

SEAN sea otter monitoring SOP 8: Counting digital images

Revision History Log:

Previous SOP version	Effective Date	Revised By	Changes Made	New SOP version
1.0	September 2020	Louise Taylor	Minor updates	2.0

Data Deliverables

SOP 8 methods are used to generate SO_D, “Count data from images” and SO_I, “Detection count data”. In both cases the results are in the form of a CSV file containing counts of sea otters and covariates derived from SO_C photos.

Summary

Digital images of sea otters are collected during aerial photographic surveys. The images are processed by counting the number of sea otters in each photo and recording those counts along with related information in CSV files. The general process for counting, below, is specific to the SO_D product. The custom form and settings described in this SOP will also be used in SOP 19 which describes creating SO_I (detection counts).

SOP 8 requires CountThings software (available at countingthings.com) installed on a computer attached to the NPS network. CountThings needs high-bandwidth access to network image files so should only be run from a location physically collocated with the photo repository, which is currently the SEAN office. Dual monitors of at least 24 inches diagonal are recommended. SOP 13, formal acceptance of the SO_C photo product, must be successfully completed before SOP 8 is attempted otherwise reproducibility may be impaired.

Detailed Steps

1. Wait for the SO_C deliverable to obtain formal acceptance.
 1. To maintain data integrity, one should not proceed until the SO_C data have been approved.
 2. Reading the photos is a laborious task and it would be costly to redo.
2. Verify the work computer can access the accepted geocoded image files.
 1. Use Windows Explorer to navigate to \\sean.glba.nps.gov\Data\SEAN_Data\Work_Zone\SO\SO_C\yyyy\ where yyyy is the year of survey effort.
 2. Verify there are a set of subfolders, each containing multiple JPEG image files.
 3. Open several of the image files to ensure they are readable.
3. Verify your computer can access the destination folder.

1. Use Windows Explorer to navigate to \\sean.glba.nps.gov\Data\SEAN_Data\Work_Zone\SO\SO_D\yyyy\ where yyyy is the year of survey effort. Create the folder if one does not exist.
2. Copy a file of any type into the ...SO_D\yyyy\ folder in order to verify there is permission to put new files there. Then delete the copied test file.
4. Open the CountThings application and customize the settings.
 1. Open Settings, select Workflow, and make these settings (see Figure SOP8.1):
 1. Select the topmost radio button: “Open – User needs to press the Count & Save buttons...”.
 2. Check “Enable Edit Tags...”.
 3. Press the save button.

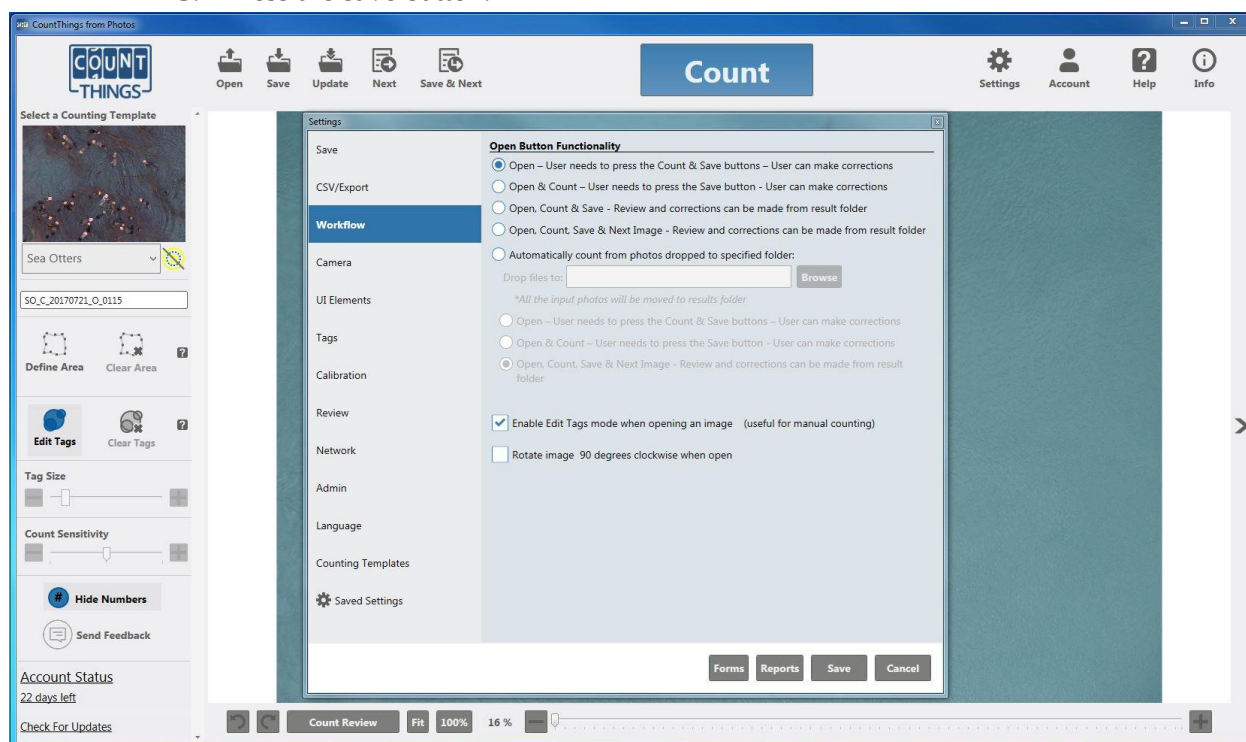


Figure SOP8.1. Setting the Workflow options in the CountThings application.

2. Select Save Options from the Settings menu and make these settings (see Figure SOP8.2):
 1. Under What to save, select the following
 1. Select Photo with results
 2. Select Editable version of the photo with results
 3. Select JSON file containing details on each detected item
 4. Select Save results to the CSV file.

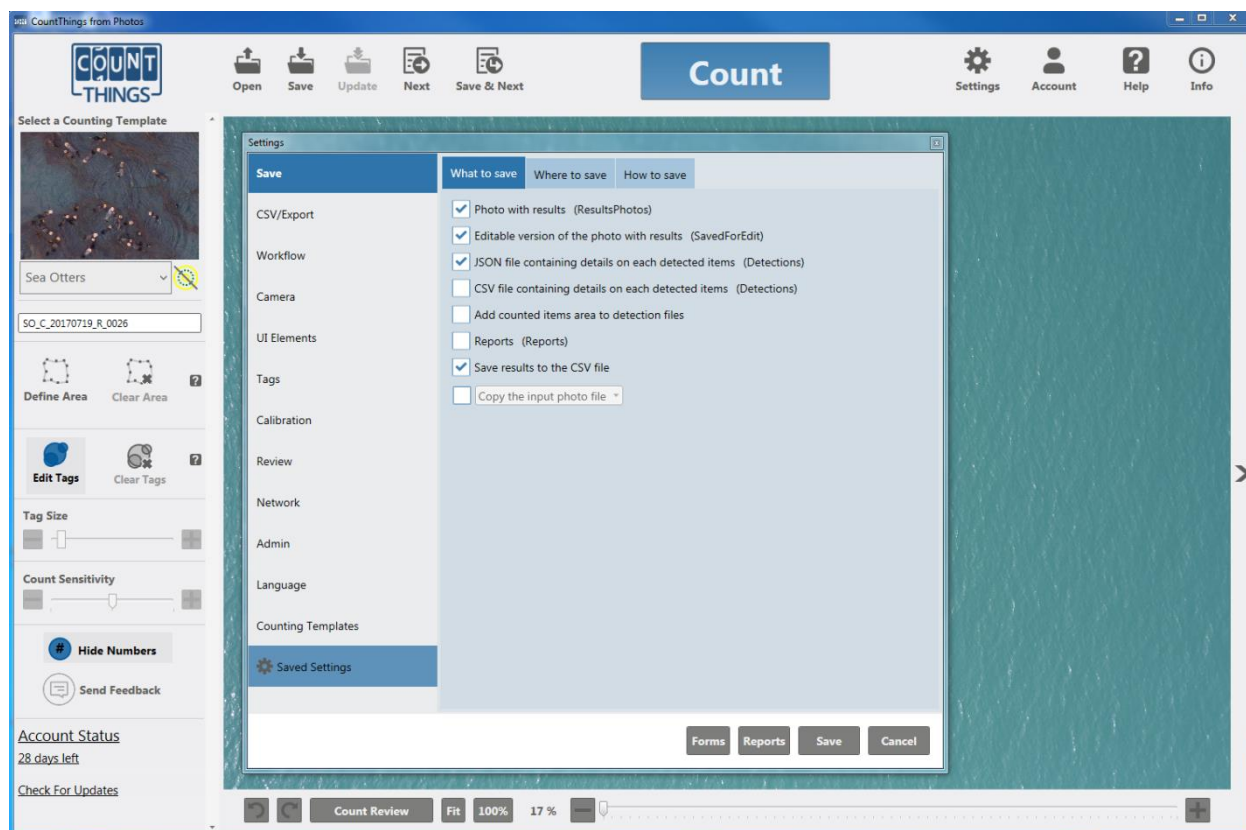


Figure SOP8.2. Setting the custom save settings, defining what to save.

2. Under the Where to save tab define the following (Figure SOP8.3):
 1. Results Root Folder is SO_D file path
 ([\\sean.glba.nps.gov\Data\SEAN_Data\Work_Zone\SO\SO_D\yyyy](#) where yyyy is the year of survey effort.
 2. Check Is network path box
 3. Save folder structure is Year
 4. Specific Folder is survey type (Abundance, Optimal, or Random)

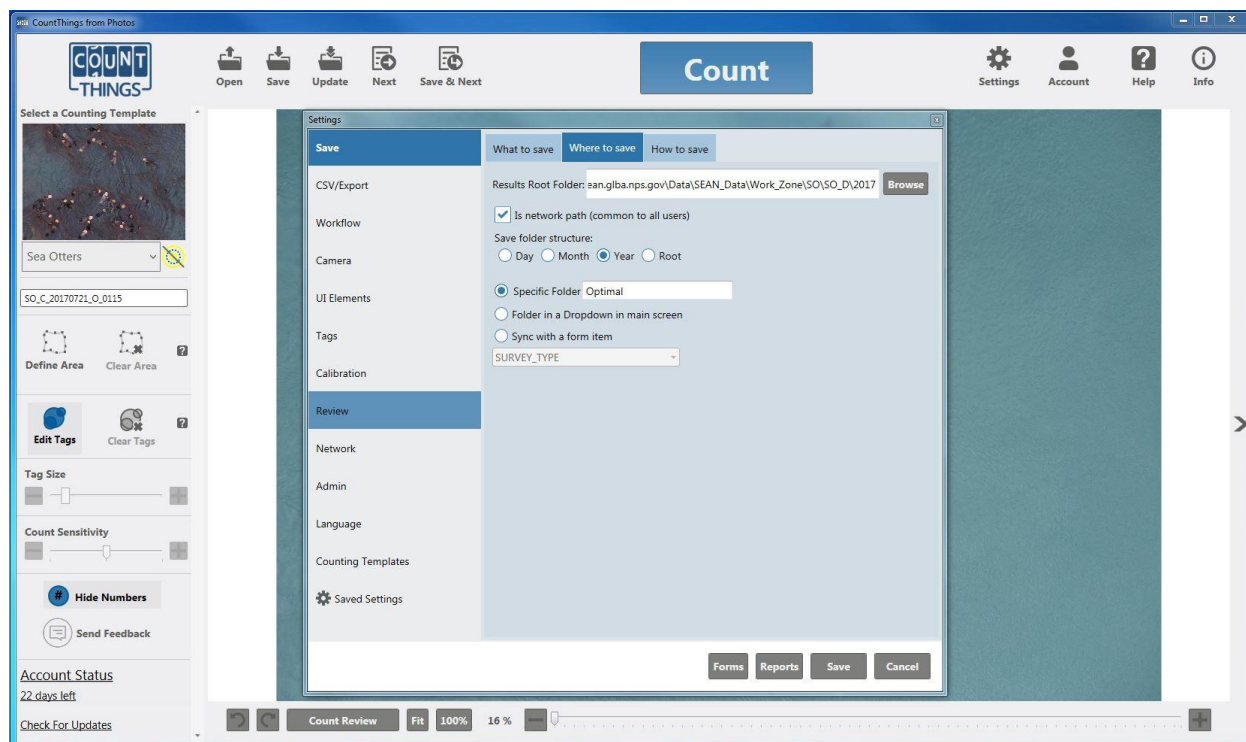


Figure SOP8.3. Setting the custom save settings, defining where to save the output file.

3. Under the How to tab define the following (Figure SOP8.4):
 1. Define Date Format as MM/DD/YYYY

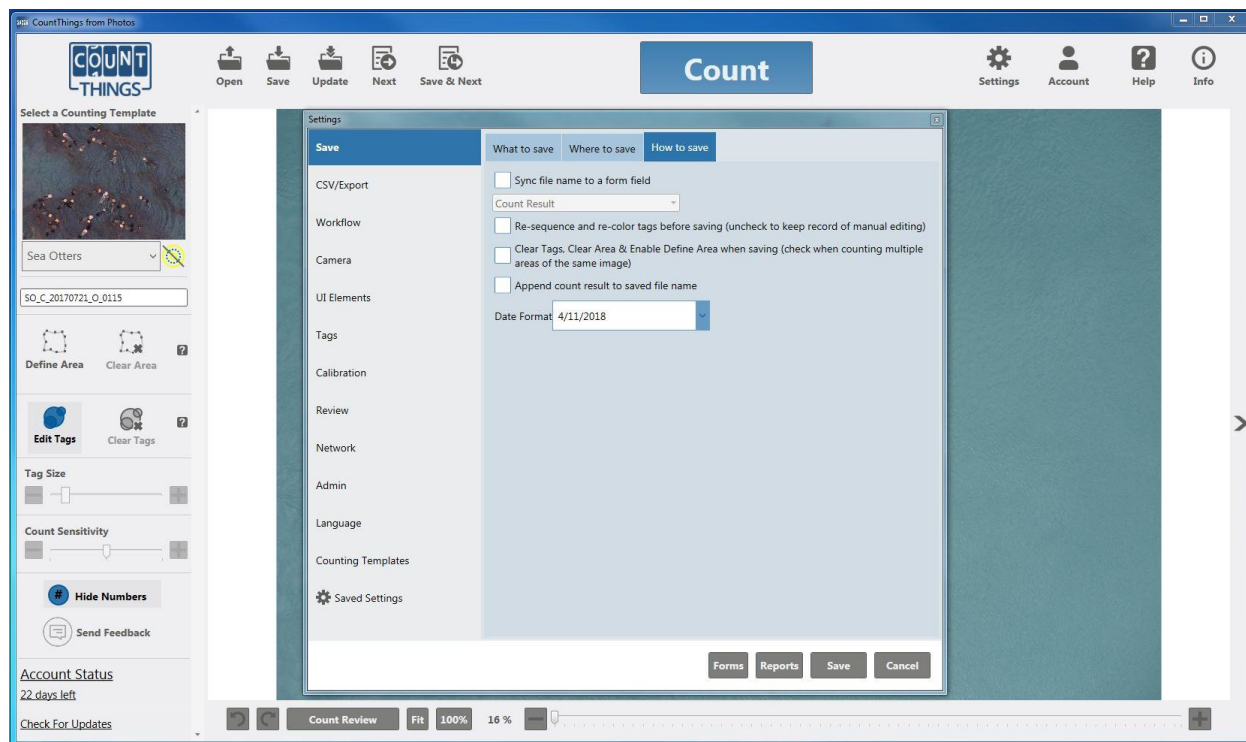


Figure SOP8.4 Setting the Save options in the CountThings application.

3. Select UI Elements (see Figure SOP8.5).
 1. Check the “Show ‘Next Image’” box.
 2. Check the “Show ‘Save & Next Image’” box.
 3. Check the “Show save changes dialog when image is closed” box.
 4. Check the “Show ‘Update Save’ button on main screen” box.

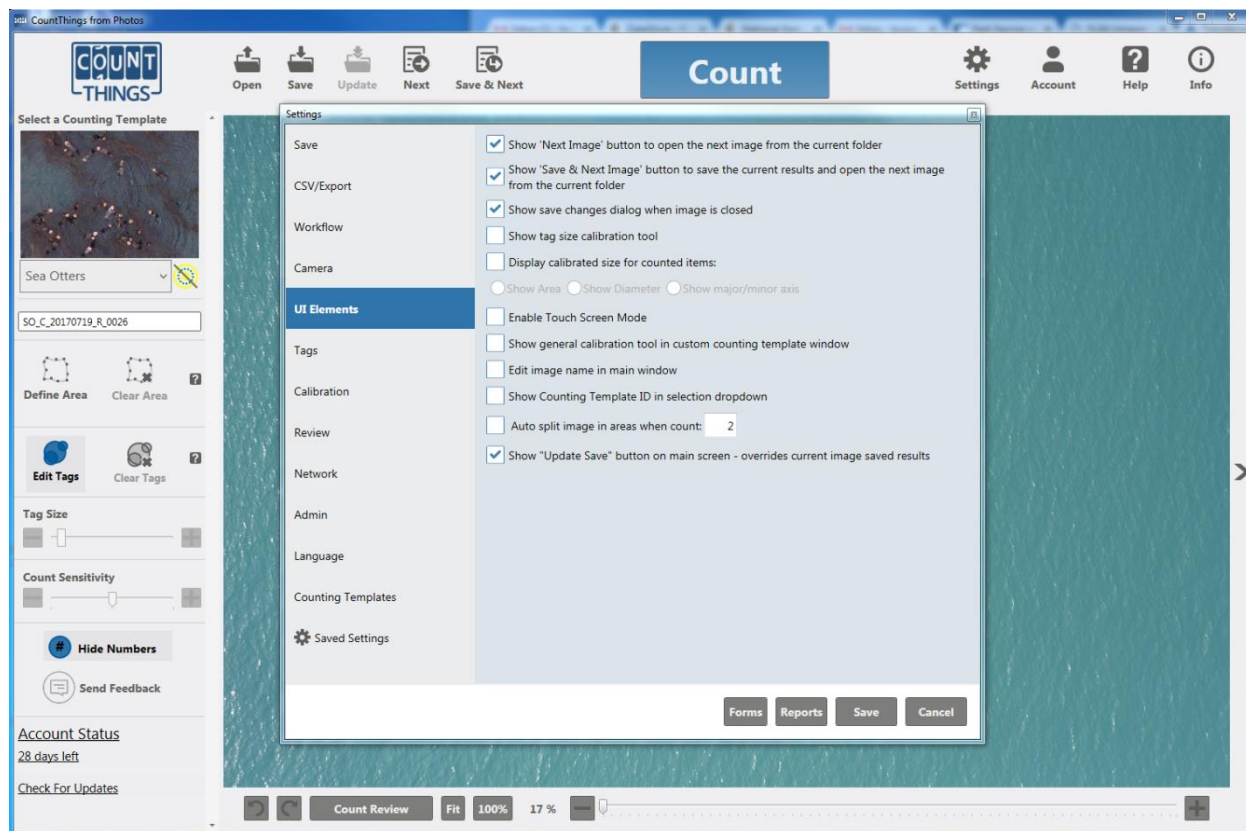


Figure SOP8.5. Setting the UI Elements options in the CountThings application.

4. Define Settings for Tags (see Figure SOP8.6).
 1. Select the Use custom tag size radio button.
 2. Set minimum radius to .05%.
 3. Set maximum radius to 2%.
 4. Set number of steps to 20.
 5. Press the save button.

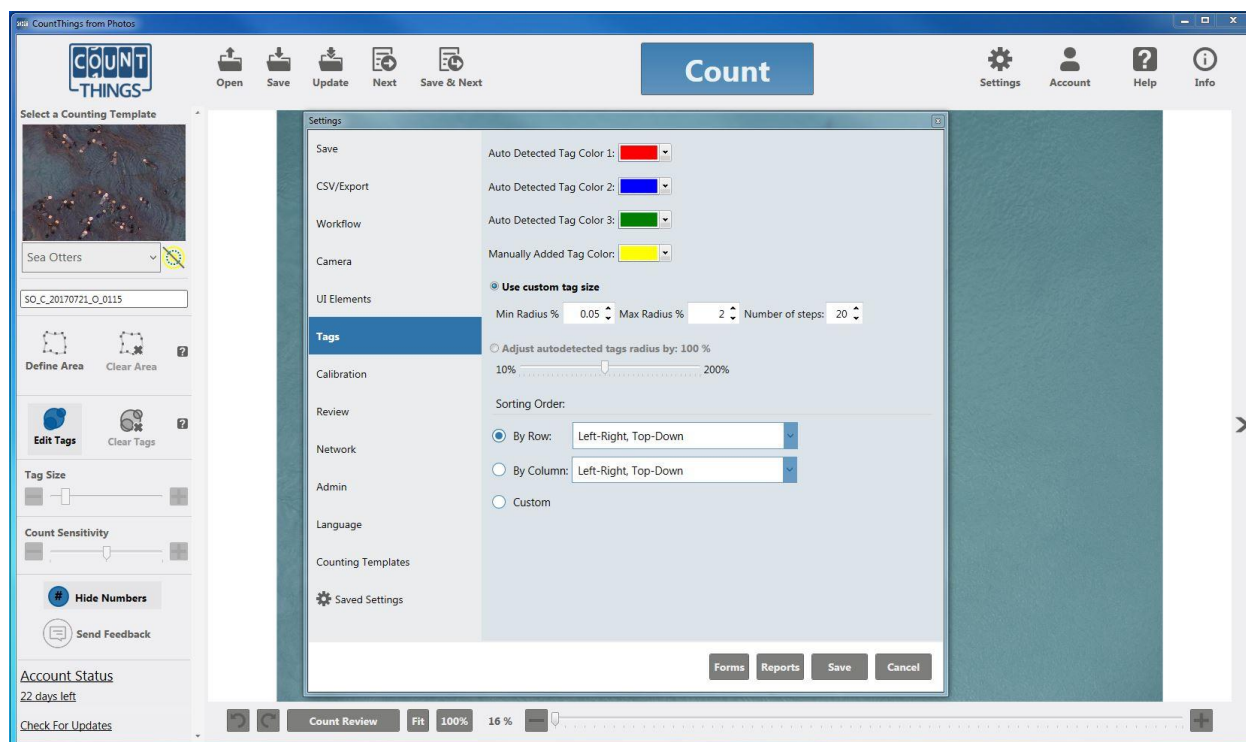


Figure SOP8.6. Setting the custom tag size options in the CountThings application.

5. Define Review Settings (see Figure SOP8.7).
 1. Check the “Hide numbers in review mode” box
 2. Set Opacity of overlapping cell boundaries to 1%
 3. Set Thickness of overlapping cell boundaries from circle radius to 2X.
 4. Select “Use Manual Review Mode” radio button.
 5. Set 6 rows and 6 columns.
 6. Press the save button.

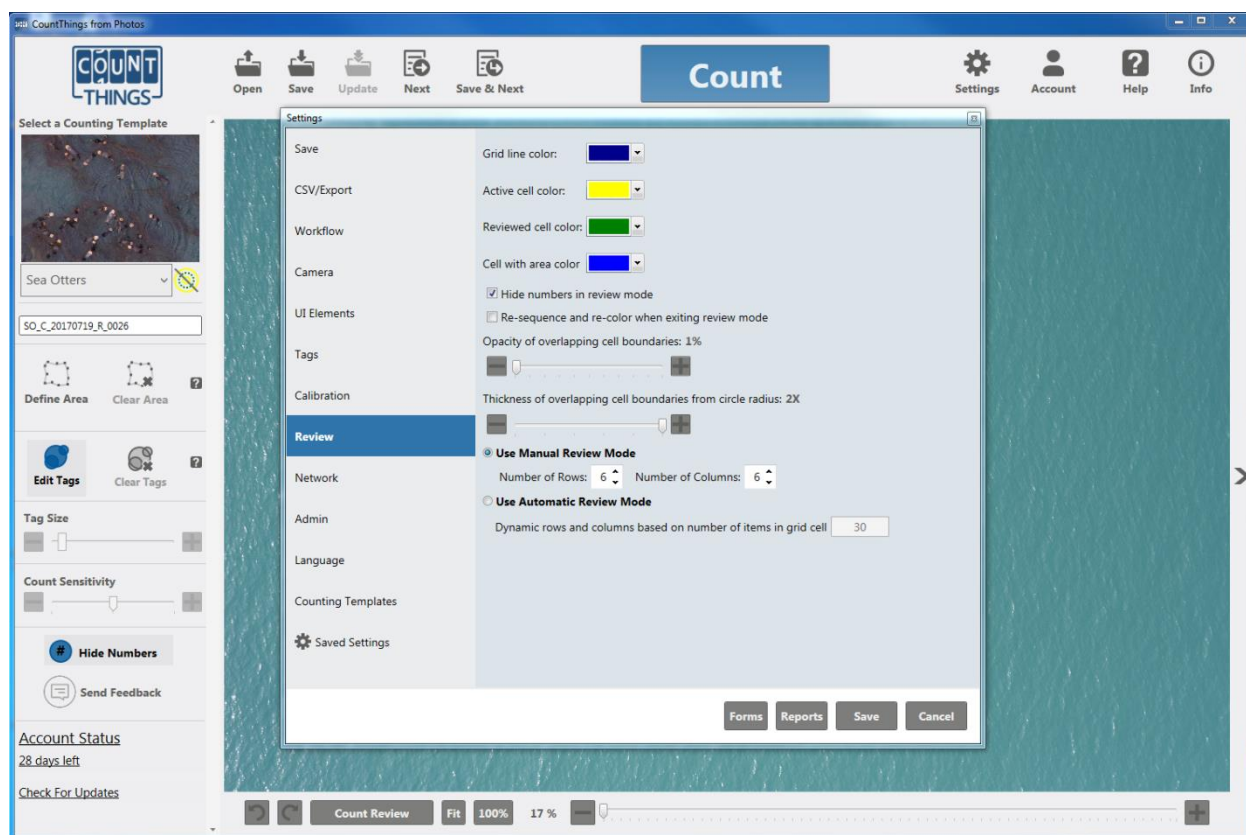


Figure SOP8.7. Review settings panel.

6. Open Counting Templates and choose “Sea Otters ID:125 Ver:001” from the counting template store (see Figure SOP8.8). Note that this automatic counting template does not actually function for counting sea otters automatically. Therefore the template is loaded even though all sea otters will be counted manually.

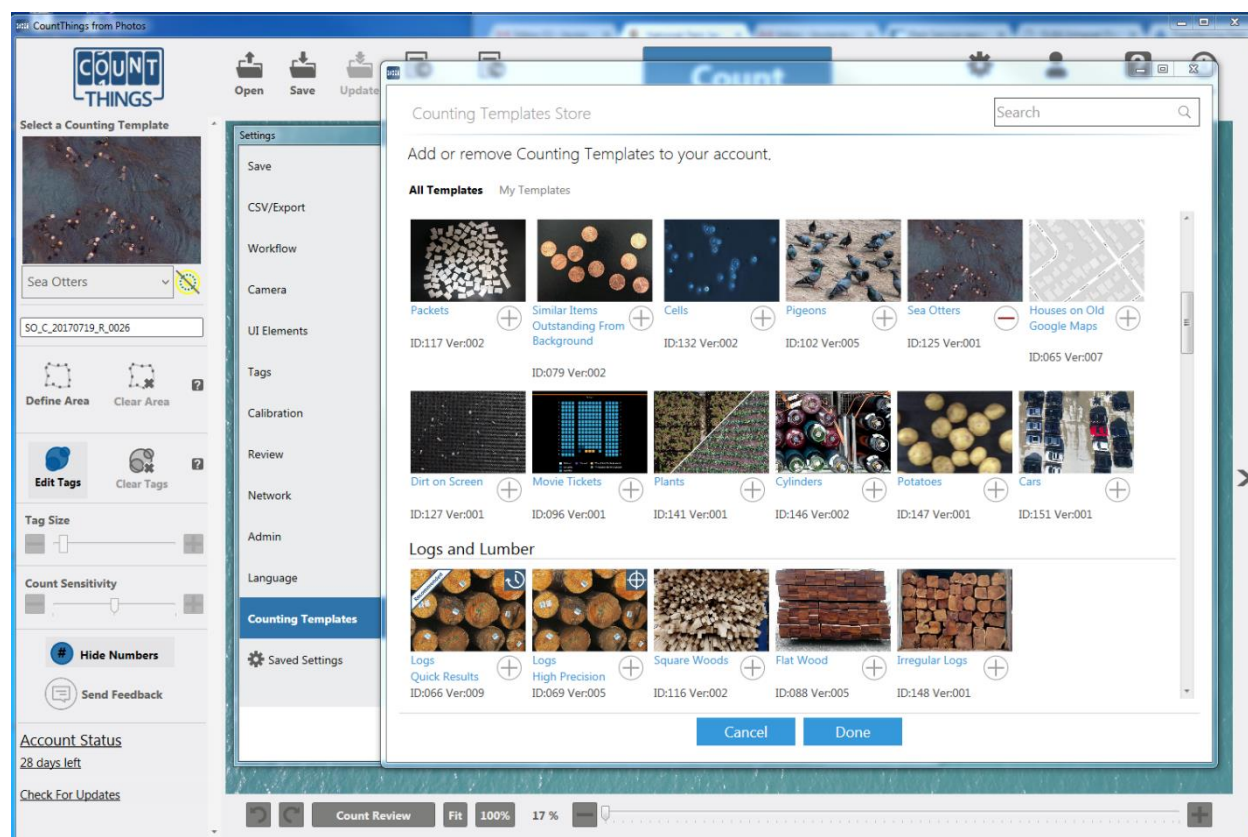


Figure SOP8.8. Selecting a count template in the CountThings application.

7. Define the fields in the CSV output file by pressing the Forms Button at the bottom of the Settings Menu, (see Figure SOP 8.7).
 1. A Customize dialog box opens (see Figure SOP8.9).
 2. The following custom output field definitions only need to be set up once. When satisfied with the fields, click the Upload Form button to upload them to storage. CountThings will remember these for subsequent uses. Others may also retrieve and use the same centrally-stored form.
 3. Create a new form by clicking the +, name this form "SO_D".
 4. Create a textbox for 'PROTOCOL_ID'. Check only Show Description.
 5. Create a textbox for 'COUNTED_BY'. Check only Show Description.
 6. Create a dropdown for 'SURVEY_TYPE' with items 'Abundance', 'Optimal', and 'Random.' Check Show description, Show option on new line, and do not check any of the items.
 7. Create a radio group for 'IMAGE_QUALITY' with items 'Good', 'Reduced', and 'Unusable.' Check boxes under Radio group settings for:
 1. Show Description.
 2. Reset with new image.
 3. Show option on new line.

4. Select 'Checked' for Good (this sets a default value of Good so the technician does not need to select this each time).

Figure SOP8.9. Building the custom form in the CountThings application.

8. Create a textbox for 'KELP_PRESENT'. Check Show Description and Reset with new image.
9. Create a textbox for 'LAND_PRESENT'. Check Show Description and Reset with new image.
10. Create a Count Radio Group with items Adult and Pup. Choose colors that contrast well with water, kelp, and otters such as red and yellow.

Customize Menu Window

Add, edit or remove items to better suit your needs

Annotate result image

Live preview

SO_D* [Edit] [Remove] [Add]

LAND_PRESENT [Edit] [Reorder] [Remove]

COUNT_ [Edit] [Reorder] [Remove]

ADULT: 0

PUP: 0

Date/Time [Edit] [Reorder] [Remove]

GPS Latitude [Edit] [Reorder] [Remove]

GPS Longitude [Edit] [Reorder] [Remove]

GPS Altitude [Edit] [Reorder] [Remove]

Add Items

+ abc Textbox

+ 123 Auto-increment Textbox

+ abc Dropdown

+ On/Off Toggle Button

+ Print Print Button

+ Export Export Button

+ V Volume

+ D Diameter

+ DB Database Action

+ Total Total Count

+ # Expected Count Result

+ Radio Group

Option 1 Option 2 Option 3

+ Count Radio Group

Option 1.0 Option 2.0 Option 3.0

+ Checklist

Option 1 Option 2 Option 3

Count Radio Group settings

SHOW Description [checked] Auto count clustering [unchecked]

COUNT_ [Reset with new image]

SHOW option on new line [checked]

+ Add new Item

ADULT :0 items [Remove] [checked] Color: [Red]

PUP :0 items [Remove] [unchecked] Color: [Yellow]

Download Forms Upload Form Save & Exit Cancel

Figure SOP 8.10 Building the custom form in CountThings

11. Create textboxes for Date/Time, GPS Longitude, GPS Latitude, and Altitude and click the box to Sync with image metadata. Select the corresponding category and field for each of these fields. (See Figure SOP8.11.) Check Reset with new image.

Customize Menu Window

Add, edit or remove items to better suit your needs

Annotate result image

Live preview

SO_D* [Edit] [Remove] [Add]

Date/Time [Edit] [Reorder] [Remove]

GPS Latitude [Edit] [Reorder] [Remove]

GPS Longitude [Edit] [Reorder] [Remove]

GPS Altitude [Edit] [Reorder] [Remove]

QUALITY_FLAG [Edit] [Reorder] [Remove]

DETECTION_GROUP [Edit] [Reorder] [Remove]

Add Items

+ abc Textbox

+ 123 Auto-increment Textbox

+ abc Dropdown

+ On/Off Toggle Button

+ Print Print Button

+ Export Export Button

+ V Volume

+ D Diameter

+ DB Database Action

+ Total Total Count

+ # Expected Count Result

+ Radio Group

Option 1 Option 2 Option 3

+ Count Radio Group

Option 1.0 Option 2.0 Option 3.0

+ Checklist

Option 1 Option 2 Option 3

Textbox settings

SHOW Description [checked] Show on the same line [unchecked] Is Numeric [unchecked] Is Required [unchecked]

Date/Time [Reset with new image]

Sync value with

Sync with Database [unchecked] Sync with count result [unchecked]

Sync with image barcode [unchecked]

Sync with image metadata [checked] Sync with other form items [unchecked]

Select a metadata field to sync with this textblock

Browse for image to load metadata fields

Select category: Exit IFD0

Select field from category: Date/Time

Value: Date/Time

Download Forms Upload Form Save & Exit Cancel

Figure SOP 8.11 Building the custom forms in CountThings, adding fields that sync with image metadata

12. Create a textbox for QUALITY_FLAG. Check Show Description and Reset with new image. (See Figure SOP 8.12)
13. Create a textbox for DETECTION_GROUP. Check Show Description and Reset with new image. (See Figure SOP 8.12)
14. Create a textbox for DETECTION_REPETITION. Check Show Description and Reset with new image. (See Figure SOP 8.12)

The screenshot shows the 'Customize Menu Window' in the CountThings application. The window is titled 'Customize Menu Window' and has a subtitle 'Add, edit or remove items to better suit your needs'. There is a button 'Annotate result image' in the top right corner. The window is divided into two main sections: 'Live preview' on the left and 'Add Items' on the right. The 'Live preview' section shows a form with fields for 'SO_D*', 'GPS Longitude', 'GPS Altitude', 'QUALITY_FLAG', 'DETECTION_GROUP', and 'DETECTION_REPETITION'. Each field has an 'Edit' button, a 'Reorder' button (up and down arrows), and a 'Remove' button (X). The 'Add Items' section lists various form items that can be added to the form: 'abc Textbox', '123 Auto-increment Textbox', 'abc Dropdown', 'On/Off Toggle Button', 'Print Print Button', 'Export Export Button', 'V Volume', 'D Diameter', and 'DB Database Action'. Below the 'Add Items' list is the 'Textbox settings' section for the 'QUALITY_FLAG' field. It includes checkboxes for 'Show Description' (checked), 'Show on the same line' (unchecked), 'Is Numeric' (unchecked), and 'Is Required' (unchecked). There is a 'Reset with new image' checkbox (checked) and a 'Sync value with' section with checkboxes for 'Sync with Database' (checked), 'Sync with count result' (checked), 'Sync with image barcode' (unchecked), 'Sync with image metadata' (unchecked), and 'Sync with other form items' (unchecked). At the bottom of the window are buttons for 'Download Forms', 'Upload Form', 'Save & Exit', and 'Cancel'.

Figure SOP8.12. Setting the form field definitions with the Customize window in the CountThings application.

8. Define the export CSV contents and order (See Figure SOP8.13).
 1. Open Settings, CSV/Export.
 2. Select form items PROTOCOLID, COUNTEDBY, SURVEYTYPE, IMAGEQUALITY, KELPPRESENT, LANDPRESENT, COUNTADULT, COUNTPUP, Date/Time, GPS Latitude, GPS Longitude, GPS Altitude, and QUALITYFLAG.
 3. Use the left and right arrows to arrange the fields in order.

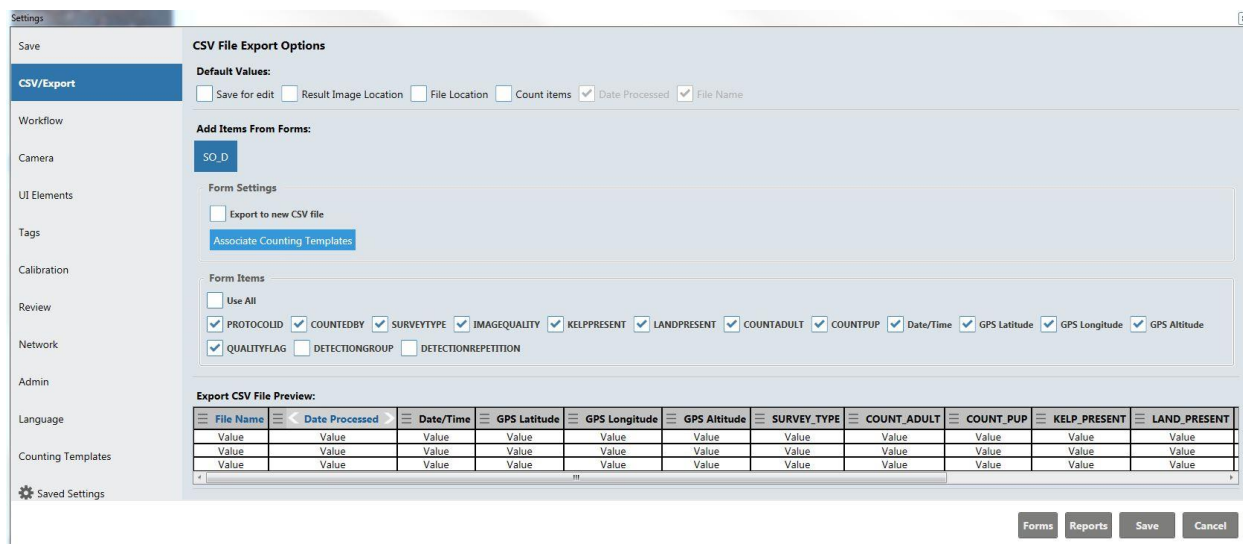


Figure SOP8.13. Setting custom CSV export options in the CountThings application.

5. Do the counting.

1. Open the first image to be counted by clicking Open and navigating to the photo folder “\\sean.glba.nps.gov\Data\SEAN_Data\Work_Zone\SO\SO_C\yyyy\yyyymmdd\t\” where yyyy is the survey effort year, yyyymmdd is the 8 digit date of the aerial survey, and t is the survey type (A, O, or R).
2. Select the first image and click Open. (See Figure SOP8.14)

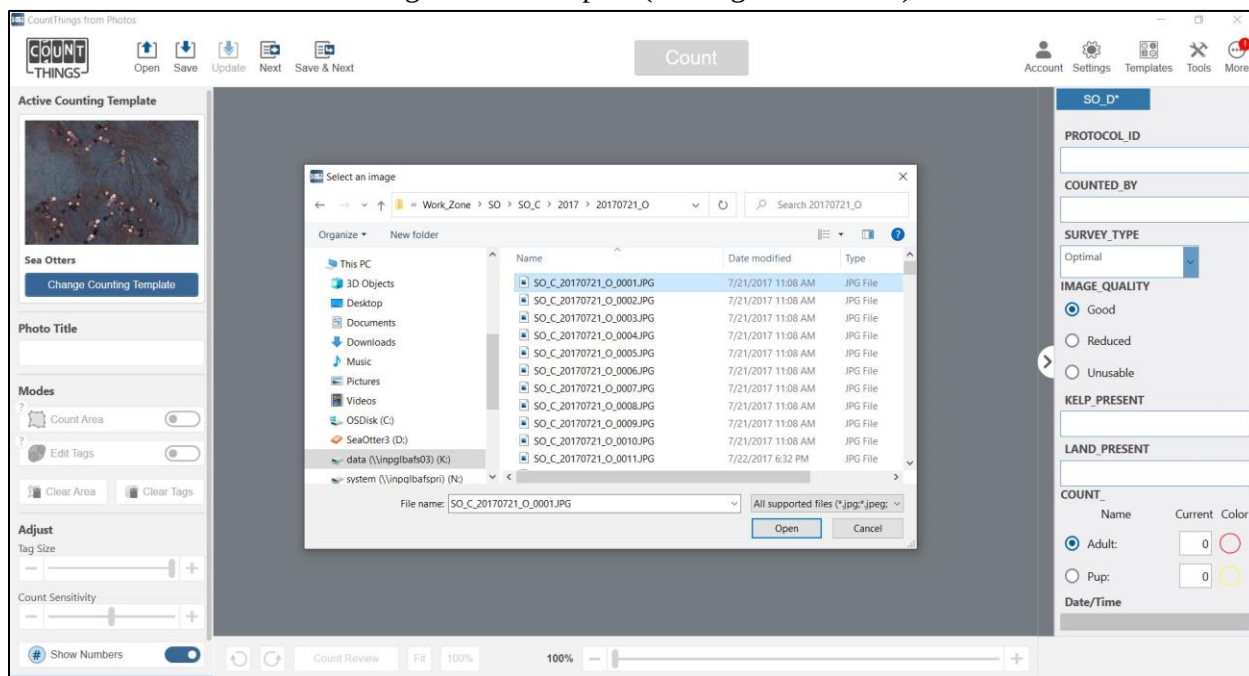


Figure SOP8.14. Opening a photo file for counting.

- To begin counting, open review mode by clicking the Count Review button on the bottom tool bar. Review mode divides the image into 36 cells as depicted in Figure SOP8.15. Click on the top left cell to zoom in to that part of the image and then use the right and left arrows to navigate through the entire image. The grid legend in the lower right shows which cell is being viewed. The legend can be hidden by clicking the down arrow.

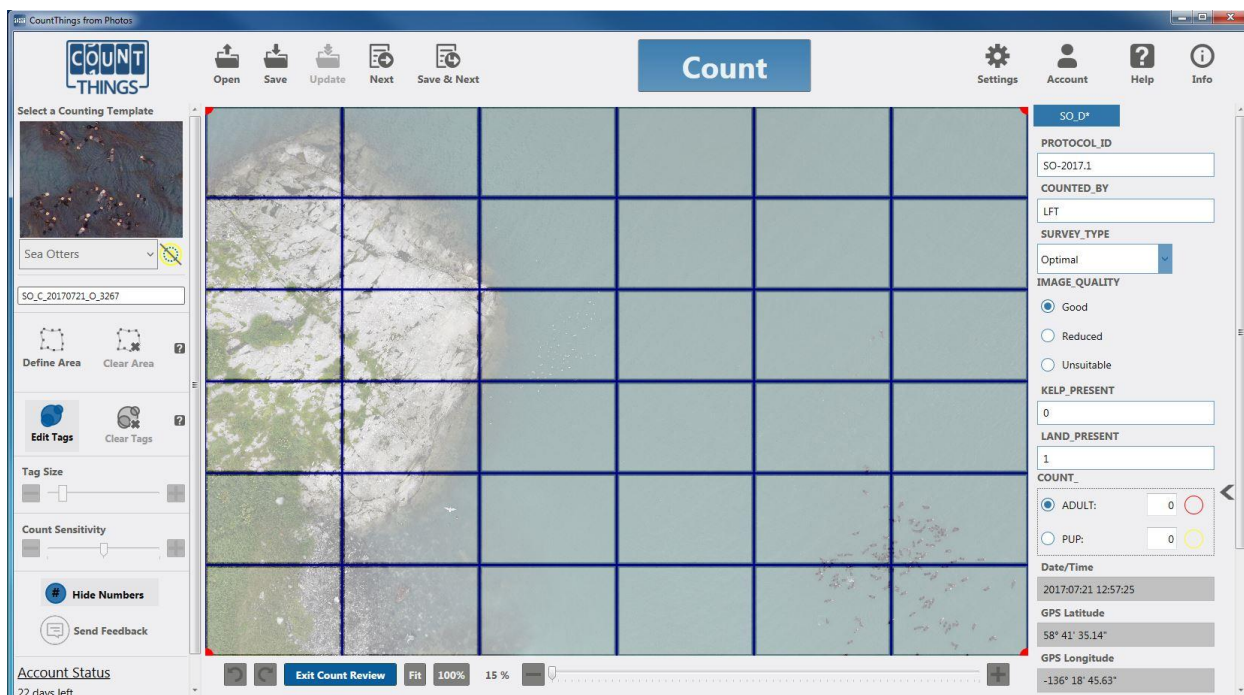


Figure SOP 8.15 Count Review mode in the CountThings application.

- Otters are counted by left clicking once on them. This marks the sea otter with a circular tag graphic and adds a count to the total (Figure SOP8.16).

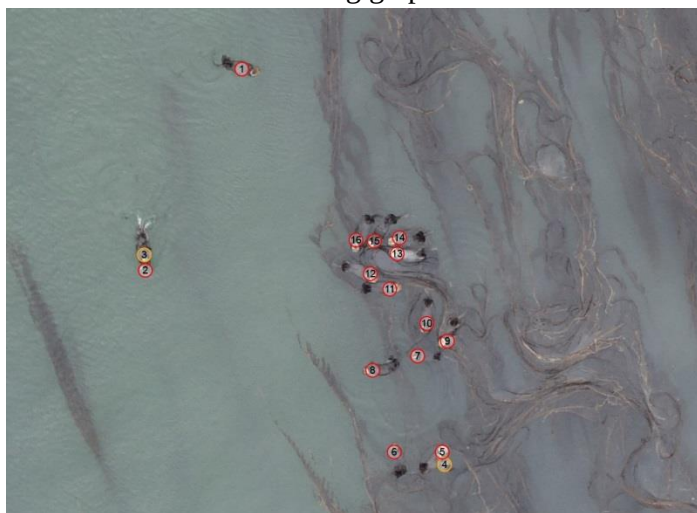


Figure SOP8.16. Identified sea otters marked with tags on the image.

2. Only objects that the observer deems to be sea otters are tagged. To be deemed a sea otter, the object must have either an unmistakable sea otter silhouette, or the color and texture of a black body with a light head. Objects that are likely but may not be sea otters are not counted. Sometimes sea otters are visible underwater. In this case, the same rules apply and the object must have either the unmistakable shape or the color and texture of a sea otter to be counted.
3. To tag a pup, open the right hand tool bar and select Pup before left clicking on the object (Figure SOP8.15).



Figure SOP8.17. Recording a sea otter as a pup in the CountThings application.

4. Pups are identified when associated with an adult, typically in a perpendicular or parallel orientation. Pups must be two-thirds the size of the associated adult or smaller. Sometimes pups are visible resting on an adult's belly and identified only by the presence of a second smaller head and lighter color and texture of the pup's fur. Objects that appear to be pups based on size and color or texture but are not associated with an adult are counted as adults. (See Figure SOP8.18).



Figure SOP8.18. Photos distinguishing adults from pups.

5. Fill in the fields on the right hand tool bar for each photo. CountThings retains the previous field values for `PROTOCOL_ID`, `COUNTED_BY`, and `SURVEY_TYPE` so they need be entered only when changed (Figure SOP8.17).

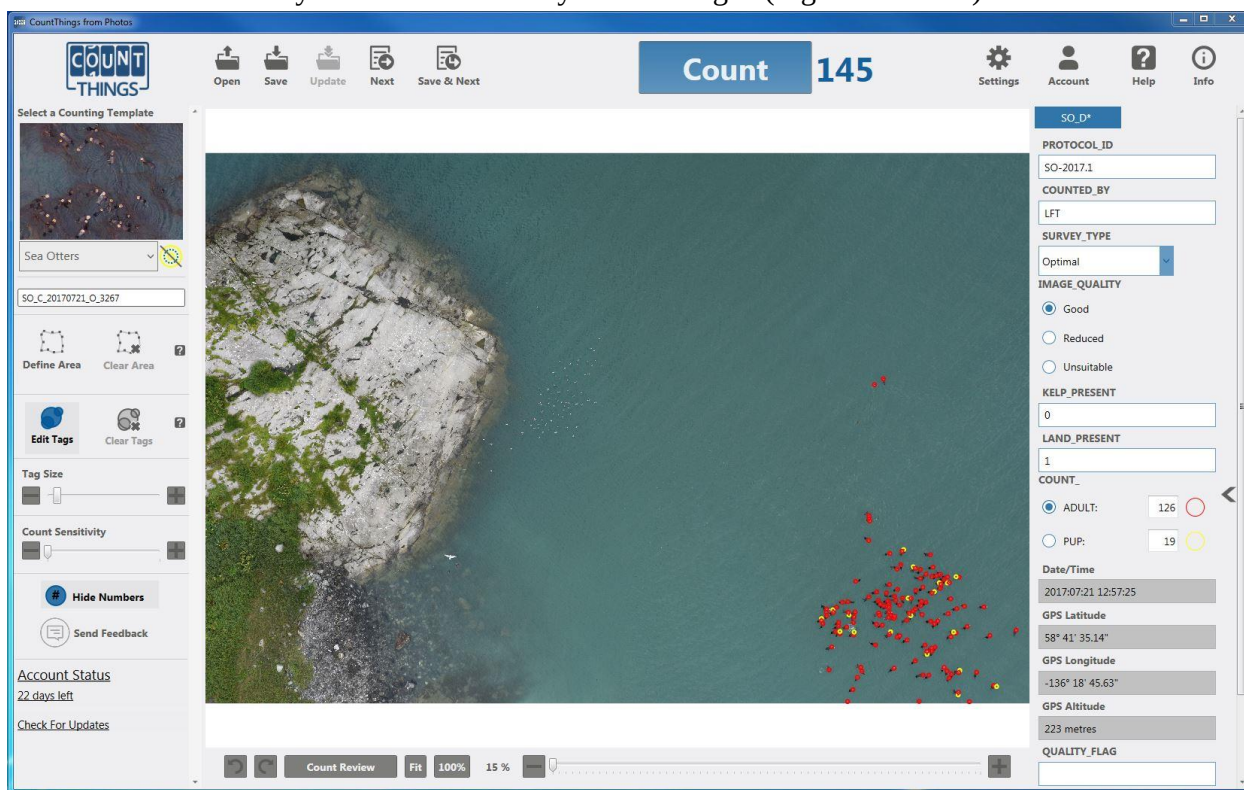


Figure SOP8.17. Entering fields to be saved in the CSV file.

6. CountThings automatically pulls metadata from the image to fill in Date/Time, GPS Longitude, GPS Latitude, and GPS Altitude. There is no need to edit these fields within CountThings. Notice these fields appear grey (Figure SOP8.17).

7. Fill in the habitat covariates by entering 1 for present and 0 for absent. For example, if an image contains land but not kelp, fill in 1 for LAND_PRESENT and 0 for KELP_PRESENT. (See Figure SOP8.17)
8. By default, IMAGE_QUALITY is Good. If an image is poorly focused, has glare or large areas of splash that reduce the ability to count sea otters accurately, select Reduced. If image quality is inadequate for the purpose of counting sea otters, select Unusable.
9. After all the otters in an image have been counted and the appropriate fields filled in, click Save & Next to save the count data and open the next image in the folder. Repeat the process until all the images in an abundance survey have been counted.
10. After clicking Save for the final image close CountThings.
11. Open the CSV file to review results of counts.
 5. Navigate to the folder designated for saving the resulting CSV files (See Settings, Save Options to see which folder was designated) and open the CSV in Excel (Figure SOP8.18).
 6. Verify the CSV is of the expected form with no obvious aberrations.
 7. Close Excel but do not save the file. Overwriting the original CSV with Excel content is a potential avenue for introducing data errors.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	Photo_File_Name	Photo_Timestamp	Latitude_WGS84	Longitude_WGS84	Altitude	Survey_Type	Count_Adult	Count_Pup	Kelp_Pri	Land_Pri	Image_quality	Counted_By	Counted_Timestamp	Protocol_ID	Quality_flag
143	SO_C_20170728_A_0143.JPG	2017-07-28 14:50:53	58.46509167	-136.06158333	218 A		0	0	0	0	Good	LFT	2017-08-25 17:49:44	SO-2017.1	
144	SO_C_20170728_A_0144.JPG	2017-07-28 14:50:54	58.46508889	-136.06241667	218 A		0	0	0	0	Good	LFT	2017-08-25 17:51:46	SO-2017.1	
145	SO_C_20170728_A_0145.JPG	2017-07-28 14:50:55	58.46508333	-136.06324722	219 A		0	0	1	0	Good	LFT	2017-08-25 17:53:48	SO-2017.1	
146	SO_C_20170728_A_0146.JPG	2017-07-28 14:50:56	58.46508056	-136.06407778	219 A		2	0	1	0	Good	LFT	2017-08-25 17:55:50	SO-2017.1	
147	SO_C_20170728_A_0147.JPG	2017-07-28 14:50:57	58.46507778	-136.06490278	220 A		4	0	1	0	Good	LFT	2017-08-25 17:57:52	SO-2017.1	
148	SO_C_20170728_A_0148.JPG	2017-07-28 14:50:58	58.46507778	-136.06572778	220 A		0	0	0	0	Good	LFT	2017-08-25 17:59:54	SO-2017.1	
149	SO_C_20170728_A_0149.JPG	2017-07-28 14:50:59	58.46507500	-136.06655278	220 A		1	0	1	0	Good	LFT	2017-08-25 18:01:56	SO-2017.1	
150	SO_C_20170728_A_0150.JPG	2017-07-28 14:51:00	58.46507500	-136.06737222	221 A		0	1	1	0	Good	LFT	2017-08-25 18:03:58	SO-2017.1	
151	SO_C_20170728_A_0151.JPG	2017-07-28 14:51:01	58.46506944	-136.06819167	222 A		0	0	1	0	Good	LFT	2017-08-25 18:06:00	SO-2017.1	
152	SO_C_20170728_A_0152.JPG	2017-07-28 14:51:02	58.46506667	-136.06900556	222 A		0	0	1	0	Good	LFT	2017-08-25 18:08:02	SO-2017.1	
153	SO_C_20170728_A_0153.JPG	2017-07-28 14:51:03	58.46505833	-136.06981944	224 A		6	2	1	0	Good	LFT	2017-08-25 18:10:04	SO-2017.1	
154	SO_C_20170728_A_0154.JPG	2017-07-28 14:51:04	58.46505000	-136.07063333	223 A		0	0	1	0	Good	LFT	2017-08-25 18:12:06	SO-2017.1	
155	SO_C_20170728_A_0155.JPG	2017-07-28 14:51:05	58.46503889	-136.07144444	223 A		0	0	1	0	Good	LFT	2017-08-25 18:14:08	SO-2017.1	

Figure SOP8.18. Reviewing CSV file for gross errors.

12. In addition to the CSV, CountThings also produces internal files that may be of interest.
 1. A JSON file for each image that contains the x-y coordinates for each tag.
 2. A low resolution JPEG of the original image showing the tags and count total.
 3. An editable version of each image saved as a CNT file. If one needs to edit CSV data points for any reason, click Open, and navigate to the CNT file of the image to be edited. Make edits and finish by clicking Save. This method also updates the CSV, JSON, and JPEG files to reflect the revised data. Always edit counts by opening the CNT file.