

# Spatially Explicit Decision Support for Watershed Management on Military Lands: Stream Integrity, Interactive Programming, and Best Management Practices

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**ABSTRACT.** The identification of land use impacts on stream habitats, biotic assemblages and microbial contamination constitutes an essential component of resource management (Richards et al. 1996). Stream hydrology, chemistry, geomorphology and biotic assemblage structure are tightly linked with a suite of regional terrestrial factors including climate, vegetation, slope, elevation, geology and land cover/land use (Johnson and Gage 1997). Because stream ecosystems are so tightly linked with their terrestrial watersheds, disturbances of land surfaces often lead to disturbances within their corresponding aquatic ecosystems (Wang et al. 2001, Wang 2003).

In the Southeastern (SE) United States numerous military installations create a patchwork of highly unique landscapes. The majority of these landscapes contain areas of dense human activity (cantonment), valued timber and recreational lands, habitat for endangered species, and other specialized areas for personnel training. Recent base activities have focused on stormwater and erosion control, wildlife and timber management, and pollution prevention and runoff.

As of 2008, Fort Jackson and associated waters had three South Carolina Department of Health and Environmental Control stations listed on the 303d list for fecal coliform impairment. The Department of Defense (DOD) recognizes that military base activity may result in ecological impairment and is in the process of assessing the impairments, and developing assessment frameworks and ecological reference models that will be used to determine the feasibility of recovery and aid in selection of recovery strategies. The DOD also requested the development of a structure for measuring progress towards meeting recovery objectives (SERDP, SI focus area, Development of Science Based Recovery

Objectives for Ecological Systems in the Southeastern United States. SON Number: SISON-09-01).

In the first step of our project we characterized the condition of watersheds on Fort Jackson. This project specifically addressed water quality issues by assessing the biological integrity of Fort Jackson streams and evaluated the bacterial contamination of streams and lakes within the watersheds. Twenty three sites were assessed for aquatic macroinvertebrate biological integrity and bacterial contamination. Seventeen ponds were assessed for microbial contamination of the water column and sediments. Utilizing a technique called carbon source utilization; we were able to isolate contamination sources for possible matches.

A GIS was used for detailed delineation of stream networks, study sites, watersheds, buffered areas, and HUC number. Water quality data was also entered in attribute tables associated with each study location and larger watershed. Detailed aerial photographs along with base wide usage and field guides were used to formulate possible impacts specific to activities present within each watershed and HUC. Each of these activities was then considered against biological measurements taken within each watershed and HUC. Environmental results (from literature) specific to each impact and water quality score by watershed and HUC were then formulated. Suggested practices were then listed by specific impacts. Applicable best management practices by impact, specific to the SE, were compiled to provide resource managers additional information.

A program was written in Visual Basic which allowed us to combine all of the above information in a user-friendly, menu-driven environment. This GIS program produces multiple levels of management strategies: HUC watershed, sub-watershed and cantonment areas. Within

each of these areas, sites are displayed and can be chosen as desired or possible impact area will be highlighted as with the cantonment area. Each step opens detailed information windows with the end product being recommendations specific to potential source and a series of hot buttons opening PDF files or web pages.

## LITERATURE CITED

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