1. INTRODUCTION

Headwater streams represent most of South Carolina’s stream miles and play an important individual and collective role in protecting and sustaining the functions and services provided by larger downstream receiving waters such as rivers and estuaries, yet maps do not accurately depict their spatial extent (Figure 1a at right), nor are their characteristics well understood. Headwater streams lie at the terrestrial-aquatic interface and thus have the potential to carry pollutants and floodwaters downstream, yet headwater streams and their associated riparian areas are often altered or lost without a clear understanding of the potential consequences.

Drying is common in headwater streams and, ordinarily, headwater streams display a longitudinal gradient of hydrologic permanence related to relative contributions from stormwater runoff and seasonally high groundwater (Figure 1b at right below 1a). Geomorphological features and other indicators develop naturally in characteristic ways in response to this and the general gradient of increased discharge with catchment size. The degree of development of indicators may also vary due to local conditions.

Hydrologic permanence categories such as ephemeral, intermittent and perennial can facilitate implementation of regulations such as county buffer ordinances intended to protect streams and riparian areas and for example limit nutrient loading in a watershed. It is possible to place headwater stream reaches into these discrete categories based on the presence or absence and degree of development of various indicators. An indicator-based methodology is suited to this application, as most regulatory decisions have to be made in real time without recourse to long-term monitoring.

2. METHODS

Our neighbor State of North Carolina (NC) shares many of the same watersheds and ecoregions and has developed a methodology and guidebook, currently in its fifth iteration since it was first adopted in 1999. Starting with the NC methodology, DHEC is collecting data (Figure 2a above left) using the current NC data form (Figure 2b at right bottom) at various headwater stream reaches that fall across the hydrologic permanence and catchment size gradient. DHEC chose a probabilistic sampling approach so inferences could be made to streams that were not sampled. DHEC also installed water sensors (Figure 2c above) for continuously monitoring hydrologic condition (i.e., presence or absence of water – Figure 2b at right), and is collecting detailed biological and geomorphological data at a subset of reaches. Biological data will be analyzed to understand the relationship between assemblage structure and hydrologic permanence and to facilitate refinement of a list of perennial indicator species. Data will be statistically analyzed and a SC methodology and guidebook will be drafted based on the results.

3. APPLICATIONS

The resulting SC methodology and guidebook will have wide application:

- Existing Statewide and local buffer programs
- SC Forestry Commission’s Best Management Practices (Figure 3a below left)
- County buffer ordinances (Figure 3b below right)
- Clean Water Act programs
  - A tool for making and documenting jurisdictional determinations
  - 401 Water Quality Certification application review evaluation of impacts and mitigation
  - Stream mitigation bank proposal review
- Watershed management and forecasting
- Related work such as development and attribution of channel network topology from LiDAR data, etc. - South Carolina Hydrographic Data Users Group

4. CONTACT

William R. “Rusty” Wenerick
Project Manager
SCDHEC Bureau of Water
2600 Bull Street, Columbia, SC 29201-1708
Phone: (803) 898-4266 / Fax: (803) 898-7344
Email: wenericw@dhec.sc.gov