

## Nitrogen Loading Determinations Using Non-Predictive Modeling Methods

Goal: Determine overall nitrogen loading to groundwater using simple accounting methods. For example a mass balance equation:

$$(N_{\text{input}}) - (N_{\text{loss}}) - (N_{\text{uptake}}) = N_{\text{leached}}$$

Using this “mass balance” approach will yield a basin wide loading figure for nitrogen entering the groundwater. This result can either be general in nature or have a period of time associated with it.

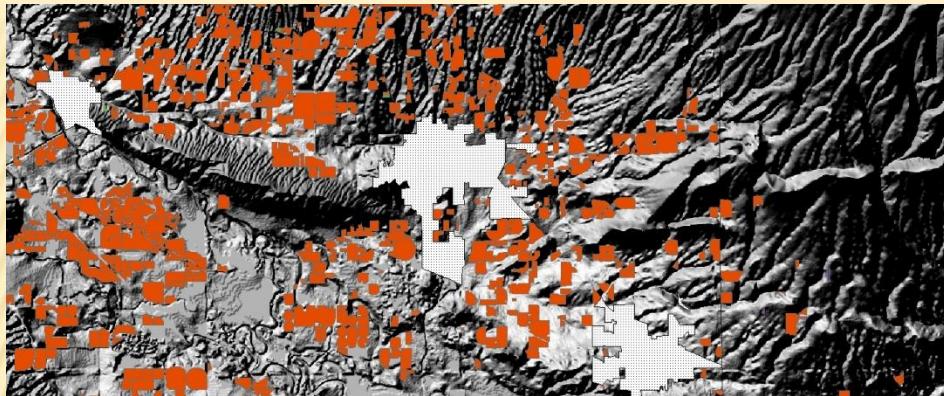
- 1) A general result can be developed using crop data and acreage (WSDA), published fertilizer guidelines (WSU, etc.), and published ranges for ammonia loss and biomass removal
- 2) A refined results can be developed using crop data and acreage (WSDA), nutrient application data (Landowners), biomass removal data (Landowners), and ammonia loss from published sources

A study using #1 as a roadmap will not have a time element associated with it, and will not likely produce a result that represents the current conditions within the basin. The results assume that N loading is being conducted at a rate where no excess is being applied

A study using #2 as a roadmap will provide a result that can be associated with time and therefore could be used as a baseline to determine how close N loading is to achieving 0 nitrogen loss to the groundwater

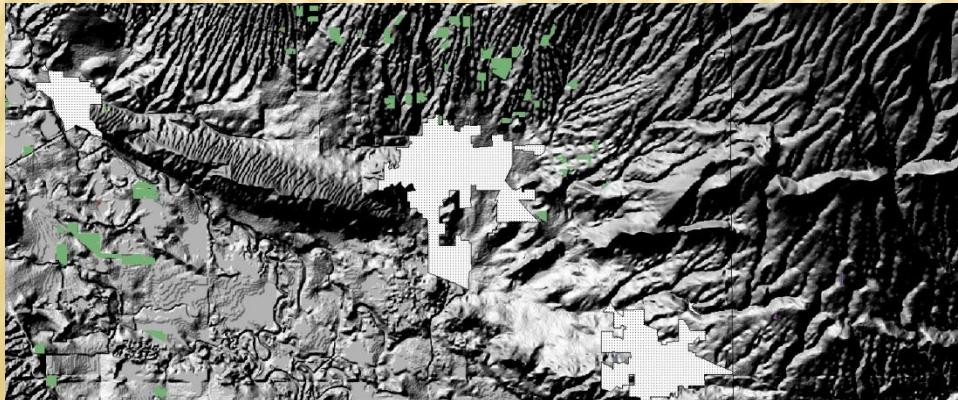
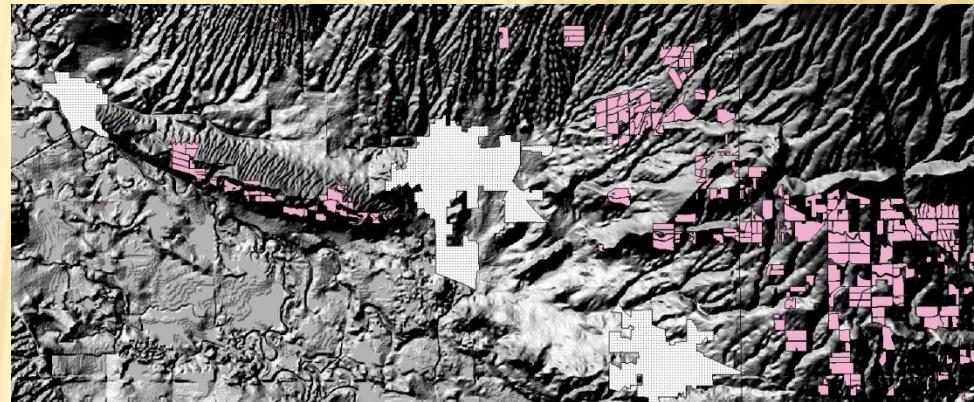
Study #1 or #2 can utilize shallow groundwater monitoring as a method to verify the results of the mass balance equation

Neither study type requires the use of a predictive model. If there is a desire to estimate impacts on points within the basin, there are several “models” that can be employed that would use the results of the mass balance equation in combination with aquifer properties to provide estimates of water quality at those points.



Within the basin we know the locations and acreage of crops such as corn, grapes or mint

Knowing the crops and acreage we use that data in conjunction with fertilizer application (either known or estimated) to develop gross loading



The known and/or estimated N losses thru uptake, volatilization, and biomass removal are then applied to gross N loading to develop estimated N loading within the basin