

A potential reservoir for the brown tide alga, *Aureoumbra lagunensis*, in a South Texas estuary

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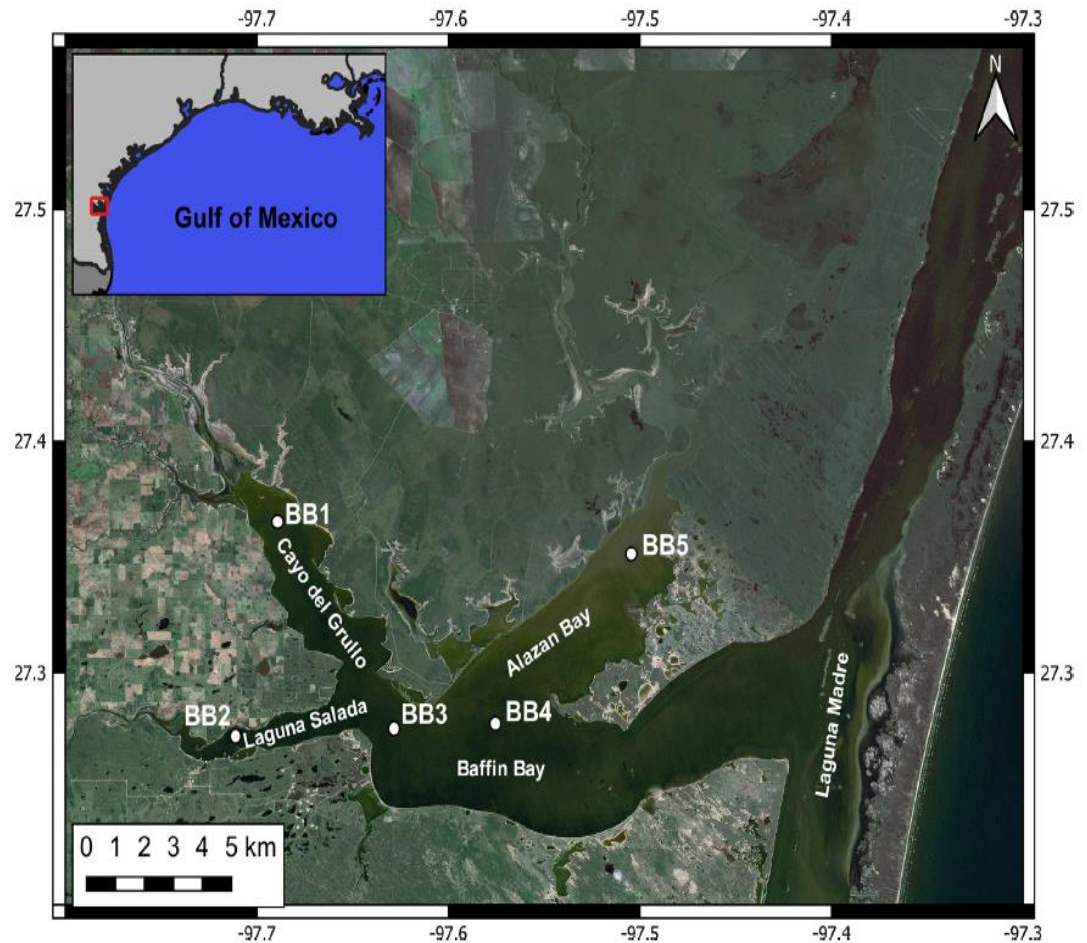
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CERF 2019
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RESPONSIVE RELEVANT READY

Study Site: Baffin Bay

- Home to Texas “brown tide” algal blooms
- ~2-3 m deep on average
- Land use dominated by agriculture & rangeland
- High evaporation rates & low rainfall on average; floods during El Niño years
- Residence time ranges from weeks to years



Los Olmos Creek & Laguna Salada

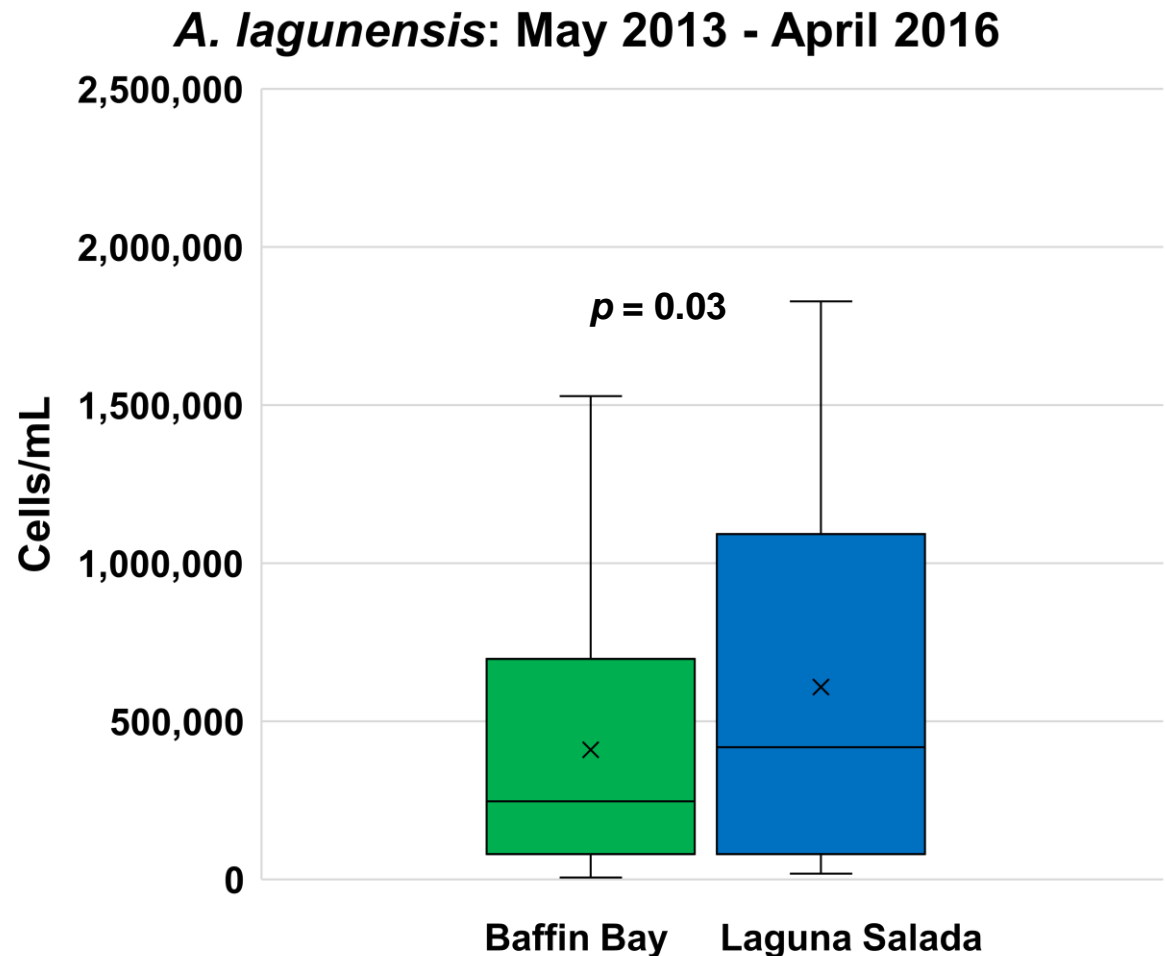
- Tributary of Baffin Bay
- Shallow (~1 m)
- Land use dominated by rangeland; receives effluent from poorly functioning municipal wastewater plant
- Poorly flushed



Research Question: Is there an identifiable source for *A. lagunensis* in Baffin Bay?

- Previous work indicated that higher abundances of *A. lagunensis* were found in Laguna Salada than rest of bay.

We hypothesize that Laguna Salada acts as a seed stock reservoir for *A. lagunensis* in Baffin Bay.

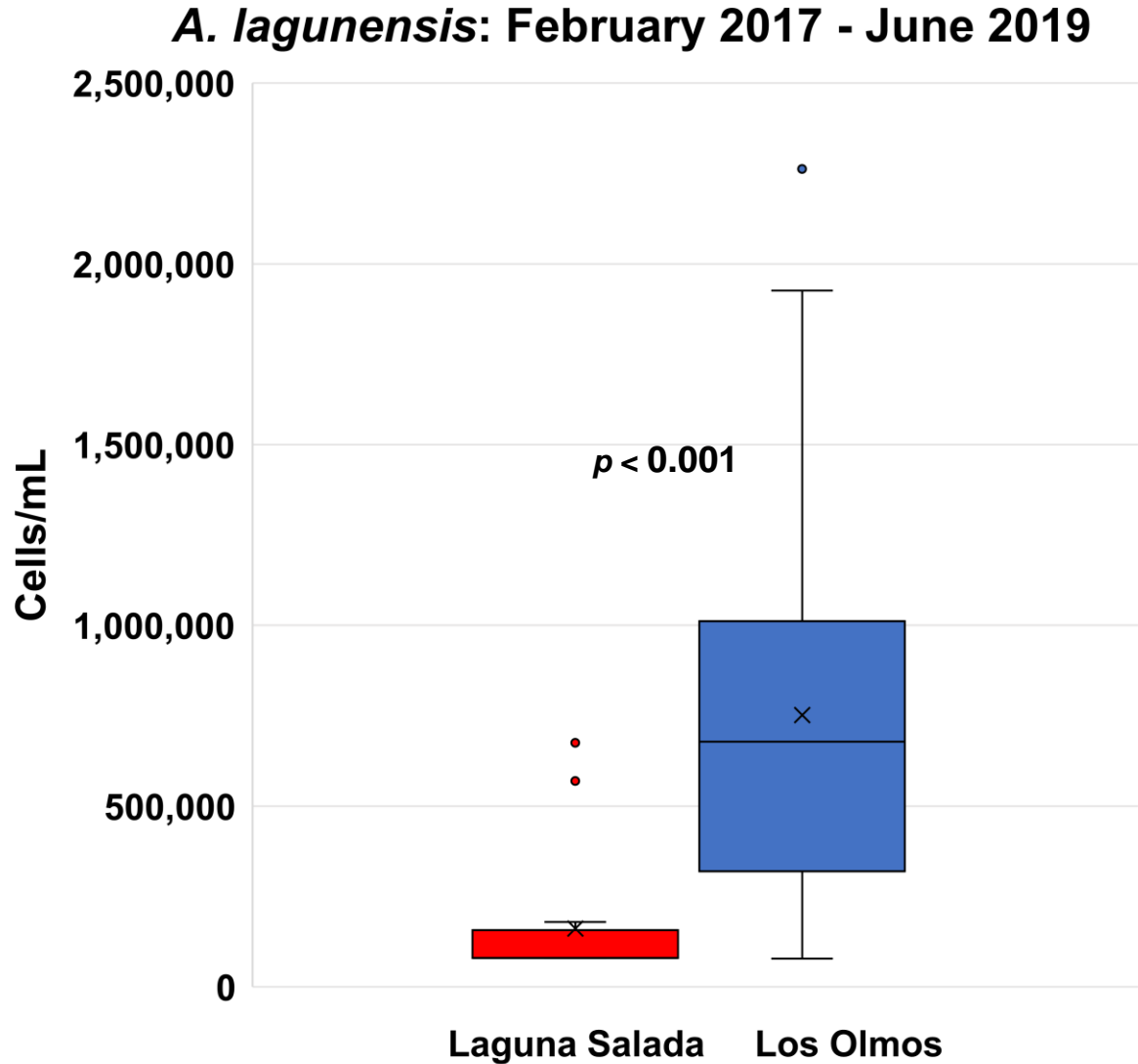


Methods

- 1) Monthly sampling in Los Olmos Creek & Laguna Salada for:
 - Water quality: temperature, salinity, D.O., turbidity & pH
 - N+N, Nitrite, Ammonium
 - Orthophosphate
 - Urea
 - DOC, TOC
 - TDN, TN
 - TDP, TP
 - Chlorophyll *a* (Turner Designs)
 - Phytoplankton and bacteria cell counts (microscopy, flow cytometry)
 - Stable isotopes ($\delta^{13}\text{C}$ & $\delta^{15}\text{N}$)
- 2) Compare chemical and biological parameters in both sites.

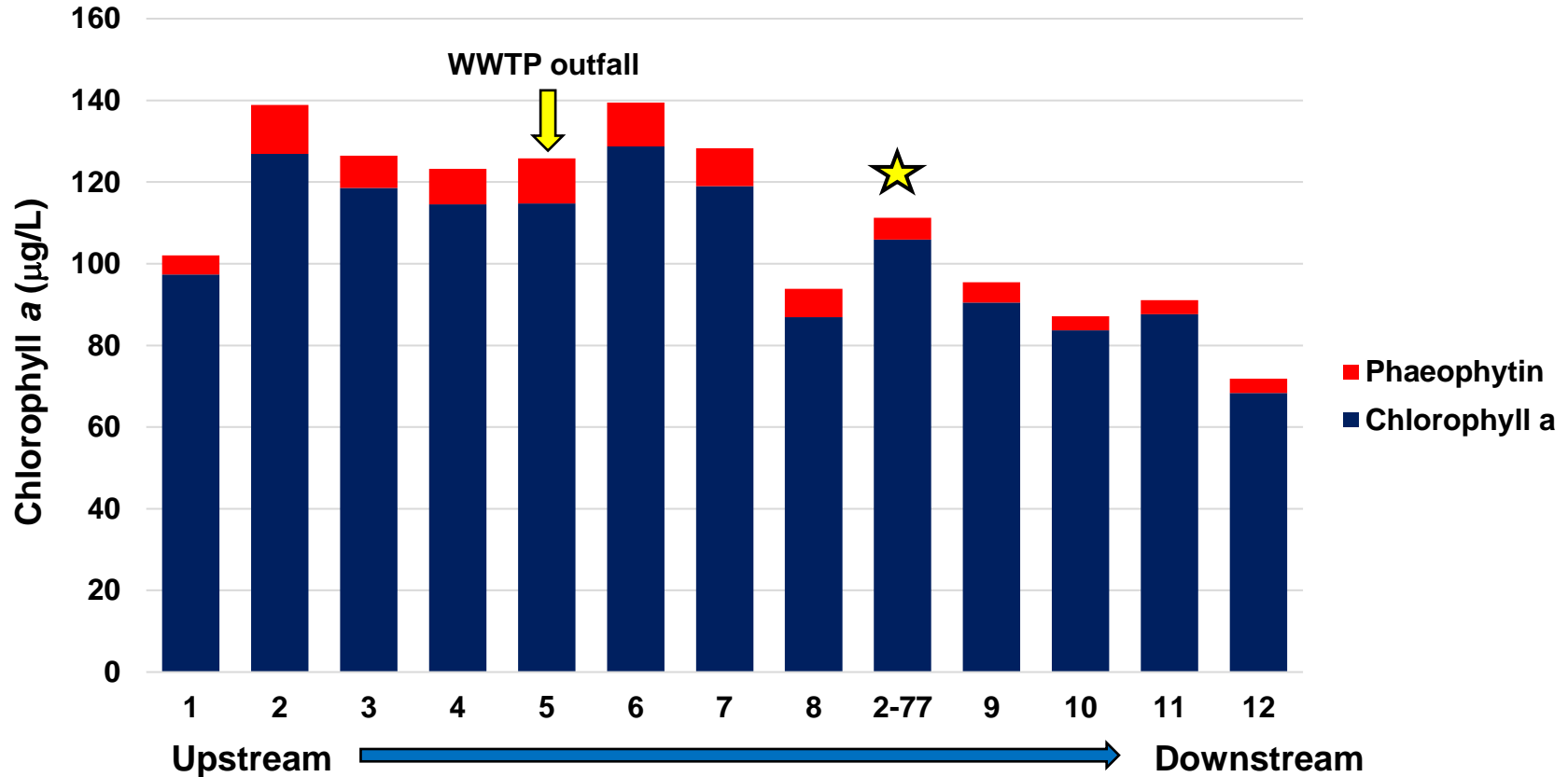
Results

- Los Olmos exhibited significantly higher *A. lagunensis* abundance than Laguna Salada.
- Still need to quantify *A. lagunensis* at other bay sites.



Results

Los Olmos creek survey: August 2019



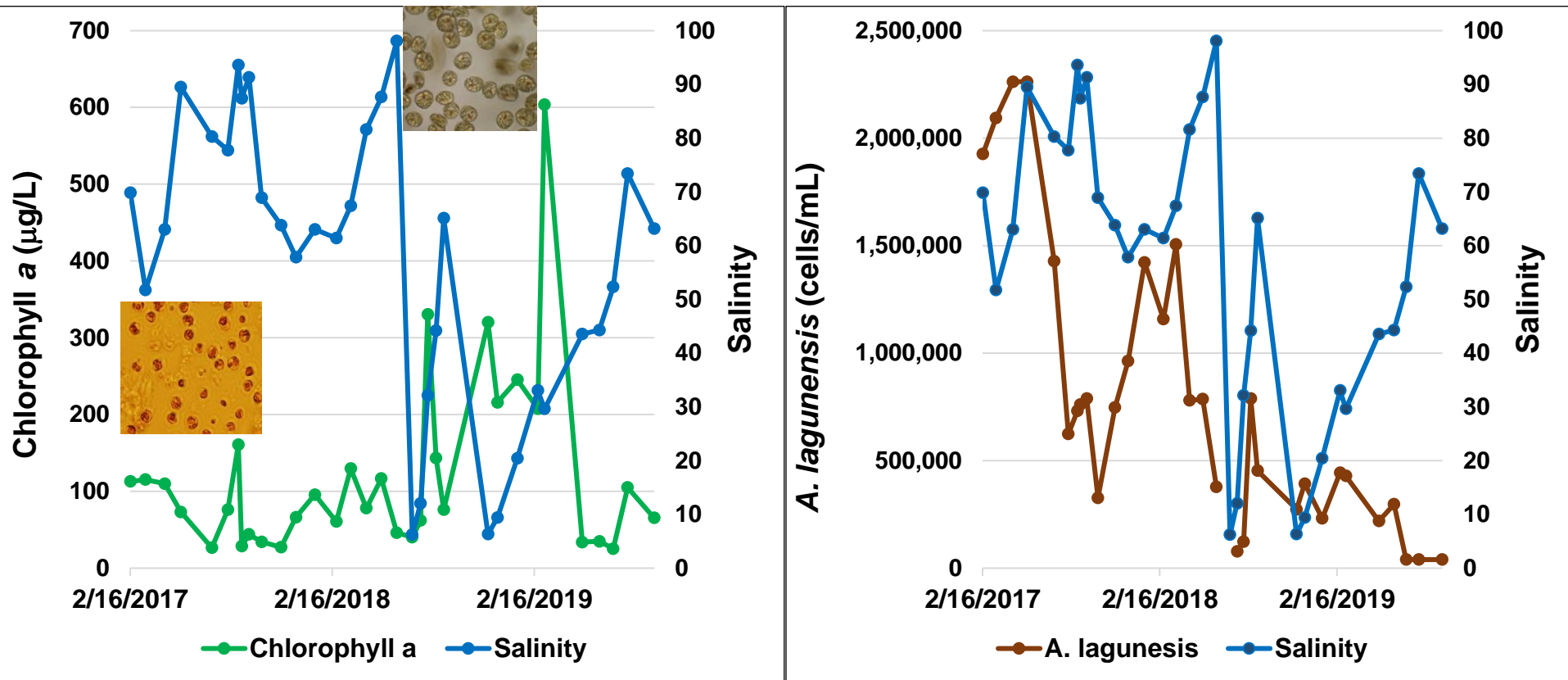
- A 1.5-mile survey of Los Olmos Creek showed high & increasing chlorophyll *a*; *A. lagunensis* samples still being analyzed
- The high ratio of Chlorophyll to Phaeophytin suggests fresh production.

Results: February 2017 – September 2019

Downstream  Upstream

	Baffin	Laguna Salada	Los Olmos
Chl a ($\mu\text{g/L}$)	14 ± 10	19 ± 13	119 ± 118
<i>A. Lagunensis</i> (cells/mL)	TBD	$161,313 \pm 184,048$	$677,172 \pm 578,142$
Salinity	42 ± 11	43 ± 13	57 ± 27
DIN (μM)	4.6 ± 5.5	4.4 ± 4.2	29 ± 48
DIP (μM)	0.5 ± 0.9	0.4 ± 0.3	2.5 ± 4.4
DON (μM)	75 ± 9	81 ± 18	205 ± 82
DOC (μM)	813 ± 154	959 ± 158	$2,452 \pm 903$
TN (μM)	104 ± 22	121 ± 30	549 ± 214

Results: Los Olmos, February 2017 – September 2019



- Phytoplankton community shifts from *A. lagunensis* to flagellate & diatom dominance as salinity decreases.

Results

Conducted linear regressions between Chlorophyll *a* and *A. lagunensis* & environmental variables.

(+) = positive correlation

(-) = negative correlation

P = 0.001 *** P = 0.01 ** P = 0.05 *

Best Chlorophyll *a* model shows:

- PO₄ and Turbidity show strong relationship in Laguna Salada.
- TN and DIN:DIP show relationship in Los Olmos.

Best *A. lagunensis* model shows:

- Salinity show relationship in Laguna Salada.
- TP strongly shows relationship in Los Olmos.

Chlorophyll <i>a</i>	
<u>Laguna Salada</u>	<u>Los Olmos</u>
(+) PO ₄ ***	(+) TDN
(-) TN	(+) TN
(+) Turbidity ***	(+) DIN:DIP ***
R ² = 0.78	R ² = 0.56

<i>A. lagunensis</i>	
<u>Laguna Salada</u>	<u>Los Olmos</u>
(+) Salinity **	(+) TP ***
(-) TOC	
(-) Temperature *	
R ² = 0.46	R ² = 0.55

Conclusions

- *A. lagunensis* abundances increase moving upstream from Laguna Salada to Los Olmos Creek.
- Los Olmos Creek has high nutrient concentrations, esp. organic nutrients; also higher salinities than Laguna Salada.
- Los Olmos Creek/Laguna Salada may act as a natural incubator for *A. lagunensis*.
- Ongoing work –
 - Process remaining isotope and phytoplankton samples.
 - Analysis of *A. lagunensis* samples from upstream-downstream sampling of Laguna Salada/Los Olmos Creek.
- Make recommendations to Baffin Bay stakeholder group.
 - Address issues with wastewater treatment plant and leaky septic tanks.
 - Incorporate stormwater managers to address nutrient reduction strategies.

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