

# Sketching

The Central Ohio Grotto (COG) is a project-oriented club — we survey caves. An important part of a survey is the sketch. The sketch records the details of the cave — speleothems, streams, type of floor, passage cross-section, breakdown and more. The sketch person has the most difficult and important job. It is up to the survey team leader to select the personnel. If the survey is not particularly difficult, allow a beginner to try his hand and check his work periodically. All surveyors should learn how to sketch.

## Why Sketch?

The object of surveying a cave is to produce a detailed map of the cave. The survey itself records the survey route through the cave and the cross section dimensions at each survey station.

- The sketch is required to fill in the details.
- The sketch is a valuable tool to trap errors that the surveyors may make.
- The sketch records the shape of the surveyed passage.
- The Sketch shows the position of cave features such as:
  - Side passages.
  - Small passages not surveyed.
  - Passages to be surveyed.
  - Speleothems.
  - Streams
  - Waterfalls
  - Pits
  - Etc.

## What is Needed?

In the past the COG has used note cards but the trend today is to use the “Rite in the Rain” survey pages. Either is acceptable.

**Paper:** I carry a “Rite in the Rain” ring binder with enough pages of the “Rite in the Rain” survey pages for the survey(s) planned. The survey pages have a grid for sketching on one side and ruled for notes on the other side. The paper is water resistant. The paper is not so water resistant that it can be used under water. If you are surveying a water passage that requires use of wet suits, I suggest using notepads made from Mylar.

**Pencil:** 2H 0.5mm mechanical pencils are great. Carry several as they can jam with mud or excessive water. These pencils write dry or wet — on Mylar or paper. I have used them in water passages in which I was recording the notes under water.

**Protractor:** Use a compass such as a Silva Ranger sighting compass or a Suunto M2D. The important factor is that the

compass have a body that rotates with respect to the base, and that the base has a scale in feet and/or meters.

A compass is preferred to a protractor because:

- It doubles as a survey instrument
- Easy to use.
- It is familiar – Survey teams are used to sighting style compasses.

## What Should be Recorded?

1. Name of the cave
2. Location within the cave
3. Survey series
4. Date
5. Personnel
6. North Arrow for orientation.
7. Units being used (feet and inches, feet or tenths, meters)
8. Page # of Pages (Frequently added on completion of the day's survey.)

There must be enough information on the sketch pages so that the pages can be placed with the survey notes should they get separated. Please remember that someone in the future may want to review the sketch and the notes.

## Scale

How big is the cave? Most of the caves that we survey are on the order of miles in length. For caves of this size the grotto has standardized on a scale of 50 feet to the inch. That is fifty feet of cave passage is represented by one inch on the sketch.

For small caves a scale of 20 feet to the inch may be more practical. The survey trip leader should determine the scale used.

## The Sketch

The first step is to determine how you want to orient the page. Try to determine the direction of the survey — once determined place an arrow representing NORTH on the page.

### The Survey Line:

*Please refer to Sketching to Scale for details on laying out the survey line. You may obtain a copy from me, Bill Walden.*

In the Central Ohio Grotto we actually draw the survey path on the sketch. Using the distance and bearing from the surveyors, draw a line on the graph paper to represent the survey line. I show each station as an X with the survey station number, other people use a triangle with a dot in the center of the triangle and survey station number to designate the stations. Either is acceptable.

Have the surveyors leave the tape measure stretched between stations. Use the tapeline as a reference for sketching in the cave walls and details along the way. The tape measure helps you place objects and features correctly on your sketch.

Note significant details and side passages along the survey route. Use the tapeline as a position reference.

### Why Sketch to Scale?

- Trap any errors made by the surveyors.
- Allows cartographer to scan your sketch into a drawing program to scale, clean it up, scale it to the final map, and paste it onto the map.
- Provides an “instant” map following completion of the survey.
- Data recovery.
- Data checking.

The trapping of errors is very important. The sketch person usually picks up any compass error made by the survey team immediately because the sketch doesn't agree with the “lay” of the cave.

Often if the data is not easily read or there is some confusion as to what the note taker wrote, the cartographer and check it against the sketch. This has saved resurveying a section of cave many times.

### Sketching Rooms or Large Passages.

Two techniques used to survey large rooms or passages are splay shots or circumference shots. In the COG we primarily use splay shots. Whether splay shots or circumference shots are used is the choice of the survey team leader.

**Circumference shots:** The survey line is taken around the entire circumference of the cave room or passage.

**Splay shots:** Survey to a point in the room or passage from which the room walls are visible. From that point make radial survey shots to the walls. The team leader should determine the radial interval. The smaller the angular interval, the better the representation of the walls of the room or large passage.

Try using intervals of  $36^\circ$  — 0,  $36^\circ$ ,  $72^\circ$ ,  $108^\circ$ ,  $144^\circ$ ,  $180^\circ$ ,  $216^\circ$ ,  $252^\circ$ ,  $288^\circ$ ,  $324^\circ$ , and back to  $0^\circ$  ( $360^\circ$ ). Keeping the interval even may not be possible because of obstacles. The important factor is to get enough points to ensure a reasonable representation of the room or passage.

If the room or passage is really huge, several central points may be required. Have the survey team use shot lengths between the central points short enough to get a good representation of the area being surveyed. 50-foot shots may be more appropriate than 150-foot shots. Let the situation dictate what is needed to get a good representation of the cave.

### Recording Survey Stations

I use an X. This is a habit established when I took Engineering Drawing in college. The habit persists to this day. Others use a triangle with a dot in the center to show survey stations. This is the more acceptable. In either case write the survey station number near the station symbol to identify the station.

In a series of stations that might go AY1, AY2, ..., AY27 you may shorten the numbers to 1, 2, 3, ... 27 so long as the series is identified as AY1 through AY27 in the page location that identifies the survey.

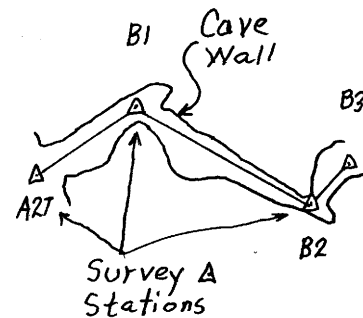
### Recording Cave Features

For me this is the hard part and the really artistic part of sketching. This is where some people really do a good job and others do not.

Please refer to the book On Station for a complete list of symbols used in the NSS for cave surveying. The grotto library has a copy.

### Symbols

Basic symbols for cave features follow. This is not a complete list but should be enough to get most of us started.

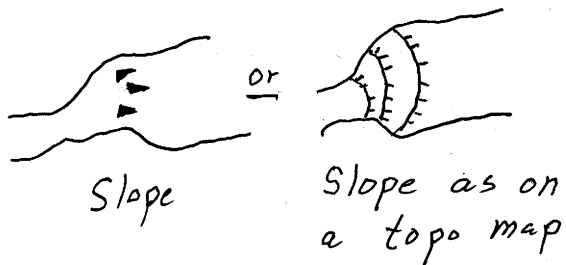


The above sample shows a survey that begins at survey station A27. A27 is a station from an earlier survey and the beginning point for the above sample. The new survey stations are labeled B1, B2, B3, and so on.

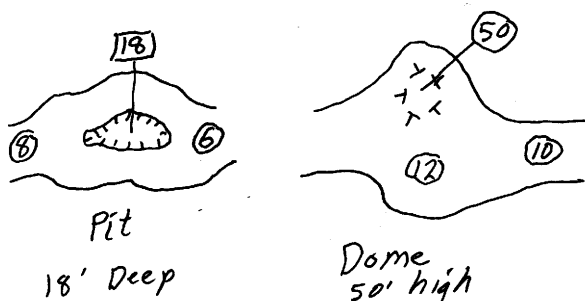
The straight lines from station to station represent the survey path. The freehand drawn lines represent the cave wall relative to the survey line.

Please note that the lines drawn from the word “survey” are to show where the survey stations are located and not part of the sketch.

The following symbols illustrate features of the cave passage.



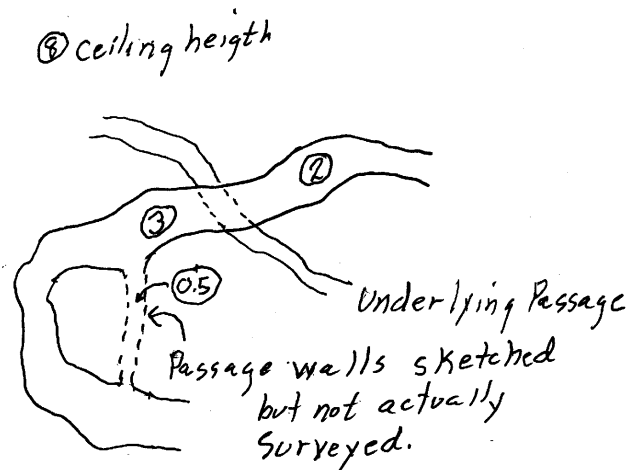
Passage floor slope can be shown using either technique shown above. The technique on the left uses the NSS standard symbol while the one on the right shows the technique that is used on topographical maps. I tend to prefer the technique shown on the right because one can show relative slope by indicating the drop between contour lines – for example 5 feet.



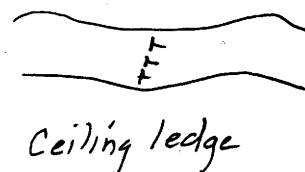
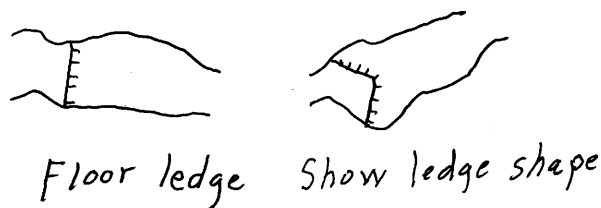
A pit in the floor of the passage is indicated like a contour line on a topo map. The depth of the pit is shown in the box. For the depth of the pit, use the same units that are being used for the survey. If the survey is being done using feet and tenths of a foot, use feet and tenths of a foot. If the survey is being done in meters, give the depth of the pit in meters.

A dome pit is shown on the right above. The height of the dome is shown in the circle.

Ceiling height of the passage is also shown in circles.



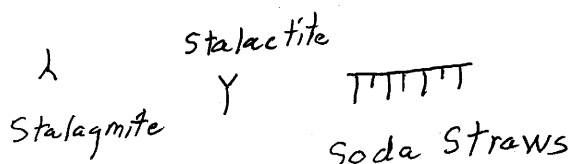
The illustration at the bottom of the page at left shows a passage that passes under the passage being surveyed. Where that passage goes beneath the survey, show the passages walls using a dashed line. Where a connecting passage that is not actually surveyed is sketched in, sketch it using dashed lines.



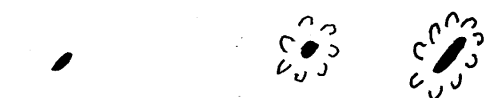
Samples of ledges are shown above. Line shows the direction of the drop of the floor or lowering of the ceiling.

Speleothems (formations) may be shown as follows:

## Speleothems



## Small Column Large Columns



Dark area shows narrow part of column.

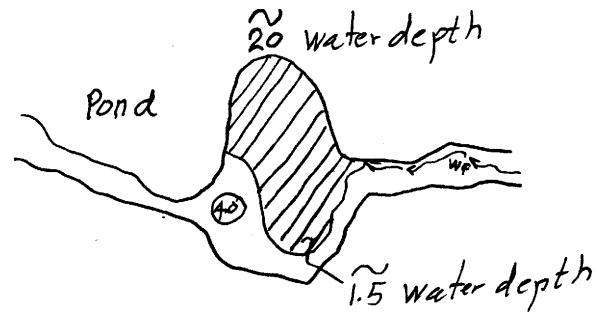
Flowstone



Rimstone

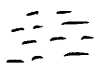


On your sketch it is a good idea to label the speleothems off to the side of your sketch. Make sure it is clear to the cartographer what you have in mind. Always remember that the cartographer may never have visited this passage. Our projects are large and many cavers participate.



Sketch ponds and use diagonal lines to indicate water. The water depth is shown by putting a wavy line over the number giving the water depth.

Floor



clay or silt



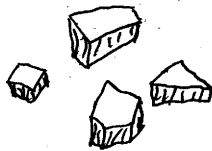
sand



gravel or cobbles

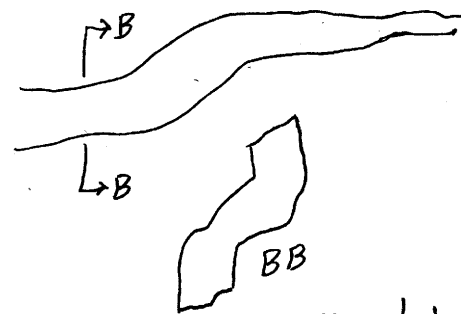


small breakdown



Large breakdown

Cross Section



Arrow shows direction

Show floor features as shown above positioning large breakdown blocks to scale. Again, be sure to place notes off to the side of the sketch as to the type of material on the floor.

Water

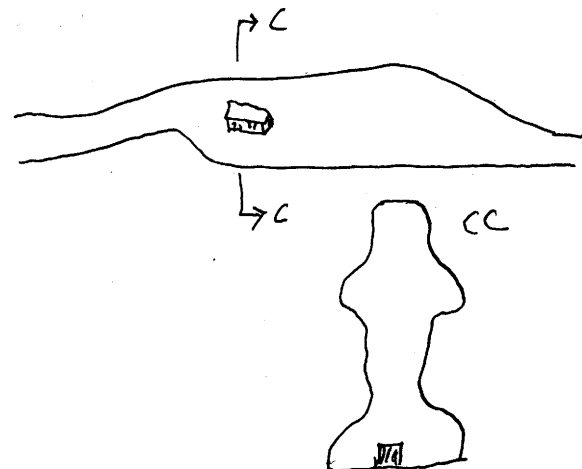


Active stream flow



Intermittent stream flow

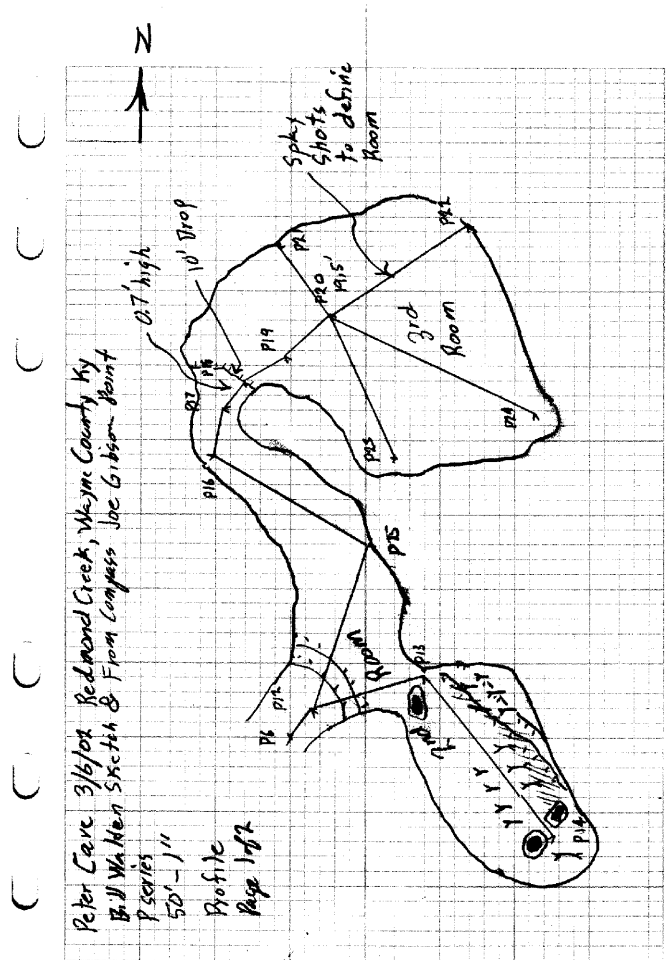
Show active streams as solid line with an arrow indicating the direction of flow. I add the WF to indicate water flow.



Show cross section and the place from which the cross section was taken. Draw cross sections to scale.

Bedrock pillar  
Large Stalactite  
Large Stalactite  
Drip line at the entrance.

**Real page!**



**In conclusion: Note the specifics – Cave name, date, personnel, north arrow, scale, and page numbers.**

Prepared by Bill Walden November 2002.