Guide to Developing a Stream Photograph Documentation Program

William Robertson: MSUEWQ & BSWC

Introduction

Landscape photographs can offer a qualitative and, in some situations, quantitative evaluation of the current and trending conditions in a watershed or on a water body. The details contained within photographs provide insight into a number of ecological parameters and environmental conditions that can be logistically challenging to measure, thus making photo monitoring cost effective. The parameters and conditions that can be documented with photographs range from stream bank erosion and riparian vegetation regeneration to assessing restoration effectiveness and consequences of natural disasters. If repeated for a sufficient period of time, these photos can be used to evaluate resource conditions over time and help inform management decisions. Modern camera technology is inexpensive, widely available, and simple to operate. In addition to being valuable pieces of scientific data, photographs can also be used in reports and presentations as a powerful tool to explain what is going on in the field. This document provides a brief insight into site establishment and photo-point monitoring methodology.

Types of Photographs

- **Photo-points**
  Photo-points are photographs that are taken at a specific location to address a specific objective. These photographs will always be taken from the same position and oriented in the same direction with the same vertical angle. The goal is recreate the same scene within the picture so changes can be documented. Using the same camera through time will make it easier to exactly repeat the photo, although this is not requisite. Camera operators must take extra precaution when taking photo-points to ensure they are in the correct location and are pointing the camera in exactly the correct direction, as well as recording the necessary information about the photograph (metadata).

- **Supplementary Photos**
  Supplementary photos can be taken of features or evidence of activity within the stream and riparian area that are either unusual or of interest. These photos do not need to be taken in any particular position, but should be documented with the same information (metadata used with the photo-points. In the extreme case of an extraordinary finding, such as Bigfoot, GPS coordinates should be recorded in the photo description section of the datasheet. Examples of supplementary photos include:

    - Evidence of flood damage
    - Invasive plants
    - Unidentifiable plants or animals
    - Extreme erosion
    - Irrigation structure damage
    - Turbidity events
    - Trash dumps
    - Happy volunteers ☺

Defining Monitoring Objectives

Photo-point sites should be selected based on their suitability to answer the scientific questions you are interested in. For stream photograph documentation, it is important to identify the specific stream parameter(s) of interest. Because different parameters dictate different procedures for documentation, the **monitoring objectives** of the program must be carefully considered and clearly defined. The following section was adapted from the NRCS document Quick Guide to Photo Point Monitoring, and can be referenced for general guidance in determining how photo-points should be taken based on monitoring objectives.

Basic Recommendations for Planning Photo Point Monitoring

Adapted from *NRCS: Quick Guide to Photo Point Monitoring, Appendix A*

Any of the following restoration actions could be the subject of either photo-points or supplementary photos.

Riparian Habitat Improvement Projects

Restoration Action	What/When to Photograph
Livestock fencing	Pre-project photos should capture representative stream bank profiles prior to fencing. Post-project photos should show fencing, and changes in vegetation and stream bank erosion.
Riparian planting	Pre-project photos should capture future planting location before site preparation. After planting, take photos showing changes in vegetation structure.
Non-native plant management	Pre-project, photos of weed patches or distribution in the area to be treated; post-project, similar photos of the area and/or of non-weedy vegetation establishing

Wetland Habitat Improvement Projects

Restoration Action	What/When to Photograph
Non-native plant management	Pre-project, photos of weed patches or distribution in the area to be treated; post-project, similar photos of the area and/or of non-weedy vegetation establishing
Planting	Pre-project photos should capture the future planting location before site preparation. After planting, take photos that show changes in the vegetation structure.
Reestablishment of wetland hydrology	Photograph area where hydrology will be restored. Make sure to take post-project photos during the appropriate season so changes will be visible.

Upland Habitat Improvement Projects

storation Action	What/When to Photograph
Juniper management	Pre-project photos should capture areas where juniper treatment will occur. Include ground so that vegetation reestablishment and reduction of sediment loss can be captured in post-project photos.
Non-native plant management	Pre-project, photograph area to be treated. Make sure to capture enough in the pre-project photos so that you will be able to detect changes in the post- project photos.
Grazing management	Photograph area prior to change in use and implementation of grazing management, and photograph again in following years.

Water Management Projects

Restoration Action	What/When to Photograph
Irrigation system improvement	Pre-project, photograph old structures and intended location of new structures. Post-project, take photos showing restoration and demonstrating that structures are still operational.
Instream flow protection	Photograph stream reach before project implementation. Take monitoring photos at weirs or other specific points

Instream Habitat Improvement Projects

Restoration Action	What/When to Photograph
Bank stabilization	Take pre- and post-project photos from the opposite bank and from mid-channel, looking across stream to future treatment location.
Boulder/LWD placement	Take pre- and post-project photos from mid-channel looking upstream and downstream from each structure location. Take more photos from either bank looking down on structure.
Weirs/grade control	Take pre- and post-project photos from mid-channel looking upstream and downstream from each structure location. Take more photos from either bank looking down on structure.

Selecting Photo-Point Sites

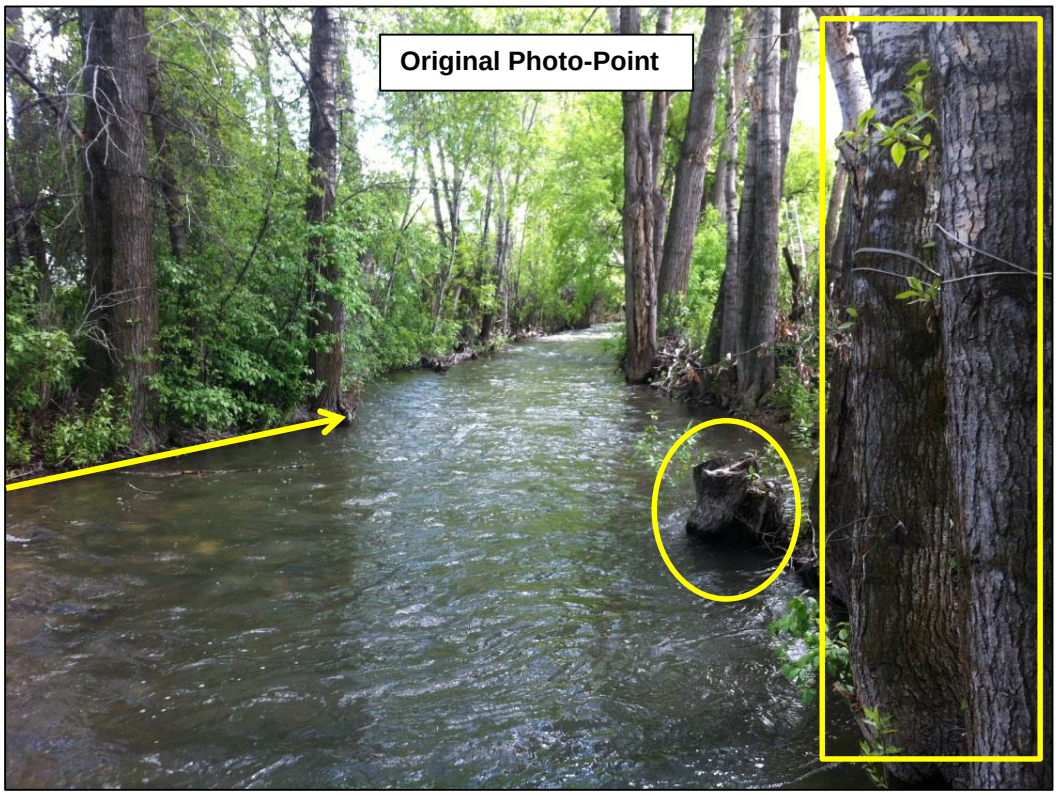
No matter the parameter of interest, photographers must always take precautions to establish photo points so that photographs that can be easily repeated. This requires definitive features for alignment and scale. Each site will be unique in what is being recorded and how it is being captured, but proper documentation must always be employed to ensure repeatability. An easily repeatable photo will be more useful than a detailed photo than cannot be recreated. While repeating photo-point photographs through time is relatively simple and can be done by almost anyone, it is important that the person who establishes a site is familiar with the study area and project objectives.

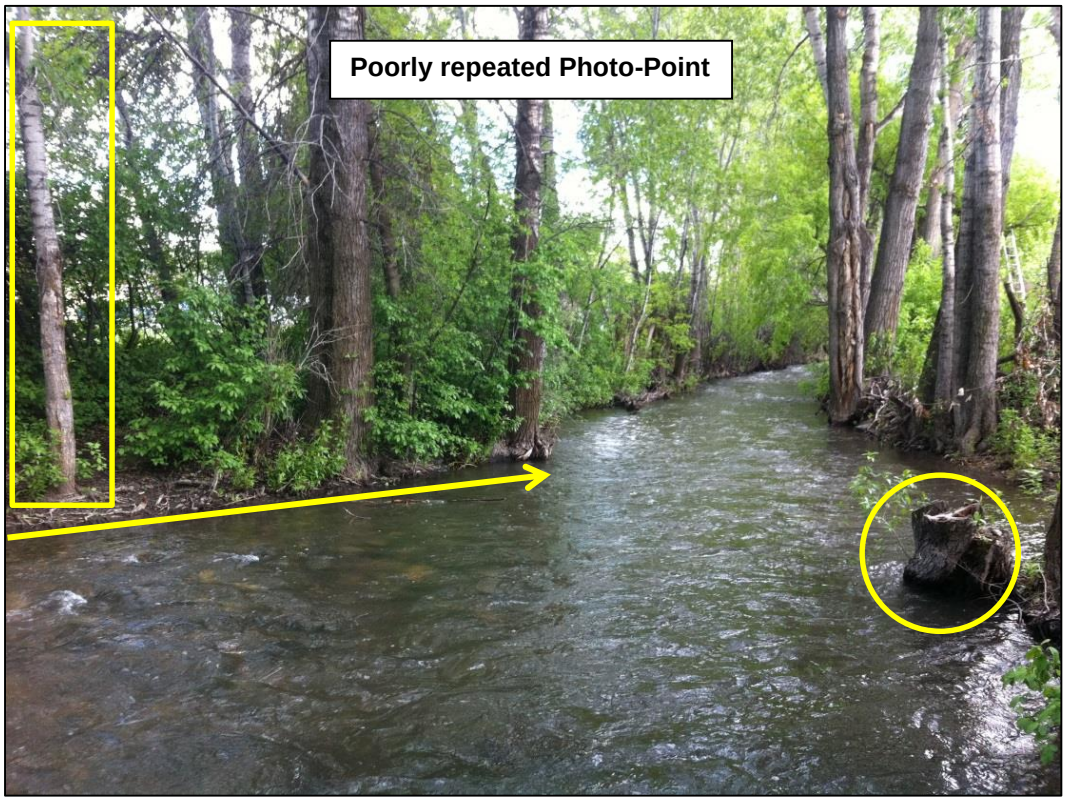
When a site is identified for a specific parameter or monitoring objective, it is imperative to document the location in which the photographer will stand and the angle and direction in which the camera will be oriented. First a definitive feature must be identified. The feature will be used to help the photographer confirm the accuracy of his or her location, align the camera properly, and provide scale to the photograph. Examples of such features can include a steel fence post driven into the ground, large down tree, bridge, staff gauge, irrigation structure, or building. A photograph of a person standing in the location where the photographer should stand (Figure 1) can be very helpful. Consideration must be given to the location of the definitive feature within the photo; it should not be too distracting, but should be easy to identify. With the definitive feature selected and aligned within the camera's view, the photographer should determine the compass bearing of the definitive feature and record the latitude and longitude using a GPS. This site information, along with helpful directions for locating the site should be recorded in detail when selecting sites for long term photo-point monitoring. Try to maintain a level (horizontal) camera view unless the terrain demands otherwise. Another exception would occur when a photo is taken from an elevated position (bridge, cliff, peak, tree, etc.), which will be instrumental in conveying the full dimensions of the project. Avoid using the zoom feature because it will make the photo more difficult to repeat. This information must all be included within a *Site Guide* for future photographers to use when repeating the photo.

Figure 1. Photographer location on bridge

Figure 2. Photo-Point taken from Bridge in Figure 1

Example of Poorly Repeated Photos:





The definitive feature in this photo-point is the tree stump on the right side of the photo. The photographer is in the correct position for the repeat photo and managed to include the definitive feature, but did not repeat the angle of the photo correctly. Comparing the corners of the two photographs is the best approach to ensure a photo has been repeated correctly. Objects that will not move must be used as additional indicators when aligning the camera. Stream height and foliage (or features that could potentially be blocked by foliage) are poor indicators.

Standard Operating Procedures (SOPs)

Considerations When Taking Photographs
It is critical that photo-point photographs are an exact replicate of previous photos. This will require the use of the *Site Guide* for each location that includes directions to the site and instructions for locating and repeating photos. The first thing you need to do is locate the position that the photograph is to be taken from. The second task is to identify the features in the photo that let you know you are repeating it exactly. In addition to photo-point photographs, supplementary photographs can be taken at the photographer's discretion to document interesting conditions at the site. Artistic expression is encouraged as some photos may be used on websites and in slide shows. Season and weather conditions should be considered when scheduling monitoring events especially if there are implications for site accessibility. Scheduling events to capture different stream flow levels and seasonal changes in vegetation can be advantageous. The camera should not be zoomed in unless specifically directed in the *Site Guide.*

Equipment Needed
Required:

- Camera and backup camera
- Site Guide
- SOP
- White board
- Dry erase marker
- Rag to erase white board
- Topographic and/or road map
- Compass
- Timepiece
- Extra batteries for camera (if applicable)
- Photo-log data sheets
- GPS unit

Optional:

- Aerial photos if available
- Staff gauge (for scale on landscape shots)
- Ruler (for scale on close up views of streams and vegetation)
- Steel fence posts for dedicating fixed photo points in the absence of available fixed landmarks

Field Procedures
Once at a monitoring site, the following step should be performed:

1. First, take a photograph of a white board that displays the information about the site. The whiteboard should be photographed before any site photos are taken and again after all photos are taken at the site to facilitate data management. Information on the white board should include stream name, site ID, date, photographer name, and start time. An example can be seen on the following page.

West Fork of the Madison
WF-CNF
July 6, 2011
D. Stout
Start 10:30 AM

2. Ensure that the date and time in the camera are set correctly. If they are not correct and you cannot figure out how to reset them; make a note of the incorrect time on the datasheet.
3. Confirm photographer location with either existing marker (steel fence post), GPS, or by referencing the description contained within the *Site Guide*.
4. Locate the definitive feature for the given photo-point and correctly align the feature within the camera's view using a compass
5. Take a photograph. Be sure not to zoom in.
6. With digital cameras, confirm photograph is as close to a complete duplication as possible to the original photograph.
    a. Pay particular attention to the corners of the old photo. Does your photo have the same features in each corner?
    b. Does your photo look like it is too close or too far away? If so, move accordingly.
    c. Is the horizon the same?
7. Record the appropriate information (metadata) on the datasheet.
8. Once all photos have been taken, update the whiteboard with the end time and the number of photos taken and photograph the board (example below). A photo of the whiteboard should be the first and last photograph taken at each site.

West Fork of the Madison
WF-CNF
July 6, 2011
D. Stout
End: 11:35 AM
5 photos taken

Photograph Metadata

For long term monitoring, it is critical to document factors about the photograph that are not contained within the picture.

The following information should be recorded with all photo-points and supplementary photographs:

- Photo file name (.jpeg)
- Date and time when photograph was taken
- Name of photographer
- Location (site and stream)
- Description of photograph
    - Examples
        - Careless Creek, looking upstream at site CC-CNF
        - North Meadow Creek, looking at north bank at site NM-MLL

Example Photo-Point Datasheet

JPEG #	Date	Time	Photographer	Site ID	Photo Description	Definitive Feature Description
123	6/14/11	13:00	D. Stout	WF-CNF	Looking upstream atop bridge	Barn smoke stack azimuth = 125°

Delivery of Photos to the Project Manager

It is critical that photos are transferred off of the camera shortly after they are collected and that they are backed up in at least 2 locations. The details of photo management plan need to be written for the specific project and included in the SOPs.

File and Data Management

Data management will be simplified by taking photographs that contain the site information both before and after photo-points and supplementary photos are taken. This will result in the photos for a given site being sandwiched between the site information when uploaded in the computer. Having a very specific system for file management is critical but the details of that system are up to the project manager. Using the white board for site information documentation alleviates the need to change the file name of the individual photos which will save a lot of time. It is still very important to keep photographs organized however. One recommended photo storage system is to have a folder for the project and a folder for each site. All photos through time can be stored in a single folder (assuming the whiteboard approach is used correctly). This will allow for photos to be sorted by date taken and easily viewed in chronological order.