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# ICO-Mark App Users Guide - version 1.3

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# ICO Mark App Users Guide Version 1.3

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## I. Introduction

ICO Mark is a tablet- and phone-based application (app) developed for forest managers and forestry field crews to spatially monitor and map forest structure. ICO Mark relies on the Individuals-Clumps-Openings approach to characterizing dry forest spatial patterning, where forests are composed of varying proportions and sizes of individual trees, clumps of trees, and treeless openings. ICO Mark allows users to track individual trees and clumps for both marking pre-harvest, and for monitoring conditions post-harvest. The app has five screens that guide the user through the data collection process. The Project Selection screen lets the user set up and manage projects, the Project Settings screen lets the user define the parameters of the marking and monitoring project, the Dashboard shows a summary of progress, the Tally screen lets the user enter clump data and tracks tabular progress through the unit, and the Map screen shows the data the user has collected and visually tracks progress through the unit.

While ICO Mark can be used on a wide variety of Android devices with GPS capabilities, including smart phones, we recommend using a small protected tablet with an external Bluetooth GPS device to collect data. We have found that a 7-inch tablet is a convenient size for field use, and have had good experiences with Asus and Samsung tablets. We also recommend protecting the tablet with a combination of shock-absorbing and waterproofing cases. The Bobj Rugged Case and Trendy Digital waterproof bag have worked well for our tablets. Although many tablets come with built-in GPS systems, we suggest using an external Bluetooth GPS device to boost accuracy. We typically use Garmin

GLO receivers. Note that if you do choose to use a Bluetooth GPS, you will need to download “Bluetooth GPS” or a similar app from the app store in order to pair the device with your tablet.

We used to recommend installing additional mapping programs on the tablet, but starting in version 1.3 of the ICO-Mark app most of the functions of these other apps have been incorporated into ICO-Mark itself. In particular, ICO-Mark can now handle UTM and State Plane projections for California, Idaho, Montana, Oregon, and Washington, and can display PDF basemaps in much the same way as Avenza PDF Maps. There are, however, a few functions that have not yet been incorporated into ICO-Mark. ICO-Mark does not support measuring distances or areas, cannot cache aerial imagery (but aerial imagery can be brought in via the PDF map support), and cannot display multiple shapefiles (only one shapefile, typically a unit boundary shapefile, can be imported).

Here are two free apps that do provide these functions, which we frequently use:

- View Ranger: uses GPX files of stand boundaries, points, and other features against a background of aerial imagery that you must download via Wi-Fi ahead of time. This provides a wide coverage area, but the download must be complete before heading out to the field.
- Avenza PDF Maps: a user-friendly app that imports georeferenced PDFs of the work area created ahead of time in ArcMap or another GIS program (ArcMap automatically georeferences PDFs upon export). Once you have created a PDF map of your stand, upload it to the tablet’s hard drive and import it to the app; you will then be able to drop points and record tracks as you move on the map, as well as measure distances and areas. Note that you will only be able to use PDF Maps within the extent of the imported map.

## II. Installation

Releases of the app are distributed by direct transfer of the .apk file, which should be named *ICO-Mark version.apk*. Copy the .apk file to your tablet, browse to its location using a file explorer, and open it. This should begin the app installation process. This process varies by tablet, but you usually have to select the “Allow installation of apps from unknown sources” setting, which is typically in a Security settings submenu.

Contact Sean Jeronimo for a copy of the app (contact info above).

### III. Using the App

#### 1. Project Selection Screen

*Create, open, or delete projects.*

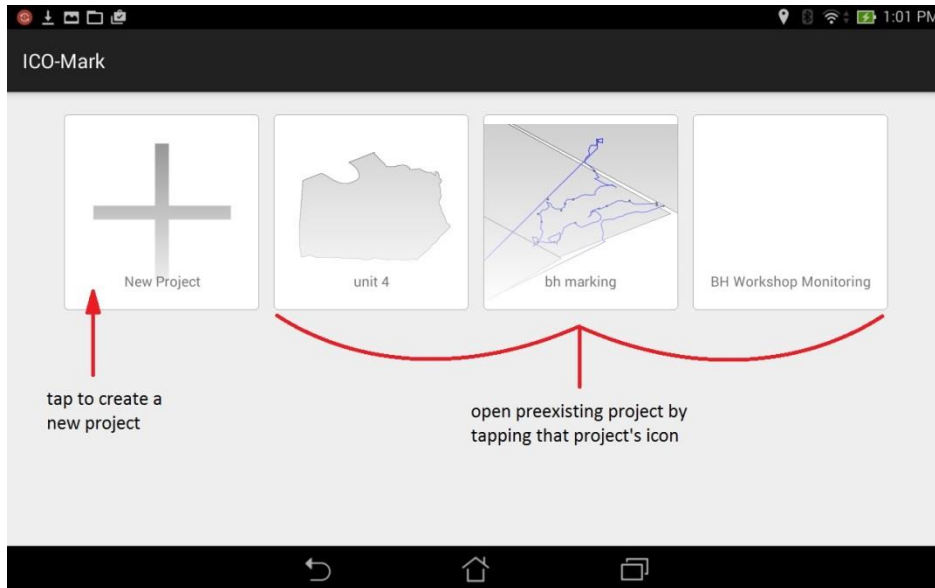


Figure 1- Project Selection Screen

→ **To create a new project:** Click the “New Project” button with the large “+” icon.

→ **To open an existing project:** Simply click on its icon. If more projects exist than can fit on one screen, the screen should scroll to the right with a flicking gesture.

→ **To a delete project:** Long-click on the project you’d like to remove. You will enter the project deletion mode: the project you selected will have a checked box overlaying its icon; other projects will have unchecked boxes. Check the boxes of all projects you’d like to delete, and then tap the garbage can icon on the action menu in the upper right-hand side of the screen. To cancel or exit deletion mode, hit the “X” icon on the action menu.

## 2. Project Settings Screen

*Set up new projects or edit settings of existing projects.*

This is the first screen that appears when you create a new project, but is also accessible from the “Settings” menu item later on. This screen has 11 fields that need to be entered.

### The *Project Setting* screen overview

The screenshot shows the 'Project Settings' screen with the following fields and options:

- Project name:
- PDF basemap (\*.pdf):  **Browse...**
- Unit boundary (\*.shp):  **Browse...**
- Clump data output folder:  **Browse...**
- Tally sheet:  **▼**
- Projection:  **▼**
- Species list (\*.txt):  **Browse...**
- Unit size (ac.):
- BA Target:
- TPA Target:

Clump Size Proportions (edit bins)

1	2-4	5-9	10-14	15-30+
0.0	0.0	0.0	0.0	0.0

**Cancel** **OK**

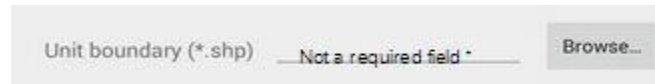
→ **The *Project name* field** sets what the project will be called on the project selection screen and also sets the filename of the output .csv file that will contain all of your tally data and clump coordinates. This is a required field.

Project name

→ **The *PDF basemap* field** sets the location in the file system of an existing georeferenced .pdf file, which is a map of the area you’ll be working in. The PDF basemap will only work with Android version 5.0 and above. This is most tablets manufactured after November 2014. This is an optional field.

PDF Basemap (\*.pdf)  **Browse...**

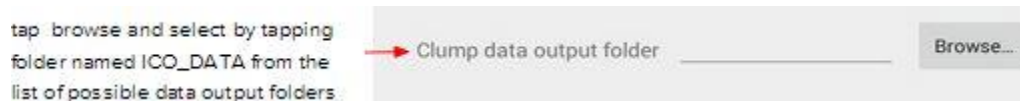
→ The **Unit boundary field** sets the location in the file system of an existing polygon .shp file, which represents the boundary of the unit you'll be working in. The Unit boundary has pre-set symbology for map display that cannot be changed at this time. This is an optional field.



**Notes about projections:**

- The projection of the PDF basemap is set by the spatial coordinate system of the data frame in ArcMap. For example, if you have a raster in a UTM projection but your ArcMap data frame spatial reference is a State Plane projection, when you go to render the PDF map it will be in a State Plane projection.
- The PDF basemap must be rendered from an ArcMap document with only 1 data frame, or where all data frames have the same spatial coordinate system.
- If the projection of the Unit boundary shapefile does not match the projection of the PDF map, the PDF may appear warped or stretched.
- The projection of the Unit boundary shapefile must match the projection that you want your spatial data recorded in.

→ The **Clump data output folder** sets the output directory for your clump data .csv file. The file containing your tally data and clump coordinates will be named "*Clump .shp folder/Project name.csv*". It is suggested to create a data storage folder (example name ICO\_DATA) on your computer to store the clump data output files within. This is a required field.



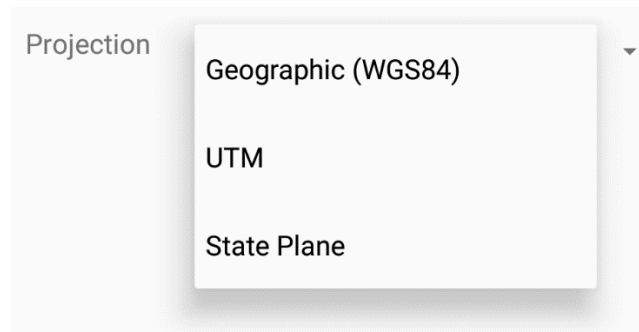
→ The **Tally sheet dropdown** field lets you choose which the type of tracking you want to use. All of the tally sheets keep track of clump location with the use of a GPS (Instructions on Pg 9 of this user manual).



- **Clump Bin Only:** This is the simplest and fastest method of tracking clumps. This tally sheet is most useful for quick tallies of clump sizes, where exact clump sizes, tree species, and diameter range data are unimportant for your results. Users of this data sheet only need to tap the clump size range as they are working through the unit.
- **Clump Size Only:** Slightly more detailed than the Clump Bin Only option, the Clump Size Only option lets users enter in the exact count of trees within a clump. Tree species and diameter data are not recorded.

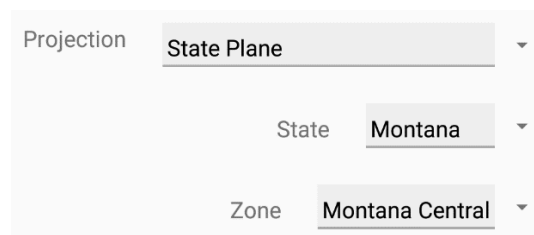
- **Clump Size + DBH:** In addition to specifying the number of trees in a clump, this option allows users to record the average DBH of trees within a clump. This requires more time to enter the data but provides tree size distribution information for the unit. Tree species are not recorded.
- **Quick Map Monitoring:** This tally sheet is designed for the Quick Map method of monitoring (see ICO Manager’s Guide for detailed information). The Quick Map Monitoring tally sheet requires users to enter species, tree count, average diameter, clump shape (point, line, circle, snake line, polygon), and clump size and orientation (azimuth, major and minor axes where applicable).
- **Customized tally sheets** can be created for specific data collection needs, designed upon request for any data management project. Contact Sean Jeronimo for more information. Contact information is listed on the first page of this Users Guide.

➔ **The Projection field** selects the projection that spatial data will be recorded in, which must also match the projection of the Unit boundary shapefile:

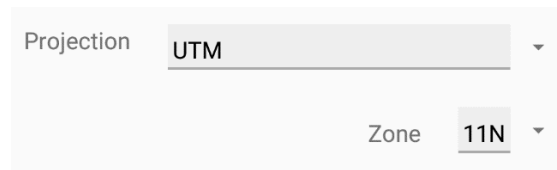


- **Geographic (WGS84):** This is standard longitude/latitude coordinates. Usually this does not work well with PDF maps because square shapes are not preserved using a geographic coordinate system.
- **UTM:** Universal Transverse Mercator system, with units in meters
- **State Plane:** This system is really a collection of systems specific to each state. Units are in feet.

➔ **The State field** selects the state for your projection system if you are using a State Plane projection. The states of California, Idaho, Montana, Oregon, and Washington are covered.

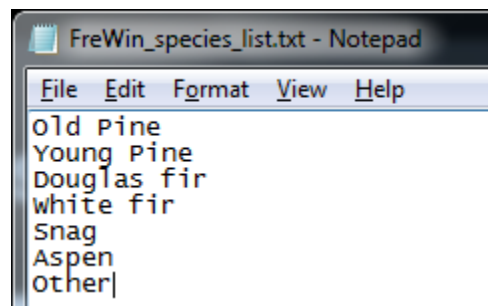


➔ **The *Zone* field** selects the zone for your projection system if you are using UTM or State Plane. Zones covering the states of California, Idaho, Montana, Oregon, and Washington are implemented.



Projection  ▾  
Zone  ▾

➔ **The *Species list* field** sets the .txt file giving the species list to use when QuickMapping. You only need to set a species list when you are using the QuickMap tally sheet. A species list file is just a list of species that you might encounter, one per line. The file might look like this:

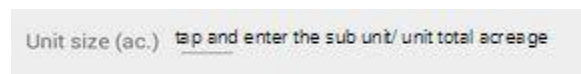


When you are not QuickMapping, this field will not be available.



Species list (\*.txt)

➔ **The *Unit size* field** sets the size of your unit in acres. The number provided here is used for all real-time progress calculations, but doesn't otherwise affect the functions of the app. This is a required field.



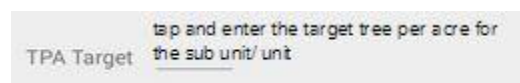
Unit size (ac.)

➔ **The *BA Target* field** sets the target basal area in ft<sup>2</sup>/acre. The number provided here is used for real-time progress calculations, but doesn't otherwise affect the functions of the app. This is a required field.



BA Target

➔ **The *TPA Target* field** sets the target density in trees/acre. The number provided here is used for real-time progress calculations, but doesn't otherwise affect the functions of the app. This is a required field.



TPA Target

➔ **The *Clump Size Proportions* fields** sets the target clump size distribution in various bins of clump sizes. Each value represents the proportion of trees in each clump size bin. Enter the values as decimal



proportions (e.g., 0.3). All values should total up to exactly 1. The number provided here is used for real-time progress calculations, but doesn't otherwise affect the functions of the app. This is a required field.

1	2-4	5-9	10-14	15-30+
0.0	0.0	0.0	0.0	0.0

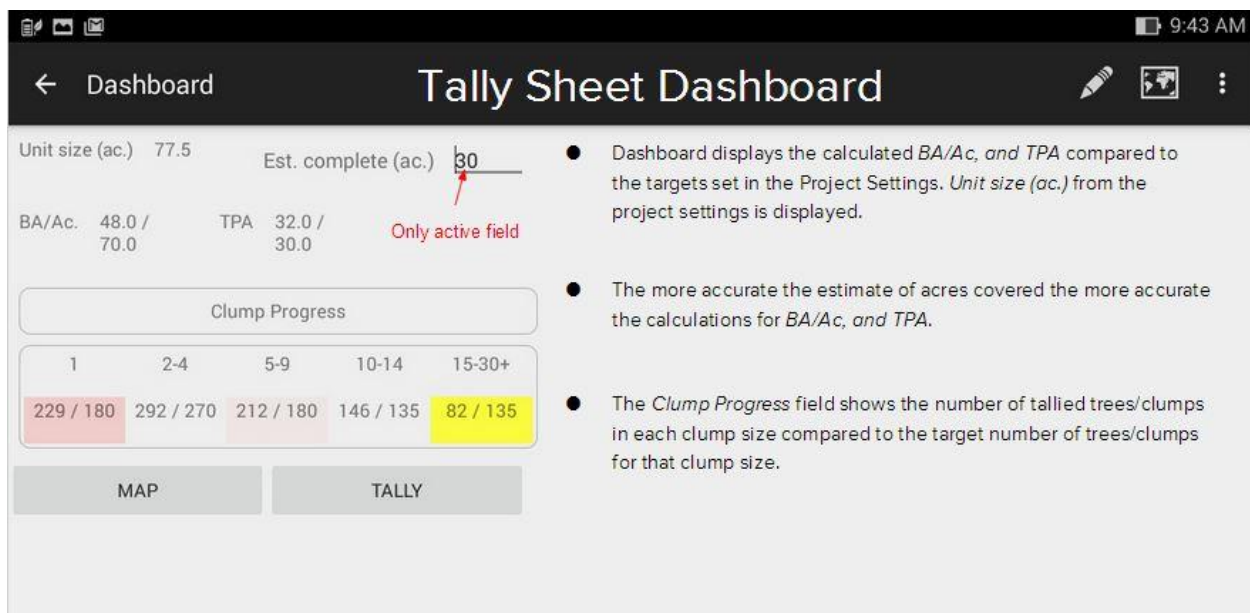
tap the 5 bins to set target clump percentages

**You can change the clump bin ranges** using the edit bins button (red box in figure above). The edit bins dialog lets you add, remove, and modify bins.

### 3. Dashboard Screen

**See a summary of your progress, manage how much of your unit is complete, and access Tally and Map screens**

The Dashboard serves as the navigational hub for the data entry process. The Dashboard gives a summary of clump progress as the user works through the unit, based on a user-provided estimate of progress through the unit in terms of area covered. Users access the mapping and tally functions via the “Map” and “Tally” buttons on the Dashboard.



➔ **The *Est. complete* field** is the one active field in the Dashboard. It is a user-provided estimate of the amount of area covered so far. The Dashboard uses this estimate to calculate progress in terms of area covered, rather than in terms of absolute targets for the whole unit. The better this estimate is, the more accurate your progress will be.

**The *TPA* and *BA/Ac* fields** display the average density so far compared to the target set in Project Settings. Note that if you are using a tally sheet that does not record DBH, the BA progress will always be zero (0).

## 4. Map Screen

### *Visually track your progress*

The map displays the unit boundary polygons, skips, gaps, clumps tallied, and the user's current GPS position, if available. Users may also record additional points and lines in addition to the automatically-generated clump points. Access the map from the Tally Sheet dashboard screen.



The first time the users opens a project's map, the map automatically zooms to show all content. Subsequently, it should open to the last active extent.

- ➔ **Pan the map** by dragging a finger
- ➔ **Zoom** by pinching
- ➔ **Zoom in a fixed amount** by double-tapping, and zoom out by tapping with two fingers
- ➔ **The zoom+ and zoom- icons** perform the same fixed zooms in and out as the finger-tapping gestures
- ➔ **The globe icon** resets the zoom to show all content
- ➔ **The crosshairs icon** shows GPS status. If the crosshairs icon is greyed out with an X, no GPS is available whatsoever. If the crosshairs are greyed out but hollow, there is no active GPS but a "last position" is available. If the crosshairs are not greyed out and is filled with a circle, there is an active GPS signal. In the latter case, clicking the button will center the map on the GPS position.
- ➔ **Create a line** by using the New Line icon. Use this to map a Snake shape in the Quick Map Tally Sheet.

➔ **Create a polygon** by using the New Line icon. ICO Mark records a line that can be converted to a polygon in GIS. The ICO-Analyze program is able to use line data so the conversion step may not be necessary for most users.

### **Mapping Snake and Polygon clump shapes from the Quick Map Tally Sheet**

The Quick Map Tally Sheet allows the user to identify clump shapes including snake and polygon shapes. Users must collect this spatial data using the Map Screen and creating a new line as they walk the clump shape. Make sure the line does not cross itself. Quick Map Tally Sheet does not automatically transition the user to the Map Screen, so users must remember to collect this data when identifying a clump with a snake or polygon shape. When the line is saved, a window will prompt the user to enter a note. To associate the line with a clump, enter the appropriate clump ID (clump IDs are the sequential integers given in bold grey text on the left-hand side of the tally sheet).

Lines can also be used to note or delineate other interesting features, such as regen patches, rock outcrops, or skips and gaps. In these cases, write a note with some descriptive text (instead of a clump ID) and the lines will be ignored in the ICO-Analyze program.

## 5. Tally Screen

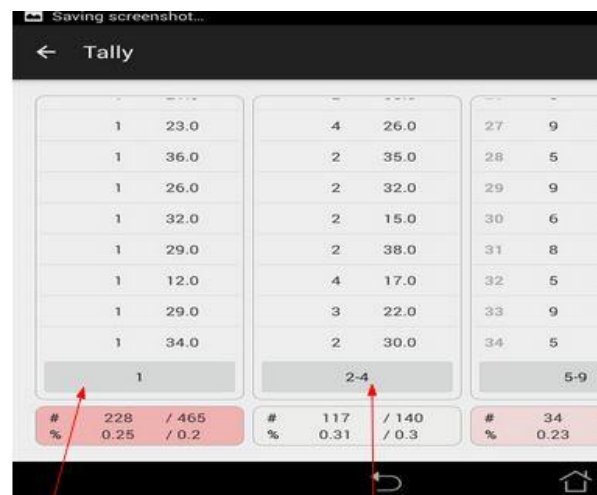
### Enter marking and monitoring data

The tally screen shows the tallied clumps, allows for new clumps to be tallied, and gives an indication of progress toward clump targets. There are several columns, each of which represents one clump size bin. The bin size is indicated by the grey button near the bottom of the screen, which also serves as the means of adding new data. The lists above the buttons show each clump recorded in each bin, and depending on which Tally Sheet the user selected for the project, the number of trees in each clump recorded, and the average DBH of each clump recorded. The summary boxes below the buttons display the number of clumps recorded in each bin compared to the total target number of clumps across the entire unit, along with the same data but expressed as proportions of trees, instead of number of trees.

Example of an active tally sheet using Clump Size + DBH Talley Sheet.



➔ **To Add Clumps:** Touch the grey button with the corresponding clump range at the bottom of the screen. You will be prompted to add more information depending on what tally sheet you have set up. Number of trees, average diameter, and species may be added for Clump Size Only, Clump Size + DBH, and Quick Map tally sheets, respectively. Quick Map Tally Sheets also include clump shape, size, and orientation data fields. ICO Mark automatically records a GPS point when the user completes entering the clump information.



Tap to add single tree

Tap to add clumps of 2 or greater

If the user enters a clump size that does not agree with the original button pressed, the clump is inserted into the correct bin. For example, clicking the “2-4” button and entering a clump of 5, the clump will actually be added to the “5-9” bin.

- **For the Quick Map Tally Sheet**, when identifying clump shape as “Snake” or “Polygon,” make sure to go to the Map Screen to map the clump shape using the New Line feature. Make sure to identify the line feature using the clump ID from the Tally Sheet.

➔ **To Edit or Delete Clumps:** Long-click on the clump of interest. A dialog box will pop up giving you the opportunity to edit any field associated with that clump.

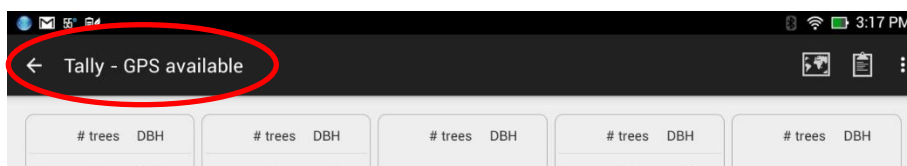


Clicking the *Delete* button will elicit an additional dialog box to confirm the deletion. Clicking the *Cancel* button will take you back. Clicking the *Save* button will save your edits. Editing the clump attributes does not change the xy point associated with the clump. The only way to associate a clump with a new xy point is to delete the clump and re-enter the data while standing at the new point.

➔ **Color Coded Summary Boxes:** The summary boxes at the bottom of the screen are colored according to how well clump targets are being met. **Yellow** indicates values below targets, **red** indicates values above targets, and white indicates values meeting targets. Stronger colors indicate a higher degree of deviation from targets.

➔ **GPS Connection:** The Tally page title shows GPS connectivity. When GPS is connected and receiving a position signal, the title will show “Tally – GPS Available”. If GPS becomes unavailable, the title will change to “Tally – GPS Unavailable”. Furthermore, if a user opens ICO Mark when the device isn’t connected to GPS, the title will simply read “Tally” and will not have coordinate information for clumps.

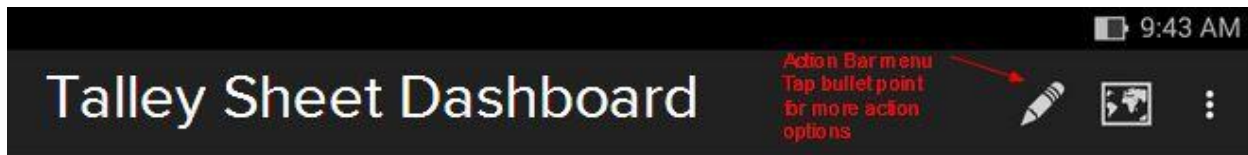
➔ **Caution:** Clumps that are recorded while GPS is available will have coordinates saved. Clumps that are recorded while GPS is unavailable will not. **Watch your GPS status while recording data.**



## 6. Action Bar Menus

*On the Dashboard, Map, and Tally screens, the Action Bar Menu allows the user to edit settings and select screens.*

The Action Bar menus allows quick navigation among the Tally, Map, and Dashboard screen using the pencil, map, and clipboard icons, respectively. Additionally, the “⋮” dropdown menu allows you to edit project settings and manage GPS recording.



➔ **Pencil:** Brings user to the Tally screen

➔ **Map:** Brings user to the Map screen

➔ **Clipboard:** Brings user to the Dashboard screen

➔ **Menu:** Access Project Settings, turn clump GPS recording on/off, and turn track recording on/off.

When clump GPS recording is off, you may still have an active GPS signal that will show your location on the map, but new clumps will not have associated x-y coordinates saved.

## IV. Data Output

Set the output file location and name in the Project Settings. The file is a comma-separated text file with four columns: X, Y, N trees, and Avg\_DBH. Each row represents one clump. The X and Y coordinates correspond to the longitude and latitude, respectively, recorded by the GPS. The N\_trees field gives the number of trees in each clump. The Avg\_DBH field gives the average DBH of trees in that clump. If using a tally sheet that does not record DBH, the Avg\_DBH values will all be zero (0).

For the Quick Map Tally Sheet, one or two additional files will be saved. A “shapes.csv” file will be saved describing the shape of each clump (point, line, circle, etc.). If any line data were recorded, a “clumplines.gpx” file will be saved containing these data.