

Modeling Requirements

1. Farm/Field Loads under current conditions by season
2. Delivery Ratios (DR) by season by subwatershed
 - ratio of contaminant yield from a drainage basin to the portion that reaches the receptor point
3. Delivered Loads
 - portion of the farm/field load arriving at the receptor point

$$\text{Delivered Load}_{\text{season}} = \text{Farm Load}_{\text{season}} * \text{DR}_{\text{season}}$$

3. Tradable Load by season
 - portion of the delivered load that can be offset due to BMP implementation or other actions
 - allow technical trade facilitator to determine the potential decrease of a load from a farm/field due to BMP implementation

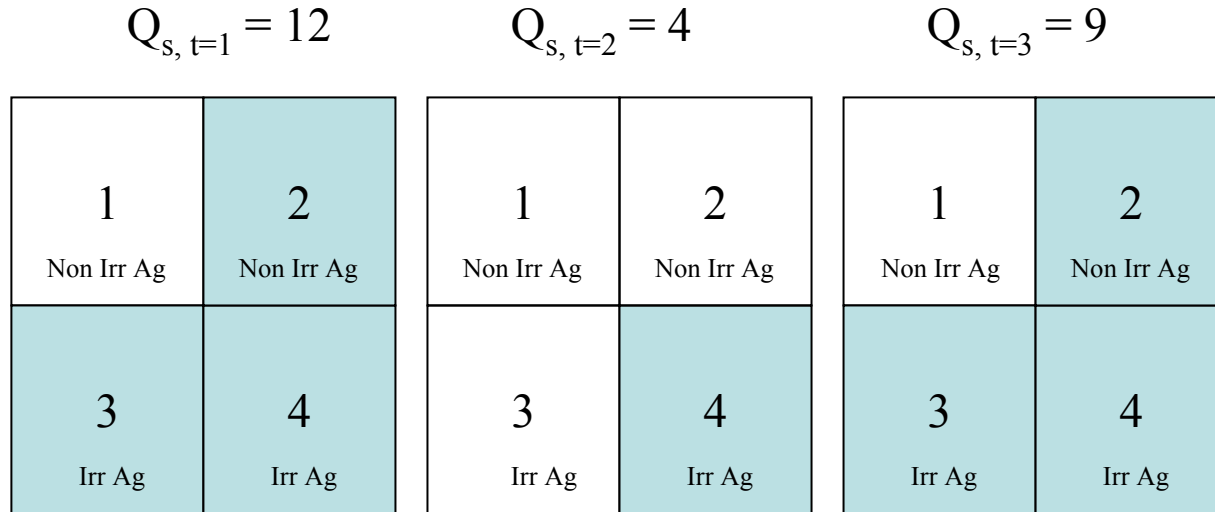
Watershed Loading Component

$$\textit{Watershed Load} = \textit{Surface Runoff Load} + \textit{Baseflow Load}$$

$$\textit{Surface Runoff Load} = \textit{Surface Flow} * \textit{Event Mean Concentration}$$

$$\textit{Baseflow Load} = \textit{Baseflow} * \textit{Average Groundwater Concentration}$$

Understanding Surface Flow Distribution to Determine Nonpoint Source Load Using Variable Source Areas



= Saturated
 = Not Saturated

Addresses Requirement #1 - Farm/Field Loads under current conditions by season

$$\text{Load} = W_{\text{Tot/season}} = \Sigma Q * \text{EMC}_{\text{LU}}$$

$$\Sigma Q_{S1} = 0+0+0$$

$$\Sigma Q_{S2} = 4+0+3$$

$$\Sigma Q_{S3} = 4+0+3$$

$$\Sigma Q_{S4} = 4+4+3$$

$$\text{EMC}_{\text{Non Irr Ag}} = 10$$

$$\text{EMC}_{\text{Irr Ag}} = 20$$

$$\Sigma W_1 = 0+0+0 = 0$$

$$\Sigma W_2 = 4(10)+0+3(10) = 70$$


$$\Sigma W_3 = 4(20)+0+3(20) = 140$$

$$\Sigma W_4 = 4(20)+4(20)+3(20) = 220$$

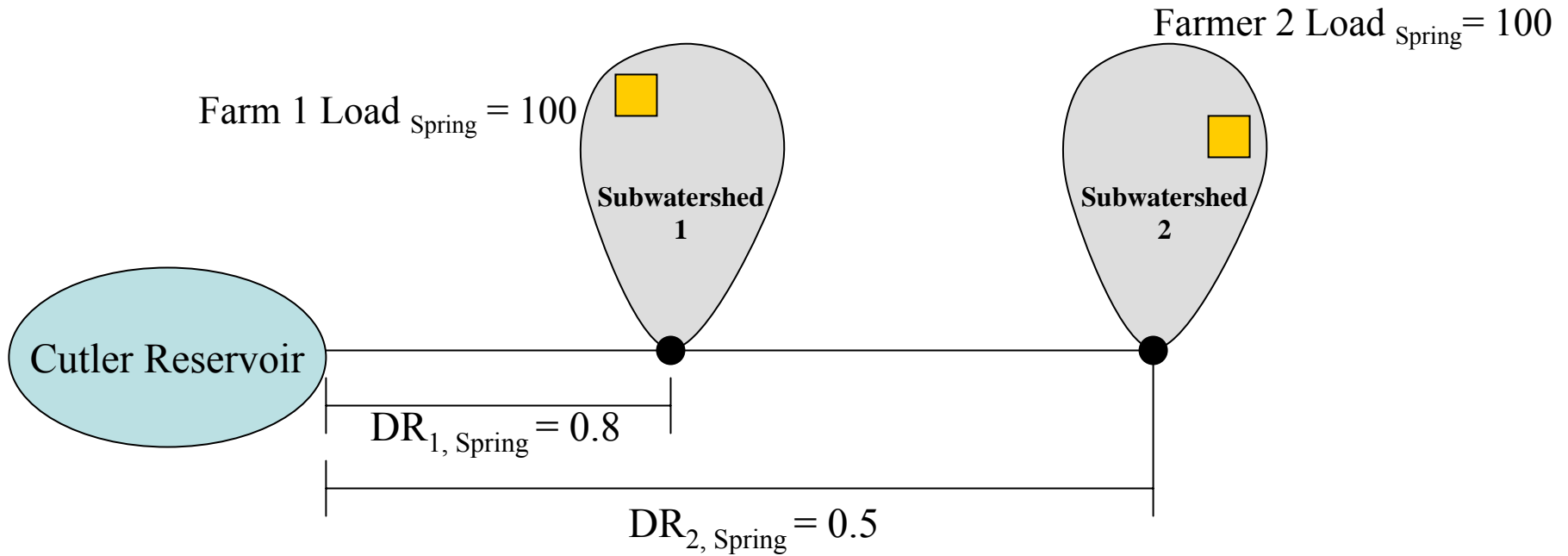


Calculation of Delivery Ratios Using Instream Water Quality Modeling

- Daily loads/watershed are put into QUAL2E (Instream Water Quality Model)
 - Qb, Qs timeseries from TOPNET (Hydrologic Model)
 - Variable Source Areas (VSA) over time
 - EMCs/Landuse
- Result = Current Conditions DRs /subwatershed/season



Addresses Requirement #2–
Delivery Ratios (DR) by season
by subwatershed.



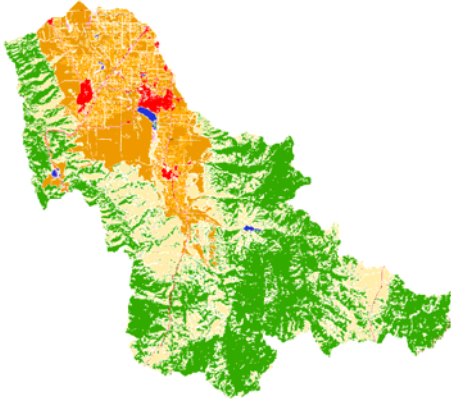
$$\text{Delivered Load}_{\text{Farm 1, Spring}} = \text{Farm 1 Load}_{\text{Spring}} * \text{DR}_{1, \text{Spring}} = 100 * 0.8 = 80$$

$$\text{Delivered Load}_{\text{Farm 2, Spring}} = \text{Farm 2 Load}_{\text{Spring}} * \text{DR}_{2, \text{Spring}} = 100 * 0.5 = 50$$

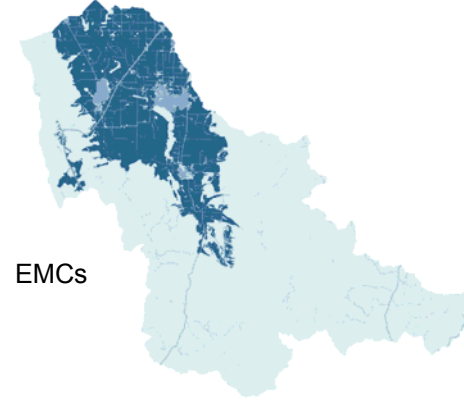
$$\text{Tradable Load}_{\text{Farm 1, Spring}} = \text{Delivered Load}_{\text{Farm 1, Spring}} * \text{BMP \% Reduction} = 80 * 0.5 = 40$$

$$\text{Tradable Load}_{\text{Farm 2, Spring}} = \text{Delivered Load}_{\text{Farm 2, Spring}} * \text{BMP \% Reduction} = 50 * 0.7 = 35$$

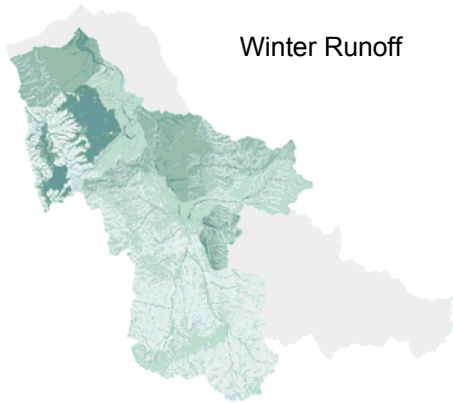
Land Cover



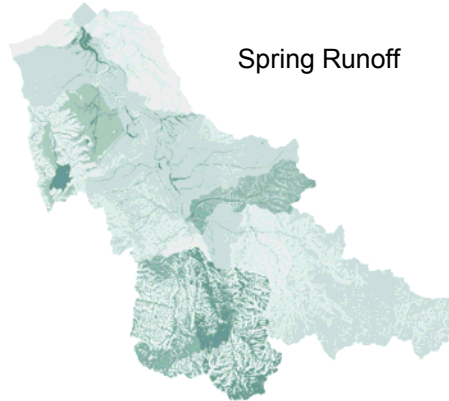
TP EMCs



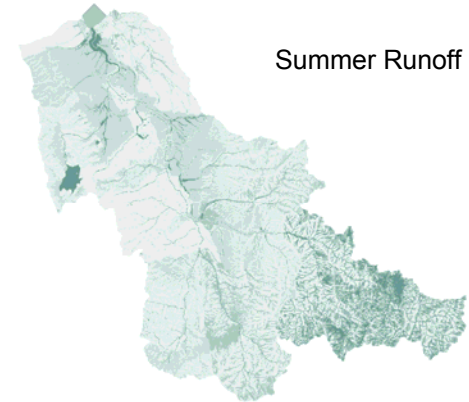
Winter Runoff



Spring Runoff



Summer Runoff



Fall Runoff



Total Annual Runoff

