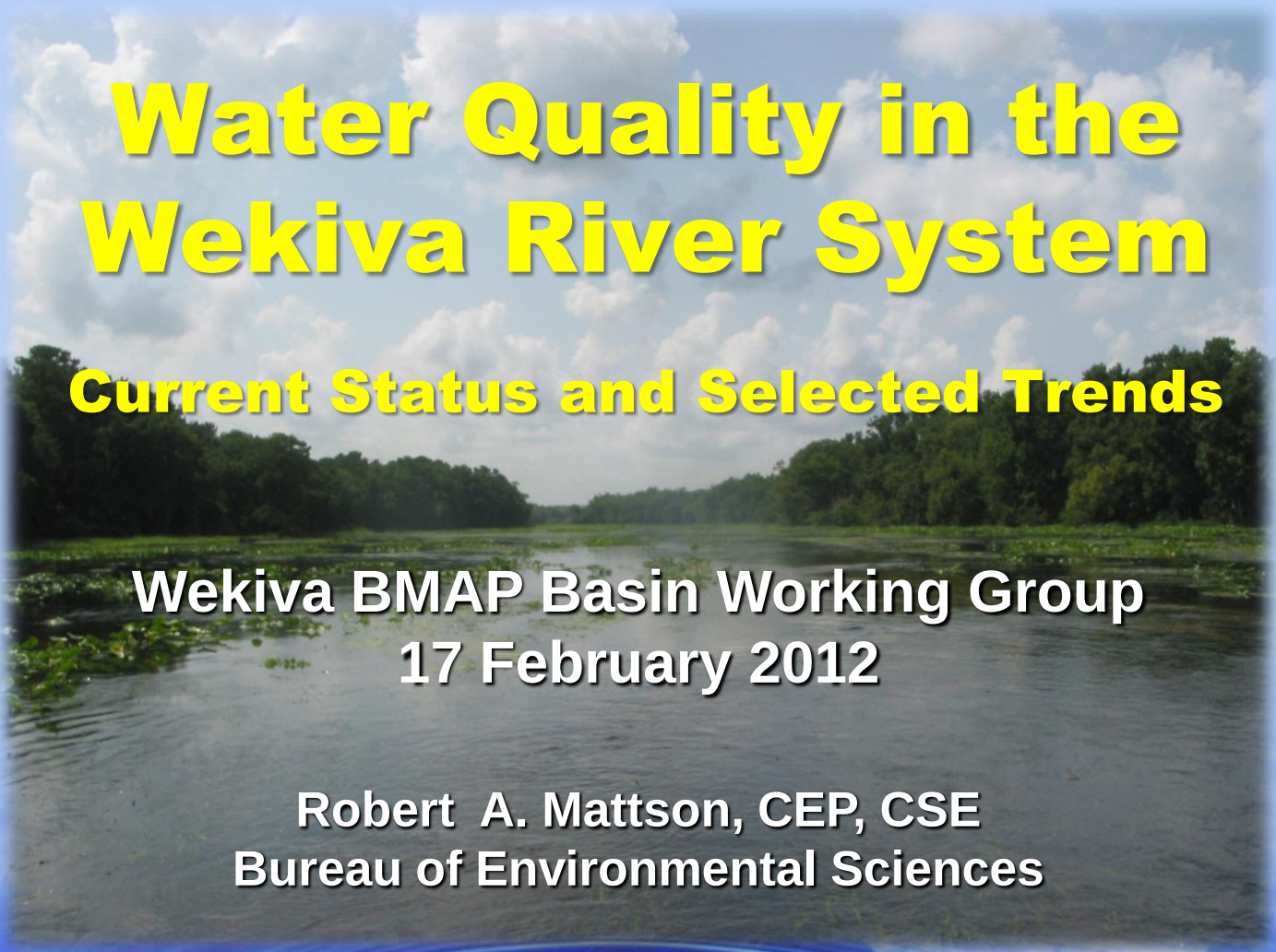
Water Quality in the Wekiva River System

Current Status and Selected Trends



Wekiva BMAP Basin Working Group
17 February 2012

Robert A. Mattson, CEP, CSE
Bureau of Environmental Sciences

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Water Quality Monitoring* in the Wekiva River System

- SJRWMD – SWIM related and ambient for FDEP; groundwater
- Seminole County (ambient surfacewater)
- Orange County (surface and groundwater)
- FDEP Florida Geological Survey – Springs
- FDEP Central District – ambient/SCI monitoring; 5-yr assessments of NPDES permits
- USGS (historical)

* - "regional", ambient monitoring

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TMDL Targets and Reduction

Nitrate-Nitrite	Rock Springs	Rock Springs Run	Wekiwa Springs	Upper Wekiva River	Lower Wekiva River
Existing Mean (highest nitrate monthly mean - mg/L)	**1.50**	**0.77**	**1.34**	**0.88**	**0.54**
Target Nitrate Concentration (mg/L)	**0.286**	**0.286**	**0.286**	**0.286**	**0.286**
Percent Reduction	**81%**	**63%**	**79%**	**68%**	**47%**
Total Phosphorus	Rock Springs	Rock Springs Run	Wekiwa Springs	Upper Wekiva River	Lower Wekiva River
Existing (highest TP monthly mean – mg/L)	**0.084**	**0.153**	**0.181**	**0.168**	**0.150**
Target TP Concentration (mg/L)	**0.065**	**0.065**	**0.065**	**0.065**	**0.065**
Percent reduction	**23%**	**58%**	**64%**	**61%**	**57%**

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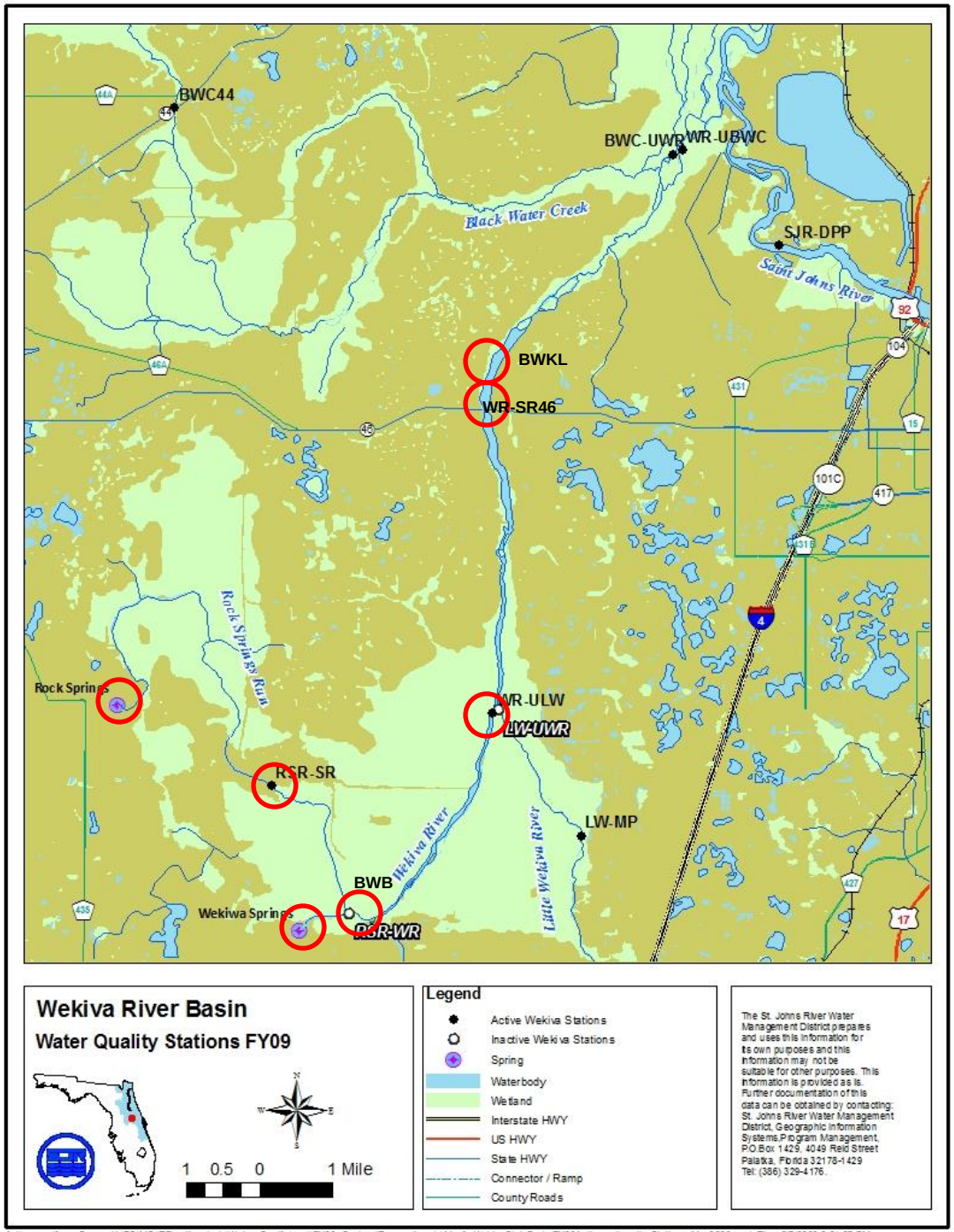

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Water Quality Analytes Measured (SJRWMD)

Field Parameters (On-site Measurements)	Water Quality (Laboratory Analysis)	Water Quality (Laboratory Analysis)
pH	Alkalinity	Si-T (Silicon-T)
Dissolved Oxygen (DO)	Ca-T (Calcium-T)	Sulfate
Conductivity	Cl (Chloride)	Total Dissolved Solids
Secchi Depth	Color	Dissolved Kjeldahl Nitrogen
Depth of Collection	Dissolved Organic Carbon	Total Kjeldahl Nitrogen
Depth of Water	Fe-T (Iron-T)	Total Organic Carbon
Air Temperature	Hardness, Calc	Dissolved Phosphorus (TP-D)
Weather	Mg-T (Magnesium-T)	Total Phosphorus (TP-T)
Cloud Cover	Dissolved Ammonia	Total Suspended Solids
Wind Speed	Total Ammonia	Turbidity
Wind Direction	Total Nitrate/Nitrite (NOx-T)	
Water Temperature	Dissolved Orthophosphate	
	Total Orthophosphate	

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Water Quality Analytes Presented

- Conductivity – basic water chemistry
- Dissolved O_2 – aquatic life support
- Turbidity – water clarity
- NOx and TP – nutrient status

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Spring Water Quality

- Wekiwa Springs
- Rock Springs

SJRWMD, USGS, and FDEP/FGS
data combined

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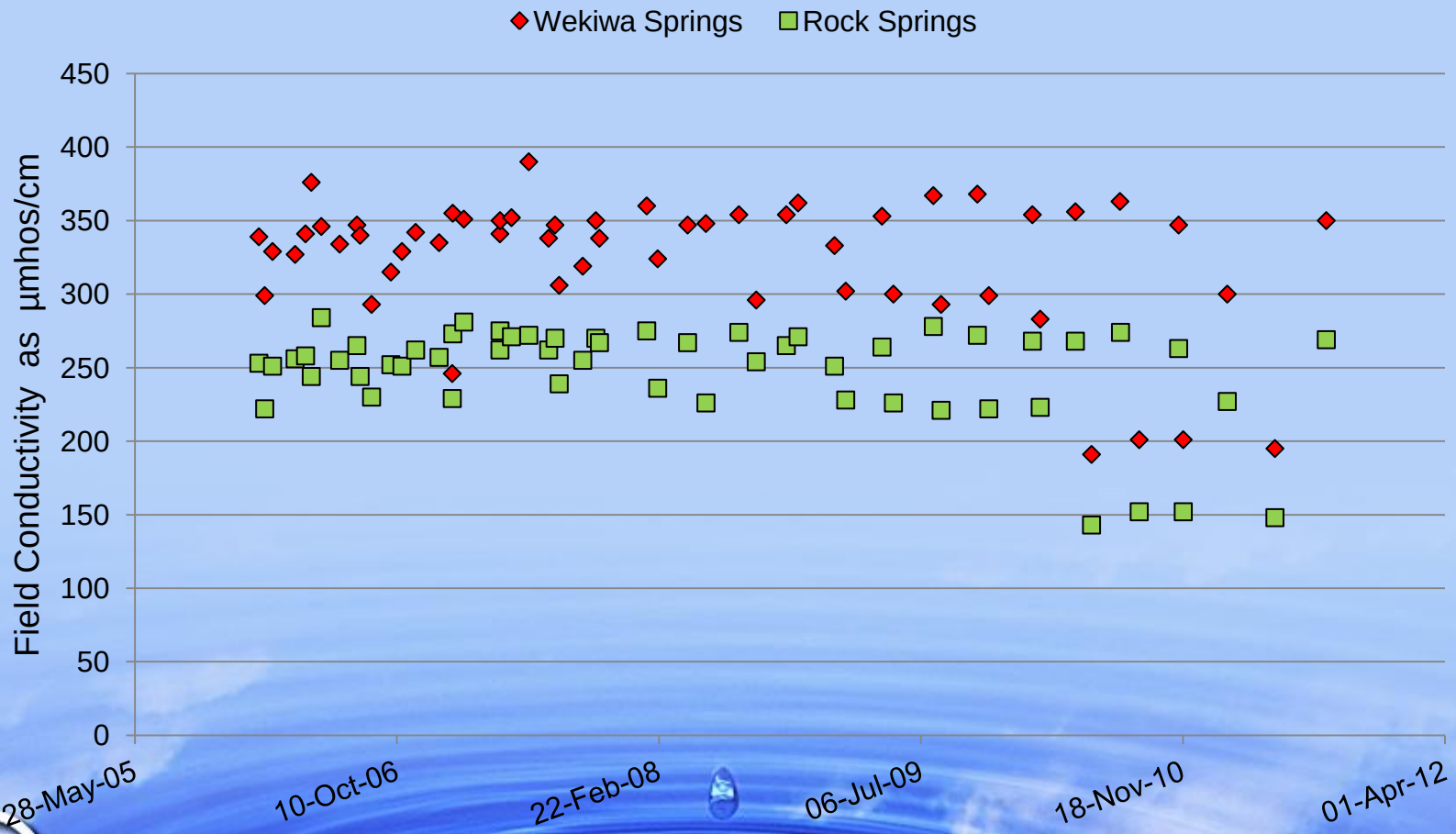
Conductivity



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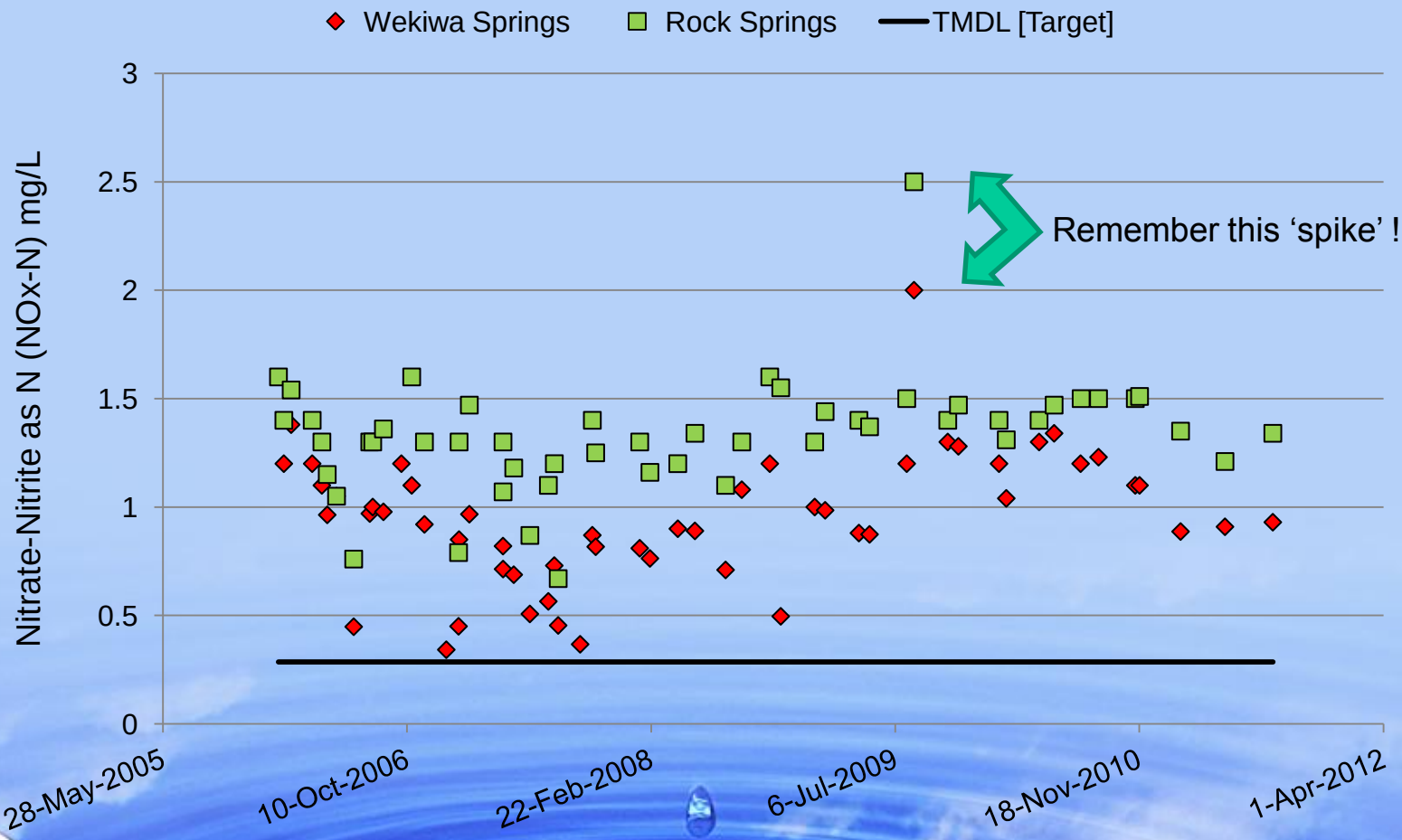
Conductivity – measure of the dissolved ionic content

Nitrate



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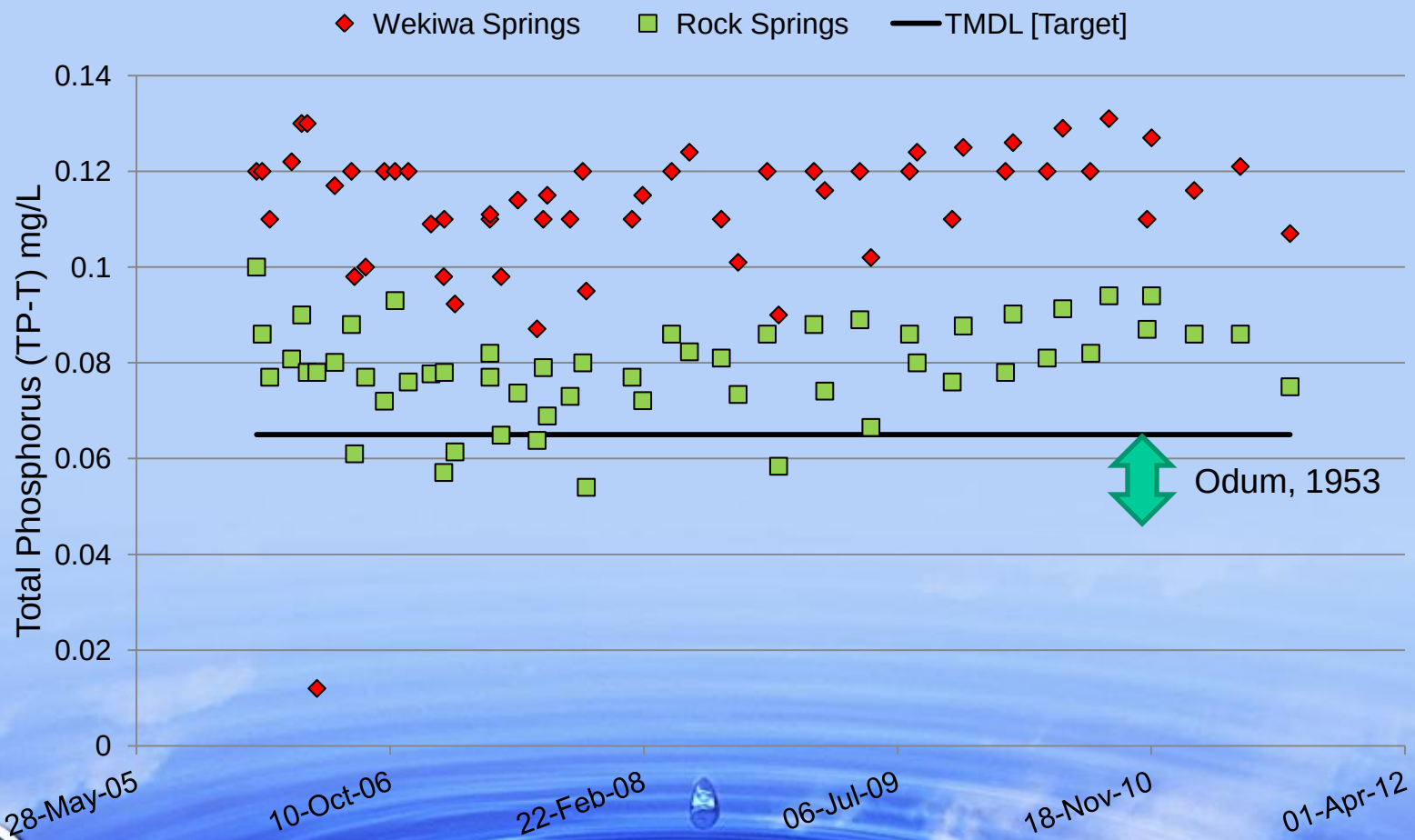
Total Phosphorus



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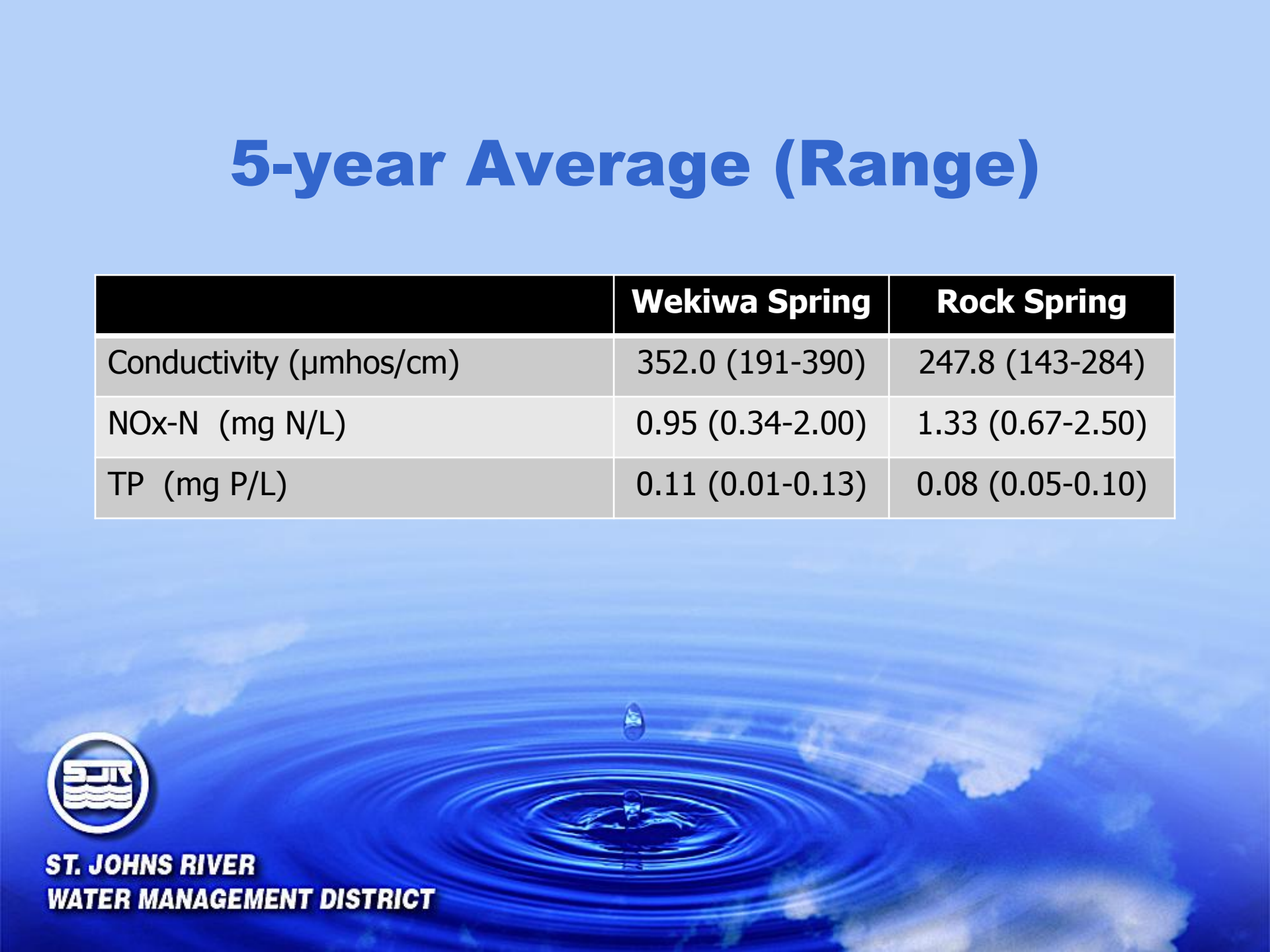
5-year Average (Range)

	Wekiwa Spring	Rock Spring
Conductivity (µmhos/cm)	352.0 (191-390)	247.8 (143-284)
NOx-N (mg N/L)	0.95 (0.34-2.00)	1.33 (0.67-2.50)
TP (mg P/L)	0.11 (0.01-0.13)	0.08 (0.05-0.10)



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Stream Water Quality

- Wekiva River[1] (ULW and SR-46)
- Wekiva River[2] (BWB and BWKL)
- Rock Springs Run (BWKP[2] and SR[1])

SJRWMD[1] and OCEPD[2] data

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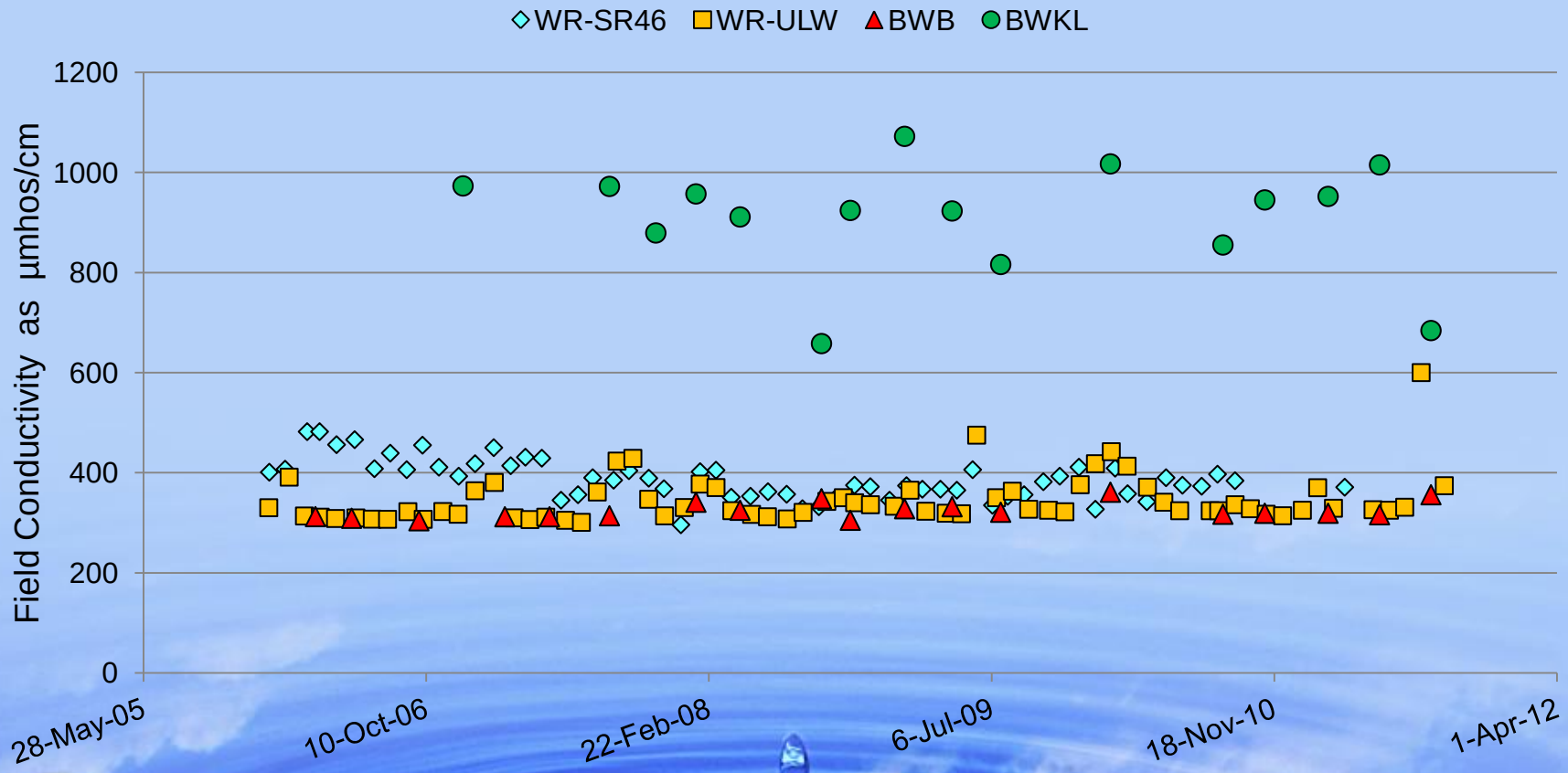
Wekiva River Conductivity



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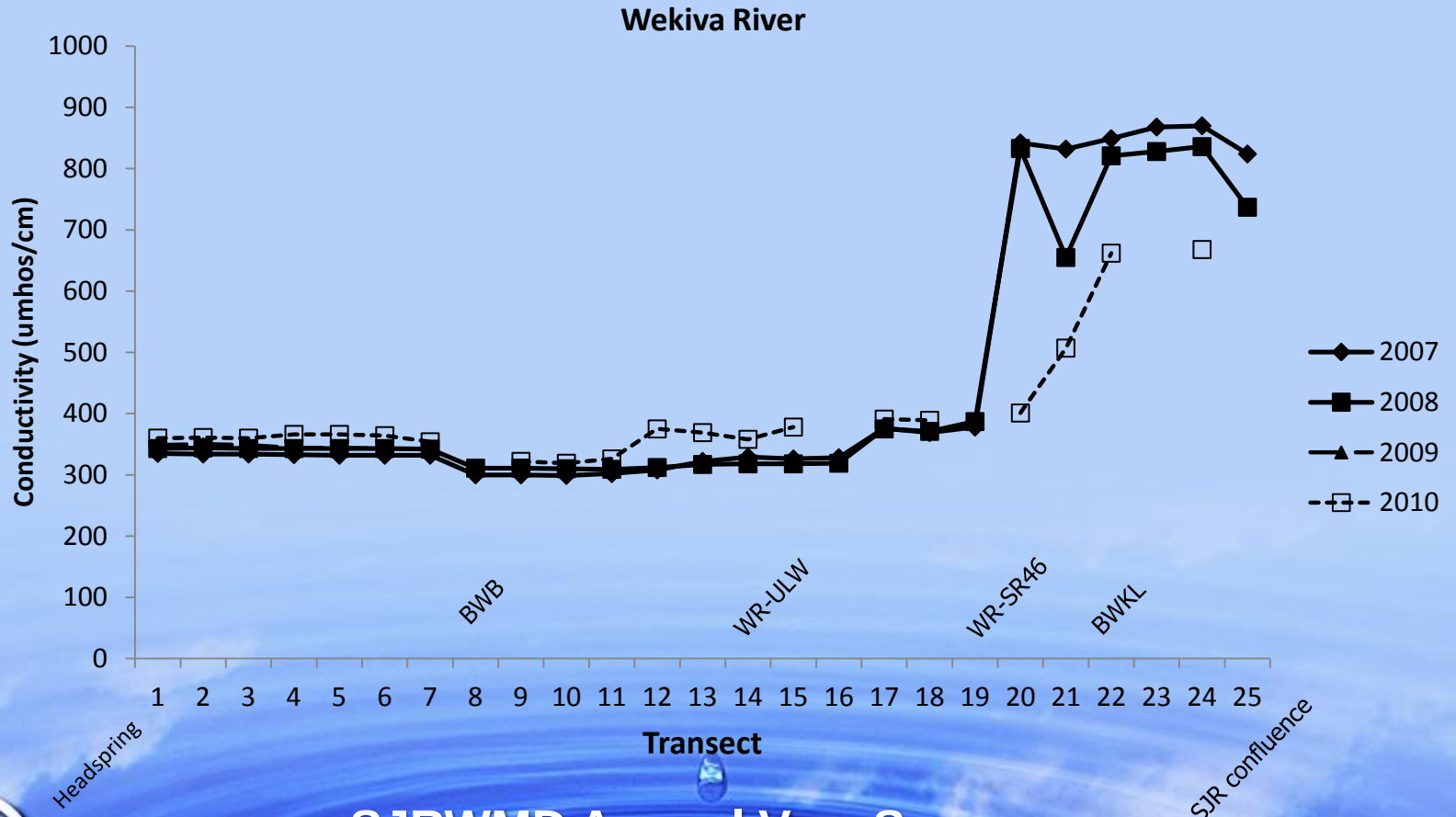
Conductivity Profile – Wekiva River



SJRWMD Annual Veg. Surveys

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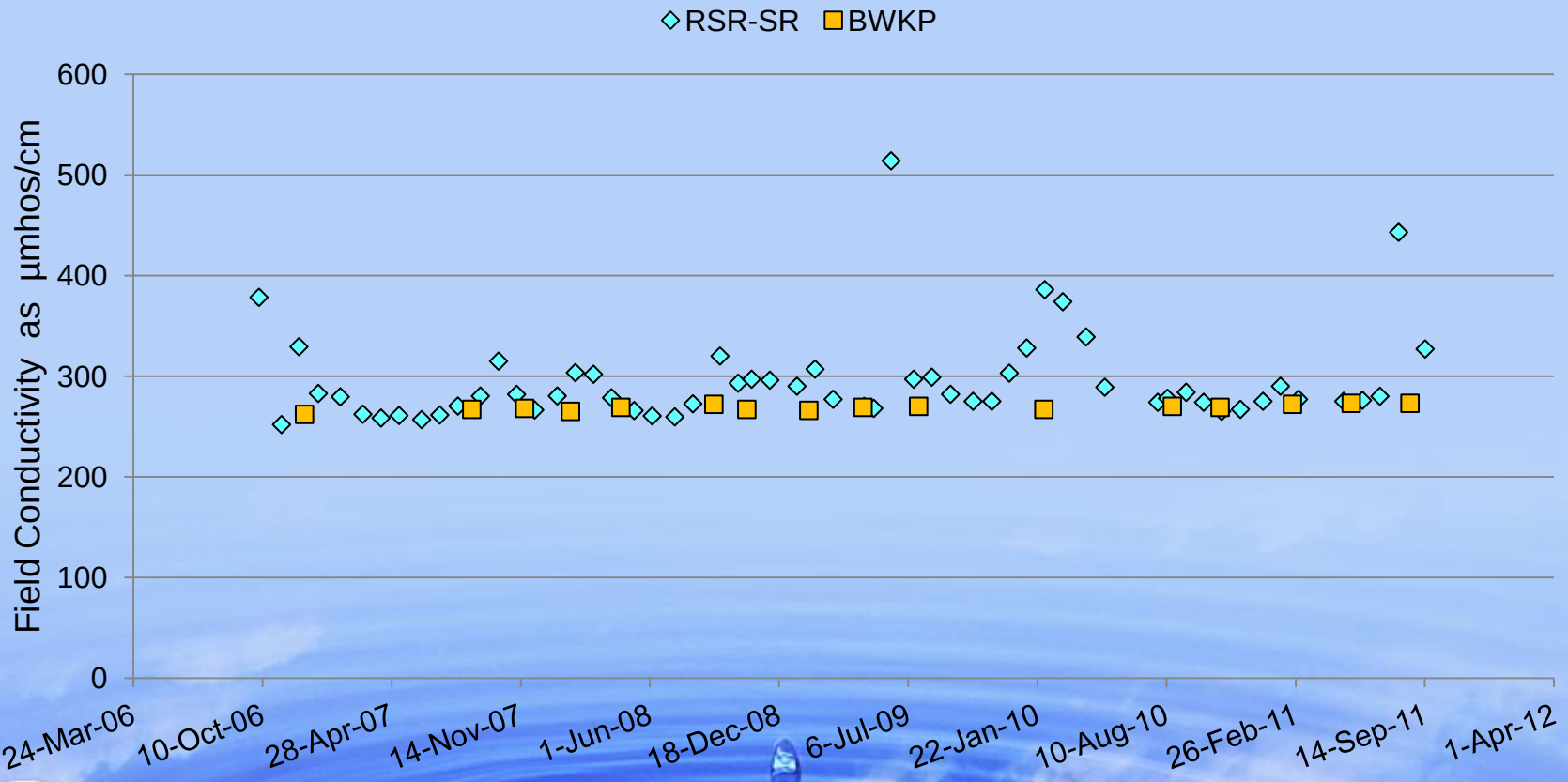
Rock Springs Run Conductivity



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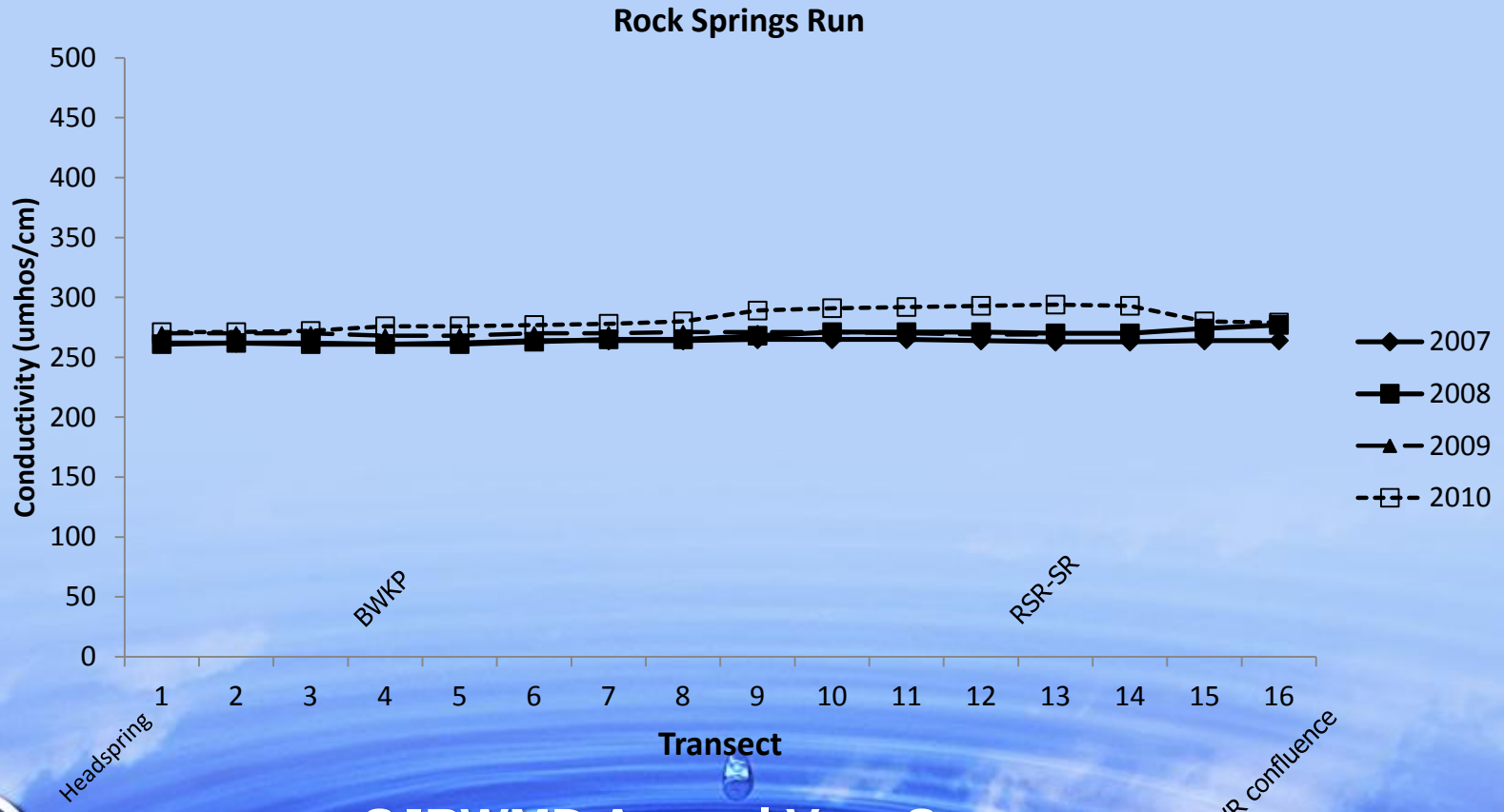
Conductivity Profile - RSR



SJRWMD Annual Veg. Surveys

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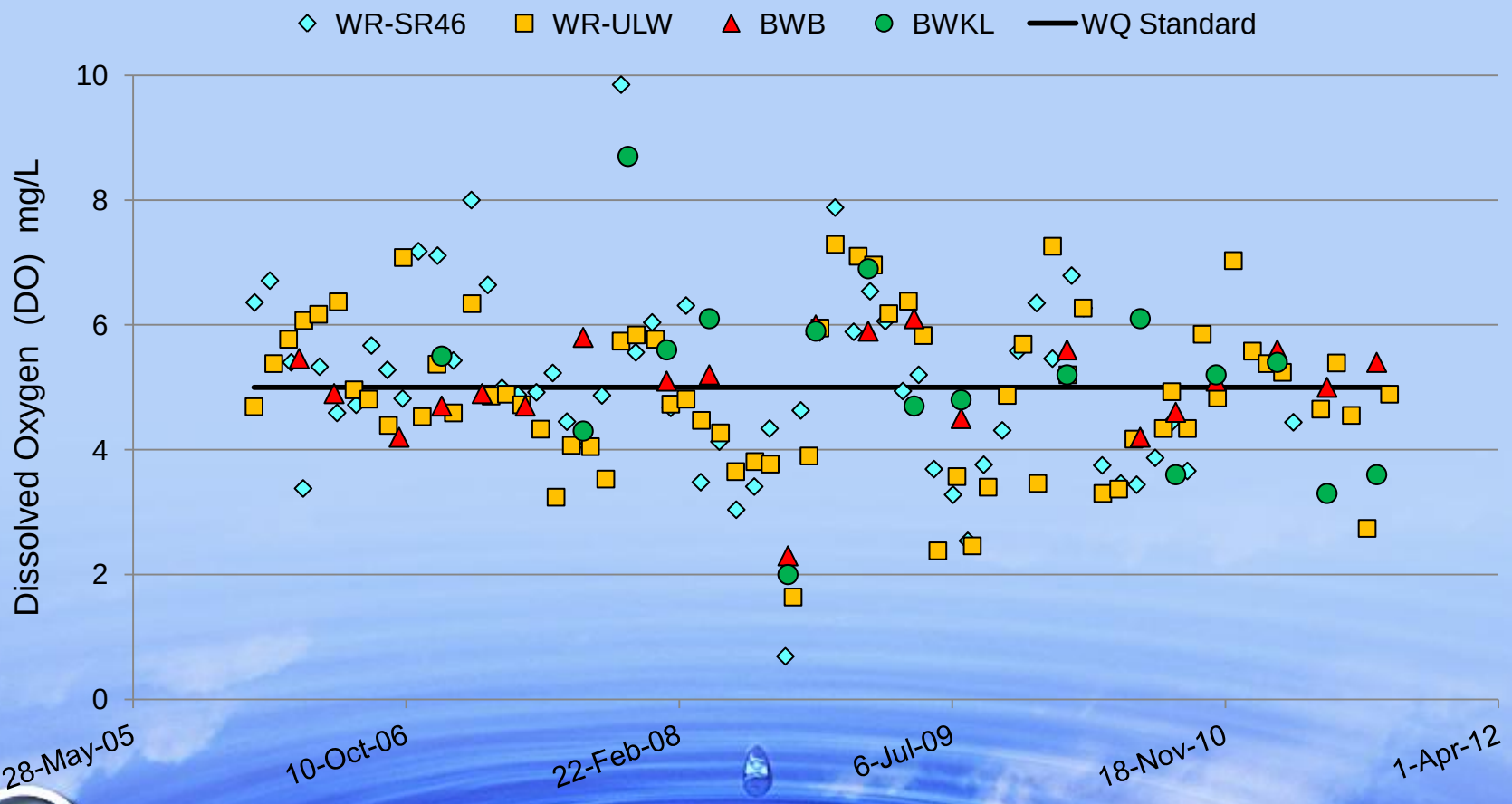
Wekiva River DO



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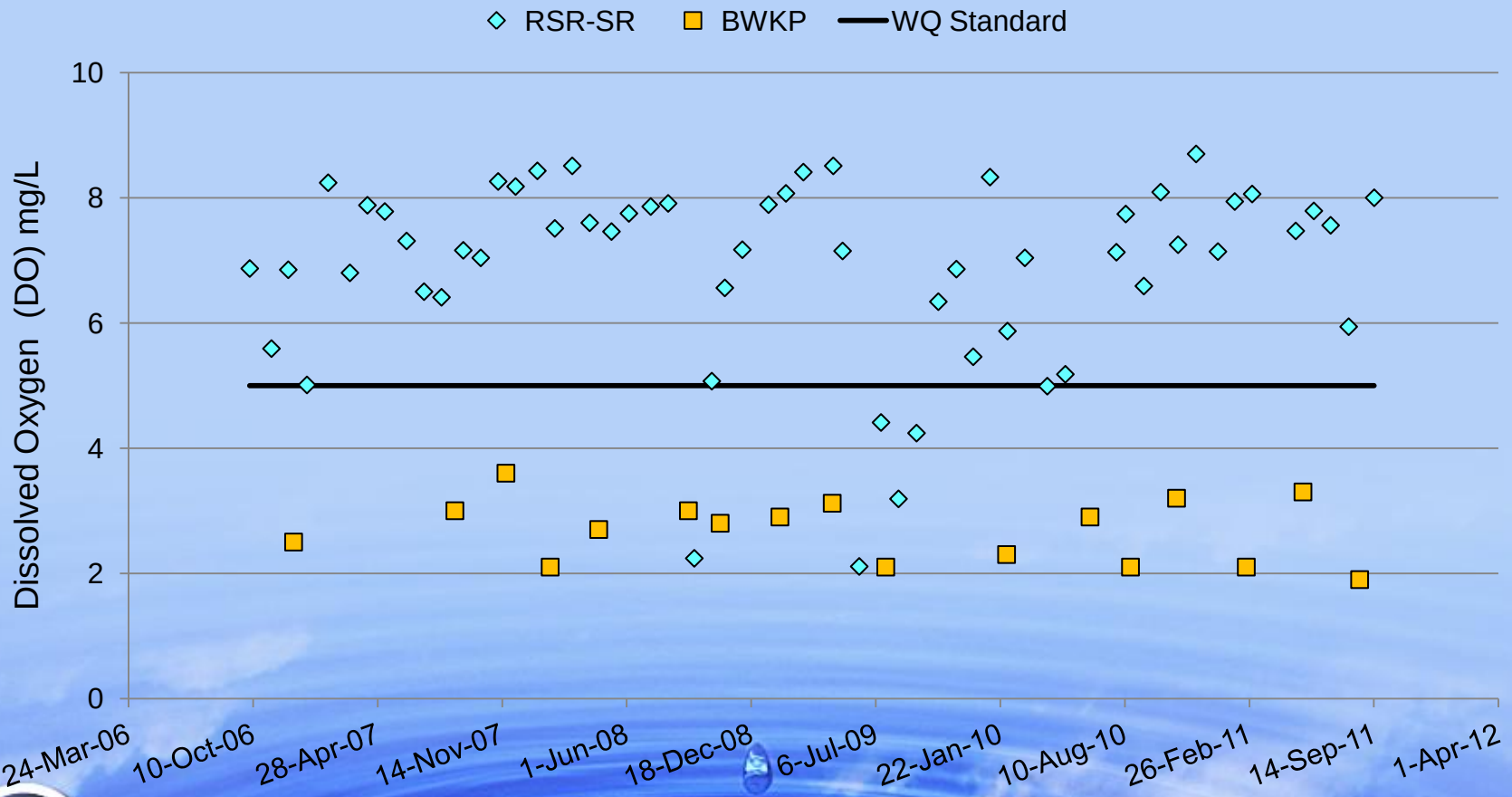
Rock Springs Run DO



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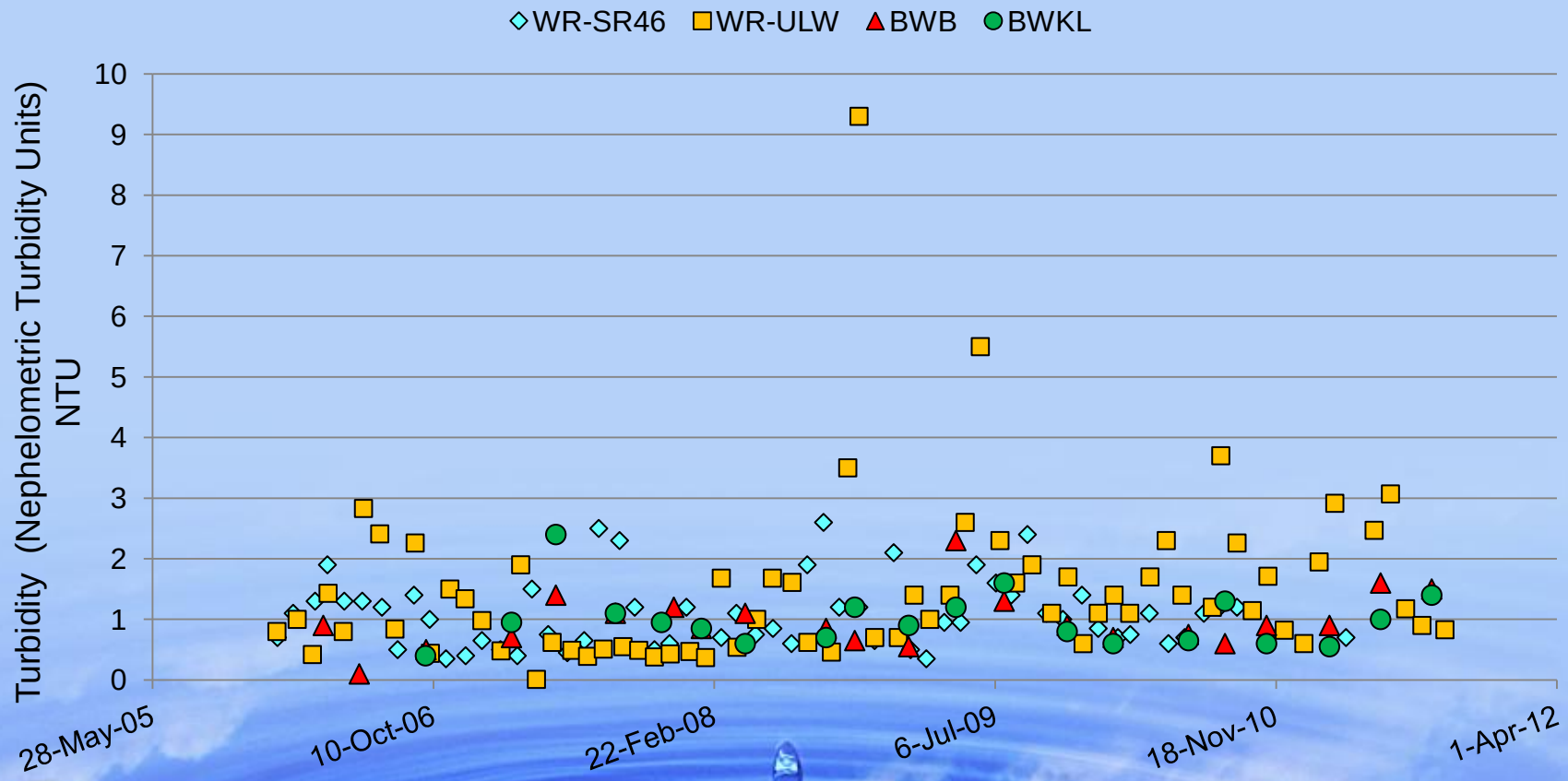
Wekiva River Turbidity



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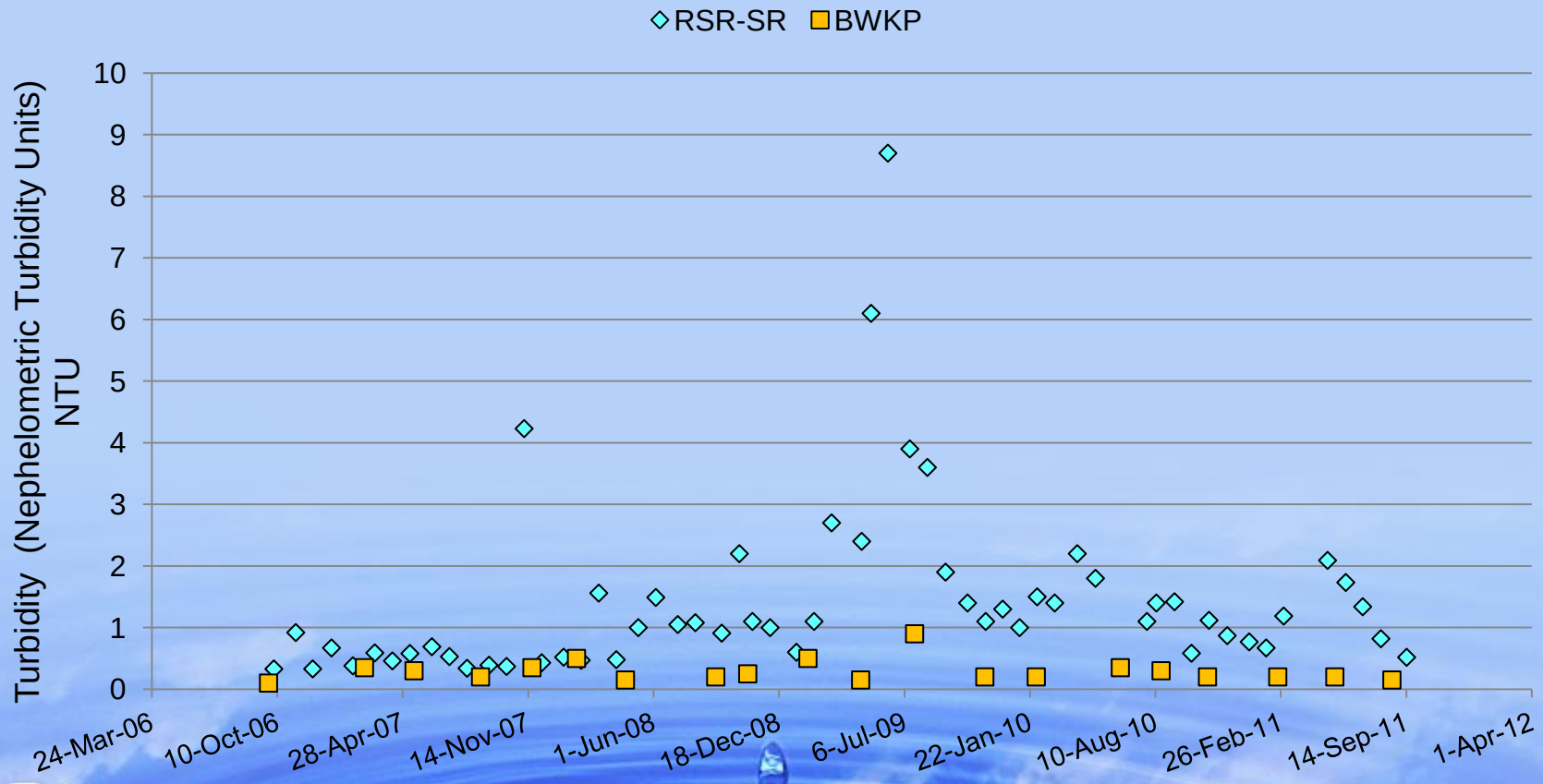
Turbidity – measure of amount of suspended material in water

Rock Springs Run Turbidity



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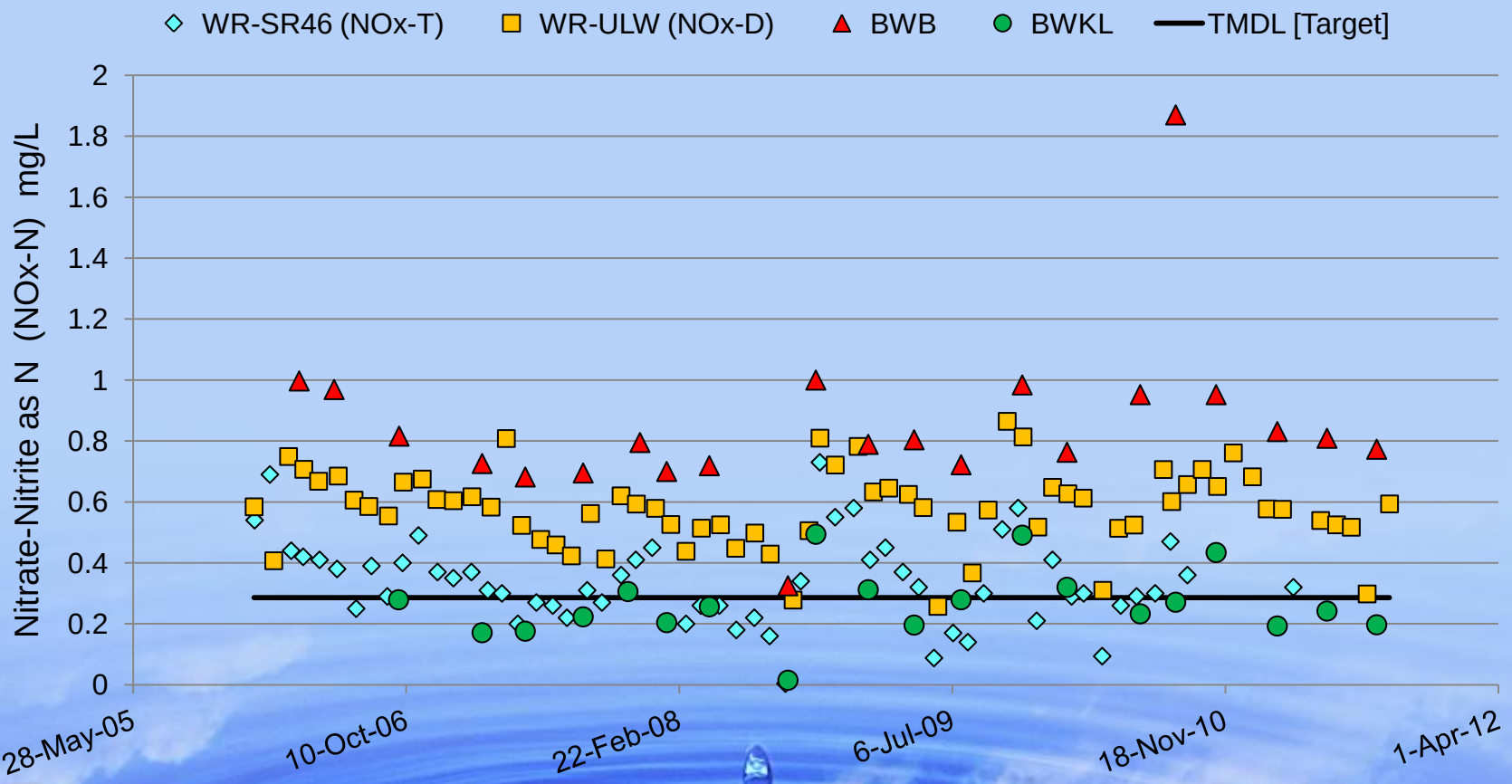
Wekiva River Nitrate



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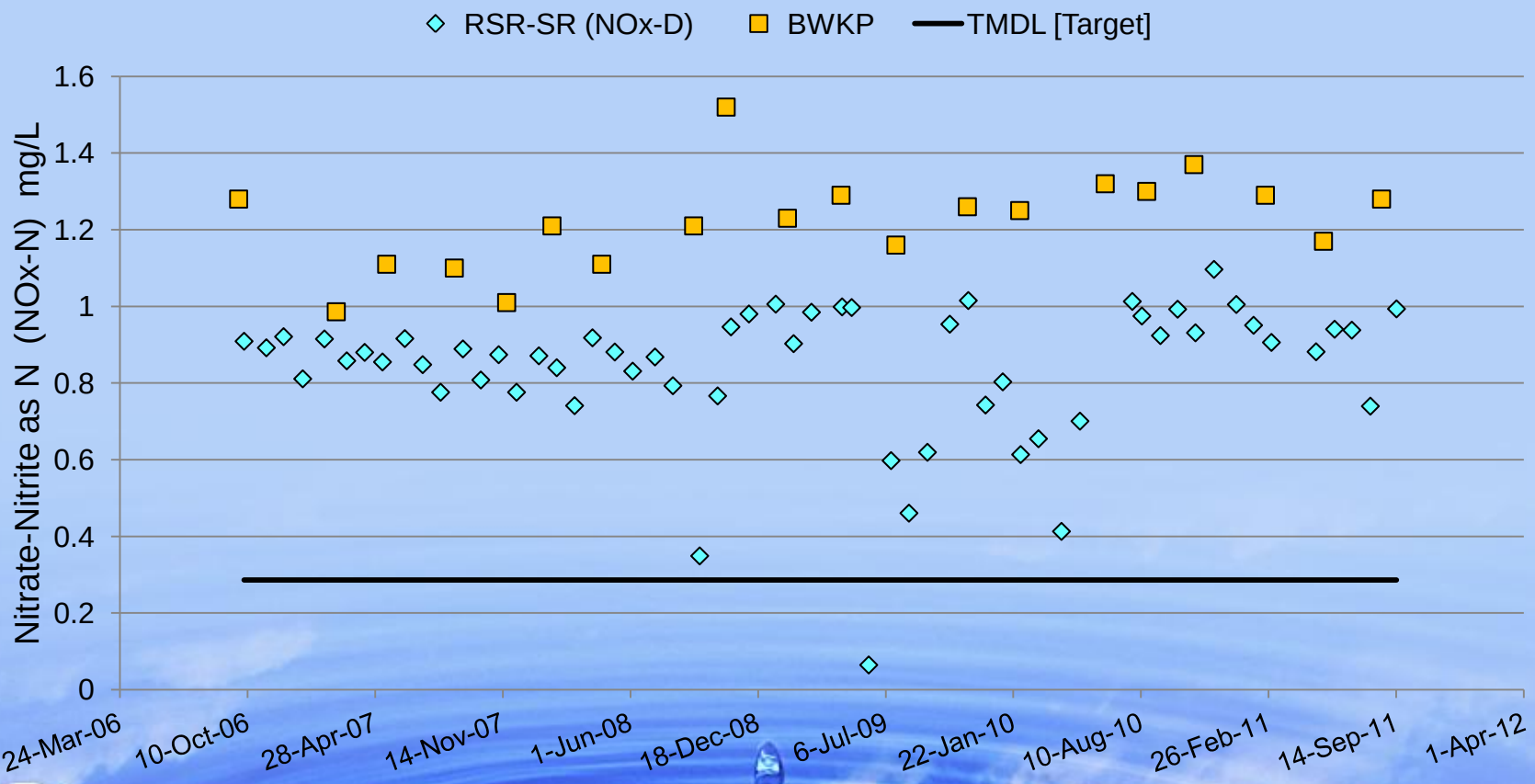
Rock Springs Run Nitrate



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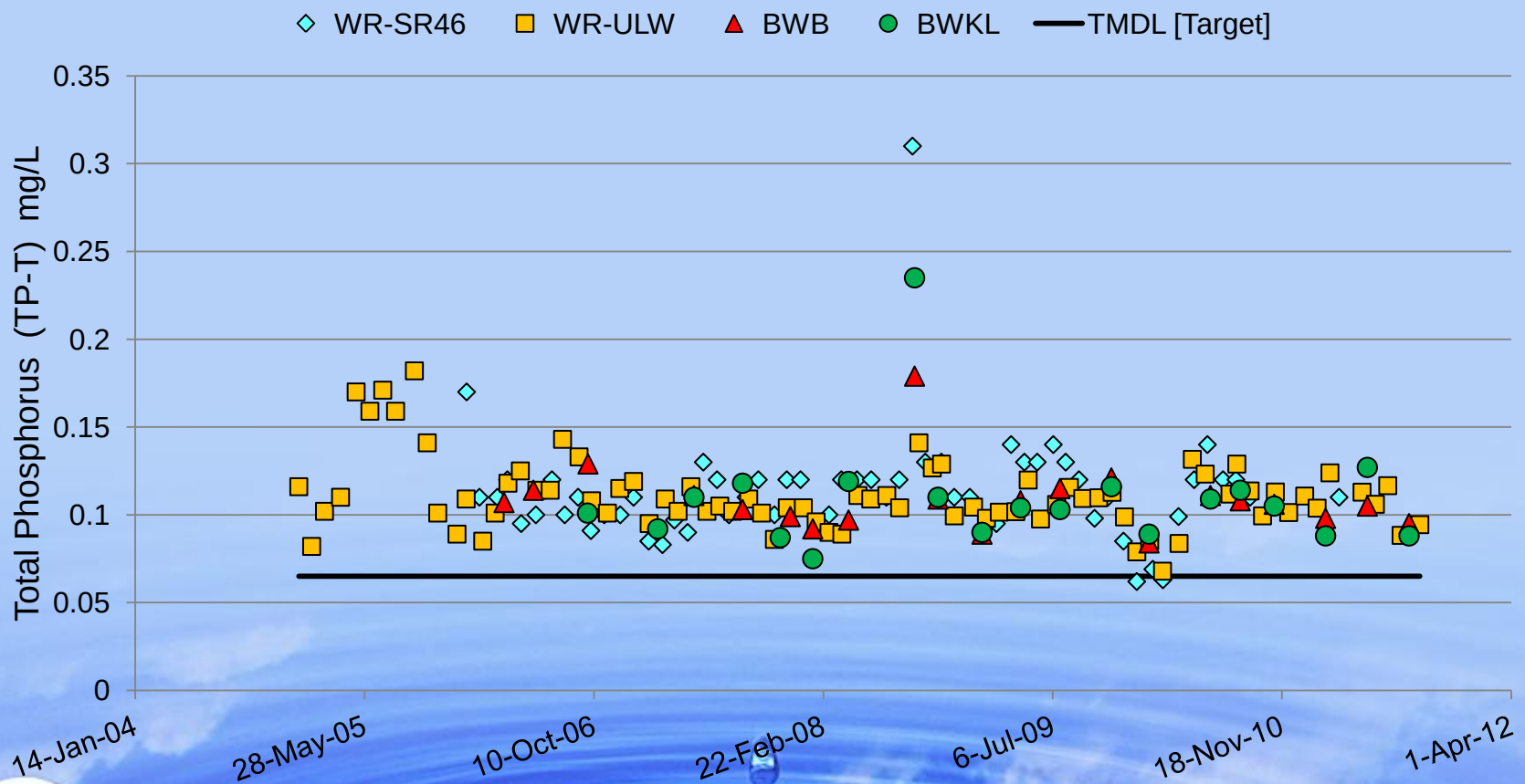
Wekiva River Total Phosphorus



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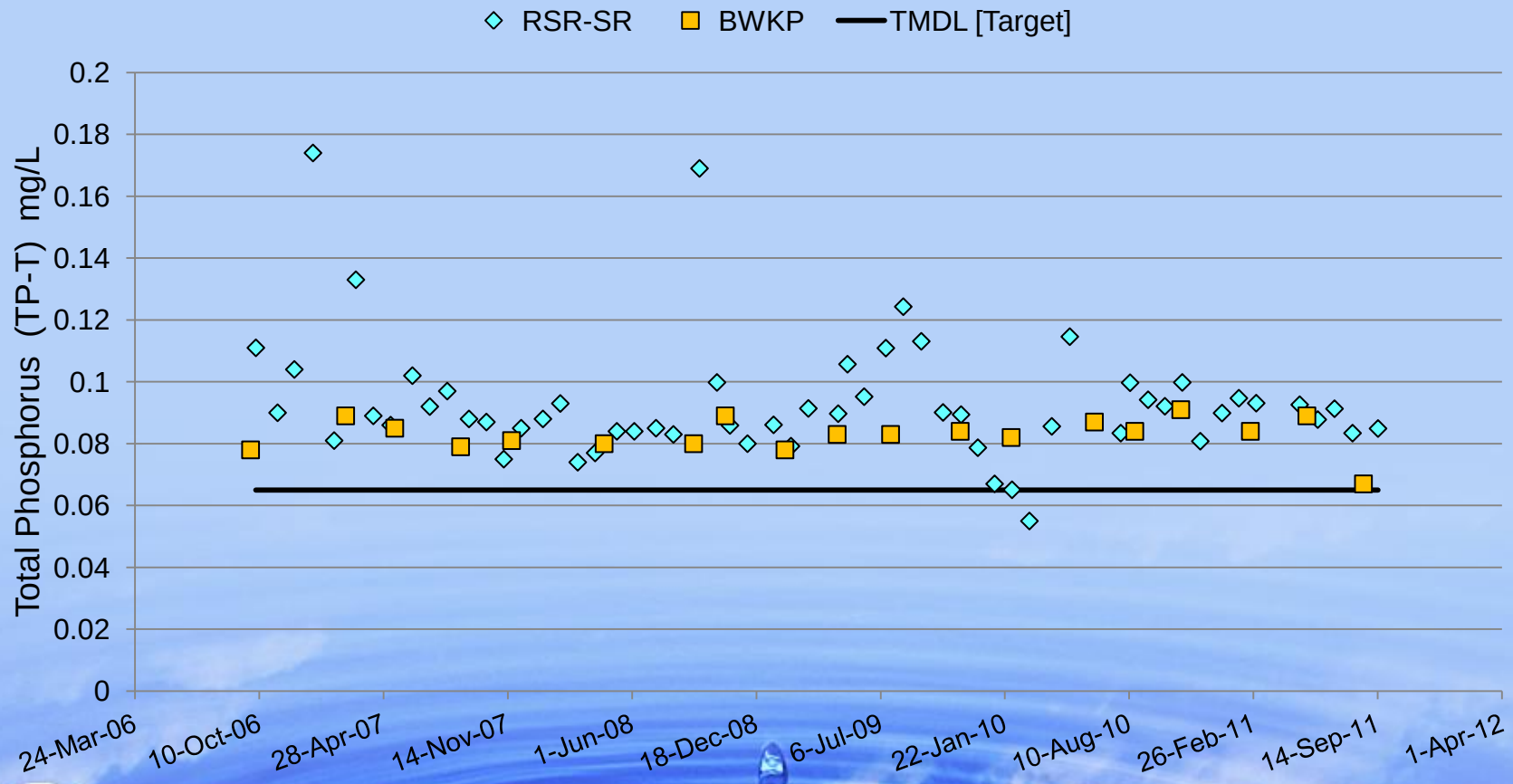
Rock Springs Run Total Phosphorus



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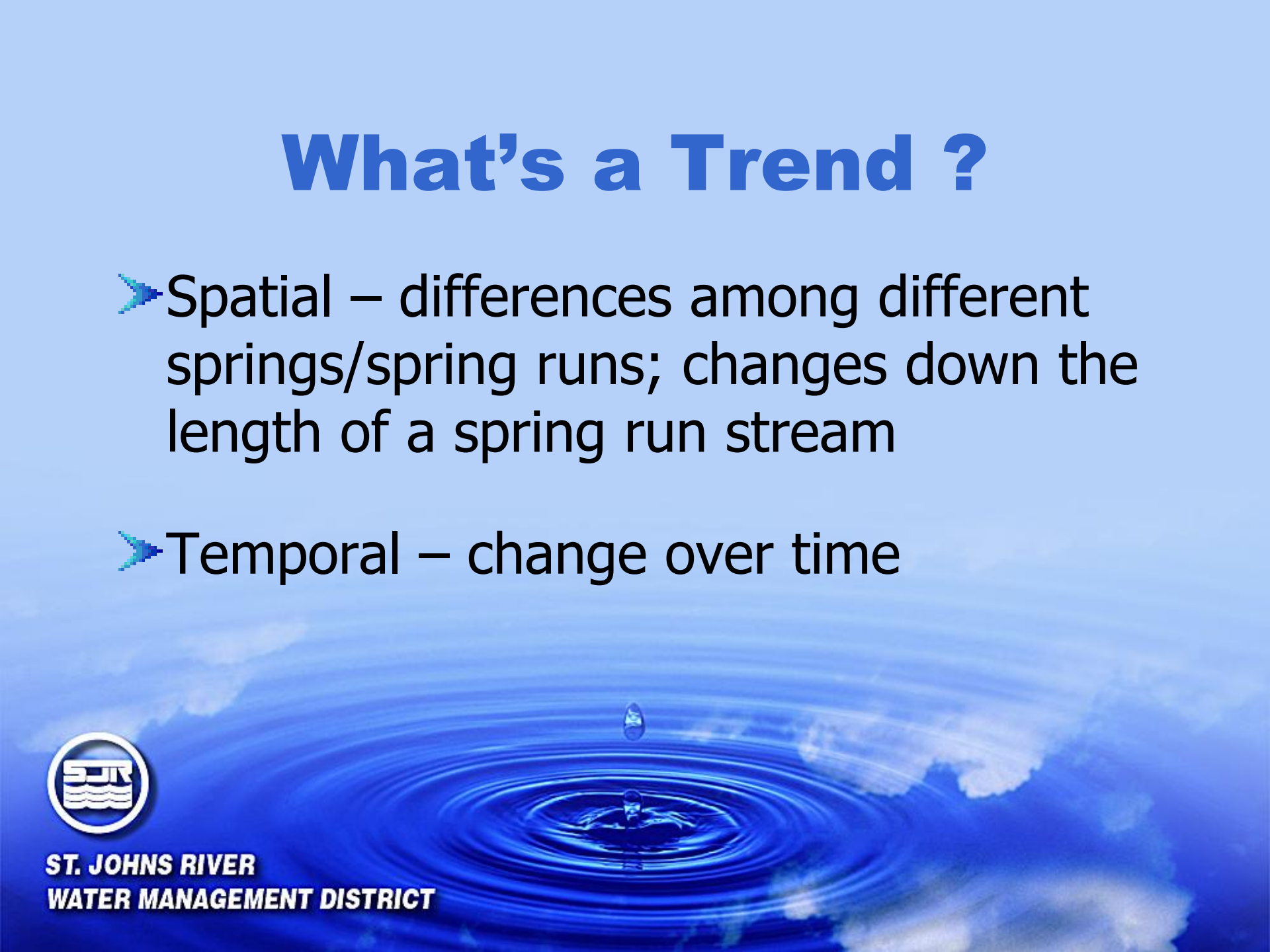
5-year Average (Range)

OCEPD	BWB	BWKL	BWKP
Conductivity (µmhos/cm)	323.8 (304-361)	909.6 (658-1072)	268.7 (262-273)
Dissolved O_2 (mg/L)	5.01 (2.30-6.10)	5.11 (2.00-8.70)	2.68 (1.90-3.60)
Turbidity (NTU)	0.97 (0.10-2.30)	0.99 (0.40-2.40)	0.29 (0.10-0.90)
NOx-N (mg N/L)	0.85 (0.33-1.87)	0.26 (0.02-0.49)	1.22 (0.99-1.52)
TP (mg P/L)	0.11 (0.08-0.18)	0.11 (0.08-0.24)	0.08 (0.07-0.09)

SJRWMD	WR-ULW	WR-SR46	RSR-SR
Conductivity (µmhos/cm)	344.9 (300.8-600)	387 (296-482)	295.2 (251.9-514)
Dissolved O_2 (mg/L)	4.90 (1.64-7.29)	5.06 (0.69-9.85)	6.89 (2.11-8.70)
Turbidity (NTU)	1.48 (0.01-9.30)	1.08 (0.35-2.60)	1.42 (0.33-8.70)
NOx-N (mg N/L)	0.58 (0.26-0.86)	0.34 (<0.01-0.73)	0.84 (0.06-1.10)
TP (mg P/L)	0.11 (0.07-0.18)	0.11 (0.06-0.31)	0.09 (0.06-0.17)

What's a Trend ?

- Spatial – differences among different springs/spring runs; changes down the length of a spring run stream
- Temporal – change over time



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Long-Term Temporal Trends

What did the springs used to be ?

What has been happening over time ?

What are the springs now ?

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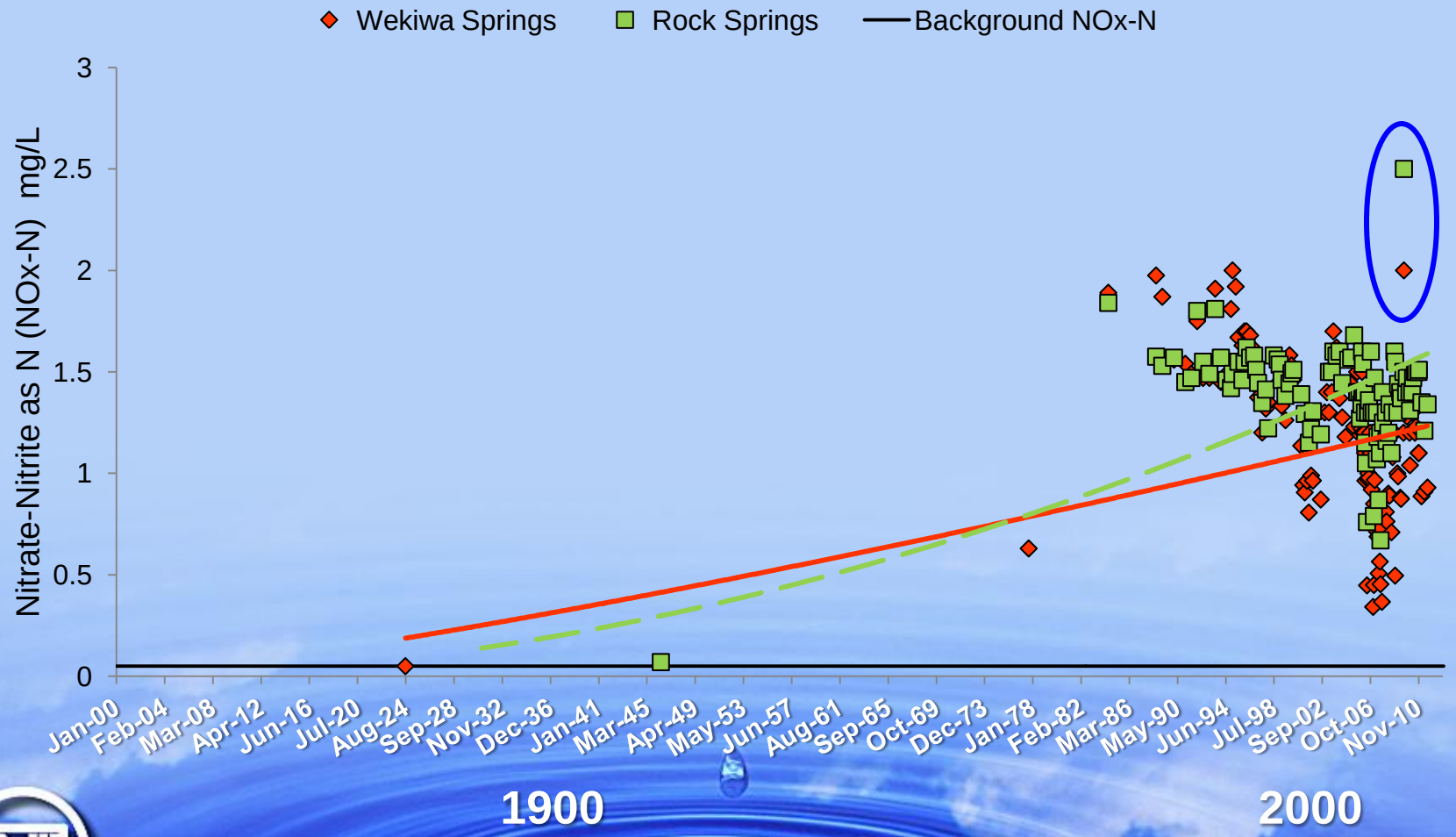
Long-term nitrate trends



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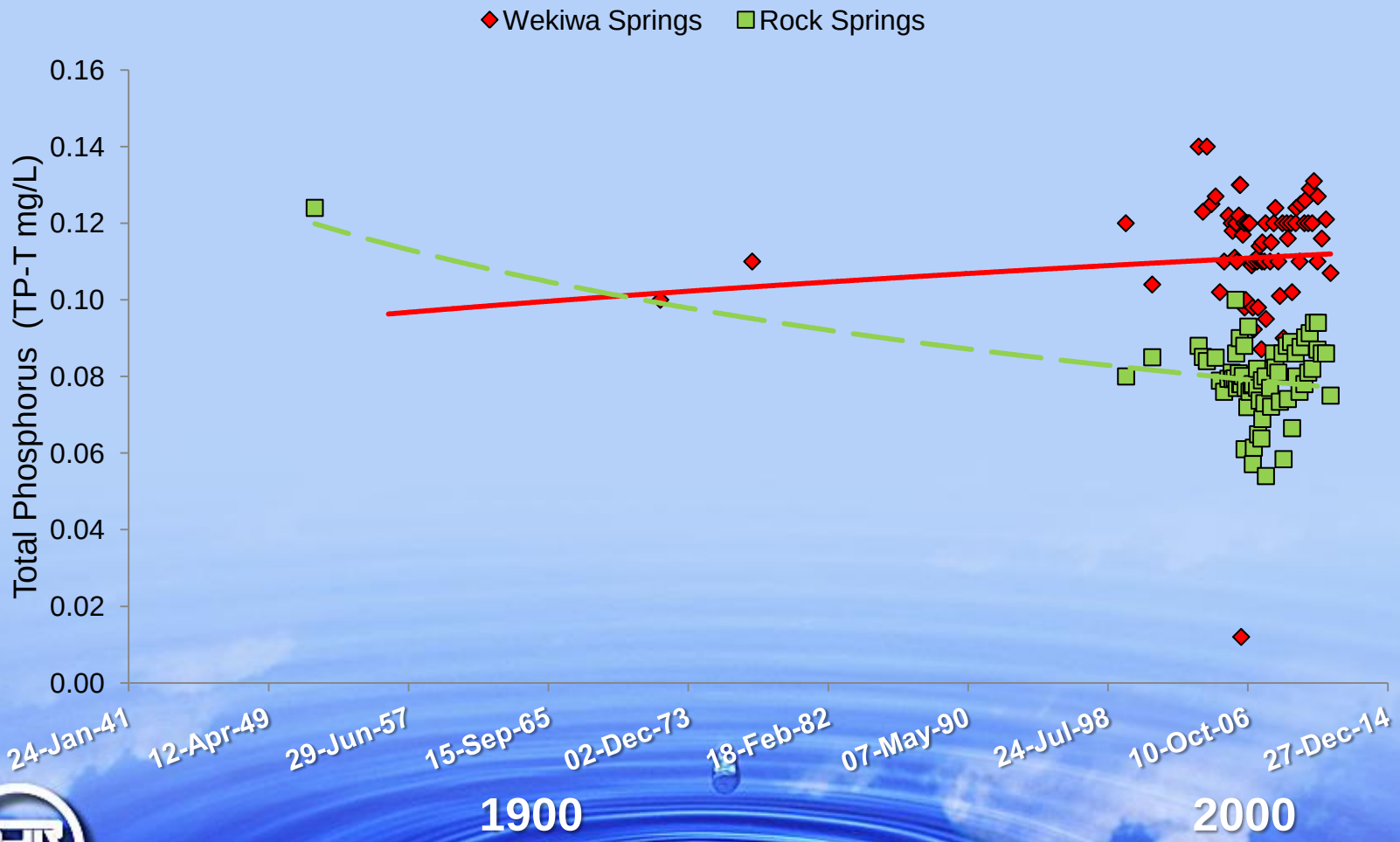
Long-term phosphorus trends



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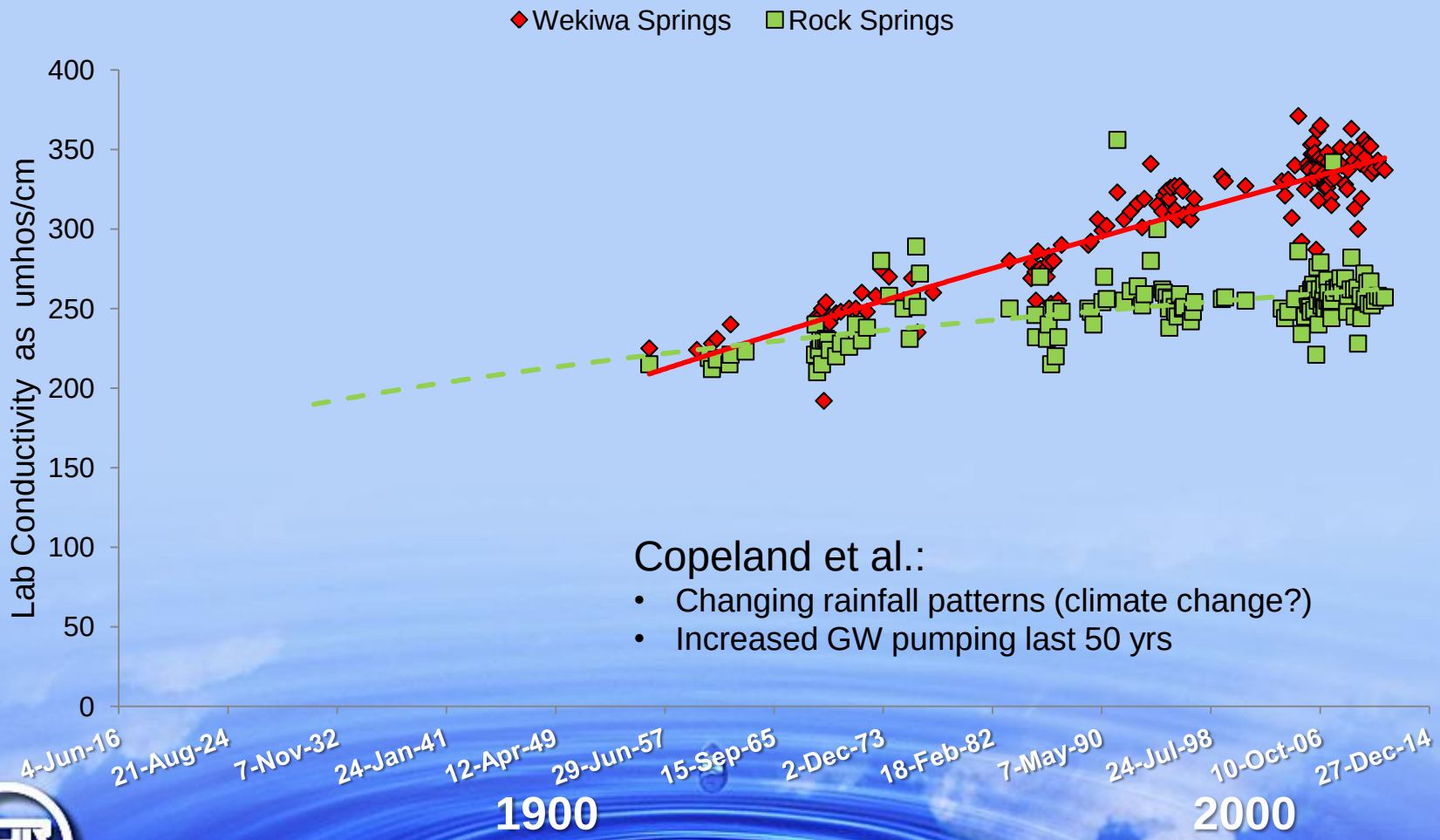
Long-term [ionic] trends



Copeland et al.:

- Changing rainfall patterns (climate change?)
- Increased GW pumping last 50 yrs

Copeland, R., et al. 2009. ***Regional and Statewide Trends in Florida's Spring and Well Groundwater Quality (1991-2003)***. Fla. Geol. Survey Bulletin No. 69. (Updated 2011)

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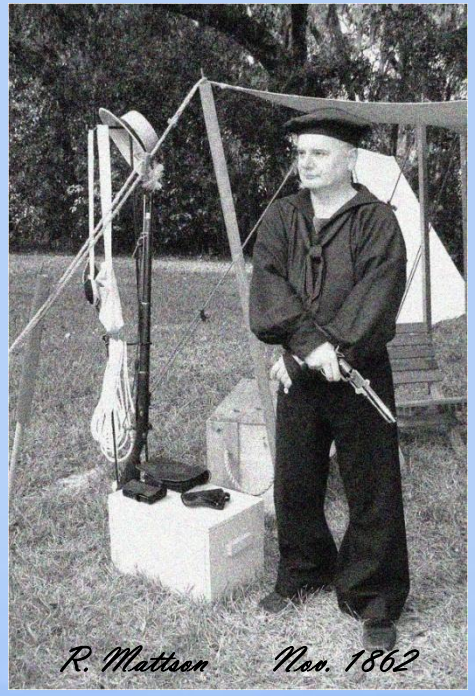
Summary

- [NOx] in the headsprings drives (in part) what's in the streams
- [NOx & TP] at this time are usually above the established TMDL targets (springs & streams)
- NOx in both springs appears to be associated with "younger" water; reflecting loading from current land uses

Summary

- TP in both springs appears to, in part, also come from landscape loading (human origin); P also derived from watershed loading downstream
- DO levels in Wekiva River frequently fall below WQ standard (mostly due to natural events)
- Conductivity in Wekiwa Springs indicates more of its flow consists of "older" water from deeper w/in the Floridan Aquifer



Contact

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Vegetation Survey Work

Wekiva River

Rock Springs Run

Alexander Springs Creek

Juniper Creek

Silver Glen Run

Blue Spring Run

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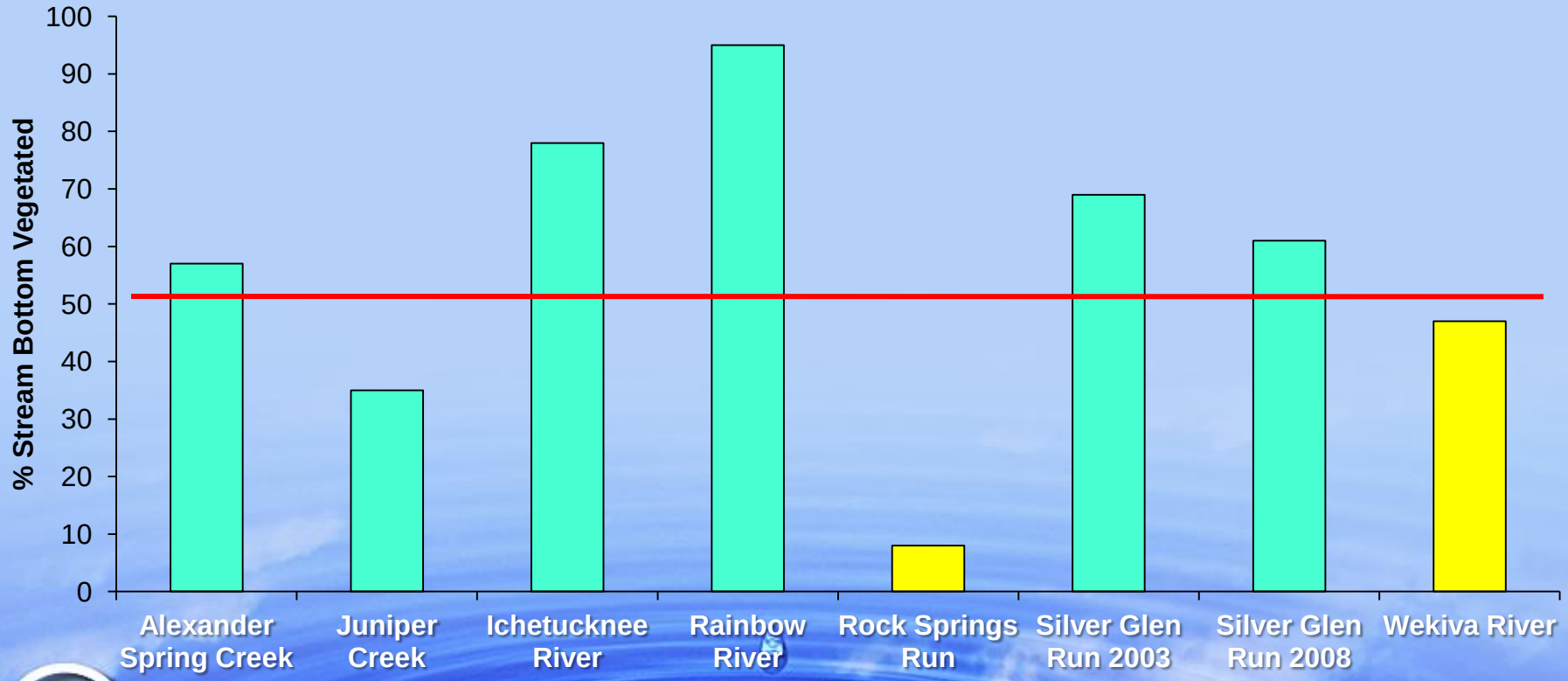
Spring Run SAV Cover

(SAV acres/Total bottom acres)



Map data from various studies
SJRWMD Report in prep.

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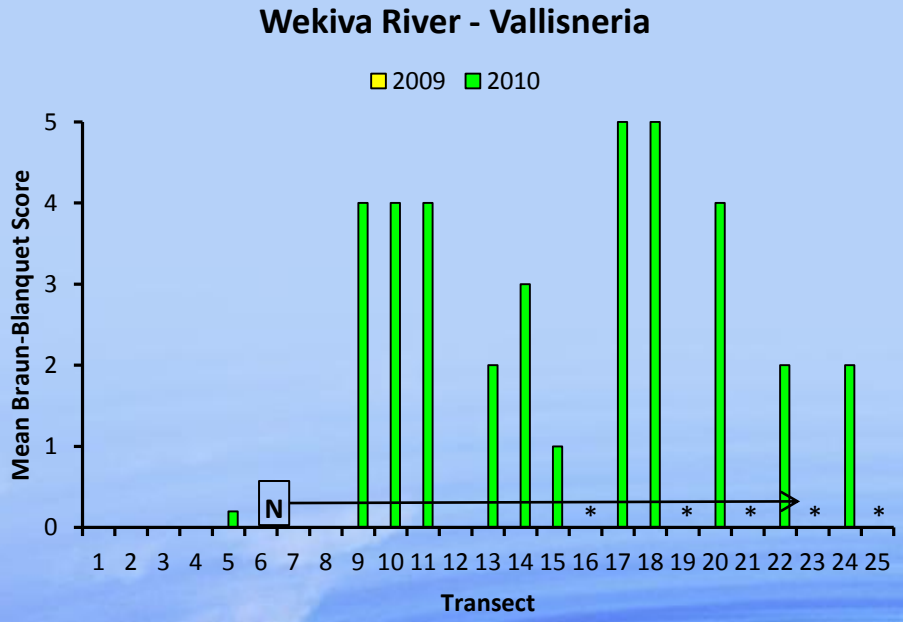
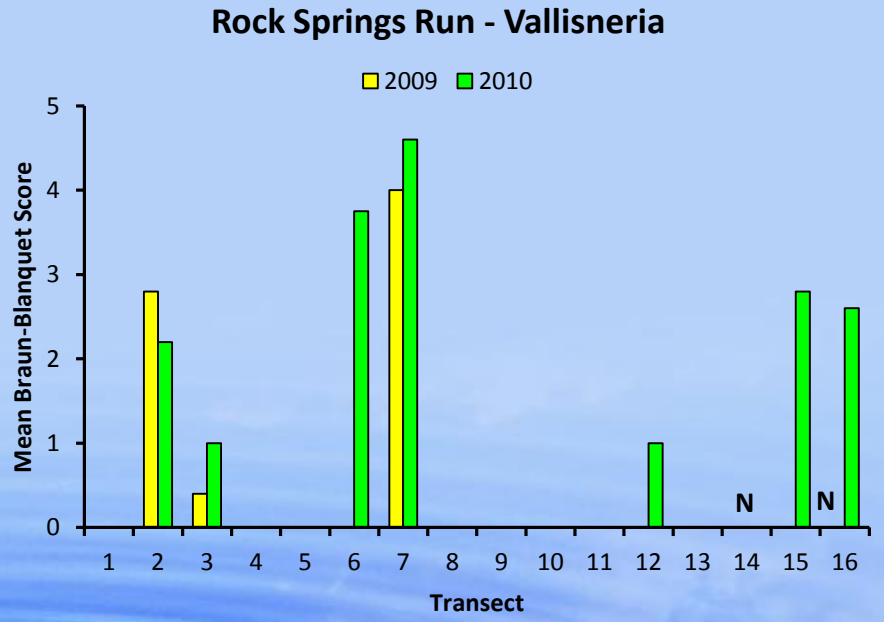
Submerged Aquatic Vegetation Survey





N = no vis 2009 * = no vis 2010

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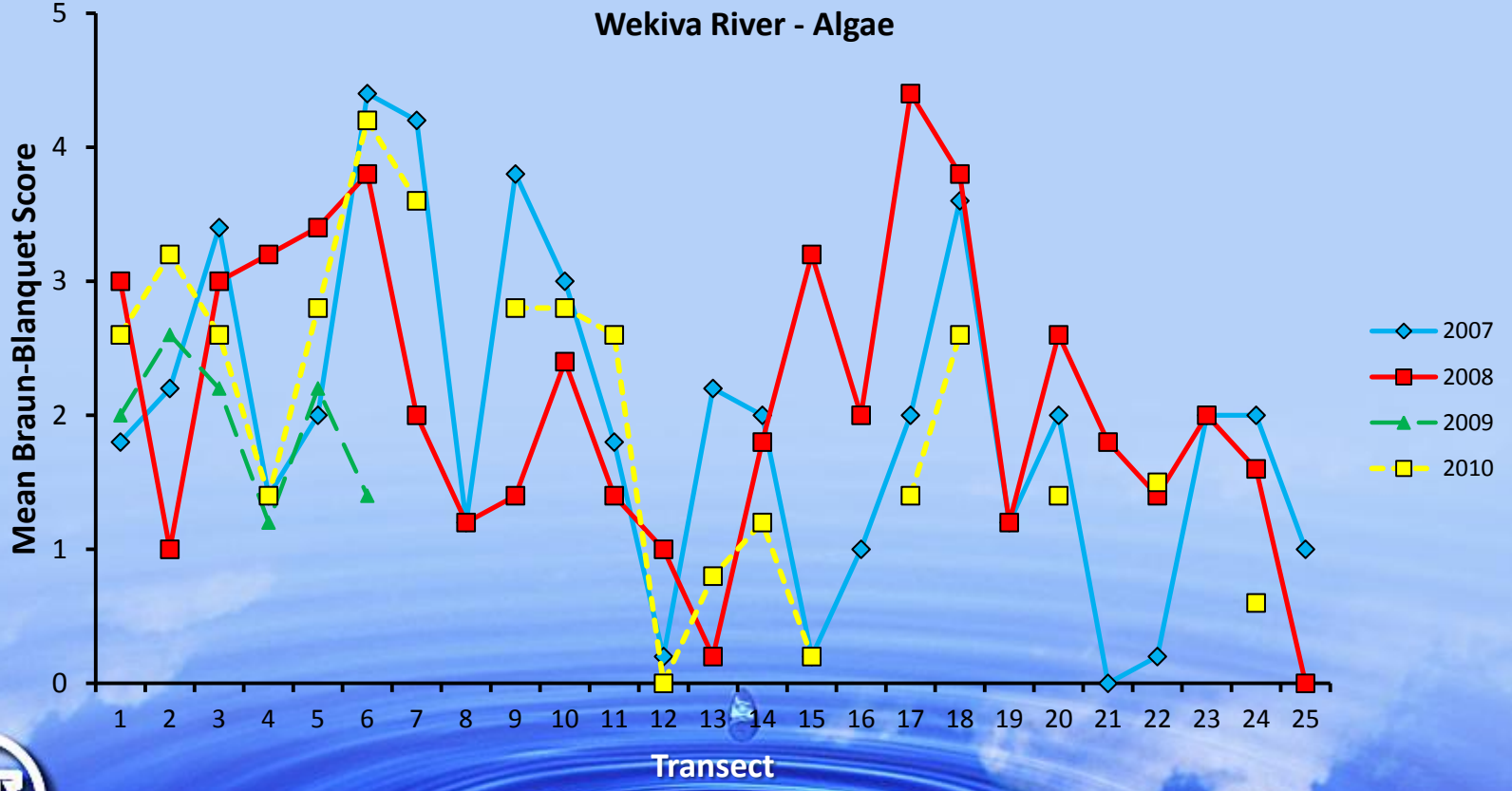
Algal Cover
(macroalgae and epiphytes)



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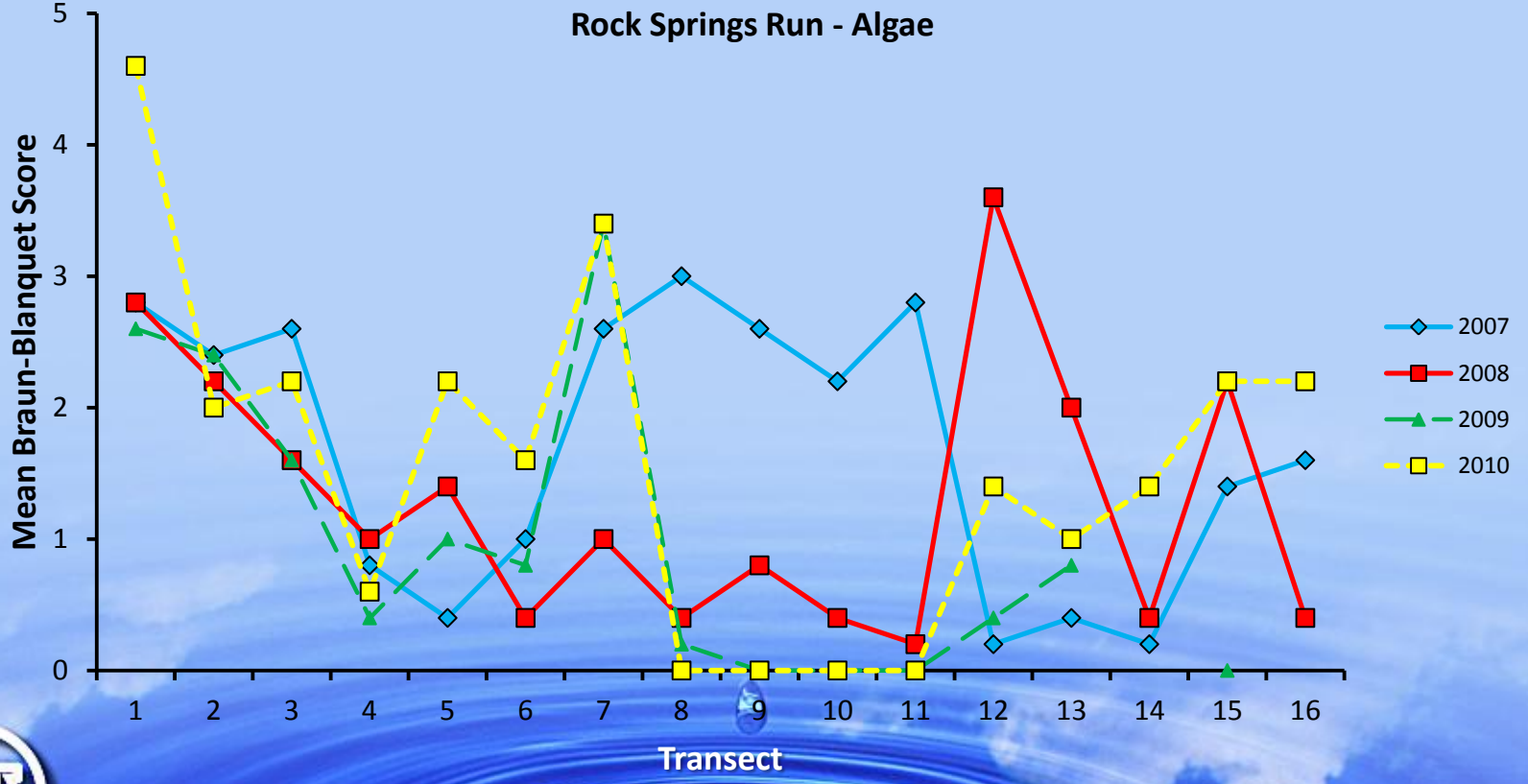
Algal Cover
(macroalgae and epiphytes)



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