North Carolina Division of Water Quality
Field Mapping Headwater Streams and Origins
Standard Protocol
Last Update: January 2008

Locating and Delineating Streams

Accurate and reliable field mapping of streams involves three primary components,

1. locating streams on the ground,
2. delineating streams by flow duration, and
3. georeferencing (GPS) delineation break points.

Locating all streams is achieved by beginning the field-mapping exercise at the most downstream point of a watershed and walking upstream until a tributary is observed. The tributary is subsequently walked upstream until another tributary is encountered, or until an origin (or origins) is reached. Once a stream origin is located, its flow duration is determined using the NC DWQ stream identification method. A stream identification form is completed and the origin is GPS'd. Both intermittent and perennial origins should be identified and GPS'd on each stream where they exist. Intermittent and/or perennial flow is to be determined by staff certified or trained to use the North Carolina Stream Identification Methodology (NCDWQ 2005). Once the origin is determined, documented and geo-referenced, the field investigator returns to the mainstem to continue the walk upstream. The process is repeated until the entire stream network is observed and all origins and flow duration data are collected.

- The origin of each intermittent or perennial stream and points of transition from intermittent to perennial downstream of the origin should be included. All streams downstream of perennial stream origins may be presumed to be perennial.

- Field determinations of the origin of streams, and flow durations (ephemeral, intermittent and perennial) are to be completed only by individuals who have successfully completed training equivalent to that described in "*Riparian Buffer Protection Program: - Surface Water Identification Training and Certification Program*" Section 143-214.25 NC General Statues. Training courses that meet that requirement are the DWQ Surface Water Identification Training and Certification Courses and the Stream Identification courses offered by the Forestry Educational Outreach Program at NC State University.

Obtaining Accurate GPS Coordinates

All units will be in the English system with locations in state plane coordinates, and determined to submeter accuracy, when feasible.

<u>GPS Equipment</u>

The GPS equipment used in stream mapping must be capable of submeter accuracy. The industry standard is the Trimble Geo Explorer series and Trimble Terrasync software, but comparable

GPS units may be used. A DWQ Stream Identification data dictionary is available in Arcpad and Terrasync formats and should be used for recording stream id determination information. The stream identification data dictionary can be downloaded from the ESRI arcscripts site http://arcscripts.esri.com/details.asp?dbid=13735.

The use of TerraSync and the standard electronic forms will insure that data are collected based on agreed upon requirements and can be imported into the DWQ stream mapping geodatabase with little or no errors or tweaking.

GPS Accuracy

At least one NGS or NCGS control point (benchmark) should be located in the stream mapping watershed or within 1000 feet of the watershed boundary, or as near as possible. ESRI shapefiles including all control points are available from http://www.ngs.noaa.gov/cgi-bin/ds_quads_sf.prl and are downloadable by USGS quad name. The GPS unit will be tested for accuracy at the beginning or end of each field day by recording the location of the control point nearest the study watershed with the GPS unit. A minimum of 10 individual GPS coordinate estimates must be logged and averaged for the GPS location of the control point to maximize the accuracy of the coordinate determination (pers. Comm., Gary Thompson, NC Geodectic Survey, 2006). The recorded GPS position (with date) of the control point and the name and coordinates of the control point will be included in the metadata for the study watershed.

Locations of stream origins will be recorded with the GPS unit to the maximum accuracy obtainable, submeter when feasible, with a minimum of 10 points (at 5 second intervals) logged for each stream origin.

Collecting and Recording Stream Attributes

DWQ Stream Identification data dictionary will be used for consistent data collection for all stream network features.

Digital photographs will be taken of each stream network feature and referenced to the GPS coordinates. Two photographs of each stream origin, one upstream of and one downstream of the origin will be taken.

Stream origins will be determined with the most current version of the DWQ Stream Identification Methodology. The stream identification data dictionary can be downloaded from the ESRI arcscripts site http://arcscripts.esri.com/details.asp?dbid=13735.
The electronic form can then be linked to the coordinates of the stream origin.

The origin of each stream will be classified in accordance with the listing below. The “orgclass” field will be used both for streams, modified streams and ditches that connect to the stream network. The “int at this point” and “per at this point” options are to be used when making a general stream determination at a location other than an origin.

- ephemeral to intermittent origin
- intermittent to perennial origin
- ephemeral to perennial origin
- wetland to intermittent origin
- wetland to perennial origin
- spring to perennial origin
- spring to intermittent origin
- canal/ditch, intermittent in character
- canal/ditch, perennial in character
- Water Intake/Outflow to intermittent stream origin (outlet of a stormwater device, e.g., pond, pipe, etc)
- Water Intake/Outflow to perennial stream origin (outlet of a stormwater device, e.g., pond, pipe, etc)
- Intermittent at This Point - Used for Buffer I/P calls when "origin" is not determined
- Perennial at This Point -Used for Buffer I/P calls when "origin" is not determined
- Intermittent Modified Natural Stream
- Perennial Modified Natural Stream
- USACE Jurisdiction Ordinary High Water Mark (OHW) - Use when DWQ will not claim stream, but Corps will. Supports "Significant Nexus" calls.
- Other - Use when no definition fits. If “Other” is selected, please provide an explanation in the notes field in the data dictionary.

Metadata

Descriptive metadata for all stream mapping areas will be submitted in MS Word format with the digital data and include as a minimum: (1) name, address, phone number, and email address of the persons involved in the data collection, (2) name and license number of the NC Professional Land Surveyor who supervised the data collection if applicable, (3) names of field team members, (4) dates and duration of field work, (5) brief description of field data collection methods and equipment, (6) assessments of data quality and accuracy of GPS data, and (7) additional comments about the character of the watershed or stream network that may be useful in the stream mapping research.

Statement of Data Completeness and Accuracy

The project manager must submit the data with a signed statement that all data have been reviewed for completeness and accuracy. Please include differential correction mask angle and P-DOP variations if applicable.

Data Delivery

All GPS data must be differentially corrected prior to submitting to DWQ. Data to be submitted must include original raw and corrected GPS files, and metadata. If data has been converted for GIS use, please submit files in ESRI shapefile format. Please include copies of all completed stream id forms (digital format if possible) and digital photos if available.