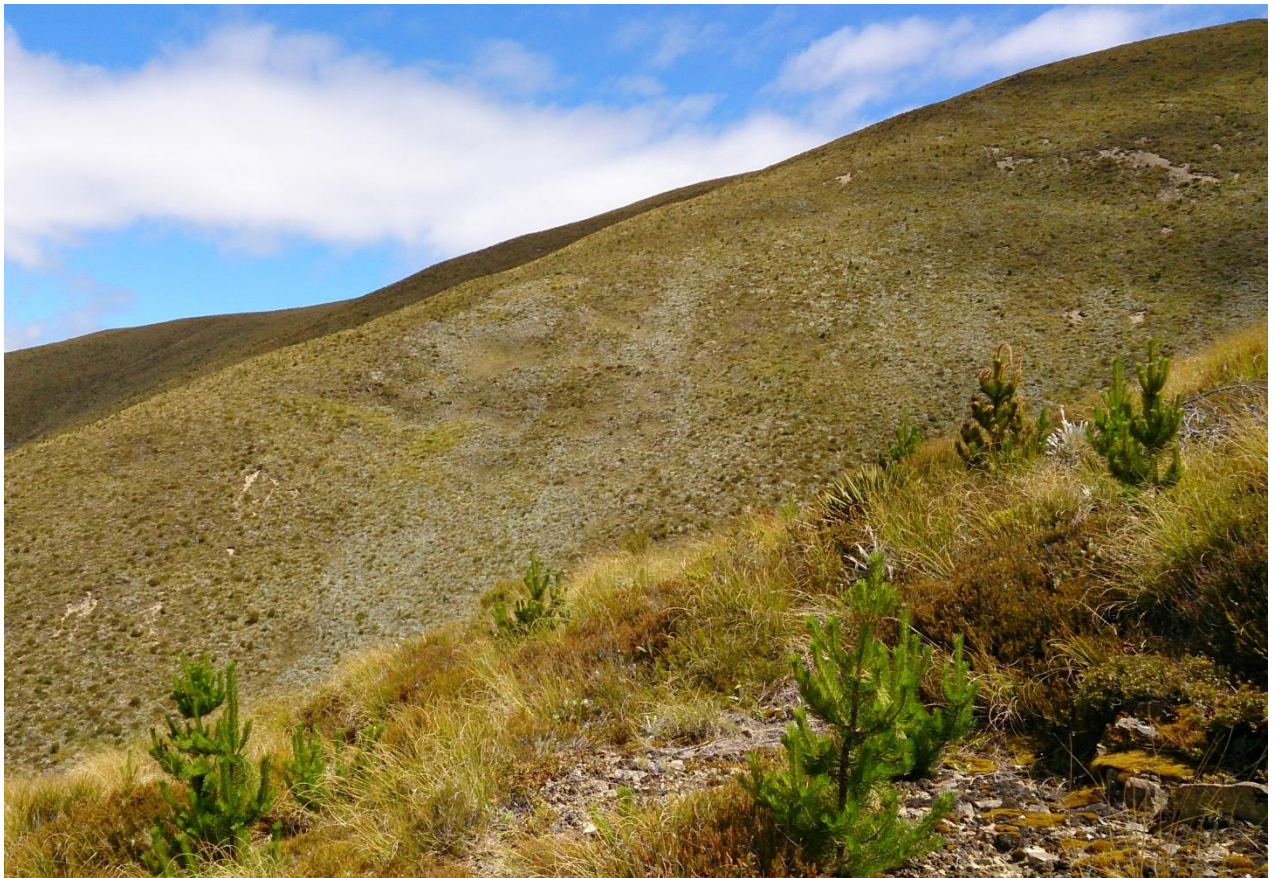


Using Android smartphones to record monitoring data to aid wilding conifer management in New Zealand

Installation, setup and data access

Thomas S.H. Paul



REPORT INFORMATION SHEET

REPORT TITLE	Using Android smartphones to record monitoring data to aid wilding conifer management in New Zealand
AUTHORS	THOMAS PAUL, SCION
ISBN:	978-0-478-11041-8
SCION PUBLICATION NUMBER	S0010
SIDNEY OUTPUT NUMBER	54659
SIGNED OFF BY	TIM BARNARD
DATE	SEPTEMBER 2014
CONFIDENTIALITY REQUIREMENT	PUBLICLY AVAILABLE
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EXECUTIVE SUMMARY

Report Title: Using Android smartphones to record monitoring data to aid wilding conifer management in New Zealand

Authors: TSH Paul

Background

Wilding conifer control in New Zealand is increasingly carried out by community groups with limited resources. Community involvement and the provision of low cost tools makes it very easy for people, as citizen scientists, to report on the success of control measures. Monitoring and reporting on the long term results of wilding conifer control is vital to acquire funding to carry out further control. We have identified smartphones and software that will enable citizen scientists to collect data on wilding conifers in conjunction with a ground-based protocol (Paul, 2014).

Purpose

This report describes how to download a smartphone app and use the app to collect data in the field on wilding conifer control and management in targeted areas.

Scope

The report describes how to install software developed by the University of Washington (OpenDataKit collect) on smartphones and how to use specifically designed data entry forms to gather plot-based data on wilding presence, cover and associated data. Underlying standards are described in Paul (2014). The report also outlines how data is transferred to a common database and how to access the data for further analysis.

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Scion Rotorua

24 September 2014

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Introduction

The internet is increasingly being used in biology as a tool to collate and analyse data collected by ecologists or citizen scientists from multiple locations. A single central database, accessed through a website, can provide the tools for the submission, visualisation and analysis of data collected by many users from many different locations. The molecular epidemiological databases that have been developed for a number of bacterial and fungal pathogens are a good example of this. Communities of researchers and public health laboratories submit data on strains of individual pathogens, including basic epidemiological information and molecular typing data. Linking the databases to Google Maps, the geographic distribution of pathogen genotypes can be displayed and the databases can be explored and analysed.

Web databases for the collation of ecological data submitted by many are another example. The databases are of utility to ecologists, allowing them, for example, to map distributions of endangered species. A single web portal can significantly decrease the time between collation and analysis of data collected by multiple users.

Transferring data to databases (e.g. from field notebooks) can be tedious and may be subject to transcription errors. Alternatives to paper collection, such as personal digital assistants (PDAs) or standard mobile phones, with subsequent synchronization with a user's laptop or desktop computer, offer attractive opportunities for remote data collection in many areas.

The growing availability of mobile smartphones with PC-like functionality and web connectivity far superior to traditional mobile phones offers an alternative way to submit data to central databases. Built-in global positioning system (GPS) receivers provide the detailed location of the phone, accelerometers can recognise changes in movement, and cameras provide the ability to record static images as well as video.

Data collection frameworks utilising mobile phones with data submission to and from central databases are widely applicable. Furthermore, such frameworks offer great potential for recruiting citizen scientists to contribute data easily to central databases through their mobile phones. We have implemented a data collection framework for ecological data collection, specifically invasive tree monitoring, and describe how to install and use the system as a citizen scientist.

The system

Scion has developed simple data collection systems using readily available application platforms that will allow users to record data in regards to wilding conifers in an easy and standardised way.

For Android users, we have developed a data collection system using OpenDataKit (ODK), a free and open source set of tools for mobile data collection. Core development for ODK is carried out at the Department of Computer Science and Engineering at the University of Washington (UW) and *Change*, a multidisciplinary group at UW. The platform has been deployed across the world and even on the international space station for data collection across a wide range of topics, such as clinical trial data, social studies, forestry, environmental monitoring. At least 12 papers have been written on the ODK system platform itself in the last five years exploring its wide usability (e.g. Anokwa et al., 2009).

For the purpose of gathering wilding conifer control data on a plot protocol basis, we used the ODK tools to setup a cloud service that allows upload of data either via the mobile network or Wi-Fi from everywhere in the country, as well as free access and basic download of the data via a webpage.

We used ODK's *XLS2XForm* to create a data entry form for collecting standardised plot data to gauge the success of previous control activities in an area and record numbers of wilding conifer trees present after control. Plot location is automatically recorded using the GPS capability of the smart phone. There is also an option to record plant composition data.

We intend to make a similar service available for IOS systems in the near future (iPhones and iPads) using a comparable data collection system (Epicollect +) developed by the Imperial College London with funds from the Wellcome Trust (Aanensen *et al.*, 2009).

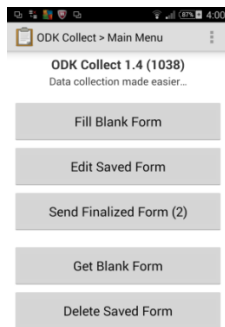
How to install it on your smartphone

We provide a step by step description of how to download and install the ODK Collect app and how to use it to upload the relevant form, record data in the field and send data to the cloud.

Firstly, you need to access and download the ODK collect application. Either enter the link below in your smartphone browser or go directly to the Google Play store and search for ODK collect. The application is free to download.

<https://play.google.com/store/apps/details?id=org.odk.collect.android>

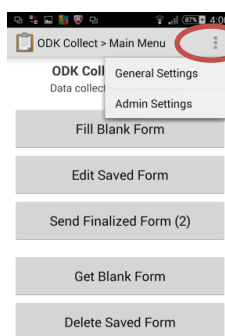
Once you installed the app follow the steps below to get started.



Step 1

Using your mobile phone, go to Google Play store, search for "ODK" and choose "ODK Collect" from "Open Data Kit".

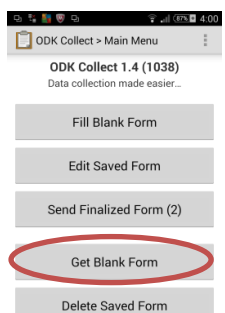
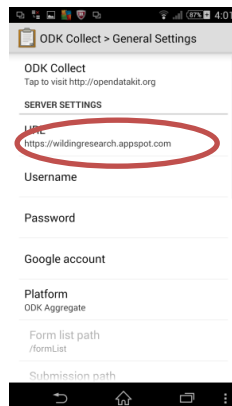
Install with all rights (required for GPS functionality and unique identity creation).



Step 2:

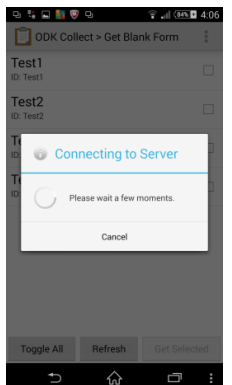
Open the app and change project website to

<https://wildingresearch.appspot.com>



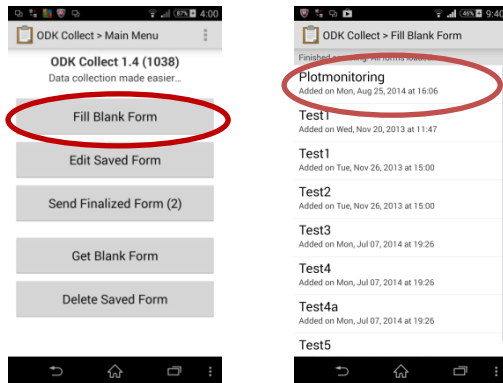
Step 3

Download the empty form "PlotmonitoringV1". Now you are ready to record plot data by selecting "fill new form".



Recording plots and the related data

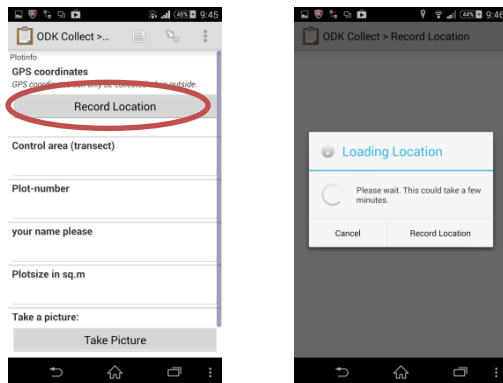
Once you installed your app on your Android phone and uploaded the required form you can start to record plot-information in the field by opening the app and selecting Fill Blank Form.



Step 1

Open the ODK app start screen. To start data collection, press “Fill Blank Form”, which takes you to the screen with the forms that you loaded earlier.

Choose the form “PlotmonitoringV1”.

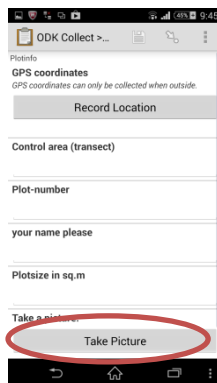


Step 2

The form loads and a starting screen appears. Swipe to the left to see the first page of the form. Record location by selecting the “Record Location” button. This may take a moment, especially if you have just started.

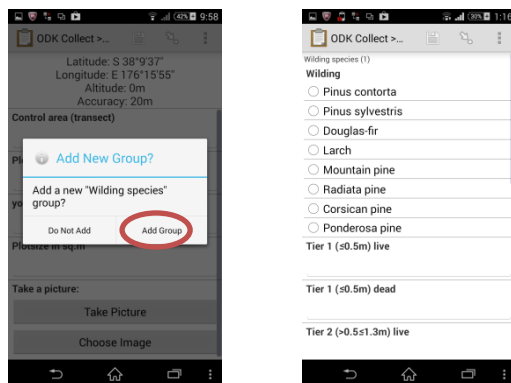
Record data for all the fields on the first page.

- Control area (transect) – the area or transect number.
- Plot Number
- Your name - initials are sufficient
- Plot size - area in m^2



Step 3

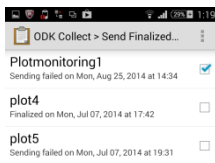
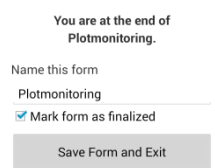
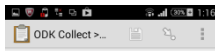
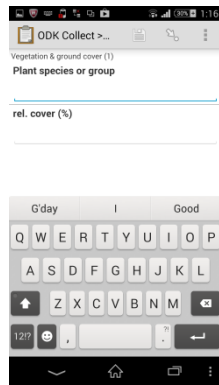
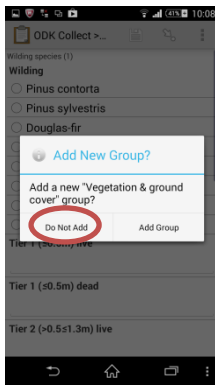
Take a picture of the plot. Try to include all main features and to cover the area of the plot. This will help data interpretation and relocating the plot.



Step 4

Once you have taken a picture, swipe to the next page/field. A new window will appear asking if you want to add a wilding species to your data. Answer “yes” if you have wildings in your plots. This will take you to a sub form where you can to record – a single wilding species at the time – name, frequency in tiers, overall cover and coning status. If you want to add another species, or close the sub form, swipe left to be taken back to the “question-window”. Please refer to the monitoring protocol (Paul, 2014) that describes the data collection in more detail.

Step 5



If recording of non-wilding vegetation and ground cover is required e.g. to record a rare species or changes in the plant composition, you can add a basic cover record for each species in a similar manner by adding records in a sub form.

If this is not required simply press “Do not add” in the question window. Plant cover can be recorded in 5% cover classes or in the described cover classes stated in the guidelines (Paul, 2014).

Step 6

When you have completed your plot assessment and entered all wilding species, vegetation and cover types, you have the opportunity to add a comment.

Finalise the form-entry by giving it a code or a name that should relate to the site and plot-number for later easy identification.

Step 7

After completing and naming your plot, it is saved under this name on your smartphone.

Pressing “send finalized form” will send data to the “cloud-database” via the mobile network or via Wi-Fi when you are at home or in the office. Your data, and other participants’, can be viewed on the website.

Data viewing and access

All collected data is stored in the cloud and can be accessed via a web-browser. The developed web-interface allows the viewing, downloading and mapping of your specific data or all the available monitoring data.

We provide access to the data to everybody that has registered by contacting the administrator at Scion. You are assigned a username and password on registering that allows full access to the database and to the data that you have collected for your area.

The database can be accessed under the following web address once you received your Username and password:

<https://wildingresearch.appspot.com>

Scion has developed routines that allow the generating of monitoring reports based on the data that you collected in your area of interest. A report can be requested once data has been uploaded to the data server and the administrator has been notified.

Final remarks

The smartphone application provided citizen scientists with an easy and enjoyable way to gather data quickly in the field and removes the need for data transcription. Used with the guidelines developed to monitor wilding control success (Paul, 2014), the data collected can inform trusts and agencies on progress and success of their wilding control efforts.

You can contact the administrator for database access and to request reports by emailing:

thomas.paul@scionresearch.com

Acknowledgement

The development of the smartphone based wilding monitoring system was supported by funding from the Sustainable Farming Fund administered by the Ministry for Primary Industries and by Scion. Research at Washington University enabled the quick implementation and Google provides free infrastructure.

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