

Farm Ponds as Nutrient Modulators

Gift Manyonga, Amy Hansen, Edward Peltier,
Civil, Environmental, and Architectural Engineering Department, University of Kansas.



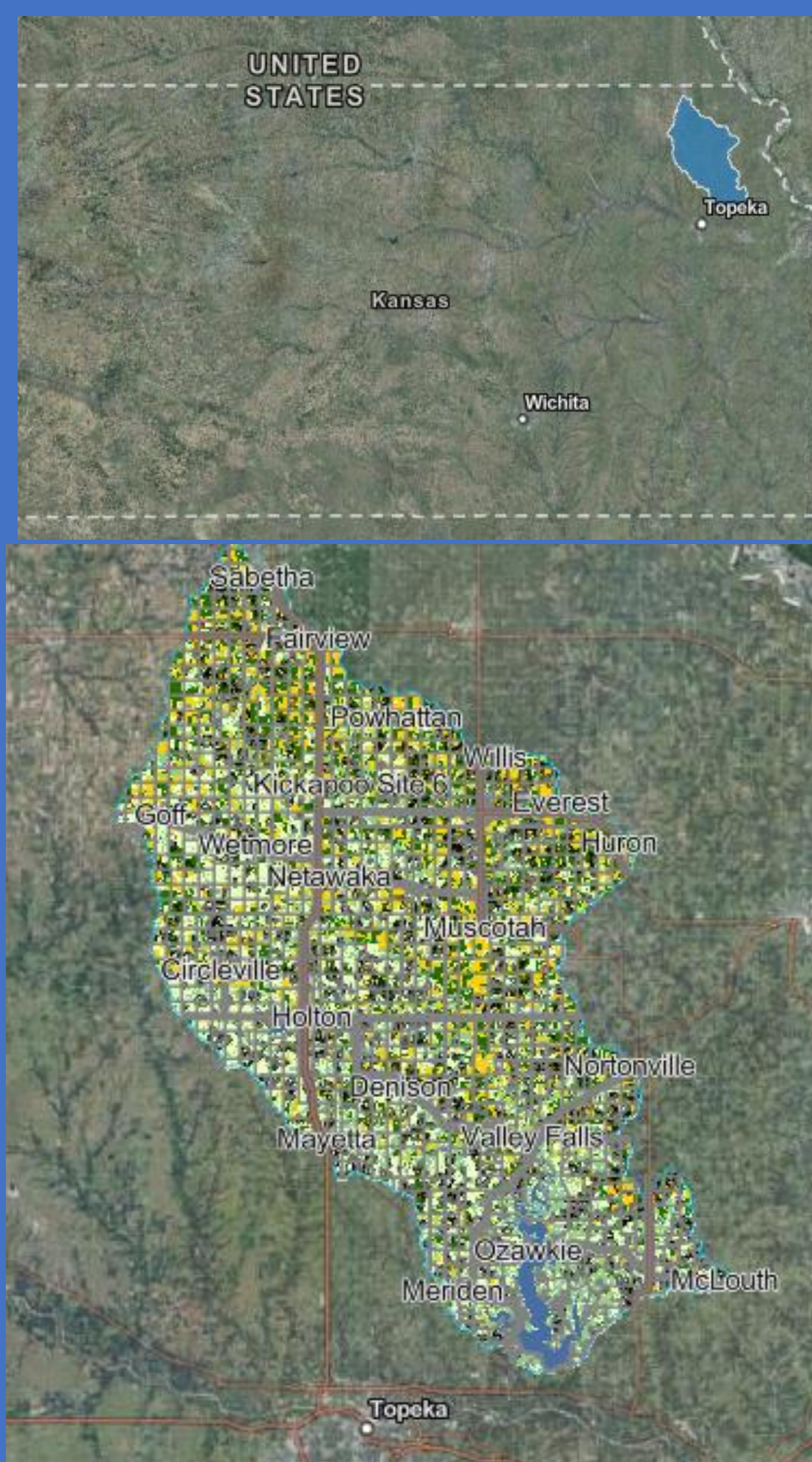
Introduction

Agricultural runoff contributes excess nutrients to waterways, potentially driving eutrophication in downstream reservoirs including Perry lake. Farm ponds can serve as natural bioreactors that process nutrients or they could serve as sources of nutrients downstream.

Objective

- Evaluate farm ponds capacity to improve water quality by assessing nutrient concentration changes, providing practical indicators for watershed management.

Study Area



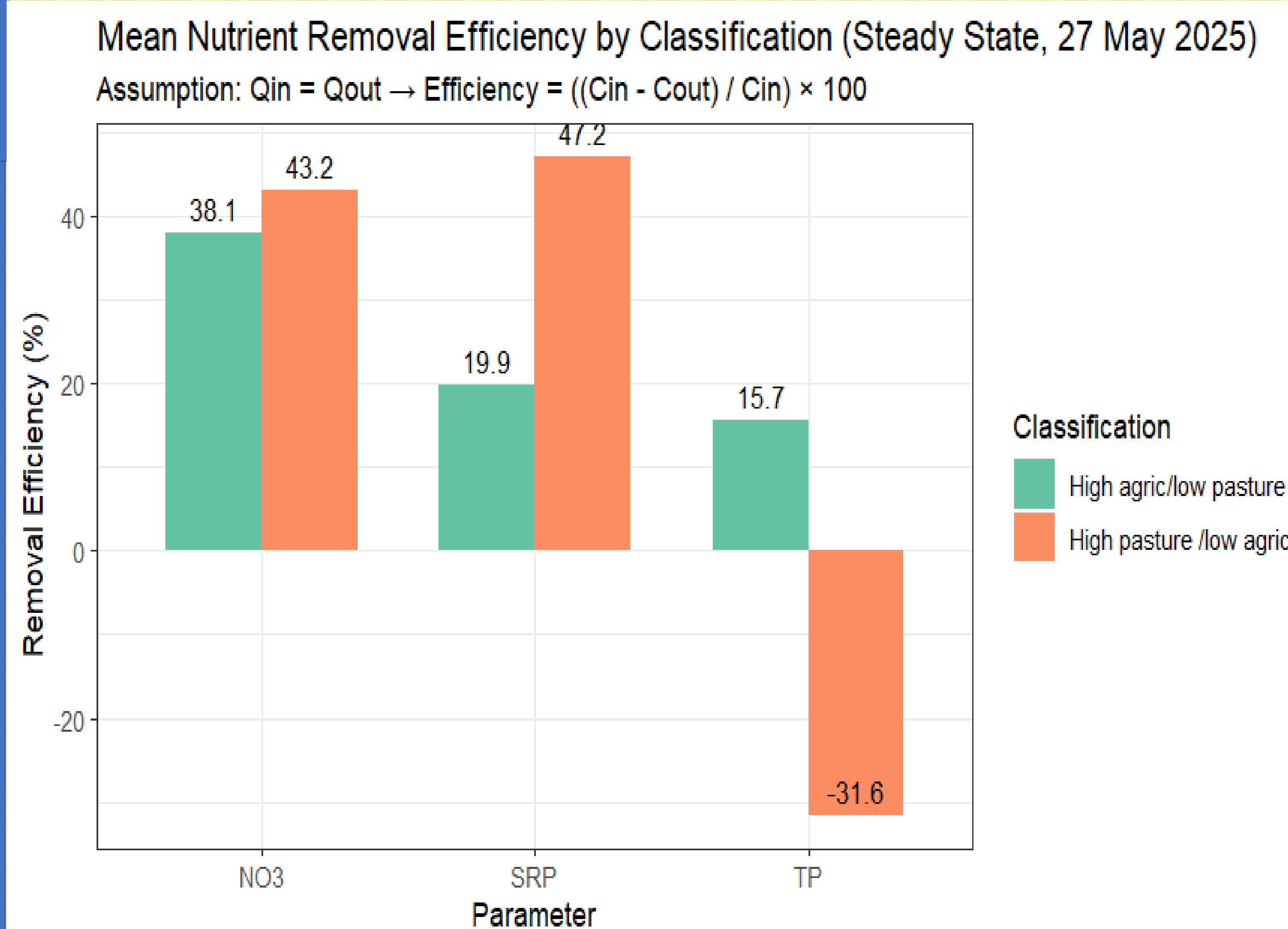
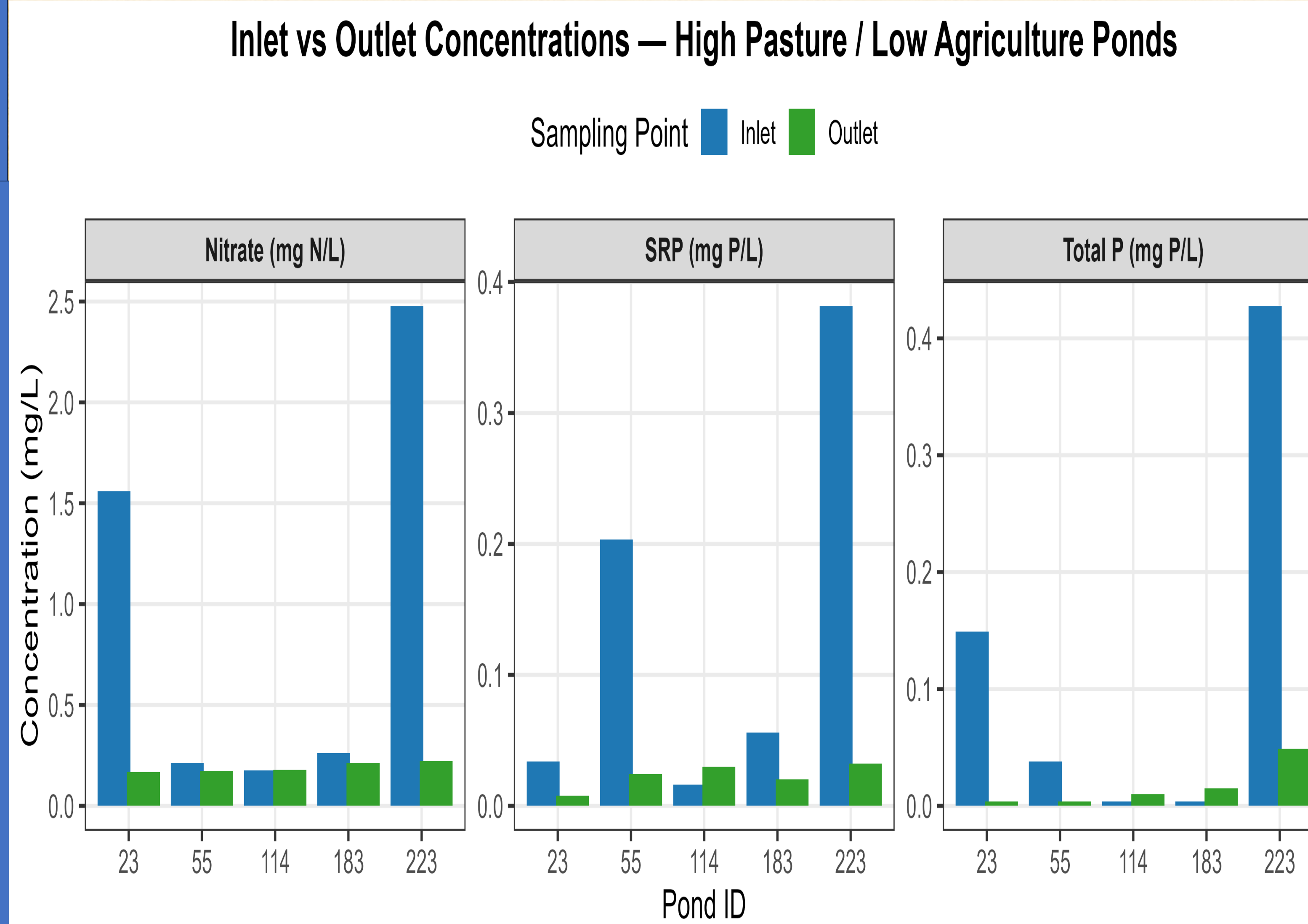
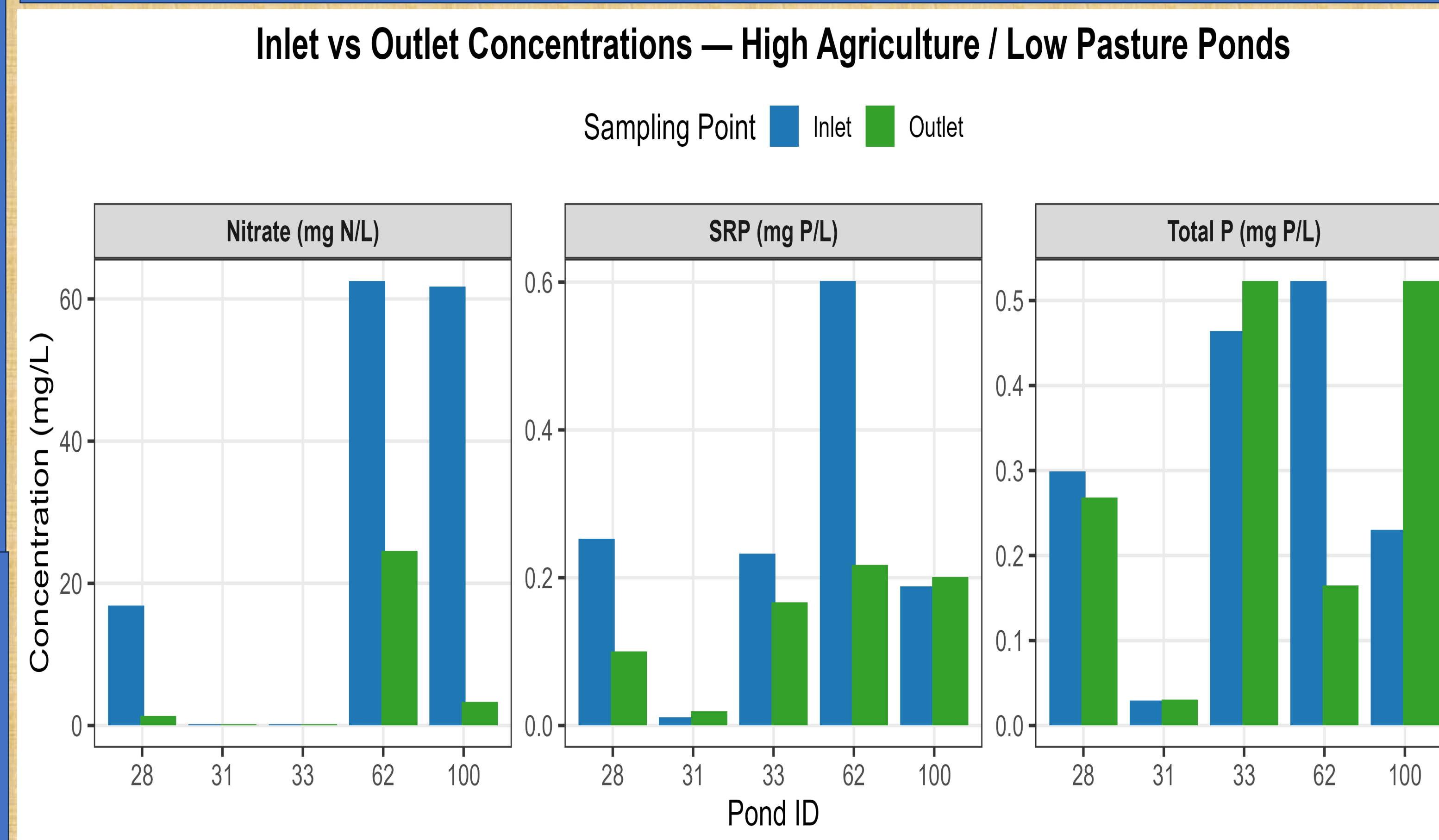
- Delaware river watershed location within Kansas.
- Drains to Perry lake.

Delaware river watershed and Perry lake connection.

Methods

- 10 Farm ponds categorized by land use.
- High agric/ low pasture (n=5).
- High pasture/low agric (n=5)
- Synoptic sampling- 8.2 % exceedance probability event.
- Samples analyzed for NO_3 , SRP and TP.
- % Reduction (Steady state assumption).
 $= [(C_{\text{in}} - C_{\text{out}}) / C_{\text{in}}] \times 100$

Changes in Concentration



Preliminary Findings

- High agriculture ponds intercepted and decreased significant nitrate concentration.
- Phosphorous responses varied by land use context.
- Land use matters: High agriculture ponds received higher loads but showed stronger N removal.
- Farm ponds demonstrate measurable nutrient modulation capacity.

Management Implications

Farm ponds can be effective components of watershed nutrient management. Simple monitoring approaches support practical decision making. Land use context should guide pond implementation strategies.

Future Works

- Extend Monitoring.
- Refine hydrology.
- Add biotic indicators.
- Build predictive models.
- Share results to guide farm pond management strategies

Farm Ponds



Acknowledgements

- This research is funded through the Kansas Water Office on the US EPA Grant CD-96717601 as part of the EPA Wetlands Protection Program.
- We thank Julia McDonald, Ezra Joseph, Chae Park, Cassandra Amrein and Jonah Rosebaugh for field and laboratory assistance and acknowledge support from Kansas Water Office, Kansas Biological Survey and University of Kansas collaborators.
- [Delaware River Watershed Farm Pond Layers](#)

