Salinity zonation of Pontchartrain Basin SAV and changes in Lake Pontchartrain SAV abundance since 1953 due to ENSO shifts and hurricanes

Michael A. Poirrier*
Claire Caputo Walker

*mpoirrie@uno.edu

SAV Biology

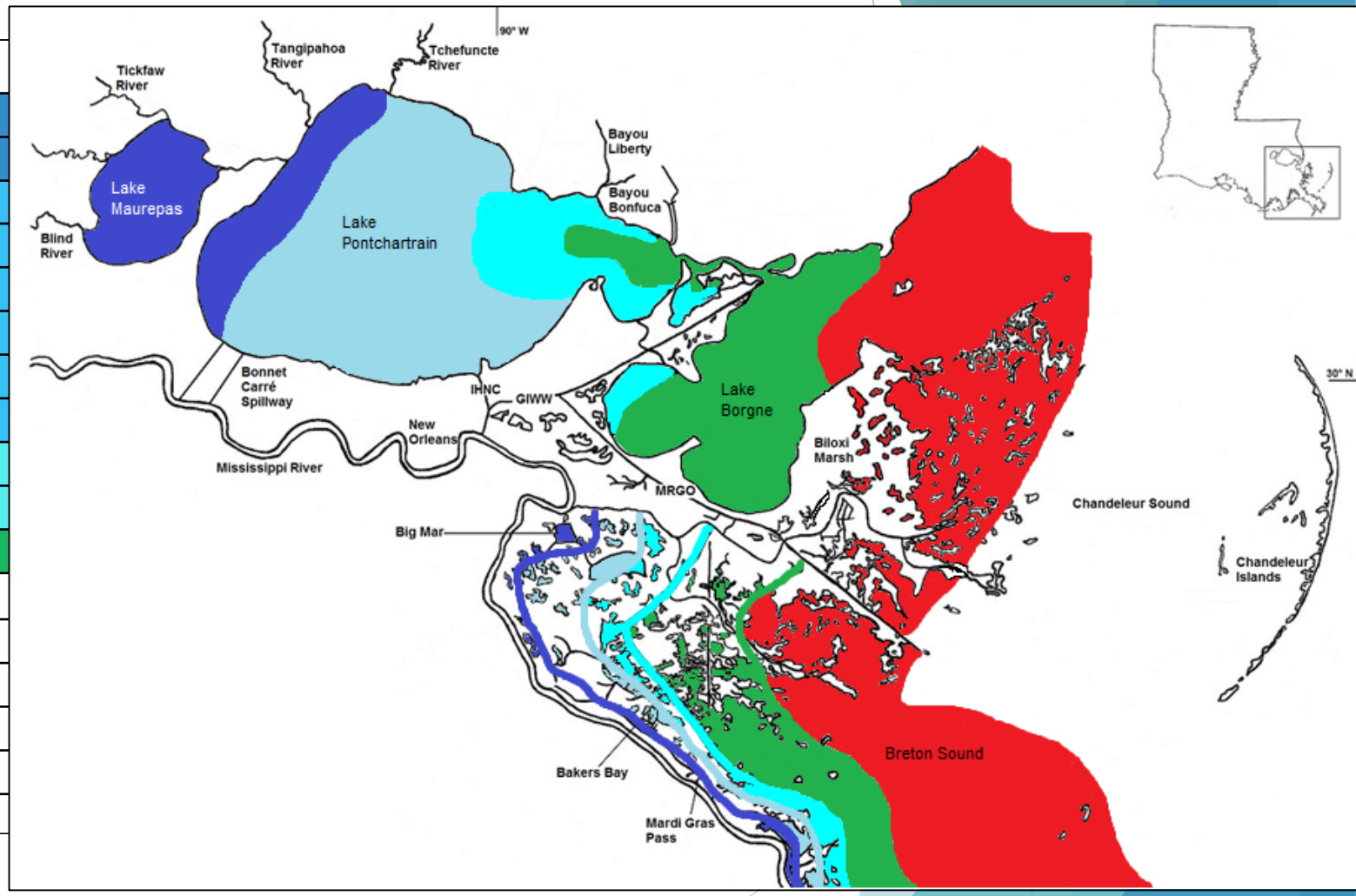
- Submerged aquatic vegetation (SAV) consists of rooted aquatic plants with submersed leaves adapted for living underwater in reduced light.
- They serve as food and habitat and provide other numerous ecosystem services.
- They are generally regarded as essential habitat that is often impaired and needs to be managed.

Origin of Basin SAV

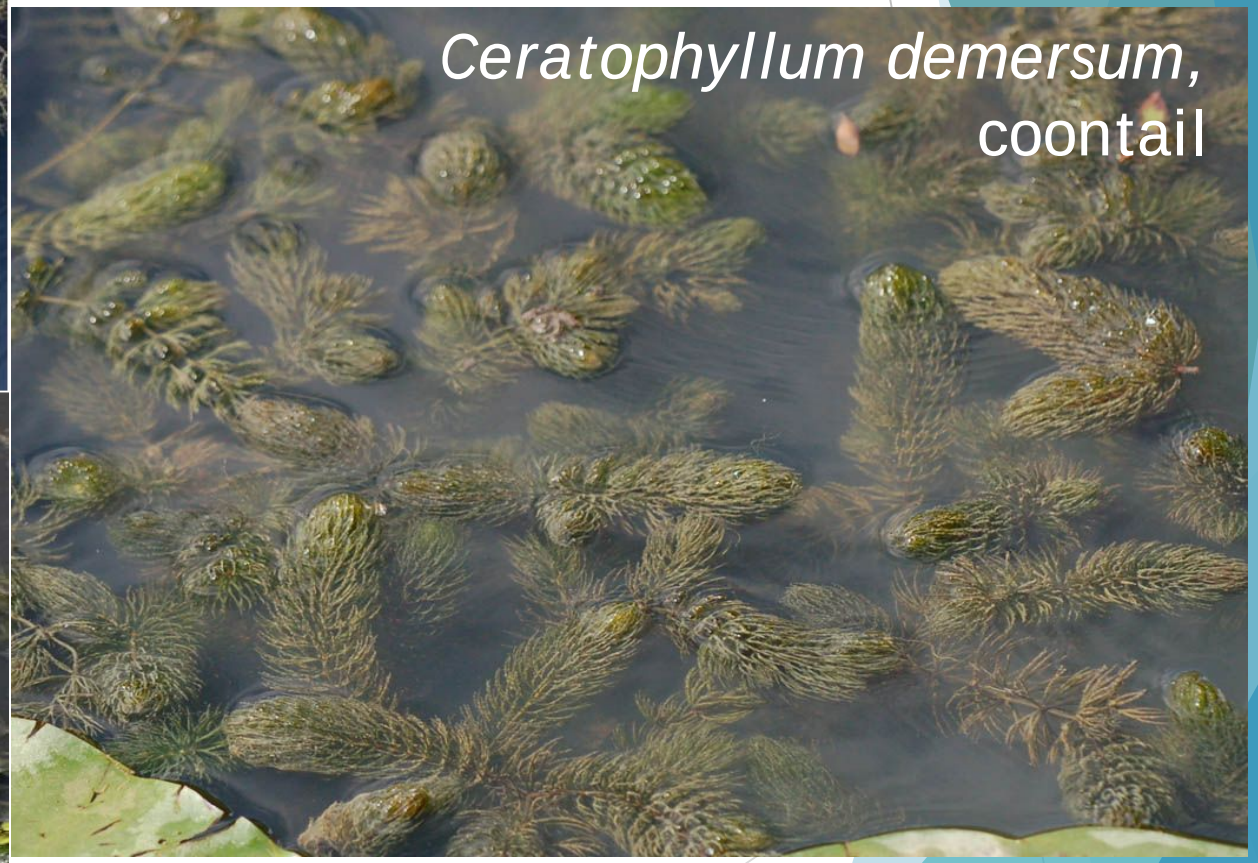
- Contemporary estuaries are geologically recent.
- Marine seagrasses were always present when the Basin was formed, but their up-estuary distribution was limited by their intolerance of lower salinities.
- Inland fresh and brackish plants probably colonized the upper Basin as it was formed.
- Their down-estuary distribution occurs in species zones caused by differences in their tolerances of higher salinity.

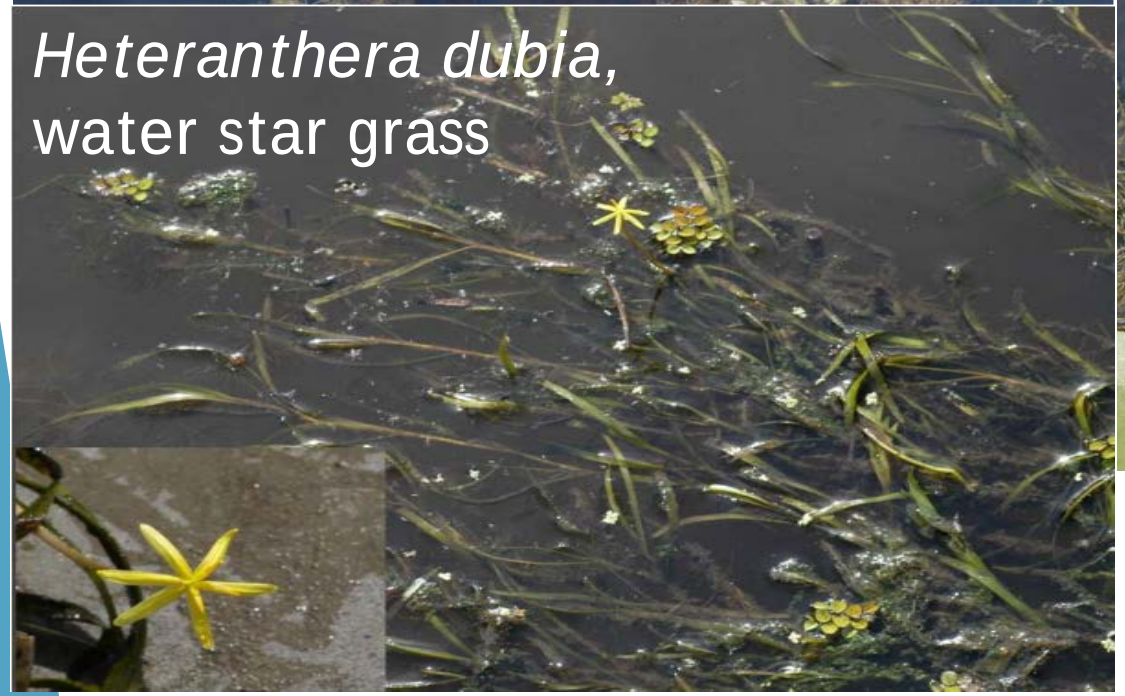
SAV Salinity Zones

Salinity zone/Origin	Species
Salinity <0.5 (I)	*Cabomba caroliniana*
	Potamogeton crispus
Salinity <3.5 (I)	*Ceratophyllum demersum*
	Heteranthera dubia
	Hydrilla verticillata
	Najas guadalupensis
	Potamogeton pusillus
	Potamogeton perfoliatus
Salinity <5 (I)	*Vallisneria americana*
	Zannichellia palustris
Salinity <10 (I)	*Myriophyllum spicatum*
Mean salinity >20 (M) (Basin salinity 27 in 2014, 31 in 2015)	*Halodule wrightii*
	Halophila engelmannii
	Syringodium filiforme
	Thalassia testudinum
Salinity 0.2-31 (E)	*Ruppia maritima*
Inland (I), Marine (M), Euryhaline (E)	

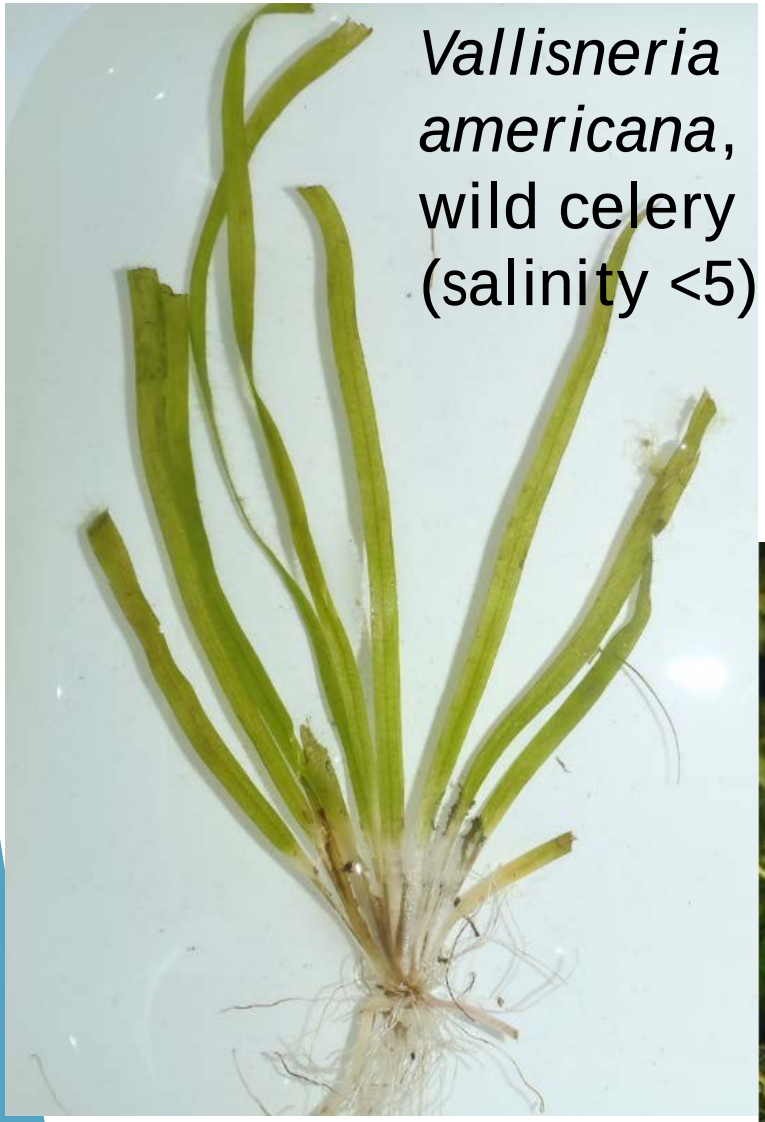


Salinity Zone <3.5





Salinity >3.5
common inland species

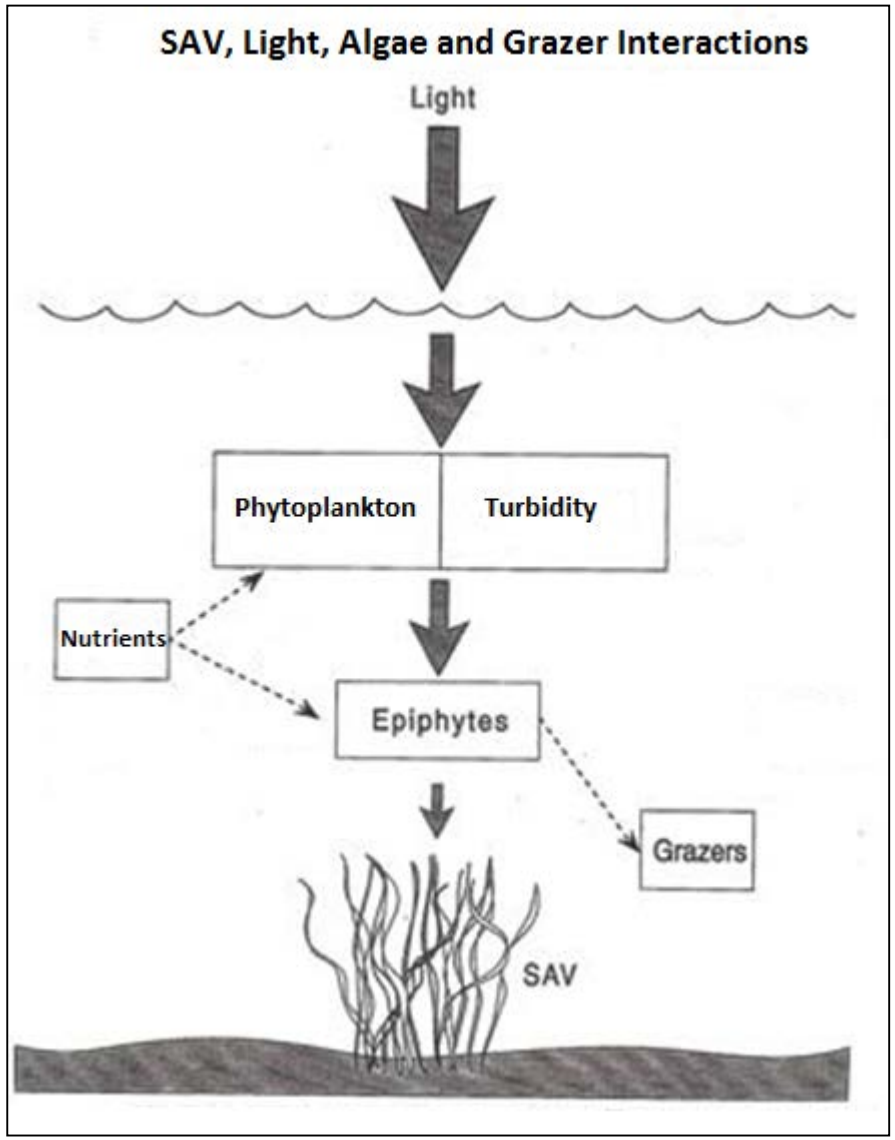


Vallisneria americana, wild celery (salinity <5)

Myriophyllum spicatum, Eurasian milfoil (salinity <10)

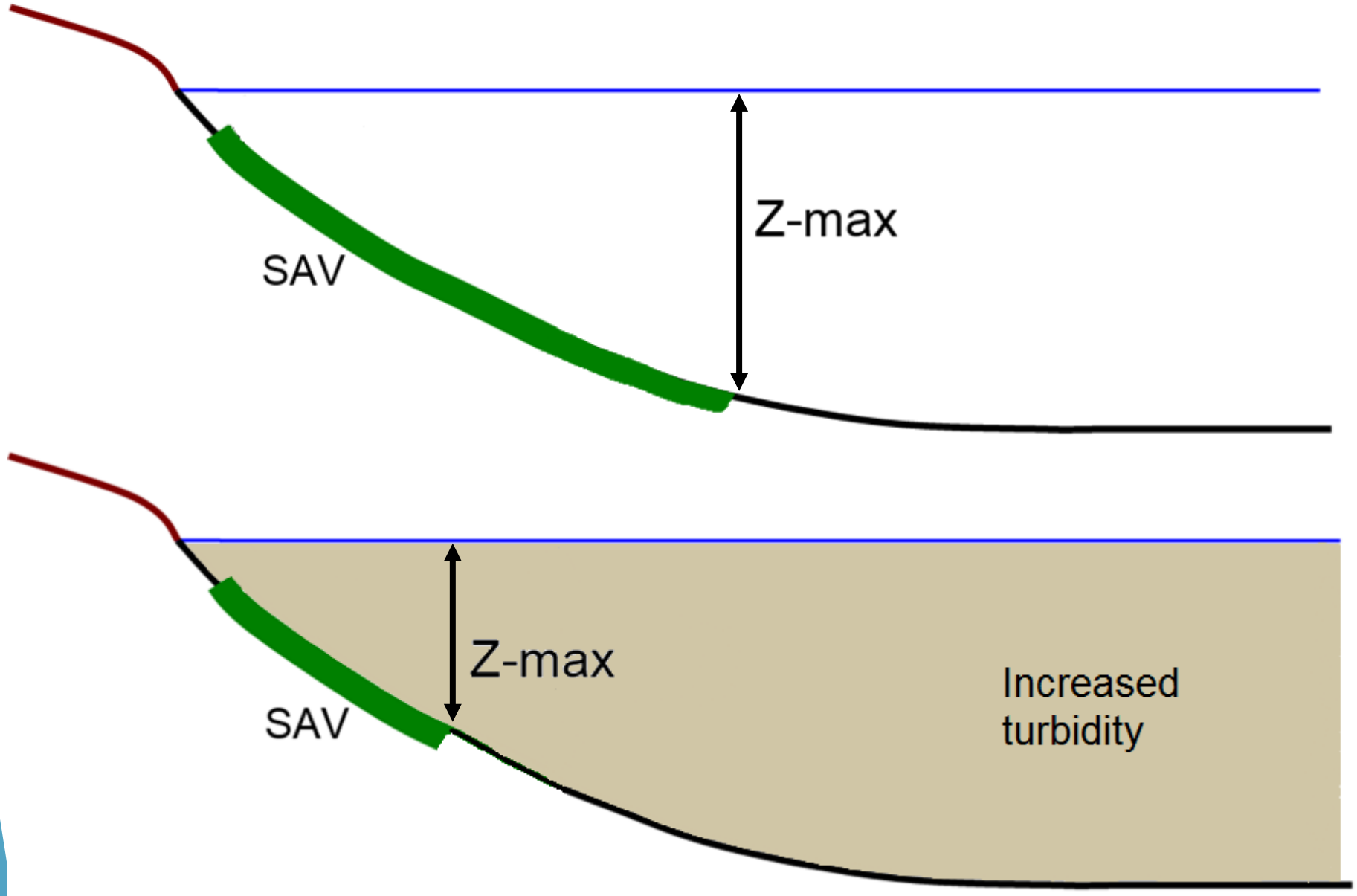
Ruppia maritima, widgeon grass (salinity 0.2-31)

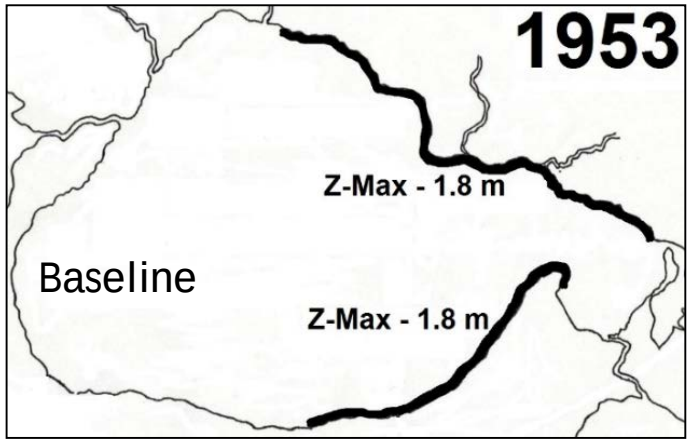
Factors that affect SAV abundance

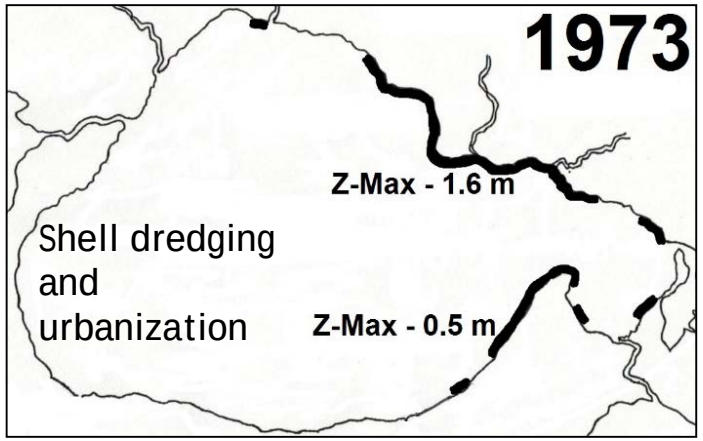


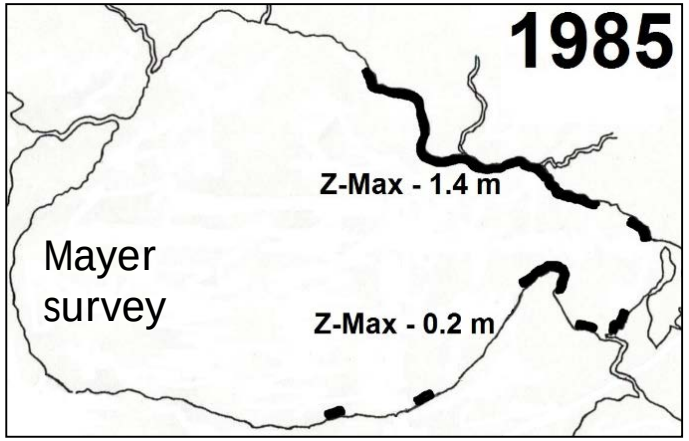
- Available light controls maximum colonization depth and abundance.
- Nutrients can increase density, they can also limit SAV growth by decreasing light due to increasing phytoplankton and algal epiphyte growth.
- Abundant clams and slow flushing rates in Lake Pontchartrain can increase water clarity, promoting SAV growth in deeper waters.
- Algal epiphyte grazers are also important in reducing shading.

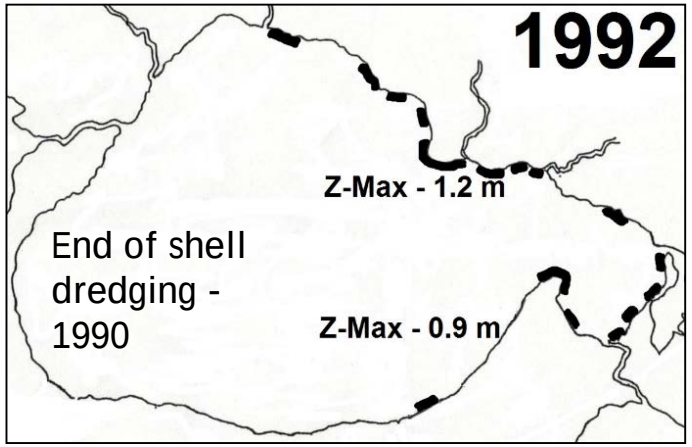
Z-max: Maximum colonization depth

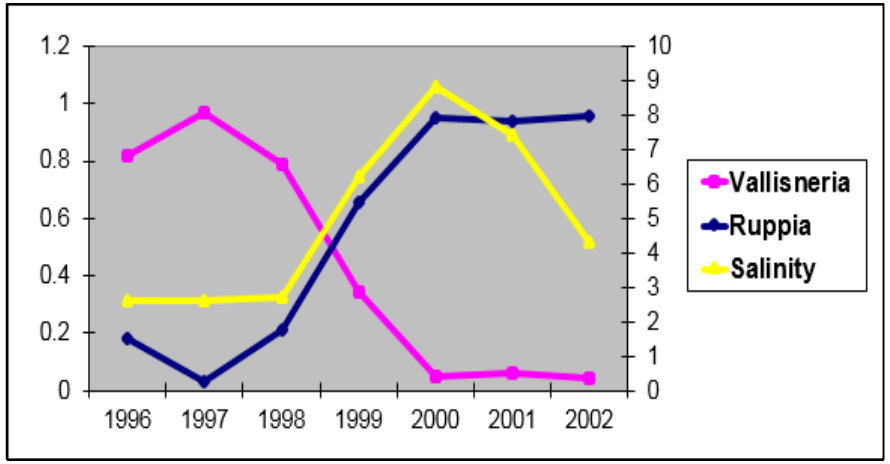


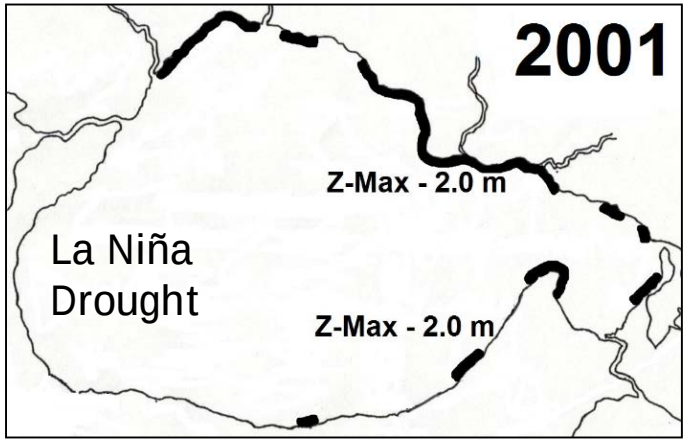

1953
Z-Max - 1.8 m
Baseline
Z-Max - 1.8 m

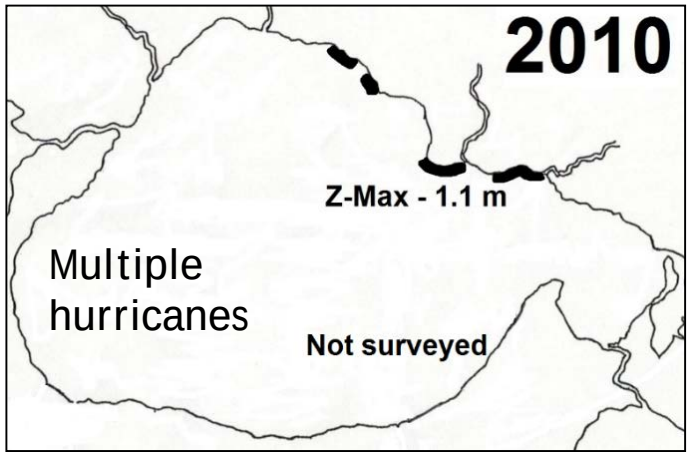

1973
Z-Max - 1.6 m
Shell dredging
and
urbanization
Z-Max - 0.5 m

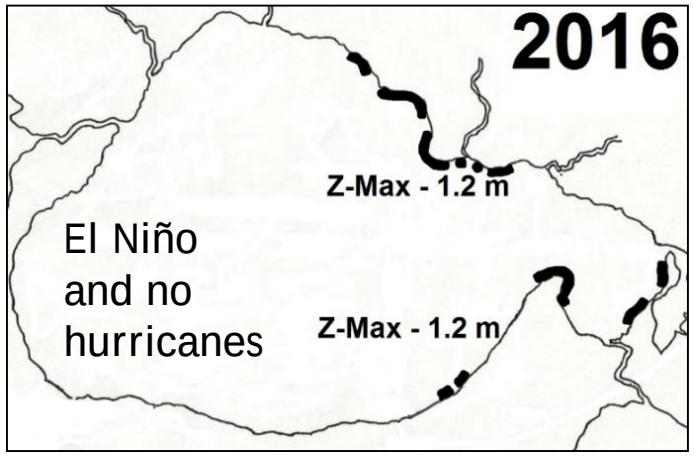

1985
Z-Max - 1.4 m
Mayer
survey
Z-Max - 0.2 m


1992
Z-Max - 1.2 m
End of shell
dredging -
1990
Z-Max - 0.9 m


1.2
1
0.8
0.6
0.4
0.2
0
10
9
8
7
6
5
4
3
2
1
0
1996
1997
1998
1999
2000
2001
2002
Vallisneria
Ruppia
Salinity


2001
Z-Max - 2.0 m
La Niña
Drought
Z-Max - 2.0 m


2010
Z-Max - 1.1 m
Multiple
hurricanes
Not surveyed


2016
Z-Max - 1.2 m
El Niño
and no
hurricanes
Z-Max - 1.2 m

Major Restoration Points

- SAV salinity zonation exists and is the most important factor driving species distribution.
- El Niño Southern Oscillation Shifts can change SAV species composition and abundance.
- Relatively high rates of sea level rise coupled with barrier island and wetland loss are increasing effects of hurricane storm surges on SAV.
- SAV restoration does not have a straight line trajectory.

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