Workflow Detail: Image Processing for SERNEC
DRAFT 2015-07-29

Imaging Processing Task List

This document outlines how to process images once they have been captured. It is based on the use of a Canon camera which captures images in a RAW format (.cr2) and are processed using Adobe Lightroom. The result will be images that are saved in the .dng format as well as their .jpg derivatives. The image will be properly adjusted and image specific metadata recorded.

It is strongly recommended that your file names and folder names do not contain spaces.

With this method, a .dng copy is created and stored, and parametric edits are performed in Adobe Lightroom. This means Lightroom is mapping to your dng files, so if you move them after the initial import, the program will be unable to find them. It is therefore recommended you carefully consider where you want to be storing files before starting. This also means that if you delete dng's after exporting them to iPlant, your library in Lightroom will no longer be able to edit them or create new derivatives. However, you can always get them back from iPlant if need be. If you then place them in the same original folder, Lightroom will remember your editing history.

Task ID	Task Description	Explanations and Comments	Resource(s)
T1	Information flow	Define sequence of folders/bins through which images and metadata will flow before imaging commences. Consider dividing images into batches for processing. It is recommended that a log be maintained in order to keep track of image processing steps and batches that have been processed. An example can be found in the document referenced at the right. It is recommended that images be processed in batches of 200 or less. Doing more than this is technically possible, but may cause the software to hang or freeze temporarily.	UNH Log: http://macroalgae.unh.edu/BarcodingandPreliminaryDataCapture.pdf
T2	File name quality control/assurance	Ensure image file names are correctly assigned based on the specimen barcode. It is also critical to document and understand how the image filename and the physical specimen are linked if specimen database currently exists for your collection.	
T3	Image quality control/assurance.	Spot check images within Adobe Lightroom for obvious imperfections in exposure, focus, etc. If obvious problems are observed then record the names in the image log and	

		recapture images as necessary. **Check that all the images are oriented correctly**. If any images are not then you should rotate them now. There are a few ways to do this in LightRoom. One way is the use the shortcut Command+] (Ctrl+]), which will rotate the image clockwise 90° Check for missing images as evidenced by barcode or filename sequence, or other parameters.	
T4	Add metadata to EXIF and IPTC in batch	The Exchangeable Image File Format (EXIF) data in the header produced by the Canon camera and contains useful information, including but not limited to image capture date/time, camera manufacturer and model, ISO rating, image size, resolution, exposure details, lens type, and a field for comments. These data remain with the image as it is copied from one storage device to another and are important properties of the image. EXIF data should never be stripped from RAW or archive files or any of the derivatives that remain with the institution. Alteration or application of additional EXIF or other image metadata should be accomplished via a batch process in Adobe Lightroom. Copyright related terms should be added to IPTC (International Press Telecommunications Council) fields. It is recommended that you use the Attribution 4.0 International (CC BY 4.0)**.** https://creativecommons.org/licenses/by/4.0/ The following outlines the specific metadata terms and the fields they should be entered into: **Rights:** This is the URL for rights statement. It should be entered in the Adobe Field *Copyright Info URL* under the IPTC metadata in the Copyright section. Example: https://creativecommons.org/licenses/by/4.0/ **Copyright Statement:** This is a text based statement describing the copyright. This	Article: “Discovery and publishing of primary biodiversity data associated with multimedia resources: The Audubon Core strategies and approaches”, https://journals.ku.edu/index.php/jbi/article/view/4117 A list of Audubon Core terms can be found here: http://terms.tdwg.org/wiki/Audubon_Core_Term_List Morris’ chapter on metadata standards in GBIF’s digital imaging best practices manual at: http://www.gbif.org/orc/?doc_id=2429 Data Norms: http://vertnet.org/resources/norms.html & http://www.canadensys.net/about/norms

		should not just be the copyright holder which goes into the Owner field. It should be entered into the Adobe Field *Copyright* under the IPTC Tab. Example: “CC BY 4.0”. **Owner:** This is the name of the owner of the copyright. It should be entered into the Adobe Field *Copyright Owner* under the IPTC Extension set in the Rights section. Note that some seem to using this for the photographer, which should go in the *Creator* field (see below). Example: Appalachian State University **Photographer**: It is strongly recommended that the name of the imager (or photographer) be inserted into the EXIF for tracking, recognition, and to assist in training and quality assurance. This should be put into the *Creator* field in the IPTC tab. Example: John K. Small **Usage Terms**: This is an optional field. This field can used to specify how the resource may be used if the user wants to get specific about particular aspects of the license terms. See the *Rights Usage Terms* field in the IPTC Copyright section.	
T5	Image Adjustment	When possible, imaging equipment should be configured to minimize or eliminate the need for post-processing adjustments. Adjustments, should be applied to derivatives such as the JPEG images, and not the RAW version of the image. Camera manufacturer software will pull metadata from the original RAW image and use this in the conversion process. In addition, there are a suite of further adjustments that can be made. These include white balance, tone curve adjustment, sharpness, corrections for spherical and chromatic aberrations. Post-image processing that adjusts white balance or applies auto-levels should be accomplished only when images include a color standard with white and black swatches.	Detailed image editing guidelines using Adobe Lightroom, from New York Botanical Garden: http://tcn.amnh.org/documents/Herbarium_Image_Editing_Guidelines.pdf?attredirects=0&d=1 See Morris’ chapter on color management in GBIF’s digital imaging best practices manual at: http://www.gbif.org/orc/?doc_id=2429

		Caution should be used when assessing the appearance of an image on a computer screen. It is possible for technically perfect images to not appear correct on the computer screen.	
5a	Image Import and DNG Creation steps	Open Adobe Lightroom Click on Library Tab Press Import (Bottom Left) In the left window, select the folder you wish to import from (e.g., Rosaceae or 2015-01-30) and make sure all images are checked. For ease, the first import should be a folder with a single image simply for creating presets, followed by a 2nd small batch to ensure the presets were applied properly. In the top of the window, select “Copy as DNG” In the right-hand window, under “File Handling,” you may choose to make a second copy. Under “Destination,” choose the folder you wish to store DNG files to (for later transfer to iPlant). The “Organize” pull down allows you to choose if you wish to lump all files into one folder, or wish to subdivide them along the same categories you stored the original Raw images in. The “Apply During Import” Section can be	

		adjusted with presets after you have set them up. Click Import (bottom right).	
5b	Image Adjustment	Clicking import should bring you back to "Library," with a view of the folder you just imported. See NYBG reference for help with adjusting the default view to your liking. Double click on the first image to select it. In the right-hand tab, pull down "Metadata," choose "EXIF and IPTC" and select "Preset-Edit Presets". Name your preset and add metadata info (institution, copyright, etc.) as per T4. Click "Done." Click on "Develop" White balance and tonal adjusting: Most of these necessary adjustments should have been applied in the image capture process, but some tweaking can be accomplished here. In the Tone Curve window, click on the eye dropper icon next to the graph. Scroll to the white chip on your color checker. Underneath the histogram in the top right, % R G B values are visible: all three should be around 93 for white. To adjust, click and drag up or down within the white square. You can perform the same for black and greys. Relevant values for the color standard you are using should be available. If your color standard is in a different color space (e.g., L* a* b*), this can be more complicated, but conversions are available. In the top menu, under Tools, select White Balance Selector. Scroll to the white color chip and click. This should make all three R G B values approximately equal. Under Detail (in right window), change the Sharpening Amount to 50, as suggested by the NYBG reference.	Detailed image editing guidelines using Adobe Lightroom, from New York Botanical Garden: http://tcn.amnh.org/documents/Herbarium_Image_Editing_Guidelines.pdf?attredirects=0&d=1

		In the left window, Click the Plus Arrow next to Presets. Choose a name and make sure all adjustments you made are checked (white balance, tone curve, sharpening, etc), and click create. This preset should now appear under User Presets. Right click and select Apply on Import. This can also be accomplished during the import process, under the "Apply During Import" pulldown. In this window, there will be a "Develop Settings" and a "Metadata" field, where you can select your presets. You should not have to worry about these adjustments again except for spot-checking values. Cropping Images: Unfortunately, cropping cannot be applied to presets and must be synchronized across all images for every imported batch. If cropping is necessary, choose one image in your Develop window and select all images in the batch. Toggle "Synchronize Settings" (bottom right) to "Auto Sync". Any changes you make will now be applied to all images you selected. Press R to open the cropping window. Drag lines to desired locations. Press R again to exit this view. Spot check the other images to ensure the changes were applied and nothing got cut off. For syncing other settings across images that were already imported before presets for metadata and processing were applied, see the NYGB link.	
T6	Create JPEGS derivatives	To create JPEG derivatives, in the library window of Lightroom, select the folder you wish to use and click Export (bottom left). Under Export location, choose the folder you would like to deposit JPEGS in (for later transport to iPlant). Under File Settings, set the image format to JPEG and quality to 100. Under Image Sizing, set resolution to 300 pixels per inch. Hit Export. This will create JPEGS with your presets.	