

# Use of Reservoir Sediment Studies for Historical Watershed Loading and TMDL's in Kansas

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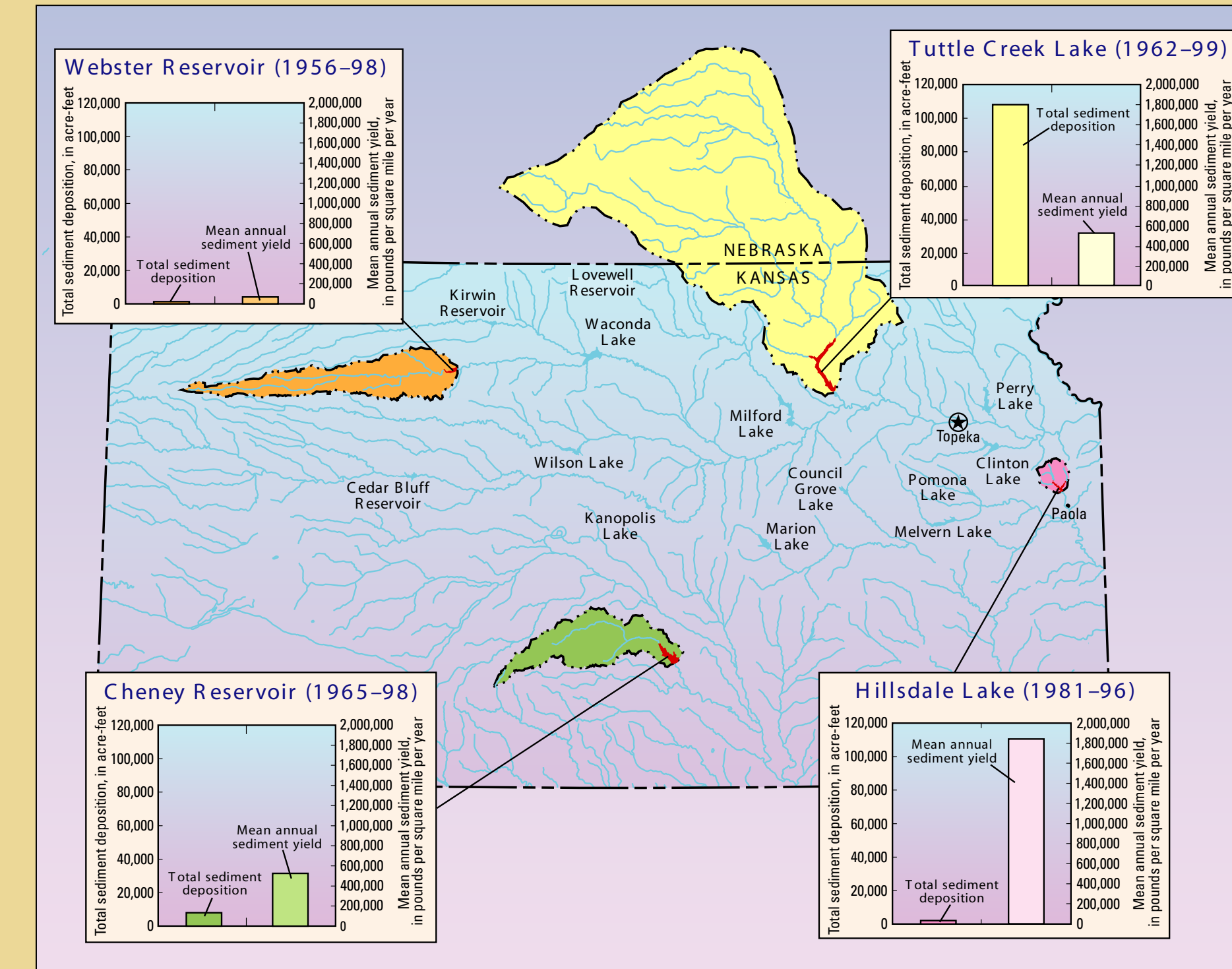
In cooperation with the Bureau of Reclamation, the city of Wichita, Johnson County Unified Wastewater Districts, the Kansas Department of Health and the Environment, and Kansas Water Office.

## Why Study Reservoir Sediments ?

- Reservoirs integrate the water quality from the watershed.
- Bathymetry and coring can be used to estimate historical **water-quality trends and loads** from watersheds for sediment, nutrients, and selenium.
- Sediment accumulation can be used to calculate mass loading of hydrophobic constituents to the reservoir and TMDL's.
- Sediment accumulation affects biota in the reservoir, the quality of water, and useful life of the reservoir.

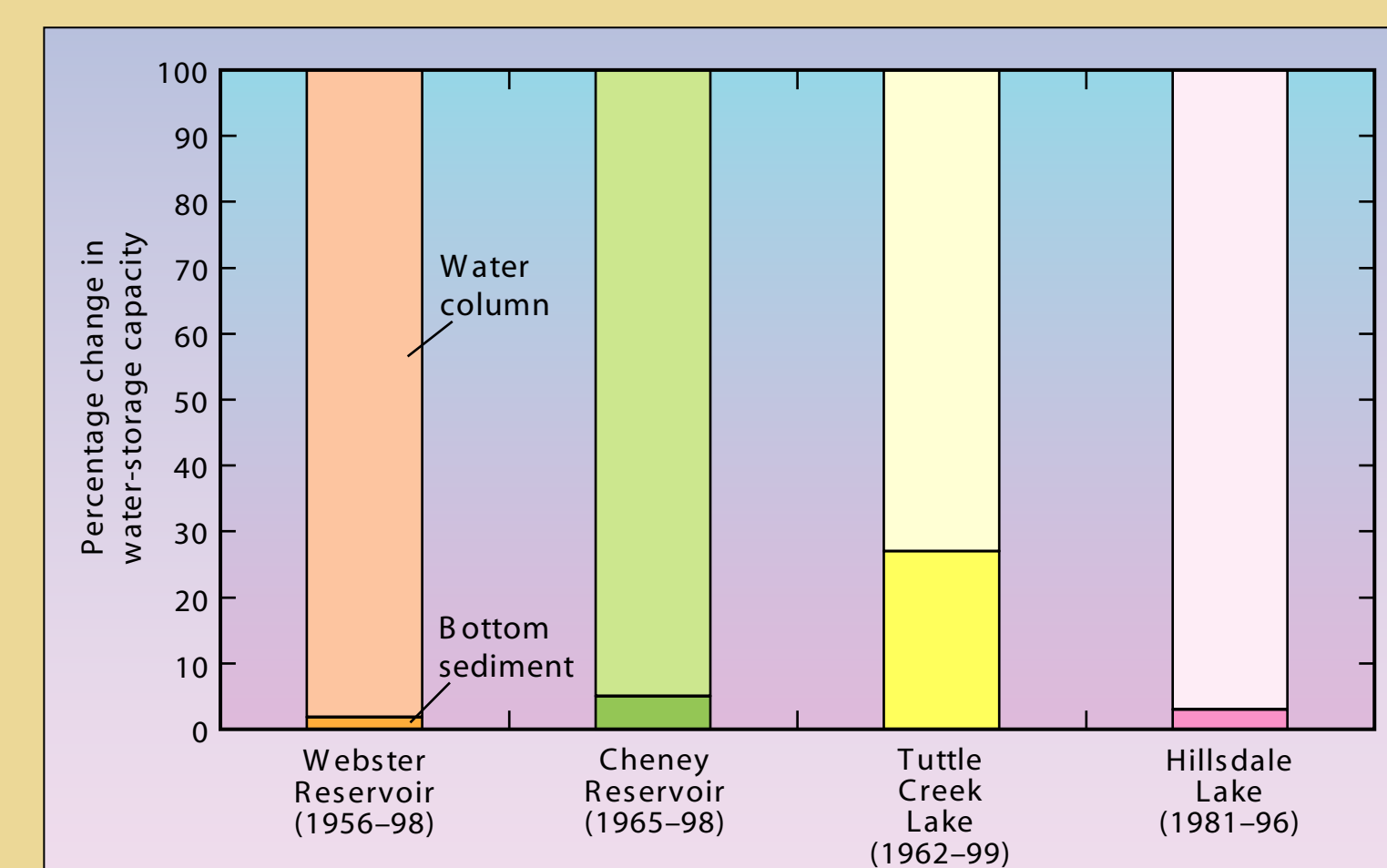


## Comparison of Reservoir Sediment Deposition and Yields from Watersheds

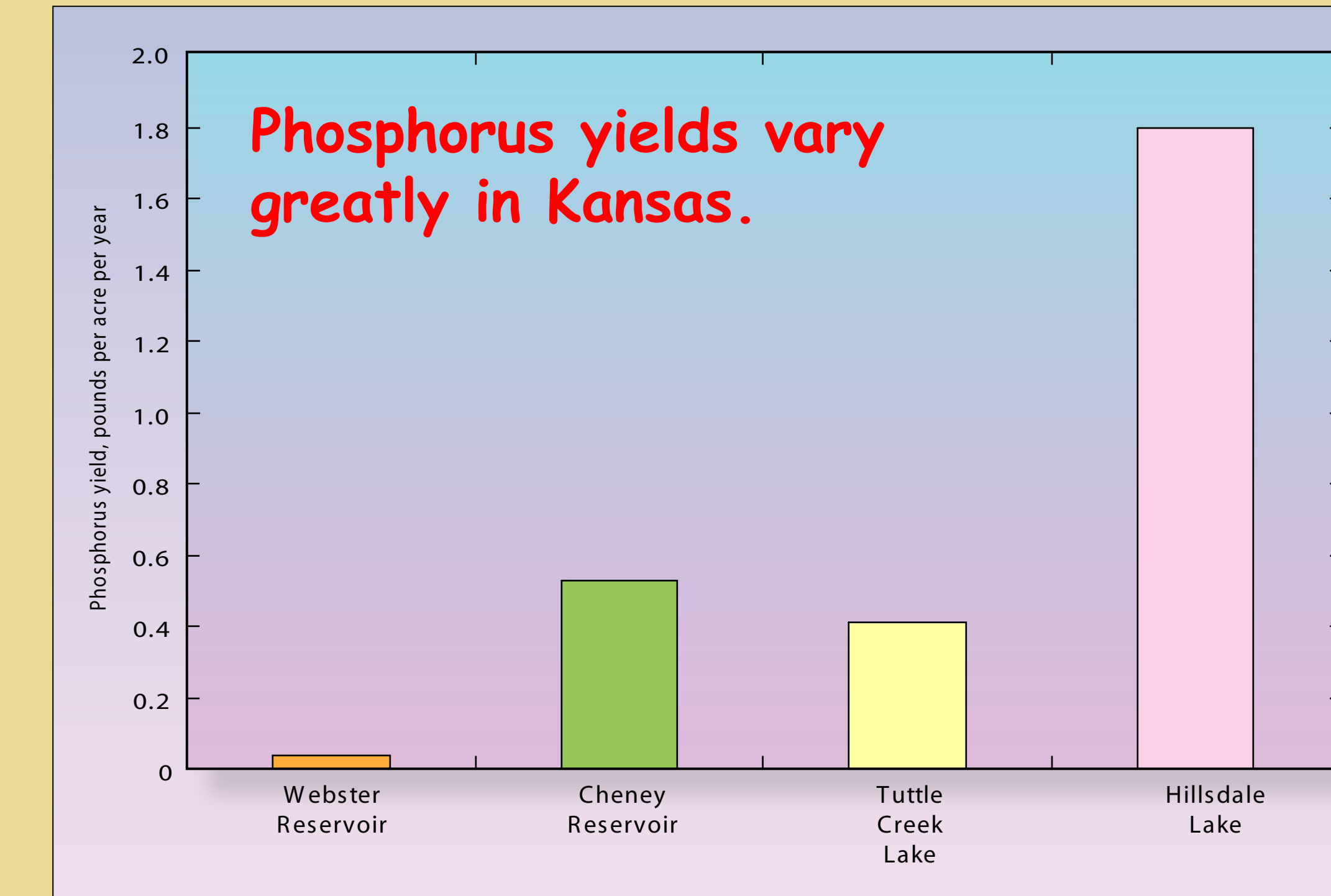


### Sediment yield from watersheds and deposition in reservoirs vary greatly in Kansas.

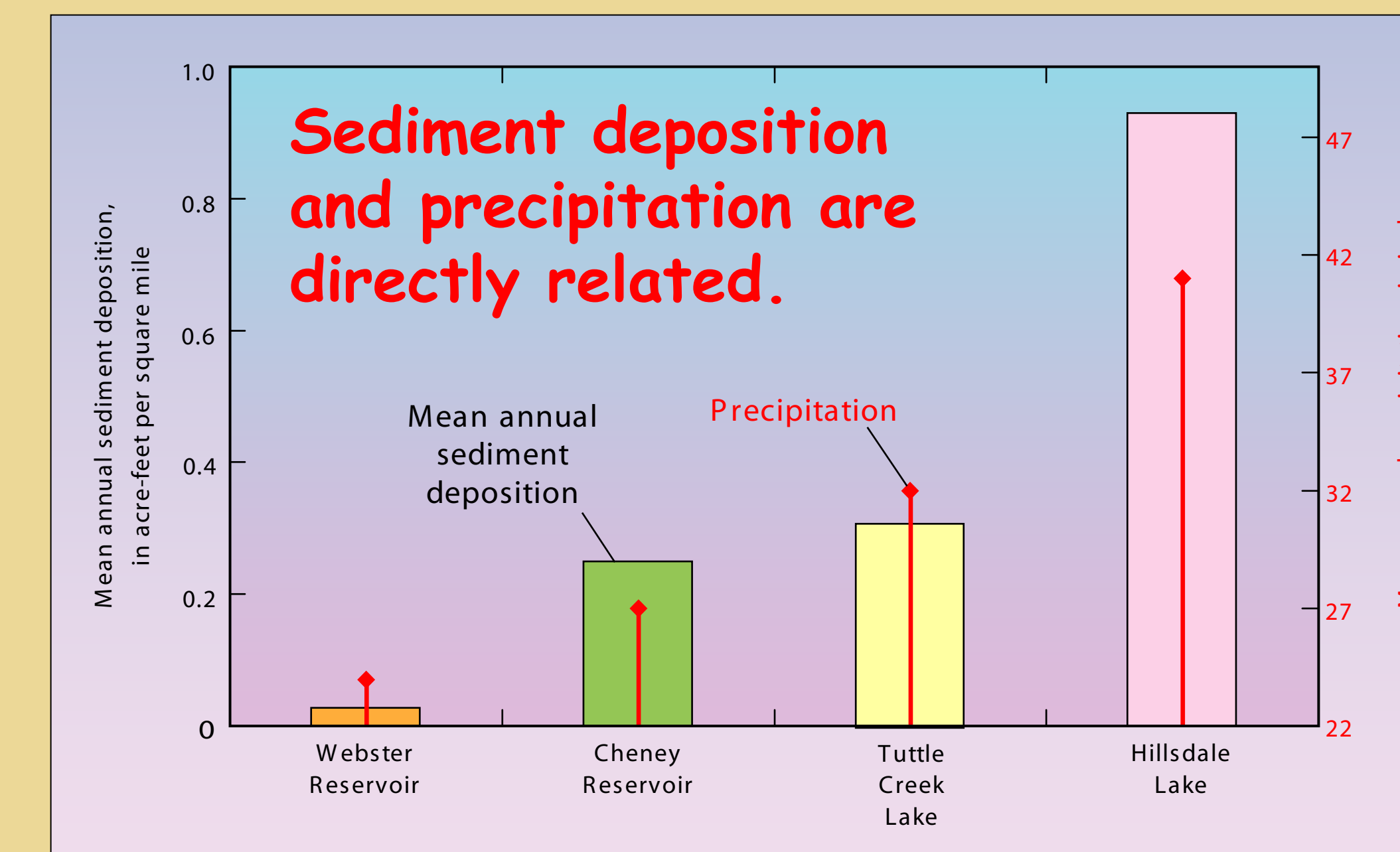
- Total sediment deposition estimates ranged from 1,330 acre-feet at Webster Reservoir to 114,000 acre-feet at Tuttle Creek Lake.
- When differences in reservoir contributing-drainage area and age of the reservoir were accounted for, mean annual sediment yield, was actually largest at Hillsdale Lake (0.97 acre-feet per square mile) and smallest at Webster Reservoir (0.03 acre-feet per square mile).



- Actual sedimentation rates were much less at all four reservoirs than what might be expected on the basis of reservoir design life.



- The phosphorus yield at Hillsdale Lake was more than four times larger than at Tuttle Creek Lake, although the percentage of land in cropland was less than one-half that of Tuttle Creek Lake. Mean annual precipitation was 28 percent larger at Hillsdale Lake than at Tuttle Creek Lake.



- Larger volumes of sediment more likely would be deposited in reservoirs having watersheds that receive more precipitation.

## Conclusions and Implications

- There are large differences in total sediment and phosphorus deposition and yields among the four reservoir watersheds.
- Volume of reservoir sediment deposition varies directly with mean annual precipitation.
- Mean annual phosphorus yield was largest where mean annual sediment yield and mean annual precipitation also were the largest.
- Trends for some constituents have been detected in some reservoirs, but not others.
- Effectiveness of best-management practices (BMPs) can be evaluated using this information coupled with chemical analysis of the sediment to determine TMDL's.

Photograph of Tuttle Creek Lake showing sediment accumulation.

