

# Taking Consulting Forestry to the Skies

By David Edwards

**W**hen I opened Flying Beaver Forestry in May 2020, I assumed that remotely piloted aircraft, better known as “drones,” would be indispensable tools for my business. I had just returned to forestry after an eight-year stint piloting airplane-sized drones for the U.S. Air Force, and I was eager to explore drone applications for wildland fire and forest management. The argument for drones in firefighting seemed clear: a long-loiter, fixed-wing drone could orbit over a fire day and night, transmitting life-saving infrared imagery to firefighters and incident commanders. Practical forest management applications were less obvious, although the forestry press was abuzz with stories of drones’ potential.

Inspired by the work being done with drones in university labs, I bought a small drone and began to experiment. I quickly saw that, while many things were possible, some ideas were better than others. I am the sole employee of my fledgling business, so it’s important that I spend my time and money in ways that add value. Drones and sensors—and the software or subscriptions required to exploit their imagery—are a noteworthy investment, so



before I got in too deep, I asked myself the question, “Can drones improve the quality of my work, or enable me to work faster and more economically?” My answer was, “I think so,” and I began an 18-month journey to prove myself right.

The drone I purchased for my consulting work was a DJI Mavic 2 Zoom, a popular off-the-shelf model with a 12-megapixel camera and 4K video recording capability. It weighs only two pounds. Drones like mine are regulated by the Federal Aviation Administration (FAA) under “Part 107” as Small Unmanned Aircraft Systems (sUAS), or those weighing less than 55 pounds. Since I am a licensed pilot, becoming certified to fly drones commercially was quick and free; a non-pilot might expect to invest up to \$300 and a weekend of studying to become a commercial operator.

My drone’s digital camera only senses light in the visible portion of the electromagnetic spectrum, but drones with advanced multispectral sensors—and even LiDAR—are available, if costly. Drones take beautiful photographs and are capable of incredible feats of photogrammetry, even with the standard camera. I have come to think of my drone as most useful in three mission areas: mensuration, scouting, and storytelling.

## Mensuration

Forest mensuration, by its nature, is

a balance between cost and required precision. Most of my consulting work involves writing management plans for nonindustrial private forest landowners, which affords me more leeway in timber cruise accuracy than if I was buying or selling timber. My clients’ parcels, like many in western Washington, are often steep and brushy; wouldn’t it be great to be able to cruise their timber with a drone from the comfort of my tailgate? It’s possible, but estimating the accuracy of my cruise data is my central concern.

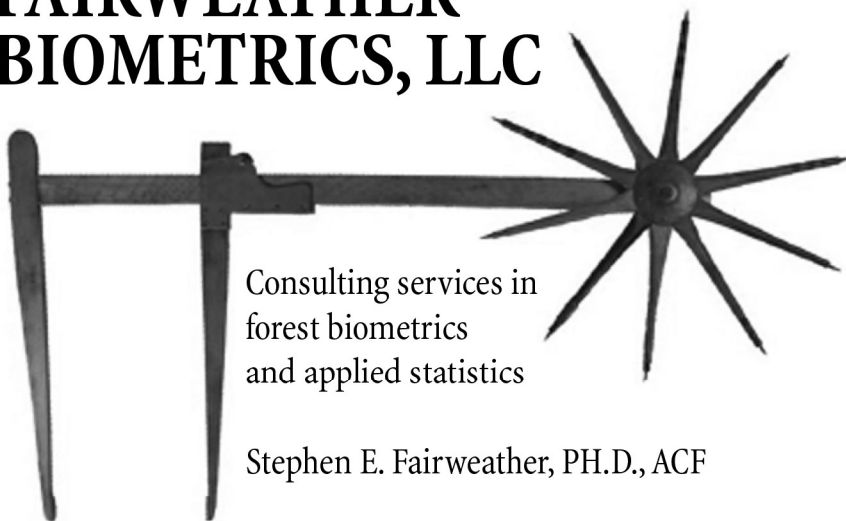
Researchers from Colorado State University have demonstrated impressive forest structure measurement results in western ponderosa pine forests using Structure-from-Motion photogrammetry compared to airborne LiDAR and ground plot measurements (<https://tinyurl.com/84fanv3n>). However, I am not confident I can duplicate their results given the dense canopy closure of westside conifer stands. Even so, I have found canopy height models to be useful in my work. I create them through the open-source software wizardry of OpenDroneMap and QGIS. I have had less success segmenting the canopy model into individual trees. All this takes time, however, or I can pay someone to do it for me, but does it improve the quality of the product I provide to my clients? Oftentimes the answer is no.

The system has other limitations as well: 30-minute drone battery life limits the acreage you can cover in one session; processing the very large image files requires considerable computing power; FAA altitude and line-of-sight restrictions often complicate the plan. In general, I suspect that if a stand is open and easy to cruise, you will have good results with a drone. My clients have not yet asked me to conduct regeneration surveys or to measure slash pile volumes, but I understand that drones perform these mensuration missions well under many circumstances.

## Scouting

I once gave a drone-flying lesson to a local organic farmer. As he sent the drone careening toward the far end of his fields, he said, “This is awesome! I can use this to check on my pigs.” This is what I mean by scouting: using the drone to show you something that is too difficult, dangerous, or time-consuming for you to

## FAIRWEATHER BIOMETRICS, LLC



Consulting services in  
forest biometrics  
and applied statistics

Stephen E. Fairweather, PH.D., ACF

[steve@fairweatherbiometrics.com](mailto:steve@fairweatherbiometrics.com)





PHOTO COURTESY OF DAVE EDWARDS

The photographs taken by drones can provide an aerial view of forests in relation to development that isn't possible from on the ground. This is a view of Saratoga Passage taken near Langley; in the distance is Camano Island.

go see for yourself (Google “epic drone crash Iceland volcano” for an extreme example). It’s great for spotting snags or damaged trees within a stand, or to identify open areas where a root rot pocket or other forest health issue may exist. When scouting, I rely less on recording photos or video and more on the drone as a real-time eye-in-the-sky. This comes in handy when a forester needs to see what’s over the hill or beyond the locked gate. Drone pilots must know and comply with airspace restrictions in the area in which they intend to fly, but in most situations I’ve encountered in forestry, it’s legal to fly over private property to view or photograph my intended subject.

### Storytelling

Storytelling is at the heart of consulting foresters’ work with small landowners, whether we think of it that way or not. We tell them a story about their land—its ecological past, present, and its potential futures—and we persuade

them to trust that our prescriptions will help them shape their forests to meet their objectives. Drone photos and videos can help us tell our story. For exam-

ple, I once shot a 45-second video flying 50 feet over a client’s dense western red-cedar stand. I emailed the clip to another consulting forester for some feedback, and he immediately replied, “Looks like it could use a harvest.” You might expect a professional to react this way, but images speak to landowners, too. Just yesterday, I huddled with a client over an orthophoto I made from drone imagery I had taken last spring. The variable crown closure across his 30-acre parcel was clear in the high-resolution image, and together we easily identified the areas in need of a precommercial thin. Normally I would deliver mini lectures about crown ratio and resource competition, but the orthophoto did most of the storytelling for me that day.

On balance, after 18 months of experimentation, I feel my drone was a good investment. Its mensuration capabilities

are less impactful than I’d hoped, but I suspect this will change as sensor and software technology is rapidly improving. For instance, you already have a LiDAR sensor in your pocket if you have the latest iPhone model, and I expect to see consumer-grade drones with LiDAR for less than \$2,000 on the shelves within the next couple of years. The scouting mission is a good enough reason to operate a drone if it allows you to gain important knowledge you couldn’t get by another means. And most importantly, if drone imagery helps me weave a stewardship story I can share with my landowner clients, then I’ll call my experiment a success. *WF*

**Dave Edwards** is the owner of *Flying Beaver Forestry*, which is based in Langley, Washington. A SAF member and ACF Candidate

Member, Edwards can

be reached at 360-914-8334 or [info@flyingbeaverforestry.com](mailto:info@flyingbeaverforestry.com).

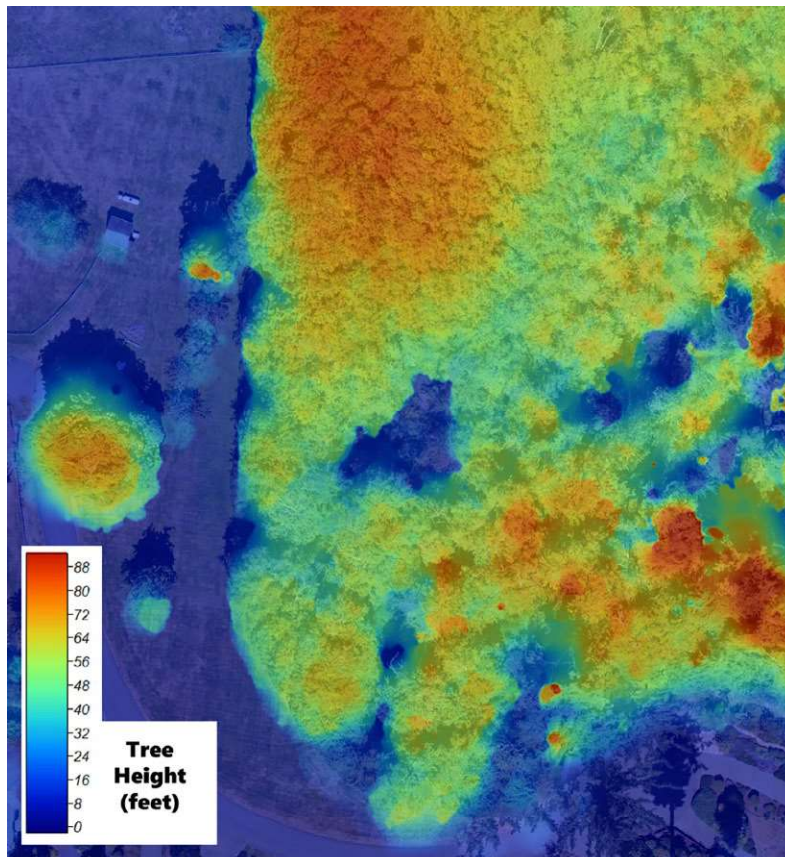


IMAGE COURTESY OF DAVE EDWARDS

This is a composite created from an orthophotograph overlaid with a color-coded canopy height model. All the images were taken with the drone, and the tree height data was from the drone images.