Status & Trends – Marine and Estuarine Conditions of Florida Bay, 2009

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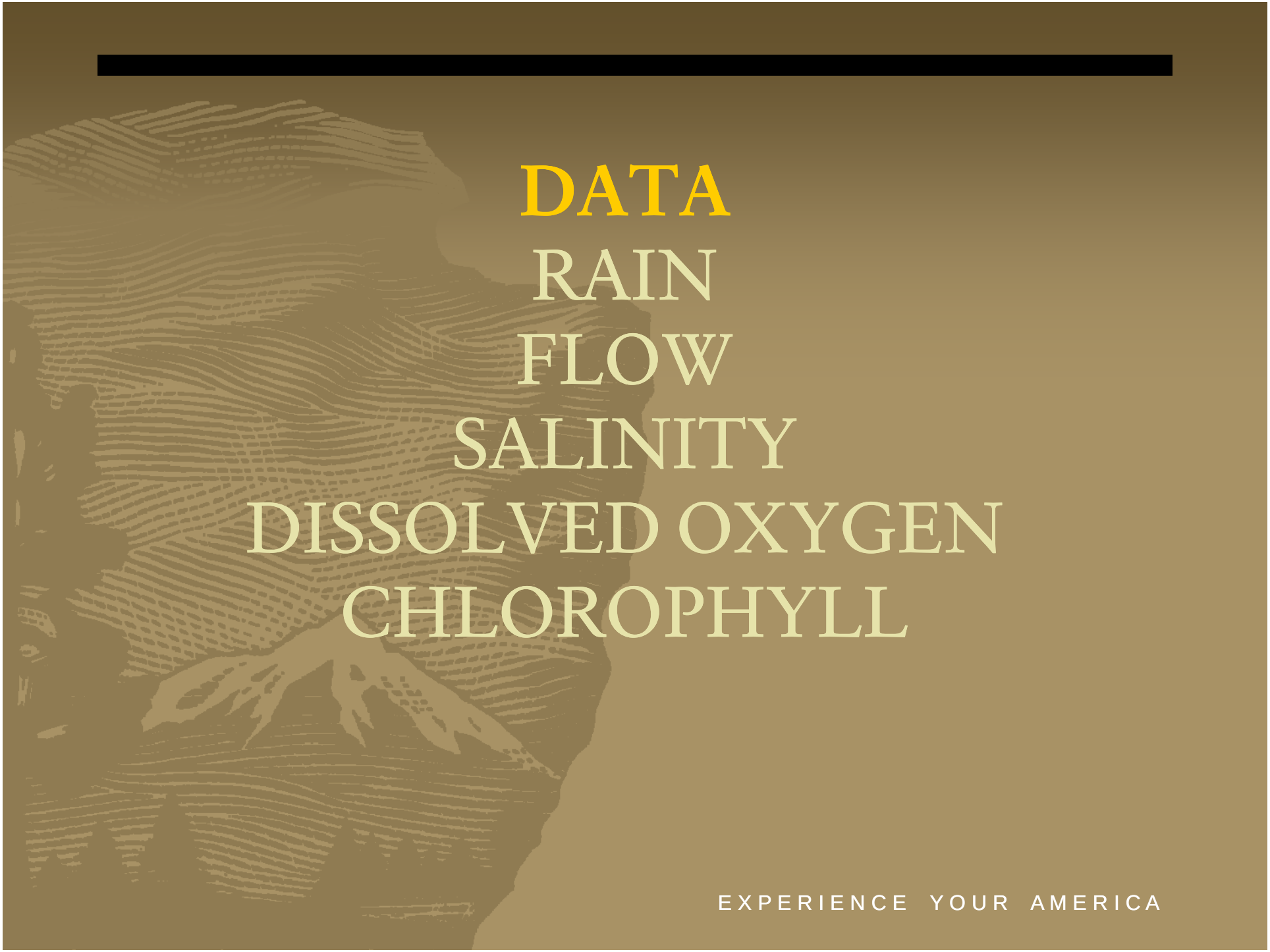
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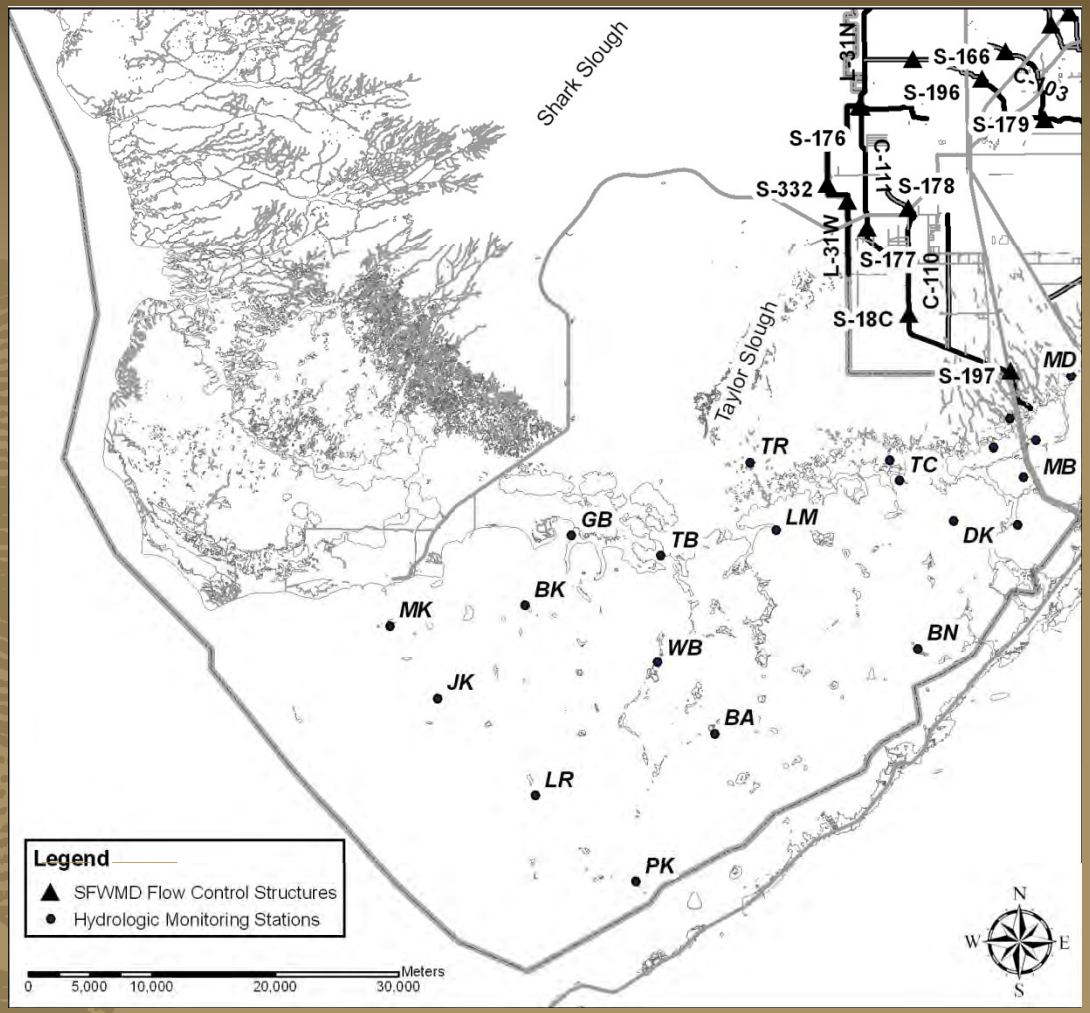
Marine Monitoring Network

- 18 Stations monitoring;
  - Hourly salinity (ppt) bottom temperature(C), rain (inches)
  - 6 min. resolution – stage (ft., NGVD29)
- 2 stations with chlorophyll A (mg/l) and turbidity (NTU)
- Upstream information –
  - USGS stream gages in 7 rivers & creeks
  - Marsh monitoring network stations with hourly rain (inches) & stage (ft., NGVD29)



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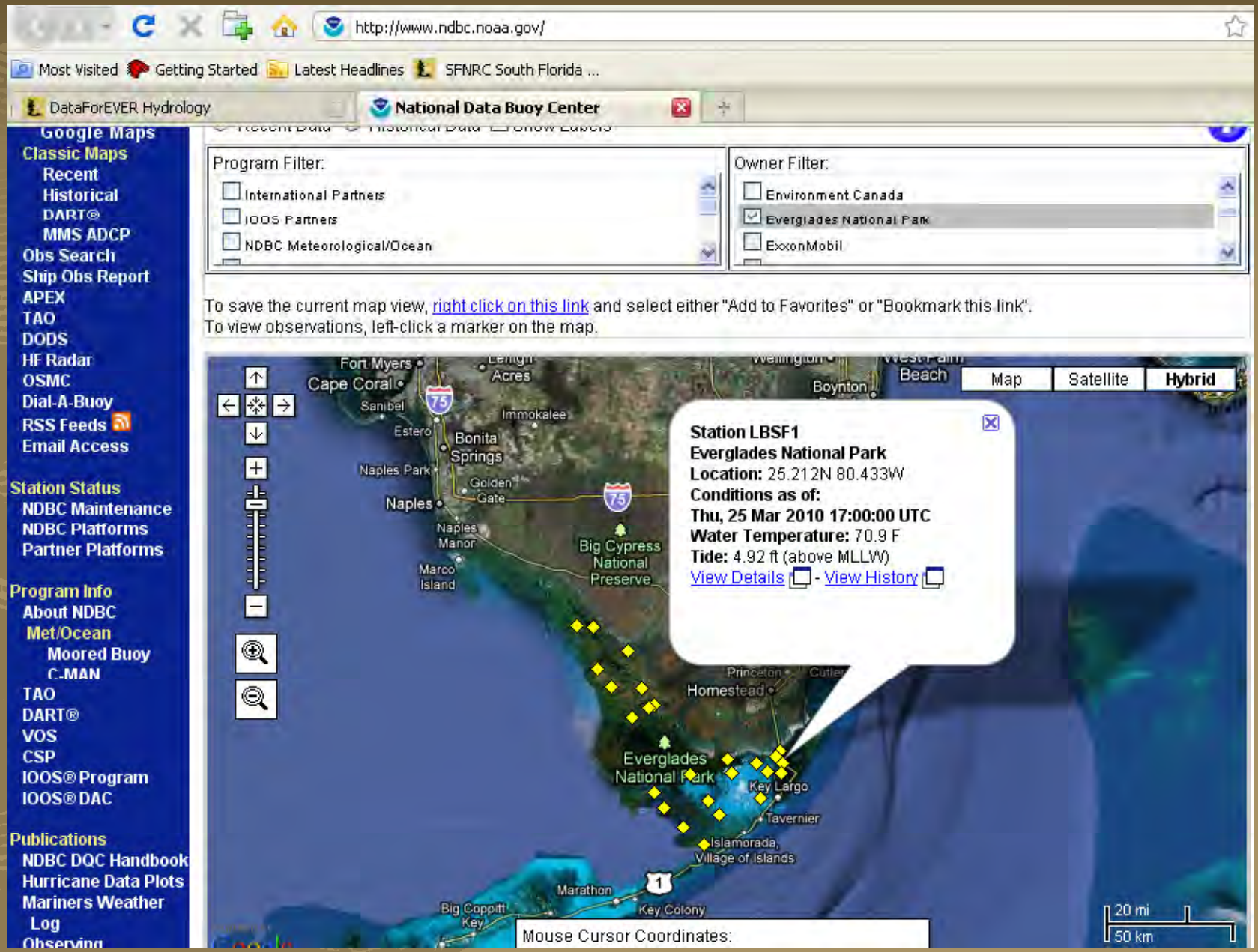
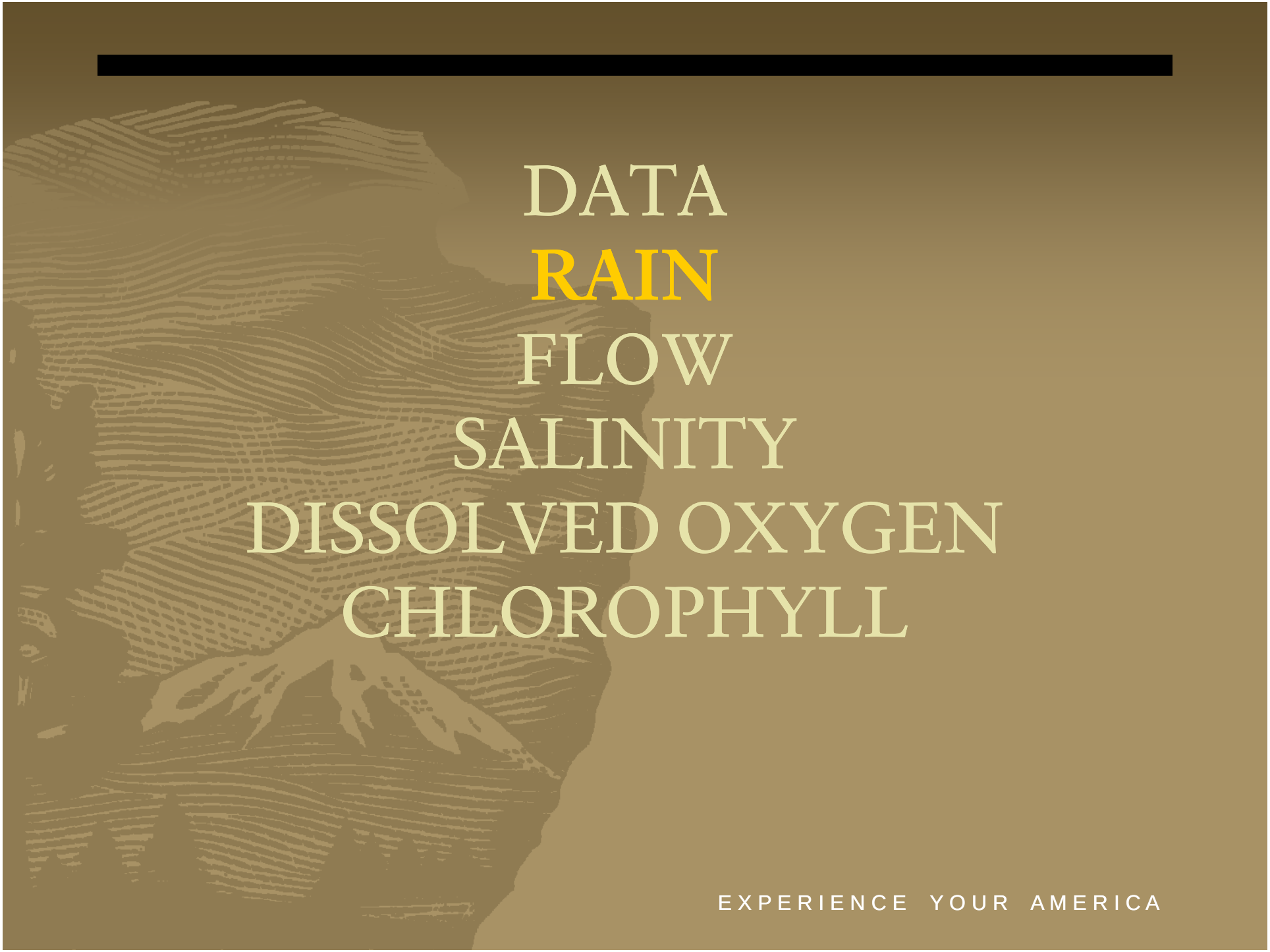
http://www.ndbc.noaa.gov

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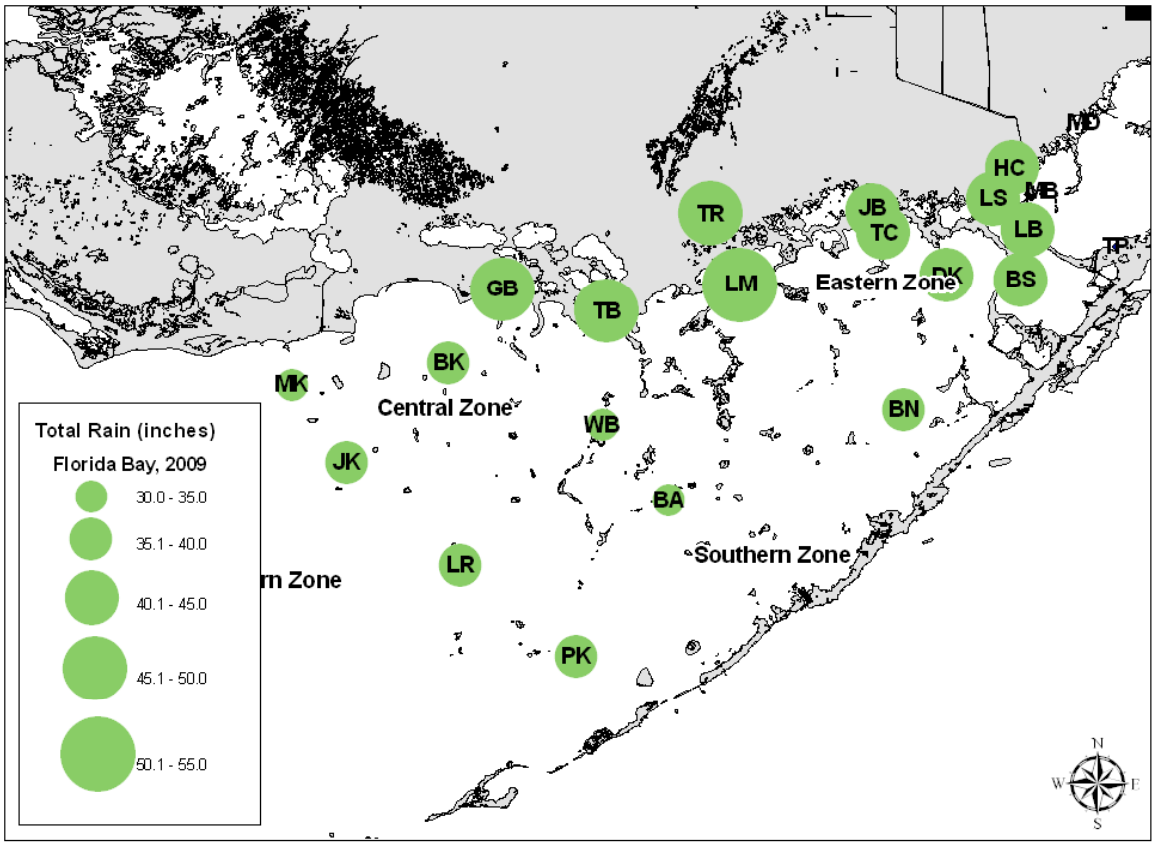
Precipitation

2009 was an average year for precipitation in the bay, with 40.66”

Bay wide trend with increasing rain to the north and east



Precipitation

2009 wet season rain:

Jun. – Oct. = 23.39”

or event based

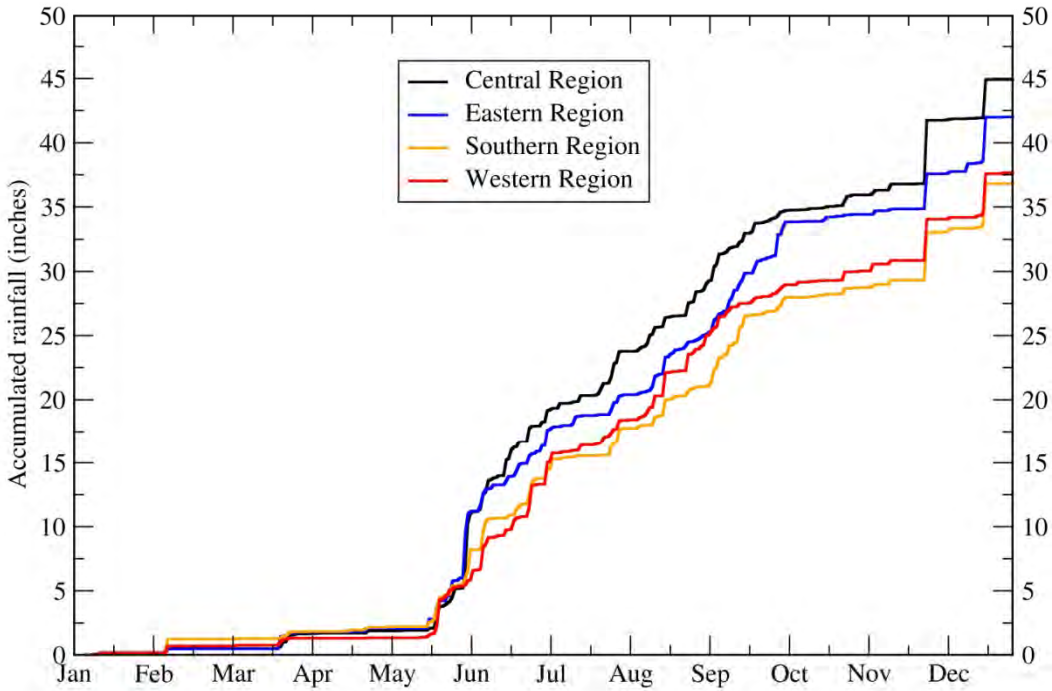
May – Oct. = 31.03”

Average but…

Late dry season rain:

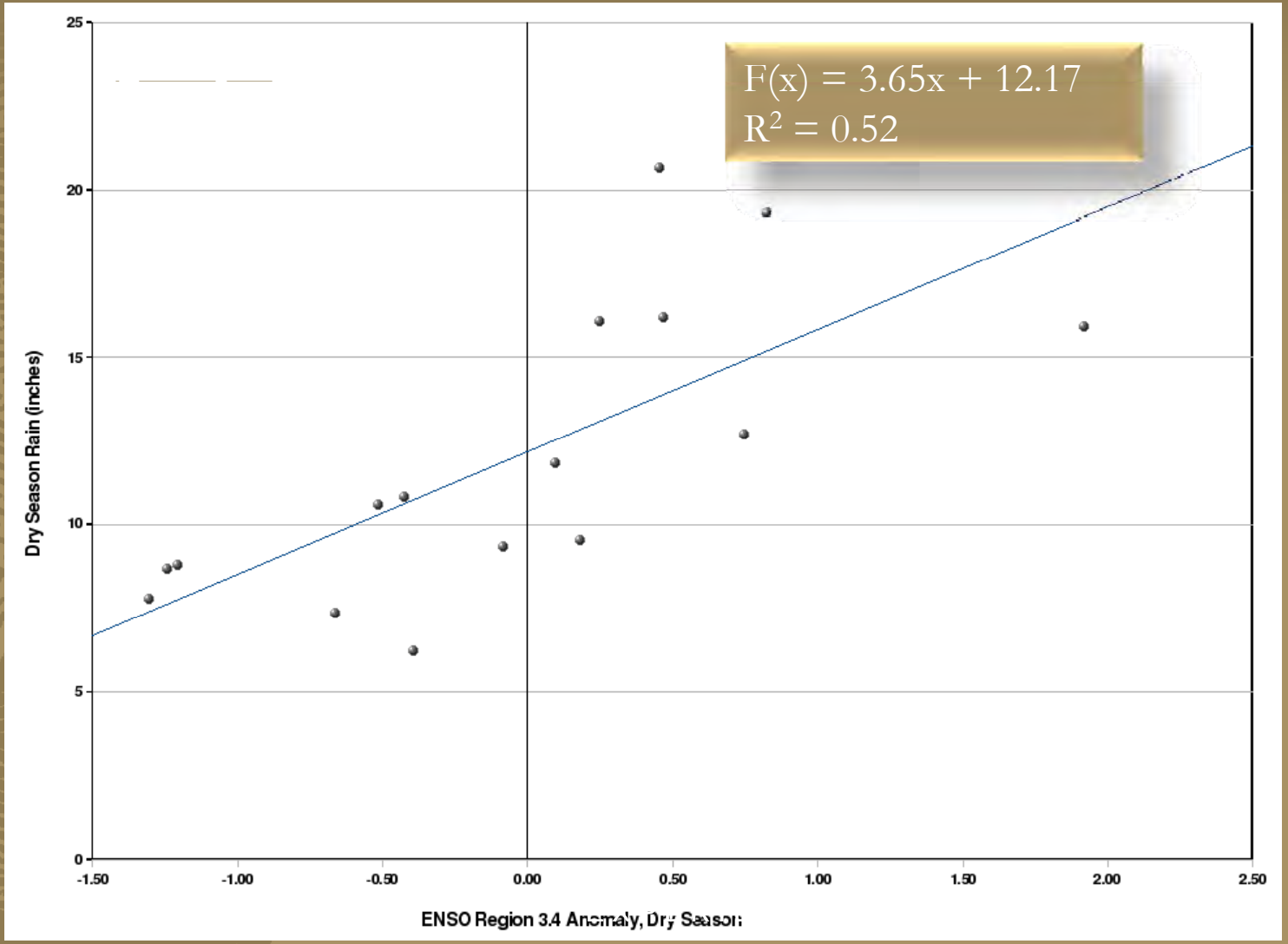
Nov. – Dec. = 7.74”

Mostly in two events



El Nino Southern Oscillation (ENSO)

Current positive ENSO phase related to wetter than normal dry season conditions.



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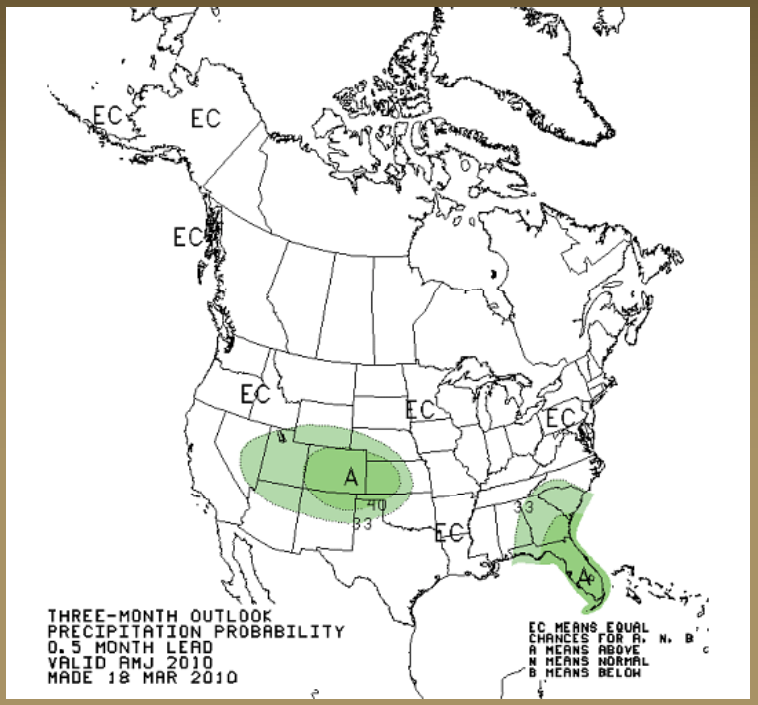

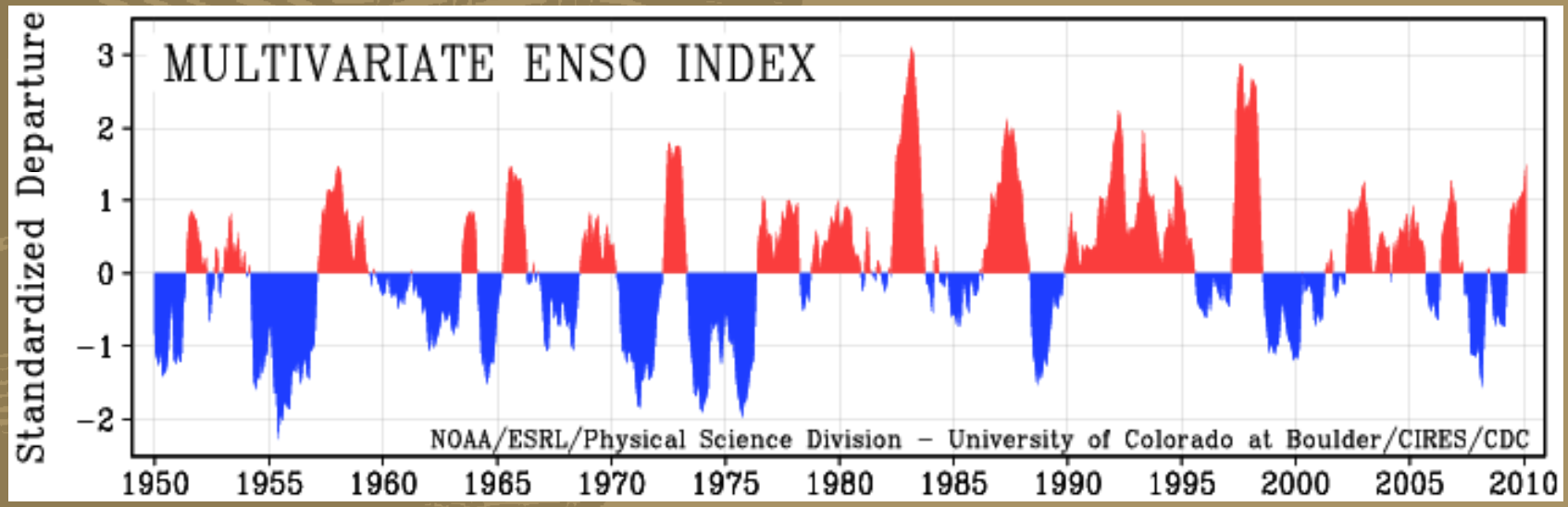

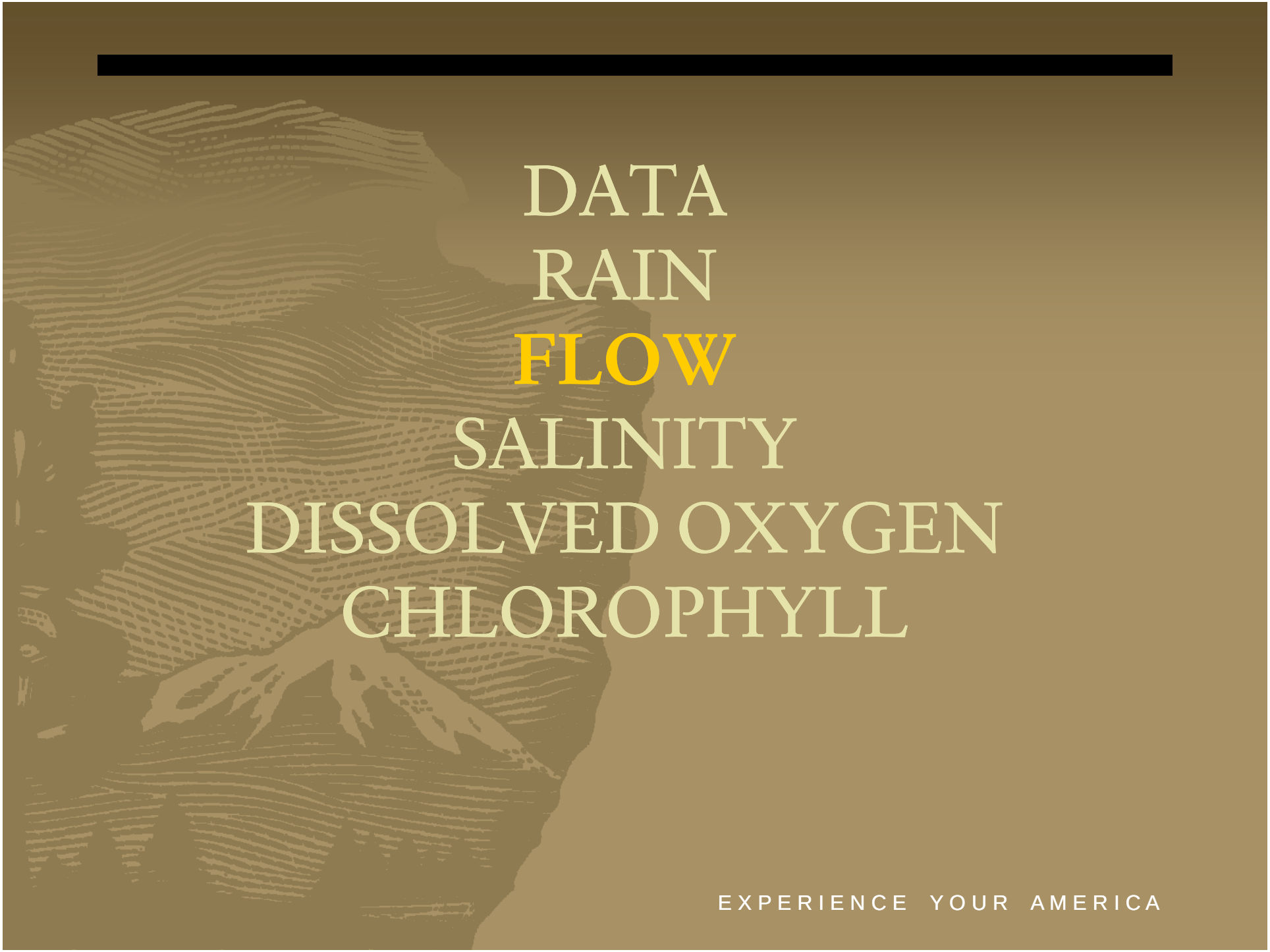
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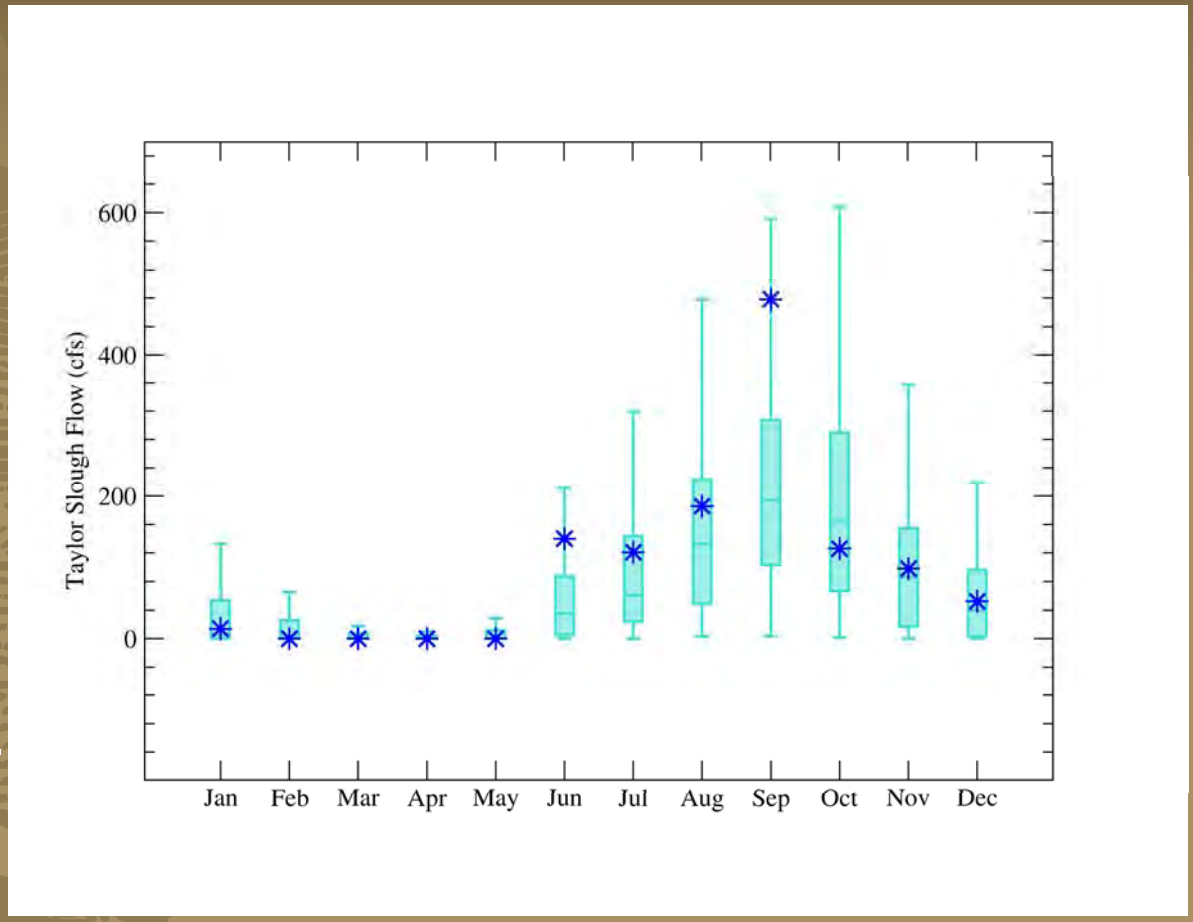
Freshwater Discharge

Taylor Slough flow 2009 compared to period of record

Large event driven flow in Jun. and Sept.

Late dry-season flow appears unaffected by unseasonably large Nov. & Dec. rain events*

Measured at Taylor Slough bridge, relatively 'high' in system



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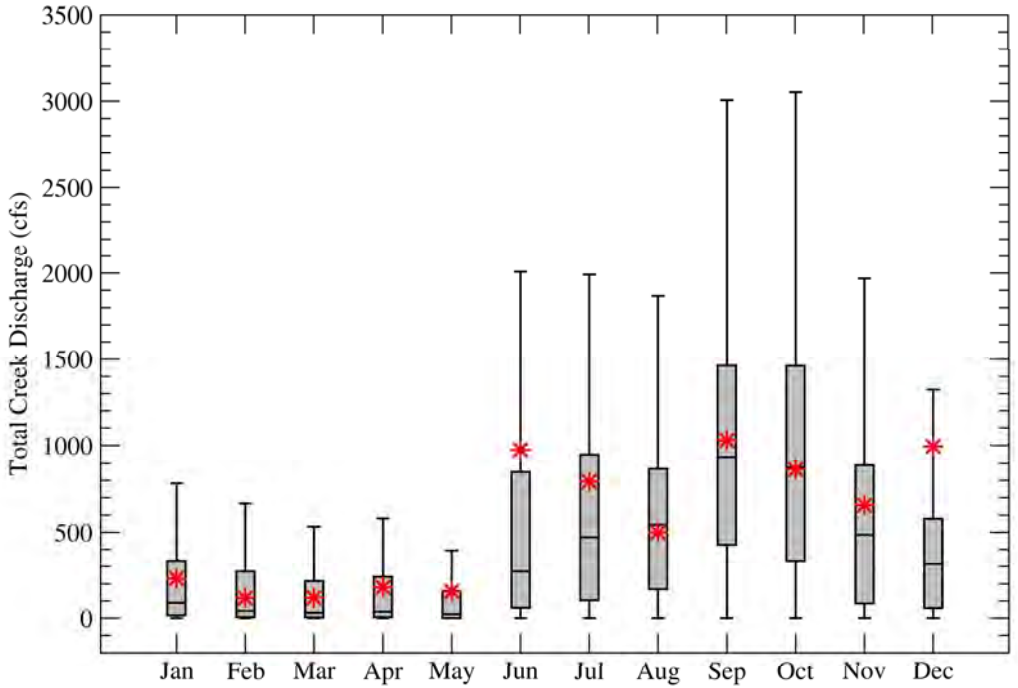
* Hittle, et Al., USGS Water-Resources Investigation Report 01-4164

Freshwater Discharge

In 1997-98, El Niño increased average dry season discharge of coastal creeks from 8.5 cfs to 55.6 cfs*

El Niño 2009-10 related increase in dry season flow visible here



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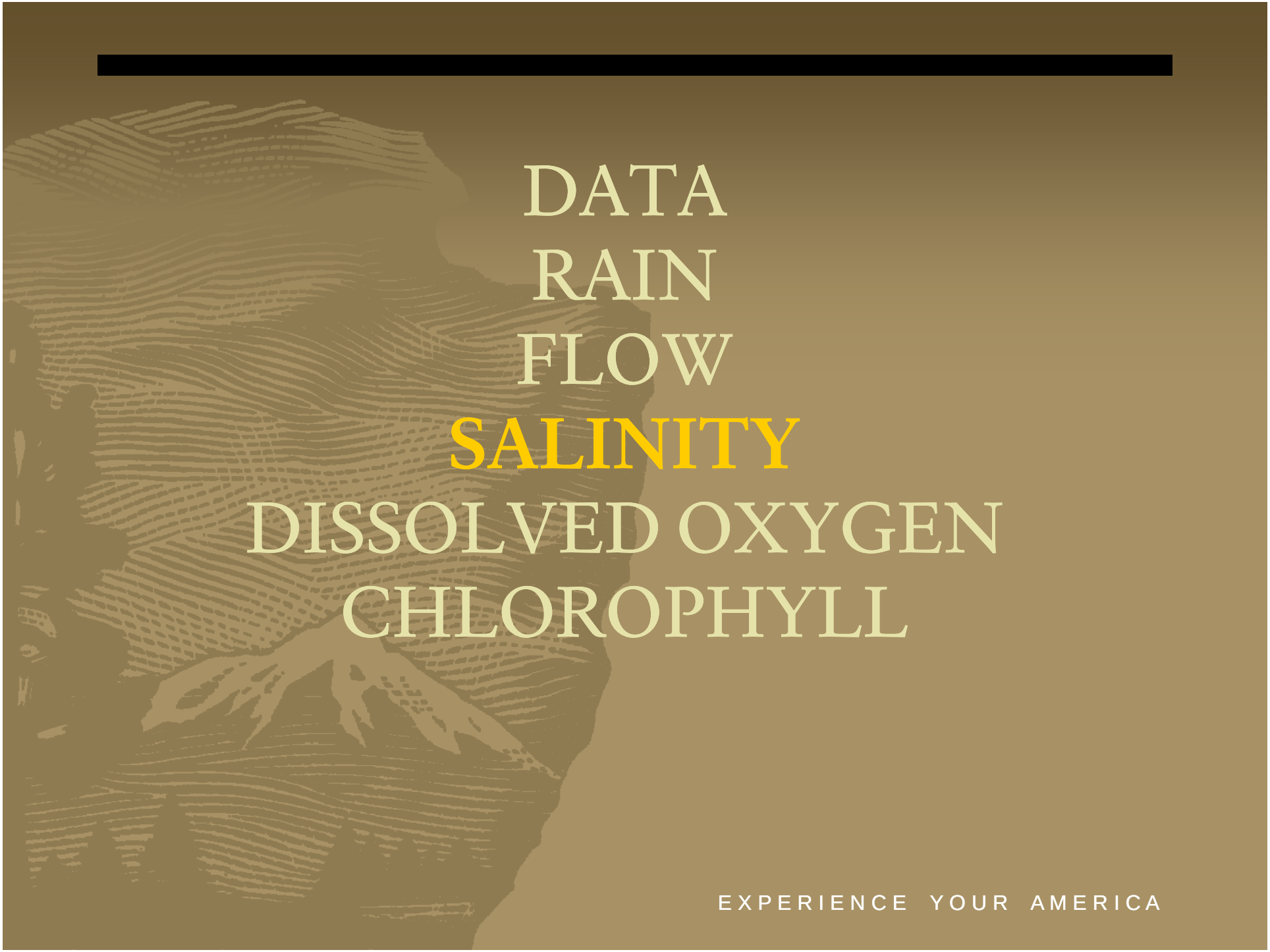
* Hittle, et Al., USGS Water-Resources Investigation Report 01-4164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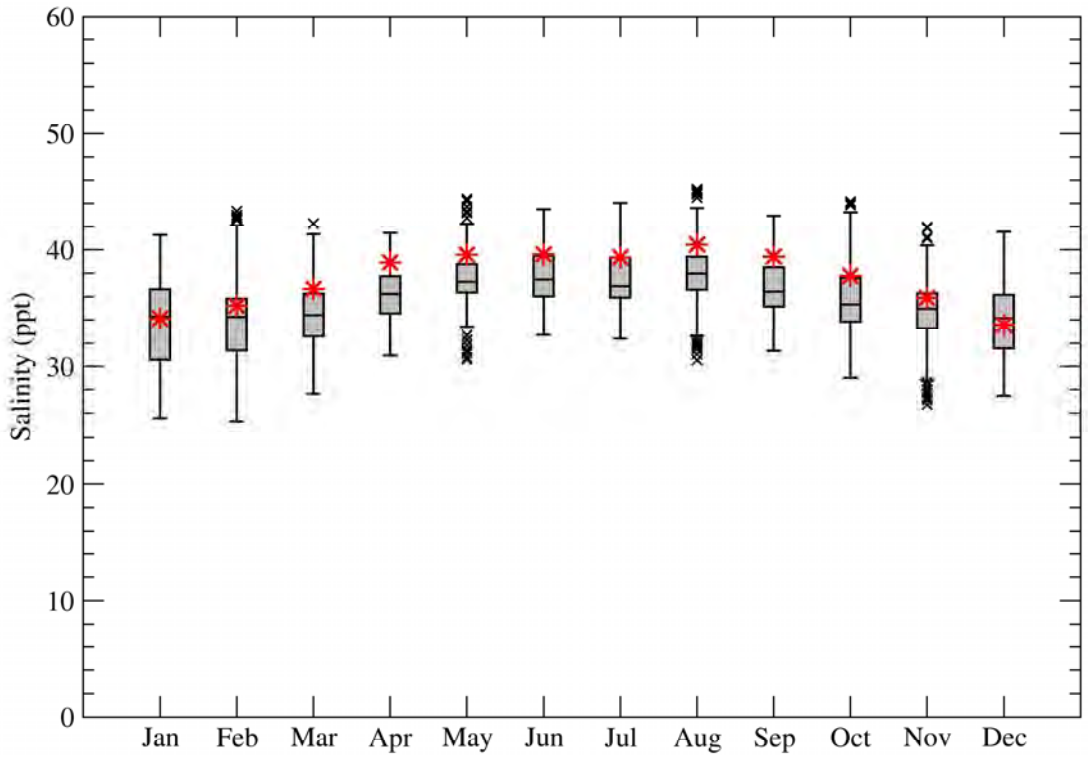
Salinity – Southern Region

Narrow salinity range

At or above historic mean throughout year

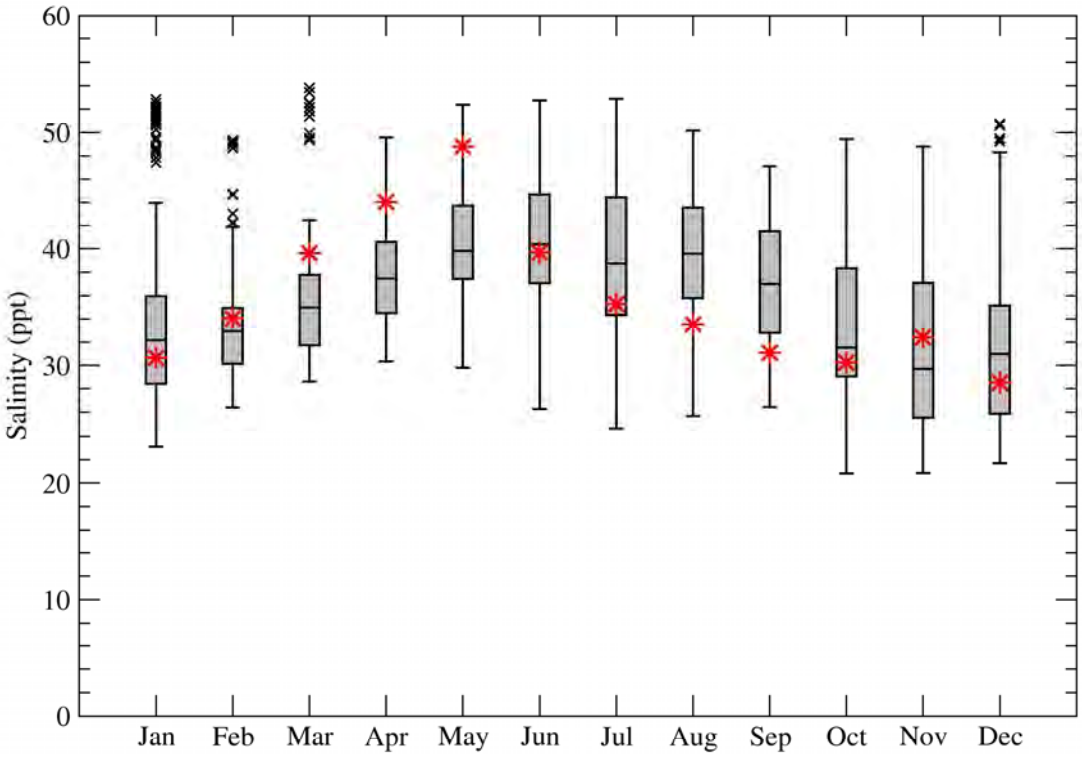


Salinity – Central Region

Long residence time so slower changes in a given year.

Below median for most of rainy season

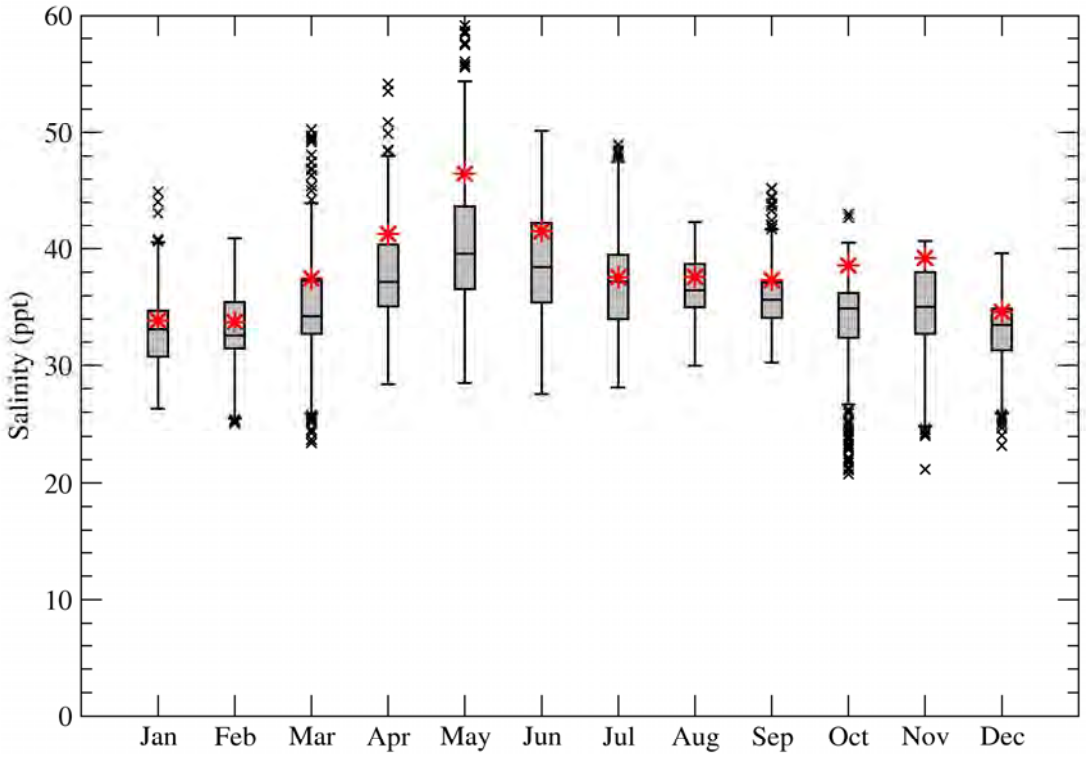
Late-dry season rain affects



Salinity – Western Region

Narrow range

Trending above median, occasionally above 75th percentile

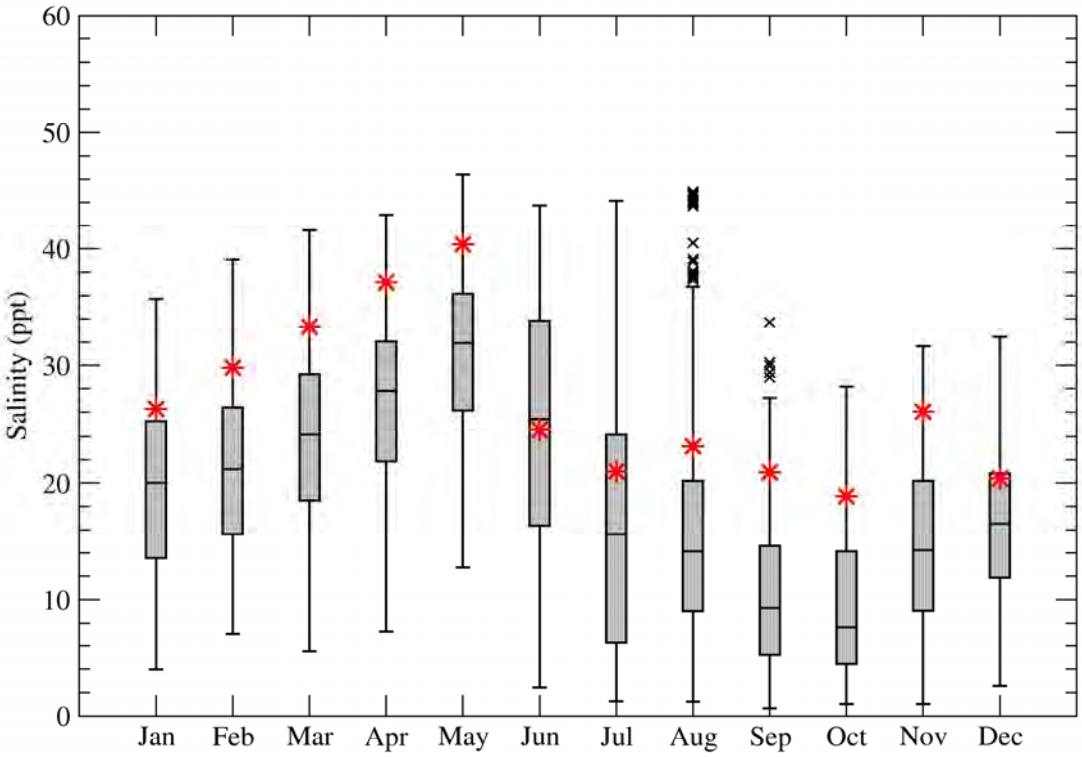


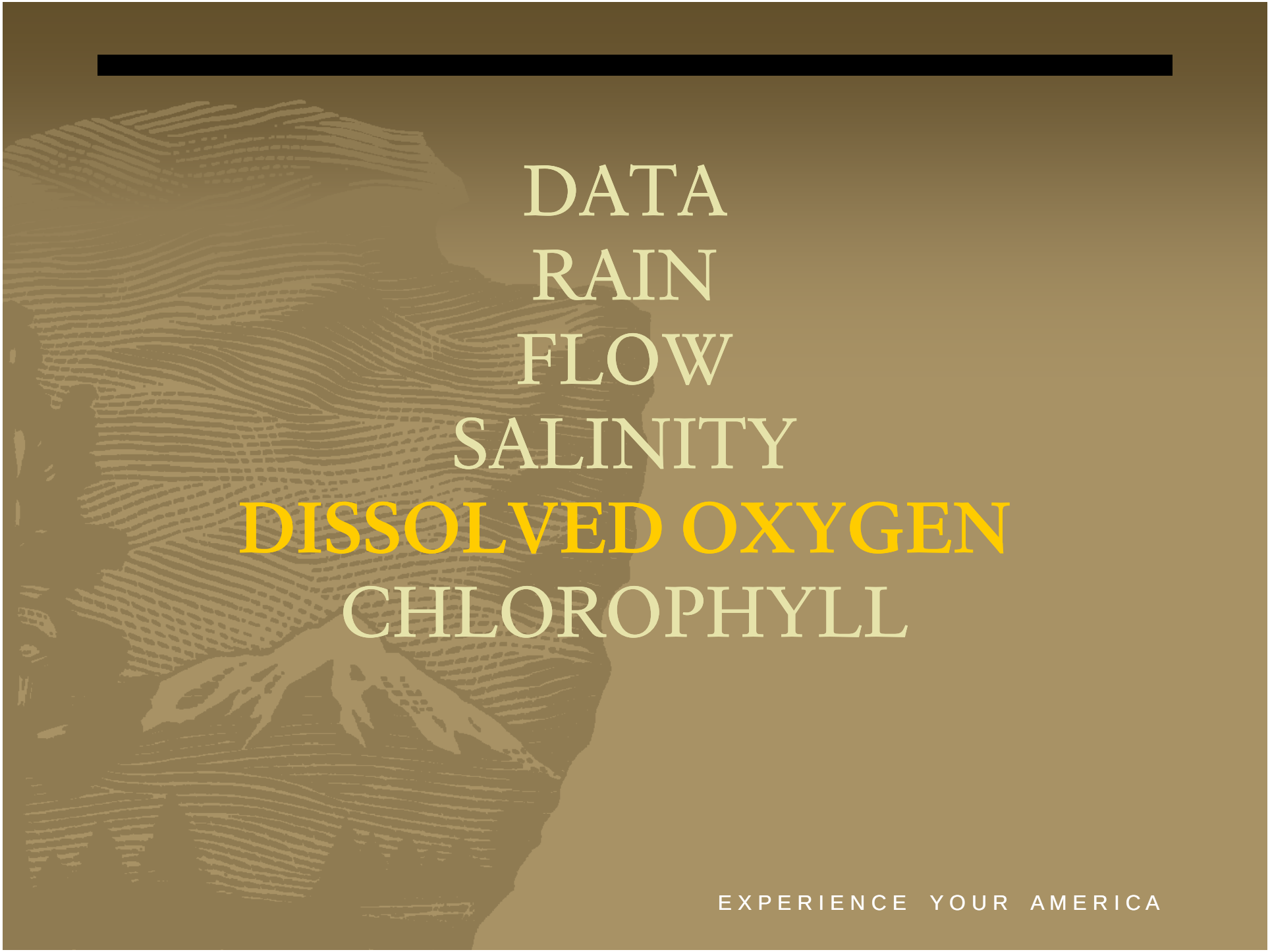
Salinity – Eastern Region

Broad range

Strong influence from discharge and rain events

Above 75 percentile through early dry season and again in late wet season

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Dissolved Oxygen

Running calculation of solubility limit based on hourly salinity and temperature.

*from Garcia & Gordon, *Oxygen solubility in seawater: Better fitting equations*, L&O, 1992.

$$\ln C_o^* = A_0 + A_1 T_s + A_2 T_s^2 + A_3 T_s^2 + A_3 T_s^3 + A_4 T_s^4 + A_5 T_s^5 + S(B_0 + B_1 T_s + B_2 T_s^2 + B_3 T_s^3) + C_0 S^2 \quad (8)$$

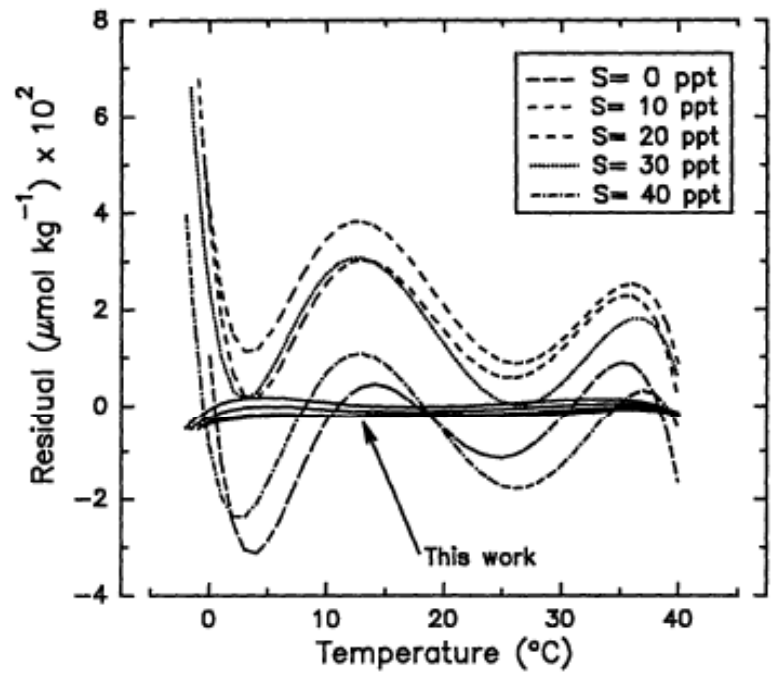
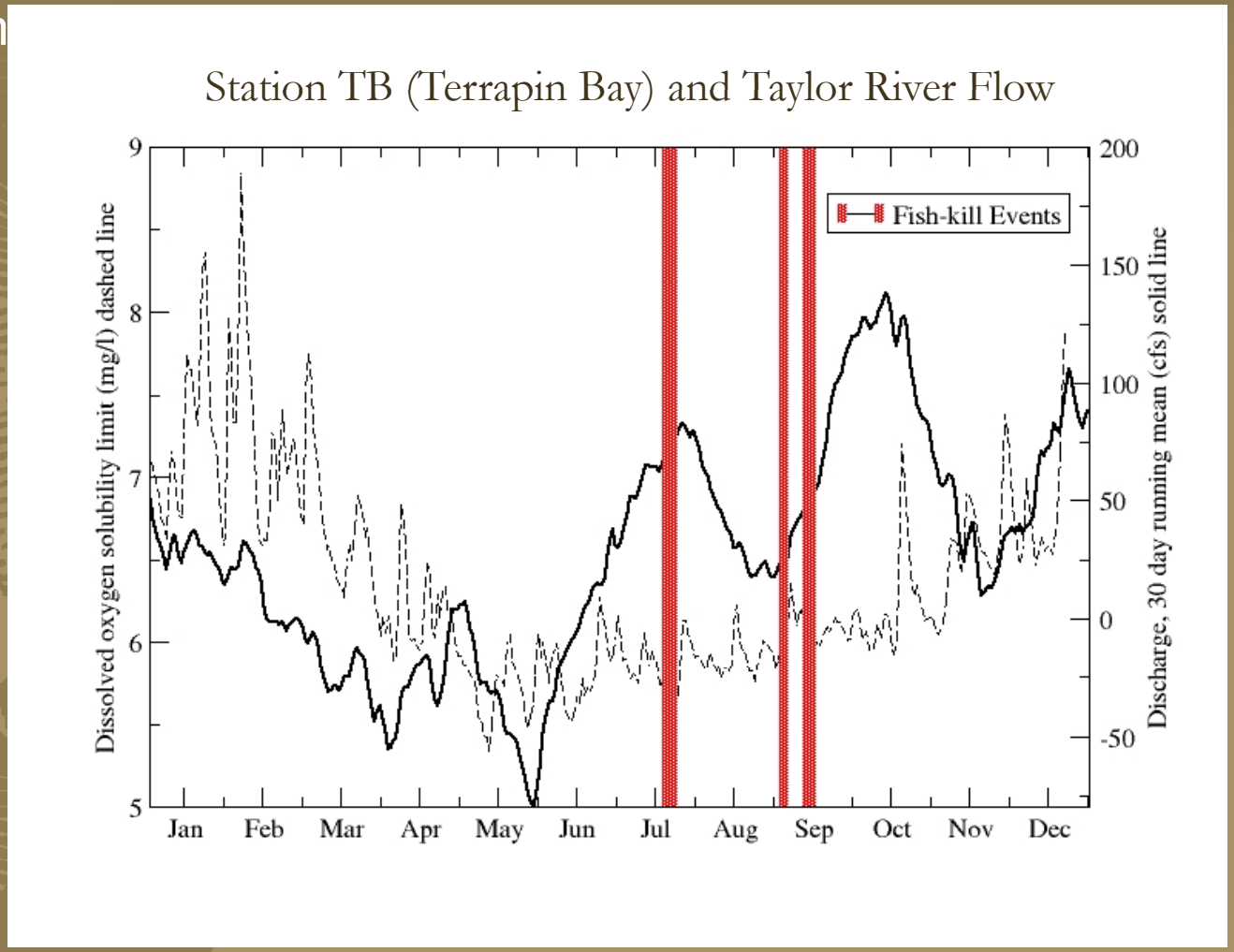


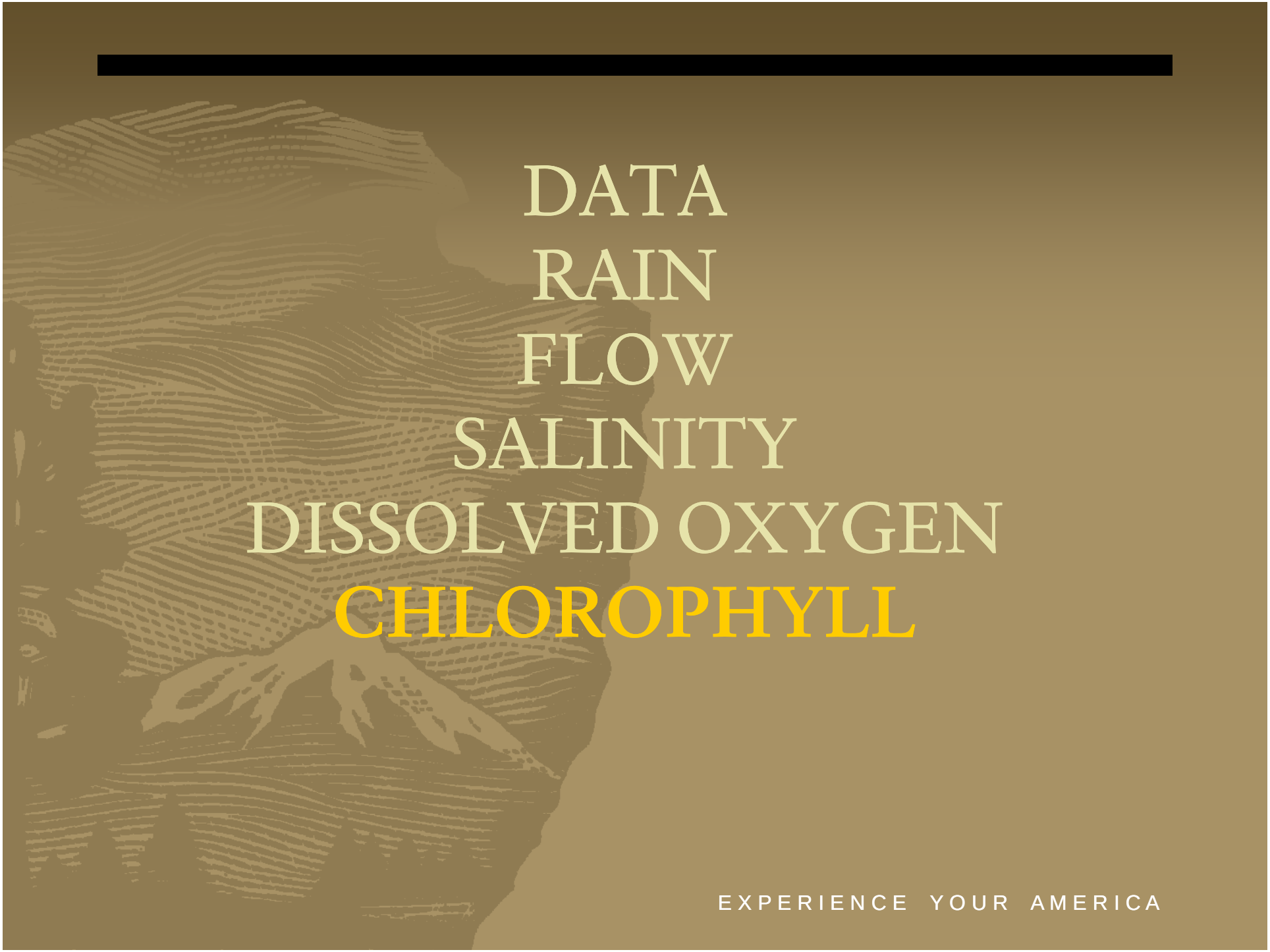
Fig. 3. Residual difference (μmol kg^{-1}) between the C_o^* (at STP, real gas) values from Eq. 4 of Benson and Krause (1984) and their fit with Eq. 5 and our fit with Eq. 8 using coefficients in Table 1 in the range ($t_F \geq t \geq 40$°C; $0 \geq S \geq 40$‰). Solid lines represent the residual of our fit in the same range of t and S.

Dissolved Oxygen

Sample from TB with 2009 fish die-off events highlighted

- No biological component in calculation
- Seasonal lower carrying capacity for O_2 in summer months

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Real time Chlorophyll Data

Two sensors in network, more coming online in 2010

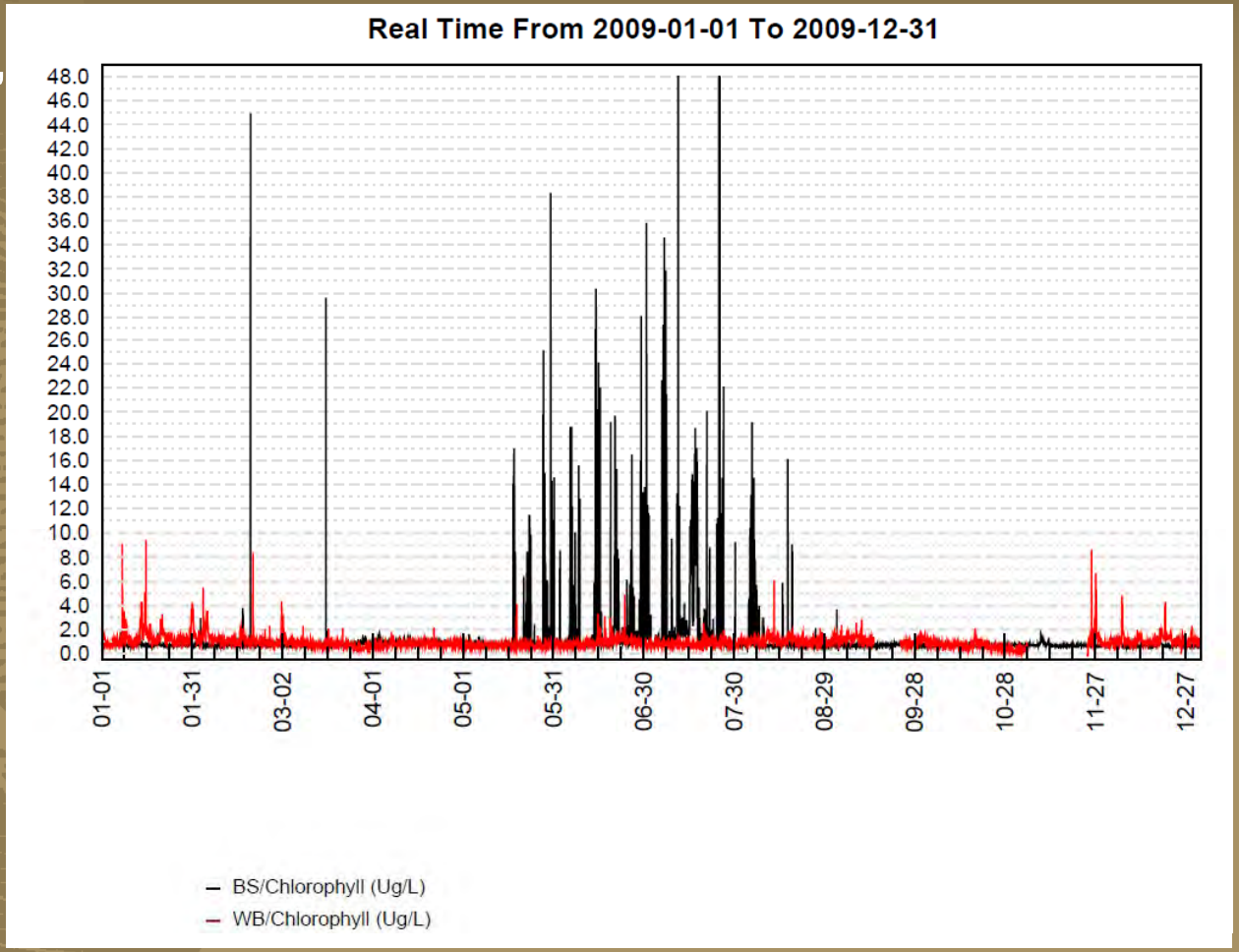
Station WB

0.95 ± 0.49 ug/l

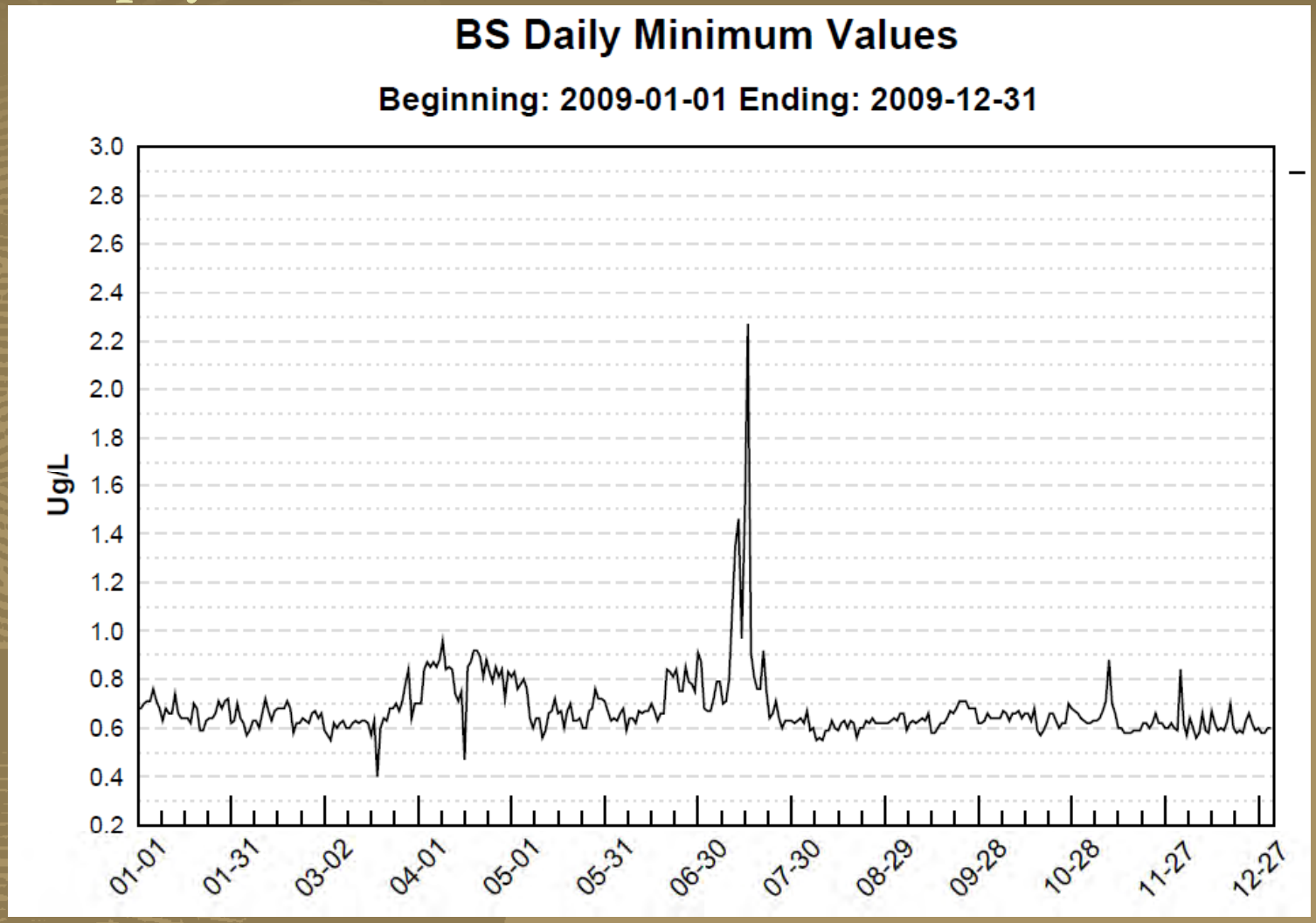
Station BS

1.14 ± 2.39 ug/l

High variability from seagrass interference, improvements in place



Filtered Chlorophyll Data



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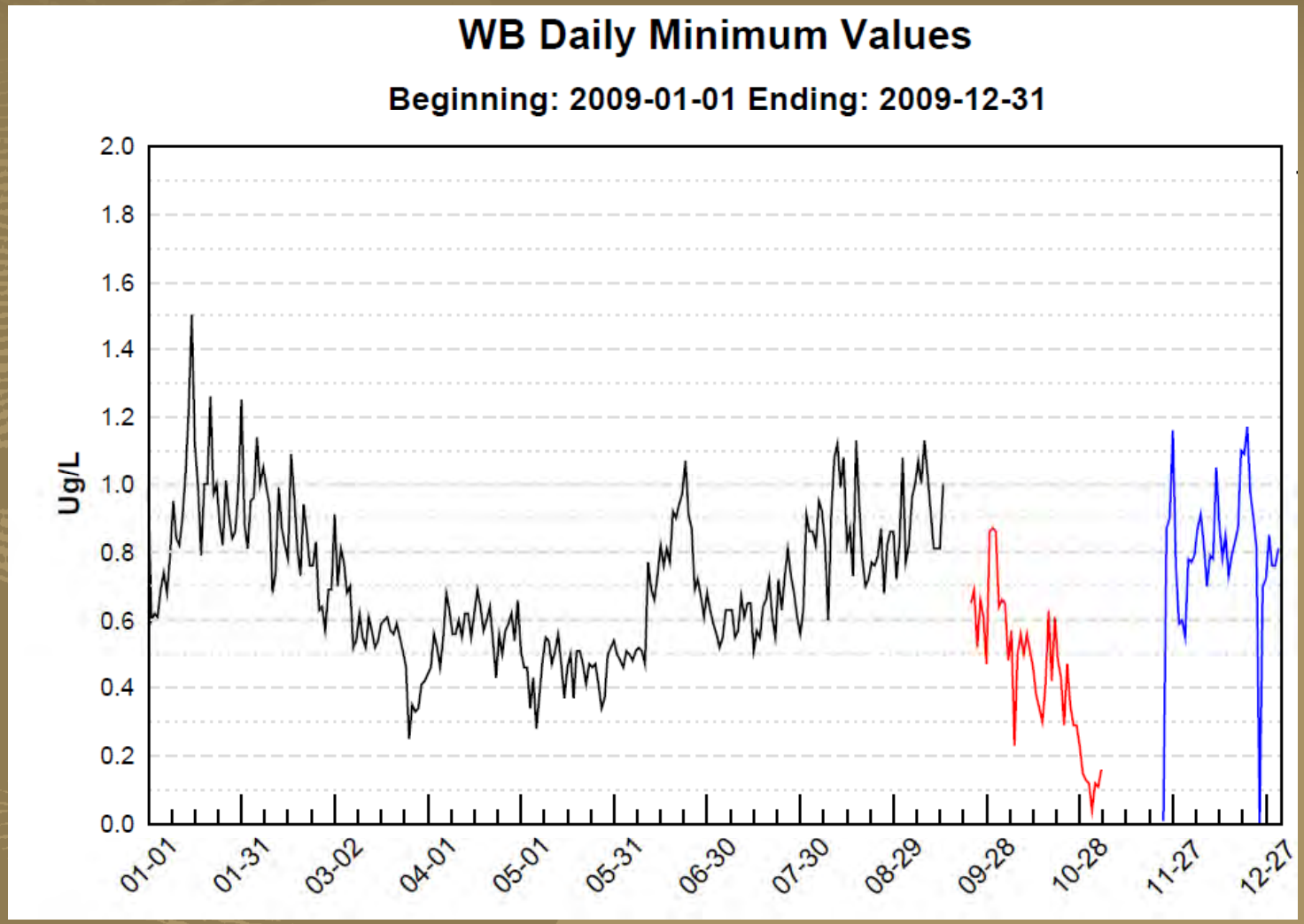


Marine Monitoring Network

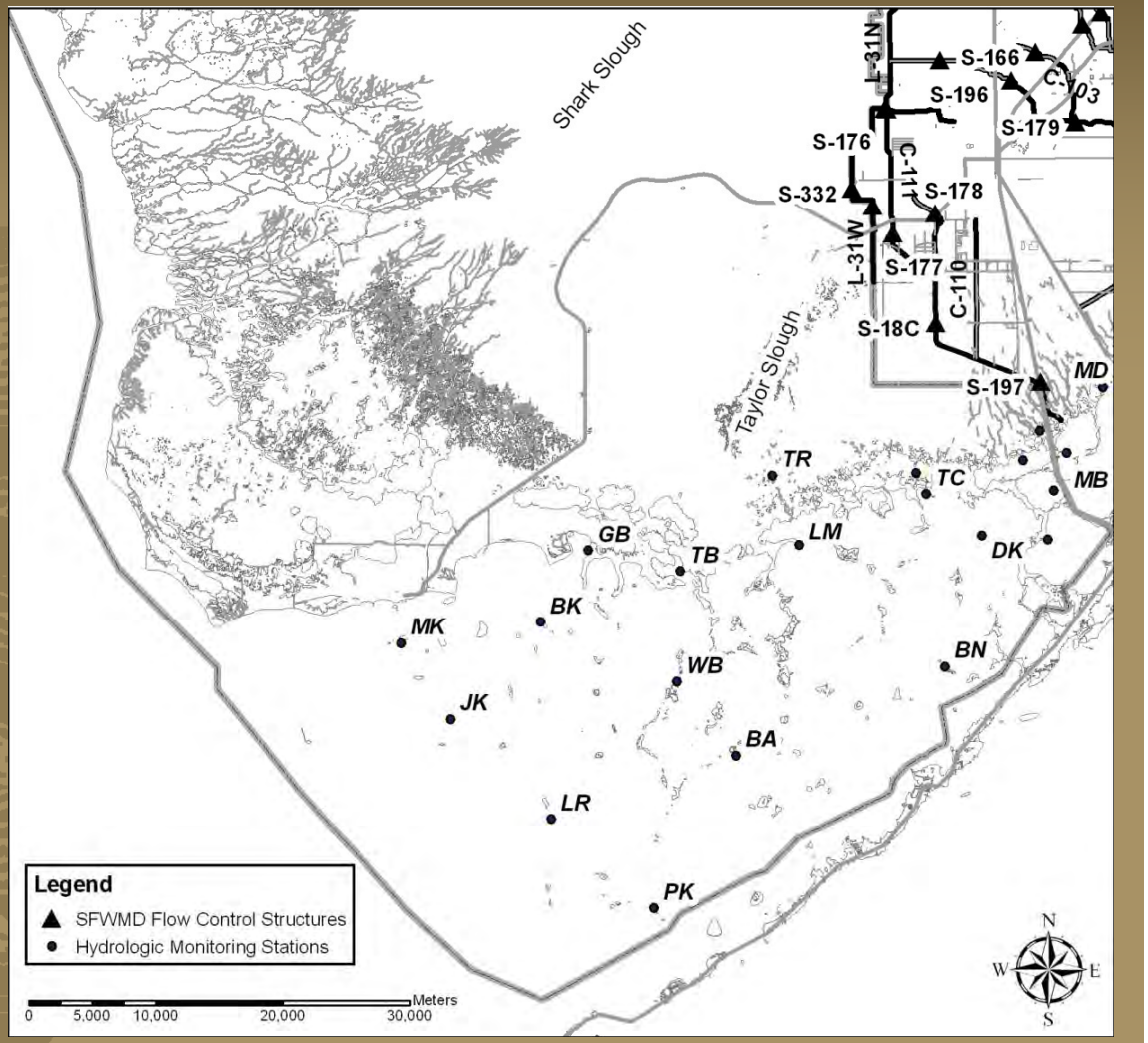
FLBAM! Florida Bay Algal Monitoring Network expanding from 2 to 7 stations in 2010

Also adding dissolved oxygen sensors at stations

Partners:

in-house efforts

external with SFWMD



Contact and References

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Hittle, Clinton, Eduardo Patino, and Mark Zucker, *Freshwater Flow from Estuarine Creeks into Northeastern Florida Bay*, U.S. Geological Survey Water Resources Investigations Report 01-4164, 2001.

Garcia, Hernan E. and Louis I. Gordan, *Oxygen solubility in seawater: Better fitting equations*, Limnology & Oceanography, 37(6), 1307-1312, 1992.

NOAA Climate Prediction Center historic archive and long range forecasts:
http://www.esrl.noaa.gov/psd/enso/enso.current.html#indices
http://www.cpc.ncep.noaa.gov/