Photomonitoring at Lava Beds National Monument

Bill and Peri Frantz
Cave Research Foundation
16345 Englewood Ave.
Los Gatos, CA 95032
bill@frantzfamily.us
peri@frantzfamily.us

Abstract

The Lava Beds National Monument Photomonitoring Project has been active for over 25 years. The project started in 1989 with the goal of setting up a photomonitoring system that could be carried on by monument staff. Due to limited staff availability, the project was restarted in 2008 with volunteers doing the field work. The project also changed from using film for the capture and storage of the photographic data to using digital capture and storage. During this time, much has been learned about how to use photography to monitor changes in the lava tubes of the Monument.

Significant results include:
- Baseline photos for the study of the disappearance of ice in Merrill Cave.
- Documenting the general disappearance of ice in the park.
- Validation of the assumption of low continuing impact of visitors in class 1 caves.
- Detection & documentation of vandalism of petroglyphs in Symbol Bridge Cave.

Background

The Lava Beds (LABE) Photomonitoring Project began in 1989 and has continued since then in various forms under the auspices of the National Park Service and the Cave Research Foundation (CRF). The CRF is a Kentucky based US non-profit organization that serves as a liaison between volunteer researchers and land management units of the US government.

The project started as an extension to a then new monument cave management plan. Its goal was and still is to produce a time series of reproducible photographs of specific locations in the caves for use as an input to monument management decisions.

Photomonitoring volunteers work with monument management to select monitoring sites, and to curate and interpret the data. Sites are selected based on anticipated impacts and the ability of photos to show those impacts.

LABE Cave Management Plan:

The LABE Cave Management Plan identified four management classes for caves:

Class 1: Open to the public with trails, stairs, and parking.
Class 2: Open to the public but not advertised.
Class 3: Closed. Not discussed with the public.
Class 4: Unique issues require a specific management plan, e.g. Mushpot Cave

Initial Project (1989 - 1995)

The initial project, conducted by Bill Frantz, worked with monument staff to select from one to three stations each in 16 caves, with at least one cave from each management class. These sites were then photographed using color slide, color print, and black and white negative films. By using three types of film, it was hoped that at least some of the photographs would survive the ravages of time. The objective in site selection was the reproducibility of each photo, including framing & lighting. It was not anticipated that this protocol would cover a large number of sites.

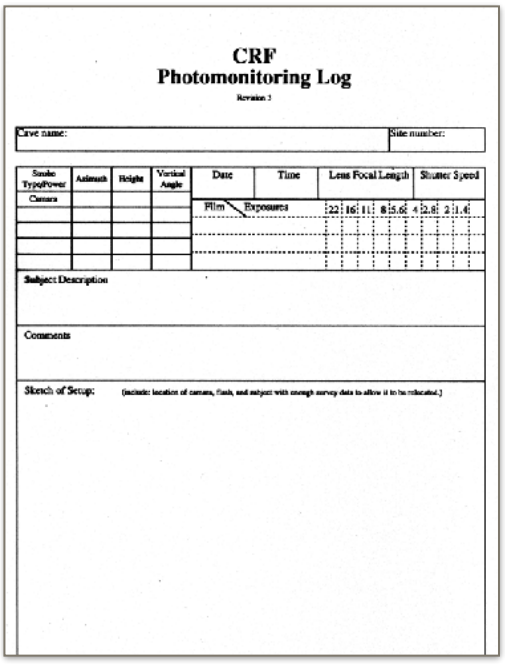

CRF
Photomonitoring Log
Revision 3
Cave name:
Site number:
Strobe Type/Power
Azimuth
Height
Vertical Angle
Date
Time
Lens Focal Length
Shutter Speed
Camera
Film
Exposures
22 16 11 8 5.6 4 2.8 2 1.4
Subject Description
Comments
Sketch of Setup:
(include: location of camera, flash, and subject with enough survey data to allow it to be relocated.)

Figure 1: Early Photomonitoring Form

A photographic protocol was introduced and documented, designed to make it easy to reproduce the framing and lighting of each picture in later years. Each site was surveyed marking the locations of the camera and the flash. The orientation, 3 F stops, shutter speed, and lens focal length were also recorded. (see figure 1). The intent was that monument staff would curate the data and periodically re-shoot the photos and evaluate the results. The photographs and site information were kept in a binder in the monument's resource office.

After the end of the initial project, the monument conducted some re-photography. However limitations in time and personnel made it difficult to do so systematically or consistently. In spite of these difficulties, the monument staff was able to add new stations as developments in the monument pointed to the need for additional monitoring.

It also proved difficult to manage and catalog the burgeoning mass of data. Comparing monitoring photos made at different times was difficult, hindering the ability to derive meaningful information from them.

Due to the staff limitations, and the difficultly of working with the data, as time passed, the data fell into disuse, and its existence was forgotten. When the ice floor in Merrill Cave developed a hole[1], the photomonitoring data was retrieved because one of the stations included a 1991 photograph of the area where the hole appeared. It became a baseline for tracking and

[1] Janet Sowers lead a study of the ice hole in Merrill cave. The results were presented in the Lava Tube Symposium at the 2003 National Speleological Society convention in Porterville California. There is an abstract of the talk in the program for that convention.

studying the disappearance of the ice. It should be noted that the then current Resource staff was unaware that it had this set of baseline data. (A sequence of photographs of this station can be seen in figure 2.)

1991

1998

2000

2009

Figure 2: Merrill cave ice

Project Restart (2008-Present)

In 2008, because of the proven value of photomonitoring during the ice floor investigation, the project was refreshed and revitalized by Bill & Peri Frantz in cooperation with the monument. The new project addressed the successes and failures of the original project, and the emergence of new digital photo-technologies. Digital photography techniques were adopted for both image creation and image storage.

All existing photos were scanned to make digital copies. Unfortunately, because of a need to minimize digital storage usage, the initial scans were predominately low resolution and included multiple exposures in a single scan. Since storage usage is no longer an issue, part of the current project activities are to rescan the photographs at higher resolutions with one image per scan.

The existing archive was reorganized and evaluated to preserve and enhance its the value by making it compatible with the new protocols. The existing binders of photographs, negatives, and slides are being reorganized removing obsolete material. Each new scan is based on a single exposure, color image.

A naming protocol for managing the photo files on mass storage devices was developed along with computer techniques for tracking and managing the archive. Each file name includes the date of the photo, a code for the cave, and a site number. The project reports regularly on the status of this new archive.

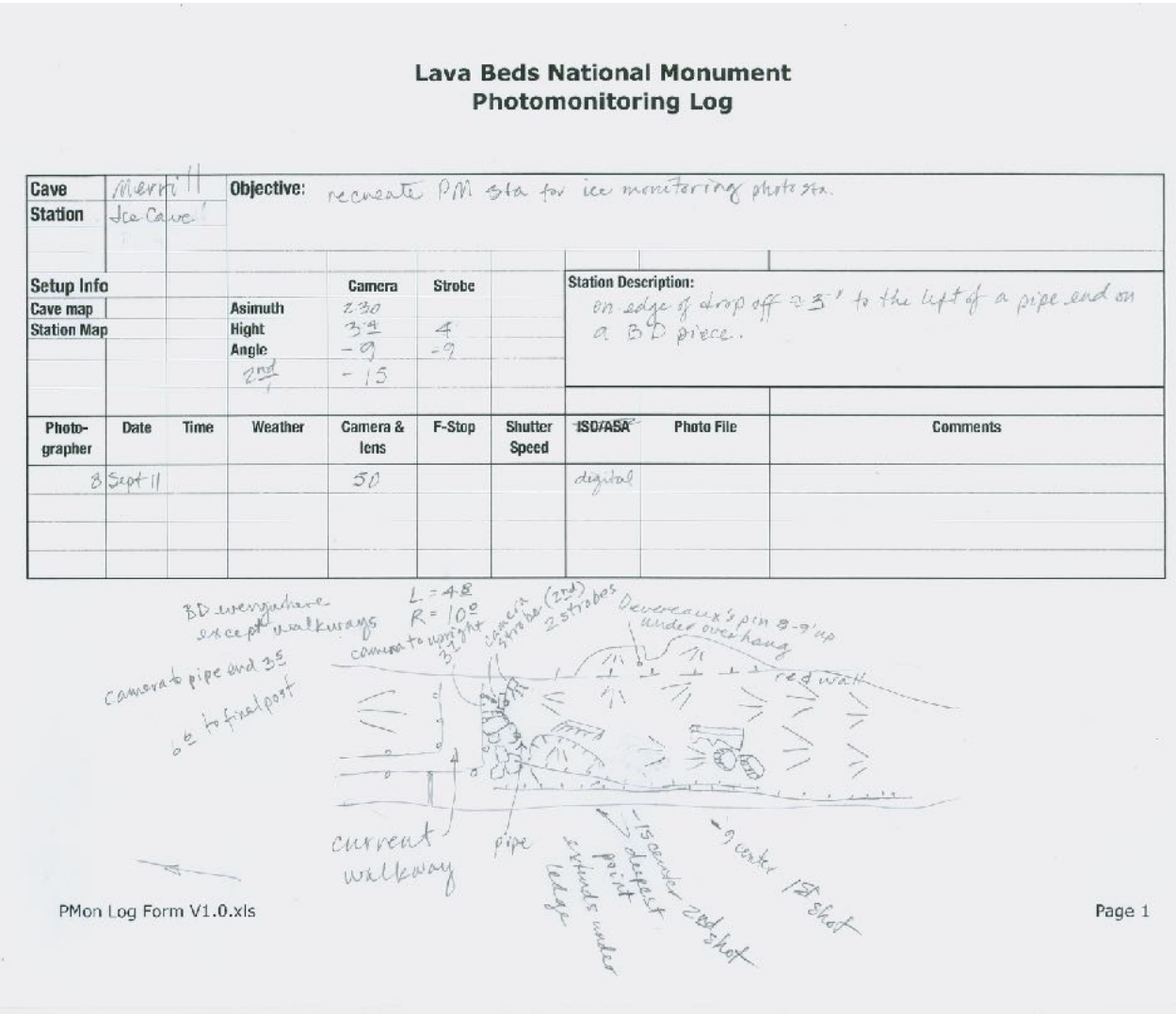
The field techniques and protocols were updated by converting the project to digital photography and a color checking card to achieve color and exposure consistency. In addition, a new station form was created which had space for multiple repetitions of the photograph as the site was rephotographed over the years, reducing the need to enter redundant data. (See figure 3.)

Established stations were rephotographed to test the new photomonitoring protocols. These photographs provide a bridge between the protocols. The photographs were analyzed to determine if there were any significant artifacts due to the change in protocols. None were observed.

After reviewing the stations set up by the old project, it became obvious that some of them, in the more visited caves, needed to be rephotographed more frequently than others. A new part of project management is determining, in consultation with monument management, the appropriate intervals for reshooting each individual station. Also, some stations were added and some were dropped because the monitoring was demonstrated to be a high impact activity. The data from the dropped stations is being retained should there be a need to resume monitoring.

Some stations are at the entrances of caves. These stations may need to be rephotographed in the same season to achieve meaningful comparisons. Protocols were adapted for those stations to include seasonal controls.

The use of photo editing software makes it easier to match photographs of the same site so they can be meaningfully compared. Where it is useful, the old photographs have been adjusted to make them more consistent with the new protocols. This includes color and exposure adjustment. This process is still being formalized.



Lava Beds National Monument
Photomonitoring Log

Cave	Merrill		Objective:	recreate PM sta for ice monitoring photo sta.					
Station	Ice Cave								
Setup Info				Camera	Strobe		Station Description:		
Cave map			Asimuth	230			on edge of drop off 3' to the left of a pipe end on a BD piece.		
Station Map			Hight	3'	4				
			Angle	-9	-9				
			2nd	-15					
Photo-grapher	Date	Time	Weather	Camera & lens	F-Stop	Shutter Speed	ISO/ASA	Photo File	Comments
B	Sept 11			50			digital		

PMon Log Form V1.0.xls

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Figure 3: New Photomonitoring Form

Photographers now have the responsibility for the initial analysis of a site's photographs and for bringing any observed problems to the attention of the Monument staff.

In 2009, vandalism was noted in a site in Symbol Bridge cave while the site was being rephotographed. The damage was documented and reported to monument management. Just taking a close look at sites can occasionally reveal changes without the need to compare photographs. Having a photomonitoring site encourages such close examination.

Significant Results:

The progress of ice disappearance from the former Merrill Ice Cave (Now Merrill Cave) has been well documented.

The general trend of ice disappearance in the monument has been documented.

Class 1 caves have exhibited a low level of additional damage over the years, validating their status in the Cave Management Plan.

The vandalism of petroglyphs in Symbol Bridge Cave has been documented.

Lessons Learned:

Photomonitoring can cause significant damage to pristine caves. A site in one class 3 cave was removed from regular monitoring for this reason. The original photographs provide a baseline should monitoring become necessary in the future.

The conversion from film to digital was a great improvement in our ability to reproduce and archive photographs. Digital editing software makes it easy to correct the exposure and color balance.

The landmarks used to relocate a site may change, such as the removal of the walkway in Merrill Cave as shown in the 2009 photograph. (See figure 2.) This problem is more likely when using artificial landmarks, or infrastructure such as walkways and ladders. These items may be removed as part of normal monument management, making it difficult to relocate a site. Selection of future sites will strongly prefer natural landmarks for site location.

Changes in monument personnel can cause loss of information about the photomonitoring data. It is useful to have regular contact between photomonitoring personnel and monument management, so that the results of individual site changes can be captured and transmitted to the ever changing management personnel[2].

With a long term project, the principle investigators grow old and need a plan to turn the project over to younger investigators. Both Bill and Peri find that they are now aging and need to train younger replacements. When suitable replacement project leaders have been identified, we will provide training. We note that other CRF projects in the Monument, such as Ice Level Monitoring, have been passed to the next generation.

[2] For data redundancy, and to allow working off-site, photo monitoring volunteers should maintain at least one separate copy of all data give to the Monument.