

Standard Operating Procedures for the Collection of Stream Restoration Monitoring Photographs

Colorado Department of Public Health and Environment
Water Quality Control Division
Nonpoint Source Program
Measurable Results Project

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1.0 INTRODUCTION

This Standard Operation Procedure (SOP) describes a sampling method for locating, collecting, and cataloging photographs for the purpose of stream restoration monitoring.

The Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division's (WQCD) Measurable Results Project (MRP) has the responsibility to assist in monitoring stream restoration projects aimed at reducing non-point source pollution. At select stream restoration projects funded by NPS 319 grants the MRP and 319-grant recipients are responsible for collecting reproducible photographic monitoring data using established data collection methods. It is the intent of this SOP to formalize a methodology for the collection and storage of monitoring photographs in order to assist reporting efforts on restoration monitoring.

The WQCD's Quality Management Plan (QMP) states that the quality assurance and quality control program will be implemented through the mandatory use of smaller Sampling and Analysis Procedure Plans (SAPPs), which are originated for program-specific projects, under the umbrella of a more comprehensive, long-term Quality Assurance Project Plan (QAPP). One of the essential tools that will be used in meeting goals and implementing QAPPs/SAPPs will be the use of SOPs.

The goal and purpose of this SOP is to aid in the collection of high quality reproducible photographs that can be: 1) Used to track and assess stream condition changes (such as changes in riparian vegetation or changes in channel features) at a particular location within a project site over time; 2) To assess trends and to assist in determination if water quality standards are being met and if pre- and post-restoration conditions can showcase project successes; 3) Identify points of interest in a project area that can be used to locate the point for future needs. The objective is to collect representative photographic documentation (with scale and resolution that is legible) and to allow for that documentation to be easily revisited and re-photographed by other individuals in the future. It is therefore, important that collection methods are consistent to maximize data usefulness and to ensure that data collected by different samplers at different sites and at different times are comparable.

2.0 EQUIPMENT

1. Digital camera (w. extra batteries)
2. Photo log/Field Notebook
3. GPS unit, a high quality topographic map or aerial photograph of the site
4. Pens, pencils
5. White board/dry erase markers (optional)
6. Wooden or metal stakes (optional)

3.0 SAMPLING PROCEDURES

Sampling Design:

The length of time required to complete photo monitoring will depend upon the size of the site and the scale of monitoring efforts. At a minimum, pre-and post-project photo monitoring is needed to create a valuable image record. Ideally monitoring efforts will be replicated at the same time of year. For channel and floodplain morphology the dormant season provides the best views of the land topography. If vegetation monitoring is the goal than it is critical to monitor at similar times so as not to mistake seasonably variable vegetation color density for vigor.

Identify a Photo Point:

Professional judgment based on project goals and the project monitoring plan will be used to establish “photo point” locations in the field. A “photo point” is where one stands to take a photograph(s) and where one will return to take additional photographs of the same view in subsequent monitoring rounds.

Detailed documentation is essential to capturing adequate information for resurveying each photo station. It is helpful for future reference to indicate on a field map (high resolution, large scale, aerial orthophotograph printed on write-in-the-rain waterproof paper later converted to a GIS point file for ease of transfer) where each photo point is established. This may be best indicated by marking a dot at the site where one is standing and labeling it as a photo point (pp) with a unique number to the specific site/reach (e.g., 1-10). For example one may record on their map “pp1” at a location where they photographed a significant area of bank erosion and took one photograph looking towards the “left bank”. One may then record “pp2” where they walked upstream to a new location to establish a cross section and took four photographs of

the cross section (“upstream”, “left bank”, “downstream”, and “right bank”). Each designated area of photo collection where photos are taken is designated with a unique “pp#” in order to orient future individuals back to this exact collection spot. *(Note: Recording a GPS point may also be done - although accuracy error, especially with field handheld units tends to be high – a survey grade GPS unit would be more ideal).*

Where photo monitoring is a significant component of a monitoring effort it may be useful to keep in mind that photo station locations may want to include long-term reference points (buildings or permanent landscape features), and be easily accessible for post-restoration monitoring. Once permanent stations are decided upon, these locations (especially those where other clear indicators are absent) should be monumented with a wooden or metal stake, if practical.

Documenting Pictures in the Field:

While in the field, use a Photo Log form (Appendix A) to document the pictures you take. For every photo you take, record the site/reach number, photo point number, photo number, photo view (example: upstream, downstream, right bank, left bank) and a brief description of what is in the picture (example: mid-channel bar and left bank erosion) to help you match up the photos with the photo log descriptions after you download them. For organizational purposes it may also be helpful to bring along a small dry erase board onto which the photo point or other descriptor can be written. The first photograph in a series can be the writing on this dry erase board then photographs that follow will all be at the same indicated location.

Photo log field forms will be transferred to an Excel spreadsheet back at the office where specific photo file names will be matched to these more extensive descriptions of the photograph.

Taking Pictures:

For each segment assessed take at least 4 photos (preferably at a permanent cross section station); **upstream view, downstream view, right bank** and **left bank**, in order to fully represent the conditions of the segment. Include some measurement of scale in your photos if possible; for example, have a person stand next to the banks when taking the left and right bank photos. A measuring tape or stadia rod can also be used to achieve scale in photographs (very helpful when photographing eroding banks for example).

Cross section photographs are treated uniquely in that only one photo point needs to be marked on the map (typically at the center of the cross section) yet the photographer must circle around the cross section in order to capture images of the section itself (this is particularly important for later verifying a plotted cross section to what was seen at the site). If you are conducting a cross section analysis with a field tape and rod take the “up-stream”,

“right bank”, “downstream”, and “left bank” picture while you have the measuring tape stretched across the channel. Walk upstream of the tape to take a “downstream” image that captures the entirety of the cross section looking downstream (Note: on larger rivers it may not be practical or possible to capture a bank to bank photograph nor will it be possible to stand in the middle of the stream to do so – standing upstream on one bank and looking downstream through an unobstructed view is acceptable. Some cameras also make it possible to take a panoramic photograph which may be useful in this situation). It is helpful for organizational purposes to choose a standard routine and stick with it. For instance when documenting cross sections start downstream and continue in a clockwise circle capturing the four photographs (i.e., looking upstream, looking to the left bank, looking downstream, looking to the right bank). Repeating this order for any other cross sections documented that day will reduce any confusion back at the office.

In addition to cross sections monitoring may want to include photos of distinct features, especially those noted on the sketch plan (i.e. animal ford, head-cut, flow-diverting structures, grade controls, culverts, large debris jams, etc.) or that are pertinent to the restoration and monitoring efforts.

Documenting Photographs and Filing for Future Retrieval:

After you have completed your field work the images will need to be downloaded and stored for future retrieval. Images will need to be labeled in a manner in which they can easily be retrieved. Where monitoring efforts are only focused on collecting four photographs at each cross section (as described previously) photo points can be labeled simply with the cross section number and the view (e.g. XS21-LB).

Where photo monitoring includes a variety of features taken from a variety of locations a more sophisticated organizational effort is recommend. In order to keep files organized and relatively succinct the following file name format is recommended:

Reach#_PhotoPoint#_Photo#

For example on the Eagle River project reaches 4 and 5 we had the following photographs documented on our Field Photo Log:

Reach Number	Photo Point	Photo Number	View	Description	
4	1	1	US	From downstream end of reach looking upstream	
		2	DS	From downstream end of reach looking upstream	
	2	1	RB	Middle of reach, bank erosion (5' high, 30' long)	
		3	1	LB	Grazing of riparian area
	4		1	US	Cross section looking upstream
			2	LB	X-sec looking towards left bank
			3	DS	X-sec looking downstream
			4	RB	X-sec looking towards right bank
	5	1	1	US	From downstream end of reach looking upstream
2		1	US	Area of lateral adjustment and mid-channel bars	
		2	DS	" "	

Back at the office these pictures would be labeled as such:

Reach#_PhotoPoint#_Photo#

- R5_pp1_p1
- R5_pp1_p2
- R5_pp2_p1
- R5_pp3_p1
- R5_pp4_p1
- R5_pp4_p2
- R5_pp4_p3
- R5_pp4_p4
- R6_pp1_p1
- R6_pp2_p1
- R6_pp2_p2

This system provides a simple method for tracking which reach or project locating number the photo was captured in, the unique mapped photo point number associated with the geographic location where the photo was taken from, and a unique photo number that will identify the image from other images taken at the same photo point.

The additional information associated with each photograph (primarily the photo view and description) would be tracked through use of an Excel spreadsheet that would look similar to the field photo log with the addition of the proper Photo_ID and the availability to easily be stored and transferred to everyone involved in the monitoring efforts.

For example:

Eagle River				
2011 NPS-319 Monitoring Photo Log				
John Doe, Eagle Watershed Coalition				
June 24, 2011				
Photo ID	Reach Number	Photo Point	Photo View	Description
R5_pp1_p1	5	1	Upstream	From downstream end of reach looking upstream
R5_pp1_p2	5	1	Downstream	From downstream end of reach looking upstream
R5_pp2_p1	5	2	Right Bank	Middle of reach, bank erosion (5' high, 30' long)
R5_pp3_p1	5	3	Left Bank	Grazing of riparian area
R5_pp4_p1	5	4	Upstream	Cross section looking upstream
R5_pp4_p2	5	4	Left Bank	X-sec looking towards left bank
R5_pp4_p3	5	4	Downstream	X-sec looking downstream
R5_pp4_p4	5	4	Right Bank	X-sec looking towards right bank
R6_pp1_p1	6	1	Upstream	From downstream end of reach looking upstream
R6_pp2_p1	6	2	Upstream	Area of rapid lateral adjustment and mid-channel bars
R6_pp2_p2	6	2	Downstream	Area of rapid lateral adjustment and mid-channel bars

As a final organizational effort a GIS shapefile (or Google Earth .kml file) should be created from your field map in order to create an electronic file whereby future monitoring efforts can revisit as-close-to-exact location from which your photo-points were taken.

Properly labeled photographs and the accompanying Excel worksheet and GIS file would be kept together in the same file folder created for that unique monitoring effort and labeled accordingly (Example: ArkansasRiver_120911_Photo_Monitoring). Provision of this file folder to other groups or agencies will allow for easy replication of photo monitoring efforts.

4.0 QA/QC

See “Standard Operating Procedures for the Planning of and Field Procedures for the Conducting of Monitoring Activity”. Colorado Department of Public Health and Environment Water Quality Control Division, May 2005.

5.0 DOCUMENTATION

1. Field photo log notes

Field photo log (see Appendix 1) or similar worksheet

2. Excel or similar spreadsheet

Links photo ID numbers to photo descriptions

3. GIS layer/shapefile

Pinpoints exact location of photo points for future re-location

Appendix A

CDPHE Standard Photo Log Form

Reach or Segment Number	Photo Point	Photo Number	Photo View*	Description

*Photo views would include upstream, downstream, right bank, left bank, cross-section, etc.