
CoCoRaHS

"Because every drop counts!"

TRAINING MANUAL



www.cocorahs.org

TABLE OF CONTENTS

GENERAL INFORMATION ABOUT THE CoCoRAHS NETWORK	3
INSTRUCTIONS FOR MOUNTING YOUR RAIN GAUGE	5
INSTRUCTIONS FOR MOUNTING YOUR HAIL PAD	5
HOW TO READ YOUR RAIN GAUGE	6
MEASURING HAIL	8
GUIDE TO MEASURING SNOW	11
MEASURING PRECIPITATION --THE WATER CONTENT OF SNOW	11
MEASURING SNOWFALL—NEW SNOW AMOUNT	12
INSTRUCTIONS FOR DATA ENTRY	13
FAQS	14
OUR CURRENT CoCoRAHS SPONSORS	19
CoCoRAHS DATA USAGE POLICY	20

Reporting forms in back

ABOUT US: WHAT IS CoCoRAHS??

CoCoRaHS is an acronym for the Community Collaborative Rain, Hail and Snow Network. CoCoRaHS is a unique, non-profit, community-based network of volunteers of all ages and backgrounds working together to measure and map precipitation (rain, hail and snow). By using low-cost measurement tools, stressing training and education, and utilizing an interactive Web-site, our aim is to provide the highest quality data for natural resource, education and research applications. We are now in all fifty states

WHERE DID THE CoCoRAHS NETWORK ORIGINATE??

The network originated with the Colorado Climate Center at Colorado State University in 1998 thanks in part to the Fort Collins flood a year prior. In the years since, CoCoRaHS now includes thousands of volunteers nationwide.

WHO CAN PARTICIPATE??

This is a community project. Everyone can help, young, old, and in-between. The only requirements are an enthusiasm for watching and reporting weather conditions and a desire to learn more about how weather can effect and impact our lives.

WHAT WILL OUR VOLUNTEER OBSERVERS BE DOING??

Each time a rain, hail or snow storm crosses your area, volunteers take measurements of precipitation from as many locations as possible (see equipment). These precipitation reports are then recorded on our Web site www.cocorahs.org. The data are then displayed and organized for many of our end users to analyze and apply to daily situations ranging from water resource analysis and severe storm warnings to neighbors comparing how much rain fell in their backyards.

WHO USES CoCoRAHS??

CoCoRaHS is used by a wide variety of organizations and individuals. The National Weather Service, other meteorologists, hydrologists, emergency managers, city utilities (water supply, water conservation, storm water), insurance adjusters, USDA, engineers, mosquito control, ranchers and farmers, outdoor & recreation interests, teachers, students, and neighbors in the community are just some examples of those who visit our Web site and use our data.

WHAT DO WE HOPE TO ACCOMPLISH??

CoCoRaHS has several goals (as stated in our mission statement). 1) provide accurate high-quality precipitation data for our many end users on a timely basis; 2) increasing the density of precipitation data available throughout the country by encouraging volunteer weather observing; 3) encouraging citizens to have fun participating in meteorological science and heightening their awareness about weather; 4) providing enrichment activities in water and weather resources for teachers, educators and the community at large to name a few.

WHO IS SPONSORING THIS NETWORK??

The National Oceanic and Atmospheric Administration (NOAA) and the National Science Foundation (NSF) are major sponsors of CoCoRaHS. Other organizations have contributed either financially, and/or with supplies and equipment. Our list of sponsors continues to grow. Many other

organizations and individuals have pitched in time and resources to help keep the network up and running. We are grateful to all of you, as CoCoRaHS would not be possible without your help.

WHAT BENEFITS ARE THERE IN VOLUNTEERING??

One of the neat things about participating in this network is coming away with the feeling that you have made an important contribution that helps others. By providing your daily observation, you help to fill in a piece of the weather puzzle that affects many across your area in one way or another. You also will have the chance to make some new friends as you do something important and learn some new things along the way. In some areas, activities are organized for network participants including training sessions, field trips, special speakers, picnics, pot-luck dinners, and photography contests just to name a few.

HOW CAN I SIGN UP??

To become a volunteer please follow these simple steps:

1. Read through the web site or handouts and know what the project is about. We have information on How To Measure Precipitation, How To Measure Snow, and How To Measure Hail as well as information on the Equipment used.
2. Make sure you have a rain gauge. You may purchase a rain gauge from WeatherYourWay.com for approx. \$25.00 (plus shipping and handling). They are very nice gauges that measure in hundredths of an inch. We ask that your rain gauge be a 4" diameter all-weather gauge or better.
3. Pick up a few hail pads (state dependant as not all states are measuring hail) from your county's local coordinator. Make sure you have read the help pages listed above so that you know how to use them.
4. Go to our "Join CoCoRaHS" web page and sign up.
5. Either attend a training session for volunteers in person, or view our "Training Slide Show" found on the CoCoRaHS home page. It is also very beneficial to read through the Web site on-line training materials completely. It is important to know how CoCoRaHS observers make and report their measurements. Good training along with careful observing and reporting are very important to the network and the users of our data.
6. Feel free to Contact Us with any questions that you may have.
7. Report your data daily on our Web site (www.cocorahs.org). If you are unable to report on the Web you may obtain CoCoRaHS Precipitation measurement forms from CoCoRaHS Headquarters or you may print your own from the website. You may also obtain Hail Report Cards in a similar fashion.
8. Let a relative or friend know about CoCoRaHS. It makes it much more interesting for the observer when there are other observations showing up on their county maps.

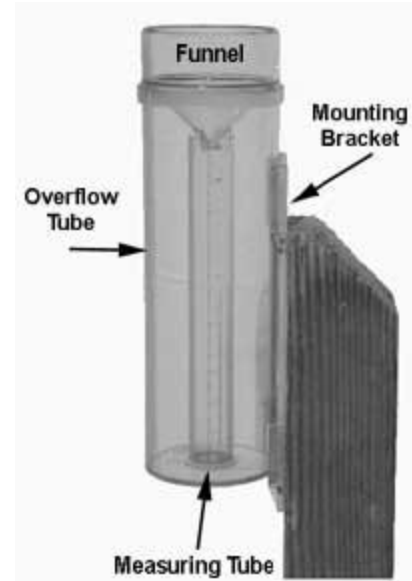
INSTRUCTIONS FOR MOUNTING YOUR RAIN GAUGE.

When installing the rain gauge it is important to consider its location. The gauge should be placed in an area that is protected from strong winds but is not bothered by obstacles that could either block precipitation from reaching the gauge or cause precipitation to splash towards it. For example, an ideal location would be a small open meadow surrounded by forest, or an open back yard not too close to buildings or trees.

The gauge should be installed 2-5 feet above the ground mounted on the side of a single post. The top of the rain gauge should extend several inches above the top of the mounting post. The mounting post should have a rounded, pointed, or slanted top to avoid upward splash towards the rain gauge.

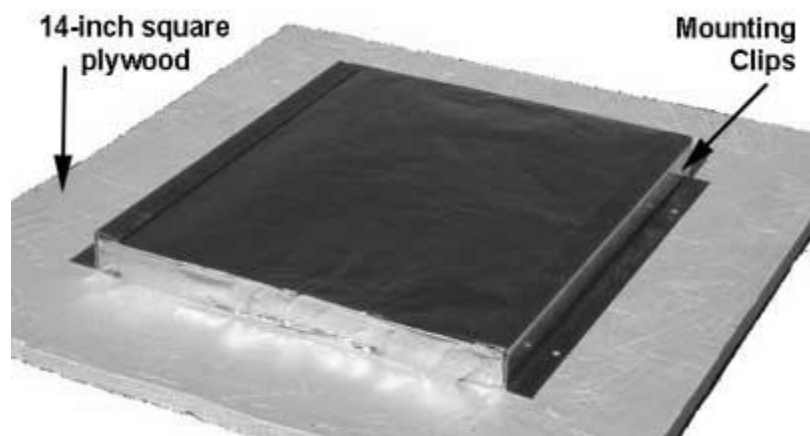
The rain gauge should be installed at a reasonable distance away from obstacles such as buildings and trees. For example, if a tree is 40ft. tall (taller than a two story house) the gauge should be placed at least 80ft. downwind from it. This will help avoid potential blockage of the rain gauge. It is not always possible to find a perfect location. **When in doubt, do your best.**

Please clean rain gauge periodically using a mild detergent and a soft bottlebrush. **Do Not let water freeze inside the gauge** as it can cause the plastic to crack. During the summer, make sure no water from nearby sprinkler systems can get in your gauge.



INSTRUCTIONS FOR MOUNTING YOUR HAIL PAD.

Hail Pad: The pad must be mounted on a solid base such as a $\frac{1}{2}$ " - $\frac{3}{4}$ " piece of plywood or particle board about 14-inch square painted white (which can also be used as a snowboard in winter) using metal clips to hold it securely. The metal clips can be 1 -1/2" or 1-3/4" L-screws. Pre-drill the board and hand tighten 3 or 4 L-screws to hold the hail pad firmly in place. Place the pad in an area free from any obstacles that would hinder or



exaggerate the hail impact (i.e. vegetation, buildings). Make sure that the pad is horizontal to the ground and that nothing will block the falling hail from reaching the pad. Always orient the hail pad the same way and mark on the edge of the pad which direction is north. It is important to know the directions in order to analyze the dents that hail will make on the pads.

THINGS TO REMEMBER: WHEN MOUNTING A HAIL PAD.

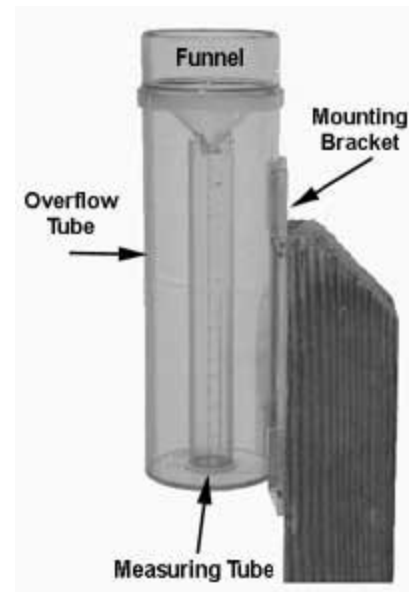
- Avoid large obstacles that could block falling hail.
- Avoid placing pad near walls, buildings with slanted roofs, or other structures that might concentrate and exaggerate the number of hailstones striking the hail pad.
- Use mounting clips to prevent pad from blowing away in the wind.
- Mount the hail pad horizontally and fasten it to a hard surface
- Always position the hail pad the same, and mark the directions on the side of the hail pad.
- Check hail pad regularly to make sure accidental damage has not occurred. Replace it if necessary

HOW TO READ YOUR RAIN GAUGE.

It is important to be as accurate as possible when reading your gauge. Scientists, engineers, and other professionals may use your data.

The rain gauge is composed of three parts: a funnel, a measuring tube, and a 4-inch diameter overflow tube, and a mounting bracket. The funnel directs the precipitation into the measuring tube and magnifies it by a factor of 10. This allows observers to report rainfall to the nearest 0.01" (one hundredth of an inch). The measuring tube, when full, will hold "one inch" of rainfall. When it rains more than one inch, the excess water collects in the overflow tube.

Reading the rain gauge is a very easy thing to do, but mistakes can occur. Here are several situations that you may encounter when reading your rain gauge and how you should deal with them.



1. THE SURFACE OF THE WATER IN THE GAUGE LOOKS CURVED. HOW DO I KNOW WHERE TO READ?

As water fills up the measuring tube, a curved surface is formed called a **meniscus**. This meniscus is formed by the surface tension of a liquid in contact with the sides of the tube. Always read the base of the meniscus when taking measurements. Here is an illustration to help you understand this process.



2. WHAT DO THE NUMBERS MEAN ON THE SIDE OF THE MEASURING TUBE AND HOW DO I READ THEM?

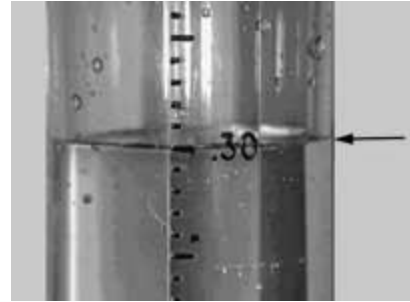
The measuring tube is designed to magnify the rainwater. This allows more precise readings. Remember that the measuring tube when full holds one inch of precipitation.

The measuring tube is divided, marked and labeled in smaller parts (increments) in tenths and hundredths. Imagine that the gauge is equivalent to a dollar, but instead of having one paper bill you have ten dimes or one hundred pennies. The smallest line on the measuring tube would equal one penny. We would write in our checkbook that we have 0.01 dollars, and when recording rainfall you would write 0.01 inches. This is also called one hundredth of an inch.

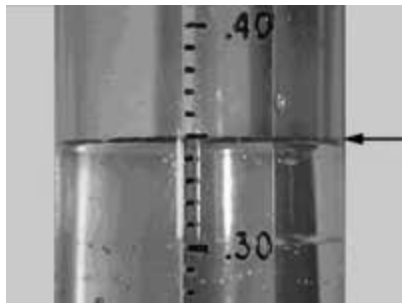
The longer lines on the measuring tube would be like a dime. We record a dime in our checkbook as 0.10 or if you have two dimes 0.20. When recording rainfall that has reached these lines we write them in the same way 0.20.

If rain has reached the line .30, you would say that you had three tenths of an inch of rain or 30 one-hundredths.

Here is an illustration of the calibrated measurement tube of the rain gauge that contains 30 one-hundredths of an inch (0.30 inches).



3. WHAT IF I HAVE A MEASUREMENT ON THE MIDDLE LINE BETWEEN 0.30 AND 0.40?



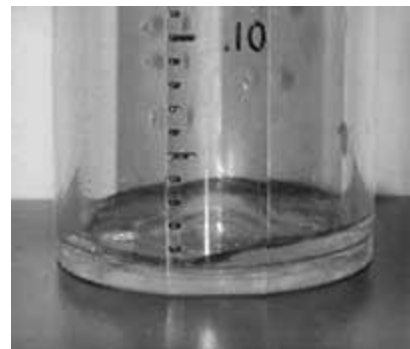
This would be saying that you have three dimes and five pennies. You would record this as 0.35 inches and report that you have 35 hundredths of an inch of rain. There are nine smaller lines (hundredth marks) between each larger lines (tenth marks). This means that you will never have a measurement like 0.0599, for this measurement would be 0.06.

Always remember that the greatest number of decimal places you will have is two. Please do not use your ruler when taking measurements. A ruler is not calibrated to the measuring tube

and will affect the data. **The most common error observers make is confusing tenths and hundredths. Please be careful, and don't make this mistake.**

4. I KNOW SOME RAIN FELL, BUT THERE IS NOTHING (OR JUST A TINY BIT BUT LESS THAN 0.01 INCH) IN MY GAUGE. WHAT SHOULD I REPORT?

We call this a "trace" of rain. This should be reported as "T" on your reports. Even if there were just a few drops that don't even dampen the gauge, you should still report a trace.



5. WHAT IF THERE IS NO PRECIPITATION TO REPORT?

Just record zero (0.00). It is very important to report 0.00, especially on days when there are scattered storms in the area. It is just as important to know where it didn't rain, as it is to know how much it rained where it did.

6. WHAT DO I DO IF THE INSIDE MEASURING TUBE IS FULL?

We can determine that more than one inch of rain has fallen by simply observing that the inside measuring tube is full and the additional water has spilled out into the larger container. Remember that the measuring tube will only hold one inch of water. Follow these steps when measuring rainfall more than one inch.

- **Step 1.** You will first need to read the precipitation in the measuring tube, record it, and empty the water in the measuring tube. **Do not empty out the water that has collected in the Overflow Tube.**

- **Step 2.** You will need to carefully pour the remaining water, from the overflow tube, into the measuring tube, record it, and add up the totals. The easiest way of doing this is by pouring the water into the measuring tube a little bit at a time. You do not have to fill up the tube to the one inch mark every time, rather fill up the tube half or three quarters of the way, record it, and add up the totals. **Be careful not to spill any precipitation.** When in doubt, place a bucket or other large container under the gauge as you pour, so that you can collect the water if you do happen to spill. If more than 2.00 inches of rain fell, you will have to repeat the process several times. Make sure you write down each rainfall quantity and add up the total. If you don't write it down immediately, you could forget.

7. DO I REPORT MORNING DEW THAT HAS COLLECTED IN MY RAIN GAUGE?

On damp, dewy spring and summer mornings a few drops of moisture may collect in your rain gauge. **Do not to report this as rain.** If the only moisture in your gauge came from dew (rarely will dew collect to more than 0.01 inch), report "0.00".

8. SHOULD I KEEP A WRITTEN RECORD OF MY PRECIPITATION DATA?

Yes, it is important to maintain a written record of your data. This gives you a permanent record and gives us a backup in case we have computer or phone problems. This is also important if we find that your data have been entered erroneously into the CoCoRaHS computer system. It might happen that a CoCoRaHS student intern spots an suspicious or erroneous report for your station. If so, they may contact you and discuss it with you. Keep your written records handy. Please **do not** be offended, we are simply trying to collect the best data as possible. You can print out our CoCo RaHS Precipitation and Snow Measurement Form to record your data on.

9. WHAT IF I LEAVE FOR A WEEKEND OR FOR A VACATION AND FIND PRECIPITATION IN THE GAUGE WHEN I GET BACK?

You need to enter your data as a multi-day report. Click on the "Multiple Day Accumulation Form" button. Enter the precipitation amount and the dates, the first date is generally the day after you left and the second date is the day you returned and emptied the rain gauge. Make sure that you don't accidentally write over good data by entering a date that is too early. Please also let us know in the comments if you think you know on which day the precipitation fell.

MEASURING HAIL

One of the goals of CoCoRaHS is to study hailstorm characteristics; the location, time, size, quantity and hardness of hailstones. In a hailstorm, the size and quantity of hailstones can vary quickly and over very small distances, like one mile or even just across the street. We need your help in determining when hail begins, how long it lasts, what size and type of stones, and whether or not rain has accompanied the storm. Your hail pad will help us measure the size and number of stones, but your own measurements will also help.



For example, the hail pads can't tell us when the storm hit. Even in places like eastern Colorado where hail is more common than almost anywhere in North America, there will still only be a few hail-producing storms each year. What this means is that you have to be ready in advance so the hail doesn't catch you by surprise.

FOLLOW THESE STEPS IN REPORTING HAILSTORM INFORMATION.

Step 1. Before the next hailstorm, make sure your hail pad is properly installed. Also make sure your CoCoRaHS Hail Report Cards are in a convenient location. Have a pencil and a ruler handy, too. Finally, read over a CoCoRaHS **Hail Report Cards** thoroughly so that you know what observations you will need to make when the time comes.

Step 2. If you are at home (or at the site of your reporting station) when a hailstorm hits, note the time that the hail begins as accurately as possible. The times that hail begins and ends are very important pieces of information needed by scientists. If you feel it is safe, report the onset of this storm via the CoCoRaHS website using the **Hail Report Form**. If you do not feel it is safe to be on the computer due to nearby lightning, wait until the storm passes. The Hail Report Form can be found on the CoCoRaHS webpage under "my data."

Step 3. Observe the hail storm in progress from a safe and secure location. **Please take notes** during the storm to help you remember important features from the storm, such as changes in stone size, hardness, and sudden changes in the number of stones reaching the ground. **Do not** expose yourself to dangerous hailstones. Keep a ruler handy. When a break in the storm gives you the opportunity, measure the **diameter** of the largest, the smallest and the most common sized hailstones. If you do not have a ruler, use your pocket change. The diameter of a dime is slightly less than 3/4 inch while a penny is almost precisely 3/4 inch across. The diameter of a nickel is slightly more than 3/4 inch while a quarter is slightly less than one inch across. Also check to see if the hail is clear, white, hard, soft, smooth, rough or has any other interesting properties. Take note if the hail began before, after, or at the same time that rain began.

Step 4. When the storm has ended, try to approximate the number of stones per unit area (per square foot) which hit the ground. Since the number is sometimes very large, it may be easier to record the average distance between stones on the ground. Use your hail pad to help you estimate the number of stones. If large quantities of hail fell, measure the average depth of accumulated hail on the ground. At the same time, do a quick assessment of hail damage. Most storms do very little damage except to tender plants.

Step 5. Fill out the CoCoRaHS Hail Report Card. Be sure to include your station name and number. If you were not at home, but you experienced hail at another location, a hail report is still beneficial. Make sure, however, to record your actual location accurately so the report is not accidentally associated with your normal station location.

Step 6. If you haven't yet done so, using the Hail Report card as a guide, submit a "**Hail Report**" via the CoCoRaHS web site (see step #2). This is an important part of the storm research.

Step 7. Retrieve your dented hail pad and replace it with a new one. Take care not to damage the hail pad for they are fragile. Artificial dents could obscure the results of the study. **When you remove the hail pad, remember to carefully etch or write with a permanent marker the date, time when hail fell, and location (station number and station name) on it. Also, mark on the hail pad which direction is north.** Attach the Hail Report Card to the back of the hail pad. Make a copy of the Report Card for your own records, if you desire. At your next convenient opportunity, drop the hail pad and report card in the mail and send it to:

CoCoRaHS Hail Pad - CSU
1371 Campus Delivery
Fort Collins, CO 80523

If you are unable to send in the hail pad, please photograph the pad and send it along with a copy of the hail card to: info@cocorahs.org, putting the words "hail pad" in the subject line.



THINGS TO REMEMBER: WHEN MEASURING HAIL.

- Note and record the time when hail begins and ends as accurately as possible.
- Do not get in the path of falling hail stones.
- Hail storms come on fast and furiously. Be ready.
- **Three types of hail reports are encouraged:**
 1. Promptly notify us via our website with a "Hail Report" when hail begins at your location to give the National Weather Service a "heads up" on developing or approaching storms with a CoCoRaHS Hail Report.
 2. You may also submit an additional "Hail Report" via the Internet at the end of each hailstorm providing a detailed summary of the hail observed.
 3. Finally, if you have one, turn in your damaged hail pad (or close-up photographs of) along with the Hail Report Card available on the CoCoRaHS Web site (Step #7 above).

WHAT IF A HAIL STORM OCCURRED, BUT YOU WERE NOT AT HOME TO OBSERVE IT?

If this happens, and it will, you will not be able to provide detailed information about the storm. If you can approximate when the storm occurred and some characteristics of the storm, try to do so. When you submit your report, make appropriate remarks expressing your uncertainty. If you do not know the time of occurrence, but you do know the date, that is also useful. Turn in the hail pad with an incomplete hail report card and a note saying, "Sorry, I wasn't home at the time of the storm."

WHAT IF YOU OBSERVE A HAILSTORM FROM A DIFFERENT LOCATION THAN YOUR STATION?

If you are not at home but experience hail storms somewhere else, we welcome these reports as well. Always make sure you note the time and location as accurately as possible. Do not give your station number if you are reporting from a different location. That might confuse us.

WHAT IF YOU SEE SOME GIANT HAILSTONES THAT ARE MORE THAN 2.5 INCHES IN DIAMETER OR HAVE VERY INTERESTING SHAPES, SIZES OR OTHER CHARACTERISTICS?

Every year, giant hailstones fall somewhere in across the country. Fortunately, at any specific location they are quite rare. If you see very large or very unusual hail stones, take close-up photographs, collect some samples, preserve them in your freezer, and contact your CoCoRaHS coordinator. If you see intact hail stones in excess of 5 inches in diameter, quickly and carefully wrap and freeze these stones. These are very rare and will be of great interest to scientists (and the media).

I HAVE SOFT ROUNDED DENTS IN MY HAIL PAD, BUT I DIDN'T SEE ANY HAIL.

The soft rounded dents are just deformations in the aluminum foil caused by rain, they aren't hail damage. Please just ignore them; the hail pad is still fine for hail data collection so you don't need to send it to us or replace it.

GUIDE TO MEASURING SNOW

EQUIPMENT

1. The 4" diameter rain gauges that we use for CoCo RaHS can be used for measuring the water content of snow. However, **you must remove the inner measuring cylinder and funnel** for measurements of snow water content and other freezing/frozen precip. The inner tube can easily crack and break if moisture collects and then freezes. But keep the funnel and measurement tube handy indoors —you'll need it.
2. Have a ruler or yardstick ready (ideally one that measures in inches & tenths).
3. You should have a snow board (a flat board, **painted white**, ideally about 16" x 16"). They come in very handy for measuring snowfall. If not, that's OK, but you will need to identify a good representative location that is as flat and level as possible where snow accumulates uniformly and does not melt prematurely. Wooden decks are OK, but they should be at least 20-30 feet away from your house since your house will affect snow accumulation patterns.
4. You may need to have warm water handy.

MEASURING PRECIPITATION—THE WATER CONTENT OF SNOW

The snow (rain, freezing rain, etc. too) will collect in the 4" diameter outer cylinder (overflow cylinder). If snow collects on the rim of the gauge you have to decide what belongs in or out of the gauge. I just take a book, snow swatter, or flat object and push gently straight down on the top of the gauge. Whatever falls in is in, and whatever falls out is out. It may not be perfect, but at least it's objective. With wet snows, a lot of snow can collect on the rim, so it makes a difference.

Bring the gauge inside at your time of observation. If it has stopped snowing, you can bring it in earlier and just let the snow melt. But you may need to hasten the process. In order to measure the water content of snow with this type of gauge, **you will need to melt the contents and pour them back into the calibrated inner cylinder.**

What I do is take my inner calibrated cylinder and pour warm water into it and jot down the amount. Then I add that warm water to the outer cylinder so that all the snow melts. Then I pour the water back into the inner tube and record the total amount. For example, lets say I added 0.51" of warm water to the snow. Then when I measured the total sample, it read 0.82" How much precipitation did I get? The answer should be 0.31"

0.82" - Total of melted snow with the added warm water

-0.51" - Total warm water added to melt snow

0.31" - Daily Precipitation

(the amount you should report)

I hope that makes sense. Make sure you avoid spilling. It can happen.

Some people have come up with creative ways to melt their snow in their microwave or by setting their gauge in a basin of warm water. That way they don't have to add and subtract additional water. Microwaving rain gauge samples is not recommended, but a careful person can do it successfully, or so I've been told. I've never tried it.

When you're done, put the outer cylinder back outside, clean and dry, so it's ready to collect the next snow (During heavy snow (6" or greater) the cylinder will fill to the top and overflow with snow. You will have to measure more often than once daily under heavy snow conditions.

MEASURING SNOWFALL—NEW SNOW AMOUNT

Snowfall is the maximum accumulation of fresh snow during the past day prior to melting or settling. We measure snowfall to the nearest 0.1 (one-tenth) inch. Maybe you have a ruler in tenths like me, but many don't. Since snow melts and settles, you may have to measure during or soon after snow ends in order to capture how much accumulated. By 7 AM there may be less.

For example if the snow begins to fall in mid morning, accumulates to 4.2" by 3 PM and then stops and begins melting and settling such that by 7 AM the next morning you only have 2.6" of snow on your snowboard, then the correct number to report for your 24-hour snowfall (new snow amount) is 4.2" -- the accumulation prior to melting and settling. If the ground was bare prior to this snow your snow depth (total depth of snow on the ground) would be rounded to the nearest half inch and would be reported as 2.5 inches.

The trick in measuring snow consistently is simply finding a good place to measure and a firm surface (such as a snow board) for your ruler to set on. Some people use low picnic tables, some use their car. I don't recommend sidewalks since they tend to accelerate melting. Grass is where snow accumulates first, and it is OK to measure on grassy surfaces, but please know that the snow tends to sit up on top of the blades of grass, sometimes by one to three inches. Your ruler, on the other hand, will go right down through the snow and grass to the ground and give you an exaggerated reading. Just be careful to measure to the bottom of the snow not to the ground.

Measuring new snow accumulation is easy when the snow falls without wind and isn't melting on the ground. But when the wind blows, measuring snow becomes a real challenge. We deal with drifted snow by simply taking many measurements from a variety of locations and averaging them to get a representative measure. You will get the hang of this -- with experience.

If you use a snowboard, take a core sample and then be sure to clear the board after your measurement and set it in a nearby location level on the surface of the new snow. If you leave it down in a depression, it will tend to collect more snow from drifting if the snow continues.

SNOW DEPTH—TOTAL DEPTH OF SNOW ON THE GROUND

Snow depth is simply the total depth of snow on ground at your scheduled observation time (hopefully 7 AM or close). Snow depth is measured to the nearest half inch. It includes both new and old snow, and should be reported even on days when no new snow has fallen. If necessary, take an average of several measurements. For example, if half the ground has 2" of old snow and the other half of the ground is already bare, the average snow depth would be 1".

SNOW CORES—CORE PRECIPITATION

Under some circumstances (primarily strong winds), your 4" diameter gauge will not catch all of the snow that has fallen. You can watch windblown snow crystals curve around a rain gauge like

water going around a rock in a river. If you believe your gauge has not adequately caught the precipitation that has fallen (or, if you're just curious), then take a core sample of the fresh snow that has fallen. After first measuring the water content in the gauge, then take the 4" outer cylinder and "cut a biscuit" in the fresh snow by pushing it straight down. It is best to do this on your snowboard (after you've measured the snow depth, but before you have cleared the snow and put it back on the surface). Use a thin sturdy cookie sheet or something like that to slide under the cylinder so that you can lift it up without spilling the contents. Be sure to measure in a representative location -- not in a drift or in a wind-blown or melted area. Then proceed to melt and measure the water content like you would with any other measurement.

THE SNOW BOOKLET

A great reference for information on snow is "**The Snow Booklet: A Guide to the Science, Climatology and Measurement of Snow in the U.S.**" written by Nolan Doesken and Arthur Judson. Copies (it's a great gift for the snow lover in your family) are available for \$10 each.

INSTRUCTIONS FOR DATA ENTRY

TOTAL RAIN AND MELTED SNOW

Enter only the amount of rain or melted snow that fell into the rain gauge for the past 24 hours ending at 7:00 A.M. the day of entry. If warm water was added to help melt snow, be sure to subtract that amount.

If there was no precipitation, report 0.00. If some precipitation fell, but the total was less than 0.01 inches, enter T in this blank "field".

NEW SNOW:

This is the depth of the new snow (not its water content) that fell in the last 24 hours. This is measured with a ruler and reported to the nearest one-tenth (0.1") inch. The **New Snow** is the maximum accumulation of fresh snow during the past day prior to melting or settling. Since snow melts and settles, you may have to measure during or soon after the snowfall ends since by 7:00 A.M. the depth may be reduced.

If snow fell in the past 24 hours, but you did not measure it, please do not leave it as 0.0". Instead, please enter NA ("not available").

TOTAL SNOW ON GROUND

This is the total amount of snow (new and old snow combined) on the ground, measured to the nearest 0.5 (1/2) inch. The **Total Snow on Ground** is reported even on days when no new snow has fallen. If there is snow on the ground but you did not measure the depth, then leave "NA" on the form ("Not Available"). If there is no snow at all on the ground, replace the "NA" on your form with 0.0

Uneven Snow: If the wind has blown and the snow is uneven, or if melting has occurred in some areas but not in others, then please take several measurements, average them, and enter that value.

Details about variations in snow may be added in the "Notes" section.

MELTED VALUE FROM CORE

If you believe your gauge has not caught all of the precipitation that has fallen (or if you're just curious), then you can take a core sample of the new snow that has fallen using your 4 inch diameter rain gauge, on your snowboard. If the amount is less than 0.01 inches, enter T in the field.

Example:

The snow begins to fall in mid-morning. At 3 P.M. the snow stops falling and you measure the depth at 4.2". The sun then comes out and the snow quickly begins to melt and settle. At 7 A.M. the next morning you measure 2.6" of snow on your snowboard. There was little wind with this snow, and your rain gauge has likely caught most of the snow that fell. You melt the contents of the gauge and find 0.41".

What do you report for each entry?

Total Rain and Melted: 0.41" (the melted snow and/or rain)

New Snow: 4.2" (the amount of snow received in the previous 24 hours, prior to melting and settling)

Total Snow on Ground (in inches) 2.5" (assuming bare ground prior to this snow)

FAQS

HOW DO I JOIN THE NETWORK AS A VOLUNTEER OBSERVER?

Click on the "Join Us" section on the website and fill out the registration form. You will be assigned a station number and will be contacted by our station administrator with some welcome information.

ARE THERE OTHER THINGS I CAN DO TO HELP THE NETWORK?

Yes, volunteers are a most treasured resource and we have many ways that you can help. Please check out our Help Us page for more details.

WHAT PROCESS HAPPENS WHEN I SIGN UP TO BE AN OBSERVER?

After you submit the application, a Station Number will automatically be assigned. You will receive an automatically generated email with your Station Number and Login information. The Station Administrator will then calculate the longitude and latitude for your station if you have not provided that information. Your station will be assigned a Station Name. You will then receive our Welcome Email that includes your Station Information and Coordinator information along with training information. You should attend a CoCoRaHS training before entering data into our system (You may either train on line or sit in on a local volunteer training if one is available in your area).

WHY DO YOU NEED LONGITUDE AND LATITUDE?

We use that information to map your data. Please let us know if your data appears to be mapped in the wrong location.

WHY DO I NEED TO ATTEND A TRAINING SESSION?

We are trying to get the most consistent data possible using volunteer observers. We hope that you will be able to attend a training session, or at least read all of the on-line training information before entering data. We care about the accuracy of our data and hope that you will too.

WHEN CAN I BEGIN ENTERING DATA?

You may begin entering data as soon as you have been assigned a station name and station number and have attended a training session. Your data will appear on the Web immediately in both report and map form.

WHAT DOES THE STATION NUMBER MEAN?

The station number is generally the abbreviation of the state that you live in, followed by your county followed by two or three number. Example: CO-LR-284. This would be Colorado-Larimer County-Station 284.

WHAT DOES THE STATION NAME MEAN?

The station name is generally the town name followed by a distance in decimal miles and a direction. For Example: 'Fort Collins 4.5 SW' means that you are approximately 4.5 miles Southwest of the geographical center of Fort Collins. The names are based on the direction and distance from an arbitrary point in a town or city based on coordinates provided by the National Weather Service.

WHO IS MY LOCAL COORDINATOR?

You may find your local coordinator by clicking the "volunteer coordinators" button under resources on the CoCoRaHS website, then clicking on your state. If you don't see one for your county, please contact your state coordinator.

DO I HAVE TO CHECK MY RAIN GAUGE AT 7AM?

No, but we would prefer it if you did. If you check your gauge at other times, your data may not be directly comparable to other data. If you check your gauge at night, your data will be in our reports but won't show up on our maps. We only map data that is collected within two hours of 7am.

WHO WILL ANSWER ANY QUESTIONS I HAVE ABOUT THE COCORAHHS NETWORK?

You should first try contacting the Local or State Coordinator for your area. You may also contact CoCoRaHS Headquarters during normal business hours at: (970) 491-8545 or (970) 491-1196. Learn more at our Contact Us page.

WHO DO I E-MAIL WITH ANY QUESTIONS OR COMMENTS ABOUT THE WEB SITE?

Any questions regarding the Web site should be directed to our general e-mail info@cocorahs.org, which will be forwarded to our Web masters.

WHERE IS COCORAHHS HEADQUARTERS LOCATED?

We are located on the Foothills Campus of Colorado State University in Fort Collins, Colorado. Please stop by the next time you are in the Fort Collins area.

WHY DOES COCORAHHS NOT USE AUTOMATED RAIN GAUGES?

We are often asked why CoCoRaHS does not encourage the use of automatic rain gauges to report 24 hour precipitation totals. After all, many weather enthusiasts already have electronic home

weather stations with automatic rain gauges to record precipitation - why should they also purchase a separate CoCoRaHS gauge?

Unfortunately, it turns out that rain gauges are not all created equal and do not all report the same. The Colorado Climate Center has been involved in rain gauge studies for many years and have had dozens of volunteers like you test their automated gauges against either the CoCoRaHS 4" diameter gauge or the National Weather Service (NWS) 8" diameter Standard Rain Gauge. We have also tested National Weather Service Automated Surface Observing System tipping bucket rain gauges (not unlike the tipping bucket gauges that come with most home weather stations, but sturdier and a lot more expensive).

While the NWS and CoCoRaHS gauges compare quite well with each other (our tests indicate that the CoCoRaHS gauge has a collection efficiency of 101-105% compared to the standard NWS gauge), the majority of automated rain gauges, when summed over several months or years, report less precipitation than actually fell by a significant amount -- sometimes 25% or more. Moreover, none of the automated gauges work well in areas that receive snow. This is not acceptable for our project because we are interested in observing and understanding natural precipitation variability, as accurately as possible. If we're all using different kinds of gauges with different abilities to catch precipitation, it's too hard to determine if differences in rain or snowfall are "real" or due to the kind of instrument that was used to report the measurement.

Because of these test results, we have asked our observers to please set up a CoCoRaHS 4" gauge along with their automated gauge and see for themselves. Many observers have converted to using the 4" gauge as their daily measurement when they see the results, and then use their automated gauge as a backup when they are gone. It is very good to use the two in combination. But whenever people do use their automated gauge as their measurement, we request that they mention that in the daily "observation notes".

For those of you who decide it's too much trouble to purchase a CoCoRaHS gauge in addition to your automatic system, you may still be able to share your data with the National Oceanic and Atmospheric Administration (NOAA - the organization that oversees the NWS) via their Citizen Weather Observation Program (CWOP). This program makes home weather station data available to the NWS for certain real time applications. WeatherUnderground is another system for web-based data sharing.

For climate data and research applications, as well as supporting the "NowCasting" goals of NOAA, we encourage you to use the 4" diameter high capacity manual rain gauge and join CoCoRaHS.

HOW DO I ENTER DATA VIA PHONE?

If you are calling ONLY to report data, call the number 970-491-6300. If you don't want to listen to the long message and are experienced in reporting by phone, you can skip over it by pressing the # key on a touch tone phone. You may also call 970-491-8545 to report data.

WHAT IS THE PHONE NUMBER FOR THE DENVER/BOULDER AREA?

The phone number for the Denver/Boulder area is (720) 913-5284. This covers all of Denver and Boulder and parts of Jefferson, Adams, and Arapahoe, and Douglas counties too.

WHAT INFORMATION SHOULD I REPORT OVER THE PHONE?

Every time you report, you must state: your name, station number, station name, time you checked your rain gauge (hopefully sometime in the morning), and the amount of precipitation that has fallen in the past 24 hours. That is the only information which is required, but any other information that is on the printable forms may be included over the phone as well.

I MADE A MISTAKE ENTERING DATA, WHAT DO I DO TO FIX IT?

You can edit your reports from the report lists in your "My Data" area

HOW DO I VERIFY THAT MY DATA WAS ENTERED CORRECTLY?

The best way to verify your data is to go to the Reports section of the web site. Your data should appear in the Daily Precipitation Report, Station Summary Report or the Data Entry Report immediately.

HOW DO I VERIFY MULTIPLE DAYS WORTH OF DATA?

You can verify multiple days worth of data by going to the Station Summary Report and entering your Station Number and the dates that you want to verify.

WHAT DO I DO IF I'VE BEEN GONE AND FOUND WATER IN THE GAUGE WHEN I RETURNED?

You need to enter your data as a multi-day report. Click on the "Multiple Day Accumulation Form" button. Enter the precipitation amount and the dates, the first date is generally the day after you left and the second date is the day you returned and emptied the rain gauge. Make sure that you don't accidentally write over good data by entering a date that is too early. Please also let us know if you think you know on which day the precipitation fell.

MY DATA IS AN ESTIMATE, HOW SHOULD THAT BE ENTERED?

If you are estimating any amount, please note that in the Comments section of the form.

WHAT SHOULD I ENTER IN THE COMMENTS FIELD?

Leave this blank unless you have additional weather observations to make. This can include any other weather related information such as wind conditions or temperature. Please don't include messages for the webmaster, they probably won't be seen. Use the webmaster link at the bottom of the page if you need to contact the webmaster. Don't enter any information such as vacation plans, the comments can be viewed by anyone over the Internet.

I HAVE DATA FROM LAST YEAR, CAN I ENTER IT?

Yes, you may enter any past data that you have as long as you are sure of its accuracy.

WHAT IS A TRACE?

Any precipitation that is seen or felt that is not a measurable amount is entered as a trace (T). If you see a drop on the pavement or feel one on your skin, that is a trace.

DO TRACES EVER ADD UP TO MEASURABLE PRECIPITATION?

No matter how many traces you sum together, the sum is still only a trace. When adding up precipitation for totals as in the Station Summary Report, we convert a Trace to 0.00.

DOES FROST COUNT AS PRECIPITATION?

Technically, frost does not count as precipitation because it did not fall from the clouds overhead. Therefore, if you have frost, do not report "T" for precipitation or snowfall. Just enter 0.00. However, frost is a significant meteorological phenomenon. If possible, you should make note of it and report it in the "Comments".

WHAT DO I DO WITH SNOW BUILDUP ON THE EDGE OF MY GAUGE?

There is no perfectly correct answer here since snow behavior can be erratic, but what I do is take a flat object like a snow swatter and I push it straight down on the gauge from above in such a way that any snow that is inside the gauge cylinder is knocked into the gauge, but whatever is outside falls out. For more snow measurement details see How to Measure Snow.

CAN THE CENTER TUBE HOLD MORE AND 1 INCH?

Some observers have noticed that when they received more than 1 inch of precipitation, the center tube actually is 0.01 or 0.02 above the 1 inch mark. Please check for this phenomena before emptying out the center tube; estimate the amount of excess and be sure to add this amount to your precipitation reading.

HOW DO I ESTIMATE INTENSE RAIN WITH MORE THAN 1 INCH?

You do not need to empty the inner tube and overflow tube every few minutes during a very heavy rain. You can use a ruler to measure the height of water in the outer tube. One inch of rain in the overflow tube represents only about 0.90" of actual precipitation -- due to the displacement of water by the inner tube. It is OK to simply estimate the rainfall to the nearest 0.10" by measuring the water depth using a ruler and then multiplying by 0.9 to account for the displacement. Remember to add the first inch, from the inner tube.

MY HAIL PAD HAS SOFT ROUNDED DENTS BUT I DIDN'T SEE ANY HAIL, WHAT TO DO?

The soft rounded dents are just deformations in the aluminum foil caused by rain, they aren't hail damage. Please just ignore them; the hail pad is still fine for hail data collection so you don't need to send it to us or replace it.

WHEN I MELT MY SNOW, THE GAUGE AMOUNT AND CORE AMOUNT DON'T MATCH, WHICH ONE SHOULD I REPORT AS MY PRECIPITATION?

The amount will rarely match but both are valid data. In general, the higher of the two is usually the best "estimate" of the amount of precipitation that fell. If you use your core measurement as your daily precipitation amount, be sure that you report your gauge catch amount in the comments. We are learning that our measurements are, in fact, just good estimates and not confident "Truth".

WHAT IF SOME OF THE SNOW MELTS BEFORE MY MORNING OBSERVATION?

If 2.0 inches of snow fell on the previous day, but in the morning there was only 0.5 inches left on the ground due to melting or settling, the New Snow amount should be 2.0 and the Total Depth of Snow on the ground should be reported as 0.5.

HOW OFTEN ARE THE PRECIPITATION MAPS GENERATED?

All Daily Maps are regenerated every 10 minutes.

WHERE ARE THE ROAD NAMES?

We are working on providing selective display of road names to the county and city maps.

WHY DOESN'T MY DATA DOESN'T SHOW UP ON ANY OF THE MAPS?

If you are new to CoCo RaHS, it might be that we don't have your longitude and latitude entered into our mapping system yet. Since maps are only created every 10 minutes, you may need to wait a bit and check again. It is also possible that we have incorrect longitude and latitude for your station. If that is the case, please contact your Volunteer Coordinator. The maps also only include data that is collected between 4:30am and 9:30am. If you read your rain gauge later in the day, then your data won't be mapped, however it is still in our data base.

WHY DOES MY STATION NEED TO BE IN THE MAPPING SYSTEM?

We have programs that draw each of the maps using your longitude and latitude to plot your data. These programs use a data file that contains all of our known stations and their locations. If your station isn't in this data file, we can't locate where your data came from therefore your data won't be mapped. When you join the project it may take time before we know your longitude and latitude and even more time before that information gets to the webmaster and gets entered into the necessary data files.

IF MY STATION ISN'T ENTERED INTO THE MAPPING SYSTEM, IS MY DATA BEING LOST?

No, all data entered is written to our data files. As soon as your information is entered into the mapping system, your data will begin appearing on our maps (within one day).

OUR CURRENT COCORAHHS SPONSORS

CIRA - CSU Cooperative Institute for Research in the Atmosphere 1997, 1999-2001, 2004-present
The Colorado Agricultural Experiment Station at Colorado State University 1998-present
Colorado State University—Department of Atmospheric Science 1998-present
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You may also find additional sponsors of CoCoRaHS within a particular state listed on one of the CoCoRaHS individual state pages. Other organizations and individuals have also contributed with volunteer assistance to keep our science-education network up and running. Many thanks to all of our sponsors. The CoCoRaHS Network would not be possible without your help.

CoCoRaHS DATA USAGE POLICY

CoCoRaHS is a non-profit, community-based organization encouraging volunteer participation in the measurement and reporting of precipitation (rain, hail and snow). Our mission is to collect and display accurate high-quality precipitation data while providing educational opportunities and experiences for volunteers. The data gathered by volunteer observers through the CoCoRaHS network is freely available to governments, academic institutions and the private sector as well as participants and the general public for the purposes of promoting learning, enhancing scientific knowledge and protecting life and property. CoCoRaHS data are made available to the public via the web site (www.cocorahs.org) at no charge. It is understood that entities using CoCoRaHS data shall not resell or receive monetary profit from it without permission from CoCoRaHS. This is an important trust which is implied between CoCoRaHS and its users. In addition, we ask that everyone who uses CoCoRaHS data to please acknowledge its source when displaying it.

Since CoCoRaHS is a non-profit network supported by donations and grants, the ongoing sustainability of the network depends upon support through both direct and in-kind donations. As we work cooperatively and collaboratively with many organizations, we hope and expect that those using CoCoRaHS data will support the organization by giving back in ways that will benefit and enhance its existence and help continue its ability to provide educational opportunities and critical and timely information on precipitation throughout the country.

Disclaimer: The data are provided "as is", and in no event shall the providers be liable for any damage or loss due to missing data or misinterpretation of its content.

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