



Early Detection of Invasive Plant Species Monitoring Plan

Standard Operating Procedure #13: Managing Photographic Images

Version 2.2 (6 June 2017)

Change History

New Version	Revision Date	Author	Changes Made	Justification
1.0	2007	PACN	Developed.	
1.1	9/27/2010	K.Kozar	Updated to add more on image resolution and image processing.	To make it clear what the image processing steps are.
2.0	2/8/2012	K. Kozar	Updated image structure and processing instructions specific to the EIPS protocol.	To clarify the image processing steps and reduce number of duplicate images.
2.1	2/19/2016	K. Kozar	Updated folder structures and instructions.	To clarify where images are saved on the server and how to process images.
2.2	6/6/2017	A. Ainsworth	Update for ED plan.	Developed for EIPS.

Only changes in this specific SOP will be logged here. Version numbers will be incremented by a whole number (e.g., Version 1.3 to Version 2.0) when a change is made that significantly affects requirements or procedures. Version numbers will be incremented by decimals (e.g., Version 1.6 to Version 1.7) when there are minor modifications that do not affect requirements or procedures for publication in the series.

Purpose

This SOP describes how to download and process photographic images collected within Pacific Island Network (PACN) parks as part of the Early Detection of Invasive Species Monitoring Plan (Ainsworth et al. 2017). Images that are acquired by other means (e.g., downloaded from a website) are not project records and should be handled separately.

In this SOP, digital photograph refers to any photo in electronic format regardless of acquisition by scanner or digital camera. Most photos acquired and used by I&M personnel should fit into one of the general categories.

1. *Library Photos*: These photos are final products that have been edited, documented, reviewed and added to the photo archive in the PACN Digital Library. Metadata for these photos is

created and stored using ThumbsPlus7 software. The PACN SOP for using ThumbsPlus gives detailed instructions on how to use the metadata database and is available on the PACN I drive or from the data manager. These photos are representative, unique and instructive and can be used for multiple purposes by a variety of staff.

2. *Data Photos*: Data photos are photos collected as data. Data photos may be linked to specific records within the database and are stored in a manner that permits the preservation of those database links. Data photos are those taken for at least one of the following reasons:
 - to document a species detection that is also recorded in the data
 - to document characteristics of an unknown species to aid in future identification
 - to document a particular feature or perspective for the purpose of site/plant relocation
 - to capture site habitat characteristics and possibly to indicate gross structural changes over time

Data photos may be linked to specific records within the database, and are stored in a manner that permits the preservation of those database links.

3. *Misc Photos*: Miscellaneous photos may also be retained but are not necessarily linked with database records (i.e., crew members at work or eating lunch)

Image Management Workflow

Effectively managing hundreds of photographic images requires a consistent method for downloading, naming, editing, and documenting. The general process for managing photos proceeds as follows:

1. File structure setup
2. Image acquisition
3. Download files
4. Process Ricoh camera image files using GeoJot+ Core software
5. Rename the image files according to convention
6. Review and edit or delete the photos
7. Move into appropriate folders for storage
8. Establish database links
9. Document the photos
10. Final storage

File Structure Setup

Prior to data collection for any given year, project staff will need to set up new folders under the Images folder in the early detection of invasive plant species project workspace and the Protocol/Plan_Processing folder in the vegetation folder. Folder structures should be set up as follows:

Images

[Year]

 _Ricoh_memos

 [Park code]

 Data

The appropriate year – 2016, 2017, etc.

Memos to be loaded onto the Ricoh GPS camera

Arrange files by park – HAVO, KAHO, etc.

Data images arranged by sampling locations and date

Misc	Non-data images taken by project staff and arranged by sampling locations and dates
Originals	Images that are downloaded from the camera, put in a folder named by the date, YYYYMMDD
Ricoh_Camera	Arranged by sampling locations and date

This folder structure permits data images to be stored and managed separately from non-record miscellaneous images collected during the course of the project. It also provides separate space for image processing and storage of originals. Note: For additional information about the project workspace, refer to the SOP#11 “Workspace Setup and Project Records Management.”

Folder Naming Standards

In all cases, folder names should follow these guidelines:

- No spaces or special characters in the folder name
- Use the underscore (“_”) character to separate words in folder names
- Try to limit folder names to 20 characters or fewer
- Dates within folder names should be formatted as YYYYMMDD (for better sorting)

Image Acquisition

Digital photographs should be captured at a resolution and quality setting appropriate for the highest detail intended use. As a general rule images destined for printing or publication should be of a higher quality and resolution than images that will be used for email or internet use. If the camera will allow, the resolution should be set at 1760 x 1168 or higher. The quality should be set for “super fine” or “high.” Uncompressed TIFF files retain the greatest amount of image information, but the trade-off for the highest image quality is that these image files are large, and fewer images can be saved to any single memory card.

Publication quality photos should be taken at a minimum of 5 megapixels. Because the destination of a photo is unknown at the time it is taken, all photos should be taken with this resolution, or for lower resolution cameras, the highest resolution possible. Any resizing or file compression should be done during post processing using image editing software.

Though most digital cameras can digitally imprint the date and time directly onto the photo image, this feature usually should not be used. Date and time data are automatically recorded in the EXIF metadata by most digital cameras. If the image is being cataloged and documented it has value – imprinting the image reduces the image quality and hence the image value.

Different brands of digital cameras name photos differently. Some cameras will have several file naming options that may include:

- Sequential numbering which resets each time a memory card is formatted or a new card is put in.
- Sequential numbering which loops from 0001 to 9999.
- Numbering based on date-photo sequence.

As a general rule, the most useful setting is a date-photo sequence, then the 0001-9999 loop and the least useful the card based sequence. Projects must carefully review the naming options of the project

cameras for the most useful convention. Projects must also ensure the same convention is used by all cameras collecting data photos. Photos will be renamed later following the naming conventions described below.

Download Images

When returning from the field, images must be downloaded from the camera and placed in the appropriate folder as soon as possible. Download the raw, unedited images from the camera into the appropriate “_Processing” folder. For images that are downloaded from the Ricoh camera and will be geospatially linked, download into the “_Processing” folder, in a folder called “RicoH.” At this point, contact the data management team if there are images to be processed in the “RicoH” folder. They will process the Ricoh camera images.

Process Ricoh Camera Images

For images taken with the Ricoh camera, process them using the GeoJot+ Core software, following the instructions in the SOP for processing images with GeoJot+ Core software available from the data manager or on the PACN I drive. The SOP contains information on how to add the watermarks to the images, rename the images, and where the processed image files should go. The file naming standards described below should be followed during processing of the Ricoh camera image files.

Rename Images

For images not taken with the Ricoh camera, rename the images according to Early Detection of Invasive Plant Species Monitoring Plan convention. If image file names were noted on the field data forms, be sure to update these to reflect the new image file name prior to data entry. See SOP #12 “Field Form Handling.”

In cases where there are small quantities of photos it is practical to individually rename these files. However, for larger numbers it may be useful to rename files in batches. This may be done using the free software Bulk Rename Utility. Contact the data manager to install this software if needed.

Renaming photos may be most efficient as a two part event – one step performed as a batch process which inserts the date and corridor at the beginning of the photo name, and a second step in which a descriptive component is manually added to each file name.

Review and Edit Images

Delete any poor quality photos, repeats, blurred or otherwise unnecessary photos. Low quality photos might be retained if the subject is highly unique, or the photo is an irreplaceable data photo (i.e., unknown plant species). Edit the photos by doing any of the following if needed:

- Rotate the image to make the horizon level.
- Photos of people should have ‘red eye’ glare removed.
- Photos should be cropped to remove edge areas that grossly distract from the subject.

Organize Images

Once images have been renamed and reviewed/edited, the data images can be copied to the “Data” folder, I:\vital_signs\03_early_detection_invasive_species\Images\2017\HAVO\Data.

Any other miscellaneous images should be moved to the “Misc” folder (I:\vital_signs\03_early_detection_invasive_species\Images\2017\HAVO\Misc). Images that are to be linked to the

database will need to go into the database images folder (I:\vital_signs\03_early_detection_invasive_species\Data\Database\Database_images\2017\HAVO).

The GeoJot_+ Core software used to process Ricoh camera images automatically creates various subfolders with duplicate images. These subfolders are necessary however, and cannot be changed or deleted until the end of the field season. Once the Ricoh camera images have been processed, all the tagged images from the “Output” folder (I:\vital_signs\03_early_detection_invasive_species\Images\2017\HAVO\Ricoh_Camera\YYYYMMDD\Output) should be moved into the “Data” folder. These will be in the Early Detection of Invasive Plant Species images folder. Images ending in “tag” are the photos that have been watermarked. These will typically be the images that need to be copied and pasted into the “Data” folder. It is up to the project staff to decide which of these images need to be linked to the database and moved to the appropriate database images folder.

Photos of interest to a greater audience should be copied to the PACN Digital Library\Photo Archive folder. Generally these images are high quality, high resolution, but lower quality images may be included if the subject matter has broad appeal and is special, rare, or unique. Metadata associated with the image should be entered into the ThumbsPlus application. The ThumbsPlus SOP gives detailed instructions on how to use the metadata database.

Establish Database Links

Images for the ED plan can be directly linked to the data in the database. During data entry and processing, the database application will provide the functionality required to establish a link between each database record and the appropriate image file(s). To establish the link, the database prompts the user to indicate the root project workspace directory path, the specific image folder within the project workspace, and the specific file name. This way, the entire workspace may be later moved to a different directory (i.e., the PACN Digital Library) and the links will still be valid after changing only the root path. Refer to SOP #11 “Workspace Setup and Project Records Management” for additional details on setting up the database images structure and establishing these links.

Note: It is important that the files keep the same name and relative organization once these database links have been established. Users should not rename or reorganize the directory structure for linked image files without first consulting with the data manager.

Image Documentation and Cataloging

The NPS has published the Digital Photo Metadata Standard (NPS 2006) for all images. This standard identifies the full scope of metadata elements that a project in the NPS might use to describe, manage, and preserve digital images. The Digital Photo Metadata Standard specifies that seven metadata elements are considered mandatory. It was determined that these are the minimum number of elements required to enable an NPS project to access, interpret, and manage an image. All photos should be documented with these minimal metadata attributes:

- Date/Time
- Title
- Location
- Park Code
- Metadata/Access Control

- Constraints Information
- Contact Information

Projects should store data photo metadata attributes in the appropriate relational tables of the project database.

Final Storage

At the end of the season, and once the year's data are certified, data images for the year will be moved to the PACN Digital Library for archival. Before data is certified all data images should be checked for completeness and linked to the database. Since the project images are on the network server, simply inform the data manager that the images are ready to be archived. These files will be loaded into the ED project section of the PACN Digital Library, and the database links to data images will be updated accordingly.

Note: It is important that the files keep the same name and relative organization once these database links have been established. Users should not rename or reorganize the directory structure for linked image files without first consulting with the data manager.

Image Documentation and Cataloging

Images stored in the PACN Digital Library should be documented and cataloged. Documentation, or metadata, provides the minimum information a user will need to appropriately use the photo.

Cataloging provides a collective means for searching, finding, and retrieving photos. A variety of software is available to facilitate this process; the software the PACN uses is ThumbsPlus version 7.

The NPS has published the Digital Photo Metadata Standard for all images (NPS 2006). This standard identifies the full scope of metadata elements that a project in the NPS might use to describe, manage, and preserve digital images. The Digital Photo Metadata Standard specifies that seven metadata elements are considered mandatory. It was determined that these are the minimum number of elements required to enable an NPS project to access, interpret, and manage an image. All photos should be documented with these minimal metadata attributes:

- Date/Time
- Title
- Location
- Park Code
- Metadata/Access Control
- Constraints Information
- Contact Information

Store data photo metadata attributes in the appropriate relational tables of the project database. Project databases should contain at least the minimum metadata requirements listed above.

Final Storage

At the end of the season, and once the year's data are certified, data images for the year may be delivered along with the working copy of the database (if images are linked to the database) to the data manager on a CD or DVD. To do this, simply copy the folder for the appropriate year(s) and all associated subfolders and images onto the disk. If the project images are on the network server, simply inform the data manager that the images are ready to be archived. These files will be loaded

into the project section of the PACN Digital Library, and the database links to data images will be updated accordingly.

Literature Cited

National Park Service (NPS). 2006. Digital photo metadata standard, Version 1.0, A conceptual model. U.S. Department of Interior, National Park Service. Washington, D.C.