

Cedar Wattle Mapping Project (final report)

Johns Hill Landcare Group Internship Project

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AIM

Mapping of the invasive tree species, cedar wattle (*Acacia elata*) in the Menzies Creek-Emerald-Avonsleigh area in Victoria, Australia, by using free Smartphone apps; and recommendations on how to adjust the same app to map other weeds with the scope of using GIS for further map development.

INTRODUCTION

Mapping invasive species and understanding the spatial distribution of weed populations has been an effective strategy in identifying and operating a successful weed management plan all over the world, including Australia (Cardina, Johnson and Sparrow, 1997). Many surveying and cartography tools, such as remote sensing and GIS, have been used to collect the spatial distribution data of different weed populations for weed management (Joshi et al. 2004; Lass et al. 2005). Mobile technology such as Smartphone apps have recently been developed and used for collecting spatial data of weeds, and for mapping them directly from the field (Taylor, 2012). This has made weed management easier and sped up the processes for land owners, weed managers as well as contractors. The aim of this project is to map the invasive tree species cedar wattle (*Acacia elata*) in Emerald by finding an easy to use Smartphone app, both for iOS and Android devices, and testing its suitability according to our client's needs. We also aimed to recommend how to use the app to map other weed species, and how GIS can be used to further improve the mapping process.

The apps that we have used to collect data and to map the weed *Acacia elata* in Emerald are called 'MDC' and 'Map Viewer' and both are distributed by the GIS Cloud Inc. company. These two apps were most suitable to meet our client's needs, which required the ability to record latitude and longitude in real time while driving. Additionally it served to record different aspects of a site including number of species, reproductive status, location type (private or public land, roadside, etc), as well as the ability to transfer data to maps and tables for reporting and printing. The 'MDC' app can be used by the data collector or Landcare group volunteers, who will record the sightings of the cedar wattle species in the field by either driving or walking. The 'Map Viewer' app can be used by weed controllers to reach the locations where the weeds are present for weed control in the field. Both the apps are connected and, if you have Internet access, once you record a sighting

in MDC it is also added in the map of the 'map viewer'. This is because the same cloud account is used in both the apps. The app can also be used when there is no Internet connection, as it has an offline mapping option.

DESCRIPTION OF THE SMARTPHONE APPS

1. MDC

Full name: GIS Cloud Mobile Data Collection (MDC), by GIS Cloud Inc.

Price: free

Available: both in iOS and Android devices

Purpose: Field Data collection and Field surveys

Likely users for weed management: Field data collectors, Landcare group volunteers, Landcare group members, Land managers, Weed controllers

Characteristics:

- Easy field data collection in real time
- GPS recording with latitude and longitude
- Can customize data forms to include choice inputs, such as location and species characteristics.
- Can include photos, audio and texts in each data form.
- Dropdowns, lists, input boxes and comment based on custom forms.
- Offline data capture and offline map use

2. Map Viewer

Full name: GIS Cloud Map Viewer, by GIS Cloud Inc.

Price: Free

Available: Both in iOS and Android devices

Purpose: To view all data points of the same species in the same map, when working in the field.

Likely users for weed management: Weed controllers, pest managers

Characteristics:

- Easy way to view maps and access data
- View all recorded sightings of a species in the same map
- Optimized for non-professionals
- Can easily reach the sites while driving or walking by viewing the GPS locations.

HOW THE TWO APPS WERE USED IN THIS PROJECT

The client required an easy way to record the sightings of the Cedar wattle species in the Emerald area while driving on the road, as well as a final map viewer: which will have all the sightings of the species recorded in a single electronic map, acting as GPS for weed controllers to drive to the locations of each sighting. An account was created in the GIS cloud website named 'Acacia elata distribution' and then a custom form was developed, which included inputs of the client's choice.

The inputs in the customized form were:

- GPS (which records the latitude and longitude)
- Name of species
- Reproductive status
- Location
- Additional info
- Picture (from album or camera)

The project was automatically included in the mobile apps, once logged in with the same account used when creating the form. A drive test was done for testing the suitability and effectiveness of the apps by spotting the weed species, and recording it using the forms of the 'MDC' app. At the end of the field recording, the 'Map Viewer' app was checked to see whether all the data was shown in the final map.

IMPLEMENTATIONS AND RESULTS OF THE TEST DRIVE

The test demonstrated that the system works, as the 'MDC' app functioned well in the test drive. But there were some complexities: including safety hazards and therefore some recommendations have been developed to use it safely and effectively. It is difficult for the driver to spot the weed species and drive at the same time, and which can be a serious safety hazard. Therefore, it is recommended that at least three people (spotter, driver and recorder) are needed for field data collection while driving.

Furthermore, it was difficult to type in the form as the car was driving at high speed and could not stop or slow down at each site, due to traffic road laws. Therefore, it is recommended to use more click buttons than filling in the blanks with texts by typing the texts. But the 'additional information' input should still be used to record any important information later. In addition, the

continued use of GPS running in the background can dramatically decrease the battery life of the device, and so it is recommended to carry a portable charger if the time of the field trip is sufficiently long to warrant its use.

FURTHER USE

The apps can also be used for the management of other weed species or native plant species, by creating customized survey forms or data collection forms. It is also possible to map several species on the same map by creating these customized forms.

The data recorded in the apps can be used in a tablet or laptop by using the same cloud account in the GIS Cloud website. The data can be managed and the map can be edited by using the map editor, in which layers and other spatial attributes can be added and spatial queries and analysis can be done. The maps can also be exported and published using the website. In addition, the data can be edited and exported for use in Geographical Information System software 'ArcGIS' for more complex map developments and spatial analysis.

CONCLUSION

The aims of the project were successfully fulfilled, as a suitable app was found which worked well in the test drive and can be used to map other weed species for an effective weed management. The use of the two apps in combination can be very helpful in weed management by landowners, land managers, weed controllers and landcare groups, as it is an effective and easy way for non-professionals to record field data and view maps.

REFERENCES

Cardina, J., Johnson, G. A., & Sparrow, D. H. (1997). The nature and consequence of weed spatial distribution. *Weed Science*, 45(3), 364-373.

Joshi, C., de Leeuw, J., & van Duren, I. C. (2004, July). Remote sensing and GIS applications for mapping and spatial modelling of invasive species. In *Proceedings of ISPRS* (Vol. 35, p. B7). Downloaded from <http://www.isprs.org/proceedings/xxxv/congress/comm7/papers/132.pdf>

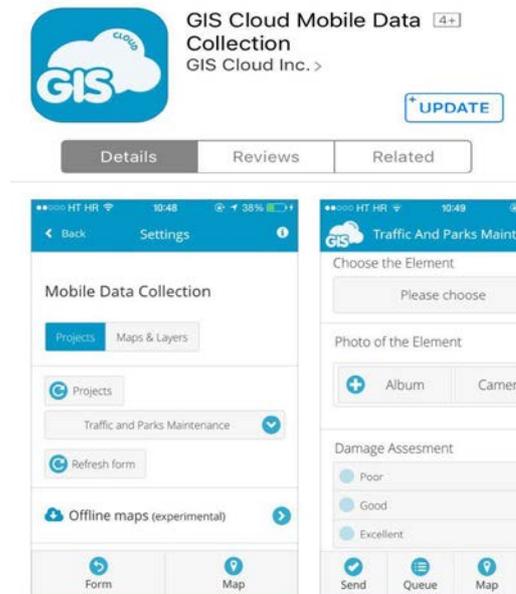
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Taylor, S. (2012). Invasive weed control in grassy ecosystems. In *Proceedings of the 18th Australasian Weeds Conference*, edn. V. Eldershaw (pp. 78-80). Downloaded from <http://www.cabi.org/ISC/FullTextPDF/2012/20123367546.pdf>

DIRECTION OF USE OF THE SMARTPHONE APPS FOR MAPPING WEED SPECIES

Download the apps from the Apple store from your IOS device, or Google play store from your Android device.

1. Search by typing “GIS Cloud Mobile Data Collection (MDC)” in the Apple store or Google play store to download the MDC app.



2. Search by typing “GIS Cloud Map Viewer” in apple store or Google play store to download the Map Viewer app.



How to set up GIS Cloud and Mobile Data Collection (MDC) for free!

1. Create an account

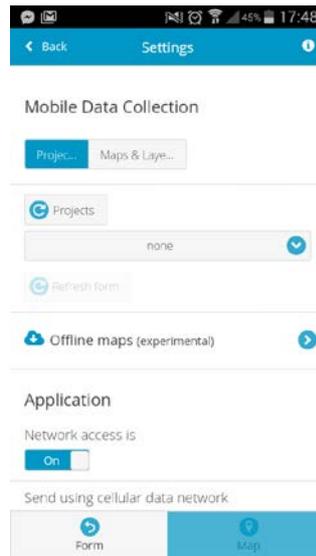
- It's a good idea to create a new Gmail account for this, as you will need to share it with anyone that is involved in the data collection and handling of the project.
- Go to the GIS cloud website: <http://www.giscloud.com/>
- Click **"Sign up"** in the top right hand corner.
- Fill in the required details to create a new account, or sign up instantly with Gmail.
- You will now have two options; **1. "Create, upload, author, publish & share my spatial data"** and **2. "Collect, inspect and manage field data"**. Choose the 2nd option.
- You are now ready to set up a mapping project and form for data collection.

2. Create a project

- Click **"Create new project"** in the top left hand corner of the screen.
- Give the project a name, e.g. *Mapping Cedar wattle distribution*.
- Add the form items or fields that you will need to collect when out there. Common ones are: longitude, latitude, altitude, etc. There is a big list to choose from when you click the **"text"** boxes. The **"radio buttons"** and **"checkboxes"** options are easiest to use, when you're out in the field and need to record observations quickly, so use these as much as possible!
- To customise the radio buttons, click **"Details"** on the field. You can add a number of items or options for the surveyor to click.
- If you tick **"Required"**, the field must be addressed in order to complete the observation when out there.
- You'll then have a screen that looks something like this:

The screenshot shows the 'New project' interface on the GIS Cloud website. The project name is 'cedar wattle distribution'. The form items section is expanded for the 'Reproductive status' field, showing a list of items: juvenile, vegetative, blooming, and fruiting. Each item has a 'Label (optional)' field and a 'No default' radio button. The 'Persistent' checkbox is checked, and the 'Required' checkbox is unchecked. A notification box states: 'Save button has been replaced with the autosave feature. Changes you make to your project structure are now automatically saved and you don't have to use the save button anymore.'

- Click “**Create project**” on the right of the screen to save it.
 - Congratulations. You now have a project.
3. The mobile app
- Go to the app store or play store, depending on your mobile device and install *Mobile Data Collection* by GIS Cloud.
 - Open the app and sign in with the Gmail account you created for the project.
 - The first screen you’ll encounter is the *Settings* screen:



- Select your project in the drop-down menu under *Projects*.
 - Scroll down to where it says *Send using cellular data network* and switch it to “**yes**”.
 - Select “**Form**”. This will bring up the form you created earlier, ready to fill out.
 - Make sure your device’s data and location settings are switched on.
 - Put on your best pair of adventure boots, and get out into the field.
 - For each observation made, you will need to press “**Send**” to upload it to the cloud database. It can sometimes take a while. You can check its sending progress in the *Queue* tab. You can also check which observations have been made on the *Map* tab.
4. Getting others involved
- For anyone to use the same form for free, they will need access to the email account that was created for the project. Then all they need to do is install the app on their smartphone or tablet (Apple or Android) and set it up as described above.

How to use the offline map option:

1. Go to the offline maps option in the *Settings* page of mobile *Data Collection*.

2. Area of interest can only be defined when the device is online by choosing *Choose area for download* and panning/zooming to the area of capture.
3. Clicking *Accept* defines the area for which offline capabilities will be enabled.
4. By default, two levels of zoom will be available. Change this setting by clicking the *Levels* button and sliding to the desired value.