<td>(6) Bedrock</td>
<td>–</td>
</tr>
<tr>
<td>(7) Small Woody Debris</td>
<td>&lt; 307 diameter</td>
</tr>
<tr>
<td>(8) Large Woody Debris</td>
<td>&gt; 307 diameter</td>
</tr>
<tr>
<td>(9) Aquatic Vegetation</td>
<td>–</td>
</tr>
<tr>
<td>(10) Margin vegetation</td>
<td>–</td>
</tr>
<tr>
<td>(11) Other</td>
<td>–</td>
</tr>
</tbody>
</table>

Comments – Enter any comments about the foregoing data.

**Lower Portion of Data Sheet**

**Fish Present** – Indicate if fish are observed or otherwise known to occur in the river or creek.

**Type** – Circle or write in the fish species group(s) present. Following are representative classifications:
- Salmonids – trout and salmon
- Centrarchids – bass and sunfish
- Cyprinids – minnows

**Herpetofauna & Life Stage** – Record all amphibians or reptiles, other than the target species, that were observed during the VESs. Include the approximate number and the life stage(s) present (A – adult, J – juvenile/subadult, T – tadpole, E – egg).

**Other Species Observed** – Record other species observed at the site/subsite during the VES.

**Comments** – Additional comments will be noted at the bottom of the VES data sheet. Comments should include observations of conditions affecting amphibians that are not listed on the main data sheet such as road construction/maintenance, recreation, and other related issues that are notable or are relatively uncommon. Additional comments may include: observations of the average size of egg masses or evidence of fungus or predation; health of tadpoles, juveniles/subadults, and adults; or direct or suspected predation on FYLFs. If extra space is required for comments, the reverse side of the data sheet should be used.
QA/QC — Record the initials of the person who reviews the data sheet, and indicate the date it was reviewed. The reviewer should not be the person who completes the data sheet.

References


Speare, R., L. Berger, and H. Hines. 1998. How to reduce the risks of you transmitting an infectious agent between frogs and between sites. James Town University, Townsville, Australia. 9 pp.

Foothill Yellow-Legged Frog  
River and Creek Visual Encounter Survey Data Sheet  

Egg Masses

Date: mm dd yy    Site #: ______   Subsite #: ______   River Name/Location: ______________________________________   Observers: _______   _______


Water Temp: (edgewater) _______   (main channel) _______   (pool) _______              Discharge: _______ cfs            Total Site Length: ________    Subsite Length: _______

Search Area Length: _______  Search Area Width: ________    Total Area Searched: (m²): ________       Site Visit: 1  2  3  4


Photograph # (index to notebook): ______   ______   ______   ______   ______   ______   ______   ______   ______   ______

Roll/Disc/Card #: _________

| Egg Mass Letter | Distance² (m) | No. of Egg Masses | Egg Mass Attachment Substrate | Distance from Shore (m) | Depth of Egg Mass (cm) | % Silt on Egg Mass¹ | Egg Mass Orientation⁵ | Flow Orientation⁶ | Velocity⁷ (cm/sec) | River and Creek Habitat⁸ | Substrate at Egg Mass¹⁰ | Max. Water Depth¹¹ (cm) | Water Temp (°C) |
|----------------|---------------|------------------|-------------------------------|-------------------------|------------------------|---------------------|----------------------|---------------------|---------------------|-------------------------|--------------------------|----------------------|

¹ Egg Mass Letter – for individual egg masses or groups of egg masses  
² Distance – distance from bottom of site/subsite to egg mass  
³ Egg Mass Attachment Substrate – (1) sand, (2) gravel/pebble (3) cobble, (4) boulder, (5) bedrock, (6) small woody debris, (7) large woody debris, (8) other  
⁴ % Silt on Egg Mass – (1) none, (2) < 25%, (3) 25 – 50%, (4) 51 – 75%, (5) > 75%  
⁵ Egg Mass Orientation – (1) upstream side, (2) downstream side, (3) shore side, (4) stream side, (5) on top of substrate, (6) underneath substrate  
⁶ Flow Orientation – (1) oriented into flow, (2) sheltered from flow, (3) flow along side of egg mass, (4) egg mass in eddy current, (5) flow over the top, (6) no flow  
⁷ Velocity – flow taken in water column as close to egg mass as possible  
⁸ River and Creek Habitat – (1) low gradient riffle, (2) high gradient riffle, (3) run, (4) glide, (5) main channel pool (6) step-pool, (7) other  
⁹ Microhabitat – (1) isolated side pool, (2) connected side pool, (3) scour pool, (4) backwater pool, (5) side channel, (6) boulder/sedge, (7) edgewater, (8) pool tail-out (9), riffle, (10) other  
¹⁰ Substrate at Egg Mass – (1) silt/clay/mud, (2) sand, (3) gravel/pebble, (4) cobble, (5) boulder, (6) bedrock, (7) small woody debris, (8) large woody debris  
¹¹ Max. Water Depth – total depth at egg mass location  

Note: On return visits note condition of egg masses – hatched, detached partially or entirely from substrate, attacked by fungus, predated upon, etc.

Fish Present: Yes No  Type: Salmonid  Centrarchid  Cyprinid  Other: ________________________________  
Herpetofauna & Life Stage (A J T E) tree frog bullfrog western pond turtle garter snake Other ________________________________

Other Species Observed: ________________________________________________________________

Comments: __________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

QA/QC (initials): ________ Date: __________
Foothill Yellow-Legged Frog
River and Creek Visual Encounter Survey Data Sheet
Tadpoles

Date: mm__ dd__ yy__      Site #: ________   Subsite #: ________   River Name/Location: _______________________________   Observers: _______   _______
Water Temp: (edgewater) ______  (main channel) ______  (pool) _______             Discharge: ______ cfs         Total Site Length: ________   Subsite Length: ________
Search Area Length: ________    Search Area Width: ________    Total Area Searched: (m²): ________     Site Visit:     1     2     3     4
Photograph # (index to notebook):       _____   _____   _____   _____   _____   _____   _____   _____   _____   _____    Roll/Disc/Card #: _________

<table>
<thead>
<tr>
<th>Group Letter¹</th>
<th>Distance² (m)</th>
<th>Approx. No. of Tadpoles³</th>
<th>Distance From Shore⁴ (m)</th>
<th>Velocity⁵ (cm/sec)</th>
<th>Tadpole Stage⁶</th>
<th>Avg. TL⁷ (mm)</th>
<th>River or Creek Habitat⁸</th>
<th>Micro-Habitat⁹</th>
<th>Dominant Substrate¹⁰</th>
<th>% Algae</th>
<th>% Detritus</th>
<th>Max. Water Depth¹¹ (cm)</th>
<th>Water Temp. (°C)</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

¹ Group Letter – if multiple groups of tadpoles at a site/subsite
² Distance – distance from bottom of site/subsite
³ No. of Tadpoles – Estimate the total number of tadpoles for the area. If tadpole counts are determined by number/meter², convert number of tadpoles/m² to number of tadpoles/site/subsite
⁴ Distance From Shore – For an aggregation of tadpoles, measure to the center of the group. If tadpoles are dispersed along the shoreline, record an average distance from the water’s edge.
⁵ Velocity – measure where tadpoles are located
⁶ Tadpole Stage – (1) no legs, (2) rear legs, (3) rear legs and front nubs, (4) legs fully grown, but with tail, (5) mixed
⁷ Avg. TL – Average total length of tadpoles
⁸ River or Creek Habitat – (1) low gradient riffle, (2) high gradient riffle, (3) run, (4) glide, (5) main channel pool, (6) step-pool, (7) other
⁹ Microhabitat – (1) isolated side pool, (2) connected side pool, (3) scour pool, (4) backwater pool, (5) side channel, (6) boulder/sedge, (7) edgewater, (8) pool tail-out, (9) riffle, (10) other
¹⁰ Dominant Substrate – (1) silt/clay/mud, (2) sand, (3) gravel/pebble, (4) cobble, (5) boulder, (6) bedrock, (7) small woody debris, (8) large woody debris (9) aquatic vegetation
¹¹ Max. Water Depth – Max. depth at tadpole location

Fish Present Yes No
Type: Salmonid _______ Centrarchid _______ Cyprinid _______ Other: __________________________
Herpetofauna & Lifestage (A J T E) tree frog _______ bullfrog _______ western pond turtle _______ garter snake _______ Other: ________________
Other Species Observed: ______________________________________________________________________________________________________________________
Comments: ____________________________________________________________________________________________________________________________________
_________________________________________________________________________________________________________________________________________
_________________________________________________________________________________________________________________________________________
_________________________________________________________________________________________________________________________________________
_________________________________________________________________________________________________________________________________________

QA/QC (initials): _________  Date: __________
# Foothill Yellow-Legged Frog

## River and Creek Visual Encounter Survey Data Sheet

### Juveniles/Subadults and Adults

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>mm/dd/yy</td>
</tr>
<tr>
<td>Site #</td>
<td></td>
</tr>
<tr>
<td>Subsite #</td>
<td></td>
</tr>
<tr>
<td>River Name/Location</td>
<td></td>
</tr>
<tr>
<td>Observers</td>
<td></td>
</tr>
<tr>
<td>Survey Method</td>
<td>tandem/separate</td>
</tr>
<tr>
<td>Start Time</td>
<td></td>
</tr>
<tr>
<td>End Time</td>
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</tr>
<tr>
<td>Actual VES Time</td>
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</tr>
<tr>
<td>Start Air Temp</td>
<td></td>
</tr>
<tr>
<td>End Air Temp</td>
<td></td>
</tr>
<tr>
<td>Water Temp</td>
<td>(edgewater)</td>
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<tr>
<td>Discharge</td>
<td>cfs</td>
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<td>Search Area Width</td>
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<td>Total Search Area (m²)</td>
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</tr>
<tr>
<td>Site Visit</td>
<td>1</td>
</tr>
<tr>
<td>Photograph # (index to notebook)</td>
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<tr>
<td>Roll/Disc/Card #</td>
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</tr>
</tbody>
</table>

## Frog Data

<table>
<thead>
<tr>
<th>Number of Frogs</th>
<th>Distance¹</th>
<th>Sex (M/F)</th>
<th>Age² (J, A)</th>
<th>Snout-Vent Length (mm)</th>
<th>Activity³</th>
<th>River or Creek Habitat⁴</th>
<th>Microhabitat Type⁵</th>
<th>Dominant Substrate⁶</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

¹ Distance – distance from bottom of site/subsite to frogs

² Age – J = Juvenile/Subadult (< 39 mm), A = Adult (≥ 40 mm), snout-vent length

³ Activity – (1) sitting in shade, (2) basking, (3) hiding, (4) calling, (5) swimming, (6) foraging, (7) amplexus, (8) floating, (9) underwater, (10) other

⁴ River or Creek Habitat – (1) low gradient riffle, (2) high gradient riffle, (3) run, (4) glide, (5) main channel pool, (6) step-pool, (7) other

⁵ Microhabitat – (1) isolated side pool, (2) connected side pool, (3) scour pool, (4) backwater pool, (5) side channel, (6) boulder/sedge, (7) edgewater, (8) pool tail-out, (9) riffle, (10) exposed bank, (11) protected bank, (12) other

⁶ Dominant Substrate – (1) silt/clay/mud, (2) sand, (3) gravel/pebble, (4) cobble, (5) boulder, (6) bedrock, (7) small woody debris, (8) large woody debris, (9) aquatic vegetation, (10) margin vegetation, (11) other

### Fish Present
- Yes
- No

### Herpetofauna & Lifestage
- (A = Adult, J = Juvenile, T = Terrestrial, E = Egg)
- Type: Salmonid, Centrarchid, Cyprinid, Other: ________________________
- Tree frog _______ bullfrog _______ western pond turtle _______ garter snake _______ Other: ________________________

### Other Species Observed:
- ____________________________________________________________________________________
- ____________________________________________________________________________________
- ____________________________________________________________________________________
- ____________________________________________________________________________________
- ____________________________________________________________________________________
- ____________________________________________________________________________________

### Comments:
- ____________________________________________________________________________________
- ____________________________________________________________________________________
- ____________________________________________________________________________________
- ____________________________________________________________________________________
- ____________________________________________________________________________________
- ____________________________________________________________________________________

QA/QC (initials): ________ Date: __________