

# Determination of the Assimilative Capacity of the SMR for Nutrients

# Background and Need

- From literature, only ~25% of nitrogen (N) added to the landscape is exported to the ocean, indicating substantial sinks for N in the watershed
  - Denitrification results in permanent loss of N
  - Other processes represent internal transformations or relocation of N.
- Models linking nutrients to algal biomass and DO require parameterization of these important processes
  - In absence of studies, will rely on literature data from other regions
- Model performance would be improved by local data

# Key Questions

What is the assimilative capacity of the SMR for nutrients?

- What is the rate of uptake of different nutrient forms in the SMR?
- How much of the nitrogen uptake represents a permanent loss from denitrification?
- How do these rates change along a nutrient disturbance gradient and with substrate type?

# Study Design

- Two index periods: Spring and Winter
- Six sites
  - 2 substrates: sand and cobble
  - 3 nutrient conditions: high, moderate and low
- Estimate changes in in-stream nutrient assimilation and cycling
  - Short-term nutrient additions and conservative tracer (chloride), dripped continuously to elevate in-stream concentrations; water samples collected downstream and analyzed for nutrients over a time course
  - From the measured concentrations, distance and time, the uptake length ( $S_w$ ), uptake velocity ( $v_f$ ), and areal uptake ( $U$ ) can be calculated.
  - Experiment will be repeated 3 times with nutrient solutions of different concentrations to extrapolate to un-elevated conditions
- Determination of the rate of denitrification
  - One of the days of assimilation study, nitrate in the injection solution will be isotopically labeled with 99%  $^{15}\text{N}$ -enriched.
  - Denitrification rates can be estimated by fitting a model of the N gas production to the longitudinal pattern in the fluxes labeled gas and nitrate

# Budget

	<b>Two Index Periods 6 sites</b>	<b>One Index Period 6 sites</b>	<b>One Index Period 3 sites</b>
Personnel	\$193 K	\$133 K	\$ 108 K
Travel and Per Diem	\$20 K	\$10 K	\$ 5 K
Supplies and Shipping	\$25 K	\$12 K	\$ 10 K
Analytical Costs	\$112 K	\$56 K	\$ 28 K
Total	\$350 K	\$210 K	\$ 151 K

# Products

- Work plan and QAPP
- Field sampling report
- Oral presentation reporting uptake and denitrification rates and relevance to TMDL
- Draft and final report and QA report