



# Eye in the Sky

Drones can be a useful tool for ranchers.

by Heather Smith Thomas

**A**n “eye in the sky” can help when you need to locate missing cattle, or check a fence or water source in a big pasture and don’t have time to drive out there. Most ranchers can’t afford to hire a helicopter to look for cattle, but they might consider having their own personal “bird” to look at everything from water troughs to activity in the calving pasture.

Unmanned aircraft systems (UAS), commonly called unmanned aerial vehicles (UAVs) or drones, have many applications, including law enforcement, land surveillance, wildlife tracking, search and rescue, disaster response, border patrol, photography, and agriculture. A growing number of farmers and ranchers are utilizing drones with on-board cameras that take high-quality photos and video for many monitoring purposes, as well as for advertising and marketing.

## Many uses

John Walker, professor and director at the San Angelo AgriLife Research and Extension

Center in San Angelo, Texas, says most ranchers in his area have sheep and goats, as well as cattle. When trapping predators with snares along some of the fences, they can fly a drone down the trap line to see if there is anything snared, without having to drive to the pasture to look.

Drones can be useful to locate cattle in big pastures, revealing where to start gathering. John Church, associate professor in the Natural Resource Sciences Department at Thompson Rivers University at Kamloops, B.C., Canada, says that in vast range country, some ranchers hire helicopters to find lost cattle.

“It’s expensive, at \$1,000 to \$1,500 an hour,” Church says. “You could buy a drone for that amount and fly the area many times.”

Church is also the BC Regional Innovation Chair in cattle industry sustainability. His

job is to bring new techniques and new technology to the table in an effort to make ranching more sustainable. He first started

thinking about drones five years ago when he watched children playing with drones in a park and realized that a person can see what that camera is seeing from up in the air.

“This is a great way to extend your vision — and a huge benefit to cattle ranchers,” he says.

Using drones could be a great tool if it is affordable and useful for the rancher to augment day-to-day operation.

“If you want to look at what’s over the ridge or in a group of trees, or some other place you can’t access readily or immediately, this is a nice tool,” Church says. “We did tests, out of curiosity, to see how fast you can get across a pasture to look at a water trough, for



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instance. We had a person on a quad versus one of my students using a drone. There is no comparison; the drone was so much quicker. It can save time and labor in simple things like checking water troughs or inspecting fencelines,” he says.

Before you turn cattle out on summer pastures, you could send a drone around the fences to make sure they haven’t incurred any damage due to weather or wildlife and to be sure that gates are still shut.

“You can pre-program drones to run a route, such as checking a fence,” says Walker.

Church explains: “In the past, it took a lot of time to check fences, and when you find a problem, you need to have the right tools and materials to fix it. If you already checked the fence with a drone, you could go right to the

problem and have the proper things for that repair.”

Drones can also be handy when checking water troughs and gates in remote locations.

With a drone, you can check pastures more often or more closely to know if there is something unusual, like a break in the fence or the neighbor’s bull in with your cows. It augments a rancher’s ability to monitor many things on the ranch.

Some producers use a drone to herd cattle out of riparian areas on public lands or to round up or move cattle.

“It is very effective for that purpose; you just lower the drone to where the cattle feel the prop wash, and they move,” says Church. “I don’t like using it that way, however. I’ve found that if you move cows with drones

they become afraid of it, and as soon as they hear it they start running from it. If you just use drones to observe cattle, however, they get used to it and it doesn’t bother them,” he says.

Church says he can get close without alarming cattle to get a good view of them.

“I feel it is much better to be able to use drones as an observational tool, rather than as a flying border collie,” he says, “but each producer can figure out how they want to use this tool.”

If you want to use a drone for checking/monitoring cattle, take a little time to get them used to it, advises Church.

“The first time we fly over they may look up at it and might move away a little, but if you don’t herd them with it and nothing happens, they quickly accept it,” he explains.

## Purchasing and learning to use a drone

A Chinese company called DJI makes most of the high-quality drones on the market today. John Walker, professor and director at the San Angelo AgriLife Research and Extension Center in San Angelo, Texas, advises choosing a higher-end model due to quick technology turnover — you don’t want your new drone to be out-of-date too soon. Expect to pay \$1,000-\$1,400 for the machine, plus batteries, a case and accessories, for an additional \$500.

Drones can be programmed to track a specified route using software. Two programs, Drone Deploy and another UGCS Mapper, can be downloaded onto your computer to plan a route for the drone. Planning and downloading a route eliminates the need to concentrate on two different tasks at the same time — flying the drone and watching the screen, Walker says.

Drone price increases with camera quality, he adds, with prices up to \$10,000-\$20,000 for some models.

Walker recommends buying a cheap drone to start with when learning to fly.

“You can build up skill and confidence and then get a better one,” Walker explains. “With the standard drone, the left joystick controls altitude and direction the drone is facing (yaw). The right one controls speed and moving left or right (roll). It takes a little practice to get good at flying it.”

It’s a great tool for younger ranchers who are already at home with technology, he says, but drone use is not limited to them.

“My uncle is in his 70s and now flying a drone and enjoying it,” he says. “It’s not only for young people. It takes some practice to learn how to use it, but there are many resources available now that didn’t exist five years ago. In the near future, we’ll see better controllers, and better antennae

on the ground that will connect you better to the drone, so you can fly farther. With those you’ll be able to get a drone out at least 6 miles with a solid connection, providing a very large search window. DJI is coming out with something they are calling the Tractenna, but you have to make sure you can legally use these longer-range drones.”

Always check the regulations in your own state or province.

“The biggest actual limitation when using a drone is battery life,” says Walker. “The upper end is about 30 minutes. In my experience, wind cuts that down; you might only get about 80% of the advertised battery life. The faster you go, the more battery it takes, compared with flying slowly.”

Even if battery life is only about 20 minutes, you can see a lot in 20 minutes.

“A bigger battery would be more weight. You’d have to use it a lot to need a bigger battery,” says Lewis.



PHOTO COURTESY OF JOHN CHURCH





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PHOTOS COURTESY OF JOHN WALKER

“The next day, they realize it won’t hurt them. The noise is just a continuous hum and doesn’t startle them. The larger drones actually disturb cattle less because they don’t have the higher-pitched noise of a smaller one.”

Roy Lewis, part owner of family-operated Lewis Farms near Edmonton, Alta., Canada, and technical services veterinarian for Merck Animal Health’s cattle business unit, has used a drone to make promotional videos of bulls produced on the farm, and recently purchased a drone.

“There are some bigger commercial drones that can do quite a bit more and carry more weight, but this small one serves our purposes for now,” he says. “It is very useful for checking cattle and finding missing cattle.”

His niece, Jordan Buba, used the drone this spring, calving out cows on pasture.

“Our cows that calve in winter are in smaller pens where we can see them easily, but the spring-calving cows are out on 80 acres. They are a little more aloof; they want to be off by themselves when they calve on the range versus in close proximity to people, and the drone allows us to observe them a little closer,” says Lewis.

“You can get goggles that show you what the drone is ‘seeing’ but Jordan just looks at the image on her cell phone,” Lewis explains. “Our cows are freeze-branded for individual ID, which enables us to see the number from a distance,” he says.

This is helpful when trying to determine the identity of an animal that is sick, lame or having a calving problem.

Church uses drones to make teaching videos for his students and for ranchers. It’s a good teaching tool for explaining how to move livestock using low-stress handling techniques.

“I am most interested in using a drone for

## Benefits for game ranchers

“Here in Texas, hunting income is important for many ranches, and a lot of people do deer surveys with helicopters,” says John Walker, professor and director at the San Angelo AgriLife Research and Extension Center in San Angelo, Texas. “You can do the same with a drone less expensively. You can send your drone out on a pattern, record all the video from the flight, and then have a permanent record. You can watch that video and do a deer survey.”

A helicopter makes enough noise to scare deer out of the brush, and you’d be able to see most of them.

“By contrast the drone might not bother them as much, and you might miss a few in the brush. The nice thing about the video, however, if you think there’s a deer there, you can pause the video and look at it closely. If you want to count the points on a buck and estimate the Boone and Crockett on him, you can see that.”

disease detection, or for monitoring calving, to know if something is wrong,” says Lewis. “In a group of cattle that’s moving, you can whip around to the other side of the group or watch an individual animal in the group; it’s much easier to do that from above.”

You can fly it high and monitor the whole herd or drop down and closely monitor one animal, to look at clinical signs and get

identification. “The drone can zip from one side of the herd to another, so it is easy to follow an individual,” he says.

Using drone technology makes it easier to detect lameness caused by an infection like foot rot, or an injury like a snakebite.

Playing back drone footage can help determine if the animal is sick, whether to go treat it or just monitor it.

“There is also some work being done with thermography, using thermal cameras that detect heat,” Lewis explains. “You can tell if an animal is getting sick (fever) or has a sore foot with heat in it. You need a bigger drone for that to carry those cameras,” he says. They can detect the body heat of an animal under trees, for instance, if you are looking for cattle.

“[Drones] can provide a recorded image that could be sent for further evaluation by experts such as your veterinarian, horticulturist or nutritionist depending on the potential problem,” Lewis says. “I frequently look at recorded videos on sick, injured or lame bulls for insurance exams. A video can form a medical record and can be compared to a later video to watch for improvement. This technology is affordable, and the payback doesn’t take long. If it helps save a calf at calving, identifies a lame bull quicker or finds lost livestock, the payback is fast.”

## Potential future uses

Some new technology has potential for use

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with drones, including the active RFID tags, says Walker. “We routinely use passive radio frequency identification (RFID) tags that have to be within 1 or 2 meters of the reader, but active RFID tags could be read from a distance — maybe up to a couple miles away. Instead of having to scan the whole pasture to know where the livestock are, the drone gets high enough to ‘see’ them, and might be able to read those tags,” he says.

Cameras are now built into the drone.

“The image transmission of the video is remarkable,” says Church. “Any drone could have a GoPro camera put on it, but getting the signal back to the controller so you can view it on your goggles or your [tablet or smartphone] gives you the most benefit. You can get that signal from well over a mile, and if you have permission (if it’s legal), up to 3 miles away,” he says.

Most drones have automated takeoff and landing capability, as well as a return-to-home feature.

“These drones are generally smart enough to land themselves and are also portable,” Church says. “The Mavic, for example, can fold down and fit in a saddlebag.”



PHOTO COURTESY OF JOHN CHURCH

► Drones can be used for multiple ranch purposes, such as to check waterers, locate cows, monitor calving, detect disease or injury, check fences and gates, take promotional photos and video, run trap lines, take thermal images, and verify activity of predators.

Newer drones have fairly decent flight times, he adds. Drones can last well over 20 minutes per flight and can travel a long way in that time. Keep four to six extra batteries

on hand, and a portable charger to keep drones in the air all day long, he advises.

Drones can also serve as platforms for other sensors, like thermal cameras. DJI now

## Regulations

Regulations are important to note when purchasing and operating drones.

“There are some things you don’t do, like fly around highly populated areas or over your neighbor’s place,” says John Church, associate professor of natural resource sciences at Thompson Rivers University in Kamloops, B.C., Canada. “Most of the people I work with are ranchers using drones on their private land where these issues are not a problem.”

In both the United States and Canada, people are wary of letting anyone fly outside the line of sight, so he and his team are working on extended-range line of sight, with spotters who can keep the drone in vision.

“In the future, however, like 10 years from now, I am hoping that this will no longer be an issue,” he says.

Legally, an unaided line of sight is required to fly a drone, says John Walker, professor and director at the San Angelo Agrilife Research and Extension Center in San Angelo, Texas.

“In other words, it shouldn’t go over the horizon out of your sight,” he explains. “Even in flat country, it might be hard to see the drone a quarter mile away. Most of them have an actual range of several miles.”

There has been some question about drone registration if you are within a certain distance of an airport, but it was recently ruled that model aircraft, i.e., commercially available drones, do not need to be registered with the Federal Aviation Administration (FAA).

As of May 19, 2017, if you buy a new drone in the United States to fly non-commercially, you no longer have to register it with the FAA. A federal court in Washington, D.C., ruled that FAA’s drone registration rules, which have been in place since 2015, were in violation of a law passed by Congress in 2012 that prohibited the FAA from passing any rules on the operation of model aircraft. If flying for commercial purposes, however, drone buyers still need to register.

Since December 2015, hobbyists with drones weighing between

0.55 pounds (lb.) and 55 lb. were required to register drones with the FAA, with a \$5 application fee. The FAA’s purpose in requiring registration was to ensure drones are operated safely and don’t pose security or privacy threats. Since the beginning of FAA’s registration system, more than 820,000 people have registered to fly drones. There may be future changes to try to provide for accountability and education of drone operators, and Congress may step in to clarify the FAA’s authority to pass laws about the use of model aircraft.

The original goal of the registration rule was to assist law enforcement and others to enforce the law against unauthorized drone flights, and to educate hobbyists that a drone is not just a toy and operators need to follow the rules. The FAA hopes to eventually have drone regulations include a way for unmanned aircraft to be remotely identified, which will help law enforcement know who is flying a drone. All new rules on how hobbyist drone owners are allowed to fly will have to wait for clarification about the FAA’s authority to regulate.

State legislatures across the country are debating if and how drone technology should be regulated, taking into account the benefits of their use and potential economic impact along with privacy concerns. So far, 37 states have enacted laws addressing unmanned aircraft systems issues and an additional three states have adopted resolutions.

Issues commonly addressed in state legislation include defining what a drone is, how they can be used by law enforcement or other state agencies, how they can be used by the general public, and regulations for use in hunting game. Some states are making laws regarding use of drones on public land, and some are enacting penalties for using drones for invasion of privacy, taking unauthorized photos, harassing wildlife or livestock, interfering with law enforcement, etc. There are also specific areas where drones are prohibited from flying. Drone operators should check the regulations in their own state or province.

has drones that can carry two cameras at once, if needed, but those are a little more expensive, Church adds, noting that a good drone with video capabilities will cost \$1,000-\$2,000.

“That is still fairly reasonable if it saves miles and hours,” he says.

“In addition to looking at thermally equipped drones, we are also looking at using them to read ear tags,” he says. “We are thinking of building an antenna to be able to read RF2 ultra-high-frequency cattle ear tags. We’ve been able to pick up signals from the new RFID ear tags 3 to 5 miles away and have been testing solar-powered ear tags we ordered from a company in Utah.”

Another innovation for the future is the concept of network tags that can talk to each other.

“This means that if you find one cow, you can find them all, since those tags are all linked together,” Church says. “We can get that information (GPS positions) into the Cloud. You can know where your cow is, and also get temperature information.”

Placing an accelerometer chip on it can help determine if animals are chased by a predator.

“We have many predators here — wolves, grizzly bears, cougars,” he continues. “With

## Promotional photography

Videos and photos taken from a drone can be useful for promotional purposes.

“I’ve seen professional videos of farms, and for bull sales,” says Roy Lewis, part owner of family-operated Lewis Farms near Edmonton, Alta., Canada, and technical services veterinarian for Merck Animal Health’s cattle business unit. “You can take photos for sale catalogs or other advertising purposes. Aerial shots are very impressive. Using a drone would be an inexpensive way to get aerial views of your farm or ranch.”

Aerial photos or video when moving cattle can be spectacular, taking cattle out in a long line across the field or rangeland. These kinds of pictures may be useful to help present farm/ranch life to the general public.

this technology, you could be sitting in your house and get a text alert on your phone saying your cattle are running around. Then I could utilize my drone that already has an antenna on it, and I could quickly find those cattle. In this kind of situation, you’d have a chance to resolve the problem.”

In areas where wolves are killing or harassing cattle, a producer could even haze

wolves out of the area with a drone. You might also find a dead animal and be able to determine if it was a wolf kill.

“We are also putting multispectral or near-infrared cameras onto the drones — the same drones we are using to find lost cattle. We are now mapping flights to look at large aerial photos (orthomosaics) to map farmers’ fields, like precision agriculture. We can use Normalized Difference Vegetation Index, which enables us to look at the pasture and determine things like proper fertilizer application or water. In the future we are hoping to come up with unique spectral signatures for things like invasive weeds. Maybe we can not only identify noxious weeds (and pinpoint location with GPS coordinates) but send out a second drone, using those coordinates, to spray the weeds,” he explains.

Drones have an exciting future for precision ranching,” Church says, adding that the technology will continue to improve. “The new ones have increased functionality. It’s like having your own personal helicopter.”



**Editor’s Note:** Heather Smith Thomas is a freelance writer and cattlemaster from Salmon, Idaho.