Commentary: A Call for Documenting Sites with Archival Images in a Best-Practices Workflow

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Abstract

Photographic documentation is an integral part of archaeological research but is not often given enough consideration. This paper outlines the basics of field photography and suggests ways in which high-quality images of archaeological sites can be captured and archivally preserved. This suggested workflow covers lighting conditions, tonal ranges, grayscale and color images, equipment choices, and archival systems. Recent iPhone apps facilitate making high-quality images, and new versions of Lightroom make it easy to manage libraries of images that also include large, archival files. In addition to offering detailed, practical information based on current technology, this paper calls for the creation and dissemination of archival images in order to communicate details about sites to a broader audience than at present. Although the formal parameters of a survey may not call for such images, there is yet an obligation to make them. Creating a set of archival, high-quality images is a form of give-back to the community: a set of files from a high-end digital camera or from scanned black-and-white negatives will ensure that sites remain visually available to researchers and community members for many decades after vegetation has grown back.

Archaeologists working in cultural resource management or conducting inventory surveys photograph sites to document their features, as supplements to text and maps that offer details about proportion and extent. The immediate need is for snapshots that meet the bottom-line, minimal requirements of individual reports. However, because archaeologists are in the privileged position of having access to cleared sites over extended periods of time, they have a larger responsibility,

beyond the immediate needs of a looming deadline, to document sites with a few high-quality images that are also archival. Once in a great while, it is even possible to capture an image that transcends its documentary function to capture something of the aesthetic beauty of a structure, perhaps even a beauty intended by its original builders. Here are some suggestions, based on 25 years of work documenting sites in Hawai‘i and in the British Isles, for a photographic workflow that may help to document sites with high-quality, archival images.

Working with Light

Photography means writing with light. The camera makes images because light falls on objects, reflects off of their surfaces, and then hits the film or digital sensor. More than any other factor, the quality of that light determines the quality of the image. The human eye is a far more efficient gatherer of light than either film or digital sensor; it sees a greater range of tones, from deep shade to upper highlights, than any analog or digital process. When we look at a structure of stacked rocks, perhaps basalt covered by light gray lichens, our eyes take in both shadow and highlight details, even in full sun. Despite what we see, though, the images we make under those conditions can appear full of blown-out highlights and blocked-up shadows when viewed on screen or in print. In fact, we rarely end up with what we see, and what we record under adverse conditions may not adequately represent the site, let alone do justice to a greater sense of place (Figure 1). This is particularly true of images made under a canopy in bright conditions, with spots of sun breaking up patches of shade (Figure 2). Under some lighting conditions, far better results may come from making no images and returning later.

Images made under cloudy-bright conditions record details more coherently than images made under full sun (Table 1). Sun filtered through clouds creates ideal conditions that compress the extremes of the tonal range to a range accessible to film or digital sensor. However, there can easily be too much of a good thing, with clouds too thick and light too filtered. Softened shadows are necessary to create relief and help establish perspective. The test is to hold out an arm under cloudy conditions to see if it casts an indistinct shadow on the ground. If it does, the light falls within the ideal cloudy-bright range (Figures 3 and 4). If clouds are passing overhead every 20 minutes, it is worth waiting for one. In fact, some of the best photographic conditions might occur just as the sun is softened, but not too much, by either the leading edge of a cloud or by its trailing edge. If shadows are completely absent or too distinct, put the camera away. When photographing sites in ‘Ewa, O‘ahu, with no clouds overhead, I have often carried the camera and tripod in the *kiawe* forest, but not made a single image. The critical skill to acquire is the ability to form a quick assessment of lighting conditions and then to come up with a strategy that optimizes the time spent photographing a site or a complex of sites, whether it’s months, days, or minutes.

Figure 1. Enclosure at Pōhakuloa, Kohala. The alternating pattern of deep shadows and highlights, besides making the image unattractive, makes it hard to grasp the overall plan of the enclosure.

Figure 2. Kapālama Heiau, Kohala. The hot spots and shadows created by sunlight through an overhead canopy make it difficult to perceive any features at all.

Table 1. Typical Light Conditions in the Hawaiian Islands

Light Condition	Corresponding Attributes	Typical Resultant Image
Bright, full sun	Areas of direct sunlight and full shadow	Blown highlights and/or no shadow detail
Cloudy-bright, “filtered” sun	Areas of softened sun and indistinct or softened shadow	Properly exposed highlights with shadow detail present, “slightly compressed tonal ranges”
Overcast	Shady light and absent or near-absent shadows	Little or no variation between highlights and shadow detail

Figure 3. Enclosure at Pōhakuloa, Kohala. The same enclosure as the one photographed in Figure 1, but under far better light, with clouds softening shadows but not eliminating them altogether. The image was made with a wide-angle lens set at f/32 so that the depth of field includes the unusual concave stone in the foreground as well at the far wall of the structure.

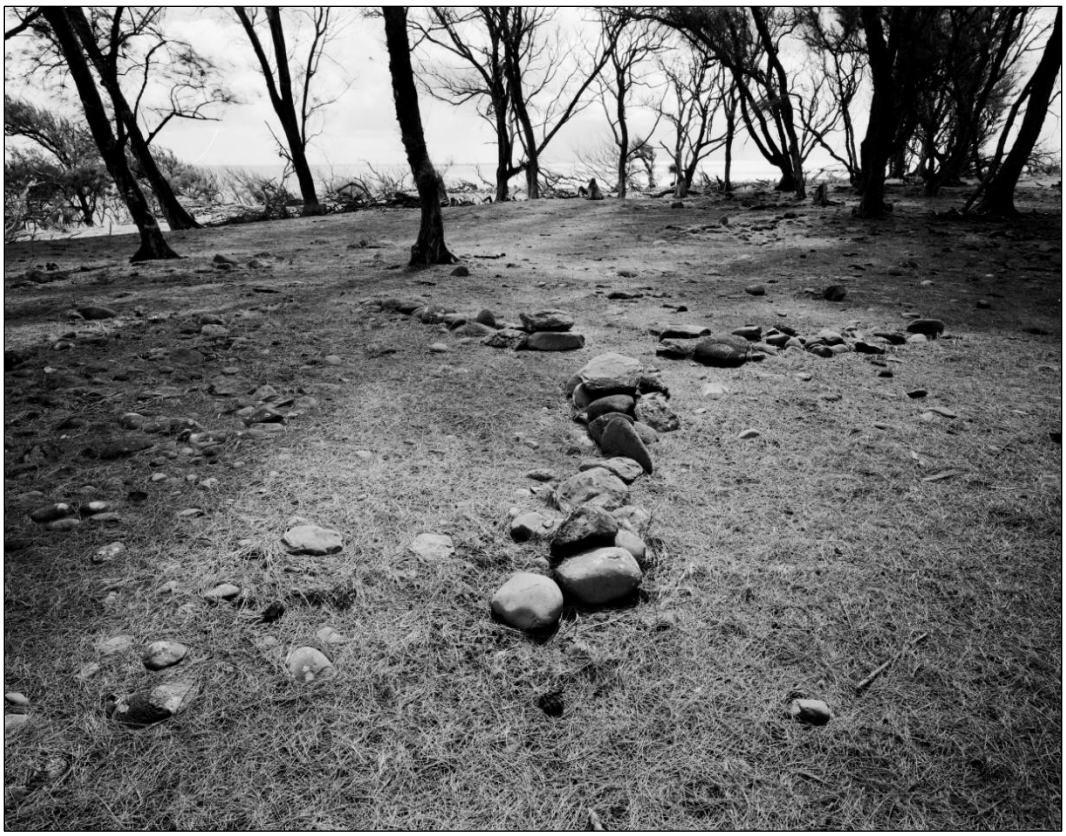

Figure 4. Kapālama Heiau, Kohala. An image similar to the one in Figure 2, but with the highlights and shadows softened by overhead clouds. Note that the alignment of stones is far more evident.

Tonal Ranges and Why They Matter

Photographers refer to "tonal range" as the spectrum of values from the darkest point to the brightest point in an image. Images with slightly compressed tonal ranges — images made under ideal light without blown-out highlights or loss of shadow detail — also reproduce better. Printing can be the weakest link in the entire process. Even the better-quality color xerox process can clip details from areas of extreme highlights and shadows, adding to patches of pure white or pure black that were not in the screen version of an image. In the end, images made under ideal "cloudy-bright" lighting conditions reproduce far better, even on generic office-quality machines, than images with more extreme tonal ranges. Only the most expensive forms of printed reproduction are faithful to the tonal range of the original image, especially images that contain wide ranges of tone.

Angle Matters

Tonal range affects the quality of light, but so does its direction and angle. Images made

in the middle of the day, even under cloudy-bright conditions, can communicate a great deal of surface detail related to texture, which might end up acting like camouflage to obscure other layers of information, such as subtle alignments and depressions on the platform of a *heiau*. This caution applies especially to the recording of petroglyphs, which might turn out to be invisible under light striking at 90º. The forest can be hidden by the trees. Again, softened shadows are necessary.

The best images are often made in the early morning or late afternoon, when lighting conditions can be at their optimum. Even under full sun, the light at those times is softened by the greater distance it must travel through the earth's atmosphere, where dust, pollution and water vapor reduce its intensity. These are similar to conditions photographers create in studios with artificial tungsten or strobe lighting: light that creates soft shadows and that strikes the subject from the side, at a 45º angle. The trick in the end is to make the shadows work for us, not against us, even when we must work under sunny conditions. Fortunately, there's an app for that, to help predict when the sun will pass at an angle necessary for the desired shadows. In the iTunes store, look at *The Photographer's Ephemeris* and similar apps.

Grayscale vs. Color Images

Grayscale (black-and-white) images can often communicate highlights and shadows better than color images. The photographer instinctively reaches for that roll of color film, or leaves the digital camera set on its color settings. In creating final images, however, consider grayscale. Why shift to grayscale? Unless color is part of the information to be communicated, it very frequently adds a layer of useless information that visually competes with the main focus of the image. If the image contains stones, as most do, the stones are already close to a grayscale tonal range, even when recorded in color. Converting the entire image to grayscale can have the (often desirable) effect of making the stones appear more distinct in the image, which can help in cases where they are indeed prominent features of the landscape. For both scanned film and digital images, the most recent versions of Photoshop (CS6) and Lightroom (LR5) contain new grayscale conversion tools that offer a great deal of control over the final image.

Technical Options: Lens Choice, Aperture, Shutter Speed and ISO

Besides making the best of available light, those recording stone or earth structures are shooting themselves in the foot (metaphorically speaking) if they don't take advantage of certain manual adjustments a camera can offer. We rarely have the time or luxury to clear enough vegetation, so that we can back up 50 feet to record the full extent of a platform, wall or other structure. A wide-angle lens is invaluable because it allows a picture to be taken close to a structure, with its full extent still captured in

Figure 5. Pao‘o, Kohala. An image shot with a wide-angle lens, with the camera obliquely facing the afternoon sun, and with the resulting shadows helping to emphasize the pattern of the structures on the hillside. In making the exposure, I was careful to shade the lens from direct sun, and to ensure that details of the stones in the shadows did not entirely disappear.

the image (Figure 5). Angle of view depends on the size of the negative or digital sensor (Table 2). With digital cameras, the larger sensor on more expensive models makes it easier to shoot with a wide-angle lens. Conversely, small sensors on inexpensive point-and-shoot digital cameras make it impossible to reach more than the medium wide angle range. If the photographer cannot afford the hefty price tag on full-frame digital cameras, excellent full-frame film cameras are still available.

If wide-angle lenses help, so do telephoto lenses. By subordinating unnecessary, competing detail in an image, we emphasize what is most important. The best way to subordinate unnecessary detail is to eliminate it altogether. Traditional photographers commonly tell students to compose in the viewfinder rather than in the darkroom. When we must enlarge a film or digital image to crop out unnecessary detail, quality declines. Changing to a telephoto lens or just walking closer preserves image quality by eliminating the need to later crop the image.

Table 2. Lens Equivalents for Common Sensor and Film Sizes

Angle of View	APS DSLR	Full Frame DSLR (and 35mm film)	4 x 5 View Camera
Wide	14 mm	21 mm	75 mm
Telephoto	55 mm	85 mm	300 mm

Telephoto lenses also compress depth of field (the zone of sharp focus before and after the one spot the camera is focused on). In taking portraits of people (or important stones) the photographer wants the subject to be sharp but at the same time wants the background to be out of focus. It is again a matter of emphasizing what is important and subordinating what is not. Selective focus can help do this.

Depth of field is affected by the focal length of the lens used. Walking closer (or using a telephoto lens) compresses it and backing up (or using a wide-angle lens) extends it. The other way to change depth of field is to use a camera that offers control of aperture settings. A large aperture (f/2, f/4) compresses depth of field and a small aperture (f/16, f/22) expands it. Photographers make use of tape measures and charts to determine the precise depth of field for a lens/aperture combination, and then sometimes deliberately reposition the zone of sharp focus closer or farther away from the camera, or verify that it will also include distant objects at "infinity." At the very least, we all need to know the near limit of our depth of field, so that in composing the image, we know which close details (usually stones) we can include in the shot, while still counting on more distant details to remain sharp (see Figure 3). Fortunately, there is an app for that. Go to the iTunes app store, search for "depth-of-field calculators" and you will find applications such as *Optimum CS* or *Optimum CS Pro*.

Control of shutter speeds helps preserve the quality of images. The safest shutter speeds for hand-held shots are greater than 1/125 second. Even at that speed, camera shake can degrade the sharpness of images, especially when they are enlarged. Digital cameras come with shake-reduction features, but except in the most expensive cameras, dependability decreases as the shutter speed slows. In other words, that technology has limits. We cannot, for example, hand-hold any camera with a shutter speed set at one second, or even 1/15 second. The safest practice is to use a tripod. It adds extra weight, but eliminates the issue of potential camera shake, making it possible to record images in dim light. With a tripod, I make images with the lens set at f/32 (for extended depth of field) and the shutter open for ten seconds, 45 seconds, and sometimes three minutes.

Film cameras come with light meters that must be set to the speed (ASA, ISO) of the film in the camera. ASA or ISO refers to the

sensitivity of the film or the digital sensor to light. An image made at 400 ISO/ASA requires only one fourth of the light needed for an image made at 100 ISO/ASA, but the 400 ISO/ASA image will be of lower quality. Film negatives will have coarse grain and digital images will have artifacts in the shadows (not cultural artifacts — just random areas of digital noise). Never allow a digital camera to remain on its auto ISO/ASA setting. If one neglects to set the ISO/ASA upper limit in the setup menu of a digital camera, the images will suffer under low light, when the camera selects a high ISO/ASA rating. I use film rated at 100 ISO/ASA. A limit of 400 ISO/ASA would be a reasonable choice for a digital camera, although the most expensive ones, with large sensors, are capable of making artifact-free images at high ISO/ASA ratings. In general, the best practice for archival images is to shoot at the lowest possible ISO/ASA.

Resolution and Quality

Resolution matters. With film, the larger the negative, the greater the resolution and the greater the size of the print it will yield. Similarly, large digital sensors offer higher megapixel ratings, which make larger prints possible. The best practice is to make images with the highest-possible resolution and then to downsize as necessary, depending on their intended use. Digital images shot in RAW format contain the most information. Those should be archived and copies down-sampled as needed. Size (printed dimensions, width x height) and resolution (dpi) have an inverse relation: enlarging the dimensions of an image shrinks its dpi. If the image is intended for a website, or for screen viewing, its resolution at any given size should not fall below 72 dpi. Images for screen viewing are best exported in JPG format. If an image is to be printed, however, its resolution should never be allowed to drop below 350 dpi for any given printed size. Those images should be saved in TIFF or in PSD format, never as JPGs. I scan my own black-and-white 4x5 negatives as 16-bit RAW files and then convert them to 16-bit PSD format, usually around 300 MB per file. For the highest-quality archival images, keep images in 16-bit grayscale or 48-bit color.

Archiving Images

Images saved on conventional CD or DVD disks have a life expectancy of about five years, depending on their storage conditions. And of course hard disks crash at inconvenient times. Fortunately, archival DVD disks are available. JVC makes one, available at sources such as Archival Methods. Mitsui Chemical makes another, MAM-A gold archival DVD-R disks. I continue to use film partly because black-and-white negatives, processed and stored correctly, last a very, very long time and can always be rescanned. (The layers of dyes that make up color negatives, on the other hand, are not stable.) Even when an archaeological survey project must make digital images, an argument can be made for a parallel set of archival images on black-

and-white medium format film – if not on 4x5 film.

Digital files are not as permanent as they seem at first. Aside from stability issues on CD/DVD media or on magnetic media (tape, hard disks), storage media have evolved through format after format in the past two decades. When ZIP disks were common, I stored digital images on a magneto-optical drive, now just as obsolete as ZIPs. It may be that this same rapid obsolescence will render a digital file, in good condition, but stored on the equivalent of a Betamax or 8-Track tape, no longer accessible 20 years from now. And of course, failure to keep up with upgrades in image-processing software will also make file formats inaccessible after a decade or two, even when the files themselves are stored on accessible media. The digital files I wish to preserve, until something better comes along, are on a RAID system, a hard-disk array of four or more disks, with mirror copies of files written simultaneously to separate disks. Hard disk manufacturers such as La Cie sell RAID storage in several configurations. Cloud storage means uploading files to the RAID of a company that sells online space. Because companies may go out of business at inconvenient moments, this is an excellent practice for secondary backup files but not for primary files.

Managing digital files, archiving them for storage, converting their formats from RAW to PSD or TIFF, exporting them for screen or print viewing — all become tedious, if not challenging, as the number of files increases. Photoshop is a great program, with actions and batch controls that offer much flexibility, but the best way to manage libraries of digital image files is with Adobe Lightroom. Easy to learn, it offers image editing controls that in many cases make Photoshop unnecessary. Its non-destructive edits preserve an archival image in its original state; Lightroom edits never degrade the original image, as they do in Photoshop, iPhoto or similar programs, and its export function is far more flexible and robust. With one of its many plug-ins I upload downsized images directly to galleries on my website. Whatever the specific workflow, the best practice is to keep images in their highest-quality formats – RAW, 16 and 48-bit TIFF or Photoshop files. Lesser-quality JPG images are created from those as needed for website screen viewing, but are never acceptable as archival formats.

A Call for Accessible, Archival Images

Archaeological sites in Hawai‘i suffer from intrusion by a heavy overgrowth of vegetation — *kiawe* in the leeward areas, and in the windward areas, guinea grass, Christmas berry, banyan and other non-native trees. Archaeological sites are often cleared just once, when they are mapped, giving cultural resource managers and those conducting inventory surveys a privileged, one-time opportunity to record them in ways that communicate their cultural significance to a broader audience. In some cases, archaeologists are afforded a unique access that is denied even to those with ancestral ties to sites. Although the formal parameters

of a survey agreement may not call for such images, there is yet an obligation to make them. Creating a set of archival, high-quality images is a form of giving back to the community: a set of files from a high-end digital camera or from scanned black-and-white negatives will ensure that sites remain visually available to researchers and community members for many decades after vegetation has grown back.

Although this commentary is a summary of best practices in making archival images — a suggested workflow — it is also a call to create them in the first place. And, beyond that, it is a call to agree on a common digital and physical storage space, in partnership with a not-for-profit institution such as the Bishop Museum, where such images might be archived, curated and made available to the larger community. In the end, of course, the gold standard for archiving and sharing selected images and information about them remains as it always has been: professionally-designed and edited books printed in high-quality offset and widely-distributed by a major press.