

# **Baltimore Ecosystem Study Metadata Report (BES)**

Syracuse, New York

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## Research Area Information

**Baltimore Ecosystem Study** .....BES

# Baltimore Ecosystem Study

## Research Area Information

### **Harvest URL - Option 1**

[http://beslter.org/climdb/bes\\_clim.txt](http://beslter.org/climdb/bes_clim.txt)

### **Site URL**

<http://www.beslter.org/>

### **Site Climate URL**

[http://beslter.org/frame4-page\\_3c.html](http://beslter.org/frame4-page_3c.html)

### **Site Watershed URL**

[http://beslter.org/frame4-page\\_3f.html](http://beslter.org/frame4-page_3f.html)

### **Site Map URL**

[http://beslter.org/frame7-page\\_4.html](http://beslter.org/frame7-page_4.html)

### **Experimental Design**

<http://beslter.org/frame4-stuff.html>

### **Publications**

[http://beslter.org/searchpubs\\_all\\_rm.asp](http://beslter.org/searchpubs_all_rm.asp)

### **USGS Harvest URL**

[http://gce-lter.marsci.uga.edu/harvest/usgs/bes\\_lter.txt](http://gce-lter.marsci.uga.edu/harvest/usgs/bes_lter.txt)

## Meteorological Stations

**BWI Airport**..... BWI  
**Inner Harbor** .....DMH  
**McDonogh Primary**..... Mcdonogh1

## BWI Airport

### Meteorological Station

**Latitude** (decimal degrees) .....39.1733 (From Google Earth)  
**Longitude** (decimal degrees) .....-76.6841 (From Google Earth)  
**Elevation** (meters; a.m.s.l.) .....48  
**Exposure** (degrees) ..... Less than 5 degrees  
**Wind Exposure** (degrees azimuth) .....270  
**Begin Date**..... January 1, 1950  
**End Date**..... Present

#### **Topography**

Flat

#### **Surface**

Grass

#### **Area Description**

Within 100 m most of the area is grass, but east-west oriented runways are about 90 m to the north and 50 m to the south.

#### **History**

This station is the U.S.National Weather Service ASOS (Automated Surface Observation System) station at the Baltimore Washington International Airport. Data included here were extracted from the NCDC (National Climatic Data Center) at <http://lwf.ncdc.noaa.gov/oa/ncdc.html>. More information about the BWI station are available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?WWDI~StnSrch#ABOUT>

#### **Photo URL**

<http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwDI~StnPhoto~20009551~a~000>

### Air Temperature

**Begin Date**... Data here begin April 2, 2000, but the station began Jan. 1, 1950, and the earlier data are available from NCDC

**End Date**..... Present

**Summary Interval** .. Normal report is hourly, but 1 min and 5 min are also avail for recent years from NCDC.

**Data Accuracy** (degree celsius) ..... 1 degree F

**Instrument Height** (meters) ..... 1.5 m

#### **Instrumentation Description**

Automated Surface Observing System (ASOS).

### Sensor History

The maximum and minimum daily temperatures for recent years are from NCDC quality checked daily data. However, we based the ClimDB mean on averaging hourly values over the day. This averaging permits comparison with the data from the BES primary station, McDonogh. This averaging over hours is different from the traditional mean, which is the average of the maximum and minimum values. If users wish to have the traditional mean, they can derive it easily from the maximum and minimum values.

## Inner Harbor

### Meteorological Station

**Latitude** (decimal degrees) ..... 39.2815 (From Google)  
**Longitude** (decimal degrees) ..... -76.6112 (From Google)  
**Elevation** (meters; a.m.s.l.) ..... 6.1  
**Exposure** (degrees) ..... Approximately 45 degrees  
**Wind Exposure** (degrees azimuth) ..... 270  
**Begin Date**..... April 29, 1998  
**End Date**..... Present

### Topography

Flat

### Surface

Grass

### Area Description

This station is in downtown Baltimore, MD, but about 40 m south of water in the Inner Harbor of Baltimore, and about 20 m east of the multi-story Maryland Science Center. Within 100 m, about 15% of the area is water, about 30% in vegetated, and the rest, about 55% is impervious.

### History

This station began operation on April 29, 1998. It replaced the former downtown station located on the roof of the Customs Building in Baltimore. This previous station has data for temperature beginning in the early 1900"s.

### Air Temperature

**Begin Date**..... 20070401  
**End Date**..... 20070430

**Data Logger Sampling Interval**..... 1 hour

**Summary Interval** ..... hourly

**Data Accuracy** (degree celsius) ..... +/- 0.56 degrees C

**Instrument Height** (meters) ..... 1.5 meter

**Instrumentation Description**

NWS ASOS

**Methods Description**

Data collected by National Weather Service ASOS instrumentation. Daily values for "daily\_airtemp\_mean\_c", "daily\_airtemp\_absmax\_c" and "daily\_airtemp\_absmin\_c" are from quality controlled NCDC ASCII file for BWI because there is no available data hourly or daily for DMH.

**Calibration History**

Using the quality controlled data for BWI from NCDC, "ASCII Download (daily)", each of "daily\_airtemp\_mean\_c", "daily\_airtemp\_absmax\_c" and "daily\_airtemp\_absmin\_c" was estimated through regression between DMH and BWI on "Tavg", "Tmax" and "Tmin" from March 2007 to May 2007. Through the regression, equations are made for each value as follows. For average temperature,  $Y = 1.0472X + 1.9718$ ,  $R^2 = 0.9788$ , for maximum temperature,  $Y = 1.0025X + 1.79$ ,  $R^2 = 0.9847$ , and for minimum temperature,  $Y = 1.023X + 6.189$ ,  $R^2 = 0.9227$ , where X is BWI value and Y is DMH value.

## McDonogh Primary

### Meteorological Station

**Latitude** (decimal degrees) .....+39.3957

**Longitude** (decimal degrees) .....-76.7713

**Elevation** (meters; a.m.s.l.) ..... 157 m

**Exposure** (degrees) .....9 degrees

**Wind Exposure** (degrees azimuth) .....9 degrees toward west

**Begin Date**..... April 26, 2000

**End Date**..... Present

**Topography**

On a gradual slope near the top of a broad low hill.

**Surface**

Short, mown grass

**Area Description**

The McDonogh weather station is located in a large area of horse pastures at a

private school near Owings Mills, MD. A 16-ft by 16-ft split-rail fence with two rails surrounds the station. The terrain is rolling Piedmont Plateau and the station is a few hundred yards from the top of a gradually rising hill; however, the slope is only 2 or 3 percent in the vicinity of the station. This location was selected because it is approximately as representative of meso-scale conditions as would be a typical 1st-order weather station at an airport. The McDonogh1 is the primary or reference meteorological station for BES, and it provides the best meteorological representation for the Gwynns Falls watershed, which is the focus of much of BES research. The Gwynns Falls watershed approximates an oval with its downstream end near the center of Baltimore and the limit of headwaters 30 km to the northwest; the McDonogh1 station is about 20 km from the downstream end.

## History

The station has been at this location since the initial setup on April 26, 2000. The first complete day of record is April 27, 2000. Surrounding ground cover and buildings have not changed. Measurements include wind speed and direction at 2-m height, air temperature and humidity at 1.5-m height, global solar radiation, global photosynthetically active radiation (PAR), reflected PAR, net all-wave radiation, soil temperature at 2 and 10 cm, volumetric soil moisture averaged from the surface to 20 cm, and soil heat flux at 2 cm. Air temperature is measured most accurately with a fan-aspired radiation shield, but a measurement of temperature with an RTD included in the humidity sensor in a Gill style radiation shield provides a backup temperature measurement that is somewhat more influenced by radiation. The global solar radiation and PAR sensors have functioned continuously, but others have had some periods of non-function that are indicated by the flags in the ClimDB data sets. Until 1100 on March 17, 2004, most variables were averaged on hourly intervals. Since that time, most variables are averaged on 15-min intervals.

## Air Temperature

**Begin Date**..... April 27, 2000  
**End Date**..... Present  
**Data Logger Sampling Interval**..... 5 seconds  
**Summary Interval** .....15 min, but hourly until 17 March 2004  
**Data Accuracy** (degree celsius) ..... +/-0.2 degrees C  
**Instrument Height** (meters) ..... 1.5 m

## Instrumentation Description

Air temperature is measured by a 100-ohm platinum resistance temperature device (RTD) in a fan-aspirated radiation shield custom produced by REBS (Radiation and Energy Balance Systems, Seattle, WA). The RTD is inside a 1-inch diameter inner tube that is centered in an outer 2-inch diameter anodized aluminum tube. The air intake faces north. Temperature is also measured at the same height by a Campbell Scientific HMP45C temperature and humidity sensor that is located in a 12-plate R.M. Young Gill type naturally ventilated radiation shield.

## Methods Description



The data logger is a Campbell Scientific CR23X. Until 17 Mar 04, data were recorded hourly at 30 minutes after the hour with the hour labeled as the previous even hour; thus the data labeled as 0200 are measured from 0130 to 0230. Mean daily values during this time are the averages of hourly means over the 24 hours from 0100 to midnight, which is effectively from 0030 of the labeled day to 0030 of the following day. The hourly means are the averages of measurements at 5-s intervals. For each hour, absolute maximum and absolute minimum values from the 720 measurements were recorded. Absolute daily maximums are the highest hourly maximums and absolute daily minimums are the lowest hourly minimums of the day. This system optimizes comparison of hourly means with data from NOAA ASOS stations, for which hourly values are means over brief time periods near the top of each hour. A disadvantage is that comparison of daily maximum and minimum values may differ, because our reported daily maximum or minimum values may occur not during the labeled day, but between 0000 and 0030 of the following day or a maximum or minimum may actually occur between 0000 and 0030 of a labeled day and not be recorded.

### **Sensor History**

Sensors have remained unchanged since the initiation of the weather station. The fan on the REBS shield has been out of commission at several times; during these periods the HMP45C sensor has been used to provide an estimate of air temperature (data flagged E). Radiation errors on sunny days with light winds can exceed 1.5 deg C for the HMP45C measurement.

### **Calibration History**

The initial manufacturers' calibrations have been used for the duration of the operation of the station.

**Minimum QC Threshold** (degree celsius) ..... -21 C  
**Maximum QC Threshold** (degree celsius) ..... 42

## Watershed

<b>Baisman Watershed .....</b>	<b>BaismanWS</b>
<b>Dead Run Watershed .....</b>	<b>DeadRunWS</b>
<b>Gwynns Falls Watershed .....</b>	<b>GwynnsWS</b>
<b>McDonough School Watershed .....</b>	<b>McDonoughW</b>
<b>Pond Branch Watershed .....</b>	<b>PndBrnchWS</b>
<b>Rognel Heights Watershed .....</b>	<b>RognelWS</b>

## Gauging Stations

**Baisman Run at Broadmoor, MD (USGS 1583580)..... BaismanRun**  
**Gwynns Falls at Rt 1/Carroll Park (USGS 01589352) ..... CarrollPk**  
**Dead Run at Franklintown (USGS 01589330).....DeadRun**  
**Gwynns Falls at Glyndon (USGS 01589180 )..... Glyndon**  
**Gwynns Falls at Gwynnbrook/Delight (USGS 01589197) .....Gwynnbrook**  
**Gwynns Run at Gwynns Falls (USGS 158935180)..... GwynnsRun**  
**McDonough School (USGS 01589238) ..... McDonough**  
**Pond Branch (USGS 01583570)..... PondBranch**  
**Rognel Heights storm sewer outfall at Baltimore (USGS 1589340)..**  
**RognelHgts**  
**Gwynns Falls at Villa Nova (USGS 01589300) .....VillaNova**

## Gwynns Falls at Rt 1/Carroll Park (USGS 01589352)

### Stream Discharge

Maximum QC Threshold (liters per second) ..... 131673

## Dead Run at Franklinton (USGS 01589330)

### Stream Discharge

Maximum QC Threshold (liters per second) ..... 22653

## Gwynns Falls at Villa Nova (USGS 01589300)

### Stream Discharge

Maximum QC Threshold (liters per second) ..... 141584