xylem

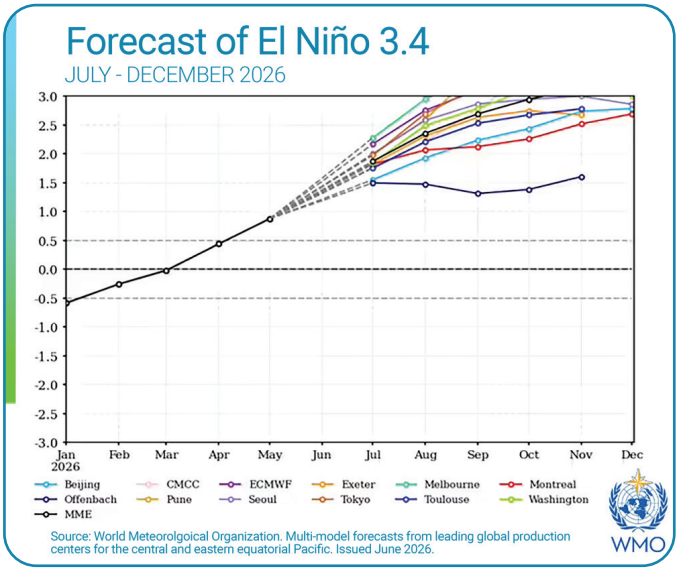
Case Study
Environmental

Preparing Water Monitoring Programs for El Niño Extremes

A practical look at how flexible flow and water-quality monitoring can help agencies prepare for a season of higher uncertainty.

Current forecast context

As of late July 2026, NOAA has declared El Niño conditions and forecasts strengthening through the second half of the year, with a 63% chance of a very strong El Niño during November 2026 through January 2027. That does not mean every region will experience the same outcome, or that “very strong” ocean conditions will translate into equally strong local impacts. It does mean water professionals have a useful early warning: this is a good time to review whether monitoring programs are ready for a wider range of conditions.



Why El Niño changes the monitoring conversation

El Niño shifts the odds of certain climate patterns, but it does not write one script for every watershed. In some regions, it may increase the risk of intense storms, high flows, channel change, and sediment movement. In others, it may contribute to drought, low flows, higher water temperatures, and water-supply stress. Some systems may even experience both ends of the spectrum in a

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short period: a dry season that increases wildfire and water-quality risk, followed by heavy rainfall that mobilizes ash, sediment, and nutrients into rivers and reservoirs.

For monitoring teams, the practical question is not simply, “Will this be a wet year or a dry year?” The better question is, “Can our network capture rapid change, difficult measurement conditions, and water-quality response with enough confidence to support decisions?”

Prepare before the hydrograph moves

The most useful preparation often happens before the first major storm arrives or the first serious low-flow period takes hold. Once field conditions begin changing quickly, there is less time to troubleshoot equipment, adjust measurement plans, or identify safer alternatives. A little preparation ahead of the season can make a meaningful difference in data quality, field efficiency, and crew safety.

Readiness should include both the instrument and the measurement plan. Instruments should be current, bench-tested, and ready to deploy, with spare accessories available where possible. Field teams should also review high- and low-flow portions of rating curves, identify sites that may become unsafe or inaccessible, and establish alternate measurement methods before they are needed. For acoustic measurements, reviewing advanced configuration guidance for instruments such as the

SonTek-M9 and RS5 can help users make better decisions when sediment, turbulence, moving-bed conditions, or unusual site hydraulics complicate a measurement. For water quality deployments, preseason calibration, maintenance, and sensor checks are equally important, especially when monitoring short-duration runoff events or rapidly changing low-flow conditions.

The SonTek-RS5 and Surfbee collect discharge data during a flood event in New Zealand. During El Niño, stronger westerly winds can bring wetter conditions to western regions while increasing hydrologic variability across the country—reinforcing the need for safe, adaptable flow-monitoring methods. Photo credit: Graham Andrew, ENVCO.

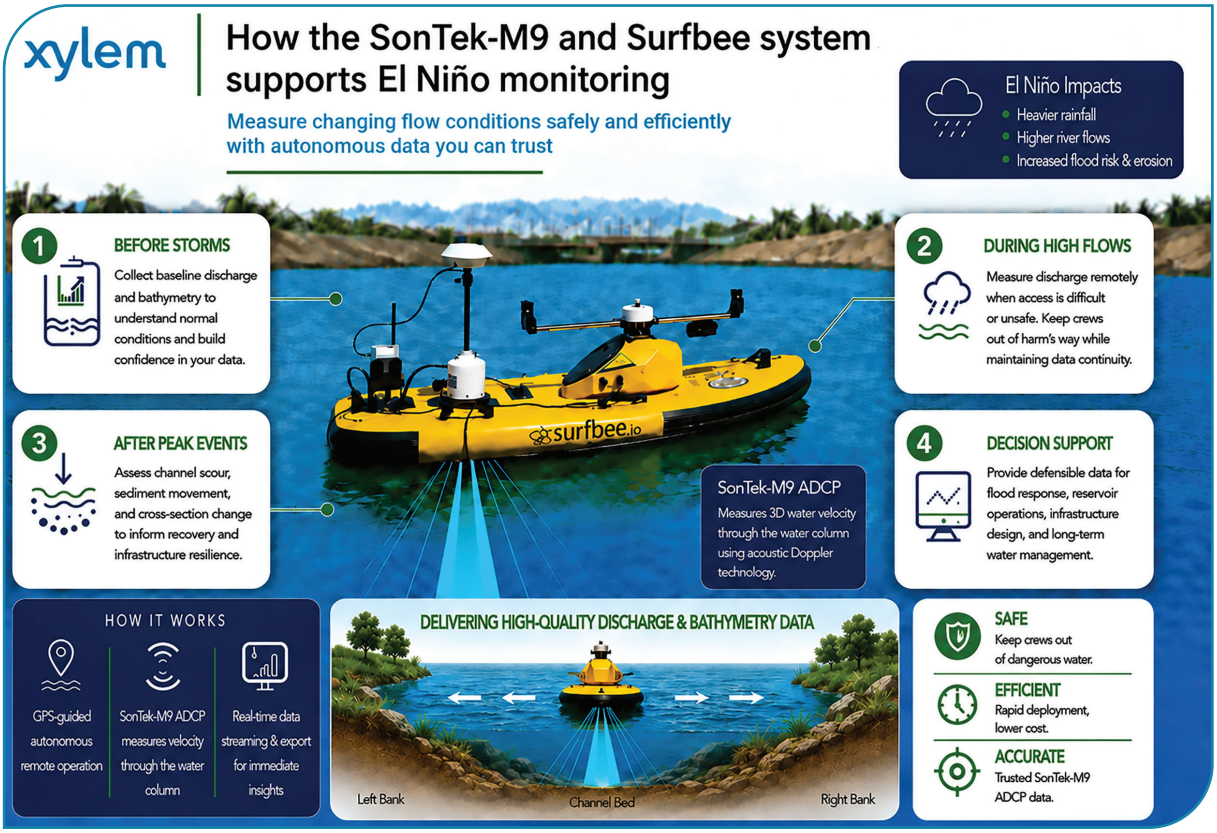
A concise preseason check should include:

- Bench test instruments, radios, batteries, cables, mounts, telemetry, and data storage.
- Confirm software and firmware are up to date.
- Collect baseline measurements before major wet or dry conditions develop.
- Review rating curves for poorly defined high-flow or low-flow ranges.
- Prepare backup methods, spare accessories, and safe alternate measurement locations.
- Calibrate and maintain water-quality sensors before event-driven deployments.

When the challenge is high flow

High-flow events can stress every part of a monitoring program. Discharge can change quickly, access may become unsafe, channels may scour or fill, and high sediment or debris can make otherwise routine measurements more difficult. This is where flexibility matters. A single method may not be enough at every site or during every part of the event.

Portable ADCPs such as the SonTek-M9 and RS5 can support discharge measurements during rapidly changing conditions, rating-curve verification, and post-event assessment. The M9 is especially valuable when teams need full velocity profiles, discharge, depth, and channel geometry across a river section, including follow-up bathymetric work where scour or deposition is suspected. The RS5 can be useful where portability, fast deployment, and smaller-site logistics are important.



In difficult acoustic conditions, teams may need to use advanced methods, adjust measurement settings, or combine multiple approaches. Flooding often brings high sediment and turbidity. If sediment load or site conditions exceed what an acoustic method can reliably handle, a non-contact option such as the SonTek-QC4 may provide an important complementary path for continuous observation and safer event monitoring.

The QC4 can help at sites that become unsafe or inaccessible during high flows by supporting non-contact monitoring of changing surface conditions, water level, and velocity information. It should be positioned as part of a defensible monitoring strategy rather than a blanket replacement for in-water reference measurements. Periodic ADCP measurements, site validation, and review of changing hydraulic conditions remain important, especially before and after large events.

Continuous instruments also belong in the high-flow discussion. Side-looking systems such as the SonTek-SL can be well suited for higher-flow environments where near-bottom sediment transport may be common, while the SonTek-IQ can support applications with quickly changing stage and shallow flows in canals or managed systems.

When the challenge is drought or low flow

Low-flow monitoring can look less dramatic than flood work, but the data can be just as consequential. During drought, small measurement errors can have outsized impacts on water allocation, ecological flow decisions, irrigation operations, and compliance reporting. Details such as transducer depth, edge distances, cross-section selection, and velocity distribution become even more important when there is less water to measure.

The best method is often the one that measures the most water in a practical, defensible way. Where site conditions allow, an ADCP such as the RS5 can provide a more complete velocity profile than a point measurement alone. In very shallow streams or wading conditions, the FlowTracker2 remains an important tool for low-flow discharge measurements. Continuous systems such as the SL or IQ can help managed rivers, canals, and irrigation networks track gradual declines, changing stage, and operational flow needs.

Low-flow periods also increase the need for accuracy in agricultural irrigation and hydroelectric power applications. When every cubic foot per second matters, preparation, method selection, and quality control become part of the decision-making infrastructure, not just field procedure.

The SonTek-IQ supports continuous flow monitoring in an irrigation canal during dry conditions in Yuma, Arizona. Drought planning is not only about measuring less water—it is about maintaining reliable data as flows decline, operational demands shift, and every available supply becomes more important.

Water quality often changes with the flow

El Niño-related preparation should not stop at discharge. Wet and dry extremes can change water quality quickly, sometimes faster than traditional sampling programs can capture. Heavy rainfall after dry periods may create first-flush effects, mobilizing sediment, nutrients, ash, contaminants, and organic matter. Drought can concentrate dissolved constituents, increase conductivity or salinity, elevate water temperature, reduce dissolved oxygen, and increase the risk of algal growth or reservoir stratification.

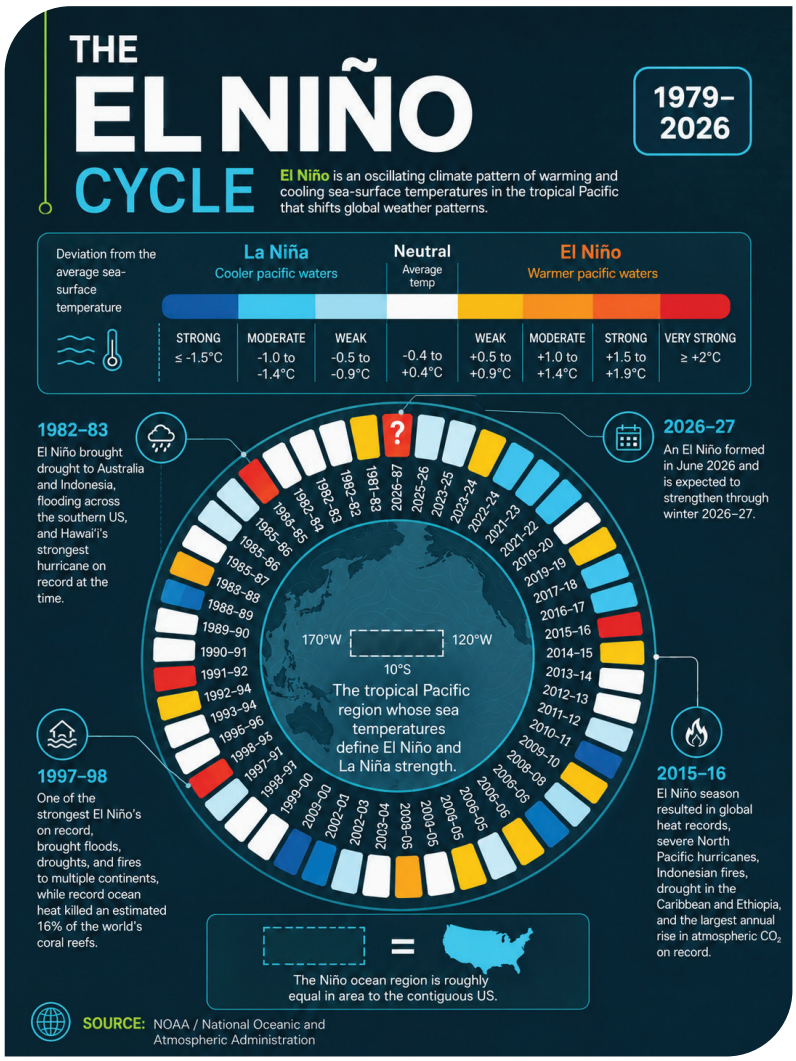
YSI instrumentation can help connect these physical and chemical changes to the hydrologic story. EXO multiparameter sondes can support continuous monitoring of parameters such as temperature, conductivity, dissolved oxygen, pH, turbidity, chlorophyll, and other indicators depending on the application. ProDSS handheld instruments can support field verification, spot checks, and troubleshooting. CastAway-CTD profiles may be useful in reservoirs, estuaries, or other locations where conductivity, temperature, and depth help explain stratification or salinity changes.

The strongest story often comes from combining flow and water-quality data. Turbidity has more meaning when it is interpreted alongside discharge. A concentration change becomes more operationally useful when paired with flow to understand load. Salinity intrusion, reservoir inflow quality, post-fire runoff, and sediment transport all become clearer when water quantity and water quality are viewed together.

Build a layered monitoring strategy

No single instrument or method can address every condition associated with an El Niño season. A more resilient approach combines continuous monitoring, field verification, and targeted survey or post-event assessment. Continuous flow and water quality systems can help identify trends and capture rapid changes, while portable instruments and reference measurements provide important checks on ratings, remote systems, and operational data. After a major event—or during prolonged low-flow conditions—additional surveys can help teams evaluate changes in channel geometry, sediment, discharge, and water quality.

The value of this layered approach extends beyond collecting more data. It strengthens readiness. When monitoring teams prepare their equipment, train personnel, review field methods, and understand where each technology fits, they are better positioned to respond safely and produce data that can be confidently supported and defended.



Preparing for What Comes Next

El Niño may increase the odds of hydrologic extremes, but the monitoring challenge extends beyond any single forecast. Some agencies may be preparing for high flows and sediment, while others are watching drought, low velocity, salinity, or water-temperature stress. Many will need to respond to rapid shifts between conditions. Flexible, defensible monitoring gives water professionals a stronger foundation for sound decisions when the season brings unexpected and dramatic change. ***SonTek*** *and* ***YSI*** *technology experts are also available to help evaluate site conditions, monitoring priorities, and the measurement options best suited for the season ahead.*

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