What is a drone?
As far as environmental research is concerned, a drone is a lightweight airborne platform from which we collect research data. At ESI DroneLab, we operate a range of drones such as small fixed-wing aircraft, as well as quadrocopters for near-real-time monitoring. Drones are very effective at capturing fine-scale data that can be used to understand landscape structure and processes.

What can drones do?
Our drones fly low and slow, to give them the best possible chance of capturing images with unrivalled spatial resolution. Drones are a game-changing remote sensing platform – they are flexible and can be used in a self-service mode. Capturing remote sensing data this way is much more responsive than, for example, via satellites or piloted aircraft.

How do we use them?
Drone data are an incredibly rich source of information for mapping land surface and coastal zone processes. We capture fine-scale imaging data that can be used to describe landscape structure in two and three dimensions. State-of-the-art data capture and analysis approaches sum single images into structure-from-motion derived topographic models and geo-referenced ortho-mosaics (specially-rectified images for environmental mapping that are corrected for terrain relief, lens distortion and camera angle).

For what purpose?
This wealth of rich information helps to inform a more sustainable way to manage landscapes, to improve functional understanding of hydrological and ecological processes and to guide interventions to improve the management of natural or semi-natural systems.

We currently use drones to support:
• Ecological mapping
• Topographic modelling
• Coastal zone surveys
• Wildlife monitoring
• Vegetation structural analysis
• Soil erosion survey
• Catchment management

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World-class answers to environmental questions
Designed and built here

We design, build and fly our own lightweight, easily repairable systems, and we rely on globally trusted control systems to power our fixed wing and multi-rotor aircraft. We use design tools – like the 3D printing of drone parts – to modify and customise our aircraft. All of this is crucial in providing flexible, bespoke ways to answer specific research questions.

A better outcome

At the data delivery end, we have developed a unique approach for improving the accuracy of our products. Our state-of-the-art methodologies turn single images into high resolution, precise, three dimensional models.

Scientific data and novel platforms

Alongside standard cameras and SLRs we have specialised sensors including thermal and multispectral imagers. We are developing swarm capabilities for larger areal coverage and smartphone-based sensors for rapid survey.

Our laboratory

We have a dedicated drone laboratory and a range of systems, including a heavy-lifting delta wing aircraft, heavy-lifting octocopter, lightweight powered gliders and lightweight multi-rotor aircraft. We combine drone survey flights with expert ground support using field validation methodologies which we have developed and refined. We have a high accuracy open-source differential GPS to support registration of data and access to a high performance computing cluster with bespoke software for rapid data processing.

Group and expertise

ESI DroneLab is led by Dr Karen Anderson. The research group comprises a range of existing PhD and post-doctoral researchers with a wealth of operational experience. We work with a wide range of stakeholders, industry figures and peer researchers from across the world building our expertise and experience in the area since 2010. Our group is growing and we’re keen to hear from you if you’d like to collaborate with us.

What’s new about ESI DroneLab?

The novelty and creativity of our approach to drone-based environmental monitoring lies in our use of very lightweight, low-cost and open-source drone systems for generating high quality spatial data. Many groups rely on closed-source systems which are expensive to buy, difficult to repair and modify, and far less flexible for creating bespoke surveying solutions to specialist applications.