
Bat Conservation and Management

Generation 5 Bat Trap Assembly and Advice



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Carlisle, Pennsylvania

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*Figure 1: Homemade harp traps like this one were the inspiration leading to today's Generation 5 bat trap.
Canoe Creek Mine, Pennsylvania.*

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*Cover:
G4 Cave Catcher Harp Trap (3' x 3.5') at the Durham Mine, Pennsylvania*



Figure 2: 6' G4 Forest Strainer Harp Trap, U.S. Steel Mine #2, Pennsylvania

What is a Harp Trap?

Harp traps are efficient solutions for capturing bats during fall swarms and at emergences from natural caves, abandoned mines, and other underground structures. But, traps are also useful for surveying bats during summer sampling, and artificial roost studies, especially when used in conjunction with conventional mist nets.

Harp traps are made up of two (sometimes up to four) frames strung with vertical arrangements of monofilament line. Bats attempting to pass through the trap are captured either by colliding with the exterior of the lines or by entering the space between the frames. Once captured, bats flutter down into a catch bag where they are confined until being removed for identification. This method of sampling can be much less stressful to and safer for the animals than being tangled in a mist net. Two trap sizes are available from BCM, one measuring approximately 3' wide x 3.8' high, and a larger 6' wide x 7.8' high version. The traps are typically referred to by their width only. The dimensions refer only to the actual capture area of the frames. An extra 2' must be allowed underneath the frame for the catch bag. Dimensions do not take into account the leg assembly that can raise either frame by an additional four feet. Fully expanded, the top of a 6' trap will be over 12' above the ground.

G5 Trap Advantage

Composed of aluminum, stainless steel, and brass hardware, BCM traps are designed to be field-assembled in minutes with cotterless hitch pins - no tools are required. The trap has been designed with a minimum number of parts required for assembly, and yet maintains enough rigidity so one person can pick up and move an assembled trap short distances safely. The 6' trap has been specifically designed so that one person is able to set up and tear down without additional help or dangerous acrobatics. The following sections address key trap parts and features.

Head-Piece

The most important part of a harp trap is the head-piece. The head-piece and the relatively delicate lines should always be stored in the protective canvas sleeve provided to prevent line abrasion during storage and transport. Lines are attached with stainless steel screws, included with each trap. These, in conjunction with the neoprene washers, create the knotless line attachment system. The entire trap can be strung with a single strand of monofilament line, each vertical pass individually locked and tensioned to suit. The simple line locking technique

does not use conventional knots and preserves 100% of the line strength. Loss of a line does not affect adjoining lines. The head features 3 stainless steel hitch pins on one end that lock the lower line bars during storage. These pins are linked with a lanyard making the loss of one unlikely. The posts used to attach the head to the columns are intentionally loose to minimize binding during assembly.

Side-Columns

The trap's vertical side-columns incorporate both a leg stand and mechanical line tensioning mechanism in one unit. Telescoping legs provide instant assembly and lock at any interval for leveling on uneven ground. The legs are permanently attached to the columns and will not disengage when the trap is moved. Most of the vertical expanse of the trap frame is extended by manually telescoping the upper portion of the column. A double-sided lock secures the tube when tension is applied. Final tension is obtained by utilizing a mechanical advantage crank on each column. The G5 traps are the first bat traps in the world to provide effortless, two-finger tensioning of a trap frame.

Catch Bag and Brackets

The catch bag is a deceptively difficult engineering problem, as most bats are quite crafty escape artists. Our bag is made from heavy-duty clear vinyl, making it easy to see if there are captured bats before fully approaching a trap. There is no bag liner for technicians to maneuver under or for bats to hide in a difficult-to-reach corner. Drain holes are incorporated to prevent bats from drowning during rain events. The bag can easily be cleaned by setting washing it out with a hose and soapy water, and allowing to dry. The catch bag can be adjusted along the columns to suit the topography of the site.

Bottom Bar and Roost Baffle

Flight baffles prevent bats from launching a direct escape from the catch bag. Two types of baffles are provided, including standard Bottom Bar with baffles made from a single piece of clear vinyl, and a Roost Baffle consisting of two clear vinyl curtains over a canvas roost flap.

Plain flight baffles are hung from the center baffle bar. An additional set of roost baffles, containing canvas drapes, is suspended from one lower line bar just touching the bottom of the catch bag. Bats will almost immediately discover the canvas drape and go to roost while waiting for processing, rather than expending energy attempting to escape. Bats can be easily removed from the roost baffle, and if desired, the entire baffle can be immediately removed from the bag, with bats attached.

Cave Catcher

3' Harp Trap

36" w x 40" (min) -45" h (max)

Max leg extension: 52"

Weight: 11 lbs. (5 kg)

Maximum catch area: 11.3 square feet (3.4m)

Forest Strainer

6' Harp Trap

72" w x 70" (min)-94" h (max)

Max leg extension: 52"

Weight: 23 lbs. (10.4 kg)

Maximum catch area: 47 square feet (14.3m)

Specifications subject to change without notice.

Your Responsibility:

The end user is responsible for proper use and monitoring of this trap system. Irresponsible use or lack of attention to this trap will inevitably lead to bat fatalities due to predation and/or suffocation, in either instance the permit holder is liable for state and federal fines and/or legal fees. BCM, Inc. is not responsible for end user application of this device! This trap is not intended for pest control purposes and doing so may be a violation of state and/or federal law. Do NOT use this device unless you have fully understood this entire manual and have practiced trap assembly under controlled conditions.

General Trap Assembly

Your harp trap, as shipped, is not strung with line. This enables the end user to select the type of line and the overall height of the trap. The following assembly instructions assume the trap is strung. Use these instructions as a general guide for setting the trap and please refer to the section titled "Stringing the Trap" on page 8 for specific stringing instructions.

Many of the harp trap's joints are formed by nesting tubes. The trap is machined with tight tolerances and certain parts will seize if not inserted or removed at the correct angles. A very small amount of lubricant will keep joints engaging freely.

Head-peice
(Matching set of upper and lower line bars)



The G5 Bat Trap



Column
*(Integrated trap sides, legs,
and mechanical tension)*

Bag Brackets



Baffle Bar



Roost Baffle



Catch Bag
*(Shown with
bag supports
installed)*



Figure 3: The G5 Harp Trap

1 Form lower frame

Remove the two Side Columns and spread the tripod legs by moving the adjustment knob all the way down on the column bar and hand tightening it by turning clockwise.

Insert the Bottom Bar into the allotted sleeve of the plastic Roost Baffle.

The Bottom Bar now connects to the base of each column. Three hitch pins, connected by a steel lanyard are provided on the side column lower bracket. Insert the Bottom Bar over the lower bracket post. Use the middle pin to secure the column to the baffle bar lining up the matching pre-drilled holes. The bottom frame of the trap is now formed and able to stand freely.

Do not extend legs any more than necessary to barely raise the baffle bar above the ground. This will allow the head-piece to be easily reached during later assembly.

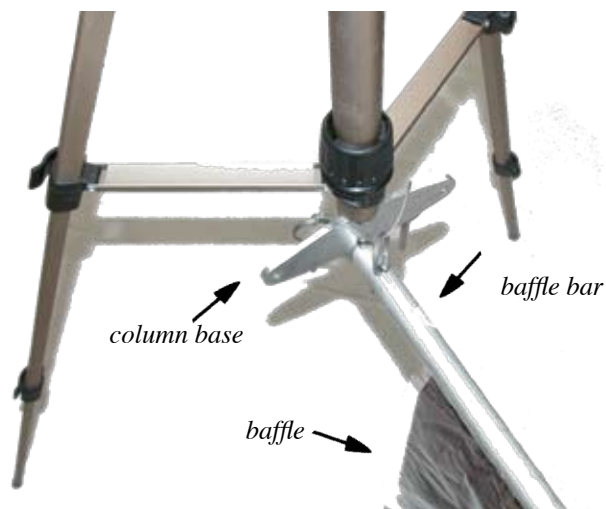


Figure 4: Baffle bar assembly

2 Add Head-piece

To prevent the lower line bars from spinning when tension is applied to the trap, these bars have rectangular posts on the ends that fit rectangular holes in only one lower bracket on a side column. (The other end of the bars attach to the column base with round cotterless pins that fit the round holes.) Note which end of the head must match which column bracket and install the head accordingly. One side of the head-piece and its corresponding side column may be color coded to help remember this orientation during this and future setups.

The removable lower line bars and the fixed upper bars are a matched set. Check to ensure the screw holes line up and do not swap the positions of the lower bars.

There are three hitch pins initially attached to each side of the head. The center pins are used to hold the head to the column, and will remain in place until the head is removed for tear-down. The end pins are used to hold the bottom line carriers and should be removed and then re-installed into the empty upper column bracket as each bottom line carrier is removed.

Disassembly tip: Do not twist the telescoping portions of the side columns after the head is removed – this will allow the holes to stay aligned for the next setup.

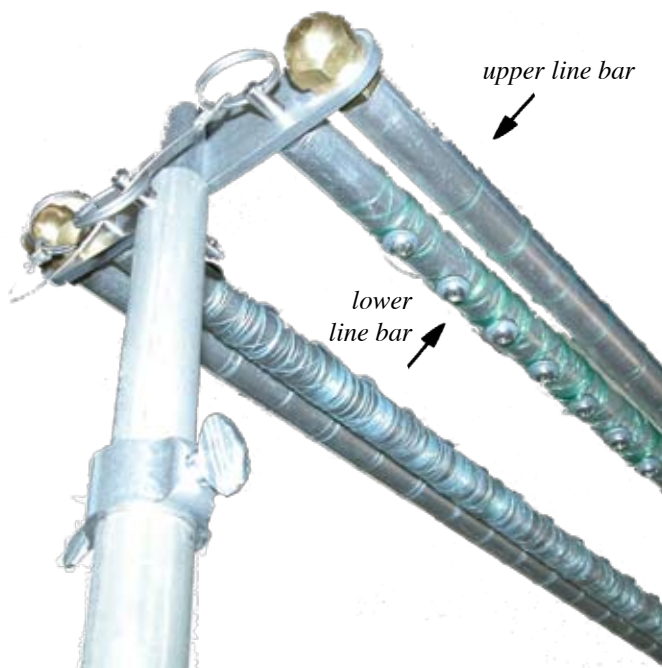


Figure 5: Head-piece assembly

3

Unroll Lower Line Bars

Remove one bottom line carrier from the head. The pin remains with the head, as there is another pin waiting for the bar at the base of the column.

Whichever hand is near the hitch pin end of the lower line bar is your “control hand.”

Keep the control hand on the hitch pin end of the line bar during unrolling (and rolling up for storage). Never remove your hand from this end during setup or tear down, lines on this end will never become wrapped the wrong direction around the bar or become entangled.

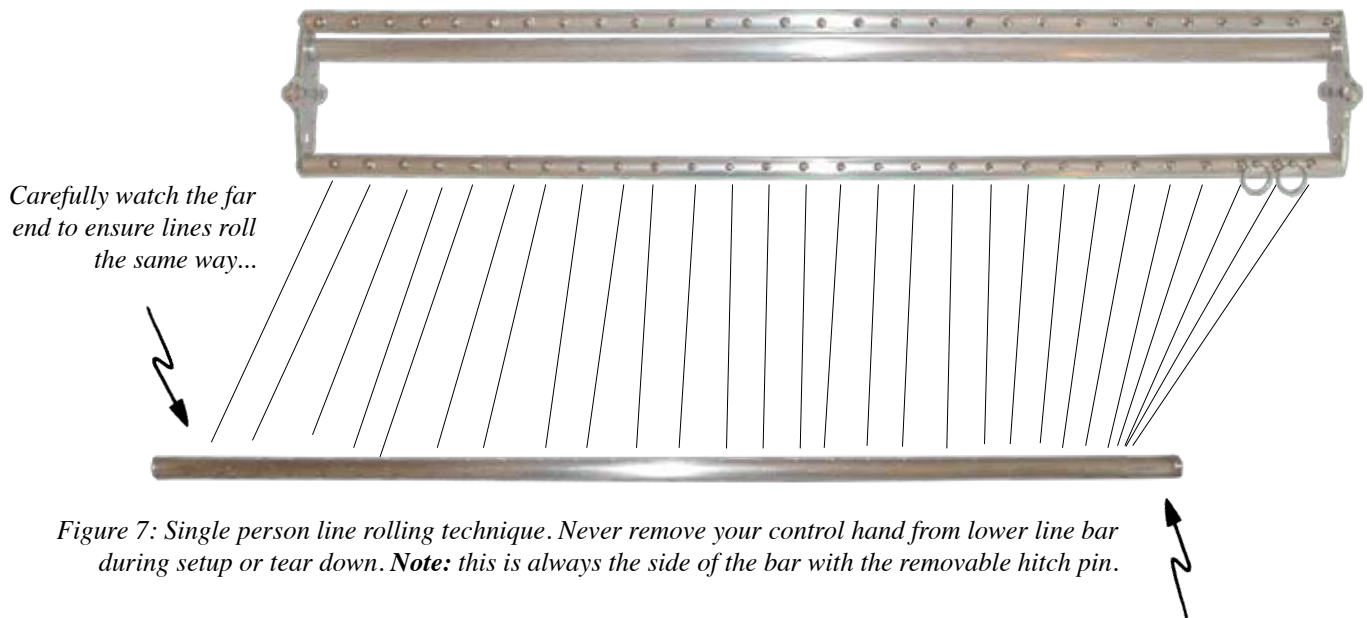
The lines on the opposite end of the bar (especially the 6' wide trap) are out of reach for one person to maintain during assembly or disassembly. The key to properly managing these lines solo is to wind the line bar on a steep offset angle from the head (see diagram below). By carefully watching the far end of the line bar without removing your control hand, the lines will not become intertwined between uses.

The more offset of an angle there is between the line bar and head, the less likely there is of any mis-wrap. However, too steep an angle may introduce lines that become snagged on the neoprene washers during unrolling. (At first glance this will appear to look like the line is hopelessly wrapped backwards, but in fact it is simply caught on a washer and easily fixed.) Experience will dictate how much offset angle is needed to prevent miswraps and minimize snags.



Figure 6: Unrolling or winding up the line bars: always keep your control hand on the hitch pin end of the bar.

Important: if a single line appears hopelessly wrapped the wrong direction, it is likely that it is simply caught on a washer and does not need to be cut! Rewind a few turns and unhook the offending snag.



*Figure 7: Single person line rolling technique. Never remove your control hand from lower line bar during setup or tear down. **Note:** this is always the side of the bar with the removable hitch pin.*

4 Add bag holders

A bag holder must be installed on each column, usually just above the leg spreaders. The bag brackets are identical and are not side specific.

In normal use the brackets would be positioned so that the bottom of the catch bag just touches the roost baffle. The bag brackets can also be raised to allow for special instances where the bag may otherwise lay on an obstruction or if the Roost Baffle does not reach the bottom of the bag.



Figure 8: Bag bracket assembly

5 Expand the trap

Loosen the top thumb screws on the side and expand the trap until the lines are snug. You may have to alternate raising sides before the trap is fully expanded.

Expand the trap until the lines are snug, there is no need to apply brute force to the lines at this stage.

Secure the thumb screws at each side column lock, hand tighten only.



Figure 9: Expanding the trap

7 Add Catch Bag & Roost Baffle

Insert the bag bars into their respective sleeves sewn in the top of the catch bag. It is not necessary to remove the bars for storage.

If you are confined to work from the front of the trap (i.e., if you are trapping a roost entrance), begin by securing the rear catch bag bar to the rear hole in the bag bar using the hitch pins. Then carefully bring the front bar forward under the trap. Carefully work the bag ends around the sides of the trap. The bag will fit nicely without pulling tightly.

The flight baffles should just touch the bottom of the catch bag. If not, adjust the bag bar upwards to suit. The catch bag extends in front and behind the trap to capture bats colliding with the outside panels.

Place the Roost Baffle on one of the Lower Line Bars, being careful not to snag any lines. This baffle should reach the bottom of the Catch Bag. The Roost Baffle should be on the line bar facing whatever direction you will be approaching the trap from.

6 Tension the trap

Loosen the crank lock and winch the trap apart even more. Immediately tension will form on the lines. Lock the crank when suitable tension is achieved. Do not over-tighten the trap or the crank handle and mechanism may be damaged.

If the lines do not evenly tension, consider adjusting those individual lines rather than over-tensioning the trap.

Important: Do not over-tighten the trap or the crank mechanism may be damaged.

NOTE: A trap under tension will generate unexpected force during de-tensioning. SLOWLY release the crank lock to prevent personal injury from the crank handle.

8 Detail check

The catch bag should hang freely without buckles or creases. Be sure to fully expand out the sides so no creases form that can become ladders or platforms for bats to use for escape. The catch bag should never rest on the ground. The full depth of the bag is necessary to prevent bats from escaping.

The trap should be level and perfectly vertical from all angles. If the frame appears “twisted”, this is a sign that at least one leg must be adjusted to level the trap.



Figure 10: Catch bag assembly



Figure 11: Tensioning the trap

Lost pins?

If you have lost a hitch pin the field, don't panic. The only pins that are really critical to the trap system in most cases, are those of the lower line bars and catch bag. Pins can be “borrowed” from other sections of the trap to replace these until new pins can be obtained. These items can be found locally at most large hardware stores in the “specialty fastener” section, they are 1/4” diameter x 1.25” long cotterless hitch pins.

Stringing the Trap

Common monofilament fishing line, 4- to 16-pound test, is generally used, and can be found at any sporting goods store. Some researchers observe no difference in capture rates when using heavier lines during swarms at hibernacula entrances. Heavier lines are generally more durable and are easier to thread, but may be harder to stretch evenly. For summer trapping in forest situations the user will probably choose the lighter end of the scale. We suggest Stren 8-pound "low visibility green" as an all-purpose line for either the 6' or 3' traps.

Composite lines offer a much higher strength to weight ratio. Fireline brand is made of spectra material and offers 20-pound strength in a traditional 6-pound line diameter, and is available in black. This line may be used on the 3' Cave Catcher trap, but is difficult to stretch properly on 6' Forest Strainer models.

Steps to string the trap

Set up the trap without the catch bag or bag holders in a room with a high ceiling. Gather a stepstool, a small Phillips head screwdriver (such as one that would fit in the palm of your hand), a spool of line, scissors, and the screws and neoprene washers provided.

Allow about an hour to string a 3' trap, or 2-3 hours for a 6' trap.

Extend the side columns to the height desired for your application. Leave at least 3" of the upper tube inside the lower tube for stability.

The removable lower line bars and the fixed upper bars are a matched set. Check to ensure the screw holes line up and do not swap the positions of the lower bars. Refer to step 2 on page 4 and ensure the line bars are properly matched.

Hand place a stainless steel #8-32 x 3/8" setscrew and neoprene flat washer in each threaded hole on the line bars. Do not tighten screws completely, as the line needs to slip under the flat washer.

Fastening the line

Wrap the line around the bar next to the first setscrew in the lower line bar. Wrap the bar 3 or 4 times, but do not wrap around the screw. The line will hold onto the bar mostly by the friction created by the wrap. The setscrew holds the line in place when no tension is being applied. Since the line does not make any sharp bends in this system, this attachment utilizes nearly 100% of the line strength.



Figure 12: Stringing a trap

The line should wrap off the lower line bar on the inside of the trap and then be taken to the corresponding set screw on the upper line bar. The line should be initially wrapped starting around the inside of the trap, and when complete, the lines will be symmetrically on the inside of the bars. Wrap the line three times around the upper line bar, and under the neoprene washer.

Add a degree of tension to the line before securing with the setscrews. The amount of tension you add should be consistent with all additional lines. Use enough torque on the setscrews to hold the line and compress the washer. The screws only need to be hand tightened. The compression of the neoprene washer will prevent the screws from becoming loose during transport. Experiment with the first line to get a feel for tensioning the line and tightening the setscrews.

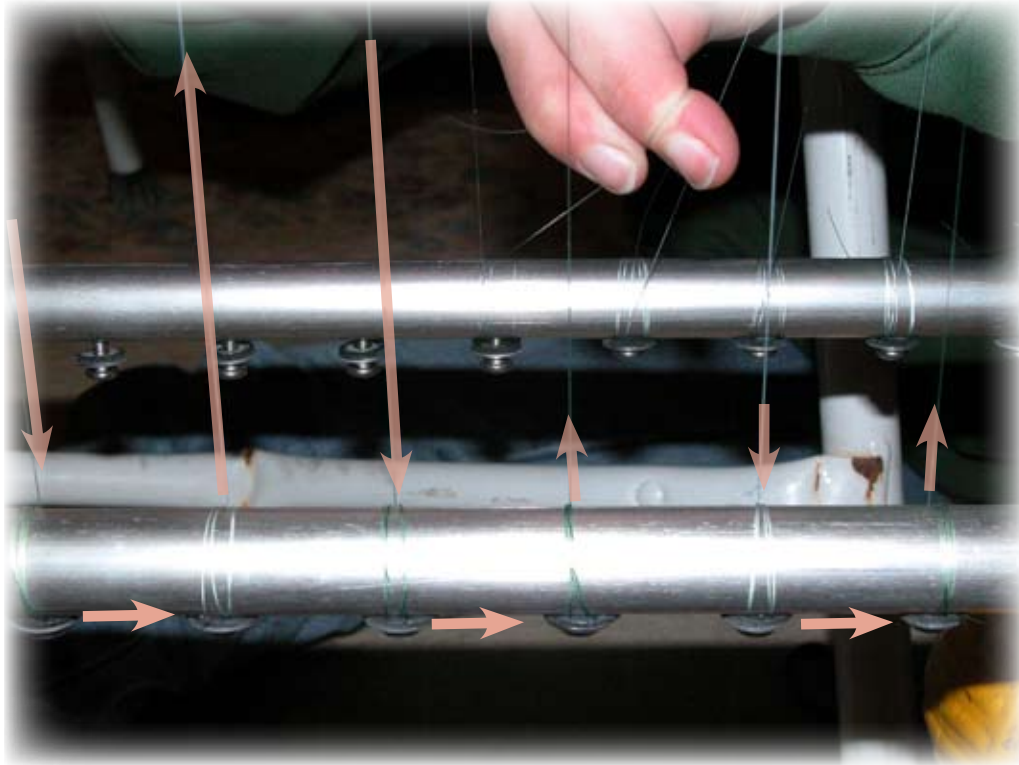


Figure 13: Stringing workflow. Arrows showing direction of line travel during stringing process. Note that this is a single strand, and it is generally not necessary to cut apart the strings until one needs replaced or re-tensioned.

Wrap the line around the bars, never completely around the screw shaft. The threads will cut the line when the screw is set. The line will wrap partway around a screw when moving horizontally to the next screw. This represents no concern as this portion of the line is not load bearing.

Additional highly recommended resources available at batmanagement.com

Download a Quicktime movie showing how to properly **string a harp trap**:
<http://www.batmanagement.com/Ordering/harp%20traps/harptrapFAQ.html>

Download a Quicktime movie showing how to **set up a harp trap**:
<http://www.batmanagement.com/Ordering/harp%20traps/harp2.html>

Free Advice

Rigging

For small hibernacula entrance trapping, legs are sometimes not needed. The trap can be readily hung from short lengths of cord looped around the ends of the head. Hang the trap from overhanging roots, shrubs, rock projections, etc. At managed sites the trap can be hung directly from cave or mine gates. In some instances, the trap can be rigged to mine walls and ceilings by pounding pitons or long nails into wall or ceiling cracks. Care and responsibility is necessary when working at natural caves due to the delicate nature of these resources. Most states have cave protection laws to deter vandalism and any modification of the site. Using formations for rigging is never acceptable, and floors with formations must also be completely avoided. Pounding objects into cracks in rocks, which upon closer inspection turn out to be near 10,000-year-old petroglyphs, is considered very poor form and could be subject to very high fines. A missed nail during take down may also rust over historic signatures or formations. For natural cave situations, tie the trap off to vegetation or use the legs provided.

Orient the trap so that the Roost Baffle in the Catch Bag is facing the exterior the hibernacula. The Roost Baffle always goes on a lower line bar, never the catch bag rod. To funnel bats towards the trap, thin plastic sheeting is usually placed behind the trap (on the side facing the mine entrance) and a hole is cut out for the trap. Duct tape can be used to attach plastic to the harp trap if necessary. Extreme care must be made so that “pockets of plastic” do not form in the sheeting. Bats may fumble into a shallow “plastic pit” of sorts and become trapped. This is especially dangerous in wet areas or during rain events where pools will form in the plastic.

While plastic sheeting is readily available at any hardware store, it may be desirable to obtain bird netting to accomplish the same task. Bird netting will not allow water to pool and will not obstruct airflow. Since the netting is black and less intrusive than the sheeting, bats may not be as nervous when approaching the trap and be more likely to be captured.

The temporary semi-closure of the entrance will have very little effect on airflow. However, for extended projects where sites are frequently trapped, it is recommended that made-to-fit screens or bird netting be installed to eliminate any chance of airflow disruption. At sites with significant airflow where plastic sheeting is used, cut a few long vertical slits in the plastic to reduce air pressure.

Trapping

Unlike mist nets, harp traps require very little attention once set. As long as white lights are off and no one is smoking, bats do not seem to mind if people are present nearby. Infrared light will not deter bat activity at all and can be used in conjunction with night-vision equipment to monitor the trapping effort. Traps should be checked occasionally to ensure bats are not escaping the Catch Bag or being tangled in bundles of extra plastic. Very rarely a bat’s wing may become caught where a line wraps around the Lower Line Carrier bar. Bats in the catch bag are easy prey for opportunistic owls, cats, weasels, raccoons, and other carnivores. In particular, weasels will jump into and out of the Catch Bag and owls will patiently perch on the Catch Bag Bars and/or ram the trap, thus breaking lines. Any site with a history of this kind of activity should be monitored continuously. This trap is not designed to be left unattended overnight without monitoring. Doing so may be a direct violation of your permit and may result in unintentional bat fatalities.



*Figure 14: Large harp traps sometimes completely fill cave and mine entrances, requiring no additional constrictions.
Canoe Creek Mine, Pennsylvania*

While most cave bats can coexist peacefully with each other in the Catch Bag, larger species such as the big brown bat (*Eptesicus fuscus*) should be removed from a batch of smaller bats sooner rather than later. Forest bats should also not share quarters with cave bat species. At large swarming sites, place bats in a temporary holding cage or even a 5-gallon bucket and process the bats away from the trap site to reduce disturbance from lights.

Do not allow more than 75 bats to accumulate inside the 6' catch bag (30 for the 3' bag) at once, as there may be a danger of suffocation. Process the catch more frequently or recruit additional staff to avoid dangerous backlogs of bats. If more than one or two bats come out of the catch bag slightly bloodied, it is a sure sign of over-crowding and infrequent processing. The catch bag contains drain holes in case of a brief rain event. The drain holes do not replace the responsibility of careful monitoring during wet weather. If rigging during the day, never install the catch bag until dusk and you are physically monitoring the trap system, local weather, and site security.



*Figure 15: Some entrances require lightweight plastic or bird netting to block odd shaped flyways.
Pittsburgh Limestone Mine, Kaylor Entrance, Pennsylvania*



Figure 16: Bats will see your trap and swirl in front of the cave/mine entrance. Use this to your advantage by erecting a 2nd trap perpendicular to the first trap (as seen here) to multiply your catch numbers. Pittsburgh Limestone Mine, Pennsylvania

The end user is responsible for proper use and monitoring this trap system. Irresponsible use or lack of attention to this trap will inevitably led to bat fatalities due to predation or suffocation, in either instance the permit holder is liable for state and federal fines and/or legal fees. BCM, Inc. is not responsible for end user application of this device!

De-rigging

Keep in mind bats will be desperate to avoid the trap. You will observe them crawling along cave passage walls and ceilings at the edges of the plastic or netting in search of a bypass. They may even be found on the ground. Careful attention must be given when disassembling any plastic or bird-netting used in conjunction with the set-up to avoid wrapping up bats. Bats also like to hide in the catch bag, and it is best to get into the habit of inspecting it several times before storing the trap for the evening (or the season). Turning the bag inside out after removing it will help dislodge any guano and/or missed bats.

Please see www.batmanagement.com for more field examples of harp trap placement, rigging, and an electronic copy of this manual.



*Figure 17: Here plastic is used to block half a mine entrance while two traps are used perpendicular to the gate in anticipation of the swarm.
Salisbury Mine, Pennsylvania.*

Cleaning and maintaining the trap

The trap is constructed of aluminum, stainless steel, and plastic. When needed, the Catch Bag may be wiped down with a mild detergent such as Ivory soap and then hosed off. To restore the aluminum to a like-new condition, scrub with a heavy-duty Scotchbrite pad and dish soap. If pins do not disengage as smoothly as you like, simply drill the hole slightly larger using a 17/64th drill bit. To remove a frozen part or to keep parts disengaging smoothly, apply a very small amount of WD-40 household lubricant. Stainless steel and aluminum may be subject to galvanic corrosion when stored in contact with each other for a long period of time. It is recommended to disengage all hitch pins before storing the trap for an extended period.



Packing the trap

Your trap came with a protective cloth sleeve for the Head Piece. Always protect the Head Piece by inserting it into the cloth sleeve before packing it in the carry bag. Load the carry bag with the Catch Bag, bottom baffle, roost baffle and bag holders first, then add the Head Piece and side Columns last.

If the head sleeve is unavailable, pack the trap by first placing all parts inside the storage bag except the catch bag and head. Protect the lines from damage by placing the Head Piece on top of or inside the catch bag, separating it from other parts and equipment.

Please see www.batmanagement.com for more field examples of harp trap placement, rigging, and an electronic copy of this manual.

Figure 18: To trap large entrances effectively, the entire passage must be sealed with plastic or bird mesh. For this long term project, an "awning" was supported by PVC pipe to completely shield the trap from weather. This trap is seen partially disassembled. South Penn Tunnel, Pennsylvania



Figure 19: To trap a large 40' square mine shaft, bird netting is first suspended above the open pit. The netting is raised extra high on the low side of the pit. Mt. Hope Shaft, New Jersey



Figure 20: Three harp traps are then placed under the netting along the low side of the pit. Extra netting can fill in edges where necessary. Mt. Hope Shaft, New Jersey