

# Onsite Mitigation Monitoring

Project Development and  
Environmental Analysis Branch



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## **Purpose**

This procedure provides guidance on long-term monitoring of planned onsite mitigation sites to ensure success of the site.

## **Responsibility**

The NEU-EG is responsible for coordinating all monitoring activities for wetland, stream, buffer, and conservation mitigation sites statewide. This includes collecting field data from both the hydraulics and vegetation perspective. This data is collected throughout the growing season according to the mitigation plan for each individual site and is reported via the annual monitoring report. Each monitoring report is submitted at the end of the growing season to state and federal environmental regulatory agencies in order to comply with roadway/bridge project permit requirements.

## **Scheduling and Time Constraints**

Monitoring schedules will be established on a per project basis.

## **Procedures**

**Step 1.** The NEU-EG will determine the method for conducting the site monitoring for each project. The methods are:

- In-house Monitoring

The NEU-EG, through coordination with the Roadside Environmental Unit (REU), will complete the monitoring requirements for vegetation monitoring, gauge installation, data collection, and report compilation. Once REU completes the vegetation monitoring reports, REU will submit to the NEU-EG to be compiled with the recorded gauge data into the monitoring report.

- Consultant Monitoring - Scope/Man-day Estimates

The consultant, through coordination with NEU-EG and/or REU, will develop a scope of work and task list for vegetation monitoring, gauge installation, monthly gauge download, and report compilation. Once the scope of work and task list is finalized the Consultant will prepare and submit a cost estimate to the Transportation Program Management Unit (TPMU). The NEU-EG project manager will also prepare and submit a cost estimate to the TPMU. The cost estimates must compare within 5% on man-days and 10% total costs. If the cost estimates do not meet these 2 criteria, the NEU-EG must negotiate with the Consultant to bring the both the man-days and total costs to within the required criteria. Refer to the example scope of services and man-day estimate under the [Resources and Tools](#) section.

**Step 2. Monitoring Requirements for Wetland, Buffer, & Conservation Mitigation Sites:**

- Hydrology

The NEU-EG is responsible for data collection of hydraulic monitoring gauges at each site on a monthly basis. This data is analyzed monthly to ensure completeness and accuracy.

Wetland hydrology is defined as groundwater within 12 inches of the surface for 12.5 percent of the growing season. The growing season is dependent upon the county that the site is located. The growing season can be determined by referencing Soil Survey book produced by the Natural Resources Conservation Service. Rainfall data for the given monitoring year is also obtained from the closest National Oceanic and Atmospheric Administration gauge station and analyzed as to whether or not the year was deemed as a normal year. The gauge data is then compared to the rainfall data to determine whether or not the site has met the success criteria stated in the mitigation plan.

- Vegetation

The REU is responsible for performing the vegetation monitoring according to the mitigation plan on an annual basis. REU performs stem counts within each of the vegetation plots that are established immediately following construction of the mitigation project. The 50 ft x 50 ft vegetation plots are randomly located throughout the site to ensure that unbiased results are produced. The number of plots on the site is determined by taking a two- percent sample of the total acreage. The vegetation data is forwarded to the NEU-EG at the end of the growing season for inclusion in the annual monitoring report. Photographs are also taken on an annual basis at the same photo point location to visually show the success of the site from the beginning to the end of the required monitoring period. The format for the annual monitoring report, as well as an example of the report, is located under the [Resources and Tools](#) section.

**Step 3. Monitoring Requirements for Stream Mitigation Sites**

The NEU-EG is responsible for coordinating with the REU to complete the monitoring of all permitted stream restoration and relocation sites as required. The level of stream monitoring is dependent upon the type of restoration that is planned for the site. The two levels of stream monitoring are explained in Steps 4 -5. This monitoring is done in accordance with the [“US Army Corps of Engineer Stream Mitigation Guidelines, April 2003”](#) and typically requires a monitoring period of one to five years. The purpose of monitoring is to determine whether or not the specific objectives of the project have been met and to what degree of success a mitigation project has achieved in providing proper channel function and increased habitat quality per the mitigation plan.

#### **Step 4. Channel Stability**

##### Full Channel Analysis Stream Monitoring

This type of stream monitoring involves surveying a reach of the restored or enhanced channel to determine success. This is typically done when a Level I Restoration or Enhancement project is completed. The channel will normally be surveyed every year or every other year depending on the permit conditions for five years. The data collected from the site is then compiled into the monitoring report and submitted each year throughout the monitoring period. The main components of the full channel analysis are as follows:

- **Cross Sections**

Cross section data provides a majority of the morphological parameters required for stream classification. Bankfull cross sectional area, bankfull width, mean and max bankfull depth, width/depth ratio, and entrenchment ratio are determined from the cross sectional survey (Wildland Hydrology, 2002).

- **Profile**

The longitudinal profile characterizes average stream slopes and depths of riffles, pools, runs, glides, rapids, and step pools. Longitudinal profile is an important component of stream monitoring in that it is used to determine the average water slope which in turn is used for delineating stream types. In addition, the longitudinal profile can be used to obtain maximum depth of individual bed features as well as bed feature spacing (Wildland Hydrology, 2002).

- **Pebble Count**

The pebble count characterizes the bed material present through a given reach. This information is used during design to determine the stream type and for use in the hydraulic calculations that are used to determine velocity. During the monitoring process this information is used to see how closely the newly designed channel substrate material mimics the reference stream.

An example of the annual monitoring report is located under the [Resources and Tools](#) section.

#### **Step 5. Visual Quarterly/Biannual Stream Monitoring**

Quarterly or biannual visual monitoring may be done on some projects per permit requirements in lieu of the full channel monitoring described above. Typically, this type of monitoring protocol is used on smaller streams and is dependent on the level of restoration that is done. While the biannual monitoring is similar to full channel analysis in that the monitoring period is typically five years in length, the quarterly monitoring is normally done for only one to two years. Both types of visual monitoring require that photo points be established such that an upstream and downstream shot of each structure are taken as well as the stability of the stream banks photographed. This allows for an evaluation over time by the regulatory agency personnel in order to determine site success.

An example of the annual monitoring report is located under the [Resources and Tools](#) section.

#### **Step 6. If during the annual monitoring problems are identified, the NEU-EG will follow the Remediation (future link) procedure to address the problem.**

## ***Background***

NCDOT is responsible for the success of the mitigation sites constructed for each project. Monitoring of these sites is required for one to five years depending on the type of mitigation and pinpoints problems that need to be corrected. Additionally, the information from the monitoring of these sites provides valuable information on what methods work best.

## ***Policy, Regulatory, and Legal Requirements***

- [US Army Corps of Engineers-Wilmington District - Mitigation](#)

## ***Warnings and Precautions***

Failure to regularly monitor mitigation sites and provide remediation as needed puts NCDOT in violation of the permit issued for the project.

## ***Resources and Tools***

- [Annual Monitoring Report Format](#)
- [Example Monitoring Scope of Work](#)
- [Example Monitoring Estimate](#)
- [Example Annual Stream Mitigation Full Channel Analysis Monitoring Report](#)
- [Example Annual Stream Mitigation Quarterly/Biannual Monitoring Report](#)
- [Example Annual Wetland Monitoring Report](#)

## ***Contacts***

- For suggestions to change this procedure contact: Karen Capps (919) 431-2003
- For questions about performing this procedure contact: Randy Griffin (919) 431-6529

## ***User Access***

- Restricted NCDOT, FHWA, MPO, RPO, Consultants, etc.

## ***Flowchart***

- None