

NUMERICAL MODELING OF PESTICIDE AND FERTILIZER TRANSPORT IN SOUTH FLORIDA

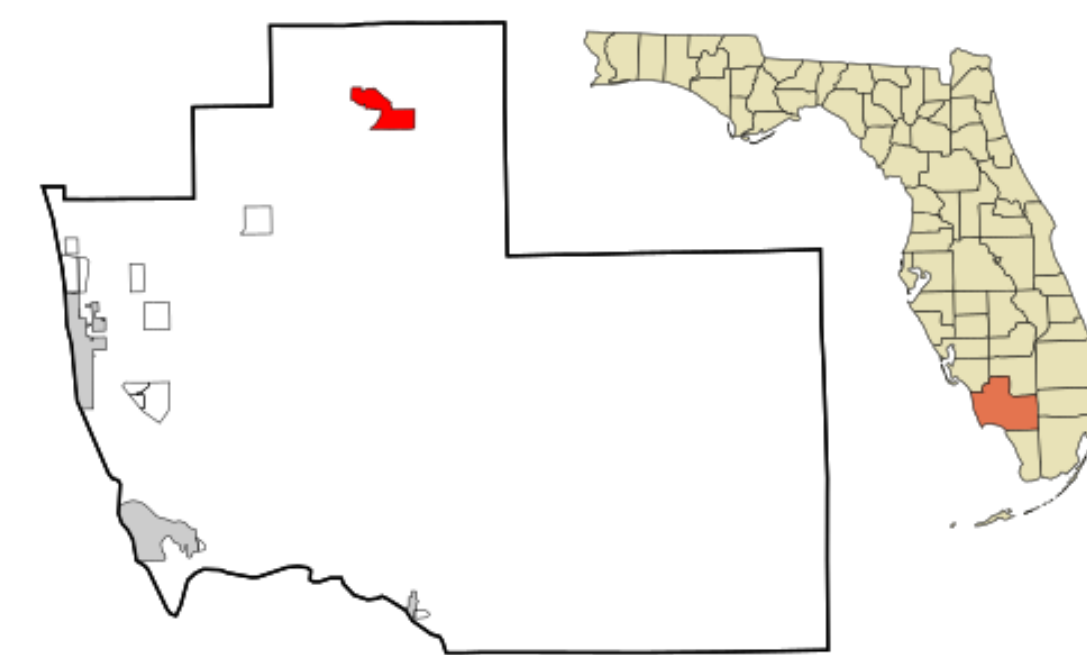
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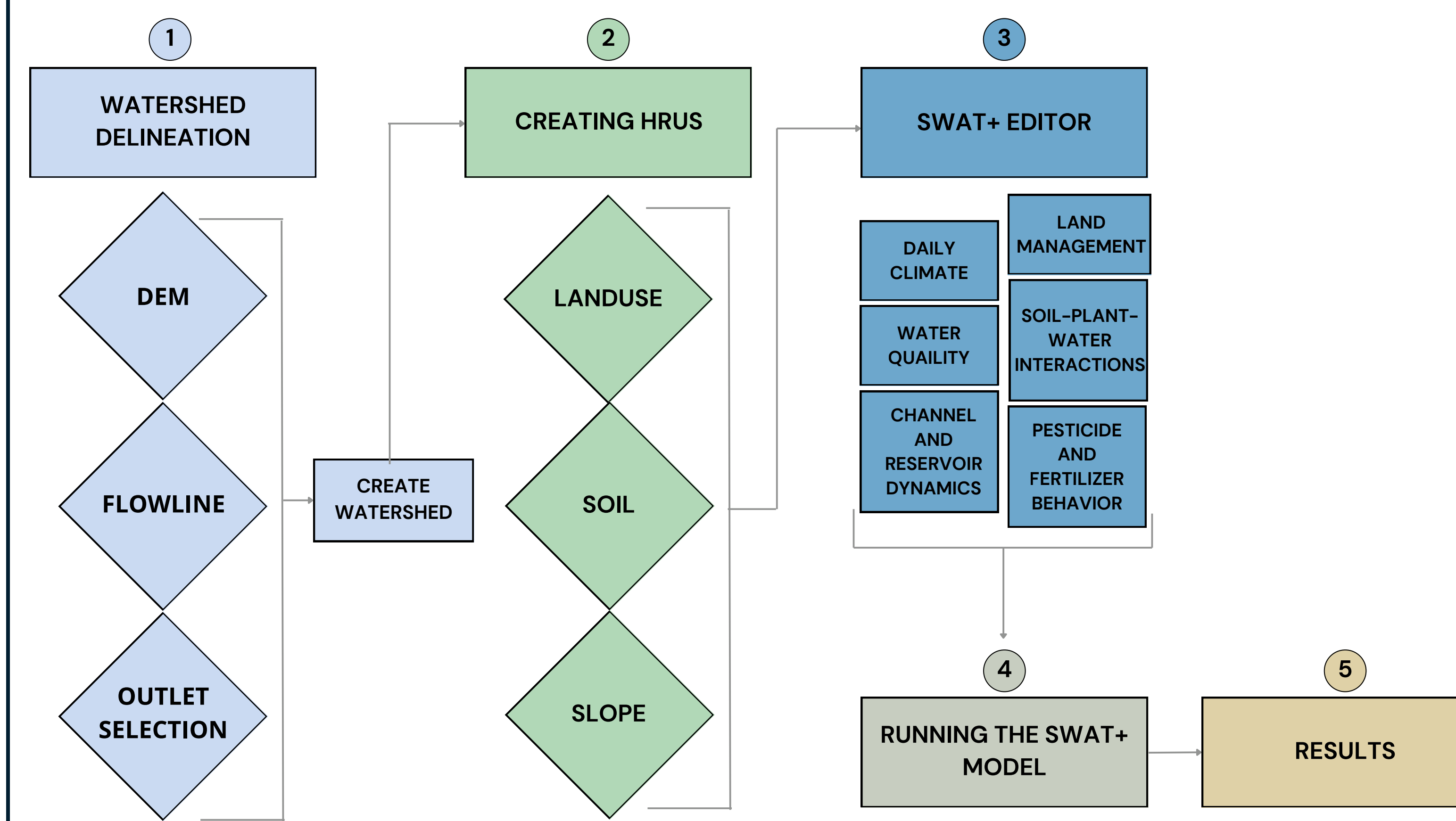
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Introduction

Industrialized agricultural use of **pesticides and fertilizers threatens water quality** (Tudi et al., 2021). In South Florida, where sandy soils, low elevation, and karst geology promote rapid contaminant transport, water sources are at an increased contamination risk (Phelps, 1994). This study develops a **Soil and Water Assessment Tool (SWAT+)** to model **pesticide and fertilizer hydrologic transport** in the Lake Trafford watershed in Immokalee, Florida.



Methods



DEM	USGS 10m
Flowline	NHDPlus with added canals
Landuse	NLCD
Soil	SSURGO
Climate	UF/IFAS Immokalee Weather Station
Agricultural Management	UF/IFAS Immokalee
Pesticide Dynamics	National Pesticide Information Center

*All additional inputs determined by SWAT+

Results

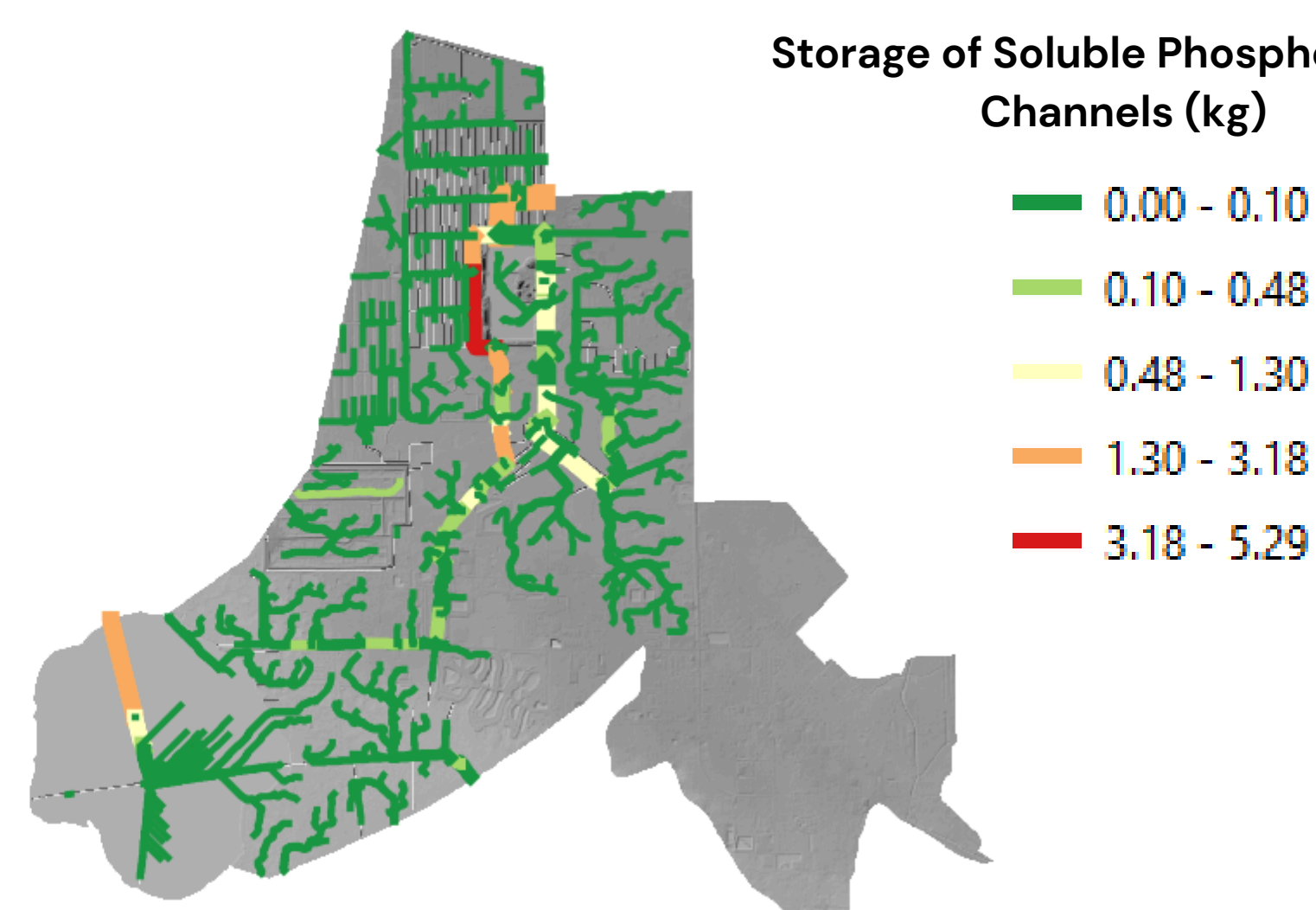


Figure 1. Average Soluble Phosphorous Storage in Channels in the Lake Trafford Watershed after a 15 year simulation period.

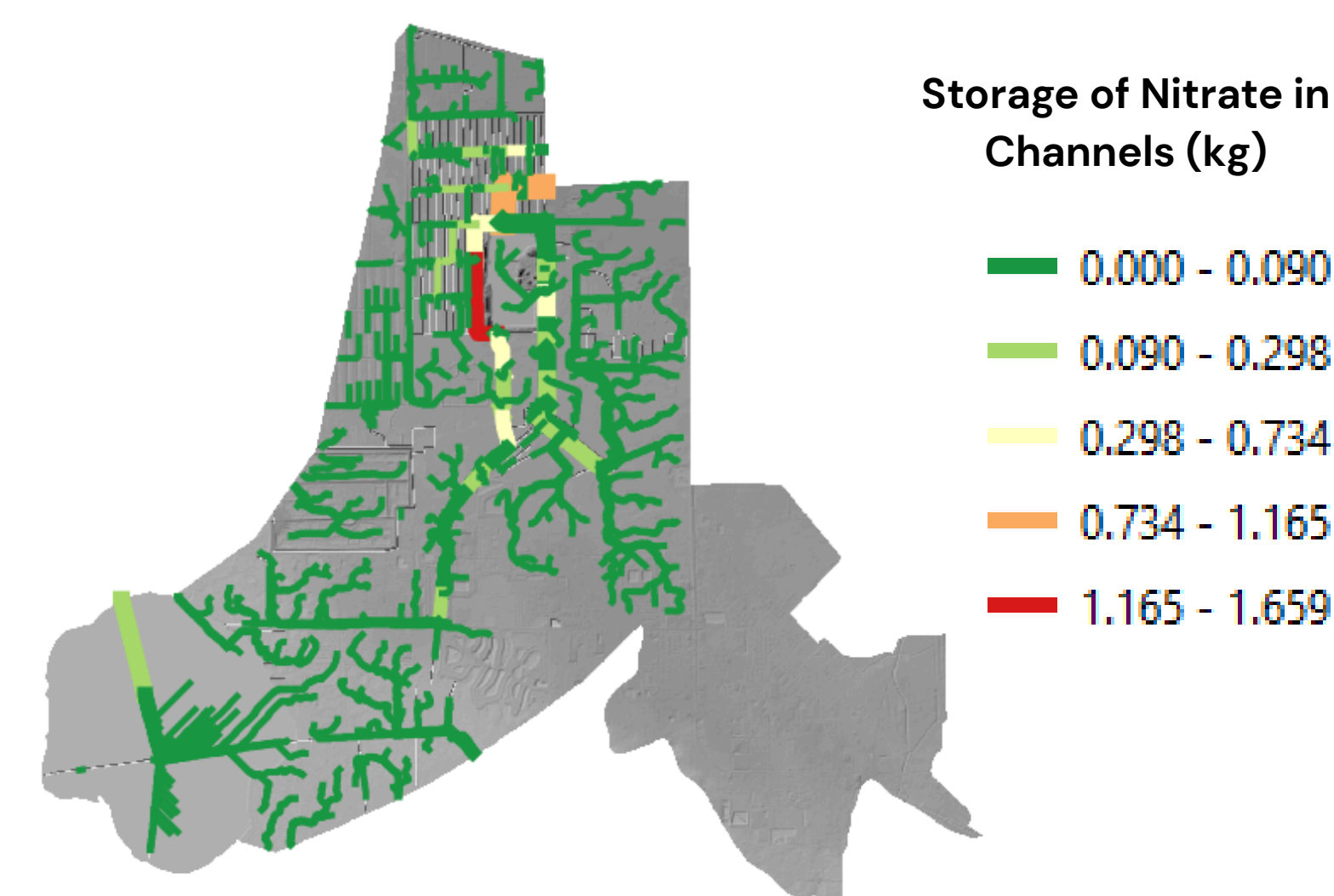


Figure 2. Average Nitrate Storage in Channels in the Lake Trafford Watershed after a 15 year simulation period.

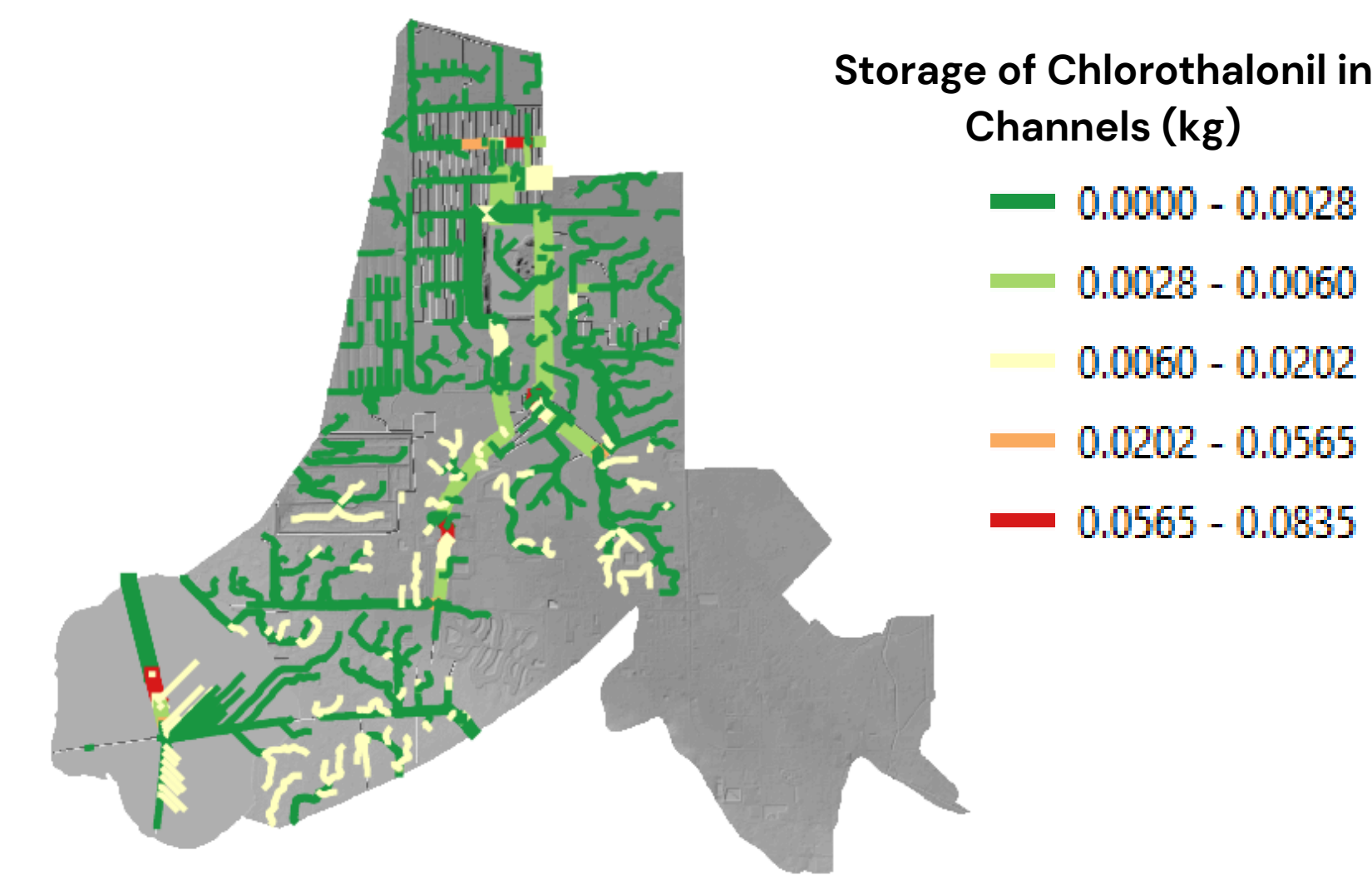


Figure 3. Average Chlorothalonil Storage in Channels in the Lake Trafford Watershed after a 15 year simulation period.

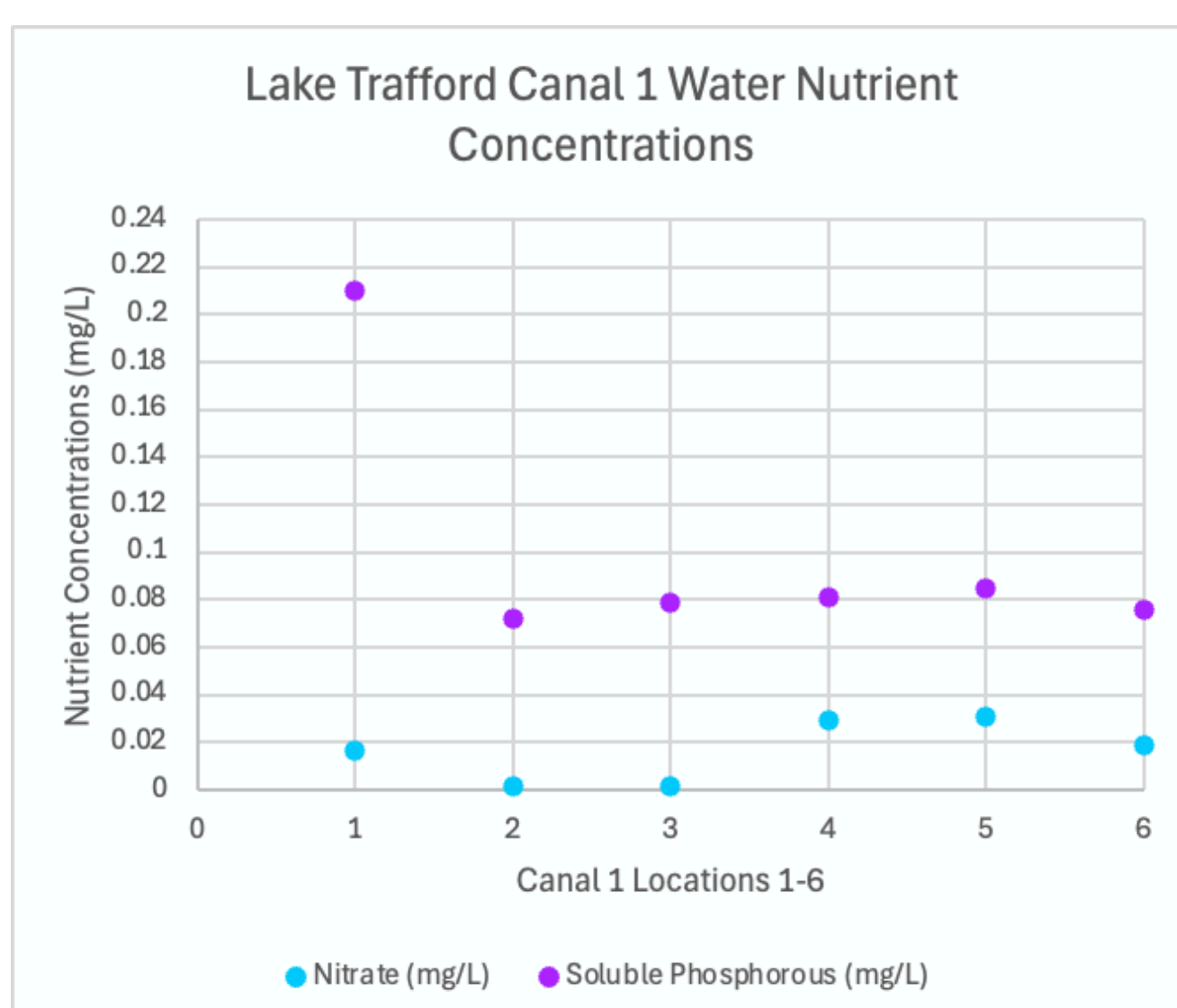


Figure 4. Average modeled Nitrate and soluble Phosphorous concentrations in Canal 1 of Lake Trafford in June 2025.

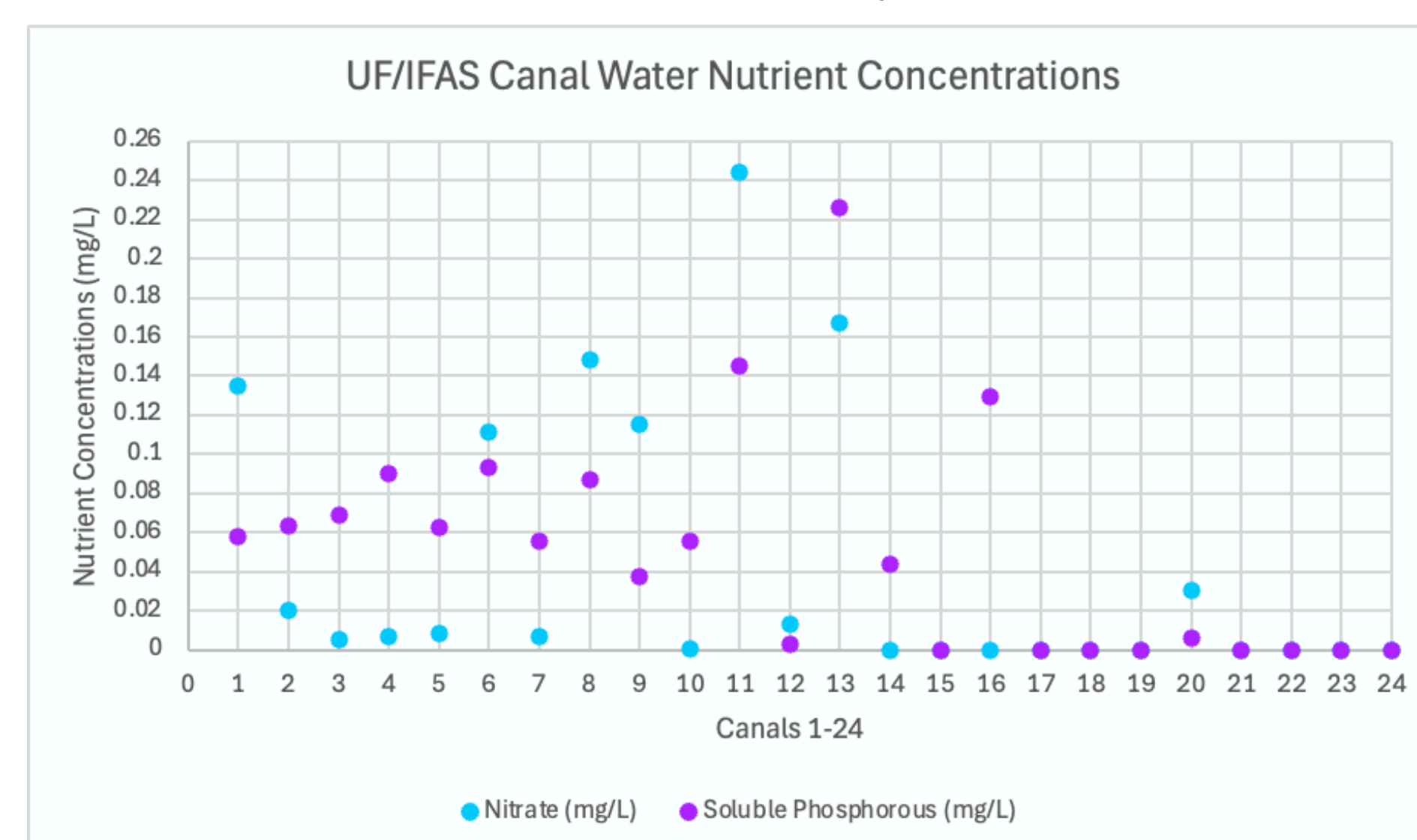


Figure 5. Average modeled Nitrate and soluble Phosphorous concentrations in canals on the UF/IFAS Immokalee research site in June 2025.

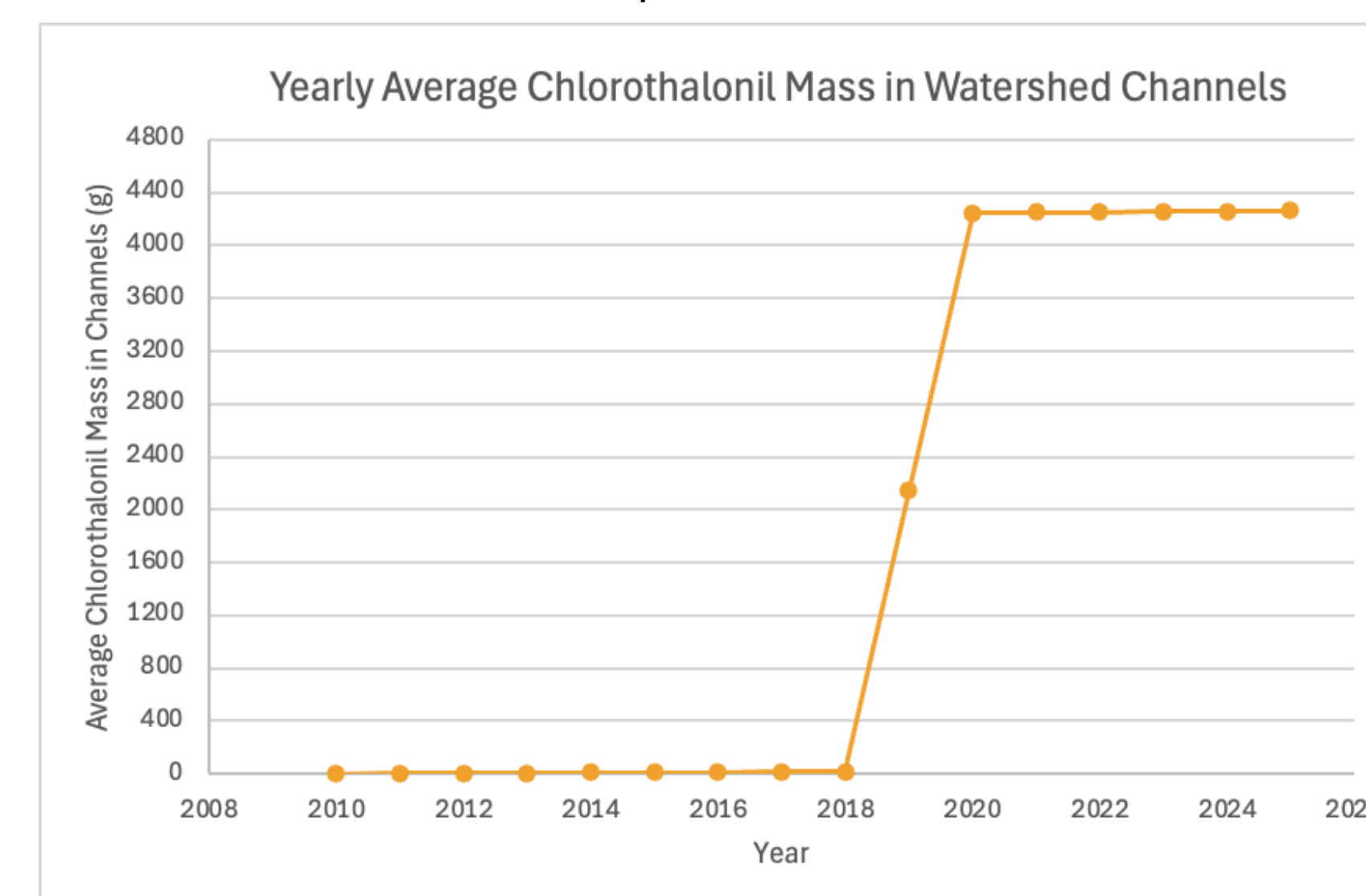


Figure 6. Yearly average modeled Chlorothalonil storage in the Lake Trafford Watershed channels during a 15 year simulation period.

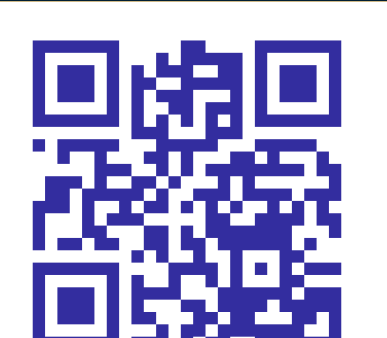
Conclusion & Discussion

- Fertilizer nutrient results coincide with Nitrate and Phosphorous concentrations **varying based on spatial relations** such as near agriculture production, urban populations, or in natural areas.
- Pesticide modeling results provide little reliable quantitative data. Considering a maximum **known value of 0.026 ppb** detected at the UF/IFAS Immokalee Site, this is **comparable to the first 8 years of simulation** with an average concentration of **0.0273 ppb**. However, the following years show a sharp increase, potentially revealing a **problem with degradation in the model**.
- SWAT+ fertilizer modeling and the **nutrient counterparts** needs to be validated with active monitoring sites because of **high fluctuability**.
- SWAT+ **pesticide modeling is highly limited** due to simplified dynamics and the lack of degradation products modeled.

Key Sources



Interested in SWAT?



	Average (ppm)	Standard Deviation
Nitrate	0.0164	0.0127
Soluble Phosphorous	0.1004	0.0539

	Average (ppm)	Standard Deviation
Nitrate	0.0539	0.0699
Soluble Phosphorous	0.0509	0.0575

	Chlorothalonil Storage (g)	Canal Concentration (ppb)
Low Value Range	1.6-17.5	0.0273
High Value Range	4243.8-4259.5	12.2