Applied Solutions for Water Resource Challenges: Floods, Contamination and Upland Water Storage

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The Center for Earth and Environmental Science, an IUPUI Signature Center, is working on a series of water resources problems and creating solutions. A series of collaborative projects are underway with the HUD, FEMA, the Office of Community and Rural Affairs, the United States Geological Survey, the Indiana State Department of Agriculture, and an international corporate partner in Berlin, KompetenzZentrum Wasser Berlin.

Flood Erosion Hazard Program

CEES, the USGS, and Polis are working with HUD and the Office of Community and Rural Affairs, though the Indiana Silver Jackets, to create tools for the State of Indiana to incorporate flood erosion hazard risk assessments into community planning.

Flooding remains the most costly natural hazard in the US and Indiana. Flood losses continue to rise despite billions of dollars in mitigation. The causes are complex and related to land use, infrastructure design and climate change. Following the June 2008 floods in Indiana, 39 counties were listed as Federal disaster areas. In early 2005, 90% of Indiana counties were declared federal disaster areas after heavy rains fell on saturated soil. There have been seven major regional flooding events since the "Great flood of 1913". The frequency of large floods appears to be increasing. Four of the eight major floods have occurred since 1982 and the last two occurred in 2005 and 2008. From 1998 through 2007, total insured flood losses in Indiana exceeded $39.8 million. While more restricted in area than the floods of 2008; record flooding occurred again throughout central and southern Indiana in early 2011 following heavy rains in February and March. Traditional flood protection usually consists of three components: flood control reservoirs, urban levees/floodwalls, and agricultural levees. These traditional flood protection methods are focused on one aspect of flooding – inundation. However, the largest single source of flood losses, both in terms of cost and number of affected persons, is damage to transportation infrastructure. Fluvial erosion is a principal cause of this damage. This significant flood-related natural hazard – the "fluvial erosion hazard" (FEH) – is not a specific component of State and local mitigation programs. This project aims to generate the tools for inclusion of FEH into statewide and local community planning.

Aquisafe II - Performance Analysis of Selected Mitigation Systems Used to Attenuate Non-Point Source Agricultural Pollution

Aquisafe is an international research collaboration with Veolia Environment based in Paris, their corporate partner in Berlin (KompetenzZentrum Wasser – Berlin Center of Competence for Water), the German Federal Environmental Agency, German university partners, and French quasi-governmental agencies in Brittany, France. The project goals are to create new mitigation systems to capture and treat polluted agricultural water running off farm fields prior to flowing into area streams, especially those used for drinking water supplies. The contaminants of specific concern are nutrients (nitrogen and phosphorus) and pesticides (atrazine – a corn-herbicide with potential endocrine disrupting effects). We are testing 2-stage, constructed wetlands in Indianapolis, Indiana and Brittany, France that have been designed to intercept and convert contaminants to harmless compounds. Site designs are guided by laboratory technical scale experiments conducted in Berlin that identified the hydrologic retention times and suitable sources of organic carbon necessary for mitigating contaminants. Construction of the experimental systems will begin in April in the Eagle Creek Watershed in cooperation with a private farmer with initial results expected this summer.