



**California Environmental Protection Agency  
Department of Pesticide Regulation  
Environmental Monitoring Branch  
Surface Water Protection Program  
1001 I Street  
Sacramento, CA 95814**

**Protocol 218: A Pilot Study of Using GIS/Modeling to Identify Vulnerable Areas for  
Pesticide Runoff and Evaluate Feasibility of Mitigation Measures**

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**Introduction**

Pesticide runoff during rainfall events is one of the major pathways for pesticide transport from the field to the surface water. Many best management practices (BMPs) have been proposed as mitigation measures to alleviate the runoff problem and therefore to reduce pesticide loading in the surface water. However, implementing BMPs is not without a price. For example, the use of buffer zone or cover crops in the field requires extra field space and/or maintenance cost. With agriculture currently operating at a marginal profit, such a cost would represent a sizable burden for the farmers. We propose to use the Geographic Information System (GIS) and modeling techniques to identify vulnerable areas for pesticide runoff based on slope, soils data, land use, pesticide application data, etc. so that the BMPs or mitigation measures can be focused only on these problem areas. By focusing these efforts on the targeted areas, instead of enforcing them uniformly, we can save the mitigation cost and achieve the best results.

**Objectives**

The objectives of this project are to 1) delineate to the section and further to field scale the vulnerable areas of pesticide runoff during dormant sprays in a selected watershed; 2) evaluate the feasibility of implementing various BMPs on these areas in reducing pesticide loading into surface water; and 3) make recommendations, based on the above analysis, with regard to the most appropriate BMPs to be implemented in the vulnerable areas, or identify the additional field studies needed.

This project will provide scientific basis for pesticide regulations with respect to dormant spray applications. As a pilot study, the scope of this project will be confined to a small watershed at this stage. Upon completion of this study, subsequent projects will be developed to expand the scope into larger watersheds to cover more agricultural areas in the Central Valley.

## **Branch Operational Plan**

This activity is included in the Operational Plan under Goal 1, Objective 1, Strategy 2 and Activity 1. Assess surface water modeling efforts to aide in evaluating the potential for contamination and the effectiveness of mitigation practices (Initiative).

### **Methods**

1. The first step of the project is to select an appropriate watershed. The following information and databases will be obtained and used to select a watershed for the pilot study:

- Pesticide use database (Pesticide Use Report or PUR)
- Soils parameter database (SSURGO)
- Land use data
- Weather data (The California Irrigation Meteorological Information System or CIMIS)
- Surface water reach data
- Surface water monitoring data (SURF)
- Topographical data
- Any other data as needed

Appropriate sources for the above data will be identified, and the data will be integrated using GIS technology. A watershed with a high dormant spray use and clear drainage boundary will be selected. In addition, a watershed with drainage monitoring data is preferred.

2. Identify vulnerable areas for runoff: Potential vulnerable areas for runoff will be first identified using GIS overlays, and will be further refined by simulations using a field runoff model based on existing data. A few field trips will also be made to verify the GIS data, and to help parameterize the transport model.

3. Perform a detailed evaluation of the feasibility and effectiveness of alternative BMPs implemented on the identified areas. Numerous simulations using different combinations of field, weather, and use conditions will be conducted. The scenarios will be developed based on real world data, and the final pesticide load to the surface water will be compared. Based on the results of the comparisons, the most appropriate BMPs will be recommended.

## **Personnel**

The following personnel will be involved in the project:

Lei Guo will be the principal investigator and project manager of this project. She will be responsible for the project design; implement and preparation of draft the final project products.

Frank Spurlock will be the Senior Scientist, in charge of the overall project design and data analysis strategies, and review the final products.

Minghua Zhang, Craig Nordmark, and Kevin Bennett will provide the GIS capability, and will offer assistance in GIS related data query, imagery processing, and mapping.

## **Potential Collaborator**

This project may require the potential collaboration of the Waterborne Environmental, Inc. Its expertise in the management of database with GIS interface and its coupling with environment models will be sought. The service budget will be limited to below \$30,000.00 on an as needed basis.

## **Timeline**

The project will be a two-year study, starting in June 2003 and ending by June 2005.