



Spur-throated locust adults often form swarms from April until August. During this period, the locusts feed on trees and winter crops and roost in trees. In spring, they spread, feed on grasses, and resume their reproduction (© Clare Mulcahy)

APPLES AND INSECTS

FOR 40 YEARS, THE AUSTRALIAN PLAGUE LOCUST COMMISSION HAS ADOPTED NEW TECHNOLOGY AS IT HAS BECOME AVAILABLE. BUT WOULD APPLE'S IPAD PROVE A GOOD SURVEYING TOOL IN 40°C HEAT AND IN THE MIDDLE OF INLAND AUSTRALIA?

HAIKOU WANG REPORTS ON THE RESULTS OF HIS TESTS

Our organisation, the Australian Plague Locust Commission, is responsible for monitoring, forecasting and managing the populations of three locust species within two million square kilometres of inland eastern Australia. Since these highly mobile locusts do not have permanent habitats but often cause severe damage to pasture and crops, ground surveillance is essential to closely monitor their abundance and distribution in order to effectively manage locust outbreaks through early intervention and rapid response.

We have routinely carried out ground surveillance of locust abundance and development in the four decades since the commission was founded. We started with pen and paper maps, but over the years, migrated to new systems as technology improved. Until recently, we used the HP iPaq 212 PDA in our field survey system but when that became unavailable, we started to seek a replacement to modernise our survey system. A rugged device would be better for our harsh environment, but portability and affordability are two other factors. In addition, future availability and support should be assured.

The Apple iPad 4 was chosen in preference to the HP Elitepad 900 (lower 1280x800 resolution and Windows 8 OS), due to the support available and security measures applied through the Australian Government system used by us. The Griffin Survivor All-Terrain case provides adequate protection in field use.

Although the iPad has a GPS module built-in, the external Bluetooth receivers of Bad Elf GPS Pro were purchased to reduce the iPad CPU and battery usage, and to improve the sensitivity, accuracy, and visibility (backlit LCD screen).

Migration of our survey application from the previous PDA to iPad faced many challenges. Although paper maps are still carried as back-up, digital maps, especially offline maps, are a must for our survey in the remote interior, which has no mobile telephone or data network coverage. Survey data stored in any GIS formats would be fine as we have Esri ArcGIS for any format manipulations, but the text format with readable coordinates is preferred to safely go through our department firewall, and to be directly stored into our current Oracle database (without spatial module).

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The old and new surveying systems

Furthermore, fast response and ease-of-use in recording survey results are essential for our staff who may occasionally be exposed to air temperatures of 40°C and above. Unless absolutely necessary, typing using touch screen should be avoided. Thus the Corvallis Microtechnology's iCMTGIS III was our best choice. It can load and cache the built-in Apple Maps maps automatically when internet access is available, and manually do the same with geo-referenced images (such as georeferenced TIFF), shapefiles or self-made maps.

We found Hema Australia 4WD Maps that include recently verified outback tracks are very useful, and the iCMTGIS III can use these geotiff maps. It also makes a lot of sense by indicating current location directly on the background map with auto-scroll/auto-zoom/move-map when the GPS is switched on. The iCMTGIS III can associate text and numeric fields with a feature. The values for attributes can also be predefined as drop-down lists with defaults. Therefore, using feature lists can speed up data entry markedly and eliminate any possibility of user typo errors when locked. The iCMTGIS III can also attach some useful built-in attributes to a feature, such as coordinates, date and time stamps, and geometry, which makes the data transfer between systems very easy when the feature is exported as a text file in addition to several popular GIS formats. With its GIS engine, the iCMTGIS III can calculate feature geometry automatically if the feature is a line or polygon, which can be very useful on our aerial survey and spray.

Migration

With iCMTGIS's user manual including step-by-step tutorials, I migrated our locust survey form from PDA to iPad in less than two weeks, making the effort to mimic the original workflow on PDA to reduce our field

staff's learning curve. The same feature list and job files were sent to all staff as email attachments to ensure the data files have the same structure. After the survey data is exported as CSV file and emailed to our HQ where the point data is stored in an Oracle database on a RHEL server and accessed from ArcGIS desktop for view and analysis within our department Intranet, the iCMTGIS III workspace is cleaned according to the exported file content for taking new survey results. This usually happens once a day, but could be more often if the locust situation required urgent attention. The app's FTP and Email functions are especially handy for transferring data to our HQ in real time, and updating our survey application.

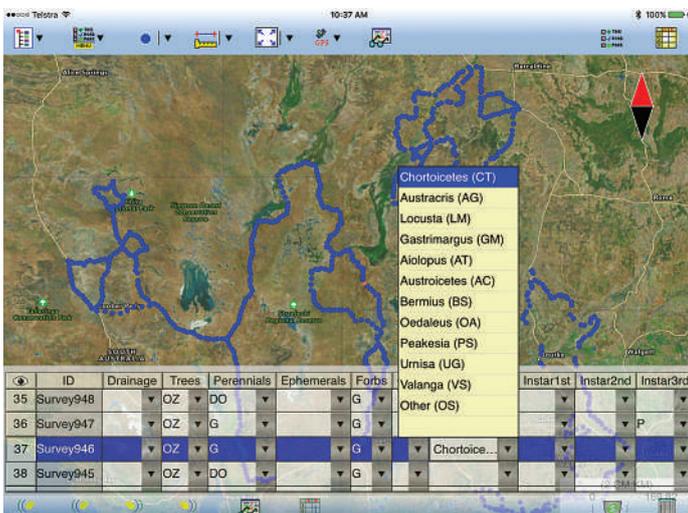
Field trials started in August 2015 and feedbacks from our colleagues warranted significant improvements and quick bug fixes from the developer. Our field staff are now generally happy with the migration. The iPad seems strong and power enough for our locust survey. A pair of polarised sunglasses improves the display visibility of iPad (our staff wear sunglasses on their survey anyway). However the iPad battery life can only last roughly half its claimed span on our survey, even only with Bluetooth to external GPS receiver, and it cannot be topped up even on cigarette charger all the time!

I am currently constructing a geospatial database on the platform of PostgreSQL and PostGIS for managing all our locust and ancillary data. Database connection from the iCMTGIS III is made indirectly at the moment and I am seeking help from the developer to see if we can push data into our database directly from the iCMTGIS III in the field.

As technology advances, the locust survey protocol deployed by APLC has evolved from pencil and paper recording to the current iPad recording with near real-time geo-spatial database connection. The timing and efficiency have improved with every application of new technology, which is critical for us to provide early warnings of locust population upsurges and movement, and complete the logistic preparations required for a locust control campaign in the often less than two-week window available to us.

I MIGRATED OUR LOCUST SURVEY FORM FROM PDA TO IPAD IN LESS THAN TWO WEEKS

Haikou Wang is GIS and information officer at the Australian Plague Locust Commission (www.agriculture.gov.au/aplc)



Locust survey form Implemented in iCMTGIS III

