



# Utilizing SWAT for Water Supply Planning in Texas

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2011 SWAT Conference – Toledo, Spain

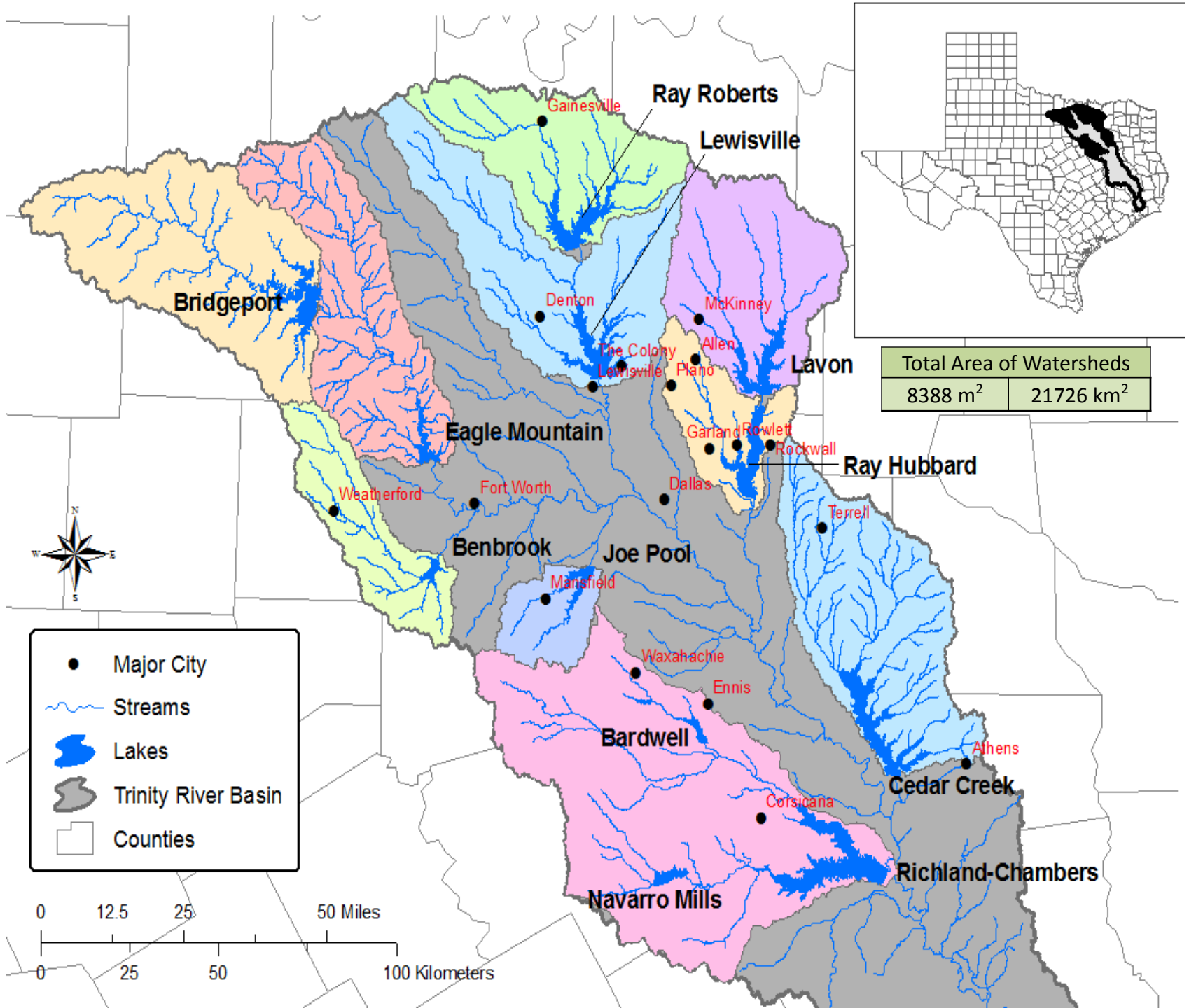
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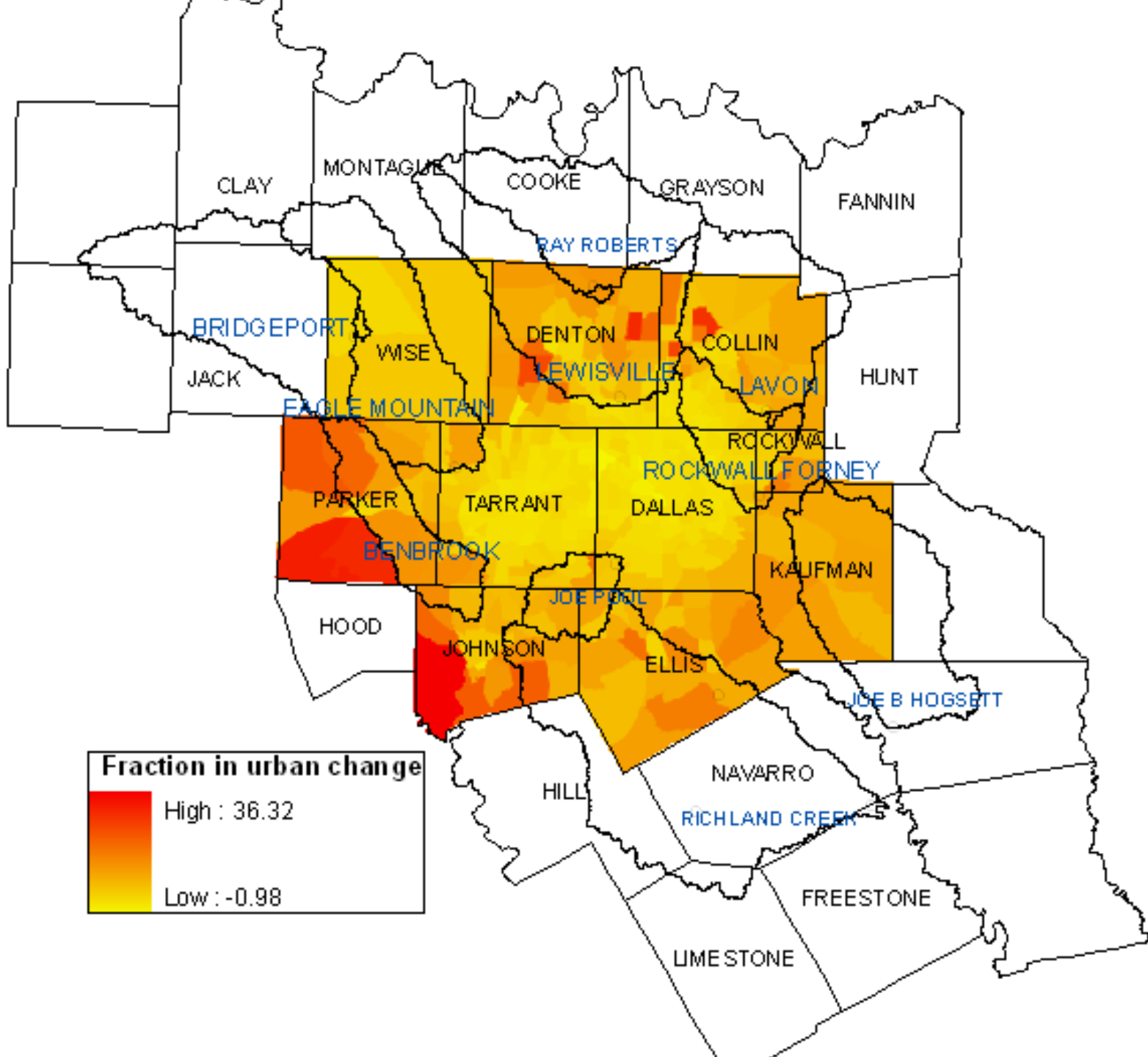


- Serves 1.7 million people
  - Eleven counties in and around Fort Worth
- Expected to serve a population of 2.7 million people by 2050
- Contracts with 65 cities
- Manages 5 major reservoirs
  - Cedar Creek, Eagle Mountain, Richland-Chambers, Bridgeport and Benbrook

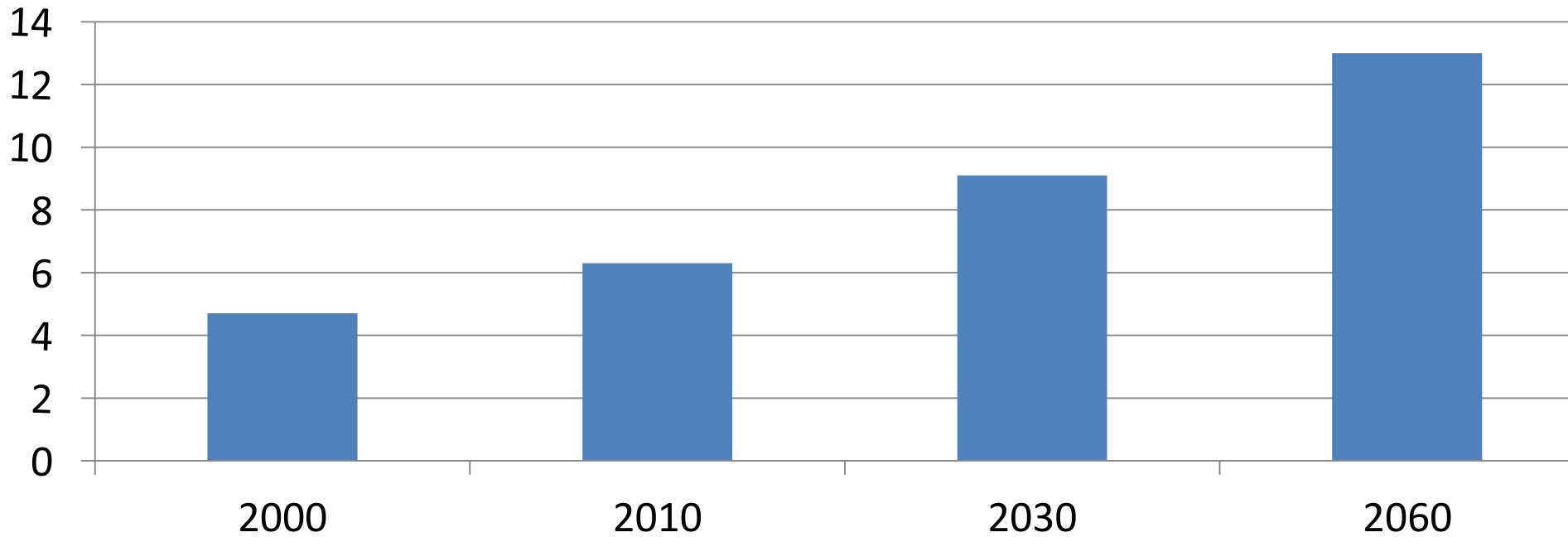
# PROJECT OBJECTIVES

- Estimate current rate of sedimentation and nutrients and effects of expected urbanization and conservation practices on sediment and nutrient delivery
- Specific Emphasis on Effects of
  - small flood control reservoirs
  - reduction of point-source discharges
  - reduction of livestock grazing rates





# Upper Trinity Basin Population Growth / Water Demand



2011 water demands  
1.8 million acre feet per year – 90% surface water

# Model Input Data

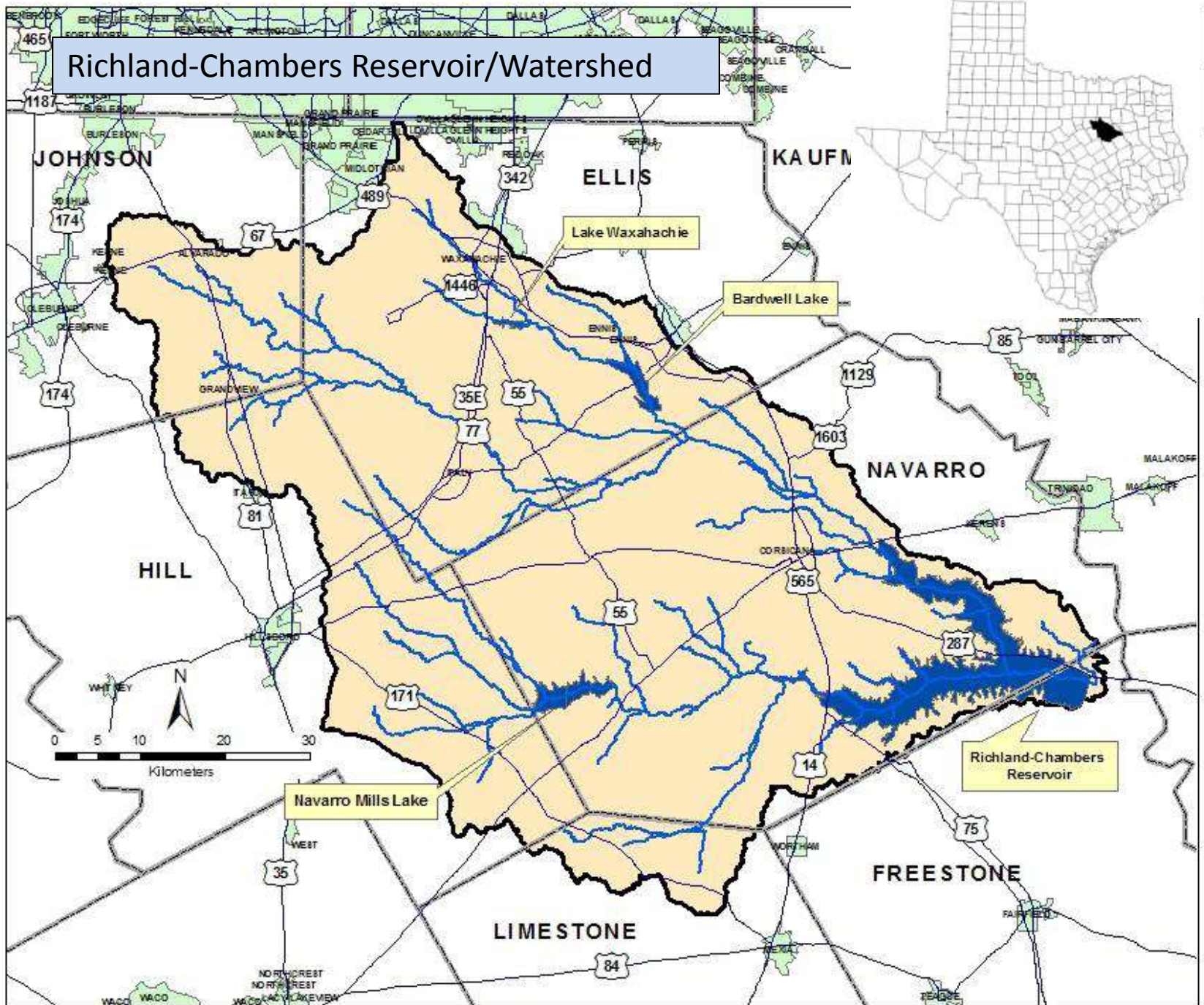
Type	Scale	Source
Topography/DEM	1:24000	USGS National Elevation Dataset (NED) <a href="http://ned.usgs.gov">http://ned.usgs.gov</a>
Land use/Land cover	1:24000	USGS NLCD 2001 MRLC consortium <a href="http://www.mrlc.gov">www.mrlc.gov</a>
Soils	1:24000	SSURGO, USDA-NRCS Soil Data Mart <a href="http://soildatamart.nrcs.usda.gov">http://soildatamart.nrcs.usda.gov</a>
Dams		U.S. Army Corps of Engineers, National Inventory of Dams
Weather (air and precip)		NOAA, NCDC <a href="http://www.ncdc.noaa.gov/oa/climate/stationlocator.html">http://www.ncdc.noaa.gov/oa/climate/stationlocator.html</a>

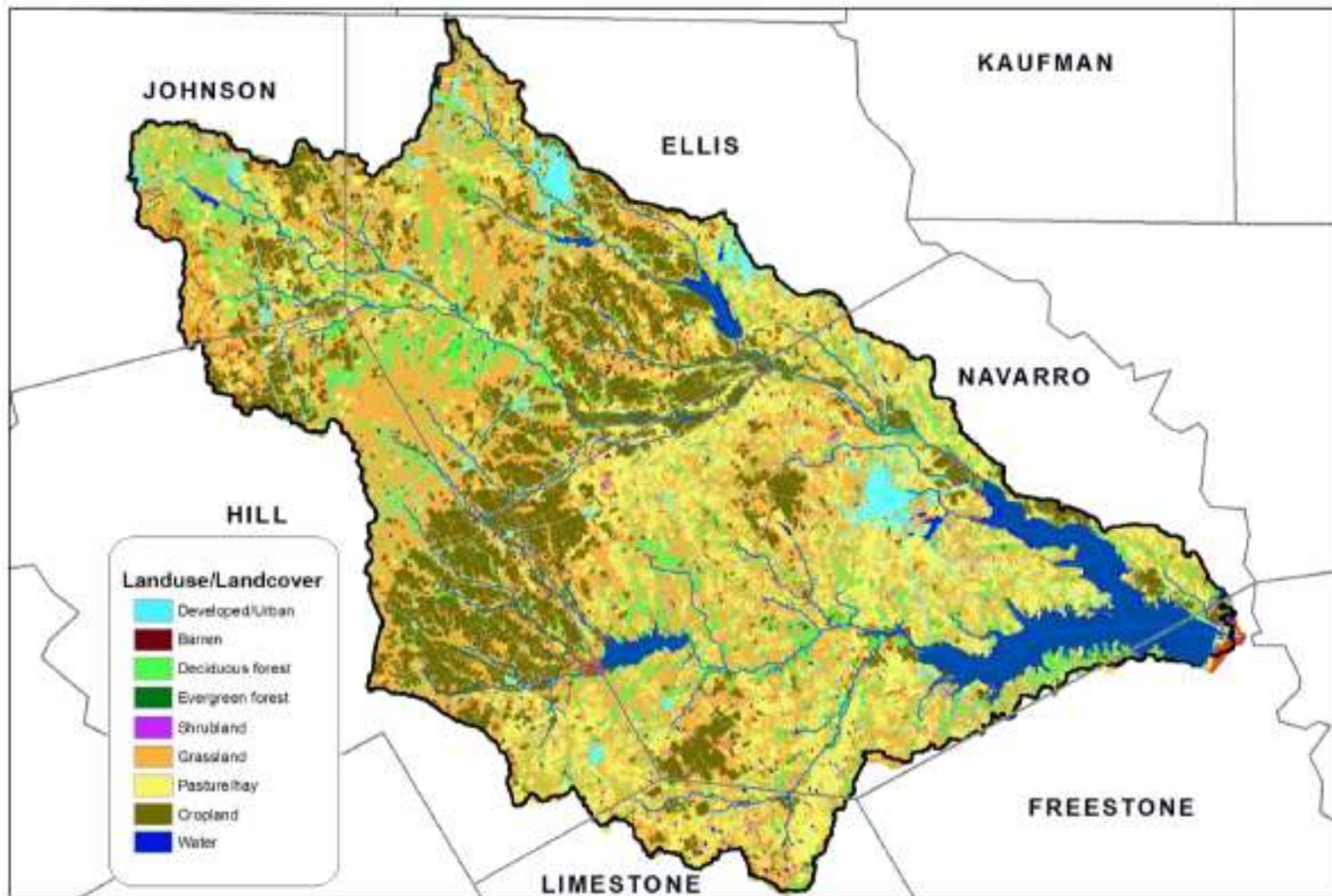
# Modeled Scenarios

- Removal of small flood control structures
- Point-source removal
- Eliminating grazing
- Urbanization

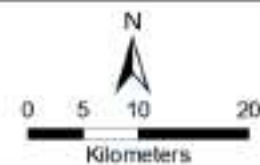


# Richland-Chambers Reservoir/Watershed

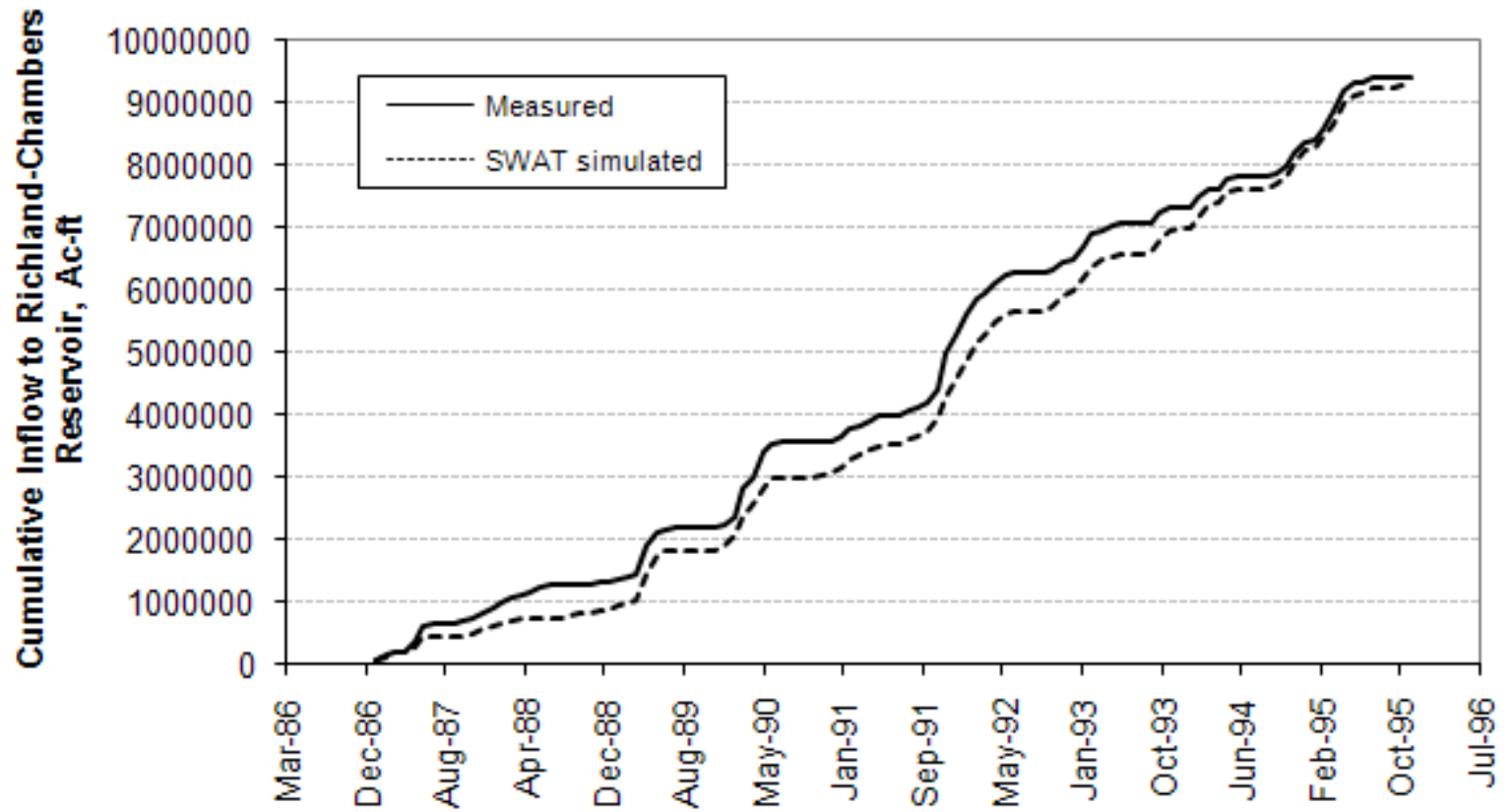




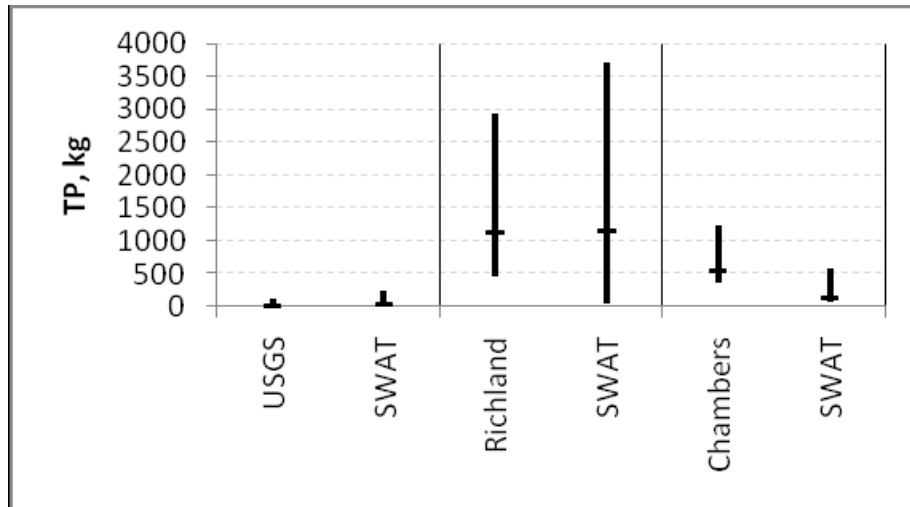
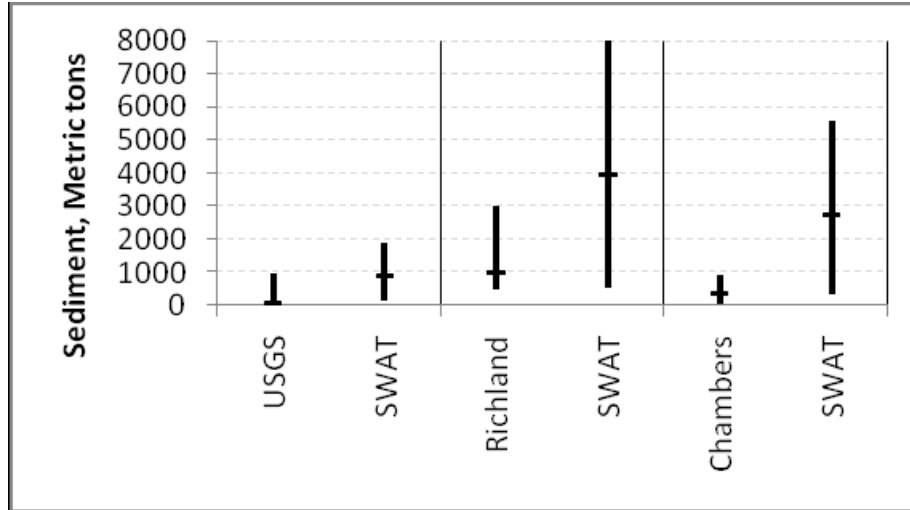
## **Landuse/Landcover Map** **Richland-Chambers Watershed**



# Measured versus SWAT-simulated flow RC - validation (1984–1995)



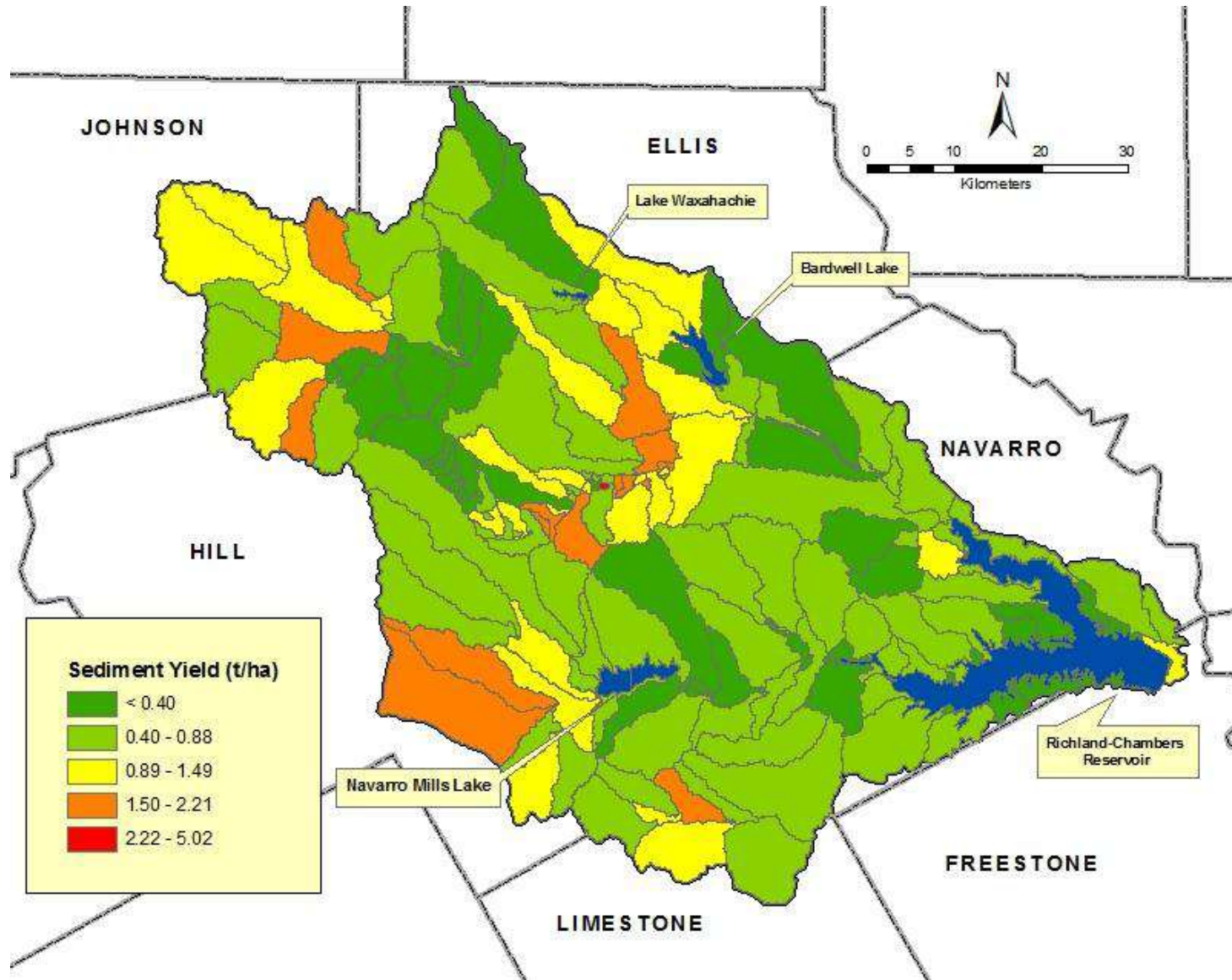
Measured and simulated sediment and total phosphorus (TP) at USGS gauge, Richland Creek and Chambers Creek monitoring stations - calibration (1984–1995).



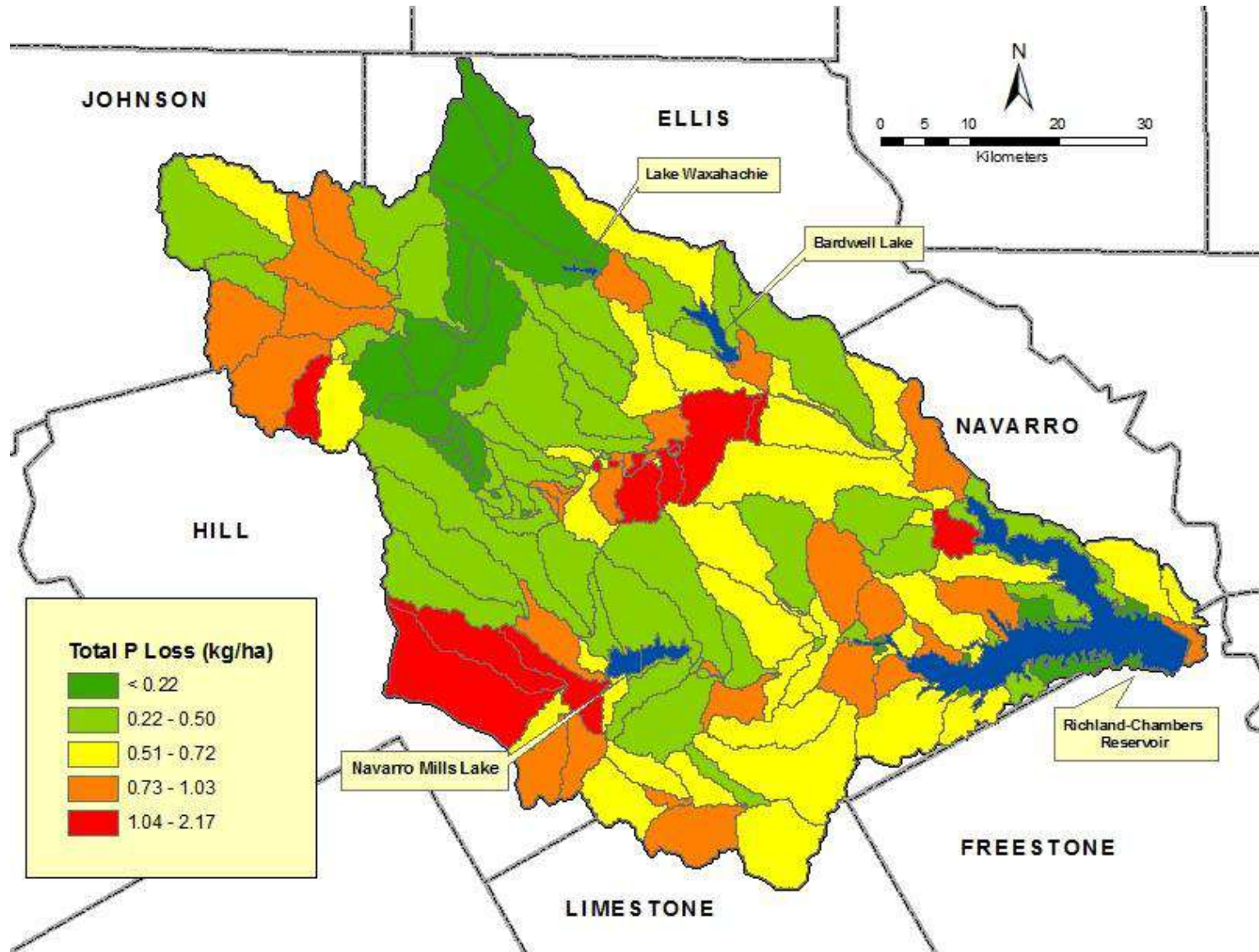
## Richland Chambers BMPs and locations

- **New ponds:** add to subbasins with relative high sediment loss (identified in report)
- **Contour farming:** cultivated cropland
- **Conservation cropping (reduced tillage or no-till):** cultivated cropland
- **Terrace:** cultivated cropland
- **Grassed waterway:** in combination with terraces or stand-alone
- **Brush management/pasture planting:** rangeland
- **Prescribed grazing:** pasture/rangeland
- **Critical area planting:** rangeland
- **Grade stabilization structure:** channels with poor grass cover, steeper landslope

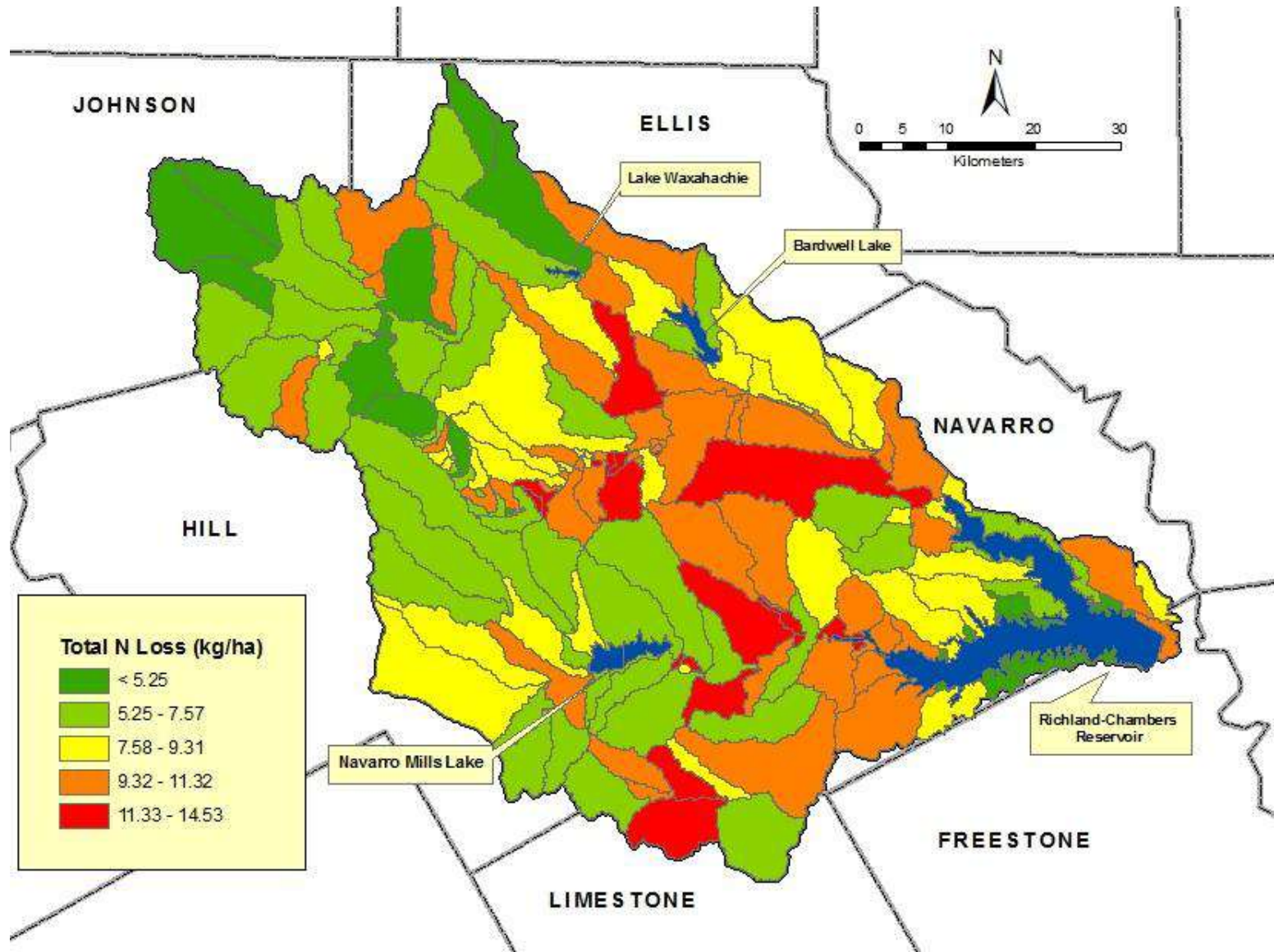
# RC Sediment yield distribution SWAT model prediction



# RC Phosphorus yield distribution SWAT model prediction



# RC Total nitrogen yield distribution SWAT model prediction



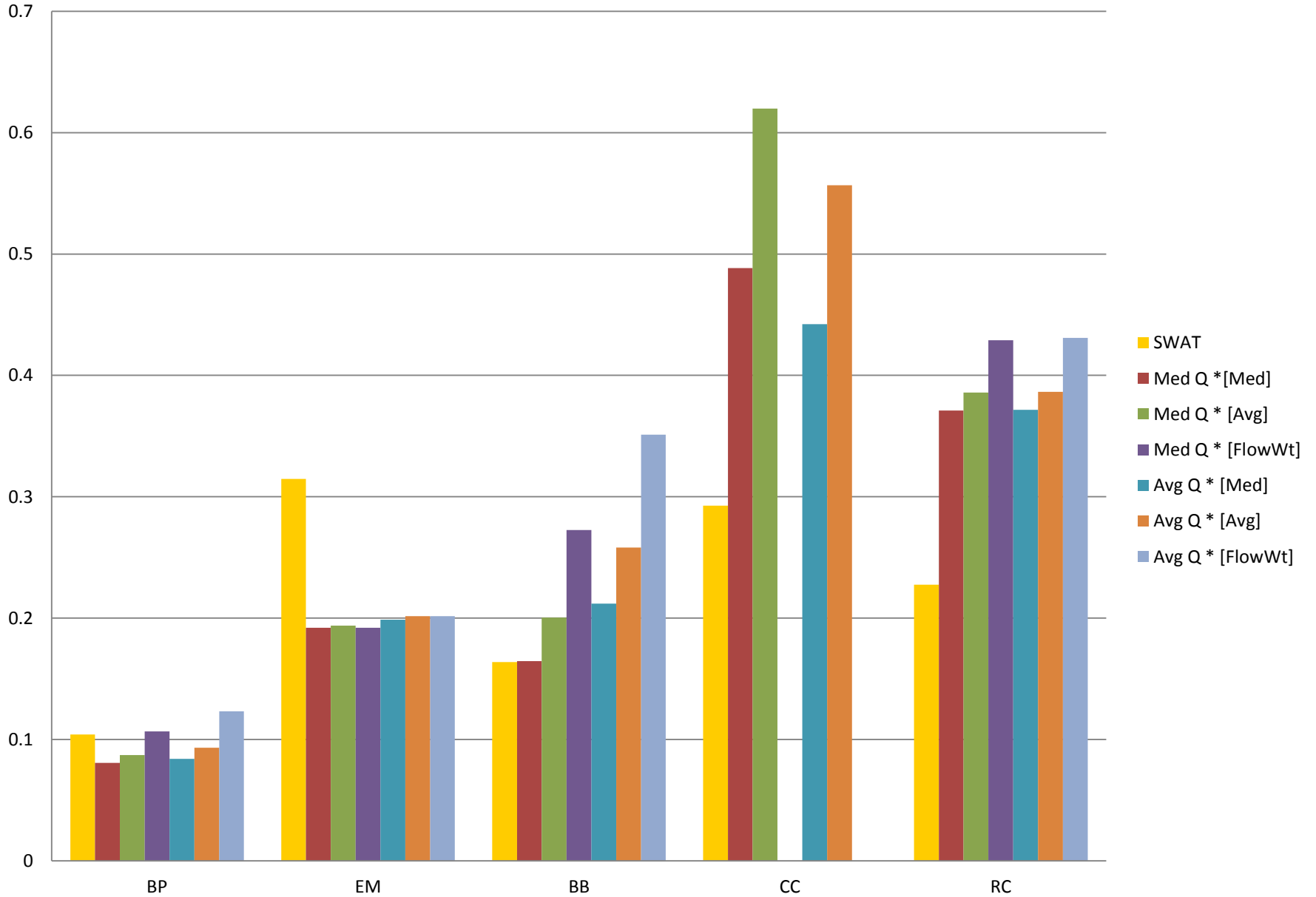


# Overall Results

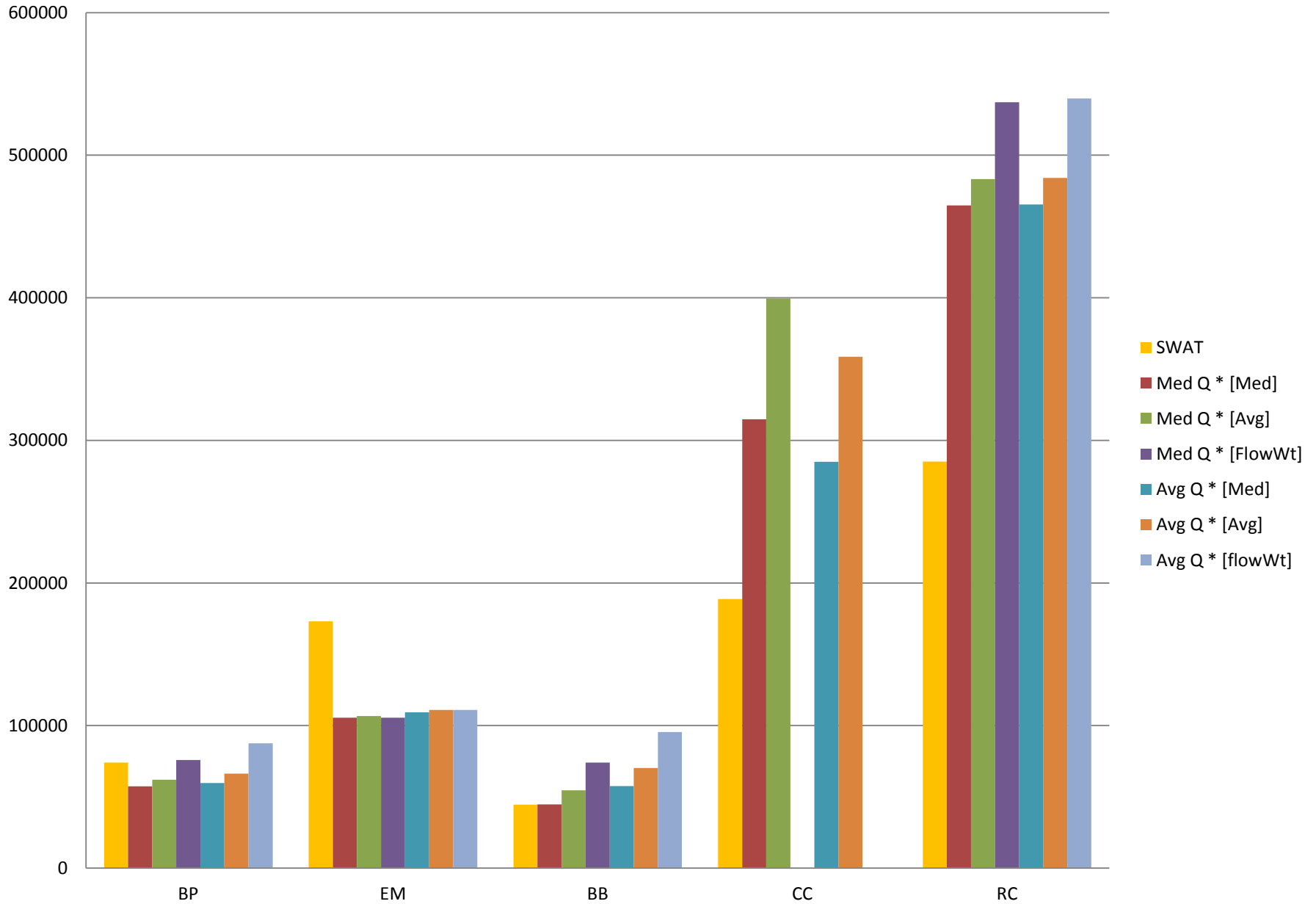
(% change)

Scenarios	Sediment Loading	Nitrogen Loading	Phosphorus Loading
Removal of FP Structures	3 to 48	2 to 10	2 to 10
Point Source Removal	Not Applicable	-1 to -84	-0.25 to -78
Elimination of Grazing	-0.3 to -37	-1 to -19	0 to -12
Urbanization	-10 to 32	-3 to 24	-1 to 111

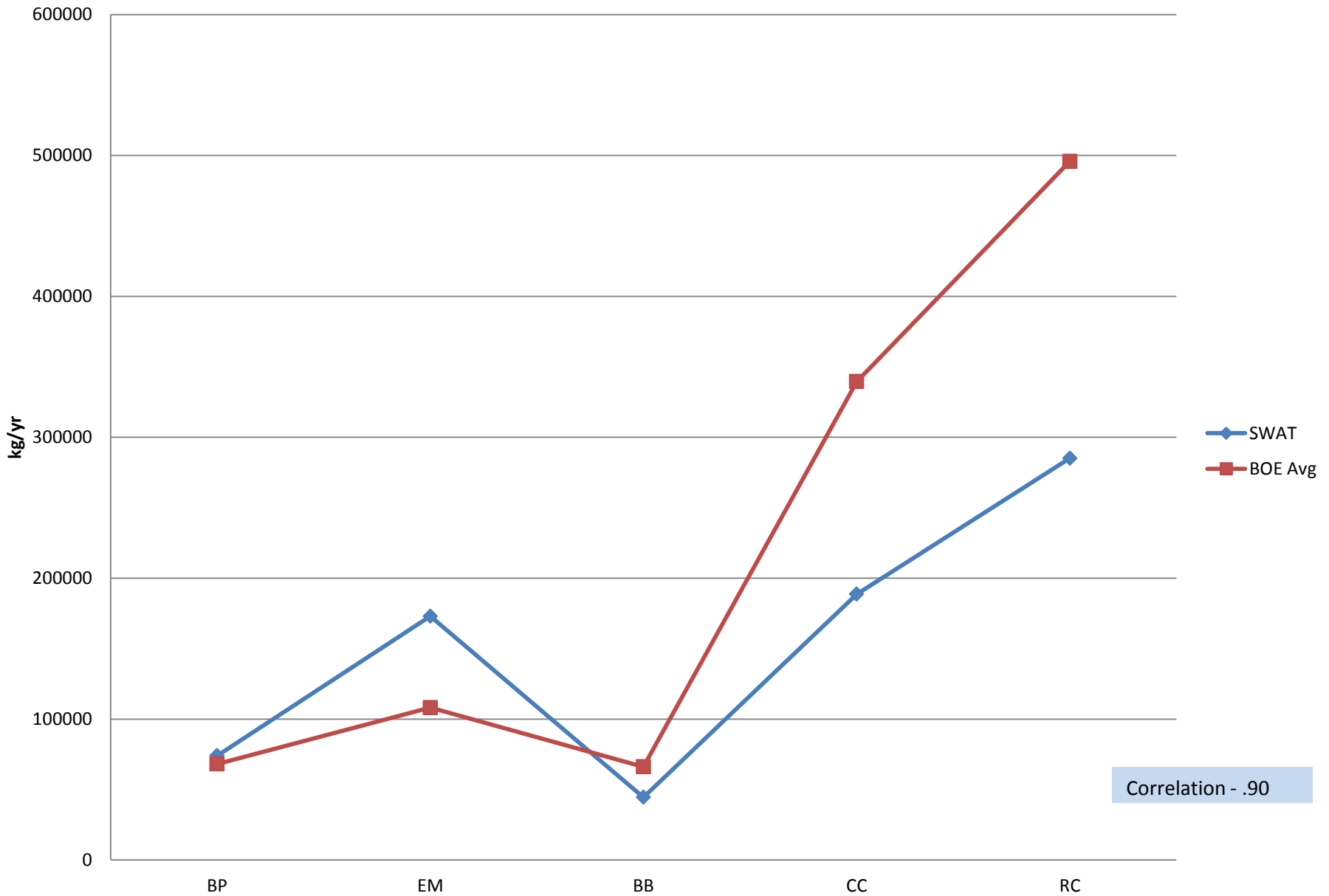
# SWAT Predictions vs. TP Export (kg/acre-yr)



# SWAT Predictions vs. Annual TP Loading (kg/yr)



# SWAT Predictions vs. Annual Reservoir TP Loading



## Future Studies

- (1) fine-tune estimates on the impacts of numerous possible conservation practices
- (2) estimate the cost-effectiveness of these practices
- (3) implement watershed protection plans
- (4) improve stormwater ordinances and management
- (5) extend this kind of analysis to watersheds in other parts of Texas.