Determining Spatial and Temporal Sources of Water in a Coastal Wetland System Using Geochemical Tracers, in Southeast Florida

Melaney Lara[1], René M. Price[1], Danielle E. Ogurcak[1], Michael Ross[1], Adalena Band[1], and Bahram Charkhian[2]

[1]Florida International University, Miami, FL, USA

[2]South Florida Water Management District, West Palm Beach, FL USA

Photo credit: Anthony Mora

Introduction

Biscayne Bay Coastal Wetlands (BBCW)

- Part of Comprehensive Everglades Restoration Plan
- Area of focus L31-East Flow Way
- Adjacent to Biscayne Bay (BB)
- Purpose of BBCW: rehydrate coastal wetlands and reduce point source discharge to BB impacting aquatic organisms and vegetation caused by discharges of canal water.
- Culverts and water pump stations divert canal water into L31-E Flow Way mangrove forest.

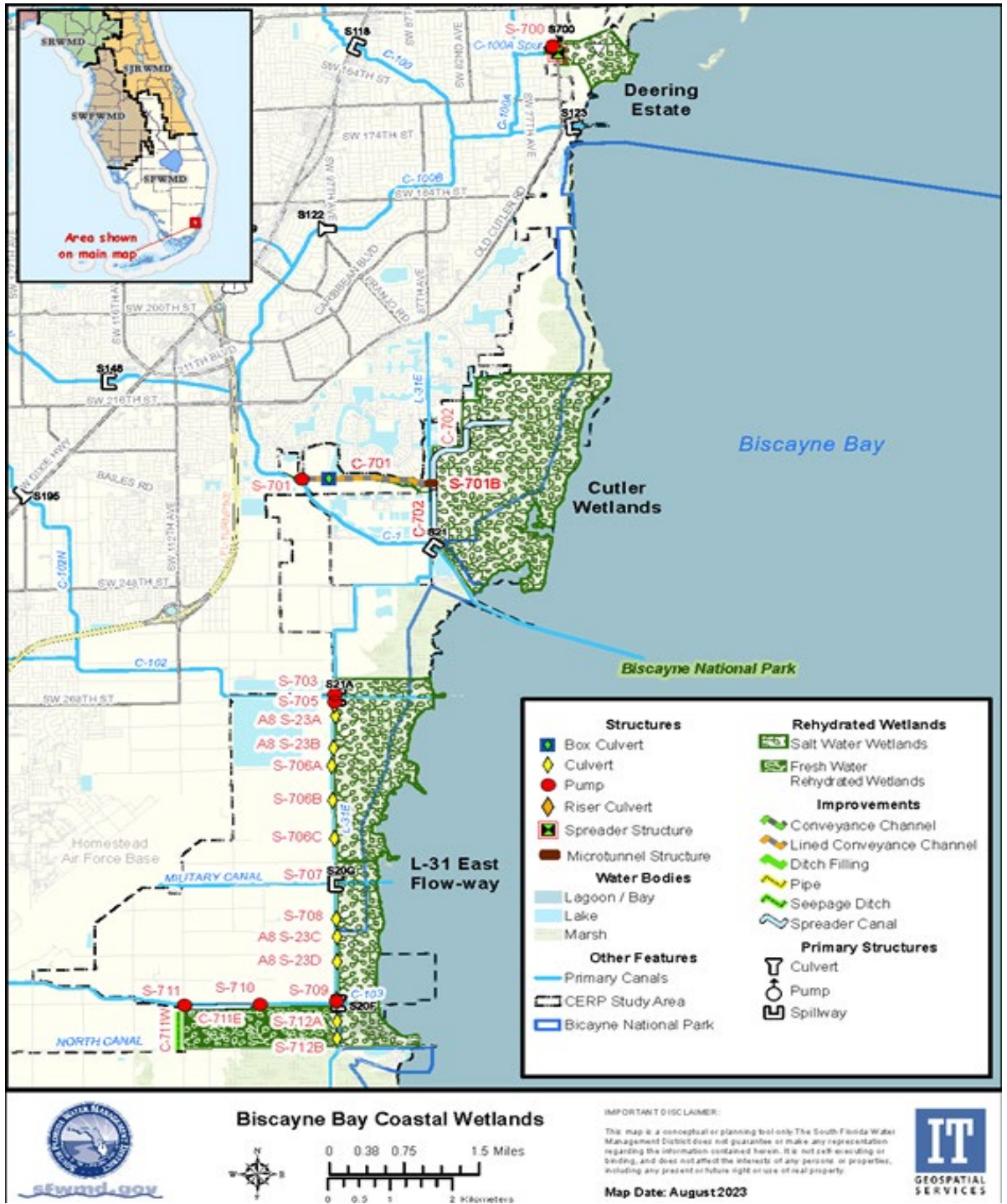


Image 1. Treated Mangrove block

Image 2. L31-E Canal featuring “Maggie the Crocodile”

Purpose

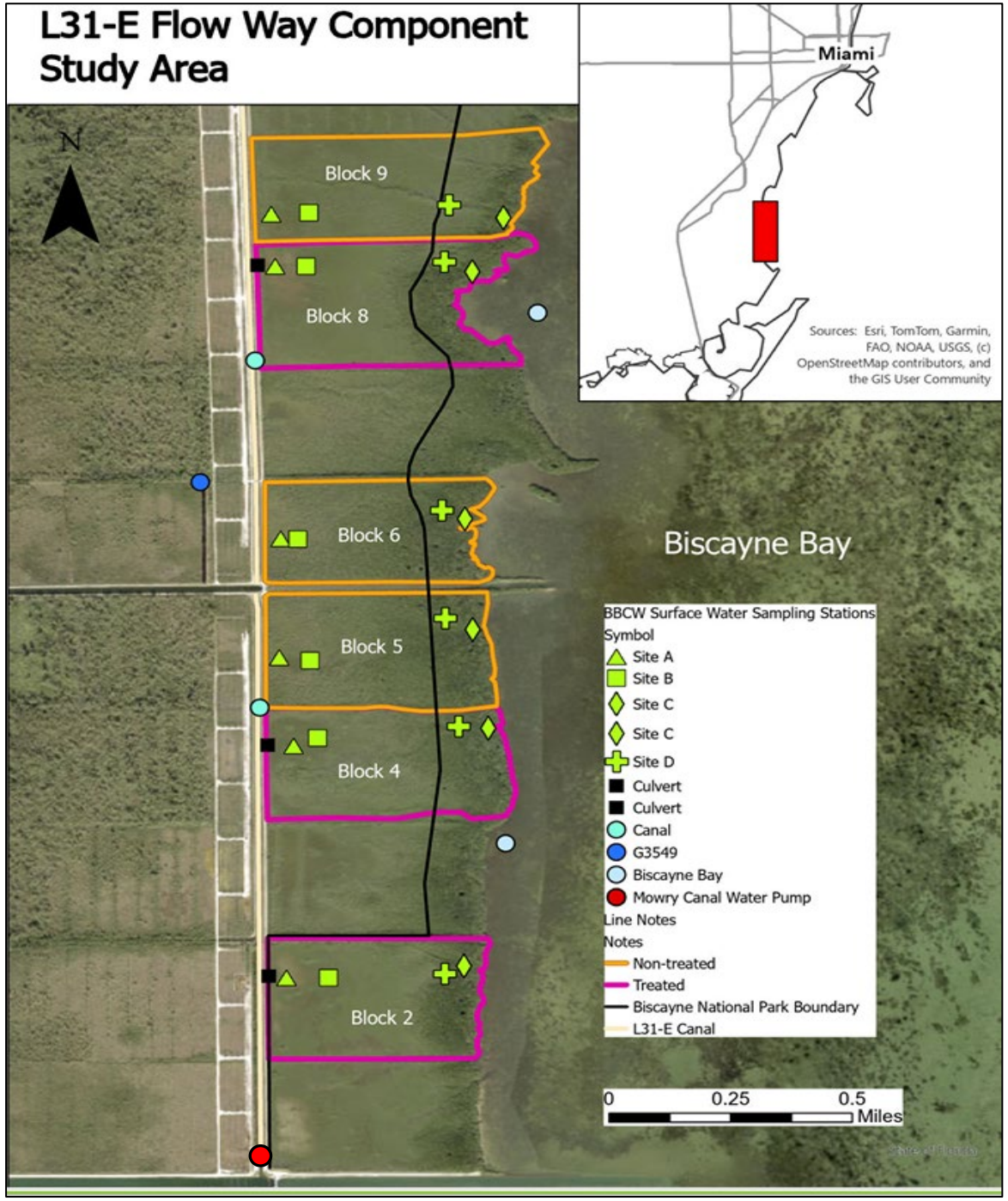
- To study the hydrogeochemical dynamics of the L31-E coastal wetlands to understand spatial and seasonal sources of water in a hydrologically modified mangrove forest.

Objective

- Determine sources of water within treated (culvert present) and non-treated (no culvert present) mangrove forest blocks, between the wet and dry season.

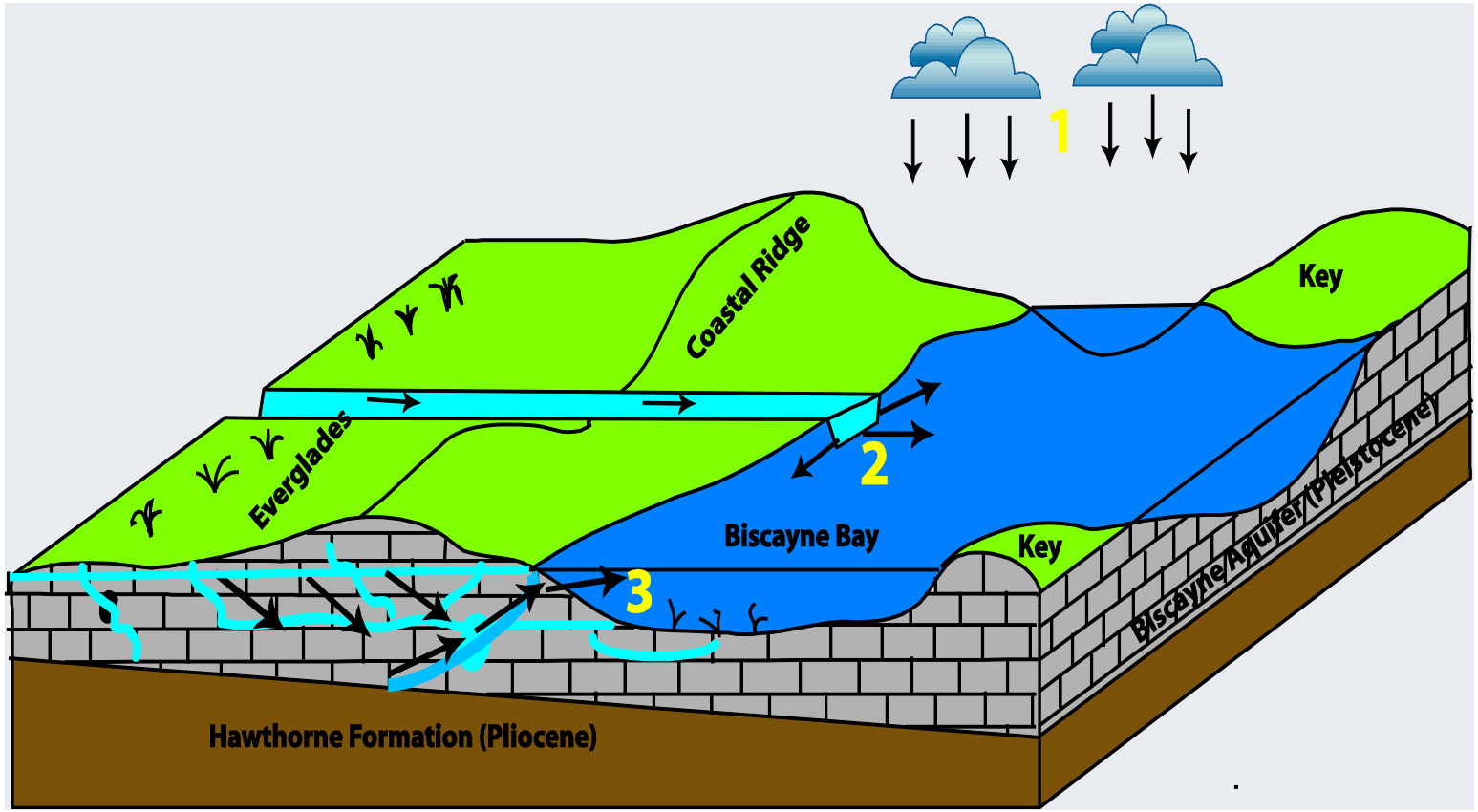
Methods

- Quarterly surface water sampling (May, August, November, and February)
- 29 surface water sampling stations- one groundwater well, 2 L-31E canal sites (northern and southern sampling sites), 2 Biscayne Bay sites (northern and southern sampling sites), and 24 water sampling stations among the mangrove blocks.
- Six blocks: three treated (culvert present) blocks and three non-treated (no culverts present) blocks.

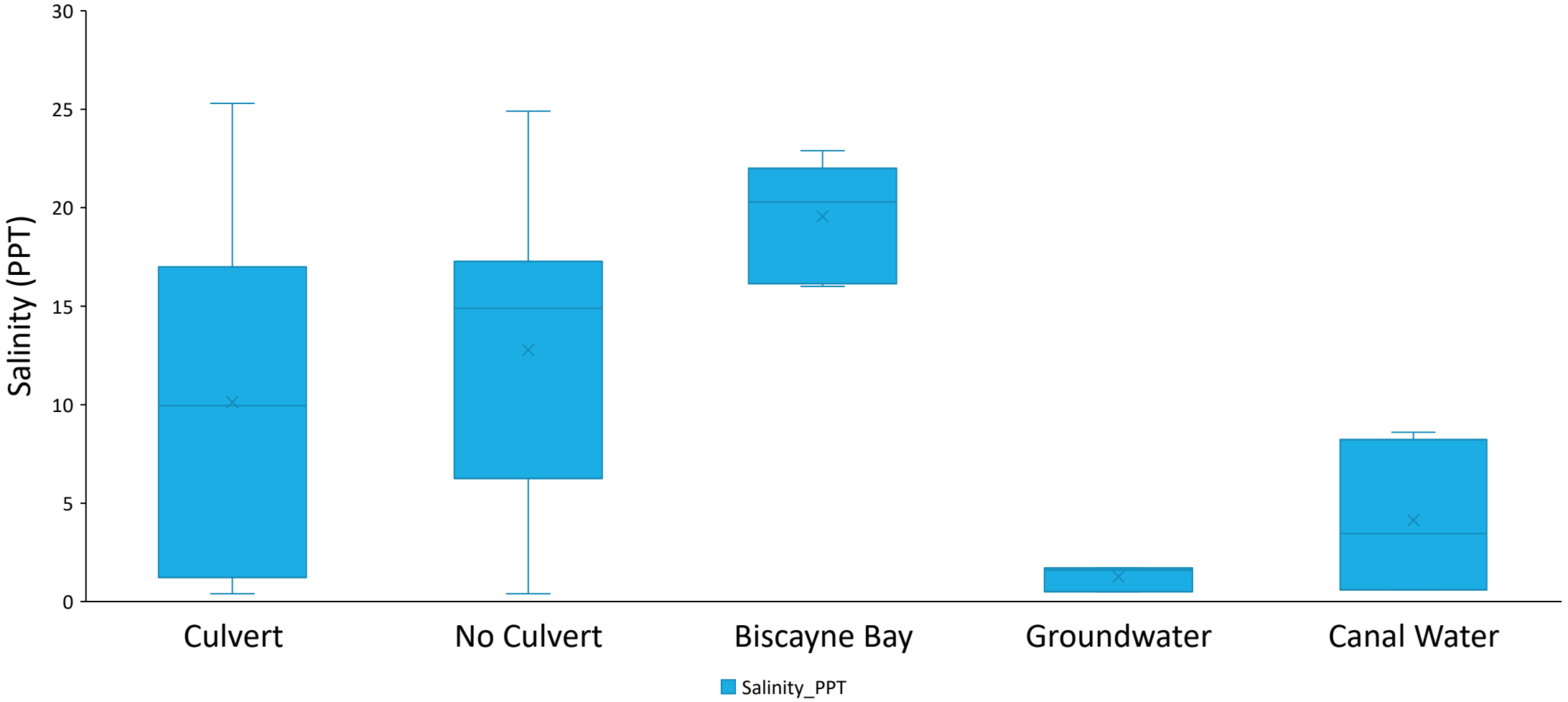


Methods: Natural Tracers

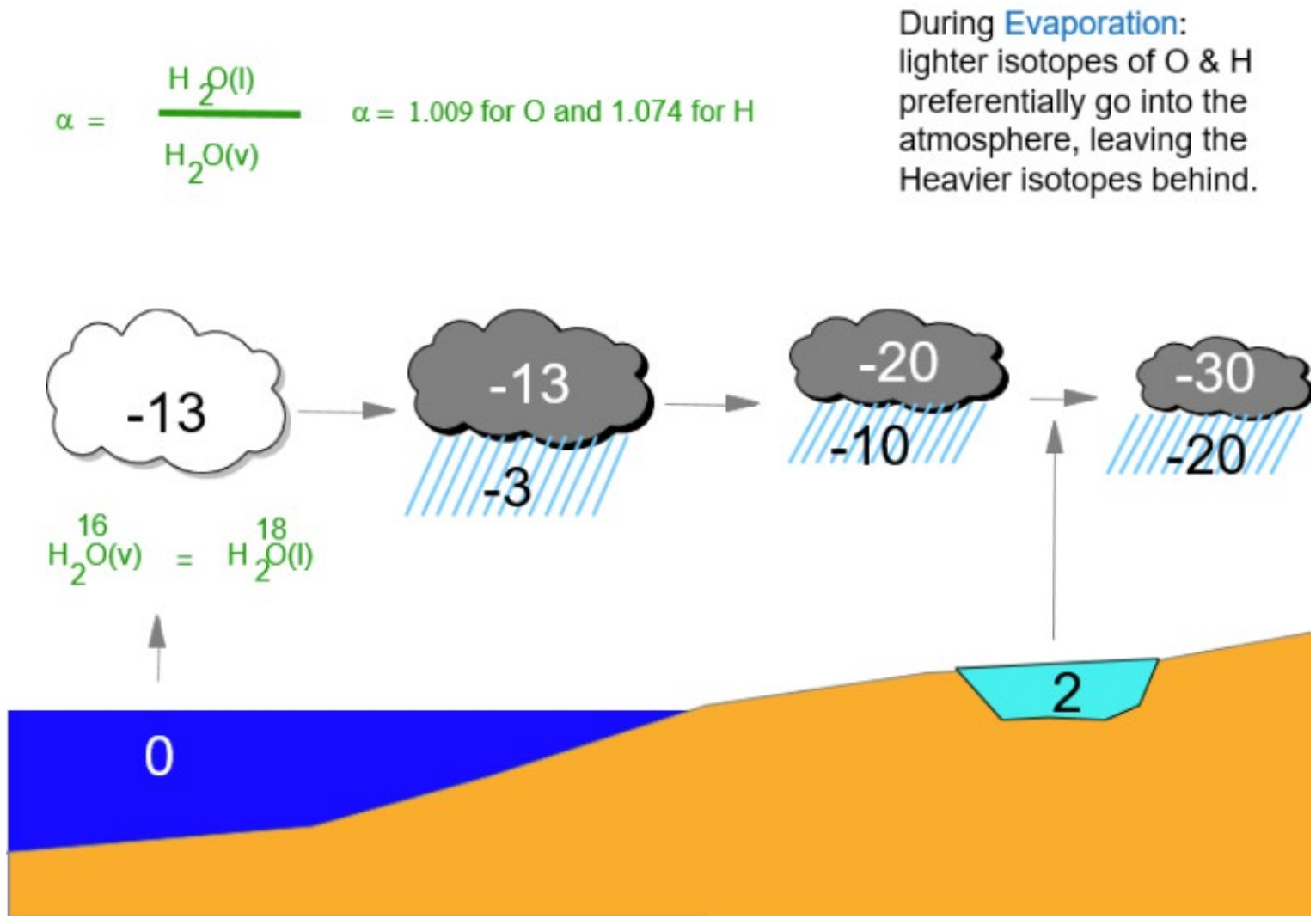
- Geochemical tracers: salinity, stable isotopes of oxygen and hydrogen, strontium, and calcium.



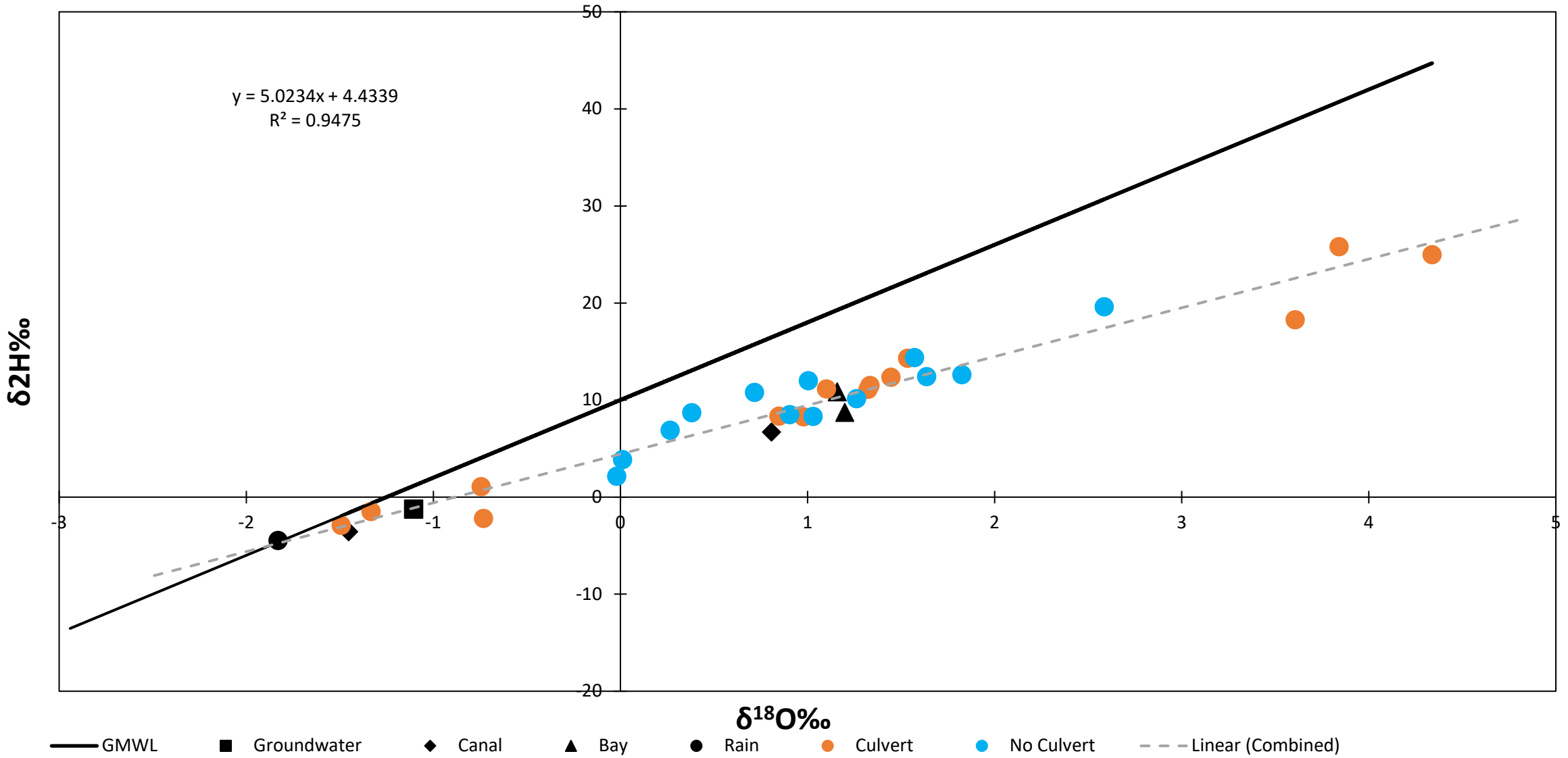
Results: May 2024 - November 2024 Salinity



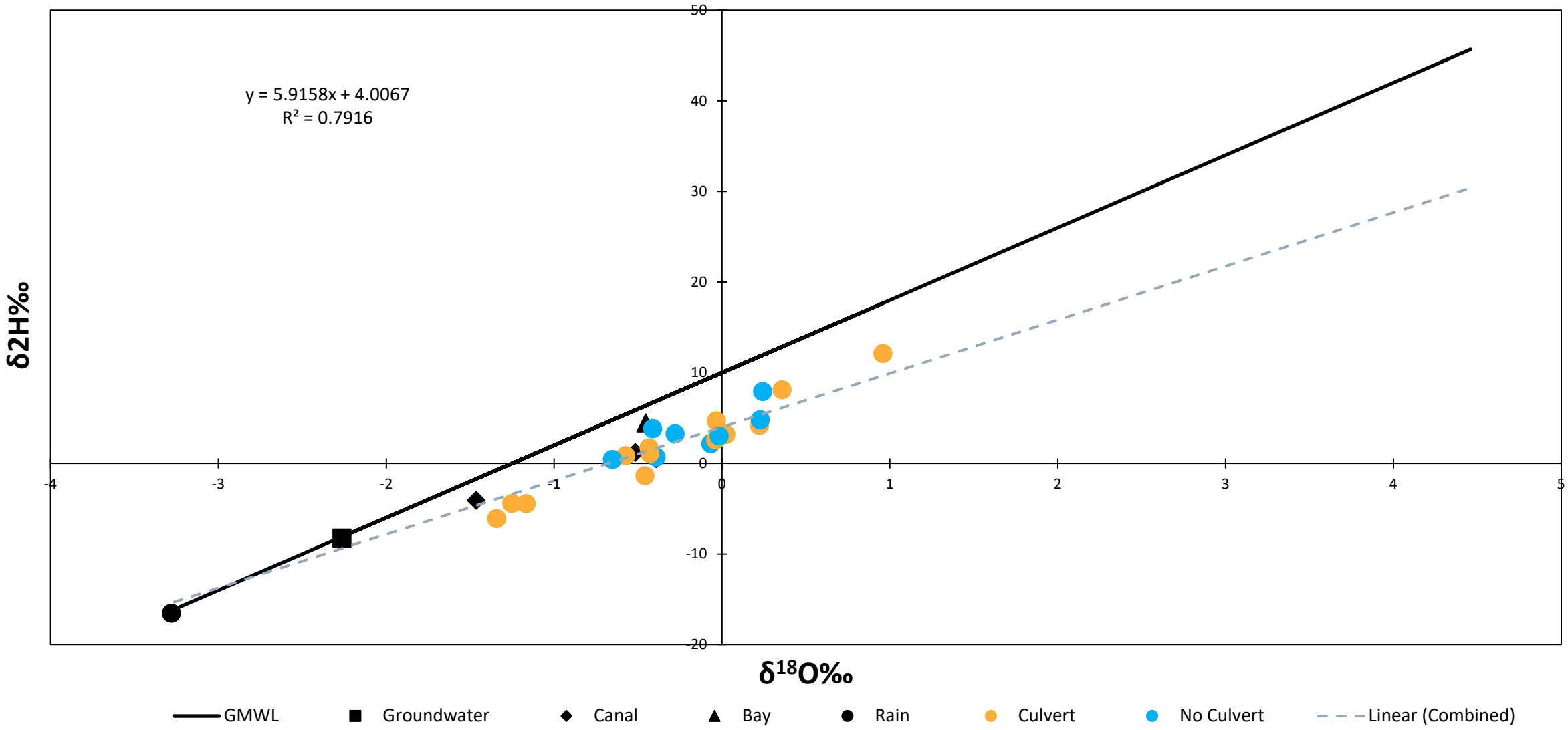
Isotopic Tracers: Stable Isotopes of Hydrogen and Oxygen



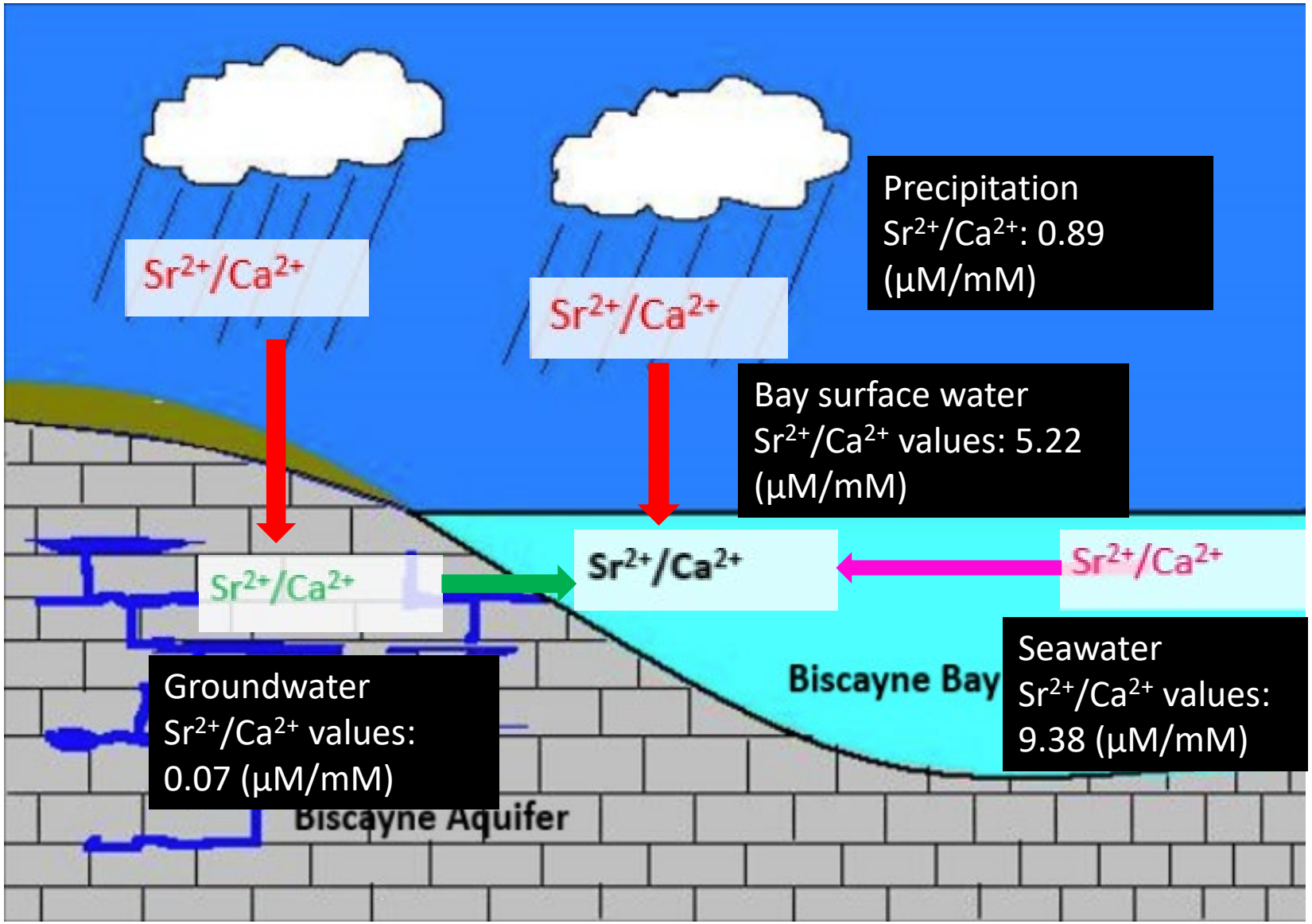
Results: May Isotope Data



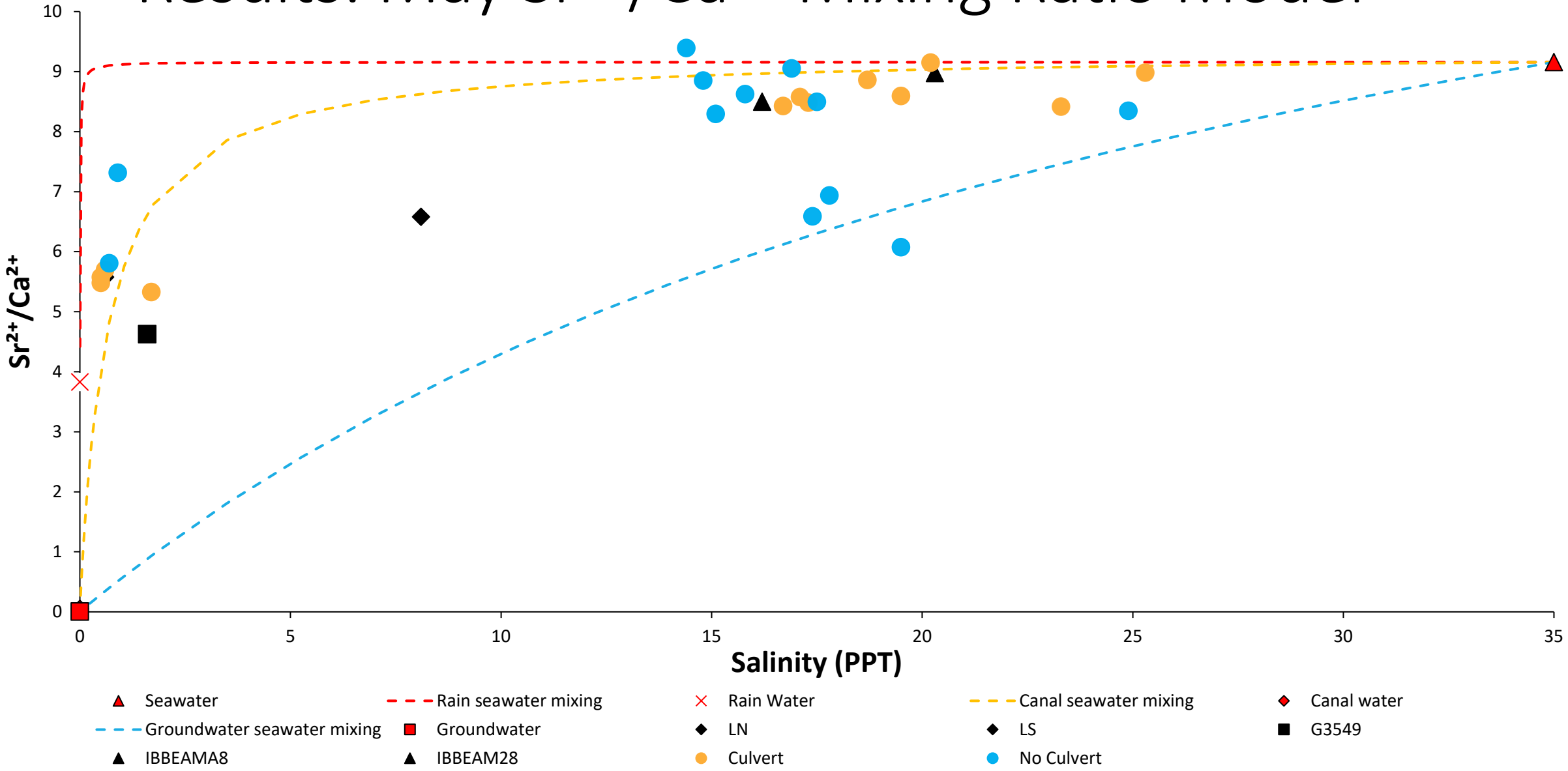
Results: November Isotope Data



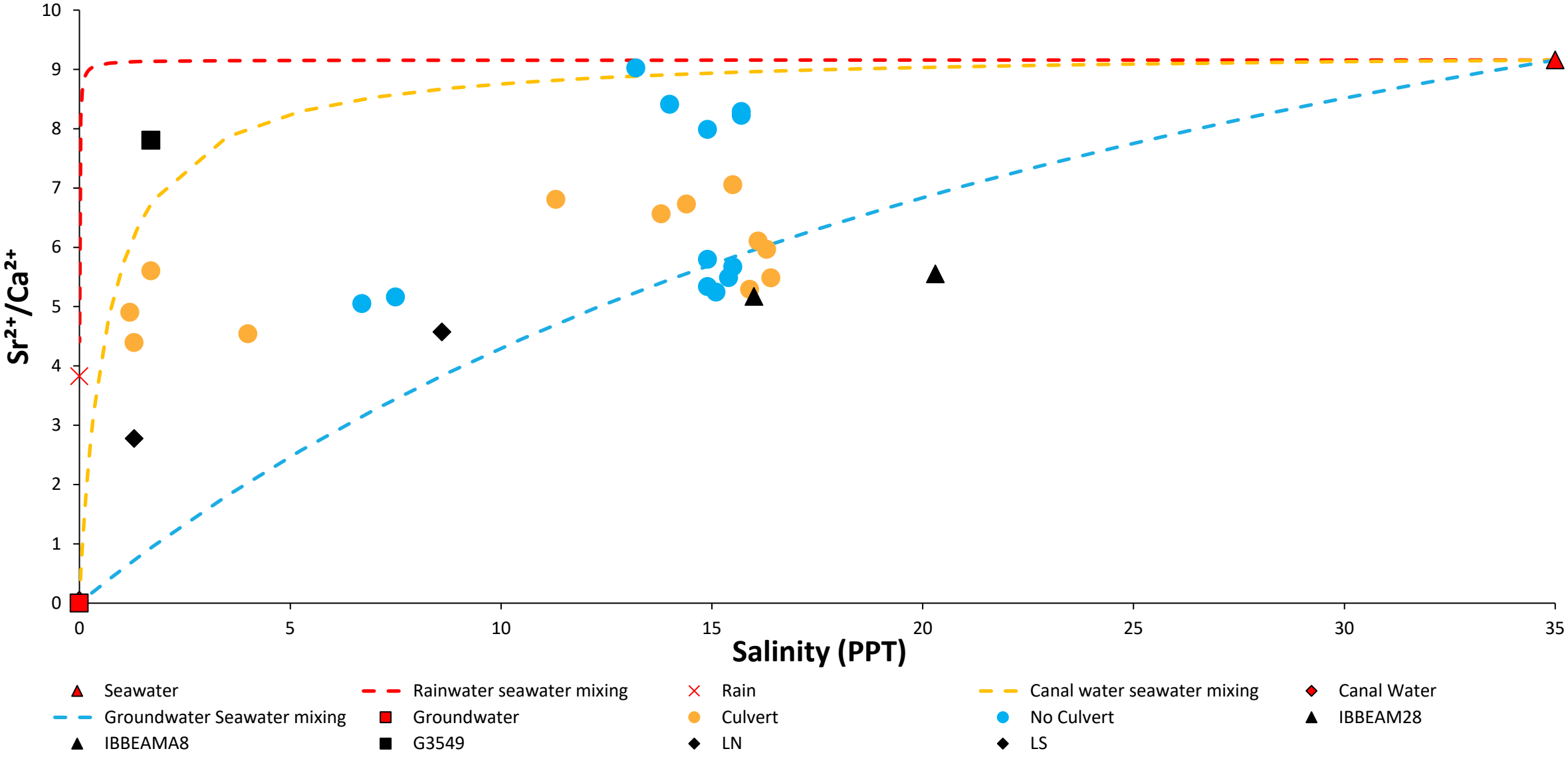
Sr^{2+}/Ca^{2+} Tracers



Results: May Sr^{2+}/Ca^{2+} Mixing Ratio Model



Results: November Sr^{2+}/Ca^{2+} Mixing Ratio Model



Conclusion

Treated blocks are experiencing a range of isotopic and Sr^{2+}/Ca^{2+} signatures, while non-treated blocks experience a more uniform seasonal shift between geochemical tracers.

Shifts in sources of water, such as groundwater influence are more prevalent in the wet season than dry season.

Using geochemical tracers are an important tool for the restoration of hydrologically modified coastal wetlands to provide insight into seasonal and spatial shifts of different sources of water.

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Thank you!

Photo Credit: Anthony Mora