Using Spatial and Remote Sensing Technologies to Help Interpret Results from Monitoring Studies and Support Stewardship Initiatives.

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BACKGROUND

In the October 2003 Atrazine Interim Reregistration Eligibility Decision (IRED), the US EPA required a statistically designed multiple season intensive monitoring program to measure atrazine concentrations in small headwater streams flowing through highly vulnerable watersheds. 40 watersheds (9-100 sq. mi.) were instrumented and monitored for at least two seasons between 2004 and 2006. Atrazine concentrations were measured at least every 4 days at all sites along with flow and weather data. Detailed GIS data were accumulated and analyzed in order to identify potential drivers of runoff in each watershed. Of these 40 potentially highly vulnerable watersheds, only 3 were determined by EPA to require continued monitoring and a watershed management program based upon the monitoring results. Two of these three streams exhibit intermittent flow during the summer. Monitoring continued after 2007 in these three as well as several adjacent watersheds using a daily auto-sampling protocol.

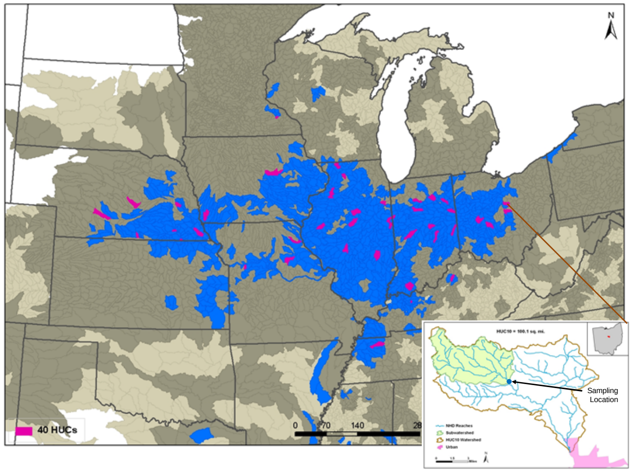
The monitoring data available by the end of 2009 were used along with intensive GIS analysis by Syngenta and US EPA to identify key conditions that distinguish watersheds with the potential for higher atrazine runoff from among the pool of highly vulnerable (high use) watersheds examined. In 2010, daily monitoring was initiated in 25 new small headwater watersheds that reflect these exceptional conditions. Between 2004 and the present, a total of over 150 site years of monitoring data have been accumulated (46 years with daily flow/chemical monitoring). Spatial analysis and remote sensing technologies have been an integral part of this unique program and continue to be used to further mine the data and support stewardship.

These graphics demonstrate some of the approaches used to:

- Identify the original pool of 40 representative highly vulnerable watersheds for monitoring.
- Predict which headwater watersheds might be similar to those shown to have higher atrazine runoff potential by the monitoring program.
- Understand the relative vulnerabilities of individual fields within watersheds and identify cost-effective and location-appropriate mitigation options.

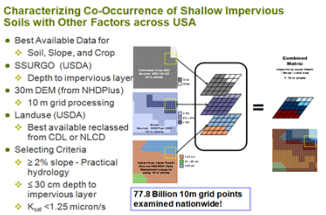
The authors look forward to discussing these approaches with conference attendees

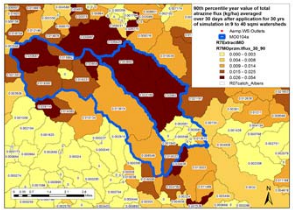
Selection of 40 Headwater Watersheds for Monitoring

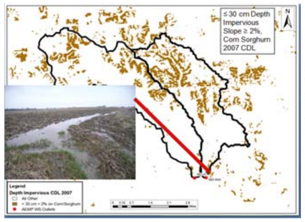


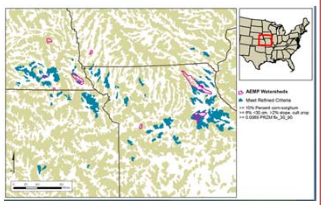
- Selected all HUC10 watersheds with any significant atrazine use (grey within beige).
- Potential watershed vulnerability ranked using USGS WARP model at the HUC 10 scale.
- Upper 20th centile of watersheds by WARP annual concentration identified (blue area).
- GRTS (EPA OW tool) used to select 40 spatially representative HUC10 watersheds (pink).
- Within each selected watershed, 1 vulnerable headwater selected using EPA criteria (inset).

Detailed Nationwide Investigation of Co-occurrence of Drivers of Potentially Unusual Runoff

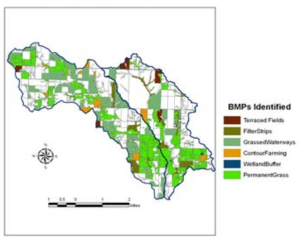




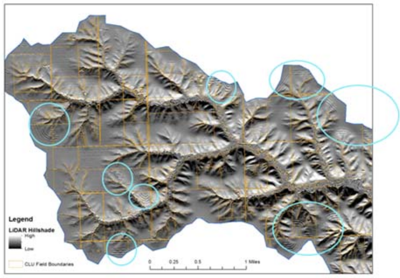




Remote Sensing to Identify Existing BMP's and In-field Flow Patterns

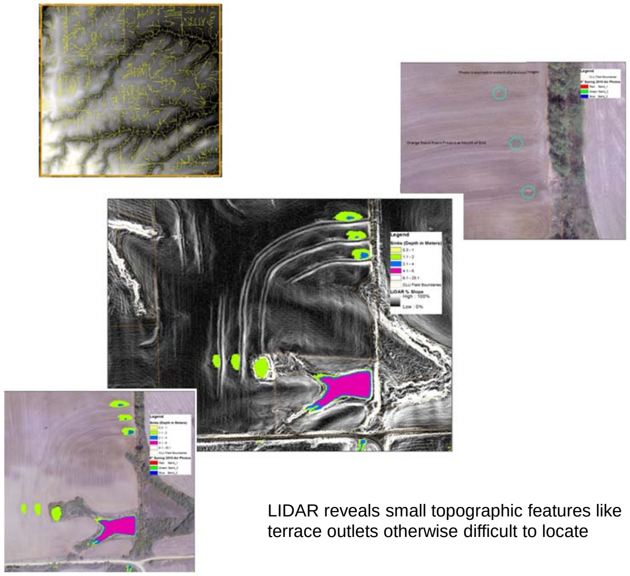


Best Management Practice	Observed
Terraced Fields (combines grass back-sloped, grass channeled, parallel, and random terraces with WASCOBs)	22
Filter Strips (combines grassed filter strips, riparian buffer strips, and grassed banked ditches)	29
Grassed Waterways	97
Contour Farming	14
Wetland Buffer	6
Permanent Grass or Hay	324



Rapidly Locating Linear Features (Terracing or Contour Plowing) in LIDAR

LIDAR to examine In-field Flow



LIDAR reveals small topographic features like terrace outlets otherwise difficult to locate