The
Monitor
CASTNET
Clean Air Status and Trends Network
Spring 2008

The Newsletter for Air Quality Station Operators

National Park Service (NPS)
Gaseous Pollutant Monitoring Program

Environmental Protection Agency (EPA)
CASTNET program

In this issue...

NETWORK NEWS

Rocky Mountain National Park center of nitrogen research study

Rocky Mountain National Park will get an NO/NOy (oxides of nitrogen) analyzer this summer to help characterize the gaseous nitrogen oxide deposition species in the park. Jeff Collette and Kip Carrico from Colorado State University will be installing devices to simultaneously measure individual nitrogen oxide species. Using both continuous and accumulating weekly samples, the researchers hope to characterize atmospheric constituents of the upslope events that bring nitrogen oxides from Front Range Colorado sources. Since NOy is also involved in ozone formation and a marker of air pollutant "age", correlations will also be made between Front Range sources and high ozone events. Some other CASTNET stations already measure NOx/NOy, including Great Smoky Mountains National Park, NC/TN; Bondville, IL; and Mammoth Cave National Park, KY; and more measurements of this type are expected in the future.

EPA sets new ozone standard

On March 12, 2008, EPA strengthened its National Ambient Air Quality Standards (NAAQS) for ground-level ozone. The new 8-hour primary standard, designed to protect public health, is 0.075 parts per million (ppm). The previous standard, set in 1997, was 0.08 ppm. The new secondary 8-hour ozone standard, designed to protect public welfare and the environment (sensitive vegetation and ecosystems), is also set to 0.075 ppm. In addition, EPA will also change its color-coded Air Quality Index (AQI) to reflect the new primary standard.

For a station to violate this new standard, the 3-year average of the 4th highest daily maximum 8-hour average ozone concentration must be greater than 75 ppb.

The new standards will be effective 60 days from its posting in the Federal Register, June 2009 for violation area recommendations, 2010 for designation of non-attainment areas, 2013 for State Implementation Plans to be due, and attainment after 2013. Considering the large number of rural counties that potentially will violate the secondary standard, EPA may have to provide new rules for designation and exit for non-attainment status. Monitoring of ozone is required both for designation and for proving attainment.

For more information on the final ruling, visit *http://www.epa.gov/groundlevelozone/actions.html.*

NETWORK NEWS **continued on page 2....**

NETWORK NEWS continued from page 1....

New datalogger installations to begin at EPA-sponsored sites

Installation of the new Campbell Scientific Inc. (Campbell) Model CR3000 Micrologger® dataloggers began during January 2008 at EPA-sponsored CASTNET sites. The first site received a new CR3000 in late January with the second installation occurring the following week. Two EPA-sponsored southeastern sites are likely the next in line to receive a CR3000 datalogger. With all 59 of the EPA-sponsored sites slated to receive a new Campbell CR3000 within the next six to eight months, a MACTEC installation team likely will be visiting your site soon, if they haven't already.

The CR3000 has increased capabilities over the current dataloggers in use. To take advantage of these capabilities, some hardware changes will be made when the new dataloggers are installed. The installation process will take about a day and a half to complete. After the CR3000 is installed, the technician will verify that everything is working properly and polling correctly. The instrumentation will be calibrated as a component of the installation visit. The MACTEC field technician will also arrange a time to meet with the site operator(s) for a training session prior to leaving the site. Obtaining data from the CR3000 in order to complete the weekly Site Status Report Form (SSRF) requires different steps than what were used with the previous datalogger. Information that describes the standard operating procedures (SOP) to follow for the weekly Tuesday site visit will be left at the site for future reference. And of course, if you have any questions, don't hesitate to call MACTEC's field operations group at 1-888-224-5663, ext. 6629 or 6621.

High-tech traffic counter tested at Yellowstone National Park

The NPS ARD has requested lawmakers in recent years to limit the number of snowmobiles entering Yellowstone National Park, WY, in an effort to decrease air pollution, noise pollution, and wildlife impacts during the winter months. Until now, park staff have been manually counting the number of snowmobiles that enter and exit the park. The park desired a better, more accurate approach to traffic counting, and worked with ARS to develop such an approach.

Traffic counter *continued on page 5....*

Staffing changes around the program

Several of the cooperating agencies and contractors that operate and manage the CASTNET program have seen additions to their staff in recent months.

At the administrative level, George Bowker has joined the EPA in Washington, DC, and assists with the implementation and development of the CASTNET program. He applies numerical models to simulate regional air quality to help with the interpretation of the CASTNET measurements. He has an interdisciplinary background with training in biology, physics, and environmental science. Dr. Bowker joined the Clean Air Markets Division, CASTNET team in December, after completing a 4-year post-doctorate with the EPA in their Atmospheric Modeling Division, where he studied the transport and dispersion of air pollutants in urban areas using numerical models, wind tunnels, and field studies.

At the scientific and field management level, José Martinez joined MACTEC's Gainesville, FL, office in January 2008. Martinez brings a wealth of knowledge and experience to the CASTNET team. His primary role as a senior scientist with MACTEC will be coordinating CASTNET field activities with Mark Hodges, the CASTNET Field Operations Manager, while also providing insight on various regulatory requirements, air monitoring research, and other related aspects of field operations.

Prior to joining MACTEC, Martinez managed the Operations Unit of the Ambient Monitoring Program for the state of Georgia, which was responsible for the FRM $PM_{2.5}$ Network, Air Toxics Network, PAMS Network, and the Bio Watch program. As a research scientist with the Georgia Institute of Technology, he developed a working prototype of monitoring instrumentation, and modified instrumentation to operate with higher specificity, achieve lower limits of detection, and collect data more rapidly. He holds a Ph.D. in earth and atmospheric sciences as well as other degrees in biochemistry and biology.

At the field support level, Kelly Blomme has recently joined ARS' field specialist team. For a short time in 1999, Blomme worked in ARS' Information Management Center as a data analyst for the NPS air quality program. From there he moved to Iowa and became an environmental chemist for a county health department, and worked with a variety of air quality instrumentation. Using his acquired experience he moved back to Colorado and ARS, and rejoined ARS as a field specialist. Blomme will be servicing the NPS primary sites and portable ozone monitoring systems sites.

STATION OPERATOR FOCUS

Environmental concern a life-long experience for Hoxeyville operator

Mike Reilly has been the CASTNET site operator at the Hoxeyville station (HOX148) since it was installed in 2000. The station is actually located in Cadillac, MI, in the north-central part of the state not far from Lake Michigan. Located in a hayfield, the station is outfitted with both CASTNET dry deposition and the National Atmospheric Deposition Program (NADP) wet deposition instrumentation.

Mike takes a keen interest in air quality, and recognizes its importance on both local and global levels. "Performing a valuable service for the people -- knowing what the air quality is, is important," said Mike. "Comparing good air quality days here in Michigan to what Los Angeles is experiencing is thought-provoking, and getting a baseline of conditions will help us in the future."

Mike spent his educational years learning about our world. He earned a B.S. degree in biology (with a minor in computer science) and an M.S. degree in education from Eastern Michigan University. Shortly after graduation he began teaching in Hoxeyville, and has remained there for the past 35 years.

After retiring from his school teaching position, Mike thought a little part-time work every Tuesday morning would be more convenient. "It worked for me," said Mike, "it fit my schedule, offered a little return in my wallet, and was an important job that coordinated with my life-long interest in biology, conservationism, and the like."

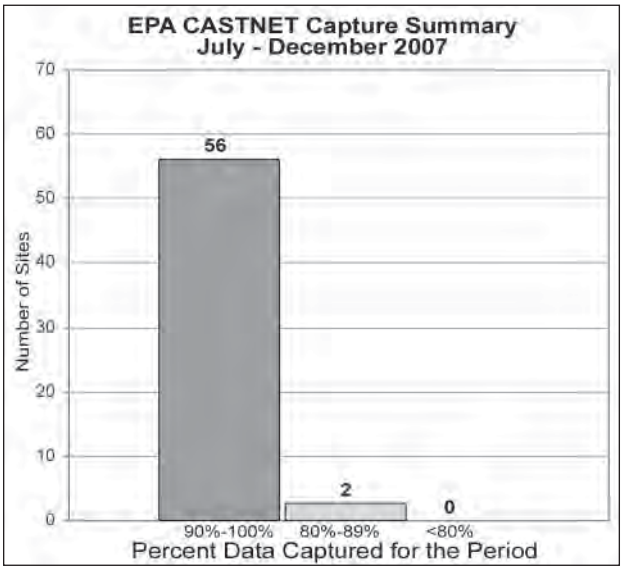
Mike also performs repairs to the station if needed. He's remodeled his home so he felt more than capable of patching a leaky shelter roof. Being a bachelor, Mike does things at his own pace, but lets his dog, a Great Pyrenees, take him for a daily walk.

Mike Reilly enjoys being a CASTNET site operator and takes special interest in supporting his local and regional air quality.

DATA COLLECTION SUMMARY

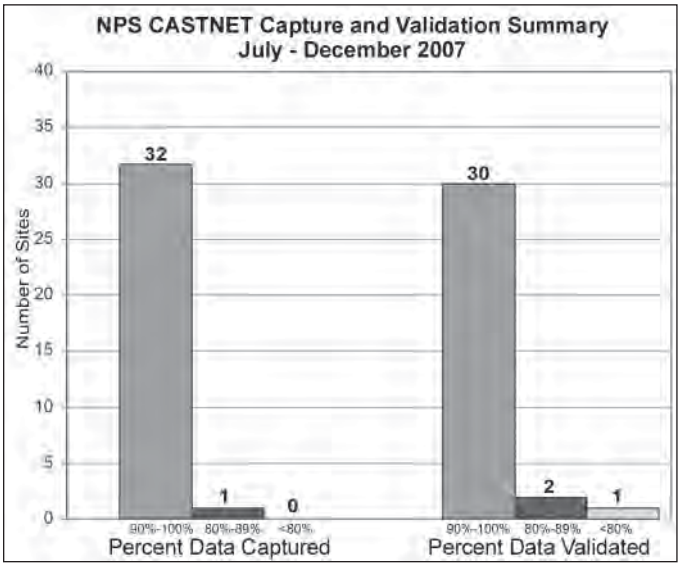
EPA Site Data Capture Summary

Ozone data capture for the EPA CASTNET sites for July through December 2007 is summarized in the graph below. The network achieved an average 99% collection for the period. Data validation statistics for the period will not be available until mid-July 2008.



NPS Data Capture and Validation Summary

Ozone data capture for the NPS CASTNET and GPMP sites for July through December 2007 achieved an average of 98% collection as illustrated in the graph below. Data validation for the same sites and period are also shown. The network achieved an average 95% final validation for the period.



FEATURE ARTICLE

AIRNow Tech provides a wealth of tools to view air quality events

The AIRNow Tech Web site has several useful data query and analysis tools available that can help one understand pollution transport and the influence of special events on the air quality in a park or other location. We will illustrate its use with a case study of a 2006 wildfire in the San Bernardino Mountains just west of Joshua Tree National Park in California. The peak ozone conditions for July 13th are shown in Figure 1 below, obtained from the AIRNow site (*http://www.airnow.gov*). Typical high ozone conditions are seen downwind of Los Angeles, yet in the area of the fire the ozone is low.

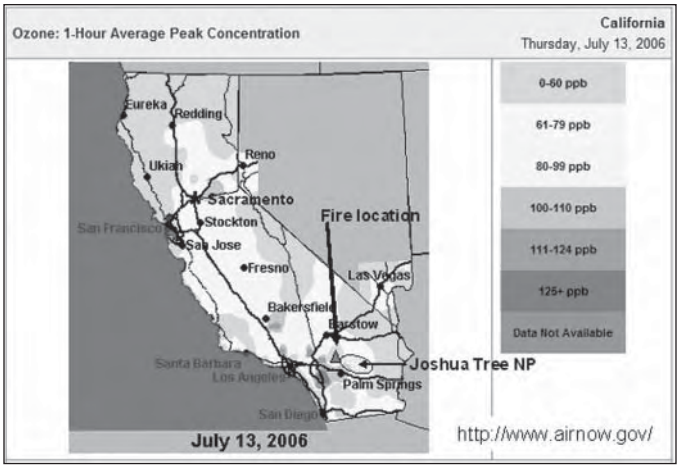


Figure 1. AIRNow map showing San Bernardino Mountains wildfire and peak ozone conditions for July 13, 2006.

We can get the location of the wildfires and smoke on a daily basis from the NOAA Satellite Fire Detection Web site; a 3-day period is shown in Figure 2. At first glance it would appear that the smoke mostly misses Joshua Tree, but does impact the Mojave Preserve and Lake Mead Recreation Area. But what's happening on the ground with the ozone and particulates that would be collected on the filter packs? We can't tell with much detail from these tools.

The AIRNow Tech Web site helps bring the information together. To use the site, you first must request a logon password. This allows one to use the Data tab to query for hourly, 8-hour, or summary ozone or $PM_{2.5}$ data. A sample query and pop-up are shown for Joshua Tree in Figure 3.

On the Navigator tab, one gets a GIS mapping tool where the air quality is mapped by monitoring station using color-coded dots and actual hourly values shown just to the side. To see the hourly data, select the Tools tab and the Hourly Data button, then in the Options tab select ozone. Pick your date and time. Zoom in or out on the map using the magnifying glass tools at the top of the map. On the Layers tab turn on the fire locations and smoke plumes check boxes; turn off things you don't want. Click on Apply Changes to update the map.

Figure 2. Fire and smoke analysis from satellites for the period July 11-13, 2006. http://map.ngdc.noaa.gov/website/firedetects/viewer.htm.

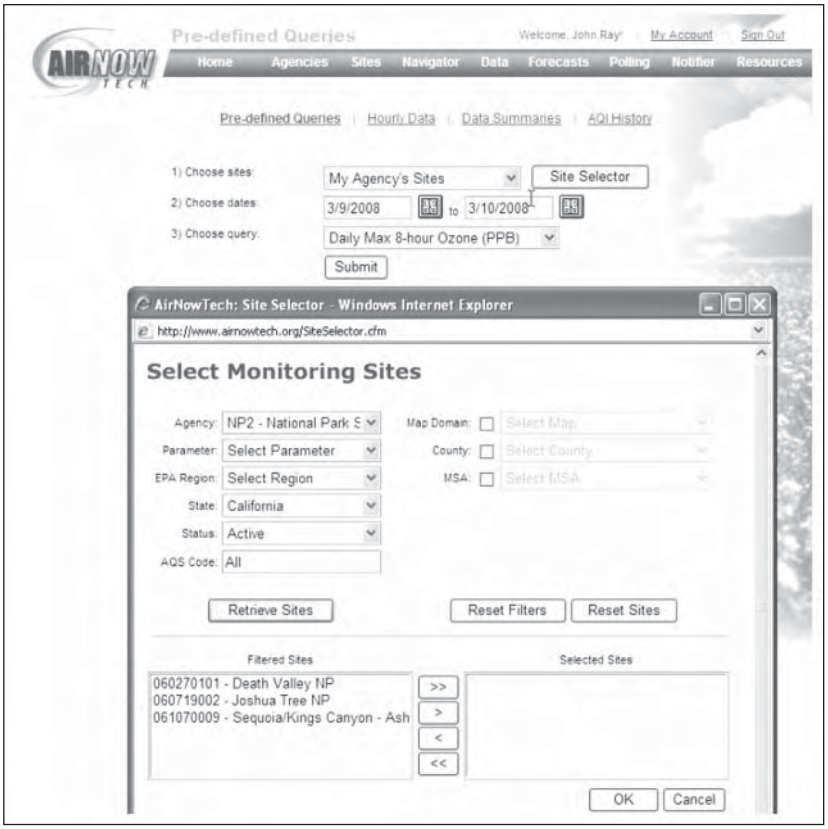


Figure 3. AIRNow Tech data query page.

If you choose July 12, 2006, the map will look like the one below (Figure 4). The wildfires are indicated by red triangles and have gray smoke plumes coming off them and traveling towards the northeast. For the mid-day hours, Joshua Tree avoids the plume from the nearby fire, but is hit by a plume from a smaller fire southwest of the park. One of the tool icons above the map is for air mass trajectories either forward or backwards. Up to three trajectories at different heights can be selected, and any number of trajectory endpoints can be displayed. Four back trajectory endpoints were chosen for the July 12th map. Three of the trajectory endpoints have air coming from the Los Angles area. The Cottonwood Canyon site (reading 50 ppb ozone) has air coming from a slightly more southern route. Thus, from the map we see the extent of the fires, the reach of the plumes, the ozone for the area, and the general flow of the winds.

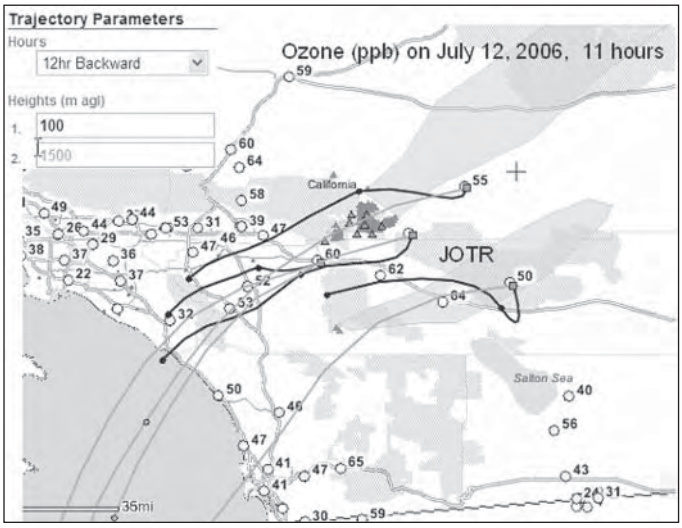


Figure 4. Back trajectory parameters for Joshua Tree National Park, July 12, 2006.

The wildfire is still quite active on July 13th and the smoke covers a broader area that includes the western end of Joshua Tree and the CASTNET air quality station at Black Rock. By mid-afternoon, high ozone concentrations exist around Riverside (high 90's for O3) and just to the east (110 ppb O3 at Banning Pass). Palm Springs is 87 ppb and the Black Rock site reads 77 ppb ozone at 3 pm local time, but ozone will go higher later in the day. The back trajectories show about the same paths as the previous day for the higher elevation (1500 m), but the lower elevation trajectories loop around, which is often an indicator of light winds (Figure 5). That would also help explain the broader smoke plume. By looking at hourly maps over several days and using the trajectory information, we can get a good idea of the pollutant source areas, effects of wildfire, and the gradient of ozone concentrations.

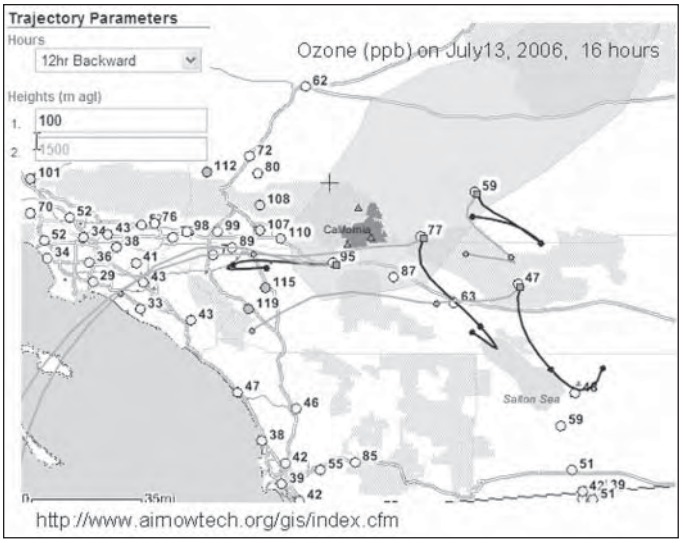


Figure 5. Back trajectory parameters for California, July 13, 2006.

What else can the AIRNow Tech Web site provide? The graphical approach is much easier to use than the EPA Air Quality System (AQS) database query Web pages and access tools. Use the identify tool (round symbol with an "i" in it) to find station information for monitors near your site. Compare ozone values over time and the back trajectories to determine if they are similar or not. Use the Agencies link to identify what parameters are being monitored at nearby sites, or even link to the monitoring agency's Web site. Other useful links are also provided under Resources. Obtaining summary data for the air pollutants monitored near your site provides spatial context. The air quality we measure at CASTNET sites is not isolated; the AIRNow Tech tools allow one to see the broader scale and some of the interactions.

Traffic counter ***continued from page 2....***

The high-tech traffic counter, which was installed at the West Entrance by park staff in September 2007, includes a microwave radar unit commonly used for traffic monitoring. The system sends out microwaves, which are bounced off of traffic (including snowmobiles) and back to the device to count them. The unit was programmed and calibrated to count up to three lanes of incoming and one lane of outgoing traffic.

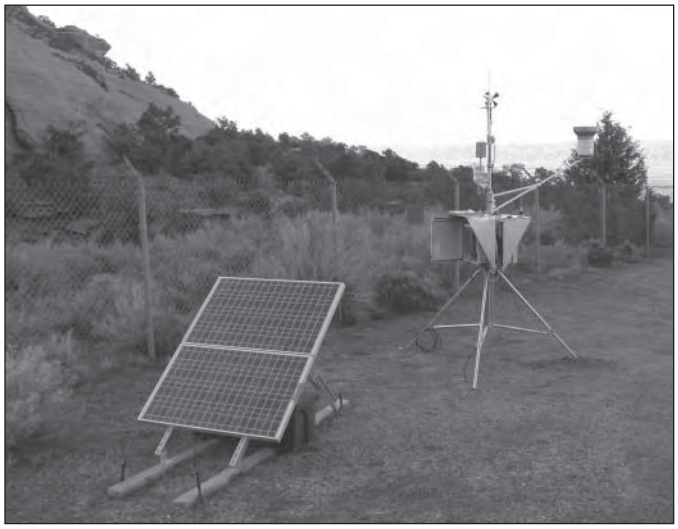
ARS polls the system daily and collects and reports the data to the NPS ARD and the park. This year's test of the system ran from mid-December through mid-March. Information learned from this test will be used to install and calibrate a more permanent unit at the new West Entrance station, which will be completed before the park reopens in the spring.

SHOP TALK

Winter POMS update

Those NPS sites equipped with a portable ozone monitoring system (POMS), note that much happens with the instruments after the monitoring season ends and before they are deployed for field operation the next season. In February, NPS ARD and ARS staff met at the POMS ozone monitor manufacturer's offices, 2B Technologies, Inc., to discuss objectives for the upcoming monitoring season as well as a few internal changes that will be made to the instruments, making their data even more reliable. These discussions are summarized below:

- Noisy lamps are uncommon in the 2B ozone monitor but when they occur they need to be replaced. During the 2007 monitoring season, 8 of 28 instruments were found to have noisy lamps. Because several variations of lamp housings exist in the 2B analyzers, there is no single method for testing and replacing lamps. Lamp tests will be performed on all instruments as they are prepared for the new monitoring season. ARS will also institute program changes so that standard deviation of ozone measurements will be recorded on the site datalogger, to help identify any noisy lamps.
- Nafion tubes are an integral component of ozone monitors and help buffer the relative humidity of the sample air inside the instrument. 2B Technologies has introduced a new, double-parallel Nafion tubing system which ARS will install in all instruments prior to the 2008 monitoring season.
- The most prevalent problem observed in past years was pump failure. To remedy this, a dual-pump system was placed in all instruments last season, but 8 of the 28 instruments exhibited unexpected, frequent switching between pumps. It was discovered that this switching was caused by lack of pressure difference through the instrument's scrubber. A filter/restrictor will be installed in all instruments prior to field installation this year, to prevent unwanted pump switching.
- Each instrument is fully calibrated at ARS' laboratory at the beginning and end of each monitoring season. ARS maintains a database containing calibration and maintenance information, providing a comprehensive historical record of each instrument. These data are used to support data validation and are thoroughly reviewed each year to identify and analyze operational issues. These analyses lead to hardware and procedural changes that improve the operation of the instruments and minimize problems and malfunctions.



POMS operating at Colorado National Monument, Colorado.

So what happens to your 2B ozone monitor after your monitoring season ends and you ship it back to ARS? ARS field specialists log the receipt of each instrument received and perform a thorough physical inspection before performing a post-calibration. After calibration data have been recorded, the photometer tubes and all internal plumbing are cleaned, and pumps and scrubbers are replaced. The instrument is shipped to 2B Technologies for additional maintenance if necessary, then carefully stored at ARS facilities until the spring thaw. While the instruments are receiving this care, NPS ARD and ARS data analysts and field specialists meet to review all data from the network for the season. The 2007 monitoring season resulted in 99% data collection with 91% of the data being valid. Additional meetings among NPS ARD, ARS, and 2B Technologies staff take place to address and resolve systematic, instrument-related operational issues. The NPS ARD also decides which sites will continue POMS monitoring during the coming year, and which systems will transfer to newly selected locations.

When the new monitoring season approaches, ARS staff take the instruments out of storage and give them the once-over again. A complete pre-season multipoint calibration is made, the instruments are packed in their shipping cases, and off they go to field monitoring locations for installation.

Monitoring Site Assistance:

NPS CASTNET sites: contact Air Resource Specialists
telephone: 1-800/344-5423 (Mountain Time)

EPA CASTNET sites: contact MACTEC
telephone: 1-888/224-5663 ext. 6629 and/or 6621
(Eastern Time)

OPERATOR'S TOOLBOX

Precipitation checks

NPS-sponsored CASTNET site operators will soon receive instructions and a package containing equipment to perform a monthly precipitation gauge calibration check. To maintain the accuracy of precipitation data, the NPS ARD is requesting more frequent volumetric checks of the system calibration. Currently, the site operator is asked to perform a 10-tip check to verify mechanical recording, but precipitation sensor accuracy is only performed during twice-annual visits of the field specialist. NPS operators will soon begin performing monthly accuracy checks to verify that precipitation amounts are being accurately recorded by the datalogger.

Sites receiving the calibration kit will also see a new checklist instruction screen on their DataView system. The monthly check will be easy to perform, and takes less than a half hour to complete. To perform the precipitation sensor check, begin by taking the corresponding datalogger channel offline. Then follow these simple steps:

- Inspect the precipitation gauge collection funnel for snow or debris and remove the screen (see Figure 1). Unmelted snow indicates a failure of the heating system. Record significant findings in the station logbook.
- Fill the graduated cylinder with water and place the black calibration funnel into the precipitation gauge (see Figure 2). The calibration kit consists of a plastic graduated cylinder and a black calibration funnel. The cylinder has a pre-drilled hole that will allow the cylinder to fill to a precise level (480ml). When the water has finished dripping from this hole, place your thumb over the hole to prevent spillage, and carry it to your precipitation gauge.
- Pour the contents of the graduated cylinder into the black calibration funnel (see Figure 3). Allow the water to drain completely from the funnel. This will take approximately 25 minutes.
- View the datalogger precipitation values for this hour and record the most recent value on the DataView checklist. DataView will indicate whether or not the measured value is within limits.
- Restore the appropriate datalogger channels.

Please call ARS field specialists with questions concerning these procedures. These monthly calibration checks will further ensure the accuracy of collected data at all monitoring sites. All NPS monitoring stations will be receiving the calibration kit and new procedures this spring.

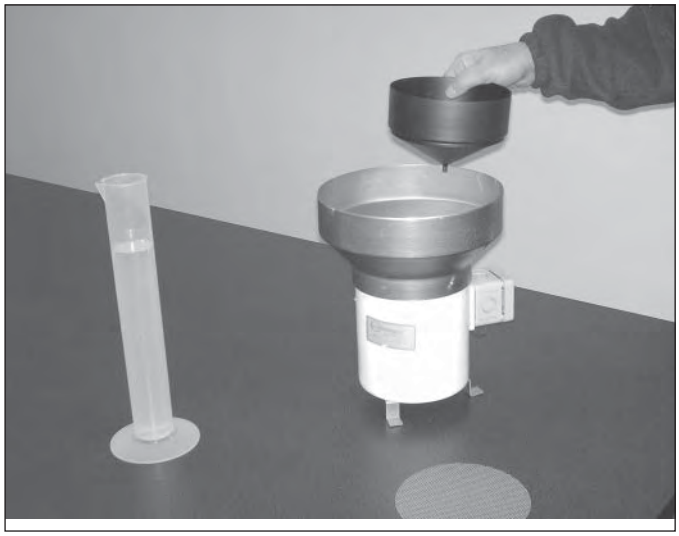


Figure 1. Remove the debris screen from the precipitation bucket.

Figure 2. Place the black, calibration funnel into the bucket. Fill the graduated cylinder with water.

Figure 3. Pour the cylinder water into the bucket and wait for it to drain completely (approximately 25 minutes). View datalogger and record results.

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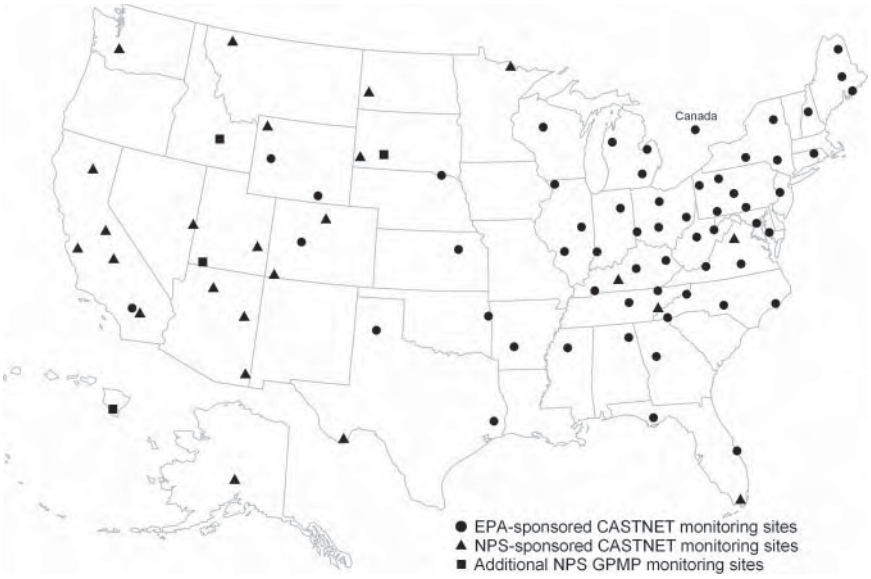
CASTNET Monitoring Program Locations



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(http://www.nature.nps.gov/air/monitoring/index.cfm)