Lithobates chiricahuensis
Survey Protocol for Project Evaluation
Taken from Appendix E of the Recovery Plan

The following describes the survey protocol adopted by the USFWS, AGFD, and NMDGF. The purpose of the protocol is to detect Chiricahua leopard frogs where they occur and to, in some cases, confirm absence. Additional information is collected about habitats, associated organisms, and threats. Surveys conducted under a USFWS enhancement of survival (10a1A) permit must adhere to this protocol. We recommend its usage for monitoring Chiricahua leopard frog populations until a more comprehensive monitoring plan and schedule is developed (recovery action 5).

Permits/Certification: Surveyors must be permitted by the USFWS and the appropriate State agency. To obtain a permit, surveyors must attend USFWS/State approved certification training.

Procedure: Surveys shall include a night visit to all suitable habitats (see definition in Attachment 1) in the project’s action area (the area affected directly and indirectly by the action). This will typically involve walking stream and river banks, along the edges of wet meadows, and around the perimeters of stock tanks and lakes in the action area. Surveys shall be carried out with flashlights/headlamps, and a dip net shall be used to sample for tadpoles and frogs concealed in undercut banks or at the base of emergent vegetation. Watch for frogs on banklines, but also floating in the water or visible on the bottom, and in areas away from water - particularly during or after rains. Surveyors shall also listen for the distinctive call of the Chiricahua leopard frog and watch for egg masses. Audible plops may indicate frogs are present, but their identity to species must be confirmed. Plops preceded by an escape call (“eeep”) indicate American bullfrog presence. In order to survey when frogs are most active, surveys shall be carried out from April through September, and when water temperatures are at least 14°C at elevations below 5,500 feet and at least 12°C at 5,500 feet and above, and winds are light or absent. A diurnal survey can substitute for a nocturnal survey, but if frogs are not detected, surveyors should return at night. In simple habitats, such as typical livestock tanks with little or no bankline and emergent cover, 2 diurnal surveys carried out at least 3 hours after sunrise can substitute for a nocturnal survey. If surveyors have valid State and Federal permits for collecting, and populations appear large enough to sustain collection, a sample of up to 3 tadpoles should be collected as vouchers. Such a population is defined here as one in which 20 or more adult frogs are visible within 100 meters of shoreline or stock tank perimeter and tadpoles are visibly abundant. Surveyors should note observations of fishes to species, if possible, American bullfrogs, crayfish, salamanders, gartersnakes to species, and other native frogs. Additional information on how to survey sites is contained in Attachment 1 (General Visual Encounter Survey Method - AGFD). Data should be recorded on standard field survey forms (Attachment 2), and data should be collected in accordance with the instructions for the form (Attachment 3).

Disease Prevention: To prevent inadvertent movement of disease or parasitic organisms among sites, surveys shall conform to Appendix G: Field Work Disease Prevention Protocol.
Survey Frequency: In simple habitats, such as stock tanks (not dry) with little or no bankline or emergent vegetation, a single nocturnal survey as described above will detect frogs, if they are present, over 90 percent of the time. Numbers of frogs detected are also likely a rough index of the relative abundance of frogs (Howland et al. 1997). If one nocturnal or two diurnal surveys of simple systems, such as typical livestock tanks with little or no bankline or emergent cover, are conducted and frogs are not detected, you may, for the purposes of section 7 consultation, conclude the species is absent. Negative survey results in complex habitats do not indicate with certainty the species is absent; however, if frogs are not detected, the species is likely rare or absent. In complex habitats, a case can be built for absence with repeated negative surveys, preferably over one or more seasons, as well as other information, such as absence of historic or recent records of the species at the project site and within reasonable dispersal distance¹, and/or that habitat suitability is marginal.

Site occupancy often changes, particularly at stock tanks or other small, dynamic aquatic systems. Some sites may only be used by transient frogs during wet periods. Frogs may be extirpated due to drought, floods, disease, or other factors. Isolated, small populations are particularly subject to extirpation and warrant more frequent surveys to assess current status. Larger populations in natural systems are less likely to be extirpated, and as a result, survey results and assessments of presence are valid for a longer period of time. Similarly, larger sites that are unoccupied due to presence of non-native predators are unlikely to be occupied in the foreseeable future and do not warrant frequent surveys.

Site occupancy can also change due to immigration and colonization, which may occur anytime during the warmer months (however, dispersal and colonization is most likely to occur during the summer monsoons). If extant populations occur within reasonable dispersal distance¹ of a site under assessment supporting suitable habitat, colonization is likely to occur and surveys more than once a year as part of project planning or BA/E preparation may be warranted to assess presence/absence. Surveys conducted in May or June, and then repeated after the monsoon season in September, can detect occupancy in both the permanently wet habitats and the seasonally colonized habitats. For long-term projects, such as 10-year grazing permits, you should assume frogs will colonize suitable habitats within reasonable dispersal distance during the life of the project. For short-term projects, surveys immediately prior to and possibly during construction or project implementation may be needed in habitats within reasonable dispersal distance of occupied sites to evaluate if frogs will be directly affected.

¹Reasonable dispersal distance includes the following distances from occupied habitat to sites being evaluated for occupancy: a) within one mile overland, b) within three miles along an ephemeral or intermittent drainage, or c) within five miles along a perennial stream.

Ranid tadpoles can be identified using:


Recordings of the calls of Southwestern anurans, including the Chiricahua leopard frog, are found in:


To identify Southwestern ranids and other anurans, see:

Attachment 1

General Visual Encounter Survey Method
(Adapted from Arizona Game and Fish Department, May 2002)

This standard visual encounter survey (VES) method is to be used for Chiricahua leopard frog surveys. This method was adopted from Heyer et al. (1994) and modified based on statewide ranid surveys in Arizona. The method is designed to be simple and repeatable with minimal training of personnel. However, all personnel should be trained and have survey technique checked periodically by a more experienced individual. The VES method described here will generate presence/absence data if used independently and generate information from which inferences about abundance and trends can be made if used in a statistically valid monitoring program. Before designing a monitoring program, it is recommended that the user consult Gibbs’ (1996) program MONITOR or Gerodette’s (1987, 1993) program TRENDS to test the statistical power of the proposed monitoring program.

Equipment needed:

The observer should always have the following when conducting a VES:

- a dip net
- a Global Positioning System unit set to read in the North American Datum 1927 (NAD27Conus) and the appropriate Universal Transverse Mercator (UTM) Zone
- a clipboard with the Chiricahua leopard frog Survey Form and instructions
- a pen with waterproof ink
- a time piece with a stop watch
- a pH meter
- 2 thermometers
- a conductivity meter
- a sling psychrometer or hygrometer
- binoculars
- the appropriate United States Geologic Survey quadrangles
- bleach or Quat128 for disinfecting all gear before and after surveying each site

Other suggested items are the following:

- a counter or clicker for keeping a tally of frogs observed
- a field notebook
- a headlamp or spotlight for night surveys
- rubber boots, hip waders, or chest waders depending on the habitat
- guides to identification of aquatic insects, fish, amphibian larvae, and adult amphibians
- a digital or conventional camera with slide film
- the appropriate land ownership maps
- database reports of historic surveys done in the area
- wind meter
- measuring tape
• “dead box” (whirl pack or ziplock bags, MS 222, and formalin for collecting specimens)
• pocket magnifier (to help identify tadpoles, look at mouthparts, etc.)
• tape player (for call backs and identifying calls)
• taped recordings of anuran calls (e.g. Davidson 1996)
• compass

Survey Method:

All “suitable” habitats within an action area (area to be affected by a project) should be surveyed.

Suitable Habitat: The frog is a habitat generalist that is found in cienegas, pools, beaver ponds, livestock tanks, lakes, reservoirs, streams, and rivers at elevations of 3,281 to 8,890 feet. They are occasionally found in livestock drinkers, irrigation sloughs and acequias, wells, abandoned swimming pools, back yard ponds, and mine adits. Table E1 provides elevations at which frogs have been found by National Forest and Region in Arizona. Lower limits, below which frogs are not expected to be found, are also presented for each National Forest and Region (groups of counties). No surveys are recommended for habitats below those lower limits. However, any suitable habitat at or above those limits are potentially occupied. The limits given by Forest should guide surveys on those National Forests. If surveys are being considered outside of a National Forest, then the Regional lower limits should guide survey necessity. A similar analysis has not been conducted in New Mexico or Mexico; however, the lower limit for the Coronado National Forest can be used for Hidalgo County, New Mexico. We recommend 3,280 feet as a lower limit elsewhere in New Mexico and in Mexico.

The frog uses permanent or nearly permanent pools and ponds for breeding. Most sites that support populations of this frog will hold water year long in most years. Time from hatching to metamorphosis is shorter in warm waters than cold water, thus water permanency is probably more important at higher elevation and in the northern portion of the species’ range. The species is rarely found in aquatic sites inhabited by non-native fish, American bullfrogs, or crayfish. However, in complex systems or large aquatic sites, Chiricahua leopard frog may occur with low densities of non-native predators.

Surveys in suitable lentic and lotic systems should be conducted as follows:

Lentic systems:
Upon approaching a survey site, stop approximately 65 feet from the bank and search the site with binoculars. Search for frogs floating in water away from the bank as well as scanning the bank as best as possible. Walk around the entire perimeter of the site. If the entire perimeter is not surveyed, record the start and stop points as UTM coordinates. While walking along banks, use a dip net to sweep vegetation to flush frogs that do not respond to the observer’s approach. After the initial perimeter survey, search mud cracks, divots, under rocks and downed branches, and any other places where frogs might find cover. If the lentic system allows, walk though the site in a zigzag fashion to further flush frogs that may be sitting on the bottom of the water. Dip net to determine the presence of amphibian larvae, fish, and aquatic insects. Record all visual
observations and audible “plops” of frogs escaping into water. Be careful not to count frogs more than once.

**Table E1**: Highest and lowest records for Chiricahua leopard frogs on Arizona National Forests and Regions, and recommended lower elevational limit for conducting surveys. Any suitable habitat above that lower limit could be occupied by frogs.

<table>
<thead>
<tr>
<th>National Forest</th>
<th>Lowest Record (ft)</th>
<th>Highest Record (ft)</th>
<th>Region</th>
<th>Lowest Record</th>
<th>Highest Record</th>
<th>Comments</th>
<th>Lower Limit National Forest</th>
<th>Lower Limit Region</th>
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<tbody>
<tr>
<td>Apache-Sitgreaves NF (all but Clifton RD)</td>
<td>5,785</td>
<td>8,485</td>
<td>Coconino, Navajo, Apache, and Greenlee counties</td>
<td>4,240</td>
<td>8,895</td>
<td>Low elevation regional records all near Clifton RD</td>
<td>4,803</td>
<td>4,232</td>
</tr>
<tr>
<td>Apache-Sitgreaves NF (Clifton RD)</td>
<td>4,240</td>
<td>7,445</td>
<td>Coconino, Navajo, Apache, and Greenlee counties</td>
<td>4,240</td>
<td>8,895</td>
<td></td>
<td>4,240</td>
<td>4,232</td>
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<tr>
<td>Coconino NF</td>
<td>5,000</td>
<td>7,326</td>
<td>Coconino, Yavapai, and Gila counties</td>
<td>4,042</td>
<td>7,326</td>
<td>2 low elevation records from San Carlos Apache lands, Gila Co</td>
<td>4,803</td>
<td>4,035</td>
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<tr>
<td>Coronado</td>
<td>3,480</td>
<td>6,605</td>
<td>Graham, Pima, Cochise, and Santa Cruz counties</td>
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<td>6,605</td>
<td></td>
<td>3,202</td>
<td>3,202</td>
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<tr>
<td>Tonto</td>
<td>6,000</td>
<td>6,405</td>
<td>Gila and Yavapai counties</td>
<td>4,040</td>
<td>6,405</td>
<td>2 low elevation records from San Carlos Apache lands, Gila Co</td>
<td>4,803</td>
<td>4,035</td>
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</tbody>
</table>

**Lotic systems:**
Upon arriving at the starting point of a lotic system, record the starting point (or the most downstream point of the site) as UTM coordinates. Proceed upstream searching the banks, surrounding vegetation, and water along a minimum of 1,300 feet of a lotic system. Search under
rocks, downed branches, undercut banks, and any other places where frogs might find cover as best as possible. Where the lotic system allows, walk though the site in a zigzag fashion to further flush frogs that may be sitting on the bottom of the water. Dip net to determine the presence of amphibian larvae, fish, and aquatic insects. Record all visual observations and audible “plops” of frogs escaping into water. Be careful not to count frogs more than once.

Data collection:
Data should be collected according to the Chiricahua Leopard Frog Survey Form Instructions (Attachment 3). Collect the following data at the specified locations, but note any major changes that occurred during the survey on the data form. Record the site name, UTM points, elevation, USGS quad, date, observers, and time the survey starts at the starting point of the survey. Record time the survey stops, time spent actively searching for herps, effort, any voucher specimens taken, water class, water type, search methods, water pH, relative humidity, air and water temperature, habitat characteristics (water clarity, vegetation types present, primary substrate, site width and/or length), weather conditions (wind, cloud cover, precipitation), land use, sign of potential vertebrate and invertebrate predators, as well as comments at the end point of the survey. Record any herps observations.
### Locality Data

**SITE:**

**NEW SITE:** Y  **NUM:** ---

**UTM ZONE:** 11 12 13  **EASTING:**  **NORTHING:**  **ELEV**: m  ft  

**QUAD:**  **MIN:** 7.5  15  **YEAR:**  **COUNTY:**  

**DIRECTIONS:**

### Site and Visit Conditions

**DATE:**  m  d  y y y  **START TIME:**  **STOP TIME:**  **SEARCH TIME:**  **OBSERVERS:**

**EFFORT:** Total Perimeter Partial Perimeter Left Bank Right Bank Both Banks  

**H2O CLASS:** Lentic  Lotic  **H2O TYPE:** Canal  Plant outflow  Riverine  Wetland  Stock tank  Lake  Reservoir  

**SEARCH METHODS:** Dip net  Seine  Trap  Hand exploration  Snorkel  Boat  Call playback  

**REL. HUM.**  **T_AIR:** °C  **T_WATER:** °C  **WATER CLARITY:** Extremely clear  Moderately clear  Extremely heavily turbid  

**LENTIC LENGTH:**  **LENTIC WIDTH:** m  **LOTIC WIDTH:** 0-2m  3-5m  6-10m  11-20m  21-50m  51-100m  

**RIPARIAN WIDTH:** 0-2 m  3-5 m  6-10 m  11-20 m  21-50 m  >50 m  

**PRIMARY SUBSTRATE** (mark 1-3): Mud/Silt  Sand  Gravel  Cobble  Boulder  

**WIND:** < 1 mph  1-3 mph  4-7 mph  8-12 mph  13-18 mph  19-24 mph  >24  

**CLOUD COVER:** 0-20%  21-40%  41-60%  61-80%  81-100%  

**PRECIPITATION:** None  Intermittent  Steady & Light  Steady & Heavy  Snow/Sleet  

**DRY SITE:** Y  N  

**VEGETATION**

**FLOATING**

**SUBMERGED**

**EMERGENT**

**PERIMETER**

**CANOPY**

**OTHER ORGANISMS:**

**OTHER ORG. NOTES:**

**SITE / SURVEY NOTES:**

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### Herpetofauna Observations

<table>
<thead>
<tr>
<th>SPECIES</th>
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<tr>
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<td>Certain</td>
<td>Larvae</td>
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<td>Adult</td>
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<td>Certain</td>
<td>Egg</td>
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<tr>
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<td>Certain</td>
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</table>

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SITE AND VISIT CONDITIONS
HERPETOFAUNAL OBSERVATIONS
Attachment 3
Adapted from Riparian Herp Survey Form Instructions (AGFD)

- Fields with an asterisk (*) are to be filled out for every survey, regardless of results.
- Check the site’s Locality Data upon returning to the office for consistency (i.e. the site name filled out is consistent with the site name used in previous surveys).
- Upon return to the office, check each Survey Form for completeness, conciseness, and clarity prior to submitting for entry.

Locality Data:

*SITE: A "site" is any aquatic system (or piece of an aquatic system) that is > 1 mile from any other survey locality, or if less than 1 mile apart, represents a distinct change in aquatic habitat types (e.g., riverine vs. lake or cienega). Features with unique names are considered unique sites regardless of how far apart they are. Record the site name as it is marked on the United States Geologic Survey (USGS) quadrangle (hereafter quadrangle or quad). If the site is unnamed on the quad, refer to the corresponding land management map (e.g., U.S. Forest Service map, BLM Surface Management Responsibility map). If the site doesn't have a name, write "unnamed" preceding the feature; similarly, if the site is not marked on any map, write "unmarked" preceding the feature (e.g., Unnamed Wash, Unmarked Tank).

SITE AT: This field should always be filled out for unnamed and unmarked sites and for large/long aquatic systems. For other localities, use this field as needed to enhance a site name (i.e., to verbally pin-point a site in space). Use such features as the nearest road crossing (e.g., East Verde River at Highway 87 stream confluence (e.g., East Fork Gila River at Diamond Creek) or topographic feature (e.g., San Francisco River, W of Glenwood) in the description.

NEW SITE: This field is used for central database management purposes only and is not to be filled out by survey personnel.

NUM: This field is used for central database management purposes only and is not to be filled out by survey personnel. A site number is a unique number that, once assigned to a site, will always be used in conjunction with that site. The site number starts with a 3-letter code that describes the land manager. These 3 letters are followed by a hyphen and then a 4-digit number (e.g., TON-0001, COC-0153).

*UTM ZONE: Circle "11", "12" or "13" to note whether the starting point of the survey is in UTM grid zone 11 (west of 114 degrees longitude) or 12 (east of 114 degrees longitude). Most of Arizona except for the extreme western portion of the state is Zone 12. Most of New Mexico, except for the extreme western portion is in Zone 13.

*EASTING: Record the starting point of the survey as a 6-digit number. An example of a UTM x-coordinate is 295440E. Use a Global Positioning System (GPS) unit to measure the UTM coordinate. The UTM coordinate should be measured in North American Datum 1927 (NAD27Conus for Garmin units). Check that the GPS unit is reading the appropriate Zone (most of AZ is Zone 12, most of NM is Zone 13). Alternatively, read UTM coordinate. The UTM coordinate should be measured in North American Datum 1927 (NAD27Conus for Garmin units). Check that the GPS unit is reading the appropriate Zone (most of AZ is Zone 12, most of NM is Zone 13). Alternatively, read
the UTM coordinate from the quad. The first 3 numbers will be found on the top or bottom edge of the quad. These numbers are in 100,000-meter increments. The fourth number describes a point with 100-meters accuracy. The fifth number describes a point with 10-meters accuracy. The last number will be a zero. Use a coordinate scale to determine the fourth and fifth numbers.

*NORTHING: Record the starting point of the survey as a 7-digit number. An example of a UTM y-coordinate is 4318410N. Use a Global Positioning System (GPS) unit to measure the UTM coordinate. The UTM coordinate should be measured in North American Datum 1927 (NAD27). Check that the GPS unit is reading the appropriate Zone (most of AZ is Zone 12, most of NM is Zone 13). Alternatively, read the UTM coordinate from the quad. The first 4 numbers will be found along the left or right edge of the quad. These numbers are in 1,000,000-meter increments that tell you how far north of the equator you are. The fifth number describes a point with 100-meter accuracy. The sixth number describes a point with 10-meter accuracy. The last number will be a zero. Use a coordinate scale to determine the fifth and sixth numbers.

*ELEV: Record the elevation at which the starting point of the survey occurs. Read the elevation off of the survey quad or GPS unit. Be sure to indicate the measurement units (ft or m). The contour interval and unit (meters or feet) is written in the center of the bottom margin of the quadrangle. To convert meters to feet multiply by 3.281. To convert feet to meters multiply by 0.3048. If using a GPS unit, ensure you have adequate satellite coverage for an accurate elevation reading (at least 4 satellites).

*QUAD: Record the quadrangle name as it appears on the quadrangle. The name of the quadrangle appears in the upper and lower right hand corners of the quadrangle. If more than one quad is used in the survey, record the name of the quad in which the survey starts and note the name(s) of the other quad(s) in the DIRECTIONS.

*MIN: Circle "7.5" or "15" to note whether the quadrangle series is 7.5 or 15 minutes. The series of the quadrangle can be found in the upper right hand corner of the quadrangle.

*YEAR: Record the year of the quadrangle as it is printed in the lower right corner of the quadrangle. If more than one year appears on the map, record the year of the most recent revision.

*COUNTRY: Record the state abbreviation (e.g., AZ, NM) followed by a hyphen and then the first 4 letters of the county (e.g., AZ-MARI, AZ-YAVA, NM-CATR, NM-SIER). The county name can be found in the upper right corner of the quadrangle if the quad covers an area within a single county. For quads that cover areas in two or more counties, the names of the counties will appear somewhere in the topographic region of the quad. National forest maps, road maps, and gazetteers are also useful in identifying counties.

DIRECTIONS: Write the directions to the site. Keep them short and pertinent (e.g., on FS 105 4.3 MI N of FS 105/FS 393 jct.). Directions are especially important when there are no roads or when existing roads are not marked on your maps. Use the directions N, NE, E, SE, S, SW, W, and NW instead of "turn right" or "veer left". This field can also contain any information or comments you want to convey to other field personnel. For example: "Contact landowner for permission to access (602) 555-9683"; "Also survey adjacent tank and draw"; etc.

Site and Visit Conditions:
*DATE:* Record the date of the survey as eight numbers giving the month first, followed by the
day then the year (e.g., 10-27-1993, 06-02-1994).

*START TIME:* Record the time the surveyor begins searching for herps using a 24-hour clock.

*STOP TIME:* Record the time the surveyor stops searching for herps using a 24-hour clock.

*SEARCH TIME:* Record the time spent actively searching for herps in minutes. The time recorded
should include only time spent actively searching for herps and should not include
time taken to write field notes, complete data sheets, read data sheet instructions, or
other activities that may be performed while at the site.

*OBSERVERS:* List the names of all people present during the survey. Record the names as: first
initial, period, second initial, period, space, and full last name (e.g., M.J. Sredl, C.W.
Painter).

*EFFORT:* There are 5 categories of effort:

- **TP** = Total Perimeter
- **PP** = Partial Perimeter
- **LB** = Left Bank
- **RB** = Right Bank
- **BB** = Both Banks

Circle all category(s) that apply. For all categories other than TP, record the distance
surveyed in meters. The minimum acceptable survey distance for linear systems and
large lentic systems (> 20 acres) is 400m (0.25 mile). Use category BB for any lotic
system in which it is possible for you to access both banks (i.e., to meander from
shore to shore). Use categories LB and RB for large, deep, and/or swiftly flowing lotic
systems in which you are unable to meander shore to shore. LB and RB should
always be filled out together even if you didn't survey, or were unable to access, one
of the shores (e.g., LB = 0000m, RB = 0350m; RB = 0050m, LB = 0200m). Left and
right banks are in reference to a person looking upstream. To calculate meters walked
use a map wheel, range finder, or measuring tape. If using a map wheel to determine
the distance in kilometers (or miles), be sure to use the scale on the map wheel that
corresponds to the scale of your map or quad. Multiply your result by 1000 to get
meters. Round the final result to the nearest 25-meter value. Alternatively, multiply the
value generated from the map wheel in miles by 5,280 feet/mile. Multiply this new
value by 0.3048 meters/foot. Remember, during the course of any survey, the
surveyor should dip net, comb through bushes and grasses, turn over rocks, and scan
the water and shore for herpetofauna.

*VOUCHERS:* Note how many photo vouchers of specimens were taken at a site. Write the number
as 2 digits (e.g., 00 or 13). Photo vouchers of specimens should be close-ups (i.e.,
macro shots) of diagnostic characters (e.g., thigh pattern and dorsolateral folds of
leopard frogs, scale row of lateral stripes in gartersnakes, dorsal and cranial views of
Arizona toads). Note how many habitat photographs were taken at a site. Write the
number as 2 digits (e.g., 00 or 02). Habitat photos should be taken at any site in which
target riparian herps were found, at any historical locality regardless of results, and at
any survey site that has suitable habitat even if no target riparian herps were found.
Keep a detailed log of all photos taken with the camera. Circle "Y" (yes) or "N" (no) as
an indication of whether voucher specimens were collected at a site. If "Y" is circled,
the collection tag number(s) should be written in the Specimen #s field. In New
Mexico, all specimens collected should be given to the New Mexico Dept. of Game
and Fish, Endangered Species Program for identification and deposition in the
Museum of SW Biology at Univ. of New Mexico. In Arizona, give specimens to the Arizona Game and Fish Dept., Nongame Branch in Phoenix for identification and deposition in the Arizona State University Museum.

*H₂O CLASS:* Circle 1 category that best describes the hydrological class of the water system you have surveyed.

- Lentic = still water (e.g., pond)
- Lotic = flowing water (e.g., stream)

*H₂O TYPE:* Circle 1 category that best describes the type of water you have surveyed. The categories are based upon lotic/lentic characteristics as well as the size/magnitude of the water body:

- Canal = manmade (metal, concrete or earthen) diversion of riverine water
- Plant outflow = sewage and electric plants; any chemical or mechanical processing of water; storm drainages
- Riverine = natural flow, from raging rivers to streams to seeps
- Wetland = an inland body of water that is primarily emergent vegetation (e.g., cienega)
- Stock tank = an earthen-dammed or dredged basin that catches run-off for livestock or wildlife
- Lake = an inland body of water that is primarily open water
- Reservoir = a dammed riverine system that is primarily used for recreation and/or human water supply
- Small metal/concrete tanks and drinkers = manmade water holding structures

*SEARCH METHODS:* Circle all methods used to search for herps. If needed, include a description of other techniques used to search in the SITE / SURVEY NOTES with a footnote reference. Remember, during the course of any survey, the surveyor should dip net, comb through bushes and grasses, turn over rocks, and scan the water and shore for herpetofauna.

**EC:** Use an electroconductivity meter to measure. The water sample should be taken 1 centimeter below water’s surface and 1 meter from shore. For bodies of water less than 2 meters wide, take the sample from the center. Record value as μS (micro-Seimens). Be sure to: 1) take the cap off the meter before using, 2) keep the level of the water sample below the mark on the meter, 3) turn the meter on before measuring the conductivity of the sample, and 4) turn the meter off when finished sampling. Meters should be calibrated monthly.

**pH:** Measure pH using a pH meter. The water sample should be taken from water column 1 meter from shore. For bodies of water less than 2 meters wide, take the sample from the center. Be sure to: 1) take the cap off the meter before using, 2) keep the level of the water sample below the mark on the meter, 3) turn the meter on before measuring the pH of the sample, and 4) turn the meter off when finished sampling. Meters should be kept hydrated and calibrated monthly.

**REL. HUM.:** With a sling psychrometer or hygrometer, measure relative humidity 1.5 meters above ground and 1.5 meters from water. Record as percent.

**TAIR:** Measure air temperature to the nearest 10° of a degree (degrees Celsius preferred, circle C or F) 1.5 meters above ground and 1.5 meters from the water. Be sure thermometer is shaded and completely dry.
**T\text{WATER}**: Measure water temperature to the nearest degree (degrees Celsius preferred, circle C or F) 1 centimeter below water's surface and 1 meter from shore. For bodies of water less than 2 meters wide, measure temperature at the center. Be sure to shade the thermometer.

**WATER CLARITY**: Circle 1 phrase that best describes the survey area.

**LENTIC LENGTH**: For lentic systems, record the length (i.e., longest axis) of the system in meters. Measure the entire system (not just the portion surveyed), and use the standing water at the time of the survey as your boundaries. Do not measure the normal waterline or highwater mark. For large systems, estimate the length using a map. Do not rely on a visual estimate for large systems.

**LENTIC WIDTH**: For lentic systems, record the width (i.e., shortest axis) of the system in meters. The width should be the maximum distance perpendicular to the length axis. As with the length, the width should reference the entire lentic system, not just the portion surveyed, and should be determined based upon the standing water present at the time of the survey, not the usual waterline or high water mark. Use a map as a guide for larger systems.

**LOTIC WIDTH**: For lotic systems, select one range that best describes the width of water at the time of the survey. Do not measure the normal waterline or the high water mark.

**RIPARIAN WIDTH**: Circle the category that includes the maximum width of the riparian area in meters. Riparian width should be measured from the boundary of riparian vegetation and upland vegetation. For a lentic system, include the area of riparian vegetation along the shore of the body of water and any vegetated waters. For a small lotic system in which both banks can be surveyed simultaneously, include the zone of riparian vegetation on both banks of the body of water surveyed and any vegetated waters. For large or swiftly flowing lotic systems, include only bank that was surveyed or the maximum width of riparian vegetation on both banks. Riparian width is measured for the area surveyed.

**PRIMARY SUBSTRATE**: Circle from 1 to 3 categories as appropriate. All substrate types may be present, but choose only those that best describe the area potentially inhabited by target species.

- Mud/Silt = 0.001-0.1 mm
- Sand = 0.1-2 mm
- Gravel = 2-32 mm
- Cobble = 32-256 mm
- Boulder >256 mm
- Bedrock = exposed sheet of rock

**WIND**: Circle 1 category as appropriate. Wind should be measured 1.5 meters above the ground and 1.5 meters from the water. If using a wind meter, be sure to: 1) hold meter near the top so that you are not blocking any holes, 2) face into the direction of the wind while reading the meter, and 3) use the left scale for wind strengths < 10 mph, and use the right scale (by putting your index finger over the red knob on top of the meter) for wind strengths ≥10 mph. Wind categories are those used in the Beaufort scale:

- ≤1 mph = smoke rises vertically
- 1-3 mph = wind direction shown by smoke drift
- 4-7 mph = wind felt on face, leaves rustle
- 8-12 mph = leaves and small twigs in constant motion, wind extends light flag
- 13-18 mph = raises dust and loose paper, small branches are moved
19-24 mph = small trees begin to sway, crested wavelets form on inland waters
>24 mph = greater effect than above

*CLOUD COVER: Circle 1 category as appropriate. Categories are based on percent cover.

*PRECIPITATION: Circle 1 category as appropriate.

*DRY SITE: Circle Y (yes), if the site has no standing or flowing water on the surface. Circle N (no) water is present.

VEGETATION percent & PROMINENT SPECIES: Record the percent of the area potentially inhabited by target species that is covered by floating vegetation (e.g., broad-leafed macrophytes and dense algal mats), submerged vegetation, emergent vegetation (e.g., cattails, sedges, rushes), perimeter vegetation (i.e., up to 1 m from waters edge), and canopy vegetation. Use increments of 5 percent (i.e., 1 percent effectively = 0). Record the genus name or common name (only if positively identified) of the 1-4 most prominent species that best describe the surveyed area.

*PREDATORS: Circle all predators seen or otherwise detected at a survey site. Most predator categories lump together similar organisms and/or organisms with similar effects on riparian herps. Record amphibians and reptiles that are predators on other herpetofauna in the Herpetofauna Observations table. For crayfish, include claws and carapaces as evidence of presence. For dragonflies, do not include damselflies. For beetles, include any large aquatic beetles observed, such as hydrophilids and dytiscids. Warm water fish include bass, carp, catfish, perch, sunfish, and walleye. Cold water fish include trout and pike. Large wading birds include American bittern, black-crowned night heron, egrets, great blue heron, and green-backed night heron. Mammals include only medium-sized mammals such as skunk, ring-tail, and raccoon.

*OTHER ORGANISMS: This field is to be used for observations of species other than riparian herpetofauna. Riparian herps are to be recorded in the "Herpetofauna Observations" table. List all non-riparian herps by 4-letter genus/species code following the list derived from Stebbins (2003) or common name. List federal or state sensitive species of other organismal groups or any other species whose occurrence merits noting by common name. Use the OTHER ORG. NOTES field as needed to expand upon why you listed a species.

OTHER ORG. NOTES: Use this field to write out noteworthy observations about any or all of the species listed in OTHER ORGANISMS (e.g., side-blotched lizard observed mating, great horned owl roost site observed, area heavily impacted by elk grazing).

SITE / SURVEY NOTES: Use this field to describe the most outstanding features of a survey or site. Don't be redundant with fields already completed. Write short, specific comments that emphasize habitat quality and why you think you did or did not find herps. Be sure to comment on any land use in, around, or in proximity of the survey area that may potentially impact the study site (e.g., large mining operation 0.5 mile upstream of survey site, agricultural spraying 1 mile from survey site). You can also use this field to describe any noteworthy similarities or dissimilarities between the area searched and the total area (e.g., wash devoid of vegetation except in area of survey, survey covered the north end of the lake which was the only area with emergent vegetation).

Herpetofauna Observations:

*SPECIES: Record all riparian herb species (target or non-target) detected during a survey in this column. Record non-riparian herpetofauna in the OTHER ORGANISMS and OTHER ORG. NOTES. If no species are observed, record "NONE." Use the unique 4-letter
Genus-species code (Derived from Stebbins (1985)) for all riparian herp species. When an organism cannot be identified to species (e.g., "I saw a ranid-like frog", or "I saw an anuran egg mass"), use the 4-letter code corresponding to the taxonomic classification for which you are confident in your identification. For the examples above, the ranid-like frog would be assigned the code "RANA", and the egg mass would be coded as "ANUR". If you are confident you saw a leopard frog but are not certain which species you saw, use the code "RAPC." Do not use historic information to bias your decision on species identification. Record your most confident observation and justify it in the NOTES or COMMENTS.

CERTAINTY: Circle 1 word to indicate your level of certainty about your identification of each species. Certainty of identification should be based on species-specific diagnostic characters (e.g., thigh pattern and dorsolateral folds in leopard frogs, scale row of lateral stripes in gartersnakes, lack of dorsal stripe and cranial crests in Arizona toads). For information on diagnostic characters of species, see the references listed in the Survey Protocol or other appropriate diagnostic keys.

LIFE STAGE: Circle the life stage of each species observed. Use separate rows for different life stages of the same species. A juvenile leopard frog is usually < 55 mm SVL, while an adult is > 55 mm SVL or exhibits obvious sign of breeding condition (e.g., swollen thumbpads, stretched vocal sacs)

# OBSERVED: Enter the number of individuals of each species and life stage you encountered. Do not estimate total numbers within the survey area, but record only the number that you saw. For egg masses, record the number of egg masses, note the overall size of mass, condition, and stage of embryos in the NOTES or COMMENTS sections

NOTES: Record any relevant notes specific to the species or life stage observed. Types of observations to include are as follows: 1) what criteria were used to identify a species; 2) if species identification is uncertain, what was observed including both physical features and behaviors would be of use (e.g., "dorsal spots obs.", “ranid like plop,” "no bullfrog peep"); 3) note the presence of disease or deformities.