

USDA/ARS Methods Catalog

MethodID	CSWO FM12.0		
Method Name	Precipitation		
Media	no media		
Method Type	Field	Method Subcategory	Physical
Method Source	USDA and Belfort Instrument		
Source Citation	Brakensiek, D. L. et al. 1979. Field Methods for Research in Agricultural Hydrology. U.S. Department of Agriculture, Agriculture Handbook 224. Belfort Instrument Company 1600 South Clinton Street Baltimore, MD 21224		
Method Summary	Orifice size is 8" (20.3 cm). Precipitation is collected in a bucket on a scale. The weight is measured with a mechanism attached to a pen that records on a drum chart recorder. The accumulated rainfall amount, in inches as per calibration, is recorded on the paper chart. The gauge is serviced once a week and bucket is dumped. Gauge calibration was confirmed annually in mid-summer by placing in the bucket a standard weight equivalent to 254 mm of rain. Deviations exceeding +/- 0.76 mm (0.3%) triggered adjustment. Clocks were adjusted in spring and fall, or upon malfunction. Rainfall depth axis of paper chart is 9", with minimum chart division equal to 0.1" and read manually to 0.01", considered equal to 0.254 mm. Time axis of daily (12-hr) chart is 20 minutes per smallest division. Chart was read to nearest minute. Data were stored at 0.01" resolution. Post-processing includes calculating the difference in depth over the time interval, screening negative values caused by evaporation, storing the positive differences, and converting to millimeters Instrument is Universal Recording Rain Gage, 5-780-9, Belfort Instrument Co., Baltimore MD. Accuracy of this 9" single traverse gauge is not less than 1/2 of 1% with a sensitivity of .01 inch (0.254 mm) of precipitation at a temperature range of -40 F to + 125 F (-40 C to 52 C). Used 12-hour raingage chart, Belfort 5-4012B..		
Instrument	Weighing rain gauge		
Detection Limit Type			
DLNote			
Scope - Application			
Concentration Range		Concentration Units	
Interferences			
Precision Notes			

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QA Requirements	
Sampling Handling	
Max Holding Time	
Sample Prep Methods	
Link To Full Method	
Method Contact	USDA/ARS Mark.Olson@ars.usda.gov

Analytes using this Method:

Analyte: Precipitation

MethodID: CSWQ_FM12.0

Detection level: 0.51 mm

	Instrument	Matrix
Accuracy		
Precision		

False Positive Value: False Positive Value:

Accuracy/Precision Concetration Used:

USDA/ARS Methods Catalog

MethodID	CSWO FM12.1		
Method Name	Precipitation		
Media	no media		
Method Type	Field	Method Subcategory	Physical
Method Source	USDA, Belfort Instrument, TE		
Source Citation	Brakensiek, D. L. et al. 1979. Field Methods for Research in Agricultural Hydrology. U.S. Department of Agriculture, Agriculture Handbook 224. Belfort Instrument Company, Baltimore, MD Tedeo Huntleigh, part of Vishay Precision Group, Rancho Cucamonga, CA		
Method Summary	This method uses the Belfort Standard Raingage retrofitted with a loadcell and datalogger for electronic recording of data. Orifice size is 8" (20.3 cm). Precipitation that passes through the orifice is collected in a bucket. The weight is measured with a load cell (Model 1040 G 20KG Single Point, TEDEA-Huntleigh Inc now part of Vishay Precision Group, Rancho Cucamonga, CA) installed under the buckets and interrogated using a datalogger to automate the measurement. The measurement is made every 2 seconds, and the datalogger calculates the average every 2 minutes and stores that number. The datalogger model used since 1996 is the BDR320 from Campbell Scientific. The gauge is serviced once a week and the bucket is dumped, and data is downloaded. Gauge calibration is confirmed annually in mid-summer by placing in the bucket a standard weight equivalent to 254 mm of rain. Deviations exceeding +/- 0.76 mm (0.3%) triggered adjustment. Datalogger clocks were adjusted in spring and fall, or upon malfunction. Data were stored at 0.01" resolution. Post-processing includes calculating the difference in depth over the time interval, screening negative values caused by evaporation, storing the positive differences, and converting to millimeters. Instrument: Universal Recording Rain Gage, 5-780-9, Belfort Instrument Co., Baltimore MD (modified) Accuracy for loadcell 0.02 ± % of rated output. Rated output is 2.0 ± 10% mV/V.		
Instrument	Weighing rain gauge		
Detection Limit Type			
DLNote			
Scope - Application			
Concentration Range		Concentration Units	
Interferences			
Precision Notes			

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QA Requirements	Yearly calibrations are made using standard Rain Gage calibration weights.
Sampling Handling	
Max Holding Time	
Sample Prep Methods	
Link To Full Method	http://www.aboutloadcells.com
Method Contact	USDA/ARS Mark.Olson@ars.usda.gov

Analytes using this Method:

Analyte: Precipitation

MethodID: CSWQ_FM12.1

Detection level: 0.25 mm

	Instrument	Matrix
Accuracy		
Precision		

False Positive Value: False Positive Value:

Accuracy/Precision Concetration Used:

USDA/ARS Methods Catalog

MethodID	CSWO FM12.11		
Method Name	Precipitation		
Media	no media		
Method Type	Field	Method Subcategory	Physical
Method Source	USDA, Belfort Instrument, TE		
Source Citation	Brakensiek, D. L. et al. 1979. Field Methods for Research in Agricultural Hydrology. U.S. Department of Agriculture, Agriculture Handbook 224. Belfort Instrument Company, Baltimore, MD Tedeo Huntleigh, part of Vishay Precision Group, Rancho Cucamonga, CA		
Method Summary	This method uses the Belfort Standard Raingage retrofitted with a loadcell and datalogger for electronic recording of data. Orifice size is 8" (20.3 cm). Precipitation that passes through the orifice is collected in a bucket. The weight is measured with a load cell (Model 1040 G 20KG Single Point, TEDEA-Huntleigh Inc now part of Vishay Precision Group, Rancho Cucamonga, CA) installed under the buckets and interrogated using a datalogger to automate the measurement. The measurement is made every 2 seconds, and the datalogger calculates the average every 2 minutes and stores that number. The datalogger model used since 1996 is the BDR320 from Campbell Scientific. The gauge is serviced once a week and the bucket is dumped, and data is downloaded. Gauge calibration is confirmed annually in mid-summer by placing in the bucket a standard weight equivalent to 254 mm of rain. Deviations exceeding ± 0.76 mm (0.3%) triggered adjustment. Datalogger clocks were adjusted in spring and fall, or upon malfunction. Data were stored at 0.01" resolution. Post-processing includes calculating the difference in depth over the time interval, screening negative values caused by evaporation, storing the positive differences, and converting to millimeters. Instrument: Universal Recording Rain Gage, 5-780-9, Belfort Instrument Co., Baltimore MD (modified) Accuracy for loadcell $0.02 \pm \%$ of rated output. Rated output is $2.0 \pm 10\%$ mV/V.		
Instrument	Weighing rain gauge		
Detection Limit Type			
DLNote			
Scope - Application			
Concentration Range		Concentration Units	
Interferences			
Precision Notes			

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QA Requirements	Yearly calibrations are made using standard Rain Gage calibration weights.
Sampling Handling	
Max Holding Time	
Sample Prep Methods	
Link To Full Method	http://www.aboutloadcells.com
Method Contact	Mark Olson

Analytes using this Method:

Analyte: **Precipitation**

MethodID: CSWQ_FM12.11

Detection level: 0.025 mm

	Instrument	Matrix
Accuracy		
Precision		

False Positive Value: False Positive Value:

Accuracy/Precision Concetration Used:

USDA/ARS Methods Catalog

MethodID	CSWO FM12.2		
Method Name	Precipitation		
Media	no media		
Method Type	Field	Method Subcategory	Physical
Method Source			
Source Citation			
Method Summary	Data logger is connected to tipping bucket, pulse events are recorded. Calibration is performed using known volume of water over prescribed period. TE525 Tipping bucket, Texas Electronics, Inc., PO Box 7225, Dallas, TX 75209 USA (obtained from Campbell Scientific, Inc.)		
Instrument	Rain Gauge Tipping Bucket		
Detection Limit Type			
DLNote			
Scope - Application			
Concentration Range		Concentration Units	
Interferences			
Precision Notes			
QA Requirements			
Sampling Handling			
Max Holding Time			
Sample Prep Methods			
Link To Full Method	http://www.campbellsci.com		
Method Contact	USDA/ARS Scott.Drummond@ars.usda.gov		

Analytes using this Method:

USDA/ARS Methods Catalog

Analyte: Rainfall

MethodID: CSWQ_FM12.2

Detection level: 0.25 mm

	Instrument	Matrix
Accuracy	3	
Precision	0.25	

False Positive Value: False Positive Value:

Accuracy/Precision Concetration Used:

USDA/ARS Methods Catalog

MethodID	CSWO FM12.3		
Method Name	Precipitation		
Media	no media		
Method Type	Field	Method Subcategory	Physical
Method Source			
Source Citation			
Method Summary	Orifice size is 8" (20.3 cm). Precipitation is collected in a bucket on a scale. The weight is measured with a mechanism attached to a pen that records on a drum chart recorder. The accumulated rainfall amount, in inches as per calibration, is recorded on the paper chart. The gauge is serviced once a week and bucket is dumped. Gauge calibration was confirmed annually in mid-summer by placing in the bucket a standard weight equivalent to 254 mm of rain. Deviations exceeding +/- 0.76 mm (0.3%) triggered adjustment. Clocks were adjusted in spring and fall, or upon malfunction. Rainfall depth axis of paper chart is 9", with minimum chart division equal to 0.1" and read manually to 0.01", considered equal to 0.254 mm. Time axis of weekly (192-hr) chart is 2 hours per smallest division. Chart was read to nearest 30 minutes. Data were stored at 0.01" resolution. Post-processing includes calculating the difference in depth over the time interval, screening negative values caused by evaporation, storing the positive differences, and converting to millimeters Instrument is Universal Recording Rain Gage, 5-780-9, Belfort Instrument Co., Baltimore MD. Accuracy of this 9" single traverse gauge is not less than 1/2 of 1% with a sensitivity of .01 inch (0.254 mm) of precipitation at a temperature range of -40 F to +125 F (-40 C to 52 C). Used 12-hour raingage chart, Belfort 5-4016B..		
Instrument	Weighing rain gauge		
Detection Limit Type			
DLNote			
Scope - Application			
Concentration Range		Concentration Units	
Interferences			
Precision Notes			
QA Requirements			
Sampling Handling			

USDA/ARS Methods Catalog

Max Holding Time	
Sample Prep Methods	
Link To Full Method	
Method Contact	USDA/ARS Mark.Olson@ars.usda.gov

Analytes using this Method:

Analyte: Precipitation

MethodID: CSWQ_FM12.3

Detection level: 0.51 mm

	Instrument	Matrix
Accuracy	0.5	
Precision		

False Positive Value: False Positive Value:

Accuracy/Precision Concetration Used:
