Understanding Linkages between Sheet Flow and Suspended Sediment Transport Processes in the Ridge and Slough Landscape

Jud Harvey[1], *Greg Noe*[1], *Ray Schaffranek*[1], *Jim Saiers*[2], *Yong Huang*[2] and *Laurel Larsen*[3]
[1]U.S. Geological Survey, Reston, VA
[2]Yale University, New Haven, CT
[3] University of Colorado, Boulder, CO

A century of water management has reduced flow and decreased hydrologic connectivity in the central Everglades, and these changes are hypothesized to be the root cause of degradation of the unique structure and function of the Everglades ridge and slough landscape. One of the guiding principles of restoration is to remove flow barriers and increase sheet flow with an aim to restore natural hydro-patterns and conserve remaining ridge and slough. The degree to which degraded areas of ridge and slough can be restored is debatable and needs to be tested because the relative importance of controlling factors is not yet well enough understood. These uncertainties also are entwined with concerns about water quality, in particular, how increased sheet flow could affect transport of phosphorus from upstream eutrophic areas.

Important factors involved in the creation and maintenance of ridge and slough landscape structure are thought to include sheet flow and its interactions with organic matter transport, nutrient retention, plant productivity and decomposition, and resulting soil buildup and/or erosion (Science Coordination Team, 2003). The hydrologic components have historically received relatively little attention (National Research Council, 2003). Our group is addressing that need through research to answer the question "How does variability in sheet flow velocities influence sources, transport rates, and removal mechanisms of suspended sediment and particle-associated phosphorus?". We have begun investigations in a region of the water conservation areas with remnant but identifiable ridge and slough landscape structure. The research site (WCA-3A-5) has dock access to a *Cladium* ridge and an adjacent *Nymphaea* slough. Measurements that began in August 2005 in both ridge and slough include: continuous measurements of water depth, wind speed and direction, air temperature and water temperature profiles, specific conductivity and velocity at fixed depths in the ridge and slough; monthly measurements of vertical velocity profiles and sampling of suspended particulates and associated nutrients in the water column; and additional vegetation clip plots, and soil core and porewater sampling. In November 2005 tracer transport experiments were conducted in two (5-m long by 1-m wide) flumes, one located on the ridge and the other in the slough, into which solute tracers and fluorescent particle tracers (1 :m) were injected at different depths of the water column.

Site WCA-3A-5 is an excellent "reference" site for comparison with transport conditions at sites with more degraded ridges and sloughs, and also an excellent site to revisit to assess changes associated with restoration. We plan to continue measurements and experimentation at site WCA-3A-5, and also possibly add an "early response" site, i.e. a site with substantially degraded ridge and slough topography located downstream of a significant barrier removal (likely in WCA-3B). Our proposed work stresses the need for research at both "reference" and "early response" sites to test hypotheses and to guide adaptive management planning for the optimal conservation of ridge and slough landscape features across gradients in eutrophication, hydrologic connectivity, and differing degrees of topographic degradation.

Contact Information: Jud Harvey, U.S. Geological Survey, 430 National Center, Reston, VA 20192, USA, Phone: (703) 648-5876; Email: jwharvey@usgs.gov