

Integrated Monitoring Protocol for Cave Entrance Communities and Cave Environments in the Klamath etwork

Standard Operating Procedure #4: Water

Version 2017Feb10

Citation:

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To create a new version of this SOP, carefully follow the instructions in SOP #18: Revising the Protocol (<https://irma.nps.gov/DataStore/Reference/Profile/2238840>). Use the Revision History Log below to describe the revisions:

- Populate the top table of the revision history log, providing the previous version date, author of the change, a specific but concise description of the changes made, the footnote number associated with change details, and a new version date.
- In the bottom table, add a footnote and as much text as needed to describe in detail the reasons for and implications of the change.

Revision History Log

Previous Version Date	Author of Change	Changes Made	Footnote #	New Version Date

Footnote #	Detailed Reasons for and Implications of the Changes

1 Introduction

This Standard Operating Procedure (SOP) is performed only in the main cave (“Oregon Caves,” or “The Cave”) at Oregon Caves National Monument and Preserve (ORCA). This cave has a stream (River Styx) running through it as well as seasonal and semipermanent pools. The majority of pools are measured using permanently affixed height gauges, with one pool measured using a staff gauge from a screw hook above the pool. Park staff will record pool levels 4 times a year.

2 Equipment

To measure pools

- Water monitoring field datasheet (attached at end of this SOP)
- Cave monitoring maps (showing location of water monitoring stations)
- Water level measuring stick (for the Icebox Entrance Pool). It is located in the tackle box labeled “KLMN Cave Monitoring Gear - ORCA”

To install a new or replacement gauge location

- Stainless steel half-eye or hook screw and plastic screw anchor (3/16 inch)
- Pliers
- Epoxy
- Electric drill
- Drill bit (3/16 inch)
- Zip-top bag
- Cement mix
- Trash bag or tub to contain potential spills during mixing

To construct a replacement measuring stick for the Icebox Entrance pool

- Electric drill
- Drill bit
- Plastic measuring stick with mm increments and greater than 37.5 cm long
- Hacksaw

3 Timing

Staff gauges will be used to measure water levels 4 times a year: during the winter (between December 1 and March 1), May, August, and November. A window between December and March is provided for data collection because it depends on the availability of staff, who are sparse during the winter. The winter

measurement should be done coincidentally with bat monitoring and climate data logger downloads. Measurements should be taken within 10 days of the initiation of the original water level measurements upon protocol implementation. For example, if the original depth was recorded on December 15, 2016, then all the follow-up measurements should be made within 10 days of this date, either before or after.

4 Location

Water levels are monitored in 7 pools in The Cave (see cave map and photos in the site dossier for The Cave). Most pools are not previously named and they are described here by location:

Icebox Entrance Pool (aka: IB): Pool before the First Bridge over River Styx; ledge to right of tour path below the Icebox entrance. Formerly referred to as Tree Root Pool.

Imagination Room Pool (IM): Follow the ledge below and to the right of the stairs leading to the Beehive Room. Pool is found directly behind a white box of electrical equipment.

Banana Grove 1 (BG1): After climbing up the slope on the right side of the Banana Grove, it will be the first pool you find.

Banana Grove 2 (BG2): This will be the second pool you find after climbing up the slope to the right of the Banana Grove.

King & Queen's Throne Room Pool (KQ): The pool is located shortly after climbing up the passage at the end of the throne room.

Lake Michigan (LM): At Miller's Chapel, climb to the left and the pool is located under an overhang.

Pool in right passage of Miller's Chapel (MCR): This pool is a deep pit located 20 or so feet after climbing through the passage in the right of Miller's Chapel.

5 Instructions

5.1 Measuring Water Levels

Six of the 7 pools are measured by reading to the nearest millimeter a gauge which is permanently fixed to the cave. The only site without a permanent gauge is the Icebox Entrance Pool. This location requires placing a measuring stick on a metal ceiling hook that allows the gauge to be suspended in the pool. After the reading, the gauge is removed in order to preserve the view from the tour path.

5.2 Install a New or Replacement Gauge Location

A new gauge location should only be created if absolutely needed because it is most important to collect the data consistently over time. If a new gauge location is needed (due to numbers being unreadable, loss, or other unforeseen circumstances), use all reasonable means to ensure the new gauge is reading the same values as the old one for a consistent pool elevation. Tools for gauge installation can include a stainless steel screw or half-eye hook, a concrete footing, or other natural anchor, but should follow the original setup. Cement should be used when fixing a screw or wire on top of bare rock, and epoxy should be used for securing a screw if the plastic screw anchor does not support the screw well enough in a hole drilled into rock. When installing new hardware, be sure that all applicable ORCA mitigation and/or permitting procedures are used.

5.3 Constructing a replacement measuring stick for the Icebox Entrance Pool

The measuring stick used at this pool is cut from a 1 m plastic measuring stick with millimeter increments. Using a hacksaw, cut a length within 37.3 to 37.6 cm, such that the units begin at 0 mm on the piece being used. Accuracy is not important for the overall length of the measuring stick, only that it is within that window so it fits properly within the space at the Icebox Entrance Pool. With the electric drill, center the bit exactly on the 36.5 cm mark and drill completely through. With the drill bit through the plastic, keep the electric drill on and push the drill bit parallel with the measuring stick towards the 37 cm mark, and carve out the hole until the edge is at exactly 36.9 cm. This allows you to bring the edge of the hole in the measuring stick that rests on the hook to where the previous measuring stick rested with a high level of accuracy.

6 Datasheet

Water Monitoring Field Data Sheet Oregon Caves National Monument and Preserve

Oregon Caves

Date: _____ Personnel: _____

Instructions:

Bring the Icebox Entrance Pool's measuring gauge from its storage place in the RM cabin. Visit each of the seven pools. At the Icebox Entrance Pool, slowly and carefully hang the gauge on the hook installed in the ceiling above the pool, trying not to disturb the water in the pool as much as possible. When the gauge is in place and level, record the depth on the datasheet and remove the gauge. At all other pools, measuring gauges are permanently installed and can be read without disturbing the pool.

Each measurement is taken in cm, and **read to the nearest mm (e.g., 4.3 cm)**.

1. Icebox Entrance Pool (IB)

Water Depth (cm): _____

2. Imagination Room Pool (IM)

Water Depth (cm): _____

3. First Pool above Banana Grove (BG1)

Water Depth (cm): _____

4. Second Pool above Banana Grove (BG2)

Water Depth (cm): _____

5. King & Queen's Throne Room Pool (KQ)

Water Depth (cm): _____

6. Lake Michigan (left passage of Miller's Chapel) (LM)

Water Depth (cm): _____

7. Miller's Chapel Right Passage Pool (MCR)

Water Depth (cm): _____

Notes: _____

Data sheet reviewed by (initial): _____