



the **Rain** events

# swamped?

## **Bomb Cyclone + Atmospheric River = a lot of rain**

Not every time it rains does it pour, but when it pours, watch out! As we just experienced with the recent storms which dumped a deluge of water on California over the New Year, this kind of storm water is a whole different ball game. Freeways flooded and were shut down, the power was out for long stretches of time for some people, huge trees which have been standing for decades fell in the storm, streets and houses and parks were flooded with an obscene amount of water, not to mention the impacts on human life and even the tragic loss of life. In this month’s edition of **The Rain Events**, we’re going to take a look at what an atmospheric river means for your industrial facility.

**What is an atmospheric river?** An atmospheric river describes a narrow corridor of concentrated moisture in the atmosphere which can result in extreme precipitation and flooding. For those of us on the West Coast, atmospheric rivers have their origins in the warm tropical waters surrounding Hawaii, giving rise to an older term you may have heard: “Pineapple Express.” The warm oceans generate considerable amounts of

evaporation, which transforms into a long narrow band of concentrated moisture – usually only a few hundred miles wide, but thousands of miles long. When this band of moisture reaches landfall, it produces significant precipitation – meteorologists say up to half of California’s annual rainfall comes from atmospheric rivers. But not all atmospheric rivers are disastrous; in many cases they can help alleviate the drought

climates in California. In 2019, the Center for Western Weather and Water Extremes released a five-level scale to categorize these atmospheric river events, similar to hurricane categories. The recent New Year’s Eve atmospheric river was categorized as a Level 3 or 4 for portions of the State. It was also called a “bomb cyclone”. This weather phenomenon, also called “bombogenesis”, is a storm that undergoes rapid strengthening.

## **The science behind atmospheric rivers**

An atmospheric river (AR) is a flowing column of condensed water vapor in the atmosphere responsible for producing significant levels of rain and snow, especially in the Western United States. When ARs move inland and sweep over the mountains, the water vapor rises and cools to create heavy precipitation. Though many ARs are weak systems that simply provide beneficial rain or snow, some of the larger, more powerful ARs can create extreme rainfall and floods capable of disrupting travel, inducing mudslides and causing catastrophic damage to life and property. Visit [www.research.noaa.gov](http://www.research.noaa.gov) to learn more.

A strong AR transports an amount of water vapor roughly equivalent to 7.5–15 times the average flow of water at the mouth of the Mississippi River.

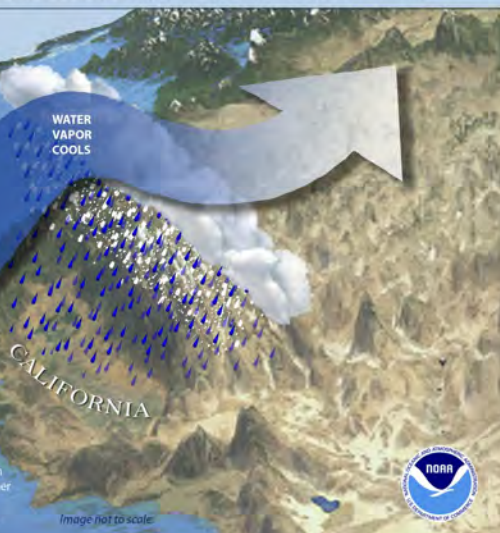
ARs are a primary feature in the entire global water cycle and are tied closely to both water supply and flood risks, particularly in the Western U.S.

On average, about 30-50% of annual precipitation on the West Coast occurs in just a few AR events and contributes to the water supply — and flooding risk.

ARs move with the weather and are present somewhere on Earth at any given time.

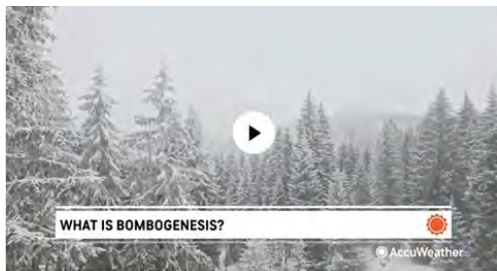
ARs are approximately 250–375 miles wide on average.

Scientists’ improved understanding of ARs has come from roughly a decade of scientific studies that use observations from satellites, radar and aircraft as well as the latest numerical weather models. More studies are underway, including a 2015 scientific mission that added data from instruments aboard a NOAA ship.



## **What to do when an atmospheric river hits your facility**

As experienced on New Year’s Eve, atmospheric rivers can have a pretty drastic impact on your site. Freeways were flooded and shut down, roads were flooding, trees and powerlines were coming down in vast quantities due to the saturated soils and high winds, and sadly even fatalities occurred from fast rising flood waters and hydroplaning vehicles. Intense rain events like these are not something to mess with – especially where



people’s lives are involved – like at your facility! One of the best safety things your site can implement during the wet season is keeping a watchful eye on forecasts. If unsafe conditions appear to be moving in, altering protocols and communicating with workers on site about safety, what the Permit says about severe storms and hazardous conditions is the first step in protecting your facility and crew from an atmospheric river. Heavy rainfall can cause deep gullies in hillsides, mudslides, unstable slopes, widespread flooding, mucky ground, heavy sheet flow, and more. As mentioned above, atmospheric rivers come in all types of sizes and durations – from beneficial to hazardous. The amount of damage and BMP failure at your facility depends on a variety of factors – how wet is the soil? How much rain is expected, over what period of time? Does your facility tend to retain water thereby causing flooding during severe storms? These storms can produce anywhere from minor runoff, to something that looks like this...



Keeping an eye on the forecast will help you be prepared for what’s coming and get BMPs in place before the rain begins. Make sure perimeter controls are properly installed and keyed in so that sheet flow doesn’t undermine them. Clean out drain inlets to prepare for heavy flows. Make sure materials are under cover and won’t leak in the case of heavy rain or flooding. Ensure that dumpsters are properly covered so they don’t become filled with water or have trash scattered by the wind. Make sure you have your sampling kit



prepared and your sampling team is aware of safety protocols. Move equipment and materials to higher ground and away from areas that may flood or have high flow. Position and secure port-a-potties so they will not be inundated or blow over.

**The Safety Clause** –Due to the high amounts of precipitation and miles per hour of wind which accompany an atmospheric river, there are some considerably unsafe conditions which would trigger the safety clause of the Permit. Flooding streets and even freeways, rapidly rising water, saturated soils, falling trees, downed power lines, unstable slopes, and visibility issues are all unsafe conditions. Never put yourself in a hazardous situation where you could get trapped. Talk with your supervisors if the facility is unsafe or if you feel uncomfortable continuing with work, inspections, or monitoring. Document the facility conditions and weather conditions as proof of why monitoring couldn’t be done. According to the Industrial General Permit, dischargers are not required to conduct visual observation during

dangerous weather conditions such as flooding and electrical storms. *“In the event that samples are not collected, or visual observations are not conducted in accordance with Section XI.B.5 due to these exceptions, an explanation shall be included in the Annual Report.”* **If you feel it is not safe to inspect or sample, follow your instincts!** But, adequately report and document why you didn’t conduct the visual observation or sampling—don’t put yourself in a dangerous situation where you could get stuck or put in harm’s way. Don’t risk your safety or the safety of others for the sake of getting the sample.

Check out the above videos for a refresher course on safety and sampling procedures!

## The Rain Events

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# *Storm Water Contest...*

Each month, we invite our readers to participate in a contest to test their knowledge of the Industrial General Permit and show their storm water compliance program. We enter all submittals to our monthly newsletter question into a drawing and one person is selected at random to receive a \$25 gift card. Last month's contest question was:

*What is your best SWPPP map making tip?*

Congratulations to Katy who replied "My best SWPPP map making tip is making sure that if Google Earth imagery is used, that it is up-to-date! It helps to visit the facility and verify where everything is located on site because sometimes Google Earth hasn't taken new images since things have moved around which may make it confusing when trying to place BMPs or identify storage locations on a map." Katy, we hope you enjoy some delicious smoothies to kick off your New Year!

## *...This Month's Contest*

*How much rain did your facility receive during the recent rain events?*

We need industrial storm water sleuths to help us with this month's question. Submit your answers by Friday, February 10th. Email your answer to [jteravskis@wgr-sw.com](mailto:jteravskis@wgr-sw.com). One winner will be selected by a random drawing to receive a \$25 gift card to Chick-fil-A.

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