

IGIS Drone Program

August, 2017



About IGIS & ANR

The Informatics and GIS (IGIS) Statewide Program is a unit within the University of California, Division of Agriculture and Natural Resources (ANR).

ANR is a branch of the UC system that provides applied research and extension (training) for California's agricultural and natural resources sectors, youth education, and nutrition programs. ANR runs a number of programs that serve the entire state, including Cooperative Extension offices in every county, nine field stations, applied research and teaching on 4 of the 9 UC campuses (Davis, Riverside, Berkeley, and Merced), public education programs such as 4H and Master Gardeners, and several research and policy institutes. See ucanr.edu for details.

IGIS is a statewide program within ANR that provides technical assistance and training on all things related to GIS, from spatial analysis, cartography, web GIS, and development of mobile data collection apps. For more information, see <http://igis.ucanr.edu>.

IGIS Drone Program Goals

In 2015 IGIS introduced a drone program to support ANR's research and extension activities, including:

- Drone data collection service
- Promoting safety and regulatory compliance within the UC system
- Training on drone technology and science for UC ANR affiliates
- Development of best practices, protocols and tools for drone data collection
- Supporting and connecting a community of drone users in California interested in drone mapping and data collection for agriculture and natural resources management

Resources

- **Personnel.** Five FAA licensed pilots based in Davis, Hopland, Kearney, and Berkeley.
- **Platforms.** DJI Matrice 100, DJI Inspire 1, DJI Phantom 3, and 3DR Solo
- **Sensors**
 - *RGB:* ZenMuse X3 and X5, GoPro
 - *Multispectral:* Parrot Sequoia and MicaSense RedEdge
 - *Thermal:* ZenMuse XT
- **Software.** Pix4Dmapper, ArcGIS, ENVI (all desktop)
- **Mission Tracking & Reporting:** internally developed system built with Google Sheets

Drone Data Collection

IGIS provides data collection services on a recharge basis for ANR units and their affiliates. In 2016 & 17, IGIS collected data for approximately 2 dozen projects covering over 5000 acres. Most missions are research projects and cover a range of landscapes including:

- Crop agriculture - plant health, water use
- Rangelands - vegetation, classification, hydrology
- Forestry - tree health, topography
- Desert - hydrology, habitat corridors

IGIS data collection services include mission planning, flying the site, data processing, quality control, and data analysis. Requests for services can be made through the website.

R&D and Documentation

As an extension unit working with emerging technology, one of IGIS's explicit roles is to develop workflows and protocols for specific hardware and science objectives, and share those with the people of California. We develop and test hardware configurations, workflows, planning tools, and analytical methods during drone missions, and share those through workshops and documentation. A "[Tech Notes](#)" section of the IGIS website provides guidelines on a variety of drone related topics, including data management, mission planning, specific hardware issues, and dissemination of data.

Drone Workshops

Training is a core part of IGIS's mission. From 2016 through mid-2017, IGIS held approximately 12 one-day workshops attended by over 200 people on drone related topics around the state. Workshop topics included intro to drone technology, regulations, data processing and analysis. All IGIS workshops are open to the public and held in collaboration with a local host.

DroneCamp

In July 2017, IGIS held a 3-day intensive "DroneCamp" training in Davis, CA. Attended by 36 people from academic institutions, government agencies, and private companies, the program included:

- Overview of drone technology and equipment features
- Safety, Risk Management, and Part 107 Certification
- Mission planning
- Principles of photogrammetry and remote sensing
- Flight operations including hands-on practice
- Data processing with Pix4Dmapper
- Data analysis and visualization with GIS
- Research and industry talks by guest presenters

Outreach and Community Building

IGIS frequently gives drone demos at public events, and actively shares information about its drone program by attending meetings and conferences, blogging, and publications. IGIS also administers a "California Drone Mapping" email list which is open to anyone interested in using drones for data collection. See <https://lists.ucdavis.edu/sympa/info/drone-mapping-ca>.