



Standard Operating Procedures (7.2): Photo Point

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Standard Operating Procedures: Photo Point

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Protocol Suitability Evaluation

A habitat suitability table containing appropriate estuarine wetland habitat types (of those evaluated) to implement Photo-point protocols is displayed in Table 1. This protocol is appropriate in any habitat type. A comparative assessment of cost, effort, and data quality are shown in Table 2. A matrix of additional detailed categorical evaluations of Photo-point survey protocols can be found in Appendix 7.1A.

Table 1. Appropriate habitat types for photo-point protocols.

Survey Protocol	Habitat Types					
	Tidal Channel	Mud/sand flat	Emergent salt marsh	Non-tidal salt marsh	Salt pan	'Degraded' / fill
Photo-point	X	X	X	X	X	X

Table 2. Categorical assessment of cost/effort and data quality for Photo-point survey protocols.

	Evaluation Metric	Photo-point	Notes
Time / Effort	Office Preparation Time (per AA)	0-10 minutes	Print data sheets and site maps
	Equipment Construction Time (one time)	0-10 minutes	Charge camera and check GPS handheld batteries; or charge GPS-enabled camera
	Field Time (per location)	0-10 minutes	Depending on field location and hiking time (site-dependent)
	Laboratory Time (per location)	0 minutes	---
	Post-Survey Processing / QAQC Time	10-20 minutes	Download photos and label file names with standardized format
	Minimum Repetition (site-dependent)	Few repetitions	Locations should be chosen to target the best possible views and attempt to capture change over time; project goal-dependent
	Relative Cost (equipment and supplies)	> \$100	One-time expense for camera and handheld GPS; or GPS-enabled camera; (<i>optional</i>) GPS-camera application on phone; (<i>optional</i>) external power supply
Survey / Data Quality	Accuracy (at a survey area level)	High	---
	Precision (at a survey area level)	High	---
	Qualitative-Quantitative Score	Qualitative	---
	Subjectivity-Objectivity Score	Objective	---

Resulting Data Types

The application of photo-point survey protocols will yield qualitative data displayed as photographic site images over time. These data are useful to identify seasonal site changes or project-level changes (e.g., restoration activities and post-restoration vegetation community expansion). The photographs can be part of a larger database or serve to assist in the development of sampling plans or targeted restoration activities. They can also be useful as stock reference photographs over time.

Objective

The primary purpose of this sampling method is to capture broad changes in the landscape and vegetation communities over seasons or years or to visually track restoration trajectories over time. This method collects georeferenced photos for use in site management (e.g., invasive species tracking) and long-term data collection. Each year (or seasonally), photograph(s) taken at fixed locations and bearings (e.g., Figure 1) are taken to ensure comparability. Panoramic photographs taken at a fixed start bearing can provide supplemental, landscape view, photograph comparison over time. If annually, the targeted time is during mid- to late summer during the peak wetland growing season, or during the appropriate peak growing season for the habitat being surveyed (e.g., spring for annuals).

Additional photo monitoring should be done before and after significant geo-morphological changes caused by natural or anthropogenic events (e.g., tsunamis, restorations), and in conjunction with other site-specific monitoring techniques (e.g., vegetation cover sampling and CRAM; refer to those specific SOPs for method details). Photo monitoring should be timed to capture seasonal vegetation changes, baseline conditions, and restoration progression over time. This SOP is modified from the US Geological Survey protocols (SCC 2005, USGS 2012) and additional monitoring programs.



Figure 1: Example of panorama photograph

Equipment

Equipment and supplies needed for this survey include:

1. GPS-enabled digital camera (preferred) or digital camera; *Helpful hint: most smart phones allow for GPS-enabled, high-resolution, digital photos and applications like “Solocator” allow metadata (location, bearing, user, date/time) to be embedded in photographs ensuring a quality control process. Ideally, users should replicate the same camera settings over time (i.e., photo resolution, size, exposure, etc.).*
2. A GPS is required if the digital camera is not GPS-enabled. GPS equipped with compass and photo point coordinates. The compass headings can be entered into the saved individual GPS coordinate points.

3. External power supply for GPS-enabled camera or extra batteries for camera and GPS combination. *Helpful hint: When using GPS-enabled cameras on mobile devices, especially applications like "Solocator", power supply can be depleted faster. Having an external power supply with a charger cable is recommended for long field data collection days or multiple days.*
4. Aerial map(s) of site with photo-point locations and compass bearings
5. Field notebook or data sheet (Appendix 7.2B), which includes the tide schedule for the day, GPS coordinates, and printouts of the previous year's photos
6. Tripod (*optional*). The minimum requirement is a height measurement for the height of the photo being taken or the eye level of the photographer.
7. Compass (*optional and typically integrated with GPS or GPS-enabled cameras*)

Field Preparation

Datasheets should be modified prior to each field excursion to incorporate a recent photo reference from each location, as well as the GPS coordinates and site identifications for each of the stations that will be surveyed.

Equipment described above should be collected prior to the field shift. Batteries for all electronic devices should be checked and replaced or charged as needed, and relevant photo and data sheets should be printed. If using a photo application on a GPS-enabled phone camera, ensure application is downloaded prior to the field shift.



Field Methods

1. Photo points should always be taken at or around low tide, and the time and tide height should be recorded on the datasheet.
2. Locate the photo-points in the field using the previous year (or season's) images, latitude and longitude coordinates, and compass bearings. Replicate the exact position if possible. *Helpful hint: Permanent field markers can be set up for a site that is frequently visited.*
3. Take a series of images (or a single image if that is more appropriate – site-dependent) at each GPS and mapped location point. This point should represent the same location, height, bearing, number of photographs, vertical angle and panorama as past surveys. Use previous photos, notes, and recorded compass bearings to verify the location. If this is the first time at a particular photo point location, record all of the new information on the datasheet (e.g., direction, number of photos, compass heading range, GPS location, camera orientation, etc; (Appendix 7.2B). *Helpful hint: For the first photo at a particular location, include a large stationary object or non-moving point of reference for ease of future replication.*

4. For panorama photo points, usually three to six photos are taken to capture a 180° panorama from a location. Additionally, many GPS-enabled cameras and/or phones have auto stitching as an included feature. This should be standardized and noted on the datasheet (e.g., four photos covering a 180° area). Depending on project need or site characteristics, a range of photos may be taken, from a single photo to a 360° panorama, as long as the number of photos and bearing are recorded on the data sheet.
5. Set the camera to 'landscape' setting and try to get an equal amount of land and sky in the photos ('portrait' may be more appropriate in some instances, and should be noted on the datasheet). This will allow the inclusion of hilltops or important features closer to the location of the camera to be incorporated in the panorama. If a slightly raised view is used to provide additional information or a better view, this should also be noted (with the height added) on the data sheet. Ideally, once a photo point has been established the effort for future photo points should be aimed at replicating the location, orientation, and bearing.
6. Double check that the date, site, GPS location, point number (or ID number), compass headings, number of photos, photo number, and any additional important notes are recorded for each panorama on the data sheet and notes correspond to the file information of the camera. These data are important when merging and georeferencing the photos.



Laboratory Methods

Not applicable.

Data Entry, Post-processing, and QAQC Procedures

Photograph data (e.g., times, locations, numbers of photos) should be entered in the field using the appropriate data sheet (Appendix 7.2B). All required fields should be completed in full, and the data recorder should fill in their name at the top of the document(s). Data and photographs should be downloaded or transferred to the appropriate electronic database the day of collection, and the hard copies of the datasheets should be filed in labeled binders. Post-processing of panorama photos should be noted on datasheets and in the label of the new photo in the electronic photo database.

Specific data management suggestions include:

1. Download images from the camera and place in appropriate file location. Photographs should be labeled exactly as: "SITE_PHOTO ID_Photo-point-survey_DATE". The words "Photo-point-survey" in the label should be written out.
2. Post-processing may involve creating a mosaic of multiple photos into a single panorama using any photo editing software. One method is the "photomerge" tool in Adobe Photoshop (V CS2 or higher), but there are many software options for Mac or PC. Photo file names for panoramas should include a note (e.g., "panorama") within the image label.
3. With the wide availability of photo enhancing and modification features, careful consideration should be made to limit alterations to original photos. Cropping, tilt, and exposure can be used limitedly to better prepare photos for comparison or to correct minor errors in photo collection. Enhancing color, applying pre-set filters, and other modifications to photos is not recommended, and in some cases should be discouraged (e.g., restoration tracking).

Electronic copies of all data and photographs should be housed on an in-house dedicated server and backed up to a cloud-based or off-site server nightly. Hard copies should be saved for five years or more depending on the requirements of monitoring protocols. Electronic copies should be saved indefinitely. Quality Assurance and Quality Control (QAQC) procedures should be conducted on all data. QAQC procedures should be conducted by the QA Officer and include a review of all entries and a confirmation that all data sheets, Chain-of-Custody forms, and field notes are filed appropriately with electronic back-up copies available. QAQC should verify that the entered data match the hard copies of the field data sheets. Any discrepancies should be corrected, and the initial data entry technician notified.

Data Analyses

After multiple seasons or years, photographs can be used as qualitative assessments of broad-scale changes to an environment or vegetation community, tracking restoration progress, or to assess if invasive vegetation communities should be targeted for management actions (Figure 2).



Figure 2. Example of comparative photos taken in fall 2012 (A) and spring 2013 (B).

Health and Safety Precautions

Not applicable.

References and Applicable Literature

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Contact Information

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APPENDIX 7.2A

	Evaluation Metric	Photo-point	Notes
	Correlation to L2 CRAM	Not applicable	---
Personnel Requirements	Specialty Equipment or Clothing Required	Few Specialty Items	GPS camera, GPS handheld, compass
	Ease of Transport (amount or weight of supplies)	Few Items / Easy	
	Ease of Implementation	Easy	Depends on field location and hiking time (site-dependent)
	Expertise / Skill Level	None Required	---
	Number of Personnel	1	---
	Training Requirements	None Required	---
	Seasonality of Survey Time	All Seasons	---
	Suggested Frequency	Semi-annual	Four times to capture seasonal variation or before/after site impacts or restoration activities
Survey / Data Quality	Type of Output	Non-numerical	---
	Active or Passive Monitoring Style	Passive	---
	Specialty Computer Software Required	No	May use a photograph-stitching software to combine panorama photographs
	Availability of Online / External Resources	Some	Camera and GPS manuals may be useful
Potential Limitations	Wetland Type Applicability	All	---
	Images or Multi-Media Required	Images Required	---
	Degree of Impact / Disturbance	No / Low Disturbance	Depending on the site; may be outside of project area / wetland habitats
	Vegetation Height Limitation	No Limitations	---
	Appropriate for Tidal / Wet Habitats	Yes	---
	Tide Height	Any tide	Low tide is preferred for maximum potential visibility
	Regional or Broad Implementation *	Frequently Used	---
	Potential for Hazards / Risk	Low to No Risk	---
Restrictions	Special Status Species	---	

* based on monitoring literature review

APPENDIX 7.2B

Photo Point Data Sheet			
Date:	Photographer:		
Survey Start Time:	End Time:	Uploaded:	Date:
Staff:	QAQC:		Date:
Other Notes:			

Photo/Station Information	Photo/Station Information
Station ID: _____	Station ID: _____
Camera: _____	Camera: _____
Photo Number(s): _____	Photo Number(s): _____
Time Taken: _____	Time Taken: _____
GPS Coordinates: _____	GPS Coordinates: _____
N 33. _____	N 33. _____
W 118. _____	W 118. _____
Bearing: _____	Bearing: _____
Notes/Orientation: _____	Notes/Orientation: _____

Photo/Station Information	Photo/Station Information
Station ID: _____	Station ID: _____
Camera: _____	Camera: _____
Photo Number(s): _____	Photo Number(s): _____
Time Taken: _____	Time Taken: _____
GPS Coordinates: _____	GPS Coordinates: _____
N 33. _____	N 33. _____
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N 33. _____	N 33. _____
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Photo/Station Information	Photo/Station Information
Station ID: _____	Station ID: _____
Camera: _____	Camera: _____
Photo Number(s): _____	Photo Number(s): _____
Time Taken: _____	Time Taken: _____
GPS Coordinates: _____	GPS Coordinates: _____
N 33. _____	N 33. _____
W 118. _____	W 118. _____
Bearing: _____	Bearing: _____
Notes/Orientation: _____	Notes/Orientation: _____