

# Southern San Joaquin Valley (SSJV) Management Practices Evaluation Program (MPEP)

## Site-Specific Management Effects on Nitrate Leaching

### Introduction

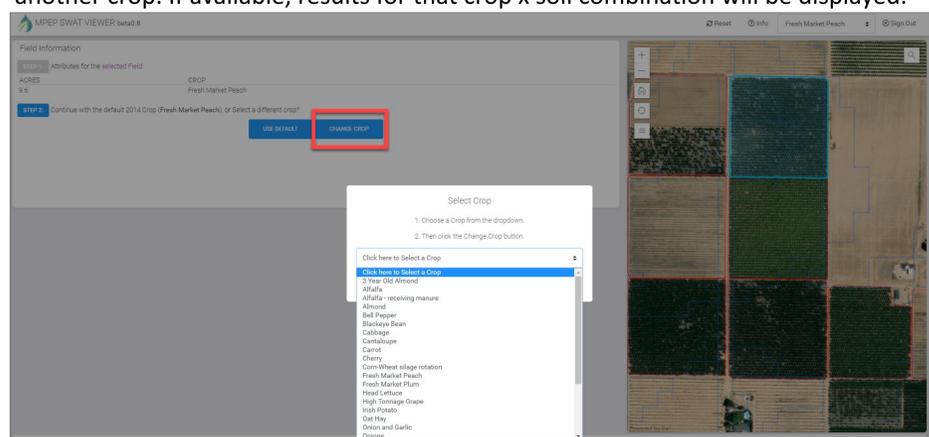
The MPEP is a required component of the Central Valley Regional Water Quality Control Board's (Water Board's) Irrigated Lands Regulatory Program (ILRP). In response, seven water quality coalitions formed the SSJV MPEP. The goal of this committee was to evaluate and promote implementation of agricultural management practices to protect water quality by minimizing nitrate leaching to groundwater. The SSJV MPEP Committee evaluated alternative methods and opted to use the globally recognized, comprehensive Soil & Water Assessment Tool (SWAT) to evaluate the effects of crop management practices on Central Valley irrigated lands. The simulation runs with a daily time-step on discrete land units called Hydrologic Response Units (HRUs). HRUs are comprised of unique combinations of soil, crop, climate, and topography. The SWAT model built for this application has 104,649 unique HRUs across Central Valley (Region 5). Furthermore, the model is executed for a 25-year time period (1990 through 2014) to capture the influences of a fluctuating climate. **A SWAT Results Viewer allowing growers to view results for specific fields that they farm is described here.**



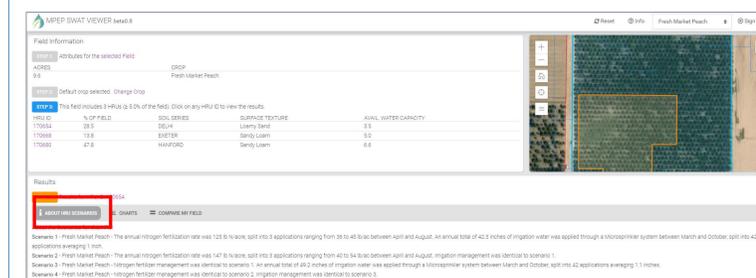
Four nitrogen (N) fertilization and irrigation management scenarios were compared for their effects on crop productivity and nitrate leaching losses. Scenario 1 represents practices considered to be reasonably efficient, based on current knowledge. In Scenario 1, the annual N application rate is near the reported industry mean, with N application timing in accordance with current UC recommendations. Irrigation rates are based on  $ET_{crop}$  and actual  $ET$  (ETa) data; irrigation volume was adjusted for an assumed distribution uniformity of 85-90%, where low-volume irrigation (drip or microsprinkler) was modeled, and 75-80% for other methods. The remaining scenarios depicted greater N application (Scenario 2), greater irrigation depth (Scenario 3), or greater N rate *and* greater irrigation depth (Scenario 4). Amounts of N and irrigation water applied were increased 15-20% above the levels used in Scenario 1. Based on grower-reported N application data, the higher N rates used in Scenarios 2 and 4 are within the mainstream of current industry practices. In this comparison, the timings of N application and irrigation were not changed—only the amounts applied.

### Step 1: Pick Field/Crop

To select a given field, users can browse the viewer map, enter specific geographic coordinates, or filter by the default crop. Upon field selection, users can choose to view results for the default crop (based on the 2014 DWR Crop Map) or select another crop. If available, results for that crop x soil combination will be displayed.



### Step 2: Evaluate Field and Management Scenario Information



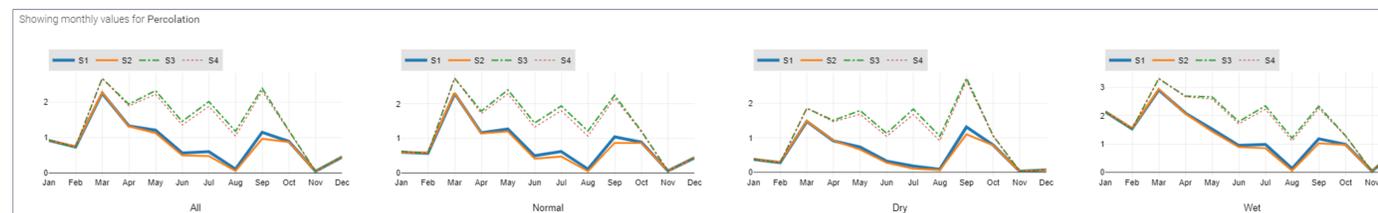
A given field can be comprised of one or multiple HRUs depending on soil type and subbasin delineation. Upon selection, information on HRU(s) constituting >5% of the field are listed, including: the proportion made up of the HRU, the mapped soil series, surface textures, and available water capacities (based on soil and crop rooting depth information). Furthermore, users can view details on applied N and irrigation for the 4 management scenarios to understand the range of practices for which results are depicted.

### Step 3: View Annual Results

Average annual results are displayed for a variety of outputs pertaining to system performance and efficiency. Results can be compared across scenarios and within or across year types (i.e., "wet," "dry," and "normal").



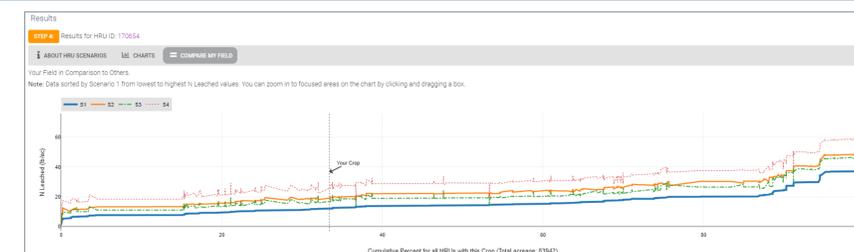
### Step 4: View Monthly Results



Results of specific parameters can also be viewed on the monthly timescale to understand in-season dynamics across management scenarios and year-types and illuminate when losses may occur.

### Step 5: Compare to Other Fields

Users can see how the HRU compares to others for the same crop, with respect to average nitrate leaching across the 4 management scenarios. HRUs are sorted by increasing nitrate leaching in the Scenario 1 (the most efficient). This plot illustrates how leaching varies across the landscape with differences being driven by soil and climatic variability. The relative response to management can be observed. This informs the user about the relative vulnerability of the selected HRU to nitrate leaching and how it may respond to management. The fact that the lines for S2, S3, and S4 do not perfectly mirror S1 shows that different HRUs respond differently to changes in management.



### Conclusions

The SWAT Results Viewer generates 30 informative plots depicting outcomes across a range of management approaches for each of over 13,000 HRUs in agricultural production within the SSJV (totaling over 400,000 plots), customizing results to the exact geography and crop selected by the user. While the crop-specific management scenarios are representative of "common" practices occurring across the landscape, they reflect generic management scenarios, not the actual management implemented. Nevertheless, the SWAT Viewer allows growers to assess the sensitivity of land they farm to degrees of N and water management efficiency, compared to other locations with the same crop. This information can inform management decisions about balancing the potential benefits and risks of N and water management approaches. It also illuminates the need for site-specific management tailored to local conditions to achieve production and environmental goals. This viewer will be accessed by growers through coalition websites.

#### Authors

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#### SSJV MPEP Committee Coalitions

Buena Vista Coalition  
Cawelo Water District Coalition  
Kaweah Basin Water Quality Association  
Kern River Watershed Coalition Authority  
Kings River Watershed Coalition Authority  
Tule Basin Water Quality Coalition  
Westside Water Quality Coalition



#### SSJV MPEP Committee Coalitions

The SSJV MPEP Committee was awarded \$2 million from the USDA NRCS Conservation Innovation Grant program to increase the use of management practices that reduce nitrate leaching. Growers and partners provided \$7.6M of additional funds and in-kind.