

Environmental Conditions: Monitoring

Environmental Conditions: Monitoring Temperature and RH

The overall environment in historic house museums affects both the objects in the house and the surrounding structure. Monitoring and analysis of the data ensures a better understanding of the overall conditions. The data analysis that results from monitoring allows staff to adjust control systems to mitigate damage to objects and structures from extremes of high and low relative humidity. It also allows equipment to be evaluated and redesigned to improve environmental conditions. The following guidelines outline the process for monitoring the environment in historic house museums.

Environmental Monitoring Guidelines

- The overall goal is long-term monitoring of average temperature and humidity in spaces. Continuity of monitoring is critical. Tracking daily fluctuations is less important
- Install data loggers in sites that require monitoring and maintain an inventory of all data loggers including location guides.
- Written instructions describing download procedure for the specific data loggers being used and relevant software should be maintained.
- One data logger per floor including the basement and attic is generally sufficient.
- Placement of data loggers should remain consistent over time to ensure useful readings.
- Additional data loggers can be deployed to supplement existing data loggers at sites where an issue or condition requires additional study.
- Identify the critical objects in each house that may not be able to handle environmental fluctuations and monitor individually.
- Develop a notification system in case the overall environmental conditions might endanger the collections.

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Environmental Monitoring Technical Information

The overall goal is long-term monitoring of average temperature and humidity in spaces. Continuity of monitoring is critical. Tracking daily fluctuations is less important.

- Downloading data on a daily or weekly basis is not necessary for the long term understanding of environments.
- The majority of objects in the houses can withstand daily fluctuations as well as seasonal fluctuations.
- Exceptions might be made when daily readings will add to the general understanding of conditions and their control.
 - Eg: Daily monitoring of a new HVAC system to ensure its operation is satisfactory when first installed.

Install data loggers in sites that require monitoring and maintain an inventory of all data loggers.

- Decisions about sites and spaces to be monitored are made by the conservator and the team leader of property care.
- A master inventory list of all deployed data loggers should be maintained
 - Inventory list should be maintained as an excel spreadsheet
 - Log in the serial number, model, location, last download, and the date batteries were last installed.
 - Master copy currently located in Property Care's Network Drive\Preservation and Maintenance\Hobo\Location\Hobo list
- Equipment - Data loggers are small electronic devices that record a particular data set over a period of time. Historic New England currently uses two different types of loggers both created by Onset. Listed below is the equipment currently used in monitoring the historic houses:
 - U12 Data Logger
 - These are the most used logger in our organization. They record temperature, relative humidity, light intensity, AC current/voltage and Carbon Dioxide.
 - Historic New England monitors temperature and RH only
 - It is 2.3 x 3 inches with a large memory and can be set to record data every second if needed.
 - Batter life is typically one year
 - Onset recommends recalibration every 3 years
 - U10 Data loggers
 - Only records temperature and RH
 - They are slightly smaller than the U12
 - Has a large memory and can also record data every second like the U12
 - Batter life is typically one year
 - Onset recommends recalibration every 3 years

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Written instructions describing download procedure for the specific data loggers being used and relevant software should be maintained.

- See the “Environmental Conditions: Data Collection” white paper.

One data logger per floor including the basement and attic is generally sufficient.

- One room per floor. Basement, First Floor, Second Floor, and Attic is the standard unless conditions warrant additional deployment.
- Data loggers should be located off the floor.
- Data loggers should **not** be in the halls or stairwells unless otherwise decided by the data collector, because these spaces are the areas that experience the most extreme changes from opening doors and tend to not contain the most important pieces of the collection.
- Data loggers should not be located near vents, windows or direct sunlight

Placement of data loggers should remain consistent over time to ensure useful readings.

- There are data logger location sheets for each house identifying the data loggers’ location on a floor plan with a photo and a description of the location.
 - Copies of the location sheets should be kept both on site and in a central digital file to be updated.
- When new or additional data loggers are added to a house the location sheet should be updated.

Additional data loggers can be deployed to supplement existing data loggers at sites where an issue or condition requires additional study.

- The deployment of additional data loggers must be approved by the team leader of property care and the lead conservator.
- Additional loggers are used when issues or problems materialize causing the need for monitoring in a space that is not typically monitored.
- Loggers are to be labeled SWAT along with the room location.
- The time frame for deployment should be indicated at the onset and can be deployed for 3 months, 6 months to a year.

Identify the critical objects in each house that may not be able to handle environmental fluctuations and monitor individually.

- The majority of objects in the houses can withstand daily fluctuations as well as seasonal fluctuations.
- Identify the critical objects that are sensitive to fluctuations and develop a separate monitoring program to ensure the object is not at high risk.

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Develop a notification system in case the overall environmental conditions might endanger the collections.

- A simple alarm notification system can be effective in alerting staff of conditions at remote sites.
- The alarms can be triggered when RH is above or below a certain limit for a period of time (e.g. 70% RH for more than 2 days).
 - This would eliminate alarm calls for small spikes but notify responders when conditions are consistently poor.
- Typical security alarms can accommodate alarms of different types including high and low temperature or high and low RH. But each may require a separate sensor in order to operate.