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A STANDARDIZED APPROACH FOR HABITAT ASSESSMENTS AND VISUAL ENCOUNTER SURVEYS FOR THE FOOTHILL YELLOW-LEGGED FROG (*Rana boylii*)

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1.0 Introduction

The survey methods described in this document are designed to determine the presence, distribution, habitat utilization, and relative abundance of the foothill yellow-legged frog (*Rana boylii*) (FYLF). The FYLF is designated by the U. S. Fish and Wildlife Service as a Species of Concern, a California Species of Special Concern that is protected under the California Code of Regulations (5:41-42), and a Region 5 U. S. Forest Service Sensitive species. It occurs in the Coast Ranges of California from the Oregon border south to the Transverse Mountains in Los Angeles County, and in most of central and northern California along the west slopes of the Sierra/Cascade crest. The historical elevational range of this species in California extends from sea level to 6,000 ft (1,830 m). However, 5,000 ft. (1,525 m) is generally considered to be the current upper elevation limit of this species in the Sierra Nevada Mountains.

These survey methods were developed by biologists at Pacific Gas and Electric Company to evaluate amphibian populations associated with five hydroelectric projects in the Sierra Nevada Mountains. They were partially derived from several currently applied published and unpublished amphibian survey methods. Modifications to existing survey methods were made based on available life history data, information obtained from other amphibian biologists, and field observations made by the authors. The resulting standardized approach offers several benefits: it improves the efficiency and usefulness of field surveys; it yields uniform data; and it assists resource managers in evaluating FYLFs and their habitat. Additionally, information gained from these surveys can aid in developing environmental protection measures.

This standardized approach for FYLF surveys involves three primary elements: preliminary field planning, visual encounter surveys (VESs), and site habitat assessments. A distinction in survey methods is made for two different classifications of streams (i.e., rivers and creeks). In general, rivers are considered to be large streams (i.e., primarily main stem or trunk streams) with relatively wide channels, and creeks are considered to be smaller streams (i.e., tributaries or branches to a river) with relatively narrow channels.

Preliminary field planning is essential for determining data requirements and the level of effort necessary to meet study objectives. The important elements of this phase of the survey are the determination of study objectives, identification of survey sites with potentially suitable habitat for FYLFs, and the timing of surveys.

The VES methods are designed to determine the presence, distribution, habitat utilization, and relative abundance of all life stages of FYLF including: egg masses, tadpoles, juveniles/subadults, and adults. Two different survey methods (tandem and separate) are described. Depending on site-specific habitat characteristics (e.g., stream size, habitat complexity, length and width of habitat, etc.), surveyors choose the most appropriate method that provides the best approach for surveying a par-

ticular site. Different VES data sheets are used for egg masses, tadpoles, and juveniles/subadults and adults.

Following the initial VES, a detailed site habitat assessment is conducted at each site. The parameters used during the site habitat assessment focus primarily on key habitat features. Additionally, other environmental information is collected to provide important data for evaluating factors that may influence each life stage of FYLF. Unless there is a significant change in habitat during the survey period (e.g., significant increases or decreases in flow, or vegetative growth), site habitat assessments need only be completed once. Due to several distinctions in the types of data collected, different site habitat assessment data sheets are used for river and creek sites.

Survey methods described by Lind (1997) and by Crump and Scott (1994) provided the basic framework for developing the VES and site habitat assessment methods for FYLFs. Extensive surveys conducted by the authors and their consultants in the Pit, North Fork Feather, North Fork Mokelumne, and Middle Fork Stanislaus river drainages in central and northern California (Spring Rivers 2001; Pacific Gas and Electric Company 2001, 2002a, 2002b; Ibis Environmental, Inc. 2002), and information obtained from other amphibian biologists that have conducted FYLF surveys on other Sierra streams, provided an expanded base of information for evaluating survey methods. Based on a synthesis of these data, a standardized approach was developed for conducting preliminary field planning, VESs, and site habitat assessments that is applicable to a wide variety of study requirements.

The major components of the survey methods are described in the following sections.

2.0 Preliminary Field Planning

Preliminary field planning is a key phase in preparing a study design for surveying for FYLFs. Prior to initiating the VES, it is necessary for surveyors to clearly define study objectives and determine the timing of surveys that will best meet those objectives. Selection of survey sites will depend on identification of potentially suitable habitat in the study area, the results of preliminary habitat assessments, and existing data on FYLF in the study area. With this information, surveyors will be able to determine the number of sites to be surveyed, the number of site visits, the timing of site visits, and the data parameters to be measured and evaluated during the VES to achieve study objectives.

2.1 Study Objectives

Study objectives should be clearly defined prior to conducting field surveys, since they will largely determine the level of effort and study design. If only basic information on FYLFs is needed (presence), the number of site visits and the extent of data collected would be substantially smaller than that necessary for studies designed to evaluate all life stages of FYLFs and habitat characteristics associated with each life stage. Site habitat assessment and VES data sheets have been designed to include all parameters and information required to thoroughly evaluate each life stage and habitat associated with FYLF breeding and oviposition, tadpole rearing, juveniles/subadults, and adults. For less intensive studies, various combinations of data parameters may be selected that would provide sufficient information to achieve the study objectives.

If the primary objective of the study is to determine presence of FYLF, surveyors may choose to conduct one or two surveys. During the late summer survey period, juveniles, and occasionally subadults and adults, are often easily observed along river margins, and subadult/adult frogs may also be ob-

served in tributary streams. This survey period has the greatest probability of detecting FYLF. However, a minimum of two surveys is recommended to increase the probability of detection. These two site visits would include a tadpole survey in the late spring/early summer followed by a second survey for juveniles/subadults and adults in the late summer. If more detailed information is required regarding habitat utilization, identification of breeding sites, and microhabitat use, surveys for all life stages of FYLFs should be conducted.

2.2 Site Selection

The selection of FYLF survey sites within the study area should be based on information obtained from all available resources including, but not limited to: literature on habitat requirements and life history of FYLFs, historical records, knowledgeable biologists, USGS topographic maps, aerial photographs, and habitat information obtained during helicopter reconnaissance flights and/or preliminary ground surveys. A helicopter reconnaissance flight, combined with some ground-truthing, provides extremely valuable information for site selection, especially when the study area is large. Such reconnaissance efforts should include at least the following elements at all potential survey sites: designation of a site number, the location indicated on a topographic map with GPS location (if possible), a minimum of two site photographs (looking upstream and downstream), and a preliminary habitat assessment.

Sites identified for surveys during the initial selection process should include all moderate- to high-value habitats for FYLFs, based on species-specific habitat criteria. If a sub-sample of these sites is selected for surveying, the sites chosen should be representative of all suitable habitats and the range of elevations within the study area. Additional sites may be selected during follow-up surveys if FYLFs are found in other locations or habitats that were not identified during the initial site selection. These habitats may not have been chosen during the initial site selection due to their limited extent, or because the site may lack habitat features typically associated with FYLFs.

For detailed information on preferred habitats and general life history of FYLFs, refer to Appendix A.

2.3 Timing of Surveys

The general time periods recommended below for VESs are provided to increase the chances of obtaining information on breeding and oviposition of FYLFs, as well as document the presence of all life stages. The actual timing of VESs for FYLFs may vary depending primarily on watershed characteristics, regional snow pack, timing and rate of spring runoff, day length, average ambient air and water temperatures, local and seasonal weather conditions, and the study objectives.

To identify the breeding period and/or oviposition, one to two VESs should be conducted from April through June. Based on data collected in California during FYLF surveys conducted on several large river systems in the Central Coast Ranges (Kupferberg 1996; and Lind et al. 1996) and Central Sierra Nevada Mountains (Pacific Gas and Electric Company 2001, 2002a, 2002b), egg laying is generally initiated on the descending limb of the spring hydrograph when water temperatures reach 12 to 15° C. If during the initial breeding survey, no egg masses are documented at a given site, a second survey should be conducted two to four weeks later. Approximately four to eight weeks after completing the breeding survey(s), a tadpole survey should be conducted (usually from June through early August). Surveys for juveniles/subadults should generally be conducted during the latter part of the summer or during early autumn, primarily from late August to early October. If abundant, juveniles are usually easy to detect. Surveys for adults, can be conducted from early spring through late summer. Surveys

conducted during the spring breeding period usually provide the best opportunities for observing adults, with the added benefit of potentially locating egg masses. However, the timing can be tricky, and many adults do not remain for extended periods at breeding locations. If the number of site visits is an issue, surveying for adults at the same time juvenile/subadult surveys are conducted can accomplish two tasks at the same time.

3.0 Visual Encounter Surveys

The VES methods described below provide a standardized approach for evaluating the presence, distribution, habitat utilization, and relative abundance of all FYLF life stages. At the beginning of the initial site visit, surveyors conduct an overall evaluation of the site to assist in determining the habitat(s) that will be included in the VES. This evaluation should be conducted from a distance to ensure that amphibians that may be present are not disturbed. Specific habitat data (e.g., type of habitat present, spatial distribution of habitats, and extent of habitat) are included in the evaluation. This information in combination with the results of the preliminary field planning effort provides sufficient data to select the appropriate survey methods, and to establish preliminary site and subsite boundaries for the VES. Separate VESs are then conducted at each identified site and subsite. Final survey boundaries for each site or subsite (i.e., a distinct habitat unit) are established at the conclusion of the initial VES and are used in the site habitat assessment and subsequent VESs. The survey team normally consists of two individuals working in tandem or separately.

3.1 Selecting the Survey Methods

Surveyors should select the most appropriate survey methods (river vs. creek, and tandem vs. separate/individual) for the VES based on stream size; the extent, distribution, and type of habitats at the site; and study objectives. Selection of survey methods involves two steps. Surveyors must first determine if the survey location is to be considered a river site or a creek site (as described in the introduction). The survey methods are generally similar for both river and creek sites; however, there are several important differences that warrant separate approaches.

Amphibian habitats along rivers can usually be found in distinct habitat units (e.g., cobble/boulder bars, side channels, boulder/sedge habitats, etc.), which may occur in relatively small isolated areas, or may be present in several locations along both sides of the river. As a result, the designation of subsites is generally necessary to adequately describe each habitat unit and conduct a comprehensive VES. In such cases, separate VESs and site habitat assessments are conducted at each subsite within the site.

In most creeks, FYLF habitat does not typically occur in distinct habitat units. Instead, suitable habitat usually occurs within reaches of the creek having a mix of habitat types (e.g., bedrock cascades, riffles, runs, pools, etc.). Since creek habitat types are often of limited extent, or intermixed, frogs may be observed in alternate habitats that are not generally considered to be suitable habitat. As a result, basic creek VESs are designed to evaluate the entire creek or selected reaches of the creek. However, depending on study objectives, study design, size of the study area, and potential monitoring requirements, subsites may be established on creeks (as described above for river sites) to obtain data on all FYLF life stages.

The second step in the survey method selection process is to determine if the two-person survey team should conduct the VES in tandem or separately. In general, it is recommended that VESs at both

river and creek sites be conducted in tandem. Two surveyors usually increase the probability of detecting FYLFs and ensure that all suitable habitats are adequately surveyed. In tandem surveys, each surveyor conducts specific tasks of the VES. However, on small creeks, where one surveyor can adequately cover all amphibian habitats, individuals may separate and search different areas at the same time, or one individual may survey the entire site. If surveyors are alone or separate, each individual conducts all elements of the VES. However, it is important to clearly define the boundaries of the search areas to avoid disturbing amphibians that may be present in adjacent areas.

The actual survey method that is selected for a site should be determined by a qualified biologist taking into consideration the approach that would be the most effective, based on the extent and distribution of amphibian habitat and overall site visibility. The selected method (tandem or separate) should be recorded on the VES data sheet. To maintain consistency throughout the survey season and to facilitate interpretation of survey data, the VES method applied at a site during the first visit should be utilized when conducting subsequent surveys at the site.

3.2. Conducting the Survey

Prior to initiation of field surveys, all surveyors should carefully review the VES standard operating procedures (SOPs) and field data sheets, so that they are familiar with the data parameters to be used and the methods for data collection. VES SOPs and field data sheets are provided in Appendix B. The general approach for conducting the VES and the methods for establishing site boundaries are discussed below.

- **General Approach**

  The survey area (length x width) of each river and creek site will vary depending on the type and extent of suitable habitat. The VES should include all aquatic habitats that can be adequately surveyed within approximately 2 hours (2 hours per surveyor). Depending on specific study objectives, the survey areas at each site/subsite can be permanently marked and re-surveyed during subsequent site visits.

  When conducting tandem VESs, one surveyor searches for adult and juvenile/subadult frogs, and the other surveyor searches for egg masses and tadpoles. The individual searching for frogs is the lead surveyor and remains ahead of the individual searching for egg masses and tadpoles. VESs should begin along the bank. Surveyors should search the bank and adjacent aquatic habitat first to avoid stepping on eggs, tadpoles, or juveniles that may be underneath substrate or along the river or creek margin. After completing these observations, surveyors may sample suitable aquatic habitats away from the stream bank. For detailed information on search techniques for all FYLF life stages, refer to Section 6.1.

  All observations made by the surveyors are recorded on the appropriate VES data sheets. Additionally, the location of egg masses and tadpoles and the general location of frogs are indicated on aerial photographs or site drawings (refer to Section 4.0 for more details).

- **Establishing Site/Subsite Boundaries**

  Establishing site boundaries at river and creek sites may vary due to differences in extent and type of aquatic habitats, and the study objectives. In general, river surveys do not include the entire length of the river, but focus on reaches of the river within the study area that contain suitable

habitat for FYLFs. These reaches are identified as individual sites, and the boundaries of the site will depend on the extent of suitable habitat present. On the other hand, surveys at creek sites may include the entire length of the creek, a section of the creek, or subsites, if detailed information (i.e., breeding and oviposition, or data on FYLF life stages) is required. If it is not feasible to survey the entire length of the study area, representative sections within the study area that contain suitable habitat should be identified as survey sites with the upstream and downstream ends marked as the site boundaries. Additional sites may also be selected if FYLFs are found in other river or creek habitats that were not identified during the initial site selection. These habitats may be of limited extent, or lack the usual habitat features typically associated with FYLFs.

At river sites, subsites may need to be established, if the site is extensive or has several distinct habitat types. Where more than one distinct habitat type is present at a river site, or where there are discontinuous sections of the same habitat type (e.g., lateral bars separated by bedrock outcrops), subsites should be designated. Subsites may also be based upon the occurrence of amphibians. If FYLFs are not observed at a site, subsites may be designated to include the most suitable habitat available at the site (e.g., cobble bars with edgewater habitat, boulder/sedge habitat, etc.). Site/subsite notations are numeric/alpha (e.g., 1a) and should be assigned beginning with the downstream subsite, sequentially working upstream (e.g., 1a, 1b, 1c). Designation of subsites and the collection of habitat-specific species information improve relative abundance estimates and assist surveyors in focusing sampling efforts on the best FYLF habitat available. A VES and a site habitat assessment data sheet should be completed for each designated subsite.

Upon completion of the initial VES, the upstream and downstream ends of the site and subsites are marked with semi-permanent markers (flagging, etc.) for single season or short-term studies, or with permanent markers for multiple-year monitoring or long-term studies. Additionally, these boundaries are indicated on aerial photographs or site drawings (refer to Section 4.0 for more details).

4.0 Site Habitat Assessments

Site habitat assessments are an important part of the overall survey. Information obtained in the site habitat assessment provides essential data on site-specific habitat characteristics such as riparian vegetation, aquatic and terrestrial cover, substrate, water quality, aquatic habitat, and upland habitat. Documenting existing habitat conditions enables surveyors to establish baseline conditions at a site and allow for monitoring of habitat changes. Also, this information, when combined with data collected during VESs, provides the data necessary for developing habitat suitability criteria for FYLFs.

The site habitat assessment is the last step in the survey process and should be conducted immediately following the initial VES. The rationale for this is twofold: (1) the VES must be completed first to avoid disturbing the site and any amphibians that may be present; and (2) the final site/subsite boundaries cannot be designated until the VES is completed and the extent of the site/subsites has been determined. Site habitat assessment SOPs and field data sheets for both river and creek sites are provided in Appendix C.

Habitat parameters are measured or estimated, and then recorded on the appropriate site habitat assessment data sheet. Prominent habitat features, such as side channels, isolated pools, or fish barriers should be recorded on aerial photographs. If aerial photographs are not available, this information should be included in a site drawing on the back of the site habitat assessment data sheet. The loca-

tion of egg masses and tadpoles, and general location of frogs, should also be included on aerial photographs and/or drawings of the site. Photographs should be taken to document general site habitat characteristics, as well as the microhabitat where eggs, tadpoles, juvenile/subadult, and adults are found. Instructions for taking and recording photographs are provided in Section 6.2.

5.0 Data Analysis

Depending on study objectives and the level of data collected during the VESs and site habitat assessment, data analysis may include only a few field parameters or the full range. The data collected during the above surveys can readily be entered in a database and used to generate baseline information and monitor changes over time.

6.0 Information and Techniques to Assist in Field Surveys

The following information regarding techniques for locating all life stages of FYLF is provided to help surveyors in identifying appropriate habitats and improve the likelihood of locating all life stages. Additionally, procedures for taking and recording photographs are provided to assist surveyors in fully documenting their findings.

6.1 Search Techniques and Information for Locating All FYLF Life Stages

The following information is based primarily on the experience and field observations made by the authors during intensive surveys for FYLF.

- **Egg masses**

  Egg masses can be the most difficult life stage to detect if the surveyor has no previous field experience. It is highly recommended that prior to conducting VESs, surveyors should visit a known FYLF breeding location to become familiar with representative habitat, and to develop a search image for FYLF egg masses. This should be done with a qualified biologist or other knowledgeable individuals familiar with the breeding area.

  If juvenile/subadult frogs have previously been documented within the study area, there is a high probability that breeding habitat may be present in the general vicinity of these sightings; thus, such areas should be included as potential survey sites. If there are no previous records, the initial search should focus on areas that have been identified as having moderate to high quality habitat. In rivers, breeding areas are often associated with the confluences of tributary streams that are predominantly perennial.

  The macro- and microhabitat utilized by FYLFs for breeding and egg laying depends largely on the availability of suitable habitat. In rivers, breeding habitats are typically located along point bars or lateral bars, in side channels, at pool tail-outs, and in side pools along river margins. In most creeks, FYLF breeding is usually associated with pools or slow runs within sections of the creek having a mix of habitat types. In rivers, FYLF egg masses are typically attached to rocky substrate in calm, shallow edgewater habitat within 3 m of shore. Studies conducted on several major rivers in the Sierra Nevada, have shown that these calm, shallow breeding areas are typically <40 cm deep with velocities <10 cm/sec. However, depending on the habitat type and pres-

ence of aquatic predators, oviposition may also occur in deeper water and in faster currents (generally up to 20 cm/sec). Field surveys conducted by the authors have documented partial scouring of egg masses at velocities of ≥20 cm/sec. Egg masses are usually laid in open areas along the stream where very little shading occurs. In general, egg masses exposed to the sun mature more quickly than those laid in partially shady conditions, regardless of water temperature.

Depending on stream currents and substrate complexity, egg masses can be found on a variety of available substrates. FYLF egg masses can usually be found attached to the sides or undersides of large cobble and boulders, although they may also be attached to small cobble, gravel/pebble, or underwater woody debris. In edgewater habitat, egg masses are more commonly found closer to the bottom than the water surface. Egg masses are typically round and gelatinous, and are about the size of a fist (3-4 inches in diameter), but can be smaller. For several days following oviposition, egg masses often appear bluish in color. As the egg mass matures, the blue color fades and becomes relatively clear. In areas with little or no flow, egg masses typically become partially or completely covered in detritus, silt, or other fine sediments, making detection more difficult. Throughout the entire developmental process, the ova remain distinctly black.

The timing of breeding or oviposition surveys in the Sierra Nevada is highly dependent on elevation, particularly in reference to water temperature and the initiation of breeding activities. VESs conducted on several large river systems (the Pit, North Fork Feather, North Fork Mokelumne, and Middle Fork Stanislaus rivers) have documented breeding activities as early as mid-April at low elevations, with breeding occurring 1-3 weeks later at slightly higher elevations. Consequently, surveys should be initiated at the lowest elevation sites first, followed by higher-elevation sites.

Plexiglas viewing boxes are effective in eliminating glare on the surface of the water, as well as improving visibility in areas where there are surface ripples. In deeper water, viewing tubes allow better viewing of bottom substrate and/or underwater woody debris.

- **Tadpoles**

As would be expected, tadpoles generally remain in the same locations and habitat as that used for oviposition. When tadpoles first emerge from the egg, they are about 7-8 mm in length and are entirely black, closely resembling tadpoles in the Bufonidae family. They usually remain close to the egg mass (which serves as food for the tiny tadpoles) for a period and slowly begin to disperse into adjacent suitable edgewater habitat as the gelatinous mass decomposes. However, they still tend to remain relatively close to the location where the egg mass was laid.

When they initially begin to disperse, the small black tadpoles are usually easy to observe feeding on diatoms and other algae on the surface of the substrate. However, as they grow, tadpoles lose the black coloration and become a more camouflaged coloration that blends with the background substrate. In edgewater habitat where water temperatures are generally warmer than the mainstream temperature, tadpoles generally hide between cobble and boulders, often well hidden under a layer of detritus. Tadpoles have limited swimming abilities until they reach about 20-25 mm in length, which could take 4-5 weeks or more, depending on water temperature and food availability.

From this stage of development until they reach metamorphosis, tadpoles are cryptic and usually difficult to spot just by looking in edgewater habitat. To locate tadpoles, surveyors should first walk slowly along the shoreline looking for quick darting movements. If nothing is readily ob-

served, surveyors should slowly run their fingers through the cracks between cobble and boulders, and underneath detritus if present. This search technique is almost always successful in locating tadpoles; however, it can be time consuming if egg masses were not detected at the site, or if edgewater habitat is extensive.

- **Juvenile/Subadult and Adult Frogs**

  Juvenile/subadult and adult FYLFs can be observed throughout much of the year, if surveyors look in the right places at the right times. During the winter, subadults and adults may occasionally be observed along stream margins on sunny days. Prior to the breeding period, adult frogs begin to appear along stream margins, especially on sunny days. As flows diminish and water temperatures begin to increase, males are usually the first to begin moving back to breeding areas to establish calling stations. Females arrive later at breeding sites when average air temperatures begin to rise, flows decrease, and water temperatures increase to 12 - 15°C. Breeding tends to take place in the same general area each year, unless stream conditions change and the habitat is no longer suitable for breeding.

  During the summer, some adults may remain in the vicinity of breeding sites if there are cool, partly shady areas with adequate cover. However, adults typically move to nearby tributary streams, where overhead riparian canopy provides areas of partial sun and shade throughout the day, and air temperatures are cooler than on the main river. Perennial streams appear to be the preferred summer habitat of adults; however, ephemeral streams with perennial pools may also provide suitable habitat. Surveyors should note that adult frogs are not usually found in sections of creek that have moderately high to high amounts of overhanging cover (shade).

  Following metamorphosis, juvenile frogs may congregate and are usually conspicuous along stream margins. Juveniles will typically remain in the vicinity of breeding locations for the remainder of the summer and fall. When associated with river cobble bars, some juveniles may disperse to nearby isolated pools or side channels. By November or December, and through the remainder of winter, juvenile/subadult and adult frogs are typically absent from stream margins. However, depending on elevation and local weather conditions, juvenile/subadult and adult frogs may be occasionally observed on warmer winter days along streams when water temperatures are as low as 9.5° C. In some streams, adult frogs may remain close to the water all winter spending a portion of the time underwater.

6.2 Taking and Recording Photographs

The procedures described in this section provide a standardized method for taking and recording photographs while conducting amphibian surveys. These procedures are intended to provide surveyors with an approach for taking photographs that will best represent overall habitat conditions at a site, document microhabitat that is being utilized, and provide an alternative to collecting voucher specimens for species identification.

Each field crew should carry at least one camera (standard 35mm or digital). Photographs are taken of representative habitat features within each survey site. When surveyors take photographs, it is often useful to provide a sense of scale in the picture using a stadia rod, a crew member, or some other object of known size. Photos should be taken from different angles to adequately document the feature. The camera should be set to record the correct date and time, if this feature is available on the camera.

For each picture, the following information should be recorded in a photo logbook:

(1) Date
(2) Time
(3) Roll number
(4) Picture number
(5) Stream name
(6) Site or subsite number
(7) Description of photo, including subject matter, direction of view (upstream or downstream), and location within the site/subsite

For standard 35mm cameras, roll number(s) and picture number(s) for a given site/subsite should be recorded in the appropriate spaces on the VES and site habitat assessment data sheets. For digital cameras, the disc or card number and the picture number should be recorded in the appropriate space on the VES and site habitat assessment data sheets.

Each field crew begins a study with Roll #1 and Picture #1, and counts upwards as needed through the entire study period. After each roll is completed, both the film canister and the roll of film should be labeled with: (1) the roll number, (2) the crew leader's initials, and (3) the stream or project name/initials. For digital cameras, after the disc or card is full, label the disc or card by project and disc/card number (e.g., card #1, card #2, etc.). Photographs used to document site characteristics should provide views of the site/subsite from: the top looking towards the bottom, the middle looking towards the top and towards the bottom, and the bottom looking towards the top. Throughout the survey season, subsequent site/subsite photos should be taken from the same locations as the initial site/subsite photographs.

At the end of the field week, 35mm film should be developed taking care to be sure that the roll number, team designation, and stream or project name are transferred to the film-processing envelope for later identification. The photos should be developed electronically and recorded on a CD. For digital cameras, individual files should be established for each disc or card and appropriately named and stored on the computer hard drive, and on a floppy disc or CD. Individual site photographs can then be moved into permanent files for each survey site. All photos should be catalogued by stream and site number.

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