

# ULTRASONIC DISTANCE WATER LEVEL SENSOR



**Sustainable Southwest Beef**  
 Knowledge and tools for ranch and rangeland resilience



## What is Precision Ranching?

Precision ranching involves the use of smart sensors for automated monitoring of livestock, stock tanks and drinkers, rainfall, and forage growth. Precision systems are fairly common in intensive animal agriculture but their use in extensive ranching operations is still in its infancy. As sensor technologies, wireless data transmission networks, and sophisticated data analytics tools become more common and less expensive, new and exciting opportunities to develop robust and relatively low cost Precision Ranching systems are rapidly emerging. Long-range wide area networks (LoRaWAN) are systems that use long-range radio frequency communication to transmit small packets of data from several moving or stationary sensors in real-time. The method is among less expensive options to collect and transmit data from large areas of rangeland and are highly suitable for use in remote locations and on extensive ranching systems.

## Benefits of Water Level Sensor

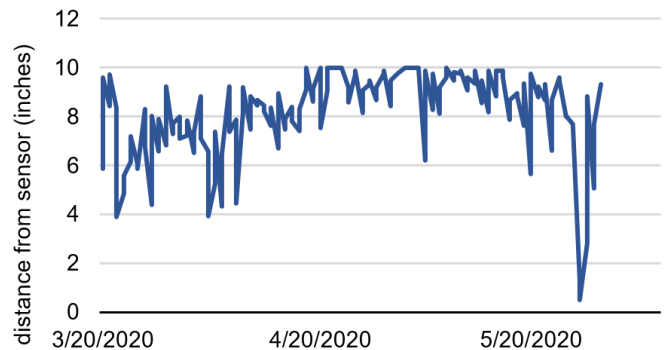
A well calibrated user-friendly precision ranching system could aid ranchers in making rapid decisions to monitor and address water supply issues, using real-time data. A precision ranching system could also help reduce the financial and environmental costs of ranching and increase the operational efficiency of rangeland cow-calf systems. For example, rough calculations for the USDA-ARS Jornada Experimental Range, a 300-section ranch in southern New Mexico, suggest that wireless sensors monitoring water levels in troughs could save up to 480 hours of driving time and up to 960 gallons of fuel per year – which would translate into cost savings of approximately \$10,000 annually (not including vehicle wear and tear and maintenance). The use of water sensors in this case could make this ranching operation more environmentally friendly by avoiding approximately 8.5 metric tons of CO2 emissions per year, and would free up valuable time that a rancher could use to pursue other endeavors.



Ultrasonic water level sensor mounted on stock tank

## Common Applications

- Trough and tank levels
- Snow levels
- Stream/ running water levels
- Flood monitoring



Real-time stock tank water level over three month window. Note that water levels never dropped below 10 inches from the sensor.



For more information, visit:  
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# FAQs

## How does it all work?

Ultrasonic water level sensors are installed on drinking tanks to monitor the water levels in real time. The sensors use LoRaWAN (radio frequency communication) to send data long-range to receiver stations placed strategically across the ranch to maximize coverage. Each receiver station then uses WiFi or cell-service to send the data from the sensors to a centralized server and dashboard that processes and prepares the data to be viewed in real time. Once the system is operational a producer can open an app on their phone or computer and check the current water level in every stock tank with a sensor installed. The system could also be customized with predefined thresholds to proactively alert the user to water supply issues in tanks.

## So it does need internet/cell service?

While the sensors don't need internet/cell-service to send data to the receiver stations, the receiver stations do need internet, WiFi, or cell-service to send data to the network server before it's accessible on the dashboard app. The water-level sensor doesn't need to be in an area of internet or cell service, but the receiver station does.

## What infrastructure do I need?

You will need: 1) ultrasonic water level sensor(s); 2) one or more solar powered receiver/transmission stations; 3) a cloud-based network server (either cellular, Ethernet, satellite, or Wi-Fi); and 4) either a cell phone or internet-enabled computer to access the transmitted data on the accompanying dashboard application. Components 2, 3, and 4 are the same infrastructure needed to support other complimentary sensors like GPS collars and smart rain gauges, and one system can support all three simultaneously.

## How many receiver stations would I need?

It really depends on the ranch size and terrain. Generally somewhere in the neighborhood of 3-5 strategically placed stations. Current receiver station designs being tested include a trailer mounted design and a tripod mounted design that each allow the receivers to be moved around to find the best coverage for your specific needs.

## How much does it cost?

As with any new technology, the costs are changing all the time as the market grows. The current\* figures are: ultrasonic water level sensor: \$670/unit; solar-powered portable receiver station: \$2,600 to \$5,000 each; data storage and processing subscription: one payment of \$2,300 for up to 7 receiver stations and 200 sensors, plus an annual fee of \$290 per receiver station. Sensors serviced can be mix & match (see above note on infrastructure).

\*At the time of document preparation: August 2022.

## Photos of typical receiver stations (also called gateways):

