Daytime Habitat Assessment Survey Protocol for the Arroyo Toad (*Bufo californicus*)

Prior To Survey

1. On the day prior to going out in the field to conduct the habitat assessment survey you will need to do the following:

   a) Familiarize yourself with the general objectives of the daytime habitat assessment survey for the arroyo toad.

   b) Make sure that your GPS is unit is properly backed up and delete all locations in the track memory.Ê Be sure not to delete the waypoint list (you may delete the waypoint list but be sure to back it up/download the waypoints prior to doing so).

   Instructions on resetting track memory

   c) Identify the start and end points of the survey reach, as determined from the initial site evaluation, and enter/download them into the GPS unit.Ê You will use these locations to a) navigate to the downstream starting point of the survey reach and b) determine where the upstream end point of the survey is reached.

   d) Add any pre-defined sites into your Palm Pilot.

   Instructions on adding pre-defined sites into the Palm Pilot

   e) After identifying the start and end points of your survey (or surveys if you will be doing more than one habitat assessment survey during the day), fill out a safety information sheet and give it to your supervisor.

   f) Be sure to have the appropriate field equipment for the daytime habitat assessment survey.

   g) Contact landowner, if necessary, to let them know you will be accessing the site.Ê **Note:** Certain properties may require greater than 24 hour notice prior to accessing the property.

   h) Secure access letters, permits (access and collecting), keys, and any maps (TOPO! and Terraserver) that you may need for the survey.

   i) Make sure that the appropriate vehicle is signed out.

Day Of Survey

1. On the day of the survey, make sure the following items are attended to:

   a) All necessary field equipment
   b) Batteries and spare batteries are charged
   c) All necessary keys and permits (access and collecting)
   d) Any necessary maps
   e) Check the vehicle check log to make sure the vehicle is in proper working condition

2. When arriving at the site, navigate to the downstream endpoint and set the GPS unit ãtripä record to 0.0km.Ê **Note:** It is important to start at the downstream end of the survey reach so that the field of view is not impaired by any debris loosened during the survey.

    [Instructions on setting ãtripä record to 0.0km](#)

3. To create a record for this survey reach, open up the Palm Pilot form ã**Control Formä** and enter the following survey data fields:

    Survey
    a) *Observer ID*: automatic entry (or tap on the ãLookupä button and add the appropriate name)
    b) *Date*: date that the habitat suitability analysis was conducted; automatic entry
    c) *Start time*: time that the habitat suitability survey started; end time is the time that the habitat suitability survey ended; **it will be entered at the completion of the habitat suitability survey (Step 16)**
    d) *Notes:* add other observers that are present on the survey

4. Enter the weather and project data fields on the ã**Control Formä** by selecting the ãProject & Weatherä subform.Ê Click on the ãSelect Oneä option, highlight the ãWeather 1.4ä option, select the ãaddä button, and enter the following data fields:

    Weather
    a) *Weather condition*: select weather condition based on [sky codes](#) (tap on the ãLookupä button to bring up the list of sky codes)
    b) *Start air temp*: record current air temperature; end air temp is the temperature at the end of the survey; **it will be recorded at the completion of the habitat suitability survey (Step 19)**
    c) *Start wind*: record current wind speed based on [Beauford wind scale](#); end wind is the wind speed at the end of the survey; **it will be recorded at the completion of the habitat suitability survey (Step 19)**
    d) *% Cloud cover*: record cloud cover (as observed from the visible sky) based on the following percent categories: 1: <10%, 2: 11-25%, 3: 26-50%, 4: 51-75%, 5: >76%
    e) *Prior Precipitation*: select the time frame of the most recent precipitation event from the pull-down menu (this can be added after the survey if it is not known immediately).
    f) Select the ãEndä button at the bottom of the screen
    g) Select the ãDoneä button at the bottom of the screen

    To enter the project data, select the ãSelect Oneä option and highlight the ãField Projectä option.Ê Select the ãAddä button and enter the following data fields:

    Project
    a) Project ID: select the appropriate project from the pull-down menu
    b) Field Project Notes: enter any notes relative to this particular project
    c) Select the ãEndä button at the bottom of the screen
    d) Select the ãDoneä button at the bottom of the screen

e) Select the ãRecord Viewä button at the bottom of the screen

5. In order to have a record of the survey reach that you are sampling, create a site record for the site that you are surveying.Ê Select the ãSiteä subform on the ã**Control Form**ä by tapping on the page icon to the right.Ê Select the ãAddä button and enter the following site data fields:

> Site
> a) *Site name*: enter site name if the survey reach is a new site; otherwise, proceed to 5b.Ê The site name should contain no spaces between words and be in Title Case format (i.e. SanMateoCreek).Ê If the survey reach is a new site, enter it into the pre-defined site list (see Instructions on adding pre-defined sites into the Palm Pilot)
> b) *Pre-defined sites*: select the survey reach from the pull-down list of pre-defined sites
> c) *GPS position grab*: Make sure that your GPS unit is properly hooked up to the Palm Pilot; hold the stylus on the line to the right of the ãStart GPS Grabä field (hold for approximately 3 seconds).Ê Tapping on this line will record the start latitude and longitude, the EPE, elevation, and datum (make sure that all of these fields are grabbed).Ê After the location is grabbed, you may need to click on another field to see the values.Ê You may need to try the GPS grab more than once.Ê The ãEnd GPS Grabä is the GPS location at the end of this survey reach; **it will be recorded at the completion of this particular stream reach (Step 14)**
>
> The following fields will be automatically updated if the survey reach is a pre-defined site, otherwise, enter them in:
>
> d) *Drainage*: enter the highest order stream/river that the survey reach is in
> e) *County*: enter the county name in which the survey is taking place
> f) *Quad name*: enter the name of the USGS quadrangle(s) that the habitat assessment survey is taking place
> g) *Land owner*: enter the owner (local, state, federal) of the land on which the habitat assessment survey is taking place

6. Continue scrolling down to the terrestrial habitat portion of the ãSiteä subform (or click on the arrow to the right of the ãSectionä field and select ãTerrestrial Habitatä) and enter the following terrestrial habitat data fields:

> Terrestrial Habitat
> a) *Slope*: slope/gradient of stream; this will be determined by calculating the ratio between the difference of the start and end locations of the stream reach and the total length of the stream reach and will be calculated when returning back from the field.Ê See example of how to calculate slope (Steps 1-4 in Initial Site Evaluation Protocol).
> b) *Aspect*: the compass direction that the stream is flowing.Ê This will be calculated after returning from the field by calculating the bearing between the start and end point of the survey.Ê See example of how to calculate aspect.

7. Continue scrolling down to the aquatic habitat portion of the ãSiteä subform and enter the following aquatic habitat data fields:

Aquatic Habitat
a) *Site length*: length of the survey reach.Ê This will calculated after returning from the field by measuring the stream distance between the start and end points of the survey reach.

8. Having entered the site data for the entire survey reach, you will now need to enter additional subsite records for each portion of the survey reach that has a different habitat suitability rating (each portion is called a stream reach).Ê
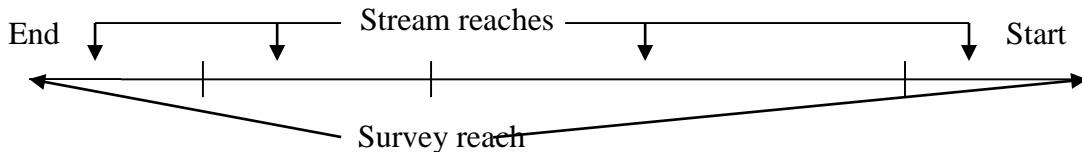
Therefore, you will be entering from 1 to *n* site records of stream reaches for this entire survey reach.Ê To begin the *first* reach, scroll up to the ãSubSiteä subform and tap on the page icon to the right.Ê Select the ãAddä button and enter the following subsite data fields:

SubSite
a) *Site name*: this is an automatic entry that is carried over from the ãSiteä form
b) *SubSite name*: if the stream reach is a pre-defined site, proceed to 8c.Ê Otherwise, enter the site name as it reads from Step 5a followed by the reach # (for single digits, use a ã0ä before 1, 2, 3, etc·).Ê For example, if starting a habitat assessment survey on a new site (i.e. San Mateo Creek), the site name (as entered in Step 5a) would be ãSanMateoCreekä; for the first stream reach (this step), the site name would be ãSanMateoCreekr01ä.Ê If returning to this step again (after Step 14) the next site would read ãSanMateoCreekr02ä, etc·
c) *Pre-defined subsites*: select the stream reach from the pull-down list of pre-defined subsites
d) *GPS position grab*: Make sure that your GPS unit is properly hooked up to the Palm Pilot; tap on the line to the right of the ãStart GPS Grabä field.Ê Tapping on this line will record the start latitude and longitude, the EPE, elevation, and datum.

9. If water is present at the beginning of the stream reach, scroll down the ãSubSiteä subform (or click on the arrow to the right of the ãSectionä field and select ãAquatic Habitatä) and enter the following aquatic habitat data fields:Ê

Aquatic Habitat
a) *Water*: enter whether there is any body of water present (checkmark) or absent (no checkmark).Ê If you encounter water anywhere along the reach, you may come back to this field and enter water present.
b) *Site length*: this will be calculated after returning from the field by measuring the stream distance between the start and end points of the stream reach

10. Select the ãWater Qualityä subform by tapping on the page icons to the right.Ê Select theÊ ãAddä button and enter the following water data fields:Ê

    Water
    a) *Start water temp*: water temperature at starting point (in C)
    b) *End water temp*: the end water temperature for each stream reach will be the same as the ãstart water tempä for the next reach.Ê Therefore, the only time an ãend water tempä will be taken is at the end of the survey
    c) *Transparency*: water transparency, as determined from the secchi disk
    d) Select the ãEndä button at the bottom of the screen
    e) Select the ãDoneä button at the bottom of the screen

11. Begin the survey by walking 20m from the start point.Ê Here, you will record the first set of stream variables.Ê These variables will be recorded every 100m (thus, measurements will be taken at 20m, 100m, 200m, 300m, etc·); they can be identified by looking at the ãtripä distance on the GPS unit.Ê At each of these locations, you will record the following variables: stream width, % Canopy cover, % Understory, and the 3 dominant plant species.Ê Following are definitions of each:

    a) *Site width*: this is equal to the average width of dominant riparian vegetation (riparian area, usually the 10 year flood terrace).Ê The dominant vegetation will typically be mule fat and/or willow and are along the margins of the stream bank (where the riparian vegetation transitions to upland vegetation).Ê If no riparian vegetation is present, than the site width is defined as the width between the transition of soil substrate on opposite sites of the stream channel.Ê The transition is the outer limits of the stream substrate.Ê The site width will be measured by a 100m tape measure.Ê For stream channels that are extremely wide, an optic measuring device will be used.Ê Stream width will be measured every 100m and averaged for each stream reach
    b) *% Canopy cover*: this is the percent category of vegetative cover (including woody debris) >1m in height that overlaps a 1m-wide belt (centered along the tape measure that was used to measure site width).Ê Categories include: 1: <10%, 2: 11-25%, 3: 26-50%, 4: 51-75%, 5: >76%.Ê In this example, the % Canopy cover would be 4 (51-75%).Ê The % canopy cover will be measured every 100m and averaged for each stream reach
    c) *% Understory*: this is the percent category of vegetative cover <1m in height that overlaps a 1m-wide belt (centered along the tape measure that was used to measure site width).Ê Categories include: 1: <10%, 2: 11-25%, 3: 26-50%, 4: 51-75%, 5: >76%.Ê In this example, the % Understory cover would be 1 (<10%).Ê The % understory
    d) *Dominant vegetation 1*: the most dominant plant species covering the 1m-wide belt
    e) *Dominant vegetation 2*: the 2nd most dominant plant species covering the 1m-wide belt
    f) *Dominant vegetation 3*: the 3rd most dominant plant species covering the 1m-wide belt

understory

Site

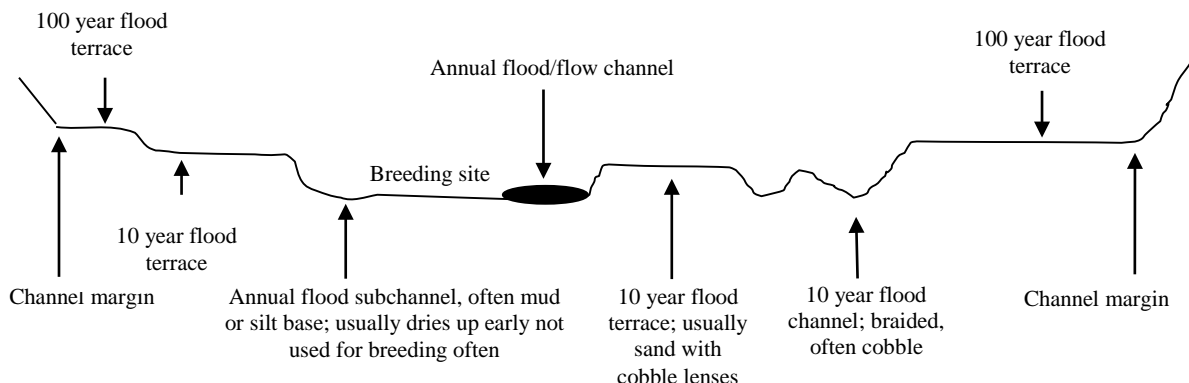overstory

Tape measure centered along 1m-wide belt
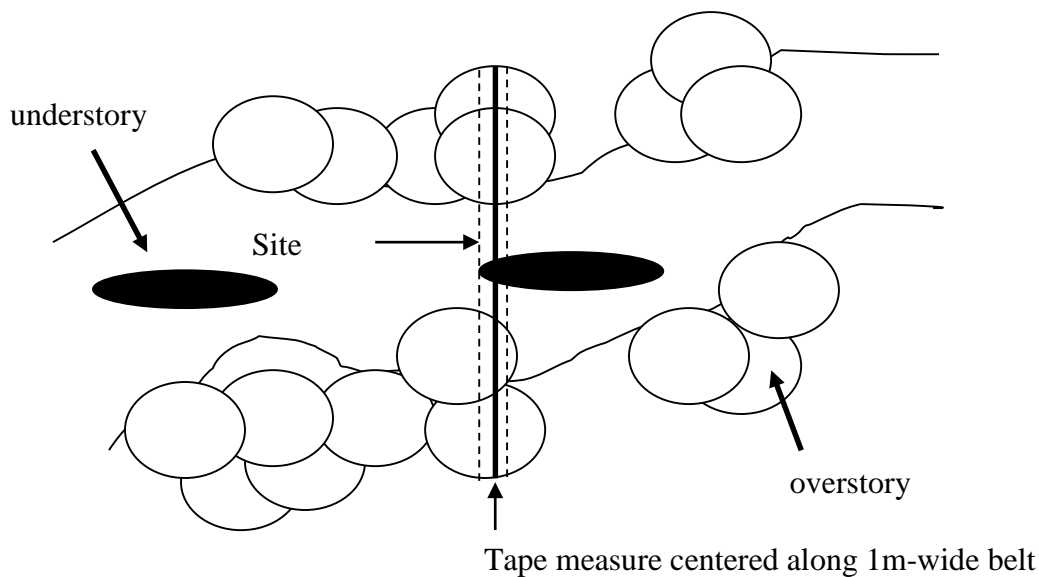
12. Continue hiking upstream.Ê Be sure to walk slowly along the stream margins and in adjacent riparian habitat, visually searching for (but not disturbing) eggs, larvae, and juveniles.Ê Also, be cognizant of any T & E plant species that may be along the stream banks.Ê Along this stretch, be sure to observe the upland habitat immediately adjacent to the stream channel.Ê Walking the reach will entail meandering back and forth along the stream channel, banks, and upland habitat in order to accurately assess the potential for arroyo toad breeding habitat; surveyors may walk within the stream, but must not disturb or create silt deposits within breeding pools.Ê If stream crossings are necessary, they should occur on the downstream ends of potential breeding pools or in fast-flowing channels. Ê

While hiking along this reach, you will be looking for the following habitat characteristics which are indicators of arroyo toad breeding habitat (see Figure below; adapted from S. Sweet, US Fish & Wildlife Service Survey Protocol For The Arroyo Toad). ÊThey include:

    a) *Sandy substrate*
        -any portion of the stream reach that contains >10m (continuous) in which sand is the greatest proportion of substrate type (other substrate types include silt/clay, gravel, cobble, rock, and boulder)

    b) *Adjacent terraces with friable soils*
        -any portion of the stream reach that contains >10m (continuous) of sandy terraces with loose soils that are sparsely to heavily vegetated with brush and trees such as mulefat, California sycamore, cottonwoods, coast live oak, and willows, and mulefat; the understory of stream terraces may consist of scattered short grasses, herbs, and leaf litter, with patches of bare or disturbed soil, or have no vegetation at all

    c) *Braided channels*
        -the channel has multiple watercourses for a stretch of >10m (continuous); these watercourses may be dry

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100 year flood
terrace

Annual flood/flow channel

100 year flood
terrace

10 year flood
terrace

Breeding site

Channel margin

Annual flood subchannel, often mud
or silt base; usually dries up early not
used for breeding often

10 year flood
terrace; usually
sand with
cobble lenses

10 year flood
channel; braided,
often cobble

Channel margin

The reach that you are walking will either have none of these characteristics, a subset of them, or all three of them.Ê You will also note the following site, terrestrial habitat, and aquatic habitat variables while walking along this stretch **(these variables may be entered in the Palm Pilot as you encounter them or at the end of this reach (step 14)):**

SubSite variables to consider while walking reach
a) *Disturbance and threats*
    -select from the list provided or add any others that are not on the list

Terrestrial habitat variables to consider while walking reach
a) *Plant community*: assign the plant community adjacent to the creek (i.e. the upland habitat type) from the <ins>habitat type</ins> list
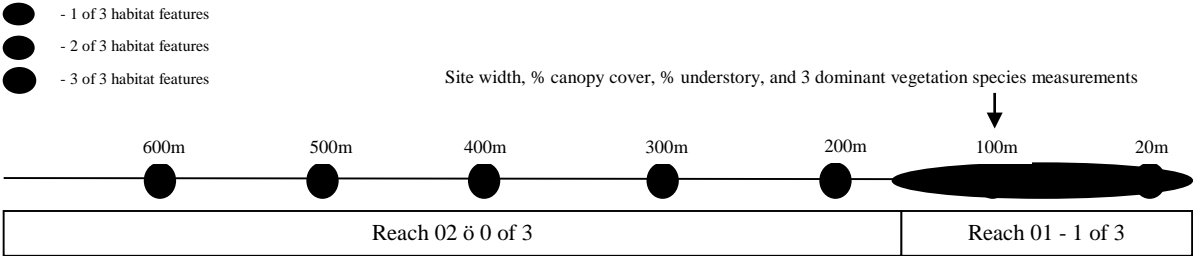
Other variables to consider while walking reach
a) *Sandy and exposed stream banks*: observe sandy and exposed stream banks along the margins of the stream channel
    ->10m (continuous) of reach in which sand is the greatest proportion of substrate type
b) *Sand and gravel bars*: observe sand and/or gravel bars within the stream channel
    ->10m (continuous) of reach in which sand and/or gravel bars are present within the stream channel
c) *Fish species*: note the fish species and numbers observed along this reach by filling out an animal record (ãAnimalä subform) for each fish species encountered along the reach; voucher specimens of each exotic and non-sensitive native species should be collected.

Protocol for collecting voucher specimens in the field

13. The end of the stream reach is defined as that location where the habitat suitability changes.Ê A habitat suitability change is defined as the addition or loss of one of the three arroyo toad breeding habitat characteristics.Ê For example, if at the start of the survey there are none of the three habitat
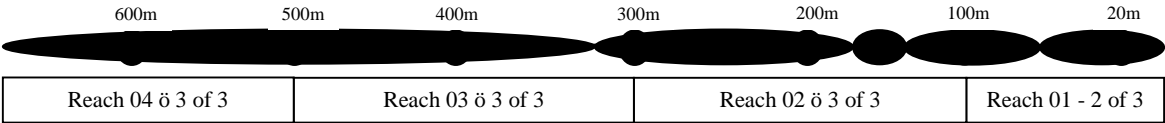
characteristics present, the end of the survey reach would occur when one, two, or three of the habitat characteristics appear along the stream channel being surveyed.Ê At this point, you would proceed to step 14.Ê Alternatively, if there were two of the three habitat characteristics present at the start of the survey, you would proceed to step 14 at the point along the stream reach where there are none, one, or all three of the habitat characteristics present along the stream channel.Ê The minimum a reach will be is 100m.Ê Therefore, if a habitat feature is gained or lost before two site width/vegetation measurements are made, a new reach will not begin until the 2nd site width/vegetation measurement is made.Ê The rating for that reach will be based on the highest number of habitat features within that reach (see examples below).

- 1 of 3 habitat features

- 2 of 3 habitat features

- 3 of 3 habitat features

Site width, % canopy cover, % understory, and 3 dominant vegetation species measurements

| 600m | 500m | 400m | 300m | 200m | 100m | 20m |

| Reach 02 ö 0 of 3 | Reach 01 - 1 of 3 |

Example 1: The first reach starts with 1 of the three characteristics.Ê Two site width/vegetation measurements are taken before the habitat feature is lost.Ê Where that habitat feature is lost, a new reach begins.Ê The site width/vegetation measurements for the 20m and 100m locations are averaged for r01; the site width/vegetation measurements for the 200m to 600m locations are averaged for r02.

| 600m | 500m | 400m | 300m | 200m | 100m | 20m |

| Reach 03 ö 1 of 3 | Reach 02 ö 2 of 3 | Reach 01 - 2 of 3 |
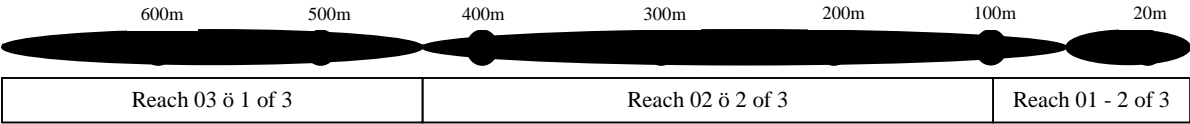
Example 2: The first reach starts with 1 of the three characteristics.Ê A second characteristic is gained, however it occurs along the reach before two site width/vegetation measurements are measured.Ê Once the second measurement is made (in this example, at 100m) a new reach (r02) is started.Ê The first reach is given a 2 of 3 rating; the second reach is given a 2 of 3 rating and continues until another habitat feature is gained or lost (even if a new feature is gained or lost within a short distance, at least two site width/vegetation measurements must be made; see example below).Ê The site width/vegetation measurements for the 200m, 300m, and 400m locations are averaged for r02.

| 600m | 500m | 400m | 300m | 200m | 100m | 20m |

| Reach 04 ö 3 of 3 | Reach 03 ö 3 of 3 | Reach 02 ö 3 of 3 | Reach 01 - 2 of 3 |

Example 3: The first reach starts with 1 of the three characteristics.Ê A second characteristic is gained, however it occurs along the reach before two site width/vegetation measurements are measured.Ê Once the second measurement is made (in this example, at 100m) a new reach (r02) is started.Ê The first reach is given a 2 of 3 rating.Ê The second reach starts with 2 of the 3 characteristics.Ê A third characteristic is gained, however it occurs for only a short distance.Ê Two site width/vegetation measurements must be made before a new reach starts.Ê When this location is reached (in this example, at 300 m) a new reach (r03) is started.Ê Within a short distance, the third characteristic appears again.Ê Although this is a change in the habitat suitability rating (from 2 characteristics to 3 characteristics), the reach started with only 2 of the 3 characteristics.Ê Thus, 2 site width/vegetation measurements must be made.Ê When this location is reached (in this example, at 500m) a new reach (r04) is started.

14. When the location along the drainage described in step 13 is reached, the remaining fields not initially entered in the site, terrestrial habitat, aquatic habitat, and water portions of the ãSubSiteä subform will need to be entered.Ê These data fields include:

SubSite
a) *GPS position grab*: Make sure that your GPS unit is properly hooked up to the Palm Pilot; tap on the line to the right of the ãEnd GPS Grabä field.Ê Tapping on this line will record the end latitude and longitude, the EPE, elevation, and datum.
b) *Disturbance and threats*: list any disturbances and/or threats encountered along stream reach

Terrestrial habitat
a) % Canopy cover: this value will be the average value of the % Canopy cover recorded at all locations along this stream reach
b) Plant community: assign the upland plant community from the <u>habitat type</u> list
c) % Understory: this value will be the average value of the % Understory recorded at all locations along this stream reach

Aquatic habitat
a) *Site length*: this will be calculated after returning from the field by measuring the stream distance between the start and end points of the stream reach
b) *Site width*: this value will be the average value of the site width recorded at all locations along this stream reach

All of the above data fields are contained within the ãSubSiteä subform and can be found by scrolling up and down the form.Ê For the ãWaterä data field, scroll to the ãWater Qualityä subform and tap on the page icons to the right.Ê Select the ãAddä button; enter the following water data field:

Water
a) *End water temp*: water temperature at end point (in C)
b) Select the ãEndä button at the bottom of the screen
c) Select the ãDoneä button at the bottom of the screen

15. Next, enter the following data for the following fields identified in the ãArroyo Toad Habitat Suitabilityä section of the Palm Pilot form ãSubSiteä subform.Ê Scroll down the ãSubSiteä subform until you reach the following fields (you may need to highlight the ãShow Allä button at the bottom of the field list to display all of these fields):

a) *% of reach with sandy and exposed stream banks*: enter the % category of the previous reach in which the banks along the stream channel were sandy and exposed: 1: <10%, 2: 11-25%, 3: 26-50%, 4: 51-75%, 5: >76%
b) *% of reach with sand and gravel bars*: estimate the % category of the previous reach in which sand and/or gravel bars were present within the stream channel: 1: <10%, 2: 11-25%, 3: 26-50%, 4: 51-75%, 5: >76%
c) *Fish observed*: tap on the box to enter a checkmark if there were fish observed within this reach

The following three physical habitat characteristics will then be assigned a yes (tap on the box to enter a checkmark) or no (leave the box blank):

d) *Sandy substrate*: did the previous stream reach contain >10m (continuous) where sand was the greatest proportion of substrate type?
e) *Adjacent terraces with friable soils*: did the adjacent upland terraces (i.e. those banks that represent the upper limits of 100-year flood events) contain >10m (continuous) of easily broken soil (i.e. sand and loose gravel as opposed to cobble and rock)?
f) *Braided channels*: does the channel have multiple watercourses for at least 10m (continuous)?

Finally, based on the answers to the above three questions, you will assign a quality of Arroyo Toad breeding habitat value to the reach of stream just surveyed.Ê To find this field, scroll back up the ãSubSiteä subform to the ãOverall Site Qualityä field:

g) *Overall Site Quality*: assign the appropriate rating based on the number of physical habitat characteristics the stream reach contains.Ê Rating is defined as:

High ö the reach contained all 3 of the physical habitat characteristics
Good ö the reach contained 2 of the 3 physical habitat characteristics
Marginal ö the reach contained 1 of the 3 physical habitat characteristics
Poor ö the reach contained none of the 3 physical habitat characteristics

16. Site Photo: take a photo of the previous reach you just surveyed

17. This completes the habitat assessment for the first reach of stream.Ê To begin a new ãSubSiteä subform for the next stream reach:

a) Select the ãEndä button at the bottom of the screen
b) Click the ãAddä button at the bottom of the screen; this will open up a new ãSubSiteä subform for the next stream reach (the new site would be (i.e.) LittleRockCreekr02)
c) Go back to Step 8 and repeat the process of entering the appropriate data fields for all remaining stream reaches

18. Continue assessing the arroyo toad breeding habitat suitability for each subsequent reach of stream, defined by the point along the stream where the habitat suitability changes, until the entire survey reach is completed.

19. After reaching the end of the survey reach, select the ãWater Qualityä subform by tapping on the page icons to the right.Ê Select theÊ ãAddä button and enter the following water data field:Ê

Water
a) *End water temp*: water temperature at end point (in C)
b) Select the ãEndä button at the bottom of the screen
c) Select the ãDoneä button at the bottom of the screen

Next, leave the ãSubSiteä subform by selecting the ãEndä button at the bottom of the screen.Ê On the next screen, tap on the ãDoneä button to bring up the ãSiteä subform.Ê Enter the following data fields:

ÊÊÊÊÊÊÊÊÊÊÊÊÊÊSite
a) *GPS position grab*: Make sure that your GPS unit is properly hooked up to the Palm Pilot; tap on the line to the right of the ãEnd GPS Grabä field.Ê Tapping on this line will record the end latitude and longitude, the EPE, elevation, and datum.

Next, leave the ãSiteä subform by selecting the ãEndä button at the bottom of the screen.Ê On the next screen, tap on the ãDoneä button to bring up the ã**Control Form**ä.Ê Enter the following survey and weather fields.Ê The remaining fields include:

Survey
a) *End time*: time that the habitat suitability survey ended

Weather
a) *End air temp*: temperature at the completion of the habitat suitability survey
b) *End wind*: wind speed at the completion of the habitat suitability survey; based on Beauford wind scale

20. Complete the Control Form by selecting ãEndä at the bottom of the screen.

21. After returning from the field, download all waypoints and track points to your computer.Ê These points should be located in a file that identifies the date and survey site from which the locations were recorded.

Instructions for downloading/uploading GPS data to/from Garmin units

Associated Forms
Control Form
Arroyo Toad daytime habitat assessment data sheet