

# Modeling the Impacts of Agricultural Conservation Strategies on Water Quality in the Des Moines Watershed

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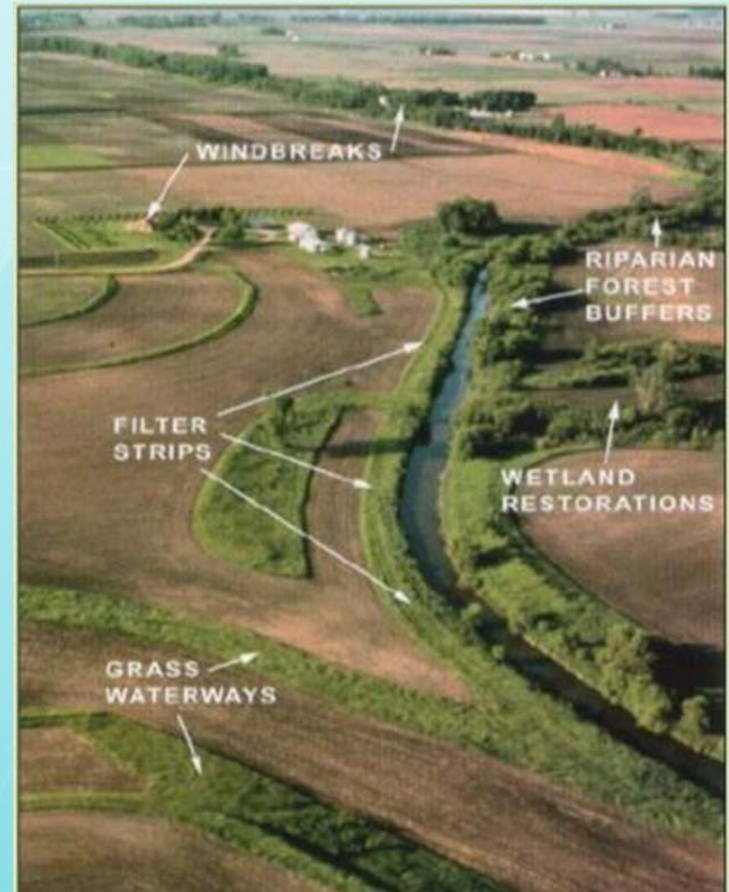


# Conservation Effects Assessment Project (CEAP) - Cropland National Assessment

Conservation programs/practices on landscape in US to increase agricultural production, control soil erosion and nutrient losses and sustain the environment.

## CEAP : Goal

- Estimate the long term impacts of cropland conservation practices on soil and water quality at watershed and regional level, and
- Assess the potential impacts of adopting additional conservation strategies on soil and water quality



# CEAP - Process

## National Water Quality Model: Soil and Water Assessment Tool (SWAT)

APEX:  
Cultivated  
Cropland and  
Practices

Grazing land



Point and non-point sources



Hayland

Forests



# Practices Simulated Within APEX

## a) Structural Practices

### In-field Practices for erosion control

- Contour Farming
- Strip Cropping
- Contour Buffer Strips
- Terraces
- Grass Terraces
- Tile Drain
- Grade Stabilization Structures
- Grassed Waterways
- Diversion

### Edge of Field Practices for buffering

- Filter Strips
- Riparian Forest Buffers
- Riparian Herb. Cover
- Field Borders
- Vegetative Barrier

### Wind Erosion Control Practices

- Windbreak / Shelterbelt
- Herbaceous Wind Barrier
- Hedgerow planting
- Cross Wind Practices

## b) Cultural/Agronomical Management Practices

Residue, tillage, nutrient, pesticide and irrigation management practices and cover crops

## c) Long-term conservation cover – CRP

- Conservation Reserve Program: Grass/trees planted on cropland

## Specific Objectives

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- 1) Estimate the sediment and nutrient loads discharged from Des Moines Watershed to the Mississippi River, and
- 2) Evaluate the effects of current agricultural conservation efforts and alternative conservation strategies on water quality in the Des Moines Watershed

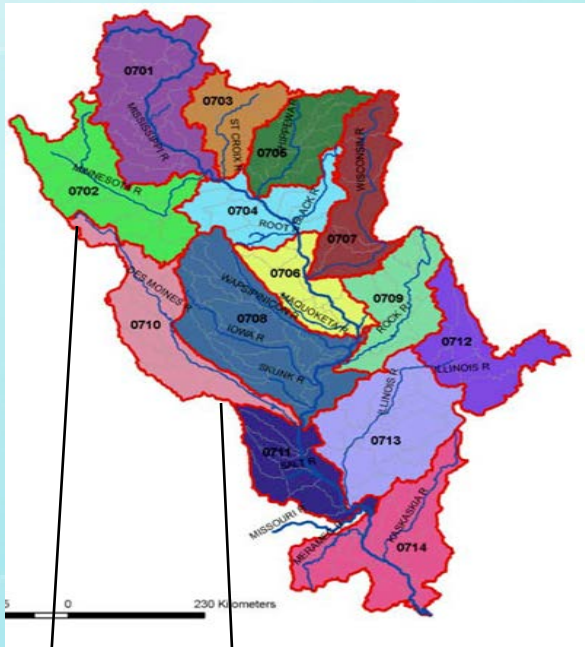
# Des Moines Watershed

Part of the Upper Mississippi River Basin; Iowa State

Agricultural land: 71 %.  
Contributes sediment and nutrient loads to the Mississippi River.

Des Moines Watershed:  
Nitrogen Enrichment; Total  
Maximum Daily Load;  
Potential Threats of Hypoxia;

USDA has invested in  
implementing conservation  
practices

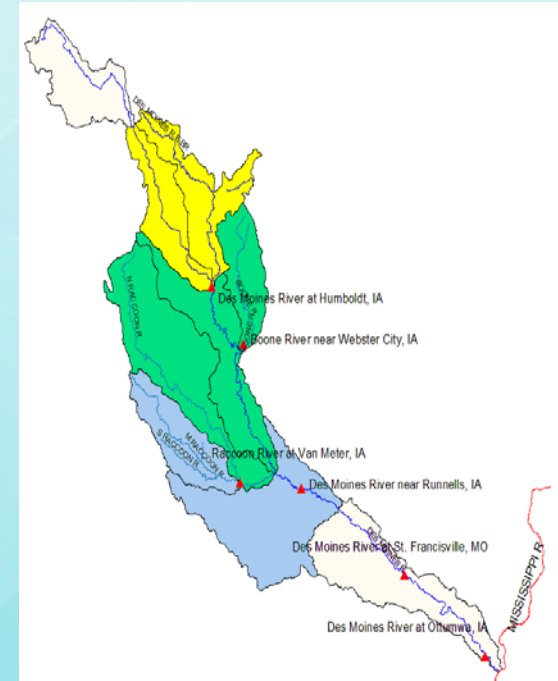
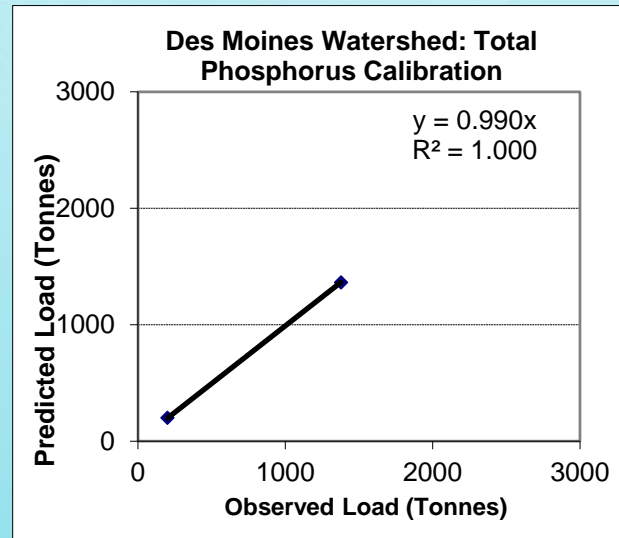
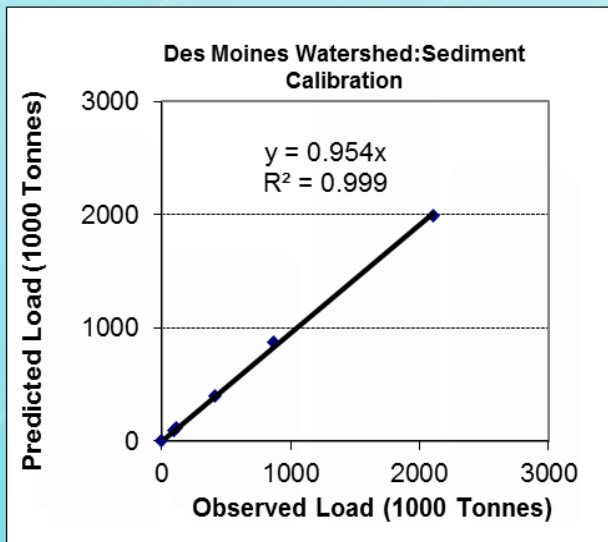
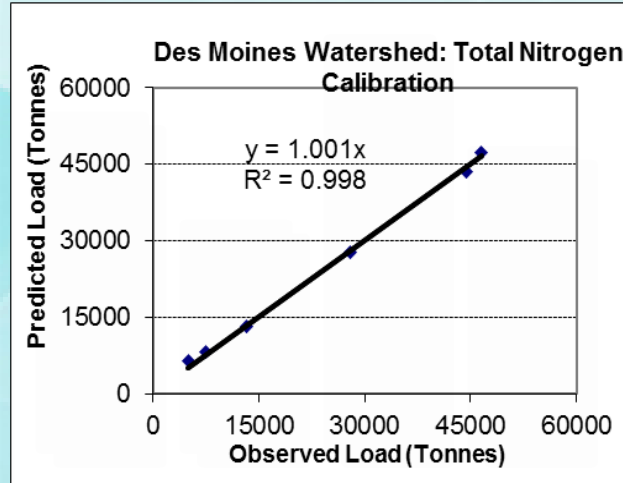
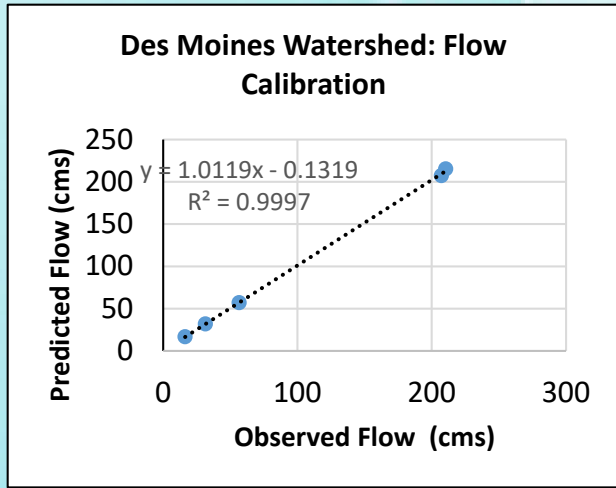


Landuse Distribution in the Des Moines Watershed



■ Hayland      ■ Pasture-Grazingland      ■ Urbanland  
■ Wetland and Others      ■ Forest      ■ Cropland

# Calibration Results at the Gages in DMW



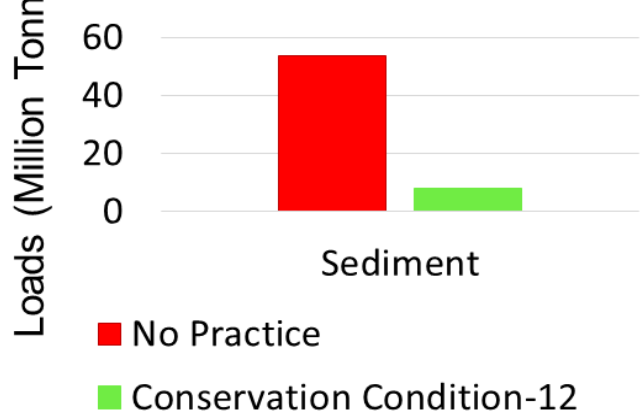
# Conservation Practice Scenarios

Conservation Scenarios	Practice Details	Abbreviation
No Practice	No conservation practices were in place on cropland. Potential impacts of farming without practices	NP
Conservation Condition-2012 (Baseline-12)	Conservation and management practices on cropland as of 2012	BL12
Structural Erosion Control	Overland and edge of field erosion trapping Practices (terraces, contour farming, grassed water ways, buffers, filter strips)	SEC
Nutrient Management	Improved nutrient management with right amount, time and method of fertilizer and manure applications	NM
Cover Crops	Cover Crop is grown when winter annual is not growing. To improve nutrient dynamics and protect soil health.	CC
Enhanced Nutrient Management on Cropland	Erosion Control Practices plus Nutrient Management Practices.	ENM
Enhanced Nutrient Management and Drainage Water Management	Erosion Control, Nutrient Management and Drainage Water Management Practices. DWM maintains the water table below root zone. Helps to denitrify the nitrogen before it enters the subsurface pathways.	ENMDWM
Enhanced Nutrient Management and Cover Crops	Erosion Control, Nutrient Management, and Cover Crops	ENMCC

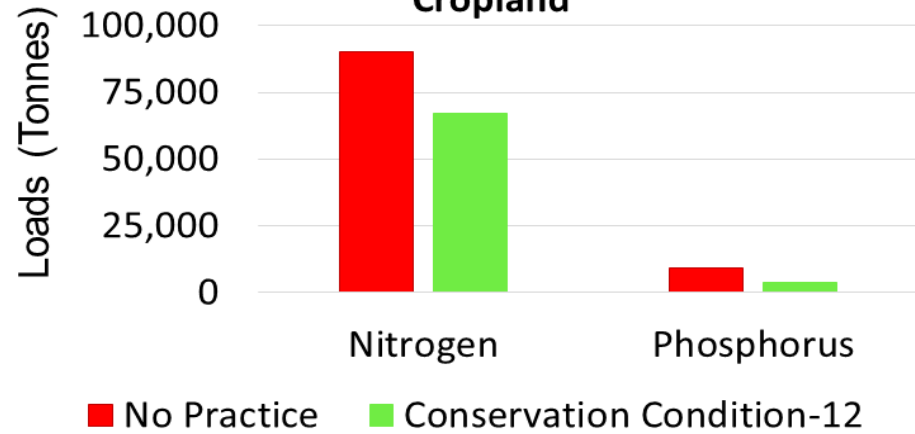


# Sediment and Nutrient Loads Discharged to the Mississippi River from Des Moines Watershed

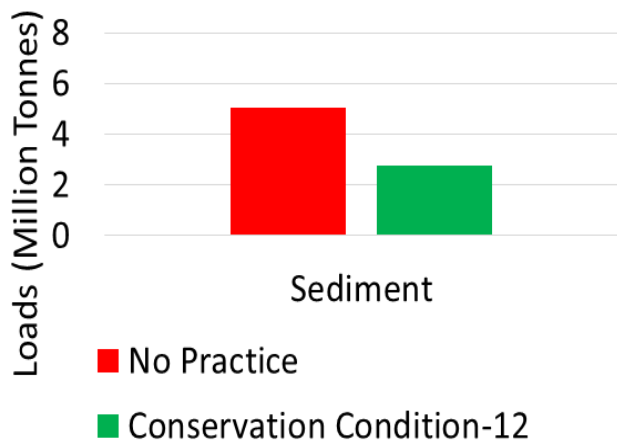
### Edge of Field Sediment Losses from Cropland



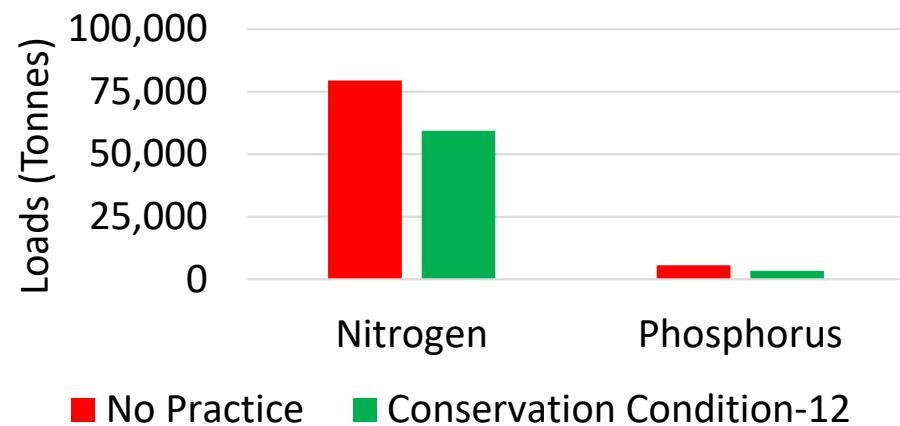
### Edge of Field Nutrient Losses from Cropland



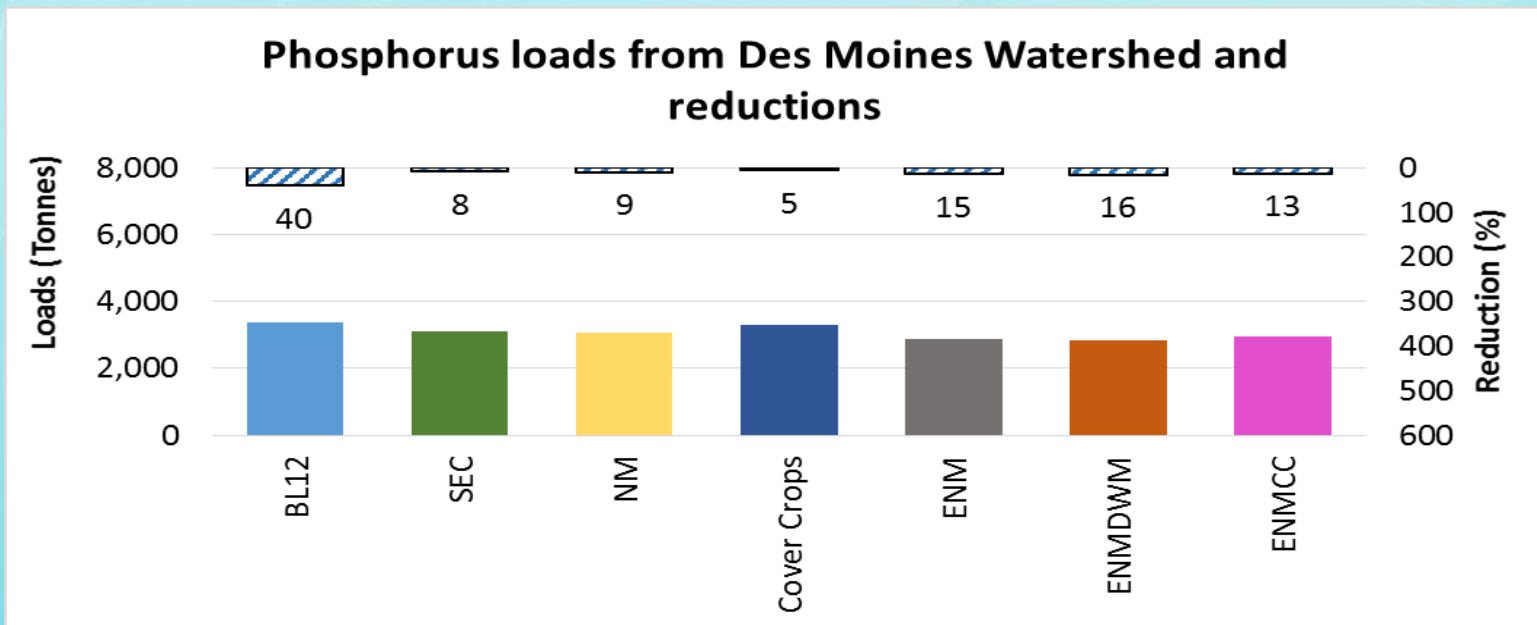
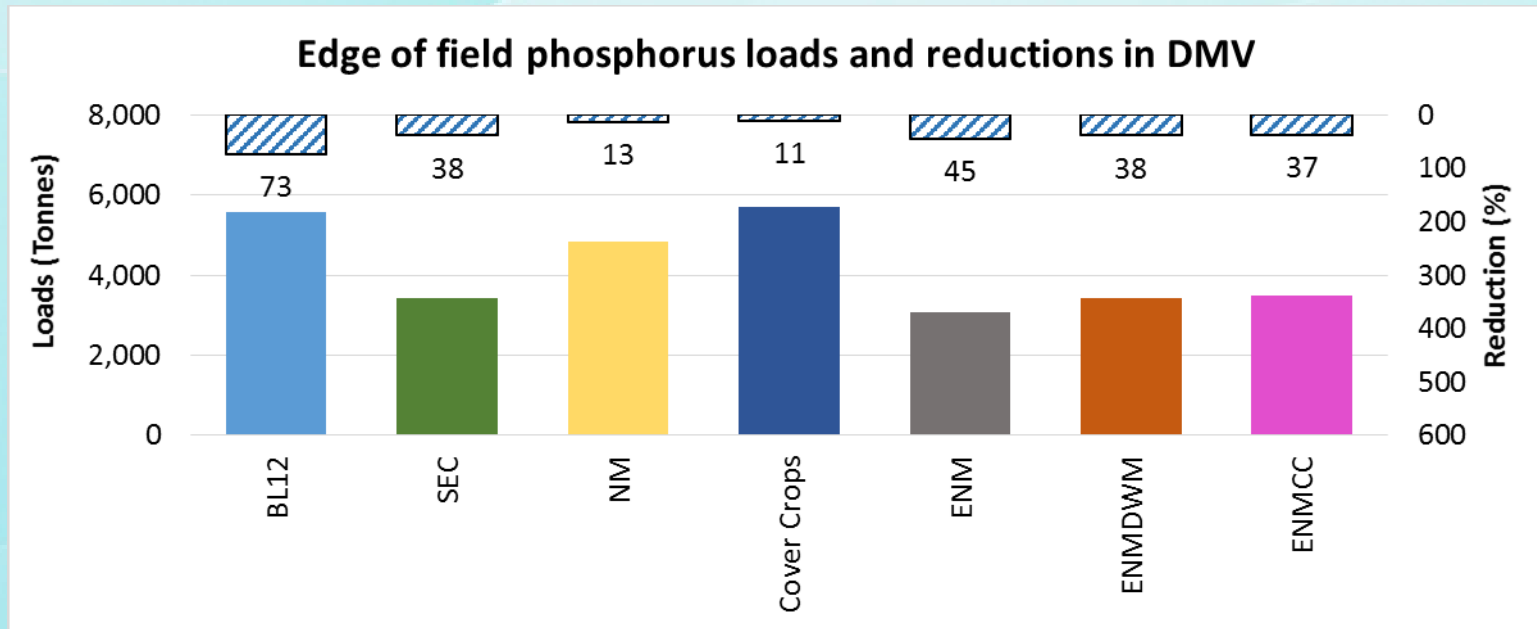
### Sediment Loads Discharged to the Miss. River from Des Moines W.



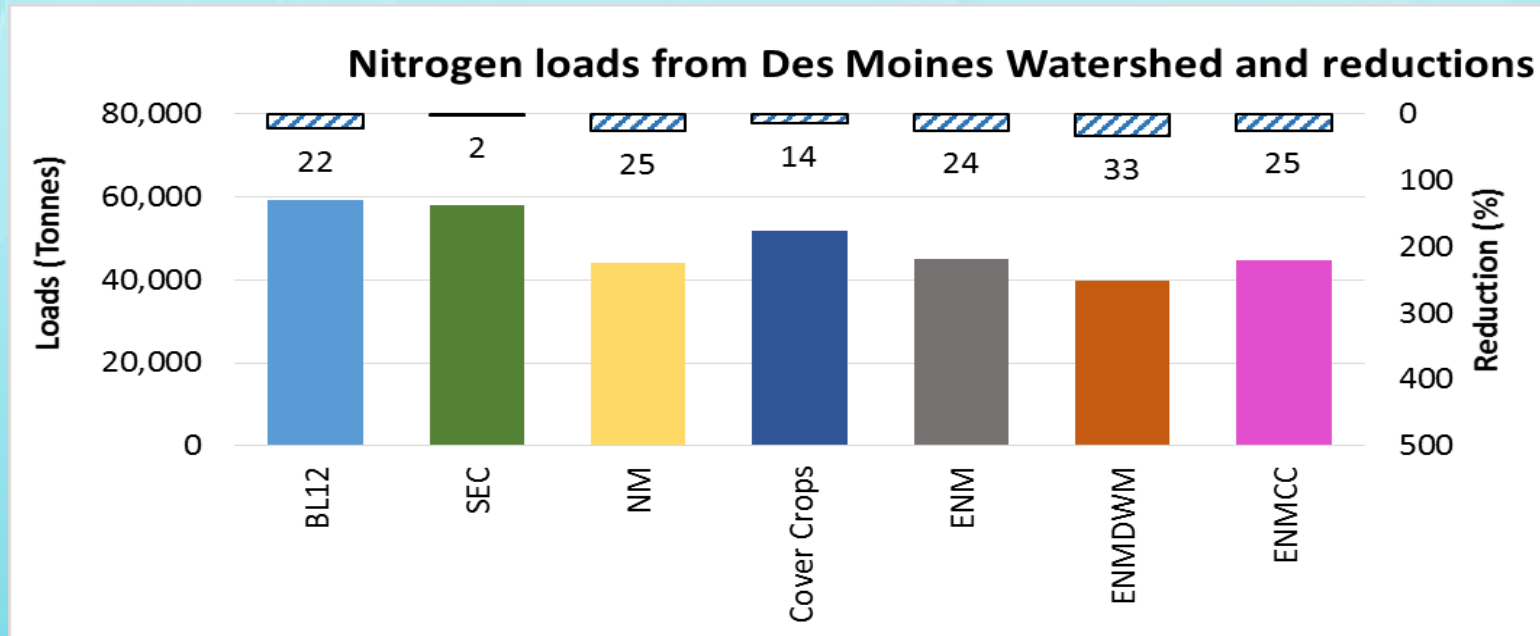
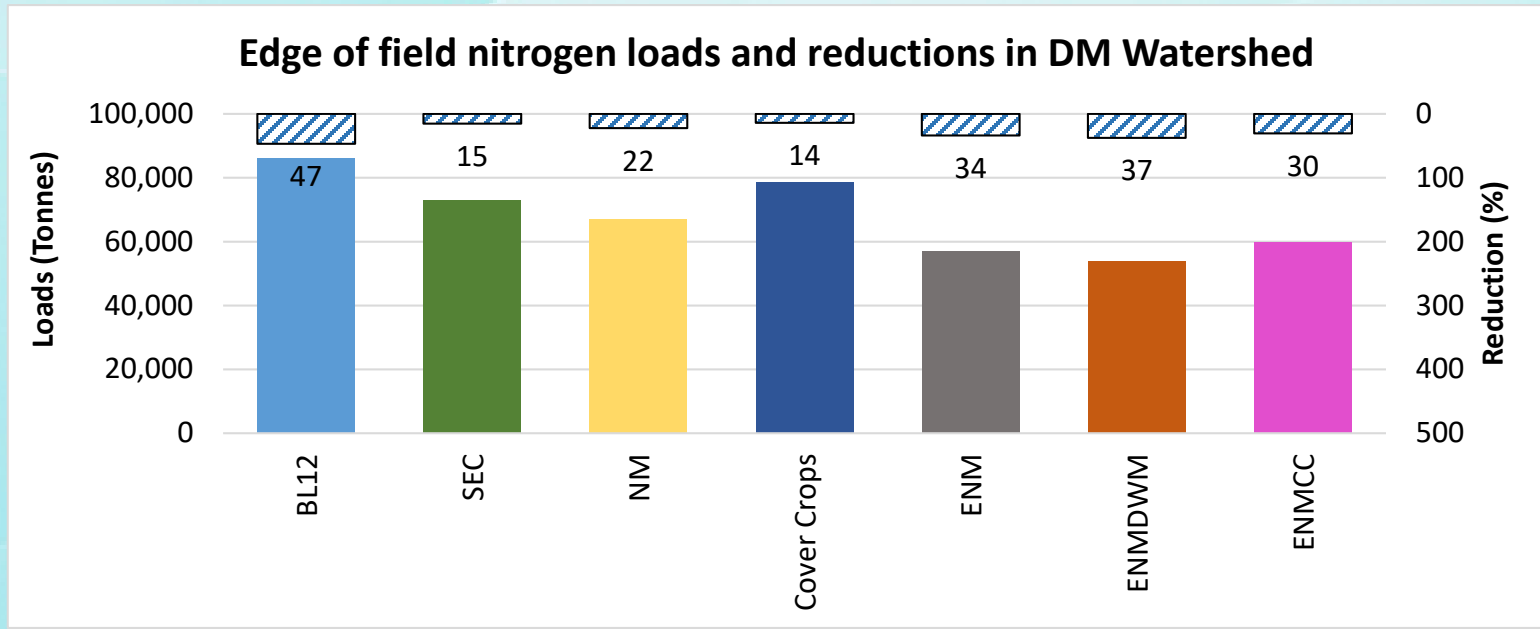
### Nutrient Loads Discharged to the Mississippi from Des Moines Watershed



# Conservation Strategies: Water Quality Benefits-Phosphorus



# Conservation Strategies: Water Quality Benefits-Nitrogen



# Major Findings from Assessment

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- Conservation practices reduce field level losses of sediment, and nutrients. They can in turn improve water quality of streams and rivers, lakes and other water bodies.
- Multiple conservation strategies improve the effects of conservation benefits better.
- Lag time and legacy loads delay/mask the benefit realization.
- Modeling can aid in the assessment processes. However, uncertainties in models and data need to be recognized.
- Modeling system is available to study other emerging issues on eutrophication, algae blooms, climate change, future conservation programs, and restoration efforts.

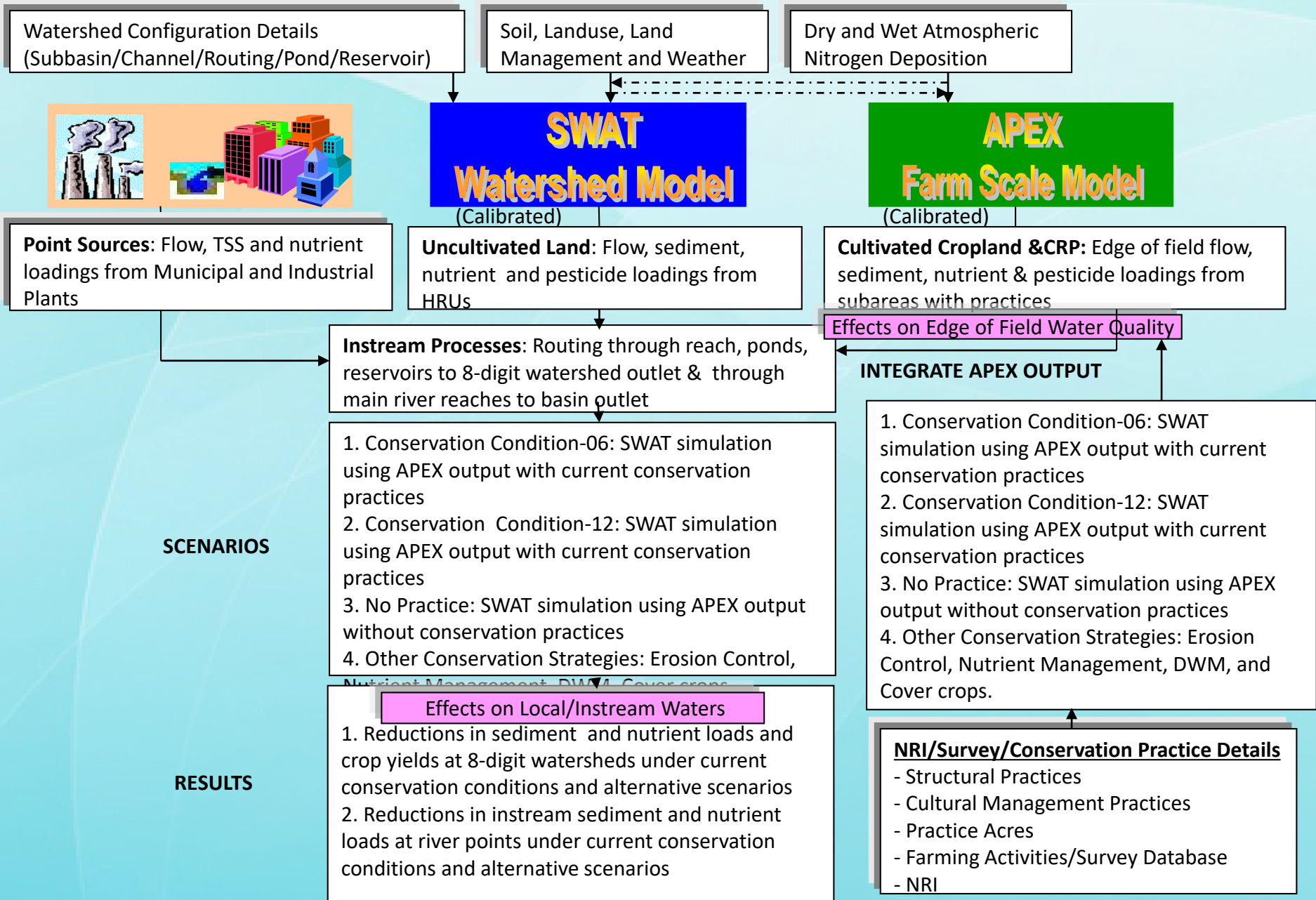


Thank you !!!

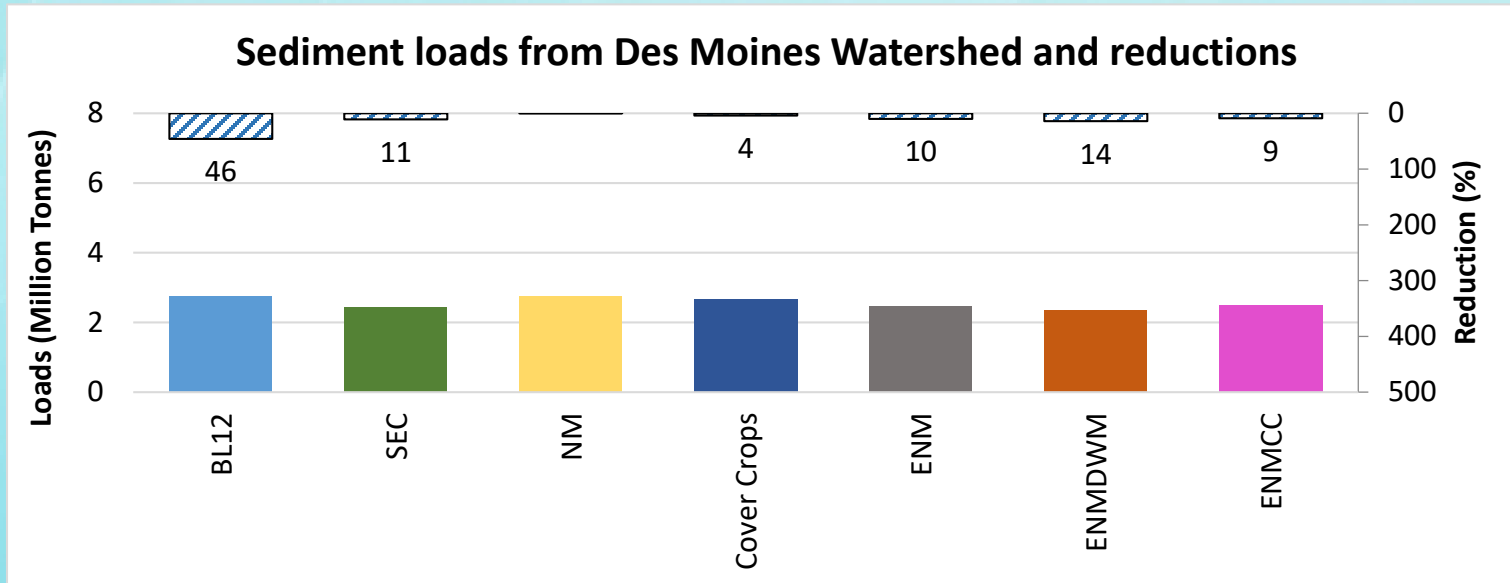
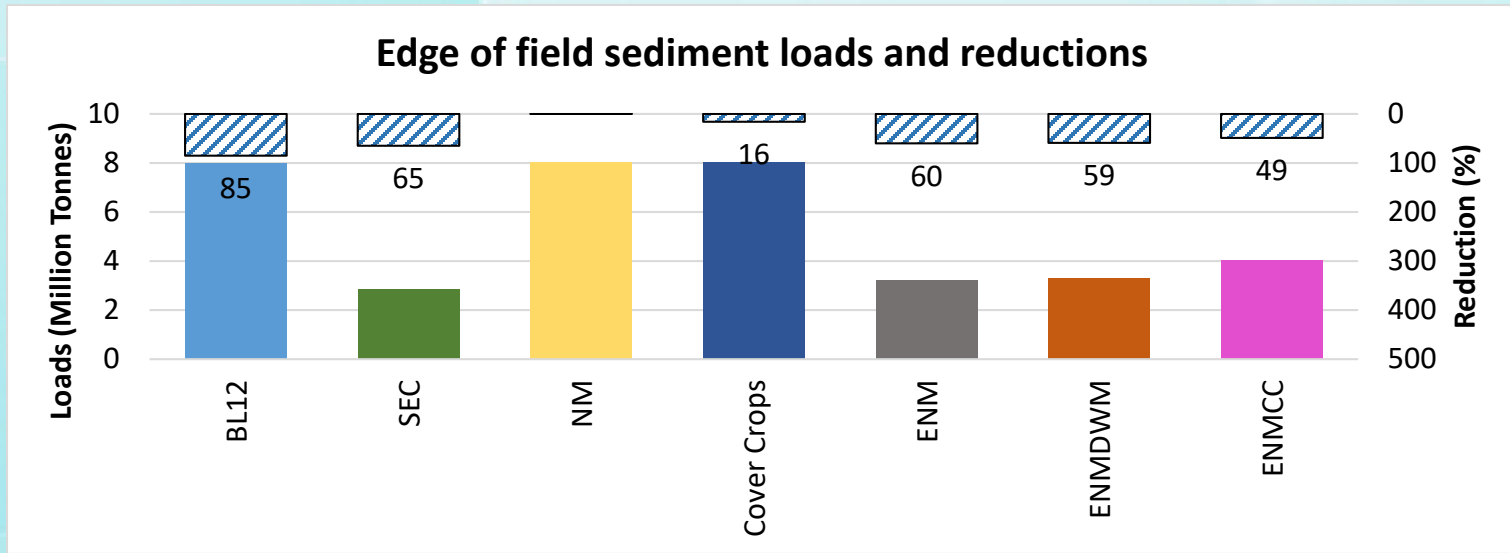
Grazie !!!



# CEAP/SWAT/APEX National Modeling System



# Conservation Strategies: Water Quality Benefits-Sediment



BL12 reduction compared to No Practice; Other Reductions compared to Conservation Condition-12