The Short-term Response of Nutrient Loads to an Agricultural Stream Restoration in Coastal Plain of North Carolina

Qianyu Hang (qhang@ncsu.edu); François Birgand, Cyrus Belenky, Chiao-Wen Lin
Department of Biological and Agricultural Engineering, North Carolina State University, Campus Box 7625, Raleigh, NC 27695-7625, USA

Billions of dollars have been spent on stream restoration, yet questions remain about its effectiveness for improving water quality, as many studies report either mixed success or lack the adequate data/methodological framework.

Objectives:
• Improve monitoring system and collect high-frequency hydro-chemical data;
• Quantify restoration effects on nitrate and DOC loads using paired-watershed method and double mass curve

Study Area:
A 2.2 km low-gradient agricultural ditch that ran approximately north to south through Claridge Nursery, Goldsboro. Three dominant land uses for the Canal’s watershed are cropland (57%), forest (14%) and developed land (10%). The Canal underwent a priority 2 restoration, creating a new connected floodplain and meandering channel.

Methodology:
1. Trapezoidal Wooden Sections
2. Time-paced Discrete Sampler (ISCO Autosampler)
3. Doppler Velocity Meter
4. UV-Vis Spectrophotometers

Results:

Verification:
○ The pre- vs post-restoration volume ratio is stable;
○ No significant changes of the reference (CLUP) signature in nitrate and DOC loads

Conclusions and Future Research:
High-resolution monitoring scheme helps generate more precise nutrient loads during pre- and post-restoration. It has been observed a dramatic short-term improvement of nitrate loads reduction after restoration. However, we do not know what processes or functions at play. Therefore, we are considering to further our research to:
1. Continue high-resolution monitoring and estimate long-term restoration effects on nutrient and suspended sediment loads;
2. Identify the drivers for the observed effects;
3. Derive additional guidelines of practices which we will find to have contributed most to the overall restoration benefits and monitoring scheme for estimating restoration effects.