

Standard Operating Procedure #3: Selecting and Documenting Sites

Version 1.1

In GLKN Amphibian Monitoring Protocol

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Revision History Log

The following table lists all edits and amendments to this document since the original publication date. Information entered in the log must be complete and concise. Users of this standard operating procedure will promptly notify the program manager and/or the Great Lakes Network (GLKN) data manager about recommended and required changes. The program manager must review and incorporate all changes, complete the revision history log, and change the date and version number on the title page and in the header of the document file. For complete instructions, please refer to Revising the Protocol, SOP #10.

Previous Version #	Revision Date	Author (with title and affiliation)	Location in Document and Concise Description of Revision	Reason for Change	New Version #
1.0	8/15/2017	Ulf Gafvert	3.3, 3.4 Revised song meter and temp logger discussion, added photos to show options	To provide more detail in song meter and logger deployments	1.1
Add rows as needed for each change or set of changes tied to an updated version number					

3.0 Introduction

The Great Lakes Inventory and Monitoring Network is implementing long-term monitoring of wetland-breeding amphibians in nine National Park units. This monitoring will consist primarily of call surveys based on the North American Amphibian Monitoring Program (NAAMP) protocol (Weir and Mossman 2005) using automated recording systems (Song Meters; Wildlife Acoustics, Inc.). This Standard Operating Procedure (SOP) provides detailed steps for selecting and documenting sites.

Initially, a minimum of 10 sites will be selected for monitoring amphibians at each park except for Grand Portage National Monument (GRPO), which will have six sites. Sites will be distributed among three wetland types: permanent, semi-permanent, and ephemeral wetlands. Permanent wetlands are often associated with lakes and streams and will have fish present. Semi-permanent wetlands will dry up in drought years hence fish will usually not survive. The presence and absence of fish as competitors for resources and as predators on amphibian eggs and larvae will be important covariates in data analyses. Ephemeral wetlands dry up each year (or at least most years) and may serve as early warnings to changes in precipitation patterns. Parks should strive for three randomly chosen monitoring sites in each of these wetland types. The tenth site can also be randomly placed in the wetland type that is most common in the park (preferred) or the wetland can be selected by the park based on other criteria. Selected wetlands are useful for monitoring known species of interest, when there are sites with management concern, or when previous monitoring can provide historical context. Data collected at these selected wetlands will be treated separately for some analyses (see SOP #7).

In addition to the wetland types, the surrounding terrestrial habitat - such as grassland vs. forest, or deciduous forest vs. coniferous forest - will likely affect amphibian occurrence. A decision should be made early in the site selection process as to whether monitoring will be limited to amphibians in particular coarse habitat classes. For example a park may be most interested in monitoring amphibians associated with conifer forests so that deciduous forests and grasslands would be excluded. Excluding coarse habitat types will limit the area of inference in the final analysis (see SOP #7). For most parks it will be difficult to separate out coarse habitats a-priori. Most often, these habitat classifications will be determined after the wetlands have been selected and will be used as a covariate in analyses. As the program expands, additional sites could be targeted for particular terrestrial habitats if desired.

Sampling may be constrained by logistics (e.g., remote regions or islands); however, this should be minimal because of the automated systems, which only need to be visited three times each season during daytime. Ideally all wetlands in a park should have equal probability of being selected so that inferences can be made across the entire park.

3.1 Selecting Sites

3.1.1 Random Points and Candidate Wetlands

Random points will be used as a basis for selecting sites. The network office or park staff will take the following steps (note: generally the network office will complete steps 1–3; step 4 will be done together, and steps 5 and 6 will be done by park staff):

1. Place 30–40 points on a GIS map of the park using the Generalized Random Tessellation Stratified (GRTS) process. This ensures the point locations are unbiased and spatially balanced (spread relatively evenly across the park).
2. Number each point sequentially in the order they were generated by GRTS and label them with “GRTS” as a prefix so they are not confused with the final site numbers.
3. Use GIS to create a 1-km circle around each GRTS point and add available layers for wetlands and soils from the most recent aerial imagery of the park (Figure 1). You should now have a GIS project with aerial imagery, randomly placed GRTS points with 1-km buffers, and any wetlands and soils layers that will help identify all known and potential wetlands.
4. Share the GIS project files and have staff knowledgeable about the park wetlands and logistics review the points (usually via conference call between park and network staff). The objective is to ensure an adequate pool of GRTS points for 3–4 wetlands in each of the three types: permanent, semi-permanent, and ephemeral wetlands, for a total of 10 wetlands. The 1-km buffer will be used to limit the search time while restricting the selection to the random GRTS point.
5. Pick candidate permanent and semi-permanent wetlands (and ephemeral if you can) using the GIS-based information augmented with local knowledge. Work through the GRTS points in sequential order, finding the nearest permanent or semi-permanent wetland within the 1-km buffer and mark it as a candidate wetland using the GRTS number and either “permanent”, “semi-permanent” or “ephemeral”. Do the same for other wetlands in the 1 km buffer. This is most easily done for permanent and semi-permanent wetlands. Ephemeral wetlands will usually require field work. Exclude points that are within 1 km of the previous point. This ensures amphibian calls recorded at one site are independent from a nearby site. Exclude wetlands that are on private property or if access would require exposing field personnel to dangerous situations (poor ice, swift currents). Work through the points until you have at least five candidate permanent and semi-permanent wetlands. If you are unable to locate a permanent or semi-permanent wetland within the 1-km circle using the remotely available information, the point may still contain an ephemeral wetland and will need to be evaluated on the ground.

6. Print maps (aerial images) for at least the first 10 valid GRTS points with 1-km circles. Candidate wetlands should be marked and additional maps and GPS coordinates made available for navigation.

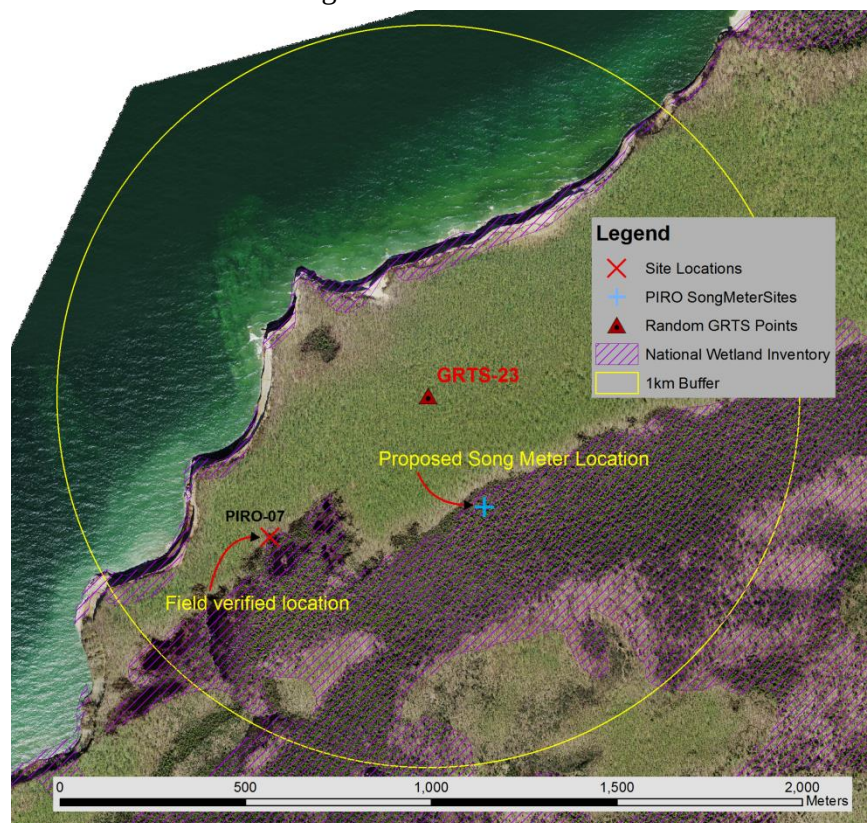


Figure 1. Example of GIS location (proposed) and field verified site.

3.1.2 Reconnaissance and Selection of Permanent and Semi-Permanent Wetlands

Use the maps and coordinates generated above to visit each candidate permanent and semi-permanent wetland. Wetlands can be visited in any order, but final selection must consider the sequential order in which the GRTS point was identified. For example, for logistical reasons you may visit wetlands associated with GRTS points #1 and #6 one day and points #2 and #4 another day; however, if all four points have wetlands appropriate for monitoring, and you must limit the number to three, then wetlands associated with #1, #2, and #4 would be selected and #6 excluded.

The objectives of the field visits are two-fold: first, to verify that the candidate permanent and semi-permanent wetlands can be monitored safely and effectively; and secondly, to establish the precise location and mounting set-up for the Song Meter and temperature logger. This “site establishment” requires making decisions on the best location and exactly how the site will be set up each year. Things to consider:

- Safety—Song Meters need to be deployed within two weeks of ice-out each year. Access to some wetlands will require crossing lakes, streams, and beaver ponds with potentially

dangerous ice conditions. This can be avoided by deploying Song Meters in late winter when ice is solid and setting the Song Meter for a delayed start. If the park chooses to use this option, it may require an external battery pack. If the park is not able to do an early deployment, and access to the wetland is dangerous, then it should be excluded.

- Vandalism—some wetlands may be visible to large numbers of visitors and Song Meters could be stolen or damaged. Such wetlands could be excluded. However, Song Meters can usually be secured (chained to a sturdy post), hidden and/or camouflaged. The park is responsible for ensuring reasonable security for the units.
- The soundscape—the best site is where the Song Meter can record amphibians from the largest portion of the target wetland. Avoid having the Song Meter surrounded by rock walls or other hard surfaces that could cause echoes and compromise the recordings. Similarly, avoid tall vegetation between the Song Meter and the target wetland that could muffle amphibian calls.
- Year to year variations—consider seasonal and annual water levels and other potentially variable environmental conditions. For example, do not deploy the Song Meter in the middle of a dry beaver meadow that in time may be inundated. Try to select a site that is permanent.
- Mounting structure—A dedicated post is recommended for permanence. The post location should be accessible and have a suitable substrate. Often a tree can be used to mount the Song Meter, but trees are not permanent and a nearby alternate location will eventually be needed as the tree ages or becomes damaged. Never select dead or dying trees, and avoid trees where beaver activity is noted. Whenever a mounting post or tree needs replacement use the same vicinity for a new post (e.g., within 30 ft). If this is not feasible choose a new location as close to the old one as possible so that the same area is acoustically monitored.
- Placement of water temperature logger—HOBO Pendant Temperature/Light Data Loggers are currently being used by the program. They will be mounted to record air temperature, located close to the song meter and out of direct sunlight. See SOP #4 for placement options. Optionally, for ephemeral wetlands only, they can be deployed in the deepest part of the wetland where feasible, to record water temperature, while also monitoring hydroperiod, as the temperature will begin to spike if/when the wetland dries up (see SOP 4).

If the candidate wetland passes the evaluation, complete a Site Establishment and Documentation Form for the site (see below). If the candidate wetland cannot be safely and effectively sampled, then it should be excluded. Move on to another wetland in the 1-km buffer or to the next GRTS point in sequential order.

3.1.3 Field Investigation and Selection of Ephemeral Wetlands

Because ephemeral wetlands are often not mapped in wetland GIS layers, selecting them will require field investigation, and initial selection may be concurrent with deploying Song Meters during the

pilot year. Selection of permanent and semi-permanent wetlands should be completed first (see 4.1.2). Then continue field investigations starting with the first GRTS point still available (i.e., not already selected as a permanent or semi-permanent wetland site). Proceed with field investigations of GRTS points in sequential order until three to four ephemeral wetlands are selected. The fourth site may be determined by the park unit outside of the random selection process (e.g., if only a few sites are known for a rare species and the park wants to make sure a particular site is monitored). At each GRTS point examined, search the 1-km buffer area until a suitable ephemeral wetland is located (see criteria below); complete a Site Establishment and Documentation Form for the site (see below). A Song Meter may then be deployed. Continue with the next identified GRTS buffer area until all ephemeral wetland sites are selected.

Suitable sites are those that support breeding for target amphibian species. The critical factor is the length of the hydroperiod (water should persist into early July). Surrounding habitat is also a factor, and should be a natural community. Ponds near roads or other disturbed lands should be avoided. See below for distances. To determine whether an ephemeral wetland is a suitable monitoring site, the criteria listed below will be used. Obtaining all criteria may not be possible during the initial site selection, but on subsequent visits (mid-season check and Song Meter retrieval; see data forms in SOP #5), data collected should be cumulatively sufficient to determine whether the site meets these criteria. If not, the site may be re-assigned.

Criteria for selecting suitable ephemeral wetland:

1. Distance to disturbance (i.e., roads, lawns, agriculture): Suitable sites should be >300 m from disturbance.
2. Hydroperiod indicators: Suitable sites should have watermarks (i.e., on tree trunks or rocks) that indicate the basin holds water. The pond should also dry in most years.
3. Isolation: The wetland must not be connected to permanent waters during high water periods. Check for potential inlets/outlets that would compromise isolation.
4. Biotic indicators (detecting one or more of the following indicates suitability):
 - a. spermatophores, eggs, larvae or metamorphs of mole salamanders (genus *Ambystoma*—Tiger, Spotted, Blue-spotted, Jefferson or Marbled salamanders);
 - b. eggs, larvae, metamorphs or calling Wood Frogs.

3.2 Site Establishment and Documentation

When a wetland is selected as a sample site, use the Site Establishment and Documentation Form in the appendix to characterize the site and document how the Song Meter and temperature logger will be deployed every year. For this step you should have the Song Meter, temperature logger, and a variety of mounting hardware available. Site establishment and documentation is often done at the first deployment, however, it can be done in a series of visits if necessary.

Complete the Site Establishment and Documentation Form as follows:

- **Park:** Use the park four letter code (e.g., PIRO for Pictured Rocks National Lakeshore).
- **Date:** mm/dd/yyyy
- **Site#:** Use the parks' four letter code as a prefix followed by two digits, 01 through 10 in sequential order as you adopt sites. For example, INDU-01 is the first site established at Indiana Dunes National Lakeshore, INDU-02 is the second site, and so on until all 10 sites are established. These numbers are not the same as the GRTS numbers. After a site has been established, the GRTS numbers should not be used.
- **Song Meter number:** This is the GLKN property number. Ideally the same Song Meter, microphones, and temperature logger will be deployed at the same sites each year to reduce variability caused by the equipment.
- **Descriptive name of the site** (optional): If desired, provide a name that is associated with the site (e.g., a connected lake, stream, or nearby community or road).
- **Visit type:** Indicate whether this is the original site establishment or a re-visit. Re-visits should be done if the site is altered (e.g., a road is built through the wetland, a fire changes the surrounding habitat) or the Song Meter or probe must be moved (e.g., the mounting tree falls).
- **Name(s) of personnel:** List the individuals who established and documented the site.
- **Primary access road and/or trail:** Name or describe the primary access route that personnel should use in the future.
- **Parking location:** Describe or provide coordinates for the best place to park and start hiking to the target wetland.
- **Description of hike to target wetland:** Describe exactly how to get to the wetland. Note how many miles, whether to use GPS coordinates to hike directly to the wetland, or if it is easiest to hike up a small creek, etc. Use additional sheets if necessary.
- **Coordinates to wetland edge or witness tree:** Provide any useful intermediate GPS coordinates that will assist future personnel in finding the wetland.
- **Wetland type:** Circle the most appropriate type. See descriptions above.

- **Wetland vegetation:** Indicate the percent cover of the dominant types of vegetation present in the target wetland. From the location of the Song Meter, scan the visible area of the wetland and estimate (to the nearest 5%) the area of the wetland covered by trees, shrubs, emergent vegetation (e.g., grasses, sedges, cattail), open water, and other.
- **Percent canopy closure:** estimate (to the nearest 5%) the percent of the wetland area that would be shaded, assuming full leaf-on at noon.
- **Size of the wetland:** For large wetlands this should be estimated by the Network office using GIS. For smaller wetlands measure the length along the longest axis and width at the widest part perpendicular to the long axis using a rule, pacing, or a range finder. For wetlands where measurement is not feasible, have the Network office estimate the size using GIS.
- **Percent of wetland basin filled with water:** using signs of the high water mark, such as lines of debris along the wetland margins or water marks on trees and rocks, estimate to the nearest 5% the portion of the wetland basin filled with water.
- **Associated waterbodies:** Circle the waterbody type that most directly influences the water levels of the target wetland. Select 'none' for ephemeral wetlands.
- **Coarse habitat class:** Circle the class that best describes the surrounding vegetation. Of interest is the context of the wetland within the larger landscape. Scan the nearby area, look at the aerial imagery, and consult available land cover classifications and local experts. Use the 'other' category if necessary.
- **Description of surrounding terrestrial habitat:** Use this space to further describe the vegetation, especially if the 'other' category was selected above. Name the dominant overstory and understory tree/shrub species and circle the approximate age of the overstory stand (if present).
- **Song Meter placement:** See Section 4.3 below for options on mounting Song Meters. Provide a description of exactly how the Song Meter should be mounted each year at this site. Attach pictures and drawings as needed.
 - Sketch and notes: Illustrate the location of the Song Meter in relation to the target wetland and any physical features that will help others locate the exact location. In some cases only a few notes will be necessary (e.g., on the lone 20" dbh cedar 5 paces east of the stream mouth). In other cases this will require detailed notes, a good sketch, triangulated measurements, and photographs. Consider how someone else will find the exact same location each year. We recommend tagging the site or burying a medallion where the post is set each year.
 - Coordinates: Use a high-quality GPS and/or use the averaging feature to get reasonably accurate coordinates.
 - Describe the mounting system: Include what the Song Meter is mounted on, how it is attached, whether a mounting board is required, etc.

- Height of Song Meter: This is the distance from the ground or water surface to the microphones.
- Compass orientation: Use a compass to determine the direction in degrees that the Song Meter is facing. It should face towards the target wetland. Stand directly behind the Song Meter far enough that the electronics do not affect the compass. Site through the center of the Song Meter directly to the wetland.
- Distance to nearest wet edge: Measure the distance from the post/tree where the Song Meter is mounted to the nearest wet edge of the target wetland. This line should be shown on the sketch above. Indicate whether the Song Meter is currently mounted over the water or whether the water is a distance away from the Song Meter.
- Water depth beneath Song Meter, if mounted over water.
- **Temperature logger placement:** Describe where the logger is placed relative to the Song Meter. The logger should be in a location that can be relocated consistently. For example, 12.5 m at 94° from the Song Meter and 182° from the base of the lone white pine will provide sufficient triangulation.
 - Sketch and notes: Illustrate the location of the logger in relation to the Song Meter and any features described above that will help others find the same precise location.
 - Describe the anchoring system: The logger will need to be anchored to the bottom by attaching it to a weight. See Section 3.4 for ideas on set-up. Note here exactly how it will be deployed each year.
 - Distance between Song Meter and temperature logger: Measure the exact distance from the base of the tree or post on which the Song Meter is mounted to the temperature logger.
 - Water depth at temperature logger: Measure depth where the temperature logger is placed.
 - Bottom substrate: Note whether the bottom at the temperature logger is: muck (organic dark mud), clay (fine, light colored silts), sand (fine to coarse grain <1 cm), gravel (>1 cm), rock (large rocks including bedrock), detritus (leaves, twigs, or other decaying organic material), or other (describe).
- **Problems noted:** Song Meter and temperature logger deployment may take a year or more to get right. Note here the problems you encountered and thoughts for correcting it as soon as practical.

3.3 Song Meter Placement and Mounting Options



Figure 2. Song Meter mounted to a 2×4 stake pounded in the ground. This 2×4 could be painted to blend with the environment better and will have to be replaced every 2–4 years. Consider a 4×4 cedar post for longevity.



Figure 3. Song Meter could be moved back and closer to background vegetation onto the historical high-water mark (*arrow*) to blend in better and save from being inundated in wet years.



Figure 4. Camouflage tape can be used reduce people finding and tampering with the Song Meters.

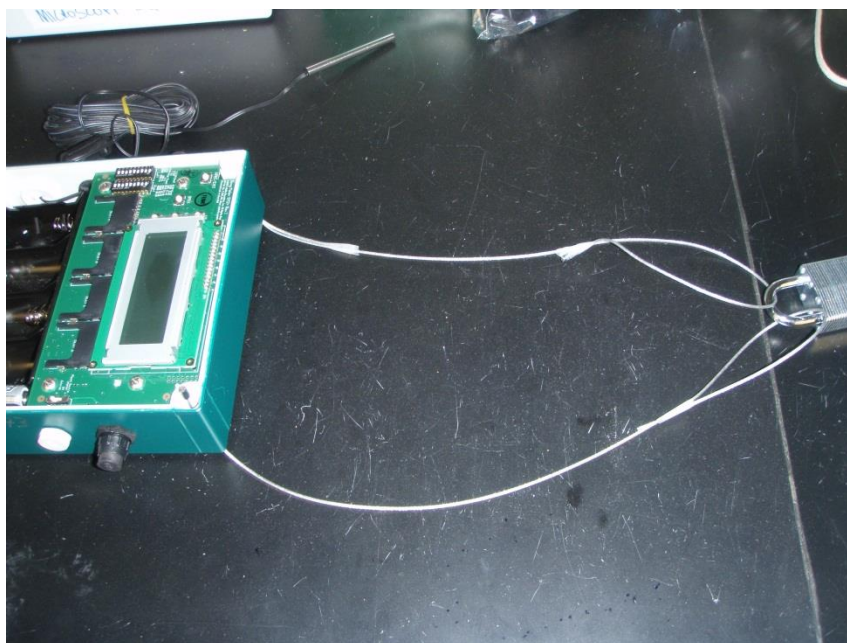


Figure 5. Small diameter cable threaded through the screw holes for the face-plate can provide some security. This will keep honest people honest, but anyone with a multi-tool can snip this cable in a hurry.



Figure 6. Alternative mounting options: T-post with U-bolts (*left*), or backer board with roof to shed water and nylon strap for mounting to tree (*right*).

3.4 Temperature Logger Placement and Mounting Options

The current protocol mandates logging of air temperature at each Song Meter location, with water temperature loggers optional. Air temperatures will be used as a pre-filter for sample selection, with samples <40F omitted from analyses.

Water temperatures can be informative covariates for data analysis. However, they can vary substantially within small distances due to layering in the water column, mixing by wind, and solar radiation. The ecologically relevant water temperature for anuran breeding activity is the surface layer in which the adults are breeding, typically the upper few inches of the water column in shallow water zones with emergent vegetation. The hydroperiod (the seasonal duration of standing water) is also important to monitor since anurans will stop calling when the wetland is dry, and short hydroperiods will affect reproductive success. Hydroperiod alone can be tracked by deploying a temperature logger at the deepest point of ephemeral and semi-permanent wetlands, and examining the seasonal log for temperature spikes characteristic of air exposure. Hydroperiod can also be tracked by temperature loggers deployed on a float system for surface water temperature as described below, with pond drying assumed if the logger becomes exposed to air (which can be determined by examining the data log). However, placing loggers on floats adds a level of complexity to the setup that can be easily compromised by windblown debris, waves, vegetation and other disturbances. Given these practical considerations, as of 2018 monitoring water temperature is optional.

3.4.1 Logger Placement for Monitoring Air Temperature

Temperature loggers are preprogrammed in the Network office to record on the hour round the clock. Placement in the field should be out of direct exposure to sunlight. A couple of examples are shown in Figure 7.



Figure 7. Temperature logger mounted under roof of backer board (*left*), or in cup for solar shielding (*right*).

3.4.2 Optional Water Temperature Logger Placement for Hydroperiod

For permanent water bodies, a logger can be placed at a depth of 0.5 m at a location directly downslope (into the wetland) from the shoreline mounted Song Meter. The objective is to allow for determining if the water recedes to where the logger is set. Loggers are set during high water in spring. Place a stake at this position and measure the azimuth and distance from the Song Meter, and from a reference tree or other permanent object, to allow for triangulation. Take a GPS reading. Attach the logger to the stake at the lake bottom, or use a brick or other weight to secure the logger. If the bottom is loose sediment or detritus, stomp the material down to compress it before cabling the logger to the stake, and make sure the cable has enough play to allow for settling of the logger with the loose bottom material as water levels recede. In addition to being cabled to the stake, the logger should be attached to a weight so that it settles properly and remains on the bottom.

For ephemeral and semi-permanent wetlands, the temperature logger should be placed at the deepest accessible point and set up as described above.

New methods for monitoring hydroperiod may also be considered in future, such as water pressure loggers that have recently become more cost efficient.



Figure 8. Example materials for temperature logger placement using a weight (*left*), and field application (*right*).

3.4.3 Optional Logger Placement for Monitoring Surface Water Temperature

For monitoring surface water temperature, a logger can be placed within the emergent vegetation zone or other area suitable for anuran breeding activity, out of boat traffic lanes, and as close to the Song Meter mounting site as possible. The logger should be deployed on a weighted float that will maintain its position approximately 5 cm (1–2 in) below the water surface under conditions of fluctuating water levels. The float system should be protected as best as possible from floating debris and vegetation, such as by securing it to a rod that allows vertical movement, and surrounding the rod with a cylinder of hardware cloth to prevent debris from entangling the logger. Potential growth of vegetation within the hardware cloth cylinder can be discouraged by placing a plug (such as a plastic disk) in the bottom of the cylinder and pressing the cylinder edges into the substrate around it. Should the water level recede to where the logger is exposed to air, this will be revealed by the data log, and such data should be excluded from data analyses. If the temperature logger is noticed to be above the water surface during QA/QC site visits, it may be re-deployed to a deeper location and data collection resumed.



Figure 9. Mounting temperature logger option for recording near water surface temperature (*left*), and field application (*right*).

3.4.3 Optional Logger Placement for Monitoring Air Temperature

Another alternative for temperature logger placement is to deploy to record air temperature. Whereas this does not record the water temperature that amphibians are experiencing, air temperature still provides a useful metric for amphibian activity, and is far simpler to deploy. Placement in the field should be out of direct exposure to sunlight. A couple of examples are shown below.



Figure 9. Temperature logger mounted under roof of backer board (*left*), or in cup for solar shielding (*right*).

3.5 Equipment and Work Schedule

3.5.1 Equipment List

- SM2+ Song Meters (Wildlife Acoustics, Inc.) Will be replacing with SM3 or SM4 units in the future
- Temperature logger (Onset HOBO Pendant)
- GPS
- Camera
- Mounting tools and hardware for Song Meters: screws, Phillips screwdriver, pliers with wire cutter, posts, mallet, electrical tape, chain and locks, etc.
- Mounting tools and hardware for loggers: nylon twine, anchor, wire or zip ties, stake (wooden or metal or PVC)
- Meter stick or rule for measuring pond depth
- 100 m tape measure
- Compass
- Hip waders
- Maps, directions
- Instructions for deploying Song Meters
- Copies of all applicable permits
- Blank data sheets on waterproof paper
- Emergency phone numbers and radio call signs for the management units being sampled

3.5.2 Schedule for Field Work

See SOP #1: Preparing for the Field Season. Review the frog call quiz for species likely to be present in the sampling region before each season begins: <http://www.pwrc.usgs.gov/frogquiz/>.

If possible, initial deployment should be made within a week of ice-out, or up to a month prior to ice-out if a delayed start is programmed in.

Because phenology will vary from year to year, flexibility is built into the schedule. However, park staff and the program manager should ensure that the equipment is deployed within one week of ice-out at the sampling sites.

Literature Cited

Weir, L. A., and M. J. Mossman. 2005. North American Amphibian Monitoring Program (NAAMP). Pages 307–313 *in* M. J. Lannoo, editor. Amphibian Declines: The Conservation of United States Species. University of California Press, Berkeley, California.

Site Establishment and Documentation Form.

Name(s) of Personnel _____

Site ID _____ Date/Time _____

Descriptive name of the site: _____

This visit is: _____ the original site establishment

_____ a re-visit to document minor changes

_____ a re-visit to document major changes

Primary access road and/or trail: _____

Parking location: _____

Description of hike to the target wetland:

Coordinates of wetland edge or witness tree: _____

Wetland type (circle): permanent / semi-permanent / ephemeral

Wetland size: _____ ha (from GIS) OR measured length _____ m of longest axis AND measured width _____ m of longest axis perpendicular to length.

Field measurements by (circle one) Rule / Pacing / Range Finder/Estimate

Associated waterbodies (circle):

lake / river / wadeable stream / beaver pond / seep or spring / none / other

Coarse habitat class (circle):

conifer forest / deciduous forest / mixed conifer-deciduous forest / grassland /

other (describe):

Description of surrounding terrestrial habitat:

- Dominant overstory species:
- Dominant understory species:
- Height of overstory:

no overstory / 0-5m (0-16ft) / 5-10 m (16-33ft) / 10-15m (33-49 ft) / over 15m

Distance to disturbance (i.e., roads, lawns, agriculture) <150 m / 150 to 300 m / >300 m

For all wetlands:

Wetland is (circle): dry / wet / open water Estimated maximum depth (cm): _____

Is the wetland connected to permanent waters during high water periods (check for potential inlets/outlets that would compromise isolation): Yes / No

Describe:

Ephemeral Wetlands Only

Describe hydroperiod indicators (height and nature of watermarks, open water, etc.):

Problems Noted:

Notes and sketches:

Any other notes:

Song Meter Deployment Form.

Name(s) of Personnel _____

Song Meter Model _____ Serial # _____ Prop # _____
 (e.g., SM2+) (e.g., 00856) (e.g., GLKN-358)

Site ID _____ Temp. Logger # _____ (e.g., Hobo 10401950)

SD card numbers (label on card) and % space available (displayed when activated)

	Slot where card is placed			
	A	B	C	D
Card name or #				
Size / % used	/	/	/	/

Date/time when unit turned on: Date: ____ - ____ - ____ Time: ____:____:____

Date/time deployed in field: Date: ____ - ____ - ____ Time: ____:____:____

Date/time of next event: Date: ____ - ____ - ____ Time: ____:____:____

Firmware version _____ File prefix _____ - _____ (Settings:Locations:)
 (Park Code) (Site #)

Pass / Fail LED light test (✓) _____

Coordinates: Use default for site _____ or

New Coordinates _____ Lat _____ Long _____ Datum

Height of SM off (circle one) GROUND or WATER to mic: _____cm

Compass orientation (front of SM faces which direction?): N NE E SE S SW W NW

Distance: SM to nearest water edge _____m; SM is inside wetland: YES / NO

Water depth: at SM (if mounted over water): _____cm

Vegetation or obstructions between meter and target wetland:

Photo #s Choose location near SM, but with good view of wetland. Take 5 photos, start by facing same direction as SM, then at each 90°, measure distance and azimuth to SM, then one photo of T° logger

1_____, 2_____, 3_____, 4_____, T° logger _____

Distance: _____ Azimuth: _____ (from photo point to SM)

Describe the relative location of the SM to the wetland and any distinguishing features.

Describe location of Air T° logger relative to SM

Miscellaneous observations of amphibian species observed or heard during visit (note or estimate count or call index of any species you are certain you have identified correctly)

Species	Eggs	Calls	Adults	Tadpoles

Call Index Value (see: <http://www.pwrc.usgs.gov/frogquiz/>):

- 1: Individuals of the species can be counted; there is silence between the calls you hear.
- 2: Calls of individuals can be distinguished, but there is some overlapping of the species' calls.
- 3: Full chorus for the species. Calls are constant, continuous, and overlapping.

Notes (Changes to original siting? Things to consider for next year? Problems?):

Song Meter Mid-Season Check Form.

Name(s) of Personnel _____

SiteID: _____ Site Name/Description: _____

Date/Time Checked: _____ Song Meter GLKN # _____

Pass or Fail Indicator Light Test (circle one): BLINKING (Pass) / NOT BLINKING (Fail)

If Failed (check appropriate lines):

1) _____ unit will not wake:

a) _____ fresh batteries solved problem, unit re-deployed at _____ (time)

b) _____ fresh batteries did not solve problem (bring unit in for repair)

2) _____ unit wakes:

a) _____ unit successfully re-started at _____ (time)

b) _____ unit could not be re-started (bring unit in for repair)

Height of SM if mounted over water (measured from mic to H₂O surface): _____ cm (if changed)

Water depth: at SM (if mounted over water): _____ cm

Distance: SM to nearest wet edge _____ m

Vegetation or obstructions between meter and target wetland:

Photo #s Choose location near SM, but with good view of wetland. Take 5 photos, start by facing same direction as SM, then at each 90°, measure distance and azimuth to SM, then one photo of T° logger

1 _____, 2 _____, 3 _____, 4 _____, T° logger _____

Distance: _____ Azimuth: _____ (from photo point to SM)

Wetland vegetation - Estimate % cover to nearest 5% (in vicinity of Song Meter location):

_____ Trees _____ Shrubs _____ Emergent _____ Open Water

_____ Other (describe) _____

_____ % Canopy closure over wetland (estimate % of wetland shaded to the nearest 5%, assuming full leaf-on at noon)

Is standing water present? YES / NO

Weather last 48 hours: _____

Other observations (e.g., disturbance in watershed, odors, appearance of water):

T° Logger Condition: _____ LED light blinking? YES / NO

Miscellaneous observations of amphibian species observed or heard during visit (note or estimate count or call index of any species you are certain you have identified correctly).

Species	Eggs	Calls	Adults	Tadpoles

Call Index Value (see: <http://www.pwrc.usgs.gov/frogquiz/>):

- 1: Individuals of the species can be counted; there is silence between the calls you hear.
- 2: Calls of individuals can be distinguished, but there is some overlapping of the species' calls.
- 3: Full chorus for the species. Calls are constant, continuous, and overlapping.

Notes, problems, things to consider:

Song Meter Recovery Form.

Name(s) of Personnel _____

Date/Time Recovered: _____ Song Meter GLKN # _____

Site ID _____ T° Logger # _____

Song meter Indicator Light Test: PASS or FAIL

Distance: SM to nearest water edge _____ m; Inside Wetland: YES / NO

Water depth: at SM (if mounted over water): _____ cm;

Photo #s Choose location near SM, but with good view of wetland. Take 5 photos, start by facing same direction as SM, then at each 90°, measure distance and azimuth to SM, then one photo of T° logger

1_____, 2_____, 3_____, 4_____, T° logger _____

Distance: _____ Azimuth: _____ (from photo point to SM)

T° Logger Condition: _____ LED light blinking? YES / NO

Notes (Changes to original siting? Things to consider for next year? Problems?):

Weather last 48 hours: _____

Other observations (e.g., disturbance in watershed, odors, appearance of water):

Miscellaneous observations of amphibian species observed or heard during visit (note or estimate count or call index of any species you are certain you have identified correctly)

Species	Eggs	Calls	Adults	Tadpoles

Call Index Value (see: <http://www.pwrc.usgs.gov/frogquiz/>):

- 1: Individuals of the species can be counted; there is silence between the calls you hear.
- 2: Calls of individuals can be distinguished, but there is some overlapping of the species' calls.
- 3: Full chorus for the species. Calls are constant, continuous, and overlapping.

Any other notes: