

Utah Lake Water Quality Study: Phase 1 Final Report Update



December 11, 2018

*Division of Water Quality
Utah Department of Environmental Quality*

Overview of Phase I Work Elements



Phase 1 Work Elements

Task 1 – Stakeholder Development

Task 2 – Data and information management

Task 3 – Water Quality Assessment and Analysis

Task 4 – Source and nutrient load analysis

Task 5 – Model Selection and Development



Updates Since Draft Phase 1 Report



Literature Review

Utah Lake Specific Research

- Compile relevant literature
- Ability to answer charge questions



Literature Summary to Support the Utah Lake Water Quality Study

Prepared for:
Utah Department of
Environmental Quality
Division of Water Quality

Date: August 2, 2018

LimnoTech 
Water | Scientists
Environment | Engineers

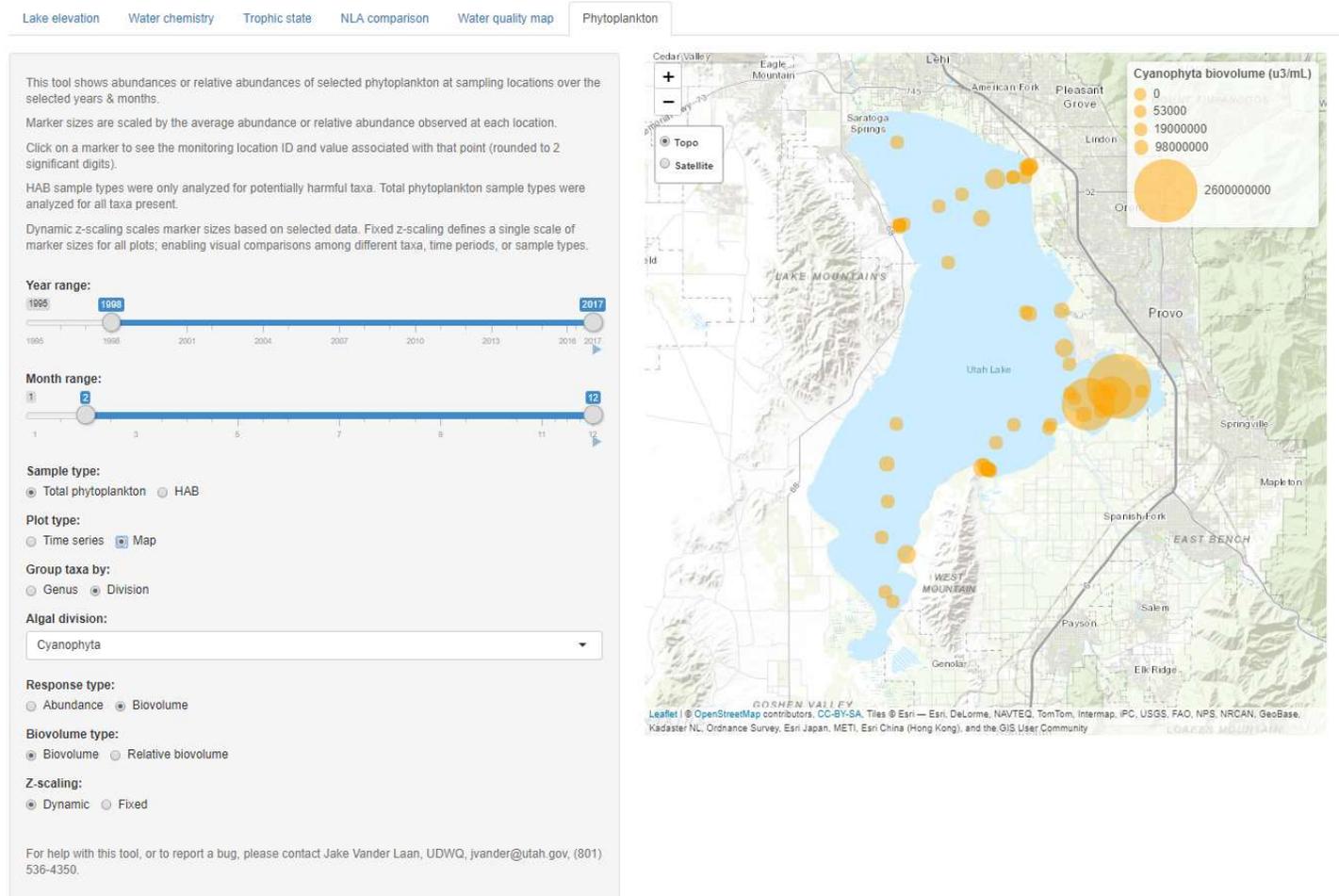


Utah Lake Data Explorer

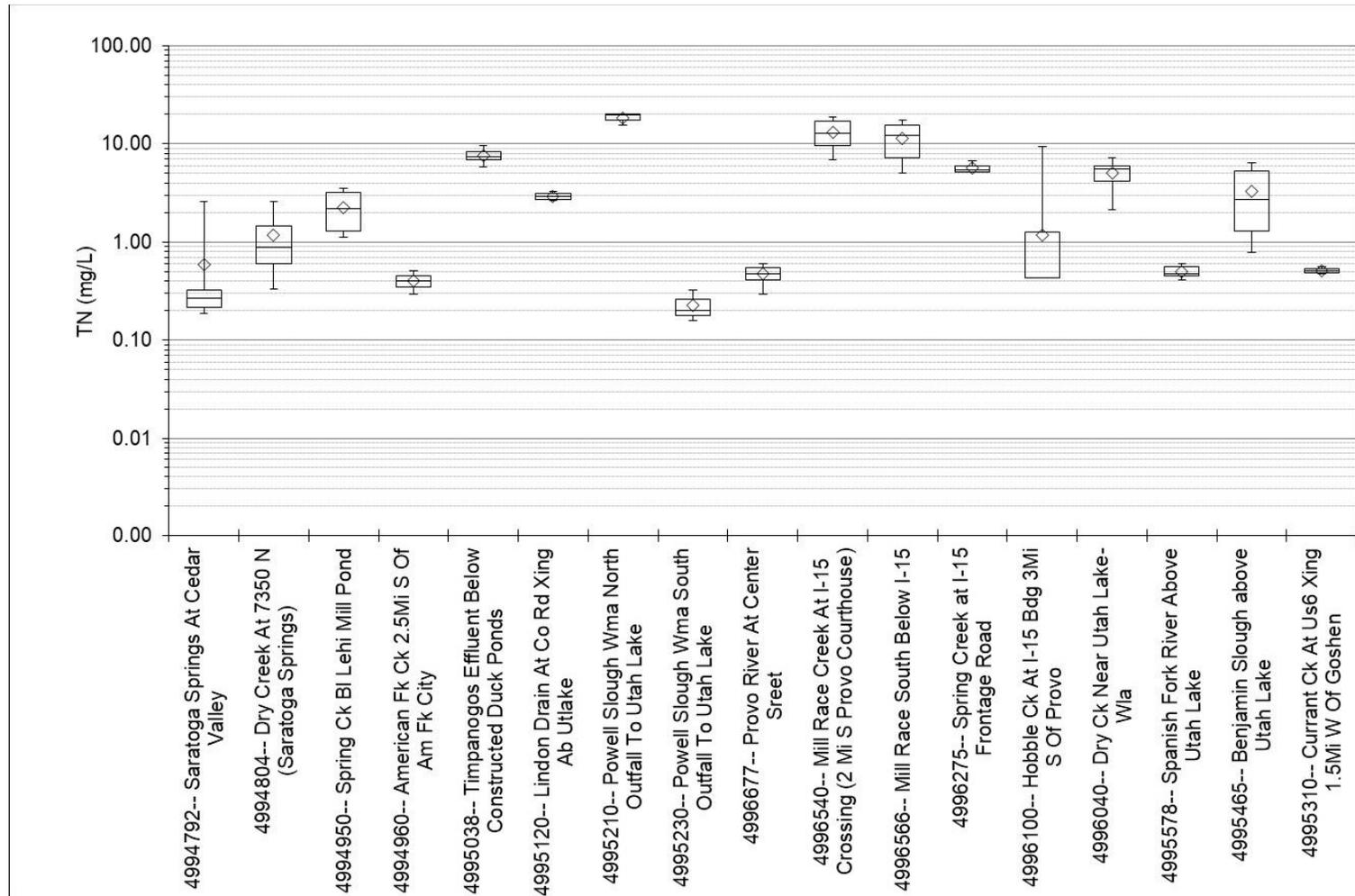
<https://udwq.shinyapps.io/UtahLakeDataExplorer/>

Enhancements

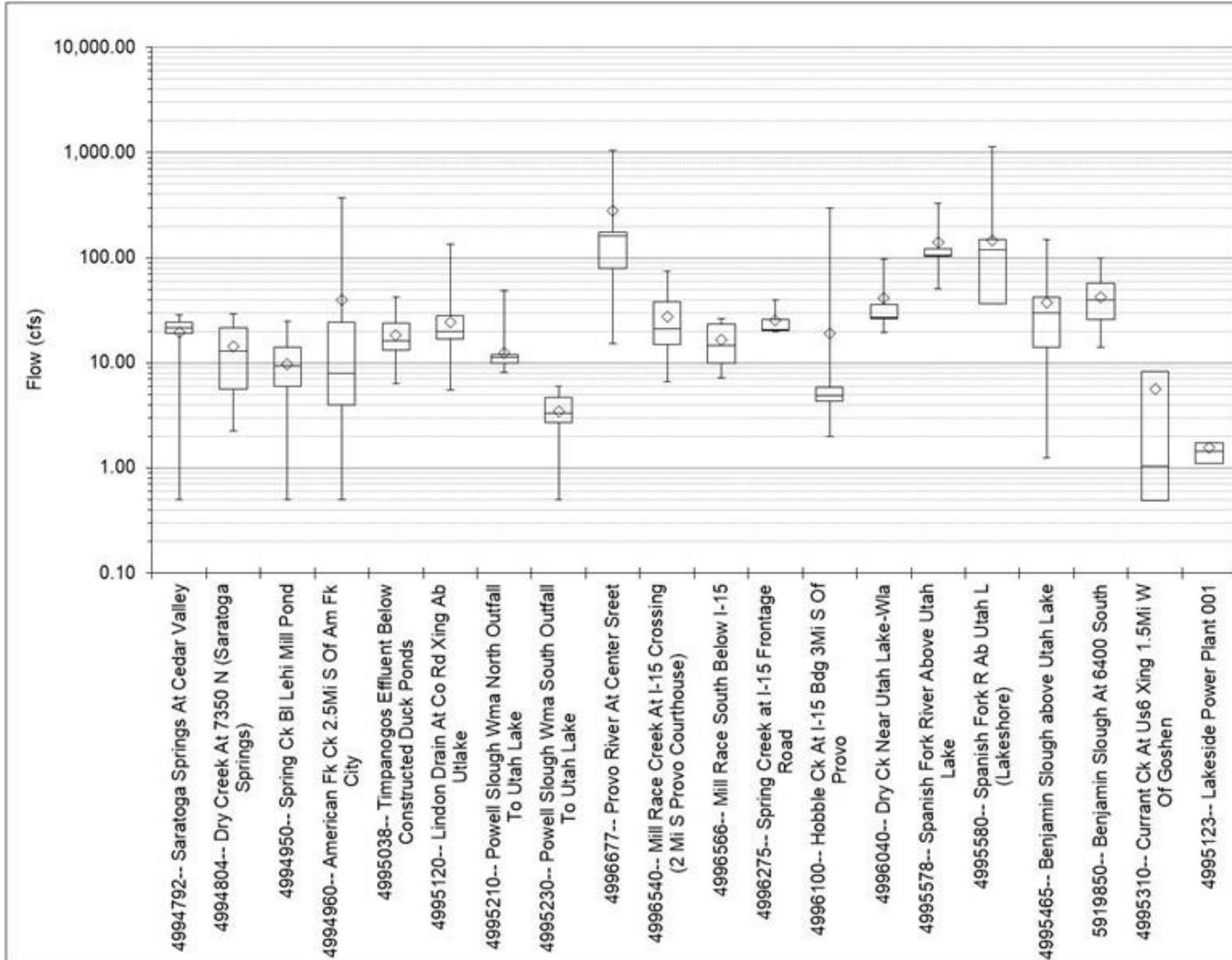
- Spatial analysis
- Phytoplankton



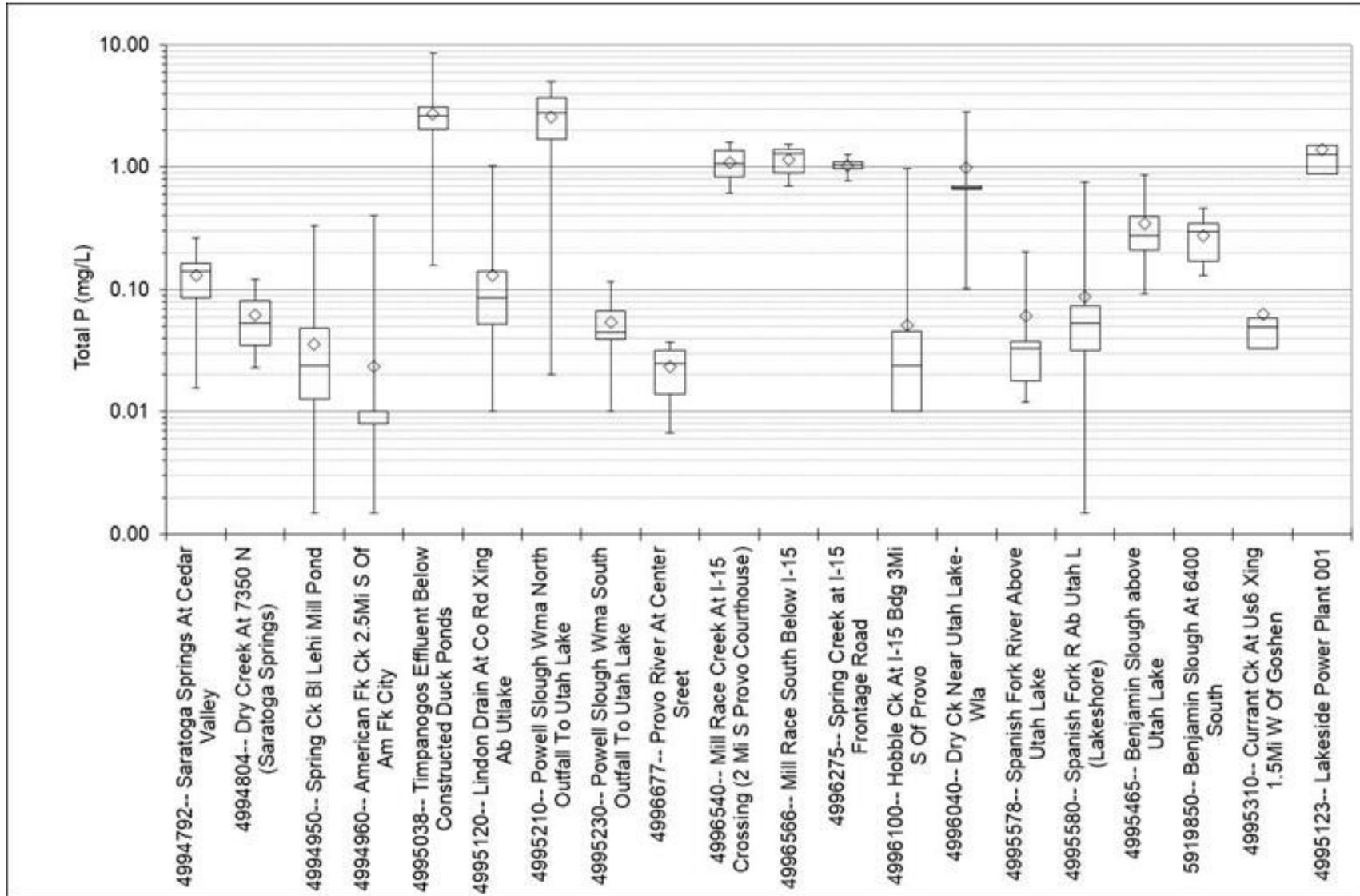
Additional Nutrient Summary



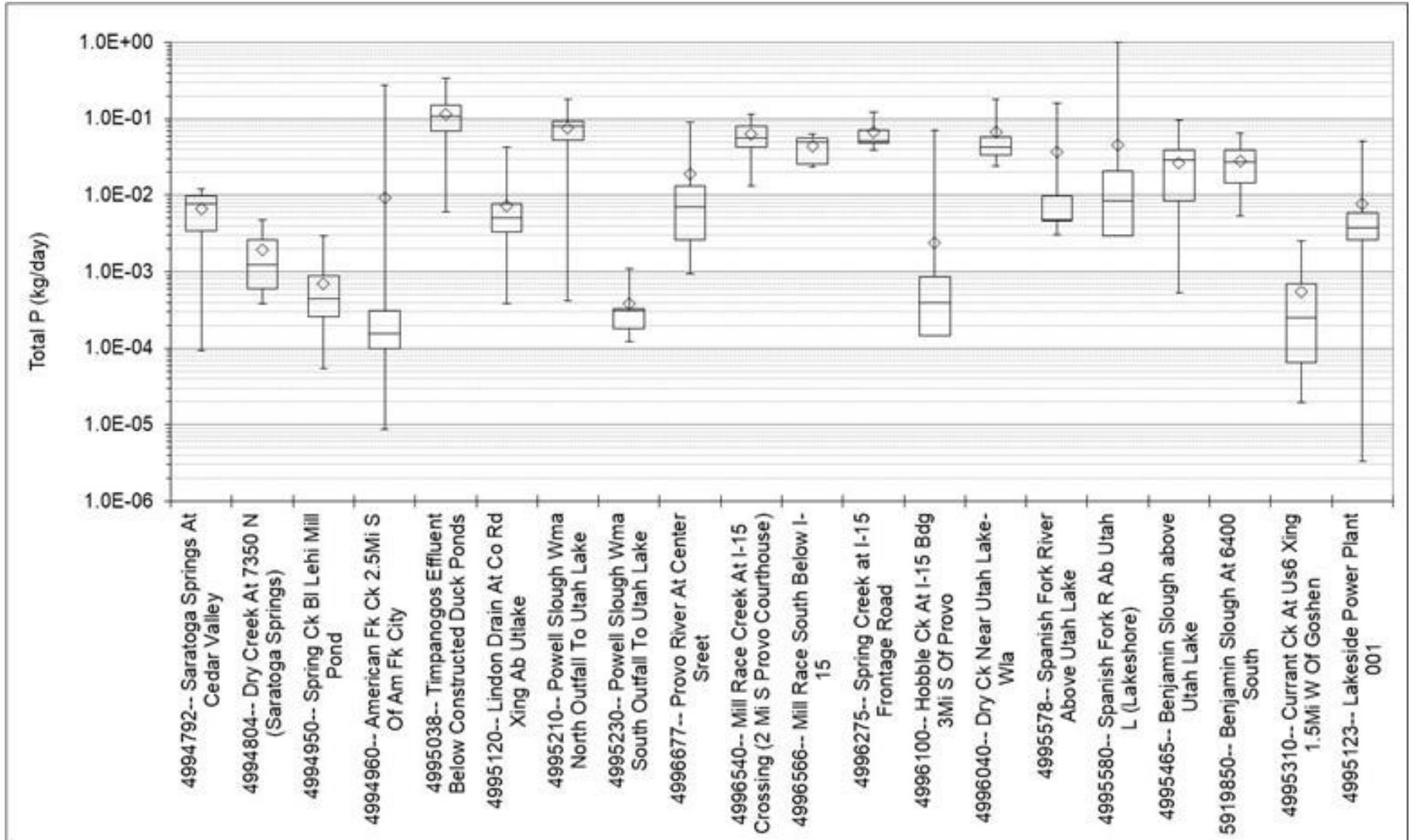
Tributary Flow



Tributary TP Concentration



Tributary TP Load

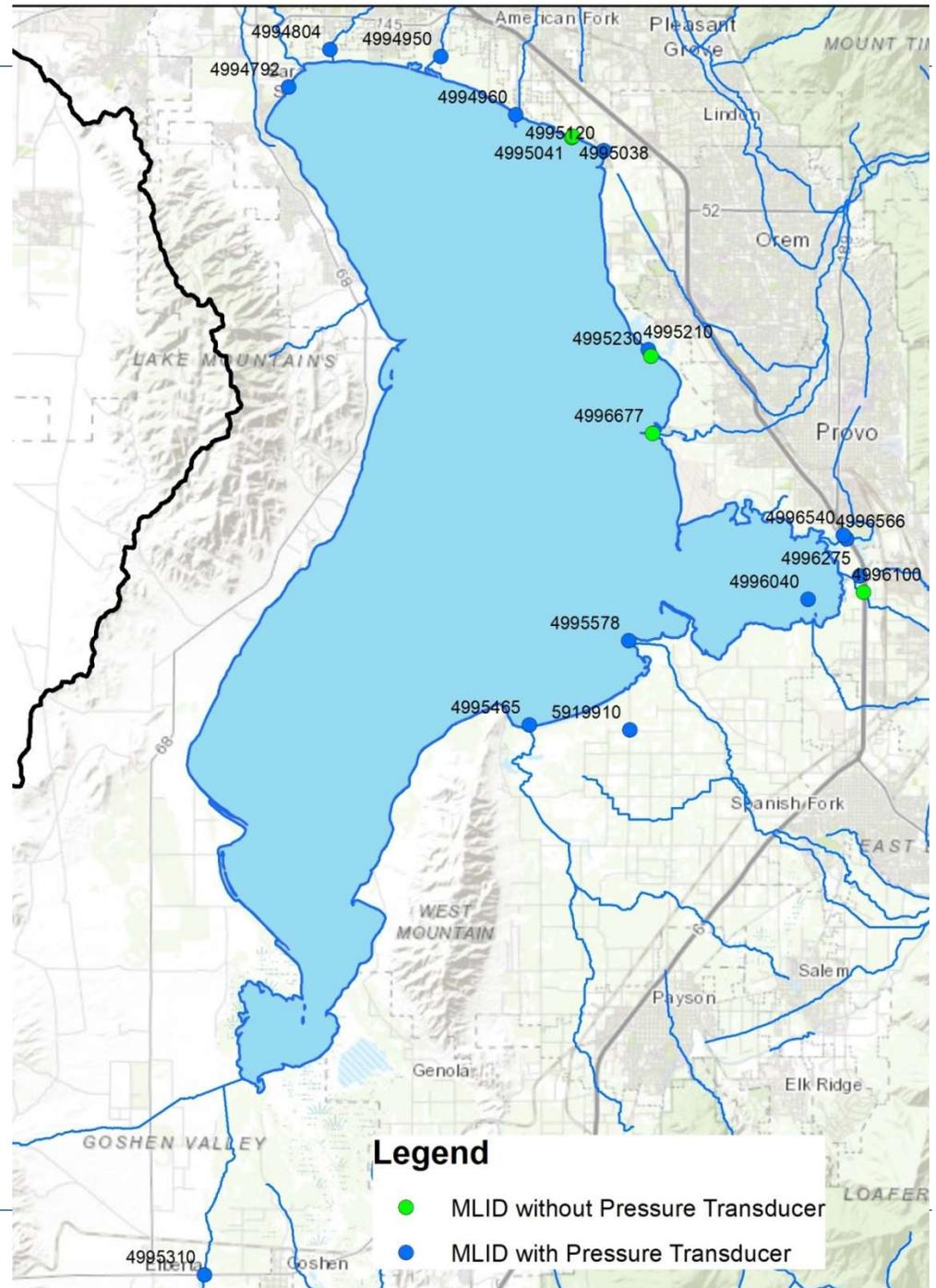


Recommendations



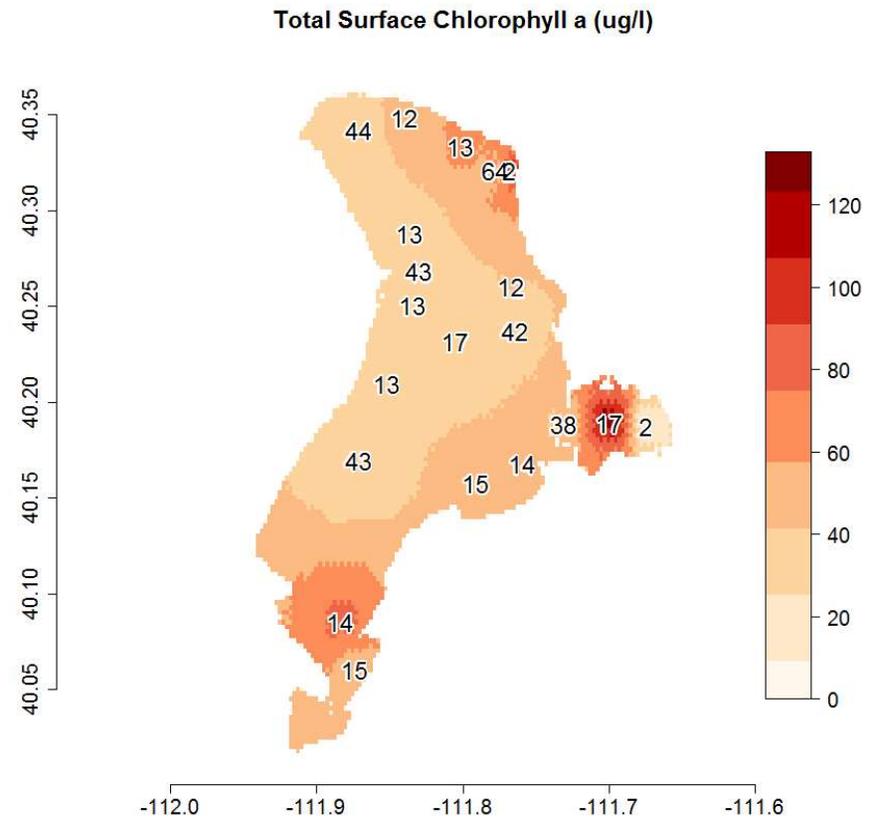
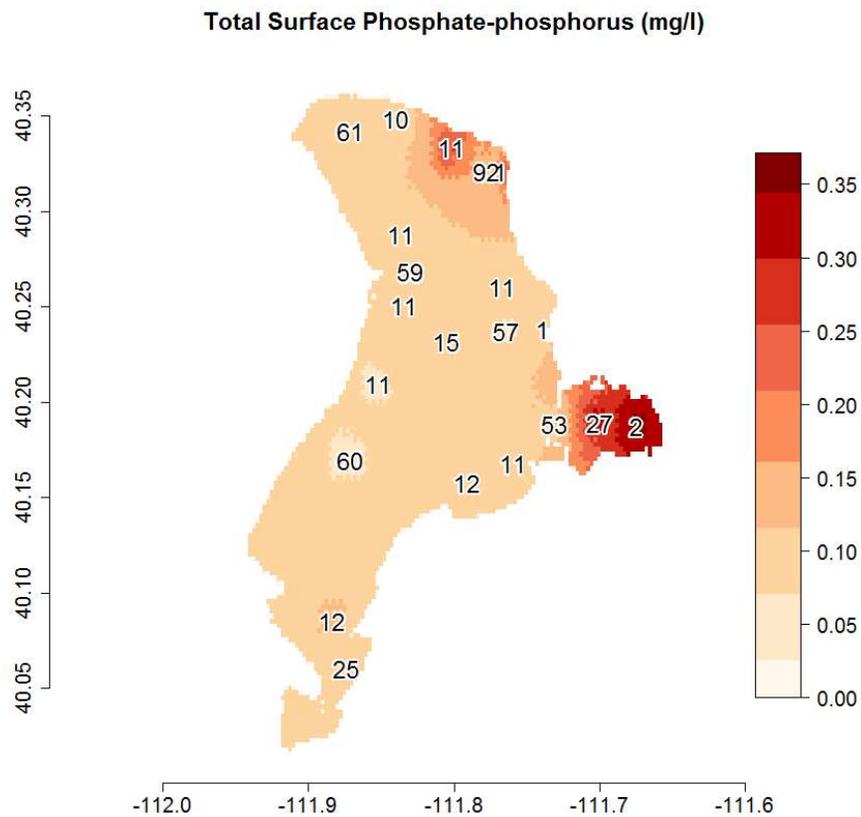
- **Data Management and Compilation**

- Improve partner coordination
- Improve data sharing
- Inflow identification and monitoring
- Continuous flow monitoring

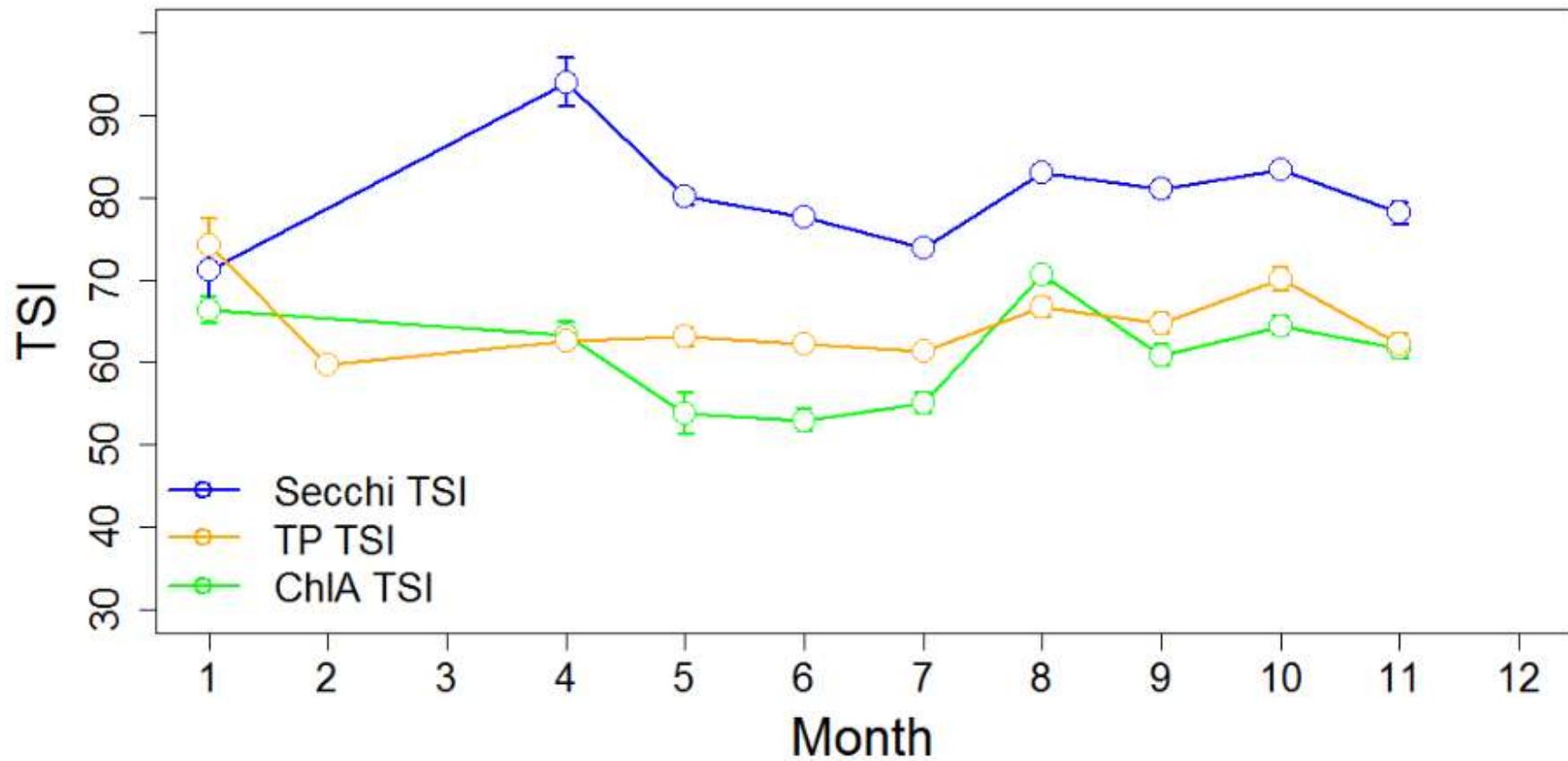


- **Water Quality Analysis**

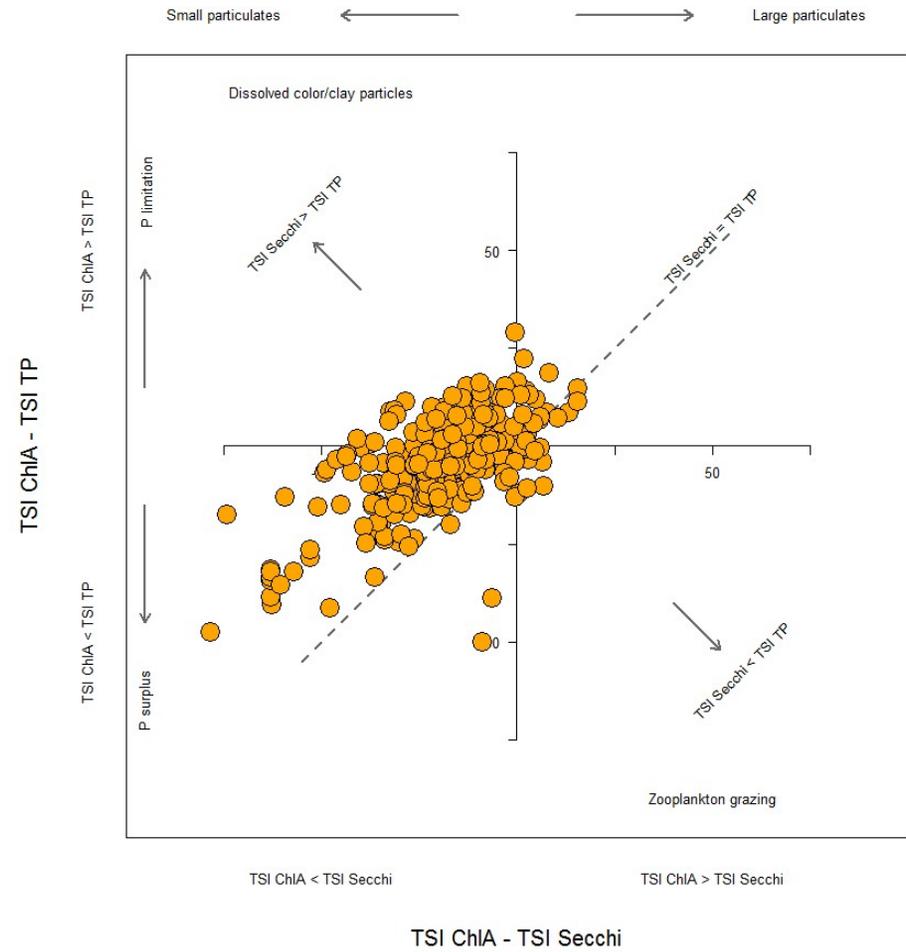
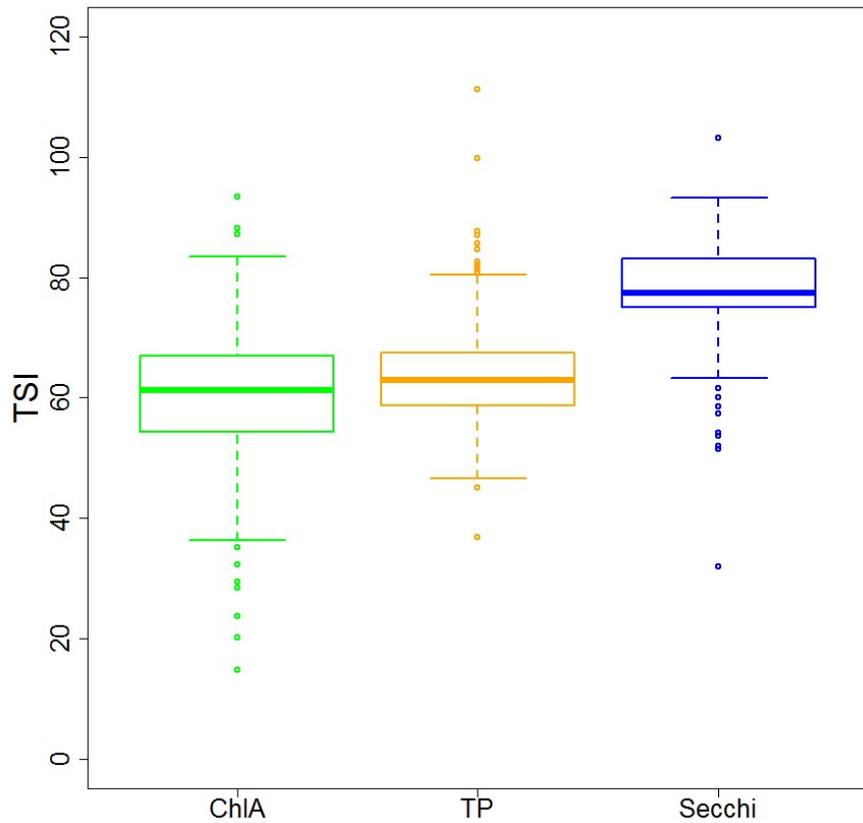
- Spatial and temporal relationships between nutrients and phytoplankton and HABs
- Early Life Stage (ELS) requirements for aquatic life



Seasonal Patterns

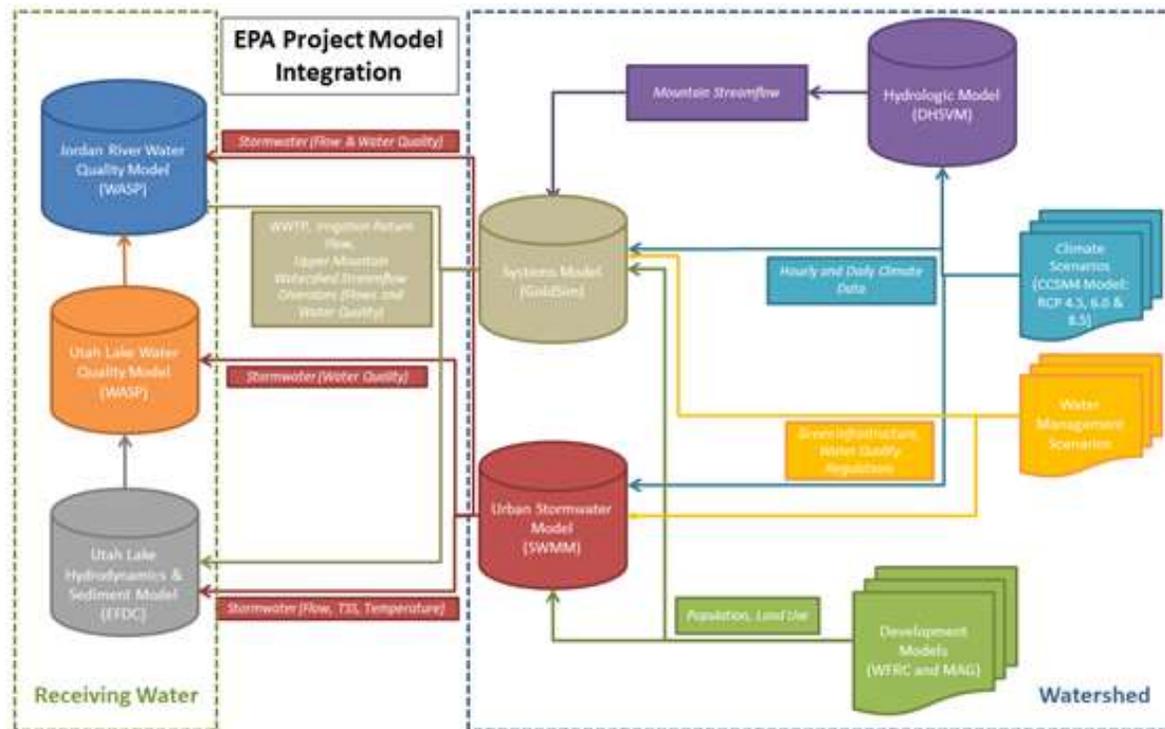


Aggregate TSI Patterns



- **Model Development**

- Support ongoing data collection for model development
- Integrate U of U model team with Science Panel
- Develop sensitivity analysis to help prioritize future research



- Loading Analysis

- Identify and monitor unengaged and direct drainage inflows
- Develop continuous flow network

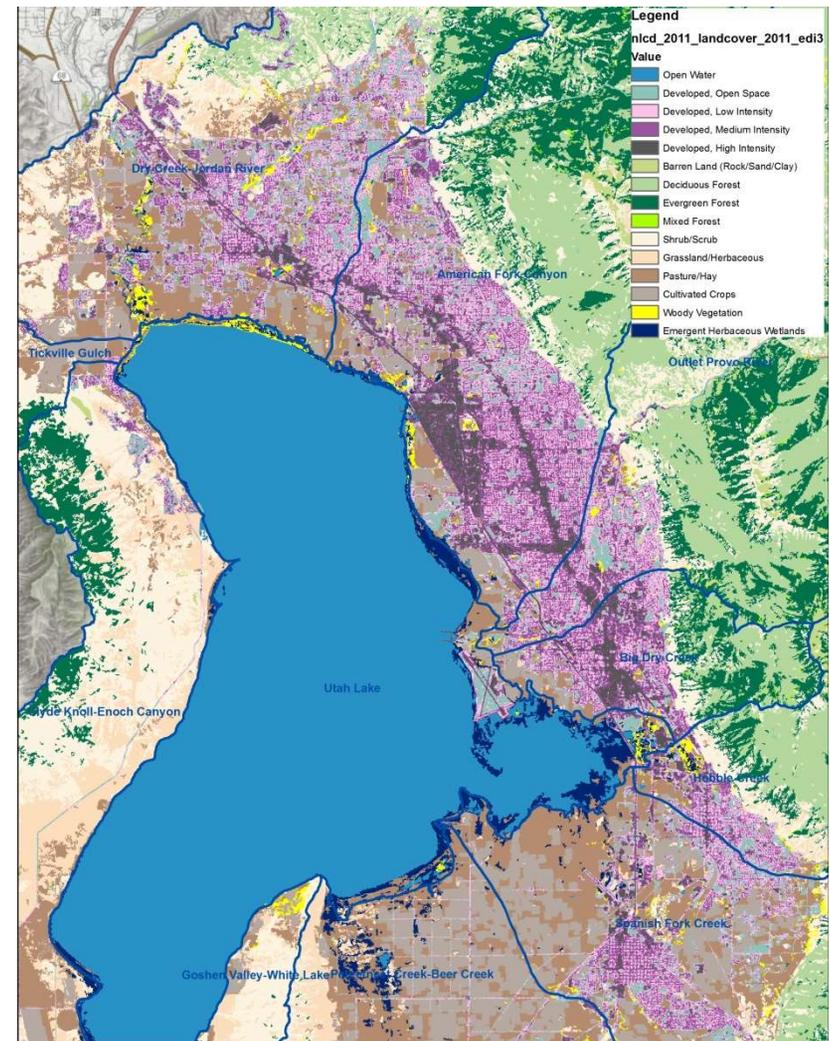
Table 5: Calculated Average Total Phosphorus Loads (tons/year) Based on Average Flows (1980-2003)

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1. INFLOWS	Inflow	Type													
Powell Slough	Powell Slough Total		5.9	6.3	5.9	6.5	8	6.6	6.8	7.5	7.8	8.2	6.5	6.4	82.4
	<i>Powell Slough (natural)</i>	S	0.3	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	3.1
	Orem WWTP	WWTF	5.6	5.9	5.6	6.2	7.8	6.4	6.6	7.3	7.6	8	6.2	6.1	79.3
Provo River	Provo River Total	Total	0.6	0.5	0.8	0.8	1.7	1.2	0.2	0.2	0.3	0.6	0.5	0.5	7.9
	Provo River (natural)	S													
	Provo River Drain	D													
Dry Creek (Lehi)	Dry Creek (Lehi)	S	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0.2
Little Dry Creek	Little Dry Creek	S	0	0	0	0	0	0	0	0	0	0	0	0	0
Big Dry Creek	Big Dry Creek	S	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.2
Mill Race Creek	Mill Race Creek Total	Total	6.2	5.6	5.8	5.9	6.7	6.2	6.4	6.7	7.5	6.2	6.6	4.6	74.4
	<i>Mill Race Creek (natural)</i>	S	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.4
	Provo WWTP	WWTF	5.9	5.4	5.6	5.7	6.5	6	6.1	6.5	7.3	5.9	6.3	4.4	71.6
	Drains	D	0.1	0	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.1	1.4
Spring Creek (East of Provo Bay)	Spring Creek (East of Provo Bay) Total	Total	0.9	1.5	1.5	1.3	1.4	1.3	1	1.1	1.3	1	1.3	0.8	14.4
	<i>Spring Creek (natural)</i>	S	0.1	0.1	0.1	0.1	0.1	0	0	0.1	0	0	0	0.1	0.7
	Springville WWTP	WWTF	0.8	1.4	1.4	1.2	1.3	1.3	1	1	1.3	1	1.3	0.7	13.7
Hobble Creek	Hobble Creek	S	0.1	0.2	0.3	0.3	0.2	0.1	0	0	0	0	0.1	0.1	1.4
Dry Creek (South of Provo Bay)	Dry Creek (South of Provo Bay) Total	Total	1	1.3	1.4	0.9	1.2	1.2	0.9	0.8	0.9	1.4	1.4	1.5	13.9
	<i>Dry Creek (natural)</i>	S	0.3	0.4	0.3	0.1	0.1	0.1	0	0	0.1	0.2	0.3	0.3	2.2
	Spanish Fork WWTP	WWTF	0.7	0.9	1.1	0.8	1.1	1.1	0.9	0.8	0.8	1.2	1.1	1.2	11.7
Spanish Fork River	Spanish Fork River	S	1.1	1	1.5	7.7	4.7	1.8	0.2	0.3	0.6	0.8	0.7	0.8	21.2
Benjamin Slough	Benjamin Slough Total	Total	1.5	1.6	1.6	1.6	1.4	1.3	1	1	1.1	1.3	1.7	1.5	16.6
	<i>Benjamin Slough (natural)</i>	S	0.4	0.4	0.5	0.4	0.4	0.2	0.1	0.2	0.2	0.4	0.5	0.4	4.1
	Salem WWTP	WWTF	0.3	0.4	0.3	0.4	0.3	0.4	0.4	0.3	0.3	0.3	0.4	0.3	4.1
	Payson WWTP	WWTF	0.8	0.8	0.8	0.8	0.7	0.7	0.5	0.5	0.6	0.6	0.8	0.8	8.4
White Lake Overflow to Goshen	White Lake Overflow to Goshen	S	0.1	0.2	0.1	0.1	0	0	0	0	0	0	0.1	0.1	0.7
Minnie Creek	Minnie Creek	S	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0	0.1	0.1	0.1	1.1
Mill Pond	Mill Pond	S	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.2
Streams	Streams		18.7	19.8	20.6	26.4	26.9	21.2	17.7	18.7	20.6	21.2	20.6	18.1	250.5
	<i>Natural Flows/Drains</i>		4.6	5	5.8	11.3	9.2	5.3	2.2	2.3	2.7	4.2	4.5	4.6	61.7
	WWTPs		14.1	14.8	14.8	15.1	17.7	15.9	15.5	16.4	17.9	17	16.1	13.5	188.8
Springs	Springs		0	0	0	0	0	0	0	0	0	0	0	0	0
Groundwater	Groundwater		0.1	0.2	0.2	0.2	0.5	0.5	0.2	0.3	0.4	0.3	0.2	0.4	3.5
Other Surface	Other Surface		3.6	2.7	2.9	3	2.5	1.9	5.5	3.4	4.3	5.3	4.8	3.7	43.6
	Timpanogos WWTP		3.3	2.3	2.5	2.7	2	1.4	5	3	3.9	5	4.5	3.4	39
	Miscellaneous Surface		0.3	0.4	0.4	0.3	0.5	0.5	0.5	0.4	0.4	0.3	0.3	0.3	4.6
TOTAL INFLOW LOAD			22.4	22.7	23.7	29.6	29.9	23.6	23.4	22.4	25.3	26.8	25.6	22.2	297.6

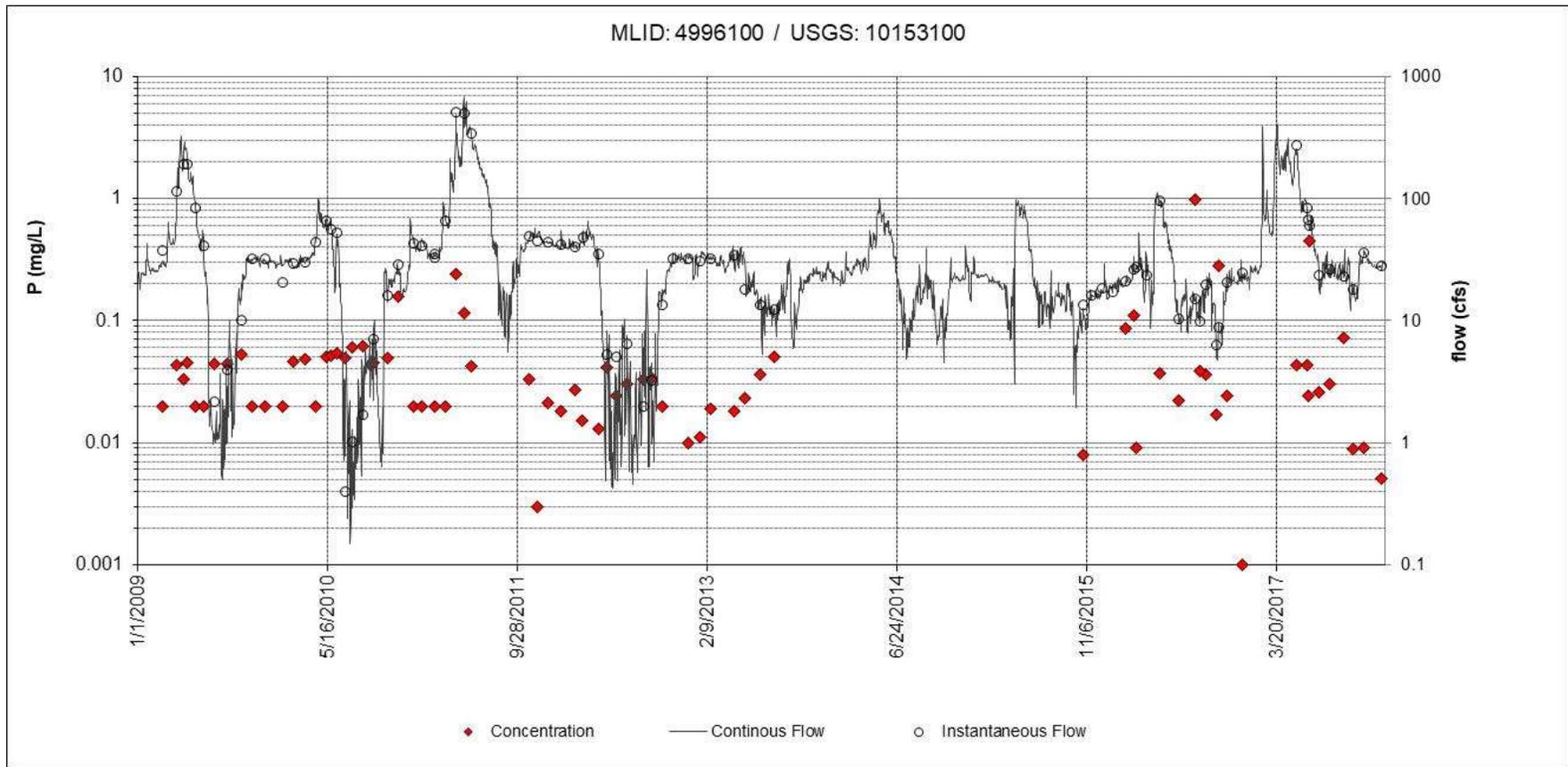


- **Watershed Source Analysis**

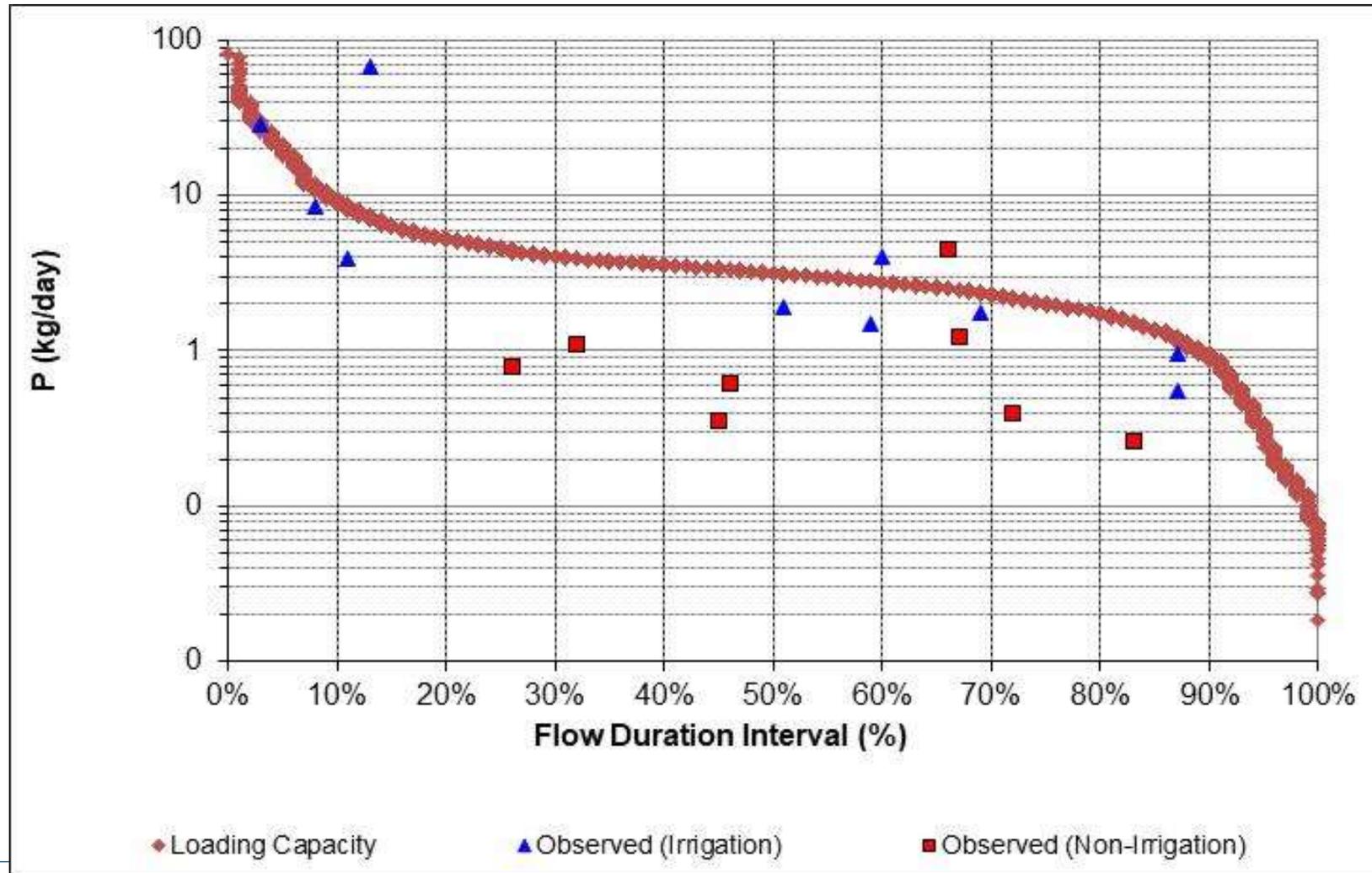
- Develop stormwater monitoring network
- Data collection to support U of U model development
- Evaluate applicability of U of U watershed models
- Evaluate agricultural drainages and return flows
- Evaluate contribution of hydrologic events



Hydrologic Influence on Load



Hydrologic Influence on Load



Discussion

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